# Optica Advanced Photonics Congress and Exhibit Session Guide

**Disclaimer**: this guide is limited to technical program with abstracts and author blocks as of 22 July. For updated and complete information with special events, reference the online schedule or mobile app.

## Monday, 27 July

### 09:00 -- 10:00
### Room: International I
### BM1A • Fundamentals of Photosensitivity
*Presider: Salvador Sales; Universitat Politècnica de València, Spain and Salvador Sales; Universitat Politècnica de València, Spain*

**BM1A.1 • 09:00 (Invited)**
**How Far Can Glass Go? Limits of Laser-Written Photonics at High Temperature,** Matthieu Lancry[1]; [1]*Universite Paris-Saclay, France.* We review femtosecond-laser-induced nanogratings in over twenty oxide glasses, linking thermal stability to viscosity, morphology, and composition, while highlighting alumina-rich outliers that retain refractive-index modifications above 1400°C for extreme-environment photonic sensing applications and optical devices.

**BM1A.2 • 09:30**
**Accuracy and Stability of Type-III Fiber Bragg Gratings for Long-Term Temperature Monitoring at 700°C,** Yann Anquetin[1], Thomas Blanchet[1], Sylvain Magne[1], Léo Colliard[1], Benjamin Sapaly[1], Frédéric Bourson[2], Mohamed Sadli[2], Guillaume Laffont[1]; [1]*Université Paris-Saclay, CEA, List, France;* [2]*LCM LNE-Cnam, France.* Temperature measurement stability and accuracy around 700°C with fiber Bragg gratings inscribed in F-doped or telecom-grade SMF-28e are presented after high-temperature annealing for improving the sensing performances.

**BM1A.3 • 09:45**
**Type-II Fiber Bragg Gratings Resilience Under 900 °C,** Indu F Saxena[1], Rahul Pashpuleti[1]; [1]*Innoveyda LLC, USA.* Regenerated Type-I FBGs are sought for ultra-high temperature sensing up to 1295°C. On annealing a Type-II FBG in SMF28 fiber at 900°C, we observe the highest regeneration efficiency of 114% reported to date.

### 08:30 -- 09:30
### Room: International III
### IM1B • Integrated Receivers
*Presider: Shinji Matsuo; NTT Device Technology Labs, Japan*

**IM1B.1 • 08:30**
**A Quasi-One-Dimensional Electro-Opto-Thermal Drift-Diffusion Model: Quantum Efficiency in MUTC Photodetectors,** Ishraq Md Anjum[1], Ergun Simsek[1], Seyed Ehsan Jamali Mahabadi[1], Thomas F. Carruthers[1], Curtis R. Menyuk[1]; [1]*Univ. of Maryland Baltimore County, USA.* We present a highly efficient quasi-one-dimensional electro-opto-thermal drift-diffusion model. Exploiting the radial Gaussian distribution of the optical beam to simplify thermal diffusion computation, we simulate self-heating dynamics and enhanced quantum efficiency in high-speed MUTC photodetectors.

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**IM1B.2 • 08:45**
**A Low-Power Monolithic Transimpedance Amplifier for 112 Gbps Optical Receivers,** Robert P. Pesch[1], Arjun Khurana[1], Joshua J. Wong[1], Stephen Ralph[1]; [1]*Georgia Inst. of Technology, USA.* We demonstrate an inductorless transimpedance amplifier implemented in a monolithic silicon photonics process enabling 112 Gbps communications at 0.08 pJ/bit via 56 GBaud PAM-4 signaling consuming 9.22 mW from a 1.2 V supply.

**IM1B.3 • 09:00 (Invited)**
**High-Speed InGaAs/InP Photodiodes for Applications Beyond 200 Gbaud,** Yuki Yamada[1], Yusuke Araki[1], Takuya Hoshi[1], Yoshiho Maeda[1], Shohei Kosuga[1], Takahiro Nakamura[1], Shoko Tatsumi[1], Fumito Nakajima[1]; [1]*NTT Corporation, Japan.* We present our recent work on high-speed vertical-illumination InP/InGaAs photodiodes (PDs) with over 200-GHz bandwidth. Interference-based absorption enhancement yields high responsivity. The inverted p-down structure ensures excellent reliability.

## 08:30 -- 10:00
## Room: Atlantic I
## NeM1C • Datacenters
*Presider: Christine Tremblay; École de technologie supérieure, Canada*

**NeM1C.1 • 08:30 (Tutorial)**
**Photonic Integration for Data Centers Systems and Networks,** Clint Schow[1]; [1]*Univ. of California Santa Barbara, USA.* Abstract not available.

**NeM1C.2 • 09:30 (Invited)**
**Silicon Photonics Switches and Filters for Fast Optically Switched AI Datacenter Networks and Interconnects,** Kazuhiro Ikeda[1], Ryotaro Konoike[1], Ryosuke Matsumoto[1], Takashi Inoue[1], Keijiro Suzuki[1], Ken-ichi Sato[1]; [1]*National Inst. of Advanced Industrial Science and Technology, Japan.* We discuss silicon photonics switches and filters for a space- and wavelength-switched optical network scalable up to 7,424 ports or larger with a switching time of one microsecond, as well as a multiband wavelength cross-connect switch with waveguide Bragg gratings that have practically unlimited FSR.

## 08:30 -- 10:00
## Room: International IV
## NoM1D • Nanophotonics and Nanomaterials
*Presider: Jonathan Hu; Baylor Univ., USA*

**NoM1D.1 • 08:30 (Invited)**
**High-Temperature Superconducting Nanowire Single-Photon Detectors,** Pankaj Jha[1]; [1]*Syracuse Univ., USA.* Detecting a single quantum of light, i.e., a photon, is a key enabling technology for applications in quantum optics and photonics. In this talk, we will present our recent work on using high-transition-temperature iron-based van der Waals superconductors as single-photon detectors that operate above liquid helium temperatures.

**NoM1D.2 • 09:00 (Invited)**
**Engineering Nanomaterials by Light: Scalable Ligand-Free Laser Synthesis in Liquids for Advanced Materials Processing,** Anna R. Ziefuss[1]; [1]*Univ. of Duisburg-Essen, Germany.* Laser synthesis in liquids enables scalable, ligand-free nanoparticle production under nonequilibrium conditions. We demonstrate how photothermal and photomechanical processes control particle properties and enable nano-functionalized feedstocks for advanced materials processing and additive manufacturing.

**NoM1D.3 • 09:30 (Invited)**
**Electrical Control of Light–Matter Interactions and Nonlinear Optics in Plasmonic Tunnel Junctions,** Hayk Harutyunyan[1]; [1]*Emory Univ., USA.* Electrical control of light–matter interactions in nanoscale junctions enables new functionality for photonics. Ultrastable epitaxial plasmonic tunnel junctions provide a platform to study photon-assisted transport and nonlinear optical processes. Optical rectification governs laser-induced currents, while electrical bias enables tunable second-harmonic generation through EFISH and ion migration, establishing programmable platforms for nonlinear nanophotonics and optoelectronic devices.

## 08:30 -- 10:00
## Room: Catalina
## NpM1E • Nonlinear Optical Effects in Fiber Systems
*Presider: Sile Nic Chormaic; Okinawa Inst of Science & Technology, Japan*

**NpM1E.1 • 08:30 (Invited)**
**Nonlinear Optical Shaping Meets Machine Learning,** Sergio Carbajo[1,2], Abhimanyu Borthakur[1], Jack Hirschman[2], Randy Lemons[2], Linshan Sun[1], Hao Zhang[1,2]; [1]*Univ. of California Los Angeles, USA;* [2]*SLAC National Accelerator Laboratory, USA.* Nonlinear optical processes enable programmable shaping of ultrafast light beyond conventional limits. We review gas-based and parametric platforms and show how machine learning enables real-time modeling, inverse design, and application-driven optimization of complex spatiotemporal waveforms.

**NpM1E.2 • 09:00**
**Broadband Spectral Phase Mapping via Frequency Mixing in Hollow Capillary Fiber,** Linshan Sun[1], Hao Zhang[1,2], Cameron Leary[1], Alex Amador[1], Sergio Carbajo[1,2]; [1]*Univ. of California Los Angeles, USA;* [2]*SLAC National Accelerator Laboratory, USA.* We introduce a phase-mapping platform that can convert near-infrared (NIR) femtosecond laser pulses to ultraviolet (UV) pulses via frequency conversion in argon gas. This technique broadens the foundation for indirect ultrafast pulse shaping.

**NpM1E.3 • 09:15**
**Polarization Control of Stimulated Raman Scattering in Highly-Birefringent Hollow-Core Fibers,** Pau Arcos[1], Xianhao Qi[2,3], Yizhi Sun[2,3], Shoufei Gao[2,4], Wei Ding[2,3], David Novoa[1,5], Yingying Wang[2,3]; [1]*Communications Engineering, Univ. of the Basque Country (UPV/EHU), Spain;* [2]*Guangdong Provincial Key Laboratory of Optical Fibre Sensing and Communication,*

*Inst. of Photonics Technology, Jinan Univ., China; [3]College of Physics Optoelectronic Engineering, Jinan Univ., China; [4]Linfiber Technology, China; [5]IKERBASQUE Basque foundation for Science, Spain.* We report the generation of highly-polarized Stokes light in nitrogen-filled polarization-maintaining hollow-core fibers. The birefringence of the structure decouples orthogonal polarization components leading to the purification of the Raman-induced emission.

**NpM1E.4 • 09:30 (Invited)**
Withdrawn

## 08:30 -- 10:00
## Room: International V
## SpM1F • Next Generation PON
*Presider: Paola Parolari; Politecnico di Milano, Italy and Paola Parolari; Politecnico di Milano, Italy*

**SpM1F.1 • 08:30 (Tutorial)**
**Recent Progress in Optical Access Networks and Their Signal Processing Needs,** Frank Effenberger[1]; *[1]Futurewei Technologies Inc, USA.* This paper reviews the progression of standardized PON systems, from early systems to the ones currently under development. It focuses on the unique signal processing tasks that they require, and the trend towards more digital signal processing.

**SpM1F.2 • 09:30 (Invited)**
**On the Trade-Offs of DSP Design for Very High-Speed Bandwidth-Limited Flexible PON,** Yanni Ou[1]; *[1]Beijing Univ. of Posts & Telecom, China.* This work explores DSP design trade-offs for 100–200 Gbps TDM-based IM/DD flexible bandwidth-limited PONs. Proposed methods address signal impairments via adaptive equalization and clock recovery, evaluating system complexity, receiver sensitivity, power budget, and transmission performance.

## 10:30 -- 12:30
## Room: International III
## JM2A • Introductory Remarks and Joint Plenary Session I
*Presider: To Be Announced*

**JM2A.1 • 10:30 (Plenary)**
**Ultrabright Tabletop UV Sources for Nuclear-Referenced Optical Clocks and Materials Metrologies,** Margaret M. Murnane[1]; *[1]Univ. of Colorado Boulder, USA.* We demonstrate ~100mW of VUV light at 8.4eV at a MHz repetition rate using four-wave mixing in structured hollow fibers. The novel source has applications in photoionization and photoelectron spectroscopies, and in nuclear-referenced optical clocks.

**JM2A.2 • 11:30 (Plenary)**
**Recent Advances and Future Outlooks for Optical and Photonic Materials to Address Space and Defense Applications,** Rohith Chandrasekar[1]; *[1]Leidos, USA.* Recent DARPA programs have advanced optical materials and photonics, establishing new modalities for sensing and computation for Defense and space systems. This talk will provide a quick snapshot of these programs and identify areas for further investigations to support future Defense applications.

## 14:00 -- 16:00
## Room: International I
## BM3A • Sensing Properties of Grating Structures
*Presider: Sébastien Loranger; Polytechnique Montréal, Canada*

**BM3A.1 • 14:00 (Invited)**
**Long-Term Thermal Stability of Fiber Grating Sensors for Industry Application,** Yunqi Liu[1]; *[1]Shanghai Univ., China.* The thermal stability of fiber Bragg gratings (FBGs) inscribed by 193 nm excimer laser was investigated experimentally. After 2000 hours annealing, the FBGs have excellent sensing performance for long-term measurements at the temperature up to 400°C.

**BM3A.2 • 14:30**
**Comparative Analysis of the Refractometric Sensitivity of 5° TFBGs in the Visible and Near-Infrared Regions,** Jieqing Zheng[1], Xuehao HU[1], Karima Chah[1,2], Christophe Caucheteur[1,2]; *[1]UMONS, Belgium; [2]WEL Research Inst., Belgium.* Tilted fiber Bragg gratings (TFBGs) are widely used for refractive index (RI) sensing due to their cladding-mode cut-off features. This work studies 5° TFBGs for RI sensing, showing that operation in the visible region increases modal density and enhances interaction with the surrounding medium, offering guidance for optimizing sensor performance.

**BM3A.3 • 14:45**
**Thermal Stability and Spectral Smoothing of Sapphire Fiber Bragg Gratings,** Antoine Bourel[2,1], Léo Colliard[2,1], Thomas Blanchet[2,1], Guillaume Laffont[2,1], Geraud Bouwmans[3], Sylvain Magne[2,1]; *[1]Commissariat a l'Energie Atomique, France; [2]Université Paris-Saclay, France; [3]Université de Lille, France.* Fiber Bragg gratings inscribed in sapphire fiber were thermally cycled up to 1500°C. Modal interferences from the multimode sapphire fiber were mitigated using a 70 m-long multimode fiber injection, enabling stable operation. At 1500°C, the uncertainty is 1.9°C (1σ) and the temperature difference with the thermocouple remains below 7°C.

**BM3A.4 • 15:00**
**Preliminary Investigation into the Radiation Sensitivity of Tilted Fiber Bragg Gratings,** Luigi D'Andrea[1], Vincenzo Romano Marrazzo[1], James Thomas Hainsworth[2], Giovanni Breglio[1], Sylvain Girard[2], Emmanuel Marin[2], Adriana Morana[2], Francesco Fienga[1]; *[1]DIETI, Università degli Studi di Napoli Federico II, Italy; [2]Université Jean Monnet, Laboratoire Hubert Curien, France.* This study experimentally investigates Tilted Fiber Bragg Gratings (TFBGs) response to ionizing radiation. By evaluating spectral stability and cladding-

mode behavior, it demonstrates TFBG potential for multi-parameter sensing in nuclear, aerospace, and medical environments.

**BM3A.5 • 15:15**
**Influence of High Temperature Boron Nitride Based Coating on the Radiation Response of Type-III Fiber Bragg Gratings,** Thomas Blanchet[1], Benjamin Sapaly[1], Laure Lago-Rached[1], Remy Bernard[3], adriana Morana[2], Sylvain Magne[1], Geraud Bouwmans[3], Guillaume Laffont[1]; *[1]CEA Paris Saclay, France; [2]Univ. St Etienne, France; [3]PhLAM - Univ. Lille, France.* Boron-Nitride coating are used to protect the fiber up to 800°C. For the first time we checked the radiation-sensitivity of this coating deposed on type III fs-Fiber Bragg Grating.

**BM3A.6 • 15:30**
**In Situ Microfluidic Synthesis of High-Density Gold Nanostars on TFBGs for Serum Anti-GBM Sensing,** Sharon Russo[1], Karima Chah[2], Nadia G. Boetti[4], Christophe Caucheteur[2,3], Davide Janner[1]; *[1]Dipartimento di Scienza Applicata e Tecnologia (DISAT), Politecnico di Torino, Italy; [2]Advanced Photonic Sensors Unit, Univ. of Mons, Belgium; [3]WEL Research Inst., Belgium; [4]Fondazione Links, Italy.* We report a label-free biosensor using gold nanostars-coated tilted fiber Bragg gratings for ultrasensitive, selective detection of anti-GBM autoantibodies in patient's serum. This approach enables real-time monitoring with high reproducibility and potential for scalable diagnostics.

## 14:00 -- 16:00
## Room: International III
## JM3B • Joint Session (IPR/NOMA): Novel Material Platforms for Integrated Photonics

*Presider: Lynda Busse; US Naval Research Laboratory, USA and Daniele Melati; C2N-CNRS, France*

**JM3B.1 • 14:00 (Invited)**
**Overcoming Limitations of Conventional and New Materials by Heterogeneous Integration: Challenges and Opportunities,** S. J. Ben Yoo[1]; *[1]Univ. of California Davis, USA.* Heterogeneous and hybrid integration techniques overcome intrinsic material limits by unifying diverse material platforms. Synthetic photonic and electronic circuits enable exceptionally efficient, high-speed neuromorphic computing and scalable data system architectures for artificial intelligence hardware.

**JM3B.2 • 14:30 (Invited)**
**Towards Fibre-Like Loss for Photonic Integration From Violet to Near-Infrared,** Hao-Jing Chen[1]; *[1]California Inst. of Technology, USA.* We report a CMOS-compatible germano-silicate PIC platform achieving ultralow loss and Q >180 million from violet to telecom wavelengths, soliton microcomb, stimulated Brillouin lasing, narrow linewidth lasers are demonstrated.

**JM3B.3 • 15:00**
**Wafer-Scale Monolithic Integration of ScAlN Modulators on Silicon-on-Insulator Platform,** Sihao Wang[1], Bo Li[2], Lin Zhou[3], Victor Leong[4], Nanxi Li[2], Xianshu Luo[2], Di Zhu[1,5]; *[1]Quantum Innovation Centre, Agency for Science, Technology and Research (A*STAR),*

*Singapore; [2]Inst. of Microelectronics, Agency for Science, Technology and Research (A*STAR), Singapore; [3]Department of Materials Science and Engineering, National Univ. of Singapore, Singapore; [4]Inst. of Materials Research and Engineering, Agency for Science, Technology and Research (ASTAR), Singapore; [5]Centre for Quantum Technologies, National Univ. of Singapore, Singapore.* We demonstrate wafer-scale (200 mm) monolithic integration of $Sc_{0.1}Al_{0.9}N$ electro-optic modulators on SOI platform, using a top-down electrode design to enhance electric fields and directly access the $r_{33}$ coefficient.

**JM3B.4 • 15:15**
**New Photonic Platform Silicon Germanium on Silicon-Nitride for Nonlinear mid-Infrared Optics,** Lamine Ferhat[1], Rémi Armand[2], Alberto Della Torre[1], Marko Perestjuk[1,3], Adam Bieganski[1,3], Thomas Valentin[1], Vincent Reboud[2], Nicolas Bresson[2], Jean-Michel Hartmann[2], Guanghui Ren[3], Arnan Mitchell[3], Christelle Monat[1], Christian Grillet[1]; *[1]Inst des Nanotechnologies de Lyon CNRS, France; [2]Univ. Grenoble Alpes, CEA, LETI, 38054 Grenoble, France; [3]School of Engineering, RMIT Univ., Melbourne, VIC 3001, Australia, Australia.* Silicon germanium on silicon nitride is a new photonic platform that overcome SOI absorption limits in the mid-infrared, offering low loss, high index contrast, CMOS compatibility, and efficient nonlinearity for supercontinuum generation in the mid infrared.

**JM3B.5 • 15:30**
**Three Dimensional Nanophotonic Materials and Devices Designed and Assembled Using Discrete Building Blocks,** Euan McLeod[1], Natalie Shultz[1], Kenneth Lang[1]; *[1]Univ. of Arizona, USA.* Thousands of nanoparticles are precisely positioned in three dimensions using optical tweezers. Nanophotonic metamaterials and devices are designed using a centroid-oriented lattice dipole sampling scheme for the discrete dipole approximation.

## 14:00 -- 16:00
## Room: Atlantic I
## NeM3C • Performance
*Presider: Yi Cai; Soochow Univ., China*

**NeM3C.1 • 14:00 (Invited)**
**Towards Automated and Interpretable ML for Quality of Transmission Estimation in Optical Networks,** Christine Tremblay[1], Sandra Aladin[1], Lena Wosinska[2]; *[1]École de technologie supérieure, Canada; [2]Chalmers Univ. of Technology, Sweden.* Machine learning enables efficient Quality of Transmission (QoT) estimation in optical networks, providing a data-driven alternative to conventional analytical modeling approaches. This presentation describes how a lightweight, automated and interpretable framework combining Boruta-SHAP feature selection, random forests, and domain adaptation achieves accurate, computationally efficient QoT estimation across heterogeneous real-world networks.

**NeM3C.2 • 14:30**

**Alleviation of Four-Wave Mixing Effect on O-Band WDM Optical Links via Polarization Interleaving,** Gyeong Cheol Park[1], Miran Park[1], Geonwon Lee[2], Namje Kim[1], Seungchul Lee[1], Jun-Hwan Shin[1], Suho Park[1], Mihee Hwang[2], Soonwon Hong[2], Jongmin Lee[3], O-Kyun Kwon[1]; *[1]Electronics and Telecom Research Inst, Korea (the Republic of); [2]OS Solutions, Korea (the Republic of); [3]HFR, Korea (the Republic of).* Four-wave mixing (FWM) severely constrains O-band WDM optical links by limiting power and channel density. We experimentally demonstrate substantial FWM mitigation in a six-channel optical link via optimized polarization tailoring, enhancing nonlinear
tolerance.

**NeM3C.3 • 14:45 (Invited)**
**Time Deterministic Passive Optical Networks: Challenges and Solutions,** Jiawei Zhang[1]; *[1]Beijing Univ. of Posts & Telecom, China.* Abstract not available.

**NeM3C.4 • 15:15**
**Detection of Beamsplitter Attacks in BB84 QKD Using Channel Transmittance and Photon Statistics Based Framework,** Shashwat Saxena[1], Anand Srivastava[1], Vimal Bhatia[2], Pravindra Kumar[3], Ritu Raj Singh[1]; *[1]Department of Electronics and Communication Engineering, Netaji Subhas Univ. of Technology, India; [2]Department of Electrical Engineering, Indian Inst. of Technology Indore, India; [3]Department of Electronics and Communication Engineering, Thapar Inst. of Engineering and Technology, Patiala, India.* The beamsplitter attack was simulated on a BB84 QKD protocol setup and a parameter was discussed that aids the legitimate users to identify presence of eavesdropper. The results show how higher number of photons per qubit pulse can easily detect the effect of beamsplitter attack.

**NeM3C.5 • 15:30**
**High-Performance Datacom Quantum Dot Lasers by Production-Ready 300mm MOCVD,** Phillip J. Skahan[1], Hongwei Zhao[1], Sabrina Wagner[1], Bei Shi[1], Jacob Ewing[1], Matt Dummer[1], Simone Suran Brunelli[1], Jonathan Klamkin[1]; *[1]Aeluma Inc., USA.* High-performance quantum dot lasers were realized with a production-ready 300mm metalorganic chemical vapor deposition capability demonstrating low threshold, high output power, and high temperature operation.

**NeM3C.6 • 15:45**
**Machine-Learning-Based Missing Data Handling for QoT Estimation,** Amir Omidi[1], Christine Tremblay[1]; *[1]ÉTS Montréal, Canada.* This paper proposes a masked autoencoder–based imputation framework for quality of transmission (QoT) estimation under missing performance monitoring data. Experiments on largescale optical network datasets demonstrate consistent performance gains over statistical imputation as missing data rates increase.

