Monday, 29 July

08:00 -- 10:00
Room: 206A
BM1A • Laser Processing of Optical Glasses and Poling
Presider: Martin Bernier; Université Laval, Canada and Martin Bernier; Université Laval, Canada

BM1A.1 • 08:00 Invited
Ultrafast Laser Volume Nanostructuring of Transparent Materials: From Nanophotonics to Nanomechanics, Yves Bellouard1; 1Ecole Polytechnique Federale de Lausanne, Switzerland. When exposed to ultrafast lasers, materials can be transformed in their volume, leading to intriguing nano-crystallization and sub-wavelength pattern formations. We will discuss occurrences in various glass substrates and applications in light harvesting and nanomechanics.

BM1A.2 • 08:30
Throughput Enhancement of Type-a Volume Bragg Gratings Inscribed by Femtosecond Laser in Burst Mode for Industrial Applications, Joelle J. Harb1,2, Lauris Talbot3, Yannick Petit1,2, Martin Bernier3, Lionel Canioni1,2,1; 1ICMCB, France; 2University of Bordeaux, France; 3University of Laval, Canada. We present Type-A volume Bragg gratings inscribed within minutes using a 100 W laser in burst mode and the phase-mask approach. This surpasses Gaussian-Bessel methods by 38-fold while decoupling efficient thermal management from photochemical processes.

BM1A.3 • 08:45
Enhanced Light-Matter Interactions in Spherical Bragg Resonators, Yalina Garcia-Puente1, Raman Kashyap1; 1Polytechnique Montreal, Canada. Our research optimized Spherical Bragg Resonators to engineering emissions from Er3+ and Eu3+ emitters, enhancing light-matter interaction. The study achieved significant electromagnetic field and radiative decay rate enhancements, demonstrating the potential for efficient lasing and all-dielectric nanoantenna.

BM1A.4 • 09:00
Ultrafast Laser Structuring of Scattering Optical Fibers, Léo Colliard2,1, Floriane Pellerin2, Geoffroy Aubry2, Martiane Cabié3, Thomas Neisius3, Franck Pigeonneau4, Réal Vallée5, Martin Bernier5, Matthieu Bellec5, Wilfried Blanc5; 1Centre Optique Photonique et Laser, Canada; 2Université Côte d'Azur, INPHYNI, CNRS, France; 3Aix Marseille Univ, CNRS, Central Marseille, FSCM, CP2M, France; 4Mines ParisTech, PSL Research University, CEMEF - Centre for Material Forming, France. We propose here an innovative structuring process of scattering optical fibers by engineering the morphology of the nanoparticles contained inside the core with a high repetition rate femtosecond laser.

BM1A.5 • 09:15
Micrometric Patterning of Luminescence and Second Order Optical Properties of a Terbium Containing Borogermanate Magneto-Optical Glass by Thermal Poling, Juliane Resges Orives2, Lia Mara Marcondes2, Frederic Adamietz2, Thierry Cardinal1, Marcelo Nalin2, Marc Dussauze1; 1Université de Bordeaux / CNRS, France; 2UNESP, Brazil. A thermo-electrical imprinting process on a borogermanate glass containing Tb3+ have permitted a micrometric
structuring of the oxidation state of Tb ions. Correlative luminescence, Raman and SHG microscopies demonstrate modification of the glass structure accompanying large luminescence changes and the appearance of an electro optical response.

BM1A.6 • 09:30 Invited
Poling of Silicon Nitride for 2nd Order Optical Nonlinearity, Camille-Sophie Brès; †Ecole Polytechnique Federale de Lausanne, Switzerland. In this talk, I will cover electric-field induced second order nonlinearities in silicon nitride waveguides and microresonators. I will show results on all-optical poling in such structures, which allows for the inscription of nonlinear gratings with periodicity controlled by the involved optical waves. I will also show results on thermally assisted electric-field poling for linear phase modulation, as an necessary advancement to bring additional nonlinear functionalities to Si photonics.

08:00 -- 10:00
Room: 205A
IM1B • IPR Opening Session - New Horizons in Integrated and Nano Photonics
Presider: Judith Su; Univ of Arizona, Coll of Opt Sciences, United States

IM1B.1 • 08:00 Invited
Optomechanical Devices Harnessing Silicon Nanostructures, Carlos A. Alonso Ramos; †C2N-CNRS, France. Subwavelength silicon nanostructures provide unprecedented flexibility in the control of optomechanical effects. Here, we review our recent results on the use of nanostructures for the optimization of Brillouin interactions in suspended and non-suspended optomechanical cavities.

IM1B.2 • 08:30 Invited
Programmability and AI-Assisted Design of Silicon Photonic Circuits, Joyce K. Poon; †Max-Planck-Inst fur Mikrostrukturphysik, Germany. Abstract not available.

IM1B.3 • 09:00 Invited
Optical Trojan Beams- Guiding Light via Lagrange Points, Mercedeh Khajavikhan; †University of Southern California, USA. Abstract not available.

IM1B.4 • 09:30 Invited
Diamond Photonics, Paul E. Barclay; †University of Calgary, Canada. Abstract not available.

08:00 -- 10:00
Room: 205C
JM1D • Radiative Cooling I (Joint SOLED/NOMA)
Presider: Alon Gorodetsky; University of California Irvine, United States

JM1D.1 • 08:00 Invited
Radiative Cooling: a new Channel From Energy Sustainability to Semiconductors, Qiaoqiang Gan; †King Abdullah Univ of Sci & Technology, Saudi Arabia. This talk will describe recent progresses regarding radiative cooling strategies for optoelectronics, from system design to on-chip integration. Specifically, we will discuss the considerations for passive cooling of solar panels and light emitting diodes.
Optica Advanced Photonics Session Guide

Disclaimer: this guide is limited to technical program with abstracts and author blocks as of 21 July. For updated and complete information with special events, reference the online schedule or mobile app.

JM1D.2 • 08:30 Invited
Radiative Cooling: a Sustainable Strategy for Thermal Management and Energy Harvesting, Lili Cai; University of Illinois Urbana-Champaign, USA. This talk will present novel scalable manufacturing techniques for passive daytime radiative cooling materials, enabling diverse applications spanning from building and personal thermal management for energy savings to low-grade heat harvesting for electricity generation.

JM1D.3 • 09:00 Tutorial
Radiative Cooling: 10 Years of Daytime Radiative Cooling and the Road Ahead, Aaswath P. Raman; University of California Los Angeles, USA. We introduce and review ten years of progress since the first demonstration of daytime radiative cooling. We further highlight recent optical materials-driven advances and emerging applications, concluding with a discussion of the many untapped opportunities that remain to more effectively harness the ultimate renewable thermodynamic resources: the cold of space.

08:00 -- 10:00
Room: 206B
NpM1E • Photonic Computing and Novel Phenomena
Presider: Mikko Huttunen; Tampere University, Finland

NpM1E.1 • 08:00 Invited
Towards an Alternating Photonic Ising Machine Based on Polarization Symmetry Breaking, Stephane Coen; Physics, The University of Auckland, New Zealand; The Dodd-Walls Centre for Photonic and Quantum Technologies, New Zealand. We describe progress towards the realization of a novel photonic Ising machine based on polarization symmetry breaking. A birefringent defect forces the artificial spins to alternate, roundtrip to roundtrip, conferring remarkable robustness to the system.

NpM1E.2 • 08:30
Experimental Design, Implementation, and Measurements of an Optical Ising Machine Using Polarization Symmetry Breaking, Liam Quinn, Yiqing Xu, Julien Fatome, Stuart Murdoch, Miro Erkintalo, Stephane Coen; University of Auckland, New Zealand; The Dodd-Walls Centre for Photonic and Quantum Technologies, New Zealand. We experimentally demonstrate a novel optical Ising machine utilizing spontaneous polarization symmetry breaking in a driven Kerr resonator constructed from off-the-shelf telecommunications optical fiber. Spin states are encoded onto two robust, easily measurable polarization states.

NpM1E.3 • 08:45
Phase Resetting in the Yamada Model of a Q-Switching Laser, Jacob Ngaha, Neil Broderick, Bernd Krauskopf; The University of Auckland, New Zealand; The Dodd Walls Centre for Quantum and Photonic Technologies, New Zealand. We investigate the phase resetting of a periodic orbit of a self-pulsing laser, described by the Yamada model. We show how the return to the periodic orbit is affected by a brief perturbation to the associated oscillation.
Optica Advanced Photonics Session Guide

Disclaimer: this guide is limited to technical program with abstracts and author blocks as of 21 July. For updated and complete information with special events, reference the online schedule or mobile app.

NpM1E.4 • 09:00 Invited
Photonic Computation Enabled by Sound Waves, Birgit Stiller¹; Max-Planck-Institute, Science of Light, Germany. We experimentally demonstrate building blocks of photonic neural network based on volatile traveling acoustic waves. We implement an optoacoustic recurrent operator and a nonlinear activation function based on stimulated Brillouin scattering.

NpM1E.5 • 09:30
Mobility-Induced Light Localization in an Adverse Nonlinear Environment, Siyu Li¹, Juan Wu¹, Yuhui Zhuang¹, Yi Hu¹, Jingjun Xu¹; Nankai University, China. We report a mobility-induced localization of a beam that tends to delocalize at rest in a fluid of light. Such a transition occurs as the beam catches up with intensity holes emerged in the fluid.

NpM1E.6 • 09:45
Withdrawn

08:00 -- 10:00
Room: 2101
NeM1C • Quantum Networks and Secure Networks
Presider: Marco Ruffini; Trinity College Dublin

NeM1C.1 • 08:00 Invited
The Art of Possible With Quantum Networking, Reza Nejabati¹; University of Bristol, United Kingdom. Abstract not available.

NeM1C.2 • 08:30 Invited
Telecom Compatibility of Quantum Key Distribution, Rui Lin¹; Chalmers Tekniska Högskola, Sweden. Abstract not available.

NeM1C.3 • 09:00 Invited
High-Rate CV-QKD Systems Leveraged by Advanced Coherent Detection Technology, Amirhossein Ghazisaeidi¹; Nokia Bell Labs France, France. We review basic concepts of continuous-variable quantum key distribution, and report on some recent demonstrations of high secret key rate systems based on advanced modulation formats and coherent detection.

NeM1C.4 • 09:30 Invited
Planning Strategy Towards Secure Optical Core Networks, Carmen Mas Machuca¹; Universitat der Bundeswehr Munchen, Germany. Network operators are considering the increase of the data transmission security by the use of QKD devices. We present best planning strategies to reduce the required investments while maximizing the key capacity.

08:00 -- 10:00
Room: 2104
SpM1G • Advanced Signal Processing
Presider: Georg Rademacher; Universität Stuttgart, Germany

SpM1G.1 • 08:00 Invited
Digital Signal Processing for Very-High Speed IM/DD Optical Communications, Vivian Xi Chen¹; Nokia Bell Labs, USA. Abstract not available.
SpM1G.2 • 08:30
Sub-Rate Sampled, Non-Integer Fractionally Spaced Volterra Nonlinear Equalizer for IM/DD Systems, Jaeyoon Kim¹, Hoon Kim¹; ¹KAIST, Korea (the Republic of). We propose and demonstrate a sub-rate sampled (<2 sample/symbol), non-integer fractionally spaced Volterra equalizer for intensity-modulation/direct-detection systems. This equalizer does not require digital upsampling at the receiver DSP, and thus greatly relieves the complexity.

SpM1G.3 • 09:00 Tutorial
Title to be Announced, Sebastian Randel¹; ¹Karlsruher Institut für Technologie, Germany. Abstract not available.

08:00 -- 10:00
Room: 207
SoM1F • Novel Fiber Materials and Tapered Fibers
Presider: Alexander Heidt, Switzerland

SoM1F.1 • 08:00 Invited
Ice Microfibers for Optical Waveguiding, Xin Guo¹, Peizhen Xu¹, Bowen Cui¹, Xiangzheng Li¹, Limin Tong¹; ¹Zhejiang University, China. We succeeded in fabricating small-molecule ice microfibers with smooth surfaces and uniform diameters, and demonstrated that the microfibers can be operated for low-loss optical waveguiding and nanophotonic applications.

SoM1F.2 • 08:30 Invited
Design Strategies and Applications of Reshapable 4D Polymer Optical Fibers, Clement Strutyński¹, Frédéric Désévédavy¹, Grégory Gadret¹, Claire-Hélène Brachais¹, Bertrand Kibler¹, Frédéric Smektala¹; ¹Université de Bourgogne, France. The subject of the present work is the elaboration and application of shape-memory optical fibers from the thermal stretching of additively manufactured preforms.

SoM1F.3 • 09:00
Fabrication of Nanodiamond-Doped Silica Fiber With Highly Dispersive Nonlinearity, Pascal Hänzi¹, Grzegorz Stepniewski², Adam Filipkowski², Sara Lukasik³, Tomasz Kardas⁴, Yuriy Stepanenko⁵, Maciej Glowacki⁶, Mariusz Mrozek⁷, Adam Wojciechowski⁷, Valerio Romano¹, Robert Bogdanowicz⁶, Katarzyna Krupa⁶, Ryszard Buczynski³, Alexander M. Heidt¹, Mariusz Klimczak³; ¹Institute of Applied Physics, University of Bern, Switzerland; ²Lukasiewicz Research Network, Poland; ³Faculty of Physics, University of Warsaw, Poland; ⁴Fluence Sp. z o.o, Poland; ⁵Institute of Physical Chemistry, Polish Academy of Sciences, Poland; ⁶Gdansk University of Technology, Poland; ⁷Jagiellonian University in Kraków, Poland. We fabricate a nanodiamond-doped silica step-index fiber exhibiting a highly dispersive nonlinearity across near-infrared wavelengths. This is achieved without altering chromatic dispersion, which resembles SMF-28 fiber.

SoM1F.4 • 09:30
10-W-Level CW Waveguiding in a Subwavelength-Diameter Silica Microfiber, Jianbin Zhang¹, Xin Guo¹, Limin Tong¹; ¹Zhejiang University, China. Here we report low-loss continuous-wave optical waveguiding in a subwavelength-diameter silica microfiber with power
up to 13 W, making it favorable for high-speed optomechanical driving of microparticles and high-efficiency second/third harmonic generation.

SoM1F.5 • 09:45
Tapered Fiber With Dual Concentric Cores for Broadband Dispersion Compensation, Wenpu Geng¹, Zhi Zeng², Lin Zhang³, Zhongqi Pan⁴, Yang Yue⁵; ¹Nankai University, China; ²Xi’an Jiaotong University, China; ³University of Louisiana at Lafayette, USA; ⁴Tianjin University, China. A tapered fiber with two Ge-doped concentric cores is proposed to achieve flexible and slope-controllable broadband flat negative dispersion. The dispersion curve of the fundamental mode features $<$0.54 ps/(nm$\cdot$km) variation from 1440 to 1700 nm.

10:30 -- 12:30
Room: 2000A
JM2A • Introductory Remarks and Plenary Session I

JM2A.1 • 10:30 Plenary Submission
Thermal Photonics and Its Implications, Shanhui Fan¹; ¹Stanford University, USA. We review the use of photonic structures to control thermal radiation and the implications of such control in renewable energy.

JM2A.2 • 10:30 Plenary Submission
Petascale Photonic Connectivity for Energy-Efficient Computing, Keren Bergman¹; ¹Columbia University, USA. Abstract not available.

14:00 -- 16:00
Room: 206A
BM3A • Laser Direct Writing in Optical Materials
Presider: Michael Withford; Macquarie University, Australia

BM3A.1 • 14:00 Invited
Internal Laser Structuring of Semiconductors: Opening a Route to Three-Dimensional Silicon Nano-Photonics, Onur Tokel¹; ¹Bilkent University, Turkey. Nano-fabrication in silicon is limited to surface. We use structured lasers and preformed seeds to establish controlled volumetric nano-fabrication; with feature sizes down to 100 nm, leading to nano-photonics applications in Si.

BM3A.2 • 14:30
Investigation of Ultrashort Pulse Written Higher Order VBG With Extended Apertures, Malte P. Siems², Daniel Richter², Ria G. Krämer², Georg R. Schwartz², Stefan Nolte²,¹; ¹Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Germany; ²Institute of Applied Physics, Friedrich-Schiller-Univ., Germany. In this paper we investigate higher order femtosecond written VBG in fused silica. Focus of this investigation will be on the influence of the Bragg order on the properties across the aperture of the VBG.

BM3A.3 • 14:45
High Order Fiber Bragg Gratings Using Point-by-Point Femtosecond Laser Technique, Romain Cotillard¹, Nicolas Roussel¹; ¹CEA, France. Here we describe the inscription of high-order Bragg gratings. These optical components feature the combined properties of Bragg
gratings and Fabry-Perot cavities, open new possibilities both for sensor applications and as optical components, such as wavelength references or fiber-optic verniers.

BM3A.4 • 15:00
Femtosecond Laser-Induced Bragg Grating Waveguide Through Selective Control of Pulse Numbers, Foroogh Jafari1, Jean-Sébastien Boisvert1, Raman Kashyap1,2, Sébastien Loranger1; 1Electrical engineering, Polytechnique Montreal, Canada; 2Physics engineering, Polytechnique Montreal, Canada. Single-step writing of Bragg grating waveguide is obtained by externally modulating the fs laser pulse picker using a waveform generator, which delivers a controlled number of pulses to induce refractive-index changes at each sub-Bragg period.

BM3A.5 • 15:15
Writing of Fiber Bragg Gratings With Focused fs Pulses Using a Two-Phase Mask Interferometer, Francois Ouellette1; †Chengdu University, China. A 2-mask interferometer is used to write fiber Bragg gratings with index modulations up to 1.6×10⁻³ without H₂ loading on time scales of 1 minute, using 343 nm, 7 μJ energy, 237 fs pulses at 60 kHz repetition rates.

BM3A.6 • 15:30 Invited
Fabrication of Thin Film Lithium Niobate Electro-Optic Devices Using a Femtosecond Laser, Ya Cheng1,2; 1Shanghai Institute of Optics and Fine Mechanics, China; 2East China Normal University, China. We report recent progresses in thin film lithium niobate integrated photonics technology, in which high-performance active and passive photonic devices are uniquely fabricated using femtosecond laser direct writing.

14:00 -- 16:00
Room: 206B
JM3E • Quantum Photonics (Joint IPR/NP)
Presider: To be determined

JM3E.1 • 14:00 Invited
Frequency-Domain Quantum and Nonlinear Nanophotonics in Low-Loss Silicon Nitride, Avik Dutt1; †University of Maryland at College Park, USA. Abstract not available.

JM3E.2 • 14:30
Time-bin Entangled Photons for Scalable Quantum Information Processing, Stefania Sciara1, Hao Yu1,2, Mario Chemnitz1,4, Monika Monika3, Farzam Nosrati1, Agnes George1, Nicola Montaut1, Bennet Fischer1,4, Benjamin Crockett1, Robin Helsten1, Benjamin Wetzel5, Thorsten A. Goebel5, Ria G. Krämer7, Brent Little5, Sai Chu11, Stefan Nolte7,8, Zhiming Wang2, José Azaña1, William J. Munro9, David J. Moss10, Ulf Peschel1, Rosario Lo Franco12, Roberto Morandotti1; 1Institut national de la recherche scientifique -Centre Énergie, Matériaux et Télécommunications (INRS-EMT), Canada; 2Shimmer Center, Tianfu Jiangxi Laboratory, China; 3Institute of Solid State Theory and Optics, Friedrich Schiller University, Germany; 4Leibniz Institute of Photonic Technology, Germany; 5XLIM Research Institute, Université de Limoges, France; 6Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Center of Excellence in Photonics, Germany; 7Friedrich-Schiller-University, Abbe Center of Photonics, Institute of Applied Physics, Germany; 8QXP Technology Inc., China; 9Okinawa Institute of Science and Technology Graduate University, Japan; 10Optical Sciences Centre, Swinburne University of Technology, Australia; 11Department of Physics, City University of Hong Kong, Hong Kong; 12Universita di
Palermo, Italy. Encoding information in photonic time bin enables quantum technologies compatible with both integrated and fiber frameworks. Here, we demonstrate time-bin entangled qudits in a programmable photonic chip and in a fully fibered coupled loop system.

JM3E.3 • 14:45
Micro-Ring Resonator in Si3N4 as a Photon Source for Quantum Repeaters, Juan S. Durán-Gómez1,2, Roberto Ramírez Alarcón1, Mauricio Gomez Robles2, Patricia Marisol del Carmen Tavares Ramírez1,2, Gerardo de Jesús Rodríguez Becerra1,2, Erasto Ortíz Ricardo3, Rafael Salas Montiel2; 1Quantum Photonics, Centro de Investigaciones en Óptica A.C., Mexico; 2Laboratory Light, nanomaterials, and nanotechnologies, Université de Technologie de Troyes, France; 3División de Ciencias e Ingenierías campus León, Universidad de Guanajuato, Mexico. We report an integrated photon source designed in a micro-ring resonator in Si3N4, that produces photons capable of interacting with a quantum memory (Y2SiO5:Pr3+crystal) by analyzing its spectral properties through the Joint Spectral Intensity.

JM3E.4 • 15:00
A Brillouin-Pumped, Four-Wave Mixing, Photon Pair Source, Alex I. Flint1, Rex Bannerman1, James Gates1, Paolo Menna1, Peter G. Smith1; 1Optoelectronics Research Centre, University of Southampton, United Kingdom. A novel method of generating photon pairs via spontaneous four-wave mixing in SMF-28 is demonstrated. We use a CW-pumped Brillouin laser where the intracavity field provides the pump power. Source characterisation will be presented.

JM3E.5 • 15:15
Quantum Squeezing in on-Chip Microring Measured With External Local Oscillator, Andrei Danilin1,2, Dmitry A. Chermoshentsev1,2, Anatoly V. Masalov1,4, Igor A. Bilenko1,2; 1Russian Quantum Center, Russian Federation; 2Faculty of Physics, Lomonosov Moscow State University, Russia; 3Skolkovo Institute of Science and Technology, Russian Federation; 4Lebedev Physical Institute, Russian Academy of Sciences, Russian Federation. We report the observation of 2 dB squeezed vacuum in an on-chip degenerate optical parametric oscillator in Si3N4 microring resonator. We experimentally show the possibility of squeezed states measurement in balanced heterodyne scheme.

14:00 -- 16:00
Room: 205C
JM3D • Radiative Cooling II (Joint SOLED/NOMA)
Presider: Aaswath Raman; University of California Los Angeles, United States

JM3D.1 • 14:00 Invited
Vapor Condensation With Daytime Radiative Cooling, Zongfu Yu1; 1University of Wisconsin - Madison, USA. Abstract not available.

JM3D.2 • 14:30
Electrochemically Active Metasurfaces for Multispectral Radiative Heat Management, Po-Chun Hsu1; 1Pritzker School of Molecular Engineering, University of Chicago, USA. The combination of reversible electrochemical reaction and metasurface allows multifunctional and multispectral light and heat management. This talk will introduce two examples, conjugated
polymers and metal, and the design principle to accomplish various dynamic thermoregulation applications.

JM3D.3 • 15:00
Adaptive Radiative Coolers May Not Be a Sustainable Option for Thermoregulating Buildings, Jyotirmoy Mandal¹, Jyothis Anand², Nithin J. Varghese¹; ¹Princeton University, USA; ²Oak Ridge National Laboratory, USA. Adaptive radiative coolers are more energy-efficient than traditional radiative coolers because they do not overcool buildings in the winter. However, because this entails trapping heat on earth, they may not be sustainable for building thermoregulation.

JM3D.4 • 15:15
Squid-Inspired Materials With Tunable Heat-Managing Properties, Aleksandra Strzelecka², Sanghoon Lee¹, Alon Gorodetsky¹, Panyiming Liu¹; ¹University of California Irvine, USA; ²Chemical and Biomolecular Engineering, university of California, Irvine, USA. Heat management is critical for the operation of many modern technologies. We have developed squid-skin-inspired thermoregulatory composite materials and further endow them with breathability, washability, and fabric compatibility. Our materials appear suitable for wearable applications.

JM3D.5 • 15:30 Invited
Hierarchical-Morphology Metafabric for Passive Thermal Management, Guangming Tao¹; ¹Huazhong Univ of Science and Technology, China. Abstract not available.
fibers. By exploiting the time-reversal symmetry, we identify the conditions for robust on-demand modal distributions. We extend our study to the reversal of spatial beam self-cleaning.

NpM3B.4 • 15:00
Four Coherent Dispersive Waves Emission for OAM$_{3,1}$ Mode in a Ring-Core Fiber, Wenpu Geng$^1$, Yuxi Fang$^1$, Zhi Zeng$^2$, Changjing Bao$^3$, Zhongqi Pan$^4$, Yang Yue$^5$; $^1$Nankai University, China; $^2$Xi'an Jiaotong University, China; $^3$University of Southern California, USA; $^4$University of Louisiana at Lafayette, USA. A ring-core fiber is designed to generate four DWs for OAM$_{3,1}$ mode. Pumping under normal dispersion, the simulated coherent output spectrum spans 1100 nm with four distinct peaks at 760, 1130, 1430 and 1685 nm.

NpM3B.5 • 15:15
Exploiting the Up-Conversion Luminescence of Material Defects to Characterize Graded-Index Optical Fibers: From Silica to Soft-Glasses, Mario Ferraro$^{2,3}$, Fabio Mangini$^1$, Raffaele Filosa$^2$, Pedro Parra-Rivas$^1$, Yifan Sun$^1$, Wasyhun A. Gmechu$^1$, Alessandro Falaschi$^1$, Grzegorz Stepniewski$^1$, Adam Filipkowski$^{4,5}$, Ryszard Buczynski$^{4,5}$, Vincent Couderc$^6$, Stefan Wabnitz$^1$; $^1$DIET, University of Rome "La Sapienza", Italy; $^2$Department of Physics, University of Calabria, Italy; $^3$Nanotec, CNR, Italy; $^4$Faculty of Physics, University of Warsaw, Poland; $^5$Institute of Microelectronics and Photonics, Lukasiewicz Research Network, Poland; $^6$XLIM, UMR CNRS 7252, University of Limoges, France. Drawing optical fibers intrinsically produces material defects, which are detrimental to most applications. Here we show that material defects may also be instrumental for characterizing the refractive index profile of graded-index fibers via up-conversion luminescence.

NpM3B.6 • 15:30
Multifrequency Nonlinear Pulse Propagation, David Castello-Lurbe$^1$, Enrique Silvestre$^1$, Miguel V. Andrés$^1$; $^1$Universitat de Valencia, Spain. The nonlinear coefficient dependence on multiple frequencies is rigorously incorporated into the propagation equation so that the resulting nonlinear term is still straightforwardly computed. Readily observable consequences due to this multifrequency dispersion are predicted.

NpM3B.7 • 15:45
Efficient Emission From a Spintronic THz Emitter Based on Pump Distribution and Exposure, Gabriel Gandubert$^1$, Joel E. Nkeck$^1$, Xavier Ropagnol$^{1,2}$, Denis Morris$^3$, Francois Blanchard$^1$; $^1$École de technologie supérieure (ÉTS), Canada; $^2$INRS-EMT, Canada; $^3$Physics, Université de Sherbrooke, Canada. Efficiency of Spintronic terahertz emitters are thermally influenced by laser pulses. Using an oscillator laser, we show that adjusting the laser pump's spatial distribution and exposure time significantly increases its generation efficiency.

14:00 -- 16:00
Room: 2101
NeM3C • Short Reach and Data-Center Networks
Presider: Lena Wosinska; Chalmers Tekniska Högskola, Sweden

NeM3C.1 • 14:00 Invited
Novel Coherent Detection Schemes for Short Reach and Datacenter Networks, Budsara Boriboon$^1$, Ruben S. Luis$^1$, Benjamin J. Puttnam$^1$, Satoshi Shinada$^1$, Hideaki Furukawa$^1$; $^1$NICT, Japan, Japan. This talk discusses the self-homodyne coherent detection for short-reach
applications. This approach can utilize a low-cost DFB laser and provides the feasibility of using an incoherent light source with multi-level modulation formats.

NeM3C.2 • 14:30 Invited
High Symbol Rate Short-Reach Communications With Silicon Photonics Components, Oskars Ozolins1; 1Riga Technical University, Latvia. Abstract not available.

NeM3C.3 • 15:00 Invited
Analog Fronthaul and Coherent Joint Transmission Technologies and Demonstrations for Next-Generation Cell-Free MIMO RAN Scenarios, Xiaodan Pang1; 1KTH Royal Inst. of Technology, Sweden. Abstract not available.

NeM3C.4 • 15:30
Optical-Amplification-Free 245/140 Gbaud OOK/PAM4 C-Band SiP Ring Resonator Modulator-Based Links, Armands Ostrovskis1, Toms Salgals1, Michael Koenigsmann2, Kristaps Rubulis1, Azra Farid2, Benjamin Krüger2, Arvids Sedulis1, Fabio Pittala2, Ryan P. Scott3, Hansjoerg Haisch2, Lu Zhang4, Xianbin Yu4, Rafael Puerta5, Sandis Spolitis1, Richard Schatz6, Katia Gallo6, Markus Gruen2, Hadrien Louchet2, Robert Jahn2, Kazuo Yamaguchi2, Vjaceslavs Bobrovs1, Xiaodan Pang6,7, Oskars Ozolins1,7; 1Riga Technical University, Latvia; 2Keysight Technologies Deutschland GmbH, Germany; 3Keysight Technologies, Inc., USA; 4Zhejiang University and Zhejiang Lab, China; 5Ericsson Research, Sweden; 6KTH Royal Institute of Technology, Sweden; 7RISE Research Institutes of Sweden AB, Sweden. We demonstrate an optical-amplification-free 245 Gbaud OOK and 140 Gbaud PAM4 links using a C-band SiP RRM-based transmitter with performance below the 6.25% overhead hard-decision forward error correction threshold after 100 meters of SMF.

