1 Tuesday, July 14, 2026

Opening Address
08:45 - 09:00

1–O1 | Dargan Auditorium | 09:00 - 10:10
Plenary Session I

09:00 PLENARY TALK **Metasurfaces as a platform for classical and quantum light control**

Ruwen Peng, Mu Wang

Nanjing University (China)
In this talk, we present metasurfaces as a platform for classical and quantum light control. The approaches achieve potential applications in optical display, data storage, information encryption, and quantum information networks.

09:35 PLENARY TALK **Plenary Lecture by Federico Capasso**

Federico Capasso

Harvard University (USA)
Plenary lecture by Federico Capasso (Harvard University). Title and abstract to be confirmed.

Coffee Break 10:10 - 10:50

1–P1 | Business School Concourse | 10:10 - 10:40
Poster Session I

P1

Phononic Crystal-Based Acoustic Sensor: Simulation and Experimental Analysis for Real-Time Characterization of Refined Petroleum Hydrocarbon Blends

Fares Kanouni, Rahmani Mahdi, Mosbah Daamouche

University of Setif 1 (Algeria)
this study introduces a phononic crystal-based sensor for characterizing refined petroleum products like gasoil, gasoline, and mixtures, leveraging acoustic band gaps for high sensitivity. Simulations and experiments validate its ability to distinguish fuels, offering a cost-effective alternative to traditional methods for real-time petrochemical monitoring.

P2

Design of High-Efficiency Electroacoustic Conversion Devices Based on Elastic Topological Materials

Jiamin Guo[1], Zhongming Gu[1], Lei Fan[2], Jie Liu[1], Yafeng Chen[1], Zhongqing Su[2], Jie Zhu[1]

[1]Tongji University (China), [2]The Hong Kong Polytechnic University (China)
Elastic topological materials enable robust wave energy capture. We demonstrate a synthetic-dimension engineered higher-order topological elastic structure with high-Q, corner-localized modes, integrated with piezoelectrics for efficient ultrasonic energy harvesting and electroacoustic conversion, offering enhanced selectivity, robustness, and device integrability.

TUE

P3

On-chip Neural Network for High-speed, Energy-efficient and Integrated Computation

Xueyun Li, Shining Zhu, Tao Li

Nanjing University (China)

We propose a novel architecture of waveguide-array optical neural network on the thin-film lithium niobate platform. The superior features of this design enable high-speed, energy-efficient, computationally dense and fabrication-robust performance on optical computation and machine learning inference, aiming at next-generation AI applications.

P4

Surface Plasmon Resonance based optical fiber refractive index sensor using tungsten disulfide and Copper

Shikha Sachdeva[1], Navneet K. Sharma[2]

[1]University of the Punjab (India), [2]Jaypee Institute of Information Technology (India)

An experimental fiber optic surface plasmon resonance (SPR) sensor based on tungsten disulfide (WS2) and copper (Cu). The sensor is analyzed using the wavelength interrogation method. The impact of the thicknesses of the materials on the sensor's sensitivity is explained.

P5

Beyond optical chirality density: tensor-based description of electromagnetic chirality

Ilia Smagin, Nikolay Gippius, Sergey Dyakov

Skolkovo Institute of Science and Technology (Russia)

Optical chirality density is commonly used to characterize chiral electromagnetic fields but fails in anisotropic media. We introduce tensorial descriptors of electromagnetic chirality based on the Lipkin formalism and link them to molecular emission processes. Complementary measures of chirality arise in anisotropic environments, even when scalar optical chirality vanishes.

P6

From Translucent to Transparent Wood

Ilya Sychugov

KTH Royal Institute of Technology (Sweden)

Using spatiotemporal measurements of light propagation in transparent wood composites the main scattering mechanism was identified as refraction on cell wall interface with polymer filler. Based on this insight we show how by controlling the wood-polymer refractive index contrast and lumen shape a truly transparent wood composite can be realized.

