Optica Advanced Photonics Session Guide

Disclaimer: this guide is limited to technical program with abstracts and author blocks as of 30 July. For updated and complete information with special events, reference the online schedule or mobile app.

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 Bellouard[1]; *[1]Ecole 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 nano-mechanics.

BM1A.2 • 08:30

Throughput Enhancement of Type-a Volume Bragg Gratings Inscribed by Femtosecond Laser in Burst Mode for Industrial Applications, Joelle J. Harb[1,2], Lauris Talbot[3], Yannick Petit[2,1], Martin Bernier[3], Lionel Canioni[2,1]; *[1]ICMCB, France; [2]University of Bordeaux, France; [3]University 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-Puente[1], Raman Kashyap[1]; *[1]Polytechnique Montreal, Canada.* Our research optimized Spherical Bragg Resonators to engineering emissions from Er^{3+} and Eu^{3+} 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 Colliard[2,1], Floriane Pellerin[2], Geoffroy Aubry[2], Martiane Cabié[3], Thomas Neisius[3], Franck Pigeonneau[4], Réal Vallée[1], Martin Bernier[1], Matthieu Bellec[2], Wilfried Blanc[2]; *[1]Centre Optique Photonique et Laser, Canada; [2]Université Côte d'Azur, INPHYNI, CNRS, France; [3]Aix Marseille Univ, CNRS, Central Marseille, FSCM, CP2M, France; [4]Mines 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 Orives[2], Lia Mara Marcondes[2], Frederic Adamietz[1], Thierry Cardinal[1], Marcelo Nalin[2], Marc Dussauze[1]; *[1]Université de Bordeaux / CNRS, France; [2]UNESP, Brazil.* A thermo-electrical imprinting process on a borogermanate glass containing Tb^{3+} 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[1]; [1]*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[1]; [1]*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[1]; [1]*Max-Planck-Inst fur Mikrostrukturphysik, Germany.* Silicon photonics technology enables large-scale programmable PICs. We review our results using programmable PICs to mitigate crosstalk in optical phased arrays and explore new research applying large language models to automate PIC design

IM1B.3 • 09:00 Invited

Optical Trojan Beams- Guiding Light via Lagrange Points, Mercedeh Khajavikhan[1]; [1]*University of Southern California, USA.* A new mechanism for guided wave transport, based on stable Lagrange points, is introduced. The concept can be applied to both optical signals and charged particle beams. This approach can, for the first time, enable the propagation of charged particles in a guided fashion.

IM1B.4 • 09:30 Invited

Diamond Photonics, Paul E. Barclay[1]; [1]*University of Calgary, Canada.* Abstract not available.

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 Nejabati[1]; *[1]University of Bristol, United Kingdom.* Abstract not available.

NeM1C.2 • 08:30 Invited
Withdrawn

NeM1C.3 • 09:00 Invited
High-Rate CV-QKD Systems Leveraged by Advanced Coherent Detection Technology, Amirhossein Ghazisaeidi[1]; *[1]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 Machuca[1]; *[1]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: 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[1]; *[1]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.

JM1D.2 • 08:30 Invited
Radiative Cooling: a Sustainable Strategy for Thermal Management and Energy Harvesting, Lili Cai[1]; *[1]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[1]; [1]*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[1,2]; [1]*Physics, The University of Auckland, New Zealand;* [2]*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[1,2], Yiqing Xu[1,2], Julien Fatome[3], Stuart Murdoch[1,2], Miro Erkintalo[1,2], Stephane Coen[1,2]; [1]*University of Auckland, New Zealand;* [2]*The Dodd-Walls Centre for Photonic and Quantum Technologies, New Zealand;* [3]*Université Bourgogne-Franche-Comté, France.* 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[1,2], Neil Broderick[1,2], Bernd Krauskopf[1,2]; [1]*The University of Auckland, New Zealand;* [2]*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.

NpM1E.4 • 09:00 Invited
Photonic Computation Enabled by Sound Waves, Birgit Stiller[1]; [1]*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 Li[1], Juan Wu[1], Yuhui Zhuang[1], Yi Hu[1], Jingjun Xu[1]; [1]*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: 207
SoM1F • Novel Fiber Materials and Tapered Fibers
Presider: Alexander Heidt, Switzerland

SoM1F.1 • 08:00 Invited
Ice Microfibers for Optical Waveguiding, Xin Guo[1], Peizhen Xu[1], Bowen Cui[1], Xiangzheng Li[1], Limin Tong[1]; *[1]Zhejiang 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 Strutynski[1], Frédéric Désévédavy[1], Grégory Gadret[1], Claire-Hélène Brachais[1], Bertrand Kibler[1], Frédéric Smektala[1]; *[1]Universite 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 Hänzi[1], Grzegorz Stepniewski[2], Adam Filipkowski[2], Sara Lukasik[3], Tomasz Kardas[4], Yuriy Stepanenko[5], Maciej Glowacki[6], Mariusz Mrozek[7], Adam Wojciechowski[7], Valerio Romano[1], Robert Bogdanowicz[6], Katarzyna Krupa[5], Ryszard Buczynski[3], Alexander M. Heidt[1], Mariusz Klimczak[3]; *[1]Institute of Applied Physics, University of Bern, Switzerland; [2]Lukasiewicz Research Network, Poland; [3]Faculty of Physics, University of Warsaw, Poland; [4]4Fluence Sp. z o.o, Poland; [5]5Institute of Physical Chemistry, Polish Academy of Sciences, Poland; [6]Gdansk University of Technology, Poland; [7]Jagiellonian 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 Zhang[1], Xin Guo[1], Limin Tong[1]; *[1]Zhejiang 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 Geng[1], Zhi Zeng[2], Lin Zhang[4], Zhongqi Pan[3], Yang Yue[2]; *[1]Nankai University, China; [2]Xi'an Jiaotong University, China; [3]University of Louisiana at Lafayette, USA; [4]Tianjin 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●km) variation from 1440 to 1700 nm.

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 Chen[1]; *[1]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 Kim[1], Hoon Kim[1]; *[1]KAIST, 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
Withdrawn

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

JM2A.1 • 10:30 Plenary
Thermal Photonics and Its Implications, Shanhui Fan[1]; *[1]Stanford 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
Petascale Photonic Connectivity for Energy-Efficient Computing, Keren Bergman[1]; *[1]Columbia 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
Fabrication of Thin Film Lithium Niobate Electro-Optic Devices Using a Femtosecond Laser, Ya Cheng[1,2]; [1]*Shanghai Institute of Optics and Fine Mechanics, China;* [2]*East 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.

BM3A.2 • 14:30 Contributed
Investigation of Ultrashort Pulse Written Higher Order VBG With Extended Apertures, Malte P. Siems[2], Daniel Richter[2], Ria G. Krämer[2], Georg R. Schwartz[2], Stefan Nolte[2,1]; [1]*Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Germany;* [2]*Institute 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 Contributed
High Order Fiber Bragg Gratings Using Point-by-Point Femtosecond Laser Technique, Romain Cotillard[1], Nicolas Roussel[1]; [1]*CEA, 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 Contributed
Femtosecond Laser-Induced Bragg Grating Waveguide Through Selective Control of Pulse Numbers, Foroogh Jafari[1], Jean-Sébastien Boisvert[1], Raman Kashyap[1,2], Sébastien Loranger[1]; [1]*Electrical engineering, Polytechnique Montreal, Canada;* [2]*Physics 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 Contributed
Writing of Fiber Bragg Gratings With Focused fs Pulses Using a Two-Phase Mask Interferometer, Francois Ouellette[1]; [1]*Chengdu University, China.* A 2-mask interferometer is used to write fiber Bragg gratings with index modulations up to $1.6\chi10^{-3}$ without H_2 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

Withdrawn

14:00 -- 16:00
Room: 205A
NpM3B • Ultrafast and Nonlinear Phenomena
Presider: Sylvie Lebrun; Centre National Recherche Scientifique, France

NpM3B.1 • 14:00 Invited
Femtosecond Fieldoscopy: Advancing Label-Free Spectroscopy and Imaging, Hanieh Fattahi[1]; [1]*Max-Planck-Inst Physik des Lichts, Germany.* This presentation introduces femtosecond fieldoscopy, a cutting-edge technique that achieves super-resolution spectro-microscopy with unprecedented sensitivity and attosecond temporal resolution. It holds promise for label-free exploration of ultrafast phenomena at the nanoscale.

NpM3B.2 • 14:30
Spontaneous Symmetry Breaking in a Coupled Photonic Crystal Dimer With Periodic Driving, Rodrigues Bitha[1], Kevin Stitely[1], Bernd Krauskopf[1], Neil Broderick[1]; [1]*University of Auckland, New Zealand.* This study examines the interactions between two optical modes in a periodically driven photonic crystal dimer. We find that the system features spontaneous symmetry breaking of different types of solutions.

NpM3B.3 • 14:45
Exploiting Time Reversal Symmetry for Beam Shaping in Multimode Nonlinear Fiber Optics, Arnaud Poisson[1], Alessandro Tonello[1], Christine Restoin[1], Vincent Couderc[1]; [1]*XLIM Research Institute, France.* We numerically study the nonlinear propagation in multimode GRIN 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[2]; [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. Gemechu[1], Alessandro Falaschi[1], Grzegorz Stepniewski[4], 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 Ozolins[1]; [1]*Riga 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 Pang[1]; [1]*KTH Royal Inst. of Technology, Sweden.* We will discuss the possibility of adopting analog fronthaul technologies for next generation cell-free MIMO RAN, and present our recent experimental results validating the performance of such links with coherent joint transmission schemes.

NeM3C.4 • 15:30
Optical-Amplification-Free 245/140 Gbaud OOK/PAM4 C-Band SiP Ring Resonator Modulator-Based Links, Armands Ostrovskis[1], Toms Salgals[1], Michael Koenigsmann[2], Kristaps Rubuls[1], Azra Farid[2], Benjamin Krüger[2], Arvids Sedulis[1], Fabio Pittala[2], Ryan P. Scott[3], Hansjoerg Haisch[2], Lu Zhang[4], Xianbin Yu[4], Rafael Puerta[5], Sandis Spolitis[1], Richard Schatz[6], Katia Gallo[6], Markus Gruen[2], Hadrien Louchet[2], Robert Jahn[2], Kazuo Yamaguchi[2], Vjaceslavs Bobrovs[1], Xiaodan Pang[6,7], Oskars Ozolins[1,7]; [1]*Riga Technical University, Latvia;* [2]*Keysight*

Technologies Deutschland GmbH, Germany; [3]Keysight Technologies, Inc., USA; [4]Zhejiang University and Zhejiang Lab, China; [5]Ericsson Research, Sweden; [6]KTH Royal Institute of Technology, Sweden; [7]RISE 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: 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 Yu[1]; *[1]University of Wisconsin - Madison, USA.* Abstract not available.

JM3D.2 • 14:30
Electrochemically Active Metasurfaces for Multispectral Radiative Heat Management, Po-Chun Hsu[1]; *[1]Pritzker 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 Mandal[1], Jyothis Anand[2], Nithin J. Varghese[1]; *[1]Princeton University, USA; [2]Oak 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 Strzelecka[2], Sanghoon Lee[1], Alon Gorodetsky[1], Panyiming Liu[1]; *[1]University of California Irvine, USA; [2]Chemical 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 Tao[1]; *[1]Huazhong Univ of Science and Technology, China.* Abstract not available.

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 Dutt[1]; *[1]University of Maryland at College Park, USA.* High-quality factor microring resonators made from low-loss silicon nitride have offered tantalizing possibilities for nonlinear nanophotonics at modest optical powers. Here we discuss how they can be leveraged for generating quantum states such as squeezed light, and also introduce a scheme for high-dimensional on-chip Hamiltonian simulation using coupled microrings.

