About CLEO

Technical Conference:
11 - 15 May 2020
Pacific Daylight Time Zone (PDT)

The 2020 CLEO Conference: An All-virtual Presentation

The CLEO co-sponsors are pleased to announce that the CLEO Technical Conference will be held in an all-virtual, web conference format, 11 - 15 May. Technical sessions will be presented live from the Pacific Daylight Time Zone (PDT) with a recorded archive available later for on-demand viewing. Authors will pay a US$ 100 publishing fee; all others can access the conference at no cost.

What Will be Presented Online?

1. All technical sessions (including invited speakers and contributed oral and poster presentations)
2. The two plenary sessions, tutorials, workshops, special symposia and Applications & Technology Topical Reviews
3. Select industry-based, “show floor” programs (to be determined)

CLEO Short Courses have been cancelled. The show floor (exhibition) component of the conference will not be presented this year.

The Virtual Presentation

1. The virtual program will be presented live using the Zoom web conferencing platform.
2. Presentations will be a hybrid of prerecorded content and live presentations—dependent upon speaker preference.
3. Poster presentations will be offered as PDF files with (tentatively) an accompanying Q&A session.
4. The flexible platform allows for interactive, two-way communications between speakers and audience, and can accommodate individual speakers through multi-participant panels.
5. Technical sessions will be recorded and made available to registrants for on-demand, archived viewing.

Schedule and Operations

1. CLEO will be presented with a slight schedule change—now starting on Monday, 11 May.
2. The virtual schedule will follow the published agenda of sessions.
3. All participants will receive access to the live technical sessions, recorded/archived content and the Technical Digest.

Registration

1. Any individual who has previously registered for the congress will automatically receive a full refund. No action is required to initiate the request.
2. Refunds will be issued back to the original payment method used and may take up to six weeks to process.

Note: Even though your registration fee will be refunded, you retain your access to participate in the virtual meeting. You will not have to register again.

The CLEO co-sponsors look forward to presenting this virtual solution that benefits speakers and attendees while ensuring the well-being of all participants.

Special Events

What's Next in Integrated Photonics - Hot Topics at CLEO: 2020

Monday, 11 May, 12:30 - 13:30

Join the OSA Integrated Photonics Technical Group for a panel discussion on Monday. Our featured presenters will give their perspective on the exciting research that will be presented at CLEO: 2020. These presentations will be followed by a moderated question and answer session, discussing the highlights in integrated photonics at the Conference. This event is an excellent opportunity to hear from experts in the field on exciting new areas in integrated photonics. Panelists include John Bowers, UC Santa Barbara; Peter Rakich, Yale University; and Paulina Kuo, NIST.

Meet the OSA Journal Editors

Tuesday, 12 May, 07:00 - 08:00

Q&A Session with Prem Kumar (*Optica*), James Leger (*Optics Express*), and Alexandra Boltasseva (*Optical Materials Express*)

Hear from three OSA Publishing Editors who welcome your questions, ideas, and concerns. Join the online event to learn more about journal acceptance criteria, responding to review requests, addressing reviewer feedback, and other topics of interest. All are welcome!

Moderators:
Alison Taylor, *The Optical Society, USA*

Kelly Cohen, *The Optical Society, USA*

Speakers:
Editor-in-Chief, *Optica*
Prem Kumar, *Northwestern University, USA*

Editor-in-Chief, *Optics Express*
James Leger, *University of Minnesota, USA*

Editor-in-Chief, *Optical Materials Express*
Alexandra Boltasseva, *Purdue University, USA*

The Brightest Light Initiative: The Future of Intense Ultrafast Lasers in the United States

Tuesday, 12 May, 10:15 - 11:30

The U.S. intense ultrafast laser community has put forward a strategy to prioritize research and build new facilities. Come hear about the Brightest Light Initiative, developed by over 100 leading scientists, that plots the U.S. path for this exciting field.

The panelists encourage the audience to send questions they would like answered in advance so that the panelists can prepare answers. Questions can be sent to dlang@osa.org.

Moderator:
Jonathan D. Zuegel, *Professor of Optics; Director, Laser Development and Engineering Division, Laboratory for Laser Energetics, USA*

Speakers:
Félicie Albert, *Staff Scientist and Deputy Director, High Energy Density Science Center, Lawrence Livermore National Laboratory, USA*

Roger Falcone, *Professor, University of California at Berkeley*

Lidar Design Trade-offs and Selection Criteria for Autonomous Applications

Tuesday, 12 May, 10:15 - 11:00

This is an overview of how lidar systems are designed, including performance trade-offs, and how this information should be used to guide the selection of the most suitable lidar product for a mobility application.

Moderator:
Michael Mielke, *Iradion Laser Inc., USA*

Speaker:
Umar Piracha, *Staff Lidar Systems Engineer, AEye Inc.*

M&A and Financing Activity in Sensors for ADAS and Autonomous Mobility

Tuesday, 12 May, 11:15 - 11:45

This talk will review the corporate finance trends and key transactions in the market for sensors for ADAS and Autonomous mobility. The talk will examine M&A and finance trends for companies in LiDAR, Radar, Vision, and Thermal Imaging.

Moderator:
Michael Mielke, *Iradion Laser Inc., USA*

Speaker:
Rudy Burger, *Managing Partner, Woodside Capital*

What's Next in Ultrafast Optics – Hot Topics at CLEO: 2020

Tuesday, 12 May, 11:45 - 12:45

This panel discussion, organized by the OSA Ultrafast Optical Phenomena Technical Group, will present the exciting and hot topics in ultrafast optics featured at CLEO: 2020. Short presentations from our panelists highlighting important themes from the conference will be followed by a moderated question and answer session.

Organizer:
Ultrafast Optical Phenomena Technical Group

This OSA Technical Group is interested in the rapidly expanding field of ultrashort pulse lasers and other broadband coherent sources and their application to problems in science and technology. Current themes involve methods for using short pulses for studying the dynamics and structural changes of systems on very short timescales, including novel methods for probing physical and chemical processes with extreme temporal resolution, and applications of ultrashort pulses in photonics, communications, microscopy, biomedicine and other emerging areas.

MONSTR Sense Product Showcase

Tuesday, 12 May, 15:05 - 15:25

Talk Title: Ultrafast Coherent Spectrometer for Microscopy; and Lock-in Spectrometer

Toptica Photonics Product Showcase

Tuesday, 12 May, 16:35 - 16:55

Cycle GmbH Product Showcase

Wednesday, 13 May, 10:05 - 10:25

OIDA Roadmap on Quantum Photonics

Wednesday, 13 May, 10:15 - 11:15

This session will briefly present highlights from the new OIDA quantum photonics roadmap, released this spring. The panelists will discuss their perspectives on some of the key findings, and their own views on what is needed for optics and photonics to commercialize quantum technology. The OIDA roadmap will be available to the public on 1 June 2020 on the OSA website.

Moderator:
Tom Hausken, *Senior Science Advisor, The Optical Society, USA*

Speakers:
Celia Merzbacher, *Quantum Economic Development Consortium Associate Director, SRI International*

Mark Tolbert, *President, Toptica Photonics, Inc.*

John Spencer, *President and CEO, Photodigm, Inc.*

Manipulating Quantum Systems: An Assessment of Atomic, Molecular, and Optical Physics in the U.S by the U.S. National Academy of Sciences

Wednesday, 13 May, 15:30 - 16:30

There have been considerable advances in atomic, molecular, and optical (AMO) science in the decade since the last NAS survey of the field. These advances have fundamentally changed not only AMO science but have also strengthened its impact and relationship to other subfields of physics and other areas of science. In this session NAS study co-chair Nergis Mavalvala, Massachusetts Institute of Technology, will discuss the survey's findings on the status and future directions of for the next decade.

Speakers:
Nergis Mavalvala, *Massachusetts Institute of Technology Kavli Institute for Astrophysics and Space Research, USA*

CLEO

Laser Science to Photonic Applications

Technical Conference:
9 - 14 May 2021
Exhibition:
11 – 13 May 2021

San Jose McEnery Convention Center
San Jose, California, USA

San Jose McEnery Convention Center
San Jose, California, USA

Schedule

Monday, 11 May

All Times are Pacific Time (US & Canada) (UTC - 07:00)

8:00 - 9:45 (UTC - 07:00)

Integrated Photonics for Neural Networks and Deep Learning (SM1E)
Presider: Ozdal Boyraz, *University of California Irvine*

8:00 - 8:30	**(Withdrawn) Deep Learning Inference Requirements on Analog Device Performance (SM1E.1)** **Presenter**: Gilbert Hendry, *Lightelligence* Expand for Abstract / Authors Lightelligence is using silicon photonic technology to accelerate industry standard deep learning workloads. This talk will focus on how algorithmic requirements drive the physical design of electro-optical and mixed-signal devices in a hybrid digital/analog system. **Authors**:Gilbert Hendry/Lightelligence Invited	
8:30 - 8:45	**Tunable Nonlinear Activation Functions for Optical Neural Networks (SM1E.2)** **Presenter**: Ian Williamson, *Stanford University* Expand for Abstract / Authors We introduce an electro-optic hardware platform for realizing optical nonlinearities and demonstrate that, as a nonlinear activation function, it can substantially improve the classification performance of optical neural networks. **Authors**:Ian Williamson/Stanford University Tyler Hughes/Stanford University Momchil Minkov/Stanford University Sunil Pai/Stanford University Ben Bartlett/Stanford University Shanhui Fan/Stanford University	Paper
8:45 - 9:00	**Improving the Inference Accuracy of Diffractive Optical Neural Networks Using Class-specific Differential Detection (SM1E.3)** **Presenter**: jingxi li, *University of California, Los Angeles* Expand for Abstract / Authors We report all-optical object classification systems that are based on class-specific design of diffractive neural networks followed by a differential detection scheme. The blind inference accuracies achieved through this framework are significantly enhanced. **Authors**:jingxi li/University of California, Los Angeles Deniz Mengu/University of California, Los Angeles Yi Luo/University of California, Los Angeles Yair Rivenson/University of California, Los Angeles Aydogan Ozcan/University of California, Los Angeles	Paper

9:00 - 9:15

Digital Optical Neural Networks for Large-Scale Machine Learning (SM1E.4)
Presenter: Liane Bernstein, *Massachusetts Institute of Technology*
Expand for Abstract / Authors

Paper

We propose a digital incoherent optical neural network architecture using the passive data routing and copying capabilities of optics for artificial neural network acceleration. We demonstrate a proof-of-concept experiment and analyze optimal use cases.

Authors:Liane Bernstein/Massachusetts Institute of Technology Alexander Sludds/Massachusetts Institute of Technology Ryan Hamerly/Massachusetts Institute of Technology Vivienne Sze/Massachusetts Institute of Technology Joel Emer/Massachusetts Institute of Technology Dirk Englund/Massachusetts Institute of Technology

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9:15 - 9:30

Parallel Fault-Tolerant Programming and Optimization of Photonic Neural Networks (SM1E.5)
Presenter: Sunil Pai, *Stanford University*
Expand for Abstract / Authors

Paper

We propose and numerically demonstrate a fault-tolerant, efficient parallel nullification protocol to program and error-correct photonic neural networks for energy-efficient machine learning tasks.

Authors:Sunil Pai/Stanford University Ian Williamson/Stanford University Momchil Minkov/Stanford University Tyler Hughes/Stanford University Olav Solgaard/Stanford University Shanhui Fan/Stanford University David Miller/Stanford University

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9:30 - 9:45

Demonstration of an Optoelectronic Excitatory & Inhibitory Neuron for Photonic Spiking Neural Networks (SM1E.6)
Presenter: Yun-Jhu Lee, *University of California, Davis*
Expand for Abstract / Authors

Paper

We designed, simulated, prototyped, and experimentally demonstrated an optoelectronic neuron with excitatory and inhibitory inputs. LTSpice simulation and experimental results closely resemble the Izhikevich model, and inhibitory input negates excitatory input to suppress output spikes.

Authors:Yun-Jhu Lee/University of California, Davis Mehmet Berkay On/University of California, Davis Xian Xiao/University of California, Davis S. J. Ben Yoo/University of California, Davis

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8:00 - 10:00 (UTC - 07:00)

Symp: Tunable and Nonlinear Optical Metasurfaces: Progress and Applications I (JM1G)
Presider: Ho Wai Lee, *Baylor University*

Special Symposium

8:00 - 8:30	**Merging Machine Learning with Quantum Photonics: Rapid Classification of Quantum Sources (JM1G.1)** **Presenter**: Vladimir Shalaev, *Purdue University* Expand for Abstract / Authors Single quantum emitters offer useful functionalities for quantum optics and sensing, but the characterization of their properties is time consuming due to low photodetection rates. We have demonstrated that machine learning assisted data analysis can dramatically reduce data collection time(<1s) and increase accuracy for measurements of second-order fluorescence autocorrelation(>90%). **Authors**:Vladimir Shalaev/Purdue University Invited	
8:30 - 9:00	**Flat Optics for Active Wavefront Manipulation (JM1G.2)** **Presenter**: Mark Brongersma, *Stanford University* Expand for Abstract / Authors In this presentation, I will highlight recent efforts in our group to realize electrically-tunable metasurfaces employing nanomechanics, microfluidics, phase change materials, and atomically-thin semiconductors. Such elements can find application in systems for optical beam steering and wavefront manipulation as well as dynamic holography **Authors**:Mark Brongersma/Stanford University Invited	
9:00 - 9:15	**Universal active metasurfaces for dynamic beam steering and reconfigurable focusing at telecommunication wavelengths (JM1G.3)** **Presenter**: Ghazaleh Shirmanesh, *California Institute of Technology* Expand for Abstract / Authors We report the design and experimental demonstration of a ‘universal’ reconfigurable metasurface, which by electrical control of individual metasurface elements, enables both dynamic beam steering and reconfigurable focusing. **Authors**:Ghazaleh Shirmanesh/California Institute of Technology Ruzan Sokhoyan/California Institute of Technology Pin Chieh Wu/California Institute of Technology Harry Atwater/California Institute of Technology	Paper

9:15 - 9:30	**All-Dielectric Intersubband Polaritonic Metasurface with Giant Second-Order Nonlinear Response (JM1G.4)** **Presenter**: Raktim Sarma, *Sandia National Labs* Expand for Abstract / Authors We demonstrate an extremely nonlinear all-dielectric metasurface that employs intersubband polaritons to achieve a second-harmonic conversion coefficient of 3 mW/W^2, and second-harmonic power conversion efficiency of 0.045% at a modest pump intensity of 6.7 kW/cm^2. **Authors**:Raktim Sarma/Sandia National Labs Jiaming Xu/University of Texas at Austin Domenico de Ceglia/University of Padova Nishant Nookala/University of Texas at Austin Luca Carletti/University of Padova Salvadore Campione/Sandia National Labs John Klem/Sandia National Labs Sylvain Gennaro/Sandia National Labs Michael Sinclair/Sandia National Labs Mikhail Belkin/University of Texas at Austin Igal Brener/Sandia National Labs	Paper
9:30 - 10:00	**Nonlinear plasmonic metasurfaces using multiresonant surface lattice resonances (JM1G.5)** **Presenter**: Orad Reshef, *University of Ottawa* Expand for Abstract / Authors Surface lattice resonances exhibit the highest quality-factors in metasurfaces containing plasmonic nanoparticles. We present our recent results in developing multiresonant high-Q metasurfaces for various nonlinear applications, including efficient harmonic generation and optical-switching. **Authors**:Orad Reshef/University of Ottawa Md Saad-Bin-Alam/University of Ottawa N. Apurv Chaitanya/Tecnologico de Monterrey Timo Stolt/Tampere University Ryan Hogan/University of Ottawa Mohammad Karimi/University of Ottawa M. Zahirul Alam/University of Ottawa Graham Carlow/Iridian Spectral Technologies Inc Brian Sullivan/Iridian Spectral Technologies Inc Israel De Leon/Tecnologico de Monterrey Jean-Michel Ménard/University of Ottawa Mikko Huttunen/Tampere University Ksenia Dolgaleva/University of Ottawa Robert Boyd/University of Ottawa Invited	Paper

Cavity and Frequency Comb Based Precision Sensing (SM1M)

Presider: Lucile Rutkowski, *Institute of Physics of Rennes*

8:00 - 8:15 **Precision coherent dual-comb spectroscopy at 3 microns (SM1M.1)**
Presenter: Zaijun Chen, *Max-Planck institute of quantum optics*
Expand for Abstract / Authors

Paper

Mid-infrared self-referenced spectra with resolved comb lines of 100-MHz spacing span up to 8 THz. Schemes for direct mid-infrared and up-conversion detections lead to signal-to-noise ratio higher than 4000 at 1000-s averaging time.

Authors:Zaijun Chen/Max-Planck institute of quantum optics Theodor Hänsch/Max-Planck institute of quantum optics Nathalie Picqué/Max-Planck institute of quantum optics

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8:15 - 8:30 **High resolution (0.0005 cm^{-1}) spectroscopy of carbon disulfide with interleaved mid-IR frequency combs (SM1M.2)**
Presenter: Andrey Muraviev, *CREOL, University of Central Florida*
Expand for Abstract / Authors

Paper

We measured the high-resolution absorption spectrum of the carbon disulfide (CS_2) $\nu_1+\nu_3$ band using a broadband dual-comb subharmonic OPO system. The 14.5-MHz effective resolution was achieved by interleaving eight comb spectra with 115-MHz intermodal spacing.

Authors:Andrey Muraviev/CREOL, University of Central Florida Dmitrii Konnov/CREOL, University of Central Florida Konstantin Vodopyanov/CREOL, University of Central Florida

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8:30 - 8:45 **Artificial Intelligence for Real-Time Dual-Frequency Comb Hyperspectral Imaging (SM1M.3)**
Presenter: Thibault Voumard, *CSEM*
Expand for Abstract / Authors

Paper

A fully convolutional deep neural network is used for rapid analysis of dual-comb interferograms. The increase in analysis speed enables massively parallelized spectroscopic detection and dual comb hyperspectral imaging in real-time.

Authors:Thibault Voumard/CSEM Thibault Wildi/CSEM Victor Brasch/CSEM Raul Gutierrez Alvarez/New Infrared Technologies Germán Vergara Ogando/New Infrared Technologies Tobias Herr/CSEM

8:45 - 9:00

Comb-locked cavity-ringdown spectroscopy for molecular transition frequency measurements below 1×10^{-12} relative uncertainty (SM1M.4)
Presenter: Zachary Reed, *National Inst of Standards & Technology*
Expand for Abstract / Authors

Paper

We describe highly accurate molecular line positions determined by a recently developed comb-locked cavity ring-down spectrometer. Molecular transition frequencies near 1.6 μm are determined with relative total uncertainties below 1×10^{-12} (200 Hz absolute uncertainty).

Authors:Zachary Reed/National Inst of Standards & Technology David Long/National Inst of Standards & Technology Helene Fleurbaey/National Inst of Standards & Technology Joseph Hodges/National Inst of Standards & Technology

9:00 - 9:15

Robust, Fast and Sensitive Near-Infrared Continuous-Filtering Vernier Spectrometer (SM1M.5)
Presenter: Aleksandra Foltynowicz, *Umea University*
Expand for Abstract / Authors

Paper

We present a new robust approach to cavity-enhanced comb spectroscopy based on Vernier filtering, a fixed diffraction grating, custom-made chopper wheel, and a low bandwidth comb-cavity stabilization scheme. We measure a CO_2 spectrum with a few GHz resolution and 5×10^{-8} cm^{-1} sensitivity in 9.4 ms.

Authors:Francisco Senna Vieira/Umea University Chuang Lu/Umea University Isak Silander/Umea University Aleksander Gluszek/Wroclaw University of Science and Technology Grzegorz Sobon/Wroclaw University of Science and Technology Aleksandra Foltynowicz/Umea University

9:15 - 9:30

Noise-immune, Cavity-enhanced, Optical Heterodyne Molecular Spectroscopy (NICE-OHMS) for Trace Gas Detection (SM1M.6)
Presenter: E. Anne Curtis, *National Physical Laboratory*
Expand for Abstract / Authors

Paper

Real-time measurement of trace gases using NICE-OHMS shows great promise in delivering the required sensitivity to meet the needs of many sectors. We present progress on NICE-OHMS-based gas sensing devices for industrial and other applications.

Authors:E. Anne Curtis/National Physical Laboratory Nicola Black/National Physical Laboratory Geoffrey Barwood/National Physical Laboratory

9:30 - 9:45	**Electro-optic frequency combs for atomic and physical metrology (SM1M.7)** **Presenter**: David Long, *NIST* Expand for Abstract / Authors David A. Long, Benjamin J. Reschovsky, Feng Zhou, Yiliang Bao, Ramgopal Madugani, Adam J. Fleisher, Jason J. Gorman, and Thomas W. LeBrun **Authors**:David Long/NIST Benjamin Reschovsky/NIST Feng Zhou/NIST Yiliang Bao/NIST Ramgopal Madugani/NIST Adam Fleisher/NIST Jason Gorman/NIST Thomas LeBrun/NIST	Paper
9:45 - 10:00	**Mid-Infrared Comb-Based Fourier Transform Spectroscopy of Halogenated Volatile Organic Compounds (SM1M.8)** **Presenter**: Aleksandra Foltynowicz, *Umea University* Expand for Abstract / Authors Broadband high-resolution spectra of two key atmospheric species, methyl iodide (CH_3I) and dibromomethane (CH_2Br_2), are measured around 3 μm using a comb-based Fourier transform spectrometer and assigned with the help of the semi-automatic fitting in PGOPHER. **Authors**:Ibrahim Sadiek/Umea University Adrian Hjältén/Umea University Michael Stuhr/University of Kiel Chuang Lu/Umea University Francisco Senna Vieira/Umea University Aleksandra Foltynowicz/Umea University	Paper

Ultrafast Pulse Manipulation I (SM1H)

Presider: Igor Jovanovic, *University of Michigan*

8:00 - 9:00	**Ultrafast Photonics Time-Frequency Signal Processing (SM1H.1)** **Presenter**: Andrew Weiner, *Purdue University* Expand for Abstract / Authors This talk introduces analog signal processing approaches such as pulse shaping and temporal imaging, which enable time-frequency manipulation of broadband light for applications ranging from ultrafast optics to quantum photonics. Andrew Weiner is known for pioneering work on programmable femtosecond pulse shaping and ultrafast signal processing. He is author of the textbook Ultrafast Optics and previously served as Editor-in-Chief of Optics Express. Weiner is a member of the National Academy of Engineering and has received numerous awards, including the OSA Wood Prize and the IEEE Photonics Society Quantum Electronics Award. **Authors**:Andrew Weiner/Purdue University Tutorial

9:00 - 9:15 **A phase-only liquid-crystal based pulse shaper for multi-octave light sources (SM1H.2)** [Paper]
Presenter: Aurelie Jullien, *INPHYNI - CNRS-UCA - UNS*
Expand for Abstract / Authors

Continuous spectral phase shaping is demonstrated over a spectral bandwidth spanning from 540 nm to 2500 nm (450 THz) with a modulation dynamic large enough to shapesingle-cyclepulsesoreventransientelectricfieldsinthenearinfrared.

Authors:Vittorio diPietro/INPHYNI - CNRS-UCA - UNS Simone Bux/FASTLITE Nicolas Forget/FASTLITE Aurelie Jullien/INPHYNI - CNRS-UCA - UNS

9:15 - 9:30 **Side-effect free carrier-envelope frequency stabilization utilizing the Doppler effect (SM1H.3)** [Paper]
Presenter: Gunter Steinmeyer, *Max Born Institute*
Expand for Abstract / Authors

We experimentally demonstrate how the optical Doppler effect can be exploited to modulate the carrier-envelope frequency of a mode-locked laser without causing detrimental side-effects and without any intervention into the laser.

Authors:Pascal Rustige/Max Born Institute Tianli Feng/Shandong University Gunter Steinmeyer/Max Born Institute

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9:30 - 9:45 **Synchronization of a mm-Wave Frequency Comb to a Chip-scale Mode-locked Laser via Harmonic Injection Locking (SM1H.4)** [Paper]
Presenter: Ricardo Bustos Ramirez, *UCF*
Expand for Abstract / Authors

A mm-Wave frequency comb with 240GHz spacing is synchronized to a MLL-PIC using harmonic injection locking, this represent optical frequency division of 24x. The Allan Deviation on the repetition rate stability is 10^{-10} at 1s.

Authors:Ricardo Bustos Ramirez/UCF Lawrence Trask/UCF Ashish Bhardwaj/Infinera Gloria Hoefler/Infinera Fred Kish/Infinera Peter Delfyett/UCF

9:45 - 10:00 **Spectrum circuit for producing spectrally separated nanosecond pulse train in free space (SM1H.5)**
Presenter: Takao Saiki, *University of Tokyo*
Expand for Abstract / Authors

[Paper]

We propose a free space time-stretching system for producing nanosecond pulse train with easily tunable time interval and spectrum period. In our demonstration experiments, we obtained 6 pulses with the time interval of 1 ns.

Authors:Takao Saiki/University of Tokyo Ayumu Ishijima/JST PRESTO Ichiro Sakuma/University of Tokyo Keiichi Nakagawa/University of Tokyo

Integrated Photonics for Beam Steering (SM1O)

Presider: Wei Jiang, *Nanjing University*

8:00 - 8:15 **Optical Beam Steering Using an N xN Phased Array with 2N Phase Shifters (SM1O.1)**
Presenter: Farshid Ashtiani, *University of Pennsylvania*
Expand for Abstract / Authors

[Paper]

A novel NxN optical phased array (OPA) with 2N phase shifters is proposed that significantly reduces power consumption and enables OPAs with compact element spacing. 2-D beam steering with an 8x8 OPA using the proposed scheme is demonstrated.

Authors:Farshid Ashtiani/University of Pennsylvania Firooz Aflatouni/University of Pennsylvania

8:15 - 8:30 **A Lidar System Based on Integrated Lens Assisted Two-dimensional Beam Steering (SM1O.2)**
Presenter: Xianyi Cao, *Shanghai Jiao Tong University*
Expand for Abstract / Authors

[Paper]

A Lidar system based on lens assisted two-dimensional beam steering at 1550nm is demonstrated. The Lidar has 19m measurement distance and 4×4 scanning points, indicating the potential of integrated beam steering technology for Lidar applications.

Authors:Xianyi Cao/Shanghai Jiao Tong University Gaofeng Qiu/Shanghai Jiao Tong University Kan Wu/Shanghai Jiao Tong University Minglu Cai/Shanghai Jiao Tong University Chao Li/Shanghai Jiao Tong University Jianping Chen/Shanghai Jiao Tong University

8:30 - 9:00 **A 20×20 Focal Plane Switch Array for Optical Beam Steering (SM1O.3)**
Presenter: Xiaosheng Zhang, *University of California, Berkeley*
Expand for Abstract / Authors

Paper

We present a two-dimensional random-access optical beam steering system composed of a 20×20 focal plane switch array integrated on a silicon photonics chip with microelectromechanical-system (MEMS) optical switches. 32°×32° field-of-view is demonstrated.

Authors:Xiaosheng Zhang/University of California, Berkeley Kyungmok Kwon/University of California, Berkeley Johannes Henriksson/University of California, Berkeley Jianheng Luo/University of California, Berkeley Ming Wu/University of California, Berkeley

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9:00 - 9:15 **LiDAR Beamsteering by Digitally Switched MEMS Gratings on a Silicon Photonics Platform (SM1O.4)**
Presenter: Steven Spector, *Charles Stark Draper Laboratory*
Expand for Abstract / Authors

Paper

A new method for solid-state beamsteering using MEMS grating switches integrated on a Si-PIC has been demonstrated. This method provides fast random access switching, simple digital control, extremely low side-lobes, and is scalable to large arrays, large apertures, and long ranges.

Authors:Steven Spector/Charles Stark Draper Laboratory Eugene Cook/Charles Stark Draper Laboratory Michael Moebius/Charles Stark Draper Laboratory Fredrick Baruffi/Charles Stark Draper Laboratory Mirela Bancu/Charles Stark Draper Laboratory Lucas Benney/Charles Stark Draper Laboratory Steven Byrnes/Charles Stark Draper Laboratory Jordan Chesin/Charles Stark Draper Laboratory Sarah geiger/Charles Stark Draper Laboratory Daniel Goldman/Charles Stark Draper Laboratory Alva Hare/Charles Stark Draper Laboratory Benjamin Lane/Charles Stark Draper Laboratory William Sawyer/Charles Stark Draper Laboratory Chris Bessette/Charles Stark Draper Laboratory

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9:15 - 9:30 **Electro-Optical Phase-Locked Loop Generating Linear Frequency Chirp for FMCW LiDAR (SM1O.5)**
Presenter: Keisuke Kondo, *University of Southern California*
Expand for Abstract / Authors

Paper

We demonstrated linear frequency-chirp modulation using a wide-bandwidth analog electro-optical phase-locked loop, leveraging linear analog multipliers in a single sideband frequency down-conversion scheme, without electrical ramp generation, predistortion circuitry, or complex digital logic.

Authors:Keisuke Kondo/University of Southern California Hossein Hashemi/University of Southern California

9:30 - 9:45 **Multi-Tone Continuous Wave Lidar in Simultaneous Ranging and Velocimetry (SM1O.6)**
Presenter: Mustafa Bayer, *University of California, Irvine*
Expand for Abstract / Authors

Paper

We demonstrate simultaneous ranging and velocimetry measurements by using multi-tone continuous wave Lidar. We show >95% agreement with conventional time-of-flight Lidar technique in ranging and ±0.8cm/s accuracy in velocity measurements.

Authors:Mustafa Bayer/University of California, Irvine Rasul Torun/University of California, Irvine Imam Zaman/University of California, Irvine Ozdal Boyraz/University of California, Irvine

9:45 - 10:00 **Resolution enhancement of optical-phased-array-based single-pixel imaging by using a multimode fiber (SM1O.7)**
Presenter: Taichiro Fukui, *The University of Tokyo*
Expand for Abstract / Authors

Paper

We demonstrate that single-pixel imaging resolution of optical phased array can be enhanced by transmitting through a multimode fiber. Using only 128 phase shifters, >1000 points are resolved, determined by the number of fiber modes.

Authors:Taichiro Fukui/The University of Tokyo Yoshiaki Nakano/The University of Tokyo Takuo Tanemura/The University of Tokyo

Flat Optics for Image Processing and Transformations (FM1R)

Presider: Vincent Ginis, *Harvard University*

8:00 - 8:15 **Properties of Ideal Flat Metalenses (FM1R.1)**
Presenter: Andrew McClung, *University of Massachusetts Amherst*
Expand for Abstract / Authors

Paper

We derive image space fields of ideal flat metalenses, which differ significantly from those of refractive lenses, and use them to determine the modulation transfer function, depth of focus and spectral bandwidth of flat metalenses.

Authors:Andrew McClung/University of Massachusetts Amherst Mahdad Mansouree/University of Massachusetts Amherst Sarath Samudrala/University of Massachusetts Amherst Amir Arbabi/University of Massachusetts Amherst

8:15 - 8:30

Retrieving Nanostructure Images from Spectra (FM1R.2)
Presenter: Michael Mrejen, *Tel Aviv University*
Expand for Abstract / Authors

Paper

We introduce spectra2pix, a deep neural network trained to generate 2D images of nanostructures based on their transmission spectra. Owing to this architecture, our model can be trained for the design of any arbitrary geometry.

Authors:Michael Mrejen/Tel Aviv University Itzik Malkiel/Tel Aviv University Lior Wolf/Tel Aviv University Haim Suchowski/Tel Aviv University

8:30 - 9:00

Flat Optics for Image Processing (FM1R.3)
Presenter: Jason Valentine, *Vanderbilt University*
Expand for Abstract / Authors

Paper

We demonstrate optical analog imaging processing using a flat optic for direct image differentiation allowing one to significantly shrink the required optical system size compared to traditional approaches.

Authors:Jason Valentine/Vanderbilt University

Invited

9:00 - 9:15

Ultra-thin Near-infrared Camera via Single Flat lens for Wide-angle Imaging (FM1R.4)
Presenter: Sourangsu Banerji, *University of Utah*
Expand for Abstract / Authors

Paper

By utilizing a single multi-level diffractive lens coupled along with a conventional monochrome image sensor, we demonstrate a ~1mm thick near-infrared camera with a Field Of View up to 50^{o} and on-axis focusing efficiency > 90%.

Authors:Sourangsu Banerji/University of Utah Monjurul Meem/University of Utah Apratim Majumder/University of Utah Fernando Vasquez/University of Utah Berardi Rodriguez/University of Utah Rajesh Menon/University of Utah

9:15 - 9:30

Inverse Designed Metalenses with Extended Depth of Focus (FM1R.5)
Presenter: Elyas Bayati, *University of Washington*
Expand for Abstract / Authors

Paper

We design, fabricate and characterize a cylindrical metasurface lens operating at ~ 625nm with a depth of focus exceeding that of an ordinary lens using adjoint optimization-based inverse electromagnetic design.

Authors:Elyas Bayati/University of Washington Raphael Pestourie/MIT Shane Colburn/University of Washington Zin Lin/MIT Steven Johnson/MIT Arka Majumdar/University of Washington

9:30 - 9:45

Deep Subwavelength Singularity Imaging Beyond λ/100 (FM1R.6)
Presenter: Nikitas Papasimakis, *University of Southampton*
Expand for Abstract / Authors

Paper

We introduce a new far-field and label-free imaging paradigm based on combining singularity illumination with artificial-intelligence enabling reconstruction of an object from the scattered light. We demonstrate imaging resolution beyond λ/100.

Authors:Tanchao Pu/University of Southampton Vassili Savinov/University of Southampton Guanghui Yuan/Nanyang Technological University Jun-Yu Ou/University of Southampton Nikitas Papasimakis/University of Southampton Nikolay Zheludev/University of Southampton

9:45 - 10:00

Lens Aberration Correction Using Large Scale Metasurfaces (FM1R.7)
Presenter: Rajath Sawant, *CRHEA-CNRS*
Expand for Abstract / Authors

Paper

Hybrid refractive-metasurface devices, with nondispersive refraction in the visible, have been demonstrated. Relying on Pancharatnam Berry phase gradient metasurfaces, we propose a centimeter scale metasurface for chromatic and spherical aberration correction of a lens.

Authors:Rajath Sawant/CRHEA-CNRS Daniel Andren/Chalmers university Mikael Kall/Chalmers university Ruggero Verre/Chalmers university Patrice Genevet/CRHEA-CNRS

Photophysics of Single Particles and Coupled Nanosystems (FM1D)

Presider: Wei Zhou, *Virginia Tech*

8:00 - 8:15

Emission of Diamond NV Centers in Dielectric, Semiconducting and Plasmonic Environments (FM1D.1)
Presenter: Hao Li, *University of Southampton*
Expand for Abstract / Authors

Paper

We demonstrate that decay rates of NV centers in diamond nanoparticles strongly depend on the dielectric environment. Embedding into and placing on dielectric, semiconductor and plasmonic films of subwavelength thickness is investigated by time-resolved cathodoluminescence.

Authors:Hao Li/University of Southampton Jun-Yu Ou/University of Southampton Vassili A. Fedotov/University of Southampton Nikitas Papasimakis/University of Southampton Nikolay Zheludev/University of Southampton

8:15 - 8:30 **$TiN@TiO_2$ Core-Shell Nanoparticles as Plasmon-Enhanced Photosensitizers for Photocatalysis (FM1D.2)**
Presenter: Xiaohui Xu, *Purdue University*
Expand for Abstract / Authors

Paper

We demonstrate the effective generation of singlet oxygen ($^1O_2$) catalyzed by hot electrons obtained from the plasmon decay in $TiN@TiO_2$ core-shell nanoparticles at 700 nm excitation.

Authors:Xiaohui Xu/Purdue University Aveek Dutta/Purdue University Jacob Khurgin/Johns Hopkins University Vladimir Shalaev/Purdue University Alexander Wei/Purdue University Alexandra Boltasseva/Purdue University

8:30 - 9:00 **(Withdrawn) Insights from single particle spectroscopy of plasmonic nanostructures (FM1D.3)**
Presenter: Stephan Link, *Rice University*
Expand for Abstract / Authors

In this talk I will discuss our recent work on understanding the radiative, non-radiative, chiral, and mechanical properties of individual and coupled plasmonic nanostructures.

Authors:Stephan Link/Rice University

Invited

9:00 - 9:15 **Control of Concentration Quenching with Metallic Substrates and Cavities (FM1D.4)**
Presenter: Samantha Koutsares, *Norfolk State University*
Expand for Abstract / Authors

Paper

We found that inhibition of concentration quenching of HITC dye in Fabry-Perot cavities is almost similar to that on top of silver. Low convexity of the emission kinetics suggests strong coupling mediated by surface plasmons.

Authors:Samantha Koutsares/Norfolk State University Lyudvig Petrosyan/Jackson State University Devon Courtwright/Norfolk State University Srujana Prayakarao/Norfolk State University Carl Bonner/Norfolk State University Mikhail Noginov/Norfolk State University Tigran Shahbazyan/Jackson State University

9:15 - 9:30 **Optimizing the Strong Coupling of Excitons in 2D Materials and Surface Plasmon Lattice Resonances (FM1D.5)**
Presenter: Yael Blechman, *Technion – Israel Institute of Technology*
Expand for Abstract / Authors

Paper

We study strong coupling (SC) in a system of plasmonic nanohole arrays and transition-metal dichalcogenide material (WS_2). Using FDTD simulations and a genetic algorithm, we design several array geometries to obtain large Rabi splitting at room-temperature.

Authors:Yael Blechman/Technion – Israel Institute of Technology Shai Tsesses/Technion – Israel Institute of Technology Gilad Feinberg/Technion – Israel Institute of Technology Alex Hayat/Technion – Israel Institute of Technology Guy Bartal/Technion – Israel Institute of Technology

9:30 - 9:45 **(Withdrawn) Strong Coupling Between Quantum Emitters and Plasmonic Nano-Gap Resonators (FM1D.6)**
Presenter: Boyang Ding, *University of Otago*
Expand for Abstract / Authors

Here we demonstrate our recent progresses on strong coupling between quantum emitters and plasmonic gap resonators, which exhibit many interesting phenomena that can not be observed in traditional cavities, such as spatial mode modification and exction number tuneability.

Authors:Boyang Ding/University of Otago

9:45 - 10:00 **Long Range Energy Transfer in Self-Assembled Stacks of Semiconducting Nanoplatelets (FM1D.7)**
Presenter: jiawen liu, *Sorbonne Université,CNRS,Institut de NanoSciences de Paris*
Expand for Abstract / Authors

Paper

To study FRET-mediated photo-physics in self-assembled CdSe nanoplatelets, we imaged their energy migration by micro-photoluminescence and found an energy transfer over 500-nm, from which a homo-FRET rate of $(1.8\text{ps})^{-1}$ is estimated by a diffusion model.

Authors:jiawen liu/Sorbonne Université,CNRS,Institut de NanoSciences de Paris Lilian Guillemeney/Univ Lyon, CNRS, École Normale Supérieure de Lyon, Laboratoire de Chimie Arnaud Choux/Sorbonne Université,CNRS,Institut de NanoSciences de Paris Agnès Maître/Sorbonne Université,CNRS,Institut de NanoSciences de Paris Benjamin Abécassis/Univ Lyon, CNRS, École Normale Supérieure de Lyon, Laboratoire de Chimie Laurent Coolen/Sorbonne Université,CNRS,Institut de NanoSciences de Paris

Non-Hermitian and Topological Phenomena I (FM1A)
Presider: Ulf Peschel, *Friedrich-Schiller-Universität Jena*

8:00 - 8:15

Bimodal Directional Laser (FM1A.1)
Presenter: Alexander Schumer, *Vienna University of Technology (TU Wien)*
Expand for Abstract / Authors

Paper

We demonstrate dynamical encirclement of an exceptional point in a laser cavity. By continuously varying the detuning and coupling between a pair of PT-symmetric waveguides, the mode morphs into a different eigenmode as it emerges from opposing facets.

Authors:Lei Ding/University of Southern California Alexander Schumer/Vienna University of Technology (TU Wien) Jason Leshin/University of Central Florida, CREOL Yousef Alahmadi/University of Central Florida, CREOL Absar Ul Hassan/University of Central Florida, CREOL Gisela LÓPEZ-GALMICHE/University of Central Florida, CREOL Patrick LiKamWa/University of Central Florida, CREOL Stefan Rotter/Vienna University of Technology (TU Wien) Demetrios Christodoulides/University of Central Florida, CREOL Mercedeh Khajavikhan/University of Southern California

8:15 - 8:30

Dynamics for Encircling an Exceptional Point in a Nonlinear Non-Hermitian System (FM1A.2)
Presenter: Haiwen Wang, *Stanford University*
Expand for Abstract / Authors

Paper

We study the dynamics of a non-Hermitian system with gain saturation non- linearity. We find the chiral state transfer behavior is recovered, and new phenomenon such as bistability and high gain threshold lasing emerges.

Authors:Haiwen Wang/Stanford University Sid Assawaworrarit/Stanford University Shanhui Fan/Stanford University

8:30 - 8:45

Omnipolarizer Action via Encirclement of Exceptional Points (FM1A.3)
Presenter: Gisela LÓPEZ-GALMICHE, *University of Central Florida*
Expand for Abstract / Authors

Paper

We experimentally demonstrate for the first time omnipolarizer action in the optical domain. This is achieved by encircling a non-Hermitian singularity through which the output polarization state can be faithfully and unidirectionally preselected.

Authors:Gisela LÓPEZ-GALMICHE/University of Central Florida Helena Lopez Aviles/University of Central Florida Absar Ul Hassan/University of Central Florida Alexander Schumer/Vienna University of Technology Tsampikos Kottos/Wesleyan University Patrick LiKamWa/University of Central Florida Mercedeh Khajavikhan/University of Southern California Demetrios Christodoulides/University of Central Florida

8:45 - 9:00	**Topological insulator VCSEL array (FM1A.4)** **Presenter**: Alex Dikopoltsev, *Technion* Expand for Abstract / Authors We observe experimentally collective lasing of a topological mode in a vertical-cavity surface-emitting laser (VCSEL) array. The array is comprised of pillar-shaped VCSELs in a crystalline model geometry and is optically pumped. **Authors**:Alex Dikopoltsev/Technion Tristan Harder/University of Wurzburg Eran Lustig/Technion Sven Höfling/University of Wurzburg Mordechai Segev/Technion Sebastian Klembt/University of Wurzburg	Paper
9:00 - 9:15	**Optical thermodynamic properties of nonlinear topological Haldane lattices (FM1A.5)** **Presenter**: Pawel Jung, *CREOL* Expand for Abstract / Authors We show that a nonlinear topological Haldane lattice can exhibit a number of intriguing thermodynamic properties such as a metastable response leading to different temperatures in two bands or thermal equilibrium at different chemical potentials. **Authors**:Pawel Jung/CREOL Fan Wu/CREOL Midya Parto/CREOL Yuzhou Liu/CREOL Mercedeh Khajavikhan/CREOL Demetrios Christodoulides/CREOL	Paper
9:15 - 9:30	**Thouless Pumping in Disordered Photonic Systems (FM1A.6)** **Presenter**: Alexander Cerjan, *Pennsylvania State University* Expand for Abstract / Authors We experimentally demonstrate topologically protected transport in the presence of disorder for a Thouless pump in a photonic waveguide lattice. This concept may lead to robust high density optical interconnects and slow light devices. **Authors**:Alexander Cerjan/Pennsylvania State University Sheng Huang/University of Pittsburgh Mohan Wang/University of Pittsburgh Kevin Chen/University of Pittsburgh Mikael Rechtsman/Pennsylvania State University	Paper

9:30 - 9:45 **Electrically Pumped Topological Insulator Lasers (FM1A.7)**
Presenter: Jae-Hyuck Choi, *University of Southern California*
Expand for Abstract / Authors

Paper

We report on the first demonstration of electrically pumped topological insulator laser arrays. When pumping is applied to the elements in the perimeter, a sharp single-mode lasing peak can be detected across the array.

Authors:Jae-Hyuck Choi/University of Southern California William Hayenga/University of Southern California Midya Parto/University of Central Florida Yuzhou Liu/University of Southern California Babak Bahari/University of Southern California Demetrios Christodoulides/University of Central Florida Mercedeh Khajavikhan/University of Southern California

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9:45 - 10:00 **Room-Temperature Lasing from Topological Cavities (FM1A.8)**
Presenter: Yuri Kivshar, *Australian National University*
Expand for Abstract / Authors

Paper

We fabricate nanophotonic topological cavities incorporating III-V semiconductor quantum wells and observe room-temperature lasing with narrow spectrum, high coherence, and threshold behavior. The emitted beam hosts a singularity encoded by the specific triade cavity mode

Authors:Aditya Tripathi/Australian National University Daria Smirnova/Australian National University Sergey Kruk/Australian National University Min-Soo Hwang/Korea University Ha-Reem Kim/Korea University Hong-Gyu Park/Korea University Yuri Kivshar/Australian National University

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Sensing the World Around (AM1K)

Presider: Fabio Di Teodoro, *Raytheon Space and Airborne Systems*

8:00 - 8:15 **Flexible and robust detection of a remotely rotating target using fiber-guided orbital angular momentum superposed modes (AM1K.1)**
Presenter: Zhenyu Wan, *Huazhong University of Science and Technology*
Expand for Abstract / Authors

Paper

We propose and experimentally verify a flexible and robust rotational Doppler velocimetry for detecting a remotely rotating target in situ, which uses a ring-core fiber that can stably transmit the orbital angular momentum superposed modes.

Authors:Zhenyu Wan/Huazhong University of Science and Technology Yize Liang/Huazhong University of Science and Technology Liang Fang/Huazhong University of Science and Technology Jian Wang/Huazhong University of Science and Technology

8:15 - 8:30	**Smart Fiber-optic Inclinometer (AM1K.2)** **Presenter**: Chen Zhu, *Missouri University of Science and Technology* Expand for Abstract / Authors Machine learning (ML) techniques combined with a high-resolution (~17 nanoradian) fiber-optic inclinometer (FOI) are used to recognize and classify vibrations stimulated at different locations on the perimeter of the FOI. **Authors**:Chen Zhu/Missouri University of Science and Technology Jie Huang/Missouri University of Science and Technology	Paper
8:30 - 8:45	**Compact Self-Mixing Vibrometer for Application to Burglary Detection (AM1K.3)** **Presenter**: Silvano Donati, *Universita degli Studi di Pavia* Expand for Abstract / Authors A laser-diode self-mixing interferometer with minimum part-count analogue processing of fringe signal is developed. It detects ambient vibrations with high sensitivity and is an excellent burglary intrusion detector, on a range up to several meters. **Authors**:Silvano Donati/Universita degli Studi di Pavia	Paper
8:45 - 9:00	**Sub-100 fε Dynamic Strain Sensing using a Meter-Long, High-Finesse Fiber Fabry-Perot Interferometer (AM1K.4)** **Presenter**: Nabil Md Rakinul Hoque, *University of Alabama in Huntsville* Expand for Abstract / Authors We report passive fiber-optic dynamic strain sensing with ultrahigh resolutions of 60 *fε*/√Hz at 1 kHz, 50 *fε*/√Hz at 2 kHz and 30 *fε*/√Hz at 23 kHz using a meter-long, high finesse fiber Fabry-Perot resonator. **Authors**:Nabil Md Rakinul Hoque/University of Alabama in Huntsville Lingze Duan/University of Alabama in Huntsville	Paper
9:00 - 9:15	**Ultra-sensitive ultrasonic sensor based on microfiber (AM1K.5)** **Presenter**: Qizhen Sun, *Huazhong Univ of Science and Technology* Expand for Abstract / Authors An ultra-sensitive optical microfiber ultrasonic sensor is proposed and demonstrated. The noise equivalent pressure length product of this sensor is 1.71kPa mm, which gives a 53 times improvement compared with standard single-mode fiber. **Authors**:Liuyang Yang/Huazhong Univ of Science and Technology Yanpeng Li/Huazhong Univ of Science and Technology Fang Fang/Huazhong Univ of Science and Technology Liangye Li/Huazhong Univ of Science and Technology Qizhen Sun/Huazhong Univ of Science and Technology	Paper

9:15 - 9:30 **Spherical Glass Based Fiber Optic Fabry-Perot Interferometric Probe for Refractive Index Sensing (AM1K.6)**
Presenter: Fintan McGuinness, *University of Limerick*
Expand for Abstract / Authors

Paper

A novel Fabry-Perot sensor, comprised a glass sphere bonded to a capillary and single-mode fiber, is proposed for refractive index sensing. It is characterized in air, water, ethanol, isopropanol, and glycerol.

Authors:Muhammad Mahmood Ali/University of Limerick Sanober Memon/University of Limerick Fintan McGuinness/University of Limerick Elfed Lewis/University of Limerick Gabriel Leen/University of Limerick

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9:30 - 9:45 **Application of Silicon Ring Resonators towards Cryogenic Sensing (AM1K.7)**
Presenter: Minmin You, *Shanghaijiaotong University*
Expand for Abstract / Authors

Paper

By utilizing a new method of package, a silicon ring resonator was successfully applied to cryogenic sensing. And it was experimentally demonstrated to have a linear sensitivity of 64.8 pm/K from 180 K to 300 K.

Authors:Minmin You/Shanghaijiaotong University jingquan liu/Shanghaijiaotong University

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9:45 - 10:00 **2 - 18 GHz ultra-wideband channel sounding with low-bandwidth ADC enabled by dual optical combs (AM1K.8)**
Presenter: Hancheng Tong, *Beihang University*
Expand for Abstract / Authors

Paper

We report an ultra-wideband channel sounding enabled by an optical dual-comb and photonic asynchronous sampling. A 2–18 GHz rich-multipath wireless channel is measured by a <60 MSa/s ADC with >1 kHz highest refresh rate.

Authors:Hancheng Tong/Beihang University Yihong Li/Beihang University Yihan Li/Beihang University Ting Li/Beihang University Xin Zhao/Beihang University Zheng Zheng/Beihang University

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Photonic Crystals (SM1J)

Presider: Harish Subbaraman, *Boise State University*

8:00 - 8:30	**Control of Light through the Addition of Deep Subwavelength Features in Photonic Crystals (SM1J.1)** **Presenter**: Sharon Weiss, *Vanderbilt University* Expand for Abstract / Authors Simulations and experiments demonstrate that inclusion of subwavelength features inside photonic crystal unit cells enables new control over mode distribution, polarization, and peak energy density for advances in nonlinear optics, light emission, and optical communication. **Authors**:Sharon Weiss/Vanderbilt University Sami Halimi/Vanderbilt University Zhongyuan Fu/Vanderbilt University Joshua Allen/Vanderbilt University Francis Afzal/Vanderbilt University Zibo Gong/Vanderbilt University Shuren Hu/Vanderbilt University Invited	Paper
8:30 - 8:45	**Low Index Asymmetric Bound States in the Continuum for Low Loss Integrated Photonics (SM1J.2)** **Presenter**: Larissa Vertchenko, *Technical University of Denmark* Expand for Abstract / Authors Radiative and intrinsic losses are significant challenges faced by near-zero-index materials. Zero-index photonic crystals with Bound States in the Continuum are able to overcome these challenges. Here we experimentally verify the combined effects in a novel dielectric photonic crystal design. **Authors**:Larissa Vertchenko/Technical University of Denmark Radu Malureanu/Technical University of Denmark Clayton DeVault/Harvard University Eric Mazur/Harvard University Andrei Lavrinenko/Technical University of Denmark	Paper
8:45 - 9:00	**Doubly resonant photonic crystal cavity based on a bound state in the continuum for efficient second harmonic generation (SM1J.3)** **Presenter**: Momchil Minkov, *Stanford University* Expand for Abstract / Authors Using the concept of bound states in the continuum, we design a photonic crystal cavity supporting two resonant modes separated by a full octave for efficient second-order nonlinear frequency conversion. **Authors**:Momchil Minkov/Stanford University Shanhui Fan/Stanford University Jun Wang/EPFL Romuald Houdre/EPFL Marco Clementi/Universita di Pavia Andrea Barone/Universita di Pavia Dario Gerace/Universita di Pavia Matteo Galli/Universita di Pavia	Paper

9:00 - 9:15	**Couping of Whispering Gallery Mode with Silicon Photonic Crystal (SM1J.4)** **Presenter**: Koki Yube, *Keio University* Expand for Abstract / Authors We demonstrate the coupling of ultrahigh-*Q* whispering-gallery-mode with silicon photonic crystals. It allows efficient coupling of high-*Q* mode directly with high-index silicon slab and will also enable further advancement of dynamic tuning of the *Q.* **Authors**:Koki Yube/Keio University Hajime Kumazaki/Keio University Yuyang Zhuang/Nanjing University Shun Fujii/Keio University Riku Imamura/Keio University Rammaru Ishida/Keio University Takasumi Tanabe/Keio University	Paper
9:15 - 9:30	**Efficient Automated Nanocavity Optimization by Direct Use of Finite Element Method Computation (SM1J.5)** **Presenter**: Eiichi Kuramochi, *NTT Corporation* Expand for Abstract / Authors An automated finite-element-method-based optimization code can optimize the position of more than 20 holes generated in an L3 nanocavity with a theoretical *Q* factor exceeding 2×10^7 with only 111-sample-cavity generation. **Authors**:Eiichi Kuramochi/NTT Corporation Shota Kita/NTT Corporation Akihiko Shinya/NTT Corporation Masaya Notomi/NTT Corporation	Paper
9:30 - 10:00	**Lasing up to T = 339 K in Subwavelength Nanowire-Induced Photonic Crystal Nanocavities (SM1J.6)** **Presenter**: Masaya Notomi, *NTT Nanophotonics Center* Expand for Abstract / Authors We report on lasing operation up to 339K in nanocavities constituted of subwavelength ZnO nanowires integrated in SiN photonic crystals. With thresholds as low as $4MW.cm^{-2}$, the investigated nanolasers outperform previously reported subwavelength ZnO nanowire lasers operating at high-temperature. **Authors**:Sylvain Sergent/NTT Nanophotonics Center Masato Takiguchi/NTT Nanophotonics Center Tai Tsuchizawa/NTT Nanophotonics Center Hideaki Taniyama/NTT Nanophotonics Center Masaya Notomi/NTT Nanophotonics Center	Paper

Zero Index, Hyperbolic and Thermal Metamaterials (FM1B)
Presider: Anthony Hoffman, *University of Notre Dame*

8:00 - 8:15 **Spectrally selective emitters stable up to 1400°C for thermophotovoltaic applications (FM1B.1)** Paper
Presenter: MANOHAR CHIRUMAMILLA, *Technical University of Hamburg*
Expand for Abstract / Authors

We demonstrate tungsten based spectrally selective structures stable up to 1400 °C for thermophotovoltaic applications. Tungsten-hafnia multilayer metamaterials and tungsten-zirconia photonic crystal structures are presented.

Authors:MANOHAR CHIRUMAMILLA/Technical University of Hamburg Gnanavel Vaidhyanathan Krishnamurthy/Helmholtz-Zentrum Geesthacht Centre for Materials and Coastal Research Katrin Knopp/Technical University of Hamburg Tobias Krekeler/Hamburg University of Technology Matthias Graf/Technical University of Hamburg Dirk Jalas/Technical University of Hamburg Martin Ritter/Hamburg University of Technology Michael Störmer/Helmholtz-Zentrum Geesthacht Centre for Materials and Coastal Research Alexander Petrov/Technical University of Hamburg Manfred Eich/Technical University of Hamburg

8:15 - 8:30 **Perovskite Gain-assisted Hyperbolic Metamaterials (FM1B.2)** Paper
Presenter: Zhitong Li, *University of Texas at Dallas*
Expand for Abstract / Authors

We experimentally demonstrate a type II hyperbolic metamaterials (HMMs) using the recently emerged perovskite gain material and Au. The hyperbolic dispersion of the fabricated device is investigated by measuring its polarization anisotropy.

Authors:Zhitong Li/University of Texas at Dallas Joseph Smalley/Digilens, Inc Ross Haroldson/University of Texas at Dallas Dayang Lin/University of Texas at Dallas Roberta Hawkins/University of Texas at Dallas Abouzar Gharajeh/University of Texas at Dallas Jiyoung Moon/University of Texas at Dallas Junpeng Hou/University of Texas at Dallas Chuanwei Zhang/University of Texas at Dallas Walter Hu/University of Texas at Dallas Anvar Zakhidov/University of Texas at Dallas Qing Gu/University of Texas at Dallas

8:30 - 8:45 **Wavelength-thick ENZ ITO Metafilm for Near IR Photonic Devices (FM1B.3)** Paper
Presenter: Jimmy Ni, *U.S. Army Research Laboratory*
Expand for Abstract / Authors

We are reporting wavelength-thick ITO films in ENZ regime around optical telecommunications wavelength, which permit the design of new ENZ photonic devices. Non-uniform optical behavior has been studied and presented in this paper.

Authors:Jimmy Ni/U.S. Army Research Laboratory Wendy Sarney/U.S. Army Research Laboratory Asher Leff/U.S. Army Research Laboratory James Cahill/U.S. Army Research Laboratory Weimin Zhou/U.S. Army Research Laboratory

8:45 - 9:00	**Hyperbolic Metamaterial Photonic Funnels (FM1B.4)** **Presenter**: Kun Li, *University of Texas at Austin* Expand for Abstract / Authors We numerically model and experimentally demonstrate sub-diffraction limited focusing of mid-infrared light using all-semiconductor hyperbolic metamaterial photonic funnels. Enhanced transmission through single funnels with aperture λ/20 is demonstrated, in excellent agreement with our simulations. **Authors**:Kun Li/University of Texas at Austin Evan Simmons/University of Massachusetts Lowell Andrew Briggs/University of Texas at Austin Jiaming Xu/University of Texas at Austin Yue Cheng/University of Texas at Austin Ray T. Chen/University of Texas at Austin Seth Bank/University of Texas at Austin Viktor Podolskiy/University of Massachusetts Lowell Dan Wasserman/University of Texas at Austin	Paper
9:00 - 9:15	**Electromagnetic Response of Ballistic Metamaterials. (FM1B.5)** **Presenter**: Evgenii Narimanov, *Purdue University* Expand for Abstract / Authors The electromagnetic response of ballistic metamaterials, metal-dielectric composites with the unit cell size smaller than electron mean free path, is defined by the surface scattering of the free electrons at the metal-dielectric interface **Authors**:Evgenii Narimanov/Purdue University	Paper
9:15 - 9:30	**Interaction Between a Nanoantenna Array and an Epsilon-Near-Zero Thin Film: Ultrastrong Coupling and Resonance Pinning for Engineered Highly Nonlinear Metasurface (FM1B.6)** **Presenter**: Karapet Manukyan, *University of Southern California* Expand for Abstract / Authors We investigate the thickness-, distance- and loss-dependent interaction between nanoantenna arrays and an epsilon-near-zero (ENZ) thin film. We show the conditions for ultrastrong coupling and the length invariant pinning of antenna resonances on ENZ films. **Authors**:Karapet Manukyan/University of Southern California M. Zahirul Alam/University of Ottawa Cong Liu/University of Southern California Kai Pang/University of Southern California Hao Song/University of Southern California Zhe Zhao/University of Southern California Moshe Tur/Tel Aviv University Robert Boyd/University of Rochester Alan Willner/University of Southern California	Paper

9:30 - 9:45

Thermal Emission from Multi-mode Optical Antennas on an Epsilon-Near-Zero Substrate (FM1B.7)
Presenter: Irfan Khan, *University of Notre Dame*
Expand for Abstract / Authors

Paper

Far-field thermal emission is measured for multi-mode optical antennas fabricated on an epsilon-near-zero substrate. The evolution of the emission pattern for the Berreman and first and second antenna modes versus antenna length is presented.

Authors:Irfan Khan/University of Notre Dame Owen Dominguez/University of Notre Dame Junchi Lu/University of Notre Dame leland Nordin/The University of Texas at Austin Dan Wasserman/The University of Texas at Austin Anthony Hoffman/University of Notre Dame

9:45 - 10:00

Low-loss Zero-Index Metamaterials (FM1B.8)
Presenter: Haoning Tang, *Harvard University*
Expand for Abstract / Authors

Paper

We have realized a silicon Dirac-cone zero-index metamaterial which incorporates a bound state in the continuum at the near-infrared degenerate triple point. Here, radiative losses are strongly suppressed by the ~5000 Q-factor of the metasurface.

Authors:Haoning Tang/Harvard University Clayton DeVault/Harvard University

Transition Metal Dichalcogenides (SM1Q)
Presider: Jiming Bao, *University of Houston*

8:00 - 8:30

Tunable Infrared Light Emission from MoS_2/WSe_2 Heterostructures (SM1Q.1)
Presenter: Ouri Karni, *Stanford University*
Expand for Abstract / Authors

Paper

We report light emission around 1200 nm from a vertical heterostructure consisting of MoS_2 and WSe_2 monolayers. The emission, arising from the fundamental interlayer exciton, can be tuned by nearly 100 nm by electrical gating.

Authors:Ouri Karni/Stanford University Elyse Barre/Stanford University Sze Cheung Lau/Stanford University Eric Yue Ma/Stanford University Roland Gillen/Friedrich-Alxander Universitat Bumho Kim/Columbia University Watanabe Watanabe/National Institute of Material Science Takashi Taniguchi/National Institute of Material Science Janina Maultzsch/Friedrich-Alxander Universitat Katayun Barmak/Columbia University Ralph Page/Stanford University Tony Heinz/Stanford University Jaffe Tzach/Technion-Israel Institute of Technology Lior Gal/Technion-Israel Institute of Technology Meir Orenstein/Technion-Israel Institute of Technology

8:30 - 8:45

Strain Induced Indirect-Direct Bandgap Transition in Bilayer $MoTe_2$ (SM1Q.2)
Presenter: Yueyang Yu, *Arizona State University*
Expand for Abstract / Authors

Paper

We experimentally demonstrate an indirect to direct bandgap transition on bilayer $MoTe_2$ by strain engineering. By applying 0.58% tensile strain, photoluminescence intensity is increased by 2.22 times, and linewidth is reduced by 36%.

Authors:Yueyang Yu/Arizona State University Cun-Zheng Ning/Arizona State University

8:45 - 9:00

Enhancement of Optical Valley Coherence in Monolayer WS_2 using Strain (SM1Q.3)
Presenter: Prathmesh Deshmukh, *City University of New York*
Expand for Abstract / Authors

Paper

We demonstrate significant enhancement (≥40%) in valley coherence of localized excitons in monolayer WS_2 via strain engineering. The observed enhancement is attributed to the suppression of inter valley scattering due to strain induced potential.

Authors:Prathmesh Deshmukh/City University of New York Biswanath Chakraborty/City University of New York Mandeep Khatoniar/City University of New York Vinod Menon/City University of New York

9:00 - 9:15

Reconstructing the Local Profile of Exciton Emission Wavelengths Across a WS_2 Bubble (SM1Q.4)
Presenter: Danyang Zhang, *Tsinghua University*
Expand for Abstract / Authors

Paper

Exciton emission wavelengths on a bubble of 2D material are affected by local strain and dielectric environment. Such localized wavelength profile is reconstructed for a WS_2 bubble smaller than wavelengths using AFM measured topography.

Authors:Danyang Zhang/Tsinghua University

9:15 - 9:30

Enhancement of the SHG in monolayer MoS_2 by an epsilon-near-zero substrate (SM1Q.5)
Presenter: Pilar Gregory Vianna, *Mackenzie Presbyterian University*
Expand for Abstract / Authors

Paper

We report on second harmonic generation in MoS_2 monolayers on a substrate with near zero dielectric constant. The enhanced pump field at the 2D material results in an order of magnitude frequency conversion increase.

Authors:Pilar Gregory Vianna/Mackenzie Presbyterian University Aline Almeida/Mackenzie Presbyterian University Rodrigo Gerosa/Mackenzie Presbyterian University Dario Bahamon/Mackenzie Presbyterian University Christiano De Matos/Mackenzie Presbyterian University

9:30 - 9:45 **Second Harmonic Generation in Directly-Grown MoS_2/WS_2 Heterostructures (SM1Q.6)**
Presenter: Christiano De Matos, *Universidade Presbiteriana Mackenzie*
Expand for Abstract / Authors

Paper

We report on second harmonic generation from MoS_2/WS_2 as-grown heterostructures. The two crystal structures naturally align with 0^o and ~60^o twist angles. While the former enhances, the latter decreases the nonlinearity from individual layers.

Authors:Alexandre Ore/Universidade Presbiteriana Mackenzie Pilar Gregory Vianna/Universidade Presbiteriana Mackenzie Syed Gardezi/Pontifícia Universidade Católica do Rio de Janeiro Vanessa Gordo/Universidade Presbiteriana Mackenzie Isabel Carvalho/Pontifícia Universidade Católica do Rio de Janeiro Victor Oliveira/Pontifícia Universidade Católica do Rio de Janeiro Christiano De Matos/Universidade Presbiteriana Mackenzie

9:45 - 10:00 **Different ultrafast dynamics of neutral and charged excitons in monolayer WS_2 (SM1Q.7)**
Presenter: Yuhan Wang, *Nanjing University*
Expand for Abstract / Authors

Paper

We investigate a back-gate-controlled monolayer WS_2 device using ultrafast pump-probe spectroscopy. While gate-induced electrostatic doping does not show impact on the transient dynamics, our experiments reveal dramatic difference for lifetimes of neutral and charged excitons.

Authors:Anran Wang/Nanjing University Yuhan Wang/Nanjing University Jianfei Li/Nanjing University Yi Shi/Nanjing University Fengqiu Wang/Nanjing University

Terahertz Emission and Quantum Optics (SM1F)
Presider: Jessica Boland, *University of Manchester*

8:00 - 8:15 **Topological Insulator-based Terahertz Emission with Manipulated Polarization (TI-TEMP) (SM1F.1)**
Presenter: Haihui Zhao, *Beihang University*
Expand for Abstract / Authors

Paper

Spin-polarized terahertz waves with arbitrarily tailored temporal shaping are successfully demonstrated in three-dimensional topological insulator Bi_2Te_3 when delicately controlling the incident femtosecond laser polarization and the sample azimuthal angle.

Authors:Xiaojun Wu/Beihang University Haihui Zhao/Beihang University Xinhou Chen/Beihang University Hangtian Wang/Beihang University Chun Wang/Institute of Physics, Chinese Academy of Sciences Tianxiao Nie/Beihang University

8:15 - 8:30

Strong Enhancement of THz Emission in a Metal-Graphene-Silicon Heterostructure (SM1F.2)
Presenter: Dehui Zhang, *University of Michigan*
Expand for Abstract / Authors

Paper

We report a THz emitter based on a metal-graphene-silicon heterostructure. Increased carrier collection efficiency by the graphene layer leads to an 80-time amplitude enhancement over its graphene-free counterpart, with no tradeoff in bandwidth or SNR.

Authors:Dehui Zhang/University of Michigan Zhen Xu/University of Michigan Gong Cheng/University of Michigan Zhe Liu/University of Michigan Audrey Rose Gutierrez/University of Michigan Theodore Norris/University of Michigan Zhaohui Zhong/University of Michigan

8:30 - 8:45

Coherent control of boosted Terahertz radiation from air plasma pumped by femtosecond 3-color sawtooth field (SM1F.3)
Presenter: Yiu Liu, *Univ. of Shanghai for Sci. and Tech.*
Expand for Abstract / Authors

Paper

Amplitude of Terahertz radiation from air plasma is enhanced by one order of magnitude with a 3-color femtosecond sawtooth field. Moreover, the THz wave can be coherently controlled by the two relative phases.

Authors:Shaojie Liu/Univ. of Shanghai for Sci. and Tech. Chenhui Lu/Shanghai University of Engineering Science Zhengquan Fan/Univ. of Shanghai for Sci. and Tech. Jieyu Gui/Univ. of Shanghai for Sci. and Tech. Qingqing Liang/Univ. of Shanghai for Sci. and Tech. Bin Zhou/Univ. of Shanghai for Sci. and Tech. Aurelien Houard/ENSTA Paris Andre Mysyrowicz/ENSTA Paris Songlin Zhuang/Univ. of Shanghai for Sci. and Tech. Yiu Liu/Univ. of Shanghai for Sci. and Tech.

8:45 - 9:00

Efficient terahertz and Brunel harmonic generation from air plasma with femtosecond two-color mid-infrared lasers (SM1F.4)
Presenter: Dogeun Jang, *University of Maryland at College Park*
Expand for Abstract / Authors

Paper

We report the generation of coherent radiation from terahertz to ultraviolet via two-color mid-infrared laser mixing in air. We achieve laser-to-terahertz conversion efficiency of ~1%, 10~100 times greater than those obtained with 800 nm lasers.

Authors:Dogeun Jang/University of Maryland at College Park Robert Schwartz/University of Maryland at College Park Daniel Woodbury/University of Maryland at College Park Jesse Griff-McMahon/University of Maryland at College Park Abdurrahman Younis/University of Maryland at College Park Howard Milchberg/University of Maryland at College Park Ki-Yong Kim/University of Maryland at College Park

9:00 - 9:15 **Terahertz Emission Spectroscopy as Contactless Ultrafast Detection for Room-temperature 2D Magnetic Materials (SM1F.5)**
Presenter: Xinhou Chen, *Beihang University*
Expand for Abstract / Authors

Paper

Room-temperature Fe_3GeTe_2-Bi_2Te_3 heterostructures have been systematically investigated on terahertz emission spectroscopy. Detectable terahertz pulses can be, to some extent, as a verification for the successful fabrication of the room-temperature 2D magnetic material.

Authors:Xiaojun Wu/Beihang University Xinhou Chen/Beihang University Hangtian Wang/Beihang University Gaoshuai Wei/Institute of Physics, Chinese Academy of Sciences Tianxiao Nie/Beihang University

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9:15 - 9:30 **Picking Out Nonlinear Collective Couplings with Two-Dimensional Terahertz Spectroscopy (SM1F.6)**
Presenter: Brittany Knighton, *Brigham Young University*
Expand for Abstract / Authors

Paper

2D terahertz spectroscopy can disentangle coupling between different degrees of freedom. We discuss the complex 2D terahertz spectra of β-barium borate and model different vibrational couplings to assign spectral features that arise from such coupling.

Authors:Brittany Knighton/Brigham Young University Megan Nielslon/Brigham Young University R. Tanner Hardy/Brigham Young University Aldair Alejandro/Brigham Young University Lauren Rawlings/Brigham Young University Jeremy Johnson/Brigham Young University

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9:30 - 10:00 **Terahertz quantum optics in the time-domain: from field correlation measurements on vacuum field fluctuations in free space towards cavity electro-optics. (SM1F.7)**
Presenter: Ileana-Cristina Benea-Chelmus, *Harvard John A. Paulson School of Engineering and Applied Sciences*
Expand for Abstract / Authors

Paper

The ground state of electromagnetic radiation is characterised by a fluctuating electromagnetic field even in a vacuum. We measure its correlation function as a function of time and space using the electro-optic effect. We determine the spectral content and the amplitude of this state and find excellent agreement with the second quatisation theory. Finally, we discuss the potential of recent electro-optic quantum coherent interfaces for cavity electrodynamics experiments in the terahertz.

Authors:Ileana-Cristina Benea-Chelmus/Harvard John A. Paulson School of Engineering and Applied Sciences Francesca Fabiana Settembrini/ETH Zurich Yannick Salamin/ETH Zurich Yuriy Fedoryshyn/ETH Zurich Wolfgang Heni/ETH Zurich Delwin Elder/University of Washington Larry Dalton/University of Washington Juerg Leuthold/ETH Zurich Giacomo Scalari/ETH Zurich Jérôme Faist/ETH Zurich

Invited

Nonlinear Optics in Fibers I (SM1P)

Presider: Sze Set, *University of Tokyo*

8:00 - 8:15	**Efficient Chirp-Assisted SRS in H_2-Filled Hollow-Core PCF for Generation of Ultrashort LP_{01} Pulses at 1.8 µm (SM1P.1)** **Presenter**: Sébastien Loranger, *Max Planck Institute for the Science of Light* Expand for Abstract / Authors Sub-40 fs pulses at 1.8 µm are generated by pumping H_2-filled hollow-core PCF with 300 fs, 1.03 µm fiber laser pulses pre-chirped to a duration of 640 fs. Conversion efficiencies of 50% are obtained. **Authors**:Sébastien Loranger/Max Planck Institute for the Science of Light David Novoa/Max Planck Institute for the Science of Light Philip Russell/Max Planck Institute for the Science of Light	Paper
8:15 - 8:30	**Raman Amplification of Charge-15 Orbital Angular Momentum Mode in a Large Core Step Index Fiber (SM1P.2)** **Presenter**: Sheng Zhu, *University of Southampton* Expand for Abstract / Authors We report 9.2-dB Raman amplification of pulses at 1121 nm in an orbital angular momentum mode with charge 15 in 30 m of 50-µm-diameter step-index-core fiber. The amplified signal mode-purity is measured to 78.4%. **Authors**:Sheng Zhu/University of Southampton Srinivas Pachava/Indian Institute of Technology Madras Shankar Pidishety/University of Southampton Yutong Feng/University of Southampton Balaji Srinivasan/Indian Institute of Technology Madras Johan Nilsson/University of Southampton	Paper
8:30 - 9:00	**Stimulated Brillouin Scatering based Optical Signal Processing (SM1P.3)** **Presenter**: Thomas Schneider, *Technische Universität Braunschweig* Expand for Abstract / Authors Stimulated Brillouin scattering is the nonlinear effect with the lowest threshold and narrowest linewidth. Additionally, the SBS gain or loss transfer function can be tailored. This makes it an ideal candidate for signal processing. **Authors**:Thomas Schneider/Technische Universität Braunschweig Invited	Paper

9:00 - 9:15	**Broadband SBS Filter for Optical Carrier Recovery Applications in Telecommunication Systems (SM1P.4)** **Presenter**: Atiyeh Zarifi, *University of Sydney* Expand for Abstract / Authors We demonstrate a broadband Brillouin filter for optical carrier recovery, which extends the operation range of the conventional filter from 2 nm to 10 nm in C-band, with a relatively flat gain and noise profile. **Authors**:Atiyeh Zarifi/University of Sydney Moritz Merklein/University of Sydney Yang Liu/University of Sydney Amol Choudhary/Indian Institute of Technology Benjamin Eggleton/University of Sydney Bill Corcoran/Monash University	Paper
9:15 - 9:30	**Tapered submicron silicon core fiber for broadband wavelength conversion (SM1P.5)** **Presenter**: Dong Wu, *Optoelectronics Research Centre* Expand for Abstract / Authors Wavelength conversion of 20 Gb/s quadrature phase shift keying (QPSK) signals is demonstrated in a tapered silicon core fiber extending across the S-, C- and L-bands. The results indicate the platform's suitability for use in broadband all-optical communication systems. **Authors**:Dong Wu/Optoelectronics Research Centre Li Shen/Optoelectronics Research Centre Cosimo Lacava/Optoelectronics Research Centre periklis petropoulos/Optoelectronics Research Centre John Ballato/COMSET Ursula Gibson/Department of Physics and Porelabs Anna Peacock/Optoelectronics Research Centre	Paper
9:30 - 9:45	**Optical Thermalization in Ultrashort Pulse Propagation in Multimode Fiber (SM1P.6)** **Presenter**: Hamed Pourbeyram, *Cornell University* Expand for Abstract / Authors We experimentally investigate a recently-proposed thermodynamic theory of highly multimode nonlinear optical systems. Mode-resolved measurements demonstrate thermalization of the distribution via the Kerr nonlinearity in multimode optical fiber. **Authors**:Hamed Pourbeyram/Cornell University Pavel Sidorenko/Cornell University Fan Wu/University of Central Florida Demetrios Christodoulides/University of Central Florida Frank Wise/Cornell University	Paper

9:45 - 10:00 **Time-Synchronized 3-Color Single-Aperture Fiber Sources via Soliton Self-Mode Conversion (SM1P.7)**
Presenter: Havva Begüm Kabagöz, *Boston University*
Expand for Abstract / Authors

Paper

We demonstrate a three-wavelength, time-synchronized, ultrashort (~90 fs), energetic (~6.5 nJ) pulse source from a single fiber aperture, uniquely enabled by the recently discovered process of soliton self-mode conversion.

Authors:Havva Begüm Kabagöz/Boston University Siyuan Zhang/Boston University Siddharth Ramachandran/Boston University Lars Sogaard Rishoj/Technical University of Denmark Aku Antikainen/Boston University

Coherent Control in Fiber Optics (SM1L)

Presider: Raja Ahmad, *OFS Laboratories*

8:00 - 8:30 **A Coherent Ising Machine Based on Degenerate Optical Parametric Oscillators (SM1L.1)**
Presenter: Hiroki Takesue, *NTT Basic Research Laboratories*
Expand for Abstract / Authors

Paper

We report a coherent Ising machine for solving combinatorial optimization problems, which uses time-multiplexed degenerate optical parametric oscillator pulses generated in a 1-km fiber cavity to represent the Ising spins.

Authors:Hiroki Takesue/NTT Basic Research Laboratories Takahiro Inagaki/NTT Basic Research Laboratories Kensuke Inaba/NTT Basic Research Laboratories Takuya Ikuta/NTT Basic Research Laboratories Yasuhiro Yamada/NTT Basic Research Laboratories Toshimori Honjo/NTT Basic Research Laboratories

Invited

8:30 - 8:45 **Tiled Aperture Beam Combining with Reinforcement Learning (SM1L.2)**
Presenter: Henrik Tuennermann, *University of Electro-Communications*
Expand for Abstract / Authors

Paper

We show deep reinforcement learning for phase stabilization in tiled aperture coherent beam combining. The trained agent was able to stabilize the phase using only a far-field image as input.

Authors:Henrik Tuennermann/University of Electro-Communications Akira Shirakawa/University of Electro-Communications

8:45 - 9:00

Controlling the temporal impulse response of light propagating through a multimode fiber (SM1L.3)
Presenter: Mickael Mounaix, *The University of Queensland*
Expand for Abstract / Authors

Paper

We demonstrate how to control the polarization-resolved temporal impulse response of transmitted light through a multimode fiber. We show enhancing or attenuating the total temporal impulse response at arbitrary delays and polarization states.

Authors:Mickael Mounaix/The University of Queensland Joel Carpenter/The University of Queensland

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9:00 - 9:15

Coherent control of light through laser written photonic lanterns (SM1L.4)
Presenter: Shuhui Li, *University of Exeter*
Expand for Abstract / Authors

Paper

We demonstrate coherent control of light through bespoke laser written photonic lanterns. This enables imaging in a variety of new situations, with potential applications to micro-endoscopy, chip-based LIDAR, and microfluidic imaging.

Authors:Shuhui Li/University of Exeter Duncan McNicholl/Heriot Watt University Graeme Whyte/Heriot Watt University Tim Birks/University of Bath Robert Thomson/Heriot Watt University David Phillips/University of Exeter

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9:15 - 9:30

Coherence property of time-multiplexed degenerate optical parametric oscillator pulses generated using a nonlinear fiber Sagnac loop (SM1L.5)
Presenter: Hsin Pin Lo, *NTT Basic Research Laboratories*
Expand for Abstract / Authors

Paper

We generated time-multiplexed degenerate optical parametric oscillator pulses using a nonlinear fiber Sagnac interferometer. We confirmed that the phases of pulses were bifurcated to 0 or π, which makes them useful for simulating Ising spins.

Authors:Hsin Pin Lo/NTT Basic Research Laboratories Takahiro Inagaki/NTT Basic Research Laboratories Toshimori Honjo/NTT Basic Research Laboratories Hiroki Takesue/NTT Basic Research Laboratories

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Coherent Biomedical Imaging (AM1I)

Presider: Tilman Schmoll, *Carl Zeiss Meditec Inc*

8:00 - 8:15 **Color Holographic Microscopy Using a Deep Neural Network (AM1I.1)**
Presenter: Tairan Liu, *University of California, Los Angeles*
Expand for Abstract / Authors

Paper

We present a deep learning-based image reconstruction framework for color holographic microscopy, which requires a single hologram taken using three wavelengths, simultaneously illuminating the specimen, to reconstruct its color images.

Authors:Tairan Liu/University of California, Los Angeles Zhensong Wei/University of California, Los Angeles Yair Rivenson/University of California, Los Angeles Kevin Haan/University of California, Los Angeles Yibo Zhang/University of California, Los Angeles Yichen Wu/University of California, Los Angeles Aydogan Ozcan/University of California, Los Angeles

8:15 - 8:30 **Testing Antibiotic Resistance by Biodynamic Imaging of Living Tissue Sentinels (AM1I.2)**
Presenter: Honggu Choi, *Purdue University*
Expand for Abstract / Authors

Paper

Misuse of antibiotics causes bacteria to develop antibiotic-resistance. Biodynamic imaging (BDI) of living tissue infected by E. coli detects antibiotic resistance and sensitivity by treating bacterial infections with antibiotics *in vitro*.

Authors:Honggu Choi/Purdue University Jessica Zuponcic/Purdue University Eduardo Ximenes/Purdue University John Turek/Purdue University Michael Ladisch/Purdue University David Nolte/Purdue University

8:30 - 9:00 **Recent Advances and Trends in Ultra-Widefield Ophthalmic Imaging (AM1I.3)**
Presenter: Conor Leahy, *Carl Zeiss Meditec, Inc.*
Expand for Abstract / Authors

Paper

We review recent advances in human *in vivo* ultra-widefield retinal imaging and optical coherence tomography, discuss emerging new technologies, and consider potential opportunities and implications for clinical research and practice.

Authors:Conor Leahy/Carl Zeiss Meditec, Inc. Jochen Straub/Carl Zeiss Meditec, Inc.

Invited

9:00 - 9:30 **Coherent Optical Scattering and Interferometry (COSI) Microscopy for Morphological Imaging of Thrombus (AM1I.4)**
Presenter: Yujie Zheng, *Australian National University*
Expand for Abstract / Authors

Paper

In this work, we propose a label-free COSI system to quantify morphological changes and platelet activity along non-patterned collagen fibres within milliseconds in microfluidics channels underflow at sub-platelet imaging resolution.

Authors:Yujie Zheng/Australian National University Samantha Montague/Australian National University Yean Lim/Australian National University Tienan Xu/Australian National University Elizabeth Gardiner/Australian National University Woei Ming Lee/Australian National University

9:30 - 9:45 **Penetration Depth Increase of Near Infrared Vortex Light through Turbid Media (AM1I.5)**
Presenter: Francesco di Bartolo, *University of Pisa*
Expand for Abstract / Authors

Paper

The higher capacity of Laguerre-Gaussian vortex beams of penetrating turbid media (e.g. biological fluids) with respect to conventional Gaussian beams is, for the first time, demonstrated in the 1.3µm-wavelength range commonly used for intravascular OCT.

Authors:Francesco di Bartolo/University of Pisa Muhammad Malik/Sant'Anna School of Advanced Studies Mirco Scaffardi/CNIT-National Inter-University Consortium for Telecommunication Antonella Bogoni/Sant'Anna School of Advanced Studies Simona Celi/Fondazione Toscana Gabriele Monasterio Antonio Malacarne/Sant'Anna School of Advanced Studies

9:45 - 10:00 **Tandem Mach-Zehnder Based Directional Coupler to Enhance Signal-to-Noise Ratio of Optical Coherence Tomography (AM1I.6)**
Presenter: Shih-Hsiang Hsu, *National Taiwan Univ of Science & Tech*
Expand for Abstract / Authors

Paper

A tandem Mach-Zehnder directional coupler (MZDC) demonstrates maximally flat wavelength-insensitive optical power divider compared with directional coupler and MZDC. Its 100-nm wavelength response could enhance the signal-to-noise ratio of optical coherence tomography up to 24-dB.

Authors:Yi-Ting Lu/National Taiwan Univ of Science & Tech Benedictus Yohanes Bagus Widhianto/National Taiwan Univ of Science & Tech Shih-Hsiang Hsu/National Taiwan Univ of Science & Tech

Quantum Photonics: Applications and Dreams (FM1C)

Presider: Marco Liscidini, *Università degli Studi di Pavia*

8:00 - 8:15	**Large-scale spectral bandwidth compression of telecom single-photon pulses (FM1C.1)** **Presenter**: Filip Sośnicki, *University of Warsaw* Expand for Abstract / Authors We experimentally demonstrate an electro-optic spectral bandwidth conversion of broadband single-photon pulses by more than 2 orders of magnitude to sub-2 GHz bandwidth. The results will enable photonic quantum network interfaces. **Authors**:Filip Sośnicki/University of Warsaw Michal Mikolajczyk/University of Warsaw Ali Golestani/University of Warsaw Adam Widomski/University of Warsaw Michal Karpinski/University of Warsaw	Paper
8:15 - 8:30	**Group-velocity symmetry for highly adaptable quantum frequency conversion (FM1C.2)** **Presenter**: Charlotte Parry, *University of Bath* Expand for Abstract / Authors We show that through engineering symmetric group velocity, frequency conversion by Bragg-scattering four-wave mixing can be phase matched over ultra-broad bandwidths, enabling highly adaptable frequency conversion interfaces for quantum networks. **Authors**:Charlotte Parry/University of Bath Philip Main/University of Bath Thomas Wright/University of Bath Peter Mosley/University of Bath	Paper
8:30 - 8:45	**Verifying the Survival of Time-Energy Entanglement Through Tissue (FM1C.3)** **Presenter**: Daniel Lum, *NIST* Expand for Abstract / Authors Two-photon microscopy (TPM) with entangled photons may provide significant enhancements over classical TPM. Though previously little explored, here we demonstrate via a unique Franson interferometer, the robust maintenance of entanglement through millimeters of bio-samples. **Authors**:Daniel Lum/NIST Michael Mazurek/NIST Alexander Mikhailov/JILA Kristen Parzuchowski/JILA Ryan Willson/JILA Marcus Cicerone/NIST Ralph Jimenez/NIST Thomas Gerrits/NIST Martin Stevens/NIST Charles Camp/NIST	Paper

8:45 - 9:00	**Experimental Demonstration of an Entangled Radiofrequency-Photonic Sensor Network (FM1C.4)** **Presenter**: Yi Xia, *University of Arizona* Expand for Abstract / Authors We propose and experimentally demonstrate a reconfigurable radiofrequency (RF)-photonic sensor network comprised of three entangled sensor nodes to increase the precision of parameter estimation in networked RF sensing tasks. **Authors**:Yi Xia/University of Arizona Wei Li/University of Arizona William Clark/General Dynamics Darlene Hart/General Dynamics Quntao Zhuang/University of Arizona Zheshen Zhang/University of Arizona	Paper
9:00 - 9:15	**Precision measurement of optical fiber delays with a quantum frequency comb (FM1C.5)** **Presenter**: Suparna Seshadri, *Purdue University* Expand for Abstract / Authors We propose a scheme to measure the time delay between two optical paths using frequency-bin entangled biphotons and show picosecond-scale features by mixing several frequency bins using electro-optic phase modulation. **Authors**:Suparna Seshadri/Purdue University Poolad Imany/Purdue University Navin Lingaraju/Purdue University Daniel Leaird/Purdue University Andrew Weiner/Purdue University	Paper
9:15 - 9:30	**Rapid Generation and Detection of Spatial Modes of Light with an Acousto-Optic Modulator (FM1C.6)** **Presenter**: Boris Braverman, *University of Ottawa* Expand for Abstract / Authors We use an acousto-optical modulator as a rapidly steerable mirror to multiplex several static patterns on a spatial light modulator, demonstrating both generation and projection of 5 spatial modes of light, with up to 500 kHz bandwidth. **Authors**:Boris Braverman/University of Ottawa Alexander Skerjanc/University of Ottawa Nicholas Sullivan/University of Ottawa Robert Boyd/University of Ottawa	Paper

9:30 - 9:45 **Discerning Polarization Objects using Non-local Measurements with Metasurfaces (FM1C.7)**
Presenter: Andres Vega, *Friedrich Schiller University Jena*
Expand for Abstract / Authors

Paper

We present an original non-local ghost measurement scheme with polarization-entangled photons, where nanostructured dielectric metasurfaces enable discrimination between a set of objects with different polarization characteristics, including fully or partially transparent birefringent elements.

Authors:Andres Vega/Friedrich Schiller University Jena Kai Wang/Australian National University Shaun Lung/Australian National University Daniel Jones/U.S. Army Research Laboratory Michael Brodsky/U.S. Army Research Laboratory Thomas Pertsch/Friedrich Schiller University Jena Frank Setzpfandt/Friedrich Schiller University Jena Andrey Sukhorukov/Australian National University

9:45 - 10:00 **Arbitrary Transformation of Two-Photon Polarization States with Metasurfaces (FM1C.8)**
Presenter: Kai Wang, *Australian National University*
Expand for Abstract / Authors

Paper

We develop and experimentally realize all-dielectric metasurfaces that can transform any input two-photon polarization-entangled state to an arbitrary target state, achieving a tailored control over the degree of entanglement through a theoretically optimal non-Hermitian operation.

Authors:Shaun Lung/Australian National University Kai Wang/Australian National University Khosro Zangeneh/Australian National University Mohsen Rahmani/Australian National University Dragomir Neshev/Australian National University Andrey Sukhorukov/Australian National University

Optical Metrology for New Physics Discoveries (SM1N)

Presider: Ladan Arissian, *National Research Council Canada*

8:00 - 9:00

Quantum Sensors for New-physics Discoveries (SM1N.1)
Presenter: Marianna Safronova, *University of Delaware*
Expand for Abstract / Authors

Paper

Extraordinary progress in quantum sensors and technologies opens new avenues for exploring the Universe and testing fundamental physics postulates. The development of the quantum technologies may answer the many persisting questions such as the nature or dark matter and if fundamental constants actually vary with time. I will discuss the future development of quantum sensors and their applications towards discoveries of new physics, with a particular emphasis on the atomic and nuclear clocks.

Marianna Safronova is a Professor of Physics at the University of Delaware. Her diverse research interests include applications of quantum technologies to tests of fundamental physics, quantum many-body theory, atomic clocks, and others. She is a Fellow of the American Physical Society (APS) and 2018-2019 Chair of DAMOP, APS.

Authors:Marianna Safronova/University of Delaware

Tutorial

9:00 - 9:15

Coherent Optical Clock Down-Conversion Realizing Microwaves With 10^{-18} Absolute Stability (SM1N.2)
Presenter: Takuma Nakamura, *National Inst. of Standards & Technology*
Expand for Abstract / Authors

Paper

We generate 10-GHz microwaves, derived from independent Yb optical clocks, with 2.4×10^{-18} absolute fractional frequency stability, no significant offset at the 10^{-19} level, and femtosecond-precision transfer of the optical clock phase to the microwave domain.

Authors:Takuma Nakamura/National Inst. of Standards & Technology Josue Davila-Rodriguez/National Inst. of Standards & Technology Holly Leopardi/National Inst. of Standards & Technology Jeff Sherman/National Inst. of Standards & Technology Tara Fortier/National Inst. of Standards & Technology Xiaojun Xie/University of Virginia Joe Campbell/University of Virginia Scott Diddams/National Inst. of Standards & Technology Will McGrew/National Inst. of Standards & Technology Xiaogang Zhang/National Inst. of Standards & Technology Youssef Hassan/National Inst. of Standards & Technology Daniele Nicolodi/National Inst. of Standards & Technology Andrew Ludlow/National Inst. of Standards & Technology Franklyn Quinlan/National Inst. of Standards & Technology

9:15 - 9:30 **Field-deployable Ultra-low-noise Clockwork for Precision Optical Clocks (SM1N.3)**
Presenter: Michele Giunta, *Menlo Systems GmbH*
Expand for Abstract / Authors

Paper

We report the development of a field-deployable frequency comb operated as clockwork for transportable Sr-clocks. While referencing it at ~194.4THz, we characterize spectral lines at ~214.6THz. Prospects on complete Sr-lattice laser systems will be outlined.

Authors:Michele Giunta/Menlo Systems GmbH Marc Fischer/Menlo Systems GmbH Nikolai Lilienfein/Menlo Systems GmbH Martin Wolferstetter/Menlo Systems GmbH Simon Holzberger/Menlo Systems GmbH Sarah Saint-Jalm/Menlo Systems GmbH Florian Skopnik/Menlo Systems GmbH Maurice Lessing/Menlo Systems GmbH Wolfgang Hänsel/Menlo Systems GmbH Ronald Holzwarth/Menlo Systems GmbH

9:30 - 10:00 **Development of transportable optical lattice clocks for geodetic applications (SM1N.4)**
Presenter: Masao Takamoto, *RIKEN*
Expand for Abstract / Authors

Paper

The recent progress of optical lattice clocks has improved the accuracies to 10^{-18}. We will present the development of the optical lattice clocks and their applications in geodetic measurements.

Authors:Masao Takamoto/RIKEN

Invited

10:30 - 12:30 (UTC - 07:00)

Symp: SiGeSnPb and Related Compounds: from Mid Infrared Photonics to Quantum Materials and Devices (JM2E)
Presider: Jifeng Liu, *Dartmouth College*

Special Symposium

10:30 - 11:00

Mid-Infrared GeSn/SiGeSn Lasers and Photodetectors Monolithically Integrated on Silicon (JM2E.1)
Presenter: Shuiqing Yu, *University of Arkansas*
Expand for Abstract / Authors

Paper

We demonstrated optically pumped GeSn lasers operating at 270 K and 3.5 µm, and photodetectors with spectral response cutoff at 3.65 µm and 300 K. Latest progress on electrically injected lasers will also be reported.

Authors:Yiyin Zhou/University of Arkansas Huong Tran/University of Arkansas Wei Du/Wilkes University Jifeng Liu/Dartmouth College Greg Sun/University of Massachusetts Boston Richard Soref/University of Massachusetts Boston Joe Margetis/ASM John Tolle/ASM Yong-Hang Zhang/Arizona State University Baohua Li/Arktonics, LLC Mansour Mortazavi/University of Arkansas at Pine Bluff Shuiqing Yu/University of Arkansas

Invited

11:00 - 11:30

(Withdrawn) Band Structure Engineering in SiGeSn/GeSn Heterostructures for Light Emitters on Si (JM2E.2)
Presenter: Dan Buca, *Forschungszentrum Jülich GmbH*
Expand for Abstract / Authors

In this presentation we will discuss the influence of GeSn band structure tuning via strain on the GeSn/SiGeSn laser properties with accent on optical pumping laser threshold and laser temperature operation.

Authors:Dan Buca/Forschungszentrum Jülich GmbH Andreas Tiedermann/Forschungszentrum Jülich GmbH Jean-Michel Hartmann/CEA, LETI Zoran Ikonic/University of Leeds Moustafa El Kurdi/Université Paris Sud Detlev Gruetzmacher/Forschungszentrum Jülich GmbH

Invited

11:30 - 12:00

Large-scale first-principle computational modeling of GeSn alloys (JM2E.3)
Presenter: Tianshu Li, *George Washington University*
Expand for Abstract / Authors

Paper

First-principle calculations combined with Monte Carlo sampling demonstrate the existence of local, partial atomic ordering in GeSn alloys. This non-ideal behavior has a few important implications on alloy's stability and electronic structures.

Authors:Tianshu Li/George Washington University Boxiao Cao/George Washington University Xiaochen Jin/George Washington University

Invited

12:00 - 12:30 **High Operating Temperature Type-II Superlattice Mid-Infrared Detectors (JM2E.4)**
Presenter: Sarath Gunapala, *Jet Propulsion Laboratory*
Expand for Abstract / Authors

Paper

We will discuss a development of high operating temperature type-II superlattices detectors. Our goal is to elevate the operating temperature of the sensor to reduce the size, weight, and power of the remote sensing instruments.

Authors:Sarath Gunapala/Jet Propulsion Laboratory David Ting/Jet Propulsion Laboratory Alexander Soibel/Jet Propulsion Laboratory Arezou Khoshakhlagh/Jet Propulsion Laboratory Sir Rafol/Jet Propulsion Laboratory Cory Hill/Jet Propulsion Laboratory Sam Keo/Jet Propulsion Laboratory Anita Fisher/Jet Propulsion Laboratory Brian Pepper/Jet Propulsion Laboratory

Invited

Symp: Tunable and Nonlinear Optical Metasurfaces: Progress and Applications II (JM2G)

Presider: Ksenia Dolgaleva, *University of Ottawa*

Special Symposium

10:30 - 11:00 **Nonlinear and Hyperbolic Metasurfaces and Applications (JM2G.1)**
Presenter: Augustine Urbas, *US Air Force Research Laboratory*
Expand for Abstract / Authors

Paper

We engineer the nonlinear response of multilayered systems by employing the optical response of Arsenide semiconductor materials. The photoexcited carriers lead to spectral, temporal, and polarization dependent optical response that is described herein. The response is suggestive of generating a transient hyperbolic materials response in this system. Exploration of this response and the use of these materials as a basis for nonlinear metasurfaces is discussed.

Authors:Augustine Urbas/ US Air Force Research Laboratory

Invited

11:00 - 11:30	**Functional Nanomechanical Metamaterials Driven by Light, Electromagnetic Forces and Sound. (JM2G.2)** **Presenter**: Nikolay Zheludev, *University of Southampton* Expand for Abstract / Authors The changing balance of forces at the nanoscale allows functional metamaterials in which electromagnetic forces, thermal stimulation, sound and optical signals can be engaged to dynamically change their optical properties. **Authors**:Nikolay Zheludev/University of Southampton Dimitrios Papas/University of Southampton Tongjun Liu/University of Southampton Jinxiang Li/University of Southampton Qiang Zhang/University of Southampton Jun-Yu Ou/University of Southampton Eric Plum/University of Southampton Kevin MacDonald/University of Southampton Invited	Paper
11:30 - 11:45	**Reconfigurable Non-volatile High-performance Metalens (JM2G.3)** **Presenter**: Mikhail Shalaginov, *Massachusetts Institute of Technology* Expand for Abstract / Authors We demonstrated a varifocal metalens based on the low-loss optical phase-change material $Ge_2Sb_2Se_4Te_1$ (GSST). The lens features diffraction-limited performance and full 2π phase tuning range. Aberration- and crosstalk-free imaging using the lens was also demonstrated. **Authors**:Mikhail Shalaginov/Massachusetts Institute of Technology sensong an/University of Massachusetts Lowell Yifei Zhang/Massachusetts Institute of Technology Fan Yang/Massachusetts Institute of Technology Peter Su/Massachusetts Institute of Technology Vladimir Liberman/Lincoln Laboratory Jeffrey Chou/Lincoln Laboratory Christopher Roberts/Lincoln Laboratory Myungkoo Kang/University of Central Florida Carlos Rios/Massachusetts Institute of Technology Qingyang Du/Massachusetts Institute of Technology clayton fowler/University of Massachusetts Lowell Anuradha Agarwal/Massachusetts Institute of Technology Kathleen Richardson/University of Central Florida Clara Rivero-Baleine/Lockheed Martin Corporation hualiang Zhang/University of Massachusetts Lowell Juejun Hu/Massachusetts Institute of Technology Tian Gu/Massachusetts Institute of Technology	Paper
11:45 - 12:00	**Modulating Chiroptical Coupling and Light-Valley Interactions with Active Chiral Metamaterials (JM2G.4)** **Presenter**: Zilong Wu, *University of Texas at Austin* Expand for Abstract / Authors Active modulation of near-field chiroptical couplings and handedness-selective valley behaviors in a monolayer semiconductor is achieved using plasmonic moiré chiral metamaterials (MCMs) with strong and dynamically tunable optical chirality. **Authors**:Zilong Wu/University of Texas at Austin Jingang Li/University of Texas at Austin Yuebing Zheng/University of Texas at Austin	Paper

12:00 - 12:30	**Design and Fabrication of the Vacuum Ultraviolet Nonlinear Metasurfaces (JM2G.5)** **Presenter**: Din Ping Tsai, *Hong Kong Polytechnic University* Expand for Abstract / Authors The approaches for design, fabrication, and measurement of the novel ultracompact nonlinear metasurface device for generation and manipulation of the coherent vacuum ultraviolet (VUV) light will be shown and discussed. **Authors**:Din Ping Tsai/Hong Kong Polytechnic University Ming Lun Tseng/National Taiwan University Michael Semmlinger/Rice University Jiang Yang/Rice University Ming Zhang/Rice University Chao Zhang/Rice University Peter Nordlander/Rice University Naomi J. Halas/Rice University Invited	Paper

Imaging, Beam Scanning and Detection in Remote Sensing (SM2M)

Presider: Nicolas Le Thomas, *Ghent University, INTEC*

10:30 - 10:45	**Two-dimensional beam steering based on LNOI optical phased array (SM2M.1)** **Presenter**: Su Tan, *Huazhong Univ of Science and Technology* Expand for Abstract / Authors We designed and fabricated two-dimensional optical beam steering chip based on X-cut LNOI wafer. The device can achieve a maximum angle of 18° in the phase tuning dimension with about 10 dB side lobe suppression ratio. **Authors**:Su Tan/Huazhong Univ of Science and Technology Jia Liu/Huazhong Univ of Science and Technology Ye Liu/Huazhong Univ of Science and Technology Heng Li/Huazhong Univ of Science and Technology Weihua Guo/Huazhong Univ of Science and Technology Qiaoyin Lu/Huazhong Univ of Science and Technology	Paper
10:45 - 11:00	**Solid-state beam scanner based on VCSEL integrated amplifier with scan resolution of over 200 (SM2M.2)** **Presenter**: SHANTING HU, *Tokyo Institute of Technology* Expand for Abstract / Authors We demonstrate a solid-state beam scanner based on VCSEL-integrated amplifier for 3D sensing. We realized a record beam-steering angle of 16 degrees with 200 resolution points. The integrated chip size is as small as 1 mm. **Authors**:SHANTING HU/Tokyo Institute of Technology Masashi Takanohashi/Tokyo Institute of Technology Xiaodong Gu/Tokyo Institute of Technology Keisuke Shimura/Tokyo Institute of Technology Fumio Koyama/Tokyo Institute of Technology	Paper

11:00 - 11:15	**Compressed Sensing Imaging via Beam Scanning (SM2M.3)** **Presenter**: Kangning Zhang, *University of California, Davis* Expand for Abstract / Authors We propose a new imaging scheme of compressed sensing by scanning an illumination pattern on the object. Comparing with conventional single-pixel cameras, we expect a >50x increase in imaging speed with similar imaging quality. **Authors**:Kangning Zhang/University of California, Davis Junjie Hu/University of California, Davis Weijian Yang/University of California, Davis	Paper
11:15 - 11:30	**Solid state LiDAR with sensing distance of over 40m using a VCSEL beam scanner (SM2M.4)** **Presenter**: Ibuki Fujioka, *Tokyo Institute of Technology* Expand for Abstract / Authors We demonstrated a solid state LiDAR with a sensing distance range of over 40m by using a non-mechanical VCSEL beam-scanner. The depth accuracy of 22cm was obtained with a low peak-power of 0.2 W. **Authors**:Ibuki Fujioka/Tokyo Institute of Technology Zeuku Ho/Tokyo Institute of Technology Xiaodong Gu/Tokyo Institute of Technology Fumio Koyama/Tokyo Institute of Technology	Paper
11:30 - 11:45	**(Withdrawn) Towards high-speed multispectral FRAME-videography with large frame numbers (SM2M.5)** **Presenter**: Vassily Kornienko, *Lund University* Expand for Abstract / Authors A FRAME (Frequency Recognition Algorithm for Multiple Exposures) system based on acousto-optic delflectors is proposed. This opens up for multispectral videography on the 100kHz timescale with a significant increase in the number of frames. **Authors**:Vassily Kornienko/Lund University Elias Kristensson/Lund University Simon Ek/Lund University	

11:45 - 12:00 **Long-range depth imaging with 13 ps temporal resolution using a superconducting nanowire single-photon detector (SM2M.6)**
Presenter: Gregor Taylor, *University of Glasgow*
Expand for Abstract / Authors

[Paper]

We demonstrate millimetre-scale depth imaging up to 325 meters by deployment of a novel superconducting nanowire single-photon detector with 13 ps FWHM instrument response function at 1550 nm wavelength.

Authors:Gregor Taylor/University of Glasgow Aongus McCarthy/Heriot-Watt University Boris Korzh/Jet Propulsion Laboratory Andrew Beyer/Jet Propulsion Laboratory Dmitry Morozov/University of Glasgow Ryan Briggs/Jet Propulsion Laboratory Jason Allmaras/Jet Propulsion Laboratory Bruce Bumble/Jet Propulsion Laboratory Matthew Shaw/Jet Propulsion Laboratory Robert Hadfield/University of Glasgow Gerald Buller/Heriot-Watt University

12:00 - 12:30 **Single Electron Detection by mid-IR Laser-Driven Avalanche Breakdown (SM2M.7)**
Presenter: Daniel Woodbury, *University of Maryland at College Park*
Expand for Abstract / Authors

[Paper]

Avalanche ionization allows detection of single electrons, analogous to photon counting in PMTs. Using a mid-IR, picosecond driver limits unwanted multi-photon ionization, enabling measurement of ultralow charge densities produced by radiation or ultrafast laser-gas interactions.

Authors:Howard Milchberg/University of Maryland at College Park Daniel Woodbury/University of Maryland at College Park

Invited

Electron-photon Interactions (FM2Q)

Presider: Hayk Harutyunyan, *Emory University*

10:30 - 10:45 **Low-Energy Optical Pulse Detection Using Biased Plasmonic Nanoantenna (FM2Q.1)**
Presenter: Marco Turchetti, *MIT*
Expand for Abstract / Authors

[Paper]

We report on compact, ultrafast, broadly tunable photodetectors exploiting cold-field electron tunneling from nanoantenna surfaces. We experimentally verify exponential sensitivity enhancement under a DC bias and examine the potential for sensing low-energy optical pulses.

Authors:Marco Turchetti/MIT Yujia Yang/MIT Mina Bionta/MIT Felix Ritzkowsky/DESY Michael Flatté/University of Iowa Karl Berggren/MIT Phillip D. Keathley/MIT

10:45 - 11:00	**Plasmonic Lenses for Ultrafast Electron Nanoemission (FM2Q.2)** **Presenter**: Daniel Durham, *University of California, Berkeley* Expand for Abstract / Authors We show the capability of plasmonic lenses for next-generation ultrafast electron sources. Using electromagnetic simulation, we design structures for femtosecond, nanoscale electron pulses. Plasmonic properties of template-stripped gold prototypes are probed by cathodoluminescence spectromicroscopy. **Authors**:Daniel Durham/University of California, Berkeley Fabrizio Riminucci/University of Salento Kostas Kanellopulos/Lawrence Berkeley National Laboratory Silvia Rotta Loria/Lawrence Berkeley National Laboratory Filippo Ciabattini/ETH Zurich Andrea Mostacci/University of Rome "La Sapienza" Andrew Minor/University of California, Berkeley Stefano Cabrini/Lawrence Berkeley National Laboratory Daniele Filippetto/Lawrence Berkeley National Laboratory	Paper
11:00 - 11:30	**Toward Nanophotonic Free-Electron Lasers (FM2Q.3)** **Presenter**: Nicholas Rivera, *Massachusetts Institute of Technology* Expand for Abstract / Authors We show that nanophotonic structures enable the possibility of realizing lasers based on stimulated emission by free electrons. The associated threshold beam currents are in the nanoampere range, and could be realized in electron microscopes. **Authors**:Nicholas Rivera/Massachusetts Institute of Technology Charles Roques-Carmes/Massachusetts Institute of Technology Ido Kaminer/Technion -- Israel Institute of Technology Marin Soljacic/Massachusetts Institute of Technology	Paper
11:30 - 11:45	**Size dependent absorption and hot electron emission from nanoporous gold (FM2Q.4)** **Presenter**: Alexander Petrov, *Hamburg University of Technology* Expand for Abstract / Authors Nanoporous gold can be tuned in its nanometer feature size without a change of porosity volume fraction. This allows studying the change in the optical damping and hot electron photoemission by electron collisions with the surface. **Authors**:Alexander Petrov/Hamburg University of Technology Matthias Graf/Hamburg University of Technology Mahima Arya/Hamburg University of Technology Manfred Eich/Hamburg University of Technology	Paper

11:45 - 12:00	**Surface Plasmon Assisted Control of Hot-Electron Relaxation Time (FM2Q.5)** **Presenter**: Sarvenaz Memarzadeh, *University of Maryland* Expand for Abstract / Authors Using time-resolved reflection measurements in the Kretschmann configuration under fixed absorbed power, we observe a slowing of the hot-electron relaxation in gold films associated with coupling to surface plasmons. **Authors**:Sarvenaz Memarzadeh/University of Maryland Jongbum Kim/University of California Yigit Aytac/Science Systems and Applications Inc Thomas Murphy/University of Maryland Jeremy Munday/University of California	Paper
12:00 - 12:15	**Giant Chirality of the Generation of Hot Electrons in Chiral Metamaterial Perfect Absorbers (FM2Q.6)** **Presenter**: Wenhao Wang, *University of Electronic Science and Technology of China* Expand for Abstract / Authors A chiral metamaterial perfect absorber is theoretically studied and presented for plasmon-induced polarization-sensitive photochemistry involving hot electrons. The g-factor of $Rate_{HE}$ reaches to 1.52, close to the theoretical upper limit of 2. **Authors**:Wenhao Wang/University of Electronic Science and Technology of China Lucas Besteiro/University of Electronic Science and Technology of China Tianji Liu/University of Electronic Science and Technology of China Cuo Wu/University of Electronic Science and Technology of China Jiachen Sun/University of Electronic Science and Technology of China Peng Yu/University of Electronic Science and Technology of China Le Chang/University of Electronic Science and Technology of China Zhiming Wang/University of Electronic Science and Technology of China Alexander Govorov/University of Electronic Science and Technology of China	Paper
12:15 - 12:30	**Controlling Free Electrons With Optical Whispering-Gallery Modes (FM2Q.7)** **Presenter**: Ofer Kfir, *University of Göttingen* Expand for Abstract / Authors We show that optical microcavities drive strong coherent modulations the in co-propagating free-electron beams, with sidebands spanning over 700eV from a sub-μm-long interaction. The electrons probe the cavity’s ringdown time and distinguish the modes spectrally. **Authors**:Ofer Kfir/University of Göttingen Hugo Lourenço-Martins/University of Göttingen Gero Storeck/University of Göttingen Murat Sivis/University of Göttingen Tyler Harvey/University of Göttingen Tobias Kippenberg/École Polytechnique Fédérale de Lausanne (EPFL) Armin Feist/University of Göttingen Claus Ropers/University of Göttingen	Paper

Ultrafast Pulse Manipulation II (SM2H)

Presider: Csaba Toth, *Lawrence Berkeley National Laboratory*

10:30 - 11:00	**Pulse compression to 3-cycle duration beyond 300 W average power (SM2H.1)** **Presenter**: Tamas Nagy, *Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy* Expand for Abstract / Authors We generate multi-mJ, 10fs pulses at average powers beyond 300W by 30-times compression of the output of an Yb-fiber CPA in a 6m long stretched capillary. Further up-scaling of the parameters is in progress. **Authors**:Tamas Nagy/Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy Steffen Hädrich/Active Fiber Systems GmbH Peter Simon/Laser-Laboratorium Göttingen e.V. Andreas Blumenstein/Laser-Laboratorium Göttingen e.V. Nico Walther/Active Fiber Systems GmbH Robert Klas/Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-Universität Jena Joachim Buldt/Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-Universität Jena Henning Stark/Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-Universität Jena Sven Breitkopf/Active Fiber Systems GmbH Peter Jojart/ELI-ALPS, ELI-HU Non-Profit Ltd. Imre Seres/ELI-ALPS, ELI-HU Non-Profit Ltd. Zoltán Várallyay/ELI-ALPS, ELI-HU Non-Profit Ltd. Tino Eidam/Active Fiber Systems GmbH Jens Limpert/Active Fiber Systems GmbH	Paper
11:00 - 11:15	**Multi-Octave Supercontinuum and Sub-Two Cycle Pulse Compression Using N2O-Filled Hollow-Core Fiber (SM2H.2)** **Presenter**: John Beetar, *University of Central Florida* Expand for Abstract / Authors The delayed optical nonlinearity of molecules is harnessed to generate a multi-octave supercontinuum and compress 280 fs pulses from a commercial Yb:KGW laser amplifier to sub-two cycle duration using an N_2O filled hollow-core fiber. **Authors**:John Beetar/University of Central Florida Nrisimhamurty Madugula/University of Central Florida Tran-Chau Truong/University of Central Florida Garima Nagar/Binghamton University Yi Wu/University of Central Florida Bonggu Shim/Binghamton University Michael Chini/University of Central Florida	Paper
11:15 - 11:30	**Compression of high-energy Ti:sapphire laser pulses to sub-2-cycle duration (SM2H.3)** **Presenter**: Tamas Nagy, *Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy* Expand for Abstract / Authors We generate 6.3mJ, sub-5fs pulses by compressing high-energy Ti:Sapphire laser pulses in a 3.75m long stretched capillary. **Authors**:Tamas Nagy/Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy Martin Kretschmar/Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy Arnaud Rouzée/Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy	Paper

11:30 - 11:45

Angular Dispersion Compensation Scheme for the Idler of Broadband Optical Parametric Amplifiers (SM2H.4)
Presenter: Huseyin Cankaya, *Deutsches Elektronen-Synchrotron (DESY)*
Expand for Abstract / Authors

- Paper

We demonstrate a technique for compensation of the idler angular chirp from an optical parametric amplifier in non-collinear geometry. This method enables generating broadband CEP-stable pulses for seeding high-energy optical parametric amplifiers.

Authors:Huseyin Cankaya/Deutsches Elektronen-Synchrotron (DESY) Giovanni Cirmi/Deutsches Elektronen-Synchrotron (DESY) peter Krogen/Massachusetts Institute of Technology (MIT) Anne-Laure Calendron/Deutsches Elektronen-Synchrotron (DESY) Yi hua/Deutsches Elektronen-Synchrotron (DESY) Benoit Debord/University of Limoges Frédéric Gérôme/University of Limoges Fetah Benabid/University of Limoges Franz X. Kaertner/Deutsches Elektronen-Synchrotron (DESY)

11:45 - 12:00

Spectral and Temporal Control of Resonant Dispersive Wave Emission in Hollow Capillary Fibres Using Pressure Gradients (SM2H.5)
Presenter: Christian Brahms, *Heriot-Watt University*
Expand for Abstract / Authors

- Paper

We demonstrate that resonant dispersive wave emission in hollow capillary fibres filled with a gas pressure gradient results in fast spectral tuneability and the generation of near transform-limited UV pulses.

Authors:Christian Brahms/Heriot-Watt University Federico Belli/Heriot-Watt University John Travers/Heriot-Watt University

12:00 - 12:15

Programmable Omni-Resonant Planar Cavity (SM2H.6)
Presenter: Abbas Shiri, *University of Central Florida, CREOL*
Expand for Abstract / Authors

- Paper

We demonstrate experimentally that omni-resonance can be controlled by introducing the appropriate spatio-temporal spectral correlations into the field using a spatial light modulator. Such‘space-time’ fields can be used for resonant spectral notching and bandwidth control.

Authors:Abbas Shiri/University of Central Florida, CREOL Kenneth Schepler/University of Central Florida, CREOL Ayman Abouraddy/University of Central Florida, CREOL

12:15 - 12:30

Optical time reverser (SM2H.7)
Presenter: Mickael Mounaix, *The University of Queensland*
Expand for Abstract / Authors

Paper

We demonstrate how to generate arbitrary optical fields in the full C band (1535nm – 1570nm), by controlling simultaneously all the degrees of freedom of a light beam: spatial, polarization, spectral and temporal properties.

Authors:Mickael Mounaix/The University of Queensland Nicolas Fontaine/Nokia Bell Labs David Neilson/Nokia Bell Labs Roland Ryf/Nokia Bell Labs Haoshuo Chen/Nokia Bell Labs Juan Carlos Alvardo-Zacarias/Nokia Bell Labs Joel Carpenter/The University of Queensland

Chip Scale Active Nano-photonic Devices (FM2R)

Presider: Jinghui Yang

10:30 - 11:00

Integrated Lithium Niobate Acousto-optic Cavities for Microwave-to-optical Conversion (FM2R.1)
Presenter: Linbo Shao, *Harvard University*
Expand for Abstract / Authors

Paper

Using integrated acousto-optic cavities on thin-film lithium niobate, we demonstrate efficient conversion of GHz microwaves to 1.5 µm wavelength light via the piezoelectric effects and the optomechanical interactions.

Authors:Linbo Shao/Harvard University Mengjie Yu/Harvard University Smarak Maity/Harvard University Neil Sinclair/California Institute of Technology Lu Zheng/University of Texas at Austin Cleaven Chia/Harvard University Amirhassan Shams-Ansari/Harvard University Cheng Wang/Harvard University Mian Zhang/Harvard University Keji Lai/University of Texas at Austin Marko Loncar/Harvard University

11:00 - 11:15

Broadband GHz ITO-based Plasmon MZI Modulator on Silicon Photonics (FM2R.2)
Presenter: Rubab Amin, *The George Washington University*
Expand for Abstract / Authors

Paper

Here we demonstrate a spectrally broadband, GHz-fast Mach Zehnder interferometer-based modulator deploying wavelength-compact phase-shifter heterogeneously integrating ENZ-near ITO films into silicon photonics utilizing a plasmonic mode.

Authors:Rubab Amin/The George Washington University Rishi Maiti/The George Washington University Yaliang Gui/The George Washington University Mario Miscuglio/The George Washington University Elham Heidari/University of Texas at Austin Ray Chen/University of Texas at Austin Hamed Dalir/Omega Optics, Inc. Volker Sorger/The George Washington University

11:15 - 11:30 **Sub-micron Plasmonic Waveguide Resonator (FM2R.3)**
Presenter: Ping Ma, *ETH Zurich*
Expand for Abstract / Authors

- Paper

An ultra-compact plasmonic resonator is experimentally demonstrated. The presented sub-mm long inline waveguide-coupled plasmonic resonator features a resonance around 1550 nm with a measured loaded quality factor of 20.

Authors:Ping Ma/ETH Zurich Xinzhi Zhang/ETH Zurich Yannick Salamin/ETH Zurich Juerg Leuthold/ETH Zurich

11:30 - 11:45 **High-resolution Spectrometer with Random Photonic Crystals (FM2R.4)**
Presenter: Takumasa Kodama, *Keio University*
Expand for Abstract / Authors

- Paper

We show that the random localization of light caused by fabrication error can be used to enhance the resolution of a photonic crystal spectrometer by combining the data with deep learning and a global optimization process.

Authors:Takumasa Kodama/Keio University Jocelyn Hofs/Keio University Shengji Jin/Keio University Takasumi Tanabe/Keio University

11:45 - 12:00 **An Efficient On-chip Single-photon SWAP Gate for Entanglement Manipulation (FM2R.5)**
Presenter: Xiang Cheng, *University of California, Los Angeles*
Expand for Abstract / Authors

- Paper

We demonstrate an on-chip single photon SWAP gate between polarization and spatial-momentum qubit. Our SWAP gate shows gate fidelity of 97.44%, and polarization entanglement preservation of SWAP operation is confirmed with average visibility over 98%.

Authors:Xiang Cheng/University of California, Los Angeles KAI-CHI CHANG/University of California, Los Angeles Zhenda Xie/Nanjing University Yoo Seung Lee/University of California, Los Angeles Murat Sarihan/University of California, Los Angeles Abhinav Kumar/University of California, Los Angeles Yongnan Li/Nankai University Serdar Kocaman/Middle East Technical University Tian Zhong/University of Chicago Mingbin Yu/Institute of Microelectronics Dim-Lee Kwong/Institute of Microelectronics Jeffrey shapiro/Massachusetts Institute of Technology Franco Wong/Massachusetts Institute of Technology Chee Wei Wong/University of California, Los Angeles

12:00 - 12:15 **Electro-optic metamaterial switch based on $BaTiO_3$ nanoparticles (FM2R.6)**
Presenter: Artemios Karvounis, *ETH Zurich*
Expand for Abstract / Authors

Paper

We harness the near-field enhancement of plasmonic metamaterials to probe the electro-optic response from 50nm $BaTiO_3$ nanoparticles, with low actuation voltage <8V and modulation speeds up to MHz regime, in the near-infrared.

Authors:Artemios Karvounis/ETH Zurich Viola Vogler-Neuling/ETH Zurich Felix Richter/ETH Zurich Rachel Grange/ETH Zurich

12:15 - 12:30 **Large thermal tuning of polymer-embedded silicon nitride nanobeam cavity (FM2R.7)**
Presenter: Yueyang Chen, *University of Washington*
Expand for Abstract / Authors

Paper

We experimentally demonstrate a thermally tunable polymer-embedded silicon nitride nanobeam cavity with a tuning efficiency of 44 pm/°C and 0.13 nm/mW in the near-visible wavelength range. The demonstrated resonator paves the path for the future development of reconfigurable SiN photonics platform.

Authors:Yueyang Chen/University of Washington James Whitehead/University of Washington Albert Ryou/University of Washington Jiajiu Zheng/University of Washington Peipeng Xu/University of Washington Taylor Fryett/University of Washington Arka Majumdar/University of Washington

Quantum Effects and Characterization (FM2C)

Presider: Thomas Gerrits, *National Inst of Standards & Technology*

10:30 - 10:45 **Continuous-wave 6-dB-squeezed vacuum state of light from optical parametric amplifier with THz-order bandwidth (FM2C.1)**
Presenter: Takahiro Kashiwazaki, *NTT Corporation*
Expand for Abstract / Authors

Paper

TEM_{00}-shaped continuous-wave 6-dB-squeezed light was obtained from a single-mode periodically poled ZnO:$LiNbO_3$ waveguide with a 2.5-THz optical-parametric-amplification bandwidth. The results will lead to the development of high-speed on-chip optical quantum processors with time-domain multiplexing.

Authors:Takahiro Kashiwazaki/NTT Corporation Naoto Takanashi/The University of Tokyo Taichi Yamashima/The University of Tokyo Takushi Kazama/NTT Corporation Koji Enbutsu/NTT Corporation Ryoichi Kasahara/NTT Corporation Takeshi Umeki/NTT Corporation Akira Furusawa/The University of Tokyo

10:45 - 11:00	**Identifying ultrafast fs-squeezing with a genuinely local oscillator and photon counting (FM2C.2)** **Presenter**: Johannes Tiedau, *University of Paderborn* Expand for Abstract / Authors We show repetition-rate locking of two passively mode-locked laser systems in order to prepare a genuine local oscillator. We demonstrate the potential of this system by measuring two-mode squeezing with photon counting. **Authors**:Johannes Tiedau/University of Paderborn Christof Eigner/University of Paderborn Victor Quiring/University of Paderborn Laura Padberg/University of Paderborn Raimund Ricken/University of Paderborn Jan Sperling/University of Paderborn Benjamin Brecht/University of Paderborn Tim Bartley/University of Paderborn Christine Silberhorn/University of Paderborn	Paper
11:00 - 11:30	**Direct temporal mode measurement for the characterization of temporally multiplexed high dimensional entanglement (FM2C.3)** **Presenter**: Xiaoying Li, *Tianjin University* Expand for Abstract / Authors We report a novel method that measures directly the exact form of temporal modes. We then apply the method to a pulse-pumped parametric amplifier and demonstrate telecom band temporally multiplexed multi-dimensional continuous variables quantum entanglement. **Authors**:Xiaoying Li/Tianjin University Nan Huo/Tianjin University Yuhong Liu/Tianjin University Jiamin Li/Tianjin University Xin Chen/Indiana University-Purdue University Indianapolis Z. Y. Ou/Tianjin University	Paper
11:30 - 11:45	**Measurement-free Kerr-based cubic phase gate with Gaussian operations (FM2C.4)** **Presenter**: Ryotatsu Yanagimoto, *Stanford University* Expand for Abstract / Authors We propose a measurement-free construction of a cubic phase gate based on a Kerr nonlinearity and Gaussian transformations. Experimental feasibility is discussed for pulsed nanophotonic waveguides where quantum states are encoded into quantum solitons. **Authors**:Ryotatsu Yanagimoto/Stanford University Tatsuhiro Onodera/Stanford University Edwin Ng/Stanford University Logan Wright/Cornell University Peter McMahon/Cornell University Hideo Mabuchi/Stanford University	Paper

11:45 - 12:00 **Experimental Evidence for the Unruh Effect (FM2C.5)**
Presenter: Morgan Lynch, *Technion - Israel Institute of Technology*
Expand for Abstract / Authors

Paper

We present a theory of radiation in accelerated quantum electrodynamics which is manifestly thermalized at the accelerated temperature. Statistical analysis of a recent channeling radiation experiment implies the first observation of the Unruh effect.

Authors:Morgan Lynch/Technion - Israel Institute of Technology Eliahu Cohen/Bar Ilan University Yaron Hadad/University of Arizona Ido Kaminer/Technion - Israel Institute of Technology

12:00 - 12:15 **Compressive characterization of biphoton frequency spectra (FM2C.6)**
Presenter: Emma Simmerman, *Oak Ridge National Laboratory*
Expand for Abstract / Authors

Paper

Frequency-bin qudits constitute a promising tool for quantum information processing. Here we use compressive sensing to characterize the spectral correlations of entangled photon pairs in a quantum frequency comb, obtaining a 26-fold reduction in measurement time compared to raster scanning.

Authors:Emma Simmerman/Oak Ridge National Laboratory Hsuan-Hao Lu/Purdue University Andrew Weiner/Purdue University Joseph Lukens/Oak Ridge National Laboratory

12:15 - 12:30 **Entanglement tuning via biphoton beating (FM2C.7)**
Presenter: Arash Riazi, *University of Toronto*
Expand for Abstract / Authors

Paper

We generate biphotons with degree of polarisation entanglement that varies over a concurrence range 0.12<C<0.97, depending on the frequency of biphotons. Our interferometric scheme offers a convenient means towards the generation of arbitrary biphoton states.

Authors:Arash Riazi/University of Toronto Changjia Chen/University of Toronto Eric Zhu/University of Toronto Alexey Gladyshev/Russian Academy of Science Peter Kazansky/University of Southampton, Southampton John Sipe/University of Toronto Li Qian/University of Toronto

Nonlinear Nano-optics (FM2D)
Presider: Moussa N'Gom, *Rensselaer Polytechnic Institute*

10:30 - 11:00 **Observation of Supercavity Modes in Individual Subwavelength Dielectric Resonators (FM2D.1)**
Presenter: Kirill Koshelev, *Australian National University*
Expand for Abstract / Authors

[Paper]

We observe for the first time high-quality modes in subwavelength dielectric resonators. Such modes result from interference of two dissimilar leaky modes, and they are governed by the physics of bound states in the continuum

Authors:Kirill Koshelev/Australian National University Sergey Kruk/Australian National University Mikhail Odit/ITMO University Elizaveta Melik-Gaykazyan/Australian National University Jae-Hyuck Choi/Korea University Sergey Gladyshev/ITMO University Konstantin Ladutenko/ITMO University Hong-Gyu Park/Korea University Andrey Bogdanov/ITMO University Yuri Kivshar/Australian National University

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11:00 - 11:15 **Light-matter Interaction and Third Harmonic Generation in the Near-infrared Using Plasmonic Metasurfaces and InAs/AlSb Semiconductor Heterostructures (FM2D.2)**
Presenter: Raktim Sarma, *Sandia National Laboratories*
Expand for Abstract / Authors

[Paper]

We leverage the very large conduction band offset of InAs/AlSb heterostructures and demonstrate coupling between a plasmonic metasurface and intersubband transitions at near-infrared wavelengths. The same nonlinear metasurface can be used for third harmonic generation.

Authors:Sebastian Gies/Sandia National Laboratories Raktim Sarma/Sandia National Laboratories Nicholas Karl/Sandia National Laboratories Michael Goldflam/Sandia National Laboratories John Klem/Sandia National Laboratories Igal Brener/Sandia National Laboratories

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11:15 - 11:30 **Mixed order nonlinear processes from metasurfaces of multi-resonant gold antennas (FM2D.3)**
Presenter: Rupert Oulton, *Imperial College London*
Expand for Abstract / Authors

[Paper]

We demonstrate mixed-order nonlinear frequency mixing in Au antennas and reveal the role of high order antenna modes in Pancharatnam-Berry Phase metasurfaces. The application of ultrafast pulse characterization is explored.

Authors:Sylvain Gennaro/Imperial College London Yi Li/Imperial College London Sefan Maier/Imperial College London Rupert Oulton/Imperial College London

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11:30 - 11:45	**Efficient four wave mixing and low-loss adiabatic incoupling in hybrid gap plasmonic waveguides (FM2D.4)** **Presenter**: Rupert Oulton, *Imperial College London* Expand for Abstract / Authors We show four-wave-mixing over micron scales with 1% signal-to-idler conversion efficiency enabled by strong non-linearities and highly confined fields. We also demonstrate low-loss incoupling into nanometer gaps with an efficiency of 80%. **Authors**:Nicholas Gusken/Imperial College London Michael Nielsen/Imperial College London Ngoc Nguyen/Imperial College London Xingyuan Shi/Imperial College London Paul Dichtl/Imperial College London Sefan Maier/Imperial College London Rupert Oulton/Imperial College London	Paper
11:45 - 12:00	**Enhanced SHG due to hybridized plasmons in Au nanotrimer structures (FM2D.5)** **Presenter**: Atsushi Sugita, *Shizuoka University* Expand for Abstract / Authors Largely enhanced SHG were obtained from dolmen-type Au nanotrimer structures. SHG conversions due to hybridized plasmon mode with quadrupolar feature were one magnitude higher than that due to normal dipolar mode localized in individual nanoparticles. **Authors**:Atsushi Sugita/Shizuoka University Yohsei Nakatsuka/Shizuoka University Atsushi Ono/Shizuoka University Wataru Inami/Shizuoka University Yoshimasa Kawata/Shizuoka University	Paper
12:00 - 12:15	**All-optical tuning of second-harmonic generation in GaAs nanowires (FM2D.6)** **Presenter**: Luca Carletti, *Universita degli Studi di Padova* Expand for Abstract / Authors We demonstrate all-optically tunable second-harmonic generation (SHG) in GaAs nanowires via nonlinear absorption. This approach enables near-infrared SHG modulation up to 60% and offers new opportunities for nonlinear applications and all-optical ultrafast modulation. **Authors**:Luca Carletti/Universita degli Studi di Padova Domenico de Ceglia/Universita degli Studi di Padova Maria Vincenti/University of Brescia Costantino De Angelis/University of Brescia	Paper

12:15 - 12:30 **Non-Degenerate Nonlinear Frequency Mixing in (110)-Grown GaAs Nanoresonators (FM2D.7)**
Presenter: Maximilian Weissflog, *Friedrich Schiller University Jena*
Expand for Abstract / Authors

Paper

We experimentally demonstrate nonlinear frequency mixing of photons with non-degenerate energy and polarization in (110)-grown GaAs nanoresonators. Based on quantum-classical correspondence we predict down-conversion processes allowing for linear, non-degenerate polarization states.

Authors:Maximilian Weissflog/Friedrich Schiller University Jena Marcus Cai/Australian National University Matthew Parry/Australian National University Mohsen Rahmani/Australian National University Lei Xu/University of New South Wales Anna Fedotova/Friedrich Schiller University Jena Giuseppe Marino/Université Paris Diderot-CNRS Mykhaylo Lysevych/Australian National University Hoe Tan/Australian National University Chennupati Jagadish/Australian National University Andrey Miroshnichenko/University of New South Wales Giuseppe Leo/Université Paris Diderot-CNRS Andrey Sukhorukov/Australian National University Frank Setzpfandt/Friedrich Schiller University Jena Thomas Pertsch/Friedrich Schiller University Jena Isabelle Staude/Friedrich Schiller University Jena Dragomir Neshev/Australian National University

Non-Hermitian and Topological Phenomena II (FM2A)

Presider: Konstantinos Makris, *University of Crete*

10:30 - 11:00 **Observation of non-Abelian Aharonov--Bohm Effect with synthetic gauge fields (FM2A.1)**
Presenter: Yi Yang, *Massachusetts Institute of Technology*
Expand for Abstract / Authors

Paper

Based on an optical mode degeneracy, we observe the non-Abelian Aharonov--Bohm effect by synthesizing non-Abelian gauge fields in real space, enabled by multiple time-reversal symmetry breaking in orthogonal bases of the Hilbert space.

Authors:Yi Yang/Massachusetts Institute of Technology Chao Peng/Peking University Di Zhu/Massachusetts Institute of Technology Hrvoje Buljan/University of Zagreb John Joannopoulos/Massachusetts Institute of Technology Bo Zhen/UPenn Marin Soljacic/Massachusetts Institute of Technology

11:00 - 11:15	**PT-symmetric topological edge-gain effect (FM2A.2)** **Presenter**: Alex Song, *Stanford University* Expand for Abstract / Authors A uniform non-Hermitian material can exhibit a state where non-Hermicity, i.e. gain and loss, only manifests on the edge but not in the bulk. This effect is protected by the bulk topology and parity-time symmetry. **Authors**:Alex Song/Stanford University Xiao-Qi Sun/Stanford University Avik Dutt/Stanford University Momchil Minkov/Stanford University Casey Wojcik/Stanford University Haiwen Wang/Stanford University Ian Williamson/Stanford University Meir Orenstein/Technion - Israel Institute of Technology Shanhui Fan/Stanford University	Paper
11:15 - 11:30	**Topological transport quantization by dissipation in fast Thouless pumps (FM2A.3)** **Presenter**: Zlata Fedorova, *Physikalisches Institut Universität Bonn* Expand for Abstract / Authors Thouless pumping is intrinsically an adiabatic effect, which breaks down at finite driving frequencies. We demonstrate both theoretically and experimentally that using time-periodic dissipation Thouless pumping can be restored outside of the adiabatic limit. **Authors**:Zlata Fedorova/Physikalisches Institut Universität Bonn Stefan Linden/Physikalisches Institut Universität Bonn Haixin Qiu/Physikalisches Institut Universität Bonn Johann Kroha/Physikalisches Institut Universität Bonn	Paper
11:30 - 11:45	**Experimental Realization of Parity-Time-Symmetric Flat Bands (FM2A.4)** **Presenter**: Alexander Szameit, *University of Rostock* Expand for Abstract / Authors We demonstrate experimentally dispersionless flat bands with parity-time symmetry. To this end, we employ precisely tailored losses in laser-written waveguide arrays as key ingredient to manage light propagation and suppress diffractive broadening. **Authors**:Tobias Biesenthal/University of Rostock Mark Kremer/University of Rostock Matthias Heinrich/University of Rostock Alexander Szameit/University of Rostock	Paper
11:45 - 12:00	**Deterministic generation of topologically-protected bound states in the continuum by breaking spatial symmetry (FM2A.5)** **Presenter**: Taiki Yoda, *Tokyo Institute of Technology* Expand for Abstract / Authors We propose a deterministic method to generate off-Γ bound states in the continuum (BICs): an at-Γ BIC with charge -2 can split into two off-Γ BICs by breaking C_6 symmetry through the charge conservation. **Authors**:Taiki Yoda/Tokyo Institute of Technology Masaya Notomi/Tokyo Institute of Technology	Paper

12:00 - 12:15 **Bound States in the Continuum of Higher-Order Topological Photonic Systems (FM2A.6)**
Presenter: Alexander Cerjan, *Pennsylvania State University*
Expand for Abstract / Authors

Paper

We numerically demonstrate that the corner-localized boundary states of a higher-order topological system are bound states in the continuum, demonstrating that bulk-boundary correspondence holds even in the absence of a bandgap.

Authors:Alexander Cerjan/Pennsylvania State University Marius Jürgensen/Pennsylvania State University Wladimir Benalcazar/Pennsylvania State University Sebabrata Mukherjee/Pennsylvania State University Mikael Rechtsman/Pennsylvania State University

12:15 - 12:30 **Broad-band impedance matching of dispersive waveguides using exceptional points and white light cavities (FM2A.7)**
Presenter: Jacob Scheuer, *Tel-Aviv University*
Expand for Abstract / Authors

Paper

We present a new approach for multi-section broadband impedance matching, overcoming structural and material dispersion. The transformer constitutes a critically-coupled white light cavity, thus minimizing reflectivity. The approach is demonstrated in the millimeter waves band.

Authors:Jacob Scheuer/Tel-Aviv University Dimitry Filonov/Tel-Aviv University Pavel Ginzburg/Tel-Aviv University

New Advances in Gas and Particle Detection (AM2K)

Presider: Nazanin Hoghooghi, *University of Colorado Boulder*

10:30 - 11:00 **Industrial Gas Sensing Applications Enabled by Cascade Lasers (AM2K.1)**
Presenter: Peter Geiser, *NEO Monitors AS*
Expand for Abstract / Authors

Paper

The development of interband and quantum cascade lasers has made the mid-infrared region available for challenging in-situ industrial applications. This presentation provides an overview of real-world applications using this new technology.

Authors:Peter Geiser/NEO Monitors AS

Invited

11:00 - 11:15	**Waveguide-Enhanced Raman Spectroscopy for Detection of Vapor Phase Threat Chemicals with Compact Raman Spectrometers (AM2K.2)** **Presenter**: Erik Emmons, *US Army CCDC CBC* Expand for Abstract / Authors We have demonstrated waveguide-enhanced Raman spectroscopy using compact Raman spectrometers for handheld detectors of vapor phase threat materials. Polymer sorbents are used to concentrate the vapors in the evanescent field of the waveguide. **Authors**:Erik Emmons/US Army CCDC CBC Phillip Wilcox/US Army CCDC CBC Jason Guicheteau/US Army CCDC CBC Nathan Tyndall/Naval Research Laboratory Dmitry Kozak/Naval Research Laboratory Marcel Pruessner/Naval Research Laboratory Courtney Roberts/Naval Research Laboratory Andrew McGill/Naval Research Laboratory Todd Stievater/Naval Research Laboratory Benjamin Miller/University of Rochester Medical Center Matthew Yates/University of Rochester Medical Center Ethan Luta/University of Rochester Medical Center	Paper
11:15 - 11:30	**Digitally Calibrated Dual-comb S pectrometer for Open-air Gases Detection (AM2K.3)** **Presenter**: Xinyi Chen, *Tsinghua University* Expand for Abstract / Authors Atmospheric gas sensing of a 200 m open path has been achieved by a digitally calibrated dual-comb spectrometer. A spectrum spanning over 10 THz has been obtained with a residual of less than 2%. **Authors**:Xinyi Chen/Tsinghua University Weipeng Zhang/Tsinghua University Yan Li/Tsinghua University Haoyun Wei/Tsinghua University	Paper
11:30 - 11:45	**1572-nm High-Energy Single-Frequency PM Fiber Laser for CO_2 Coherent Remote Sensing (AM2K.4)** **Presenter**: Song Sun, *Laser Institute, Qilu University of Technology(Shandong Academy of Sceinces)* Expand for Abstract / Authors We report a high-energy narrow-linewidth SBS-free high-efficiency PM fiber laser based on MOPA at 1572 nm for CO_2 coherent remote sensing. The seed laser linewidth is <10 kHz, the fiber amplifier output pulse energy is >150 uJ, with tunable repetition rate of 1 k~1 MHz and pulse width of 100~500 ns. **Authors**:Song Sun/Laser Institute, Qilu University of Technology(Shandong Academy of Sceinces) Wei Yan/Laser Institute, Qilu University of Technology(Shandong Academy of Sceinces) Lisha Wang/Laser Institute, Qilu University of Technology(Shandong Academy of Sceinces) Fei Liu/Laser Institute, Qilu University of Technology(Shandong Academy of Sceinces) Yong Wang/Laser Institute, Qilu University of Technology(Shandong Academy of Sceinces)	Paper

11:45 - 12:00	**Cavity-Enhanced Measurements of Benzene for Environmental Monitoring (AM2K.5)** **Presenter**: Mhanna Mhanna, *KAUST* Expand for Abstract / Authors A laser sensor is developed for trace detection of benzene. It is based on a DFB-ICL near 3.3 µm and off-axis cavity-enhanced absorption, enabling minimum detection of 2 ppb for 6-second integration at room conditions. **Authors**:Mhanna Mhanna/KAUST Guangle Zhang/KAUST noushad kunnummal/Saudi Aramco Aamir Farooq/KAUST	Paper

Hybrid Photonics Integration (SM2O)

Presider: Wei Jiang, *Nanjing University*

10:30 - 11:00	**Novel Optical Fibers for Silicon Photonic Chip Packaging (SM2O.1)** **Presenter**: Ming-Jun Li, *Corning Incorporated* Expand for Abstract / Authors We present new optical fiber designs for silicon photonic chip packing applications, including Titania-clad bend-insensitive fiber for surface coupling, D-shaped fiber for evanescent wave coupling and multicore fiber for edge coupling. **Authors**:Ming-Jun Li/Corning Incorporated Invited	Paper
11:00 - 11:15	**Robust and automated direct on-axis laser writing of coupling elements for photonic chips (SM2O.2)** **Presenter**: Edgar Perez, *University of Maryland* Expand for Abstract / Authors The size/complexity of coupling structures printed with direct laser writing at the ports of photonic chips is increased by printing parallel to the ports' axes. We demonstrate robust automated laser writing using passive alignment. **Authors**:Edgar Perez/University of Maryland Xiyuan Lu/University of Maryland Daron Westly/National Institute of Standards and Technology Kartik Srinivasan/National Institute of Standards and Technology	Paper

11:15 - 11:30	**(Withdrawn) Integrated Optical Free-form Couplers for High-performance Optical Interconnection (SM2O.3)** **Presenter**: Shaoliang Yu, *MIT* Expand for Abstract / Authors We present a new and high-performance coupling scheme based on microfabricated free-form optical reflectors that can be versatility adapted for on-chip optical couplings between photonic chips, fibers, and free-space surface-incident devices. **Authors**:Shaoliang Yu/MIT Haijie Zuo/MIT Xiaochen Sun/LaXense Inc. Jifeng Liu/Dartmouth College Tian Gu/MIT Juejun Hu/MIT	
11:30 - 11:45	**3D Vertical Coupler Array for 4-Way Multi-Core Fiber-To-Chip Coupling by Two-Photon Lithography (SM2O.4)** **Presenter**: Lifeng Chen, *Sun Yat-Sen University* Expand for Abstract / Authors We demonstrate a 3D vertical coupler array design realizing efficient 4-way multi-core fiber to chip coupling via two-photon lithography on SOI platform, structure shows 3dB insertion loss and wide bandwidth is useful in space-division multiplexing. **Authors**:Lifeng Chen/Sun Yat-Sen University Haozhi Luo/Sun Yat-Sen University Xinlun Cai/Sun Yat-Sen University	Paper
11:45 - 12:00	**Low-loss, high-bandwidth fiber-to-chip coupling using capped adiabatic tapered fibers (SM2O.5)** **Presenter**: Saeed Khan, *National Institute of Standards and Technology* Expand for Abstract / Authors We demonstrate adiabatically tapered fibers clad with a higher-index material for coupling to an on-chip waveguide. The loss from fiber to a sub-micron waveguide in a packaged device is 1.3 dB, and the 3 dB bandwidth is is 90 nm. **Authors**:Saeed Khan/National Institute of Standards and Technology Sonia Buckley/National Institute of Standards and Technology Jeffrey Chiles/National Institute of Standards and Technology Sae Woo Nam/National Institute of Standards and Technology Richard Mirin/National Institute of Standards and Technology Jeffrey Shainline/National Institute of Standards and Technology	Paper

12:00 - 12:15

Bridging Between Si and Few-Mode Fiber Higher Order Modes. (SM2O.6)
Presenter: Oscar Jimenez Gordillo, *Columbia University*
Expand for Abstract / Authors

Paper

We show a mode converter between silicon and polymer waveguides compatible with few-mode fibers for mode-division multiplexing. We convert 4 TE modes of a silicon waveguide to the TE_{11}, TM_{11}, TE_{21}, TM_{21} modes of a polymer.

Authors:Oscar Jimenez Gordillo/Columbia University Utsav Dave/Columbia University Michal Lipson/Columbia University

12:15 - 12:30

III-V/Si Adiabatic-Crossing Taper Structure Designed for μ-Transfer Printing (SM2O.7)
Presenter: Rai Kou, *National Institute of Advanced Industrial Science and Technology (AIST)*
Expand for Abstract / Authors

Paper

We propose an efficient and robust adiabatic-crossing coupler for a μ-transfer printed III-V/Si platform. Two-stage GaInAsP/InP tapers equipped with a side terrace are designed to maximize the efficiency (1.26 dB/coupling on average) and bonding area.

Authors:Rai Kou/National Institute of Advanced Industrial Science and Technology (AIST) Takuo Hiratani/Sumitomo Electric Industries, Ltd Hideki Yagi/Sumitomo Electric Industries, Ltd Haruhiko Kuwatsuka/National Institute of Advanced Industrial Science and Technology (AIST) Makoto Okano/National Institute of Advanced Industrial Science and Technology (AIST) Morifumi Ohno/National Institute of Advanced Industrial Science and Technology (AIST) Hitoshi Kawashima/National Institute of Advanced Industrial Science and Technology (AIST) Keijiro Suzuki/National Institute of Advanced Industrial Science and Technology (AIST) Naoki Fujiwara/Sumitomo Electric Industries, Ltd Hajime Shoji/Sumitomo Electric Industries, Ltd Koji Yamada/National Institute of Advanced Industrial Science and Technology (AIST)

Modulators (SM2J)

Presider: Harish Subbaraman, *Boise State University*

10:30 - 11:00 **High-speed optical modulation based on Pockels effect in strained silicon waveguides (SM2J.1)**
Presenter: Laurent Vivien, *Universite Paris Saclay, CNRS*
Expand for Abstract / Authors

Paper

We report on the first demonstration of high-speed optical modulation exploiting Pockels effect in strained silicon waveguides. Bandwidths larger than 20 GHz and low insertion loss have been achieved at a wavelength of 1550 nm.

Authors:Christian Lafforgue/Universite Paris Saclay, CNRS Mathias Berciano/Universite Paris Saclay, CNRS Lucas Deniel/Universite Paris Saclay, CNRS Guillaume Marcaud/Universite Paris Saclay, CNRS Xavier Le Roux/Universite Paris Saclay, CNRS Carlos Alonso-Ramos/Universite Paris Saclay, CNRS Daniel Benedikovic/Universite Paris Saclay, CNRS Vladyslav Vakarin/Universite Paris Saclay, CNRS Alicia Ruiz-Caridad/Universite Paris Saclay, CNRS Paul Crozat/Universite Paris Saclay, CNRS Delphine Marris-Morini/Universite Paris Saclay, CNRS Eric Cassan/Universite Paris Saclay, CNRS Laurent Vivien/Universite Paris Saclay, CNRS

11:00 - 11:15 **Silicon Microring Modulator Driven by Transparent Conductive Oxide Capacitor (SM2J.2)**
Presenter: Alan Wang, *Oregon State University*
Expand for Abstract / Authors

Paper

We experimentally demonstrated a novel silicon microring modulator driven by transparent conductive oxide capacitor, achieving a large tuning efficiency of 95 pm/V. Analysis indicates that a potential high-speed operation above 44GHz can be reached.

Authors:Erwen Li/Oregon State University Bokun Zhou/Oregon State University Wei-Che Hsu/Oregon State University Alan Wang/Oregon State University

11:15 - 11:30 **Impact of optical free-carrier generation on the performance of SOI phase shifters (SM2J.3)**
Presenter: Clemens Krueckel, *Ghent University*
Expand for Abstract / Authors

Paper

We provide measurement and simulation data of optical free-carrier generation in SOI phase shifters. We conclude that phase impairments caused by unwanted free-carriers can be equalized with an ~50% increase in phase-shifter diode current.

Authors:Clemens Krueckel/Ghent University Joris Van Campenhout/IMEC Dries Van Thourhout/Ghent University

11:30 - 11:45 **Horizontal-Slot Plasmonic-Organic Hybrid (POH) Modulator (SM2J.4)**
Presenter: Sandeep Ummethala, *Karlsruhe Institute of Technology*
Expand for Abstract / Authors

Paper

We demonstrate horizontal-slot plasmonic-organic hybrid (HS-POH) modulators and show that the π-voltage-loss product $aU_{\pi}L$ is by 25% better than for conventional vertical-slot devices. The slot is realized by a sacrificial layer, thereby relaxing extreme lithography-resolution requirements.

Authors:Sandeep Ummethala/Karlsruhe Institute of Technology Venkata Anirudh Pammi/Karlsruhe Institute of Technology Ahsan H. M. Uddin/Karlsruhe Institute of Technology Lothar Hahn/Karlsruhe Institute of Technology Wolfgang Freude/Karlsruhe Institute of Technology Christian Koos/Karlsruhe Institute of Technology

11:45 - 12:00 **Surface-Acoustic-Wave Modulation of a Silicon-on-Insulator Defect Bragg Grating (SM2J.5)**
Presenter: Moshe Katzman, *Bar-Ilan University*
Expand for Abstract / Authors

Paper

A surface acoustic wave modulator is implemented in standard silicon-on-insulator. Acoustic waves are stimulated by absorption of pump light in metallic patterns and thermo-elastic expansion, and modulate probe light in a defect waveguide grating cavity.

Authors:Dvir Munk/Bar-Ilan University Moshe Katzman/Bar-Ilan University Mirit Hen/Bar-Ilan University Maayan Priel/Bar-Ilan University Avi Zadok/Bar-Ilan University

12:00 - 12:15 **Low Power Electro-Optic SRAM Based On Negative Differential Resistance (SM2J.6)**
Presenter: Rivka Gherabli, *Hebrew University*
Expand for Abstract / Authors

Paper

We present a new electro-optics data storage device based on the combination of negative differential resistances and optical cavity, remarkable for its simplicity and its complete CMOS compatibility with power consumption around the nanoWatt

Authors:Rivka Gherabli/Hebrew University Roy Zektzer/Hebrew University Meir Grajower/Hebrew University Joseph Shappir/Hebrew University Menachem Wofsy/TowerJazz Naor Inbar/TowerJazz Uriel Levy/Hebrew University

12:15 - 12:30 **The impact of laser frequency noise on high-extinction optical modulators (SM2J.7)**
Presenter: Gavin West, *Massachusetts Institute of Technology*
Expand for Abstract / Authors

Paper

We discuss the effects of laser frequency noise on the extinction ratio of typical integrated filters and amplitude modulators. It is shown that, even for spectrally-pure lasers, this noise inhibits realization of high extinction ratios.

Authors:Gavin West/Massachusetts Institute of Technology William Loh/MIT Lincoln Laboratory Dave Kharas/MIT Lincoln Laboratory Rajeev Ram/Massachusetts Institute of Technology

Nonlinear Optics in Fibers II (FM2P)

Presider: Zhigang Chen, *San Francisco State University*

10:30 - 11:00 **Light condensation in multimode fibers (FM2P.1)**
Presenter: Antonio Picozzi, *CNRS-UNiversite Bourgogne Franche-Comte*
Expand for Abstract / Authors

Paper

We report the observation of the transition to condensation of optical waves propagating in multimode fibers: below a critical value of the energy, the fundamental mode gets macroscopic populated, in agreement with the equilibrium theory.

Authors:KIlian Baudin/CNRS-UNiversite Bourgogne Franche-Comte Adrien Fusaro/CNRS-UNiversite Bourgogne Franche-Comte Katarzyna Krupa/CNRS-UNiversite Bourgogne Franche-Comte Josselin Garnier/Institut Polytechnique de Paris Claire Michel/University Cote d'Azur Sergio Rica/University Adolfo Ibanez Guy Millot/CNRS-UNiversite Bourgogne Franche-Comte Antonio Picozzi/CNRS-UNiversite Bourgogne Franche-Comte

Invited

11:00 - 11:15 **Raman Frequency Conversion Between Guided Vortex Modes in Twisted Gas-filled Photonic Crystal Fibers (FM2P.2)**
Presenter: Sona Davtyan, *Max Planck Institute for the Science of Light*
Expand for Abstract / Authors

Paper

We report efficient Raman conversion of vortex modes in twisted hydrogen-filled hollow-core photonic crystal fibers. Circular birefringence provides topological protection and broadband guidance of helically-phased modes over long distances.

Authors:Sona Davtyan/Max Planck Institute for the Science of Light David Novoa/Max Planck Institute for the Science of Light Yang Chen/Max Planck Institute for the Science of Light Michael Frosz/Max Planck Institute for the Science of Light Philip Russell/Max Planck Institute for the Science of Light

11:15 - 11:30

Cross-Phase Modulation Instability in PM ANDi Fiber-Based Supercontinuum Generation (FM2P.3)
Presenter: Etienne Genier, *NKT Photonics Inc*
Expand for Abstract / Authors

Paper

We investigate supercontinuum generation in a polarization-maintaining (PM) all-normal dispersion (ANDi) photonic crystal fiber and show that pumping along the fiber’s fast axis is stable while both the slow and off-axis exhibit cross-phase modulation instability

Authors:Etienne Genier/NKT Photonics Inc Amar Ghosh/FEMTO-ST Swetha bobba/FEMTO-ST Patrick Bowen/NKT Photonics Inc Ole Bang/DTU Fotonik Peter Moselund/NKT Photonics Inc John Dudley/FEMTO-ST Thibaut Sylvestre/FEMTO-ST

11:30 - 11:45

Exceptional points in fiber optomechanics (FM2P.4)
Presenter: Avi Zadok, *Faculty of Engineering and Institute for Nano-Technology and Advanced Materials, Bar-Ilan University,*
Expand for Abstract / Authors

Paper

We report the first realization of an anti-parity-time symmetric optical potential supporting 2nd-order exceptional point in standard optical fibers. Phase-transition, symmetry-breaking and coalescence of supermodes are observed when Brillouin optomechanical coupling exceeds the wavenumber-mismatch.

Authors:Arik Bergman/Photonics Initiative, Advanced Science Research Center, City University of New York, Robert Duggan/Photonics Initiative, Advanced Science Research Center, City University of New York, Kavita Sharma/Faculty of Engineering and Institute for Nano-Technology and Advanced Materials, Bar-Ilan University, Hilel Hagai Diamandi/Faculty of Engineering and Institute for Nano-Technology and Advanced Materials, Bar-Ilan University, Moshe Tur/School of Electrical Engineering, Tel-Aviv University, Avi Zadok/Faculty of Engineering and Institute for Nano-Technology and Advanced Materials, Bar-Ilan University, Andrea Alù/Photonics Initiative, Advanced Science Research Center, City University of New York,

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11:45 - 12:00

Suppression of Raman scattering by controlling the angular momentum content of fiber modes (FM2P.5)
Presenter: Xiao Liu, *Boston University*
Expand for Abstract / Authors

Paper

We demonstrate, for the first time, that Raman scattering can be suppressed, by as much as ~17 dB, just by controlling the angular momentum content of fiber modes, of identical mode area.

Authors:Xiao Liu/Boston University Zelin Ma/Boston University Poul Kristensen/OFS-Fitel Siddharth Ramachandran/Boston University

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12:00 - 12:15 **Narrowband VUV Light by Molecular Modulation in Dual-Pumped H_2-filled Hollow-Core Photonic Crystal Fiber (FM2P.6)**
Presenter: Rinat Tyumenev, *Max Planck Institute for Light*
Expand for Abstract / Authors

Paper

A Raman comb extending down to 140 nm in the vacuum UV is generated in hydrogen-filled hollow-core photonic crystal fiber pumped simultaneously by visible and UV pulses obtained from a compact 1030 nm pump laser.

Authors:Rinat Tyumenev/Max Planck Institute for Light David Novoa/Max Planck Institute for Light Philip Russell/Max Planck Institute for Light

12:15 - 12:30 **Generation of Broadband Circularly Polarized Deep-Ultraviolet Pulses in Hollow Capillary Fibers (FM2P.7)**
Presenter: Athanasios Lekosiotis, *Heriot-Watt University*
Expand for Abstract / Authors

Paper

We demonstrate an efficient scheme (> 30%) for the generation of ultra-short circularly polarized pulses in the deep ultraviolet with high energy (> 20μJ) through seeded four-wave mixing in stretched gas-filled hollow capillary fibers.

Authors:Athanasios Lekosiotis/Heriot-Watt University Federico Belli/Heriot-Watt University Christian Brahms/Heriot-Watt University John Travers/Heriot-Watt University

Controlling Spin and OAM of Light (FM2B)
Presider: Zubin Jacob, *Purdue University*

10:30 - 10:45 **Total Angular Momentum Management of Three Dimensional Vortices with a Single Plate (FM2B.1)**
Presenter: Ahmed Dorrah, *Harvard University*
Expand for Abstract / Authors

Paper

We present compact planar devices that enable light's spin and orbital angular momenta to evolve, simultaneously, from one state to another along the propagation direction, and report on arbitrary spin-orbit coupling into three dimensional vortices.

Authors:Ahmed Dorrah/Harvard University Noah Rubin/Harvard University Aun Zaidi/Harvard University Michele Tamagnone/Harvard University Federico Capasso/Harvard University

10:45 - 11:00	**Unidirectional Maxwellian Spin Waves (FM2B.2)** **Presenter**: Todd Van Mechelen, *Purdue University* Expand for Abstract / Authors We develop a unified perspective of unidirectional topological edge waves in non-reciprocal media. We focus on the inherent role of photonic spin in non-reciprocal gyroelectric media, ie. magnetized metals or magnetized insulators. **Authors**:Todd Van Mechelen/Purdue University Zubin Jacob/Purdue University	Paper
11:00 - 11:15	**Measuring Optical Spin in the Near Field of Photonic Topological Edge States (FM2B.3)** **Presenter**: Sonakshi Arora, *Delft University of Technology* Expand for Abstract / Authors With phase- and polarization-resolving near-field optical microscopy we directly visualize the electromagnetic vector field in topological photonic crystals featuring the optical quantum spin Hall effect. We reveal that the *local* optical spin of spin-protected edge states is highly structured. **Authors**:Sonakshi Arora/Delft University of Technology Thomas Bauer/Delft University of Technology René Barczyk/AMOLF Ewold Verhagen/AMOLF Kobus Kuipers/Delft University of Technology	Paper
11:15 - 11:30	**Giant nonlinear circular dichroism from nonlinear chiral polaritonic metasurfaces (FM2B.4)** **Presenter**: Daeik Kim, *UNIST* Expand for Abstract / Authors We report giant nonlinear circular dichroism for second- and third-harmonic generation from nonlinear chiral polaritonic metasurfaces. Experimentally, over 86% of circular dichroisms for the two harmonic generations on one-chip system around 10 μm were achieved. **Authors**:Daeik Kim/UNIST Jaeyeon Yu/UNIST Frederic Demmerle/Technische Universitat Munchen Gerhard Boehm/Technische Universitat Munchen Mikhail Belkin/Technische Universitat Munchen Jongwon Lee/UNIST	Paper
11:30 - 11:45	**Chiral and Spatially Tailored Quasi-Bound States in the Continuum (FM2B.5)** **Presenter**: Adam Overvig, *City University of New York* Expand for Abstract / Authors We show that two-layer photonic crystal slabs with chiral perturbations yield Fano resonances with controllable amplitude and phase, and demonstrate devices with spatially tailored dark modes that anomalously reflect light with controllable diffraction efficiency. **Authors**:Adam Overvig/City University of New York Stephanie Malek/Columbia University Nanfang Yu/Columbia University Andrea Alù/City University of New York	Paper

11:45 - 12:00	**(Withdrawn) Photonic Rashba Effect from Dipole Emitters Embedded into Berry Phase Defective Photonic Crystal (FM2B.6)** **Presenter**: Kexiu Rong, *Technion* Expand for Abstract / Authors We report on the observation of photoluminescence-mediated spin-split dispersions in momentum space–photonic Rashba effect–from quantum dots or transition metal dichalcogenide monolayer, which are embedded into a photonic crystal with geometric phase defects. **Authors**:Kexiu Rong/Technion Bo Wang/Technion Avi Reuven/Technion Elhanan Maguid/Technion Bar Cohn/Technion Vladimir Kleiner/Technion Erez Hasman/Technion	
12:00 - 12:15	**Plasmonic Metasurfaces for the Near-Field Directional Control of Spontaneous Light Emission (FM2B.7)** **Presenter**: Xiaowei Wang, *Boston University* Expand for Abstract / Authors We investigate the ability of gradient metasurfaces to promote directional light emission from an ensemble of dipole sources (colloidal quantum dots) in their near field. Well-collimated output beams along geometrically tunable directions are measured. **Authors**:Xiaowei Wang/Boston University Yuyu Li/Boston University Reyhaneh Toufanian/Boston University Leonard Kogos/Boston University Allison Dennis/Boston University Roberto Paiella/Boston University	Paper
12:15 - 12:30	**Experimental Verification of Vortex Generation through Spin-Orbit Coupling in Epsilon-Near-Zero films (FM2B.8)** **Presenter**: Ravi Saripalli, *Physical Research Laboratory* Expand for Abstract / Authors We experimentally demonstrate the spin-orbit interaction of light in Indium Tin Oxide film when illuminated with circularly-polarized light of wavelength close to the epsilon-near-zero region where the real part of its permittivity vanishes. **Authors**:Ravi Saripalli/Physical Research Laboratory N. Apurv Chaitanya/Tecnologico de Monterrey Anirban Ghosh/Physical Research Laboratory Varun Sharma/Physical Research Laboratory Israel de Leon/Tecnologico de Monterrey Goutam Samanta/Physical Research Laboratory	Paper

Fiber Based Imaging (SM2L)

Presider: Maria Chernysheva, *Leibniz Institute of Photonic Technology*

10:30 - 10:45	**High-resolution scanning phonon imaging in microfluidics based on optical fibers (SM2L.1)** **Presenter**: Huojiao Sun, *Jinan University* Expand for Abstract / Authors We report a new acoustic-spectral imaging approach based on localized phonons in optical fibers, based on microfluidic channel diffusion, that can measure with a spatial resolution of 10 μm and frame rate of 50 Hz. **Authors**:Huojiao Sun/Jinan University Yizhi Liang/Jinan University Long Jin/Jinan University Bai-Ou Guan/Jinan University	Paper
10:45 - 11:00	**Smartphone-based Optical Fiber Speckle Spectrometer (SM2L.2)** **Presenter**: Henry Tan, *University of Melbourne* Expand for Abstract / Authors We demonstrate a spectrometer that uses a smartphone to image the speckle pattern produced by a multimode optical fiber. A smartphone-based algorithm uses the measured pattern and a calibration library to determine the input spectrum **Authors**:Henry Tan/University of Melbourne Jasper Cadusch/University of Melbourne Bingxi Li/University of Melbourne Kenneth Crozier/University of Melbourne	Paper
11:00 - 11:30	**Multispectral ghost imaging using broadband supercontinuum (SM2L.3)** **Presenter**: Goëry Genty, *Tampereen Yliopisto* Expand for Abstract / Authors We review our recent work on multispectral ghost imaging where broadband spectral fluctuations can be efficiently used to perfrom single-pixel sensing and imaging. **Authors**:Goëry Genty/Tampereen Yliopisto Caroline Amiot/Tampereen Yliopisto Piotr Ryczkowski/Tampereen Yliopisto Han Wu/Sichuan University Ariari Friberg/University of Eastern Finland John Dudley/University of Burgundy Franche-Comté Invited	

11:30 - 11:45	**Speckle Reconstruction with Corruption through Multimode Fibers Using Deep Learning (SM2L.4)** **Presenter**: Pengfei Fan, *Queen Mary University of London* Expand for Abstract / Authors We present a deep-learning approach toward speckle reconstruction with corruption through a multimode fiber (MMF). Our experiments demonstrate a partly or randomly corrupted speckle can be reconstructed into its intact speckle over a 1km-100μm-step-index MMF. **Authors**:Pengfei Fan/Queen Mary University of London Michael Ruddlesden/Queen Mary University of London Yufei Wang/Queen Mary University of London Lei Su/Queen Mary University of London	Paper
11:45 - 12:00	**Learning-Supported Full-Color Cell Imaging Through Disordered Optical Fiber (SM2L.5)** **Presenter**: Xiaowen Hu, *University of Central Florida* Expand for Abstract / Authors Full-color artifact-free cell image transport through an 80 cm disordered optical fiber is demonstrated for the first time using a learning-based wide-field configuration. Incoherent broadband light from a halogen lamp is used for illumination. **Authors**:Xiaowen Hu/University of Central Florida Jian Zhao/University of Central Florida Shengli Fan/University of Central Florida Jose Enrique Antonio-Lopez/University of Central Florida Rodrigo Amezcua Correa/University of Central Florida Axel Schülzgen/University of Central Florida	Paper
12:00 - 12:30	**Digital holographic endo-microscopes based on multimode fibres (SM2L.6)** **Presenter**: Tomas Cizmar, *Leibniz-Institut für Photonische Tech* Expand for Abstract / Authors Here I review the recent progress of endo-microscopes based on holographic control of light transport through multimode fibres. I discuss the fundamental and technological bases as well as recent applications of the new imaging tool. **Authors**:Tomas Cizmar/Leibniz-Institut für Photonische Tech Invited	Paper

Terahertz Imaging and Spectroscopy (SM2F)

Presider: Markus Huber, *University of Regensburg*

10:30 - 10:45

Polarization-Dependent Disappearance of THz Reflectance in an Aligned Carbon Nanotube Film (SM2F.1)
Presenter: Andrey Baydin, *Rice University*
Expand for Abstract / Authors

Paper

We have performed polarization-dependent terahertz time-domain spectroscopy measurements on a highly aligned film of single-wall carbon nanotubes and found that the terahertz pulse reflected from the substrate-film interface totally disappears at a specific polarization angle. © 2020 The Authors

Authors:Andrey Baydin/Rice University Natsumi Komatsu/Rice University Saunab Ghosh/Rice University Takuma Makihara/Rice University Gary Noe/Rice University Junichiro Kono/Rice University

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10:45 - 11:00

Nanoscale Laser Terahertz Emission Microscopy and THz Nanoscopy (SM2F.2)
Presenter: Angela Pizzuto, *Brown University*
Expand for Abstract / Authors

Paper

We compare near-field tip-based Terahertz Time-Domain Spectroscopy and Laser Terahertz Emission Microscopy. We quantitatively determine each technique’s spatial field confinement and adapt the finite dipole model for applicability to both techniques.

Authors:Angela Pizzuto/Brown University Daniel Mittleman/Brown University Pernille Klarskov Pedersen/Aarhus University

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11:00 - 11:30

Terahertz lights up the nanoscale: *Revealing the nanoscale optoelectronic properties of low-dimensional materials via terahertz spectroscopy and microscopy.* (SM2F.3)
Presenter: Jessica Boland, *University of Manchester*
Expand for Abstract / Authors

We utilise optical-pump/terahertz-probe, terahertz emission spectroscopy and near-field terahertz microscopy to explore the optoelectronic properties of novel low-dimensional materials, including Dirac semi-metal nanowires, at the following extremes: temperatures <10K, sub-picosecond timescales and nanometre (<30nm) length scales.

Authors:Jessica Boland/University of Manchester

Invited

11:30 - 11:45	**Hyperspectral THz Microscopy via Time-resolved Nonlinear Ghost Imaging (SM2F.4)** **Presenter**: Juan Sebastian Totero Gongora, *EPic Laboratory, University of Sussex* Expand for Abstract / Authors We demonstrate a new type of nonlinear THz Ghost-Imaging technique combining nonlinear pattern generation and time-resolved single-pixel measurements. Our approach allows reconstructing the morphology and spectral features of complex samples with subwavelength resolution. **Authors**:Juan Sebastian Totero Gongora/EPic Laboratory, University of Sussex Luana Olivieri/EPic Laboratory, University of Sussex Luke Peters/EPic Laboratory, University of Sussex Vittorio Cecconi/EPic Laboratory, University of Sussex Antonio Cutrona/EPic Laboratory, University of Sussex Jacob Tunesi/EPic Laboratory, University of Sussex Robyn Tucker/EPic Laboratory, University of Sussex Alessia Pasquazi/EPic Laboratory, University of Sussex Marco Peccianti/EPic Laboratory, University of Sussex	Paper
11:45 - 12:00	**Terahertz Spectral Imaging Through Turbid Media: A Wavelet Approach to Scattering Mitigation (SM2F.5)** **Presenter**: Mahmoud Khani, *Stony Brook University* Expand for Abstract / Authors Terahertz imaging often involves seeing through inhomogeneous and highly scattering media. We propose a wavelet multiresolution analysis approach to mitigate the scattering effects and produce highly-resolved reflection spectral images for chemical mapping through turbid media. **Authors**:Mahmoud Khani/Stony Brook University Zachery Harris/Stony Brook University Hassan Arbab/Stony Brook University	Paper
12:00 - 12:15	**THz Generation and Spectroscopy with Nonlinear Plasmonic Metasurface Antennas Excited by a Nanojoule Femtosecond Laser (SM2F.6)** **Presenter**: Mai Tal, *Tel Aviv University* Expand for Abstract / Authors We study THz light emitted from nonlinear metasurfaces, excited by low energy femtosecond lasers. Conversion efficiencies comparable to 2500-fold thicker nonlinear crystals allow measurement of α-lactose absorption lines, showing suitability for time domain spectroscopy. **Authors**:Mai Tal/Tel Aviv University Shay Keren-Zur/Tel Aviv University Tal Ellenbogen/Tel Aviv University	Paper

12:15 - 12:30 **Terahertz Gas-phase Spectroscopy of CO using a Silicon-based Picosecond Impulse Radiator (SM2F.7)**
Presenter: Yash Sanjay Mehta, *UCLA*
Expand for Abstract / Authors

Paper

A custom energy-efficient silicon impulse radiator is used as a source for THz spectroscopy of carbon monoxide (CO). Multiple absorption lines are measured across varying pressures and mixing ratios using a single broadband integrated source.

Authors:Yash Sanjay Mehta/UCLA Sam Razavian/UCLA Kevin Schwarm/UCLA R. M. Spearrin/UCLA Aydin Babakhani/UCLA

Advanced Microscopy (AM2I)

Presider: Gabriel Popescu, *Univ of Illinois at Urbana-Champaign*

10:30 - 10:45 **Raster Adaptive Optics for Video Rate Laser Scanning Microscopy with Large Field of View Correction (AM2I.1)**
Presenter: Yongxiao Li, *Auatralian National University*
Expand for Abstract / Authors

Paper

We propose a raster scanning adaptive optics method that uses digital image segmentation and a low-resolution deformable mirror with a maximum of 50 wavefront masks, which removes spatially varying aberrations (both sample and lens) across a field of view of 0.8 mm at 500 ms.

Authors:Yongxiao Li/Auatralian National University Yean Lim/Auatralian National University Woei Ming Lee/Auatralian National University Qiongkai Xu/Auatralian National University Lynette Beattie/University of Melbourne Elizabeth Gardiner/Auatralian National University Katharina Gaus/University of New South Wales William Heath/University of Melbourne

10:45 - 11:15 **Phase imaging with computational specificity (PICS) (AM2I.2)**
Presenter: Gabriel Popescu, *Univ of Illinois at Urbana-Champaign*
Expand for Abstract / Authors

Paper

We present a new microscopy concept, where the process of retrieving computational specificity is part of the acquisition software, performed in real-time. We demonstrate it with various fluorescence tags and operation on live cells as well as tissue pathology.

Authors:Gabriel Popescu/Univ of Illinois at Urbana-Champaign

Invited

11:15 - 11:30	**Tessellation Structured Illumination Microscopy (AM2I.3)** **Presenter**: Doron Shterman, *Technion - Israel Institute of Technology* Expand for Abstract / Authors Treating structured illumination microscopy (SIM) as a Fourier domain tessellation challenge, we suggest a super-resolution method allowing spatial resolution better than l/4 and requiring up to three times less raw images, effectively increasing temporal resolution **Authors**:Doron Shterman/Technion - Israel Institute of Technology Ori Eyal/Technion - Israel Institute of Technology Shai Tsesses/Technion - Israel Institute of Technology Guy Bartal/Technion - Israel Institute of Technology	_ Paper
11:30 - 11:45	**Label-Free Super-Resolution Imaging of Mitochondria Structure of Mouse Muscles with Photothermal Microscopy (AM2I.4)** **Presenter**: Takayoshi Kobayashi, *University of Electro-Communications* Expand for Abstract / Authors Label-free photothermal microscopy with super-resolution was developed to investigate mouse brains, skin sections and unstained mouse muscle fibers. Continuous structural changing process of muscle fibers and mitochondria during and after muscle training was clearly resolved. **Authors**:Takayoshi Kobayashi/University of Electro-Communications Kazuaki Nakata/University of Electro-Communications Hiroki Tanaka/University of Electro-Communications Yutaka Kano/University of Electro-Communications	_ Paper
11:45 - 12:00	**3D Reconstruction for Volumetric Two-photon Microscopy Using Dual Airy Beam (AM2I.5)** **Presenter**: KA YAN CHAN, *The University of Hong Kong* Expand for Abstract / Authors We present a 3D reconstruction algorithm for the dual Airy beam scanning in volumetric two-photon microscopy. Lateral and axial positions of objects within the axial length of Airy beam can be accurately reconstructed. **Authors**:KA YAN CHAN/The University of Hong Kong HONGSEN HE/The University of Hong Kong YU-XUAN REN/The University of Hong Kong Cora S. W. Lai/The University of Hong Kong Kenneth Wong/The University of Hong Kong	_ Paper

12:00 - 12:15 **Two-Photon Microscopy Using Hollow Gaussian Beam (AM2I.6)**
Presenter: SABIR UL ALAM, *THE UNIVERSITY OF HONG KONG*
Expand for Abstract / Authors

Paper

We demonstrate two-photon microscopy based on hollow Gaussian beam illumination by leveraging an axially elongated central lobe, along with reduced central lobe width for increased mode order of the focused hollow Gaussian beam.

Authors:SABIR UL ALAM/THE UNIVERSITY OF HONG KONG NIRAJ KUMAR SONI/THE UNIVERSITY OF HONG KONG YU-XUAN REN/THE UNIVERSITY OF HONG KONG HONGSEN HE/THE UNIVERSITY OF HONG KONG KEVIN K TSIA/THE UNIVERSITY OF HONG KONG Kenneth Wong/THE UNIVERSITY OF HONG KONG

12:15 - 12:30 **Through Cuticle Neural Imaging of Drosophila Melanogaster with Multiphoton Microscopes (AM2I.7)**
Presenter: Aaron Mok, *Cornell University*
Expand for Abstract / Authors

Paper

Multiphoton neural imaging of *Drosophila melanogaster* required the removal of dorsal head capsule cuticle, prohibiting longitudinal imaging studies (> 5hrs). Here we demonstrate two- and three-photon imaging on cuticle-intact Drosophila brains with dorsal air-sacs removed.

Authors:Aaron Mok/Cornell University Jamien Shea/CORNELL UNIVERSITY Nilay Yapici/CORNELL UNIVERSITY Chris Xu/Cornell University

Length, Time and Rotation Metrology (SM2N)

Presider: Pascal Del'Haye, *National Inst of Standards & Technology*

10:30 - 11:00 **Optical Frequency Transfer over Submarine Fibers (SM2N.1)**
Presenter: Cecilia Clivati, *INRIM*
Expand for Abstract / Authors

Paper

We characterized phase noise and instability of submarine optical fibers in view of trans-oceanic atomic clock comparisons. The low background acoustic noise recorded on submarine fibers allows under-water earthquakes detection over trans-oceanic distances.

Authors:Cecilia Clivati/INRIM Giuseppe Marra/National Physical Laboratory Filippo Levi/INRIM Alberto Mura/INRIM Andrè Xuereb/Department of Physics, University of Malta Davide Calonico/INRIM

Invited

11:00 - 11:15	**Massively parallel coherent LiDAR using dissipative Kerr solitons (SM2N.2)** **Presenter**: Johann Riemensberger, *Swiss Federal Institute of Technology in Lausanne (EPFL)* Expand for Abstract / Authors We demonstrate an architecture for massively parallel frequency-modulated continuous wave (FMCW) laser ranging (LiDAR) by transferring linear chirps of a single narrow linewidth laser onto all soliton comb teeth though generation of a dissipative Kerr soliton in an integrated Si_3N_4 microresonator. **Authors**:Johann Riemensberger/Swiss Federal Institute of Technology in Lausanne (EPFL) Anton Lukashchuk/Swiss Federal Institute of Technology in Lausanne (EPFL) Maxim Karpov/Swiss Federal Institute of Technology in Lausanne (EPFL) Erwan Lucas/Swiss Federal Institute of Technology in Lausanne (EPFL) Wenle Weng/Swiss Federal Institute of Technology in Lausanne (EPFL) Junqiu Liu/Swiss Federal Institute of Technology in Lausanne (EPFL) Tobias Kippenberg/Swiss Federal Institute of Technology in Lausanne (EPFL)	Paper
11:15 - 11:30	**Frequency-modulated comb LIDAR (SM2N.3)** **Presenter**: Naoya Kuse, *IMRA America, Boulder Research Labs* Expand for Abstract / Authors We propose and demonstrate frequency-modulated comb LIDAR (FMcomb LIDAR), in which comb modes of a frequency-modulated optical frequency comb are coherently stitched, generating an effective larger scanning range and enhanced ranging resolution. **Authors**:Naoya Kuse/IMRA America, Boulder Research Labs Martin Fermann/IMRA America	Paper
11:30 - 11:45	**A Coherent Optical Fiber Link for Very Long Baseline Interferometry (SM2N.4)** **Presenter**: Cecilia Clivati, *INRIM* Expand for Abstract / Authors We realize a coherent fiber link between the National Metrology Institute and two radio telescopes in Italy. It allows referencing of Very Long Baseline Interferometry (VLBI) facilities with primary frequency standards and common-clock campaigns, which we are now using to assess VLBI performances. **Authors**:Cecilia Clivati/INRIM Roberto Aiello/Istituto Nazionale di Ottica INO-CNR Giuseppe Bianco/Agenzia Spaziale Italiana Claudio Bortolotti/Istituto di Radioastronomia IRA-INAF Valentina Di Sarno/Istituto Nazionale di Ottica INO-CNR Pasquale Maddaloni/Istituto Nazionale di Ottica INO-CNR Filippo Levi/INRIM Giuseppe Maccaferri/Istituto di Radioastronomia IRA-INAF Alberto Mura/INRIM Monia Negusini/Istituto di Radioastronomia IRA-INAF Federico Perini/Istituto di Radioastronomia IRA-INAF Mauro Roma/Istituto di Radioastronomia IRA-INAF Roberto Ricci/Istituto di Radioastronomia IRA-INAF Luigi Santamaria Amato/Agenzia Spaziale Italiana Mario Siciliani De Cumis/Agenzia Spaziale Italiana Matteo Stagni/Istituto di Radioastronomia IRA-INAF Davide Calonico/INRIM	Paper

11:45 - 12:00 **A Pulsed-Optical Timing Distribution System for LCLS-II (SM2N.5)**
Presenter: Kemal Shafak, *Cycle GmbH*
Expand for Abstract / Authors

Paper

We present the technical design of the pulsed-optical timing distribution system for LCLS-II and characterize its performance with out-of-loop measurements indicating a long-term timing stability of one femtosecond.

Authors:Kemal Shafak/Cycle GmbH Stefan Droste/SLAC National Accelerator Laboratory Haynes Pak Hay Cheng/Cycle GmbH Anan Dai/Cycle GmbH Karl Gumerlock/SLAC National Accelerator Laboratory Andrej Berlin/Cycle GmbH Shashank Bhat/Cycle GmbH Mathias Neuhaus/Cycle GmbH Julia Paradowski/Cycle GmbH Frank Okrent/Cycle GmbH Philipp Schiepel/Cycle GmbH Alan Fry/SLAC National Accelerator Laboratory Franz KÄRTNER/Deutsches Elektronen-Synchrotron

12:00 - 12:15 **Dual-Comb Based Two-Dimensional Angle Measurement System (SM2N.6)**
Presenter: Siyu Zhou, *Tsinghua University*
Expand for Abstract / Authors

Paper

We present a dynamic angle measurement method based on dual-comb interferometry that can reach a precision of 0.08 arc-second with 1 kHz response speed. This method can also be applied at long stand-off distances.

Authors:Siyu Zhou/Tsinghua University Vunam Le/Tsinghua University Kai Ni/Division of Advanced Manufacturing, Graduate School at Shenzhen, Tsinghua University, Shenzhen 518055, China Qian Zhou/Division of Advanced Manufacturing, Graduate School at Shenzhen, Tsinghua University, Shenzhen 518055, China Guanhao Wu/Tsinghua University

12:15 - 12:30 **AFM Engine with Optical Actuation and Readout Printed on the Facet of a Multi-core Fiber (SM2N.7)**
Presenter: Mareike Trappen, *KIT, IPQ*
Expand for Abstract / Authors

Paper

Using two-photon lithography, we fabricate an ultra-compact atomic force microscope engine on the facet of a multi-core fiber. The AFM is optically actuated and read out, and it offers atomic step-height resolution in difficult-to-access areas.

Authors:Mareike Trappen/KIT, IPQ Philipp-Immanuel Dietrich/KIT, IPQ Pascal Burger/KIT Matthias Blaicher/KIT, IPQ Gerald Göring/KIT Thomas Schimmel/KIT Wolfgang Freude/KIT, IPQ Hendrik Hölscher/KIT Christian Koos/KIT, IPQ

13:30 - 15:30 (UTC - 07:00)

Symp: Advances in Topological Photonics I (JM3A)
Presider: Benjamin Eggleton, *University of Sydney*

Special Symposium

13:30 - 14:00	**Topological photonics in synthetic space (JM3A.1)** **Presenter**: Mordechai Segev, *Technion Israel Institute of Technology* Expand for Abstract / Authors The recent progress on synthetic space topological photonics will be described, from the basic concepts and first experiments to new ideas on high-dimensional physics and mode-locking of topological insulator lasers. **Authors**:Mordechai Segev/Technion Israel Institute of Technology Eran Lustig/Technion Israel Institute of Technology Steffen Weimann/University of Rostock Yonatan Plotnik/Technion Israel Institute of Technology yaakov lumer/Technion Israel Institute of Technology Miguel Bandres/CREOL, University of Central Florida Zhaoju Yang/Technion Israel Institute of Technology Alexander Szameit/University of Rostock Invited	
14:00 - 14:30	**Topologically protected path-entangled photonic states (JM3A.2)** **Presenter**: Andrea Blanco-Redondo, *Nokia Bell Labs* Expand for Abstract / Authors We report our experimental results on topologically protected path-entangled photonic states using dimer chains in silicon photonics. These results highlight the potential of the lattice topology to protect photonic quantum information. **Authors**:Andrea Blanco-Redondo/Nokia Bell Labs Invited	Paper
14:30 - 15:00	**Experimental demonstration of higher-order topological states in photonic metasurfaces (JM3A.3)** **Presenter**: Alexander Khanikaev, *City College of New York* Expand for Abstract / Authors We demonstrate and visualize the emergence of a topological transition and opening of a Dirac cone by directly exciting the bulk modes of the higher-order topological metasurface via solid-state immersion spectroscopy. The open nature of the metasurface is then utilized to directly image topological boundary states. We show that, while the topological domain walls host 1D edge states, their bending induces 0D higher-order topological modes confined to the corners. **Authors**:Alexander Khanikaev/City College of New York Invited	Paper

15:00 - 15:15

Viscous Maxwell-Chern-Simons Theory for Topological Photonics (JM3A.4)
Presenter: Todd Van Mechelen, *Purdue University*
Expand for Abstract / Authors

_ Paper

Chern-Simons theories have been incredibly successful explaining integer and fractional quantum Hall phases, as well as topological insulators. Here, we develop viscous Maxwell-Chern-Simons theory to capture the fundamental physics of topological electromagnetic phases.

Authors:Todd Van Mechelen/Purdue University Zubin Jacob/Purdue University

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15:15 - 15:30

Long-range interactions near photonicWeyl points (JM3A.5)
Presenter: Lei Ying, *University of Wisconsin-Madison*
Expand for Abstract / Authors

_ Paper

A general relation between the resonant dipole-dipole interaction range and properties of the isosurface is described. This work lays the foundation to use Weyl photonic crystals as a platform to extend the interaction range

Authors:Lei Ying/University of Wisconsin-Madison Ming Zhou/University of Wisconsin-Madison Michael Mattei/University of Wisconsin-Madison Boyuan Liu/University of Wisconsin-Madison Paul Campagnola/University of Wisconsin-Madison Randall Goldsmith/University of Wisconsin-Madison Zongfu Yu/University of Wisconsin-Madison

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Symp: Light by Design: Structured Light, from Theory to Application I (JM3N)
Presider: Mo Mojahedi, *University of Toronto*

Special Symposium

13:30 - 14:00

Designer Structured Light With Metasurfaces (JM3N.1)
Presenter: Federico Capasso, *Harvard University*
Expand for Abstract / Authors

_ Paper

Metasurfaces are a powerful tool to design arbitrary vector beams. I will discuss recent work on spin to total orbital angular momentum converters, multi-momentum metatransformers, high purity OAM lasing and transverse/longitudinal structured light generation

Authors:Federico Capasso/Harvard University

Invited

14:00 - 14:30 **Structured Light in Space and Time for Wide Field Imaging (JM3N.2)**
Presenter: Kishan Dholakia, *University of St Andrews*
Expand for Abstract / Authors

Paper

I will describe the use of propagation invariant light fields for light sheet microscopy. In addition I will show the use of temporal focusing with single pixel detection for imaging at depth.

Authors:Kishan Dholakia/University of St Andrews

Invited

14:30 - 15:00 **Generation of Structured Light Via Nano Structures, and Applications (JM3N.3)**
Presenter: Fuyong Yue, *INRS-Energie Mat & Tele Site Varennes*
Expand for Abstract / Authors

Paper

The generation of structured light by means of metasurfaces is presented and the applications in the characterizations of polarization rotation and Pancharatnam-Berry phase are discussed.

Authors:Fuyong Yue/INRS-Energie Mat & Tele Site Varennes Vincenzo Aglieri/INRS-Energie Mat & Tele Site Varennes Riccardo Piccoli/INRS-Energie Mat & Tele Site Varennes Aadhi Rahim/INRS-Energie Mat & Tele Site Varennes Roberto Macaluso/Università degli Studi di Palermo Andrea Toma/Istituto Italiano di Tecnologia, Via Morego Luca Razzari/INRS-Energie Mat & Tele Site Varennes Roberto Morandotti/INRS-Energie Mat & Tele Site Varennes

Invited

15:00 - 15:30 **Airy beams and accelerating waves: an overview of recent advances (JM3N.4)**
Presenter: Demetrios Christodoulides, *University of Central Florida*
Expand for Abstract / Authors

Paper

We provide an overview of recent activities in the general area of Airy beams and accelerating waves. The fundamentals behind this class of wavefronts will be discussed with special emphasis on applications.

Authors:Demetrios Christodoulides/University of Central Florida

Invited

Symp: Photonic NISQ Technologies I (JM3G)
Presider: Lincoln Carr, *Colorado School of Mines*

Special Symposium

13:30 - 14:00

Universal Quantum Computing with Quantum Teleportation (JM3G.1)
Presenter: Akira Furusawa, *University of Tokyo*
Expand for Abstract / Authors

We can make a universal quantum computing based on quantum teleportation. For that purpose, we need non-Gaussian ancillary inputs, measurements, and nonlinear feedforward. I will explain this methodology.

Authors:Akira Furusawa/University of Tokyo

Invited

14:00 - 14:30

Non-Abelian Geometric Phases in Integrated Waveguide Systems (JM3G.2)
Presenter: Stefan Scheel, *Universität Rostock*
Expand for Abstract / Authors

Non-Abelian geometric phases are at the heart of holonomic quantum computing. Here we show their implementation in photonic waveguides, their characterization by the Wilson loop, and their optimization based on the quantum metric.

Authors:Stefan Scheel/Universität Rostock Mark Kremer/Universität Rostock Lucas Teuber/Universität Rostock Julien Pinske/Universität Rostock Alexander Szameit/Universität Rostock

Invited

14:30 - 15:00

Near-Term Photonic Quantum Computing on the Cloud (JM3G.3)
Presenter: Zachary Vernon, *Xanadu Quantum Technologies Inc*
Expand for Abstract / Authors

Photonic quantum computers are now accessible on the cloud. In this presentation we discuss the hardware and software development enabling this, and the application areas and problems addressable with such present-day and near-term systems.

Authors:Zachary Vernon/Xanadu Quantum Technologies Inc

Invited

15:00 - 15:15	**A 128-channel diamond quantum memory array integrated in a microphotonic chip (JM3G.4)** **Presenter**: Noel Wan, *Massachusetts Institute of Technology* Expand for Abstract / Authors We experimentally demonstrate the integration of 128 waveguide-coupled diamond spin qubits with aluminum nitride photonics. This large-scale, tunable, efficient and optically coherent multi-qubit platform sets the stage for high-rate entanglement distribution in a large quantum network. **Authors**:Noel Wan/Massachusetts Institute of Technology Tsung-Ju Lu/Massachusetts Institute of Technology Kevin Chen/Massachusetts Institute of Technology Michael Walsh/Massachusetts Institute of Technology Matthew Trusheim/Massachusetts Institute of Technology Lorenzo De Santis/Massachusetts Institute of Technology Eric Bersin/Massachusetts Institute of Technology Isaac Harris/Massachusetts Institute of Technology Sara Mouradian/Massachusetts Institute of Technology Ian Christen/Massachusetts Institute of Technology Edward Bielejec/Sandia National Laboratories Dirk Englund/Massachusetts Institute of Technology	Paper
15:15 - 15:30	**Quantum many-body simulations through quantum walks of high-dimensionally entangled photons (JM3G.5)** **Presenter**: Poolad Imany, *Purdue University* Expand for Abstract / Authors We demonstrate continuous photonic quantum walks with tunable depth in the frequency domain with high-dimensional entangled photon pairs. We generate a biphoton energy bound state through coherent control of the phase on the initial state. **Authors**:Poolad Imany/Purdue University Navin Lingaraju/Purdue University Mohammed Alshaykh/Purdue University Daniel Leaird/Purdue University Andrew Weiner/Purdue University	Paper

Ultrafast Metrology I (SM3H)

Presider: Alan Fry, *SLAC National Accelerator Laboratory*

13:30 - 13:45	**Characterization of High Harmonic Beam Profiles and Wavefronts with Ptychographic Imaging (SM3H.1)** **Presenter**: David Schmidt, *Colorado School of Mines* Expand for Abstract / Authors We use multi-modal ptychography to obtain harmonic-resolved beam profiles and wavefronts without grating dispersion. These beams can be back-propagated to the source to characterize the generation process. **Authors**:David Schmidt/Colorado School of Mines Logan Ramlet/Colorado School of Mines Alex Wilhelm/Colorado School of Mines Carlos Hernández-García/Department of Applied Physics, Universidad de Salamanca Daniel Adams/Colorado School of Mines Charles Durfee/Colorado School of Mines	Paper
13:45 - 14:00	**Retrieving the coherent artifact with FROG (SM3H.2)** **Presenter**: Rana Jafari, *Georgiatech* Expand for Abstract / Authors The coherent artifact hinders accurate inversion of FROG spectrograms. Here we demonstrate a technique to accurately retrieve not only the average pulse shape but also the artifact itself, providing access to the underlying coherence properties. **Authors**:Esmerando Escoto/Max Born Institute Rana Jafari/Georgiatech Rick Trebino/Georgiatech Gunter Steinmeyer/Max Born Institute	Paper
14:00 - 14:15	**Common Pulse Retrieval Algorithm: a Fast and Universal Method to Retrieve Ultrashort Pulses (SM3H.3)** **Presenter**: Nils Geib, *Friedrich Schiller University Jena* Expand for Abstract / Authors In this work we present a common pulse retrieval algorithm (COPRA) that can be universally applied to many pulse measurement methods and compares favorably in terms of speed and accuracy to existing approaches. **Authors**:Nils Geib/Friedrich Schiller University Jena Heiko Knopf/Friedrich Schiller University Jena Gia Quyet Ngo/Friedrich Schiller University Jena Thomas Pertsch/Friedrich Schiller University Jena Falk Eilenberger/Friedrich Schiller University Jena	Paper

14:15 - 14:30 **Single-Shot Ultrafast Pulse Reconstruction with Deep Learning (SM3H.4)**
Presenter: Ron Ziv, *Technion - Israel Institute of Technology*
Expand for Abstract / Authors

Paper

We propose a simple all-in-line single-shot scheme for diagnostics of ultrashort laser pulses, consisting of a multi-mode fiber and a $\chi^{(2)}$ nonlinear crystal. Complete pulse characterization is done from the measurements using Deep Learning methods.

Authors:Ron Ziv/Technion - Israel Institute of Technology Alex Dikopoltsev/Technion - Israel Institute of Technology Tom Zahavy/Technion - Israel Institute of Technology Ittai Rubinstein/Technion - Israel Institute of Technology Pavel Sidorenko/Technion - Israel Institute of Technology Oren Cohen/Technion - Israel Institute of Technology Mordechai Segev/Technion - Israel Institute of Technology

14:30 - 14:45 **Pulse Recovery from Frequency-Resolved-Optical-Gating Traces of Trains of Unstable Pulse Shapes (SM3H.5)**
Presenter: Rana Jafari, *Georgia Institute of Technology*
Expand for Abstract / Authors

Paper

We show that the recently introduced RANA FROG pulse-retrieval approach provides an exceptionally reliable indication of pulse-shape stability vs. instability in trains of pulses.

Authors:Rana Jafari/Georgia Institute of Technology Rick Trebino/Georgia Institute of Technology

14:45 - 15:00 **Measuring Simultaneously Spatially and Temporally Focused Ultrafast Laser Pulses Using the Dispersion Scan Technique (SM3H.6)**
Presenter: Alex Wilhelm, *Colorado School of Mines*
Expand for Abstract / Authors

Paper

We demonstrate a novel dispersion scan algorithm using grating dispersion. We also propose using the intrinsic dispersion of temporally focused laser pulses to characterize the pulse structure by scanning a nonlinear crystal through focus.

Authors:Alex Wilhelm/Colorado School of Mines David Schmidt/Colorado School of Mines Daniel Adams/Colorado School of Mines Charles Durfee/Colorado School of Mines

15:00 - 15:15	**Experimental Demonstration of Simplified Single-shot Supercontinuum Spectral Interferometry (SM3H.7)** **Presenter**: Dhruvit Patel, *University of Maryland at College Park* Expand for Abstract / Authors We use a genetic algorithm (GA) to retrieve a pump-induced phase modulation on a probe pulse in Single-Shot Supercontinuum Spectral Interferometry (SSSI) without pre-characterizing the probe pulse to determine its spectral phase. **Authors**:Dhruvit Patel/University of Maryland at College Park Dogeun Jang/University of Maryland at College Park Scott Hancock/University of Maryland at College Park Howard Milchberg/University of Maryland at College Park Ki-Yong Kim/University of Maryland at College Park	Paper
15:15 - 15:30	**Real-Time Optical Vector Network Analyzer Based On Coherent Time-Stretch (SM3H.8)** **Presenter**: Chi Zhang, *Wuhan National Lab for Optoelectronics* Expand for Abstract / Authors An ultrafast optical vector network analyzer (OVNA) based on dispersive time-stretch and digital coherent detection is proposed and experimentally demonstrated, and it successfully characterizes a micro-ring cavity with 20-MHz frame rate and over 12-nm bandwidth. **Authors**:Lun Li/Wuhan National Lab for Optoelectronics Liang Xu/Wuhan National Lab for Optoelectronics Lei Zhang/Wuhan National Lab for Optoelectronics Yuhua Duan/Wuhan National Lab for Optoelectronics Yaoshuai Li/Wuhan National Lab for Optoelectronics Ningning Yang/Wuhan National Lab for Optoelectronics Chi Zhang/Wuhan National Lab for Optoelectronics Xinliang Zhang/Wuhan National Lab for Optoelectronics	Paper

Nanoantenna-enhanced Near-field Interactions (FM3Q)

Presider: Esther Wertz, *Rensselaer Polytechnic Institute*

13:30 - 14:00	**Watching the Dialogue between Molecules and Nanoantennas (FM3Q.1)** **Presenter**: Niek van Hulst, *ICFO -Institut de Ciencies Fotoniques* Expand for Abstract / Authors I will present both deterministic scanning antenna and stochastic localisation mapping of the nanoscale antenna-molecule interaction, towards stronger coupling, bright single photon sources, rate enhancement and spectral control. **Authors**:Niek van Hulst/ICFO -Institut de Ciencies Fotoniques Invited	Paper

14:00 - 14:15

Ultrasensitive Field-Effect Plasmonics: Electro-Active Probes for Wireless Voltage Sensing and Electrophysiology (FM3Q.2)
Presenter: Ahsan Habib, *University of California*
Expand for Abstract / Authors

Paper

Optical detection of electrogenic activity has been the goal of neuroscientists for decades. We introduce an electro-active plasmonic field probe enabling label-free and ultrasensitive detection of electrophysiological signals with unprecedent spatiotemporal resolution capability.