## 14:00 -- 15:30
## Room: Catalina
## NpM3E • Quantum Nonlinear Photonics: Sources, Entanglement, and Integration
*Presider: To Be Announced*

**NpM3E.1 • 14:00 (Invited)**
**Integrated Nonlinear and Quantum Photonics With Heterogeneous III-v-on-Silicon Nitride,** Galan Moody[1]; [1]*Univ. of California Santa Barbara, USA.* Integrated photonics is revolutionizing how we generate, manipulate, and transmit quantum information. In this presentation, I'll highlight recent results on heterogeneous integration of III-V nonlinear and quantum photonic components with ultra-low-loss silicon nitride circuits, including multiplexing arrays of ultrabright quantum sources, chip-scale squeezed microcombs for quantum-enhanced detectors, and optical parametric amplifiers with a low-noise figure of merit.

**NpM3E.2 • 14:30 (Invited)**
Withdrawn

**NpM3E.3 • 14:45**
**Generation of UV-Vis Correlated Photon Pairs Using PP-$LaBGeO_5$,** Ricardo P. Tolentino[1], Nathan Harper[1], Ayantika Sengupta[1], Scott K. Cushing[1]; [1]*California Inst. of Technology, USA.* Spontaneous parametric down-conversion (SPDC) from periodically poled $LaBGeO_5$ (PP-LBGO) was characterized. A coincidence-to-accidental ratio (CAR) of 244 and pair generation rate of $1.45\times10^6$ pairs $s^{-1}$ $mW^{-1}$ were measured, with output tunable from 507– 556 nm.

**NpM3E.4 • 15:00**
Withdrawn

**NpM3E.5 • 15:15**
**Inverse-Design-Based Experimental Generation of High Dimensional Spatially Entangled Light,** Joshua Foley Comer[1], Ofir Yesharim[1], Sarika Mishra[2], Shashi Prabhakar[2], Eyal Rozenberg[3], Aviv Karnieli[1], Ravindra P Singh[2], Ady Arie[1]; [1]*Tel Aviv Univ., Israel;* [2]*Physical Research Laboratory, India;* [3]*Technion, Israel.* Inverse-design of the nonlinear coupling via pump shaping enables non-trivial generation of high-dimensional spatially entangled photon states through parametric down conversion, achieving high-fidelity states and Bell inequality violations, with minimal post-selection.

## 14:00 -- 16:00
## Room: Pacific II
## SoM2F • Nonlinear Optics and Quantum Applications of SOF
*Presider: Mariusz Klimczak; Uniwersytet Warszawski, Poland*

**SoM2F.1 • 14:00 (Invited)**
**Nonlinearity Management in Optical Fibers for Ultrashort Laser Pulse Generation Supported With Machine Learning,** Grzegorz Sobon[1]; [1]*Politechnika Wroclawska, Poland.* We present recent results on AI/ML-driven optimization of ultrashort pulses in fiber lasers, showing that metaheuristic algorithms can

efficiently shorten pulse duration and broaden the output spectrum in ultrafast fiber laser systems under diverse conditions

**SoM2F.2 • 14:30 (Invited)**
**Generation and Characterisation of TW-Scale Optical Attosecond Pulses and Tunable GW-Level Far-Ultraviolet Radiation via Extreme Soliton Dynamics,** Nikoleta Kotsina[1], Michael Heynck[1], Joleik Nordmann[1], Martin Gebhardt[1], Teodora Grigorova[1], Christian Brahms[1], John C. Travers[1]; [1]*Heriot-Watt Univ., UK.* We introduce a new beamline for extreme soliton dynamics (XSOL) that can produce terawatt scale, self compressed optical attosecond pulses, as well as gigawatt level, tunable vacuum to deep ultraviolet pulses via resonant dispersive wave emission.

**SoM2F.3 • 15:00 (Invited)**
**Mid-IR Milijoule Energy Amplification in Er: ZBLAN Fibers,** Yu Bai[1], Bohan Zhou[1], Weizhi Du[1], Yifan Cui[1], Almantas Galvanauskas[1]; [1]*Univ. of Michigan, USA.* We demonstrate coiled large-core and low-NA (46 µm, NA ~0.064) Er: ZBLAN fiber amplifiers robustly producing single-transverse-mode beams of ~mJ energy pulses at ~2.78 µm, thus enabling practical and robust high energy mid-IR fiber technology.

**SoM2F.4 • 15:30**
**Compact Lens-Free Excitation of $Ta_2O_5$ Waveguides for Broadband Supercontinuum Generation,** Szymon Matczak[1], Dorota Stachowiak[1], Grzegorz Sobon[1]; [1]*Wroclaw Univ. of Science and Technology, Poland.* We demonstrated supercontinuum generation in $Ta_2O_5$ waveguides using fabricated microlens fiber tips, enabling stable emission from near-IR to mid-IR regions while significantly reducing the system footprint and simplifying the experimental setup.

**SoM2F.5 • 15:45**
**Polarization Extinction Ratio Dynamics in Yb-Doped Large-Mode-Area Fibers During High-Energy Pulse Amplification,** Marek Dachniewicz[1], Urszula Zdulska[1], Jan Szczepanek[1], Tomasz M. Kardas[1], Yuriy Stepanenko[1]; [1]*Fluence Technology sp. z o.o., Poland.* We investigate polarization extinction ratio dynamics in Yb-doped large-mode-area fibers amplifying chirped femtosecond pulses. Combining experiments and comprehensive UPPE simulations, we reveal how nonlinear effects and polarization instability drive complex PER fluctuations during high-power amplification.

## 14:00 -- 16:00
## Room: International V
## SpM3G • Performance Monitoring and Sensing
*Presider: Jun-ichi Kani; NTT Access Service Systems Laboratories, Japan and Jun-ichi Kani; NTT Access Service Systems Laboratories, Japan*

**SpM3G.1 • 14:00 (Invited)**
**DSP and APD-Enabled Feedforward Monitoring for Optical Distribution Network in High-Speed PONs,** Han Hyub Lee[1], KwangOk Kim[1], Kyeong-Hwan Doo[1], Kyungmin Woo[1], Hwan Seok Chung[1]; [1]*Electronics and Telecom Research Inst, Korea (the Republic of).* We present a DSP- and APD-based feedforward monitoring method for high-speed PONs, enabling real-time ODN monitoring, loss/reflection discrimination, segment-level fault localization, and efficient

fiber management via simplified drop fiber identification.

**SpM3G.2 • 14:30 (Invited)**
**Optical DAC and Faster-Than-Nyquist Transmission for the Next Generation of Power Efficient 400G DCI,** Charles St-Arnault[1], Derek Kita[2], Ross Dickson[3], Bruce Beggs[3], Naim Ben-Hamida[3], Christian Reimer[2], David V. Plant[1]; *[1]McGill Univ., Canada; [2]HyperLight Corporation, USA; [3]Ciena Corporation, Canada.* We explore two approaches to increase data rate for next-generation DCI transceivers: driver-less TFLN optical DACs and faster-than-Nyquist signaling.

**SpM3G.3 • 15:00**
**Event Signatures for Polarization Sensing in Commercial Coherent Transceivers,** Meredith Caveney[1], David V. Anderson[1], Stephen Ralph[1]; *[1]Georgia Inst. of Technology, USA.* We introduce a novel method to characterize fiber perturbations for polarization sensing using commercial transceivers. We experimentally validate our method over deployed fiber to demonstrate joint transmission with distinct signature generation.

**SpM3G.4 • 15:15**
**Extended Spectral Subtraction for Broadband Fiber Phase Sensing,** Meredith Caveney[1], Alex Kaylor[2], David V. Anderson[1], Stephen Ralph[1]; *[1]Georgia Inst. of Technology, USA; [2]Ciena Corporation, USA.* We demonstrate the performance of extended spectral subtraction for broadband phase sensing in an experimental noisy fiber link, achieving up to 5dB of noise reduction across three types of perturbations consistent with urban acoustic disturbances.

## 16:30 -- 18:30
## Room: International I
## BM4A • Femtosecond Inscription of Photonic Structures
*Presider: Rebeca Martinez Vazquez; Istituto di Fotonica Nanotecnologie CNR, Italy and Rebeca Martinez Vazquez; Istituto di Fotonica Nanotecnologie CNR, Italy*

**BM4A.1 • 16:30 (Invited)**
**In-Fiber Microstructures Fabricated by Femtosecond Laser for Sensing and Laser Applications,** Xuewen Shu[1]; *[1]Huazhong Univ of Science and Technology, China.* We report our recent research progress on in-fiber microstructures fabricated by femtosecond laser and discuss their broad applications in sensing and laser systems.

**BM4A.2 • 17:00**
**Towards a Fabrication Process for Direct Femtosecond Laser Writing of Phase Masks in Polydimethylsiloxane,** Thomas Sicotte[1], Lucien E. Weiss[1,2], Sébastien Loranger[3]; *[1]Engineering Physics, Polytechnique Montréal, Canada; [2]Lassonde Deeptech Inst., Polytechnique Montréal, Canada; [3]Electrical Engineering, Polytechnique Montréal, Canada.* Femtosecond direct laser writing of phase masks offers a rapid prototyping alternative to complex lithography. We introduce a process to inscribe phase shifts up to 2π on a 5 × 5 μm pixel in polydimethylsiloxane.

**BM4A.3 • 17:15**

**Mid-Infrared Waveguide Fabrication in Heavy Oxide Germanate Glass via Femtosecond Laser Direct Writing,** Alexis Tryoen[1,2], Hussain Wajahat[3], Julien Ari[2], Olivier Gazzano[1], Guillaume Druart[1], Alex Fuerbach[3], Matthieu Lancry[2]; *[1]DOTA, ONERA, Université Paris-Saclay, France; [2]Institut de Chimie Moléculaire et des Matériaux d'Orsay, Université Paris-Saclay, CNRS, France; [3]School of Mathematical and Physical Sciences, Macquarie Univ., Australia.* We demonstrate that heavy oxide germanate glass Corning 9754 is an effective platform for femtosecond laser-written mid-infrared waveguides, combining high refractive index contrast (1.2x10-2), low propagation loss (0.5 dB/cm) and high thermal stability.

**BM4A.4 • 17:30 (Invited)**
**Monolithic Frequency-Converted Waveguide Laser via Ultrafast Laser Inscription,** Jie Qiao[1,2], Wendwesen Gebremichael[2], Christophe Dorrer[2]; *[1]Rochester Inst. of Technology, USA; [2]Aktiwave LLC, USA.* We demonstrate a monolithic, alignment-free waveguide laser integrating Nd: YAG gain and PPLN frequency conversion using ultrafast laser microwelding and inscription. Continuous waveguides span dissimilar materials, enabling 1064 nm lasing and on-chip 532 nm generation. Waveguide geometry is optimized to balance confinement, loss, and conversion efficiency, providing a scalable path toward compact integrated photonic sources.

## 16:30 -- 18:30
## Room: International III
## JM4B • Joint Session (IPR/NP): Nonlinear Effects in Integrated Waveguides and Devices

*Presider: Christelle Monat; Ecole Centrale de Lyon, France and Katia Shtyrkova; MIT Lincoln Laboratory, USA*

**JM4B.1 • 16:30 (Invited)**
**Ultra-Wideband and Ultrafast Integrated Nonlinear and Quantum Photonics on Lithium Niobate,** Qiushi Guo[1]; *[1]CUNY Advanced Science Research Center, USA.* Abstract not available.

**JM4B.2 • 17:00**
**Waveguide Design for Broadband mid-Infrared Generation via Spontaneous Parametric Down-Conversion,** Sofiane MEZIANI[1], Brieg Le Corre[1,2], Maria Amanti[3], Alexandre Beck[1], Felicien Appas[1], Abdelmounaim Harouri[2], Gregoire Beaudoin[2], Luc Le Gratiet[2], Konstantinos Pantzas[2], Isabelle Sagnes[2], Yoan Léger[1]; *[1]Institut FOTON, UMR 6082, Univ Rennes, INSA Rennes, CNRS, France; [2]Centre de Nanosciences et de Nanotechnologie, CNRS, France; [3]Laboratoire Matériaux et Phénomènes Quantiques, CNRS, Université de Paris, France.* We propose generation of multiple photon pairs in the near-infrared and mid-infrared regions using orientation-patterned gallium phosphide waveguides. Suspended shallow-ridge architecture enables broadband mid-infrared light generation via spontaneous parametric down-conversion.

**JM4B.3 • 17:15**
**Direct Observation of 5 dB Squeezing From a SiN Micro-Ring With an on-Chip Parametric Amplifier and Realization of an on-Chip SU(1,1) Interferometer,** Zhe-Yu J. Ou[1], Yuhang

Lei[1], Chenfei Cui[2], Yue Li[1], Hon Ki Tsang[2]; *[1]City Univ. of Hong Kong, Hong Kong; [2]Chinese Univ. of Hong Kong, Hong Kong.*

By using two sequentially coupled SiN micro-rings, we measure quantum noise from the first with the second one as a part of quantum measurement tool and observe 5 dB of squeezing from the first micro-ring. Such a scheme with an injection also forms an SU(1,1) interferometer.

**JM4B.4 • 17:30**
**Spontaneous Inter-Color Symmetry Breaking in an Integrated Microresonator,** Alekhya Ghosh[1,2], Arghadeep Pal[1,2], Luca d. Trinchão[1,3], Haochen Yan[1,2], Toby Bi[1,2], Shuangyou Zhang[4], Nathalia B. Tomazio[5], Flore K. Kunst[1,2], Lewis J. Hill[1], Gustavo S. Wiederhecker[3], Pascal Del'Haye[1,2]; *[1]Max-Planck-Inst Physik des Lichts, Germany; [2]Physics, Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany; [3]Gleb Wataghin Inst. of Physics, Univ. of Campinas, Brazil; [4]Department of Electrical and Photonics Engineering, Technical Univ. of Denmark, Denmark; [5]Instituto de Física, Universidade de São Paulo, Brazil.* We demonstrate symmetry breaking between co-propagating fields at different frequencies circulating in a silicon nitride microresonator. This phenomenon is particularly suited for all-optical nonlinear activation function generation for neuromorphic computing.

**JM4B.5 • 17:45**
**Manipulating Symmetry Breaking in Faticons: a Pathway to Fine-Tuned Frequency Combs,** Lewis J. Hill[1], Juan D. Mazo[1,2], Julius T. Gohsrich[1,2], Alekhya Ghosh[1,2], Arghadeep Pal[1,2], Haochen Yan[1,2], Pascal Del'Haye[1,2], Erwan Lucas[3], Stéphane Coen[4,5], Flore K. Kunst[1,2], Gian-Luca Oppo[6], Julien Fatome[3]; *[1]Max Planck Inst. for the Science of Light, Germany; [2]Department of Physics, Friedrich-Alexander Universität Erlangen-Nürnberg, Germany; [3]Laboratoire Interdisciplinaire Carnot de Bourgogne, France; [4]Department of Physics, Univ. of Auckland, New Zealand; [5]The Dodd-Walls Centre for Photonic and Quantum Technologies, New Zealand; [6]Department of Physics, Univ. of Strathclyde, UK.* Controlled pump bias or Kerr-induced higher-order spontaneous symmetry breaking enables manipulation of faticon propagation speed and repetition rate, providing a flexible and robust route to engineered soliton dynamics and tailored comb generation.

**JM4B.6 • 18:00**
**Fast Thermo-Optic Modulation in Nanophotonic Resonators,** Pavel Shafirin[1], Pengli Feng[1], Artur Davoyan[1]; *[1]Univ. of California Los Angeles, USA.*
We develop a semi-analytical model of transient photo-thermal interaction in resonant nanophotonic structures. The framework captures coupled optical–thermal co-evolution and identifies regimes enabling efficient switching on nanosecond timescales.

**JM4B.7 • 18:15**
**Dense Topological Soliton Crystals in Nanophotonic Parametric Oscillators,** Justin Widjaja[1], Thomas Zacharias[1], Nicolas Englebert[1], Robert Gray[1], Emir Arda Deger[1], Selina Zhou[1], Ryoto Sekine[1], Alireza Marandi[1]; *[1]California Inst. of Technology, USA.* We experimentally report localized topological soliton structures, bound by tail-to-tail interactions in a nanophotonic parametric oscillator in thin-film lithium niobate. We characterize a dense (203 fs period) dark soliton crystal with ~80 fs long pulses.

## 16:30 -- 18:30
## Room: Atlantic I
## NeM4C • Sensing and Security
*Presider: Lena Wosinska; Chalmers Tekniska Högskola, Sweden*

**NeM4C.1 • 16:30 (Invited)**
**Advanced Applications of Distributed Optical Fiber Sensing for Real-Time Monitoring in Nuclear Power Systems,** Yi Cai[1], Wanxin Li[1], Zeyuan Lin[1], Zhiyang Xue[1], Yuhan Jiang[1]; [1]*Soochow Univ., China.* This paper pioneers distributed optical fiber sensing (DOFS) for real-time nuclear power system monitoring. By leveraging a novel spatiotemporal signal processing strategy, the DOFS technique demonstrates exceptional reliability and monitoring performance within extreme radiation environments.

**NeM4C.2 • 17:00 (Invited)**
**New Frontier in Optical Network Security,** Luca Poti[1]; [1]*CNIT, Italy.* The key of a steganographic transmission is reconstructed from the unclonable Rayleighbackscattering fingerprints of both nodes. No key is distributed, and recovering the message authenticates the sender and decrypts the data at once.

**NeM4C.3 • 17:30 (Invited)**
**Technologies and Sensing Techniques for Next-Generation PON,** Kovendhan Vijayan[1]; [1]*Nokia Bell Labs, USA.* Abstract not available.

**NeM4C.4 • 18:00 (Invited)**
**Advanced and Secure Optical Access Networks,** Paola Parolari[1], Alessandro Gagliano[1], Marco Fasano[1], Andrea Madaschi[1], Alberto Gatto[1], Paolo Martelli[1], Pierpaolo Boffi[1]; [1]*Politecnico di Milano, Italy.* We discuss advanced optical access networks integrating PON communications, in-fiber sensing, and quantum key distribution to enhance both infrastructure surveillance and data security. Coordinated control can further improve resilience, automation and service flexibility in future access systems.

## 16:30 -- 18:30
## Room: International IV
## NoM4D • Metasurfaces and Nanophotonics
*Presider: Euan McLeod; Univ. of Arizona, USA*

**NoM4D.1 • 16:30 (Invited)**
**Topology-Enabled Optical Rectification in Asymmetrically Patterned Gold Metasurfaces,** Michael Leuenberger[1]; [1]*Univ. of Central Florida, CREOL, USA.* Abstract not available.

**NoM4D.2 • 17:00 (Invited)**
**Recent Advances in Electrically Reconfigurable Metasurfaces and Their Applications,** Jeong Moon[1], K. Kay Son[1], Chuong Dao[1], Ryan Quafoth[1], Aaron Bluestone[1],

Hanseong Lee[1], Dave Chow[1], Yuri Owechko[1]; *[1]HRL Laboratories, LLC, USA.* Recent advances in electrically reconfigurable metasurfaces and their applications
J. Moon, K. Son, C. Dao, R. Quarfoth, A. Bluestone, H. Lee, Y. Owechko, and D. Chow
In this talk, we will present recent advances in electrically reconfigurable metasurfaces, comprising plasmonic or dielectric resonators, operating at infrared wavelengths. We will also discuss their potential applications and challenges to overcome.

**NoM4D.3 • 17:30 (Invited)**
**Thermal Detectors With Custom Multi-Spectral Response,** Silvia Guadagnini[1], Zarko Sakotic[2], Yue Yu[3], Mengjie Yu[3], Daniel Wasserman[2], Michelle L. Povinelli[1]; *[1]Univ. of Southern California, USA; [2]Univ. of Texas at Austin, USA; [3]Univ. of California Berkeley, USA.* The ability to engineer the absorption spectrum in the midwave infrared is leading to a new class of detectors for thermal emission. While metamaterials provide one traditional approach, so-called dilute metal absorbers offer a route to drastically reduce thermal mass. Here we demonstrate the use of dilute metal absorbers, containing patterned subwavelength features, to control spectral absorption within platforms suitable for bolometry.

**NoM4D.4 • 18:00**
**Design of High Sensitivity Tunable Bowtie Metasurface in the Mid-IR With $BaTiO_3$,** Shadman Shahid[1], Daniel Wasserman[3], Michelle L. Povinelli[1,2]; *[1]Ming Hsieh Department of Electrical and Computer Engineering, Univ. Of Southern California, USA; [2]Department of Physics & Astronomy, Univ. of Southern California, USA; [3]The Chandra Department of Electrical and Computer Engineering, Univ. of Texas at Austin, USA.* A highly sensitive metasurface is designed that can be tuned via the electrooptic effect of Barium Titanate ($BaTiO_3$). The device utilizes a bowtie antenna design to enhance the field overlap between the electrical and IR fields needed to improve sensitivity in such devices.

**NoM4D.5 • 18:15**
**Tuning Phonon Polaritons in van der Waals Crystals via Elemental Metal Intercalation,** Mariia Stepanova[1], Mashnoon A. Sakib[1], Wills Harris[1], Ruqian Wu[1], Kristie Koski[2], Maxim R. Shcherbakov[1]; *[1]Univ. of California Irvine, USA; [2]Univ. of California Davis, USA.* Phonon polaritons are modulated via metal intercalation in α-$MoO_3$. Near-field nanoimaging reveals systematic, metal-dependent shifts in polariton dispersion, with tin-intercalated α-$MoO_3$ exhibiting the largest modulation of up to 23.5 ± 5.1%.

## 16:30 -- 18:30
## Room: Catalina
## NpM4E • Applied Nonlinear Photonics: Sensing, Metrology, and Beam Manipulation

**NpM4E.1 • 16:30 (Invited)**
**Frequency Combs and Nonlinear Optics in THz Domain,** Harald G. Schwefel[1]; *[1]Univ. of Otago, New Zealand.* Abstract not available.

**Disclaimer**: this guide is limited to technical program with abstracts and author blocks as of 22 July. For updated and complete information with special events, reference the online schedule or mobile app.

**NpM4E.2 • 17:00**
**Using Photonics to Enhance the Sensitivity of Fourier Transform Infrared Spectroscopy Beyond Nominal Levels,** Sergey Vasilyev[1], Roderik Krebbers[2], Mathieu Walsh[3], Dmitrii Konnov[4], Igor Moskalev[1], Mike Mirov[1], Andrey Muraviev[4], Jérôme Genest[3], Konstantin Vodopyanov[4], Simona Cristescu[2]; *[1]IPG Photonics Corp, USA; [2]Inst. for Molecules and Materials, Radboud Univ., Netherlands; [3]Centre d'Optique, Photonique et Laser, Université Laval, Canada; [4]CREOL, the College of Optics and Photonics, Univ. of Central Florida, USA.* We use nonlinear optics and photonics to push the sensitivity of broadband long-wave infrared spectroscopy beyond the reach of any previously reported direct-detection Fourier spectrometer.

**NpM4E.3 • 17:15 (Invited)**
**Dual Comb Spectroscopy for Imaging and Sensing,** Esther Baumann[1]; *[1]National Inst of Standards & Technology, USA.*
We present a free-form dual-comb spectroscopy platform that supports sampling strategies beyond those achievable with conventional dual-comb spectroscopy, enabling compressive sampling and imaging.