P7

Temporal Disorder in Two-Dimensional Phononic Time Crystals: A Numerical Study

Takamichi Terao

Gifu University (Japan)

Numerical simulations of a 2D mass-spring lattice with time-varying stiffness reveal parametric amplification of vibrational waves. The exponential growth depends on the modulation interval and temporal disorder. The Fourier analysis shows selective amplification of specific wavenumbers governed by momentum bandgaps that can be tuned or suppressed by temporal disorder.

P8

Control of Chiroptical Response with Chiral Plasmonic Nanoparticles

Ruiqian Zhang, Xiaolu Zhuo, Jianfang Wang

The Chinese University of Hong Kong (China)

In this work, we investigated the chiroptical response of chiral plasmonic nanoparticles via structural and substrate design. The plasmonic nanohelix exhibits distinct mode-dependent chiroptical far-field properties. Plasmonic helicoid with high-refractive-index substrate shows remarkable enhancement in g-factor and peak separation between absorption and scattering g-factor spectra, attributed to strong plasmon hybridization.

TUE

P9

A Low-Profile Microfluidic Frequency Selective Surface with Wideband Reconfigurable and Thermally Tunable Absorption

Yang Wang, Rongzhou Gong

Huazhong University of Science and Technology (China)

A novel reconfigurable frequency selective surface is proposed. By controlling the water layer, the absorption and transmission functions can be switched. Numerical results show that the relative bandwidth is 29.8%. Due to the Debye model, the absorption band of this RFSS can also be tuned by the water temperature.

P10

Artificial Organic Hyperbolic Metamaterials Supporting Surface Exciton Polaritons and Near-Zero Permittivity Surface Waves

José N. Gama[1], Diogo Cunha[2], Carla Estévez-Varela[3], Marina Garcia-Pardo[4], Pablo Pedreira[5], Adelaide Miranda[6], M. Carmen González-López[4], Pieter A.A. De Beule[6], Eduardo Solano[5], Rosalia Serna[4], Vasilevskiy[2], Lopez-Garcia[4], Pastoriza-Santos[1], Núñez-Sánchez[3]

[1]Universidade de Vigo (UVigo) (Spain), [2]Universidades do Minho e do Porto (Portugal), [3]Instituto de Ciencia de Materiales de Madrid (ICMM-CSIC) (Spain), [4]Instituto de Óptica (IO-CSIC) (Spain), [5]ALBA Synchrotron (Spain), [6]International Iberian Nanotechnology Laboratory (INL) (Portugal)

This study introduces fully organic hyperbolic metamaterials created from J-aggregate dyes and polyelectrolyte multilayers. These structures exhibit extreme optical anisotropy and support surface exciton polaritons at the nanoscale. By linking supramolecular order to photonic states, this robust platform enables precise control over light confinement at the nanoscale.

P11

Research on Hydrogel-Based Flexible Underwater Acoustic Metamaterials

Haoyu Zhao[1], Lei Zuo[1], Jinxin Zhao[2], Kai Zhang[1]

[1]Beijing Institute of Technology (China), [2]Beijing Ningji New Materials Technology Co., Ltd (China)

We develop a hydrogel-based flexible acoustic metamaterial for underwater carpet cloaking. To elucidate the underlying mechanism of the proposed microstructure, the effects of anisotropic stiffness and anisotropic density are investigated. It suppresses shear waves and utilizes a longitudinal wave-dominant coupling mode, enabling excellent cloaking performance confirmed by simulations and experiments.

P12

Harmonizing Plasmonic and Photonic Effects to Boost Photocatalytic H2 Production

Tharishinny Raja Mogan[1], Jiajia Zhang[1], Li Shiuan Ng[1], Siew Kheng Boong[1], Carice Chong[1], JinnKye Lee[1], Haitao Li[2], Hiang Kwee Lee[1]

[1]Nanyang Technological University (Singapore), [2]Yangzhou University (China)

This work demonstrates a plasmonic photonic architecture using an optically inert silica opal framework to confine light efficiently. Spectral alignment between photonic and plasmonic modes amplifies electromagnetic fields, enabling exceptionally high solar driven hydrogen generation without semiconductors or cocatalysts and establishing a general design principle for plasmonic catalysis.