Authors:Ahsan Habib/University of California Xiangchao Zhu/University of California Uryan Can/University of Notre Dame Maverick McLanahan/University of California Pinar Zorlutuna/University of Notre Dame Ahmet Yanik/University of California

14:15 - 14:30

Nanoplasmonic $|E|^4$ Enhancement of Molecular Raman Scattering and Electronic Raman Scattering with Spatial Correlation (FM3Q.3)
Presenter: Wei Zhou, *Virginia Tech*
Expand for Abstract / Authors

Paper

By 2D Raman mapping, we observe a spatially correlated linear dependence between molecular Raman scattering (MRS) and electronic Raman scattering (ERS) signals, revealing the same nanoplasmonic $|E|^4$ enhancement factors for both MRS and ERS processes.

Authors:Wonil Nam/Virginia Tech Yuming Zhao/Virginia Tech Wei Zhou/Virginia Tech

14:30 - 15:00

(Withdrawn) Femtosecond Atomic Forces Coherently Control Single-Molecule Switching Reactions (FM3Q.4)
Presenter: Dominik Peller, *University of Regensburg*
Expand for Abstract / Authors

We introduce femtosecond atomic forces as a new stimulus to choreograph ultrafast molecular motion. Applying sub-cycle forces to key atoms of a molecular switch allows us to coherently steer a frustrated structural rotation that modulates the molecule’s transient reaction statistics by up to 39%.

Authors:Dominik Peller/University of Regensburg Lukas Z. Kastner/University of Regensburg Thomas Buchner/University of Regensburg Carmen Roelcke/University of Regensburg Florian Albrecht/University of Regensburg Nikolaj Moll/IBM Research-Zurich Jascha Repp/University of Regensburg Rupert Huber/University of Regensburg

15:00 - 15:15	**Quantitative Fourier Demodulation Analysis of Nanoscale Electromagnetic Fields in Near-field Microscopy (FM3Q.5)** **Presenter**: Markus Huber, *University of Regensburg* Expand for Abstract / Authors We combine a novel Fourier demodulation analysis with numerical simulations of near-field microscopy. Thereby, we quantify the experimentally inaccessible, nanoscale electric field distributions from which we infer the fundamental limits of the spatial resolution. **Authors**:Markus Huber/University of Regensburg Fabian Mooshammer/University of Regensburg Fabian Sandner/University of Regensburg Markus Plankl/University of Regensburg Martin Zizlsperger/University of Regensburg Rupert Huber/University of Regensburg	Paper
15:15 - 15:30	**(Withdrawn) Quantitative Sampling of Atomistic Near-field Waveforms (FM3Q.6)** **Presenter**: Carmen Roelcke, *University of Regensburg* Expand for Abstract / Authors Measuring near-field waveforms on atomic length scales has remained an open challenge. Using a molecular switch as a local field sensor, we directly sample the temporal shape and strength of atomically confined light field transients. **Authors**:Carmen Roelcke/University of Regensburg Dominik Peller/University of Regensburg Alexander Neef/University of Regensburg Lukas Z. Kastner/University of Regensburg Thomas Buchner/University of Regensburg Johannes Hayes/University of Regensburg Dominik Sidler/Max Planck Institute for the Structure and Dynamics of Matter Franco Bonafe/Max Planck Institute for the Structure and Dynamics of Matter Michael Ruggenthaler/Max Planck Institute for the Structure and Dynamics of Matter Angel Rubio/Max Planck Institute for the Structure and Dynamics of Matter Jascha Repp/University of Regensburg Rupert Huber/University of Regensburg	

Nanoscale Electromagnetism: From Fundamental to Funky (FM3D)

Presider: Ofer Kfir, *University of Göttingen*

13:30 - 14:00 **A General Framework for Nanoscale Electromagnetism (FM3D.1)**
Presenter: Yi Yang, *Massachusetts Institute of Technology*
Expand for Abstract / Authors

Paper

We introduce the mesoscopic electromagnetic boundary conditions and establish an experimental procedure to measure the dispersive surface response functions, enabled by observations of pronounced nonclassical effects—spectral shifts >30% and the breakdown of Kreibig-like broadening.

Authors:Yi Yang/Massachusetts Institute of Technology Di Zhu/Massachusetts Institute of Technology Wei Yan/CNRS Akshay Agrawal/Massachusetts Institute of Technology Mengjie Zheng/Massachusetts Institute of Technology John Joannopoulos/Massachusetts Institute of Technology Philippe Lalanne/CNRS Thomas Christensen/Massachusetts Institute of Technology Karl Berggren/Massachusetts Institute of Technology Marin Soljacic/Massachusetts Institute of Technology

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14:00 - 14:15 **Maximal Single-frequency Light–matter Interactions (FM3D.2)**
Presenter: Zeyu Kuang, *Yale Univeristy*
Expand for Abstract / Authors

Paper

We predict upper bounds to light–matter interactions at a given frequency in passive nanophotonic systems. Such bounds set the ultimate limits to the control of light for architectures from nanoparticles to metasurfaces.

Authors:Zeyu Kuang/Yale Univeristy Owen Miller/Yale Univeristy

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14:15 - 14:30 **Imaging across an Unlimited Bandwidth: is it possible? (FM3D.3)**
Presenter: Sourangsu Banerji, *University of Utah*
Expand for Abstract / Authors

Paper

By allowing phase in the image plane to be a free parameter, we experimentally demonstrate that it is possible to correct chromatic aberrations over an almost unlimited bandwidth with a single diffractive flat lens.

Authors:Sourangsu Banerji/University of Utah Monjurul Meem/University of Utah Apratim Majumder/University of Utah Berardi Rodriguez/University of Utah Rajesh Menon/University of Utah

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14:30 - 14:45	**Observation of plasmonic exceptional points at subwavelength scale (FM3D.4)** **Presenter**: Abdoulaye Ndao, *University California Berkeley* Expand for Abstract / Authors We propose a novel approach to EPs and report their first observation in plasmonics at room temperature. Enhanced sensing of anti-Immunoglobulin G (attomolar detection), the most common antibody found in blood circulation, is reported **Authors**:Abdoulaye Ndao/University California Berkeley Junhee Park/University California Berkeley Liyi Hsu/University California Berkeley Boubacar Kante/University California Berkeley	Paper
14:45 - 15:00	**Non-*PT*-symmetric Two-layer Waveguides for Exceptional-point-enhanced Optical Devices (FM3D.5)** **Presenter**: Georgios Veronis, *Louisiana State University* Expand for Abstract / Authors We investigate the exceptional points in a two-layer cylindrical waveguide structure consisting of absorbing and non-absorbing dielectrics. We show that the sensitivity of the effective index of the waveguide mode is enhanced at exceptional points. **Authors**:Yin Huang/Central South University Yuecheng Shen/Sun Yat-Sen University Georgios Veronis/Louisiana State University	Paper
15:00 - 15:15	**Maximal Concentration of Electromagnetic Waves (FM3D.6)** **Presenter**: Hyungki Shim, *Yale University* Expand for Abstract / Authors We derive general bounds to optical superresolution, i.e., maximum intensity for electromagnetic waves from arbitrary wavefront-shaping devices that break the diffraction "limit." We use inverse design to discover metasurfaces operating close to our bounds. **Authors**:Hyungki Shim/Yale University Haejun Chung/Yale University Owen Miller/Yale University	Paper
15:15 - 15:30	**Scaling Laws for Plasmonic Nanolasers Far Beyond the Diffraction Limit (FM3D.7)** **Presenter**: Hao Wu, *Zhejiang University* Expand for Abstract / Authors Scaling laws of mode confinement and lasing threshold in plasmonic nanolasers far beyond the diffraction limit are proposed, by which we revisit the reported realizations and discuss the future prospects in further plasmonic nanolaser miniaturization. **Authors**:Hao Wu/Zhejiang University Xin Guo/Zhejiang University Pan Wang/Zhejiang University Daoxin Dai/Zhejiang University Limin Tong/Zhejiang University	Paper

Quantum Integrated Photonics I (SM3O)

Presider: Yu Yao, *Arizona State University*

13:30 - 13:45

Integrated WDM-based Optical Comparator for High-speed Computing (SM3O.1)

Presenter: Chenghao Feng, *University of Texas at Austin*

Expand for Abstract / Authors

- Paper

We propose and experimentally demonstrate a 2-bit wavelength-division-multiplexing (WDM) based optical comparator using microdisk modulators operating at 10 Gb/s. The proposed comparator has advantages of higher speed and lower power consumption compared to electronic counterparts.

Authors:Chenghao Feng/University of Texas at Austin Zhoufeng Ying/University of Texas at Austin Zheng Zhao/University of Texas at Austin Jiaqi Gu/University of Texas at Austin David Pan/University of Texas at Austin Ray Chen/University of Texas at Austin

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13:45 - 14:00

Integrated Photon-Pair Generation and ~112 dB Pump Rejection Filters for Silicon Quantum Photonics (SM3O.2)

Presenter: Rakesh Ranjan Kumar, *The Chinese University of Hong Kong*

Expand for Abstract / Authors

- Paper

We demonstrate on-chip quantum-correlated photons and rejection of pump photons by ~112 dB using filters on two silicon-on-insulator photonic integrated circuits. The photon pairs had coincidence-to-accidental ratio (CAR) of 155 at 0.2 mW pump power.

Authors:Rakesh Ranjan Kumar/The Chinese University of Hong Kong Xinru Wu/The Chinese University of Hong Kong Yaojing Zhang/The Chinese University of Hong Kong Hon Ki Tsang/The Chinese University of Hong Kong

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14:00 - 14:30

Integrated quantum photonics (SM3O.3)

Presenter: Jelena Vuckovic, *Stanford University*

Expand for Abstract / Authors

- Paper

Color centers in diamond and silicon carbide in combination with novel fabrication techniques and photonics inverse design approach offer a scalable platform for implementation of quantum technologies.

Authors:Jelena Vuckovic/Stanford University

Invited

14:30 - 14:45 **Nanophotonic Tantalum Pentoxide Devices for Integrated Quantum Technology (SM3O.4)**
Presenter: Martin Wolff, *University of Münster*
Expand for Abstract / Authors

Paper

We present a novel platform for integrated quantum photonics based on tantalum pentoxide thin films. We show passive and active functionality with 356,000 Q-factor ring resonators, nanoelectromechanical phase shifters and 84% efficiency waveguide-integrated single-photon detectors.

Authors:Martin Wolff/University of Münster Lukas Splitthoff/University of Münster Thomas Grottke/University of Münster Simon Vogel/University of Münster Carsten Schuck/University of Münster

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14:45 - 15:00 **(Withdrawn) Optical Computing chip executing Complex-valued Neural Network (SM3O.5)**
Presenter: Hui Zhang, *Nanyang Technological University*
Expand for Abstract / Authors

An integrated silicon photonic chip is proposed and demonstrated for executing complex-valued neural network. Complex arithmetic is executed by encoding and manipulating information in both magnitude and phase. High accuracy and strong learning capability are achieved.

Authors:Hui Zhang/Nanyang Technological University Mile Gu/Nanyang Technological University Xudong Jiang/Nanyang Technological University Jayne Thompson/National University of Singapore Hong Cai/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Stefano Paesani/University of Bristol Raffaele Santagati/University of Bristol Anthony Laing/University of Bristol Yi Zhang/Nanyang Technological University Faeyz Karim Muhammad/Nanyang Technological University Patrick Guo-Qiang Lo/Advanced Micro Foundry Dim-Lee Kwong/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Leong Chuan Kwek/National University of Singapore Ai Qun Liu/Nanyang Technological University

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15:00 - 15:15 **Monolithic Integration of GaP on Superconducting Circuits for Applications in Quantum Computing (SM3O.6)**
Presenter: Simon Hönl, *IBM Research -- Zurich*
Expand for Abstract / Authors

Paper

We demonstrate hybrid integration of gallium phosphide photonic crystal cavities with superconducting Nb circuits using direct wafer bonding. Quality factors of $Q_o = 1.4*10^5$ are achieved for optical cavities in close proximity to the Nb electrodes.

Authors:Simon Hönl/IBM Research -- Zurich Youri Popoff/IBM Research -- Zurich Diana Davila Pineda/IBM Research -- Zurich Daniele Caimi/IBM Research -- Zurich Paul Seidler/IBM Research -- Zurich

15:15 - 15:30	**Tapered atomic cladded nano waveguide for improved frequency stabilization (SM3O.7)** **Presenter**: Roy Zektzer, *The hebrew university of Jerusalem* Expand for Abstract / Authors We integrate atoms and nano-waveguides on a chip to demonstrate a chip-scale frequency reference. Novel design and fabrication allows to face challenges related to linewidth, light-shift and frequency instability **Authors**:Roy Zektzer/The hebrew university of Jerusalem Noa Mazurski/The hebrew university of Jerusalem yefim barash/The hebrew university of Jerusalem Uriel Levy/The hebrew university of Jerusalem	Paper

New Dimensions in Imaging (AM3K)

Presider: James Fraser, *Queen's University*

13:30 - 13:45	**Single Flat lens enables Extreme Depth of Focus Imaging (AM3K.1)** **Presenter**: Sourangsu Banerji, *University of Utah* Expand for Abstract / Authors With judicious design of a multi-level diffractive lens (MDL), it is possible to drastically enhance the depth of focus by over ~4 orders of magnitude while maintaining focus for objects that are separated by ~6m. **Authors**:Sourangsu Banerji/University of Utah Monjurul Meem/University of Utah Apratim Majumder/University of Utah Berardi Rodriguez/University of Utah Rajesh Menon/University of Utah	Paper
13:45 - 14:00	**Metasurfaces for generating complementary wavefront-coded beams for three-dimensional scene reconstruction (AM3K.2)** **Presenter**: Shane Colburn, *University of Washington* Expand for Abstract / Authors We demonstrate a spatially multiplexed metasurface for generating paired propagation-invariant and rotating beams with complementary depth responses, enabling three-dimensional computational imaging of scenes with a single camera snapshot in a compact form factor. **Authors**:Shane Colburn/University of Washington Arka Majumdar/University of Washington	Paper

14:00 - 14:15 **Fourier-plane Vortex Laser Holography for Robust, Small-brain Machine Learning and Image Classification (AM3K.3)**
Presenter: Baurzhan Muminov, *University of California at Riverside*
Expand for Abstract / Authors

Paper

We show that the optical vortex illumination of objects undergoing diffraction performs simultaneous corner detection and image compression to be exploited in machine learning applications immune to adversarial attacks and robust to background noise.

Authors:Luat Vuong/University of California at Riverside Baurzhan Muminov/University of California at Riverside

14:15 - 14:30 **High-resolution integral imaging of micron-sized objects (AM3K.4)**
Presenter: Yajing Liu, *University of Melbourne*
Expand for Abstract / Authors

Paper

We present computational reconstruction of 3D images from a micron-sized object using a nanophotonic lens array made of a hybrid combination of multiwall carbon nanotubes and liquid crystals.

Authors:Yajing Liu/University of Melbourne XIN HE/University of Melbourne Timothy D Wilkinson/University of Cambridge Qing Dai/National Centre for Nanoscience and Technology BAHRAM JALALI/University of Connecticut Ranjith R Unnithan/University of Melbourne

14:30 - 14:45 **Three-Dimensional Single-shot Ptychography (AM3K.5)**
Presenter: David Goldberger, *Colorado School of Mines*
Expand for Abstract / Authors

Paper

We introduce three-dimensional single-shot ptychography (3DSSP). 3DSSP implements a novel algorithm to reconstruct multiple 2D planes of a 3D object. We analyze the technique’s performance via numerical simulations, and we demonstrate it experimentally.

Authors:David Goldberger/Colorado School of Mines Jonathan Barolak/Colorado School of Mines Charles Durfee/Colorado School of Mines Daniel Adams/Colorado School of Mines

14:45 - 15:00 **Time-of-Flight Depth-Resolved Imaging with Heralded Photon Source Illumination (AM3K.6)**
Presenter: Alex McMillan, *University of Bristol*
Expand for Abstract / Authors

Paper

We demonstrate 3D time-of-flight imaging from a scattering target illuminated with a heralded single photon source. Our image reconstruction algorithm achieves millimeter depth resolution with only 0.3 average detected photons per image pixel.

Authors:Ximing Ren/Heriot-Watt University Stefan Frick/University of Bristol Alex McMillan/University of Bristol Songmao Chen/Heriot-Watt University Abderrahim Halimi/Heriot-Watt University Peter Connolly/Heriot-Watt University Siddarth Joshi/University of Bristol Stephen Mclaughlin/Heriot-Watt University John Rarity/University of Bristol Jonathan Matthews/University of Bristol Gerald Buller/Heriot-Watt University

15:00 - 15:15 **Lithium Niobate Resonant Photoelastic Modulator for Time-of-Flight Imaging (AM3K.7)**
Presenter: Okan Atalar, *Stanford University*
Expand for Abstract / Authors

Paper

We demonstrate the working principle of a lithium niobate resonant photoelastic modulator. The optomechanical device can be integrated with a standard image sensor to convert it into a time-of-flight imaging system.

Authors:Okan Atalar/Stanford University Raphaël Van Laer/Stanford University Christopher Sarabalis/Stanford University Amir Safavi-Naeini/Stanford University Amin Arbabian/Stanford University

15:15 - 15:30 **(Withdrawn) Single-shot Ultrafast Burst Imaging with Nanosecond Observation Time Window using Spectrally Shifted Burst Laser Pulses and an Image Mapping Spectrometer (AM3K.8)**
Presenter: Fumihiko Kannari, *Keio University*
Expand for Abstract / Authors

Adopting spectrally sweeping burst laser pulses to sequentially timed all-optical mapping photography, we realize single-shot ultrafast 2D burst imaging with a nanosecond time window. We use an image mapping spectrometer to increase the frame numbers.

Authors:Fumihiko Kannari/Keio University Hirofumi Nemoto/Keio University Takakazu Suzuki/Keio University Riku Watase/Keio University Shota Itoyama/Keio University

Silicon Photonics Integration I (SM3J)
Presider: Sylvie MENEZO, *CEA-LETI*

13:30 - 14:30	**Heterogeneously integrated photonic crystal lasers on silicon photonics platform (SM3J.1)** **Presenter**: Shinji Matsuo, *NTT Device Technology Labs., NTT Corp.* Expand for Abstract / Authors This talk describes recent progress of photonic-crystal lasers, focusing on ultralow-power-consumption directly modulated lasers and their photonic integrated circuits. We also describe progress in heterogeneous integration of these lasers and Si photonics devices. Shinji Matsuo is a Senior Distinguished Researcher in NTT Device Technology Laboratories. He has been researching InP-based photonic integrated circuits including membrane lasers, photonic crystal lasers, and tunable lasers. He is also interested in heterogeneous integration. Dr. Matsuo is a member of the JSAP, IEICE, and a Fellow of IEEE. **Authors**:Shinji Matsuo/NTT Device Technology Labs., NTT Corp. Tutorial	Paper
14:30 - 14:45	**Compact Low Loss MEMS Phase Shifters for Scalable Field-Programmable Silicon Photonics (SM3J.2)** **Presenter**: Pierre Edinger, *KTH Royal Institute of Technology* Expand for Abstract / Authors MEMS offer low power tunability to silicon photonics. However, reported phase shifters lack in range, IL, or linearity. We show π linear phase shift in compact, 0.2 dB-IL MEMS devices, and demonstrate trade-offs for scalability. **Authors**:Pierre Edinger/KTH Royal Institute of Technology Carlos Errando-Herranz/KTH Royal Institute of Technology Alain Takabayashi/Ecole Polytechnique Federale de Lausanne Hamed Sattari/Ecole Polytechnique Federale de Lausanne Niels Quack/Ecole Polytechnique Federale de Lausanne Peter Verheyen/Interuniversity Microelectronics Centre Wim Bogaerts/Ghent University Kristinn Gylfason/KTH Royal Institute of Technology	Paper
14:45 - 15:00	**Tunable Matched-Pair High-Order Vernier Multi-Ring Filters with >100 nm FSR (SM3J.3)** **Presenter**: Jason Mak, *University of Toronto* Expand for Abstract / Authors We propose and demonstrate a novel Vernier microring filter achieving an ultra-high out-of-band extinction of -52 dB and large free spectral range > 100 nm. The filter is wavelength-tunable over the O-band. **Authors**:Jason Mak/University of Toronto Joyce Poon/Max Planck Institute of Microstructure Physics	Paper

15:00 - 15:15	**Design of a multi-channel photonic crystal dielectric laser accelerator (SM3J.4)** **Presenter**: Zhexin Zhao, *Stanford University* Expand for Abstract / Authors We propose a photonic crystal architecture for a dielectric laser accelerator that enables simutaneous acceleration of multiple electron beams. To achieve this, the band structure condition is discussed. **Authors**:Zhexin Zhao/Stanford University Dylan Black/Stanford University R. Joel England/SLAC Tyler Hughes/Stanford University Yu Miao/Stanford University Olav Solgaard/Stanford University Robert Byer/Stanford University Shanhui Fan/Stanford University	Paper
15:15 - 15:30	**Real-time, in-situ monitoring of Gamma radiation effects in packaged silicon photonic chips (SM3J.5)** **Presenter**: Qingyang Du, *Massachusetts Institute of Technology* Expand for Abstract / Authors We measured in-situ gamma radiation effect and post-radiation relaxation behavior on packaged SiC integrated photonic devices. A method to deconvolve the radiation responses from constituent materials was also proposed and validated. **Authors**:Qingyang Du/Massachusetts Institute of Technology Jerome Michon/Massachusetts Institute of Technology bingzhao li/University of Washington Derek Kita/Massachusetts Institute of Technology Danhao Ma/Massachusetts Institute of Technology Haijie Zuo/Massachusetts Institute of Technology Shaoliang Yu/Massachusetts Institute of Technology Tian Gu/Massachusetts Institute of Technology Anuradha Agarwal/Massachusetts Institute of Technology Mo Li/Massachusetts Institute of Technology Juejun Hu/Massachusetts Institute of Technology	Paper

Photodetectors (SM3R)

Presider: Harish Subbaraman, *Boise State University*

13:30 - 13:45	**Fractal superconducting nanowire avalanche photodetector with 60% system efficiency and 1.05 polarization sensitivity (SM3R.1)** **Presenter**: Yun Meng, *Tianjin University* Expand for Abstract / Authors We report on a fractal superconducting nanowire avalanche photodetector simultaneously with 60% system efficiency, 1.05 polarization sensitivity, 4-ns recovery time, and 45-ps timing jitter. The efficiency is the highest among polycrystalline SNSPDs with polarization-insensitive designs. **Authors**:Xiaojian Lan/Tianjin University Yun Meng/Tianjin University Kai Zou/Tianjin University Nan Hu/Tianjin University Liang Xu/Tianjin University Zhao Wang/Tianjin University Xuhui Cao/Tianjin University Julien Zichi/Royal Institute of Technology Stephan Steinhauer/Royal Institute of Technology Val Zwiller/Royal Institute of Technology Xiaolong Hu/Tianjin University	Paper
13:45 - 14:00	**Quantum Dot Avalanche Photodetector on Si Substrate (SM3R.2)** **Presenter**: Yating Wan, *University of California Santa Barbara* Expand for Abstract / Authors We demonstrate an InAs quantum dot (QD) avalanche photodetectors (APD) monolithically grown on Si substrate working at 1300 nm. Low dark current and high gain were demonstrated for these QD APDs. **Authors**:Baile Chen/ShanghaiTech University Yating Wan/University of California Santa Barbara Zhiyang Xie/ShanghaiTech University Jian Huang/ShanghaiTech University Chen Shang/University of California Santa Barbara Justin Norman/University of California Santa Barbara Qiang Li/Hong Kong University of Science and Technology Kei May Lau/Hong Kong University of Science and Technology Arthur Gossard/University of California Santa Barbara John Bowers/University of California Santa Barbara	Paper
14:00 - 14:15	**High-Speed InGaAs/InAlGaAs Waveguide Photodiodes Grown on Silicon by Heteroepitaxy (SM3R.3)** **Presenter**: Junyi Gao, *University of Virginia* Expand for Abstract / Authors We demonstrate III-V on silicon waveguide photodiodes with 200 nA dark current, 0.27 A/W fiber-coupled responsivity, and over 25 GHz 3-dB bandwidth. **Authors**:Junyi Gao/University of Virginia Keye Sun/University of Virginia Daehwan Jung/Center for Opto-electronic Devices and Materials, Korea Institute of Science and Technology John Bowers/University of California, Santa Barbara Andreas Beling/University of Virginia	Paper

14:15 - 14:30	**High-Linearity V-Band InGaAs/InP Photodiodes Working at 1064 nm (SM3R.4)** **Presenter**: Yiwei Peng, *University of Virginia* Expand for Abstract / Authors We demonstrate the modified uni-travelling-carrier photodiodes achieving RF power levels of 21.7 dBm to 15 dBm in the frequency range of 39 GHz to 60 GHz, respectively, at 1064 nm wavelength. The photodiodes show good linearity with a third-order intercept point up to 33 dBm at 40 GHz. **Authors**:Yiwei Peng/University of Virginia Keye Sun/University of Virginia Yang Shen/University of Virginia Andreas Beling/University of Virginia Joe Campbell/University of Virginia	Paper
14:30 - 14:45	**1.5-Gbit/s Filter-free Optical Communication Link based on Wavelength-selective Semipolar (20-2-1) InGaN/GaN Micro-photodetector (SM3R.5)** **Presenter**: Chun Hong Kang, *King Abdullah University of Science and Technology (KAUST)* Expand for Abstract / Authors We report on wavelength-selective semipolar (20-2-1) InGaN/GaN micro-photodetector with broad modulation bandwidth of 293.52 MHz, outperforming polar-based devices. A 1.5-Gbit/s data rate was achieved without the need of spectral-efficient modulation format. **Authors**:Chun Hong Kang/King Abdullah University of Science and Technology (KAUST) Guangyu Liu/King Abdullah University of Science and Technology (KAUST) Changmin Lee/University of California Santa Barbara (UCSB) Omar Alkhazragi/King Abdullah University of Science and Technology (KAUST) Jonathan Wagstaff/King Abdullah University of Science and Technology (KAUST) Kuang-Hui Li/King Abdullah University of Science and Technology (KAUST) Fatimah Alhawaj/King Abdullah University of Science and Technology (KAUST) Tien Khee Ng/King Abdullah University of Science and Technology (KAUST) James Speck/University of California Santa Barbara (UCSB) Shuji Nakamura/University of California Santa Barbara (UCSB) Steven DenBaars/University of California Santa Barbara (UCSB) Boon S. Ooi/King Abdullah University of Science and Technology (KAUST)	Paper
14:45 - 15:00	**Strain-Engineered $MoTe_2$ Photodetector in Silicon Photonics at 1550 nm (SM3R.6)** **Presenter**: Volker Sorger, *George Washington University* Expand for Abstract / Authors Here we show how strain-engineering (~4% tensile strain) lowers the bandgap (-0.2eV) of $MoTe_2$ nanocrystals heterogeneously integrated around a silicon photonic waveguide, thus enabling photoabsorption at 1550nm, a responsivity of 0.5A/W and NEP of 90pW/Hz^2. **Authors**:Rishi Maiti/George Washington University Chandraman Patil/George Washington University Ti Xie/George Washington University Javad Azadani/University of Minnesota Rubab Amin/George Washington University Mario Miscuglio/George Washington University Dries Van Thourhout/Ghent University Tony Low/University of Minnesota Seth Bank/University of Texas Volker Sorger/George Washington University	Paper

15:00 - 15:15	**Schottky-Junction-based Near-Infrared Sub-Bandgap Organic Photodetectors with Coherent Perfect Absorption (SM3R.7)** **Presenter**: Yeonghoon Jin, *Korea Advanced Inst of Science & Tech* Expand for Abstract / Authors We demonstrate Schottky-junction-based near-infrared sub-bandgap organic photodetectors operating up to 1300 nm. Coherent perfect absorption mechanism improves broadband optical absorption over wide incident angles with a responsivity of 0.88 μA/W at 975 nm. **Authors**:Yeonghoon Jin/Korea Advanced Inst of Science & Tech Hyung Suk Kim/Korea Advanced Inst of Science & Tech Seunghyup Yoo/Korea Advanced Inst of Science & Tech Kyoungsik Yu/Korea Advanced Inst of Science & Tech	Paper
15:15 - 15:30	**Plasmon-enhanced graphene photothermoelectric detector (SM3R.8)** **Presenter**: Di Wang, *Purdue University* Expand for Abstract / Authors We enhance the graphene photothermoelectric effect by overlaying an electrically-controlled graphene *p-n* junction with a gap-plasmon structure, and demonstrate a responsivity 25 times greater than that obtained without plasmonic and junction enhancements. **Authors**:Di Wang/Purdue University Andres Llacsahuanga Allcca/Purdue University Ting-Fung Chung/Purdue University Alexander Kildishev/Purdue University Yong Chen/Purdue University Alexandra Boltasseva/Purdue University Vladimir Shalaev/Purdue University	Paper

Nonlinear Metasurfaces (FM3B)

Presider: Ward Newman, *University of Alberta*

13:30 - 13:45	**Structurally Tunable Nonlinear Terahertz Metamaterials (FM3B.1)** **Presenter**: George Keiser, *Washington College* Expand for Abstract / Authors We present an experimental study of a nonlinear terahertz metamaterial with a power dependent transmission peak. This nonlinear transmission can be modulated via the relative structural positioning of two stacked resonator arrays. **Authors**:George Keiser/Washington College Nicholas Karl/Sandia National Laboratory Rubiat Haque/University of California- San Diego Igal Brener/Sandia National Laboratory Daniel Mittleman/Brown University Richard Averitt/University of California- San Diego	Paper

13:45 - 14:00

Encrypting Information with an All-Dielectric Bistable Metasurface (FM3B.2)
Presenter: Shengyuan Chang, *Pennsylvania State University*
Expand for Abstract / Authors

Paper

We report an all-dielectric metasurface exhibiting strong optical bistable behavior in the near infrared regime. We show that such a metasurface can be used for concealing optical information through the bistable states.

Authors:Shengyuan Chang/Pennsylvania State University Xuexue Guo/Pennsylvania State University xingjie ni/Pennsylvania State University

14:00 - 14:15

Optical Parametric Oscillation in Dielectric Multipolar Nanostructures (FM3B.3)
Presenter: Saman Jahani, *California Institute of Technology*
Expand for Abstract / Authors

Paper

We present a theoretical framework using time-domain slowly varying envelope approximation to study optical parametric oscillators (OPOs) in nanostructures with multipolar Mie resonances. We show feasibility of wavelength-scale OPOs which can be useful for numerous applications.

Authors:Saman Jahani/California Institute of Technology Arkadev Roy/California Institute of Technology Alireza Marandi/California Institute of Technology

14:15 - 14:30

(Withdrawn) Nonlinear Characterization of Engineered Materials Using Bi-anisotropic Homogenization and Time-Domain Simulations (FM3B.4)
Presenter: Ludmila Prokopeva, *Purdue University*
Expand for Abstract / Authors

We combine the theory of nonlinear bi-anisotropic homogenization with direct time-domain simulations of light propagation in nonlinear engineered materials. This approach allows us to characterize effective nonlinearities that are enhanced by resonant nanostructures

Authors:Ludmila Prokopeva/Purdue University Omer Yesilyurt/Purdue University Alexander Kildishev/Purdue University

14:30 - 14:45

Artificial Generation of Broadband Second Harmonic by Magnetoelectric Coupling in Metamaterial (FM3B.5)
Presenter: Chen Wang, *Tsinghua University*
Expand for Abstract / Authors

Paper

We present a broadband second harmonic generation (SHG) by a metamaterial-based artificial nonlinearity. By combining different meta-molecules together, SHG covering 60% wavelength range of the long-wave infrared can be achieved.

Authors:Chen Wang/Tsinghua University yongzheng wen/Tsinghua University Jingbo sun/Tsinghua University Ji Zhou/Tsinghua University

14:45 - 15:00	**Metamaterial-Enabled Distributed Feedback Lasing without a Diffraction Grating (FM3B.6)** **Presenter**: Bryce Tennant, *Rochester Institute of Technology* Expand for Abstract / Authors We analyze distributed-feedback lasing due to a negative-index metamaterial waveguide evanescently coupled to an active positive-index waveguide. Single-mode operation is predicted by tailoring the wavenumber difference to avoid mode degeneracy. **Authors**:Bryce Tennant/Rochester Institute of Technology Riffat ARA/Rochester Institute of Technology Abdulaziz Atwiri/Rochester Institute of Technology Govind Agrawal/University of Rochester Natalia Litchinitser/Duke University Drew Maywar/Rochester Institute of Technology	Paper
15:00 - 15:15	**Electrically Tunable Optical Metasurfaces with Barium Titanate Nanoparticles (FM3B.7)** **Presenter**: Felix Richter, *ETH Zürich* Expand for Abstract / Authors We demonstrate electrical tuning of optical metasurfaces realized in barium titanate nanoparticle thin-films. An electrically induced linear resonance shift of (1.6 ± 1.2) nm/V has been observed in the metasurfaces transmission spectra. **Authors**:Felix Richter/ETH Zürich Viola Vogler-Neuling/ETH Zürich Flavia Timpu/ETH Zürich Artemios Karvounis/ETH Zürich David Pohl/ETH Zürich Helena Weigand/ETH Zürich Marc Reig Escale/ETH Zürich Rachel Grange/ETH Zürich	Paper
15:15 - 15:30	**Tunable Polarization-independent Absorber Using a Hybrid Plasmonic and Phase-change Chalcogenide Platform (FM3B.8)** **Presenter**: Omid Hemmatyar, *Georgia Institute of Technology* Expand for Abstract / Authors Here, we experimentally demonstrate a polarization-independent metasurface (MS) in the near-infrared regime by employing a hybrid plasmonic/phase-change material architecture for non-volatile and wide-band tunable modulation. **Authors**:Omid Hemmatyar/Georgia Institute of Technology Sajjad Abdollahramezani/Georgia Institute of Technology Hossein Taghinejad/Georgia Institute of Technology Ali Adibi/Georgia Institute of Technology	Paper

Group-IV Materials (SM3M)

Presider: Jifeng Liu, *Dartmouth College*

13:30 - 14:00

(Withdrawn) α-Sn Growth, Characterization, and Properties (SM3M.1)
Presenter: Arnold Kiefer, *Air Force Research Laboratory*
Expand for Abstract / Authors

α-Sn is the diamond cubic form of tin with significantly different properties than C, Si, and Ge. The thin-film growth and characterization of α-SnGe will be discussed in addition to its possible topological states.

Authors:Arnold Kiefer/Air Force Research Laboratory

14:00 - 14:15

Epitaxial GeSn and its integration in MIR Optoelectronics (SM3M.2)
Presenter: Simone Assali, *Polytechnique Montreal*
Expand for Abstract / Authors

Paper

The effect of strain and composition on the opto-electronic properties of (Si)GeSn semiconductors across the 4-300K temperature range will be discussed to pave the way for future device operation up to 4.5 μm wavelengths.

Authors:Simone Assali/Polytechnique Montreal Anis Attiaoui/Polytechnique Montreal Mahmoud Atalla/Polytechnique Montreal Alain Dijkstra/Eindhoven University of Technology Aashish Kumar/Polytechnique Montreal Samik Mukherjee/Polytechnique Montreal Salim Abdi/Polytechnique Montreal Oussama Moutanabbir/Polytechnique Montreal

14:15 - 14:30

Mid-infrared emission and absorption from GeSn/Ge core-shell nanowires with nanophotonic light extraction (SM3M.3)
Presenter: Siying Peng, *Stanford University*
Expand for Abstract / Authors

Paper

We demonstrate room temperature mid-infrared photodetection using resonantly absorbing GeSn/Ge core/shell nanowire photonic crystals. For emission, we designed and characterized mid-infrared emission of resonantly scattering GeSn/Ge coreshell nanowires with 9-12% Sn.

Authors:Siying Peng/Stanford University Michael Braun/Stanford University Andrew Meng/Stanford University Zhengrong Shang/Stanford University Alberto Salleo/Stanford University Paul McIntyre/Stanford University

14:30 - 14:45 **Direct bandgap electroluminescence from SiGeSn/GeSn double-heterostructure monolithically grown on Si (SM3M.4)**
Presenter: Yiyin Zhou, *University of Arkansas*
Expand for Abstract / Authors

Paper

Electroluminescence from direct bandgap GeSn double-heterostructure light-emitting diodes grown on Si is presented. Using SiGeSn as the barrier provides better carrier confinement compared GeSn barrier, as evidenced by enhanced emission intensity.

Authors:Yiyin Zhou/University of Arkansas Yuanhao Miao/University of Arkansas Solomon Ojo/University of Arkansas Grey Abernathy/University of Arkansas Wei Du/Wilkes University Greg Sun/University of Massachusetts Boston Richard Soref/University of Massachusetts Boston Jifeng Liu/Dartmouth College Yong-Hang Zhang/Arizona State University Mansour Mortazavi/University of Arkansas at Pine Bluff Baohua Li/Arktonics, LLC Shuiqing Yu/University of Arkansas

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14:45 - 15:00 **Study of gain for SiGeSn/GeSn/SiGeSn multiple quantum well lasers (SM3M.5)**
Presenter: Grey Abernathy, *University of Arkansas*
Expand for Abstract / Authors

Paper

We studied the design of SiGeSn/GeSn/SiGeSn multiple-quantum-well active regions and the gain threshold needed to achieve lasing. The enhancement of optical confinement factor was demonstrated by introducing a SiGeSn cap.

Authors:Grey Abernathy/University of Arkansas Yiyin Zhou/University of Arkansas Solomon Ojo/University of Arkansas Yuanhao Miao/University of Arkansas Wei Du/Wilkes University Greg Sun/University of Massachusetts Boston Richard Soref/University of Massachusetts Boston Jifeng Liu/Dartmouth College Yong-Hang Zhang/Arizona State University Mansour Mortazavi/University of Arkansas at Pine Bluff Baohua Li/Arktonics, LLC Shuiqing Yu/University of Arkansas

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15:00 - 15:15 **Towards a Hexagonal SiGe Semiconductor Laser. (SM3M.6)**
Presenter: Alain Dijkstra, *Technische Universiteit Eindhoven*
Expand for Abstract / Authors

Paper

Hexagonal SiGe is shown to feature a direct bandgap with a radiative strength comparable to InP. Surprisingly, it features a temperature independent emission strength, thus promising a silicon compatible laser tunable from 1.8 to 3.5µm.

Authors:Marvin van Tilburg/Technische Universiteit Eindhoven Alain Dijkstra/Technische Universiteit Eindhoven Elham Fadaly/Technische Universiteit Eindhoven Victor van Lange/Technische Universiteit Eindhoven Marcel Verheijen/Technische Universiteit Eindhoven Jens Rene Suckert/Friedrich Schiller Universitat Claudia Rodl/Friedrich Schiller Universitat juergen furthmueller/Friedrich Schiller Universitat Friedhelm Bechstedt/Friedrich Schiller Universitat Silvana Botti/Friedrich Schiller Universitat David Busse/Technische Universitat Munchen Jonathan Finley/Technische Universitat Munchen Erik Bakkers/Technische Universiteit Eindhoven Jos Haverkort/Technische Universiteit Eindhoven

15:15 - 15:30 **GaAs epitaxy on (001) Si: below 1×10^6 cm^{-2} dislocation density with 2.4 μm buffer thickness (SM3M.7)**
Presenter: Chen Shang, *University of California Santa Barbara*
Expand for Abstract / Authors

We report a record-low threading dislocation density of 9.3×10^5 cm^{-2} in GaAs thin films directly grown on (001) Si substrates. The total buffer thickness (2.4 μm) is only two thirds of the state-of-art reported value.

Authors:Chen Shang/University of California Santa Barbara Justin Norman/University of California Santa Barbara Arthur Gossard/University of California Santa Barbara John Bowers/University of California Santa Barbara

Paper

Terahertz Plasmonics and Metamaterials (SM3F)

Presider: Pernille Klarskov Pedersen, *Aarhus Universitet*

13:30 - 14:00 **Terahertz quantum plasmonics at nanometer and picometer scales (SM3F.1)**
Presenter: Dai-Sik Kim, *Seoul National University*
Expand for Abstract / Authors

We bring high aspect ration gaps from nanometer to Angstrom, all the way down to the quantum regime and beyond, achieving multi-functionalities

Authors:Dai-Sik Kim/Seoul National University

Invited

Paper

14:00 - 14:15 **THz emitting nonlinear metasurface Fresnel zone plates (SM3F.2)**
Presenter: Eviatar Minerbi, *Tel Aviv University*
Expand for Abstract / Authors

We introduce a nonlinear metasurface that generates broadband terahertz radiation and focuses each frequency to a different focal point. This demonstration advances the development of efficient optical devices for the terahertz spectral region.

Authors:Eviatar Minerbi/Tel Aviv University Shay Keren-Zur/Tel Aviv University Tal Ellenbogen/Tel Aviv University

Paper

14:15 - 14:30 **Electrically Tunable Terahertz Plasmonic Metasurfaces Employing Multilayer Graphene (SM3F.3)**
Presenter: Peter Liu, *State University of New York at Buffalo*
Expand for Abstract / Authors

Paper

We demonstrate electrically tunable terahertz metasurface employing multilayer graphene realized by repeated transfer/stacking of monolayer graphene. Such multilayer graphene plasmonic structures exhibit significant increase of plasmonic resonance frequency compared to monolayer graphene structures.

Authors:Geng Li/State University of New York at Buffalo Viacheslav Semenenko/State University of New York at Buffalo Vasili Perebeinos/State University of New York at Buffalo Peter Liu/State University of New York at Buffalo

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14:30 - 14:45 **Double Layer Active Terahertz Chiral Metamaterial/graphene Modulators (SM3F.4)**
Presenter: Nikita Almond, *University of Cambridge*
Expand for Abstract / Authors

Paper

Active circular dichroism is demonstrated with a double layer metamaterial device that uses electrical backgating of monolayer graphene to achieve linear to circular conversion at 2.13 THz.

Authors:Nikita Almond/University of Cambridge Stephen Kindness/University of Cambridge Wladislaw Michailow/University of Cambridge Binbin Wei/University of Cambridge Philipp Braeuninger-Weimer/University of Cambridge Stephan Hofmann/University of Cambridge Harvey Beere/University of Cambridge David Ritchie/University of Cambridge Riccardo Degl'Innocenti/Lancaster University

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14:45 - 15:00 **A High-Sensitivity Plasmonic Photoconductive Terahertz Focal-Plane Array (SM3F.5)**
Presenter: Xurong Li, *UCLA*
Expand for Abstract / Authors

Paper

We demonstrate a 63-pixel photoconductive terahertz focal-plane array, which uses plasmonic nanoantennas to maximize terahertz and optical pump interaction at each pixel to provide signal-to-noise-ratios exceeding 60dB and more than 2THz bandwidth for all pixels.

Authors:Xurong Li/UCLA Mona Jarrahi/UCLA

15:00 - 15:15

(Withdrawn) Ultrathin off-axis Parabolic Flat Reflectarray for Terahertz Applications (SM3F.6)
Presenter: Sinhara Silva, *Los Alamos National Laboratory*
Expand for Abstract / Authors

We demonstrate a flat, ultrathin, ultralight, and flexible, metasurface-based off-axis parabolic reflector for the terahertz regime. The size variable resonators covering phases from 0 to 2π are strategically arranged to allow a 45° off-axis focusing reflector.

Authors:Sinhara Silva/Los Alamos National Laboratory Shobitha Kramadati/Los Alamos National Laboratory Shai Vardeny/Los Alamos National Laboratory Nicholas Sirica/Los Alamos National Laboratory Abul Azad/Los Alamos National Laboratory Hou-Tong Chen/Los Alamos National Laboratory

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15:15 - 15:30

Broadband Diffractive Neural Networks (SM3F.7)
Presenter: Yi Luo, *University of California, Los Angeles*
Expand for Abstract / Authors

Paper

Broadband diffractive neural networks that process a continuum of wavelengths for task-specific component design and all-optical inference are presented. This framework is experimentally demonstrated by designing spectral filters and a spatially-controlled demultiplexer at THz wavelengths.

Authors:Yi Luo/University of California, Los Angeles Deniz Mengu/University of California, Los Angeles Nezih Yardimci/University of California, Los Angeles Yair Rivenson/University of California, Los Angeles Muhammed Veli/University of California, Los Angeles Mona Jarrahi/University of California, Los Angeles Aydogan Ozcan/University of California, Los Angeles

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Mid-Infrared Lasers and Materials (SM3E)

Presider: Clara Saraceno, *Ruhr Universität Bochum*

13:30 - 13:45

100 W-class 2 µm Ho:YAG Thin-Disk Laser (SM3E.1)
Presenter: Sergei Tomilov, *Ruhr-Universität Bochum*
Expand for Abstract / Authors

Paper

We demonstrate a continuous-wave single fundamental-mode Ho:YAG thin-disk oscillator pumped by Tm-fiber at 1908 nm, delivering record high output power of 96 W with an M^2 of ~1.09 at 2090 nm and 2096 nm.

Authors:Sergei Tomilov/Ruhr-Universität Bochum Tim Vogel/Ruhr-Universität Bochum Martin Hoffmann/Ruhr-Universität Bochum Yicheng Wang/Ruhr-Universität Bochum Clara Saraceno/Ruhr-Universität Bochum

13:45 - 14:00	**Few-cycle multi-millijoule 2.5 μm pulses generation from a single-stage Cr^{2+}:ZnSe amplifier (SM3E.2)** **Presenter**: Yi Wu, *University of Central Florida* Expand for Abstract / Authors A single-stage chirped-pulse amplifier centered at 2.5 μm was developed to produce 3.5 mJ, 44 fs pulses at 1 kHz. The 80 GW peak power allows attosecond X-ray pulses generation in the water window. **Authors**:Yi Wu/University of Central Florida Fangjie Zhou/University of Central Florida Esben Larsen/Imperial College London Fengjiang Zhuang/University of Central Florida Yanchun Yin/University of Central Florida Zenghu Chang/University of Central Florida	Paper
14:00 - 14:15	**Observation of High Gain in a CO_2 Amplifier Pumped by a 4.3 µm Laser (SM3E.3)** **Presenter**: Dana Tovey, *UCLA* Expand for Abstract / Authors Gain dynamics in a 10 µm CO2 amplifier pumped by a 4.3 µm Fe:ZnSe laser are studied. Measured gain coefficients reached 30%/cm, indicating potentially high efficiency for short pulse amplification. **Authors**:Dana Tovey/UCLA Jeremy Pigeon/Stony Brook University Sergei Tochitsky/UCLA Gerhardus Louwrens/UCLA Ilan Ben-Zvi/Stony Brook University Chan Joshi/UCLA Dmitry Martyshkin/University of Alabama, Birmingham Vladimir Fedorov/University of Alabama, Birmingham Krishna Karki/University of Alabama, Birmingham Sergey Mirov/University of Alabama, Birmingham	Paper
14:15 - 14:30	**Infrared Diffraction-Free Space-Time Light Sheets (SM3E.4)** **Presenter**: Kenneth Schepler, *University of Central Florida* Expand for Abstract / Authors We report the demonstration of infrared diffraction-free space-time pulsed 1D light sheets. We achieved diffraction-free propagation for a 60-nm-bandwidth, 2.35 µm central-wavelength, 300-µm-FWHM beam up to 7 m, 80× the corresponding Rayleigh range. **Authors**:Murat Yessenov/University of Central Florida Qitian Ru/University of Central Florida Kenneth Schepler/University of Central Florida Monjurul Meem/University of Utah Rajesh Menon/University of Utah Konstantin Vodopyanov/University of Central Florida Ayman Abouraddy/University of Central Florida	Paper

14:30 - 14:45

Single-Longitudinal-Mode Tunable Actively Q-switched 2 µm Tm:YAP Laser Using a Transversally Chirped Volume Bragg Grating (SM3E.5)

Presenter: Antoine Godard, *DPHY, ONERA, Université Paris Saclay*

Expand for Abstract / Authors

Paper

A pulsed, single-longitudinal-mode, wavelength-tunable Tm:YAP laser was realized, delivering 270-µJ, 50-ns pulses with 1-kHz repetition rate. Spectral narrowing and tuning from 1940 to 1960 nm is carried out with a transversally chirped volume Bragg grating.

Authors:Quentin Berthomé/Teem Photonics Arnaud Grisard/Thales Research & Technology Basile Faure/Teem Photonics Grégoire Souhaité/Teem Photonics Eric Lallier/Thales Research & Technology Jean-Michel Melkonian/DPHY, ONERA, Université Paris Saclay Antoine Godard/DPHY, ONERA, Université Paris Saclay

14:45 - 15:00

Growth, Spectroscopy and Laser Operation in Disordered Tm,Ho:Ca(Gd,Lu)AlO_4 Crystals (SM3E.6)

Presenter: Valentin Petrov, *Max Born Institute*

Expand for Abstract / Authors

Paper

We report on Czochralski growth, structure, spectroscopy and laser operation of tetragonal disordered calcium aluminate crystals, Tm,Ho:Ca(Gd,Lu)AlO_4. The laser generates 763 mW at 2078.6 nm with a slope efficiency of 26.4% (tuning range: 212 nm).

Authors:Zhongben Pan/Institute of Chemical Materials Pavel Loiko/Universite de Caen Josep Serres/Universitat Rovira i Virgili Esrom Kifle/Universite de Caen Hualei Yuan/Institute of Chemical Materials Xiaojun Dai/Institute of Chemical Materials Huaqiang Cai/Institute of Chemical Materials Yicheng Wang/Max Born Institute Yongguang Zhao/Max Born Institute Rosa Sole/Universitat Rovira i Virgili Magdalena Aguilo/Universitat Rovira i Virgili Francesc Diaz/Universitat Rovira i Virgili Patrice Camy/Universite de Caen Elena Dunina/Vitebsk State Technological University Alexey Kornienko/Vitebsk State Technological University Uwe Griebner/Max Born Institute Valentin Petrov/Max Born Institute Xavier Mateos/Universitat Rovira i Virgili

15:00 - 15:15 **Ultrafast Laser Inscribed Waveguide Lasers in Tm^{3+}:SrF_2 (SM3E.7)**
Presenter: Valentin Petrov, *Max Born Institute*
Expand for Abstract / Authors

Paper

Depressed-index low-loss (0.38 dB/cm) buried channel waveguides with a circular cladding are fabricated in bulk Tm^{3+}:SrF_2 by ultrafast laser inscription. The waveguide laser generated 148 mW at 1.87 μm with a slope efficiency of 63.9%.

Authors:Victor Llamas/Universitat Rovira i Virgili Pavel Loiko/Universitat Rovira i Virgili Esrom Kifle/Universitat Rovira i Virgili Carolina Romero/University of Salamanca Javier Vazquez de Aldana/University of Salamanca Josep Serres/Universitat Rovira i Virgili Mauro Tonelli/Universita di Pisa Eugenio Damiano/Universita di Pisa Viktor Zakharov/ITMO University Andrey Veniaminov/ITMO University Magdalena Aguilo/Universitat Rovira i Virgili Francesc Diaz/Universitat Rovira i Virgili Weidong Chen/Max Born Institute Uwe Griebner/Max Born Institute Valentin Petrov/Max Born Institute Xavier Mateos/Universitat Rovira i Virgili

15:15 - 15:30 **400 W All-fiberized Tm-doped MOPA with Narrow-linewidth (SM3E.8)**
Presenter: Ying-bin Xing, *Huazhong Univ Sci andTech*
Expand for Abstract / Authors

Paper

We demonstrate an all-fiberized master-oscillator power-amplifier (MOPA) at 1980 nm with homemade 25/400 Tm-doped fibers. An maximum output power of 400 W was obtained with a slope efficiency of 51%. The linewidth was measured to be 0.1 nm.

Authors:Yinzi Liu/Huazhong Univ Sci andTech Ying-bin Xing/Huazhong Univ Sci andTech Jinyan Li/Huazhong Univ Sci andTech

Integrated Nonlinear Photonic Devices I (SM3L)

Presider: Katia Shtyrkova, *MIT Lincoln Laboratory*

13:30 - 14:00 **Entanglement Distribution for Quantum Networks (SM3L.1)**
Presenter: Catherine Lee, *Lincoln Laboratory*
Expand for Abstract / Authors

Entanglement-based quantum networks enable new and more powerful applications in computing, sensing, and communication. We describe technologies and architectures for entanglement distribution in quantum networks.

Authors:Catherine Lee/Lincoln Laboratory

Invited

14:00 - 14:15	**Photonic Ising Spin-Glass via Chip-Based Degenerate Kerr Oscillators (SM3L.2)** **Presenter**: Yoshitomo Okawachi, *Columbia University* Expand for Abstract / Authors We demonstrate reconfigurable all-optical coupling between two degenerate optical parametric oscillators in silicon-nitride microresonators. We show in-phase and out-of-phase operation which is achieved at a fast regeneration rate of 400 kHz with a large phase tolerance. **Authors**:Yoshitomo Okawachi/Columbia University Mengjie Yu/Columbia University Jae Jang/Columbia University Xingchen Ji/Columbia University Yun Zhao/Columbia University Michal Lipson/Columbia University Alexander Gaeta/Columbia University	Paper
14:15 - 14:30	**A shot-noise-limited ultrabroadband sampling oscilloscope (SM3L.3)** **Presenter**: Abijith Kowligy, *NIST* Expand for Abstract / Authors We demonstrate a shot-noise-limited electric-field sampling oscilloscope with >75 THz bandwidth in the mid-infrared. We discuss fundamental noise sources in the electric-field measurements, including timing jitter induced phase-to-amplitude noise at the 100 attosecond level. **Authors**:Abijith Kowligy/NIST Alexander Lind/NIST Daniel Lesko/NIST Sida Xing/NIST Scott Diddams/NIST	Paper
14:30 - 14:45	**Inverse design of microresonator dispersion for nonlinear optics (SM3L.4)** **Presenter**: Geun Ho Ahn, *Stanford University* Expand for Abstract / Authors Inverse design optimizes microcavity structures for desired dispersion properties and fabrication constraints. We experimentally demonstrate robust control of cavity dispersion at the telecommunication band on foundry compatible photonic platform. **Authors**:Geun Ho Ahn/Stanford University Kiyoul Yang/Stanford University Jinhie Skarda/Stanford University Jelena Vuckovic/Stanford University	Paper

14:45 - 15:00	**Phase-sensitive Amplification in Nanophotonic Periodically Poled Lithium Niobate Waveguides (SM3L.5)** **Presenter**: jiayang chen, *Stevens Institute of Technology* Expand for Abstract / Authors We demonstrate phase-sensitive amplification in periodically poled lithium niobate nanowavguides, achieving a net gain of 11.8 dB and an extinction ratio of 14.9 dB for 1.2-ps pump pulse with 2.4-pJ pulse energy. **Authors**:jiayang chen/Stevens Institute of Technology Yong Meng Sua/Stevens Institute of Technology zhaohui ma/Stevens Institute of Technology Lac Nguyen/Stevens Institute of Technology Yuping Huang/Stevens Institute of Technology	Paper
15:00 - 15:15	**Cryogenic Second Harmonic Generation in Periodically-Poled Lithium Niobate Waveguides (SM3L.6)** **Presenter**: Moritz Bartnick, *Paderborn University* Expand for Abstract / Authors We demonstrate type-II SHG in fiber-coupled periodically-poled lithium niobate waveguides down to 4.4K. This is the lowest temperature SHG experiment in an integrated photonic circuit, which is also compatible with other low temperature photonic technologies. **Authors**:Moritz Bartnick/Paderborn University Matteo Santandrea/Paderborn University Jan Philipp Hoepker/Paderborn University Frederik Thiele/Paderborn University Raimund Ricken/Paderborn University Victor Quiring/Paderborn University Christof Eigner/Paderborn University Christine Silberhorn/Paderborn University Tim Bartley/Paderborn University	Paper
15:15 - 15:30	**2 µm Microcomb Generation from a Monolithic Lithium Niobate Optical Parametric Oscillator (SM3L.7)** **Presenter**: Kunpeng Jia, *Nanjing University* Expand for Abstract / Authors We demonstrate 2 µm frequency comb generation via optical parametric down conversion from a high-quality-factor $\chi^{(2)}$ optical superlattice box resonator. Low noise comb is achieved with high output power. **Authors**:Kunpeng Jia/Nanjing University Xiaohan Wang/Nanjing University Xin Ni/Nanjing University Jian Guo/Nanjing University Zhenda Xie/Nanjing University Shu-Wei Huang/University of Colorado Boulder Shi-ning Zhu/Nanjing University	Paper

Nonlinear Optics in Fibers III (SM3P)

Presider: Li Qian, *University of Toronto*

13:30 - 14:30	**Perspectives in Nonlinear Guided Wave Optics – New Waveguides, New Sources, New Applications. (SM3P.1)** **Presenter**: John Dudley, *Université Bourgogne Franche Comté* Expand for Abstract / Authors New breakthroughs in nonlinear guided wave optics are leading to both fundamental advances and new applications across many different fields. This Tutorial will review recent developments in these areas. John Dudley is Professor of Physics at the Université Bourgogne Franche Comté and the CNRS Institute FEMTO-ST. He has published over 600 contributions in journals & conference proceedings and received a number of awards and distinctions in both research and science communication. He is an OSA, IEEE and EOS Fellow. **Authors**:John Dudley/Université Bourgogne Franche Comté Tutorial	Paper
14:30 - 14:45	**Active Mode-Selective Conversion Enabled by an Elliptical-Core Highly Nonlinear Few-Mode Fiber (SM3P.2)** **Presenter**: Jitao Gao, *Huazhong University of Science and Technology* Expand for Abstract / Authors We design an elliptical-core highly nonlinear few-mode fiber to achieve mode-selective conversion without parasitic wavelength conversion, using intermodal four-wave mixing. The proposed mode converter can be used in optical cross-connects over the C-band. **Authors**:Jitao Gao/Huazhong University of Science and Technology Elham Nazemosadat/Chalmers University of Technology Yi Yang/Huazhong University of Science and Technology Xi Chen/Huazhong University of Science and Technology Songnian Fu/Huazhong University of Science and Technology Ming Tang/Huazhong University of Science and Technology Jochen Schröder/Chalmers University of Technology Magnus Karlsson/Chalmers University of Technology Peter Andrekson/Chalmers University of Technology	Paper
14:45 - 15:00	**Mode-Selective Frequency Conversion in a Three-Mode Fiber (SM3P.3)** **Presenter**: Afshin Shamsshooli, *University of Texas at Arlington* Expand for Abstract / Authors We present a scheme for spatial-mode-selective frequency conversion in a few-mode fiber and experimentally demonstrate upconversion of either of two signal modes from C-band to fundamental mode in S-band with crosstalk below –15.5 dB. **Authors**:Afshin Shamsshooli/University of Texas at Arlington Cheng Guo/University of Texas at Arlington Francesca Parmigiani/Microsoft Research Xiaoying Li/Tianjin University Michael Vasilyev/University of Texas at Arlington	Paper

15:00 - 15:15 **Statistical Modelling of Coherent Rayleigh Backscattered Intensity Fluctuations in Single Mode Optical Fibers (SM3P.4)**
Presenter: Pedro Tovar, *PUC-Rio*
Expand for Abstract / Authors

Paper

We experimentally validate a model for coherent backscattering of light in fibers based on random fluctuations of the refractive index over the fiber length, described by an ergodic process. Simulations remarkably agree with experimental results.

Authors:Pedro Tovar/PUC-Rio Bismarck Lima/PUC-Rio Guilherme Temporão/PUC-Rio Jean von der Weid/PUC-Rio

Advanced Biomedical Diagnostics (AM3I)

Presider: Samantha McBirney, *University of Southern California*

13:30 - 13:45 **A Wearable Optical Fiber Wristband for Continuous and Accurate Blood Pressure Monitoring (AM3I.1)**
Presenter: Qizhen Sun, *Huazhong Univ of Science and Technology*
Expand for Abstract / Authors

Paper

We present a wearable blood pressure wristband based on optical fiber probe with composite diaphragm. Clinical results show errors of systolic pressure and diastolic pressure are 0.24 ± 2.32 mmHg and 0.18 ± 2.48 mmHg.

Authors:Liangye Li/Huazhong Univ of Science and Technology Yanpeng Li/Huazhong Univ of Science and Technology Liuyang Yang/Huazhong Univ of Science and Technology Fang Fang/Huazhong Univ of Science and Technology Qizhen Sun/Huazhong Univ of Science and Technology

13:45 - 14:00 **Thin Patch Type Tissue Oximeter with Deep Light Penetration Depth by Integrating Micro Lens Array (MLA) (AM3I.2)**
Presenter: Minhyung Kang, *Gwangju Institute of Science and Technology*
Expand for Abstract / Authors

Paper

We present a thin patch type tissue oximeter that consists of a microscale light-emitting diode, photodetector, wireless powering module and Micro Lens Array (MLA). The MLA with optimized geometry significantly improves the light penetration depth

Authors:Minhyung Kang/Gwangju Institute of Science and Technology Gil Ju Lee/Gwangju Institute of Science and Technology Joong Hoon Lee/Gwangju Institute of Science and Technology Hyun Myung Kim/Gwangju Institute of Science and Technology Minseok Kim/Gwangju Institute of Science and Technology Hyuk Jae Jang/Gwangju Institute of Science and Technology Young Min Song/Gwangju Institute of Science and Technology

14:00 - 14:15	**Spatially offset Raman spectroscopy for the diagnosis of bone composition (AM3I.3)** **Presenter**: Han Cui, *University of Glasgow* Expand for Abstract / Authors Spatially Offset Raman Spectroscopy involves the collection off-axial scattered light, enabling the rapid collection of high signal-to-noise spectral information including that for phosphate, collagen and carbonate at millimeter depths, all indicative of bone health. **Authors**:Han Cui/University of Glasgow Andrew Glidle/University of Glasgow Jonathan Cooper/University of Glasgow	Paper
14:15 - 14:30	**Optical probing of nanostructural alterations of brain tissues by partial wave spectroscopy in chronic alcoholism (AM3I.4)** **Presenter**: Prakash Adhikari, *Mississippi State University* Expand for Abstract / Authors We report the recently partial wave spectroscopy (PWS) with finner focusing that can probe precise scattering volume in tissues. Applications in distinguishing the nanostructural alteration in brain tissues in chronic alcoholism are reported **Authors**:Prakash Adhikari/Mississippi State University Binod Regmi/Mississippi State University Fatemah Alharthi/Mississippi State University Radhakrishna Rao/University of Tennessee Health Science Center Prabhakar Pradhan/Mississippi State University Pradeep K Shukla/University of Tennessee Health Science Center	Paper
14:30 - 15:00	**Imaging Light-induced Neural Activity Using Optoretinography (AM3I.5)** **Presenter**: Ramkumar Sabesan, *University of Washington* Expand for Abstract / Authors We will introduce the paradigm of optoretinography – the all-optical imaging of light-induced neural activity in the living human retina. Example applications for studying basic retinal physiology in vivo will be described. **Authors**:Ramkumar Sabesan/University of Washington Invited	

15:00 - 15:15 **An Automated and Cost-Effective System for Early Antimicrobial Susceptibility Testing (AM3I.6)**
Presenter: Calvin Brown, *University of California, Los Angeles*
Expand for Abstract / Authors

Paper

We present a cost-effective, automated antimicrobial susceptibility testing system that delivers results after as little as 4 hours of sample incubation, as opposed to manual readings performed by professionals after ≥18 hours of incubation.

Authors:Calvin Brown/University of California, Los Angeles Derek Tseng/University of California, Los Angeles Paige Larkin/University of California, Los Angeles Susan Realegeno/University of California, Los Angeles Dino Di Carlo/University of California, Los Angeles Omai Garner/University of California, Los Angeles Aydogan Ozcan/University of California, Los Angeles

15:15 - 15:30 **Computational Sensing with a Multiplexed Vertical Flow Assay for High-Sensitivity C-Reactive Protein Quantification (AM3I.7)**
Presenter: Artem Goncharov, *UCLA*
Expand for Abstract / Authors

Paper

We demonstrate computational sensing with a multiplexed paper-based point-of-care assay for high sensitivity C-Reactive protein testing (hsCRP). Using blindly-tested human serum samples, we achieved an R^2 value of 0.95 and an average coefficient-of-variation of 11.2%.

Authors:Zachary Ballard/UCLA Hyou-Arm Joung/UCLA Artem Goncharov/UCLA Jesse Liang/UCLA Karina Nugroho/UCLA Dino Di Carlo/UCLA Omai Garner/UCLA Aydogan Ozcan/UCLA

Quantum Measurement and Manipulation (FM3C)

Presider: Martin Stevens, *National Inst of Standards & Technology*

13:30 - 13:45 **Demonstration of 8-Step Single-Photon Quantum Walk using 32 × 32 Reconfigurable Silicon Photonics Switch (FM3C.1)**
Presenter: Ryotaro Konoike, *National Institute of Advanced Industrial Science and Technology (AIST)*
Expand for Abstract / Authors

Paper

We implemented a reconfigurable quantum-walk circuit on a 32×32 silicon photonics switch system. The 1 to 8-step quantum walk exhibited a long-term stability over 45 hours with clear single-photon interference for 10-nm-bandwidth heralded single photons.

Authors:Ryotaro Konoike/National Institute of Advanced Industrial Science and Technology (AIST) Akio Yoshizawa/National Institute of Advanced Industrial Science and Technology (AIST) Shu Namiki/National Institute of Advanced Industrial Science and Technology (AIST) Kazuhiro Ikeda/National Institute of Advanced Industrial Science and Technology (AIST)

13:45 - 14:00 **Exploring complex graphs with 3D quantum walks of correlated photons (FM3C.2)**
Presenter: Alexander Szameit, *University of Rostock*
Expand for Abstract / Authors

Paper

We study three-dimensional quantum walks on complex graphs arising from the hybrid action of the spatial and polarization degrees of freedom for single photons in photonic waveguide circuits with tailored birefringence.

Authors:Max Ehrhardt/University of Rostock Robert Keil/University of Innsbruck Lukas Maczewsky/University of Rostock Matthias Heinrich/University of Rostock Alexander Szameit/University of Rostock

14:00 - 14:15 **Simulating the Quantum Correlations of Structured Photons (FM3C.3)**
Presenter: Aviv Karnieli, *Tel Aviv University*
Expand for Abstract / Authors

Paper

We introduce an efficient, nonperturbative method for calculating the first and second order quantum correlations of down converted photons that recovers experimental results. Our algorithm paves the way towards engineering arbitrarily structured nonclassical light.

Authors:Sivan Trajtenberg-Mills/Tel Aviv University Aviv Karnieli/Tel Aviv University Noa Voloch-Bloch/Hebrew University of Jerusalem Eli Megidish/Hebrew University of Jerusalem Hagai S. Eisenberg/Hebrew University of Jerusalem Ady Arie/Tel Aviv University

14:15 - 14:30 **Are photons bosons? Measuring the particle exchange phase of photons (FM3C.4)**
Presenter: Konrad Tschernig, *Max-Born-Institut*
Expand for Abstract / Authors

Paper

It is widely accepted that photons are bosons. To the best of our knowledge, we present the first-ever test of this fundamental assumption of quantum electrodynamics and discuss the influence of experimental imperfections.

Authors:Konrad Tschernig/Max-Born-Institut Malte Smoor/Humboldt-Universität zu Berlin Chris Müller/Humboldt-Universität zu Berlin Tim Kroh/Humboldt-Universität zu Berlin Armando Leija/Max-Born-Institut Oliver Benson/Humboldt-Universität zu Berlin Kurt Busch/Humboldt-Universität zu Berlin

14:30 - 14:45 **Topological Protection of Biphoton States Generated in Waveguide Arrays by Parametric Fluorescence (FM3C.5)**
Presenter: Nicola Bergamasco, *Dipartimento di Fisica UNIPV*
Expand for Abstract / Authors

[Paper](#)

We study spontaneous four-wave mixing in waveguide arrays supporting topologically protected modes. We clarify the mechanisms associated with the topological protection of the quantum correlations of the generated photon pairs.

Authors:Nicola Bergamasco/Dipartimento di Fisica UNIPV Marco Liscidini/Dipartimento di Fisica UNIPV

14:45 - 15:00 **Topological Edge States in Parity-Time-Broken Haldane Honeycomb Lattices (FM3C.6)**
Presenter: Armando Leija, *Max Born Institute*
Expand for Abstract / Authors

[Paper](#)

We present the first study on the emergence of topologically-protected edge states in a two-dimensional Haldane honeycomb lattice with balanced gain and loss

Authors:Armando Leija/Max Born Institute Pablo Resendiz-Vazquez/ICN, UNAM Roberto Leon-Montiel/ICN, UNAM Konrad Tschernig/Max Born Institute Kurt Busch/Max Born Institute

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15:00 - 15:30 **Photonic Entanglement Sharing and Conclusively Asymmetric Nonlocality with the Detection Loophole Closed (FM3C.7)**
Presenter: Geoffrey Pryde, *Griffith University*
Expand for Abstract / Authors

[Paper](#)

The quantum steering task's asymmetry makes it interesting and useful. We experimentally explore detection-loophole-free steering with and without heralding. We perform a conclusive demonstration of one-way steering, where otherwise-successful steering fails on exchange of parties.

Authors:Geoffrey Pryde/Griffith University

Invited

16:00 - 18:00 (UTC - 07:00)

Symp: Advances in Topological Photonics II (JM4A)
Presider: Luqi Yuan, *Shanghai Jiao Tong University*

Special Symposium

16:00 - 16:30	**Topological nonlinear optics (JM4A.1)** **Presenter**: Mikael Rechtsman, *Pennsylvania State University* Expand for Abstract / Authors The large majority of research in topological photonics has been in the linear domain. We discuss nonlinear optical topological states, including how topology can be used to overcome a fundamental trade-off in slow-light systems. **Authors**:Mikael Rechtsman/Pennsylvania State University Invited	Paper
16:30 - 17:00	**Topological photonic-crystal cavity and fiber (JM4A.2)** **Presenter**: ling lu, *Institute of Physics* Expand for Abstract / Authors We present the Dirac-vortex optical cavity with tunable mode area, arbitrary mode degeneracy, robustly large free-spectral-range, vector-beam output of low divergence, and compatibility with high-index substrates. We also discuss the design of topological photonic-crystal fibers. **Authors**:ling lu/Institute of Physics Invited	Paper
17:00 - 17:30	**Exploring Synthetic Dimensions by Dynamically Modulating a Ring Resonator (JM4A.3)** **Presenter**: Avik Dutt, *Stanford University* Expand for Abstract / Authors Photonic gauge potentials and quantum Hall physics can be realized in a single dynamically modulated ring resonator by leveraging multiple synthetic dimensions. We experimentally observe this using our recently developed time-resolved band-structure spectroscopy technique. **Authors**:Avik Dutt/Stanford University Luqi Yuan/Shanghai Jiao Tong University Momchil Minkov/Stanford University Qian Lin/Stanford University Meng Xiao/Wuhan University David Miller/Stanford University Shanhui Fan/Stanford University Invited	Paper

17:30 - 17:45 **Broadband Slow Light in Topologically Protected Waveguides (JM4A.4)**
Presenter: Sander Mann, *CUNY ASRC*
Expand for Abstract / Authors

[Paper]

We demonstrate that broadband slow light can be achieved over the entire bandgap by periodically loading a topologically protected unidirectional waveguide with low-Q resonances. We discuss implementations and limitations in both reciprocal and nonreciprocal systems.

Authors:Sander Mann/CUNY ASRC Andrea Alù/CUNY ASRC

17:45 - 18:00 **Theory of Momentum-to-Real Space Mapping of Topological Singularities (JM4A.5)**
Presenter: Ema Jajtić, *Faculty of Science, University of Zagreb*
Expand for Abstract / Authors

[Paper]

We present a theoretical framework describing the connection between pseudospin, orbital angular momentum, and the underlying topology for lattices with conical intersections, which manifest the universal mapping of topological singularities from momentum to real space.

Authors:Ema Jajtić/Faculty of Science, University of Zagreb Xiuying Liu/TEDA Applied Physics Institute and School of Physics, Nankai University Shiqi Xia/TEDA Applied Physics Institute and School of Physics, Nankai University Daohong Song/TEDA Applied Physics Institute and School of Physics, Nankai University Denghui Li/TEDA Applied Physics Institute and School of Physics, Nankai University Liqin Tang/TEDA Applied Physics Institute and School of Physics, Nankai University Daniel Leykam/Institute for Basic Science Jingjun Xu/TEDA Applied Physics Institute and School of Physics, Nankai University Zhigang Chen/TEDA Applied Physics Institute and School of Physics, Nankai University Hrvoje Buljan/Faculty of Science, University of Zagreb

Symp: Light by Design: Structured Light, from Theory to Application II (JM4N)
Presider: Robert Boyd, *University of Ottawa*

Special Symposium

16:00 - 16:30 **Extreme Doppler Shifts with Structured Light: the Road to Negative Frequency (JM4N.1)**
Presenter: Miles Padgett, *University of Glasgow*
Expand for Abstract / Authors

The rotational Doppler shift is what we see when we rotate a watch face: the hands go round at a different speed. When a light beam or sound wave carries angular momentum the same effect arises and because sound waves have a much lower frequency, the Doppler shift can reach negative frequencies where strange effects occur.

Authors:Miles Padgett/University of Glasgow

Invited

16:30 - 17:00

(Withdrawn) Photonic Spin Symmetry Breaking Phenomena Mediated by Metasurfaces (JM4N.2)
Presenter: Erez Hasman, *Technion*
Expand for Abstract / Authors

We report on the observation of photonic Rashba effect from quantum dot emitters incorporated into a photonic crystal with geometric phase defects, and stochastic photonic spin Hall effect from a band-limited lattice with nanoscale fluctuation.

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Authors:Erez Hasman/Technion Kexiu Rong/Technion Bo Wang/Technion Avi Reuven/Technion Elhanan Maguid/Technion Vladimir Kleiner/Technion

Invited

17:00 - 17:30

Advances in High-Capacity Optical Communications using Multiple Structured Beams (JM4N.3)
Presenter: Alan Willner, *University of Southern California*
Expand for Abstract / Authors

The amplitude and phase of light can be structured such that different beams can be spatially orthogonal. This can enable a capacity enhancement when multiple data-carrying beams are multiplexed. Recent advances in achieving high-capacity communications using structured light will be highlighted.

Authors:Alan Willner/University of Southern California

Invited

17:30 - 18:00

(Withdrawn) Structured Light in Turbulence (JM4N.4)
Presenter: Andrew Forbes, *University of Witwatersrand*
Expand for Abstract / Authors

Structuring light allows for a higher information capacity per photon, but is adversely affected by turbulence. Here we review modal resilient to turbulence, resolving contradictions and revealing the importance of the measurement process.

Authors:Andrew Forbes/University of Witwatersrand

Invited

Symp: Photonic NISQ Technologies II (JM4G)
Presider: Valérian Thiel, *University of Oregon*

Special Symposium

16:00 - 16:15	**Cryogenic-Temperature Operation of SPADs in Deep Submicrometer CMOS (JM4G.1)** **Presenter**: Danielius Kramnik, *Massachusetts Institute of Technology* Expand for Abstract / Authors We discuss dark count, afterpulsing, and detection efficiency trends from 77K to 300K in SPADs fabricated in standard 90nm CMOS. With 1µs dead time, afterpulses and primary dark counts are traded-off optimally at 120K. **Authors**:Danielius Kramnik/Massachusetts Institute of Technology Rajeev Ram/Massachusetts Institute of Technology	Paper
16:15 - 16:30	**An Integrated Photonic Platform for Rare-Earth Ions in Thin Film Lithium Niobate (JM4G.2)** **Presenter**: Subhojit Dutta, *University of Maryland, College Park* Expand for Abstract / Authors We demonstrate an integrated photonic platform for rare earth ions in thin film lithium niobate. The ions in the thin film retain bulk like optical properties. This paves way to a new generation of highly scalable, active optoelectronic devices with applications to both classical and quantum optics. **Authors**:Subhojit Dutta/University of Maryland, College Park Elizabeth Goldschmidt/University of Illinois Sabyasachi Barik/University of Maryland, College Park Uday Saha/University of Maryland, College Park Edo Waks/University of Maryland, College Park	Paper
16:30 - 16:45	**A Super Ising Machine with All-to-All Two-body and Four-body Interactions (JM4G.3)** **Presenter**: Santosh Kumar, *Stevens Institute of Technology* Expand for Abstract / Authors We propose and demonstrate an Ising machine that contains nearly a million spins and supports all-to-all many-body interactions via frequency-conversion process. Its ground state is approximately obtained via adaptive feedback control. **Authors**:Santosh Kumar/Stevens Institute of Technology He Zhang/Stevens Institute of Technology Yuping Huang/Stevens Institute of Technology	Paper
16:45 - 17:00	**Quantum computing with 20 photons in 60 modes (JM4G.4)** **Presenter**: Chaoyang Lu, *Univ of Science and Technology of China* Expand for Abstract / Authors We resonantly excite a single quantum dot coupled to a polarized microcavity to create single photons with high efficiency, purity, and indistinguishability simultaneously. We inject 20 photons into a 60-mode interferometer to perform boson sampling at a Hilbert space size of 10^14. **Authors**:Chaoyang Lu/Univ of Science and Technology of China	Paper

17:00 - 17:15

The Capacity of Quantum Neural Networks (JM4G.5)
Presenter: Logan Wright, *Cornell University*
Expand for Abstract / Authors

Paper

Quantum neural networks (QNN) are a promising application of near-term quantum computers. We present an information theory of QNN's expressive power, which we apply to an example optical QNN based on a Gaussian Boson Sampler.

Authors:Logan Wright/Cornell University Peter McMahon/Cornell University

17:15 - 17:30

Nanophotonic Quantum Network Nodes Based on Epitaxial Rare-Earth on Silicon Heterostructures (JM4G.6)
Presenter: Christina Wicker, *University of Chicago*
Expand for Abstract / Authors

Paper

We present the development of nanophotonic quantum nodes based on an epitaxial $^{167}Er^{3+}:Y_2O_3$ on silicon platform. Slot photonic crystal cavities with an ultra-small mode volume enable coupling to individual erbium qubits at the telecom wavelength.

Authors:Christina Wicker/University of Chicago Tao Tao/University of Chicago Yizhong Huang/University of Chicago Abhinav Prakash/Argonne National Laboratory Manish Singh/University of Chicago Alan Dibos/Argonne National Laboratory Supratik Guha/University of Chicago Tian Zhong/University of Chicago

17:30 - 17:45

(Withdrawn) Quantum Proof of NP Problems with Linear Optics (JM4G.7)
Presenter: Aonan Zhang, *Nanjing University*
Expand for Abstract / Authors

We report the quantum verification of the Boolean satisfiability problem, an NP-complete problem, with single photons and a linear optical circuit. The results foreshadow a new route towards quantum advantages.

Authors:Aonan Zhang/Nanjing University Hao Zhan/Nanjing University Junjie Liao/Nanjing University Kaimin Zheng/Nanjing University Tao Jiang/Nanjing University Penghui Yao/Nanjing University Lijian Zhang/Nanjing University

17:45 - 18:00

Photonic Quantum Programmable Gate Arrays (JM4G.8)
Presenter: Ben Bartlett, *Stanford University*
Expand for Abstract / Authors

Paper

We describe a photonic integrated circuit architecture which can be reprogrammed to prepare any quantum state or operator, in principle deterministically. Gradient-based circuit optimization can automatically implement highly compact approximate quantum circuits with near-unity fidelity.

Authors:Ben Bartlett/Stanford University Shanhui Fan/Stanford University

Optomechanical Physical Sensing (SM4M)

Presider: Erik Emmons, *US Army CCDC CBC*

16:00 - 16:15

Optomechanical Sensing in the Nonlinear Saturation Limit (SM4M.1)

Presenter: Usman Javid, *University of Rochester*

Expand for Abstract / Authors

Paper

The dynamic range of optomechanical-displacement measurement is limited by the nonlinearity of the cavity transmission. We demonstrate that the dynamic range can be made arbitrarily large within a small detection bandwidth in the resolved-sideband regime.

Authors:Usman Javid/University of Rochester Steven Rogers/Johns Hopkins University Austin Graf/University of Rochester Qiang Lin/University of Rochester

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16:15 - 16:30

Low-frequency noise stabilization in optomechanical inertial accelerometers for high-resolution sensing (SM4M.2)

Presenter: Jaime Flor Flores, *University of California Los Angeles*

Expand for Abstract / Authors

Paper

We demonstrate a solid-state optomechanical resonator driven into oscillation mode for high resolution acceleration sensing. The low-frequency performance is greatly increased to 70μg/Hz$^{1/2}$ at 10^{-3} Hz when the resonant wavelength detuned pump laser is stabilized.

Authors:Jaime Flor Flores/University of California Los Angeles Wenting Wang/University of California Los Angeles Yongjun Huang/University of California Los Angeles Jiagui Wu/University of California Los Angeles Talha Yerebakan/University of California Los Angeles Qingsong Bai/University of California Los Angeles Chee Wei Wong/University of California Los Angeles

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16:30 - 16:45

Ultrasensitive torque detection and ultrafast rotation with an optically levitated nanoparticle (SM4M.3)

Presenter: JongHoon Ahn, *Purdue University*

Expand for Abstract / Authors

Paper

We develop an ultrasensitive optically levitated nanoparticle torque sensor and experimentally demonstrate sensitivity of $(4.2 \pm 1.2) \times 10^{-27}$ Nm / sqrt(Hz) at room temperature. We also achieve record high mechanical rotation at several GHz.

Authors:JongHoon Ahn/Purdue University Zhujing Xu/Purdue University Jaehoon Bang/Purdue University Peng Ju/Purdue University Xingyu Gao/Purdue University Tongcang Li/Purdue University

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16:45 - 17:00

An angular velocity sensor using machine learning and optical orbital angular momentum (SM4M.4)
Presenter: Elizabeth Strong, *University of Colorado, Boulder*
Expand for Abstract / Authors

[Paper]

We demonstrate a means for measuring the angular velocity of small particles using light with orbital angular momentum and a machine learning signal processing toolbox. This approach is applicable to studying turbulence at small scales.

Authors:Elizabeth Strong/University of Colorado, Boulder Alex Anderson/University of Colorado, Boulder Brendan Heffernan/University of Colorado, Boulder Michael Brenner/Harvard University Juliet Gopinath/University of Colorado, Boulder Gregory Rieker/University of Colorado, Boulder

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17:00 - 17:15

Simultaneous Strain and Force Sensing in an Antiresonant Fiber Featuring Enhanced Modal Interference (SM4M.5)
Presenter: Matyas Parrot, *Nanyang Technological University*
Expand for Abstract / Authors

[Paper]

We evaluate the performance of a multi-parameter fiber sensor utilizing microrestructuring of hollow core anti-resonant fiber parameters to enhance modal interference pattern. The resulting sensor allows to simultaneously measure both strain and transversal force.

Authors:Charu Goel/Nanyang Technological Universit Matyas Parrot/Nanyang Technological University Jichao Zang/Nanyang Technological University Seongwoo Yoo/Nanyang Technological University

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17:15 - 17:30

A 3-D Integrated Photonics Platform with Deterministic Geometry Control (SM4M.6)
Presenter: Juejun Hu, *Massachusetts Institute of Technology*
Expand for Abstract / Authors

[Paper]

We report a fully-packaged 3-D integrated photonics platform with devices placed at arbitrary pre-defined locations in 3-D. We further demonstrated the application of the platform to mechanical strain sensing.

Authors:Jerome Michon/Massachusetts Institute of Technology Sarah Geiger/University of Delaware Lan Li/Westlake University Claudia Gonçalves/University of Central Florida Hongtao Lin/Zhejiang University Kathleen Richardson/University of Central Florida Xinqiao Jia/University of Delaware Juejun Hu/Massachusetts Institute of Technology

17:30 - 17:45

Real-time microanalysis on evaporation rate for cellular subpicoliter liquid droplet using off-axis fiber interferometer (SM4M.7)
Presenter: Nan-Kuang Chen, *Liaocheng University*
Expand for Abstract / Authors

Paper

We demonstrate a real-time microanalysis approach to the evaporation rate of a (sub)picoliter liquid drop, measured over a 7.85-0.38 picoliter volume, using an off-axis fiber interferometer and achieving the best displacement resolution of 24 nm.

Authors:Cheng-Kai Yao/Liaocheng University Nan-Kuang Chen/Liaocheng University Hsiang-Chen Chui/Dalian University of Technology Chun-Nien Liu/National Chung Hsing University Haili Han/Liaocheng University Kenneth T. V. Grattan/City, University of London B.M.A Rahman/City, University of London

17:45 - 18:00

In-Situ Monitoring of Homogeneously Catalysed Reactions using Raman Spectroscopy Inside Hollow-Core Photonic Crystal Fibres (SM4M.8)
Presenter: Nicolas Joly, *Universität Erlangen-Nürnberg*
Expand for Abstract / Authors

Paper

We monitor the reaction of an acid with an alcohol inside a hollow-core photonic crystal fibre using Raman spectroscopy. The method uses tiny amount of chemicals and allows precise measurement of the activation energy.

Authors:Florian Schorn/Lehrstuhl für Chemische Reaktionstechnik Manfred Aubermann/Helmholtz Institute Erlangen-Nuremberg for Renewable Energy Richard Zeltner/Universität Erlangen-Nürnberg Peter Wasserscheid/Lehrstuhl für Chemische Reaktionstechnik Marco Haumann/Lehrstuhl für Chemische Reaktionstechnik Nicolas Joly/Universität Erlangen-Nürnberg

Ultrafast Metrology II (SM4H)

Presider: Christophe Dorrer, *Laboratory for Laser Energetics*

16:00 - 16:15

Towards Integrated Attosecond Time-Domain Spectroscopy (SM4H.1)
Presenter: Mina Bionta, *MIT*
Expand for Abstract / Authors

Paper

We report a cross-correlation technique based on perturbation of local electron field emission rates that allows for the full characterization of arbitrary electric fields down to 4 femtojoules using plasmonic nanoantennas.

Authors:Mina Bionta/MIT Felix Ritzkowsky/DESY Marco Turchetti/MIT Yujia Yang/MIT Franz KÄRTNER/DESY Karl Berggren/MIT Phillip D. Keathley/MIT

16:15 - 16:30

Characterization of a Diode-Pumped Ti:sapphire Frequency Comb (SM4H.2)
Presenter: Pablo Castro-Marin, *Heriot-Watt University*
Expand for Abstract / Authors

Paper

We describe and characterize a fully stabilized directly-diode-pumped Ti:sapphire frequency comb, exhibiting cumulative phase noise (1 Hz to 1 MHz) of 860 mrad for f_{CEO} and 54 mrad for f_{REP}.

Authors:Pablo Castro-Marin/Heriot-Watt University Toby Mitchell/Heriot-Watt University Jinghua Sun/Dongguan University of Technology Derryck Reid/Heriot-Watt University

16:30 - 16:45

Dual Comb Spectroscopy for Characterization of Short Optical Pulses (SM4H.3)
Presenter: Sutapa Gosh, *Technion*
Expand for Abstract / Authors

Paper

A technique to characterize arbitrary optical pulses based on dual comb spectroscopy was developed. Distortions due to timing and phase fluctuations were determined and a method to compensate for them was demonstrated.

Authors:Sutapa Gosh/Technion Gadi Eisenstein/Technion

16:45 - 17:00

(Withdrawn) Transient Grating in a Thin Gas Target for the Characterization of Extremely Short Optical Pulses (SM4H.4)
Presenter: Yuichiro Kida, *JST, PRESTO*
Expand for Abstract / Authors

Cross-correlation frequency-resolved optical gating in a thin gas target for characterization of subfemtosecond pulses is experimentally investigated with use of sub-10-fs laser pulses, covering the energy range of the few-fs ultraviolet laser sources recently reported.

Authors:Yuichiro Kida/JST, PRESTO

17:00 - 17:15

Measuring ultraviolet, femtosecond pulses in a medium with a slow response (SM4H.5)
Presenter: Travis Jones, *Georgia Institute of Technology*
Expand for Abstract / Authors

Paper

We demonstrate that with transient grating, ultraviolet pulse shapes can be encoded in near-infrared nonlinear optical signals, even in a non-instantaneous medium. We present measurements of chirped 400 nm pulses made in an absorbing medium.

Authors:Travis Jones/Georgia Institute of Technology William Peters/Los Alamos National Laboratory Anatoly Efimov/Los Alamos National Laboratory Dmitry A. Yarotski/Los Alamos National Laboratory Richard Sandberg/Los Alamos National Laboratory Rick Trebino/Georgia Institute of Technology Pamela Bowlan/Los Alamos National Laboratory

17:15 - 17:30	**Complete, Single Shot, Spatiotemporal Measurement of a Terawatt Laser System (SM4H.6)** **Presenter**: Elizabeth Grace, *Georgia Institute of Technology* Expand for Abstract / Authors A single shot, complete spatiotemporal measurement of the complex electric field emitted by a high power (>0.1 TW) laser is demonstrated for the first time. **Authors**:Elizabeth Grace/Georgia Institute of Technology Tammy Ma/Lawrence Livermore National Laboratory Rana Jafari/Georgia Institute of Technology Zhe Guang/Georgia Institute of Technology Jaebum Park/Colorado State University Brent Stuart/Lawrence Livermore National Laboratory Jerry Clark/Florida A&M University Elijah Kemp/Lawrence Livermore National Laboratory Stephen Maricle/Lawrence Livermore National Laboratory Jim Moody/Lawrence Livermore National Laboratory Ronnie Shepherd/Lawrence Livermore National Laboratory Rick Trebino/Georgia Institute of Technology	Paper
17:30 - 17:45	**One Megahertz Single-Shot Measurement of Ultrafast Laser Pulses (SM4H.7)** **Presenter**: Daniel Kane, *Mesa Photonics, LLC* Expand for Abstract / Authors We develop a system for measuring single shot ultrafast laser pulses with a bandwidths of 2 THz at 1550 nm. Rates of 1 MHz are possible. The process is all linear, and single pulses from a mode-locked Erbium fiber laser are characterized. **Authors**:Daniel Kane/Mesa Photonics, LLC Andrei Vakhtin/Mesa Photonics, LLC	Paper
17:45 - 18:00	**Real-time spectroscope characterization for acousto-optical dynamics analysis in fiber (SM4H.8)** **Presenter**: Yu Long Cao, *Chongqing University* Expand for Abstract / Authors We propose a dissipative-soliton assisted dispersive Fourier transform technology for ultra-fast spectroscope characterization of controllable passive devices. The transient spectra of the acoustically-induced fiber grating are emerged with a frame rate of MHz scale. **Authors**:Yu Long Cao/Chongqing University Yujia Liu/Chongqing University Lei Gao/Chongqing University Ligang Huang/Chongqing University Iroegbu Ikechukwu/Chongqing University Tao Zhu/Chongqing University	Paper

May the (Optical) Force Be With You (FM4Q)

Presider: Justus Ndukaife, *Vanderbilt University; Sc of Engineering*

16:00 - 16:15 **Self-stabilizing Long Range Photonic Manipulation of Nanostructured Macroscopic Objects (FM4Q.1)**
Presenter: Ognjen Ilic, *University of Minnesota*
Expand for Abstract / Authors

Paper

We show that long-range optical manipulation of macroscopic objects becomes possible when their surface is patterned on the subwavelength scale. Metasurface engineering of the anisotropy of light scattering gives rise to self-stabilizing optical radiation forces.

Authors:Ognjen Ilic/University of Minnesota

16:15 - 16:30 **Accurate Electromagnetic Field and Optical Force Calculations for Metallic Nanoparticles (FM4Q.2)**
Presenter: Weilin Liu, *Univeristy of Arizona*
Expand for Abstract / Authors

Paper

Computation of the scattered electromagnetic fields from and optical forces on metallic nanoparticles depend on their dipole moments. We show that an extensively-used volume correction based on skin depth for calculating dipole moments is inaccurate.

Authors:Weilin Liu/Univeristy of Arizona Euan McLeod/Univeristy of Arizona

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16:30 - 16:45 **Pushing and Pulling Optomechanics with Plasmonic Surface Waves (FM4Q.3)**
Presenter: Li-Fan Yang, *Purdue University*
Expand for Abstract / Authors

Paper

Light incident on a periodic plasmonic nanostructure is shown to exhibit a pushing or pulling pressure, depending on regulation of the surface wave on the top or bottom, respectively, thereby allowing wavelength control.

Authors:Li-Fan Yang/Purdue University Kevin Webb/Purdue University

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16:45 - 17:00 **Efficient nanoparticle trapping and local heat by an integrated plasmonic tweezers (FM4Q.4)**
Presenter: Vy Yam, *C2N*
Expand for Abstract / Authors

Paper

Experimental characterizations show that surface plasmon-based nanotweezers composed of short gold nanoparticle chains coupled to traditional SOI waveguides enable to trap effectively dielectric nanobead, but also to heat locally.

Authors:Aurore Ecarnot/C2N Giovanni Magno/C2N Xavier Leroux/C2N Béatrice DAGENS/C2N Vy Yam/C2N

17:00 - 17:15	**Opto-thermoelectric Speckle Tweezers (FM4Q.5)** **Presenter**: Abhay Kotnala, *University of Texas, Austin* Expand for Abstract / Authors We present opto-thermoelectric speckle tweezers based on random thermal speckle field for large-scale trapping of nanoparticles. By integrating it with microfluidic flow, we demonstrate its application as a size-based nanoparticle filtration device. **Authors**:Abhay Kotnala/University of Texas, Austin Yuebing Zheng/University of Texas, Austin	Paper
17:15 - 17:30	**Versatile optothermal micro/nanorobots for cellular biology (FM4Q.6)** **Presenter**: Hongru Ding, *The University of Texas at Austin* Expand for Abstract / Authors We develop a new type of low-power optical platform - optothermal robots - to achieve versatile three-dimensional (3D) manipulation of colloidal particles and biological cells at nanoscale resolution for single-cell study. **Authors**:Hongru Ding/The University of Texas at Austin Zhihan Chen/The University of Texas at Austin Yuebing Zheng/The University of Texas at Austin	Paper
17:30 - 17:45	**An Automatic Cell Cyclic Motor in Microfluidics *via* Self-Induced Back-Action (FM4Q.7)** **Presenter**: Yuzhi Shi, *Nanyang Technological University* Expand for Abstract / Authors We present the first optofluidic cell cyclic motor operated in an asymmetric potential well landscape with four energy states. The cell can continuously cycle between different hotspots inside the microchannel via self-induced back-action effect. **Authors**:Yuzhi Shi/Nanyang Technological University Yi Zhang/Nanyang Technological University Peng Huat Yap/Nanyang Technological University Ai Qun Liu/Nanyang Technological University	Paper
17:45 - 18:00	**Extreme sensitivity of plasmon drag to surface modification (FM4Q.8)** **Presenter**: Tejaswini Ronur Praful, *Norfolk State University* Expand for Abstract / Authors Plasmon-induced photocurrents in 1D profile modulated structures switch their polarity in the presence of an additional monolayer at the metal-dielectric interface. The effect presents opportunities for compact plasmonic sensors with electrical detection. **Authors**:Tejaswini Ronur Praful/Norfolk State University Nelly Jerop/Norfolk State University Ashah Koech/Norfolk State University Kenae Thompson/Matthew Fontaine Maury High School Natalia Noginova/Norfolk State University	Paper

Quantum Integrated Photonics II (SM4O)

Presider: Alan Wang, *Oregon State University*

16:00 - 17:00

Deploying Quantum Cryptography in Telecom Networks (SM4O.1)

Presenter: Taofiq Paraiso, *Toshiba Research Europe Ltd*

Expand for Abstract / Authors

- Paper

I discuss advances in quantum key distribution technology (with bit rates >10Mb/s, single fibre links >500km and operation on Tb/s data-carrying fibres), as well as its deployment in installed fibre networks.
Andrew Shields FREng, FInstP directs R&D in Toshiba Research Europe on quantum technologies. He leads the UK-funded AQuaSeC project developing next generation quantum communication technology, is a member of the technical management team of the EU-funded OpenQKD project and serves as Chair of Industry Specification Group for QKD of ETSI.

Authors:Andrew Shields/Toshiba Research Europe Ltd Taofiq Paraiso/Toshiba Research Europe Ltd

Tutorial

17:00 - 17:15

(Withdrawn) Tantala Integrated-Photonics Platform in the Visible for an Ultracold Strontium Optical Clock (SM4O.2)

Presenter: Grisha Spektor, *National Institute of Standards and Technology*

Expand for Abstract / Authors

We explore integrated photonics for shaping and delivering laser cooling, optical-lattice trapping, and clock interrogation beams to miniaturize a strontium optical clock. We show that tantalum-pentoxide nanophotonics offers low-loss for visible photonic-quantum integration.

Authors:Grisha Spektor/National Institute of Standards and Technology Kieran Lamee/National Institute of Standards and Technology Richelle Streater/National Institute of Standards and Technology Akash Rakholia/Vector Atomic Jennifer Black/National Institute of Standards and Technology Su-Peng Yu/Colorado University David Carlson/National Institute of Standards and Technology Kartik Srinivasan/National Institute of Standards and Technology Amit Agrawal/National Institute of Standards and Technology Vladimir Aksyuk/National Institute of Standards and Technology Martin Boyd/Vector Atomic Scott Papp/National Institute of Standards and Technology

17:15 - 17:30

High-Fidelity Cryogenic Photonic Link for the Readout of Superconducting Qubits (SM4O.3)
Presenter: Franklyn Quinlan, *National Inst of Standards & Technology*
Expand for Abstract / Authors

Paper

We perform readout of a superconducting qubit with microwave pulses delivered via optical fiber and a cryogenic high-speed photodetector. High coherence and readout fidelity are maintained, compatible with the stringent requirements of quantum information systems.

Authors:Franklyn Quinlan/National Inst of Standards & Technology Scott Diddams/National Inst of Standards & Technology Florent Lecocq/National Inst of Standards & Technology Jose Aumentado/National Inst of Standards & Technology John Teufel/National Inst of Standards & Technology

17:30 - 17:45

Superconducting nanowire single-photon detector on thin-film lithium niobate photonic waveguide (SM4O.4)
Presenter: Marco Colangelo, *Massachusetts Institute of Technology*
Expand for Abstract / Authors

Paper

We integrate niobium nitride superconducting nanowire single-photon detectors (SNSPDs) on thin-film lithium niobate (LN) photonic waveguides. Further development of this technology may push towards more complex circuits and functionalities on this already promising platform.

Authors:Marco Colangelo/Massachusetts Institute of Technology Boris Desiatov/Harvard University Di Zhu/Massachusetts Institute of Technology Jeffrey Holzgrafe/Harvard University Owen Medeiros/Massachusetts Institute of Technology Marko Loncar/Harvard University Karl Berggren/Massachusetts Institute of Technology

17:45 - 18:00

Waveguide-Integrated Superconducting Nanowire Single-Photon Detector Array for Ultra-Fast Quantum Key Distribution (SM4O.5)
Presenter: Martin Wolff, *University of Münster*
Expand for Abstract / Authors

Paper

We present an array of 16 superconducting nanowire single-photon detectors made from NbTiN thin films on Si_3N_4-waveguides that we interface with 3D printed couplers providing wide transmission bandwidth.

Authors:Martin Wolff/University of Münster Fabian Beutel/University of Münster Matthias Häußler/University of Münster Helge Gehring/University of Münster Robin Stegmüller/University of Münster Nicolai Walter/University of Münster Wladick Hartmann/University of Münster Max Tillmann/PicoQuant GmbH Michael Wahl/PicoQuant GmbH Tino Röhlicke/PicoQuant GmbH Andreas Bülter/PicoQuant GmbH Doreen Wernicke/Entropy GmbH Nicolas Perlot/Fraunhofer Heinrich Hertz Institute Jasper Rödiger/Fraunhofer Heinrich Hertz Institute Wolfram Pernice/University of Münster Carsten Schuck/University of Münster

NIR and MIR Sources and Application (AM4K)

Presider: Maria Navas Moreno

16:00 - 16:30	**Single mode laser diodes with 150nm tuning range at 2100nm and 2300nm (AM4K.1)** **Presenter**: Johannes Koeth, *nanoplus Nanosystems and Technologies GmbH* Expand for Abstract / Authors We demonstrated widely tunable edge emitting single mode lasers based on the Vernier tuning principle using coupled cavities. We achieve a tuning range of 150nm with SMSR>30dB with central wavelengths at 2100nm and 2300nm. **Authors**:Johannes Koeth/nanoplus Nanosystems and Technologies GmbH Invited	Paper
16:30 - 16:45	**Mutually Injection Locked Gain Switched Optical Frequency Combs for Dual Comb Spectroscopy of H_2S (AM4K.2)** **Presenter**: Eamonn Martin, *Dublin City University* Expand for Abstract / Authors Application of two mutually injection-locked gain-switched optical frequency combs for near-infrared spectroscopy of H_2S in air is demonstrated. The high phase correlation between OFCs allows measurement sensitivities of 740 ppmv using a compact, flexible device. **Authors**:Eamonn Martin/Dublin City University Satheesh Chandran/Univeristy College Cork Alejandro Rosado/Universidad Politécnica de Madrid (UPM) Justin Alexander/Univeristy College Cork Frank Peters/Univeristy College Cork Albert Ruth/Univeristy College Cork Prince Anandarajah/Dublin City University Erik Soderholm/Dublin City University	Paper
16:45 - 17:00	**Field-deployable Mid-infrared Quantum Cascade Laser Dual-comb Spectrometer with Multi-pass Cell Module (AM4K.3)** **Presenter**: JIE LIU, *Princeton University* Expand for Abstract / Authors Multi-pass cell extractive sensing function is integrated into a field-deployable mid-infrared quantum-cascade-laser based dual comb stand-off spectrometer. The multi-pass cell allows for high-sensitivity extractive point sensing and for conducting controlled experiments for system calibration. **Authors**:JIE LIU/Princeton University Jonas Westberg/Princeton University Linhan Shen/Princeton University Chu Teng/Princeton University Yifeng Chen/Princeton University Gerard Wysocki/Princeton University	Paper

17:00 - 17:15

Widely Tunable, Fast Scanning, Narrow Linewidth, Mid-IR Source Centred at 2.9 mm (AM4K.4)
Presenter: Jingda Wu, *University of British Columbia*
Expand for Abstract / Authors

Paper

A mid-IR source based on difference frequency generation is shown capable of performing a 100 nm wide scan centred at 2.9 mm in under 3 minutes. Its use for measuring the quality factors of photonic crystal cavities is demonstrated.

Authors:Jingda Wu/University of British Columbia Edmund Kelleher/University of British Columbia Lukas Chrostowski/University of British Columbia David Jones/University of British Columbia Jeff Young/University of British Columbia

17:15 - 17:30

Polarization State Generation and Detection by VCSELs with Integrated Metasurfaces (AM4K.5)
Presenter: Dandan Wen, *The University of Melbourne*
Expand for Abstract / Authors

Paper

We experimentally demonstrate vertical-cavity surface-emitting lasers (VCSEL) with integrated plasmonic and dielectric metasurfaces. The metasurfaces shape the polarization of the laser emission from the VCSELs and also enable them to serve as polarization-dependent photodetectors.

Authors:Dandan Wen/The University of Melbourne jiajun Meng/The University of Melbourne Jasper Cadusch/The University of Melbourne Kenneth Crozier/The University of Melbourne

17:30 - 18:00

Recent Progress In Rapidly Tuned MEMS-VCSELs From Near To Mid-Infrared (AM4K.6)
Presenter: Vijaysekhar Jayaraman, *Praevium Research, Inc.*
Expand for Abstract / Authors

Paper

MEMS-tunable VCSELs provide a unique combination of dynamic single mode operation, exceptionally wide and fast tuning, and wafer level fabrication and testing. In this paper, we review recent progress in devices from near to mid-infrared.

Authors:Vijaysekhar Jayaraman/Praevium Research, Inc. Christopher Burgner/Praevium Research, Inc. Peter Heim/Thorlabs Quantum Electronics Alex Cable/Thorlabs

Invited

Silicon Photonics Integration II (SM4J)

Presider: Vladimir Aksyuk, *National Inst of Standards & Technology*

16:00 - 16:15	**Inverse-designed optical interconnect based on multimode photonics and mode-division multiplexing (SM4J.1)** **Presenter**: Kiyoul Yang, *Stanford University* Expand for Abstract / Authors We experimentally demonstrate inverse-designed multimode silicon photonics for on-chip interconnect. Inverse design enables spatial mode conversion, multimode waveguide bending, and mode-division beam splitting with compact footprint and low insertion loss. **Authors**:Kiyoul Yang/Stanford University Jinhie Skarda/Stanford University Melissa Guidry/Stanford University Avik Dutt/Stanford University Shanhui Fan/Stanford University Jelena Vuckovic/Stanford University	Paper
16:15 - 16:30	**Monolithically Fabricated Subwavelength Grating Filters for O-band MUX/DEMUX Applications (SM4J.2)** **Presenter**: Francis Afzal, *Vanderbilt University* Expand for Abstract / Authors We demonstrate low loss (-1.2dB), high extinction ratio (-30dB) and single-source thermal tunability of the first silicon add/drop subwavelength grating filters fabricated at a CMOS foundry, using a commercial, monolithic silicon photonics technology from GlobalFoundries. **Authors**:Francis Afzal/Vanderbilt University Bo Peng/GlobalFoundries Shuren Hu/Vanderbilt University Kevin Dezfulian/GlobalFoundries Karen Nummy/GlobalFoundries Andy Stricker/GlobalFoundries Abdelsalam Aboketaf/GlobalFoundries Crystal Hedges/GlobalFoundries Dave Riggs/GlobalFoundries Ken Giewont/GlobalFoundries Sharon Weiss/Vanderbilt University	Paper
16:30 - 16:45	**(Withdrawn) Fabrication-tolerant wavelength filters based on cascaded Mach-Zehnder interferometers with broadband directional coupler (SM4J.3)** **Presenter**: Tzu-Hsiang Yen, *National Sun Yat-Sen University* Expand for Abstract / Authors We experimentally demonstrate a broadband and fabrication-tolerant wavelength filter based on cascaded MZI configuration that greatly reduces the process-oriented spectral shift from 10.54±2.34 nm to only 1.3±0.63 nm in o-band wavelengths. **Authors**:Tzu-Hsiang Yen/National Sun Yat-Sen University Cheng-Tse Tang/National Sun Yat-Sen University Tai-Chun Wang/National Sun Yat-Sen University Yung-Jr Hung/National Sun Yat-Sen University	

16:45 - 17:00	**Efficient, narrow profile waveguide crossings based on rapid adiabatic coupling (SM4J.4)** **Presenter**: Josep Fargas Cabanillas, *Boston University* Expand for Abstract / Authors We demonstrate a compact waveguide crossing based on the rapid adiabatic coupling (RAC) concept. Insertion loss and crosstalk are under 0.05dB and -50dB in simulation and 0.3dB and -17dB in experiment, over a 100nm bandwidth. **Authors**:Josep Fargas Cabanillas/Boston University Bohan Zhang/Boston University Miloš Popović/Boston University	Paper
17:00 - 17:15	**A Theoretical Analysis of a Resonator-Assisted Silicon Photonic Interleaver (SM4J.5)** **Presenter**: Zicong Huang, *Columbia University* Expand for Abstract / Authors We presented new physical insights into designing resonator-assisted photonic interleavers. The robust flat-top transmission spectra of the devices can be achieved and interpreted through rigorous mathematical models based on quasi Fourier series. **Authors**:Zicong Huang/Columbia University Xiang Meng/Columbia University Richard Osgood/Columbia University	Paper
17:15 - 17:30	**Experimental Demonstration of Broadband Silicon Mode Converter Designed by Wavefront-Matching Method (SM4J.6)** **Presenter**: Yusuke Sawada, *Hokkaido University* Expand for Abstract / Authors A broadband Si-based TE0-TE1 mode converter is successfully designed by a wavefornt-matching method for the first time and experimentally demonstrated. The effect of the broadband design appearing in the optimum waveguide geometry is observed. **Authors**:Yusuke Sawada/Hokkaido University Takeshi Fujisawa/Hokkaido University Kunimasa Saitoh/Hokkaido University	Paper

17:30 - 18:00	**Integration of III-V on Silicon Gain Devices a t the Backside of Silicon-on-Insulator Wafers f or Photonic Fully Integrated Circuits (SM4J.7)** **Presenter**: Sylvie MENEZO, *SCINTIL Photonics* Expand for Abstract / Authors We present a new platform integrating heterogeneous III-V/silicon gain devices at the backside of silicon-on-insulator wafers. The fabrication relies on commercial silicon photonic processes. The performances of lasers and SOAs fabricated accordingly are reported. **Authors**:Sylvie MENEZO/SCINTIL Photonics Torrey Thiessen/University of Toronto Jason Mak/University of Toronto Jeremy Da Fonseca/CEA-LETI Karen Ribaud/CEA-LETI Zheng Yong/University of Toronto Christophe Jany/CEA-LETI Joyce Poon/University of Toronto Invited	Paper

Wide Bandgap Devices (SM4R)

Presider: Daron Westly, *NIST*

16:00 - 16:15	**Demonstration of Hexagonal Boron Nitride Optical Microcavities With Q > 200,000. (SM4R.1)** **Presenter**: Anustup Das, *University of Calgary* Expand for Abstract / Authors Hexagonal boron nitride is a unique opto-electrical 2D material that hosts ultra-bright quantum emitters and is an emerging candidate for integrated quantum-optical system. Here we demonstrate hBN integrated microdisk optical resonators with optical quality factor >280,000. **Authors**:Anustup Das/University of Calgary Prasoon Shandilya/University of Calgary Dong Lee/Korea Institute of Science and Technology Gumin Kang/Korea Institute of Science and Technology Sejeong Kim/University of Technology, Sydney David Lake/University of Calgary Matthew Mitchell/University of Calgary Igor Aharonovich/University of Technology, Sydney Jaehyun Park/Korea Institute of Science and Technology Paul Barclay/University of Calgary	Paper
16:15 - 16:30	**High *Q* Microresonators Based on Epitaxial GaN Film (SM4R.2)** **Presenter**: Yanzhen Zheng, *Tsinghua University* Expand for Abstract / Authors High-*Q* GaN microring resonators are fabricated with optimized Cl_2/BCl_3/Ar inductively coupled plasma (ICP) dry etching process. The GaN microresonator exhibits an intrinsic *Q* factor exceeding 2×10^5, which is the highest *Q* reported so far. **Authors**:Yanzhen Zheng/Tsinghua University Changzheng Sun/Tsinghua University Bing Xiong/Tsinghua University Lai Wang/Tsinghua University Jian Wang/Tsinghua University Yanjun Han/Tsinghua University Zhibiao Hao/Tsinghua University Hongtao Li/Tsinghua University Jiadong Yu/Tsinghua University Yi Luo/Tsinghua University	Paper

16:30 - 16:45

On-Chip Optical Spectrometer Based on InGaN/GaN Wavelength-Selective Nanostructural Absorbers (SM4R.3)
Presenter: Tuba Sarwar, *University of Michigan*
Expand for Abstract / Authors

Paper

We demonstrate an optics-free chip-scale optical spectrometer consisting of monolithically integrated semiconductor photodetectors that have inherent wavelength selectivity by local strain engineering. Computational spectral estimation of unknown incident light is also presented in visible range.

Authors:Tuba Sarwar/University of Michigan Srinivasa Cheekati/University of Michigan Kunook Chung/University of Michigan Pei-Cheng Ku/University of Michigan

16:45 - 17:00

(Withdrawn) Compact Acousto-optics Based on Single Crystal Gallium Nitride Membranes (SM4R.4)
Presenter: Hugo Larocque, *Massachusetts Institute of Technology*
Expand for Abstract / Authors

We introduce compact acousto-optic devices based on double patterned single crystal gallium nitride membranes. We observe strong and confined acousto-optic interactions that can be of use for quantum photonic information.

Authors:Hugo Larocque/Massachusetts Institute of Technology Chansoo Kim/Massachusetts Institute of Technology Ian Christen/Massachusetts Institute of Technology Wei Kong/Massachusetts Institute of Technology Kohei Yoshiwaza/Massachusetts Institute of Technology Jeehwan Kim/Massachusetts Institute of Technology Dirk Englund/Massachusetts Institute of Technology

17:00 - 17:15

Direct Patterned Growth of PECVD Graphene Transparent Electrodes on GaN LED Epiwafers Using Co as a Sacrificial Catalyst Layer (SM4R.5)
Presenter: Fangzhu Xiong, *Beijing University of Technology*
Expand for Abstract / Authors

Paper

Co acts as both an etching mask and a catalyst for the growth of graphene,high-quality graphene can be obtained quickly and at low temperatures for transparent electrode applications on GaN LEDs.

Authors:Fangzhu Xiong/Beijing University of Technology Weiling Guo/Beijing University of Technology Yibo Dong/Beijing University of Technology Zaifa Du/Beijing University of Technology Jie Sun/Fuzhou University

17:15 - 17:30 **Characterization of a self-organized deep-ultraviolet micro-light-emitting diode structure for high-speed solar-blind optical wireless communications (SM4R.6)**
Presenter: Kazunobu Kojima, *Tohoku University*
Expand for Abstract / Authors

Paper

Time- and spatio-resolved electroluminescence spectroscopy was performed to characterize a self-organized micro-structure in the AlGaN LEDs, which have realized gigabit-class solar-blind optical wireless communication.

Authors:Kazunobu Kojima/Tohoku University Yuki Yoshida/NICT Masaki Shiraiwa/NICT Yoshinari Awaji/NICT Atsushi Kanno/NICT Naokatsu Yamamoto/NICT Akira Hirano/UV craftory Co., Ltd. Yosuke Nagasawa/UV craftory Co., Ltd. Masamichi Ippommatsu/UV craftory Co., Ltd. Shigefusa Chichibu/Tohoku University

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17:30 - 17:45 **Supercontinuum Generation in Dispersion Engineered 4H-SiC-on-insulator Waveguides at Telecom Wavelengths (SM4R.7)**
Presenter: Yi Zheng, *Technical University of Denmark*
Expand for Abstract / Authors

Paper

We characterize pulse spectral broadening in dispersion-engineered 4H-SiC-on-insulator waveguides. We demonstrate, for the first time, supercontinuum generation in SiC waveguides. We achieve a 30-dB bandwidth over 300 nm by using 510-fs pulses as the pump.

Authors:Yi Zheng/Technical University of Denmark Minhao Pu/Technical University of Denmark Pengyu Guan/Technical University of Denmark Ailun Yi/Shanghai Institute of Microsystem and Information Technology, Chinese Academy of Sciences Leif K. Oxenløwe/Technical University of Denmark Xin Ou/Shanghai Institute of Microsystem and Information Technology, Chinese Academy of Sciences Haiyan Ou/Technical University of Denmark

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17:45 - 18:00 **Monolayer Passivation of Silica Resonators to Prevent Excess Thermal Line Broadening (SM4R.8)**
Presenter: Dongin Jeong, *Korea Advanced Institute of Science and Technology*
Expand for Abstract / Authors

Paper

We report passivation of silica resonators with hexamethyldisilazane which prevents excess thermal line broadening by water adsorption without degradation of Q-factor. Soliton mode locking was demonstrated with the passivated resonators kept in moisturized atmosphere.

Authors:Dongin Jeong/Korea Advanced Institute of Science and Technology Hansuek Lee/Korea Advanced Institute of Science and Technology

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Advances in Metasurfaces (FM4B)

Presider: Junsuk Rho, *POSTECH*

16:00 - 16:15	**Polarization Dependence of Friedric-Wintgen Bound States in the Continuum from THz Metasurfaces (FM4B.1)** **Presenter**: Chan Kyaw, *Howard University* Expand for Abstract / Authors In this experiment, we present a unique method to induce Friedric-Wintgen bound states in the continuum (BIC) also called accidental BIC by rotating a metasurface with asymmetric split ring resonators in the terahertz (THz) regime. **Authors**:Chan Kyaw/Howard University Riad Yahiaoui/Howard University Joshua Burrow/University of Dayton Viet Tran/Howard University Kyron Keelen/Morehouse College Wesley Sims/Morehouse College Eddie Red/Morehouse College Mikkel Thomas/Georgia Institute of Technology Andrew Saragan/University of Dayton Imad Agha/University of Dayton Thomas Searles/Howard University	Paper
16:15 - 16:30	**Photoconductive Metasurfaces for Terahertz Detection (FM4B.2)** **Presenter**: Lucy Hale, *University College London* Expand for Abstract / Authors We developed terahertz detectors with integrated perfectly-absorbing photoconductive metasurfaces as an active region for improved efficiency and performance. The metasurface switches photoconductivity in the detector with contrast of ~10^7 using substantially reduced (>10X) optical power. **Authors**:Lucy Hale/University College London Thomas Siday/University College London Polina Vabishchevich/CINT Tom Harris/CINT Ting Luk/CINT John Reno/CINT Igal Brener/CINT Oleg Mitrofanov/University College London	Paper
16:30 - 16:45	**Broadband Linear-to-Circular Polarization Conversion Enabled by Birefringent Reflective Metasurfaces (FM4B.3)** **Presenter**: Dongfang Li, *Los Alamos National Laboratory* Expand for Abstract / Authors We theoretically proposed and experimentally demonstrated a broadband linear-to-circular polarization converter with up to 80% fractional bandwidth and near unity power conversion efficiency at the terahertz regime. **Authors**:Dongfang Li/Los Alamos National Laboratory Chun-Chieh Chang/Los Alamos National Laboratory Zhexin Zhao/Stanford University Antoinette Taylor/Los Alamos National Laboratory Shanhui Fan/Stanford University Hou-Tong Chen/Los Alamos National Laboratory	Paper

16:45 - 17:00	**Integrated Plasmonic Flat Optics for Broadband Highly Efficient Stokes Parameter Detection in MIR (FM4B.4)** **Presenter**: Jing Bai, *Arizona State University* Expand for Abstract / Authors We demonstrated a solution for highly efficient MIR broadband polarization detection based on an integrated plasmonic metasurface device. The measured error from 3.3 to 5μm for S_1, S_2 and S_3 is 1.28%, 1.96% and 0.94%. **Authors**:Jing Bai/Arizona State University Yu Yao/Arizona State University	Paper
17:00 - 17:15	**A Pragmatic Metasurface with Asymmetric Spin Interactions (FM4B.5)** **Presenter**: Muhammad Afnan Ansari, *Information Technology University of the Punjab* Expand for Abstract / Authors Traditional PB-Phase metaholograms based on spin-orbit-interactions exhibit central-symmetric holographic images, applying a limit to the helicity-multiplexing. Asymmetric metasurface is proposed to achieve spin-dependent and bidirectional propagation with high conversion efficiency and fidelity. **Authors**:Muhammad Ashar Naveed/Information Technology University of the Punjab Muhammad Afnan Ansari/Information Technology University of the Punjab Inki Kim/Pohang University of Science and Technology (POSTECH) Muhammad Zubair/Information Technology University of the Punjab Kashif Riaz/Information Technology University of the Punjab Tauseef Tauqeer/Information Technology University of the Punjab Junsuk Rho/Pohang University of Science and Technology (POSTECH) Muhammad Qasim Mehmood/Information Technology University of the Punjab	Paper
17:15 - 17:30	**Optimal Monitoring of Arbitrary Target Polarization with Metasurfaces (FM4B.6)** **Presenter**: Shaun Lung, *Australian National University* Expand for Abstract / Authors We reveal that dielectric metasurfaces can perform tailored non-Hermitian transformations optimized for monitoring of deviations around arbitrarily linear, circular, or elliptical polarizations, delivering the amplified vertical-to-horizontal polarization ratios for sensitive single-shot detection. **Authors**:Shaun Lung/Australian National University Kai Wang/Australian National University Khosro Zangeneh/Australian National University Mohsen Rahmani/Australian National University Dragomir Neshev/Australian National University Andrey Sukhorukov/Australian National University	Paper

17:30 - 17:45 **Optically-Induced Antiferromagnetic Order in Mie-Resonant Dielectric Metasurfaces (FM4B.7)**
Presenter: Yuri Kivshar, *Australian National University*
Expand for Abstract / Authors

Paper

We study silicon metasurfaces with complex unit cells composed of Mie-resonant dielectric nanodisks and nanorings and observe experimentally a signature of optical response with a staggered structure of optically-induced magnetic dipole moments, the so-called optical antiferromagnetic order.

Authors:Wenjia Zhou/Friedrich Schiller University Jena Duk-Yong Choi/Australian National University Jürgen Sautter/Friedrich Schiller University Jena Dennis Arslan/Friedrich Schiller University Jena Chengjun Zou/Friedrich Schiller University Jena Stefan Fasold/Friedrich Schiller University Jena Sergey Lepeshov/ITMO University Thomas Pertsch/Friedrich Schiller University Jena Isabelle Staude/Friedrich Schiller University Jena Yuri Kivshar/Australian National University

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17:45 - 18:00 **Octave bandwidth Metasurface lens (FM4B.8)**
Presenter: Abdoulaye Ndao, *University of California Berkeley*
Expand for Abstract / Authors

Paper

We report and experimentally demonstrate polarization-independent fishnet-achromatic-metalenses with measured average efficiencies over 70% in the continuous band from the visible (640 nm) to the infrared (1200 nm).

Authors:Abdoulaye Ndao/University of California Berkeley Liyi Hsu/University of California Berkeley Jeongho Ha/University of California Berkeley Junhee Park/University of California Berkeley Connie Chang-Hasnain/University of California Berkeley Boubacar Kante/University of California Berkeley

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Measurement and Control of Laser Beam Properties (SM4E)
Presider: Shang-da Yang, *National Tsing Hua University*

16:00 - 16:30	**Single-shot diagnostics development for high power laser driven relativistic plasma experiments at the Helmholtz-Zentrum Dresden-Rossendorf (SM4E.1)** **Presenter**: S. Bock, *Helmholtz-Zentrum Dresden-Rossendorf* Expand for Abstract / Authors At the HZDR TO-AC contrast measurement tools and newly developed single-shot diagnostics characterizing laser pulses are applied for laser improvements and particle acceleration experiments. An overview of the applied techniques and recent results is presented. **Authors**:S. Bock/Helmholtz-Zentrum Dresden-Rossendorf Thomas Püschel/Helmholtz-Zentrum Dresden-Rossendorf René Gebhardt/Helmholtz-Zentrum Dresden-Rossendorf Uwe Helbig/Helmholtz-Zentrum Dresden-Rossendorf Arie Irman/Helmholtz-Zentrum Dresden-Rossendorf Jurjen Pieter Couperus Cabadağ/Helmholtz-Zentrum Dresden-Rossendorf Karl Zeil/Helmholtz-Zentrum Dresden-Rossendorf Josefine Metzkes-Ng/Helmholtz-Zentrum Dresden-Rossendorf Hans-Peter Schlenvoigt/Helmholtz-Zentrum Dresden-Rossendorf Tim Ziegler/Helmholtz-Zentrum Dresden-Rossendorf Thomas Kluge/Helmholtz-Zentrum Dresden-Rossendorf Thomas Cowan/Helmholtz-Zentrum Dresden-Rossendorf Ulrich Schramm/Helmholtz-Zentrum Dresden-Rossendorf Invited
16:30 - 16:45	**(Withdrawn) High Dynamic Range Temporal Characterization of Single Shot Nanosecond Laser Pulses (SM4E.2)** **Presenter**: David Hillier, *Atomic Weapons Establishment* Expand for Abstract / Authors A fiber-based temporally-multiplexed pulse replication system is used to extend the dynamic range of temporal profile measurements of the nanosecond beamlines of the Orion laser facility **Authors**:David Hillier/Atomic Weapons Establishment David Winter/Atomic Weapons Establishment James Mcloughlin/Atomic Weapons Establishment
16:45 - 17:00	**(Withdrawn) Gain and wave-front distortion measurements and Top-hat phase plate regenerative cavity performance at repetition rates up to 10 Hz with a 0.5%Nd:5%Lu:CaF_2 crystal (SM4E.3)** **Presenter**: Cyril Bernerd, *CEA CESTA* Expand for Abstract / Authors We performed gain and thermal lens measurements in a small-size cavity containing two rods of 0.5%Nd:5%Lu:CaF_2 crystals or Nd:Phosphate glasses as amplifier media. Results aimed to size a regenerative cavity that works up to 10Hz. **Authors**:Cyril Bernerd/CEA CESTA Margaux Chanal/CEA CESTA Elodie Boursier/CEA CESTA Jacques Luce/CEA CESTA Nicolas Belon/CEA CESTA Alain Braud/CIMAP-Cean Cesare Meroni/CIMAP-Cean Patrice Camy/CIMAP-Cean Sébastien Montant/CEA CESTA

17:00 - 17:15 **Extracting the Gouy Phase of Radially Polarized Laser Beams in the Presence of Diffraction (SM4E.4)**
Presenter: Shanny Pelchat-Voyer, *University Laval*
Expand for Abstract / Authors

Paper

We show using vectorial integrals how the Gouy phase shift of radially polarized laser beams can be severely impacted by diffraction. We describe how to retrieve the Gouy phase even when diffraction is dominant.

Authors:Shanny Pelchat-Voyer/University Laval Michel Piché/University Laval

17:15 - 17:30 **Generation of Annular Beam using Photonic Crystal Cavity (SM4E.5)**
Presenter: Naresh Sharma, *Indian Institute of Technology Kanpur*
Expand for Abstract / Authors

Paper

We demonstrate generation of an annular beam by spatially filtering a circularly-polarized Gaussian beam using a photonic crystal cavity that exhibits in-plane symmetry and narrow bandpass-filtering. Our experimental results match well with simulations.

Authors:Naresh Sharma/Indian Institute of Technology Kanpur Govind Kumar/Indian Institute of Technology Kanpur R. Vijaya/Indian Institute of Technology Kanpur Shilpi Gupta/Indian Institute of Technology Kanpur

17:30 - 17:45 **Enhanced Polarization Purity in Twisted-Mode Lasers Using Helically-Structured Mirrors (SM4E.6)**
Presenter: Jean-Francois Bisson, *Universite de Moncton*
Expand for Abstract / Authors

Paper

Helically-structured mirrors producing circular Bragg reflection, used as laser mirrors for the twisted-mode operation of compact single frequency microchip lasers, offer better suppression of dual polarization oscillation than linear birefringent nanostructured mirrors.

Authors:Jean-Francois Bisson/Universite de Moncton Gabriel Gallant/Universite de Moncton Kristopher Bulmer/Universite de Moncton Georges Bader/Universite de Moncton

17:45 - 18:00 **(Withdrawn) Generation of a Radially Polarized Beam in a Solid-State Laser Using an Intracavity Spatially Variant Waveplate (SM4E.7)**
Presenter: William Clarkson, *University of Southampton*
Expand for Abstract / Authors

Direct excitation of a radially polarized mode from an end-pumped Nd:YVO_4 laser using an intracavity spatially variant waveplate is reported. The laser yielded a radially polarized output of 1.3W with a 35:1 polarization extinction ratio.

Authors:Thomas Jefferson-Brain/University of Southampton Yuhao Lei/University of Southampton Peter Kazansky/University of Southampton William Clarkson/University of Southampton

Applications of THz Technology (SM4F)
Presider: Ileana-Cristina Benea-Chelmus, *Harvard University*

16:00 - 16:15	**Telecommunication-Compatible Photoconductive Terahertz Detection without Using a Short-Carrier-Lifetime Substrate (SM4F.1)** **Presenter**: Ping-Keng Lu, *UCLA* Expand for Abstract / Authors We present a telecommunication-compatible photoconductive detector, which uses plasmonic nanostructures to provide ultrafast carrier transit times for high-performance terahertz detection (>110dB SNR and >3THz bandwidth), eliminating the need for short-carrier-lifetime substrates for the first time. **Authors**:Ping-Keng Lu/UCLA Mona Jarrahi/UCLA	Paper
16:15 - 16:30	**Real-Time Radar for the THz Region (SM4F.2)** **Presenter**: Yasith Amarasinghe, *Brown University* Expand for Abstract / Authors We implement a 2D real-time radar system for the THz region using a leaky parallel-plate waveguide. The radar can locate a target within 200ms with an accuracy of 1mm in range and 1.2° in angle. **Authors**:Yasith Amarasinghe/Brown University rajind Mendis/Riverside Research Daniel Mittleman/Brown University	Paper
16:30 - 16:45	**Telecommunication-Compatible Bias-Free Photoconductive Source with a 5 THz Radiation Bandwidth (SM4F.3)** **Presenter**: Deniz Turan, *University of California, Los Angeles* Expand for Abstract / Authors We demonstrate a telecommunication-compatible bias-free plasmonic photoconductive source that induces a strong built-in electric field to drift the majority of photocarriers to generate terahertz radiation over a bandwidth exceeding 5THz with a 100dB dynamic range. **Authors**:Deniz Turan/University of California, Los Angeles Nezih Yardimci/University of California, Los Angeles Ping-Keng Lu/University of California, Los Angeles Mona Jarrahi/University of California, Los Angeles	Paper

16:45 - 17:00

Two-wire Waveguide for Terabit DSL (SM4F.4)
Presenter: Rabi Shrestha, *Brown University*
Expand for Abstract / Authors

Paper

We investigate the data transmission capabilities of a two-wire waveguide ensheathed in a metallic conduit at THz frequencies and demonstrate that data rates of Tbps are achievable using vectoring techniques.

Authors:Rabi Shrestha/Brown University Kenneth Kerpez/ASSIA Inc Chan Soo Hwang/ASSIA Inc Mehedi Mohseni/ASSIA Inc John Cioffi/ASSIA Inc Daniel Mittleman/Brown University

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17:00 - 17:30

Field Trials of Photonics Based Terahertz Non-Destructive Testing Technologies (SM4F.5)
Presenter: Kyung Hyun Park, *Electronics and Telecom Research Inst*
Expand for Abstract / Authors

Paper

In this study we present our recent achievements in industrial applications of terahertz technology: Cost-effective high-speed reflective imaging nondestructive testing (NDT) system, real-time thickness monitoring system of slurry film, and other recent works.

Authors:Kyung Hyun Park/Electronics and Telecom Research Inst

Invited

17:30 - 17:45

(Withdrawn) Comb-Locked Frequency-Domain Spectroscopy of Ultra-High-Q Terahertz Whispering-Gallery Modes (SM4F.6)
Presenter: Thomas Puppe, *TOPTICA Photonics AG*
Expand for Abstract / Authors

We introduce a frequency-domain terahertz spectrometer (FDS) based on a comb locked optical frequency synthesizer which combines >3 THz scanning range at rates >300 GHz/s. We demonstrate kHz frequency resolution in terahertz precision spectroscopy on ultra-high-Q silicon whispering gallery modes.

Authors:Thomas Puppe/TOPTICA Photonics AG Dominik Vogt/Dodd-Walls Centre for Photonic and Quantum Technologies Yuriy Mayzlin/TOPTICA Photonics AG Anselm Deninger/TOPTICA Photonics AG Rafal Wilk/TOPTICA Photonics AG

17:45 - 18:00 **(Withdrawn) Frequency Measurement of Millimeter Waves Using Optical Combs from a 40 GHz Actively Mode-Locked Laser Diode (SM4F.7)**
Presenter: Isao Morohashi, *National Inst of Information & Comm Tech*
Expand for Abstract / Authors

Frequency measurement of millimeter waves has been demonstrated by electro-optic sampling using an actively mode-locked laser diode. The frequency accuracy depends on that of the modulation signal of the mode-locked laser diode.

Authors:Isao Morohashi/National Inst of Information & Comm Tech Yoh Ogawa/National Inst of Information & Comm Tech Norihiko Sekine/National Inst of Information & Comm Tech Akifumi Kasamatsu/National Inst of Information & Comm Tech Iwao Hosako/National Inst of Information & Comm Tech

Integrated Nonlinear Photonic Devices II (SM4L)
Presider: Jaime Cardenas, *University of Rochester*

16:00 - 16:30 **Ultrashort Laser Pulse-assisted Nonlinear Photonic Lattices (SM4L.1)** Paper
Presenter: Cornelia Denz, *University of Muenster*
Expand for Abstract / Authors

We give an overview of recent developments in structuring nonlinear photonic lattices for quasi-phase matched parametric processes. Focused femtosecond laser pulses are used to modulate the $\chi^{(2)}$-nonlinearity of nonlinear optical crystals in all three dimensions.

Authors:Cornelia Denz/University of Muenster Joerg Imbrock/University of Muenster Haissam Hanafi/University of Muenster

Invited

16:30 - 16:45 **Efficient Second Harmonic Generation in GaAs-on-Insulator Waveguides (SM4L.2)** Paper
Presenter: Eric Stanton, *National Institute of Standards and Tech*
Expand for Abstract / Authors

Second-harmonic generation is demonstrated with 38 W^{-1} conversion efficiency in a single-pass waveguide. A highly uniform wafer-scale process is used to fabricate these devices, which are suitable for frequency-comb stabilization.

Authors:Nima Nader/National Institute of Standards and Tech Eric Stanton/National Institute of Standards and Tech Jeffrey Chiles/National Institute of Standards and Tech Galan Moody/National Institute of Standards and Tech Lin Chang/University of California Santa Barbara John Bowers/University of California Santa Barbara Sae Woo Nam/National Institute of Standards and Tech Richard Mirin/National Institute of Standards and Tech

16:45 - 17:00

Ultra-efficient and highly tunable frequency conversion in Z-cut periodically poled lithium niobate nanowaveguides (SM4L.3)
Presenter: jiayang chen, *Stevens Institute of Technology*
Expand for Abstract / Authors

Paper

We demonstrate ultra-efficient (~ 1900 ± 500%$W^{-1}cm^{-2}$) and highly tunable (~ 1.71 nm/K) second harmonic generation from 1530 to 1583 nm via type-0 phase matching in Z-cut periodically poled lithium niobate nanowavguides.

Authors:jiayang chen/Stevens Institute of Technology chao tang/Stevens Institute of Technology zhaohui ma/Stevens Institute of Technology zhan li/Stevens Institute of Technology yongmeng sua/Stevens Institute of Technology Yuping Huang/Stevens Institute of Technology

17:00 - 17:15

Tailoring the phase-matching condition of four-wave mixing via Brillouin scattering in a chalcogenide waveguide (SM4L.4)
Presenter: Yuanfei Zhang, *The Chinese University of Hong Kong*
Expand for Abstract / Authors

Paper

We controlled the phase matching for four-wave mixing (FWM) in a chalcogenide waveguide by Brillouin-induced phase shift. Over 2π phase shift was realized and a 6-dB improvement in FWM conversion efficiency was obtained.

Authors:Yuanfei Zhang/The Chinese University of Hong Kong Moritz Merklein/University of sydney Zihang Zhu/University of sydney Chester Shu/The Chinese University of Hong Kong Khu Vu/Australian National University Pan Ma/Australian National University Duk-Yong Choi/Australian National University Stephen Madden/Australian National University Benjamin Eggleton/University of sydney

17:15 - 17:30

Enhanced four-wave mixing in micro-ring resonators integrated with layered graphene oxide films (SM4L.5)
Presenter: David Moss, *Swinburne University of Technology*
Expand for Abstract / Authors

Paper

We experimentally demonstrate enhanced four-wave mixing in micro-ring resonators (MRRs) integrated with graphene oxide films. We achieve up to ~7.6-dB enhancement in conversion efficiency for a uniformly coated MRR and ~10.3-dB for a patterned device.

Authors:Jiayang Wu/Swinburne University of Technology Yunyi Yang/Swinburne University of Technology Yuning Zhang/Swinburne University of Technology Yang Qu/Swinburne University of Technology Linnan Jia/Swinburne University of Technology Xingyuan Xu/Swinburne University of Technology Sai Chu/City University of Hong Kong Brent Little/Chinese Academic of Science Roberto Morandotti/INRS Baohua Jia/Swinburne University of Technology David Moss/Swinburne University of Technology

17:30 - 17:45 **On-chip High-efficiency Channel-selective Wavelength Multicasting of PAM3/PAM4 Signals Using an AlGaAsOI Waveguide (SM4L.6)**
Presenter: jun qin, *Peking University*
Expand for Abstract / Authors

Paper

A high-efficiency one-to-six wavelength multicasting scheme for 10 Gbaud PAM3 /PAM4 signal based a high nonlinearity AlGaAsOI waveguide is experimentally demonstrated. The average conversion efficiency for the output multicasting channels is -11.2 dB, all with BER under 10^{-4}.

Authors:jun qin/Peking University Haowen Shu/Peking University lin chang/University of california weiqiang xie/University of california yuansheng tao/Peking University ming jin/Peking University Xingjun Wang/Peking University John Bowers/University of california

17:45 - 18:00 **Stimulated Brillouin Scattering in AlGaAs on Insulator Waveguides (SM4L.7)**
Presenter: Warren Jin, *University of California Santa Barbara*
Expand for Abstract / Authors

Paper

We observe stimulated Brillouin scattering (SBS) in AlGaAs-on-insulator integrated waveguides. A guided transverse acoustic mode has a 12.3 GHz Brillouin shift, and a full-width half-maximum of 25 MHz.

Authors:Warren Jin/University of California Santa Barbara Lin Chang/University of California Santa Barbara Weiqiang Xie/University of California Santa Barbara Haowen Shu/University of California Santa Barbara Jonathan Peters/University of California Santa Barbara Xingjun Wang/Peking University John Bowers/University of California Santa Barbara

Spatio-temporal Multimode and Nonlinear Fiber Optics (SM4P)

Presider: William Renninger, *University of Rochester*

16:00 - 16:30 **Dispersion-Managed Soliton Multimode Fiber Laser (SM4P.1)**
Presenter: Uğur Tegin, *Ecole Polytechnique Federale de Lausanne*
Expand for Abstract / Authors

Paper

We demonstrate the first spatiotemporally mode-locked dispersion-managed fiber laser. The fiber oscillator generates 20 nJ pulses centered at 1034 nm with a Gaussian beam output profile which can be dechirped down to 97 fs.

Authors:Uğur Tegin/Ecole Polytechnique Federale de Lausanne Babak Rahmani/Ecole Polytechnique Federale de Lausanne Eirini Kakkava/Ecole Polytechnique Federale de Lausanne Demetri Psaltis/Ecole Polytechnique Federale de Lausanne Christophe Moser/Ecole Polytechnique Federale de Lausanne

16:30 - 16:45 **Multimode Q-switching and Spatiotemporal Mode-locking in Multimode Fiber Lasers (SM4P.2)** Paper

Presenter: Changxi Yang, *Tsinghua University*

Expand for Abstract / Authors

Multimode Q-switching and spatiotemporal mode-locking are achieved in multimode fiber lasers. The transition between multimode Q-switching and spatiotemporal mode-locking is experimentally revealed.

Authors:Kewei Liu/Tsinghua University Xiaosheng Xiao/Beijing University of Posts and Telecommunications Xiaoguang Zhang/Beijing University of Posts and Telecommunications Changxi Yang/Tsinghua University

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16:45 - 17:00 **Beam self-cleaning in tapered Ytterbium-doped multimode fiber with decelerating nonlinearity (SM4P.3)** Paper

Presenter: Alioune Niang, *Università degli Studi di Brescia*

Expand for Abstract / Authors

We demonstrate Kerr self-cleaning of beams in an Ytterbium doped multimode fiber taper with exponentially decreasing nonlinearity, with no accompanying frequency conversion or spectral broadening.

Authors:Alioune Niang/Università degli Studi di Brescia Daniele Modotto/Università degli Studi di Brescia Alessandro Tonello/Université de Limoges, XLIM, UMR CNRS 7252 Fabio Mangini/Università degli Studi di Brescia Umberto Minoni/Università degli Studi di Brescia Marc Fabert/Université de Limoges, XLIM, UMR CNRS 7252 Measy Jima/Università degli Studi di Brescia Olga Egorova/Prokhorov General Physics Institute of the Russian Academy of Sciences Andrey Levchenko/Fiber Optics Research Center of the Russian Academy of Sciences Sergey Semjonov/Fiber Optics Research Center of the Russian Academy of Sciences Denis Lipatov/Devyatykh Institute of Chemistry of High-Purity Substances of the Russian Academy of Sciences Vincent Couderc/Université de Limoges, XLIM, UMR CNRS 7252 Stefan Wabnitz/Sapienza University of Rome

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17:00 - 17:15 **Spatio-Temporal Beam Mapping for Studying Nonlinear Dynamics in Graded Index Multimode Fiber (SM4P.4)** Paper

Presenter: Yann Leventoux, *Université de Limoges, XLIM*

Expand for Abstract / Authors

We experimentally demonstrate high-resolution mapping of the spatio-temporal dynamics of the beam cleaning process in graded index multimode fibers. This high-resolution characterization reveals the time-dependent nature of the beam self-cleaning process.

Authors:Yann Leventoux/Université de Limoges, XLIM Geoffroy Granger/Université de Limoges, XLIM Alessandro Tonello/Université de Limoges, XLIM Stefan Wabnitz/DIET, Sapienza Università di Roma Katarzyna Krupa/Université Bourgogne Franche-Comté, ICB UMR CNRS 6303 Guy Millot/Université Bourgogne Franche-Comté, ICB UMR CNRS 6303 Sebastien Fevrier/Université de Limoges, XLIM Vincent Couderc/Université de Limoges, XLIM

17:15 - 17:30 **Inheriting from a Daughter Pulse: Coherence Eradication in Soliton Self-Mode Conversion (SM4P.5)**
Presenter: Aku Antikainen, *Boston University*
Expand for Abstract / Authors

_ Paper

We demonstrate how >100 kW peak power solitons in a multi-mode fiber can experience complete degradation of shot-to-shot coherence due to an ultra-low power noise seed in a different spatial mode.

Authors:Aku Antikainen/Boston University Havva Kabagöz/Boston University Siddharth Ramachandran/Boston University

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17:30 - 17:45 **High Energy Raman Solitons in Multimode GRIN Fibers (SM4P.6)**
Presenter: Mario Zitelli, *Sapienza University of Rome*
Expand for Abstract / Authors

_ Paper

We experimentally demonstrate the fission of femtosecond pulses in a GRIN standard fiber, leading to high-energy multimode solitons that undergo huge Raman-frequency shifts, and exhibit complex multisoliton dynamics

Authors:Mario Zitelli/Sapienza University of Rome fabio mangini/University of Brescia Denis Kharenko/Novosibirsk State University Alioune Niang/University of Brescia Stefan Wabnitz/Sapienza University of Rome

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Ultrafast Magnetospectroscopy (FM4D)

Presider: Vasily Temnov, *IMMM UMR CNRS 6283*

16:00 - 16:30 **Amplification of Magneto-Optical Activity via Hybridization with Dark Plasmons (FM4D.1)**
Presenter: Paolo Vavassori, *CIC nanoGUNE*
Expand for Abstract / Authors

_ Paper

We designed and realized non-concentric magnetoplasmonic-disk/plasmonic-ring nanocavities. Free-space light excitation and hybridization of multipolar modes in the plasmonic nanoring with the dipolar plasmon of the magnetoplasmonic disk produce an unprecedented amplification of the magneto-optic response.

Authors:Paolo Vavassori/CIC nanoGUNE Mario Zapata-Herrera/CIC nanoGUNE Mikel Garcia/CIC nanoGUNE Andrey Chuvilin/CIC nanoGUNE Alberto Lopez-Ortega/CIC nanoGUNE Nicoló Maccaferri/Universite du Luxembourg Matteo Pancaldi/Stockholm University

Invited

16:30 - 16:45	**Observation of Giant Optical Linear Dichroism and Pseudo Critical Slowing Down in van der Waals Zigzag Antiferromagnets (FM4D.2)** **Presenter**: Qi Zhang, *University of Washington* Expand for Abstract / Authors We observed giant linear dichroism (LD) in van der Waals zigzag antiferromagnets (AFM) FePS3 and NiPS3. With LD, we identified the zigzag-AFM alignment direction and AFM domains. In addition, we observed pseudo-critical slowing down of the recovery of AFM order parameters near Néel temperature. **Authors**:Qi Zhang/University of Washington Kyle Hwangbo/University of Washington Qianni Jiang/University of Washington Jiun-Haw Chu/University of Washington Di Xiao/Carnegie Mellon University Haidan Wen/Argonne National Lab Xiaodong Xu/University of Washington	Paper
16:45 - 17:00	**(Withdrawn) Ultrafast photoswitching of a chiral Fe(II) complex studied by time-resolved absorption and second harmonic generation (FM4D.3)** **Presenter**: Eric FREYSZ, *Université de Bordeaux* Expand for Abstract / Authors Transient absorption and second-harmonic generation reveal the ultrafast photo-switching of a chiral Fe(II) complex. We evaluate the relaxation times as well as the hyperpolarizabilities of the different states occurring during the photoswitching of this complex **Authors**:Amine Ould-Hamouda/Université de Bordeaux Frederic Dutin/Université de Bordeaux Marc Tondusson/Université de Bordeaux jerome degert/Université de Bordeaux Patrick Rosa/Université de Bordeaux Eric FREYSZ/Université de Bordeaux	
17:00 - 17:30	**Observation of Ultrastrong Magnon-Magnon Coupling in $YFeO_3$ Using Terahertz Magnetospectroscopy (FM4D.4)** **Presenter**: Takuma Makihara, *Rice University* Expand for Abstract / Authors We studied magnon-magnon ultrastrong coupling in $YFeO_3$ using terahertz magnetospectroscopy in magnetic fields up to 30 T, which led to an extreme breakdown of the rotating-wave approximation where the counter-rotating term dominates the co-rotating term. **Authors**:Takuma Makihara/Rice University Gary Noe/Rice University Xinwei Li/Rice University Kenji Hayashida/Rice University Nicolas Marquez Peraca/Rice University Kevin Tian/Rice University Xiaoxuan Ma/Shanghai University Zuanming Jin/Shanghai University Wei Ren/Shanghai University Guohong Ma/Shanghai University Shixun Cao/Shanghai University Ikufumi Katayama/Yokohama National University Jun Takeda/Yokohama National University Dmitry Turchinovich/Universität Bielefeld Hiroyuki Nojiri/Tohoku University Motoaki Bamba/Kyoto University Junichiro Kono/Rice University	Paper

17:30 - 17:45 **Terahertz Magnon Spectroscopy Mapping of the Low-Temperature Phases of $Er_xY_{1-x}FeO_3$ (FM4D.5)**
Presenter: Nicolas Marquez Peraca, *Rice University*
Expand for Abstract / Authors

_ Paper

We excited terahertz magnons in $Er_xY_{1-x}FeO_3$ as a function of temperature, magnetic field, and yttrium composition (x), providing insight into the role of cooperative Er^{3+}-Fe^{3+} exchange interactions in the low-temperature phase transition.

Authors:Nicolas Marquez Peraca/Rice University Xinwei Li/Rice University Motoaki Bamba/Kyoto University Chien-Lung Huang/Rice University Ning Yuan/International Center of Quantum and Molecular Structures and Materials Genome Institute Xiaoxuan Ma/International Center of Quantum and Molecular Structures and Materials Genome Institute Tim Noe/Rice University Emilia Morosan/Rice University Shixun Cao/International Center of Quantum and Molecular Structures and Materials Genome Institute Junichiro Kono/Rice University

17:45 - 18:00 **Coherent control of higher-order spin precession modes in ferromagnetic permalloy thin films by double pulse excitation (FM4D.6)**
Presenter: Makoto Okano, *Keio University*
Expand for Abstract / Authors

_ Paper

We demonstrate ultrafast coherent control of higher-order spin precession modes in the permalloy thin film by means of optical techniques. We can selectively excite one of the higher spin precession modes using double pulse excitation.

Authors:Makoto Okano/Keio University Tomohiro Takahashi/Keio University Shinichi Watanabe/Keio University

Photonic Cancer and Tissue Diagnostics (AM4I)
Presider: Utkarsh Sharma, *Volk Optical Inc.*

16:00 - 16:15 **Automated Multi-modal Laser Emission Microscopy towards Cancer Diagnosis (AM4I.1)**
Presenter: Yunlu Sun, *BLME, UMich*
Expand for Abstract / Authors

_ Paper

Automated multi-modal laser emission microscopy is developed that enables fast, large-area mapping of lasing spot distribution in tissues concomitantly with fluorescence imaging. This system is used to categorize lung carcinoma with different degrees of differentiation.

Authors:Yunlu Sun/BLME, UMich Qiushu Chen/BLME, UMich Xudong Fan/BLME, UMich

16:15 - 16:30 **Elemental Mapping of Paraffin-Embedded Ductal Carcinoma Using Laser-Induced Breakdown Spectroscopy (AM4I.2)**
Presenter: Xiaohui Li, *Harbin Institute of Technology*
Expand for Abstract / Authors

Paper

We present multi-elemental mapping of paraffine-embedded ductal carcinoma tissues using laser-induced breakdown spectroscopy (LIBS). Distributions of major elements (Ca, K, Mg, Na) were obtained. Automatic discrimination of malignant and non-malignant regions was achieved using cluster analysis.

Authors:Xiaohui Li/Harbin Institute of Technology Xue Chen/Harbin Medical University Cancer Hospital Yao Zhang/Harbin Institute of Technology Sibo Yang/Harbin Institute of Technology Guodong Yao/Harbin Medical University Cancer Hospital Aichun Liu/Harbin Medical University Cancer Hospital Xin Yu/Harbin Institute of Technology

16:30 - 17:00 **Development of Precision Photomedicine to Mop up Residual Tumor Deposits at the Surgical Margins (AM4I.3)**
Presenter: Bryan Spring, *Northeastern University*
Expand for Abstract / Authors

This talk will introduce targeted photodynamic therapy with microscale fidelity using clinical antibody–photosensitizer conjugates, which may be applied for fluorescence-guided surgery as well as phototherapy of residual cancer cells near the surgical margin.

Authors:Bryan Spring/Northeastern University

Invited

17:00 - 17:15 **(Withdrawn) Near Infrared Photoimmunotherapy of Cancer: Mechanism of cytotoxicity and immune activation (AM4I.4)**
Presenter: Hisataka Kobayashi, *National Institutes of Health*
Expand for Abstract / Authors

Near infrared photoimmunotherapy (NIR-PIT) is a molecularly-targeted cancer photo-therapy based on antibody-photoabsorber conjugates. By crashing cancer cells combined with immuno-activation, NIR-PIT activates anti-cancer immunity resulted in curing local and metastatic cancers without recurrence.

Authors:Hisataka Kobayashi/National Institutes of Health

17:15 - 17:30 **Falloposcope Modifications for Clinical Trials (AM4I.5)**
Presenter: Kelli Kiekens, *University of Arizona*
Expand for Abstract / Authors

[Paper]

We present engineering design improvements upon a prototype fallopian tube endoscope. These modifications allow for interchangeability between endoscopes and reduce complexity. The construction time for each endoscope has been significantly reduced compared to the prototype.

Authors:Kelli Kiekens/University of Arizona Dominique Galvez/University of Arizona Gabriela Romano/University of Arizona Ricky Cordova/University of Arizona Jennifer Barton/University of Arizona

17:30 - 18:00 **Intra-needle Optical Sensor for Real-time Tissue Identification (AM4I.6)**
Presenter: Jeon Woong Kang, *Massachusetts Institute of Technology*
Expand for Abstract / Authors

[Paper]

We have developed intra-needle optical sensors which can identify and diagnose the tissue types at the needle tip. This technique may reduce the complication rates associated with needle misplacement during various medical procedures.

Authors:Jeon Woong Kang/Massachusetts Institute of Technology Thomas Anderson/Stanford University Peter So/Massachusetts Institute of Technology

Invited

Single Quantum Emitters (FM4C)

Presider: Galan Moody

16:00 - 16:15 **Chiral coupling of a quantum emitter in a topological photonic resonator (FM4C.1)**
Presenter: Sabyasachi Barik, *Inst for Res in Elect & Applied Physics*
Expand for Abstract / Authors

[Paper]

Here we demonstrate chiral light-matter interactions in a topological photonic crystal resonator. We achieve this by employing valley-Hall topological edge states to create a helical resonator at the interface of two topologically distinct regions.

Authors:Sabyasachi Barik/Inst for Res in Elect & Applied Physics Aziz Karasahin/Inst for Res in Elect & Applied Physics Sunil Mittal/Inst for Res in Elect & Applied Physics Mohammad Hafezi/Joint Quantum Institute Edo Waks/Joint Quantum Institute

16:15 - 16:30 **Emitter-Metasurface Interface for Manipulating Emission Characteristics of Quantum Defects (FM4C.2)** [Paper]
Presenter: Pankaj Jha, *California Institute of Technollogy*
Expand for Abstract / Authors

We demonstrate a chip-scale quantum emitter-metamaterial device that emits highly directional photons. Our device opens the door for quantum imaging of weak sources by adding photon(s) to manipulate the photon statistics for improved signal-to-noise ratio.

Authors:Pankaj Jha/California Institute of Technollogy Ghazaleh Shirmanesh/California Institute of Technollogy Hamidreza Akbari/California Institute of Technollogy Meir Grajower/California Institute of Technollogy claudio Parazzoli/North West Quantum Science benjamin koltenbah/Boeing Company Harry Atwater/California Institute of Technollogy

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16:30 - 16:45 **Enhancing the performance of coupled cavity-antenna plasmonic nanostructures for ultrafast quantum photonics (FM4C.3)** [Paper]
Presenter: Simeon Bogdanov, *Purdue University*
Expand for Abstract / Authors

We analytically establish the fundamental limit for quantum emission enhancement in plasmonic nanostructures combining smaller (cavity) and larger (antenna) modes. We confirm this result numerically and optimize the performance of nanoantennas experimentally through controlled photomodification.

Authors:Simeon Bogdanov/Purdue University Oksana Makarova/Purdue University Xiaohui Xu/Purdue University Alexei Lagoutchev/Purdue University Deesha Shah/Purdue University Aidar Gabidullin/Bauman Moscow State Technical University Ilya Ryzhikov/Bauman Moscow State Technical University Ilya Rodionov/Bauman Moscow State Technical University Alexander Kildishev/Purdue University Sergey Bozhevolnyi/University of Southern Denmark Alexandra Boltasseva/Purdue University Vladimir Shalaev/Purdue University Jacob Khurgin/Johns Hopkins University

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16:45 - 17:00 **Merging Machine Learning with Quantum Photonics: Rapid classification of quantum sources (FM4C.4)** [Paper]
Presenter: Zhaxylyk Kudyshev, *Purdue*
Expand for Abstract / Authors

Single quantum emitters offer useful functionalities for quantum optics, but measurements of their properties are time-consuming. We demonstrate that machine learning dramatically reduces data collection time (1s), increasing the accuracy of second-order autocorrelation measurements (>90%).

Authors:Zhaxylyk Kudyshev/Purdue Simeon Bogdanov/Purdue Theodor Isacsson/Purdue Alexander Kildishev/Purdue Alexandra Boltasseva/Purdue Vladimir Shalaev/Purdue

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17:00 - 17:30	**Quantum Emitters in Hexagonal Boron Nitride (FM4C.5)** **Presenter**: Igor Aharonovich, *University of Technology Sydney* Expand for Abstract / Authors In this talk, i will review the most recent progress in the field of quantum emitters in hexagonal boron nitride (hBN), predominantly focusing on their engineering, optical and spin properties. **Authors**:Igor Aharonovich/University of Technology Sydney Invited	Paper
17:30 - 17:45	**Position and Frequency Control of Strain-induced Quantum Emitters in WSe2 Monolayers (FM4C.6)** **Presenter**: Jong Sung Moon, *UNIST* Expand for Abstract / Authors By integrating WSe_2 monolayers with a nanopatterned Si micro-cantilever, we create the quantum emitters at deterministic sites and control their frequency with voltages. Also, reduction of the fine-structure splitting is observed by engineering the strain. **Authors**:Jong Sung Moon/UNIST Hyoju Kim/UNIST Gichang Noh/Ajou University Jieun Lee/Ajou University Jehyung Kim/UNIST	Paper
17:45 - 18:00	**(Withdrawn) Chiral Nanophotonic Waveguide for On-demand Entangled Photon Pair Generation (FM4C.7)** **Presenter**: Freja Pedersen, *University of Copenhagen* Expand for Abstract / Authors Chiral coupling of emission from the biexciton cascade in a quantum dot in a photonic crystal waveguide and near-unity outcoupling of photons enables a deterministic entangled photon source, which is key for quantum information processing. **Authors**:Freja Pedersen/University of Copenhagen Ying Wang/University of Copenhagen Svend Scholz/Ruhr-Universitt Bochum, Andreas Wieck/Ruhr-Universitt Bochum, Arne Ludwig/Ruhr-Universitt Bochum, Leonardo Midolo/University of Copenhagen Ravitej Uppu/University of Copenhagen Peter Lodahl/University of Copenhagen	

Tuesday, 12 May

All Times are Pacific Time (US & Canada) (UTC - 07:00)

10:00 - 11:30 (UTC - 07:00)

Joint Poster Session 1 (JTu2A)

Comparison of excitation methods for frequency conversion in rubidium (JTu2A.1)
Presenter: Erik Brekke, *St. Norbert College*
Expand for Abstract / Authors

Paper

We compare the effectiveness of frequency conversion using four-wave mixing in rubidium. Two-photon excitation in a ring cavity results in more output power than two-step excitation, with similar linewidth and tuneability.

Authors:Erik Brekke/St. Norbert College Leah Zimmer/St. Norbert College

Strong Coherent Excitation of a single $^{171}Yb^{+}$ Ion by Ultrafast π-Pulses (JTu2A.2)
Presenter: Erik Streed, *Griffith University*
Expand for Abstract / Authors

Paper

Ultrafast optical p pulses can generate the strong, coherent optical forces required implement high-speed quantum gates. We excited $^{171}Yb^{+}$ with 2.2 ps pulses near resonance at 369.5 nm and observe Rabi flopping.

Authors:Erik Streed/Griffith University Kenji Shimizu/Griffith University Jordan Scarabel/Griffith University Steven Connell/Griffith University Mirko Lobino/Griffith University

Measurement of two-photon position-momentum EPR-correlation by detecting single-photon correlation (JTu2A.3)
Presenter: Abhinandan Bhattacharjee, *Indian Institute of Technology Kanpur*
Expand for Abstract / Authors

Paper

We propose a technique for measuring position-momentum EPR-correlation by detecting single-photon position and momentum correlation function. Our method does not involve coincidence detection for measuring EPR-correlation.

Authors:Abhinandan Bhattacharjee/Indian Institute of Technology Kanpur Anand K Jha/Indian Institute of Technology Kanpur

Below-threshold harmonic generation of homonuclear and heteronuclear diatomic molecules (JTu2A.5)
Presenter: Shih-I Chu, *The University of Kansas*
Expand for Abstract / Authors

Paper

We present an *ab initio* quantum study of the roles of the nuclear symmetry on below-threshold harmonic generation (BTHG) from homonuclear and heteronuclear diatomic molecules. We discover the intuitive electronic dynamical behaviors in molecular BTHG.

Authors:Pengcheng Li/Shantou University Long lin/Shantou University Shih-I Chu/The University of Kansas

Cavity transport of excitations in the presence of collective dissipation. (JTu2A.6)
Presenter: Francesca Mineo, *Max Planck Institute for Light*
Expand for Abstract / Authors

Paper

We study a combination of subradiant states' access and embedding into an optical cavity to enable very efficient excitons' transport in chains of quantum emitters. Localization in the presence of disorder can additionally be prevented.

Authors:Francesca Mineo/Max Planck Institute for Light Claudiu Genes/Max Planck Institute for Light

Microrefractometry and Mapping of the Local Fields by Multiparameter Fluorescence Nanoscopy of Single Molecules and Quantum Dots (JTu2A.7)
Presenter: Maxim Gladush, *Institute for Spectroscopy of RAS*
Expand for Abstract / Authors

_ Paper

We introduce a novel experimental approach for mapping the effective local value of the refractive index in solid films and the analysis of related local-field enhancement effects using imaging and spectroscopy of single quantum emitters.

Authors:Maxim Gladush/Institute for Spectroscopy of RAS Alexey Gorshelev/Institute for Spectroscopy of RAS Ivan Eremchev/Institute for Spectroscopy of RAS Jurgen Koehler/University of Bayreuth Lother Kador/University of Bayreuth Andrei Naumov/Institute for Spectroscopy of RAS

Characterizing the Quantum Phase Transition using a Flat Band in Circuit QED Lattices (JTu2A.8)
Presenter: Hamidreza Ramezani, *University of Texas Rio Grande Valley*
Expand for Abstract / Authors

_ Paper

We show the superradiant phase transition (SPT) can control the existence of flat band in an extended Dicke-Hubbard lattice.

Authors:Gui-Lei Zhu/University of Texas Rio Grande Valley Xin-You Lv/Huazhong University of Science and Technology Hamidreza Ramezani/University of Texas Rio Grande Valley

A Tunable Fabry-Perot Cavity Stabilized by a Connected Shearing Interferometer (JTu2A.9)
Presenter: Raju KC, *West Virginia University*
Expand for Abstract / Authors

_ Paper

A spectrometer is insufficient to resolve all emission lines from a single quantum dot. A custom-made Fabry-Perot Interferometer mechanically linked to an actively stabilized Shearing Interferometer is used as a stable and tunable narrow-band filter.

Authors:Raju KC/West Virginia University Cainan Nichols/West Virginia University Jaxon Lee/West Virginia University Edward Flagg/West Virginia University

Electromagnetically induced transparency of a single frequency comb mode (JTu2A.10)
Presenter: Ticijana Ban, *Institut za Fiziku*
Expand for Abstract / Authors

_ Paper

We study the EIT of a single frequency comb mode interacting with a cold rubidium cloud. A ~Λ hyperfine level structure in a D2 transition is used in the configuration of co-propagated probe (frequency comb) and coupling (continuous-wave) laser fields.

Authors:Ticijana Ban/Institut za Fiziku Damir Aumiler/Institut za Fiziku Mateo kruljac/Institut za Fiziku Ivor Kresic/Institut za Fiziku

N_2 Defects in Silicon Nitride for Quantum Applications (JTu2A.11)
Presenter: Kai Shinbrough, *University of Illinois at Urbana-Champaign*
Expand for Abstract / Authors

Paper

We present preliminary data on Raman-active nitrogen molecules trapped in amorphous silicon nitride thin films, and detail the potential use of these emitters for quantum applications.

Authors:Kai Shinbrough/University of Illinois at Urbana-Champaign Kejie Fang/Univ of Illinois at Urbana-Champaign Virginia Lorenz/University of Illinois at Urbana-Champaign

Nonlinear Floquet Dynamics of Spinor Condensates in an Optical Cavity: Cavity-amplified Parametric Resonance (JTu2A.12)
Presenter: ZhengChun Li, *East China Normal University*
Expand for Abstract / Authors

Paper

We investigate the Floquet dynamics of a cavity-spinor Bose-Einstein condensate coupling system. Due to cavity field nonlinearity, the spin oscillation can be amplified to all orders of parametric resonance.

Authors:ZhengChun Li/East China Normal University Qi-Hui Jiang/East China Normal University Lu Zhou/East China Normal University

EIT-like Phenomena and Characteristics of Cavity Optomechanics in a Single Cavity (JTu2A.13)
Presenter: Yang Luo, *Tsinghua-Berkeley Shenzhen Institute*
Expand for Abstract / Authors

Paper

We investigated the controllability of EIT-like phenomena in a single cavity by adjusting various parameters of the cavity for coupling. It provides a route on cavity optomechanics that could benefit quantum engineering.

Authors:Yang Luo/Tsinghua-Berkeley Shenzhen Institute Zhenmin Chen/Tsinghua-Berkeley Shenzhen Institute Qian Li/School of Electronic and Computer Engineering H.Y. Fu/Tsinghua-Berkeley Shenzhen Institute

Polarization-multiplexed continuous-variable quantum key distribution (JTu2A.15)
Presenter: Binjie Chu, *Beijing University of Posts and Telecomm*
Expand for Abstract / Authors

Paper

We first experimentally demonstrate a polarization-multiplexed continuous-variable quantum key distribution architecture eliminating the requirement for polarization controlling, where the polarization mixing and phase rotation are simultaneously compensated in a dual reference compensation scheme.

Authors:Binjie Chu/Beijing University of Posts and Telecomm Yichen Zhang/Beijing University of Posts and Telecomm YIfan Xu/Beijing University of Posts and Telecomm Song Yu/Beijing University of Posts and Telecomm

A High Dimensional Entanglement-based Fully Connected Quantum Key Distribution Network over 100 Users (JTu2A.17)
Presenter: Xu Liu, *Frontier Science Center for Quantum Information, Beijing National Research Center for Information Science and Technology (BNRist), Beijing Innovation Center for Future Chips, Electronic Engineering Department, Tsinghua University*
Expand for Abstract / Authors

Paper

A high-dimensional entanglement-based fully connected quantum key distribution network is proposed and demonstrated experimentally over 100 users, where a broadband entanglement photon pair source is shared by end users via wavelength and space division multiplexing.

Authors:Xu Liu/Frontier Science Center for Quantum Information, Beijing National Research Center for Information Science and Technology (BNRist), Beijing Innovation Center for Future Chips, Electronic Engineering Department, Tsinghua University Rong Xue/Frontier Science Center for Quantum Information, Beijing National Research Center for Information Science and Technology (BNRist), Beijing Innovation Center for Future Chips, Electronic Engineering Department, Tsinghua University Xin Yao/Frontier Science Center for Quantum Information, Beijing National Research Center for Information Science and Technology (BNRist), Beijing Innovation Center for Future Chips, Electronic Engineering Department, Tsinghua University Heqing Wang/State Key Laboratory of Functional Materials for Informatics, Shanghai Institute of Microsystem and Information Technology Hao Li/State Key Laboratory of Functional Materials for Informatics, Shanghai Institute of Microsystem and Information Technology Lixing You/State Key Laboratory of Functional Materials for Informatics, Shanghai Institute of Microsystem and Information Technology Yidong Huang/Frontier Science Center for Quantum Information, Beijing National Research Center for Information Science and Technology (BNRist), Beijing Innovation Center for Future Chips, Electronic Engineering Department, Tsinghua University Wei Zhang/Frontier Science Center for Quantum Information, Beijing National Research Center for Information Science and Technology (BNRist), Beijing Innovation Center for Future Chips, Electronic Engineering Department, Tsinghua University

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Practical route to entanglement-enhanced communication over noisy bosonic channels (JTu2A.18)
Presenter: Haowei Shi, *University of Arizona*
Expand for Abstract / Authors

Paper

We report structured encoding and decoding schemes for entanglement-assisted classical communication in a lossy and noisy scenario. Phase encoding on the entangled two-mode squeezed vacuum is shown to be optimal and practical receivers are analyzed.

Authors:Haowei Shi/University of Arizona Zheshen Zhang/University of Arizona Quntao Zhuang/University of Arizona

Complete Population Transfer of Maximally Entangled States in 2^2N-level Systems (JTu2A.19)
Presenter: Muhammad Erew, *Tel Aviv University*
Expand for Abstract / Authors

[Paper]

We present a novel scheme for complete population transfer of maximally entangled states in 2^2N-level Systems based on Pythagorean coupling scheme. We derive a new complete transfer recipe as well as provide geometrical visualization.

Authors:Muhammad Erew/Tel Aviv University Haim Suchowski/Tel Aviv University moshe Goldstein/Tel Aviv University

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CHSH-nonlocality-breaking channels and their activation (JTu2A.21)
Presenter: Yujie Zhang, *Univ of Illinois at Urbana-Champaign*
Expand for Abstract / Authors

[Paper]

We characterize CHSH-breaking conditions for different qubit channels and demonstrate that certain pairs of CHSH-breaking channels can be activated to become CHSH-nonlocality preserving when used in parallel, thus enabling CHSH-nonlocality distribution through noisy channels.

Authors:Yujie Zhang/Univ of Illinois at Urbana-Champaign Rodrigo Bravo/Univ of Illinois at Urbana-Champaign Virginia Lorenz/Univ of Illinois at Urbana-Champaign Eric Chitambar/Univ of Illinois at Urbana-Champaign

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Higher-Order Interference in Quantum Mechanics Induced by Optical Nonlinearities (JTu2A.22)
Presenter: Lee Rozema, *University of Vienna, Austria*
Expand for Abstract / Authors

[Paper]

It has been proven theoretically that quantum mechanics exhibits only second-order interference. However, this makes several implicit assumptions. Here we highlight these assumptions experimentally, showing that optical nonlinearities can induce higher-order interference.

Authors:Lee Rozema/University of Vienna, Austria Peter Namdar/University of Vienna, Austria Irati Alonso Calafell/University of Vienna, Austria Alessandro Trenti/University of Vienna, Austria Borivoje Dakic/University of Vienna, Austria Philip Walther/University of Vienna, Austria

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Generation of Narrow-band Photon Pairs for Solid-state Quantum Memories (JTu2A.23)
Presenter: Jiachen Liu, *Nankai University*
Expand for Abstract / Authors

[Paper]

We achieve a narrow-band frequency-entangled photon-pair source using the cavity-enhanced spontaneous parametric down conversion. The bandwidth of photon pairs is 1.07 MHz at 605.78 nm, which could be used for Pr^{3+} based quantum memory.

Authors:Jiachen Liu/Nankai University Jianji Liu/Nankai University Xinge Wang/Nankai University GuoQuan Zhang/Nankai University

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Experimental Demonstration of Upstream Continuous-variable QKD Access Network (JTu2A.24)
Presenter: Yundi Huang, *Beijing Univ of Posts & Telecom*
Expand for Abstract / Authors

Paper

A continuous variable quantum key distribution upstream quantum access network is proposed and experimentally demonstrated. Average secret key rates of 55kbps and 77kbps are achieved for one end-user and total network within maximum physical reach.

Authors:Yundi Huang/Beijing Univ of Posts & Telecom Yichen Zhang/Beijing Univ of Posts & Telecom Tao Shen/Beijing Univ of Posts & Telecom Ge Huang/Beijing Univ of Posts & Telecom Song Yu/Beijing Univ of Posts & Telecom

Impact of Modulation Formats and Bandwidth on Quantum Secured 5G Optical Fronthaul over Multicore Fiber (JTu2A.25)
Presenter: Weiwen Kong, *Beijing University of Posts & Telecomm.*
Expand for Abstract / Authors

Paper

We integrate QKD system and 5G optical fronthaul based on MCF, and experimentally evaluate the performance of QKD system at different bandwidths and modulation formats of classical signals.

Authors:Weiwen Kong/Beijing University of Posts & Telecomm. Yongmei Sun/Beijing University of Posts & Telecomm. Chun Cai/Beijing University of Posts & Telecomm. Yuefeng Ji/Beijing University of Posts & Telecomm.

Low Group Index Optical Slot Structure for High Performance Optical Modulation (JTu2A.26)
Presenter: Sourabh Jain, *Indian Institute of Technology, Indore*
Expand for Abstract / Authors

Paper

Optical modulation based on traveling-wave electrode is proposed using slot-waveguide structure. With the help of high velocity-matching between microwave and optical modes, high data-rate of 40Gbps with the high extinction ratio of 8.7dB is obtained.

Authors:Sourabh Jain/Indian Institute of Technology, Indore Lalit Singh/Indian Institute of Technology, Indore SWATI RAJPUT/Indian Institute of Technology, Indore Mukesh Kumar/Indian Institute of Technology, Indore

Joint Poster Session 2 (JTu2B)

Polaron protected long-lived hot carriers in mixed cation and anion perovskite nanocrystals (JTu2B.1)
Presenter: Megha Shrivastava, *Indian Institute of Science Education and Research*
Expand for Abstract / Authors

Paper

We demonstrate protection of hot-carriers at nanosecond timescales via polaron formation in mixed cation and anion perovskite nanocrystals using ultrafast spectroscopy. The effective carrier protection precedes perovskite photovoltaic devices with efficiencies exceeding Shockley-Quisser limit.

Authors:Megha Shrivastava/Indian Institute of Science Education and Research Abhijit Hazarika/Indian Institute of Chemical Technology Matthew Beard/National Renewable Energy Laboratory Adarsh K V/Indian Institute of Science Education and Research

Effect of Perturbation on Vector Field Singularities (JTu2B.2)
Presenter: Gauri Arora, *IIT Delhi*
Expand for Abstract / Authors

Paper

Polarization singular points are points of dislocations in azimuth of polarization ellipse. We demonstrate here disintegration of vector field singularities into ellipse field singularities by means of perturbation followed by index and helicity conservation rules.

Authors:Gauri Arora/IIT Delhi P. Senthilkumaran/IIT Delhi

Blue-Laser Enhancer-Free Singlet Oxygen Generation in Water and Heavy Water (JTu2B.3)
Presenter: Aristides Marcano Olaizola, *Delaware State University*
Expand for Abstract / Authors

Paper

We detect the generation of enhancer-free singlet oxygen in distilled water and heavy water upon illumination with 405-nm laser radiation by measuring the quenching of the uric acid spectral peak at 294 nm.

Authors:Aristides Marcano Olaizola/Delaware State University Jailyn Dorsett/Delaware State University David Kingsley/Food Safety and Intervention Technologies Research Unit Robinson Kuis/University of Maryland Baltimore County Anthony Johnson/University of Maryland Baltimore County

Broadband Incoherent Space-Time Field Generation with an SLED as a Source for Confocal Light-Sheet Microscopy (JTu2B.4)
Presenter: Alyssa Allende Motz, *CREOL, the College of Optics and Photonics at University of Central Florida*
Expand for Abstract / Authors

Paper

Confocal light sheet microscopes (CLSM) increase image field-of-view (FOV) and reduce acquisition time while maintaining optical sectioning. Implementation of broadband space-time fields in a CLSM enhances the FOV beyond the limitation of the Rayleigh range.

Authors:Alyssa Allende Motz/CREOL, the College of Optics and Photonics at University of Central Florida Murat Yessenov/CREOL, the College of Optics and Photonics at University of Central Florida Monjurul Meem/University of Utah Rajesh Menon/University of Utah Ayman Abouraddy/CREOL, the College of Optics and Photonics at University of Central Florida

Se nanoislands formation on Bi_2Se_3 by femtosecond laser ablation (JTu2B.5)
Presenter: Chih Wei Luo, *National Chiao Tung University*
Expand for Abstract / Authors

Paper

The Se nanoislands with amorphous and crystalline type were generated under femtosecond laser pulses irradiation on surface of Bi_2Se_3 single crystal at room temperature and ambient pressure. The position dependence of diameter distribution of Se nanoislands has been found between 50 -500 nm.

Authors:Wen-Yen Tzeng/National Chiao Tung University Ya-Hsin Tseng/National Chiao Tung University Tien-Tien Yeh/National Chiao Tung University Chien-Ming Tu/National Chiao Tung University Chih Wei Luo/National Chiao Tung University

High-Efficiency Mid-Wave Infrared (MWIR) Sensors with Embedded Two Grating Layers for Gas Monitoring Applications (JTu2B.6)
Presenter: Moshe Zohar, *Shamoon College of Engineering*
Expand for Abstract / Authors

Paper

We suggest a novel design for CO_2 sensors. This design could be adjusted for various gas sensing approaches and other MWIR range applications, such as free-space communication, imaging systems, and light detection and ranging systems.

Authors:Moshe Zohar/Shamoon College of Engineering Mark Auslender/Ben-Gurion University of the Negev Roy Avrahamy/Ben-Gurion University of the Negev Rafi Shikler/Ben-Gurion University of the Negev

Preliminary analysis of the laser polishing process by high-speed thermographic visualization (JTu2B.7)
Presenter: Jack Beyfuss, *Western University*
Expand for Abstract / Authors

Paper

A method for visualization and monitoring of the laser polishing was developed using high-speed thermographic imaging. The preliminary analysis demonstrates correlation with different LP parameters suitability to process deep learning, optimization and control.

Authors:Jack Beyfuss/Western University Evgueni Bordatchev/National Research Council of Canada Remus Tutunea-Fatan/Western University

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Toward Stable Room-Temperature Polaritonic Devices (JTu2B.8)
Presenter: Yumeng Cao, *MIT*
Expand for Abstract / Authors

Paper

Self-assembled organic molecules of cyanine dye are proposed for room-temperature, low-cost scalable polaritonic devices after first result of stabilized photoluminescence of solid-state film and polariton emission from metallic microcavities achieved through integration of hygroscopic stabilizers.

Authors:Yumeng Cao/MIT Vladimir Bulovic/MIT

Blue Femtosecond Laser-Induced Crystallization of Amorphous Silicon (JTu2B.9)
Presenter: Shih-Hsuan Kao, *National Tsing Hua Unversity*
Expand for Abstract / Authors

Paper

Amorphous silicon was crystallized using a blue ultrafast Ti:Sapphire laser system. Polysilicon with average grain size of 280 nm was achieved with fluence 30 of mJ/cm^2 and overlapping of 93.75% at room temperature.

Authors:Kuan-Wen Chen/National Chiao Tung University Yi-Chao Wang/National Chiao Tung University Shih-Hsuan Kao/National Tsing Hua Unversity Pohsun Wu/National Tsing Hua Unversity Ci-Ling Pan/National Tsing Hua Unversity

Fabrication of Waveguide-integrated Suspended Chalcogenide Glass Microdisk Resonator (JTu2B.11)
Presenter: Ying Zhu, *Sun Yat-sen University*
Expand for Abstract / Authors

Paper

We have demonstrated a waveguide-integrated suspended $Ge_{11.5}As_{24}Se_{64.5}$ microdisk with intrinsic quality factor of 1×10^6, which is the highest figure, to the best of our knowledge, with respect to reported thus far in suspended chalcogenide resonators.

Authors:Ying Zhu/Sun Yat-sen University Lei Wan/Jinan University Zelin Yang/Sun Yat-sen University Zhenshi Chen/Jinan University Jingcui Song/Sun Yat-sen University Di Xia/Sun Yat-sen University Pingyang Zeng/Sun Yat-sen University Mingjie Zhang/Jinan University Bin Zhang/Sun Yat-sen University Zhaohui Li/Sun Yat-sen University

Flattened chromatic dispersion and birefringence properties of chalcogenide all-solid hybrid microstructured optical fibers (JTu2B.12)
Presenter: Hoang Tuan Tong, *Toyota Technological Institute*
Expand for Abstract / Authors

Paper

We proposed new chalcogenide all-solid hybrid microstructured optical fibers which provide flattened normal chromatic dispersion over a wide range from 4.5 to 13 µm and high phase birefringence up to 2.5×10^{-3} at 12 µm.

Authors:Hoang Tuan Tong/Toyota Technological Institute Hoa Nguyen/Toyota Technological Institute Takenobu Suzuki/Toyota Technological Institute Yasutake Ohishi/Toyota Technological Institute

Tuning the Optical Signature of Few-Layer MoS 2 on Silicon Substrate using Mechanical Nano-Stamping Approach (JTu2B.13)
Presenter: Ghada Dushaq, *New York University Abu Dhabi*
Expand for Abstract / Authors

Paper

Spatially modulated biaxial tensile strain in a few-layers MoS2 on pre-patterned Si substrate is demonstrated. Using depth-controlled nanoindentation, localized strain on Si is achieved. Results are verified by observing shifts in the MoS2 ’s bandgap and phonon modes.

Authors:Ghada Dushaq/New York University Abu Dhabi Pawan Mishra/New York University Abu Dhabi Mahmoud Rasras/New York University Abu Dhabi

Waveform-Agile Frequency Doubled Laser System for Optical Switching and Characterization of Phase Change Materials at Near-IR Wavelengths (JTu2B.14)
Presenter: Gary Sevison, *University of Dayton*
Expand for Abstract / Authors

Paper

We created a system for the characterization of Ge2Sb2Te5 starting with a 1550 nm CW laser and utilizing second harmonic generation through a PPLN crystal in order to achieve full pulse control at 775 nm.

Authors:Gary Sevison/University of Dayton Joshua Burrow/University of Dayton Joshua Hendrickson/Air Force Research Laboratory Andrew Sarangan/University of Dayton Imad Agha/University of Dayton

Far-field thermal radiation at the optical topological transition (OTT) (JTu2B.15)
Presenter: Sanjay Debnath, *Purdue University*
Expand for Abstract / Authors

Paper

We develop theoretical description of far-field thermal emission near OTTs. Our results show a strong asymmetric pattern of reduced emission near the transition and are applicable in both natural and composite media.

Authors:Sanjay Debnath/Purdue University Evgenii Narimanov/Purdue University

Motheye Structures Antireflective Coatings for Enhancing GaAs Transmission Performance at Mid-Infrared Wavelengths (JTu2B.16)
Presenter: Chaoran Tu, *University of Maryland Baltimore County*
Expand for Abstract / Authors

Paper

We have fabricated GaAs motheye structures using contact photolithography printing.We have achieved an overall transmission improvement of 123% from 2000 cm^{-1} to 700 cm^{-1} (5 μm–14 μm) relative to an uncoated wafer.

Authors:Chaoran Tu/University of Maryland Baltimore County Rachit Sood/University of Maryland Baltimore County Douglas Bamford/Physical Sciences Inc. David Woolf/Physical Sciences Inc. Joel Hensley/Physical Sciences Inc. Thomas Carruthers/University of Maryland Baltimore County Curtis Menyuk/University of Maryland Baltimore County Fow-Sen Choa/University of Maryland Baltimore County

All-optical light control in MXene-deposited microfiber knot resonator (JTu2B.17)
Presenter: Meng Zhang, *Beihang University*
Expand for Abstract / Authors

_ Paper

We report an efficient all-optical modulator based on a MXene-deposited microfiber knot resonator, generating a phase modulation with a conversion efficiency of 0.196 π/mW and an all-optical switch of ~306 μs.

Authors:Qing Wu/Beihang University Meng Zhang/Beihang University Yunzheng Wang/Shenzhen University Weichun Huang/Shenzhen University Zheng Zheng/Beihang University Han Zhang/Shenzhen University

Red-Emitting Carbon Dots for MicroLED Application (JTu2B.19)
Presenter: Ye Liu, *Oregon State University*
Expand for Abstract / Authors

_ Paper

We report 635 nm red-emitting carbon dots with a 230 nm Stokes shift, quantum yield more than 30%, and a wide UV-blue range excitation. We demonstrate the UV-curable carbon dot-embedded polymer for microLED application.

Authors:Ye Liu/Oregon State University Bo Wu/Oregon State University Ekembu Tanyi/Oregon State University Li-Jing Cheng/Oregon State University

Multi-imaging analysis of exciton states in monolayer of transition metal dichalcogenides (JTu2B.20)
Presenter: Felice Gesuele, *University Federico II of Naples*
Expand for Abstract / Authors

_ Paper

We report the Photoluminescence and Raman imaging of WS_2 monolayers grown by chemical vapor deposition. The PL emission intensity and wavelength show spatial nonuniformities which can be interpreted as the result of the formation of charged and defect-bound excitons.

Authors:Felice Gesuele/University Federico II of Naples pasqualino maddalena/University Federico II of Naples

Facile Patterning of Hybrid Perovskite Metasurfaces for Opto-Electronic Applications (JTu2B.21)
Presenter: Amit Kessel, *The Hebrew University*
Expand for Abstract / Authors

_ Paper

We demonstrate a soft lithography method for patterning large area metasurfaces onto hybrid Perovskite thin films and show enhanced optical extinction with the goal of improving the efficiency of thin films photodetectors and solar cells.

Authors:Amit Kessel/The Hebrew University Christian Frydendahl/The Hebrew University SITA RAMA KRISHNA INDUKURI/The Hebrew University Noa Mazurski/The Hebrew University Uriel Levy/The Hebrew University

High-Q Ge-As-S Microring Resonators based on improved fabrication process for optical parametric amplifier (JTu2B.22)
Presenter: Bin Zhang, *Sun Yat-Sen University*
Expand for Abstract / Authors

Paper

We experimentally demonstrate Ge-As-S resonators with intrinsic quality factor more than 1 million through a thermal annealing process (TAP). Preliminary result of optical parametric amplifier (OPA) in the ChG-based resonators can be observed.

Authors:Pingyang Zeng/Sun Yat-Sen University Di Xia/Sun Yat-Sen University Zelin Yang/Sun Yat-Sen University Bin Zhang/Sun Yat-Sen University Yaodong Sun/Sun Yat-Sen University Yufei Huang/Sun Yat-Sen University Jingcui Song/Sun Yat-Sen University Ying Zhu/Sun Yat-Sen University Zhaohui Li/Sun Yat-Sen University

Chalcogenide Cylindrical Helix Nanocollumnar Thin Films for Switchable Polarization Sensitive Devices (JTu2B.23)
Presenter: Joshua Burrow, *University of Dayton*
Expand for Abstract / Authors

Paper

Phase change material Ge2Sb2Te5 tilted and helical nanorods films featuring 25 nm diameters are grown using the oblique and glancing angle deposition techniques. We provide insights on the growth process, structural integrity and optical responses.

Authors:Joshua Burrow/University of Dayton Andrew Sarangan/University of Dayton Imad Agha/University of Dayton

Local Defects in Colloidal Quantum Dot Thin Films Measured via Spatially-Resolved Multi-Modal Optoelectronic Spectroscopy (JTu2B.24)
Presenter: Yida Lin, *Johns Hopkins University*
Expand for Abstract / Authors

Paper

We propose a scanning-based 2D multi-modal spectroscopy for optoelectronic devices. The method has a diffraction-limit resolution and centimeter-scale field-of-view and provides a versatile way to analyze optoelectronic device behaviors by simultaneously measuring multiple physical quantities.

Authors:Yida Lin/Johns Hopkins University Tina Gao/Johns Hopkins University Xiaoyun Pan/Boston University Maria Kamenetska/Boston University Susanna Thon/Johns Hopkins University

Self-Assembly of Di-Block Copolymers for Hyperbolic Metasurfaces (JTu2B.25)
Presenter: Angelo Angelini, *Istituto Nazionale di Ricerca Metrologica*
Expand for Abstract / Authors

Paper

We exploit directed self-assembly of di-block copolymers to obtain metal-dielectric nano-patterns over large area acting as hyperbolic metasurface at visible wavelengths. We show that decay rate can be enhanced when spontaneous emitters are thereon located.

Authors:Angelo Angelini/Istituto Nazionale di Ricerca Metrologica Irdi Murataj/Istituto Nazionale di Ricerca Metrologica Marwan Channab/Politecnico di Torino Eleonora Cara/Istituto Nazionale di Ricerca Metrologica Natascia De Leo/Istituto Nazionale di Ricerca Metrologica Fabrizio Pirri/Politecnico di Torino Luca Boarino/Istituto Nazionale di Ricerca Metrologica Federico Ferrarese Lupi/Istituto Nazionale di Ricerca Metrologica

Free-standing quasiperiodic nanohole arrays to suppress higher-order diffraction in the x-ray region (JTu2B.26)
Presenter: Hailiang Li, *Institue MicroElec Chinese Acad Sci*
Expand for Abstract / Authors

Paper

Here we report a strategy to mimic the function of x-ray transmission gratings with free-standing quasiperiodic nanohole array, which can effectively suppress the higher-order diffractions in the x-ray region.

Authors:Hailiang Li/Institue MicroElec Chinese Acad Sci Yilei Hua/Institue MicroElec Chinese Acad Sci Changqing Xie/Institue MicroElec Chinese Acad Sci

High-voltage Sensor Based on Fiber Bragg Grating in Fibers with Electrodes (JTu2B.27)
Presenter: João Manoel Pereira, *RISE Acreo AB*
Expand for Abstract / Authors

Paper

This work describes the use of FBGs inscribed in optical fiber with electrodes for voltage sensing. The results show a quadratic voltage dependence. The device can be explored for a multi-point, single-ended voltage sensing device.

Authors:João Manoel Pereira/RISE Acreo AB Demetrio Sartiano/Universitat Politècnica de Valencia Javier Hervas/Universitat Politècnica de Valencia David Barrera/Universitat Politècnica de Valencia Javier Madrigal/Universitat Politècnica de Valencia Salvador Sales/Universitat Politècnica de Valencia Fredrik Laurell/KTH Oleksandr Tarasenko/RISE Acreo AB Walter Margulis/RISE Acreo AB

CMOS-Compatible Metasurface-based Subtractive Color Filters on a 300-mm Glass Wafer (JTu2B.28)
Presenter: Nanxi Li, *Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research)*
Expand for Abstract / Authors

Paper

Si metasurface-based subtractive color filter (SCF) is demonstrated on a 300-mm glass wafer. The transmittance of periodic Si pillars is investigated both numerically and experimentally. The SCF-based pseudo color image is also presented.

Authors:Zhengji Xu/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Nanxi Li/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Yuan Dong/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Ting Hu/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Qize Zhong/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Wei Kang/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Yanyan Zhou/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Dongdong Li/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Yuan Hsing Fu/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Qunying Lin/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Shiyang Zhu/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Navab Singh/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research)

11:00 - 13:00 (UTC - 07:00)

Joint Dynamic e-Posters I (JTU2C)
Presider: Rohit Prasankumar, *Los Alamos National Laboratory*

11:00 - 11:12

Quantum Information on Nonlinearly Coupled Optical Modes (JTU2C.1)
Presenter: Stefan Krastanov, *Massachusetts Institute of Technology*
Expand for Abstract / Authors

Paper

Pursuing room-temperature quantum hardware, we discuss multi-mode optical cavities with nonlinear couplings and focus on material and fabrication requirements for such devices. We demonstrate their use for a number of quantum communication and computation tasks.

Authors:Stefan Krastanov/Massachusetts Institute of Technology Mikkel Heuck/Massachusetts Institute of Technology Kurt Jacobs/Army Research Laboratory Prineha Narang/Harvard University Dirk Englund/Massachusetts Institute of Technology

11:12 - 11:24

Optical Vortex Interactions Depend on Core Structure (JTU2C.2)
Presenter: Jasmine Andersen, *University of Denver*
Expand for Abstract / Authors

Paper

We elucidate the impact of optical vortex structure on pair coupling and two-body dynamics. Vortices with hyperbolic tangent cross-sections are found to have reduced coupling strength as evidenced by slowed annihilation between oppositely charged pairs.

Authors:Jasmine Andersen/University of Denver Andrew Voitiv/University of Denver Mark Lusk/Colorado School of Mines Mark Siemens/University of Denver

11:24 - 11:36

(Withdrawn) Majorana Bound State Cavity (JTU2C.3)
Presenter: Babak Bahari, *University of Southern California*
Expand for Abstract / Authors

We present a new class of topological cavities based on Majorana bound states. These cavities are inherently single-moded and robust to local disorder regardless of the size of the structure.

Authors:Babak Bahari/University of Southern California Demetrios Christodoulides/University of Central Florida Mercedeh Khajavikhan/University of Southern California

11:36 - 11:48

Transient Nonlinear Refraction of Air in the Mid-IR (JTU2C.4)
Presenter: Salimeh Tofighi, *University of Central Florida, CREOL*
Expand for Abstract / Authors

Paper

By exciting in both the Near-IR and Mid-IR and probing in the mid-IR, using the polarization-resolved Beam Deflection Technique, the bound electronic nonlinear refractive index of air is measured below the ionization threshold.

Authors:Salimeh Tofighi/University of Central Florida, CREOL Natalia Munera/University of Central Florida, CREOL Eric Van Stryland/University of Central Florida, CREOL David Hagan/University of Central Florida, CREOL

11:48 - 12:00	**(Withdrawn) Optical Mode Conversion Through Nonlinear Two-Wave Mixing (JTU2C.5)** **Presenter**: José Carlos Rocha, *Universidade Federal de Alagoas* Expand for Abstract / Authors Two-wave mixing under second harmonic generation is used to convert Hermite-Gaussian modes into other modes. The nonlinear medium selects the basis needed and the second harmonic superposition is then converted into another mode. **Authors**:Danilo Pires/Universidade Federal de Alagoas José Carlos Rocha/Universidade Federal de Alagoas Alcenísio José Jesus-Silva/Universidade Federal de Alagoas Eduardo Jorge Silva Fonseca/Universidade Federal de Alagoas	
12:00 - 12:12	**Modulation Response of Coupled Microcavity Laser Array Operated Near Modal Exceptional Point (JTU2C.6)** **Presenter**: Harshil Dave, *University of Illinois at Urbana-Champaign* Expand for Abstract / Authors Laser array dynamics of coupled microcavity laser arrays operated near a modal exceptional point is studied using coupled laser rate equations. Tuning the laser array near exceptional point results in rejection of common-mode interference. **Authors**:Harshil Dave/University of Illinois at Urbana-Champaign Zihe Gao/Facebook Reality Labs Kent Choquette/University of Illinois at Urbana-Champaign	Paper
12:12 - 12:24	**Generation of Kerr frequency comb aligned with ITU-T DWDM grid for telecom applications (JTU2C.7)** **Presenter**: Tamiki Ohtsuka, *Keio University* Expand for Abstract / Authors We generated a Kerr frequency comb with a linewidth of 80 kHz by using a SiN microresonator and aligned the wavelengths with the ITU-T grid for telecom applications. **Authors**:Tamiki Ohtsuka/Keio University Shun Fujii/Keio University Hajime Kumazaki/Keio University Koshiro Wada/Keio University Kentaro Furusawa/National Institute of information and Communications Technology Norihiko Sekine/National Institute of information and Communications Technology Takasumi Tanabe/Keio University	Paper

12:24 - 12:36	**Photonic Recurrent Neural Networks with Gating Circuit (JTU2C.8)** **Presenter**: George Dabos, *Aristotle University of Thessaloniki* Expand for Abstract / Authors We experimentally demonstrate the first all-optical Recurrent-Neural-Network (RNN) with a gating circuit and a sigmoid activation unit. By introducing a gating circuit to the RNN we implemented the “forget” function, resembling an all-optical Gated-Recurrent-Unit (GRU). **Authors**:George Dabos/Aristotle University of Thessaloniki George Mourgias-Alexandris/Aristotle University of Thessaloniki Angelina Totović/Aristotle University of Thessaloniki Nikolaos Passalis/Aristotle University of Thessaloniki Anastasios Tefas/Aristotle University of Thessaloniki Nikos Pleros/Aristotle University of Thessaloniki	Paper
12:36 - 12:48	**The efficiency of volume data processing using virtual reality (JTU2C.9)** **Presenter**: Mateusz Pomianek, *Military University of Technology* Expand for Abstract / Authors The paper shows pilot studies aimed at examining the effectiveness of volumetric data processing in a virtual environment compared to standard solution. The speed and accuracy of the users' actions in the environments were analyzed. **Authors**:Mateusz Pomianek/Military University of Technology Marek Piszczek/Military University of Technology Marcin Maciejewski/Military University of Technology	Paper
12:48 - 13:00	**Optofluidic Fiber Component to Separate Micron-Sized Particles Using Elasto-Inertial Focusing (JTU2C.10)** **Presenter**: Sebastian Etcheverry, *Research Institutes of Sweden* Expand for Abstract / Authors Using various fiber capillaries with different diameters and multiple holes we develop an optofluidic component capable of separating micron-sized beads emulating cells and bacteria, exploiting particle focusing in a viscoelastic fluid and analyzed optically. **Authors**:Harish Achar/KTH-Royal Institute of Technology Tharagan Kumar/KTH Royal Institute of Technology Sebastian Etcheverry/Research Institutes of Sweden Aman Russom/KTH Royal Institute of Technology Walter Margulis/Research Institutes of Sweden Fredrik Laurell/KTH-Royal Institute of Technology	Paper

11:30 - 13:00 (UTC - 07:00)

Joint Poster Session 3 (JTu2D)

Broadband, High-Speed, and Extraordinarily Large All-Optical Switching with Yttrium-doped Cadmium Oxide (JTu2D.1) Paper
Presenter: Soham Saha, *Purdue University*
Expand for Abstract / Authors

We demonstrate significant epsilon-near-zero point shifts (11.3 µm to 5.3 µm), extraordinarily large (135%) optically-induced reflection modulation with picosecond response times, and carrier relaxation time-engineering in cadmium oxide via Yttrium doping.

Authors:Soham Saha/Purdue University Benjamin Diroll/Argonne National Laboratory Joshua Shank/Sandia National Laboratory Zhaxylyk Kudyshev/Purdue University Aveek Dutta/Purdue University Sarah Chowdhury/Purdue University Ting Luk/Sandia National Laboratory Salvadore Campione/Sandia National Laboratory Richard Schaller/Argonne National Laboratory Vladimir Shalaev/Purdue University Alexandra Boltasseva/Purdue University Michael Wood/Sandia National Laboratory

Generation of Arbitrary Longitudinal Polarized Optical Field Under Tight Focusing Condition (JTu2D.2) Paper
Presenter: Guan-Lin Zhang, *Nankai University*
Expand for Abstract / Authors

We propose a method to realize the customized longitudinal polarized field in the tight focusing system. This method includes a modulated Fourier transform, so the Gerchberg-Saxton algorithm can also be used to perform complex designs.

Authors:Guan-Lin Zhang/Nankai University Chenghou Tu/Nankai University Yongnan Li/Nankai University Hui-Tian Wang/Nanjing university

Linewidth Broadening Induced by Fundamental Thermal Fluctuations in Metallo-Dielectric Nanolasers (JTu2D.4) Paper
Presenter: Sizhu Jiang, *University of California, San Deigo*
Expand for Abstract / Authors

We demonstrate that the fundamental thermal fluctuations can induce significant linewidth broadening effect in metallo-dielectric nanolasers through numerical simulation. Broader linewidths are observed with the decrease of resonator dimensions and the increase of ambient temperatures.