14:00 -- 16:00
Room: 2104
SpM3G • Coherent Technologies I
Presider: Werner Rosenkranz; Kiel University, Germany

SpM3G.1 • 14:00 Invited
Scenarios for DSP Evolution in Long Haul Optical Communication Systems, Domaniç Lavery1, Siddharth Varughese2, Pierre Mertz2, Han Sun1; 1Infinera Canada Inc., United Kingdom; 2Infinera Corporation, USA. We discuss how changing market requirements and the availability of coherent pluggable modules present challenges for DSP development. Possible development paths for DSP in coherent, long-haul transmission systems are discussed.

SpM3G.2 • 14:30
Fully Generalized Machine Learning-Based Equalization in Coherent Optical Transmission, Samuel Lennard1, Fabio A. Barbosa1, Filipe Ferreira1; 1University College London, United Kingdom. We introduce a novel training paradigm for machine learning-based equalization without any online training for dual-polarization IQ-modulated signals. Lab transmission of 30Gbaud DP-16-QAM has shown this equalizer matching conventional DSP over a range of conditions.
SpM3G.3 • 14:45 Invited
Unlocking the Potential of Ultrawide O-Band Coherent DWDM Fiber Transmission, Yuta Wakayama1, Daniel J. Elson1, Filippos Balasis1, Shohei Beppu1, Noboru Yoshikane1, Takehiro Tsuritani1; 1KDDI Research, Japan. This presentation delves into our latest research and hurdles in creating high-capacity O-band transmission systems, facing greater nonlinear interference and fiber attenuation than the C-band, with non-consistent behavior across wavelengths.

SpM3G.4 • 15:15
On Link Budget of PCS-Based Coherent Transceivers With Different Client Framing in C&L-Band Networks, Ahmad Abdo1, Willy Georges2, Shahab Oveis Gharan1, Ahmed A. Omar2; 1Ciena Canada Inc., Canada; 2Zain Oman Tele International, Oman. Improvement in performance of Ethernet (ETH) versus Optical Transport Network (OTN), in probabilistic shaped constellation (PCS)-based coherent transceivers, are presented. As well, we simulated the impact of fiber characteristics on the end-of-life (EoL) capacity of a C&L-Band open line system (OLS) and Ciena’s WaveLogic5 Extreme (WL5E).

SpM3G.5 • 15:30 Invited
Unlocking the Shaping Gain in Unamplified Coherent Links, Beatriz Oliveira5,2, Manuel Neves5,2, Jorge Silva5, Fernando P. Guiomar1, Maria d. Medeiros4,3, Paulo M. Monteiro2,5; 1Instituto De Telecomunicacoes, Portugal; 2Universidade de Aveiro, Portugal; 3Universidade de Coimbra, Portugal; 4Instituto de Telecomunicações, Portugal; 5Instituto de Telecomunicações, Portugal. The benefits of probabilistic constellation shaping in unamplified links are still under debate, putting into question Maxwell-Boltzmann (MB)-based PCS. We optimize the probability mass function and demonstrate gains of 4.2 dB at 400 Gbit/s.

14:00 -- 16:00
Room: 207
SoM3F • Hollow-core Fibers
Presider: Benoît Beaudou; GLO Photonics, France

SoM4F.1 • 14:00
Multi-Mode Deep Ultraviolet Hollow Core Fibre, Kerrianne Harrington1, Robbie Mears1, James M. Stone1, William J. Wadsworth1, Jonathan C. Knight1, Tim A. Birks1; 1University of Bath, United Kingdom. We report a multi-mode hollow core fibre, with a 33 µm diameter core, that guides ultraviolet light (330-440 nm in UV-A and 220-255 nm in UV-C). One cane stage is used for high yield fabrication.

SoM4F.2 • 14:30
Investigation Into the use of gas Permeation to Control the gas Composition and Pressure Within Hollow-Core Fibers, Kavitha Srinivasan1, Thomas Kelly1, Somaripita Pradhan1, Ian Davidson1, Radan Slavik1, Peter Horak1, Natalie V. Wheeler1; 1University of Southampton, United Kingdom. We investigate, both via simulations and experiments, a new approach for gas purging in hollow-core fibers based on side permeation of helium gas into the fiber’s microstructure and subsequent pressure-driven flow along the fiber core.
SoM4F.3 • 15:00
Mode Coupling and Ultimate Loss Limit in Hollow Core Fibers, Federico Melli¹, Kostiantyn Vasko², Lorenzo Rosa¹, Fetah Benabid²,³, Luca Vincetti¹; ¹Univ degli Studi Modena e Reggio Emilia, Italy; ²GLOPHOTONICS, France; ³XLIM, France. A theoretical model describing the modes coupling in hollow core inhibited coupling fibers is presented. This model gives new insights about the ultimate limits in terms of loss and bandwidth of this kind of fibers.

SoM4F.4 • 15:15
Bending and Temperature Dependence of Polarization Mode Dispersion in Nodeless Antiresonant Hollow Core Fibers, Austin Taranta¹, Seyed Mohammad Abokhamis Mousavi¹, Eric Numkam Fokoua², Gianluca Guerra¹, Gregory Jasion¹, Konstantin Vidiajev¹, Hesham Sakr², John Hayes¹, Thomas Bradley³, Ghafour A. Mahdiraji¹, Jaroslav Rzegocki¹, Ian Davidson¹, Radan Slivák¹, Francesco Poletti¹,²; ¹Optoelectronics Research Centre, University of Southampton, United Kingdom; ²Microsoft Azure Fiber, United Kingdom; ³High-Capacity Optical Transmission Laboratory, Eindhoven University of Technology, Netherlands. We identify empirical thermal and bending attributes of PMD in short nodeless antiresonant fibers (ARFs). Surprisingly, bend-scaling properties of ARF are comparable to solid fiber, albeit with greater magnitude, while temperature dependence is more varied.

SoM4F.5 • 15:30
Sealing Purged Mid-Infrared Hollow-Core Fibers, Qiang Fu¹, Thomas Kelly¹, Jing Meng¹, Yongmin Jung¹, Francesco Poletti¹, Natalie V. Wheeler¹, Ian Davidson¹; ¹University of Southampton, United Kingdom. We report two practical methods for sealing purged mid-infrared (3-4.6 μm) anti-resonant, hollow-core fibers and demonstrate that inert gas purging significantly reduces loss, which is effectively maintained by sealing.

SoM4F.6 • 15:45
Transverse Roughness: Modeling and Effects Analysis on Inhibited Coupling Fibers, Federico Melli¹, Kostiantyn Vasko², Lorenzo Rosa¹, Fetah Benabid³,², Luca Vincetti¹; ¹Univ degli Studi Modena e Reggio Emilia, Italy; ²Glophotonics, France; ³XLIM, France. A Transverse Roughness theoretical model based on the Azimuthal Fourier Decomposition is proposed to analyse the effects of this perturbation on the Confinement Loss of Hollow-Core Inhibited Coupling Fibers. Scaling laws are also given.

16:30 -- 18:30
Room: 206A
BM4A • Symposium on Optical Fiber Sensors for Extreme Environments I
Presider: Guillaume Laffont

BM4A.1 • 16:30 Invited
Fiber Sensors in Tokamak for Nuclear Fusion, Jonathan Gaspar¹; ¹Aix-Marseille Université, France. Abstract not available.

BM4A.2 • 17:00
Survival of Nanogratings in High Melting Oxide Glasses Upon Thermal Annealing, Imane Kafi¹, Qiong Xie¹, Gözden Torun², Yves Bellouard², Maureen Yembele³, Mathieu Allix³, Thomas Wade Hawkins⁴, John Ballato⁴, Maxime Cavillon¹, Matthieu Lancry¹; ¹Université Paris-Saclay, France; ²EPFL, Switzerland; ³CEMHTI – CNRS, France; ⁴Clemson University, USA.
Nanogratings were fabricated using a fs-laser inside more than 20 oxide glasses. Glass viscosity mostly dictates their thermal stability but deviation from this trend was observed in glasses containing large amount of Al_{2}O_{3} or ZrO_{2}

**BM4A.3 • 17:15**
**Ceramic-Coated Type III Femtosecond Fiber Bragg Grating for High Temperature Environments**, Laure Lago¹, Guillaume Laffont¹, Rémy Bernard²; ¹CEA, France; ²Laboratoire PhLAM, Université de Lille, France. Boron nitrite-based ceramic coating is developed to protect fiber Bragg gratings (FBG) for harsh environment use. Coated FBGs are manufactured. Characterization and tests are made in Air at different high temperature levels (700°C, 800°C, 900°C) during 500 hours. Long-term behavior (up to 1500 hours) is also studied at 800°C.

**BM4A.4 • 17:30**
**Ultra-High Temperature Sensor Utilizing an Intrinsic Sapphire Fabry-Pérot Interferometer**, Alexander Roehrl¹, Andrea Stadler¹, Fabian Buchfellner¹, Simon Zehetmair¹, Johannes Roths¹; ¹Munich University of Applied Sciences, Germany. We propose and present a high temperature fiber optic sensor based on an intrinsic sapphire Fabry-Pérot interferometer and a single mode interrogation system for temperature measurements up to 1200°C.

**BM4A.5 • 17:45 Invited**
**Recent Developments in Fiber Optic Sensing for Energy Infrastructure Applications**, Paul Ohodnicki¹, Khurram Naem¹, Pengdi Zhang¹, Yang-Duan Su¹, Dolendra Karki¹, Nageswara Lalam²³, Ruishu Wright³; ¹University of Pittsburgh, USA; ²Leidos, USA; ³National Energy Technology Laboratory, USA. Fiber optic sensing technologies show unique relevance for energy infrastructure sensing. A non-exhaustive overview of several emerging trends within the field of optical fiber sensing technology and energy infrastructure monitoring is presented.

**BM4A.6 • 18:15**
**Long-Term High-Temperature Wavelength Drift Trends of Type II FBGs Written in Standard Single Mode Fibers**, Robert B. Walker¹, Cyril Hnatovsky¹, Stephen J. Mihailov¹, Manny De Silva¹, Ping Lu¹, Huimin Ding¹; ¹National Research Council Canada, Canada. A comparison of Type II Fiber Bragg Grating (FBG) wavelength drift is reported for 600°C, 800°C, 900°C and 1000°C. Significant prolonged redshift was observed at 800°C, transitioning to blueshift more quickly at higher temperatures.

**16:30 -- 19:00**
**Room: 205A**
**IM4B • Integrated Quantum Photonics**
*Presider: Nathaniel Kinsey; Virginia Commonwealth Univ., United States*

**IM4B.1 • 16:30 Tutorial**
**Development and Applications of Superconducting Single-Photon and Photon-Number Resolving Detectors**, Adriana E. Lita¹, Varun Verma¹, Dileep Reddy¹, Martin Stevens¹, Richard Mirin¹; ¹National Inst of Standards & Technology, USA. Will present an overview of superconducting single-photon detectors such as optical transition-edge sensors (TES) and superconducting nanowire single-photon detectors (SNSPD) including the operation principles and optimization of key performance metrics required for quantum information applications.
Optica Advanced Photonics Session Guide

Disclaimer: this guide is limited to technical program with abstracts and author blocks as of 21 July. For updated and complete information with special events, reference the online schedule or mobile app.

IM4B.2 • 17:30 Invited
Epitaxial Quantum Dots for on-Chip Photonics and Long Distance Quantum Implementations, Simone Portalupi

IM4B.3 • 18:00 Invited
Visible Light to NIR Integrated Photonics for Atomic and Quantum Applications, Daniel J. Blumenthal

IM4B.4 • 18:30 Invited
Quantum Noise Limited Homodyne Detectors Integrated Into Silicon Photonics for Quantum Technologies, Jonathan Matthews

16:30 -- 18:30
Room: 205B
IM4G • Passive Photonic Devices
Presider: Daniele Melati; CNRS, France

16:30 -- 18:30
Room: 205B
IM4G.1 • 16:30 Invited
Scalable Surface Gratings for Efficient Fiber-Chip and Free-Space Optical Coupling, Radovan Korcek, William Fraser, Sara Salhi, Xiaochen Xin, Quentin Wilmart, David Medina, Samson Edmond, Thalia Domínguez Bucio, Frederic Gardes, Winnie N. Ye, Jens H. Schmid, Pavel Cheben, Daniele Melati, Laurent Vivien, Carlos Ramos, Daniel Benedikovic

Details as of 21 July 2024 Page | 15 All times in EDT, UTC - 04:00
Southampton, United Kingdom. Efficient optical input/output interfaces between photonic chips and fibers or free-space ports are indispensable building blocks for a wide range of applications. Here, we present our recent progress in the development of silicon nitride grating couplers and compact silicon antennas.

IM4G.2 • 17:00
Open-Source Finite Element Models for the Design of Topology Optimized Blazed Grating Under Conical Incidence, Simon Ans\textsuperscript{1,2}, Frédéric Zamkotsian\textsuperscript{2}, Guillaume Demesy\textsuperscript{1}; \textsuperscript{1}Institut Fresnel, France; \textsuperscript{2}Laboratoire d’Astrophysique de Marseille, France. We present a suite of open-source template models based on the finite element for the topology optimization of nanophotonic structures under conical incidence, with applications to the broadband optimization of nanostructured blazed gratings.

IM4G.3 • 17:15
Highly Efficient and Compact non-Uniform Waveguide Grating Antenna for Beam Steering Application, Diksha Maurya\textsuperscript{1}; \textsuperscript{1}Indian Institute of Technology (ISM) Dha, India. We propose a highly efficient non-uniform waveguide grating antenna for beam steering in the C band. The waveguide grating antenna is optimized using the genetic algorithm to achieve high diffraction efficiency and compactness.

IM4G.4 • 17:30
Tilted Subwavelength Grating Assisted Directional Coupler Based Wavelength Division Demultiplexer, Rajarshi Guchhait\textsuperscript{1}, Ravi Roushan Kumar\textsuperscript{1}, Devendra Chack\textsuperscript{1}; \textsuperscript{1}Indian Institute of Technology, India. We propose a compact dual-wavelength multiplexer using a tilted SWG-assisted Directional Coupler (DC). The device is 28.1 µm long, with insertion loss (IL) less than 0.96 dB and an extinction ratio exceeding 16.5 dB.

IM4G.5 • 17:45
Optical Delay in Subwavelength Grating Waveguides Operating Near the Bandgap, Luyao Xie\textsuperscript{1}, Lawrence R. Chen\textsuperscript{1}; \textsuperscript{1}McGill University, Canada. We explore the dispersive characteristics of subwavelength grating (SWG) waveguides near the bandgap and demonstrate how they can provide additional flexibility for providing optical time delays.

IM4G.6 • 18:00 Invited
Recent Advances on Silicon-Based Metamaterial Grating Couplers, Winnie N. Ye\textsuperscript{1}; \textsuperscript{1}Carleton University, Canada. Grating couplers have emerged as crucial elements for photonic integrated circuits due to their ability to provide flexible light-coupling and enable wafer-scale testing. We present our recent advances in grating coupler designs using subwavelength metamaterials.

16:30 -- 18:30
Room: 205C
JM4D • Radiative Cooling III (Joint SOLED/NOMA)
Presider: Jyotirmoy Mandal; Princeton University, United States

JM4D.1 • 16:30 Invited
Passive Radiative Cooling Film (PRCF) and Applications of PRCF, Timothy Hebrink\textsuperscript{1}; \textsuperscript{1}3M Company, USA. Nano-layered and nano-particle technologies have been innovated into easy to
apply passive cooling films and have demonstrated significant cooling of roof surfaces by both reflecting solar energy and radiating heat away from the roof surfaces.

JM4D.2 • 17:00 Invited
*Polymer-Based Multi-Functional Micro-Photonic Metamaterials for Radiative Cooling*,
Gan Huang¹, Bryce S. Richards¹; ¹Karlsruher Institut für Technologie, Germany. Polymer-based micro-photonic multi-functional materials from small-scale to large-scale, wherein micro-photonic structures are used to enable multi-function of high-emissivity, self-cleaning, and also high transparency.

JM4D.3 • 17:30
*Passive Radiative Cooling With High-Mass Roof and Temperature-Driven Ventilation*,
Remy Fortin¹, Jyotirmoy Mandal², Salmaan Craig¹; ¹Mcgill University, Canada; ²Princeton University, USA.
A reduced-scale model building uses a daytime radiative cooling coating (α\text{Solar} \sim 0.97, \varepsilon_{\text{LWIR}} \sim 0.94) on a high-mass, uninsulated roof without a convection guard to produce stable indoor temperatures and temperature-driven ventilation.

JM4D.4 • 17:45
*Daytime Radiative Cooling Near the Equator*,
Jaesuk Hwang¹²; ¹The Centre for Quantum Technologies, Singapore; ²National University of Singapore, Singapore.
Daytime radiative cooling is challenging in the equatorial tropics, where the weather is extremely humid and cloudy. With a high degree of thermal insulation, radiative cooling can be exploited for thermal management and energy generation.

JM4D.5 • 18:00 Invited
*Polymer Metasurface Radiative Cooling Film From Lab to Fab*,
Baohua Jia¹, Han Lin¹, Keng-Te Li¹; ¹Royal Melbourne Institute of Technology, Australia.
We demonstrate a thin film polymer metasurface radiative cooling film enabled by periodically arranged three-dimensional (3D) trench-like structures manufactured by a roll-to-roll printing method. It exhibits superior spectral breadth, selectivity and diurnal cooling performance.

16:30 -- 18:30
Room: 206B
NpM4E • Integrated and Nonlinear Micro-Optics
Presider: Ksenia Dolgaleva; University of Ottawa, Canada

NpM4E.1 • 16:30 Invited
*Optical Nonlinearities in 2D-Material-Augmented Waveguides: Enhancement Versus Counteraction*,
Nathalie Vermeulen¹; ¹Vrije Universiteit Brussel, Belgium.
Combining two-dimensional materials with waveguides can lead to an enhanced nonlinear-optical performance. However, in some cases, the combined material platforms counteract each other. In this talk, I will illustrate both scenarios with two concrete examples.

NpM4E.2 • 17:00
*Nonlinear Characterization of InGaAsP/InP Platform in the C-Band Telecom Range*,
Gabriel Flizikowski¹, Lais F. dos Santos¹, Ozan W. Oner¹, Athulya Thulaseedharan¹, Ehsan Mobini¹, Kaustubh Vyas¹, Fatemeh M. Karimi¹, Kashif M. Awan¹, Daniel Espinosa¹, Ksenia Dolgaleva¹; ¹University of Ottawa, Canada.
We conducted four-wave mixing and nonlinear
absorption experiments in InGaAsP/InP waveguides of different geometries in the telecom C-band. Further, we measured the nonlinear refractive index to be $n_2 = 1.9 \times 10^{-13}$ cm$^2$/W.

**NpM4E.3 • 17:15**

**A Broadband Chip-Based Gallium Phosphide Traveling-Wave Parametric Amplifier**, Alberto Nardi$^{1,2}$, Nikolai Kuznetsov$^2$, Alisa Davydova$^2$, Mikhail Churaev$^2$, Johann Riemensberger$^{3,2}$, Paul Seidler$^1$, Tobias Kippenberg$^2$; $^1$IBM Research Europe, Zurich, Switzerland; $^2$Swiss Federal Institute of Technology Lausanne (EPFL), Switzerland; $^3$Norwegian University of Science and Technology, Norway. We present a gallium phosphide optical traveling-wave parametric amplifier on a chip, achieving up to 35 dB of parametric gain, corresponding to a fiber-to-fiber net gain exceeding 10 dB over a bandwidth of 140 nm.

**NpM4E.4 • 17:45**

**Kerr Switch Versus Nonlinear Thermal Effects in Whispering Gallery Resonators**, Gabriele Frigenti$^1$, Daniele Farnesi$^1$, Stefano Pelli$^1$, Guattiero Nunzi Conti$^1$, Tatyana V. Murzina$^2$, Silvia Soria$^1$; $^1$Istituto di Fisica Applicata Nello Carrara, Italy; $^2$Department of Physics, Moscow State University, Russian Federation. Whispering-gallery-modes resonators are effective switching devices when either coated or filled with non-linear material. We present examples of all-optical switching of hybrid WGM using polyfluorene, a methacrylate azobenzene and an acrylate derivatives.

**NpM4E.5 • 18:00**

**Coupled Microdisk Cavities: Emission Pattern From Circular Versus Deformed Geometries**, Tom S. Rodemund$^2$, Sile Nic Chormaic$^1$, Martina Hentschel$^2$; $^1$Okinawa Inst of Science & Technology, Japan; $^2$Technische Universitaet Chemnitz, Germany. In this work, we discuss mode-dependent chiral effects that appear when two dielectric limaçon cavities are coupled to each other via their optical fields, leading to far-field emission directionality.

**NpM4E.6 • 18:15**

**Controllable Light Distributions in 1-D Microresonator Chains With Kerr-Nonlinearity**, Alekhya Ghosh$^{1,2}$, Arghadeep Pal$^{1,2}$, Lewis J. Hill$^1$, Graeme N. Campbell$^{3,1}$, Toby Bi$^{1,2}$, Yaojing Zhang$^1$, Abdullah Alabbadi$^{1,2}$, Shuangyou Zhang$^1$, Pascal Del'Haye$^{1,2}$; $^1$Max-Planck-Institut fur Physik des Lichts, Germany; $^2$Physics, Friedrich-Alexander-Universitaet Erlangen-Nuernberg, Germany; $^3$Physics, University of Strathclyde, United Kingdom. We demonstrate the control of optical power patterns in one dimensional (1D) photonic lattices of coupled resonators via the Kerr effect. This can advance photonic integrated circuits, especially for light steering, and optical computing.

16:30 -- 18:30
Room: 2101
NeM4C • Advanced Core Networks
Presider: Marco Ruffini; Trinity College Dublin

**NeM4C.1 • 16:30 Tutorial**

**Artificial Intelligence and Machine Learning in Optical Networking [Tutorial]**, Christine Tremblay$^1$; $^1$École de technologie supérieure, Canada. In this tutorial, we explore various applications of artificial intelligence (AI) and machine learning (ML) methods aimed at improving...
the performance, operations, and reliability of optical networks, as well as simplifying their management.

NeM4C.2 • 17:30 Invited
The Future of Global Coherent Optical Transmission Systems for Submarine and Space Applications, Hidenori Takahashi¹, Shota Ishimura¹, Takehiro Tsuritani¹; ¹KDDI Research, Inc., Japan. This paper reviews recent usage of digital coherent transmission technologies in submarine cable and optical satellite communications. The digital coherent technologies play important role to support the capacity demands.

NeM4C.3 • 18:00 Invited
Integrated Optical Communication and Distributed Sensing Systems, Chao Lu¹,², Jingchuan Wang¹, Shaoyi Chen², Yaxi Yan¹, Tianrui Li², Liwang Lu¹, Yichang Wu², Wenjin Huang², Alan Pak Tao Lau Lau¹, Zhaohui Li²; ¹Hong Kong Polytechnic University, Hong Kong; ²School of Electronic and Information Technology, Sun Yat-sen University, China. Recent work on integrating sensing functions into optical communication systems is described. The developed techniques are expected to enhance the reliability of optical networks and enable a range of applications in marine and urban environments.

16:30 -- 18:30
Room: 2104
SpM4H • Next Generation PON
Presider: Jun-ichi Kani; NTT Access Service Systems Laboratories, Japan

SpM4H.1 • 16:30 Invited
IM-DD for Next Generation PON Networks, Will the Trend Continue?, Vincent Houtsma¹, Dora van Veen¹; ¹Nokia Bell Labs, USA. We evaluate the status of current PONs and assess if the trend for next generation PONs will continue.

SpM4H.2 • 17:00
Non-Orthogonal Multiplexing Access (NOMA)-Based DEense Passive Optical Networks Considering Fairness Under Differential Split Ratios, Zixian Wei¹, Jinsong Zhang¹, Weijia Li¹, Charles St-Arnault¹, Santiago Bernal¹, Mostafa Khalil¹, Ramón Gutiérrez-Castrejón¹,², Lawrence R. Chen¹, David V. Plant¹; ¹McGill University, Canada; ²Institute of Engineering, Universidad Nacional Autonoma de Mexico UNAM, Mexico. We demonstrate a NOMA-based 200-G coherent PON for two access users with a differential split ratio, where the fairness and performance of far-end users with 256 SR are increased by adjusting the power allocation factor.

SpM4H.3 • 17:15
Spatial Diversity in Non-Orthogonal Multiplexing Access (NOMA)-Based Coherent Optical Transmission Under Differential Path Loss, Zixian Wei¹, Jinsong Zhang¹, Weijia Li¹, Charles St-Arnault¹, Santiago Bernal¹, Ramón Gutiérrez-Castrejón¹,², Lawrence R. Chen¹, David V. Plant¹; ¹McGill University, Canada; ²Institute of Engineering, Universidad Nacional Autonoma de Mexico UNAM, Mexico. We first demonstrate a MISO coherent optical transmission based on joint NOMA and spatial diversity, where maximal ratio combining brings 1.764-db diversity gain for two high-path-loss 120-km and 140-km branches.
SpM4H.4 • 17:30 Invited
Cost Effective TFDM Coherent PON Enabled by Remote Optical Carrier Delivery and Optical Injection Locking, Haipeng Zhang¹, Zhensheng Jia¹, Karthik Choutagunta¹, Luis Alberto Campos¹, Curtis Knittle¹; ¹CableLabs, USA. We demonstrate a TFDM coherent PON with low-cost ECL-free ONU, enabled by remote optical carrier delivery through injection locking. Experimental demonstration of 50 km transmission shows similar performance to regular ECL-based systems.

SpM4H.5 • 18:00
Rate-Flexible Coherent TFDM PON With Transparent Digital Signal Processing Aided by Residual Carrier, Ziheng Zhang¹, Yixiao Zhu¹, Guangying Yang¹, Lina Man¹, Gengming Lin¹, Qunbi Zhuge¹, Weisheng Hu¹; ¹Shanghai Jiao Tong University, China. We leverage modulator finite extinction ratio-induced residual carrier for transparent digital signal processing in coherent time-frequency-division-multiplexing PON. We experimentally demonstrate flexible data rates from 100-Gb/s to 300-Gb/s after 20-km SSMF transmission with a 112-ns preamble.

16:30 -- 18:30
Room: 207
SoM4F • Nonlinear Fiber Optics
Presider: Alexander Heidt, Switzerland

SoM4F.1 • 16:30 Tutorial
Machine Learning for Nonlinear Fiber Optics, Goëry Genty¹; ¹Tampere University, Finland. In this tutorial, we will discuss how the techniques of machine learning techniques can be leveraged for the analysis, prediction, and control of nonlinear propagation dynamics in optical fiber systems.

SoM4F.2 • 17:30 Invited
Fiber Light Sources for Nonlinear Imaging Applications, Cassia Corso¹, Tigran Mansuryan², Alessandro Tonello², Lukasz Zinkiewicz²,³, Bartosz Fabjanowicz¹, Mateusz Pielach¹, Agnieszka Jamrozik¹, Tomasz Kardas³, Yago Arosa², Piotr Wasylczyk³, Vincent Couderc², Yuriy Stepanenko¹, Katarzyna Krupa¹; ¹Institute of Physical Chemistry PAS, Poland; ²Université de Limoges, XLIM UMR CNRS 7252, France; ³Faculty of Physics, University of Warsaw, Poland; ⁴Fluence Sp. z o.o., Poland. We discuss new ideas for developing fiber light sources for nonlinear imaging. We demonstrate high-power SC-based laser tunable within fingerprint region, as well as new methods of tuning FWM sidebands.

SoM4F.3 • 18:00
Strong Reduction of Frequency-Comb Noise in All-<normal Dispersion Supercontinuum, Benoît Sierro¹, Sandro Camenzind², Benjamin Willenberg², Alexander Nussbaum-Lapping², Anupama Rampur¹, Ursula Keller², Christopher R. Philips², Alexander M. Heidt¹; ¹Institute of Applied Physics, University of Bern, Switzerland; ²Department of Physics, Institute for Quantum Electronics, ETH Zurich, Switzerland. Experimental observations show that broadening frequency-combs in all-normal dispersion fibers can reduce noise by up to 20 dB. Our new numerical model propagates pulse trains generated from real noise measurements and replicates this accurately.
SoM4F.4 • 18:15
Scaling of Stimulated Raman Scattering and Molecular Modulation in Hollow Anti-Resonant Fibers, Pau Arcos¹, Arturo Mena¹, María Sánchez-Hernández¹, Amaia Berganza², Begoña Garcia-Ramiro², Joseba Zubia³, David Novoa³; ¹Comunications Engineering, University of the Basque Country, Spain; ²Applied Mathematics, University of the Basque Country, Spain; ³IKERBASQUE, Basque Foundation for Science, Spain; ⁴Communications Engineering and EHU Quantum Center, University of the Basque Country, Spain. We report a scaling methodology for Raman molecular modulation dynamics in gas-filled anti-resonant fibers. The dephasing-gain length ratio allows complex nonlinear propagation dynamics to be reproduced with high fidelity under very different input conditions.
Tuesday, 30 July

10:00 -- 12:00
Room 2000B
JTu1A • Joint Plenary Posters Session

JTu1A.1
Channel Prediction and Phase Correction in a Vertical FSO Link Using Recurrent Neural Network, Souvik Sen¹, Pritam Paul¹, Rik Chattopadhyay¹; ¹Electronics and Telecommunication, Indian Institute of Engineering Science and Technology, Shibpur, India. We report prediction and pre-compensation of phase aberration of data in FSO link from ground to a HAP using machine learning and GS Algorithm. Probe beam is used on demand to self-correct the prediction algorithm.