JM3E.2 • 14:30
Time-bin Entangled Photons for Scalable Quantum Information Processing, Stefania Sciara[1], Hao Yu[1,2], Mario Chemnitz[1,4], Monika Monika[3], Farzam Nosrati[1], Agnes George[1], Nicola Montaut[1], Bennet Fischer[1,4], Benjamin Crockett[1], Robin Helsten[1], Benjamin Wetzel[5], Thorsten A. Goebel[6], Ria G. Krämer[7], Brent Little[8], Sai Chu[11], Stefan Nolte[7,6], Zhiming Wang[2], José Azaña[1], William J. Munro[9], David J. Moss[10], Ulf Peschel[3], Rosario Lo Franco[12], Roberto Morandotti[1]; *[1]Institut national de la recherche scientifique -Centre Énergie, Matériaux et Télécommunications (INRS-EMT), Canada; [2]Shimmer Center, Tianfu Jiangxi Laboratory, China; [3]Institute of Solid State Theory and Optics, Friedrich Schiller University, Germany; [4]Leibniz Institute of Photonic Technology, Germany; [5]XLIM Research Institute, Université de Limoges, France; [6]Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Center of Excellence in Photonics, Germany; [7]Friedrich-Schiller-University, Abbe Center of Photonics, Institute of Applied Physics, Germany; [8]QXP Technology Inc., China; [9]Okinawa Institute of Science and Technology Graduate University, Japan; [10]Optical Sciences Centre, Swinburne University of Technology, Australia; [11]Department of Physics, City University of Hong Kong, Hong Kong; [12]Universita 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-Gómez[1,2], Roberto Ramírez Alarcón[1], Mauricio Gomez Robles[2], Patricia Marisol del Carmen Tavares Ramírez[1,2], Gerardo de Jesús Rodríguez Becerra[1,2], Erasto Ortíz Ricardo[3], Rafael Salas Montiel[2]; *[1]Quantum Photonics, Centro de Investigaciones en Óptica A.C., Mexico; [2]Laboratory Light, nanomaterials, and nanotechnologies, Université de Technologie de Troyes, France; [3]División 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. Flint[1], Rex Bannerman[1], James Gates[1], Paolo Menna[1], Peter G. Smith[1]; *[1]Optoelectronics 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
Withdrawn

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 Harrington[1], Robbie Mears[1], James M. Stone[1], William J. Wadsworth[1], Jonathan C. Knight[1], Tim A. Birks[1]; *[1]University 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 Srinivasan[1], Thomas Kelly[1], Somarpita Pradhan[1], Ian Davidson[1], Radan Slavik[1], Peter Horak[1], Natalie V. Wheeler[1]; *[1]University 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 Melli[1], Kostiantyn Vasko[2], Lorenzo Rosa[1], Fetah Benabid[2,3], Luca Vincetti[1]; *[1]Univ degli Studi Modena e Reggio Emilia, Italy; [2]GLOPHOTONICS, France; [3]XLIM, 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 Taranta[1], Seyed Mohammad Abokhamis Mousavi[1], Eric Numkam Fokoua[2], Gianluca Guerra[1], Gregory Jasion[1], Konstantin Vidiajev[1], Hesham Sakr[2], John Hayes[1], Thomas Bradley[3], Ghafour A. Mahdiraji[1], Jaroslaw Rzegocki[1], Ian Davidson[1], Radan Slavik[1], Francesco Poletti[1,2]; *[1]Optoelectronics Research Centre, University of Southampton, United Kingdom; [2]Microsoft Azure Fiber, United Kingdom; [3]High-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 Fu[1], Thomas Kelly[1], Jing Meng[1], Yongmin Jung[1], Francesco Poletti[1], Natalie V. Wheeler[1], Ian Davidson[1]; *[1]University 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 Melli[1], Kostiantyn Vasko[2], Lorenzo Rosa[1], Fetah Benabid[3,2], Luca Vincetti[1]; *[1]Univ degli Studi Modena e Reggio Emilia, Italy; [2]glophotonics, France; [3]xlim, 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

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 Lavery[1], Siddharth Varughese[2], Pierre Mertz[2], Han Sun[1]; *[1]Infinera Canada Inc., United Kingdom; [2]Infinera 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 Lennard[1], Fabio A. Barbosa[1], Filipe Ferreira[1]; *[1]University 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 Wakayama[1], Daniel J. Elson[1], Filippos Balasis[1], Shohei Beppu[1], Noboru Yoshikane[1], Takehiro Tsuritani[1]; *[1]KDDI 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 Abdo[1], Willy Georges[2], Shahab Oveis Gharan[1], Ahmed A. Omar[2]; *[1]Ciena Canada Inc., Canada; [2]Zain OmanTel 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 Oliveira[5,2], Manuel Neves[5,2], Jorge Silva[5], Fernando P. Guiomar[1], Maria d. Medeiros[4,3], Paulo M. Monteiro[2,5]; [1]*Instituto De Telecomunicacoes, Portugal;* [2]*Universidade de Aveiro, Portugal;* [3]*Instituto de Telecomunicações, Portugal;* [4]*Universidade de Coimbra, Portugal;* [5]*Instituto 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. invert these maps and obtain quantitative information about connectivity and blood flow.

14:00 -- 16:00
Room: 205B
NoM3H • Emerging Imaging Techniques for Biology and Materials Science (Computational Methods)
Presider: Alon Gorodetsky; University of California Irvine, United States

NoM3H.1 • 14:00 Tutorial

Holotomography and Artificial Intelligence: Label-Free 3D Imaging, Classification, and Inference of Live Cells, Tissues, and Organoids, YongKeun Park[1]; [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[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.

NoM3H.2 • 15:00 Invited

3D Inverse-Scattering in Biological Samples, Shwetadwip Chowdhury[1]; [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.

NoM3H.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[5], 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 to invert these maps and obtain quantitative information about connectivity and blood flow.

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 Gaspar[1]; *[1]Aix-Marseille Université, France.* Temperature measurement and heat flux estimation of plasma facing component in Tokamak is mandatory for component protection and physics studies. Fiber Bragg diagnostics have been used in WEST Tokamak up to 800°C and 9 MW/m2.

BM4A.2 • 17:00
Survival of Nanogratings in High Melting Oxide Glasses Upon Thermal Annealing, Imane Ktafi[1], Qiong Xie[1], Gözden Torun[2], Yves Bellouard[2], Maureen Yembele[3], Mathieu Allix[3], Thomas Wade Hawkins[4], John Ballato[4], Maxime Cavillon[1], Matthieu Lancry[1]; *[1]Universite Paris-Saclay, France; [2]EPFL, Switzerland; [3]CEMHTI – CNRS, France; [4]Clemson 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_2O_3 or ZrO_2

BM4A.3 • 17:15
Ceramic-Coated Type III Femtosecond Fiber Bragg Grating for High Temperature Environments, Laure Lago[1], Guillaume Laffont[1], Rémy Bernard[2]; *[1]CEA, France; [2]Laboratoire 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 Roehrl[1], Andrea Stadler[1], Fabian Buchfellner[1], Simon Zehetmair[1], Johannes Roths[1]; *[1]Munich 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 Ohodnicki[1], Khurram Naeem[1], Pengdi Zhang[1], Yang-Duan Su[1], Dolendra Karki[1], Nageswara Lalam[2,3], Ruishu Wright[3]; *[1]University of Pittsburgh, USA; [2]Leidos, USA; [3]National 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. Walker[1], Cyril Hnatovsky[1], Stephen J. Mihailov[1], Manny De Silva[1], Ping Lu[1], Huimin Ding[1]; [1]*National 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. Lita[1], Varun Verma[1], Dileep Reddy[1], Martin Stevens[1], Richard Mirin[1]; [1]*National 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.

IM4B.2 • 17:30 Invited
Epitaxial Quantum Dots for on-Chip Photonics and Long Distance Quantum Implementations, Simone Portalupi[1]; [1]*IHFG, Universität Stuttgart, Germany.* We will discuss the realization of bright sources of quantum light at telecommunication wavelength via strain engineering of In(Ga)As quantum dots. Furthermore, using GaAs-based system we will show most recent achievements in photonic integrated circuits.

IM4B.3 • 18:00 Invited
Visible Light to NIR Integrated Photonics for Atomic and Quantum Applications, Daniel J. Blumenthal[1]; [1]*University of California Santa Barbara, USA.* Visible light photonic integration will enable compact atomic and quantum experiments with the potential to bring about improved reliability, performance, and scaling for sensing, clocks, and compute. We discuss progress using the ultra-low loss silicon nitride platform to integrate precision lasers and photonics and higher level functions for cold and thermal neutral atom and trapped ion based systems.

IM4B.4 • 18:30 Invited
Quantum Noise Limited Homodyne Detectors Integrated Into Silicon Photonics for Quantum Technologies, Jonathan Matthews[1]; [1]*University of Bristol, United Kingdom.* It is critical for any emerging technology that a path to scalable manufacture at volume is essential for impact outside the lab. Integrated quantum photonics has already revolutionized the way in which photonic quantum technology can be researched and developed. Silicon photonics offers high component density as well as CMOS compatibility for monolithic integration of photonic devices with electronics. In this talk we will cover how a particular key component for quantum technologies — quantum noise limited homodyne detectors — can be implemented in silicon

photonics and how this integration can bring about improvement in key device performance metrics. Applications of these detectors include continuous variables quantum computing and communications, and detection of squeezed light. We will show how miniaturizing these quantum light detectors shrinks total detector footprint right down to 10s of micrometres squared (including the core electronic and photonic components), opens the way to scalable implementation of high numbers of detectors for a single piece of technology, and we will show how implementing the detectors with electronic-photonic integration increases speed performance beyond what is achievable without integration. Time permitting, we will show how we are using such detectors to demonstrate chip-scale sensor nodes for distributed quantum sensing.

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 Takahashi[1], Shota Ishimura[1], Takehiro Tsuritani[1]; *[1]KDDI 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 Lu[1,2], Jingchuan Wang[1], Shaoyi Chen[2], Yaxi Yan[1], Tianrui Li[2], Liwang Lu[1], Yichang Wu[2], Wenjin Huang[2], Alan Pak Tao Lau Lau[1], Zhaohui Li[2]; *[1]Hong Kong Polytechnic University, Hong Kong; [2]School 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: 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[1]; *[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
Withdrawn

JM4D.3 • 17:30
Passive Radiative Cooling With High-Mass Roof and Temperature-Driven Ventilation, Remy Fortin[1], Jyotirmoy Mandal[2], Salmaan Craig[1]; *[1]Mcgill University, Canada; [2]Princeton University, USA.* A reduced-scale model building uses a daytime radiative cooling coating (α_{solar} ~ 0.97, ε_{LWIR} ~ 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 Hwang[1,2]; *[1]The Centre for Quantum Technologies, Singapore; [2]National 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 Jia[1], Han Lin[1], Keng-Te Li[1]; *[1]Royal Melbourne Institute of Technology, Australia.* We demonstrate a thin film polymer metasurface radiative colling 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 Vermeulen[1]; *[1]Vrije 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 Flizikowski[1], Lais F. dos Santos[1], Ozan W. Oner[1], Athulya Thulaseedharan[1], Ehsan Mobini[1], Kaustubh Vyas[1], Fatemeh M. Karimi[1], Kashif M. Awan[1], Daniel Espinosa[1], Ksenia Dolgaleva[1]; *[1]University 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 x 10^{-13} cm^2 W.

NpM4E.3 • 17:15

Withdrawn

NpM4E.4 • 17:45

Kerr Switch Versus Nonlinear Thermal Effects in Whispering Gallery Resonators, Gabriele Frigenti[1], Daniele Farnesi[1], Stefano Pelli[1], Gualtiero Nunzi Conti[1], Tatyana V. Murzina[2], Silvia Soria[1]; *[1]Ist 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 derivates.

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-Inst Physik des Lichts, Germany; [2]Physics, Friedrich-Alexander-Universität Erlangen-Nürnberg, 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: 207
SoM4F • Nonlinear Fiber Optics
Presider: Alexander Heidt, Switzerland

SoM4F.1 • 16:30 Tutorial

Machine Learning for Nonlinear Fiber Optics, Goëry Genty[1]; *[1]Tampere 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 Corso[1], Tigran Mansuryan[2], Alessandro Tonello[2], Lukasz Zinkiewicz[1,3], Bartosz Fabjanowicz[1], Mateusz Pielach[1], Agnieszka Jamrozik[1], Tomasz Kardas[4], Yago Arosa[2], Piotr Wasylczyk[3], Vincent Couderc[2], Yuriy Stepanenko[1], Katarzyna Krupa[1]; *[1]Institute of Physical Chemistry PAS, Poland; [2]Université de Limoges, XLIM UMR CNRS 7252, France; [3]Faculty of Physics, University of Warsaw, Poland; [4]Fluence 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 Sierro[1], Sandro Camenzind[2], Benjamin Willenberg[2], Alexander Nussbaum-Lapping[2], Anupamaa Rampur[1], Ursula Keller[2], Christopher R. Philips[2], Alexander M. Heidt[1]; *[1]Institute of Applied Physics, University of Bern, Switzerland; [2]Department 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 Arcos[1], Arturo Mena[1], María Sánchez-Hernández[1], Amaia Berganza[2], Begoña Garcia-Ramiro[2], Joseba Zubia[4], David Novoa[4,3]; *[1]Comunications Engineering, University of the Basque Country, Spain; [2]Applied Mathematics, University of the Basque Country, Spain; [3]IKERBASQUE, Basque Foundation for Science, Spain; [4]Communications 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.