Authors:Sizhu Jiang/University of California, San Deigo Si Hui Pan/University of California, San Deigo Suruj Deka/University of California, San Deigo Cheng-Yi Fang/University of California, San Deigo Zijun Chen/University of California, San Deigo Yeshaiahu Fainman/University of California, San Deigo Abdelkrim El Amili/University of California, San Deigo

Transition Metal Nitride as a Plasmonic Material for Tamm Plasmon States (JTu2D.5)
Presenter: Samir Kumar, *Hotilal Ramnath College Amnour*
Expand for Abstract / Authors

Paper

Tamm plasmon polaritons (TPP) modes localized at the interface of distributed Bragg reflector (DBR) and Titanium Nitride (TiN) films are investigated. Impact of TiN thickness on TPP modes is carried out using Transfer matrix method.

Authors:Samir Kumar/Hotilal Ramnath College Amnour

Mirrored Plasmonic Filter Design via Active Learning of Multi-Fidelity Physical Models (JTu2D.6)
Presenter: Yury Tokpanov, *California Institute of Technology*
Expand for Abstract / Authors

Paper

We designed mirrored plasmonic filters using an advanced active machine learning algorithm that efficiently explores multiple physical models with different approximation fidelities and costs. This method is applicable to a variety of nanophotonics optimization problems.

Authors:Jialin Song/California Institute of Technology Yury Tokpanov/California Institute of Technology Dagny Fleischman/California Institute of Technology Katherine Fountaine/NG Next, Northrop Grumman Corporation Yisong Yue/California Institute of Technology Harry Atwater/California Institute of Technology

Strong coupling in a 1D plasmonic-exciton hybrid systems (JTu2D.8)
Presenter: Min-Wen Yu, *NCTU, Taiwn*
Expand for Abstract / Authors

Paper

A Rabi splitting of 90 meV at room temperature is estimated from monolayer MoS_2 coupled to plasmonic gold nanogrooves which was confirmed by the photoluminescent enhancement, Kelvin probe force microscope scanning, and fluorescence lifetime measurement.

Authors:Min-Wen Yu/NCTU, Taiwn Satoshi Ishii/NIMS Shisheng Li/NIMS Ji-Ren Ku/NCTU, Taiwn Jhen-Hong Yang/NCTU, Taiwn Kuan-Lin Su/NCTU, Taiwn Takaaki Taniguchi/NIMS Tadaaki Nagao/NIMS Kuo-Ping Chen/NCTU, Taiwn

Tunable Transparency and Slow Light in Plasmonic Lattice (JTu2D.9)
Presenter: Lior Michaeli, *Tel-Aviv University*
Expand for Abstract / Authors

Paper

We experimentally and numerically demonstrate an induced tunable transparency windows and slow light at the localized plasmon band via collective coherent scattering at the surface of plasmonic nanoparticle lattice.

Authors:Lior Michaeli/Tel-Aviv University Haim Suchowski/Tel-Aviv University Tal Ellenbogen/Tel-Aviv University

On-chip Distinguishable Beam Splitter of Both Spin & Orbital Angular Momentum of Light with Plasmonic Nano-Slits Array (JTu2D.10)
Presenter: Xuesi Zhao, *Tsinghua univeristy*
Expand for Abstract / Authors

Paper

An on-chip beam splitter of both spin & orbital angular momentum of light has been proposed and demonstrated while the generated plasmonic beam is elaborately modulated to achieve non-diffracting propagation for optimal discrimination.

Authors:Xuesi Zhao/Tsinghua univeristy Xue Feng/Tsinghua univeristy Yidong Huang/Tsinghua univeristy

Controlling andShaping the Emission of Electrically Excited Organic Molecules By Using Plasmonic Effects (JTu2D.11)
Presenter: sarah Hamdad, *University*
Expand for Abstract / Authors

Paper

We investigate the influence of Ag nanoparticle arrays on the emission of electrically pumped organic molecules in the context of organic light emitting diodes. Our results emphasize the possible tuning of the OLED electroluminescence by controlling the plasmonic interactions.

Authors:sarah Hamdad/University Amadou Thierno Diallo/University Mahmoud Chakaroun/University Azzedine Boudrioua/University

Enhanced Emission from Ultra-Thin Long Wavelength Infrared Superlattices on Epitaxial Plasmonic Materials (JTu2D.12)
Presenter: Evan Simmons, *University of Massachusetts Lowell*
Expand for Abstract / Authors

Paper

We demonstrate an order of magnitude enhancement of emission from mid-infrared emitters monolithically integrated with semiconductor designer metals relative to the same emitters on dielectric substrates and provide theoretical explanation of the observed phenomena.

Authors:Evan Simmons/University of Massachusetts Lowell leland Nordin/University of Texas at Austin Kun Li/University of Texas at Austin Andrew Briggs/University of Texas at Austin Seth Bank/University of Texas at Austin Dan Wasserman/University of Texas at Austin Viktor Podolskiy/University of Massachusetts Lowell

Semiconductor Metasurfaces with Lattice Kerker Effects in Near Band Edge Absorption Enhancement (JTu2D.13)
Presenter: Jhen-Hong Yang, *National Chaio-Tung University*
Expand for Abstract / Authors

Paper

Lattice resonance of electric dipole (ED) and magnetic dipole (MD) would generate the narrowband absorption. Here we propose a high absorptance device by using high refractive index metasurfaces near the semiconductor band-edge.

Authors:Jhen-Hong Yang/National Chaio-Tung University Zhong-Xing Jhou/National Chaio-Tung University Kuo-Ping Chen/National Chaio-Tung University

Magneto-dependent plasmon drag in permalloy structures. (JTu2D.14)
Presenter: Mohammad Shahabuddin, *Norfolk State University*
Expand for Abstract / Authors

Paper

Plasmon-enhanced photovoltages in 1D profile-modulated permalloy films strongly depend on magnetic field, with a characteristic hysteresis. The effect is discussed in terms of the anomalous Nernst effect.

Authors:Mohammad Shahabuddin/Norfolk State University David Keene/Norfolk State University Maxim Durach/Georgia Southern University Natalia Noginova/Norfolk State University

Non-Trivial Optical Force Predictions for Coupled Waveguides Depend on Choice of Stress Tensor (JTu2D.15)
Presenter: Pierre Assis, *"Gleb Wataghin" Institute of Physics - UNICAMP*
Expand for Abstract / Authors

Paper

Many stress tensors have been proposed to calculate optical forces in dielectrics. We show analytically and verify numerically that loss of translation symmetry means they must disagree on predictions of non-trivial forces in coupled waveguides.

Authors:Thales Fernandes/Universidade Federal de Minas Gerais Pierre Assis/"Gleb Wataghin" Institute of Physics - UNICAMP

Plasmonic Sensor Using Double-Layered Stimuli-Responsive Polymer Gels for Multiplexed Detection of Multiple Analytes (JTu2D.16)
Presenter: J. Stewart Aitchison, *University of Toronto*
Expand for Abstract / Authors

Paper

We present a proof-of-concept for a double-layered plasmonic biosensor using stimuli-responsive polymers. The relative change of each SPR and PWR peak are decoupled to identify how much each microgel layer reacts to a given stimulus.

Authors:Hannah Mundel/University of Toronto Menglian Wei/University of Alberta Michael Serpe/University of Alberta J. Stewart Aitchison/University of Toronto

Synthesis of TiN Nanoparticles by Pulsed Laser Ablation for Photothermal and Photodynamic Therapy (JTu2D.17)
Presenter: Xiaohui Xu, *Purdue University*
Expand for Abstract / Authors

Paper

Spherical Titanium nitride (TiN) nanoparticles (NPs) (<50 nm) demonstrating high-quality plasmon resonances are synthesized from commercially available much larger TiN NPs using pulsed laser ablation with an 800 nm femtosecond laser.

Authors:Xiaohui Xu/Purdue University Aveek Dutta/Purdue University Badhu Sivasubramaniam/Purdue University Khomidkhodzha Kholikov/Purdue University Vladimir Shalaev/Purdue University Alexander Wei/Purdue University Alexandra Boltasseva/Purdue University

Surface Phonon Polariton Modes in Zinc Oxide Nanoparticles (JTu2D.18)
Presenter: Irfan Khan, *University of Notre Dame*
Expand for Abstract / Authors

Paper

We characterize two phonon polariton modes in ZnO nanoparticles, as well as strong absorption at frequencies near an infrared-silent phonon mode, suggesting that disruption of symmetry in the crystal lattice may be activating this mode.

Authors:Irfan Khan/University of Notre Dame Caroline Howell/University of Notre Dame Tracie McGinnity/University of Notre Dame Ryan Roeder/University of Notre Dame Anthony Hoffman/University of Notre Dame

Compound Nanostructure of Metallic Nanoholes with 1D Photonic Crystal for Multispectral Imaging Applications (JTu2D.19)
Presenter: XIN HE, *the University of Melbourne*
Expand for Abstract / Authors

Paper

This paper demonstrates a single sensor based multispectral spectral imaging camera using a hybrid RGB colour mosaic made of plasmonic and 1D photonic crystal layers.

Authors:XIN HE/the University of Melbourne Yajing Liu/the University of Melbourne Hemayet Uddin/Melbourne centre for nanofabrication Ampalavanapillai Nirmalathas/the University of Melbourne Ranjith R Unnithan/the University of Melbourne

Phase Manipulation by Dislocation of Two Plasmonic Nanohole Arrays (JTu2D.20)
Presenter: Hyunsoo Lee, *Pusan National University*
Expand for Abstract / Authors

_ Paper

The surface plasmons on the metallic nanohole induce nonlinear optical transmission and phase retardation of incident beam. We report that the phase can be precisely controlled by adjusting dislocation between two nanohole arrays.

Authors:Hyunsoo Lee/Pusan National University Jongkyoon Park/Pusan National University Taein Jeong/Pusan National University San Kim/Pusan National University Hana Ryu/Pusan National University Seungchul Kim/Pusan National University

Upmost Efficiency Mid IR Thin HgCdTe Photodetectors (JTu2D.21)
Presenter: Roy Avrahamy, *Ben Gurion University of the Negev*
Expand for Abstract / Authors

_ Paper

A new resonant-cavity photodetector architecture, where mirrors are surrogated by grating-patterned meta-surfaces is suggested. We show by design that thus structured, sub-10μm thick mid-IR photodetectors, with 75nm thick HgCdTe photo-absorber, can attain unsurpassable peak efficiency.

Authors:Roy Avrahamy/Ben Gurion University of the Negev Moshe Zohar/Shamoon College of Engineering Mark Auslender/Ben Gurion University of the Negev Shlomo Hava/Ben Gurion University of the Negev Benny Milgrom/Jerusalem College of Technology Rafi Shikler/Ben Gurion University of the Negev

Integration of Angle Independent CMY Nanorod Colour Filter mosaic on CMOS Image Sensor (JTu2D.22)
Presenter: XIN HE, *the University of Melbourne*
Expand for Abstract / Authors

_ Paper

The paper presents a polarization independent and incident angle insensitive CMY colour filter mosaic made of nanorods with high transmission suitable for integration on a CMOS sensor for making CMY cameras.

Authors:XIN HE/the University of Melbourne Yajing Liu/the University of Melbourne Hemayet Uddin/Melbourne centre for nanofabarication Ampalavanapillai Nirmalathas/the University of Melbourne Ranjith R Unnithan/the University of Melbourne

Towards Ultrafast Phase Microscopy: Femtosecond Rabi Oscillations in Coupled LSPRs (JTu2D.23)
Presenter: Uri Arieli, *Tel-Aviv University*
Expand for Abstract / Authors

Paper

We present an ultra-broadband interference microscope for measuring ultrafast response of broadband femtosecond pulses. We use this setup to unravel the ultrafast linear dynamics of coupled Localized Surface Plasmon Resonances.

Authors:Uri Arieli/Tel-Aviv University Haim Suchowski/Tel-Aviv University

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Giant enhancement of high-harmonic generation in graphene-metal heterostructures (JTu2D.24)
Presenter: Irati Alonso Calafell, *University of Vienna, Austria*
Expand for Abstract / Authors

Paper

Graphene-metal heterostructures can confine the optical field down to the atomic level. We report record enhancement of high-harmonic generation and demonstrate, for the first time, that plasmons can indeed affect the graphene nonlinear optical response.

Authors:Irati Alonso Calafell/University of Vienna, Austria Lee Rozema/University of Vienna, Austria David Alcaraz Iranzo/ICFO Alessandro Trenti/University of Vienna, Austria Joel Cox/ICFO Avinash Kumar/ICFO Hlib Bieliaiev/University of Vienna, Austria Sebastian Nanot/ICFO Cheng Peng/MIT Dmitri Efetov/MIT Jing Hong/MIT Jing Kong/MIT Dirk Englund/MIT F. Javier García de Abajo/ICFO Frank Koppens/ICFO Philip Walther/University of Vienna, Austria

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Observation and nonlinear optical probing of flat band states in high-Q dielectric metasurfaces (JTu2D.25)
Presenter: Kirill Okhlopkov, *Lomonosov Moscow State University*
Expand for Abstract / Authors

Paper

We experimentally observe flat band states in high-Q dielectric metasurfaces and employ them to enhance third harmonic generation.

Authors:Kirill Okhlopkov/Lomonosov Moscow State University Ilya Antropov/Lomonosov Moscow State University Alyona Nazarenko/Lomonosov Moscow State University Maxim Shcherbakov/Lomonosov Moscow State University Vladimir Bessonov/Lomonosov Moscow State University Alexey Rubtsov/Lomonosov Moscow State University Gennady Shvets/Cornell University Andrey Fedyanin/Lomonosov Moscow State University

Second-Harmonic Generation in Plasmonic Nanoarcs (JTu2D.26)
Presenter: Kunyi Zhang, *Univ of Maryland-College Park*
Expand for Abstract / Authors

Paper

Second-harmonic generation (SHG) from arrays of gold nanoarcs is systematically investigated as a function of excitation wavelength to understand the dependence of the SHG efficiency on the excitation of the fundamental localized surface plasmon resonance.

Authors:Kunyi Zhang/Univ of Maryland-College Park Gyan Prakash/Univ of Maryland-College Park Thomas Murphy/Univ of Maryland-College Park Oded Rabin/Univ of Maryland-College Park

Low-loss Photonic Crystal Platform by Foundry Processing (JTu2D.28)
Presenter: Feifan Wang, *University of Delaware*
Expand for Abstract / Authors

Paper

We demonstrated a low loss (<1dB) photonic crystal waveguide within a CMOS multiproject wafer, with more than 30 dB extinction ratio.

Authors:Feifan Wang/University of Delaware Yahui Xiao/University of Delaware Thomas Kananen/University of Delaware Tiantian Li/University of Delaware Zi Wang/University of Delaware Hwaseob Lee/University of Delaware Xiaoyong Hu/Peking University Tingyi Gu/University of Delaware

Metal-dielectric resonators for multimode, ultrafast all-optical switching in the NIR (JTu2D.29)
Presenter: Soham Saha, *Purdue University*
Expand for Abstract / Authors

Paper

We experimentally demonstrate broadband, polarization-sensitive reflection modulation and picosecond relaxation-times with TiN-ZnO metal-dielectric resonators. We perform a rigorous investigation of the effects of pump-powers, probe-wavelengths, and polarizations on the device performance.

Authors:Soham Saha/Purdue University Aveek Dutta/Purdue University Benjamin Diroll/Argonne National Laboratory Clayton DeVault/Harvard University Zhaxylyk Kudyshev/Purdue University Richard Schaller/Argonne National Laboratory Alexander Kildishev/Purdue University Vladimir Shalaev/Purdue University Alexandra Boltasseva/Purdue University

Observation of Directional Surface Plasmon Polariton Scattering by Single Low-index Dielectric Nanoparticles (JTu2D.31)
Presenter: Xinchao Lu, *Institute of Microelectronics of Chinese Academy of Sciences*
Expand for Abstract / Authors

Paper

The directional scattering in low-index dielectric nanoparticles is hard to detect, as the multipole resonances are weak. With surface plasmon polariton (SPP) induced multipole moments, we observed the directional SPP scattering by single polystyrene nanoparticles.

Authors:Xuqing Sun/Institute of Microelectronics of Chinese Academy of Sciences Hongyao Liu/Institute of Microelectronics of Chinese Academy of Sciences Liwen Jiang/Institute of Microelectronics of Chinese Academy of Sciences Ruxue Wei/Institute of Microelectronics of Chinese Academy of Sciences Chang Wang/Institute of Microelectronics of Chinese Academy of Sciences Xue Wang/Institute of Microelectronics of Chinese Academy of Sciences Xinchao Lu/Institute of Microelectronics of Chinese Academy of Sciences Chengjun Huang/Institute of Microelectronics of Chinese Academy of Sciences Andrey Evlyukhin/Institute of Quantum Optics, Leibniz Universität Hannover

Manipulating the surface plasmon propagation by single hollow nanoparticle (JTu2D.32)
Presenter: Ruxue Wei, *Institute of Microelectronics of Chinese Academy of Sciences*
Expand for Abstract / Authors

Paper

We presented a method to manipulate the surface plasmon propagation by using the total reflection of single hollow nanoparticle. We used plasmonic imaging to observe the manipulation by single hollow nanoparticle in different surrounding medium.

Authors:Ruxue Wei/Institute of Microelectronics of Chinese Academy of Sciences Xuqing Sun/Institute of Microelectronics of Chinese Academy of Sciences Hongyao Liu/Institute of Microelectronics of Chinese Academy of Sciences Liwen Jiang/Institute of Microelectronics of Chinese Academy of Sciences Xue Wang/Institute of Microelectronics of Chinese Academy of Sciences Chang Wang/Institute of Microelectronics of Chinese Academy of Sciences Xinchao Lu/Institute of Microelectronics of Chinese Academy of Sciences Chengjun Huang/Institute of Microelectronics of Chinese Academy of Sciences

Coupled Optical Resonators for Tunable Infrared Emissivity Spectrum (JTu2D.33)
Presenter: Ahmed Morsy, *University of Southern California*
Expand for Abstract / Authors

Paper

We present a bright- dark mode coupled resonators scheme to shape infrared emissivity spectrum by tuning the coupling coefficient. We use temporal coupled mode theory to derive a closed form expression of the emissivity spectrum and FDTD simulations to verify the effect in an example design.

Authors:Ahmed Morsy/University of Southern California Michelle Povinelli/University of Southern California

Joint Poster Session 4 (JTu2E)

Verification of Signal-to-Crosstalk Measurements for WDM Fiber Optical Parametric Amplifiers (JTu2E.1) Paper
Presenter: Aron Szabo, *Aston Institute of Photonic Technologies, Aston University*
Expand for Abstract / Authors

Gaussian distribution of nonlinear inter-channel crosstalk noise is numerically shown in fiber optical parametric amplifiers with over 16 dB gain. Confidence of signal-to-crosstalk power ratio measurements is justified by consistency with error vector magnitude calculations.

Authors:Aron Szabo/Aston Institute of Photonic Technologies, Aston University Vitor Ribeiro/Aston Institute of Photonic Technologies, Aston University Vladimir Gordienko/Aston Institute of Photonic Technologies, Aston University Filipe Ferreira/Aston Institute of Photonic Technologies, Aston University Chandra Gaur/Aston Institute of Photonic Technologies, Aston University Nick Doran/Aston Institute of Photonic Technologies, Aston University

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Turbulence-Resistant Free-Space Optical Communications Using Few-Mode DPSK (JTu2E.2) Paper
Presenter: Rachel Sampson, *University of Central Florida, CREOL*
Expand for Abstract / Authors

We demonstrate the first few-mode DPSK receiver for turbulence-resistant free-space optical communication. Compared to a single-mode DPSK receiver, an 8.2 dB improvement in the power budget was achieved.

Authors:Rachel Sampson/University of Central Florida, CREOL Fatemeh Ghaedi Vanani/University of Central Florida, CREOL Yuanhang Zhang/University of Central Florida, CREOL Huiyuan Liu/University of Central Florida, CREOL Alireza Fardoost/University of Central Florida, CREOL Ning Wang/University of Central Florida, CREOL He Wen/University of Central Florida, CREOL Juan Carlos Alvardo-Zacarias/University of Central Florida, CREOL Rodrigo Amezcua Correa/University of Central Florida, CREOL Guifang Li/University of Central Florida, CREOL

A Resilient Optical Satellite Signaling Network Architecture for Fast Convergence under Time-Varying Topologies (JTu2E.3) Paper
Presenter: Chen Zhao, *Beijing National Research Center for Information Science and Technology (Abbreviation: BNRist)*
Expand for Abstract / Authors

We propose a novel information-diffusion-based resilient optical satellite signaling network architecture to support time-varying optical satellite network topologies. Results show that sub-second fast signaling convergence can be achieved under an emulated 54-node federal satellite system.

Authors:Chen Zhao/Beijing National Research Center for Information Science and Technology (Abbreviation: BNRist) Nan Hua/Beijing National Research Center for Information Science and Technology (Abbreviation: BNRist) Xin Li/Shanghai institute of Satellite Engineering Tianliang Wang/Shanghai institute of Satellite Engineering Xiaoping Zheng/Beijing National Research Center for Information Science and Technology (Abbreviation: BNRist)

448-Gb/s PAM4 FSO Communications Utilizing Polarization-Multiplexed Injection-Locked VCSELs with 500-m Free-Space Link (JTu2E.4)
Presenter: Qi-Ping Huang, *National Taipei University of Technology*
Expand for Abstract / Authors

Paper

We demonstrate a 448-Gb/s PAM4 FSO communication utilizing polarization-multiplexed injection-locked VCSELs with 500-m free-space link. Combining PAM4 and polarization-multiplexed scenarios, the channel capacity is greatly increased. It develops a framework for providing high-transmission-rate.

Authors:Qi-Ping Huang/National Taipei University of Technology Yong-Cheng Huang/National Taipei University of Technology Jing-Yan Xie/National Taipei University of Technology Song-En Tsai/National Taipei University of Technology Xu-Hong Huang/Fujian University of Technology Chung-Yi Li/National Taipei University Hai-Han Lu/National Taipei University of Technology

Novel Digital and Analogue Hybrid Radio over Fibre System for Distributed Antenna System (DAS) Fronthaul Applications (JTu2E.5)
Presenter: Tongyun Li, *University of Cambridge*
Expand for Abstract / Authors

Paper

A hybrid digital and analogue radio over fibre (RoF) architecture carrying WCDMA and LTE services with data compression at the digital path is demonstrated. Over 40dB dynamic range is achieved for both services.

Authors:Tongyun Li/University of Cambridge Yumeng Yang/University of Cambridge Michael Crisp/University of Cambridge Ian white/University of Cambridge Richard Penty/University of Cambridge

Cross-Phase Modulation Based Wavelength Multicasting Using a Single High-Repetition-Rate Pulsed Pump Generated from the Temporal Talbot Effect (JTu2E.6)
Presenter: Honghui Zhang, *The Chinese University of Hong Kong*
Expand for Abstract / Authors

Paper

We demonstrate wavelength multicasting enabled by multiplied 50-GHz optical pulses through cross-phase modulation. The maximum difference in optical signal-to-noise ratio sensitivity among the central 11 channels is less than 1.1 dB at the HD-FEC threshold.

Authors:Honghui Zhang/The Chinese University of Hong Kong Qijie Xie/The Chinese University of Hong Kong Chester Shu/The Chinese University of Hong Kong

Frequency-Domain VFF-RLS Equalization for the Time-Varying Mode-Division Multiplexed Channels (JTu2E.7)
Presenter: Wenbo Yu, *Key Laboratory of Opto-electronic Information Technical Science of Ministry of Education, School of Precision Instruments and Optoelectronics Engineering, Tianjin University, Tianjin, 300072, China*
Expand for Abstract / Authors

Paper

An FD-VFF-RLS equalization with fast tracking capability for MDM links is proposed. We show that its Q^2 factor has 4.5-dB gain compared with conventional FD-LMS when the evolution frequency of channel reaches 500 krad/s.

Authors:Wenbo Yu/Key Laboratory of Opto-electronic Information Technical Science of Ministry of Education, School of Precision Instruments and Optoelectronics Engineering, Tianjin University, Tianjin, 300072, China Zhiqun Yang/Key Laboratory of Opto-electronic Information Technical Science of Ministry of Education, School of Precision Instruments and Optoelectronics Engineering, Tianjin University, Tianjin, 300072, China Xutao Wang/Key Laboratory of Opto-electronic Information Technical Science of Ministry of Education, School of Precision Instruments and Optoelectronics Engineering, Tianjin University, Tianjin, 300072, China Lin Zhang/Key Laboratory of Opto-electronic Information Technical Science of Ministry of Education, School of Precision Instruments and Optoelectronics Engineering, Tianjin University, Tianjin, 300072, China Guifang Li/CREOL, The College of Optics and Photonics, University of Central Florida, FL 32816, Orlando, USA

Artificial Neural Network Assisted Demodulation for Directly Detected QAM Signals (JTu2E.8)
Presenter: Qiulin Zhang, *Chinese University of Hong Kong*
Expand for Abstract / Authors

Paper

We propose an artificial neural network based demodulation block to mitigate the effect caused by signal to signal beating noise. Experimental results show that our proposed scheme outperforms Volterra equalizer assisted scheme.

Authors:Qiulin Zhang/Chinese University of Hong Kong Chester Shu/Chinese University of Hong Kong

Demonstration of 608 Gbps CO-OFDM Transmission using Gain Switched Comb (JTu2E.9)
Presenter: LAKSHMI NARAYANAN VENKATASUBRAMANI, *Indian Institute of Technology Madras*
Expand for Abstract / Authors

Paper

We experimentally demonstrate 608 Gbps CO-OFDM superchannel transmission over 25 km using optical carrier generated from an externally injected gain-switched comb source with linewidth ~ 19 kHz. We show the BER performance is within the HD-FEC limit.

Authors:LAKSHMI NARAYANAN VENKATASUBRAMANI/Indian Institute of Technology Madras Yi Lin/Dublin City University Colm Browning/Dublin City University Anirudh Vijay/Indian Institute of Technology Madras Frank Smyth/Pilot Photonics Ltd. R. David Koilpillai/Indian Institute of Technology Madras Liam Barry/Dublin City University Deepa Venkitesh/Indian Institute of Technology Madras

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Effect of Limited DAC Resolution on the Determination of Optimal Constellation Size in Probabilistic Shaping (JTu2E.10)
Presenter: Qiulin Zhang, *Chinese University of Hong Kong*
Expand for Abstract / Authors

Paper

In probabilistic shaping, a smaller constellation size leads to a lower peak-to-average power ratio but a higher average power. By jointly considering the signal-to-noise ratio and the DAC resolution, we determine the optimal constellation size.

Authors:Qiulin Zhang/Chinese University of Hong Kong Chester Shu/Chinese University of Hong Kong

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Photonic Reservoir Computing enabled by Active Silicon Micro-Rings with Transparent Signal Injection (JTu2E.11)
Presenter: Shi Li, *Christian-Albrechts University zu Kiel*
Expand for Abstract / Authors

Paper

Photonic masking enables fully transparent silicon micro-ring-based reservoir computing for channel equalization. We have evaluated the performance of micro-ring-based reservoir computing estimation for a 28GBd SSB PAM-4 transmission setup over 100km SSMF with Kramers-Kronig reception.

Authors:Shi Li/Christian-Albrechts University zu Kiel Sourav Dev/TU Dresden Kambiz Jamshidi/TU Dresden Stephan Pachnicke/Christian-Albrechts University zu Kiel

Optical Caching Network: A Seamless Bridge Between Electrical Packet Switching and Optical Circuit Switching (JTu2E.12)
Presenter: Nan Hua, *Tsinghua University*
Expand for Abstract / Authors

Paper

We propose a novel mechanism for instant access of latency-sensitive traffic using optical caching network. Lightpath setup delay can be avoided by caching-based optical circuit switching and the router workload can be reduced by 96%.

Authors:Ruijie Luo/University College London Nan Hua/Tsinghua University Kangqi Zhu/Tsinghua University Chen Zhao/Tsinghua University Bingli Guo/Beijing Univ. of Post and Telecomm. Chuanchuan Yang/Peking University Xiaoping Zheng/Tsinghua University

Joint Equalization of CD and RSOP Using a Time-frequency Domain Kalman Filter Structure in Kramers-Kronig Receivers (JTu2E.13)
Presenter: Leiya Hu, *BUPT*
Expand for Abstract / Authors

Paper

We propose a joint equalization scheme for CD and RSOP in KK receivers based on a time-frequency domain Kalman filter, which has strong tolerance to accumulated CD (more than 2040ps/nm) combined with 2Mrad/s RSOP.

Authors:Leiya Hu/BUPT Xue Li/BUPT Qi Zhang/BUPT Xiaoguang Zhang/BUPT Lixia Xi/BUPT

Four-Color LD+LED Lighting Module for 30-Gbps Visible Wavelength Division Multiplexing Data Transmission (JTu2E.14)
Presenter: Chih-Hsien Cheng, *Graduate Institute of Photonics and Optoelectronics, and Department of Electrical Engineering, National Taiwan University*
Expand for Abstract / Authors

Paper

A red/green/violet-LD and yellow-LED based four-color white-lighting module is employed for free-space visible wavelength division multiplexing (VWDM) data transmission at 30 Gbps with using the bit-loaded discrete multi-tone (DMT) data format.

Authors:Chih-Hsien Cheng/Graduate Institute of Photonics and Optoelectronics, and Department of Electrical Engineering, National Taiwan University Yi-Chien Wu/Graduate Institute of Photonics and Optoelectronics, and Department of Electrical Engineering, National Taiwan University Cheng-Ting Tsai/Graduate Institute of Photonics and Optoelectronics, and Department of Electrical Engineering, National Taiwan University Huai-Yung Wang/Graduate Institute of Photonics and Optoelectronics, and Department of Electrical Engineering, National Taiwan University Gong-Ru Lin/Graduate Institute of Photonics and Optoelectronics, and Department of Electrical Engineering, National Taiwan University

10 Gbps single μLED Visible Light Communication with PAPR Reduction and Bit-Power Allocation (JTu2E.15)
Presenter: Ming Wei Li, *National Tsin Hua University*
Expand for Abstract / Authors

Paper

A 520-nm GaN green μLED-based for visible light communication is experimentally demonstrated. By optimizing the PAPR and bit-power allocation of QAM-OFDM signals, the capacity achieves 10.05 Gbps with single μLED over air transmission.

Authors:Ming Wei Li/National Tsin Hua University Jhih-heng Yan/National Tsin Hua University Chien-Ju Chen/National Tsin Hua University Pin-Chao Huang/National Tsin Hua University Kai-Chia Chen/National Tsin Hua University Mengzhe Liao/National Tsin Hua University Kai-Ming Feng/National Tsin Hua University Meng-Chyi Wu/National Tsin Hua University

Free-Space Adaptive Optical Communication Systems Against Atmospheric Turbulence and Device Vibrations (JTu2E.16)
Presenter: Yize Liang, *Wuhan National Laboratory for Optoelectronics and School of Optical and Electronic Information*
Expand for Abstract / Authors

Paper

We experimentally demonstrate an adaptive free-space optical (FSO) communication system against atmospheric turbulence and device vibrations. BER of 10-Gbaud 16-QAM signal transmission is measured under different transmitted power, showing ~8dB penalty improvement with the adaptive system.

Authors:Yize Liang/Wuhan National Laboratory for Optoelectronics and School of Optical and Electronic Information Xinzhou Su/Wuhan National Laboratory for Optoelectronics and School of Optical and Electronic Information Lulu Wang/Wuhan National Laboratory for Optoelectronics and School of Optical and Electronic Information Jian Wang/Wuhan National Laboratory for Optoelectronics and School of Optical and Electronic Information

Reinforced Virtual Network Function Chain Deployment in Elastic Optical Networks for Edge Computing (JTu2E.17)
Presenter: Ruijie Zhu, *Zhengzhou University*
Expand for Abstract / Authors

Paper

A reinforced virtual network function chain deployment algorithm is proposed in elastic optical networks for edge computing. Simulation results show that it can achieve lower blocking probability compared to state-of-art algorithms.

Authors:Ruijie Zhu/Zhengzhou University Peisen Wang/Zhengzhou University Shihua Li/Zhengzhou University Lulu Li/Zhengzhou University Samuel Aretor/Zhengzhou University Yongli Zhao/Beijing University of Posts and Telecommunications

PAM4 Receiver based on Quantum-dot SOA Preamplifier for Short-Reach Applications (JTu2E.18)
Presenter: Guo-Wei Lu, *Tokai University*
Expand for Abstract / Authors

Paper

PAM4 receiver based on QD-SOA preamplifier is experimentally demonstrated with a 2.8-dB sensitivity improvement and a 2.5-dB gain in IPDR when amplifying 20-Gb/s PAM4 signals in contrast to its counterpart with MQW-SOA preamplifier.

Authors:Guo-Wei Lu/Tokai University Hong-Bo Zhang/Chengdu University of Information Technology Zhengkun Xing/Tianjin University Kouichi Akahane/National Institute of Information and Comm. Tech. Zhenzhou Cheng/Tianjin University Tiegen Liu/Tianjin University Takahide Sakamoto/Tokyo Metropolitan University Naokatsu Yamamoto/National Institute of Information and Comm. Tech.

13:00 - 14:30 (UTC - 07:00)

Q-PNT: Quantum Positioning Navigation and Timing (STu3F)
Presider: Eisuke Abe, *RIKEN*

13:30 - 13:45 **Quantum-Enhanced Fiber-Optic Gyroscopes Using Quadrature Squeezing and Continuous-Variable Entanglement (STu3F.2)**
Presenter: Michael Grace, *University of Arizona*
Expand for Abstract / Authors

Paper

For fiber-optic gyroscope designs, we analyze the quantum enhancement from quadrature-squeezed and entangled optical probe states for rotation sensing. Under realistic experimental constraints and fiber loss, we analytically show substantial variance suppression over classical sensors.

Authors:Michael Grace/University of Arizona Christos Gagatsos/University of Arizona Quntao Zhuang/University of Arizona Saikat Guha/University of Arizona

13:45 - 14:00 **Highly-sensitive multi-axes rotation sensing using large momentum transfer point source atom interferometry (STu3F.3)**
Presenter: Jinyang Li, *Northwestern University*
Expand for Abstract / Authors

Paper

Employing a fully quantized model for atomic wave-packets, we show that a large momentum transfer, multi-axes gyroscope using point-source atomic interferometry (PSAI) can achieve a sensitivity much higher than that of a conventional PSAI gyroscope

Authors:Jinyang Li/Northwestern University Wayne Huang/Northwestern University Mohamed Fouda/Digital Optics Technologies Timothy Kovachy/Northwestern University Selim Shahriar/Northwestern University

14:00 - 14:30 **Rotation rate measurements with a large area cold atom interferometer (STu3F.4)**
Presenter: Arnaud Landragin, *Observatoire de Paris, Université PSL, CNRS, Sorbonne université*
Expand for Abstract / Authors

Paper

We present a cold atom gyroscope based on the Sagnac effect for matter-wave with very large area of 11 cm^2 with record sensitivity and preliminary study of the scaling factor.

Authors:Arnaud Landragin/Observatoire de Paris, Université PSL, CNRS, Sorbonne université Matteo Altorio/Observatoire de Paris, Université PSL, CNRS, Sorbonne université Romain Gautier/Observatoire de Paris, Université PSL, CNRS, Sorbonne université Leonid Sidorenkov/Observatoire de Paris, Université PSL, CNRS, Sorbonne université Remi Geiger/Observatoire de Paris, Université PSL, CNRS, Sorbonne université

Invited

13:00 - 14:45 (UTC - 07:00)

LIDAR: from Algorithms to Modern Systems (ATu3T)
Presider: Brian Simonds, *National Institute of Standards and Tech*

13:00 - 13:30 **(Withdrawn) Compact Automated Lidars for Environmental Remote Sensing (ATu3T.1)**
Presenter: David Sonnenfroh, *Physical Sciences Inc.*
Expand for Abstract / Authors

Advances in solid state lasers and detectors have catalyzed a rebirth of interest in deploying compact lidars in a variety of applications. This talk will review some examples of micropulse lidars applied to remote sensing of various aspects of the atmosphere. Design and performance challenges of modern systems will be highlighed.

Authors:David Sonnenfroh/Physical Sciences Inc. Scott Bender/Physical Sciences Inc. Joseph Goodwin/Physical Sciences Inc. Robert Minelli/Physical Sciences Inc.

Invited

13:30 - 13:45	**LiDAR-Embedded Smart Laser Headlight Module Using a Single Digital Micromirror Device for Autonomous Drive (ATu3T.2)** **Presenter**: Liu Chun-Nien, *National Chung Hsing University* Expand for Abstract / Authors The LiDAR-embedded smart laser headlight module employing a single digital micromirror device is demonstrated. This novel scheme enables reduction in optical components and module space requirements for use in the next-generation high-performance autonomous vehicles. **Authors**:Liu Chun-Nien/National Chung Hsing University Yung-Peng Chang/National Chung Hsing University Hsing-Kun Shih/National Chung Hsing University Han Pin/National Chun Hsing University Kenneth Li/Optonomous Technologies Inc. Zingway Pei/National Chung Hsing University Silvano Donati/University of Pavia Wood-Hi Cheng/National Chung Hsing University	Paper
13:45 - 14:00	**Predicting Dead Time Distortion for High-Flux Single-Photon Lidar (ATu3T.3)** **Presenter**: Joshua Rapp, *Boston University* Expand for Abstract / Authors Detector and electronics dead times distort photon detection histograms at high flux, but can be mitigated by probabilistic modeling identifying the sequence of detections as a Markov chain. **Authors**:Joshua Rapp/Boston University Yanting Ma/Mitsubishi Electric Research Laboratories Robin Dawson/Charles Stark Draper Laboratory Vivek Goyal/Boston University	Paper
14:00 - 14:30	**Microresonator Dual-Comb Coherent FMCW LiDAR (ATu3T.4)** **Presenter**: Anton Lukashchuk, *EPFL* Expand for Abstract / Authors We introduce a novel architecture for parallel frequency-modulated continuous wave (FMCW) laser ranging (LiDAR). Using dual soliton microcombs, we demonstrate a parallel distance measurement with 24 channels requiring only a single FMCW pump laser and coherent receiver for read-out. **Authors**:Anton Lukashchuk/EPFL Johann Riemensberger/EPFL Maxim Karpov/EPFL Junqiu Liu/EPFL Erwan Lucas/EPFL Tobias Kippenberg/EPFL	Paper

14:30 - 14:45	**Single-pixel LIDAR with Deep Learning Optimised Sampling (ATu3T.5)** **Presenter**: Steven Johnson, *University of Glasgow* Expand for Abstract / Authors We present a LIDAR system that compressively samples a scene using a deep learning optimised sampling basis and reconstruction algorithm. This approach improves scene reconstruction quality compared to an orthogonal sampling method. **Authors**:Steven Johnson/University of Glasgow Neal Radwell/University of Glasgow Matthew Edgar/University of Glasgow Catherine Higham/University of Glasgow Roderick Murray-Smith/University of Glasgow Miles Padgett/University of Glasgow	Paper

All-Optical Nonlinearity Compensation (STu3L)

Presider: Mihaela Dinu, *LGS Innovations LLC*

13:00 - 13:15	**Four-wave mixing conversion efficiency requirements for optical phase conjugation based fiber nonlinearity compensation (STu3L.1)** **Presenter**: Francesco Da Ros, *DTU Fotonik, Technical Univ of Denmark* Expand for Abstract / Authors It is demonstrated that 90% of the nonlinearity compensation gains of mid-link OPC can be achieved by a fraction of the maximum conversion efficiency provided by the nonlinear medium used for the four-wave mixing. **Authors**:Metodi Yankov/DTU Fotonik, Technical Univ of Denmark Pawel Kaminski/DTU Fotonik, Technical Univ of Denmark Francesco Da Ros/DTU Fotonik, Technical Univ of Denmark	Paper
13:15 - 13:30	**Nonlinear Phase-Shift Cancellation in Dispersion-Shifted Fiber Transmission by All-Optical Back-Propagation (STu3L.2)** **Presenter**: Pawel Marcin Kaminski, *Technical University of Denmark* Expand for Abstract / Authors We experimentally demonstrate an unrepeatered system with optical phase conjugation (OPC)-based receiver-side back-propagation. Dispersion-shifted fibers employed for transmission simplify the OPC symmetry requirements, leading up to 2.93-dB SNR gains for dual-polarization 16-QAM signals. **Authors**:Pawel Marcin Kaminski/Technical University of Denmark Johan Bertram Thjalfe Ulvenberg/Technical University of Denmark Christian Koefoed Schou/Technical University of Denmark Francesco Da Ros/Technical University of Denmark Anders Thomas Clausen/Technical University of Denmark Søren Forchhammer/Technical University of Denmark Leif K. Oxenløwe/Technical University of Denmark Michael Galili/Technical University of Denmark	Paper

13:30 - 14:00

Phase Sensitive Amplifiers in Fiber-Optic and Free-Space Optical Communication Links (STu3L.3)
Presenter: Peter Andrekson, *Chalmers Tekniska Hogskola*
Expand for Abstract / Authors

Paper

We review recent progress of using phase-sensitive amplifiers (PSA) in optical communication. Perhaps their most intriguing property is the amplification without adding excess noise. In a free-space demonstration, this enabled a “black-box”, error-free sensitivity of 1 photon per bit. In fiber systems, PSAs can mitigate transmission fiber nonlinearities as well.

Authors:Peter Andrekson/Chalmers Tekniska Hogskola

Invited

14:00 - 14:15

Improved nonlinearity compensation of OPC-aided EDFA-amplified transmission by enhanced dispersion mapping (STu3L.4)
Presenter: Pawel Marcin Kaminski, *Technical University of Denmark*
Expand for Abstract / Authors

Paper

We demonstrate enhanced system symmetry for OPC-based nonlinearity compensation through dispersion mapping and nonlinear phase-shift optimization. Transmission reach increases of 40% and 7% are achieved w.r.t. dispersion-managed links without and with OPC, respectively.

Authors:Pawel Marcin Kaminski/Technical University of Denmark Francesco Da Ros/Technical University of Denmark Anders Thomas Clausen/Technical University of Denmark Søren Forchhammer/Technical University of Denmark Leif K. Oxenløwe/Technical University of Denmark Michael Galili/Technical University of Denmark

14:15 - 14:30

Noise Statistics and its Implications on Optimal Constellation Shapes for Channels with Optical Phase Conjugation (STu3L.5)
Presenter: Henrik Hansen, *DTU Fotonik*
Expand for Abstract / Authors

Paper

Probabilistic shaping designed for AWGN channels used on dispersion-compensated channels with mid-link OPC results in shaping gains comparable to those of specialized shaping. Without OPC, specialized probabilistic shaping is required to achieve comparable gains.

Authors:Henrik Hansen/DTU Fotonik Metodi Yankov/DTU Fotonik Pawel Kaminski/DTU Fotonik Francesco Da Ros/DTU Fotonik Leif K. Oxenløwe/DTU Fotonik Søren Forchhammer/DTU Fotonik

14:30 - 14:45	**All-Optical 2×2-Bit Multiplier at 40Gb/s Using Bidirectional Multichannel Four-Wave Mixing (STu3L.6)** **Presenter**: Wenchan Dong, *Wuhan National Lab for Optoelectronics* Expand for Abstract / Authors We propose and experimentally demonstrate an all-optical 2×2-bit multiplier with neither adder nor shift register. Based on bidirectional multichannel four-wave mixing, output logic results of multiplier at 40 Gb/s are clearly identified and correct. **Authors**:Wenchan Dong/Wuhan National Lab for Optoelectronics liao chen/Wuhan National Lab for Optoelectronics Lei Lei/School of Physics and Optoelectronic Engineering, Shenzhen University Yu Yu/Wuhan National Lab for Optoelectronics Xinliang Zhang/Wuhan National Lab for Optoelectronics	Paper

13:00 - 15:00 (UTC - 07:00)

Symp: Quantum Biophotonics I (JTu3N)

Presider: Sergey Polyakov

Special Symposium

13:00 - 13:30	**Single Photon Quantum Efficiency of Photosynthetic Light Harvesting (JTu3N.1)** **Presenter**: Birgitta Whaley, *University of California Berkeley* Expand for Abstract / Authors I present a theoretical analysis for absorption of single photons by realistic light harvesting systems, with calculation of absorption, transmission, fluorescence probabilities and photon counts, for comparison with experiments using quantum light sources. **Authors**:Birgitta Whaley/University of California Berkeley Invited	Paper
13:30 - 14:00	**Measurement of Photon Statistics with Live Photoreceptor Cells (JTu3N.2)** **Presenter**: Leonid Krivitsky, *IMRE, A*STAR* Expand for Abstract / Authors We study responses of live retinal photoreceptors to light sources with different photon statistics. We show the ability of the cells to discriminate between the sources, down to the level of single photons. **Authors**:Leonid Krivitsky/IMRE, A*STAR Invited	Paper

14:00 - 14:15

Four-wave mixing spectroscopy with squeezed light (JTu3N.3)
Presenter: Konstantin Dorfman, *East China Normal University*
Expand for Abstract / Authors

Paper

We propose a new four-wave mixing spectroscopy with quantum light where the two output fields form a two-mode squeezed state and carry the information about the third order nonlinear susceptibility beyond semiclassical response function.

Authors:Konstantin Dorfman/East China Normal University

14:15 - 14:30

Single-emitter-sensitivity in flow cytometry verified by quantum measurement (JTu3N.4)
Presenter: Javier Sabines Chesterking, *NIST*
Expand for Abstract / Authors

Paper

We demonstrate single quantum emitter sensitivity in a flow cytometer by measuring the second order correlation function to be $g^{(2)}(0)=0.5(1)$

Authors:Javier Sabines Chesterking/NIST Ivan Burenkov/joint quantum institute UMD Sergey Polyakov/NIST

14:30 - 15:00

Sub Shot Noise Precision of Absorption Estimation per Photon Flux with Quantum States of Light (JTu3N.5)
Presenter: Jonathan Matthews, *University of Bristol*
Expand for Abstract / Authors

We will present experiments using correlated twin beams for absorption imaging and bright amplitude squeezed light, to measure absorption with precision beyond the shot noise limit. We will discuss application to absorption spectroscopy and imaging.

Authors:Euan Allen/University of Bristol George Atkinson/University of Bristol Giacomo Ferranti/University of Bristol Jonathan Matthews/University of Bristol Alex McMillan/University of Bristol Paul-Antoine Moreau/University of Glasgow Jason Mueller/University of Bristol John Rarity/University of Bristol Javier Sabines Chesterking/NIST Nigam Samantaray/University of Bristol

Invited

Environmental and Atmospheric Sensing I (ATu3I)
Presider: David Bomse, *Mesa Photonics, LLC*

13:00 - 13:15	**Dual-comb Spectroscopy for Cascaded Multi-paths (ATu3I.1)** **Presenter**: Xinyi Chen, *Tsinghua University* Expand for Abstract / Authors A cascaded dual-comb system retrieving both spectral transmittances and absorption lengths for multiple path-segments of different gases is reported with 1.2% concentration extraction deviation within 1 s. **Authors**:Xinyi Chen/Tsinghua University Weipeng Zhang/Tsinghua University Yan Li/Tsinghua University Haoyun Wei/Tsinghua University	Paper
13:15 - 13:30	**Precision Spectroscopy of N_2O with a Cross-Dispersed Spectrometer and Mid-Infrared Frequency Comb (ATu3I.2)** **Presenter**: D. Bailey, *National Inst of Standards & Technology* Expand for Abstract / Authors A two-dimensional dispersive spectrometer achieves single element noise equivalent absorbance of 2.2×10^{-5} $Hz^{-1/2}$ and resolves rovibrational lines for all singly-substituted stable isotopic variants of nitrous oxide near 4.5 µm. **Authors**:D. Bailey/National Inst of Standards & Technology Gang Zhao/National Inst of Standards & Technology Adam Fleisher/National Inst of Standards & Technology	Paper
13:30 - 13:45	**Part-per-billion Level Radiocarbon Dioxide Detection Using Photoacoustic Spectroscopy (ATu3I.3)** **Presenter**: Mehr Fatima, *VTT Technical Research Center of Finland* Expand for Abstract / Authors We report a first investigation into cantilever-enhanced photoacoustic spectroscopy for radiocarbon dioxide detection using a quantum cascade laser as light source. The achieved sensitivity is sufficient for applications related to nuclear facilities. **Authors**:Mehr Fatima/VTT Technical Research Center of Finland Thomas Hausmaninger/VTT Technical Research Center of Finland Teemu Tomberg/University of Helsinki Juho Karhu/University of Helsinki Tuomas Hieta/Gasera Ltd Markku Vainio/University of Helsinki Guillaume Genoud/VTT Technical Research Center of Finland	Paper

13:45 - 14:00

Nighttime Radical Chemistry Observations based on a Visible Dual-Comb Spectrometer (ATu3I.4)
Presenter: Jy Zhao, *Peking University*
Expand for Abstract / Authors

Paper

We propose a visible dual-comb spectroscopy with 0.001 nm spectrum resolution and 50 microseconds time resolution. We perform high-precision observing of NO_3 real-time chemical reactions by using a dual-comb Spectrometer and the Herriott Cell.

Authors:Haoyuan Lu/Peking University Hao Xu/Peking University Jy Zhao/Peking University Peng Zuo/Peking University

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14:00 - 14:15

Theoretical Performance Analysis of QCL-Based Dual Comb Spectroscopic System for Trace Detection of Chemicals in Air (ATu3I.5)
Presenter: Miftahul Jannat Rasna, *Princeton University*
Expand for Abstract / Authors

Paper

We develop realistic air and noise models for dual-comb spectroscopy using real urban background measurements and analyze true- and false-positive rates of target molecules. Real-world situations for various targets can be simulated using these models.

Authors:Miftahul Jannat Rasna/Princeton University Chu Teng/Princeton University Jonas Westberg/NEO Monitors AS Gerard Wysocki/Princeton University

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14:15 - 14:30

Open-path atmospheric ammonia sensor based on 9.06 µm hollow core fiber coupled quantum cascade laser (ATu3I.6)
Presenter: Hongming Yi, *Princeton University*
Expand for Abstract / Authors

Paper

An open-path ammonia sensor based on 9.06 µm hollow core fiber coupled quantum cascade laser was developed to atmospheric NH_3 monitoring, measurement precision of 0.25 ppb was obtained with fast time response of 0.1 s.

Authors:Hongming Yi/Princeton University Lei Tao/Princeton University Da Pan/Princeton University Xuehui Guo/Princeton University James McSpiritt/Princeton University Rui Wang/Princeton University Charles Luu/AdTech Photonics, Inc. Mark Zondlo/Princeton University

14:30 - 15:00

Sensors for Climate Change and Air Quality: the Path from the Lab to the Stratosphere (ATu3I.7)
Presenter: Mark Zondlo, *Princeton University*
Expand for Abstract / Authors

New sensors are critically needed for understanding air quality and climate. I will identify common processes needed to successfully transition trace gas sensors from the laboratory to those making high-quality, scientific discoveries in the field.

Authors:Mark Zondlo/Princeton University

Invited

Non-Hermitian Photonics (FTu3A)

Presider: Mohammad-Ali Miri, *Queens College of CUNY*

13:00 - 14:00

Non-Hermitian Photonics – the Strange Effects of Gain and Loss (FTu3A.1)
Presenter: Ulf Peschel, *Friedrich-Schiller-University Jena*
Expand for Abstract / Authors

Paper

The tutorial will comprise an introduction into Non-Hermitian and Parity-Time symmetric photonics including the dynamics around exceptional points, propagation effects in one- and two-dimensional parity-time symmetric systems and the formation of new topological states. Ulf Peschel is holding a chair position at the Friedrich-Schiller-University of Jena, Germany since 2014. Before he was doing research at the University of Erlangen, Germany. His main interests are in electromagnetic modeling, nanophotonics and in the nonlinear dynamics of optical systems. He has been an OSA Fellow since 2015.

Authors:Ulf Peschel/Friedrich-Schiller-University Jena

Tutorial

14:00 - 14:15

Realizing Spin-Hamiltonians in Nanolaser Lattices (FTu3A.2)
Presenter: Midya Parto, *University of Central Florida, CREOL*
Expand for Abstract / Authors

Paper

We demonstrate both theoretically and experimentally that coupled metallic nanolasers can be used to emulate spin-Hamiltonians. Depending on the geometry of the array, we observe ferromagnetic and antiferromagnetic behaviors, as well as geometric frustration.

Authors:Midya Parto/University of Central Florida, CREOL William Hayenga/University of Central Florida, CREOL Alireza Marandi/california institute of technology Demetrios Christodoulides/University of Central Florida, CREOL Mercedeh Khajavikhan/University of Central Florida, CREOL

14:15 - 14:30

Non-Hermitian Anderson Transport (FTu3A.3)
Presenter: Alexander Szameit, *University of Rostock*
Expand for Abstract / Authors

Paper

We predict and experimentally verify a novel non-Hermitian transport mechanism in which a stochastic energy exchange with the environment leads to localization of all eigenstates, while simultaneously enabling particles to travel via ultra-far jumps.

Authors:Sebastian Weidemann/University of Rostock Mark Kremer/University of Rostock Stefano Longhi/Politecnico di Milano Alexander Szameit/University of Rostock

14:30 - 14:45

Petermann-factor Limited Sensing near an Exceptional Point (FTu3A.4)
Presenter: Heming Wang, *California Institute of Technology*
Expand for Abstract / Authors

Paper

We show that enhanced responsivity of a laser gyroscope operating near an exceptional point is accompanied by laser linewidth broadening related to the Petermann factor. The broadening imposes a fundamental sensitivity limit.

Authors:Heming Wang/California Institute of Technology Yu-Hung Lai/California Institute of Technology Zhiquan Yuan/California Institute of Technology Myoung-Gyun Suh/California Institute of Technology Kerry Vahala/California Institute of Technology

14:45 - 15:00

Exceptional Point Based He-Ne Ring Laser Gyroscope (FTu3A.5)
Presenter: Alexander Schumer, *Vienna University of Technology (TU Wien)*
Expand for Abstract / Authors

Paper

A non-Hermitian He-Ne ring laser gyroscope (RLG) that operates at an exceptional point is proposed and experimentally realized. Compared to a standard RLG, the device exhibits more than an order of magnitude enhancement in sensitivity.

Authors:Mohammad Parvinnezhad Hokmabadi/University of Southern California Alexander Schumer/Vienna University of Technology (TU Wien) Demetrios Christodoulides/University of Central Florida Mercedeh Khajavikhan/University of Southern California

Emerging Platforms in Integrated Photonics (STu3O)
Presider: Ozdal Boyraz, *University of California Irvine*

13:00 - 13:30 **Exploring Integrated Photonics with Symmetry and Topology (STu3O.1)**
Presenter: Liang Feng, *University of Pennsylvania*
Expand for Abstract / Authors

Paper

Quantum mechanics and photonics share mathematical equivalence. Exploring integrated photonics with symmetry and topology not only deepens fundamental understanding in quantum physics but also endows novel photonic functionality for optical communication and information technology.

Authors:Liang Feng/University of Pennsylvania

Invited

13:30 - 13:45 **Magneto-optical isolator and self-holding optical switch integrated with thin-film magnet (STu3O.2)**
Presenter: Toshiya Murai, *Tokyo Institute of Technology*
Expand for Abstract / Authors

Paper

Novel magneto-optical isolator and self-holding optical switch with an a-Si:H microring resonator are demonstrated. The devices are driven by the remanence of integrated thin-film magnet and, therefore, maintain their state without any power supply.

Authors:Toshiya Murai/Tokyo Institute of Technology Yuya Shoji/Tokyo Institute of Technology Nobu Nishiyama/Tokyo Institute of Technology Tetsuya Mizumoto/Tokyo Institute of Technology

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13:45 - 14:00 **Experimental Demonstration of a Data Correlation and Data Equalization using a Tunable Optical Tapped-Delay-Line Using the Spatial Domain and Modal-Dependent Delay (STu3O.3)**
Presenter: Ahmed Almaiman, *University of Southern California*
Expand for Abstract / Authors

Paper

We demonstrate a tunable OTDL using the orbital angular momentum modal domain to create the taps through mode-multicasting. We demonstrate 2-3 tap correlation and equalization. Equalization results show EVM improvement of a 20-Gbaud QPSK with chromatic dispersion of 20-km from EVM=26.3% to EVM=11.4%

Authors:Ahmed Almaiman/University of Southern California Hao Song/University of Southern California Amir Minoofar/University of Southern California Haoqian Song/University of Southern California Runzhou Zhang/University of Southern California Xinzhou Su/University of Southern California Kaiheng Zou/University of Southern California Kai Pang/University of Southern California Cong Liu/University of Southern California Peicheng Liao/University of Southern California Nanzhe Hu/University of Southern California Zhe Zhao/University of Southern California Moshe Tur/School of Electrical Engineering, Tel Aviv University Alan Willner/University of Southern California

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14:00 - 14:15 **Slaving a Highly Multi-Mode Laser to an On-Chip Single Mode Microresonator (STu3O.4)**
Presenter: Yair Antman, *Columbia University*
Expand for Abstract / Authors

Paper

We demonstrate transverse and longitudinal modal collapse of a highly multi-mode Fabry-Perot laser coupled to a silicon-nitride resonator, via self-injection locking. We show coupling to single transverse mode with more than 50% efficiency and sub-MHz linewidth.

Authors:Yair Antman/Columbia University ohad Westreich/Columbia University Andres Gil-Molina/Columbia University Xingchen Ji/Columbia University Alexander Gaeta/Columbia University Michal Lipson/Columbia University

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14:15 - 14:30 **Active-passive Integration on III-V-OI Platform using Quantum Well Intermixing (STu3O.5)**
Presenter: Naoki Sekine, *The University of Tokyo*
Expand for Abstract / Authors

Paper

We investigated quantum well intermixing for III-V on insulator platform to achieve active-passive integration. Owing to P_2 implantation into multi-quantum well, we monolithically integrated passive waveguide and waveguide photodetector with responsivity of 0.4 A/W

Authors:Naoki Sekine/The University of Tokyo Kasidit Toprasertpong/The University of Tokyo Shinichi Takagi/The University of Tokyo Mitsuru Takenka/The University of Tokyo

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14:30 - 15:00 **Topological Photonic Crystal Waveguides and Resonators (STu3O.6)**
Presenter: Natalia Litchinitser, *Duke University*
Expand for Abstract / Authors

TBD

Authors:Natalia Litchinitser/Duke University

Invited

Nonlinear Phenomena in Nano Structures (FTu3Q)
Presider: Ksenia Dolgaleva, *University of Ottawa*

13:00 - 13:30	**Nonlinear Vector-Field Microscopy of Nanostructures (FTu3Q.1)** **Presenter**: Godofredo Bautista, *Tampere University* Expand for Abstract / Authors We review our results regarding cylindrical vector beams in nonlinear microscopy. Such techniques open completely new opportunities for the characterization of nanostructures. In addition, nanowires provide near-ideal probes of longitudinal electric focal fields. **Authors**:Martti Kauranen/Tampere University Léo Turquet/Tampere University Leevi Kallioniemi/Tampere University Xiaorun Zang/Tampere University Godofredo Bautista/Tampere University Invited	Paper
13:30 - 13:45	**Two-photon Absorption in Semiconductor Monolayers (FTu3Q.2)** **Presenter**: Qile Wu, *University of Michigan* Expand for Abstract / Authors Two-photon absorption in GaN monolayers is studied with a systematic many-body theory. A nearly perfect quantum efficiency for two-photon absorption is found in a cavity, and the results identify vitally important quantum-memory and intriguing Coulomb enhancement effects. **Authors**:Qile Wu/University of Michigan Haiyi Liu/University of Michigan Ping Wang/University of Michigan Zetian Mi/University of Michigan Steven Cundiff/University of Michigan Mackillo Kira/University of Michigan	Paper
13:45 - 14:00	**Semiconductor III-V Nanowires as Building Blocks for Flexible Nonlinear Photonic Components (FTu3Q.3)** **Presenter**: Gregoire Saerens, *ETH Zurich* Expand for Abstract / Authors We show two functionalities of GaAs nanowires to control the second harmonic generation: beam steering up to 30° in sliced nanoantenna and three orders of magnitude enhancement within 3% stretching in mechanically tunable metamaterials. **Authors**:Gregoire Saerens/ETH Zurich Iek Tang/ETH Zurich Esther Bloch/ETH Zurich Kristina Frizyuk/ITMO University Marc Reig Escalé/ETH Zurich Claude Renaut/ETH Zurich Flavia Timpu/ETH Zurich Vogler-Neuling Viola/ETH Zurich Igor Shtrom/Saint Petersburg Academic University Elizaveta Semenova/Technical University of Denmark Elizaveta Lebedkina/Technical University of Denmark Alexei Bouravleuv/Saint Petersburg Academic University Zarina Sadrieva/ITMO University George Cirlin/Saint Petersburg Academic University Mihail Petrov/ITMO University Rachel Grange/ETH Zurich Mariia Timofeeva/ETH Zurich	Paper

14:00 - 14:15 **What Is the Origin of Second Harmonic Generation in Strained Silicon Waveguides? (FTu3Q.4)**
Presenter: Alessandro Trenti, *University of Trento*
Expand for Abstract / Authors

Paper

A study of SHG in silicon waveguides strained by a silicon nitride cladding is reported. Interestingly, the dominant role in the measured SHG is due to charges in the cladding and not from strain effect.

Authors:Alessandro Trenti/University of Trento Claudio Castellan/University of Trento Chiara Vecchi/University of Trento Alessandro Marchesini/University of Trento Mattia Mancinelli/University of Trento Mher Ghulinyan/Fondazione Bruno Kessler Georg Pucker/Fondazione Bruno Kessler Lorenzo Pavesi/University of Trento

14:15 - 14:30 **Experimental Demonstration of Self-Phase-Modulation Induced Wavelength Shift in an 80-nm thick ITO-ENZ Material in the Telecom C Band (FTu3Q.5)**
Presenter: Cong Liu, *University of Southern California*
Expand for Abstract / Authors

Paper

We experimentally demonstrate self-phase-modulation-induced wavelength shift of up-to 15-nm in an 80-nm-thick ITO at a zero-permittivity wavelength of 1550 nm. We also explore the effect of the pump pulse temporal duration on the wavelength shift.

Authors:Cong Liu/University of Southern California M. Zahirul Alam/University of Ottawa Kai Pang/University of Southern California Karapet Manukyan/University of Southern California Joshua Hendrickson/Air Force Research Laboratory Evan Smith/Air Force Research Laboratory Yiyu Zhou/University of Rochester Orad Reshef/University of Ottawa Hao Song/University of Southern California Runzhou Zhang/University of Southern California Haoqian Song/University of Southern California Fatemeh Alishahi/University of Southern California Ahmad Fallahpour/University of Southern California Ahmed Almaiman/University of Southern California Robert Boyd/University of Rochester Moshe Tur/Tel Aviv University Alan Willner/University of Southern California

14:30 - 14:45	**Coherent Mid-Infrared Supercontinuum Sources in Silicon-Germanium Waveguides (FTu3Q.6)** **Presenter**: Alberto Della Torre, *Institut des Nanotechnologies de Lyon* Expand for Abstract / Authors We report coherent mid-infrared supercontinuum generation in silicon-germanium waveguides. We show that the degree of coherence can be controlled by either employing an air clad configuration or a hybrid chalcogenide/silicon-germanium system. **Authors**:Alberto Della Torre/Institut des Nanotechnologies de Lyon Milan Sinobad/Institut des Nanotechnologies de Lyon Remi Armand/Institut des Nanotechnologies de Lyon Barry Luther-Davies/Australian National University Pan Ma/Australian National University Stephen Madden/Australian National University Sukanta Debbarma/Australian National University Khu Vu/Australian National University David Moss/Swinburne University of Technology Arnan Mitchell/RMIT University Jean-Michel Hartmann/CEA-Leti Jean-Marc Fedeli/CEA-Leti Christelle Monat/Institut des Nanotechnologies de Lyon Christian Grillet/Institut des Nanotechnologies de Lyon	Paper
14:45 - 15:00	**High-Gain Twin-Beam Generation in Waveguides: Experimental Characterization Using Cascaded Stimulated Emission (FTu3Q.7)** **Presenter**: Mihai Vidrighin, *Oxford University* Expand for Abstract / Authors We introduce a new method for spectral characterization of twin-beam generation in waveguides, based on cascaded stimulated emission. We provide a complete and accurate experimental characterization of high-gain effects in a parametric down-conversion source. **Authors**:Mihai Vidrighin/Oxford University Gil Triginer/Oxford University Nicolas Quesada/Xanadu Andreas Eckstein/Oxford University Merritt Moore/Oxford University Steve Kolthammer/Imperial College London John Sipe/University of Toronto Ian Walmsley/Oxford University	Paper

Topological Photonic Devices (STu3J)

Presider: Yasutomo Ota, *University of Tokyo*

13:00 - 13:30	**Recent advances in quantum topological photonics (STu3J.1)** **Presenter**: Mohammad Hafezi, *Joint Quantum Institute* Expand for Abstract / Authors We report on recent advances in the field of topological photonics, in particular in both silicon photonics and photonic crystal platforms. **Authors**:Mohammad Hafezi/Joint Quantum Institute Invited	Paper

13:30 - 13:45

Probing the Limits to Topological Protection in Photonic Crystal Waveguides and Cavities (STu3J.2)
Presenter: René Barczyk, *AMOLF*
Expand for Abstract / Authors

Paper

We employ near- and far-field optical microscopy to characterize the propagation of edge states in topological photonic crystal waveguides and cavities. We test fundamental and practical limits to topological protection, quantifying dispersion, loss, and scattering.

Authors:René Barczyk/AMOLF Sonakshi Arora/Delft University of Technology Thomas Bauer/Delft University of Technology Nikhil Parappurath/AMOLF Ewold Verhagen/AMOLF Kobus Kuipers/Delft University of Technology

13:45 - 14:00

A Synthetic Hall effect for photons (STu3J.3)
Presenter: Soonwook Kim, *University of Illinois at Urbana Champaign*
Expand for Abstract / Authors

Paper

We experimentally realize a synthetic Hall effect for light, by producing synthetic electric and magnetic fields in a nanophotonic resonator chain. We show that the synthetic Hall effect can be dynamically reconfigured and manifests as non-reciprocal light transmission through the system.

Authors:Soonwook Kim/University of Illinois at Urbana Champaign Donggyu Sohn/University of Illinois at Urbana Champaign Christopher Peterson/University of Illinois at Urbana Champaign Gaurav Bahl/University of Illinois at Urbana Champaign

14:00 - 14:15

Generating Light with Orbital and Spin Angular Momenta in Silicon Waveguides using Berry’s Phase (STu3J.4)
Presenter: Ryan Patton, *Ohio State University*
Expand for Abstract / Authors

Paper

We utilize out-of-plane waveguides exhibiting Berry’s phase to generate guided light carrying angular momentum. The normalized output orbital and spin angular momenta are computed to be 0.85 and 0.15 per photon, respectively, at 1550 nm wavelength.

Authors:Ryan Patton/Ohio State University Ronald Reano/Ohio State University

14:15 - 14:30	**Topological nanophotonic circuits based on valley kink states (STu3J.5)** **Presenter**: Xiankai Sun, *The Chinese University of Hong Kong* Expand for Abstract / Authors We experimentally demonstrated topological light manipulation based on valley kink states, achieving waveguiding, refracting, resonating, and routing of photons on an integrated platform. These functionalities are essential for the development of large-scale backscattering-free photonic systems. **Authors**:Jingwen Ma/The Chinese University of Hong Kong Xiang Xi/The Chinese University of Hong Kong Xiankai Sun/The Chinese University of Hong Kong	Paper
14:30 - 14:45	**Silicon Topological Photonic Bandpass/Notch Filter (STu3J.6)** **Presenter**: Lu Sun, *Shanghai Jiao Tong University* Expand for Abstract / Authors By constructing waveguides and triangular microloops with two types of valley photonic crystals, we experimentally demonstrate a topological photonic bandpass/notch filter in the telecom band on the SOI platform. **Authors**:Lu Sun/Shanghai Jiao Tong University Hongwei Wang/Shanghai Jiao Tong University Yong Zhang/Shanghai Jiao Tong University Yikai Su/Shanghai Jiao Tong University	Paper
14:45 - 15:00	**Slow Light Waveguide Based on Topological Edge States in Valley Photonic Crystals (STu3J.7)** **Presenter**: Hironobu Yoshimi, *The University of Tokyo* Expand for Abstract / Authors We demonstrate slow light waveguides using topological valley kink states. We found in-gap high-group-index modes at bearded interfaces of silicon-based valley photonic crystals, clearing the path to build topologically-protected slow light waveguides only using semiconductors. **Authors**:Hironobu Yoshimi/The University of Tokyo Takuto Yamaguchi/The University of Tokyo Ryota Katsumi/The University of Tokyo Yasutomo Ota/The University of Tokyo Yasuhiko Arakawa/The University of Tokyo Satoshi Iwamoto/The University of Tokyo	Paper

High Energy Lasers for Facilities I (STu3E)

Presider: Erhard Gaul, *University of Texas at Austin*

13:00 - 13:30 **10 Hz Petawatt lasers for driving extreme beams of particles and photons for applications in science, industry, and security (STu3E.1)** _ Paper

Presenter: Ceri Brenner, *UK Research and Innovation*

Expand for Abstract / Authors

The Central Laser Facility in the UK is building a new 10 Hz PW application centre - a £81.2 M facility that will use CLF's patented diode-pumped laser technology (DiPOLE) to drive plasma accelerator beams of particles and x-rays for academic and industry users - for imaging industrial components and biomedical systems, for fundamental discovery science, & for supporting innovation. This application centre will build a unique innovation ecosystem with academia, industry and security communities.

Authors:Ceri Brenner/UK Research and Innovation

Invited

13:30 - 13:45 **(Withdrawn) Performance Optimization of the Allegra TW-class Kilohertz Laser System at ELI-Beamlines (STu3E.2)**

Presenter: Roman Antipenkov, *Institute of Physics CAS*

Expand for Abstract / Authors

We report on the performance optimization of the ALLEGRA laser system, as a reliable source for user experiments. This TW-class system is designed to provide sub-15 fs pulses with tens of mJ of energy with exceptionally high contrast at a 1 kHz repetition rate.

Authors:Roman Antipenkov/Institute of Physics CAS František Batysta/Institute of Physics CAS Robert Boge/Institute of Physics CAS Emily Erdman/Institute of Physics CAS Michael Greco/Institute of Physics CAS Jonathan T. Green/Institute of Physics CAS Zbyněk Hubka/Institute of Physics CAS Lukáš Indra/Institute of Physics CAS Karel Majer/Institute of Physics CAS Tomáš Mazanec/Institute of Physics CAS Petr Mazúrek/Institute of Physics CAS Jack Naylon/Institute of Physics CAS Jakub Novák/Institute of Physics CAS Václav Šobr/Institute of Physics CAS Alexandr Špaček/Institute of Physics CAS Murat Torun/Institute of Physics CAS Boguslaw Tykalewicz/Institute of Physics CAS Pavel Bakule/Institute of Physics CAS Bedrich Rus/Institute of Physics CAS

13:45 - 14:00 **Broadband parametric-gain optimization of partially deuterated KDP with two-wavelength tuning curves (STu3E.3)** _ Paper

Presenter: Christophe Dorrer, *Laboratory for Laser Energetics*

Expand for Abstract / Authors

We investigate the use of phase-matching parametric-gain curves at two wavelengths to determine the deuteration level of a partially deuterated KDP crystal and optimize its broadband performance for optical parametric chirped-pulse amplification.

Authors:Christophe Dorrer/Laboratory for Laser Energetics Ildar Begishev/Laboratory for Laser Energetics Seung-Whan Bahk/Laboratory for Laser Energetics Jake Bromage/Laboratory for Laser Energetics

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14:00 - 14:30

Few Cycle, Phase Controlled Laser Developments for ELI-ALPS (STu3E.4)
Presenter: Karoly Osvay, *University of Szeged*
Expand for Abstract / Authors

Paper

Developments in high repetition rate, efficient amplification, nonlinear pulse compression, and diagnostics are discussed towards the next upgrade of the 100W average power, TW-to-PW peak power, single and few cycle light sources of ELI-ALPS.

Authors:Karoly Osvay/University of Szeged Adam Borzsonyi/University of Szeged Huabao Cao/ELI-ALPS, ELI-HU Nkft. Vladimir Chvykov/ELI-ALPS, ELI-HU Nkft. Eric Cormier/ELI-ALPS, ELI-HU Nkft. Roland Flender/ELI-ALPS, ELI-HU Nkft. Peter Jojart/ELI-ALPS, ELI-HU Nkft. Mikhail Kalashnikov/ELI-ALPS, ELI-HU Nkft. Balint Kiss/ELI-ALPS, ELI-HU Nkft. Mate Kurucz/ELI-ALPS, ELI-HU Nkft. Nikita Khodakovskiy/ELI-ALPS, ELI-HU Nkft. Rodrigo Lopez-Martens/ELI-ALPS, ELI-HU Nkft. Roland Nagymihaly/ELI-ALPS, ELI-HU Nkft. Viktor Pajer/ELI-ALPS, ELI-HU Nkft. Imre Seres/ELI-ALPS, ELI-HU Nkft. Szabolcs Toth/University of Szeged

Invited

14:30 - 15:00

High-Efficiency Parametric Amplification of Broadband Spectrally Incoherent Pulses (STu3E.5)
Presenter: Christophe Dorrer, *Laboratory for Laser Energetics*
Expand for Abstract / Authors

Paper

We investigate the high-efficiency parametric amplification of broadband incoherent waves, in particular in a spatially collinear spectrally quasi-degenerate configuration increasing the output energy and bandwidth, for enhanced laser–target interaction.

Authors:Christophe Dorrer/Laboratory for Laser Energetics Elizabeth Hill/Laboratory for Laser Energetics Jonathan Zuegel/Laboratory for Laser Energetics

Wide-Bandgap Materials (STu3P)

Presider: Oana Malis

13:00 - 13:30

β-Ga2O3: MacEtch, Passivation, and Ultra-wide Bandgap Photonic Devices (STu3P.1)
Presenter: Xiuling Li, *University of Illinois*
Expand for Abstract / Authors

Paper

Using the unconventional metal-assisted chemical etching (MacEtch) method, we present the fabrication of high aspect ratio β-Ga_2O_3 nanostructures and characterization of photonic devices enabled by the high quality surface produced.

Authors:Xiuling Li/University of Illinois

Invited

13:30 - 13:45 **Toward Frequency-Selective Surfaces via Doping of Zinc Oxide with a Focused Ion Beam (STu3P.2)**
Presenter: Hongyan Mei, *University of Wisconsin-Madison*
Expand for Abstract / Authors

Paper

We demonstrate a method to modify the optical properties of zinc oxide by doping with gallium using a focused-ion beam system, which may be a promising way to create ultra-thin plasmonic devices.

Authors:Hongyan Mei/University of Wisconsin-Madison Alexander Koch/Friedrich Schiller University Jena Jad Salman/University of Wisconsin-Madison Chenghao Wan/University of Wisconsin-Madison Raymond Wambold/University of Wisconsin-Madison Martin Hafermann/Friedrich Schiller University Jena Jura Rensberg/Friedrich Schiller University Jena Carsten Ronning/Friedrich Schiller University Jena Mikhail Kats/University of Wisconsin-Madison

13:45 - 14:00 **High-Q Suspended Optical Resonators in 3C-SiC Obtained by Thermal Annealing (STu3P.3)**
Presenter: Keith Powell, *University of Sydney*
Expand for Abstract / Authors

Paper

We fabricate suspended single-mode optical waveguides and ring resonators in 3C-SiC that operate at telecommunication wavelength, leverage post-fabrication thermal annealing to minimize optical propagation losses and demonstrate Q of over 41,000

Authors:Keith Powell/University of Sydney Amirhassan Shams-Ansari/Harvard University Smit Desai/University of Sydney Mitchell Austin/University of Sydney Jiangdong Deng/Harvard University Neil Sinclair/Harvard University Marko Loncar/Harvard University Xiaoke Yi/University of Sydney

14:00 - 14:15 **High-Efficiency Ultraviolet Emission from AlInN/GaN Nanowires Grown by Molecular Beam Epitaxy (STu3P.4)**
Presenter: Ravi Teja Velpula, *New Jersey Institute of Technology*
Expand for Abstract / Authors

Paper

The epitaxial growth and characterization of AlInN/GaN core-shell nanowire structures with highly stable emission and high internal quantum efficiency of ~52% in the ultraviolet wavelength range are presented.

Authors:Ravi Teja Velpula/New Jersey Institute of Technology Barsha Jain/New Jersey Institute of Technology HA QUOC THANG BUI/New Jersey Institute of Technology Hieu Nguyen/New Jersey Institute of Technology

14:15 - 14:30

Integrated ScAlN Photonic Circuits on Silicon Substrate (STu3P.5)
Presenter: Nanxi Li, *Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research)*
Expand for Abstract / Authors

Paper

ScAlN has been applied in piezoelectric micro-electro-mechanical systems, while application in photonics remains unexplored. Here, ScAlN photonic circuits on silicon is presented, demonstrating waveguide propagation loss of 9±2 dB/cm and microring quality factor of 1.4×10^4

Authors:Shiyang Zhu/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Qize Zhong/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Nanxi Li/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Ting Hu/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Yuan Dong/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Zhengji Xu/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Yanyan Zhou/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Yuan Hsing Fu/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Navab Singh/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research)

14:30 - 14:45

Modulation of QCSE in InGaN-based LEDs with truncated-hexagonal-pyramid patterned-sapphire substrates (STu3P.6)
Presenter: Cheng-Yen Chien , *National Taiwan University*
Expand for Abstract / Authors

Paper

A method for the modulation of QCSE inside multiple-quantum wells of InGaN-based LEDs is proposed and confirmed with photoluminescence, Raman spectra, and electroluminescence using an integrating sphere.

Authors:Cheng-Yen Chien /National Taiwan University Meng-Hsin Chen/Institute of Nuclear Energy Research Chia-Wei Pai/National Taiwan University Yu-Jen Lee/National Taiwan University Chiu-Chang Huang/National Taiwan University Vin-Cent Su/National United University Chieh-Hsiung Kuan/National Taiwan University

14:45 - 15:00

Quantum Dots Color Converters for microLEDs: Material Composite and Patterning Technology (STu3P.7)
Presenter: Xinhao Li, *Massachusetts Institute of Technology*
Expand for Abstract / Authors

Paper

We demonstrated high-resolution pixelated quantum dots (QDs)/thiol-ene photopolymer color converters patterned by projection lithography on microLEDs. The material composite and patterning technology enable high-efficiency, wide-gamut and low crosstalk color conversion compared to drop-cast QDs.

Authors:Xinhao Li/Massachusetts Institute of Technology Darshan Kundaliya/OSRAM Opto Semiconductors Inc. Zheng Jie Tan/Massachusetts Institute of Technology Maria Anc/OSRAM Opto Semiconductors Inc. Nicholas Fang/Massachusetts Institute of Technology

Integrated Frequency Combs (STu3H)

Presider: Youjian Song, *Tianjin University*

13:00 - 13:15

Optical synthesis by spectral translation (STu3H.1)
Presenter: Jennifer Black, *National Institute of Standards and Technology, Boulder*
Expand for Abstract / Authors

Paper

We present a technique for optical-frequency synthesis by four-wave-mixing spectral translation of a soliton microcomb in a second microresonator. We demonstrate broadly tunable translation by over 600 nm and explore parametric amplification of the microcomb.

Authors:Jennifer Black/National Institute of Standards and Technology, Boulder Su-Peng Yu/National Institute of Standards and Technology, Boulder Richelle Streater/National Institute of Standards and Technology, Boulder Jordan Stone/National Institute of Standards and Technology, Boulder Xiyuan Lu/National Institute of Standards and Technology, Gaithersburg Gregory Moille/National Institute of Standards and Technology, Gaithersburg Kartik Srinivasan/National Institute of Standards and Technology, Gaithersburg Scott Papp/National Institute of Standards and Technology, Boulder

13:15 - 13:30

Adjustable repetition rate Kerr frequency combs in an integrated silica microring (STu3H.2)
Presenter: Stuart Murdoch, *University of Auckland*
Expand for Abstract / Authors

Paper

We generate Kerr frequency combs in a synchronously-driven silica microring resonator. Driving at integer (and fractional) multiples of the cavity free-spectral-range, we obtain soliton microcombs with adjustable comb spacings between 3.2 and 19.2 GHz.

Authors:Yiqing Xu/University of Auckland Yi Lin/Zhejiang University Alexander Nielsen/University of Auckland Ian Hendry/University of Auckland Stephane Coen/University of Auckland Miro Erkintalo/University of Auckland Huilian Ma/Zhejiang University Stuart Murdoch/University of Auckland

13:30 - 13:45

(Withdrawn) Subharmonic Synchronization of Kerr Breather Solitons to a Periodic Force (STu3H.3)
Presenter: Jordan Stone, *NIST*
Expand for Abstract / Authors

We show how Kerr-soliton breathing oscillations synchronize to the subharmonic of a periodic pump-laser modulation with locking ratios up to 7:1. We explore the Kerr-soliton parameter space and measure its effect on the nonlinear coupling.

Authors:Jordan Stone/NIST Scott Papp/NIST

13:45 - 14:00

Ultrafast real-time dynamics of frequency microcomb transitions (STu3H.4)
Presenter: XINGHE JIANG, *University of California, Los Angeles*
Expand for Abstract / Authors

Paper

We demonstrated a real-time parametric time magnifier (PTM) and recorded the ultrafast transitions between different soliton states in Kerr frequency comb.

Authors:XINGHE JIANG/University of California, Los Angeles Wenting Wang/University of California, Los Angeles Jinghui Yang/University of California, Los Angeles Mingbin Yu/University of Southern California Dim-Lee Kwong/A*STAR Chee Wei Wong/University of California, Los Angeles

14:00 - 14:15

Dark-pulse Kerr combs in linearly coupled microring structures (STu3H.5)
Presenter: Óskar Helgason, *Chalmers University of Technology*
Expand for Abstract / Authors

Paper

We demonstrate mode-locked dark-pulse Kerr comb formation in linearly coupled microresonators. The comb states are coherent and reproducible, and feature 36% conversion when pumped with 2.5 mW power.

Authors:Óskar Helgason/Chalmers University of Technology Zhichao Ye/Chalmers University of Technology Krishna Twayana/Chalmers University of Technology Peter Andrekson/Chalmers University of Technology Jochen Schröder/Chalmers University of Technology Victor Company/Chalmers University of Technology

14:15 - 14:30

Turn-Key, High-Efficiency Kerr Comb Source (STu3H.6)
Presenter: Bok Young Kim, *Columbia University*
Expand for Abstract / Authors

Paper

We demonstrate automated Kerr comb generation in the normal group-velocity dispersion regime. Using a coupled-ring geometry, we precisely control the spectral positions of avoided mode crossings to generate coherent combs with 41% pump-to-comb conversion efficiencies.

Authors:Bok Young Kim/Columbia University Yoshitomo Okawachi/Columbia University Jae Jang/Columbia University Mengjie Yu/Columbia University Xingchen Ji/Columbia University Yun Zhao/Columbia University Chaitanya Joshi/Columbia University Michal Lipson/Columbia University Alexander Gaeta/Columbia University

14:30 - 14:45

Octave-Spanning Frequency Comb Generation in All-Normal-Dispersion Silicon-Rich Silicon Nitride Waveguide (STu3H.7)
Presenter: Simon Christensen, *Technical University of Denmark*
Expand for Abstract / Authors

Paper

A frequency comb spanning from 1100 nm to 2200 nm is generated in an all-normal-dispersion silicon-rich silicon nitride waveguide. Phase noise measurements indicate
that the supercontinuum generation retains the coherence.

Authors:Simon Christensen/Technical University of Denmark Zhichao Ye/Chalmers University of Technology Morten Bache/Technical University of Denmark Victor Company/Chalmers University of Technology

14:45 - 15:00	**Ultra-efficient frequency comb generation in AlGaAs-on-insulator microresonators (STu3H.8)** **Presenter**: Lin Chang, *University of California Santa Barbara* Expand for Abstract / Authors We demonstrated ultra-efficient frequency comb generation in AlGaAs-on-insulator ring resonators that have a quality factor beyond 1.5×10^6. The threshold power is as low as 36 µW. **Authors**:Lin Chang/University of California Santa Barbara weiqiang xie/University of California Santa Barbara Haowen Shu/Peking university Qifan Yang/Caltech Boqiang Shen/Caltech Andreas Boes/RMIT Jonathan Peters/University of California Santa Barbara Warren Jin/University of California Santa Barbara Chao Xiang/University of California Santa Barbara Songtao Liu/University of California Santa Barbara Gregory Moille/NIST Su Peng Yu/NIST Xingjun Wang/Peking university Kartik Srinivasan/NIST Scott Papp/NIST Kerry Vahala/Caltech John Bowers/University of California Santa Barbara	Paper

Novel THz Generation (STu3G)

Presider: Daniel Mittleman, *Brown University*

13:00 - 13:30	**Room Temperature Compact Terahertz Laser Tunable over 1 THz (STu3G.1)** **Presenter**: Arman Amirzhan, *Harvard University* Expand for Abstract / Authors We demonstrate a new type of Terahertz Gas Laser pumped by a tunable solid-state laser. This laser has a wide tuning range and operates at room temperature with a high efficiency in a very compact design. **Authors**:Arman Amirzhan/Harvard University Paul Chevalier/Harvard University Fan Wang/Massachusetts Institute of Technology Marco Piccardo/Harvard University Steven Johnson/Massachusetts Institute of Technology Henry Everitt/Redstone Arsenal Federico Capasso/Harvard University	Paper

13:30 - 13:45

(Withdrawn) Multi-mode Emission From A Waveguide Integrated THz Quantum Cascade Ring Laser (STu3G.2)
Presenter: Michael Jaidl, *TU Wien*
Expand for Abstract / Authors

We present multi-mode emission from epi-up and epi-down mounted THz Quantum Cascade Ring Lasers (QCRL). Our experimental results are promising to control laser characteristics like threshold, mode spacing and dispersion by varying the surrounding waveguide.

Authors:Michael Jaidl/TU Wien Martin Kainz/TU Wien Sebastian Schoenhuber/TU Wien Dominik Theiner/TU Wien Aaron Andrews/TU Wien Maximilian Beiser/TU Wien Miriam Giparakis/TU Wien Gottfried Strasser/TU Wien Juraj Darmo/TU Wien Karl Unterrainer/TU Wien

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13:45 - 14:00

Generation of Continuously-Tunable, Narrowband THz Pulses from Phase-Locked Femtosecond Pulse Bursts (STu3G.3)
Presenter: Vinzenz Stummer, *TU Wien*
Expand for Abstract / Authors

Paper

We demonstrate generation of continuously-tunable, narrowband THz pulses from phase-locked multi-millijoule femtosecond pulse bursts by optical rectification in a tilted-pulse-front setup. Experimental results indicate advances in both, femtosecond pulse burst and high-energy THz source technology.

Authors:Vinzenz Stummer/TU Wien Tobias Flöry/TU Wien Edgar Kaksis/TU Wien Audrius Pugzlys/TU Wien Andrius Baltuska/TU Wien Gergö Krizsán/University of Pécs Gyula Polónyi/University of Pécs József Fülöp/University of Pécs

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14:00 - 14:15

Generation of High-Field Single-Cycle Terahertz Pulses at 100 kHz (STu3G.4)
Presenter: Patrick Kramer, *SLAC National Accelerator Laboratory*
Expand for Abstract / Authors

Paper

High-field single-cycle terahertz pulses were generated through optical rectification in LiNbO3 at 100 kHz with 144 mW maximum power using a high energy, spectrally broadened, sub-100 fs Yb:YAG amplifier system for tilted pulse front pumping.

Authors:Patrick Kramer/SLAC National Accelerator Laboratory Matthias Hoffmann/SLAC National Accelerator Laboratory Franz Tavella/SLAC National Accelerator Laboratory

14:15 - 14:30

High Power Thin-Disk Oscillator Driven Single-Cycle THz Source with 66 mW of Average Power (STu3G.5)
Presenter: Frank Meyer, *Ruhr-University Bochum*
Expand for Abstract / Authors

We demonstrate a THz source based on optical rectification of a high-power thin-disk laser using the tilted pulse front technique in Lithium Niobate, reaching a record-high average power of 66mW at 13.3MHz repetition rate.

Authors:Frank Meyer/Ruhr-University Bochum Tim Vogel/Ruhr-University Bochum Shahwar Ahmed/Ruhr-University Bochum Clara Saraceno/Ruhr-University Bochum

Paper

14:30 - 14:45

Multi-cycle terahertz generation in a periodically poled Rb:KTP crystal (STu3G.6)
Presenter: Wenlong Tian, *DESY*
Expand for Abstract / Authors

We investigate multi-cycle 0.5-Terahertz generation in a periodically poled Rb-doped potassium titanyl phosphate (PPKTP) crystal. Up to 0.65-µJ terahertz energy is obtained at 77 K with maximum internal optical-to-terahertz efficiency of 0.09%.

Authors:Wenlong Tian/DESY Giovanni Cirmi/DESY Carlota Canalias/Royal Institute of Technology Andrius Zukauskas/Royal Institute of Technology Halil Olgun/DESY Elias Kueny/DESY Anne-Laure Calendron/DESY Fabian Reichert/University of Hamburg Kore Hasse/The Hamburg Centre for Ultrafast Imaging Yi hua/DESY Damian Schimpf/DESY Hüseyin Çankaya/DESY Mikhail Pergament/DESY Michael Hemmer/DESY Nicholas Matlis/DESY Valdas Pasiskevicius/Royal Institute of Technology Fredrik Laurell/Royal Institute of Technology Franz KÄRTNER/DESY

Paper

14:45 - 15:00

Sub-Joule Single-Cycle Terahertz Pulse by Frequency Downshifting of a Picosecond 10 µm CO_2 Laser Pulse in a Tailored Plasma Structure (STu3G.7)
Presenter: Zan Nie, *UCLA*
Expand for Abstract / Authors

We propose a method of generating sub-joule single-cycle terahertz pulse tunable from 2-10 THz by using a picosecond 10 µm CO_2 laser pulse based on frequency downshifting in a tailored plasma structure.

Authors:Zan Nie/UCLA Chih-Hao Pai/Tsinghua University Jianfei Hua/Tsinghua University Wei Lu/Tsinghua University Warren Mori/UCLA Chan Joshi/UCLA

Paper

Space Division Multiplexing I (STu3R)

Presider: Raja Ahmad, *OFS Laboratories*

13:00 - 13:30 **Space-Division Multiplexing Fibers for Microwave Signal Processing (STu3R.1)**
Presenter: Ivana Gasulla Mestre, *Universitat Politècnica de València*
Expand for Abstract / Authors

Paper

We report the implementation of tunable microwave signal processing based on sampled true time delay line operation using a dispersion-engineered heterogeneous multicore fiber link.

Authors:Ivana Gasulla Mestre/Universitat Politècnica de València Sergi García/Universitat Politècnica de València Mario Ureña/Universitat Politècnica de València

Invited

13:30 - 13:45 **Annular core photonic crystal fiber for propagation of optical vortices (STu3R.2)**
Presenter: Manish Sharma, *Electrical Engineering*
Expand for Abstract / Authors

Paper

We demonstrate for the first time the transmission of OAM and vector singular beams inside an endlessly-monoradial photonic crystal fiber (AC-PCF). The high mode purity indicates that the AC-PCF can find applications in space-division multiplexing and optical sensing.

Authors:Manish Sharma/Electrical Engineering Fatemeh Amirkhan/Electrical Engineering Satyendra Mishra/Electrical Engineering Dipankar Sengupta/Electrical Engineering Younès Messaddeq/Electrical Engineering François Blanchard/Electrical Engineering Bora Ung/Electrical Engineering

13:45 - 14:00 **All-Fiber Second-Order OAM Amplifier Based on Mode Selective Coupler (STu3R.3)**
Presenter: Yan Wu, *Shanghai University*
Expand for Abstract / Authors

Paper

We fabricate a kind of mode selective coupler which can generate $OAM_{\pm 2}$ mode, and further propose an all-fiber $OAM_{\pm 2}$ mode amplifier with high gain and good flatness at range of 1525-1575 nm.

Authors:Yan Wu/Shanghai University Xinyu He/Shanghai University Jianxiang Wen/Shanghai University Fufei Pang/Shanghai University Zhenyi Chen/Shanghai University Xianglong Zeng/Shanghai University Tingyun Wang/Shanghai University

14:00 - 14:15	**Optical-controlled Fast Switching of Radio Frequency Orbital Angular Momentum Beams with Different Modes and Steering Directions (STu3R.4)** **Presenter**: xiyao song, *State Key Laboratory of Information Photonics and Optical Communications, Beijing University of Post and Telecommunications* Expand for Abstract / Authors A system of optical-controlled fast switching of RF-OAM beams with different modes and steering directions is proposed. Two RF-OAM beams with l=1, θ=-30° and l=-1, θ=30° are generated and switched 5 times in 100ms. **Authors**:xiyao song/State Key Laboratory of Information Photonics and Optical Communications, Beijing University of Post and Telecommunications Jingcan Ma/State Key Laboratory of Information Photonics and Optical Communications, Beijing University of Post and Telecommunications Yunping Bai/State Key Laboratory of Information Photonics and Optical Communications, Beijing University of Post and Telecommunications Zhennan Zheng/State Key Laboratory of Information Photonics and Optical Communications, Beijing University of Post and Telecommunications Xinlu Gao/State Key Laboratory of Information Photonics and Optical Communications, Beijing University of Post and Telecommunications Shanguo Huang/State Key Laboratory of Information Photonics and Optical Communications, Beijing University of Post and Telecommunications	Paper
14:15 - 14:45	**Dynamic Mode Coupling In Mode-Division-Multiplexed Systems (STu3R.5)** **Presenter**: Joseph Kahn, *Stanford University* Expand for Abstract / Authors We investigate mode coupling dynamics in mode-division-multiplexed links by measuring the rate of channel change in a four-core coupled-core fiber and a single-mode fiber. We show that the speed of dynamics increases with increasing mode count. **Authors**:Karthik Choutagunta/Stanford University Joseph Kahn/Stanford University Invited	Paper

Ultrafast Electron Microscopy (FTu3B)

Presider: Mackillo Kira, *University of Michigan*

13:00 - 14:00

Ultrafast Electron Microscopy and Diffraction (FTu3B.1)
Presenter: Claus Ropers, *University of Göttingen*
Expand for Abstract / Authors

Paper

Abstract not available.
Bio not available.

Authors:Claus Ropers/University of Göttingen

Tutorial

14:00 - 14:30

Lightwave Topology for Strong-field Valleytronics (FTu3B.2)
Presenter: Alvaro Jimenez-Galan, *Max Born Institute*
Expand for Abstract / Authors

Paper

Modern light generation technology offers extraordinary capabilities for sculpting light pulses, with full control over individual electric field oscillations within each laser cycle. These capabilities are at the core of lightwave electronics -- the dream of ultrafast lightwave control over electron dynamics in solids, on a few-cycle to sub-cycle timescale, aiming at information processing at tera-Hertz to peta-Hertz rates. At the same time, quantum materials have opened the way to dissipationless electron transport and to the possibility to harness extra electronic degrees of freedom, such as the valley pseudospin, that can be used as additional information carriers. In this talk, I will show a robust and general approach to control and probe the topological properties of 2D quantum materials by controlling the sub-cycle structure of non-resonant driving fields at a few-femtosecond timescale. I will show that this control permits non-resonant excitation, manipulation and reading of valley-polarized electrons in 2D materials on timescales orders of magnitude shorter than valley lifetime, crucial for practical implementation of valleytronic devices.

Authors:Olga Smirnova/Max Born Institute Alvaro Jimenez-Galan/Max Born Institute R. Silva/Max Born Institute M. Ivanov/Max Born Institute

Invited

14:30 - 14:45	**Free Electron Cavity Quantum Electrodynamics in an Ultrafast Electron Microscope (FTu3B.3)** **Presenter**: Kangpeng Wang, *Israel Institute of Technology – Technion* Expand for Abstract / Authors We observe an increased interaction strength and time between quantum electron wavepackets and laser pulses due to the large Q-factor of a photonic crystal slab, promoting the integration of free-electron emitters into cavity quantum electrodynamics. **Authors**:Kangpeng Wang/Israel Institute of Technology – Technion Raphael Dahan/Israel Institute of Technology – Technion Michael Shentcis/Israel Institute of Technology – Technion Yaron Kauffmann/Technion-Israel Institute of Technology Adi Ben-Hayun/Israel Institute of Technology – Technion Ori Reinhardt/Israel Institute of Technology – Technion Shai Tsesses/Israel Institute of Technology – Technion Ido Kaminer/Israel Institute of Technology – Technion	Paper
14:45 - 15:00	**Spatial modulation of free-electron wavepackets by shaping ultrafast plasmonic excitations (FTu3B.4)** **Presenter**: Shai Tsesses, *Technion-Israeli institute of technology* Expand for Abstract / Authors By engineering the boundary conditions of plasmonic excitations, we present a novel method for electron wavefront shaping utilizing the ultrafast interaction of femtosecond free-electron and laser pulses in plasmonic samples. **Authors**:Shai Tsesses/Technion-Israeli institute of technology Raphael Dahan/Technion-Israeli institute of technology Kangpeng Wang/Technion-Israeli institute of technology Guy Bartal/Technion-Israeli institute of technology Ido Kaminer/Technion-Israeli institute of technology	Paper

Laser-Based Photonic Fabrication and Integration (ATu3K)

Presider: Manyalibo Matthews, *Lawrence Livermore National Laboratory*

13:00 - 13:15 **Dynamic modelling for predicting temperature evolution and modification during fs-laser welding of borofloat glass (ATu3K.2)** Paper

Presenter: Jie Qiao, *Rochester Institute of Technology*
Expand for Abstract / Authors

A dynamic heat accumulation modelling for femtosecond laser welding of Borofloat glass is developed and verified experimentally. The temperature evolution and internal modifications are predicted by incorporating the nonlinear electron dynamics along with temperature dependent thermal properties.

Authors:Pankaj Sahoo/Rochester Institute of Technology Tao Feng/Rochester Institute of Technology Manish Sharma/Rochester Institute of Technology Gabriel von Kessel/Rochester Institute of Technology Susant Patra/Lawrence Livermore National Labs Razi Haque/Lawrence Livermore National Labs Jie Qiao/Rochester Institute of Technology

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13:15 - 13:30 **Strong Nonlinear Optics in On-chip Lithium Niobate Photonic Molecules Fabricated by Femtosecond Laser (ATu3K.3)** Paper

Presenter: Min Wang, *East China Normal University*
Expand for Abstract / Authors

A photonic molecule (PM) composed of two strongly coupled lithium niobate microdisks was fabricated using femtosecond laser ablation followed by focused ion beam milling. Strong cascaded four-wave mixing and stimulated Raman scattering was demonstrated.

Authors:Min Wang/East China Normal University Ni Yao/Zhejiang University Zhiwei Fang/East China Normal University Rongbo Wu/Shanghai Institute of Optics and Fine Mechanics Jianhao Zhang/Shanghai Institute of Optics and Fine Mechanics Jintian Lin/Shanghai Institute of Optics and Fine Mechanics Wei Fang/Zhejiang University Ya Cheng/Shanghai Institute of Optics and Fine Mechanics

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13:30 - 13:45 **Internal Structuring of Silicon using THz-Repetition-Rate Trains of Ultrashort Pulses (ATu3K.4)** Paper

Presenter: Andong Wang, *CNRS/Aix-Marseille Univ.*
Expand for Abstract / Authors

We generate and apply trains of infrared femtosecond pulses at the highest achievable repetition-rates. This gives unique multi-timescale control parameters used for improved energy deposition and reliable 3D laser writing deep inside silicon.

Authors:Andong Wang/CNRS/Aix-Marseille Univ. Amlan Das/CNRS/Aix-Marseille Univ. David Grojo/CNRS/Aix-Marseille Univ.

13:45 - 14:00	**Sulfur-Hyperdoped Silicon-Based Flexible Photodetector with Excellent Comprehensive Performance (ATu3K.5)** **Presenter**: Jin Xiaorong, *Nankai University* Expand for Abstract / Authors The first free-standing flexible photodetector based on sulfur-hyperdoped ultrathin silicon is obtained by femtosecond laser processing. The device described here exhibits excellent comprehensive performance, which surpasses most values reported for flexible Si-based photodetectors. **Authors**:Jin Xiaorong/Nankai University Qiang Wu/Nankai University Zixi Jia/Nankai University Song Huang/Nankai University Jianghong Yao/Nankai University Jingjun Xu/Nankai University	Paper
14:00 - 14:15	**3-D optical cavities created using local light-triggered polymerization on fiber tips (ATu3K.6)** **Presenter**: Jonathan Smith, *Air Force Institute of Technology* Expand for Abstract / Authors This paper presents 3-D optical cavities fabricated directly onto cleaved ends of optical fibers by local light-triggered polymerization. This fabrication technique is quick, simple, and inexpensive compared to standard microfabrication processes. **Authors**:Jonathan Smith/Air Force Institute of Technology Jeremiah Williams/Air Force Institute of Technology Joseph Suelzer/Air Force Research Laboratory Nicholas Usechak/Air Force Research Laboratory Hengky Chandrahalim/Air Force Institute of Technology	Paper
14:15 - 14:30	**Miniature All-Sapphire Single-Crystal Fiber Fabry-Perot Sensor Fabricated by Femtosecond Laser Micromachining and CO_2 Laser Welding (ATu3K.7)** **Presenter**: Shuo Yang, *Virginia Tech* Expand for Abstract / Authors This paper reports a miniature all-sapphire high temperature fiber sensor based on fiber Fabry-Perot interferometer fabricated by femtosecond laser micromachining and CO_2 laser welding. The sensor was tested to 1455°C with up to 5.38 nm/°C sensitivity. **Authors**:Shuo Yang/Virginia Tech Ziang Feng/Virginia Tech Xiaoting Jia/Virginia Tech Gary Pickrell/Virginia Tech Ng Wing/Virginia Tech Anbo Wang/Virginia Tech Yizheng Zhu/Virginia Tech	Paper

Practical Implementations of Quantum Networks (ATu3S)

Presider: Peter Fendel, *Thorlabs Inc*

13:00 - 13:30	**Making quantum key distribution attractive for a mass market (ATu3S.1)** **Presenter**: Imran Khan, *MPI for the Science of Light* Expand for Abstract / Authors We will present the efforts of our startup project InfiniQuant. The idea is to make quantum key distribution small, affordable and integrate it into existing networks using COTS technology, opening QKD for a mass market. **Authors**:Imran Khan/MPI for the Science of Light Emanuel Eichhammer/MPI for the Science of Light Christoph Marquardt/MPI for the Science of Light Invited	
13:30 - 14:00	**Integrated platforms for continuous variable quantum optics (ATu3S.2)** **Presenter**: Dylan Mahler, *Xanadu Quantum Technologies* Expand for Abstract / Authors Integrated continuous variable quantum optics provides a promising route towards developing quantum technologies. In this talk I will describe Xanadu's approach to quantum computing and its progress towards building a practical quantum computer. **Authors**:Dylan Mahler/Xanadu Quantum Technologies Invited	Paper
14:00 - 14:15	**Generating Quantum Random Numbers on a CubeSat (SpooQy-1) (ATu3S.3)** **Presenter**: Ayesha Reezwana, *Centre for Quantum Technologies* Expand for Abstract / Authors We demonstrate a quantum random number generator based on entangled photon-pair statistics on-board a CubeSat orbiting in Low Earth Orbit. **Authors**:Ayesha Reezwana/Centre for Quantum Technologies Tanvirul Islam/Centre for Quantum Technologies James Grieve/Centre for Quantum Technologies Christoph F. Wildfeuer/FHNW University of Applied Sciences and Arts Northwestern Switzerland Alexander Ling/Centre for Quantum Technologies	Paper

14:15 - 14:30

Polarization Entangled Photon-pair Source Using a Broadband Pump (ATu3S.4)
Presenter: Chithrabhanu Perumangatt, *Centre for quantum technologies*
Expand for Abstract / Authors

Paper

We experimentally demonstrate a high quality, 100~nm broadband polarization entangled photon-pair source using a linear interferometer design based on a single periodically-poled potassium titanyl phosphate (PPKTP) crystal pumped with a free running laser diode.

Authors:Chithrabhanu Perumangatt/Centre for quantum technologies Alexander Lohrmann/Centre for quantum technologies Alexander Ling/Centre for quantum technologies

14:30 - 14:45

Stable Polarization Entanglement based Quantum Key Distribution over Metropolitan Fibre Network (ATu3S.5)
Presenter: Yicheng Shi, *National University of Singapore / CQT*
Expand for Abstract / Authors

Paper

Quantum key distribution with O-band polarization-entangled photons over deployed telecom fiber network is demonstrated. Liquid-crystal retarders are used to compensate for fiber birefringence induced errors and ensure stable operation.

Authors:Yicheng Shi/National University of Singapore / CQT soe moe thar/National University of Singapore / CQT Hou Shun Poh/National University of Singapore / CQT James Grieve/National University of Singapore / CQT Christian Kurtsiefer/National University of Singapore / CQT Alexander Ling/National University of Singapore / CQT

14:45 - 15:00

Practical Nonlocal Dispersion Compensation of O-band Entangled Photons over 20 km Deployed Metropolitan Fiber (ATu3S.6)
Presenter: James Grieve, *Centre for Quantum Technologies*
Expand for Abstract / Authors

Paper

Time-energy entangled photon pairs experience nonlocal dispersion compensation after propagation over multi-segment deployed telecommunications fiber. The preservation of tight timing correlations enables the use of broadband quantum light sources in existing metropolitan fiber networks.

Authors:James Grieve/Centre for Quantum Technologies Rui Ming Chua/Centre for Quantum Technologies Yicheng Shi/Centre for Quantum Technologies Hou Shun Poh/Centre for Quantum Technologies Christian Kurtsiefer/Centre for Quantum Technologies Alexander Ling/Centre for Quantum Technologies

Narrow- Linewidth Lasers (STu3M)

Presider: Fumio Koyama, *Tokyo Institute of Technology*

13:00 - 13:30	**Recent Progress of Narrow Linewidth InP Tunable Lasers (STu3M.1)** **Presenter**: Hiroyuki Ishii, *Furukawa Electric co. ltd.* Expand for Abstract / Authors Narrow linewidth tunable lasers have been developed as the digital coherent systems have been used in optical networks. In this paper, the state of the art in the tunable laser is reviewed. **Authors**:Hiroyuki Ishii/Furukawa Electric co. ltd. Invited	Paper
13:30 - 13:45	**Hybrid external cavity laser with a 160-nm tuning range (STu3M.2)** **Presenter**: Yuyao Guo, *Shanghai Jiao Tong University* Expand for Abstract / Authors We present a hybrid laser by using an InP reflective semiconductor optical amplifier chip butt-coupled with a SiN tunable reflector chip. The laser wavelength tuning range is 160 nm and the linewidth is 30 kHz. **Authors**:Yuyao Guo/Shanghai Jiao Tong University Linjie Zhou/Shanghai Jiao Tong University Gangqiang Zhou/Shanghai Jiao Tong University Ruiling Zhao/Shanghai Jiao Tong University Liangjun Lu/Shanghai Jiao Tong University Jianping Chen/Shanghai Jiao Tong University	Paper
13:45 - 14:00	**High Power (> 300 mW) 1550 nm On-Chip Laser Realized Using Passively Aligned Hybrid Integration (STu3M.3)** **Presenter**: Dave Kharas, *MIT Lincoln Laboratory* Expand for Abstract / Authors **Abstract:** We present the flip-chip integration of a slab coupled optical waveguide amplifier (SCOWA) with a silicon-nitride waveguide DBR, creating an external cavity laser emitting 312 mW with RIN of <-160 dB/Hz. **Authors**:Dave Kharas/MIT Lincoln Laboratory Jason Plant/MIT Lincoln Laboratory Suraj Bramhavar/MIT Lincoln Laboratory William Loh/MIT Lincoln Laboratory Reuel Swint/MIT Lincoln Laboratory Cheryl Sorace-Agaskar/MIT Lincoln Laboratory Christopher Heidelberger/MIT Lincoln Laboratory Paul Juodawlkis/MIT Lincoln Laboratory	Paper

14:00 - 14:15 **Robust Hybrid III-V/Si3N4 Laser with kHz-Linewidth and GHz-Pulling Range (STu3M.4)**
Presenter: Andres Gil-Molina, *Columbia University*
Expand for Abstract / Authors

Paper

We demonstrate a hybrid III-V/Si3N4 laser system robust to coupling losses and reflection variations. We show self-injection locking of a conventional laser diode to a high-Q resonator obtaining 1 kHz linewidth and 2 GHz pulling range.

Authors:Andres Gil-Molina/Columbia University ohad Westreich/Columbia University Yair Antman/Columbia University Xingchen Ji/Columbia University Alexander Gaeta/Columbia university Michal Lipson/Columbia University

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14:15 - 14:30 **Ultra-Narrow Linewidth Chip-Scale Heterogeneously Integrated Silicon/III-V Tunable Laser Pumped Si/Si_3N_4 SBS Laser (STu3M.5)**
Presenter: Grant Brodnik, *University of California Santa Barbara*
Expand for Abstract / Authors

Paper

We demonstrate a chip-scale ultra-narrow-linewidth stimulated Brillouin scattering laser pumped by a narrow-linewidth, tunable silicon/III-V laser. Reduction of ~600x in fundamental linewidth (1.1kHz to 1.8Hz) and ~9x in integral linewidth (110kHz to 12kHz) is achieved.

Authors:Grant Brodnik/University of California Santa Barbara Songtao Liu/University of California Santa Barbara Mark Harrington/University of California Santa Barbara Debapam Bose/University of California Santa Barbara Minh Tran/University of California Santa Barbara Duanni Huang/University of California Santa Barbara Joel Guo/University of California Santa Barbara Lin Chang/University of California Santa Barbara Paul Morton/Morton Photonics John Bowers/University of California Santa Barbara Daniel Blumenthal/University of California Santa Barbara

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14:30 - 14:45 **Temperature stable, narrow linewidth heterogeneously integrated semiconductor laser with Si_3N_4 cavity (STu3M.6)**
Presenter: Chao Xiang, *University of California Santa Barbara*
Expand for Abstract / Authors

Paper

We demonstrate the first heterogeneously integrated laser with a Si3N4 external cavity. Through a multilayer heterogeneous integration with InP and Si, the laser shows narrow linewidth and high temperature stability expected from a Si_3N_4 cavity.

Authors:Chao Xiang/University of California Santa Barbara warren jin/University of California Santa Barbara Joel Guo/University of California Santa Barbara Jonathan Peters/University of California Santa Barbara MJ Kennedy/University of California Santa Barbara Jennifer Selvidge/University of California Santa Barbara Paul Morton/Morton Photonics John Bowers/University of California Santa Barbara

14:45 - 15:00 **Easily Manufacturable GaAs/AlGaAs DFB Lasers with Shallow Surface Gratings and Oxide Aperture (STu3M.7)**
Presenter: Pengfei Zhang, *Wuhan National Lab for Optoelectronics*
Expand for Abstract / Authors

Paper

An easily manufacturable oxide-aperture ridge-waveguide GaAs/AlGaAs DFB laser has been demonstrated with first-order surface-gratings shallowly etched into the ridge. Uncoated devices exhibit SMSR>40dB over the temperature range from 10 to 50°C and 10mA threshold current .

Authors:Pengfei Zhang/Wuhan National Lab for Optoelectronics Can Liu/Wuhan National Lab for Optoelectronics Minwen Xiang/Wuhan National Lab for Optoelectronics Xiang Ma/Wuhan National Lab for Optoelectronics Su Tan/Wuhan National Lab for Optoelectronics Xiangyang Dai/Wuhan National Lab for Optoelectronics Jia Liu/Wuhan National Lab for Optoelectronics Gongyuan Zhao/Wuhan National Lab for Optoelectronics Bao Tang/China Information and Communication Technology Group Corporation Qiaoyin Lu/Wuhan National Lab for Optoelectronics John Donegan/Semiconductor Photonics Group, School of Physics and CRANN, Trinity College Weihua Guo/Wuhan National Lab for Optoelectronics

Beyond Photon Pairs (FTu3C)

Presider: Paulina Kuo, *National Inst of Standards & Technology*

13:00 - 13:30 **Large-scale quantum computing with quantum teleportation (FTu3C.1)**
Presenter: Akira Furusawa, *University of Tokyo*
Expand for Abstract / Authors

Paper

Time-domain-multiplexed quantum teleportation based on cluster states of light pulses is a promising way to large-scale and fault-tolerant universal quantum computing. I will explain this methodology.

Authors:Akira Furusawa/University of Tokyo

Invited

13:30 - 13:45 **On-Chip Squeezed-State Generation via Dual-Pumped Four-Wave Mixing (FTu3C.2)**
Presenter: Yun Zhao, *Columbia University*
Expand for Abstract / Authors

Paper

We experimentally demonstrate on-chip generation of quadrature squeezed light with a loss-corrected squeezing level of 3.1 dB. This technology provides a light source solution for photonics based large-scale continuous-variable quantum information processing.

Authors:Yun Zhao/Columbia University Yoshitomo Okawachi/Columbia University Jae Jang/Columbia University Xingchen Ji/Columbia University Michal Lipson/Columbia University Alexander Gaeta/Columbia University

13:45 - 14:00 **Scalable squeezed light source for continuous variable quantum sampling (FTu3C.3)**
Presenter: Nicolas Quesada, *Xanadu*
Expand for Abstract / Authors

Paper

We propose a squeezed light source meeting the stringent requirements of continuous variable quantum sampling. With typical parameters, squeezed states with mean photon number of 10 or higher can be generated at repetition rates of over 100MHz.

Authors:Zachary Vernon/Xanadu Nicolas Quesada/Xanadu Marco Liscidini/Universita degli studi di Pavia Blair Morrison/Xanadu Matteo Menotti/Xanadu Kang Tan/Xanadu John Sipe/University of Toronto

14:00 - 14:15 **High-gain twin-beam generation in waveguides: from Maxwell's equations to efficient simulation (FTu3C.4)**
Presenter: Nicolas Quesada, *Xanadu*
Expand for Abstract / Authors

Paper

We provide an efficient method for the calculation of the quantum state describing high-gain, twin-beam generation in waveguides that is derived from a canonical treatment of Maxwell's equations and accommodates self- and cross-phase modulation.

Authors:Nicolas Quesada/Xanadu Gil Triginer/University of Oxford Mihai Vidrighin/University of Oxford John Sipe/University of Toronto

14:15 - 14:30 **(Withdrawn) Ultra-high-rate Heralded Single Photon Source with 50 GHz-repetition-rate Mode-locked Pump Pulses and Multiplexed Single Photon Detectors (FTu3C.5)**
Presenter: Kentaro Wakui, *National Institute of Information and Communications Technology*
Expand for Abstract / Authors

Ultra-high-rate heralded single photon source at telecom wavelength is demonstrated using 50 GHz-repetition-rate mode-locked pump pulses and multiplexed eight superconducting single photon detectors. Our heralding rate surpassed 10 MHz while keeping the intensity correlation function below unity.

Authors:Kentaro Wakui/National Institute of Information and Communications Technology Yoshiaki Tsujimoto/National Institute of Information and Communications Technology Mikio Fujiwara/National Institute of Information and Communications Technology Isao Morohashi/National Institute of Information and Communications Technology Tadashi Kishimoto/National Institute of Information and Communications Technology Shigehito Miki/National Institute of Information and Communications Technology Hirotaka Terai/National Institute of Information and Communications Technology Masahide Sasaki/National Institute of Information and Communications Technology Masahiro Takeoka/National Institute of Information and Communications Technology

14:30 - 14:45	**Towards Frequency–Transverse-Mode Hybrid-Entangled Photon-Pair Generation in Optical Fiber (FTu3C.6)** **Presenter**: Dong Beom Kim, *University of Illinois at Urbana Champaign* Expand for Abstract / Authors We present stimulated-emission-based characterization of transverse photon-pair modes in birefringent fiber, towards an optical fiber source of photon-pairs hybrid-entangled in frequency and transverse spatial mode. **Authors**:Dong Beom Kim/University of Illinois at Urbana Champaign Bin Fang/The University of Texas at Austin Oliver Wang/Columbia University Xiye Hu/University of Illinois at Urbana Champaign Yujie Zhang/University of Illinois at Urbana Champaign Xinan Chen/University of Illinois at Urbana Champaign Karina Garay-Palmett/Centro de Investigación Científica y de Educación Superior de Ensenada Alfred U'Ren/Instituto de Ciencias Nucleares, Universidad Nacional Autónoma de México Virginia Lorenz/University of Illinois at Urbana Champaign	Paper
14:45 - 15:00	**Time-frequency multiplexed single-photon source based on LiNbO3 modulators (FTu3C.7)** **Presenter**: Marcello Massaro, *Paderborn University* Expand for Abstract / Authors We present advances in the use of gigahertz LiNbO3 modulators enabling us programmable delays, which we will use to implement a multiplexed single-photon source, based on birefringent phase-matching in KTP waveguides. **Authors**:Marcello Massaro/Paderborn University Vahid Ansari/Paderborn University Thomas Dirmeier/FAU Erlangen-Nürnberg Fabian Schlue/Paderborn University Kai-Hong Luo/Paderborn University Harald Herrmann/Paderborn University Benjamin Brecht/Paderborn University Christoph Marquardt/FAU Erlangen-Nürnberg Gerd Leuchs/FAU Erlangen-Nürnberg Christine Silberhorn/Paderborn University	Paper

Single Color Centers in Wide-Bandgap Semiconductors (FTu3D)

Presider: Marina Radulaski, *University of California Davis*

13:00 - 13:15 **Static and Dynamic Stark Tuning of the Silicon Vacancy in Silicon Carbide (FTu3D.1)**
Presenter: Alexander White, *Stanford*
Expand for Abstract / Authors

Paper

We present the DC Stark tuning of single Silicon Vacancies in SiC. We demonstrate static tuning across 200 GHz, exceeding the inhomogenous broadening, and dynamic tuning on timescales shorter than the optical decay rate.

Authors:Alexander White/Stanford Daniil Lukin/Stanford Melissa Guidry/Stanford Rahul Trivedi/Stanford Naoya Morioka/University of Stuttgart and Institute for Quantum Science and Technology IQST Charles Babin/University of Stuttgart and Institute for Quantum Science and Technology IQST Florian Kaiser/University of Stuttgart and Institute for Quantum Science and Technology IQST Jawad Ul-Hassan/Linkoping University Nguyen Tien Son/Linkoping University Takeshi Ohshima/National Institutes for Quantum and Radiological Science and Technology Praful Vasireddy/SLAC National Accelerator Laboratory Mamdouh Nasr/SLAC National Accelerator Laboratory Emilio Nanni/SLAC National Accelerator Laboratory Jörg Wrachtrup/University of Stuttgart and Institute for Quantum Science and Technology IQST Jelena Vuckovic/Stanford

13:15 - 13:30 **(Withdrawn) On the Limits of Spin Lifetimes in Group-IV Color Centers in Diamond (FTu3D.2)**
Presenter: Matthew Feldman, *Vanderbilt University*
Expand for Abstract / Authors

We explore the limits of spin polarization and spin lifetimes in group-IV color centers in electron grade CVD diamond via all-optical techniques at mK temperatures.

Authors:Matthew Feldman/Vanderbilt University Matthew Trusheim/Harvard University Claire Marvinney/Oak Ridge National Lab Noel Wan/MIT Michael Walsh/MIT Lorenzo DeSantis/MIT Kevin Chen/MIT Eric Bersin/MIT Yun-Yi Pai/Oak Ridge National Lab Richard Haglund/Vanderbilt University Dirk Englund/MIT Benjamin Lawrie/Oak Ridge National Lab

13:30 - 13:45 **Site-Controlled Generation of Tin-Vacancy Centers in Diamond via Shallow Ion Implantation and Diamond Overgrowth (FTu3D.3)**
Presenter: Alison Rugar, *Stanford University*
Expand for Abstract / Authors

Paper

We generate tin-vacancy (SnV^-) centers in patterned arrays by shallowly implanting Sn ions into diamond through an implantation mask and subsequently growing diamond. This method eliminates extraneous emission lines present in vacuum-annealed SnV^- samples.

Authors:Alison Rugar/Stanford University Haiyu Lu/Stanford University Constantin Dory/Stanford University Shuo Sun/Stanford University Patrick McQuade/Stanford University Zhi-Xun Shen/Stanford University Nicholas Melosh/Stanford University Jelena Vuckovic/Stanford University

13:45 - 14:00	**Measuring the Diamond Strain Tensor with Silicon-Vacancy Centers (FTu3D.4)** **Presenter**: Kelsey Bates, *University of Michigan* Expand for Abstract / Authors We use two coherent spectroscopy techniques to measure the strain tensor local to an ensemble of silicon-vacancy centers in diamond. Our results provide a possible pathway for using diamond as a tensorial strain gauge. **Authors**:Kelsey Bates/University of Michigan Matthew Day/University of Michigan Christopher Smallwood/San Jose State University Ronald Ulbricht/Max Planck Institute for Polymer Research Travis Autry/National Institute of Standards and Technology Rachel Owen/University of Michigan Geoffrey Diederich/University of Denver Tim Schroeder/Humboldt-Universitat zu Berlin Edward Bielejec/Sandia National Laboratories Mark Siemens/University of Denver Steven Cundiff/University of Michigan	Paper
14:00 - 14:15	**Unveiling Emitter Wavefunction Size via the Quantum Coherence of its Radiation (FTu3D.5)** **Presenter**: Aviv Karnieli, *Tel Aviv University* Expand for Abstract / Authors We study the fundamental influence of an emitter's wavefunction on the coherence of its electromagnetic radiation. Our findings allow for a new method to measure the wavefunction dimensions of charged quantum particles. **Authors**:Aviv Karnieli/Tel Aviv University Nicholas Rivera/Massachusetts Institute of Technology Ady Arie/Tel Aviv University Ido Kaminer/Technion	Paper
14:15 - 14:30	**Quantum Walk with Coherent Uncertainty in Electron-Laser Interaction** **(FTu3D.6)** **Presenter**: Ori Reinhardt, *Technion* Expand for Abstract / Authors We show that pulsed laser-driven free electrons undergo quantum walk with coherent uncertainty in the electron energy levels, characterized by their spread. We study this quantum walk experimentally and develop its analytic theory. **Authors**:Ori Reinhardt/Technion Ido Kaminer/Technion Kangpeng Wang/Technion Shai Tsesses/Technion saar nehemia/Technion Raphael Dahan/Technion Michael Shentcis/Technion	Paper

14:30 - 15:00 **Spins in Diamond for Quantum Metrology (FTu3D.7)**
Presenter: Joonhee Choi, *California Institute of Technology*
Expand for Abstract / Authors

Spins in diamond can be harnessed as powerful nanoscale sensors for electric and magnetic fields. Using tools from quantum optics and coherent spin control, we perform quantum metrology with ensembles of spins.

Authors:Joonhee Choi/California Institute of Technology Helena Knowles/University of Cambridge

Invited

15:15 - 16:45 (UTC - 07:00)

Joint Poster Session 5 (JTu2F)

Optical imaging to assess the early metabolic response of rat kidney to uninephrectomy (JTu2F.1)
Presenter: Mahsa Ranji, *University of Wisconsin-Milwaukee*
Expand for Abstract / Authors

Paper

Optical cryo-imaging captured the metabolic redox state (NADH/FAD) of rat kidneys quantitatively post-uninephrectomy. The result shows a more oxidized mitochondrial bioenergetics of the remaining kidney due to increased oxidative stress.

Authors:Mahsa Ranji/University of Wisconsin-Milwaukee Farnaz Foomani/University of Wisconsin-Milwaukee Shima mehrvar/University of Wisconsin-Milwaukee Soudeh Mostaghimi/University of Wisconsin-Milwaukee Nadya Zheleznova/Medical college of Wisconsin Allen Cowley/Medical college of Wisconsin

High Speed Vocal fold imaging By Using Smartphone Adapted Endoscope: A preliminary study (JTu2F.2)
Presenter: Youngkyu Kim, *Asan Medical Center*
Expand for Abstract / Authors

Paper

The objective of this study is the development Smartphone adaptor for endoscope to reduce the cost of device and demonstrate possibility of high speed vocal cord imaging by using high performance smartphone camera.

Authors:Youngkyu Kim/Asan Medical Center Jeongmin Oh/Asan Medical Center Seung-ho Choi/Asan Medical Center Ah Ra Jung/Asan Medical Center Yoon Se Lee/Asan Medical Center June-Goo Lee/Asan Medical Center Jun Ki Kim/Asan Medical Center

Alternating Projection Phase Recovery from Chromatic Aberration (JTu2F.3)
Presenter: Shaohui Zhang, *Beijing Institute of Technology*
Expand for Abstract / Authors

Paper

We report a phase recovery method utilizing the chromatic aberration of telecentric objective and alternating projection algorithm. The axial defocus distance of each color channel and complex function of sample can be calculated simultaneously.

Authors:Shaohui Zhang/Beijing Institute of Technology Guocheng Zhou/Beijing Institute of Technology Yao Hu/Beijing Institute of Technology Qun Hao/Beijing Institute of Technology

Compact All-fiber Mode-locked Laser at 1.8 μm for Three-photon Imaging (JTu2F.5)
Presenter: Xiaoxiao Wen, *South China University of Technology*
Expand for Abstract / Authors

Paper

We demonstrate a compact all-fiber mode-locked ultrashort pulse laser at 1.8 μm. This cost-effective pulsed laser is expected to be promising for deep-brain multiphoton imaging at the third near infrared optical tissue window.

Authors:Xiaoxiao Wen/South China University of Technology Yueyi Sun/South China University of Technology tian qiao/South China University of Technology Wei Lin/South China University of Technology Xiaoming Wei/South China University of Technology Zhongmin Yang/South China University of Technology

Development of ultraviolet down conversion filters based on scattering filter materials (JTu2F.6)
Presenter: Junfeng Zhu, *Kyushuuniversity*
Expand for Abstract / Authors

Paper

We proposed a novel ultraviolet down conversion filter. It is mainly fabricated based on our scattering filtering materials that can show transparency at specific ultraviolet wavelength owing to refractive index matching.

Authors:Junfeng Zhu/Kyushuuniversity Ryo Sakai/Kyushuuniversity Chenxi Zhao/Kyushuuniversity Hiroaki Yoshioka/Kyushuuniversity Kinichi Morita/UshioInc. Yuji Oki/Kyushuuniversity

Sampling and Scrambling in Compressive Sensing Based Spectral Domain Optical Coherence Tomography (JTu2F.7)
Presenter: Shikhar Uttam, *University of Pittsburgh*
Expand for Abstract / Authors

Paper

Compressed sensing-based sampling and scrambling strategies for spectral-domain optical coherence tomography are presented and their performance evaluated. It is shown that the latter can be used for reconstructing both spatially sparse and non-sparse signals

Authors:Shikhar Uttam/University of Pittsburgh

Optical Biosensor Based on Ultrathin SOI Waveguides (JTu2F.8)
Presenter: Mohamed Swillam, *American University in Cairo*
Expand for Abstract / Authors

Paper

We introduce an optical biosensor utilizing the MMI configuration and based on the ultrathin SOI platform. The biosensor was optimized using finite difference time domain simulations. A sensitivity of 420 nm/RIU was achieved.

Authors:Mohamed Elsayed/American University in Cairo Sherif Mohamed/Qatar University Amina Aljaber/Qatar University Mohamed Swillam/American University in Cairo

Thermal Conductivity of Jurkat Cell Measured by Laser Point Heating and Micropipette Thermal Sensor (JTu2F.9)
Presenter: Ramesh Shrestha, *University of North Texas*
Expand for Abstract / Authors

Paper

We report herein a measurement technique that utilizes a micro-pipette thermal sensor to measure the temporal temperature during pulsed laser heating of the sensor tip touching the Jurkat cell. With this technique, the thermal conductivity of a Jurkat cell was determined to be 0.538 W/m.K ± 1%.

Authors:Ramesh Shrestha/University of North Texas Rohini Atluri/University of North Texas Denise Simmons/University of North Texas Dongsik Kim/POSTECH Tae-Youl Choi/University of North Texas

Generation of cylindrical vector beams with adjustable diffraction pattern in the focal plane (JTu2F.10)
Presenter: Craciun Alexandru, *Natl Inst Lasers Plasma & Radiation Phys*
Expand for Abstract / Authors

Paper

We designed and analyzed an optical component that works as a radially symmetric wave-plate and an associated optical system to control the polarization state of the beam, which as a consequence, change the shape of the focal spot.

Authors:Craciun Alexandru/Natl Inst Lasers Plasma & Radiation Phys Traian Dascalu/Natl Inst Lasers Plasma & Radiation Phys

Silicon Photonic Sensor with Intensity Interrogation by Employing the Cascade of Ring Resonator and Mach-Zehnder Interferometer (JTu2F.12)
Presenter: zhenyu Li, *Peking University*
Expand for Abstract / Authors

Paper

A silicon photonic sensor with intensity interrogation by employing the cascade of ring resonator and MZI is proposed a theoretically investigated. Photodetector used instead of spectrometer leads to prospect of low cost sensor system.

Authors:zhenyu Li/Peking University Jun Zou/Nanyang Technological University HUIHUI ZHU/Nanyang Technological University Hui Zhang/Nanyang Technological University Hong Cai/Institute of Microelectronics, A*STAR zhenchuan yang/Peking University Yufeng Jin/Peking University yilong hao/Peking University Ai Qun Liu/Nanyang Technological University

Portable instrument for paper-based isothermal nucleic acid amplification tests (JTu2F.13)
Presenter: Mingdian Liu, *Iowa State University*
Expand for Abstract / Authors

Paper

A paper-based nucleic acid amplification technology is demonstrated. The paper sensor can store reagents, transport samples, and amplify multiple target genes. The portable detector can measure DNA amplification in real-time for quantitative analysis.

Authors:Mingdian Liu/Iowa State University Zheyuan Tang/Iowa State University Hosein Monshat/Iowa State University Yuxin Zhao/Iowa State University Meng Lu/Iowa State University

Generation of 14.0 W of single frequency light at 770 nm by intracavity frequency doubling (JTu2F.14)
Presenter: Minho Kwon, *University of Wisconsin-Madison*
Expand for Abstract / Authors

Paper

We report on the first high power, high efficiency frequency doubling of a 1540 nm laser using an enhancement cavity and LBO crystal.

Authors:Minho Kwon/University of Wisconsin-Madison Peiyu Yang/East China Normal University Preston Huft/University of Wisconsin-Madison Christopher Young/University of Wisconsin-Madison Matthew Ebert/University of Wisconsin-Madison Mark Saffman/University of Wisconsin-Madison

Simulating One- and Two-Dimensional Ising Models in a Magnetic Field Using a Coherent Ising Machine (JTu2F.15)
Presenter: Hiroki Takesue, *NTT Basic Research Laboratories*
Expand for Abstract / Authors

Paper

We report a coherent Ising machine (CIM) based on degenerate optical parametric oscillators with a magnetic field. The CIM successfully simulated behaviors of one- and two-dimensional networks of 400 spins in a uniform magnetic field.

Authors:Hiroki Takesue/NTT Basic Research Laboratories Kensuke Inaba/NTT Basic Research Laboratories Takahiro Inagaki/NTT Basic Research Laboratories Takuya Ikuta/NTT Basic Research Laboratories Yasuhiro Yamada/NTT Basic Research Laboratories Toshimori Honjo/NTT Basic Research Laboratories Takushi Kazama/NTT Device Technology Laboratories Koji Enbutsu/NTT Device Technology Laboratories Takeshi Umeki/NTT Device Technology Laboratories Ryoichi Kasahara/NTT Device Technology Laboratories

Ion-exchanged Waveguides in Periodically Poled Rb-doped $KTiOPO_4$ for Efficient Second Harmonic Generation (JTu2F.16)
Presenter: Patrick Mutter, *Royal Institute of Technology (KTH)*
Expand for Abstract / Authors

Paper

We present the fabrication of channel waveguides in PPRKTP crystals for QPM SHG in the blue region. Our waveguides reached a normalized conversion efficiency of 119 %/Wcm^2 and showed low loss (0.51dB/cm).

Authors:Patrick Mutter/Royal Institute of Technology (KTH) Cristine Kores/Royal Institute of Technology (KTH) Fredrik Laurell/Royal Institute of Technology (KTH) Carlota Canalias/Royal Institute of Technology (KTH)

Programmable Fast All-Optical Thresholder (JTu2F.17)
Presenter: Aashu Jha, *Princeton University*
Expand for Abstract / Authors

Paper

We theoretically study the effect of free-carrier lifetime on processing speed and nonlinearity, pertaining to our all-optical thresholder. We also experimentally demonstrate speed improvement from 400 Mbps to 2.5 Gbps incorporating PN-junction mediated free-carrier removal.

Authors:Aashu Jha/Princeton University Chaoran Huang/Princeton University Thomas de Lima/Princeton University Paul Prucnal/Princeton University

Observation of 2D Spatiotemporal Rogue Events in a Quadratic Nonlinear Medium (JTu2F.18)
Presenter: Raphaël Jauberteau, *Université de Limoges, institut XLIM*
Expand for Abstract / Authors

Paper

We experimentally demonstrate 2D quadratic extreme events, appearing and disappearing without a trace. Besides the spontaneous formation of self-guided bicolor solitary waves, ultrafast spatial switching, cascaded events and pulse reshaping are observed.

Authors:Raphaël Jauberteau/Université de Limoges, institut XLIM Alessandro Tonello/Université de Limoges, institut XLIM Fabio Baronio/Università di Brescia Katarzyna Krupa/Laboratoire Interdisciplinaire Carnot de Bourgogne Guy Millot/Laboratoire Interdisciplinaire Carnot de Bourgogne Benjamin Wetzel/Université de Limoges, institut XLIM Stefan Wabnitz/DIET Sapienza Università di Roma Vincent Couderc/Université de Limoges, institut XLIM

Optical Parametric Amplification at 10.6 μm in GaSe Pumped by a 2.75-μm Parametric Source (JTu2F.19)
Presenter: Xuan Xiao, *University of Michigan*
Expand for Abstract / Authors

Paper

Small-signal parametric gain at 10.6 μm in GaSe crystal pumped at 2.75 μm is experimentally demonstrated. Simulation predicts that nanosecond optical parametric chirped-pulse amplification in GaSe supports sub-three-cycle pulses.

Authors:Xuan Xiao/University of Michigan John Nees/University of Michigan Hao Huang/University of Michigan Igor Jovanovic/University of Michigan

Multi-Spectral Regenerative Frequency Microcombs with Coherent Satellite Clusters (JTu2F.20)
Presenter: Jinghui Yang, *Univ. of California Los Angeles*
Expand for Abstract / Authors

Paper

We report coherent satellites in multi-spectral regenerative microcombs with enhanced intensities at the octave points and engineered frequency spanning. Regenerative satellite preserves coherence and mirrored appearance of dynamics with central comb through nonlinear parametric process.

Authors:Jinghui Yang/Univ. of California Los Angeles Shu-Wei Huang/University of Colorado Boulder Zhenda Xie/Nanjing University Mingbin Yu/Institute of Microelectronics, A*STAR Dim-Lee Kwong/Institute of Microelectronics, A*STAR Chee Wei Wong/Univ. of California Los Angeles

Intracavity supercntinuum generation in mode-locked Er-doped fiber laser based on Mamyshev mechanism (JTu2F.21)
Presenter: Luo Xing, *Toyota Technological Institute*
Expand for Abstract / Authors

Paper

A supercontinuum mode-locked Er-doped laser based on Mamyshev mechanism with a piece of intracavity highly nonlinear fiber is experimentally demonstrated. This mode-locked laser realizes intracavity supercontinuum generation spanning from ~1300 nm to ~2100 nm directly.

Authors:Luo Xing/Toyota Technological Institute Tong Tuan/Toyota Technological Institute Hoa Nguyen/Toyota Technological Institute Takenobu Suzuki/Toyota Technological Institute Yasutake Ohishi/Toyota Technological Institute

Boardband Coherent Comb Generation in an All-Normal-Dispersion AlGaAs-on-Sapphire Waveguide (JTu2F.22)
Presenter: Yujun Cheng, *Technical University of Denmark*
Expand for Abstract / Authors

Paper

We experimentally demonstrate coherent comb generation in a 5-mm long all-normal-dispersion AlGaAs-on-sapphire waveguide with a 47% pump-to-comb conversion efficiency. We achieve a 20-dB bandwidth of 24.5 THz covering from the S- to U-band wavelength ranges.

Authors:Yujun Cheng/Technical University of Denmark Yi Zheng/Technical University of Denmark Chanju Kim/Technical University of Denmark Pengyu Guan/Technical University of Denmark Jinhui Yuan/Beijing University of Posts and Telecommunications Leif K. Oxenløwe/Technical University of Denmark Kresten Yvind/Technical University of Denmark Minhao Pu/Technical University of Denmark

Yb-fiber-pumped MgO:PPLN-based Picosecond Optical Parametric Oscillator Tunable Across 1.3-1.5 µm (JTu2F.23)
Presenter: Biplob Nandy, *ICFO -Institut de Ciencies Fotoniques*
Expand for Abstract / Authors

Paper

We report the generation of high-average-power high-repetition-rate picosecond pulses across 1305-1540 nm by internal frequency-doubling of an idler-resonant MgO:PPLN picosecond optical parametric oscillator in fanout MgO:PPLN pumped by Yb-fiber-laser at 1.064 µm.

Authors:Biplob Nandy/ICFO -Institut de Ciencies Fotoniques Chaitanya Kumar Suddapalli/Radiantis Majid Ebrahim-Zadeh/ICFO -Institut de Ciencies Fotoniques

Rapidly Tunable Continuous-wave Green-pumped Optical Parametric Oscillator Based on Fanout MgO:PPLN (JTu2F.24)
Presenter: Sukeert ., *ICFO-The Institute of Photonic Sciences*
Expand for Abstract / Authors

Paper

We report a green-pumped continuous-wave OPO using a fanout-grating MgO:PPLN, tunable across 813-1032 nm (signal) and 1098-1539 nm (idler) with >30% extraction efficiency in excellent beam-quality and power stability better than 3% rms over 1 hour.

Authors:Sukeert ./ICFO-The Institute of Photonic Sciences Chaitanya Kumar Suddapalli/ICFO-The Institute of Photonic Sciences Majid Ebrahim-Zadeh/ICFO-The Institute of Photonic Sciences

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Nonlinear Optical Wavelength Conversion System from the C-Band to the Mid-Infrared (JTu2F.25)
Presenter: Imtiaz Alamgir, *McGill University*
Expand for Abstract / Authors

Paper

We demonstrate an all-fiber system that performs nonlinear wavelength conversion from a wavelength of 1.550 µm to 2.300-2.640 µm. This spectral shift >80 THz is achieved thanks to a combination of silica and chalcogenide fibers.

Authors:Imtiaz Alamgir/McGill University François St-Hilaire/McGill University Martin Rochette/McGill University

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Mid-Infrared Pumping of Supercontinuum Generation in Single-Crystal YAG Optical Fibers (JTu2F.26)
Presenter: Michael Tripepi, *Air Force Research Laboratory*
Expand for Abstract / Authors

Paper

Using ~3.6µm, 200fs, 500Hz laser pulses, we observed supercontinuum generation in 50 and 150µm outer diameter undoped, single-crystal YAG fibers with sol-gel cladding. We note differences in supercontinuum based on diameter and cladding thickness.

Authors:Michael Tripepi/Air Force Research Laboratory Ben Eshel/Air Force Research Laboratory Laura Vanderhoef/CCDC Army Research Laboratory Anthony Valenzuela/CCDC Army Research Laboratory Kent Averett/Air Force Research Laboratory Enam Chowdhury/The Ohio State Univ. Carl Liebig/Air Force Research Laboratory

Monostable Single Dissipative Kerr Soliton Generation in a Periodically Poled Lithium Niobate Microresonator (JTu2F.27)
Presenter: Eugene Tsao, *University of Colorado*
Expand for Abstract / Authors

Paper

By establishing a generalizable framework based on the interplay of a fast, negative Kerr nonlinearity and a slow, thermo-optic redshift, we theoretically and numerically demonstrate deterministic, monostable single soliton generation in a proposed PPLN microresonator.

Authors:Eugene Tsao/University of Colorado

Chirp-Assisted Sum Frequency Generation of Over 200 THz from Near-Infrared to Visible (JTu2F.28)
Presenter: Connor Fredrick, *University of Colorado at Boulder*
Expand for Abstract / Authors

Paper

Sum frequency generation (SFG) with short pulses requires phase matching as well as temporal overlap across broad bandwidths. We introduce a chirp assisted SFG technique for the efficient transfer of over 200 THz of supercontinuum from the near infrared (NIR) to the visible.

Authors:Connor Fredrick/University of Colorado at Boulder Abijith Kowligy/University of Colorado at Boulder Scott Diddams/University of Colorado at Boulder

Robust, efficient, and broadband SHG of ultrashort pulses in composite crystals (JTu2F.29)
Presenter: Yonatan Erlich, *Tel Aviv university*
Expand for Abstract / Authors

Paper

We experimentally demonstrate efficient second harmonic generation (SHG) of tunable ultrashort pulses of 100 femtosecond (fs), using novel method based on composite segmented periodically poled (CSPP) design.

Authors:Yonatan Erlich/Tel Aviv university Haim Suchowski/Tel Aviv university Andon Rangelov/Sofia University Germano Montemezzani/University of Lorraine

Frequency Comb and Ultrashort Pulse Generation in a Normal-Dispersion FP Microresonator with Bandpass Filtering (JTu2F.30)
Presenter: Zeyu Xiao, *Shanghai Jiao Tong University*
Expand for Abstract / Authors

Paper

Frequency comb and ultrashort pulse generation in a normal-dispersion Fabry-Perot microresonator with bandpass filtering are demonstrated. The spectral filtering introduces different cavity dynamics and can support 371-fs pulse and parabolic spectral shape.

Authors:Zeyu Xiao/Shanghai Jiao Tong University Kan Wu/Shanghai Jiao Tong University Jianping Chen/Shanghai Jiao Tong University

Enhanced self-phase modulation in silicon nanowires integrated with layered graphene oxide films (JTu2F.31)
Presenter: David Moss, *Swinburne University of Technology*
Expand for Abstract / Authors

Paper

We experimentally demonstrate enhanced self-phase modulation in silicon nanowire waveguides integrated with layered graphene oxide films. We achieve spectral broadening of optical pulses in the GO-silicon waveguide with a broadening factor up to 3.07.

Authors:Yuning Zhang/Swinburne University of Technology Jiayang Wu/Swinburne University of Technology Yunyi Yang/Swinburne University of Technology Yang Qu/Swinburne University of Technology Tania Moein/Swinburne University of Technology Baohua Jia/Swinburne University of Technology David Moss/Swinburne University of Technology

Universal Conversion Efficiency Scaling with Free-Spectral-Range for Soliton Kerr Combs (JTu2F.32)
Presenter: Jae Jang, *Columbia University*
Expand for Abstract / Authors

Paper

We experimentally and theoretically investigate the dependence of the pump-to-comb conversion efficiency of soliton Kerr combs on the cavity free-spectral-range and determine that three different regimes exist with distinct scaling behavior.

Authors:Jae Jang/Columbia University Yoshitomo Okawachi/Columbia University Xingchen Ji/Columbia University Chaitanya Joshi/Columbia University Michal Lipson/Columbia University Alexander Gaeta/Columbia University

TeO_2-Coated Si_3N_4 Waveguides with Engineered Dispersion and Enhanced Nonlinearity (JTu2F.33)
Presenter: Hamidu M. Mbonde, *McMaster University*
Expand for Abstract / Authors

Paper

We present designs of TeO_2-coated Si_3N_4 waveguides with engineered anomalous dispersion and calculated nonlinear parameter up to three times that of stoichiometric Si_3N_4. We observe four wave mixing in high-Q ring resonators on this platform.

Authors:Hamidu M. Mbonde/McMaster University Khadijeh Kiani/McMaster University Henry Frankis/McMaster University Jonathan Bradley/McMaster University

Double-Resonant Sum-Frequency Generation of Blue Light with Near-Unity Quantum Conversion Efficiency (JTu2F.34)
Presenter: Hugo Kerdoncuff, *Danish Fundamental Metrology*
Expand for Abstract / Authors

Paper

We demonstrate double-resonant sum-frequency generation of coherent blue light in a bow-tie cavity with record high quantum conversion efficiency of 95% of mode-matched near-infrared photons and a high output beam quality.

Authors:Hugo Kerdoncuff/Danish Fundamental Metrology Jesper Christensen/Danish Fundamental Metrology Túlio Brasil/Niels Bohr Institute, University of Copenhagen Valeriy Novikov/Niels Bohr Institute, University of Copenhagen Eugene Polzik/Niels Bohr Institute, University of Copenhagen Jan Hald/Danish Fundamental Metrology Mikael Lassen/Danish Fundamental Metrology

Surface Nanoscale Axial Photonics (SNAP) Microresonator: A New Platform for Quantum Frequency Conversion and Squeezing Generation (JTu2F.35)
Presenter: Tabassom Hamidfar, *Northwestern University*
Expand for Abstract / Authors

Paper

We introduce a new approach for quantum frequency conversion of narrowband optical signals by four-wave mixing in a surface nanoscale axial photonics (SNAP) microresonator. We also discuss a SNAP-based scheme for generating amplitude-squeezed light.

Authors:Tabassom Hamidfar/Northwestern University Prem Kumar/Northwestern University

Efficient Raman Conversion in SF_6- and CF_4-Filled Hollow-Core Photonic Bandgap Fibers (JTu2F.36)
Presenter: shahar Edelstein, *Ben Gurion University of the Negev*
Expand for Abstract / Authors

Paper

We investigate Raman conversion in hollow-core photonic bandgap fibers pressurized with Sulfur hexafluoride (SF_6) and Tetrafluoromethane (CF_4) gases. We obtain conversion efficiency to the first Stokes of 55.7% with SF_6 and 45.4% with CF_4.

Authors:shahar Edelstein/Ben Gurion University of the Negev Amiel Ishaaya/Ben Gurion University of the Negev

Joint Poster Session 6 (JTu2G)

A Self-referencing Digital Error Correction Method for Dual-comb Interferometer (JTu2G.1)
Presenter: Haoyang Yu, *Tsinghua University*
Expand for Abstract / Authors

Paper

We present a self-referencing digital error correction method for dual-comb interferometry. Fully mutual coherence of a dual-comb interferometer is reconstructed and 1 Hz theoretical linewidth in 1 second acquisition time is achieved.

Authors:Haoyang Yu/Tsinghua University Kai Ni/Tsinghua University Qian Zhou/Tsinghua University Xinghui Li/Tsinghua University Xiaohao Wang/Tsinghua University Guanhao Wu/Tsinghua University

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Time-resolved Thermoreflectance Imaging for Mid-infrared Quantum Cascade Laser (JTu2G.2)
Presenter: Siyi Wang, *University of Waterloo*
Expand for Abstract / Authors

Paper

Time-resolved thermal imaging profile of mid-infrared quantum cascade laser was achieved by using 50 ns temporal resolution, observing temperature increase of 36.8% in the first 100 ns with subsequent decrease of 63.2% at t_d=1.5 us.

Authors:Siyi Wang/University of Waterloo Chao Xu/University of Waterloo Fei Duan/Huazhong University of Science and Technology Boyu Wen/University of Waterloo SM Shazzad Rassel/University of Waterloo Zbigniew Wasilewski/University of Waterloo Lan Wei/University of Waterloo Dayan Ban/University of Waterloo

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Multiplexable Intrinsic Fabry-Perot Cavities using Femtosecond Laser Inscribed Scattering Centers (JTu2G.3)
Presenter: Jingyu Wu, *University of Pittsburgh*
Expand for Abstract / Authors

Paper

We propose a fabrication technique to multiplex Intrinsic Fabry-Perot Cavity sensors using femtosecond laser induced Rayleigh scattering centers. Up to 20 sensors were multiplexed and demodulated using a fast white-light interferometry demodulation algorithm.

Authors:Mohan Wang/University of Pittsburgh Jingyu Wu/University of Pittsburgh Yang Yang/University of Pittsburgh Kehao Zhao/University of Pittsburgh Sheng Huang/University of Pittsburgh Hui Lan/University of Pittsburgh Michael Buric/U.S. Department of Energy Paul Ohodnicki/U.S. Department of Energy Bo Liu/U.S. Department of Energy Qingxu Yu/Dalian University of Technology Kevin Chen/University of Pittsburgh

Reconfigurable Low-SWaP Eye-safe LiDAR based on Static Unitary Detector (STUD) Technology (JTu2G.4)
Presenter: Bongki Mheen, *Electronics and Telecommunications Research Institute (ETRI)*
Expand for Abstract / Authors

Paper

A reconfigurable and cost-efficient Eye-safe LIDAR transceiver architecture is proposed and implemented based on Static Unitary Detector (STUD) technology where time-of- flight (TOF) is measured using a stationary receiver and a scanning transmitter.

Authors:Bongki Mheen/Electronics and Telecommunications Research Institute (ETRI) Munhyun Han/Electronics and Telecommunications Research Institute (ETRI) Gyudong Choi/Electronics and Telecommunications Research Institute (ETRI) Hongseok Seo/Electronics and Telecommunications Research Institute (ETRI) Yongsoon Baek/Electronics and Telecommunications Research Institute (ETRI)

Sub-fm/Hz$^{1/2}$ displacement measurement on MgF_2 whispering gallery mode microcavity (JTu2G.5)
Presenter: Yoon-Soo Jang, *UCLA*
Expand for Abstract / Authors

Paper

We present sub-fm/Hz$^{1/2}$ displacement measurement on the MgF_2 whispering gallery mode microcavity. We analyze power spectral density of the displacement from 1 Hz to 100 kHz of the Fourier offset frequency.

Authors:Yoon-Soo Jang/UCLA Jinkang Lim/UCLA Wenting Wang/UCLA Jaime G. Flor Flores/UCLA Seung-Woo Kim/Korea Advanced Institute of Science and Technology (KAIST) Anatoliy Savchenkov/OEwaves Inc. Andrey Matsko/OEwaves Inc. Chee Wei Wong/UCLA

Optimizing Metalens Spectral Range – Experimental Study (JTu2G.6)
Presenter: Jacob Engelberg, *Hebrew University*
Expand for Abstract / Authors

Paper

We present a method of optimizing the operating spectral range of a metalens. This is of importance for practical applications, and as a metric for comparing the performance of different metalens designs.

Authors:Jacob Engelberg/Hebrew University Talia Wildes/Hebrew University Chen Zhou/Technical University of Denmark Noa Mazurski/Hebrew University Jonathan Bar-David/Hebrew University Anders Kristensen/Technical University of Denmark Uriel Levy/Hebrew University

Laser-Driven Light Source (LDLS™) With Multiple Fiber Outputs (JTu2G.7)
Presenter: Xiaohua Ye, *Energetiq Inc.*
Expand for Abstract / Authors

Paper

A laser-driven light source (LDLS™) system with multiple fiber outputs is developed for photonic or semiconductor processing applications. Simulation and measurement results of fiber-to-fiber uniformity from 380nm to 1000nm are presented.

Authors:Xiaohua Ye/Energetiq Inc. Huiling Zhu/Energetiq Inc. Qingsong Wang/Energetiq Inc. Megan Dube/Energetiq Inc. Debbie Gustafson/Energetiq Inc.

Optical Frequency Discriminator based on Polarization-Maintaining Fiber Bragg Gratings (JTu2G.8)
Presenter: Lingze Duan, *University of Alabama in Huntsville*
Expand for Abstract / Authors

Paper

A novel, fiber-optic optical frequency discriminator (OFD) based on polarization-maintaining fiber Bragg grating is demonstrated. Bias-free linear frequency discrimination with an efficiency of 3.248 V/nm over ~0.2 nm range is demonstrated by employing polarization-assisted balanced detection.

Authors:Dipenkumar Barot/University of Alabama in Huntsville Lingze Duan/University of Alabama in Huntsville

Temperature Sensor Using Fiber Ring Laser Based on a Core-offset Mach-Zehnder Interferometer (JTu2G.9)
Presenter: MARCO CONTRERAS, *Universidad de Guanajuato*
Expand for Abstract / Authors

Paper

A laser temperature sensor based on a core-offset Mach-Zehnder interferometer is presented. The experimental results shown a temperature sensitivity of 31.19 pm/°C and a signal to noise ratio of 52 dB.

Authors:MARCO CONTRERAS/Universidad de Guanajuato Juan Sierra/Universidad de Guanajuato

All-fiber Online Raman Detection System Based on Hollow Core Fiber (JTu2G.10)
Presenter: Guanghui Wang, *Nanjing University*
Expand for Abstract / Authors

Paper

Based on hollow core fiber, we proposed an all-fiber online Raman detection system. To further enhance the light-sample interaction, we use a FP cavity structure, which provides a 4.367 times signal enhancement.

Authors:Xingtao Yu/Nanjing University Caoxin LI/Nanjing University Qian Chu/Nanjing University Perry Ping Shum/Nanyang Technological University Guanghui Wang/Nanjing University

Tunable and stabilized short cavity Brillouin fiber ring laser for BOTDA sensing (JTu2G.11)
Presenter: Diego Marini, *Consiglio Nazionale delle Ricerche*
Expand for Abstract / Authors

Paper

In this work we present a novel Brillouin Ring-Laser (BRL) source for Brillouin optical time-domain analysis (BOTDA) based on a short cavity and active stabilization scheme, presenting low RIN, narrow linewidth and high frequency stability.

Authors:Leonardo Rossi/Università di Bologna Diego Marini/Consiglio Nazionale delle Ricerche Filippo Bastianini/Sestosensor S.r.l. Gabriele Bolognini/Consiglio Nazionale delle Ricerche

Optical Simulation and Design of Polymer-based Multi-Modal Surface Relief Fiber Bragg Grating (SR-FBG) for Chemical Detection (JTu2G.12)
Presenter: Bibek Ramdam, *Howard University*
Expand for Abstract / Authors

Paper

This paper discusses an optical design of a surface relief fiber Bragg grating (SR-FBG) optic sensors for Fentanyl and related toxins detection. Numerical optical simulations were performed to design the sensor structure for the SR-FBG.

Authors:Hyung Bae/Howard University Bibek Ramdam/Howard University Donipolo Ghimire/Howard University

A Radar-communication System Based on Optoelectronic Oscillator for Intelligent Transportation (JTu2G.13)
Presenter: Zhujun Xue, *Tsinghua University*
Expand for Abstract / Authors

Paper

A hybrid radar-communication system for intelligent transportation based on optoelectronic oscillator is proposed. A code-stream with QPSK modulation of 2.4 Gb/s is generated experimentally at 24 GHz for high-speed communication and accurate ranging simultaneously.

Authors:Zhujun Xue/Tsinghua University Shangyuan Li/Tsinghua University Xuedi Xiao/Tsinghua University Xiaoxiao Xue/Tsinghua University Xiaoping Zheng/Tsinghua University Bingkun Zhou/Tsinghua University

Optomechanical Detection of Acoustic Blackbody Radiation for Remote Temperature Metrology (JTu2G.14)
Presenter: Robinjeet Singh, *National Institute of Standards and Technology*
Expand for Abstract / Authors

Paper

We use a nanomechanical resonator to detect thermal acoustic radiation from a remote acoustic blackbody with an ultra-high signal-to-noise ratio. In addition to performing remote thermometry, our optomechanical detector presents a route to sensitive photoacoustic imaging.

Authors:Robinjeet Singh/National Institute of Standards and Technology Thomas Purdy/University of Pittsburgh

Online Reliability of Planar Lightwave Circuit Splitters (JTu2G.15)
Presenter: Yu Zheng, *Central South University*
Expand for Abstract / Authors

Paper

This paper focus on the optical performance of the Planar Lightwave Circuit (PLC) splitters in real-time testing and study the online reliability of the PLC splitters by on-line experimental testing.

Authors:Yu Zheng/Central South University Yao Wu/Central South University Bingxin Xia/Central South University Lianqiong Jiang/Central South University

Single-Photon Counting Laser Ranging with an Electro-Optic Dual-Comb Interferometer (JTu2G.16)
Presenter: XINYI REN, *East China Normal University*
Expand for Abstract / Authors

Paper

We explore the potential of combining dual-comb interferometry with single-photon detection and counting technologies for precise time-of-flight relative distance measurements with two asynchronous 25-GHz line-spacing combs at the single-photon level.

Authors:Bo Xu/University of Shanghai for Science and Technology XINYI REN/East China Normal University Qilai Fei/University of Shanghai for Science and Technology Yan Liang/University of Shanghai for Science and Technology Ming Yan/East China Normal University xiaoyue wang/East China Normal University Heping Zeng/University of Shanghai for Science and Technology

Photoacoustic Multicomponent SF_6 Decomposition Sensor for an Electric Power System (JTu2G.17)
Presenter: xukun yin, *Shanxi University*
Expand for Abstract / Authors

Paper

An on-line ppb-level SF_6 decomposition detection gas sensor was developed via a 303 nm solid state laser and two near-IR diode lasers. The minimum detection limits of 440 ppb, 90 ppb and 115 ppb were achieved for CO, H_2S and SO_2 by means of a time division multiplexing (TDM) method.

Authors:xukun yin/Shanxi University Ning Zi/Shandong Huigong Electric CO. LTD Lei Dong/Shanxi University Hongpeng Wu/Shanxi University Frank Tittel/Rice University

Realization of THz Vortex with Spiral Zone Plate Fabricated by Femtosecond Laser Filament in Air (JTu2G.18)
Presenter: Zhi Zhang, *Nankai University*
Expand for Abstract / Authors

Paper

We have fabricated large size (100×100 mm^2) spiral zone plates (SZPs) by laser direct writing using femtosecond laser filament in air. The obtained THz vortex beams are in good agreement with the theoretical predictions.

Authors:Zhi Zhang/Nankai University Zijie Dai/Nankai University Yunfei Wang/Nankai University Chunyue Chu/Nankai University Qiang Su/Nankai University Olga Kosareva/International Laser Center, Lomonosov Moscow State University, Moscow Nan Zhang/Nankai University Lie Lin/Nankai University Weiwei Liu/Nankai University

Terahertz compressive imaging directly in the time domain (JTu2G.19)
Presenter: Luca Zanotto, *INRS-EMT*
Expand for Abstract / Authors

Paper

We exploit a single-pixel imaging approach to obtain multi-dimensional (space, time/frequency) images at terahertz frequencies by reconstructing the temporal waveform in each pixel. Moreover, we apply compressive sensing to reduce the acquisition time.

Authors:Luca Zanotto/INRS-EMT Riccardo Piccoli/INRS-EMT Junliang Dong/INRS-EMT Diego Caraffini/INRS-EMT Roberto Morandotti/INRS-EMT Luca Razzari/INRS-EMT

Pulsed Terahertz Detection with a 95 dB Signal-to-Noise Ratio Using a Femtosecond Ytterbium-Doped Fiber Laser (JTu2G.20)
Presenter: Deniz Turan, *University of California, Los Angeles*
Expand for Abstract / Authors

Paper

We present a photoconductive terahertz detector that operates at ~1 μm pump wavelengths, offering a detection bandwidth exceeding 4THz and a 95dB signal-to-noise ratio, a 10dB enhancement over the state-of-the-art detectors with similar bandwidth

Authors:Deniz Turan/University of California, Los Angeles Nezih Yardimci/University of California, Los Angeles Mona Jarrahi/University of California, Los Angeles

Dynamic THz dual-comb spectrometer: an optoelectronic fast interrogation approach (JTu2G.21)
Presenter: Roberto Barreiro Marcos, *Universidad Carlos III de Madrid*
Expand for Abstract / Authors

Paper

We present an absolute-frequency THz dual-comb spectrometer based on electro-optic modulators that provides dynamic spectroscopic measurements with a temporal resolution of 1ms. This feature is complemented by ultra-narrow linewidth teeth and total control over central and repetition frequencies.

Authors:Cristina de Dios/Universidad Carlos III de Madrid Pedro Martín-Mateos/Universidad Carlos III de Madrid Borja Jerez/Luz Wavelabs Andres Betancur/Universidad Carlos III de Madrid Roberto Barreiro Marcos/Universidad Carlos III de Madrid Pablo Acedo/Universidad Carlos III de Madrid

High-energy multicycle terahertz pulse generation in a bulk lithium niobate crystal (JTu2G.22)
Presenter: Dogeun Jang, *University of Maryland*
Expand for Abstract / Authors

Paper

We demonstrate 0.71-mJ multicycle terahertz pulse generation at 14.8 THz from a bulk lithium niobate crystal with 80 TW femtosecond laser pumping. This terahertz radiation arises from large-area, phase-matched, optical rectification in lithium niobate.

Authors:Dogeun Jang/University of Maryland Chul Kang/Advanced Photonics Research Institute Seong Ku Lee/Advanced Photonics Research Institute Jae Hee Sung/Advanced Photonics Research Institute Ki-Yong Kim/University of Maryland

On-Wafer Metrology for a Transmission Line Integrated Terahertz Source (JTu2G.23)
Presenter: Kassiopeia Smith, *NIST*
Expand for Abstract / Authors

Paper

We developed a measurement system that combines on-wafer metrology and high-frequency network analysis to characterize the response of transmission-line integrated Er-GaAs and InGaAs photomixers up to 1 THz to support the telecommunication and electronics industry.

Authors:Kassiopeia Smith/NIST Bryan Bosworth/NIST Nicholas Jungwirth/NIST Jerome Cheron/NIST Nathan Orloff/NIST Christian Long/NIST Dylan Williams/NIST Richard Chamberlin/NIST Franklyn Quinlan/NIST Tara Fortier/NIST Ari Feldman/NIST

Broadband Intense THz Radiation from Organic Crystals Driven by Mid-Infrared Pulses (JTu2G.24)
Presenter: Claudia Gollner, *TU Wien*
Expand for Abstract / Authors

Paper

We report on unexpected efficient THz generation in organic crystals (DAST and DSTMS) by optical rectification (OR) of intense mid-infrared pulses. The crystals experience superior damage threshold and an ultra-broadband THz spectrum reaching 10 THz.

Authors:Claudia Gollner/TU Wien Mostafa Shalaby/Swiss Terahertz Research-Zurich Edgar Kaksis/TU Wien Ignas Astrauskas/TU Wien Valentina Shumakova/TU Wien Corinne Brodeur/Swiss Terahertz Research-Zurich Andrius Baltuska/TU Wien Audrius Pugzlys/TU Wien

On-Chip Multi-Beam Emitting Optical Phased Array for Wide-Angle LIDAR (JTu2G.25)
Presenter: Yaqi Liu, *Tsinghua University*
Expand for Abstract / Authors

Paper

A multi-beam emitting optical phased array for LIDAR with wide angle of coverage is proposed and simulated, providing a 11×7 beam array with a static angular range of 68.8°×39.7° and steerable in 6.5°.

Authors:Yaqi Liu/Tsinghua University Zhibiao Hao/Tsinghua University Lai Wang/Tsinghua University Jian Wang/Tsinghua University Jiadong Yu/Tsinghua University Bing Xiong/Tsinghua University Changzheng Sun/Tsinghua University Hongtao Li/Tsinghua University Yanjun Han/Tsinghua University Yi Luo/Tsinghua University

Highly sensitive bending sensor based on a tapered hollow core microstructured optical fiber (JTu2G.26)
Presenter: Yu Zheng, *Nanyang Technological University*
Expand for Abstract / Authors

Paper

We develop an in-line bending sensor based on a tapered hollow core microstructured optical fiber, which paves a promising way for improving the sensing sensitivity. Accordingly, the bending sensitivity is up to 34.2 nm/m^{-1}.

Authors:Yu Zheng/Nanyang Technological University Perry Ping Shum/Nanyang Technological University Shuhui Liu/Wuhan Institute of Technology Wenjun Ni/Nanyang Technological University Yiyang Luo/Nanyang Technological University Guanghui Wang/Nanjing University Baocheng Li/Nanyang Technological University Chenlu Wang/Nanyang Technological University Zhifang Wu/Huaqiao University Jean-Louis Auguste/XLIM Research Institute Georges Humbert/XLIM Research Institute

Broadening frequency response of distributed sparse-wideband vibration sensing via time-division multi-frequency sub-Nyquist sampling (JTu2G.27)
Presenter: Zengguang Qin, *Shandong University*
Expand for Abstract / Authors

Paper

A sub-Nyquist sampling sequence with an average repetition rate less than 5-kHz can be efficiently utilized to detect 24-kHz sparse-wideband vibration signal along 4.5-km sensing fiber and recover its frequency information via compressive sensing technique

Authors:Zengguang Qin/Shandong University Shuai Qu/Shandong University Zhigang Zhao/Shandong University Yanping Xu/Shandong University Zhaojun Liu/Shandong University Zhenhua Cong/Shandong University Shang Wang/Shandong University Zhao Li/Shandong University Heng Wang/Shandong University

Baseline Correction and Denoising of Raman Spectra by Deep Residual CNN (JTu2G.28)
Presenter: Bo-Han Kung, *National Taiwan University*
Expand for Abstract / Authors

Paper

A practical deep residual CNN model for the improvement of Raman spectral analysis is proposed in this work. Through the feature transformation in the deep residual blocks, it successfully denoises and precisely corrects the baseline.

Authors:Bo-Han Kung/National Taiwan University Chiu-Chang Huang/National Taiwan University Po-Yuan Hu/National Taiwan University Shao-yu Lo/National Taiwan University Cheng-Che Lee/National Taiwan University Chia-Yu Yao/National Taiwan University of Science and Technology Chieh-Hsiung Kuan/National Taiwan University

High-Power Broadband Dual Comb Spectroscopy in the Mid Infrared (JTu2G.29)
Presenter: Grace Kerber, *University of Michigan*
Expand for Abstract / Authors

Paper

We present results of directly measured acetone absorption in the mid infrared using high-powered broadband dual comb spectroscopy. The technique developed is applicable to a wide variety of systems with mid infrared spectral features.

Authors:Grace Kerber/University of Michigan Kevin Lee/IMRA America, Inc. Gengji Zhou/University of Michigan Marco Cassinerio/IMRA America, Inc. Jie Jiang/IMRA America, Inc. Martin Fermann/IMRA America, Inc. Steven Cundiff/University of Michigan

Detection Strategies for Measuring Rotation with the Rotational Doppler Effect (JTu2G.30)
Presenter: Alex Anderson, *University of Colorado at Boulder*
Expand for Abstract / Authors

Paper

We report sensitivity differences for two established techniques for measuring rotational Doppler shifts from randomly distributed scatterers. The phase sensitivity of heterodyne detection can measure targets with high scatterer density whereas the fringe method cannot.

Authors:Alex Anderson/University of Colorado at Boulder Elizabeth Strong/University of Colorado Boulder Brendan Heffernan/University of Colorado Boulder Mark Siemens/University of Denver Gregory Rieker/University of Colorado Boulder Juliet Gopinath/University of Colorado at Boulder

3 GHz All-fiber Dual Optical Frequency Combs at 2.0 μm for High-speed Spectroscopic Applications (JTu2G.31)
Presenter: tian qiao, *South China University of Technology*
Expand for Abstract / Authors

Paper

We demonstrate dual frequency combs in all-fiber architecture that so far have the highest fundamental repetition rates (FRRs) of 3 GHz at 2.0 μm. An FRR difference of 1.5 MHz enables an ultrafast spectroscopic detection.

Authors:tian qiao/South China University of Technology Wen Xiaoxiao/South China University of Technology Jingfeng Wu/South China University of Technology Wei Lin/South China University of Technology Xiaoming Wei/South China University of Technology Zhongmin Yang/South China University of Technology

A High-resolution Integrated Spectrometer based on cascaded a ring resonator and an AWG (JTu2G.32)
Presenter: HUIHUI ZHU, *NTU*
Expand for Abstract / Authors

Paper

A high-resolution integrated spectrometer consists of a cascaded microring resonator and an AWG is demonstrated and achieved a high resolution of 0.42 nm and bandwidth of 90 nm. It has high potential in biochemical sensing applications.

Authors:HUIHUI ZHU/NTU Shaonan Zheng/AStar Jun Zou/NTU Hong Cai/AStar zhenyu Li/NTU Ai Qun Liu/NTU

Antiresonant Hollow-Core Fiber for Multiple Gas Detection in the Mid-IR (JTu2G.33)
Presenter: Piotr Jaworski, *Laser & Fiber Electronics Group, Faculty of Electronics, Wroclaw University of Science and Technology*
Expand for Abstract / Authors

Paper

We have fabricated an Antiresonant Hollow-Core Fiber for low-loss single-mode guidance in the Mid-IR and demonstrated its application to simultaneous detection of methane and ethane using Wavelength Modulation Spectroscopy.

Authors:Piotr Jaworski/Laser & Fiber Electronics Group, Faculty of Electronics, Wroclaw University of Science and Technology Fei Yu/R&D Center of High Power Laser Component,. Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences Piotr Bojes/Laser & Fiber Electronics Group, Faculty of Electronics, Wroclaw University of Science and Technology Dakun Wu/R&D Center of High Power Laser Component,. Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences Pawel Koziol/Laser & Fiber Electronics Group, Faculty of Electronics, Wroclaw University of Science and Technology Grzegorz Dudzik/Laser & Fiber Electronics Group, Faculty of Electronics, Wroclaw University of Science and Technology Krzysztof Abramski/Laser & Fiber Electronics Group, Faculty of Electronics, Wroclaw University of Science and Technology Meisong Liao/R&D Center of High Power Laser Component,. Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences Karol Krzempek/Laser & Fiber Electronics Group, Faculty of Electronics, Wroclaw University of Science and Technology

Non-Mechanical Scanning AMCW Laser Rangefinder Using Wavelength-Swept Dispersion-Tuned Fiber Laser (JTu2G.34)
Presenter: Zheyuan Zhang, *University of Tokyo*
Expand for Abstract / Authors

Paper

We for the first time proposed a non-mechanical AMCW rangefinder using dispersion-tuned wavelength-swept laser source. Continuous high-speed scanning of 10 kHz and centimeter-level depth resolution had been achieved with a single-pixel detector.

Authors:Zheyuan Zhang/University of Tokyo Chao Zhang/University of Tokyo takuma shirahata/University of Tokyo Shinji Yamashita/University of Tokyo Sze Set/University of Tokyo

Surface Plasmon Resonance Biosensor with Coated Graphene Oxide Embedded in a Microfluidic Chip (JTu2G.35)
Presenter: zhao yang, *Huazhong Univ of Science & Technology*
Expand for Abstract / Authors

Paper

An MMF-OHSC-MMF SPR sensor with coated GO/Au film is presented and available for microfluidic chips. Our proposed sensor has advantages of high BSA concentration sensitivity (6.29 nm/(mg/ml)), low sample consumption and robust.

Authors:zhao yang/Huazhong Univ of Science & Technology Li Xia/Huazhong Univ of Science & Technology Wei Li/Huazhong Univ of Science & Technology Gangmin Li/Huazhong Univ of Science & Technology Zhiyuan Li/Huazhong Univ of Science & Technology Zhengran Li/Huazhong Univ of Science & Technology Jinmin Wang/Huazhong Univ of Science & Technology

17:00 - 18:30 (UTC - 07:00)

Symposium on 60 Years of Laser (JTu4P)
Presider: Kent Choquette

Special Symposium

17:00 - 17:30	**Optoelectronic Integrated Circuits (OEICs) and the Semiconductor DFB laser: The Early Days (JTu4P.1)** **Presenter**: Amnon Yariv, *California Institute of Technology* Expand for Abstract / Authors Abstract not available. **Authors**:Amnon Yariv/California Institute of Technology Invited	
17:30 - 18:00	**From Broadband Mid-IR Quantum Cascade Lasers to widely tunable THz Molecular Lasers (JTu4P.2)** **Presenter**: Federico Capasso, *Harvard University* Expand for Abstract / Authors TBD **Authors**:Federico Capasso/Harvard University Invited	
18:00 - 18:30	**The Development of the Semiconductor Quantum Well Laser – its dependence on epitaxial growth and its many applications (JTu4P.3)** **Presenter**: Daniel Dapkus, *University of Southern California* Expand for Abstract / Authors Abstract not available. **Authors**:Daniel Dapkus/University of Southern California Invited	Paper

17:00 - 18:45 (UTC - 07:00)

Microwave and Millimeter-wave Photonics (STu4L)
Presider: Ryan Scott, *Keysight Technologies Inc.*

17:00 - 17:30	**Approaches to Improve Performance of 60 GHz Radio-0ver-Fiber Fronthaul Links (STu4L.1)** **Presenter**: Christina Lim, *University of Melbourne* Expand for Abstract / Authors In this paper, we review the work we have done to improve the performance of users located at the cell boundary of a 60 GHz radio-over-fibre fronthaul using coordinated-multipoint (CoMP) together with non-orthogonal-multiple-access (NOMA). **Authors**:Christina Lim/University of Melbourne Yu Tian/University of Melbourne Ampalavanapillai Nirmalathas/University of Melbourne Ka-Lun Lee/University of Melbourne Invited	Paper
17:30 - 17:45	**Incoherent Dual Laser Carriers Enable 60-GHz Millimeter-Wave-Over-Fiber Link (STu4L.2)** **Presenter**: Cheng-Ting Tsai, *National Taiwan University* Expand for Abstract / Authors Remote heterodyne of incoherent dual laser carriers enables local-oscillator-free 60-GHz MMWoF link for delivering 10-Gbit/s 16-QAM OFDM data over 25-km single-mode-fiber and 3-m free-space with 1.7-dB signal-to-noise ratio enhancement via Volterra series nonlinear noise compensation. **Authors**:Cheng-Ting Tsai/National Taiwan University Chien-Cheng Li/National Chiao-Tung University Chao-Wei Chen/National Chiao-Tung University Chun-Ting Lin/National Chiao-Tung University Chih-Hsien Cheng/National Taiwan University Sien Chi/National Chiao-Tung University Gong-Ru Lin/National Taiwan University	Paper
17:45 - 18:00	**5G Service Overlay in WDM Optical Access Network with Colorless Smart Edge Based on SiP MRM (STu4L.3)** **Presenter**: Xun Guan, *Laval University* Expand for Abstract / Authors We propose a low-cost, compact and colorless smart edge using silicon photonic microring modulators to overlay 5G services on wavelength division multiplexing (WDM) optical access networks; experimental results validate the effectiveness of this approach. **Authors**:Xun Guan/Laval University Raphael Dube-Demers/Laval University Wei Shi/Laval University Leslie Rusch/Laval University	Paper

18:00 - 18:15 **Wide Field-of-View Flexible Wavelength Routing and Multicasting for Multi-user Bi-directional Indoor Optical Wireless Communications (STu4L.4)**
Presenter: Feng Feng, *Tianjin University*
Expand for Abstract / Authors

Paper

Between an SLM-based base station with ±30°FOV and 4 steering-mirror-based nomadic terminals with ±50° FOV, we demonstrate flexible wavelength routing and multicasting with bi-directional optical wireless transmissions at 25 Gb/s over 4 meters.

Authors:Feng Feng/Tianjin University Paramin sangwongngam/University of Oxford Grahame Faulkner/University of Oxford Dominic O'Brien/University of Oxford

18:15 - 18:45 **PS-64QAM-OFDM THz Photonic-Wireless Transmission with 2×300 Gbit/s Line Rate (STu4L.5)**
Presenter: Shi Jia, *Technical University of Denmark (DTU) Fotonik*
Expand for Abstract / Authors

Paper

THz photonic-wireless transmission of a record 612.65 Gbit/s line rate is successfully demonstrated in the 320-380-GHz band by employing THz orthogonal polarization dual-antenna, PS-64QAM-OFDM modulation and advanced nonlinear-digital reception techniques.

Authors:Shi Jia/Technical University of Denmark (DTU) Fotonik Lu Zhang/Zhejiang University Shiwei Wang/Zhejiang University Wei Li/Zhejiang University Mengyao Qiao/Zhejiang University Zijie Lu/Zhejiang University Nazar Ideer/Zhejiang University Xiaodan Pang/KTH Royal Institute of Technology Hao Hu/Technical University of Denmark (DTU) Fotonik Leif K. Oxenløwe/Technical University of Denmark (DTU) Fotonik Xianbin Yu/Zhejiang University

17:00 - 19:00 (UTC - 07:00)

Environmental and Atmospheric Sensing II (ATu4I)
Presider: David Bomse, *Mesa Photonics, LLC*

17:00 - 17:15 **(Withdrawn) Simultaneous Measurement of Underwater Pressure and Temperature With a Dual-Mode Fiber-Based Sensor (ATu4I.1)**
Presenter: Lei Xueqin, *Xiamen University*
Expand for Abstract / Authors

We propose an all-fiber sensor for underwater pressure and temperature simultaneous measurements, utilizing a special dual-mode fiber with acritical wavelength existed in its transmission spectrum. This device shows its unique advantages in marine applications.

Authors:Lei Xueqin/Xiamen University xiaopeng dong/Xiamen University chenxu lu/Xiamen University

17:15 - 17:30

Virus-based ultra-thin film colorimetric sensors for enhanced chromaticity (ATu4I.2)
Presenter: Youngjin Yoo, *Gwangju Institute of Science and Technology*
Expand for Abstract / Authors

Paper

We present a virus-coated ultra-thin films for colorimetric detection with enhanced chromaticity. Designed to be sensitive to outer changes, ultra-thin porous structures detect external environment changes with dynamic thickness variation of a virus coating layer.

Authors:Youngjin Yoo/Gwangju Institute of Science and Technology Won-Geun Kim/Pusan National University Joo Hwan Ko/Gwangju Institute of Science and Technology Yujin Lee/Pusan National University Jin-Woo Oh/Pusan National University

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17:30 - 17:45

A Brillouin LIDAR For Remote Sensing the Temperature Profile in the Mixed Layer (ATu4I.3)
Presenter: Thomas Walther, *Technische Universität Darmstadt*
Expand for Abstract / Authors

Paper

We present latest results on our Brillouin Scattering LIDAR to remotely measure the temperature profile in the ocean, i.e. accuracy, improvements on various components as well as a method to independently determine temperature and salinity.

Authors:Daniel Koestel/Technische Universität Darmstadt David Rupp/Technische Universität Darmstadt Benedikt Langfeld/Technische Universität Darmstadt Thomas Walther/Technische Universität Darmstadt

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17:45 - 18:00

(Withdrawn) High speed differentiation of ore mining samples with a novel, low cost, portable multispectral image sensor (ATu4I.4)
Presenter: Peter Stark, *Harvard University*
Expand for Abstract / Authors

We demonstrate a novel multispectral filter comprising arrayed silicon nanowires in the optical near field of a commercial CMOS image sensor. The resultant camera is used for quick and high precision distinction of ore mining samples.

Authors:Peter Stark/Harvard University

18:00 - 18:30

Surface Enhanced Raman Spectroscopy, SERS for Aerosol Point Detection (ATu4I.5)
Presenter: Vasanthi Sivaprakasam, *US Naval Research Laboratory*
Expand for Abstract / Authors

Paper

A SERS technique is developed for potential *in situ* detection, chemical identification and dynamics study of individual aerosol particles. Our technique involves generating and trapping aerosols containing analyte molecules and metallic nanoparticles that demonstrates 10^5 enhancement.

Authors:Vasanthi Sivaprakasam/US Naval Research Laboratory

Invited

18:30 - 18:45

Selective Detection of Ethylene Using a Fiber-Optic Guided Mode Resonance Device: In-Field Crop/Fruit Diagnostics (ATu4I.6)
Presenter: Shawana Tabassum, *Iowa State University*
Expand for Abstract / Authors

Paper

We demonstrate a *first-of-its-kind* heater-integrated fiber optic sensor utilizing guided mode resonance and coated it with a copper complex-1 coating for selective detection of gaseous ethylene, that provides a sensitivity of 20 pm/ppm for ethylene.

Authors:Shawana Tabassum/Iowa State University Ratnesh Kumar/Iowa State University

18:45 - 19:00

Optical Isotope Analyzer for Subsurface Gases (ATu4I.7)
Presenter: Andrei Vakhtin, *Mesa Photonics, LLC*
Expand for Abstract / Authors

Paper

A Raman spectrometer for field measurement of isotope ratios of subsurface gases including nitrogen, oxygen and carbon dioxide is presented.

Authors:Andrei Vakhtin/Mesa Photonics, LLC David Bomse/Mesa Photonics, LLC

Generation and Manipulation of Light with Metasurfaces (FTu4Q)
Presider: Thomas Searles, *Howard University*

17:00 - 17:15	**Geometric Phase Metasurface Hologram for Optical Tractor Beam Generation (FTu4Q.1)** **Presenter**: Jasper Cadusch, *University of Melbourne* Expand for Abstract / Authors We present a geometric phase silicon metasurface hologram design intended to produce a non-diffracting solenoid beam. Such optical beams have been shown to exert long range retrograde (i.e. toward source) optical forces on light-scattering particles. **Authors**:Jasper Cadusch/University of Melbourne Dandan Wen/University of Melbourne jiajun Meng/University of Melbourne Kenneth Crozier/University of Melbourne	Paper
17:15 - 17:30	**Resonant Wavefront-Shaping Metasurfaces Based on Quasi-Bound States in the Continuum (FTu4Q.2)** **Presenter**: Stephanie Malek, *Columbia University* Expand for Abstract / Authors We experimentally demonstrate dielectric metasurfaces that support spatially tailored dark modes (quasi-Bound States in the Continuum) and mold optical wavefronts only at narrowband Fano resonances, while leaving the rest of the spectrum unaffected. **Authors**:Stephanie Malek/Columbia University Adam Overvig/Columbia University Sajan Shrestha/Columbia University Nanfang Yu/Columbia University	Paper
17:30 - 18:00	**Twisting Polarization of Ultrafast Pulses using Metasurfaces (FTu4Q.3)** **Presenter**: Lu Chen, *NIST* Expand for Abstract / Authors Dielectric metasurfaces enable control of the temporal profile of large bandwidth, near-infrared femtosecond pulses. Using this approach, we demonstrate shaping of the time-domain polarization state within a single pulse. **Authors**:Lu Chen/NIST Wenqi Zhu/NIST Junyeob Song/NIST Jared Strait/NIST Cheng Zhang/NIST Pengcheng Huo/Nanjing University Wei Zhou/Virginia Tech Henri Lezec/NIST Ting Xu/Nanjing University Amit Agrawal/NIST	Paper

18:00 - 18:15

Unidirectional Luminescence from InGaN/GaN Quantum-Well Metasurfaces (FTu4Q.6)
Presenter: Ryan DeCrescent, *University of California Santa Barbara*
Expand for Abstract / Authors

Paper

We demonstrate metasurface-based designs of InGaN/GaN quantum-well structures that generate narrow, unidirectional emission lobes at arbitrary engineered angles. The metasurface structuring also leads to ~100-fold enhancements in photoluminescence efficiencies for emission into air.

Authors:Ryan DeCrescent/University of California Santa Barbara Prasad Iyer/University of California Santa Barbara Yahya Mohtashami/University of California Santa Barbara Guillaume Lheureux/University of California Santa Barbara Nikita Butakov/University of California Santa Barbara Abdullah Alhassan/University of California Santa Barbara Claude Weisbuch/University of California Santa Barbara Shuji Nakamura/University of California Santa Barbara Steven DenBaars/University of California Santa Barbara Jon Schuller/University of California Santa Barbara

18:15 - 18:30

Patterning Refractive Index on the Surface of a Chip by Direct Nanoimprinting (FTu4Q.5)
Presenter: Judson Ryckman, *Clemson University*
Expand for Abstract / Authors

Paper

We demonstrate a means for patterning refractive index on the surface of a chip by directly imprinting porous nanomaterials. This offers a new route toward high index contrast and low-cost chip-scale diffractive, waveguided and meta-optic devices.

Authors:Julius Perez/Clemson University Tahmid Hassan Talukdar/Clemson University Judson Ryckman/Clemson University

18:30 - 18:45

Light-Emitting Metasurfaces: A Metalens Approach for Focusing Spontaneous Emission (FTu4Q.4)
Presenter: Yahya Mohtashami, *University of California Santa Barbara*
Expand for Abstract / Authors

Paper

We present a metalens design made from GaN nanopillars with embedded quantum-well emitters. We fabricate, using nanolithography, metalenses with different focal lengths and observe that the proposed design can effectively focus the emitted photoluminescence.

Authors:Yahya Mohtashami/University of California Santa Barbara Ryan DeCrescent/University of California Santa Barbara Prasad Iyer/University of California Santa Barbara Nikita Butakov/University of California Santa Barbara William Mitchell/University of California Santa Barbara Abdullah Alhassan/University of California Santa Barbara Shuji Nakamura/University of California Santa Barbara Steven DenBaars/University of California Santa Barbara Jon Schuller/University of California Santa Barbara

18:45 - 19:00 **Ultrafast optical switching and power limiting in intersubband polaritonic metasurfaces (FTu4Q.7)**
Presenter: Sander Mann, *CUNY ASRC*
Expand for Abstract / Authors

We experimentally demonstrate a nonlinear metasurface comprising plasmonic resonators coupled to multi-quantum well transition. Due to MQW saturation, the metasurface provides a giant $\chi^{(3)}$ on the order of $3x10^{-13}$ m^2/V^2 with ~2 ps response time.

Authors:Sander Mann/CUNY ASRC Nishant Nookala/University of Texas at Austin Samuel Johnson/University of Colorado at Boulder Ahmed Mekkawy/CUNY ASRC John Klem/Sandia National Laboratories Igal Brener/Sandia National Laboratories Andrea Alù/CUNY ASRC Mikhail Belkin/Technical University of Munich

Paper

Nitride Integrated Photonics (STu4O)
Presider: Yu Yao, *Arizona State University*

17:00 - 17:15 **Observation of stimulated Brillouin scattering in silicon nitride integrated waveguides (STu4O.1)**
Presenter: Flavien Gyger, *Ecole Polytechnique Federale de Lausanne*
Expand for Abstract / Authors

We report the first observation of backward stimulated Brillouin scattering in fully cladded Si_3N_4 waveguides. The intrinsic Brillouin gain at 25GHz and the photoelastic constant are estimated to be 4×10^{-13} m/W and p_{12}=0.047±0.004 respectively.

Authors:Fan Yang/Ecole Polytechnique Federale de Lausanne Flavien Gyger/Ecole Polytechnique Federale de Lausanne Junqiu Liu/Ecole Polytechnique Federale de Lausanne Jijun He/Ecole Polytechnique Federale de Lausanne Arslan Raja/Ecole Polytechnique Federale de Lausanne Rui Ning Wang/Ecole Polytechnique Federale de Lausanne Sunil Bhave/Purdue University Tobias Kippenberg/Ecole Polytechnique Federale de Lausanne Luc Thévenaz/Ecole Polytechnique Federale de Lausanne

Paper

17:15 - 17:30 **A Nitride Ring Isolator (STu4O.2)**
Presenter: Hao Tian, *Purdue University*
Expand for Abstract / Authors

A silicon nitride optical ring isolator is realized by spatiotemporal modulation using bulk acoustic wave stress-optical transducers. By driving three actuators with fixed relative phases, over 17 dB isolation is achieved.

Authors:Hao Tian/Purdue University Junqiu Liu/École Polytechnique Fédérale de Lausanne Connor Skehan/École Polytechnique Fédérale de Lausanne Anat Siddharth/École Polytechnique Fédérale de Lausanne Tobias Kippenberg/École Polytechnique Fédérale de Lausanne Sunil Bhave/Purdue University

Paper

17:30 - 17:45

Integrated Graphene Electro-Optic Modulator on Si_3N_4 with Increasing Bandwidth at Cryogenic Temperatures (STu4O.3)
Presenter: Brian Lee, *Columbia University*
Expand for Abstract / Authors

Paper

We demonstrate an integrated graphene modulator overcoming the limits of 3D photonic materials at cryogenic temperatures, with a 17% bandwidth improvement from 11.9 GHz at 293 K to 13.9 GHz at 4.9 K.

Authors:Brian Lee/Columbia University Yibo Zhu/Columbia University Alexandre Freitas/University of Campinas Gaurang Bhatt/Columbia University James Hone/Columbia University Michal Lipson/Columbia University

17:45 - 18:00

Graphene–silicon nitride photodetector with bound state in the continuum (STu4O.4)
Presenter: YI WANG, *Chinese University of Hong Kong*
Expand for Abstract / Authors

Paper

We introduce a new approach for fully planar integration of graphene on silicon nitride channel light-guiding based on bound states in the continuum. The graphene photodetector has 37 GHz bandwidth and 1 A/W responsivity.

Authors:YI WANG/Chinese University of Hong Kong Zejie Yu/Chinese University of Hong Kong Beilei Sun/Chinese University of Hong Kong Yeyu Tong/Chinese University of Hong Kong Jian-Bin Xu/Chinese University of Hong Kong Xiankai Sun/Chinese University of Hong Kong Hon Ki Tsang/Chinese University of Hong Kong

18:00 - 18:15

(Withdrawn) Monolithically integrated erbium-silicon nitride hybrid photonic platform (STu4O.5)
Presenter: Tianyi Liu, *Ecole Polytechnique Federale de Lausanne*
Expand for Abstract / Authors

We present a hybrid platform incorporating erbium-doped layer and ultralow-loss Si3N4 photonic integrated circuits, and demonstrate strong optical absorption by erbium, a key step for integrated mode-lock lasers.

Authors:Junqiu Liu/Ecole Polytechnique Federale de Lausanne Tianyi Liu/Ecole Polytechnique Federale de Lausanne John Roenn/Aalto University Jijun He/Ecole Polytechnique Federale de Lausanne Fabien Gremion/Ecole Polytechnique Federale de Lausanne Zhipei Sun/Aalto University Tobias Kippenberg/Ecole Polytechnique Federale de Lausanne

18:15 - 18:30 **Silicon nitride waveguide as a power delivery component for dielectric laser accelerators (STu4O.6)**
Presenter: Zhexin Zhao, *Stanford University*
Expand for Abstract / Authors

[Paper]

We study the weakly-guided silicon nitride waveguide to deliver sub-picosecond high power laser pulses for dielectric laser accelerators. Damage limited deliverable fluence (0.19 J/cm^2) is measured and nonlinear effects are characterized.

Authors:Zhexin Zhao/Stanford University Si Tan/Stanford University Karel Urbanek/Stanford University Tyler Hughes/Stanford University Yun Lee/Purdue University Shanhui Fan/Stanford University James Harris/Stanford University Robert Byer/Stanford University

18:30 - 18:45 **High Quality Factor Aluminum Nitride on Sapphire Resonators at Infrared and Near Infrared Wavelengths (STu4O.7)**
Presenter: Yi Sun, *University of Michigan*
Expand for Abstract / Authors

[Paper]

We demonstrate low-loss aluminum nitride waveguides and ring resonators on sapphire. The ring resonators on this platform shows a high quality factor above 2.8 million at 1550 nm and above 120,000 at 780 nm.

Authors:Yi Sun/University of Michigan Walter Shin/University of Michigan Ping Wang/University of Michigan David Laleyan/University of Michigan Ayush Panday/University of Michigan Xianhe Liu/University of Michigan Yuanpeng Wu/University of Michigan Mohammad Soltani/Raytheon BBN Technologies Zetian Mi/University of Michigan

18:45 - 19:00 **1.4 Million Q-Factor 780 nm Wavelength Si_3N_4 Micro-rings for Chip-Scale Atomic Systems (STu4O.8)**
Presenter: Martin Sinclair, *University Of Glasgow*
Expand for Abstract / Authors

[Paper]

A silicon nitride micro-ring resonator with loaded Q factor of 1.4 million at 780 nm wavelength on silicon substrates for chip-scale atomic systems targeting the 87Rb atomic transition at 780.24 nm

Authors:Martin Sinclair/University Of Glasgow Kevin Gallacher/University Of Glasgow Marc Sorel/University Of Glasgow Joseph Bayley/University Of Glasgow Euan McBrearty/University Of Glasgow Ross Millar/University Of Glasgow Stefan Hild/University Of Glasgow Douglas Paul/University Of Glasgow

Topological Effects (FTu4A)

Presider: Cheng Zhang, *Huazhong University of Science and Technology (HUST)*

17:00 - 17:15	**Topological compensation of Rayleigh scattering induced reflection in a single mode waveguide (FTu4A.1)** **Presenter**: Hwaseob Lee, *University of Delaware* Expand for Abstract / Authors Intrinsic backscattering generated from waveguide sidewall roughness is suppressed by a designed dielectric scatter. Merging mode-splitting in a micro-ring resonator confirms the exceptional point. **Authors**:Hwaseob Lee/University of Delaware Tingyi Gu/University of Delaware Feifan Wang/University of Delaware Tiantian Li/University of Delaware Alec Scallo/University of Delaware Zi Wang/University of Delaware	Paper
17:15 - 17:30	**Topologically protected acoustic wave amplification in an optomechanical array (FTu4A.2)** **Presenter**: Xiankai Sun, *The Chinese University of Hong Kong* Expand for Abstract / Authors By exploiting the simultaneous particle-conserving and particle-nonconserving phonon-photon interactions in an optomechanical array, we find a topologically protected edge state for phonons that can be parametrically amplified when all the bulk states remain stable. **Authors**:Jingwen Ma/The Chinese University of Hong Kong Ziyao Feng/The Chinese University of Hong Kong Yuan Li/The Chinese University of Hong Kong Xiankai Sun/The Chinese University of Hong Kong	Paper
17:30 - 17:45	**Spin-orbit interaction of light in plasmonic lattices: modified and broken angular momentum conservation (FTu4A.3)** **Presenter**: Shai Tsesses, *Technion-Israeli institute of technology* Expand for Abstract / Authors We show how the spin-orbit interaction of light in systems with non-circular symmetry changes optical angular momentum conservation, or even completely breaks it. We demonstrate our claims through phase-resolved near-field measurements and optical force calculations. **Authors**:Shai Tsesses/Technion-Israeli institute of technology Kobi Cohen/Technion-Israeli institute of technology Evgeny Ostrovsky/Technion-Israeli institute of technology Bergin Gjonaj/Technion-Israeli institute of technology Tomer Bucher/Technion-Israeli institute of technology Shay Sapir/Technion-Israeli institute of technology Guy Bartal/Technion-Israeli institute of technology	Paper

17:45 - 18:00

(Withdrawn) Observation of Energy-Momentum Optical Vortices (FTu4A.4)
Presenter: Gilad Rosenblatt, *Technion - Israel Institute of Technology*
Expand for Abstract / Authors

We report the experimental observation of optical vortices in energy-momentum space carrying conserved topological charge that governs their robust creation and annihilation, generated by exciting antiresonant plasmon polaritons in metallic films with focused broadband beams.

Authors:Gilad Rosenblatt/Technion - Israel Institute of Technology Boris Simkhovich/Technion - Israel Institute of Technology Meir Orenstein/Technion - Israel Institute of Technology

18:00 - 18:15

(Withdrawn) 3D-Printed Topology-Optimized Metaoptics (FTu4A.5)
Presenter: Charles Roques-Carmes, *MIT*
Expand for Abstract / Authors

We propose a novel topology optimization method to design 3D, large-area, multifunctional metasurfaces. A compact, high-NA infrared multilayer lens design that exhibits broad angular control is proposed. We demonstrate experimentally a proof-of-concept single-layer 3D-printed metalens.

Authors:Charles Roques-Carmes/MIT Zin Lin/MIT Rasmus Ellebaek Christiansen/MIT Yannick Salamin/MIT Steven Kooi/MIT John Joannopoulos/MIT Steven Johnson/MIT Marin Soljacic/MIT

18:15 - 18:30

One Dimensional Long Range Surface Plasmon Polariton Topological Insulator in Telecomm Wavelength (FTu4A.6)
Presenter: Ran Gladstein Gladstone, *Cornell University*
Expand for Abstract / Authors

We present a platform that implements the topological Su-Schrieffer-Heeger model using long range surface plasmon polaritons on a gold strip at telecomm wavelength. We provide a theoretical model and simulations showing a topological edge mode.

Authors:Ran Gladstein Gladstone/Cornell University Gennady Shvets/Cornell University

Paper

18:30 - 18:45 **Demonstration of highly unidirectional edge states in terahertz slab waveguides (FTu4A.7)**
Presenter: hao xiong, *Nankai University*
Expand for Abstract / Authors

Paper

We achieved highly unidirectional topological edge states in a terahertz slab waveguide based on the triangular honeycomb lattice. The unidirectional property and robustness of edge states against various kinds of defects were presented and studied.

Authors:hao xiong/Nankai University Yao lu/Nankai University Qiang Wu/Nankai University Jingjun Xu/Nankai University

18:45 - 19:00 **(Withdrawn) Violations of the Bulk-Edge Correspondence in Uniform Topological Photonic Materials (FTu4A.8)**
Presenter: Seyyed Ali Hassani Gangaraj, *Cornell University*
Expand for Abstract / Authors

Apparent violations of the bulk-edge correspondence in topological continua are discussed. We show that, while the inclusion of nonlocality mathematically restores the correspondence, this principle is violated in practice due to Landau-damping or nonlocality-induced radiation.