P13

Multiscale QM/Classical Modeling of SERS Spectra in Amino Acids and Nucleobases

Sveva Sodomaco, Chiara Cappelli

Scuola Normale Superiore (Italy)

Our recently developed multiscale quantum mechanics/classical approach is presented for modeling surface-enhanced (SE) Raman scattering (SERS) spectra of amino acids and nucleobases near plasmonic nanostructures. Atomistic yet classical force fields describe the plasmonic properties of noble-metal nanostructures. SERS results are complemented by SE hyper-Raman spectra, together with experimental data.

P14

Topological edge state waveguide fed antennas

Shih-Hui Gilbert Chang

National Cheng Kung University (Taiwan)

Topological edge-states based on the quantum spin-Hall effect are implemented in a dual layer PEC structure to form a one-way propagation waveguide. A slot antenna fed by such a topological waveguide exhibits higher-order resonant modes and leads to pseudospin-flips. The properties of the topological protection, simulated by FDTD, are discussed.

P15

ENZ Multilayers to Control of Time-Dependent Non-Hermitian Modes

Giuseppina Simone

University of Napoli "Federico II" (Italy)

I investigate ultrafast, non-Hermitian photonic dynamics in ITO-based multilayers under time-dependent permittivity modulation. Transient ENZ–plasmonic mode hybridization drives spectral shifts, broadening, and avoided crossings. Using scattering-matrix eigenvalues and reflection-phase topology, I reveal ultrafast reconfigurable control of photonic states, demonstrating dynamic manipulation of non-Hermitian scattering on picosecond timescales.

P16

Gradient-Momentum Engineering in Metasurface for Continuous and Asymmetric Beam Steering

Hsiu-Ping Su, Po-Sheng Huang, Pin Chieh Wu

National Cheng Kung University (Taiwan)

We develop a transmissive metasurface featuring spatially continuous, independently tunable in-plane momentum gradients, enabling wide FOI coverage of 100° and 70° in the horizontal and vertical directions. By tuning the gradient momentum distribution, it enables precise control of the FOI along orthogonal axes, making it well suited for next-generation applications.

P17

Multiscale analysis of anisotropic composites

Natalia Rylko

Cracow University of Technology (Poland)

A new two-dimensional polydisperse model for analyzingtwo-phase composites is developed. Verification of the-model is performed using composite microstructures in whichthe local inclusion concentration is sufficiently uniform, ensuringthat the material does not exhibit a graded structure.The examined microstructure is characterized at the macro-,meso-, and micro-scales.

P18

Establishing a Library of Metasurface Building Blocks through Coherence-Controlled Holographic Microscopy

Ondrej Cervinka, Vlastmil Weiss, Martin Hrtoň, Petr Bouchal, Petr Liška, Filip Ligmajer, Tomáš Šikola, Petr Viewegh

Brno University of Technology (Czech Republic)

We demonstrate coherence-controlled holographic microscopy as a robust tool for creating experimental metasurface building block libraries. By measuring the experimental response of TiO2 nanostructures across varying wavelengths, polarizations, and numerical apertures, we identify critical discrepancies between simulations and real-world performance caused by fabrication-induced internal voids in modified damascene nanofabrication process.

P19

Spectral and Polarization Control of Smith-Purcell Radiation via Chiral Dielectric Gratings

Loris Cavenaile, Thomas Delplace, Muluneh Abebe, Bjorn Maes

UMONS (Belgium)

We utilize chiral materials to unlock Smith-Purcell radiation into modes typically forbidden in two-dimensional achiral structures. Via a Pasteur medium, the modes hybridize, allowing excitation by the passing electron's evanescent field. This approach offers a new degree of freedom for wavelength and polarization control.

TUE

P20

Carbon Nanodot Superparticles as a new family of Optical Metamaterials

Caterina Tortorici[1], Riccardo Rubino[1], Laureline Roffi[2], Vincenzo De Michele[2], Rodrigo Szostak[3], Fabrizio Messina[1], Alice Sciortino[1]

[1]University of Palermo (Italy), [2]Université Jean Monnet (France), [3]Brazilian Synchrotron Light Laboratory (Brazil)

Carbon nanodot superparticles were fabricated via emulsion-templated assembly using bare and PEGylated nanodots. PEG functionalization modulates interparticle spacing, leading to emission blueshifts and longer lifetimes. Structural uniformity is confirmed by electron microscopy, while humidity induces emission quenching and structural degradation.