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

IM4G.1 • 16:30 Invited

Scalable Surface Gratings for Efficient Fiber-Chip and Free-Space Optical Coupling, Radovan Korcek[1], William Fraser[2,3], Sara Salhi[4], Xiaochen Xin[2], Quentin Wilmart[5], David Medina[4], Samson Edmond[4], Thalía Domínguez Bucio[6], Frederic Gardes[6], Winnie N. Ye[2], Jens H. Schmid[3], Pavel Cheben[3], Daniele Melati[4], Laurent Vivien[4], Carlos Ramos[4], Daniel Benedikovic[1]; *[1]University of Zilina, Slovakia; [2]Carleton university, Canada; [3]National Research Council, Canada; [4]Centre de Nanosciences et de Nanotechnologies, CNRS & Universite Paris-Saclay, France; [5]CEA LETI, France; [6]Optoelectronic Research Centre, University of*

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[1,2], Frédéric Zamkotsian[2], Guillaume Demesy[1]; [1]*Institut Fresnel, France;* [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[1]; [1]*Indian Institute of Technology (ISM) Dha, India.* We proposed 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[1], Ravi Roushan Kumar[1], Devendra Chack[1]; [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[1], Lawrence R. Chen[1]; [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[1]; [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: 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 Houtsma[1], Dora van Veen[1]; [1]*Nokia 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 DEnse Passive Optical Networks Considering Fairness Under Differential Split Ratios, Zixian Wei[1], Jinsong Zhang[1], Weijia Li[1], Charles St-Arnault[1], Santiago Bernal[1], Mostafa Khalil[1], Ramón Gutiérrez-Castrejón[1,2], Lawrence R. Chen[1], David V. Plant[1]; [1]*McGill University, Canada;* [2]*Institute 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 Wei[1], Jinsong Zhang[1], Weijia Li[1], Charles St-Arnault[1], Santiago Bernal[1], Ramón Gutiérrez-Castrejón[1,2], Lawrence R. Chen[1], David V. Plant[1]; [1]*McGill University, Canada;* [2]*Institute 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 Zhang[1], Zhensheng Jia[1], Karthik Choutagunta[1], Luis Alberto Campos[1], Curtis Knittle[1]; [1]*CableLabs, 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 Zhang[1], Yixiao Zhu[1], Guangying Yang[1], Lina Man[1], Gengming Lin[1], Qunbi Zhuge[1], Weisheng Hu[1]; [1]*Shanghai 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.

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 Sen[1], Pritam Paul[1], Rik Chattopadhyay[1]; *[1]Electronics 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. Tanna[1], Dhara Maheta[1], B S. Madhukar[2]; *[1]RK University, India; [2]Department 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 CeO_2, La_2O_3, & ThO_2 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-Tossou[1], Antoine Bard[2], Clementine Symonds[2], Jean-Michel Benoit[2], Joel Bellessa[2], Alban Gassenq[2]; *[1]Unversity of Lomé, Togo; [2]Institut 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 Chen[1]; *[1]Institute 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
Withdrawn

JTu1A.6
Epsilon Near Zero Metasurfaces (ENZ) at Visible Wavelengths, Iman Alhamdan[1]; *[1]school 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. Mihailov[1], Huimin Ding[1], Robert B. Walker[1], Katherine Szabo[1], Cyril Hnatovsky[1], Abdullah Rahnama[1], Ping Lu[1], Manny De Silva[1]; *[1]National 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 Tan[2], Hang Qu[2], Xiaoyong Chen[3], Yi-Wei Xu[4], Patrice Mégret[1], Christophe Caucheteur[1], Xuehao Hu[1]; *[1]Universite de Mons, Belgium; [2]Shantou University, China; [3]Dongguan University of Technology, China; [4]Cancer 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 Carlesi[1,2], Patrice Mégret[1]; *[1]University of Mons, Belgium; [2]Environmental 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 Theodosiou[2,1], Yauhen Baravets[2], Kirill Grebnev[3], Maria Chernysheva[3], Pavel Honzatko[2], Pavel Peterka[2]; *[1]Lumoscribe Ltd., Cyprus; [2]Institute of Photonics and Electronics, Czechia; [3]Leibniz 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. Menon[1], Nadia G. Boetti[2], Davide Janner[1]; *[1]Politecnico di Torino - DISAT, Italy; [2]LINKS 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[1], Nicolas Roussel[1]; *[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[1], Eduardo H. Dureck[1], Felipe Mezzadri[1], Cicero Martelli[1], Jean Carlos Cardozo da Silva[1]; [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[1], Cyril Hnatovsky[1], Stephen J. Mihailov[1], Manny De Silva[1], Ping Lu[1], Huimin Ding[1]; [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[1], Cyril Hnatovsky[1], Stephen J. Mihailov[1], Ping Lu[1], Manny De Silva[1], Huimin Ding[1]; [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[1], Jun He[1], Runxiao Chen[1], Yiping Wang[1]; [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[1], Paige Wilson[1], Meghan N. Beattie[1], Ryan Hogan[3], Narmada Rajaram[1], Ross Cheriton[2], Ahmad Atieh[3], Karin Hinzer[1]; [1]*University of Ottawa, Canada;* [2]*National Research Council, Canada;* [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 Pal[1,2], Alekhya Ghosh[1,2], Shuangyou zhang[1], Lewis J. Hill[1], Toby Bi[1,2], Pascal Del'Haye[1,2]; [1]*Max-Planck-Inst Physik des Lichts, Germany;* [2]*Physics, 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 zhang[1], Toby Bi[1,2], Irina Harder[1], Olga Ohletz[1], Florentina Gannott[1], Alexander Gumann[1], Eduard Butzen[1], Yaojing Zhang[1], Lewis J. Hill[1], Pascal Del'Haye[1]; *[1]Max-Planck-Inst Physik des Lichts, Germany; [2]Friedrich-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 Kim[1], Sang-Ho Park[1], Young-Tak Han[1], Seo-Young Lee[1], Honghwi Park[1], Dong-Hun Lee[1], Shin-Mo An[1], Won-Seok Han[1], Jang-Uk Shin[1]; *[1]Electronics 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 Kheyri[1,2], Shuangyou zhang[1], Toby Bi[1,2], Arghadeep Pal[1,2], Hao Zhang[1,4], Yaojing Zhang[1,3], Abdullah Alabbadi[1,2], Haochen Yan[1,2], Alekhya Ghosh[1,2], Lewis J. Hill[1], Pablo Bianucci[5], Eduard Butzen[1], Florentina Gannott[1], Alexander Gumann[1], Irina Harder[1], Olga Ohletz[1], Pascal Del'Haye[1]; *[1]Max Planck institute for the science of light, Germany; [2]Department of Physics, Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany; [3]The Chinese University of Hong Kong, China; [4]National Key Laboratory of Microwave Photonics, Nanjing University of Aeronautics and Astronautics, China; [5]Department 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 Vallée[1], Wei Shi[1]; *[1]Centre 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.

JTu1A.24
Integrated Photon Pairs Source Based on Counter-Propagating Spontaneous Four Wave Mixing in a Silicon Nitride Chip, Gerardo Rodríguez Becerra[1]; *[1]Photonics, 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 Chen[1], Chia-Wei Lu[2], Chin-Chuan Wu[1], Wen-Chin Hsieh[1], Chung-Chih Wu[1,2]; [1]*Graduate Institute of Electronics Engineering, National Taiwan University, Taiwan;* [2]*Graduate 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 Sato[1], Hiroshi Fukuda[1,2]; [1]*Chitose Institute of Science and Technology, Japan;* [2]*Silicon 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
Withdrawn

JTu1A.28
A Switchable Polarization Converter on an Indium Phosphide Membrane, Sander Reniers[1], Jos van der Tol[1], Kevin Williams[1], Yuqing Jiao[1]; [1]*TU/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 Siddiqui[2], Ahmet E. Akosman[1], Mustafa Ordu[2]; [1]*Roger Williams University, USA;* [2]*UNAM - 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 Zhang[1], Yuemei Li[1], Ziyang Xiao[2], Yao Guo[1], Zheng Liu[1], Haobo Guo[1]; [1]*Beijing University of Posts and Telecomm, China;* [2]*Information and Communications branch, Jiangxi Electric Power Company, China.* By introducing Gap Compensation tubes, we have reduced the LP01 mode loss to 3.487×10^{-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 Wu[1], Pengfei Wang[1], Jian Yang[2], Yuanpeng Liu[2], Zhongqi Pan[3], Yang Yue[1]; [1]*Xi'an Jiaotong University, China;* [2]*Nankai University, China;* [3]*University 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 Howard[1], Julia Ward[1], Ethan Neidt[1], Riley Como[1], Ahmet E. Akosman[1]; *[1]Roger 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 hu[1], Yunhan Luo[1], Yaofei Chen[1], Lei Chen[1], Gui-shi Liu[1], Zhe Chen[1]; *[1]Jinan 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 Robb[1], Josh Walker[1], Gian-Luca Oppo[1], Thorsten Ackemann[1]; *[1]University 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 Yan[1,2], Alekhya Gosh[1,2], Arghadeep Pal[1,2], Hao Zhang[1], Toby Bi[1,2], George Ghalanos[1], Shuangyou zhang[1], Lewis J. Hill[1], Yaojing Zhang[1], Yongyong Zhuang[1,3], Jolly Xavier[1,4], Pascal Del'Haye[1,2]; *[1]Max-Planck Institute, Science of Light, Germany; [2]Physics, Friedrich Alexander University Erlangen-Nuremberg, Germany; [3]Electronic Materials Research Laboratory, Xi'an Jiaotong University, China; [4]SeNSE, 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 Lee[1]; *[1]Korea Institute of Science & Technology, Korea (the Republic of).* This study highlights the potential of DMSO-Ti_3C_2Tx MXene in enhancing the stability of ultrafast fiber lasers, opening avenues for exploring soliton rains in nonlinear optical dynamics.

JTu1A.37
Withdrawn

JTu1A.38
Real-Time Coupling Induced Linear and Nonlinear Light Dynamics in Coupled Microresonators, Arghadeep Pal[1,2], Alekhya Ghosh[1,2], Shuangyou Zhang[1], Lewis J. Hill[1],

Haochen Yan[1,2], Hao Zhang[1,3], Toby Bi[1,2], Abdullah Alabbadi[1,2], Pascal Del'Haye[1,2]; *[1]Max-Planck-Inst Physik des Lichts, Germany; [2]Physics, Friedrich Alexander University, Germany; [3]National 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 Wu[1]; *[1]Guangdong 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 Otake[1], Riku Imamura[1], Shun Fujii[1], Takasumi Tanabe[1]; *[1]Keio 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 Chatterjee[1], Akram Muntaser[1]; *[1]University 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. Pal[1], Leslie Rusch[1]; *[1]Université 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 Cho[1], Jonathan King[1], Dung Quach[2], Martin Hafermann[3], Karla Paz[3], Hongyan Mei[1], Shenwei Yin[1], Tanuj Kumar[1], Joseph Andrade[2], Colin Hessel[2], Carsten Ronning[3], David Woolf[2], Mikhail A. Kats[1]; *[1]University of Wisconsin-Madison, USA; [2]Physical Sciences Inc., USA; [3]University 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. Bhadouria[1], You-rim Park[1], Joo-beom Eom[1]; *[1]Department 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 Lemoine[1], Antoine Létoublon[1], Alex Naïm[1], Thomas Batte[1], Charles Cornet[1], Yannick Dumeige[1], Christophe Levallois[1], Yoan Léger[1]; *[1]Univ 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-Rivera[1], Anette López-Sierra[1], Diana Salvador-García[1], Joel E. Valdivieso-Villegas[1], María del Pilar Gutiérrez-Amador[1], Ariadna Sánchez-Castillo[1]; *[1]Autonomous 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 Umesh[1], Gaurang Potdar[1], Aavishkar Katti[1]; *[1]MIT 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 Riabenko[1], Konstantin Beloshenko[1]; *[1]V. N. Karazin Kharkiv National Universit, Ukraine.* Silver transfer to interference minima in AgCl-Ag films creates periodic structures through interaction with the waveguide TE_0-mode. This phenomenon enables the recording of Raman spectra of biological samples, potentially enhancing low-intensity signal registration.