**NpM4E.4 • 17:45**
**Avalanche Sensing via Kerr Frequency Comb in an Optical Microcavity,** Chenchen Wang[1], Qingyi Zhou[1], Lan Yang[2], Zongfu Yu[1]; *[1]Univ. of Wisconsin-Madison, USA; [2]Department of Electrical and Systems Engineering, Washington Univ., USA.* We propose an avalanche sensing scheme based on Kerr nonlinearity, which amplifies weak perturbations through abrupt state transitions in a Kerr frequency comb.

**NpM4E.5 • 18:00**
**Laser-Assisted Longitudinal Shaping of Relativistic Electron Beams,** Hao Zhang[1,2], Randy Lemons[2], Jack Hirschman[2,3], Nicholas Sudar[2], Nicole Neveu[2], River Robles[2], Paris Franz[2], David Cesar[2], Zihan Zhu[2], Mathew Britton[2], Kurtis Borne[2], Zhen Zhang[2], Kirk A. Larsen[2], Benjamin Mencer[2], Justin Baker[1], Chad Pennington[1], Razib Obaid[2], Taran Driver[2], Yuantao Ding[2], Ryan Coffee[2], Gabriel Just[2], Feng Zhou[2], Ji Qiang[4], James Cryan[2], Joseph Robinson[2], Mike Dunne[2], Agostino Marinelli[2], Sergio Carbajo[1,2]; *[1]Univ. of California Los Angeles, USA; [2]SLAC National Accelerator Laboratory, USA; [3]Stanford Univ., USA; [4]Lawrence Berkeley National Laboratory, USA.* We explore new spatiotemporal control regimes of dispersion-managed nonlinear techniques to enable tailored field synthesis and precise manipulation of high-intensity, high-brightness electron and X-ray beams.

**NpM4E.6 • 18:15**
**Hybrid Nonlinear Photonics Using Atoms and Optical Nanofibers,** Anna Kortel[1], Sergei Abdrakhmanov[1], Anton Konovalov[1], Kateryna Rachek[1], Aswathy Raj[1], Zohreh Shahrabifarahani[1], Rohit Kumar[1], Krishna Jadeja[1], Alexey Vylegzhanin[1], Sile Nic Chormaic[1]; *[1]Okinawa Inst of Science & Technology, Japan.* Nonlinear photonics platforms combining atoms and optical nanofibers enable strong light-matter interactions from the classical to quantum regime. We explore atom-mediated nonlinearities and nanofiber-based four-wave mixing for entangled photon generation, targeting scalable systems suitable for sensing, networking, and quantum technologies.

## 16:30 -- 18:30
## Room: International V
## SpM4G • Digital Signal Processing and Performance Monitoring
*Presider: Charles St-Arnault; McGill Univ., Canada*

**SpM4G.1 • 16:30 (Invited)**
**Implementation and Use Cases of Zero-Shot Learning in Optical Coherent Communications,** Samuel Lennard[1]; [1]*Univ. College London, UK.* Zero-shot learning allows for the efficient use of neural networks in digital signal processing for optical coherent communications. We outline the underlying principles of ZSL, and the applications and potential use cases it supports.

**SpM4G.2 • 17:00 (Invited)**
**Advances in ML-Monitored ODSP Parameters for DT-Based QoT Estimation,** Kayol Mayer[1], Trung-H. Nguyen[1], Celestino S. Martins[1], Sami Mumtaz[1], Gabriel Charlet[1]; [1]*Huawei Technologies, France.* Digital twins (DTs) are emerging as transformative tools for optical network automation. By integrating ML-monitored oDSP parameters, DTs enable dynamic QoT estimation.We review key opportunities and challenges in ML-driven parameter estimation for DT models.

**SpM4G.3 • 17:30**
**OSNR and Spectral Spacing Estimation in Gridless WDM Systems Based on IQ Histograms and Kernel Density Estimation,** Camilo A. Anacona[1], Hernan F. García[1], Jhon J. Granada Torres[1]; [1]*Universidad de Antioquia, Colombia.* We propose an experimentally validated method based on IQ histograms and KDE-based features to estimate OSNR and spectral separation from symbol-level statistics in a 3×16-GBd Nyquist-WDM system, achieving errors of 1.5 dB and 0.37 GHz.

**SpM4G.4 • 17:45**
**Multitask Gaussian Process Framework for Joint Estimation of OSNR and Spectral Spacing in Gridless WDM Systems,** Cesar A. Montoya Ocampo[1], Jhon J. Granada Torres[1], Hernan F. García[1]; [1]*Universidad de Antioquia, Colombia.* A probabilistic multitask Gaussian process framework is proposed for joint optical performance monitoring, enabling simultaneous estimation of OSNR and spectral spacing while modeling inter-parameter correlations and predictive uncertainty.

## Tuesday, 28 July

### 08:30 -- 10:00
### Room: International I
### BTu1A • Applications of Gratings and Poled Devices
*Presider: Matthieu Bellec; Institut de Physique de Nice, France*

**BTu1A.1 • 08:30 (Invited)**
**Nonlinear Optical Based Display for AI Smart Glasses,** Peter G. Smith[1]; [1]*Univ. of Southampton, UK.* Nonlinear wave-mixing provides a new way to create a near-to-eye display, which can alter the rules of display- optics, so that it can be100% transparent and can add light on top the natural scene.

**BTu1A.2 • 09:00**
**Speckle-Based Spectroscopy Using Random Fiber Bragg Grating,** Olivier Bélanger[1], Sébastien Loranger[1,2], Antoine Lesage-Landry[1,3]; [1]*Electrical Engineering, Polytechnique Montréal, Canada;* [2]*Poly-Grames Research center, Canada;* [3]*Mila - Institut québécois d'intelligence artificielle, Canada.* We demonstrate that a random fiber Bragg grating inscribed in multimode fiber significantly reduces the spectral correlation width with minimal fiber length for speckle spectrometry and propose a machine learning-based reconstruction algorithm for spectrum recovery.

**BTu1A.3 • 09:15**
**In-Situ 3D-Printing of Diffractive Optical Elements via Liquid-Immersed Xolography,** yizhuo liu[1], Henry J. Shook[1], Yujie Shan[1], Huachao Mao[1]; [1]*Purdue Univ., USA.* We demonstrated an in-situ 3D-printing strategy for optics using Xolography. By removing post-processing steps, the liquid resin is regarded as an immersion medium to achieve low refractive index contrast. A Dammann grating is successfully printed.

**BTu1A.4 • 09:30 (Invited)**
**Fiber-to-the-Tree: Optical Fiber Sensors for Precision Agriculture,** Maria Konstantaki[1], Vasilios Sarakatsianos[1], Antonia Bagkeri[2], Stelios Christodoulou[3], Stavros Pissadakis[1]; [1]*FORTH-IESL, Greece;* [2]*Department of Agriculture Hellenic Mediterranean Univ. (HMU), Greece;* [3]*Drones UAV IONOS, STEP-C, Greece.* Optical fiber sensors rapidly evolve into the emerging field of Precision Agriculture. Benefits and challenges related to the implementation of optical fiber sensors into the agricultural field are reviewed, together with outlining specific application examples.

## 08:30 -- 10:00
## Room: International III
## ITu1B • Programmable and Tunable Integrated Photonics
*Presider: Qiushi Guo; CUNY Advanced Science Research Center, USA*

**ITu1B.1 • 08:30 (Invited)**
**Programmable Nonlinear Photonics With Arbitrarily Reconfigurable Quasi-Phase Matching,** Ryotatsu Yanagimoto[1,2], Benjamin A. Ash[2], Mandar M. Sohoni[2], Martin M. Stein[2], Yiqi Zhao[2], Federico Presutti[2], Marc Jankowski[1], Logan Wright[1], Tatsuhiro Onodera[1], Peter L. McMahon[2]; *[1]NTT Research Inc., USA; [2]Cornell Univ., USA.* We demonstrated programmable nonlinear photonics: a device on which an arbitrary quasi-phase-matching grating can be set and reconfigured. We show the ability of a prototype device to implement and switch between versatile nonlinear-optical functions.

**ITu1B.2 • 09:00**
**Adaptive Q-Factor Integrated Microring Resonator for Reconfigurable Quantum Light Sources,** Juan Samuel S. S. Duran Gomez[1,2], Jan Heine[1,2], Michael Kues[1,2]; *[1]Inst. of Photonics, Leibniz Univ. Hannover, Germany; [2]Cluster of Excellence PhoenixD, Leibniz Univ. Hannover, Germany.* We present an integrated photon-pair source based on an actively controlled, Q-factor-tunable optical cavity. This approach enables optimization of photon-pair generation and emission characteristics for application-specific requirements, providing a reconfigurable platform for quantum photonic applications.

**ITu1B.3 • 09:15**
**Magnetic-Field Modulation of the Demon Wave in Graphene,** guangliang niu[1], yibo feng[1], Yuwei Zhuang[1], Lidong Zhang[1], Zhenjie Duan[1], Leda Jia[1], Ju Shang[1], wenyu zhao[1]; *[1]Huazhong Univ of Science and Technology, China.* Abstract: We report the magnetic response of the graphene Demon wave near the charge neutrality point. A 0–100 mT field inhibits spatial propagation, accelerates temporal decay, and dynamically controls dispersion relations.

**ITu1B.4 • 09:30 (Invited)**
**Nonlinear Control of Topological Photonic Modes,** Dawn T. Tan[1], Byoung Uk Sohn[1], Ju Won Choi[1], Hongwei Gao[1], Doris Ng[2], George Chen[1], Xavier Chia[1]; *[1]Singapore Univ. of Technology & Design, Singapore; [2]Inst. of Microelectronics, Agency for Science, Technology and Research, Singapore.* Topological photonics leverage edge modes for propagation, providing robustness against certain classes of disorder during propagation. Here, we report topological photonic devices implemented on the ultra-silicon-rich nitride (USRN) platform, primarily taking advantage of the platform's high Kerr nonlinearity and thermo-optic coefficient. The topological propagation dynamics is shown to be tunable through nonlinear optical and thermo-optical mechanisms.

## 08:30 -- 10:00
## Room: Atlantic I
## NeTu1C • Network Operation
*Presider: Luca Poti; CNIT, Italy*

**NeTu1C.1 • 08:30 (Invited)**
**Disaggregate Everything, Automate Anything: Optical Edge Networking in the AI Era,** Jim Zou[1]; [1]*ADTRAN, Inc, USA.* AI is reshaping where compute, data, and connectivity converge, pushing network intelligence and performance requirements closer to the edge. This talk explores how next-generation optical edge networking enables this shift through network convergence, open disaggregation, and AI-enhanced operations. We discuss how disaggregated optical architectures, open line systems, and coherent pluggable optics provide the scalability, cost efficiency, and flexibility.

**NeTu1C.2 • 09:00 (Invited)**
**Microservice-Based Impairment-Aware Hierarchical PCE Supporting Federated Multi-Operator Photonic Fabric,** Linqi Xiao[1], Aparaajitha Gomathinayakam Latha[1], Rahim Muhammad Ridwanur[1], Moojan Kamalzadeh[1], Sone Yoshiaki[2], Martin Birk[1], Andrea Fumagalli[1]; [1]*Univ. of Texas at Dallas, USA;* [2]*NTT Network Innovation Laboratories, Japan.* A microservice-based hierarchical PCE automates topology abstraction across multi-domain OpenROADM networks and computes end-to-end routing and spectrum assignment with integrated impairment validation, representing a first step toward elastic scaling of edge-to-core transport for AI workloads.

**NeTu1C.3 • 09:30**
**LLM-Assisted Digital Twin for Next Generation Optical Network-as-a-Service (ONaaS),** Imran Chowdhury Dipto[1], Sanwal Zeb[1], Muhammad Umar Masood[1], Ihtesham Khan[2], Joao Pedro[3], Antonio Napoli[3], Vittorio Curri[1]; [1]*Politecnico di Torino, Italy;* [2]*Nokia Bell Labs, USA;* [3]*Nokia Optical Networks, Portugal.* We present an LLM-assisted Digital Twin that automates optical network design and configuration from operator intent, delivering rapid planning and accurate QoT evaluation for next-generation ONaaS while minimizing reliance on detailed physical-layer expertise.

**NeTu1C.4 • 09:45**
Withdrawn

## 08:45 -- 10:00
## Room: International IV
## NoTu1D • Nanomaterials and Applications
*Presider: Francois Chenard; IRflex Corporation, USA*

**NoTu1D.1 • 08:45 (Invited)**
**The Chip-Scale Unification of the Terahertz and GHz,** Jia Xu Brian Sia[1]; [1]*Nanyang Technological Univ., Singapore.* Abstract not available.

**NoTu1D.2 • 09:15**

**Accurately Characterizing the Ensemble Transition Dipole Moment Alignment to Enable Next Generation Optoelectronic Devices,** Brendan D. Russ[1], Tung-Tung Lin[1], Carissa Eisler[1]; [1]*Univ. of California Los Angeles, USA.* Accurately measuring the net transition dipole moment alignment of an emissive material is necessary as it bounds the maximum external efficiency of an optoelectronic device. However, measurement methods are not widely explored in literature.

**NoTu1D.3 • 09:30**
**Electrothermal Kirigami Actuators for Optics,** Hanseong Jo[1], Pavel Shafirin[1], Mozakkar Hossain[1], Seonghyeon Kim[2], Jeongrak Lee[2], Anna Lee[2], Artur Davoyan[1]; [1]*Univ. of California Los Angeles, USA;* [2]*POSTECH, Korea (the Republic of).* We demonstrate an electrothermal kirigami actuator for thin-film optical surfaces, enabling controllable local and bidirectional tilting. The resulting deformation steers and scatters reflected light, offering a promising approach for adaptive optics, beam steering, and solar sails.

**NoTu1D.4 • 09:45 Postdeadline Submission**
**Co-Originated Dipole Channels for Noise-Resilient Optical Decoding in 2D Nanosheets,** Rong Lyu[1], Zhikao Li[1], Timothy Scott[1], Minsu Liu[2]; [1]*Material science and engineering, Monash Univ., Australia;* [2]*School of Advanced Engineering, Great Bay Univ., China.* Electric-field-induced anisotropy in two-dimensional rare-earth titanate nanosheets differentiates co-originated $Eu^{3+}$ electric-dipole and magnetic-dipole emissions, enabling self-referenced spectral-polarization optical decoding with suppressed common-mode fluctuations and field-tunable contrast.

## 08:30 -- 10:00
## Room: Catalina
## NpTu1E • Kerr Combs and Microresonators
*Presider: Sergey Vasilyev; IPG Photonics Corp, USA*

**NpTu1E.1 • 08:30 (Invited)**
**The on-Chip Microcomb Self-Referencing Bottleneck and How to Solve it With Dual-Driven Cavity Solitons,** Gregory Moille[1]; [1]*Joint Quantum Inst., NIST/UMD, USA.* On-chip self-referenced microcombs remain lab-bound due to a fundamental CEO detection bottleneck. We will discuss a new quasi-harmonic dual-pump architecture for Kerr comb generation, making CEO detection straightforward before the chip, and demonstrate universal frequency metrology on foundry-fabricated chips.

**NpTu1E.2 • 09:00 (Invited)**
**High-Power Picosecond Kerr Soliton Microcombs,** Shun Fujii[1]; [1]*Keio Univ., Japan.* Abstract not available.

**NpTu1E.3 • 09:30**
**Full-Wave Simulation of Kerr Comb Generation Using FDTD,** Chenchen Wang[1], Qingyi Zhou[1], Zongfu Yu[1]; [1]*Univ. of Wisconsin-Madison, USA.* We simulate Kerr frequency comb formation using FDTD, capturing finer spatiotemporal dynamics, and providing a unified, first-

principles modeling framework.

**NpTu1E.4 • 09:45**
**Nonlinear Dynamics of Kerr-Based Degenerate Optical Parametric Oscillators,** Luca d. Trinchão[3,1], Juan D. Mazo[1,2], Miguel Nienstedt[3,1], Luiz Peres[3], Julius T. Gohsrich[1,2], Eduardo S. Gonçalves[3], Alekhya Ghosh[1,2], Arghadeep Pal[1,2], Laís Fujii dos Santos[4], Paulo F. Jarschel[3], Thiago P. Mayer Alegre[3], Nathalia B. Tomazio[5,6], Pascal Del'Haye[1,2], Flore K. Kunst[1,2], Lewis Hill[1], Gustavo S. Wiederhecker[3]; *[1]Max Planck Inst. for the Science of Light, Germany; [2]Department of Physics, Friedrich-Alexander Universität Erlangen-Nürnberg, Germany; [3]Gleb Wataghin Physics Inst., Univ. of Campinas, Brazil; [4]School of Electrical Engineering and Computer Science, Univ. of Ottawa, Canada; [5]Instituto de Física, Universidade de São Paulo, Brazil; [6]Leibniz Inst. of Photonic Technology, Germany.* Degenerate optical parametric oscillators enable binary phase states relevant for optical computing. We investigate their nonlinear dynamics in silicon-nitride microring resonators, showing the emergence of self-pulsing and other complex dynamical regimes.

## 08:30 -- 10:00
## Room: Pacific II
## SoTu1F • Hollow Core Fibers I
*Presider: Yingying Wang; Jinan Univ., China*

**SoTu1F.1 • 08:30 (Invited)**
**HCF and/or MCF, What's the Next?,** Jie Luo[1]; *[1]State Key Laboratory of Optical Fiber and Cable Manufacture Technology, YOFC, China.* The latest progress of hollow core fiber and multi-core fiber is reviewed, and their application prospects are discussed.

**SoTu1F.2 • 09:00 (Invited)**
**Recent Advances in Twisted Hollow-Core Fibres,** Francesco Tani[2,1]; *[1]CNRS, France; [2]Max-Planck-Inst Physik des Lichts, Germany*. Twisting single-ring hollow-core fibers provides a unique route to control their polarisation properties, introduce circular and helical dichroism, and realize birefringent-free and polarisation-maintaining fibers, enabling polarisation-sensitive applications such as precise characterization of nanoliter-volume chiral solutions.

**SoTu1F.3 • 09:30 (Invited)**
**Hollow-Core Fiber Testing and the Challenges in the Field Deployments,** Mario Simard[1]; *[1]VIAVI, Canada.* Abstarct not available.

## 08:30 -- 10:00
## Room: International V
## SpTu1H • Datacenter Interconnects
*Presider: Frank Effenberger; Futurewei Technologies Inc, USA*

**SpTu1H.1 • 08:30 (Invited)**
**Beyond the Power Wall: Eliminating the Coherent DSP Tax in Data Centers via Photonic Time Stretch Physics,** Bahram Jalali[1]; *[1]ECE Dept, UCLA (Retired), USA.* High power consumption and digital signal processing (DSP) complexity in optical transceivers can be

addressed using the electro-optic phase diversity technique from Photonic Time Stretch. By eliminating chromatic dispersion similar to Coherent-Lite architectures - while maintaining intensity modulation and direct detection (IMDD) at the C-band - this approach offers a potentially disruptive solution for power-efficient data center and AI-driven wide-area networks (WANs).

**SpTu1H.2 • 09:00 (Invited)**
**High-Speed Intra-Datacenter Connections Based on VCSEL-MMF Links: Advances and Solutions,** Ann Margareth Rosa Brusin[1], Dario Pilori[1], Francesco Aquilino[2], Antonino Nespola[2], Fabrizio Forghieri[3], Andrea Carena[1]; *[1]Politecnico di Torino, Italy; [2]LINKS Foundation, Italy; [3]CISCO Photonics Italy S.r.l, Italy.* We discuss recent advances and solutions to achieve high-speed transmission rates in intra-datacenter connections based on VCSEL and MMF technologies, as required by the ever-growing capacity demand pushed by recent and wide-spread AI-powered applications.

**SpTu1H.3 • 09:30 (Invited)**
**Integrated Forward Optical Fiber Sensing and Communication Systems,** Yaxi Yan[1], Alan Pak Tao Lau[1], Chao Lu[1]; *[1]Hong Kong Polytechnic Univ., Hong Kong.* This paper reviews technologies and advances in integrated forward optical fiber sensing and communication systems.

## 08:30 -- 10:00
## Room: Pacific I
## STu1G • Thermal Photonics I
*Presider: Aaswath Raman; Univ. of California Los Angeles, USA*

**STu1G.1 • 08:30**
**Perturbation Theory for non-Reciprocal Thermal Emission at low Magnetic Fields,** Daniel D. Cui[1], Aaswath P. Raman[1]; *[1]Univ. of California Los Angeles, USA.* We develop an analytical expression from dispersive perturbation theory for magneto-optical resonance frequency shifts in plasmonic semiconductors. This expression is used to design a metasurface that achieves nonreciprocal emissivity contrast of 0.8 at 0.1T.

**STu1G.2 • 08:45 (Invited)**
**Title to be Announced,** Peter Bermel[1]; *[1]Purdue Univ., USA.* Abstract not available.

**STu1G.3 • 09:15**
**Dynamic Thermal Emissivity Control by Micro-Mirrors,** Mozakkar Hossain[1], Tom Joly-Jehenne[1], Pavel Shafirin[1], Aryan Zaveri[2], Hanseong Jo[1], Christie Phan[1], Dhruv Patel[1], Aaswath P. Raman[2], Artur Davoyan[1]; *[1]Department of Mechanical and Aerospace Engineering, Univ. of California Los Angeles, USA; [2]Department of Materials Science and Engineering, Univ. of California, Los Angeles, USA.* We integrate an infrared metasurface with micro-electromechanical systems to tune thermal emissivity dynamically and reversibly through a broadband infrared spectral range with a larger emissivity switching contrast.

**STu1G.4 • 09:30 (Invited)**

**Designing the Angular and Spectral Properties of Thermal Emitters,** Raymond Yu[1], Andrew Lee[1], Tien H. Wang[1], Harish Kumarasubramanian[1], Bo Shrewsbury[1], Jayakanth Ravichandran[1], Michelle L. Povinelli[1]; *[1]Univ. of Southern California, USA.* The ability to design the angular and spectral properties of thermal emitters offers new possibilities for controlling heat flux. We first review the fundamental constraints on angular emissivity arising from reciprocity, within the context of coupled mode theory. We then present strategies forpointing / redirecting thermal emissivity, as well as controlling the upward/downward thermal flux. We discuss all-oxide approaches that can provide high-temperature stability for emissive applications.

## 10:30 -- 12:00
## Room: International I
## BTu2A • Properties and Applications of Grating Structures
*Presider: Martin Bernier; Université Laval, Canada*

**BTu2A.1 • 10:30**
**Point by Point Tilted Fibre Bragg Gratings for SRI Sensing Applications,** James T. Hainsworth[1,2], Adriana Morana[2], Sylvain Girard[2,3], Emmanuel Marin[2]; *[1]IRT Saint Exupery, France; [2]Laboratoire Hubert Curien, France; [3]Ministère de l'Enseignement Supérieur et de la Recherche, Institut Universitaire de France (IUF), France.* We demonstrate Point-by-Point Tilted Fibre Bragg Gratings for surrounding refractive index sensing. The sensor achieves -540.44 nm/RIU sensitivity with a 0.2461 RIU dynamic range, increasing TFBG performance while maintaining the core-guided resonance for temperature compensation.

**BTu2A.2 • 10:45**
**Radiation Effects on Long Period Gratings Inscribed by Femtosecond Laser,** Adriana Morana[1], James Thomas Hainsworth[1], Lucas Lescure[1], Youcef Ouerdane[1], Aziz Boukenter[1], Emmanuel Marin[1], Sylvain Girard[1,2]; *[1]Laboratoire Hubert Curien, France; [2]Institut Universitaire de France (IUF) Ministère de l'Enseignement Supérieur et de la Recherche, France.* A Long Period Grating was inscribed in the Corning SMF28e+ point by point by femtosecond laser pulses at 515 nm and irradiated with X-rays up to doses of ~1.5 MGy($SiO_2$) at room temperature.