JTu1A.2
Optical Studies of Rare Earth Nano Metal Oxides Prepared Using D-Glycine as Fuel in Solution Combustion Synthesis, Ashish R. Tanna¹, Dhara Maheta¹, B S. Madhukar²; ¹RK University, India; ²Department of Chemistry, JSS Science and Technology University, India. The structural and optical studies have been used for nano rare earth oxides. The refractive indices modeling has been applied for CeO₂, La₂O₃, & ThO₂ where 3.10, 4.84 & 5.76 eVs values for band gaps.

JTu1A.3
TDBC Microstructures Made by Local Photo-Bleaching in J-Aggregate Thin Organic Layers for Photonics Applications, Komlan Segbéya Gadedjisso-Tossou¹, Antoine Bard², Clementine Symonds², Jean-Michel Benoit², Joel Bellessa², Alban Gassenq²; ¹University of Lomé, Togo; ²Institut Lumière Matière, France. TDBC layers are very interesting for photonics applications due to their huge oscillator strength, narrow absorption, local photo-bleaching, and low-cost fabrication. These intrinsic properties need to be investigated to fully exploit his high potential.

JTu1A.4
Optical Manipulation of Microdroplets for Precise Imaging and Manipulation of Nanostructures, Xixi Chen¹; ¹Institute of Nanophotonics, Jinan University, China. The presentation centers on optical manipulation research for precise microdroplet formation/dissolution, shaping, and repositioning, enabling accurate nanostructure imaging and manipulation. It covers the physical mechanisms and fabrication methods of droplets using artificial and natural biological materials.

JTu1A.5
Analyzing Near-Field Enhancement in Plasmonic Nanocylinder-Based SPASER Systems, Amine Jaouadi¹, Ahmed Mahjoub², Montacer Dridi³; ¹ECE - Paris School of Engineering, LyRIDS - ECE Research Center, France; ²Space Science Institute, USA; ³SCIO, ESIEA, France. We explore here the enhancement of electromagnetic fields near to a periodic array of gold nanoparticles. The obtained SPASER demonstrates a remarkable promise, boasting energy conversion efficiencies of up to 80%, underscoring its potential as a highly efficient nano-scale energy source.
JTu1A.6
Epsilon Near Zero Metasurfaces (ENZ) at Visible Wavelengths, Iman Alhamdan1; 1School of Physics and Astronomy, United Kingdom. Here we showcase a multilayer structure metasurface incorporating an epsilon near zero (ENZ) material. The simulation results prove the tendency of this structure to operate with high efficiency and tunability in the visible range.

JTu1A.7
Durable Fiber Bragg Gratings With Thickened Polyimide Coatings for High Sensitivity Humidity Sensing, Stephen J. Mihailov1, Huimin Ding1, Robert B. Walker1, Katherine Szabo1, Cyril Hnatovsky1, Abdullah Rahnama1, Ping Lu1, Manny De Silva1; 1National Research Council Canada, Canada. Fiber Bragg Grating (FBG) relative humidity (RH) sensors were written in 50 μm diameter fibers through the polyimide coating. Thickening the polyimide resulted in the highest sensitivity reported for polyimide coated FBG RH sensors.

JTu1A.8
Specificity of NY-ESO-1 Antibody Detection Using TFBG Plasmonic Sensor, Linyao Tan2, Hang Qu2, Xiaoyong Chen3, Yi-Wei Xu4, Patrice Mégret1, Christophe Caucheteur1, Xuehao Hu1; 1Université de Mons, Belgium; 2Shantou University, China; 3Dongguan University of Technology, China; 4Cancer Hospital of Shantou University Medical College, China. Autoantibodies against New York esophageal squamous cell cancer 1 (NY-ESO-1) are essential for diagnosing esophageal cancer. This study introduces a surface plasmonic tilted fiber Bragg grating (TFBG) biosensor designed to detect NY-ESO-1 antibody and investigate its specificity.

JTu1A.9
Factors Influencing the Behaviour of FBG Sensors for Temperature Measurements, Tommaso Carlesi1,2, Patrice Mégret1; 1University of Mons, Belgium; 2Environmental and Industrial Flow, Von Karman Institute for Fluid Dynamics, Belgium. Investigating Fiber Bragg Gratings (FBG) behavior in varied fluid environments for temperature measurements. Analysis includes secondary effects and liquid metal influence on peak spectrum.

JTu1A.10
Fluoride Long Period Grating Developed Using Filament Fusion Splicer, Antreas Theodosiou2,1, Yauhen Baravets2, Kirill Grebnev3, Maria Chernysheva3, Pavel Honzatko2, Pavel Peterka2; 1Lumoscribe Ltd., Cyprus; 2Institute of Photonics and Electronics, Czechia; 3Leibniz Institute of Photonic Technology, Germany. We report on the first fabrication of long period grating in ZBLAN fiber using filament fusion splicer. The grating has been designed to operate at 1900-nm range. The sensitivity of the grating with respect to the axial tension has been investigated.

JTu1A.11
Laser-Induced Fabrication of Micro-Optics on Bioresorbable Calcium Phosphate Glass, Devanarayanan M. Menon1, Nadia G. Boetti2, Davide Janner1; 1Politecnico di Torino - DISAT, Italy; 2LINKS Foundation, Italy. We present a flexible and precise technique to obtain microoptics in a bioresorbable phosphate glass by laser processing. Tuning the laser parameters we obtained different micro-optic shapes from hyperbolic to parabolic lenses and diffraction gratings.
JTu1A.12
Reference Wavelength Comb Based on High Order Fiber Bragg Grating for FBG Optical Interrogators, Romain Cotillard\textsuperscript{1}, Nicolas Roussel\textsuperscript{1}; \textsuperscript{1}CEA, France. We use a High Order Fiber Bragg Grating as an all-fiber reference wavelength comb for a FBG measurement system based on a tunable VCSEL source.

JTu1A.13
Data Analysis Algorithm to Evaluate Temperature Tendency From Locomotives Diesel Engines, Gabriel Martelli\textsuperscript{1}, Eduardo H. Dureck\textsuperscript{1}, Felipe Mezzadri\textsuperscript{1}, Cicero Martelli\textsuperscript{1}, Jean Carlos Cardozo da Silva\textsuperscript{1}; \textsuperscript{1}Federal University of Technology-Paraná, Brazil. The proposed algorithm interprets locomotive engine oil temperature data via the FBG sensor system, conducting a thorough analysis, reducing false alarms, and enhancing operational safety and precision compared to previous methods.

JTu1A.14
High-Temperature Wavelength Drift Comparison of Type II FBGs Written in Different Types of Single Mode Fiber, Robert B. Walker\textsuperscript{1}, Cyril Hnatovsky\textsuperscript{1}, Stephen J. Mihailov\textsuperscript{1}, Manny De Silva\textsuperscript{1}, Ping Lu\textsuperscript{1}, Huimin Ding\textsuperscript{1}; \textsuperscript{1}National Research Council Canada, Canada. Type II Fiber Bragg Grating (FBG) wavelength drift is reported and compared for gratings in single mode fibers, having different diameter and dopant configurations. Some fibers respond with less drift than others.

JTu1A.15
Large Arrays of Low Loss Type II FBGs Written With a Phase Mask Through a Polyimide Coating, Robert B. Walker\textsuperscript{1}, Cyril Hnatovsky\textsuperscript{1}, Stephen J. Mihailov\textsuperscript{1}, Ping Lu\textsuperscript{1}, Manny De Silva\textsuperscript{1}, Huimin Ding\textsuperscript{1}; \textsuperscript{1}National Research Council Canada, Canada. Practical quasi-distributed sensing with Fiber Bragg Gratings (FBGs) depends on the repeatable fabrication of numerous, mechanically robust, low loss FBGs. This work reports an array of 1008 FBGs written with a phase mask through polyimide.

JTu1A.16
Femtosecond Laser Direct Writing of Polarization-Controllable DBR Fiber Lasers for Harsh Environmental Sensing, Xizhen Xu\textsuperscript{1}, Jun He\textsuperscript{3}, Runxiao Chen\textsuperscript{1}, Yiping Wang\textsuperscript{1}; \textsuperscript{1}Shenzhen University, China. We propose the fabrication of polarization-controllable DBR FLs by using a slit beam shaping femtosecond laser point-by-point technology. Experimental results show the fabricated DBR FL can withstand a high temperature up to 800 degree.

JTu1A.17
Withdrawn

JTu1A.18
A Free Space Optical Link Model for C-Band Data and Power Transmission, Idriss A. Ali\textsuperscript{1}, Paige Wilson\textsuperscript{1}, Meghan N. Beattie\textsuperscript{1}, Ryan Hogan\textsuperscript{3}, Narmada Rajaram\textsuperscript{1}, Ross Cheriton\textsuperscript{2}, Ahmad Atieh\textsuperscript{2}, Karin Hinzer\textsuperscript{1}; \textsuperscript{1}University of Ottawa, Canada; \textsuperscript{2}National Research Council, Canada; \textsuperscript{3}Optiwave Systems Inc., Canada. We have modelled a free space optical (FSO) channel transmitting data and power at 1550 and 1520 nm, respectively, under various meteorological conditions. Quadratic Phase-Shift Keying is predicted to have the longest viable FSO range.
JTu1A.19
All-Optical Switch and Logic Gates Using Phase Asymmetries in High-Q Resonators, Arghadeep Pal1,2, Alekhya Ghosh1,2, Shuangyou zhang1, Lewis J. Hill1, Toby Bi1,2, Pascal Del'Haye1,2; 1Max-Planck-Inst Physik des Lichts, Germany; 2Physics, Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany. We demonstrate an optical switch and propose designs of photonic logic gates exploiting the Kerr-effect induced enhancement of phase asymmetries. This will be of immense importance in integrated all-optical computing.

JTu1A.20
Room-Temperature Sputtered Silicon Nitride for Soliton Microcombs, Shuangyou zhang1, Toby Bi1,2, Irina Harder1, Olga Ohletz1, Florentina Gannott1, Alexander Gumann1, Eduard Butzen1, Yaojing Zhang1, Lewis J. Hill1, Pascal Del'Haye1; 1Max-Planck-Inst Physik des Lichts, Germany; 2Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany. We present ultralow-loss, high-thickness silicon nitride photonic circuits fabricated using room-temperature sputtering. After 800 °C annealing, we achieve propagation losses of 3.5 dB/m, enabling ring resonators with optical quality factors exceeding 10 million.

JTu1A.21
Silicon Nitride Based Planar Lightwave Circuits for Coherent Optics, Jong-Hoi Kim1, Sang-Ho Park1, Young-Tak Han1, Seo-Young Lee1, Honghwi Park1, Dong-Hun Lee1, Shin-Mo An1, Won-Seok Han1, Jang-Uk Shin1; 1Electronics and Telecom Research Inst, Korea (the Republic of). We present planar lightwave circuits based on silicon nitride waveguides platform to realize monolithic integration of polarization beam splitters, optical 90-degree hybrids, variable optical attenuators, and micro-ring resonators for coherent detection.

JTu1A.22
Dispersion Engineering in Silicon Nitride Ring Resonators via Partial Sidewall Modulation, Masoud Kheyri1,2, Shuangyou zhang1, Toby Bi1,2, Arghadeep Pal1,2, Hao Zhang1,4, Yaojing Zhang1,3, Abdullah Alabbadi1,2, Haochen Yan1,2, Alekhya Ghosh1,2, Lewis J. Hill1, Pablo Bianucci5, Eduard Butzen1, Florentina Gannott1, Alexander Gumann1, Irina Harder1, Olga Ohletz1, Pascal Del'Haye1; 1Max Planck institute for the science of light, Germany; 2Department of Physics, Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany; 3The Chinese University of Hong Kong, China; 4National Key Laboratory of Microwave Photonics, Nanjing University of Aeronautics and Astronautics, China; 5Department of Physics, Concordia University, Canada. We propose a method for dispersion engineering in silicon nitride microresonators via mode splitting. Mode splitting is induced by partially modulating the resonator inner-sidewall at four different segments. We report dispersion improvement over a range 100 nm.

JTu1A.23
Time-Domain Analysis of a Reflective Kerr Microcomb, Jean-Michel Vallée1, Wei Shi1; 1Centre d'optique, photonique et laser (COPL), Laval university, Canada. We introduce a structure based on a reflective nonlinear microring for microcomb generation. By leveraging finite difference time-domain methods in our simulations, we offer a novel approach to microcomb development.
Optica Advanced Photonics Session Guide

Disclaimer: this guide is limited to technical program with abstracts and author blocks as of 21 July. For updated and complete information with special events, reference the online schedule or mobile app.

JTu1A.24
Integrated Photon Pairs Source Based on Counter-Propagating Spontaneous Four Wave Mixing in a Silicon Nitride Chip, Gerardo Rodríguez Becerra1; 1Photonics, Centro de Investigaciones en Óptica A.C., Mexico. We report the design of an on-chip integrated photon pair source based on Counter Propagating Spontaneous Four Wave Mixing (CP-SFWM) capable of generate separable photon pairs with narrow bandwidth.

JTu1A.25
Robust Structural Design and Fabrication of High-Efficiency Functional Metasurfaces, Po-Jui Chen1, Chia-Wei Lu2, Chin-Chuan Wu1, Wen-Chin Hsieh1, Chung-Chih Wu1; 1Graduate Institute of Electronics Engineering, National Taiwan University, Taiwan; 2Graduate Institute of Photonics and Optoelectronics, National Taiwan University, Taiwan. Incomplete etching of nanostructures would reduce transmission of metasurfaces by 10%-20%. By over-etching the nanostructures, transmission can reach a value similar to or even higher than the nanostructures being precisely etched to the substrate surface.

JTu1A.26
Numerical Estimation of a Propagation Loss Evaluation Using an Asymmetric Mach-Zehnder Interferometer, Kodai Sato1, Hiroshi Fukuda1; 1Chitose Institute of Science and Technology, Japan; 2Silicon Research Center, Japan. This study numerically estimated the effectiveness of an evaluation method using an asymmetric Mach-Zehnder interferometer and an embedded photodiode and revealed that this technique is applicable for propagation loss characterization in a practical range.

JTu1A.27
A Rib Waveguide Design for Reduction of Leakage Loss of TM Modes, Mir Hammadi1, Matthew Barrett1, Muhammad Z. Alam1; 1Queens University, Canada. We propose a rib waveguide design to address the leakage radiation inherent to silicon rib waveguides. The guide provides good tolerance to fabrication imperfections and flexibility in independent control of orthogonal polarizations.

JTu1A.28
A Switchable Polarization Converter on an Indium Phosphide Membrane, Sander Reniers1, Jos van der Tol1, Kevin Williams1, Yuqing Jiao1; 1TU/e, Netherlands. We present a switchable polarization converter on an indium phosphide membrane, using an simple fabrication process. A polarization extinction ratio above 19 dB and insertion loss below 0.5 dB are demonstrated in simulation.

JTu1A.29
Higher Order Mode Analysis in Frequency Selective Negative Curvature Fibers, Muhammad Zain Siddiqui2, Ahmet E. Akosman1, Mustafa Ordu2; 1Roger Williams University, USA; 2UNAM - Institute of Materials Science and Nanotechnology, Turkey. A novel negative curvature hollow-core fiber is numerically designed capable of filtering specific frequencies. The six-tube silica fiber strongly favors fundamental mode transmission over higher order modes despite uneven positioning of cladding elements.
JTu1A.30
Exploring the Impact of Gap Compensation Tubes on Enhancing the Performance of Anti-Resonant Fibers, Zhaoyang Zhang¹, Yuemei Li¹, Ziyang Xiao², Yao Guo¹, Zheng Liu¹, Haobo Guo¹; ¹Beijing University of Posts and Telecomm, China; ²Information and Communications branch, Jiangxi Electric Power Company, China. By introducing Gap Compensation tubes, we have reduced the LP01 mode loss to $3.487 \times 10^{-6}$ dB/km, setting a new record in anti-resonant fibers. This paper will delve into the effects of Gap Compensation tubes.

JTu1A.31
Over Two-Octave Supercontinuum Generation for OAM$_{19,1}$ Mode in Air-Core Ring Fiber, Xiaoke Wu¹, Pengfei Wang¹, Jian Yang², Yuanpeng Liu², Zhongqi Pan³, Yang Yue¹; ¹Xi’an Jiaotong University, China; ²Nankai University, China; ³University of Louisiana at Lafayette, USA. An air-core ring fiber with flat and near-zero dispersion is designed and simulated for broadband OAM$_{19,1}$ supercontinuum generation. A 2410-nm supercontinuum is formed from 770 nm to 3180 nm at -40 dB, covering more than 2-octave bandwidth.

JTu1A.32
Tailoring Strut Thicknesses for Selective THz Negative Curvature Fiber Sensors, Ethan Howard¹, Julia Ward¹, Ethan Neidt¹, Riley Como¹, Ahmet E. Akosman¹; ¹Roger Williams University, USA. A cascaded hollow-core negative curvature fiber design is proposed for selective THz sensing. Numerical investigations suggest significant spectral shift up to 0.1 THz in relative sensitivities, enabling differentiation between analytes at certain design frequencies.

JTu1A.33
Hyperbolic Metamaterial Enhancement Based High Sensitivity Side-Polished Fiber SPR Sensors, Shiqi hu¹, Yunhan Luo¹, Yaofei Chen¹, Lei Chen¹, Gui-shi Liu¹, Zhe Chen¹; ¹Jinan University, China. Hyperbolic metamaterials are novel materials that excite the surface plasmon resonance (SPR) by their unique hyperbolic dispersion properties. Here, we design a composite-based fiber HMM-SPR sensor and apply it to magnetic field and temperature sensing. It provides a new research avenue for the application of high-sensitivity fiber sensors.

JTu1A.34
Acceleration of Optomechanical Droplets, Gordon Robb¹, Josh Walker¹, Gian-Luca Oppo¹, Thorsten Ackemann¹; ¹University of Strathclyde, United Kingdom. We describe a scheme for acceleration sensing using stable optomechanical droplets formed when a Bose–Einstein Condensate is illuminated by a far off-resonant optical pump field and by its retroreflection from a feedback mirror.

JTu1A.35
Standing-Wave Patterns Visualization on a Toroidal Microresonator, Haochen Yan¹,2, Alekhya Gosh¹,2, Arghadeep Pal¹,2, Hao Zhang¹, Toby Bi¹,2, George Ghalanos¹, Shuangyou zhang¹, Lewis J. Hill¹, Yaojing Zhang¹, Yongyong Zhuang¹,3, Jolly Xavier¹,4, Pascal Del'Haye¹,2; ¹Max-Planck Institute, Science of Light, Germany; ²Physics, Friedrich Alexander University Erlangen-Nuremberg, Germany; ³Electronic Materials Research Laboratory, Xi’an Jiaotong University, China; ⁴SeNSE, Indian Institute of Technology, India. The standing wave patterns generated on a microresonator by bidirectional pumping can be directly visualized by a near-infrared camera. We quantitatively analyze the scattered light intensity and apply the pattern for sub-wavelength accuracy distance measurement.
JTu1A.36
Bound State Soliton Rain Generation in Femtosecond Fiber Laser Using Mxene Saturable Absorber, Kwanil Lee¹; ¹Korea Institute of Science & Technology, Korea (the Republic of).
This study highlights the potential of DMSO-Ti₃C₂Tx MXene in enhancing the stability of ultrafast fiber lasers, opening avenues for exploring soliton rains in nonlinear optical dynamics.

JTu1A.37
Dispersion Engineering of Integrated Gallium Phosphide Fabry-Pérot Resonators, Alberto Nardi¹,2, Thomas Karg¹, Alisa Davydova², Johann Riemensberger³,², Tobias Kippenberg², Paul Seidler¹; ¹IBM Research Europe, Zurich, Switzerland; ²Swiss Federal Institute of Technology Lausanne (EPFL), Switzerland; ³Norwegian University of Science and Technology, Norway.
We present a protocol to engineer the dispersion of integrated Fabry-Pérot resonators made of gallium phosphide by taking into account the group index of the light propagating into integrated chirped mirrors, enabling exotic dispersion profiles.

JTu1A.38
Real-Time Coupling Induced Linear and Nonlinear Light Dynamics in Coupled Microresonators, Arghadeep Pal¹,2, Alekhya Ghosh¹,2, Shuangyou Zhang¹, Lewis J. Hill¹, Haochen Yan¹,2, Hao Zhang¹,³, Toby Bi¹,2, Abdullah Alabbadi¹,2, Pascal Del'Haye¹,2; ¹Max-Planck-Inst Physik des Lichts, Germany; ²Physics, Friedrich Alexander University, Germany; ³National Key Laboratory of Microwave Photonics, Nanjing University of Aeronautics and Astronautics, China.
We study the linear and nonlinear light interactions in coupled resonators. In our experiments, we can control the coupling gap between two resonators instantaneously to investigate symmetry breaking of hybridized counterpropagating modes.

JTu1A.39
Graphdiyne Oxide as a Promising Candidate for Nonlinear Optical Switching Applications, Leiming Wu¹; ¹Guangdong University of technology, China.
Graphene oxide demonstrates a significant nonlinear optical response with light intensity dependence upon stimulation by light waves. Taking advantage of this characteristic, graphyne oxide shows important application value in optical switching.

JTu1A.40
Pulse Formation in the Stokes Region Through Dispersion Tailoring in Silica Microresonators, Ryo Otake¹, Riku Imamura¹, Shun Fuji¹, Takasumi Tanabe¹; ¹Keio University, Japan.
We show numerically that a pulse with a peak power of ~200W is formed in the Stokes region in a silica microresonator when careful dispersion tailoring is performed.

JTu1A.41
Enhancing Solar Cell Efficiency With Tunable Transverse Modal Response to Natural Light of a Linear Chiral Thin Film Array, Monish Chatterjee¹, Akram Muntaser¹; ¹University of Dayton, USA.
We propose the design of a chiral thin film resonator array aligned horizontally illuminated by a collimated linear p-polarized plane wave. This analysis aims to optimize the transmission of light; such a tuned high intensity transmission may be utilized to maximize the conversion efficiency of solar cells with tunable bandgaps.
JTu1A.42
Tight Focusing of Obstructed Radially-Azimuthally Polarized Higher Order Poincare Sphere Beams, Sushanta K. Pal1, Leslie Rusch1; 1Université Laval, Canada. We study the intensity landscapes of obstructed radially-azimuthally polarized higher-order Poincare sphere beams under tight focusing conditions. These optical fields can be used to achieve strong longitudinal and transverse components at the focal plane.

JTu1A.43
Engineering of Vanadium Dioxide for Reconfigurable Optics by Combining Metal Doping and Defect Engineering, Jin-Woo Cho1, Jonathan King1, Dung Quach2, Martin Hafermann3, Karla Paz3, Hongyan Mei1, Shenwei Yin1, Tanuj Kumar1, Joseph Andrade2, Colin Hessel2, Carsten Ronning3, David Woolf2, Mikhail A. Kats1; 1University of Wisconsin-Madison, USA; 2Physical Sciences Inc., USA; 3University Jena, Germany. We demonstrate that metal doping and defect engineering can work in tandem to modify phase-transition temperature and hysteresis of vanadium dioxide films, enabling new opportunities for reconfigurable infrared optics.

JTu1A.44
A Template-Matching-Based Algorithm for Optical Microscope Image Stitching, Vikesh S. Bhadouria1, You-rim Park1, Joo-beom Eom1; 1Department of Biomedical Science, Dankook University, Korea (the Republic of). This paper proposes a template-based method to enhance image-stitching in whole slide microscopy, tackling stage misalignment and flat field issues, improving accuracy and efficiency despite mechanical instability.

JTu1A.45
Characterization of Zinc Sulfide Waveguides for Nonlinear Photonics, Antoine Lemoine1, Antoine Létoublon1, Alex Naim1, Thomas Batte1, Charles Cornet1, Yannick Dumeige1, Christophe Levallois1, Yoan Léger1; 1Univ Rennes, INSA Rennes, CNRS, Institut FOTON - UMR 6082, F-35000 Rennes, France, France. This paper presents the advantages of zinc sulfide (ZnS) for second order nonlinear photonics through structural and optical characterizations of ZnS thin films and waveguides.

JTu1A.46
Withdrawn

JTu1A.47
Analysis of the Optical Behavior of Diffuse Reflectance in Polycrystalline Yttrium–Iron Garnet Synthesized by Different Methods and its Effect to Estimate Eg by Tauc Plot, Lis Tamayo-Rivera1, Anette López-Sierra1, Diana Salvador-García1, Joel E. Valdivieso-Villegas1, María del Pilar Gutiérrez-Amador1, Ariadna Sánchez-Castillo1; 1Autonomous University of Hidalgo State, Mexico. Optical characterization of colored samples allowed us to observe clear differences in amplitude and position of reflectivity bands around the fundamental absorption energy-edge; so, different criteria to estimate Eg by Tauc plot are discussed.

JTu1A.48
Withdrawn
JTu1A.49
Defect Superlattice Optical Solitons Supported by Centrosymmetric Photonic
Superlattice, Draupath Umesh1, Gaurang Potdar1, Aavishkar Katti1; 1MIT World Peace
University, India. Optical spatial gap solitons are analyzed in centrosymmetric photorefractive
media with an embedded defect superlattice for the first time. Double and multi hump solitons
existence and characteristics are studied across both band gaps.

JTu1A.50
Exploring Bistable Properties in AgCl-Ag Multilayer Nonlinear Structures for Blood
Serum Analysis, Iuliia Riabenko1, Konstantin Beloshenko1; 1V. N. Karazin Kharkiv National
Universit, Ukraine. Silver transfer to interference minima in AgCl-Ag films creates periodic
structures through interaction with the waveguide TE0-mode. This phenomenon enables the
recording of Raman spectra of biological samples, potentially enhancing low-intensity signal
registration.

14:00 -- 16:00
Room: 206A
BTu2A • Symposium on Optical Fiber Sensors for Extreme Environments II
Presider: Tobias Habisreuther; Leibniz Institute of Photonic Tech., Germany

BTu2A.1 • 14:00 Invited
Sensing in Extreme High Temperature Environments With Regenerated Fiber Bragg
Gratings, Johannes Roths1, Qiang Bian2, Andrea Stadler1, Fabian Buchfellner1, Alexander
Roehrl1; 1Photonics Laboratory, Munich University of Applied Sciences, China; 2College of
Meteorology and Oceanography, National University of Defense Technology, China. In recent
years, multipoint temperature sensors based on regenerated fibre Bragg gratings (RFBG) have
achieved a high degree of maturity. Specific sensor characteristics and applications in
metallurgy, gas turbine and aircraft engine instrumentations, are reviewed.

BTu2A.2 • 14:30
Nanoscale Porous Silica Sensing Layers on Tilted FBGs Made by Flame Spray Pyrolysis,
Zayne Ramotar1, Qianzhu Li2, Jacques Albert2, Reza Kholghy1, Hubert Jean-Ruel2; 1Department
of Mechanical and Aerospace Engineering, Carleton University, Canada; 2Department of
Electronics, Carleton University, Canada. Nanoscale coatings of pure porous silica are
deposited on optical fibers in a few minutes and atmospheric conditions. A tilted FBG in the fiber
enables measurements of the coating and of its sensing properties.

BTu2A.3 • 14:45
Point-by-Point Femtosecond Fiber Bragg Gratings Behavior at High Temperatures,
Matilde Sosa1,2, Maxime Cavillon2, Thomas Blanchet1, Matthieu Lancry2, Guillaume Laffont1;
1Université Paris-Saclay, CEA List, France; 2Institut de Chimie Moléculaire et des Matériaux
d’Orsay (ICM2M/SP2M/MAP), Université Paris-Saclay, France. Void-based fiber Bragg gratings
were studied from quantitative phase microscopy and spectral measurements, under isochronal
annealing experiments up to 1250°C. We reveal a link between the micro-void deformation and
the Bragg reflectivity degradation at high temperatures.
BTu2A.4 • 15:00
High Temperature Resistance fs-FBGs in Large Diameter Optical Fibers, Karima Chah¹, Damien Kinet¹,², Corentin Guyot², Christophe Caucheteur¹; ¹UMONS / Faculté Polytechnique de Mons, Belgium; ²B-SENS, Belgium. We subject Fs-FBGs in silica optical fibers of 125, 200 and 400 µm diameters to high temperature cycling. Post-annealing tensile tests confirm the higher mechanical resistance of large diameter optical fibers compared to standard ones.