JTu1A.51
Rate-Adaptive Protograph-Based Raptor-Like LDPC Code for Continuous-Variable Quantum Key Distribution, Erdem E. Cil[1], Laurent Schmalen[1]; *[1]CEL, 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.

JTu1A.52
Enhancing Absorption in Cadmium Telluride Solar Cells using Ti Nanoparticles, Sudarshan K. Jain[1], Nikhil Deep Gupta[2], Vijay Janyani[1]; *[1]ECE, Malaviya National Institute of Technology, Jaipur, India; [2]Center 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.

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 Roths[1], Qiang Bian[2], Andrea Stadler[1], Fabian Buchfellner[1], Alexander Roehrl[1]; *[1]Photonics Laboratory, Munich University of Applied Sciences, China; [2]College 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 Ramotar[1], Qianzhu Li[2], Jacques Albert[2], Reza Kholghy[1], Hubert Jean-Ruel[2]; *[1]Department of Mechanical and Aerospace Engineering, Carleton University, Canada; [2]Department 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 Sosa[1,2], Maxime Cavillon[2], Thomas Blanchet[1], Matthieu Lancry[2], Guillaume Laffont[1]; *[1]Université Paris-Saclay, CEA List, France; [2]Institut de Chimie Moléculaire et des Matériaux d'Orsay (ICMMO/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 Chah[1], Damien Kinet[1,2], Corentin Guyot[2], Christophe Caucheteur[1]; *[1]UMONS / Faculté Polytechnique de Mons, Belgium; [2]B-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 Habisreuther[1], Kerstin Schröder[1], Rene Eisermann[2], Adrian Lorenz[1], Stephan Krenek[2]; [1]*Leibniz Institute of Photonic Tech., Germany;* [2]*Physikalisch-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 Diamantopoulos[1], Takuro Fujii[1], Suguru Yamaoka[1], Hidetaka Nishi[1], Koji Takeda[1], Shinji Matsuo[1]; [1]*NTT 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 Sakumoto[1,2], Yi Wang[2], Desalegn W. feyisa[2], Sander Reniers[2], Ripalta Stabile[2], Kevin Williams[2], Yuqing Jiao[2]; [1]*Department of Electrical Engineering and Information Systems, The University of Tokyo, Japan;* [2]*Eindhoven 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 Takiguchi[1], Hironori Nishihara[1]; [1]*Department 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 Wang[1]; *[1]McGill 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 Sun[1,2], Minkyu Kim[1], Pol Van Dorpe[1,2], Francky Catthoor[1,3], Mikael Mazur[4], Joris Van Campenhout[1], Christian Haffner[1], Dennis Lin[1]; *[1]Interuniversity Microelectronics Centre, Belgium; [2]Department of Physics and Astronomy Research unit Quantum Solid-State Physics, KU Leuven, Belgium; [3]Department of Electrical Engineering (ESAT), KU Leuven, Belgium; [4]Nokia 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 V_π of 13.3 V/5.3 V respectively

ITu2B.6 • 15:30 Invited
Non-Reciprocal Materials for Photonic in-Memory Computing, Nathan Youngblood[1], Paolo Pintus[2,3], Mario Dumont[3], Vivswan Shah[1], Toshiya Murai[5], Yuya Shoji[4], Duanni Huang[3], John Bowers[3]; *[1]University of Pittsburgh, USA; [2]Physics, University of Cagliari, Italy; [3]ECE, University of California, Santa Barbara, USA; [4]Electrical and Electronic Engineering, Tokyo Institute of Technology, Japan; [5]Platform 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: 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 Forysiak[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.

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. Bartels[1]; [1]*Morgridge Institute & U of Wisconsin, USA.* We demonstrate computational adaptive optical correction for second harmonic generation (SHG) and third harmonic generation (THG) holographic imaging. Results for transmission and epi SHG and transmission THG imaging will be discussed.

NpTu2E.2 • 14:30 Invited
Miniaturized Nonlinear Micro-Endoscopes, Dylan Septier[2], Eloïse Lefebvre[1,2], Gaëlle Brévalle-Wasilewski[2], Naveen Gajendra Kumar[2], Yong Jian Wang[2], Attila Kaszas[2], Hervé Rigneault[3], Alexandre Kudlinski[1]; [1]*Univ Lille 1 Laboratoire PhLAM, France;* [2]*Lightcore Technologies, France;* [3]*Institut 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 2nd and 3rd Order Nonlinearities, Sylvie Lebrun[1], Abderrahim Azzoune[2], Maha Bouhadida[1], Théo Dampt[3], Laurent Divay[3], Mathieu Fauvel[3], Christian Larat[3], Jean-Charles Beugnot[4]; [1]*Université Paris-Saclay, Institut d'Optique Graduate School, CNRS, Laboratoire Charles Fabry, France;* [2]*Ecole Militaire Polytechnique, Laboratoire Systèmes Lasers, Algeria;* [3]*Thales Research and Technology, France;* [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 2nd and 3rd order nonlinear effects.

NpTu2E.4 • 15:15
1-GHz Dual-Comb Supercontinuum From a Single Nonlinear Fiber Using Polarization Multiplexing, Alexander M. Heidt[1], Sandro Camenzind[2], Benoît Sierro[1], Anupamaa Rampur[1], Benjamin Willenberg[2], Ursula Keller[2], Christopher R. Philips[2]; [1]*Universitat Bern, Switzerland;* [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 as_2S_3-Polycarbonate Hybrid Microtaper, Md. Hosne Mobarok Shamim[1], Imtiaz Alamgir[1], Martin Rochette[1]; *[1]McGill University, Canada.* We present an all-fiber supercontinuum source spanning over the spectral range of 1.2-3.9 µm from an As_2S_3-polycarbonate hybrid microtaper. This is the broadest supercontinuum obtained from a robust polymer clad hybrid microtaper.

14:00 -- 16:00
Room: 207
SoTu2F • Trends in Industry & Commercial Applications
Presider: Yingying Wang; Jinan University, United States

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.* For decades, hollow-core-fibres were considered the epitome of a (niche) specialty fibre. Thanks to the recent improvements I will discuss, the technology has started impacting commercial applications, with the ambition of (one day) becoming mainstream.

SoTu2F.3 • 15:00 Invited
Withdrawn

SoTu2F.4 • 15:30
Withdrawn

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 Ehrler[5], Wilfried Favre[7], Antonin Fejfar[8], Tristan Gageot[7], Ivan Gordon[9,10], Henning Helmers[6], Oliver Höhn[6], Olindo Isabella[10], Marko Jost[11], Martin Ledinsky[8], Jyotirmoy Mandal[12], Phillip Manley[3,2], Delfina Munoz[7], Juan C. Ortiz Lizcano[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.

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 Kim[1]; *[1]NTT 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 Reza[1], Lakshmi Narayanan Venkatasubramani[1], Anil Raj Gautam[1], Liam P. Barry[1]; *[1]Dublin 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 Rabiepoor[1], Leslie Rusch[1], Ming Zeng[1]; *[1]Université 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 Zhu[1], Chenbo Zhang[2], Xiansong Fang[2], Yicheng Xu[1], Ziheng Zhang[1], Fan Zhang[2], Qunbi Zhuge[1], Xiaopeng Xie[2], Weisheng Hu[1]; *[1]Shanghai Jiao Tong University, China; [2]Peking 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 chevalier[1,2], Pascal Scalart[3], Gaël Simon[1], Laurent Bramerie[2], Michel Joindot[2], Jérémy Potet[1], Mathilde Gay[2], Philippe Chanclou[1], Monique Thual[2]; *[1]Orange Labs, France; [2]Institut FOTON - UMR 6082, France; [3]IRISA - 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.

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 Desmarchelier[1], Romain Cotillard[1], Matthieu Lancry[2], Stephane Breaud[3], Andrei Goussarov[4], Christophe Destouches[3], Guillaume Laffont[1]; [1]*CEA Paris-Saclay, France;* [2]*Université Paris-Saclay, France;* [3]*CEA Cadarache, France;* [4]*SCK-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 Perrot[1], James Hainsworth[1,2], Emmanuel Marin[1], Adriana Morana[1], Youcef Ouerdane[1], Aziz Boukenter[1], Hugo Boiron[3], Johan Bertrand[4], Sylvain Girard[1]; [1]*Institut d'Optique Lab Hubert Curien, France;* [2]*IRT Saint Exupery, France;* [3]*Exail, France;* [4]*ANDRA, France.* This study compares radiation-induced refractive index variations in SMF-28e+ 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 Blanchet[1], Benjamin Sapaly[1], Romain Cotillard[1], Sylvain Magne[1], Adriana Morana[2], Emmanuel Marin[2], Sylvain Girard[2], Christophe Destouches[3], Guillaume Laffont[1]; [1]*CEA Saclay - LIST - LSPM, France;* [2]*Hubert Curien Laboratory, France;* [3]*CEA 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 Twayana[1], Fuchuan Lei[1,2], Victor Torres Company[1]; *[1]Chalmers University of Technology, Sweden; [2]Northeast 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 Nazneen[1], Odile Liboiron -Ladouceur[1]; *[1]McGill University, Canada.* We measure a SiN microring resonator with a Q-factor of 7.78×10^5. 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 Muratsubaki[1], Takanori Sato[1], Kunimasa Saitoh[1]; *[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
Withdrawn

ITu3B.5 • 17:45
Theoretical Exploration of Biosensing Using Hybrid Semiconductor Plasmonic Lasers, Shayan Saeidi[1], Pavel Cheben[2], Jens H. Schmid[2], Pierre Berini[1]; *[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: 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[1], Gian-Luca Oppo[2]; *[1]Loughborough University, United Kingdom; [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[1,2], Zongda Li[1,2], Yiqing Xu[1,2], Xiaoming Wei[3], Zhongmin Yang[3], Stephane Coen[1,2], Miro Erkintalo[1,2], Stuart Murdoch[1,2]; *[1]The University of Auckland, New Zealand; [2]The Dodd-Walls Centre for Photonic and Quantum Technologies, New Zealand; [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[1], Martin Rochette[1]; *[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 $C_0 \approx 0.65 g_{LD}$. 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[1], Md Hosne Mobarok Shamim[1], Martin Rochette[1]; *[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[1]; *[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
Seeing the Invisible: Meta-Optics and Phase Imaging, Ann Roberts[1]; *[1]University 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.2 • 17:00 Invited
Advances in Quantitative Label-Free Imaging for Micro/Nano-Scale Object Analysis, Jose A. Rodrigo[1], Tatiana Alieva[1]; *[1]Universidad 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.3 • 17:30 Invited
Microwave Resonances in Water-Based Objects, Yuchen Song[1], Aaron D. Slepkov[1]; *[1]Trent 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.

NoTu3D.4 • 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 Barrett[1], Cherrie Lee[1], Carlota Canalias[1]; *[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 Tishchenko[1], Francis Berghmans[1], Tigran Baghdasaryan[1]; *[1]Vrije Universiteit Brussel, Belgium.* We show numerically the feasibility to achieve doubly phase-matched cascaded four-wave mixing in high GeO_2-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 Moses[1]; *[1]Cornell 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 Ren[1], Wenpu Geng[2], Jian Yang[2], Yuetian Wang[3], Zhongqi Pan[4], Yang Yue[1]; *[1]School of Information and Communications Engineering, Xi'an Jiaotong University, China; [2]Institute of Modern Optics, Nankai University, China; [3]Department of Optoelectronic Information Science and Engineering, School of Physics, Xi'an Jiaotong University, China; [4]Department 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-Raya[1,2], Luca Leggio[1,3], Arturo Mena[3], David Novoa[4,5], Mikel Sanz[6,7]; *[1]Basque Center for Applied Mathematics (BCAM), Spain; [2]EHU Quantum Center, Spain; [3]Department of Communications Engineering, University of the Basque Country (UPV/EHU), Spain; [4]Department of Communications Engineering, University of the Basque Country (UPV/EHU) and EHU Quantum Center, Spain; [5]IKERBASQUE, Basque Foundation for Science, Spain; [6]Basque Center for Applied Mathematics (BCAM) and IKERBASQUE, Basque Foundation for Science, Spain; [7]Department 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 Shamim[1], Laurent Brilland[2], Radwan Chahal[2], Johann Troles[2], Martin Rochette[1]; *[1]McGill University, Canada; [2]CNRS, 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: 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 Georges[1]; *[1]Oxxius SA, France.* Fluoride fiber lasers are promising candidates for high power visible laser generation. Recent breakthrough and means to overcome current limitations will be presented.