Authors:Seyyed Ali Hassani Gangaraj/Cornell University Francesco Monticone/Cornell University

Lithium Niobate Photonics (STu4J)

Presider: Amir Safavi-Naeini, *Stanford University*

17:00 - 17:30 **Nanobenders: efficient piezoelectric actuators for widely tunable nanophotonics at CMOS-level voltages (STu4J.1)**
Presenter: Felix Mayor, *Stanford University*
Expand for Abstract / Authors

Paper

We introduce a compact ($\sim$ \SI{10}{\micro\meter^2}) piezoelectric actuator, and use it to tune the optical resonance wavelength of a lithium niobate photonic crystal cavity by ~ 5 nm/V. The tuning range is 1520-1560 nm with 4 V.

Authors:Wentao Jiang/Stanford University Felix Mayor/Stanford University Rishi Patel/Stanford University Timothy McKenna/Stanford University Christopher Sarabalis/Stanford University Amir Safavi-Naeini/Stanford University

17:30 - 17:45

Piezo-optomechanics in lithium niobate on silicon-on-insulator for microwave-to-optics transduction (STu4J.2)
Presenter: Raphaël Van Laer, *Stanford University*
Expand for Abstract / Authors

Paper

We demonstrate efficient piezoelectricity and optomechanics in a hybrid platform combining thin-film lithium niobate with silicon-on-insulator. The devices establish an intriguing path towards low-energy classical and quantum transduction between microwaves and optics.

Authors:Raphaël Van Laer/Stanford University Wentao Jiang/Stanford University Rishi Patel/Stanford University Christopher Sarabalis/Stanford University Agnetta Cleland/Stanford University Timothy McKenna/Stanford University E. Alex Wollack/Stanford University Patricio Arrangoiz-Arriola/Stanford University Jeremy Witmer/Stanford University Amir Safavi-Naeini/Stanford University

17:45 - 18:00

$LiNbO_3$ Photonic Crystal Optical Modulator (STu4J.3)
Presenter: Mingxiao Li, *University of Rochester*
Expand for Abstract / Authors

Paper

We report $LiNbO_3$ photonic-crystal electro-optic modulators (EOMs) with a modulation efficiency up to 11~pm/V and a bandwidth up to 17.5~GHz, the smallest $LiNbO_3$ EOM ever demonstrated while with the highest modulation efficiency.

Authors:Mingxiao Li/University of Rochester Jingwei Ling/University of Rochester Yang He/University of Rochester Usman Javid/University of Rochester Shixin Xue/University of Rochester Qiang Lin/University of Rochester

18:00 - 18:15

Electro-optic frequency shifting using coupled lithium-niobate microring resonators (STu4J.4)
Presenter: Yaowen Hu, *Harvard University*
Expand for Abstract / Authors

We experimentally investigate electro-optic frequency shifting of continuous wave optical signal using harmonic RF signal. We demonstrate 11GHz shift with 98.2% efficiency and 1.25dB device insertion loss. This was accomplished by unidirectionally controlling the photon flow in frequency domain.

Authors:Yaowen Hu/Harvard University Mengjie Yu/Harvard University Di Zhu/Harvard University Neil Sinclair/Harvard University Amirhassan Shams-Ansari/Harvard University Linbo Shao/Harvard University Jeffrey Holzgrafe/Harvard University Mian Zhang/HyperLight Corporation Marko Loncar/Harvard University

18:15 - 18:30	**Tunable Bragg Grating Filters and Resonators in Lithium Niobate-on-Insulator Waveguides (STu4J.5)** **Presenter**: David Pohl, *ETH Zurich* Expand for Abstract / Authors We present integrated uniform, phase-shifted and sampled Bragg gratings in lithium niobate-on-insulator. High extinction ratios of 35 dB at 1550 nm, quality factors of 3.4×10^4 and an electro-optic tuning efficiency of 14.6 pm/V are achieved. **Authors**:David Pohl/ETH Zurich Fabian Kaufmann/ETH Zurich Marc Reig Escalé/ETH Zurich Jannis Holzer/ETH Zurich Rachel Grange/ETH Zurich	Paper
18:30 - 18:45	**Photonics-to-Free-Space Interface in Lithium Niobate-on-Sapphire (STu4J.6)** **Presenter**: Taha Rajabzadeh, *Stanford* Expand for Abstract / Authors We present a device in thin-film lithium niobate-on-sapphire that scatters light from a ridge waveguide into a 4.5 x 12.6 milliradian beam in free-space that can be steered by tuning the wavelength. **Authors**:Taha Rajabzadeh/Stanford Christopher Sarabalis/Stanford Okan Atalar/Stanford Amir Safavi-Naeini/Stanford	Paper
18:45 - 19:00	**$LiNbO_3/Si_3N_4$-Bilayer Vertical Coupler for Integrated Photonics (STu4J.7)** **Presenter**: Ahmed Shariful Alam, *Denmark Technical University* Expand for Abstract / Authors The design of a $LiNbO_3/Si_3N_4$-bilayer vertical coupler is proposed based on adiabatic transition from a thick-Si_3N_4 strip waveguide to a $LiNbO_3$/thin-Si_3N_4 striploaded hybrid waveguide having a gross coupling loss of ∼0.08 dB. **Authors**:Ahmed Shariful Alam/Denmark Technical University Marcello Girardi/Chalmers University of Technology Alexander Caut/Chalmers University of Technology Anders Larsson/Chalmers University of Technology Victor Company/Chalmers University of Technology Michael Galili/Denmark Technical University Yunhong Ding/Denmark Technical University Kresten Yvind/Denmark Technical University	Paper

Disorder and Localization (FTu4B)

Presider: Todd Van Mechelen, *Purdue University*

17:00 - 17:15 **Incoherent Branched Flow of Light (FTu4B.1)**
Presenter: Anatoly Patsyk, *Technion-Israel Institute of Technology*
Expand for Abstract / Authors

Paper

We present the first observation of optical branched flow of spatially-incoherent light.

Authors:Anatoly Patsyk/Technion-Israel Institute of Technology Mordechai Segev/Technion-Israel Institute of Technology Uri Sivan/Technion-Israel Institute of Technology

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17:15 - 17:30 **(Withdrawn) Collective effects in the delayed luminescence from mesoscopic scattering media (FTu4B.2)**
Presenter: Mahed Batarseh, *University of Central Florida, CREOL*
Expand for Abstract / Authors

Superradiance-like emission is observed in the delayed luminescence from mesoscopic systems of off-resonant microspheres. The optical density of the medium and the distance between emitters control the properties of this cooperative effect.

Authors:Mahed Batarseh/University of Central Florida, CREOL Aristide Dogariu/University of Central Florida, CREOL

17:30 - 17:45 **(Withdrawn) Light Scattering of Random Close Packed Nanorods (FTu4B.3)**
Presenter: Mutasem ODEH, *university of California Berkeley*
Expand for Abstract / Authors

In this work, we investigate the scattering behavior of nanorods that are randomly packed at various densities and aspect ratios. We show that the maximum packing density, maximum scattering density, and the percolation threshold are all tightly related to Onsager excluded-area principle.

Authors:Mutasem ODEH/university of California Berkeley Matthieu Dupre/University of California San Diego Kevin Kim/University of California San Diego Boubacar Kante/university of California Berkeley

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17:45 - 18:00 **High-Resolution Imaging in Arbitrarily Heavily Scattering Random Media with Speckle Correlations over Object Position (FTu4B.4)**
Presenter: Kevin Webb, *Purdue University*
Expand for Abstract / Authors

Paper

A general theory is presented for speckle intensity correlations over object position that allows an arbitrary object to be imaged through an amount of random scatter limited by detector noise, with retention of subwavelength information.

Authors:Qiaoen Luo/Purdue University Ryan Hastings/Purdue University Kevin Webb/Purdue University

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18:00 - 18:15 **Observation of Anderson localization by virtual transitions (FTu4B.5)**
Presenter: Alex Dikopoltsev, *Technion*
Expand for Abstract / Authors

Paper

We observe experimentally that virtual transitions can cause Anderson localization, without any first-order scattering processes. We implement this in a time-bin encoded 1+1D lattice in fiber loops.

Authors:Alex Dikopoltsev/Technion Mark Kremer/Technion Hanan Sheinfux/ICFO Sebastian Weidemann/University of Rostock Alexander Szameit/University of Rostock Mordechai Segev/Technion

18:15 - 18:30 **Optical Thouless Conductance in Anderson Localizing Systems (FTu4B.6)**
Presenter: Sushil Mujumdar, *Tata Institute of Fundamental Research*
Expand for Abstract / Authors

Paper

A non-intuitive combination of near-Wigner Dyson spacing statistics and lognormal conductance distribution is measured in a two-dimensional finite-sized Anderson localizing system. Theoretical analysis uncovers a novel nonlinear connection between repulsion exponent and localization length.

Authors:Sandip Mondal/Tata Institute of Fundamental Research Randhir Kumar/Tata Institute of Fundamental Research Martin Kamp/University of Wuerzburg Sushil Mujumdar/Tata Institute of Fundamental Research

18:30 - 19:00 **Statistics of individual eigenchannels of diffusive random medium (FTu4B.7)**
Presenter: Alexey Yamilov, *Missouri University of Science and Technology*
Expand for Abstract / Authors

Paper

We measure correlations between individual transmission eigenchannels in a unique on-chip photonic platform that allows both selective coupling of light into a single eigenchannel and direct probe of its spatial structure inside the random medium.

Authors:Alexey Yamilov/Missouri University of Science and Technology Nicholas Bender/Yale University Hasan Yilmaz/Yale University Hui Cao/Yale University

Invited

High Energy Lasers for Facilities II (STu4E)
Presider: Emily Frances Link, *Lawrence Livermore National Laboratory*

17:00 - 18:00

(Withdrawn) Laser plasma accelerator: compact, competitive and useful (STu4E.1)
Presenter: Victor Malka, *Weizmann Institute of Science*
Expand for Abstract / Authors

This tutorial will describe how by manipulating electrons with intense laser on can create in a compact and elegant way a high quality electron beams. The latest advances in laser plasma accelerators will be discussed.
Victor Malka being fascinated by electrons motions in very strong laser field, has shown how by manipulating collectively electrons one can build compact accelerators delivering high quality beams of electrons, protons and X-rays that open opportunities for societal applications in medicine and security, and for fundamental research in other areas

Authors:Victor Malka/Weizmann Institute of Science

Tutorial

18:00 - 18:15

10 PetaWatt Laser System for Extreme Light Physics (STu4E.2)
Presenter: Sandrine Ricaud, *Thales Las France*
Expand for Abstract / Authors

We present results obtained on the first 10PW laser at ELI-NP installation. We demonstrated a laser system delivering pulses at 1 shot/min with a peak power of 10.9PW.

Authors:Sandrine Ricaud/Thales Las France François Lureau/Thales Las France Guillaume Matras/Thales Las France Olivier Chalus/Thales Las France Christophe Derycke/Thales Las France Christophe Radier/Thales Las France Olivier Casagrande/Thales Las France Christophe Simon Boisson/Thales Las France

- Paper

18:15 - 18:30

(Withdrawn) Commissioning of a High Energy kW-class DPSSL System for HED Experiments at the European XFEL (STu4E.3)
Presenter: Saumyabrata Banerjee, *STFC Rutherford Appleton Laboratory*
Expand for Abstract / Authors

We report commissioning results of a 100 J, 10 Hz cryogenic gas cooled, multi-slab Yb:YAG DPSSL system, including, long-term energy stability and temporal pulse shaping capability.

Authors:Saumyabrata Banerjee/STFC Rutherford Appleton Laboratory Paul Mason/STFC Rutherford Appleton Laboratory Jonathan Phillips/STFC Rutherford Appleton Laboratory Thomas Butcher/STFC Rutherford Appleton Laboratory Jodie Smith/STFC Rutherford Appleton Laboratory Stephanie Tomlinson/STFC Rutherford Appleton Laboratory Hauke Höppner/Helmholtz-Zentrum Dresden-Rossendorf e.V., D-01328 Dominik Möller/Helmholtz-Zentrum Dresden-Rossendorf e.V., D-01328 Ian Hollingham/STFC Rutherford Appleton Laboratory Andrew Norton/STFC Rutherford Appleton Laboratory Klaus Ertel/STFC Rutherford Appleton Laboratory Mariastefania De. Vido/STFC Rutherford Appleton Laboratory Mike Tyldesley/STFC Rutherford Appleton Laboratory Cristina Hernandez-Gomez/STFC Rutherford Appleton Laboratory Toma Toncian/Helmholtz-Zentrum Dresden-Rossendorf e.V., D-01328 Ulf Zastrau/European X-Ray Free-Electron Laser-Facility GmbH, Albert-Einstein-Ring 19, 22761 Erik Brambrink/European X-Ray Free-Electron Laser-Facility GmbH, Albert-Einstein-Ring 19, 22761 Chris Edwards/STFC Rutherford Appleton Laboratory John Collier/STFC Rutherford Appleton Laboratory

18:30 - 19:00

Relativistic nanoplasmonics (STu4E.4)
Presenter: Laszlo Veisz, *Umea University*
Expand for Abstract / Authors

- Paper

We report the first observations of ultrahigh intensity sub-two-optical-cycle laser pulse interaction with nanometric solid density plasmas. Laser-waveform-dependent relativistic electron bunches are generated. These results represent the extension of nanoplasmonics into the relativistic realm.

Authors:Laszlo Veisz/Umea University Aitor De Andres/Umea University Daniel Cardenas/Max-Planck-Institut für Quantenoptik Laura Di Lucchio/Forschungszentrum Jülich GmbH Tobias Ostermayr/Max-Planck-Institut für Quantenoptik Luisa Hofmann/Max-Planck-Institut für Quantenoptik Matthias Kling/Max-Planck-Institut für Quantenoptik Jörg Schreiber/Max-Planck-Institut für Quantenoptik Paul Gibbon/Forschungszentrum Jülich GmbH

Invited

Nonlinear and Ultrafast Terahertz Phenomena (STu4G)

Presider: George Keiser, *Washington College*

17:00 - 18:00

Nonlinear Lattice Dynamics Driven by Intense Terahertz Pulses (STu4G.1)
Presenter: Matthias Hoffmann, *SLAC National Accelerator Laboratory*
Expand for Abstract / Authors

Paper

Intense Terahertz (THz) pulses offer a unique way to manipulate matter on a sub-picosecond timescale. Their strong electric and magnetic field components efficiently couple to low-energy degrees of freedom like optical phonons or magnons while we can simultaneously use ultrafast probe techniques to monitor changes in the sample with femtosecond resolution. This allows us to study novel nonequilibrium phases and the response of matter to strong transient fields.
Matthias Hoffmann is staff scientist at LCLS, the world’s first hard x-ray free electron laser. He has spent most of hiscareer in ultrafast laser science, primarily on terahertz generation and spectroscopy. After graduating from the University of Freiburg in Germany, he joined Keith Nelson‘s group at MIT as a postdoc where he worked with Janos Hebling to implement the first high energy THz sources based on the tilted pulse front technique in lithium niobate. In 2009 he moved to Hamburg, Germany and worked as a scientist in Andrea Cavalleri’s group at CFEL and continued his work on nonlinear THz spectroscopy, exploring light-induced superconductivity in high temperature superconductors.
After two years in Andrea’s group he accepted a position as staff scientist at LCLS. His main responsibilities here are the development of improved THz sources and the support of user experiments using these sources at LCLS. In the last few years, he had many fruitful collaborations with researchers from all over the world and demonstrating some of the first THz-pump x-ray probe experiments.
In his free time he enjoys spending time with his family and road cycling on the beautiful roads of northern California.

Authors:Matthias Hoffmann/SLAC National Accelerator Laboratory

Tutorial

18:00 - 18:15

Magnetically Tuned THz Nonlinearity in Bilayer Graphene Disc Arrays (STu4G.2)
Presenter: Matthew Chin, *US Army Combat Capabilities Dev. Com.*
Expand for Abstract / Authors

Paper

We study the nonlinear plasmonic response of bilayer graphene disks using terahertz pump probe spectroscopy. An applied magnetic field induces a splitting in the plasmon resonance, which is shown to tune the nonlinear response.

Authors:Matthew Chin/US Army Combat Capabilities Dev. Com. Florian Stawitzki/University of Duisburg-Essen Sebastian Matschy/University of Duisburg-Essen Jayaprakash Poojali/University of Maryland, College Park Hassan Hafez/Bielefeld University Dmitry Turchinovich/Bielefeld University Stephan Winnerl/Helmholtz-Zentrum Dresden-Rossendorf Gagan Kumar/Indian Institute of Technology Guwahati Rachael Myers-Ward/US Naval Research Laboratory Matthew Dejarld/US Naval Research Laboratory Kevin Daniels/University of Maryland, College Park Thomas Murphy/University of Maryland, College Park Martin Mittendorff/University of Duisburg-Essen

18:15 - 18:30

Ultrafast Dynamics of a Terahertz Dual-Fed Relativistic Electron Bunch Compressor (STu4G.3)

Presenter: Mohamed Othman, *SLAC National Accelerator Laboratory*

Expand for Abstract / Authors

Paper

We present the initial characterization of a THz-based dual-fed electron bunch compressor. Intense single-cycle THz pulses, generated by optical rectification in organic crystals OH1, are coupled into a parallel-plate waveguide and characterized using electro-optic sampling.

Authors:Mohamed Othman/SLAC National Accelerator Laboratory Emma Snively/SLAC National Accelerator Laboratory Michael Kozina/SLAC National Accelerator Laboratory Patrick Kramer/SLAC National Accelerator Laboratory Xiaozhe Shen/SLAC National Accelerator Laboratory Fuhao Ji/SLAC National Accelerator Laboratory Stephen Weathersby/SLAC National Accelerator Laboratory Xijie Wang/SLAC National Accelerator Laboratory Matthias Hoffmann/SLAC National Accelerator Laboratory Emilio Nanni/SLAC National Accelerator Laboratory

18:30 - 19:00

Hot Carriers in Graphene: a Versatile Platform for THz Nonlinear Plasmonics (STu4G.4)

Presenter: Martin Mittendorff, *University of Duisburg-Essen*

Expand for Abstract / Authors

Paper

Plasmonic graphene structures exhibit an enhanced light matter interaction. Intense THz radiation efficiently heats the electrons, resulting in a strong optical nonlinearity that can be tailored by structuring, gating, or applying magnetic fields.

Authors:Martin Mittendorff/University of Duisburg-Essen Florian Stawitzki/University of Duisburg-Essen Sebastian Matschy/University of Duisburg-Essen M. Jadidi/Columbia University Matt Chin/University of Maryland Stephan Winnerl/Helmholtz-Zentrum Dresden-Rossendorf Thomas Murphy/University of Maryland

Invited

Space Division Multiplexing II (STu4R)

Presider: Shibin Jiang, *AdValue Photonics Inc*

17:00 - 17:15 **Dynamic Skew Measurements in a Deployed 4-core Fiber (STu4R.1)**
Presenter: Benjamin Puttnam, *National Inst Info & Comm Tech (NICT)*
Expand for Abstract / Authors

Paper

We measure inter-core skew in a deployed 4-core fiber, observing maximum variation of <1.5 ps on a 25.2 km link over a 48-hour period and static skew of 1.12 ns for 6.3 km span, both similar to measurements in spooled fibers

Authors:Benjamin Puttnam/National Inst Info & Comm Tech (NICT) Ruben Luis/National Inst Info & Comm Tech (NICT) Georg Rademacher/National Inst Info & Comm Tech (NICT) Andrea Marotta/University of L'Aquila Cristian Antonelli/National Inst Info & Comm Tech (NICT) Antonio Mecozzi/University of L'Aquila Fabio Graziosi/University of L'Aquila Tetsuya Hayashi/Sumitomo Electric Industries Tetsuya Nakanishi/Sumitomo Electric Industries Yoshinari Awaji/National Inst Info & Comm Tech (NICT) Hideaki Furukawa/National Inst Info & Comm Tech (NICT) Naoya Wada/National Inst Info & Comm Tech (NICT)

17:15 - 17:30 **All-Fiber Tunable Ultra-Broadband Mode Converter Based on Helical Long-Period Grating (STu4R.2)**
Presenter: Yunqi Liu, *Shanghai University*
Expand for Abstract / Authors

Paper

We propose a tunable ultra-broadband mode converter based on helical long-period gratings inscribed in a two-mode fiber by CO_2-laser. The 1st order orbital angular momentum mode was generated directly over 10-dB bandwidth of 296.7 nm.

Authors:Xinyi Zhao/Shanghai University Yunqi Liu/Shanghai University Zuyao Liu/Shanghai University Chengbo Mou/Shanghai University

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17:30 - 17:45 **Degenerate LP mode asymmetric coupling and OAM mode directional transmission between weakly guiding FMFs (STu4R.3)**
Presenter: Liang Fang, *Wuhan National Lab for Optoelectronics*
Expand for Abstract / Authors

Paper

We fabricate a directional coupler by side-polishing few-mode fibers (FMFs) to experimentally investigate the higher-order linearly polarized (LP) mode coupling asymmetry, and realize orbital angular momentum (OAM) mode directional transmission by controlling the coupling length.

Authors:Liang Fang/Wuhan National Lab for Optoelectronics Yue Qin/Wuhan National Lab for Optoelectronics Yize Liang/Wuhan National Lab for Optoelectronics Han Cao/Wuhan National Lab for Optoelectronics Wei Zhou/Wuhan National Lab for Optoelectronics Hongya Wang/Wuhan National Lab for Optoelectronics Jian Wang/Wuhan National Lab for Optoelectronics

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17:45 - 18:00 **Beam Shaping with a Multicore Fiber Amplifier (STu4R.4)**
Presenter: Di Lin, *University of Southampton*
Expand for Abstract / Authors

Paper

We experimentally generate various spatial modes (e.g. optical vector or vortex beams) from a coherently-combined 7-core Er/Yb-doped multicore fiber amplifier through control of the amplitude, phase and polarization state of the individual core beams.

Authors:Di Lin/University of Southampton Joel Carpenter/The University of Queensland Yutong Feng/University of Southampton Saurabh Jain/University of Southampton Yongmin Jung/University of Southampton Yujun Feng/University of Southampton Michalis Zervas/University of Southampton David Richardson/University of Southampton

18:00 - 18:15 **Spatially Multiplexed Picosecond Pulse-Train Generations in a Multimode Fiber (STu4R.5)**
Presenter: Haisu Zhang, *CNRS-Universite Bourgonge Franche-Comte*
Expand for Abstract / Authors

Paper

We experimentally demonstrate the spatially multiplexed picosecond pulse-train generations based on the intramodal multiple four-wave mixings in a km-long graded-index multimode fiber.

Authors:Haisu Zhang/CNRS-Universite Bourgonge Franche-Comte Marianne Bigot-Astruc/Prysmian Group Pierre Sillard/Prysmian Group Julien Fatome/CNRS-Universite Bourgonge Franche-Comte

18:15 - 18:45 **Optical fibers: Challenges and Opportunities in SDM (STu4R.6)**
Presenter: David DiGiovanni, *OFS Laboratories*
Expand for Abstract / Authors

Paper

Continued growth in communications bandwidth demand pushes limits of optical fiber capacity. Space division multiplexing may be a solution, but commercial realities must be carefully evaluated. We review multiple applications and explore applications beyond communications.

Authors:David DiGiovanni/OFS Laboratories

Invited

Innovation in Sensing and Measurement (STu4F)
Presider: Jonathan Pritchard, *Strathclyde University*

17:00 - 17:30	**Unforeseen Applications of Rydberg Atom-Based Sensors: SI Traceability, Phase Detection, Musical Recording, and other Unique Applications (STu4F.1)** **Presenter**: Christopher Holloway, *National Inst of Standards & Technology* Expand for Abstract / Authors Great progress had been made in the use of Rydberg atoms to detect the amplitude, phase, and polarization of electric fields and modulated signals. This has led to several unforeseen applications, which are discussed here. **Authors**:Christopher Holloway/National Inst of Standards & Technology Matthew Simons/National Inst of Standards & Technology Amy Robinson/National Inst of Standards & Technology Abdulaziz Haddab/National Inst of Standards & Technology Josh Gordon/National Inst of Standards & Technology	Paper
17:30 - 17:45	**(Withdrawn) Quantum Optics and Technologies at 2\,$\bm{\mu}$m for Next-Generation Gravitational Wave Observatories (STu4F.2)** **Presenter**: Paul Altin, *Australian National University* Expand for Abstract / Authors We present recent work on technologies for quantum enhancement of interferometric gravitational wave detectors operating at 2 μm, including a narrow-linewidth laser source, generation of audio-frequency vacuum squeezing, and the development of high-quantum-efficiency photodetectors. **Authors**:Paul Altin/Australian National University Disha Kapasi/Australian National University Min-Jet Yap/Australian National University Vaishali Adya/Australian National University Georgia Mansell/Australian National University Daniel Gould/Australian National University Daniel Toyra/Australian National University Nutsinee Kijbunchoo/Australian National University Johannes Eichholz/Australian National University Terry McRae/Australian National University Robert Ward/Australian National University Daniel Shaddock/Australian National University Bram Slagmolen/Australian National University David McClelland/Australian National University	
17:45 - 18:00	**Single Photons and Single Spins: NV Centres Encapsulated in Silicon Nitride (STu4F.3)** **Presenter**: Joseph Smith, *University of Bristol* Expand for Abstract / Authors We demonstrate nitrogen-rich silicon nitride is a viable quantum photonics platform, evidencing both the optical and spin properties of an individual NV centre is preserved after encapsulation, surpassing the single photon and single spin threshold. **Authors**:Joseph Smith/University of Bristol Jorge Monroy Ruz/University of Bristol Krishna Coimbatore Balram/University of Bristol John Rarity/University of Bristol	Paper

18:00 - 18:30 **Compact Frequency Stabilized Laser Based on Gas-filled Hollow-Core Fiber Cells with Applications in Satellite-Based Gas Sensing (STu4F.4)**
Presenter: E. Anne Curtis, *National Physical Laboratory*
Expand for Abstract / Authors

TBD

Authors:E. Anne Curtis/National Physical Laboratory

Invited

18:30 - 18:45 **Quantum Limits of Optical Beam Deflection Measurements of a Nanomechanical Resonator (STu4F.5)**
Presenter: Thomas Purdy, *University of Pittsburgh*
Expand for Abstract / Authors

Paper

Optical lever detection is a simple and robust method to measure small displacements. We report on our experimental efforts toward reaching and surpassing the quantum backaction limits of this method when probing a high Q nanomechanical resonator.

Authors:Shan Hao/University of Pittsburgh Robinjeet Singh/NIST Thomas Purdy/University of Pittsburgh

18:45 - 19:00 **High-Q Nanomechanical Resonators for Optomechanical Sensing Beyond the Standard Quantum Limit. (STu4F.6)**
Presenter: Robinjeet Singh, *Joint Quantum Institute*
Expand for Abstract / Authors

Paper

We fabricate high-stress silicon and silicon-nitride based nanomechanical string resonators to study quantum optomechanical interactions. We use phononic band-gap engineering techniques to minimize mechanical energy dissipation in the out-of-plane defect mode of the resonator.

Authors:Robinjeet Singh/Joint Quantum Institute Thomas Purdy/University of Pittsburgh

Optical Microcavity QED (FTu4D)

Presider: Kevin Cox, *US Army Research Laboratory*

17:00 - 18:00	**Fiber Fabry-Perot microcavities and their applications (FTu4D.1)** **Presenter**: Jakob Reichel, *Laboratoire Kastler Brossel* Expand for Abstract / Authors Laser-machined micromirrors with ultralow roughness can be fabricated on optical fiber tips, enabling a new type of fiber Fabry-Perot microcavities (FFPs) with a unique combination of properties. I will give an introduction to FFPs and highlight some of their application. Jakob Reichel is professor of physics at Sorbonne Université and Laboratoire Kastler Brossel of the ENS, Paris. His group working in the field of quantum technologies with ultacold atoms is also known for their development of novel tools, such as atom chips and fiber Fabry-Perot microcavities. **Authors**:Jakob Reichel/Laboratoire Kastler Brossel Tutorial	Paper
18:00 - 18:15	**A Fast Photon-Interface Using a Fiber-Based Atom-Cavity System (FTu4D.2)** **Presenter**: DEEPAK PANDEY, *Institute for Applied Physics, University Bonn* Expand for Abstract / Authors Using a cavity assisted two-photon Raman process, we demonstrate the deterministic generation and storage of fast photons (pulse width < atomic excited-state lifetime) in an atomic system coupled to a high-bandwidth cavity (κ > γ). **Authors**:DEEPAK PANDEY/Institute for Applied Physics, University Bonn Eduardo Uruñuela/Institute for Applied Physics, University Bonn Lukas Ahlheit/Institute for Applied Physics, University Bonn Maximilian Ammenwerth/Institute for Applied Physics, University Bonn Pooja Malik/Institute for Applied Physics, University Bonn Tobias Macha/Institute for Applied Physics, University Bonn Hannes Pfeifer/Institute for Applied Physics, University Bonn Wolfgang Alt/Institute for Applied Physics, University Bonn Dieter Meschede/Institute for Applied Physics, University Bonn	Paper
18:15 - 18:30	**An Advanced Apparatus for Integrating Nanophotonics and Cold Atoms (FTu4D.3)** **Presenter**: zhongzhong Qin, *California Institute of Technology* Expand for Abstract / Authors Integrating nanophotonics with cold atoms permits the exploration of novel paradigms in quantum optics and many-body physics. We realize an advanced apparatus which enables the delivery of single-atom tweezer arrays in the vicinity of photonic crystal waveguides. **Authors**:zhongzhong Qin/California Institute of Technology Jean-Baptiste Beguin/California Institute of Technology Alexander Burgers/California Institute of Technology Xingsheng Luan/California Institute of Technology Su-Peng Yu/California Institute of Technology H. Jeff Kimble/California Institute of Technology	Paper

18:30 - 18:45 **Demonstration of on chip cavity to thermal Rb vapor strong coupling (FTu4D.4)**
Presenter: Alex Naiman, *The Hebrew University of Jerusalem*
Expand for Abstract / Authors

Paper

We experimentally demonstrate a chip scale platform supporting strong coupling between hot atomic rubidium vapor and a whispering gallery mode, with diverse applications in quantum photonics, sensing, nonlinear physics, chemistry and more.

Authors:Alex Naiman/The Hebrew University of Jerusalem Yoel Sebbag/The Hebrew University of Jerusalem Uriel Levy/The Hebrew University of Jerusalem

18:45 - 19:00 **Cavity Quantum Electrodynamical Metamaterials (FTu4D.5)**
Presenter: Josephine Yu, *Massachusetts Institute of Technology*
Expand for Abstract / Authors

Paper

We introduce the concept of designing new optical materials from "meta-atoms" comprised of matter ultra-strongly-coupled to an optical cavity. Such "strongly-coupled" materials can have surprising properties, such as metallic behavior at low frequencies.

Authors:Josephine Yu/Massachusetts Institute of Technology Jamison Sloan/Massachusetts Institute of Technology Nicholas Rivera/Massachusetts Institute of Technology Marin Soljacic/Massachusetts Institute of Technology

Supercontinuum Generation (STu4H)

Presider: Sergey Vasilyev, *IPG Photonics Corp*

17:00 - 17:15 **Ultraviolet to Mid-Infrared Supercontinuum Generation in Lithium-Niobate Waveguides (STu4H.1)**
Presenter: Mengjie Yu, *Harvard University*
Expand for Abstract / Authors

Paper

Using a single dispersion-engineered lithium-niobate waveguide, we demonstrate broadband supercontinuum generation leveraging both second- and third-order nonlinear interactions. We achieve a spectrum spanning from 350 nm to 4100 nm using 240 pJ pulse energies.

Authors:Mengjie Yu/Harvard University Linbo Shao/Harvard University Yoshitomo Okawachi/Columbia University Alexander Gaeta/Columbia University Marko Loncar/Harvard University

17:15 - 17:30 **Supercontinuum Generation in Orientation-Patterned Gallium Phosphide (STu4H.2)**
Presenter: Derryck Reid, *Heriot-Watt University*
Expand for Abstract / Authors

Paper

A visible supercontinuum is produced in bulk orientation-patterned gallium phosphide from 100-MHz 1040-nm femtosecond pulses. High-order parametric gain near 550 nm, seeded by self-phase-modulated spectral sidebands, underpins this new and simple supercontinuum process.

Authors:Marius Rutkauskas/Heriot-Watt University Anchit Srivastava/Heriot-Watt University Derryck Reid/Heriot-Watt University

17:30 - 17:45 **Spectral Broadening by Saturated Second Harmonic Generation in Nanophotonic Lithium Niobate Waveguides (STu4H.3)**
Presenter: Marc Jankowski, *Stanford University*
Expand for Abstract / Authors

Paper

We demonstrate a new approach to carrier-envelope-offset detection in dispersion-engineered waveguides based on saturated second harmonic generation of femtosecond pulses. This technique broadens both harmonics, resulting in coherent carrier-envelope-offset beatnotes across ~400-nm of bandwidth.

Authors:Marc Jankowski/Stanford University Carsten Langrock/Stanford University Boris Desiatov/Harvard University Marko Loncar/Harvard University Marty Fejer/Stanford University

17:45 - 18:00 **Low-noise octave spanning mid-infrared supercontinuum generation in a large core chalcogenide fiber (STu4H.4)**
Presenter: Zahra Eslami, *Tampere university*
Expand for Abstract / Authors

Paper

We report the generation of a low noise, octave-spanning supercontinuum in the normal dispersion regime of a multimode chalcogenide fiber with 100 µm core size. The noise performances are characterized in different output wavelength bands.

Authors:Zahra Eslami/Tampere university Piotr Ryczkowski/Tampere university lauri SALMELA/Tampere university Goëry Genty/Tampere university

18:00 - 18:30

Mid-infrared supercontinuum laser source based on fluorotellurite fibers (STu4H.5)
Presenter: Guanshi Qin, *Jilin University*
Expand for Abstract / Authors

We demonstrated 20-W-level mid-infrared supercontinuum laser source, ultrabroadband supercontinuum generation from 600 to 5400 nm, and tunable Raman soliton generation from 2 to 4 μm in newly-developed all-solid fluorotellurite fibers.

Authors:Guanshi Qin/Jilin University

Invited

Paper

18:30 - 18:45

Supercontinuum Spectral Evolution Prediction by Recurrent Neural Network (STu4H.6)
Presenter: lauri SALMELA, *Tampere University*
Expand for Abstract / Authors

We use recurrent neural network to successfully predict the spectral evolution of cohererent supercontinuum along propagation in an optical fiber. The network performs particularly well for a wide range of input pulse parameters.

Authors:lauri SALMELA/Tampere University Coraline Lapre/Université Bourgogne Franche-Comté John Dudley/Université Bourgogne Franche-Comté Goëry Genty/Tampere University

Paper

18:45 - 19:00

Photonic chip-based resonant supercontinuum generation with intrinsic nonlinear filtering (STu4H.7)
Presenter: Miles Anderson, *Ecole Polytechnique Federale de Lausanne*
Expand for Abstract / Authors

We demonstrate broadband soliton-based resonant supercontinuum generation in a chip-based microresonator. We show that the soliton possesses an intrinsic ability to filter RF noise transfer from the input pulses, which can be further improved with asynchronous driving.

Authors:Miles Anderson/Ecole Polytechnique Federale de Lausanne Romain Bouchand/Ecole Polytechnique Federale de Lausanne Junqiu Liu/Ecole Polytechnique Federale de Lausanne Wenle Weng/Ecole Polytechnique Federale de Lausanne Ewelina Obrzud/Swiss Center for Electronics and Microtechnology (CSEM) Tobias Herr/Swiss Center for Electronics and Microtechnology (CSEM) Tobias Kippenberg/Ecole Polytechnique Federale de Lausanne

Paper

Diagnostics, Dynamics and Beam Control for Laser-based Processing (ATu4K)
Presider: Jie Qiao, *Rochester Institute of Technology*

17:00 - 17:30 **Classification of femtosecond-laser-induced modifications by LED-array-based illumination and machine learning (ATu4K.1)**
Presenter: Wataru Watanabe, *Ritsumeikan University*
Expand for Abstract / Authors

Paper

Ultrashort laser micromachining of glass has possible applications in drilling, cutting, welding, and waveguide fabrication. We present machine learning method for classification of modifications by multi-contrast images obtained with a programmable LED array.

Authors:Wataru Watanabe/Ritsumeikan University

Invited

17:30 - 17:45 **Laser-Induced Fluorescence for Element Detection during Laser Welding of Al to Cu Foils (ATu4K.2)**
Presenter: Brian Simonds, *National Institute of Standards and Tech*
Expand for Abstract / Authors

Paper

The use of laser-induced fluorescence for detecting Cu in the vapor plume under laser welding conditions is investigated. It is found that LIF is sensitive enough to detect Cu even before mechanical joint formation.

Authors:Brian Simonds/National Institute of Standards and Tech

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17:45 - 18:00 **Radiation Pressure Laser Power Meter for Industrial Laser Machining (ATu4K.3)**
Presenter: Alexandra Artusio-Glimpse, *National Inst of Standards & Technology*
Expand for Abstract / Authors

Paper

Demonstration and validation of a linear radiation pressure-based high-power laser power meter is presented. To date, this device is the most promising real-time, absolute power meter for laser material processing where power monitoring is crucial.

Authors:Alexandra Artusio-Glimpse/National Inst of Standards & Technology Ivan Ryger/National Inst of Standards & Technology Natalia Azarova/National Inst of Standards & Technology Paul Williams/National Inst of Standards & Technology John Lehman/National Inst of Standards & Technology

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18:00 - 18:30

Controlling light propagation through a multimode fiber for Imaging and selective laser ablation (ATu4K.4)
Presenter: Christophe Moser, *Ecole Polytechnique Federale de Lausanne*
Expand for Abstract / Authors

We will show that a single multimode fiber can be used to combine two-photon imaging with selective ablation using the same ultrafast laser light source albeit at different average power levels.

Authors:Christophe Moser/Ecole Polytechnique Federale de Lausanne Demetri Psaltis/Ecole Polytechnique Federale de Lausanne Eirini Kakkava/Ecole Polytechnique Federale de Lausanne Babak Rahmani/Ecole Polytechnique Federale de Lausanne Uğur Tegin/Ecole Polytechnique Federale de Lausanne

Invited

18:30 - 18:45

Thermal Compensation for High Load Spatial Light Modulators in Real-Time (ATu4K.5)
Presenter: Peter Christopher, *University of Cambridge*
Expand for Abstract / Authors

Paper

We introduce a concurrent real-time calibration process for diffractive lithography using liquid crystal spatial light modulators. This allows for increased power handling capabilities for given phase modulation accuracy.

Authors:Peter Christopher/University of Cambridge Ralf Mouthaan/University of Cambridge Andrew Kadis/University of Cambridge Nadeem Gabbani/University of Cambridge William O'Neill/University of Cambridge Timothy Wilkinson/University of Cambridge

18:45 - 19:00

Printed Random Lasers (ATu4K.6)
Presenter: YI-ZIH CHEN, *National Taiwan University*
Expand for Abstract / Authors

Paper

Printed random lasers with great versatility, compatibility, and universality can be well adopted by most of the commercial inkjet printers or 3D printers in the mainstream market, promising high application values from lab to fab.

Authors:Yu-Ming Liao/National Taiwan University Yun Tzu Hsu/National Taiwan University Yang Fang Chen/National Taiwan University YI-ZIH CHEN/National Taiwan University

Integrated Quantum Photonics: Sources (FTu4C)
Presider: John Sipe, *University of Toronto*

17:00 - 17:15	**Chromatically coupled silicon photonic resonators for high purity single-photon generation (FTu4C.1)** **Presenter**: Imad Faruque, *University of Bristol* Expand for Abstract / Authors We present experimental results on single-photon generation using compact chromatically-coupled resonators on an SOI platform. We measure a purity of 96%, beyond the 92% purity limitation of conventional structures, in agreement with our simulated model. **Authors**:Imad Faruque/University of Bristol Gary Sinclair/University of Bristol Ben Burridge/University of Bristol Will McCutcheon/University of Bristol Massimo Borghi/University of Bristol Jorge Barreto/University of Bristol John Rarity/University of Bristol	Paper
17:15 - 17:30	**TM Polarized Photon Pair Generation in Linearly Uncoupled Silicon Resonators (FTu4C.2)** **Presenter**: David Starling, *Pennsylvania State University* Expand for Abstract / Authors We demonstrate photon pair production with measured rates above 1 kHz in linearly uncoupled resonators in a silicon waveguide using highly dispersive TM polarized light. This approach extends the capabilities of quantum devices in silicon. **Authors**:David Starling/Pennsylvania State University Jacob Poirier/Rochester Institute of Technology MIchael Fanto/Air Force Research Laboratory Jeffery Steidle/Rochester Institute of Technology Christopher Tison/Air Force Research Laboratory Gregory Howland/Rochester Institute of Technology Stefan Preble/Rochester Institute of Technology	Paper

17:30 - 17:45

An Integrated Quantum Light Source of Frequency Degenerate Polarization Entangled Bell States (FTu4C.3)

Paper

Presenter: Wei Zhang, *Frontier Science Center for Quantum Information, Beijing National Research Center for Information Science and Technology (BNRist), Beijing Innovation Center for Future Chips, Electronic Engineering Department, Tsinghua University*

Expand for Abstract / Authors

An integrated quantum light source of telecom band polarization entangled Bell state generation is proposed and demonstrated on a SOI chip. Its output state can be switched between two frequency-degenerate Bell states.

Authors:Lingjie Yu/Frontier Science Center for Quantum Information, Beijing National Research Center for Information Science and Technology (BNRist), Beijing Innovation Center for Future Chips, Electronic Engineering Department, Tsinghua University Jingyuan Zheng/Frontier Science Center for Quantum Information, Beijing National Research Center for Information Science and Technology (BNRist), Beijing Innovation Center for Future Chips, Electronic Engineering Department, Tsinghua University Xu Liu/Frontier Science Center for Quantum Information, Beijing National Research Center for Information Science and Technology (BNRist), Beijing Innovation Center for Future Chips, Electronic Engineering Department, Tsinghua University Yidong Huang/Frontier Science Center for Quantum Information, Beijing National Research Center for Information Science and Technology (BNRist), Beijing Innovation Center for Future Chips, Electronic Engineering Department, Tsinghua University Wei Zhang/Frontier Science Center for Quantum Information, Beijing National Research Center for Information Science and Technology (BNRist), Beijing Innovation Center for Future Chips, Electronic Engineering Department, Tsinghua University

17:45 - 18:00

Emission of Time-Energy Entangled Photon Pairs by a Self-Pumped Silicon Microresonator (FTu4C.4)

Paper

Presenter: Francesco Garrisi, *Università di Pavia*

Expand for Abstract / Authors

We demonstrate emission of photon pairs from a Silicon integrated microresonator under electrical self-pumping. By controlling excitation conditions, the photon pairs are time-energy entangled, with fringe visibility in a Franson experiment of 93.9% ± 0.9%.

Authors:Francesco Garrisi/Università di Pavia Federico Andrea Sabattoli/Università di Pavia Savda Sam/Università di Pavia Andrea Barone/Università di Pavia Nicola Bergamasco/Università di Pavia Micol Previde Massara/EPFL Francesco Morichetti/Politecnico di Milano Andrea Melloni/Politecnico di Milano Federico Pirzio/Università di Pavia Marco Liscidini/Università di Pavia Matteo Galli/Università di Pavia Daniele Bajoni/Università di Pavia

18:00 - 18:15

Mid infrared heralded single photons on a silicon chip (FTu4C.5)
Presenter: Stefano Signorini, *University of Trento*
Expand for Abstract / Authors

Despite the large interest in developing mid infrared quantum photonics, an integrated source of single photons beyond 2 µm is still missing. Here, we demonstrate the first mid infrared heralded single photon source based on silicon photonics.

Authors:Stefano Signorini/University of Trento Sara Piccione/University of Trento Giorgio Fontana/University of Trento Lorenzo Pavesi/University of Trento Mher Ghulinyan/Bruno Kessler Foundation Martino Bernard/Bruno Kessler Foundation Georg Pucker/Bruno Kessler Foundation

Paper

18:15 - 18:45

Frequency-Domain Quantum Interference with Entangled Photons from an Integrated Microresonator (FTu4C.6)
Presenter: Chaitali Joshi, *Cornell University*
Expand for Abstract / Authors

We report frequency-domain quantum interference with spectrally distinct photons from a microresonator. We create an active, tunable 'frequency beam splitter' via Bragg-scattering four-wave mixing and achieve interference visibilities of 0.95 ±0.02.

Authors:Chaitali Joshi/Cornell University Alessandro Farsi/Columbia University Avik Dutt/Stanford University Bok Young Kim/Columbia University Xingchen Ji/Columbia University Yun Zhao/Columbia University Andrew Bishop/Columbia University Michal Lipson/Columbia University Alexander Gaeta/Columbia University

Paper

18:45 - 19:00

Two photon interference via coupled ring resonators on a silicon photonic chip (FTu4C.7)
Presenter: John Serafini, *Rochester Institute of Technology*
Expand for Abstract / Authors

We demonstrate an on-chip Hong-Ou-Mandel (HOM) experiment where the conventional directional coupler-based beam splitter is replaced with coupled ring resonators. Two photon interference is achieved with raw visibilities as high as 95% and, ~π rotation is achieved.

Authors:John Serafini/Rochester Institute of Technology David Spiecker/University of Rochester Jeffrey Steidle/Precision Optical Transceivers MIchael Fanto/Rochester Institute of Technology Ed Hach/Rochester Institute of Technology Stefan Preble/Rochester Institute of Technology

Paper

Surface- Emitting Lasers (STu4M)

Presider: Jiaxing Wang, *University of California Berkeley*

17:00 - 17:15 **Athermal Operation of Multi-Section Surface Grating Lasers for Applications including Burst-Mode for TWDM-PONs (STu4M.1)**
Presenter: Dovydas Mickus, *Trinity College Dublin*
Expand for Abstract / Authors

[Paper]

A multi-section laser with high order surface grating is operated athermally with variation in wavelength of 0.003 nm (±375 MHz) from 10-100 ^{o}C. In pulsed operation emulating burst mode, the maximum variation is 0.05 nm.

Authors:Dovydas Mickus/Trinity College Dublin Gaurav Jain/Trinity College Dublin Sepideh Naimi/Trinity College Dublin Robert Mckenna/Trinity College Dublin Caolán Murphy/Trinity College Dublin John Donegan/Trinity College Dublin

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17:15 - 17:30 **Integration of multiple diffractive elements on photonic crystal surface emitting lasers for beam manipulation (STu4M.2)**
Presenter: Lih-Ren Chen, *National Chiao Tung University*
Expand for Abstract / Authors

[Paper]

We demonstrate the multi-sectional diffractive elements integrated vertically on photonic crystal surface emitting laser featuring the naturally formed periodic ITO cladding layer. The corresponding output beam steering mechanism is investigated in depth.

Authors:Lih-Ren Chen/National Chiao Tung University Kuo-Bin Hong/National Chiao Tung University Shuo-Ling Chen/National Chiao Tung University Kuan-Chih Huang/National Chiao Tung University Tien-Chang Lu/National Chiao Tung University

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17:30 - 18:00 **High power VCSEL amplifier for 3D sensing (STu4M.3)**
Presenter: Fumio Koyama, *Tokyo Institute of Technology*
Expand for Abstract / Authors

[Paper]

The device concept and experiments for high power VCSEL photonics will be presented for 3D sensing. We demonstrate a VCSEL amplifier, which offers watt-class high power operations and high-resolution non-mechanical beam steering functions.

Authors:Fumio Koyama/Tokyo Institute of Technology

Invited

18:00 - 18:15	**Single-Mode VCSEL with Double-Focusing High-Contrast Gratings (STu4M.4)** **Presenter**: Xiangli Jia, *UC Berkeley* Expand for Abstract / Authors We present designs of high-contrast gratings (HCGs) functioning as both reflection mirror and double-sided wavefront engineering plate for single-mode 940-nm VCSELs. This approach enables simutaneous engineering of VCSEL cavity and emitting properties. **Authors**:Xiangli Jia/UC Berkeley Yipeng Ji/Tsinghua-Berkeley Shenzhen Institute Connie Chang-Hasnain/UC Berkeley	Paper
18:15 - 18:30	**Multimode VCSEL Enables Multi-Data-Format Encoding up to 124 Gbit/s (STu4M.5)** **Presenter**: Wei-Chi Lo, *Graduate Institute of Photonics and Optoelectronics, and Department of Electrical Engineering, National Taiwan University* Expand for Abstract / Authors The 850-nm multimode VCSEL designed with dual-oxide-layer confined 7.5-µm-large aperture and doped DBR shortened RC response improves its modulation linearity to 0.3±0.1-mW/mA for 61-Gbps NRZ-OOK, 102-Gbps PAM-4 and 124-Gbit/s 32-QAM GFDM data transmissions. **Authors**:Wei-Chi Lo/Graduate Institute of Photonics and Optoelectronics, and Department of Electrical Engineering, National Taiwan University Wei-Li Wu/Graduate Institute of Photonics and Optoelectronics, and Department of Electrical Engineering, National Taiwan University Chun-Yen Peng/Graduate Institute of Photonics and Optoelectronics, and Department of Electrical Engineering, National Taiwan University Huai-Yung Wang/Graduate Institute of Photonics and Optoelectronics, and Department of Electrical Engineering, National Taiwan University Cheng-Ting Tsai/Graduate Institute of Photonics and Optoelectronics, and Department of Electrical Engineering, National Taiwan University Borching Su/Graduate Institute of Communication Engineering, National Taiwan University Chao-Hsin Wu/Graduate Institute of Photonics and Optoelectronics, and Department of Electrical Engineering, National Taiwan University Gong-Ru Lin/Graduate Institute of Photonics and Optoelectronics, and Department of Electrical Engineering, National Taiwan University	Paper
18:30 - 18:45	**Two-dimensional Plasmonic Crystal Surface Emitting Lasers with Gain Medium of InGaAs/GaAs Quantum Wells (STu4M.6)** **Presenter**: Kuan-Ying Huang, *Electronics* Expand for Abstract / Authors Room-temperature plasmonic-crystal surface-emitting laser is demonstrated with a square-lattice gold nano-arrays on the surface of InGaAs/GaAs quantum well. The lasing peak determined by lattice constant shows excellent linewidth (<0.5 nm) and thermal stability (~0.083 nm/^{o}C). **Authors**:Kuan-Ying Huang/Electronics Chu-Chun Wu/Office of Research and Development Gray Lin/Electronics Sheng-Di Lin/Electronics	Paper

18:45 - 19:00 **Photonic crystal lasers grown on CMOS-compatible on-axis Si(001) (STu4M.7)**
Presenter: TaoJie Zhou, *School of Science and Engineering, The Chinese University of Hong Kong, Shenzhen*
Expand for Abstract / Authors

Paper

Semiconductor photonic crystal (PC) lasers are regarded as promising ultra-compact light sources with ultra-low energy consumption. Here, we demonstrate PC lasers monolithically grown on CMOS-compatible on-axis Si (001) substrate with an ultra-low threshold of ∼0.6 µW.

Authors:TaoJie Zhou/School of Science and Engineering, The Chinese University of Hong Kong, Shenzhen Mingchu Tang/Department of Electronic and Electrical Engineering, University College London Siming Chen/Department of Electronic and Electrical Engineering, University College London Huiyun Liu/Department of Electronic and Electrical Engineering, University College London Zhaoyu Zhang/School of Science and Engineering, The Chinese University of Hong Kong, Shenzhen

Precision Optical Spectroscopy and Imaging (STu4N)

Presider: Laura Sinclair, *National Inst of Standards & Technology*

17:00 - 17:15 **Sub-Doppler Double-Resonance Spectroscopy of Methane Using a Frequency Comb Probe (STu4N.1)**
Presenter: Vinicius Silva de Oliveira, *Umeå University*
Expand for Abstract / Authors

Paper

We use a 3.3 µm continuous wave optical parametric oscillator as a pump and a 1.67 µm frequency comb as a probe to record 36 sub-Doppler double-resonance transitions in the $3v_3$ band of methane (including 26 previously unreported) with ~1.5 MHz center frequency accuracy.

Authors:Aleksandra Foltynowicz/Umeå University Lucile Rutkowski/Univ Rennes Isak Silander/Umeå University Alexandra C. Johansson/Umeå University Vinicius Silva de Oliveira/Umeå University Ove Axner/Umeå University Grzegorz Sobon/Wroclaw University of Science and Technology Tadeusz Martynkien/Wroclaw University of Science and Technology Pawel Mergo/Maria Curie-Sklodowska University Kevin K. Lehmann/University of Virginia

17:15 - 17:30	**Optical Frequency Comb Calibrated Near Infrared Solar Heterodyne Spectroscopy (STu4N.2)** **Presenter**: Connor Fredrick, *University of Colorado at Boulder* Expand for Abstract / Authors We perform heterodyne spectroscopy at 1.56 um with a tunable laser and thermal radiation from the Sun. The laser tuning is calibrated with a frequency comb, providing a simple spectrometer with resolving power of 2,000,000. **Authors**:Connor Fredrick/University of Colorado at Boulder Freja Olsen/Carleton College Ryan Terrien/Carleton College Suvrath Mahadevan/The Pennsylvania State University Franklyn Quinlan/National Institute of Standards and Technology Scott Diddams/University of Colorado at Boulder	Paper
17:30 - 18:00	**High Precision 2S-8D Spectroscopy in Hydrogen (STu4N.3)** **Presenter**: Dylan Yost, *University of Colorado at Boulder JILA* Expand for Abstract / Authors TBD **Authors**:Dylan Yost/University of Colorado at Boulder JILA Invited	
18:00 - 18:15	**Towards a Transferable Standard for Nitrous Oxide Isotopomer Ratio (STu4N.4)** **Presenter**: Ibrahim Sadiek, *Umea University* Expand for Abstract / Authors We report on a novel approach for identifying the ^{15}N site-preference in N_2O from a chemical reaction using continuous wave cavity ringdown spectroscopy and comb-based Fourier transform spectroscopy, with the aim to establish the currently lacking international N_2O isotopomer standard. **Authors**:Ibrahim Sadiek/Umea University Adrian Hjältén/Umea University Michael Stuhr/University of Kiel Gernot Friedrichs/University of Kiel Aleksandra Foltynowicz/Umea University	Paper

18:15 - 18:30 **Scan-less Full-field Fluorescence Lifetime Imaging by 2D Spectral Encoding and Dual-Comb Heterodyne-Beating (STu4N.5)**
Presenter: Takahiko Mizuno, *Tokushima University*
Expand for Abstract / Authors

Paper

Fluorescence lifetime imaging microscopy (FLIM) is useful for life science; however, mechanical scanning of focal point hampers rapid imaging. In this article, we demonstrated scan-less full-filed FLIM imaging by 2D spectral encoding and dual-comb heterodyne-beating.

Authors:Takahiko Mizuno/Tokushima University Eiji Hase/Tokushima University Takeo Minamikawa/Tokushima University Hirotsugu Yamamoto/JST, ERATO MINOSHIMA Intelligent Optical Synthesizer (IOS) Takeshi Yasui/Tokushima University

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18:30 - 18:45 **Spatiotemporal Characterization of Optical Vortex Light-wave using Hyperspectral Dual-comb Imaging (STu4N.6)**
Presenter: Akifumi Asahara, *University of Electro-Communications*
Expand for Abstract / Authors

Paper

We demonstrate detailed assessment of optical vortex using single-pixel-imaging dual-comb spectroscopy. The method realizes full-characterization of vortex light-waves and is expected as a versatile measurement tool for chiral optical properties, material studies, and optical communications.

Authors:Akifumi Asahara/University of Electro-Communications Takuto Adachi/University of Electro-Communications Seishiro Akiyama/University of Electro-Communications Kaoru Minoshima/University of Electro-Communications

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18:45 - 19:00 **Pico-second single-pulse three-dimensional imaging with an optical frequency comb (STu4N.7)**
Presenter: Takashi Kato, *The Univ. of Electro-Communications*
Expand for Abstract / Authors

Paper

Using a 15-ps chirped pulse of an optical frequency comb, fully single pulse, 3D surface profile imaging is demonstrated, at 100-square-pixel resolution and µm-level uncertainty. Electric-field-induced picosecond transient 3D imaging is also demonstrated.

Authors:Takashi Kato/The Univ. of Electro-Communications Hirotaka Ishii/The Univ. of Electro-Communications Kazuhiro Terada/The Univ. of Electro-Communications Tamaki Moritoh/The Univ. of Electro-Communications Kaoru Minoshima/The Univ. of Electro-Communications

Wednesday, 13 May

All Times are Pacific Time (US & Canada) (UTC - 07:00)

10:00 - 11:30 (UTC - 07:00)

Joint Poster Session 7 (JW2A)

Optical Response of the Centric Valve in Cyclotella Quillensis Diatoms (JW2A.1)
Presenter: Santiago Bernal, *McGill University*
Expand for Abstract / Authors

Paper

The optical behaviour of frustules in the centric phytoplankton species *Cyclotella Quillensis* was investigated using SEM, AFM and SNOM techniques. Our results revealed a photonic crystal lattice that was analysed by photonic band structure simulations

Authors:Santiago Bernal/McGill University Yannick D'Mello/McGill University Dan Petrescu/McGill University Mark Andrews/McGill University David Plant/McGill University

Coupling assisted high efficiency sorting of spherical and rod-shaped bacteria in an optofluidic chip (JW2A.2)
Presenter: Yuzhi Shi, *Nanyang Technological University*
Expand for Abstract / Authors

Paper

We present a nano-photonic lattice to sort bacteria with equivalent size but different shapes. It has an ultra-sensitive trapping capability for the two bacteria with *S. aureus* above 95% and *E. coli* less than 3%.

Authors:Yuzhi Shi/Nanyang Technological University Yi Zhang/Nanyang Technological University Peng Huat Yap/Nanyang Technological University Ai Qun Liu/Nanyang Technological University

High Density 3D Localization Microscopy by Multimodal Point Spread Function Engineering (JW2A.3)
Presenter: Boris Ferdman, *Technion*
Expand for Abstract / Authors

Paper

Point-spread-function engineering enables the extraction of depth information from fluorescence microscopy images by sacrificing lateral resolution and labeling density. Here, we introduce a bifurcated multimodal approach that facilitates 3D super-resolution in densely labeled samples

Authors:Boris Ferdman/Technion Elias Nehme/Technion Lucien Weiss/Technion Reut Orange/Technion Yoav Shechtman/Technion

Hybrid Photonic Crystal-Plasmonic Lab-on-chip Device using TLC-SERS for Multiple Chemical Sensing (JW2A.4)
Presenter: Alan Wang, *Oregon State University*
Expand for Abstract / Authors

Paper

By coupling surface-enhanced Raman spectroscopy (SERS) with thin-layer chromatography, hybrid photonic crystal-plasmonic devices provide lab-on-a-chip functionalities for separating and detecting multiple chemical targets in a complex solution.

Authors:Kundan Sivashanmugan/Oregon State University Kenneth Squire/Oregon State University Boxin Zhang/Oregon State University Alan Wang/Oregon State University

An Ultrasensitive Optofluidic Biosensor for PCR-Free Detection of Arboviral Biomarker at Attomolar Levels (JW2A.5)
Presenter: Xiangchao Zhu, *University of California*
Expand for Abstract / Authors

Paper

A point-of-care technology is critically needed for detection of low-abundance arboviral biomarkers. We introduce an optofluidic-nanoplasmonic diagnostic platform enabling ultrasensitive detection of infectious arboviruses in human serum at attomolar concentrations.

Authors:Xiangchao Zhu/University of California Mustafa Mutlu/University of California Jose Fuentes/University of California Ray Jara/University of California Alexandra Hunsinger/University of California Kyle O’Rourke/University of California Ahmet Yanik/University of California

Spectral Flow Cytometry to Distinguish Tamoxifen Resistant Breast Cancer Cells (JW2A.6)
Presenter: Aric Bitton, *New Mexico State University*
Expand for Abstract / Authors

Paper

A multi-color spectral flow cytometry panel targeting receptors on MCF-7 breast cancer cells is used to potentially identify a tamoxifen resistant subpopulation. Results using separate resistant and normal cells indicate detection and sorting is plausible.

Authors:Aric Bitton/New Mexico State University Jessica Houston/New Mexico State University Kevin Houston/New Mexico State University

Light-Driven Formation and Fast Transportation of Microdroplet on a GeSbTe Substrate Based on Inverse Marangoni Effect (JW2A.7)
Presenter: Toshiharu Saiki, *Keio University*
Expand for Abstract / Authors

Paper

We demonstrated formation and transportation of microdroplets by laser heating to generate a temperature gradient on a GeSbTe substrate. We observed inverse Marangoni effect, in which a toluene/PEG mixed droplet moved towards higher temperature region.

Authors:Yuka Takamatsu/Keio University Masashi Kuwahara/National Institute of Advanced Industrial Science and Technology Toshiharu Saiki/Keio University

A naturally trapped Rare-Earth doped solid-state superradiant laser clock (JW2A.8)
Presenter: Mahmood Sabooni, *Institute for Quantum Computing (IQC)*
Expand for Abstract / Authors

Paper

We propose a narrow linewidth solid-state based superradiant laser, which is almost insensitive to the cavity mirror vibration, the best frequency-stable local oscillators and employed in quantum metrology.

Authors:Mahmood Sabooni/Institute for Quantum Computing (IQC) Kyung Soo Choi/Institute for Quantum Computing (IQC)

Realization of ultra-low-loss microscopic optics for quantum-enhanced imaging (JW2A.9)
Presenter: Natsuha Ochiai, *The University of Tokyo*
Expand for Abstract / Authors

Paper

We demonstrate microscopic optics with high transmittance of 89% using custom-made objective lenses, anti-reflection-coated cover slips, and axicons for beam shaping. We carefully designed the optics considering the position-dependent transmittance of the objective lenses.

Authors:Natsuha Ochiai/The University of Tokyo Yasuyuki Ozeki/The University of Tokyo

Chip scale integration of nanophotonic-atomic quantum Magnetic sensors (JW2A.10)
Presenter: Yoel Sebbag, *The Hebrew University of Jerusalem*
Expand for Abstract / Authors

Paper

We present and experimentally demonstrate an integrated magnetic quantum sensing platform, based on nanophotonic chip interfaced to microfabricated alkali vapor cells. Applications such as magnetometry and off-resonance modulation free laser stabilization are discussed.

Authors:Yoel Sebbag/The Hebrew University of Jerusalem Alex Naiman/The Hebrew University of Jerusalem Eliran Talker/The Hebrew University of Jerusalem yefim barash/The Hebrew University of Jerusalem Uriel Levy/The Hebrew University of Jerusalem

Towards polarization-based, low-latency quantum communication over hollow-core conjoined-tube fibers at around 800 nm (JW2A.11)
Presenter: Xinyu Chen, *National Laboratory of Solid State Microstructures and College of Engineering and Applied Sciences, Nanjing University*
Expand for Abstract / Authors

Paper

We experimentally demonstrate high-fidelity (~0.98), polarization-based single-photon transmission and entanglement distribution over a 36-meter-long, low-loss (<10 dB/km), 800 nm-guiding hollow-core conjoined-tube fiber quantum channel, which inherently possesses low transmission latency.

Authors:Xinyu Chen/National Laboratory of Solid State Microstructures and College of Engineering and Applied Sciences, Nanjing University Wei Ding/Institute of Photonics Technology, Jinan University Ying-Ying Wang/Institute of Photonics Technology, Jinan University Shou-Fei Gao/Institute of Photonics Technology, Jinan University Fei-Xiang Xu/National Laboratory of Solid State Microstructures and College of Engineering and Applied Sciences, Nanjing University Hui-Chao Xu/National Laboratory of Solid State Microstructures and College of Engineering and Applied Sciences, Nanjing University Yi-Feng Hong/Institute of Laser Engineering, Beijing University of Technology Yi-Zhi Sun/Institute of Photonics Technology, Jinan University Pu Wang/Institute of Laser Engineering, Beijing University of Technology Lijian Zhang/National Laboratory of Solid State Microstructures and College of Engineering and Applied Sciences, Nanjing University

Atom Trapping with Metasurface Optics (JW2A.12)
Presenter: Ting-Wei Hsu, *JILA,University of Colorado at Boulder*
Expand for Abstract / Authors

Paper

We present results on trapping ensembles of cold atoms with metasurface optics for portable atomic clock application, and progress towards single atom trapping and detection in high-NA optical tweezers with dielectric metalenses.

Authors:Ting-Wei Hsu/JILA,University of Colorado at Boulder Tobias Thiele/JILA,University of Colorado at Boulder Wenqi Zhu/National Institute of Standards and Technology Mark Brown/JILA,University of Colorado at Boulder Scott Papp/National Institute of Standards and Technology Amit Agrawal/National Institute of Standards and Technology Cindy Regal/JILA,University of Colorado at Boulder

Receiving Electric Fields with a Rydberg Quantum Sensor (JW2A.13)
Presenter: Kevin Cox, *US Army Research Laboratory*
Expand for Abstract / Authors

Paper

We experimentally and theoretically evaluate the performance of a quantum sensor based on Rydberg atoms across the entire radio-frequency spectrum from DC to 1 THz and make fundamental comparisons with other sensor types.

Authors:Kevin Cox/US Army Research Laboratory David Meyer/US Army Research Laboratory Zachary Castillo/US Army Research Laboratory Paul Kunz/US Army Research Laboratory

High Efficiency Fiber-Coupled Single-Photon Source Based on Quantum Dot Embedded in a Semiconductor Nanowire (JW2A.14)
Presenter: Rubayet Al Maruf, *University of Waterloo*
Expand for Abstract / Authors

Paper

We integrate a semiconductor nanowire embedded quantum dot with a single-mode fiber. To maximize photon collection, we optimize the nanowire geometry and align the lens-tipped fiber with the nanowire using lithographically defined structure.

Authors:Rubayet Al Maruf/University of Waterloo Divya Bharadwaj/University of Waterloo Paul Anderson/University of Waterloo Jiawei Qiu/University of Waterloo Mohd Zeeshan/University of Waterloo Philip Poole/National Research Council of Canada Dan Dalacu/National Research Council of Canada Michael Reimer/University of Waterloo Michal Bajcsy/University of Waterloo

Sustainable QKD transmissions over fiber infrastructures shared with data and real-time transfers (JW2A.15)
Presenter: Josef Vojtech, *CESNET*
Expand for Abstract / Authors

Paper

We present reasons for sharing the fibres by both Quantum key distribution and telecommunication traffic and propose suitable wavelength band and verify injection of such Quantum key distribution signal into telecommunication fibre with no impact to transmission system performance.

Authors:Josef Vojtech/CESNET Rudolf Vohnout/CESNET Tomáš Horváth/CESNET Sarbojeet Bhownick/CESNET Martin Slapak/CESNET Petr Munster/CESNET Ondrej Havlis/CESNET Radek Velc/CESNET Jan Kundrat/CESNET Pavel Skoda/CESNET Lada Altmannova/CESNET Michal Hazlinsky/CESNET Vladyslav Usenko/Dept. Optics, Palacky university Vladimir Smotlacha/Dept. Applications for technologies CESNET

Drone-Based Quantum Key Distribution (JW2A.16)
Presenter: Samantha Isaac, *University of Illinois at Urbana-Champaign*
Expand for Abstract / Authors

Paper

Current QKD protocols are limited to wired point to point key exchange. Utilizing drones, we work to establish free space quantum channels. Here, we report the progress of the tracking system used on the drones.

Authors:Samantha Isaac/University of Illinois at Urbana-Champaign Andrew Conrad/University of Illinois at Urbana-Champaign Alex Hill/University of Illinois at Urbana-Champaign Kyle Herndon/University of Illinois at Urbana-Champaign Brian Wilens/University of Illinois at Urbana-Champaign Dalton Chaffee/University of Illinois at Urbana-Champaign Daniel Sanchez-Rosales/Ohio State University Roderick Cochran/Ohio State University Daniel Gauthier/Ohio State University Paul Kwiat/University of Illinois at Urbana-Champaign

Joint Poster Session 8 (JW2B)

1108 nm Vortex Mode Generation From a Self-Raman Nd:GdVO$_4$ Laser (JW2B.1)
Presenter: Yuanyuan Ma, *Chiba University*
Expand for Abstract / Authors

Paper

We demonstrate a continuous-wave optical vortex source operating at 1108 nm, corresponding to the weaker Raman transition at 382 cm^{-1} in Nd:GdVO$_4$, by employing an annular beam pumping geometry.

Authors:Yuanyuan Ma/Chiba University Andrew Lee/Macquarie University Helen Pask/Macquarie University Takashige Omatsu/Chiba University

Phase Offset Locking of 689 nm Laser for the Cold Sr Atom (JW2B.2)
Presenter: shengnan zhang, *University of Birmingham*
Expand for Abstract / Authors

Paper

Phase offset locking between two 689 nm diode lasers is performed. The frequency variation of the beat note is suppressed within 0.2 Hz and phase noise is reduced by 30 dB at 100 Hz.

Authors:shengnan zhang/University of Birmingham Yeshpal Singh/University of Birmingham Kai Bongs/University of Birmingham

Compact Solid-state Laser With Novel Yb:YAG/YAG Pyramidal Active-mirror (JW2B.3)
Presenter: Peng Wang, *Beihang University*
Expand for Abstract / Authors

Paper

A compact solid-state laser based on a novel composite Yb:YAG/YAG pyramidal active-mirror is proposed with a folded cavity optical structure. Numerical simulation results predict pulse energy of 10.57mJ with 16.02% optical efficiency obtained.

Authors:Peng Wang/Beihang University Yanxiong Niu/Beihang University Chunxi Zhang/Beihang University Di Feng/Beihang University

Stable and Ultra-narrow Linewidth Random Fiber Laser Based on Random Fiber Bragg gratings (JW2B.4)
Presenter: Jie Hu, *Huazhong Univ of Science and Technology*
Expand for Abstract / Authors

Paper

We propose a stable random fiber Bragg grating based random fiber laser with ring cavity. The linewidth is only 1.63 kHz, which is the narrowest in Random fiber laser to the best of our knowledge.

Authors:Jie Hu/Huazhong Univ of Science and Technology Yifei wang/Huazhong Univ of Science and Technology Zhikun Xing/Huazhong Univ of Science and Technology Tongda Li/Huazhong Univ of Science and Technology Zhen Wang/Huazhong Univ of Science and Technology Zhijun Yan/Huazhong Univ of Science and Technology Qizhen Sun/Huazhong Univ of Science and Technology Deming Liu/Huazhong Univ of Science and Technology

Mode Dependent Laser Pulse Amplification: A Computational Approach in 3D (JW2B.5)
Presenter: Christoph Pflaum, *Universität Erlangen-Nürnberg*
Expand for Abstract / Authors

Paper

We present a numerical simulation technique for short laser pulse amplification in solid-state crystals. It takes into account the full spatial pumping profile by solving the 3-dimensional photon transport and allows to calculate pulse energy accurately.

Authors:Christoph Pflaum/Universität Erlangen-Nürnberg Ramon Springer/Universität Erlangen-Nürnberg

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Octave-spanning 1.7 um dual-chirped optical parametric amplification by the dual pumping (JW2B.6)
Presenter: Lu Xu, *RIKEN*
Expand for Abstract / Authors

Paper

We report on the generation of 103 mJ mid-infrared pulses at 1.7 mm using a BBO dual-chirped optical parametric amplification scheme (DC-OPA) and discuss the octave-spanning DC-OPA by using the dual pumping scheme.

Authors:Lu Xu/RIKEN Kataro Nishimura/RIKEN Akira Suda/Tokyo University of Science Katsumi Midorikawa/RIKEN Eiji Takahashi/RIKEN

Fast tunable narrow-linewidth fiber laser based on the acousto-controlled polarization conversion in DCF (JW2B.7)
Presenter: Yujia Liu, *Chongqing University*
Expand for Abstract / Authors

Paper

Pursuing high coherent light sources with spectral purity, rapid tuning speed and wide wavelength range, we propose a fast tunable narrow-linewidth fiber laser assisted by acoustically-induced polarization conversion in dispersion compensation fiber.

Authors:Yujia Liu/Chongqing University Yu Long Cao/Chongqing University Haonan Han/Chongqing University Ligang Huang/Chongqing University Tianyi Lan/Chongqing University Lei Gao/Chongqing University Tao Zhu/Chongqing University

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Suppression of Transverse Mode Instability in Ring-core Fiber (JW2B.8)
Presenter: Nan Xia, *Nanyang Technological University*
Expand for Abstract / Authors

Paper

We theoretically investigate transverse mode instability (TMI) in ytterbium doped ring-core fiber. The unique geometry reduces thermal load and enhances gain saturation effect, leading to large suppression of TMI. Gaussian-like beam is formed at far-field.

Authors:Nan Xia/Nanyang Technological University Seongwoo Yoo/Nanyang Technological University

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ZEUS: A National Science Foundation Mid-Scale Facility for Laser-Driven Science in the QED Regime (JW2B.9)
Presenter: John Nees, *University of Michigan*
Expand for Abstract / Authors

Paper

Building on past support, NSF has funded the Zetawatt Equivalent Ultrashort pulse laser System (ZEUS), a mid-scale 3PW multi-beam user facility, to explore nonlinear quantum electrodynamics, relativistic plasmas, and other phenomena in High-Field Science. © 2020 The Authors.

Authors:John Nees/University of Michigan Anatoly Maksimchuk/University of Michigan Galina Kalinchenko/University of Michigan Bixue Hou/University of Michigan Yong Ma/University of Michigan Paul Campbell/University of Michigan Andrew McKelvey/University of Michigan Louise Willingale/University of Michigan Igor Jovanovic/University of Michigan Carolyn Kuranz/University of Michigan Alexander Thomas/University of Michigan Karl Krushelnick/University of Michigan

Development of self-resonating enhancement cavity operating in single-longitudinal-mode (JW2B.10)
Presenter: Yuuki Uesugi, *Tohoku University*
Expand for Abstract / Authors

Paper

A single-longitudinal-mode operation of a self-resonating enhancement cavity with the finesse of 524 was achieved without any feedback control, demonstrating a capability to automaticaly follow the cavity resonance frequency against environmental disturbance.

Authors:Yuuki Uesugi/Tohoku University Alexander Aryshev/High Energy Accelerator Research Organization Masafumi Fukuda/High Energy Accelerator Research Organization Tsunehiko Omori/High Energy Accelerator Research Organization Nobuhiro Terunuma/High Energy Accelerator Research Organization Junji Urakawa/High Energy Accelerator Research Organization Tohru Takahashi/Hirohima University Yuya Koshiba/Waseda University Seiya Otsuka/Waseda University Masakazu Washio/Waseda University Yuji Hosaka/National Institutes for Quantum and Radiological Science and Technology Shunichi Sato/Tohoku University

All-fiber frequency shifter via mode conversion for optical heterodyne micro-vibration measurement (JW2B.12)
Presenter: Zhang kun, *Shanghai Institute of Optics and Fine Mechanics*
Expand for Abstract / Authors

Paper

We demonstrate an all-fiber mode conversion frequency shifter (MCFS) for optical heterodyne microvibration detection, which efficiently converts LP_{11} core mode to LP_{01} mode and acts as a frequency shifter. The SNR is ~ 65 dB.

Authors:Zhang kun/Shanghai Institute of Optics and Fine Mechanics

Compact Thin-disk Multipass Amplifier Tolerant of Strong Disk Thermal Distortions (JW2B.13)
Presenter: Hantian Chen, *Huazhong University of Science and Technology*
Expand for Abstract / Authors

Paper

A thin-disk multipass amplifier with good stability for the thermal lensing of disk is presented. Simulations and experiments demonstrated slight beam variations on the disk of which the dioptric power varies in a wide range.

Authors:Hantian Chen/Huazhong University of Science and Technology Enmao Song/Huazhong University of Science and Technology Jing Dong/Huazhong University of Science and Technology Xiao Zhu/Huazhong University of Science and Technology Hailin Wang/Huazhong University of Science and Technology Guangzhi Zhu/Huazhong University of Science and Technology

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Mid-infrared Absorption of Femtosecond Laser Micro-structured Silicon Formed in Different Gas Ambient (JW2B.14)
Presenter: Haibin Sun, *Key laboratory of intelligent infrared perception, Chinese academy of science*
Expand for Abstract / Authors

Paper

We researched the mid-infrared absorption changes of micro-structured silicon prepared in SF6, N2, and NF3, the different changes mainly due to the concentrations of impurities doped in surface layer.

Authors:Haibin Sun/Key laboratory of intelligent infrared perception, Chinese academy of science Shengli Sun/SITP Fuchun Chen/SITP Guifu wang/SITP

Determination of Femtosecond Laser Direct Written Waveguide Refractive Index Using Machine Learning (JW2B.15)
Presenter: Mohan Wang, *University of Pittsburgh*
Expand for Abstract / Authors

Paper

A machine learning-based model was trained on beam propagation simulation data of a femtosecond laser direct written 1-D waveguide array structure with varying refractive indices, to predict the refractive index difference of laser-induced waveguide.

Authors:Mohan Wang/University of Pittsburgh Sheng Huang/University of Pittsburgh Jingyu Wu/University of Pittsburgh Kehao Zhao/University of Pittsburgh Zhi-Hong Mao/University of Pittsburgh Kevin Chen/University of Pittsburgh

5 nm Nanogap Electrodes and Arrays by a Super-resolution Laser Lithography (JW2B.16)
Presenter: Liang Qin, *Suzhou Institute of Nano-Tech and Nano-Bionics*
Expand for Abstract / Authors

Paper

A 5 nm super high-resolution laser direct writing lithography technique has been developed that exhibits great capability for the fabrication of well site-control and mass-production nanogap electrodes and directly electrically modulated nano-sensing chips.

Authors:Liang Qin/Suzhou Institute of Nano-Tech and Nano-Bionics Yuanqing Huang/Suzhou Institute of Nano-Tech and Nano-Bionics Feng Xia/Qingdao University Lei Wang/National Center for Nanoscience and Technology Jiqiang Ning/Suzhou Institute of Nano-Tech and Nano-Bionics Hongmei Chen/Suzhou Institute of Nano-Tech and Nano-Bionics Xu Wang/Suzhou Institute of Nano-Tech and Nano-Bionics Wei Zhang/Suzhou HWN Nanotec. Co., LTD. Yong Peng/Lanzhou University Qian Liu/National Center for Nanoscience and Technology Ziyang Zhang/Suzhou Institute of Nano-Tech and Nano-Bionics

Accumulation-Driven Single-Step Synthesis and Structuring of Immiscible Metallic Nanoalloys (JW2B.17)
Presenter: Pavana Siddhartha Kollipara, *University of Texas at Austin*
Expand for Abstract / Authors

Paper

Immiscible metallic nanoalloys (Rh-Au) have been synthesized using the confinement effect of bubble. Synthesized Rh-Au alloy which is printed on the substrate has been implemented as reducing catalyst in the conversion of p-nitrophenol with $NaBH_4$.

Authors:Bharath Rajeeva/University of Texas at Austin Pavana Siddhartha Kollipara/University of Texas at Austin Pranaw Kunal/University of Texas at Austin Simon Humphrey/University of Texas at Austin Yuebing Zheng/University of Texas at Austin

Regulating the Fs-laser Material Removal Mechanism to Improve Processing Quality Effectively (JW2B.18)
Presenter: Zhixuan Li, *Nankai University*
Expand for Abstract / Authors

Paper

A novel method, confirmed theoretically and experimentally, is demonstrated to regulate the material removal mechanism in fs-laser processing via elevating the initial temperature of the sample, which effectively improves the processing quality.

Authors:Zhixuan Li/Nankai University Jinze Li/Nankai University Qiang Wu/Nankai University Xiaoyang Hu/Nankai University Xinda Jiang/Nankai University hao xiong/Nankai University Jianghong Yao/Nankai University Jingjun Xu/Nankai University

130 W, 1.2 GHz Femtosecond All-fiber Laser at 1.0 μ m (JW2B.19)
Presenter: Yicai Liu, *South China University of Technology*
Expand for Abstract / Authors

Paper

We present a 130 W femtosecond all-fiber laser at 1.0 μm that works at a fundamental repetition rate of up to 1.2 GHz, which is expected to be a promising alternative for high-throughput material process.

Authors:Yicai Liu/South China University of Technology Wei Lin/South China University of Technology Wenlong Wang/South China University of Technology Xiaoming Wei/South China University of Technology Zhongmin Yang/South China University of Technology

As_2S_3 Glass Mid-IR Transmission Enhancement with Femtosecond Laser Treatment (JW2B.20)
Presenter: Andrey Bushunov, *Bauman Moscow State Technical University*
Expand for Abstract / Authors

Paper

We report on As_2S_3 glass surface transmission increase from 82.5% to 92% in range from 3 to 5 μm through femtosecond pulsed laser treatment.

Authors:Andrey Bushunov/Bauman Moscow State Technical University Andrei Teslenko/Bauman Moscow State Technical University Mikhail Tarabrin/Bauman Moscow State Technical University Vladimir Lazarev/Bauman Moscow State Technical University Gennady Snopatin/Institute of Chemestry of High-Purity Substances of the Russian Academy of Sciences Vasilii Kolvtashev/Fiber Optics Research Center of the Russian Academy of Sciences Victor Plotnichenko/Fiber Optics Research Center of the Russian Academy of Sciences

Super Black Stainless Steel Surface Fabricated by Nanosecond Laser Irradiation (JW2B.21)
Presenter: Md Abu Taher, *University of Hyderabad*
Expand for Abstract / Authors

Paper

Super-black stainless-steel (SS) surfaces were prepared by nanosecond laser irradiation giving low reflectivities close to 0.5% over broad wavelength range of 250-1800 nm and even lower (0.14%) over 250-850 nm.

Authors:D. Narayana Rao/University of Hyderabad Sri Ram Naraharisetty/University of Hyderabad Md Abu Taher/University of Hyderabad

The influence of atmospheric helium on secondary clocks (JW2B.22)
Presenter: Wang-Yau Cheng, *NCU*
Expand for Abstract / Authors

Paper

We report a new error source for the frequency of glass-cell based secondary time-frequency standards. That is, a frequency shift by helium collision was perceived where the helium atoms were confirmed as from the atmosphere

Authors:Wang-Yau Cheng/NCU Ko-Han Chen/NCU Chien-Ming Wu/NCU Su-Ron Wu/NCU Hsin-Hung Yu/NCU Tz-Wei Liu/NCU

Dual-Comb Swept Wavelength Interferometry (JW2B.23)
Presenter: Mikael Mazur, *Chalmers University of Technology*
Expand for Abstract / Authors

Paper

We demonstrate a hybrid swept wavelength interferometry -- dual-comb spectroscopy system for fast broadband full-field measurements. Phase and amplitude retrieval is experimentally verified and compensation of laser sweep nonlinearity is demonstrated without external referencing.

Authors:Mikael Mazur/Chalmers University of Technology Nicolas Fontaine/Nokia Bell Labs Magnus Karlsson/Chalmers University of Technology Peter Andrekson/Chalmers University of Technology Victor Company/Chalmers University of Technology Jochen Schröder/Chalmers University of Technology

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Space-Very Long Baseline Interferometry Mission Requirements Analysis on Space Borne Frequency Standards and Optical Frequency Combs (JW2B.24)
Presenter: Lin Yi, *California Institute of Technology*
Expand for Abstract / Authors

Paper

Low phase noise microwave frequency generation with low power and miniaturized optical frequency comb may greatly impact future space-based Very Long Baseline Interferometry (VLBI) missions. We will show our analysis of the frequency and timing requirements of such missions.

Authors:Lin Yi/California Institute of Technology Eric Burt/California Institute of Technology Wei Zhang/California Institute of Technology

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Pump frequency noise influence on a microresonator-based soliton frequency comb (JW2B.25)
Presenter: Tomohiro Tetsumoto, *IMRA America Inc.*
Expand for Abstract / Authors

Paper

By compensating the pump laser noise of a 300 GHz microresonator soliton comb, we analyze its impact on each comb line as well as the repetition rate. We demonstrate a timing noise of 200 as/$Hz^{1/2}$.

Authors:Tomohiro Tetsumoto/IMRA America Inc. Mark Yeo/IMRA America Inc. Antoine Rolland/IMRA America Inc.

Narrow Linewidth Electro-Optic Modulator Based Comb Generation with a Simple Modulator Configuration (JW2B.26)
Presenter: Ken Kashiwagi, *National Metrology Inst. of Japan, AIST*
Expand for Abstract / Authors

Paper

We demonstrate a narrow linewidth electro-optic modulator based frequency comb with a simple modulator configuration. It was achieved by a servo control of a fragment of a high-frequency modulation signal through a low-frequency voltage-controlled oscillator.

Authors:Ken Kashiwagi/National Metrology Inst. of Japan, AIST Sho Okubo/National Metrology Inst. of Japan, AIST Hajime Inaba/National Metrology Inst. of Japan, AIST

High-Harmonic Synchronization of Optomechanical Oscillators (JW2B.27)
Presenter: Caique Rodrigues, *Unicamp*
Expand for Abstract / Authors

Paper

We experimentally demonstrate injection locking of an optomechanical oscillator driven at multiple harmonics of its fundamental frequency. The measured Arnold tongues show strongest synchronization when driven at even harmonics.

Authors:Caique Rodrigues/Unicamp Cauê Moreno Kersul de Castro Carvalho/Unicamp Michal Lipson/Columbia University Thiago Alegre/Unicamp Gustavo S. Wiederhecker/Unicamp

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Ultra-fast Waveform Measurement in Single-shot Using Optical Frequency Comb Analyzer (JW2B.28)
Presenter: Hayate Imai, *Saitama University*
Expand for Abstract / Authors

Paper

The 2.7ps time resolution of single shot waveform measurement was experimentally performed by measuring on frequency domain using improved optical frequency comb analyzer based on dual-hetero dyne mixing in time-division multiplexing.

Authors:Hiroali Tada/Saitama University Hayate Imai/Saitama University Nasrin Sultana/Saitama University Shioda Tatsutoshi/Saitama University

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Enhancement of the response of an intracaviy mode-locked phase sensor (JW2B.29)
Presenter: Ladan Arissian, *University of New Mexico*
Expand for Abstract / Authors

Paper

A doubling of the slope sensitivity of a mode-locked laser gyroscope is experimentally demonstrated,
This enhancement is through resonant dispersion applied to all modes of the frequency combs interfered to produce the beat note response.

Authors:James Hendrie/University of New Mexico Ning Hsu/University of New Mexico Ladan Arissian/University of New Mexico Matthias Lenzner/University of New Mexico Jean-Claude Diels/University of New Mexico

In-situ loss measurements of silicon nano-waveguides using spectrum analysis and silver nano-wire as an obstacle in a reflection-based scattering NSOM (JW2B.30)
Presenter: Wei Ding, *Inst of Photonics Technology, Jinan Univ*
Expand for Abstract / Authors

Paper

An in-situ waveguide loss measurement technique using a reflection-based scattering NSOM is developed. Putting a vibrating probe in different places along the waveguide, we accurately acquire local loss values of different segments of silicon nano-waveguides.

Authors:Yi-Zhi Sun/Inst of Photonics Technology, Jinan Univ Xiao-Hong Yan/Institute of Physics, Chinese Academy of Sciences Hong Wei/Institute of Physics, Chinese Academy of Sciences Sylvain Blaize/Université de Technologie de Troyes Renaud Bachelot/Université de Technologie de Troyes Wei Ding/Inst of Photonics Technology, Jinan Univ

Wideband High-resolution Spectral Analysis Assisted by Soliton Micro-combs (JW2B.31)
Presenter: Hao Hu, *Wuhan National Laboratory for Optoelectr*
Expand for Abstract / Authors

Paper

A high-resolution and large-bandwidth spectral analysis is demonstrated utilizing tunable laser and micro-comb. Bandwidth is extended by 100 times up to 2.5 THz with 2-MHz resolution and a high-Q resonator is successfully characterized in L-band.

Authors:Hao Hu/Wuhan National Laboratory for Optoelectr liao chen/Wuhan National Laboratory for Optoelectr Ruolan Wang/Wuhan National Laboratory for Optoelectr Yanjing Zhao/Wuhan National Laboratory for Optoelectr Xinyu Wang/Xi’an Institute of Optics and Precision Mechanics (XIOPM) Weiqiang Wang/Xi’an Institute of Optics and Precision Mechanics (XIOPM) Chi Zhang/Wuhan National Laboratory for Optoelectr Wenfu Zhang/Xi’an Institute of Optics and Precision Mechanics (XIOPM) Xinliang Zhang/Wuhan National Laboratory for Optoelectr

Counterpropagating Pair of Superluminal Raman Lasers without Cross-Talks for Ultrasensitive Rotation Sensing (JW2B.32)
Presenter: Selim Shahriar, *Northwestern University*
Expand for Abstract / Authors

Paper

We have demonstrated a pair of counter-propagating superluminal Raman lasers without cross-talk, employing two different gain cells, each containing two isotopes of Rb, as a key step in realizing an ultrasensitive rotation sensor.

Authors:Zifan Zhou/Northwestern University Minchuan Zhou/Northwestern University Selim Shahriar/Northwestern University

Time-offset measurement with dual-comb linear optical sampling and time interval counter (JW2B.33)
Presenter: Abulikemu Abuduweili, *Peking University*
Expand for Abstract / Authors

Paper

We demonstrate a sub-picosecond resolution time-offset comparison over l00 km long fiber between using asynchronized dual-comb linear optical sampling and the time interval counter.

Authors:Abulikemu Abuduweili/Peking University Xing Chen/Beijing University of Posts and Telecommunications Wenbo Ma/Peking University Zhigang Zhang/Peking University

Transfer Oscillator Technique for Generation of High-Stability Timing Signals from Optical References (JW2B.34)
Presenter: Archita Hati, *NIST*
Expand for Abstract / Authors

Paper

We generate a high stability 10 GHz microwave signals with close to 30 dB of comb noise suppression via optical frequency division using a transfer oscillator scheme.

Authors:Archita Hati/NIST Marco Pomponio/NIST Nick Nardelli/NIST Esther Baumann/NIST Tara Fortier/NIST Craig Nelson/NIST

11:00 - 13:00 (UTC - 07:00)

Joint Dynamic e-Posters II (JW2C)
Presider: Stephanie Tomasulo, *US Naval Research Laboratory*

11:00 - 11:12

(Withdrawn) Inkjet Printed Hydrogel Lasing Microarray for Biomolecular Analysis (JW2C.1)
Presenter: Xuerui Gong, *Nanyang Technological University*
Expand for Abstract / Authors

An inkjet-printed lasing microarray based on water/hydrogel micro-droplets was first demonstrated, where single-mode lasing was employed for precise biomolecular interaction analysis. This work represents a milestone to implement laser technology towards high-throughput biomedical analysis.

Authors:Xuerui Gong/Nanyang Technological University Peng Guan/Nanyang Technological University Shilun Feng/Nanyang Technological University Zhen Qiao/Nanyang Technological University Zhiyi Yuan/Nanyang Technological University YU-CHENG CHEN/Nanyang Technological University

11:12 - 11:24

Broadly-tunable, High-resolution Mid-IR Spectroscopy (JW2C.2)
Presenter: David Foote, *Toptica Photonics, Inc.*
Expand for Abstract / Authors

Paper

We demonstrate automated C_2H_2 direct absorption spectroscopy using a CW, tunable optical parametric oscillator, with a resolution of $<5x10^{-4}$ cm^{-1} at 2 cm^{-1}/min. We improve the resolution substantially by locking to a frequency comb.

Authors:David Foote/Toptica Photonics, Inc. Matthew Cich/Toptica Photonics, Inc. Walter Hurlbut/Toptica Photonics, Inc. Ulrich Eismann/TOPTICA Photonics AG Adam Heiniger/Toptica Photonics, Inc. Daniel Christensen/Lumencor Inc Chris Haimberger/Toptica Photonics, Inc.

11:24 - 11:36

Downconversion Free Real-time Spectral Analysis of High-Frequency Broadband Waveforms (JW2C.3)
Presenter: Saikrishna Konatham, *INRS-EMT*
Expand for Abstract / Authors

Paper

We propose a method for real-time spectral analysis of high-frequency and high-bandwidth waveforms, without the downconversion stage. Time-mapped spectrograms of nanosecond-long microwave pulses modulated on high carrier frequencies are captured directly in a real-time scope.

Authors:Saikrishna Konatham/INRS-EMT Luis Cortés/INRS-EMT Jun Chang/Centre for Optics, Photonics and Lasers Leslie Rusch/Centre for Optics, Photonics and Lasers Sophie LaRochelle/Centre for Optics, Photonics and Lasers Jose Azana/INRS-EMT

11:36 - 11:48

Large-Area Ultra-Broadband Achromatic Flat Lens for Imaging in the SWIR (JW2C.4)
Presenter: Sourangsu Banerji, *University of Utah*
Expand for Abstract / Authors

Paper

We demonstrate an achromatic multi-level diffractive lens, which has a focal length of 25 mm, aperture diameter of 8.93 mm, and thickness of 2.6 μm operating in the SWIR band (875 nm - 1675 nm).

Authors:Sourangsu Banerji/University of Utah Monjurul Meem/University of Utah Apratim Majumder/University of Utah Curt Dvonch/Lockheed Martin Corp. Berardi Rodriguez/University of Utah Rajesh Menon/University of Utah

11:48 - 12:00

Mobile quantum gravimeter with a novel pyramidal magneto-optical trap (JW2C.5)
Presenter: Xuejian Wu, *University of California Berkeley*
Expand for Abstract / Authors

Paper

We demonstrate a mobile quantum gravimeter measuring tidal gravity variations in the laboratory and surveying gravity in the field. With simplicity and sensitivity, our instrument paves the way for bringing quantum sensors to field applications.

Authors:Xuejian Wu/University of California Berkeley Storm Weiner/University of California Berkeley Zachary Pagel/University of California Berkeley Bola Malek/University of California Berkeley Holger Müller/University of California Berkeley

12:00 - 12:12

Experimental demonstration of in-service security monitoring using a quantum modulated signal (JW2C.6)
Presenter: Yupeng Gong, *University of Cambridge*
Expand for Abstract / Authors

Paper

We experimentally demonstrate a method for in-service optical physical layer security monitoring with vacuum-noise sensitivity that can detect a 1% fiber tapping attack at 50km without classical security loopholes.

Authors:Yupeng Gong/University of Cambridge Shuai Yang/University of Cambridge Jeffrey Hunt/Boeing company adrian wonfor/University of Cambridge Richard Penty/University of Cambridge Ian White/University of Cambridge

12:12 - 12:24

Large Shift of Surface Plasmon Resonances on Gold Film with Graphene (JW2C.7)
Presenter: Chao Niu, *Baylor University*
Expand for Abstract / Authors

Paper

Disagreement exists between theory and experiment when we study surface plasmon resonance (SPR) of gold film with graphene. We attribute this large shift in SPR angle to the rough gold film and wrinkled graphene layer.

Authors:Chao Niu/Baylor University Md Alam/University of Houston Jonathan Hu/Baylor University Zhiming Wang/University of Electronic Science and Technology of China Jiming Bao/University of Houston

12:24 - 12:36

(Withdrawn) Identifying phonon-polariton resonances with near-field optical microscopy (JW2C.8)
Presenter: Viktoriia Babicheva, *University of New Mexico*
Expand for Abstract / Authors

Resonant responses of flat surfaces and sharp edges of the nanostructures supporting phonon polaritons are studied aiming at the prediction of scattering-type SNOM response and developing a modeling approach that adequately describes the nanostructure resonant behavior.

Authors:Fatih Ince/University of New Mexico Viktoriia Babicheva/University of New Mexico

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12:36 - 12:48

Low-cost mid-infrared polarizer based on direct coupling to surface-plasmon polaritons (JW2C.9)
Presenter: Alireza Shahsafi, *University of Wisconsin-Madison*
Expand for Abstract / Authors

Paper

We report a new type of reflective polarizer based on free-space coupling to surface-plasmon polaritons that has a high extinction ratio and high efficiency at infrared frequencies.

Authors:Alireza Shahsafi/University of Wisconsin-Madison Jad Salman/University of Wisconsin-Madison Bryan Rubio Perez/University of Wisconsin-Madison Yuzhe Xiao/University of Wisconsin-Madison Chenghao Wan/University of Wisconsin-Madison Mikhail Kats/University of Wisconsin-Madison

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12:48 - 13:00

Generation of Pulsating Solitons with Different Ultrafast Spectro-temporal Dynamics from One Mode-locked Fiber Laser (JW2C.10)
Presenter: Zheng Zheng, *Beihang University*
Expand for Abstract / Authors

Paper

Three types of pulsating soliton dynamics are experimentally observed in a hybrid, dispersion-managed mode-locked fiber laser. It provides new insights into the complex nonlinear soliton behavior in ultrafast lasers and potential ways to control them.

Authors:Jie Chen/Beihang University Xin Zhao/Beihang University Ting Li/Beihang University Jianjun Yang/Beihang University Jiansheng Liu/Beihang University Zheng Zheng/Beihang University

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11:30 - 13:00 (UTC - 07:00)

Joint Poster Session 9 (JW2D)

Localizing a Topological Mode Using a Near-Conservation of the Valley Degree of Freedom (JW2D.1)
Presenter: Yandong Li, *Cornell University*
Expand for Abstract / Authors

Paper

We demonstrate the energy localization at the end of an abruptly terminated topologically nontrivial waveguide. This localization relies on a near-conservation of the valley degree of freedom and does not require time-reversal symmetry breaking.

Authors:Yandong Li/Cornell University Yang Yu/Cornell University Fengyu Liu/University of Maryland Baile Zhang/Nanyang Technological University Gennady Shvets/Cornell University

Zero-energy Corner States in a Non-Hermitian Quadrupole Insulator (JW2D.2)
Presenter: Yang Yu, *Cornell University*
Expand for Abstract / Authors

Paper

We find a zero-energy corner state in a non-Hermitian quadrupole insulator without an Hermitian counterpart, and the response of the system near zero energy can be drastically different from Hermitian systems.

Authors:Yang Yu/Cornell University Gennady Shvets/Cornell University

Angular momentum-dependent topological transport (JW2D.3)
Presenter: Meng Xiao, *Wuhan University*
Expand for Abstract / Authors

Paper

Analogs of the quantum spin Hall effect (QSHE) in classical waves are mostly based on the construction of pseudo-spins. Here we demonstrate analogs of QSHE in classical waves by utilizing the orbital angular momentum.

Authors:Meng Xiao/Wuhan University Jiang Tianshu/the Hong Kong University of Science and Technology Chan C. T./the Hong Kong University of Science and Technology

Circular Dichroism in Multilayered Chiral Mid-Infrared Metamaterials (JW2D.4)
Presenter: Hannah Barnard, *University of Exeter*
Expand for Abstract / Authors

Paper

An FDTD simulation based study of a mid-IR chiral metamaterial showing enhanced circular dichroism by stacking multiple chiral layers as well as changing the order of enantiomeric layer stacking.

Authors:Hannah Barnard/University of Exeter Eleanor Barr/University of Exeter Geoffrey Nash/University of Exeter

Beam Steering and Dynamic Focusing by Coherent Control of Light with Light on Metasurfaces (JW2D.5)
Presenter: Xu Fang, *University of Southampton*
Expand for Abstract / Authors

Paper

We report continuous ‘coherently controlled’ tuning of the wavefront of light scattered by phase-gradient silicon metasurfaces, which enables optical-frequency beam steering and dynamic focusing without moving parts.

Authors:Fei He/University of Southampton Kevin MacDonald/University of Southampton Xu Fang/University of Southampton

Emission in Fabry-Perot Cavities in Weak and Strong Coupling Regimes (JW2D.6)
Presenter: Md Omar Faruk, *University of California Irvine*
Expand for Abstract / Authors

Paper

We have studied spectra and angular distribution of emission of Rhodamine 6G dye in Fabry-Perot cavities in weak and strong coupling regimes and demonstrated control of the strong coupling with the pumping intensity.

Authors:Md Omar Faruk/University of California Irvine Mikhail Noginov/Norfolk State University Nelly Jerop/Norfolk State University

1020-nm-band optical cloak using double-layered metamaterial film (JW2D.7)
Presenter: Tomo Amemiya, *Tokyo Institute of Technology*
Expand for Abstract / Authors

Paper

We propose and demonstrate a near-infrared invisibility cloaking by using a double-layered metamaterial film. 1020-nm-band light is guided so as not to hit a tungsten wire around which the film is wound.

Authors:Tomo Amemiya/Tokyo Institute of Technology Hibiki Kagami/Tokyo Institute of Technology Makoto Tanaka/Tokyo Institute of Technology Sho Okada/Tokyo Institute of Technology Nobu Nishiyama/Tokyo Institute of Technology Mayu Takagi/Toyota Motor Corporation Tatsuhiro Urakami/Mitsui Chemicals, Inc.

Design of Nonlinear Absorbers via Doped ENZ Metastructures (JW2D.8)
Presenter: Ehsan Nahvi, *University of Pennsylvania*
Expand for Abstract / Authors

Paper

Replacing the dielectric spacer layer in a Salisbury screen with a nonlinear doped ENZ slab, we theoretically demonstrate the possibility of obtaining a tailorable nonlinear absorber.

Authors:Ehsan Nahvi/University of Pennsylvania Inigo Liberal/Public University of Navarra Nader Engheta/University of Pennsylvania

Anisotropic circular topological structures. (JW2D.9)
Presenter: Claudio Conti, *Italian National Research Council*
Expand for Abstract / Authors

Paper

We design cylindrical multilayer structures by exploiting anisotropy and topological features. This provides a new approach to tailor electromagnetic fields into desired patterns with angular momentum in cylindrical geometries as topologically protected resonators and fibers.

Authors:Laura Pilozzi/Italian National Research Council Claudio Conti/Italian National Research Council

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Angle Tolerant Mid-Infrared Notch Filters Using Two-dimensional Amorphous Germanium High Index Contrast Sub-wavelength Gratings (JW2D.10)
Presenter: Lal Krishna A S, *Indian Institute of Science*
Expand for Abstract / Authors

Paper

We experimentally demonstrated polarization independent, angle tolerant mid-infrared notch filters using amorphous-Germanium 2D high contrast gratings. Centered at 7.42 µm wavelength, the filter exhibits wide field-of-view notch filtering characteristics across 0 to 30^{o} incidence angles.

Authors:Lal Krishna A S/Indian Institute of Science Viphretuo Mere/Indian Institute of Science Shankar Selvaraja/Indian Institute of Science Varun Raghunathan/Indian Institute of Science

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Photonic topological phase transition with phase-change materials (JW2D.11)
Presenter: Takahiro Uemura, *Tokyo institute of Technology*
Expand for Abstract / Authors

Paper

We propose and demonstrate a way to accomplish photonic topological phase transition by a specially-arranged photonic crystal slab selectively loaded by a phase-change material: $Ge_2Sb_2Te_5$ (GST) or $Ge_2Sb_2Se_4Te_1$ (GSST), which enables reconfigurably tunable edge modes.

Authors:Takahiro Uemura/Tokyo institute of Technology Hisashi Chiba/Tokyo institute of Technology Taiki Yoda/Tokyo institute of Technology Yuto Moritake/Tokyo institute of Technology Yusuke Tanaka/NTT Corporation Masaya Notomi/Tokyo institute of Technology

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Tuning the Speed of Optical Coherence in Free Space (JW2D.13)
Presenter: Murat Yessenov, *University of Central Florida, CREOL*
Expand for Abstract / Authors

Paper

We introduce the concept of `coherence group velocity', which is the speed of the peak of the coherence function and demonstrate experimentally that incorporating spatio-temporal spectral structure into a field allows tuning its coherence group velocity in free space.

Authors:Murat Yessenov/University of Central Florida, CREOL Ayman Abouraddy/University of Central Florida, CREOL

Deep Convolutional Neural Network for the Inverse Design of Layered Photonic Structures (JW2D.14)
Presenter: Rohit Unni, *University of Texas at Austin*
Expand for Abstract / Authors

Paper

We report a neural network trained for the inverse design of layered planar photonic structures, able to handle arbitrary incidence conditions and high spectral complexity using a selection of candidate materials in the design.

Authors:Rohit Unni/University of Texas at Austin Kan Yao/University of Texas at Austin Yuebing Zheng/University of Texas at Austin

A Theoretical Explanation for Enhanced Nonlinear Response in Epsilon-Near-Zero Media (JW2D.15)
Presenter: Diego M. Solis, *University of Pennsylvania*
Expand for Abstract / Authors

Paper

We theoretically investigate the effects of a material's linear permittivity ε on its nonlinear response, showing that conversion efficiency increases as ε decreases, consistent with other groups' measurements of unusually high effective nonlinear refractive index in transparent conducting oxides.

Authors:Diego M. Solis/University of Pennsylvania Nader Engheta/University of Pennsylvania

All-dielectric Tunable Metasurface Based on Guide-Mode Resonance and ENZ Effects (JW2D.16)
Presenter: Xiaoming Qiu, *Peking University*
Expand for Abstract / Authors

Paper

A guide-mode resonance-based Indium Tin Oxide electrical tunable metasurface is proposed. By forming two metal-oxide-semiconductor capacitors in a single period, resonance wavelength can be tuned larger than 20nm in near-IR spectral range.

Authors:Xiaoming Qiu/Peking University Fan Yang/Peking University Yanping Li/Peking University Fan Zhang/Peking University

Epsilon-Near-Zero Induced Near-Perfect Absorption in Thin-Film ITO – Pt Multilayers (JW2D.17)
Presenter: Stephen O'Brien, *University of Dublin Trinity College*
Expand for Abstract / Authors

Paper

We demonstrate near perfect absorption (> 95%) in the near-infrared from 127 nm thick ITO films backed with various thicknesses (7 nm – 25 nm) of Pt. This absorption is achieved by exciting two plasmon modes associated with epsilon-near-zero behavior.

Authors:Stephen O'Brien/University of Dublin Trinity College Frank Bello/University of Dublin Trinity College Lisanne Peters/University of Dublin Trinity College Christopher Smith/University of Dublin Trinity College David McCloskey/University of Dublin Trinity College John Donegan/University of Dublin Trinity College

Robust Self-Induced Nonreciprocal Transmission in Nonlinear PT-Symmetric Epsilon-Near-Zero Metamaterials (JW2D.18)
Presenter: Christos Argyropoulos, *University of Nebraska Lincoln*
Expand for Abstract / Authors

Paper

Self-induced nonreciprocal transmission is demonstrated due to the enhanced Kerr nonlinear effect in compact epsilon-near-zero media photonically doped with gain and loss defects. Unitary transmission contrast is obtained by operating close to the exceptional point.

Authors:Boyuan Jin/University of Nebraska Lincoln Christos Argyropoulos/University of Nebraska Lincoln

2D Gradient Composition Alloys: Excitonic and Dielectric Properties (JW2D.19)
Presenter: MUHAMMED KILINC, *University at Buffalo*
Expand for Abstract / Authors

Paper

We map the optical properties with Raman, PL and SHG methods of a single gradient 2D alloy flake with spatially varying composition of CVD grown WSe_2-WS_2 monolayers that can be used in novel opto-electronics devices.

Authors:MUHAMMED KILINC/University at Buffalo Alireza Jalouli/University at Buffalo Peijian Wang/University at Buffalo Christian Neureuter/University at Buffalo Hao Zeng/University at Buffalo Tim Thomay/University at Buffalo

Connecting Floquet Crystals and Time Crystals (JW2D.20)
Presenter: Yang Yu, *Cornell University*
Expand for Abstract / Authors

Paper

We investigate the criteria of bandgaps opening in frequency or momentum, in both electromagnetism and condensed matter models with periodic modulation in time, showing Floquet crystals and time crystals are closely related.

Authors:Yang Yu/Cornell University Gennady Shvets/Cornell University

Dissipation of Topological Charge in Plasmonic Weyl Semimetals (JW2D.21)
Presenter: Kunal Shastri, *Cornell University*
Expand for Abstract / Authors

Paper

Breaking time-reversal or inversion symmetry are two ways of realizing a Weyl semimetal. We report that, in a plasmonic medium with Weyl point dispersion, the time-reversal broken realization is fundamentally more resilient against losses.

Authors:Kunal Shastri/Cornell University Francesco Monticone/Cornell University

Generalized Class of Kerker Particles: Self-Duality and Zero Backscattering (JW2D.22)
Presenter: Nasim Mohammadi Estakhri, *University of Pennsylvania*
Expand for Abstract / Authors

Paper

We introduce a generalized class of arbitrarily sized/shaped particles that satisfy the Kerker zero backscattering condition for normal incidence for all incident polarizations. We prove that self-duality is a sufficient condition to achieve zero backscattering.

Authors:Nasim Mohammadi Estakhri/University of Pennsylvania Raphael Kastner/University of Pennsylvania Nader Engheta/University of Pennsylvania

Optical vortex beam splitter using topological edge state waveguide (JW2D.23)
Presenter: Sho Okada, *Tokyo Institute of Technology*
Expand for Abstract / Authors

Paper

We propose an Si-based optical vortex beam splitter consisting of topological edge state waveguides with C6 symmetry. The device can change the branching ratio of the propagate light in the range from 16% to 84%.

Authors:Sho Okada/Tokyo Institute of Technology Tomo Amemiya/Tokyo Institute of Technology Hibiki Kagami/Tokyo Institute of Technology Koichi Saito/Tokyo Institute of Technology Makoto Tanaka/Tokyo Institute of Technology Nobu Nishiyama/Tokyo Institute of Technology Xiao Hu/National Institute for Materials Science

***Ghost Coupling*: Exact Degeneracies in Guided Modes of Biaxial Dielectric Waveguides (JW2D.24)**
Presenter: Emroz Khan, *Purdue University*
Expand for Abstract / Authors

Paper

We show that ghost surface waves, a special class of Dyakonov waves at the interface of a biaxial and an isotropic dielectric, can lead to exact frequency degeneracies in guided modes.

Authors:Emroz Khan/Purdue University Sanjay Debnath/Purdue University Evgenii Narimanov/Purdue University

On-chip flexible waveguides with amorphous structures in the near-infrared (JW2D.25)
Presenter: Murat Sarihan, *University of California,Los Angeles*
Expand for Abstract / Authors

Paper

We have fabricated and tested on-chip waveguides using amorphous photonic structures. Amorphous structures offer greater flexibility compared to photonic crystal for photonic device designs. Furthermore, we offer a general guideline for amorphous structures.

Authors:Murat Sarihan/University of California,Los Angeles Alperen Govdeli/Middle East Technical University Yildirim Batuhan Yilmaz/Middle East Technical University Mertcan Erdil/Middle East Technical University Mehmet Sirin Aras/University of California,Los Angeles Cenk Yanik/Sabanci University Chee Wei Wong/University of California,Los Angeles Serdar Kocaman/Middle East Technical University

Controlling the Level of Coupling Between Quantum Emitters and Planar Hyperbolic Metamaterial (JW2D.26)
Presenter: Ekembu Tanyi, *Oregon State University*
Expand for Abstract / Authors

Paper

We discuss the effects of the ENZ position of multilayer HMM substrates (alternating layers Ag and ITO) on the level of their coupling with quantum emitters.

Authors:Ekembu Tanyi/Oregon State University Jonathan Van Schenck/Oregon State University Gregory Giesbers/Oregon State University Oksana Ostroverkhova/Oregon State University Li-Jing Cheng/Oregon State University

High-contrast structural color based on photonic glass from core-shell particles (JW2D.27)
Presenter: Alexander Petrov, *Hamburg University of Technology*
Expand for Abstract / Authors

Paper

Photonic glass provides angle-independent, spectrally selective scattering that can be used as structural colors. We show how the core-shell geometry of the particles can be used to improve the saturation of blue color.

Authors:Alexander Petrov/Hamburg University of Technology Guoliang Shang/Hamburg University of Technology Lukas Maiwald/Hamburg University of Technology Manfred Eich/Hamburg University of Technology

Shape-independent, scattering-free topological photonic crystal resonator (JW2D.28)
Presenter: Mikhail Shalaev, *Duke University*
Expand for Abstract / Authors

Paper

We consider the properties of dielectric topological photonic-crystal-based resonators featuring reflection-less in-plane light propagation.
We demonstrated that out-of-plane scattering is also suppressed due to the edge state localization near K and K' points away from the light line.

Authors:Mikhail Shalaev/Duke University Wiktor Walasik/Duke University Jiannan Gao/Duke University Natalia Litchinitser/Duke University

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Reconfigurable all-dielectric metasurfaces using phase-change chalcogenide $Ge_2Sb_2Te_5$ (JW2D.29)
Presenter: Kirsten Masselink, *Georgia Tech*
Expand for Abstract / Authors

Paper

We demonstrate a reconfigurable all-dielectric metasurface comprising of concentric GST/high-index materials nanopillars. The dynamic interplay of dominant Mie resonance modes due to the real-time phase-transition of GST grants 2π phase agility with unprecedented efficiency.

Authors:Kirsten Masselink/Georgia Tech Sajjad Abdollahramezani/Georgia Tech Omid Hemmatyar/Georgia Tech Ali Adibi/Georgia Tech

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Electromagnetic Nonreciprocity Using Electron Beams in a Waveguide (JW2D.30)
Presenter: Asma Fallah, *University of Pennsylvania*
Expand for Abstract / Authors

Paper

We theoretically show how the Lorentz reciprocity can be broken via interaction of electron beams with electromagnetic waves in cylindrical waveguides. Salient features such as the operating frequency range and nonreciprocity’s strength are discussed.

Authors:Asma Fallah/University of Pennsylvania Yasaman Kiasat/University of Pennsylvania Mario Silveirinha/University of Lisbon Nader Engheta/University of Pennsylvania

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Tuning metasurface hologram by changing surrounding medium (JW2D.31)
Presenter: Weiping Wan, *Peking University*
Expand for Abstract / Authors

Paper

We tune a metasuraface hologram by changing its surrounding medium to change the propagation phase experienced by the transmitted light from a nanostructure, which depends on the thickness and the transverse sizes.

Authors:Weiping Wan/Peking University Hang Feng/Peking University Qihuang gong/Peking University yan li/Peking University

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Creation of a robust zero mode at will (JW2D.32)
Presenter: Hamidreza Ramezani, *University of Texas,Rio Grande Valley*
Expand for Abstract / Authors

Paper

We show that one can obtain a topological state in a photonic lattice by incorporating a defect and uniform amplification and absorption mechanism that satisfies a local broken parity-time symmetry condition.

Authors:Hamidreza Ramezani/University of Texas,Rio Grande Valley Fatemeh Mostafavi/University of Texas,Rio Grande Valley

Tunable Ultrahigh-saturation Structural Colors From Toroidal Resonances by Phase-change Material Sb$_2$S$_3$ Metasurfaces (JW2D.33)
Presenter: Omid Hemmatyar, *Georgia Institute of Technology*
Expand for Abstract / Authors

Paper

Leveraging sharp toroidal resonances supported by an all-dielectric metasurface (MS) made of high-index phase-change material Sb$_2$S$_3$ nanopillars (NPs), we demonstrate tunable ultrahighly saturated structural color with unprecendted large color gamut.

Authors:Omid Hemmatyar/Georgia Institute of Technology Tyler Brown/Georgia Institute of Technology Ali Adibi/Georgia Institute of Technology

Fano Resonant All-dielectric HfO$_2$ Metasurfaces for Full Color Generation Designed by Deep Learning (JW2D.34)
Presenter: Omid Hemmatyar, *Georgia Institute of Technology*
Expand for Abstract / Authors

Paper

Here, we experimentally demonstrate full color generation by a Fano-resonant all-dielectric metasurface (MS) consisting of HfO$_2$ nanopillars (NPs), for the first time to our knowledge, designed by a novel deep learning approach named dimensionality reduction.

Authors:Omid Hemmatyar/Georgia Institute of Technology Sajjad AbdollahRamezani/Georgia Institute of Technology Yashar Kiarashinejad/Georgia Institute of Technology Mohammadreza Zandehshahvar/Georgia Institute of Technology Ali Adibi/Georgia Institute of Technology

13:00 - 15:00 (UTC - 07:00)

Symp: Understanding the Brain with Light (JW3P)
Presider: Emily Gibson, *University of Colorado Denver*

Special Symposium

13:00 - 13:30	**Advanced optical microscopy for high spatiotemporal resolution in vivo brain imaging (JW3P.1)** **Presenter**: Na Ji, *University of California Berkeley* Expand for Abstract / Authors Optical microscopy is an ideal tool to monitor neural activity in vivo. I will discuss how we use advanced concepts in optics to develop next-generation microscopy methods for imaging the brain at high spatiotemporal resolution. **Authors**:Na Ji/University of California Berkeley Invited	Paper
13:30 - 14:00	**Computational Microscopes for In Vivo Brain Imaging (JW3P.2)** **Presenter**: Kaspar Podgorski, *Howard Hughes Medical Institute* Expand for Abstract / Authors We use compressive sensing, optimization, and closed-loop control principles to create high speed microscopes for recording activity from neurons and synapses in the brains of model organisms. **Authors**:Kaspar Podgorski/Howard Hughes Medical Institute Invited	Paper
14:00 - 14:15	**Video-rate three-photon imaging of awake mouse brain (JW3P.3)** **Presenter**: Bo Li, *Cornell University* Expand for Abstract / Authors We demonstrate three-photon imaging of brain activity in awake mice, achieving 30 frames/s at 512x512 pixels per frame and 620x620 µm field-of-view (FOV) at 750 µm depth. **Authors**:Bo Li/Cornell University chunyan wu/Cornell University Mengran Wang/Cornell University Kriti Charan/Cornell University Chris Xu/Cornell University	Paper

14:15 - 14:30	**CAMERA-ARRAY 25-PLANE MULTIFOCUS MICROSCOPE FOR ULTRAFAST LIVE 3D IMAGING (JW3P.4)** **Presenter**: Eduardo Hirata-Miyasaki, *University of California Santa Cruz* Expand for Abstract / Authors We demonstrate an ultrafast Multifocus 25-camera-array microscope (M25) for truly simultaneous 3D imaging of 25 focal planes of a living specimen. Customized for functional neural circuit imaging, our M25 prototype captures 130×130×50um3 volumes at >100Hz **Authors**:Eduardo Hirata-Miyasaki/University of California Santa Cruz Gustav Pettersson/University of California Santa Cruz Khant Zaw/University of California Santa Cruz Demis John/UCSB Nanofabrication Facility Brian Thibeault/UCSB Nanofabrication Facility Brandon Lynch/University of California Santa Cruz Juliana Hernandez/University of California Santa Cruz Sara Abrahamsson/University of California Santa Cruz	Paper
14:30 - 15:00	**Illuminating neural coding with sculpted wavefronts (JW3P.5)** **Presenter**: Shy Shoham, *NYU Langone Health* Expand for Abstract / Authors We present methodological and conceptual advances in applying multiphoton light sculpting towards precise optogenetic probing of neural coding. Our approach highlights behavioral readout, manipulating physical parameters and in-situ evaluation towards illuminating the brain’s computational strategies. **Authors**:Shy Shoham/NYU Langone Health Gilad Lerman/NYU Langone Health Jonathan Gill/NYU Langone Health Dmitry Rinberg/NYU Langone Health Invited	Paper

ATTR: Artificial Intelligence for Photonics Imaging and Sensing (AW3T)

Presider: Yasha Yi, *University of Michigan*

13:00 - 13:30	**Deep learning based computational biomedical microscopy with uncertainty quantification (AW3T.1)** **Presenter**: Lei Tian, *Boston University* Expand for Abstract / Authors I will present several deep learning based computational microscopy techniques including phase microscopy and imaging oximetry. Emphasis will be put on an uncertainty quantification framework for assessing the reliability of these techniques. **Authors**:Lei Tian/Boston University Yujia Xue/Boston University Shiyi Cheng/Boston University Yunzhe Li/Boston University Ji Yi/Boston University Invited	Paper

13:30 - 14:00

Translation of Applied Research on Artificial Intelligence in Medical Imaging (AW3T.2)
Presenter: Daguang Xu, *NVIDIA Corporation*
Expand for Abstract / Authors

This talk shall briefly summarize the major research topics on artificial intelligence in medical imaging recently. It will also cover some research results produced in NVIDIA and how they have been applied to NVIDIA's products.

Authors:Daguang Xu/NVIDIA Corporation

Invited

14:00 - 14:15

High-Speed Multiplexed Vibrational Imaging by Femtosecond Stimulated Raman Scattering and Deep Learning (AW3T.3)
Presenter: Jing Zhang, *Boston University*
Expand for Abstract / Authors

Paper

High-speed chemical imaging is achieved by combining femtosecond pulse stimulated Raman scattering with deep learning. Speed is improved by ~60 times with four sub-cellular organelles (lipid droplets, endoplasmic reticulum, nuclei, cytoplasm) classified in MiaPaCa2 cells.

Authors:Jing Zhang/Boston University Haonan Lin/Boston University Jian Zhao/Boston University Yuying Tan/Boston University Ji-Xin Cheng/Boston University

14:15 - 14:30

Deep Learning Structured Illumination Microscopy (AW3T.4)
Presenter: Doron Shterman, *Technion - Israel Institute of Technology*
Expand for Abstract / Authors

Paper

We propose a Deep Learning (DL) framework for reconstructing super-resolved images in structured illumination microscopy, which reduces the amount of raw data required for the reconstruction and allows real-time super resolution imaging

Authors:Doron Shterman/Technion - Israel Institute of Technology Gilad Feinberg/Technion - Israel Institute of Technology Shai Tsesses/Technion - Israel Institute of Technology yochai blau/Technion - Israel Institute of Technology Guy Bartal/Technion - Israel Institute of Technology

14:30 - 14:45 **Automated Screening of Sickle Cells Using a Smartphone-Based Microscope and Deep Learning (AW3T.5)**
Presenter: Kevin de Haan, *University of California Los Angeles*
Expand for Abstract / Authors

Paper

We present a deep learning-based framework for performing automatic screening of sickle cells using a smartphone-based microscope. We achieved 98% accuracy when blindly testing 96 human blood smear slides, including 32 with sickle cell disease.

Authors:Kevin de Haan/University of California Los Angeles Hatice Ceylan Koydemir/University of California Los Angeles Yair Rivenson/University of California Los Angeles Derek Tseng/University of California Los Angeles Elizabeth Van Dyne/University of California Los Angeles Lissette Bakic/University of California Los Angeles Doruk Karinca/University of California Los Angeles Kyle Liang/University of California Los Angeles Megha Ilango/University of California Los Angeles Esin Gumustekin/University of California Los Angeles Aydogan Ozcan/University of California Los Angeles

14:45 - 15:00 ***Deep-Z*: 3D Virtual Refocusing of Fluorescence Images Using Deep Learning (AW3T.6)**
Presenter: Yichen Wu, *University of California Los Angeles*
Expand for Abstract / Authors

Paper

We demonstrate a deep learning-based 3D virtual refocusing framework for fluorescence microscopy, which extends the imaging depth-of-field by 20-fold and corrects various aberrations, all digitally performed after a 2D image of the sample is captured.

Authors:Yichen Wu/University of California Los Angeles Yair Rivenson/University of California Los Angeles Hongda Wang/University of California Los Angeles Yilin Luo/University of California Los Angeles Eyal Ben-David/University of California Los Angeles Laurent Bentolila/University of California Los Angeles Christian Pritz/Hebrew University of Jerusalem Aydogan Ozcan/University of California Los Angeles

ATTR: Optics and Photonics for Precision Agriculture I (AW3K)
Presider: Joachim Sacher

13:00 - 13:30 **(Withdrawn) Raman Spectroscopy in Agriculture (AW3K.1)**
Presenter: Malgorzata Baranska, *Jagiellonian University*
Expand for Abstract / Authors

TBD

Authors:Malgorzata Baranska/Jagiellonian University

Invited

13:30 - 14:00 **Farm to Table: Applications for New Hyperspectral Imaging Technologies in Precision Agriculture, Food Quality and Safety (AW3K.2)**
Presenter: Alex Fong, *TruTag Technologies Inc*
Expand for Abstract / Authors

Paper

Hyperspectral imagers can be deployed in a number of locations in the food supply chain. From laboratory studies of plant genomics, to drones measuring crop health in the field, to inline or end-of-line positioning in process facilities. In the quality assurance, the additional spectral and spatial information provided by hyperspectral imaging can be utilized by food processors to provide details of chemical and structural composition previously not discernible yielding value in several areas.

Authors:Alex Fong/TruTag Technologies Inc George Shu/HinaLea Imaging Barry McDonogh/TruTag Technologies Inc

Invited

14:00 - 14:30 **Addressing the Challenges of Agriculture and Food Distribution System through Photonics (AW3K.3)**
Presenter: Aparajita Bandyopadhyay, *Indian Institute of Technology Delhi*
Expand for Abstract / Authors

Modern-day agriculture and food distribution across the world are complex and diverse. With increasing demands of food-water-land; push to conserve resources and minimize wastage; photonic tools are being explored to analyse these intricate dynamics.

Authors:Aparajita Bandyopadhyay/Indian Institute of Technology Delhi

Invited

14:30 - 14:45 **Miniaturized QEPAS Detector Concept for Methane (AW3K.4)**
Presenter: Herve Tatenguem Fankem, *Sacher Lasertechnik GmbH*
Expand for Abstract / Authors

Paper

QEPAS enables very compact detectors due to the small detection volume. Currently limitations originate from bulky control electronics, like lock-in amplifiers. We report on reducing size and energy of FPGA based devices and their application in methane detection.

Authors:Herve Tatenguem Fankem/Sacher Lasertechnik GmbH Amrita Devi Josnan/Sacher Lasertechnik GmbH Tobias Milde/Sacher Lasertechnik GmbH Morten Hoppe/Sacher Lasertechnik GmbH Joachim Sacher/Sacher Lasertechnik GmbH

14:45 - 15:00 **Fully room temperature bio-sensing using active microdisk fabricated by ink-jet printing method (AW3K.5)**
Presenter: Abdul Nasir, *Kyushu University*
Expand for Abstract / Authors

Paper

Fluorinated hyper branched polymer based active microdisk was fabricated by ink-jet printing method. The carboxyl functional group of the polymer was used for the biotinylation of microdisk and then adsorption characteristics of avidin were evaluated.

Authors:Abdul Nasir/Kyushu University Yuya Mikami/Kyushu University Taku Takagishi/Kyushu University Rui Yatabe/Kyushu University Hiroaki Yoshioka/Kyushu University Nilesh J Vasa/Indian Institute of Technology Madras Yuji Oki/Kyushu University

Attosecond Dynamics in Gases (FW3D)

Presider: Julia Mikhailova

13:00 - 13:30 **(Withdrawn) Attoclock experiments on atomic and molecular hydrogen: tunnelling time and electron correlations (FW3D.1)**
Presenter: Igor Litvinyuk, *Griffith University*
Expand for Abstract / Authors

We performed attoclock experiments on atomic and molecular hydrogen. For H we put an upper limit of 2 attoseconds on electron tunneling time. For H_2 we studied dependence of electron offset angle on molecular orientation.

Authors:U. Satya Sainadh/Griffith University Han Xu/Griffith University Xiaoshan Wang/Griffith University Atia Atia-Tul-Noor/Griffith University William Wallace/Griffith University Nicolas Douget/University of Central Florida Alexander Bray/Australian National University Igor Ivanov/Institute for Basic Sciences Klaus Bartschat/Drake University Anatoli Kheifets/Australian National University Robert Sang/Griffith University Igor Litvinyuk/Griffith University

Invited

13:30 - 13:45 **Time delays from one-photon transitions in the continuum (FW3D.2)**
Presenter: Jaco Fuchs, *ETH Zurich*
Expand for Abstract / Authors

Paper

We experimentally resolve the time delay of electron wave packets arising from one-photon transitions in the continuum. This allows us to determine and quantify the angular momentum dependence of the photoionization time delay.

Authors:Jaco Fuchs/ETH Zurich Nicolas Douguet/University of Central Florida Stefan Donsa/Vienna University of Technology Fernando Martin/Universidad Autónoma de Madrid Joachim Burgdörfer/Vienna University of Technology Luca Argenti/University of Central Florida Laura Cattaneo/ETH Zurich Ursula Keller/ETH Zurich

13:45 - 14:00 **Control of electron recollision and molecular nonsequential double ionization (FW3D.3)**
Presenter: Marcos Dantus, *Michigan State University*
Expand for Abstract / Authors

Paper

Control of electron recollision and molecular nonsequential double ionization via pulse shaping was obtained on ethane. A model based on sudden jump in driving frequency is found to be in excellent agreement with experimental results.

Authors:Shuai Li/Michigan State University Diego Sierra-Costa/Michigan State University Matthew Michie/Michigan State University Itzik Ben-Itzhak/J. R. Macdonald Laboratory Marcos Dantus/Michigan State University

14:00 - 14:15 **On the Quantum-Optical Nature of High Harmonic Generation (FW3D.4)**
Presenter: Alexey Gorlach, *Technion*
Expand for Abstract / Authors

Paper

We show novel effects in high harmonic generation arising from the quantum nature of light. These effects include multiple shifted combs of high harmonics, where each photon carries all the spectral information of the combs.

Authors:Alexey Gorlach/Technion Ofer Neufeld/Technion Nicholas Rivera/Massachusetts Institute of Technology Oren Cohen/Technion Ido Kaminer/Technion

14:15 - 14:30 **(Withdrawn) Sub-Cycle Time Resolution of Multi-Photon Momentum Transfer in Strong-Field Ionization (FW3D.5)**
Presenter: Benjamin Willenberg, *ETH Zurich*
Expand for Abstract / Authors

We experimentally demonstrate that the transfer of photon linear momentum is a sub-cycle time-dependent process. This observation is explained by a semi-classical free-electron-model in a laser field, extended by parent-ion-interaction and time-dependent initial momentum shift.

Authors:Benjamin Willenberg/ETH Zurich Jochen Maurer/ETH Zurich Benedikt Mayer/ETH Zurich Ursula Keller/ETH Zurich

14:30 - 14:45	**Attosecond streaking of parametrically amplified and synthesized waveforms. (FW3D.6)** **Presenter**: Fabian Scheiba, *Deutsches Elektronen-Synchrotron (DESY)* Expand for Abstract / Authors We demonstrate attosecond streaking with a parametric waveform synthesizer. The characterization demonstrates the excellent pulse-to-pulse stability and versatile waveform shaping at subcycle pulse durations, allowing for the direct generation of isolated attosecond pulses. **Authors**:Fabian Scheiba/Deutsches Elektronen-Synchrotron (DESY) Yudong Yang/Deutsches Elektronen-Synchrotron (DESY) Giulio Maria Rossi/Deutsches Elektronen-Synchrotron (DESY) Roland E. Mainz/Deutsches Elektronen-Synchrotron (DESY) Miguel Angel Silva-Toledo/Deutsches Elektronen-Synchrotron (DESY) Phillip D. Keathley/Massachusetts Institute of Technology (MIT) Giovanni Cirmi/Deutsches Elektronen-Synchrotron (DESY) Franz KÄRTNER/Deutsches Elektronen-Synchrotron (DESY)	Paper
14:45 - 15:00	**Polarimetry of a Single-Order Circularly Polarized High Harmonic Separated by a Time-Delay Compensated Monochromator (FW3D.7)** **Presenter**: Taro Sekikawa, *Hokkaido University* Expand for Abstract / Authors Polarization of single-order circularly polarized high harmonic is characterized after the separation by a time-delay compensated monochromator. The ellipticity introduced by the anisotropy of the toroidal gratings in diffraction is evaluated. **Authors**:Kengo Ito/Hokkaido University Eisuke Haraguchi/Hokkaido University Keisuke Kaneshima/Hokkaido University Taro Sekikawa/Hokkaido University	Paper

Ultrafast Phenomena (SW3H)

Presider: Ticijana Ban, *Institut za Fiziku*

13:00 - 13:15

Noise Effect and Stability of Deep-UV Gas-filled Fiber Lasers Pumped with Ultrafast Mid-IR Pulses (SW3H.1)

Presenter: ABUBAKAR ISA ADAMU, *Technical University Of Denmark*

Expand for Abstract / Authors

Paper

Noise and spectral stability of dispersive waves generated in an argon-filled hollow-core fiber pumped with 2.4 μm ultrafast pulses is presented. Long-term stability and pulse-to-pulse relative intensity noise of the strongest dispersive wave at 275 nm is shown.

Authors:ABUBAKAR ISA ADAMU/Technical University Of Denmark Md. Selim Habib/Florida Polytechnic University, FL-33805, USA Callum Smith/Technical University Of Denmark Jose Enrique Antonio-Lopez/University of Central Florida, Orlando, FL-32816, USA Peter Uhd Jepsen/Technical University Of Denmark Rodrigo Amezcua Correa/University of Central Florida, Orlando, FL-32816, USA Ole Bang/Technical University Of Denmark Christos Markos/Technical University Of Denmark

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13:15 - 13:30

Thermal Effects in Molecular Gas-Filled Hollow-Core Fibers (SW3H.2)

Presenter: Nrisimhamurty Madugula, *University of Central Florida*

Expand for Abstract / Authors

Paper

Molecular gas-filled hollow-core fibers are attractive for pulse compression of Yb lasers. Here, we show that rotational heating prevents efficient spectral broadening at high average powers and find that buffer-gas cooling can mitigate this effect.

Authors:Nrisimhamurty Madugula/University of Central Florida John Beetar/University of Central Florida Yangyang Liu/University of Central Florida Michael Chini/University of Central Florida

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13:30 - 13:45

Spectral Broadening of Femtosecond UV Pulses in Air-filled Hollow-Core Photonic Crystal Fiber (SW3H.3)

Presenter: Jie Luan, *Max Planck Institute for the Science of Light*

Expand for Abstract / Authors

Paper

Air-filled kagomé-type photonic crystal fiber pumped by 40-fs pulses at 400 nm produces a spectrum with several nitrogen-related Raman bands that is broad enough to support transform-limited 7 fs pulses in the UV.

Authors:Jie Luan/Max Planck Institute for the Science of Light David Novoa/Max Planck Institute for the Science of Light Philip Russell/Max Planck Institute for the Science of Light

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13:45 - 14:00

Broadband Ultraviolet Generation with 50% Conversion Efficiency in Hollow Capillary Fibers (SW3H.4)
Presenter: Federico Belli, *Heriot-Watt University*
Expand for Abstract / Authors

Paper

We demonstrate broadband wavelength up-conversion (240-320nm) based on a seeded four-wave mixing scheme in gas-filled stretched hollow-capillary fibers with 50% conversion efficiency. Our technique is scalable in energy from the nJ to mJ level

Authors:Federico Belli/Heriot-Watt University Athanasios Lekosiotis/Heriot-Watt University John Travers/Heriot-Watt University

14:00 - 14:30

High-order Harmonic Generation in Femtosecond Laser Micromachined Devices for Ultrafast X-ray Spectroscopy (SW3H.5)
Presenter: Caterina Vozzi, *IFN-CNR*
Expand for Abstract / Authors

Paper

We demonstrate efficient high-order harmonic generation in fused-silica chips fabricated by femtosecond laser micromachining. This work provides a route toward the miniaturization of HHG beamlines and the implementation of X-ray spectroscopy with attosecond temporal resolution.

Authors:Anna Ciriolo/IFN-CNR Rebeca Martínez Vázquez/IFN-CNR Valer Tosa/National Institute for Research and Development of Isotopic and Molecular Technologies Aldo Frezzotti/Politecnico di Milano Eugenio Cinquanta/IFN-CNR Gabriele Crippa/Politecnico di Milano Michele Devetta/IFN-CNR Roberto Osellame/IFN-CNR Salvatore Stagira/Politecnico di Milano Caterina Vozzi/IFN-CNR

Invited

14:30 - 14:45

Trains and Isolated Attosecond Pulses at 100 kHz (SW3H.6)
Presenter: Federico Furch, *Max Born Institute*
Expand for Abstract / Authors

Paper

We report on the generation and characterization of trains and isolated attosecond pulses at a repetition rate of 100 kHz. This system will be utilized for attosecond pump-probe spectroscopy studies with electron-ion coincidence detection.

Authors:Federico Furch/Max Born Institute Tobias Witting/Max Born Institute Mikhail Osolodkov/Max Born Institute Felix Schell/Max Born Institute Carmen Menoni/Colorado State University Claus P. Schulz/Max Born Institute Marc J. J. Vrakking/Max Born Institute

14:45 - 15:00 **Role of Van Hove singularities on high harmonic generation in solids by high power mid-IR pulses (SW3H.7)**
Presenter: Tsuneto Kanai, *Max Planck Center for Attosecond Science*
Expand for Abstract / Authors

Paper

We generate high harmonics in polycrystalline and monocrystalline ZnSe with a high-power mid-IR optical parametric amplifier. By using its high photon flux and wavelength tunability, novel paths based on Van Hove singularities were observed.

Authors:Tsuneto Kanai/Max Planck Center for Attosecond Science Yeon Lee/Max Planck Center for Attosecond Science Dong Kim/Max Planck Center for Attosecond Science

Tunable Nanophotonics (FW3Q)

Presider: Amit Agrawal, *National Inst of Standards & Technology*

13:00 - 14:00 **Design of Tunable Nanophotonic Devices (FW3Q.1)**
Presenter: Harry Atwater, *California Institute of Technology*
Expand for Abstract / Authors

Paper

This tutorial addresses design of tunable nanophotonic arrays, enabling dynamic, active control of the properties of light – amplitude, phase, wavevector, wavelength and polarization – opening new applications such as optical beam steering, focusing and wavefront engineering.
Harry Atwater is the Howard Hughes Professor of Applied Physics and Materials Science at the California Institute of Technology. His scientific interests span nanophotonic light-matter interactions and solar energy conversion. Atwater was an early pioneer in nanophotonics and plasmonics; he gave the name to the field of plasmonics in 2001.

Authors:Harry Atwater/California Institute of Technology

Tutorial

14:00 - 14:15 **Mixed Eletro-optic Metasurface with a Hybrid Plasmonic-phase-change Material Architecture (FW3Q.2)**
Presenter: Omid Hemmatyar, *Georgia Institute of Technology*
Expand for Abstract / Authors

Paper

We demonstrate an electro-optically reconfigurable hybrid metasurface platform formed by integration of plasmonic nanostructures with phase-change materials to effectively modulate the incident light over a broad range of wavelengths in the telecommunication window.

Authors:Omid Hemmatyar/Georgia Institute of Technology Sajjad Abdollahramezani/Georgia Institute of Technology Hossein Taghinejad/Georgia Institute of Technology Ali Adibi/Georgia Institute of Technology

14:15 - 14:30	**Dynamic Beam Steering by All-Dielectric Magneto-Optical Nanoantennas (FW3Q.3)** **Presenter**: Ihar Faniayeu, *University of Gothenburg* Expand for Abstract / Authors We propose employing a magneto-optical nanoantenna that allows transmitted optical beam steering. The proposed nanoantenna produces a few degrees spanning of the optical beam propagation direction, controlled by the strength of the external magnetic field. **Authors**:Ihar Faniayeu/University of Gothenburg Alexander Dmitriev/University of Gothenburg	Paper
14:30 - 14:45	**(Withdrawn) Tunable metasurface and Tamm plasmon polaritons with liquid crystals (FW3Q.4)** **Presenter**: Jhen-Hong Yang, *National Chiao Tung University, Taiwan* Expand for Abstract / Authors Liquid crystal based metasurface would be a potential candidate in the tunable planar nanophotonics devices. In this work, the tunable metasurfaces with the functions of beam steering, color pixels, and resonance bandwidth are presented. **Authors**:Jhen-Hong Yang/National Chiao Tung University, Taiwan Kuo-Ping Chen/National Chiao Tung University, Taiwan	
14:45 - 15:00	**Electrically programmable phased-array antenna using phase-change materials (FW3Q.5)** **Presenter**: Sajjad AbdollahRamezani, *Georgia Institute of Technology* Expand for Abstract / Authors We present an electrically tunable metasurface as an optical phased array antenna by employing a deep learning approach to intelligently design hybrid phasechange/ plasmonic materials-based meta-atoms spatially adding 0 and p phase-shift while minimize reflectance variation. **Authors**:Sajjad AbdollahRamezani/Georgia Institute of Technology Yashar Kiarashinejad/Georgia Institute of Technology Omid Hemmatyar/Georgia Institute of Technology Mohammadreza Zandehshahvar/Georgia Institute of Technology Ali Adibi/Georgia Institute of Technology	Paper

Topological Photonics I (FW3A)

Presider: Andrea Blanco-Redondo, *Nokia Bell Labs*

13:00 - 13:30 **Topological Haldane Lattice (FW3A.1)**
Presenter: Yuzhou Liu, *University of Southern California*
Expand for Abstract / Authors

_ Paper

We report on the first demonstration of topological Haldane lattice, also known as quantum anomalous Hall effect, in a photonic setting using active microring structures.

Authors:Yuzhou Liu/University of Southern California Pawel Jung/University of Central Florida, CREOL Midya Parto/University of Central Florida, CREOL William Hayenga/University of Southern California Demetrios Christodoulides/University of Central Florida, CREOL Mercedeh Khajavikhan/University of Southern California

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13:30 - 13:45 **Experimentally Realizing Photonic Topological Edge States in 3D**

(FW3A.2)
Presenter: Eran Lustig, *Technion Israel Institute of Technology*
Expand for Abstract / Authors

_ Paper

<div style="direction: ltr;">We demonstrate photonic structures, which support topological edge-states propagating in 3D. The robust edge-states propagate in a screw motion in a 3D topological insulator with two spatial dimensions and one synthetic dimension.</div>

Authors:Eran Lustig/Technion Israel Institute of Technology Lukas Maczewsky/Institut für Physik, Universität Rostock Tobias Biesenthal/Institut für Physik, Universität Rostock Zhaoju Yang/Technion Israel Institute of Technology Yonatan Plotnik/Technion Israel Institute of Technology Alexander Szameit/Institut für Physik, Universität Rostock Mordechai Segev/Technion Israel Institute of Technology

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13:45 - 14:00 **Topological Behaviors in Networks of Time-Multiplexed Optical Resonators (FW3A.3)**
Presenter: Christian Leefmans, *California Institute of Technology*
Expand for Abstract / Authors

_ Paper

We observe topological phenomena in coupled, time-multiplexed optical resonators by mapping topologically nontrivial energy spectra to the network’s loss. We detect topological edge states and reconstruct the band structures of noninteracting tight-binding Hamiltonians.

Authors:Christian Leefmans/California Institute of Technology Avik Dutt/Stanford University James Williams/Northwestern University Luqi Yuan/Shanghai Jiao Tong University Shanhui Fan/Stanford University Alireza Marandi/California Institute of Technology

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14:00 - 14:15

Generation of Topological Space-Time Non-Separable Light Pulses (FW3A.4)
Presenter: Apostolos Zdagkas, *ORC, University of Southampton*
Expand for Abstract / Authors

_ Paper

We report the generation of space-time non-separable toroidal pulses of complex topological structure. Such pulses, a formation of singularities propagating in free space, are ideal probes for toroidal and anapole modes in matter.

Authors:Apostolos Zdagkas/ORC, University of Southampton Yaonan Hou/ORC, University of Southampton Vassili Savinov/ORC, University of Southampton Huifang Zhang/ORC, University of Southampton Oleksandr Buchnev/ORC, University of Southampton Nikitas Papasimakis/ORC, University of Southampton Nikolay Zheludev/ORC, University of Southampton

14:15 - 14:30

Experimental observation of braiding topological zero modes in a photonic waveguide array (FW3A.5)
Presenter: Jiho Noh, *Pennsylvania State University*
Expand for Abstract / Authors

_ Paper

We demonstrate a non-trivial Berry phase that originates from braiding topological defects in a photonic waveguide array. The non-zero Berry phase implies that braiding operations involving the defects are non-Abelian.

Authors:Jiho Noh/Pennsylvania State University Thomas Schuster/University of California, Berkeley Thomas Iadecola/Iowa State University Sheng Huang/University of Pittsburgh Mohan Wang/University of Pittsburgh Kevin Chen/University of Pittsburgh Claudio Chamon/Boston University Mikael Rechtsman/Pennsylvania State University

14:30 - 14:45

Universal conversion of topological singularities from momentum to real space (FW3A.6)
Presenter: Shiqi Xia, *Teda College of Nankai University*
Expand for Abstract / Authors

_ Paper

We demonstrate universal conversion of topological singularities in momentum-space (Dirac points) to topological defects in real-space (optical vortices). We show that this conversion persists even in stretched lattices, topologically protected by a quantized Berry phase.

Authors:Xiuying Liu/Teda College of Nankai University Shiqi Xia/Teda College of Nankai University Ema Jajtić/University of Zagreb Daohong song/Teda College of Nankai University Denghui Li/Teda College of Nankai University Liqin Tang/Teda College of Nankai University Daniel Leykam/Institute for Basic Science Jingjun Xu/Teda College of Nankai University Hrvoje Buljan/University of Zagreb Zhigang Chen/Teda College of Nankai University

14:45 - 15:00

The non-Hermitian Skin Effect as Light Funnel (FW3A.7)
Presenter: Alexander Szameit, *University of Rostock*
Expand for Abstract / Authors

Paper

Non-Hermiticity, induced by anisotropic coupling, makes the mode spectrum highly sensitive to the existence of boundaries. We demonstrate and exploit this behaviour experimentally in a photonic lattice to construct a light funnel.

Authors:Mark Kremer/University of Rostock Sebastian Weidemann/University of Rostock Tobias Helbig/Julius-Maximilians-University Tobias Hofmann/Julius-Maximilians-University Alexander Stegmaier/Julius-Maximilians-University Martin Greiter/Julius-Maximilians-University Ronny Thomale/Julius-Maximilians-University Alexander Szameit/University of Rostock

Interaction of Strong Fields with Low Dimensional Materials (SW3G)
Presider: Nadezhda Bulgakova, *HiLASE, Institute of Physics CAS*

13:00 - 13:30

Femtosecond Laser-induced Breakdown of Monolayer Two-dimensional Materials (SW3G.1)
Presenter: Tsing-Hua Her, *Univ of North Carolina at Charlotte*
Expand for Abstract / Authors

Paper

Progress on single-shot femtosecond laser ablation of a variety of monolayer two-dimensional materials is reported. Various mechanisms leading towards to their dielectric breakdown are experimentally explored and numerically modeled.

Authors:Tsing-Hua Her/Univ of North Carolina at Charlotte Jole Solomon/Univ of North Carolina at Charlotte Sih-Hua chen/National Chiao Tung University Hsin-Yu Yao/National Tsing Hua University Li-Syuan Lu/National Chiao Tung University Joseph Obeid/Univ of North Carolina at Charlotte Yu-Chen Wu/National Chiao Tung University Sabeeh Ahmad/Univ of North Carolina at Charlotte Wen-Hao Chang/National Chiao Tung University Chih Wei Luo/National Chiao Tung University

Invited

13:30 - 13:45

Abnormal Anisotropic Nonlinear Absorption in Bulk ReS_2 Measured by Intensity-scan Method (SW3G.2)
Presenter: Yongjian Zhou, *University of Texas at Austin*
Expand for Abstract / Authors

Paper

Polarization-dependent nonlinear absorption in bulk ReS_2 is measured by Intensity-scan. Absorption under high peak power shows a transition from saturable absorption to reverse saturable absorption when rotating the polarization with respect to the b-axis.

Authors:Yongjian Zhou/University of Texas at Austin Xianghai Meng/University of Texas at Austin Yaguo Wang/University of Texas at Austin

13:45 - 14:00

Long Range Polariton Hall Effect in Bloch Surface Waves WS_2 Exciton Polaritons (SW3G.3)
Presenter: Mandeep Khatoniar, *City University of New York*
Expand for Abstract / Authors

Paper

We demonstrate long range Hall like propagation features in a polariton fluid formed via coupling WS_2 excitons to Bloch surface waves at room temperatures.

Authors:Mandeep Khatoniar/City University of New York Biswanath Chakraborty/City College of New York Nicholas Yama/University of Hawaii Vinod Menon/City University of New York

14:00 - 14:15

Periodic Surface Functional Group Density on Graphene Induced by Pulsed Laser Patterning of SiO_2/Si Substrate (SW3G.4)
Presenter: Inam Mirza, *HiLASE Centre, Institute of Physics of the Czech Academy of Sciences*
Expand for Abstract / Authors

Paper

The periodic functionalization of graphene has been achieved by pulsed laser substrate patterning. Laser-induced ripples formed at Si/SiO_2 interface periodically modulate the reactivity of the monolayer graphene via modulation of the doping density

Authors:Inam Mirza/HiLASE Centre, Institute of Physics of the Czech Academy of Sciences Karolina Drogowska/J. Heyrovsky Institute of Physical Chemistry of the Czech Academy of Sciences Álvaro Rodriguez/J. Heyrovsky Institute of Physical Chemistry of the Czech Academy of Sciences Petr Kovaríček/J. Heyrovsky Institute of Physical Chemistry of the Czech Academy of Sciences Juraj Sládek/HiLASE Centre, Institute of Physics of the Czech Academy of Sciences Thibault Derrien/HiLASE Centre, Institute of Physics of the Czech Academy of Sciences Mindaugas Gedvilas/Centre for Physical Sciences and Technology, Savanoriu Ave. 231, LT-02300 Gediminas Račiukaitis/Centre for Physical Sciences and Technology, Savanoriu Ave. 231, LT-02300 Nadezhda Bulgakova/HiLASE Centre, Institute of Physics of the Czech Academy of Sciences Martin Kalbáč/J. Heyrovsky Institute of Physical Chemistry of the Czech Academy of Sciences

14:15 - 14:30

(Withdrawn) Polymeric microcavities incorporated with graphene oxide fabricated by two-photon polymerization (SW3G.5)
Presenter: Cleber Mendonca, *USP - Instituto de Fisica de Sao Carlos*
Expand for Abstract / Authors

Polymeric microcavities ($Q{\sim}10^4$) doped with graphene oxide were fabricated. No Q-factor decrease was noticed upon doping, albeit smaller number of modes was observed. Also, graphene oxide layers were deposited on microcavities by laser-induced forward transfer.

Authors:Cleber Mendonca/USP - Instituto de Fisica de Sao Carlos Nathalia Tomazio/USP - Instituto de Fisica de Sao Carlos Kelly Paula/USP - Instituto de Fisica de Sao Carlos

14:30 - 14:45	**Unravelling the role of trap states on carrier dynamics of WS_2 quantum dots (SW3G.6)** **Presenter**: RIYANKA KARMAKAR, *Indian Institute of Science Education and Research Bhopal* Expand for Abstract / Authors Here, we studied the intriguing optical properties of WS_2 quantum dots by various time-resolved spectroscopic techniques to get a comprehensive understanding of spectral and dynamical characteristics, specifically, we show long-lived ~ 95 ps trap-state emission. **Authors**:RIYANKA KARMAKAR/Indian Institute of Science Education and Research Bhopal Adarsh K V/Indian Institute of Science Education and Research Bhopal	_ Paper
14:45 - 15:00	**Observation of Nanoscale Opto-Mechanical Molecular Damping; Origin of Spectroscopic Contrast in Infrared Photo Induced Force Microscopy (SW3G.7)** **Presenter**: Mohammad Almajhadi, *University of California Irvine* Expand for Abstract / Authors The contrast mechanism of infrared photoinduced force microscopy (IR-PiFM) for recording vibrational resonances is experimentally investigated. We show that spectroscopic contrast in IR-PiFM is mediated by opto-mechanical damping of the cantilever oscillation. © 2020 The Author(s) **Authors**:Mohammad Almajhadi/University of California Irvine Syed Mohammad Ashab Uddin/University of California Irvine H. Kumar Wickramasinghe/University of California Irvine	_ Paper

Microwave Photonics (SW3O)

Presider: Sungwon Chung, *Neuralink Corporation*

13:00 - 13:15	**Integrated Opto-Electronic Circulator for Radio-over-Fiber Links (SW3O.1)** **Presenter**: Sergio Pinna, *University of California Santa Barbara* Expand for Abstract / Authors A silicon photonics integrated opto-electronic circulator for radio over fiber links is proposed and experimentally demonstrated. The device shows an isolation between optical ports above 20 dB over the 0-20 GHz range. **Authors**:Sergio Pinna/University of California Santa Barbara Fabrizio Gambini/University of California Santa Barbara Jonathan Klamkin/University of California Santa Barbara	_ Paper

13:15 - 13:30

On-Chip Dispersive Phase Filters for Photonic Signal Processing (SW3O.2)
Presenter: Saket Kaushal, *Institut National de la Recherche Scientifique*
Expand for Abstract / Authors

Paper

We propose a dispersive phase filter design suitable for compact integration using waveguide Bragg gratings in silicon. On-chip 2x pulse repetition-rate multiplication of a 10-GHz pulse train by Talbot effect is experimentally demonstrated using this design.

Authors:Saket Kaushal/Institut National de la Recherche Scientifique Jose Azana/Institut National de la Recherche Scientifique

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13:30 - 13:45

Fully reconfigurable chip-based Brillouin microwave photonic multi-passband filter with high RF link gain (SW3O.3)
Presenter: Matthew Garrett, *Instute of Photonics and Optical Sciences (IPOS)*
Expand for Abstract / Authors

Paper

Using a novel suppressed carrier phase modulation scheme, which increases RF gain for constant on-chip optical power, we demonstrate a microwave photonic filter with three independent passbands, low RF loss (-5dB) and deep out-of-band rejection.

Authors:Matthew Garrett/Instute of Photonics and Optical Sciences (IPOS) Yang Liu/Instute of Photonics and Optical Sciences (IPOS) Pan Ma/Laser Physics Centre Duk-Yong Choi/Laser Physics Centre Stephen Madden/Laser Physics Centre Benjamin Eggleton/Instute of Photonics and Optical Sciences (IPOS)

13:45 - 14:00

Silicon Photonic Weights for Microwave Photonic Canceller (SW3O.4)
Presenter: Eric Blow, *Princeton University*
Expand for Abstract / Authors

Paper

Demonstration of silicon integrated linear filter, comprised of tunable weights, implemented as the matched filter of a microwave photonic canceller. Achieving 34 dB of weighting and 20 dB of cancellation over 6 GHz operating range.

Authors:Eric Blow/Princeton University Chaoran Huang/Princeton University Zheng Liu/Princeton University Samuel Markoff/Princeton University Paul Prucnal/Princeton University

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14:00 - 14:30

Photonic Assisted Microwave Near-field Imager (SW3O.5)
Presenter: Farshid Ashtiani, *University of Pennsylvania*
Expand for Abstract / Authors

Paper

The first nanophotonic near-field imager is reported that optically processes the received microwave signals to form a 121-pixel image. It achieves 4.8° spatial resolution and is significantly smaller and more power efficient than the all-electrical counterparts.

Authors:Farshid Ashtiani/University of Pennsylvania Firooz Aflatouni/University of Pennsylvania

14:30 - 14:45 **(Withdrawn) Frequency compensated uni-travelling carrier photoreceiver for 100 Gbaud IM-DD communications (SW3O.6)**
Presenter: Toshimasa Umezawa, *National Inst of Information & Comm Tech*
Expand for Abstract / Authors

We present a frequency compensated uni-traveling-carrier photoreceiver using an LC resonance technique for 100 Gbaud intensity-modulation direct-detection communications. Then, the great advantage for the frequency response and the bit error rate will be discussed.

Authors:Toshimasa Umezawa/National Inst of Information & Comm Tech Atsushi Kanno/National Inst of Information & Comm Tech Atsushi Matsumoto/National Inst of Information & Comm Tech Kouichi Akahane/National Inst of Information & Comm Tech Naokatsu Yamamoto/National Inst of Information & Comm Tech Tetsuya Kawanishi/Waseda University

14:45 - 15:00 **(Withdrawn) Microwave Doppler Frequency Shift Measurement based on an Integrated Silicon Six-Port Receiver (SW3O.7)**
Presenter: Zhenzhou Tang, *Nanjing Univ Aeronautics & Astronautics*
Expand for Abstract / Authors

A microwave Doppler-frequency-shift (DFS) measurement system based on an integrated silicon six-port receiver is proposed. A DFS measurement over a range ±100 kHz with a measurement error lower than ±6 Hz is realized.

Authors:Zhenzhou Tang/Nanjing Univ Aeronautics & Astronautics Jing Zhang/ghent university Zhengqian He/Nanjing Univ Aeronautics & Astronautics Shilong Pan/Nanjing Univ Aeronautics & Astronautics Gunther Roelkens/ghent university Dries Van Thourhout/ghent university

Frequency Combs I (SW3J)

Presider: Daron Westly, *NIST*

13:00 - 13:30 **Interleaved difference-frequency-generation for mid-infrared microcomb spectral densification (SW3J.1)**
Presenter: Chengying Bao, *Caltech*
Expand for Abstract / Authors

Paper

Generation of mid-infrared combs (3.3 micron band) with GigaHertz line spacing is demonstrated by interleaved difference-frequency-generation. The method, applied to a 22 GHz repetition-rate microcomb, is useful for spectral densification of sparse microcomb spectra.

Authors:Chengying Bao/Caltech Zhiquan Yuan/Caltech Heming Wang/Caltech LUE WU/Caltech Boqiang Shen/Caltech Keeyoon Sung/JPL Stephanie Leifer/JPL Qiang Lin/University of Rochester Kerry Vahala/Caltech

13:30 - 13:45	**Electrically Operated Integrated Optical Dual-Comb Source Based on Microresonators (SW3J.2)** **Presenter**: Sergey Koptyaev, *Samsung R&D Institute Russia* Expand for Abstract / Authors We demonstrate for the first time the compact optical dual-comb source based on high-Q integrated microresonators pumped by semiconductor Fabry-Pérot laser diodes. This demonstration provides a route to fully integrated spectrometer of high-volume fabrication. **Authors**:Alexander Gorodnitskiy/Russian Quantum Center Andrey Voloshin/Russian Quantum Center Sergey Koptyaev/Samsung R&D Institute Russia Maxim Ryabko/Samsung R&D Institute Russia Sofya Agafonova/Russian Quantum Center Igor Bilenko/Russian Quantum Center Stas Polonsky/Samsung R&D Institute Russia	Paper
13:45 - 14:00	**Generation of a dissipative Kerr-microresonator soliton comb pumped by a MHz linewidth DFB laser (SW3J.3)** **Presenter**: Kenji Nishimoto, *Tokushima University* Expand for Abstract / Authors We generate a dissipative Kerr-microresonator soliton comb pumped by a MHz linewidth distributed feedback laser. The phase noise of a soliton comb mode and the timing jitter of the soliton comb are also measured. **Authors**:Kenji Nishimoto/Tokushima University Kaoru Minoshima/University of Electro-Communications Takeshi Yasui/Tokushima University Naoya Kuse/Tokushima University	Paper
14:00 - 14:15	**Dynamics of Soliton Microcomb Self-Injection Locking in a Silicon Nitride Microresonator (SW3J.4)** **Presenter**: Andrey Voloshin, *Russian Quantum Center* Expand for Abstract / Authors We demonstrate a chip-scale 30 GHz single soliton microcomb based on DFB laser locked to a Si_3N_4 microresonator. We propose novel theoretical and experimental approaches to explain dynamics of self-injection locking, modified by Kerr nonlinearity. **Authors**:Andrey Voloshin/Russian Quantum Center Junqiu Liu/Swiss Federal Institute of Technology Lausanne (EPFL) Nikita Kondratiev/Russian Quantum Center Grigory Lihachev/Swiss Federal Institute of Technology Lausanne (EPFL) Tobias Kippenberg/Swiss Federal Institute of Technology Lausanne (EPFL) Igor Bilenko/Russian Quantum Center	Paper

14:15 - 14:30

Post-Fabrication Trimming of Microresonator Frequency Combs for Visible Optical Atomic Clocks (SW3J.5)
Presenter: Gregory Moille, *National Institute of Standards and Technology*
Expand for Abstract / Authors

_ Paper

We study broadband Si$_3$N$_4$ microresonator frequency combs aimed at addressing atomic transitions in the visible. Using an air-clad system, we show how post-process trimming enables tuning of the dispersive wave position to wavelengths below 700~nm.

Authors:Gregory Moille/National Institute of Standards and Technology Xiyuan Lu/National Institute of Standards and Technology Ashutosh Rao/National Institute of Standards and Technology Daron Westly/National Institute of Standards and Technology Kartik Srinivasan/National Institute of Standards and Technology

14:30 - 14:45

Ultra-Low Threshold Broadband Soliton Frequency Comb Generation (SW3J.6)
Presenter: Xingchen Ji, *Columbia University*
Expand for Abstract / Authors

_ Paper

We measure a record-low threshold power of 84 μW for parametric oscillation using resonators with intrinsic Q of 31.8±4.4 million and demonstrate a broadband single soliton comb spectrum spanning 1097 nm-2040 nm. The resonator compact profile is designed to minimize higher order modes excitation.

Authors:Xingchen Ji/Columbia University Jae Jang/Columbia University Utsav Dave/Columbia University Chaitanya Joshi/Columbia University Mateus Corato-Zanarella/Columbia University Alexander Gaeta/Columbia University Michal Lipson/Columbia University

14:45 - 15:00

On-chip Q-factor Greater than 1 Billion (SW3J.7)
Presenter: LUE WU, *California Institute of Technology*
Expand for Abstract / Authors

_ Paper

A record Q-factor of 1.1 billion is demonstrated in on-chip silica whispering-gallery resonators. Using the devices, sub-milliwatt parametric oscillation threshold is measured in 9 GHz free-spectral-range devices.

Authors:LUE WU/California Institute of Technology Heming Wang/California Institute of Technology Qifan Yang/California Institute of Technology maodong gao/California Institute of Technology Qing-Xin Ji/California Institute of Technology Boqiang Shen/California Institute of Technology Chengying Bao/California Institute of Technology Kerry Vahala/California Institute of Technology

Optical Networks (SW3L)

Presider: Mihaela Dinu, *LGS Innovations LLC*

13:00 - 14:00	**Towards cognitive management and performance monitoring in coherent optical networks (SW3L.1)** **Presenter**: Christine Tremblay, *École de technologie supérieure* Expand for Abstract / Authors In this tutorial, we review cognitive management and performance monitoring methods based on machine learning for addressing important challenges such as quality of transmission estimation, performance prediction and failure detection in coherent optical networks. Christine Tremblay joined the École de technologie supérieure as Professor in 2004 after 14 years in the photonics industry. Founder and Head of the Network Technology Lab, her team pioneered the research in filterless optical networking. Her research interests include performance monitoring and machine learning for optical networking applications. **Authors**:Christine Tremblay/École de technologie supérieure Tutorial	Paper
14:00 - 14:15	**Real-Time Monitoring of the Impact of Cascaded Wavelength-Selective Switches in Digital Coherent Receivers (SW3L.2)** **Presenter**: Gabriella Bosco, *Politecnico di Torino* Expand for Abstract / Authors A simple real-time monitoring algorithm for the impact of cascaded WSSs in elastic optical networks, which exploits the information available in a digital coherent receiver, is proposed and demonstrated through both numerical simulations and experiments. **Authors**:Dario Pilori/Politecnico di Torino Antonino Nespola/LINKS Foundation Fabrizio Forghieri/Cisco Photonics Italy Stefano Piciaccia/Cisco Photonics Italy Gabriella Bosco/Politecnico di Torino	Paper
14:15 - 14:30	**Experimental Demonstration of a 4D PDL-resilient Signaling for Long-haul Networks (SW3L.3)** **Presenter**: Arnaud Dumenil, *Nokia Bell Labs* Expand for Abstract / Authors We experimentally demonstrate improvement of the worst-case information rate using the New Spatially Balanced (NSB) signaling recently proposed for PDL mitigation. NSB-coded and dual-polarization QPSK formats are compared over a multi-span link with inline PDL. **Authors**:Arnaud Dumenil/Nokia Bell Labs Elie Awwad/Nokia Bell Labs Cyril Measson/Nokia Bell Labs Dylan Le Gac/Nokia Bell Labs	Paper

14:30 - 15:00	**Progress and Challenges in bringing SDM Technologies to Optical Networks (SW3L.4)** **Presenter**: Werner Klaus, *NICT* Expand for Abstract / Authors Many technological challenges have to be overcome before a cost and energy efficient system based on SDM can be realized. In this talk I will discuss both recent efforts and challenges in making SDM practical. **Authors**:Werner Klaus/NICT Invited	Paper

Inverse Design (FW3B)

Presider: Rajesh Menon, *University of Utah*

13:00 - 13:15	**Focusing on Bandwidth: Achromatic Metalens Limits (FW3B.1)** **Presenter**: Francesco Monticone, *Cornell University* Expand for Abstract / Authors We derive fundamental bandwidth limits on achromatic optical metalenses, regardless of their implementation. Specifically, we discuss the product between achievable time delay and bandwidth, and apply well-established bounds on this product to a general focusing system. **Authors**:Federico Presutti/Cornell University Francesco Monticone/Cornell University	Paper
13:15 - 13:30	**Inverse Designed Shape-Reconfigurable Multifunctional Photonics (FW3B.2)** **Presenter**: Gregory Roberts, *California Institute of Tech* Expand for Abstract / Authors In this work, we design multifunctional nanophotonic devices with drastically switchable properties upon simple mechanical transformations. Inverse design for photonic and mechanical metamaterials can be combined to simultaneously optimize custom multifunctionality in both domains. **Authors**:Philip Camayd-Munoz/California Institute of Tech Gregory Roberts/California Institute of Tech Conner Ballew/California Institute of Tech Max Debbas/California Institute of Tech Andrei Faraon/California Institute of Tech	Paper

13:30 - 13:45	**Achromatic Metalenses Based on Inverse-Designed Random Meta-Atoms (FW3B.3)** **Presenter**: Xiaojie Zhang, *Penn State University* Expand for Abstract / Authors We present a new type of achromatic metalenses consisting of inversely designed random-shaped meta-atoms. The inverse design algorithm makes the designs not limited to human cognitive capabilities. **Authors**:Xiaojie Zhang/Penn State University Haiyang Huang/Penn State University Xuexue Guo/Penn State University xingjie ni/Penn State University	Paper
13:45 - 14:00	**Array-Scale Inverse Design of Active Metasurfaces (FW3B.4)** **Presenter**: Prachi Thureja, *California Institute of Technology* Expand for Abstract / Authors We develop an inverse design approach to optimize array architectures of reconfigurable metasurfaces and report dramatically improved beam steering performances with non-ideal antenna components. The versatility is enhanced by enabling continuous steering up to 70°. **Authors**:Prachi Thureja/California Institute of Technology Ghazaleh Shirmanesh/California Institute of Technology Katherine Fountaine/Northrop Grumman NG Next Ruzan Sokhoyan/California Institute of Technology Meir Grajower/California Institute of Technology Harry Atwater/California Institute of Technology	Paper
14:00 - 14:30	**Optical Fourier Surfaces (FW3B.5)** **Presenter**: David Norris, *ETH Zurich* Expand for Abstract / Authors Complex “wavy” surfaces cannot be easily fabricated, frustrating the design and implementation of sophisticated diffractive optics. We will discuss a simple but powerful approach that provides surfaces containing an arbitrary number of specified spatial frequencies. **Authors**:David Norris/ETH Zurich Invited	Paper
14:30 - 14:45	**Beam steering metasurfaces via inverse design (FW3B.6)** **Presenter**: Haejun Chung, *Yale University* Expand for Abstract / Authors We numerically demonstrate state-of-the-art beam steering metasurfaces via inverse design, which show tunable steering angles ranging from 12° to 144° and switching efficiencies above 80%. **Authors**:Haejun Chung/Yale University Owen Miller/Yale University	Paper

14:45 - 15:00

Machine Learning-based Diffractive Imaging with Subwavelength Resolution (FW3B.7)
Presenter: Abantika Ghosh, *University of Massachusetts Lowell*
Expand for Abstract / Authors

Paper

We report detection and characterization of wavelength-scale objects with subwavelength resolution by combining diffractive imaging and machine learning. The technique clarifies the information channels in the diffraction imaging and provides insight into machine learning processes.

Authors:Abantika Ghosh/University of Massachusetts Lowell Diane Roth/King's College London Luke Nicholls/King's College London Anatoly Zayats/King's College London Viktor Podolskiy/University of Massachusetts Lowell

High-power Lasers (SW3E)

Presider: Lutz Winkelmann, *DESY*

13:00 - 13:15

20 W, 2.0 mJ, sub-ps deep-ultraviolet laser at 258 nm (SW3E.1)
Presenter: Kun Liu, *Nanyang Technological University*
Expand for Abstract / Authors

Paper

We report a 20W, 2.0mJ, 10kHz deep-ultraviolet laser at 258nm with a pulse duration of 665fs. To the best of our knowledge, this is the highest-power sub-ps 258nm solid-state laser reported to date.

Authors:Kun Liu/Nanyang Technological University Shizhen Qu/Nanyang Technological University Hao Li/Singapore Institute of Manufacturing Technology Qijie Wang/Nanyang Technological University Ying Zhang/Singapore Institute of Manufacturing Technology

13:15 - 13:30

Nonlinear Crystals for Efficient High-Energy Fifth-Harmonic Generation of Near-IR Lasers (SW3E.2)
Presenter: Ildar Begishev, *University of Rochester*
Expand for Abstract / Authors

Paper

The fifth harmonic (211 nm) of a pulsed, joule-class Nd:YLF laser has been generated with efficiency up to 30% in BBO, CLBO, and ADP crystals. Nonlinear absorption was demonstrated to be a major limiting factor.

Authors:Ildar Begishev/University of Rochester Vladimir Ivanov/University of Nevada Siddharth Patankar/Lawrence Livermore National Laboratory Philip Datte/Lawrence Livermore National Laboratory Steven Yang/Lawrence Livermore National Laboratory Jonathan Zuegel/University of Rochester Jake Bromage/University of Rochester

13:30 - 13:45 **The LCLS-II Photo-Injector Drive Laser System (SW3E.3)**
Presenter: Sasha Gilevich, *SLAC National Accelerator Lab*
Expand for Abstract / Authors

Paper

Abstract: We present the new drive laser system for the photo-injector of the LCLS-II XFEL at SLAC, including the first commissioning results and challenges encountered due to high power, high repetition rate ultraviolet laser operation.

Authors:Sasha Gilevich/SLAC National Accelerator Lab Shawn Alverson/SLAC National Accelerator Lab Sergio Carbajo/SLAC National Accelerator Lab Stefan Droste/SLAC National Accelerator Lab Steve Edstrom/SLAC National Accelerator Lab Alan Fry/SLAC National Accelerator Lab Michael Greenberg/SLAC National Accelerator Lab Randy Lemons/SLAC National Accelerator Lab Alan Miahnahri/SLAC National Accelerator Lab Wayne Polzin/SLAC National Accelerator Lab Sharon Vetter/SLAC National Accelerator Lab Feng Zhou/SLAC National Accelerator Lab

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13:45 - 14:00 **High power cryogenic Yb:YLF regenerative amplifier (SW3E.4)**
Presenter: Mikhail Pergament, *Center for Free-Electron Laser Science, Deutsches Elektronen-Synchrotron DESY*
Expand for Abstract / Authors

Paper

We present a cryogenic Yb:YLF regenerative amplifier which can reach 70 W average power and 20 mJ output energy at 3.5 kHz operation. The output beam quality factor is better than 1.05 in both axes.

Authors:Mikhail Pergament/Center for Free-Electron Laser Science, Deutsches Elektronen-Synchrotron DESY Umit Demirbas/Center for Free-Electron Laser Science, Deutsches Elektronen-Synchrotron DESY Huseyin Cankaya/Center for Free-Electron Laser Science, Deutsches Elektronen-Synchrotron DESY Yi hua/Center for Free-Electron Laser Science, Deutsches Elektronen-Synchrotron DESY Jelto Thesinga/Center for Free-Electron Laser Science, Deutsches Elektronen-Synchrotron DESY Franz KÄRTNER/Center for Free-Electron Laser Science, Deutsches Elektronen-Synchrotron DESY

14:00 - 14:15 **Compact High-Power Ytterbium Thin-Disk Laser Based on Kaleidoscopic Reflections of Pump Radiation (SW3E.5)**
Presenter: Raoul-Amadeus Lorbeer, *German Aerospace Center*
Expand for Abstract / Authors

Paper

We present a new pump geometry for compact thin disk lasers. Multi-pass pumping without external pump optics is realized with a uniquely coated wedged laser medium. CW output powers of 700 W are achieved.

Authors:Thomas Dekorsy/German Aerospace Center Benjamin Ewers/German Aerospace Center Raoul-Amadeus Lorbeer/German Aerospace Center Alexander Fischer/German Aerospace Center Jochen Speiser/German Aerospace Center

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14:15 - 14:30

(Withdrawn) 113-W cryogenically-cooled 946-nm Nd:YAG laser (SW3E.6)
Presenter: Gholamreza Shayeganrad, *University of Southampton*
Expand for Abstract / Authors

We report a closed-cycle cryogenically-cooled diode-end-pumped continuous-wave Nd:YAG laser operating at 946-nm, generating 113-W of output power (pump power limited) with a slope and an optical-to-optical conversion efficiency of 80% and 76%, respectively.

Authors:Gholamreza Shayeganrad/University of Southampton Silvia Cante/University of Southampton J. Pelegrin Mosquera/Institute of Cryogenics, University of Southampton Wendell Bailey/Institute of Cryogenics, University of Southampton Jacob Mackenzie/University of Southampton

14:30 - 14:45

Hybrid master oscillator power amplifier single-frequency, nanosecond, multi-mJ, 5 kHz at 1030 nm. (SW3E.7)
Presenter: Thomas Hamoudi, *ONERA*
Expand for Abstract / Authors

Paper

We demonstrate that the combination of Ytterbium doped-fiber and bulk crystals amplifiers, in a Master Oscillator Power Amplifier configuration (MOPA) allows obtaining 3.6 mJ, 15 ns, single-frequency pulses and 5 kHz repetition rate.

Authors:Thomas Hamoudi/ONERA Xavier Délen/Laboratoire Charles Fabry Jean-Baptiste Dherbecourt/ONERA Antoine Godard/ONERA Jean-Michel Melkonian/ONERA Myriam Raybaut/ONERA Patrick Georges/Laboratoire Charles Fabry

14:45 - 15:00

Factor 40 pulse post-compression of 200 W in-burst average power pulses via single-stage multi-pass spectral broadening (SW3E.8)
Presenter: Prannay Balla, *Deutsches Elektronen-Synchrotron DESY*
Expand for Abstract / Authors

Paper

We report nonlinear pulse compression of 1.2-ps, 2-mJ pulses. For spectral broadening, we use a Kr-filled Herriott-type cell with 22-roundtrips. After a chirped-mirror compressor, we measure 30-fs pulses, 80% transmission and an M^2 of 1.5x1.7.

Authors:Prannay Balla/Deutsches Elektronen-Synchrotron DESY Ammar Bin Wahid/Deutsches Elektronen-Synchrotron DESY Ivan Sytcevich/Lund University chen Guo/Lund University Arthur Schönberg/Deutsches Elektronen-Synchrotron DESY Anne-Lise Viotti/Lund University Laura Silletti/Deutsches Elektronen-Synchrotron DESY Andrea Cartella/Universität Hamburg Skirmantas Alisauskas/Deutsches Elektronen-Synchrotron DESY Hamed Tavakol/Deutsches Elektronen-Synchrotron DESY Uwe Grosse-Wortmann/Deutsches Elektronen-Synchrotron DESY Marcus Seidel/Deutsches Elektronen-Synchrotron DESY Bastian Manschwetus/Deutsches Elektronen-Synchrotron DESY Tino Lang/Deutsches Elektronen-Synchrotron DESY Francesca Calegari/Deutsches Elektronen-Synchrotron DESY Arnaud Couairon/Institut Polytechnique de Paris Anne L'Huillier/Lund University Cord L. Arnold/Lund University Ingmar Hartl/Deutsches Elektronen-Synchrotron DESY Christoph Heyl/Deutsches Elektronen-Synchrotron DESY

Integrated Photonic Platforms (SW3F)

Presider: Jifeng Liu, *Dartmouth College*

13:00 - 13:30	**What makes the best chip-scale photonic sensor? (SW3F.1)** **Presenter**: Juejun Hu, *Massachusetts Institute of Technology* Expand for Abstract / Authors In this talk, we will provide a detailed account regarding the design rationales of different essential components of a photonic chip-based sensing system: the sensing element, the light source, and the light analyzer or spectrometer. **Authors**:Derek Kita/Massachusetts Institute of Technology Qingyang Du/Massachusetts Institute of Technology Jerome Michon/Massachusetts Institute of Technology Tian Gu/Massachusetts Institute of Technology Zhengqian Luo/Xiamen University Steven Johnson/Massachusetts Institute of Technology Juejun Hu/Massachusetts Institute of Technology Invited	Paper
13:30 - 13:45	**Erbium-Doped Tellurium-Oxide-Coated Silicon Nitride Waveguide Amplifiers (SW3F.2)** **Presenter**: Henry Frankis, *McMaster University* Expand for Abstract / Authors We demonstrate 5 dB of net gain at 1558 nm in a 6.7 cm long erbium-doped tellurium-oxide-coated silicon nitride waveguide, in a process compatible with silicon nitride photonic integrated circuits. **Authors**:Henry Frankis/McMaster University Hamidu M. Mbonde/McMaster University Dawson Bonneville/McMaster University Chenglin Zhang/McMaster University Richard Mateman/LioniX International BV Arne Leinse/LioniX International BV Jonathan Bradley/McMaster University	Paper
13:45 - 14:00	**In Situ Temporal Periodic Poling of Lithium Niobate Thin Films (SW3F.3)** **Presenter**: Karan Prabhakar, *Ohio State University* Expand for Abstract / Authors We repeatedly pole and unpole a lithium niobate thin film second harmonic generator while monitoring the switching of the optical output. Increasing asymmetry in the poling waveform results in increasing optical extinction ratio. **Authors**:Jonathan Nagy/Ohio State University Karan Prabhakar/Ohio State University Ronald Reano/Ohio State University	Paper

14:00 - 14:15	**Monitoring and Trimming of Integrated Silicon Photonic Circuits via Laser Irradiation (SW3F.4)** **Presenter**: Vera Biryukova, *University of Glasgow* Expand for Abstract / Authors We demonstrate a laser annealing technique capable of compensating for parameter and fabrication non-uniformity in complex silicon photonic devices. The technique does not compromise device performance and can be used for trimming at wafer level **Authors**:Vera Biryukova/University of Glasgow Charalambos Klitis/University of Glasgow Marc Sorel/University of Glasgow	Paper
14:15 - 14:30	**“Grayscale” Material Deposition with Spatial Thickness Variation for Spectral Filtering (SW3F.5)** **Presenter**: Xinhao Li, *Massachusetts Institute of Technology* Expand for Abstract / Authors A new material deposition method to pattern 2D structures with spatial thickness variation using single fixed shadow mask is demonstrated. The method is applied to fabricate multispectral reflective color filter arrays of high customizability. **Authors**:Xinhao Li/Massachusetts Institute of Technology Zheng Jie Tan/Massachusetts Institute of Technology Nicholas Fang/Massachusetts Institute of Technology	Paper
14:30 - 14:45	**Camera-Based Modal Fingerprinting of Cavity Resonances in a Photonic Crystal Nanobeam (SW3F.6)** **Presenter**: Francis Afzal, *Vanderbilt University* Expand for Abstract / Authors Utilizing distinct features in the leaky region of k-space as ‘modal fingerprints’, we demonstrate resonant mode identification in a photonic crystal nanobeam via infrared camera measurements with a ~19dB detection SNR improvement over transmission measurements. **Authors**:Francis Afzal/Vanderbilt University Sharon Weiss/Vanderbilt University Joshua Petrin/Vanderbilt University	Paper

14:45 - 15:00 **Spectral Interferometric Microscopy for Fast and Broadband Phase Characterization (SW3F.7)**
Presenter: Lior Michaeli, *Tel-Aviv University*
Expand for Abstract / Authors

Paper

We introduce a novel interferometric method for fast, broadband and microscopic phase characterization, based on common-path configuration. The method can be implemented by adding a simple optical relay to connect conventional microscope and imaging spectrometer.

Authors:Lior Michaeli/Tel-Aviv University Danielle Ben Haim/Tel-Aviv University Haim Suchowski/Tel-Aviv University Tal Ellenbogen/Tel-Aviv University

Nonlinear Optical Phenomena (SW3N)

Presider: Yoshitomo Okawachi, *Columbia University*

13:00 - 13:45 **How Light Behaves When The Refractive Index Vanishes (SW3N.1)**
Presenter: Robert Boyd, *University of Ottawa*
Expand for Abstract / Authors

We present an overview of the science and applications of physical sitations in which the dielectric permittivity, and consequently the refractive index, has a value close to zero. Robert Boyd was born in Buffalo, New York, USA. He received a BS degree in physics from MIT and a PhD in Physics from the University of California at Berkeley. He joined the faculty of the University of Rochester in 1977, where he is now a full professor. In 2010 he took in addition a faculty position at the University of Ottawa in Canada. His research involves but classical and quantum aspects of Nonlinear Optics. He is the recipient of the OSA Townes award and the APS Schawlow Award and the Isakson Award. He is a fellow of OSA, APS, SPIE, IEEE and AAAS. He is a fellow of the Royal Society of Canada and a corresponding member of the Heidelberg Academy.

Authors:Robert Boyd/University of Ottawa

Tutorial

13:45 - 14:00	**Switching Second-Harmonic Forward to Backward Emission via GaAs Nanoantennas (SW3N.2)** **Presenter**: Mohsen Rahmani, *Australian National University* Expand for Abstract / Authors Switching forward-to-backward linear scattering of nanoantennas is a process of major importance. Here, we demonstrate the first nonlinear switching of forward to backward second harmonic generation, via engineering the nonlinear-tensors of the (110)-GaAs nanoantennas. **Authors**:Lei Xu/University of New South Wales Saerens Grégoire/ETH Zurich Mariia Timofeeva/ETH Zurich Daria Smirnova/Australian National University Irina Volkovskaya/Russian Academy of Sciences Mykhaylo Lysevych/Australian National University Rocio Camacho/Australian National University Marcus Cai/Australian National University Khosro Zangeneh/Australian National University Lujun Huang/University of New South Wales Fouad Karouta/Australian National University Hoe Tan/Australian National University Chennupati Jagadish/Australian National University Andrey Miroshnichenko/University of New South Wales Rachel Grange/ETH Zurich Dragomir Neshev/Australian National University Mohsen Rahmani/Australian National University	Paper
14:00 - 14:15	**Millisecond Suppression of Counter-propagating Optical Signal using Ultrafast Laser Filaments (SW3N.3)** **Presenter**: Patrick Skrodzki, *University of Michigan, Ann Arbor* Expand for Abstract / Authors We demonstrate millisecond-scale on-axis signal suppression using filament air plasmas formed by unaltered Gaussian beams with implications for background/continuum rejection for remote sensing applications. **Authors**:Patrick Skrodzki/University of Michigan, Ann Arbor Lauren Finney/University of Michigan, Ann Arbor Milos Burger/University of Michigan, Ann Arbor John Nees/University of Michigan, Ann Arbor Igor Jovanovic/University of Michigan, Ann Arbor	Paper
14:15 - 14:30	**Engineered generation of a specfic Stokes order in stimulated Raman scattering process (SW3N.4)** **Presenter**: Weiyong Liu, *University of Electro-Communications* Expand for Abstract / Authors We present how to engineer nonlinear optical process with a wide freedom, by arbitrarily manipulating relative phases among relevant electromagnetic fields. We report engineered generation of 1st order stimulated Raman scattering with near 50% quantum efficiency. **Authors**:Weiyong Liu/University of Electro-Communications Chiaki Ohae/University of Electro-Communications Jian Zheng/University of Electro-Communications Soma Tahara/University of Electro-Communications Masaru Suzuki/University of Electro-Communications Kaoru Minoshima/University of Electro-Communications Masayuki Katsuragawa/University of Electro-Communications	Paper

14:30 - 14:45 **Record-High Continuous-Wave Nonlinear Performance of Amorphous Silicon Waveguides (SW3N.5)**
Presenter: Peter Girouard, *DTU Fotonik*
Expand for Abstract / Authors

Paper

We present an amorphous silicon material having a record-high continuous-wave L-band conversion efficiency of -14.7 dB. The material is stable over 12 hours of 23 dBm continuous-wave C-band pumping.

Authors:Peter Girouard/DTU Fotonik Lars Frandsen/DTU Fotonik Michael Galili/DTU Fotonik Leif K. Oxenløwe/DTU Fotonik

14:45 - 15:00 **Second-Harmonic Generation from WS_2 Monolayers Enhanced by BIC Resonances (SW3N.6)**
Presenter: Nils Bernhardt, *University of Technology Sydney*
Expand for Abstract / Authors

Paper

Through the utilization of resonant dielectric metasurfaces governed by bound states in the continuum, we demonstrate a strong increase in the second-harmonic generation in WS_2 monolayers by a factor exceeding 700.

Authors:Nils Bernhardt/University of Technology Sydney Kirill Koshelev/Australian National University Simon White/University of Technology Sydney Kelvin Meng/University of Technology Sydney Johannes Fröch/University of Technology Sydney Trong Tran/University of Technology Sydney Sejeong Kim/University of Technology Sydney Duk-Yong Choi/Australian National University Yuri Kivshar/Australian National University Alexander Solntsev/University of Technology Sydney

Resonator-Coupled Solid-State Emitters (FW3C)

Presider: Glenn Solomon, *Joint Quantum Institute*

13:00 - 13:15 **Towards Spin-Multiphoton Entanglement using Quantum Dots with Asymmetric Waveguide Coupling (FW3C.1)**
Presenter: Martin Appel, *University of Copenhagen*
Expand for Abstract / Authors

Paper

We demonstrate selectively enhanced dipoles of an InAs quantum dot embedded in a nanophotonic waveguide, thereby forming optical cycling transitions, a basic tool for scalable spin-multiphoton entanglement generation.

Authors:Martin Appel/University of Copenhagen Alexey Tiranov/University of Copenhagen Konstantin Tiurev/University of Copenhagen Alisa Javadi/University of Basel Ying Wang/University of Copenhagen Leonardo Midolo/University of Copenhagen Svend Scholz/University of Bochum Andreas Wieck/University of Bochum Arne Ludwig/University of Bochum Richard Warburton/University of Basel Peter Lodahl/University of Copenhagen

13:15 - 13:30	**Integration of rare earth ions and photonic resonators for quantum application (FW3C.2)** **Presenter**: Mahdi Hosseini, *Purdue University* Expand for Abstract / Authors Using ion implantation, on-chip photonic fabrication and heterogeneous integration, we demonstrate a solid-state interface between rare earth ions and telecomm photons in various designs. The platforms enable study of collective and coherent light-atom interactions on chip. **Authors**:Mahdi Hosseini/Purdue University	Paper
13:30 - 13:45	**Epitaxial Rare-Earth on Silicon as a Scalable Quantum Photonic Platform (FW3C.3)** **Presenter**: Yizhong Huang, *The University of Chicago* Expand for Abstract / Authors We present an epitaxial Er^{3+}:Y_2O_3/silicon material platform for scalable quantum photonic devices. We discuss a system integrating suspended Er^{3+}:Y_2O_3 membranes with a fiber Fabry-Perot cavity for coherent spectroscopy enabling quantum memory and transduction. **Authors**:Yizhong Huang/The University of Chicago Manish Singh/The University of Chicago Rikuto Fukumori/The University of Chicago Natasha Tomm/University of Basel Christina Wicker/The University of Chicago Abhinav Prakash/The University of Chicago Tijana Rajh/Argonne National Laboratory Richard Warburton/University of Basel Supratik Guha/The University of Chicago Tian Zhong/The University of Chicago	Paper
13:45 - 14:00	**Measuring the dark exciton in a quantum dot inside a planar microcavity using a bright state cycling transition (FW3C.4)** **Presenter**: Markus Müller, *Joint Quantum Institute, National Institute of Standards and Technology and University of Maryland* Expand for Abstract / Authors We demonstrate the resonant excitation of a so-called dark exciton state in a quantum dot with a readout scheme based on the resonance fluorescence of the correlated bright exciton. **Authors**:Markus Müller/Joint Quantum Institute, National Institute of Standards and Technology and University of Maryland Bin Cao/Joint Quantum Institute, National Institute of Standards and Technology and University of Maryland Glenn Solomon/National Institute of Standards and Technology	Paper

14:00 - 14:15

Coherent scattering from quantum dots: beyond the atomic picture (FW3C.5)
Presenter: Alistair Brash, *University of Sheffield*
Expand for Abstract / Authors

Paper

Coherent scattering by a quantum dot in a nano-cavity with high Purcell factor is demonstrated. Major deviations from atom-like behaviour are observed due to phonon coupling that is completely insensitive to excitation conditions.

Authors:Alistair Brash/University of Sheffield Jake Iles-Smith/University of Sheffield Catherine Phillips/University of Sheffield John O'Hara/University of Sheffield Benjamin Royall/University of Sheffield Luke Wilson/University of Sheffield Maurice Skolnick/University of Sheffield A. Mark Fox/University of Sheffield Dara McCutcheon/University of Bristol Edmund Clarke/University of Sheffield Jesper Mørk/Technical University of Denmark Ahsan Nazir/University of Manchester

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14:15 - 14:45

Telecom quantum network nodes based on single Er$^3+$ ions in silicon nanophotonic devices (FW3C.6)
Presenter: Songtao Chen, *Princeton University*
Expand for Abstract / Authors

Paper

I will present our work on developing building blocks for telecom-wavelength quantum networks using individually addressed Erbium ions in crystalline hosts. Leveraging strong Purcell enhancement to overcome the intrinsically low photon emission rate, we have demonstrated single photon emission, high-fidelity single-shot spin readout and coherent manipulation. Improvements including new host materials and device architectures will be discussed.

Authors:Jeff Thompson/Princeton University Songtao Chen/Princeton University

Invited

Fiber Lasers I (SW3R)

Presider: Guoqing Chang, *Institute of Physics, CAS*

13:00 - 13:15

Passively Q-switched Er^{3+}-doped ZBLAN fiber laser at ~3.5 μm based on a semiconductor saturable absorber mirror (SW3R.1)
Presenter: Jun Liu, *Shenzhen University*
Expand for Abstract / Authors

Paper

By adopting a GaAs based semiconductor saturable absorber mirror (SESAM), we have demonstrated a ~3.5 μm passively Q-switched Er^{3+}:ZBLAN fiber laser. The recorded highest repetition rate is 58.71 kHz with a pulse width of 2.4 μs and pulse energy of ~1 μJ. The results prove that the GaAs based SESAM has the capacity to extend the operation wavelength to mid-infrared region beyond 3.0 μm.

Authors:Jun Liu/Shenzhen University Zhixiang Deng/Shenzhen University Yu Chen/Shenzhen University Dianyuan Fan/Shenzhen University

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13:15 - 13:30

Experimental Characterization of Bismuth-Doped Fibre Amplifier: Electrical NF, PDG, and XGM (SW3R.2)
Presenter: Natsupa Taengnoi, *University of Southampton*
Expand for Abstract / Authors

Paper

We present a detailed characterisation of the emergent bismuth-doped fibre amplifier, characterising performance in terms of electrical noise figure, polarisation dependent gain, and cross gain modulation. The results support its suitability for high capacity links.

Authors:Natsupa Taengnoi/University of Southampton Kyle Bottrill/University of Southampton Yang Hong/University of Southampton Yu Wang/University of Southampton Naresh Thipparapu/University of Southampton Jayanta Sahu/University of Southampton Periklis Petropoulos/University of Southampton David Richardson/University of Southampton

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13:30 - 13:45

All-polarization-maintaining dual-wavelength mode-locked fiber laser based on macro-bending loss tuning (SW3R.3)
Presenter: YUANJUN ZHU, *The university of Tokyo*
Expand for Abstract / Authors

Paper

We demonstrate an all-polarization-maintaining dual-wavelength mode-locked fiber laser by bending a section of polarization maintaining fiber for intra-cavity loss tuning for the first time. This technique provides a simple way to generate dual-wavelength pulses with different repetition rate.

Authors:YUANJUN ZHU/The university of Tokyo Zekun Cui/The university of Tokyo Xiangnan Sun/The university of Tokyo Hongbo Jiang/The university of Tokyo Hengwei Zhao/The university of Tokyo Lei Jin/The university of Tokyo Shinji Yamashita/The university of Tokyo Sze Set/The university of Tokyo

13:45 - 14:00 **Stable Harmonic Mode Locking in all PM-Fiber Mamyshev Oscillator (SW3R.4)**
Presenter: Bernard Piechal, *Institute of Physical Chemistry PAS*
Expand for Abstract / Authors

Paper

We present the first observation of harmonic mode locking in Mamyshev oscillator. The Yb-doped all-PM oscillator emits 2 nJ pulses with repetition rate up to 229 MHz at 14th harmonic, limited by available pump power.

Authors:Bernard Piechal/Institute of Physical Chemistry PAS Tomasz Kardas/Fluence sp. z o. o. Mateusz Pielach/Institute of Physical Chemistry PAS Yuriy Stepanenko/Institute of Physical Chemistry PAS

14:00 - 14:30 **High Power Er Fiber Comb Beyond Soliton Compression (SW3R.5)**
Presenter: Kevin Lee, *IMRA America, Inc.*
Expand for Abstract / Authors

Paper

We demonstrate a 5 W, 65 fs single-mode Er fiber comb based on efficient pulse compression of gain-narrowed pulses from a chirped pulse amplification system. We generate two octaves of midinfrared with these pulses.

Authors:Kevin Lee/IMRA America, Inc. Gengji Zhou/University of Michigan Peter Schunemann/BAE Systems Jie Jiang/IMRA America, Inc. Martin Fermann/IMRA America, Inc.

14:30 - 14:45 **Control of pulse regime generation with electrochemically gated carbon nanotube saturable absorber (SW3R.6)**
Presenter: YURY GLADUSH, *Skoltech*
Expand for Abstract / Authors

Paper

In present paper we demonstrate a carbon nanotube saturable absorber with variable nonlinear optical response controlled by electrochemical gating. Implemented into all-PM fiber laser scheme this device allows switching between mode-locked and Q-switched generation regimes.