**BTu2A.3 • 11:00 (Invited)**
**Bragg Gratings Beyond Round Fibre,** Christopher Holmes[1]; *[1]Univ. of Southampton, UK.* Abstract not available.

**BTu2A.4 • 11:30 (Invited)**
**Title to be Announced,** Remco Nieuwland[1]; *[1]Somni Solutions, Netherlands.* Abstract not available.

**BTu2A.5 • 11:45 (Invited)**
**FBG-Based mid-IR Fiber Laser Development at LumIR Lasers,** Martin Bernier[1]; *[1]Université Laval, Canada.* This presentation will introduce the FBG technology behind LumIR Lasers and will provide an overview of the company's latest developments.

## 10:30 -- 12:00
## Room: International III
## ITu2B • Heterogeneous and Hybrid Integration
*Presider: Yoan Léger; CNRS, France*

**ITu2B.1 • 10:30 (Invited)**
**Hybrid Integrated Quantum–Classical Nanophotonics via Transfer Printing,** Yasutomo Ota[1]; *[1]Keio Univ., Japan.* Abstract not available.

**ITu2B.2 • 11:00**
**Adhesive Free Self-Aligning Micro-Transfer Printing Process,** Ruben Alemany Server[1], Daniel Pastor[1], Pascual Muñoz[1]; *[1]Universitat Politècnica de València, Spain.* The Micro-Transfer printing (MTP) technique employed in photonic platforms hybridization typically uses an adhesive layer. Here we propose and demonstrate an adhesive free process by means of stoppers fabricated both in the coupon and in the target substrate. At the same time the stoppers allow self-alignment of the coupons against the target.

**ITu2B.3 • 11:15**
**III--v-on-Lithium-Niobate Balanced Photodetectors via Covalent Wafer Bonding,** Chao Dong[1], Zheng Gong[1], Geza Kurczveil[1], Sean Hooten[1], Antoine Descos[1], Yingtao Hu[1], Jongseo Baek[1], Jiaqi Huang[2], Linran Fan[2], Sagi Mathai[1], Marco Fiorentino[1], Raymond Beausoleil[1]; *[1]Hewlett Packard Enterprise, USA; [2]Department of Electrical and Computer Engineering, The Univ. of Texas at Austin, USA.* We demonstrate balanced III--V-on-lithium-niobate photodetectors enabled by covalent wafer bonding. The devices exhibit 67% quantum efficiency, high responsivity matching over 1500--1630 nm, and a common-mode rejection ratio over 40dB.

**ITu2B.4 • 11:30**
**Heterogeneously Integrated InP MQW Mach-Zehnder Modulators on Silicon Photonics Platform,** Jianying Zhou[4], Xuejin Yan[5], Yang Li[1], Xiaopeng Xu[2], Lei Xin[3], Jin Hong[6]; *[1]Ligent Technologies Inc, China; [4]Ligent Technologies Inc, USA.* We report heterogeneously integrated InP MQW Mach-Zehnder modulators on silicon photonics, achieving, for the first time, electro-optic 3dB BW of 91GHz with a Vπ of 3.3V using a 1-mm-long phase shifter, to enable 400G-per-lane applications.

## 10:30 -- 12:00
## Room: International IV
## NoTu2C • Chalcogenide Materials
*Presider: Lynda Busse; US Naval Research Laboratory, USA*

**NoTu2C.1 • 10:30 (Invited)**
**Complex Chalcogenides for Infrared Photonics,** Jayakanth Ravichandran[1]; *[1]Univ. of Southern California, USA.* Complex chalcogenides such as $BaTiS_3$, $BaTiSe_3$, and $Sr_{1+x}TiS_3$ have emerged as a new class of low-dimensional materials with large optical anisotropy. In this talk, I

will outline the efforts of my group and the community in developing a fundamental understanding of light-matter interaction, and the characteristics of the photo-generated charge carriers, and using these insights to build novel optical elements and opto-electronic devices from these materials.

**NoTu2C.2 • 11:00 (Invited)**
**Optical Second Harmonic Generation From Ferroelectric Tin Monochalcogenides,** Kung-Hsuan Lin[1]; [1]*Academia Sinica, Taiwan.* Tin monochalcogenide crystals are typically stacked in an antiferroelectric manner. In this talk, we report giant second harmonic generation and its strain-modulated response in the emerging few-layer SnS and SnSe with ferroelectric stacking.

**NoTu2C.3 • 11:30 (Invited)**
Withdrawn

## 10:30 -- 12:00
## Room: Pacific II
## SoTu2D • Hollow Core Fibers II
*Presider: Yong Chen; Microsoft Azure Fiber, UK*

**SoTu2D.1 • 10:30 (Invited)**
**Inline Non-Destructive Characterization of Hollow Core Fibers,** Leonard Budd[1], Seyed Reza Sandoghchi[2], Francesco Poletti[1,2]; [1]*Univ. of Southampton, UK;* [2]*Microsoft Azure Fiber, UK.* We review techniques for non-destructively measuring hollow core fiber microstructure and present recent results where these methods have enabled automatic feedback control of the microstructure during fabrication.

**SoTu2D.2 • 11:00 (Invited)**
**Recent Advances on Hollow-Core Fiber-Based Sensors for Physical Parameters,** Jonas H. Osório[1], Cristiano Cordeiro[2], Frédéric Gérôme[3], Fetah Benabid[3]; [1]*Federal Univ. of Lavras, Brazil;* [2]*Univ. of Campinas, Brazil;* [3]*Univ. of Limoges, France.* In this invited talk, we report on the development of hollow-core fiber sensors for physical parameters monitoring. We hence describe the use of these fibers as platforms for temperature, curvature, displacement, and polarization angle sensors.

**SoTu2D.3 • 11:30**
**Thermal Characterization of Modal Interference in a Hollow-Core Antiresonant Fiber,** Gianluca Guerra[1], Alice Evans[1], Karlie H. Choi[1], Konstantin Vidiajev[1], Jaroslaw Rzegocki[1], Ghafour A. Mahdiraji[1], Radan Slavik[1], Francesco Poletti[1], Austin Taranta[1]; [1]*Optoelectronics Research Centre, Univ. of Southampton, UK.* We present a technique to characterize the temperature-induced modal interference in hollow-core antiresonant fibers. We apply the technique to a 75m double-nested antiresonant nodeless fiber (DNANF) with temperature ranging from 25 to 80 °C.

**Disclaimer**: this guide is limited to technical program with abstracts and author blocks as of 22 July. For updated and complete information with special events, reference the online schedule or mobile app.

**SoTu2D.4 • 11:45**
**Designing an Anti-Resonant Hollow Core Fiber for Broadband Midwave Infrared Transmission,** Amy Van Newkirk[1], Jose Enrique Antonio Lopez[2], Rodrigo Amezcua Correa[2], Axel Schulzgen[2]; *[1]Penn State Applied Research Lab, USA; [2]CREOL, Univ. of Central Florida, USA.* Here we explore two hollow core fiber (HCF) designs for broadband transmission of mid-infrared light. Experimental characterization and simulation results show the promising potential of silica-based HCF for use in the 3-5 μm wavelength range.

## 10:30 -- 12:00
## Room: Pacific I
## STu2E • Thermal Photonics II
*Presider: Jyotirmoy Mandal; Princeton Univ., USA*

**STu2E.1 • 10:30 (Invited)**
**Customization of Narrowband Thermal Emission Using Nonlocal Metasurfaces,** Adam C. Overvig[1]; *[1]Stevens Inst. of Technology, USA.* We discuss fundamental challenges to achieving custom wavefronts from a nansotructured thin film, and specific design strategies to overcome these obstacles. We report experimental platforms based on nonlocal metasurfaces which yield pixel-wise control over the polarization and geometric phase of thermal emission.

**STu2E.2 • 11:00**
**A Selective Longwave Infrared Emitter Enabled by Ultrabroadband Light Scattering,** Zhenpeng Li[1], Mathis Degeorges[1], Nithin J. Varghese[1], Jyotirmoy Mandal[1]; *[1]Princeton Univ., USA.* Random photonic media with a layered, multiscale scattering architecture simultaneously achieve ultraviolet-to-far-infrared reflection and selective LWIR emission, enabling enhanced radiative cooling and thermoregulation across conditions, offering scalable, low-cost solutions for energy savings and improved thermal comfort.

**STu2E.3 • 11:15**
**Nonreciprocal Magneto-Optic Beam Steering of Thermal Emission,** Mason Christiansen[1], Daniel D. Cui[1], Aaswath P. Raman[1]; *[1]Univ. of California Los Angeles, USA.* We demonstrate nonreciprocal beam steering of thermal emission, wherein an applied magnetic field enables direct, asymmetric, and tunable directed emission. We numerically highlight a III–V semiconductor photonic structure at 24.5 μm with a >50% emissivity difference between θ = ±75° at 50 mT and 22° of beam steering at 1 T applied field.

**STu2E.4 • 11:30**
**Near Gray-Body Emitter Coatings in Thermal Infrared Wavelengths,** Nithin J. Varghese[1], Jyotirmoy Mandal[1]; *[1]Princeton Univ., USA.* We present coatings that achieve near gray-body emittance across the thermal infrared wavelengths. Parameters that can be controlled during fabrication enables arbitrary control of emittance.

## 10:30 -- 12:00
## Room: International V
## SpTu2F • High Capacity Transmission and Signal Processing I

*Presider: Han Hyub Lee; Electronics and Telecom Research Inst and Han Hyub Lee; Electronics and Telecom Research Inst*

**SpTu2F.1 • 10:30 (Invited)**
**Amplification Challenges in Ultra-Wideband Communication Systems - S-Band Amplifiers,** Lutz Rapp[1]; [1]*Adtran Networks SE, Germany.* Optical amplifiers for the S-band based on thulium and erbium enable energy-efficient operation of multi-band systems. However, they are sensitive to signal components from adjacent bands, which makes sufficient suppression of neighboring bands necessary.

**SpTu2F.2 • 11:00 (Invited)**
**High-Throughput Transmission Systems Over the Hollow Core Fiber,** Haik MARDOYAN[1]; [1]*Nokia Bell Labs, France.* Next-generation long-haul coherent systems demand ultra-high symbol rates to increase bandwidth needs. Advancements in modulation, optical components, and signal processing, especially with hollow core fibers, address challenges and boost network speed and efficiency.

**SpTu2F.3 • 11:30**
**Analytical Modeling of Inter-Channel Four-Wave Mixing Impairments in O-Band WDM Systems,** Ryosuke Matsumoto[1], Takayuki Kurosu[1], Satoshi Suda[1]; [1]*National Inst. of Advanced Industria, Japan.* In this paper, we present a simplified model for analyzing inter-channel four-wave mixing interference in O-band IM/DD transmissions. The analytical model demonstrates high accuracy, with a predicted power penalty within 0.8 dB of simulation results.

**SpTu2F.4 • 11:45**
**Nonlinear Optical Fiber Communication Using Hirota Multi-Solitons,** Meghna Mukhopadhyay[1], Yves Jaouën[1], Mansoor Yousefi[1], Bruno Thedrez[1]; [1]*Télécom Paris, Institut Polytechnique de Paris, France.* We consider optical fiber communication by modulating information in the nonlinear spectrum of Hirota multi-solitons. Transmission is demonstrated in a 20x80km fiber link, using a low-complexity neural network receiver with small bit error rates.

## 13:30 -- 15:00
## Room: Promenade- Posters
## JTu3A • Joint Poster Session

**JTu3A.1**
**Reconstruction Fidelity of Chirped FBGs via Discrete Layer Peeling: a Round-Trip Study,** Wardeh S. Al-Younis[1]; [1]*Department of Communications and Computer Engineering, Faculty of Engineering, Jadara Univ., Jordan.* Discrete layer peeling reconstruction fidelity is evaluated for 12 chirped fiber Bragg grating designs across three chirp profiles and four apodizations. Apodization governs accuracy, with the raised-cosine profile achieving sub-3

picometer (pm) chirp error.

**JTu3A.2**
**Tunable Optical Filtering Enabled by Hybrid Modes in Planar Chromium–Dielectric Stacks,** Victor Taranenko[1], Svitlana Ilchenko[1], Vladyslav Panasyuk[1]; *[1]Branch of Applied Optics, IP NASU, Ukraine.* Spectral–angular filtering is demonstrated using tunable hybrid Tamm–waveguide modes in planar chromium–multilayer-dielectric stacks. Mode hybridization generates narrowband high-contrast Fano resonances, enabling both passband and stopband optical filtering.

**JTu3A.3**
**Beyond Spectral Sensitivity: Fisher Information As A Design Metric For Dielectric Nanograting Sensors,** Juan Sumaya-Martinez[1]; *[1]Univ Autónoma del Estado de México, Mexico.* We introduce a Fisher-information framework for dielectric nanogratings that quantifies parameter identifiability under noise and fabrication tolerances, showing that geometries maximizing spectral sensitivity need not maximize estimation precision, robustness, or multiparameter decoupling in nanophotonic sensing applications.

**JTu3A.4**
**Metasurface Tunable Reflector Based on Silicon-Doped p-Type,** Mahmoud A. Aly[1], Abdelrahman M. Ghanim[1], Mohamed A. Swillam[1]; *[1]American Univ. in Cairo, Egypt.* In this paper, a metamaterial tunable reflector for use in the infrared region is presented. It consists of a highly p-type silicon layer, silicon hexagonal array, thin film of silicon dioxide, and silver as a back reflector. Sensor achieves a narrow peak over a wavelength range of 950-1200 nm.

**JTu3A.5**
**Femtosecond Laser - Induced Adaptive Antimicrobial Interfaces: Combining Surface Morphology and Biomimetic HELP Coating,** Albena Daskalova[1], Liliya Angelova Angelova[1], Laura Colomina-Alfaro[2], Antonella Bandiera[2]; *[1]Inst. of Electronics-Bulgarian academy of Sciences, Bulgaria; [2]Life Science Dept., Univ. of Trieste, Italy.* To address persistent challenges associated with pathogen-material transfer, we propose a chemical-free approach of surface engineering based on the synergistic combination of ultra-short laser surface texturing and Human Elastin-Like Polypeptide (HELP) coating which provides an optimal antimicrobial platform.

**JTu3A.6**
**Plane Wave Angular Spectrum Approach to Effective Fresnel Coefficients at an Achiral-Chiral Interface for Profiled Electromagnetic Beams,** Monish R. Chatterjee[1], Mohammed Alfaifi[1]; *[1]Univ. of Dayton, USA.* Electromagnetic propagation across achiral/chiral (ACC) and chiral/achiral (CAC) interfaces, for chiral slabs, spherical chiral lenses and Fresnel zone plates investigated for uniform plane wave profiles, is re-visited for Gaussian-profiled beams using angular plane wave spectral decomposition in search of anomalous Brewster, TIR and other effects.

**JTu3A.7**
**Superradiant Optical Transition Radiation,** Chad Pennington[1], Gia Azcoitia[1], Blae Stacey[2,3], Willi Kuropka[3], Jackson Rozells[1], Francois Lemery[3], Florian Burkart[3], Sergio Carbajo[1,4]; *[1]Univ.*

*of California Los Angeles, USA; [2]Univ. of Hamburg, Germany; [3]Deutsches Elektronen-Synchrotron, Germany; [4]Stanford Univ., USA.* We demonstrate superradiant optical transition radiation from ultrashort electron bunches. Quadratic charge scaling (500--800~nm) confirms coherence, with modeling indicating sub-femtosecond structure ($\sigma_{\mathrm{FWHM}} \approx 1.2~\mathrm{fs}$), enabling coherent beam-driven optical sources.

**JTu3A.8**
**High Efficiency Ultraviolet Laser Based on Compensation Plate,** Haozhe Li[1,2], Zhenhua Yu[1], Yong Yao[2]; *[1]Han's Laser Technology Industry Group Co., Ltd., China; [2]Harbin Inst. of Technology, China.* The power of femtosecond UV laser is limited by temporal walk-off. A BBO crystal can be used to compensate for the walk-off and yield an IR-to-UV efficiency over 31 % in this paper, showing its potential in high-power UV generation.

**JTu3A.9**
**Physics-Guided Optical Shaping for High-Brightness Photoemission,** Hao Zhang[1,2], Jack Hirschman[2,3], Randy Lemons[2], Nicole Neveu[2], Joseph Robinson[2], Auralee L. Edelen[2], Tor O. Raubenheimer[2], Dan Wang[4], Ji Qiang[4], Sergio Carbajo[1,2]; *[1]Univ. of California Los Angeles, USA; [2]SLAC National Accelerator Laboratory, USA; [3]Stanford, USA; [4]Lawrence Berkeley National Laboratory, USA.* In this work, we propose a physics-guided machine learning approach to design driving laser pulses, bypassing current performance limits. Our method eliminates traditional computational bottlenecks. Consequently, the system can uncover complex, non-standard laser shapes that directly minimize extrinsic emittance degradation.

**JTu3A.10**
**Monolithic mid-Infrared Nonlinear Multimode Interference Device,** Sebastian Alveteg[2,1], Marc Sciamanna[1], delphine wolfersberger[1], Alex Fuerbach[2]; *[1]CentraleSupelec Metz, France; [2]Macquarie Univ., Australia.* We investigate nonlinear multimode interference devices in chalcogenide glass for use as mid-infrared saturable absorbers. Numerical simulations are used to design fully monolithic devices, which are then fabricated using femtosecond laser direct-inscription.

**JTu3A.11**
**Coherent Transition Radiation Modeling from Ultrashort and Structured Electron Beams,** Gia Azcoitia[1], Eesha Jain[1], Chad Pennington[1], Sergio Carbajo[1]; *[1]Electric and Computer Engineering, Univ. of California, Los Angeles, USA.* We model coherent transition radiation from previously unexplored form factors, using simulations to identify optimal experimental parameters and clarify how bunch structure maps to emitted wavelengths, enabling improved diagnostics and predictions of downstream radiation characteristics.

**JTu3A.12**
**Machine Learning-Based Estimation of Injection Current in an Ultrashort-Pulse Laser Using Photodetected Signal Features,** Oscar A. Gutierrez Rivadeneira[1], Cesar A. Montoya Ocampo[1], Juan D. Zapata Caro[1], Hernan F. García[1], Jhon J. Granada Torres[1]; *[1]Universidad de Antioquia, Colombia.* We estimate injection current in a graphene-based ultrashort-pulse fiber laser from oscilloscope-acquired photodetected signals using multi-domain feature fusion. A

nonlinear regression model achieves 7.52 mA error, enabling compact, instrumentation-efficient monitoring without optical spectrum analysis.

**JTu3A.13**
**A Spectral Phase Modulation Transfer Function for Dispersive Four-Wave Mixing,** Linshan Sun[1], Sergio Carbajo[1]; [1]*Univ. of California Los Angeles, USA.* Indirect ultraviolet pulse-phase control via nonlinear frequency conversion is promising, but a general evaluation framework is still lacking. We formulate DFWM as a pump-conditioned spectral kernel and derive a practical transfer-function description in the locally one-to-one regime.

**JTu3A.14**
**Collisions of Periodic and Chaotic Pulsating Solitons,** Mario F.S. Ferreira[1]; [1]*Universidade de Aveiro, Portugal.* We investigate numerically the collisions of two counter-propagating periodic pulsating and of two chaotic pulsating solitons. Different outcomes are found, namely periodic solutions, bound states with one and two compounds of plain pulses, and solutions with complex behavior. Collisions between pulses and bound states have also been investigated.

**JTu3A.15**
**Self-Selected Noncritical Phase-Matched SHG as an all-Optical Probe for Lithium Niobate,** Niklas Dömer[1], Tobias Hehemann[1], Felix Sauerwein[1], Sebastian Inckemann[2], Steffen Ganschow[2], Mirco Imlau[1]; [1]*Osnabrück Univ., Germany;* [2]*Leibniz-Institut für Kristallzüchtung, Germany.* We introduce self-selected noncritical phase-matched SHG as an all-optical spectral probe for lithium niobate, enabling contact-free readout of stoichiometry, temperature and lithium niobate-tantalate composition through phase-matching wavelength maps.

**JTu3A.16**
Withdrawn

**JTu3A.17**
**Tailoring Mixed-Dimensional Lattices via Remote Epitaxy,** Zhiqiang J. Liu[1]; [1]*Inst. of Physics CAS (China), China.* Here, we extend the application of remote epitaxy from producing transferable single-crystalline membranes to achieving lattice-level heterogeneous integration. By constructing spatially overlapping lattices, remote epitaxy yields quantum structures beyond natural materials, which provide guidelines for mixed-dimensional lattice structures.

**JTu3A.18**
**Design of a Novel SPR Sensor for Detection of Formalin in Milk Samples,** Vipin Sharma[3], Arun Uniyal[1,2], Sachin Singh[5], Lalit K. Dwivedi[4], Nitesh Mudgal[6]; [1]*I.T.Gopeshwar, India;* [2]*Center for innovation and inclusive research, Sharda Univ., India;* [3]*Physics, Rana Pratap Post Graduate College, India;* [4]*Department of Physics & Electronics, Kamla Nehru Inst. of Physical & Social Sciences, India;* [5]*Faculty of Physical Sciences, Shri Ramswaroop Memorial Univ., India;* [6]*Department of ECE, Poornima College of Engineering, India.* The study is intended to quantify the optical behavior, aiming for the detection of formalin in milk and was tested in the angular interrogation regime on an operating wavelength of 633 nm using the Transfer Matrix Method (TMM).

**JTu3A.19**

**High-Efficiency Cadmium Telluride Solar Cells With ZnTe HTL for Improved Thermal Stability,** Sudarshan K. Jain[1]; [1]*Electrical and Electronics Engineering, Poornima Univ., India.* This paper demonstrates the performance analysis of CdTe solar cells by incorporating ZnTe HTL. The study demonstrates that ZnTe HTL efficiently enhances the light-trapping capability with reduced absorber layer thickness and shows better temperature stability.

**JTu3A.20**
**Simultaneous Generation of Quantum Frequency Combs and Squeezed Kerr Combs in an Integrated Single Photonic Platform for Hybrid Quantum Information Protocols,** Raktim Haldar[1]; [1]*School of Electrical and Computer Sciences (SECS), Indian Inst. of Technology Bhubaneswar, India.* In this work, a novel approach based on the mode-splitting phenomena of serially coupled microring resonators is harnessed for the co-generation of quantum frequency combs and squeezed Kerr combs, enabling simultaneous discrete- and continuous-variable nonclassical resources, respectively, for integrated hybrid quantum information protocols.

## Wednesday, 29 July

### 09:00 -- 10:00
### Room: International I
### BW1A • Optical Sensing Applications
*Presider: Christophe Caucheteur; Universite de Mons, Belgium*

**BW1A.1 • 09:30 (Invited)**
**Toward Deployable Bio-Brillouin Instrumentation Using Fiber Gratings,** Hubert Jean-Ruel[1]; *[1]Carleton Univ., Canada.* We present our vision for fiber grating-based bio-Brillouin instrumentation for clinical deployment, highlighting Fabry-Perot Rayleigh suppression filters and spectrometers enabling alignment-free, compact, and low-cost Brillouin systems with the contrast and resolution required for biomedical applications.