SoTu3F.2 • 17:00 Invited
Phosphate Glass Fibers for Biomedical Applications, Nadia G. Boetti[1], Jawad Talekkara Pandayil[1,2], Sharon Russo[2], Martha Segura[3], Diego Pugliese[2], Joris Lousteau[4], Davide Janner[2]; *[1]Fondazione LINKS, Italy; [2]DISAT, Politecnico di Torino, Italy; [3]Universitat Rovira i Virgili (URV), Spain; [4]DCMC, 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. Zeweldi[1], Mohsen Rezaei[1], Martin Rochette[1]; *[1]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. Boetti[1], Martha Segura[2], Amiel Ishaaya[3], Davide Janner[4], Francesc Diaz[2], Xavier Matteos[2], Joris Lousteau[5]; *[1]Fondazione LINKS, Italy; [2]Universitat Rovira i Virgili, Spain; [3]Ben-Gurion University of the Negev, Israel; [4]Politecnico di Torino, Italy; [5]Politecnico 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 Tm^{3+} and Ho^{3+} doping is investigated.

SoTu3F.5 • 18:00
In-Line Polarization Control in Soft Glass Fibers, Md Moinul Islam Khan[1], Md Hosne Mobarok Shamim[1], Martin Rochette[1]; *[1]McGill 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 As_2S_3 fibers exhibit high polarization extinction ratios (PER) of 20.8 dB and 19.8 dB, respectively.

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. Klimov[1], Valerio Pinchetti[1]; *[1]Los 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. Samuel[1]; *[1]University 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 Lafontaine[1]; *[1]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: 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 Feng[1], Francois Ladouceur[1], Amr A. Abed[1], Reem Almasri[1]; *[1]University 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 King[1], Jin-Woo Cho[1], Dung Quach[2], Martin Hafermann[3], Karla Paz[3], Hongyan Mei[1], Shenwei Yin[1], Tanuj Kumar[1], Joseph Andrade[2], Colin Hessel[2], Carsten Ronning[3], David Woolf[2], Mikhail A. Kats[1]; *[1]University of Wisconsin-Madison, USA; [2]Physical Sciences Incorporated, USA; [3]Friedrich 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 Córdova[1]; *[1]University 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

Cephalopod-Inspired Optical Living Systems With Tunable Properties, Nikhil Kaimal[1], Georgii Bogdanov[1], Alon Gorodetsky[1]; *[1]University 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.

Wednesday, 31 July

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

JW1A.1 • Plenary
An Overview of Data Movement in AI/ML Systems and Their Impact on Interconnects, Ashkan Seyedi[1]; [1]*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
A Light in Digital Darkness: Optical Wireless Communication to Connect the Unconnected, Mohamed-Slim Alouini[1]; [1]*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[1]; [1]*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 Kashyap[1]; [1]*Photonova 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 Melanson[1], Julien Gagnon[1]; [1]*ITF 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 Tongue[1]; [1]*Sensuron, 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 Khalil[1], Valerian Freysz[1], Kevin Armengaud[1], Christophe Pierre[1], Marc Castaing[1]; [1]*ALPhANOV, 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.2 • 14:30
Photonic Neural Network and in-Situ Training in a Synthetic Frequency Dimension, Felix Gottlieb[1], Abhinav Sinha[2], Kai Wang[1]; [1]*McGill University, Canada;* [2]*Indian 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 Rollinson[1], Robert F. Karlicek[1], Mona M. Hella[1]; [1]*Rensselaer 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 Ghanaatian[1], Amin Shafiee[1], Mahdi Nikdast[1]; [1]*Colorado 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 Wright[1]; *[1]Yale 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: 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 Natalino[1]; *[1]Chalmers Tekniska Högskola, Sweden.* Abstract not available

NeW2C.2 • 15:30 Invited
Withdrawn

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 Hougne[1]; *[1]IETR, 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 Feigenbaum[1]; *[1]Lawrence 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 Niu[1], Kai Wang[1]; [1]*McGill 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 MacLellan[1,2], Piotr Roztocki[1,2], Julie Belleville[1], Luis Romero Cortés[1,3], Kaleb Ruscitti[1], Bennet Fischer[1], José Azaña[1], Roberto Morandotti[1]; [1]*Institut National de la Recherche Scientifique, Canada;* [2]*Ki3 Photonics Technologies, Canada;* [3]*Universitat 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: 206B
NpW2E • Integrated Nonlinear Photonics
Presider: Silvia Soria; Inst. di Fisica Applicata Nello Carrara, Italy

NpW2E.1 • 14:30 Invited
Withdrawn

NpW2E.2 • 15:00 Invited
THz Generation Using Thin-Film LNBO, Ileana-Cristina Benea-Chelmus[1]; [1]*Ecole Polytechnique Federale de Lausanne, Switzerland.* Integrated photonic circuits from thin film lithium niobate are emerging as a promising platform to address the lack of miniaturized terahertz emitters and detectors within one single chip. In this talk, we will discover how terahertz transmission lines co-integrated with photonics fulfill the essential requirements for efficient terahertz-optical bidirectional conversion.

NpW2E.3 • 15:30
Impact of Nonlinear Losses on the Performance of InGaAsP-on-Insulator Ring Resonators, Athulya Thulaseedharan[1], Laís Fujii dos Santos[1], Tara Moradi[2], Connor Kupchak[2], Ksenia Dolgaleva[1]; [1]*University of Ottawa, Canada;* [2]*Carleton 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 ($In_{0.7}Ga_{0.18}As_{0.3}P$ on SiO_2 (InGaAsP-on-insulator, or InGaAsP-OI) platform.

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 Young[1,2], Zhihao Hu[1], Curtis Menyuk[2], Jonathan Hu[1]; [1]*Baylor University, USA;* [2]*University 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. Abouelela[1], Sophie LaRochelle[1], Leslie Rusch[1]; [1]*ECE 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 Vukovic[1], Christophe A. Codemard[2], Michalis N. Zervas[1]; [1]*University of Southampton, United Kingdom;* [2]*TRUMF 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 Gillooly[1], Mark Hill[1], Jose Maria Alvarez De Con[1]; [1]*Fibercore 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 Mimouni[1], Younès Messaddeq[2], Bora Ung[1]; [1]*Ecole de Technologie Superieure, Canada;* [2]*Centre 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 Huang[1], Yuanpeng Liu[2], Wenqian Zhao[1], Zhongqi Pan[3], Yang Yue[1]; [1]*Xi'an Jiaotong University, China;* [2]*Nankai University, China;* [3]*University 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.

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 Koida[1]; [1]*Natl Inst of Adv Industrial Sci & Tech, Japan.* Two transparent conductive oxide (TCO) films of interest in the solar cell field are highlighted: high-mobility In_2O_3-based TCOs currently in production lines and the indium-free, highly conductive amorphous SnO_2 films discovered recently in the laboratory.

SW2G.2 • 15:00 Invited
Contact Engineering for Organic Photovoltaics, Canek Fuentes-Hernandez[1,2], Felipe A. Larrain[2], Vladimir Kolesov[2], Yi-Chien Chang[2,4], Minwoo Nam[2,5], Tzu-Yen Huang[3], Michael Toney[3], Bernard Kippelen[2]; [1]*Department of Electrical and Computer Engineering, Northeastern University, USA;* [2]*Center for Organic Photonics and Electronics (COPE), School of Electrical and Computer Engineering, Georgia Institute of Technology, USA;* [3]*Standford Synchrotron Radiation Light Source (SSRL), SLAC National Accelerator Laboratory, USA;* [4]*Faculty of Engineering and Sciences, Universidad Adolfo Ibanez, Chile;* [5]*Department of Electronic Engineering, Keimyung University, Korea (the Republic of).* 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
Withdrawn

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

SpW2H.1 • 14:00 Invited
Time-Multiplexed Programmable Continuous-Variable Photonic Quantum Computing, Shuntaro Takeda[1]; [1]*The University of Tokyo, Japan.* We report on our recent development of time-multiplexed programmable continuous-variable photonic quantum computing, especially focusing on our programmable loop-based quantum processor capable of performing multi-step quantum operations on highly non-classical states of light.

SpW2H.2 • 14:30
Digital Equalization Techniques for Continuous Variable Quantum Key Distribution, Utku Akin[1,2], Jonas Berl[1,3], Tobias Fehenberger[1], Norbert Hanik[2]; *[1]Adva Network Security GmbH, Germany; [2]Institute for Communications Engineering, Technical University of Munich, Germany; [3]Communications Engineering Lab, Karlsruhe Institute of Technology, Germany.* We experimentally investigate two digital equalization schemes for ISI mitigation in CV-QKD. The proposed static zero-forcing method shows similar performance to an adaptive equalizer at a significantly reduced DSP complexity.

SpW2H.3 • 14:45 Invited
Integrating Quantum Communications in Telecom Infrastructures, Andrew Shields[1], Tina Muller[1]; *[1]Toshiba Research Europe Ltd, United Kingdom.* Establishing practical quantum networks requires advanced functionality, such as quantum repeaters, to enable fully private networks operating over much larger distances. Here, I will review the development of quantum dot devices for these applications.

SpW2H.4 • 15:15
Spectral Efficient Physical Layer Security by Using Coherent All-Optical Processing and Multichannel Obfuscation, Yarden Yalinevich[1,2], Eyal Wohlgemuth[1,2], Dan Sadot[1,2]; *[1]Ben-Gurion University, Israel; [2]CyberRidge, 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.5 • 15:30
Quantum-Inspired Encryption Using Displacement Operators in Coherent Optical Communications, Mostafa Khalil[1], Adrian Chan[2], Lawrence R. Chen[1], David V. Plant[1], Randy Kuang[3]; *[1]McGill University, Canada; [2]Synopsys Inc., Canada; [3]Quantropi 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.

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
Thick Femtosecond-Inscribed Silica VBGs for mid-IR Spectral Filtering Applications, Lauris Talbot[2], Malte P. Siems[1], Daniel Richter[1], Nicolas David[3], Sébastien Blais-Ouellette[3], Stefan Nolte[1,4], Martin Bernier[2]; *[1]Institute of Applied Physics, Friedrich Schiller University Jena, Germany; [2]Centre d'Optique, Photonique et Laser (COPL), Université Laval, Canada; [3]Photon Etc., Canada; [4]Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Center of Excellence in Photonics, Germany.* 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.2 • 16:45

Fs-Written FBGs in InF3 Fibers Using the Scanning Phase Mask Technique for Mid-IR All-Fiber Laser, Tommy T. Boilard[1], Réal Vallée[1], Martin Bernier[1]; [1]*COPL, 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.

BW3A.3 • 17:00

Thermal Stability of Fiber Bragg Gratings Fabricated in Fluoride Glass Optical Fibers via Femtosecond Laser Direct-Inscription, Alex Fuerbach[1], Toney T. Fernandez[2,1], Luyi Xu[1]; [1]*Macquarie University, Australia;* [2]*University of South Australia, Australia.* We report on the annealing properties of fiber Bragg gratings (FBGs) that have been inscribed into fluorozirconate (ZBLAN) and fluoroindate (InF_3) optical fibers via the femtosecond laser direct write technique.