P21

Enhancement of Spontaneous Decay Rate in Hybrid Photonic Nanocavities

Themistoklis Deloudis, Angus Crookes, Angela Demetriadou

University of Birmingham (United Kingdom)

Structured optical environments modify the spontaneous decay rate of quantum emitters. Ultra high emission rates are often hindered by either the diffraction limit or material losses. We design a hybrid photonic nanocavity with extreme enhancement of the spontaneous decay rate, not often seen in diffraction-limited photonic cavities.

P22

Solution-processed microcavities incorporating luminescent hybrid Copper(I) iodides

Federica Bortoletto[1], Emma Contini[2], Ullrich Steiner[1], Andrea Dodero[1]

[1]Adolphe Merkle Institute (Switzerland), [2]University of Bologna (Italy)

Luminescent hybrid crystals are grown via organic ligand evaporation within a CuI-containing polymeric layer. This emissive layer can serve as defect layer in solution-processed microcavities, whose photonic bandgap and cavity mode are tuned to spectrally match the hybrid crystals emission, to the end of narrowing and enhancing it.

P23

VO_2-Based Smart Window Enabling High Transparency and Tunable Thermal Emissivity

Jaehyeong Kim, Dongkyun Kang, Jungwoo Pyo, Hwaji An, Myeongkyu Lee

Yonsei University (Korea)

This work demonstrates a sputtered VO_2/ZnS/ITO smart window with high visible transparency and strong thermal emissivity modulation. The structure achieves a luminous transmittance of 47% and an emissivity modulation of 0.52 between 20 °C and 80 °C, enabling simultaneous control of solar transmission and mid-infrared radiative cooling.

P24

Experimental Study of Mechanically Graded Tensegrity-Inspired Cellular Metamaterials

Anna Al Sabouni-Zawadzka, Adam Zawadzki, Wojciech Gilewski, Maciej Kołodziejczak

Warsaw University of Tehcnology (Poland)

This paper presents an experimental study of graded tensegrity-inspired metamaterials fabricated by additive manufacturing.Compression tests are performed under uniform and concentrated loads on simplex- and expanded octahedron-based lattices to demonstrate the influence of unit cell topology and cell gradation on their mechanical behaviour.

P25

Tunable Polaritonic Topologies Generated by qBIC Metasurfaces

Connor Heimig[1], Enrico Baù[1], Jonas Biechteler[1], Florian Mangold[2], Julian Schwab[2], Manobina Karmakar[1], Leonardo Menezes[1], Haoran Ren[3], Stefan A. Maier[3], Harald Giessen[2], Tittl[2]

[1]Ludwig-Maximilians-Universität München (Germany), [2]University of Stuttgart (Germany), [3]Monash University (Australia)

We experimentally demonstrate tunable polaritonic topological textures using nonlocal photonic modes in dielectric metasurfaces supporting quasi bound states in the continuum. Hyperbolic phonon polaritons launched in hBN form skyrmion lattices on individual resonators. Frequency and geometry control enable reconfigurable skyrmions, merons, and related topological textures within a single platform.

TUE

P26

Diversity-Optimized Dataset Generation Pipeline for High-Reflectivity Metamirror Inverse Design

Swarali Talele, Liam Shelling Neto, Stefanie Kroker

TU Braunschweig (Germany)

Designing complex multispectral metamirrors for cavities requires precise control of phase and reflectivity across subwavelength metaatoms. Diffusion-based generative models enable inverse design for such structures but are limited by dataset quality, especially when crucial regions are underpopulated. We present a pipeline that generates validated candidate geometries, yielding an enriched dataset.

P27

Dynamical superradiance in vibrationally dressed molecules

Lukas Freter[1], Piper Fowler-Wright[2], Javier Cuerda[1], Brendon Lovett[2], Jonathan Keeling[2], Paivi Törmä[1]

[1]Aalto University (Finland), [2]University of St Andrews (United Kingdom)

We study dynamical superradiance-the collective oscillation of energy between a cavity mode and emitters-in organic materials by solving the open Holstein-Tavis-Cummings model in the mean-field approximation. We show that superradiance survives for small vibrational coupling, and that fornegative cavity detunings, vibrational coupling may even enhancesuperradiance.