**BW1A.2 • 10:00**
**1700 °C-Stable Single-Mode Sapphire Fiber Sensor Using Helical Waveguide and Ring Bragg Grating,** Chao He[1], Xuewen Shu[1]; *[1]Huazhong Univ of Science and Technology, China.* We demonstrate a single-mode sapphire ring Bragg grating fabricated by femtosecond laser direct writing. The device achieves stable operation at 1700 °C with a sensitivity of 39.1 pm/°C, showing strong potential for ultra-high-temperature sensing.

**BW1A.3 • 10:15**
**Custom-Made Multi-Core Fiber for Dual Temperature-Dose Measurements,** Benjamin Sapaly[1], Thomas Blanchet[1], Monika Bouet[2], olivier vanvincq[2], Remy Bernard[2], Laure Lago-Rached[1], Adriana Morana[3], Sylvain Magne[1], Geraud Bouwmans[2], Guillaume Laffont[1]; *[1]LIST-LSPM, CEA, France; [2]PhLAM, Université de Lille, CNRS, France; [3]Hubert Curien laboratory, UJM Saint-Etienne, France.* A custom-made multi-core fiber was designed and manufactured for all-in-one online temperature and dose measurements. Type-III fiber Bragg gratings were inscribed by the point-by-point technique with a fs-laser in this multi-core fiber and irradiated by X-rays up to 500 kGy at room temperature and also up to 75 kGy at 300°C.

### 08:30 -- 10:00
### Room: International III
### IW1B • Integrated Optics for Sensing Applications

**IW1B.1 • 08:30 (Invited)**
**Scalable on-Chip Terahertz Metasurface Sensing Platform for Biochemical Detection,** Minah Seo[1]; *[1]Sogang Univ., Korea (the Republic of).* THz metasurfaces confine electromagnetic fields into deep subwavelength volumes, dramatically enhancing light-matter interaction for biochemical sensing. By engineering nanoscale slot antennas and nanodisc arrays on-chip, we demonstrate label-free detection of molecular vibrations, neurotransmitters, and disease biomarkers with high sensitivity and selectivity. Graphene-integrated hybrid

metasurfaces further enable real-time interfacial monitoring and isomer discrimination.

**IW1B.2 • 09:00**
**Demystifying the Independence of Dual-Comb Interferometry on Carrier-Envelope Offset Noise,** Gregory Sercel[1], Obinna Oligbo[1], Cyrus Bry[1], Sergio Carbajo[1]; [1]*Univ. of California Los Angeles, USA.* Dual-comb interferometry is largely insensitive to carrier-envelope offset phase noise when a high-bandwidth optical beat lock is employed. A subtle mechanism redistributes noise between comb parameters, preserving local optical coherence and interferogram signal-to-noise ratio.

**IW1B.3 • 09:15**
**Epsilon-Near-Zero Metamaterial for Refractive Index Sensing,** Moataz M. Farouk[1], Abdelrahman M. Ghanim[1], Mohamed A. Swillam[1]; [1]*American Univ. in Cairo, Egypt.* An epsilon-near-zero aluminum-doped zinc oxide refractive index sensor is numerically investigated using finite-difference time-domain simulations, demonstrating a sharp transmission resonance highly sensitive to refractive index variations, enabling high-performance optical sensing applications.

**IW1B.4 • 09:30**
**Design and Experimental Demonstration of a Bragg Grating-Based Slotted Ring Resonator for High-Sensitivity Silicon Photonic Sensing,** Merna Khafagy[1], Maira M. Khafagy[1], sara shafaay[1], Mohamed A. Swillam[1]; [1]*Department of Physics, School of Science, Egypt.* This work introduces a silicon photonics Bragg grating-based ring resonator for sensing, supported by fabrication and characterization results aligning with FDTD simulations, confirming design accuracy, and demonstrating enhanced spectral response with a high quality factor.

**IW1B.5 • 09:45**
**Machine Learning-Driven Inverse Optimization of Silicon Photonic Bragg Grating Gas Sensors,** Maira M. Khafagy[1], Merna Khafagy[1], Mohamed A. Swillam[1]; [1]*Department of Physics, School of Science, Egypt.* Machine learning enables rapid inverse design of polymer slot Bragg grating gas sensors, predicting structural parameters from spectral responses with high accuracy of 99.9%, eliminating iterative simulations, and accelerating photonic sensor development for gas detection.

## 08:30 -- 10:00
## Room: Atlantic I
## IW1C • Integrated Light Sources
*Presider: Sihao Wang; Quantum Innovation Centre, Singapore*

**IW1C.1 • 08:30 (Invited)**
**Heterogeneously Integrated Semiconductor Lasers for Quantum Systems,** Richard Mirin[1]; [1]*Univ. of California Santa Barbara, USA.* This talk will describe design, fabrication, and measurements of heterogeneously integrated semiconductor lasers that operate at wavelengths shorter than 1000 nm for addressing quantum systems such as atoms, ions, and quantum dots.

**IW1C.2 • 09:00**
**Power-Efficient Athermal Burst Mode Operation of Widely Tunable Multi-Section Laser,** Dovydas Mickus[1], Gabriele Di Rosa[1], Benjamin Wohlfeil[1]; [1]*Adtran Networks SE, Germany.* A widely tunable multi-section ring laser, based on the Vernier effect was fabricated and operated in burst mode, achieving a maximum wavelength drift transient of 2.5~GHz using a simple, optimized electrical bias control technique.

**IW1C.3 • 09:15 (Invited)**
**Impact of Quantum Dot Lasers on Silicon Photonics.,** Yasuhiko Arakawa[1]; [1]*Univ. of Tokyo, Japan.* Photonic–electronic convergence (PEC) underpins data centers, AI computing, and edge systems, with silicon photonics and co-packaged optics (CPO) as key enablers. A major challenge is the on-chip light source. Quantum dot (QD) lasers provide an ideal solution, offering high-temperature operation and strong tolerance to optical feedback without optical isolators. This talk reviews their development, industrial realization, and recent advances in III–V/Si integration for next-generation CPO.

## 08:30 -- 10:00
## Room: International IV
## NoW1D • Nanostructured Materials
*Presider: Jonathan Hu; Baylor Univ., USA*

**NoW1D.1 • 08:30 (Invited)**
**3D Lithography and Patterning of Low-Index Nanolattice Materials for Nanophotonics,** Chih-Hao Chang[1], I-Te Chen[1], Vijay A. Premnath[1], Dokyung Kyeong[1], Nayoung Kim[1]; [1]*Univ. of Texas at Austin, USA.* Porous, order three-dimensional nanolattice films can have low-refractive index that are close to air. These nanostructures can also have enhanced mechanical properties, allowing them to be used as a robust building block for nanophotonics. This work will discuss our recent efforts in the fabrication and precise control of their optical properties using 3D nanolithography and their applications in multilayer photonic devices such as gradient-index material and dielectric broadband reflectors.

**NoW1D.2 • 09:00**
**Near-Unity Index Periodic Hollow-Core Nanostructures With Tunable Optical Anisotropy,** Dokyung Kyeong[1], Chih-Hao Chang[1]; [1]*Univ. of Texas at Austin, USA.* This work presents periodic hollow-core nanostructures with near-unity effective refractive indices and geometry-controlled form birefringence. Hollow-core nanopillars and nanogratings exhibit uniaxial and biaxial anisotropy, respectively, for low-index photonic coatings and polarization-engineered optical components.

**NoW1D.3 • 09:15**
**Effect of Pillar Geometry on Optical and Mechanical Properties of Sapphire Subwavelength Nanopillar Arrays,** Mehmet Kepenekci[1], Kun-Chieh Chien[1], Natalia A. Rueda Guerrero[1], Chih-Hao Chang[1]; [1]*Univ. of Texas at Austin, USA.* Subwavelength nanopillar arrays enhance optical transmission. While better optical properties require high aspect ratio pillars, high hardness require low aspect ratio structures. Transmission enhancement in visible

wavelength range is possible with low aspect ratio nanopillars.

**NoW1D.4 • 09:30**
**Transmission Study of Positive and Negative Cone and Pyramid Moth-Eye Structures,** Wei Zhang[1], Jonathan Hu[1], Curtis R. Menyuk[2], Thomas F. Carruthers[2], Brandon Shaw[3], Lynda E. Busse[3]; *[1]Baylor Univ., USA; [2]Univ. of Maryland Baltimore County, USA; [3]US Naval Research Lab, USA.* We numerically compare positive and negative cone and pyramid moth-eye structures on $SiO_2$ under fabrication limits. We found positive structures yield higher transmission than negative structures due to amount of top flat surface area.

## 08:30 -- 10:00
## Room: Catalina
## NpW1E • Thin Film Lithium Niobate Nonlinear Photonics
*Presider: Esther Baumann; National Inst of Standards & Technology, USA*

**NpW4E.1 • 16:00 (Invited)**
**Orientation Patterned GaP Waveguides for Integrated Nonlinear Photonics,** Konstantinos Pantzas[1], Sylvain Combrié[2], Brieg Le Corre[1], Maxime Millotte[1], Abdelmounaim Harouri[1], Bruno Gérard[3], Luc Le Gratiet[1], Grégoire Beaudoin[1], Gilles Patriarche[1], Alfredo De Rossi[2], Isabelle Sagnes[1], Yoan Léger[4], Arnaud Grisard[2]; *[1]Centre de Nanosciences et de Nanotechnologies, Université Paris Saclay - CNRS, France; [2]Thales Research and Technology,, France; [3]III-V Lab, France; [4]Institut Foton (UMR6082/CNRS-Univ. Rennes-INSA),, France.* Orientation-Patterned Gallium Phosphide (OP-GaP) is presented as an emerging III-V platform for integrating a variety of nonlinear optical processes on photonic integrated chips. The paper discusses the fabrication process, performance compared to competing platforms, and applications for a variety of second-order nonlinear conversion processes between the visible and the near infrared, including spontaneous parametric down-conversion.

**NpW4E.2 • 16:30**
**Nonlinear Optical Properties of Erbium-Doped ZBLAN Slabs,** chinonso e. ezeobi[1]; *[1]Univ. of Maryland, Baltimore, USA.* Characterization of nonlinear refractive index and nonlinear absorption coefficient of erbium-doped ZBLAN slabs using Z-scan technique. We measured n2 = (5.60 ± 0.05) × 10−16 cm2/W and β = (−3.86 ± 0.03) × 10−11 m/W.

**NpW4E.3 • 16:45**
**Excitation Spectra Signatures of SHG-Assisted UV Defect Luminescence in Rhombohedral Boron Nitride,** Bazlul Karim[2], Krzysztof P. Korona[1], Aleksandra K. Dabrowska[1], Jakub Iwanski[1], Johannes Binder[1], Andrzej Wysmolek[1], Mariusz Klimczak[1]; *[1]Uniwersytet Warszawski, Poland; [2]Laser Centre, Instytut Chemii Fizycznej, Poland.* Photoluminescence and SHG excitation spectra of epitaxial BN reveal that rhombohedral stacking enables an additional SHG pathway to C300 ultraviolet emission, strengthening visible pump response compared to hBN and enabling long-wavelength access to UV emitters.

**NpW4E.4 • 17:00**
**Dynamic Coupling Between an Epsilon-Near-Zero Thin Film and Conducting Polymer Nanoantennas,** Suraya Kazi[1], Yulong Duan[1], Magnus Jonsson[1]; [1]*Linköpings universitet, Sweden.* Epsilon-near-zero (ENZ) systems provide compelling opportunities for nonlinear optics but are typically static. We demonstrate a dynamically tunable ENZ system by coupling to redox-active conducting polymer nanoantennas, providing 90% modulation of the local field enhancement within the ENZ thin film.

**NpW4E.5 • 17:15**
**All-Optical Exceptional-Line Semimetallic Character in Thermal Atomic Vapor,** Arannya Ghosh[1], Soumik Nandi[2], Ashok K. Mohapatra[2], Ritwick Das[1]; [1]*Optics and Photonics Centre, Indian Inst. of Technology Delhi, India;* [2]*Physical Science, National Inst. of Science Education and Research Bhubaneswar, India.* We show a non-Hermitian anti-PT symmetric character in thermal atomic-vapor, exhibiting concentric bright rings in the near-field of the probe laser beam. We also describe the $Z_2$ index through spatial topology to illustrate the topological phase transition at exceptional rings. This system is analogous to an all-optical exceptional-line semimetal.

## 08:30 -- 10:00
## Room: Pacific II
## SoW1F • Radiation Hardened and Novel Hybrid Material Fibers
*Presider: Amy Van Newkirk; Penn State Applied Research Lab, USA*

**SoW1F.1 • 08:30 (Invited)**
**Silica–Diamond Interface Formation Dynamics During Specialty Optical Fiber Preform Processing,** Robert Bogdanowicz[1]; [1]*Departament of Optoelectronics, Gdansk Univ. of Technology, Poland.* This paper presents experimental, computational, and fabrication insights into diamond–glass interface formation during specialty optical fibre preform processing. We elucidate thermally driven decomposition pathways, diamond-termination-dependent colour-centre preservation mechanisms, and carboxyl-mediated interfacial bonding dynamics critical for developing diamond-doped photonic fibres targeting distributed optical quantum sensing applications.

**SoW1F.2 • 09:00 (Invited)**
**New Fiber Structures via Glass Extrusion,** Erik Schartner[1]; [1]*Univ. of Adelaide, Australia.* Abstract not available.

**SoW1F.3 • 09:30 (Invited)**
Withdrawn

## 08:30 -- 10:00
## Pacific I
## SW1G • New Directions in LEDs and Light Sources
*Presider: Carissa Eisler; Univ. of California Los Angeles, USA*

**SW1G.1 • 08:30**
**15 W of Solar-Pumped Laser With 0.8 m$^2$ of Fresnel Lens,** Tomomasa Ohkubo[1], Haochen Lou[1], Ryota Yamada[1], Ei-ichi Matsunaga[1], Thanh Hung Dinh[2], Yuji Sato[3]; *[1]Tokyo Univ. of Technology, Japan; [2]Kansai Inst. for Photon Science, National Inst.s for Quantum Science and Technology, Japan; [3]Joining and Welding Research Inst., Osaka Univ., Japan.* A solar-pumped laser produced 15.2 W output using a 0.8 m$^2$ Fresnel lens. Improved concentrator efficiency and optimized output coupler reflectivity led to a 1.4-fold increase in power compared to earlier setups.

**SW1G.2 • 08:45 (Invited)**
**Quantum Rods: Materials for LED Devices,** Abhishek Srivastava[1]; *[1]Hong Kong Univ of Science & Technology, Hong Kong.* Abstract not available.

**SW1G.3 • 09:15 (Invited)**
**Development of Device Technology for Micro-Light-Emitting Diodes,** Matthew S. Wong[1]; *[1]Univ. of Texas at Dallas, USA.* GaN-based micro-light-emitting diodes (μLEDs) are attractive for high-resolution displays, optical interconnects, and emerging sensing applications, but their performance is strongly limited by plasma-induced sidewall damage. As device dimensions shrink, the increased surface-to-volume ratio enhances nonradiative recombination, leakage current, and efficiency degradation, making effective sidewall treatment essential. This work presents a method that recovery the efficiency of μLEDs from 10 μm up to 100 μm.

**SW1G.4 • 09:45**
**Chip-Scale Optoelectronic Voltage Boost Converters,** Parthiban Santhanam[1], Daniel D. Cui[1], Aryan Zaveri[1], Isabella He[1], Jae S. Hwang[1], David E. Abraham[1], Aaswath P. Raman[1]; *[1]Mat Sci & Eng Dept, UCLA, USA.* We report experimental realization of optoelectronic voltage conversion in a chip-scale, single-die, monolithic photonic integrated circuit. Utilizing the same InGaAsP epitaxy for all devices eliminates Stokes losses while the transparent substrate's refractive index enhances performance.

## 08:30 -- 10:00
## Room: International V
## SpW1H • High Capacity Transmission and Signal Processing II
*Presider: Haik MARDOYAN; Nokia Bell Labs, France*

**SpW1H.1 • 08:30 (Invited)**
**Ultra-Compact Super-Channel Transmitter for Coherent Optical Datacenter Interconnects,** Erwan Weckenmann[1], Arman Safarnejadian[1], Alireza Geravand[1], Jean-Michel Vallée[1], Frashid Shateri[1], Zibo Zheng[1], Simon Levasseur[1], Ming Zeng[1], Leslie Rusch[1], Wei Shi[1]; *[1]Electrical and Computer Engineering, Université Laval, Canada.* We review our recent

demonstrations of coherent optical transmissions in the O-band using ultra-compact silicon I/Q modulators. Dual-carrier signaling of up to 220 GBaud and net data rate up to 626.7 Gbps per polarization have been achieved under super-channel configuration, highlighting a path toward future generations of coherent datacenter interconnects.

**SpW1H.2 • 09:00 (Invited)**
**All-Optical MIMO for Space-Division-Multiplexing Systems,** Stefano Grillanda[1]; *[1]Nokia Bell Labs, USA.* We present our results on all-optical multiple-input multiple-output (MIMO) for space-division-multiplexing systems. We demonstrate that optical MIMO equalizers, made with silicon photonic Mach-Zehnder interferometer meshes, can demultiplex and track channels transmitted over randomly-coupled multi-core fiber.

**SpW1H.3 • 09:30 (Invited)**
**Real-Time SDM MIMO DSP Using GPUs,** David Winter[1,2], Roland Ryf[1], Nicolas K. Fontaine[1], Lauren Dallachiesa[1], Pierre Sillard[3], Marianne Bigot[3], Frank Achten[4], David Neilson[1], Mikael Mazur[1]; *[1]Nokia Bell Labs, USA; [2]Inst. of Photonics and Quantum Electronics, Karlsruhe Inst. for Technology, Germany; [3]Prysmian Group, France; [4]Prysmian Group, Netherlands.* We demonstrate real-time 10-mode transmission over 48\,km of graded-index few-mode fiber using a hybrid FPGA and GPU receiver architecture. The GPU-based DSP enables flexible, reconfiguration of the DSP chain, and continuous long-term channel characterization over 12 hours across all mode groups. We report practical aspects of real-time processing on GPUs, scaling and limitations.

## 10:30 -- 12:30
## Room: International III
## JW2A • Joint Plenary Session II
*Presider: To Be Announced*

**JW2A.1 • 10:30 (Plenary)**
**Re-Thinking Fiber-to-the-Home and Building Networks for the Next Decade: Challenges and Emerging Solutions,** Elaine Wong[1]; *[1]Univ. of Melbourne, Australia.* The telecommunications industry is transitioning toward an experience-driven era, shaped by immersive and interactive applications that place stringent demands on network latency, bandwidth and reliability. Over the past two decades, passive optical network (PON) technologies have been central to delivering high-capacity broadband access to homes and businesses. As fiber access continues to evolve beyond the curb and basement and deeper into indoor environments, this trajectory is set to accelerate. This talk examines the key drivers behind this shift, the technical and architectural challenges of deploying fiber within buildings, and emerging solutions aimed at ensuring indoor fiber networks can consistently meet user experience and application performance expectations.

**JW2A.2 • 11:30 (Plenary)**
**Microstructure Fibers, a Photonic Playground,** Nicolas Joly[1]; *[1]FAU Erlangen-Nürnberg, Germany.* Microstructured fibers offer a versatile photonic platform, enabling both quantum state generation and manipulation as well as precise optical trapping of nanoparticles. We'll present

recent advances in specialty fibers, highlighting their broad potential in photonics.

## 14:00 -- 15:30
## Room: International I
## BW3A • Fundamentals of Fiber Bragg Gratings
*Presider: Adriana Morana; Universite Jean Monnet, France and Adriana Morana; Universite Jean Monnet, France*

**BW3A.1 • 14:00 (Invited)**
**Supermode Fiber Bragg Gratings,** Joel Villatoro[1,2]; [1]*Universidad del Pais Vasco, Spain;* [2]*IKERBASQUE, Spain.* Bragg gratings inscribed in coupled-core optical fibers (CCFs) give rise to a double-peak spectrum and can be exploited for dual-parameter sensing. In this talk, gratings in different configurations of CCFs and applications will be discussed.

**BW3A.2 • 14:30**
**Interpretable End-to-End Deep Learning for Sub-Micrometer Fiber–Phase Mask Alignment in FBG Fabrication,** Shuda Zhong[1], Evgenii Venediktov[1], Guangqun Ma[1], Emeka Ikpeazu[1], Zachary Splain[1], Ming-Jun Li[2], Guangyin Zhang[1], Qirui Wang[1], Kehao Zhao[1], Zekun Wu[1], Michael Buric[3], Hongbo Xiong[4], Majid Chauhdry[1], Elvis Dominguez-ontiveros[5], Kevin P. Chen[1]; [1]*Univ. of Pittsburgh, USA;* [2]*Corning Incorporated, USA;* [3]*National Energy Technology Laboratory (NETL), USA;* [4]*Jiaheshun Optoelectronic Technology Co., Ltd., China;* [5]*Oak Ridge National Laboratory (ORNL), USA.* We demonstrate an end-to-end deep learning system achieving 0.79 μm MAE error in fiber-to-phase mask alignment using low-cost stepper motors. Interpretability analysis confirms predictions are driven by fiber edges and phase mask gratings.

**BW3A.3 • 14:45**
**On-Chip Chromatic Dispersion via Multi-Mode Bragg Gratings: a Design Study,** Ipshita Datta[1], Jacky C. Chan[1], Mason L. Holley[1], Jubal John Peter[1], Victor Khitrov[1], Andrea Nelson[1], Brian M. Worthmann[1], Sheldon Wu[1], Jason Chou[1], Apurva Gowda[1], Peter Devore[1]; [1]*Lawrence Livermore National Laboratory, USA.* We explore designs trends for a scalable multi-mode bragg grating platform for broadband dispersion engineering, enabling systematic bandwidth and group delay tuning with low loss. Experiments agree with simulations within fabrication tolerances, validating device performance.

**BW3A.4 • 15:00 (Invited)**
**Micro-Engineered Fiber Bragg Gratings,** Julian A. Fells[1], Mohan Wang[1], Zipei Song[1], Tongyu Liu[1], Frank Payne[1], Tao Wang[2], Kaihui Zhang[2], Jian Zhang[2], Zhitai Jia[2], Stephen M. Morris[1], Patrick S. Salter[1], Martin J. Booth[1]; [1]*Univ. of Oxford, UK;* [2]*State Key Laboratory of Crystal Materials, Shandong Univ., China.* Femtosecond laser microfabrication allows for considerable freedom in the design of fiber Bragg gratings. We explore a range of three-dimensional devices fabricated in silica and sapphire fiber with enhanced functionality.

## 14:00 -- 15:30
## Room: International III
## IW3B • Chip-based Modulators and Isolators
*Presider: Beichen Wang; OpenLight Photonics, USA*

**IW3B.1 • 14:00 (Invited)**
**THz Bandwidth Nonmagnetic Isolators in Silicon Photonics,** Peter T. Rakich[1]; [1]*Yale Univ., USA.* Abstract not available.