BW3A.4 • 17:15

Bragg Grating Reflectors Inscribed in Polypropylene Lightpipes, Vasilis Sarakatsianos[1], Ivan Chapalo[1], Eleni Grantzioti[1], Theodoros Manouras[1,2], Maria Vamvakaki[1,2], Maria Konstantaki[1], Stavros Pissadakis[1]; [1]*FORTH-IESL, Greece;* [2]*Department 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.5 • 17:30 Invited

A Type-1 Fluoride Glass Optical Waveguide Laser for mid Infrared Integrated Optics., Toney T. Fernandez[1], Dale Otten[1], Simon Gross[2], Michael J. Withford[2], Alex Fuerbach[2], David Lancaster[1]; [1]*University of South Australia, Australia;* [2]*Macqurie 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.

BW3A.6 • 18:00 Invited

Withdrawn

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 Nicolaescu[1]; [1]*Pointcloud Inc., Switzerland.* Abstract not available.

IW3B.2 • 17:00
Direct Laser Writing of a Compact 1x4 Splitter for Multi-Core Optical Fibers, Tigran Baghdasaryan[1], Koen Vanmol[1], Hugo Thienpont[1], Francis Berghmans[1], Jurgen Van Erps[1]; [1]*Vrije 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 Liang[1], Salim Abdi[1], Sander Reniers[1], Jos van der Tol[1], Kevin Williams[1], Yuqing Jiao[1]; [1]*Eindhoven university of technology, Netherlands.* We experimentally demonstrate an efficient TM_0 filter on InP membrane. The filter exhibits an extinction ratio exceeding 34 dB for TM_0 and a loss lower than 0.5 dB for TE_0 at a wavelength of 1570 nm

IW3B.4 • 17:30
CubeSat Astrophotonics: Lower Cost, Space-Based Optical Astronomy Using Photonic Integrated Circuits, Tyler J. deLoughery[1,2], Clayton D. Lauzon[1,2], Kyle H. Sims[1,2], John Weber[3], Wahab Almuhtadi[2,1], Ross Cheriton[3]; [1]*Carleton University, Canada;* [2]*Faculty of Technology and Trades, Algonquin College, Canada;* [3]*National 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 Kaushalram[1], Jacob Hiesener[1], Clay A. Kaylor[1], Stephen Ralph[1]; [1]*ECE, Georgia Institute of Technology, USA.* We report a peak dispersion of $\pm 10^5$ 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 Gostimirovic[1], Odile Liboiron-Ladouceur[1]; [1]*Department 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: 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[1]; *[1]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[1]; *[1]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[1]; *[1]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: 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 Bougdid[1], Gunjan Kulkarni[1], Francois Chenard[2], Chandraika J. Sugrim[4], Ranganathan Kumar[3], Aravinda Kar[1]; *[1]University of Central Florida, CREOL, USA; [2]IRflex Corporation, USA; [3]University of Central Florida, USA; [4]Naval Air Warfare Center, Aircraft Division, USA.* CO_2 laser-assisted deposition of transparent chalcogenide As_2S_3 glass and TiO_2 films is reported. A theoretical model is developed to select the laser sintering parameters. The optical properties of transparent As_2S_3 and TiO_2 coatings are investigated.

NoW3D.2 • 17:00 Invited
Digital Glass Forming of Optics and Photonics, Edward Kinzel[1]; *[1]University of Notre Dame, USA.* CO_2 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 Qiao[1]; *[1]Rochester Institute of Technology, USA.* We report on the nano-structuring and precision finishing of optical material

using a femtosecond laser, including surface patterning, 3D writing of an NIR low-threshold waveguide laser, and an MIR waveguide beam splitter.

NoW3D.4
Withdrawn

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. Boyd[1]; *[1]University 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 Cardenas[1]; *[1]University 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
Nonlinear Photonics for Applications in Quantum Science and Technology, Alexander L. Gaeta[1]; *[1]Columbia University, USA.* Nonlinear photonics offers the potential to solve several key challenges that would greatly enable quantum computing and networking.

NpW3E.4 • 17:30 Invited
Extremely Non-Degenerate Nonlinear Optics: Dedicated to the Memory of Mansoor Sheik-Bahae, Eric W. Van Stryland[1]; *[1]University of Central Florida, CREOL, USA.* Mansoor et.al. introduced Z-scan 35 years ago (10^4 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 Vermeulen[1]; *[1]Vrije 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: 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[1], Gebrehiwot T. Zeweldi[1], Md. Hosne Mobarok Shamim[1], Martin Rochette[1]; *[1]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[1], Martin Rochette[1]; *[1]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 Wang[1], Bailey Meehan[2], Thomas Wade Hawkins[2], John Ballato[2], Peter D. Dragic[1]; *[1]University of Illinois Urbana Champaign, USA; [2]Clemson University, USA.* Through a series of thermal annealing experiments, it is shown that Yb^{3+} 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 Merlas[1], Natasha Vukovic[1], Christophe A. Codemard[2], Michalis N. Zervas[1]; *[1]University of Southampton, United Kingdom; [2]TRUMPF 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 Jalilpiran[1], Hamed Rabbani[1], Jacques Lefebvre[1], Leslie Rusch[1], Younès Messaddeq[1], Sophie LaRochelle[1]; *[1]Centre 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 Er^{3+}:Yb^{3+} 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 Wang[1], Bailey Meehan[2], Thomas Wade Hawkins[2], John Ballato[2], Peter D. Dragic[1]; *[1]University of Illinois Urbana Champaign, USA; [2]Clemson 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.

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 Guha[1]; *[1]University 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 Mastria[1]; *[1]CNR 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 Niroui[1]; *[1]Massachusetts 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 Pirvaram[1], Paul G. O'Brien[1], Siu N. Leung[1]; *[1]York 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
Optimal Thermophotovoltaics Using Bilayer Emitters, Paige Delsa[1], Mariama Rebello de Sousa Dias[1]; [1]*University 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: 2104
NoW3H • Optical Sensors, Biosensors, and Imaging
Presider: Alon Gorodetsky; University of California Irvine, United States

NoW3H.1 • 16:30 Invited
Cool Color with Nanocellulose: Structure Colored Radiative Cooling, Tian Li[1]; [1]*Purdue University, USA.* Abstract not available.

NoW3H.2 • 17:00
A Multiplexed Quantitative Spectroscopy Method to Measure Spectrally Overlapping Metabolic Fluorophores, Victoria W. DAgostino[1], Michelle Kwan[1], Megan Madonna[1], Brian Crouch[1], Nimmi Ramanujam[1]; [1]*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 Meskoob[1], Mathieu Gratuze[1], Gabriel Gandubert[1], Xavier Ropagnol[1], Frederic Nabki[1], Francois Blanchard[1]; [1]*Ecole 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 Sebastian[1], Redwan Ahmad[1], Jonathan Lafrenière-Greig[1], Xavier Ropagnol[1,2], Francois Blanchard[1]; [1]*École de technologie supérieure ÉTS, Canada;* [2]*Institut National de la recherche scientifique (INRS-EMT), 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 Zimmermann[1], Koffi N. Amouzou[1], Dipankar Sengupta[1], Aashutosh Kumar[1], Nicole Demarquette[1], Bora Ung[1]; *[1]École de technologie supérieure 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. Amouzou[1], Camila Zimmermann[1], Bora Ung[1], Dipankar Sengupta[1], Normand Gravel[1], Jean-Marc Lina[1], Bora Ung[1]; *[1]École de technologie supérieure, 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.

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 Richter[1], Malte P. Siems[1], Ria G. Krämer[1], Georg R. Schwartz[1], Abdolnaser Ghazagh[1], Stefan Nolte[1,2]; [1]*Institute of Applied Physics, Abbe Center of Photonics, Friedrich Schiller University Jena, Germany;* [2]*Fraunhofer 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-Perez[2], Médéric Loyez[3], Joel Villatoro[4], Christophe Caucheteur[5], Jacques Albert[1]; [1]*Electronics, Carleton University, Canada;* [2]*Optics, National Institute of Astrophysic Optics and Electronics, Mexico;* [3]*Proteomics and Microbiology, University of Mons, Belgium;* [4]*Ingeniería de Comunicaciones UPV/EHU, University of the Basque Country UPV/EHU, Spain;* [5]*Electromagnetism 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 Leymonerie[1], Olivier Bélanger[1], Jean-Sébastien Boisvert[1], Sébastien Loranger[1]; [1]*Electrical 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 Nicolai[1], Hubert Jean-Ruel[1]; [1]*Department 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 Hartmann[1], Remco Nieuwland[1]; [1]*United Fiber Sensing B.V., Netherlands.* A Fiber Bragg grating (FBG)-based hydrogen sensor coated with a catalytic layer was developed, detecting H_2 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 Lapointe[1], Cedrik Coia[2], Albert Dupont[1], Réal Vallée[1]; [1]*Center for Optics, Photonics and Lasers, Canada;* [2]*Aeponyx, 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
ITh1B • Novel Integrated Materials I
Presider: Christian Haffner; Interuniversity Microelectronics Center, Belgium

ITh1B.1 • 08:00 Tutorial

Advanced Integrated Photonics on Lithium Niobate, Sasan Fathpour[1]; [1]*University of Central Florida, CREOL, USA.* Abstract not available.

ITh1B.2 • 09:00

Four-Wave Mixing in Highly Nonlinear Silicon Slot Waveguides With a Crystal Violet Cladding, Devika P. Nair[1], Michael Menard[1]; [1]*École 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.

ITh1B.3 • 09:15

The Effect of a Protective ALD Layer on the Stability of Electro-Optic Polymer, Marwan Albarghouti[1], Mateo Powell Serrano[1], Jasper Drisko[1], Patrick Riedel[1], Gannon Kehe[1], Ginnelle Ramann[1], Xiaoyue P. Huang[1], Brenden Basica[1], John Zyskind[1], Zhiming Liu[1]; [1]*Lightwave 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 O_2

ITh1B.4 • 09:30 Invited

Withdrawn

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. Barry[1], Amol Delmade[1], Simon Nellen[2], David Coffey[3], Cristian Vargas[2], Alison Kearney[3,1], Robert Kohlhaas[2], Martin Schell[2], Frank Smyth[3]; *[1]Dublin City University, Ireland; [2]Fraunhofer Institute for Telecommunications, Heinrich Hertz Institute (HHI), Germany; [3]Pilot 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 Dass[1]; *[1]University of Dublin Trinity College, Ireland.* We experimentally study transmission of digitally multiplexed 15 GBd 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 Avazpour[1], Narmada Rajaram[2], Ahmad Atieh[2,3], Liam P. Barry[1]; *[1]Dublin City University, Ireland; [2]Department of Electrical and Computer Engineering, University of Ottawa, Canada; [3]Optiwave 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: 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 McLeod[1]; *[1]University 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
Withdrawn

NoTh1D.3 • 09:00 Contributed
Tunable Nanophotonic Materials for Multispectral Reconfigurability, Yujie Luo[1], Thomas Christensen[2], Ognjen Ilic[1]; *[1]University of Minnesota Twin Cities, USA; [2]Technical 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.

NoTh1D.4 • 09:15 Invited
Withdrawn

NoTh1D.5 • 09:45
Withdrawn

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
Withdrawn

NpTh1E.2 • 08:30
Coherent Generation of Ultra-Stable Smart Frequency Combs, Celine Mazoukh[1], Luigi Di Lauro[1], Imtiaz Alamgir[1], Bennet Fischer[1,2], Nicolas Perron[1], A Aadhi[3], Armaghan Eshaghi[4], Brent Little[5], Sai Chu[6], David J. Moss[7], Roberto Morandotti[1]; *[1]INRS-EMT, Canada; [2]Leibniz Institute of Photonic Technology, Germany; [3]Centre for Nanophotonics, Queen's University, Canada; [4]Huawei Technologies Canada, Canada; [5]QXP Technologies, China; [6]City University of Hong Kong, Hong Kong; [7]Optical 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. Campbell[1,2], Lewis J. Hill[2], Pascal Del'Haye[2,3], Gian-Luca Oppo[1]; *[1]Department of Physics, University of Strathclyde, United Kingdom; [2]Max Planck Institute for the Science of Light, Germany; [3]Department 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 Xu[1,2], Matthew Macnaughtan[1,2], Zongda Li[1,2], Xiaoming Wei[3], Zhongmin Yang[3], Stephane Coen[1,2], Miro Erkintalo[1,2], Stuart Murdoch[1,2]; *[1]The Dodd-Walls Centre for Photonic and Quantum Technologies, New Zealand; [2]Department of Physics, University of Auckland, New Zealand; [3]School 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 Alamgir[1], A Aadhi[1], Luigi Di Lauro[1], Pavel Dmitriev[1], Nicolas Perron[1], Celine Mazoukh[1], Bennet Fischer[2], Piotr Roztocki[1,3], Cristina Rimoldi[1,4], Mario Chemnitz[1,2], Armaghan Eshaghi[5], Evgeny Viktorov[6], Anton Kovalev[6], Brent Little[7], Sai Chu[8], David J. Moss[9], Roberto Morandotti[1]; *[1]Énergie Matériaux Télécommunications, Institut national de la recherche scientifique, Canada; [2]Leibniz Institute of Photonic Technology, Germany; [3]Ki3 Photonics Technologies, Canada; [4]Dipartimento di Elettronica e Telecomunicazioni, Politecnico di Torino, Italy; [5]Huawei Technologies Canada, Canada; [6]ITMO University, Russian Federation; [7]QXP Technology Inc., China; [8]City University of Hong Kong, China; [9]Swinburne 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.