BTu2A.5 • 15:15
Withdrawn

BTu2A.6 • 15:30 Invited
Interferometric Inscription of Sapphire Fiber Bragg Gratings and Temperature Diagnosis Using These Gratings in Applications Above 1400°C, Tobias Habiserether¹, Kerstin Schröder¹, René Eisermann², Adrian Lorenz¹, Stephan Krenek²; ¹Leibniz Institute of Photonic Tech., Germany; ²Physikalisch-Technische Bundesanstalt, Germany. The paper reports the inscription of fiber Bragg gratings by 400nm femtosecond laser pulses using an interferometer setup. High temperatures probes were assembled, calibrated using temperature fixed-points and applied in industrial processes at T>1400°C.

14:00 -- 16:00
Room: 205A
ITu2B • Optical Communications and Computing
Presider: Nathalie Vermeulen; Vrije Universiteit Brussel, Belgium

ITu2B.1 • 14:00 Invited
Ultrafast Membrane Lasers With Optical Feedback for Optical Interconnects and Neuromorphic Computing, Pandelis Diamantopoulos¹, Takuro Fujii¹, Suguru Yamaoka¹, Hidetaka Nishi¹, Koji Takeda¹, Shinji Matsuo¹; ¹NTT Device Technology Labs, Japan. We present the first 16-channel membrane laser array exhibiting photon-photon resonance, achieving 50-GHz bandwidths and <130 fJ/bit energies, for 1.6 Tbps transceivers. Additionally, we have showcased ultra-fast and energy-efficient spiking dynamics for neuromorphic applications.

ITu2B.2 • 14:30
BER Measurement in Data Transmission With a Double-Pass SOA, Hiroya Sakumoto¹,², Yi Wang², Desalegn W. feyisa², Sander Reniers², Ripalta Stabile², Kevin Williams², Yuqing Jiao²; ¹Department of Electrical Engineering and Information Systems, The University of Tokyo, Japan; ²Eindhoven Hendrik Casimir Institute, Eindhoven University of Technology, Netherlands. We demonstrate transmitting NRZ-OOK PRBS31 signal at 25 Gb/s with a double-pass SOA, showing a 61% gain boosted with the same electrical power consumption while keeping almost the same BER as a conventional single-pass SOA.

ITu2B.3 • 14:45
Flexible Opto-Electronic Logical Gate Circuit Comprising Waveguide-Based Interferometer and Photodetector, Koichi Takiguchi¹, Hironori Nishihara¹; ¹Department of Electrical and Electronic Engineering, Ritsumeikan University, Japan. We report an opto-electronic logical gate with flexible operation, which consists of an integrated-optic symmetric
Mach-Zehnder interferometer and a balanced photodetector. We show Boolean AND and NAND computations of 40 Gbit/s signals with the gate.

**ITu2B.4 • 15:00**
Compact TE-Pass Polarizer Covering Full Communication Band With Ultra-High Extinction Ratio in O-Band and C+L Band, Zhuoran Wang1; 1McGill University, Canada. We design and simulate a hybrid plasmonic waveguide TE-pass polarizer operating from 1260 - 1675 nm with an extinction ratio >18 dB, and exceeding 35 dB in the O band and C+L band with bandwidths of 50 nm and 120 nm, respectively.

**ITu2B.5 • 15:15**
Proposal for a 500 GHz Silicon Photonic Modulator, Conglin Sun1,2, Minkyu Kim1, Pol Van Dorpe1,2, Francky Catthoor1,3, Mikael Mazur4, Joris Van Campenhout1, Christian Haffner1, Dennis Lin1; 1Interuniversity Microelectronics Centre, Belgium; 2Department of Physics and Astronomy Research unit Quantum Solid-State Physics, KU Leuven, Belgium; 3Department of Electrical Engineering (ESAT), KU Leuven, Belgium; 4Nokia Bell Labs, USA. We propose a silicon modulator concept utilizing organic electro-optical Pockels materials in a vertical gap configuration to reach 500 GHz bandwidth. Simulations show that optical losses can be ~0.5 dB/~0.2 dB for a 500 GHz/200 GHz design with an Vπ of 13.3 V/5.3 V respectively.

**ITu2B.6 • 15:30 Invited**
Non-Reciprocal Materials for Photonic in-Memory Computing, Nathan Youngblood1, Paolo Pintus2,3, Mano Dumont3, Viveswan Shah1, Toshiya Murai5, Yuya Shoji4, Duanni Huang3, John Bowers3, 1University of Pittsburgh, USA; 2Physics, University of Cagliari, Italy; 3ECE, University of California, Santa Barbara, USA; 4Electrical and Electronic Engineering, Tokyo Institute of Technology, Japan; 5Platform Photonics Research Center, National Institute of Advanced Industrial Science and Technology (AIST), Japan. Non-reciprocal platforms can offer several key advantages for scalable and efficient photonic computing. In this talk, I will present our recent experimental work validating the use of non-reciprocal materials to implement high-endurance memory for photonic computing.

14:00 -- 16:00
Room: 206B
NpTu2E • Applications of Nonlinear Optics
Presider: Sile Nic Chormaic; Okinawa Inst of Science & Technology, Japan

**NpTu2E.1 • 14:00 Invited**
NLO Microscopy, Randy A. Bartels1; 1Morgridge Institute & U of Wisconsin, USA. Abstract not available.

**NpTu2E.2 • 14:30 Invited**
Miniaturized Nonlinear Micro-Endoscopes, Dylan Septier2, Eloïse Lefebvre1,2, Gaëlle Brévalle-Waslewski2, Naveen Gajendra Kumar2, Yong Jian Wang2, Attila Kaszas2, Hervé Rigneault3, Alexandre Kudlinski1; 1Univ Lille 1 Laboratoire PhLAM, France; 2Lightcore Technologies, France; 3Institut Fresnel, Aix Marseille Univ, Centrale Med, France. We report miniaturized and flexible micro-endoscopes based on double-clad negative curvature hollow core fibers. They allow to perform multiphoton, second and third harmonic and coherent anti-Stokes Raman scattering imaging.
NpTu2E.3 • 15:00
Study of Composite Optical Nanofibers for 2\textsuperscript{nd} and 3\textsuperscript{rd} Order Nonlinearities, Sylvie Lebrun\textsuperscript{1}, Abderrahim Azzoune\textsuperscript{2}, Maha Bouhadida\textsuperscript{1}, Théo Dampt\textsuperscript{3}, Laurent Divay\textsuperscript{3}, Mathieu Fauvel\textsuperscript{3}, Christian Larat\textsuperscript{3}, Jean-Charles Beugnot\textsuperscript{4}; \textsuperscript{1}Université Paris Saclay, Institut d’Optique Graduate School, CNRS, Laboratoire Charles Fabry, France; \textsuperscript{2}Ecole Militaire Polytechnique, Laboratoire Systèmes Lasers, Algeria; \textsuperscript{3}Thales Research and Technology, France; \textsuperscript{4}Institut Femto-ST, CNRS, Université Bourgogne, Franche-Comté, France. We present the design of composite optical nanofibers coated with different nonlinear materials for the realization of 2\textsuperscript{nd} and 3\textsuperscript{rd} order nonlinear effects.

NpTu2E.4 • 15:15
1-GHz Dual-Comb Supercontinuum From a Single Nonlinear Fiber Using Polarization Multiplexing, Alexander M. Heidt\textsuperscript{1}, Sandro Camenzind\textsuperscript{2}, Benoît Sierro\textsuperscript{1}, Anupamaa Rampur\textsuperscript{1}, Benjamin Willenberg\textsuperscript{2}, Ursula Keller\textsuperscript{2}, Christopher R. Philips\textsuperscript{2}; \textsuperscript{1}Universität Bern, Switzerland; \textsuperscript{2}Institute for Quantum Electronics, ETH Zurich, Switzerland. We report 1-GHz watt-level ultra-low noise dual-comb supercontinuum generation in a single birefringent photonic crystal fiber using polarization multiplexing. Both combs originate from the same laser cavity and are broadened to > 450 nm bandwidth.

NpTu2E.5 • 15:45
All-Fiber Broadband mid-Infrared Supercontinuum Generation in \textit{As$_2$S$_3$}-Polycarbonate Hybrid Microtaper, Md. Hosne Mobarok Shamim\textsuperscript{1}, Imtiaz Alamgir\textsuperscript{1}, Martin Rochette\textsuperscript{1}; \textsuperscript{1}McGill University, Canada. We present an all-fiber supercontinuum source spanning over the spectral range of 1.2-3.9 µm from an \textit{As$_2$S$_3$}-polycarbonate hybrid microtaper. This is the broadest supercontinuum obtained from a robust polymer clad hybrid microtaper.

14:00 -- 16:00
Room: 205C
NoTu2D • Emerging Imaging Techniques for Biology and Materials Science (Computational Methods)
Presider: Alon Gorodetsky; University of California Irvine, United States

NoTu2D.1 • 14:00 Tutorial
Holotomography and Artificial Intelligence: Label-Free 3D Imaging, Classification, and Inference of Live Cells, Tissues, and Organoids, YongKeun Park\textsuperscript{1}; \textsuperscript{1}Korea Advanced Inst of Science & Tech, Korea (the Republic of). Holotomography (HT) is a powerful label-free imaging technique that enables high-resolution, three-dimensional quantitative phase imaging (QPI) of live cells and organoids through the use of refractive index (RI) distributions as intrinsic imaging contrast\textsuperscript{1-3}. Similar to X-ray computed tomography, HT acquires multiple two-dimensional holograms of a sample at various illumination angles, from which a 3D RI distribution of the sample is reconstructed by inversely solving the wave equation.

NoTu2D.2 • 15:00 Invited
3D Inverse-Scattering in Biological Samples, Shwetadwip Chowdhury\textsuperscript{1}; \textsuperscript{1}University of Texas at Austin, USA. I will cover the computational imaging frameworks that support our recent efforts for 3D imaging of multiple-scattering samples. I will specifically focus on our choice of large-scale nonlinear and nonconvex inverse-scattering techniques. Additionally, I will share recent
findings from applying these methods to biological samples, and I will explore ongoing challenges and prospective avenues for future research.

**NoTu2D.3 • 15:30 Invited**  
**On the use of Machine Learning for Quantifying Complex Processes, With Application to Retina Vasculature and Glaucoma Diagnostics**, George Barbastathis\(^1,2\), Sandip Mondal\(^2\), Thiara S. Ahmed\(^3\), Bingayo Tan\(^4,3\), Qihang Zhang\(^3\), Fabian Braeu\(^4\), Liangcai Cao\(^5\), Michael Girard\(^4\), Leopold Schmetterer\(^4,3\), Aung Tin\(^4\); \(^1\)Massachusetts Institute of Technology, USA; \(^2\)Singapore-MIT Alliance for Research and Technology Centre, Singapore; \(^3\)Nanyang Technological University, Singapore; \(^4\)Singapore Eye Research Institute, Singapore; \(^5\)Tsinghua University, China. We investigate the mapping between flows on complex graphs, such as retina vasculature, and spatial-temporal fluctuations in the far field. Unsupervised and supervised learning algorithms can be used to invert these maps and obtain quantitative information about connectivity and blood flow.

**14:00 -- 16:00**  
**Room: 2101**  
**NeTu2C • SDM and Multi-band Networks**  
*Presider: Ruben Luis; NICT, Japan*

**NeTu2C.1 • 14:00 Invited**  
Withdrawn

**NeTu2C.2 • 14:30 Invited**  
**High Capacity Optical Transmission Using Spatial Division Multiplexing**, Georg Rademacher\(^1\); \(^1\)Universität Stuttgart, Germany. Space-division multiplexing offers a tremendous potential for high speed optical fiber communications systems. In this talk, we will review key components and technologies required to implement SDM transmission in multi-mode and multi-core fibers.

**NeTu2C.3 • 15:00 Invited**  
**Raman Amplifiers for Multi-Band Optical Transmission Systems**, Mingming Tan\(^1\), Pratim Hazarika\(^1\), Dini Pratiwi\(^1\), Wladek Forysia\(^1\); \(^1\)Aston University, United Kingdom. We showcase effective strategies to mitigate undesirable pump-to-pump power transfer in wideband Raman amplifiers, encompassing a spectrum of up to 210nm, inclusive of E, S, C, and L bands.

**NeTu2C.4 • 15:30**  
**MPI Impact in C+L+S Multiband Transmission Reach**, Luis G. Cancela\(^1,2\), João O. Pires\(^3,2\); \(^1\)Iscte - Instituto Universitário de Lisboa, Portugal; \(^2\)Instituto de Telecomunicações, Portugal; \(^3\)Instituto Superior Técnico, Portugal. Multipath interference (MPI) impact is assessed in a C+L+S multiband transmission scenario. For a typical -34 dB/span MPI, transmission reach in the L-band suffers a 20% reach penalty considering the QPSK modulation format.
Optica Advanced Photonics Session Guide

Disclaimer: this guide is limited to technical program with abstracts and author blocks as of 21 July. For updated and complete information with special events, reference the online schedule or mobile app.

14:00 -- 16:00
Room: 2104
SpTu2H • Next Generation PON, Fronthaul and Data Center Networks
Presider: Molly Piels; OpenLight, United States

SpTu2H.1 • 14:00 Invited
Softwarization of DSP and Other Physical-Layer Functions for Future Optical Access,
Sang-Yeup Kim1; 1NTT Access Service Systems Laboratories, Japan. This talk covers challenges and opportunities encountered when designing future optical access given the wide variation in service requirements. To address the challenges, we introduce a softwarized platform that offers DSP-oriented access on commodity servers.

SpTu2H.2 • 14:30
Single-Wavelength 100 Gbit/s PS-PAM8 Transmission Over Hybrid Fiber-FSO Links for Data Center Interconnect,
Ahmed Galib Reza1, Lakshmi Narayanan Venkatasubramani1, Anil Raj Gautam1, Liam P. Barry1; 1Dublin City University, Ireland. We demonstrate ≈100 Gbit/s PS-PAM8 transmission over a hybrid intra-data center interconnect link consisting of 1 km SMF and 6 m FSO channels. The BER below the HD-FEC level is achieved with a T-spaced FFE.

SpTu2H.3 • 14:45
RL-Based Digital Pre-Distortion for Drive Signals in Non-Differentiable Channel,
Arash Rabiepoor1, Leslie Rusch1, Ming Zeng1; 1Université Laval, Canada. This paper proposes a novel digital pre-distortion, a technique based on deep reinforcement learning to combat instantaneous nonlinearities in electrical back-to-back communication systems. Simulation results demonstrate its superiority over the case without DPD in terms of bit error rate performance.

SpTu2H.4 • 15:00 Invited
Digital-Analog Mobile Fronthaul With Efficient SNR Scaling,
Yixiao Zhu1, Chenbo Zhang2, Xiansong Fang2, Yicheng Xu1, Ziheng Zhang1, Fan Zhang2, Qunbi Zhuge1, Xiaopeng Xie2, Weisheng Hu1; 1Shanghai Jiao Tong University, China; 2Peking University, China. We overview the principle of hybrid digital-analog radio-over-fiber technique for high-fidelity and high spectral efficiency mobile fronthaul. The SNR scaling law is theoretically derived and compared with the existing radio-over-fiber techniques.

SpTu2H.5 • 15:30
Analog FFE Coefficients Optimization Using MMSE-Based LMS Algorithm in PON Context,
Dylan chevalier1,2, Pascal Scalart3, Gaël Simon1, Laurent Bramerie2, Michel Joindot2, Jérémy Potet1, Mathilde Gay2, Philippe Chanclou1, Monique Thual2; 1Orange Labs, France; 2Institut FOTON - UMR 6082, France; 3IRISA - UMR 6074, France. A novel approach is proposed for Analog Signal Processing (ASP) in enhanced 50G-PON using analog FFE filters based on MMSE technique. Performance are validated through experimental transmission of electrical NRZ signals.
14:00 -- 16:00
Room: 205B
STu2G • Solar Optics
Presider: Mathieu de Lafontaine; University of Ottawa, Canada

STu2G.1 • 14:00 Invited
New Limits for Light-Trapping and Ultrathin Solar Cells, Stéphane Collin\(^1,2\), Maxime Giteau\(^1\); \(^1\)C2N CNRS, France; \(^2\)IPVF, France. We present new upper bounds for light-trapping in solar cells, and we provide an answer to the long-debated question of the best strategy for light-trapping: isotropic scattering using random texturing, or multi-resonant absorption using periodical patterning. We also discuss state-of-the-art ultrathin solar cells and prospects.

STu2G.2 • 14:30
Stationary Solar Concentrators for any Latitude, Gianpaolo Lenarduzzi\(^1\), Tahzinul Islam\(^1\), Thomas Cooper\(^1\); \(^1\)York University, Canada. We introduce a generalized source/acceptance map matching method to design non-tracking concentrators for virtually any latitude. Several practical configurations are explored. A particularly useful arrangement makes use of a pivotable front wall to achieve a seasonally-adaptive design which surpasses the static concentration limit.

STu2G.3 • 14:45
Daylighting System Using Solar Concentrator With Efficient Spectral Utilization of Sunlight, Mayank Gupta\(^1,2\), Zala P. Bharatsinh\(^1\); \(^1\)Department of Physics, Pandit Deendayal Energy University, India; \(^2\)Indian Institute of Technology Delhi, India. Spectral profile of Sunlight is utilized efficiently with solar Fresnel lens as primary and Compound parabolic as secondary concentrator for daylighting. The results of photometric parameters of daylighting are very encouraging with improved optical efficiency.

STu2G.4 • 15:00 Invited
Title to be Announced, Andru Prescod\(^1\); \(^1\)ManTech International Corp., USA. Abstract not available.

STu2G.5 • 15:30
A Roadmap on Optics for Terawatt Scale Photovoltaics, Klaus Jaeger\(^1,2\), Sven Burger\(^2,3\), Urs Aeberhard\(^4\), Esther Alarcon Llado\(^5\), Benedikt Bläsi\(^6\), Bruno Ehrl\(^5\), Wilfried Favre\(^7\), Antonin Fejfar\(^8\), Tristan Gageot\(^9\), Ivan Gordon\(^9,10\), Henning Helmers\(^6\), Oliver Höhn\(^8\), Olindo Isabella\(^10\), Marko Jost\(^11\), Martin Ledinsky\(^9\), Jyotirmoy Mandal\(^12\), Phillip Manley\(^3,2\), Delfina Munoz\(^7\), Juan C. Ortiz Lizzano\(^10\), Ulrich W. Paetzold\(^13\), Aaswath P. Raman\(^14\), Hitoshi Sai\(^15\), Rebecca Saive\(^16\), Martina Schmid\(^17\), Eli Yablonovitch\(^18\), Christiane Becker\(^1\); \(^1\)Helmholtz-Zentrum Berlin für Materialien und Energie GmbH, Germany; \(^2\)Zuse Institute Berlin, Germany; \(^3\)JCMWave GmbH, Germany; \(^4\)Fluxim AG, Switzerland; \(^5\)AMOLF, Netherlands; \(^6\)Fraunhofer ISE, Germany; \(^7\)CEA-INES, LITEN, France; \(^8\)FZU - Institute of Physics of the Czech Academy of Sciences, Czechia; \(^9\)IMEC, Belgium; \(^10\)Delft University of Technology, Netherlands; \(^11\)University of Ljubljana, Slovenia; \(^12\)Princeton University, USA; \(^13\)Karlsruhe Institute of Technology, Germany; \(^14\)University of California Los Angeles, USA; \(^15\)AIST, Japan; \(^16\)University of Twente, Netherlands; \(^17\)Universität Duisburg-Essen, Germany; \(^18\)University of California Berkeley, USA. The ongoing development of photovoltaics into terawatt scale poses a number of challenges where the optics
and photonics communities can contribute. An international consortium recently compiled a roadmap that elaborates on these challenges.

**STu2G.6 • 15:45**  
**Optimization of 1.65 eV Al$_{0.18}$Ga$_{0.82}$as Tunnel Junctions for Monolithic III-v/Si Solar Cell,** May Angelu L. Madarang$^{2,1}$, Rafael Jumar Chu$^{2,1}$, Yeonhwa Kim$^{2,3}$, Eunkyo Ju$^{2,3}$, Tsimafei Laryn$^{1,2}$, Won Jun Choi$^{2}$, Daehwan Jung$^{1,2}$; $^1$Nanomaterials Science and Technology, KIST School at University of Science and Technology, Korea (the Republic of); $^2$Center for Optoelectronic Materials and Devices, Korea Institute of Science and Technology, Korea (the Republic of); $^3$Department of Materials Science and Engineering, Korea University, Korea (the Republic of). We investigate thermally stable, optically transparent 1.65 eV AlGaAs tunnel junctions crucial for interconnecting tandem cells. Devices with 2× 8% Te delta-doping show five orders of magnitude improvement and thermal robustness compared to Si-doped counterparts.

**SoTu2F • Trends in Industry & Commercial Applications**

**SoTu2F.1 • 14:00 Invited**  
**Modern Industrial Processes to Bring Specialty Optical Fibre to Scale,** Julien Roy$^1$; $^1$Coractive, Canada. Specialty Optical Fiber demand and performance have greatly evolved in the last 25 years. In this talk we present the major challenges faced by this industry and how Coractive has embraced these market evolutions.

**SoTu2F.2 • 14:30 Invited**  
**Hollow Core Fibre: a Specialty Fibre With the Dream of Becoming Mainstream,** Francesco Poletti$^1$; $^1$University of Southampton, United Kingdom. Abstract not available.

**SoTu2F.3 • 15:00 Invited**  
**Polarization Maintaining Large-Mode Area Double Clad Fiber Design Strategies to Power-Scale Narrow-Line Width Industrial Lasers Beyond 2 kW,** Clemence Jollivet$^1$; $^1$Coherent Corp, USA. Abstract not available.

**SoTu2F.4 • 15:30**  
Withdrawn

**SoTu2F.5 • 16:00**  
Withdrawn

**SoTu2F.6 • 16:30**  
Withdrawn

16:30 -- 18:30  
Room: 206A  
**BTu3A • Glasses & Gratings in Radiative Environment**  
Presider: Matthieu Lancry; Universite Paris-Saclay, France

**BTu3A.1 • 16:30 Invited**  
**Femtosecond Laser Fabrication Enabled Fiber Optical Sensors for Nuclear Energy Applications: Rad-Hard Sensors, Sensor Fusion, and Machine Learning,** Kevin P. Chen$^1$; $^1$University of Pittsburgh, USA. Abstract note available.
BTu3A.2 • 17:00
Behavior During in-Core Reactor Irradiation at 500°C of Regenerated and Type III Femtosecond FBGs Written in Germano-Silicate Single-Mode Fiber, Rudy Desmarchelier1, Romain Cotillard1, Matthieu Lancty2, Stephane Breaud3, Andrei Goussarov4, Christophe Destouches5, Guillaume Laffont1; 1CEA Paris-Saclay, France; 2Université Paris-Saclay, France; 3CEA Cadarache, France; 4SCK-CEN, Belgium. In-core reactor irradiation of regenerated and type III femtosecond Fiber Bragg Gratings has been realized during the TESCA experiment in the SCK CEN BR2 reactor on the LIBERTY rig. FBG transducers are simultaneously sensitive to environment. In this study we have investigated a new method to discriminate temperature and radiation effects on FBGs.

BTu3A.3 • 17:15
Radiation Induced Refractive Index Change in Optical Fibres Through Rayleigh-OFDR and FBG Techniques, Jérémy Perrot1, James Hainsworth1,2, Emmanuel Marin1, Adriana Morana1, Youcef Ouerdane1, Aziz Boukenter1, Hugo Boiron5, Johan Bertrand4, Sylvain Girard1; 1Institut d'Optique Lab Hubert Curien, France; 2IRT Saint Exupery, France; 3Exail, France; 4ANDRA, France. This study compares radiation-induced refractive index variations in SMF-28+ fibres using Type II femtosecond-inscribed FBGs and R-OFDR techniques. It aims to understand femtosecond laser pulse effects on fibre core composition and behaviour in harsh environment.

BTu3A.4 • 17:30
Type III Femtosecond Fiber Bragg Grating Behaviors Under X-Rays, Thomas Blanchet1, Benjamin Sapaly1, Romain Cotillard1, Sylvain Magne1, Adriana Morana2, Emmanuel Marin2, Sylvain Girard2, Christophe Destouches3, Guillaume Laffont1; 1CEA Saclay - LIST - LSPM, France; 2Hubert Curien Laboratory, France; 3CEA DES Cadarache, France. We demonstrate that the behavior under X-rays at a constant dose-rate at room temperature of type III fs-void fiber Bragg gratings, inscribed with the point-by-point technique, depends on the fiber radiation response, i.e. on its core composition.

BTu3A.5 • 17:45 Invited
Withdrawn

16:30 -- 18:30
Room: 205A
ITu3B • Integrated Photonic Devices I
Presider: Christian Haffner; Interuniversity Microelectronics Center, Belgium

ITu3B.1 • 16:30 Invited
Overcoming Fundamental Noise Sources in Parametric Oscillators, Krishna Twayana1, Fuchuan Lei1,2, Victor Torres Company1; 1Chalmers University of Technology, Sweden; 2Northeast Normal University, China. We demonstrate self-injection locking of a parametric oscillator subject to feedback. This process results in phase noise reduction of modes below the limits imposed by fundamental noise sources in the coherent parametric wave generation.

ITu3B.2 • 17:00
Silicon Nitride Microring Resonator for Optical Frequency Comb Generation in Normal Dispersion, Rifat Nazneen1, Odile Liboiron -Ladouceur1; 1McGill University, Canada. We
measure a SiN microring resonator with a Q-factor of $7.78 \times 10^5$. Simulation shows that the resonator can generate six comb lines with 60 mW sources using four-wave mixing in normal dispersion.

**ITu3B.3 • 17:15**

**Mode-Dependent Thermo-Optic Phase Shifter Using Coupled Waveguides on Silicon for 2-µm Waveband**, Taichi Muratsubaki¹, Takanori Sato¹, Kunimasa Saitoh¹; ¹*Hokkaido University, Japan*. Silicon mode-dependent thermo-optic phase shifter is proposed for the 2-µm waveband. Appropriately designed coupled-waveguides structure provides a difference in the thermo-optic phase-shift factors between TE0 and TE1 modes by a factor of two.

**ITu3B.4 • 17:30**

**InAs/GaAs Quantum dot Based Laser Arrays and Single Photon Sources**, Ying Yu¹, Jaiwei Yang¹, Hancheng Zhong¹, Siyuan Yu¹; ¹*Sun Yat-Sen University, China*. We have presented low noise distributed-feedback laser arrays and low-threshold continuous-wave micro-lasers based on quantum dots (QDs), and also demonstrated a bright single photon source from a deterministically coupled single QD within monolithic Fabry-Perot microcavity.

**ITu3B.5 • 17:45**

**Theoretical Exploration of Biosensing Using Hybrid Semiconductor Plasmonic Lasers**, Shayan Saeidi¹, Pavel Cheben², Jens H. Schmid², Pierre Berini¹; ¹*University of Ottawa, Canada*; ²*National Research Council of Canada, Canada*. We present a new methodology for biosensing based on a hybrid plasmonic-semiconductor laser. We use the laser metal contact for plasmonic sensing while using an electrically pumped semiconductor heterostructure to produce TM gain.

**ITu3B.6 • 18:00 Invited**

Withdrawn

**16:30 -- 18:30**

**Room: 206B**

**NpTu3E • Frequency Conversion**

*Presider: Sylvie Lebrun; Centre National Recherche Scientifique, France*

**NpTu3E.1 • 16:30 Invited**

**Material Engineering for Poling sub-µm Periods in KTP**, Laura Barrett¹, Cherrie Lee¹, Carlota Canalias¹; ¹*Kungliga Tekniska Hogskolan, Sweden*. We present and discuss different methods for domain engineering in KTP. These methods are based on ion-exchange, are useful for fabrication of bulk nano-domain gratings, and are compatible with waveguide implementation.

**NpTu3E.2 • 17:00**

**Simultaneous Modal Phase- and Group Velocity Matching for Frequency Tripling and Consecutive Cascaded Wave Mixing**, Artemii Tishchenko¹, Francis Berghmans¹, Tigran Baghdasaryan¹; ¹*Vrije Universiteit Brussel, Belgium*. We show numerically the feasibility to achieve doubly phase-matched cascaded four-wave mixing in high GeO₂-content microstructured optical fibers. The first stage of said cascade involves simultaneous modal phase and group velocity matching-based third harmonic generation.
NpTu3E.3 • 17:15 Invited
Adiabatic Frequency Converter as a Single-Cycle Pulse Generator and Custom Dispersive Element, Jeffrey Moses1; 1Cornell University, USA. An adiabatic parametric frequency converter efficiently handles octave-spanning bandwidth while providing a route to tailor group delay dispersion through the quasi-phase matching grating design. Recent advancements include nearly dispersion-free frequency translation of mid-infrared single-cycle pulses.

NpTu3E.4 • 17:45
Over 2.5-Octave OAM Supercontinuum Generation in ZBLAN Ring-Core Fiber, Haoyang Ren1, Wenpu Geng2, Jian Yang3, Yuetian Wang4, Zhongqi Pan5, Yang Yue6; 1School of Information and Communications Engineering, Xi'an Jiaotong University, China; 2Institute of Modern Optics, Nankai University, China; 3Department of Optoelectronic Information Science and Engineering, School of Physics, Xi'an Jiaotong University, China; 4Department of Electrical & Computer Engineering, University of Louisiana at Lafayette, USA. A ring-core ZBLAN fiber with low dispersion is designed and simulated for broadband OAM supercontinuum generation. A 4117-nm supercontinuum is formed from 863 nm to 4980 nm at -40 dB, covering more than 2.5-octave bandwidth.