**IW3B.2 • 14:30**
**Adaptive OFDM Modulation on Soliton Microcomb Lines for Photonic MmWave Wireless Systems,** Ningning Wang[1]; [1]*Univ. of California Los Angeles, USA.* We experimentally demonstrate highly spectral-efficient OFDM modulation and adaptive bit loading on the soliton microcomb line. A net rate of 20.57 Gb/s with BER below the SD-FEC threshold for one comb line is achieved, highlighting the potential of coherent comb carriers for multipath-tolerant wireless links and future hundred-Tb/s communication.

**IW3B.3 • 14:45**
**A High-Swing Monolithic Distributed MZM Driver for High-Linearity Optical Transmitters,** Robert P. Pesch[1], Joshua J. Wong[1], Arjun Khurana[1], Stephen Ralph[1]; [1]*Georgia Inst. of Technology, USA.* We demonstrate a 4.5 V differential output distributed MZM driver and architecture implemented in a monolithic silicon photonics process enabling high-linearity analog (11.6 dBm IIP3) and high-data-rate digital (112 Gbps) photonic links consuming 79.2 mW.

**IW3B.4 • 15:00**
**Optimizing Silicon Microring Modulators on a Foundry Monolithic Platform,** Alex Kaylor[2,1], Archana Kaushalram[1], Vishal Dhurgude[1], Arjun Khurana[1], Joel Slaby[1], Stephen E. Ralph[1]; [1]*Georgia Inst. of Technology, USA;* [2]*Ciena Corporation, USA.* Microring modulators fabricated on a monolithic platform are demonstrated with electro-optic bandwidths exceeding 50GHz. Trade-off between bandwidth and modulation index is analyzed for three doping-profiles and four distinct coupling strengths to optimize for O-band deployments.

**IW3B.5 • 15:15**
**The Modulation of the Reflectivity of Silica Glasses Produced by an Aligned Array of Surface Dipoles,** Cristian Bahrim[1]; [1]*Physics, Lamar Univ., USA.* The coherent superposition of two polarized TEMoo cw-laser beams on a glass surface can produce a sinusoidal modulation of the Probe's reflectance near the Brewster angle. A voltage set up across the surface can shift and shrink this modulation, thus allowing at certain angles and for different voltages to have opposite fringe pairs (max-min).

## 14:00 -- 15:30
## Room: Atlantic I
## IW3C • Quantum Integrated Photonics
*Presider: Warit Asavanant; OptQC Corp., USA*

**IW3C.1 • 14:00 (Invited)**
**Broadband High-Level Squeezed Light Generation Using Periodically Poled Lithium Niobate Waveguide,** Takahiro Kashiwazaki[1], Taichi Yamashima[1], Asuka Inoue[1], Mamoru Endo[2,3], Akira Furusawa[2,3], Takeshi Umeki[1]; *[1]NTT, Inc., Japan; [2]The Univ. of Tokyo, Japan; [3]RIKEN, Japan.* We demonstrate THz-bandwidth squeezed light generation using directly bonded PPLN waveguides for ultrafast optical quantum information processing. By reducing waveguide loss and improving detection, we achieve squeezing levels exceeding 10 dB.

**IW3C.2 • 14:30**
**Simultaneous Generation of Quantum Frequency Combs and Squeezed Kerr Combs in an Integrated Single Photonic Platform for Hybrid Quantum Information Protocols,** Raktim Haldar[1]; *[1]School of Electrical and Computer Sciences (SECS), Indian Inst. of Technology Bhubaneswar, India.* In this work, a novel approach based on the mode-splitting phenomena of serially coupled microring resonators is harnessed for the co-generation of quantum frequency combs and squeezed Kerr combs, enabling simultaneous discrete- and continuous-variable nonclassical resources, respectively, for integrated hybrid quantum information protocols.

**IW3C.3 • 14:45**
**Generation of a CW Anti-Bunched Photon Field from a Thin-Film PPLN Waveguide by two-Photon Interference With a Weak Coherent State,** Zhe-Yu J. Ou[1], Yue Li[1], Haochuan Li[1], Yuhang Lei[1], Xiaoting Li[1], Jianmin Wang[1], Xuan Tang[1], Mu Ku Chen[1], Edwin Y. B. Pun[1], Cheng Wang[1]; *[1]City Univ. of Hong Kong, Hong Kong.* An anti-bunched photon field is produced from a thin-film PPLN waveguide by mixing the on-chip two-photon state with a weak but matched coherent state. This is achieved by taking out the two-photon part of the coherent state via a destructive two-photon interference.

## 14:00 -- 15:30
## Room: International IV
## NoW3D • Waveguides and Resonators
*Presider: Brandon Shaw; US Naval Research Laboratory, USA*

**NoW3D.1 • 14:00 (Invited)**
**Optical Frequency Combs in Topologically-Engineered Ring Resonator Arrays,** Sunil Mittal[1], Seyed Danial Hashemi[1]; *[1]Northeastern Univ., USA.* Optical frequency combs in Kerr micro-ring resonators enable applications in metrology, spectroscopy, and communications, but are typically limited to equidistant, phase-locked lines. We present topologically engineered coupled ring resonator arrays that generate unconventional combs beyond this paradigm. We demonstrate Floquet incommensurate combs with nonuniform spacing and mode locking, and reconfigurable nested combs via non-Hermitian physics, enabling new functionalities.

**NoW3D.2 • 14:30 (Invited)**
**Scalable Production of High-Quality Single Crystal Fibers,** Benjamin Gray[1], Ryan Nelson[1], Alan Martinez[1]; *[1]Air Force Research Lab, USA.* This talk presents an adaptive control framework for Laser Heated Pedestal Growth using machine vision and dynamic modeling. We explore how system dynamics and material-specific properties influence molten zone stability for scalable fiber production.

**NoW3D.3 • 15:00**
**Solution Processable Single-Mode, Low-Loss Mid-IR Waveguides,** Ali Yadollahi[1], Harish Subbaraman[1]; *[1]Oregon State Univ., USA.* While low-absorption mid-IR materials are limited, discovering new cost-effective alternatives is essential. Here, a solution-processable polymeric mid-IR waveguide was designed and optimized for single-mode guidance at 2.6 μm, achieving 4.13 dB/cm loss.

**NoW3D.4 • 15:15**
**Optical Fiber Integrated with a Bi-Layer Co-ZIF-90-on-ZIF-8 Thin Film for Humidity Sensing,** Lei Zheng[1,2], Lukas Steinbach[1,2], Yash Bhatia[1,2], Andreas Schneider[1,2], Andreas Schaate[1,2], Bernhard Roth[1,2]; *[1]Leibniz Universität Hannover, Germany; [2]Cluster of Excellence PhoenixD (Photonics, Optics, and Engineering-Innovation Across Disciplines), Germany.* Optical fiber integrated with a thin MOF-on-MOF layer for humidity sensing is demonstrated. High sensitivity with ~80% transmission reduction and rapid response with adsorption time 1.5 s and desorption time 3.5 s was reported.

## 14:00 -- 15:30
## Room: Catalina
## NpW3E • Nonlinear Frequency Conversion and Ultrafast Nonlinear Optics

**NpW3E.1 • 14:00 (Invited)**
**Engineered Chi(3) Nonlinearity in Atomic Vapor,** Shiqian Ding[1]; *[1]Tsinghua Univ., China.* Abstract not available.

**NpW3E.2 • 14:30**
**Vacuum Ultraviolet Optical Frequency Comb Generated via $\chi^{(2)}$ Nonlinearity,** Sergey Vasilyev[1], Tian Ooi[2], Igor Moskalev[1], Mike Mirov[1], Andrey Muraviev[3], Dmitrii Konnov[3], Victor Churikov[1], Viktor Sukharev[1], Evgeny Galenin[1], Jack Doyle[2], Chuankun Zhang[2], Kai Li[2], Georgiy Seryogin[1], Dan Perlov[1], Igor Samartsev[1], Konstantin Vodopyanov[3], Jun Ye[2]; *[1]IPG Photonics Corp, USA; [2]JILA, NIST and Univ. of Colorado, USA; [3]CREOL, The College of Optics and Photonics, USA.* A novel quasi-phase-matched crystal is used to generate a vacuum ultraviolet frequency comb with 1 nW per mode (40 μW total), greatly simplifying precision spectroscopy of the $^{229}$Th nuclear transition at 148 nm.

**NpW3E.3 • 15:00**
**Plug and Play COPRA: Augmented Universal Ultrafast Pulse Characterization,** Abhimanyu Borthakur[1], Sergio Carbajo[1,2], Atal Narayan Sahu[1]; *[1]Univ. of California Los Angeles, USA; [2]CNSI, USA.* We introduce a universal ultrafast pulse retrieval method that augments the common pulse retrieval algorithm (COPRA) with training-free denoising. The method lowers pulse reconstruction error substantially(≈19%) while preserving reconstructed-trace fidelity.

**NpW3E.4 • 15:15**
**Pulse Retrieval from Partial FROG Traces Using Implicit Diffusion Models,** Abhimanyu Borthakur[1], Jack Hirschman[2,3], Sergio Carbajo[1,4]; *[1]Univ. of California Los Angeles, USA; [2]Applied Physics, Stanford Univ., USA; [3]SLAC, USA; [4]CNSI, USA.* We present a novel generative diffusion model to automate the recovery of ultrafast pulses from highly incomplete Frequency Resolved Optical Gating traces, resulting in a precise, fast, and advanced deep learning algorithm.

## 14:00 -- 15:30
## Room: International V
## SpW3G • Transmission Impairments and Equalization
*Presider: Jim Zou; ADTRAN, Inc, USA and Jim Zou; ADTRAN, Inc, USA*

**SpW3G.1 • 14:00 (Invited)**
**Modeling Equalization-Enhanced Phase Noise,** Benedikt Geiger[1], Fred Buchali[2], Vahid Aref[2], Laurent Schmalen[1]; *[1]Communications Engineering Lab (CEL), Karlsruhe Inst. of Technology (KIT), Germany; [2]Nokia, Germany.* Equalization-enhanced phase noise has emerged as a

critical impairment in high-baud-rate coherent optical systems. This talk reviews recent modeling advances, highlights its distortion-induced nature, and discusses implications for digital signal processing-based mitigation.

**SpW3G.2 • 14:30**
**Loss Budget Evaluation of a 120-Gbit/s C-Band Hybrid PON With IM-Coherent Upstream and DCPC Downstream,** Ryo Igarashi[1], Jin Uchiyama[1], Ryo Koma[1], Kazutaka Hara[1], Jun-ichi Kani[1], Tatsuya Shimada[1]; *[1]NTT Access Service Systems Laboratories, Japan.* This paper investigates a hybrid IM-coherent/DCPC PON achieving 120-Gbit/s transmission using a 20-km fiber link. Calculation results reveal the impact of the extinction ratio and demonstrate a 35-dB loss budget in both upstream and downstream.

**SpW3G.3 • 14:45**
**On the Multipath Interference-Induced BER Fluctuation Within Laser Coherence Length,** Wing-Chau Ng[1], Scott Yam[2]; *[1]Carleton Univ., Canada; [2]Electrical and Computer Engineering, Queen's Univ., Canada.* We demonstrate, for the first time, how multipath interference resizes PAM 4 constellation before the addition of receiver addition in the coherent regime and thus increases bit error rate fluctuation in intra data centers.

**SpW3G.4 • 15:00**
**Modulation-Aware Fixed-FFT Nonlinear Equalization Using Statistical Phase Variance Modeling for Coherent Optical Systems,** Nidhi Singh[1]; *[1]IIT Kanpur, India.* A modulation-aware nonlinear equalization framework with fixed FFT size is proposed. A statistical phase variance model enables joint mitigation of dispersion and nonlinear effects, achieving up to 1.6 dB OSNR gain with constant complexity.

## 14:00 -- 15:30
## Room: Pacific I
## SW3F • Solar Spectral Management
*Presider: Susanna Thon; Johns Hopkins Univ., USA*

**SW3F.1 • 14:00 (Invited)**
**Large-Area, Nanoscale Optics for Photovoltaics, Agrivoltaics, and Radiative Cooling,** Vivian Ferry[1]; *[1]Univ. of Minnesota Twin Cities, USA.* This talk will discuss new materials for very-large-scale optical structures for photovoltaics, agrivoltaics, and radiative cooling. I will discuss light management for land co-use, and fabrication strategies for roll-to-roll printing of metamaterials and structured polymers.

**SW3F.2 • 14:30**
**Radiative Thermal Constraints on the Optimal Absorption Band of Space-Based Photovoltaics,** Daehyun L. Kim[1], David E. Abraham[1], Aaswath P. Raman[1]; *[1]Department of Materials Science and Engineering, Univ. of California, Los Angeles, USA.* Solar-infrared photon conversion in space generates disproportionate waste heat due to radiative cooling constraints.

We show that the optimal absorption cutoff shifts to shorter wavelengths, establishing new fundamental efficiency limits for thermally constrained photovoltaics.

**SW3F.3 • 14:45 (Invited)**
**Title to be Announced,** Lin Zhao[1]; [1]*Massachusetts Inst. of Technology, USA.* Abstract not available.

**SW3F.4 • 15:15**
**Luminescent Solar Concentrator Based Building Integrated Photovoltaic Device for Indoor Lighting and Power Generation,** Mayank Gupta[1], Param Sinh Zala[1], Brijesh Kumar Tripathi[1], Prakash Chandra[1]; [1]*Pandit Deendayal Energy Univ., India.* The luminescent solar concentrator based on Fluoride host $NaYF_4$ co-doped with $Er^{3+}$ and $Yb^{3+}$ is developed to convert near infrared into visible sunlight efficiently and characterized optically for simultaneous indoor daylighting and electrical power generation.

## 16:00 -- 18:00
## Room: International I
## BW4A • Symposium on Ultrafast Laser Processing in Transparent Material
*Presider: Matthieu Lancry, Universite Paris-Saclay, France*

**BW4A.1 • 16:00 (Invited)**
**Strong Field Photoinscription in Solid Dielectrics With Few-Cycle Pulses,** Alexandre Mermillod-Blondin[1], Tamas Nagy[1], Dieter Engel[1], Razvan Stoian[2], Jean-Philippe Colombier[2], Jose Andrade[1], Laura Rammelt[1], Vladimir Fedorov[2], Federico Furch[3,1]; [1]*Max-Born Institut, Germany;* [2]*Laboratoire Hubert Curien, France;* [3]*Ruhr Universität Bochum, Germany.* Near-infrared few-cycle pulses (with a typical duration < 10 fs) combine high peak intensity with low deposited energy, enabling low-temperature interactions. This regime supports high-precision microprocessing of solid dielectrics, particularly in geometries where thermal effects typically limit accuracy.

**BW4A.2 • 16:30 (Invited)**
**Silicon Photonic Integrated Bragg Gratings and Applications,** Jianping Yao[1]; [1]*Microwave Photonics Research Laboratory, School of Electrical Engineering and Computer Science, Univ. of Ottawa, Canada.* Recent advances in silicon photonic integrated Bragg gratings are reviewed, highlighting special designs enabling arbitrary spectral response, as well as ultrafast tunability for filtering, pulse shaping, and microwave photonic signal processing.

**BW4A.3 • 17:00 (Invited)**
**Glass Waveguides for Co-Packages Optics,** Jason Grenier[1]; [1]*Corning Inc., USA.* Abstract not available.

**BW4A.4 • 17:30**
**Engineering Dielectric Nanoparticles in Optical Fiber With Femtosecond Laser Beam Shaping,** Floriane Pellerin[1], Imane Sahnoune[2], Geoffroy Aubry[1], Martiane Cabié[3], Thomas Neisius[3], Claire Petuya[4], Marc Dussauze[4], Franck Pigeonneau[2], Wilfried Blanc[1], Matthieu

Bellec[1]; *[1]Institut de Physique de Nice, Université Côte d'Azur, CNRS, France; [2]CEMEF - Centre for Material Forming, UMR 7635, France; [3]CP2M, Aix Marseille Univ, CNRS, Centrale Marseille, FSCM, France; [4]Univ. Bordeaux, ISM, UMR 5255, France.*

New optical fibres with dielectric nanoparticles enhance scattering for distributed sensors. Precise control of nanoparticle properties is essential. We propose using a beam-shaped femtosecond laser to locally, at the microscale, heat and modify them.

## 16:00 -- 18:00
## International III
## IW4B • Packaging and Out of Chip Coupling
*Presider: Minah Seo; Sogang Univ. South Korea*

**IW4B.1 • 16:00 (Invited)**
**Voluminizing Photonics Packaging and Assembly With Electronics Manufacturing Services,** Yanran Xie[1]; *[1]Jabil, Inc., Canada.* In this talk, we explore the current status and challenges of photonics packaging from design to a volume production scale, especially the key processes including die attach, lens alignment and fiber attach.

**IW4B.2 • 16:30**
**Experimental Characterization of Mode-Dependent Beam Emission From Integrated Photonic Grating Couplers,** Melika Momenzadeh[1], Ping-Chun Chen[1], joshua bocanegra[3], Maxim R. Shcherbakov[1,2]; *[1]Electrical Engineering and Computer Science, Univ. of California Irvine, USA; [2]Materials Science and Engineering, Univ. of California, Irvine, USA; [3]Physics and Astronomy, Univ. of California, Irvine, USA.* Mode-dependent emission from an apodized focusing grating coupler is experimentally characterized. At z = 100 μm, $TE_{00}$ and $TE_{10}$ modes enable three-point addressing with −11 dB/−15 dB crosstalk (outer) and < −20 dB (center).

**IW4B.3 • 16:45**
**Vertically Coupled Antenna for the Development of Large-Area, Dense Optical Phased Arrays,** GERVASIO A. D'ANZIERI[1], SARRA SALHI[1], JIAN CAO[1], WARREN KUT KING KAN[2], Daniele Melati[1], Jean-René Coudevylle[3]; *[1]C2N-CNRS, France; [2]CEA-LETI, France; [3]Centre de Nanosciences et de Nanotechnologies, Université Paris-Saclay, CNRS, France.* We exploit a multi-layer integration platform to separate photonic feed waveguides from grating antennas. We demonstrate 1.5mm × 40 μm antennas that achieve near-unity filling factor, enabling highly directional, large-area optical phased arrays.

**IW4B.4 • 17:00**
**High-Efficiency Normal-Incidence Dual-Etch Silicon Nitride Grating Couplers at 780 nm,** Simon A. Bongarz[1], Carson G. Valdez[1], David A. Miller[1], Olav Solgaard[1], Michel Digonnet[1]; *[1]Stanford Univ., USA.* Normal-incidence silicon-nitride grating couplers at 780 nm for quantum photonics and atomic physics applications are designed using adjoint-based inverse design in either an oxide cladding, an air cladding, or an oxide cladding with a bottom-reflector, with peak coupling efficiencies of 73%, 89%, and 97%, respectively.

## 16:00 -- 18:00
## Room: Atlantic I
## IW4C • Integration Platforms
*Presider: Daniele Melati; C2N-CNRS, France*

**IW4C.1 • 16:00 (Invited)**
**Lithium Niobate Integrated Photonics: Can Nitride Loading Compete With Direct Etching?,** Arnan Mitchell[1]; [1]*Royal Melbourne Inst. of Technology, Australia.* Abstract not available.

**IW4C.2 • 16:30**
**Oxidation-Robust SiC Photonic Crystal Nanocavities for Stable Resonance,** Heungjoon Kim[2,4], Bong-Shik Song[2,1], susumu Noda[3,2], takashi Asano[2]; [1]*Department of Electrical and Computer Engineering, Sungkyunkwan Univ., Korea (the Republic of);* [2]*Department of Electronic Science and Engineering, Kyoto Univ., Japan;* [3]*Inst. for Advanced Study, Kyoto Univ., Japan;* [4]*Electronics and Telecommunication Research Inst., Korea (the Republic of).* We investigate surface oxidation effects in SiC photonic crystal nanocavities using ozone-based processing. Compared with Si nanocavities, SiC exhibits minimal and highly stable resonance shifts, demonstrating superior robustness against oxidation-induced optical perturbations under ambient conditions.

**IW4C.3 • 16:45 (Invited)**
**Silicon Carbide Integrated Photonics,** Xiaoke Yi[1]; [1]*Univ. of Sydney, Australia.* Silicon carbide is emerging as a powerful platform for photonic integrated circuits (PICs) for both classical and quantum applications. This talk will highlight recent advances in silicon carbide PICs, and discuss opportunities for future integrated devices

**IW4C.4 • 17:15 (Invited)**
**Growth-Programmed Optical Resonances and Switching Energetics in Phase Change Metastructures,** Yedeng Fei[1], Tony Kong[1], avik Mandal[1], Abbas Sheikh-Ansari[1], Behrad Gholipour[1]; [1]*Univ. of Alberta, Canada.* Glancing-angle deposition of GeTe enables self-assembled anisotropic metastructures where morphology alone co-programs optical eigenmodes and phase-transition energetics. At constant composition, growth geometry links resonant response and switching thresholds, establishing a lithography-free paradigm for active metamaterials.

## 16:00 -- 18:00
## International IV
## NoW4D • Soft Materials for Novel Applications
*Presider: Richard Osgood; US Army, USA*

**NoW4D.1 • 16:00 (Invited)**
**Ultra-Flexible Organic Phtonic Devices for Sensor Applications,** Tomoyuki Yokota[1]; [1]*The Universit of TOkyo, Japan.* We developed a flexible imager comprising thin-film transistor and organic photodiodes with high-resolution and high-speed readout characteristics. Owing to

these characteristics, pulse wave signals can be measured, and the images of fingerprints and veins can be obtained.

**NoW4D.2 • 16:30 (Invited)**
**Mechanically Responsive Microstructured Optics via Two-Photon Polymerization: Recent Progress and Next Steps,** Paige Stinson[1]; [1]*MetaForge Technology, LLC, USA.* Micro-optomechanical structures offer more dynamic optical control than static micro-optics. In this work, several novel mechanically sensitive micro-structured optics are presented. In each case, mechanical tuning is enabled by combining the advantageous physical properties of polymers with geometries optimized for actuation.

**NoW4D.3 • 17:00 (Invited)**
**Paper-Based Chemosensor Array Devices for Pattern Recognition-Driven Sensing,** Tsuyoshi Minami[1]; [1]*Univ. of Tokyo, Japan.* Paper substrates are attractive platforms for chemical sensors because of their eco-friendliness and excellent processability. By integrating cross-reactive chemosensor elements, paper-based optical sensor arrays enable multicomponent analysis through pattern recognition. Herein, the author presents design strategies for paper-based chemosensor array devices and demonstrates their applicability to real-sample analysis without relying on stationary analytical instruments.

**NoW4D.4 • 17:30**
**The Beating Heart of Reflectin:**
**a Protein Machine Dynamically Fine-Tuning the Color of Squid Skin for Camouflage and Communication,** Daniel Morse[1]; [1]*Univ. of California Santa Barbara, USA.* Reflectin is a novel signal transducer that finely tunes color of squid skin in response to neuronal control. Cyclically repetitive, reversible folding and assembly of small synthetic peptides, triggered with low voltage, confirms reflectin's molecular mechanism of action, like the mechanical action of a concatanate of opposing mechanical springs.