Authors:YURY GLADUSH/Skoltech Aram Mkrtchyan/Skoltech Daria Kopylova/Skoltech Aleksey Ivanenko/Novosibirsk State University Boris Nyushkov/Novosibirsk State University Sergey Kobtsev/Novosibirsk State University Alexey Kokhanovskiy/Novosibirsk State University Alexander Khegay/Fiber optic research center Mikhail Melkumov/Fiber optic research center Maria Burdanova/University of Warwick Michael Staniforth/University of Warwick James Lloyd-Hughes/University of Warwick Albert Nasibulin/Skoltech

14:45 - 15:00	**38 µJ Short-Wavelength Q-Switched Thulium Fiber Laser (SW3R.7)** **Presenter**: Shankar Pidishety, *Optoelectronics Research Centre, University of Southampton* Expand for Abstract / Authors 38 µJ pulse energy with peak power of 1.3 kW and 0.3 nm spectral width is obtained at a short-wavelength of 1851 nm by actively Q-switching a thulium fiber laser cladding-pumped at 792 nm. **Authors**:Shankar Pidishety/Optoelectronics Research Centre, University of Southampton Pranabesh Barua/SPI Lasers UK Ltd Pablo G. Rojas Hernández/Optoelectronics Research Centre, University of Southampton Belal Mohammad/Optoelectronics Research Centre, University of Southampton Jayanta K. Sahu/Optoelectronics Research Centre, University of Southampton M. Núñez Velázquez/Optoelectronics Research Centre, University of Southampton Johan Nilsson/Optoelectronics Research Centre, University of Southampton	Paper

Semiconductor Devices for Telecommunication and Signal Processing (AW3M)

Presider: Richard Hogg, *University of Glasgow*

13:00 - 13:30	**Electrically Injected Parity-Time Symmetric DFB Lasers for Telecom Applications (AW3M.1)** **Presenter**: Abderrahim Ramdane, *Centre de Nanosciences et Nanotechnologies, CNRS, Univ. Paris-Sud, Université Paris-Saclay* Expand for Abstract / Authors Electrically injected single frequency lasers based on the concept of parity-time symmetry are designed and realized using standard fabrication techniques. High performance ridge waveguide complex coupled devices are reported. **Authors**:Abderrahim Ramdane/Centre de Nanosciences et Nanotechnologies, CNRS, Univ. Paris-Sud, Université Paris-Saclay Vincent Brac de la Perriere/Centre de Nanosciences et Nanotechnologies, CNRS, Univ. Paris-Sud, Université Paris-Saclay Quentin gaimard/Centre de Nanosciences et Nanotechnologies, CNRS, Univ. Paris-Sud, Université Paris-Saclay Henri Benisty/Laboratoire Charles Fabry de l’Institut d’Optique, CNRS, Univ. Paris Saclay Anatole LUPU/Centre de Nanosciences et Nanotechnologies, CNRS, Univ. Paris-Sud, Université Paris-Saclay Invited	Paper

13:30 - 13:45	**High temperature operation of quantum dot semiconductor optical amplifier for uncooled 80 Gbps data transmission (AW3M.2)** **Presenter**: Kouichi Akahane, *National Inst Information & Comm Tech* Expand for Abstract / Authors The amplification of 80 Gbps non-return to zero signal and error-free operation within the FEC limit were demonstrated in online data transmission measurements at over 60^{o}C using quantum dot SOA. **Authors**:Kouichi Akahane/National Inst Information & Comm Tech Toshimasa Umezawa/National Inst Information & Comm Tech Atsushi Matsumoto/National Inst Information & Comm Tech Yuki Yoshida/National Inst Information & Comm Tech Naokatsu Yamamoto/National Inst Information & Comm Tech	Paper
13:45 - 14:00	**Demonstration of High-Speed Digital-to-Analog Conversion using Photonic Integration (AW3M.3)** **Presenter**: Shivangi Chugh, *IIT Bombay* Expand for Abstract / Authors We propose use of photonic integration to develop ultra-high-speed digital-to-analog converters (DACs). As a proof of concept, a 12.4 GS/s DAC has been demonstrated experimentally on a silicon photonics platform. **Authors**:Shivangi Chugh/IIT Bombay Sandeep Goyal/IIT Bombay Shalabh Gupta/IIT Bombay	Paper
14:00 - 14:15	**Sub-wavelength Channel Waveguide with Near-Zero Flattened Dispersion at 1.55 µm on Silicon (AW3M.4)** **Presenter**: Lai Ting, *National Chiao-Tung University* Expand for Abstract / Authors We propose a new type of channel waveguide with sub-wavelength structure for achieving near-zero and flattened dispersion-band (< 100ps/nm/km variation within 200nm bandwidth) on the silicon-on insulator (SOI) platform at the 1.55µm telecommunication wavelength. **Authors**:Lai Ting/National Chiao-Tung University Yi-Jang Hsu/National Chiao-Tung University Xuan-Ming Guo/National Chiao-Tung University Yinchieh Lai/National Chiao-Tung University	Paper

14:15 - 14:30	**(Withdrawn) Engineering the Gap States of ZnO Nanoparticles for High Performance InP-based Quantum-dot Light-emitting Diodes (AW3M.5)** **Presenter**: Zhenghui Wu, *Southern Unverisity of Science and Technology* Expand for Abstract / Authors Two kinds of ZnO with different electronic properties were used as electron transport layer in quantum dot light emitting diode. Their gap states were engineered by different ways to improve the device performance. **Authors**:Zhenghui Wu/Southern Unverisity of Science and Technology Wenda Zhang/Southern Unverisity of Science and Technology Pai Liu/Southern Unverisity of Science and Technology Kai Wang/Southern Unverisity of Science and Technology Xiao Wei Sun/Southern Unverisity of Science and Technology	
14:30 - 14:45	**Silicon Nitride Arrayed Waveguide Grating with a Waveguide Superlattice (AW3M.6)** **Presenter**: Qi Han, *University Laval* Expand for Abstract / Authors A compact 100-GHz 1× 8 arrayed waveguide grating with 3 dB insertion loss and -20 dB crosstalk, enabled by a novel concept of waveguide superlattice, is experimentally demonstrated. **Authors**:Qi Han/University Laval Michaël Ménard/Université du Québec à Montréal Wei Shi/University Laval	Paper
14:45 - 15:00	**Design of the Microstructure Parallel-Connected PIN Photodetector with High Bandwidth- Efficiency Product (AW3M.7)** **Presenter**: Huijuan Niu, *Beijing Univ. Posts & Telecommunications* Expand for Abstract / Authors We propose and optimize a parallel structure PIN photodetector by using a obconical shape surrounded by a ring-shaped V-groove trench to improve the PD performance. The bandwidthefficiency product is increased by 67.89% with the construction. **Authors**:Huijuan Niu/Beijing Univ. Posts & Telecommunications Yongqing Huang/Beijing Univ. Posts & Telecommunications Yisu Yang/Beijing Univ. Posts & Telecommunications Kai Liu/Beijing Univ. Posts & Telecommunications Xiaofeng Duan/Beijing Univ. Posts & Telecommunications Bing Shen/Beijing Univ. Posts & Telecommunications Mingwei Yang/The University of Arizona Qi Wei/Beijing Univ. Posts & Telecommunications Gang Wu/Beijing Univ. Posts & Telecommunications Chaozheng Xiao/Beijing Univ. Posts & Telecommunications Huayun Zhi/Beijing Univ. Posts & Telecommunications Shiwei Cai/Beijing Univ. Posts & Telecommunications Xiaomin Ren/Beijing Univ. Posts & Telecommunications	Paper

Commercial Quantum Computing Platforms and Funding Landscape (AW3S)

Presider: Wilhelm Kaenders, *TOPTICA Photonics Inc*

13:00 - 13:30	**The Quantum Economic Development Consortium (QED-C) (AW3S.1)** **Presenter**: Celia Merzbacher, *SRI International* Expand for Abstract / Authors This talk will update the audience on the progress of the QED-C consortium. The purpose of the QED-C is to identify and close gaps in critical supporting technologies for the emerging quantum industry. **Authors**:Joe Broz/SRI International Celia Merzbacher/SRI International Invited	Paper
13:30 - 14:00	**(Withdrawn) Quantum Supremacy Using a Programmable Superconducting Processor (AW3S.2)** **Presenter**: John Martinis, *Google LLC* Expand for Abstract / Authors A superconducting processor with 53 qubits was used to perform a "parallel computation" on 10^16 states. Running the quantum circuit 10^6 times takes 200 seconds, whereas a classical supercomputer would take 10,000 years. **Authors**:John Martinis/Google LLC Invited	
14:00 - 14:30	**Honeywell's Trapped-Ion Quantum Computer: Advanced Optics Solutions (AW3S.3)** **Presenter**: Lora Nugent, *Honeywell* Expand for Abstract / Authors Honeywell Quantum Solutions is focused on developing state-of-the-art trapped-ion quantum computers. Advanced optics solutions enable parallel multi-zone high-fidelity single- and two-qubit laser-based gates, sympathetic cooling of multi-species crystals and high fidelity state preparation and measurement. **Authors**:Lora Nugent/Honeywell Invited	Paper

14:30 - 15:00	**Individual Addressing and Manipulation of Neutral Strontium (AW3S.4)** **Presenter**: Benjamin Bloom, *Atom Computing* Expand for Abstract / Authors Recent advances in the manipulation of individual neutral atoms offer a promising path to interesting NISQ devices. Here I will give an overview of recent advances in the field and introduce the system we have built at Atom Computing. **Authors**:Benjamin Bloom/Atom Computing Robin Coxe/Atom Computing Jonathan King/Atom Computing Stanimir Kondov/Atom Computing Krish Kotru/Atom Computing Brian Lester/Atom Computing Mickey Mcdonald/Atom Computing Remy Notermans/Atom Computing Alexander Papageorge/Atom Computing Prasahnt Sivarajah/Atom Computing Invited	

Photonic MicroFluidic BioSensors (AW3I)

Presider: David Nolte, *Purdue University*

13:00 - 13:15	**Developing a time-resolved acoustofluidic flow cytometer for FRET studies and near-infrared fluorescent protein development (AW3I.1)** **Presenter**: Jesus Sambrano, *New Mexico State University* Expand for Abstract / Authors We present a novel time-resolved acoustofluidic flow cytometer that will be capable of resolving heterogenous cell populations in FRET studies and screen for and enrich cells with near-infrared fluorescent proteins with higher quantum yields. **Authors**:Jesus Sambrano/New Mexico State University Jessica Houston/New Mexico State University	Paper
13:15 - 13:30	**Active and Ultrasensitive Chemical and Biosensing through Optothermally Generated Microbubble. (AW3I.2)** **Presenter**: Farzia Karim, *University of Dayton* Expand for Abstract / Authors An ultrasensitive chemical and biosensing method has been demonstrated for active sensing of analytes. This method works based on an optothermal microbubble which is generated through laser heating of metallic nanoparticles solution. **Authors**:Farzia Karim/University of Dayton Yvonne Sun/University of Dayton Erick Vasquez/University of Dayton Chenglong Zhao/University of Dayton	Paper

13:30 - 13:45	**Fiber Based Optofluidic Micro-Flow Cytometer Collecting Side-Scattered Light (AW3I.3)** **Presenter**: Harish Achar, *KTH-Royal Institute of Technology* Expand for Abstract / Authors A compact fiber capillary based microflow cytometer capable of detecting side-scattered-light is demonstrated by using a 45^0 angle-cleaved metal coated optical fiber tip. **Authors**:Harish Achar/KTH-Royal Institute of Technology Tharagan Kumar/KTH-Royal Institute of Technology Aman Russom/KTH-Royal Institute of Technology Walter Margulis/Research Institutes of Sweden Fredrik Laurell/KTH-Royal Institute of Technology	Paper
13:45 - 14:00	**Probing the red blood cell interaction in individual cell pairs by optical tweezers (AW3I.4)** **Presenter**: Ruixue Zhu, *University of Oulu, Finland* Expand for Abstract / Authors The peculiarity of red blood cell interaction was studied by optical tweezers. The intercellular interaction force in cell pairs and the role of cell deformation and adhesion time in interaction dynamics were evaluated and discussed. **Authors**:Ruixue Zhu/University of Oulu, Finland Alexey Popov/University of Oulu, Finland Igor Meglinski/University of Oulu, Finland	Paper
14:00 - 14:15	**Optical Flow Sensor for Lung Surfactant Delivery (AW3I.5)** **Presenter**: Silvano Donati, *Universita degli Studi di Pavia* Expand for Abstract / Authors We propose a non-invasive 5%-accuracy flow sensor based on self-mixing interferometry, and develop a dedicated prototype for measuring surfactant flow rate to help with respiratory distress due to lung surfactant problem in premature babies. **Authors**:Silvano Donati/Universita degli Studi di Pavia	Paper
14:15 - 14:30	**Sensitivity-enhanced Terahertz Microfluidic Chip Sensor Based on a Fano Resonance of a Few Arrays of Meta-atoms (AW3I.6)** **Presenter**: Kazunori Serita, *Osaka University* Expand for Abstract / Authors A compact terahertz microfluidic chip based on a Fano resonance of meta-atoms was demonstrated for the ultra-trace measurements of solutions. We successfully detected attomole order of solutes in a 77 pL volume of the solution. **Authors**:Kazunori Serita/Osaka University Masayoshi Tonouchi/Osaka University	Paper

14:30 - 14:45

(Withdrawn) Gap plasmon-based fluorescence correlation spectroscopy for anomalous molecular diffusion (AW3I.7)
Presenter: H K Lee, *Yonsei University*
Expand for Abstract / Authors

We demonstrated gold nanodimer arrays could improve the signal-to-noise ratio (SNR) of fluorescence correlation spectroscopy. We simultaneously acquired fluorescence and surface plasmon images of nanoscale objects with enhanced SNR using near-field localization at nanodimer's gap.

Authors:H K Lee/Yonsei University Gwiyeong Moon/Yonsei University Seongmin Im/Yonsei University Donghyun Kim/Yonsei University

15:15 - 16:45 (UTC - 07:00)

Joint Poster Session 10 (JW2E)

Experimental Demonstration of Heterogeneous Optical Networks Incorporating Low-Loss Vortex-Mode Fiber and Ultra-Low-Loss Single-Mode Fibers Seamlessly Connected by All-Fiber Vortex (De)Multiplexer Experimental Demonstration of Heterogeneous Optical Networks Incorporating Low-Loss Vortex-Mode Fiber and Ultra-Low-Loss Single-Mode Fibers Seamlessly Connected by All-Fiber Vortex (De)Multiplexer (JW2E.1)
Presenter: Lei Sheng, *YOFC*
Expand for Abstract / Authors

Paper

We report vortex-mode-assisted heterogeneous optical networks by incorporating low-loss vortex-mode fiber (VMF) and ultra-low-loss single-mode fibers (SMFs). Two vortex modes, each carrying a 8QAM signal, are successfully (de)multiplexed and transmitted through 100-km heterogeneous fiber links.

Authors:Wei Zhou/HUST Lei Sheng/YOFC Lulu Wang/HUST Yize Liang/HUST Shi Chen/HUST Lei zhang/YOFC Jie Luo/HUST Jian Wang/HUST

Exploiting Resonant Band of Antiresonant Hollow Core Fiber for Highly Birefringent Inline Fiber Polarizer (JW2E.2)
Presenter: Charu Goel, *Nanyang Technological University*
Expand for Abstract / Authors

Paper

We present first report on an inline fiber polarizer design based on single-ring negative curvature fiber. Polarization filtering is achieved by selectively coupling one polarization to glass modes with extinction ratio >30dB and birefringence $>10^{-4}$.

Authors:Charu Goel/Nanyang Technological University Seongwoo Yoo/Nanyang Technological University

Creating secondary reflection along a fiber axis for out scattering light (JW2E.3)
Presenter: Seongwoo Yoo, *Nanyang Technological University*
Expand for Abstract / Authors

Paper

An illuminating fiber is demonstrated by incorporating a reflecting element along a fiber. The element creates a helical path longitudinally to efficiently scatter light. We present the concept and its demonstration in a 200-mm fiber.

Authors:Seongwoo Yoo/Nanyang Technological University Sidharthan Raghuraman/Nanyang Technological University chenjia Cheng/Nanyang Technological University Jichao Zang/Nanyang Technological University Ji Ming Ho/Nanyang Technological University Men Seng Yue/Nanyang Technological University David Payne/University of Southampton

High Energy Wave-breaking-free Pulse from All-normal-dispersion Fiber Laser with NALM (JW2E.4)
Presenter: Jiaqi Zu, *Tsinghua University*
Expand for Abstract / Authors

Paper

We explored the energy scalability in single pulse domain of all-normal-dispersion fiber laser with NALM numerically and experimentally. We conquered wave-breaking problem and achieved the highest pulse energy from the laser of this structure.

Authors:Decai Deng/Tsinghua University Haitao Zhang/Tsinghua University Qihang Gong/Tsinghua University Jiaqi Zu/Tsinghua University

Interpreting fiber-guided mode degeneracy lifting as spin-orbit interaction of orbital angular momentum modes (JW2E.5)
Presenter: Liang Fang, *Wuhan National Lab for Optoelectronics*
Expand for Abstract / Authors

Paper

We present a visual interpretation of fiber-guided mode degeneracy lifting as spin-orbit interaction of orbital angular momentum modes in a ray picture, and the analytical results are verified by comparing them with eigen equation solutions.

Authors:Liang Fang/Wuhan National Lab for Optoelectronics Jian Wang/Wuhan National Lab for Optoelectronics

Nanometer Precision Measurement of Submicron Fibers via Seeded Four-Wave-Mixing (JW2E.6)
Presenter: Jonas Hammer, *Max Planck Inst. Science of Light*
Expand for Abstract / Authors

Paper

We report non-destructive measurement of the diameter of submicron air-clad waveguides to nanometer precision, based on parametric amplification of a broadband seed signal. Ultrashort pump and seed pulses allow the diameter to be longitudinally resolved.

Authors:Jonas Hammer/Max Planck Inst. Science of Light Daniel Häupl/Max Planck Inst. Science of Light Philip Russell/Max Planck Inst. Science of Light Nicolas Joly/Friedrich-Alexander University

Optical Pulse Generation with Versatile Time-Varying Polarization States (JW2E.7)
Presenter: Helena Lopez Aviles, *University of Central Florida*
Expand for Abstract / Authors

Paper

We experimentally demonstrate a novel fiber-based LiDAR polarimetric system capable of generating pulses with customized temporal variations in their polarization. This technique allows for a complete set of polarimetric measurements without invoking complex external components.

Authors:Helena Lopez Aviles/University of Central Florida Christian Keyser/Air Force Research Laboratory Munitions Directorate Richard Martin/The Air Force Institute of Technology Khanh Nguyen/Torch Technologies Arielle Adams/Air Force Research Laboratory Munitions Directorate Demetrios Christodoulides/University of Central Florida

Real-Time Collision Dynamics of Vector Solitons in a Fiber Laser (JW2E.8)
Presenter: Changxi Yang, *Tsinghua University*
Expand for Abstract / Authors

Paper

Real-time collision dynamics of vector solitons in a polarization-multiplexed mode-locked fiber laser was investigated with the help of time-stretch dispersive Fourier transform technique. Numerical simulation matches well with our experiments.

Authors:Kangjun Zhao/Tsinghua University Xiaosheng Xiao/Beijing University of Posts and Telecommunications Changxi Yang/Tsinghua University

Fabrication of chalcogenide transversely disordered optical fiber for mid-infrared image transport (JW2E.9)
Presenter: Asuka Nakatani, *Toyota Technological Institute*
Expand for Abstract / Authors

Paper

We successfully fabricated a transversely disordered optical fiber made of chalcogenide glasses (AsSe2 and As2S5) for high-resolution mid-infrared image transport. Moreover, we evaluated local confinement on the fiber using finite element method.

Authors:Asuka Nakatani/Toyota Technological Institute Tong Tuan/Toyota Technological Institute Hayato Isai/Toyota Technological Institute Morio Matsumoto/Furukawa Denshi Co.,Ltd. Goichi Sakai/Furukawa Denshi Co.,Ltd. Takenobu Suzuki/Toyota Technological Institute Yasutake Ohishi/Toyota Technological Institute

Fading Noise Free Distributed Acoustic Sensor Assisted with Double Wavelength lasers (JW2E.10)
Presenter: Tao Liu, *Huazhong Univ of Science and Technology*
Expand for Abstract / Authors

Paper

We propose a fading free distributed acoustic sensor assisted with the scattering enhanced optical fiber and double wavelength lasers. The random polarization fading is effectively eliminated by synthesizing the scattering signals of two lasers.

Authors:Tao Liu/Huazhong Univ of Science and Technology Hao Li/Huazhong Univ of Science and Technology Tao He/Huazhong Univ of Science and Technology Cunzheng Fan/Huazhong Univ of Science and Technology Zhijun Yan/Huazhong Univ of Science and Technology Deming Liu/Huazhong Univ of Science and Technology Qizhen Sun/Huazhong Univ of Science and Technology

All-fiber counter-propagation pumped amplifier tailored for Coherent Beam Combining technique (JW2E.11)
Presenter: Matthieu Veinhard, *Ecole Polytechnique, Institut Polytechnique de Paris*
Expand for Abstract / Authors

Paper

We report on the qualification of an all-fiber counter propagating pumped amplifier by using a narrow-linewidth single-frequency nanosecond fiber laser. The proposed amplifier is tailored to be used for coherent beam combining of fiber amplifiers.

Authors:Ihsan Fsaifes/Ecole Polytechnique, Institut Polytechnique de Paris Louis Daniault/LOA, ENSTA, Institut Polytechnique de Paris Séverine Bellanger/Ecole Polytechnique, Institut Polytechnique de Paris Matthieu Veinhard/Ecole Polytechnique, Institut Polytechnique de Paris Daniel Schulz/Optical Engines Inc Jason Tafoya/Optical Engines Inc Donald Sipes/Optical Engines Inc Jean-Christophe Chanteloup/Ecole Polytechnique, Institut Polytechnique de Paris

Polarization analysis of a supercontinuum generated in a germania-doped photonic crystal fiber (JW2E.12)
Presenter: Nicolas Couture, *University of Ottawa*
Expand for Abstract / Authors

Paper

We investigate experimentally the effect of input polarization and pulse energy on the generated supercontinuum. Our detection system reveals the polarization properties of the supercontinuum, a typically unexplored parameter of these sources.

Authors:Nicolas Couture/University of Ottawa Rachel Ostic/University of Ottawa P. Harshavardhan Reddy/CSIR-Central Glass and Ceramics Research Institute Shyamal Das/CSIR-Central Glass and Ceramic Research Institute Anirban Dhar/CSIR-Central Glass and Ceramic Research Institute Mrinmay Pal/CSIR-Central Glass and Ceramic Research Institute Mukul Paul/CSIR-Central Glass and Ceramic Research Institute Ajoy Kar/Heriot-Watt University Jean-Michel Ménard/University of Ottawa

Q-switched Ho^{3+}-doped ZBLAN Fiber Laser at 1.2 µm Based on D-shaped Fiber Carbon-nanotube Saturable Absorber (JW2E.13)
Presenter: Shijie Fu, *The University of Arizona*
Expand for Abstract / Authors

Paper

D-shaped fiber deposited with single-wall carbon-nanotubes was used as saturable absorber to achieve Q-switched Ho^{3+}-doped fluoride fiber laser in all-fiber configuration. Stable Q-switched operation at 1192 nm was established with radio-frequency signal-to-noise ratio >50 dB.

Authors:Shijie Fu/The University of Arizona Xiushan Zhu/The University of Arizona Minghong Tong/The University of Arizona Masoud Mollaee/The University of Arizona Kort Wiersma/NP Photonics Khawlah AlYahyaei/The University of Arizona Jie Zong/NP Photonics Arturo Chavez/NP Photonics Nasser Peyghambarian/The University of Arizona

Two-octave Supercontinuum Generation of OAM Mode in Air-core As_2S_3 Ring Fiber (JW2E.14)
Presenter: Yingning Wang, *Nankai University*
Expand for Abstract / Authors

Paper

Two-octave supercontinuum of light-carrying orbital angular momentum is generated by launching a 100-fs 35-kW hyperbolic secant pulse in 10-mm air-core As_2S_3 ring fiber, covering 5219 nm bandwidth from 1422 nm to 6713 nm at -45dB.

Authors:Yingning Wang/Nankai University Yuxi Fang/Nankai University Wenpu Geng/Nankai University Jicong Jiang/Nankai University Zhi Wang/Nankai University Hao Zhang/Nankai University Changjing Bao/University of Southern California Hao Huang/University of Southern California Yongxiong Ren/University of Southern California Zhongqi Pan/University of Louisiana at Lafayette Yang Yue/Nankai University

Mid-Infrared Dual-Comb Fiber Laser from 3.2 to 4.4 µm (JW2E.15)
Presenter: Yoshiaki Nakajima, *University of Electro-Communications*
Expand for Abstract / Authors

Paper

Mid-infrared dual-comb fiber laser employing a high-coherence, ultra-broadband bi-directional fiber laser and periodically poled lithium niobate waveguides was developed for practical dual-comb spectroscopy. Mid-infrared generation with a broad spectrum range of 3.2-4.4 µm was demonstrated.

Authors:Yoshiaki Nakajima/University of Electro-Communications Yuya Hata/University of Electro-Communications Yugo Kusumi/University of Electro-Communications Kazumichi Yoshii/JST, ERATO IOS Project Kaoru Minoshima/University of Electro-Communications

Pre-chirp Managed and Circularly Polarized Fiber Amplification Using Chirped Mirrors for Pulse Compression (JW2E.16)
Presenter: Yao Zhang, *Xidian University*
Expand for Abstract / Authors

Paper

We demonstrate an Yb-fiber based pre-chirp managed amplification system that emits 50-MHz, 47-fs pulses with 101.2-W average power. Using chirped mirrors as a compressor, we achieve 98% throughput efficiency.

Authors:Yao Zhang/Xidian University Runzhi CHen/Institute of Physics, Chinese Academy o Hangdong Huang/Xidian University Hao Teng/Institute of Physics, Chinese Academy o Shaobo Fang/Institute of Physics, Chinese Academy o Jiangfeng Zhu/Xidian University Junli Wang/Xidian University Guoqing Chang/Institute of Physics, Chinese Academy o zhiyi wei/Institute of Physics, Chinese Academy o

MXene-based all-optical microfiber knot resonator for active Q-switching (JW2E.17)
Presenter: Meng Zhang, *Beihang University*
Expand for Abstract / Authors

Paper

We report an all-optical modulator based on a MXene-deposited microfiber knot resonator, and apply it in an erbium-doped fiber as an active Q-switch for microsecond pulse generation.

Authors:Qing Wu/Beihang University Meng Zhang/Beihang University Yunzheng Wang/Shenzhen University Weichun Huang/Shenzhen University Zheng Zheng/Beihang University Han Zhang/Shenzhen University

Polarization Dependent Noise Suppression for Fiber Distributed Acoustic Sensor with Birefringence Estimation (JW2E.18)
Presenter: Yujia Liu, *Huazhong Univ of Science and Technology*
Expand for Abstract / Authors

Paper

We propose and demonstrate a fiber distributed acoustic sensing demodulation scheme based on dynamic birefringence estimation. The phase noise was effectively suppressed about 9.5dB at the fading channels in experiment.

Authors:Yujia Liu/Huazhong Univ of Science and Technology Hao Li/Huazhong Univ of Science and Technology Tao Liu/Huazhong Univ of Science and Technology Cunzheng Fan/Huazhong Univ of Science and Technology Zhijun Yan/Huazhong Univ of Science and Technology Deming Liu/Huazhong Univ of Science and Technology Qizhen Sun/Huazhong Univ of Science and Technology

Single-mode Ti:sapphire Crystal Fiber (JW2E.19)
Presenter: Teng I Yang, *National Taiwan University*
Expand for Abstract / Authors

Paper

We report on the fabrication and characterization of single-mode Ti:sapphire crystalline fibers. Using dip coating and high-temperature sintering at 1650 °C, solid-state single crystal growth was observed, and single-crystalline cladding was formed.

Authors:Teng I Yang/National Taiwan University Yu-Chan Lin/National Taiwan University Yi-Hsun Li/National Taiwan University Hou-Ting Liu/National Taiwan University Shih-Chang Wang/National Taiwan University Kai-Hsiang Chuang/Industrial Technology Research Institute Tzu-Chi Chou/Industrial Technology Research Institute Sheng-Lung Huang/National Taiwan University

Dual-band synchronization of fiber lasers through a common black phosphorus saturable absorber (JW2E.20)
Presenter: Meng Zhang, *Beihang University*
Expand for Abstract / Authors

Paper

We present the dual-band synchronization of two all-fiber mode-locked lasers, operating at 1.53-µm and 1.91-µm, using a common black phosphorus saturable absorber. This synchronized dual-wavelength laser shows a large cavity mismatch of 1.98 mm.

Authors:Xin Lian/Beihang University Guohua Hu/University of Cambridge Xinxin Jin/Beihang University Meng Zhang/Beihang University Qian Zhang/Beihang University Zheng Zheng/Beihang University Tawfique Hasan/University of Cambridge

All-fiber, all-optical modulator based on Michelson interferometer structure (JW2E.21)
Presenter: Meng Zhang, *Beihang University*
Expand for Abstract / Authors

Paper

We demonstrate an all-optical modulator based on a fiber-type Michelson interferometer. This modulator, fabricated utilizing a microfiber deposited with carbon nanotubes, shows a large modulation depth >29 dB and a slop efficiency of 0.0504 π/mW.

Authors:Menglu Zhu/Beihang University Meng Zhang/Beihang University Qing Wu/Beihang University Zheng Zheng/Beihang University

Experimental Evidence of the Real Multimode Nature of Geometric Parametric Instability (JW2E.22)
Presenter: Yann Leventoux, *Université de Limoges, XLIM*
Expand for Abstract / Authors

Paper

We show experimentally that geometric parametric instability in graded-index multimode fibers is composed by several multimode spectral components. The experimental observation is obtained by using a new 3D technique of high-resolution spatial and spectral analysis.

Authors:Yann Leventoux/Université de Limoges, XLIM Geoffroy Granger/Université de Limoges, XLIM Alessandro Tonello/Université de Limoges, XLIM Katarzyna Krupa/Université Bourgogne Franche-Comté, ICB UMR CNRS 6303 Guy Millot/Université Bourgogne Franche-Comté, ICB UMR CNRS 6303 Stefan Wabnitz/DIET, Sapienza Università di Roma, Sebastien Fevrier/Université de Limoges, XLIM Vincent Couderc/Université de Limoges, XLIM

Image-Recognition Assisted Infrared Femtosecond Laser Direct-Writing Method for Silica Fiber Bragg Gratings (JW2E.23)
Presenter: Xian Feng, *Jiangsu Normal University*
Expand for Abstract / Authors

Paper

We present a highly reproducible fiber Bragg grating (FBG) fabrication approach using IR femtosecond laser direct-writing method with the assistance of image-recognition technique for automatically positioning grating microstructure inside fiber core.

Authors:Yanjiang Yu/Jiangsu Normal University Feng Han/Jiangsu Normal University Wenjuan sun/Jiangsu Normal University Xian Feng/Jiangsu Normal University Jindan Shi/Jiangsu Normal University

Cross Talk and Interference in MIMO less Few Mode Transmission Systems. (JW2E.24)
Presenter: Neethu Mariam Mathew, *DTU Fotonik*
Expand for Abstract / Authors

Paper

We show that the performance of mode division multiplexed systems is degraded by both cross talk and interference. The effect of interference can be mitigated by using different wavelengths for the different modes.

Authors:Neethu Mariam Mathew/DTU Fotonik Lars Grüner-Nielsen/DTU Fotonik Michael Galili/DTU Fotonik Mads Lillieholm/DTU Fotonik Karsten Rottwitt/DTU Fotonik

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Highly customizable all polarization-maintaining wavelength switchable mode-locked fiber laser based on Thermally controlled Lyot-filter (JW2E.25)
Presenter: XIANGNAN SUN, *The University of Tokyo*
Expand for Abstract / Authors

Paper

We demonstrate highly customizable all polarization maintaining wavelength switchable mode-locked fiber laser using thermally controlled Lyot-filter, which delivers 25nm tunable output from 1546nm to 1571nm and dual-wavelength output at 1545nm and 1571nm.

Authors:XIANGNAN SUN/The University of Tokyo YUANJUN ZHU/The University of Tokyo YOHEI SUGIURA/The University of Tokyo Sze Set/The University of Tokyo Shinji Yamashita/The University of Tokyo

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Pulsating internal oscillation of soliton molecules in passively mode-locked fiber lasers (JW2E.26)
Presenter: Yiyang Luo, *Nanyang Technological University*
Expand for Abstract / Authors

Paper

We report on the experimental observation of pulsating internal oscillation of soliton pairs featuring twofold relative phase evolution. These results could enrich the transient dynamics of soliton complexes and fuel the molecular analogy.

Authors:Yiyang Luo/Nanyang Technological University Ran Xia/Huazhong University of Science and Technology Perry Ping Shum/Nanyang Technological University Yusong liu/Huazhong University of Science and Technology Wenjun Ni/Nanyang Technological University Qizhen Sun/Huazhong University of Science and Technology Luming Zhao/Huazhong University of Science and Technology Xiahui Tang/Huazhong University of Science and Technology

All Normal Dispersion Fiber Laser with Bandwidth Tunable Fiber Based Spectral Filter (JW2E.27)
Presenter: Ankita Khanolkar, *University of Dayton*
Expand for Abstract / Authors

Paper

We have demonstrated a stable ytterbium mode-locked fiber laser with an all fiber, bandwidth tunable spectral filter which can generate mode-locked spectrums of different shapes and bandwidth.

Authors:Ankita Khanolkar/University of Dayton Xiaowei Ge/Boston University Andy Chong/University of Dayton

Dual-pulse Complex Superposition Based Noise Suppression for Distributed Acoustic Sensing (JW2E.28)
Presenter: Qizhen Sun, *Huazhong Univ of Science and Technology*
Expand for Abstract / Authors

Paper

A noise suppression method for distributed acoustic sensing based on the dual-pulse coherent detection is proposed and demonstrated. Through the complex superposition of two different frequency pulses, a maximum noise reduction of 15dB is realized.

Authors:Hao Li/Huazhong Univ of Science and Technology Yujia Liu/Huazhong Univ of Science and Technology Tao He/Huazhong Univ of Science and Technology Cunzheng Fan/Huazhong Univ of Science and Technology Tao Liu/Huazhong Univ of Science and Technology Zhijun Yan/Huazhong Univ of Science and Technology Deming Liu/Huazhong Univ of Science and Technology Qizhen Sun/Huazhong Univ of Science and Technology

Refractive Index Measurement of Hazardous Liquid Samples using Common Path Bessel Beam Optical Interferometry (JW2E.29)
Presenter: Amit Pandey, *CSIR-CSIO, Chandigarh*
Expand for Abstract / Authors

Paper

This work reports a packaged optical fiber axicon probe generating Bessel beam and Bessel beam interferometry technique for measuring RI of hazardous liquid HCL, H_2SO_4. The measurement resolution of our system is $1*10^{-4} \pm 0.0007$.

Authors:Amit Pandey/CSIR-CSIO, Chandigarh Pooja Gupta/CSIR-CSIO, Chandigarh Kaushal Vairagi/CSIR-CSIO, Chandigarh Samir Mondal/CSIR-CSIO, Chandigarh

Simultaneous Measurement of Curvature and Temperature Based on a Dual Interference Effects in a Line-by-Line Inscribed Fiber Bragg Grating (JW2E.30)
Presenter: Yang Huang, *Huazhong University of Science and Technology*
Expand for Abstract / Authors

Paper

We propose a single Line-by-Line inscribed FBG structure with both FBG and MZI characteristics for the first time to our knowledge. It has great potential to be used in dual parameter synchronous sensors

Authors:Yang Huang/Huazhong University of Science and Technology Xuewen Shu/Huazhong University of Science and Technology Yujie Kong/Huazhong University of Science and Technology Zuowei Xu/Huazhong University of Science and Technology

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Non-invasive imaging based on low spatial coherence multimode random fiber laser illumination (JW2E.31)
Presenter: Zhao Wang, *University of Electronic Science and Technology of China*
Expand for Abstract / Authors

Paper

Non-invasive imaging through low spatial coherence light source based on multimode random fiber laser is proposed and demonstrated. A much simpler, robust and highly efficient structure is realized benefiting from the optical fiber based illumination.

Authors:Zhao Wang/University of Electronic Science and Technology of China Rui Ma/University of Electronic Science and Technology of China Shan Shan Wang/University of Electronic Science and Technology of China Wei Li Zhang/University of Electronic Science and Technology of China Yunjiang Rao/University of Electronic Science and Technology of China

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Ultra-Broadband Spectrum Generation from a Stretched - Pulse Mode - locked Yb - doped Fiber Laser at High Repetition Rate (JW2E.32)
Presenter: Shoko Yokokawa, *The University of Tokyo*
Expand for Abstract / Authors

Paper

Spectrum broader than 100 nm was generated from a mode-locked Yb-doped fiber laser at 169 MHz. Simulations revealed that broadband originated from the scheme of stretched-pulse rather than similariton.

Authors:Shoko Yokokawa/The University of Tokyo Lei Jin/The University of Tokyo Sze Set/The University of Tokyo Shinji Yamashita/The University of Tokyo

A robust, field-deployable, low-cost mode-locked laser oscillator for real-world frequency comb experiments (JW2E.33)
Presenter: Henry Timmers, *Vescent Photonics*
Expand for Abstract / Authors

Paper

A low-volume mode-locked oscillator has been designed for environmental robustness and is suitable for frequency comb applications. Performance metrics include signal-to-noise ratios greater than 40 dB and in-loop Allan Deviations below 1E−16/Rt.Tau.

Authors:Henry Timmers/Vescent Photonics Dylan Tooley/Vescent Photonics Bennett Sodergren/Vescent Photonics Ryan Robinson/Vescent Photonics Kurt Vogel/Vescent Photonics Kevin Knabe/Vescent Photonics

Joint Poster Session 11 (JW2F)

3D Kerr Microscopy of Magnetic Vortex States in the Presence and Absence of Uniaxial Anisotropy (JW2F.1)
Presenter: Mahdi Mehrnia, *Case Western Reserve University*
Expand for Abstract / Authors

Paper

We use a 3D scanning Kerr microscopy technique to resolve the 3D magnetization response in both equilibrium and non-equilibrium regimes for micron-sized permalloy disks. Moreover, we show the effect of uniaxial anisotropy in both regimes.

Authors:Mahdi Mehrnia/Case Western Reserve University Jeremy Trimble/Case Western Reserve University Jesse Berezovsky/Case Western Reserve University

Width dependent disorder and many-body effects in gallium arsenide quantum wells (JW2F.2)
Presenter: Cesar Perez, *University of Michigan*
Expand for Abstract / Authors

Paper

We study many body effects and disorder in both narrow and wide quantum wells with two-dimensional coherent spectroscopy. The inhomogeneous linewidth, homogeneous linewidth, and exictation induced dephasing depend on width in AlGaAs/GaAs quantum wells.

Authors:Cesar Perez/University of Michigan John Reno/Sandia National Laboratories Steven Cundiff/University of Michigan

Transition Matrix Element and Recombination Mechanism of Hexagonal SiGe. (JW2F.3)
Presenter: Marvin van Tilburg, *Technische Universiteit Eindhoven*
Expand for Abstract / Authors

Paper

Hexagonal SiGe is a direct bandgap semiconductor due to zone folding. A Lasher-Stern-Würfel fit of the photoluminescence spectrum unambiguously confirms band-to-band recombination. The transition matrix elements are large since the translational symmetry is broken.

Authors:Alain Dijkstra/Technische Universiteit Eindhoven Marvin van Tilburg/Technische Universiteit Eindhoven Elham Fadaly/Technische Universiteit Eindhoven Victor van Lange/Technische Universiteit Eindhoven Marcel Verheijen/Technische Universiteit Eindhoven Jens Rene Suckert/Friedrich Schiller Universitat Claudia Rodl/Friedrich Schiller Universitat juergen furthmueller/Friedrich Schiller Universitat Friedhelm Bechstedt/Friedrich Schiller Universitat Silvana Botti/Friedrich Schiller Universitat David Busse/Technische Universitat Munchen Jonathan Finley/Technische Universitat Munchen Erik Bakkers/Technische Universiteit Eindhoven Jos Haverkort/Technische Universiteit Eindhoven

Modification of Photoinduced Electron Transfer in the Strong Light-Matter Coupling Regime (JW2F.4)
Presenter: Nina Krainova, *Pennsylvania State University*
Expand for Abstract / Authors

Paper

We report non-trivial changes in the photoconductivity of organic semiconductor polarons when their optical transition is strongly-coupled to a microcavity mode. Our observations point to a change in the underlying photoinduced electron transfer process.

Authors:Nina Krainova/Pennsylvania State University Noel Giebink/Pennsylvania State University

Electroluminescence by Impact Excitation of Excitons in a Monolayer WSe $_2$ (JW2F.5)
Presenter: Jiabin Feng, *Tsinghua University*
Expand for Abstract / Authors

Paper

We demonstrated exciton electroluminescence by impact excitation in a monolayer WSe_2 based field effect transistor on SiO_2/Si substrate at room temperature. Hot electrons or holes can be controlled as impact sources through the back gate.

Authors:Jiabin Feng/Tsinghua University Yongzhuo Li/Tsinghua University Song Fu/Tsinghua University Jianxing Zhang/Tsinghua University Hao Sun/Tsinghua University Lin Gan/Tsinghua University Cunzheng Ning/Tsinghua University

Wavelength Scaling of Photoionization of Size-Dependent Dielectric Nanoparticles (JW2F.6)
Presenter: Jeffrey Powell, *Kansas State University*
Expand for Abstract / Authors

Paper

We present the effects of wavelength scaling on the photoelectron cutoff energy of laser-driven dielectric nanoparticles. Results indicate a complex mix of ponderomotive scaling, field enhancement and charge interactions dictate photoionization and subsequent electron propagation.

Authors:Jeffrey Powell/Kansas State University Adam Summers/Kansas State University Matthias Kling/Ludwig-Maximilians-Universität Daniel Rolles/Kansas State University Carlos Trallero-Herrero/University of Connecticut Artem Rudenko/Kansas State University

High Harmonic Generation from Thin-film $LiNbO_3$ (JW2F.7)
Presenter: Shima Gholam Mirzaeimoghadar, *University of Central Florida*
Expand for Abstract / Authors

Paper

High-order harmonic spectroscopy is a powerful tool for studying structural symmetries in solids. Here, we study the orientation dependence and polarization of high-order harmonics generated from $LiNbO_3$ thin films driven by femtosecond mid-infrared laser pulses.

Authors:Shima Gholam Mirzaeimoghadar/University of Central Florida Erin Crites/University of Central Florida Troie Journigan/University of Central Florida Volodymyr Turkowski/University of Central Florida Tracy Sjaardema/University of Central Florida Sasan Fathpour/University of Central Florida Michael Chini/University of Central Florida

Enhanced Photoluminescence of Heterostructure: Energy Transfer and Nonradiative Exciton Relaxation Suppression (JW2F.10)
Presenter: Yang Luo, *School of Physics, Peking University*
Expand for Abstract / Authors

Paper

The exciton dynamics from the aspect of acceptor is revealed by the time-resolved differential reflection measurement and the enhanced photoluminescence of heterostructure is achieved by energy transfer and the suppression of exciton-exciton annihilation.

Authors:Yang Luo/School of Physics, Peking University Hangyong Shan/School of Physics, Peking University Xiaoqing Gao/College of Physics and Optoelectronic Engineering, Shenzhen University Pengfei Qi/School of Physics, Peking University Zheyu Fang/School of Physics, Peking University

Ultrafast optical pulse induced topological resonance in gapped graphene (JW2F.11)
Presenter: Seyyedeh Azar Oliaei Motlagh, *Georgia State University*
Expand for Abstract / Authors

Paper

We show that in the presence of an intense and single oscillation optical pulse, how the ultrafast topological resonance in gapped graphene leads to a strong valley polarization.

Authors:Seyyedeh Azar Oliaei Motlagh/Georgia State University Vadym Apalkov/Georgia State University Mark Stockman/Georgia State University

Symmetry Properties of Harmonics Generated in Single-Crystal Chalcogenides Using Ultrafast Mid-Infrared Pulses (JW2F.12)
Presenter: Aaron Schweinsberg, *U.S. Army Research Laboratory*
Expand for Abstract / Authors

Paper

We focus intense, ultrashort, 3.6 micron-wavelength pulses into three single-crystal zincblende chalcogenide samples, ZnS(100), ZnS(110), and ZnSe(100). Symmetry properties of the generated harmonics are studied by rotating the crystals and measuring the output polarization.

Authors:Aaron Schweinsberg/U.S. Army Research Laboratory Michael Tripepi/The Ohio State University noah talisa/The Ohio State University Laura Vanderhoef/U.S. Army Research Laboratory Christopher Wolfe/U.S. Army Research Laboratory Michael Hastings/University of Arizona Miroslav Kolesik/University of Arizona Anthony Valenzuela/U.S. Army Research Laboratory Enam Chowdhury/The Ohio State University

Optimisation of a Femtosecond Pulse Synthesiser for High Harmonic Generation Using the Semi-Classical Model (JW2F.13)
Presenter: Allan Pettipher, *Imperial College London*
Expand for Abstract / Authors

Paper

By tailoring the driving electric field at the sub-cycle level, high harmonic generation (HHG) can be enhanced. We use the semi-classical model to configure a three-colour femtosecond field synthesiser to deliver optimised waveforms for HHG.x

Authors:Allan Pettipher/Imperial College London Bruce Weaver/Imperial College London Daniel Greening/Imperial College London Feng Li/Imperial College London James Turner/Imperial College London Jon Marangos/Imperial College London John Tisch/Imperial College London

Tunable optical funnel effect in graphene/III-V semiconductor van der Waals heterostructures: optical evidences and ultrafast photonics applications (JW2F.14)
Presenter: Xu Wang, *SINANO, CAS*
Expand for Abstract / Authors

Paper

We describe the bandgap opening of graphene engineered by femtosecond laser irradiation and develop a 1.55 μm saturable absorber combining a delicately engineered graphene/GaAs vdW heterostructure with InAs quantum dots capped with short-period superlattices.

Authors:Xu Wang/SINANO, CAS Cheng Jiang/SINANO, CAS Jian Liu/SINANO, CAS Xiaohui Li/Shaanxi Normal University Ziyang Zhang/SINANO, CAS

Optimization of Probe Time Delays in Hybrid Femtosecond/Picosecond Vibrational Coherent anti-Stokes Raman Scattering Thermometry (JW2F.15)
Presenter: Huijie Zhao, *Key Lab of Precision Measurement Technology & Instrument, Department of Precision Instrument Tsinghua University, Beijing, China.*
Expand for Abstract / Authors

Paper

We propose a method that utilizes optimized probe time delays of 10 to 35 ps in hybrid femtosecond/picosecond vibrational coherent anti-Stokes Raman scattering thermometry and maximize sensitivity for temperatures from 300 to 2500 K.

Authors:Huijie Zhao/Key Lab of Precision Measurement Technology & Instrument, Department of Precision Instrument Tsinghua University, Beijing, China. Ziyang Tian/Key Lab of Precision Measurement Technology & Instrument, Department of Precision Instrument Tsinghua University, Beijing, China. Tao Wu/Key Lab of Precision Measurement Technology & Instrument, Department of Precision Instrument Tsinghua University, Beijing, China. Yan Li/Key Lab of Precision Measurement Technology & Instrument, Department of Precision Instrument Tsinghua University, Beijing, China. Haoyun Wei/Key Lab of Precision Measurement Technology & Instrument, Department of Precision Instrument Tsinghua University, Beijing, China.

Supercontinuum generation in dispersion-engineered PECVD SiN waveguides for a Yb-fiber laser frequency comb (JW2F.16)
Presenter: Thomas Feigenson, *MIT*
Expand for Abstract / Authors

Paper

We present the development of a self-referencing Yb-fiber laser frequency comb based on octave-spanning supercontinuum generation from dispersion-engineered silicon nitride waveguides, fabricated with the standard, readily available plasma-enhanced chemical vapor deposition (PECVD) process.

Authors:Thomas Feigenson/MIT Kelsey Johnsen/MIT Dave Kharas/MIT Wonseok Shin/MIT Ryan Maxson/MIT Kevin Bagnall/MIT Adam Libson/MIT Andrew Benedick/MIT William Loh/MIT Cheryl Sorace-Agaskar/MIT Danielle Braje/MIT Robert McConnell/MIT Kyung-Han Hong/MIT

Soliton Comb Generation from a Fabry-Pérot Microresonator (JW2F.17)
Presenter: Xiaohan Wang, *Nanjing University*
Expand for Abstract / Authors

Paper

We demonstrate a Kerr soliton comb generation from a high-quality-factor fiber Fabry-Pérot microresonator. Single soliton can be achieved, with narrow beatnote linewidth and near-quantum-noise-limited low phase noise.

Authors:Xiaohan Wang/Nanjing University Kunpeng Jia/Nanjing University Dohyeon Kwon/Korea Advanced Institute of Science and Technology Jiarong Wang/University of Colorado, Boulder Eugene Tsao/University of Colorado, Boulder Jian Guo/Nanjing University Xiaoshun Jiang/Nanjing University Jungwon Kim/Korea Advanced Institute of Science and Technology Shi-ning Zhu/Nanjing University Zhenda Xie/Nanjing University Shu-Wei Huang/University of Colorado, Boulder

Carrier-envelope-offset-stable Yb:CaF$_2$ laser pumped by a single-mode laser diode (JW2F.18)
Presenter: Maciej Kowalczyk, *Wroclaw Uni. of Science and Technology*
Expand for Abstract / Authors

Paper

We present a carrier-envelope-offset-stabilized, self-referenceable Yb:CaF$_2$ oscillator. Employed single-mode diode pumping scheme enabled us to achieve low-noise operation with sub-70 mrad integrated phase noise of the locked f_{ceo} beat note (1 Hz – 1 MHz).

Authors:Maciej Kowalczyk/Wroclaw Uni. of Science and Technology Arkadiusz Hudzikowski/Wroclaw Uni. of Science and Technology Michal Porebski/Wroclaw Uni. of Science and Technology Jaroslaw Sotor/Wroclaw Uni. of Science and Technology

Real-time detection of transient roundtrip property in ultrafast lasers (JW2F.19)
Presenter: Tianhao Xian, *Shanghai Jiao Tong University*
Expand for Abstract / Authors

Paper

We demonstrate the dispersive temporal interferometer technique to detect the intracavity dynamics of ultrafast lasers. The roundtrip time variation during and after pulse formation and the relaxation process is real-time observed for the first time.

Authors:Tianhao Xian/Shanghai Jiao Tong University Li Zhan/Shanghai Jiao Tong University

Ultrafast Carrier Dynamics Spectrogram of Semiconductor Optical Amplifier (JW2F.20)
Presenter: Chi Zhang, *Wuhan National Lab for Optoelectronics*
Expand for Abstract / Authors

Paper

An ultrafast temporal spectrum analyzer based on asynchronous optical sampling and dispersive time-stretch is demonstrated with 592.5-fs sampling resolution, 21-nm bandwidth, and 0.214-nm spectral resolution, and characterizes the ultrafast carrier dynamics of semiconductor optical amplifier.

Authors:Ningning Yang/Wuhan National Lab for Optoelectronics liao chen/Wuhan National Lab for Optoelectronics Lun Li/Wuhan National Lab for Optoelectronics Chen Liu/Wuhan National Lab for Optoelectronics Dong Xin/Wuhan National Lab for Optoelectronics Chi Zhang/Wuhan National Lab for Optoelectronics Xinliang Zhang/Wuhan National Lab for Optoelectronics

Dual-channel laser system with gap-less tuning from 250 – 1300 nm at megahertz repetition rates for time-resolved photoelectron-emission microscopy and spectroscopy (JW2F.22)
Presenter: Michael Schulz, *Class 5 Photonics GmbH*
Expand for Abstract / Authors

Paper

A dual-channel, high-power laser system with gap-less tuning from 250 – 1300 nm at 30 – 50 femtoseconds pulse duration is presented as the ideal tool for time-resolved photoemission microscopy and spectroscopy experiments.

Authors:Michael Schulz/Class 5 Photonics GmbH Jan-Heye Buss/Class 5 Photonics GmbH Torsten Golz/Class 5 Photonics GmbH Ivanka Grguras/Class 5 Photonics GmbH Mark Prandolini/Class 5 Photonics GmbH Gregor Indorf/Class 5 Photonics GmbH Thomas Braatz/Class 5 Photonics GmbH Robert Riedel/Class 5 Photonics GmbH

N_2^+-lasing Induced by Filamentation in Air for Femtosecond Coherent Anti-Stokes Raman Spectroscopy (JW2F.23)
Presenter: Xiaodong Zhao, *Institute of applied physics*
Expand for Abstract / Authors

Paper

We investigated both ultrashort pulse filamentation and lasing action of N_2^+ for pump-probe experiments. The CARS signals of air and CO_2 were detected with the lasing pulse of N_2^+ as a probe.

Authors:Xiaodong Zhao/Institute of applied physics Stefan Nolte/Institute of applied physics Roland Ackermann/Institute of applied physics

Power scaling of high-repetition-rate inter-pulse DFG for achieving long-wave mid-IR frequency combs (JW2F.24)
Presenter: Guoqing Chang, *Institute of Physics*
Expand for Abstract / Authors

[Paper]

We numerically investigate inter-pulse DFG process aiming for high-power long-wave mid-IR frequency combs. We show that 2-µm driven DFG can improve the average/peak power by a factor of ~33/246 compared with 1-µm driven DFG.

Authors:Qian Cao/DESY Franz KÄRTNER/DESY Guoqing Chang/Institute of Physics

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Effect of timing jitter on performance of DFG-based offset-free frequency combs (JW2F.25)
Presenter: Guoqing Chang, *Institute of Physics*
Expand for Abstract / Authors

[Paper]

We numerically investigate how the timing-jitter noise affects DFG-based offset-free frequency combs and demonstrate that β-separation line method can be used to geometrically estimate the comb linewidth.

Authors:Qian Cao/DESY Guoqing Chang/Institute of Physics

Highly efficient, octave-spanning mid-infrared OPA in $ZnGeP_2$ pumped by a femtosecond Cr:ZnSe laser (JW2F.26)
Presenter: Sang-Hoon Nam, *RLE/MIT*
Expand for Abstract / Authors

[Paper]

We present octave-spanning femtosecond mid-infrared optical parametric amplification in $ZnGeP_2$, pumped by a 2.4 µm Cr:ZnSe chirped-pulse amplifier. The full spectral coverage of 3-10 µm and a conversion efficiency of up to 23% have been obtained.

Authors:Sang-Hoon Nam/RLE/MIT Kyung-Han Hong/RLE/MIT

Omni-Resonant Space-Time Wave Packets Are Invariant After Traversing a Narrow Linewidth Fabry-P{\'e}rot Cavity (JW2F.27)
Presenter: Abbas Shiri, *University of Central Florida, CREOL*
Expand for Abstract / Authors

[Paper]

We describe theoretically and verify experimentally a class of diffraction-free pulsed optical beams that are `omni-resonant': they are transmitted through planar Fabry-P{\'e}rot resonators without spectral filtering even if their bandwidth far exceeds the cavity resonant linewidth.

Authors:Abbas Shiri/University of Central Florida, CREOL Murat Yessenov/University of Central Florida, CREOL Rohinraj Aravindakshan/University of Central Florida, CREOL Ayman Abouraddy/University of Central Florida, CREOL

Coherent stacking of 128 pulses from a GHz repetition rate femtosecond Yb:fiber laser (JW2F.28)
Presenter: Bowei Yang, *Peking University*
Expand for Abstract / Authors

Paper

We demonstrate the coherent staking of 128 pulses from a 0.95 GHz repetition rate femtosecond Yb:fiber laser by delay line and polarization control. More pulse stacking is in progress.

Authors:Bowei Yang/Peking University Guanyu Liu/Institute of Photonics Technology Abuduweili Abulikemu/Peking University Yan Wang/Peking University Aimin Wang/Peking University Zhigang Zhang/Peking University

Ultrafast Phase Imaging by Single-Shot Chirped Pulse Digital Holography (JW2F.29)
Presenter: Naoki Karasawa, *Chitose Inst of Science and Technology*
Expand for Abstract / Authors

Paper

Single-shot chiped pulse digital holography was proposed recently for recording multiple ultrafast wavefronts. We obtained phase images of spark discharge using two 35 fs probe pulses separated by 3.7 ps successfully by this method.

Authors:Naoki Karasawa/Chitose Inst of Science and Technology Shogo Yamada/Chitose Inst of Science and Technology Hiroki Kanaya/Chitose Inst of Science and Technology

Ultrafast soliton dynamics of micro-combs observed by aberration-free temporal magnifier (JW2F.30)
Presenter: Yanjing Zhao, *Wuhan National Lab for Optoelectronics*
Expand for Abstract / Authors

Paper

Ultra-fast soliton dynamics of micro-combs are investigated based on an aberration-free temporal magnifier. By eliminating aberrations, temporal window is greatly extended to 1.4 ns and transient phenomena are clearly observed including soliton annihilation and mergence.

Authors:liao chen/Wuhan National Lab for Optoelectronics Yanjing Zhao/Wuhan National Lab for Optoelectronics Weiqiang Wang/Xi’an Institute of Optics and Precision Mechanics Hao Hu/Wuhan National Lab for Optoelectronics Ruolan Wang/Wuhan National Lab for Optoelectronics Xinyu Wang/Xi’an Institute of Optics and Precision Mechanics Sai Chu/City University of Hong Kong Brent Little/Xi’an Institute of Optics and Precision Mechanics Chi Zhang/Wuhan National Lab for Optoelectronics Wenfu Zhang/Xi’an Institute of Optics and Precision Mechanics Xinliang Zhang/Wuhan National Lab for Optoelectronics

Optical Parametric Oscillators (OPOs) with 3-5 µm Instantaneous Bandwidth Based on an Aperiodically-poled Lithium-niobate (APPLN) Crystal (JW2F.31)
Presenter: Pei Liu, *Huazhong Univ. of Science and Technology*
Expand for Abstract / Authors

Paper

We reported an OPO generating an idler wave with an instantaneous bandwidth covering the atmospheric transmission window at 3–5 µm based on an APPLN crystal and revealed a novel pulse-formation mechanism in this system.

Authors:Pei Liu/Huazhong Univ. of Science and Technology Jiaxing Heng/Huazhong Univ. of Science and Technology Chengxiao Ning/Huazhong Univ. of Science and Technology Zhaowei Zhang/Huazhong Univ. of Science and Technology

A Continuously Tunable Ultrafast Doubly-Resonant Optical Parametric Oscillator (JW2F.32)
Presenter: Chengxiao Ning, *Huazhong Univ. of Science and Technology*
Expand for Abstract / Authors

Paper

A continuously tunable ultrafast doubly-resonant OPO with central-wavelength tunable over 1910-2070 nm for signal pulses and 2140-2340 nm for idler pulses has been demonstrated by introducing a frequency selection element into the cavity-length-locking system.

Authors:Chengxiao Ning/Huazhong Univ. of Science and Technology Pei Liu/Huazhong Univ. of Science and Technology Zhaowei Zhang/Huazhong Univ. of Science and Technology

Control of delay lines with reinforcement learning for coherent pulse stacking (JW2F.33)
Presenter: Abulikemu Abuduweili, *Peking University*
Expand for Abstract / Authors

Paper

We demonstrate the effectiveness of reinforcement learning for controlling the feedback of delay line coherent pulse stacking.

Authors:Abulikemu Abuduweili/Peking University Bowei Yang/Peking University Zhigang Zhang/Peking University

1 kHz, 32 mJ pulses at 2.05 µm from multi-pass Ho: YLF amplifiers for pumping an 8 µm OPCPA (JW2F.34)
Presenter: Fangjie Zhou, *University of Central Florida*
Expand for Abstract / Authors

Paper

We present a multi-pass Chirped Pulse Amplification system using Ho:YLF that can produce 32 mJ pules at 2.05 µm and 1 kHz repetition rate. The seed is generated from DC-OPA which is driven by a Ti:Sapphire laser.

Authors:Fangjie Zhou/University of Central Florida

Direct Evidence of Drift-Assisted Carrier Transportation in a Gradient-Doped GaAs Photocathode (JW2F.35)
Presenter: Rui Zhou, *The University of Alabama in Huntsville*
Expand for Abstract / Authors

Paper

We report a comparative study of free-electron dynamics in uniform-doped and gradient-doped GaAs photocathodes using femtosecond pump-probe transient reflectometry. The result shows better photoelectron accumulation in gradient-doped device, evidently due to drift-assisted carrier transportation.

Authors:Rui Zhou/The University of Alabama in Huntsville Hemang Jani/The University of Alabama in Huntsville Lingze Duan/The University of Alabama in Huntsville

Effect of Mode-Area Dispersion on Ultrafast Nonlinear Dynamics in Gas-Filled Anti-Resonant Hollow-Core Fibers (JW2F.36)
Presenter: YING WAN, *Nanyang Technological University*
Expand for Abstract / Authors

Paper

We numerically investigate the effect of mode-area dispersion on nonlinear pulse propagation dynamics in gas-filled anti-resonant hollow-core fibers. We find that this effect becomes nonnegligible when the system is pumped close to the zero dispersion.

Authors:YING WAN/Nanyang Technological University Md Hasan/The Australian National University Perry Ping Shum/Nanyang Technological University Wonkeun Chang/Nanyang Technological University

$SnSe_2$ Nanosheets for Subpicosecond Harmonic Mode-Locked Pulse Generation (JW2F.37)
Presenter: Xiaohui Li, *Shaanxi Normal University*
Expand for Abstract / Authors

Paper

The $SnSe_2$ nanosheets fabricated by using solvothermal treatment have been successfully prepared as fiber-based saturable absorber by utilizing evanescent-field effect which can bear a high pump power. A 31st order subpicosecond harmonic-mode-locking has been generated.

Authors:Jishu Liu/Shaanxi Normal University Xiaohui Li/Shaanxi Normal University

Generation of a Spatiotemporal Vortex with a Purely Transverse Orbital Angular Momentum (JW2F.38)
Presenter: Andy Chong, *University of Dayton*
Expand for Abstract / Authors

Paper

We demonstrate a spatiotemporal optical vortex with a purely transverse orbital angular momentum. Since the spatiotemporal vortex carries a scalable orbital angular momentum in the unique transverse direction, novel applications are expected.

Authors:Andy Chong/University of Dayton Chenhao Wan/Huazhong University of Science and Technology Jian Chen/University of Shanghai for Science and Technology Qiwen Zhan/University of Dayton

17:00 - 18:15 (UTC - 07:00)

Free Space Optical Communications (SW4L)
Presider: Jade Wang

17:00 - 17:15

An Indoor Visible Light Communication and Positioning System Based on Machine Learning and Alamouti STBC (SW4L.1)
Presenter: Shencheng Ni, *Soochow Universtiy*
Expand for Abstract / Authors

Paper

We proposed and experimentally demonstrated a simultaneous indoor visible light communication and positioning system based on machine learning and Alamouti STBC with two LED lamps. The average positioning error is as low as 0.73 cm.

Authors:Shencheng Ni/Soochow Universtiy Shanhong You/Soochow Universtiy

17:15 - 17:30

First Demonstration of Multi-user QAM-OFDMA Visible Light Communication System Based on a 75-µm Single Layer Quantum Dot Blue Micro-LED (SW4L.2)
Presenter: Li Zhang, *Tsinghua University*
Expand for Abstract / Authors

Paper

We demonstrate a 3-meter 2.5-Gbaud QAM-OFDMA visible light communication (VLC) system affording two users by implementing a 75-µm single layer quantum dot (QD) blue micro-LED with achieved extremely high packaging modulation bandwidth at 1.03 GHz.

Authors:Li Zhang/Tsinghua University Zixian Wei/Tsinghua University Chien-Ju Chen/National Tsing Hua University Lei Wang/Tsinghua University Kai-Chia Chen/National Tsing Hua University Meng-Chyi Wu/National Tsing Hua University Yuhan Dong/Tsinghua University Lai Wang/Tsinghua University Yi Luo/Tsinghua University H.Y. Fu/Tsinghua University

17:30 - 18:00

Coherent Architectures for Free-Space Optical Communications (SW4L.3)
Presenter: David Geisler, *Massachusetts Inst of Tech Lincoln Lab*
Expand for Abstract / Authors

Paper

Custom coherent architectures can provide many advantages for FSO communications systems through co-development of integrated photonics, ASIC- or FPGA-based DSP algorithms, and system design to mitigate atmospheric turbulence and reduce pointing requirements.

Authors:David Geisler/Massachusetts Inst of Tech Lincoln Lab

Invited

18:00 - 18:15

Experimental Demonstration of Crosstalk Reduction to Achieve Turbulence-Resilient Multiple-OAM-Beam Free-Space Optical Communications using Pilot Tones to Mix Beams at the Receiver (SW4L.4)
Presenter: Runzhou Zhang, *University of Southern California*
Expand for Abstract / Authors

Paper

We experimentally demonstrate a 4-Gbit/s turbulence-resilient two-OAM-mode-multiplexed FSO link using pilot tones at different wavelengths to mix beams at the receiver. Inter-modal crosstalk is measured to be resilient to turbulence for different OAM mode selections.

Authors:Runzhou Zhang/University of Southern California Nanzhe Hu/University of Southern California Kaiheng Zou/University of Southern California Huibin Zhou/University of Southern California Xinzhou Su/University of Southern California Zhe Zhao/University of Southern California Haoqian Song/University of Southern California Hao Song/University of Southern California Ahmed Almaiman/University of Southern California Kai Pang/University of Southern California Cong Liu/University of Southern California Brittany Lynn/Space & Naval Warfare Systems Center Moshe Tur/Tel Aviv University Alan Willner/University of Southern California

17:00 - 19:00 (UTC - 07:00)

ATTR: Optics and Photonics for Precision Agriculture II (AW4K)

Presider: Krishnan Parameswaran, *Analog Devices Inc.*

17:00 - 17:15 **Agri-combs: Open-path dual-comb spectroscopy of livestock emissions (AW4K.1)**
Presenter: Daniel Herman, *National Institute of Standards and Technology*
Expand for Abstract / Authors

- Paper

Near-infrared dual-comb spectroscopy is performed over two open-air paths upwind and downwind from pens containing approximately four hundred cattle. Time-resolved enhancements of CO_2, CH_4, NH_3 and H_2O were observed on the downwind path.

Authors:Daniel Herman/National Institute of Standards and Technology Lindsay Hutcherson/Kansas State University Chinthaka Weerasekara/Kansas State University Fabrizio Giorgetta/National Institute of Standards and Technology Kevin Cossel/National Institute of Standards and Technology Gabriel Colacion/National Institute of Standards and Technology Nathan Newbury/National Institute of Standards and Technology Stephen Welch/Kansas State University Brett DePaola/Kansas State University Ian Coddington/National Institute of Standards and Technology Eduardo Santos/Kansas State University Brian Washburn/National Institute of Standards and Technology

17:15 - 17:45 **Ubiquitous Spectral Sensing for Precision Agriculture and Food Testing (AW4K.2)**
Presenter: Bassam Saadany, *Si-War Systems*
Expand for Abstract / Authors

In this talk we discuss the use of micro spectrometers – as tiny sensors- for precision agriculture and food testing. Will be showing the widespread use of applications and the positive impact in real life examples.

Authors:Bassam Saadany/Si-War Systems

Invited

17:45 - 18:00 **(Withdrawn) Feasibility studies of Optical Spectroscopic techniques in examining milk spoilage (AW4K.3)**
Presenter: Diksha Garg, *Indian Institute of Technology Delhi*
Expand for Abstract / Authors

A comparative approach using terahertz-time domain spectroscopy and micro-Raman spectroscopy is demonstrated to examine the spoilage of milk sample.

Authors:Diksha Garg/Indian Institute of Technology Delhi Aparajita Bandyopadhyay/Indian Institute of Technology Delhi Amartya Sengupta/Indian Institute of Technology Delhi

18:00 - 18:15

Cooperative Emissions from Hydrogen-Bonded Heterocyclic Organic Compounds (AW4K.4)
Presenter: Supriya Nagpal, *Mississippi State University*
Expand for Abstract / Authors

Paper

Additional spectral broadening for pyridine-water complexes was observed that cooperative phenomenon is in effect. Probe pulse delay measurements in coherent Raman spectroscopy differentiated spectral dephasing rates for cooperative species among others.

Authors:Gombojav Ariunbold/Mississippi State University Bryan Semon/Mississippi State University Supriya Nagpal/Mississippi State University Yuri Rostovtsev/University of North Texas

18:15 - 18:30

Mid-Infrared Dual-Comb Spectroscopy of Biomass Pyrolysis (AW4K.5)
Presenter: Nazanin Hoghooghi, *University of Colorado Boulder*
Expand for Abstract / Authors

Paper

We use a broadband mid-IR dual-comb spectrometer operating between 2.8 and 5 microns to measure time-resolved mole fractions of 12 gaseous species and isotopologues in the pyrolysis products above a heated Eucalyptus wood sample.

Authors:Amanda Makowiecki/University of Colorado Boulder Nazanin Hoghooghi/University of Colorado Boulder Daneil Herman/National Institute of Standard andTechnology Elizabeth Strong/University of Colorado Boulder Ryan Cole/University of Colorado Boulder Gabriel Ycas/National Institute of Standard andTechnology Fabrizio Giorgetta/National Institute of Standard andTechnology Nathan Newbury/National Institute of Standard andTechnology Ian Coddington/National Institute of Standard andTechnology Gregory Rieker/University of Colorado Boulder

18:30 - 19:00

Smart Raman for Safe and Healthy Food (AW4K.6)
Presenter: Juergen Popp, *Friedrich-Schiller-Universität Jena*
Expand for Abstract / Authors

TBD

Authors:Juergen Popp/Friedrich-Schiller-Universität Jena

Invited

High Intensity X-ray Sources (FW4D)
Presider: Julia Mikhailova, *Princeton University*

17:00 - 18:00

High-Intensity X-ray Science (FW4D.1)
Presenter: Robin Santra, *DESY*
Expand for Abstract / Authors

High-intensity x-ray/matter interactions have important applications. However, capturing the associated ultrafast dynamics remains difficult using standard simulation techniques. In this tutorial, I will present the methodological progress that has been made to address this challenge.
Robin Santra is a professor at DESY/Universität Hamburg. He was a staff scientist at Argonne National Laboratory and an associate professor at the University of Chicago. He won an IUPAP Young Scientist Prize and a U.S. Presidential Early Career Award. He is a Fellow of the American Physical Society.

Authors:Robin Santra/DESY

Tutorial

18:00 - 18:15

A Synchronized VUV Beamline for Time Domain Two-Color Dynamic Studies at FLASH2 (FW4D.2)
Presenter: Elisa Appi, *Leibniz Universität Hannover*
Expand for Abstract / Authors

Paper

We present a HHG-based vacuum ultraviolet (VUV) source at the free electron laser FLASH2. The source provides ultrashort pulses from 10 to 40 eV, coupled to the REMI end-station (beamline FL26) for VUV-FEL pump-probe experiments.

Authors:Elisa Appi/Leibniz Universität Hannover Christina Papadopoulou/DESY Jose Mapa/Leibniz Universität Hannover Nishad Wesavkar/Leibniz Universität Hannover Christoph Jusko/Leibniz Universität Hannover Philip Mosel/Leibniz Universität Hannover Skirmantas Alisauskas/DESY Tino Lang/DESY Christoph Heyl/DESY Bastian Manschwetus/DESY Markus Braune/DESY Maciej Brachmanski/DESY Hannes Lindenblatt/Max-Planck-Institut für Kernphysik Florian Trost/Max-Planck-Institut für Kernphysik Severin Meister/Max-Planck-Institut für Kernphysik Patrizia Schoch/Max-Planck-Institut für Kernphysik Rolf Treusch/DESY Robert Moshammer/Max-Planck-Institut für Kernphysik Ingmar Hartl/DESY Uwe Morgner/Leibniz Universität Hannover Milutin Kovacev/Leibniz Universität Hannover

18:15 - 18:30 **Single-shot Measurement of Extreme Ultraviolet Free Electron Laser Pulses (FW4D.3)**
Presenter: William Peters, *Los Alamos National Lab*
Expand for Abstract / Authors

_ Paper

We demonstrate an all-optical approach for measuring spectrograms of individual FEL pulses by measuring a spectrally-resolved EUV-EUV-optical four-wave-mixing signal. We experimentally demonstrate that this is phase-sensitive can be applied to structured and unstable pulse trains.

Authors:William Peters/Los Alamos National Lab Travis Jones/Georgia Institute of Technology Anatoly Efimov/Los Alamos National Lab Emanuele Pedersoli/Elletra-Sincrotrone Laura Foglia/Elletra-Sincrotrone Riccardo Mincigrucci/Elletra-Sincrotrone Ivaylo Nikolov/Elletra-Sincrotrone Rick Trebino/Georgia Institute of Technology Richard Sandberg/Brigham Young University Miltcho Danailov/Elletra-Sincrotrone Flavio Capotondi/Elletra-Sincrotrone Filippo Bencivenga/Elletra-Sincrotrone Pamela Bowlan/Los Alamos National Lab

18:30 - 18:45 **A Robust Scaling Up Method of Output Energy and Photon Energy on High-Order Harmonic Generation:**
Towards Sub-μJ Water Window Soft X-rays (FW4D.4)
Presenter: Kotaro Nishimura, *RIKEN Center for Advanced Photonics*
Expand for Abstract / Authors

_ Paper

Nano-joule class “water-window” high-order harmonic generation under a neutral-medium condition is presented. The maximum harmonic photon energy reaches 360 eV with 3.5-nJ/shot in the “water-window” region.

Authors:Kotaro Nishimura/RIKEN Center for Advanced Photonics Lu Xu/RIKEN Center for Advanced Photonics Akira Suda/Tokyo University of Science Katsumi Midorikawa/RIKEN Center for Advanced Photonics Yuxi Fu/RIKEN Center for Advanced Photonics Eiji Takahashi/RIKEN Center for Advanced Photonics

18:45 - 19:00 **(Withdrawn) High-Harmonic Generation in the Water Window with a High-Average Power Mid-Infrared OPCPA at 100 kHz (FW4D.5)**
Presenter: Pierre-Alexis Chevreuil, *ETH Zurich*
Expand for Abstract / Authors

We present an OPCPA with 25 W average power, generating 16.5 fs pulses with 14 GW peak power at 2.2 μm with 100 kHz repetition rate. This source enabled high-harmonic generation extending beyond 0.6 keV.

Authors:Pierre-Alexis Chevreuil/ETH Zurich Justinas Pupeikis/ETH Zurich Nicolas Bigler/ETH Zurich Christopher Phillips/ETH Zurich Lukas Gallmann/ETH Zurich Ursula Keller/ETH Zurich

Ultrafast Applications (SW4H)

Presider: Giacomo Coslovich, *SLAC*

17:00 - 17:30	**Advances in Spatial Frequency Modulation Imaging Techniques for Applications from Advanced Manufacturing to the Neurosciences (SW4H.1)** **Presenter**: Jeffrey Squier, *Colorado School of Mines* Expand for Abstract / Authors Spatial frequency modulation imaging has a broad range of attributes: enhanced resolution in linear and nonlinear imaging modalities, phase sensitivity, and random access capability. Advanced manufacturing to the neurosciences can benefit from this unique optical metrology. **Authors**:Jeffrey Squier/Colorado School of Mines Jeff Field/Colorado State University Randy Bartels/Colorado State University Invited	Paper
17:30 - 17:45	**Gas Concentration Measurements Based on Ultrabroadband Coherent Anti-Stokes Raman Scattering Using the Non-resonant Signal (SW4H.2)** **Presenter**: Yang Ran, *Institute of Applied Physics* Expand for Abstract / Authors We propose a method using the non-resonant signal measured in pure argon for gas concentration measurements based on ultrabroadband fs/ps coherent anti-Stokes Raman scattering. Measurement accuracies are greatly improved to 5% for $CO_2/N_2/CH_4$ gas mixtures. **Authors**:Yang Ran/Institute of Applied Physics Stefan Nolte/Institute of Applied Physics Andreas Tünnermann/Institute of Applied Physics Roland Ackermann/Institute of Applied Physics	Paper
17:45 - 18:00	**Frequency Division Using a Soliton-Injected Semiconductor Gain-Switched Frequency Comb (SW4H.3)** **Presenter**: Wenle Weng, *Ecole Polytechnique Federale de Lausanne* Expand for Abstract / Authors By injecting a soliton microcomb into a semiconductor laser that is driven by a sinusoidal current at the subharmonic frequencies of the soliton rate, we demonstrate broadband gain-switched frequency comb generation and low-noise microwave synthesis. **Authors**:Wenle Weng/Ecole Polytechnique Federale de Lausanne Aleksandra Kaszubowska-Anandarajah/Trinity College Dublin Junqiu Liu/Ecole Polytechnique Federale de Lausanne Prince Anandarajah/Dublin City University Tobias Kippenberg/Ecole Polytechnique Federale de Lausanne	Paper

18:00 - 18:30

Attosecond Science using High Average Power and High Peak Power Optical Parametric Chirped Pulse Amplifiers (SW4H.4)
Presenter: Mark Vrakking, *Max Born Institute*
Expand for Abstract / Authors

Attosecond Science has developed from the ability to drive High Harmonic Generation using intense, few-cycle laser pulses, traditionally obtained using Ti:Sapphie technology. I will discuss new opportunities arising from the development of high average power and high peak power OPCPA systems.

Authors:Mark Vrakking/Max Born Institute

Invited

18:30 - 18:45

A Compact MHz-repetition-rate VUV Source: Implementation, Modeling, and Applications (SW4H.5)
Presenter: Dan Hickstein, *KMLabs*
Expand for Abstract / Authors

Paper

Utilizing highly cascaded harmonic generation, we upconvert a MHz fiber laser to the vacuum ultraviolet (up to 18~eV). We apply the source to combustion-chemistry experiments and conduct numerical simulation to understand the nonlinear generation process

Authors:Dan Hickstein/KMLabs David Couch/University of Colorado Matthew Kirchner/KMLabs Scott Domingue/KMLabs Jessica Ramirez/KMLabs barney Ellison/University of Colorado Nicole Labbe/University of Colorado Brennan Peterson/KMLabs Margaret Murnane/University of Colorado Sterling Backus/KMLabs Henry Kapteyn/University of Colorado

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18:45 - 19:00

Coherent Control with Vector Beams for Ultrafast Magnetic Pulses (SW4H.6)
Presenter: Shawn Sederberg, *Joint Attosecond Science Laboratory*
Expand for Abstract / Authors

Paper

We demonstrate coherent control in a semiconductor using vector laser beams and spatially map the resulting currents. Ring currents are excited using two configurations, and the potential for generating short, intense magnetic impulses is demonstrated.

Authors:Shawn Sederberg/Joint Attosecond Science Laboratory Fanqi Kong/Joint Attosecond Science Laboratory Felix Hufnagel/University of Ottawa Ebrahim Karimi/University of Ottawa Paul Corkum/Joint Attosecond Science Laboratory

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Topological Photonics II (FW4A)

Presider: Alireza Marandi, *California Institute of Technology*

17:00 - 17:15	**Topological Evolution - Invariant Photonic Structures in Synthetic Dimensions (FW4A.1)** **Presenter**: Liat Nemirovsky, *Technion* Expand for Abstract / Authors We present topologically–protected propagation of unidirectional edge states at the interface between two dynamically–invariant systems with opposite effective magnetic field in synthetic dimensions. **Authors**:Liat Nemirovsky/Technion Moshe-Ishay Cohen/Technion yaakov lumer/Technion Eran Lustig/Technion Mordechai Segev/Technion	Paper
17:15 - 17:30	**Demonstration of a nonlinearity induced photonic topological insulator (FW4A.2)** **Presenter**: Alexander Szameit, *Institute of Physics, University of Rostock* Expand for Abstract / Authors We theoretically propose and experimentally demonstrate a nonlinear photonic Floquet topological insulator. The system enters a topological non-trivial phase under the influence of a high-power excitation by the optical Kerr effect in detuned directional couplers. **Authors**:Lukas Maczewsky/Institute of Physics, University of Rostock Matthias Heinrich/Institute of Physics, University of Rostock Mark Kremer/Institute of Physics, University of Rostock Sergey Ivanov/Moscow Institute of Physics and Technology Max Ehrhardt/Institute of Physics, University of Rostock Franklin Martinez/Institute of Physics, University of Rostock Yaroslav Kartashov/Institute of Spectroscopy, Russian Academy of Science Vladimir Konotop/Departemento de Fisica and Centro de Fisica Teorica e Computacional, Universidade de Lisboa Lluis Torner/Departemento de Fisica and Centro de Fisica Teorica e Computacional, Universidade de Lisboa Alexander Szameit/Institute of Physics, University of Rostock	Paper
17:30 - 17:45	**Observation of non-contractible loop states in a photonic Kagome lattice of Corbino-geometry (FW4A.3)** **Presenter**: Liqin Tang, *Nankai University* Expand for Abstract / Authors We demonstrate robust-boundary-mode (RBM) and non-contractible loop state (NLS) in a photonic Kagome lattice, manifesting unique topological entities in flatband systems. We achieve direct observation of the NLS along toroidal direction in a Corbino-geometry. **Authors**:Jina Ma/Nankai University Jun-Won Rhim/Seoul National University Liqin Tang/Nankai University Shiqi Xia/Nankai University Haiping Wang/Nankai University Xiuyan Zheng/Nankai University Shiqiang Xia/Nankai University Daohong Song/Nankai University Yi Hu/Nankai University Yigang Li/Nankai University Bohm-Jung Yang/Seoul National University Daniel Leykam/Institute for Basic Science Zhigang Chen/Nankai University	Paper

17:45 - 18:00 **(Withdrawn) Topologically-controlled Nonlinear Propagation (FW4A.4)**
Presenter: Giulia Marcucci, *Sapienza University of Rome*
Expand for Abstract / Authors

The correspondence between phases and genus of toroidal surfaces, associated with nonlinear Schroedinger equation, lets us introduce the topological control. We prove it experimentally and report observations of controlled transitions from shock to rogue waves.

Authors:Giulia Marcucci/Sapienza University of Rome Davide Pierangeli/Sapienza University of Rome Aharon J. Agranat/Hebrew University of Jerusalem Ray-Kuang Lee/National Tsing Hua University Eugenio DelRe/Sapienza University of Rome Claudio Conti/ISC - CNR

18:00 - 18:15 **Two-dimensional Zitterbewegung analog in symmetry-breaking photonic honeycomb lattices (FW4A.5)**
Presenter: Xiuying Liu, *Nankai University*
Expand for Abstract / Authors

Paper

We demonstrate photonic analog of 2D Zitterbewegung of an optical wavepacket in inversion-symmetry-breaking honeycomb lattices by exciting modes around the gapped Dirac points, leading to self-rotation of the “center-of-mass” mediated by Berry curvature.

Authors:Xiuying Liu/Nankai University Zhixuan Dai/Nankai University Daohong song/Nankai University Zhiming Zhang/Nankai University Shiqi Xia/Nankai University Liqin Tang/Nankai University Hrvoje Buljan/Nankai University Jingjun Xu/Nankai University Zhigang Chen/Nankai University

18:15 - 18:30 **Optical Skyrmions and a Topological Hall Effect in Artificial Gauge Fields (FW4A.6)**
Presenter: Aviv Karnieli, *Tel Aviv University*
Expand for Abstract / Authors

Paper

We construct skyrmion textures in a synthetic spin-1/2 dimension using nonlinear photonic crystals, giving rise to artificial gauge fields: a magnetic field, mimicking the topological Hall effect, and an electric field unique to our system.

Authors:Aviv Karnieli/Tel Aviv University Shai Tsesses/Technion - Israel institute of technology Guy Bartal/Technion - Israel institute of technology Ady Arie/Tel Aviv University

18:30 - 18:45 **Demonstration of nonlinearity-induced coupling to topological edge and interface states (FW4A.7)**
Presenter: Shiqi Xia, *Teda College of Nankai University*
Expand for Abstract / Authors

Paper

We observe nonlinearity-induced excitation of topological edge and interface states in a photonic SSH lattice, where two beams from opposite directions are coupled into (reflected from) nontrivial defect channel under nonlinear (linear) excitation upon collision.

Authors:Shiqi Xia/Teda College of Nankai University Nan Wang/Teda College of Nankai University Daria Smirnova/Australian National University Lev Smirnov/Institute of Applied Physics Liqin Tang/Teda College of Nankai University Daohong Song/Teda College of Nankai University Alexander Szameit/Universität Rostock Daniel Leykam/Institute for Basic Science Zhigang Chen/Teda College of Nankai University

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18:45 - 19:00 **Observation of Topological Band Gap Solitons (FW4A.8)**
Presenter: Sebabrata Mukherjee, *Penn State University*
Expand for Abstract / Authors

Paper

We present the first experimental observation of solitons in the bulk of a photonic Floquet topological insulator. We probe a family of these nonlinear states residing on the topological band gap and performing cyclotron-like orbits.

Authors:Sebabrata Mukherjee/Penn State University Mikael Rechtsman/Penn State University

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Nonlinear Optics and Laser-Driven Excitations (SW4G)

Presider: Enam Chowdhury, *Ohio State University*

17:00 - 17:15 **Z-Scan Measurements of CdSiP2 at OPA Pumping Wavelengths (SW4G.1)**
Presenter: Manuel Ferdinandus, *Air Force Institute of Technology*
Expand for Abstract / Authors

Paper

We measure the birefringence of nonlinear optical properties of cadmium silicon phosphide via the Z-scan technique at common pumping wavelengths. We discuss the implications of the NLO properties on the parametric conversion efficiency.

Authors:Manuel Ferdinandus/Air Force Institute of Technology Gengler Jamie/Air Force Research Laboratory Kent Averett/Air Force Research Laboratory Kevin Zawilski/BAE Systems Peter Schunemann/BAE Systems Carl Liebig/Air Force Research Laboratory

17:15 - 17:30

Theory and Observation of Magneto-Electric Field-induced Second Harmonic Generation (SW4G.2)
Presenter: Gregory Smail, *Univ of Michigan - Ann Arbor*
Expand for Abstract / Authors

- Paper

We report induced second harmonic generation mediated by a new rectification nonlinearity in polycrystalline pentacene. Results with tilted wavefronts confirm its magneto-electric origin, ultrafast character and capability of supporting all-optical switching at right angles.

Authors:Gregory Smail/Univ of Michigan - Ann Arbor Tuan Trinh/Univ of Michigan - Ann Arbor Krishnandu Makhal/Univ of Michigan - Ann Arbor Da Yang/Univ of Michigan - Ann Arbor Jinsang Kim/Univ of Michigan - Ann Arbor Stephen Rand/Univ of Michigan - Ann Arbor

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17:30 - 18:00

Terahertz Field-Driven Quantum Phase Transitions (SW4G.3)
Presenter: Keith Nelson, *MIT*
Expand for Abstract / Authors

- Paper

Single-cycle terahertz fields have driven quantum phase transitions through electronic and ionic mechanisms. Phase transition dynamics have been measured using THz, optical, and x-ray probes, including real-time single-shot measurements of irreversible transitions.

Authors:Keith Nelson/MIT

Invited

18:00 - 18:15

Observation of the Quantum Nature of Laser-Driven Particle Acceleration

(SW4G.4)
Presenter: Yuval Adiv, *Technion*
Expand for Abstract / Authors

- Paper

<div style="direction: ltr;">We reveal quantum features in laser acceleration arising from the underlying wave nature of the accelerated electron, and we present the first accelerator on-chip operated inside a transmission electron microscope.</div>

Authors:Yuval Adiv/Technion Kangpeng Wang/Technion Raphael Dahan/Technion Payton Broaddus/Stanford Yu Miao/Stanford Dylan Black/Stanford Kenneth Leedle/Stanford Olav Solgaard/Stanford R. Joel England/Stanford Ido Kaminer/Technion

18:15 - 18:30	**Time-Resolved Single-Shot Ablation Dynamics of Silicate Glasses with Few-Cycle Laser Pulses (SW4G.5)** **Presenter**: noah talisa, *Ohio State University* Expand for Abstract / Authors Few-cycle pulse laser damage and ablation of silicate glasses are studied using time-resolved surface microscopy. Unlike in metals, semiconductors, and various dielectrics, interference fringes due to an ablating layer are not observed for these glasses. **Authors**:noah talisa/Ohio State University Brandon Harris/Ohio State University Abdallah AlShafey/Ohio State University Jacob Krebs/Ohio State University Sean Locker/Alfred University S. Sundaram/Alfred University Enam Chowdhury/Ohio State University	Paper
18:30 - 18:45	**Liquid crystal-enhanced photophone cells (SW4G.6)** **Presenter**: Michael Dela Cruz, *Air Force Institute of Technology* Expand for Abstract / Authors This paper demonstrates for the first time the intrinsic enhancing nature of liquid crystal to acoustically modulated light on a microscale platform. This study enables many advanced applications in optoacoustic sensing and signal processing. **Authors**:Michael Dela Cruz/Air Force Institute of Technology Ling Wang/Tianjin University Hengky Chandrahalim/Air Force Institute of Technology	Paper
18:45 - 19:00	**Unravelling Ultrafast Excited State Absorption in Few Layer ReS_2 (SW4G.7)** **Presenter**: Dipendranath Mandal, *IISER Bhopal* Expand for Abstract / Authors Here we report excited-state absorption in few layer ReS_2 using ultrafast pump-probe and nonlinear spectroscopy. The remarkable transition from reverse-saturable to two-photon absorption reveals its potential applications in optical limiting and switching. **Authors**:Dipendranath Mandal/IISER Bhopal Sourav Marik/IISER Bhopal Sudarshan Sharma/IISER Bhopal R. P. Singh/IISER Bhopal Adarsh K V/IISER Bhopal	Paper

Inverse Design and Computation (FW4B)

Presider: Rajesh Menon, *University of Utah*

17:00 - 17:15	**Recurrent Machine Learning and Computing with Nonlinear Optical Waves (FW4B.1)** **Presenter**: Ian Williamson, *Stanford University* Expand for Abstract / Authors We demonstrate that optical time-dynamics are equivalent to a recurrent neural network and that they can be trained for high-performance on complex classification tasks, paving the way for passive analog machine learning processors. **Authors**:Ian Williamson/Stanford University Tyler Hughes/Stanford University Momchil Minkov/Stanford University Shanhui Fan/Stanford University	Paper
17:15 - 17:30	**Performing Spatial Differentiation and Edge Detection with Dielectric metasurface (FW4B.2)** **Presenter**: Tianhua Feng, *Jinan University* Expand for Abstract / Authors Spatial differentiation and edge detection have been proposed to realize with a dielectric metasurface by engineering the spatial dispersion of electric dipole resonance. The results show excellent performances for 2D images. **Authors**:Danping Pan/Jinan University Lei Wan/Jinan University Alexander Potapov/Jinan University Tianhua Feng/Jinan University	Paper
17:30 - 17:45	**Inverse designed metagratings for far-field integral equations solving (FW4B.3)** **Presenter**: Concetto Eugenio Andrea Cordaro, *AMOLF* Expand for Abstract / Authors We present a metasurface-based platform that solves Fredholm integral equations of the second kind for free-space radiation. An inverse-designed metagrating is coupled to a semitransparent mirror providing feedback in order to perform an analog version of the Neumann series. **Authors**:Concetto Eugenio Andrea Cordaro/AMOLF Brian Edwards/University of Pennsylvania Vahid Nikkhah/University of Pennsylvania Andrea Alù/Advanced Science Research Center Albert Polman/AMOLF Nader Engheta/University of Pennsylvania	Paper
17:45 - 18:00	**Reparameterization to Enforce Constraints in the Inverse Design of Metasurfaces (FW4B.4)** **Presenter**: Mingkun Chen, *Stanford University* Expand for Abstract / Authors We report new scheme for enforcing constraints on structural features of merasurfaces in inverse design process by imposing controls through transforming the parameter space. Using this method, we design metagratings with restricted minimum feature size. **Authors**:Mingkun Chen/Stanford University Jiaqi Jiang/Stanford University Jonathan Fan/Stanford University	Paper

18:00 - 18:15 **Space-Time Wave Packets Wave-Guided in an Unpatterned Thin Film (FW4B.5)**
Presenter: Abbas Shiri, *University of Central Florida, CREOL*
Expand for Abstract / Authors

Paper

We demonstrate that propagation-invariant `space-time' wave packets can be guided in two dimensions in an unpatterned thin optical film by relying on index-guiding in one dimension and on space-time confinement in the other.

Authors:Abbas Shiri/University of Central Florida, CREOL Murat Yessenov/University of Central Florida, CREOL Scott Webster/University of Central Florida, CREOL Kenneth Schepler/University of Central Florida, CREOL Ayman Abouraddy/University of Central Florida, CREOL

18:15 - 18:30 **Simultaneous Analog Computing Using Multi-Frequency Inverse-Designed Metamaterial Platforms (FW4B.6)**
Presenter: Miguel Camacho, *University of Pennsylvania*
Expand for Abstract / Authors

Paper

Here we introduce inverse-designed structures for inverting several matrices at the same time by exploiting multi-frequency design. We demonstrate possibilities of feasible designs for up to four different mathematical kernels that can be inverted simultaneously.

Authors:Miguel Camacho/University of Pennsylvania Brian Edwards/University of Pennsylvania Nader Engheta/University of Pennsylvania

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18:30 - 18:45 **Landau Levels in Inhomogeneously Strained Photonic Crystals (FW4B.7)**
Presenter: Jonathan Guglielmon, *Pennsylvania State University*
Expand for Abstract / Authors

Paper

We theoretically demonstrate the emergence of highly degenerate Landau levels in inhomogeneously strained 2D photonic crystals. This provides a novel mechanism for engineering high density of states in photonic media.

Authors:Jonathan Guglielmon/Pennsylvania State University Mikael Rechtsman/Pennsylvania State University Michael Weinstein/Columbia University

18:45 - 19:00 **All-dielectric Metasurface Designs Enabled by Deep Neural Networks (FW4B.8)**
Presenter: sensong an, *University of Massachusetts Lowell*
Expand for Abstract / Authors

Paper

We propose a deep learning design approach that significantly improves the design efficiency and accuracy over traditional trial-and-error methods that are currently in use to engineer metasurface-based devices.

Authors:sensong an/University of Massachusetts Lowell clayton fowler/University of Massachusetts Lowell bowen zheng/University of Massachusetts Lowell Mikhail Shalaginov/Massachusetts Institute of Technology hong tang/University of Massachusetts Lowell hang li/University of Massachusetts Lowell jun ding/East China Normal University Myungkoo Kang/University of Central Florida Anuradha Agarwal/Massachusetts Institute of Technology Clara Rivero-Baleine/Lockheed Martin Corporation Kathleen Richardson/University of Central Florida Tian Gu/Massachusetts Institute of Technology Juejun Hu/Massachusetts Institute of Technology hualiang Zhang/University of Massachusetts Lowell

Unconventional Imaging (FW4Q)

Presider: Ward Newman, *University of Alberta*

17:00 - 17:15 **Compressed single-pixel photoacoustic imaging (FW4Q.1)**
Presenter: Yuning Guo, *University of Colorado Boulder*
Expand for Abstract / Authors

Paper

Taking advantage of single-pixel detection, we present compressed photoacoustic imaging with spatial resolution unlimited by acoustics. It allows surface tomography in optically diffusive media and enables sub-wavelength structures resolvable with a reduced measurement demand.

Authors:Yuning Guo/University of Colorado Boulder Baowen Li/University of Colorado Boulder Xiaobo Yin/University of Colorado Boulder

17:15 - 17:30

Cascaded Multifunctional Metasurfaces for Single-shot Quantitative Phase Gradient Microscopy (FW4Q.2)
Presenter: Hyounghan Kwon, *California Institute of Technology*
Expand for Abstract / Authors

Paper

We experimentally demonstrate a single-shot quantitative phase gradient microscope by two cascaded multifunctional metasurfaces. Experiments with various specimens show the capability to capture quantitative phase gradient images with single-cell resolution and low noise levels.

Authors:Hyounghan Kwon/California Institute of Technology Ehsan arbabi/California Institute of Technology Seyedeh Mahsa kamali/California Institute of Technology MohammadSadegh Faraji-Dana/California Institute of Technology Andrei Faraon/California Institute of Technology

17:30 - 17:45

Single-shot Quantitative Phase Microscopy Assisted by an All-Dielectric Metasurface (FW4Q.3)
Presenter: Einstom Engay, *Technical University of Denmark*
Expand for Abstract / Authors

Paper

We present a new approach for simultaneous capture of two images using a metasurface made of titania nanopillars. We use this technique to make quantitative phase measurements by employing the transport of intensity model.

Authors:Einstom Engay/Technical University of Denmark Dewang Huo/Technical University of Denmark Radu Malureanu/Technical University of Denmark Alexandre Emmanuel Wetzel/Technical University of Denmark Ada-Ioana Bunea/Technical University of Denmark Peter John Rodrigo/Technical University of Denmark Andrei Lavrinenko/Technical University of Denmark

17:45 - 18:00

A Space Compression Optic (FW4Q.4)
Presenter: Michael DelMastro, *University of Ottawa*
Expand for Abstract / Authors

Paper

We theoretically introduce a new optic, a plate that reduces propagation length for image formation. We experimentally demonstrate it advances a beam's focus and shifts an obliquely incident beam identically to a longer propagation distance.

Authors:Michael DelMastro/University of Ottawa Orad Reshef/University of Ottawa Katherine Bearne/University of Ottawa Ali Alhulaymi/University of Ottawa Lambert Giner/National Research Council of Canada Robert Boyd/University of Ottawa Jeff Lundeen/University of Ottawa

18:00 - 18:15	**Passive, Thermal, Reference-Free, Non-Line-of-Sight Imaging (FW4Q.5)** **Presenter**: Shawn Divitt, *Jacobs Corporation* Expand for Abstract / Authors We demonstrate passive image recovery of mid-infrared thermal objects around corners using speckle correlation techniques. **Authors**:Shawn Divitt/Jacobs Corporation Dennis Gardner/U.S. Naval Research Laboratory Abbie Watnik/U.S. Naval Research Laboratory	Paper
18:15 - 18:30	**Full field-of-view imaging through scattering media beyond optical memory effect using modulated illumination and independent component analysis (FW4Q.6)** **Presenter**: Wei Li, *Xidian University* Expand for Abstract / Authors We experimentally demonstrate full field-of-view optical imaging through scattering regardless of the optical memory effect utilizing designed modulated illumination and independent component analysis. Imaging of large field-of-view multi-objects is achieved numerically and experimentally. **Authors**:Wei Li/Xidian University jietao liu/Xidian University Shunfu He/Xidian University Mingrui Xia/Xidian University Yuxiang Wu/Xidian University Lixian Liu/Xidian University Jinjin Zhu/Xidian University Xiaopeng Shao/Xidian University	Paper
18:30 - 18:45	**Optical field recovery through thin scattering layer for wide-field scattering imaging (FW4Q.7)** **Presenter**: jietao liu, *Xidian University* Expand for Abstract / Authors Wide-field imaging through thin scattering layer is verified experimentally utilizing round-trip optical field estimation method. Large field-of-view imaging strategy dealing with complex and even violent phase variations is demonstrated. **Authors**:jietao liu/Xidian University Wei Li/Xidian University Shunfu He/Xidian University Mingrui Xia/Xidian University Yuxiang Wu/Xidian University Lixian Liu/Xidian University Jinjin Zhu/Xidian University Xiaopeng Shao/Xidian University	Paper
18:45 - 19:00	**(Withdrawn) Nonstationary Intensity Statistics in Diffusive Waves (FW4Q.8)** **Presenter**: Ruitao Wu, *CREOL* Expand for Abstract / Authors We demonstrate that intensity statistics is nonstationary in diffusive regimes of waves in reflection from random media. A statistical model based on recurrent scattering in disordered cavities is confirmed by systematic experiments. **Authors**:Ruitao Wu/CREOL Aristide Dogariu/CREOL	

Frequency Combs II (SW4J)

Presider: Takasumi Tanabe, *Keio University*

17:00 - 17:30	**Stable Dissipative Kerr Solitons in a AlGaAs Microresonator Through Cryogenic Operation (SW4J.1)** **Presenter**: Gregory Moille, *National Institute of Standards and Technology* Expand for Abstract / Authors We demonstrate stable microresonator Kerr solitons in an Al\textsubscript{0.2}Ga\textsubscript{0.8}As-on-insulator resonator thanks to cryogenic quenching of the thermorefractive effect. Reaching such a phase-stable state is a prerequisite to fully exploit the potential of this platform. **Authors**:Gregory Moille/National Institute of Standards and Technology Lin Chang/University of California, Santa Barbara Weiqiang Xie/University of California, Santa Barbara Xiyuan Lu/National Institute of Standards and Technology Ashutosh Rao/National Institute of Standards and Technology Marcelo Davanco/National Institute of Standards and Technology John Bowers/University of California, Santa Barbara Kartik Srinivasan/National Institute of Standards and Technology	Paper
17:30 - 17:45	**(Withdrawn) Kerr frequency comb generation in photonic integrated Ge-As-S chalcogenide microresonators (SW4J.2)** **Presenter**: Bin Zhang, *Sun Yat-sen University* Expand for Abstract / Authors Here, we demonstrate dispersion-engineered chalcogenide glasses (ChG)-microresonator with a loaded Q-factor of ~0.5 million. Kerr combs generation is first experimentally demonstrate using the ChG-based micro-resonators **Authors**:Di Xia/Sun Yat-sen University Pingyang Zeng/Sun Yat-sen University Zelin Yang/Sun Yat-sen University Yaodong Sun/Sun Yat-sen University Yufei Huang/Sun Yat-sen University Jingshun Pan/Sun Yat-sen University Jingcui Song/Sun Yat-sen University Ying Zhu/Sun Yat-sen University Hairun Guo/Shanghai University Bin Zhang/Sun Yat-sen University Zhaohui Li/Sun Yat-sen University	

17:45 - 18:00 **Soliton Comb Generation in Air-Clad AlN Microresonators (SW4J.3)**
Presenter: Yanzhen Zheng, *Tsinghua University*
Expand for Abstract / Authors

Paper

Air-clad microring resonators with intrinsic quality factor exceeding 2×10^6 are fabricated based on AlN-on-sapphire platform, and dissipative Kerr solitons (DKSs) are stably generated with the help of auxiliary pump.

Authors:Yanzhen Zheng/Tsinghua University Changzheng Sun/Tsinghua University Bing Xiong/Tsinghua University Lai Wang/Tsinghua University Jian Wang/Tsinghua University Yanjun Han/Tsinghua University Zhibiao Hao/Tsinghua University Hongtao Li/Tsinghua University Jiadong Yu/Tsinghua University Yi Luo/Tsinghua University jianchang yan/Chinese Academy of Sciences Tongbo Wei/Chinese Academy of Sciences Yun Zhang/Chinese Academy of Sciences Junxi Wang/Chinese Academy of Sciences

18:00 - 18:15 **AlN microresonators fabricated with standard photolithography for broadband Kerr frequency comb generation (SW4J.4)**
Presenter: Haizhong Weng, *Trinity College Dublin*
Expand for Abstract / Authors

Paper

A near octave comb spectrum ranging from 1100 to 2150 nm is generated at 406 mW pump power for AlN microresonators fabricated with standard photolithography. This work decreases the requirement for fabrication significantly.

Authors:Haizhong Weng/Trinity College Dublin Jia Liu/Huazhong University of Science and Technology Adnan Ali Afridi/Trinity College Dublin Jing Li/Trinity College Dublin Qiaoyin Lu/Huazhong University of Science and Technology John Donegan/Trinity College Dublin Weihua Guo/Huazhong University of Science and Technology

18:15 - 18:30 **A Deterministic Method for Obtaining Large-Bandwidth Frequency Combs in Microresonators with Thermal Effects (SW4J.5)**
Presenter: Zhen Qi, *University of Maryland Baltimore County*
Expand for Abstract / Authors

Paper

We describe a deterministic method for obtaining large-bandwidth frequency combs in microresonators using cnoidal waves in the soliton crystal limit. We take thermal effects into account.

Authors:Zhen Qi/University of Maryland Baltimore County Jose Jaramillo-Villegas/Technological University of Pereira Giuseppe D'Aguanno/University of Maryland Baltimore County Thomas Carruthers/University of Maryland Baltimore County Omri Gat/Hebrew University of Jerusalem Andrew Weiner/Purdue University Curtis Menyuk/University of Maryland Baltimore County

18:30 - 18:45	**Observation of Islands of Stability in the Chaotic Regime of Kerr Frequency Combs (SW4J.6)** **Presenter**: Futai Hu, *University of California, Los Angeles* Expand for Abstract / Authors We present results on the transition from chaos to dark pulse and back to chaos with uni-directional pump tuning in Kerr microresonators using an ultrafast spectrum analyzer based on a four-wave-mixing time lens. **Authors**:Futai Hu/University of California, Los Angeles Abhinav Kumar/University of California, Los Angeles Chuancheng Jia/University of California, Los Angeles Mali Gong/Tsinghua University Chee Wei Wong/University of California, Los Angeles	Paper
18:45 - 19:00	**Photonic RF fractional Hilbert transformers and filters based on integrated soliton crystal microcombs (SW4J.7)** **Presenter**: David Moss, *Swinburne University of Technology* Expand for Abstract / Authors We report photonic RF fractional Hilbert transformers and filters based on a 49GHz soliton crystal micro-comb source. By employing up to 80 wavelengths and controlling the channel weights, diverse transfer functions are achieved. **Authors**:Xingyuan Xu/Swinburne University of Technology Mengxi Tan/Swinburne University of Technology Jiayang Wu/Swinburne University of Technology Thach Nguyen/RMIT Sai Chu/City University of Hong Kong Brent Little/Chinese Academy of Science Roberto Morandotti/INRS Arnan Mitchell/RMIT David Moss/Swinburne University of Technology	Paper

Optical Methods for Neural Imaging (SW4P)

Presider: Mahsa Ranji, *University of Wisconsin-Milwaukee*

17:00 - 18:00	**Optical interrogation of Neurovascular Coupling (SW4P.1)** **Presenter**: Ramin Pashaie, *University of Wisconsin_Milwaukee* Expand for Abstract / Authors Brain function is the result of the interaction between neural and vascular networks. We have used optical and electrophysiology techniques to interrogate the coupling between these two networks. Here we report our latest results. Ramin Pashaie received his Ph.D. from University of Pennsylvania in 2007 and continued his studies as a postdoctoral scholar at Stanford University. From September 2009 he joined the engineering school of University of Wisconsin-Milwaukee where he currently serves as an associate professor. His research is focused on neuro-imaging and neuro-engineering. **Authors**:Ramin Pashaie/University of Wisconsin_Milwaukee Tutorial	Paper

18:00 - 18:15

Whole Brain Optical Access in Adult Vertebrates: Two- and Three-Photon Imaging in a Miniature Fish, *Danionella priapus* (SW4P.2)
Presenter: Najva Akbari, *Cornell University*
Expand for Abstract / Authors

_ Paper

We use two- and three-photon microscopy to demonstrate *in vivo*, whole-brain neuroimaging in adult *Danionella priapus*, a miniature vertebrate species closely related to zebrafish (*Danio rerio*).

Authors:Najva Akbari/Cornell University Rose Tatarsky/Cornell University Kristine Kolkman/Cornell University Joseph Fetcho/Cornell University Andrew Bass/Cornell University Chris Xu/Cornell University

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18:15 - 18:30

Dual Independent Enhanced Scan Engines, Large-Field Two Photon Microscopy (DIESEL2p) (SW4P.3)
Presenter: Che-Hang Yu, *University of California, Santa Barbara*
Expand for Abstract / Authors

_ Paper

We developed a large field-of-view (Ø>5mm) two-photon microscopy with simultaneous and independent two-region access to enable the imaging of neuronal activities widely-distributed in mice’s visual cortex, which is hardly achievable with current commercial systems.

Authors:Che-Hang Yu/University of California, Santa Barbara Jeffrey Stirman/University of California, Santa Barbara Riichiro Hira/University of California, Santa Barbara Yiyi Yu/University of California, Santa Barbara Spencer Smith/University of California, Santa Barbara

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18:30 - 18:45

Widefield fluorescence optical sectioning microscopy in a miniature fiber-coupled microscope with active axial scanning (SW4P.4)
Presenter: Gabriel Martinez Sanchez, *University of Colorado Anschutz Medical Campus*
Expand for Abstract / Authors

_ Paper

We present widefield structured illumination in a miniature, light-weight fiber-coupled microscope with electrowetting axial scanning. We demonstrate imaging of YFP-labeled neurons in mouse brain tissue showing potential for fast volumetric imaging in freely moving animals.

Authors:Gabriel Martinez Sanchez/University of Colorado Anschutz Medical Campus Omkar Supekar/University of Colorado Boulder Gregory Futia/University of Colorado Anschutz Medical Campus Baris Ozbay/University of Colorado Anschutz Medical Campus Cristin Welle/University of Colorado Anschutz Medical Campus Victor Bright/University of Colorado Boulder Juliet Gopinath/University of Colorado Boulder Diego Restrepo/University of Colorado Anschutz Medical Campus Douglas Shepherd/Arizona State University Emily Gibson/University of Colorado Anschutz Medical Campus

18:45 - 19:00

Near-infrared Femtosecond Time Lens Diode Laser with kW Peak Powers for Two-Photon Microscopy (SW4P.5)
Presenter: Yonge Simmons, *University of Colorado, Boulder*
Expand for Abstract / Authors

Paper

A diode-based time lens laser with nonlinear pulse compression at 976 nm produces 700 fs pulses with 17 kW peak power. Two-photon imaging of a mouse brain slice is demonstrated with the laser.

Authors:Yonge Simmons/University of Colorado, Boulder Kenneth Underwood/University of Colorado, Boulder Brendan Heffernan/University of Colorado, Boulder Omkar Supekar/University of Colorado, Boulder Emily Gibson/University of Colorado Denver Juliet Gopinath/University of Colorado, Boulder

High-power Optics (SW4E)

Presider: Lynda Busse, *US Naval Research Laboratory*

17:00 - 17:15

Ultrafast Multiphoton Absorption in Optical-Coating Materials at Near-Damage-Threshold Fluence (SW4E.1)
Presenter: Vitaly Gruzdev, *University of New Mexico*
Expand for Abstract / Authors

Paper

Multiphoton absorption substantially contributes to the initiation of laser damage of optical coatings by ultrashort laser pulses. Here we report a simulation approach to fix some assumptions of the traditional models violated at near-damage-threshold fluence.

Authors:Vitaly Gruzdev/University of New Mexico Kyle Kafka/University of Rochester

17:15 - 17:30

Integrated-Flow Active Cooling for the Thermal Management of Reflective Optics Under High-Average-Power Load (SW4E.2)
Presenter: Erik Power, *University of Rochester*
Expand for Abstract / Authors

Paper

We developed multi-physics numerical models for high-power reflective optics with integrated active cooling of low-expansion ceramic substrates. They predict a 400× improvement in average-power handling versus passive cooling. © 2020 The Author(s)

Authors:Erik Power/University of Rochester Jake Bromage/University of Rochester Jonathan Zuegel/University of Rochester

17:30 - 18:00

High Power Optical Breakdown and Design to Combat Dirt and Airborne Particles (SW4E.3)

Presenter: Joseph Talghader, *University of Minnesota Twin Cities*

Expand for Abstract / Authors

Paper

Traditional design involves the spectrum of an optic, but mechanical and materials properties must be included for high CW power. High bandgaps and low stress maximize damage thresholds in the presence of dirt and particles.

Authors:Joseph Talghader/University of Minnesota Twin Cities

Invited

18:00 - 18:15

Large-area Flat Optics via Immersion Lithography on CMOS Platform for Laser Beam Shaping (SW4E.4)

Presenter: Yuan Hsing Fu, *Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research)*

Expand for Abstract / Authors

Paper

We report a large-area metasurface beam shaper via 12-inch immersion lithography CMOS platform. A 3 × 3 mm^2 metasurface beam shaper is designed to transfer a Gaussian intensity distribution to a Top-Hat intensity distribution.

Authors:Yuan Hsing Fu/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Nanxi Li/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Lei Chen/Wavelength Opto-Electronic (S) Pte Ltd Qize Zhong/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Yuan Dong/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Dongdong Li/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Zhengji Xu/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Ting Hu/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Yanyan Zhou/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Keng Heng Lai/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Min Zhu/Wavelength Opto-Electronic (S) Pte Ltd Shiyang Zhu/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Qunying Lin/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Shengdi Huang/Wavelength Opto-Electronic (S) Pte Ltd Navab Singh/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research)

18:15 - 18:30 **(Withdrawn) Robust Metasurfaces with Tailored Graded Index for High Power Laser Applications (SW4E.5)**
Presenter: Nathan Ray, *Lawrence Livermore National Laboratory*
Expand for Abstract / Authors

Solid-state diffusional dewetting is utilized to produce randomly oriented ensembles of nanoparticles on large scales, which then function as dry etching masks for generation of durable metasurfaces for antireflective and metaoptics applications.

Authors:Nathan Ray/Lawrence Livermore National Laboratory Jae-Hyuck Yoo/Lawrence Livermore National Laboratory Hoang Nguyen/Lawrence Livermore National Laboratory Michael Johnson/Lawrence Livermore National Laboratory Salmaan Baxamusa/Lawrence Livermore National Laboratory Selim Elhadj/Lawrence Livermore National Laboratory Eyal Feigenbaum/Lawrence Livermore National Laboratory

18:30 - 18:45 **(Withdrawn) Study on the Beam Smoothness Characteristic of 3×3 array lasers based on Independent Beams (SW4E.6)**
Presenter: Ping Li, *Research Center of Laser Fusion of CAEP*
Expand for Abstract / Authors

An experimental platform of 3×3 array lasers (Octuplet) with the strongest output in the world is established, and its optimal performance such as beam smoothing and pulse precise control based on independent beams is verified.

Authors:Ping Li/Research Center of Laser Fusion of CAEP Bing Feng/Research Center of Laser Fusion of CAEP

18:45 - 19:00 **Coherence Length Measurements Under Strong Scintillation Conditions Using a Five-layer Laboratory-scaled Atmospheric Simulator (SW4E.7)**
Presenter: Alexandre Braga, *Applied Technology Associates*
Expand for Abstract / Authors

Paper

Measurements of structure functions and coherence lengths using two separate sensors in an atmospheric turbulence simulator shows realistic Kolmogorov statistics. The system provides accurate optical benchtop simulations of beam propagation under strong scintillation conditions.

Authors:Alexandre Braga/Applied Technology Associates Denis Oesch/Leidos Mark Spencer/Air Force Research Laboratory

Graphene (SW4F)

Presider: Oana Malis

17:00 - 17:15	**Tunable Terahertz Light Emission from Current-Driven Graphene Plasmonic Oscillators (SW4F.1)** **Presenter**: Yuyu Li, *Boston Unviersity* Expand for Abstract / Authors Pronounced terahertz emission peaks originating from current-driven plasmonic oscillations in graphene nanoribbons are measured. The emission frequency can be tuned by design through the ribbon width and actively by varying the applied gate voltage. **Authors**:Yuyu Li/Boston Unviersity Pablo Ferreyra/Boston Unviersity Anna Swan/Boston Unviersity Roberto Paiella/Boston Unviersity	Paper
17:15 - 17:30	**(Withdrawn) Graphene-based Mid-infrared Thermal Emitters (SW4F.2)** **Presenter**: Geoffrey Nash, *The University of Exeter* Expand for Abstract / Authors The incorporation of a back reflector is shown to dramatically increase the light output from a graphene-based mid-infrared thermal emitter, demonstrating the feasibility of using these devices in applications such as gas sensing. **Authors**:Prarthana Gowda/The University of Exeter Cheng Shi/The University of Exeter Geoffrey Nash/The University of Exeter	
17:30 - 17:45	**Large Scale Fabrication of Graphene Nanostructures (SW4F.3)** **Presenter**: Joel Siegel, *University of Wisconsin-Madison Physics* Expand for Abstract / Authors Patterning graphene into nanostructures enables the coupling of free space radiation to plasmons in graphene. Here, we demonstrate block copolymer based fabrication can create sub 20 nm nanostructures in a scalable, efficient, and repeatable manner. **Authors**:Joel Siegel/University of Wisconsin-Madison Physics Jonathan Dwyer/University of Wisconsin-Madison Anjali Suresh/University of Wisconsin-Madison Margaret Fortman/University of Wisconsin-Madison Physics Padma Gopalan/University of Wisconsin-Madison Victor Brar/University of Wisconsin-Madison Physics	Paper

17:45 - 18:00	**Towards active photonic dispersion control using graphene-induced non-radiative loss (SW4F.4)** **Presenter**: Jeremy Lhuillier, *Ecole Centrale de Lyon* Expand for Abstract / Authors We show that the photonic dispersion of a two coupled-mode system can be actively tuned using graphene-induced non-radiative loss. Our implementation exploits the spatial modulation of graphene's absorption via patterned oxide substrates. **Authors**:Jeremy Lhuillier/Ecole Centrale de Lyon Pierre Demongodin/Ecole Centrale de Lyon Thomas Wood/Ecole Centrale de Lyon Malik kemiche/Ecole Centrale de Lyon Bertrand Vilquin/Ecole Centrale de Lyon Genevieve Grenet/Ecole Centrale de Lyon Sébastien Cueff/Ecole Centrale de Lyon Pedro Rojo-Romeo/Ecole Centrale de Lyon Xavier Letartre/Ecole Centrale de Lyon Christelle Monat/Ecole Centrale de Lyon	Paper
18:00 - 18:15	**Graphene Nanowalls Field Effect Structure Photodetector and Its Light Response Mechanism (SW4F.5)** **Presenter**: Fengsong Qian, *Beijing University of Technology* Expand for Abstract / Authors Graphene nanowalls were first used to prepare field effect structure photodetector, which has a responsivity ten times higher than that of monolayer graphene detector with the same structure. **Authors**:Fengsong Qian/Beijing University of Technology Yibo Dong/Beijing University of Technology Liangchen Hu/Beijing University of Technology Qiuhua Wang/Beijing University of Technology Jie Sun/Beijing University of Technology Yiyang Xie/Beijing University of Technology Chen Xu/Beijing University of Technology	Paper
18:15 - 18:30	**Electronic and UV light programmable doping in graphene for memory applications (SW4F.6)** **Presenter**: Christian Frydendahl, *Hebrew University of Jerusalem* Expand for Abstract / Authors We demonstrate the integration of graphene with conventional flash memory technology. The structure allows for programmable memory by electrostatic doping in graphene. The device could also find applications in tunable plasmonics, chemical sensing, photodetection, etc. **Authors**:Christian Frydendahl/Hebrew University of Jerusalem SITA RAMA KRISHNA INDUKURI/Hebrew University of Jerusalem Meir Grajower/Hebrew University of Jerusalem Noa Mazurski/Hebrew University of Jerusalem Joseph Shappir/Hebrew University of Jerusalem Uriel Levy/Hebrew University of Jerusalem	Paper

18:30 - 18:45

Graphene Assisted Preparation of Large area Ag Nanoparticles with Periodic Arrangement towards Raman Enhancement (SW4F.7)
Presenter: Yibo Dong, *Beijing University of Technology*
Expand for Abstract / Authors

Paper

A graphene assisted method for preparation of large area Ag NPs with periodic arrangement is introduced in this paper. Graphene is used as a perfect barrier layer to prevent Ag atoms from evaporation.

Authors:Yibo Dong/Beijing University of Technology Chen Xu/Beijing University of Technology Yiyang Xie/Beijing University of Technology guanzhong pan/Beijing University of Technology Qiuhua Wang/Beijing University of Technology Jie Sun/Beijing University of Technology

18:45 - 19:00

Preparation of Few-layer Black Phosphorus with Enhanced Photoluminescence and Stability (SW4F.8)
Presenter: Dongying Li, *Arizona State University*
Expand for Abstract / Authors

Paper

We propose a method to prepare few-layer black phosphorus by oxygen plasma etching, followed by boron nitride encapsulation and thermal annealing. This method produces few-layer black phosphorus with strongly enhanced photoluminescence and greatly improved stability.

Authors:Dongying Li/Arizona State University Yueyang Yu/Arizona State University Cunzheng Ning/Arizona State University

Mid-Infrared Photonics and Sensing (SW4N)

Presider: Matthew Grein, *Massachusetts Inst of Tech Lincoln Lab*

17:00 - 17:15

Spectrally and temporally resolved mid-infrared imaging by Adiabatic Sum Frequency upconversion (SW4N.1)
Presenter: Michael Mrejen, *Tel Aviv University*
Expand for Abstract / Authors

Paper

We introduce a broadband mid-infrared upconversion imaging scheme based on adiabatic frequency conversion. Contrary to state-of-the-art upconversion imaging limited by phase matching, our method does not require serial acquisitions to cover a large spectrum.

Authors:Michael Mrejen/Tel Aviv University Yonatan Erlich/Tel Aviv University Assaf Levanon/Tel Aviv University Haim Suchowski/Tel Aviv University

17:15 - 17:30

Ultra-broadband complementary vibrational spectroscopy with cascaded intra-pulse difference frequency generation (SW4N.2)
Presenter: Kazuki Hashimoto, *The University of Tokyo*
Expand for Abstract / Authors

Paper

We demonstrate ultra-broadband dual-modal Fourier-transform spectroscopy simultaneously measuring infrared absorption and Raman scattering spectra spanning from 800 to 2900 cm^{-1} by expanding infrared spectrum via cascaded intra-pulse difference frequency generation.

Authors:Kazuki Hashimoto/The University of Tokyo Venkata Ramaiah Badarla/The University of Tokyo Takuro Ideguchi/The University of Tokyo

17:30 - 18:00

Nonlinear Infrared Photothermal Imaging (SW4N.3)
Presenter: Michelle Sander, *Boston University*
Expand for Abstract / Authors

Paper

Infrared photothermal imaging in the fingerprint region offers label-free chemical characterization with insights into absorption and thermal diffusion. Nonlinear phenomena and detection are presented to enhance sensitivity and contrast for biomedical tissue imaging.

Authors:Michelle Sander/Boston University

Invited

18:00 - 18:15

Mid-infrared photon-number-resolving detection based on efficient nonlinear frequency conversion (SW4N.4)
Presenter: Kun Huang, *Univ of Shanghai for Sci & Tech*
Expand for Abstract / Authors

Paper

We have implemented a coincidence-pumping frequency upconversion system with a nonlinear conversion efficiency up to 80%, which enabled to demonstrate high-performance mid-infrared photon detection and photon-number-resolving capability at 3.1 μm.

Authors:Weiyan Kang/Univ of Shanghai for Sci & Tech Jiamei Wu/Univ of Shanghai for Sci & Tech Yan Liang/Univ of Shanghai for Sci & Tech Ming Yan/State Key Laboratory of Precision Spectroscopy, East China Normal University Kun Huang/Univ of Shanghai for Sci & Tech Heping Zeng/Univ of Shanghai for Sci & Tech

18:15 - 18:30 **A Real-time Radio Frequency Spectrum Analyzer With1.8 THz Bandwidth (SW4N.5)**
Presenter: Ruolan Wang, *Wuhan National Laboratory for Optoelectr*
Expand for Abstract / Authors

Paper

An optimized real-time radio frequency spectrum analyzer is experimentally demonstrated. By eliminating third-order dispersion, the bandwidth is increased by 2.25 times up to 1.8-THz and 1-GHz resolution is achieved with 20-MHz frame rate.

Authors:Ruolan Wang/Wuhan National Laboratory for Optoelectr liao chen/Wuhan National Laboratory for Optoelectr Hao Hu/Wuhan National Laboratory for Optoelectr Yanjing Zhao/Wuhan National Laboratory for Optoelectr Chi Zhang/Wuhan National Laboratory for Optoelectr Xinliang Zhang/Wuhan National Laboratory for Optoelectr

18:30 - 18:45 **Carrier-Envelope Offset-Free Pulse Train by Difference-Frequency Generation from a Silicon-Nitride-Waveguide Supercontinuum Output (SW4N.6)**
Presenter: Robert Herda, *TOPTICA Photonics AG*
Expand for Abstract / Authors

Paper

We present a novel approach to generate a frequency comb based on Difference Frequency Generation (DFG). The frequency components required for the DFG process are generated in a silicon-nitride waveguide.

Authors:Robert Herda/TOPTICA Photonics AG Florian Kienle/TOPTICA Photonics AG Ali Seer/TOPTICA Photonics AG Christoph Tresp/TOPTICA Photonics AG Evelyn Niedermaier/Hochschule für angewandte Wissenschaften Miles Anderson/EPFL Tobias Kippenberg/EPFL Anton Stroganov/LIGENTEC SA Gabriele Navickaite/LIGENTEC SA Davide Sacchetto/LIGENTEC SA Michael Geiselmann/LIGENTEC SA Wilhelm Kaenders/TOPTICA Photonics AG

18:45 - 19:00 **6-octave UV to MIR frequency comb driven by a <10 fs Er:fiber laser (SW4N.7)**
Presenter: Daniel Lesko, *NIST*
Expand for Abstract / Authors

Paper

We present a 6-octave frequency comb (0.35-22.4 micron) driven by a 9.4 fs, 0.56 MW peak power Er:fiber laser at 100 MHz. Through intrapulse difference frequency generation we produce 5 mW of broadband MIR radiation.

Authors:Daniel Lesko/NIST Henry Timmers/NIST Sida Xing/NIST Abijith Kowligy/NIST Alexander Lind/NIST Kevin Zawilski/BAE Systems Peter Schunemann/BAE Systems Scott Diddams/NIST

Quantum Optics in Atomic Ensembles (FW4C)
Presider: zhongzhong Qin, *California Institute of Technology*

17:00 - 17:15 **A Single Mode Optical Cavity Containing Four (up to 1000) Independent Spin Waves (FW4C.1)**
Presenter: Kevin Cox, *US Army Research Laboratory*
Expand for Abstract / Authors

Paper

We present an experimental scheme for many-body quantum electrodynamics by multiplexing of cavity-coupled spin-wave excitations. We experimentally observe the core phenomena and point the way toward creating many-body entanglement in a test-bed quantum network.

Authors:Kevin Cox/US Army Research Laboratory Zachary Castillo/US Army Research Laboratory David Meyer/US Army Research Laboratory Paul Kunz/US Army Research Laboratory

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17:15 - 17:30 **Quantum phase synchronization and blockade in spin-1 system (FW4C.2)**
Presenter: Pratik Adhikary, *Indian Institute of Technology Kanpur*
Expand for Abstract / Authors

Paper

We report observation of quantum phase synchronization of spin-1 atoms, with the relative phase getting entrained with external drive phases in presence of anisotropic decay channels.

Authors:Pratik Adhikary/Indian Institute of Technology Kanpur Arif Laskar/Indian Institute of Technology Kanpur Suprodip Mondal/Indian Institute of Technology Kanpur Parag Katiyar/Indian Institute of Technology Kanpur Sai Vinjanampathy/Indian Institute of Technology, Bombay Saikat Ghosh/Indian Institute of Technology Kanpur

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17:30 - 17:45 **Quantum Enhancement of Optical Measurements using Four-wave Mixing in Rb vapor (FW4C.3)**
Presenter: Irina Novikova, *College of William & Mary*
Expand for Abstract / Authors

Paper

Using four-wave mixing in hot Rb vapor, we demonstrate the production of two-mode intensity squeezing between beams with significantly different optical angular momenta and an all-optical polarization-based truncated SU(1,1) interferometer for all-optical quantum-enhanced imaging and sensing.

Authors:Irina Novikova/College of William & Mary Nikunj Prajapati/College of William & Mary Savannah Cuozzo/College of William & Mary Elisha Siddiqui/Louisiana State University Lior Cohen/Louisiana State University Jonathan Dowling/Louisiana State University Eugeniy Mikhailov/College of William & Mary

17:45 - 18:00 **Conversion from Telecom to Atomic Photons by Four-Wave Mixing in a Warm Rb Cell (FW4C.4)** [Paper]
Presenter: Jonathan Kwolek, *U.S. Naval Research Laboratory*
Expand for Abstract / Authors

We convert telecom photons at 1530 nm to atomic photons on the ^{87}Rb D1 transition at 795 nm in a warm vapor with efficiency near 10% by employing efficient optical pumping and four-wave mixing.

Authors:Michal Piotrowicz/Jacobs Adam Black/U.S. Naval Research Laboratory Jonathan Kwolek/U.S. Naval Research Laboratory Mark Bashkansky/U.S. Naval Research Laboratory

18:00 - 18:15 **Demonstration of an Atomic Frequency Comb Quantum Memory Using Velocity-Selective Pumping in Warm Alkali Vapour (FW4C.5)** [Paper]
Presenter: Thomas Hird, *University of Oxford*
Expand for Abstract / Authors

We present the first demonstration of velocity-selective pumping in an atomic vapour to preserve light-matter coherence. Control is illustrated by a subsequent demonstration of an atomic frequency comb quantum memory realised in the vapour.

Authors:Thomas Hird/University of Oxford Dougal Main/University of Oxford Shaobo Gao/University of Oxford Eren Oğuz/University of Oxford Dylan Saunders/University of Oxford Ian Walmsley/University of Oxford Patrick Ledingham/University of Oxford

18:15 - 18:30 **Simultaneous laser cooling of multiple atomic species using an optical frequency comb (FW4C.6)** [Paper]
Presenter: Ticijana Ban, *Institut za Fiziku*
Expand for Abstract / Authors

We report on simultaneous laser cooling of two rubidium isotopes by using a frequency comb. Cooling is achieved by using two different comb modes from the spectrum of the frequency comb, on a dipole-allowed transition and in a one dimensional beam geometry.

Authors:Ticijana Ban/Institut za Fiziku Damir Aumiler/Institut za Fiziku Danijel Buhin/Institut za Fiziku Fabian Schmidt/Max Planck Institute of Quantum Optics Mateo kruljac/Institut za Fiziku Domagoj Kovacic/Institut za Fiziku

18:30 - 18:45 **Single-Shot Absorption Imaging of Ultracold Atoms Using Deep-Neural-Network (FW4C.7)**
Presenter: Gal Ness, *Technion - Israel Institute of Technology*
Expand for Abstract / Authors

[Paper]

We demonstrate the use of a deep-neural-network to perform absorption imaging of ultracold atoms in a single exposure. The noise in the resulting images is smaller, hence physical observables can be extracted with better accuracy.

Authors:Gal Ness/Technion - Israel Institute of Technology Anastasiya Vainbaum/Technion - Israel Institute of Technology Constantine Shkedrov/Technion - Israel Institute of Technology Yanay Florshaim/Technion - Israel Institute of Technology Yoav Sagi/Technion - Israel Institute of Technology

18:45 - 19:00 **Interferometric Control of Photo-Chemical Reactions in ^{87}Rb Bose-Einstein Condensates (FW4C.8)**
Presenter: Hasan Kondakci, *Purdue University*
Expand for Abstract / Authors

[Paper]

We report on an interferometric control of photo-chemical reactions in ^{87}Rb condensates, where the scattering channels behaves as if the arms of an interferometer. We control the relative phase between the scattering channels by exploiting the quadratic Zeeman shift at low magnetic field strengths.

Authors:Hasan Kondakci/Purdue University David Blasing/Purdue University Chuan-Hsun Li/Purdue University Yong Chen/Purdue University

Fiber Lasers II (SW4R)

Presider: Guoqing Chang, *Institute of Physics, CAS*

17:00 - 17:15 **Compact, alignment-free, environmentally stable dispersion compensated femtosecond Yb-fiber oscillator (SW4R.1)**
Presenter: Yuxuan Ma, *DESY*
Expand for Abstract / Authors

[Paper]

We demonstrate a fully integrated alignment free, femtosecond Yb:fiber laser operating in the stretched pulse regime. After compression, the laser provides a long-term stable output of 104 fs pulses at 76 MHz repetition rate.

Authors:Yuxuan Ma/DESY Haydar Salman/DESY Chen Li/DESY Christoph Mahnke/DESY Jakob Fellinger/University of Vienna Aline Sophie Mayer/University of Vienna Oliver Heckl/University of Vienna Christoph Heyl/DESY Ingmar Hartl/DESY

17:15 - 17:30

All-PM dual-comb fiber ring laser using CNT-SA (SW4R.2)
Presenter: Kota Uyama, *The University of Tokyo*
Expand for Abstract / Authors

Paper

We propose a new truly all-PM dual-comb fiber laser using CNT-SA. We demonstrated stable polarization-multiplexed mode-locked operation by compensating the PDL. The repetition frequency difference between the two polarization-multiplexed outputs was 413 Hz.

Authors:Kota Uyama/The University of Tokyo takuma shirahata/The University of Tokyo Lei Jin/The University of Tokyo Sze Set/The University of Tokyo Shinji Yamashita/The University of Tokyo

17:30 - 17:45

Generation of 64 fs, 10 kW Peak-Power, Transform-Limited Pulses Directly From an Yb-Doped Figure-9 F iber Laser (SW4R.3)
Presenter: Marvin Edelmann, *Universität Oldenburg*
Expand for Abstract / Authors

Paper

We numerically and experimentally generate transform-limited, 64 fs pulses with 10 kW peak-power directly from the output of a modified Yb-doped Figure-9 fiber laser by overdriving the transmittance of the NALM.

Authors:Marvin Edelmann/Universität Oldenburg Yi hua/DESY Andrea Koch/University of Applied Science and Art Franz KÄRTNER/DESY

17:45 - 18:00

2 GHz Regeneratively Mode-locked Laser at 2 Micron (SW4R.4)
Presenter: Jiarong Qin, *Nanjing University*
Expand for Abstract / Authors

Paper

We have for the first time demonstrated a 2 GHz regeneratively mode-locked 2 μm fiber laser with PLL operation, which shows long-term stability. Such a source is well suited for soliton communications and signal processing.

Authors:Jiarong Qin/Nanjing University Weiqi Jiang/Nanjing University Shiyu Zhu/Nanjing University Ruihong Dai/Nanjing University Yafei Meng/Nanjing University Yao Li/Nanjing University Fengqiu Wang/Nanjing University

18:00 - 18:15

1.6-1.7 um Wavelength Tunable, All-Polarization Maintaining, Dual-Comb Fiber Laser with Single Wall Carbon Nanotube for Dual Comb Spectroscopy (SW4R.5)
Presenter: Norihiko Nishizawa, *Nagoya University*
Expand for Abstract / Authors

Paper

We developed 1.6-1.7 um wavelength tunable, polarization-maintaining dual comb fiber laser. Spectral width was controlled and wideband measurement was realized without bandpass filters. Absorption spectra of CH_4 gas was observed in this wide range.

Authors:Norihiko Nishizawa/Nagoya University Yuki Kanehara/Nagoya University Masahito Yamanaka/Nagoya University Ryohei Terabayashi/Nagoya University Emiko Omoda/AIST hiromichi kataura/AIST Youichi Sakakibara/AIST

18:15 - 18:30

(Withdrawn) SimpleCW-UV generator by SHG technique with double-clad Pr-doped waterproof fluoro-aluminate glass fiber laser (SW4R.6)
Presenter: Yasushi Fujimoto, *Chiba Institute of Technology*
Expand for Abstract / Authors

Wedemonstrated a CW-UV output over 500 mW using a single-mode double-clad structured Pr-doped waterproof fluoride glass fiber laser by a SHG technique and suggest this system produces a very unique and simple CW-UV generator.

Authors:Yasushi Fujimoto/Chiba Institute of Technology Masamori Nakahara/Kimmon Koha Co., Ltd. Paul Binun/Kimmon Koha Co., Ltd. Shinji Motokoshi/Institute for Laser Technology Osamu Ishii/Sumita Optical Glass, Inc. Muneyuki Watanabe/Sumita Optical Glass, Inc. Masaaki Yamazaki/Sumita Optical Glass, Inc. Tsutomu Shinozaki/Kimmon Koha Co., Ltd. Tsuyoshi Sato/Kimmon Koha Co., Ltd. Masaki Fukagawa/Kimmon Koha Co., Ltd.

18:30 - 18:45

Dispersion-managed Tm-doped fiber laser mode-locked with a black phosphorus saturable absorber (SW4R.7)
Presenter: Meng Zhang, *Beihang University*
Expand for Abstract / Authors

Paper

We demonstrate an all-fiber Tm-doped mode-locked fiber laser utilizing a black phosphorus saturable absorber. The oscillator delivers self-starting, 139 fs pulses centered at 1859 nm with 55.6 nm spectral bandwidth.

Authors:Qian Zhang/Beihang University Xinxin Jin/Beihang University Guohua Hu/University of Cambridge Meng Zhang/Beihang University Zheng Zheng/Beihang University Tawfique Hasan/University of Cambridge

18:45 - 19:00

Femtosecond Nd:fiber laser at 920nm mode-locked by biased NALM (SW4R.8)
Presenter: Siying Wang, *Peking University*
Expand for Abstract / Authors

Paper

We demonstrate a mode-locked NALM polarization-maintaining Nd:fiber laser at 920 nm with a repetition rate of 43.6 MHz. The average output power is 8 mW and the pulse width is 109 fs.

Authors:Siying Wang/Peking University Yijun Li/Beijing Transcend Vivoscope Biotech Co., Ltd Yanchuan Chen/Beijing Transcend Vivoscope Biotech Co., Ltd Yuqian Gao/Beijing Transcend Vivoscope Biotech Co., Ltd Zhigang Zhang/Peking University Aimin Wang/Peking University

Far Infrared to Terahertz Band Semiconductor Devices (AW4M)

Presider: Oleg Khodykin, *KLA-Tencor Corp*

17:00 - 17:30

(Withdrawn) Quantum Engineering of Broadband Quantum Cascade THz Lasers Operating as Random Sources or Fully Stabilized Optical Frequency Comb Synthesizers (AW4M.1)
Presenter: Miriam Vitiello, *Scuola Normale Superiore di Pisa*
Expand for Abstract / Authors

We demonstrate low spatially coherent and highly temporal coherent, broadband, continuous-wave quantum-cascade random-lasers and record dynamic range, high-power, fully stabilized, QCL frequency-combs opening the route for novel applications in speckle-free imaging and quantum-metrology.

Authors:Miriam Vitiello/Scuola Normale Superiore di Pisa

Invited

17:30 - 17:45

High-power continuously tunable terahertz beat note generation based on a generic photonic integration platform (AW4M.2)
Presenter: PENGLI AN, *Aarhus University*
Expand for Abstract / Authors

Paper

We generate a continuously tunable terahertz beat note, with a maximum output power of 50 mW and frequency range from 807 to 915 GHz, by using the device implemented on a generic photonic integration platform.

Authors:PENGLI AN/Aarhus University Erwin Bente/Eindhoven University of Technology Martijn Heck/Aarhus University

17:45 - 18:00

A Thin Film Black Phosphorus Light-Emitting Diode (AW4M.3)
Presenter: Junjia Wang, *Polytechnique Montreal*
Expand for Abstract / Authors

Paper

We demonstrate a black phosphorus light-emitting diode based on a black phosphorus/molybdenum disulfide heterostructure. The device shows an electroluminescence maximum at a wavelength of 3.68 µm with an internal quantum efficiency of ~1%.

Authors:Junjia Wang/Polytechnique Montreal Adrien Rousseau/Polytechnique Montreal Mei Yang/Polytechnique Montreal Tony Low/University of Minnesota Sébastien Francoeur/Polytechnique Montreal Stéphane Kéna-Cohen/Polytechnique Montreal

18:00 - 18:30

Absorption Enhancement in Terahertz Photoconductive Antenna by Means of the Novel Types of Metamaterials (AW4M.4)
Presenter: Tatjana Gric, *Aston university*
Expand for Abstract / Authors

Paper

We numerically investigate terahertz photoconductive antenna based on optimized plasmonic nanostructures, stressing the stronger enhancement in case of transparent conducting oxide nanowires. The case is treated by means of local and nonlocal effective medium approximations.

Authors:Tatjana Gric/Aston university Edik Rafailov/Aston university

Invited

18:30 - 18:45

Frequency blue chirp in Fabry-Perot cavity QCL (AW4M.5)
Presenter: Dmitri Boiko, *CSEM*
Expand for Abstract / Authors

Paper

The spectral measurement of the blue chirped emission in FP cavity QCL operating at 8.15 µm has been successfully demonstrated. The output frequency of the laser was swept over the spectral range of 25 cm^{-1} within 2 µs.

Authors:Sanghoon Chin/CSEM Valentin Mitev/CSEM Dmitri Boiko/CSEM

18:45 - 19:00 **Co-Occurrence of Resonance and Non-Resonance Tunneling Injection Processes in Quantum Dot Gain Media (AW4M.6)**
Presenter: Igor Khanonkin, *Technion- Israel Institute of Technology*
Expand for Abstract / Authors

Paper

Resonance and non-resonance tunneling processes in tunneling injection quantum dot gain media were demonstrated, to occur simultaneously. Our finding sheds light on the basic tunneling injection schemes and their proper utilization in quantum dot lasers.

Authors:Igor Khanonkin/Technion- Israel Institute of Technology Ori Eyal/Technion- Israel Institute of Technology Sven Bauer/Kassel University Johann Reithmaier/Kassel University Gadi Eisenstein/Technion- Israel Institute of Technology

Optimization of Laser Based Manufacturing (AW4I)

Presider: Dirk Mueller, *Coherent Inc*

17:00 - 17:30 **Ultrafast laser ablation of silicon with ~GHz bursts (AW4I.1)**
Presenter: Jan Kleinert, *MKS|ESI*
Expand for Abstract / Authors

Paper

We report on a systematic study of silicon ablation with 864 MHz bursts of green fs laser pulses, compare it to non-burst benchmark results and elucidate the key ablation mechanisms via a hydrodynamic multiphysics model.

Authors:Jan Kleinert/MKS|ESI Hisashi Matsumoto/MKS|ESI Zhibin Lin/MKS|ESI

Invited

17:30 - 17:45 **GHz femtosecond ablation: efficiency and quality aspects (AW4I.2)**
Presenter: Clemens Hoenninger, *Amplitude Systemes*
Expand for Abstract / Authors

Paper

GHz femtosecond ablation results in high specific removal rates. The efficiency increase can be explained by combined non-thermal and thermal contributions in the laser-matter interaction. We study the impact of the efficiency gain on the obtained processing quality.

Authors:Guillaume Bonamis/Amplitude Systemes Konstantin Mishchik/Amplitude Systemes Eric Audouard/Amplitude Systemes Eric Mottay/Amplitude Systemes Clemens Hoenninger/Amplitude Systemes John Lopez/Université Bordeaux Inka Manek-Hönninger/Université Bordeaux

17:45 - 18:00

Investigations Concerning the Removal Rate and Surface Quality for Laser Machining with GHz bursts in Real Surface Structuring Applications (AW4I.3)
Presenter: Beat Neuenschwander, *Bern University of Applied Sciences*
Expand for Abstract / Authors

Paper

fs-GHz-burst experiments with up to 25 pulses per burst show strong melting effects and a tremendous decrease of the removal rate. The latter follows the tendency obtained for single pulses of corresponding pulse duration.

Authors:Beat Neuenschwander/Bern University of Applied Sciences Stefan Remund/Bern University of Applied Sciences Markus Gafner/Bern University of Applied Sciences Michalina Veronika Chaja/Bern University of Applied Sciences Aivaras Urniezius/LIGHTCONVERSION Simas Butkus/LIGHTCONVERSION

18:00 - 18:15

Nonlinear Resolution: A Misconception in Femtosecond Laser Ablation (AW4I.4)
Presenter: Mario Garcia-Lechuga, *CNRS/Aix-Marseille Univ.*
Expand for Abstract / Authors

Paper

We demonstrate a systematic one-to-one mapping between femtosecond laser ablation features and beam contours at a strict threshold-intensity. This is independent of the nonlinearity of interaction varied using various wavelengths and dielectric materials.

Authors:Mario Garcia-Lechuga/CNRS/Aix-Marseille Univ. Olivier Utéza/CNRS/Aix-Marseille Univ. Nicolas Sanner/CNRS/Aix-Marseille Univ. Andong Wang/CNRS/Aix-Marseille Univ. David Grojo/CNRS/Aix-Marseille Univ.

18:15 - 18:30

(Withdrawn) High Throughput Surface Functionalization of Injection Molds with High Average Power Femtosecond Lasers (AW4I.5)
Presenter: Rainer Kling, *ALPhANOV*
Expand for Abstract / Authors

Direct laser texturing on metal surfaces has be applied to modify bacterial adhesion. To avoid biofilm generation on dish washers we present the high troughput surface functionalization and antibacterial performance of the water tank.

Authors:Rainer Kling/ALPhANOV Laura Gemini/ALPhANOV Luca Romoli/Università degli Studi di Parma Javier Graus/Infinitia Reseach S.L Marc Faucon/ALPhANOV benoit tropheme/Amplitude Clemens Hoenninger/Amplitude

18:30 - 18:45

Laser Additive Manufacturing through Opto-thermo-mechanical Printing under Ambient Conditions (AW4I.6)
Presenter: Md Shah Alam, *University of Dayton*
Expand for Abstract / Authors

Paper

This work represents a low-cost additive manufacturing using laser assisted thermo-mechanical printing of metallic nanoparticles under ambient conditions. This method offers enormous prospective in 3D printing technology at submicron and nano scale.

Authors:Md Shah Alam/University of Dayton Chenglong Zhao/University of Dayton

18:45 - 19:00

Laser De-bonding from Silicon Wafers with Picosecond 2.09- µm Holmium Laser (AW4I.7)
Presenter: Ignas Astrauskas, *Photonics institute, TU Wien*
Expand for Abstract / Authors

Paper

We study an effect of pulse duration of 2.09-mm laser on the laser de-bonding of gold from silicon wafers. Developed picosecond Ho:YAG laser with a simple dispersion management is found to be optimal for the process.

Authors:Ignas Astrauskas/Photonics institute, TU Wien Boris Povazay/EV Group E.Thallner GmbH Audrius Pugzlys/Photonics institute, TU Wien Andrius Baltuska/Photonics institute, TU Wien

Thursday, 14 May

All Times are Pacific Time (US & Canada) (UTC - 07:00)

8:00 - 10:00 (UTC - 07:00)

Symp: Single-shot Ultrafast Imaging (JTh1G)
Presider: Lihong Wang

Special Symposium

8:00 - 8:30 **Extension of STAMP technology for single-shot imaging of ultrafast laser-matter interactions (JTh1G.1)** Paper
Presenter: Keiichi Nakagawa, *University of Tokyo*
Expand for Abstract / Authors

We present the current development and applications of sequentially timed all-optical mapping photography (STAMP), and show multi-timescale imaging, named nesting high-speed videography, based on the combination of ultrafast optical imaging and high-speed camera.

Authors:Keiichi Nakagawa/University of Tokyo Takakazu Suzuki/Keio University Takao Saiki/University of Tokyo Fumihiko Kannari/Keio University

Invited

8:30 - 9:00 **(Withdrawn) Femtosecond videography using the FRAME technique (JTh1G.2)**
Presenter: Elias Kristensson, *Lunds Universitet*
Expand for Abstract / Authors

FRAME is a laser-based multiplexed imaging technique that can provide femtosecond videography. This talk will describe the working principles of FRAME and its advantages for spectroscopic investigations of non-repetitive ultrafast transient events.

Authors:Elias Kristensson/Lunds Universitet

Invited

9:00 - 9:30	**Compressed Ultrafast Photography: Imaging Light-Speed Events in a Snapshot (JTh1G.3)** **Presenter**: Jinyang Liang, *Institut National de la Recherche Scientifique* Expand for Abstract / Authors We review the operating principle of compressed ultrafast photography (CUP)—the world's fastest single-shot receive-only 2D imaging modality. We will also discuss representative recent advances of CUP in hardware improvement, software development, and application exploration. **Authors**:Jinyang Liang/Institut National de la Recherche Scientifique Invited	Paper
9:30 - 10:00	**Multi-Tap Charge Modulator Based Ultra-Fast Computational CMOS Image Sensors for Single-Shot and Repeatable Image Acquisition (JTh1G.4)** **Presenter**: Keiichiro Kagawa, *Shizuoka University* Expand for Abstract / Authors A computational CMOS image sensor with programmable temporal shutters is developed. The macro-pixel structure enables to utilize ordinary single-aperture lenses. The pixel is based on the lateral electric-field charge modulator (LEFM) with a sub-nanosecond response. **Authors**:Keiichiro Kagawa/Shizuoka University Invited	Paper

Chip Based Sensing (STh1N)

Presider: Eric Zhang, *IBM T. J. Watson Research Center*

8:00 - 9:00	**Stabilizing Chip-scale Combs and Infrared Sources: A Metrological View on the Molecular World (STh1N.1)** **Presenter**: Paolo De Natale, *Istituto Nazionale di Ottica-CNR* Expand for Abstract / Authors Tight stabilization of infrared sources is proving to be a key technology for opening this broad window to unprecedented measurements in molecular samples in a wide range of thermodynamic conditions. Since 2007 Paolo De Natale is the director of the Italian National Institute of Optics (CNR-INO). PDN main achievements include the development and phase control of metrological-grade infrared single- and multi-frequency (comb) source as well as a novel high-sensitivity spectroscopy technique (SCaR). PDN is Fellow of IEEE and OSA **Authors**:Francesco Cappelli/Istituto Nazionale di Ottica-CNR Luigi Consolino/Istituto Nazionale di Ottica-CNR Simone Borri/Istituto Nazionale di Ottica-CNR Saverio Bartalini/Istituto Nazionale di Ottica-CNR Pablo Cancio/Istituto Nazionale di Ottica-CNR Iacopo Galli/Istituto Nazionale di Ottica-CNR Davide Mazzotti/Istituto Nazionale di Ottica-CNR Paolo De Natale/Istituto Nazionale di Ottica-CNR Tutorial	Paper
9:00 - 9:15	**High-Resolution and Gapless Dual Comb Spectroscopy with Current-Tuned Quantum Cascade Lasers (STh1N.2)** **Presenter**: Michele Gianella, *Empa* Expand for Abstract / Authors We measured gapless, high-resolution absorption spectra spanning 55 cm^{-1} by simultaneous current-modulation of two quantum cascade laser frequency combs. Detector noise limited spectra were obtained in as little as 10 ms with a resolution of a few MHz. **Authors**:Michele Gianella/Empa Akshay Nataraj/Empa Béla Tuzson/Empa Jérôme Faist/ETH Zurich Lukas Emmenegger/Empa	Paper
9:15 - 9:30	**On-Chip Dispersion Spectroscopy of CO_2 Using a Mid-Infrared Microring Resonator (STh1N.3)** **Presenter**: Floria Ottonello-Briano, *Kungliga Tekniska Hogskolan* Expand for Abstract / Authors We demonstrate on-chip molecular fingerprinting by measuring the refractive index dispersion of gas in the mid-IR using a thermally tuned suspended silicon microring resonator. We show CO_2 sensing down to 1000 ppm at 4.23 µm wavelength. **Authors**:Floria Ottonello-Briano/Kungliga Tekniska Hogskolan Carlos Errando-Herranz/Kungliga Tekniska Hogskolan Kristinn Gylfason/Kungliga Tekniska Hogskolan	Paper

9:30 - 9:45	**Ultra-Sensitive and High Figure of Merit Interferometric Biosensors Using Dispersion Effects in Porous Waveguides (STh1N.4)** **Presenter**: Judson Ryckman, *Clemson University* Expand for Abstract / Authors We report an interferometric biosensor that theoretically and experimentally exceeds the sensitivity predicted by bulk effective medium theory. The devices are realized by engineering dispersion effects in high confinement factor multilayer porous silicon rib waveguides. **Authors**:Tahmid Hassan Talukdar/Clemson University Ivan Kravchenko/Oak Ridge National Laboratory Judson Ryckman/Clemson University	Paper
9:45 - 10:00	**Nanophotonic Biomolecular Sensor with Passive Molecule Trapping Functionality (STh1N.5)** **Presenter**: Xianglong Miao, *University at Buffalo* Expand for Abstract / Authors We experimentally demonstrate a nanophotonic biomolecular sensor which can passively concentrate and trap biomolecules in a drying analyte solution to regions of device structures where the field is highly enhanced, leading to improved sensing performance. **Authors**:Xianglong Miao/University at Buffalo Lingyue Yan/University at Buffalo Yun Wu/University at Buffalo Peter Liu/University at Buffalo	Paper

Quantum Channels (FTh1D)

Presider: Peter Mosley, *University of Bath*

8:00 - 8:15	**Operation of Semiconductor Telecom Entangled Photon Sources Over Installed Fiber Networks (FTh1D.1)** **Presenter**: Jan Huwer, *Toshiba Research Europe Ltd* Expand for Abstract / Authors We show deployment of a tunable telecom entangled photon source based on semiconductor quantum dots in an installed fiber network. We further report about network integration of a pulsed device operating at GHz clock rates. **Authors**:Jan Huwer/Toshiba Research Europe Ltd Ziheng Xiang/Toshiba Research Europe Ltd Ginny Shooter/Toshiba Research Europe Ltd Joanna Skiba-Szymanska/Toshiba Research Europe Ltd Tina Müller/Toshiba Research Europe Ltd David Ellis/Toshiba Research Europe Ltd Matthew Anderson/Toshiba Research Europe Ltd Jonathan Müller/Toshiba Research Europe Ltd Thomas Mitchell/University of Cambridge Jonathan Griffiths/University of Cambridge Mark Stevenson/Toshiba Research Europe Ltd Andrey Krysa/University of Sheffield Jon Heffernan/University of Sheffield Ian Farrer/University of Sheffield David Ritchie/University of Cambridge Andrew Shields/Toshiba Research Europe Ltd	Paper

8:15 - 8:30	**Adaptive Bandwidth Management for Entanglement Distribution in a Fully-connected Fiber-optic Network (FTh1D.2)** **Presenter**: Navin Lingaraju, *Purdue University* Expand for Abstract / Authors By using wavelength-selective switches to flexibly allocate source bandwidth across multiple users for entanglement distribution over a fiber-optic network, we accommodate both channels with disparate losses and requests for differentiated service. **Authors**:Navin Lingaraju/Purdue University Hsuan-Hao Lu/Purdue University Suparna Seshadri/Purdue University Daniel Leaird/Purdue University Andrew Weiner/Purdue University Joseph Lukens/Oak Ridge National Laboratory	Paper
8:30 - 8:45	**Entanglement Preservation Based on Classical Correlations (FTh1D.3)** **Presenter**: Daniel Jones, *U.S. Army Research Laboratory* Expand for Abstract / Authors Entanglement suffers from noise in quantum channels. Noise originating from bit-flip and phase-flip errors has intrinsically different classical correlations. We find that these can be effectively explored when recovering entanglement by procrustean filtering. **Authors**:Daniel Jones/U.S. Army Research Laboratory Gabriele Riccardi/University of L'Aquila Brian Kirby/U.S. Army Research Laboratory Cristian Antonelli/University of L'Aquila Michael Brodsky/U.S. Army Research Laboratory	Paper
8:45 - 9:00	**Concurrent Quantum State Transfer and Random Channel Sniffing (FTh1D.4)** **Presenter**: Bahaa Saleh, *University Of Central Florida* Expand for Abstract / Authors Harnessing the interplay between polarization and temporal degrees of freedom, the quantum polarization state of a single photon can be transferred with high fidelity through a polarization-drifting channel whose stochastic parameters are concurrently estimated. **Authors**:Salem Hegazy/Cairo University Salah Obayya/Zewail Univ of Science and Technology Bahaa Saleh/University Of Central Florida	Paper

9:00 - 9:15

Distillation of Gaussian Einstein-Podolsky-Rosen steering (FTh1D.5)
Presenter: Xiaolong Su, *Shanxi University*
Expand for Abstract / Authors

Paper

Einstein-Podolsky-Rosen (EPR) steering is a useful resource for secure quantum communication. We experimentally demonstrate the distillation of Gaussian Einstein-Podolsky-Rosen steering by noiseless linear amplification. The results show that the Gaussian EPR steering is increased.

Authors:Yang Liu/Shanxi University Kaimin Zheng/Nanjing University Haijun Kang/Shanxi University Dongmei Han/Shanxi University Lijian Zhang/Nanjing University Xiaolong Su/Shanxi University Kunchi Peng/Shanxi University

9:15 - 9:30

Loophole-Free Test of Einstein-Podolsky-Rosen Steering with One Bit of Faster-than-Light Communication (FTh1D.6)
Presenter: Michael Mazurek, *NIST Boulder*
Expand for Abstract / Authors

Paper

The communication cost for classically simulating Einstein-Podolsky-Rosen (EPR) steering correlations quantifies their strength. We report a loophole-free demonstration of EPR steering correlations requiring more than one faster-than-light bit to simulate.

Authors:Michael Mazurek/NIST Boulder Yu Xiang/Peking University Martin Stevens/NIST Boulder Joshua Bienfang/NIST Boulder Michael Wayne/NIST Boulder Carlos Abellán/Barcelona Institute of Science and Technology Waldimar Amaya/Barcelona Institute of Science and Technology Morgan Mitchell/Barcelona Institute of Science and Technology Richard Mirin/NIST Boulder Sae Woo Nam/NIST Boulder Qiongyi He/Peking University Lynden Shalm/NIST Boulder Howard Wiseman/Griffith University

9:30 - 9:45

Continuous-variable Quantum Teleportation of States Multiplexed in Time Domain (FTh1D.7)
Presenter: Baramee Charoensomutamon, *the University of Tokyo*
Expand for Abstract / Authors

Paper

We develop fast and programmable phase switching of local oscillators of homodyne measurements suitable for time-domain multiplexed one-way quantum computation. Using this technique, we demonstrate quantum teleportation of EPR states multiplexed in time.

Authors:Baramee Charoensomutamon/the University of Tokyo Warit Asavanant/the University of Tokyo Tomohiro Nakamura/the University of Tokyo Takeru Ebihara/the University of Tokyo Shota Yokoyama/University of New South Wales Rafael Alexander/University of New Mexico Nicolas Menicucci/RMIT University Mamoru Endo/the University of Tokyo Jun-ichi Yoshikawa/the University of Tokyo Hidehiro Yonezawa/University of New South Wales Akira Furusawa/the University of Tokyo

9:45 - 10:00	**Entanglement Distribution Using a Number State and a Beam Splitter (FTh1D.8)** **Presenter**: James Franson, *University of Maryland Baltimore County* Expand for Abstract / Authors We show that a photon number state incident on a beam splitter will create a phase-entangled state that violates Bell's inequality. This approach may have practical applications in quantum communications and quantum key distribution. **Authors**:James Franson/University of Maryland Baltimore County Saurabh Shringarpure/University of Maryland Baltimore County	Paper

Optical Phenomena in Metasurfaces (FTh1C)

Presider: Sushil Mujumdar, *Tata Institute of Fundamental Research*

8:00 - 8:30	**Optical Forces in Complex Nanostructures (FTh1C.1)** **Presenter**: Simon Hanna, *University of Bristol* Expand for Abstract / Authors Large forces and torques are generated when light is scattered from metamaterial surfaces. Here we explore how refractive-index patterning may be used to optimise such forces and torques, for applications in optically driven micro-machines. **Authors**:Simon Hanna/University of Bristol Invited	Paper
8:30 - 8:45	**Nonlinear Geometric Phase Gradient Metasurfaces beyond the Dipole Approximation (FTh1C.2)** **Presenter**: Sylvain Gennaro, *Sandia National Laboratories* Expand for Abstract / Authors In this work, we identify the role of higher order antenna's modes on a metasurface's Pancharatnam – Berry phase by investigating second harmonic light scattering from two metasurfaces exhibiting dipolar and quadrupolar radiation. **Authors**:Sylvain Gennaro/Sandia National Laboratories Yi Li/Southern University of Science and Technology Stefan Maier/Ludwig-Maximilians Universitat Rupert Oulton/Imperial College London	Paper

8:45 - 9:00 **Electrically Tunable Second Harmonic Generation Enhancement on a Parametrically Excited Metasurface (FTh1C.3)** Paper
Presenter: Xuexue Guo, *Pennsylvania State University*
Expand for Abstract / Authors

Leveraging the resonantly enhanced parametric excitation of amorphous silicon metasurface, we achieved second harmonic generation (SHG) with ultra-high ON/OFF ratio of 15000. It provides a compact and electrically tunable approach to boosting and dynamically controlling SHG.

Authors:Xuexue Guo/Pennsylvania State University Yimin Ding/Pennsylvania State University Xingjie Ni/Pennsylvania State University

9:00 - 9:15 **Room-Temperature Lasing Action from All-dielectric Metasurfaces Near Bound States in the Continuum (FTh1C.4)** Paper
Presenter: Shaimaa Azzam, *Purdue University*
Expand for Abstract / Authors

We demonstrate lasing action in the visible from an all-dielectric metasurface. A low laser threshold is achieved with a high-Q resonance due to operation at the near bound states in the continuum (BIC) regime.

Authors:Shaimaa Azzam/Purdue University Krishnakali Chaudhuri/Purdue University Alexei Lagoutchev/Purdue University Young L. Kim/Purdue University Vladimir Shalaev/Purdue University Alexandra Boltasseva/Purdue University Alexander Kildishev/Purdue University

9:15 - 9:30 **High-Harmonic Generation in Dielectric Metasurfaces Empowered by Bound States in the Continuum (FTh1C.5)** Paper
Presenter: Sergey Kruk, *Australian National University*
Expand for Abstract / Authors

We demonstrate nonlinear silicon metasurfaces empowered by collective localized modes governed by bound states in the continuum operating in mid-infrared spectral range. When being resonantly excited, the metasurfaces generate 3^{rd}, 5^{th} and 7^{th} optical harmonics.

Authors:George Zograf/Australian National University Anastasia Zalogina/Australian National University Kirill Koshelev/Australian National University Duk-Yong Choi/Australian National University Viacheslav Korolev/Friedrich-Schiller University Jena Richard Hollinger/Friedrich-Schiller University Jena Daniil Kartashov/Friedrich-Schiller University Jena Michael Zürch/Friedrich-Schiller University Jena Christian Spielmann/Friedrich-Schiller University Jena Sergey Makarov/ITMO University Barry Luther-Davies/Australian National University Sergey Kruk/Australian National University Yuri Kivshar/Australian National University

9:30 - 10:00 **Lithium niobate metasurfaces for second-harmonic generation (FTh1C.6)**
Presenter: Luca Carletti, *Università degli Studi di Padova*
Expand for Abstract / Authors

Paper

We demonstrate monolithic lithium niobate metasurfaces for enhanced second-harmonic generation in the visible spectrum. Our approach offers a conversion efficiency above 5×10^{-5} with applications in novel nonlinear and quantum light sources.

Authors:Luca Carletti/Università degli Studi di Padova Attilio Zilli/Politecnico di Milano Fabio Moia/Istituto Italiano di Tecnologia Andrea Toma/Istituto Italiano di Tecnologia Marco Finazzi/Politecnico di Milano Michele Celebrano/Politecnico di Milano Costantino De Angelis/Politecnico di Milano Dragomir Neshev/The Australian National University

Lithium Niobate Integrated Photonics (STh1F)

Presider: Alan Wang, *Oregon State University*

8:00 - 8:15 **Low-loss Thin Film Lithium Niobate Bonded on Silicon Nitride Waveguides (STh1F.1)**
Presenter: Siddhartha Ghosh, *MIT Lincoln Laboratory*
Expand for Abstract / Authors

Paper

We demonstrate heterogeneous integration of thin film $LiNbO_3$ on Si_3N_4 photonic integrated circuits with SiO_2, Al_2O_3 and direct bonding. We report record low losses in bonded ring resonators of 0.4 dB/cm (intrinsic $Q = 8.19\text{x}10^5$).

Authors:Siddhartha Ghosh/MIT Lincoln Laboratory Siva Yegnanarayanan/MIT Lincoln Laboratory Matthew Ricci/MIT Lincoln Laboratory Dave Kharas/MIT Lincoln Laboratory Paul Juodawlkis/MIT Lincoln Laboratory

8:15 - 8:30 **Electro-optic polarisation conversion at 0.8K in titanium in-diffused lithium niobate waveguides (STh1F.2)**
Presenter: Frederik Thiele, *Paderborn University*
Expand for Abstract / Authors

Paper

We demonstrate an electro-optic polarisation converter for 1550nm at cryogenic temperatures in titanium in-diffused lithium niobate waveguides. The switching voltage increases, the modulation depth remains unchanged, and we show operation up to 25MHz.

Authors:Frederik Thiele/Paderborn University Jan Philipp Hoepker/Paderborn University Moritz Bartnick/Paderborn University Felix vom Bruch/Paderborn University Harald Herrmann/Paderborn University Raimund Ricken/Paderborn University Victor Quiring/Paderborn University Christof Eigner/Paderborn University Christine Silberhorn/Paderborn University Tim Bartley/Paderborn University

8:30 - 8:45	**Hybrid Si3N4-LiNbO3 integrated platform for electro-optic conversion (STh1F.3)** **Presenter**: Mikhail Churaev, *EPFL* Expand for Abstract / Authors We demonstrate the integration of a Si3N4 Damascene photonic platform with thin-film lithium niobate on insulator (LNOI), via direct wafer bonding. This process enables fabrication of hybrid χ(2)-χ(3) microresonators with Q∼10^6, as well as integrated travelling wave EO modulators. **Authors**:Mikhail Churaev/EPFL Simon Hönl/IBM Research - Zurich Rui Ning Wang/EPFL Charles Möhl/IBM Research - Zurich Tianyi Liu/EPFL Connor Skehan/EPFL Johann Riemensberger/EPFL Daniele Caimi/IBM Research - Zurich Junqiu Liu/EPFL Paul Seidler/IBM Research - Zurich Tobias Kippenberg/EPFL	Paper
8:45 - 9:00	**Hybrid Silicon and Lithium Niobate Mach-Zehnder Modulators with High Bandwidth Operating at C-band and O-band (STh1F.4)** **Presenter**: Shihao Sun, *Sun Yat-Sen University* Expand for Abstract / Authors We first demonstrate a hybrid silicon and lithium niobate Mach-Zehnder modulator operating at C-band and O-band simultaneously. The device shows high Electro-optic modulation efficiency and bandwidth beyond 70 GHz with ultra-wide band operation. **Authors**:Shihao Sun/Sun Yat-Sen University Mingbo He/Sun Yat-Sen University Siyuan Yu/Sun Yat-Sen University Xinlun Cai/Sun Yat-Sen University	Paper
9:00 - 9:30	**Integrated Lithium Niobate Acousto-optic Frequency Shifter (STh1F.5)** **Presenter**: Linbo Shao, *Harvard University* Expand for Abstract / Authors We demonstrate a 3-GHz acousto-optic frequency shifter on a thin-film lithium niobate platform, featuring over 30 dB carrier suppression. The active frequency shifting loop generates a frequency comb with 200 lines over 5 nm optical bandwidth. **Authors**:Linbo Shao/Harvard University Neil Sinclair/Harvard University James Leatham/Raytheon Space & Airborne Systems Yaowen Hu/Harvard University Mengjie Yu/Harvard University Terry Turpin/9918 Evergreen Ave Devon Crowe/Raytheon Space & Airborne Systems Marko Loncar/Harvard University	Paper

9:30 - 9:45 **Acousto-optic modulation of photonic bound state in the continuum (STh1F.6)**
Presenter: Zejie Yu, *The Chinese University of Hong Kong*
Expand for Abstract / Authors

Paper

We demonstrated acousto-optic modulation of photonic bound state in the continuum on an etchless lithium niobate platform. We obtained coherent coupling between microwave and optical photons, exhibited by the observed electro-acousto-optically induced transparency and absorption.

Authors:Zejie Yu/The Chinese University of Hong Kong Xiankai Sun/The Chinese University of Hong Kong

9:45 - 10:00 **Hybrid two-dimensional-material photonics with bound states in the continuum (STh1F.7)**
Presenter: Zejie Yu, *The Chinese University of Hong Kong*
Expand for Abstract / Authors

Paper

We introduced a new scheme for integrating 2D materials with photonic integrated circuits by harnessing bound states in the continuum. We demonstrated efficient thermo-optic and electro-optic modulation on a hybrid graphene/$LiNbO_3$ platform with this approach.

Authors:Zejie Yu/The Chinese University of Hong Kong Yi Wang/The Chinese University of Hong Kong Beilei Sun/The Chinese University of Hong Kong Yeyu Tong/The Chinese University of Hong Kong Jian-Bin Xu/The Chinese University of Hong Kong Hon Ki Tsang/The Chinese University of Hong Kong Xiankai Sun/The Chinese University of Hong Kong

Optical Comb and Spectroscopic Applications I (STh1O)
Presider: Sungwon Chung, *Neuralink Corporation*

8:00 - 8:15 **Ultra-Broadband Silicon Photonic Interleaver for Massive Channel Count Frequency Combs (STh1O.1)**
Presenter: Anthony Rizzo, *Columbia University*
Expand for Abstract / Authors

Paper

We demonstrate an ultra-broadband interleaver operating over 100 nm for interleaving frequency comb lines with a box-like spectral response. This demonstration paves the way for fully-integrated wavelength division multiplexed transceivers scalable to hundreds of wavelengths.

Authors:Anthony Rizzo/Columbia University Qixiang Cheng/Columbia University Stuart Daudlin/Columbia University Keren Bergman/Columbia University

8:15 - 8:30

Low-repetition-rate Integrated Electro-optic Frequency Comb Sources (STh1O.2)
Presenter: Amirhassan Shams-Ansari, *Harvard University*
Expand for Abstract / Authors

Paper

We demonstrate a low-repetition-rate lithium niobate based electro-optic (EO) frequency comb operating with 3.481 GHz line spacing, by integrating a cavity-based EO comb source with traveling-wave phase-modulators on the same chip.

Authors:Amirhassan Shams-Ansari/Harvard University Christian Reimer/Harvard University Neil Sinclair/Harvard University Mian Zhang/Harvard University Nathalie Picqué/Max-Planck Institut für Quantenoptik Marko Loncar/Harvard University

8:30 - 8:45

Laser Self-Injection Locked Frequency Combs in a Normal GVD Integrated Microresonator (STh1O.3)
Presenter: Grigory Lihachev, *Ecole Polytechnique Federale de Lausanne*
Expand for Abstract / Authors

Paper

We report the first demonstration of microresonator dark pulse generation by self-injection locking of a DFB laser to a Si3N4 microresonator with normal GVD. The 26 GHz repetition rate beatnote is characterized.

Authors:Junqiu Liu/Ecole Polytechnique Federale de Lausanne Grigory Lihachev/Ecole Polytechnique Federale de Lausanne Lin Chang/University of California Santa Barbara Jijun He/Ecole Polytechnique Federale de Lausanne Rui Ning Wang/Ecole Polytechnique Federale de Lausanne Joel Guo/University of California Santa Barbara Arslan Raja/Ecole Polytechnique Federale de Lausanne Erwan Lucas/Ecole Polytechnique Federale de Lausanne Nikolay Pavlov/MicroR Systems Sarl John Jost/MicroR Systems Sarl David Kinghorn/University of California Santa Barbara John Bowers/University of California Santa Barbara Tobias Kippenberg/Ecole Polytechnique Federale de Lausanne

8:45 - 9:00

Demonstration of PAM-4 Data Transmission from a Modulation Instability Induced Frequency Comb (STh1O.4)
Presenter: Chinmay Shirpurkar, *CREOL, The College of Optics & Photonics*
Expand for Abstract / Authors

Paper

We demonstrate PAM-4 modulation on a modulation instability frequency comb, generated by tuning through the cavity resonance of a Kerr microresonator. We determine the BER for the corresponding eye diagram.

Authors:Chinmay Shirpurkar/CREOL, The College of Optics & Photonics Ricardo Bustos Ramirez/CREOL, The College of Optics & Photonics Su Peng Yu/National Institute for Standards and Technology Travis Briles/National Institute for Standards and Technology Scott Papp/National Institute for Standards and Technology Peter Delfyett/CREOL, The College of Optics & Photonics

9:00 - 9:15 **Generation of Flat Optical Frequency Comb Using Integrated Cascaded Lithium Niobate Modulators (STh1O.5)**
Presenter: Mengyue Xu, *Sun Yat-Sen University*
Expand for Abstract / Authors

Optical frequency comb with 9 lines, 20 GHz spacing and 0.89 dB flatness is generated by cascading modulators on the lithium niobate-on-insulator platform. The device features an on-chip optical loss less than 1.19 dB.

Authors:Mengyue Xu/Sun Yat-Sen University Mingbo He/Sun Yat-Sen University Xinlun Cai/Sun Yat-Sen University

_ Paper

9:15 - 9:30 **Semiconductor laser integration for octave-span Kerr-soliton frequency combs (STh1O.6)**
Presenter: Travis Briles, *NIST-Boulder*
Expand for Abstract / Authors

We report octave spanning frequency combs generated by self-injection locking a distributed feedback laser to a Kerr microresonator. This method benefits from mitigated thermal transients and eliminates an optical isolator which simplifies photonic integration.

Authors:Travis Briles/NIST-Boulder Lin Chang/University of California - Santa Barbara Chao Xiang/University of California - Santa Barbara Joel Guo/University of California - Santa Barbara David Kinghorn/University of California - Santa Barbara Jordan Stone/NIST-Boulder Su-Peng Yu/NIST-Boulder Gregory Moille/National Institute of Standards and Technology Kartik Srinivasan/National Institute of Standards and Technology John Bowers/University of California - Santa Barbara Scott Papp/NIST-Boulder

_ Paper

9:30 - 10:00 **Monolithic piezoelectric control of integrated soliton microcombs (STh1O.7)**
Presenter: Junqiu Liu, *Ecole Polytechnique Federale de Lausanne*
Expand for Abstract / Authors

We demonstrate piezoelectric actuators monolithically integrated on ultralow-loss Si3N4 waveguides. Varying the voltage applied on the actuator allows tuning the microresonator, and is used to initiate, switch, stabilize and tightly phase lock the single soliton microcomb.

Authors:Junqiu Liu/Ecole Polytechnique Federale de Lausanne Hao Tian/Purdue University Erwan Lucas/Ecole Polytechnique Federale de Lausanne Arslan Raja/Ecole Polytechnique Federale de Lausanne Grigory Lihachev/Ecole Polytechnique Federale de Lausanne Rui Ning Wang/Ecole Polytechnique Federale de Lausanne Jijun He/Ecole Polytechnique Federale de Lausanne Tianyi Liu/Ecole Polytechnique Federale de Lausanne Miles Anderson/Ecole Polytechnique Federale de Lausanne Wenle Weng/Ecole Polytechnique Federale de Lausanne Sunil Bhave/Purdue University Tobias Kippenberg/Ecole Polytechnique Federale de Lausanne

_ Paper

Intense Light Interactions with Ordered and Disordered Materials (STh1H)

Presider: Anthony Valenzuela, *US Army Research Laboratory*

8:00 - 8:15	**Towards the smallest anisotropic structures by ultrafast laser writing in silica glass (STh1H.1)** **Presenter**: Yuhao Lei, *University of Southampton* Expand for Abstract / Authors A localized nanoplane modification was created in silica glass with a few femtosecond laser pulses. Fast writing of anisotropic structures and high-density data storage can be achieved. **Authors**:Yuhao Lei/University of Southampton Masaaki Sakakura/University of Southampton Lei Wang/University of Southampton Yanhao Yu/University of Southampton Huijun Wang/University of Southampton Peter Kazansky/University of Southampton	Paper
8:15 - 8:30	**Femtosecond Laser Nano-Filament Explosion: Opening Fiber Bragg Gratings for Opto-Fluidic Sensing (STh1H.2)** **Presenter**: Peter Herman, *University of Toronto* Expand for Abstract / Authors Aberrated femtosecond laser pulses were applied to telecommunication fiber to open nano-filament arrays through the silica cladding and waveguide cross-section. Strong photonic bandgap response from p-shifted, second-order Bragg gratings enabled high resolution refractive index sensing. **Authors**:Peter Herman/University of Toronto Keivan Aghdami/University of Toronto Erden Ertorer/University of Toronto Jianzhao Li/University of Toronto Abdullah Rahnama/University of Toronto	Paper
8:30 - 9:00	**Non-Perturbative Modeling of Ultrafast Photoionization of Transparent Solids: from the Keldysh Formula to a Model for Few-Cycle Laser Pulses (STh1H.3)** **Presenter**: Vitaly Gruzdev, *University of New Mexico* Expand for Abstract / Authors Based on the Keldysh concept of laser-driven electron oscillations, we overview recent progress in development of non-perturbative approaches to simulation of the photoionization of non-metal crystals by few-cycle ultrashort laser pulses with non-zero spectral bandwidth. **Authors**:Vitaly Gruzdev/University of New Mexico Olga Sergaeva/ITMO University	Paper

9:00 - 9:15

Dual Wavelength Laser Excitation of Bandgap Materials: Challenges for Efficient Energy Coupling (STh1H.4)
Presenter: Nadezhda Bulgakova, *HiLASE, Institute of Physics CAS*
Expand for Abstract / Authors

Paper

Theoretical and experimental studies have demonstrated that bi-chromatic laser action on bandgap materials can result in highly enhanced efficiency of local energy coupling at properly chosen combinations of wavelengths and energies.

Authors:Nadezhda Bulgakova/HiLASE, Institute of Physics CAS Vladimir Zhukov/HiLASE, Institute of Physics CAS Juraj Sládek/HiLASE, Institute of Physics CAS Inam Mirza/HiLASE, Institute of Physics CAS Alexander Bulgakov/HiLASE, Institute of Physics CAS

9:15 - 9:30

(Withdrawn) Evolution of the Fictive Temperature In Oxide Glass Substrate Upon Laser Irradiation of its Thin Film Coating
(STh1H.5)
Presenter: Driffa Guerfa, *Saint Gobain Recherche*
Expand for Abstract / Authors

Evolution of the physicochemical properties of glass substrate upon laser treatment of its thin film coating is analyzed numerically. Raman spectroscopy is applied for experimental validation of the model.

Authors:Driffa Guerfa/Saint Gobain Recherche Iryna Gozhyk/Saint Gobain Recherche Ekaterina Burov/Saint Gobain Recherche Matthieu Lancry/Institut de Chimie Moléculaire d'Orsay Bertrand Poumellec/Institut de Chimie Moléculaire d'Orsay

9:30 - 9:45

Dehydrogenation Condensation by Intense Laser Irradiation of Liquid Hexane Creating Dodecane Isomers (STh1H.6)
Presenter: Shunichi Sato, *Tohoku University*
Expand for Abstract / Authors

Paper

Liquid hexane was irradiated by focused femtosecond laser pulses. The GC-MS analysis of the samples suggested that the major process was the dehydrogenation condensation of hexane producing dodecane and its structural isomers.

Authors:Shunichi Sato/Tohoku University Wakako Ishikawa/Tohoku University

9:45 - 10:00 **Optical Manipulation and Assembly of Colloidal Particles on Solid Substrates (STh1H.7)**
Presenter: Jingang Li, *The university of Texas at Austin*
Expand for Abstract / Authors

We report optical nanomanipulation and assembly of colloidal particles on a solid substrate by modulating particle-substrate interactions through laser-induced optothermal dynamics.

Authors:Jingang Li/The university of Texas at Austin Yuebing Zheng/The university of Texas at Austin

Paper

Optomechanics (STh1R)

Presider: Amir Safavi-Naeini, *Stanford University*

8:00 - 8:30 **Engineering scalable, high-frequency resonant acousto-optic modulators (AOMs) using a MEMS foundry platform (STh1R.1)**
Presenter: Krishna Coimbatore Balram, *University of Bristol*
Expand for Abstract / Authors

Acousto-optic devices promise high modulation efficiency on account of their ability to simultaneously exploit acoustic and optical resonances. Their adoption and complexity has been limited by the lack of foundry compatibility and low operation frequency. In this work, we show a MEMS foundry platform can be used to build efficient, high frequency (~ 4 GHz) AOMs.

Authors:Krishna Coimbatore Balram/University of Bristol

Invited

Paper

8:30 - 8:45 **Self-injected piezoelectric optomechanical crystal (STh1R.2)**
Presenter: Inès Ghorbel, *Thales Research & Technology*
Expand for Abstract / Authors

We show here an InGaP optomechanical crystal oscillating at 21 MHz stabilized by injecting a delayed copy of itself thanks to electrodes. An improvement of 20 dBc/Hz is achieved at 1 kHz offset.

Authors:Inès Ghorbel/Thales Research & Technology Maëlle Bénéfice/Thales Research & Technology Rui Zhu/Centre de Nanosciences et de Nanotechnologies Aude Martin/Thales Research & Technology Loïc Morvan/Thales Research & Technology Daniel Dolfi/Thales Research & Technology Sylvain Combrié/Thales Research & Technology Rémy Braive/Centre de Nanosciences et de Nanotechnologies Alfredo De Rossi/Thales Research & Technology

Paper

8:45 - 9:00

Surface-Acoustic-Wave Characterization of Thin Layer Deposition on a Standard Silicon-Photonic Circuit (STh1R.3)
Presenter: Mirit Hen, *Bar-Ilan University*
Expand for Abstract / Authors

Paper

A thin layer of alumina is characterized using a surface acoustic wave photonic circuit in standard silicon on insulator. Small changes in acoustic velocity are identified by an integrated microwave photonic filter, through acoustic delays.

Authors:Mirit Hen/Bar-Ilan University Dvir Munk/Bar-Ilan University Moshe Katzman/Bar-Ilan University Maayan Priel/Bar-Ilan University Sarah Taragin/Bar-Ilan University Avi Zadok/Bar-Ilan University

9:00 - 9:15

High-Frequency Photonic Crystal Torsional Optomechanics (STh1R.4)
Presenter: Bishnupada Behera, *University of Calgary*
Expand for Abstract / Authors

Paper

An optomechanical system that couples external torque to the harmonic vibrations of a photonic crystal nanobeam is presented. Measurements reveal torque sensitivity of $\tau_{min} \sim 10^{-22} – 10^{-19}$ Nm/√Hz for mechanical frequencies spanning MHz-GHz.

Authors:Bishnupada Behera/University of Calgary Hamidreza Kaviani/University of Calgary Ghazal Hajisalem/University of Calgary Gustavo Luiz/University of Alberta Paul Barclay/University of Calgary

9:15 - 9:30

High-Frequency GaAs Bullseye Optomechanical Resonator (STh1R.5)
Presenter: Natalia do Carmo Carvalho, *University of Campinas*
Expand for Abstract / Authors

Paper

We fabricated and measured a GaAs bullseye resonator able to operate above 3 GHz when coupled to whispering gallery optical modes. Our large phononic bandgap allowed us to observe the symmetry break caused by the material anisotropy and obtain optomechanical coupling rates above 30 kHz.

Authors:Natalia do Carmo Carvalho/University of Campinas Rodrigo Benevides/University of Campinas Michaël Ménard/Université du Québec à Montréal Gustavo S. Wiederhecker/University of Campinas Newton C. Frateschi/University of Campinas Thiago Mayer Alegre/University of Campinas

9:30 - 9:45 **Thermodynamic model for photothermal effects in optomechanics (STh1R.6)**
Presenter: André Primo, *University of Campinas*
Expand for Abstract / Authors

Paper

We derive and validate a model for the photothermal forces that act on optomechanical cavities. Our results not only enable the prediction of such effect but also show that it is much stronger than previously estimated.

Authors:André Primo/University of Campinas Rodrigo Benevides/University of Campinas Cauê Moreno Kersul de Castro Carvalho/University of Campinas Pierre Assis/University of Campinas Gustavo S. Wiederhecker/University of Campinas Thiago Alegre/University of Campinas

9:45 - 10:00 **Coupled Waveguides Optomechanical Device for the Investigation of the Beating Force (STh1R.7)**
Presenter: Cauê Moreno Kersul de Castro Carvalho, *“Gleb Wataghin” Institute of Physics*
Expand for Abstract / Authors

Paper

We present a device composed of a pair of suspended evanescently-coupled waveguides built to investigate non-eigenmode optical forces. A disk microcavity is used for near-field optomechanical transduction of the motion driven by a modulated pump.

Authors:Cauê Moreno Kersul de Castro Carvalho/“Gleb Wataghin” Institute of Physics Rodrigo Benevides/“Gleb Wataghin” Institute of Physics Pierre Assis/“Gleb Wataghin” Institute of Physics

Soliton Physics (FTh1A)

Presider: Daniel Brunner, *CNRS*

8:00 - 8:30 **High-order dispersion solitons in mode-locked lasers (FTh1A.1)**
Presenter: Antoine Runge, *University of Sydney*
Expand for Abstract / Authors

Paper

We present a fiber laser, generating solitons arising from balancing the Kerr nonlinearity and high, even-order dispersion, (i.e., fourth order, etc.). These pulses follow new energy-width scaling, which unlocks opportunities for novel mode-locked lasers.

Authors:Antoine Runge/University of Sydney Darren Hudson/Miriad technologies Kevin Tam/University of Sydney C. de Sterke/University of Sydney Andrea Blanco-Redondo/Nokia Bell labs

Invited

8:30 - 8:45 **Self-guiding and Coupling of Light through Suspensions of Sheep Red Blood Cells (FTh1A.2)**
Presenter: Nicolas Perez, *California state University Northridgee*
Expand for Abstract / Authors

Paper

We demonstrate nonlinear self-trapping and guiding of light through suspensions of red-blood-cells from sheep. By master/slave-type coupling, biological waveguides formed at one wavelength can effectively guide a wide spectrum of light at low power.

Authors:Nicolas Perez/California state University Northridgee Jacob Chambers/California state University Northridgee Zhigang Chen/san francisco state san francisco Anna Bezryadina/California state University Northridgee

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8:45 - 9:00 **Experimental Demonstration of the Noisy Origins of Soliton Self-Mode Conversion (FTh1A.3)**
Presenter: Havva Begüm Kabagöz, *Boston University*
Expand for Abstract / Authors

Paper

We experimentally demonstrate that solitons generated through the newly discovered phenomenon, soliton self-mode conversion, are purely noise-initiated although they yield record high energy fs pulses that are strictly transform limited.

Authors:Havva Begüm Kabagöz/Boston University Aku Antikainen/Boston University Siddharth Ramachandran/Boston University

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9:00 - 9:15 **Spontaneous Soliton Formation in Photonic-Crystal Ring Resonators (FTh1A.4)**
Presenter: Su-Peng Yu, *National Inst of Standards & Technology*
Expand for Abstract / Authors

Paper

We introduce edgeless photonic-crystal resonators, creating photonic bandgap atop one azimuthal mode. The bandgap affects re-balancing of resonator Kerr-shift to enable spontaneous soliton generation, which we demonstrate by tuning laser onto resonance with the mode.

Authors:Su-Peng Yu/National Inst of Standards & Technology Daniel Cole/National Inst of Standards & Technology Hojoong Jung/National Inst of Standards & Technology Gregory Moille/National Institute of Standards and Technology Kartik Srinivasan/National Institute of Standards and Technology Scott Papp/National Inst of Standards & Technology

9:15 - 9:30

Dissipative Kerr solitons in a photonic dimer (FTh1A.5)
Presenter: Alexey Tikan, *Ecole Polytechnique Federale de Lausanne*
Expand for Abstract / Authors

Paper

We study nonlinear dynamics emerging in a photonic microring dimer. It is shown that four wave mixing pathways between the dimer supermodes lead to novel nonlinear phenomena going beyond the single resonator physics.

Authors:Alexey Tikan/Ecole Polytechnique Federale de Lausanne Johann Riemensberger/Ecole Polytechnique Federale de Lausanne Kenichi Komagata/Ecole Polytechnique Federale de Lausanne Simon Hönl/IBM Mikhail Churaev/Ecole Polytechnique Federale de Lausanne Connor Skehan/Ecole Polytechnique Federale de Lausanne Haiurn Guo/Ecole Polytechnique Federale de Lausanne Rui Ning Wang/Ecole Polytechnique Federale de Lausanne Junqiu Liu/Ecole Polytechnique Federale de Lausanne Paul Seidler/IBM Tobias Kippenberg/Ecole Polytechnique Federale de Lausanne

9:30 - 9:45

Machine Learning Analysis of Optical Rogue Solitons in Supercontinuum Generation (FTh1A.6)
Presenter: lauri SALMELA, *Tampere University*
Expand for Abstract / Authors

Paper

We use machine learning techniques to predict the peak intensity and temporal shift of extreme red-shifted rogue solitons in supercontinuum generation from simulated single-shot spectral intensity profiles without any phase information.

Authors:lauri SALMELA/Tampere University Coraline Lapre/Université Bourgogne Franche-Comté John Dudley/Université Bourgogne Franche-Comté Goëry Genty/Tampere University

9:45 - 10:00

High-Energy Infrared Soliton Dynamics in Hollow Capillary Fibres (FTh1A.7)
Presenter: Christian Brahms, *Heriot-Watt University*
Expand for Abstract / Authors

Paper

We demonstrate soliton self-compression of high-energy 1800 nm laser pulses in hollow capillary fibres. This enables generation of infrared attosecond pulses and few-femtosecond pulses from the deep ultraviolet to the infrared with resonant dispersive wave emission.

Authors:Christian Brahms/Heriot-Watt University Federico Belli/Heriot-Watt University John Travers/Heriot-Watt University

Silicon Nitride Photonics (STh1J)

Presider: Minhao Pu, *Danmarks Tekniske Universitet*

8:00 - 8:15 **Overcoming the Trade-Off Between Loss and Dispersion in Microresonators (STh1J.1)**
Presenter: Mateus Corato Zanarella, *Columbia University*
Expand for Abstract / Authors

Paper

We overcome the trade-off between loss and dispersion in high Q microresonators by engineering their cross-section along the length. We show high quality factor of 8.0 million, corresponding to a propagation loss of 4.7 dB/m.

Authors:Mateus Corato Zanarella/Columbia University Xingchen Ji/Columbia University Aseema Mohanty/Columbia University Utsav Dave/Columbia University Alexander Gaeta/Columbia University Michal Lipson/Columbia University

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8:15 - 8:30 **Ultra-Low Loss 698 nm and 450 nm Silicon Nitride Visible Wavelength Waveguides for Strontium Atomic Clock Applications (STh1J.2)**
Presenter: Nitesh Chauhan, *University of California, Santa Barbara*
Expand for Abstract / Authors

Paper

We report tightly confining Si_3N_4 waveguides with record low loss at key strontium clock visible wavelengths, 0.03dB/cm at λ=698nm, 0.08dB/cm at 450nm and ring resonators with measured loaded Q of 8.6 million at λ=674nm.

Authors:Nitesh Chauhan/University of California, Santa Barbara Jiawei Wang/University of California, Santa Barbara Debapam Bose/University of California, Santa Barbara Renan Moreira/University of California, Santa Barbara Daniel Blumenthal/University of California, Santa Barbara

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8:30 - 8:45 **Low-loss D-shape Silicon Nitride Waveguides Using a Dielectric Lift-off Fabrication Process (STh1J.3)**
Presenter: Qiancheng Zhao, *University of California Santa Barbara*
Expand for Abstract / Authors

Paper

D-shape Si_3N_4 waveguides are fabricated by dielectric lift-off process. We measure ultra-low loss for a 90nm-thick core of 2.42 dB/m at 1550 nm and a loaded Q-factor of 1.12×10^6 for a 0.8 mm radius resonator.

Authors:Qiancheng Zhao/University of California Santa Barbara Jiawei Wang/University of California Santa Barbara Nitesh Chauhan/University of California Santa Barbara Debapam Bose/University of California Santa Barbara Naijun Jin/Yale University Renan Moreira/University of California Santa Barbara Ryan Behunin/Northern Arizona University Peter Rakich/Yale University Daniel Blumenthal/University of California Santa Barbara

8:45 - 9:00	**Robust Miniature Pure-Phase Modulators at λ = 488 nm (STh1J.4)** **Presenter**: Heqing Huang, *Columbia University* Expand for Abstract / Authors We demonstrate miniature silicon nitride (SiN) pure-phase modulators operating at the blue wavelength. The devices are based on adiabatic micro-rings that are robust against fabrication variations and hold great promise for large-scale visible integrated systems. **Authors**:Heqing Huang/Columbia University Guozhen Liang/Columbia University Aseema Mohanty/Columbia University Xingchen Ji/Columbia University Min Shin/Columbia University Michal Lipson/Columbia University Nanfang Yu/Columbia University	Paper
9:00 - 9:15	**Low-loss and Ultra-broadband Silicon Nitride Angled MMI Polarization Splitter (STh1J.5)** **Presenter**: Ramesh k, *Institute for Research in Electronics & Applied Physics, University of Maryland* Expand for Abstract / Authors We experimentally demonstrate a SiN angled-MMI based polarization splitter with nearly wavelength-independent performance over C+L bands, insertion loss ≈0.8 dB (1.0 dB), and crosstalk < −18 dB (< −20 dB) for TE (TM) polarization. **Authors**:Ramesh k/Institute for Research in Electronics & Applied Physics, University of Maryland Thomas Murphy/Institute for Research in Electronics & Applied Physics, University of Maryland Karen Grutter/Laboratory for Physical Sciences	Paper
9:15 - 9:30	**Efficient Second Harmonic Generation in a Si_3N_4 microring (STh1J.6)** **Presenter**: Xiyuan Lu, *National Inst of Standards & Technology* Expand for Abstract / Authors We demonstrate efficient second harmonic generation in a silicon nitride microring, through perfect phase matching of a photogalvanic DC-field-induced SHG process. The efficiency of 2,500 %/W is > 100 times larger than the previous record in silicon photonics. **Authors**:Xiyuan Lu/National Inst of Standards & Technology Gregory Moille/National Inst of Standards & Technology Ashutosh Rao/National Inst of Standards & Technology Daron Westly/National Inst of Standards & Technology Qing Li/National Inst of Standards & Technology Kartik Srinivasan/National Inst of Standards & Technology	Paper

9:30 - 9:45 **Broadband Quasi-Phase-Matching in All-Optically Poled Stoichiometric Silicon Nitride Waveguides (STh1J.7)**
Presenter: Edgars Nitiss, *Ecole Polytechnique Federale de Lausanne*
Expand for Abstract / Authors

Paper

We show how broadband (>30nm) quasi-phase matching in all-optically poled Si_3N_4 waveguides provides a platform for efficient sum-frequency generation, and for femtosecond pulse processing such as f_{CEO} detection without the need for group velocity engineering.

Authors:Edgars Nitiss/Ecole Polytechnique Federale de Lausanne Boris Zabelich/Ecole Polytechnique Federale de Lausanne Camille-Sophie Brès/Ecole Polytechnique Federale de Lausanne

9:45 - 10:00 **A Waveguide-Coupled Colloidal Quantum Dot LED on a Silicon Nitride Platform (STh1J.8)**
Presenter: Lukas Elsinger, *Ghent University - imec*
Expand for Abstract / Authors

Paper

Colloidal quantum dots (QDs) have become an attractive light source for visible photonics. Here, we demonstrate the first integrated LED based on CdSe/CdS QDs, with the emission directly coupled to a silicon nitride waveguide.

Authors:Lukas Elsinger/Ghent University - imec Ivo Tanghe/Ghent University - imec Frederik Van Acker/Ghent University Natalia K. Zawacka/Ghent University Robin Petit/Ghent University Kristiaan Neyts/Ghent University Christophe Detavernier/Ghent University Pieter Geiregat/Ghent University Zeger Hens/Ghent University Dries Van Thourhout/Ghent University - imec

Space-division Multiplexing Transmission (STh1L)

Presider: Giovanni Milione, *NEC Laboratories America Inc*

8:00 - 8:15 **Two-channel data transmission on a polarization-maintaining highly elliptical core fiber without MIMO (STh1L.1)**
Presenter: Alessandro Corsi, *Laval University*
Expand for Abstract / Authors

Paper

We transmit two QPSK signals over a polarization maintaining highly-elliptical-core multimode fiber without recourse to MIMO processing. OSNR penalty is between 2.3 and 3.5 dB at 24 Gbaud.

Authors:Alessandro Corsi/Laval University Jun Chang/Laval University Stanley Johnson/Laval University Sasan Zhalehpour/Laval University Leslie Rusch/Laval University Sophie LaRochelle/Laval University

8:15 - 8:30

DMD Reduction by Strong Mode Coupling in Few-mode Fibers Using Multi-laser Inscribed LPFGs (STh1L.2)

Paper

Presenter: Xutao Wang, *Key Laboratory of Opto-electronic Information Technical Science of Ministry of Education, School of Precision Instruments and Optoelectronics Engineering, Tianjin University, Tianjin, 300072, China*

Expand for Abstract / Authors

We propose to use multiple lasers to write long-period gratings into few-mode fibers for significant reduction of the mean DMD by 280 times from 1700 to 6.2 ns at 1500 km.

Authors:Xutao Wang/Key Laboratory of Opto-electronic Information Technical Science of Ministry of Education, School of Precision Instruments and Optoelectronics Engineering, Tianjin University, Tianjin, 300072, China Zhiqun Yang/Key Laboratory of Opto-electronic Information Technical Science of Ministry of Education, School of Precision Instruments and Optoelectronics Engineering, Tianjin University, Tianjin, 300072, China Wenbo Yu/Key Laboratory of Opto-electronic Information Technical Science of Ministry of Education, School of Precision Instruments and Optoelectronics Engineering, Tianjin University, Tianjin, 300072, China Yaping Liu/Key Laboratory of Opto-electronic Information Technical Science of Ministry of Education, School of Precision Instruments and Optoelectronics Engineering, Tianjin University, Tianjin, 300072, China Zixiang Di/Key Laboratory of Opto-electronic Information Technical Science of Ministry of Education, School of Precision Instruments and Optoelectronics Engineering, Tianjin University, Tianjin, 300072, China Guifang Li/CREOL, The College of Optics and Photonics, University of Central Florida, FL 32816, Lin Zhang/Key Laboratory of Opto-electronic Information Technical Science of Ministry of Education, School of Precision Instruments and Optoelectronics Engineering, Tianjin University, Tianjin, 300072, China

8:30 - 8:45

Fabry-Perot Filter-Based Mode-Group Demultiplexers (STh1L.3)

Paper

Presenter: Fatemeh Ghaedi Vanani, *University of Central Florida*

Expand for Abstract / Authors

A novel mode-group demultiplexer using Fabry-Perot (FP) filters has been proposed and designed to enable low-crosstalk demultiplexing of mode groups with degeneracies commensurate with those of graded-index (GRIN) MMFs.

Authors:Fatemeh Ghaedi Vanani/University of Central Florida Alireza Fardoost/University of Central Florida Guifang Li/University of Central Florida

8:45 - 9:00 **Nonlinearity-Aware OAM Mode-Group Multiplexed Transmission over 1-km Ring-Core Fiber with Low High-Order Inter-Mode-Group Crosstalk (STh1L.4)**
Presenter: Junwei Zhang, *Sun Yat-Sen University*
Expand for Abstract / Authors

Paper

Based on a ring-core fiber (RCF) with low high-order inter-mode-group crosstalk, OAM mode-group multiplexed transmission using polynomial nonlinear equalizer over 1-km RCF is successfully demonstrated, achieving an effective electrical spectrum efficiency of ~7.2 bit/s/Hz.

Authors:Junwei Zhang/Sun Yat-Sen University Junyi Liu/Sun Yat-Sen University Zhenrui Lin/Sun Yat-Sen University Jie Liu/Sun Yat-Sen University Lei Sheng/Yangtze Optical Fiber and Cable Joint Stock Limited Company Siyuan Yu/Sun Yat-Sen University

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9:00 - 9:30 **Optimized Multicore Amplifiers for Space-Division Multiplexing Transmission Systems (STh1L.5)**
Presenter: Emmanuel Le Taillandier de Gabory, *NEC Corporation*
Expand for Abstract / Authors

Paper

We show recent technologies for low power consumption multi-core amplifiers. We report advances concerning core pumping, cladding pumping and optimized hybrid pumping technologies for power efficient optical amplification with erbium doped multi-core fiber amplifiers.