NpTu3E.5 • 18:00
Tavis-Cummings Model for Frequency Up-Conversion in Gas-Filled Anti-Resonant Hollow-Core Fibers, Tasio Gonzalez-Raya1,2, Luca Leggio1,3, Arturo Mena3, David Novoa4,5, Mikel Sanz6,7; 1Basque Center for Applied Mathematics (BCAM), Spain; 2EHU Quantum Center, Spain; 3Department of Communications Engineering, University of the Basque Country (UPV/EHU), Spain; 4Department of Communications Engineering, University of the Basque Country (UPV/EHU) and EHU Quantum Center, Spain; 5IKERBASQUE, Basque Foundation for Science, Spain; 6Basque Center for Applied Mathematics (BCAM) and IKERBASQUE, Basque Foundation for Science, Spain; 7Department of Physical Chemistry, University of the Basque Country (UPV/EHU) and EHU Quantum Center, Spain. We introduce a full quantum-mechanical description of recent experiments on correlation-preserving frequency up-conversion of single photons in gas-filled anti-resonant fibers using an N-molecule Tavis-Cummings model. Our formalism predicts preservation of entanglement under specific conditions.

NpTu3E.6 • 18:15
All-Fiber Coherent Supercontinuum in the mid-Infrared, Md. Hosne Mobarok Shamim1, Laurent Brilland2, Radwan Chahal2, Johann Troles2, Martin Rochette1; 1McGill University, Canada; 2CNRS, ISCR-UMR, Université Rennes, France. We present an all-fiber coherent supercontinuum spanning over the spectral range of 1.7- 5.0 µm from a cascade of silica, ZBLAN, and chalcogenide nonlinear fibers. The estimated average coherence across the supercontinuum is 0.83.
16:30 -- 18:30
Room: 2101
NpTu3C • Soliton Dynamics
Presider: Silvia Soria; Inst di Fisica Applicata Nello Carrara, Italy

NpTu3C.1 • 16:30 Invited
Emergence of Laser Cavity-Solitons in Micro-Resonators, Alessia Pasquazi\textsuperscript{1}, Gian-Luca Oppo\textsuperscript{2}; \textsuperscript{1}Loughborough University, United Kingdom; \textsuperscript{2}Physics, University of Strathclyde, United Kingdom. We review our results on the modelling and observation of temporal laser cavity-solitons in a microresonator filtered fibre laser.

NpTu3C.2 • 17:00
Withdrawn

NpTu3C.3 • 17:15
Soliton Self-Generation Under Pulsed-Pumping Conditions in a Coherently Driven Passive Kerr Resonator, Matthew Macnaughtan\textsuperscript{1,2}, Zongda Li\textsuperscript{1,2}, Yiqing Xu\textsuperscript{1,2}, Xiaoming Wei\textsuperscript{3}, Zhongmin Yang\textsuperscript{3}, Stephane Coen\textsuperscript{1,2}, Miro Erkintalo\textsuperscript{1,2}; \textsuperscript{1}The University of Auckland, New Zealand; \textsuperscript{2}The Dodd-Walls Centre for Photonic and Quantum Technologies, New Zealand; \textsuperscript{3}School of Physics and Optoelectronics, South China University of Technology, China. We unveil a novel dynamical regime in which dissipative Kerr cavity solitons spontaneously emerge in a coherent, pulse-driven passive Kerr resonator. The regime is robust against perturbations, ensuring reliable and deterministic cavity soliton generation.

NpTu3C.4 • 17:30
Demonstration of the in-Amplifier Soliton Self-Frequency Shift Optimization by Pre-Chirping, Robi Kormokar\textsuperscript{1}, Martin Rochette\textsuperscript{1}; \textsuperscript{1}McGill University, Canada. We experimentally demonstrate that in-amplifier soliton self-frequency shift and energy conversion efficiency are maximized using a pump pulse with chirp of $C_0 \approx 0.65g_{LD}$. This result is fundamental for optimal design of SSFS based wavelength converters.

NpTu3C.5 • 17:45
Pre-Compression of High-Order Soliton for Enhanced Soliton Self-Frequency Shift, Fariha Mehjabin\textsuperscript{1}, Md Hosne Mobarok Shamim\textsuperscript{1}, Martin Rochette\textsuperscript{1}; \textsuperscript{1}McGill University, Canada. We demonstrate the optimal design conditions of a soliton self-frequency shift (SSFS) based wavelength converter with pulse pre-compression. Sidelobes energy of a compressed high-order soliton is partially recycled to maximize SSFS and energy conversion efficiency.

NpTu3C.6 • 18:00 Invited
Dissipative Temporal Solitons in Coherently Driven Phase Modulated Cavities and in Active PT-Symmetric Dimers, Simon-Pierre Gorza\textsuperscript{1}; \textsuperscript{1}Universite libre de Bruxelles, Belgium. We discuss recent results on the manipulation of temporal Kerr cavity solitons by external potentials and on the spontaneous formation of pulses by mode-locking in active PT-cavities. Our experimental demonstrations are performed with fiber resonators.
16:30 -- 18:30
Room: 205C
NoTu3D • Emerging Imaging Techniques for Biology and Materials Science (Experimental Strategies)
Presider: Alon Gorodetsky; University of California Irvine, United States

NoTu3D.1 • 16:30 Invited
Quantitative Phase Microscopy With Sub-A Measurement Accuracy for Mapping Interlayer Spacing of 2D Materials, Nansen Zhou¹, Renjie Zhou¹; ¹Chinese University of Hong Kong, Hong Kong. We developed quantitative phase microscopy with pm-level sensitivity. By introducing a practical phase cavity on the sample substrate, we achieved 0.1 Å measurement accuracy for mapping electronic coupling induced interlayer spacing in 2D materials.

NoTu3D.2 • 17:00 Invited
Seeing the Invisible: Meta-Optics and Phase Imaging, Ann Roberts¹; ¹University of Melbourne, Australia. Recent demonstrations of all-optical, object plane image processing using metasurfaces highlight their considerable potential as alternative, energy-efficient, compact, analog computing platforms. Here, their application to phase contrast imaging, including of unstained biological cells, is discussed.

NoTu3D.3 • 17:30 Invited
Advances in Quantitative Label-Free Imaging for Micro/Nano-Scale Object Analysis, Jose A. Rodrigo¹, Tatiana Alieva¹; ¹Universidad Complutense de Madrid, Spain. Quantitative label-free imaging provides information about the 3D shape of micro/nano-scale objects and their electric permittivity. Advantages and drawbacks of refractive index tomography and a technique based on nanoparticle manipulation by structured light are discussed.

NoTu3D.4 • 18:00 Invited
Microwave Resonances in Water-Based Objects, Yuchen Song¹, Aaron D. Slepkov¹; ¹Trent University, Canada. We study centimeter-scale aqueous objects as high-index models for fundamental microwave dielectric resonators. We use thermal imaging, calorimetry, FEM simulations, and analytical methods to predict how/which resonances in isolated spheres couple to form intense dimer hotspots.

16:30 -- 18:30
Room: 2104
NoTu3H • Reconfigurable Materials and Devices
Presider: Richard Osgood; US Army, United States

NoTu3H.1 • 16:30 Invited
Withdrawn

NoTu3H.2 • 17:00
Optimising Liquid Crystal Alignment via Image Gradient Analysis, Zihan Feng¹, Francois Ladouceur¹, Amr A. Abed¹, Reem Almasri¹; ¹University of New South Wales, Australia. This paper explores the quantification of liquid crystal alignment, crucial for optimising optoelectronic devices. By using image processing techniques, we facilitate the quantification of alignment thus facilitating the identification of alignment-related issues during device fabrication.
NoTu3H.3 • 17:15
Impact of Lattice Strain on Vanadium Dioxide Transition Temperature, Induced via Defects and Doping, Jonathan King¹, Jin-Woo Cho¹, Dung Quach², Martin Hafermann³, Karla Paz³, Hongyan Mei¹, Shenwei Yin¹, Tanuj Kumar¹, Joseph Andrade², Colin Hessel², Carsten Ronning³, David Woolf², Mikhail A. Kats¹; ¹University of Wisconsin-Madison, USA; ²Physical Sciences Incorporated, USA; ³Friedrich Schiller University Jena, Germany. We modify the transition temperature of vanadium dioxide films using two different methods: Ar⁺ irradiation and transition-metal-doping and observe a unified relationship between transition temperature and lattice strain, regardless of modification method or combination thereof.

NoTu3H.4 • 17:30
Hollow Plasmonic 3D Metamaterials for LDOS Enhancement and Control of Light-Matter Interaction, Margoth Córdova¹; ¹University of Ottawa, Dept of Physics, Canada. We proposed to explore room-temperature quantum devices operating at the single-photon level, with functionalities that can be tailored changing different parameters of a plasmonic metamaterial composed of hollow truncated nanocones that greatly enhance the photonic density of states.

NoTu3H.5 • 17:45 Postdeadline Submission
Cephalopod-Inspired Optical Living Systems With Tunable Properties, Nikhil Kaimal¹, Georgii Bogdanov¹, Alon Gorodetsky¹; ¹University of California Irvine, USA. Cephalopods are powerful sources of inspiration for the engineering of dynamic optical systems. We have drawn inspiration from cephalopod skin cells to engineer human cells to possess tunable transparency-changing and light scattering capabilities.

16:30 -- 18:30
Room: 205B
STu3G • Photonic Devices
Presider: Noel Giebink; University of Michigan, United States

STu3G.1 • 16:30 Invited
Colloidal Quantum Dot Laser Diodes and ASE Light Source, Victor I. Klimov¹, Valerio Pinchetti¹; ¹Los Alamos National Laboratory, USA. Solution-processable colloidal quantum dot lasers and amplifiers have been pursued for ease of integration with on-chip circuits. Here we discuss recent progress and present challenges in this field with focus on electrically pumped devices.

STu3G.2 • 17:00 Invited
OLEDs With Record Light Output Enable an Electrically Driven Polymer Laser, Ifor D. W. Samuel¹; ¹University of St Andrews, United Kingdom. Organic semiconductors have many attractive properties and are suitable as laser gain media. However, making electrically driven organic lasers has proved exceptionally challenging. This is because of the low mobility of the materials, losses due to charges, and losses due to triplets and contacts. We have explored an approach of separating charges and light generation from the gain medium to address the main challenges. This in turn brings its own challenges as it requires the development of OLEDs giving world record intensity of light output, and efficient transfer of the light generated to the laser structure. We show that such an OLED can excite lasing in a polymer distributed feedback laser. Measurements of threshold, beam and spectral narrowing will be presented.
STu3G.3 • 17:30 Invited
3D Interconnects and III-v Semiconductor Plasma Etching for Low-Cost and High-Efficiency Photonic Devices, Mathieu de Lafontaine¹; 'University of Ottawa, Canada. Photonic chips require new processes to enable transitioning to 3D interconnects. We fabricated 3D interconnects on a multijunction solar cell. We demonstrate photonic devices having areas 3 orders of magnitude smaller compared to standard chips.

STu3G.4 • 18:00 Invited
Withdrawn

STu3G.5 • 18:00 Invited
Withdrawn

16:30 -- 18:30
Room: 207
SoTu3F • Soft Glass Fibers
Presider: Solenn Cozic; Le Verre Fluore, France

SoTu3F.1 • 16:30 Invited
High Power Diode Pumped Rare Earth Doped ZBLAN Visible Fiber Lasers: Technologies, Challenges and Opportunities, Thierry Georges¹; 'Oxxius SA, France. Abstract not available.

SoTu3F.2 • 17:00 Invited
Phosphate Glass Fibers for Biomedical Applications, Nadia G. Boetti¹, Jawad Talekkara Pandayil¹², Sharon Russo², Martha Segura³, Diego Pugliese², Joris Loustau⁴, Davide Janner²; ¹Fondazione LINKS, Italy; ²DISAT, Politecnico di Torino, Italy; ³Universitat Rovira i Virgili (URV), Spain; ⁴DCMC, Politecnico di Milano, Italy. Phosphate glass optical fibers hold promise in biomedical applications, providing versatility for diagnosis, monitoring and treatment. Tailoring specific glass compositions enables biocompatibility and resorbability, facilitating implantation and unlocking potential for various promising applications.

SoTu3F.3 • 17:30
Low-Loss Single-Mode Fluoride Optical Fiber Coupler, Gebrehiwot T. Zeweldi¹, Mohsen Rezaei¹, Martin Rochette¹; 'McGill University, Canada. A single-mode fluoride optical fiber coupler is demonstrated with excess loss of ≤0.75 dB in the spectral range of 1500-2680 nm. Surface crystallization and associated losses are reduced by processing under an argon environment.

SoTu3F.4 • 17:45
Germanate Glass: Enabling 2 µm Eye-Safe Lasers, Nadia G. Boetti¹, Martha Segura², Amiel Ishaaya³, Davide Janner⁴, Francesc Diaz², Xavier Matteos², Joris Loustau⁵; ¹Fondazione LINKS, Italy; ²Universitat Rovira i Virgili, Spain; ³Ben-Gurion University of the Negev, Israel; ⁴Politecnico di Torino, Italy; ⁵Politecnico di Milano, Italy. We report on the design, fabrication, and characterization of a novel germanate glass host for efficient 2 µm eye-safe laser operation. Spectroscopic characterization and CW laser generation with Tm³⁺ and Ho³⁺ doping is investigated.
SoTu3F.5 • 18:00
In-Line Polarization Control in Soft Glass Fibers, Md Moinul Islam Khan¹, Md Hosne Mobarak Shamim¹, Martin Rochette¹; ¹McGill University, Canada. We demonstrate the first proof of concept in-line polarization control using soft-glass fibers, crucial for mid-infrared applications. ZBLAN and hybrid As₂S₃ fibers exhibit high polarization extinction ratios (PER) of 20.8 dB and 19.8 dB, respectively.
Wednesday, 31 July

09:00 -- 11:00
Room: 2000A
JW1A • Plenary Session II

JW1A.1 • Plenary Submission
An Overview of Data Movement in AI/ML Systems and Their Impact on Interconnects,
Ashkan Seyedi; NVIDIA Corporation, USA. This talk will provide an overview of how system
topologies, workloads and AI algorithms drive specific demands for system interconnects for
data movement. A state-of-the-art summary of leading interconnect solutions will provide the
audience with an update on how copper and optical interconnects stand to solve these
problems. The second portion of the talk will focus on upcoming trends and technologies for
future systems, such as classical optical and in-memory computing, as well as packaging and
thermo-mechanical challenges.

JW1A.2 • Plenary Submission
A Light in Digital Darkness: Optical Wireless Communication to Connect the
Unconnected, Mohamed-Slim Alouini; King Abdullah University of Science and Technology
(KAUST), Saudi Arabia. The transformative influence of Internet and Communication
Technology (ICT) has reshaped society, touching every aspect from the economy to healthcare.
As the widespread deployment of 5G continues, there is an ongoing focus on the inception of
the sixth generation (6G) of wireless communication systems (WCSs). Anticipated to shape the
future of connectivity in the 2030s, 6G aims to deliver unparalleled communication services to
meet hyper-connectivity demands. While densely populated urban areas have traditionally been
the primary beneficiaries of WCS advancements, the vision for 6G transcends city limits.
Aligned with the United Nations' sustainability goals for 2030, an important aspect of 6G
endeavors to democratize the benefits of ICT, fostering global connectivity sustainably. This talk
delves into this particular envisioned landscape of 6G, providing insights into the future of
wireless communication and guiding research efforts toward sustainable, inclusive and high-
speed connectivity solutions for the future. Central to this discussion are two emerging
technologies: Free Space Optics (FSO) and Non-Terrestrial Networks (NTN). These innovative
solutions hold the promise of extending high-speed connectivity beyond urban hubs to
underserved regions, fostering digital inclusivity and contributing to the development of remote
areas. Through this exploration, we aim to convey the potential of 6G and its role in shaping a
connected, sustainable future for all.

14:30 -- 16:00
Room: 206A
BW2A • BGPP Industry Session
Presider: Remco Nieuwland; Somni Solutions, The Netherlands

BW2A.1 • 14:30 Invited
High Performance Distributed Acoustic Sensing Enabled by Continuously Enhanced
Backscattering Fiber, Ping Lu; OFS Fitel LLC, USA. We developed a grating-based specialty
single-mode fiber that is compatible with most distributed acoustic/vibrational sensing
interrogators. Laboratory and field-based testing results with improved sensing performance
including SNR and position accuracy will be discussed.
BW2A.2 • 15:00 Invited
The BraggATune: the Ultimate Fiber Bragg Grating Writing Machine, Raman Kashyap1; 1Photonova Inc., Canada. We present our fiber Bragg grating tunable fabrication system. A motorized system capable of adjusting itself to write at any wavelengths, with a single phase-mask. Our system can also provide custom apodization, phase-shifts and chirp.

BW2A.3 • 15:15 Invited
Opportunities and Challenges in the Photonics Market, David Melanson1, Julien Gagnon1; 1ITF Technologies Inc., Canada. This presentation provides a high-level view of the opportunities and challenges in the world of photonics components and sub-systems. From market demand to new applications, we will see what drives today’s photonic experts.

BW2A.4 • 15:30 Invited
Fiber-Based Sensing Using Optical Frequency Domain Reflectometry (OFDR) and Distributed Bragg Gratings, Alex Tongue1; 1Sensuron, USA. Abstract not available.

BW2A.5 • 15:45
Femtosecond Laser Writing of Fiber Bragg Grating Within a PM Active Fiber for 1535 nm all-Fiber Laser Demonstration, Alain Abou Khalil1, Valerian Freysz1, Kevin Armengaud1, Christophe Pierre1, Marc Castaing1; 1ALPhANOV, France. Using femtosecond laser pulses, a highly reflective Fiber Bragg Grating was inscribed inside the core of an active PM fiber, integrated into a 1535 nm all-fiber PM laser system

14:30 -- 16:00
Room: 205A
IW2B • Neural Network Photonics
Presider: Nathaniel Kinsey; Virginia Commonwealth Univ., United States

IW2B.1 • 15:00 Invited
Mastering Silicon Photonics Device Design for Scalable and Robust Optical Neural Networks, Zahra Ghanaatian1, Amin Shafiee1, Mahdi Nikdast1; 1Colorado State University, USA. We demonstrate a design optimization approach for Mach–Zehnder Interferometers

IW2B.2 • 14:30
Photonic Neural Network and in-Situ Training in a Synthetic Frequency Dimension, Felix Gottlieb1, Abhinav Sinha2, Kai Wang3; 1McGill University, Canada; 2Indian Institute of Science (IISc), India. We develop a scalable photonic neural network utilizing the discrete frequency degree of freedom of light with the ability to train itself based on an in-situ backpropagation method with minimal reliance on external computers.

IW2B.3 • 14:45
Inverse-Designed 16-Channel Time-of-Flight Receiver in 45nm Silicon Photonic Process, John Rollinson1, Robert F. Karlicek1, Mona M. Hella1; 1Rensselaer Polytechnic Institute, USA. A 16-channel monolithic electronic-photonic receiver for flash time-of-flight LIDAR is demonstrated in 45nm silicon photonic process. Enverse-designed grating array antennas are utilized for efficient, low-noise coupling of free-space light, thus improving signal-to-noise ratio and extending sensing range of the free-space optical receiver.

IW2B.1 • 15:00 Invited
Mastering Silicon Photonics Device Design for Scalable and Robust Optical Neural Networks, Zahra Ghanaatian1, Amin Shafiee1, Mahdi Nikdast1; 1Colorado State University, USA. We demonstrate a design optimization approach for Mach–Zehnder Interferometers
(MZIs) in optical neural networks under fabrication-process variations (FPVs). Our results show increased inferencing accuracy in the network under realistic FPVs by using optimized MZIs.

IW2B.4 • 15:30
Physical Neural Networks Based on Multimode Optical Waves, Logan Wright1; 1Yale University, USA. Physical neural networks provide a way to realize neural network calculations by leveraging the controllable computations physical systems natively perform. I present an example on-chip physical neural network based on arbitrarily controllable multimode wave propagation.

14:30 -- 16:00
Room: 206B
NpW2E • Integrated Nonlinear Photonics
Presider: Silvia Soria; Inst. di Fisica Applicata Nello Carrara, Italy

NpW2E.1 • 14:30 Invited
Ultrafast Optics on Thin-Film Lithium Niobate, Mengjie Yu1; 1University of Southern California, USA. Abstract not available.

NpW2E.2 • 15:00 Invited
THz Generation Using Thin-Film LNBO, Ileana-Cristina Benea-Chelmus1; 1Ecole Polytechnique Federale de Lausanne, Switzerland. Abstract not available.

NpW2E.3 • 15:30
Impact of Nonlinear Losses on the Performance of InGaAsP-on-Insulator Ring Resonators, Athulya Thulaseedharan1, Laís Fujii dos Santos1, Tara Moradi2, Connor Kupchak2, Ksenia Dolgaleva1; 1University of Ottawa, Canada; 2Carleton University, Canada. We study the impact of nonlinear losses such as two-photon absorption (TPA) and free-carrier absorption (FCA) on frequency comb generation in ring resonators made of InGaAsP (In0.7Ga0.18As0.3P on SiO2 (InGaAsP-on-insulator, or InGaAsP-OI) platform.

14:30 -- 16:00
Room: 205C
NoW2D • Metasurfaces and Inverse Design
Presider: Lynda Busse; US Naval Research Laboratory, United States

NoW2D.1 • 14:30 Invited
Physical-Model-Based Wave Control With Reverberation-Nonlocal Programmable Metasurfaces, Philipp del Hougne1; 1IETR, CNRS, IETR - Univ Rennes, France. Chaotic-cavity-backed programmable metasurfaces experience significant coupling between meta-atoms (i.e., non-locality) due to reverberation. We frugally calibrate accurate physical models mapping metasurface configuration to scattered fields and discuss how they enable previously inaccessible wave-control regimes.

NoW2D.2 • 15:00 Invited
All-Glass Metasurfaces for High Power Lasers Optics Using a Self-Organizing Approach, Eyal Feigenbaum1; 1Lawrence Livermore National Laboratory, USA. We present a scalable method for producing all-glass meta-surfaces using a self-organizing approach, resulting in high
mechanical stability and laser-induced damage durability. We will present process advances enabling formation of lenses, antireflection surfaces, and waveplates.

NoW2D.3 • 15:30
Inverse-Designed Metasurface for Multidimensional Spatial State Reconstruction, Yuming Niu¹, Kai Wang¹; ¹McGill University, Canada. We report inverse-designed nonlocal metasurfaces for transforming multidimensional states of light represented in the Hermite-Gaussian basis into optimally designed spatial states, where a simple imaging can accurately extract the full multidimensional state including amplitude, phase, and coherence.

NoW2D.4 • 15:45
Inverse Design of Photonic Systems, Benjamin MacLellan¹², Piotr Roztocki¹², Julie Belleville¹, Luis Romero Cortés¹³, Kaleb Ruscitti¹, Bennet Fischer¹, José Azaña¹, Roberto Morandotti¹; ¹Institut National de la Recherche Scientifique, Canada; ²Ki3 Photonics Technologies, Canada; ³Universitat Politècnica de València, Spain. We present a framework for identifying the optimal topologies and operational parameters of photonic systems. Leveraging automatic differentiation and topology search, it facilitates the discovery of physically-feasible designs for applications like waveform generation and sensing.

14:30 -- 16:00
Room: 2101
NeW2C • ML and AI informed Networks
Presider: Lena Wosinska; Chalmers Tekniska Högskola, Sweden

NeW2C.1 • 14:30 Tutorial
AI-Driven Optical Network Automation: Opportunities and Challenges, Carlos Natalino¹; ¹Chalmers Tekniska Högskola, Sweden. Abstract not available

NeW2C.2 • 15:30 Invited
Withdrawn

14:30 -- 16:30
Room: 2104
SpW2H • Quantum Communication and Computing
Presider: Stephan Pachnicke; Christian-Albrechts Universität zu Kiel, Germany

SpW2H.1 • 14:30 Invited
Time-Multiplexed Programmable Continuous-Variable Photonic Quantum Computing, Shuntaro Takeda¹; ¹The University of Tokyo, Japan. Abstract not available.

SpW2H.2 • 15:00
Digital Equalization Techniques for Continuous Variable Quantum Key Distribution, Ulku Akin¹², Jonas Berl¹³, Tobias Fehenerberger¹, Norbert Hanik²; ¹Adva Network Security GmbH, Germany; ²Institute for Communications Engineering, Technical University of Munich, Germany; ³Communications Engineering Lab, Karlsruhe Institute of Technology, Germany. We experimentally investigate two digital equalization schemes for ISI mitigation in CV-QKD. The
The proposed static zero-forcing method shows similar performance to an adaptive equalizer at a significantly reduced DSP complexity.

**SpW2H.3 • 15:15**
**Rate-Adaptive Protograph-Based Raptor-Like LDPC Code for Continuous-Variable Quantum Key Distribution**, Erdem E. Cil¹, Laurent Schmalen¹; ¹CEI, Karlsruhe Institute of Technology, Germany. We propose a new type-based protograph raptor-like LDPC code for rate-adaptive information reconciliation in CV-QKD systems. It offers robust error-correction performance across a wide range of rates while simplifying the code design process.

**SpW2H.4 • 15:30 Invited**
**Integrating Quantum Communications in Telecom Infrastructures**, Andrew Shields¹, Tina Muller¹; ¹Toshiba Research Europe Ltd, United Kingdom. Abstract not available.

**SpW2H.5 • 16:00**
**Spectral Efficient Physical Layer Security by Using Coherent All-Optical Processing and Multichannel Obfuscation**, Yarden Yalinevich¹,², Eyal Wohlgemuth¹,², Dan Sadot¹,²; ¹Ben-Gurion University, Israel; ²CyberRidge, Israel. A spectral-efficient physical layer security system is introduced, which enhances capacity by transmitting multiple channels over shared spectrum. Demonstrating that the success probability of an attack is extremely low and further decreases with the inclusion of more channels.

**SpW2H.6 • 16:15**
**Quantum-Inspired Encryption Using Displacement Operators in Coherent Optical Communications**, Mostafa Khalil¹, Adrian Chan², Lawrence R. Chen¹, David V. Plant¹, Randy Kuang³; ¹McGill University, Canada; ²Synopsys Inc., Canada; ³Quantropi Inc., Canada. We demonstrate experimental results of a physical layer encryption technique based on displacement operators in coherent optical transmission systems. The system is tested over 80 km of SSMF using 4/16/32QAM at 56 Gbd.

**14:30 -- 16:00**
**Room: 205B**
**SW2G • Thin-Film Applications**
**Presider: Stéphane Collin; CNRS, France**

**SW2G.1 • 14:30 Invited**
**Noble Transparent Conductive Oxide (TCO) Materials for Solar Cells: a Viable Alternative to Conventional TCOs**, Takashi Koida¹; ¹Natl Inst of Adv Industrial Sci & Tech, Japan. Two transparent conductive oxide (TCO) films of interest in the solar cell field are highlighted: high-mobility In₂O₃-based TCOs currently in production lines and the indium-free, highly conductive amorphous SnO₂ films discovered recently in the laboratory.

**SW2G.2 • 15:00 Invited**
**Contact Engineering for Organic Photovoltaics**, Canek Fuentes-Hernandez¹,², Felipe A. Larrain², Vladimir Kolesov², Yi-Chien Chang²,⁴, Minwoo Nam²,⁵, Tzu-Yen Huang³, Michael Toney³, Bernard Kippelen²; ¹Department of Electrical and Computer Engineering, Northeastern University, USA; ²Center for Organic Photonics and Electronics (COPE), School of Electrical and Computer Engineering, Georgia Institute of Technology, USA; ³Standford Synchrotron
We present an overview of solution-based electrical p-doping of organic semiconductors using polyoxometalates yielding stable exponentially decaying depth-profiles into the bulk and other highly desirable properties for the realization of organic photovoltaics.

**SW2G.3 • 15:30 Invited**  
**Material Design of Solution-Processed Semiconductors for Wearable Applications**, Xiwen Gong¹; ¹University of Michigan, USA. I will discuss new material design strategies that impart mechanical deformability in solution-processed optoelectronic materials and their applications in wearable and healthcare technologies.

**14:30 -- 16:00**  
**Room: 207**  
**SoW2F • Fiber Design and Modelling**  
**Presider: Peter Dragic; Univ of Illinois at Urbana-Champaign, United States**

**SoW2F.1 • 14:30**  
**Modeling Transverse Mode Instability Experiment Using Phase-Matched Model**, Josh Young¹,², Zhihao Hu¹, Curtis Menyuk², Jonathan Hu¹; ¹Baylor University, USA; ²University of Maryland Baltimore County, USA. We compare the results of experiment and phase-matched model for transverse mode instability (TMI). The simulation accurately identifies the threshold of TMI, which shows strong potential for future design optimizations.