**NoW4D.5 • 17:45**
**Enhanced Third-Harmonic Generation via Femtosecond Laser-Induced De-Doping in PEDOT:PSS,** Oleksiy Anopchenko[1], Jin Yan[1], Hyung Joon Shim[2], Quynh T. Dang[1], Christopher M. Gonzalez[1], Zhaofu Chen[3], Dion Khodagholy[2], Ho Wai Howard Lee[1]; [1]*Physics and Astronomy, Univ. of California Irvine, USA;* [2]*Electrical Engineering and Computer Science, Univ. of California, Irvine, USA;* [3]*Chemical and Biomolecular Engineering, Univ. of California, Irvine, USA.* Enhanced third-harmonic generation in PEDOT:PSS thin films under 1300 nm femtosecond irradiation occurs with increased laser power and repeated exposure. Systematic control of power and dwell time tunes the response via irradiation-induced PEDOT dedoping, enabling programmable nonlinear optical functionality.

## 16:00 -- 18:00
## Room: Catalina
## NpW4E • Nonlinear Optical Materials and Characterization
*Presider: Ofir Yesharim; Tel Aviv Univ., Israel*

**NpW4E.1 • 16:00 (Invited)**
**Orientation Patterned GaP Waveguides for Integrated Nonlinear Photonics,** Konstantinos Pantzas[1], Sylvain Combrié[2], Brieg Le Corre[1], Maxime Millotte[1], Abdelmounaim Harouri[1], Bruno Gérard[3], Luc Le Gratiet[1], Grégoire Beaudoin[1], Gilles Patriarche[1], Alfredo De Rossi[2], Isabelle Sagnes[1], Yoan Léger[4], Arnaud Grisard[2]; *[1]Centre de Nanosciences et de Nanotechnologies, Université Paris Saclay - CNRS, France; [2]Thales Research and Technology,, France; [3]III-V Lab, France; [4]Institut Foton (UMR6082/CNRS-Univ. Rennes-INSA),, France.* Orientation-Patterned Gallium Phosphide (OP-GaP) is presented as an emerging III-V platform for integrating a variety of nonlinear optical processes on photonic integrated chips. The paper discusses the fabrication process, performance compared to competing platforms, and applications for a variety of second-order nonlinear conversion processes between the visible and the near infrared, including spontaneous parametric down-conversion.

**NpW4E.2 • 16:30**
**Nonlinear Optical Properties of Erbium-Doped ZBLAN Slabs,** chinonso e. ezeobi[1]; *[1]Univ. of Maryland, Baltimore, USA.* Characterization of nonlinear refractive index and nonlinear absorption coefficient of erbium-doped ZBLAN slabs using Z-scan technique. We measured n2 = (5.60 ± 0.05) × 10−16 cm2/W and β = (−3.86 ± 0.03) × 10−11 m/W.

**NpW4E.3 • 16:45**
**Excitation Spectra Signatures of SHG-Assisted UV Defect Luminescence in Rhombohedral Boron Nitride,** Bazlul Karim[2], Krzysztof P. Korona[1], Aleksandra K. Dabrowska[1], Jakub Iwanski[1], Johannes Binder[1], Andrzej Wysmolek[1], Mariusz Klimczak[1]; *[1]Uniwersytet Warszawski, Poland; [2]Laser Centre, Instytut Chemii Fizycznej, Poland.* Photoluminescence and SHG excitation spectra of epitaxial BN reveal that rhombohedral stacking enables an additional SHG pathway to C300 ultraviolet emission, strengthening visible pump response compared to hBN and enabling long-wavelength access to UV emitters.

**NpW4E.4 • 17:00**
**Dynamic Coupling Between an Epsilon-Near-Zero Thin Film and Conducting Polymer Nanoantennas,** Suraya Kazi[1], Yulong Duan[1], Magnus Jonsson[1]; *[1]Linköpings universitet, Sweden.* Epsilon-near-zero (ENZ) systems provide compelling opportunities for nonlinear optics but are typically static. We demonstrate a dynamically tunable ENZ system by coupling to redox-active conducting polymer nanoantennas, providing 90% modulation of the local field enhancement within the ENZ thin film.

**NpW4E.5 • 17:15**
**All-Optical Exceptional-Line Semimetallic Character in Thermal Atomic Vapor,** Arannya Ghosh[1], Soumik Nandi[2], Ashok K. Mohapatra[2], Ritwick Das[1]; *[1]Optics and Photonics Centre,*

*Indian Inst. of Technology Delhi, India; [2]Physical Science, National Inst. of Science Education and Research Bhubaneswar, India.* We show a non-Hermitian anti-PT symmetric character in thermal atomic-vapor, exhibiting concentric bright rings in the near-field of the probe laser beam. We also describe the $Z_2$ index through spatial topology to illustrate the topological phase transition at exceptional rings. This system is analogous to an all-optical exceptional-line semimetal.

**NpW4E.6 • 17:30**
**Plasmonic Dynamics Under High Intensity Illumination,** Pavel Shafirin[1], Durga Prasad[1], Artur Davoyan[1]; *[1]Univ. of California Los Angeles, USA.*
We investigate dynamic properties of plasmonic modes under femtosecond laser illumination at intensities ranging from 1e12 to 1e16 W/cm2 using particle-in-cell (PIC) simulations. Our results demonstrate that plasmonic excitations persist in this extreme regime.

## 16:00 -- 18:00
## Room: International V
## SpW4G • FSO/THz
*Presider: Yuanqiu Luo; Futurewei Technologies Inc, USA*

**SpW4G.1 • 16:00 (Invited)**
**Mid-Infrared Free Space Optical Transmissions Enabled by Semiconductor Optoelectronics,** Xiaodan Pang[1,2], Zhidong Lyu[1], Yan-Ting Sun[3], Lu Zhang[1], Xianbin Yu[1], Baile Chen[4], Carlo Sirtori[5], Oskars Ozolins[2]; *[1]Zhejiang Univ., China; [2]Riga Technical Univ., Latvia; [3]KTH Royal Inst. of Technology, Sweden; [4]ShanghaiTech Univ., China; [5]École Normale Supérieure, France.* We review recent progress in mid-infrared free-space optical (FSO) communications leveraging semiconductor optoelectronics. Exploiting the low atmospheric loss and scattering resilience of MWIR (3–5 μm) and LWIR (8–14 μm) windows, we demonstrate multi-Gbps FSO links using directly modulated quantum cascade lasers, quantum cascade detectors, and Stark-effect modulators, achieving data rates up to 55 Gb/s in the LWIR and 14 Gb/s in the MWIR.

**SpW4G.2 • 16:30 (Invited)**
**Photonics Terahertz DSCM Communication Systems,** Lu Zhang[1], Zhanhong Wang[1], Oskars Ozolins[2], Xiaodan Pang[1], Xianbin Yu[1]; *[1]Zhejiang Univ., China; [2]Riga Technical Univ., Latvia.* Photonics-assisted terahertz communication systems, combined with digital subcarrier multiplexing (DSCM), offer a compelling solution for future high-speed wireless networks by enabling flexible and efficient spectrum utilization.

**SpW4G.3 • 17:00**
**17Gb/s MWIR FSO Transmission Using Low-Threshold Directly-Modulated QCL With a UTC-PD Detector,** Zhidong Lyu[1], Yuhang Zhang[3], Yang Cheng[2], Zhecheng Dai[4], Tianyu Jiang[6,7], Richard Schatz[6], Yan-Ting Sun[7], Toms Salgals[5], Sandis Spolitis[5], Vjaceslavs Bobrovs[5], Sergei Popov[7], Lu Zhang[1], Xianbin Yu[1], Oskars Ozolins[5], Baile Chen[4], Jun Wang[2], Xiaodan Pang[1,5]; *[1]Zhejiang Univ., China; [2]Suzhou Everbright Photonics Co., Ltd., China; [3]Sichuan Univ., China; [4]ShanghaiTech Univ., China; [5]Riga Technical Univ., Latvia; [6]RISE Research Inst.s of Sweden, Sweden; [7]KTH Royal Inst. of Technology, Sweden.* We achieve 17 Gb/s MWIR FSO

transmission at room temperature using an energy-efficient QCL with a low lasing threshold of 30 mA and an uncooled UTC-PD.

## 16:00 -- 18:00
## Room: Pacific I
## SW4F • Solar Photovoltaics: Light Management & Optimization
*Presider: Vivian Ferry; Univ. of Minnesota Twin Cities, USA*

**SW4F.1 • 16:00 (Invited)**
**Unintended Consequences: Connections Between Optical Gains and Reliability in PV Modules,** Michael Deceglie[1]; [1]*National Laboratory of the Rockies, USA.* With solar cells nearing efficiency limits, optical engineering boosts energy output. However, strategies like bifacial modules and UV-transmitting encapsulants can have unintended impacts on module reliability. This talk explores trade-offs between optical gains and reliability.

**SW4F.2 • 16:30**
**Pathways to Ultra High Efficiency (>70%) Solar Modules Using Luminescent Solar Concentrators With Photoluminescence Trapping,** Daniel J. Katz[1], Lauren Darzynkiewicz[1], Lindsey Parsons[1], Carissa Eisler[1]; [1]*Univ. of California Los Angeles, USA.* Luminescent concentrators could enable >70% efficiency solar modules. We used probabilistic modeling and detailed balance calculations to quantify the required material properties. We explored experimentally verified photoluminescence trapping via filters and directional light emission engineering.

**SW4F.3 • 16:45 (Invited)**
**Light-Enhanced Evaporation With White Wick:Towards Nonphotothermal Charge Transfer to Solvent,** Navindra D. Singh,[1], Rohit Nandivada[1], Luat Vuong[1]; [1]*Univ. of California at Riverside, USA.* We elaborate on the fabrication, characterization, testing, and spectral selective trends associated with light-induced evaporation with a microporous aluminum nitride wick. Bulk and surface light-matter interactions may explain the enhanced evaporation above the photo-thermal limit.

**SW4F.4 • 17:00**
**ToMAI-Sense: Optical Sensing and AI for non-Destructive Tomato Quality Assessment Under Natural Illumination,** David Helman[1], Yedidya Harris[1]; [1]*Hebrew Univ. of Jerusalem, Israel.* Tomato quality assessment relies on destructive lab testing. ToMAI-Sense is a low-cost multispectral imaging prototype for rapid, non-destructive assessment of multiple fruits. Machine learning–based spectral feature selection reduced 204 bands to 3–5 channels, enabling accurate prediction on unseen fruit with promising field performance.

**SW4F.5 • 17:15**
**Geometry-Dependent Plasmonic Light–Matter Interaction in Coumarin-Based DSSCs: a Multiscale Study,** Richa Verma[1], Alok Singh[1], Pratima Rajput[1]; [1]*JSS UNIV. NOIDA, India.* This work examines size- and geometry-dependent plasmonic effects in coumarin-based DSSCs using a multiscale framework (DFT, COMSOL, SCAPS-1D), demonstrating improved light absorption, charge transport, and device performance through nanoparticle-induced local field

effects.

**SW4F.6 • 17:30**
**Coloring Solar Photovoltaic Panels with Quasi-Ordered Photonic Structures,** Zhenpeng Li[1]; [1]*Princeton Univ., USA.* Quasi-ordered photonic structures offer a bioinspired route to colored solar photovoltaic panels by selectively scattering visible light while transmitting most usable solar radiation. This optical design enables non-iridescent blue, cyan, and greyish-white silicon PV modules with over 20% efficiencies to facilitate integrated applications.

## Thursday, 30 July

### 09:00 -- 10:00
### International I
### BTh1A • Industrial Standardization and Applications I

**BTh1A.1 • 09:00 (Invited)**
**Athermal Single Frequency Fibre Amplifiers,** Chun-Wei Chen[1]; [1]*Univ. of Bath, UK.* Almost all lasers generate heat, leading to noise and nonlinear effects. We use anti-Stokes-fluorescence cooling to make fibre lasers that run cool without external cooling. Advances in glass have enabled watt-level output and continued scaling.

**BTh1A.2 • 09:30**
**Femtosecond Laser Inscribed all-Fiber add-Drop Multiplexer,** Foroogh Jafari[1], François Gonthier[3], Sebastien Quatresooz[1], Raman Kashyap[1,2], Sébastien Loranger[1]; [1]*Electrical engineering, Polytechnique Montreal, Canada;* [2]*Engineering Physics, Polytechnique Montreal, Canada;* [3]*O'Fiberty technologies Inc, Canada.* An in-coupler Bragg grating with ~ 70 % drop efficiency is achieved in a low-loss coupler. A Michelson filter achieves up to 93% drop efficiency using identical FBGs, with phase instability mitigated by waveguide inscription.

**BTh1A.3 • 09:45**
**Direct Laser Writing of an Implantable Integrated Platform for High Resolution Intravital Imaging,** Alessandra Nardini[1], Marco Vigneri[4], Behjat S. Kariman[2], Mario Marini[3], Claudio Conci[4], Laura Sironi[4], Maddalena Collini[3], Roberto Osellame[1], Giulio N. Cerullo[2], Manuela T. Raimondi[4], Giuseppe Chirico[3], Rebeca Martinez Vazquez[1]; [1]*Istituto di Fotonica Nanotecnologie CNR, Italy;* [2]*Physics, Politecnico di Milano, Italy;* [3]*Physics, Università di Milano-Bicocca, Italy;* [4]*Chemistry, Materials and Chemical Engineering "Giulio Natta", Politecnico di Milano, Italy.* We developed a miniaturized implantable optical system to deliver high-resolution intravital microscopy with minimal invasiveness. The device is fabricated by multiphoton laser polymerization and combines microscaffolds to guide tissue ingrowth, and microlenses for *in-situ* non-linear imaging with improved magnification and spatial resolution.

### 08:30 -- 10:00
### Room: International III
### lTh1B • Integrated Classical and Quantum Photonic Computing
*Presider: Yanran Xie; McMaster Univ., Canada*

**lTh1B.1 • 08:30 (Invited)**
**Integrated Reconfigurable Metasurface Photonic Systolic Arrays for High-Performance, Energy Efficient AI Interference,** Cristian Ciraci[1]; [1]*Neurophos, USA.* We present a metasurface-based optical systolic array that performs matrix multiplication—the core of AI inference—entirely in the optical domain, with sub-microsecond switching. Roadmap performance could reach exaops/s at a few percent of GPU power.

**ITh1B.2 • 09:00**
**Surrogate Neural Networks for SiN and Si Photonic Mesh Circuits,** Ananya Susan Cherian[2], Anagha Gayathri[1,2], Aaron Danner[3], Anil Prabhakar[1,2]; *[1]Electrical Engineering, IIT Madras, India; [2]CQUICC, India; [3]Electrical and Computer Engineering, NUS, Singapore.* We develop surrogate neural networks for two photonic integrated circuits, a 4$\times$4 SiN Mach-Zender interferometer and a 6$\times$6 Si multiplier, and conduct a comparative analysis of these different material-based chips. Predicted outputs from the surrogate networks match measurements, enabling optical hardware control.

**ITh1B.3 • 09:15**
**Trapped ion Qubit Gate Operations With Integrated Photonic Lasers,** Robert Niffenegger[1], Chris Caron[1], Zhenyu Wei[1], Nick Montifore[2], Andrei Isichenko[2], David Heim[2], Meiting Song[2], Daniel Blumenthal[2]; *[1]Univ. of Massachusetts Amherst, USA; [2]Univ. of California Santa Barbara, USA.* We report progress developing a compact trapped ion quantum computer and portable optical clock, utilizing both a photonic integrated direct-drive visible wavelength Brillouin laser and a photonic external cavity laser stabilized to an integrated 3-meter coil-resonator reference cavity.

**ITh1B.4 • 09:30 (Invited)**
**Integrated Silicon Photonic Circuit for Quantum Information Processing,** Nobuyuki Matsuda[1]; *[1]Tohoku Univ., Japan.* Silicon photonics is a powerful tool for quantum technologies. We present the development of silicon photonic integrated circuits for quantum information processing and their applications.

## 08:30 -- 10:00
## Room: International IV
## JTh1C • Joint Session (NOMA/SOLITH): Perovskite Optical Materials and Devices
*Presider: Carissa Eisler; Univ. of California Los Angeles, USA*

**JTh1C.1 • 08:30 (Invited)**
**Controlling Halide Perovskite Surface Chemistry for Optical Applications Using Ionic Liquids,** Richard L. Brutchey[1]; *[1]Department of Chemistry, Univ. of Southern California, USA.* Perovskite $CsPbBr_3$ quantum dots exhibit defect-limited emission governed by surface chemistry. Using solution NMR and photophysical analysis, we investigate phosphonium ionic liquids (ILs) that exchange native ligands and modify quantum dot surfaces. Bromide ILs passivate halide vacancies, while a redox-active tribromide IL heals metallic $Pb^0$ defects, producing up to ~5× PLQY enhancement and improved stability.

**JTh1C.2 • 09:00**
**Tunable Optical Switching in Layered Halide Perovskites,** Lance Wheeler[1], Nikhila Balasubramaniam[1], Brodrick Sevart[1,2], Jeffrey Blackburn[1], Andrew Ferguson[1], Matthew Crane[1,2]; *[1]National Laboratory of the Rockies, USA; [2]Colorado School of Mines, USA.* Switchable layered halide perovskite composite films were fabricated using two solvents and atmospheric conditions. Both solvents facilitated color tunability by exposing the composite films to humidity. 2-Methoxyethanol allowed for tunability between a broad continuum of optical

states to near binary-like switching and air-free processing.

**JTh1C.3 • 09:15**
**Designing Efficient Solution-Processed $CsPbBr_3$ Perovskite Luminescent Solar Concentrators with Enhanced Photon Trapping,** Daniel J. Katz[1], Gabriela Nerhood[1], Rishab Gupta[1,2], Ella Levine[1], Nadia Owen[1,3], Samuel Acker[1], Carissa Eisler[1]; *[1]Univ. of California Los Angeles, USA; [2]Intel Corporation, USA; [3]Total Energies, USA.* An entirely solution-processed $CsPbBr_3$ perovskite Luminescent Solar Concentrator architecture was achieved through a room temperature synthesis. Spin coated thin film reflectors increased the fraction of emission trapped in the device for improved performance.

**JTh1C.4 • 09:30 (Invited)**
**Title to be Announced,** David P. Fenning[1]; *[1]Univ. of California San Diego, USA.* Abstract not available.

## 08:30 -- 10:00
## Room: Catalina
## NoTh1D • Laser Assisted Fabrication
*Presider: Edward Kinzel; Univ. of Notre Dame, USA*

**NoTh1D.1 • 08:30 (Invited)**
**Developments in the Additive Manufacturing of Optical Lenses Using Laser Directed Energy Deposition,** John Bernardin[1]; *[1]Los Alamos National Laboratory, USA.* The detailed design of a glass additive manufacturing system is presented along with preliminary results of manufacturing geometrical lenses. Influential manufacturing variables and their impact on the quality of the optical lenses will be discussed.

**NoTh1D.2 • 09:00 (Invited)**
**Transfer Function Based Spectral Tolerancing of Additively Manufactured Gradient-Index Optical Materials,** george williams[1], Maxim Lunin[1], Samuel Grimm[1], Daniel Peterson[1], Jule Thomas[1]; *[1]NanoVox LLC, USA.* A spectral tolerancing framework for additively manufactured gradient-index (GRIN) optics is developed, linking multispecies composition, apochromatic control, deposition, quantization, diffusion, and curing to optical performance. Fabrication is modeled as a cascaded transfer-function process that replaces voxel-pitch criteria with spectral error metrics, evaluating tolerances through the spatial-frequency content of residual refractive-index error and projected wavefront statistics.

**NoTh1D.3 • 09:30 (Invited)**
**Epitaxial $BaTiO_3$ Thin Films Integrated on Si by Pulsed Laser Deposition for Large Electro-Optic Response,** Heungsoo Kim[1], Scott Mathews[1], Jason Tischler[2], Agham Posadas[2], Alexander Demkov[2], Alberto Piqué[1]; *[1]US Naval Research Laboratory, USA; [2]The Univ. of Texas at Austin, USA.* By controlling epitaxial strain of $BaTiO_3$ thin films integrated on Si, we were able to produce *a*-oriented domains in $BaTiO_3$ films and demonstrated an effective electro-optic response of 432 pm/V in 500 nm-thick $BaTiO_3$ films.

## 08:30 -- 10:00
## Room: Pacific II
## SoTh1E • Sensing Applications of SOF
*Presider: Peter Dragic; Univ of Illinois at Urbana-Champaign, USA*

**SoTh1E.1 • 08:30 (Invited)**
**Structuring Nanoparticle-Doped Optical Fibres From the km to the µm Scale,** Wilfried Blanc[1,2], Floriane Pellerin[1,2], Franck Pigeonneau[3,4], Matthieu Bellec[1,2]; *[1]CNRS, France; [2]Université Côte d'Azur, France; [3]Mines Paris, France; [4]PSL Univ., France.* There is growing interest in incorporating nanoparticles into optical fibres for use in sensors and lasers. The performance of these fibres depends on our ability to optimise the characteristics of the nanoparticles (size, shape, etc.). This presentation will discuss the various fabrication processes that enable such engineering, from the kilometre to the micrometre scale.

**SoTh1E.2 • 09:00 (Invited)**
**Hollow Core Fibres for Compact, High-Performance Sensors: Challenges, Trade-Offs, and Opportunities,** Austin Taranta[1]; *[1]Univ. of Southampton, UK.* Hollow core fibres (HCFs) offer compelling performance for many sensors but are limited by bend sensitivity and size. We report progress in low-loss HCFs enabling long-baseline, tightly coiled deployment in high-performance gyroscopes and other sensors.

**SoTh1E.3 • 09:30**
Withdrawn

**SoTh1E.4 • 09:45**
**Enhancing Robustness of Speckle Based Sensing With Deep Learning,** Przemyslaw L. Falak[1], Zhiyuan Zheng[2], Dan Varughese[2], Timothy Lee[1], Pawel Maniewski[2], Gholamreza Shayeganrad[2], Martynas Beresna[1], Christopher Holmes[1,2]; *[1]Optoelectronics Research Centre, Univ. of Southampton, UK; [2]School of Engineering, Univ. of Southampton, UK.* Deep-learning enhances speckle-based sensing robustness. A convolutional neural network is exploited for a wavemeter classifier and a supervised-contrastive model is utilised for polarization-robust strain discrimination with 8 microstrain spacing, together improving speckle-based fiber-optic interrogation.

## 08:30 -- 10:00
## Room: International V
## SpTh1F • Quantum Communications and Security
*Presider: Takuya Ikuta; NTT Basic Research Laboratories, Japan*

**SpTh1F.1 • 08:30 (Invited)**
**Integrated Photonics Platforms for Quantum Networks,** Giulia Guarda[1], Domenico Ribezzo[1], Alessandro Zavatta[2], Davide Bacco[1]; *[1]Universita degli Studi di Firenze, Italy; [2]CNR INO, Italy.* Entanglement distribution is central to quantum networks, enabling quantum key

distribution for secure communication. This paper reviews recent developments in photonic integrated circuits for entanglement distribution, focusing on path and frequency degrees of freedom.

**SpTh1F.2 • 09:00 (Invited)**
**Ultra-High-Speed Spatially Multiplexed Quantum Random Number Generator Based on Vacuum Fluctuations,** Ken Tanizawa[1], Kentaro Kato[1], Fumio Futami[1]; *[1]Tamagawa Univ., Japan.* We present a real-time 50-Gbit/s quantum random number generator employing four parallel homodyne receivers. A table-top prototype demonstrates long-term stable operation with high security and remote random number generation over optical fiber.