P28

Surface-Enhanced Raman Spectroscopic Observation of SuFEx Processes at Metal Surfaces

Aleksandra Miszczak, Justyna Grzeda, Hubert Sobiech, Jan Dudziński, Michał Barbasiewicz, Andrzej Kudelski, Aleksandra Szaniawska

University of Warsaw (Poland)

Surface-enhanced Raman spectroscopy (SERS) was applied to investigate sulfur (VI) fluoride exchange reactions at metal-solution interfaces. The study demonstrates that SERS enables monitoring of click reaction, close proximity of metal surface does not significantly change the reaction and elegantly shows that structural changes of adsorbate influence their orientation on metal.

P29

Chiral Meta-atoms for Geometric-phase Manipulation in Metasurfaces Operating in the Visible Range

Mircea Giloan

MG Data (Romania)

The geometric phase method enables phase manipulation of circularly polarized incident light. We investigate the ability of chiral metaatoms with specific geometries to convert incident circularly polarized light into its orthogonal handedness in transmission. Such metaatoms can be used to design efficient, polarizationinsensitive metasurfaces.

P30

Quantum nanophotonics with free electrons

Javier García de Abajo

ICFO-Institute of Photonics Sciences (Spain)

At the intersection of electron microscopy, ultrafast optics, and quantum physics, ultrafast electron microscopy enables the study of plasmonic excitations with unmatched spatiotemporal resolution. We discuss quantum aspects of electron-plasmon interactions, including the generation of single and entangled photons, highlighting prospects for quantum technologies.

P31

Pascal's Triangle in Cascaded Polarization Systems: Bridging Classical Optics and Metasurfaces

Ata Ur Rahman Khalid, Neem Ullah

Queen's University Belfast (United Kingdom)

1–O2 | **Dargan Auditorium** | **10:50 - 12:40**

SP16: Metamaterials and Metasurfaces as Platforms for Next-Generation Electromagnetics: Fundamentals, Applications and Future Trends

Organized by: David R. Smith and Okan Yurduseven
Chaired by: David R. Smith and Okan Yurduseven

10:50 KEYNOTE TALK **Auger processes and switching Indium Tin Oxide with femtosecond laser pulses**

John Pendry

Imperial College London (United Kingdom)

ITO, is the workhorse of high speed switching of light. Recent experiments using multi-GW intensity pumps reveal processes where very hot conduction electrons have enough energy to promote valence electrons into the conduction band via the Auger effect. We construct a model which accurately reproduces the features seen in experiment.

11:20 INVITED TALK **Communicating and Computing with Microwave Networks**

Matteo Nerini, Bruno Clerckx

Imperial College London (United Kingdom)

Future wireless systems will communicate and process extremely high-dimensional signals under stringent latency constraints. As antenna arrays scale toward massive and gigantic multiple-input multiple-output (MIMO), conventional digital signal processing becomes prohibitive, motivating paradigm shifts where both communication and computation are partially offloaded from the digital to the analog domain.

11:40 INVITED TALK **Universal Wave-Control Framework for Reconfigurable Microwave Systems**

Philipp del Hougne

IETR - Université de Rennes (France)

Reconfigurable microwave systems (e.g., involving programmable metasurfaces) can be treated as multiport networks, enabling a universal, experiment-calibrated model-based framework for optimization and determining fundamental limits. This model also reveals how to maximize wave-domain flexibility. Altogether, the universal framework paves the way toward a prototype-aware electromagnetic information theory.

12:00 INVITED TALK **Compressive Metasurfaces for Communications and Imaging Applications**

Okan Yurduseven[1], David Smith[2]

[1]Queen's University Belfast (United Kingdom), [2]Duke University (USA)

We present a physical layer compression framework for communications and imaging applications. The system makes use of wave-chaotic metasurface antennas, generating quasi-random radiated field patterns. This mechanism enables wireless channels to be characterized using a single-pixel hardware architecture while operating as a single-pixel microwave camera for imaging.