Authors:Emmanuel Le Taillandier de Gabory/NEC Corporation Hitoshi Takeshita/NEC Corporation Keiichi Matsumoto/NEC Corporation

Invited

9:30 - 9:45 **Experimental Demonstration of Record 300-km Orbital Angular Momentum (OAM) Mode-Division Multiplexing Transmission Using a Ring-Core Fiber Recirculating Loop (STh1L.6)**
Presenter: Hongya Wang, *Huazhong University of Science and Techn*
Expand for Abstract / Authors

Paper

Using two high-order OAM modes each carrying a quadrature phase-shift keying signal, we experimentally demonstrate a record 300-km OAM mode-division multiplexing transmission assisted by a ring-core fiber recirculating loop without multiple-input multiple-output digital signal processing.

Authors:Hongya Wang/Huazhong University of Science and Techn Min yang/Huazhong University of Science and Techn Lulu Wang/Huazhong University of Science and Techn Lei Sheng/Yangtze Optical Fibre and Cable Joint Stock Limited Company Lei zhang/Yangtze Optical Fibre and Cable Joint Stock Limited Company Jie Luo/Yangtze Optical Fibre and Cable Joint Stock Limited Company Jian Wang/Huazhong University of Science and Techn

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9:45 - 10:00 **Demonstration of 160 Gb/s On-chip Mode-division Multiplexing Transmission (STh1L.7)**
Presenter: Yetian Huang, *Shanghai University*
Expand for Abstract / Authors

Paper

We experimentally demonstrate 160 Gbit/s on-chip mode-multiplexed transmission over a multimode silicon-on-insulator (SOI) waveguide using four spatial and polarization modes. 4×4 MIMO-based DSP is used to compensate mode coupling.

Authors:Yetian Huang/Shanghai University Hanzi Huang/Shanghai University Ruihuan Zhang/Shanghai Jiao Tong University Yingxiong Song/Shanghai University Haoshuo Chen/Nokia bell labs Nicolas Fontaine/Nokia bell labs Roland Ryf/Nokia bell labs Qingming Zhu/Shanghai Jiao Tong University Yu He/Shanghai Jiao Tong University Yong Zhang/Shanghai Jiao Tong University Yikai Su/Shanghai Jiao Tong University Min Wang/Shanghai University

Topological Photonics III (FTh1B)
Presider: Todd Van Mechelen, *Purdue University*

8:00 - 8:15 **(Withdrawn) A Stochastic Photonic Spin Hall Effect Tapping Nanoscale Size Fluctuation of Ferromagnetic Meta-atoms (FTh1B.1)**
Presenter: Bo Wang, *Technion-Israel Institute of Technology*
Expand for Abstract / Authors

We observed a stochastic photonic spin Hall effect from a spatially-bounded lattice of ferromagnetic meta-atoms of nanoscale size fluctuations. These results open the way towards sensing deep-subwavelength disorders by actively breaking the photonic spin symmetry.

Authors:Bo Wang/Technion-Israel Institute of Technology Kexiu Rong/Technion-Israel Institute of Technology Elhanan Maguid/Technion-Israel Institute of Technology Vladimir Kleiner/Technion-Israel Institute of Technology Erez Hasman/Technion-Israel Institute of Technology

8:15 - 8:30 **Observation of Charge-2 Photonic Weyl Point (FTh1B.2)**
Presenter: Sachin Vaidya, *The Pennsylvania State University*
Expand for Abstract / Authors

Paper

We present the experimental realization of a charge-2 Weyl point in a low index-contrast (n=1.52) photonic crystal fabricated using two-photon polymerization and characterized at mid-infrared wavelengths.

Authors:Sachin Vaidya/The Pennsylvania State University Jiho Noh/The Pennsylvania State University Alexander Cerjan/The Pennsylvania State University Mikael Rechtsman/The Pennsylvania State University

8:30 - 9:30

Dualities for metamaterial design (FTh1B.3)
Presenter: Vincenzo Vitelli, *University of Chicago*
Expand for Abstract / Authors

Paper

Metamaterial design is often based on symmetries and their breaking. In this tutorial, we introduce an alternative paradigm based on the notion of dualities and illustrate it using general theoretical principles and hands-on demonstrations.
Vitelli is a Professor of Physics at the University of Chicago. He obtained his Phd at Harvard in 2006 and was a post-doc at the University of Pennsylvania until he moved to Leiden University where he was a faculty till 2017. He is a fellow of the American Physical Society.

Authors:Vincenzo Vitelli/University of Chicago

Tutorial

9:30 - 9:45

Topological Insulator Chalcogenides for Infrared Dielectric Metamaterials (FTh1B.4)
Presenter: Giorgio Adamo, *Nanyang Technological University*
Expand for Abstract / Authors

Paper

We show that chalcogenide topological insulators have exceptionally high infrared refractive indices, enabling metamaterials with complex mode structures that could open up pathways to combine dielectric, plasmonic and magnetic metamaterials in a single platform.

Authors:Harish Krishnamoorthy/Nanyang Technological University Giorgio Adamo/Nanyang Technological University Jun Yin/Nanyang Technological University Vassili Savinov/University of Southampton Nikolay Zheludev/Nanyang Technological University Cesare Soci/Nanyang Technological University

9:45 - 10:00

Non-Hermitian Topological Light Steering (FTh1B.5)
Presenter: Tianwei Wu, *University of Pennsylvania*
Expand for Abstract / Authors

Paper

By strategically interfacing non-Hermitian and topological physics, we demonstrate arbitrary, robust light steering in reconfigurable non-Hermitian junctions, in which chiral topological states can propagate at an interface of the gain and loss domains.

Authors:Han Zhao/University of Pennsylvania Xingdu Qiao/University of Pennsylvania Tianwei Wu/University of Pennsylvania Bikashkali Midya/University of Pennsylvania Stefano Longhi/Politecnico di Milano Liang Feng/University of Pennsylvania

Advances in Microscopy (STh1M)

Presider: Emily Gibson, *University of Colorado Denver*

8:00 - 8:15 **Ultrafast Coherent Vibrational Spectroscopy Using Infrared Four Wave Mixing (STh1M.1)**
Presenter: Kai Wang, *Texas AM University*
Expand for Abstract / Authors

Paper

We experimentally demonstrate a femtosecond coherent vibrational spectroscopy based on infrared four wave mixing. The technique can be applied to obtain a chemical image of biological tissue combined with microscopy.

Authors:jizhou Wang/Texas AM University Kai Wang/Texas AM University yujie Shen/Texas AM University Zehua Han/Texas AM University Alexei Sokolov/Texas AM University Marlan Scully/Texas AM University

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8:15 - 8:30 **Real-time Frequency-encoded Spatiotemporal Focusing (STh1M.2)**
Presenter: Xiaoming Wei, *California Institute of Technology*
Expand for Abstract / Authors

Paper

We present a novel real-time frequency-encoded spatiotemporal (FEST) focusing technology using a programmable two-dimensional optical frequency comb. This technique enables, for the first time, simultaneous spatial and temporal focusing at microseconds through thick scattering media.

Authors:Xiaoming Wei/California Institute of Technology Yuecheng Shen/California Institute of Technology Joe Jing/California Institute of Technology A. S. Hemphill/California Institute of Technology Changsheng Yang/South China University of Technology Shanhui Xu/South China University of Technology Zhongmin Yang/South China University of Technology Lihong Wang/California Institute of Technology

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8:30 - 8:45 **Fast and Wide Field-of-View Microscopy using a Coded Aperture (STh1M.3)**
Presenter: Velat Kilic, *Johns Hopkins University*
Expand for Abstract / Authors

Paper

Microscopes suffer from limited space-bandwidth product at high frame rates due to data collection bottlenecks. We demonstrate a coded aperture compressive microscope that enhances the space-bandwidth product of high-speed imagers.

Authors:Jaewook Shin/Johns Hopkins University Velat Kilic/Johns Hopkins University Mark Foster/Johns Hopkins University

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8:45 - 9:00 **Optogenetic control of calcium signaling over individual cells with a micro-LED array (STh1M.4)**
Presenter: Dacheng Mao, *UMass Amherst*
Expand for Abstract / Authors

[Paper]

We report a 16 μm-pitched micro-LED array that enables single-cell optogenetics with *in vitro* calcium imaging. Our LEDs can output bright, localized light to optogenetically address cells that are sub-10 μm apart with low crosstalk.

Authors:Dacheng Mao/UMass Amherst Zheshun Xiong/UMass Amherst Ningwei Li/UMass Amherst Yubing Sun/UMass Amherst Guangyu Xu/UMass Amherst

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9:00 - 9:15 **Resolution Enhancement in Scanning Electron Microscopy using Deep Learning (STh1M.5)**
Presenter: Kevin de Haan, *University of California Los Angeles*
Expand for Abstract / Authors

[Paper]

We present a deep learning-based framework to perform image super-resolution in scanning electron microscopy. The technique was demonstrated to perform a resolution enhancement using a standard resolution test target and hydrogel samples.

Authors:Kevin de Haan/University of California Los Angeles Zachary Ballard/University of California Los Angeles Yair Rivenson/University of California Los Angeles Yichen Wu/University of California Los Angeles Aydogan Ozcan/University of California Los Angeles

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9:15 - 9:30 **Dual-comb photoacoustic spectroscopy of polymer films (STh1M.6)**
Presenter: Jacob Friedlein, *National Institute of Standards and Technology*
Expand for Abstract / Authors

[Paper]

Dual-comb photoacoustic spectroscopy (DCPAS) is a new spectroscopy technique that measures photoacoustic signals in thousands of wavelength bands simultaneously. We report the first demonstration of this technique and show DCPAS spectra of polymer films.

Authors:Jacob Friedlein/National Institute of Standards and Technology Esther Baumann/National Institute of Standards and Technology Kimberly Briggman/National Institute of Standards and Technology Gabriel Colacion/National Institute of Standards and Technology Fabrizio Giorgetta/National Institute of Standards and Technology Daniel Herman/National Institute of Standards and Technology Eli Hoenig/National Institute of Standards and Technology Jeeseong Hwang/National Institute of Standards and Technology Nathan Newbury/National Institute of Standards and Technology Edgar Perez/National Institute of Standards and Technology Christopher Yung/National Institute of Standards and Technology Ian Coddington/National Institute of Standards and Technology Kevin Cossel/National Institute of Standards and Technology

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9:30 - 10:00	**Multi-parametric Photoacoustic Microscopy: Auscultation of Hemodynamics and Energy Metabolism at the Microscopic Level (STh1M.7)** **Presenter**: Song Hu, *Washington University in St. Louis* Expand for Abstract / Authors Integrating innovations in instrumentation and image analysis, multi-parametric PAM enables comprehensive and quantitative characterization of the microvascular structure, mechanical properties, hemodynamics, and tissue oxygen metabolism, all at the microscopic level. This enabling technology has opened up unprecedented opportunities in brain, cardiovascular and cancer research. **Authors**:Song Hu/Washington University in St. Louis Invited	Paper

Ultrashort Pulse Generation at Novel Wavelengths (STh1P)

Presider: Maria Chernysheva, *Leibniz Institute of Photonic Technology*

8:00 - 8:15	**kW-peak Power Level Blue Light Sources via a Hybrid Fiber and Crystal Nonlinear Process Using Higher Order Modes (STh1P.1)** **Presenter**: Robert Lindberg, *Kungliga Tekniska Högskolan* Expand for Abstract / Authors We generate high peak-power, Gaussian-shaped 486-nm pulses using a PPKTP crystal that performs simultaneous frequency doubling and nonlinear mode conversion, and FWM in the LP_{07} mode of a fiber. **Authors**:Robert Lindberg/Kungliga Tekniska Högskolan XIao Liu/Boston University Andrius Zukauskas/Kungliga Tekniska Högskolan Siddharth Ramachandran/Boston University Valdas Pasiskevicius/Kungliga Tekniska Högskolan	Paper
8:15 - 8:30	**Multi-color, repetition-rate tunable, energetic femtosecond source aiming for multimodal nonlinear microscopy (STh1P.2)** **Presenter**: Yang Yu, *Xidian University* Expand for Abstract / Authors We demonstrate an energetic ultrafast laser source that simultaneously provides three-color pulses tunable from 925 nm to 1150 nm with energy up to 75 nJ. The repetition-rate can be tuned from 1 to 20 MHz. **Authors**:Yang Yu/Xidian University Shaobo Fang/Institute of physics, Chinese Academy of Science Hao Teng/Institute of physics, Chinese Academy of Science Jiangfeng Zhu/Xidian University Junli Wang/Xidian University Guoqing Chang/Institute of physics, Chinese Academy of Science zhiyi wei/Institute of physics, Chinese Academy of Science	Paper

8:30 - 8:45 **All-fiber Short-wavelength Mode-locked Fiber Laser and Amplifier Using Normal Dispersion Thulium-doped Fiber (STh1P.3)**
Presenter: Shaoxiang Chen, *Nanyang Technological University*
Expand for Abstract / Authors

Paper

A W-type normal dispersion thulium-doped fiber with distributed filtering effect at long wavelengths is exploited for short-wavelength pulse amplification. We achieved a pulse laser with high energy of~ 32.7-nJ at 1755-nm and no pulse break-up. .

Authors:Shaoxiang Chen/Nanyang Technological University Yuhao CHEN/Nanyang Technological University Sidharthan Raghuraman/Nanyang Technological University Kun Liu/Nanyang Technological University chenjia Cheng/Nanyang Technological University Qijie Wang/Nanyang Technological University Dingyuan Tang/Nanyang Technological University Seongwoo Yoo/Nanyang Technological University

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8:45 - 9:00 **L-band Wavelength-tunable Fiber Laser Based on Er^{3+}-doped Tellurite Fiber (STh1P.4)**
Presenter: Shijie Fu, *The University of Arizona*
Expand for Abstract / Authors

Paper

L-band wavelength-tunable Er^{3+}-doped tellurite fiber lasers in a linear cavity based on Littrow configuration were developed. Wavelength tunable range of 38 nm from 1589 to 1627 nm was achieved with in-band pump at 1570 nm.

Authors:Shijie Fu/The University of Arizona Xiushan Zhu/The University of Arizona Junfeng Wang/The University of Arizona Jingwei Wu/The University of Arizona Minghong Tong/The University of Arizona Jie Zong/NP Photonics Michael Li/NP Photonics Kort Wiersma/NP Photonics Arturo Chavez/NP Photonics Nasser Peyghambarian/The University of Arizona

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9:00 - 9:15 **High-power 1700 nm femtosecond laser based on optical parametric chirped-pulse amplification (STh1P.5)**
Presenter: Yukun Qin, *University of Arizona*
Expand for Abstract / Authors

Paper

We present a high-power, all-fiber optical parametric chirped-pulse amplifier working at 1700 nm. The laser delivers 1.42 W average power and ~40 nJ pulse energy. The pulses can be de-chirped to ~450 fs.

Authors:Yukun Qin/University of Arizona Orkhongua Batjargal/University of Arizona Benjamin Cromey/University of Arizona Khanh Kieu/University of Arizona

9:15 - 9:30	**Generation of Femtosecond Pulses at 1080 nm and 1200 nm in Ytterbium-Doped Fiber (STh1P.6)** **Presenter**: Michael Buttolph, *Cornell University* Expand for Abstract / Authors We demonstrate a synchronously-pumped Raman oscillator that generates a 48 nJ Stokes pulse at 1200 nm and a 43 nJ pulse at 1080 nm, extending the spectral range of conventional ytterbium-doped silica fiber-based ultrafast sources. **Authors**:Michael Buttolph/Cornell University Pavel Sidorenko/Cornell University Menansili A Mejooli/Cornell University Chris Schaffer/Cornell University Frank W Wise/Cornell University	Paper
9:30 - 9:45	**All-fiber wavelength-tunable Bi-doped laser employing a fiber Bragg grating operating in the 1300nm band (STh1P.7)** **Presenter**: Siyi Wang, *University Southampton, ORC* Expand for Abstract / Authors We present a Bi-doped fiber laser (BDFL) at 1340nm with >170mW output power and 35% slope efficiency. A wavelength-tunable version of the BDFL facilitated by an FBG is demonstrated from 1315-1340nm with >120mW output power. **Authors**:Siyi Wang/University Southampton, ORC Yu Wang/University Southampton, ORC Naresh Thipparapu/University Southampton, ORC Morten Ibsen/University Southampton, ORC David Richardson/University Southampton, ORC Jayanta Sahu/University Southampton, ORC	Paper
9:45 - 10:00	**(Withdrawn) Widely-Tunable Operation of a Thulium Doped Fiber Laser Between 1654 nm and 2025 nm (STh1P.8)** **Presenter**: William Clarkson, *University of Southampton* Expand for Abstract / Authors A very widely tunable thulium-doped alumino-silicate fiber laser is reported. The laser was core-pumped by an erbium-doped fiber laser at 1580nm and was continuously tunable over a 371 nm tuning range, from 1654-2025 nm. **Authors**:Mark Burns/University of Southampton Peter Shardlow/University of Southampton William Clarkson/University of Southampton	

Ultrafast Phenomena in Quantum Condensed Matter Systems (FTh1Q)

Presider: Diyar Talbayev, *Tulane University*

8:00 - 8:15 **Ultrafast Quantum-memory Effects in Carbon Nanotubes (FTh1Q.1)**
Presenter: Weiwei Jiang, *University of Michigan*
Expand for Abstract / Authors

[Paper]

Reversible, 200 fs optical switching of carbon nanotubes is demonstrated by utilizing Coulombic many-body effects, strong exciton binding and quantum memory in Coulombic scattering which together eliminate pure dephasing of coherences.

Authors:Weiwei Jiang/University of Michigan Kankan Cong/Rice University Bryan Anthonio/Rice University Tim Noe/Rice University Huaping Liu/Chinese Academy of Sciences hiromichi kataura/National Institute of Advanced Industrial Science and Technology Junichiro Kono/Rice University Mackillo Kira/University of Michigan

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8:15 - 8:30 **Femtosecond Stimulated Emission Microscopy of Single Nanocrystals (FTh1Q.2)**
Presenter: Niek van Hulst, *ICFO -Institut de Ciencies Fotoniques*
Expand for Abstract / Authors

[Paper]

We demonstrate direct detection of stimulated emission from individual colloidal nanocrystals at room temperature, while simultaneously recording the depleted spontaneous emission, enabling us to trace the carrier population through the entire photo-cycle.

Authors:Lukasz Piatkowski/Institute of Physical Chemistry, Polish Academy of Sciences, Kasprzaka 44/52, 01-224 Warsaw, Poland. Nicolò Accanto/ICFO -Institut de Ciencies Fotoniques Gaëtan Calbris/ICFO -Institut de Ciencies Fotoniques Sotirios Christodoulou/ICFO -Institut de Ciencies Fotoniques iwan moreels/Department of Chemistry, Ghent University, Krijgslaan 281-S3, 9000 Gent, Belgium. Niek van Hulst/ICFO -Institut de Ciencies Fotoniques

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8:30 - 8:45 **Electric Field Based Spectrum Control of Deterministic Quantum Emitters in Atomically Thin Semiconductors (FTh1Q.3)**
Presenter: ARUNABH MUKHERJEE, *University of Rochester*
Expand for Abstract / Authors

[Paper]

Spectrally tunable quantum emitters (QEs) at predetermined locations can enable scalable quantum technologies. We employ a van-der Waals’ capacitor on nanopillars to deterministically create QEs in monolayer WSe_2 and tune their energies by applying electric field.

Authors:ARUNABH MUKHERJEE/University of Rochester Chitraleema Chakraborty/Harvard University Liangyu Qiu/University of Rochester Nickolas Vamivakas/University of Rochester

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8:45 - 9:00 **(Withdrawn) Diffusion-Limited Trapping at Nanoscale Defect Sites in Hybrid Organic-Inorganic Perovskite Films (FTh1Q.4)**
Presenter: Andrew Winchester, *Okinawa Institute of Science and Technology*
Expand for Abstract / Authors

We use time resolved photoemission electron microscopy to visualize the nanoscale hole trapping dynamics in hybrid organic-inorganic perovskite films. The trapping kinetics are found to be limited by carrier diffusion to the trap sites.

Authors:Andrew Winchester/Okinawa Institute of Science and Technology Stuart Macpherson/University of Cambridge Vivek Pareek/Okinawa Institute of Science and Technology Sofiia Kosar/Okinawa Institute of Science and Technology Mojtaba Abdi-Jalebi/University of Cambridge Zahra Andaji-Garmaroudi/University of Cambridge Christopher Petoukhoff/Okinawa Institute of Science and Technology E Laine Wong/Okinawa Institute of Science and Technology Julien Madéo/Okinawa Institute of Science and Technology Michael Man/Okinawa Institute of Science and Technology Samuel Stranks/University of Cambridge Keshav Dani/Okinawa Institute of Science and Technology

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9:00 - 9:15 **Optical Field Induced Upconversion in Quantum Dots from Mid- and Long-Wavelength Infrared Radiation (FTh1Q.5)**
Presenter: Ibrahim Boulares, *U.S. Army Research Laboratory*
Expand for Abstract / Authors

Paper

We investigate the interaction of the optical electric field of intense sub-picosecond infrared pulses, between 3.5 and 12 micrometers, with visible quantum dots materials. Significant visible luminescence is observed from upconversion of the infrared light.

Authors:Ibrahim Boulares/U.S. Army Research Laboratory Jiaojian Shi/Massachusetts Institute of Technology Blair Connelly/U.S. Army Research Laboratory Keith Nelson/Massachusetts Institute of Technology

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9:15 - 9:30 **Gate-Tunable Kerr Nonlinearity of Graphene in the Mid-Infrared (FTh1Q.6)**
Presenter: Gauri Patwardhan, *Cornell University*
Expand for Abstract / Authors

Paper

We measure the nonlinear refractive index n_2, two-photon absorption coefficient, and hot-electron nonlinearity of gated graphene in the mid-IR regime. Our results show that both the magnitude and sign of n_2 can be voltage-controlled.

Authors:Gauri Patwardhan/Cornell University M. Jadidi/Columbia University Brian Lee/Columbia University Ipshita Datta/Columbia University Jared Ginsberg/Columbia University Cecilia Chen/Columbia University Michal Lipson/Columbia University Alexander Gaeta/Columbia University

9:30 - 9:45 **Exciton polariton-mediated long-range excitation energy transport in disordered organic semiconductors (FTh1Q.7)**
Presenter: Shaocong Hou, *University of Michigan*
Expand for Abstract / Authors

[Paper]

We demonstrate room-temperature ultralong-range transport >80 μm of exciton-polaritons in a disordered organic thin-film using a one-sided distributed Bragg reflector, which is orders of magnitude larger than expected for excitons in disordered systems.

Authors:Shaocong Hou/University of Michigan Mandeep Khatoniar/City College of New York Kan Ding/University of Michigan Yue Qu/University of Michigan Vinod Menon/City College of New York Stephen Forrest/University of Michigan

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9:45 - 10:00 **Intersubband Polaritons and Strong Coupling in Single Nanoantenna Observed by Near-field Microscopy (FTh1Q.8)**
Presenter: Oleg Mitrofanov, *University College London*
Expand for Abstract / Authors

[Paper]

Strong coupling of intersubband excitation until recently was observed only in large-scale systems. We demonstrate intersubband polariton formation in an isolated nanoantenna using near-field spectroscopy, enabling investigations of light-matter interaction in the single nanoantenna regime.

Authors:Chih-Feng Wang/UNM Terefe Habteyes/UNM Ting Luk/CINT John Klem/Sandia NL Hou-Tong Chen/CINT Igal Brener/CINT Oleg Mitrofanov/University College London

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High Brightness and Ultrafast Lasers and Systems (ATh1K)

Presider: Edik Rafailov, *Aston University*

8:00 - 8:30 **The hybrid technology of solid-state laser systems (ATh1K.1)**
Presenter: Regina Gumenyuk, *Ampliconyx Oy*
Expand for Abstract / Authors

In this talk, I will present an overview of the current state-of-the-art in the design of solid-state short-pulsed and high-power laser systems for industrial applications based on the hybrid approach.

Authors:Regina Gumenyuk/Ampliconyx Oy

Invited

8:30 - 9:00	**Recent Progress Towards Commercial Semiconductor Disk Lasers and Relevant Applications (ATh1K.2)** **Presenter**: Christopher Head, *M Squared Lasers Ltd* Expand for Abstract / Authors Squared Lasers is developing Semiconductor disk lasers as an attractive compact and low-cost alternative to Titanium-sapphire based systems for markets such as nonlinear microscopy and quantum technologies. **Authors**:Graeme Malcolm/M Squared Lasers Ltd Christopher Head/M Squared Lasers Ltd Invited	
9:00 - 9:30	**One-Picosecond High-Energy Pulses in Edge-Emitting Laser Devices (ATh1K.3)** **Presenter**: Dmitri Boiko, *CSEM* Expand for Abstract / Authors Two approaches to get one-picosecond pulses on hundred pJ pulse energy scale from edge-emitting lasers are reported. One approach is based on very long tapered mode-locked lasers. The second utilizes short cavities in superradiance regime. **Authors**:Dmitri Boiko/CSEM Invited	Paper
9:30 - 9:45	**High-Brightness and High-Speed Coherent VCSEL Array (ATh1K.4)** **Presenter**: Zuhaib Khan, *National Central University* Expand for Abstract / Authors Novel 940 nm (quasi-)coherent VCSEL array (3x3) is demonstrated. It exhibits high-power (62.4 mW), single-spot output with narrow divergence angle (~5^0) over the full range of bias currents, and wide 3-dB E-O bandwidth (10 GHz). **Authors**:Zuhaib Khan/National Central University Jie-Chen Shih/National Central University Yung-Hao Chang/National Central University Jin-Wei Shi/National Central University	Paper

9:45 - 10:00

A Laboratory Light Source for Ultrafast Kinetics of EUV Exposure Processes and Ultra-Small Pitch Lithography (ATh1K.5)
Presenter: Seth Cousin, *KM Labs*
Expand for Abstract / Authors

Paper

An ultra-short pulsed, ultra-broadband (~13nm-~13µm) light-source has been developed to drive atto- to femto- second time-resolved studies on EUV photo-resist materials. The same source will also be used to investigate EUV driven nano-lithography.

Authors:Seth Cousin/KM Labs Clayton Bargsten/KM Labs Eric Rinard/KM Labs Rod Ward/KM Labs Erik Hosler/KM Labs Brennan Petersen/KM Labs Henry Kapteyn/KM Labs Pieter Vanelderen/imec John Petersen/imec Paul van der Heide/imec

Silicon Photonics and Quantum Information Processing (ATh1I)

Presider: Reza Salem, *Thorlabs Inc*

8:00 - 8:30

Photonic Quantum Computing (ATh1I.1)
Presenter: Mark Thompson, *PsiQuantum*
Expand for Abstract / Authors

Paper

Quantum computing is set to revolutionize information technologies. In this talk I will outline the photonics approach to quantum computing, introducing the silicon photonic quantum circuit and highlighting approaches to manufacturability and scalability.

Authors:Mark Thompson/PsiQuantum

Invited

8:30 - 8:45

High Extinction Pump Rejection Bragg Filters for Silicon Quantum Photonic Devices (ATh1I.2)
Presenter: Arnab Goswami, *IIT Madras*
Expand for Abstract / Authors

Paper

A single-stage distributed Bragg filter in silicon waveguide has been demonstrated with a rejection bandwidth of 7-nm and ultra-high extinction of ∼ 55-dB; suitable towards silicon quantum photonic chip operating at λ ∼ 1.55 µm for on-chip pump rejection.

Authors:Arnab Goswami/IIT Madras Bijoy Das/IIT Madras

8:45 - 9:00 **EO Integration of Planar Ion Trap and Silicon Photonics for Optical Addressing in Quantum Computing (ATh1I.3)** Paper

Presenter: Yu Dian Lim, *Nanyang Technological University*

Expand for Abstract / Authors

Feasibilities of Electro-Optical integration for ion-trapping in quantum computing are demonstrated. Photonics devices exhibit ~33% coupling efficiency and 1.12 dB/cm propagation loss. Wide positional tolerance of ± 10 µm is obtained for optical addressing of trapped ion.

Authors:Yu Dian Lim/Nanyang Technological University Jing Tao/Nanyang Technological University Peng Zhao/Nanyang Technological University Hong Yu Li/Institute of Microelectronics, Agency for Science, Technology and Research (A*STAR) Anak Agung Alit Apriyana/Nanyang Technological University Luca Guidoni/Université Paris Diderot Chuan Seng Tan/Nanyang Technological University

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9:00 - 9:15 **Modelling Weak-Coherent QKD Systems Using a Classical Simulation Framework (ATh1I.4)** Paper

Presenter: Sören Kreinberg, *VPIphotonics GmbH*

Expand for Abstract / Authors

We demonstrate how an existing simulation framework for modelling classical optical systems can be utilized for simulations of weak-coherent QKD links.

Authors:Sören Kreinberg/VPIphotonics GmbH Piotr Novik/VPI Development Center Igor Koltchanov/VPIphotonics GmbH André Richter/VPIphotonics GmbH

9:15 - 9:30 **A High Efficiency Reconciliation Method for Free-space Continuous-Variable QKD (ATh1I.5)** Paper

Presenter: Chao Zhou, *Beijing University of Posts and Telecomm*

Expand for Abstract / Authors

We propose a high efficiency reconciliation method for continuous-variable quantum key distribution over free-space channel, which achieves stable reconciliation efficiency of more than 95% under the fluctuation of the SNR (as low as -16 dB).

Authors:Chao Zhou/Beijing University of Posts and Telecomm Xiangyu Wang/Beijing University of Posts and Telecomm Yichen Zhang/Beijing University of Posts and Telecomm Zhiguo Zhang/Beijing University of Posts and Telecomm Song Yu/Beijing University of Posts and Telecomm

9:30 - 9:45	**Adding Artificial Noise for Dynamic Code Rate Matching in Continuous-Variable Quantum Key Distribution (ATh1I.6)** **Presenter**: Sören Kreinberg, *VPIphotonics GmbH* Expand for Abstract / Authors CV-QKD over long distances requires high reconciliation efficiencies, hence matching error correction code rate vs. SNR. For time-varying quantum channels, we achieve this by adding a controlled amount of digital noise to the measured data. **Authors**:Sören Kreinberg/VPIphotonics GmbH Igor Koltchanov/VPIphotonics GmbH André Richter/VPIphotonics GmbH	Paper
9:45 - 10:00	**Experimental Resource-Efficient Entanglement Detection (ATh1I.7)** **Presenter**: Valeria Saggio, *University of Vienna* Expand for Abstract / Authors A new entanglement-verification method is introduced and experimentally verified with a six-photon cluster state. We demonstrate that it is possible to efficiently detect multipartite entanglement with only a few copies of the state. **Authors**:Valeria Saggio/University of Vienna Aleksandra Dimic/University of Belgrade Chiara Greganti/VitreaLab GmbH Lee Rozema/University of Vienna Borivoje Dakic/University of Vienna Philip Walther/University of Vienna	Paper

Quantum Cascade and other mid-IR Lasers (STh1E)

Presider: Dan Wasserman, *University of Texas at Austin*

8:00 - 8:15	**Ridge-width Dependence of the Dispersion and Performance of Mid-infrared Quantum Cascade Laser Frequency Combs (STh1E.1)** **Presenter**: ruijun wang, *ETH Zürich* Expand for Abstract / Authors We investigate the effects of ridge width on the characteristics of quantum cascade laser frequency combs and study how to achieve optimal performance. Very narrow ridges lead to much broader lasing spectra but also results in weaker comb stability. **Authors**:ruijun wang/ETH Zürich Filippos Kapsalidis/ETH Zürich Mehran Shahmohammadi/ETH Zürich Mattias Beck/ETH Zürich Jérôme Faist/ETH Zürich	Paper

8:15 - 8:30	**Single-mode Tunable Mid-IR Laser Based on a High-Q Silicon Ring Resonator (STh1E.2)** **Presenter**: Euijae Shim, *Columbia University* Expand for Abstract / Authors We demonstrate a single longitudinal mode, tunable mid-IR laser by self-injection locking a multiple longitudinal mode Interband Cascade Laser (ICL) to a high-Q Si microresonator at 3.4 μm. **Authors**:Euijae Shim/Columbia University Andres Gil-Molina/Columbia University ohad Westreich/Columbia University Yamac Dikmelik/Thorlabs, Inc. Kevin Lascola/Thorlabs, Inc. Alexander Gaeta/Columbia University Michal Lipson/Columbia University	Paper
8:30 - 9:00	**Interband Cascade and Quantum Cascade Ring Lasers (STh1E.3)** **Presenter**: Hedwig Knötig, *TU Wien* Expand for Abstract / Authors Quantum cascade and interband cascade lasers are fabricated into surface and substrate emitting coherent light sources and detectors. We report about latest achievements in terms of power, temperature and dynamic performance of on-chip sensing systems. **Authors**:Hedwig Knötig/TU Wien Aaron Andrews/TU Wien Borislav Hinkov/TU Wien Robert Weih/nanoplus Nanosystems and Technologies Johannes Koeth/nanoplus Nanosystems and Technologies Benedikt Schwarz/TU Wien Gottfried Strasser/TU Wien Invited	Paper
9:00 - 9:15	**Excitability in Mid-Infrared Quantum Cascade Lasers: from Communication Jamming to Neuromorphic Photonics (STh1E.4)** **Presenter**: Olivier Spitz, *Télécom Paris* Expand for Abstract / Authors We experimentally build a basic optical neuron by taking advantage of excitability in a semiconductor laser under optical feedback, rather than conventional injection schemes. This optical neuron operates faster than its biological and electronical counterparts **Authors**:Olivier Spitz/Télécom Paris Jiagui Wu/University of California Los Angeles Mathieu Carras/mirSense Grégory Maisons/mirSense Chee Wei Wong/University of California Los Angeles Frédéric Grillot/Télécom Paris	Paper

9:15 - 9:30	**(Withdrawn) Precise Characterization of Mid-Infrared InGaSb SESAMs (STh1E.5)** **Presenter**: Jonas Heidrich, *ETH Zürich* Expand for Abstract / Authors We present an accurate mid-infrared nonlinear reflectivity characterization with a precision of <0.1%. MBE-grown InGaSb-quantum-well SESAMs at 2.05µm show a good modulation depth between 1 - 2.2%, low saturation fluence ~4µJ/cm^2 and excellent nonsaturable losses. **Authors**:Jonas Heidrich/ETH Zürich Marco Gaulke/ETH Zürich Ajanta Barh/ETH Zürich Matthias Golling/ETH Zürich Behçet Özgür Alaydin/ETH Zürich Ursula Keller/ETH Zürich	
9:30 - 10:00	**Interband Cascade Lasers (STh1E.6)** **Presenter**: Jerry Meyer, *US Naval Research Laboratory* Expand for Abstract / Authors Recent advances in midwave infrared interband cascade laser (ICL) technology include novel distributed feedback configurations, frequency combs, dual-comb spectroscopy, vertical-cavity surface-emitting lasers, light-emitting devices, and ICLs incorporated into photonic integrated circuits on silicon and III-V platforms. **Authors**:Igor Vurgaftman/US Naval Research Laboratory Chadwick Canedy/US Naval Research Laboratory Chul Kim/US Naval Research Laboratory Mijin Kim/KeyW Corporation Charles Merritt/US Naval Research Laboratory William Bewley/US Naval Research Laboratory Stephanie Tomasulo/US Naval Research Laboratory Jerry Meyer/US Naval Research Laboratory Invited	Paper

10:00 - 11:30 (UTC - 07:00)

Joint Poster Session 12 (JTh2A)

Effects of Electron Bunch Width on the Efficiency of High-Order Harmonic Generation from Ultrathin Solid Targets (JTh2A.1) **Presenter**: Nicholas Fasano, *Princeton University* Expand for Abstract / Authors We demonstrate the importance of the finite extent of the electron bunch width on the spectral power law and the efficiency of high harmonic generation from a relativistic laser interacting with an ultrathin target. **Authors**:Nicholas Fasano/Princeton University Matthew Edwards/Princeton University Julia Mikhailova/Princeton University	Paper

Generation of Intense Single-cycle Pulse in the Air Based on All Solid State System (JTh2A.2)
Presenter: Tsendsuren Khurelbaatar, *Pohang Univ of Science & Technology*
Expand for Abstract / Authors

Paper

We use thin solid plates in a double stage multi-plate configuration to produce high-contrast, intense single-cycle pulse at 3 kHz. Generated spectrum spans from 400 to 1000 nm at -20 dB intensity level. Output pulses are compressed down to 2.6 fs (transform-limit 2.55 fs) with an energy of 0.235 mJ

Authors:Meenkyo Seo/Pohang Univ of Science & Technology Tsendsuren Khurelbaatar/Pohang Univ of Science & Technology Sambit Mitra/Max Planck Institute of Quantum Optics Matthias Kling/Max Planck Institute of Quantum Optics Dong Kim/Pohang Univ of Science & Technology

High Harmonic Spectroscopy of Circularly Polarized High Hamonic Generation Process (JTh2A.4)
Presenter: Keisuke Kaneshima, *Hokkaido University*
Expand for Abstract / Authors

Paper

We studied the phase properties of circularly polarized high harmonics (CP-HHs) via interferometric measurements using a mixed gas. The results showed that the phase properties of CP-HHs are well described by a semiclassical model.

Authors:Keisuke Kaneshima/Hokkaido University Takuto Ando/Hokkaido University Taro Sekikawa/Hokkaido University

Interference of the Constituent Atomic Orbitals of Molecule in Laser-induced Electron Tunneling Spectroscopy (JTh2A.5)
Presenter: Shaogang Yu, *Wuhan Institute of Physics and Mathematics*
Expand for Abstract / Authors

Paper

A distinct interference feature from the different constituent atomic orbitals of molecules is clearly observed in laser-induced electron tunneling spectroscopy. This may be employed to explore the components of the molecular orbitals.

Authors:XuanYang Lai/Wuhan Institute of Physics and Mathematics RenPing Sun/Wuhan Institute of Physics and Mathematics Shaogang Yu/Wuhan Institute of Physics and Mathematics YanLan Wang/Wuhan Institute of Physics and Mathematics Wei Quan/Wuhan Institute of Physics and Mathematics Xiaojun Liu/Wuhan Institute of Physics and Mathematics

Measurement technique of unpasteurized Japanese Sake freshness by Raman spectroscopy (JTh2A.6) Paper
Presenter: Tetsuya Abe, *TOPCON CORPORATION*
Expand for Abstract / Authors

We proposed a method to inspect the quality of sake from the ethanol and glucose content of sake, and showed that it can be quantified by Raman spectrometry with calibration curve accuracy, R2 = 0.992 (Ethanol), R2 = 0.932 (Glucose).

Authors:Tetsuya Abe/TOPCON CORPORATION

Femtosecond Laser Fabricated Sensor Devices on Single-Crystal Sapphire Optical Fiber (JTh2A.7) Paper
Presenter: Mohan Wang, *University of Pittsburgh*
Expand for Abstract / Authors

We use the femtosecond laser direct writing technique to fabricate Rayleigh-scattering based distributed sensing and point sensing devices on single-crystal sapphire optical fiber. This technique can be potentially useful for harsh environment sapphire sensor integration.

Authors:Mohan Wang/University of Pittsburgh Kehao Zhao/University of Pittsburgh Sheng Huang/University of Pittsburgh Yang Yang/University of Pittsburgh Michael Buric/National Energy Technology Laboratory Paul Ohodnicki/National Energy Technology Laboratory Bo Liu/National Energy Technology Laboratory Kevin Chen/University of Pittsburgh

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Summary of modeling thermo-photo-voltaic selective emitter design based on theoretical semi-transparent materials with integrated pre-filter using Mie scattering spheres (JTh2A.8) Paper
Presenter: Frank Stake, *Freelance*
Expand for Abstract / Authors

Theoretical study to improve Thermo-Photo-Voltaic (TPV) Selective Emitters (SE) based on specialized grey body dielectric materials by adding microstructures which work within the body of semi-transparent SEs to refine their surface output spectrum.

Authors:Frank Stake/Freelance

Nonreciprocal Thermal Radiation from Magnetic Weyl Semimetals (JTh2A.9) Paper
Presenter: Cheng Guo, *Stanford University*
Expand for Abstract / Authors

We propose a strongly nonreciprocal thermal emitter based on magnetic Weyl semimetals. Such an emitter enables near complete violation of Kirchhoff's law over broad angular and frequency ranges without an external magnetic field.

Authors:Bo Zhao/Stanford University Cheng Guo/Stanford University Christina Garcia/Harvard University Prineha Narang/Harvard University Shanhui Fan/Stanford University

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Optical properties of PEDOT:PSS – silicon solar cells (JTh2A.10)
Presenter: Anastasiia Mykytiuk, *Taras Shevchenko National University of Kyiv*
Expand for Abstract / Authors

Paper

We study the optical and electrical losses in PEDOT:PSS/n-Si solar cells using spectroscopic ellipsometry and current-voltage measurements. We clarify the role of interfacial layer in optical reflection and recombination of charge carriers.

Authors:Anastasiia Mykytiuk/Taras Shevchenko National University of Kyiv Serhii Kondratenko/Taras Shevchenko National University of Kyiv

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Patterned-graphene-based broadband tunable metamaterial absorber in terahertz band (JTh2A.13)
Presenter: Fengping Yan, *Beijing Jiaotong University*
Expand for Abstract / Authors

Paper

A broadband metamaterial absorber based on the novel design of the combination of cross and slotted-square graphene sheets is presented and analyzed from the perspectives: perfect absorptivity, absorption bandwidth, tunability and insensitivity.

Authors:Xuemei Du/Beijing Jiaotong University Fengping Yan/Beijing Jiaotong University Wei Wang/Beijing Jiaotong University Luna Zhang/Beijing Jiaotong University zhuoya bai/Beijing Jiaotong University

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Alignment-free Optical Pre-conditioning System for Omni-resonant Enhancement of a Solar Cell (JTh2A.14)
Presenter: Abbas Shiri, *University of Central Florida, CREOL*
Expand for Abstract / Authors

Paper

We construct an alignment-free, planar optical system consisting of diffraction gratings and micro-prism array that pre-conditions near-infrared sunlight for broadband omni-resonant enhancement of a solar cell photocurrent.

Authors:Abbas Shiri/University of Central Florida, CREOL Massimo L. Villinger/University of Central Florida, CREOL Christopher H. Villinger/University of Central Florida, CREOL Ayman Abouraddy/University of Central Florida, CREOL

Geometric Deep Learning Unlocks the Underlying Physics of Nanostructures (JTh2A.15)
Presenter: Mohammadreza Zandehshahvar, *Georgia Institute of Technology*
Expand for Abstract / Authors

Paper

We present a learning-based technique to develop a reliable tool for discovering the underlying physics and feasibility of achieving different type of responses in electromagnetic nanostructures.

Authors:Yashar Kiarashinejad/Georgia Institute of Technology Mohammadreza Zandehshahvar/Georgia Institute of Technology Sajjad Abdollahramezani/Georgia Institute of Technology Omid Hemmatyar/Georgia Institute of Technology Reza Pourabolghasem/Independent researcher Ali Adibi/Georgia Institute of Technology

Lasing in Pyramid: Alert microstructures for dye laser (JTh2A.16)
Presenter: Hsia Yu Lin, *National Taiwan University*
Expand for Abstract / Authors

Paper

Pyramid structure was used as a resonance cavity for lasing, encapsulated with stilbene420 dye. Light is confied and multiply reflected at the boundary, thus enhancing the fluorescence. With a small threshold, a laser emission occurs.

Authors:Hsia Yu Lin/National Taiwan University Siang Yao Tan/National Taiwan University Yun Tzu Hsu/National Taiwan University Cheng Fu Hou/National Taiwan University Yang Fang Chen/National Taiwan University

Photonic discrete-time quantum walks using spatial light modulators (JTh2A.18)
Presenter: Graciana Puentes, *Universidad de Buenos Aires*
Expand for Abstract / Authors

Paper

We report a novel scheme for photonic discrete-time quantum walks, using transverse spatial modes of photons and programmable spatial light modulators (SLM). Our scheme enables simulation of arbitrary steps, only limited by the SLM resolution

Authors:Graciana Puentes/Universidad de Buenos Aires Leonardo Neves/Universidade Federal de Minas Gerais

Stronger Quantum Contextuality (JTh2A.19)
Presenter: Wen-Rong Qi, *Nankai University*
Expand for Abstract / Authors

Paper

We theoretically introduce a family of Hardy-like proofs which lead to stronger noncontextuality inequalities than that of extended KCBS. Meanwhile, we experimentally verify the simplest Hardy-like proof based on a four-dimensional photonic system.

Authors:Wen-Rong Qi/Nankai University Jie Zhou/Nankai University Ling-Jun Kong/Nanjing University Chenghou Tu/Nankai University Yongnan Li/Nankai University Adán Cabello/Universidad de Sevilla Jing-Ling Chen/Nankai University Hui-Tian Wang/Nanjing University

High-Precision Spectral Measurements of Photon-Pair Sources via Frequency-Resolved Sum-Frequency generation (JTh2A.20)
Presenter: Fumihiro Kaneda, *Tohoku University*
Expand for Abstract / Authors

Paper

Photon-pair generation via spontaneous parametric downconversion (SPDC) has been widely used for optical quantum information experiments. We demonstrate high-precision spectral measurements of SPDC sources, utilizing frequency-resolved sum-frequency generation, a reverse process of SPDC.

Authors:Fumihiro Kaneda/Tohoku University Jo Oikawa/Tohoku University Yasuyoshi Mitsumori/Tohoku University Keiichi Edamatsu/Tohoku University

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Gate-Tunable Single-Photon Emitting Diode with an Extremely Low Tuning Time (JTh2A.21)
Presenter: Igor Khramtsov, *Moscow Institute of Physics & Technology*
Expand for Abstract / Authors

Paper

We present a gate-tunable single-photon emitting diode based on a color center in 4H-SiC whose emission rate can be dynamically switched from 0.16 to 40 Mcps with a characteristic time of only 200 ps

Authors:Igor Khramtsov/Moscow Institute of Physics & Technology Dmitry Fedyanin/Moscow Institute of Physics & Technology

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High-Dimensional Time-Frequency Entanglement and Schmidt Number Witnesses Using a Biphoton Frequency Comb (JTh2A.23)
Presenter: KAI-CHI CHANG, *UCLA*
Expand for Abstract / Authors

Paper

We demonstrated high-dimensional time-frequency entanglement with a mode-locked biphoton frequency comb. Hong-Ou-Mandel interference and joint spectral intensity measurements are performed, and we estimated Hilbert space dimensionality of at least 3481 via Schmidt mode decompositions.

Authors:KAI-CHI CHANG/UCLA Xiang Cheng/UCLA Murat Sarihan/UCLA Abhinav Kumar/UCLA Yoo Seung Lee/UCLA Tian Zhong/University of Chicago Yan-Xiao Gong/Nanjing university Zhenda Xie/Nanjing university Jeffrey shapiro/MIT Franco Wong/MIT Chee Wei Wong/UCLA

Proposal of Chip-Scale Generation and Verification of Photonic Dimers (JTh2A.24)
Presenter: JUHYEON KIM, *University of Michigan*
Expand for Abstract / Authors

Paper

A semiconductor chip to generate and verify the photonic dimers, a quantum photonic state, is proposed and analyzed, even in the limit of low efficiency.

Authors:JUHYEON KIM/University of Michigan Donato Mastropietro/University of Michigan Duncan Steel/University of Michigan Jung-Tsung Shen/Washington University in St. Louis Pei-Cheng Ku/University of Michigan

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Nonperiodic optical superlattice lithium niobate waveguides for the generation of polarization entanglement (JTh2A.25)
Presenter: Hung-Pin Chung, *National Central University*
Expand for Abstract / Authors

Paper

We implement a nondegenerate polarization-correlated photon-pair source on titanium-diffused nonperiodically-poled lithium niobate waveguides. The nonperiodic domains are optimized using genetic algorithm to maximize and equalize efficiencies of the spontaneous parametric down-conversion processes

Authors:Hung-Pin Chung/National Central University Jasleen Lugani/Friedrich-Schiller-Universität Jena Wen-Chiuan Su/National Central University Pawan Kumar/Friedrich-Schiller-Universität Jena Yang-Teng Le/National Central University Thomas Pertsch/Friedrich-Schiller-Universität Jena Frank Setzpfandt/Friedrich-Schiller-Universität Jena Yen-Hung Chen/National Central University

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Time-Domain Analysis on the Impacts of Chirp and Walk-Off in Picosecond Pulsed Squeezing (JTh2A.26)
Presenter: Yoshitaka Taguchi, *The University of Tokyo*
Expand for Abstract / Authors

Paper

We investigate the relation between the squeezing level, chirp parameter of pulses, and the effect of group velocity difference in nonlinear crystals through time-domain analysis, which realizes straightforward evaluation of picosecond pulsed squeezing.

Authors:Yoshitaka Taguchi/The University of Tokyo Yasuyuki Ozeki/The University of Tokyo

Toward Generation of Spatially-Entangled Photon Pairs in a Few-Mode Fiber (JTh2A.27)
Presenter: Afshin Shamsshooli, *University of Texas at Arlington*
Expand for Abstract / Authors

Paper

We describe a novel scheme for spatial-mode-entangled photon-pair generation in a few-mode fiber. We experimentally verify the underlying inter-modal parametric processes with two-mode classical signal input and demonstrate high mode purity of the generated idler.

Authors:Afshin Shamsshooli/University of Texas at Arlington Cheng Guo/University of Texas at Arlington Francesca Parmigiani/Microsoft Research Xiaoying Li/Tianjin University Michael Vasilyev/University of Texas at Arlington

Low-cost Spectroscopy of Individual Quantum Dots (JTh2A.28)
Presenter: Jiawei Qiu, *Institute of Quantum Computing*
Expand for Abstract / Authors

Paper

We present spectroscopy measurements of individual InAsP quantum dots in photonic nanowires using (i) a home-build Czerny Turner spectrometer with an astronomy camera and (ii) an economical sub-picometre laser wavemeter from MOGLabs.

Authors:Jiawei Qiu/Institute of Quantum Computing Divya Bharadwaj/Institute of Quantum Computing Paul Anderson/Institute of Quantum Computing Sonell Malik/Institute of Quantum Computing Behrooz Semnani/Institute of Quantum Computing Mohd Zeeshan/Institute of Quantum Computing Philip Poole/National Research Council of Canada Dan Dalacu/National Research Council of Canada Michael Reimer/Institute of Quantum Computing Michal Bajcsy/Institute of Quantum Computing

Efficient Statistical Separation of Primary Dark Counts and Afterpulses in Free-Running SPADs (JTh2A.29)
Presenter: Danielius Kramnik, *Massachusetts Institute of Technology*
Expand for Abstract / Authors

Paper

We describe a binning-free method to quantify primary dark counts and afterpulses in free-running SPADs, requiring fewer samples than histogramming. This technique can enhance TCSPCs such as ToF LiDARs and fluorescence lifetime instruments.

Authors:Danielius Kramnik/Massachusetts Institute of Technology Rajeev Ram/Massachusetts Institute of Technology

Klyshko efficiency optimization using a genetic algorithm (JTh2A.30)
Presenter: Javier Sabines Chesterking, *university of Bristol*
Expand for Abstract / Authors

Paper

We use a spatial light modulator and a genetic algorithm to manipulate the spatial profile of the pump beam of a down-conversion source in order to improve its Klyshko efficiency.

Authors:Javier Sabines Chesterking/university of Bristol Paul-Antoine Moreau/university of Glasgow Alex McMillan/university of Bristol robert fickler/Tampere University John Rarity/university of Bristol Jonathan Matthews/university of Bristol

Generation of Telecom Band Photon Pairs with Factorable Spectrum by Using Few-Mode Fiber (JTh2A.31)
Presenter: Liang Cui, *Tianjin University*
Expand for Abstract / Authors

Paper

We demonstrate that telecom band photon pairs with a factorable joint spectrum can be generated via inter-modal spontaneous four-wave mixing in a two-mode few-mode fiber supporting the LP01 and LP11 spatial modes.

Authors:Liang Cui/Tianjin University Jinjin Wang/Tianjin University Xiaodong Liu/Tianjin University Xiaoying Li/Tianjin University

Joint Poster Session 13 (JTh2B)

On-chip mode-controlled waveguiding and versatile multi-wavelength light routing using chip-integrated dielectric metasurface for arbitrary polarizations (JTh2B.1)
Presenter: Yuan Meng, *Tsinghua University*
Expand for Abstract / Authors

Paper

A comprehensive design strategy using waveguide-integrated-metasurface is proposed for versatile on-chip light-coupling. The coupling-direction, operation-wavelength and excited-mode-type are configurable at will for arbitrary polarizations, with high efficiency of 67% and directivity over 20 dB.

Authors:Yuan Meng/Tsinghua University Zhoutian Liu/Tsinghua University Ride Wang/Nankai University Tiancheng Qi/Tsinghua University Futai Hu/Tsinghua University Qiang Wu/Nankai University Qirong Xiao/Tsinghua University Sang-Hoon Bae/Massachusetts Institute of Technology Hyunseok Kim/Massachusetts Institute of Technology Mali Gong/Tsinghua University

Coupled Waveguides Geometry Retrieval Using Neural Networks (JTh2B.2)
Presenter: Tom Coen, *Tel Aviv University*
Expand for Abstract / Authors

Paper

This work presents a data driven method to retrieve the geometry of a coupled waveguide system from the measured intensity of the electric field. It is shown that neural networks perform better than kNN regression.

Authors:Tom Coen/Tel Aviv University Hadar Greener/Tel Aviv University Michael Mrejen/Tel Aviv University Lior Wolf/Tel Aviv University Haim Suchowski/Tel Aviv University

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Non-volatile Integrated Photonics enabled by Broadband Transparent Phase Change Material (JTh2B.3)
Presenter: Zhuoran Fang, *University of Washington*
Expand for Abstract / Authors

Paper

We report a non-volatile integrated photonic platform enabled by the broadband transparent phase change material Sb_2S_3. Extreme low loss and non-volatile switching was demonstrated with <10 reduction in Q factor and over 30dBm extinction ratio.

Authors:Zhuoran Fang/University of Washington

Speckle-Based Optical Waveguide Reservoir Computer for Blind Signal Classification (JTh2B.4)
Presenter: Marta Luengo-Kovac, *The Aerospace Corporation*
Expand for Abstract / Authors

Paper

An opto-electronic reservoir computer based on a light valve, multimode fiber speckle, and a camera combined with back-end signal processing experimentally performs blind signal classification for return-to-zero and non-return-to-zero communications signals at low signal-to-noise
ratio.

Authors:Marta Luengo-Kovac/The Aerospace Corporation Uttam Paudel/The Aerospace Corporation Thomas Shaw/The Aerospace Corporation George Valley/The Aerospace Corporation

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Construction of a Multi-Wavelength Unitary Operator via Cascaded Optical Resonators (JTh2B.5)
Presenter: Taewon Park, *KAIST*
Expand for Abstract / Authors

Paper

In universal linear optics, programmable photonic circuits perform an arbitrary linear transformation by the sequential multiplication of two-level achromatic unitary operators. Based on cascaded optical resonator-based building blocks, we construct an arbitrary multi-wavelength unitary operator.

Authors:Taewon Park/KAIST Youngjae Jeong/KAIST Kyoungsik Yu/KAIST

Efficient Nonlinear Activation Function in Optical Neural Network (JTh2B.6)
Presenter: Hui Zhang, *Nanyang Technological University*
Expand for Abstract / Authors

Paper

An efficient nonlinear activation function for optical neural network is proposed and demonstrated by executing complex-valued algorithms and intensity measurement. Great learning capability are achieved by the inherent properties of the complex-valued optical neural network.

Authors:Hui Zhang/Nanyang Technological University Lingxiao Wan/Nanyang Technological University Mile Gu/Nanyang Technological University Xudong Jiang/Nanyang Technological University Jayne Thompson/National University of Singapore Hong Cai/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Stefano Paesani/University of Bristol Raffaele Santagati/University of Bristol Anthony Laing/University of Bristol Patrick Guo-Qiang Lo/Advanced Micro Foundry Dim-Lee Kwong/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Leong Chuan Kwek/National University of Singapore Ai Qun Liu/Nanyang Technological University

Low-Power SiN Thermo-Optic Phase Modulator Operating in Red Visible Wavelength Range (JTh2B.7)
Presenter: Samer Idres, *University of Southern California*
Expand for Abstract / Authors

Paper

We demonstrate a geometrically-optimized, silicon nitride, thermo-optic phase modulator, with a record-low $P_{2\pi}$ = 10.7 mW, operating in the red visible wavelength range that is fabricated in a commercial foundry silicon photonics process.

Authors:Samer Idres/University of Southern California Hossein Hashemi/University of Southern California

Compact Design of On-chip Elman Optical Recurrent Neural Network (JTh2B.8)
Presenter: Chenghao Feng, *University of Texas at Austin*
Expand for Abstract / Authors

Paper

We propose an on-chip optical Elman recurrent neuron network (RNN) architecture for high-speed sequence processing using Mach-Zehnder interferometers and looped waveguides. The proposed design paves way for future integrated-photonics-based artificial intelligence hardware design.

Authors:Chenghao Feng/University of Texas at Austin Zheng Zhao/University of Texas at Austin Zhoufeng Ying/University of Texas at Austin Jiaqi Gu/University of Texas at Austin David Pan/University of Texas at Austin Ray Chen/University of Texas at Austin

Single-Shot, Multiple I/O Photonic Chip to Fiber Array Packaging Using Fusion Splicing (JTh2B.9)
Presenter: Juniyali Nauriyal, *University of Rochester*
Expand for Abstract / Authors

Paper

We show a novel multiple I/O photonic packaging method for 4-fiber array using fusion splicing. We demonstrate a minimum loss of 2.5dB per facet with a variation of +/-0.1dB through a 4-fiber array.

Authors:Juniyali Nauriyal/University of Rochester Meiting Song/University of Rochester Marissa Granados Báez/University of Rochester Yi Zhang/University of Rochester Jaime Cardenas/University of Rochester

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Low fiber-to-fiber loss, large bandwidth and low drive voltage lithium niobate on insulator modulators (JTh2B.10)
Presenter: pan ying, *Sun Yat-Sen University*
Expand for Abstract / Authors

Paper

We demonstrate a thin-film LiNbO3 Mach-Zehnder modulator with polymer edge coupler. The modulator exhibits a half-wave voltage of 2 V, insertion loss less than 5 dB and modulation speed up to 128 Gb s^{-1}.

Authors:pan ying/Sun Yat-Sen University Shihao Sun/Sun Yat-Sen University Mengyue Xu/Sun Yat-Sen University Mingbo He/Sun Yat-Sen University Siyuan Yu/Sun Yat-Sen University Xinlun Cai/Sun Yat-Sen University

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Azimuthally Apodized Focusing Gratings (JTh2B.11)
Presenter: Rijan Maharjan, *Phutung Research Institute*
Expand for Abstract / Authors

Paper

We experimentally show that azimuthally apodized circular gratings can allow light to penetrate further into the structure, and create a focus of ≈10 μm, allowing for biomedical applications such as OCT.

Authors:Rijan Maharjan/Phutung Research Institute Sanket Bohora/Phutung Research Institute Richard Hogg/University of Glasgow David Childs/University of Glasgow Richard Curry/University of Manchester Iain Crowe/University of Manchester Ashim Dhakal/Phutung Research Institute

Plasmonic-assisted Mach-Zehnder Interferometric photonic sensor using aluminum waveguides (JTh2B.12)
Presenter: Evangelia Chatzianagnostou, *Aristotle University of Thessaloniki, Center for Interdisciplinary Research and Innovation*
Expand for Abstract / Authors

Paper

We demonstrate a CMOS compatible interferometric plasmo-photonic sensor exploiting Si_3N_4 photonic and aluminum (Al) plasmonic stripe waveguides. Experimental evaluation revealed bulk sensitivity of 4764 nm/RIU, holding promise for ultra-sensitive and low cost sensing devices.

Authors:Evangelia Chatzianagnostou/Aristotle University of Thessaloniki, Center for Interdisciplinary Research and Innovation Athanasios Manolis/Aristotle University of Thessaloniki, Center for Interdisciplinary Research and Innovation George Dabos/Aristotle University of Thessaloniki, Center for Interdisciplinary Research and Innovation Dimitra Ketzaki/Aristotle University of Thessaloniki, Center for Interdisciplinary Research and Innovation Bartos Chmielak/AMO GmbH, Advanced Microelectronic Center Aachen (AMICA) Anna-Lena Giesecke/AMO GmbH, Advanced Microelectronic Center Aachen (AMICA) Caroline Porschatis/AMO GmbH, Advanced Microelectronic Center Aachen (AMICA) Piotr Cegielski/AMO GmbH, Advanced Microelectronic Center Aachen (AMICA) Stephan Suckow/AMO GmbH, Advanced Microelectronic Center Aachen (AMICA) Laurent Markey/Laboratoire Interdisciplinaire Carnot de Bourgogne, CNRS-Université de Bourgogne Jean-Claude Weeber/Laboratoire Interdisciplinaire Carnot de Bourgogne, CNRS-Université de Bourgogne Alain Dereux/Laboratoire Interdisciplinaire Carnot de Bourgogne, CNRS-Université de Bourgogne Stefan Schrittwieser/Molecular Diagnostics, AIT Austrian Institute of Technology Rudolf Heer/Molecular Diagnostics, AIT Austrian Institute of Technology Nikos Pleros/Aristotle University of Thessaloniki, Center for Interdisciplinary Research and Innovation Dimitris Tsiokos/Aristotle University of Thessaloniki, Center for Interdisciplinary Research and Innovation

A single microring resonator for measuring waveguide losses (JTh2B.13)
Presenter: Hossam Shoman, *University of British Columbia*
Expand for Abstract / Authors

Paper

We present a compact, single microring resonator with a tunable coupler to measure waveguide losses. The method is demonstrated by extracting the propagation losses of 550 nm and 600 nm wide SOI rib waveguides.

Authors:Hossam Shoman/University of British Columbia Hasitha Jayatilleka/Intel Corporation Nicolas Jaeger/University of British Columbia Sudip Shekhar/University of British Columbia Lukas Chrostowski/University of British Columbia

Photonic integrated circuits with bound states in the continuum (JTh2B.14)
Presenter: Zejie Yu, *The Chinese University of Hong Kong*
Expand for Abstract / Authors

Paper

We experimentally demonstrated photonic integrated circuits with bound states in the continuum by patterning low-index waveguides on a high-index substrate. We also demonstrated high-*Q* microcavities, directional couplers, and electro-optic modulators working under this principle.

Authors:Zejie Yu/The Chinese University of Hong Kong Xiang Xi/The Chinese University of Hong Kong Jingwen Ma/The Chinese University of Hong Kong Hon Ki Tsang/The Chinese University of Hong Kong Chang-Ling Zou/University of Science and Technology of China Xiankai Sun/The Chinese University of Hong Kong

Two Microwave Vector Signals Transmission Using Single DD-MZM Modulation and Optical Heterodyne Detection (JTh2B.15)
Presenter: Yuancheng Cai, *University of Electronic Science and Technology of China*
Expand for Abstract / Authors

Paper

Utilizing single DD-MZM modulation and optical heterodyne detection based on a single-ended photodiode, two identical frequency 5 Gbaud 16-QAM signals can be successfully recovered over 100-km SSMF with only 0.6 dB receiver sensitivity penalty.

Authors:Yuancheng Cai/University of Electronic Science and Technology of China Xiang Gao/University of Electronic Science and Technology of China Yun Ling/University of Electronic Science and Technology of China Bo Xu/University of Electronic Science and Technology of China Kun Qiu/University of Electronic Science and Technology of China

A Cylindrical Lens-based Integrated 2D Beam-steering Device Using Staircase Grating Emitters (JTh2B.16)
Presenter: Chao Li, *Shanghai Jiao Tong University*
Expand for Abstract / Authors

Paper

A 15°×12° integrated two-dimensional beam-steering device based on an on-chip silicon-nitride switch/emitter structure and off-chip cylindrical lens is demonstrated. The staircase grating emitters allow a directional emission greater than 90%.

Authors:Chao Li/Shanghai Jiao Tong University Xianyi Cao/Shanghai Jiao Tong University Minglu Cai/Central South University Kan Wu/Shanghai Jiao Tong University Xinwan Li/Shanghai Jiao Tong University Jianping Chen/Shanghai Jiao Tong University

Experimental Evolutionary Optimization of an Active Multimode Interferometer (JTh2B.17)
Presenter: Matthew van Niekerk, *Rochester Institute of Technology*
Expand for Abstract / Authors

Paper

Compact, re-configurable integrated photonic devices are important for communications and computing applications. In this work, we demonstrate an integrated silicon photonic tunable multimode interferometer with > 25 dB tunabilty per port, optimized experimentally with an evolutionary algorithm.

Authors:Matthew van Niekerk/Rochester Institute of Technology David Starling/Pennsylvania State University Gregory Howland/Rochester Institute of Technology Gerald Leake/SUNY Polytechnic Institute Alin Antohe/SUNY Polytechnic Institute Siti Binti/SUNY Polytechnic Institute Daniel Coleman/SUNY Polytechnic Institute A. Matthew Smith/Air Force Research Laboratory Christopher Tison/Air Force Research Laboratory MIchael Fanto/Rochester Institute of Technology Stefan Preble/Rochester Institute of Technology

Two-soliton Microcombs Enabled Reconfigurable Microwave Photonic Filters (JTh2B.18)
Presenter: Jianqi Hu, *Swiss Federal Institute of Technology in Lausanne (EPFL)*
Expand for Abstract / Authors

Paper

We demonstrate reconfigurable microwave photonic filters based on two-soliton microcombs. The filter passbands can be reconfigured inherently via the various angles between two solitons of microresonator, without involving programmable pulse shapers.

Authors:Jianqi Hu/Swiss Federal Institute of Technology in Lausanne (EPFL) Jijun He/Swiss Federal Institute of Technology in Lausanne (EPFL) Junqiu Liu/Swiss Federal Institute of Technology in Lausanne (EPFL) Arslan Raja/Swiss Federal Institute of Technology in Lausanne (EPFL) Maxim Karpov/Swiss Federal Institute of Technology in Lausanne (EPFL) Anton Lukashchuk/Swiss Federal Institute of Technology in Lausanne (EPFL) Tobias Kippenberg/Swiss Federal Institute of Technology in Lausanne (EPFL) Camille-Sophie Brès/Swiss Federal Institute of Technology in Lausanne (EPFL)

Gallium- and Silicon Nitride-Based Photonic Integrated Circuits for Visible Wavelengths (JTh2B.19)
Presenter: Riazul Arefin, *The Ohio State University*
Expand for Abstract / Authors

Paper

Photonic integration of GaN and Si-SiN platforms at the shortest visible wavelength is reported. Maximum theoretical coupling efficiencies up to 51% and 24% for a vertical grating coupler (fiber-chip) and hybrid integration, respectively, are achieved.

Authors:Riazul Arefin/The Ohio State University Sujit Ramachandra/The Ohio State University Hyemin Jung/The Ohio State University Syed M. N. Hasan/The Ohio State University Weicheng You/The Ohio State University Sarvagya Dwivedi/IMEC Shamsul Arafin/The Ohio State University

Robust Light Coupling to Photonic Crystal Waveguide Using Integrated Metalens (JTh2B.20)
Presenter: Yahui Xiao, *University of Delaware*
Expand for Abstract / Authors

Paper

We demonstrate robust and low loss coupling into photonic crystal waveguide by using a one-dimensional dielectric metalens.

Authors:Yahui Xiao/University of Delaware Zi Wang/University of Delaware Feifan Wang/University of Delaware Thomas Kananen/University of Delaware Hwaseob Lee/University of Delaware Tingyi Gu/University of Delaware

WS_2 Monolayer Integrated Photodetector (JTh2B.21)
Presenter: Chandraman Patil, *George Washington University*
Expand for Abstract / Authors

Paper

Here, we demonstrate the fabrication of tungsten di-sulfide integrated photodetector on silicon nitride photonic platform. We observe high responsivity of ~100mA/W at exciton wavelength (~625 nm) due to strong photo-absorption.

Authors:Chandraman Patil/George Washington University RISHI MAITI/George Washington University Volker Sorger/George Washington University

Broadband fiber-to-chip coupling in different wavelength regimes realized by 3D-structures (JTh2B.22)
Presenter: Helge Gehring, *Universität Münster*
Expand for Abstract / Authors

Paper

We present efficient coupling schemes based on direct-laser-writing to enable broadband interfacing of nanophotonic circuits to optical fibers. We demonstrate wide bandwidth coupling at both telecom and visible wavelengths.

Authors:Helge Gehring/Universität Münster Wolfram Pernice/Universität Münster

Guided-Wave-Driven Photonic Integrated Metasurface Holograms (JTh2B.23)
Presenter: Yimin Ding, *The Pennsylvania State University*
Expand for Abstract / Authors

Paper

Widely adopted holographic projection technique of light field requires high level of integration and versatility in various areas. We demonstrated integrated optical holographic devices with wavelength-multiplexing based on a photonic integrated metasurface.

Authors:Yimin Ding/The Pennsylvania State University Yao Duan/The Pennsylvania State University Xi Chen/The Pennsylvania State University Haiyang Huang/The Pennsylvania State University Xuexue Guo/The Pennsylvania State University xingjie ni/The Pennsylvania State University

Si-photonic integrated PZT thin film for acousto-optic modulation (JTh2B.24)
Presenter: Irfan Ansari, *UGent*
Expand for Abstract / Authors

Paper

We demonstrate optical phase modulation in a Si waveguide by generation of surface acoustic wave using Lead Zirconate Titanate (PZT) thin film. Our measurement shows a $V_{\pi}L \approx 3.35$ V cm before any device-optimization.

Authors:Irfan Ansari/UGent

Hybrid imaging-based beam steering system using a sparse photonic integrated circuit outcoupling array (JTh2B.25)
Presenter: Sajad Saghaye Polkoo, *University of Central Florida, CREOL*
Expand for Abstract / Authors

Paper

We introduce a sparse photonic integrated circuit outcoupling (PICO) array for use with fast steering mirrors in a hybrid imaging-based beam steering (IBBS) system for free-space optical communications and LIDAR applications.

Authors:Sajad Saghaye Polkoo/University of Central Florida, CREOL Christopher Renshaw/University of Central Florida, CREOL

Self-reconfigurable Field Programmable Photonic Gate Arrays Using First-order Optimization Techniques (JTh2B.26)
Presenter: Aitor López Hernández, *Universitat Politècnica de València*
Expand for Abstract / Authors

Paper

We demonstrate a novel technique for the automated synthesis of photonic structures in a field-programmable photonic gate array using first-order optimization techniques and defining customized cost functions as per their main figures of merit.

Authors:Aitor López Hernández/Universitat Politècnica de València Daniel Pérez/Universitat Politècnica de València Prometheus DasMahapatra/Universitat Politècnica de València José Capmany/Universitat Politècnica de València

Integrated Lithium Niobate Modulator and Frequency Comb Generator Based on Fabry-Perot Resonators (JTh2B.27)
Presenter: Mengyue Xu, *Sun Yat-Sen University*
Expand for Abstract / Authors

Paper

We achieve 40 Gb/s operation of a low-loss modulator and generation of an optical frequency comb with spacing of 16.3 GHz on lithium niobate on insulator platform. These devices are based on distributed Bragg reflectors.

Authors:Mengyue Xu/Sun Yat-Sen University Mingbo He/Sun Yat-Sen University Xiaoyue Liu/Sun Yat-Sen University pan ying/Sun Yat-Sen University Siyuan Yu/Sun Yat-Sen University Xinlun Cai/Sun Yat-Sen University

Scalability of Universal Nanophotonic Processing Circuits based on Multi-Plane Light Conversion (JTh2B.28)
Presenter: Ryota Tanomura, *the University of Tokyo*
Expand for Abstract / Authors

Paper

Universal linear processing circuit based on multi-plane light conversion, comprising multiport directional couplers, is demonstrated to exhibit excellent fabrication tolerance even at increased scale, owing to its unique all-to-all unitary coupling at every layer.

Authors:Ryota Tanomura/the University of Tokyo Rui Tang/the University of Tokyo Takuo Tanemura/the University of Tokyo Yoshiaki Nakano/the University of Tokyo

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An RF Photonic Phase Digital-to-analog Converter for Chirped Radar Applications (JTh2B.29)
Presenter: Jiading Li, *Tsinghua University*
Expand for Abstract / Authors

Paper

A novel method of wideband radiofrequency signal generation is proposed based on photonic phase digitizing and heterodyne mixing. Synthesis of a linear frequency-modulated radar waveform with a bandwidth of 4 GHz is demonstrated.

Authors:Jiading Li/Tsinghua University Xiaoxiao Xue/Tsinghua University Shangyuan Li/Tsinghua University Xiaoping Zheng/Tsinghua University

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Single microcavity with top grating for cylindrical vector beam lasing (JTh2B.30)
Presenter: Jian Wang, *Wuhan National Laboratory for Optoelectr*
Expand for Abstract / Authors

Paper

Based on InP platform, we design and optimize a compact integrated device to realize efficient lasing of azimuthally polarized beam. Single-mode selection, emission and high speed can be achieved under electrical pumping.

Authors:Shuang Zheng/Wuhan National Laboratory for Optoelectr xiang ma/Wuhan National Laboratory for Optoelectr quanan chen/Wuhan National Laboratory for Optoelectr qiaoyin lu/Wuhan National Laboratory for Optoelectr Weihua Guo/Wuhan National Laboratory for Optoelectr Jian Wang/Wuhan National Laboratory for Optoelectr

Demonstration of on-chip hybrid (de)multiplexer with 4×32 channels for simultaneous mode- and wavelength-division multiplexing (JTh2B.31)
Presenter: Xiaoping Cao, *WNLO*
Expand for Abstract / Authors

Paper

We demonstrate on-chip monolithically integrated hybrid (de)multiplexer with 4×32 channels for simultaneous mode- and wavelength-division multiplexing for ultra-large capacity optical interconnect link. The chip consists of 4-channel mode (de)multiplexer and 32-channel arrayed waveguide grating.

Authors:Xiaoping Cao/WNLO Shuang Zheng/WNLO Feng Cui/WNLO Jian Wang/WNLO

11:00 - 13:00 (UTC - 07:00)

Joint Dynamic e-Posters III (JTh2C)
Presider: Takasumi Tanabe, *Keio University*

11:00 - 11:12

Simulation of Femtosecond Laser Induced Photoionization Dynamics of Multilayer dielectric Thin Films (JTh2C.1)
Presenter: Simin Zhang, *The Ohio State University*
Expand for Abstract / Authors

Paper

Interaction of HfO_2/SiO_2-based multilayer thin films and 10-, 100-fs high intensity laser pulses are simulated using finite-difference time-domain method coupled with Keldysh ionization model to assist in design of damage resistant ultrabroad-band optics.

Authors:Simin Zhang/The Ohio State University Noah Talisa/The Ohio State University Carmen Menoni/Colorado State University Vitaly Gruzdev/University of New Mexico Enam Chowdhury/The Ohio State University

11:12 - 11:24

Efficient Kerr comb generation aligned with ITU-T grid for DWDM telecom applications (JTh2C.2)
Presenter: KOSHIRO WADA, *Keio University*
Expand for Abstract / Authors

Paper

We demonstrated efficient Kerr comb generation in an ultra-high *Q* MgF_2 with an output power of 0 dBm/channel that is aligned with a 25 GHz ITU-T grid suitable for DWDM telecom applications.

Authors:KOSHIRO WADA/Keio University Shun Fujii/Keio University Hajime Kumazaki/Keio University Tamiki Ohtsuka/Keio University Shota Sota/Keio University Satoki Kawanishi/Keio University Takasumi Tanabe/Keio University

11:24 - 11:36

Optimization of Simulated Coherent Combination System Using Fourier Optics Based Genetic Algorithm (JTh2C.3)
Presenter: Randy Lemons, *Colorado School of Mines*
Expand for Abstract / Authors

Paper

We present a method for the optimization of complex laser systems and laser shaping tools using a genetic algorithm utilizing accurate simulation based on Fourier optics.

Authors:Randy Lemons/Colorado School of Mines Sergio Carbajo/SLAC National Accelerator Laboratory

11:36 - 11:48

Tailoring group-velocity dispersion in microspheres with alumina coating (JTh2C.4)
Presenter: Marvyn Inga Caqui, *University of Campinas*
Expand for Abstract / Authors

Paper

We experimentally demonstrate that the group-velocity-dispersion of silica microspheres can be engineered by coating it with nanometer-thick layers of alumina (Al2O3). The ultra-high optical quality factor (>10 millions) achieved allows for the generation of broadband frequency combs.

Authors:Marvyn Inga Caqui/University of Campinas Laís Fujii do Santos/University of Campinas Jose Maria Silva Filho/University of Campinas Yovanny Espinel/University of Campinas Francisco Marques/University of Campinas Thiago Mayer Alegre/University of Campinas Gustavo Wiederhecker/University of Campinas

11:48 - 12:00

Nonlinear absorption measurements of aza-borondipyrromethene dyes (JTh2C.5)
Presenter: Hao-Jung Chang, *University of Central Florida*
Expand for Abstract / Authors

Paper

We study the nonlinear absorption properties of aza-borondipyrromethene dyes using the Z-scan and transient absorption methods. Near 1200 nm, excited-state absorption due to two-photon excitation appears, which is more pronounced in the brominated dyes.

Authors:Hao-Jung Chang/University of Central Florida Sanaz Faryadras/University of Central Florida Natalia Munera/University of Central Florida Sepehr Benis/University of Central Florida Mykhailo Bondar/University of Central Florida Sylvain David/University of Lyon Oliver Maury/University of Lyon Gerard Berginc/Thales Research & Technology Andraud Chantal/University of Lyon David Hagan/University of Central Florida Eric Van Stryland/University of Central Florida

12:00 - 12:12

(Withdrawn) Ultrafast Measurement of Formation of the Sommerfeld Enhancement of Absorption (JTh2C.6)
Presenter: Adam Halaoui, *University of Denver*
Expand for Abstract / Authors

We employ multidimensional coherent spectroscopy to directly observe and measure the ultrafast relaxation of free carriers in bulk gallium arsenide to form the Sommerfeld enhancement of absorption. We observe two populations with different relaxation dynamics.

Authors:Geoffrey Diederich/University of Denver Adam Halaoui/University of Denver Mark Siemens/University of Denver

12:12 - 12:24

Nanoporous Gold Nanoleaf as Tunable Metamaterial (JTh2C.7)
Presenter: Sangeeta Rout, *Norfolk State University*
Expand for Abstract / Authors

We have studied optical properties of single and multi-fold nanoporous gold leaf metamaterials and demonstrated that they can be controlled with applied voltage and dielectric environment.

Authors:Sangeeta Rout/Norfolk State University Zhen Qi/Lawrence Livermore National Laboratory Monika Biener/Lawrence Livermore National Laboratory Devon Courtwright/Norfolk State University Jakeem Adrien/Norfolk State University Carl Bonner/Norfolk State University Mohammad Shahabuddin/Norfolk State University Natalia Noginova/Norfolk State University Mikhail Noginov/Norfolk State University Md Omar Faruk/UCLA

Paper

12:24 - 12:36

Real-valued network for imaging through multimode fiber (JTh2C.8)
Presenter: Ziyu Wang, *Beijing Univ. Posts & Telecomm.*
Expand for Abstract / Authors

A real-valued neural network overwhelmingly outperforms its complex-valued counterpart in natural scene reconstruction through multimode fiber, suggesting that knowledge of intensity rather than phase information is enough, therefore brings much robustness and convenience in practice.

Authors:Ziyu Wang/Beijing Univ. Posts & Telecomm. Yangyang Xiang/Beijing Univ. Posts & Telecomm. Mingying Lan/Beijing Univ. Posts & Telecomm. Junhui Li/Beijing Univ. Posts & Telecomm. Li Gao/Beijing Univ. Posts & Telecomm. Song Yu/Beijing Univ. Posts & Telecomm. Guohua Wu/Beijing Univ. Posts & Telecomm. Tianwei Jiang/Beijing Univ. Posts & Telecomm.

Paper

12:36 - 12:48 **3D printed glass preforms for optical fibers with nonequilibrium cross-sections (JTh2C.9)**
Presenter: Mengxin Zheng, *Indiana University*
Expand for Abstract / Authors

_ Paper

Considering the demand for increasing complexity in optical fiber cross-sections, we present a novel approach for glass perform fabrication based on 3-D printing and show that it can produce glass preforms with non-equilibrium cross-sections. © 2020 The Author(s)

Authors:Mengxin Zheng/Indiana University Camila Faccini de Lima/Indiana University Veda Narayana Koraganji/Indiana University Alexander Gumennik/Indiana University

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12:48 - 13:00 **Scan-less Dispersion Spectroscopy with Single-shot Dual-Heterodyne Mixing and Optical Frequency Comb (JTh2C.10)**
Presenter: Nasrin Sultana, *Saitama University*
Expand for Abstract / Authors

_ Paper

High-speed dispersion spectroscopy has been developed with wide dispersion range, while avoiding an increase in imprecision, by 1.4- and 50 GHz frequency intervals parallel processing of single-shot dual-heterodyne mixing combined with an optical frequency comb.

Authors:Nasrin Sultana/Saitama University Hiroali Tada/Saitama University Shioda Tatsutoshi/Saitama University

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11:30 - 13:00 (UTC - 07:00)

Joint Poster Session 14 (JTh2D)

On the Modulation of a Random Feedback Laser Emission (JTh2D.1)
Presenter: Bismarck Lima, *Pontifical Catholic University of Rio de Janeiro*
Expand for Abstract / Authors

_ Paper

We present a novel technique to control a half-open cavity laser emission. Fast temporal phase variation acting as an active Q-switch enables controlled pulsed emission of an SOA-based random feedback laser.

Authors:Pedro Tovar/Pontifical Catholic University of Rio de Janeiro Bismarck Lima/Pontifical Catholic University of Rio de Janeiro Jean von der Weid/Pontifical Catholic University of Rio de Janeiro

Innovative concept of tunable ECDLs based on MEMS in the NIR and MIR spectral regime (JTh2D.2)
Presenter: Morten Hoppe, *Sacher Lasertechnik GmbH*
Expand for Abstract / Authors

Paper

An innovative ECDL concept based on MEMS technology in NIR and MIR is presented. Results of laser performance and its application as well as the possibility of ultra-fast tuning through MEMS actuators are shown.

Authors:Morten Hoppe/Sacher Lasertechnik GmbH Hanna Rohling/Sacher Lasertechnik GmbH Sebastian Schmidtmann/Sensor Photonics GmbH Herve Tatenguem/Sacher Lasertechnik GmbH Jan Grahmann/Institute for Photonic Microsystems IPMS Tobias Milde/Sacher Lasertechnik GmbH Thomas Schanze/Technische Hochschule Mittelhessen (THM) – Institut für Biomedizinische Technik (IBMT) Joachim Sacher/Sacher Lasertechnik GmbH

Degradation Mechanisms in MOVPE-Grown High-Power Buried-Heterostructure Quantum Cascade Lasers (JTh2D.3)
Presenter: Yongkun Sin, *The Aerospace Corporation*
Expand for Abstract / Authors

Paper

Analysis of catastrophically degraded high-power buried-heterostructure quantum cascade lasers, performed near front facets by using focused ion beam and high-resolution TEM techniques, has revealed formation of voids and extensive dislocations away from active regions.

Authors:Yongkun Sin/The Aerospace Corporation Zachary Lingley/The Aerospace Corporation Miles Brodie/The Aerospace Corporation Benjamin Knipfer/University of Wisconsin – Madison C Sigler/University of Wisconsin – Madison C Boyle/University of Wisconsin – Madison J Kirch/University of Wisconsin – Madison K Oresick/University of Wisconsin – Madison H Kim/University of Wisconsin – Madison Dan Botez/University of Wisconsin – Madison Luke Mawst/University of Wisconsin – Madison D Lindberg/Intraband, LLC Tom Earles/Intraband, LLC

High power single mode triple-ridge waveguide semiconductor laser (JTh2D.4)
Presenter: Xiao-Lei Zhao, *Clemson University*
Expand for Abstract / Authors

Paper

We propose a high-power, single transverse mode, edge-emitting diode laser by constructing a triple-ridge waveguide structure. Two integrated lossy auxiliary waveguides are utilized to suppress the unwanted high order modes in the main waveguide.

Authors:Xiao-Lei Zhao/Clemson University Siwei Zeng/Clemson University Yeyu Zhu/Clemson University Ying Wu/Clemson University Lin Zhu/Clemson University

45 GHz VCSEL with Multiple Transverse-Coupled-Cavities (JTh2D.5) [Paper]
Presenter: Elham Heidari, *University of Texas at Austin*
Expand for Abstract / Authors

We propose a VCSEL laterally coupled to multiple-cavities providing modulation bandwidth beyond the relaxation-oscillation-frequency. We show a 3dB modulation bandwidth of 45 GHz, five times greater than its conventional VCSEL fabricated on the same epi-wafer.

Authors:Elham Heidari/University of Texas at Austin Hamed Dalir/Omega Optics Inc. Moustafa Ahmed/King Abdul-Aziz University Mohammad Teimourpour/George Washington University Volker Sorger/George Washington University Ray T. Chen/University of Texas at Austin

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Evaluation of Lasing Temperature Characteristics of 1550nm QD-based-LDs by IID-QDI Technique with Ar and B Ions and High Temperature Stability (JTh2D.6) [Paper]
Presenter: Atsushi Matsumoto, *National Inst of Information & Comm Tech*
Expand for Abstract / Authors

We evaluated temperature characteristics of QD-based-LDs by ion-implantation-induced-disordering quantum-dot intermixing technique with Ar and B ions, and demonstrated high temperature stability with a characteristic temperature of 284 K and a wavelength shift of 0.15 nm/K

Authors:Atsushi Matsumoto/National Inst of Information & Comm Tech Shohei Isawa/Waseda University Runa Kaneko/Waseda University Kouichi Akahane/National Inst of Information & Comm Tech Toshimasa Umezawa/National Inst of Information & Comm Tech Yuichi Matsushima/Waseda University Katsuyuki Utaka/Waseda University

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CCD-Thermoreflectance Imaging of Self-Heating in 1.5 µm Semiconductor Laser Diodes (JTh2D.7) [Paper]
Presenter: Robert Mckenna, *Trinity College Dublin*
Expand for Abstract / Authors

The surface temperature distribution of 1.5 µm multi-section slotted single-mode semiconductor lasers is determined experimentally using high resolution CCD-TR microscopy. The surface temperature, thermal spreading between sections, longitudinal and lateral temperature profiles are reported.

Authors:Robert Mckenna/Trinity College Dublin Sepideh Naimi/Trinity College Dublin Simon Corbett/Trinity College Dublin David McCloskey/Trinity College Dublin John Donegan/Trinity College Dublin

Stabilization of Self-Mode-Locked Quantum Dash Lasers by Symmetric Dual-Loop Optical Feedback: Effects of Power Ratio and Optical Phase Tuning (JTh2D.8)
Presenter: Haroon Asghar, *UNIVERSITY COLLEGE CORK*
Expand for Abstract / Authors

Paper

We stabilize jitter in self-mode-locked quantum dash lasers emitting at 1550nm, reducing pulse train RF linewidth by 100x, using optical feedback from dual fiber loops. We demonstrate how to optimize this method and packaging tolerances.

Authors:John McInerney/UNIVERSITY COLLEGE CORK Haroon Asghar/UNIVERSITY COLLEGE CORK

Transverse Mode Control in HCG-VCSELs (JTh2D.9)
Presenter: Yipeng Ji, *Tsinghua University*
Expand for Abstract / Authors

Paper

We present a detailed study to select transverse modes and control far field pattern of a multi-mode HCG-VCSEL using reflection dispersion for the former and angular-dependent transmission for the latter, for the first time.

Authors:Yipeng Ji/Tsinghua University Mingyue Guan/Tsinghua University Jipeng Qi/University of California, Berkeley Connie Chang-Hasnain/University of California, Berkeley

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Effect of Double-Lattice Pitch in Type-I Quantum Well Mid-Infrared Photonic-crystal Surface-Emitting Lasers (JTh2D.10)
Presenter: SULING CHENG, *National Chiao Tung University*
Expand for Abstract / Authors

Paper

We demonstrate an optically-pumped mid-infrared InGaAsSb/AlGaAsSb type-I QW surface-emitting laser operated at 2.26 mm using double-lattice photonic crystal structure. Light output intensity of the device with double-lattice structures was enhanced by an order of magnitude than that of single-holes.

Authors:YuHsun Huang/National Chiao Tung University SULING CHENG/National Chiao Tung University Gray Lin/National Chiao Tung University Sheng-Di Lin/National Chiao Tung University Kien-Wen Sun/National Chiao Tung University

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Demonstration of 1300 nm Directly Modulated DBR Lasers Based on V-shaped High-Order Slotted Surface-Gratings (JTh2D.11)
Presenter: Wei Sun, *Huazhong University of Sci. Technol*
Expand for Abstract / Authors

[Paper]

We present 1.3μm regrowth-free directly-modulated DBR lasers based on V-shaped slotted surface-gratings through standard photolithography. The fabricated laser has achieved the threshold-current ~12mA, SMSR ~50dB from 0°C to 50°C and 3-dB bandwidth ~12GHz.

Authors:Wei Sun/Huazhong University of Sci. Technol Shuangzhi Wei/Huazhong University of Sci. Technol Gonghai Liu/Huazhong University of Sci. Technol Xiangyang Dai/Huazhong University of Sci. Technol Jia Liu/Huazhong University of Sci. Technol Su Tan/Huazhong University of Sci. Technol Qiaoyin Lu/Huazhong University of Sci. Technol John Donegan/School of Physics & CRANN Weihua Guo/Huazhong University of Sci. Technol

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30-nm Consecutive Discrete Tuning Range Semiconductor Laser with 100-GHz Channel Spacing Based on Slotted Structures Fabricated by Standard Contact Lithography (JTh2D.12)
Presenter: Fengxin Dong, *CAS Institute of Semiconductors*
Expand for Abstract / Authors

[Paper]

A widely tunable semiconductor laser based on slotted surface grating fabricated by standard contact lithography is presented. This regrowth-free tunable semiconductor laser shows a consecutive discrete tuning range over 30-nm with 100-GHz channel spacing.

Authors:Fengxin Dong/CAS Institute of Semiconductors Fangling Du/CAS Institute of Semiconductors Pijie Ma/CAS Institute of Semiconductors Xuyan Zhou/CAS Institute of Semiconductors Wan-hua Zheng/CAS Institute of Semiconductors

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Electrical Pumped InAs QD Lasers Directly Grown on Hollow SOI Substrate (JTh2D.13)
Presenter: Qi Feng, *Institute of Physics, CAS*
Expand for Abstract / Authors

[Paper]

Monolithic growth of efficient III-V QD lasers on (111)-faceted hollow SOI substrate has been achieved for realizing silicon photonic integrated circuits. The lasers can be pulse- operated up to 50oC with lasing threshold of ~70mA.

Authors:Qi Feng/Institute of Physics, CAS Zihao Wang/Institute of Physics, CAS Ting Wang/Institute of Physics, CAS

Primary Processes in ITO/TPD/Alq_3/Al OLEDs at Low Voltage: On the Aging of OLEDs (JTh2D.15)
Presenter: Fanomezantsoa RATSIMBAZAFY, *GCMP - Université de Moncton*
Expand for Abstract / Authors

Paper

Current-voltage measurements at low voltage indicate that ions move in OLEDs on the first *I-V* scan. On subsequent scans, molecular rotations result in weak current spikes. As expected, neither current leads to luminescence.

Authors:Fanomezantsoa RATSIMBAZAFY/GCMP - Université de Moncton Serge Gauvin/GCMP - Université de Moncton

Investigation of High Temperature LED and Photodetector from InGaN/GaN MQWs (JTh2D.16)
Presenter: Abbas Sabbar, *University of Arkansas*
Expand for Abstract / Authors

Paper

InGaN/GaN multiple quantum well LED structure was studied for the possible integration as a detector in future power electronics applications. The electroluminescence (EL) and spectral response were measured from 77 K to 800 K.

Authors:Abbas Sabbar/University of Arkansas Syam Madhusoodhanan/University of Arkansas Huong Tran/University of Arkansas Binzhong Dong/2HC SemiTek Jiangbo Wang/2HC SemiTek Alan Mantooth/University of Arkansas Shuiqing Yu/University of Arkansas zhong chen/University of Arkansas

Intersubband Transitions in GaN/$Al_{0.5}Ga_{0.5}N$ Quantum Wells on *a*-Plane and *m*-Plane GaN Substrates (JTh2D.17)
Presenter: Jiaming Xu, *University of Texas at Austin*
Expand for Abstract / Authors

Paper

We experimentally characterize mid-infrared intersubband transitions in identical $Al_{0.5}Ga_{0.5}N$/GaN heterostructures grown on *a*- and *m*-plane GaN substrates. The absorption peaks of the *m*-plane samples are 10 to 40% narrower than that of the *a*-plane samples.

Authors:Jiaming Xu/University of Texas at Austin Morteza Monavarian/University of California at Santa Barbara Nishant Nookala/University of Texas at Austin Micha Fireman/University of California at Santa Barbara Kai Qwah/University of California at Santa Barbara James Speck/University of California at Santa Barbara Mikhail Belkin/University of Texas at Austin

Shallow Mesa InP Avalanche Photodiode with Ultralow Dark Current (JTh2D.18)
Presenter: Jingchang Zhang, *Tsinghua University*
Expand for Abstract / Authors

Paper

A shallow-mesa InP avalanche photodiode is proposed and fabricated by a simple dry etching process. The device exhibits a remarkably low dark current of 4 pA at unit gain and a high gain of 320.

Authors:Jingchang Zhang/Tsinghua University Yaru Han/Tsinghua University Bing Xiong/Tsinghua University Yi Luo/Tsinghua University Changzheng Sun/Tsinghua University Lai Wang/Tsinghua University Jian Wang/Tsinghua University Yanjun Han/Tsinghua University Zhibiao Hao/Tsinghua University Hongtao Li/Tsinghua University Jiadong Yu/Tsinghua University

Fine-pitch Quantum Dot Dispense on Micro-LEDs (JTh2D.19)
Presenter: Chien-Chung Lin, *National Chiao Tung University*
Expand for Abstract / Authors

Paper

We report the fine-pixel quantum dot (<5mm) deposited on micro-LED chips directly. The electrical and optical characterization shows 35% color conversion efficiency and area-dependent QD emission intensity.

Authors:Yu-Ming Huang/National Chiao Tung University Kai-Ling Liang/Industrial Technology Research Institute of Taiwan Yi-Lin Tsai/National Chiao Tung University Wei-Hung Kuo/Industrial Technology Research Institute of Taiwan Yen-Hsiang Fang/Industrial Technology Research Institute of Taiwan Chung-Ping Huang/National Chiao Tung University Hao-Chung Kuo/National Chiao-Tung University Chien-Chung Lin/National Chiao Tung University

Timing anomalies in comb-based optical two-way time-frequency transfer (O-TWTFT) (JTh2D.20)
Presenter: William Swann, *National Inst of Standards & Technology*
Expand for Abstract / Authors

Paper

Comb-based O-TWTFT provides exemplary performance in transferring precision timing over km-scale turbulent atmospheric paths. However, its performance through strong turbulence is not fully understood. Here we investigate transient timing deviations associated with low received power.

Authors:William Swann/National Inst of Standards & Technology Martha Bodine/National Inst of Standards & Technology Jennifer Ellis/National Inst of Standards & Technology Emily Hannah/National Inst of Standards & Technology Laura Sinclair/National Inst of Standards & Technology Nathan Newbury/National Inst of Standards & Technology Jean-Daniel Deschenes/National Inst of Standards & Technology

Joint Poster Session 15 (JTh2E)

Observation of Polarization Singularities in a Brewster-Reflected Paraxial Beam (JTh2E.1)
Presenter: ANIRBAN DEBNATH, *University of Hyderabad*
Expand for Abstract / Authors

Paper

Using a simulated model of a diverging paraxial beam reflected at a plane dielectric interface, we show that the Brewster-reflected beam manifests phase and polarization singularities.

Authors:ANIRBAN DEBNATH/University of Hyderabad Nirmal Viswanathan/University of Hyderabad

Gouy phase shift contribution on efficient SHG at noncentrosymmetric materials interfaces (JTh2E.2)
Presenter: Lino Misoguti, *Instituto de Física de São Carlos, USP*
Expand for Abstract / Authors

Paper

We observed that applying tightly focused laser beam, Gouy phase shift plays important role on efficient SHG at interfaces of both isotropic and anisotropic noncentrosymmetric materials. This effect is similar to THG at materials interfaces.

Authors:Jorge Gomes/Instituto de Física de São Carlos, USP Emerson Barbano/Universidade Federal do Parana Sergio Zilio/Instituto de Física de São Carlos, USP Lino Misoguti/Instituto de Física de São Carlos, USP

A wide detection range refractive index sensor based on exposed core tellurite micro-structured optical fiber (JTh2E.3)
Presenter: Tonglei Cheng, *Northeastern University*
Expand for Abstract / Authors

Paper

A novel refractive index sensor based on an exposed-core tellurite microstructure optical fiber has been implemented. The sensitivity of sensor is up to 2919.4nm/RIU. It is reliable, cost-effective and offers a possibility for label-free biosensing.

Authors:Xue Zhou/Northeastern University Tonglei Cheng/Northeastern University Takenobu Suzuki/Research Center for Advanced Photon Technology Yasutake Ohishi/Research Center for Advanced Photon Technology

MXene and nonlinear polarization evolution hybrid mode-locking for high performance ultrafast fiber lasers (JTh2E.4)
Presenter: Chunyang Ma, *Shenzhen University*
Expand for Abstract / Authors

Paper

A self-starting mode-locked laser with low threshold can be achieved using V_2CT_x nanosheets and nonlinear polarization evolution. 72 fs pulse duration is easily achieved from this hybrid mode-locked fiber laser system.

Authors:Chunyang Ma/Shenzhen University Weichun Huang/Shenzhen University Yunzheng Wang/Shenzhen University Han Zhang/Shenzhen University

Tailoring optical nonlinearities of indium tin oxide (JTh2E.5)
Presenter: Mario Miscuglio, *George Washington University*
Expand for Abstract / Authors

Paper

Here we experimentally show the capability of tailoring the nonlinear all-optical modulation of the complex refractive index in response of pulsed laser in the Epsilon Near Zero (ENZ) region for different deposition conditions of ITO.

Authors:Mario Miscuglio/George Washington University Yaliang Gui/George Washington University Jagannath Paul/National Institute of Standards and Technology Jared Wahlstrand/National Institute of Standards and Technology Volker Sorger/George Washington University

Intrinsic anisotropy in nonlinear optical absorption of Sb_2S_3 nanorods (JTh2E.6)
Presenter: Rajesh Yadav, *IISER Bhopal*
Expand for Abstract / Authors

Paper

Here, we report the first observation of the fundamental intrinsic anisotropy (61%) in nonlinear absorption (NLA) of Sb_2S_3 nanorods. Experimentally, we found the anisotropy in NLA ΔI_S (anisotropy) ≈ 0.058GW/cm^2 at a peak intensity of 0.095GW/cm^2.

Authors:Rajesh Yadav/IISER Bhopal

Propagation phase elimination of light pulses by an initial phase-locked synchronized moving source (JTh2E.7)
Presenter: Yao lu, *Nankai University*
Expand for Abstract / Authors

Paper

We demonstrate an innovative approach to eliminate the propagation phase of light pulses by designing an initial phase-locked synchronizing moving source. Counterintuitively, this result shows the propagation phase could be eliminated, for the first time.

Authors:Yao lu/Nankai University hao xiong/Nankai University Qiang Wu/Nankai University Jingjun Xu/Nankai University

Noise Investigation of Deep-UV Dispersive Wave Generation in Gas-Filled Fiber Utilizing Nonlinear Pulse Compression (JTh2E.8)
Presenter: Callum Smith, *Technical University of Denmark*
Expand for Abstract / Authors

Paper

Deep-UV radiation is achieved through dispersive wave generation in an argon-filled anti-resonant fiber utilizing a nonlinearly compressed 1030nm pump. Relative intensity noise is characterized at 280nm, with 1.6% achieved for optimal argon-pressure and pump parameters.

Authors:Callum Smith/Technical University of Denmark Asbjørn Moltke/Technical University of Denmark Abubakar Adamu/Technical University of Denmark Mattia Michieletto/NKT Photonics A/S Patrick Bowen/NKT Photonics A/S Peter Moselund/NKT Photonics A/S Christos Markos/Technical University of Denmark Ole Bang/Technical University of Denmark

Second-harmonic Generation of Asymmetric Bessel-Gaussian Beams Carrying Multiple OAM Charge Numbers (JTh2E.9)
Presenter: Kunjian Dai, *Clemson University*
Expand for Abstract / Authors

Paper

In this paper we demonstrate the second-harmonic generation of asymmetric Bessel-Gaussian beams carrying orbital angular momentum. One advantage is that the asymmetric Bessel-Gaussian beams offer a chance to tailor the generated field.

Authors:Kunjian Dai/Clemson University Wenzhe Li/Clemson University Kaitlyn Morgan/Clemson University Keith Miller/Clemson University Richard Watkins/Clemson University Eric Johnson/Clemson University

Experimental Demonstration of Mid-Infrared Spontaneous Four-wave Mixing with A Tellurite All-solid Hybrid Microstructured Fiber (JTh2E.10)
Presenter: Hoa Nguyen, *Toyota Technological Institute*
Expand for Abstract / Authors

Paper

Spontaneous four-wave mixing in a novel tellurite fiber is demonstrated. Using a pumping laser at 1.9 μm, a signal and an idler at 1.25 and 4.1 μm are generated. This corresponds to a frequency shift of 85 THz which is the largest frequency shift in soft-glass fiber ever reported

Authors:Hoa Nguyen/Toyota Technological Institute Than Singh Saini/Toyota Technological Institute Hoang Tuan Tong/Toyota Technological Institute Goichi Sakai/Furukawa Denshi Co Morio Matsumoto/Furukawa Denshi Co Takenobu Suzuki/Toyota Technological Institute Yasutake Ohishi/Toyota Technological Institute

Nonlinear computer-generated optical holograms in lithium niobate crystal by femtosecond laser micromachining (JTh2E.11)
Presenter: Bing Zhu, *Shanghai Jiao Tong University*
Expand for Abstract / Authors

_ Paper

An efficient nonlinear computer-generated optical holograms technique has been demonstrated in lithium niobate crystal, which fabricated by femtosecond laser pulses. The birefringence progress is used to provide the longitudinal phase matching of the wave vectors.

Authors:Bing Zhu/Shanghai Jiao Tong University Haigang Liu/Shanghai Jiao Tong University Yi'an Liu/Shanghai Jiao Tong University Yan Xiongshuo/Shanghai Jiao Tong University Yuping Chen/Shanghai Jiao Tong University Xianfeng Chen/Shanghai Jiao Tong University Xiangmin Liu/Shanghai Jiao Tong University

Development of a Sub-microsecond Broadband Pulsed Laser for Cooling Positronium (JTh2E.12)
Presenter: Yohei Tajima, *The University of Tokyo*
Expand for Abstract / Authors

_ Paper

We develop a unique deep-ultraviolet pulsed laser proposed for achieving laser cooling of positronium. It fulfills a wide bandwidth and a long pulse duration for atoms with a small mass and a finite lifetime.

Authors:Yohei Tajima/The University of Tokyo Kyohei Yamada/The University of Tokyo Kenji Shu/The University of Tokyo Akira Ishida/The University of Tokyo Shoji Asai/The University of Tokyo Makoto Kuwata-Gonokami/The University of Tokyo Eunmi Chae/The University of Tokyo Kosuke Yoshioka/The University of Tokyo

Third-harmonic Generation from Multilayer Graphene on Silicon Nitride Guided Mode Resonance Structures (JTh2E.13)
Presenter: Sruti Menon, *Indian Institute of Science*
Expand for Abstract / Authors

_ Paper

We report third-harmonic generation enhancement with strong polarization-dependence from multilayer graphene on silicon nitride guided-mode resonance structures. These gratings are a promising passive platform with weak inherent nonlinearity for integration with strong nonlinear layered materials.

Authors:Sruti Menon/Indian Institute of Science Medha Dandu/Indian Institute of Science Jayanta Deka/Indian Institute of Science Kausik Majumdar/Indian Institute of Science Varun Raghunathan/Indian Institute of Science

Nonlinear optical properties of metal halide perovskite single crystals (JTh2E.14)
Presenter: Christian Kriso, *Philipps-Universität Marburg*
Expand for Abstract / Authors

Paper

We measure nonlinear refraction and absorption of a $CH_3NH_3PbBr_3$ single crystal with the Z-scan technique. Our results provide the first reference of the intrinsic, ultrafast nonlinear refractive index in the metal halide perovskite material class.

Authors:Christian Kriso/Philipps-Universität Marburg Markus Stein/Philipps-Universität Marburg Tobias Haeger/University of Wuppertal Neda Pourdavoud/University of Wuppertal Marina Gerhard/Philipps-Universität Marburg Arash Rahimi-Iman/Philipps-Universität Marburg Thomas Riedl/University of Wuppertal Martin Koch/Philipps-Universität Marburg

On-Chip Fabry-Perot Bragg Grating Cavity Enhanced Four-Wave Mixing (JTh2E.15)
Presenter: Shengjie Xie, *University of Maryland*
Expand for Abstract / Authors

Paper

We report the generation of a Fabry-Perot Bragg grating cavity enhanced four-wave mixing signal with a conversion efficiency of -37.7 dB experimentally. A thermal-tuning based dispersion compensation technique is also demonstrated for zero dispersion implementation.

Authors:Shengjie Xie/University of Maryland Yang Zhang/University of Maryland Yi-Wen Hu/University of Maryland Sylvain Veilleux/University of Maryland Mario Dagenais/University of Maryland

Nonlinear Microscopy of Self-Assembled Organic Microcavities (JTh2E.16)
Presenter: Nikolai Mitetelo, *M.V. Lomonosov Moscow State University*
Expand for Abstract / Authors

Paper

We observe experimentally multiphoton processes in active organic microresonators with different shapes: spheres, squares, octahedrons and rods. Pronounced whispering gallery modes with Q-factor up to 700 and coupling induced mode splitting are demonstrated.

Authors:Nikolai Mitetelo/M.V. Lomonosov Moscow State University Evgeniy Mamonov/M.V. Lomonosov Moscow State University Mikhail Popov/M.V. Lomonosov Moscow State University Dasari Venkatakrishnarao/University of Hyderabad Mari Annadhasan/University of Hyderabad Rajadurai Chandrasekar/University of Hyderabad Tatiana Murzina/M.V. Lomonosov Moscow State University

Biperiodically Poled Lithium Niobate Microcavities for Multiple Nonlinear Optical Processes (JTh2E.17)
Presenter: Li Zhang, *NanKai University*
Expand for Abstract / Authors

Paper

We fabricated periodically poled lithium niobate microdisks with a 2.4×10^5 quality factor and a double-period domain pattern, where multiple nonlinear optical wavelength conversion processes were obtained, including SHG with a 5.1×10^{-4} mW^{-1} normalized conversion efficiency.

Authors:Li Zhang/NanKai University Zhen Hao/NanKai University Wenbo Mao/NanKai University Ang Gao/NanKai University Fang Bo/NanKai University Feng Gao/NanKai University GuoQuan Zhang/NanKai University Jingjun Xu/NanKai University

Third-order Riemann Pulses in Optical Fiber (JTh2E.18)
Presenter: domenico bongiovanni, *Nankai University*
Expand for Abstract / Authors

Paper

We report on the generation of third-order Riemann pulses in nonlinear optical fiber, obtained by tailoring the initial pulse in presence of high-order dispersion and Kerr nonlinearity. Analytical and numerical results show controllable pulse steepening and shock formation.

Authors:domenico bongiovanni/Nankai University Zhili Li/Nankai University Benjamin Wetzel/Université de Limoges Yi Hu/Nankai University Stefan Wabnitz/Sapienza University of Rome Roberto Morandotti/INRS University Zhigang Chen/San Francisco State University

Dynamical Refraction of Space-time Wave Packets (JTh2E.19)
Presenter: Murat Yessenov, *University of Central Florida, CREOL*
Expand for Abstract / Authors

Paper

We show that introducing tight spatio-temporal correlations into a wave-packet unveils remarkable dynamical refractive phenomena, such as group-velocity invariance with respect to the refractive index and group-delay cancellation while traversing stack of optical materials.

Authors:Murat Yessenov/University of Central Florida, CREOL Basanta Bhaduri/University of Central Florida, CREOL Ayman Abouraddy/University of Central Florida, CREOL

Transient Soliton Dynamics from Stationary to Pulsation in Fiber Laser (JTh2E.20)
Presenter: Qianqian Huang, *Shanghai University*
Expand for Abstract / Authors

Paper

We firstly report the transient soliton dynamics from stationary to pulsation via dispersive Fourier transformation. It is found that the soliton pulsation occurs accompanied with the generation of sub-sideband.

Authors:Qianqian Huang/Shanghai University Zinan Huang/Shanghai University Zhichao Luo/South China Normal University Chengbo Mou/Shanghai University

On the role of higher order dispersion in a doubly resonant optical parametric oscillator (JTh2E.21)
Presenter: Christian Dietrich, *Institute of Quantum Optics*
Expand for Abstract / Authors

Paper

We present experimental and numerical investigations on the spectral behaviour of a doubly resonant optical parametric oscillator. The third-order dispersion plays an important role for the pulsing and tuning dynamics.

Authors:Christian Dietrich/Institute of Quantum Optics Ihar Babushkin/Institute of Quantum Optics José Andrade/Institute of Quantum Optics Han Rao/Institute of Quantum Optics Ayhan Demircan/Institute of Quantum Optics Uwe Morgner/Institute of Quantum Optics

Kerr Microcomb Generation With Self-injection Locked Distributed Feedback Diode Laser (JTh2E.22)
Presenter: Liyun Hao, *Nanjing University*
Expand for Abstract / Authors

Paper

We experimentally demonstrate a Kerr frequency comb from a fiber Fabry-Pérot(FP) microresonator that is pump by a self-injection locked distributed feedback diode laser. The comb span exceeds 80 nm around 1550 nm, with beatnote linewidth of 370Hz.

Authors:Liyun Hao/Nanjing University Kunpeng Jia/Nanjing University Xiaohan Wang/Nanjing University Jian Guo/Nanjing University Zhenda Xie/Nanjing University

Multi-Soliton Generation in a Femtosecond Degenerate Optical Parametric Oscillator (JTh2E.23)
Presenter: Chengxiao Ning, *Huazhong Univ. of Science and Technology*
Expand for Abstract / Authors

Paper

Multi-soliton formation is observed theoretically and experimentally in a femtosecond degenerate optical parametric oscillator (OPO) with positive residual third-order dispersion and relatively high pump power.

Authors:Chengxiao Ning/Huazhong Univ. of Science and Technology Zhaowei Zhang/Huazhong Univ. of Science and Technology

Cascaded Third Harmonic Generation in Dielectric Metasurfaces (JTh2E.24)
Presenter: Sylvain Gennaro, *Sandia National Laboratories*
Expand for Abstract / Authors

Paper

In this work, we investigate cascaded third harmonic generation in a dielectric metasurface by exploiting high quality factor Fano resonances obtained using broken symmetry unit cells.

Authors:Sylvain Gennaro/Sandia National Laboratories Sadhvikas Addamane/Sandia National Laboratories John Reno/Sandia National Laboratories Polina Vabishchevich/Sandia National Laboratories Michael Sinclair/Sandia National Laboratories Igal Brener/Sandia National Laboratories

Generation of Path-Frequency Hyperentanglement by Simultaneous Multiple Quasi-Phase Matching in Nonlinear Photonic Crystals (JTh2E.25)
Presenter: Guangqiang He, *Shanghai Jiao Tong University*
Expand for Abstract / Authors

Paper

By using multiple quasi-phase matching in the nonlinear photonic crystals (NPC) whose poling direction is perpendicular to the pump beam, we theoretically generated path-frequency hyperentangled photon pairs.

Authors:Guangqiang He/Shanghai Jiao Tong University Yizhou Ding/Shanghai Jiao Tong University Chaoxiang Xi/Shanghai Jiao Tong University

A Soliton Micro-truck (JTh2E.26)
Presenter: Manuel Crespo Ballesteros, *Aston Institute of Photonic Technologies*
Expand for Abstract / Authors

Paper

We design a miniature device enabling conveyance of weak localized states of light along an optical fiber employing a whispering gallery soliton micro-truck, which slows down for loading and unloading at designated stops.

Authors:Manuel Crespo Ballesteros/Aston Institute of Photonic Technologies Misha Sumetsky/Aston Institute of Photonic Technologies

Limit on Differential Group Delay Achievable by Space-Time Wave Packets (JTh2E.27)
Presenter: Layton Hall, *University of Central Florida*
Expand for Abstract / Authors

Paper

We investigate the effects of the spectral uncertainty on the maximum differential group delay (DGD) for a finite-energy space-time wave-packet, showing the maximum DGD that can be obtained with respect to a reference pulse at c.

Authors:Murat Yessenov/University of Central Florida Lam Mach/University of Central Florida Basanta Bhaduri/University of Central Florida Layton Hall/University of Central Florida Davood Mardani/University of Central Florida Hasan Kondakci/University of Central Florida George Atia/University of Central Florida Miguel Alonso/University of Rochester Ayman Abouraddy/University of Central Florida

Large Optomechanical Coupling near the Excitonic Resonance of a Suspended TMD Monolayer Membrane (JTh2E.28)
Presenter: Mostafa Honari-Latifpour, *City University of New York*
Expand for Abstract / Authors

Paper

We investigate the frequency shift of an optical resonator per displacement of an atomically thin transition metal dichalcogenide suspended membrane. We show that giant optomechanical coefficients can be achieved near the excitonic resonance.

Authors:Mostafa Honari-Latifpour/City University of New York Vinod Menon/City University of New York Mohammad-Ali Miri/City University of New York

Nondegenerate Nonlinearities in Semiconductor Quantum Wells (JTh2E.29)
Presenter: Nicholas Cox, *University of Central Florida*
Expand for Abstract / Authors

Paper

We present measurements of the nonlinear absorption and refraction of GaAs/AlGaAs quantum wells, and explore the fitness of this material system for nonlinear photonic devices.

Authors:Nicholas Cox/University of Central Florida Junxiong Wei/Université Libre de Bruxelles Simon-Pierre Gorza/Université Libre de Bruxelles David Hagan/University of Central Florida Eric Van Stryland/University of Central Florida

Tunable stimulated Brillouin scattering by dual lasers pumping in a WGM microcavity (JTh2E.31)
Presenter: Zhenmin Chen, *Tsinghua University*
Expand for Abstract / Authors

Paper

High order cascaded stimulated Brillouin scattering (SBS) is achieved when a microcavity is pumped with a 1550-nm tunable laser. The SBS can be tuned by a pump laser assisted with a heating laser, which provides a new approach to generate SBS in whispering gallery mode microresonators.

Authors:Zhenmin Chen/Tsinghua University H.Y. Fu/Tsinghua University Qian Li/Peking University

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Wavelength-dependent third-harmonic generation in monolayer MoS_2 (JTh2E.32)
Presenter: Yadong Wang, *Aalto university*
Expand for Abstract / Authors

Paper

We present broadband third harmonic generation (THG) in monolayer MoS_2, showing strong enhancement (up to three orders of magnitude) with excitons. Our results pave the way to understand strong THG in MoS_2 for potential applications.

Authors:Yadong Wang/Aalto university Susobhan Das/Aalto university Xuerong Hu/Aalto university Yunyun Dai/Aalto university Xueyin Bai/Aalto university Zhipei Sun/Aalto university

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Discrete Cosine Single-pixel Salient Object Detection Base on Deep Learning via Fast Binary Illumination (JTh2E.33)
Presenter: Li Yonghao, *Shanghai Jiao Tong University*
Expand for Abstract / Authors

Paper

Discrete cosine single-pixel imaging with binary illumination can fastly reconstruct a scene where area of the salient object can be detected rapidly and accurately even in the case of undersampling, utilizing deep learning model.

Authors:Li Yonghao/Shanghai Jiao Tong University Jianhong Shi/Shanghai Jiao Tong University Lei Sun/Shanghai Jiao Tong University xiaoyan wu/Shanghai Jiao Tong University Guihua Zeng/Shanghai Jiao Tong University

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A Mode Division Multiplexing Scheme Utilizing Accelerating Beams Constructed in Mixed Domain (JTh2E.34)
Presenter: Shuqing Lin, *Sun Yat-Sen University*
Expand for Abstract / Authors

Paper

We design and experimentally demonstrate a system for mode-division multiplexing of accelerating plane wave beams, by combining light field control methods in line and frequency domains with reasonably arranged basic optical components.

Authors:Shuqing Lin/Sun Yat-Sen University Yuanhui Wen/Sun Yat-Sen University Yujie Chen/Sun Yat-Sen University Yanfeng Zhang/Sun Yat-Sen University Siyuan Yu/Sun Yat-Sen University

Discretized light behavior in optomechanical waveguide arrays (JTh2E.35)
Presenter: Linhao Ren, *Huazhong Univ of Science and Technology*
Expand for Abstract / Authors

Paper

Propagation properties of light in optomechanical waveguides arrays are studied for the first time. This work provides a new platform for discrete optics and broaden the application of integrated optomechanics.

Authors:Xinbiao Xu/Huazhong Univ of Science and Technology Linhao Ren/Huazhong Univ of Science and Technology Lei Shi/Huazhong Univ of Science and Technology Xinliang Zhang/Huazhong Univ of Science and Technology

Generation of broadband THz transients via metallic spintronic emitters driven by 20-fs pulses at 1030 nm (JTh2E.36)
Presenter: Alexander Weigel, *Ludwig-Maximilians-Universität München*
Expand for Abstract / Authors

Paper

We explore power and bandwidth scaling for the generation of highly-temporally-confined THz transients from spintronic emitters, driven by the 250-fs and 20-fs pulses of a high-power 28-MHz Yb-based laser, spectrally centered at 1030 nm.

Authors:Alexander Weigel/Ludwig-Maximilians-Universität München Leon Helms/Ludwig-Maximilians-Universität München Theresa Buberl/Ludwig-Maximilians-Universität München Tim Vogel/Ruhr-Universität Bochum Christina Hofer/Ludwig-Maximilians-Universität München Kilian Fritsch/Helmut-Schmidt University Hamburg Natalia Martín Sabanés/Freie Universität Berlin Gerhard Jakob/Johannes Gutenberg University Mainz Mathias Kläui/Johannes Gutenberg University Mainz Oleg Pronin/Helmut-Schmidt University Hamburg Tobias Kampfrath/Freie Universität Berlin Clara Saraceno/Ruhr-Universität Bochum Ioachim Pupeza/Ludwig-Maximilians-Universität München

Joint Poster Session 16 (JTh2F)

A Universal Reconfigurable Waveguide Coupler for Microresonators (JTh2F.1)
Presenter: Dae-Gon Kim, *Korea Advanced Institute of Science and Technology*
Expand for Abstract / Authors

Paper

We describe a universal, reconfigurable waveguide coupler based on an alignment-tolerant design to access microresonators. The coupler can be made of any material so as to cover a wide range of refractive index for phase-matching.

Authors:Dae-Gon Kim/Korea Advanced Institute of Science and Technology Sangyoon Han/Korea Advanced Institute of Science and Technology Duk-Yong Choi/Australian National University Hansuek Lee/Korea Advanced Institute of Science and Technology

Chip-scale mode-configurable light couplers and vortex beam generators using waveguide-integrated metasurface (JTh2F.2)
Presenter: Yuan Meng, *Tsinghua University*
Expand for Abstract / Authors

Paper

Integrated mode-selective on-chip couplers are reported using Si-nanoantennas-patterned Si_3N_4 waveguide. A chip-integrated twisted-light generator coupling free-space light into optical vortex carrying 1h OAM is numerically demonstrated, by engineering spatial modal-overlap & controlled mode mixing.

Authors:Yuan Meng/Tsinghua University Zhoutian Liu/Tsinghua University Zhenwei Xie/Shenzhen University Futai Hu/Tsinghua University Tiancheng Qi/Tsinghua University Qirong Xiao/Tsinghua University Hyunseok Kim/Massachusetts Institute of Technology Sang-Hoon Bae/Massachusetts Institute of Technology Xing Fu/Tsinghua University Mali Gong/Tsinghua University Xiaocong Yuan/Shenzhen University

All-optical micro-ring modulator with phosphorene film (JTh2F.4)
Presenter: Zhao Cheng, *Wuhan National Lab for Optoelectronics*
Expand for Abstract / Authors

Paper

We propose and experimentally demonstrate a unique phosphorene integrated photothermal modulator in telecommunication applications. The rise time and decay time are only 475 and 134 ns, and the 3 dB bandwidth is more than 2.5 MHz.

Authors:Zhao Cheng/Wuhan National Lab for Optoelectronics Rui Cao/Shenzhen University Jia Guo/Shenzhen University Yuhan Yao/Wuhan National Lab for Optoelectronics Kangkang Wei/Wuhan National Lab for Optoelectronics Shan Gao/Shenzhen University Yunzheng Wang/Shenzhen University Jianji Dong/Wuhan National Lab for Optoelectronics Han Zhang/Shenzhen University Xinliang Zhang/Wuhan National Lab for Optoelectronics

Tunable composite photonic crystal cavity on an optical nanofiber (JTh2F.5)
Presenter: Ramachandrarao Yalla, *University of Hyderabad*
Expand for Abstract / Authors

Paper

A tunable nanophotonic cavity with a wide tunability of ±10 nm is demonstrated using an optical nanofiber. The key point of the method is to combine the optical nanofiber with a chirped-period defect-mode grating.

Authors:Ramachandrarao Yalla/University of Hyderabad Kohzo Hakuta/University of Electro-Communications

Bloch-Surface-Wave Nanobeam Cavity (JTh2F.7)
Presenter: Tommaso Perani, *University of Pavia*
Expand for Abstract / Authors

Paper

We design a novel nanobeam cavity based on Bloch surface waves. Light is confined near the structure surface in a low-index material and in a volume $V \sim \lambda^3$, with a Q factor exceeding 5×10^4.

Authors:Tommaso Perani/University of Pavia Daniele Aurelio/University of Pavia Marco Liscidini/University of Pavia

Dual-wavelength-band Multiplexed Grating Coupler on Multilayer SiN-on-SOI Photonic Integrated Platform (JTh2F.8)
Presenter: Lirong Cheng, *Tsinghua University*
Expand for Abstract / Authors

Paper

We propose and design a dual-layer grating coupler for dual-wavelength-band multiplexing on multilayer SiN-on-SOI photonic integrated platform. Its peak coupling efficiencies are -2.95 dB for O-band and -2.49 dB for C-band.

Authors:Lirong Cheng/Tsinghua University Simei Mao/Tsinghua University Xin Mu/Tsinghua University Sailong Wu/Tsinghua University H.Y. Fu/Tsinghua University

Mode Switching in a Metallic Photonic Crystal Slab (JTh2F.9)
Presenter: Timothy Palinski, *NASA Glenn Research Center*
Expand for Abstract / Authors

Paper

We demonstrate selective mode switching between substrate and superstrate Fano resonances in a metallic photonic crystal slab. A maximum experimental modulation depth of ~45% was achieved for the (1 0) substrate mode at 755 nm.

Authors:Timothy Palinski/NASA Glenn Research Center Brian Vyhnalek/NASA Glenn Research Center Gary Hunter/NASA Glenn Research Center Amogha Tadimety/Dartmouth College John Zhang/Dartmouth College

TE_0-TM_0 mode hybridization in LNOI ridge waveguide (JTh2F.10)
Presenter: An Pan, *Wuhan National Lab for Optoelectronics*
Expand for Abstract / Authors

Paper

We demonstrate the fundamental transverse electric field (TE_0) and magnitude field (TM_0) mode hybridization in a thin film lithium niobate (LNOI) ridge waveguide. A microring resonator with a quality factor of 1.76 million was fabricated to observe the occurrence of the mode hybridization.

Authors:An Pan/Wuhan National Lab for Optoelectronics Cheng Zeng/Wuhan National Lab for Optoelectronics Jinsong Xia/Wuhan National Lab for Optoelectronics

Broadband absorption enhancement for InAsSb-based mid-infrared detection via photon-trapping structure (JTh2F.11)
Presenter: FEI SUO, *Nanyang Technological University*
Expand for Abstract / Authors

Paper

We demonstrate an InAsSb-based mid-infrared detector via integrated photon-trapping hole array cavity structure, realizing 40% broadband absorption and 36% photocurrent enhancement in the wavelength range of 2 to 5 μm.

Authors:FEI SUO/Nanyang Technological University JINCHAO TONG/Nanyang Technological University HUA ZHANG/Nanyang Technological University

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Apodized 2D Slanted Grating Coupler for Efficient Mode Multiplexing Between Few Mode Fiber and SOI Chip (JTh2F.12)
Presenter: Xuan-Ming Guo, *National Chiao-Tung University*
Expand for Abstract / Authors

Paper

We have designed an apodized 2D slanted grating coupler that can multiplex four spatial fiber modes in two polarizations (fundamental + one higher-order mode in each polarization) into the SOI waveguides with high efficiency.

Authors:Xuan-Ming Guo/National Chiao-Tung University Yi-Jang Hsu/National Chiao-Tung University Chih-Chi Chang/National Chiao-Tung University Yinchieh Lai/National Chiao-Tung University

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Integrated optical pulse generator based on hybrid modulation induced by Franz-Keldysh effect (JTh2F.13)
Presenter: WU ZHAO, *Institute of Semiconductors, Chinese Academy of Sciences*
Expand for Abstract / Authors

Paper

An optical pulse generator is demonstrated using the amplitude/phase hybrid modulation of an integrated laser-modulator transmitter followed by chirp compression. 6-GHz optical pulse with a width of 8.27 ps is realized.

Authors:WU ZHAO/Institute of Semiconductors, Chinese Academy of Sciences yaobin li/Institute of Semiconductors, Chinese Academy of Sciences Huan Wang/Institute of Semiconductors, Chinese Academy of Sciences Qiang Kan/Institute of Semiconductors, Chinese Academy of Sciences Dan Lu/Institute of Semiconductors, Chinese Academy of Sciences Lingjuan Zhao/Institute of Semiconductors, Chinese Academy of Sciences

On-Chip Compact Silicon-Based Polarizer with Ultra-Broad Bandwidth (>340 nm) by Sputtering Cadmium Oxide layers (JTh2F.14)
Presenter: Yin Xu, *Jiangnan University*
Expand for Abstract / Authors

Paper

We propose an on-chip compact silicon-based polarizer by sputtering multi-cadmium oxide layers on the silicon nanowire. The working bandwidth of higher than 340 nm is obtained in a short device length of 5 um.

Authors:Yin Xu/Jiangnan University Xin Hu/Hangzhou Dianzi University Yue Dong/Jiangnan University Bo Zhang/Jiangnan University Yi Ni/Jiangnan University

Extreme suppression of waveguide crosstalk with all-dielectric metamaterials (JTh2F.16)
Presenter: Md Borhan Mia, *Texas Tech University*
Expand for Abstract / Authors

Paper

We present and demonstrate an exceptional coupling in extreme skin-depth waveguides for the extreme suppression of waveguide crosstalk. The anisotropic dielectric perturbation of metamaterial claddings causes such an exceptional coupling and results in an extremely long coupling length.

Authors:Md Borhan Mia/Texas Tech University Syed Ahmed/Texas Tech University Ishtiaque Ahmed/Texas Tech University Yun Lee/Purdue University Minghao Qi/Purdue University Sangsik Kim/Texas Tech University

Optical frequency comb generation using low stress reactive sputtered silicon nitride waveguides (JTh2F.17)
Presenter: Andreas Frigg, *RMIT University*
Expand for Abstract / Authors

Paper

We demonstrate fully CMOS-compatible anomalous dispersive SiN microring resonators with an intrinsic Q factor of 6.6×10^5 based on reactive sputtering SiN, yielding in a 250 nm wide modulation-instability frequency comb.

Authors:Andreas Frigg/RMIT University Andreas Boes/RMIT University Guanghui Ren/RMIT University Thach Nguyen/RMIT University Duk-Yong Choi/Australian National University Silvio Gees/Evatec Ltd David Moss/Swinburne University of Technology Arnan Mitchell/RMIT University

Interactions between indirect excitons in separate coupled quantum wells (JTh2F.18)
Presenter: Darius Choksy, *University of California San Diego*
Expand for Abstract / Authors

Paper

We report on the repulsive and attractive interactions between indirect excitons in a system of separated coupled quantum wells.

Authors:Darius Choksy/University of California San Diego Leonid Butov/University of California San Diego Justin Norman/University of California, Santa Barbara Arthur Gossard/University of California, Santa Barbara

Electrically Pumped Light-emitting Device Based on $MoTe_2$ Directly Integrated with Doped Silicon (JTh2F.19)
Presenter: Jianxing Zhang, *Tsinghua University*
Expand for Abstract / Authors

Paper

We demonstrate an electrically pumped light emitting device by integrating a monolayer $MoTe_2$ directly on doped Silicon to form a Si-$MoTe_2$ double heterostructure. An external quantum efficiency of ~0.65% was achieved.

Authors:Jianxing Zhang/Tsinghua University Yongzhuo Li/Tsinghua University Song Fu/Tsinghua University Jiabin Feng/Tsinghua University Cun-Zheng Ning/Tsinghua University

Backward Cladding-Mode Coupling in Integrated Bragg Gratings on a Si3N4 Platform (JTh2F.20)
Presenter: Jiahao Zhan, *University of Maryland, College Park*
Expand for Abstract / Authors

Paper

We present a detailed study of a parasitic effect connected to integrated Bragg gratings. An appreciable transmission drop is observed experimentally and originates from the backward cladding-mode coupling.

Authors:Jiahao Zhan/University of Maryland, College Park Mario Dagenais/University of Maryland, College Park

Deterministic soliton switching dynamics in strong polarization-coupling microcavity (JTh2F.21) [Paper]
Presenter: Wenting Wang, *University of California, Los Angeles*
Expand for Abstract / Authors

We observed the deterministic soliton switching dynamics based on intrinsically thermal cooling process in a strong polarization-coupling microcavity. The pump laser is polarized at the TM direction and the TE-polarized cavity soliton is generated.

Authors:Wenting Wang/University of California, Los Angeles XINGHE JIANG/University of California, Los Angeles Heng Zhou/University of California, Los Angeles Jinghui Yang/University of California, Los Angeles Mingbin Yu/Institute of Microelectronics, A*STAR Dim-Lee Kwong/Institute of Microelectronics, A*STAR Chee Wei Wong/University of California, Los Angeles

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Designing Ultra-Compact Silicon T-junctions using Machine Learning (JTh2F.22) [Paper]
Presenter: Sourangsu Banerji, *University of Utah*
Expand for Abstract / Authors

We designed an ultra-compact and low-loss T-junction via a reinforcement learning algorithm coupled with finite difference time domain (FDTD) simulations. Simulated insertion loss is < 1dB with a device footprint of 1.2 μm x 1.2 μm.

Authors:Sourangsu Banerji/University of Utah Alex Hamrick/University of Utah Apratim Majumder/University of Utah Rajesh Menon/University of Utah Berardi Rodriguez/University of Utah

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Nanofence Assisted Microring Resonator for Single Nanoparticle Detection with Size Selectivity (JTh2F.23) [Paper]
Presenter: Saawan Kumar Bag, *Indian Institute of Technology Kharagpur*
Expand for Abstract / Authors

Two parallel coupled racetrack microring resonators assisted with photonic nanofence have been proposed. Numerical simulations demonstrate the device’s capability of detecting and quantifying sizes of single-gold nanoparticles. The approach exhibits robustness in sensing and selectivity.

Authors:Saawan Kumar Bag/Indian Institute of Technology Kharagpur Sauradeep Kar/Indian Institute of Technology Kharagpur Rajat Sinha/Indian Institute of Technology Kharagpur Shubhanshi Sharma/Indian Institute of Technology Kharagpur Shailendra Varshney/Indian Institute of Technology Kharagpur

High-Q Dispersion-Engineered Si_3N_4 Microresonators Based on a Subtractive Processing Technique (JTh2F.24)
Presenter: Zhichao Ye, *Chalmers University of Technology*
Expand for Abstract / Authors

Paper

We demonstrate dispersion-engineered Si_3N_4 microresonators with mean Q values >10 million fabricated using standard subtractive techniques. Soliton microcombs at 100 GHz line spacing and mode-locked dark-pulse Kerr combs are reported.

Authors:Zhichao Ye/Chalmers University of Technology Krishna Twayana/Chalmers University of Technology Peter Andrekson/Chalmers University of Technology Victor Company/Chalmers University of Technology

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Mode Splitting in Subwavelength Grating Metamaterial Ring Resonator (JTh2F.25)
Presenter: Wanxin Li, *Harbin Institute of Technology, Shenzhen*
Expand for Abstract / Authors

Paper

In this paper, the break of rotational symmetry induced mode splitting is observed in subwavelength grating metamaterial ring resonator, which can potentially be exploited for ultrasensitive optical detection and sizing of nanoparticles and molecules.

Authors:Wanxin Li/Harbin Institute of Technology, Shenzhen Jiaxin Chen/Harbin Institute of Technology, Shenzhen Xiaochuan Xu/Harbin Institute of Technology, Shenzhen

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Demonstration of Low Loss β-Ga_2O_3 Optical Waveguides in the UV–NIR Spectra (JTh2F.26)
Presenter: Jingan Zhou, *ARIZONA STATE UNIVERSITY*
Expand for Abstract / Authors

Paper

We report the first demonstration of beta-phase gallium oxide optical waveguides on sapphire in the ultraviolet to near-infrared spectra. A low propagation loss of 3.7 dB/cm was obtained at the wavelength of 810 nm. © 2020 The Author(s)

Authors:Jingan Zhou/ARIZONA STATE UNIVERSITY Hong Chen/ARIZONA STATE UNIVERSITY Houqiang Fu/ARIZONA STATE UNIVERSITY Kai Fu/ARIZONA STATE UNIVERSITY Xuguang Deng/Suzhou Institute of Nano-Tech and Nano-Bionics xuanqi Huang/ARIZONA STATE UNIVERSITY Tsung-Han Yang/ARIZONA STATE UNIVERSITY Jossue Montes/ARIZONA STATE UNIVERSITY Chen Yang/ARIZONA STATE UNIVERSITY Xin Qi/ARIZONA STATE UNIVERSITY Baoshun Zhang/Suzhou Institute of Nano-Tech and Nano-Bionics Xiaodong Zhang/Suzhou Institute of Nano-Tech and Nano-Bionics Yuji Zhao/ARIZONA STATE UNIVERSITY

An Isotropic Lithium Niobate Microring Resonator with a 1.38-nm Wide Continuous Tuning Range using 80 V (JTh2F.27)
Presenter: Yansong Yang, *University of Illinois at Urbana-Champaign*
Expand for Abstract / Authors

Paper

We present simulation and experimental results for an optical microring resonator in Z-cut thin-film lithium niobate with SiO_2 claddings and integrated tuning electrodes. Applying 0 to -80 V, we achieved a 1.38-nm continuous tuning range.

Authors:Yansong Yang/University of Illinois at Urbana-Champaign Meisam Bahadori/University of Illinois at Urbana-Champaign Ahmed E. Hassanien/University of Illinois at Urbana-Champaign Lynford L. Goddard/University of Illinois at Urbana-Champaign Songbin Gong/University of Illinois at Urbana-Champaign

self improvement of Q-factor in a lithium tantalite microcavity with high optical damage threshold (JTh2F.28)
Presenter: Yan Xiongshuo, *Shanghai Jiao Tong University*
Expand for Abstract / Authors

Paper

A more than 500 mw input power and 2 uw second harmonic generation had been demonstrated in a Lithium tantalite (LT) microcavity. The Q-factor improving with high input power in the LT microdisk had been observed.

Authors:Yan Xiongshuo/Shanghai Jiao Tong University Yi'an Liu/Shanghai Jiao Tong University Bing Zhu/Shanghai Jiao Tong University Yuping Chen/Shanghai Jiao Tong University Xianfeng Chen/Shanghai Jiao Tong University

25 GHz soliton microcombs in high-Q Si_3N_4 racetrack-shaped microresonators (JTh2F.29)
Presenter: Zhichao Ye, *Chalmers University of Technology*
Expand for Abstract / Authors

Paper

We demonstrate a 25 GHz single-soliton comb on a Si_3N_4 platform fabricated using a novel subtractive method. A long cavity is carefully designed to fit within the e-beam writing field while minimizing coupling to higher-order modes.

Authors:Zhichao Ye/Chalmers University of Technology Fuchuan Lei/Chalmers University of Technology Krishna Twayana/Chalmers University of Technology Marcello Girardi/Chalmers University of Technology Peter Andrekson/Chalmers University of Technology Victor Company/Chalmers University of Technology

Realization of Optical Anti-Parity-Time Symmetry by Spatiotemporal Modulation (JTh2F.31)
Presenter: Yao Duan, *Pennsylvania State University*
Expand for Abstract / Authors

Paper

We present a scheme to realize anti-parity-time (anti-PT) symmetry in an optical system by spatiotemporally modulating the imaginary part of permittivity. Direction-dependent bi-color lasing was achieved in an anti-PT symmetric micro-ring resonator.

Authors:Yao Duan/Pennsylvania State University Xingwang Zhang/Pennsylvania State University Yimin Ding/Pennsylvania State University xingjie ni/Pennsylvania State University

Bandwidth- and wavelength-tunable optical filter based on cascaded waveguide gratings on silicon-on-insulator (JTh2F.32)
Presenter: Tai-Chun Wang, *National Sun Yat-sen University*
Expand for Abstract / Authors

Paper

A tunable optical filter based on cascaded side-lobe-free waveguide gratings allows continuous tuning of 7 nm in bandwidth through on-chip heater and 83.2 pm/ ^{o} C in center wavelength through controlling environment temperature.

Authors:Tai-Chun Wang/National Sun Yat-sen University Tzu-Hsiang Yen/National Sun Yat-sen University Chia-J Yu/National Sun Yat-sen University Yen-Chieh Wang/National Sun Yat-sen University Yung-Jr Hung/National Sun Yat-sen University

Two-Photon-Pumped Single-Mode Vertical Cavity Lasing Based on Perovskite Monocrystalline Films (JTh2F.33)
Presenter: Xiaohong Li, *Huazhong University of Science and Technology*
Expand for Abstract / Authors

Paper

A two-photon pumped high quality single-mode vertical cavity lasing was realized. The VCSEL exhibits a remarkable low threshold of ~421 μJ/cm^2, a high quality factor of ~1286 and a small divergence angle of ~0.5°.

Authors:Xiaohong Li/Huazhong University of Science and Technology Weiwei Liu/Huazhong University of Science and Technology Peixiang Lu/Huazhong University of Science and Technology

2-um high-speed graphene electro-optic modulator based on silicon slot microring resonator (JTh2F.34)
Presenter: chao luan, *Technical University of Denmark*
Expand for Abstract / Authors

Paper

We show in simulation a 2-um graphene on silicon suspended electro-optic (E/O) modulator based on slot microring resonator working at critical coupling that shows dramatically increased speed while keeping big modulation depth

Authors:chao luan/Technical University of Denmark Yong Liu/Technical University of Denmark Yunhong Ding/Technical University of Denmark Hao Hu/Technical University of Denmark

Optical diode based on the integrated optomechanical structures (JTh2F.35)
Presenter: Linhao Ren, *Huazhong Univ of Science and Technology*
Expand for Abstract / Authors

Paper

We demonstrated a nonreciprocal device which is based on a silicon optomechanical microring resonator and a 3-dB directional coupler. The nonreciprocal transmission ratio of 22.235 dB with the input power of 251 μW is achieved.

Authors:Linhao Ren/Huazhong Univ of Science and Technology Xinbiao Xu/Huazhong Univ of Science and Technology Lei Shi/Huazhong Univ of Science and Technology Xinliang Zhang/Huazhong Univ of Science and Technology

Far-field Optical Diffraction Imaging of Opal-based Photonic Crystal (JTh2F.36)
Presenter: Govind kumar, *Indian Institute of Technology Kanpur*
Expand for Abstract / Authors

Paper

A bidirectional scattering distribution function with rigorous coupled-wave analysis is used to simulate the far-field diffraction pattern from opal-based photonic crystals. Experimental studies with monochromatic light provide a perfect correspondence with the simulation.

Authors:Govind kumar/Indian Institute of Technology Kanpur Arpita Haldar/Indian Institute of Technology Kanpur R. Vijaya/Indian Institute of Technology Kanpur

Compact micro-ring resonator using low-loss silicon waveguide bends (JTh2F.37)
Presenter: Jeong Hwan Song, *IMEC*
Expand for Abstract / Authors

Paper

A compact micro-ring resonator composed using low-loss advanced bends is reported. The effective radius of the ring is 2.5µm. The Q of 6200, *finesse* of 140, FSR of 35nm and ER of 15dB have been measured.

Authors:Jeong Hwan Song/IMEC Tangla Kongnyuy/IMEC Peter De Heyn/IMEC Sebastien Lardenois/IMEC Roelof Jansen/IMEC Xavier Rottenberg/IMEC

Performance Comparison Among Silicon-based Arrayed Waveguide Grating with Rowland and Confocal Configuration (JTh2F.38)
Presenter: zhenyu Li, *Peking University*
Expand for Abstract / Authors

Paper

With comparison, experimental results show that the AWG with Rowland configuration in combination with constant period along the tangent line to its grating pole for arrayed waveguides has the best cross talk

Authors:zhenyu Li/Peking University Jun Zou/Nanyang Technological University HUIHUI ZHU/Nanyang Technological University Hui Zhang/Nanyang Technological University Hong Cai/Institute of Microelectronics, A*STAR zhenchuan yang/Peking University Yufeng Jin/Peking University yilong hao/Peking University Ai Qun Liu/Nanyang Technological University

14:00 - 16:00 (UTC - 07:00)

Symp: Quantum Biophotonics II (JTh3N)
Presider: Ralph Jimenez

Special Symposium

14:00 - 14:30

Multiphoton effects with bright squeezed vacuum (JTh3N.1)
Presenter: Maria Chekhova, *Max-Planck-Inst Physik des Lichts*
Expand for Abstract / Authors

Paper

Light generated through strongly pumped parametric down-conversion has extremely strong photon-number fluctuations and is therefore highly efficient for multiphoton effects. In addition, its spectral and spatial properties can be tailored to allow two-dimensional multiphoton spectroscopy.

Authors:Denis Kopylov/Max-Planck-Inst Physik des Lichts Kirill Spasibko/Max-Planck-Inst Physik des Lichts Paula Cutipa/Max-Planck-Inst Physik des Lichts Tatiana Murzina/M. V. Lomonosov Moscow State University Maria Chekhova/Max-Planck-Inst Physik des Lichts

Invited

14:30 - 15:00

The role of quantum correlations in entangled two-photon absorption (JTh3N.2)
Presenter: Frank Schlawin, *University of Oxford*
Expand for Abstract / Authors

Paper

The theoretical description of entangled photon absorption in complex multilevel systems undergoing dissipative dynamics is reviewed. The impact of quantum correlations on the efficiency of the absorption process and the excited state distributions is discussed.

Authors:Frank Schlawin/University of Oxford Andreas Buchleitner/Albert-Ludwigs University Freiburg Konstantin Dorfman/East China Normal University Shaul Mukamel/University of California

Invited

15:00 - 15:30

Energy Transfer and Two-Photon Absorption with Entangled Photons (JTh3N.3)
Presenter: George Schatz, *Northwestern University*
Expand for Abstract / Authors

Paper

This talk overviews our recent work on two photon absorption and donor-acceptor energy transfer, including for the influence of photon entanglement on the results.

Authors:George Schatz/Northwestern University

Invited

15:30 - 15:45 **Setting limits on two-photon absorption cross sections in common fluorescent molecules with entangled photon pairs excitation (JTh3N.4)**
Presenter: Alexander Mikhailov, *University of Colorado Boulder JILA*
Expand for Abstract / Authors

Paper

We present a detailed study of two-photon absorption in some common fluorescent molecules with excitation by entangled photon pairs. Using fluorescence and transmittance measurements, we set an upper bound on the absorption cross sections.

Authors:Alexander Mikhailov/University of Colorado Boulder JILA Kristen Parzuchowski/University of Colorado Boulder JILA Michael Mazurek/University of Colorado Boulder JILA Thomas Gerrits/NIST Daniel Lum/NIST Martin Stevens/NIST Ralph Jimenez/University of Colorado Boulder JILA Ryan Willson/University of Colorado Boulder JILA Charles Camp/NIST

15:45 - 16:00 **Enhanced Two-photon Absorption Fluorescence of Fluorescein Biomarkers Using Squeezed Light Excitation (JTh3N.5)**
Presenter: Tian Li, *Dept. of Bio.&Agri. Eng. Texas A&M Univ.*
Expand for Abstract / Authors

Paper

We demonstrate that by using squeezed light for two-photon absorption (TPA) of fluorescein biomarkers, a fluorescence enhancement of nearly 50 is achieved as compared to conventional TPA using coherent light.

Authors:Tian Li/Dept. of Bio.&Agri. Eng. Texas A&M Univ. Fu Li/Institute for Quantum Science and Engineering, Texas A&M Univ. Charles Altuzarra/Institute for Quantum Science and Engineering, Texas A&M Univ. Anton Classen/Dept. of Bio.&Agri. Eng. Texas A&M Univ. Girish Agarwal/Dept. of Bio.&Agri. Eng. Texas A&M Univ.

ATTR: Augmented and Virtual Reality: Systems Meet Devices I (ATh3I)
Presider: Reza Khorasaninejad, *Brelyon Inc.*

14:00 - 14:30 **Metasurfaces for Augmented and Virtual Reality (ATh3I.1)**
Presenter: Mark Brongersma, *Stanford University*
Expand for Abstract / Authors

In this presentation, I will show how passive metasurfaces can start to impact Augmented and Virtual Reality applications. I will discuss the creation of high-efficiency, metasurface-based optical combiners for near-eye displays and eye tracking systems.

Authors:Mark Brongersma/Stanford University

Invited

14:30 - 15:00 **Foveated Displays for Augmented Reality (ATh3I.2)**
Presenter: Edward Tang, *Avegant Corporation*
Expand for Abstract / Authors

Display technologies are soon limited by pixel density and power challenges. Closely optimizing display technologies to human vision through active optics and software algorithms allows the decoupling field-of-view with resolution. Steered foveated displays will enable a significant increase in effective resolution, while simultaneously decreasing pixel count.

Authors:Edward Tang/Avegant Corporation

Invited

15:00 - 15:30 **Volumetric Immersive Experiences, Display Technology Considerations (ATh3I.3)**
Presenter: Ajit Ninan, *Dolby Laboratories*
Expand for Abstract / Authors

In the race to the face for AR and volumetric experiences some key considerations for displays and video arises. In this session we look at 9 axes that are essential to address for this technology to be successful.

Authors:Ajit Ninan/Dolby Laboratories

Invited

15:30 - 15:45 **Full-Color MicroLEDs for Display Technologies (ATh3I.4)**
Presenter: HA QUOC THANG BUI, *New Jersey Institute of Technology*
Expand for Abstract / Authors

Paper

Red, green, and blue InGaN/AlGaN nanowire micro-light-emitting diodes (µLEDs) grown on a silicon substrate by molecular beam epitaxy with diameters from 20 to 100µm present stable emissions in the visible spectra, promising for microLED displays.

Authors:HA QUOC THANG BUI/New Jersey Institute of Technology Ravi Teja Velpula/New Jersey Institute of Technology Barsha Jain/New Jersey Institute of Technology Hieu Nguyen/New Jersey Institute of Technology

15:45 - 16:00 **Three-Color Phase-Amplitude Holography with a Metasurface Doublet (ATh3I.5)**
Presenter: Xiaoyan Huang, *Columbia University*
Expand for Abstract / Authors

Paper

We report experimental demonstrations of a phase-amplitude metasurface doublet capable of producing 2D artifact-free, full-color holographic images.

Authors:Xiaoyan Huang/Columbia University Sajan Shrestha/Columbia University Adam Overvig/Columbia University Nanfang Yu/Columbia University

Precision Time-Resolved Spectroscopy (STh3F)

Presider: Adam Fleisher, *National Inst of Standards & Technology*

14:00 - 14:15	**Mid-infrared time-stretch spectroscopy (STh3F.1)** **Presenter**: Akira Kawai, *The University of Tokyo* Expand for Abstract / Authors Speeding up mid-infrared spectroscopy is an essential demand in molecular science. We demonstrate a broadband mid-infrared spectroscopy technique, called time-stretch infrared spectroscopy, spanning over 4.4-4.9 μm at a spectral acquisition rate of 80 MSpectra/s. **Authors**:Akira Kawai/The University of Tokyo Tatsuo Dougakiuchi/Hamamatsu Photonics K.K. Venkata Ramaiah Badarla/The University of Tokyo Kazuki Hashimoto/The University of Tokyo Takayuki Imamura/The University of Tokyo Tadataka Edamura/Hamamatsu Photonics K.K. Takuro Ideguchi/The University of Tokyo	Paper
14:15 - 14:30	**Mid-infrared phase-controlled Fourier-transform spectroscopy (STh3F.2)** **Presenter**: Kazuki Hashimoto, *The University of Tokyo* Expand for Abstract / Authors We develop a rapid-scan phase-controlled Fourier-transform spectroscopic technique to demonstrate broadband and high-resolution mid-infrared spectroscopy of gaseous and liquid phase molecules at a spectral acquisition rate of over 12 kHz. **Authors**:Kazuki Hashimoto/The University of Tokyo Venkata Ramaiah Badarla/The University of Tokyo Takuro Ideguchi/The University of Tokyo	Paper
14:30 - 14:45	**Impact of Atmospheric Turbulence on Frequency Comb Optical Timing Jitter (STh3F.3)** **Presenter**: Emily Hannah, *University of Colorado Boulder* Expand for Abstract / Authors We characterize the impact of turbulence on optical pulse timing jitter over a uniform, near-ground path and compare the results with theory. Use of frequency combs enabled phase-continuous measurements down to 200-fs over multiple hours. **Authors**:Emily Hannah/University of Colorado Boulder William Swann/National Institute of Standards and Technology Jennifer Ellis/National Institute of Standards and Technology Martha Bodine/National Institute of Standards and Technology Carter Mak/University of Colorado Boulder Nathan Kuczun/University of Colorado Boulder Nathan Newbury/National Institute of Standards and Technology Laura Sinclair/National Institute of Standards and Technology Andreas Muschinski/University of Colorado Boulder Gregory Rieker/University of Colorado Boulder	Paper

14:45 - 15:00	**Dual-Comb Hyperspectral Imaging with a High-Framerate Infrared Detector Array (STh3F.4)** **Presenter**: Thibault Voumard, *Centre Suisse d'Electronique et de Microtechnique* Expand for Abstract / Authors Dual-comb hyperspectral imaging is demonstrated using a high-framerate 128x128 pixel infrared detector array. 10 GHz wide gas-phase absorption features are well-resolved at 1 Hz-rate and extension to the entire 1-5 micron wavelength range is possible. **Authors**:Thibault Voumard/Centre Suisse d'Electronique et de Microtechnique Thibault Wildi/Centre Suisse d'Electronique et de Microtechnique Victor Brasch/Centre Suisse d'Electronique et de Microtechnique Germán Vergara Ogando/New Infrared Technology Raul Gutierrez Alvarez/New Infrared Technology Tobias Herr/Centre Suisse d'Electronique et de Microtechnique	Paper
15:00 - 15:30	**Emerging Femtosecond Laser Sampling Approaches in All-optical Plasma Spectroscopy (STh3F.5)** **Presenter**: Vassilia Zorba, *Lawrence Berkeley National Laboratory* Expand for Abstract / Authors In this talk we provide an overview of recent work on emerging ultrafast laser approaches for remote sensing of elements and isotopes in solid samples, and preferentially enhancing or impeding chemical reactions in laser plasmas. **Authors**:Vassilia Zorba/Lawrence Berkeley National Laboratory Invited	
15:30 - 15:45	**Pulse Burst Mode Dual-Comb Spectroscopy for Time-Resolved Measurements of Laser-Induced Plasmas (STh3F.6)** **Presenter**: Yu Zhang, *University of Arizona* Expand for Abstract / Authors We introduce a pulse burst mode form of dual-comb spectroscopy to enable time-resolved measurements of singular events. The time-resolved spectrum of iron following a single ablation shot of stainless steel is demonstrated. **Authors**:Yu Zhang/University of Arizona Reagan Weeks/University of Arizona Caroline Lecaplain/University of Arizona Jeremy Yeak/Opticslah Sivanandan Harilal/Pacific Northwest National Laboratory Mark Phillips/University of Arizona R. Jones/University of Arizona	Paper

15:45 - 16:00

Time-Resolved Mid-Infrared Dual-Comb Spectroscopy of Methane in an Electrical Discharge (STh3F.7)
Presenter: Muhammad Abbas, *Radboud University*
Expand for Abstract / Authors

Paper

A time-resolved mid-infrared dual-comb spectrometer with a spectral bandwidth of ~300 cm^{-1} and 6 GHz spectral resolution is used to monitor the dynamics in a CH_4 discharge plasma with 20 µs temporal resolution.

Authors:Muhammad Abbas/Radboud University Qing Pan/Radboud University Julien Mandon/Radboud University Frans J. Harren/Radboud University Amir Khodabakhsh/Radboud University

Quantum Networks and Architectures (FTh3D)

Presider: Xianmin Jin, *Shanghai Jiao Tong University*

14:00 - 14:30

Atomic Quantum Memory in the Autler-Townes Regime (FTh3D.1)
Presenter: Lindsay LeBlanc, *University of Alberta*
Expand for Abstract / Authors

Paper

Using cold and ultracold rubidium atoms controlled with lasers intense enough to put the system into the Autler-Townes regime, fast, efficient, and broadband storage and manipulation of photonic signals is achieved. In demonstrating single-photon-level operation, signals are read out with exceptionally low-noise, which is inherent to this method. Finally, high efficiency and longer storage times are made possible by using Bose-condensed samples as the storage medium.

Authors:Erhan Saglamyurek/University of Alberta Anindya Rastogi/University of Alberta Taras Hrushevskyi/University of Alberta Benjamin Smith/University of Alberta Logan Cooke/University of Alberta Khabat Heshami/National Research Council Lindsay LeBlanc/University of Alberta

Invited

14:30 - 14:45	**Generation of two-mode quantum states of light with timing controllable memories (FTh3D.2)** **Presenter**: Mamoru Endo, *University of Tokyo* Expand for Abstract / Authors We created and experimentally verified two-mode entangled states of light, α|0,1>+βexp(iθ)|1,0>, by means of two phase-sensitive optical quantum memories. The release timing of each optical mode can be independently controlled for up to 400 ns. **Authors**:Mamoru Endo/University of Tokyo Fumiya Okamoto/University of Tokyo Mikihisa Matsuyama/University of Tokyo Yuya Ishizuka/University of Tokyo Yosuke Hashimoto/University of Tokyo Rei Sakakibara/University of Tokyo Jun-ichi Yoshikawa/University of Tokyo Peter van Loock/Johannes Gutenberg Universität Mainz Akira Furusawa/University of Tokyo	Paper
14:45 - 15:00	**Resource reduction for quantum error correction using quantum multiplexed photons (FTh3D.3)** **Presenter**: Nicolo Lo Piparo, *National Institute of Informatics* Expand for Abstract / Authors Quantum error correction codes require large numbers of physical resources, in terms of photons and qubits. Here, we show how we can drastically reduce the number of photons required in quantum communication through quantum multiplexing **Authors**:Nicolo Lo Piparo/National Institute of Informatics Michael Hanks/National Institute of Informatics Claude Gravel/National Institute of Informatics William Munro/NTT Basic Research Laboratories Kae Nemoto/National Institute of Informatics	Paper
15:00 - 15:15	**Routing on quantum repeater networks (FTh3D.4)** **Presenter**: William Munro, *NTT Basic Research Laboratories* Expand for Abstract / Authors We explore quantum routing on a future quantum internet and highlight the limitations current repeater architectures imposes on them. A number of quantum repeater architectures are not likely to be compatible with the quantum internet especially with constrained resources. **Authors**:William Munro/NTT Basic Research Laboratories Kae Nemoto/National Institute of Photonics	Paper

15:15 - 15:30	**Hybrid Quantum Networks for High-Fidelity Entanglement Distribution (FTh3D.5)** **Presenter**: Yuan Lee, *Research Laboratory of Electronics, Massachusetts Institute of Technology* Expand for Abstract / Authors We present an architecture for multiplexed quantum repeaters using local connectivity to improve fidelity in entanglement distribution. Simulations indicate our scheme achieves rates comparable to competing schemes, with fidelity improvements that increase with repeater size. **Authors**:Yuan Lee/Research Laboratory of Electronics, Massachusetts Institute of Technology Eric Bersin/Research Laboratory of Electronics, Massachusetts Institute of Technology Axel Dahlberg/QuTech, Delft University of Technology Stephanie Wehner/QuTech, Delft University of Technology Dirk Englund/Research Laboratory of Electronics, Massachusetts Institute of Technology	Paper
15:30 - 16:00	**Quantum Computing with Silicon Photonics (FTh3D.6)** **Presenter**: Mercedes Gimeno-Segovia, *PsiQuantum* Expand for Abstract / Authors In this talk, I will describe an architecture for fault-tolerant quantum computing that can be manufactured at large scales using silicon photonics. **Authors**:Mercedes Gimeno-Segovia/PsiQuantum Invited	Paper

Silicon Photonics I (STh3O)

Presider: Beibei Zeng, *Lehigh University*

14:00 - 14:15	**Nanophotonic Phased Arrays with Compact and Low Power Silicon Resonator Phased Shifters (STh3O.1)** **Presenter**: Hugo Larocque, *Massachusetts Institute of Technology* Expand for Abstract / Authors We introduce silicon nanophotonic phased arrays with ultracompact and low-power resonator phase shifters for beam steering with an average applied power of 0.4 mW per phase shifter. **Authors**:Hugo Larocque/Massachusetts Institute of Technology Leonardo Ranzani/Raytheon BBN Technologies James Leatham/Raytheon Space and Airborne Systems Jeffrey Tate/Raytheon Space and Airborne Systems Alex Niechayev/Raytheon Space and Airborne Systems Thomas Yengst/Raytheon Space and Airborne Systems Tin Komljenovic/Nexus Photonics Charley Fodran/Raytheon Space and Airborne Systems Duane Smith/Raytheon Space and Airborne Systems Mohammad Soltani/Raytheon BBN Technologies	Paper

14:15 - 14:30	**High-Speed Low-Voltage Waveguide-Integrated Ge-on-Si Avalanche Photodiodes (STh3O.2)** **Presenter**: Jin Zhang, *University of California San Diego* Expand for Abstract / Authors We demonstrate waveguide-integrated silicon-germanium avalanche photodiodes. With a unity-gain responsivity of 0.95 A/W, gain of 16 and bandwidth of 33 GHz are achieved. 32 G-baud PAM-4 eyes are demonstrated without digital signal processing. **Authors**:Jin Zhang/University of California San Diego Ana Pejkic/University of California San Diego Ping P. Kuo/University of California San Diego Radic Stojan/University of California San Diego	Paper
14:30 - 14:45	**Hybrid Integration of High-Q Chalcogenide Microring Resonators on Silicon-on-insulator (STh3O.3)** **Presenter**: Philippe Jean, *Centre d'Optique Photonique et Laser* Expand for Abstract / Authors We demonstrate novel on-chip chalcogenide microresonators directly integrated on the silicon-on-insulator platform using an etchless fabrication method and thermal dewetting. A high Q greater than $4.6x10^5$ is measured at telecommunication wavelengths. **Authors**:Philippe Jean/Centre d'Optique Photonique et Laser Alexandre Douaud/Centre d'Optique Photonique et Laser Sophie LaRochelle/Centre d'Optique Photonique et Laser Younès Messaddeq/Centre d'Optique Photonique et Laser Wei Shi/Centre d'Optique Photonique et Laser	Paper

14:45 - 15:00	**GFDM Data Encoded Si Waveguide Mach-Zehnder Modulator Beyond 150 Gbit/s (STh3O.4)** **Presenter**: Shih-Chun Kao, *Graduate Institute of Photonics and Optoelectronics, and Department of Electrical Engineering, National Taiwan University, Taipei, Taiwan.* Expand for Abstract / Authors Beyond 150-Gbit/s single-arm modulation of a waveguide-type silicon Mach-Zehnder interferometer (MZI) modulator operated at 1550 nm is achieved by using the GFDM data stream with optimizing K subcarriers and M time slots. **Authors**:Shih-Chun Kao/Graduate Institute of Photonics and Optoelectronics, and Department of Electrical Engineering, National Taiwan University, Taipei, Taiwan. Chih-Hsien Cheng/Graduate Institute of Photonics and Optoelectronics, and Department of Electrical Engineering, National Taiwan University, Taipei, Taiwan. Huai-Yung Wang/Graduate Institute of Photonics and Optoelectronics, and Department of Electrical Engineering, National Taiwan University, Taipei, Taiwan. Cheng-Ting Tsai/Graduate Institute of Photonics and Optoelectronics, and Department of Electrical Engineering, National Taiwan University, Taipei, Taiwan. Patrick Chiang/Department of Microelectronics, Fudan University, Shanghai, China Borching Su/Graduate Institute of Communication Engineering, National Taiwan University, Taiwan, Taipei, Taiwan. Hao-Chung Kuo/Department of Photonics, National Chiao Tung University, Hsinchu, Taiwan. Gong-Ru Lin/Graduate Institute of Photonics and Optoelectronics, and Department of Electrical Engineering, National Taiwan University, Taipei, Taiwan.	Paper
15:00 - 15:15	**High-Speed Broadband Plasmonic-Silicon Modulator Integrated with Epsilon-near-zero Conductive Oxide (STh3O.5)** **Presenter**: Alan Wang, *Oregon State University* Expand for Abstract / Authors We demonstrated a compact broadband plasmonic-silicon electro-absorption modulator driven by epsilon-near-zero conductive oxide, covering the entire C-band from 1515nm to 1580nm wavelength. It achieved 3.5 GHz modulation bandwidth and 4.5 Gb/s data rate. **Authors**:Bokun Zhou/Oregon State University Erwen Li/Oregon State University Yufei Bo/Oregon State University Wei-Che Hsu/Oregon State University Alan Wang/Oregon State University	Paper

15:15 - 15:30

Graphene-assisted electro-optomechanical integration on a silicon-on-insulator platform (STh3O.6)
Presenter: Xiankai Sun, *The Chinese University of Hong Kong*
Expand for Abstract / Authors

_ Paper

We demonstrated for the first time graphene-assisted electro-optomechanical integration on a silicon-on-insulator platform. Various mechanical modes were effectively actuated with mechanical *Q* as high as ~1000 measured in air.

Authors:Xiang Xi/The Chinese University of Hong Kong Zefeng Chen/The Chinese University of Hong Kong Jian-Bin Xu/The Chinese University of Hong Kong Xiankai Sun/The Chinese University of Hong Kong

15:30 - 16:00

A gain-enhanced silicon-photonic optical phased array with integrated O-band amplifiers for 40-m ranging and 3D scan (STh3O.7)
Presenter: Hyunil Byun, *Samsung Advanced Institute of Technology*
Expand for Abstract / Authors

_ Paper

For the first time, we demonstrate 40-m range detection and 3D depth scan up to 20 m using a silicon-photonic optical phased array with integrated amplifiers, promising a highperformance solid-state light-detection and ranging (LiDAR) system.

Authors:Hyunil Byun/Samsung Advanced Institute of Technology Jisan Lee/Samsung Advanced Institute of Technology Bongyong Jang/Samsung Advanced Institute of Technology Changbum Lee/Samsung Advanced Institute of Technology Eunkyung Lee/Samsung Advanced Institute of Technology Inoh Hwang/Samsung Advanced Institute of Technology Changgyun Shin/Samsung Advanced Institute of Technology Dongjae Shin/Samsung Advanced Institute of Technology Dongshik Shim/Samsung Advanced Institute of Technology Tatsuhiro Otsuka/Samsung Advanced Institute of Technology Sungwoo Hwang/Samsung Advanced Institute of Technology Hyuck Choo/Samsung Advanced Institute of Technology Kyoungho Ha/Samsung Advanced Institute of Technology

Nonlinear and Novel Phenomena I (FTh3A)

Presider: Matthias Heinrich, *University of Rostock*

14:00 - 14:30

Unconventional computing with liquid light (FTh3A.1)
Presenter: Natalia Berloff, *University of Cambridge*
Expand for Abstract / Authors

_ Paper

Quantum fluids of light such as polariton or photon condensates can act as analogue Hamiltonian simulators for solving large-scale hard optimisation problems. I will discuss the requirements and recent progress in realising such systems.

Authors:Natalia Berloff/University of Cambridge

Invited

14:30 - 14:45

(Withdrawn) Theory of neuromorphic computing by waves (FTh3A.2)
Presenter: Claudio Conti, *ISC-CNR Dep. Physics Univ. Sapienza*
Expand for Abstract / Authors

We study theoretically neural networks embedding a nonlinear wave as a computing reservoir. We demonstrate interpolation of large datasets and Boolean logic. We discuss the existence of a critical nonlinearity for learning.

Authors:Giulia Marcucci/ISC-CNR Dep. Physics Univ. Sapienza Davide Pierangeli/ISC-CNR Dep. Physics Univ. Sapienza Claudio Conti/ISC-CNR Dep. Physics Univ. Sapienza

14:45 - 15:00

Mapping a Nonlinear Response to a Wave Profile (FTh3A.3)
Presenter: Pengbo Jia, *The MOE Key Laboratory of Weak-Light Nonlinear Photonics, TEDA Applied Physics Institute and School of Physics, Nankai University*
Expand for Abstract / Authors

Paper

We demonstrate theoretically and experimentally, for the first time to our knowledge, that the nonlinear response of a medium can be mapped directly onto a dynamical wave profile governed by a generalized nonlinear Schrödinger equation.

Authors:Pengbo Jia/The MOE Key Laboratory of Weak-Light Nonlinear Photonics, TEDA Applied Physics Institute and School of Physics, Nankai University Zhili Li/The MOE Key Laboratory of Weak-Light Nonlinear Photonics, TEDA Applied Physics Institute and School of Physics, Nankai University Yi Hu/The MOE Key Laboratory of Weak-Light Nonlinear Photonics, TEDA Applied Physics Institute and School of Physics, Nankai University Zhigang Chen/The MOE Key Laboratory of Weak-Light Nonlinear Photonics, TEDA Applied Physics Institute and School of Physics, Nankai University Jingjun Xu/The MOE Key Laboratory of Weak-Light Nonlinear Photonics, TEDA Applied Physics Institute and School of Physics, Nankai University

15:00 - 15:15

First Experimental Observation of Four Fermi-Pasta-Ulam-Tsingou Recurrences in an Optical Fiber (FTh3A.4)
Presenter: Guillaume Vanderhaegen, *PhLAM*
Expand for Abstract / Authors

Paper

We report the first experimental observation of four Fermi-Pasta-Ulam-Tsingou recurrences along an optical fiber thanks to an active compensation of the losses.

Authors:Guillaume Vanderhaegen/PhLAM Pascal Szriftgiser/PhLAM Alexandre Kudlinski/PhLAM Matteo Conforti/PhLAM Stefano Trillo/University of Ferrara Arnaud Mussot/PhLAM

15:15 - 15:30	**The fast resonant rovibrational nonlinearity of CO and CO_2 in the mid-IR (FTh3A.5)** **Presenter**: Jeremy Pigeon, *Stony Brook University* Expand for Abstract / Authors Time- and frequency-resolved measurements of resonant nonlinear refraction of mid-IR radiation by CO and CO_2 gas reveal a fast optical nonlinearity that is dominated by power-broadening resulting in sign reversals of the nonlinear refractive index. **Authors**:Jeremy Pigeon/Stony Brook University Dana Tovey/UCLA Sergei Tochitsky/UCLA Gerhardus Louwrens/UCLA Ilan Ben-Zvi/Stony Brook University Chan Joshi/UCLA Dmitry Martyshkin/University of Alabama at Birmingham Vladimir Fedorov/University of Alabama at Birmingham Krishna Karki/University of Alabama at Birmingham Sergey Mirov/University of Alabama at Birmingham	Paper
15:30 - 15:45	**(2+1)D Spatiotemporal Characterization of Nonlinear Interactions between Selectively Excited Spatial Modes of a Few-Mode Fiber (FTh3A.6)** **Presenter**: Sai Kanth Dacha, *University of Maryland* Expand for Abstract / Authors We present a novel approach to measure nonlinear interaction between selectively-excited modes of few-mode fibers. Selective excitation is achieved by end-facet patterning; spatiotemporal measurements are performed by raster-scanning a near-field probe coupled to high-speed detection. **Authors**:Sai Kanth Dacha/University of Maryland Thomas Murphy/University of Maryland	Paper
15:45 - 16:00	**Thermodynamic pressure emerging from highly multimoded nonlinear optical systems (FTh3A.7)** **Presenter**: Huizhong Ren, *CREOL, University of Central Florida* Expand for Abstract / Authors We demonstrate that in nonlinear waveguide arrangements, the optical thermodynamic pressure results from the electrodynamic force exerted on the guiding interface and from an entropy growth term associated with an irreversible expansion. **Authors**:Huizhong Ren/CREOL, University of Central Florida Fan Wu/CREOL, University of Central Florida Pawel Jung/CREOL, University of Central Florida Mercedeh Khajavikhan/University of Southern California Demetrios Christodoulides/CREOL, University of Central Florida	Paper

Optical Phenomena Driven by Complex Beams (STh3H)

Presider: Takashige Omatsu, *Chiba University*

14:00 - 14:15	**Laser-induced Cavitation Using Amplified Dynamic Higher Order Bessel-gauss Beams Integrated in Time (HOBBIT) (STh3H.1)** **Presenter**: Keith Miller, *Clemson University* Expand for Abstract / Authors Optimization of laser-induced cavitation using amplified dynamic HOBBIT beams is demonstrated. The ring-profiled beams consist of coherent superpositions of asymmetric Bessel-Gauss beams containing orbital angular momentum with dynamic spatial and temporal control at λ=2.09 μm. **Authors**:Keith Miller/Clemson University Yuan Li/Clemson University Eric Johnson/Clemson University	Paper
14:15 - 14:30	**Laser Microfabrication of Metal Surfaces by Tightly Focused Higher-Order Vector Beams (STh3H.2)** **Presenter**: Yuichi Kozawa, *Tohoku University* Expand for Abstract / Authors We present an experimental study on laser microfabrication of metal surfaces by using femtosecond, higher-order vector beams. The contribution of the longitudinal electric field in laser ablation depends on target material. **Authors**:Masaki Sato/Tohoku University Yuichi Kozawa/Tohoku University Shunichi Sato/Tohoku University	Paper
14:30 - 14:45	**Fractional Optical Vortex Induced Mass Forward Transfer -Deflected ‘Spin-Jet’- (STh3H.3)** **Presenter**: Haruki Kawaguchi, *Graduate School of Engineering Chiba University* Expand for Abstract / Authors We demonstrate, for the first time, the creation of a deflected spinning jet, made of high-viscosity donor material, so-called deflected ‘spin-jet’, by employing fractional optical vortex induced mass forward transfer technique. **Authors**:Haruki Kawaguchi/Graduate School of Engineering Chiba University Ryosuke Nakamura/Graduate School of Engineering Chiba University Kei Umesato/Graduate School of Engineering Chiba University Katsuhiko Miyamoto/Molecular Chirality Research Center, Chiba University Takashige Omatsu/Molecular Chirality Research Center, Chiba University	Paper

14:45 - 15:00 **Adaptive Wavefront Manipulation for Remote Detection via Filamentation (STh3H.4)**
Presenter: Lauren Finney, *University of Michigan*
Expand for Abstract / Authors

Paper

We demonstrate that optical wavefront control can enhance the intensity of signal in filament-induced breakdown spectroscopy, and that this enhancement can be associated with the application of astigmatism.

Authors:Lauren Finney/University of Michigan Jinpu Lin/University of Michigan Patrick Skrodzki/University of Michigan Milos Burger/University of Michigan John Nees/Gerard Mourou Center for Ultrafast Optical Science Karl Krushelnick/University of Michigan Igor Jovanovic/University of Michigan

15:00 - 15:15 **Femtosecond Beam Shaping for Filament-induced Breakdown Spectroscopy (STh3H.5)**
Presenter: Milos Burger, *University of Michigan*
Expand for Abstract / Authors

Paper

We examine the utility of beam shaping for femtosecond filament-induced breakdown spectroscopy at long range. Diffraction-resistant and self-healing Bessel and Airy beams offer the advantage of longitudinally extended working zones.

Authors:Milos Burger/University of Michigan pavel polynkin/University of Arizona Igor Jovanovic/University of Michigan

15:15 - 15:30 **(Withdrawn) Manipulating Lasers in Microcavity with Programmable Chirality and Spherical Nano-Confinement (STh3H.6)**
Presenter: YU-CHENG CHEN, *Nanyang Technological University*
Expand for Abstract / Authors

A novel approach to manipulate higher-order laser modes in Fabry-Perot microcavity was developed, where single-mode and multi-mode lasing could be fully configured by intracavity spherical confinement, chirality, as well as biochemical changes at the nanoscale.

Authors:Yifan Zhang/Nanyang Technological University Hamim Rivy/Nanyang Technological University Zhen Qiao/Nanyang Technological University Zhiyi Yuan/Nanyang Technological University YU-CHENG CHEN/Nanyang Technological University

15:30 - 15:45	**Two photon-induced chiral structures of azo-polymers (STh3H.7)** **Presenter**: Ami Shiraishi, *Chiba University* Expand for Abstract / Authors We report on two-photon-absorption induced chiral surface structures of azo-polymers with high three-dimensional spatial resolution beyond diffraction limit and without undesired outer rings due to Airy patterns by irradiation of picosecond 1μm optical vortex pulses. **Authors**:Ami Shiraishi/Chiba University KEIGO MASUDA/Chiba University Keisaku Yamane/Hokkaido University Kohei Toyoda/Chiba University Katsuhiko Miyamoto/Chiba University Takashige Omatsu/Chiba University	Paper
15:45 - 16:00	**(Withdrawn) Plasmonic Anderson localization in engineered disorder (STh3H.8)** **Presenter**: Ruwen Peng, *Nanjing University* Expand for Abstract / Authors We experimentally demonstrate plasmonic Anderson localization in metallic nanogratings with short-range correlated disorder, which achieves various applications, such as in random nanolasing, solar energy, and strong light-matter interactions, etc. **Authors**:Ruwen Peng/Nanjing University Wen-Bo Shi/Nanjing University Ying-Ying Zhu/Nanjing University Mu Wang/Nanjing University	

Optomechanical Phenomena (FTh3C)

Presider: Thomas Purdy, *NIST*

14:00 - 14:30	**Light-induced Breaking of Time-reversal Symmetry in Nano-optomechanical Networks (FTh3C.1)** **Presenter**: Ewold Verhagen, *AMOLF* Expand for Abstract / Authors Subwavelength light confinement leads to strong radiation pressure interactions with multiple nanomechanical resonators. This allows optically-controlled phonon transport with broken time-reversal symmetry. We demonstrate the emergent quantum Hall physics in Hermitian and non-Hermitian nano-optomechanical lattices. **Authors**:Ewold Verhagen/AMOLF Invited	Paper

14:30 - 14:45	**Strong Confinement of Short-Wave Brillouin Phonons in Silicon Waveguide Periodic Lattices (FTh3C.2)** **Presenter**: Roberto Zurita, *University of Campinas* Expand for Abstract / Authors We propose a feasible silicon waveguide design that can strongly trap short-wavelength Brillouin phonons. Intramodal backward Brillouin gain is improved about 4.3 while radiation losses are suppressed. The structure could be implemented using SOI technology. **Authors**:Roberto Zurita/University of Campinas Thiago Mayer Alegre/University of Campinas Gustavo Wiederhecker/University of Campinas	Paper
14:45 - 15:00	**Non-Hermitian Optomechanics (FTh3C.3)** **Presenter**: André Primo, *University of Campinas* Expand for Abstract / Authors We propose and numerically validate a modified perturbation theory that captures non-Hermitian features present in dissipative optomechanical systems. Our theory predicts different behaviors than commonly used perturbation theories derived assuming purely Hermitian dynamics. **Authors**:André Primo/University of Campinas Natalia do Carmo Carvalho/University of Campinas Cauê Moreno Kersul de Castro Carvalho/University of Campinas Gustavo Wiederhecker/University of Campinas Newton C. Frateschi/University of Campinas Thiago Alegre/University of Campinas	Paper
15:00 - 15:15	**Optically-Induced Shock-Wave Interaction in Colloidal Nanosuspensions (FTh3C.4)** **Presenter**: Jeccy Sun, *Technion* Expand for Abstract / Authors We study the nonlinear interaction between two optically-induced density shock waves in colloidal nanosuspensions, and observe evidence for Mach reflection between the light-induced shock fronts. **Authors**:Jeccy Sun/Technion Anatoly Patsyk/Technion Mordechai Segev/Technion	Paper
15:15 - 15:30	**Acousto-Optics in Lithium Niobate-on-Sapphire (FTh3C.5)** **Presenter**: Christopher Sarabalis, *Stanford University* Expand for Abstract / Authors We demonstrate nanophotonic waveguides modulated by surface acoustic waves and use them to study the piezoelectric and photoelastic properties of thin-film lithium niobate-on-sapphire. **Authors**:Christopher Sarabalis/Stanford University Timothy McKenna/Stanford University Rishi Patel/Stanford University Amir Safavi-Naeini/Stanford University	Paper

15:30 - 16:00

Demonstration of High Quantum Cooperativities and Optomechanical Strong Coupling within a Bulk Crystalline Cavity Optomechanical System (FTh3C.6)
Presenter: Prashanta Kharel, *Yale University*
Expand for Abstract / Authors

[Paper]

Within a Brillouin-based bulk crystalline cavity optomechanical system, we demonstrate high quantum cooperativities as well as strong coupling between infrared light and high-frequency (12.7 GHz) bulk acoustic modes.

Authors:Prashanta Kharel/Yale University Yiwen Chu/Yale University Eric Kittlaus/Yale University Nils Otterstrom/Yale University Shai Gertler/Yale University David Mason/Yale University Peter Rakich/Yale University

Invited

Nonlinear Microresonators (FTh3J)

Presider: Marco Peccianti, *University of Sussex*

14:00 - 14:15

Persistence of extreme events in microresonators (FTh3J.1)
Presenter: Abhinav Vinod, *University of California Los Angeles*
Expand for Abstract / Authors

[Paper]

Here we report a novel method utilizing a four-wave-mixing time lens to observe and characterize rogue waves in microresonators. We also experimentally measure, for the first time, persistence of these extreme events.

Authors:Abhinav Vinod/University of California Los Angeles Wenting Wang/University of California Los Angeles Shu-Wei Huang/University of Colorado, Boulder Jinghui Yang/University of California Los Angeles Bowen Li/University of Colorado, Boulder Chee Wei Wong/University of California Los Angeles

14:15 - 14:30

Resonant dissipative Kerr soliton supercontinuum in the normal dispersion regime (FTh3J.2)
Presenter: Miles Anderson, *Ecole Polytechnique Federale de Lausanne*
Expand for Abstract / Authors

[Paper]

We demonstrate broadband resonant supercontinuum generation in a Si$_3$N$_4$ microresonator with normal dispersion. Rectangular bright pulses are shown to form directly using synchronous pulse-driving, generating a 2,600-line comb at 28 GHz repetition rate.

Authors:Miles Anderson/Ecole Polytechnique Federale de Lausanne Grigory Lihachev/Ecole Polytechnique Federale de Lausanne Junqiu Liu/Ecole Polytechnique Federale de Lausanne Tobias Herr/Swiss Center for Electronics and Microtechnology (CSEM) Tobias Kippenberg/Ecole Polytechnique Federale de Lausanne

14:30 - 14:45

On-Chip Synchronization of Kerr Frequency Combs (FTh3J.3)
Presenter: Jae Jang, *Columbia University*
Expand for Abstract / Authors

Paper

We demonstrate synchronization of two coupled soliton Kerr frequency combs on a single silicon nitride chip. We observe frequency-locking between the two solitons over a large range of comb spacing mismatches up to 2 MHz.

Authors:Jae Jang/Columbia University Xingchen Ji/Columbia University Chaitanya Joshi/Columbia University Yoshitomo Okawachi/Columbia University Michal Lipson/Columbia University Alexander Gaeta/Columbia University

14:45 - 15:00

Impact of Spatio-temporal Thermal Decoherence on Soliton Microcombs In Multimode Microresonators (FTh3J.4)
Presenter: Qifan Yang, *California Institute of Technology*
Expand for Abstract / Authors

Paper

The phase noise of the soliton repetition rate is experimentally characterized in silica microresonators. In conjunction with dispersive wave quieting of pump technical noise, spatio-temporal fluctuations of distinct transverse modes set a limit to performance.

Authors:Qifan Yang/California Institute of Technology Qing-Xin Ji/California Institute of Technology LUE WU/California Institute of Technology Boqiang Shen/California Institute of Technology Heming Wang/California Institute of Technology Zhiquan Yuan/California Institute of Technology Chengying Bao/California Institute of Technology maodong gao/California Institute of Technology Kerry Vahala/California Institute of Technology

15:00 - 15:15

Multistability-Enabled Complex Soliton Dynamics in a Bichromatically Driven Optical Microresonator (FTh3J.5)
Presenter: Wenle Weng, *Ecole Polytechnique Federale de Lausanne*
Expand for Abstract / Authors

Paper

We enter a bichromatically-pumped multistability regime in a microresonator to observe the emergence of complex dynamics of dissipative Kerr soliton interactions, including short-range soliton binding and periodic soliton collision.

Authors:Wenle Weng/Ecole Polytechnique Federale de Lausanne Romain Bouchand/Ecole Polytechnique Federale de Lausanne Tobias Kippenberg/Ecole Polytechnique Federale de Lausanne

15:15 - 15:30

(Withdrawn) On Directionality of Resonant Stimulated Raman Scattering (FTh3J.6)
Presenter: Anatoliy Savchenkov, *OEwaves Inc*
Expand for Abstract / Authors

Stimulated Raman scattering (SRS) with arbitrary directionality is observed in a high-Q whispering gallery mode resonator. We demonstrate purely backward SRS pumped with 493 nm light encompassing more than twenty modes covering 5 nm.

Authors:Anatoliy Savchenkov/OEwaves Inc Andrey Matsko/OEwaves Inc Skip Williams/OEwaves Inc

15:30 - 15:45

Optical Parametric Oscillation Using 4H-SiC-on-Insulator Nanophotonics (FTh3J.7)
Presenter: Melissa Guidry, *Stanford University*
Expand for Abstract / Authors

Paper

We experimentally demonstrate 22 mW-threshold on-chip optical parametric oscillation using 4H-SiC-on-insulator microring resonators. Low-loss, high-confinement resonators may exhibit threshold powers as low as 6 mW.

Authors:Melissa Guidry/Stanford University Kiyoul Yang/Stanford University Daniil Lukin/Stanford University Joshua Yang/Stanford University Jelena Vuckovic/Stanford University

15:45 - 16:00

Observation of internally-pumped parametric oscillation and initial stages of $\chi^{(2)}$ comb generation in a lithium niobate microresonator (FTh3J.8)
Presenter: Ian Hendry, *University of Auckland*
Expand for Abstract / Authors

Paper

We report on the experimental observation of internally-pumped optical parametric oscillation and initial stages of quadratic optical frequency comb generation in a lithium niobate microresonator driven with a continuous wave laser around 1050 nm.

Authors:Ian Hendry/University of Auckland Luke Trainor/University of Otago Yiqing Xu/University of Auckland Stephane Coen/University of Auckland Stuart Murdoch/University of Auckland Harald Schwefel/University of Otago Miro Erkintalo/University of Auckland

Phase Change Material Devices (STh3R)

Presider: Krishna Coimbatore Balram, *University of Bristol*

14:00 - 14:30	**Nanoscale Optoelectronic Memory with Nonvolatile Phase-Change Photonics (STh3R.1)** **Presenter**: Nathan Youngblood, *University of Oxford* Expand for Abstract / Authors Waveguide-integrated plasmonic nanogap electrodes bridged by GST form a phase-change memory cell addressable in both the optical and electrical domains. Our hybrid memory cell reduces the footprint and switching energy by 100× and 2× respectively over prior works. **Authors**:Nathan Youngblood/University of Oxford Nikolaos Farmakidis/University of Oxford Xuan Li/University of Oxford Harish Bhaskaran/University of Oxford	Paper
14:30 - 14:45	**VO_2 electro-optic memory and oscillator for neuromorphic computing (STh3R.2)** **Presenter**: Junho Jeong, *University of Toronto* Expand for Abstract / Authors We demonstrate optical memory and light-triggered electrical oscillations in a VO_2 electro-optic micro-wire device for potential applications in neuromorphic computing architectures. **Authors**:Junho Jeong/University of Toronto Youngho Jung/University of Toronto Zhongnan Qu/University of Toronto Bin Cui/Max Plank Institute of Microstructure Physics Ankita Khanda/University of Toronto Ankita Sharma/University of Toronto Stuart Parkin/Max Plank Institute of Microstructure Physics Joyce Poon/University of Toronto	Paper
14:45 - 15:00	**Broadband, Integrated, Micron-Scale, All-Optical Si_3N_4/VO_2 Modulators with pJ Switching Energy (STh3R.3)** **Presenter**: Herman Man Kai Wong, *University of Toronto* Expand for Abstract / Authors All-optical, non-resonant, in-plane Si_3N_4/VO_2 modulators offering 6.4 pJ switching energy, 1.68 dB/µm extinction ratio, and 4 µm length are demonstrated. This is obtained with broadband control (800-1000 nm) and signal (1500-1600 nm) wavelengths. **Authors**:Herman Man Kai Wong/University of Toronto Zhizhong Yan/University of Toronto Kent Hallman/Vanderbilt University Robert Marvel/Vanderbilt University Rohit Prasankumar/Los Alamos National Laboratory Richard Haglund/Vanderbilt University Amr Helmy/University of Toronto	Paper

15:00 - 15:15 **Non-volatile integrated photonic memory using GST phase change material on a fully etched Si_3N_4/SiO_2 waveguide (STh3R.4)**
Presenter: Christos Vagionas, *Aristotle University of Thessaloniki*
Expand for Abstract / Authors

We experimentally demonstrate an integrated photonic non-volatile memory using GST phase change material on a fully etched Si_3N_4/SiO_2-cladded waveguide for lower switching power and CMOS-compatibility, reporting interchangable switching from amorphous to crystalline state.

Authors:Athanasios Manolis/Aristotle University of Thessaloniki Joaquin Faneca/University of Southampton, Southampton, U.K. Thalia Domínguez Bucio/University of Southampton, Southampton, U.K. Anna Baldycheva/University of Exeter, EX4 4QL, UK Amalia Miliou/Aristotle University of Thessaloniki Frederic Gardes/University of Southampton, Southampton, U.K. Nikos Pleros/Aristotle University of Thessaloniki Christos Vagionas/Aristotle University of Thessaloniki

Paper

15:15 - 15:30 **Programmable metasurface using phase change material for waveguide mode conversion (STh3R.5)**
Presenter: Changming Wu, *University of Washington*
Expand for Abstract / Authors

We demonstrate a programmable TE_0-to-TE_1 mode converter utilizing phase change material $Ge_2Sb_2Te_5$ (GST) based phase gradient metasurface integrated on a silicon nitride waveguide. This compact mode converter features high energy efficiency and broadband performance.

Authors:Changming Wu/University of Washington Heshan Yu/University of Maryland Huan Li/University of Washington Ichiro Takeuchi/University of Maryland Mo Li/University of Washington

Paper

15:30 - 15:45 **Pixel Level Demonstration of Phase Change Material Based Spatial Light Modulation (STh3R.6)**
Presenter: Joshua Burrow, *University of Dayton*
Expand for Abstract / Authors

We present an advancement towards high speed (sub μs) phase change material based spatial light modulators by electrically addressing single pixels with high-speed optical monitoring at 1550nm light.

Authors:Joshua Burrow/University of Dayton Gary Sevison/University of Dayton mehdi asheghi/Stanford University Joshua Hendrickson/Air Force Research Laboratory Andrew Sarangan/University of Dayton kenneth goodson/Stanford University Imad Agha/University of Dayton

Paper

15:45 - 16:00 **Spatial and Dynamical Multi-level Control over Thermal Emission (STh3R.7)**
Presenter: Ziquan Xu, *Zhejiang University*
Expand for Abstract / Authors

Paper

We demonstrate a thermal emitter with spatial and dynamic tunability by using phase-transition material vanadium dioxide. Emissivity varies from 0.19 to 0.91 during the insulator-to-metal transition. Multi-level spatial control of thermal emission is also demonstrated.

Authors:Ziquan Xu/Zhejiang University Qiang Li/Zhejiang University Kaikai Du/Zhejiang University Shiwei Long/Shanghai institute of Ceramics, Chinese Academy of Sciences Yang Yang/Shanghai institute of Ceramics, Chinese Academy of Sciences Xun Cao/Shanghai institute of Ceramics, Chinese Academy of Sciences Hao Luo/Zhejiang University Huanzheng Zhu/Zhejiang University Pintu Ghosh/Zhejiang University Weidong Shen/Zhejiang University Min Qiu/Westlake University

Tunable and Reconfigurable Metasurfaces (FTh3Q)

Presider: Milan Palei, *University of Notre Dame*

14:00 - 14:15 **Dynamically Tunable Amplitude and Phase Modulation Using Vanadium Dioxide Huygens Metasurfaces (FTh3Q.1)**
Presenter: Isaac Oguntoye, *Tulane University*
Expand for Abstract / Authors

Paper

We design and fabricate continuously tunable vanadium dioxide Huygens metasurfaces for optical modulation in an all-in-one device. Simulation results show near π continuous phase modulation and ~20 dB amplitude modulation at near-infrared wavelengths. Experimental verification is in progress

Authors:Isaac Oguntoye/Tulane University Adam Ollanik/University of Colorado Boulder Siddharth Padmanabha/Tulane University George Hartfield/Tulane University Brittany Simone/Tulane University Matthew Escarra/Tulane University

14:15 - 14:30 **Ultrafast Mid-Infrared Optical Modulator Based on Optically Controlled Graphene-Integrated Metasurface (FTh3Q.2)**
Presenter: Ali Basiri, *ASU*
Expand for Abstract / Authors

Paper

We report ultrafast mid-infrared optical modulation on a subwavelength ($<\lambda_0/10$) graphene-integrated plasmonic metasurface using pump-probe spectroscopy.

Authors:Ali Basiri/ASU Md Zubair Ebne Rafique/ASU Jing Bai/ASU Jiawei Zuo/ASU Shinhyuk Choi/ASU Yu Yao/ASU

14:30 - 14:45

Reconfigurable Photonic Structures for Solving Linear Differential Equations (FTh3Q.3)
Presenter: Dimitrios Tzarouchis, *University of Pennsylvania*
Expand for Abstract / Authors

Paper

We theoretically explore a reconfigurable, Mach—Zehnder interferometer–based photonic network capable of solving linear equations by implementing arbitrary matrix operators. The solutions of various differential equations are numerically demonstrated and discussed.

Authors:Dimitrios Tzarouchis/University of Pennsylvania Nader Engheta/University of Pennsylvania

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14:45 - 15:00

Tunable Mie-resonant dielectric metasurfaces based on VO_2 phase-change materials (FTh3Q.4)
Presenter: Sergey Kruk, *Australian National University*
Expand for Abstract / Authors

Paper

We demonstrate Mie-resonant silicon metasurfaces tunable via the insulator-to-metal transition of a deposited VO_2 layer. We observe two orders of magnitude modulation depth of the metasurface reflection with reversible properties and a hysteresis-like behavior.

Authors:Sergey Kruk/Australian National University Jimmy John/Institut des Nanotechnologies de Lyon Zhen Zhang/Purdue University Hai Nguyen/Institut des Nanotechnologies de Lyon Lotfi Berguiga/Institut des Nanotechnologies de Lyon Pedro Romeo/Institut des Nanotechnologies de Lyon Régis Orobtchouk/Institut des Nanotechnologies de Lyon Shriram Ramanathan/Institut des Nanotechnologies de Lyon Yuri Kivshar/Australian National University Sébastien Cueff/Institut des Nanotechnologies de Lyon

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15:00 - 15:15

Programmable metasurfaces employing phase-change-dielectric materials architecture (FTh3Q.5)
Presenter: Sajjad AbdollahRamezani, *Georgia Institute of Technology*
Expand for Abstract / Authors

Paper

We experimentally demonstrate reconfigurable metasruface capable of high modulating of scattered light thanks to the interplay of electric and magnetic Mie resonance modes, due to the induced intermediate states of GST necessary for beaming applications.

Authors:Sajjad AbdollahRamezani/Georgia Institute of Technology Omid Hemmatyar/Georgia Institute of Technology Hossein Taghinejad/Georgia Institute of Technology Kirsten Masselink/Georgia Institute of Technology Ali Adibi/Georgia Institute of Technology

15:15 - 15:30

Photo-ionic reconfigurable chalcogenide metasurfaces (FTh3Q.6)
Presenter: Behrad Gholipour, *University of Alberta*
Expand for Abstract / Authors

Paper

We report the first metasurfaces nanostructured from metal doped chalcogenide semiconductors that can be reversibly reconfigured through non-volatile photo-induced long range movement of their metal ions (photo-ionic behavior), without the need for a phase transition.

Authors:Liam McRae/University of Alberta Yunhui Xie/University of Southampton Behrad Gholipour/University of Alberta

15:30 - 15:45

Ultrafast Diffraction Switching Using GaAs Metasurfaces (FTh3Q.7)
Presenter: Polina Vabishchevich, *Sandia National Laboratories Albuquerque*
Expand for Abstract / Authors

Paper

We design a resonant metasurface that uses Mie quadrupole modes to suppress the -1 diffraction order. We show that this suppression can be spectrally tuned using optical pumping on a picosecond timescale.

Authors:Polina Vabishchevich/Sandia National Laboratories Albuquerque Aleksandr Vaskin/Institute of Applied Physics, Abbe Center of Photonics, Friedrich Schiller University Jena Nicholas Karl/Sandia National Laboratories Albuquerque John Reno/Sandia National Laboratories Albuquerque Michael Sinclair/Sandia National Laboratories Albuquerque Isabelle Staude/Institute of Applied Physics, Abbe Center of Photonics, Friedrich Schiller University Jena Igal Brener/Sandia National Laboratories Albuquerque

15:45 - 16:00

Thermo-optic Dielectric Metasurfaces for Polarization State Synthesizers and Active Lensing (FTh3Q.8)
Presenter: Melissa Bosch, *Cornell University*
Expand for Abstract / Authors

Paper

We exploit low-loss dielectric metasurfaces with thermally tunable resonances to demonstrate active polarization control and lensing. These metasurfaces represent a novel class of active ultrathin optical devices poised to find use in free-space and integrated photonics.

Authors:Melissa Bosch/Cornell University Maxim Shcherbakov/Cornell University Zhiyuan Fan/Cornell University Steven H. Huang/Cornell University Gennady Shvets/Cornell University

Nanoparticle Applications and Imaging Technology (STh3M)
Presider: Jessica Houston, *New Mexico State University*

14:00 - 14:30 **Manipulate Protein Activity and the Blood-Brain Barrier using Light and Nanoparticles (STh3M.1)**
Presenter: Zhenpeng Qin, *The University of Texas at Dallas*
Expand for Abstract / Authors

_ Paper

Here I will present a new method called "molecular hyperthermia" for photo-inactivation of protein activity and a new approach to optically open the blood-brain barrier by targeting and stimulating blood vessel, using light and nanoparticles.

Authors:Zhenpeng Qin/The University of Texas at Dallas

Invited

14:30 - 14:45 **Smart nanophotonics silicon spectrometer array for hyperspectral imaging (STh3M.2)**
Presenter: Ahasan Ahamed, *University of California, Davis*
Expand for Abstract / Authors

_ Paper

We propose a novel spectral imaging technique with silicon photodiodes arrays having unique responsivity across a wide spectrum. Our method can detect random spectra with less than 2% standard deviation. © 2020 The Author(s).

Authors:Ahasan Ahamed/University of California, Davis soroush ghandiparsi/University of California, Davis Cesar Bartolo-Perez/University of California, Davis Ahmed Mayet/University of California, Davis Hilal Cansizoglu/University of California, Davis Ekaterina Devine/W&WSens Devices, Inc. Aly Elrefaie/W&WSens Devices, Inc. Nibir Dhar/US Army Night Vision and Electronic Sensors Directorate Shih-Yuan Wang/W&WSens Devices, Inc. Weijian Yang/University of California, Davis Saif Islam/University of California, Davis

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14:45 - 15:00 **Three-dimensional Imaging with a Single Layer of Random Microlens Array (STh3M.3)**
Presenter: Feng Tian, *University of California, Davis*
Expand for Abstract / Authors

_ Paper

We propose a compact, three-dimensional and large-field-of-view imaging system using a single layer of random microlens array. Comparing to other mask-based imaging systems, our approach has a higher image reconstruction speed and increased signal-to-background ratio.