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 Boudoux[1]; *[1]Polytechnique Montréal, Canada.* Abstract not available.

SoTh1F.2 • 08:30
Distributed Hydrogen Sensing and Leak Detection Using Draw-Tower Fabricated Optical Fiber, sandy alomari[1], Kenny Hey Tow[1], Joao Pereira[1], Ari Antikainen[1], Tedros Weldehawariat[1], Korina Hartmann[2], Remco Nieuwland[2], Åsa Claesson[1]; *[1]RISE Fiberlab, RISE Research Institutes of Sweden, Sweden; [2]United 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. Davidson[1], Thomas Kelly[1], Peter Horak[1], David J. Richardson[1], Francesco Poletti[1], Natalie V. Wheeler[1]; *[1]University 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 Silanteva[1], Vincent V. Vliet[1], Menno V. Hout[1], Chigo Okonkwo[1], Thomas Bradley[1]; *[1]Eindhoven 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 Abuhelwa[1], Arshdeep Singh[1], Jiayu Liu[1], Amit Morey[2], Lakshmikantha Channaiah[1], Mahmoud Almasri[1]; *[1]University of Missouri-Columbia, USA; [2]Auburn 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 Ward[1], Ethan Neidt[1], Riley Como[1], Ahmet E. Akosman[1]; *[1]Roger 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.

08:00 -- 10:00
Room: 205B
NoTh1G • Chalcogenides and Nonlinear Materials
Presider: Brandon Shaw; Naval Research Laboratory, United States

NoTh1G.1 • 08:00 Invited
on the Temperature Dependence of Photo-Structural Changes in Chalcogenide Glasses, Pierre Lucas[1]; *[1]University 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 SiO_2 – Al_2O_3 – Lu_2O_3 Yb-Doped Glasses, Thomas Meyneng[1,2], Jyothis Thomas[1], Nicolas Grégoire[2], Morency Steeve[2], Philippe Labranche[2], Jean-Sebastien Boisvert[1], Younès Messaddeq[2], Raman Kashyap[1]; *[1]Departement of electrical engineering, Polytechnique Montréal, Canada; [2]COPL, Université Laval, Canada.* This work demonstrates the applications of Lu_2O_3-Al_2O_3-SiO_2 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 10^{25} to 10^{26} m^{-3}.

NoTh1G.3 • 08:45
Tunable Continuous Wave Tm^{3+}-Doped Gallium-Rich BGG Glass Laser, Stanislav Leonov[1], Théo Guérineau[1], Martin Bernier[1], Younès Messaddeq[1], Réal Vallée[1]; *[1]Center for Optics, Photonics and Lasers (COPL), Université Laval, Canada.* We present a room-temperature

tunable continuous wave laser based on Tm^{3+}-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 $CdSiP_2$ and $BaGa_2GeSe_6$ at 1064 nm for Different Spot Sizes, Shekhar Guha[1], Kevin Cissner[1], Alexander Carson[1], Kevin Zawilski[2], Valentin Petrov[3]; *[1]US Air Force Research Laboratory, USA; [2]BAE Inc., USA; [3]Max Born Institut, Germany.* Damage threshold values of $CdSiP_2$ and $BaGa_2GeSe_6$ 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 Rudenko[2], Anatolii Tolochko[2], Svitlana Bugaychuk[2], Dmytro Zhulai[2], Gertruda Klimusheva[2], Galina Yaremchuk[3], Tatyana Mirnaya[3], Yuriy Garbovskiy[1]; *[1]Central Connecticut State University, USA; [2]Institute of Physics of National Academy of Sciences of Ukraine, Ukraine; [3]V.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
Withdrawn

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

SpTh1H.1 • 08:00 Invited
Withdrawn

SpTh1H.2 • 08:30
Add-Drop Multiplexing for Full Spectrum WDM NFDM Transmission Systems Using Spectral Overlap, Olaf Schulz[1], Alvaro Moscoso-Mártir[2], Jeremy Witzens[2], Stephan Pachnicke[1]; *[1]Kiel University, Germany; [2]RWTH 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-Hamida[1], Shahab Oveis Gharan[1], Ahmad Abdo[1], Bilal Riaz[1]; *[1]Ciena 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 Attia[1,2], Dan Sadot[1,2]; *[1]Ben-Gurion University of the Negev, Israel; [2]CyberRidge, 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 Smyth[1]; *[1]Pilot Photonics, Ireland.* An integrated comb laser assembly (iCLA) based on a monolithic InP gain switched comb source and demultiplexer PIC is presented. Its design, characterisation, and demonstration in coherent optical communication and mmWave generation applications are presented.

SpTh1H.6 • 09:45
Feedforward Phase Noise Compensation of Free-Running DFB Lasers Heterodyned for sub-THz Generation Without Optical Filtering, Kyungmin Woo[1], Hoon Kim[1]; *[1]KAIST, 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.

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 Grantzioti[1], Panagiotis Kleitsiotis[1,2], Emmanouil Gagaoudakis[1], Vassilios Binas[1,3], Stavros Pissadakis[1], Maria Konstantaki[1]; *[1]FORTH-IESL, Greece; [2]Physics Department, University of Crete, Greece; [3]Chemistry 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 Anderson[1], Peter Dekker[1], Heriberto Bustamante[2], Thomas Kuen[3], Michael J. Withford[1], Martin Ams[1]; *[1]Macquarie University, Australia; [2]Sydney Water, Australia; [3]Melbourne 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 Fasseaux[1], Christophe Caucheteur[1], Médéric Loyez[1]; *[1]Universite 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 Cotillard[1], Nicolas Roussel[1]; *[1]CEA, 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 Mazzo[1], Gabriel A. Torelli[1], Uilian J. Dreyer[1], Jesse Pelegrin[2], Leonardo Siqueira[1], Jhoan Cubas[1], Moises Neto[1], Luiz C. Silva[3], Gabriel Romero[3], Jurandir Silva[3], Rigoberto Morales[1], Jean Carlos Cardozo da Silva[1]; *[1]Federal University of Technology-Paraná, Brazil; [2]Instituto Federal Catarinense, Brazil; [3]PETRÓLEO 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. Sanipatin[1], Luis Sánchez[2], Lucía Arques[1], Salvador Sales[1]; *[1]Universidad Politécnica de Valencia, Spain; [2]Cal-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 Landreau[2,1], Thomas Le Gall[2], Nicolas Ponthus[2], Adriana Morana[1], Jacques Charvin[2], Sylvain Girard[1], Emmanuel Marin[1]; *[1]Laboratoire Hubert Curien, France; [2]Avnir 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
Wafe-Scale TMD Monolayer Waveguide, Myungjae Lee[1]; *[1]Seoul National University, Korea (the Republic of).* Abstract not available.

ITh2B.2 • 11:00

Demonstration of Graphene Waveguide Photodetector Based on Photothermoelectric Effect, Yishu Huang[1,2], Tom Reep[1,2], Hung-Chieh Tsai[1], Jeroen De Coster[1], Steven Brems[1], Inge Asselberghs[1], Klaas-Jan Tielrooij[3,4], Dries Van Thourhout[1,2], Christian Haffner[1]; *[1]imec, Belgium; [2]Ghent University, Belgium; [3]Catalan Institute of Nanoscience and Nanotechnology (ICN2), Spain; [4]TU 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 Morice[1,2], Brieg Le Corre[3,1], Antoine Lemoine[1], Abdelmounaim Harouri[3], Grégoire Beaudoin[3], Luc Le Gratiet[3], Tony Rohel[1], Julie Le Pouliquen[1], Rozenn Bernard[1], Christian Grillet[2], Charles Cornet[1], Isabelle Sagnes[3], Konstantinos Pantzas[3], Christelle Monat[2], Yoan Léger[1]; *[1]Univ Rennes, INSA de Rennes, CNRS, Institut FOTON, UMR 6082, France; [2]Institut des Nanotechnologies de Lyon, UMR CNRS 5270, Ecole Centrale de Lyon, France; [3]Centre de Nanosciences et de Nanotechnologies, CNRS, Univ Paris-Saclay, France.* Here we compare different Gallium Phospide photonic platforms in the framework of non-linear photonic integration. This comparison is firstly carried out through the evaluation of propagation losses within nano-waveguides in the near infrared.

ITh2B.4 • 11:30

Linear and Nonlinear Characterization of Vertical Orientation-Patterned Gallium Phosphide Waveguides for Second Harmonic Generation, Antoine Lemoine[1], Brieg Le Corre[2,1], Lise Morice[1], Abdelmounaim Harouri[2], Luc Le Gratiet[2], Grégoire Beaudoin[2], Julie Le Pouliquen[1], Arnaud Grisard[3], Sylvain Combrié[3], Bruno Gérard[4], Charles Cornet[1], Yannick Dumeige[1], Konstantinos Pantzas[2], Isabelle Sagnes[2], Yoan Léger[1]; *[1]Univ Rennes, INSA Rennes, CNRS, Institut FOTON - UMR 6082, F-35000 Rennes, France, France; [2]Centre de Nanosciences et de Nanotechnologie, CNRS, 91120 Palaiseau, France, France; [3]Thales Research and Technology, 91767 Palaiseau, France, France; [4]III-V Lab, 91767 Palaiseau, France, 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 Corre[1,2], Antoine Lemoine[2], Abdelmounaim Harouri[1], Luc Le Gratiet[1], Bruno Gérard[4], Sylvain Combrié[3], Arnaud Grisard[3], Grégoire Beaudoin[1], Isabelle Sagnes[1], Konstantinos Pantzas[1], Gilles Patriarche[1], Yoan Léger[2]; *[1]Centre de Nanosciences et de Nanotechnologies, CNRS, France; [2]Univ Rennes, INSA Rennes, CNRS, Institut FOTON - UMR 6082, France; [3]Thales Research and Technology, France; [4]III-V Lab, France.* 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. Moss[1]; *[1]Swinburne University of Technology, Australia.* Abstract not available.

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 Rodriguez[1], John Fourkas[1], Mario Lopez[1], Abhishek Kalpattu[1]; [1]*University of Maryland at College Park, USA.* Abstract not available.

NoTh2C.2 • 11:00 Invited
High Index Nanophotonic Structures and Optoelectronic Devices, Leland Nordin[1,2]; [1]*CREOL, University of Central Florida, USA;* [2]*Materials 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.3 • 11:30 Invited
Transparent Conductive Oxides for Epsilon-Near-Zero and Integrated Photonics, Alan X. Wang[1]; [1]*Baylor 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.

NoTh2C.4 • 12:00 Invited
Withdrawn

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 Mittal[1]; [1]*Northeastern 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 Lucas[2], Lewis J. Hill[1], Gang Xu[3], Gian-Luca Oppo[4], Yiqing Xu[5], Pascal Del'Haye[1], Bertrand Kibler[2], Stuart Murdoch[5], Miro Erkintalo[5], Stephane Coen[5], Julien Fatome[2]; [1]*Max-Planck-Inst Physik des Lichts, Germany;* [2]*Laboratoire ICB, CNRS-Université de*

Bourgogne, France; [3]School of Optical and Electronic Information, Huazhong University of Science and Technology, China; [4]SUPA and Department of Physics, University of Strathclyde, United Kingdom; [5]Physics 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 π in one of the linear polarization components are presented.