12:20 INVITED TALK **Self-Organized Photonic Metasurface Synthesis Inspired by Morphogenesis**

Thomas Fromentèze[1], Marco Gandolfi[2], Andrea Locatelli[2], Costantino De Angelis[2], Emebet Woldu Hadgu[1], Rapha¨el Pestourie[3]

[1]University of Limoges (France), [2]Universita degli Studi di Brescia - CNR-INO (Italy), [3]Georgia Institute of Technology (USA)

We introduce a bio-inspired generative model that serves as a parametrization of photonic metasurfaces. This approach, inspired by morphogenesis, has proved successful in the microwave range. This framework utilizes reaction-diffusion patterns to self-organize dielectric structures. We demonstrate a functional 50 μm silicon lens operating at λ = 1550 nm.

1–O3 | McNabb Theatre | 10:50 - 12:40

SYM2: New trends in nanophotonics and advanced materials

Organized by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han
Chaired by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

10:50 INVITED TALK **Manipulate Multispectral 3D Polarization Structures with Optical Metasurfaces**

Xianzhong Chen, Hammad Ahmed, Chunmei Zhang

Heriot-Watt University (United Kingdom)

3D polarization structures are garnering significant interest owing to their peculiar properties. We use optical metasurfaces to generate various multispectral polarization 3D structures and cascaded polarization cages, whose polarization profiles can be dynamically modulated.

11:10 INVITED TALK **Metasurface concepts for polarisation control**

Ilya Shadrivov

Australian National University (Australia)

We develop metasurface based broadband polarisers and waveplates for controlling Terahertz radiation. We discuss effects of topology and mode interplay for achieving broadband operation of the proposed devices.

11:30 KEYNOTE TALK **How can light be used for measurements a myriad times finer than those of Robert Hooke and a million times faster than those of Eadweard Muybridge?**

Nikolay Zheludev

University of Southampton (United Kingdom)

By training metrological estimators, employing topologically structured light, and engineering the flow of Fisher information, optical metrology can surpass conventional resolution limits by orders of magnitude-achieving atomic-scale precision at megahertz acquisition rates.

12:00 INVITED TALK **Numerical analysis of directional guided modes on highly anisotropic metasurface**

Maxim Nikitin, Andrei Lavrinenko, Battulga Munkhbat, Osamu Takayama

DTU Electro (Denmark)

Anisotropic materials can support directional surface waves and guided modes. Their propagation direction and its angular cone depend on the optical properties of the anisotropic materials. We numerically analyze directional surface waves on tungsten disulfide metasurface, which exhibits large effective anisotropy and transparency for near-infrared wavelengths.

12:20 INVITED TALK **DRUM: From Diabolic to Exceptional Point and Phase-Tunable Hysteresis toward Controllable Artificial Neurons**

Stefano Biasi, Bülent Aslan, Davide Olivieri, Stefano Gretter, Lorenzo Pavesi

University of Trento (Italy)

We present the Dynamically Reconfigurable Unified Microresonator (DRUM), an integrated silicon photonic platform enabling tunable Hermitian and non-Hermitian coupling between counter-propagating modes. The DRUM exploits coupling-controlled feedback to access diabolic and exceptional points, inducing nonlinear hysteresis and memory effects. This enables controllable bifurcations and functions as a reconfigurable artificial neuron.

1–O4 | Maharry Theatre | 10:50 - 12:40

SYM4: Chirality, magnetism, and magnetoelectricity: Separate phenomena and joint effects in metamaterial structures

Organized by: Eugene Kamenetskii
Chaired by: Eugene Kamenetskii

10:50 INVITED TALK **Theory of Spin-Chiral Phonon Coupling in Chiral Crystals**

Dapeng Yao, Gen Tatara

RIKEN (Japan)

We microscopically show the spin-chiral phonon coupling in 3D chiral crystals. We consider that phonon modulate the electron motion through the electron-phonon coupling, leading to an effective magnetic field on electron spins via spin-orbital coupling. We derive an effective Hamiltonian which couples the phonon and spin degrees of freedom.