**SoW2F.2 • 14:45**  
**Performance Trade-Offs Spanning O-C-L-Bands in Antiresonant Fiber Designs**, Rania A. Abouelela¹, Sophie LaRochelle¹, Leslie Rusch¹; ¹ECE Department-Center for Optics, Photonics and Lasers (COPL), Laval University, Canada. We examine antiresonant nodeless fiber (ANF) geometries with good C-band compromises between single-mode operation and loss. We identify one geometry offering good trade-offs throughout the antiresonance window, particularly in the telecommunications O-band and L-band.

**SoW2F.3 • 15:00**  
**Comparative Modelling and Design Aspects of PANDA PM Fiber**, Natasha Vukovic¹, Christophe A. Codemard², Michalis N. Zervas¹; ¹University of Southampton, United Kingdom; ²TRUMF Lasers UK Ltd, United Kingdom. Using finite-element-method, we assess birefringence in PANDA PM-fiber, comparing it with several analytical expressions proposed in the literature. Our study shows agreement with one expression, while two others show varied discrepancies, indicating different underlying causes.

**SoW2F.4 • 15:15**  
**A New Simplified Bend Loss Model for Polarizing Optical Fibers**, Andy Gillooly¹, Mark Hill¹, Jose Maria Alvarez De Con¹; ¹Fibercore Limited, United Kingdom. A simplified numerical bend loss model is presented to predict the performance of polarizing optical fibers in the spectral domain. Theoretical calculation are compared to experimental results and shown to give a close approximation.
SoW2F.5 • 15:30
**Design of a Few-Mode Fiber With Radial Anisotropy for Improved Modal Efficiency**, Asma Mimouni¹, Younès Messaddeq², Bora Ung¹; ¹Ecole de Technologie Superieure, Canada; ²Centre for Optics, Photonics and Lasers (COPL), Université Laval, Canada. A novel few-mode fiber design with radial anisotropy is proposed. The fiber improves the degeneracy of TE01 and TM01 modes and is a potential solution for expanding data channels and improving modal efficiency.

SoW2F.6 • 15:45
**Trench-Assisted Seven-Core Non-Zero Dispersion Shifted Ring Fiber for OAM Modes**, Yuxiang Huang¹, Yuanpeng Liu², Wenchuan Zhao¹, Zhongqi Pan³, Yang Yue¹; ¹Xi’an Jiaotong University, China; ²Nankai University, China; ³University of Louisiana at Lafayette, USA. A trench-assisted seven-core non-zero dispersion shifted ring fiber is designed to support 98 OAM modes, which can maintain <-40 dB crosstalk across the C-band. Large effective mode area and low differential mode delay are also achieved.

16:30 -- 18:30
Room: 206A
**BW3A • Mid-IR Glasses and Optical Materials**
*Presider: Daniel Richter; Institute of Applied Physics (Germany), Germany*

**BW3A.1 • 16:30 Invited**
**Fibre Bragg Gratings Inscription in Fluoride Fibers and Their Application for Spectrometry and Thermal Sensors**, Maria Chernysheva¹; ¹Ultrafast Fibre Lasers, Leibniz Institute of Photonic Technology, Germany. In my presentation, I will demonstrate that FBGs inscribed in fluoride-based fibres can serve as sensitive thermal sensors down to cryogenic conditions as well as exhibit unique scattering patterns, facilitating tailored light emission designs.

**BW3A.2 • 17:00**
**Thick Femtosecond-Inscribed Silica VBGs for mid-IR Spectral Filtering Applications**, Lauris Talbot², Malte P. Siems¹, Daniel Richter¹, Nicolas David³, Sébastien Blais-Ouellette³, Stefan Nolte¹, Martin Bernier²; ¹Institute of Applied Physics, Friedrich Schiller University Jena, Germany; ²Centre d’Optique, Photonique et Laser (COPL), Université Laval, Canada; ³Photon Etc., Canada. We report on the femtosecond inscription of a 3 mm thick silica volume Bragg grating. By combining it with a mid-IR supercontinuum laser, a narrowband light source tunable from 2.8 to 4.3 μm is obtained.

**BW3A.3 • 17:15**
**Fs-Written FBGs in InF3 Fibers Using the Scanning Phase Mask Technique for Mid-IR All-Fiber Laser**, Tommy T. Boilard¹, Réal Vallée¹, Martin Bernier¹; ¹COPL, Université Laval, Canada. Highly reflective FBGs are written in InF3 fibers using the scanning phase mask technique. Their application as reflectors in an Ho3+:InF3 all-fiber laser cavity emitting at 3920 nm is also presented.
**Optica Advanced Photonics Session Guide**

**Disclaimer:** this guide is limited to technical program with abstracts and author blocks as of 21 July. For updated and complete information with special events, reference the online schedule or mobile app.

**BW3A.4 • 17:30**
**Thermal Stability of Fiber Bragg Gratings Fabricated in Fluoride Glass Optical Fibers via Femtosecond Laser Direct-Inscription,** Alex Fuerbach¹, Toney T. Fernandez², Luyi Xu¹; ¹Macquarie University, Australia; ²University of South Australia, Australia. We report on the annealing properties of fiber Bragg gratings (FBGs) that have been inscribed into fluorozirconate (ZBLAN) and fluoroindate (InF₃) optical fibers via the femtosecond laser direct write technique.

**BW3A.5 • 17:45**
**Bragg Grating Reflectors Inscribed in Polypropylene Lightpipes,** Vasilis Sarakatsianos¹, Ivan Chapalo¹, Eleni Grantzioti¹, Theodoros Manouras¹, Maria Vamvakaki¹, Maria Konstantaki¹, Stavros Pissadakis¹; ¹FORTH-IESL, Greece; ²Department of Materials Science and Technology, University of Crete, Greece. Bragg grating reflectors are inscribed and characterized in toluene loaded, polypropylene lightpipes using 248nm, excimer laser radiation. Refractive index changes of the order of ~6.6x10⁻⁴ are introduced in the polymer matrix, through single photon-absorption.

**BW3A.6 • 18:00 Invited**
**A Type-1 Fluoride Glass Optical Waveguide Laser for mid Infrared Integrated Optics,** Toney T. Fernandez¹, Dale Otten¹, Simon Gross², Michael J. Withford², Alex Fuerbach², David Lancaster¹; ¹University of South Australia, Australia; ²Macquarie University, Australia. Reporting the long-anticipated type-1 waveguide laser in erbium-doped fluoride glass. The laser cavity is formed using a butt-coupled HR-mirror and a fiber Bragg grating output coupler positioned at both ends of a 10 mm-long glass waveguide.

16:30 -- 18:30
Room: 205A
IW3B • Photonic Integrated Devices II
Presider: Judith Su; Univ of Arizona, Coll of Opt Sciences, United States

**IW3B.1 • 16:30 Invited**
**Title to be Announced,** Remus Nicolaescu¹; ¹Pointcloud Inc., Switzerland. Abstract not available.

**IW3B.2 • 17:00**
**Direct Laser Writing of a Compact 1x4 Splitter for Multi-Core Optical Fibers,** Tigran Baghdasaryan¹, Koen Vanmol¹, Hugo Thienpont¹, Francis Berghmans¹, Jurgen Van Erps¹; ¹Vrije Universiteit Brussel, Belgium. We used triangular cross-section multimode interference coupler, S-bends, and adiabatic tapers as building blocks to design and fabricate ultracompact 3D splitters for multi-core optical fiber with an insertion loss below -3 dB per channel.

**IW3B.3 • 17:15**
**Highly Efficient TM Fundamental Mode Filter on InP Membrane,** Dong Liang¹, Salim Abdi¹, Sander Reniers¹, Jos van der Tol¹, Kevin Williams¹, Yuqing Jiao¹; ¹Eindhoven university of technology, Netherlands. We experimentally demonstrate an efficient TM₀ filter on InP membrane. The filter exhibits an extinction ratio exceeding 34 dB for TM₀ and a loss lower than 0.5 dB for TE₀ at a wavelength of 1570 nm
IW3B.4 • 17:30
CubeSat Astrophotonics: Lower Cost, Space-Based Optical Astronomy Using Photonic Integrated Circuits, Tyler J. deLoughery1,2, Clayton D. Lauzon1,2, Kyle H. Sims1,2, John Weber3, Wahab Almuhtadi2,1, Ross Cheriton3;1Carleton University, Canada; 2Faculty of Technology and Trades, Algonquin College, Canada; 3National Research Council Canada, Canada. CubeSats are low-cost, space-based platforms for sensing instrumentation, where limits on size, weight and power limitations favour using photonic integrated circuit. We explore the design and performance of a proof-of-concept astrophotonic CubeSat for optical astronomy.

IW3B.5 • 17:45
High Dispersion in Hybridized Modes of Silicon Photonic Devices Compatible With a Foundry Platform, Archana Kaushalram1, Jacob Hiesener1, Clay A. Kaylor1, Stephen Ralph1;1ECE, Georgia Institute of Technology, USA. We report a peak dispersion of ±105 ps/nm/km with a bandwidth >35 nm in hybridized modes of a loaded-strip and loaded-slot waveguide with L-rails, structures that meet design rule checks of a commercial foundry.

IW3B.6 • 18:00 Invited
Image-to-Image Computer Vision for Advanced Nanophotonic Fabrication and Design, Dusan Gostimirovic1, Odile Liboiron-Ladouceur1;1Department of Electrical and Computer Engineering, McGill University, Canada. We present PreFab, an image-to-image computer vision system that predicts and corrects nanofabrication variations in complex integrated photonic circuits with fine features, enabling higher precision, improved yields, and accelerated development of next-generation photonic technologies.

16:30 -- 18:30
Room: 205B
SW3G • Radiative Cooling IV & Thermophotovoltaics & Perovskites (Joint SOLED/NOMA)
Presider: Canek Fuentes-Hernandez; Northeastern University, United States

SW3G.1 • 16:30 Invited
Nonlinear Optical Properties and Exciton Dynamics of Quantum Confined Halide Perovskites, Suchi Guha1;1University of Missouri-Columbia, USA. Two-dimensional (2D) organic-inorganic halide perovskites emphasize a strong excitonic contribution, which enhances both linear and nonlinear optical properties. We present third harmonic generation and transient absorption studies from 2D and other quantum confined perovskites.

SW3G.2 • 17:00 Invited
Perovskite Single-Crystals: New Opportunities for Optoelectronics and Photonics, Rosanna Mastria1;1CNR Nanotec, Italy. Perovskite single-crystals emerged as a promising alternative to polycrystalline samples for optoelectronics. This talk highlights how the growth of perovskite single-crystals can be tailored to obtain specific features that fulfil the requirements of device integration.

SW3G.3 • 17:30 Invited
Bottom-Up Engineered Halide Perovskites for Optoelectronic Devices, Farnaz Niroui1;1Massachusetts Institute of Technology, USA. This talk will introduce bottom-up engineering of designer materials with unique functionalities for emerging optoelectronic devices with a focus...
on metal halide perovskites and their applications in nanoscale light-emitting devices and quantum light sources.

**SW3G.4 • 18:00**
Fabrication and Optimization of Highly Solar Reflective and Long-Wavelength Infrared (LWIR) Emissive Porous Polymers for Passive Daytime Radiative Cooling, Atousa Pirvaram¹, Paul G. O’Brien¹, Siu N. Leung¹; ¹York University, Canada. This study explores the fabrication and optimization of micro- and nano-cellular poly(vinylidene fluoride-co-hexafluoropropylene) (PVDF-HFP) for passive daytime radiative cooling using phase inversion technique. By tailoring the water amount a high reflectance and a significant emittance are achieved, facilitating efficient cooling.

**SW3G.5 • 18:15 Postdeadline Submission**
Optimal Thermophotovoltaics Using Bilayer Emitters, Paige Delsa¹, Mariama Rebello de Sousa Dias¹; ¹University of Richmond, USA. In thermophotovoltaics, components are required to function reliably under high temperatures. Here, we describe the optimal operating temperature, photovoltaic bandgap, and coating thickness of 283 bilayer emitters that are thermal stable beyond 1,800°C.

**16:30 -- 18:30**
Room: 206B
**NpW3E • Special Symposium: The Future of Nonlinear Photonics**
**Presider: Ksenia Dolgaleva; University of Ottawa, Canada**

**NpW3E.1 • 16:30 Invited**
An Embarrassment of Riches: What to Do With a Material 1 Million Times More Nonlinear Than Silica, Robert W. Boyd¹; ¹University of Ottawa, Canada. Research reported in 2016 [Alam, De Leon, Boyd, Science 352, 795-797 (2016)] showed that materials such as indium tin oxide (ITO) display an unprecedentedly large nonlinear refractive index when excited at a frequency where the dielectric permittivity is nearly vanishing. The large nonlinear response of these epsilonnear-zero (ENZ) materials, some million times larger than that of silica glass, suggest that these materials would prove extremely useful in the development of new classes of photonic devices. In this contribution, we review the history of the understanding of nature of the nonlinear response of ENZ materials and the development of ENZ-based photonic devices. Specific investigations over the past eight years have led to increased understanding of topics including (1) the origin of the enhancement of the nonlinear optical response, (2) the possibility of using nanofabrication methods to create ENZ behavior at any specified wavelength, and (3) the exploration of what interactions and devices are enabled through use of ENZ materials. In this contribution, we review the recent history of the development of the field of ENZ science and of the development of ENZ applications.

**NpW3E.2 • 16:50 Invited**
Progress Towards Silicon Nitride as a $\chi^{(3)}$ and $\chi^{(2)}$ Nonlinear Optics Platform, Jaime Cardenas¹; ¹University of Rochester, USA. Silicon nitride is the leading on-chip platform for $\chi^{(3)}$ nonlinear optics. It has recently emerged as candidate for $\chi^{(2)}$ nonlinear processes through optical and electrical poling. We review recent progress in silicon nitride $\chi^{(2)}$ photonics.
NpW3E.3 • 17:10 Invited
Title to be Announced, Alexander L. Gaeta1; 1Columbia University, USA. Abstract not available.

NpW3E.4 • 17:30 Invited
Extremely Non-Degenerate Nonlinear Optics: Dedicated to the Memory of Mansoor Sheik-Bahae, Eric W. Van Stryland1; 1University of Central Florida, CREOL, USA. Mansoor et.al. introduced Z-scan 35 years ago (10⁴ citations) which led to understanding Kramers-Kronig for bound-electronic nonlinearities, which led to establishing and understanding the large enhancement of nonlinearities for Extremely Non-Degenerate (END) nonlinear optics.

NpW3E.5 • 17:50 Invited
Perspectives on the Future of Nonlinear Photonics: the Promise of Well-Established and Novel Materials, Nathalie Vermeulen1; 1Vrije Universiteit Brussel, Belgium. The rise of low-dimensional materials, meta-materials, etc. has expedited nonlinear-optics research. Meanwhile, fabrication technologies for well-established materials have significantly advanced. This talk will explore the implications of both developments for the future of nonlinear photonics.

16:30 -- 18:30
Room: 205C
NoW3D • Laser Assisted Processing of Optics
Presider: Francois Chenard; IRflex Corporation, United States

NoW3D.1 • 16:30 Invited
Laser-Assisted Deposition of Oxide Layers for Transparency in Different Wavelength Ranges, Yahya Bougdid1, Gunjan Kulkarni1, Francois Chenard2, Chandraika J. Sugrim4, Ranganathan Kumar3, Aravinda Kar1; 1University of Central Florida, CREOL, USA; 2IRflex Corporation, USA; 3University of Central Florida, USA; 4Naval Air Warfare Center, Aircraft Division, USA. CO₂ laser-assisted deposition of transparent chalcogenide As₂S₃ glass and TiO₂ films is reported. A theoretical model is developed to select the laser sintering parameters. The optical properties of transparent As₂S₃ and TiO₂ coatings are investigated.

NoW3D.2 • 17:00 Invited
Digital Glass Forming of Optics and Photonics, Edward Kinzel1; 1University of Notre Dame, USA. CO₂ lasers are used for digital glass forming. This produces surface heating that slowly diffuses through the filament. We investigate using a NIR laser and glass doping for faster printing of optics and photonics.

NoW3D.3 • 17:30 Invited
Ultrafast Lasers Enabled Optical Figuring and 3D Writing, Jie Qiao1; 1Rochester Institute of Technology, USA. Abstract not available.

NoW3D.4
Withdrawn
16:30 -- 18:30  
Room: 2104  
NoW3H • Optical Sensors, Biosensors, and Imaging  
Presider: Alon Gorodetsky; University of California Irvine, United States

**NoW3H.1 • 16:30 Invited**  
Title to be Announced, Tian Li; Purdue University, USA. Abstract not available.

**NoW3H.2 • 17:00**  
A Multiplexed Quantitative Spectroscopy Method to Measure Spectrally Overlapping Metabolic Fluorophores, Victoria W. DAgostino¹, Michelle Kwan¹, Megan Madonna¹, Brian Crouch¹, Nimmi Ramanujam¹; Duke University, USA. We have developed and validated an in vivo quantitative spectroscopy method to measure spectrally overlapping fluorophores relevant to cancer metabolism using an inverse Monte Carlo algorithm and linear spectral unmixing.

**NoW3H.3 • 17:15**  
Terahertz Time-Domain Derivative Spectroscopy of Fructose Using a MEMS Piezo Speaker, Behnoosh Meskoob¹, Mathieu Gratuze¹, Gabriel Gandubert¹, Xavier Ropagnol¹, Frederic Nabki¹, Francois Blanchard¹; École de Technologie Superieure, Canada. This paper presents the implementation of MEMS to convert Terahertz Time-Domain Spectroscopy (THz-TDS) to the Time-Domain Derivative Spectroscopy (THz-TDDS). This THz signal modulation is achieved without losing the spectroscopy ability for material characterization.

**NoW3H.4 • 17:30**  
Feature-Dependent Accuracy in Classification Models for Ultrafast THz Spectroscopy Using Frequency Selective Surfaces, Rejeena R Sebastian¹, Redwan Ahmad¹, Jonathan Lafrenière-Greig¹, Xavier Ropagnol¹,², Francois Blanchard¹; École de technologie superieure ÉTS, Canada; École de technologie superieure ÉTS, Canada. This work analyzes data from a novel setup for ultrafast selective multispectral Terahertz (THz) spectroscopy using Frequency Selective Surface (FSS). A comparative evaluation of the performance of four different classification models is conducted and a feature-accuracy mapping is done for optimization.

**NoW3H.5 • 17:45**  
Spiropyran-Doped Poly(Dimethylsiloxane) Optical Waveguides for UV Sensing, Camila Zimmermann¹, Koffi N. Amouzou¹, Dipankar Sengupta¹, Aashutosh Kumar¹, Nicole Demarquette¹, Bora Ung¹; École de technologie superieure ÉTS, Canada. Novel spiropyran-doped PDMS optical waveguides were fabricated. Their UV sensing response was investigated by monitoring changes in transmitted optical power when coupled to a 633–nm HeNe laser.

**NoW3H.6 • 18:00**  
Novel Porous-Cladding Polydimethylsiloxane Optical Waveguide for Biomedical Pressure Sensing Applications, Koffi N. Amouzou¹, Camila Zimmermann¹, Bora Ung¹, Dipankar Sengupta¹, Normand Gravel¹, Jean-Marc Lina¹, Bora Ung¹; École de technologie superieure, Canada. We report a new concept of pressure sensor made from polydimethylsiloxane solid core and porous cladding that operates through frustrated total internal reflection. A high sensitivity to transverse compression of 0.22%/dB optical losses is demonstrated.
16:30 -- 18:30
Room: 2101
NeW3C • Coherent Access Networks
Presider: Domaniç Lavery; Infinera Corporation, United Kingdom

NeW3C.1 • 16:30 Invited
Coherent PON for Optical Access Networks Evolution Beyond 50G-PON, Giuseppe Talli; Huawei, Germany. Coherent PON is a promising candidate for the next generation VHSP-PON systems, which could support net data rates beyond 200Gb/s per wavelength, maintain coexistence with previous generations, and enable new services.

NeW3C.2 • 17:00 Invited
Coherent Optical Technologies Shaping the Evolution of Passive Optical Networks, Zhensheng Jia; CableLabs, USA. This paper discusses the evolution of PON technologies by ITU-T and IEEE. It evaluates the progress and limitations of IM-DD PONs, and presents the drivers for longer reach and higher split coherent PONs. The paper also explores key technology developments and options to simplify coherent designs for cost reduction.

NeW3C.3 • 17:30
Supporting 100 Gb/s and 200Gb/s Optical Access for PON Using Coherent Technologies, Mark E. Laubach; Ciena Corporation, USA. Demand for higher speed subscriber networks coupled with developing ecosystems for coherent point-to-point technologies suggest cost-effective re-use for 100 Gb/s and 200 Gb/s for the standardization of Coherent PON.

16:30 -- 18:30
Room: 207
SoW3F • Active Fibers, Lasers & Amplifiers
Presider: Martin Rochette; McGill University, Canada

SoW3F.1 • 16:30 Invited
Withdrawn

SoW3F.2 • 17:00
All Fiber Mid-Infrared Ring Cavity Laser, Nasrollah Karampour; Gebrehiwot T. Zeweldi; Md. Hosne Mobarak Shamim; Martin Rochette; McGill university, Canada. We demonstrate the first all-fluoride mid-infrared ring cavity laser, comprising a single-mode ZBLAN optical fiber coupler and an Er: ZBLAN gain fiber. The laser exhibits continuous-wave emission at a wavelength of 2.7-2.8 μm.

SoW3F.3 • 17:15
Mode-Locking Using Polarization Dependent Fluoride Optical Fiber Coupler, Gebrehiwot T. Zeweldi; Martin Rochette; McGill University, Canada. We make the first demonstration of a polarization-dependent single-mode fluoride-based optical fiber coupler. The practicality of this mid-infrared compatible coupler is shown with the successful realization of an all-fiber mode-locked ring cavity laser.
SoW3F.4 • 17:30
Improved Emission Lifetime via Thermal Annealing for Ytterbium-Doped High-Power Fiber Lasers, Siyuan Wang¹, Bailey Meehan², Thomas Wade Hawkins², John Ballato², Peter D. Dragic¹; ¹University of Illinois Urbana Champaign, USA; ²Clemson University, USA. Through a series of thermal annealing experiments, it is shown that Yb³⁺ emission properties could be further optimized, particularly as relates to the quantum efficiency. Achieving near-unity quantum efficiency is paramount to continued power scaling.

SoW3F.5 • 17:45
Effects of Package Layout on Active Fibre Absorption, Mihai-Stefan Merlas¹, Natasha Vukovic¹, Christophe A. Codemard², Michalis N. Zervas¹; ¹University of Southampton, United Kingdom; ²TRUMPF Lasers UK, United Kingdom. We investigate numerically the impact of layout in the absorption in double-clad fibres. We find that the local curvature and its variation along the fibre length are the key parameters, defining the total pump absorption.

SoW3F.6 • 18:00
Larger Cladding Diameter for Improved Power Conversion Efficiency in Cladding Pumped Super L-Band Amplifiers, Saber Jalilpiran¹, Hamed Rabbani¹, Jacques Lefebvre¹, Leslie Rusch¹, Younès Messaddeq¹, Sophie LaRochelle¹; ¹Centre d'optique, photonique et laser (COPL), Laval University, Canada. We compare pump power requirements of two fibers having respective cladding diameters of 125 mm and 200 mm in cladding-pumped amplifiers. The Er³⁺:Yb³⁺ co-doped alumino-phospho-silicate fibers were optimized for super L-band operation.

SoW3F.7 • 18:15
Impact of Annealing and Fictive Temperature on Brillouin and Raman Scattering Spectra in Yb-Doped Fibers, Siyuan Wang¹, Bailey Meehan², Thomas Wade Hawkins², John Ballato², Peter D. Dragic¹; ¹University of Illinois Urbana Champaign, USA; ²Clemson University, USA. The impacts of thermal annealing on Brillouin and Raman scattering in Yb-doped fibers are studied and explained by mechanical stress relief, ion diffusion, and glass relaxation. The results facilitate improved performance for high-power laser applications.
Thursday, 1 August

08:00 -- 10:00
Room: 206A
BTh1A • Applications of FBG and Laser Written Devices
Presider: Christophe Caucheteur; Universite de Mons, Belgium

BTh1A.1 • 08:00 Invited
Ultrashort Pulse Written VBGs: Achievements and Next Step, Daniel Richter¹, Malte P. Siems¹, Ria G. Krämer¹, Georg R. Schwartz¹, Abdolnaser Ghazagh¹, Stefan Nolte¹,²; ¹Institute of Applied Physics, Abbe Center of Photonics, Friedrich Schiller University Jena, Germany; ²Fraunhofer Institute for Applied Optics and Precision Engineering, Center of Excellence in Photonics, Germany. With ultrashort pulsed VBGs, the already impressive application areas of commercial VBGs can be even further expanded by overcoming process-related material limitations. Achievements, performance, current challenges and future applications will be highlighted.

BTh1A.2 • 08:30
Dual Mode-Comb Plasmonic Optical Fiber Sensing, Gabriel E. Villatoro-Perez², Médéric Loyez³, Joel Villatoro⁴, Christophe Caucheteur⁵, Jacques Albert¹; ¹Electronics, Carleton University, Canada; ²Optics, National Institute of Astrophysic Optics and Electronics, Mexico; ³Proteomics and Microbiology, University of Mons, Belgium; ⁴Ingeniería de Comunicaciones UPV/EHU, University of the Basque Country UPV/EHU, Spain; ⁵Electromagnetism and Telecom, University of Mons, Belgium. A partially gold-coated tilted FBG is proposed for self-referenced plasmonic sensing. The device exhibits two interleaved combs of resonances with unpolarized light; one comb is used as a reference and the other as a sensor.

BTh1A.3 • 08:45
Distributed Magnetic and Current Sensing Through Enhanced-Signal Random Bragg Grating, Antoine Leymonerie¹, Olivier Bélanger¹, Jean-Sébastien Boisvert¹, Sébastien Loranger¹; ¹Electrical Engineering, Polytechnique Montréal, Canada. We demonstrate the advantage of random fiber Bragg grating for distributed magnetic and current sensing. The 40 dB signal increase of the gratings allows a measurement down to 10 mT with 8 cm spatial resolution.

BTh1A.4 • 09:00
Multi-Channel and Dual-Range Spectrum Analyzer for Low-Cost Parallel TFBG Sensing, Julian Nicolai¹, Hubert Jean-Ruel¹; ¹Department of Electronics, Carleton University, Canada. An inexpensive spectrometer scheme for multiplexed TFBG biosensors is proposed. Multiple channels and two spectral windows are combined on a CMOS camera to measure with high-resolution a selection of cladding modes and the Bragg peak.

BTh1A.5 • 09:15
Fiber Bragg Grating Based Hydrogen Leak Detection, Korina Hartmann¹, Remco Nieuwland¹; ¹United Fiber Sensing B.V., Netherlands. A Fiber Bragg grating (FBG)-based hydrogen sensor coated with a catalytic layer was developed, detecting H₂ from 0.1 vol.% with response times of 3s. Experimental verification showed safe usage above the lower explosion limit (LEL).
BTh1A.6 • 09:30 Invited
The Road to a Practicable Magnetless Integrated Optical Isolator, Jerome Lapointe1, Cedrik Coia2, Albert Dupont1, Réal Vallée1; 1Center for Optics, Photonics and Lasers, Canada; 2Aeponyx, Canada. Since the 1990s, optical isolators have hindered full integration of photonic chips. Here, we describe challenges and a successful solution: an fs-laser-inscribed low-loss magnetless broadband integrated isolator. Additionally, we discuss potential routes to mass production.

08:00 -- 10:00
Room: 205A
I'Th1B • Novel Integrated Materials I
Presider: Christian Haffner; Interuniversity Microelectronics Center, Belgium

I'Th1B.1 • 08:00 Tutorial
Advanced Integrated Photonics on Lithium Niobate, Sasan Fathpour1; 1University of Central Florida, CREOL, USA. Abstract not available.

I'Th1B.2 • 09:00
Four-Wave Mixing in Highly Nonlinear Silicon Slot Waveguides With a Crystal Violet Cladding, Devika P. Nair1, Michael Menard1; 1École de technologie supérieure, Canada. We introduce a silicon slot waveguide encased in a highly nonlinear cladding containing crystal violet molecules. We measured the four-wave mixing efficiency and results show potential for implementing compact high-performance nonlinear optical devices.

I'Th1B.3 • 09:15
The Effect of a Protective ALD Layer on the Stability of Electro-Optic Polymer, Marwan Albarghouti1, Mateo Powell Serrano1, Jasper Drisko1, Patrick Riedel1, Gannon Kehe1, Ginnelle Ramann1, Xiaoyue P. Huang1, Brenden Basica1, John Zyskind1, Zhiming Liu1; 1Lightwave Logic, Inc., USA. We describe a method to improve the photo and thermal stability of electro-optic polymers. Our results show that degradation is reduced by encapsulating the EOP with a layer that is impermeable to molecular oxygen O2

I'Th1B.4 • 09:30 Invited
Near-Zero-Power Consumption Chalcogenide Phase Change Materials Photonic Devices for OFPGA Applications, Hongtao Lin1; 1Zhejiang University, China. Abstract not available.