Authors:Feng Tian/University of California, Davis Junjie Hu/University of California, Davis Weijian Yang/University of California, Davis

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15:00 - 15:15	**Interfacial Lasing Microsensors Driven by Cavity Resonant Energy Transfer (STh3M.4)** **Presenter**: Zhiyi Yuan, *Nanyang Technological University* Expand for Abstract / Authors We have proposed a novel concept to achieve active lasing-encoded biosensors by taking advantage of light-harvesting effect at the cavity interface, where interfacial molecular lasers based on cavity resonant energy transfer was demonstrated. **Authors**:Zhiyi Yuan/Nanyang Technological University Peng Guan/Nanyang Technological University Ziyihui Wang/Nanyang Technological University YU-CHENG CHEN/Nanyang Technological University	Paper
15:15 - 15:30	**Alkaline-earth Rare-earth Upconverting Nanoparticles as Bio-compatible Mechanical Force Sensors (STh3M.5)** **Presenter**: Claire McLellan, *Stanford University* Expand for Abstract / Authors We measure the color ratio-metric response of alkaline-earth rare-earth upconverting nanoparticles with a diamond anvil cell. We find ensembles of SrLuF particles detect 32.8 MPa in pressure change corresponding to 24 nN of force. **Authors**:Claire McLellan/Stanford University Chris Siefe/Stanford University Stefan Fischer/Stanford University Jason Casar/Stanford University Dayne Swearer/Stanford University Miriam Goodman/Stanford University Jennifer Dionne/Stanford University	Paper
15:30 - 15:45	**A Core-Shell-Shell Nanoparticle Architecture Towards Bright Upconversion and Improved Förster Resonant Energy Transfer (STh3M.6)** **Presenter**: Christopher Siefe, *Stanford University* Expand for Abstract / Authors We synthesized and characterized a core-shell-shell upconverting nanoparticle architecture. Compared to the traditional core-shell architecture, we demonstrated 2-fold brighter single particle emission and 8-fold improved emission enhancement via Förster resonant energy transfer to a dye. **Authors**:Christopher Siefe/Stanford University Randy Mehlenbacher/Stanford University Chunte Sam Peng/Stanford University Yunxiang Zhang/Stanford University Stefan Fischer/Stanford University Alice Lay/Stanford University Claire McLellan/Stanford University A. Paul Alivisatos/University of California, Berkeley Steven Chu/Stanford University Jennifer Dionne/Stanford University	Paper

15:45 - 16:00 **Perfluoropentane-in-Water Biphasic System for Low-Power Photothermal Bubble Generation and Sensitive Immunoassay (STh3M.7)**
Presenter: Youngsun Kim, *University of Texas at Austin*
Expand for Abstract / Authors

Paper

A perfluoropentane-in-water system, capable of photothremally generating microbubbles at low power, was developed. This system enabled the bulk-to-surface concentration of protein for immunoassay with enhanced sensitivity and minimal loss in protein activity.

Authors:Youngsun Kim/University of Texas at Austin Hongru Ding/University of Texas at Austin Pavana Siddhartha Kollipara/University of Texas at Austin Yuebing Zheng/University of Texas at Austin

Ultrafast Spectroscopy of Topological Matter (FTh3B)

Presider: Liuyan Zhao, *University of Michigan*

14:00 - 14:15 **Ultrafast carrier dynamics in the candidate magneticWeyl semimetal $EuCd_2As_2$ (FTh3B.1)**
Presenter: Kenneth O'Neal, *Los Alamos National Laboratory*
Expand for Abstract / Authors

Paper

Ultrafast optical pulses were used to search for light-induced topological changes in the candidate magnetic Weyl semimetal EuCd2As2, revealing signatures of coupling between spin and charge degrees of freedom which holds promise for device applications.

Authors:Kenneth O'Neal/Los Alamos National Laboratory La Moyne Mix/Los Alamos National Laboratory Min-Cheol Lee/Los Alamos National Laboratory Brinda Kuthanazhi/Iowa State University Na Jo/Iowa State University Sergey Bud'ko/Iowa State University Paul Canfield/Iowa State University Rohit Prasankumar/Los Alamos National Laboratory Dmitry A. Yarotski/Los Alamos National Laboratory

14:15 - 14:30

Ultrafast Acoustic Phonon Dynamics in the Weyl Semimetal TaAs Probed by Time-Resolved X-ray Diffraction (FTh3B.2)

Presenter: Min-Cheol Lee, *LOS ALAMOS NATIONAL LABORATORY*

Expand for Abstract / Authors

Paper

We utilized ultrafast X-ray diffraction to investigate optically induced strain waves in the Weyl semimetal TaAs, revealing real-time structural oscillations originating from quasi-longitudinal and quasi-shear acoustic phonon modes.

Authors:Min-Cheol Lee/LOS ALAMOS NATIONAL LABORATORY Nicholas Sirica/LOS ALAMOS NATIONAL LABORATORY S. W. Teitelbaum/SLAC National Accelerator Laboratory Alexei Maznev/Massachusetts Institute of Technology G. A. de la Pena Munoz/SLAC National Accelerator Laboratory Viktor Krapivin/SLAC National Accelerator Laboratory Yijing Huang/SLAC National Accelerator Laboratory Jiaojian Shi/Massachusetts Institute of Technology Roxanne Tutchton/LOS ALAMOS NATIONAL LABORATORY Jian-Xin Zhu/LOS ALAMOS NATIONAL LABORATORY L. X. Zhao/Chinese Academy of Sciences G. F. Chen/Chinese Academy of Sciences B. Xu/Chinese Academy of Sciences R. Yang/Chinese Academy of Sciences X. Q. Qiu/Chinese Academy of Sciences Dmitry A. Yarotski/LOS ALAMOS NATIONAL LABORATORY Keith Nelson/Massachusetts Institute of Technology Mariano Trigo/SLAC National Accelerator Laboratory David A. Reis/SLAC National Accelerator Laboratory Rohit Prasankumar/LOS ALAMOS NATIONAL LABORATORY

14:30 - 15:00

THz Emission Spectroscopy of Surface Photogalvanic Effects in a Chiral Weyl Semimetal (FTh3B.3)

Presenter: Darius Torchinsky, *Temple University Department of Physics*

Expand for Abstract / Authors

Paper

We present photogalvanic effect data collected via terahertz emission spectroscopy on a chiral Weyl semimetal as a function of polarization and incident wavelength and discuss how our data reveal signatures of topologically relevant surface states.

Authors:Darius Torchinsky/Temple University Department of Physics Baozhu Lu/Temple University Department of Physics Dylan Rees/University of California, Berkeley Kaustuv Manna/Max Planck Institute for Chemical Physics of Solids Daniel Parker/University of California, Berkeley Horst Borrmann/Max Planck Institute for Chemical Physics of Solids Joel Moore/University of California, Berkeley Claudia Felser/Max Planck Institute for Chemical Physics of Solids Joseph Orenstein/University of California, Berkeley

Invited

15:00 - 15:15	**Room-Temperature Large Terahertz Anomalous Hall Effect in Weyl Antiferromagnet Mn_3Sn Thin Film (FTh3B.4)** **Presenter**: Takuya Matsuda, *The University of Tokyo* Expand for Abstract / Authors We perform polarization-resolved spectroscopy to study terahertz anomalous Hall effect (AHE) in Weyl antiferromagnet Mn_3Sn thin film. Large AHE comparable to ferromagnets is observed at room temperature, paving a new avenue for high-speed spintronics application. **Authors**:Takuya Matsuda/The University of Tokyo Natsuki Kanda/The University of Tokyo Tomoya Higo/The University of Tokyo N. Armitage/The Johns Hopkins University Satoru Nakatsuji/The University of Tokyo Ryusuke Matsunaga/The University of Tokyo	Paper
15:15 - 15:30	**(Withdrawn) Efficient Terahertz Harmonic Generation and Sub-cycle Spectroscopy in the Dirac Semimetal Cd_3As_2 (FTh3B.5)** **Presenter**: Natsuki Kanda, *The Univ. Tokyo* Expand for Abstract / Authors We observed efficient terahertz (THz) harmonic generation in a three-dimensional Dirac semimetal Cd_3As_2 at room temperature. THz-pump-THz-probe spectroscopy and theoretical calculation revealed that this nonlinearity originates from intraband current of coherently accelerated Dirac electrons. **Authors**:Natsuki Kanda/The Univ. Tokyo Bing Chen/The Johns Hopkins University Tatsuhiko Ikeda/The Univ. Tokyo Takuya Matsuda/The Univ. Tokyo Peiyu Xia/The Univ. Tokyo Timo Schumann/University of California, Santa Barbara Susanne Stemmer/University of California, Santa Barbara Jiro Itatani/The Univ. Tokyo N. Armitage/The Johns Hopkins University Ryusuke Matsunaga/The Univ. Tokyo	
15:30 - 15:45	**Control and Optimization of High Harmonic Generation in 3D Dirac Semimetals (FTh3B.6)** **Presenter**: Jeremy Lim, *Singapore University of Technology and Design* Expand for Abstract / Authors We show that 3D Dirac semimetals (DSMs) can function as efficient emitters of high harmonic radiation and identify operation regimes for controlled and suppressed high-order light emission. **Authors**:Jeremy Lim/Singapore University of Technology and Design Yee Sin Ang/Singapore University of Technology and Design Javier de Abajo/ICFO Institut de Ciencies Fotoniques, The Barcelona Institute of Science and Technology Ido Kaminer/Technion Ricky Ang/Singapore University of Technology and Design Liang Jie Wong/Nanyang Technological University	Paper

15:45 - 16:00 **Trion Valley Polarization Dynamics in Electrically-gated Monolayer Molybdenum Ditelluride (FTh3B.7)** Paper

Presenter: Qiyao Zhang, *Department of Electronic Engineering, Tsinghua University*

Expand for Abstract / Authors

We investigated spin-valley dynamics of excitons and trions in electrically-gated monolayer MoTe2 using helicity-resolved quasi-resonant pump-probe spectroscopy. Trion valley polarization was observed for the first time in MoTe2, with initial polarization degree up to 60%.

Authors:Qiyao Zhang/Department of Electronic Engineering, Tsinghua University Hao Sun/Department of Electronic Engineering, Tsinghua University Jiacheng Tang/Department of Electronic Engineering, Tsinghua University Zhen Wang/Department of Electronic Engineering, Tsinghua University Xingcan Dai/Department of Electronic Engineering, Tsinghua University Cun-Zheng Ning/Department of Electronic Engineering, Tsinghua University

Clocks, Combs and Enabling Technologies (STh3G)

Presider: Susan Schima, *NIST*

14:00 - 15:00 **Twenty years of optical frequency combs: Science, technology and applications (STh3G.1)** Paper

Presenter: Scott Diddams, *National Inst. of Standards & Technology*

Expand for Abstract / Authors

Optical frequency combs provide the means to seamlessly unite the electromagnetic spectrum, from the RF through the XUV. This tutorial with provide an overview of frequency comb science, technology and applications.
Scott A. Diddams is a Fellow of the National Institute of Standards and Technology (NIST) and an Adjoint Professor at the University of Colorado (CU). His research interests include ultrafast nonlinear optics, as well as the development of laser frequency combs for optical clocks, metrology, spectroscopy and astronomy.

Authors:Scott Diddams/National Inst. of Standards & Technology

Tutorial

15:00 - 15:15

Sr optical lattice clock assisted by optical frequency combs for contribution to International Atomic Time (STh3G.2)

Presenter: Yusuke Hisai, *Yokohama National University*

Expand for Abstract / Authors

Paper

We evaluate the uncertainty of our Sr optical lattice clock at the 10^{-17} level, through robust clock operation with assistance of optical frequency combs. This clock will be operated for contribution to the International Atomic Time.

Authors:Yusuke Hisai/Yokohama National University Daisuke Akamatsu/National Institute of Advanced Industrial Science and Technology Takumi Kobayashi/National Institute of Advanced Industrial Science and Technology Kazumoto Hosaka/National Institute of Advanced Industrial Science and Technology Hajime Inaba/National Institute of Advanced Industrial Science and Technology Feng-Lei Hong/Yokohama National University Masami Yasuda/National Institute of Advanced Industrial Science and Technology

15:15 - 15:30

10^{-18} Optical Atomic Clock Comparisons within the Boulder Atomic Clock Network (STh3G.3)

Presenter: Nicholas Nardelli, *National Institute of Standards and Technology*

Expand for Abstract / Authors

Paper

We demonstrate optical frequency comparison of the ^{171}Yb, ^{27}Al^{+} and ^{87}Sr atomic clocks with measurement uncertainties below 1 part in 10^{17}, and discuss how phase-coherent and synchronous clock comparisons can be used to improve measurement stability.

Authors:Nicholas Nardelli/National Institute of Standards and Technology Kyle Beloy/National Institute of Standards and Technology Martha Bodine/National Institute of Standards and Technology Tobias Bothwell/University of Colorado Boulder Samuel Brewer/National Institute of Standards and Technology Sarah Bromley/University of Colorado Boulder Jwo-Sy Chen/National Institute of Standards and Technology Ethan Clements/National Institute of Standards and Technology Jean-Daniel Deschenes/Octosig Consulting Scott Diddams/National Institute of Standards and Technology Robert Fasano/National Institute of Standards and Technology Tara Fortier/National Institute of Standards and Technology Youssef Hassan/National Institute of Standards and Technology David Hume/National Institute of Standards and Technology Dhruv Kedar/University of Colorado Boulder Colin Kennedy/JILA Isaac Khader/National Institute of Standards and Technology May Kim/National Institute of Standards and Technology Amanda Koepke/National Institute of Standards and Technology David Leibrandt/National Institute of Standards and Technology Holly Leopardi/National Institute of Standards and Technology Andrew Ludlow/National Institute of Standards and Technology Will McGrew/National Institute of Standards and Technology William Milner/University of Colorado Boulder Nathan Newbury/National Institute of Standards and Technology Daniele Nicolodi/National Institute of Standards and Technology Eric Oelker/University of Colorado Boulder Stefan Schaffer/National Institute of Standards and Technology Tom Parker/National Institute of Standards and Technology John Robinson/University of Colorado Boulder Jeff Sherman/National Institute of Standards and Technology Laura Sinclair/National Institute of Standards and Technology Lindsay Sonderhouse/University of Colorado Boulder William Swann/National Institute of Standards and Technology David Wineland/National Institute of Standards and Technology Jian Yao/National Institute of Standards and Technology Jun Ye/National Institute of Standards and Technology Xiaogang Zhang/National Institute of Standards and Technology

15:30 - 15:45

Micro-Integrated Laser Modules for Optical Clocks (STh3G.4)
Presenter: Bassem Arar, *Ferdinand-Braun-Institut*
Expand for Abstract / Authors

Paper

A micro-integrated laser module has been developed for the deployment in a compact, transportable $^{171}Yb^{+}$ optical clock. With this laser module, the clock laser system demonstrated a Modified Allan Deviation of less than 1.5×10^{-15} for 1 s ≤ 100 s when compared against a superior reference laser.

Authors:Bassem Arar/Ferdinand-Braun-Institut Christian Kürbis/Ferdinand-Braun-Institut Robert Smol/Ferdinand-Braun-Institut Ahmad Bawamia/Ferdinand-Braun-Institut Andreas Wicht/Ferdinand-Braun-Institut Jialiang Yu/Physikalisch-Technische Bundesanstalt Matthäus Halder/Menlo Systems GmbH Maurice Lessing/Menlo Systems GmbH Ronald Holzwarth/Menlo Systems GmbH Moustafa Abdel Hafiz/Physikalisch-Technische Bundesanstalt Nils Huntemann/Physikalisch-Technische Bundesanstalt Burghard Lipphardt/Physikalisch-Technische Bundesanstalt Thomas Legero/Physikalisch-Technische Bundesanstalt Uwe Sterr/Physikalisch-Technische Bundesanstalt

15:45 - 16:00

Demonstration of sub-micron hot vapor cells for quantum technology applications (STh3G.5)
Presenter: Eliran Talker, *Hebrew University of Jerusalem*
Expand for Abstract / Authors

Paper

We report on the fabrication of a glass vapor cell with a scalable thickness varying from 50 nm to 30 micron. It is used to demonstrate atomic based laser stabilization at 780 nm wavelength.

Authors:Eliran Talker/Hebrew University of Jerusalem Roy Zektzer/Hebrew University of Jerusalem yefim barash/Hebrew University of Jerusalem Noa Mazurski/Hebrew University of Jerusalem Uriel Levy/Hebrew University of Jerusalem

Fiber Laser Dynamics (STh3P)

Presider: William Renninger, *University of Rochester*

14:00 - 14:15	**Stable Single-Longitudinal-Mode Dual-Ring Fiber Laser with Ultra-Narrow Linewidth (STh3P.1)** **Presenter**: Zhengkang Wang, *Beijing Univ. of Post. and Telecom* Expand for Abstract / Authors A dual-ring-architecture-based single-longitudinal-mode fiber laser with an ultra-narrow linewidth of 610 Hz is proposed and experimental demonstrated. We achieved a lasing wavelength stabilization of less than 0.004 nm. **Authors**:Zhengkang Wang/Beijing Univ. of Post. and Telecom Jianming Shang/Beijing Univ. of Post. and Telecom Kuanlin Mu/Beijing Univ. of Post. and Telecom Yaojun Qiao/Beijing Univ. of Post. and Telecom Song Yu/Beijing Univ. of Post. and Telecom Tianwei Jiang/Beijing Univ. of Post. and Telecom	Paper
14:15 - 14:30	**Dynamic Mode-Switchable All-Fiber Brillouin/Erbium Laser (STh3P.2)** **Presenter**: Xu Tao, *Shanghai University* Expand for Abstract / Authors We experimentally demonstrate a scheme of dynamic switching between LP_{01} and LP_{11} modes in a Brillouin/Erbium fiber laser based on acoustically-induced fiber grating and realize tunable-wavelength Brillouin laser output. **Authors**:Xu Tao/Shanghai University	Paper
14:30 - 14:45	**Phase-locking of multiple acoustic resonances by intense optomechanical interactions in a soliton fiber laser (STh3P.3)** **Presenter**: Dung-Han Yeh, *MPI Science of Light* Expand for Abstract / Authors In a soliton fiber laser incorporating three different PCF sections and optomechanically mode-locked at around 1.94 GHz, the three acoustic core resonances are strongly driven, coupled and phase-locked by the sequence of laser pulses. **Authors**:Dung-Han Yeh/MPI Science of Light Wenbin He/MPI Science of Light Meng Pang/MPI Science of Light XIn Jiang/MPI Science of Light Philip Russell/MPI Science of Light	Paper

14:45 - 15:00 **Real-time Noise Measurement in Supercontinuum Generation in PM and Non-PM ANDi Tellurite Fibers (STh3P.4)**
Presenter: Tanvi Karpate, *Institute of Electronic Materials Technology*
Expand for Abstract / Authors

Paper

We compare real-time noise measured using dispersive Fourier transform spectroscopy in supercontinuum generated in PM and non-PM all-normal dispersion tellurite fibers and show that PM fiber provides better stability and higher coherence.

Authors:Shreesha Rao D S/Technical University of Denmark Tanvi Karpate/Institute of Electronic Materials Technology Amar Ghosh/Institut FEMTO-ST, CNRS Mariusz Klimczak/Institute of Electronic Materials Technology Dariusz Pysz/Institute of Electronic Materials Technology Ryszard Buczynski/Institute of Electronic Materials Technology Cyril Billet/Institut FEMTO-ST, CNRS Ole Bang/Technical University of Denmark John Dudley/Institut FEMTO-ST, CNRS Thibaut Sylvestre/Institut FEMTO-ST, CNRS

15:00 - 15:15 **Long-range synchronization of soliton molecules in fiber ring laser cavity (STh3P.5)**
Presenter: Pierre Colman, *Universite Bourgogne Franche Comte*
Expand for Abstract / Authors

Paper

We demonstrate the synchronization of two soliton molecules separated by several nanoseconds in a laser fiber ring cavity. This synchronization is accompanied by inter-molecules oscillations that are locked to the internal motion of the molecules.

Authors:Said Hamdi/Universite Bourgogne Franche Comte Aurelien coillet/Universite Bourgogne Franche Comte Benoit Cluzel/Universite Bourgogne Franche Comte Philippe Grelu/Universite Bourgogne Franche Comte Pierre Colman/Universite Bourgogne Franche Comte

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15:15 - 15:30 **Dual-comb characterization of bound soliton states in a single-cavity dual-comb laser (STh3P.6)**
Presenter: Lukasz Sterczewski, *Wroclaw University of Science and Technology*
Expand for Abstract / Authors

Paper

We present a cross-correlation characterization of bound soliton states emerging in a polarization-multiplexed single-cavity dual-comb laser. High temporal and spectral resolution measurements over long optical delays are obtained through multi-heterodyne beating of the laser output.

Authors:Lukasz Sterczewski/Wroclaw University of Science and Technology Aleksandra Przewloka/Polish Academy of Sciences Wawrzyniec Kaszub/Institute of Electronic Materials Technology Jaroslaw Sotor/Wroclaw University of Science and Technology

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15:30 - 15:45

Transition dynamics of soliton molecules in passively mode-locked fiber lasers (STh3P.7)

Presenter: Yiyang Luo, *Nanyang Technological University*

Expand for Abstract / Authors

Paper

Real-time spectroscopy unveils the build-up and transient dynamics of ultrashort pulses. Here, we experimentally characterize the evolution scenario of single soliton and bi-/tri-soliton molecules, further highlighting the underlying transition dynamics.

Authors:Yiyang Luo/Nanyang Technological University Ran Xia/Huazhong University of Science and Technology Perry Ping Shum/Nanyang Technological University Yusong liu/Huazhong University of Science and Technology Wenjun Ni/Nanyang Technological University Qizhen Sun/Huazhong University of Science and Technology Luming Zhao/Huazhong University of Science and Technology Xiahui Tang/Huazhong University of Science and Technology

Light Sources for Biomedical Applications (ATh3K)

Presider: Tilman Schmoll, *Carl Zeiss Meditec Inc*

14:00 - 14:15

Biologically Wavelength-Tunable Droplet Laser for Molecular Barcoding Analysis (ATh3K.1)

Presenter: YU-CHENG CHEN, *Nanyang Technological University*

Expand for Abstract / Authors

Paper

The first demonstration of molecular barcoding analysis based on wavelength-tunable lasers was conceptualized and demonstrated. Our work shows great impact in both biomedical sensing and fundamental research in biology, paving a new road for biomedical analysis.

Authors:Zhiyi Yuan/Nanyang Technological University Xuerui Gong/Nanyang Technological University Xin Cheng/Nanyang Technological University Shilun Feng/Nanyang Technological University YU-CHENG CHEN/Nanyang Technological University

14:15 - 14:30

Multiharmonic Imaging of Human Peripheral Nerves using a 1300 nm Ultrafast Fiber Laser (ATh3K.2)

Presenter: Lars Rishoj, *Boston University*

Expand for Abstract / Authors

Paper

We demonstrate multicolor multiphoton imaging of label-free human peripheral nerve samples. This is realized using a high peak power (1 MW) custom built fiber source that delivers ultrashort pulses (74-fs) at 1300 nm.

Authors:Lars Rishoj/Boston University Ivan Coto Hernandez/Boston University Nate Jowett/Mass Eye and Ear and Harvard Medical School Siddharth Ramachandran/Boston University

14:30 - 14:45	**Instantaneous Generation of Static Light-sheets Using 1D Coherent Beam (ATh3K.3)** **Presenter**: Jialei Tang, *University of Central Florida* Expand for Abstract / Authors We propose a method of creating static light-sheets by 1D spatially coherent beams. We theoretically and experimentally reveal the equivalence between our method and scanned light-sheet, and investigate its characteristics in detail. **Authors**:Jialei Tang/University of Central Florida Kyu Young Han/University of Central Florida	Paper
14:45 - 15:00	**Speckle Based Sensing using Incoherent Thermal Light Source: Passive Speckles (ATh3K.4)** **Presenter**: Zeev Zalevsky, *Bar-Ilan University* Expand for Abstract / Authors The angle of a rotating diffuser was evaluated by tracking the speckle pattern produced from an incoherent thermal radiation source demonstrating the use of an incoherent source for speckle-based sensing. **Authors**:Hadar Genish/ContinUse biometrics Lauren Wolbromsky/ContinUse biometrics Matan Benyamin/ContinUse biometrics Ran Califa/ContinUse biometrics Zeev Zalevsky/Bar-Ilan University	Paper
15:00 - 15:15	**GaN µLED Arrays in Parylene C Substrate for Flexible Implantable Optogenetics: Fabrication and Modeling (ATh3K.5)** **Presenter**: Jay Reddy, *Carnegie Mellon University* Expand for Abstract / Authors Optoelectronic neural probes with (22 µm × 22 µm) Gallium-Nitride µLED arrays (up to 32 devices) on a Parylene C substrate are fabricated and analyzed using thermal and optical modeling to identify thermally-safe stimulation parameters. **Authors**:Jay Reddy/Carnegie Mellon University Ibrahim Kimukin/Carnegie Mellon University Luke Stewart/Carnegie Mellon University Zabir Ahmed/Carnegie Mellon University Alison Barth/Carnegie Mellon University Elias Towe/Carnegie Mellon University Maysamreza Chamanzar/Carnegie Mellon University	Paper

15:15 - 15:45 **Femtosecond laser written photonics for high speed telecommunications. (ATu3K.1)**
Presenter: Michael Withford, *Macquarie University*
Expand for Abstract / Authors

Paper

To meet future data traffic demand, the telecommunications industry is developing optical fibre network architectures that exploit space division multiplexing (SDM). Femtosecond laser written photonics is a promising platform for SDM end-of-fibre components.

Authors:Michael Withford/Macquarie University Simon Gross/Macquarie University Andrew Ross-Adams/Macquarie University Toney Fernandez/Macquarie University nicolas riesen/University of South Australia

Invited

15:45 - 16:00 **(Withdrawn) Surface Plasma Resonance Biosensing through High Coherence Laser Source (ATh3K.6)**
Presenter: Shih-Hsiang Hsu, *National Taiwan Univ of Science & Tech*
Expand for Abstract / Authors

The surface plasma resonance (SPR) phase sensitivity is proposed to utilize two Mach–Zehnder interferometers in parallel, a laser source to detect SPR effect and broadband source as a reference point, to gauge interferogram displacements.

Authors:Che-Hao You/National Taiwan Univ of Science & Tech Yuan-Chun Hsu/National Taiwan Univ of Science & Tech Ding-Siang Hong/National Taiwan Univ of Science & Tech Meng-Syuan Jian/National Taiwan Univ of Science & Tech Shih-Hsiang Hsu/National Taiwan Univ of Science & Tech

16:00 - 16:00 **(Withdrawn) Microfluidics Integrated VCSELs for Biosensing On-a-Chip (ATh3K.7)**
Presenter: Peinan NI, *Centre national de la recherche scientifique*
Expand for Abstract / Authors

Microfluidics integrated vertical cavity surface emitting lasers (VCSELs) are presented as a prototype of miniaturized high sensitivity chemical/biosensor on a chip. The advantage of such chips are demonstrated.

Authors:Qiuhua Wang/Beijing University of Technology Yiyang Xie/Beijing University of Technology Qiang Kan/Institute of Semiconductor Peinan NI/Centre national de la recherche scientifique Ho Wai Lee/baylor university Chen Xu/Beijing University of Technology Patrice Genevet/Centre national de la recherche scientifique

Mode-Locked lasers (STh3E)
Presider: Dan Wasserman, *University of Texas at Austin*

14:00 - 14:15 **Parametric Conversion in Compact Ring Diode Laser (STh3E.1)**
Presenter: Bilal Janjua, *University of Toronto*
Expand for Abstract / Authors

Paper

Single mode Bragg ring lasers, with SNR > 30 dB have been demonstrated. Efficient, self-pumped, broadband phase-matching of $\chi^{(2)}$ nonlinearity is observed, offering self-pumped parametric C-band conversion >40 nm with efficiency of 142% $W^{-1}cm^{-2}$.

Authors:Bilal Janjua/University of Toronto Meng Iu/University of Toronto Paul Charles/University of Toronto Eric Chen/University of Toronto Amr Helmy/University of Toronto

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14:15 - 14:30 **Demystifying semiconductor self-mode-locking without saturable absorber (STh3E.2)**
Presenter: Gunter Steinmeyer, *Max Born Institute*
Expand for Abstract / Authors

Paper

Self-mode-locking of semiconductor lasers has been frequently reported, defying all known solutions of the Haus Master Equation approach. Here we show that four-wave mixing all by itself suffices to mode-lock a laser.

Authors:Esmerando Escoto/Max Born Institute Ayhan Demircan/Leibniz University Hannover Ihar Babushkin/Leibniz University Hannover Gunter Steinmeyer/Max Born Institute

---

14:30 - 14:45 **2 µm Actively Mode-locked External-cavity Semiconductor Laser (STh3E.3)**
Presenter: Weiqi Jiang, *Nanjing University*
Expand for Abstract / Authors

Paper

We have for the first time demonstrated a 450 MHz actively mode-locked external-cavity semiconductor laser at 2 µm. The system can be tuned from 1870-1980 nm, which makes the laser a wavelength-agile pulsed source.

Authors:Weiqi Jiang/Nanjing University Jiarong Qin/Nanjing University Yi Shi/Nanjing University Shi-ning Zhu/Nanjing University Fengqiu Wang/Nanjing University

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14:45 - 15:00 **Hybrid mode-locked 20 GHz colliding pulse Si/III-V laser with 890 fs pulsewidth (STh3E.4)**
Presenter: Songtao Liu, *University of California, Santa Barbara*
Expand for Abstract / Authors

Paper

We report the hybrid mode locking (HML) performance of a 20 GHz colliding pulse mode-locked heterogeneously integrated Si/III-V laser. By HML, the laser shows a 6.7x timing jitter reduction with minimum pulsewidth down to 890 fs.

Authors:Songtao Liu/University of California, Santa Barbara Michael Davenport/Quintessent, Inc. John Bowers/University of California, Santa Barbara

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15:00 - 15:15	**Offset Quantum Dot Mode-Locked Laser Enabled by Passive-Active Integration (STh3E.5)** **Presenter**: Zeyu Zhang, *University of California Santa Barbara* Expand for Abstract / Authors We report the first demonstration of an offset quantum dot laser platform which enables integration of active gain section with passive waveguide section. Based on this platform, we have designed and fabricated dispersion compensated offset quantum dot mode-locked lasers. **Authors**:Zeyu Zhang/University of California Santa Barbara Justin Norman/University of California Santa Barbara Songtao Liu/University of California Santa Barbara Aditya Malik/University of California Santa Barbara John Bowers/University of California Santa Barbara	Paper
15:15 - 15:30	**Tunable Repetition Rates in Compound Cavity Mode Locked Laser Diodes using External Reflector (STh3E.6)** **Presenter**: Jianfei Chen, *UT Dallas* Expand for Abstract / Authors We report on the harmonic mode-locking effects in external reflector compound cavity laser diodes. By forming the semiconductor-air compound cavity, the pulse repetition rate changed from 33GHz to 231GHz and 75 GHz to 225GHz. **Authors**:Jianfei Chen/UT Dallas banaful paul/UT Dallas A. Catrina coleman/UT Arlington	Paper
15:30 - 15:45	**Coherent Frequency Comb with 100 GHz Spacing Generated by an Asymmetric MQW Mode-Locked Laser (STh3E.7)** **Presenter**: Lianping Hou, *University of Glasgow* Expand for Abstract / Authors A coherent frequency comb with a 100 GHz frequency spacing, −3 dB bandwidth of 8.05 nm and pulse width of 440 fs, was generated using an asymmetric multiple quantum well mode locked laser. **Authors**:Yihui Liu/Institute of Semiconductors, Chinese Academy of Sciences Yongguang Huang/Institute of Semiconductors, Chinese Academy of Sciences Ruikang Zhang/Institute of Semiconductors, Chinese Academy of Sciences Jiankun Wang/Institute of Semiconductors, Chinese Academy of Sciences Baojun Wang/Institute of Semiconductors, Chinese Academy of Sciences Bin Hou/University of Glasgow John Marsh/University of Glasgow Lianping Hou/University of Glasgow	Paper

15:45 - 16:00 **Shaping harmonic frequency combs in ring injection lasers by defect engineering (STh3E.8)**
Presenter: Dmitry Kazakov, *Harvard University*
Expand for Abstract / Authors

Paper

Quantum cascade lasers are known to spontaneously skip modes and generate widely-spaced harmonic frequency combs. We show that engineering defects in a ring waveguide allows for deterministic control of the comb intermode spacing.

Authors:Dmitry Kazakov/Harvard University Marco Piccardo/Harvard University Maximilian Beiser/TU Wien Nikola Opacak/TU Wien Yongrui Wang/Texas A&M University Alexey Belyanin/Texas A&M University Benedikt Schwarz/Harvard University Federico Capasso/Harvard University

Short Reach Communications (STh3L)
Presider: Xi Chen, *Nokia Bell Labs*

14:00 - 14:15 **Intelligent Bandwidth Allocation for Latency Management in NG-EPON using Reinforcement Learning Method (STh3L.1)**
Presenter: Qi Zhou, *Georgia Institute of Technology*
Expand for Abstract / Authors

Paper

A novel intelligent bandwidth allocation scheme in NG-EPON using reinforcement learning is proposed and demonstrated for latency management. The capability of the proposed scheme is verified under both fixed and dynamic traffic loads.

Authors:Qi Zhou/Georgia Institute of Technology Jingjie Zhu/CableLabs Junwen Zhang/CableLabs Zhensheng Jia/CableLabs Bernardo Huberman/CableLabs Gee-Kung Chang/Georgia Institute of Technology

14:15 - 14:30 **Experimental Demonstration of Hybrid OFDM-Digital Filter Multiple Access PONs for 5G and Beyond Networks (STh3L.2)**
Presenter: Wei Jin, *Bangor University*
Expand for Abstract / Authors

Paper

Aggregated 16.6Gbit/s@26km upstream hybrid OFDM-DFMA IMDD PONs utilizing low-cost optical/electrical devices are demonstrated, for the first time, which significantly improve the performance robustness and differential ONU optical launch power dynamic range, compared to published work.

Authors:Wei Jin/Bangor University Zhuqiang Zhong/Bangor University Yixian Dong/Bangor University Jiaxiang He/Bangor University Longfei Li/Bangor University Abdulai Sankoh/Bangor University Shaohua Hu/Bangor University Roger Giddings/Bangor University Yanhua Hong/Bangor University Maurice O’Sullivan/Ciena Canada, Inc. Jeffrey Lee/EFFECT Photonics LTD. Tim Durrant/EFFECT Photonics LTD. Jianming Tang/Bangor University

14:30 - 15:00

First Investigation on Double- and Single-sideband Formats in BDFA-enabled O-band Transmission (STh3L.3)

Presenter: Yang Hong, *University of Southampton*

Expand for Abstract / Authors

Paper

We experimentally compare 50-Gb/s single- and double-sideband formats in an O-band BDFA-amplified transmission system over different distances. The results show that single-sideband transmission is beneficial for distances beyond ~50km at more dispersive O-band wavelengths.

Authors:Yang Hong/University of Southampton Kyle Bottrill/University of Southampton Natsupa Taengnoi/University of Southampton Naresh Thipparapu/University of Southampton Yu Wang/University of Southampton Jayanta Sahu/University of Southampton David Richardson/University of Southampton Periklis Petropoulos/University of Southampton

15:00 - 15:15

The Impact of Higher Order Dispersion in a Time Lens based WDM Transmitter (STh3L.4)

Presenter: Xiaoyu Xu, *Technical University of Denmark*

Expand for Abstract / Authors

Paper

We investigate the effect of third order dispersion on the WDM signal generated by optical Fourier transformation. Compared to FBGs, SMF is experimentally shown to result in a channel frequency drift exceeding the channel spacing.

Authors:Xiaoyu Xu/Technical University of Denmark Mads Lillieholm/Technical University of Denmark Peter David Girouard/Technical University of Denmark Peter Dahl Ekner/Technical University of Denmark Michael Galili/Technical University of Denmark Leif K. Oxenløwe/Technical University of Denmark Pengyu Guan/Technical University of Denmark

15:15 - 15:30

Real-time FPGA Verification for 25G-PON and 50G-PON LDPC Codes

(STh3L.5)

Presenter: Weiming Wang, *ZTE Corporation*

Expand for Abstract / Authors

Paper

Employing 75-piece FPGA implementation, we investigate the performance down to 10^{-15} BER of hard-decision 25G-PON LDPC and soft-decision 50G-PON LDPC at a record 90-Gbps throughput. FPGA emulations reveal soft-decision LDPC code offers more than 1.5dB coding gain with no error floor.

Authors:Weiming Wang/ZTE Corporation Kai Tao/ZTE Corporation Weifeng Qian/ZTE Corporation Yi Cai/ZTE (TX) Inc. Ming Lei/ZTE Corporation Xin Zhou/ZTE Corporation Huang-Chang Chien/ZTE (TX) Inc. Junpeng Liang/ZTE Corporation Shihua Zhang/ZTE Corporation Zheng Liu/ZTE Corporation

15:30 - 16:00 **300+ Gbps Short-Reach Optical Communications (STh3L.6)**
Presenter: Oskars Ozolins, *RISE Research Institutes of Sweden AB*
Expand for Abstract / Authors

Paper

We review experimental intensity modulation and direct detection demonstrations for short reach optical communications. We also evaluate 8-level PAM and DMT transmitter to deliver 300 Gbps line rate and beyond per single lane in C-band.

Authors:Oskars Ozolins/RISE Research Institutes of Sweden AB Lu Zhang/Zhejiang University Aleksejs Udalcovs/RISE Research Institutes of Sweden AB Hadrien Louchet/Keysight Technologies GmbH Thomas Dippon/Keysight Technologies GmbH Markus Gruen/Keysight Technologies GmbH Xiaodan Pang/KTH Royal Institute of Technology Richard Schatz/KTH Royal Institute of Technology Urban Westergren/KTH Royal Institute of Technology Shilin Xiao/Shanghai Jiao Tong University Sergei Popov/KTH Royal Institute of Technology Jiajia Chen/Chalmers University of Technology

Invited

16:30 - 18:15 (UTC - 07:00)

Applications of Machine Learning (STh4M)

Presider: Ryan Scott, *Keysight Technologies Inc.*

16:30 - 16:45 **Deep Learning for Multi-Step Performance Prediction in Operational Optical Networks (STh4M.1)**
Presenter: Ameni Mezni, *École de technologie supérieure*
Expand for Abstract / Authors

Paper

We propose a 1D Convolutional Neural Network to predict the performance of a lightpath using field bit error rate data and we evaluate the model robustness over forecast horizons up to 24 hours.

Authors:Ameni Mezni/École de technologie supérieure Douglas Charlton/Ciena Corp. Christine Tremblay/École de technologie supérieure Christian Desrosiers/École de technologie supérieure

16:45 - 17:00

Integration of Diffractive Optical Neural Networks with Electronic Neural Networks (STh4M.2)
Presenter: Deniz Mengü, *University of California, Los Angeles*
Expand for Abstract / Authors

Paper

We demonstrate jointly-trained hybrid (optical-electronic) networks, where diffractive optical neural networks act as a trainable front-end mitigating the information loss at a low-resolution image sensor to improve the overall classification accuracy of the hybrid network.

Authors:Deniz Mengü/University of California, Los Angeles Yi Luo/University of California, Los Angeles Yair Rivenson/University of California, Los Angeles Aydogan Ozcan/University of California, Los Angeles

17:00 - 17:15

A compact and inexpensive coherent Ising machine based on opto-electronic feedback for solving combinatorial optimization problems (STh4M.3)
Presenter: Fabian Böhm, *Vrije Universiteit Brussel*
Expand for Abstract / Authors

Paper

We propose and demonstrate a new type of coherent Ising machine based on opto-electronic feedback systems for solving NP-hard optimization problems. The design is significantly cheaper and more compact than current state-of-the-art Ising machines.

Authors:Fabian Böhm/Vrije Universiteit Brussel Guy Verschaffelt/Vrije Universiteit Brussel Guy Van der Sande/Vrije Universiteit Brussel

17:15 - 17:30

Neural Nets to Approach Optimal Receivers for High Speed Optical Communication (STh4M.4)
Presenter: Sai Chandra Kumari Kalla, *Universite Laval*
Expand for Abstract / Authors

Paper

We show via simulation that two nonlinear neural network solutions can achieve performance close to that of the maximum likelihood sequence estimator for experimental frequency responses of a silicon photonic modulator and coherent detection.

Authors:Sai Chandra Kumari Kalla/Universite Laval Rizan Homayoun Nejad/Universite Laval Sasan Zhalehpour/Universite Laval Leslie Rusch/Universite Laval

17:30 - 18:00 **Design Optimisation of Power-Efficient Submarine Line through Machine Learning (STh4M.5)**
Presenter: Maria Vasilica Ionescu, *Nokia Bell Labs France*
Expand for Abstract / Authors

Paper

An optimised subsea system design for energy-efficient SDM operation is demonstrated using machine learning. The removal of gain-flattening filters employed in submarine optical amplifiers can result in capacity gains at no additional overall repeater cost.

Authors:Maria Vasilica Ionescu/Nokia Bell Labs France Amirhossein Ghazisaeidi/Nokia Bell Labs France Jeremie Renaudier/Nokia Bell Labs France Pascal Pecci/Alcatel Submarine Networks Olivier Courtois/Alcatel Submarine Networks

18:00 - 18:15 **Saliency Segmentation with Fourier-space Diffractive Deep Neural Networks (STh4M.6)**
Presenter: Tao Yan, *Tsinghua University*
Expand for Abstract / Authors

Paper

We propose to apply diffractive deep neural networks (D^2NN) for solving advanced computer vision tasks and demonstrate the successful application of Fourier-space D^2NN for all-optical saliency segmentation of both microscopic samples and macroscopic scenes.

Authors:Tao Yan/Tsinghua University Jiamin Wu/Tsinghua University Tiankuang Zhou/Tsinghua University Lu Fang/Tsinghua University Xing Lin/Tsinghua University Qionghai Dai/Tsinghua University

16:30 - 18:30 (UTC - 07:00)

ATTR: Augmented and Virtual Reality: Systems Meet Devices II (ATh4I)
Presider: Barmak Heshmat, *BRELYON*

16:30 - 17:00 **Prescription AR and Modul AR: AR-convertible eyeglasses (ATh4I.1)**
Presenter: Jonghyun Kim, *NVIDIA Corporation*
Expand for Abstract / Authors

Prescription AR is a prescription-embedded fully-customized AR display that is optimized for each user’s vision, facial structure and taste of fashion. Based on Prescription AR optics, we present AR-convertible prescription glasses, dubbed as ModulAR.

Authors:Jonghyun Kim/NVIDIA Corporation

Invited

17:00 - 17:30 **A metalens-based virtual reality (VR) / augmented reality (AR) system (ATh4I.2)**
Presenter: Zhaoyi Li, *Harvard University*
Expand for Abstract / Authors

Paper

We demonstrated a large RGB-achromatic metalens by novel design methods. Furthermore, we realized a compact platform for a virtual reality / augmented reality system based on an RGB metalens and a fiber scanning display.

Authors:Zhaoyi Li/Harvard University Yao-Wei Huang/Harvard University Peng Lin/Boston University Joon-Suh Park/Harvard University Wei-Ting Chen/Harvard University Zhujun Shi/Harvard University Chengwei Qiu/National University of Singapore Ji-Xin Cheng/Boston University Federico Capasso/Harvard University

Invited

17:30 - 17:45 **(Withdrawn) All-Polarization Generation and Manipulation Using Dielectric Metasurfaces (ATh4I.3)**
Presenter: Fei Ding, *University of Southern Denmark*
Expand for Abstract / Authors

We demonstrate the strategy for producing dielectric metasurfaces that generate arbitrary polarizations with controllable wavefronts from a linearly-polarized source. The polarization-resolved multifocal metalens and vectorial holographic display have been accomplished in a broadband spectrum range.

Authors:Fei Ding/University of Southern Denmark Bingdong Chang/Technical University of Denmark Qunshuo Wei/Beijing Institute of Technology Lingling Huang/Beijing Institute of Technology Xiaowei Guan/Technical University of Denmark Sergey Bozhevolnyi/University of Southern Denmark

17:45 - 18:00 **A broadband achromatic SiN metalens array for visible integral imaging (ATh4I.5)**
Presenter: Zhi-Bin Fan, *Sun Yat-sen University*
Expand for Abstract / Authors

Paper

We realize a silicon nitride metalens array that can be used to reconstruct 3D optical scene and shows the achromatic integral imaging for white light. The array contains 60×60 polarization-insensitive metalens with nearly diffraction-limited focusing.

Authors:Zhi-Bin Fan/Sun Yat-sen University Rui Chen/Sun Yat-sen University Jianwen Dong/Sun Yat-sen University

18:00 - 18:15

Vectorial Hologram Based on Pixelated Metasurface (ATh4I.6)
Presenter: Qinghua Song, *Université Cote d'Azur*
Expand for Abstract / Authors

_ Paper

We report a general method for full-polarization generation based on pixelated metasurface. By encoding the holographic phase profile into such pixels, vectorial holograms are constructed for the application of multidirectional display and cylindrical vector beam.

Authors:Qinghua Song/Université Cote d'Azur Arthur Baroni/Aix Marseille univ Rajath Sawant/Université Cote d'Azur Peinan Ni/Université Cote d'Azur Samira Khadir/Université Cote d'Azur Patrick Ferrand/Aix Marseille univ Patrice Genevet/Université Cote d'Azur

2D or Not 2D (FTh4N)

Presider: Esther Wertz, *Rensselaer Polytechnic Institute*

16:30 - 17:00

Single Photons, Spins and Dipoles in van der Waals Materials (FTh4N.1)
Presenter: Ajit Srivastava, *Emory University*
Expand for Abstract / Authors

_ Paper

I will present evidence for optical initialization of single spin-valley in WSe_2 and dipole-dipole interactions, much larger than the linewidth of the optical transition, amongst localized interlayer excitons of van der Waals heterobilayers.

Authors:Ajit Srivastava/Emory University

Invited

17:00 - 17:15

High Q-factor resonators and nanoantennas based on phonon polaritons in van der Waals materials (FTh4N.2)
Presenter: Michele Tamagnone, *Harvard University*
Expand for Abstract / Authors

_ Paper

We experimentally demonstrate mid-infrared resonators and antennas with Q-factors larger than 350 based on phonon polaritons in hexagonal boron nitride and molybdenum trioxide. We characterize the fabricated nanostructures with near field imaging and spectroscopy.

Authors:Michele Tamagnone/Harvard University Maryna Meretska/Harvard University Kundan Chaudhary/Harvard University Christina Spägele/Harvard University Alex Zhu/Harvard University Jiahan Li/Kansas State University James Edgar/Kansas State University Antonio Ambrosio/IIT Federico Capasso/Harvard University

17:15 - 17:30 **Directivity Modulation of Monolayer WS_2 Emission by Single Hydrogenated Amorphous Silicon Nanospheres (FTh4N.3)**
Presenter: Jie Fang, *The University of Texas at Austin*
Expand for Abstract / Authors

Paper

Monolayer WS_2 emission is limited by its poor emission directivity. We introduce single hydrogenated amorphous silicon nanospheres (a-Si:H NSs) to realize on-demand directivity modulation. We demonstrate the active control of forward-to-backward modulation ratio via tuning the radius of a-Si:H NSs.

Authors:Jie Fang/The University of Texas at Austin Mingsong Wang/The University of Texas at Austin Kan Yao/The University of Texas at Austin Yuebing Zheng/The University of Texas at Austin

17:30 - 17:45 **(Withdrawn) Lattice Plasmon-enhanced Photodetection Performance in Monolayer MoS_2 (FTh4N.4)**
Presenter: Hao-Yu Lan, *Academia Sinica*
Expand for Abstract / Authors

We report the lattice plasmon-enhanced large-area monolayer MoS_2 photodetectors with a responsivity of 10 μA/W. By integrating with plasmonic nanoantennas array, a 3.5-fold enhancement of photocurrent was achieved under 4.7K compared to bare MoS_2 photodetectors.

Authors:Hao-Yu Lan/Academia Sinica Jung-Chan Lee/Academia Sinica Po-Cheng Tsai/Academia Sinica Shih-Yen Lin/Academia Sinica Yu-Jung Lu/Academia Sinica

17:45 - 18:00 **Monolayer lasing from photoactivation-enhanced photoluminescence at room temperature (FTh4N.5)**
Presenter: Fuxing Gu, *Univer. of Shanghai for Science and Tech*
Expand for Abstract / Authors

Paper

We use a photoactivation method to enhance the room-temperature photoluminescence quantum yields in monolayer MoS_2 grown on silica micro/nanofibres by more than two orders of magnitude, and realize continuous-wave lasing with greatly reduced thresholds.

Authors:Fuxing Gu/Univer. of Shanghai for Science and Tech

18:00 - 18:15 **(Withdrawn) Limits to Graphene Frequency Tunability (FTh4N.6)**
Presenter: Gregory Holdman, *University of Wisconsin - Madison*
Expand for Abstract / Authors

Tunable photonic structures operate by integrating a material with a tunable permittivity. Changes to the permittivity alter the optical properties of the structure and can shift the frequencies of local resonances. We derive a material-dependent limit to tunability and explore the case of graphene.

Authors:Gregory Holdman/University of Wisconsin - Madison Victor Brar/University of Wisconsin - Madison

18:15 - 18:30 **Tunable Bandgap Renormalization by Nonlocal Ultra-Strong Coupling in Nanophotonics (FTh4N.7)**
Presenter: Yaniv Kurman, *Israel Institute of technology*
Expand for Abstract / Authors

Paper

We find up-to 100meV bandgap shift in a semiconductor when stated near graphene. The graphene plasmons vacuum fluctuations enable nonlocal interactions between a single semiconductor electron and all available valence states to reach ultra-strong coupling.

Authors:Yaniv Kurman/Israel Institute of technology Ido Kaminer/Israel Institute of technology

Nonlinear and Novel Phenomena II (FTh4A)

Presider: Alexander Szameit, *Universität Rostock*

16:30 - 16:45 **Optical Thermodynamics in Nonlinear Photonic Lattices (FTh4A.1)**
Presenter: Andre Luiz Muniz, *Friedrich-Schiller-Universität Jena*
Expand for Abstract / Authors

Paper

We report the first experimental observation of optical thermodynamic processes in nonlinear mesh photonic lattices. These include Rayleigh-Jeans distributions with either positive or negative temperatures, isentropic expansions and compressions, as well as Joule photon gas expansions.

Authors:Andre Luiz Muniz/Friedrich-Schiller-Universität Jena Pawel Jung/UCF Fan Wu/UCF Midya Parto/UCF Mercedeh Khajavikhan/University of Southern California Demetrios Christodoulides/UCF Ulf Peschel/Friedrich-Schiller-Universität Jena

16:45 - 17:00 **Longitudinally Variable Polarization Optics (FTh4A.2)**
Presenter: Ahmed Dorrah, *Harvard University*
Expand for Abstract / Authors

Paper

We introduce a new class of polarizing elements (analyzers and retarders) that virtually rotate their orientation as a function of the propagation distance, thus expanding the scope of conventional polarization devices into 3D space.

Authors:Ahmed Dorrah/Harvard University Noah Rubin/Harvard University Aun Zaidi/Harvard University Michele Tamagnone/Harvard University Federico Capasso/Harvard University

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17:00 - 17:30 **Wideband Nonmagnetic Linear Optical Isolator in Thin-Film Lithium Niobate (FTh4A.3)**
Presenter: Kamal Abdelsalam, *University of Central Florida*
Expand for Abstract / Authors

Paper

We introduce a new class of wideband and integrated nonmagnetic linear optical isolators based on nonlinear frequency conversion and spectral filtering with isolation ratio up to 40 dB and bandwidth in excess of 150 nm.

Authors:Kamal Abdelsalam/University of Central Florida Tengfei Li/Johns Hopkins University Jacob Khurgin/Johns Hopkins University Sasan Fathpour/University of Central Florida

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17:30 - 17:45 **Dispersion in Photonic Time Crystals (FTh4A.4)**
Presenter: Jamison Sloan, *Massachusetts Institute of Technology*
Expand for Abstract / Authors

Paper

We present a framework for predicting the behavior of materials which are simultaneously strongly dispersive and time-dependent. We show that dispersion and time-dependence can cooperate to strongly enhance frequency conversion.

Authors:Jamison Sloan/Massachusetts Institute of Technology Nicholas Rivera/Massachusetts Institute of Technology Marin Soljacic/Massachusetts Institute of Technology

17:45 - 18:00 **Observation of second-order spectral phase transition in optical parametric oscillator (FTh4A.5)**
Presenter: Arkadev Roy, *California Institute of Technology*
Expand for Abstract / Authors

Paper

We demonstrate second-order phase transition in optical parametric oscillators corresponding to a transition from degenerate to non-degenerate oscillation at a critical cavity detuning which can be utilized for enhanced sensing and information processing.

Authors:Arkadev Roy/California Institute of Technology Saman Jahani/California Institute of Technology Carsten Langrock/Stanford University Marty Fejer/Stanford University Alireza Marandi/California Institute of Technology

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18:00 - 18:15 **Phonon-Polariton-Enhanced Nonlinearity in Hexagonal Boron Nitride (FTh4A.6)**
Presenter: Mehdi Jadidi, *Columbia University*
Expand for Abstract / Authors

Paper

We report the first measurements of the nonlinear response of phonon polaritons near 7.3 μm in atomically thin layers of hexagonal boron nitride. We observe the phonon-enhanced third harmonic and the transient phonon-induced second harmonic.

Authors:Mehdi Jadidi/Columbia University Jared Ginsberg/Columbia University Gauri Patwardhan/Columbia University Sang Chae/Columbia University Cecilia Chen/Columbia University Baichang Li/Columbia University Watanabe Watanabe/National Institute for Materials Science Takashi Taniguchi/National Institute for Materials Science James Hone/Columbia University Alexander Gaeta/Columbia University

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18:15 - 18:30 **Brightness Enhancement in Multimode Nonlinear Systems via Thermodynamic Optical Cooling (FTh4A.7)**
Presenter: Midya Parto, *University of Central Florida, CREOL*
Expand for Abstract / Authors

Paper

We show that the optical brightness of a high-intensity multimode beam can be substantially enhanced using thermodynamic optical cooling schemes enabled by nonlinear interactions. This can be achieved without violating the second law of thermodynamics.

Authors:Midya Parto/University of Central Florida, CREOL Fan Wu/University of Central Florida, CREOL Pawel Jung/University of Central Florida, CREOL Mercedeh Khajavikhan/University of Southern California Demetrios Christodoulides/University of Central Florida, CREOL

Nonlinear Optical Transformation of Semiconductors (STh4H)
Presider: Renee Sher, *Wesleyan University*

16:30 - 16:45 **Second-Harmonic Generation from Plasmon-Plasmon Coupling in a Semiconductor-Metal Heterostructure (STh4H.1)**
Presenter: Richard Haglund, *Vanderbilt University*
Expand for Abstract / Authors

Paper

A heterostructure comprising CuS and Au nanoparticle films separated by insulating ligands yields enhanced second harmonic generation from coupling of localized surface plasmon resonance modes of CuS and Au at 1050 nm and 525 nm, respectively.

Authors:Nathan Spear/Vanderbilt University Kent Hallman/Vanderbilt University Emil Hernández-Pagán/Vanderbilt University Richard Haglund/Vanderbilt University Janet Macdonald/Vanderbilt University

16:45 - 17:00 **Narrow Linewidth Photoluminescence from Top-Down Fabricated 20 nm InGaN/GaN Quantum Dots at Room Temperature (STh4H.2)**
Presenter: Bryan Melanson, *Rochester Institute of Technology*
Expand for Abstract / Authors

Paper

Promising narrow linewidth photoluminescence with a FWHM of 7.1 nm at wavelength 418 nm was achieved at room temperature from InGaN/GaN quantum dot in a 20-nm-diameter top-down fabricated nanowire.

Authors:Bryan Melanson/Rochester Institute of Technology David Starling/Pennsylvania State University Hazleton Matthew Hartensveld/Rochester Institute of Technology Gregory Howland/Rochester Institute of Technology Stefan Preble/Rochester Institute of Technology Jing Zhang/Pennsylvania State University Hazleton

17:00 - 17:15 **Ordered Configuration of Strained Ge Nanostructures on Si using Mechanical Nano-stamping: Towards Light Sources on Silicon (STh4H.3)**
Presenter: Ghada Dushaq, *New York University*
Expand for Abstract / Authors

Paper

Highly tensile-strained Ge nanostructures grown on pre-patterned (001) Si substrate is demonstrated. Using depth controlled nanoindentation, 2.7% strain value has been obtained. Results are verified by observing photoluminescence emission properties of the Ge/Si nanostructures.

Authors:Ghada Dushaq/New York University Mahmoud Rasras/New York University

17:15 - 17:30

Functional Surfaces of Laser-microstructured Silicon Coated with Polymer Blends Switching Between Hydrophilicity and Hydrophobicity (STh4H.4)
Presenter: Maria Kandyla, *National Hellenic Research Foundation*
Expand for Abstract / Authors

We develop functional surfaces of laser-microstructured silicon, spin-coated with thermoresponsive PS/PNIPAM polymer blends and we study their switching wetting behavior between hydrophilicity and hydrophobicity upon heating. The transition is reversible for multiple heating/cooling cycles.

Authors:Maria Kandyla/National Hellenic Research Foundation Maria Kanidi/National Hellenic Research Foundation Aristeidis Papagiannopoulos/National Hellenic Research Foundation Andreea Matei/National Institute for Lasers, Plasma and Radiation Physics Maria Dinescu/National Institute for Lasers, Plasma and Radiation Physics Stergios Pispas/National Hellenic Research Foundation

Paper

17:30 - 18:00

(Withdrawn) PLD deposition of HfO2 and PZT ferroelectric thin films for THz applications (STh4H.5)
Presenter: Maria Dinescu, *NILPRP*
Expand for Abstract / Authors

Ferroelectric textured PZT and HfO_2 thin films have been deposited by radiofrequency assisted pulsed laser deposition on highly resistive silicon substrates. Subsequently graphene layers have been transferred and the heterojunction characterization has been performed.

Authors:Maria Dinescu/NILPRP

Invited

18:00 - 18:15

Evaluating Charge Carrier Lifetime of Laser Hyperdoped Germanium Using Terahertz Spectroscopy (STh4H.6)
Presenter: Senali Dissanayake, *Wesleyan University*
Expand for Abstract / Authors

Gold-hyperdoped germanium extends photodetection into the infrared. Pulsed-laser processing makes single crystal material with ultrahigh dopant concentrations. The laser parameters influence the dopant's atomic position which leads to different light absorption and carrier transport properties.

Authors:Senali Dissanayake/Wesleyan University Naheed Ferdous/University of Illinois at Urbana-Champaign Hemi Gandhi/Harvard University Eric Mazur/Harvard University Elif Ertekin/University of Illinois at Urbana-Champaign Renee Sher/Wesleyan University

Paper

18:15 - 18:30 **Thermal assisted carrier recombination in CsPbBr3 nanocrystals (STh4H.7)**
Presenter: Megha Shrivastava, *Indian Institute of Science Education and Research, Bhopal*
Expand for Abstract / Authors

Paper

We have studied band edge carrier dynamics in CsPbBr3 nanocrystals using ultrafast non-degenerate transient absorption spectroscopy and report three times slower carrier recombination at low temperatures compared to ambient conditions.

Authors:Ajay Poonia/Indian Institute of Science Education and Research, Bhopal Wasim Mir/IISER Pune Megha Shrivastava/Indian Institute of Science Education and Research, Bhopal Angshuman Nag/IISER Pune Adarsh K V/Indian Institute of Science Education and Research, Bhopal

Structured Light and Beams (FTh4C)

Presider: Anna Bezryadina, *California State University Northridge*

16:30 - 16:45 **Space-Time Wave Packets as a Platform for a Free-Space Optical Delay Line (FTh4C.1)**
Presenter: Murat Yessenov, *University of Central Florida, CREOL*
Expand for Abstract / Authors

Paper

We demonstrate free-space optical delay lines that make use of diffraction-free space-time wave-packets whose group velocities are continuously tunable in free space, and thus provides a potential platform for all-optical buffers by providing group delays that far exceed the pulse widths.

Authors:Murat Yessenov/University of Central Florida, CREOL Basanta Bhaduri/University of Central Florida, CREOL Ayman Abouraddy/University of Central Florida, CREOL

16:45 - 17:00 **Pin-like Optical Vortex Beams (FTh4C.2)**
Presenter: Denghui Li, *Nankai University*
Expand for Abstract / Authors

Paper

We demonstrate pin-like optical vortex beams (POVBs) by tailoring amplitude and phase of a laser beam in Fourier space. For certain applications, such POVBs with anti-diffractive features can outperform conventional Bessel and abruptly auto-focusing beams.

Authors:Denghui Li/Nankai University domenico bongiovanni/Nankai University Mihalis Goutsoulas/University of Crete Yi Hu/Nankai University Daohong Song/Nankai University Roberto Morandotti/INRS-Energie Mat & Tele Site Varennes Nikolaos K. Efremidis/University of Crete Zhigang Chen/Nankai University

17:00 - 17:15 **Nonlinear Light Generation Driven by Collective Magnetic Modes in Oligomers of Silicon Nanoparticles Excited by Vector Beams (FTh4C.3)**
Presenter: Maria Kroychuk, *Lomonosov Moscow State University*
Expand for Abstract / Authors

- Paper

We demonstrated two orders of magnitude enhancement of the third-harmonic intensity for isolated nanoclusters of silicon nanoparticles illuminated by normally incident azimuthally polarized cylindrical vector beams at the wavelength of oligomer's out-of-plane magnetic mode.

Authors:Maria Kroychuk/Lomonosov Moscow State University Alexander Shorokhov/Lomonosov Moscow State University Damir Yagudin/Lomonosov Moscow State University Daria Smirnova/Australian National University Irina Volkovskaya/Institute of Applied Physics Maxim Shcherbakov/Cornell University Gennady Shvets/Cornell University Andrey Fedyanin/Lomonosov Moscow State University

17:15 - 17:30 **(Withdrawn) Optical Density Variations Induced by Bessel-Gauss Beams (FTh4C.4)**
Presenter: Ruitao Wu, *CREOL*
Expand for Abstract / Authors

We demonstrate the steady-state reduction of optical density along the path of Bessel-Gauss beams. This optical path clearing though colloidal suspensions is due to specific optical forces and hydrodynamic interactions.

Authors:Cristian Hernando Acevedo/CREOL Ruitao Wu/CREOL Keith Miller/Clemson University Eric Johnson/Clemson University Aristide Dogariu/CREOL

17:30 - 17:45 **(Withdrawn) Characterization and conversion of complex vector light via optical nonlinear interactions (FTh4C.5)**
Presenter: Zhihan Zhu , *Harbin Univ of Science and Technology*
Expand for Abstract / Authors

We present a systematic demonstration of characterization and on-demand conversion of complex vector light via nonlinear interactions. Our results enhance our understanding of vector nonlinear optics and paves the way for nonlinear manipulating hyper-entangled photons.

Authors:Zhihan Zhu /Harbin Univ of Science and Technology Hai-Jun Wu/Harbin Univ of Science and Technology Wei Gao/Harbin Univ of Science and Technology Carmelo Rosales-Guzmán/Harbin Univ of Science and Technology Bao-Sen Shi/University of Science and Technology of China

17:45 - 18:00	**Nondiffracting Waves that Auto-Disrupt: Designing Novel Wavepackets Using Electromagnetic Singularities (FTh4C.6)** **Presenter**: Liang Jie Wong, *Nanyang Technological University* Expand for Abstract / Authors We introduce the use of electromagnetic singularities in complex space-time as a robust means of designing new exotic wavepackets, exemplified by nondiffracting pulses that auto-disrupt in free space at user-chosen places. **Authors**:Liang Jie Wong/Nanyang Technological University Demetrios Christodoulides/University of Central Florida Ido Kaminer/Technion	Paper
18:00 - 18:15	**Experimental Demonstration of Optimal Curved Beams in Micrometer-Scale (FTh4C.7)** **Presenter**: Mo Mojahedi, *University of Toronto* Expand for Abstract / Authors Using ideas from optimization theory and calculus of variation we demonstrate beams that follow curved trajectories in micrometers scale, in air. Unlike commonly studied Airy beams, the beams generated here have minimal side lobes. **Authors**:Yousuf Aborahama/University of Toronto Ahmed Dorrah/University of Toronto Mo Mojahedi/University of Toronto	Paper
18:15 - 18:30	**Optical Vortex Scattering in Composite Bessels (FTh4C.8)** **Presenter**: Andrew Voitiv, *University of Denver* Expand for Abstract / Authors We theoretically propose and experimentally demonstrate the scattering of optical vortices in a laser beam by superposing Bessel modes. Such processes are mediated by the ephemeral generation and annihilation of vortex pairs. **Authors**:Andrew Voitiv/University of Denver Jasmine Andersen/University of Denver Mark Siemens/University of Denver Mark Lusk/Colorado School of Mines	Paper

Silicon Photonics II (STh4O)

Presider: Beibei Zeng, *Lehigh University*

16:30 - 16:45 **Unidirectional injection-locked Brillouin laser in silicon (STh4O.1)**
Presenter: Nils Otterstrom, *Yale University*
Expand for Abstract / Authors

Paper

We demonstrate injection-locked operation of a silicon-based Brillouin laser for the first time. The unique spatio-temporal inter-modal Brillouin dynamics enable nonreciprocal control and low-phase-noise operation within a monolithically integrated system.

Authors:Nils Otterstrom/Yale University Shai Gertler/Yale University Yishu Zhou/Yale University Eric Kittlaus/Yale University Ryan Behunin/Northern Arizona University Michael Gehl/Sandia National Laboratories Andrew Starbuck/Sandia National Laboratories Christina Dallo/Sandia National Laboratories Andrew Pomerene/Sandia National Laboratories Douglas Trotter/Sandia National Laboratories Anthony Lentine/Sandia National Laboratories Peter Rakich/Yale University

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16:45 - 17:00 **Energy-Efficient Thermo-Optic Phase Shifter with a Small Footprint Based on a Silicon Spiral Waveguide (STh4O.2)**
Presenter: Huaqing Qiu, *Technical University of Denmark*
Expand for Abstract / Authors

Paper

We experimentally demonstrate a thermo-optic phase shifter based on a densely distributed silicon spiral waveguide, with power consumption, insertion loss, footprint and modulation bandwidth of 3 mW/π, 0.9 dB, 28×67 μm^2 and 39 kHz respectively.

Authors:Huaqing Qiu/Technical University of Denmark Yong Liu/Technical University of Denmark Chao Luan/Technical University of Denmark Deming Kong/Technical University of Denmark Xiaowei Guan/Technical University of Denmark Yunhong Ding/Technical University of Denmark Hao Hu/Technical University of Denmark

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17:00 - 17:15 **High Gain-Bandwidth Waveguide Coupled Silicon Germanium Avalanche Photodiode (STh4O.3)**
Presenter: Olivier Carpentier, *McGill University*
Expand for Abstract / Authors

Paper

We present the DC, small signal and large signal performance of low excess-noise waveguide coupled germanium-on-silicon avalanche photodetectors with over 400 GHz gain-bandwidth product.

Authors:Olivier Carpentier/McGill University Alireza Samani/McGill University Maxime Jacques/McGill University Eslam El-Fiky/McGill University Md Samiul Alam/McGill University Yun Wang/McGill University Ping-Chiek Koh/Lumentum Nicolas Albadia Calvo/Cardiff University David Plant/McGill University

17:15 - 17:30	**Ultraflat bandpass high extinction silicon photonic filters (STh4O.4)** **Presenter**: Anshuman Singh, *Raytheon BBN* Expand for Abstract / Authors We report silicon photonic ultraflat bandpass high-rejection (>55 dB) filters with low insertion loss at telecommunication wavelengths and efficient tunability via silicon-doped microheaters. Such filters are promising for RF photonics and quantum information processing applications. **Authors**:Anshuman Singh/Raytheon BBN Richard Belansky/Raytheon Space & Airborne Systems Mohammad Soltani/Raytheon BBN	Paper
17:30 - 17:45	**Silicon Photonic WDM-Polarization Receiver with Automated Feedback Control (STh4O.5)** **Presenter**: Minglei Ma, *University of British Columbia* Expand for Abstract / Authors We demonstrate a silicon photonic, two-channel, tunable WDM-polarization receiver with automated polarization and wavelength control. Using a gradient descent-based control algorithm, we realize automated polarization adaptation and wavelength stabilization for two arbitrarily polarized inputs. **Authors**:Minglei Ma/University of British Columbia Hossam Shoman/University of British Columbia Sudip Shekhar/University of British Columbia Nicolas Jaeger/University of British Columbia Lukas Chrostowski/University of British Columbia	Paper
17:45 - 18:00	**Coherent parallel binary-weighted digital-to-analog converter in silicon photonics (STh4O.6)** **Presenter**: Volker Sorger, *George Washington University* Expand for Abstract / Authors Here, we introduce a coherent parallel photonic DAC concept along with an experimental demonstration based on binary-weighted bits in a silicon PIC platform unlike other concepts capable of performing the conversion without optical-electronic-optical domain crossings. **Authors**:Jiawei Meng/George Washington University Mario Miscuglio/George Washington University Jonathan George/George Washington University Aydin Babakhani/University of California, Los Angeles Volker Sorger/George Washington University	Paper

18:00 - 18:15	**Physically secure image transfer using synchronized chaos between silicon optomechanical cavities (STh4O.7)** **Presenter**: Jia-Gui Wu, *Fang Lu Mesoscopic Optics and Quantum Electronics Laboratory, University of California, Los Angeles* Expand for Abstract / Authors We demonstrate physically-secured image transfer using dynamical chaos synchronization between silicon optomechanical nanocavities. Chaos masking and pass filtering effect and color image with error correction are all realized in the silicon chip-based synchronous chaos system **Authors**:Jia-Gui Wu/Fang Lu Mesoscopic Optics and Quantum Electronics Laboratory, University of California, Los Angeles Jaime G. Flor Flores/Fang Lu Mesoscopic Optics and Quantum Electronics Laboratory, University of California, Los Angeles Derek Shidla/Fang Lu Mesoscopic Optics and Quantum Electronics Laboratory, University of California, Los Angeles Jinghui Yang/Fang Lu Mesoscopic Optics and Quantum Electronics Laboratory, University of California, Los Angeles Binglei Shi/Southwest University Mingbin Yu/The Institute of Microelectronics, 11 Science Park Road Guoqiang Lo/The Institute of Microelectronics, 11 Science Park Road Dim-Lee Kwong/The Institute of Microelectronics, 11 Science Park Road Shukai Duan/Southwest University Chee Wei Wong/Fang Lu Mesoscopic Optics and Quantum Electronics Laboratory, University of California, Los Angeles	- Paper
18:15 - 18:30	**Low-power thermo-optic silicon modulator geometrically optimized for photonic integrated circuits (STh4O.8)** **Presenter**: Makoto Nakai, *University of Southern California* Expand for Abstract / Authors We demonstrate geometrically-optimized thermo-optic phase modulator structures to achieve low power consumption, low loss, and compact formfactor. One such optimized design consumes 1.67 mW for π phase modulation with 0.98 dB optical loss in 0.0057 mm^2 footprint. **Authors**:Makoto Nakai/University of Southern California Sungwon Chung/University of Southern California Hossein Hashemi/University of Southern California	- Paper

Time Varying Metasurfaces (FTh4Q)

Presider: xingjie ni, *Pennsylvania State University*

16:30 - 16:45	**Negative Extinction and Broadband Light-matter Interactions in High-Q Time-variant Metasurfaces (FTh4Q.1)** **Presenter**: Maxim Shcherbakov, *Cornell University* Expand for Abstract / Authors We present experimental observations of frequency conversion and negative optical extinction in time-variant metasurfaces and their applications to surpassing the time-bandwidth limit in photonics. **Authors**:Maxim Shcherbakov/Cornell University Robert Lemasters/Emory University Jia Song/Emory University Pavel Shafirin/Lomonosov Moscow State University Tianquan Lian/Emory University Hayk Harutyunyan/Emory University Gennady Shvets/Cornell University	Paper
16:45 - 17:00	**Nonreciprocal Acoustic Transmission using Lithium Niobate Parity-Time-Symmetric Resonators (FTh4Q.2)** **Presenter**: Linbo Shao, *Harvard University* Expand for Abstract / Authors Taking advantage of the piezoelectricity of lithium niobate, we achieve nonreciprocal transmission of 10 decibels for a 200-MHz surface acoustic wave using parity-time-symmetric resonators and demonstrate one-way circulation of acoustic waves. **Authors**:Linbo Shao/Harvard University Wenbo Mao/Washington University Smarak Maity/Harvard University Neil Sinclair/Harvard University Yaowen Hu/Harvard University Lan Yang/Washington University Marko Loncar/Harvard University	Paper
17:00 - 17:15	**Breaking Reciprocity with Space-Time Phase Modulated Metasurfaces (FTh4Q.3)** **Presenter**: Xuexue Guo, *Pennsylvania State University* Expand for Abstract / Authors We constructed a space-time phase modulated metasurface consisting of amorphous silicon building blocks, and demonstrated nonreciprocal light reflection at wavelengths around 860 nm. Our approach paves a way for miniaturized on-chip nonreciprocal optical components. **Authors**:Xuexue Guo/Pennsylvania State University Yimin Ding/Pennsylvania State University Yao Duan/Pennsylvania State University xingjie ni/Pennsylvania State University	Paper

17:15 - 17:30 **Experimental Demonstration of Non-Symmetric Diffusion via Spatiotemporal Metamaterials (FTh4Q.4)**
Presenter: Miguel Camacho, *University of Pennsylvania*
Expand for Abstract / Authors

Paper

Spatiotemporal variation of material parameters (capacity and conductivity) can lead to unconventional diffusion phenomena. We have constructed and tested a metamaterial consisting of spatiotemporally variable capacitors and switches, demonstrating highly asymmetric charge
diffusion and accumulation.

Authors:Miguel Camacho/University of Pennsylvania Brian Edwards/University of Pennsylvania Nader Engheta/University of Pennsylvania

17:30 - 17:45 **Frequency Conversion in a Dielectric Time-Variant Metasurface via Optical Pumping (FTh4Q.5)**
Presenter: Nicholas Karl, *Sandia National Laboratories*
Expand for Abstract / Authors

Paper

We experimentally observe frequency conversion via electromagnetic wave interaction with a high quality-factor resonance in an array of resonators whose refractive indices are varied on an ultrafast timescale. Further, we describe the observations using coupled-mode-theory.

Authors:Nicholas Karl/Sandia National Laboratories Polina Vabishchevich/Sandia National Laboratories maxim shcherbakov/Cornell University Sheng Liu/Sandia National Laboratories Michael Sinclair/Sandia National Laboratories Gordon Keeler/Sandia National Laboratories Gregory Peake/Sandia National Laboratories Gennady Shvets/Cornell University Igal Brener/Sandia National Laboratories

17:45 - 18:00

Plasmonic Nanoantenna-Enhanced Adiabatic Wavelength Conversion using a Time-varying Epsilon-near-zero-based Metasurface (FTh4Q.6)
Presenter: Kai Pang, *Universit of Southern California*
Expand for Abstract / Authors

Paper

We experimentally demonstrate adiabatic wavelength conversion using a time-varying epsilon-near-zero-based metasurface. We observe up to 47-nm redshift with 4-GW/cm^2 pump peak intensity. The wavelength shift depends on both pump-probe delay time and pump peak intensity.

Authors:Kai Pang/Universit of Southern California M. Zahirul Alam/University of Ottawa Yiyu Zhou/University of Rochester Orad Reshef/University of Ottawa Cong Liu/Universit of Southern California Karapet Manukyan/Universit of Southern California Matt Voegtle/Universit of Southern California Anuj Pennathur/Universit of Southern California Cindy Tseng/Universit of Southern California Xinzhou Su/Universit of Southern California Hao Song/Universit of Southern California Zhe Zhao/Universit of Southern California Runzhou Zhang/Universit of Southern California Haoqian Song/Universit of Southern California Nanzhe Hu/Universit of Southern California Ahmed Almaiman/Universit of Southern California Jahan Dawlaty/Universit of Southern California Robert Boyd/University of Rochester Moshe Tur/Tel Aviv University Alan Willner/Universit of Southern California

18:00 - 18:15

Enhanced Resolution Imaging By Aperiodically Perturbed Photonic Time Crystals (FTh4Q.7)
Presenter: Zahra Manzoor, *Purdue University*
Expand for Abstract / Authors

Paper

This study presents enhanced resolution imaging systems formed by aperiodic perturbed temporal photonic crystals. Such crystals excite low loss high modes with wavenumbers above diffraction limit and ability to manipulate Floquet mode’s phase and amplitude.

Authors:Zahra Manzoor/Purdue University

18:15 - 18:30

Spatiotemporal Photonic Crystals

(FTh4Q.8)
Presenter: yonatan sharabi, *Technion*
Expand for Abstract / Authors

Paper

<div style="direction: ltr;">We study photonic systems periodic in both time and space – spatiotemporal photonic crystals, and find that their bandstructure contains both frequency and momentum bandgaps. When the two types of bandgaps coincide, anomalous bandstructure is observed.</div>

Authors:yonatan sharabi/Technion Mordechai Segev/Technion Alex Dikopoltsev/Technion Eran Lustig/Technion yaakov lumer/Technion

Chiral and Nonreciprocal Devices (STh4J)

Presider: Takasumi Tanabe, *Keio University*

16:30 - 17:00	**Chiral quantum photonics in semiconductor nano-photonic waveguides (STh4J.1)** **Presenter**: A. Mark Fox, *University of Sheffield* Expand for Abstract / Authors Chiral coupling between InAs quantum dots and nano-photonic waveguides arises when the dots are positioned at chiral points. This gives directional emission and non-reciprocal transmission. Experimental progress towards large chiral phase shifts will be reviewed. **Authors**:A. Mark Fox/University of Sheffield Invited	Paper
17:00 - 17:15	**(Withdrawn) On-chip Polarimeter for Stokes Parameters Detection (STh4J.2)** **Presenter**: Ting Lei, *Shenzhen University* Expand for Abstract / Authors We design an on-chip polarimeter using the silicon nanodisk based elements enabled by spin-orbit interactions. We also demonstrate the polarimetry for Stokes parameters detection by separating and measuring the polarization components of the incident light. **Authors**:Changyu Zhou/Shenzhen University Ting Lei/Shenzhen University Xiaocong Yuan/Shenzhen University	
17:15 - 17:30	**High-Gyrotropy Seedlayer-Free Ce:TbIG for Monolithic Laser-Matched SOI Optical Isolators (STh4J.3)** **Presenter**: Karthik Srinivasan, *University of Minnesota* Expand for Abstract / Authors Monolithic optical isolators that provide polarization diversity, dimensional (500 nm core) matching to on-chip lasers and magnetless operation have been realized with “one step” seedlayer-free garnet in a non-reciprocal mode conversion design. **Authors**:Karthik Srinivasan/University of Minnesota Cui Zhang/University of Glasgow Prabesh Dulal/University of Minnesota Cosmin Radu/Lakeshore Cryotronics Inc. Thomas Gage/University of Minnesota David Hutchings/University of Glasgow Bethanie Stadler/University of Minnesota	Paper

17:30 - 17:45	**Theoretical and numerical study of the time-bandwidth product in resonant cavities with nonreciprocal coupling (STh4J.4)** **Presenter**: Ivan Cardea, *Ecole Polytechnique Fédérale de Lausanne* Expand for Abstract / Authors We present a theoretical and numerical model to show how the nonreciprocal coupling in a generalized resonator affects the balance between the reflected and intracavity power as well as the time-bandwidth product of the system. **Authors**:Ivan Cardea/Ecole Polytechnique Fédérale de Lausanne Davide Grassani/Università degli studi di Pavia Jeremy Upham/University of Ottawa Robert Boyd/University of Ottawa Sebastian Schulz/University of St Andrews Kosmas Tsakmakidis/National and Kapodistrian University of Athens Camille-Sophie Brès/Ecole Polytechnique Fédérale de Lausanne	Paper
17:45 - 18:00	**Unreleased on-chip frequency-shifting optical isolator (STh4J.5)** **Presenter**: Donggyu Sohn, *University of Illinois* Expand for Abstract / Authors *We demonstrate an unreleased acousto-optic frequency-shifting optical isolator on chip that exhibits improved mechanical and thermal robustness compared to prior art. The system leverages traveling surface acoustic waves to break the symmetry for light propagation via indirect intermodal scattering.* **Authors**:Donggyu Sohn/University of Illinois Soonwook Kim/University of Illinois Gaurav Bahl/University of Illinois	Paper
18:00 - 18:15	**Optical Data Stream Wavelength Conversion by a Dual-Active-Cavity Silicon Microring Wavelength Converter (STh4J.6)** **Presenter**: Hayk Gevorgyan, *Boston University* Expand for Abstract / Authors Data wavelength conversion is demonstrated in coupled active silicon microring resonators with push-pull cavity modulation. A 4 Gbps NRZ signal is up/down-converted by 24GHz and 56GHz with respective conversion efficiencies of -13 and -18 dB. **Authors**:Hayk Gevorgyan/Boston University Anatol Khilo/Boston University Milos Popovic/Boston University	Paper

18:15 - 18:30

Demonstration of compact high-Q $Ge_{11.5}As_{24}Se_{64.5}$ chalcogenide microring resonators in telecom band (STh4J.7)
Presenter: Wei Jiang, *Corning Research and Development Corporation*
Expand for Abstract / Authors

- Paper

We demonstrate compact $Ge_{11.5}As_{24}Se_{64.5}$ chalcogenide microring resonators with a radius of 20 µm and achieve a high intrinsic optical quality factor of 3.8×10^5 in telecom band, which corresponds to a low propagation loss around 1.4 dB/cm.

Authors:Wei Jiang/Corning Research and Development Corporation Kangmei Li/Corning Research and Development Corporation Gai Xin/City University of Hong Kong Stephen Wright/Corning Research and Development Corporation Daniel Nolan/Corning Research and Development Corporation Paulo Dainese/Corning Research and Development Corporation

Linear Metasurfaces (FTh4B)

Presider: Junsuk Rho, *POSTECH*

16:30 - 16:45

Aliasurface- Aliasing Based Metasurface (FTh4B.1)
Presenter: Kobi Cohen, *Technion - Israel Institute of Technology*
Expand for Abstract / Authors

- Paper

We present a new degree of control over surface-waves enabled by aliasing in periodic structures. Using phase-resolved near-field microscopy, we map the two-dimensional eigenmodes and demonstrate geometry-dependent control over their propagation, featuring new diffraction schemes.

Authors:Kobi Cohen/Technion - Israel Institute of Technology Shai Tsesses/Technion - Israel Institute of Technology Yael Blechman/Technion - Israel Institute of Technology Asaf David/Technion - Israel Institute of Technology Guy Bartal/Technion - Israel Institute of Technology

16:45 - 17:00

Low-cost scalable manufacturing of dielectric metalenses for commercialization of high-end ultrathin lenses (FTh4B.2)
Presenter: Gwanho Yoon, *POSTECH*
Expand for Abstract / Authors

- Paper

We present a low-cost scalable manufacturing method for dielectric metalenses based on nanoparticle composites. Experimental results verify the feasibility of our method which boosts commercialization of high-end ultrathin lenses.

Authors:Gwanho Yoon/POSTECH Kwan Kim/Korea University Heon Lee/Korea University Junsuk Rho/POSTECH

17:00 - 17:15	**Large Scale Fabrication of Chiral Metamaterials (FTh4B.3)** **Presenter**: Yiping Zhao, *University of Georgia* Expand for Abstract / Authors By combining nanosphere monolayer and glancing angle deposition, several strategies have been demonstrated to fabricate quasi-three dimensional or three-dimensional chiral metamaterials such as fan-structures, helically stacked plasmonic structures, Swiss-roll structures, and chiral-nanohole arrays. **Authors**:Yiping Zhao/University of Georgia	Paper
17:15 - 17:30	**Dielectric Metasurfaces with High-Q Toroidal Resonances (FTh4B.4)** **Presenter**: Peter Jeong, *Sandia National Laboratories* Expand for Abstract / Authors Toroidal dielectric metasurface with a Q-factor of 728 in 1500 nm wavelength are reported. The resonance couples strongly to the environment, as demonstrated with a refractometric sensing experiment. **Authors**:Peter Jeong/Sandia National Laboratories Michael Goldflam/Sandia National Laboratories Jayson Briscoe/Sandia National Laboratories Polina Vabishchevich/Sandia National Laboratories John Nogan/Sandia National Laboratories Ting Luk/Sandia National Laboratories Igal Brener/Sandia National Laboratories	Paper
17:30 - 17:45	**Ultracompact Structured Light System of Vertical-Cavity Surface-Emitting Lasers Combining Metagratings (FTh4B.5)** **Presenter**: Nir Shitrit, *University of California, Berkeley* Expand for Abstract / Authors We report the alliance of vertical-cavity surface-emitting lasers and beam multiplier Dammann gratings for built-in structuring of the lasing emission. Such ultracompact combined laser-metasurface systems open a new paradigm for three-dimensional imaging in small-footprint devices. **Authors**:Nir Shitrit/University of California, Berkeley Kevin Cook/University of California, Berkeley Jonas Kapraun/University of California, Berkeley Jipeng Qi/University of California, Berkeley Jiaxing Wang/University of California, Berkeley Connie Chang-Hasnain/University of California, Berkeley	Paper

17:45 - 18:00	**Capacitive-mediated strong coupling in terahertz plasmonic metafilms (FTh4B.6)** **Presenter**: Riad Yahiaoui, *Howard University* Expand for Abstract / Authors We report terahertz metafilms designed to strongly couple hybridized lattice and fundamental dipole modes to form polaritons. By altering the metafilm’s capacitance, the coupling strength of the dipole-lattice coupling is tuned from weak to strong. **Authors**:Riad Yahiaoui/Howard University Zizwe Chase/Howard University Chan Kyaw/Howard University Tim Noe/Rice University ANDREY BAYDIN/Rice University Jared Strait/NIST Junichiro Kono/Rice University Amit Agrawal/NIST Thomas Searles/Howard University	Paper
18:00 - 18:15	**On-chip Integrated Spectrometers based on Metasurfaces on Waveguides (FTh4B.7)** **Presenter**: Yimin Ding, *The Pennsylvania State University* Expand for Abstract / Authors Spectrometers with small footprint and high resolutions are in highly demanded in various areas. We designed and experimentally demonstrated an ultra-compact fully integrated spectrometer based on such metasurface-decorated photonic integrated waveguides. **Authors**:Yimin Ding/The Pennsylvania State University Yao Duan/The Pennsylvania State University Xi Chen/The Pennsylvania State University Xuexue Guo/The Pennsylvania State University xingjie ni/The Pennsylvania State University	Paper
18:15 - 18:30	**Nanostructure-Enhanced Absorption in Thermoelectric photodetector (FTh4B.8)** **Presenter**: Nityanand Sharma, *The Hebrew University of Jerusalem* Expand for Abstract / Authors We experimentally demonstrate a thermoelectric photodetector combined with nanostructured thin-film broadband super-absorber in the visible to short wave infrared with an order of magnitude enhanced sensitivity as compared to a flat metal film device. **Authors**:Nityanand Sharma/The Hebrew University of Jerusalem Jonathan Bar-David/The Hebrew University of Jerusalem Noa Mazurski/The Hebrew University of Jerusalem Uriel Levy/The Hebrew University of Jerusalem	Paper

Mid-Infrared Photonics (STh4L)

Presider: Mo Li

16:30 - 16:45	**High-efficiency photo detection at 2 μm realized by GeSn/Ge multiple-quantum-well photodetectors with photon-trapping microstructure (STh4L.1)** **Presenter**: Hao Zhou, *Nanyang Technological University* Expand for Abstract / Authors Photon-trapping microstructure was designed and incorporated into GeSn/Ge multiple-quantum-well photodetectors to enhance the optical absorption. A four times higher responsivity of 0.11 A/W was achieved at a wavelength of 2 μm. **Authors**:Hao Zhou/Nanyang Technological University Shengqiang Xu/National University of Singapore Yiding Lin/Nanyang Technological University Yi-Chiau Huang/Applied Materials Inc Bongkwon Son/Nanyang Technological University Wei Li/Nanyang Technological University Xin Guo/Nanyang Technological University Lin Liu/Nanyang Technological University Kwang Hong Lee/Singapore MIT Alliance for Research and Technology (SMART) Xiao Gong/National University of Singapore Chuan Seng Tan/Nanyang Technological University	Paper
16:45 - 17:00	**Broadband, Waveguide-integrated Mid-Infrared Black Phosphorus Modulator with High Modulation Dept (STh4L.2)** **Presenter**: Seokhyeong Lee, *University of Washington* Expand for Abstract / Authors The electro-optical modulation of black phosphorus is promising in broad mid-IR range. We demonstrated 10% of modulation at 3-μm wavelength by a multi-passing waveguide device and proposed a plasmonic waveguide to achieve higher modulation depth and smaller footprint. **Authors**:Seokhyeong Lee/University of Washington Ruoming Peng/University of Washington Mo Li/University of Washington	Paper
17:00 - 17:15	**Chalcogenide Photonic Integration at 2 Micron with Improved Wavelength and Fabrication Dependency (STh4L.3)** **Presenter**: Weihong Shen, *Shanghai Jiao Tong University* Expand for Abstract / Authors Grating coupler and mode converter working at 2-micron waveband were fabricated on the 600-nm-thick As_2S_3-on-oxide platform. Both simulation and experiment results indicate that 2-micron As_2S_3 components has broadened wavelength bandwidth and improved fabrication tolerance. **Authors**:Weihong Shen/Shanghai Jiao Tong University Pingyang Zeng/Sun Yat-Sen University Jiangbing Du/Shanghai Jiao Tong University Bin Zhang/Sun Yat-Sen University Zhaohui Li/Sun Yat-Sen University Ke Xu/Harbin Institute of Technology (Shenzhen) Zuyuan He/Shanghai Jiao Tong University	Paper

17:15 - 17:30 **Sub-Parts-Per-Million Level Detection of Ethanol using Mid-Infrared Photonic Crystal Waveguide in Silicon-on-Insulator (STh4L.4)**
Presenter: Ali Rostamian, *University of Texas at Austin*
Expand for Abstract / Authors

Paper

We experimentally demonstrate an Ethanol sensor based on a slotted photonic crystal waveguide fabricated on a silicon on insulator platform to perform at a center wavelength of 3.4µm. Utilizing a 9mm long PCW, concentrations of down to 500 parts per billion (ppb) of Ethyl alcohol is detected.

Authors:Ali Rostamian/University of Texas at Austin Hamed Dalir/Omega Optics Inc Mohammad Teimourpour/Omega Optics Inc Ray Chen/University of Texas at Austin

17:30 - 17:45 **Mid-infrared interband cascade LEDs emitting >5 mW of output power (STh4L.5)**
Presenter: Nicolas Schaefer, *nanoplus Nanosystems and Technologies Gm*
Expand for Abstract / Authors

Paper

We present ICLEDs emitting at peak wavelengths of around 3.7 µm. A record efficiency was achieved by growing the epitaxial structures on low doped substrates and positioning the active stages at antinodes of the optical field.

Authors:Nicolas Schaefer/nanoplus Nanosystems and Technologies Gm Julian Scheuermann/nanoplus Nanosystems and Technologies Gm Robert Weih/nanoplus Nanosystems and Technologies Gm Johannes Koeth/nanoplus Nanosystems and Technologies Gm Sven Höfling/Universität Würzburg

17:45 - 18:00 **Monolithically Integrated Resonant Cavity Enhanced Type-II Superlattice Detectors (STh4L.6)**
Presenter: leland Nordin, *The University of Texas at Austin*
Expand for Abstract / Authors

Paper

We demonstrate all-epitaxial resonant cavity-enhanced type-II superlattice detectors (T2SL). Our structures show peak quantum efficiencies of 43-59%, which is a 4.0-6.6x enhancement compared to our control structures and greater than state-of-the-art long-wavelength infrared T2SL detectors.

Authors:leland Nordin/The University of Texas at Austin Abhilasha Kamboj/The University of Texas at Austin Priyanka Petluru/The University of Texas at Austin Narae Yoon/The University of Texas at Austin Dan Wasserman/The University of Texas at Austin

18:00 - 18:15 **(Withdrawn) InP based SWIR dual-band photodetector (STh4L.7)**
Presenter: Baile Chen, *ShanghaiTech University*
Expand for Abstract / Authors

InP based near infrared/extended-short wave infrared dual band photodetector has been demonstrated. The results show the potential for monolithically growing dual band SWIR photodetector on InP substrate.

Authors:Zongheng Xie/ShanghaiTech University Zhuo Deng/ShanghaiTech University Baile Chen/ShanghaiTech University

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18:15 - 18:30 **Ge-on-Si Waveguide Polarization Rotator Operating in the 8-14 μm Atmospheric TransmissionWindow (STh4L.8)**
Presenter: Kevin Gallacher, *University of Glasgow*
Expand for Abstract / Authors

- Paper

An ultra-broadband Ge-on-Si waveguide polarization rotator is experimentally demonstrated with a polarization extinction ratio of ≥ 15 dB over a 2 μm bandwidth (9-11 μm wavelength) with an insertion loss of ≤ 1 dB.

Authors:Kevin Gallacher/University of Glasgow Ross Millar/University of Glasgow Ugne griskeviciute/University of Glasgow Martin Sinclair/University of Glasgow Marc Sorel/University of Glasgow Leonetta baldassarre/Sapienza University of Rome Michele Ortolani/Sapienza University of Rome Richard Soref/University of Massachusetts Boston Douglas Paul/University of Glasgow

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Hot-Carrier Phenomena and Optical Pumping (STh4F)
Presider: Roberto Paiella, *Boston University*

16:30 - 17:00 **Hot carrier optoelectronics with titanium nitride (STh4F.1)**
Presenter: Rupert Oulton, *Imperial College London*
Expand for Abstract / Authors

Paper

Titanium oxynitride enables a range of plasmonic and optoelectronic functionality using long-lived photo-generated hot carriers. We explore the time scale of hot carriers in TiN and their use in photochemical reduction and Schottky detectors.

Authors:Brock Doiron/Imperial College London Nicholas Gusken/Imperial College London Alberto Lauri/Imperial College London Takayuki Matsui/Imperial College London Yi Li/Ludwig Maximillans Universitat Andrei Mihai/Imperial College London Stefano Dal Forno/Imperial College London Sarah Fearn/Imperial College London Ludwig Huettenhofer/Ludwig Maximillans Universitat Emiliano Cortes/Ludwig Maximillans Universitat Ryan Bower/Imperial College London Anna Regoutz/Imperial College London Lesley Cohen/Imperial College London Neil Alford/Imperial College London Johannes Lischner/Imperial College London Peter Petrov/Imperial College London Stefan Maier/Imperial College London Rupert Oulton/Imperial College London

Invited

17:00 - 17:15 **Hot Carrier Cooling and Recombination Dynamics of Chlorine Doped Hybrid Perovskite Single Crystals (STh4F.2)**
Presenter: L Mix, *Los Alamos National Lab*
Expand for Abstract / Authors

Paper

Methyl ammonium lead bromide ($MAPbBr_3$) crystals, possible replacements for silicon in many photonic applications, were probed with transient reflectivity spectroscopy, revealing faster carrier cooling dynamics and slower recombination dynamics with increased chlorine doping.

Authors:L Mix/Los Alamos National Lab Min-Cheol Lee/Los Alamos National Lab Kenneth O'Neal/Los Alamos National Lab Nicholas Sirica/Los Alamos National Lab Jeremy Tisdale/Los Alamos National Lab Dibyajyoti Ghosh/Los Alamos National Lab Amanda Neukirch/Los Alamos National Lab Wanyi Nie/Los Alamos National Lab Rohit Prasankumar/Los Alamos National Lab Dmitry A. Yarotski/Los Alamos National Lab

17:15 - 17:30

Auger Recombination in Strained Mid-Infrared Quantum Wells (STh4F.3)
Presenter: Kenneth Underwood, *University of Colorado at Boulder*
Expand for Abstract / Authors

- Paper

We measure effect of strain on Auger recombination from compositional and applied biaxial stress using time-resolved photoluminescence and pump-probe spectroscopy. Results suggest that straining by composition, but not external stress, can tune the Auger coefficient.

Authors:Kenneth Underwood/University of Colorado at Boulder Andrew Briggs/University of Texas Austin Scott Sifferman/University of Texas Austin Varun Verma/National Institute of Standards and Technology Nicholas Sirica/Los Alamos National Laboratory Rohit Prasankumar/Los Alamos National Laboratory Sae Woo Nam/National Institute of Standards and Technology Kevin Silverman/National Institute of Standards and Technology Seth Bank/University of Texas Austin Juliet Gopinath/University of Colorado at Boulder

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17:30 - 17:45

Spectroscopy, Cooperative Upconversion and Optical Gain in Amorphous $Al_2O_3:Yb^{3+}$ Waveguides on Silicon (STh4F.4)
Presenter: Markus Pollnau, *University of Surrey*
Expand for Abstract / Authors

- Paper

Ridge waveguides in amorphous $Al_2O_3:Yb^{3+}$ are produced by reactive co-sputtering and reactive-ion etching. Their spectroscopic properties, optical gain, and cooperative upconversion are studied and explained based on a model of distinct ion classes.

Authors:Pavel Loiko/KTH-Royal Institute of Technology Laura Agazzi/University of Twente Cristine Kores/KTH-Royal Institute of Technology Meindert Dijkstra/University of Twente Dimitri Geskus/KTH-Royal Institute of Technology Markus Pollnau/University of Surrey

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17:45 - 18:00

Fe:ZnSe Hot-Pressed Ceramic Laser (STh4F.5)
Presenter: Karki Krishna, *UAB*
Expand for Abstract / Authors

- Paper

We report optical characterization of Fe:ZnSe hot-pressed ceramics and demonstrate first room-temperature gain-switched lasing of this new ceramic medium. The maximum output energy was measured to be 0.7 mJ at 3.5% slope efficiency.

Authors:Karki Krishna/UAB Shengquan Yu/Alfred University Vladimir Fedorov/UAB Yiquan Wu/Alfred University Sergey Mirov/UAB

18:00 - 18:15 **Thulium-doped fiber laser mode-locked from nonlinear multimode interference in chalcogenide fiber (STh4F.6)**
Presenter: Kaixuan Zhang, *McGill University*
Expand for Abstract / Authors

Paper

A step-index chalcogenide fiber with multimode interference effect is used to realize an all-fiber saturable absorber with modulation depth of 8.5%. The saturable absorber is used to trigger pulses from a mode-locked fiber laser.

Authors:Kaixuan Zhang/McGill University Martin Rochette/McGill University

18:15 - 18:30 **Tailoring of Effective Refractive Indices: A New Paradigm towards Ultralow Excitation Power of Upconversion Nanoparticles (STh4F.7)**
Presenter: Hung-I Lin, *National Taiwan University*
Expand for Abstract / Authors

Paper

The integration of core-multishell nanostructure with upconversion nanoparticles achieve the ultralow pumping power density of 0.7 W cm^{-2} by continuous-wave infrared laser due to the formation of whispering gallery modes with diverse effective refractive indices.

Authors:Hung-I Lin/National Taiwan University Kanchan Yadav/National Taiwan University Ting-Jia Chang/National Taiwan University Monika Kataria/National Taiwan University Mikhail Shalaginov/Massachusetts Institute of Technology Kun-Ching Shen/National Taiwan University Chun-Che Wang/National Taiwan University Yit-Tsong Chen/National Taiwan University Yang Fang Chen/National Taiwan University

Optofluidics and Flow Cytometry (STh4R)
Presider: Fan Xiong, *Bio-Rad Laboratories, Inc*

16:30 - 17:00 **Single-cell Fourier-transform Light Scattering Analysis by High-throughput Label-free Imaging Flow Cytometry (STh4R.1)**
Presenter: Ziqi Zhang, *the Univeristy of Hong Kong*
Expand for Abstract / Authors

Paper

We report a high-throughput imaging flow cytometer that employs Fourier-transform light-scattering analysis to parametrize high-resolution single-cell morphology, notably subcellular mass-density fractal pattern, as sensitive label-free phenotypes to identify different cell types and states.

Authors:Ziqi Zhang/the Univeristy of Hong Kong Queenie Lai/the Univeristy of Hong Kong Kelvin Lee/the Univeristy of Hong Kong Kenneth Wong/the Univeristy of Hong Kong Kevin Tsia/the Univeristy of Hong Kong

17:00 - 17:30

Repeated Single Cell Cytometry in an Optofluidic Chip (STh4R.2)
Presenter: Gregory Cooksey, *National Institute of Standards and Tech*
Expand for Abstract / Authors

Paper

We have developed an optofluidic device with multiple measurement zones to improve quantification and rare event detection in flow cytometry. We discuss reproducibility (to within 3%) across zones and improvements in measurement uncertainty.

Authors:Gregory Cooksey/National Institute of Standards and Tech

Invited

17:30 - 17:45

Optofluidic Chromatography: A Tunable Plasmonic Microlens for Label-Free On-Flight Sorting of Exosomes (STh4R.3)
Presenter: Xiangchao Zhu, *University of California*
Expand for Abstract / Authors

Paper

Sophisticated instrumentation requirements for optics and microfluidics are fundamental shortcomings of optical chromatography. We introduce a subwavelength-thick 4μm×4μm footprint optofluidic microlens for high-throughput label-free sorting of exosomes by size and chemical composition on-chip.

Authors:Xiangchao Zhu/University of California Ahmet Cicek/University of California Yixiang Liu/University of California Ahmet Yanik/University of California

17:45 - 18:00

RI-Insensitive Surface-enhanced Raman Spectroscopy (SERS) for Label-free Profiling and Classification of Living Cancer Cells (STh4R.4)
Presenter: Wei Zhou, *Virginia Tech*
Expand for Abstract / Authors

Paper

By supporting uniform arrays of hot spots with significant SERS enhancement factors (> 10^7) insensitive to background refractive-index (RI) variations, nanolaminate plasmonic substrates can enable label-free molecular profiling and statistical classification of living cancer cells.

Authors:Wonil Nam/Virginia Tech Xiang Ren/Virginia Tech Seied Tali/Virginia Tech Parham Ghassemi/Virginia Tech Inyoung Kim/Virginia Tech Masoud Agah/Virginia Tech Wei Zhou/Virginia Tech

18:00 - 18:30

Sensitive Flow Cytometry Detection of Phospholipases and Its Inhibitors by Hydrolysis of Spherical Supported Lipid Membranes (STh4R.5)
Presenter: Menake Piyasena, *New Mexico Tech*
Expand for Abstract / Authors

Paper

Phospholipases are membrane lytic enzymes and they have emerged as potential biomarkers as well as therapeutic targets for several diseases. In this talk, we will present a flow cytometry based sensitive detection method of phospholipases.

Authors:Menake Piyasena/New Mexico Tech Shahriare Hossain/New Mexico Tech Kalika Pai/New Mexico Tech Nelum Perera/New Mexico Tech

Invited

Quantum Information Technology (STh4G)

Presider: Hiroki Takahashi, *Okinawa Inst of Science & Technology*

16:30 - 16:45

A Trusted-Node-Free Eight-User Metropolitan Quantum Communication Network (STh4G.1)
Presenter: Siddarth Koduru Joshi, *University of Bristol*
Expand for Abstract / Authors

Paper

Complex quantum networks are vital for quantum technologies. Entanglement based networks are the most versatile in terms of supported applications (including beyond just quantum communication). Here we present an 8 user city wide entanglement network.

Authors:Siddarth Koduru Joshi/University of Bristol Djeylan Aktas/University of Bristol Soeren Wengerowsky/IQOQI-Vienna Martin Loncaric/Rudjer Boskovic Institute Sebastian Philipp Neumann/IQOQI-Vienna Bo Liu/College of Advanced Interdisciplinary Studies, NUDT Thomas Scheidl/IQOQI-Vienna Zeljko Samec/Rudjer Boskovic Institute Laurent Kling/University of Bristol Alex Qiu/University of Bristol Mario Stipcevic/Rudjer Boskovic Institute John Rarity/University of Bristol Rupert Ursin/IQOQI-Vienna

16:45 - 17:00

(Withdrawn) Spectrally Multiplexed Spin Registers for Robust Quantum Networking (STh4G.2)
Presenter: Eric Bersin, *Massachusetts Institute of Technology*
Expand for Abstract / Authors

Spectral multiplexing of solid-state spin qubits offers a pathway towards scalable, high rate quantum networking. We explore two architectures that employ such multiplexing to improve rate, fidelity, and ease of implementation.

Authors:Eric Bersin/Massachusetts Institute of Technology Matthew Trusheim/Massachusetts Institute of Technology Kevin Chen/Massachusetts Institute of Technology Isaac Harris/Massachusetts Institute of Technology Michael Walsh/Massachusetts Institute of Technology Ian Christen/Massachusetts Institute of Technology Dirk Englund/Massachusetts Institute of Technology

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17:00 - 17:15

Single-chip heterodyne characterization of heralded ring resonator photon pair source (STh4G.3)
Presenter: Giacomo Ferranti, *University of Bristol*
Expand for Abstract / Authors

Paper

We perform on-chip heterodyne tomography of the quantum state generated by a heralded microring single photon source. The quantum state is generated and characterized without ever being coupled off-chip.

Authors:Giacomo Ferranti/University of Bristol Francesco Raffaelli/KETS Quantum Security Ltd Dylan Mahler/Xanadu Joel Tasker/University of Bristol Jonathan Frazer/University of Bristol Alberto Santamato/Università di Padova Gary Sinclair/University of Bristol Damien Bonneau/University of Bristol Mark Thompson/University of Bristol Jonathan Matthews/University of Bristol

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17:15 - 17:30

Highly Efficient Broadband Frequency Entangled Photon Pair Sources for Optical Quantum Applications (STh4G.4)
Presenter: Bo Cao, *Kyoto University*
Expand for Abstract / Authors

Paper

We developed highly efficient frequency entangled photon-pair sources using slab type waveguide QPM device for non-collinear emission, as well as ridge type waveg- uide chirp QPM devices for collinear emission with a 150 THz ultra-broadband

Authors:Bo Cao/Kyoto University Kyohei Hayama/Kyoto University Mamoru Hisamitsu/Shimadzu Corporation Katsuhiko Tokuda/Shimadzu Corporation Sunao Kurimura/National Institute for Materials Science (NIMS) Ryo Okamoto/Kyoto University Shigeki Takeuchi/Kyoto University

17:30 - 18:00 **Towards scalable quantum computing with neutral atoms (STh4G.5)**
Presenter: Jonathan Pritchard, *University of Strathclyde*
Expand for Abstract / Authors

Paper

We present progress towards scalable quantum computing with neutral atoms excited to Rydberg states, including recent results of two-qubit gates and design of a hybrid quantum interface between neutral atoms and superconducting circuits.

Authors:Jonathan Pritchard/University of Strathclyde

Invited

18:00 - 18:15 **Space-variant holographic imaging for 3D Rydberg quantum simulators (STh4G.6)**
Presenter: Haeun Sun, *KAIST*
Expand for Abstract / Authors

Paper

As a scalable and time-efficient means to measure the state of Rydberg-atom quantum simulators, we propose space-variant holographic imaging of three-dimensional single-atom structures. Wave-front shaping in quasi-image planes allows simultaneous and fast quantum-state detections.

Authors:Haeun Sun/KAIST Yunheung Song/KAIST Jaewook Ahn/KAIST

18:15 - 18:30 **Diffractive chips for magneto-optical trapping of two atomic species (STh4G.7)**
Presenter: ZHAONING YU, *University of Wisconsin - Madison*
Expand for Abstract / Authors

Paper

We investigate diffractive grating chips that can be used as part of a magneto-optical trap (MOT) to trap both Rb and Cs atoms with a single input beam for each atom species.

Authors:ZHAONING YU/University of Wisconsin - Madison Garrett Hickman/University of Wisconsin - Madison Mark Saffman/University of Wisconsin - Madison Mikhail Kats/University of Wisconsin - Madison

High Power Fiber Lasers (STh4P)

Presider: Raja Ahmad, *OFS Laboratories*

16:30 - 16:45	**Modified stochastic gradient algorithms for controlling coherent pulse stacking (STh4P.1)** **Presenter**: Abulikemu Abuduweili, *Peking University* Expand for Abstract / Authors We demonstrate the modified stochastic gradient descent algorithms with incorporating exponential moving average filtering to control delay lines in coherent pulse stacking. **Authors**:Abulikemu Abuduweili/Peking University Bowei Yang/Peking University Zhigang Zhang/Peking University	Paper
16:45 - 17:00	**Yb-doped Large Mode Area Multicore Fiber Laser with a Fs-inscribed Fiber Bragg Grating (STh4P.2)** **Presenter**: Yair Alon, *Ben-Gurion University of the Negev* Expand for Abstract / Authors We inscribe a fiber Bragg grating in an Yb-doped multicore LMA fiber, and demonstrate efficient lasing with it in a fiber laser configuration. We obtain 51.8W output power with a 72% slope efficiency. **Authors**:Yair Alon/Ben-Gurion University of the Negev Aviran Halstuch/Ben-Gurion University of the Negev Raghuraman Sidharthan/Nanyang Technological University Seongwoo Yoo/Nanyang Technological University Amiel Ishaaya/Ben-Gurion University of the Negev	Paper
17:00 - 17:15	**Programmable Orbital Angular Momentum beam generated from a 61 channels Coherent Beam Combining femtosecond laser (STh4P.3)** **Presenter**: Matthieu Veinhard, *XCAN, Ecole Polytechnique, Institut Polytechnique de Paris,* Expand for Abstract / Authors A 61 beamlets Coherent Beam Combination femtosecond laser is used as a programmable phase source to generate high power Orbital Angular Momentum beams and open the path for higher order non-symmetrical user-defined far field distributions **Authors**:Matthieu Veinhard/XCAN, Ecole Polytechnique, Institut Polytechnique de Paris, Séverine Bellanger/XCAN, Ecole Polytechnique, Institut Polytechnique de Paris, Louis Daniault/LOA, ENSTA, Institut Polytechnique de Paris Ihsan Fsaifes/XCAN, Ecole Polytechnique, Institut Polytechnique de Paris, Jean-Christophe Chanteloup/XCAN, Ecole Polytechnique, Institut Polytechnique de Paris,	Paper

17:15 - 17:30

New Approach to Beam Diagnostics for High-Power Fiber Lasers (STh4P.4)
Presenter: Shamus McNamara, *University of Louisville*
Expand for Abstract / Authors

Paper

The average propagating power in an optical fiber can be derived from the forward and backward Mie scattered light intensities, and the mode structure can be derived from the interference pattern near the fiber.

Authors:Arianna McNamara/University of Louisville Shamus McNamara/University of Louisville John Jones/Wright Patterson Air Force Base Frank Hopkins/Wright Patterson Air Force Base

17:30 - 17:45

High-power core-pumped quasi 4 kW Raman fiber lasers (STh4P.5)
Presenter: Zehui Wang, *Tsinghua University*
Expand for Abstract / Authors

Paper

High-power core-pumped Raman fiber lasers are researched theoretically and experimentally. We built multi-frequency model to simulate the power and spectrum of Raman laser. We also established quasi 4-kW Raman fiber laser at 1124 nm.

Authors:Zehui Wang/Tsinghua University Tiancheng Qi/Tsinghua University Yusheng Huang/Tsinghua University Jiading Tian/Tsinghua University Ping Yan/Tsinghua University Qirong Xiao/Tsinghua University Mali Gong/Tsinghua University

17:45 - 18:00

Eliminating photodarkening effect by H_2-loading in high power Yb-doped fiber amplifiers (STh4P.6)
Presenter: Rui-ting Cao, *Huazhong Univ of Science and Technology*
Expand for Abstract / Authors

Paper

The radical elimination of photodarkening effect by H_2-loading was demonstrated, and the output power was stable during long term operation in high power fiber amplifiers, without mode instability and photodarkening-induced core laser leakage.

Authors:Rui-ting Cao/Huazhong Univ of Science and Technology Gui Chen/Huazhong Univ of Science and Technology Jinyan Li/Huazhong Univ of Science and Technology

18:00 - 18:15

Development of Tm:Ho Co-doped Silica Fiber for High-power Operation at 2.1μm (STh4P.7)
Presenter: Martin Nunez Velazquez, *University of Southampton*
Expand for Abstract / Authors

Paper

We present Tm:Ho co-doped fibers with different thulium concentrations and Tm:Ho ratios for 2.1μm laser operation. Laser efficiency of 56% was achieved with 5.5wt% of thulium and 10:1 ratio of Tm:Ho when diode-pumped at 793nm.

Authors:Martin Nunez Velazquez/University of Southampton Norberto Ramirez-Martinez/University of Southampton Jayanta Sahu/University of Southampton

Quantum Optomechanics and Transduction (FTh4D)

Presider: Yizhong Huang, *The University of Chicago*

16:30 - 16:45

Piezoelectric Optomechanics in the Quantum Regime (FTh4D.1)

Presenter: Moritz Forsch, *TU Delft*

Expand for Abstract / Authors

We show a 1D optomechanical crystal fabricated from gallium phosphide.
We operate this device in the quantum ground state of motion and observe non-classical correlations between photons and phonons using a DLCZ scheme.

Authors:Moritz Forsch/TU Delft Robert Stockill/TU Delft Grégoire Beaudoin/CNRS, Université Paris-Sud, Université Paris-Saclay, C2N Isabelle Sagnes/CNRS, Université Paris-Sud, Université Paris-Saclay, C2N Konstantinos Pantzas/CNRS, Université Paris-Sud, Université Paris-Saclay, C2N Rémy Braive/CNRS, Université Paris-Sud, Université Paris-Saclay, C2N Simon Gröblacher/TU Delft

Paper

16:45 - 17:00

Versatile Alligator Nanostructures for Quantum Networks with Solid-State Emitters (FTh4D.2)

Presenter: Kevin Chen, *Massachusetts Institute of Technology*

Expand for Abstract / Authors

We report design and fabrication of novel alligator nanostructures as both a high-Q photonic crystal cavity that helps preserve NV centers' optical coherence and a polarization-selective mirror for high-fidelity quantum state transfer.

Authors:Kevin Chen/Massachusetts Institute of Technology Eric Bersin/Massachusetts Institute of Technology Michael Walsh/Massachusetts Institute of Technology Sara Mouradian/University of California, Berkeley Dirk Englund/Massachusetts Institute of Technology

Paper

17:00 - 17:30

Mechanically Mediated Entanglement of Propagating Optical Modes (FTh4D.3)

Presenter: Junxin Chen, *University of Copenhagen*

Expand for Abstract / Authors

We demonstrate stationary entanglement between two non-degenerate propagating optical modes, via interaction with the same soft-clamped mechanical mode. We detect, without any corrections, correlations corresponding to a logarithmic negativity of 0.35.

Authors:Junxin Chen/University of Copenhagen Massimiliano Rossi/University of Copenhagen David Mason/University of Copenhagen Albert Schliesser/University of Copenhagen

Paper

17:30 - 17:45	**A quantum plasmonic launcher for integrated ultrafast single-photon sources (FTh4D.4)** **Presenter**: Simeon Bogdanov, *Purdue University* Expand for Abstract / Authors We demonstrate a quantum plasmonic launcher – a metal-based chip-compatible nanostructure featuring near-THz emission rates. Nanodiamonds with single NV centers are sandwiched between two silver films coupling about half of the emission into in-plane surface plasmons. **Authors**:Chin-Cheng Chiang/Purdue University Simeon Bogdanov/Purdue University Oksana Makarova/Purdue University Xiaohui Xu/Purdue University Soham Saha/Purdue University Deesha Shah/Purdue University Di Wang/Purdue University Alexei Lagoutchev/Purdue University Alexander Kildishev/Purdue University Alexandra Boltasseva/Purdue University Vladimir Shalaev/Purdue University	Paper
17:45 - 18:00	**Toward Efficient Microwave-Optical Transduction using Cavity Electro-Optics in Thin-Film Lithium Niobate (FTh4D.5)** **Presenter**: Jeffrey Holzgrafe, *Harvard University* Expand for Abstract / Authors We describe progress toward high-efficiency transduction between microwave and optical radiation using integrated thin-film superconducting microwave resonators and lithium niobate optical resonators. **Authors**:Jeffrey Holzgrafe/Harvard University Neil Sinclair/Harvard University Di Zhu/Harvard University Amirhassan Shams-Ansari/Harvard University Marco Colangelo/Massachusetts Institute of Technology Yaowen Hu/Harvard University Mian Zhang/Hyperlight Corporation Karl Berggren/Massachusetts Institute of Technology Marko Loncar/Harvard University	Paper
18:00 - 18:15	**Surface Acoustic Wave Cavities and InAs Quantum Dots For Quantum Transduction (FTh4D.6)** **Presenter**: Travis Autry, *NIST* Expand for Abstract / Authors We demonstrate progress in developing a new microwave-optical quantum transducer. We demonstrate focusing and stable surface acoustic wave cavities at 3.4 GHz and characterize the acoustic performance. **Authors**:Travis Autry/NIST Samuel Berweger/NIST Lucas Sletten/JILA / University of Colorado Richard Mirin/NIST Pavel Kabos/NIST Konrad Lehnert/JILA / University of Colorado Kevin Silverman/NIST	Paper

18:15 - 18:30

Wave-Particle Duality Controlled by Single-Photon Self-Entanglement (FTh4D.7)
Presenter: Xiao-Feng Qian, *Stevens Institute of Technology*
Expand for Abstract / Authors

Paper

We experimentally observe that quantum duality of a single photon is controlled by its self-entanglement through a three-way quantum coherence identity $V^2+D^2+C^2=1$. Here V, D, C represent waveness, particleness, and self-entanglement respectively.

Authors:Xiao-Feng Qian/Stevens Institute of Technology Kumarasiri Konthasinghe/University of Rochester Sreenath Manikandan/University of Rochester David Spiecker/University of Rochester Nickolas Vamivakas/University of Rochester Joseph Eberly/University of Rochester

Material Fabrication for Optical Biosensors (ATh4K)

Presider: Samantha McBirney, *University of Southern California*

16:30 - 16:45

Large-Area Silver Nanodimple Arrays for Ultrasensitive Molecular Beacon-Based DNA Sensing (ATh4K.1)
Presenter: Ye Liu, *Oregon State University*
Expand for Abstract / Authors

Paper

We report a large-area nanoplasmonic device fabricated by nanosphere lithography for enhanced molecular beacon-based biosensing. The device enabled 20-fold fluorescence enhancement that led to ultrasensitive DNA sensing with the detection limit of 10 fM.

Authors:Yi-Chieh Wang/Oregon State University Ye Liu/Oregon State University Ekembu Tanyi/Oregon State University Bo Wu/Oregon State University Li-Jing Cheng/Oregon State University

16:45 - 17:00

Sensitizing an all-optical ultrasound sensor with a polymer overlayer (ATh4K.2)
Presenter: Eric Zhu, *University of Toronto*
Expand for Abstract / Authors

Paper

We exploit the refractive-index (RI)-sensing capabilities of a photonic crystal slab (PCS) and the photoelastic effect in a polymer overlayer to measure ultrasonic signals in water. Using a TM resonance in the PCS device, we obtain an acoustic sensitivity of 4.4$\times10^{-2}$ nm/MPa.

Authors:Eric Zhu/University of Toronto Maria Charles/University of Toronto Cory Rewcastle/University of Toronto Raanan Gad/University of Toronto Li Qian/University of Toronto Ofer Levi/University of Toronto

17:00 - 17:30 **(Withdrawn) Femtosecond Laser Induced Hydrophilicity Change in Hydrophobic and Hydrophilic Acrylic Polymer Materials (ATh4K.3)**
Presenter: Ruth Sahler, *Perfect Lens*
Expand for Abstract / Authors

A 2D scan system in combination with modulated femtosecond laser pulses are used to precisely modify the hydrophilicity of an acrylic polymer to create a phase wrapped gradient lens inside the material.

Authors:Ruth Sahler/Perfect Lens

Invited

17:30 - 17:45 **BioBots: 3D-printed microrobots manipulated by light as potential biomedical "surgeons" (ATh4K.4)**
Presenter: Einstom Engay, *Technical University of Denmark*
Expand for Abstract / Authors

Paper

Microrobots with spherical handles for optical trapping and additional features for biological applications are fabricated by direct laser writing. Surface functionalization, combined with wavefront correction algorithms, shows promise for improved microrobot manipulation in biological fluids.

Authors:Ada-Ioana Bunea/Technical University of Denmark Einstom Engay/Technical University of Denmark Alexandre Emmanuel Wetzel/Technical University of Denmark Rafael Taboryski/Technical University of Denmark

17:45 - 18:00 **Microbubble-Assisted Preconcentration and Ultrasensitive Detection of Biomolecules Using Plasmonic Chiral Metamaterials (ATh4K.5)**
Presenter: Yaoran Liu, *The University of Texas at Austin*
Expand for Abstract / Authors

Paper

We demonstrate microbubble-assisted preconcentration of biomolecules on plasmonic moiré chiral metamaterials, enabling enantiodiscrimination of L-glucose and D-glucose at picomolar level, which is 10^7 times improvement in sensitivity.

Authors:Yaoran Liu/The University of Texas at Austin Zilong Wu/The University of Texas at Austin Richard Montellano/UT Health San Antonio Kumar Sharma/UT Health San Antonio Yuebing Zheng/The University of Texas at Austin

18:00 - 18:15

(Withdrawn) Bubble Printing of Nanocomposites with Aligned Carbon Nanotubes for Wearable Devices (ATh4K.6)
Presenter: Jimi Wang, *The University of Texas at Austin*
Expand for Abstract / Authors

We exploit opto-thermo-dynamics at laser-induced microbubbles to pattern nanocomposites with the well-controlled alignment of dispersed nanostructures for wearable medical sensors.

Authors:Jimi Wang/The University of Texas at Austin Yuebing Zheng/The University of Texas at Austin

18:15 - 18:30

Photopatternable Carbon Dot-Embedded Hydrogels for Sensitive pH Detection (ATh4K.7)
Presenter: Ye Liu, *Oregon State University*
Expand for Abstract / Authors

We report photopatternable pH sensors using carbon dot-copolymerized hydrogels that exhibit a large emission intensity change in response to a transition across pH 7. The device enables the monitoring of biochemical conditions in microfluidic platforms.

Authors:Ye Liu/Oregon State University Bo Wu/Oregon State University Ekembu Tanyi/Oregon State University Li-Jing Cheng/Oregon State University

Paper

Frequency Comb Generation (STh4E)

Presider: Yuji Zhao, *Arizona State University*

16:30 - 17:00

Ring Laser Frequency Combs Enabled by Phase Turbulence and Their Connection to Kerr Combs (STh4E.1)
Presenter: Marco Piccardo, *Harvard University*
Expand for Abstract / Authors

We demonstrate that ring lasers can attain multimode operation at a very low pumping level, contrary to common belief. The instability is explained via the Ginzburg-Landau theory, establishing a connection between laser and microresonator combs.

Authors:Marco Piccardo/Harvard University Benedikt Schwarz/Harvard University Dmitry Kazakov/Harvard University Maximilian Beiser/TU Wien Nikola Opacak/TU Wien Yongrui Wang/Texas A&M Shantanu Jha/Harvard University Johannes Hillbrand/TU Wien Michele Tamagnone/Harvard University Wei Ting Chen/Harvard University Alex Zhu/Harvard University Lorenzo Columbo/Politecnico di Torino Alexey Belyanin/Texas A&M Federico Capasso/Harvard University

Paper

17:00 - 17:15 **Mid-Infrared Frequency Comb from a Ring Quantum Cascade Laser (STh4E.2)**
Presenter: Bo Meng, *ETH Zurich*
Expand for Abstract / Authors

Paper

We report a mid-infrared quantum cascade laser frequency comb based on a ring cavity showing a predominantly sech^2 profile. The reconstructed intensity shows a bright pulse waveform in the time domain.

Authors:Bo Meng/ETH Zurich Matthew Singleton/ETH Zurich Mehran Shahmohammadi/ETH Zurich Filippos Kapsalidis/ETH Zurich ruijun wang/ETH Zurich Mattias Beck/ETH Zurich Jérôme Faist/ETH Zurich

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17:15 - 17:30 **Quantum Well Laser Diode Frequency Comb in the 2 µm Region (STh4E.3)**
Presenter: Lukasz Sterczewski, *NASA Jet Propulsion Laboratory*
Expand for Abstract / Authors

Paper

We present the first semiconductor laser frequency comb in the 2 µm region. The source relies of an inherent gain nonlinearity in a quantum well laser diode, which promotes frequency-modulated operation with sub-THz spectral coverage.

Authors:Lukasz Sterczewski/NASA Jet Propulsion Laboratory Clifford Frez/NASA Jet Propulsion Laboratory Siamak Forouhar/NASA Jet Propulsion Laboratory David Burghoff/University of Notre Dame Mahmood Bagheri/NASA Jet Propulsion Laboratory

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17:30 - 17:45 **High performance quantum cascade laser frequency combs at λ ~ 6 µm (STh4E.4)**
Presenter: Sargis Hokobyan, *Alpes Lasers*
Expand for Abstract / Authors

Paper

We present efficient quantum cascade laser frequency combs at 6 µm, operating from -20°C to 50°C, with a maximum total output power of 520 mW. The dispersion of the waveguide is carefully engineered with the help of plasmonic-waveguide method to achieve efficient comb operation.

Authors:Sargis Hokobyan/Alpes Lasers Richard Maulini/Alpes Lasers Stéphane Blaser/Alpes Lasers Tobias Gresch/Alpes Lasers Yan Francescato/Alpes Lasers Antoine Muller/Alpes Lasers Pitt Allmendinger/IRsweep Markus Mangold/IRsweep Pierre Jouy/IRsweep Andreas Hugi/IRsweep

17:45 - 18:00 **(Withdrawn) Quantum Cascade Laser (QCL) at ~ 6 um for Frequency Comb applications (STh4E.5)**
Presenter: Xiaojun Wang, *adtech photonics, Inc.*
Expand for Abstract / Authors

With dispersion engineering through Plasmon-enhanced waveguide and broad gain profile, a QCL fabricated at ~1650cm-1, had been performed as frequency combs, generating narrow multi-heterodyne beat lines corresponding to optical spectrum coverage more than 70cm-1.

Authors:Xiaojun Wang/adtech photonics, Inc.

18:00 - 18:15 **(Withdrawn) Upconversion sampling of mid-infrared quantum cascade laser frequency combs (STh4E.6)**
Presenter: Philipp Täschler, *ETH*
Expand for Abstract / Authors

We report on an indirect measurement of the instantaneous intensity of a mid-infrared quantum cascade laser (QCL) frequency comb using sum frequency generation. The intensity profile is reconstructed using a coherent sampling technique.

Authors:Philipp Täschler/ETH Filippos Kapsalidis/ETH Matthew Singleton/ETH Jérôme Faist/ETH Mattias Beck/ETH

18:15 - 18:30 **(Withdrawn) RF-modulation of quantum cascade laser frequency combs with a co-planar waveguide geometry (STh4E.7)**
Presenter: Filippos Kapsalidis, *ETH Zurich, Institute of Quantum Electro*
Expand for Abstract / Authors

In this work, a novel design for a quantum cascade laser frequency comb is presented. The design is based on a highly doped substrate, combined with a coplanar-like waveguide structure that enhances the RF-domain properties and response of the device.

Authors:Filippos Kapsalidis/ETH Zurich, Institute of Quantum Electro Barbara Schneider/ETH Zurich, Institute of Quantum Electro Matthew Singleton/ETH Zurich, Institute of Quantum Electro Mattias Beck/ETH Zurich, Institute of Quantum Electro Jérôme Faist/ETH Zurich, Institute of Quantum Electro

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20:00 - 22:00 (UTC - 07:00)

Joint Postdeadline Paper Session I (JTh4A)
Presider: Rohit Prasankumar, *Los Alamos National Laboratory*

20:00 - 20:15	**Multi-color Three-photon Fluorescence Imaging Deep in Mouse Brain with Enhanced Cross Section (JTh4A.1)** **Presenter**: Yusaku Hontani, *Cornell University* Expand for Abstract / Authors We demonstrate that excitation to a higher-energy excited state enables three-photon fluorescence signal enhancement in Texas Red. Moreover, we show multi-color three-photon fluorescence images and Ca^{2+} activity recording deep in mouse brain with single-wavelength excitation. **Authors**:Yusaku Hontani/Cornell University Fei Xia/Cornell University Chris Xu/Cornell University	Paper
20:15 - 20:30	**Laser Inscribed $Fe:LiNbO_3$ Photorefractive Waveguides (JTh4A.2)** **Presenter**: Michael Coco, *Air Force Research Laboratory* Expand for Abstract / Authors We utilize ultra-fast laser inscription to fabricate photorefractive type III waveguides in $Fe:LiNbO_3$ along the crystal c-axis. We demonstrate the ability to write transmission and reflection gratings into these waveguides with losses of 2.5 dB cm^{-1} and 48 dB cm^{-1} respectively. **Authors**:Michael Coco/Air Force Research Laboratory Sean McDaniel/Air Force Research Laboratory Gary Cook/Air Force Research Laboratory	Paper
20:30 - 20:45	**8192-Element Optical Phased Array with 100° Steering Range and Flip-Chip CMOS (JTh4A.3)** **Presenter**: Chris Poulton, *Analog Photonics* Expand for Abstract / Authors We present an optical phased array with a record 8192 individually-addressed elements driven by flip-chip CMOS spanning a 100°×17° field of view. The reticle-sized PIC+CMOS beam steering engine enables near cm-scale apertures for long-range applications. **Authors**:Chris Poulton/Analog Photonics Matthew Byrd/Analog Photonics Benjamin Moss/Analog Photonics Erman Timurdogan/Analog Photonics Ron Millman/Analog Photonics Michael Watts/Analog Photonics	Paper

20:45 - 21:00

Electrically-driven Acousto-optic Modulators in Silicon Photonics (JTh4A.4)
Presenter: Eric Kittlaus, *Jet Propulsion Laboratory*
Expand for Abstract / Authors

Paper

We report integrated, electrically-driven acousto-optic modulators in silicon photonics. Electromechanical transducers in piezoelectric aluminium nitride are harnessed to enable nonlocal phase modulation and non-reciprocal single-sideband modulation in silicon-on-insulator waveguides from 1-5 GHz.

Authors:Eric Kittlaus/Jet Propulsion Laboratory William Jones/Jet Propulsion Laboratory Peter Rakich/Yale University Nils Otterstrom/Yale University Richard Muller/Jet Propulsion Laboratory Mina Rais-Zadeh/Jet Propulsion Laboratory

21:00 - 21:15

Widely Tunable, Narrow Linewidth Quantum Dot Lasers Heterogeneously Integrated on Silicon (JTh4A.5)
Presenter: Joel Guo, *University of California Santa Barbara*
Expand for Abstract / Authors

Paper

We demonstrate widely tunable, narrow linewidth, heterogeneous QD lasers utilizing Vernier ring resonators, setting a record for integrated lasers in the O-band with 47 nm tuning range, 52 dB SMSR, and 9.5 kHz Lorentzian linewidth.

Authors:Joel Guo/University of California Santa Barbara Aditya Malik/University of California Santa Barbara Minh Tran/University of California Santa Barbara Geza Kurczveil/Hewlett Packard Labs Di Liang/Hewlett Packard Labs John Bowers/University of California Santa Barbara

21:15 - 21:30

Heterogeneous Gallium-Arsenide Lasers on Silicon-Nitride (JTh4A.6)
Presenter: Tin Komljenovic, *Nexus Photonics*
Expand for Abstract / Authors

Paper

We demonstrate heterogeneously integrated gallium arsenide (GaAs) on silicon nitride (SiN) lasers using wafer-scale integration operating at a wavelength below Si bandgap with high uniformity enabled by advanced lithography and optimized fabrication.

Authors:Hyundai Park/Nexus Photonics Chong Zhang/Nexus Photonics Minh Tran/Nexus Photonics Tin Komljenovic/Nexus Photonics

21:30 - 21:45	**Single Dark-Pulse Kerr Comb Supporting 1.84 Pbit/s Transmission over 37-Core Fiber (JTh4A.7)** **Presenter**: Asbjørn Jørgensen, *University of Copenhagen* Expand for Abstract / Authors We show that a single dark-pulse Kerr comb can generate high enough OSNR to carry 1.84 Pbit/s data, achieved by 223 WDM spectral lines modulated with 32-Gbaud, SNR-adapted probabilistically shaped DP-QAM, over a 37-core fiber **Authors**:Deming Kong/Technical University of Denmark Asbjørn Jørgensen/University of Copenhagen Martin Henriksen/University of Copenhagen Frederik Klejs/Technical University of Denmark Zhichao Ye/Chalmers University of Technology Óskar Helgason/Chalmers University of Technology Henrik Hansen/Technical University of Denmark Hao Hu/Technical University of Denmark Metodi Yankov/Technical University of Denmark Søren Forchhammer/Technical University of Denmark Peter Andrekson/Chalmers University of Technology Anders Larsson/Chalmers University of Technology Magnus Karlsson/Chalmers University of Technology Jochen Schröder/Chalmers University of Technology Yusuke Sasaki/Fujikura Ltd. Kazuhiko Aikawa/Fujikura Ltd. Jan Thomsen/University of Copenhagen Toshio Morioka/Technical University of Denmark Michael Galili/Technical University of Denmark Victor Company/Chalmers University of Technology Leif K. Oxenløwe/Technical University of Denmark	Paper
21:45 - 22:00	**High-resolution dual-comb gas-phase spectroscopy with a mode-locked laser on a photonic chip (JTh4A.8)** **Presenter**: Zaijun Chen, *Max-Planck Institute of Quantum Optics* Expand for Abstract / Authors An integrated III-V-on-silicon mode-locked laser enables the first on-chip comb generator of 1.0-GHz line-spacing for direct interrogation of gas-phase narrow rovibrational transitions in molecules. Its flat-top spectrum empowers real-time multiplexed spectroscopy without any scanning elements. **Authors**:Zaijun Chen/Max-Planck Institute of Quantum Optics Kasper Van Gasse/Ghent University - imec Edoardo Vicentini/Max-Planck Institute of Quantum Optics JEONG HYUN HUH/Max-Planck Institute of Quantum Optics Stijn Poelman/Ghent University - imec Zhechao Wang/Ghent University - imec Gunther Roelkens/Ghent University - imec Theodor Haensch/Max-Planck Institute of Quantum Optics Bart Kuyken/Ghent University - imec Nathalie Picqué/Max-Planck Institute of Quantum Optics	Paper

Joint Postdeadline Paper Session II (JTh4B)

Presider: Mercedeh Khajavikhan, *University of Southern California*

20:00 - 20:15	**Generation of pure-sextic, -octic and -decic Kerr solitons (JTh4B.1)** **Presenter**: Antoine Runge, *University of Sydney* Expand for Abstract / Authors We report the experimental discovery of new classes of solitons arising from Kerr nonlinearity and negative sixth-; eighth-; and tenth-order dispersion. These pulses demonstrate the use of high-order dispersion for unlocking innovations in nonlinear optics. **Authors**:Antoine Runge/University of Sydney Y. Qiang/University of Sydney Tristram Alexander/University of Sydney Darren Hudson/CACI-Photonics Solutions Andrea Blanco-Redondo/Nokia Bell Labs C. de Sterke/University of Sydney	Paper
20:15 - 20:30	**Helicity-Dependent Coherent Spin-Phonon Oscillations in the Ferromagnetic van der Waals Crystal CrI_3 (JTh4B.2)** **Presenter**: Prashant Padmanabhan, *Los Alamos National Laboratory* Expand for Abstract / Authors We demonstrate a significant pump helicity dependence in the amplitude of coherent Raman active phonon oscillations in the van der Waals magnet CrI_3, revealing a strong non-equilibrium coupling between spin and structural order. **Authors**:Prashant Padmanabhan/Los Alamos National Laboratory Kevin Kwock/Columbia University Luis Martinez/The University of Texas at El Paso Roxanne Tutchton/Los Alamos National Laboratory Finn Buessen/University of Toronto Samuel Gilinsky/Los Alamos National Laboratory Min-Cheol Lee/Los Alamos National Laboratory Jian-Xin Zhu/Los Alamos National Laboratory Arun Paramekanti/University of Toronto Michael McGuire/Oak Ridge National Laboratory Dmitry A. Yarotski/Los Alamos National Laboratory Srinivasa Singamaneni/The University of Texas at El Paso Rohit Prasankumar/Los Alamos National Laboratory	Paper
20:30 - 20:45	**Relaxing Symmetry Rules for Nonlinear Optical Interactions via Strong-Coupling in Bulk Transition Metal Dichalcogenides (JTh4B.3)** **Presenter**: Rezlind Bushati, *City University of New York* Expand for Abstract / Authors We report enhanced second harmonic generation (SHG) from centrosymmetric bulk WSe_2. This enhancement arises due to pumping in resonance with the Exciton-Polariton modes formed in self-hybridized bulk WSe_2. **Authors**:Rezlind Bushati/City University of New York Mandeep Khatoniar/City University of New York Vinod Menon/City University of New York	Paper

20:45 - 21:00	**Demonstration of Ultra-small MIR Acoustic-graphene-plasmon Cavities Based on Magnetic Resonators (JTh4B.4)** **Presenter**: Itai Epstein, *ICFO – The Institute of Photonic Science* Expand for Abstract / Authors We demonstrate efficient far-field excitation of highly-confined, nano-scale, single acoustic-graphene-plasmons cavities, by graphene-based magnetic-resonators, which confine MIR light to record-breaking ultrasmall mode-volumes that are ~5x10^{10} times smaller than their free-space volume. **Authors**:Itai Epstein/ICFO – The Institute of Photonic Science David Alcaraz Iranzo/ICFO – The Institute of Photonic Science Zhiqin Huang/Duke University Varun Pusapati/ICFO – The Institute of Photonic Science jean-paul hugonin/institut de optique Avinash Kumar/ICFO – The Institute of Photonic Science Xander Deputy/Duke University Tymofiy Khodkov/ICFO – The Institute of Photonic Science Tatiana Rappoport,/Universidade do Minho Nuno Peres/Universidade do Minho David Smith/Duke University Frank Koppens/ICFO – The Institute of Photonic Science	Paper
21:00 - 21:15	**(Withdrawn) Design and fabrication of the vacuum ultraviolet nonlinear metasurfaces (JTh4B.5)** **Presenter**: Din Ping Tsai, *Hong Kong Polytechnic University* Expand for Abstract / Authors The approaches for design, fabrication, and measurement of the novel ultracompact nonlinear metasurface device for generation and manipulation of the coherent vacuum ultraviolet (VUV) light will be shown and discussed. **Authors**:Din Ping Tsai/Hong Kong Polytechnic University Ming Lun Tseng/National Taiwan University Michael Semmlinger/Rice University Jiang Yang/Rice University Ming Zhang/Rice University Chao Zhang/Rice University Peter Nordlander/Rice University Naomi J. Halas/Rice University	
21:15 - 21:30	**Overcoming Detection Losses in a Supersensitive Interferometer with Coherent and Squeezed Vacuum Inputs (JTh4B.6)** **Presenter**: Gaetano Frascella, *Max-Planck-Inst. Physik des Lichts* Expand for Abstract / Authors We report phase sensitivity overcoming the shot-noise limit by 3 dB for a squeezing-assisted interferometer with 50% detection losses. The performance is tolerant to losses up to 87% because of an optical parametric amplifier at the output. **Authors**:Gaetano Frascella/Max-Planck-Inst. Physik des Lichts Sascha Agne/Max-Planck-Inst. Physik des Lichts Farid Khalili/Russian Quantum Center Maria Chekhova/Max-Planck-Inst. Physik des Lichts	Paper

21:30 - 21:45 **Record-Bandwidth, Spectrally Incoherent UV Laser Pulses (JTh4B.7)**
Presenter: Christophe Dorrer, *Laboratory for Laser Energetics*
Expand for Abstract / Authors

Paper

A novel scheme for frequency upconversion of nanosecond optical pulses is proposed and demonstrated, yielding more than 10× bandwidth improvement and enabling the generation of broadband spectrally incoherent pulses in the ultraviolet.

Authors:Christophe Dorrer/Laboratory for Laser Energetics Elizabeth Hill/Laboratory for Laser Energetics Ted Borger/Laboratory for Laser Energetics

21:45 - 22:00 **Controllable Generation of Structured Light Beams in a Few-mode Fiber MOPA (JTh4B.8)**
Presenter: Di Lin, *Optoelectronics Research Centre, University of Southampton*
Expand for Abstract / Authors

Paper

We experimentally demonstrate the selective amplification of structured light beams with >10W of output power for ~150 picosecond pulses in a few-mode Yb-doped large mode area fiber based Master Oscillator Power Amplifier (MOPA).

Authors:Di Lin/Optoelectronics Research Centre, University of Southampton Joel Carpenter/University of Queensland Yutong Feng/Optoelectronics Research Centre, University of Southampton Yongmin Jung/Optoelectronics Research Centre, University of Southampton Shaiful ALAM/Optoelectronics Research Centre, University of Southampton David Richardson/Optoelectronics Research Centre, University of Southampton

Friday, 15 May

All Times are Pacific Time (US & Canada) (UTC - 07:00)

8:00 - 9:00 (UTC - 07:00)

Communication Subsystems (SF1L)

Presider: Francesco Da Ros, *DTU Fotonik*

8:00 - 8:15

Optic-Electronic-Optic Interferometer: A First Experimental Demonstration (SF1L.1)
Presenter: Md Salek Mahmud, *Karlsruhe Institute of Technology*
Expand for Abstract / Authors

Paper

We demonstrate an interferometer that is opaque in one arm, where the optical signal is coherently detected, processed, and remodulated. In case of constructive interference, stable operation is shown for 5 Gbit/s OOK signaling.

Authors:Md Salek Mahmud/Karlsruhe Institute of Technology Juned Nassir Kemal/Karlsruhe Institute of Technology Md Mosaddek Hossain Adib/Karlsruhe Institute of Technology Christoph Füllner/Karlsruhe Institute of Technology Alexander Schindler/Technische Universität Berlin Patrick Runge/Fraunhofer Heinrich Hertz Institut Martin Schell/Technische Universität Berlin Wolfgang Freude/Karlsruhe Institute of Technology Christian Koos/Karlsruhe Institute of Technology Sebastian Randel/Karlsruhe Institute of Technology

8:15 - 8:30

An All-Optical Wavelength-Selective O-band Chip-Scale Silicon Photonic Switch (SF1L.2)
Presenter: Takako Hirokawa, *University of California Santa Barbara*
Expand for Abstract / Authors

Paper

The first chip-scale wavelength-selective silicon photonic switch in the O-band is demonstrated. We describe the design and report results from the crossbar switch, which utilizes three pairs of microring resonators per crossing for wavelength selectivity.

Authors:Takako Hirokawa/University of California Santa Barbara Andrew Netherton/University of California Santa Barbara Mitra Saeidi/University of California Santa Barbara Luke Theogarajan/University of California Santa Barbara John Bowers/University of California Santa Barbara Adel Saleh/University of California Santa Barbara Clint Schow/University of California Santa Barbara

8:30 - 8:45 **Silicon Photonic 2.5D Integrated Multi-Chip Module Receiver (SF1L.3)**
Presenter: Nathan Abrams, *Columbia University*
Expand for Abstract / Authors

Paper

We demonstrate the first 2.5D integrated, wavelength division multiplexing, silicon photonic receiver. The multi-chip module utilizes a silicon interposer to integrate the four-channel photonic cascaded microdisk receiver with four electronic transimpedance amplifiers.

Authors:Nathan Abrams/Columbia University Qixiang Cheng/Columbia University Madeleine Glick/Columbia University Moises Jezzini/Tyndall National Institue Padraic Morrissey/Tyndall National Institue Peter O'Brien/Tyndall National Institue Keren Bergman/Columbia University

8:45 - 9:00 **Phase Retrieval Receiver using Parallel Alternative Projections for Coherent Communications (SF1L.4)**
Presenter: Hanzi Huang, *Shanghai University*
Expand for Abstract / Authors

Paper

We demonstrate a phase retrieval receiver to recover the full-field with intensity-only measurements based on parallel alternative projections. Phase accuracy improvement is verified by detecting a 30-Gbaud QPSK signal transmitted over 55-km single-mode fiber.

Authors:Hanzi Huang/Shanghai University Haoshuo Chen/Nokia Bell Labs Yetian Huang/Shanghai University Zhengxuan Li/Shanghai University Qianwu Zhang/Shanghai University Nicolas Fontaine/Nokia Bell Labs Roland Ryf/Nokia Bell Labs Yingxiong Song/Shanghai University

8:00 - 10:00 (UTC - 07:00)

Symp: Neural Networks I: Integrated Photonics in Neural Networks (JF1A)
Presider: Yasha Yi, *University of Michigan*

Special Symposium

8:00 - 8:20 **3D integrated photonic interconnects for scalable Neural Networks (JF1A.1)**
Presenter: Daniel Brunner, *CNRS*
Expand for Abstract / Authors

Neural networks yearn for parallel connections, yet such interconnects were not scalable. We demonstrate scalable, integrated photonic interconnects using 3D printed waveguides, achieving a record of 2500 densely connected channels/mm^{2} as well as convolutional layers.

Authors:Daniel Brunner/CNRS Jhonny Moughames/CNRS Xavier Porte/CNRS Michael Thiel/NanoscribeGmbH Maxime Jacquot/CNRS Laurent Larger/CNRS Muamer Kadic/CNRS

Invited

8:20 - 8:40	**Nonvolatile Vanadium Dioxide Photo-Electric Memory-Oscillators (JF1A.2)** **Presenter**: Joyce Poon, *Max-Planck-Inst fur Mikrostrukturphysik* Expand for Abstract / Authors We present an optically addressable nonvolatile vanadium dioxide (VO2) memory device that exhibits sustained voltage oscillations upon writing. This discovery paves the path toward VO2-based artificial neurons for neuromorphic computing. **Authors**:Joyce Poon/Max-Planck-Inst fur Mikrostrukturphysik Invited
8:40 - 9:00	**Photonic Neuromorphic Computing with Nanophotonics (JF1A.3)** **Presenter**: Zongfu Yu, *University of Wisconsin-Madison* Expand for Abstract / Authors Abstract to be provided. **Authors**:Zongfu Yu/University of Wisconsin-Madison Invited
9:00 - 9:20	**Machine Learning Applications in Optical Communications (JF1A.4)** **Presenter**: Alan Pak Tao Lau, *Hong Kong Polytechnic University* Expand for Abstract / Authors Machine Learning has gained increasing attention in communication systems. We will then provide an overview of current ML applications in optical communications and networks and highlight upcoming trends and challenges. **Authors**:Alan Pak Tao Lau/Hong Kong Polytechnic University Invited

9:20 - 9:40

Intelligent Integration of Photonics and Neural Networks (JF1A.5)
Presenter: Weiwen Zou, *Shanghai Jiao Tong University*
Expand for Abstract / Authors

The collective aim of high-speed and intelligent processing tightens the contact between photonics and neural networks. Recent advances in AI-powered photonics and photonics-enabled neural networks are reviewed to reveal the promising integration.

Authors:Weiwen Zou/Shanghai Jiao Tong University Shaofu Xu/Shanghai Jiao Tong University Xiuting Zou/Shanghai Jiao Tong University Bowen Ma/Shanghai Jiao Tong University

Invited

9:40 - 10:00

Title to be Announced (JF1A.6)
Presenter: Min Gu, *Univ of Shanghai Science & Technology*
Expand for Abstract / Authors

TBD

Authors:Min Gu/Univ of Shanghai Science & Technology

Invited

ATTR: Optical Technologies for Autonomous Cars and Mobility I (AF1M)
Presider: Mohammad Umar Piracha, *AEye, Inc*.

8:00 - 8:30

(Withdrawn) Title to be Announced (AF1M.1)
Presenter: Lute Maleki, *OEwaves, Inc.*
Expand for Abstract / Authors

TBD

Authors:Lute Maleki/OEwaves, Inc.

Invited

8:30 - 9:00 **Predicting Stray Light Artifacts in Direct Detection Lidars (AF1M.2)**
Presenter: Hamilton Shepard, *Waymo*
Expand for Abstract / Authors

Overview of a framework to predict point cloud artifacts through knowledge of the survey method, the scene dynamic range, and a scatter point spread function.

Authors:Hamilton Shepard/Waymo Chase Salsbury/Waymo

Invited

9:00 - 9:30 **The Evolving Role of Lidar from Automotive ADAS to Robotaxis (AF1M.3)**
Presenter: Rajeev Thakur, *Velodyne Lidar, Inc.*
Expand for Abstract / Authors

Automotive OEM know the public is willing to pay for ADAS technology that prevent accidents. ADAS also clearly helps to sell cars – all top 10 selling vehicles in 2019 featured active safety technology. Many OEM are working to add lidar sensing to cameras and radars to make perception robust and representative of real-world conditions and not just minimum regulatory standards to earn a higher crash rating. This movement is enabled by increasingly smaller, efficient and cost effective lidar concepts being offered by the innovative market – the latest from Velodyne being its $100 Velabit lidar. The requirements for lidar in ADAS and robotaxis are different – this poses additional challenges to lidar makers – who on one hand have to find the right value proposition of performance to price and on the other hand are trying to accelerate the technology out of the lab into the mass production world. In this presentation, Velodyne will present some of our findings and roadmap to bring safety and economies of scale to the masses through our lidar innovations.

Authors:Rajeev Thakur/Velodyne Lidar, Inc.

Invited

9:30 - 9:45 **Reduction of Effective Pixel Pitch of Digital Micromirror Device for Lidar Transmitter and Receiver (AF1M.4)** Paper
Presenter: Chuan Luo, *University of Arizona*
Expand for Abstract / Authors

Small pixel pitch with a large array size is highly anticipated for solid-state lidar transmitter and receiver. We demonstrate 2D beam steering with reduced effective pixel pitch by harnessing transitional state of the mirror array.

Authors:Chuan Luo/University of Arizona Brandon Hellman/University of Arizona Guanghao Chen/University of California San Diego Joshua Rodriguez/TuSimple Inc. Diego Jimenez/University of Arizona Charles Perkins/University of Arizona Jae-Hyeung Park/Inha University Ali Akoglu/University of Arizona Yuzuru Takashima/University of Arizona

Emissions Monitoring and Remote Sensing (SF1N)
Presider: Zachary Reed, *National Inst of Standards & Technology*

8:00 - 8:30

Data-driven Urban Methane Emission Estimates Based on Aircraft Observations: Sensing Considerations and Results (SF1N.1)
Presenter: Genevieve Plant, *University of Michigan*
Expand for Abstract / Authors

Paper

Urban methane emissions from major United States East Coast cities are investigated using an aircraft platform equipped with a suite of high precision spectroscopic instrumentation. Sensing details and results will be presented.

Authors:Genevieve Plant/University of Michigan Eric Kort/University of Michigan Colm Sweeney/National Oceanic and Atmospheric Administration

Invited

8:30 - 8:45

Atmospheric monitoring in the 4.5 to 4.9 µm region using open-path dual-comb spectroscopy (SF1N.2)
Presenter: Daniel Herman, *National Institute of Standards and Technology*
Expand for Abstract / Authors

Paper

Open-path mid-infrared dual-comb spectroscopy is performed over a 2 km-long link with bandwidth spanning the atmospheric transmission window near 4.7 µm. We quantify mixing ratios for CO, CO_2, N_2O, H_2O, and O_3.

Authors:Daniel Herman/National Institute of Standards and Technology Fabrizio Giorgetta/National Institute of Standards and Technology Gabriel Ycas/National Institute of Standards and Technology Eleanor Waxman/National Institute of Standards and Technology Ian Coddington/National Institute of Standards and Technology Nathan Newbury/National Institute of Standards and Technology Kevin Cossel/National Institute of Standards and Technology

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8:45 - 9:00

FPGA implemented real time computational coherent averaging algorithm for dual-comb spectroscopy (SF1N.3)
Presenter: Yifeng Chen, *Princeton University*
Expand for Abstract / Authors

Paper

We report a FPGA implementation of coherent averaging for dual comb spectroscopy and demonstrate with free-running combs a 7 times improvement in random noise as compared with post-processed raw data given the same acquisition time.

Authors:Yifeng Chen/Princeton University Jonas Westberg/Princeton University Jie Liu/Princeton University Gerard Wysocki/Princeton University

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9:00 - 9:15

Field Deployment of Mid-Infrared Dual-Comb Spectrometer for Measurements of Volatile Organic Compounds (SF1N.4)
Presenter: Kevin Cossel, *National Institute of Standards and Technology*
Expand for Abstract / Authors

Paper

We depoly a mid-infrared dual-comb spectrometer in a van for field measurements of volatile organic compounds (VOCs) at an oil and gas drilling site. We use a similar, laboratory system to measure ambient VOCs over a 2-km round-trip path.

Authors:Kevin Cossel/National Institute of Standards and Technology Eleanor Waxman/National Institute of Standards and Technology Fabrizio Giorgetta/National Institute of Standards and Technology Esther Baumann/National Institute of Standards and Technology Gabriel Ycas/National Institute of Standards and Technology Daniel Herman/National Institute of Standards and Technology Jacob Friedlein/National Institute of Standards and Technology Daniel Bon/Colorado Department of Public Health and Environment Ian Coddington/National Institute of Standards and Technology Nathan Newbury/National Institute of Standards and Technology

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9:15 - 9:30

Backwards Lasing from Krypton in Atmospheric Air (SF1N.5)
Presenter: Arthur Dogariu, *Princeton University*
Expand for Abstract / Authors

Paper

We present first evidence of backwards lasing from Krypton present in atmospheric air. Two-photon femtosecond UV excitation leads to stimulated emission at 759nm. The air laser can be used for standoff detection.

Authors:Arthur Dogariu/Princeton University Richard Miles/Texas A&M University

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9:30 - 9:45

Towards Hollow-Core-Fiber Delivery of Broadband Mid-Infrared Light for Remote Spectroscopy (SF1N.6)
Presenter: Derryck Reid, *Heriot-Watt University*
Expand for Abstract / Authors

Paper

We describe progress towards fiber-delivered broadband mid-IR light for multi-species spectroscopy in inaccessible environments. Water and HCl are resolved after propagating 3-µm light through five meters of hollow-core fiber, illustrating the technique's potential.

Authors:Oguzhan Kara/Heriot-Watt University Pablo Castro-Marin/Heriot-Watt University Ian Davidson/University of Southampton Natalie Wheeler/University of Southampton Francesco Poletti/University of Southampton David Richardson/University of Southampton Derryck Reid/Heriot-Watt University

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9:45 - 10:00 **Sensitive Trace Gas Detection Based on Quartz-enhanced Photothermal Spectroscopy (SF1N.7)**
Presenter: Yufei Ma, *Harbin Institute of Technology*
Expand for Abstract / Authors

Paper

An ultra-high sensitive trace gas sensing method based on quartz-enhanced photothermal spectroscopy (QEPTS) with significant advantages of standoff and remote sensing ability will be reported.

Authors:Yufei Ma/Harbin Institute of Technology Yinqiu Hu/Harbin Institute of Technology Shunda Qiao/Harbin Institute of Technology Ying He/Harbin Institute of Technology Frank Tittel/Rice University

Attosecond Dynamics and HHG in Solid State (FF1C)
Presider: Julia Mikhailova, *Princeton University*

8:00 - 8:30 **Attosecond Singularities in Solid State High Harmonic Generation (FF1C.1)**
Presenter: Ayelet Uzan, *Weizmann Institute of Science*
Expand for Abstract / Authors

TBD

Authors:Ayelet Uzan/Weizmann Institute of Science

Invited

8:30 - 9:00 **Ultrafast Charge and Spin Dynamics in Ferromagnets (FF1C.2)**
Presenter: Julia Gessner, *Max Planck Institute of Quantum Optics*
Expand for Abstract / Authors

Paper

With our experiment we demonstrate all-optical control of magnetization in a ferromagnet with an unprecedented sub-femtosecond time resolution. The reported results open the doors to a new generation of spintronic devices with petahertz clock-rates

Authors:Julia Gessner/Max Planck Institute of Quantum Optics Florian Siegrist/Max Planck Institute of Quantum Optics Marcus Ossiander/Max Planck Institute of Quantum Optics Christian Denker/Universität Greifswald Yi-Ping Chang/Max Planck Institute of Quantum Optics Malte Schröder/Max Planck Institute of Quantum Optics Alexander Guggenmos/Max Planck Institute of Quantum Optics Yang Cui/Max Planck Institute of Quantum Optics Jakob Walowski/Universität Greifswald Ulrike Martens/Universität Greifswald J.K. Dewhurst/Max-Planck-Institute of Microstructure Physics Ulf Kleineberg/Max Planck Institute of Quantum Optics Markus Münzenberg/Universität Greifswald Sangeeta Sharma/Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy Martin Schultze/Technische Universität Graz

9:00 - 9:15 **Attosecond Vacuum-Ultraviolet Photoconductive Switching in Dielectrics (FF1C.3)**
Presenter: Marcus Ossiander, *Max-Planck-Institut fur Quantenoptik*
Expand for Abstract / Authors

Paper

We demonstrate an attosecond one-photon photoconductive switch by injecting conduction band carriers in dielectrics using vacuum-ultraviolet light pulses. Femtosecond pulse-driven currents reveal intra- and inter-band conduction band carrier dynamics.

Authors:Marcus Ossiander/Max-Planck-Institut fur Quantenoptik Keyhan Golyari/Max-Planck-Institut fur Quantenoptik Kevin Scharl/Max-Planck-Institut fur Quantenoptik Lukas Lehnert/Max-Planck-Institut fur Quantenoptik Florian Siegrist/Max-Planck-Institut fur Quantenoptik Dmitry Zimin/Max-Planck-Institut fur Quantenoptik Matthew Weidman/Max-Planck-Institut fur Quantenoptik Isabella Floss/Vienna University of Technology Valerie Smejkal/Vienna University of Technology Christoph Lemell/Vienna University of Technology Joachim Burgdörfer/Vienna University of Technology Ferenc Krausz/Max-Planck-Institut fur Quantenoptik Martin Schultze/Graz University of Technology

9:15 - 9:30 **High Harmonic Generation from a Large-gap Semiconductor Metasurface (FF1C.4)**
Presenter: Maxim Shcherbakov, *Cornell University*
Expand for Abstract / Authors

Paper

Efficient generation of even and odd high harmonics from a resonant large-gap semiconductor metasurface interacting with femtosecond mid-infrared pulses is reported.

Authors:Maxim Shcherbakov/Cornell University Haizhong Zhang/A*STAR (Agency for Science, Technology and Research) Michael Tripepi/The Ohio State University Noah Talisa/The Ohio State University Abdallah AlShafey/The Ohio State University Giovanni Sartorello/Cornell University Zhiyuan Fan/Cornell University Justin Twardowski/The Ohio State University Leonid Krivitsky/A*STAR (Agency for Science, Technology and Research) Arseniy Kuznetsov/A*STAR (Agency for Science, Technology and Research) Enam Chowdhury/The Ohio State University Gennady Shvets/Cornell University

9:30 - 9:45 **(Withdrawn) Angular and Polarization Selection Rule of Frequency Mixing Deformed by Strongly Driven Carrier Motion (FF1C.5)**
Presenter: Hideki Hirori, *Kyoto University*
Expand for Abstract / Authors

We firstly observe HHG in GaSe with two-orthogonally polarized laser fields, and provide the selection rule for frequency-mixing deformed by strongly driven carriers, leading to new technologies for waveform synthesis of high-order harmonics.

Authors:Hideki Hirori/Kyoto University Yasuyuki Sanari/Kyoto University Tomohito Otobe/National Institutes for Quantum and Radiological Science and Technology Yoshihiko Kanemitsu/Kyoto University

9:45 - 10:00

Tuning the Ellipticity of Harmonics Generated in Graphene (FF1C.6)
Presenter: Jared Ginsberg, *Columbia University*
Expand for Abstract / Authors

Paper

We show that the ellipticity dependence of harmonic generation from graphene is a function of its Fermi energy. This allows for the yield and output ellipticity to be readily tuned via electrostatic gating.

Authors:Jared Ginsberg/Columbia University M. Jadidi/Columbia University Brian Lee/Columbia University Sang Chae/Columbia University Cecilia Chen/Columbia University Gauri Patwardhan/Columbia University James Hone/Columbia University Michal Lipson/Columbia University Alexander Gaeta/Columbia University

Ultrafast Parametric Sources (SF1H)

Presider: Igor Jovanovic, *University of Michigan*

8:00 - 8:30

Dual-chirped optical parametric amplification for energy scaling of near-IR, mid-IR, and far-IR pulses (SF1H.1)
Presenter: Eiji Takahashi, *RIKEN*
Expand for Abstract / Authors

Paper

A robust energy scaling method for infrared pulses using a dual-chirped optical parametric amplification is presented. TW mid-infrared pulses enable generation of a nano-joule level water window high-order harmonic beam.

Authors:Eiji Takahashi/RIKEN

Invited

8:30 - 8:45

Mid-Infrared Frequency Comb with 6.7 W Average Power Based on Difference Frequency Generation (SF1H.2)
Presenter: Jay Rutledge, *Stony Brook University*
Expand for Abstract / Authors

Paper

We present a frequency comb with 6.7 W at 2.9 μm with carrier-envelope phase stable pulses. To our knowledge, this is the highest power such comb reported to date.

Authors:Jay Rutledge/Stony Brook University Anthony Catanese/Stony Brook University Myles Silfies/Stony Brook University Xinlong Li/Stony Brook University Henry Timmers/National Institute of Standards Abijith Kowligy/National Institute of Standards Alexander Lind/National Institute of Standards Scott Diddams/National Institute of Standards Thomas Allison/Stony Brook University

8:45 - 9:00 **Mid-infrared spectra driven by 1.5-cycle pulses from a Tm-doped polarization-maintaining fiber amplifier (SF1H.3)**
Presenter: Sida Xing, *NIST*
Expand for Abstract / Authors

Paper

We present a Tm:fiber amplifier emitting octave-spanning 10 fs pulses centered at 1920 nm at 100 MHz repetition rate. Intra-pulse difference frequency generation in GaAs and GaP yields spectra beyond 7 µm .

Authors:Sida Xing/NIST Abijith Kowligy/NIST Daniel Lesko/NIST Alexander Lind/NIST Peter Schunemann/BAE Systems Scott Diddams/NIST

9:00 - 9:15 **Broadband Mid-Infrared Source Tunable through 3-11µm Based on Yb-doped Laser and Dual OPA Setup (SF1H.4)**
Presenter: Rimantas Budriunas, *Light Conversion, Ltd.*
Expand for Abstract / Authors

Paper

We generate 3-11.6µm tunable mid-IR pulses by mixing outputs of a broadband 2µm NOPA and a narrowband tunable OPA, pumped by an Yb-doped 2mJ, 10kHz femtosecond laser. FWHM bandwidths up to >600cm-1 and multi-µJ pulse energies are achieved.

Authors:Rimantas Budriunas/Light Conversion, Ltd. Karolis Jurkus/Light Conversion, Ltd. Arûnas Varanavičius/Vilnius University Laser Research Center Darius Gadonas/Light Conversion, Ltd.

9:15 - 9:30 **(Withdrawn) Towards High Power Broad-Band OPCPA at 3 µm (SF1H.5)**
Presenter: Alexander Tarasevitch, *University of Duisburg-Essen*
Expand for Abstract / Authors

We report a four stage optical parametric chirped pulse amplifier which generates femtosecond pulses at a central wavelength of 3 mm with the bandwidth of 490 nm and the energy of 430 mJ per pulse.

Authors:Alexander Tarasevitch/University of Duisburg-Essen

9:30 - 9:45

Ps Front End of the PW Beamline for Vulcan Laser Facility (SF1H.6)
Presenter: Giedre Archipovaite, *Central Laser Facility, STFC*
Expand for Abstract / Authors

Paper

In this paper we present a picosecond Front End developed for an OPCPA based new PW system for the Vulcan Laser Facility. The system delivers 22fs pulses with 1.3mJ pulse energy at 100Hz repetition rate.

Authors:Giedre Archipovaite/Central Laser Facility, STFC Mario Galletti/Central Laser Facility, STFC Munadi Ahmad/Central Laser Facility, STFC Steve Blake/Central Laser Facility, STFC Nicola Booth/Central Laser Facility, STFC Oleg Chekhlov/Central Laser Facility, STFC Rob Clarke/Central Laser Facility, STFC Marco Galimberti/Central Laser Facility, STFC Ian Musgrave/Central Laser Facility, STFC Dave Neely/Central Laser Facility, STFC Pedro Oliveira/Central Laser Facility, STFC Waseem Shaikh/Central Laser Facility, STFC Trevor Winstone/Central Laser Facility, STFC Brian Wyborn/Central Laser Facility, STFC Cristina Hernandez-Gomez/Central Laser Facility, STFC John Collier/Central Laser Facility, STFC

9:45 - 10:00

High-power OPCPAs at 1.45 – 2.4 µm and up to 100 W power scalability (SF1H.7)
Presenter: Robert Riedel, *Class 5 Photonics GmbH*
Expand for Abstract / Authors

Paper

A high-power optical parametric chirped-pulse amplifier (OPCPA) at 1.45 – 2.40 µm wavelength, pumped by Yb-based solid-state lasers with average power scalability up to 100 W and pulse durations in the few-cycle regime is presented.

Authors:Jan-Heye Buss/Class 5 Photonics GmbH Ivanka Grguras/Class 5 Photonics GmbH Torsten Golz/Class 5 Photonics GmbH Mark Prandolini/Class 5 Photonics GmbH Michael Schulz/Class 5 Photonics GmbH Robert Riedel/Class 5 Photonics GmbH

Thermal Emission and Radiative Heat Engineering (FF1F)

Presider: Peter Catrysse, *Stanford University*

8:00 - 8:15

Topological Thermal Emission in Non-Hermitian Selective Thermal Emitters (FF1F.1)
Presenter: Chloe Doiron, *Rice University*
Expand for Abstract / Authors

Paper

We present a nanophotonic device capable of displaying non-trivial topology in thermal emission. By coupling the horizontal and vertical modes of two resonators with large loss asymmetry, exceptional lines are observed in parameter space.

Authors:Chloe Doiron/Rice University Gururaj Naik/Rice University

8:15 - 8:30 **Highly Confined Plasmons in Individual Single-Walled Carbon Nanotube Nanoantennas (FF1F.2)**
Presenter: Shangjie Yu, *Stanford University*
Expand for Abstract / Authors

Paper

We study highly confined plasmons in individual single-walled carbon nanotube nanoantennas in the mid-infrared regime. This work paves the way for extreme light-matter interactions at the nanoscale and quantum plasmonics.

Authors:Shangjie Yu/Stanford University John Roberts/Stanford University Qing Lin/Stanford University Stephanie Bohaichuk/Stanford University Yue Luo/Harvard University Yi Taek Choi/Gwangju Institute of Science and Technology Po-Hsun Ho/Stanford University Kayoung Lee/Gwangju Institute of Science and Technology Abram Falk/IBM T.J. Watson Research Center William Wilson/Harvard University Eric Pop/Stanford University H.-S. Philip Wong/Stanford University Jonathan Fan/Stanford University

8:30 - 8:45 **Nonreciprocal Radiative Heat Transfer Between Two Planar Bodies (FF1F.3)**
Presenter: Lingling Fan, *Stanford University*
Expand for Abstract / Authors

Paper

We analyze nonreciprocal radiative heat transfer in two-body planar systems, identify unique nonreciprocal effects, introduce the constraint from the second law of thermodynamics and reciprocity and demonstrate numerically our findings with magneto-optical materials.

Authors:Lingling Fan/Stanford University Yu Guo/Stanford University Georgia Papadakis/Stanford University Bo Zhao/Stanford University Zhexin zhao/Stanford University Siddharth Buddhiraju/Stanford University Meir Orenstein/Stanford University Shanhui Fan/Stanford University

8:45 - 9:00 **Aluminum Plasmonics in Thermal Wavelengths for Multispectral Imaging (FF1F.4)**
Presenter: Noor-E-Karishma Shaik, *The University of Melbourne*
Expand for Abstract / Authors

Paper

Single sensor-based, one-shot multispectral imaging beyond the visible region is rapidly emerging. We present a multispectral filter array in thermal wavelengths using aluminum infrared plasmonics on germanium substrate and illustrate its spectral performance.

Authors:Noor-E-Karishma Shaik/The University of Melbourne Luke Weston/The University of Melbourne Ampalavanapillai Nirmalathas/The University of Melbourne Ranjith R Unnithan/The University of Melbourne

9:00 - 9:15

Broadband Mid-Infrared Resonances in Aligned Carbon Nanotube Films (FF1F.5)
Presenter: John Roberts, *Stanford University*
Expand for Abstract / Authors

Paper

We show that nanophotonic resonators made from self-assembled aligned carbon nanotubes support multiple resonant modes in the mid-infrared resulting in broadband extinction from 2.5-10μm. We study these modes using far-field spectroscopy, simulations, and near-field imaging.

Authors:John Roberts/Stanford University Po-Hsun Ho/Stanford University Shangjie Yu/Stanford University Stefan Schoeche/J.A. Woollam Co., Inc. Yue Luo/Harvard University William Wilson/Harvard University Abram Falk/IBM T.J. Watson Research Center Jonathan Fan/Stanford University

9:15 - 9:30

T-Operator Bounds on Absorption, Scattering and Thermal Emission for Arbitrary Objects (FF1F.6)
Presenter: Sean Molesky, *Princeton University*
Expand for Abstract / Authors

Paper

We report bounds on angle-integrated absorption, scattering and far- and near-field radiative emission, capturing both per-volume material limits and geometric effects. We then describe potential extensions of this formalism to a variety of electromagnetic phenomena.

Authors:Sean Molesky/Princeton University Prashanth Venkataram/Princeton University Weiliang Jin/Stanford University Pengning Chao/Princeton University Alejandro Rodriguez/Princeton University

9:30 - 9:45

Phonon Mediated Infrared Metamaterial Emitters towards Multifunctional Encoding and Display (FF1F.7)
Presenter: Junyu Li, *Huazhong Univ. of Science and Technology*
Expand for Abstract / Authors

Paper

We experimentally demonstrate a phonon mediated infrared metamaterial emitters with multifunctional information encoding, display, and hiding with resolution up to the diffraction limit. Multiplexed polarized grayscale patterns can also be encoded in the same region.

Authors:Junyu Li/Huazhong Univ. of Science and Technology Fei Yi/Huazhong Univ. of Science and Technology

9:45 - 10:00 **Active photonic cooling using time-modulated thermal emission (FF1F.8)**
Presenter: Siddharth Buddhiraju, *Stanford University*
Expand for Abstract / Authors

Paper

We present a coupled-mode theory and a computational formalism to describe thermal radiation from time-modulated systems. We show that such modulation results in an active cooling mechanism with high thermodynamic performance approaching the Carnot limit.

Authors:Siddharth Buddhiraju/Stanford University Wei Li/Stanford University Shanhui Fan/Stanford University

Quantum Devices (FF1D)

Presider: Joshua Nunn, *University of Bath*

8:00 - 8:15 **Experimental Demonstration of Time Resolving Quantum Receiver for Bandwidth and Power Efficient Communications (FF1D.1)**
Presenter: Ivan Burenkov, *University of Maryland*
Expand for Abstract / Authors

Paper

We developed Coherent Frequency Shift Keying and Hybrid Frequency-Phase Shift Keying protocols optimized for quantum measurement. Paired with our new quantum receiver, these protocols experimentally demonstrate the record energy efficiency and improve communication channel capacity.

Authors:Ivan Burenkov/University of Maryland M.V. Jabir/NIST N. Fajar R. Annafianto/NIST Abdella Battou/NIST Sergey Polyakov/NIST

8:15 - 8:30 **A Simple Low-latency Real-time Certifiable Quantum Random Number Generator (FF1D.2)**
Presenter: William Munro, *NTT Basic Research Laboratories*
Expand for Abstract / Authors

Paper

We demonstrate a simple scheme for generating certifiable quantum random numbers where every.0.12s we **certify** enough entropy to generate a block of 8192 random bits with a certified error bounded by 10^-20. It can be run continuously and is suited as a quantum randomness beacon.

Authors:Yanbao Zhang/NTT Basic Research Laboratories Hsin Pin Lo/NTT Basic Research Laboratories Takuya Ikuta/NTT Basic Research Laboratories Toshimori Honjo/NTT Basic Research Laboratories Hiroki Takesue/NTT Basic Research Laboratories William Munro/NTT Basic Research Laboratories

8:30 - 8:45 **How to use an Acousto-Optic Modulator as a Fast Spatial Light Modulator (FF1D.3)**
Presenter: Boris Braverman, *University of Ottawa*
Expand for Abstract / Authors

Paper

We generate arbitrary 1-dimensional spatial profiles in a laser pulse by mapping the temporal electrical waveform sent to an acousto-optic modulator (AOM). The AOM can be therefore used as a spatial light modulator with 50 um pixel pitch, fast refresh rate, and high damage threshold.

Authors:Boris Braverman/University of Ottawa Xialin Liu/University of Ottawa Robert Boyd/University of Ottawa

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8:45 - 9:00 **Towards Photonic Interconnects between Ion Traps for Scalable Quantum Information Processing (FF1D.4)**
Presenter: Hiroki Takahashi, *Okinawa Institute of Science and Technology Graduate University*
Expand for Abstract / Authors

Paper

Based on the recent achievement of strong coupling between a single ion and a single photon in a cylindrical trap, an ongoing work to extend it to linear traps and photonic interconnects is reported.

Authors:Hiroki Takahashi/Okinawa Institute of Science and Technology Graduate University

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9:00 - 9:15 **Polarization diversity phase modulator for frequency-bin operations with hyperentangled biphoton frequency combs (FF1D.5)**
Presenter: Navin Lingaraju, *Purdue University*
Expand for Abstract / Authors

Paper

Using a polarization diversity phase modulator, we carry out projective measurements in the spectral domain to characterize frequency-bin entanglement in a hyperentangled photon pair without degrading nonclassical correlations in polarization state.

Authors:Navin Lingaraju/Purdue University Nathan O'Malley/Purdue University Daniel Jones/U.S. Army Research Laboratory Oscar Sandoval/Purdue University Hana Azzouz/Purdue University Daniel Leaird/Purdue University Joseph Lukens/Oak Ridge National Laboratory Michael Brodsky/U.S. Army Research Laboratory Andrew Weiner/Purdue University

9:15 - 9:30 **Graphene-Based Electro-Optic Entangler (FF1D.6)**
Presenter: Montasir Qasymeh, *Abu Dhabi University*
Expand for Abstract / Authors

Paper

We propose a novel technique for entanglement of microwave and optical fields using capacitor loaded with graphene waveguide. The proposed technique utilizes the graphene conductivity to realize an off-resonant interaction and achieve a tunable entanglement.

Authors:Montasir Qasymeh/Abu Dhabi University Hichem Eleuch/Abu Dhabi University

9:30 - 10:00 **Generation of Quantum Light in Silicon Nitride (FF1D.7)**
Presenter: Alberto Politi, *University of Southampton*
Expand for Abstract / Authors

Paper

The generation of non-classical light on-chip is of key importance for quantum technologies based on photons. Here I discuss the generation of different quantum states of light produced by CMOS compatible Silicon Nitride integrated cavities.

Authors:Alberto Politi/University of Southampton

Invited

Integrated Light Sources (SF1O)

Presider: Qiaoqiang Gan, *State University of New York at Buffalo*

8:00 - 8:15 **Wide-band Millimeter-wave Synthesizer by Integrated Microcomb Photomixing (SF1O.1)**
Presenter: Jizhao Zang, *National Institute of Standards and Technology*
Expand for Abstract / Authors

Paper

We demonstrate a wideband and tunable millimeter-wave synthesizer, using microcomb photomixing. For example, we generate a 150.8 GHz signal with Allan deviation of $\sim 3\times10^{-12}$/s. Our microcomb system supports a continuous range of 0.05–1 THz.

Authors:Jizhao Zang/National Institute of Standards and Technology Travis Briles/National Institute of Standards and Technology Jesse Morgan/University of Virginia Andreas Beling/University of Virginia Scott Papp/National Institute of Standards and Technology

8:15 - 8:30 **Ultra-efficient RF photonics filter based on an AlGaAs-on-insulator integrated Kerr frequency comb source (SF1O.2)**
Presenter: Haowen Shu, *Peking University*
Expand for Abstract / Authors

Paper

We demonstrate an efficient RF photonics filter based on AlGaAs-on-insulator integrated comb. With a record low on-chip pumping power of ~20 mW, the reconfigurable filter achieves a main-to-secondary sidelobe ratio of > 25 dB.

Authors:Haowen Shu/Peking University yuansheng tao/Peking University weiqiang xie/university of california santa barbara Lin Chang/university of california santa barbara warren jin/university of california santa barbara jiangrui deng/Peking University ming jin/Peking University Xingjun Wang/Peking University John Bowers/university of california santa barbara

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8:30 - 9:00 **Controlling the integrated micro-lasers with ultrahigh speed and ultralow energy consumption (SF1O.3)**
Presenter: Qinghai Song, *Harbin Institute of Technology*
Expand for Abstract / Authors

Paper

Here we study the bounded states in the continuum (BICs) based microlasers in microcavity. With the assistance of BICs, the trade-off between ultrahigh speed and ultralow energy consumption can be broken for the first time.

Authors:Qinghai Song/Harbin Institute of Technology Shumin Xiao/Harbin Institute of Technology

Invited

9:00 - 9:15 **Design Chip-Scale Integration of Tunable Short-Wavelength Photonic Devices (SF1O.4)**
Presenter: Kunook Chung, *University of Michigan*
Expand for Abstract / Authors

Paper

Semiconductor heterostructures capable of producing a broadband gain in the short-wavelength
(UV-purple-blue) spectrum for light emitters and detectors have been designed and experimentally studied.

Authors:Kunook Chung/University of Michigan Ayush Panday/University of Michigan Tuba Sarwar/University of Michigan Anthony Aiello/University of Michigan Zetian Mi/University of Michigan Pallab Bhattacharya/University of Michigan Pei-Cheng Ku/University of Michigan

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9:15 - 9:30

Self-Pulsing in Hybrid Subwavelength Grating Metamaterial Ring Resonator (SF1O.5)
Presenter: Xiaochuan Xu, *Harbin Institute of Technology, Shenzhen*
Expand for Abstract / Authors

Paper

This paper reports the observation of 26 GHz self-pulsing in a subwavelength grating metamaterial ring resonator refilled with DDMEBT, which is the fastest self-pulsing that has been reported according to the authors' best knowledge.

Authors:Xiaochuan Xu/Harbin Institute of Technology, Shenzhen Yang Wang/Tokyo Institute of Technology Jiaxin Chen/Harbin Institute of Technology, Shenzhen Wanxin Li/Harbin Institute of Technology, Shenzhen Yaguo Wang/The University of Texas at Austin Yong Yao/Harbin Institute of Technology, Shenzhen Tsuyoshi Michinobu/Tokyo Institute of Technology Ray Chen/The University of Texas at Austin

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9:30 - 9:45

Photonic integrated circuit based beam combining for future direct diode laser systems (SF1O.6)
Presenter: Siwei Zeng, *Clemson University*
Expand for Abstract / Authors

Paper

We demonstrate photonic integrated circuit (PIC) based beam combining methods for future direct diode laser systems. Both coherent and wavelength beam combining are realized through hybrid integration of gain chips with PICs.

Authors:Siwei Zeng/Clemson University Yeyu Zhu/Clemson University Xiao-Lei Zhao/Clemson University Ying Wu/Clemson University Lance Sweatt/Clemson University Lin Zhu/Clemson University

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9:45 - 10:00

High-efficiency broadband vortex beam generator with a backside metal mirror (SF1O.7)
Presenter: Heyun Tan, *Sun Yat-sun University*
Expand for Abstract / Authors

Paper

Based on integrated silicon platform, we propose and fabricate a high-efficiency broadband vortex beam generator by introducing a metal mirror. The device provides potential applications in multidimensional optical communications to increase information capacity.

Authors:Heyun Tan/Sun Yat-sun University Yuntao Zhu/Sun Yat-sun University Nan Zhou/Huazhong University of Science and Technology Jian Wang/Huazhong University of Science and Technology Xinlun Cai/Sun Yat-sun University

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Spectral and Power Detection and Control (AF1K)

Presider: Alexandra Artusio-Glimpse, *National Inst of Standards & Technology*

8:00 - 8:15	**Spectral Shaping of Mid-Infrared Laser Pulses with a Digital Micromirror Device (AF1K.1)** **Presenter**: Marius Rutkauskas, *Heriot-Watt University* Expand for Abstract / Authors Spectral shaping of ultrafast laser pulses in the 3.6–3.9-µm wavelength region is implemented using a CaF_2-windowed digital micromirror device. Low-pass, high-pass, band-pass and multi-wavelength shaping is demonstrated, enabling applications in spectroscopy and compressive sensing. **Authors**:Marius Rutkauskas/Heriot-Watt University Anchit Srivastava/Heriot-Watt University Derryck Reid/Heriot-Watt University	Paper
8:15 - 8:30	**On-chip high-quality $Ge_{23}Sb_7S_{70}$ round-wedge resonators for broadband dispersion engineering (AF1K.2)** **Presenter**: Kyuyoung Bae, *CU Boulder* Expand for Abstract / Authors We report $Ge_{23}Sb_7S_{70}$ chalcogenide wedge resonators with a high quality factor and broadband dispersion which is induced by an exceedingly smooth and varying-angle wedge surface. **Authors**:Kyuyoung Bae/CU Boulder Thomas Horning/CU Boulder Steven Pampel/CU Boulder Mo Zohrabi/CU Boulder Michael Grayson/CU Boulder Juliet Gopinath/CU Boulder Wounjhang Park/CU Boulder	Paper
8:30 - 8:45	**High Efficiency Narrow Bandwidth Chirped Moiré Bragg Gratings (AF1K.3)** **Presenter**: Vadim Smirnov, *OptiGrate Corp* Expand for Abstract / Authors High efficiency moiré chirped Bragg gratings with ultranarrow bandwidths are fabricated in Photo-Thermo-Refractive glass. Application of those filters for signal processing and laser design is discussed. **Authors**:Vadim Smirnov/OptiGrate Corp Paul Ramos/OptiGrate Corp Ruslan Vasilyeu/OptiGrate Corp Alexei Glebov/OptiGrate Corp	Paper

8:45 - 9:00	**Optical Power Limiters Based on Frequency-selective Surfaces and Phase-transtion Materials (AF1K.4)** **Presenter**: Chenghao Wan, *University of Wisconsin-Madison* Expand for Abstract / Authors We designed and demonstrated optical limiters that incorporate thin-film vanadium dioxide into metallic frequency selective surfaces and feature large, broadband off-state transmittance, small on-state transmittance, and minimized absorption. **Authors**:Chenghao Wan/University of Wisconsin-Madison Zhen Zhang/Purdue University Jad Salman/University of Wisconsin-Madison Yuzhe Xiao/University of Wisconsin-Madison ZHAONING YU/University of Wisconsin-Madison Alireza Shahsafi/University of Wisconsin-Madison Shriram Ramanathan/Purdue University Mikhail Kats/University of Wisconsin-Madison	Paper
9:00 - 9:15	**Broadband Electromagnetic Radiation Detector Based on Photoacoustic Effect (AF1K.5)** **Presenter**: Markku Vainio, *University of Helsinki* Expand for Abstract / Authors We report a highly linear and sensitive power detector, which is based on a silicon-cantilever enhanced photoacoustic sensor. Broadband operation from visible to mid-infrared is demonstrated, and extension to THz is envisioned. **Authors**:Jussi Rossi/Tampere University Juho Uotila/Gasera Ltd. Toni Laurila/Aalto University Erkki Ikonen/Aalto University Markku Vainio/University of Helsinki	Paper
9:15 - 9:30	**Measuring spectral bandwidth with OAM fiber mode induced optical activity (AF1K.6)** **Presenter**: Aaron Peterson-Greenberg, *Boston University* Expand for Abstract / Authors We present a high resolution optical rotary dispersion spectrometer that can detect spectral bandwidth with high sensitivity (< 1 pm) by exploiting the induced optical activity of OAM fiber modes. **Authors**:Aaron Peterson-Greenberg/Boston University Gautam Prabhakar/Boston University Siddharth Ramachandran/Boston University	Paper

9:30 - 10:00	**Ultrahigh Spatial Resolution Analysis of Mid-Infrared Optical Excitations with Monochromated Electron Energy-Loss Spectroscopy (AF1K.7)** **Presenter**: Jordan Hachtel, *Oak Ridge National Laboratory* Expand for Abstract / Authors Monochromated electron energy-loss spectroscopy (EELS) can now reach the mid-infrared spectral regime in the electron microscope. Here, we use monochromated EELS to examine geometry and coupling effects for infrared excitations in complex nanostructures. **Authors**:Jordan Hachtel/Oak Ridge National Laboratory Andrea Konecna/Institut de Ciencies Fotoniques Kevin Roccapriore/Oak Ridge National Laboratory Shin Hum Cho/University of Texas at Austin Delia Milliron/University of Texas at Austin F. Javier García de Abajo/Institut de Ciencies Fotoniques Juan Carlos Idrobo/Oak Ridge National Laboratory	Paper

Laser Processing of Soft Materials and 3D Printing (SF1R)

Presider: Edward Kinzel, *University of Notre Dame*

8:00 - 8:15	**(Withdrawn) Nanofabrication Deep Inside Silicon Wafers (SF1R.1)** **Presenter**: Onur Tokel, *Bilkent Universitesi* Expand for Abstract / Authors Here, to the best of our knowledge for the first time, we introduce nanofabrication capability into the bulk of silicon wafers. We exploit Bessel beams, and demonstrate “in-chip” nano-structuring with features down to 250 nm. **Authors**:Aqiq Ishraq/Bilkent Universitesi Rana Asgari Sabet/Bilkent Universitesi Onur Tokel/Bilkent Universitesi	
8:15 - 8:30	**Broadband Epsilon-Near-Zero Behavior in Deep-etched Grating Metasurfaces (SF1R.2)** **Presenter**: Milan Palei, *University of Notre Dame* Expand for Abstract / Authors In this work, we experimentally demonstrate coupling between free-space light and surface plasmon and epsilon-near-zero modes on Ag grating metasurfaces. **Authors**:Milan Palei/University of Notre Dame John Haug/University of Notre Dame Joshua Shrout/University of Notre Dame Paul Bohn/University of Notre Dame Anthony Hoffman/University of Notre Dame	Paper

8:30 - 8:45 **Optical Manipulation of Nanoparticles for Assembly of 3D Devices and Materials (SF1R.3)**
Presenter: Euan McLeod, *University of Arizona*
Expand for Abstract / Authors

Paper

New approaches are needed to prototype heterogeneous 3D photonic materials and devices with 100 nm or smaller feature sizes. We demonstrate that optical tweezers can provide the necessary speed and positioning accuracy for rapid prototyping.

Authors:Euan McLeod/University of Arizona Jeffrey Melzer/University of Arizona

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8:45 - 9:00 **Cracking the Design Complexity of Nanostructures Using Geometric Deep Learning (SF1R.4)**
Presenter: Mohammadreza Zandehshahvar, *Georgia Institute of Technology*
Expand for Abstract / Authors

Paper

We present a new approach based on machine learning algorithms for inverse design of photonic nanostructure to provide the desired response while iteratively reducing the complexity of the structure to minimize the design complexity.

Authors:Mohammadreza Zandehshahvar/Georgia Institute of Technology Yashar Kiarashinejad/Georgia Institute of Technology Omid Hemmatyar/Georgia Institute of Technology Sajjad Abdollahramezani/Georgia Institute of Technology Reza Pourabolghasem/Independent Researcher Ali Adibi/Georgia Institute of Technology

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9:00 - 10:00 **Light Matter Interactions at Nanoscale for Materials Processing and Manufacturing (SF1R.5)**
Presenter: Xianfan Xu, *Purdue University*
Expand for Abstract / Authors

Paper

This talk will describe fundamental studies of optical phenomena at the nanoscale. Such phenomena can be used for applications, including nanomanufacturing, nanoscale processing, and ultra-high density, next generation data storage.
Xianfan Xu is James J. and Carol L. Shuttleworth Professor of Mechanical Engineering at Purdue University. He obtained Ph.D. degree from UC Berkeley. His research is focused on ultrafast and nanoscale optics. He is Fellow of ASME, SPIE, and OSA, and an Associated Editor for Scientific Reports and Optics Express.

Authors:Xianfan Xu/Purdue University

Tutorial

Photon-electron Interactions (FF1Q)
Presider: Wei Zhou, *Virginia Tech*

8:00 - 8:30	**Observation of the Stimulated Quantum Cherenkov Effect (FF1Q.1)** **Presenter**: Ido Kaminer, *Technion* Expand for Abstract / Authors We present the first observation of the quantum nature of the Cherenkov effect, by phase-matching light & electron waves. Interacting coherently along hundreds of microns, each electron simultaneously absorbs and emits hundreds of photon quanta. **Authors**:Raphael Dahan/Technion saar nehemia/Technion Michael Shentcis/Technion Ori Reinhardt/Technion yuval adiv/Technion Kangpeng Wang/Technion orr be'er/Technion Yaniv Kurman/Technion Xihang Shi/Technion Morgan Lynch/Technion Ido Kaminer/Technion	Paper
8:30 - 8:45	**Optical Parametric Amplification in 2D Semiconductors (FF1Q.2)** **Presenter**: Chiara Trovatello, *Politecnico di Milano* Expand for Abstract / Authors We demonstrate single-pass optical parametric amplification (OPA) in monolayer transition-metal dichalcogenides. Our experimental findings of OPA efficiency and polarization dependence are fully supported by first-principle calculations of the nonlinear response within a tight-binding model. **Authors**:Chiara Trovatello/Politecnico di Milano Andrea Marini/University of L'Aquila Xinyi Xu/Columbia University Changhwan Lee/Columbia University Fang Liu/Columbia University Cristian Manzoni/IFN-CNR Stefano Dal Conte/Politecnico di Milano Alessandro Ciattoni/CNR-SPIN Kaiyuan Yao/Columbia University Xiaoyang Zhu/Columbia University P. James Schuck/Columbia University Giulio Cerullo/Politecnico di Milano	Paper
8:45 - 9:00	**Breaking the Inversion Symmetry via Hot-Electron Transport (FF1Q.3)** **Presenter**: Mohammad Taghinejad, *Georgia Institute of Technology* Expand for Abstract / Authors We demonstrate the ultrafast conversion of statically passive dielectrics (e.g., amorphous TiO_2) to transient second-order nonlinear media upon the sub-picosecond transfer of hot electrons, enabling active control of second-order optical processes. **Authors**:Mohammad Taghinejad/Georgia Institute of Technology Zihao Xu/Emory University Kyutae Lee/Georgia Institute of Technology Tianquan Lian/Emory University Wenshan Cai/Georgia Institute of Technology	Paper

9:00 - 9:15 **Free-electrons radiation in a photonic time crystal (FF1Q.4)**
Presenter: Alex Dikopoltsev, *Technion*
Expand for Abstract / Authors

Paper

We present novel radiation emission by free electrons moving in a spatiotemporally modulated medium, which in specific cases acts as a photonic time crystal. We observe two regimes of radiation, subluminal and superluminal.

Authors:Alex Dikopoltsev/Technion Yonatan Sharabi/Technion Shai Tsesses/Technion Ido Kaminer/Technion Mordechai Segev/Technion

9:15 - 9:30 **Large Second Harmonic Generation from Polar van der Waals Bismuth Telluro-Halide Semiconductors (FF1Q.5)**
Presenter: Prashant Padmanabhan, *Los Alamos National Laboratory*
Expand for Abstract / Authors

Paper

We demonstrate large second harmonic generation from the polar van der Waals semiconductors BiTeI and BiTeBr, with responses comparable to leading semiconducting nonlinear optical (NLO) materials. This highlights their promise for nanoscale NLO applications.

Authors:Prashant Padmanabhan/Los Alamos National Laboratory Kevin Kwock/Columbia University Samuel Gilinsky/Northern Arizona University Nicholas Sirica/Los Alamos National Laboratory Jaewook Kim/Rutgers University Kai Du/Rutgers University Sang-Wook Cheong/Rutgers University Rohit Prasankumar/Los Alamos National Laboratory

9:30 - 9:45 **Quantum Electron Wave-Shaping for Coherent Enhancement of Radiation (FF1Q.6)**
Presenter: Liang Jie Wong, *Nanyang Technological University*
Expand for Abstract / Authors

Paper

We show how quantum wave-shaping of electron beams can selectively enhance and inhibit spectral features in free-electron radiation, resulting for instance in enhanced monochromaticity of emitted photons from electrons in a magnetic nano-undulator.

Authors:Liang Jie Wong/Nanyang Technological University Nicholas Rivera/Massachusetts Institute of Technology Chitraang Murdia/Massachusetts Institute of Technology Thomas Christensen/Massachusetts Institute of Technology John Joannopoulos/Massachusetts Institute of Technology Marin Soljacic/Massachusetts Institute of Technology Ido Kaminer/Technion

9:45 - 10:00 **Tunable Free-electron X-ray Radiation From van der Waals Materials (FF1Q.7)**
Presenter: Michael Shentcis, *Technion – Israel Institute of Technology*
Expand for Abstract / Authors

Paper

We present the first observation of energy-tunable X-ray radiation from van-der-Waals materials. Tunability is achieved by control of the incident electron energy and lattice structure - towards a new designer concept for novel X-ray sources.

Authors:Michael Shentcis/Technion – Israel Institute of Technology Adam Budniak/Technion – Israel Institute of Technology Raphael Dahan/Technion – Israel Institute of Technology Yaniv Kurman/Technion – Israel Institute of Technology Xihang Shi/Technion – Israel Institute of Technology Michael Kalina/Technion – Israel Institute of Technology Hanan Sheinfux/ICFO–Institut de Ciencies Fotoniques Mark Blei/Arizona State University Mark Svendsen/Technical University of Denmark Yaron Amouyal/Technion – Israel Institute of Technology Frank Koppens/ICFO–Institut de Ciencies Fotoniques Sefaattin Tongay/Arizona State University Kristian Thygesen/Technical University of Denmark Efrat Lifshitz/Technion – Israel Institute of Technology Javier de Abajo/ICFO–Institut de Ciencies Fotoniques Liang Wong/Nanyang Technological University Ido Kaminer/Technion – Israel Institute of Technology

Quantum Meta-photonics (FF1B)

Presider: Sushil Mujumdar, *Tata Institute of Fundamental Research*

8:00 - 8:15 **Polarization-Diverse Metasurfaces for High-Dimensional Spatial-Mode Entanglement Generation (FF1B.1)**
Presenter: Hyunpil Boo, *University of California, Los Angeles*
Expand for Abstract / Authors

Paper

We demonstrate metasurfaces consisting of meta-atoms that generate spatial-mode entangled photons with different polarization, designed through careful FDTD simulations. Using our biphoton comb setup, these metasurfaces will enable for testing spatial-energy-time hyperentanglement.

Authors:Hyunpil Boo/University of California, Los Angeles Yoo Seung Lee/University of California, Los Angeles Hangbo Yang/University of California, Los Angeles KAI-CHI CHANG/University of California, Los Angeles Chee Wei Wong/University of California, Los Angeles

8:15 - 8:30 **Broadband second-harmonic generation from electrically tunable nonlinear polaritonic metasurfaces (FF1B.2)**
Presenter: Jaeyeon Yu, *UNIST*
Expand for Abstract / Authors

Paper

We report broadband second-harmonic generation based on Stark-tunable intersubband nonlinearities in multiple-quantum-well structures combined with plasmonic nanoresonators. Experimentally, 0.75 µm of the second-harmonic generation spectral peak tuning around pump wavelength of 9.8 µm was achieved.

Authors:Jaeyeon Yu/UNIST InYong Hwang/UNIST Daeik Kim/UNIST Frederic Demmerle/Technische Universitat Munchen Gerhard Boehm/Technische Universitat Munchen Markus-Christian Amann/Technische Universitat Munchen Mikhail Belkin/Technische Universitat Munchen Jongwon Lee/UNIST

8:30 - 8:45 **Plasmonic Metamaterials for THz-rate Quantum Photonics (FF1B.3)**
Presenter: Vladimir Shalaev, *Purdue University/Birck Nanotechnology*
Expand for Abstract / Authors

Paper

The use of hybrid, plasmonic-photonic meta-structures and machine learning to optimize light-matter coupling and speed-up quantum processes to THz-rates so that they outpace quantum decoherence and losses at room temperature will be discussed.