11:10 INVITED TALK **Orbital optical chirality: Spectrally and spatially resolved measurements of multipolar chiroptical responses for optical vortex beams**

Yoshito Tanaka

Hokkaido University (Japan)

We demonstrate spatially and spectrally resolved chiral dichroism using a single twisted nanorod pair with spectrally separated plasmon resonances and rapid modulation of optical vortex handedness. At the vortex center, dichroism arises from novel optical chirality dependent on orbital angular momentum, which interacts with hybridized twisted quadrupole plasmon modes.

11:30 INVITED TALK **Strong coupling of chiral light with chiral matter: a macroscopic study**

Sergey Dyakov[1], Natalia Salakhova[1], Ilia Smagin[1], Denis Baranov[2], Ilia Fradkin[1], Nikolay Gippius[1]

[1]Skolkovo Institute of Science and Technology (Russia), [2]Moscow Center for Advanced Studies (Russia)

We consider a Fabry-Perot resonator supporting photonic modes with non-zero handedness. By placing chiral material into such a resonator, we demonstrate chiral strong coupling. The interaction strength depending on the chiralities of both the medium and the photonic mode enabling selective optical sensing of molecular enantiomers for pharmaceuticals and chemistry.

11:50 INVITED TALK **Self-Polarizing Chiral Cavities for Control of Quantum Emitters**

Behrooz Semnani[1], Anya Houk[2], M. Soltani[2], Athena Xu[2], M. Bajcsy[2]

[1]University of Waterloo (Canada), [2]Institute for Quantum Computing (IQC) (Canada)

We report experimental progress on the design, fabrication, and characterization of highperformance confocal Fabry-Pérot cavities formed by dielectric metasurfaces. These metasurfaces stabilize the cavity, optimize the mode volume, and introduce polarization birefringence, with particular emphasis on singlespin chiral cavities enabled by dielectric metasurface mirrors.

12:10 KEYNOTE TALK **Generating Optical Merons through Spin-orbit Coupling in Anisotropic Metamaterials**

Vittorio Aita, Anastasiia Zaleska, Anatoly Zayats

King's College London (United Kingdom)

We will discuss the enhanced spin-orbit coupling in strongly anisotropic metamaterials which provides efficient conversion of polarisation state of the transmitted light and results in meron-type topological structures of the electromagnetic field. Flexible control of polarisation and its topological properties is important for optical manipulation, communications, metrology and quantum technologies.

1–O5 | Room 3074 | 10:50 - 12:45

SYM1: Hybrid Nanomaterials and Metastructures for Photonics, Sensing and Energy

Organized by: Jérôme Plain, Alexander Govorov, Davy Gérard, Pedro Hernandez Martinez
Chaired by: Jérôme Plain, Alexander Govorov, Davy Gérard, Pedro Hernandez Martinez

10:50 INVITED TALK **Green Hydrogen Produced from Water Splitting at Photocatalytic Titanium Dioxide Thin Films on Gold Nanoislands**

Nicolas Albenge, Florian Laible, Jonas Rathgeb, Timo Braun, Sandra Glocker, Bjarne Gutbrod, Leah Schynowski, Udo Weimar, Nicolae Barsan, Monika Fleischer

Eberhard Karls University of Tübingen (Germany)

Gold nanoislands are hybridized with a titanium dioxide thin film combining visible light absorbing structures with UV absorbing photocatalysts for light-induced water splitting. A custom reactor is built to measure the amount of hydrogen generated. Design considerations and first hints to the generation of green hydrogen are presented.

11:10 INVITED TALK **Very-large scale reconfigurable surfaces for dynamic control of THz and millimeter waves**

Said Ergoktas

University of Bath (United Kingdom)

In this talk, I will go through brief history of our research on graphene-based terahertz (THz) devices leading to our latest work on very large-scale reconfigurable surfaces for dynamic control of THz and millimeter-wave.