08:00 -- 10:00
Room: 206B
NpTh1E • Frequency Combs and Spectral Broadening
Presider: Sile Nic Chormaic; Okinawa Inst of Science & Technology, Japan

NpTh1E.1 • 08:00 Invited
Title to be Announced, Zaijun Chen1; 1University of Southern California, USA. Abstract not available.
NpTh1E.2 • 08:30
Coherent Generation of Ultra-Stable Smart Frequency Combs, Celine Mazoukh1, Luigi Di Lauro1, Imtiaz Alamgir1, Bennet Fischer1,2, Nicolas Perron1, A Aadhi3, Armaghan Eshaghi4, Brent Little5, Sai Chu6, David J. Moss7, Roberto Morandotti1; 1INRS-EMT, Canada; 2Leibniz Institute of Photonic Technology, Germany; 3Centre for Nanophotonics, Queen's University, Canada; 4Huawei Technologies Canada, Canada; 5QXP Technologies, China; 6City University of Hong Kong, Hong Kong; 7Optical Sciences Centre, Swinburne University of Technology, Australia. We present a novel smart method to customize microcomb state generation in microring resonators pumped with a continuous-wave laser, using genetic algorithms to identify optimal experimental parameters for coherent state generation.

NpTh1E.3 • 08:45
Control of Frequency Comb Spacing via Self-Crystallization of Dark Vectorial Solitons in Kerr Resonators, Graeme N. Campbell1,2, Lewis J. Hill2, Pascal Del'Haye2,3, Gian-Luca Oppo1; 1Department of Physics, University of Strathclyde, United Kingdom; 2Max Planck Institute for the Science of Light, Germany; 3Department of Physics, Friedrich-Alexander-Universitat Erlangen-Nurnberg, Germany. Dark vectorial solitons in Kerr resonators with normal dispersion can spontaneously self-organize into regularly spaced crystals resulting in greater power and spacing of the frequency comb lines with increasing soliton numbers.

NpTh1E.4 • 09:00
Frequency-Offset Kerr Soliton Comb Generation in a Dispersion-Shifted Fiber Fabry-Perot Resonator, Yiqing Xu1,2, Matthew Macnaughtan1,2, Zongda Li1,2, Xiaoming Wei3, Zhongmin Yang3, Stephane Coen1,2, Miro Erkintalo1,2, Stuart Murdoch1,2; 1The Dodd-Walls Centre for Photonic and Quantum Technologies, New Zealand; 2Department of Physics, University of Auckland, New Zealand; 3School of Physics and Optoelectronics, South China University of Technology, China. We present a study of frequency-offset soliton combs that arise when a Kerr resonator is driven by a desynchronized pulsed field. We experimentally observe these offset-combs in a Fabry-Perot resonator constructed from dispersion-shifted optical fiber.

NpTh1E.5 • 09:15
Tunable Timescale Mode-Locked Laser Based on a Nested Microring Resonator, Imtiaz Alamgir1, A Aadhi1, Luigi Di Lauro1, Pavel Dmitriev1, Nicolas Perron1, Celine Mazoukh1, Bennet Fischer2, Piot Roztocki1,3, Cristina Rimoldi1,4, Mario Chernitzi1,2, Armaghan Eshaghi5, Evgeny Viktorov6, Anton Kovalen6, Brent Little7, Sai Chu8, David J. Moss9, Roberto Morandotti1; 1Énergie Matériaux Télécommunications, Institut national de la recherche scientifique, Canada; 2Leibniz Institute of Photonic Technology, Germany; 3K13 Photonics Technologies, Canada; 4Dipartimento di Elettronica e Telecomunicazioni, Politecnico di Torino, Italy; 5Huawei Technologies Canada, Canada; 6TMO University, Russian Federation; 7QXP Technology Inc., China; 8City University of Hong Kong, China; 9Swinburne University of Technology, Australia. We demonstrate an active mode-locked laser based on a nested microring resonator configuration that generates and switches between different repetition rates. This technique offers a versatile solution for spectroscopy, micromachining, and telecommunications applications.
NoTh1G.1 • 08:00 Invited
On the Temperature Dependence of Photo-Structural Changes in Chalcogenide Glasses, Pierre Lucas¹; ¹University of Arizona, USA. This presentation will show that while photo-structural changes in chalcogenide glasses are unquestionably optically induced, there is also clear evidence that many of these changes are thermally facilitated even at moderate laser power.

NoTh1G.2 • 08:30
Demonstration of Optical Refrigeration in SiO₂ – Al₂O₃ – Lu₂O₃ Yb-Doped Glasses, Thomas Meyneng¹,², Jyothis Thomas¹, Nicolas Grégoire², Morency Steeve⁴, Philippe Labranche², Jean-Sebastien Boisvert¹, Younès Messaddeq², Raman Kashyap³; ¹Department of electrical engineering, Polytechnique Montréal, Canada; ²COPL, Université Laval, Canada. This work demonstrates the applications of Lu₂O₃-Al₂O₃-SiO₂ Yb-doped glasses for optical refrigeration. Samples prepared by modified chemical vapor deposition, combined with solution-doping, exhibits near-unity quantum efficiency, with Yb-content ranging from 10²⁵ to 10²⁶ m⁻³.

NoTh1G.3 • 08:45
Tunable Continuous Wave Tm³⁺-Doped Gallium-Rich BGG Glass Laser, Stanislav Leonov¹, Théo Guérineau¹, Martin Bernier¹, Younès Messaddeq¹, Réal Vallée¹; ¹Center for Optics, Photonics and Lasers (COPL), Université Laval, Canada. We present a room-temperature tunable continuous wave laser based on Tm³⁺-doped Ga-rich BGG glass. The laser wavelength was continuously tuned from 1855 to 1965 nm, representing a tuning range of 110 nm.

NoTh1G.4 • 09:00
Comparison of Laser Induced Damage Thresholds of CdSiP₂ and BaGa₂GeSe₆ at 1064 nm for Different Spot Sizes, Shekhar Guha¹, Kevin Cissner¹, Alexander Carson¹, Kevin Zawilski², Valentin Petrov³; ¹US Air Force Research Laboratory, USA; ²BAE Inc., USA; ³Max Born Institut, Germany. Damage threshold values of CdSiP₂ and BaGa₂GeSe₆ under 5 ns duration 1064 nm laser exposure were measured for various spot sizes.

NoTh1G.5 • 09:15
Tuning Effective Optical Nonlinearities of Overlooked Glass-Forming Ionic Liquid Crystals, Valentyn Rudenko², Anatolii Tolochko², Svitlana Bugaychuk², Dmytro Zhulai², Gertruda Klimusheva², Galina Yaremchuk³, Tatjana Mirnaya³, Yuriy Garbovskiy¹; ¹Central Connecticut State University, USA; ²Institute of Physics of National Academy of Sciences of Ukraine, Ukraine; ³V.I. Vernadsky Institute of General and Inorganic Chemistry of National Academy of Sciences of Ukraine, Ukraine. This paper reports the modification of nonlinear-optical properties of very common yet often overlook glass-forming mesogenic materials (metal alkanoates) by using several types of nanoparticles including metal (silver and gold), bimetallic, and carbon dots.
NoTh1G.6 • 09:30 Invited
Mid Infrared Photonics on Thin-Film Lithium Niobate, Mengjie Yu1; 1University of Southern California, USA. Abstract not available.

08:00 -- 10:00
Room: 205C
NoTh1D • Nanophotonics
Presider: Jonathan Hu; Baylor University, United States

NoTh1D.1 • 08:00 Invited
Optical Positioning and Linking Using Optical Tweezers for 3D Nanofabrication, Euan McLeod1; 1University of Arizona, USA. Optical tweezers can accurately position nanoparticles of a wide range of materials in complex geometries. Assembly is automated using computer control. Applications include the fabrication of grating arrays for free-space coupling into microtoroidal optical sensors.

NoTh1D.2 • 08:30 Invited
Nanowire Terahertz Detectors: From Laboratory to Industrial Scale, Kun Peng1, Nicholas Morgan2, Ford Wagner1, Thomas Siday1, Chelsea Xia1, Didem Dede2, Victor Boureau3, Valerio Piazza2, Anna Fontcuberta i Morral2,4, Michael Johnston1; 1Department of Physics, University of Oxford, United Kingdom; 2Institute of Materials, EPFL, Switzerland; 3Interdisciplinary Centre for Electron Microscopy, EPFL, Switzerland; 4Institute of Physics, EPFL, Switzerland. Nanowires are advantageous for the phase-sensitive coherent detection of terahertz radiation by enabling the measurement of the full terahertz polarization state. However, the development of parallel-nanowire detectors or large-scale imaging arrays is challenging. Our work delivered solutions to this challenge.

NoTh1D.3 • 09:00 Invited
UV to Mid-IR Single Photon Detection Using Superconducting Fractal Nanowires, Vidur Raj1, Fiheon Imroze1, Dmitry Morozov1, Ciaran T. Lennon1, Gregor G. Taylor2, Martin Weides1, Robert H. Hadfield1; 1University of Glasgow, United Kingdom; 2EPFL, Switzerland. Superconducting nanowire single photon detectors (SNSPDs) have emerged as a preferred single photon detection technology for photonic quantum technology applications. Here, we show fractal nanowire SNSPDs operating from up to mid-IR regime, with saturating internal quantum efficiency.

NoTh1D.4 • 09:30
Withdrawn

NoTh1D.5 • 09:45
Tunable Nanophotonic Materials for Multispectral Reconfigurability, Yujie Luo1, Thomas Christensen2, Ognjen Ilic1; 1University of Minnesota Twin Cities, USA; 2Technical University of Denmark, Denmark. We show that active metasurface networks can accurately emulate and switch between complex spectral profiles, such as those of gases. This multispectral reconfigurability applies to coupled networks in active materials, including 2D or phase-change materials.
08:00 -- 10:00
Room: 2101
**NeTh1C • Wireless, Transport, and Sensing in Networks**
*Presider: Xiaodan Pang, KTH Royal Institute of Technology, Sweden*

**NeTh1C.1 • 08:00 Invited**
Withdrawn

**NeTh1C.2 • 08:30 Invited**
**Enabling Sub-THz 6G Wireless Systems Using Photonic Technologies**, Liam P. Barry¹, Amol Delmade¹, Simon Nellen², David Coffey², Cristian Vargas², Alison Kearney³, Robert Kohlhaas², Martin Schell², Frank Smyth³; ¹Dublin City University, Ireland; ²Fraunhofer Institute for Telecommunications, Heinrich Hertz Institute (HHI), Germany; ³Pilot Photonics, Ireland. The key elements of an optical heterodyne analog radio-over-fiber link, i.e. optical source, detector technology and impairment compensation techniques, are analyzed for high frequency (180-260 GHz) sub-THz signal generation in 6G wireless systems.

**NeTh1C.3 • 09:00 Invited**
**Hybrid Digital PAM and 60 GHz Analog Radio Over Fiber Optical Spectrum as a Service Applications**, Devika Dass¹; ¹University of Dublin Trinity College, Ireland. We experimentally study transmission of digitally multiplexed 15 Gb/s PAM-8, wideband 16-QAM OFDM (WiGig) and narrowband 64-QAM OFDM (5G NR) waveforms over a 10 km fiber, undergoing up-conversion to 60 GHz and achieving FEC limited performance.

**NeTh1C.4 • 09:30**
**Optical Frequency Comb Generation for DWDM Free Space Optical Communication Links**, Mahrokh Avazpour¹, Narmada Rajaram², Ahmad Atieh²,³, Liam P. Barry¹; ¹Dublin City University, Ireland; ²Department of Electrical and Computer Engineering, University of Ottawa, Canada; ³Optiwave System Inc., Canada. This paper presents DWDM-based FSO system with 42 channels generated via SOA-Fiber Loop Modulation. System performance is assessed using BER and eye diagrams considering bit rate, and FSO range applicable for high-capacity FSO link.

08:00 -- 10:00
Room: 2104
**SpTh1H • Coherent Technologies II**
*Presider: Dora van Veen; Nokia Corporation, United States*

**SpTh1H.1 • 08:00 Invited**
**Programmable Coherent Linear Processor for Machine Learning and Optical Communications**, Mitsumasa Nakajima¹, Kohei Ikeda²,³, Kohki Shibahara⁴, Akira Kawai⁴, Masaya Notomi²,³, Takayuki Kobayashi⁴, Yutaka Miyamoto⁴, Toshikazu Hashimoto¹; ¹NTT Device Technology Labs., Japan; ²NTT Nanophotonic Center, Japan; ³NTT Basic Research Labs., Japan; ⁴NTT Network Innovation Labs., Japan. We demonstrate linear algebra processors on integrated photonic circuits. Applications to a machine learning accelerator and pre-processor for optical communications are demonstrated by implementing recurrent, convolutional, and unitary processors on photonic chips.
SpTh1H.2 • 08:30
Add-Drop Multiplexing for Full Spectrum WDM NFDM Transmission Systems Using Spectral Overlap, Olaf Schulz¹, Alvaro Moscoso-Mártir², Jeremy Witzens², Stephan Pachnicke¹; ¹Kiel University, Germany; ²RWTH Aachen University, Germany. We present add-drop multiplexing for full spectrum modulated WDM nonlinear frequency division multiplexed transmission systems, in which spectral overlap between channels is used to eliminate nonlinear inter-channel crosstalk.

SpTh1H.3 • 08:45
From Analog Coherent Optics to Linear Drive Pluggable Optics: Lessons Learnt, Naim Ben-Hamida¹, Shahab Oveis Gharan¹, Ahmad Abdo¹, Bilal Riaz¹; ¹Ciena Canada Inc., Canada. Linear drive pluggable optics (LPO) forms a paradigm shift in the short-reach optical switching space. In here, we go through the trajectory from the CFP2-Analog Coherent Optics (ACO) to LPO and discuss the challenges to tackle as data rates increase.

SpTh1H.4 • 09:00
Interlocking of Mode-Locked Lasers Utilizing Optical Communication Equipment, Ido Attia¹,², Dan Sadot¹,²; ¹Ben-Gurion University of the Negev, Israel; ²CyberRidge, Israel. Interlocking of mode-locked lasers (MLLs) has several applications in the optical communication field and beyond. This work uses an on-chip, integrated coherent receiver (ICR) for successfully interlocking two 80GHz MLLs without exploiting the ICR high-speed outputs.

SpTh1H.5 • 09:15 Invited
Integrated Comb Lasers for Coherent Transceiver Scaling, Frank Smyth¹; ¹Pilot Photonics, Ireland. Abstract not available.

SpTh1H.6 • 09:45
Feedforward Phase Noise Compensation of Free-Running DFB Lasers Heterodyned for sub-THz Generation Without Optical Filtering, Kyungmin Woo¹, Hoon Kim¹; ¹KAIST, Korea (the Republic of). We experimentally demonstrate the feedforward compensation of phase fluctuations of two free-running DFB lasers heterodyned for 166-GHz signal without any optical filtering. We achieve the SSB phase noise of -80 dBc/Hz at 100-kHz offset frequency.

08:00 -- 10:00
Room: 207
SoTh1F • Fibers and Devices for Biomedical and Sensing Applications I
Presider: Natalie Wheeler; University of Southampton, United Kingdom

SoTh1F.1 • 08:00 Invited
Novel Fiber Optic Components for Biomedical Imaging and Sensing, Caroline Boudoux¹; ¹Polytechnique Montréal, Canada. Abstract not available.

SoTh1F.2 • 08:30
Distributed Hydrogen Sensing and Leak Detection Using Draw-Tower Fabricated Optical Fiber, sandy alomari¹, Kenny Hey Tow¹, Joao Pereira¹, Ari Antikainen¹, Tedros Weldehawariat¹, Korina Hartmann², Remco Nieuwland², Åsa Claesson¹; ¹RISE Fiberlab, RISE Research Institutes of Sweden, Sweden; ²United Fiber Sensing, Netherlands. A long length distributed
hydrogen sensor was demonstrated for the first time, using a draw-tower fabricated optical fiber with a sensor coating that reacts exothermically in the presence of hydrogen in air.

**SoTh1F.3 • 09:00**  
**Anti-Resonant, Hollow-Core Fiber Enhanced Raman Gas Spectroscopy With a 520nm Edge-Emitting Laser Diode**, Ian A. Davidson¹, Thomas Kelly¹, Peter Horak¹, David J. Richardson¹, Francesco Poletti¹, Natalie V. Wheeler¹; ¹University of Southampton, United Kingdom. Hollow-core fiber enhanced Raman spectroscopy is a highly versatile technique that normally utilizes narrow linewidth pump-lasers. Here a low-cost, ~1nm linewidth, edge-emitting laser diode is used resulting in a potentially more compact and energy-efficient system.

**SoTh1F.4 • 09:15**  
**Tapering Space-Division Multiplexing Fibers for Multi-Parameter Sensing**, Liudmila Silanteva¹, Vincent V. Vliet¹, Menno V. Hout¹, Chigo Okonkwo¹, Thomas Bradley¹; ¹Eindhoven University of Technology, Netherlands. We report on simulations of coupled-core fibers tapered to a diameter ≈ 1.2 μm, resulting in mode field diameters of ≈ 1.3 μm (LP01) and ≈ 2 μm (LP11) respectively for enhancing the field for a multi-parameter sensor.

**SoTh1F.5 • 09:30**  
**Optical Fiber SERS Sensors for Salmonella Detection in Poultry Products**, Mai Abuhelwa¹, Arshdeep Singh¹, Jiayu Liu¹, Amit Morey², Lakshmikantha Channaiah¹, Mahmoud Almasri¹; ¹University of Missouri-Columbia, USA; ²Auburn University, USA. This paper introduces SERS sensors with nanoantenna arrays on an optical fiber and 3D printed microstructure, detecting 1-3 cells/ml in 10 minutes. It enhances signal-to-noise ratio through increased surface area, unpublished.

**SoTh1F.6 • 09:45**  
**THz Negative Curvature Fiber Sensor Design for Blood Constituent Analysis**, Julia Ward¹, Ethan Neidt¹, Riley Como¹, Ahmet E. Akosman¹; ¹Roger Williams University, USA. A unique hollow-core negative curvature fiber design to achieve broadband sensing of blood constituents in the THz range is proposed. Numerical investigations indicate operational bandwidths exceeding 0.6 THz and simultaneous selectivity for different constituents.

**10:30 -- 12:30**  
**Room: 206A**  
**BTh2A • Optical Fiber Sensing**  
*Presider: Patrice Mégret; Universite de Mons, Belgium*

**BTh2A.1 • 10:30 Invited**  
**Optical Fiber Sensors for Volatile Organic Compound Vapors**, Eleni Grantzioti¹, Panagiotis Kleitsiotis¹,², Emmanouil Gagoudakis¹, Vassilios Binas³, Stavros Pissadakis¹, Maria Konstantaki¹; ¹FORTH-IESL, Greece; ²Physics Department, University of Crete, Greece; ³Chemistry Department, Aristotle University of Thessaloniki, Greece. A review of optical fiber sensors utilizing tilted Bragg gratings, long-period gratings, or Fabry-Perot interferometer coupled with metal oxide or polymeric sensing overlays/cavities for the detection of methanol, ethanol, isopropanol and acetone vapors.
BTh2A.2 • 11:00
Developing Robust Optical Fibre Sensors for use in Hostile Sewer Environments, Lachlan Anderson¹, Peter Dekker¹, Heriberto Bustamante², Thomas Kuen³, Michael J. Withford¹, Martin Ams¹; ¹Macquarie University, Australia; ²Sydney Water, Australia; ³Melbourne Water, Australia. We report robust fibre Bragg grating (FBG) sensors that optically measure environmental conditions in concrete wastewater networks over long periods. We also demonstrate an optical fibre dew point sensor.

BTh2A.3 • 11:15
Spectral Detangling of Plasmonic Fiber Bragg Grating Biosensors, Hadrien Fasseaux¹, Christophe Caucheteur¹, Médéric Loyez¹; ¹Université de Mons, Belgium. Plasmonic tilted fiber Bragg gratings are highly sensitive refractometers and biosensors. The detection occurs through the detangling of intricate comb-like spectral signatures and various demodulation techniques have been proposed. We study here their relative performance.

BTh2A.4 • 11:30
Optical Vernier Effect Based on High Order Fiber Bragg Grating, Romain Cotillard¹, Nicolas Roussel¹; ¹CEA, France. The use of the Optical Vernier effect to increase sensitivity to a physical parameter is well known in the field of Fabry-Perot cavities. We propose here a simplified application with fiber Bragg gratings.

BTh2A.5 • 11:45
Optical Sensing for Temperature and Vibration Analysis of Submersible Pumps, Paulo H. Ruiz Mazzo¹, Gabriel A. Torelli¹, Uilian J. Dreyer¹, Jesse Pelegrin², Leonardo Siqueira¹, Jhoan Cubas¹, Moises Neto¹, Luiz C. Silva³, Gabriel Romero³, Jurandir Silva³, Rigoberto Morales¹, Jean Carlos Cardozo da Silva¹; ¹Federal University of Technology-Paraná, Brazil; ²Instituto Federal Catarinense, Brazil; ³PETRÓLEO BRASILEIRO S.A. - PETROBRAS, Brazil. Fiber Bragg Grating and Distributed Temperature Sensing are discussed to protect submersible pump components. Through a combined method using temperature and vibration measurement, we can detect early-stage issues correlated with variations in pump flow rate.

BTh2A.6 • 12:00
Small-Scale Optrode Based on PDMS for Improved Temperature Measurement, Bryan D. Sanipatin¹, Luis Sánchez², Lucía Arques¹, Salvador Sales¹; ¹Universidad Politécnica de Valencia, Spain; ²Cal-Sens, Spain. A novel, small-scale PDMS-based fiber-optic sensor is proposed to enhance sensitivity in temperature measurements. This sensor, also referred to as an optrode, was experimentally studied obtaining a substantial improvement in terms of sensitivity and size.

BTh2A.7 • 12:15
FBG-Based Accelerometer With Temperature Compensation for Structural Health Monitoring, Chloé Landreau², Thomas Le Gall², Nicolas Ponthus², Adriana Morana¹, Jacques Charvin², Sylvain Girard¹, Emmanuel Marin¹; ¹Laboratoire Hubert Curien, France; ²Avnir Energy, France. A Fiber Bragg Grating based accelerometer has been designed and manufactured for Structural Health Monitoring applications. It has a linear response up to 250 Hz and a temperature compensation system.
10:30 -- 12:30
Room: 205A
ITh2B • Novel Integrated Materials II
Presider: Nathalie Vermeulen; Vrije Universiteit Brussel, Belgium

ITh2B.1 • 10:30 Invited
Wafer-Scale TMD Monolayer Waveguide, Myungjae Lee1; 1Seoul National University, Korea (the Republic of). Abstract not available.

ITh2B.2 • 11:00
Demonstration of Graphene Waveguide Photodetector Based on Photothermoelectric Effect, Yishu Huang1,2, Tom Reep1,2, Hung-Chieh Tsai1, Jeroen De Coster1, Steven Brems1, Inge Asselberghs1, Klaas-Jan Tielrooij3,4, Dries Van Thourhout1,2, Christian Haffner1; 1imec, Belgium; 2KU Leuven, Belgium; 3Catalan Institute of Nanoscience and Nanotechnology (ICN2), Spain; 4TU Eindhoven, Netherlands. We demonstrate a graphene waveguide photodetector featuring a responsivity of ~1.2 V/W. The photovoltage map measured under zero bias confirms that photothermoelectric effect is dominating.

ITh2B.3 • 11:15
Gallium Phosphide Platforms for Integrated Photonics, Lise Morice1,2, Brieg Le Corre3,1, Antoine Lemoine1, Abdelmounaim Harouri2, Grégoire Beaudoin2, Luc Le Gratiet3, Tony Rohel1, Julie Le Pouliquen1, Rozenn Bernard1, Christian Grillet2, Charles Cornet1, Isabelle Sagnes3, Konstantinos Pantzas3, Christelle Monat2, Yoan Léger1; 1Univ Rennes, INSA de Rennes, CNRS, Institut FOTON, UMR 5270, Ecole Centrale de Lyon, France; 2Centre de Nanosciences et de Nanotechnologies, CNRS, Univ Paris-Saclay, France. Here we compare different Gallium Phosphide photonic platforms in the framework of non-linear photonic integration. This comparison is firstly carried out through the evaluation of propagation losses within nanowaveguides in the near infrared.

ITh2B.4 • 11:30
Linear and Nonlinear Characterization of Vertical Orientation-Patterned Gallium Phosphide Waveguides for Second Harmonic Generation, Antoine Lemoine1, Brieg Le Corre2, Lise Morice1, Abdelmounaim Harouri2, Luc Le Gratiet2, Grégoire Beaudoin2, Julie Le Pouliquen1, Arnaud Grisard3, Sylvain Combré3, Bruno Gérard4, Charles Cornet1, Yannick Dumeige1, Konstantinos Pantzas2, Isabelle Sagnes2, Yoan Léger1; 1Univ Rennes, INSA Rennes, CNRS, Institut FOTON - UMR 6082, France; 2Centre de Nanosciences et de Nanotechnologies, CNRS, Univ Paris-Saclay, France. This paper discusses the potential of vertical orientation-patterned gallium phosphide (VOP-GaP) waveguide for second harmonic generation. The design of the devices, their fabrication and the linear and nonlinear characterizations are presented.

ITh2B.5 • 11:45
C-Band Translation by Second-Harmonic Generation in an Orientation-Patterned Gallium Phosphide Waveguide, Brieg Le Corre1,2, Antoine Lemoine1, Abdelmounaim Harouri1, Luc Le Gratiet1, Bruno Gérard4, Sylvain Combré3, Arnaud Grisard3, Grégoire Beaudoin1, Isabelle Sagnes1, Konstantinos Pantzas1, Gilles Patriarche1, Yoan Léger2; 1Centre de Nanosciences et
Orientation-patterned gallium phosphide (OP-GaP) is studied for frequency combs conversion from C-band to visible. Simulations of periodic and chirped OP-GaP waveguides nonlinear response are presented. Design rules for future developments are established using this study.

ITH2B.6 • 12:00 Invited
Advanced Applications of Kerr Micro-Combs, David J. Moss1; 1Swinburne University of Technology, Australia. Abstract not available.

10:30 -- 12:30
Room: 206B
NpTh2D • Topological and Quantum Nonlinear Optics
Presider: Mikko Huttunen; Tampere University, Finland

NpTh2D.1 • 10:30 Invited
Topological Optical Frequency Combs, Sunil Mittal1; 1Northeastern University, USA. We report the generation of nested topological frequency combs using two-dimensional arrays of coupled ring resonators that host robust topological edge states with linear dispersion.

NpTh2D.2 • 11:00
Topological Features of Bright Vector Solitons in Ring Resonators With Normal Dispersion, Erwan Lucas2, Lewis J. Hill1, Gang Xu3, Gian-Luca Oppo4, Yiqing Xu5, Pascal Del'Haye1, Bertrand Kibler2, Stuart Murdoch5, Miro Erkintalo5, Stephane Coen5, Julien Fatome2; 1Max-Planck-Inst Physik des Lichts, Germany; 2Laboratoire ICB, CNRS-Université de Bourgogne, France; 3School of Optical and Electronic Information, Huazhong University of Science and Technology, China; 4SUPA and Department of Physics, University of Strathclyde, United Kingdom; 5Physics Department, The University of Auckland, New Zealand. Experiments and simulations of unusual bright vector solitons in Kerr ring resonators with normal dispersion displaying a phase defect with a phase jump of $\pi$ in one of the linear polarization components are presented.

NpTh2D.3 • 11:15
Promoting Light Localization of Topological Edge States via Weak Nonlinearity, Xiaoqin Huang1, Zhaoyuan Wang1, Yi Hu1, Jingjun Xu1; 1Nankai University, China. We demonstrate that a weak optical nonlinearity can further enhance the localization of topological edge states. As opposite to the reported nonlinearly-induced spreading of these states, our work introduces a solution coordinating nonlinearity and topology.

NpTh2D.4 • 11:30
Separating Spontaneous Symmetry Breaking From Exceptional Points, Lewis J. Hill1, Julius Gohsrich12, Jacob Fauman12, Alekhya Ghosh12, Kyle Kawagoe34, Pascal Del'Haye12, Flore Kunst12; 1Max-Planck-Inst Physik des Lichts, Germany; 2Department of Physics, Friedrich Alexander University Erlangen-Nuremberg, Germany; 3Department of Physics, The Ohio State University, USA; 4Department of Mathematics, The Ohio State University, USA. Spontaneous symmetry breaking is often thought of as ubiquitous with an exceptional point. However, we show that for equations describing three different systems from nonlinear optics this is probably not the case.
NpTh2D.5 • 11:45
Non-Hermitian Swallowtail Degeneracy in the two-Mode Squeezing of Light, Polina Blinova¹², Evgeny Moiseev¹, Kai Wang¹; ¹Physics, McGill, Canada; ²School of Applied and Engineering Physics, Cornell University, USA. We show that swallowtail catastrophe consisting of various-order non-Hermitian degeneracies naturally exists in the dynamics of two-mode quadrature squeezing systems with asymmetric losses that break pseudo-Hermicity and propose a practical experimental setup.

10:30 -- 12:30
Room: 205C
NoTh2C • 2D and Nanophotonic Devices
Presider: Jonathan Hu; Baylor University, United States

NoTh2C.1 • 10:30 Invited
Photoluminescence and Non-Linear Optical Behavior in Two-Dimensional Metal Chalcophosphates, Efrain Rodriguez¹; ¹University of Maryland at College Park, USA. Abstract not available.