**SpTh1F.3 • 09:30**
**Ultra-Low-Rate Information Reconciliation: Repetition Coding or Dedicated Codes,** Erdem E. Cil[1], Laurent Schmalen[1]; *[1]Karlsruher Institut für Technologie, Germany.* We compare repetition-based ultra-low-rate information reconciliation with dedicated ultra-low-rate codes for CV-QKD. Repetition coding offers a favorable performance-complexity trade-off, incurring only a moderate error-rate penalty while reducing decoding complexity by 2x, making it attractive for implementation-constrained systems.

**SpTh1F.4 • 09:45**
**Improving Fiber Network Observability for Security Research,** Jennifer M. Sheldon[1], Russell Schwartz[1], Nicola Peserico[1], Volker Sorger[1], Md Jahidul Islam[1], Takeshi Sugawara[2], Sara Rampazzi[1]; *[1]Univ. of Florida, USA; [2]The Univ. of Electro-Communications, Japan.* Splitter backscatter renders PONs susceptible to eavesdropping. Previous works only evaluate the overall power of the reflected signal. We propose a setup to improve signal observability to facilitate development of physical defenses against eavesdropping.

## 10:30 -- 12:30
## International I
## BTh2A • Industrial Standardization and Applications II
*Presider: Maria Konstantaki; FORTH-IESL, Greece and Maria Konstantaki; FORTH-IESL, Greece*

**BTh2A.1 • 10:30 (Invited)**
**Applications of Bragg-Based Phase Filters for Photonic Signal Processing of Quantum and Classical Signals,** Benjamin G. Crockett[2,1], Nicola Montaut[2], Connor Rowe[2], James van Howe[2,3], Piotr Roztocki[4], Yang Liu[2], Robin Helsten[2], Wei Zhao[2], Roberto Morandotti[2], José Azaña[2]; *[1]Univ. of British Columbia, Canada; [2]Insititut National de la Recherche Scientifique, Canada; [3]Augustana College, USA; [4]Ki3 Photonics Technologies Inc., Canada.* We will present recent works on coherent energy redistribution schemes relying on Bragg-based phase filters, covering applications such as real-time spectrum analysis of optical and microwave signals, as well as quantum state denoising.

**BTh2A.2 • 11:00**

**Refractive Index Sensor Based on a Suspended Core Fabricated With a Femtosecond Laser,** David Barrera[1], Lucía Arques[1], Elham Nazemosadat[1], Emanuele de Cristofaro[2], Salvador Sales[1]; *[1]Photonics Research Labs, ITEAM, Universitat Politècnica de València, Spain; [2]Optoelectronics Group, Engineering Department, Univ. of Sannio, Italy.* We present a refractive-index sensor based on a cavity created in multicore fiber using femtosecond laser-assisted irradiation and chemical etching. The structure enhances interaction with the external medium and is interrogated using an FBG.

**BTh2A.3 • 11:15**
**No-Core Fiber Optical Sensor for pH Monitoring Using Polymer and Metal Oxide Overlayers,** Stavroula Spyropoulou[1,2], Emmanouil Gagaoudakis[1], Christos P. Tsichlis[1,3], Theodoros Manouras[1,4], Maria Konstantaki[1]; *[1]FORTH-IESL, Greece; [2]Department of Physics, Univ. of Crete, Greece; [3]Department of Chemistry, Aristotle Univ. of Thessaloniki, Greece; [4]Department of Materials Science and Engineering, Univ. of Crete, Greece.* We demonstrate a no-core fiber optical pH sensor functionalized with APTES polymer, copper and tin oxides overlayers. Significant spectral shifts up to 30 nm were observed, with tin oxide showing reversible pH response in aqueous solutions.

**BTh2A.4 • 11:30 (Invited)**
**Non-Collinear Photoinduced Second Harmonic Generation,** Dmitry Starodubov[1]; *[1]DSTAR Communications, USA.* The photoinduced second-harmonic generation effect enables the formation of second-order nonlinear gratings in optical waveguides and bulk materials. This paper discusses the recording of such nonlinear gratings through the nonlinear interference of non-collinear optical beams.

## 10:30 -- 12:30
## International III
## ITh2B • Integrated Resonators and Passive Devices
*Presider: Cristian Ciraci; Neurophos, USA*

**ITh2B.1 • 10:30 (Invited)**
**Electronic-Photonic co-Design: From Deep Neural Networks to Ising Solvers,** Firooz Aflatouni[1]; *[1]Univ. of Pennsylvania, USA.*
In this talk I will present our work on photonic deep neural networks, training approaches used to mitigate the effect of process and temperature variations on analog computing, and electronic photonic optimizers.

**ITh2B.2 • 11:00**
**Spiral Resonator Referenced Low Phase Noise Microwave Generation,** Long Cheng[1], Mengdi Zhao[1], Yang He[1], Yu zhang[2], Roy Meade[2], Kerry Vahala[3], Mian Zhang[2], Jiang Li[1]; *[1]hQphotonics Inc., USA; [2]HyperLight Corporation, USA; [3]California Inst. of Technology, USA.* We report a high-performance photonic microwave oscillator based on ultra-low loss silicon nitride spiral resonators and integrated optical frequency division. The measured phase noise achieves record-low phase noise for chip-based microwave oscillators.

**ITh2B.3 • 11:30**

**Towards a Compact Hyperspectral Camera Based on Femtosecond-Laser-Written 3D Waveguides,** Alexis Tryoen[1,2], Sébastien Bourdel[1,2], Guillaume Druart[1], Matthieu Lancry[2], Olivier Gazzano[1]; *[1]DOTA, ONERA, Université Paris-Saclay, France; [2]Institut de Chimie Moléculaire et des Matériaux d'Orsay, Université Paris-Saclay, CNRS, France.* We report progress towards a compact hyperspectral camera enabled by 3D waveguides.We demonstrate both the femtosecond-laser fabrication and experimental operation of a waveguide-based spectrometer and a three-dimensional 30×30 waveguide array.

**lTh2B.4 • 11:45**
**Broadband Curved Directional Couplers Based on Semi-Analytic Model,** Ryosuke Mashiko[1], Jaekwon Lee[1], Fatima Alhosani[1], Carson G. Valdez[1], David A. Miller[1], Olav Solgaard[1]; *[1]Stanford Univ., USA.* We present a simple semi-analytical model for curved broadband directional couplers that maintain uniform splitting ratio over a wide wavelength range, offering an intuitive design framework and efficient low-cost design, validated by FDTD simulations.

**lTh2B.5 • 12:00**
**Seeded to for Ultra-Compact Arbitrary Angle Bends on Commercial Foundries,** Joshua J. Wong[1], Robert Pesch[1], Arjun Khurana[1], Stephen Ralph[1]; *[1]Georgia Inst. of Technology, USA.* We demonstrate ultra-compact (1.5 μm radius) arbitrary angle waveguide bends (45°, 60°, 90°, 180°) for commercial foundries with average insertion losses lower than 100 mdB and are comparable with the state of the art.

## 10:30 -- 12:30
## Room:International IV
## NoTh2C • 2D Materials and Metasurfaces
*Presider: K. Kay Son; HRL Laboratories, LLC, USA*

**NoTh2C.1 • 10:30 (Invited)**
**Toward a Metasurface Genome: Generative AI for Photonic Design,** W. J. Kort-Kamp[1]; *[1]Theoretical Division, Los Alamos National Laboratory, USA.* Generative AI is reshaping metasurface design by enabling scalable exploration of complex photonic structures. We present physics-informed and language-based frameworks that encode metasurfaces into interpretable representations for inverse design. Supported by experimentally validated devices and emerging foundation models, this approach establishes a path toward autonomous discovery of optical materials and photonic systems, unifying data-driven learning with physical constraints.

**NoTh2C.2 • 11:00**
**Metasurface Inverse Design for Optimized Near-Arbitrary Diffraction Engineering,** Tom Joly-Jehenne[1], Artur Davoyan[1]; *[1]Univ. of California Los Angeles, USA.* We propose a novel approach to metasurface engineering that applies a precise phase map to a wavefront. As a result, an arbitrary diffraction order distribution with arbitrary materials over custom frequency ranges can be achieved.

**NoTh2C.3 • 11:15**
**Designing High Reflectance Multilayered Epsilon-Near-Zero Metamaterials,** Alexander McLintock[1], Waleed Al Any[1], Blake Buckner[1], Lyuba Kuznetsova[1]; *[1]San Diego State Univ., USA.* We engineered polarization-controlled high-reflectance multilayered epsilon-near-zero metamaterial in near-infrared spectral range. Results show a characteristic dip in p-polarized light reflectance spectra at the epsilon-near-zero spectral point for the oblique angles of incidence.

**NoTh2C.4 • 11:30 (Invited)**
**Recent Advances in 2D Optical Materials,** Xiangfeng Duan[1]; *[1]California NanoSystems Inst., USA.* Abstract not available.

**NoTh2C.5 • 12:00**
**Optically Rectified Electrical Currents With Spin-Momentum-Locking and Extraordinary Transmission in Plasmonic Symmetry-Breaking Metasurfaces,** Richard M. Osgood[1], Michael Leuenberger[2], Kin Chung Fong[3]; *[1]DEVCOM SC, USA; [2]Univ. of Central Florida, USA; [3]Northeastern Univ., USA.* We have found experimentally that grating metasurfaces exhibit optical rectification currents from field-enhancing plasmonic resonances for polarization perpendicular to the grating's stripes like in the nonlinear Hall effect; the Berry curvature acts as a magnetic field and the Berry curvature dipole of the surface states creates a direct current.

**NoTh2C.6 • 12:15**
**Fano-Engineered Metamaterial Platforms for Enhanced Optical Forces at the Nanoscale,** German Suslin[1], Hania Altabbaa[1], Viet Giang Truong[1], Domna Kotsifaki[2], Sile Nic Chormaic[1]; *[1]Okinawa Inst of Science & Technology, Japan; [2]Duke Kunshan Univ., China.* We use resonant metastructures to tailor optical forces at the nanoscale. Fano resonances provide strong field confinement, while self-induced back-action enables feedback-driven trapping. This approach reveals new regimes of light–matter interaction for nanoscale manipulation and sensing.

## 10:30 -- 12:30
## Room: Catalina
## NpTh2D • Optical Computing and Advanced Nonlinear Optics Applications
*Presider: Mengjie Yu*

**NpTh2D.1 • 10:30 (Invited)**
**Ultrafast Quantum and Classical Nonlinear Nanophotonic Circuits,** Alireza Marandi[1]; *[1]California Inst. of Technology, USA.* I will present recent experimental advances in nonlinear nanophotonic circuits across quantum and classical regimes, highlighting ultrabroadband frequency comb generation, squeezed vacuum, and progress toward scalable large-scale integrated photonic systems in lithium niobate nanophotonics.

**NpTh2D.2 • 11:00 (Invited)**

**Probabilistic Photonic Computing From Quantum Vacuum Fluctuations,** Yannick Salamin[1]; [1]*Univ. of Central Florida, CREOL, USA.* I will present our recent work on biased optical parametric oscillators as stochastic computing elements, where quantum vacuum fluctuations seed controllable randomness, enabling probabilistic machine learning and highlighting opportunities for low-latency, energy-efficient photonic computing architectures.

**NpTh2D.3 • 11:30 (Invited)**
**Pulsed Stimulated Brillouin Microscopy for Fast, Low-Phototoxicity Biomechanical Imaging of Living Systems,** Fan Yang[1]; [1]*Shanghai Inst of Optics and Fine Mech, China.* Abstract not available.

**NpTh2D.4 • 12:00 (Invited)**
**Brillouin Interactions with Long Photon Lifetimes,** William Renninger[1]; [1]*Univ. of Rochester, USA.* Abstract not available.

## 10:30 -- 12:30
## Pacific II
## SoTh2E • Sensing Applications of SOF II
*Presider: Robert Bogdanowicz; Politechnika Gdanska, Poland*

**SoTh2E.1 • 10:30**
**Brazed Fiber-in-Metal Architecture for Multiaxial Strain Monitoring,** Amelia A. Ford[1], Benjamin Hatfield[2], Timothy Lee[1], Peter Glynne-Jones[2], Pawel Maniewski[2], Christopher Holmes[1,2]; [1]*Optoelectronics Research Centre, UK;* [2]*School of Engineering, Univ. of Southampton, UK.* We demonstrate novel fiber architecture, High-Aspect Ratio Flat Fiber, for enhanced mechanical coupling and stress-evolution monitoring. A proof-of-concept aluminum structure with embedded sensors enabled interpretation of directional strain in metal-integrated smart components.

**SoTh2E.2 • 10:45**
**Scattering Nanoparticle-Doped Optical Fibers for Refractive Index Sensing,** Floriane Pellerin[1], Arnaud Guardia[1], Geoffroy Aubry[1], Matthieu Bellec[1], Wilfried Blanc[1]; [1]*Institut de Physique de Nice, Université Côte d'Azur, CNRS, France.* Optical fibers with nanoparticles offer enhanced scattering, crucial for applications relying on backscattered light intensity. We demonstrate that the fiber's coating alters this intensity, enabling the development of sensors sensitive to refractive indices and liquid levels.

**SoTh2E.3 • 11:00**
**Design Map for FBG Apodization Under WDM Constraints,** Issam Trrad[1], Wardeh S. Al-Younis[1]; [1]*Department of Communications and Computer Engineering, Faculty of Engineering, Jadara Univ., Jordan.* We compare six FBG apodization profiles using the transfer-matrix method. Kaiser achieves 45.7 dB sidelobe suppression at β =6, 10 dB above Gaussian, with minimal bandwidth penalty, enabling a practical WDM design map.

**SoTh2E.4 • 11:15**

**Compact and Low-Insertion-Loss Mode-Selective LPFG-Based MDL Equalizer for 2-LP Transmission With Modulation-Radius Optimization,** Takumi Kimura[1], Takanori Sato[1], Masaki Wada[2], Yoko Yamashita[1,2], Taro Iwaya[2], Takashi Matsui[2], Kazuhide Nakajima[2], Kunimasa Saitoh[1]; *[1]Graduate School of Information Science and Technology, Hokkaido Univ., Japan; [2]NTT Access Network Service Systems Laboratories, NTT, Inc., Japan.* LPFG-based MDL-equalizer for 2-LP-mode transmission suffers from a trade-off between device length and $LP_{11}$-mode excess loss. Modulation-radius optimization enhances $LP_{01}$-to-cladding-mode coupling while suppressing $LP_{11}$-to-cladding-mode coupling, halving device length versus full-core modulation with negligible $LP_{11}$-mode loss.

## 10:30 -- 12:30
## International V
## SpTh2G • Photonic Signal Processing

*Presider: Hwan Seok Chung; Electronics and Telecom Research Inst*

**SpTh2G.1 • 10:30 (Invited)**
**Monolithically Integrated Comb Lasers for Optical Transceiver Scaling and MmWave Generation,** Gaurav Jain[1]; *[1]Pilot Photonics, Ireland.* This work investigates integrated comb laser assemblies as scalable, coherent light sources. By reducing complexity, cost, and power consumption, these technologies enable compact photonic systems for communications, sensing, mmWave generation, and related applications.

**SpTh2G.2 • 11:00 (Invited)**
**Title to be Announced,** Tobias J. Kippenberg[1]; *[1]École Polytechnique Fédérale de Lausanne, Switzerland.* Next Generation Integrated Photonics: from Lithium Tantalate Based Modulators to Erbium Doped Integrated Lasers, Amplifiers and Femtosecond Lasers

**SpTh2G.3 • 11:30 (Invited)**
**InP Photonic Components for Analog Signal Processing,** Weiming Yao[1], Lukas Puts[1], Rajib R. Ghosh[1], Joris Borms[1], Dylan Harmsen[1], Victor D. Calzdilla[1]; *[1]Technische Universiteit Eindhoven, Netherlands.* Indium phosphide photonics can combine active and passive functionalities on-chip for high-capacity information transport. We outline recent work in realizing linear and nonlinear optical functions on InP that could be used for optical information processing.

## 10:30 -- 12:30
## Room: Pacific I
## STh2F • Radiative Cooling & Solar Management

**STh2F.1 • 10:30**
**Building Integration Pathways for Daytime Radiative Cooling Materials,** Davide Forte[1], Matteo Fasano[1], Lorenzo Pattelli[2], Pietro Asinari[1,2]; *[1]Politecnico di Torino, Italy; [2]Istituto Nazionale di Ricerca Metrologica, Italy.* A transient, spectrum-resolved model is used to

compare three building integration strategies for a daytime radiative cooling material. Across dry climates, a novel hydronic radiant configuration provides a highly effective strategy, delivering significant cooling-energy savings.

**STh2F.2 • 11:00**
**The Role of Insulation and Convection Shields for Subambient Cooling,** Mathis Degeorges[1], Jyotirmoy Mandal[1]; [1]*Princeton Univ., USA.* Insulation and convection shields are optimized computationally and experimentally for radiative cooling under different weather conditions, enabling cooling targets to reach temperatures 14 °C below ambient. Selective emitters provide comparable performance to broadband designs.

**STh2F.3 • 11:15**
**Polymeric Multilayer Optical Film for Solar Energy Management, Agrivoltaics, and Passive Radiative Cooling,** Timothy Hebrink[2], Raghu Padiyath[1], Lin Zhao[1]; [1]*Transportation & Electronics Business Group, 3M Company, USA;* [2]*Corporate Research Laboratory, 3M Company, USA.* Polymeric multilayer optical films enable precise, scalable light management for solar control, agrivoltaics, and passive radiative cooling. Engineered spectral, directional, and polarization responses support reduced heat load, enhanced crop productivity, and energy efficient building and vehicle applications.

**STh2F.4 • 11:30**
**Mesoporous Silica Aerogels and Bilayer Coatings for Building Envelope Thermal Management,** Aryan Zaveri[1]; [1]*Univ. of California Los Angeles, USA.* We present two passive radiative cooling strategies: a high-reflectance bilayer paint reducing fluoropolymer use, and a visibly transparent, LWIR-selective silica ambigel. Both designs optimize spectral response enabling daytime radiative cooling for the built thermal environment.

**STh2F.5 • 11:45 Postdeadline Submission**
**Angular-Selective Thermal Emitters for Pedestrian Heat Mitigation in Solar Canopies,** Erfan Hosseini[1], Mathis Degeorges[1], Jyotirmoy Mandal[1], Elie Bou-Zeid[1]; [1]*Princeton Univ., USA.* A coupled heat exchange model shows that angular-selective thermal emitters applied to the back of photovoltaic panels in parking canopies reduce peak pedestrian physiologically equivalent temperature across all configurations with only a modest efficiency penalty.

**STh2F.6 • 12:00**
**Simultaneous Radiative Cooling and Solar Energy Harvesting for Cooling, Electricity and Heat Generation,** Ivan Alberto Cruz Garcia[1], Botho Lehmann[1], Shanhui Fan[2], Gan Huang[1]; [1]*Karlsruher Institut für Technologie, Germany;* [2]*Stanford Univ., USA.* Passive daytime radiative cooling and solar energy harvesting usually compete for limited surface area. We present a hybrid architecture integrating a transparent radiative cooler with a hybrid solar module to co-produce cooling, electricity and heat.

**STh2F.7 • 12:15 (Invited)**
Withdrawn

## 14:00 -- 15:00
## Room: International III
## JTh3A • Joint Postdeadline Paper Presentations

**JTh3A.1 • 14:00**
**High-Power, High-SMSR, Ultra-Narrow Lorentzian Linewidth Silicon Photonics CW Laser,** Pascal Gehrmann[1,4], Neetesh Singh[1], Jan Lorenzen[1,3], Milan Sinobad[1], Kai Wang[2], Mike Külkens[1,3], Sonia M. Garcia-Blanco[2], Franz Kärtner[1,3]; *[1]Center for Free-Electron Laser Science CFEL, Deutsches Elektronen-Synchrotron DESY, Germany; [2]Integrated Optical Systems, MESA+ Inst., Univ. of Twente, Netherlands; [3]Physics Department, Univ. of Hamburg, Germany; [4]Inst. of High-Frequency Technology, TU Hamburg, Germany.* We present a silicon photonics distributed-feedback laser with 233 mW on-chip output power, 16% slope efficiency, 80 dB SMSR and a 50 Hz Lorentzian linewidth at 2 μm wavelength enabled by large-mode-area technology.

**JTh3A.2 • 14:15**
**A Self-Starting Silicon Photonics Mode Locked Laser,** Neetesh Singh[1], Milan Sinobad[1], Jan Lorenzen[1], Pascal Gehrmann[1], Mike Külkens[1,2], Muqing Jiang[2], Stefanie Haugg[3], Robert Blick[3,1], Joakim Andersson[4], Franz Kärtner[1]; *[1]Deutsches Elektronen-Synchrotron, Germany; [2]Cycle GmbH, Germany; [3]Center for Hybrid Nanostructures, Universität Hamburg, Germany; [4]JAVU AB, Sweden.* We present a fully integrated, self-starting mode-locked laser on a silicon photonic chip. The dispersion-managed soliton laser generates 310-fs pulses at 1.3 GHz repetition rate with 22 mW output power from a 0.14x32 mm footprint.

**JTh3A.3 • 14:30**
**First Coherent Mode-Division Multiplexed Transmission at 1 μm Over Standard G.652 Fibre,** Romulo Aparecido de Paula Junior[3,1], Ruben S. Luis[3], Vitaly Mikhailov[4], Julian Schneck[2], Hameeda Ibrahim[3], Mindaugas Jarmolovicius[1], Simon Gross[5], Lachlan Anderson[6], Michael Withford[6], Nicolas K. Fontaine[7], Sezer Erkilinc[7], Georg Rademacher[2], Jeffrey W. Nicholson[4], Robert Killey[1], Polina Bayvel[1], Hideaki Furukawa[3], K.W. Kim[7], Alessandro Aimon[7]; *[1]Univ. College London, UK; [2]Inst. of Electrical and Optical Communications, Univ. of Stuttgart, Germany; [3]National Inst. of Information and Communications Technology (NICT), Japan; [4]Lightera Laboratories, USA; [5]MQ Photonics, Australia; [6]School of Mathematical and Physical Sciences, Macquarie Univ., Australia; [7]Nokia Bell Labs, USA.* We demonstrate the first 1-μm coherent transmission over a 20.5 km, G.652 fibre operating below the cut-off wavelength. This enables mode-division-multiplexing over the LP01/11a/b modes to achieve >7 Tb/s (GMI) supported by Ytterbium-doped fibre amplifiers.

**JTh3A.4 • 14:45**
**Cavity-Enhanced EO Comb-Enabled 23.2-Tb/s Bi-Directional Direct Detection Optical Interconnects with Clock Distribution,** Yixiao Zhu[1], Chenbo Zhang[2], Xiang Cai[2], Yi Zou[2], Yutong Pan[2], Xiansong Fang[2], Weisheng Hu[1], Fan Zhang[2], Dawei Ge[3], Xiaopeng Xie[2], Zhangyuan Chen[2]; *[1]Shanghai Jiao Tong Univ., China; [2]Peking Univ., China; [3]China Mobile Research Inst., China.* We present cavity-enhanced spectral-broadened electro-optic comb spanning 3.2-THz with >35-dB OCNR, achieving record 23.2-Tb/s bidirectional direct detection

scale-across AIDC interconnect with 101.5-fs (from 100Hz to 100MHz) jitter clock distribution over 30-km low-latency hollow-core fiber.