Authors:Vladimir Shalaev/Purdue University/Birck Nanotechnology Alexandra Boltasseva/Purdue University/Birck Nanotechnology Alexander Kildishev/Purdue University/Birck Nanotechnology Zhaxylyk Kudyshev/Purdue University/Birck Nanotechnology Simeon Bogdanov/Purdue University/Birck Nanotechnology

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8:45 - 9:00 **Ultra-small mode volume hyperbolic metamaterial cavity enhanced emission from 2D TMDC materials (FF1B.4)**
Presenter: SITA RAMA KRISHNA INDUKURI, *Hebrew university of Jerusalem.*
Expand for Abstract / Authors

Paper

We design and experimentally demonstrate ultra-small mode volume hyperbolic metamaterial nano cavities in the visible frequency band. These HMM cavities show enhancement of light-matter interaction with 2D TMDC materials in the deep subwavelength limit.

Authors:SITA RAMA KRISHNA INDUKURI/Hebrew university of Jerusalem. Christian Frydendahl/Hebrew university of Jerusalem. Jonathan Bar-David/Hebrew university of Jerusalem. Noa Mazurski/Hebrew university of Jerusalem. Uriel Levy/Hebrew university of Jerusalem.

9:00 - 9:15 **(Withdrawn) Inverse-Designed High-Efficiency Metasurfaces for Optically Interfacing Solid-State Qubits (FF1B.5)**
Presenter: Amelia Klein, *University of Pennsylvania*
Expand for Abstract / Authors

We use inverse design to construct immersion metalenses for photon collection from quantum emitters. We push the limits of efficient, ultrahigh-NA, achromatic metalenses and move towards a compact, scalable platform for interfacing quantum photonic devices.

Authors:Amelia Klein/University of Pennsylvania Nader Engheta/University of Pennsylvania Lee Bassett/University of Pennsylvania

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9:15 - 9:30 **Intersubband Polaritonics in Dielectric Metasurfaces (FF1B.6)**
Presenter: Raktim Sarma, *Sandia National Labs*
Expand for Abstract / Authors

Paper

We experimentally demonstrate a metasurface that supports tailorable polaritons arising from strong coupling between Mie modes of dielectric nanoresonators and intersubband transitions of semiconductor quantum wells that are embedded inside the resonator.

Authors:Raktim Sarma/Sandia National Labs Nishant Nookala/University of Texas at Austin Kevin Reilly/University of New Mexico Sheng Liu/Sandia National Labs Domenico de Ceglia/University of Padova Michael Goldflam/Sandia National Labs Luca Carletti/University of Padova Salvadore Campione/Sandia National Labs John Klem/Sandia National Labs Michael Sinclair/Sandia National Labs Mikhail Belkin/University of Texas at Austin Igal Brener/Sandia National Labs

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9:30 - 9:45 **All-dielectric multiple quantum well active metasurfaces (FF1B.7)**
Presenter: Meir Grajower, *California Institute of Technology, Pasadena*
Expand for Abstract / Authors

Paper

We report a design of an all-dielectric Mie-resonant active metasurface, which exhibits a high reflectance (>45%) and a broad tunable phase shift at an operation wavelength of 1550 nm. The proposed design can be used for the realization of *two-dimensional* active metasurfaces.

Authors:Meir Grajower/California Institute of Technology, Pasadena Ruzan Sokhoyan/California Institute of Technology, Pasadena Pin Chieh Wu/California Institute of Technology, Pasadena Ghazaleh Shirmanesh/California Institute of Technology, Pasadena Souvik Biswas/California Institute of Technology, Pasadena Harry Atwater/California Institute of Technology, Pasadena

9:45 - 10:00 **Metasurface-based external cavity diode laser (FF1B.8)**
Presenter: Christina Spaegele, *Harvard University*
Expand for Abstract / Authors

Paper

We experimentally demonstrate a tunable external cavity laser based on a metasurface. The metasurface focuses light back on the facet of a diode laser, and the emission wavelength can be tuned by moving the metasurface.

Authors:Christina Spaegele/Harvard University Michele Tamagnone/Harvard University Dmitry Kazakov/Harvard University Marco Piccardo/Harvard University Federico Capasso/Harvard University

New Approaches to Mode Coupling (SF1J)

Presider: Takasumi Tanabe, *Keio University*

8:00 - 8:15 **Projecting a Wide Surface-Normal Gaussian Beam from an Apodised Grating Supporting Spatially-Broad Standing Wave Resonances (SF1J.1)**
Presenter: Alexander Yulaev, *University of Maryland/PML-NIST*
Expand for Abstract / Authors

Paper

We present an apodised grating converter capable to couple a waveguide single-mode to a surface-normal collimated Gaussian beam in free space. Mode conversion proceeds via coupling to a spatially-broad standing-wave resonance supported inside the grating.

Authors:Alexander Yulaev/University of Maryland/PML-NIST Daron Westly/NIST Vladimir Aksyuk/NIST

8:15 - 8:30 **Low-back-reflection grating coupler on silicon-on-insulator for on-chip gyroscope application (SF1J.2)**
Presenter: Yin-Hsuan Lee, *National Sun Yat-sen University*
Expand for Abstract / Authors

Paper

To achieve optical access between silicon gyroscope chip and fiber sensing coil, we experimentally demonstrate grating coupler with asymmetric trenches on silicon-on-insulator with -4 dB coupling efficiency, 40.5 nm bandwidth, and -32.9 dB interface reflection.

Authors:Yin-Hsuan Lee/National Sun Yat-sen University Tzu-Hsiang Yen/National Sun Yat-sen University Ren-Young Liu/National Sun Yat-sen University Chun-Ta Wang Wang/National Sun Yat-sen University Yi-Jen Chiu/National Sun Yat-sen University Yung-Jr Hung/National Sun Yat-sen University

8:30 - 8:45 **Inverse Geometric Design of Fabrication-Robust Nanophotonic Waveguides (SF1J.3)**
Presenter: Ziwei Zhu, *Columbia University*
Expand for Abstract / Authors

Paper

We present an inverse design method making waveguides with high performance and high robustness to fabrication errors. As an example, we show a 1-to-4 mode converter with > −1.5 dB conversion efficiency under geometric variations within fabrication tolerances.

Authors:Ziwei Zhu/Columbia University Utsav Dave/Columbia University Michal Lipson/Columbia University Changxi Zheng/Columbia University

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8:45 - 9:00 **Breaking the Fabrication Determined Resolution Limit of Photonic Crystal Wavemeter by Machine Learning (SF1J.4)**
Presenter: Jocelyn Hofs, *Keio University*
Expand for Abstract / Authors

Paper

By utilizing random localization patterns as training data for machine learning, we achieved a 0.2-nm wavelength resolution with a fabricated photonic crystal wavemeter, which greatly exceeds the limit imposed by the fabrication.

Authors:Jocelyn Hofs/Keio University Takumasa Kodama/Keio University Shengji Jin/Keio University Takasumi Tanabe/Keio University

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9:00 - 9:15 **Transmissive Multi-plane Light Conversion for Demultiplexing Orbital Angular Momentum Modes (SF1J.5)**
Presenter: Zhongzheng Lin, *Sun Yat-Sen University*
Expand for Abstract / Authors

Paper

We design and demonstrate an OAM mode demultiplexer based on a novel transmissive multi-plane light conversion scheme and fabricated on two glass plates with double-sided patterns. 7 OAM modes are supported across the C-band.

Authors:Zhongzheng Lin/Sun Yat-Sen University Yuanhui Wen/Sun Yat-Sen University Yujie Chen/Sun Yat-Sen University Siyuan Yu/Sun Yat-Sen University

9:15 - 9:30 **Metasurface Manufacturing on 300-mm Wafer Platforms (SF1J.6)**
Presenter: Nanxi Li, *Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research)*
Expand for Abstract / Authors

Paper

The CMOS-compatible flat optics fabrication platforms developed within the Institute of Microelectronics (IME) for multi-purpose wafers have been presented. The work aims to drive the flat optics towards the mass-manufacturing and commercialization.

Authors:Nanxi Li/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Zhengji Xu/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Yuan Dong/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Ting Hu/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Qize Zhong/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Yuan Hsing Fu/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Shiyang Zhu/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Navab Singh/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research)

9:30 - 10:00 **(Withdrawn) Active and Tunable Dielectric Nanoantenna Devices (SF1J.7)**
Presenter: Arseniy Kuznetsov, *Institute of Materials Research and Engineering, A*STAR (Agency for Science, Technology and Research)*
Expand for Abstract / Authors

Dielectric nanoantennas represent a low-loss alternative to plasmonics bringing nanophotonic concepts to real-world applications. Here, I will discuss high-resolution spatial light modulators and directional nanolasers based on active and tunable dielectric nanoantennas and metasurfaces.

Authors:Arseniy Kuznetsov/Institute of Materials Research and Engineering, A*STAR (Agency for Science, Technology and Research)

Invited

Novel Optical Fibers (SF1P)

Presider: Yingying Wang, *Beijing University of Technology*

8:00 - 8:30	**Multi-material and Multi-functional Optical Fibers: Fabrication and Opportunities (SF1P.1)** **Presenter**: Fabien Sorin, *Ecole Polytechnique Federale de Lausanne* Expand for Abstract / Authors The fabrication challenges and application opportunities associated with the integration of novel materials at the micro- and nano-scale and prescribed positions within rigid and soft optical fibers will be presented. **Authors**:Fabien Sorin/Ecole Polytechnique Federale de Lausanne Invited	Paper
8:30 - 8:45	**Light guidance beyond cutoff in optical fibers (SF1P.2)** **Presenter**: Zelin Ma, *Boston University* Expand for Abstract / Authors We demonstrate that light can be guided in higher azimuthal order modes with negligible loss over 100-m lengths, even at wavelengths 100-200 nm past cutoff. This has fundamental implications for the design of multimode fibers. **Authors**:Zelin Ma/Boston University Poul Kristensen/OFS-Fitel Siddharth Ramachandran/Boston University	Paper
8:45 - 9:00	**Ytterbium-Doped Fiber With Tapered Core and Uniform Cladding (SF1P.3)** **Presenter**: Xianfeng Lin, *Wuhan National Laboratory for Optoelectronics* Expand for Abstract / Authors We report an Yb-doped fiber with tapered core and uniform cladding. A 364 W laser output was observed in MOPA structure. The laser slope efficiency was measured to be 71.11% and M^2 factor was 1.63. **Authors**:Xianfeng Lin/Wuhan National Laboratory for Optoelectronics Yongshi Cheng/Wuhan National Laboratory for Optoelectronics Yibo Wang/Wuhan National Laboratory for Optoelectronics Yingbo Chu/Wuhan National Laboratory for Optoelectronics Lei Liao/Wuhan National Laboratory for Optoelectronics Jinyan Li/Wuhan National Laboratory for Optoelectronics	Paper

9:00 - 9:15

(Withdrawn) Nd^{3+}-doped Phosphate Glasses and Fibers for Laser Emission Below 900 nm (SF1P.4)
Presenter: Shijie Fu, *The University of Arizona*
Expand for Abstract / Authors

Nd^{3+}-doped phosphate glasses and fibers were fabricated and studied for short-wavelength emission. The experimental results show that low doping level of Nd^{3+} is favorable for efficient emission below 900 nm.

Authors:Shijie Fu/The University of Arizona Xiushan Zhu/The University of Arizona Junfeng Wang/The University of Arizona Minghong Tong/The University of Arizona Jie Zong/NP Photonics Michael Li/NP Photonics Arturo Chavez/NP Photonics Nasser Peyghambarian/The University of Arizona

9:15 - 9:30

170-nm Tuning Range and Low-threshold Cr^{4+}:YAG Double-clad Crystal Fiber Laser (SF1P.5)
Presenter: Yi-Hsun Li, *National Taiwan University*
Expand for Abstract / Authors

Paper

A broadly tunable Cr^{4+}:YAG double-clad crystal fiber laser is demonstrated by laser diode pump with a threshold power of 55 mW. The tuning range was 170 nm centered at 1438 nm limited by excited-state absorption.

Authors:Yi-Hsun Li/National Taiwan University Yu-Chan Lin/National Taiwan University Yu-Wei Hsu/National Taiwan University Teng-I Yang/National Taiwan University Sheng-Lung Huang/National Taiwan University

9:30 - 9:45

Ultra-Large Mode Area Chalcogenide Photonic Crystal Fiber for High-Power Mid-Infrared Applications (SF1P.6)
Presenter: Xian Feng, *Jiangsu Normal University*
Expand for Abstract / Authors

Paper

We report a mid-infrared chalcogenide glass ultralarge mode area photonic crystal fiber for high power applications. Broadband mid-infrared single-mode operation and supercontinuum have been observed in the fiber with recorded mode area of 5200μm^2.

Authors:Xian Feng/Jiangsu Normal University He Ren/Jiangsu Normal University Sisheng Qi/Jiangsu Normal University Yongsheng Hu/Jiangsu Normal University Feng Han/Jiangsu Normal University Jindan Shi/Jiangsu Normal University Zhiyong Yang/Jiangsu Normal University

Ultraviolet to Green Wavelength Semiconductor Devices (AF1I)
Presider: Grigorii Sokolovskii, *Ioffe Institute*

8:00 - 8:15 **Advantages of AlGaN-based deep ultraviolet light-emitting diodes with graded quantum structures in the active region (AF1I.1)**
Presenter: Huabin Yu, *University of Science and Technology of China*
Expand for Abstract / Authors

Paper

We have investigated several DUV LEDs with graded quantum wells and graded quantum barriers. We found that these unique MQW structures could remarkably improve the internal quantum efficiency, external quantum efficiency and light output power.

Authors:Huabin Yu/University of Science and Technology of China Zhongjie Ren/University of California San Diego Zhongling Liu/University of Sci. & Tech. of China Chong Xing/University of Science and Technology of China Haiding Sun/University of Sci. & Tech. of China

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8:15 - 8:30 **High Internal Quantum Efficiency from AlGaN-delta-GaN Quantum Well at 260 nm (AF1I.2)**
Presenter: Cheng Liu, *Rochester Institute of Technology*
Expand for Abstract / Authors

Paper

High internal quantum efficiency (85%) was realized from the AlGaN-delta-GaN quantum well (QW) structure grown on a conventional AlN/sapphire template by Molecular Beam Epitaxy. The peak emission wavelength is observed at 260 nm.

Authors:Cheng Liu/Rochester Institute of Technology Kevin Lee/Cornell University Galen Harden/University of Notre Dame Anthony Hoffman/University of Notre Dame Huili Grace Xing/Cornell University Debdeep Jena/Cornell University Jing Zhang/Rochester Institute of Technology

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8:30 - 8:45 **Electron Blocking Layer Free AlGaN Deep-Ultraviolet Light Emitting Diodes (AF1I.3)**
Presenter: Barsha Jain, *New Jersey Institute of Technology*
Expand for Abstract / Authors

Paper

Performance of the deep-ultraviolet LEDs is improved by replacing conventional *p*-doped electron blocking layer with an intrinsic 2 nm thin AlGaN strip in the last quantum barrier due to enhancement of the hole transportation.

Authors:Barsha Jain/New Jersey Institute of Technology Ravi Teja Velpula/New Jersey Institute of Technology HA QUOC THANG BUI/New Jersey Institute of Technology Moses Tumuna/New Jersey Institute of Technology Jeffrey Jude/New Jersey Institute of Technology Hieu Nguyen/New Jersey Institute of Technology

8:45 - 9:00	**Boosted performance of ultraviolet light-emitting diodes via wavy quantum wells grown on large misoriented sapphire substrate (AF1I.4)** **Presenter**: Haiding Sun, *University of Sci. & Tech. of China* Expand for Abstract / Authors High quality and wavy $Al_{1-x}Ga_xN/Al_{1-y}Ga_yN$ multiple quantum wells emitting at ~280 nm was successfully grown on sapphire substrate with a misorientation angle as large as 4°. A significantly enhanced optical performance was achieved. **Authors**:Haiding Sun/University of Sci. & Tech. of China	Paper
9:00 - 9:15	**Single/Multi-wavelength green laser diode system (AF1I.5)** **Presenter**: Md. Hosne Mobarok Shamim, *King Fahd University of Petroleum & Mine* Expand for Abstract / Authors Single and two-stage self-injection locking in InGaN/GaN laser diode is presented. Near single-mode emission with 34pm linewidth, and simultaneous locking of four longitudinal modes with appreciable 18dB SMSR and <2.5dB peak power ratio is achieved. **Authors**:Md. Hosne Mobarok Shamim/King Fahd University of Petroleum & Mine Tien Khee Ng/King Abdullah University of Science and Technology Boon S. Ooi/King Abdullah University of Science and Technology Mohammed Khan/King Fahd University of Petroleum & Mine	Paper
9:15 - 9:30	**Green Light-Emitting Diodes with 667 MHz Modulation Bandwidth for Visible Light Communication (AF1I.6)** **Presenter**: Yu-Chien Hsu, *National Chiao Tung University* Expand for Abstract / Authors High-quality semipolar GaN is crucial in realizing high-performance optoelectronic devices and overcome quantum confined Stark effect. The green light VLC-LED achieves 667 MHz bandwidth due to a high quality and stacking-faults free semipolar epitaxial method. **Authors**:Yu-Chien Hsu/National Chiao Tung University Sung-Wen Huang Chen/National Chiao Tung University Fang-Jyun Liou/National Chiao Tung University Jie Song/Saphlux Inc Joowon Choi/Saphlux Inc Jung Han/Yale University Hao-Chung Kuo/National Chiao Tung University	Paper

9:30 - 9:45	**Low-Noise GaN *p-i-n* Avalanche Photodiodes for Ultraviolet Applications Using an Ion-Implantation Isolation Technique (AF1I.7)** **Presenter**: Minkyu Cho, *Georgia Institute of Technology* Expand for Abstract / Authors We report high-performance GaN avalanche photodiodes using a novel ion implanted isolation technique. The devices showed low dark current, an equivalent noise power of $<10^{-16}$ $WHz^{-0.5}$ and avalanche gain of 7×10^{5} at *l* = 280 nm. **Authors**:Minkyu Cho/Georgia Institute of Technology Hoon Jeong/Georgia Institute of Technology Chuan-Wei Tsou/Georgia Institute of Technology Marzieh Bakhtiary-Noodeh/Georgia Institute of Technology Theeradetch Detchprohm/Georgia Institute of Technology Russell Dupuis/Georgia Institute of Technology Shyh-Chiang Shen/Georgia Institute of Technology	Paper
9:45 - 10:00	**Very-Fast Timing Performance of InGaAs/InAlAs Single Photon Avalanche Diode with Dual Multiplication Layers (AF1I.8)** **Presenter**: PING-Li WU, *National Central University* Expand for Abstract / Authors We present novel InGaAs/InAlAs single photon avalanche diodes with dual multiplication layers, large active diameters (240mm), high detection efficiency (32%), record small jitter (35ps), and low afterpulsing (<1% at 2ms hold-off time) at nearly 200K. **Authors**:Yi-Shan Lee/National Central University Yu-Chia Chen/National Central University PING-Li WU/National Central University Jin-Wei Shi/National Central University Naseem Naseem/National Central University	Paper

Lasers with Novel Properties (SF1E)

Presider: Shamsul Arafin, *ECE, Ohio State University*

8:00 - 8:15	**AZO nanowires as a random laser (SF1E.1)** **Presenter**: Wan Maryam Wan Ahmad Kamil, *Universiti Sains Malaysia* Expand for Abstract / Authors AZO nanowires show lowest threshold of 0.07 W/cm^2 when added with 12.5 % of aluminium nitride. Threshold was at least 2 orders of magnitude lower than pure ZnO nanowires and emission was single mode. **Authors**:Wan Maryam Wan Ahmad Kamil/Universiti Sains Malaysia nur fadzliana Ramli/Universiti Sains Malaysia siti Azrah Mohammad Samsuri/Universiti Sains Malaysia Si Yuan Chan/National Cheng Kung University Hsu Cheng Hsu/National Cheng Kung University Norzaini zainal/Universiti Sains Malaysia haslan abu hassan/Universiti Sains Malaysia Otto Muskens/university of southampton	Paper

8:15 - 8:30	**Parallel Incoherent Wideband Complex Chaos Generation Using Semiconductor Lasers (SF1E.2)** **Presenter**: Ning Jiang, *Univ of Electronic Science & Tech China* Expand for Abstract / Authors We propose a parallel chaos generation by applying self-phase-modulation CW injection to external-cavity laser and phase-to-intensity conversion to CW light, and experimentally demonstrate simultaneous generation of two incoherent chaotic signals with wideband-flat-spectra and excellent complexity. **Authors**:Ning Jiang/Univ of Electronic Science & Tech China Anke Zhao/Univ of Electronic Science & Tech China Shiqin Liu/Univ of Electronic Science & Tech China Yiqun Zhang/Univ of Electronic Science & Tech China Jiafa Peng/Univ of Electronic Science & Tech China Kun Qiu/Univ of Electronic Science & Tech China	Paper
8:30 - 9:00	**Topological Light Sources (SF1E.3)** **Presenter**: Boubacar Kante, *University of California Berkeley* Expand for Abstract / Authors TBD **Authors**:Boubacar Kante/University of California Berkeley Invited	
9:00 - 9:15	**Topological charge of finite-size photonic crystal lasing modes (SF1E.4)** **Presenter**: Zhixin Wang, *ETH Zurich* Expand for Abstract / Authors We analyze the topological charge of photonic crystal modes that have polarization properties dictated by their non-trivial envelopes, and demonstrate experimentally their lasing operation in electrically pumped mid-infrared photonic crystal lasers with high slope efficiency. **Authors**:Zhixin Wang/ETH Zurich Yong Liang/ETH Zurich Mattias Beck/ETH Zurich Giacomo Scalari/ETH Zurich Jérôme Faist/ETH Zurich	Paper
9:15 - 9:30	**Elusive Coherence of Metal-Semiconductor Nanolasers (SF1E.5)** **Presenter**: Dmitry Fedyanin, *Moscow Institute of Physics & Technology* Expand for Abstract / Authors We revise the definition of the lasing threshold of metal-semiconductor nanolasers using a clear coherence definition and present an expression for the threshold current that can be applied to most thresholdless and non-thresholdless nanolasers. **Authors**:Andrey Vyshnevyy/Moscow Institute of Physics & Technology Dmitry Fedyanin/Moscow Institute of Physics & Technology	Paper

9:30 - 9:45	**Spatio-temporal dynamics of highly multimode semiconductor lasers (SF1E.6)** **Presenter**: Kyungduk Kim, *Yale University* Expand for Abstract / Authors We present a cavity design for broad-area semiconductor lasers that stabilizes lasing dynamics and produces directional emission. By tuning the cavity geometry, we control nonlinear interactions of the lasing modes with the gain medium. **Authors**:Kyungduk Kim/Yale University Stefan Bittner/Yale University Yongquan Zeng/Nanyang Technological University Stefano Guazzotti/Imperial College Ortwin Hess/Imperial College Qijie Wang/Nanyang Technological University Hui Cao/Yale University	Paper
9:45 - 10:00	**Fabry Perot Laser Arrays Covering C+L Band Obtained by Selective Area Growth on InP-SiO_2/Si Substrate (SF1E.7)** **Presenter**: Claire Besancon, *III-V Lab, a joint lab of Nokia Bell Labs, Thales Research and Technology and CEA LETI* Expand for Abstract / Authors Fabry-Perot laser arrays based on vertical p-i-n laser diode structures grown on InP layer directly bonded to Si wafer is presented. Lasing emission covering the C+L bands is achieved by means of a single-epitaxy Selective Area Growth (SAG) technology. **Authors**:Claire Besancon/III-V Lab, a joint lab of Nokia Bell Labs, Thales Research and Technology and CEA LETI Delphine Néel/III-V Lab, a joint lab of Nokia Bell Labs, Thales Research and Technology and CEA LETI Giancarlo Cerulo/III-V Lab, a joint lab of Nokia Bell Labs, Thales Research and Technology and CEA LETI Nicolas Vaissiere/III-V Lab, a joint lab of Nokia Bell Labs, Thales Research and Technology and CEA LETI Dalila Make/III-V Lab, a joint lab of Nokia Bell Labs, Thales Research and Technology and CEA LETI Karim Mekhazni/III-V Lab, a joint lab of Nokia Bell Labs, Thales Research and Technology and CEA LETI Frédéric Pommereau/III-V Lab, a joint lab of Nokia Bell Labs, Thales Research and Technology and CEA LETI Frank Fournel/Univ. Grenoble Alpes, CEA LETI Cécilia Dupré/Univ. Grenoble Alpes, CEA LETI Christophe Jany/Univ. Grenoble Alpes, CEA LETI Franck Bassani/Univ. Grenoble Alpes; CNRS, CEA LETI Minatec, LTM Sylvain David/Univ. Grenoble Alpes; CNRS, CEA LETI Minatec, LTM Thierry Baron/Univ. Grenoble Alpes; CNRS, CEA LETI Minatec, LTM	Paper

Frontiers in Frequency Combs I (SF1G)

Presider: Akifumi Asahara, *University of Electro-Communications*

8:00 - 8:15 **Elastic-Tape Picture of a Bi-Directional Kerr-Lens Mode-Locked Dual-Comb Ring Laser (SF1G.1)**
Presenter: Bachana Lomsadze, *Santa Clara University*
Expand for Abstract / Authors

Paper

A fixed point of a bi-directional dual-comb ring laser is investigated. Using dual-comb spectroscopy we show how changes in the combs' relative repetition and offset frequencies are correlated, giving insight into the combs' mutual coherence.

Authors:Bachana Lomsadze/Santa Clara University Kelly Fradet/Santa Clara University Richard Arnold III/Santa Clara University

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8:15 - 8:30 **All-fiber-photonic sub-10^{-14}-level comb-line stabilization (SF1G.2)**
Presenter: Dohyeon Kwon, *Korea Advanced Inst of Science & Tech*
Expand for Abstract / Authors

Paper

We demonstrate a fiber delay line-based direct comb-line stabilization with $6x10^{-15}$ frequency instability whitin 1 s. Two combs could be simultaneously stabilized to a single fiber delay-line with ~1-Hz relative linewidth and ~20-Hz absolute linewidth.

Authors:Dohyeon Kwon/Korea Advanced Inst of Science & Tech Igju Jeon/Korea Advanced Inst of Science & Tech Won-Kyu Lee/Korea Research Institute of Standards and Science Myoung-Sun Heo/Korea Research Institute of Standards and Science Jungwon Kim/Korea Advanced Inst of Science & Tech

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8:30 - 9:00 **Microcombs Based on Laser Cavity Solitons (SF1G.3)**
Presenter: Alessia Pasquazi, *University of Sussex*
Expand for Abstract / Authors

Paper

We summarize our results on the generation of temporal laser cavity-solitons in a system comprising an optical micro-cavity nested in a fiber laser. We will discuss their features, region of existence, potential and challenges ahead.

Authors:Alessia Pasquazi/University of Sussex Hualong Bao/University of Sussex Maxwell Rowley/University of Sussex Pierre-Henry Hazard/University of Sussex Luana Olivieri/University of Sussex Antonio Cutrona/University of Sussex Benjamin Wetzel/University of Sussex Luigi Di Lauro/University of Sussex Juan Sebastian Totero Gongora/University of Sussex Sai Chu/University of Sussex Brent Little/University of Sussex Gian-Luca Oppo/University of Sussex Roberto Morandotti/University of Sussex David Moss/University of Sussex Marco Peccianti/University of Sussex

Invited

9:00 - 9:15 **(Withdrawn) Femtosecond dual-comb generation from a polarization-multiplexed Yb:CaF$_2$ laser cavity (SF1G.4)**
Presenter: Benjamin Willenberg, *ETH Zurich*
Expand for Abstract / Authors

We demonstrate a single-cavity dual-comb diode-pumped solid-state oscillator. A polarization-multiplexed Yb:CaF$_2$-based cavity outputs two beams each with >300-mW average power, 200-fs pulse duration, 137-MHz repetition rate, and highly stable repetition rate difference of 3.7-kHz.

Authors:Benjamin Willenberg/ETH Zurich Christopher Phillips/ETH Zurich Florian Koch/ETH Zurich Léonard Krüger/ETH Zurich Ursula Keller/ETH Zurich

9:15 - 9:30 **III-V-on-silicon mode-locked lasers with 1-GHz line spacing for dual-comb spectroscopy (SF1G.5)**
Presenter: Kasper Van Gasse, *Ghent University-imec*
Expand for Abstract / Authors

We demonstrate dual-comb interferometry and spectroscopy with a III-V-on-silicon passively mode-locked laser of 1-GHz repetition rate and 1-THz span. We heterodyne the on-chip device with an electro-optic modulator comb for initial assessment.

Authors:Kasper Van Gasse/Ghent University-imec JEONG HYUN HUH/Max-Planck institude of Quantum Optics Zaijun Chen/Max-Planck institude of Quantum Optics Stijn Poelman/Ghent University-imec Zhechao Wang/Ghent University-imec Gunther Roelkens/Ghent University-imec Theodor Haensch/Max-Planck institude of Quantum Optics Bart Kuyken/Ghent University-imec Nathalie Picqué/Max-Planck institude of Quantum Optics

Paper

9:30 - 9:45 **Frequency Comb Offset Stabilization via Integrated Lithium Niobate *f*-2*f* Interferometer (SF1G.6)**
Presenter: Yoshitomo Okawachi, *Columbia University*
Expand for Abstract / Authors

We demonstrate carrier-envelope offset frequency (f_{CEO}) stabilization of a modelocked laser using an integrated, dispersion engineered lithium niobate *f*-2*f* interferometer via simultaneous supercontinuum and second-harmonic generation with only 107 pJ pulse energy.

Authors:Yoshitomo Okawachi/Columbia University Mengjie Yu/Harvard University Boris Desiatov/Harvard University Bok Young Kim/Columbia University Marko Loncar/Harvard University Alexander Gaeta/Columbia University

Paper

9:45 - 10:00 **Photodetector Flicker Noise Optimization for Ultralow Noise Optical-to-Electrical Conversion (SF1G.7)**
Presenter: Dahyeon Lee, *University of Colorado Boulder*
Expand for Abstract / Authors

Paper

We examine the optical pulse width and illumination spot size dependence on the flicker phase noise of a photodiode, resulting in a 10 dB noise reduction to -143/f dBc/Hz on a 1 GHz carrier.

Authors:Dahyeon Lee/University of Colorado Boulder Takuma Nakamura/National Institute of Standards and Technology Joe Campbell/University of Virginia Scott Diddams/National Institute of Standards and Technology Franklyn Quinlan/National Institute of Standards and Technology

10:30 - 11:45 (UTC - 07:00)

ATTR: Optical Technologies for Autonomous Cars and Mobility II (AF2M)
Presider: Paul McManamon, *Exciting Technology LLC*

10:30 - 11:00 **Integrated Photonics for Automotive LIDAR (AF2M.1)**
Presenter: Michael Larson, *Lumentum Operations Inc*
Expand for Abstract / Authors

We describe InP-based integrated narrow linewidth tunable lasers with separate electrodes for frequency modulation, fast wavelength switching, and amplification, which are uniquely suited to FMCW LIDAR, as well as complementary photonic technologies for automotive applications.

Authors:Michael Larson/Lumentum Operations Inc

Invited

11:00 - 11:30 **(Withdrawn) Title to be Announced (AF2M.2)**
Presenter: Gary Hicok, *NVIDIA Corporation*
Expand for Abstract / Authors

TBD

Authors:Gary Hicok/NVIDIA Corporation

Invited

11:30 - 11:45 **Lidar Optical Architectures with Digital Micromirror Devices (AF2M.3)**
Presenter: Yuzuru Takashima, *University of Arizona*
Expand for Abstract / Authors

Paper

Lidar optical architecture employing Digital Micromirror Device provides unique features such as low mechanical inertia, a large aperture area, fast scanning speed, and a high efficiency in beam steering.

Authors:Yuzuru Takashima/University of Arizona Brandon Hellman/University of Arizona Joshua Rodriguez/University of Arizona Chuan Luo/University of Arizona Young-sik Kim/University of Arizona Jae-Hyeung Park/Inha University

10:30 - 12:30 (UTC - 07:00)

Symp: Neural Networks II: Emerging Concepts (JF2A)
Presider: Jeffrey Shainline

Special Symposium

10:30 - 11:00 **Photonic Accelerator : Challenges and Promise (JF2A.1)**
Presenter: Ken-ichi Kitayama, *Grad Sch Creation of New Photonics Ind*
Expand for Abstract / Authors

Paper

Photonic accelerator is optimized to perform specific functions placed at frontend, which does so faster with less power consumption than electronic counterparts. We will introduce its concept and discuss the challenges and promising use cases.

Authors:Ken-ichi Kitayama/Grad Sch Creation of New Photonics Ind

Invited

11:00 - 11:30 **The Past and Future of Optical Neural Networks (JF2A.2)**
Presenter: Demetri Psaltis, *Ecole Polytechnique Federale de Lausanne*
Expand for Abstract / Authors

Paper

Interest in optical hardware for the implementation of neural networks has been revived recently with the advent of new optoelctronics technologies and the large increse in the size of neural networks that are being implemented or contemplated. At the same time, digitally implemented neural networks are increasingly being used to help improve the performane of optical systems. We will compare these two emerging trends and discuss how they might possibly merge in the future.

Authors:Demetri Psaltis/Ecole Polytechnique Federale de Lausanne

Invited

11:30 - 12:00

Photonic neural network: training, nonlinearity, and recurrent systems (JF2A.3)
Presenter: Shanhui Fan, *Stanford University*
Expand for Abstract / Authors

Paper

We discuss some of our recent works on photonic neural network, focusing in particular on concepts for introducting nonlinearity and for training. We also discuss efforts in constructing recurrent neural networks based on wave physics.

Authors:Shanhui Fan/Stanford University

Invited

12:00 - 12:30

Progress in Superconducting Optoelectronic Networks for Neuromorphic Computing (JF2A.4)
Presenter: Sonia Buckley, *National Inst of Standards & Technology*
Expand for Abstract / Authors

Paper

We have proposed a superconducting opto-electronic platform for neuromorphic computing utilizing semiconductor light sources coupled to integrated waveguides for communication, and superconducting detectors and electronics for efficient computation. Here we summarize the recent experimental progress.

Authors:Sonia Buckley/National Inst of Standards & Technology Jeffrey Chiles/National Inst of Standards & Technology Alexander Tait/National Inst of Standards & Technology Adam McCaughan/National Inst of Standards & Technology Sae Woo Nam/National Inst of Standards & Technology Richard Mirin/National Inst of Standards & Technology Jeffrey Shainline/National Inst of Standards & Technology

Invited

High-field Phenomena (FF2C)

Presider: John Nees, *University of Michigan*

10:30 - 10:45

Cascaded Plasma Mirrors for Enhanced Relativistic Harmonic Generation (FF2C.1)
Presenter: Matthew Edwards, *Princeton University*
Expand for Abstract / Authors

Paper

Relativistic harmonic generation is a waveform-dependent process that can be enhanced by multi-color driving pulses. We experimentally demonstrate higher-efficiency harmonics from a plasma mirror cascade, where an initial plasma mirror produces the multi-color beam.

Authors:Matthew Edwards/Princeton University Nicholas Fasano/Princeton University Eric Lepowsky/Princeton University Andreas Giakas/Princeton University Timothy Bennett/Princeton University Julia Mikhailova/Princeton University

10:45 - 11:00 **Measured Polarization Components of Nonlinear Thomson Scattering (FF2C.2)**
Presenter: Justin Peatross, *Brigham Young University*
Expand for Abstract / Authors

Paper

We measure fundamental, second, and third harmonics of nonlinear Thomson scattering emitted by free electrons out the side of a laser focus with 10^{18}W/cm^{2}. The redshifted photons show distinct spatial patterns when resolved by polarization.

Authors:Justin Peatross/Brigham Young University Nic Atkinson/Brigham Young University Daniel Hodge/Brigham Young University Brittni Pratt/Brigham Young University Mahonri Romero/Brigham Young University Christoph Schulzke/Brigham Young University Michael Ware/Brigham Young University

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11:00 - 11:15 **LWIR filamentation arrested by avalanche ionization (FF2C.3)**
Presenter: Daniel Woodbury, *University of Maryland at College Park*
Expand for Abstract / Authors

Paper

Long wave infrared (LWIR) filamentation enables long range channeling of higher peak power beams before modulation and breakup. We present self-consistent modeling of the effect of avalanche ionization on LWIR filamentation, consistent with recent experiments.

Authors:Daniel Woodbury/University of Maryland at College Park Robert Schwartz/University of Maryland at College Park Josh Isaacs/US Naval Research Laboratory Howard Milchberg/University of Maryland at College Park

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11:15 - 11:30 **Spatio-temporal measurement of super-fluorescence from light filaments in air (FF2C.4)**
Presenter: Ladan Arissian, *National Research Council Canada*
Expand for Abstract / Authors

Paper

Using a streak camera, we measure
the spatial profile of fluorescence emission of from a filament in air. The delay is inversely proportional to the density of the excited states contributing in collective emission.

Authors:Ladan Arissian/National Research Council Canada Ali Rastegari/University of New Mexico Brian Kamer/University of New Mexico

11:30 - 11:45

(Withdrawn) Formation dynamics of excited neutral nitrogen molecules inside femtosecond laser filaments (FF2C.5)
Presenter: Yiu Liu, *Univ. of Shanghai for Sci. and Tech.*
Expand for Abstract / Authors

Using a laser-induced fluorescence depletion technique, we measure the formation dynamics of the excited neutral nitrogen molecules inside filaments. Our results suggest that the excitation of neutral N_2 occurs via collisions with energetic free electrons.

Authors:Xiang Zhang/Univ. of Shanghai for Sci. and Tech. Rostyslav Danylo/Univ. of Shanghai for Sci. and Tech. Zhengquan Fan/Univ. of Shanghai for Sci. and Tech. Dongjie Zhou/Univ. of Shanghai for Sci. and Tech. Qi Lu/Univ. of Shanghai for Sci. and Tech. Bin Zhou/Univ. of Shanghai for Sci. and Tech. Qingqing Liang/Univ. of Shanghai for Sci. and Tech. Songlin Zhuang/Univ. of Shanghai for Sci. and Tech. Aurelien Houard/ENSTA Paris Andre Mysyrowicz/ENSTA Paris Eduardo Oliva/Universidad Politécnica de Madrid Yiu Liu/Univ. of Shanghai for Sci. and Tech.

11:45 - 12:00

Controlling N_2^+ Lasing (FF2C.6)
Presenter: Mathew Britton, *University of Ottawa*
Expand for Abstract / Authors

- Paper

Traditional N_2^+ lasing experiments are limited because the pump pulse combines ionization with excitation of the gain medium. A second excitation pulse can act independent of ionization to control electronic, vibrational, and rotational dynamics.

Authors:Mathew Britton/University of Ottawa Dong Hyuk Ko/University of Ottawa Patrick Laferriere/University of Ottawa Chunmei Zhang/University of Ottawa Ladan Arissian/University of Ottawa Paul Corkum/University of Ottawa

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12:00 - 12:15

Few Cycle EUV Continuum Generation via Thin Film Compression (FF2C.7)
Presenter: Matthew Stanfield, *University of California*
Expand for Abstract / Authors

- Paper

Generation of an extreme ultraviolet continuum (33 eV to 72 eV) by a multimillijoule, few-cycle (7 fs) laser pulse produced by the Thin Film Compression technique.

Authors:Matthew Stanfield/University of California Hunter Allison/University of California Nicholas Beier/University of California Sahel Hakimi/University of California Amina Hussein/University of California Franklin Dollar/University of California

12:15 - 12:30

High-Order Harmonic Source for Time- and Angle-Resolved Photoemission Spectroscopy based on Nonlinear Compression of a Yb:KGW Laser (FF2C.8)
Presenter: Yangyang Liu, *University of Central Florida*
Expand for Abstract / Authors

Paper

We have developed an experimental setup for ultrafast angle-resolved photoemission spectroscopy based on high-order harmonic generation from a Yb:KGW laser. Using nonlinear compression, we show that the time resolution can be improved to ~30 fs.

Authors:Yangyang Liu/University of Central Florida John Beetar/University of Central Florida Nrisimhamurty Madugula/University of Central Florida Shima Gholam Mirzaeimoghadar/University of Central Florida Md Hosen/University of Central Florida Gyanendra Dhakal/University of Central Florida Christopher Sims/University of Central Florida Marc Etienne/University of Central Florida firoza kabir/University of Central Florida Klauss Dimitri/University of Central Florida Sabin Regmi/University of Central Florida Madhab Neupane/University of Central Florida Michael Chini/University of Central Florida

Applied Chemical Sensing (SF2N)

Presider: Erik Emmons, *US Army CCDC CBC*

10:30 - 11:00

Laser-Induced Breakdown Spectroscopy. A future superstar? (SF2N.1)
Presenter: Vincenzo Palleschi, *Consiglio Nazionale delle Ricerche*
Expand for Abstract / Authors

Paper

In this communication, the possible routes of LIBS to reach the status of 'analytical superstar' will be discussed, with a special emphasis on the most promising applications of the technique.

Authors:Vincenzo Palleschi/Consiglio Nazionale delle Ricerche

Invited

11:00 - 11:15

Dual-Comb Photoacoustic Spectroscopy (SF2N.2)
Presenter: Thibault Voumard, *Centre Suisse d'Electronique et de Microtechnique*
Expand for Abstract / Authors

Paper

Photoacoustic dual-comb spectroscopy is demonstrated, providing scan-free mapping of optical absorption spectra to acoustically detectable frequencies. Narrow absorption features of a low volume gas sample are resolved with high signal-to-noise ratio in short acquisition time.

Authors:Thibault Wildi/Centre Suisse d'Electronique et de Microtechnique Thibault Voumard/Centre Suisse d'Electronique et de Microtechnique Victor Brasch/Centre Suisse d'Electronique et de Microtechnique Gürkan Yilmaz/Centre Suisse d'Electronique et de Microtechnique Tobias Herr/Centre Suisse d'Electronique et de Microtechnique

11:15 - 11:30	**Cantilever-Enhanced Photoacoustic Spectroscopy of Radioactive Methane (SF2N.3)** **Presenter**: Markku Vainio, *University of Helsinki* Expand for Abstract / Authors We report the first high-resolution spectroscopy study of radiocarbon methane, $^{14}CH_4$. Several absorption lines of the fundamental vibrational band ν_3 were measured using a continuous-wave mid-infrared optical parametric oscillator with cantilever-enhanced photoacoustic spectroscopy. **Authors**:Markku Vainio/University of Helsinki Santeri Larnimaa/University of Helsinki Juho Karhu/University of Helsinki Teemu Tomberg/University of Helsinki Guillaume Genoud/MIKES VTT Tuomas Hieta/Gasera Ltd. Markus Metsälä/University of Helsinki Lauri Halonen/University of Helsinki	Paper
11:30 - 11:45	**(Withdrawn) Carbon Monoxide Photoacoustic Detection Exploiting a Surface Grooved Tuning Fork (SF2N.4)** **Presenter**: Lei Dong, *Shanxi University* Expand for Abstract / Authors Based on a grooved quartz tuning fork (QTF), a mid-IR CO quartz-enhanced photoacoustic sensor was demonstrated, which removes the conventional requirement of spatial filter. A minimum detection limit of ~ 7 ppbv was obtained with a 300 ms integration time. **Authors**:Lei Dong/Shanxi University Shangzhi Li/Shanxi University Hongpeng Wu/Shanxi University Angelo Sampaolo/University and Politecnico of Bari Pietro Patimisco/University and Politecnico of Bari Vincenzo Spagnolo/University and Politecnico of Bari Frank Tittel/Rice University	
11:45 - 12:00	**Broadband Mid-infrared Trace Gas Sensor Based on a Supercontinuum Source and Lock-in Detection (SF2N.5)** **Presenter**: KHALIL ESLAMI JAHROMI, *Radboud Universiteit Nijmegen* Expand for Abstract / Authors We present a mid-infrared supercontinuum-based trace gas sensor. A lock-in technique is applied to enhance the signal-to-noise ratio by over an order of magnitude, achieving a sensitivity of ~10 ppbv $Hz^{-1/2}$ for the detection of methane. **Authors**:KHALIL ESLAMI JAHROMI/Radboud Universiteit Nijmegen Amir Khodabakhsh/Radboud Universiteit Nijmegen Mohammadreza Nematollahi/Radboud Universiteit Nijmegen Qing Pan/Radboud Universiteit Nijmegen Frans J. Harren/Radboud Universiteit Nijmegen	Paper

12:00 - 12:15 **Ultra-sensitive Silicon Nitride Waveguide-Enhanced Raman Spectroscopy For Aqueous Solutions of Organic Compounds (SF2N.6)**
Presenter: Zuyang Liu, *Ghent University - IMEC*
Expand for Abstract / Authors

Paper

We demonstrate a waveguide-enhanced Raman sensor functionalized with mesoporous silica coating for organic compounds in aqueous solutions. The detection limit of cyclohexanone in water is improved by at least 100 times compared to bare waveguides.

Authors:Zuyang Liu/Ghent University - IMEC Haolan Zhao/Ghent University - IMEC Bettina Baumgartner/Technische Universitat Wien Bernhard Lendl/Technische Universitat Wien Andre Skirtach/Ghent University Nicolas Le Thomas/Ghent University - IMEC Roel Baets/Ghent University - IMEC

12:15 - 12:30 **Single nanoparticle detection with CMOS-compatible heterodyne interferometry (SF2N.7)**
Presenter: ming jin, *Peking University*
Expand for Abstract / Authors

Paper

We introduce a CMOS-compatible waveguide interferometry for single nanoparticle detection using optical dark-field scattering and heterodyne technique. The integrated sensor is capable of detecting single 40-nm-radius nanoparticles with a signal-to-noise ratio of 13 dB.

Authors:ming jin/Peking University shuijing tang/Peking University Haowen Shu/Peking University yuansheng tao/Peking University Xingjun Wang/Peking University yunfeng xiao/Peking University

Ultrafast Oscillators and Amplifiers I (SF2H)

Presider: Clara Saraceno, *Ruhr Universität Bochum*

10:30 - 10:45 **97-fs pulses with 10-W average power generated from a Kerr-lens mode-locked Yb:$CaYAlO_4$ oscillator (SF2H.1)**
Presenter: Rui Xu, *Xidian University*
Expand for Abstract / Authors

Paper

We demonstrated a diode laser pumped high-power Kerr-lens mode-locked Yb:$CaYAlO_4$ oscillator. 97-fs pulses with up to 10-W average power were obtained with the assistance of an additional Kerr medium in a double confocal cavity.

Authors:Rui Xu/Xidian University Geyang Wang/Xidian University Li Zheng/Xidian University Wenlong Tian/Xidian University Xiaodong Xu/Jiangsu Normal University Jiangfeng Zhu/Xidian University zhiyi wei/Institute of Physics Chinese Academy of Sciences

10:45 - 11:00	**Yb:CALGO Oscillator Generates 31-fs Pulses with 389 mW at 29% Efficiency by Cross-Polarized Optical Pumping (SF2H.2)** **Presenter**: François Labaye, *Universite de Neuchatel* Expand for Abstract / Authors Standard collinear pumping of Yb-oscillators with dichroic mirrors severely limits operation at minimum pulse-duration due to dispersion and losses. A novel pumping scheme enables substantially higher efficiency, opening new opportunities for compact high-power few-cycle Yb-oscillators. **Authors**:François Labaye/Universite de Neuchatel Valentin Wittwer/Universite de Neuchatel Norbert Modsching/Universite de Neuchatel Olga Razskazovskaya/Universite de Neuchatel Eric Cormier/Laboratoire Photonique, Numérique et Nanosciences Thomas Südmeyer/Universite de Neuchatel	Paper
11:00 - 11:15	**Pseudo mode-locking (SF2H.3)** **Presenter**: Gunter Steinmeyer, *Max Born Institute* Expand for Abstract / Authors A new mode-locking mechanism is discussed that solely relies on four-wave mixing and does not require a saturable absorber. This mechanism explains a number of previously reported peculiar findings of self-modelocking and comb formation. **Authors**:Esmerando Escoto/Max Born Institute Ayhan Demircan/Leibniz University Hannover Ihar Babushkin/Leibniz University Hannover Gunter Steinmeyer/Max Born Institute	Paper
11:15 - 11:30	**Starting Dynamics of a Linear Mamyshev Oscillator (SF2H.4)** **Presenter**: Yi-Hao Chen, *Cornell University* Expand for Abstract / Authors We investigate the starting dynamics of an environmentally-stable linear Mamyshev oscillator that is started by modulation of the pump power. A moving filter is implemented to generate 21-nJ and 65-fs pulses. **Authors**:Yi-Hao Chen/Cornell University Pavel Sidorenko/Cornell University Robert Thorne/MiTeGen, LLC Frank Wise/Cornell University	Paper

11:30 - 12:00 **An Evolution to Simplicity: 2D Materials, a Tool to Ultrashort Pulse Generation (SF2H.5)**
Presenter: Thoroh De Souza, *Universidade Presbiteriana Mackenzie*
Expand for Abstract / Authors

We will present the state of the art in the use of this new class of 2D materials such as graphene, graphene oxide, reduced graphene oxide, rhenium disulfide and Black Phosphorous to obtain ultrashort pulses.

Authors:Thoroh De Souza/Universidade Presbiteriana Mackenzie

Invited

12:00 - 12:15 **Ultra-Low-Threshold Diode-Pumped Ti:sapphire Laser Modelocked Using Carbon Nanotubes (SF2H.6)**
Presenter: Toby Mitchell, *Heriot-Watt University*
Expand for Abstract / Authors

Paper

We demonstrate 55-fs pulses at 802 nm from a directly-diode-pumped Ti:sapphire laser modelocked using single-walled carbon nanotubes spin-coated on a cavity mirror. This low-loss saturable absorber enables modelocking with pump powers as low as 545 mW.

Authors:Toby Mitchell/Heriot-Watt University Pablo Castro-Marin/Heriot-Watt University Jinghua Sun/Dongguan University of Technology Derryck Reid/Heriot-Watt University

12:15 - 12:30 **A SESAM-like Device Operating beyond 3 Micron (SF2H.7)**
Presenter: Yafei Meng, *Nanjing University*
Expand for Abstract / Authors

Paper

We have for the first time demonstrated a SESAM-like device operating beyond 3 micron. The SESAM-like device is comprised of a highly-reflective Si/SiO Bragg reflector, a Dirac semimetal thin film absorber and a mica substrate as the passivation layer.

Authors:Yafei Meng/Nanjing University Yunkun Yang/Fudan University Xinchao Zhao/Shanghai Institute of Technical Physics Chinese Academy of Science yongbing Xu/Nanjing University Shaowei Wang/Shanghai Institute of Technical Physics Chinese Academy of Science Faxian Xiu/Fudan University Yi Shi/Nanjing University Fengqiu Wang/Nanjing University

Combustion Dynamics: in the Heat of a Flame (AF2K)
Presider: Daniel Adams, *Colorado School of Mines*

10:30 - 11:00 **Progress and Trends in Intracavity Absorption Spectroscopy for Combustion Diagnostics (AF2K.1)**
Presenter: Peter Fjodorow, *University of Duisburg-Essen*
Expand for Abstract / Authors

Paper

First proposed in 1970, intracavity absorption spectroscopy (ICAS) has developed into a powerful diagnostics technique. This talk will focus on recent ICAS applications to combustion diagnostics and sketch promising future developments.

Authors:Peter Fjodorow/University of Duisburg-Essen

Invited

11:00 - 11:15 **Combustion Diagnostics Using a Difference-Frequency-Generation Laser Tunable from 12.6 to 15 μm (AF2K.2)**
Presenter: Mohammad Khaled Shakfa, *King Abdullah University of Science and Technology (KAUST)*
Expand for Abstract / Authors

Paper

We developed a new diagnostic technique based on a widely tunable difference-frequency-generation laser for combustion studies. We applied this technique to probe benzene near 14.84 μm during its formation from propargyl radicals.

Authors:Mohammad Khaled Shakfa/King Abdullah University of Science and Technology (KAUST) Mhanna Mhanna/King Abdullah University of Science and Technology (KAUST) Marco Marangoni/Politecnico di Milano Aamir Farooq/King Abdullah University of Science and Technology (KAUST)

11:15 - 11:30 **(Withdrawn) Determination of soot radiative properties from short-range multi-static elastic lidar (AF2K.3)**
Presenter: Romain Ceolato, *ONERA*
Expand for Abstract / Authors

The aim of this work is to present the recent advances in high spatial resolution profiling of aerosols with a short-range multi-static elastic lidar system. The objective is to retrieve the radiative properties of soot particles in smoke clouds, using light-scattering computation.

Authors:Lucas Paulien/ONERA Romain Ceolato/ONERA

11:30 - 11:45 **(Withdrawn) Atomic Oxygen Lasing Induced by Femtosecond Laser Pulse in Plasma-Assisted Flame (AF2K.4)**
Presenter: Pengji Ding, *Lund University*
Expand for Abstract / Authors

We report on 845-nm lasing generation of atomic oxygen in a methane-air flame by using 2-photon pumping with femtosecond 226-nm laser pulses, particularly focusing on the impact of glow discharges forcing on the backward lasing.

Authors:Pengji Ding/Lund University

11:45 - 12:00 **Three-Dimensional Hyperspectral Imaging with Femtosecond Laser-Induced Filamentation (AF2K.5)** - Paper
Presenter: xiaoyue wang, *East China Normal University*
Expand for Abstract / Authors

We explore the potential of femtosecond laser-induced filamentation for optical gas imaging. In a proof-of-concept experiment, non-contact three-dimensional hyperspectral imaging of an alcohol/air flame is demonstrated with high spatial and spectral resolution.

Authors:xiaoyue wang/East China Normal University Ming Yan/East China Normal University Shuai Yuan/University of Shanghai for Science and Technology Junyi Nan/East China Normal University XINYI REN/East China Normal University Yinqi Wang/East China Normal University Heping Zeng/East China Normal University

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12:00 - 12:15 **(Withdrawn) Transient (kHz) gas jet characterization for laser plasma accelerator optimization (AF2K.6)**
Presenter: François Sylla, *SourceLAB SAS*
Expand for Abstract / Authors

A new technique to map at high temporal resolution in a single shot way a gas jet is presented.

Authors:François Sylla/SourceLAB SAS Benoit Wattellier/Phasics Ivan Doudet/Phasics

12:15 - 12:30 **Wavelength-Multiplexed Single-Shot Ptychography (AF2K.7)**
Presenter: Jonathan Barolak, *Colorado School of Mines*
Expand for Abstract / Authors

_ Paper

We present multiwavelength single-shot ptychography, a technique which is ideally suited for imaging dynamically evolving plasmas. Through improvements to single-shot ptychography and a novel probe constraint, wavelength-multiplexed single-shot ptychography was developed and experimentally realized.

Authors:Jonathan Barolak/Colorado School of Mines David Goldberger/Colorado School of Mines Yves Bellouard/Ecole Polytechnique Federale de Lausanne Jeffrey Squier/Colorado School of Mines Charles Durfee/Colorado School of Mines Daniel Adams/Colorado School of Mines

Light Manipulation with Laser Writing and Lithography/Patterning (SF2R)

Presider: Carl Liebig, *US AFRL Wright Patterson*

10:30 - 11:00 **3D laser printing: high resolution and throughput (SF2R.1)**
Presenter: Saulius Juodkazis, *Swinburne University of Technology*
Expand for Abstract / Authors

_ Paper

A GHz-burst ablation rate using fast scan of ultra-short laser pulses depends on pulse fluence [J/cm^2] as F_p^2 due to strong absorption within the skin depth of photo-excited material. The very same phenomenon of shallow energy deposition is responsible for polymerisation using fast 1cm/s scan of ultra-short laser pulses.

Authors:Saulius Juodkazis/Swinburne University of Technology

Invited

11:00 - 11:15 **Non-fading Plasmonic Color Printing on Semicontinuous Metal Films with Protective Atomic Layer Deposition (SF2R.2)**
Presenter: Sarah Chowdhury, *Purdue University*
Expand for Abstract / Authors

_ Paper

A non-fading and environment-friendly technique of generation of bright vivid colors is achieved through femtosecond laser modification of semicontinuous Ag films, which thermally induces changes in the nanostructures resulting in the variation of optical spectra.

Authors:Sarah Chowdhury/Purdue University Piotr Nyga/Purdue University Zhaxylyk Kudyshev/Purdue University Esteban Garcia/Purdue University Alexander Kildishev/Purdue University Vladimir Shalaev/Purdue University Alexandra Boltasseva/Purdue University

11:15 - 11:30	**Femtosecond Laser Writing of Near-Surface Waveguides for Refractive-index Sensing (SF2R.3)** **Presenter**: Alain Abou Khalil, *Université de Bordeaux* Expand for Abstract / Authors Using femtosecond laser writing technique, near-surface waveguides with no need for additional processing were written in silver-containing glasses. An ultra-sensitive refractive index sensor exhibiting a novel double-wing feature is manufactured in a 1 cm glass chip **Authors**:Alain Abou Khalil/Université de Bordeaux Philippe Lalanne/Université de Bordeaux Jean-Philippe Bérubé/Université Laval Sylvain Danto/Université de Bordeaux Thierry Cardinal/Université de Bordeaux Yannick Petit/Université de Bordeaux Réal Vallée/Université Laval Lionel Canioni/Université de Bordeaux	Paper
11:30 - 11:45	**(Withdrawn) Fabrication of Hydrogenated Amorphous Silicon Waveguides via a Lithography-Free Direct Laser Writing Method (SF2R.4)** **Presenter**: Stuart MacFarquhar, *University of Southampton* Expand for Abstract / Authors We demonstrate a lithography-free laser-based manufacturing process for low temperature deposited hydrogenated amorphous silicon waveguides. The waveguide boundaries are defined using a localised crystallisation process, allowing precise manufacture of complex waveguide structures. **Authors**:Stuart MacFarquhar/University of Southampton Ozan Aktas/University of Southampton Swe Oo/University of Southampton Dong Wu/University of Southampton Harold Chong/University of Southampton Anna Peacock/University of Southampton	
11:45 - 12:00	**Laser-Written Silicon-Germanium Alloy Microstructures with Tunable Compositionally Graded Profiles (SF2R.5)** **Presenter**: Ozan Aktas, *University of Southampton* Expand for Abstract / Authors A laser processing method is introduced for post-deposition tailoring of local composition and bandgap in amorphous silicon-germanium thin films on silicon substrates. Spatial distribution of the alloy constituents can be controlled through the scan speed. **Authors**:Ozan Aktas/University of Southampton Stuart MacFarquhar/University of Southampton Swe Oo/University of Southampton Vinita Mittal/University of Southampton Harold Chong/University of Southampton Anna Peacock/University of Southampton	Paper

12:00 - 12:15 **Fano Resonant All-dielectric Metasurfaces for Polarization-sensitive Structural Coloration (SF2R.6)**
Presenter: Omid Hemmatyar, *Georgia Institute of Technology*
Expand for Abstract / Authors

Paper

Herein, for the first time to our knowledge, we experimentally demonstrate Fano resonant all-dielectric metasurfaces comprising of high- and median-index nanopillars (HfO$_2$, TiO$_2$ and ZrO$_2$) with zero loss in visible range for polarization-sensitive structural coloration.

Authors:Omid Hemmatyar/Georgia Institute of Technology Zhou Lu/Georgia Institute of Technology Tyler Brown/Georgia Institute of Technology Hossein Maleki/Georgia Institute of Technology Ali Adibi/Georgia Institute of Technology

12:15 - 12:30 **Metalens with Fixed-Gap Nanopillars for Immersion Lithography Patterning on 12-inch Glass Wafer (SF2R.7)**
Presenter: Yuan Hsing Fu, *Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research)*
Expand for Abstract / Authors

Paper

Metalens with fixed-gap nanopillars release fabrication challenges in photolithography on CMOS platform. Their performances are investigated through simulation, and the characterization results of metalens patterned directly on 12-inch glass-wafer via immersion lithography are presented.

Authors:Yuan Hsing Fu/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Nanxi Li/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Qize Zhong/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Yuan Dong/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Ting Hu/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Dongdong Li/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Zhengji Xu/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Yanyan Zhou/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Keng Heng Lai/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Vladimir Bliznetsov/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Hou-Jang Lee/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Wei Loong Loh/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Shiyang Zhu/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Qunying Lin/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research) Navab Singh/Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research)

On-chip Photonic Integration (SF2O)
Presider: Beibei Zeng, *Lehigh University*

10:30 - 10:45	**On-chip reconfigurable mode-order converter based on subwavelength symmetric multimode Y-junctions (SF2O.1)** **Presenter**: Lu hui, *Huazhong University of Science and Technology* Expand for Abstract / Authors A high-performance on-chip reconfigurable mode-order converter is realized, based on subwavelength symmetric multimode Y-junctions assisted by phase shifters. The data information carried among four different mode channels can be arbitrarily converted or remain the same. **Authors**:Lu hui/Huazhong University of Science and Technology Deming Liu/Huazhong University of Science and Technology Max Yan/KTH Royal Institute of Technology Minming Zhang/Huazhong University of Science and Technology	Paper
10:45 - 11:00	**Suppression of Avoided Mode Crossing in High-Index-Contrast AlGaAs-on-Insulator Microresonator (SF2O.2)** **Presenter**: Chanju Kim, *DTU Fotonik* Expand for Abstract / Authors We report the suppression of avoided-mode-crossing induced by polarization mode-coupling in a high-index-contrast AlGaAs-on-insulator microresonator. An avoided-mode-crossing-free TE-mode anomalous dispersion microresonator is demonstrated by reducing the cavity lifetime of the coupled TM mode. **Authors**:Chanju Kim/DTU Fotonik Yi Zheng/DTU Fotonik Kresten Yvind/DTU Fotonik Minhao Pu/DTU Fotonik	Paper
11:00 - 11:15	**Integrated Spiral Waveguide Filter with 55 Arbitrary Notches: Design and Fabrication (SF2O.3)** **Presenter**: Yi-Wen Hu, *University of Maryland* Expand for Abstract / Authors We design and fabricate an integrated arbitrary filter near 1550 nm. The 50 mm long 55-notch filter is implemented on a low-loss Si_3N_4/SiO_2 spiral waveguide. The notches have uniform depths/widths of about 28 dB/0.22 nm. **Authors**:Yi-Wen Hu/University of Maryland Shengjie Xie/University of Maryland Jiahao Zhan/University of Maryland Yang Zhang/University of Maryland Sylvain Veilleux/University of Maryland Mario Dagenais/University of Maryland	Paper

11:15 - 11:30	**Low-Noise Balanced Photoreceiver with Waveguide SiN Photodetectors and SiGe TIA (SF2O.4)** **Presenter**: Robert Costanzo, *University of Virginia* Expand for Abstract / Authors A photoreceiver with balanced SiN waveguide photodetectors and BiCMOS transimpedance amplifier is proposed, achieving a high conversion gain of greater than 2 kV/W up through 2 GHz, and a low in-band NEP of 8 pW/√Hz. **Authors**:Robert Costanzo/University of Virginia Qianhuan Yu/University of Virginia Xiaochuan Shen/University of Virginia Junyi Gao/University of Virginia Andreas Beling/University of Virginia Steven Bowers/University of Virginia	Paper
11:30 - 11:45	**Liquid crystal based active phase modulator for silicon nitride photonics circuits at near infrared (SF2O.5)** **Presenter**: Marcus Dahlem, *IMEC* Expand for Abstract / Authors We demonstrate for the first time voltage driven phase modulation with liquid crystal on SiN photonics at 874nm wavelength. We report a $V_{\pi}L_{\pi}$ 0.72 V. cm with a loss of 1.8dB/cm **Authors**:John Sundar Kamal/IMEC Aleksandrs Marinins/IMEC Bruno Figeys/IMEC Roelof Jansen/IMEC Xavier Rottenberg/IMEC Przemyslaw Kula/Military univesity of technology Jeroen Beeckman/Ghent university Marcus Dahlem/IMEC Philippe Soussan/IMEC	Paper
11:45 - 12:00	**Nonvolatile Electrically Reconfigurable Integrated Photonic Switches Using Phase-Change Materials (SF2O.6)** **Presenter**: Jiajiu Zheng, *University of Washington, Seattle* Expand for Abstract / Authors We report nonvolatile electrically reconfigurable photonic switches using PCM-clad waveguides and microrings actuated by in-situ silicon PIN heaters. High extinction ratio (~15 dB), near-zero extra loss, and high cyclability (> 1000) are demonstrated. **Authors**:Jiajiu Zheng/University of Washington, Seattle Zhuoran Fang/University of Washington, Seattle Changming Wu/University of Washington, Seattle Shifeng Zhu/University of Washington, Seattle Peipeng Xu/Ningbo University Jonathan Doylend/Intel Corporation Sanchit Deshmukh/Stanford University Eric Pop/Stanford University Scott Dunham/University of Washington, Seattle Mo Li/University of Washington, Seattle Arka Majumdar/University of Washington, Seattle	Paper

12:00 - 12:15 **Controllable selective coupling of Dyakonov surface wave at liquid-crystal-based interface (SF2O.7)**
Presenter: Yan Li, *Tsinghua University*
Expand for Abstract / Authors

Paper

A selective coupling behavior of Dyakonov surface wave at the liquid-crystal-based interface has been demonstrated experimentally. Such a highly directional and lossless surface wave has promising applications in two-dimensional photonic circuits and devices.

Authors:Yan Li/Tsinghua University Jingbo sun/Tsinghua University yongzheng wen/Tsinghua University Ji Zhou/Tsinghua University

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12:15 - 12:30 **Machine Learning with Integrated Metasystem (SF2O.8)**
Presenter: Zi Wang, *University of Delaware*
Expand for Abstract / Authors

Paper

We utilize machine learning algorithm to design integrated photonic meta-systems, and experimentally demonstrated the device performance.

Authors:Zi Wang/University of Delaware Lorry Chang/University of Delaware Feifan Wang/University of Delaware Tiantian Li/University of Delaware Tingyi Gu/University of Delaware

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Nonlinear Transmission and Optical Signal Processing (SF2L)
Presider: Xi Chen, *Nokia Bell Labs*

10:30 - 10:45 **Generation and heterodyne detection of a 2-µm-band 16-QAM signal based on inter-band wavelength conversion (SF2L.1)**
Presenter: Yong Liu, *Technical University of Denmark*
Expand for Abstract / Authors

Paper

We demonstrate the generation and self-heterodyne detection of a 2-µm-band 32-Gbit/s line-rate 16-QAM signal based on inter-band wavelength conversion in an AlGaAsOI nanowaveguide. Error-free performance is achieved using LDPC codes with 33% overhead.

Authors:Yong Liu/Technical University of Denmark Deming Kong/Technical University of Denmark Zhengqi Ren/University of Southampton Yongmin Jung/University of Southampton Minhao Pu/Technical University of Denmark Kresten Yvind/Technical University of Denmark Michael Galili/Technical University of Denmark Leif K. Oxenløwe/Technical University of Denmark David Richardson/University of Southampton Hao Hu/Technical University of Denmark

10:45 - 11:00

All-optical frequency hopping and broadcasting in wavelength-multiplexed channels (SF2L.2)
Presenter: Joseph Lukens, *Oak Ridge National Laboratory*
Expand for Abstract / Authors

Paper

We demonstrate all-optical routing of wavelength-multiplexed fiber-optic data streams. Utilizing an all-optical frequency processor, we show low-noise broadcasting and carrier-frequency hopping of binary data without optical-to-electrical conversion.

Authors:Joseph Lukens/Oak Ridge National Laboratory Hsuan-Hao Lu/Purdue University Bing Qi/Oak Ridge National Laboratory Pavel Lougovski/Oak Ridge National Laboratory Andrew Weiner/Purdue University Brian Williams/Oak Ridge National Laboratory

11:00 - 11:15

Performance degradation of digital back-propagation in the presence of power excursion (SF2L.3)
Presenter: Xiatao Huang, *University of Electronic Science and Technology of China*
Expand for Abstract / Authors

Paper

Unlike linear transmission, the performance of nonlinear optical fiber transmission can change significantly in the presence of power excursion. We experimentally show a much larger SNR degradation and its dependence on the location of power excursion.

Authors:Xiatao Huang/University of Electronic Science and Technology of China Xingwen Yi/Sun Yat-Sen University Gai Zhou/The Hong Kong Polytechnic University Taowei Jin/University of Electronic Science and Technology of China Ruiqi Fan/The Hong Kong Polytechnic University Fan Li/Sun Yat-Sen University Zhaohui Li/Sun Yat-Sen University Jing Zhang/University of Electronic Science and Technology of China Bo Xu/University of Electronic Science and Technology of China Alan Pak Tao Lau/The Hong Kong Polytechnic University

11:15 - 11:30

End-to-end optimized nonlinear Fourier transform-based coherent communications (SF2L.4)
Presenter: Francesco Da Ros, *DTU Fotonik*
Expand for Abstract / Authors

Paper

We propose a jointly optimized nonlinear Fourier transform (NFT)-based transmitter and neural network-based receiver. More than two orders of magnitude improvement in bit error ratio is numerically reported for 5600-km transmission compared to a standard NFT system.

Authors:Simone Gaiarin/DTU Fotonik Rasmus Jones/DTU Fotonik Francesco Da Ros/DTU Fotonik Darko Zibar/DTU Fotonik

11:30 - 11:45 **Analytical Model of Nonlinear Noise in the b-modulated Optical Transmission Systems (SF2L.5)** Paper

Presenter: Stanislav Derevyanko, *Ben Gurion University of the Negev*
Expand for Abstract / Authors

We propose an analytical channel model for optical communication systems employing the nonlinear division multiplexing scheme using b-modulation and show that as the energy of the NFT burst grows, the noise in the b-coefficient decreases.

Authors:Stanislav Derevyanko/Ben Gurion University of the Negev Dmitry Shepelsky/B.I. Verkin Institute for Low Temperature Physics and Technology Maryna Pankratova/Aston Institute of Photonic Technologies, Aston University Anastasiia Vasylchenkova/Aston Institute of Photonic Technologies, Aston University Nikolai Chichkov/Aston Institute of Photonic Technologies, Aston University Jaroslaw Prilepsky/Aston Institute of Photonic Technologies, Aston University

11:45 - 12:00 **Prediction of Performance Penalty due to Pump-Signal Overlap in Raman-amplified Systems (SF2L.6)** Paper

Presenter: Gabriele Di Rosa, *VPIphotonics GmbH*
Expand for Abstract / Authors

We present an efficient numerical model to predict the performance penalty induced by Rayleigh backscattered light arising from counter-propagating pumps in Raman-amplified ultra-wide-band transmission systems. The model is validated through comparison with experimental findings.

Authors:Gabriele Di Rosa/VPIphotonics GmbH Md Iqbal/Aston Institute of Photonics Technologies André Richter/VPIphotonics GmbH Wladek Forysiak/Aston Institute of Photonics Technologies

Van der Waals Materials-Based Devices (SF2J)

Presider: Arka Majumdar

10:30 - 10:45 **Thermal Infrared Spectral Imagers Based on Graphene-Loaded Slot Antennas (SF2J.1)** Paper

Presenter: Jordan Goldstein, *Massachusetts Institute of Technology*
Expand for Abstract / Authors

We propose a compact thermal infrared spectral imager comprising a metasurface composed of subwavelength-spaced graphene-loaded slot antennas. We establish a model for the antennas' properties and simulate a metasurface with broadband efficient absorption.

Authors:Jordan Goldstein/Massachusetts Institute of Technology Dirk Englund/Massachusetts Institute of Technology

10:45 - 11:00 **Nanoscale Photodetector Using 7-Atom Wide Armchair-Edge Graphene Nanoribbons (SF2J.2)**
Presenter: Klas Lindfors, *University of Cologne*
Expand for Abstract / Authors

_ Paper

We demonstrate a nanoscale photoconductive photodetector with seven-atom wide armchair-edge graphene nanoribbons as the active material. The detector responsivity is 0.04 mAW^{-1} with a dark current below 30 pA under a bias voltage of 1.5 V.

Authors:Seyed Khalil Alavi/University of Cologne Boris Senkovskiy/University of Cologne Dirk Hertel/University of Cologne Danny Haberer/University of California at Berkeley Yoichi Ando/University of Cologne Klaus Meerholz/University of Cologne Felix R. Fischer/University of California at Berkeley Alexander Grüneis/University of Cologne Klas Lindfors/University of Cologne

11:00 - 11:30 **Hybrid graphene chip-based nonlinear optical devices (SF2J.3)**
Presenter: Christelle Monat, *Institut des Nanotechnologies de Lyon*
Expand for Abstract / Authors

_ Paper

Two-dimensional materials represent a promising route to create compact and novel hybrid chip-based architectures. I will here discuss some of these developments, including the demonstration of graphene/ Si3N4 waveguides for chip-based saturable absorbers.

Authors:Christelle Monat/Institut des Nanotechnologies de Lyon Pierre Demongodin/Institut des Nanotechnologies de Lyon Jeremy Lhuillier/Institut des Nanotechnologies de Lyon Thomas Wood/Institut des Nanotechnologies de Lyon Malik kemiche/Institut des Nanotechnologies de Lyon Houssein El Dirani/CEA-LETI Corrado SCIANCALEPORE/CEA-LETI

Invited

11:30 - 11:45 **Platform for ultra-strong modulation in hybrid silicon nitride/2D material photonic structures (SF2J.4)**
Presenter: Ipshita Datta, *Columbia University*
Expand for Abstract / Authors

_ Paper

We demonstrate a platform for ultra-strong optical modulation in hybrid silicon nitride (SiN)/2D waveguides, by leveraging the gate dependent absorption modulation in graphene and the strong electro-refractive effects in monolayer TMDs.

Authors:Ipshita Datta/Columbia University Sang Chae/Columbia University Brian Lee/Columbia University Baichang Li/Columbia University James Hone/Columbia University Michal Lipson/Columbia University

11:45 - 12:00	**On-Chip Monolayer WSe2 Microring Laser Operating At Room Temperature (SF2J.5)** **Presenter**: Marissa Granados Báez, *University of Rochester* Expand for Abstract / Authors We demonstrate lasing at room temperature of monolayer WSe_2 integrated with a silicon nitride ring resonator. Signatures of lasing are shown by a 'kink' in the L-L plot and 30% linewidth narrowing when reaching threshold. **Authors**:Marissa Granados Báez/University of Rochester ARUNABH MUKHERJEE/University of Rochester Liangyu Qiu/University of Rochester Chitraleema Chakraborty/University of Rochester Nickolas Vamivakas/University of Rochester Jaime Cardenas/University of Rochester	Paper
12:00 - 12:15	**Voltage-Controlled Long-Range Transport of Indirect Excitons in $MoSe_2/WSe_2$ Van der Waals Heterostructure (SF2J.6)** **Presenter**: Lewis Fowler-Gerace, *University of California, San Diego* Expand for Abstract / Authors We observe transport of indirect excitons over a distance greater than 10 μm in a $MoSe_2/WSe_2$ heterostructure. The transport is switched on or off by gate voltage and is observed up to 40 K. **Authors**:Lewis Fowler-Gerace/University of California, San Diego Darius Choksy/University of California, San Diego Leonid Butov/University of California, San Diego	Paper
12:15 - 12:30	**Disentanglement of Heat and Carrier Transfer Effects in WS_2/Graphene Heterostructure Under Near-infrared Laser Excitation (SF2J.7)** **Presenter**: Ruiling Zhang, *Tsinghua University* Expand for Abstract / Authors Combined photoluminescence and Raman spectroscopies of WS_2/graphene heterostructure through pump-power and temperature controls show that redshift of photoluminescence is mainly caused by pump induced heating, while linewidth-broadening has contributions from both heating and carrier transfer. **Authors**:Ruiling Zhang/Tsinghua University Lin Gan/Tsinghua University Danyang Zhang/Tsinghua University Jiabin Feng/Tsinghua University Cunzheng Ning/Tsinghua University	Paper

Light-Matter Interactions and Quantum Materials (SF2F)

Presider: Tingyi Gu, *University of Delaware*

10:30 - 11:30	**Strong light-matter interaction in 2D materials (SF2F.1)** **Presenter**: Vinod Menon, *City College of New York & Graduate Center - CUNY* Expand for Abstract / Authors In this tutorial we introduce the fundamentals of polariton formation in 2D materials in the strong light-matter coupling regime and their potential applications. Realization of exciton, phonon and plasmon polaritons will be discussed. ***Vinod Menon*** is a Professor of Physics at the City College of New York and doctoral faculty at the Graduate Center of the City University of New York (CUNY). He is also a fellow of the Optical Society of America and an IEEE Distinguished Lecturer in Photonics (2018-2020). **Authors**:Vinod Menon/City College of New York & Graduate Center - CUNY Tutorial	_ Paper
11:30 - 11:45	**Phase Transition and Raman Evolution in Pressurized Antiferromagnetism van der Waals Topological Insulator (SF2F.2)** **Presenter**: Zhangji Zhao, *University of California Los Angeles* Expand for Abstract / Authors We investigate the antiferromagnetic topological insulator $MnBi_4Te_7$ using Raman and powder XRD under high pressure. Raman peaks are red-shifted from 0 to 8.28 GPa. No structural phase transition is observed below 10.4GPa. **Authors**:Zhangji Zhao/University of California Los Angeles Chaowei Hu/University of California Los Angeles Abby Kavner/University of California Los Angeles Ni Ni/University of California Los Angeles Chee Wei Wong/University of California Los Angeles	_ Paper
11:45 - 12:00	**Third Harmonic Generation (THG) in Three-Dimensional Dirac Semimetal Cd3As2 (SF2F.3)** **Presenter**: Kaleem Ullah, *Nanjing University* Expand for Abstract / Authors We have for the first time reported third harmonic generation in a three-dimensional Dirac semimetal Cd3As2 film. We further demonstrate that a simple planar cavity can be used to significantly enhance the nonlinear response. **Authors**:Kaleem Ullah/Nanjing University Yafei Meng/Nanjing University Yue Yue Sun/Nanjing University Yunkun Yang/Fudan university Anran Wang/Nanjing University Xiangjing Wang/Nanjing University Xiaoqing Chen/Nanjing University Taotao Li/Nanjing University Danfeng Pan/Nanjing University Xinran Wang/Nanjing University Faxian Xiu/Fudan university Yi Shi/Nanjing University Fengqiu Wang/Nanjing University	_ Paper

12:00 - 12:30 **Efficient Optical Characterization of Solid-state Defects for Quantum Information Science (SF2F.4)**
Presenter: Lee Bassett, *University of Pennsylvania*
Expand for Abstract / Authors

_ Paper

Point defects are robust quantum memories and versatile quantum sensors. Millions of potential defects exist; however, their identification is tedious and challenging. I will discuss approaches to efficiently characterize quantum defects in new materials.

Authors:Lee Bassett/University of Pennsylvania

Invited

Nonlinear Optics in Waveguides and Microresonators (SF2B)
Presider: Thomas Schneider, *Technische Universität Braunschweig*

10:30 - 10:45 **Perfect soliton crystals on demand (SF2B.1)**
Presenter: Yang He, *University of Rochester*
Expand for Abstract / Authors

_ Paper

We report the on-demand generation of perfect soliton crystals in a LiNbO3 microresonator, with an arbitrary dialing of the comb line spacing from 1 to 11 times of the free-spectral range of the resonator.

Authors:Yang He/University of Rochester Jingwei Ling/University of Rochester Mingxiao Li/University of Rochester Qiang Lin/University of Rochester

10:45 - 11:00 **Extended access to self-disciplined platicon generation in normal dispersion regime via intensity-modulated pump (SF2B.2)**
Presenter: Hao Liu, *University of California Los Angeles*
Expand for Abstract / Authors

_ Paper

Through dual-driven method, we successfully access to the effective red detuning zone for platicon generation in normal dispersion regime via intensity-modulated pump, and the phase noise performance also beats the local oscillator at high frequency.

Authors:Hao Liu/University of California Los Angeles Wenting Wang/University of California Los Angeles Shu-Wei Huang/University of Colorado Boulder, Mingbin Yu/Institute of Microelectronics, A*STAR Dim-Lee Kwong/Institute of Microelectronics, A*STAR Chee Wei Wong/University of California Los Angeles

11:00 - 11:30

Temperature Dependent Sellmeier Equations for III-V Semiconductors GaN, GaP, GaAs, GaSb, InAs and InSb (SF2B.3)
Presenter: Shekhar Guha, *US Air Force Research Laboratory*
Expand for Abstract / Authors

Paper

Recent measurement of refractive indices of binary III-V semiconductors GaN, GaP, GaAs, GaSb, InAs and InSb over temperature range of 77 – 450 K and wavelength range spanning the transmission window of each will be presented.

Authors:Shekhar Guha/US Air Force Research Laboratory Jean Wei/UES, Inc Joel Murray/UES, Inc

Invited

11:30 - 11:45

Versatile Dispersion Measurement via a Reflective Nonlinear Interferometer (SF2B.4)
Presenter: Arash Riazi, *University of Toronto*
Expand for Abstract / Authors

Paper

We present a novel dispersion measurement technique using a reflective common-path nonlinear interferometer. Our method is fast, alignment-free, and does not require phase stabilization. It can extract the dispersion for samples with dispersion-length products as small as $D\times L$~0.007 ps/nm.

Authors:Arash Riazi/University of Toronto Changjia Chen/University of Toronto Eric Zhu/University of Toronto Alexey Gladyshev/Russian Academy of Science Peter Kazansky/University of Southampton, Southampton John Sipe/University of Toronto Li Qian/University of Toronto

11:45 - 12:00

Large-frequency-shift tunable parametric oscillation in a Kerr microresonator (SF2B.5)
Presenter: Stuart Murdoch, *University of Auckland*
Expand for Abstract / Authors

Paper

We demonstrate widely tunable parametric oscillation in a magnesium-fluoride optical microresonator. The observed tuning range spans from 0.9 to 2.6 μm, and the presence of parametric signals out to 3.9 μm is inferred.

Authors:Noel Sayson/University of Auckland Toby Bi/University of Auckland Vincent Ng/University of Auckland Hoan Pham/University of Auckland Luke Trainor/University of Otago Harald Schwefel/University of Otago Stephane Coen/University of Auckland Miro Erkintalo/University of Auckland Stuart Murdoch/University of Auckland

12:00 - 12:15	**Spectral Multiplexing of Dissipative Kerr Solitons in a Single Optical Microresonator (SF2B.6)** **Presenter**: Maxim Karpov, *Lab. of Photonics and Quantum Measuremen* Expand for Abstract / Authors We experimentally demonstrate that dissipative Kerr solitons generated in different spectral regions can stably coexist in a single optical microresonator enabling spectral multiplexing of soliton microcombs. **Authors**:Maxim Karpov/Lab. of Photonics and Quantum Measuremen Martin Pfeiffer/Lab. of Photonics and Quantum Measuremen Anton Lukashchuk/Lab. of Photonics and Quantum Measuremen Junqiu Liu/Lab. of Photonics and Quantum Measuremen Tobias Kippenberg/Lab. of Photonics and Quantum Measuremen	Paper
12:15 - 12:30	**Efficient Widely-Separated Optical Parametric Oscillation (SF2B.7)** **Presenter**: Xiyuan Lu, *National Inst of Standards & Technology* Expand for Abstract / Authors We demonstrate the first widely-separated optical parametric oscillation in silicon nanophotonics, with milliwatt-level threshold power that is > 50 times smaller than other widely-separated OPOs. This demonstration is promising for on-chip visible light generation **Authors**:Xiyuan Lu/National Inst of Standards & Technology Gregory Moille/National Inst of Standards & Technology Anshuman Singh/National Inst of Standards & Technology Qing Li/National Inst of Standards & Technology Daron Westly/National Inst of Standards & Technology Ashutosh Rao/National Inst of Standards & Technology Su-Peng Yu/National Inst of Standards & Technology Travis Briles/National Inst of Standards & Technology Scott Papp/National Inst of Standards & Technology Kartik Srinivasan/National Inst of Standards & Technology	Paper

2-Dimensional and Field-Resolved Condensed Matter Spectroscopy (FF2Q)

Presider: Lyubov Titova, *University of Alberta*

10:30 - 11:00 **Examining Nonlinear Excitation with Two-Dimensional Terahertz Spectroscopy (FF2Q.1)**
Presenter: Jeremy Johnson, *Brigham Young University*
Expand for Abstract / Authors

Using 2D THz spectroscopy we can investigate photonic and phononic excitation and isolate the dominant and secondary nonlinear excitation pathways. We present a general framework for 2D THz spectroscopy in solids that provides important clarification for the growing new field of nonlinear phononics.

Authors:Brittany Knighton/Brigham Young University Megan Nielslon/Brigham Young University R. Tanner Hardy/Brigham Young University Aldair Alejandro/Brigham Young University Lauren Rawlings/Brigham Young University Clayton Moss/Brigham Young University Jeremy Johnson/Brigham Young University

Paper

11:00 - 11:15 **Giant nonlinearity of THz waves mediated by photon-phonon strong coupling (FF2Q.2)**
Presenter: Yao lu, *Nankai University*
Expand for Abstract / Authors

We demonstrate a giant difference-frequency generation of THz waves in a subwavelength waveguide, mediated by phonon-photon strong coupling. The nonlinear susceptibility achieved five (three) orders of magnitude larger than that for visible light (microwave).

Authors:Yao lu/Nankai University Qiang Wu/Nankai University hao xiong/Nankai University Zhigang Chen/Nankai University Jingjun Xu/Nankai University

Paper

11:15 - 11:30 **Reconstructing Bloch Wavefunctions in GaAs through High Order Sideband Polarimetry (FF2Q.3)**
Presenter: James O'Hara, *Department of Physics, UCSB*
Expand for Abstract / Authors

Comparing the polarimetry of the high-order sidebands emitted by bulk GaAs with theory, we can extract the Luttinger parameters, from which Bloch wavefunctions and Berry curvature of the valence band can be calculated.

Authors:James O'Hara/Department of Physics, UCSB Joe Costello/Department of Physics, UCSB Qile Wu/University of Michigan Darren Valovcin/Department of Physics, UCSB Loren Pfeiffer/Princeton University Mackillo Kira/University of Michigan Mark Sherwin/Department of Physics, UCSB

Paper

11:30 - 11:45	**Machine Learning Enabled Lineshape Analysis in OptIcal Two-Dimensional Coherent Spectroscopy (FF2Q.4)** **Presenter**: Michael Titze, *Florida International University* Expand for Abstract / Authors Although analytical solutions exist, the analysis of two-dimensional spectroscopy (2DCS) data can be tedious. A machine learning approach to analyzing 2DCS spectra is presented. We test the accuracy of the algorithm on simulated and experimental data. **Authors**:Michael Titze/Florida International University Srikanth Namuduri/Florida International University Shekhar Bhansali/Florida International University Hebin Li/Florida International University	Paper
11:45 - 12:00	**Ultrafast Dephasing and Coherent Exciton Dynamics in Transition Metal Dichalcogenide Bilayers (FF2Q.5)** **Presenter**: Sophia Helmrich, *Technical University Berlin* Expand for Abstract / Authors We investigate quantum dynamics of excitons in $MoSe_2$ bilayers using coherent two-dimensional spectroscopy. When compared to a $MoSe_2$ monolayer, we find ultrafast dephasing and an additional excited state absorption in the bilayer. **Authors**:Sophia Helmrich/Technical University Berlin Kevin Sampson/University of Texas at Austin Kha Tran/University of Texas at Austin Ulrike Woggon/Technical University Berlin Nina Owschimikow/Technical University Berlin Xiaoqin Li/University of Texas at Austin	Paper
12:00 - 12:15	**Engineering Atomic Defects in Hexagonal Boron Nitride via Resonant Optical Excitation of Phonons (FF2Q.6)** **Presenter**: Cecilia Chen, *Columbia University* Expand for Abstract / Authors We introduce an approach to engineer defects in hBN using intense pulses resonant with phonons at 7.3 μm. Such defects are highly subwavelength (< 30 nm) with an alignment sensitive to the polarization. **Authors**:Mehdi Jadidi/Columbia University Cecilia Chen/Columbia University Baichang Li/Columbia University Jared Ginsberg/Columbia University Sang Chae/Columbia University Chaitali Joshi/Columbia University Gauri Patwardhan/Columbia University Watanabe Watanabe/National Institute for Materials Science Takashi Taniguchi/National Institute for Materials Science James Hone/Columbia University Alexander Gaeta/Columbia University	Paper

12:15 - 12:30

Collective Rayleigh Scattering from Molecular Ensembles under Strong Coupling (FF2Q.7)

Presenter: M. Balasubrahmaniyam, *Tel-Aviv University*

Expand for Abstract / Authors

Paper

We demonstrate that strongly coupled organic microcavities exhibit strong resonant scattering at wavelengths corresponding to the hybrid polaritonic states. Interestingly, we observe that the scattering strength increases linearly with the photonic weight of the polaritons.

Authors:Adina Golombek/Tel-Aviv University M. Balasubrahmaniyam/Tel-Aviv University Maria Kaeek/Tel-Aviv University Keren Hadar/Tel-Aviv University Tal Schwartz/Tel-Aviv University

Hollow-core Fibers (SF2P)

Presider: Yingying Wang, *Beijing University of Technology*

10:30 - 10:45

Giant Brillouin amplification in gas using hollow-core waveguides (SF2P.1)

Presenter: Fan Yang, *Ecole Polytechnique Fédérale de Lausanne*

Expand for Abstract / Authors

Paper

We report a strong Brillouin amplification in gas using hollow-core fibers, exceeding by 6 times the gain in solid silica fibers. A novel fiber laser using Brillouin lasing in gas has been demonstrated.

Authors:Fan Yang/Ecole Polytechnique Fédérale de Lausanne Flavien Gyger/Ecole Polytechnique Fédérale de Lausanne Luc Thévenaz/Ecole Polytechnique Fédérale de Lausanne

10:45 - 11:00

Hollow core fiber Fabry-Perot interferometers with finesse over 3000 (SF2P.2)

Presenter: Meng Ding, *University of Southampton*

Expand for Abstract / Authors

Paper

We investigate the limits to achievable finesse in hollow core fiber Fabry-Perot interferometers due to loss at the interferometer mirrors. We predict that finesses > 6000 is achievable and demonstrate a value of >3000 experimentally.

Authors:Meng Ding/University of Southampton Eric Fokoua/University of Southampton Thomas Bradley/University of Southampton Francesco Poletti/University of Southampton David Richardson/University of Southampton Radan Slavik/University of Southampton

11:00 - 11:30	**Optical Attosecond Pulses and Bright VUV Generation from Soliton Dynamics in Hollow Capillaries (SF2P.3)** **Presenter**: John Travers, *Heriot-Watt University* Expand for Abstract / Authors Soliton dynamics in large-core gas-filled hollow capillary fibres can create high-energy sub-femtosecond and few-femtosecond pulses tuneable across the vacuum ultraviolet to infrared. Our work provides a new platform technology for ultrafast science. **Authors**:John Travers/Heriot-Watt University Christian Brahms/Heriot-Watt University Teodora Grigorova/Heriot-Watt University Federico Belli/Heriot-Watt University Invited	Paper
11:30 - 11:45	**Growth of Ammonium Chloride on Cleaved End-Facets of Hollow Core Fibers (SF2P.4)** **Presenter**: Shuichiro Rikimi, *University of Southampton* Expand for Abstract / Authors The contamination found on the cleaved end-facet of a hollow core fiber is identified as ammonium chloride. Through observations made under different experimental conditions we identify the likely contamination source and means to remove it. **Authors**:Shuichiro Rikimi/University of Southampton Yong Chen/University of Southampton Matthew Partridge/University of Southampton Thomas Bradley/University of Southampton Ian Davidson/University of Southampton Austin Taranta/University of Southampton Francesco Poletti/University of Southampton Marco Petrovich/University of Southampton David Richardson/University of Southampton Natalie Wheeler/University of Southampton	Paper
11:45 - 12:00	**Periodic Dispersive Wave Pattern Induced by Ozone Formation in Air-Filled Hollow-Core Fiber (SF2P.5)** **Presenter**: Mohammed Sabbah, *Heriot-Watt University* Expand for Abstract / Authors We describe the experimental observation of ozone formation inside an air-filled hollow-core fiber driven by ultra-short pulses and its effect on the emitted UV resonant dispersive wave. **Authors**:Mohammed Sabbah/Heriot-Watt University Federico Belli/Heriot-Watt University Christian Brahms/Heriot-Watt University Shou-Fei Gao/Beijing University of Technology Ying-Ying Wang/Beijing University of Technology Pu Wang/Beijing University of Technology John Travers/Heriot-Watt University	Paper

12:00 - 12:15 **High-birefringence hollow-core anti-resonant fiber (SF2P.6)**
Presenter: Yifeng Hong, *Beijing University of Technology*
Expand for Abstract / Authors

- Paper

We report the first high-birefringence hollow-core anti-resonant fiber with a pseudo-$C_{4\nu}$ symmetry. The resulted fiber shows a phase birefringence, polarization extinction ratio, and loss of 0.9×10^{-4}, 25 dB, and 250 dB/km, respectively, at 1550 nm.

Authors:Yifeng Hong/Beijing University of Technology Shoufei Gao/Beijing University of Technology Wei Ding/Jinan University Yingying Wang/Beijing University of Technology Pu Wang/Beijing University of Technology

Semiconductor Fabrication Processes and Silicon Photonics (AF2I)

Presider: William Whelan-Curtin, *University of St Andrews*

10:30 - 11:00 **(Withdrawn) Laser-Induced Forward-Transfer Printing for High-Speed Precision Assembly of Microchips (AF2I.1)**
Presenter: Geert Van Steenberge, *Ghent University - IMEC*
Expand for Abstract / Authors

Laser-induced forward-transfer printing (LIFT) is presented as a new approach for high-speed serial transfer and assembly of microchips, serving the needs for future heterogeneously integrated systems-in-package.

Authors:Geert Van Steenberge/Ghent University - IMEC Tom Sterken/Ghent University - IMEC Jeroen Missinne/Ghent University - IMEC

Invited

11:00 - 11:15 **Gradual Modulation of Semiconductor Properties via Grayscale Processing (AF2I.2)**
Presenter: Sara Kacmoli, *Princeton University*
Expand for Abstract / Authors

- Paper

We demonstrate a novel method of inducing a gradual change in semiconductor conductivity by combining grayscale processing of photoresist and proton implantation. This method is flexible and lends itself to many applications in semiconductor-based optical and electrical devices.

Authors:Sara Kacmoli/Princeton University Carlo Holly/Trumpf Photonics Inc. Claire Gmachl/Princeton University

11:15 - 11:30	**2D Material based Electro-Absorption Modulator in Si Photonics (AF2I.3)** **Presenter**: RISHI MAITI, *George Washington University* Expand for Abstract / Authors Here, we demonstrate an efficient electro-absorption modulator (EAM) based on few-layered $MoTe_2$ into a silicon photonics platform for the 1^{st} time. The modulator exhibits an extinction ratio of ~0.1dB/m at 1310 nm. **Authors**:RISHI MAITI/George Washington University Ti Xie/George Washington University Hao Wang/George Washington University Rubab Amin/George Washington University Chandraman Patil/George Washington University Volker Sorger/George Washington University	Paper
11:30 - 12:00	**Hexagonal SiGe: A Light Emitter for Silicon Photonics! (AF2I.4)** **Presenter**: Jos Haverkort, *Technische Universiteit Eindhoven* Expand for Abstract / Authors Hexagonal silicon-germanium (SiGe) is a direct bandgap semiconductor tunable between 1.8-3.5 µm. It features a subnanosecond radiative lifetime and a radiative efficiency comparable to III/V semiconductors, promising a Si-photonics light emitter. © 2020 The Authors **Authors**:Jos Haverkort/Technische Universiteit Eindhoven Alain Dijkstra/Technische Universitat Munchen Marvin van Tilburg/Technische Universiteit Eindhoven Victor van Lange/Technische Universiteit Eindhoven Elham Fadaly/Technische Universiteit Eindhoven Jens Rene Suckert/Friedrich Schiller Universitat Claudia Rodl/Friedrich Schiller Universitat juergen furthmueller/Friedrich Schiller Universitat Friedhelm Bechstedt/Friedrich Schiller Universitat Silvana Botti/Friedrich Schiller Universitat David Busse/Technische Universitat Munchen Jonathan Finley/Technische Universitat Munchen Marcel Verheijen/Technische Universiteit Eindhoven Erik Bakkers/Technische Universiteit Eindhoven	Paper
12:00 - 12:15	**(Withdrawn) 3-5/Silicon Photonic Hybrid Ring External Cavity (SHREC) Wavelength-Tunable Laser Diode Operating at the Application-Rich Wavelength Region of 1.65 µm (AF2I.5)** **Presenter**: Xiang Li, *Temasek Laboratories* Expand for Abstract / Authors We demonstrate, for the first time, a 3-5/SHREC wavelength-tunable laser operating at the application-rich region of 1653-1679 nm. Minimum side-mode suppression ratio and maximum output power of 34.4 dB and 26.79 mW respectively was obtained. **Authors**:Jia Xu Brian Sia/Nanyang Technological University Xiang Li/Temasek Laboratories Wanjun Wang/Nanyang Technological University Zhongliang Qiao/Nanyang Technological University Xin Guo/Nanyang Technological University jin zhou/Nanyang Technological University callum littlejohns/University of Southampton Chongyang Liu/Temasek Laboratories Graham Reed/University of Southampton Hong Wang/Nanyang Technological University	

12:15 - 12:30	**Ge-on-Si Single Photon Avalanche Diode Detectors for LIDAR in the Short Wave Infrared (AF2I.6)** **Presenter**: Ross Millar, *University of Glasgow* Expand for Abstract / Authors Ge-on-Si single photon avalanche diodes are used to demonstrate LIDAR in laboratory conditions. Modelling demonstrates that eye-safe kilometre range-finding is achievable at 1450nm wavelength. Afterpulsing is found to be considerably lower than commercial InGaAs/InP devices. **Authors**:Ross Millar/University of Glasgow Jaroslaw Kirdoda/University of Glasgow Kateryna Kuzmenko/Heriot-Watt University Peter Vines/Heriot-Watt University Abderrahim Halimi/Heriot-Watt University Robert Collins$/Heriot-Watt University Aurora Maccarone/Heriot-Watt University Aongus McCarthy/Heriot-Watt University Zoë Greener/Heriot-Watt University Fiona Thorburn/Heriot-Watt University Derek Dumas/University of Glasgow Lourdes Ferre Llin/University of Glasgow Muhammad Mirza/University of Glasgow Douglas Paul/University of Glasgow Gerald Buller/Heriot-Watt University	Paper

Frontiers in Frequency Combs II (SF2G)

Presider: Florian Adler, *Tiger Optics*

10:30 - 10:45	**Mid-IR DFG frequency combs with high mode power and 1.5 Hz linewidth using femtosecond fiber laser systems (SF2G.1)** **Presenter**: Carsten Cleff, *Menlo Systems GmbH* Expand for Abstract / Authors We present DFG frequency comb systems operating between 3 and 5 µm based on femtosecond Er- and Yb-fiber laser-amplifier systems, providing an average power of up to 250 mW and 31 µW per comb mode with 1.5 Hz optical linewidths in the mid-IR. **Authors**:Carsten Cleff/Menlo Systems GmbH Maximilian Bradler/Menlo Systems GmbH Peter Adel/Menlo Systems GmbH Stefan Matern/Menlo Systems GmbH Marc Fischer/Menlo Systems GmbH Ronald Holzwarth/Menlo Systems GmbH	Paper

10:45 - 11:00	**Noise Correlation Between the Two Degrees of Freedom of a Mid-Infrared Quantum Cascade Laser Frequency Comb (SF2G.2)** **Presenter**: Atif Shehzad, *University of Neuchatel* Expand for Abstract / Authors We present a detailed frequency noise characterization of a mid-infrared QCL comb with separate investigations of an optical line, the mode spacing and the offset frequency, and show strong anti-correlation between the two free-running comb parameters. **Authors**:Atif Shehzad/University of Neuchatel Pierre Brochard/University of Neuchatel Kenichi Komagata/University of Neuchatel Renaud Matthey/University of Neuchatel Filippos Kapsalidis/ETH Zurich Mehran Shahmohammadi/ETH Zurich Mattias Beck/ETH Zurich Andreas Hugi/IRsweep Pierre Jouy/IRsweep Jérôme Faist/ETH Zurich Thomas Südmeyer/University of Neuchatel Stephane Schilt/University of Neuchatel	Paper
11:00 - 11:15	**Frequency Stabilization of a Quantum Cascade Dual-Comb Spectrometer to a Molecular Transition (SF2G.3)** **Presenter**: Chu Teng, *Princeton University* Expand for Abstract / Authors We demonstrate absolute frequency stabilization of a quantum cascade dual-comb spectrometer to a molecular transition. A line-locked quantum cascade laser is introduced to the dual-comb system, improving frequency stability to <0.5 MHz. **Authors**:Chu Teng/Princeton University Jonas Westberg/NEO Monitors Gerard Wysocki/Princeton University	Paper
11:15 - 11:30	**Optical Frequency Comb Based on Cr:ZnS Laser (SF2G.4)** **Presenter**: Sergey Vasilyev, *IPG Photonics SETC* Expand for Abstract / Authors We report mid-IR frequency comb with 3.25 W average power and spectrum spanning 60 THz near 2.4 µm. We stabilized the offset frequency of the comb with accumulated phase error of 75 mrads. **Authors**:Sergey Vasilyev/IPG Photonics SETC Viktor Smolski/IPG Photonics SETC Jeremy Peppers/IPG Photonics SETC Igor Moskalev/IPG Photonics SETC Mike Mirov/IPG Photonics SETC Vladimir Fedorov/IPG Photonics SETC Yury Barnakov/IPG Photonics SETC Sergey Mirov/IPG Photonics SETC Valentin Gapontsev/IPG Photonics Corporation	Paper

11:30 - 12:00 **Ultrastable THz Wave Generation using a Soliton Microcomb (SF2G.5)**
Presenter: Shuangyou zhang, *National Physical Laboratory*
Expand for Abstract / Authors

[Paper]

We demonstrate the generation of highly stable THz-waves using a microresonator-based optical frequency comb. The compact chip-based photonic THz source is characterized for ultra-low phase noise operation. Potential applications range from telecommunication systems to THz-spectroscopy.

Authors:Shuangyou zhang/National Physical Laboratory Jonathan Silver/National Physical Laboratory Xiaobang Shang/National Physical Laboratory Leonardo Del Bino/National Physical Laboratory Nick Ridler/National Physical Laboratory Pascal Del'Haye/National Physical Laboratory

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12:00 - 12:15 **Ultra-Broadband Single-Branch Optical Frequency Comb Using a Periodically Poled Lithium Niobate Waveguide (SF2G.6)**
Presenter: Kazumichi Yoshii, *Institute of Post-LED Photonics*
Expand for Abstract / Authors

[Paper]

We generate a broadband frequency comb using a PPLN WG in a single-branch configuration and simultaneously measure the carrier-envelope-offset frequency and the beat note with a CW laser at 1.56 μm with sufficient signal-to-noise ratio.

Authors:Kazumichi Yoshii/Institute of Post-LED Photonics Feng-Lei Hong/Yokohama National University Takeshi Yasui/Institute of Post-LED Photonics Kaoru Minoshima/Institute of Post-LED Photonics Naoya Kuse/Institute of Post-LED Photonics

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12:15 - 12:30 **(Withdrawn) Self-Referenced CEO Frequency Detection of 10-GHz Laser Enabled by Highly Efficient Nonlinear Waveguides (SF2G.7)**
Presenter: Léonard Krüger, *ETH Zurich*
Expand for Abstract / Authors

We use two chip-scale waveguide platforms for self-referenced carrier-envelope offset frequency detection of a 10-GHz modelocked laser. A tunable beat note with a 33-dB signal-to-noise ratio is generated with only 18-pJ of coupled pulse energy.

Authors:Léonard Krüger/ETH Zurich Yoshitomo Okawachi/Columbia University Xingchen Ji/Columbia University Alexander Klenner/Columbia University Adrea Johnson/Columbia University Carsten Langrock/Stanford University Marty Fejer/Stanford University Michal Lipson/Columbia University Alexander Gaeta/Columbia University Christopher Phillips/ETH Zurich Ursula Keller/ETH Zurich

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Integrated Quantum Photonics: Circuits (FF2D)
Presider: Emma Wollman, *Jet Propulsion Laboratory*

10:30 - 11:30	**Programmable Photonic Circuits for Quantum Information Processing and Machine Learning (FF2D.1)** **Presenter**: Dirk Englund, *Massachusetts Institute of Technology* Expand for Abstract / Authors Abstract not available. Bio not available. **Authors**:Dirk Englund/Massachusetts Institute of Technology Tutorial	Paper
11:30 - 11:45	**Design and fabrication of a 128-channel array of quantum memories in hybrid photonic circuits (FF2D.2)** **Presenter**: Tsung-Ju Lu, *Massachusetts Institute of Technology* Expand for Abstract / Authors We show the design, fabrication, and integration of a 128-channel aluminum nitride photonic chip with tunable diamond quantum micro-chiplets containing silicon vacancy and germanium vacancy color centers, enabling a chip-integrated architecture towards multiplexed photon-mediated entanglement. **Authors**:Tsung-Ju Lu/Massachusetts Institute of Technology Noel Wan/Massachusetts Institute of Technology Kevin Chen/Massachusetts Institute of Technology Michael Walsh/Massachusetts Institute of Technology Matthew Trusheim/Massachusetts Institute of Technology Lorenzo De Santis/Massachusetts Institute of Technology Eric Bersin/Massachusetts Institute of Technology Isaac Harris/Massachusetts Institute of Technology Sara Mouradian/Massachusetts Institute of Technology Ian Christen/Massachusetts Institute of Technology Edward Bielejec/Sandia National Laboratories Dirk Englund/Massachusetts Institute of Technology	Paper
11:45 - 12:00	**Efficient single photon sources transfer-printed on Si with unidirectional light output (FF2D.3)** **Presenter**: Ryota Katsumi, *The University of Tokyo* Expand for Abstract / Authors We report efficient quantum-dot single-photon sources with unidirectional output integrated on Si by transfer printing. The device was designed to be robust against misalignment accompanied by the hybrid integration. Efficient single-photon generation was experimentally confirmed. **Authors**:Ryota Katsumi/The University of Tokyo Yasutomo Ota/The University of Tokyo Takeyoshi Tajiri/The University of Tokyo Masahiro Kakuda/The University of Tokyo Hidefumi Akiyama/The University of Tokyo Satoshi Iwamoto/The University of Tokyo Yasuhiko Arakawa/The University of Tokyo	Paper

12:00 - 12:15	**Combining silicon photonics and micro-electronics for high bandwidth squeezed light detection (FF2D.4)** **Presenter**: Jonathan Frazer, *University of Bristol* Expand for Abstract / Authors We demonstrate a homodyne detector consisting of integrated silicon waveguides and Si-Ge photodiodes wirebonded directly to an amplification integrated circuit. The device performance is verified by detecting squeezed vacuum over 9~GHz of optical bandwidth. **Authors**:Jonathan Frazer/University of Bristol Joel Tasker/University of Bristol Giacomo Ferranti/University of Bristol Euan Allen/University of Bristol Floriane Brunel/Université Côte d'Azur Sebastien Tanzilli/Université Côte d'Azur Virginia D'Auria/Université Côte d'Azur Jonathan Matthews/University of Bristol	Paper
12:15 - 12:30	**Spectrally Tailorable Photon Pairs Generated by Using Nonlinear Interferometer with Programmed Phase Shifts (FF2D.5)** **Presenter**: Liang Cui, *Tianjin University* Expand for Abstract / Authors Photon pairs with flexibly tailorable spectral property are experimentally realized by using a fiber-based two-stage nonlinear interferometer scheme consisting of two pieces of dispersion-shifted fibers with a programmable optical filter in between. **Authors**:Mingyi Ma/Tianjin University Liang Cui/Tianjin University Jiamin Li/Tianjin University Jie Su/Tianjin University Z. Y. Ou/Tianjin University Xiaoying Li/Tianjin University	Paper

Nanophotonic Lasers (SF2E)

Presider: Qing Gu, *The University of Texas at Dallas*

10:30 - 10:45	**1.3 µm tunable quantum dot lasers (SF2E.1)** **Presenter**: Yating Wan, *University of California Santa Barbara* Expand for Abstract / Authors We report the first directly modulated single-mode tunable quantum dot lasers at 1.3 µm. 27-channel wavelength switching was achieved with side-mode-suppression-ratio of around 35 dB without requiring nonuniform gratings or epitaxial regrowth. **Authors**:Yating Wan/University of California Santa Barbara Sen Zhang/Zhejiang University Justin Norman/University of California Santa Barbara MJ Kennedy/University of California Santa Barbara William He/University of California Santa Barbara Yeyu Tong/University of California Santa Barbara Chen Shang/University of California Santa Barbara Jian-Jun He/Zhejiang University Hon Ki Tsang/The Chinese University of Hong Kong Arthur Gossard/University of California Santa Barbara John Bowers/University of California Santa Barbara	Paper

10:45 - 11:00	**Stabilization of Self-Mode-Locked Quantum Dash lasers by symmetric dual-loop optical feedback: effects of power ratio and optical phase tuning (SF2E.2)** **Presenter**: John Gerard McInerney, *University College Cork* Expand for Abstract / Authors We have stabilized self mode-locked quantum dash lasers emitting at 1550nm, reducing pulse train RF linewidth by 100x, using optical feedback from dual fiber loops. **Authors**:John Gerard McInerney/University College Cork	Paper
11:00 - 11:15	**Telecom InAs quantum-dot FP and microdisk lasers epitaxially grown on (111)-faceted SOI (SF2E.3)** **Presenter**: Ting Wang, *Institute of Physics, CAS* Expand for Abstract / Authors By utilizing homo-epitaxially formed (111)-faceted silicon hollow structures on U-shaped patterned SOI substrates, 1310 nm and 1510 nm InAs quantum dot (QD) fabry-perot and microdisk lasers are achieved on such platform, which paves a promising way to realize silicon-based light source. **Authors**:Ting Wang/Institute of Physics, CAS	Paper
11:15 - 11:30	**Comparison of Dynamic Characteristics of Quantum Dash and Quantum Well Lasers on InP (SF2E.4)** **Presenter**: Bei Shi, *University of California Santa Barbara* Expand for Abstract / Authors 1550 nm InAs/InAlGaAs quantum dash lasers exhibit higher modulation efficiencies and bandwidths than the InGaAsP-based quantum well lasers. Their lasing thresholds, output powers and temperature stabilities are greatly improved after the high reflectance coating. **Authors**:Bei Shi/University of California Santa Barbara Sergio Pinna/University of California Santa Barbara Wei Luo/Hong Kong University of Science and Technology Hongwei Zhao/University of California Santa Barbara Si Zhu/Hong Kong University of Science and Technology Simone Suran Brunelli/University of California Santa Barbara Kei May Lau/Hong Kong University of Science and Technology Jonathan Klamkin/University of California Santa Barbara	Paper

11:30 - 12:30

(Withdrawn) Nanophotonic Lasers in the GaN Material System (SF2E.5)
Presenter: Evelyn Hu, *Harvard University*
Expand for Abstract / Authors

Abstract not available.
Biography not available.

Authors:Evelyn Hu/Harvard University

Tutorial

14:00 - 15:00 (UTC - 07:00)

Direct Detection Links (SF3L)
Presider: Giovanni Milione, *NEC Laboratories America Inc*

14:00 - 14:15

100-Gb/s PAM-4 Transmission for Next-Generation Optical Access Networks Using a Silicon Micro-Ring Resonator (SF3L.1)
Presenter: Xiao Zhang, *Key Lab. of Optical Fiber Sensing and Communications, University of Electronic Science and Technology of China, Chengdu 611731, China*
Expand for Abstract / Authors

Paper

We experimentally demonstrated 100-Gb/s PAM-4 signal transmission over 25-km SSMF using a 10-G class DML. A polarization-diversity silicon micro-ring resonator is employed to enhance the dispersion tolerance and extinction ratio in the DML based IM/DD system.

Authors:Xiao Zhang/Key Lab. of Optical Fiber Sensing and Communications, University of Electronic Science and Technology of China, Chengdu 611731, China Yunhong Ding/DTU Fotonik, Technical University of Denmark, Kgs. Lyngby, Denmark Longsheng Li/DTU Fotonik, Technical University of Denmark, Kgs. Lyngby, Denmark Wei Jin/School of Electronic Engineering, Bangor University, Bangor LL57 1UT, U.K. Chongfu Zhang/Key Lab. of Optical Fiber Sensing and Communications, University of Electronic Science and Technology of China, Chengdu 611731, China Kun Qiu/Key Lab. of Optical Fiber Sensing and Communications, University of Electronic Science and Technology of China, Chengdu 611731, China Hao Hu/DTU Fotonik, Technical University of Denmark, Kgs. Lyngby, Denmark

14:15 - 14:30

44 Gb/s PAM-4 Transmission with a Polarization-Independent Surface-Normal Electroabsorption Modulator (SF3L.2)
Presenter: Patrick Iannone, *Nokia Bell Labs*
Expand for Abstract / Authors

Paper

We measure performance of 44-Gb/s (22-GBd) PAM-4 short-reach direct detection links with a polarization-independent surface-normal electro-absorption modulator. Transmission is demonstrated in standard single-mode fiber links with no dispersion compensation for distances up to 18 km.

Authors:Patrick Iannone/Nokia Bell Labs Xi Chen/Nokia Bell Labs Stefano Grillanda/Nokia Bell Labs Gregory Raybon/Nokia Bell Labs Andrew Adamiecki/Nokia Bell Labs Ellsworth Burrows/Nokia Bell Labs Ting-Chen Hu/Nokia Bell Labs David Neilson/Nokia Bell Labs Nagesh Basavanhally/Nokia Bell Labs Yee Low/Nokia Bell Labs Rose Kopf/Nokia Bell Labs Alaric Tate/Nokia Bell Labs Mark Earnshaw/Nokia Bell Labs

14:30 - 14:45

Demonstration of a PMC-SH link using a phase recovery IC for low-power high-capacity DCIs (SF3L.3)
Presenter: Rakesh Ashok, *IIT Bombay*
Expand for Abstract / Authors

Paper

We demonstrate a coherent polarization multiplexed carrier based self-homodyne (PMC-SH) 16-QAM link using a phase synchronization IC and an automatic polarization control technique. The system can replace PAM-4 links to achieve practical high-capacity short-reach DCIs.

Authors:Rakesh Ashok/IIT Bombay Rashmi Kamran/IIT Bombay Sana Naaz/IIT Bombay Shalabh Gupta/IIT Bombay

14:45 - 15:00

C-band 4×150 Gbit/s PAM8 transmission over 30 km SSMF using direct detection without CD compensation (SF3L.4)
Presenter: Li Di, *Huazhong University of Sci. & Tech.*
Expand for Abstract / Authors

Paper

We demonstrated 4×150Gbit/s PAM8 signal transmission system using dual-drive MZM and direct-detection for the first time. By optimizing the Volterra equalizer, 30km SSMF without CD compensation is achieved with BER below HD-FEC limit of 3.8×10^{-3}.

Authors:Li Di/Huazhong University of Sci. & Tech. wen cheng/Huazhong University of Sci. & Tech. Haiping Song/Huazhong University of Sci. & Tech. Lei Deng/Huazhong University of Sci. & Tech. Mengfan Cheng/Huazhong University of Sci. & Tech. Songnian Fu/Huazhong University of Sci. & Tech. Ming Tang/Huazhong University of Sci. & Tech. Deming Liu/Huazhong University of Sci. & Tech.

14:00 - 16:00 (UTC - 07:00)

Symp: Neural Networks III: Recent Advances and Applications of Optical Neural Networks (JF3A)
Presider: Volker Sorger, *George Washington University*

Special Symposium

14:00 - 14:30	**Physics-AI Symbiosis: How to Utilize Physics to Accelerate Artificial Intelligence (JF3A.1)** **Presenter**: BAHRAM JALALI, *University of California Los Angeles* Expand for Abstract / Authors Applications of AI in realtime applications calls for low-power and low-latency. This talk will explore emerging techniques in which analog physical systems, as well as laws of physics, are being employed to enhance artificial intelligence. **Authors**:BAHRAM JALALI/University of California Los Angeles Invited	
14:30 - 14:45	**GSST-based photonic memory multilevel perceptron (JF3A.2)** **Presenter**: Mario Miscuglio, *George Washington University* Expand for Abstract / Authors Here we demonstrate an on-chip programmable multi-level non-volatile photonic memory based on an ultra-compact (<4µm) hybrid GSST-silicon Mach Zehnder modulator, with low insertion losses (3dB), used as node in a photonic neural network that effortlessly perform inference **Authors**:Mario Miscuglio/George Washington University Jiawei Meng/George Washington University Omer Yesilyurt/Birck Nanotechnology Center, Purdue University Ludmila Prokopeva/Birck Nanotechnology Center, Purdue University Yifei Zhang/, Massachusetts Institute of Technology Armin Mehrabian/George Washington University Juejun Hu/, Massachusetts Institute of Technology Alexander Kildishev/Birck Nanotechnology Center, Purdue University Volker Sorger/George Washington University	Paper

14:45 - 15:15	**Nanophotonics Technology for Signal Processing and Neuromorphic Accelerators (JF3A.3)** **Presenter**: Yeshaiahu Fainman, *University of California San Diego* Expand for Abstract / Authors Dense photonic integration requires miniaturization of materials, devices and subsystems, including passive components (e.g., engineered composite metamaterials, filters, etc.), active components (e.g., lasers, modulators and nonlinear wave mixers) and integrated circuits (Fourier transform spectrometer, programmable phase modulator of free space modes, etc.). These novel devices are needed for future signal processing and neuromorphic processors. **Authors**:Yeshaiahu Fainman/University of California San Diego Invited	Paper
15:15 - 15:30	**Million-channel parallelism Fourier-optic convolutional filter and neural network processor (JF3A.4)** **Presenter**: Volker Sorger, *George Washington University* Expand for Abstract / Authors Here we report on a massively-parallel Fourier-optics convolutional processor accelerated 160x over spatial-light-modulators using digital-mirror-display technology as input and kernel. Testing the system on MNIST and CIFAR-10 datasets shows 96% and 54% accuracy, respectively. **Authors**:Mario Miscuglio/George Washington University Zibo Hu/George Washington University Shurui Li/University of California Los Angeles Jiaqi Gu/University of Texas Aydin Babakhani/University of California Los Angeles Puneet Gupta/University of California Los Angeles Chee Wei Wong/University of California Los Angeles David Pan/University of Texas Seth Bank/University of Texas Hamed Dalir/Omega Optics Inc Volker Sorger/George Washington University	Paper
15:30 - 16:00	**Diffractive Optical Neural Networks Designed by Deep Learning (JF3A.5)** **Presenter**: Aydogan Ozcan, *University of California Los Angeles* Expand for Abstract / Authors We present diffractive optical networks that can all-optically implement various functions following deep learning-based design of passive transmissive layers that work collectively. This framework has applications in all-optical image analysis, feature detection and object classification. **Authors**:Aydogan Ozcan/University of California Los Angeles Invited	

Solar and Optical Energy Conversion and Radiative Cooling (AF3N)

Presider: Daniel Law, *The Boeing Company*

14:00 - 14:30

Introduction to Over-the-air-wireless Power (AF3N.1)

Presenter: Ori Mor, *Wi-Charge Ltd*

Expand for Abstract / Authors

Wi-Charge developed the ability to power devices from a distance. With 30ft. range and 100X more power than batteries a transforming building block is born. New dimension to power delivery. All thanks to infrared.

Authors:Ori Mor/Wi-Charge Ltd

Invited

14:30 - 14:45

Going Beyond the Shockley-Queisser Efficiency Limit for a GaAs Laser Power Converter (LPC) Using Optical Front and Rear Coat Optimization (AF3N.2)

Presenter: Tianna McBroom, *Syracuse University*

Expand for Abstract / Authors

Paper

For laser power converters dominated by photon recycling, optimized anti-reflection coatings will achieve efficiencies that exceed the Shockley-Queisser limit. We present designs for such coatings based on efficiency optimization considering both anti-reflection and low hemispherical emissivity.

Authors:Tianna McBroom/Syracuse University Eric Schiff/Syracuse University

14:45 - 15:15

Advances and Needs in Laser Power Beaming (AF3N.3)

Presenter: Thomas Nugent, *Powerlight Technologies*

Expand for Abstract / Authors

Will review past demonstrations of laser power beaming, metrics for performance, and a focus on needs for improving end-to-end efficiency.

Authors:Thomas Nugent/Powerlight Technologies

Invited

15:15 - 15:30	**Solar powered fiber laser for energy conversion applications (AF3N.4)** **Presenter**: Taizo Masuda, *Toyota Motor Corporation* Expand for Abstract / Authors We demonstrate an “unconcentrated” solar-powered laser (SPL) for energy conversion applications. The lasing threshold of the proof-of-concept apparatus is 0.07 W/cm^2 which is four orders of magnitude smaller than those of conventional SPLs. **Authors**:Taizo Masuda/Toyota Motor Corporation Stephan Dottermusch/Karlsruhe Institute of Technology Ian Howard/Karlsruhe Institute of Technology Bryce Richards/Karlsruhe Institute of Technology Jean-Francois Bisson/Université de Moncton Masamori Endo/Tokai University	Paper
15:30 - 15:45	**Spectrally-selective mirrors for doubled-sided radiative cooling (AF3N.5)** **Presenter**: Lyu Zhou, *State University of New York at Buffalo* Expand for Abstract / Authors We report a spectrally-selective metafilm and implement it into a doubled-sided radiative cooling system. As a result, a cooling power beyond 280 W/m^2 was demonstrated experimentally, surpassing the single-sided blackbody radiation limit of ~ 160 W/m^2. **Authors**:Lyu Zhou/State University of New York at Buffalo Haomin Song/State University of New York at Buffalo Nan Zhang/State University of New York at Buffalo Jacob Rada/State University of New York at Buffalo Matthew Singer/State University of New York at Buffalo Huafan Zhang/King Abdullah University of Science and Technology Boon S. Ooi/King Abdullah University of Science and Technology Zongfu Yu/University of Wisconsin-Madison Qiaoqiang Gan/State University of New York at Buffalo	Paper
15:45 - 16:00	**Black TiO_2 on nanoporous substrates for improved solar vapor generation (AF3N.6)** **Presenter**: Haomin Song, *State University of New York at Buffalo* Expand for Abstract / Authors We report a black TiO_2 on nanoporous anodic alumina oxide (AAO) architecture for improved solar vapor generation. The efficiency reached 85.3% under one sun illumination, corresponding to a vapor generation rate of 1.29 kg/(m^2●h). **Authors**:Youhai Liu/State University of New York at Buffalo Haomin Song/State University of New York at Buffalo Matthew Singer/State University of New York at Buffalo Lyu Zhou/State University of New York at Buffalo Nan Zhang/State University of New York at Buffalo Zongmin Bei/State University of New York at Buffalo Qiaoqiang Gan/State University of New York at Buffalo	Paper

Ultrafast Oscillators and Amplifiers II (SF3H)

Presider: John Nees, *University of Michigan*

14:00 - 14:15 **(Withdrawn) Ultrafast Thin-Disk Laser Oscillator with 430-W Average Power and 78-MW Peak Power (SF3H.1)**
Presenter: Francesco Saltarelli, *ETH Zurich*
Expand for Abstract / Authors

We demonstrate a thin-disk oscillator delivering a record-high 430-W average power with 68-μJ, 769-fs pulses at 6.29-MHz repetition rate. We combined vacuum operation, an active multi-pass cavity, and a thin SESAM optimized for heat management.

Authors:Francesco Saltarelli/ETH Zurich Ivan Graumann/ETH Zurich Lukas Lang/ETH Zurich Dominik Bauer/TRUMPF Laser GmbH Christopher Phillips/ETH Zurich Ursula Keller/ETH Zurich

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14:15 - 14:30 **Dual-Comb Thin-Disk Laser Oscillator Based on Polarization Splitting (SF3H.2)**
Presenter: Norbert Modsching, *Université de Neuchâtel*
Expand for Abstract / Authors

We present the first dual-comb thin-disk laser based on polarization splitting. It generates 6-W and 8-W outputs of 240-fs pulses with adjustable repetition rate. We investigate noise properties and demonstrate a proof-of-principle spectroscopy experiment.

Authors:Norbert Modsching/Université de Neuchâtel Jakub Drs/Université de Neuchâtel Julian Fischer/Université de Neuchâtel Stephane Schilt/Université de Neuchâtel Valentin Wittwer/Université de Neuchâtel Thomas Südmeyer/Université de Neuchâtel

Paper

14:30 - 14:45 **Intra-Oscillator High Harmonic Generation in a ~100-fs Kerr-Lens Mode-Locked Thin-Disk Laser (SF3H.3)**
Presenter: Julian Fischer, *Time and Frequency Laboratory, University of Neuchatel*
Expand for Abstract / Authors

We demonstrate HHG with ~10^{14} W/cm^2 peak intensity in argon and ~5×10^{13} W/cm^2 in krypton inside a mode-locked laser oscillator. The system operates with up to 180-W intracavity average power with 89-fs pulses at 11-MHz.

Authors:Julian Fischer/Time and Frequency Laboratory, University of Neuchatel Jakub Drs/Time and Frequency Laboratory, University of Neuchatel François Labaye/Time and Frequency Laboratory, University of Neuchatel Norbert Modsching/Time and Frequency Laboratory, University of Neuchatel Christian Kränkel/Zentrum für Lasermaterialien - Kristalle (ZLM-K) Valentin Wittwer/Time and Frequency Laboratory, University of Neuchatel Thomas Südmeyer/Time and Frequency Laboratory, University of Neuchatel

Paper

14:45 - 15:00	**(Withdrawn) Spectral Gain Optimization of Ultrafast Thin-Disk Laser Oscillators (SF3H.4)** **Presenter**: Lukas Lang, *ETH Zurich - Inst. of Quantum El.* Expand for Abstract / Authors We present a novel approach based on spectral gain-flattening to obtain short-pulsed, high-power modelocking in thin-disk lasers with narrowband gain materials. Our numerical model and spectral-gain measurement scheme enable careful optimization of the experimental parameters. **Authors**:Lukas Lang/ETH Zurich - Inst. of Quantum El. Ivan Graumann/ETH Zurich - Inst. of Quantum El. Francesco Saltarelli/ETH Zurich - Inst. of Quantum El. Valentin Wittwer/University of Neuchatel Thomas Südmeyer/University of Neuchatel Christopher Phillips/ETH Zurich - Inst. of Quantum El. Ursula Keller/ETH Zurich - Inst. of Quantum El.	
15:00 - 15:30	**Directly Diode-Pumped Few-Optical-Cycle Cr:ZnS Laser at 800 mW of Average Power (SF3H.5)** **Presenter**: Nathalie Nagl, *Ludwig-Maximilians-Universität München* Expand for Abstract / Authors We report a Kerr-lens mode-locked Cr:ZnS oscillator directly pumped by two laser diodes, providing 34 fs pulses with 800 mW average power at 2.4 µm. This low-noise affordable femtosecond laser facilitates numerous emerging mid-infrared applications. **Authors**:Nathalie Nagl/Ludwig-Maximilians-Universität München Sebastian Gröbmeyer/Ludwig-Maximilians-Universität München Markus Pötzlberger/Max Planck Institute of Quantum Optics Vladimir Pervak/Ludwig-Maximilians-Universität München Ferenc Krausz/Ludwig-Maximilians-Universität München Ka Fai Mak/Max Planck Institute of Quantum Optics	Paper
15:30 - 15:45	**Generation of 7 mJ, 115 fs pulses at 2.4 µm, 1 kHz from a Cr:ZnSe amplifier (SF3H.6)** **Presenter**: Vyacheslav Leshchenko, *The Ohio State University* Expand for Abstract / Authors We report on the generation of 7 mJ, 115 fs pulses at 2.4 µm and 1 kHz repetition rate from a Cr^{2+}:ZnSe chirped pulse amplifier, which is very promising for applications in strong-field and attosecond physics. **Authors**:Vyacheslav Leshchenko/The Ohio State University Bradford Talbert/The Ohio State University Yu Hang Lai/The Ohio State University Sha Li/The Ohio State University Cosmin Blaga/The Ohio State University Pierre Agostini/The Ohio State University Louis DiMauro/The Ohio State University	Paper

15:45 - 16:00

Carrier to Envelope Phase (CEP) Stable, 2.37 µm, Ultrashort Cr:ZnSe Laser. (SF3H.7)
Presenter: Gilad Marcus, *The Hebrew University, Jerusalem*
Expand for Abstract / Authors

Paper

Cr:ZnSe laser amplifier resulted more than 40 uJ , 72fs pulses, at λ0 ≈ 2375nm. The CEP stability of the parametrically generated seed stands firm through 6 orders of magnitude of amplification.

Authors:Gilad Marcus/The Hebrew University, Jerusalem Pavel Komm/The Hebrew University, Jerusalem Uzziel Sheintop/The Hebrew University, Jerusalem Salman Noach/Jerusalem College of Technology

Quantum Communications (FF3C)

Presider: Lijun Ma, *National Inst of Standards & Technology*

14:00 - 14:15

Proof-of-Principle Experimental Demonstration of Twin-Field Quantum Key Distribution over Asymmetric Channels (FF3C.1)
Presenter: Xiaoqing Zhong, *University of Toronro*
Expand for Abstract / Authors

Paper

We demonstrate a first experiment of twin-field quantum key distribution over asymmetric channels. We use asymmetric signal intensities and show that the secret key rate can beat the repeaterless bound at 50 (30+20) dB total loss.

Authors:Xiaoqing Zhong/University of Toronro Wenyuan Wang/University of Toronro Li Qian/University of Toronro Hoi-Kwong Lo/University of Toronro

14:15 - 14:30

An Integrated Photonic Chip of Measurement-Device-Independent Quantum Key Distribution (MDI-QKD) (FF3C.2)
Presenter: LIN CAO, *Peking University*
Expand for Abstract / Authors

Paper

An integrated chip of MDI-QKD system is demonstrated. The system generates a key rate per pulse of 2.923×10^{-6} over a distance corresponding to 50-km optical fibre with 25% detection efficiency.

Authors:LIN CAO/Peking University WEI LUO/Nanyang Technological University Yunxiang Wang/Nanyang Technological University Jun Zou/Nanyang Technological University Rudai Yan/Nanyang Technological University Hong Cai/Agency for Science, Technology and Research Xiaolong Hu/Tsinghua University Cong Jiang/Tsinghua University Xiaoqi Zhou/Sun Yat-sen University Shihai Sun/Nanyang Technological University Xiangbin Wang/Tsinghua University Yufeng Jin/Peking University Leong Kwek/Nanyang Technological University Ai Qun Liu/Nanyang Technological University

14:30 - 14:45

Frequency-Multiplexed Rate-Adaptive Quantum Key Distribution with High-Dimensional Encoding (FF3C.3)
Presenter: Murat Sarihan, *University of California,Los Angeles*
Expand for Abstract / Authors

Paper

We offer a photon-efficient QKD protocol based on energy-time entangled biphoton frequency combs that supports multiplexing and rate adaptivity under various channel conditions.

Authors:Murat Sarihan/University of California,Los Angeles Kai-Chi Chang/University of California,Los Angeles Xiang Cheng/Beijing University of Posts and Telecommunications Yoo Seung Lee/University of California,Los Angeles Changchen Chen/Massachusetts Institute of Technology Tian Zhong/University of Chicago Hongchao Zhou/Shandong University Zheshen Zhang/University of Arizona Franco Wong/Massachusetts Institute of Technology Jeffrey shapiro/Massachusetts Institute of Technology Chee Wei Wong/University of California,Los Angeles

14:45 - 15:00

Demonstration of Robust Self-Referenced Continuous Variable Quantum Key Distribution over 25km Fiber Link (FF3C.4)
Presenter: Shengjun Ren, *University of Cambridge*
Expand for Abstract / Authors

Paper

We experimentally demonstrate a practical self-referenced continuous variable quantum key distribution system composed of embedded data conversion/acquisition units and standard telecommunication components over a 25km optical fiber, with a predicted key rate of 649kbps.

Authors:Shengjun Ren/University of Cambridge Shuai Yang/University of Cambridge adrian wonfor/University of Cambridge Richard Penty/University of Cambridge Ian white/University of Cambridge

15:00 - 16:00

Photonic-based quantum communication and sensing: an interplay between fundamental and technological resources (FF3C.5)
Presenter: Sebastien Tanzilli, *CNRS*
Expand for Abstract / Authors

Paper

We will present guided-wave photonic solutions enabling the production and manipulation of entangled photons at telecommunication wavelengths. We will also discuss how entanglement-induced correlations are subsequently exploited as key re- sources for implementing fundamental quantum optical experiments, establishing long-distance quantum cryptography links, and for characterizing optical materials with unprecedented precision.
Sébastien Tanzilli is a CNRS research director at the Institut de Physique de Nice, Université Côte d‘Azur, where he leads the team “Quantum Photonics & Information”. He has a 20-year experience in the field of fundamental quantum optics and photonic-based quantum information systems, finding applications in quantum communication and metrology. He has been the PI, co-Pi, or partner of many research projects, at both the national and European levels, that led to more than 50 publications in international peer-reviewed journals, as well as several book chapters. He was awarded the CNRS Bronze Medal in 2009 and the French Optical Society Fabry - de Gramont Prize in 2008. Among his responsibilities, he is a member of several scientific committees, and he notably coordinates the CNRS network on “Quantum Engineering” that gathers a hundred teams all over Europe.

Authors:Sebastien Tanzilli/CNRS

Tutorial

Metasurfaces for Optical Control and Detection (FF3E)

Presider: Aaswath Raman

14:00 - 14:30

(Withdrawn) Flat optics for vortex generation, multiplexing and lasing (FF3E.1)
Presenter: Chengwei Qiu, *National University of Singapore*
Expand for Abstract / Authors

We will present recent progress in the generation of various orbital angular momentum (OAM) using metasurfaces. The multiplexing of various topological charges in one metasurface and cavity-based mechanism for OAM lasing will be reported.

Authors:Chengwei Qiu/National University of Singapore

Invited

14:30 - 14:45	**Multiresonant Nanolaminate Plasmonic Metamaterials with Spatial Mode Overlap (FF3E.2)** **Presenter**: Wei Zhou, *Virginia Tech* Expand for Abstract / Authors By supporting multiple hybridized surface plasmon resonances with spatial mode overlap, multiresonant nanolaminate plasmonic metamaterials can achieve broadband deep-subwavelength light concentration in the same nano-localized volume at multiple different wavelength ranges. **Authors**:Seied Tali/Virginia Tech Junyeob Song/Virginia Tech Wonil Nam/Virginia Tech Wei Zhou/Virginia Tech	Paper
14:45 - 15:00	**Ultra-High-Q Resonance in a Plasmonic Metasurface (FF3E.3)** **Presenter**: Md Saad-Bin-Alam, *University of Ottawa* Expand for Abstract / Authors We experimentally demonstrate an unprecedented ultra-high-Q (2400) surface lattice resonance in a metasurface array of periodically arranged plasmonic nanostructures, which can be adopted for highly efficient nanophotonic applications e.g. nano-lasing, sensing, and nonlinear optical processes. **Authors**:Md Saad-Bin-Alam/University of Ottawa Orad Reshef/University of Ottawa Yaryna Mamchur/National Technical University of Ukraine ``Igor Sikorsky Kyiv Polytechnic Institute'' Graham Carlow/Iridian Spectral Technologies Inc. Brian Sullivan/Iridian Spectral Technologies Inc. Jean-Michel Ménard/University of Ottawa Mikko Huttunen/Tampere University Ksenia Dolgaleva/University of Ottawa Robert Boyd/University of Ottawa	Paper
15:00 - 15:15	**Tantalum Pentoxide-based, All-dielectric Ultraviolet Metasurfaces (FF3E.4)** **Presenter**: Cheng Zhang, *National Inst of Standards & Technology* Expand for Abstract / Authors We demonstrate a novel all-dielectric, ultraviolet metasurface platform based on Tantalum Pentoxide, enabling high-performance meta-devices operating across the mid- and near-ultraviolet frequency regimes. **Authors**:Cheng Zhang/National Inst of Standards & Technology Wenqi Zhu/National Inst of Standards & Technology Junyeob Song/National Inst of Standards & Technology David Carlson/National Inst of Standards & Technology Jinghui Yang/National Inst of Standards & Technology Lu Chen/National Inst of Standards & Technology Wei Zhou/Virginia Tech Scott B. Papp/National Inst of Standards & Technology Henri Lezec/National Inst of Standards & Technology Amit Agrawal/National Inst of Standards & Technology	Paper

15:15 - 15:30 **Design and Prototyping of a Portable Metasurface-Based Refractive Index Sensor (FF3E.5)**
Presenter: Brittany Simone, *Tulane University*
Expand for Abstract / Authors

Paper

Demonstration of nanophotonic platform for metasurface-based refractive index sensing. Prototype results indicate that dramatic cost (~$5,000) and scale (e.g. portable, handheld) reductions are attainable in comparison to existing technologies with comparable sensitivity ($\Delta n = 10^{-6}$).

Authors:Brittany Simone/Tulane University Isaac Oguntoye/Tulane University George Hartfield/Tulane University Siddharth Padmanabha/Tulane University Adam Ollanik/University of Colorado Boulder Matthew Escarra/Tulane University

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15:30 - 15:45 **Multifunctional Infrared Plasmonic Metamaterial Absorbers for Infrared Polarimetric Imaging (FF3E.6)**
Presenter: Junyu Li, *Huazhong Univ. of Science and Technology*
Expand for Abstract / Authors

Paper

Here we design and experimentally demonstrate broadband and highly polarization selective mid-IR absorbers with spectrally averaged absorption exceeding 70% and polarization extinction ratio of 40.6, covering the important 3-5 μm atmospheric band for infrared polarimetric imaging.

Authors:Junyu Li/Huazhong Univ. of Science and Technology Fei Yi/Huazhong Univ. of Science and Technology

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15:45 - 16:00 **Penetration Depth Engineering in Plasmonic Metafilms for Enhanced Reflection and Confinement (FF3E.7)**
Presenter: Nathan Zhao, *Stanford University*
Expand for Abstract / Authors

Paper

We introduce a metafilm consisting of regions of metal and dielectric which has a much smaller penetration depth than that of a corresponding metal film, leading to enhanced device performance in lightweight ultrahigh reflectivity reflectors and increased packing density of subwavelength waveguides.

Authors:Nathan Zhao/Stanford University Ian Williamson/Stanford University Zhexin Zhao/Stanford University Salim Boutami/CEA Leti Shanhui Fan/Stanford University

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Emerging Materials for Functional Nanophotonics (FF3Q)
Presider: Sander Mann, *CUNY ASRC*

14:00 - 14:15	**Chalcogenide-based Photonic Quasicrystals for Novel Phase Matching (FF3Q.1)** **Presenter**: Jiannan Gao, *Duke University* Expand for Abstract / Authors We design and realize chalcogenide-based photonic quasicrystals enabling simultaneous phase matching of an arbitrary number of nonlinear optical processes in a single engineered nanostructure. **Authors**:Jiannan Gao/Duke University Wiktor Walasik/Duke University Mikhail Shalaev/Duke University Jesse Frantz/US Naval Research Laboratory Jason Myers/US Naval Research Laboratory Robel Bekele/University Research Foundation Jasbinger Sanghera/US Naval Research Laboratory Natalia Litchinitser/Duke University	Paper
14:15 - 14:30	**Aluminum Outshines Silver: Radiative Decay Engineering and Ultrahigh Q-Factor Plasmonics with a Lossy Metal (FF3Q.2)** **Presenter**: Xiangchao Zhu, *University of California* Expand for Abstract / Authors Aluminum has emerged as a broadband and low-cost alternative to noble metals. We demonstrate remarkably high quality-factor plasmonic resonances in inverse-designed aluminum-nanostructures over a broad spectrum from visible to near-ultraviolet, surpassing those of silver counterparts. **Authors**:Xiangchao Zhu/University of California Golam Hossain/University of California Matthew George/Moxtek Arash Farhang/Moxtek Ahmet Cicek/University of California Ahmet Yanik/University of California	Paper
14:30 - 14:45	**An Optical Limiter Using a Strongly Correlated Material (FF3Q.3)** **Presenter**: Weijian Li, *Rice University* Expand for Abstract / Authors Photorefractive optical properties of a strongly-correlated material, 1T-TaS_2 allows many nonlinear nanophotonic devices. Here, we present optical limiters using 1T-TaS_2. **Authors**:Weijian Li/Rice University Yuning Wang/Rice University Gururaj Naik/Rice University	Paper

14:45 - 15:00

(Withdrawn) Demonstration of drift-induced mid-IR surface plasmon nonreciprocity in CdO (FF3Q.4)
Presenter: Yufei Jia, *The Pennsylvania State University*
Expand for Abstract / Authors

We demonstrate nonreciprocal surface plasmon propagation in high-mobility CdO films in the presence of a DC electrical current due to the drift-induced Doppler shift of the plasma frequency. This effect may enable non-magnetic on-chip isolation.

Authors:Yufei Jia/The Pennsylvania State University Alex Grede/The Pennsylvania State University Baomin Wang/The Pennsylvania State University Angela Cleri/The Pennsylvania State University John Murphy/The Pennsylvania State University Jon-Paul Maria/The Pennsylvania State University Noel Giebink/The Pennsylvania State University

15:00 - 15:15

Luttinger Liquid Plasmons in Single Walled Carbon Nanotubes (FF3Q.5)
Presenter: Sheng Wang, *University of California, Berkeley*
Expand for Abstract / Authors

Paper

Quantum-confined electrons in one-dimensional (1D) metals are described by a Luttinger liquid. Using infrared nano-imaging, we probe the Luttinger liquid plasmons in single walled carbon nanotubes, which behaves qualitatively different from conventional metallic plasmonic systems.

Authors:Sheng Wang/University of California, Berkeley Sihan Zhao/University of California, Berkeley Fanqi Wu/University of Southern California Chongwu Zhou/University of Southern California Feng Wang/University of California, Berkeley

15:15 - 15:30

Highly-Enhanced Plasmonic Biosensors based on Atomically Thin Two-Dimensional Chalcogenide Phase-change Materials (FF3Q.6)
Presenter: Yuye Wang, *The Chinese University of Hong Kong*
Expand for Abstract / Authors

Paper

We designed an enhanced plasmonic sensing device based on 2D $Ge_2Sb_2Te_5$ phase change nanomaterials. The sensing capability has been experimentally demonstrated to be 7000,000 μm/RIU with a detection limit of 10 fM for BSA molecules.

Authors:Yuye Wang/The Chinese University of Hong Kong SHUWEN ZENG/XLIM Research Institute,UMR 7252 CNRS/University of Limoges Aurelian Crunteanu/XLIM Research Institute,UMR 7252 CNRS/University of Limoges Yuanyuan Wei/The Chinese University of Hong Kong Georges Humbert/XLIM Research Institute,UMR 7252 CNRS/University of Limoges Jean-Christophe Orlianges/XLIM Research Institute,UMR 7252 CNRS/University of Limoges Ho-Pui Ho/The Chinese University of Hong Kong

15:30 - 15:45 **Dynamic tuning of visible spectrum response using polymer-embedded TiO_2 nanodiscs (FF3Q.7)**
Presenter: Han-Don Um, *Harvard University*
Expand for Abstract / Authors

Paper

We created a polymer-embedded TiO_2 nanodiscs device with a robust tunable color filters that preserve very sharp spectral bands through spatial variations of the pitch of the meta array.

Authors:Han-Don Um/Harvard University Deokjae Choi/Ulsan National Institute of Science and Technology (UNIST) Amit Solanki/Harvard University Kwanyong Seo/Ulsan National Institute of Science and Technology (UNIST) Fawwaz Habbal/Harvard University

15:45 - 16:00 **Planar Resonators Supporting Extremely Confined Phonon-Polariton Modes (FF3Q.8)**
Presenter: Alexander Dubrovkin, *Nanyang Technological University, Centre for Disruptive Photonic Technologies*
Expand for Abstract / Authors

Paper

Infrared nanoimaging revealed extremely subwavelength sheet and edge surface phonon-polariton modes on few-nm thick CMOS-compatible Ge-on-SiC resonators. Surface nature of phononic modes on these ultrathin planar structures enables local sensing at the molecular scale.

Authors:Alexander Dubrovkin/Nanyang Technological University, Centre for Disruptive Photonic Technologies Bo Qiang/Nanyang Technological University, Centre for Disruptive Photonic Technologies Teddy Salim/Nanyang Technological University, School of Materials Science and Engineering Donguk Nam/Nanyang Technological University, Centre for OptoElectronics and Biophotonics Nikolay Zheludev/Nanyang Technological University, Centre for Disruptive Photonic Technologies Qijie Wang/Nanyang Technological University, Centre for OptoElectronics and Biophotonics

Advances in Ranging Technologies (AF3M)

Presider: Martha Bodine

14:00 - 14:15 **A novel software-based optical sampling scheme for high-precision and interference-free time-of-flight LiDAR (AF3M.1)**
Presenter: Yu Ishizaki, *The University of Tokyo*
Expand for Abstract / Authors

Paper

We propose a novel software-based optical sampling scheme for time-of-flight light detection and ranging using psedo-random binary sequences. Temporal resolution of 1.1 ps, corresponding to a ranging resolution of 165um can be achieved.

Authors:Yu Ishizaki/The University of Tokyo Chao Zhang/The University of Tokyo Sze Set/The University of Tokyo Shinji Yamashita/The University of Tokyo

14:15 - 14:30

Amplitude-Modulated Continuous-Wave Light Detection and Ranging with Bessel Beamforming (AF3M.2)
Presenter: Chao Zhang, *University of Tokyo*
Expand for Abstract / Authors

Paper

We realized a novel light detection and ranging whose beam propagates >40 times longer than the depth of focus of Gaussian beam with a beam spot size of <1/3 of that of the collimated beam.

Authors:Chao Zhang/University of Tokyo Sifan Liu/University of Tokyo Zheyuan Zhang/University of Tokyo Lei Jin/University of Tokyo Sze Set/University of Tokyo Shinji Yamashita/University of Tokyo

14:30 - 14:45

Synchronous laser ranging to multiple targets by dual-comb optical cross-correlation (AF3M.3)
Presenter: Wooram Kim, *Korea Advanced Institute of Science and Technology (KAIST)*
Expand for Abstract / Authors

Paper

We perform synchronous laser ranging by dual-comb optical cross-correlation to multiple targets moving along a single optical axis individually. The measurement repeatability reaches 41 nm at 0.1 averaging, satisfying diverse requirements of ultraprecision positioning control.

Authors:Wooram Kim/Korea Advanced Institute of Science and Technology (KAIST) Jaeyoung Jang/Korea Advanced Institute of Science and Technology (KAIST) Seongheum Han/2Korea Institute of Machinery and Materials (KIMM) Young-Jin Kim/Korea Advanced Institute of Science and Technology (KAIST) Seung-Woo Kim/Korea Advanced Institute of Science and Technology (KAIST)

14:45 - 15:00

Multi-Pulse Sampling Dual-Comb Interferometer (AF3M.4)
Presenter: Siyu Zhou, *Tsinghua University*
Expand for Abstract / Authors

Paper

We present a multi-pulse sampling dual-comb interferometer that realizes the multiplication of cross-correlation interferograms and improves the ranging precision. The experimental results demonstrate that a precision of 3.1nm is obtained with 15ms averaging time.

Authors:Siyu Zhou/Tsinghua University Kai Ni/Division of Advanced Manufacturing, Graduate School at Shenzhen, Tsinghua University, Shenzhen 518055, China Qian Zhou/Division of Advanced Manufacturing, Graduate School at Shenzhen, Tsinghua University, Shenzhen 518055, China Guanhao Wu/Tsinghua University

15:00 - 15:30

5.6-GHz-Bandwidth Photonic Stepped-Frequency Radar using MHz-level Frequency-Shifting Modulation (AF3M.5)
Presenter: Ziqian Zhang, *The University of Sydney*
Expand for Abstract / Authors

Paper

We present the first demonstration of a photonics-based stepped-frequency radar imaging system with 5.6 GHz bandwidth and thus a centimetre-level range resolution, enabled by a simple optical frequency-shifting loop using an 80-MHz acousto-optic modulator.

Authors:Ziqian Zhang/The University of Sydney Yang Liu/The University of Sydney Maurizio Burla/ETH Zurich Benjamin Eggleton/The University of Sydney

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15:30 - 15:45

Design of 2D Optical Phased Array Emitters with Half-wavelength Spacing and Less Than -20 dB Crosstalk (AF3M.6)
Presenter: Ziyun Kong, *Purdue University*
Expand for Abstract / Authors

Paper

We propose a multi-layered, 2D optical phased array capable of 180°×180° beam steering range without wavelength tuning. Evanescent coupling between half-wavelength spaced waveguides is suppressed below –20 dB through index-mismatch and extreme skin-depth metamaterial waveguides.

Authors:Ziyun Kong/Purdue University Yun Lee/Purdue University Abdullah Noman/Purdue University Yingheng Tang/Purdue University Gregory Chang/Purdue University Minghao Qi/Purdue University

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15:45 - 16:00

Large-field step-structure surface profilometry using a femtosecond laser (AF3M.7)
Presenter: yue wang, *Tsinghua University*
Expand for Abstract / Authors

Paper

We present a femtosecond laser based interferometer for step-structure surface measurement. The synthetic-wavelength method is adopted to bridge the envelope positioning and carrier phase extraction methods. A three step surface is precisely reconstructed.

Authors:yue wang/Tsinghua University Guangyao Xu/Tsinghua University Shilin Xiong/Tsinghua University Guanhao Wu/Tsinghua University

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Optical Comb and Spectroscopic Applications II (SF3O)

Presider: Sungwon Chung, *Neuralink Corporation*

14:00 - 14:15	**Integrated Photonic Interposers for Processing Octave-Spanning Microresonator Frequency Combs (SF3O.1)** **Presenter**: Ashutosh Rao, *National Institute of Standards and Technology* Expand for Abstract / Authors We demonstrate multiple silicon-nitride nanophotonic elements for on-chip processing of octave-spanning microresonator frequency combs. Dichroic filters, multimode interferometers, and tunable add-drop microring filters are shown along with soliton microcombs generated on a bilayer photonic chip. **Authors**:Ashutosh Rao/National Institute of Standards and Technology Gregory Moille/National Institute of Standards and Technology Xiyuan Lu/National Institute of Standards and Technology Davide Sacchetto/Ligentec Michael Geiselmann/Ligentec Michael Zervas/Ligentec Scott Papp/National Institute of Standards and Technology John Bowers/University of California, Santa Barbara Kartik Srinivasan/National Institute of Standards and Technology	Paper
14:15 - 14:30	**A High-resolution Fourier-transform Spectrometer based on cascaded a ring resonator and an MZI array (SF3O.2)** **Presenter**: HUIHUI ZHU, *NTU* Expand for Abstract / Authors A high-resolution FT spectrometer consists of a cascaded microring resonator and an MZI array is demonstrated and achieved a high resolution of 0.74 nm and bandwidth of 20 nm. It has high potential in biochemical sensing applications. **Authors**:HUIHUI ZHU/NTU Shaonan Zheng/AStar Jun Zou/NTU Hong Cai/AStar zhenyu Li/NTU Ai Qun Liu/NTU	Paper
14:30 - 15:00	**Photonic Integrated Circuits for Precision Spectroscopy (SF3O.3)** **Presenter**: Joseph Fridlander, *University of California Santa Barbara* Expand for Abstract / Authors A dual-laser indium phosphide photonic integrated circuit for precision spectroscopy lidar was designed and fabricated. A stabilization experiment demonstrated a twentyfold improvement in the long-term frequency stability of the master laser. **Authors**:Joseph Fridlander/University of California Santa Barbara Victoria Rosborough/University of California Santa Barbara Fengqiao Sang/University of California Santa Barbara Michael Nickerson/University of California Santa Barbara Jeffrey Chen/NASA-Goddard Kenji Numata/NASA-Goddard Paul Verrinder/University of California Santa Barbara Fabrizio Gambini/University of California Santa Barbara Sergio Pinna/University of California Santa Barbara Stephan Kawa/NASA-Goddard Mark Stephen/NASA-Goddard larry coldren/University of California Santa Barbara Jonathan Klamkin/University of California Santa Barbara	Paper

15:00 - 15:15

Integrated Turnkey Soliton Microcombs Operated at CMOS Frequencies (SF3O.4)
Presenter: Boqiang Shen, *California Institute of Technology*
Expand for Abstract / Authors

Paper

We experimentally discovered and theoretically explain a novel turnkey regime for operation of soliton microcombs, wherein a new operating point enables the direct access of the soliton state by simple turn-on of the pump laser.

Authors:Boqiang Shen/California Institute of Technology Lin Chang/University of California Santa Barbara Junqiu Liu/Swiss Federal Institute of Technology Lausanne (EPFL) Heming Wang/California Institute of Technology Qi-Fan Yang/California Institute of Technology Chao Xiang/University of California Santa Barbara Rui Ning Wang/Swiss Federal Institute of Technology Lausanne (EPFL) Jijun He/Swiss Federal Institute of Technology Lausanne (EPFL) Tianyi Liu/Swiss Federal Institute of Technology Lausanne (EPFL) Weiqiang Xie/University of California Santa Barbara Joel Guo/University of California Santa Barbara David Kinghorn/University of California Santa Barbara LUE WU/California Institute of Technology Qing-Xin Ji/California Institute of Technology Tobias Kippenberg/Swiss Federal Institute of Technology Lausanne (EPFL) Kerry Vahala/California Institute of Technology John Bowers/University of California Santa Barbara

15:15 - 15:30

Optical Frequency Comb Generation in Silicon by Recursive Electro-Optic Modulation (SF3O.5)
Presenter: Mohamad Hossein Idjadi, *University of Pennsylvania*
Expand for Abstract / Authors

Paper

On-chip optical frequency comb generation using recursive electro-optic modulation is demonstrated. The chip, fabricated on IME 180 nm SOI process, is used to generate a 120 GHz wide frequency comb with 10 GHz tooth-spacing.

Authors:Mohamad Hossein Idjadi/University of Pennsylvania Shermin Arab/University of Pennsylvania Firooz Aflatouni/University of Pennsylvania

15:30 - 15:45

Correlation between RF Signal Reflection on Electrodes and Modulation Variation of Silicon Mach-Zehnder Modulators (SF3O.6)
Presenter: Zhaobang Zeng, *Nanjing University*
Expand for Abstract / Authors

Paper

We introduce (partial) correlation coefficients to explore the relation between the driving signal reflection on traveling wave electrodes and the performance variation of silicon Mach-Zehnder modulators. Relevant fabrication variation scenarios and potential remedies are discussed.

Authors:Zhaobang Zeng/Nanjing University peiyan zhao/Nanjing University Nan Yang/Nanjing University Qianyi Gao/Nanjing University Bo Tang/Chinese Academy of Science Zhihua Li/Chinese Academy of Science Jiang Yan/North China University of Technology Wei Jiang/Nanjing University

15:45 - 16:00

(Withdrawn) Fully Integrated Highly Sensitive Broadband Photonic Spectrometer Based on Disorder (SF3O.7)
Presenter: Wladick Hartmann, *University of Muenster*
Expand for Abstract / Authors

We demonstrate an on-chip photonic spectrometer exploiting tailored disorder with broadband fiber-to-chip couplers and superconducting single-photon detectors. Probe signals over
a wide wavelength range are faithfully reconstructed with low input power down to -111.5 dBm.

Authors:Wladick Hartmann/University of Muenster Paris Varytis/Humboldt University Berlin Helge Gehring/University of Muenster Nicolai Walter/University of Muenster Fabian Beutel/University of Muenster Kurt Busch/Humboldt University Berlin Wolfram Pernice/University of Muenster

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Novel Device Applications (SF3J)

Presider: Rohit Prasankumar, *Los Alamos National Laboratory*

14:00 - 14:15

Physically unclonable optical functions using native silk (SF3J.1)
Presenter: Minseok Kim, *GIST*
Expand for Abstract / Authors

Paper

Combination of Physically unclonable functions (PUF) and optical materials can potentially enhance hardware and information security. Here, we propose a strong optical PUF device with native silk having inherent disordered structures.

Authors:Minseok Kim/GIST Gil Ju Lee/GIST Seung Ho Choi/Yonsei University Jung Woo Leem/Purdue University Young L. Kim/Purdue University Young Min Song/GIST

14:15 - 14:30

Realization of robust optical physical unclonable function using a silicon photonic quasicrystal interferometer (SF3J.2)
Presenter: Judson Ryckman, *Clemson University*
Expand for Abstract / Authors

Paper

We report the first optical physical unclonable function designed for robustness against fluctuations in optical angular/spatial alignment, polarization, and temperature, and introduce silicon photonic quasicrystal interferometry for secure hardware applications.

Authors:Farhan Bin Tarik/Clemson University Azadeh Famili/Clemson University Yingjie Lao/Clemson University Judson Ryckman/Clemson University

14:30 - 15:00	**Towards photonic neuromorphic processing (SF3J.3)** **Presenter**: Wolfram Pernice, *Universität Münster* Expand for Abstract / Authors I present an all-optical version of a neurosynaptic system, capable of supervised and unsupervised learning. We exploit wavelength division multiplexing techniques to implement a scalable circuit architecture for photonic artificial neural networks. **Authors**:Wolfram Pernice/Universität Münster Invited	Paper
15:00 - 15:15	**Enhanced On-Chip Phase Measurement by Weak Value Amplification (SF3J.4)** **Presenter**: Meiting Song, *University of Rochester* Expand for Abstract / Authors We show, for the first time, phase measurement with weak value amplification on an integrated photonic chip. We demonstrate 9 dB of signal enhancement over a standard on-chip Mach-Zehnder interferometer with equal detected optical power. **Authors**:Meiting Song/University of Rochester John Steinmetz/University of Rochester Yi Zhang/University of Rochester Juniyali Nauriyal/University of Rochester Marissa Granados Báez/University of Rochester Andrew Jordan/University of Rochester Jaime Cardenas/University of Rochester	Paper
15:15 - 15:30	**Photonic-crystal Scintillators for Enhancing X-ray and Gamma-ray Detection (SF3J.5)** **Presenter**: Yaniv Kurman, *Israel Institute of technology* Expand for Abstract / Authors Scintillator materials are ubiquitous in detectors of high-energy photons. We show that their efficiency can be enhanced using the Purcell effect in nanophotonics and exemplify the concept with designs of photonic crystals made from scintillator materials **Authors**:Yaniv Kurman/Israel Institute of technology Raphael Dahan/Israel Institute of technology Ido Kaminer/Israel Institute of technology	Paper

15:30 - 15:45 **Self-Stabilizing Silicon Nitride Lightsails (SF3J.6)**
Presenter: Ramon Gao, *California Institute of Technology*
Expand for Abstract / Authors

Paper

We report a design for a microscopic lightsail prototype that allows for passive stabilization in the radiation-pressure dominated regime. Stable dynamics of our silicon nitride structure are predicted for initial tilts of up to ±10°.

Authors:Ramon Gao/California Institute of Technology Yonghwi Kim/California Institute of Technology Laura Kim/Massachusetts Institute of Technology Michael Kelzenberg/California Institute of Technology Ognjen Ilic/University of Minnesota Harry Atwater/California Institute of Technology

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15:45 - 16:00 **Flexible Photonics Based on Whispering-Gallery-Mode Resonators and Liquid-Crystal-Elastomers (SF3J.7)**
Presenter: Simon Woska, *KIT, Institute of Applied Physics*
Expand for Abstract / Authors

Paper

Liquid-Crystal-Elastomers were integrated into building blocks containing Whispering-Gallery-Mode resonators. Exploiting their directional mechanical actuation, full tunability of single cavities and flexible coupling of resonator pairs were realized and verified by fiber-transmission spectroscopy.

Authors:Simon Woska/KIT, Institute of Applied Physics Osman Karayel/KIT, Institute of Applied Physics Pascal Rietz/KIT, Institute of Applied Physics Jannis Hessenauer/KIT, Institute of Applied Physics Roman Oberle/KIT, Institute of Applied Physics Evelyn Kaiser/KIT, Institute of Applied Physics Stefan Pfleging/KIT, Institute of Applied Physics Carolin Klusmann/KIT, Institute of Applied Physics Tobias Siegle/KIT, Institute of Applied Physics Heinz Kalt/KIT, Institute of Applied Physics

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Thermal Emission Engineering and Perovskites (SF3F)

Presider: Tingyi Gu, *University of Delaware*

14:00 - 14:30 **Measurement and engineering of thermal radiation (SF3F.1)**
Presenter: Mikhail Kats, *University of Wisconsin-Madison*
Expand for Abstract / Authors

Paper

This talk will describe our advances in thermal-emission measurement and engineering, including phenomena such as negative- and zero-differential thermal emittance, radiative thermal runaway, and nanosecond-scale modulation of emissivity, as well as applications in infrared camouflage and thermoregulation.

Authors:Mikhail Kats/University of Wisconsin-Madison

Invited

14:30 - 14:45	**Passive Thermal Homeostasis using Vanadium Dioxide Thin Films (SF3F.2)** **Presenter**: Ahmed Morsy, *University of Southern California* Expand for Abstract / Authors Thermal homeostasis is a biological term describing the process warm-blooded animals use to maintain constant body temperature. We present an experimental demonstration of a radiative solid-state analogous system that passively regulates its temperature in response to a dynamic thermal environment. **Authors**:Ahmed Morsy/University of Southern California Michael Barako/NG NEXT Vladan Jankovic/NG NEXT Virginia Wheeler/U.S. Naval Research Labs Mark Knight/NG NEXT Georgia Papadakis/Stanford University Luke Sweatlock/NG NEXT Philip Hon/NG NEXT Michelle Povinelli/University of Southern California	Paper
14:45 - 15:00	**Measuring non-equilibrium and temperature-dependent thermal emitters (SF3F.3)** **Presenter**: Yuzhe Xiao, *University of Wisconsin-Madison* Expand for Abstract / Authors We describe and demonstrate general procedures for thermal-emission measurements that are applicable to most experimental conditions, including more-challenging cases such as thermal emitters with temperature-dependent emissivity and emitters that are not in thermal equilibrium. **Authors**:Yuzhe Xiao/University of Wisconsin-Madison Chenghao Wan/University of Wisconsin-Madison Alireza Shahsafi/University of Wisconsin-Madison Jad Salman/University of Wisconsin-Madison ZHAONING YU/University of Wisconsin-Madison Raymond Wambold/University of Wisconsin-Madison Hongyan Mei/University of Wisconsin-Madison Bryan Rubio Perez/University of Wisconsin-Madison Chunhui Yao/University of Wisconsin-Madison Mikhail Kats/University of Wisconsin-Madison	Paper
15:00 - 15:15	**(Withdrawn) Non-volatile, Small Footprint Phase Shifter with Ultra-Low Loss Phase Change Material for Photonic Computing (SF3F.4)** **Presenter**: Xuan Li, *Department of Materials of Oxford* Expand for Abstract / Authors Nonvolatile phase shifter with ultra-low loss phase change material has been demonstrated in this work in the telecom wavelength range. 2π phase shift has been achieved with 41 μm long waveguide with zero maintaining energy requirement. **Authors**:Xuan Li/Department of Materials of Oxford Nathan Youngblood/Department of Materials of Oxford Ioannis Zeimpekis/University of Southampton Matthew Delaney/University of Southampton Zengguang Cheng/Department of Materials of Oxford Otto Muskens/University of Southampton Daniel Hewak/University of Southampton Harish Bhaskaran/Department of Materials of Oxford	

15:15 - 15:30	**Phase Change Perovskite Metasurfaces (SF3F.5)** **Presenter**: Giorgio Adamo, *Nanyang Technological University* Expand for Abstract / Authors We report the first dielectric perovskite metasurfaces with continuously tunable optical response across the visible spectrum via a small temperature gradient around room temperature, bearing potential applications in active light-emitting devices and spatial-light-modulators. **Authors**:Giorgio Adamo/Nanyang Technological University Jingyi Tian/Nanyang Technological University Matteo Degani/Nanyang Technological University Harish Krishnamoorthy/Nanyang Technological University Daniele Cortecchia/Italian Institute of Technology Maciej Klein/Nanyang Technological University Cesare Soci/Nanyang Technological University	Paper
15:30 - 15:45	**A Dry Lift-off Method for Patterning Perovskites (SF3F.7)** **Presenter**: Cheng Chang, *University of Washington* Expand for Abstract / Authors In this paper, we demonstrate a new method to pattern perovskites using a dry lift-off process. By utilizing parylene-C as a sacrificial layer, patterns with <12 um features and multi-color patterns can be achieved. **Authors**:Cheng Chang/University of Washington Chen Zou/University of Washington Mark Odendahl/University of Washington Lih Lin/University of Washington	Paper
15:45 - 16:00	**Imaging light-induced phase separation dynamics of inorganic halide perovskites (SF3F.6)** **Presenter**: Siying Peng, *Stanford University* Expand for Abstract / Authors We synthesized inorganic halide perovskite films. We report the kinetics of light induced phase separation of halide perovskites by photoluminescnence characterization. Length scale of the phase separation is studied by X-ray diffraction and cryo-TEM. **Authors**:Siying Peng/Stanford University Andrew Meng/Stanford University Wanliang Tan/Stanford University Balreen Saini/Stanford University Kayla Severson/Stanford University Ann Marshall/Stanford University Paul McIntyre/Stanford University	Paper

Semiconductor Devices for Targeted Photonic Applications (AF3I)

Presider: Oleg Khodykin, *KLA-Tencor Corp*

14:00 - 14:30	**High-brightness wavelength stabilized diode lasers for sensor systems and non-linear frequency conversion (AF3I.1)** **Presenter**: Bernd Sumpf, *Ferdinand-Braun-Institut* Expand for Abstract / Authors High-brightness wavelength stabilized diode lasers emitting between 750nm and 1100nm with output powers up to 15W for sensor applications such as biomedical imaging and spectroscopy as well as for non-linear frequency conversion will be presented. **Authors**:Bernd Sumpf/Ferdinand-Braun-Institut Invited	Paper
14:30 - 14:45	**Covert polarization display based on ultra-thin lossy nanocolumns with wide color selectivity (AF3I.2)** **Presenter**: Youngjin Yoo, *Gwangju Institute of Science and Technology* Expand for Abstract / Authors We present a flexible, large-area covert polarization display based on ultra-thin lossy nanocolumns with a wide color selectivity. Self-aligned porous nanocolumns (PNCs) fabricated by glancing angle deposition are a facile approach to polarization distinguishable structures. **Authors**:Youngjin Yoo/Gwangju Institute of Science and Technology Joo Hwan Ko/Gwangju Institute of Science and Technology Yeong Jae Kim/Gwangju Institute of Science and Technology Young Min Song/Gwangju Institute of Science and Technology	Paper
14:45 - 15:00	**Polarization Bistable Single Fundamental Mode Photonic Crystal VCSELs (AF3I.3)** **Presenter**: Qiuhua Wang, *Beijing University of Technology* Expand for Abstract / Authors The polarization bistable (PB) single fundamental mode VCSEL was realized by using dual mode confinement microstructure , rhombus shape-oxide aperture and photonic crystal. As the injection current increasing, the device polarization direction has been changed. **Authors**:Qiuhua Wang/Beijing University of Technology Yiyang Xie/Beijing University of Technology Chen Xu/Beijing University of Technology guanzhong pan/Beijing University of Technology Yibo Dong/Beijing University of Technology	Paper

15:00 - 15:15 **Photonic Neural Activation Function Using An ITO Electro-Absorption Modulator (AF3I.4)**
Presenter: Rubab Amin, *The George Washington University*
Expand for Abstract / Authors

Paper

We demonstrate an ITO-based electro-absorption modulator monolithically integrated into silicon photonics as nonlinear activation function of a photonic neuron. The synapse and neuron circuit executes a 200-node MNIST neural network benchmarking the nonlinear activation function.

Authors:Rubab Amin/The George Washington University Jonathan George/The George Washington University Rishi Maiti/The George Washington University Mario Miscuglio/The George Washington University Volker Sorger/The George Washington University

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15:15 - 15:30 **Narrow Linewidth Distributed Feedback Diode Lasers for Cooling in Cold Atom Systems (AF3I.5)**
Presenter: Scott Watson, *University of Glasgow*
Expand for Abstract / Authors

Paper

Distributed feedback (DFB) lasers have been realized emitting at a wavelength of 780.24 nm which demonstrate powers in excess of 60 mW with 612 kHz linewidth for use in rubidium (^{87}Rb) cold atom systems.

Authors:Scott Watson/University of Glasgow Eugenio Di Gaetano/University of Glasgow Euan McBrearty/University of Glasgow Marc Sorel/University of Glasgow Douglas Paul/University of Glasgow

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15:30 - 15:45 **Performance Enhanced Multicolor Quantum Grid Infrared Photodetector with Graphene/GaAs Heterojunction (AF3I.6)**
Presenter: Bor-Wei Liang, *National Taiwan University*
Expand for Abstract / Authors

Paper

We have demonstrated a performance enhanced multicolor quantum grid infrared photodetector (QGIP) through graphene overlaying. The responsivity and the detectivity are improved due to the photoelectrons extra-generated at the Graphene-GaAs interface contribute to the photocurrent.

Authors:Bor-Wei Liang/National Taiwan University Chiu-Chang Huang/National Taiwan University Kuang-Ju Kao/National Taiwan University Yann-Wen Lan/National Taiwan normal university Chieh-Hsiung Kuan/National Taiwan University

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15:45 - 16:00

(Withdrawn) Growth of Si/Ge/Sn thin films using simplified PECVD reactor For IR photodetectors (AF3I.7)
Presenter: Arul Chakkaravarthi Arjunan, *Structured Materials Industries*
Expand for Abstract / Authors

Ge and SiGeSn thin films have been deposited using an in-house developed PECVD reactor on patterned Si substrates and test photodiode fabricated using the deposited films. The devices show rectifying behavior and enhanced photodetection under IR illumination.

Authors:Jignesh Vanjaria/Arizona State University Arul Chakkaravarthi Arjunan/Structured Materials Industries Yanze Wu/Arizona State University Todd Houghton/Arizona State University Hongbin Yu/Arizona State University Gary Tompa/Structured Materials Industries

Optical Parametric Processes and Devices (SF3R)

Presider: Sergey Vasilyev, *IPG Photonics Corp*

14:00 - 14:15

Efficient DFG via Large Effective χ^2 in Monolithic Diode Lasers (SF3R.1)
Presenter: Meng Lon Iu, *University of Toronto*
Expand for Abstract / Authors

Paper

Diode lasers with effective χ^2 nonlinearity of 36 pm/V are designed and fabricated for facilitating phase-matching and on-chip pumping of parametric processes. A record DFG conversion efficiency of 169%$W^{-1}cm^{-2}$ is demonstrated with tuning over 200 nm.

Authors:Meng Lon Iu/University of Toronto Nima Zareian/University of Toronto Bilal Janjua/University of Toronto Paul Charles/University of Toronto Eric Chen/University of Toronto Amr Helmy/University of Toronto

14:15 - 14:30

Effective Nonlinearity of $BaGa_2GeSe_6$: A Promising Quaternary Chalcogenide Crystal for the Mid-IR (SF3R.2)
Presenter: Valentin Petrov, *Max Born Institute*
Expand for Abstract / Authors

Paper

We determine the magnitude and relative sign of the nonlinear coefficients of the low-symmetry trigonal nonlinear crystal $BaGa_2GeSe_6$: d_{11}= +23.6, d_{22}= -18.5, and d_{31}= +18.3 pm/V, opening the way for maximizing d_{eff} and broad applications.

Authors:Kiyoshi Kato/Chitose Institute of Science and Technology Valeriy Badikov/Kuban State University Li Wang/Max Born Institute Vladimir Panyutin/Max Born Institute Konstantin Mitin/JSC Polyus Kentaro Miyata/RIKEN Valentin Petrov/Max Born Institute

14:30 - 14:45	**Quarter Watt 2-octave Wide Mid-IR Frequency Comb from a Subharmonic OPO Based on OP-GaP Crystal (SF3R.3)** **Presenter**: Qitian Ru, *University of Central Florida* Expand for Abstract / Authors We used a dispersionless-cavity subharmonic OPO pumped by femtosecond 2.35-µm pulses to demonstrate a coherent output spanning 3–12µm with up to 245-mW power. We also compare the performance of the OP-GaP vs OP-GaAs crystal. **Authors**:Qitian Ru/University of Central Florida Taiki Kawamori/University of Central Florida Peter Schunemann/BAE Systems Sergey Vasilyev/IPG Photonics STC Sergey Mirov/IPG Photonics STC Konstantin Vodopyanov/University of Central Florida	Paper
14:45 - 15:00	**Quadratic Soliton Frequency Comb at 4 µm from an OP-GaP-based Optical Parametric Oscillator (SF3R.4)** **Presenter**: Mingchen Liu, *California Institute of Technology* Expand for Abstract / Authors We report generation of quadratic solitons, i.e. temporal simultons, in an OP-GaP based half-harmonic optical parametric oscillator. We achieve 4-µm pulses with $sech^2$ spectrum of 790nm FWHM bandwidth, 197% slope efficiency, and 38% conversion efficiency. **Authors**:Mingchen Liu/California Institute of Technology Robert Gray/California Institute of Technology Arkadev Roy/California Institute of Technology Kirk Ingold/U.S. Military Academy Evgeni Sorokin/Vienna University of Technology Irina Sorokina/Norwegian University of Science and Technology Peter Schunemann/BAE Systems Alireza Marandi/California Institute of Technology	Paper
15:00 - 15:15	**Dither-Free Stabilization of a Femtosecond Doubly-Resonant OPO Using Parasitic Sum-Frequency Mixing (SF3R.5)** **Presenter**: Yuk Shan Cheng, *Heriot-Watt University* Expand for Abstract / Authors A new stabilization paradigm for degenerate femtosecond OPOs is demonstrated in a Ti:sapphire-pumped PPKTP OPO. Based on parasitic sum-frequency mixing, the approach achieves long-term locking and a tenfold reduction in relative-intensity noise compared with dither-locking. **Authors**:Yuk Shan Cheng/Heriot-Watt University Richard McCracken/Heriot-Watt University Derryck Reid/Heriot-Watt University	Paper

15:15 - 15:30	**Backward Terahertz-Wave Parametric Oscillator with Optical Injection Seeding (SF3R.6)** **Presenter**: Yuma Takida, *RIKEN* Expand for Abstract / Authors Continuous-wave injection seeding of a subnanosecond backward terahertz-wave parametric oscillator based on slant-strip-type periodically poled lithium niobate is demonstrated. Enhancement of pump-to-idler conversion efficiency up to 39% is achieved by seeding for forward-propagating idler wave. **Authors**:Yuma Takida/RIKEN Kouji Nawata/RIKEN Hiroaki Minamide/RIKEN	Paper
15:30 - 15:45	**(Withdrawn) Spontaneous parametric downconversion in sub-μm periodically poled KTP (SF3R.7)** **Presenter**: Paulina Kuo, *National Inst of Standards & Technology* Expand for Abstract / Authors We observe spontaneous parametric downconversion in a periodically poled $KTiOPO_4$ (KTP) crystal with 509 nm period. The idler emerges in the backwards direction, counter-propagating to the pump and signal. **Authors**:Paulina Kuo/National Inst of Standards & Technology Varun Verma/National Inst of Standards and Technology Sae Woo Nam/National Inst of Standards and Technology Andrius Zukauskas/Royal Institute of Technology (KTH) Carlota Canalias/Royal Institute of Technology (KTH)	
15:45 - 16:00	**Electro-optic spectral switching in multiline optical parametric oscillators using aperiodic optical superlattice lithium niobate (SF3R.8)** **Presenter**: Yen-Hung Chen, *National Central University* Expand for Abstract / Authors We demonstrate an electro-optically switchable multi-wavelength optical parametric oscillator (OPO) based on an aperiodically poled $LiNbO_3$ (APPLN). The OPO can radiate at 1540nm, 1550nm, or both wavelengths simply by switching the voltage on the APPLN. **Authors**:Tai-Jie Wang/National Central University Hung-Pin Chung/National Central University Lin-Ming Deng/National Central University Wei-Kun Chang/National Tsinghua University Tien-Dat Pham/National Central University Reinhard Geiss/Friedrich-Schiller-Universität Jena Thomas Pertsch/Friedrich-Schiller-Universität Jena Yen-Hung Chen/National Central University	Paper

Optical Fiber Sensors (SF3P)

Presider: Raja Ahmad, *OFS Laboratories*

14:00 - 14:30 **Forward stimulated Brillouin scattering and its applications (SF3P.1)**
Presenter: Avi Zadok, *Bar-Ilan University*
Expand for Abstract / Authors

Paper

Forward stimulated Brillouin scattering is a nonlinear interaction between co-propagating optical and acoustic waves. Principles and applications of the effect in sensing and signal processing over fiber and integrated devices are discussed.

Authors:Avi Zadok/Bar-Ilan University

Invited

14:30 - 14:45 **Real-time spectral interferometry assisted recording of acoustic wave (SF3P.2)**
Presenter: Yiyang Luo, *Nanyang Technological University*
Expand for Abstract / Authors

Paper

Optical spectroscopy yields the investigations of soliton molecular dynamics. Here, we transfer the concept of real-time spectral interferometry to the dynamic-parameter sensing, especially highlighting the shot-to-shot pulse interferograms assisted recording of acoustic wave.

Authors:Yiyang Luo/Nanyang Technological University Wenjun Ni/Huazhong University of Science and Technology Perry Ping Shum/Nanyang Technological University Ran Xia/Nanyang Technological University Xiahui Tang/Huazhong University of Science and Technology Luming Zhao/Huazhong University of Science and Technology Qizhen Sun/Huazhong University of Science and Technology

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14:45 - 15:00 **Novel Measurement Method of Fiber-Birefringence Spatial Distribution by Coherent Heterodyne Detection of Rayleigh Backscattered Light (SF3P.3)**
Presenter: Nanako Takei, *School of Interdisciplinary Mathematical*
Expand for Abstract / Authors

Paper

Theory of fiber-birefringence spatial distribution measurement is established by measurement of optical phase of Rayleigh backscattered light with coherent heterodyne detection. Measurement results agree well with the results using polarization optical time domain reflectometry.

Authors:Nanako Takei/School of Interdisciplinary Mathematical Shiro Ryu/School of Interdisciplinary Mathematical

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15:00 - 15:15	**Broadband Optical Fiber-Facet Silicon Pressure Sensor (SF3P.4)** **Presenter**: Simon Lorenzo, *Stanford University* Expand for Abstract / Authors A buried photonic element fabrication technique is used to create a broadband optical fiber-facet absolute pressure sensor in a 150 um wide by 5 um thick crystalline silicon disk with 50 uatm pressure resolution at 1 atm. **Authors**:Simon Lorenzo/Stanford University Yu-Po Wong/Stanford University Olav Solgaard/Stanford University	Paper
15:15 - 15:30	**High resolution spatially continuous curvature sensing using a twisted multicore optical fiber (SF3P.5)** **Presenter**: Raja Ahmad, *OFS Laboratories* Expand for Abstract / Authors Using a twisted multicore optical fiber, we demonstrate the distributed curvature sensing on a textured surface having sinusoidal deformations of a micron-scale peak-to-peak amplitude and a sub-millimeter spatial period. **Authors**:Raja Ahmad/OFS Laboratories Wing Ko/OFS Laboratories Paul Westbrook/OFS Laboratories Kenneth Feder/OFS Laboratories	Paper
15:30 - 15:45	**Nanorod-cladding sapphire fiber for continuous temperature measurement in molten steel (SF3P.6)** **Presenter**: Jingjing Qian, *Iowa state University* Expand for Abstract / Authors A nanorod-cladding sapphire fiber is implemented as an optical fiber thermometer to measure temperature of molten steel. The nanorod cladding enabled stable transmission of thermal radiation spectra, which were analyzed to determine temperature above 1600°C. **Authors**:Jingjing Qian/Iowa state University Zijian Zhao/Iowa state University Qinming Zhang/Iowa state University Meng Lu/Iowa state University Sunday Abraham/SSAB Matthew Werner/SSAB Randy Petty/SSAB	Paper
15:45 - 16:00	**Brillouin Optical Time Domain Analysis Using Spectrally Reshaped 12-GHz Spacing Multimode Pump and Probe (SF3P.7)** **Presenter**: Yosuke Tanaka, *Tokyo Univ. of Agriculture and Technology* Expand for Abstract / Authors We propose and experimentally demonstrate Brillouin optical time domain analysis using spectrally reshaped multimode pump and probe light, which amplifies the probe light in proportion to the change in amount of Brillouin frequency shift. **Authors**:Yosuke Tanaka/Tokyo Univ. of Agriculture and Technology Takahiro Hasegawa/Tokyo Univ. of Agriculture and Technology	Paper

Quantum Sensing and Enabling Instrumentation (AF3K)

Presider: Wilhelm Kaenders, *TOPTICA Photonics Inc*

14:00 - 14:30	**Compact Ion Clocks for Navigation Applications (AF3K.8)** **Presenter**: John Prestage, *Jet Propulsion Lab, Caltech* Expand for Abstract / Authors Compact Ion Clocks for Navigation Applications **Authors**:John Prestage/Jet Propulsion Lab, Caltech Invited	Paper
14:30 - 14:45	**Laser Rack Systems for Quantum Technologies (AF3K.2)** **Presenter**: Felix Rohde, *TOPTICA Photonics AG* Expand for Abstract / Authors We report on our development of laser rack systems as “quantum enabling” building blocks of future quantum devices. We present funded projects, where such rack laser systems are integrated into first prototypes. **Authors**:Felix Rohde/TOPTICA Photonics AG Rudolf Neuhaus/TOPTICA Photonics AG Stephan Ritter/TOPTICA Photonics AG Stephan Falke/TOPTICA Photonics AG Ulrich Eismann/TOPTICA Photonics AG Florian Kienle/TOPTICA Photonics AG Stefan Brakhane/TOPTICA Photonics AG Benedikt Heizenreder/TOPTICA Photonics AG Ruben Horvath-Klein/TOPTICA Photonics AG Jürgen Stuhler/TOPTICA Photonics AG	Paper
14:45 - 15:00	**A High-Power, Low-Noise, Ultraviolet Laser System for Trapped-Ion Quantum Computing (AF3K.3)** **Presenter**: Matthew Bohn, *Honeywell Quantum Solutions* Expand for Abstract / Authors We demonstrate a high power, modular, bichromatic, ultraviolet laser system based on the Master Oscillator / Power Amplifier (MOPA) configuration for quantum computing with Yb+ ions. Low phase noise allows for high fidelity qubit operations. **Authors**:Raanan Tobey/Honeywell Quantum Solutions Kenneth Lee/Honeywell Quantum Solutions Aaron Hankin/Honeywell Quantum Solutions Daniel Gresh/Honeywell Quantum Solutions David Francois/Honeywell Quantum Solutions Justin Bohnet/Honeywell Quantum Solutions David Hayes/Honeywell Quantum Solutions Matthew Bohn/Honeywell Quantum Solutions	Paper

15:00 - 15:15	**Efficient Bidirectional Piezo-optomechanical Transduction between Microwave and Optical Frequency (AF3K.4)** **Presenter**: Wentao Jiang, *Stanford University* Expand for Abstract / Authors We demonstrate a lithium niobate piezo-optomechanical frequency converter which exhibits an acousto-optic modulation V_{π} = 0.02 V and a quantum conversion efficiency of 10^{-5}. **Authors**:Wentao Jiang/Stanford University Christopher Sarabalis/Stanford University Yanni Dahmani/Stanford University Rishi Patel/Stanford University Felix Mayor/Stanford University Timothy McKenna/Stanford University Raphaël Van Laer/Stanford University Amir Safavi-Naeini/Stanford University	Paper
15:15 - 15:30	**(Withdrawn) Extreme Laser Background Suppression for Resonant Fluorescence of a Quantum Emitter (AF3K.5)** **Presenter**: Meryem ben elajla, *attocube systems AG* Expand for Abstract / Authors We show that confocal microscopy arrangement in conjunction with metallic mirrors or beam splitters enhance the cross-polarization extinction by several orders of magnitude, with a view to facilitating the detection of the resonant fluorescence emission. **Authors**:Meryem ben elajla/attocube systems AG Elena Kammann/attocube systems AG Sebastian. H.E Müller/attocube systems AG Bernhard Urbaszek/INSA-CNRS-UPS, LPCNO Alexander Högele/Nanophotonics Group Khaled Karrai/attocube systems AG	
15:30 - 15:45	**Design and fundamental limits of nearfield magnetic-force scanning microscopy via the no-cloning theorem (AF3K.6)** **Presenter**: Chen Mechel, *Technion* Expand for Abstract / Authors We analyze nearfield measurements of magnetic fields originating from quantum sources and measured by quantum probes. We show that cloning-inspired techniques reveal optimal measurement schemes and new universal precision bounds for nearfield detectors. **Authors**:Jonathan Nemirovsky/Technion Chen Mechel/Technion Eliahu Cohen/Bar Ilan university Ido Kaminer/Technion	Paper

15:45 - 16:00

Nanoscale ultrathin glass cantilevers for quantum sensing (AF3K.7)
Presenter: Kamal Singh, *Femtosecond Laser Lab., IISER Mohali*
Expand for Abstract / Authors

Paper

We fabricated ultra-thin glass cantilever's using femtosecond laser pulses while integrating nitrogen-vacancy (NV) center's at its tip. The magneto-optical susceptibility of NV centers towards electron spin was exploited for quantum sensing applications.

Authors:Mehra Sidhu/Femtosecond Laser Lab., IISER Mohali Kamal Singh/Femtosecond Laser Lab., IISER Mohali

16:00 - 16:00

(Withdrawn) Opportunities and challenges in implementation of quantum sensors in space (AF3K.1)
Presenter: Nan Yu, *Jet Propulsion Laboratory*
Expand for Abstract / Authors

This talk will discuss some of the JPL activities in developing and maturing atomic clock and quantum sensor technology in space as well as scientific applications enabled by these new precision measurement tools.

Authors:Nan Yu/Jet Propulsion Laboratory

Invited

Single Photon Detectors (FF3D)

Presider: Tim Bartley, *Universität Paderborn*

14:00 - 14:15

Advances in Readout Techniques for Arrays of Superconducting Nanowire Single-Photon Detectors (FF3D.1)
Presenter: Emma Wollman, *Jet Propulsion Laboratory*
Expand for Abstract / Authors

Paper

We present recent advances in multi-channel superconducting nanowire single-photon detector readout. In particular, we focus on row-column multiplexing of kilopixel SNSPD arrays, row-column multiplexing using thermal coupling, and prospects for frequency multiplexing at optical wavelengths.

Authors:Emma Wollman/Jet Propulsion Laboratory Jason Allmaras/Jet Propulsion Laboratory Varun Verma/National Institute of Standards and Technology Marc de Cea/Massachusetts Institute of Technology Boris Korzh/Jet Propulsion Laboratory Amir Atabaki/Massachusetts Institute of Technology Rajeev Ram/Massachusetts Institute of Technology Sae Woo Nam/National Institute of Standards and Technology Matthew Shaw/Jet Propulsion Laboratory

14:15 - 14:30 **Amplitude Multiplexing Readout for Integrated SNSPD (FF3D.2)**
Presenter: Alessandro Gaggero, *Consiglio Nazionale delle Ricerche*
Expand for Abstract / Authors

Paper

The growing complexity of integrated quantum optics experiments requires the simultaneous readout of an increasing number of optical mode, hence integrated detectors. Amplitude-multiplexing scheme allows the reading of tens of SNSPDs using only one coaxial-cable.

Authors:Alessandro Gaggero/Consiglio Nazionale delle Ricerche Francesco Martini/Consiglio Nazionale delle Ricerche Francesco Mattioli/Consiglio Nazionale delle Ricerche fabio chiarello/Consiglio Nazionale delle Ricerche Robert Cernansky/University of Southampton Alberto Politi/University of Southampton Roberto Leoni/Consiglio Nazionale delle Ricerche

14:30 - 14:45 **Supeconducting nanowire multi-photon detectors (FF3D.3)**
Presenter: Kai Zou, *Tianjin University*
Expand for Abstract / Authors

Paper

We propose superconducting nanowire multi-photon detectors with simple bias and readout circuitry to count n-fold photon coincidences, where n is set by bias conditions. We present the concept, device architecture, and operating principle.

Authors:Kai Zou/Tianjin University Yun Meng/Tianjin University Zhao Wang/Tianjin University Xiaolong Hu/Tianjin University

14:45 - 15:00 **Superconducting Nanowire Single Photon Detector Rise-Time Analysis (FF3D.4)**
Presenter: Claire Marvinney, *Oak Ridge National Laboratory*
Expand for Abstract / Authors

Paper

We explore the limits of spatial, spectral, and photon-number resolution in superconducting nanowire single photon detectors by characterizing the rising edge of a readout pulse with a low-noise high-bandwidth readout circuit. © 2020 The Authors

Authors:Claire Marvinney/Oak Ridge National Laboratory Brian Lerner/Rutgers University Matthew Feldman/Vanderbilt University Yun-Yi Pai/Oak Ridge National Laboratory Eugene Dumitrescu/Oak Ridge National Laboratory Alexander Puretzky/Oak Ridge National Laboratory Aaron Miller/Quantum Opus LLC Benjamin Lawrie/Oak Ridge National Laboratory

15:00 - 15:30 **Photon-Number Resolution Using Superconducting Tapered Nanowire Detector (FF3D.5)**
Presenter: Di Zhu, *MIT*
Expand for Abstract / Authors

Paper

We show that a superconducting nanowire with an integrated impedance-matching taper can resolve photon numbers. The taper increases the nanowire detector's output amplitude and makes it sensitive to the number of single-photon-induced hotspots.

Authors:Di Zhu/MIT Marco Colangelo/MIT Changchen Chen/MIT Boris Korzh/Jet Propulsion Laboratory Franco Wong/MIT Matthew Shaw/Jet Propulsion Laboratory Karl Berggren/MIT

15:30 - 15:45 **Integrated superconducting detectors on titanium in-diffused lithium niobate waveguides (FF3D.6)**
Presenter: Jan Philipp Hoepker, *Paderborn University*
Expand for Abstract / Authors

Paper

Integrating single-photon detectors on an electro-optic, second-order nonlinear medium opens the field for new complex photonic circuits. We present our detection efficiency results on evanescently coupled SNSPDs and TESs on titanium in-diffused lithium niobate waveguides.

Authors:Jan Philipp Hoepker/Paderborn University Varun Verma/National Institute of Standards and Technology Thomas Gerrits/National Institute of Standards and Technology Adriana Lita/National Institute of Standards and Technology Raimund Ricken/Paderborn University Victor Quiring/Paderborn University Richard Mirin/National Institute of Standards and Technology Sae Woo Nam/National Institute of Standards and Technology Christine Silberhorn/Paderborn University Tim Bartley/Paderborn University

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15:45 - 16:00 **Development of Superconducting Nanowire Single Photon Detectors on Silicon-Carbide Photonics for Quantum Technologies (FF3D.7)**
Presenter: Francesco Martini, *IFN-CNR*
Expand for Abstract / Authors

Paper

SiC is a promising platform for photonic quantum technologies. We present our efforts in the development of SNSPDs on SiC photonic structures, demonstrating high internal efficiency and the integration on SiCOI waveguides structures

Authors:Francesco Martini/IFN-CNR Tianren Fan/Georgia Institute of Technology Alessandro Gaggero/IFN-CNR Francesco Mattioli/IFN-CNR Xi Wu/Georgia Institute of Technology Ali Eftekhar/Georgia Institute of Technology Ali Adibi/Georgia Institute of Technology Roberto Leoni/IFN-CNR

Low-Noise Laser Sources (SF3G)

Presider: Laura Sinclair, *National Inst of Standards & Technology*

14:00 - 14:15	**Versatile Figure-9 Design: How to Access Low-Noise Regimes in an All-PM Yb:Fiber Laser (SF3G.1)** **Presenter**: Aline Sophie Mayer, *University of Vienna* Expand for Abstract / Authors We present a versatile all-PM Yb:fiber-laser and demonstrate the impact of dispersion engineering on amplitude/phase noise and the carrier-envelope-offset frequency, whose linewidth can be reduced from several MHz down to single-digit-kHz values in free-running operation. **Authors**:Aline Sophie Mayer/University of Vienna Jakob Fellinger/University of Vienna Wilfrid Grosinger/University of Vienna Georg Winkler/University of Vienna Lukas Perner/University of Vienna Christoph Heyl/Deutsches Elektronen-Synchrotron DESY Ingmar Hartl/Deutsches Elektronen-Synchrotron DESY Oliver Heckl/University of Vienna	Paper
14:15 - 14:30	**Narrow Linewidth Quantum Cascade Laser (SF3G.2)** **Presenter**: Gang Zhao, *National Inst of Standards & Technology* Expand for Abstract / Authors A narrow linewidth quantum cascade laser was obtained by optical feedback locking to a high finesse linear cavity with locking bandwidth larger than 5 MHz, resulting in an instantaneous linewdith at mHz levels. **Authors**:Gang Zhao/National Inst of Standards & Technology D. Bailey/National Inst of Standards & Technology Adam Fleisher/National Inst of Standards & Technology	Paper
14:30 - 14:45	**(Withdrawn) Brillouin laser stabilization at the nanoKelvin regime (SF3G.3)** **Presenter**: William Loh, *Massachusetts Inst of Tech Lincoln Lab* Expand for Abstract / Authors We demonstrate the ability to both detect and stabilize the temperature of a Brillouin laser cavity at the level of 170 nK. This laser achieves 20 Hz linewidth and 300 Hz long-term frequency variation. **Authors**:William Loh/Massachusetts Inst of Tech Lincoln Lab Jules Stuart/Massachusetts Inst of Tech Lincoln Lab David Reens/Massachusetts Inst of Tech Lincoln Lab Colin Bruzewicz/Massachusetts Inst of Tech Lincoln Lab Danielle Braje/Massachusetts Inst of Tech Lincoln Lab John Chiaverini/Massachusetts Inst of Tech Lincoln Lab Kyung-Han Hong/Massachusetts Inst of Tech Lincoln Lab Paul Juodawlkis/Massachusetts Inst of Tech Lincoln Lab Jeremy Sage/Massachusetts Inst of Tech Lincoln Lab Robert McConnell/Massachusetts Inst of Tech Lincoln Lab	

14:45 - 15:00

Single-Digit Attosecond Carrier-Envelope Phase Stabilization of an Er:Yb:Glass Laser with Feed-Forward Technique (SF3G.4)
Presenter: Randy Lemons, *Colorado School of Mines*
Expand for Abstract / Authors

Paper

We present carrier-envelope phase stabilization of an Er:Yb:glass laser at 1.55 µm via the feed-forward method with 2.9 as (1 Hz – 3 MHz) timing jitter and continuous stabilization over 24 hours.

Authors:Randy Lemons/Colorado School of Mines Wei Liu/SLAC National Accelerator Laboratory Irene Fernandez De Fuentes/SLAC National Accelerator Laboratory Stefan Droste/SLAC National Accelerator Laboratory Gunter Steinmeyer/Max Born Insitute for Nonlinear Optics and Short Pulse Spectroscopy Charles Durfee/Colorado School of Mines Sergio Carbajo/SLAC National Accelerator Laboratory

15:00 - 15:30

Optical Frequency Divider for Spectroscopy and Optical Frequency Measurement (SF3G.5)
Presenter: Yanyi Jiang, *East China Normal University*
Expand for Abstract / Authors

Paper

We discuss an accurate multi-channel optical frequency divider based on an optical frequency comb, which enables accurate optical frequency measurement and optical frequency synthesis for laser spectroscopy.

Authors:Yanyi Jiang/East China Normal University Yuan Yao/East China Normal University Bo Li/East China Normal University Xiaotong Chen/East China Normal University Yuxin Sun/East China Normal University Yaqin Hao/East China Normal University Longsheng Ma/East China Normal University

Invited

15:30 - 15:45

Near Infrared Ultra-Narrow-Linewidth Laser (SF3G.6)
Presenter: Yu-Hung Lai, *OEwaves Inc*
Expand for Abstract / Authors

Paper

We report on self-injection-locked near infrared laser technology using whisper-gallery-mode resonators. The laser linewidth is suppressed by 10000X and has an instantaneous linewidth in the sub-10 Hertz range. The laser is used for generating stable reference light for atomic clocks.

Authors:Yu-Hung Lai/OEwaves Inc Stuart Love/OEwaves Inc Anatoliy Savchenkov/OEwaves Inc Danny Eliyahu/OEwaves Inc Robert Moss/OEwaves Inc Andrey Matsko/OEwaves Inc Skip Williams/OEwaves Inc

15:45 - 16:00	**Quantum cascade laser frequency stabilization to an atomic mid-infrared transition (SF3G.7)** **Presenter**: Yoel Sebbag, *The Hebrew University of Jerusalem* Expand for Abstract / Authors We demonstrate frequency stabilization of a distributed feedback quantum cascade laser at 5.23 μm to an atomic transition of Rubidium vapors, paving the way for establishing portable and accurate primary frequency references in the mid-infrared. **Authors**:Yoel Sebbag/The Hebrew University of Jerusalem Roy Zektzer/The Hebrew University of Jerusalem yefim barash/The Hebrew University of Jerusalem Uriel Levy/The Hebrew University of Jerusalem	Paper