NpTh2D.3 • 11:15
Promoting Light Localization of Topological Edge States via Weak Nonlinearity, Xiaoqin Huang[1], Zhaoyuan Wang[1], Yi Hu[1], Jingjun Xu[1]; *[1]Nankai 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. Hill[1], Julius Gohsrich[1,2], Jacob Fauman[1,2], Alekhya Ghosh[1,2], Kyle Kawagoe[3,4], Pascal Del'Haye[1,2], Flore Kunst[1,2]; *[1]Max-Planck-Inst Physik des Lichts, Germany; [2]Department of Physics, Friedrich Alexander University Erlangen-Nuremberg, Germany; [3]Department of Physics, The Ohio State University, USA; [4]Department 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 Blinova[1,2], Evgeny Moiseev[1], Kai Wang[1]; *[1]Physics, McGill, Canada; [2]School 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-Hermiciticy and propose a practical experimental setup.

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 Meneghetti[1,2], Kunyang Sui[1,2], Rune W.Berg[2], Christos Markos[1,3]; *[1]Technical University of Denmark, Denmark; [2]University of Copenhagen, Denmark; [3]NORBLIS 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 Pisanello[1], Marco Bianco[1]; *[1]Istituto Italiano di Tecnologia, Italy.* We propose multimodal cylindrical and tapered optical fibers as a platform to develop minimally-invasive multifunctional neural interfaces for optogenetics, fiber photometry, raman spectroscopy, SERS, electrophysiology and temperature sensing in vivo in the mouse brain.

SoTh2E.3 • 11:30
Thermally Drawn Biodegradable Optical Fiber for Neural Applications, Parinaz Abdollahian[1,2], Kunyang Sui[1,2], Guanghui Li[2], Jiachen Wang[1], Cuiling Zhang[1], Yazhou Wang[1], Rune W.Berg[2], Marcello Meneghetti[1,2], Christos Markos[1]; *[1]Photonics and Electronic Engineering, Technical University of Denmark, Denmark; [2]Neuroscience, 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 Luo[1,2], Jiapeng Huang[1,3], Yu Zheng[4], Ruochen Yin[1,3], Long Zhang[1], Meng Pang[1,2], Xin Jiang[1,3]; *[1]Russell Centre for Advanced Lightwave Science, Hangzhou Institute of Optics and Fine Mechanics and Shanghai Institute of Optics and Fine Mechanics, China; [2]State 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; [3]Innovation and Integration Center of New Laser Technology, Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, China; [4]iFiber 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 persisted high single-mode purity is also investigated.

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 Lee[1], Jaeha Hwang[1], Youngkyu Ko[1], Suyeon Lee[1], Jungi Song[1], Yongwook Seok[1], Hanbyeol Jang[2], Kenji Watanabe[3], Takashi Taniguchi[3]; *[1]Korea Advanced Institute of Science & Technology (KAIST), Korea (the Republic of); [2]Gwangju Institute of Science and Technology (GIST), Korea (the Republic of); [3]National 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 $CsPbBr_3$ in Presence of Layered Material, Naresh C. Maurya[1], K V Adarsh[1]; [1]*IISER Bhopal, India, India.* Our study reveals that the hot carriers' initial temperature of $CsPbBr_3$ 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
Withdrawn

STh2F.4 • 11:30 Invited
Probing Dynamics of Chemical Bonds in Organic Chromophores by X-ray Spectroscopies, Sergei Tretiak[1]; [1]*Los 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 Hahn[1], Carmela Michelle Esteban[1], Sun-Woo Jo[1], Songhyun Kim[1], Kyungmin Kim[1], Seunghyup Yoo[1]; [1]*KAIST, 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.

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 Beppu[1], Daiki Soma[1]; [1]*KDDI 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 Safarnejadian[1], Leslie Rusch[1], Wei Shi[1], Ming Zeng[1]; [1]*ECE 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 Li[1]; [1]*Huawei Technologies, Germany.* Abstract not available.

SpTh2G.4 • 11:45

Anomaly Detection in Optical Fiber: a Change-Point Detection Perspective, Reza Mosayebi[1], Lutz Lampe[1]; [1]*University 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 Mazur[1], Nicolas K. Fontaine[1], Roland Ryf[1], Lauren Dallachiesa[1], Haoshuo Chen[1], David Neilson[1]; [1]*Nokia 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.

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 Theodosiou[1], Jan aubrecht[2], Pavel Peterka[2], Kyriacos Kalli[3], Ori Sapir-Henderson[4]; [1]*Lumoscribe Ltd., Cyprus;* [2]*UFE, Czechia;* [3]*CUT, Cyprus;* [4]*UoA, 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. Schwartz[1], Ria G. Krämer[1], Malte P. Siems[1], Abdolnaser Ghazagh[1], Daniel Richter[1], Stefan Nolte[1,2]; [1]*Institute of applied physics, Friedrich-Schiller-Univ., Germany;* [2]*Fraunhofer 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 Rahnama[1], Cyril Hnatovsky[1], Robert B. Walker[1], Kasthuri De Silva[1], Stephen J. Mihailov[1]; [1]*National 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. Hainsworth[1,2], Adriana Morana[2], Lucien Pouget[1], Marina Arnaud[1], Sylvain Girard[2], Jacques Decroix[1], Emmanuel Marin[2]; [1]*IRT Saint Exupery, France;*

[2]*Laboratory 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 Morasse[1], Alexandre Perron[1], Dominic Faucher[1], Pierre-Michel Belzile[1], Mathieu Vollant Deschênes[1], Frédéric Faucher[1], Guillaume Brochu[1], François Trépanier[1], Michel Bégin[1], Pascal Deladurantaye[1]; [1]*TeraXion 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 Ouellette[1], Hui Wang[2]; [1]*Chengdu University, China;* [2]*Ultron 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 Repentigny[2,1], Lauris Talbot[2], François Trépanier[1], Martin Bernier[2]; [1]*TeraXion Inc., Canada;* [2]*Centre 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: 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-Agaskar[1], Colin Bruzewicz[1], Patrick Callahan[1], Christopher Heidelberger[1], Dave Kharas[1], William Loh[1], Thomas Mahony[1], Ryan Maxson[1], Robert McConnell[1], Alexander Medeiros[1], Rachel Morgan[2], Alkesh Sumant[1], Meghan Schuldt[1], Reuel Swint[1], Kerri Cahoy[2], Jelena Notaros[2], John Chiaverini[1,2], Paul Juodawlkis[1]; [1]*MIT Lincoln Laboratory, USA;* [2]*MIT, 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
Withdrawn

NoTh3B.3 • 15:00 Invited
Harnessing Ultrafast Optical Pulses for 3D Microfabrication by Selective Tweezing and Immobilization of Colloids , Krishangi Krishna[1], Jieliyue Sun[1], Kimani C. Toussaint[1]; *[1]Brown 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 Contributed
Withdrawn

NoTh3B.5 • 15:45
Withdrawn

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 Vaddi[1], Theng-Loo Lim[1], M. Zahirul Alam[1], Shivashankar R. Vangala[2], Jeremy Upham[1], Joshua Hendrickson[2], Robert W. Boyd[1,3]; *[1]Department of Physics, University of Ottawa, Canada; [2]Sensors Directorate, Air Force Research Laboratory, USA; [3]Institute of Optics, University of Rochester, USA.* We experimentally demonstrate an ultrafast all-optical switch using a 1D, non-linear 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. Suresh[1], M. Zahirul Alam[1], Jeremy Upham[1], R. Margoth Cordova Castro[1], Maryam Abbasi[1], Robert W. Boyd[1]; *[1]University 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 Maleki[1], Moritz B. Heindl[2], Yongbao Xin[3], Robert W. Boyd[1,4], Georg Herink[2], Jean-Michel Ménard[1]; *[1]University of Ottawa, Canada; [2]University of Bayreuth, Germany; [3]Iridian Spectral Technologies Ltd, Canada; [4]University 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 Flizikowski[1], Ozan W. Oner[2], Lais F. dos Santos[1], M. Saad Bin-Alam[3], Thomas Pertsch[4], Isabelle Staude[4], Jens H. Schmid[3], Pavel Cheben[3], Ksenia Dolgaleva[1,2]; *[1]School of Electrical Engineering and Computer Science, University of Ottawa, Canada; [2]Department of Physics, University of Ottawa, Canada; [3]National Research Council of Canada, Canada; [4]Friedrich-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 Lim[1], Yaswant V. Vaddi[1], M. Zahirul Alam[1], Shivashankar R. Vangala[3], Jeremy Upham[1], Joshua Hendrickson[3], Robert W. Boyd[1,2]; *[1]University of Ottawa, Canada; [2]University of Rochester, USA; [3]Air 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 Aghili[1], Ksenia Dolgaleva[1]; *[1]University 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
Withdrawn

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 Ferraro[1,3], Maria Caterina Crocco[1,3], Raffaele Filosa[1,3], Kevin Kiedrowski[2], Marco Jupé[2], Marco Leonetti[4], Giancarlo Ruocco[4], Stefan Wabnitz[5], Riccardo C. Barberi[1,3], Vincenzo Formoso[1,3], Raffaele G. Agostino[1,3]; *[1]STAR Research Infrastructure, University of Calabria, Italy; [2]Laser Zentrum Hannover e.V., Germany; [3]Physics Department, University of Calabria, Italy; [4]Center for Life Nano Science@Sapienza, Italian Institute of Technology, Italy; [5]DIET, 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 Maniewski[1,2], Valdas Pasiskevicius[1], Christopher Holmes[2]; *[1]KTH Royal Institute of Technology, Sweden; [2]Optoelectronic 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 Hannah[1], Emily Eadie[1], Samar Deep[1], Pablo Bianucci[1]; *[1]Concordia 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 Chang[1], Jun-Cheng Hsu[1], Jia-Ming Liu[1,2]; *[1]National Yang Ming Chiao Tung University, Taiwan; [2]Electrical 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 Toropov[1], Christophe A. Codemard[2], Neil P. Sessions[1], Michalis N. Zervas[1]; *[1]University of Southampton, United Kingdom; [2]TRUMPF 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
High Fiber-to-Fiber Gain low Noise Figure Erbium Doped Waveguide Amplifiers in the Manufacturable Al_2O_3 Platform, Carlos E. Osornio-Martinez[1], Dawson B. Bonneville[1], Meindert Dijkstra[1], Sonia Garcia-Blanco[1]; *[1]Universiteit 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 Al_2O_3 integrated photonics platform are reported.

JTh4A.2 • 16:45 Postdeadline
Microstructured Optical Fibers Made by Additive Manufacturing of Chalcogenide Glasses, Johann Troles[1], Leo Szymczyk[1,2], Francois Chevire[1], Catherine Boussard[1], Antoine Gautier[1], Frederic Charpentier[2], Yann Guimond[2], Mathieu Roze[2], Gilles Renversez[3]; *[1]University of Rennes, France; [2]UMICORE IR Glass, France; [3]Centrale 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
Four-Fold Truncated Double-Nested Anti-Resonant Hollow-Core Fiber for Ultralow Loss and Robust Single Mode Operation, Shoufei Gao[2,1], Yizhi Sun[1,2], Hao Chen[1], Dawei Ge[3], Dong Wang[3], Dechao Zhang[3], Han Li[3], Wei Ding[1,2], Yingying Wang[2,1]; *[1]Jinan University, China; [2]Linfiber Technology (Nantong) Co., Ltd., China; [3]China 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
Degenerate Optical Parametric Oscillation in Coupled Cavities, Laís Fujii dos Santos[1], Felipe G. Santos[2], Ksenia Dolgaleva[1]; *[1]University of Ottawa, Canada; [2]Quantum 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
Machine Learning-Assisted Extreme Events Forecasting, Saliya Coulibaly[1]; *[1]Universite 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
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 Luo[1], Jun-Hua Huang[1], Jian-Kun Wang[1], Geng-Liang Chen[1], Guo-Liang Zheng[1], Xuhui Zhang[1]; *[1]Shenzhen 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 Wang[1], Dangyuan Lei[2], Jianguo Dai[2]; *[1]The Hong Kong Polytechnic University, Hong Kong; [2]City 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 VSe_2-SWCNT Nanohybrid, Vinod Kumar[1], Chandra S. Rout[2], K. V. Adarsh[1]; *[1]IISER Bhopal, India; [2]Jain university, India.* We demonstrate enhanced third-order nonlinear optical response in the charged-coupled VSe_2-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/cm^2.