NoTh2C.2 • 11:00 Invited
Non-Volatile Optical Switch Through Sliding Ferroelectricity in 2D Semiconductors, Ziliang Ye¹; ¹University of British Columbia, Canada. Rhombohedral stacked transition metal dichalcogenides exhibit a strong excitonic effect and an out-of-plane electrical polarization associated with the stacking configuration. Here we utilize them to achieve a non-volatile switchable behaviour in the material’s optical properties.

NoTh2C.3 • 11:30 Invited
High Index Nanophotonic Structures and Optoelectronic Devices, Leland Nordin¹²; ¹CREOL, University of Central Florida, USA; ²Materials Science and Engineering, University of Central Florida, USA. High-index IV-VI semiconductors promise advancements in next-generation mid-infrared devices, with high refractive index, dislocation tolerance, low Auger recombination, and cold growth temperatures. We’ll discuss our heteroepitaxial IV-VI/III-V devices and high-index epitaxial nanophotonic device architectures.

NoTh2C.4 • 12:00 Invited
Transparent Conductive Oxides for Epsilon-Near-Zero and Integrated Photonics, Alan X. Wang¹; ¹Baylor University, USA. Transparent conductive oxides offer unique optical properties for epsilon-near-zero photonics and photonic integrated circuits. The research progress in energy-efficient optical modulators, tunable filters, and metasurfaces will be reviewed. We also discuss perspectives toward scalable manufacturing through integration with silicon photonics.
10:30 -- 12:30
Room: 2104
SpTh2G • Signal Processing Applications
Presider: Vincent Houtsma; Nokia Bell Labs, United States

SpTh2G.1 • 10:30 Invited
Long-Haul MIMO Transmission With a Coupled Core MCF, Shohei Beppu¹, Daiki Soma¹; ¹KDDI Research, Japan. We review recent progress of long-haul MIMO transmission experiments with a coupled core MCF. Issues of real-time MIMO DSP implementation such as DSP complexity and adaptive tracking are also discussed.

SpTh2G.2 • 11:00
Enhanced Digital-to-Analog Converter Model Capturing Frequency Dependent ENoB, Arman Safarnejadian¹, Leslie Rusch¹, Wei Shi¹, Ming Zeng¹; ¹ECE Department, Center for Optics, Photonics and Lasers (COPL), Canada. We propose a digital-to-analog converter (DAC) model that accurately captures frequency-dependent effective number of bits (ENoB). Our model overcomes previous limitations (including aliasing and distortion) and reflects the DAC true frequency response.

SpTh2G.3 • 11:15 Invited
Neuromorphic Computing for Low Power DSP, Shuangxu Li¹; ¹Huawei Technologies, Germany. Abstract not available.

SpTh2G.4 • 11:45
Anomaly Detection in Optical Fiber: a Change-Point Detection Perspective, Reza Mosayebi¹, Lutz Lampe¹; ¹University of British Columbia, Canada. We present a change-point detection algorithm for optical fibers. Utilizing SNR, our approach swiftly identifies soft anomalies, aiding early failure detection. This proactive identification can mitigate connectivity disruptions, an important step toward enhancing network reliability.

SpTh2G.5 • 12:00 Invited
Fiber Sensing Using Real-Time Coherent Transceivers, Mikael Mazur¹, Nicolas K. Fontaine¹, Roland Ryf¹, Lauren Dallachiesa¹, Haoshuo Chen¹, David Neilson¹; ¹Nokia Bell Labs, USA. We review progress on fiber sensing using coherent transceivers and benchmark it to regular dedicated fiber sensing methods. Applications over aerial, terrestrial and transoceanic links are covered, focusing on both network protection and environmental sensing.

10:30 -- 12:30
Room: 205B
STh2F • Spectroscopy & Dynamics
Presider: Thomas Cooper; York University, Canada

STh2F.1 • 10:30 Invited
Drain and Photo-Induced Multifunctional Ambipolar Optoelectronics Based on 2D Semiconductors, Kayoung Lee¹, Jaeha Hwang¹, Youngkyu Ko¹, Suyeon Lee¹, Jungi Song¹, Yongwook Seok¹, Hanbyeoel Jang², Kenji Watanabe³, Takashi Taniguchi³; ¹Korea Advanced Institute of Science & Technology (KAIST), Korea (the Republic of); ²Gwangju Institute of Science and Technology (GIST), Korea (the Republic of); ³National Institute for Materials
Science, Japan. Practical applications of drain-bias-induced effect in the advancement of
switching electronics have remained limited. Here, I will talk strategies to achieve significant
current changes by utilizing drain-induced and photo-induced carrier type switching in 2D
semiconductors.

STh2F.2 • 11:00
Ultrafast Hot Carrier Relaxation Dynamics in CsPbBr3 in Presence of Layered Material,
Naresh C. Maurya¹, K V Adarsh¹; ¹IISER Bhopal, India, India. Our study reveals that the hot
carriers’ initial temperature of CsPbBr3 dropped from 1000 to 542 K and the thermalization time
550 to 350 fs in the presence of layered material, indicating hot carrier relaxation.

STh2F.3 • 11:15
Exceptionally Low-Threshold Multiple Carrier Generation in Atomically Thin Transition
Metal Dichalcogenides, Riyanka Karmakar¹, Pravrati Taank¹, K V Adarsh¹; ¹IISER Bhopal,
India, India. We experimentally demonstrate multiple carrier generation at 1.12Eg (Eg is
bandgap) threshold energy in monolayer MoS2 by leveraging the carrier-carrier scattering that
excites secondary electrons from electron-donating sulfur-vacancy states strategically
positioned below the conduction band.

STh2F.4 • 11:30 Invited
Probing Dynamics of Chemical Bonds in Organic Chromophores by X-ray
Spectroscopies, Sergei Tretiak¹; ¹Los Alamos National Laboratory, USA. I will overview some
possible measurements that can be done with X-ray lasers suggested by computational
investigations. This includes monitoring the coherence evolution in molecular photoswitches and
using X-ray Circular Dichroism as local chirality probe.

STh2F.5 • 12:00
Organic Photodetector Crossbar Array With Visible to Near-Infrared Responsivity,
Sangin Hahn¹, Carmela Michelle Esteban¹, Sun-Woo Jo¹, Songhyun Kim¹, Kyungmin Kim¹, Seunghyup
Yoo¹; ¹KAIST, Korea (the Republic of), This study presents the implementation of the 8×8
crossbar photodetector array, with a vertically combined organic photodiode-blocking diode
pixel structure. Optimized components and simplified fabrication processes demonstrate a
straightforward strategy for realizing photodetector arrays.

STh2F.6 • 12:15
Enhancing Absorption in Cadmium Telluride Solar Cells using Ti Nanoparticles,
Sudarshan K. Jain¹, Nikhil Deep Gupta², Vijay Janyani³; ¹ECE, Malaviya National Institute of
Technology, Jaipur, India; ²Center for VLSI and Nano Technology, Visvesvaraya National
Institute of Technology, India. This paper presents the integration of titanium nanoparticles into
the active layer of CdTe solar cells to increase light absorption. It was found that titanium
nanoparticles' light-trapping capability profoundly improved the performance of the CdTe solar
cells.
Optica Advanced Photonics Session Guide

Disclaimer: this guide is limited to technical program with abstracts and author blocks as of 21 July. For updated and complete information with special events, reference the online schedule or mobile app.

10:30 -- 12:30
Room: 207
SoTh2E • Fibers and Devices for Biomedical and Sensing Applications II
Presider: Natasha Vukovic; University of Southampton, United Kingdom

SoTh2E.1 • 10:30 Invited
Bidirectional Interfaces Based on Multimaterial Optical Fibers for Infrared Neurostimulation, Marcello Meneghetti1,2, Kunyang Sui1,2, Rune W.Berg2, Christos Markos1,3; 1Technical University of Denmark, Denmark; 2University of Copenhagen, Denmark; 3NORBLIS Aps, Denmark. Here, we present the development of multifunctional neural implants based on soft optical fibers, and their application to infrared neural stimulation, a transgene-free neuromodulation technique with high potential for clinical translation.

SoTh2E.2 • 11:00 Invited
Multifunctional Neural Interfaces With Multimodal Optical Fibers, Ferruccio Pisanello1, Marco Bianco1; 1Istituto Italiano di Tecnologia, Italy. Abstract not available.

SoTh2E.3 • 11:30
Thermally Drawn Biodegradable Optical Fiber for Neural Applications, Parinaz Abdollahian1,2, Kunyang Sui1,2, Guanghui Li2, Jiachen Wang1, Cuiling Zhang1, Yazhou Wang1, Rune W.Berg2, Marcello Meneghetti1,2, Christos Markos1; 1Photonics and Electronic Engineering, Technical University of Denmark, Denmark; 2Neuroscience, Copenhagen University, Denmark. This study focuses on the development of implantable, biodegradable optical fibers for light delivery in the brain without the necessity of explanation surgeries. The biodegradability of the fibers was verified in vitro and in vivo.

SoTh2E.4 • 12:00
Ultra-High Transverse Mode Purity in Double-Clad Hollow-Core Photonic Crystal Fiber, Zhuozhao Luo1,2, Jiapeng Huang1,3, Yu Zheng4, Ruochen Yin1,3, Long Zhang1, Meng Pang1,2, Xin Jiang1,3; 1Russell Centre for Advanced Lightwave Science, Hangzhou Institute of Optics and Fine Mechanics and Shanghai Institute of Optics and Fine Mechanics, China; 2State Key Laboratory of High Field Laser Physics and CAS Center for Excellence in Ultra-intense Laser Science, Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, China; 3Innovation and Integration Center of New Laser Technology, Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, China; 4iFiber Optoelectronics Technology Co., Ltd., China. Ultra-high single-mode purity is achieved in a double-clad hollow-core photonic crystal fiber by enhanced higher-order-mode filtering. The wavelength tunability with persist high single-mode purity is also investigated.

14:00 -- 16:00
Room: 206A
BTh3A • FBG for Laser and Spectrometer Applications
Presider: Sébastien Loranger; Polytechnique Montréal, Canada

BTh3A.1 • 14:00 Invited
Beyond 2 μm Bragg Grating Components for Monolithic Fiber Lasers, Antreas Theodosiou1, Jan Aubrecht2, Pavel Peterka2, Kyriacos Kalli3, Ori Sapir-Henderson4; 1Lumoscribe Ltd., Cyprus; 2UFE, Czechia; 3CUT, Cyprus; 4UoA, Australia. We report on our latest results on
the inscription of uniform and blazed fiber Bragg gratings in fluoride and silica optical fibers for monolithic SWIR fiber lasers.

BTh3A.2 • 14:30
Femtosecond Written Chirped Fiber Bragg Gratings for Dispersion Control at 2 μm,
Georg R. Schwartz1, Ria G. Krämer1, Malte P. Siems1, Abdolnaser Ghazagh1, Daniel Richter1, Stefan Nolte1,2; 1Institute of applied physics, Friedrich-Schiller-Univ., Germany; 2Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Germany. We present femtosecond written CFBGs using a chirped phase mask for dispersion control. A bandwidth of >140 nm and reflectivity of ~70 % were achieved, with tailored dispersion up to the 3rd order.

BTh3A.3 • 14:45
High Efficiency Fiber Bragg Grating Spectrometer Fabricated Using One Infrared Femtosecond Laser Pulse and the Phase Mask Technique, Abdullah Rahnama1, Cyril Hnatovsky1, Robert B. Walker1, Kasthuri De Silva1, Stephen J. Mihailov1; 1National Research Council Canada, Canada. A super-efficient all-fiber visible spectrometer with sub-nanometer resolution is fabricated using one infrared femtosecond laser pulse and a phase mask. The strong light outcoupling from the fiber is due to micropores formed in its core.

BTh3A.4 • 15:00
Selective Modal Excitation of FBGs in FMF Through Inscription Techniques and the use of a Spatial Multiplexer, James T. Hainsworth1, Adriana Morana2, Lucien Pouget1, Marina Arnaud1, Sylvain Girard2, Jacques Decroix1, Emmanuel Marin2; 1IRT Saint Exupery, France; 2Laboratoire Hubert Curien, France. Fibre Bragg grating spectral control by use of a spatial mode sorter and inscription eccentricity has been investigated. Results show extensive peak suppression in the transmission and reflection spectra with the capability for peak erasure.

BTh3A.5 • 15:15
Chirped Tilted Fiber Bragg Gratings Used as Intracavity ASE Band-Stop Filters in a High Power 1018 nm Fiber Laser, Bertrand Morasse1, Alexandre Perron1, Dominique Faucher1, Pierre-Michel Belzile1, Mathieu Voiant Deschênes1, Frédéric Faucher1, Guillaume Brochu1, François Trépanier1, Michel Bégin1, Pascal Deladurantaye1; 1TeraXion Inc., Canada. We present chirped tilted fiber Bragg grating intracavity filters to suppress amplified spontaneous emission from the core of a 20/400 Yb-doped high power fiber laser, allowing the efficient generation of 432 W at 1018 nm.

BTh3A.6 • 15:30
Effect of Group Delay Ripples of Chirped Fiber Bragg Gratings Used in CPA Lasers, Francois Ouellette1, Hui Wang2; 1Chengdu University, China; 2Ultron Photonics, China. The effect of group delay ripples (GDR) in chirped fiber Bragg gratings used in chirped pulse amplification lasers is analyzed. The polarization rotation method is shown to measure the most deleterious GDR with a resolution better than 50 fs.

BTh3A.7 • 15:45
Femtosecond-Written Large Area FBGs for Wavelength Stabilization of Blue Laser Diodes, Ludovic de Repentigny2,1, Lauris Talbot2, François Trépanier1, Martin Bernier2; 1TeraXion Inc., Canada; 2Centre d’Optique, Photonique et Laser (COPL), Université Laval,
Canada. We report the wavelength stabilization of blue laser diodes using fiber Bragg gratings femtosecond-written in their highly multimode fiber pigtail.

14:00 -- 16:00
Room: 206B
NpTh3C • Novel Nonlinear Materials
Presider: Mikko Huttunen; Tampere University, Finland

NpTh3C.1 • 14:00
An Ultrafast All-Optical Switch With an Epsilon-Near-Zero-Based Nanocavity, Yaswant Vaddi1, Theng-Loo Lim1, M. Zahirul Alam1, Shivashankar R. Vangala2, Jeremy Upham1, Joshua Hendrickson2, Robert W. Boyd1,3; 1Department of Physics, University of Ottawa, Canada; 2Sensors Directorate, Air Force Research Laboratory, USA; 3Institute of Optics, University of Rochester, USA. We experimentally demonstrate an ultrafast all-optical switch using a 1D, nonlinear nanocavity with an epsilon-near-zero mirror. The switch exhibits a 10 dB modulation depth over a large spectral range.

NpTh3C.2 • 14:15
Tailoring Nonlinear Response of ENZ Metamaterials at Oblique Incidence, Sisira S. Suresh1, M. Zahirul Alam1, Jeremy Upham1, R. Margoth Cordova Castro1, Maryam Abbasi1, Robert W. Boyd1; 1University of Ottawa, Canada. We study nonlinear optical properties of a layered ENZ metamaterial with oblique incident TM-polarized light. Maximum nonlinear responses occur at angle-dependent zero-permittivity wavelengths, demonstrating enhancement is due to ENZ condition regardless of constituents' microscopic details.

NpTh3C.3 • 14:30
Enhanced THz Third-Harmonic Generation in a Graphene-Metamaterial Hybrid Structure, Ali Maleki1, Moritz B. Heindl2, Yongbao Xin3, Robert W. Boyd1,4, Georg Herink2, Jean-Michel Ménard1; 1University of Ottawa, Canada; 2University of Bayreuth, Germany; 3Iridian Spectral Technologies Ltd, Canada; 4University of Rochester, USA. We present a metasurface design to enhance third harmonic generation at terahertz frequencies inside two decoupled graphene sheets. Spectral filtering of terahertz pulses produced by a table-top source enables sensitive monitoring of nonlinear effects.

NpTh3C.4 • 14:45
All-Dielectric Huygens’ Metawaveguides for Nonlinear Integrated Photonics, Gabriel Flizikowski1, Ozan W. Oner2, Lais F. dos Santos1, M. Saad Bin-Alam3, Thomas Pertsch4, Isabelle Staude4, Jens H. Schmid3, Pavel Cheben3, Ksenia Dolgaleva1,2; 1School of Electrical Engineering and Computer Science, University of Ottawa, Canada; 2Department of Physics, University of Ottawa, Canada; 3National Research Council of Canada, Canada; 4Friedrich-Schiller-Universitat Jena, Germany. We have experimentally demonstrated the compensation of nonlinear optical effects by a silicon-on-insulator nanophotonic metawaveguide comprising a chain of resonantly forward-scattering nanoparticles, exhibiting soliton-like behavior and spectral pulse integrity.

NpTh3C.5 • 15:00
Highly Efficient Degenerate Four-Wave Mixing With an Epsilon-Near-Zero-Based Low-Q Cavity, Theng Loo Lim1, Yaswant V. Vaddi1, M. Zahirul Alam1, Shivashankar R. Vangala3,
Jeremy Upham¹, Joshua Hendrickson³, Robert W. Boyd¹,²; ¹University of Ottawa, Canada; ²University of Rochester, USA; ³Air Force Research Laboratory, USA. We experimentally demonstrated high-efficiency frequency-degenerate four-wave mixing (DFWM) using an epsilon-near-zero-based nanocavity. The cavity length is approximately two wavelengths thick. We measured an absolute efficiency as large as 34%.

NpTh3C.6 • 15:15
Second Harmonic Enhancement With a U-Shaped InSb Plasmonic Antenna in the THz Regime, Sina Aghili¹, Ksenia Dolgaleva¹; ¹University of Ottawa, Canada. We propose a U-shaped plasmonic antenna made of the InSb semiconductor, enhancing the SHG process with an effective second-order susceptibility of 90 pm/V in the THz regime.

NpTh3C.7 • 15:30 Invited
Nonlinear Laser Conversion in Nanophotonic Resonators, Jennifer A. Black¹; ¹NIST Boulder, USA. Integrated Kerr microresonators incorporating nanostructures provide a novel approach to phase-matching for flexible and efficient laser wavelength conversion based on optical-parametric oscillation. I will discuss the development of these nanophotonic oscillators for laser wavelength conversion spanning beyond an octave.

14:00 -- 16:00
Room: 205C
NoTh3B • Emerging Photonic Devices
Presider: Lynda Busse; US Naval Research Laboratory, United States

NoTh3B.1 • 14:00 Invited
Near-Ultraviolet to Midwave Infrared Devices for Quantum Sensing and Information Processing, Cheryl M. Sorace-Agaskar¹, Colin Bruzewicz¹, Patrick Callahan¹, Christopher Heidelberger¹, Dave Kharas¹, William Loh¹, Thomas Mahony¹, Ryan Maxson¹, Robert McConnell¹, Alexander Medeiros¹, Rachel Morgan², Alkesh Sumant¹, Meghan Schuld¹, Reuel Swint¹, Kerri Cahoy², Jelena Notaros², John Chiaverini¹,², Paul Juodawlkis¹; ¹MIT Lincoln Laboratory, USA; ²MIT, USA. The talk reviews photonic integrated circuit materials, devices and integration techniques developed at MIT Lincoln Laboratory to support the needs of next generation quantum systems across the wavelength spectrum from the near-ultraviolet to the midwave-infrared.

NoTh3B.2 • 14:30 Invited
Deep Ultraviolet MicroLEDs and Arrays for Advanced Optical Communication, Haiding Sun¹; ¹University of Sci. & Tech. of China, China. Abstract not available.

NoTh3B.3 • 15:00 Invited
Harnessing Ultrafast Optical Pulses for 3D Microfabrication by Selective Tweezing and Immobilization of Colloids, Krishangi Krishna¹, Jieliyue Sun¹, Kimani C. Toussaint¹; ¹Brown University, USA. We employ femtosecond-laser pulses for a two-step microfabrication process: optical tweezing of microparticles to target positions, followed by immediate particle immobilization by two-photon polymerization. The challenges and opportunities of this platform are discussed.
NoTh3B.4 • 15:30
Withdrawn

NoTh3B.5 • 15:45

Mie-Resonant Huygens' Metawaveguide Microring Resonators, Md Saad-Bin-Alam¹, Jianhao Zhang¹, Yunus Denizhan Sirmaci², Thomas Pertsch², Isabelle Staude², Jens H. Schmid¹, Pavel Cheben¹; ¹National Research Council Canada, Canada; ²Friedrich-Schiller-Universität Jena, Germany. Metawaveguides consisting of Mie-resonant dielectric Huygens' nanoantennas can propagate light with negative group index and zero-to-anomalous dispersion. Here, we demonstrate a Huygens' metawaveguide microring resonator, which could revolutionize the on-chip nonlinear and quantum photonics applications.

14:00 -- 16:00
Room: 207
SoTh3D • Novel Fabrication & Characterization Techniques
Presider: Nadia Boetti; Fondazione LINKS, Italy

SoTh3D.1 • 14:00 Invited
X-ray-Based Techniques for the Characterization of Polymer Optical Fibers, Mario Ferraro¹,³, Maria Caterina Crocco¹,³, Raffaele Filosa¹,³, Kevin Kiedrowski², Marco Jupé², Marco Leonetti⁴, Giancarlo Ruocco⁴, Stefan Wabnitz⁵, Riccardo C. Barberi¹,³, Vincenzo Formoso¹,³, Raffaele G. Agostino¹,³; ¹STAR Research Infrastructure, University of Calabria, Italy; ²Laser Zentrum Hannover e.V., Germany; ³Physics Department, University of Calabria, Italy; ⁴Center for Life Nano Science@Sapienza, Italian Institute of Technology, Italy; ⁵DIET, University of Rome "La Sapienza", Italy. We report on a characterization study of polymer optical fibers based on X-ray computed microtomography and X-ray small-angle scattering.

SoTh3D.2 • 14:30 Invited
Silica Specialty Fibers Made Through Laser-Assisted Additive Manufacturing, Pawel Maniewski¹,², Valdas Pasiskvicius¹, Christopher Holmes²; ¹KTH Royal Institute of Technology, Sweden; ²Optoelectronic Research Centre, University Of Southampton, United Kingdom. Novel approaches for laser-based silica processing are demonstrated, that offer unique fabrication capabilities for specialty fibers. High performance and new fiber geometries are offered through multi-material additive manufacturing, cutting, polishing, welding, and laser-based preform drawing.

SoTh3D.3 • 15:00
Systematic Study of Flame-Fabricated Surface Nanoscale Axial Photonics Resonators, Asaad Hannah¹, Emily Eadie¹, Samar Deep¹, Pablo Bianucci¹; ¹Concordia University, Canada. We present a systematic investigation of the different parameters involved in the fabrication of surface nanoscale axial photonics resonators from optical fibers using a flame, and how they affect the resulting resonant mode structure.

SoTh3D.4 • 15:15
Accurate Measurement of Wavelength-Dependent Beam Parameters of a Supercontinuum Laser Source Focused by a Lensed Fiber Probe, Kuan-Yuan Chang¹, Jun-Cheng Hsu¹, Jia-Ming Liu¹,²; ¹National Yang Ming Chiao Tung University, Taiwan; ²Electrical and Computer Engineering, University of California, Los Angeles, USA. A supercontinuum (SC)
laser is focused by an optical lensed fiber (OLF). By applying a spectrometer to measure back-coupling efficiency, multi-wavelength parameters of the OLF probe and the focused SC laser beam can be analyzed.

**SoTh3D.5 • 15:30**

**Enhanced Ytterbium Emission – Manifold Resolution at Room Temperature Using the Purcell Effect in Doped Silica Microspheres,** Nikita Toropov¹, Christophe A. Codemard², Neil P. Sessions¹, Michalis N. Zervas¹; ¹University of Southampton, United Kingdom; ²TRUMPF Lasers UK Ltd, United Kingdom. We propose and demonstrate a novel method to characterize the Stark-split emission manifold of rare-earth doped silica glass at room temperature, using the Purcell effect in Yb-doped microspheres.

**16:30 -- 18:30**

**Room: 2000A**

**JTh4A • Joint Postdeadline Paper Presentations and Student Award Winner Announcement**

**JTh4A.1 • 16:30 Postdeadline Submission**

**High Fiber-to-Fiber Gain low Noise Figure Erbium Doped Waveguide Amplifiers in the Manufacturable Al₂O₃ Platform,** Carlos E. Osornio-Martinez¹, Dawson B. Bonneville¹, Meindert Dijkstra¹, Sonia García-Bianco¹; ¹Universiteit Twente, Netherlands. Erbium doped waveguide amplifiers (EDWAs) with performance approaching fiber amplifiers (i.e., net fiber-to-fiber gain (~17 dB), noise figure (~6 dB) and off-chip output power (~15 dBm) in the manufacturable Al₂O₃ integrated photonics platform are reported.

**JTh4A.2 • 16:45 Postdeadline Submission**

**Microstructured Optical Fibers Made by Additive Manufacturing of Chalcogenide Glasses,** Johann Troles¹, Leo Szymczyk¹², Francois Chevire¹, Catherine Boussard¹, Antoine Gautier¹, Frederic Charpentier², Yann Guimond², Mathieu Roze², Gilles Renversez³; ¹University of Rennes, France; ²UMICORE IR Glass, France; ³Centrale Marseille, France. Chalcogenide preforms obtained by an additive manufacturing process have been drawn into chalcogenide optical fibers. Those results open a way for the elaboration of chalcogenide microstructured optical fibers, especially for hollow-core fibers.

**JTh4A.3 • 17:00 Postdeadline Submission**

**Four-Fold Truncated Double-Nested Anti-Resonant Hollow-Core Fiber for Ultralow Loss and Robust Single Mode Operation,** Shoufei Gao²¹, Yizhi Sun¹², Hao Chen¹, Dawei Ge³, Dong Wang³, Dechao Zhang³, Han Li³, Wei Ding¹², Yingying Wang²¹; ¹Jinan University, China; ²Linfiber Technology (Nantong) Co., Ltd., China; ³China Mobile Research Institute, China. We report the simultaneous achievement of ultralow loss in fundamental mode (0.1-0.2 dB/km) and high loss in higher order modes (db/m level) with an extinction ratio reaching 26000 in a novel four-fold truncated DNANF structure.

**JTh4A.4 • 17:15 Postdeadline Submission**

**Degenerate Optical Parametric Oscillation in Coupled Cavities,** Laís Fujii dos Santos¹, Felipe G. Santos², Ksenia Dolgaleva¹; ¹University of Ottawa, Canada; ²Quantum Valley Ideas Laboratories, Canada. Networks of coupled parametric oscillators exhibiting binary phase state
can be used for computation. The phase relation between oscillators can be switched with frequency detuning.

**JTh4A.5 • 17:30 Postdeadline Submission**  
**Machine Learning-Assisted Extreme Events Forecasting**, Saliya Coulibaly\(^1\); \(^1\)Univrsite de Lille, France. Here, we propose a new supervised machine learning strategy to locally forecast bursts occurring in the turbulent regime of a fiber ring cavity.

**JTh4A.6 • 17:45 Postdeadline Submission**  
**Radiation Hardness Evaluation of Anti-Resonant Hollow Core Fibers for Extreme Environments**, Amy Van Newkirk\(^1\), William Lo\(^2\), Matt Leoschke\(^2\), Marcello Catellani\(^2\), Michael Reilly\(^1\), J. Enrique Antonio Lopez\(^3\), Rodrigo Amezcua Correa\(^3\), Axel Schulzgen\(^3\), Shlomi Zilberman\(^2\), Federico Scurti\(^2\); \(^1\)Penn State Electro-Optics Center, USA; \(^2\)Ken and Mary Alice Lindquist Department of Nuclear Engineering, Pennsylvania State University, USA; \(^3\)CREOL, University of Central Florida, USA. An ARHCF was irradiated with neutron and gamma radiation from a nuclear reactor. The RIA was 5x less than that of pure silica core fiber, showing significant promise for applications in extreme radiation environments.
JD1 • Joint On-demand Session

JD1.1
Low-Cost Egg White Based Whispering Gallery Mode Micro-Laser, Yang Luo¹, Jun-Hua Huang¹, Jian-Kun Wang¹, Geng-Liang Chen¹, Guo-Liang Zheng¹, Xuhui Zhang¹; ¹Shenzhen Technology University, China. We present a protein microsphere laser by dehydration by mixing egg white with dye solution, and analyze the data of its optical characterization measurement, which verifies that it has great potential for application in bio-microlaser.

JD1.2
Design of Colored Fluorescent Radiative Cooling Bilayer Polymer Coatings by Modified Monte Carlo Method, Tao Wang¹, Dangyuan Lei², Jianguo Dai²; ¹The Hong Kong Polytechnic University, Hong Kong; ²City University of Hong Kong, Hong Kong. Colored radiative cooling is challenging. Here, a modified Monte Carlo method was proposed for design of colored fluorescent radiative cooling coatings. Colored bilayer coatings were designed for efficient cooling performance.

JD1.3
Enhanced Nonlinearity in VSe₂-SWCNT Nanohybrid, Vinod Kumar¹, Chandra S. Rout², K. V. Adarsh¹; ¹IISER Bhopal, India; ²Jain university, India. We demonstrate enhanced third-order nonlinear optical response in the charged-coupled VSe₂-SWCNT hybrid attributed to charge transfer. This enhancement paves the way for potential applications in optical limiting, with an impressive onset threshold of 40 GW/cm².