11:30 INVITED TALK **Engineering Local Field Enhancement with Single-Crystal Noble Metal Plasmonics**

Jacob Syme, Tashfin Shaife, Rebbeca Storck, Hannah Martinelli, Albert Adserias, Finlay MacNab, Sasan V. Grayli, Gary Leach

Simon Fraser University (Canada)

11:50 INVITED TALK **Control of photo-induced absorption and chemical functionalization within plasmonic nanostructures**

Marlo Vega[1], Thomas Prieur[1], Julien Moreau[1], Paul-Ludovic Karsenti[2], Céline Molinaro[3], Olivier Soppera[3], Paul Charette[2], Michael Canva[2], Jean-François Bryche[4]

[1]Université Paris-Saclay (France), [2]Université de Sherbrooke (Canada), [3]Université de Haute Alsace (France), [4]Université Grenoble Alpes (France)

We demonstrate how thermal energy distribution within excited plasmonic metasurfaces can be used for local modification of chemical functionalization for biosensing applications.

12:10 **Terahertz Slow- and Fast-Light Switching Through Liquid-Crystal-Integrated Plasmon-Induced Transparency Fano-resonant Metamaterials**

Rafał Kowerdziej[1], Ilario Bisignano[2], Dmitriy Yavorskiy[3], Marek Olifierczuk[1], Antonio Ferraro[4], Giuseppe Lio[5], Norbert Pałka[1], Jerzy Wróbel[1], Roberto Caputo[6]

[1]Military University of Technology (Poland), [2]University of Tsukuba (Japan), [3]Institute of High Pressure Physics PAS (Poland), [4]Consiglio Nazionale delle Ricerche (Italy), [5]University of Pisa (Italy), [6]University of Calabria (Italy)

Active and hybrid Fano-resonant plasmon induced transparency (PIT) metasurfaces are identified as an emerging technology in terahertz optics. Here, we introduce Fano-resonant liquid crystal integrated PIT metasurface for terahertz slow- and fast-light switching. Our findings support active Fano-resonant metasurfaces as compelling candidates for state-of-the-art nonlinear and slow- and fast-light devices.

12:25 INVITED TALK **Hybrid integrated nonlinear photonics with resonant 2D materials**

Alessandro Bile[1], Domenico de Ceglia[2], Daniele Ceneda[1], Maria Cristina Larciprete[1], Marco Centini[1]

[1]Sapienza Universita di Roma (Italy), [2]University of Brescia (Italy)

We present a hybrid integrated platform based on patterned 3R MoS2 enabling compact visible second harmonic generation. Band edge localization and counter propagating excitation provide efficient vertical emission from nanoscale nonlinear regions, supporting scalable integrated nonlinear and quantum photonic architectures.

1–O6 | Room 4050B | 10:50 - 12:45

SP4: Chiral fields and ultrafast chiral spectroscopy

Organized by: Jamal Berakdar and Andrei Afanasev

Chaired by: Jamal Berakdar and Andrei Afanasev

10:50 INVITED TALK **Manipulating chiral effects with plasmonic nanostructures**

Yuanyang Xie, Alexey Krasavin, Anatoly Zayats

King's College London (United Kingdom)

Plasmonics offers unique opportunities to enhance and engineer optical chirality. In this talk we present an overview of our recent research in chiral plasmonics, starting with discussion of how plasmonic chirality can be defined, and then presenting how it can be used to engineer chiral optical scattering and emission.

11:10 INVITED TALK **Enabling Ultrastrong Chiral Light-Matter Interactions With Chiral Superradiance**

Jonah Peter, Susanne Yelin

Harvard University (USA)

The first experimental observation of chiral superradiance is presented and supported by theoretical quantum optics calculations. Our results demonstrate strong chiral light-matter coupling owing to enhancement via quantum coherence in the solid state and at room temperature.

11:30 INVITED TALK **Non-dichroic Chiral Photoelectron Spectroscopy**

Letizia Fede[1], Debobrata Rajak[2], Chris Sparling[3], David Ayuso[4], Sylvain Betoule[5], Valérie Blanchet[1], Piero Decleva[6], Dominique Decamps[1], Stéphane Petit[1], Bernard Pons[1], Mairesse[1], Ordonez[7]

[1]Universite de Bordeaux (France), [2]The Extreme Light Infrastructure ERIC (Hungary), [3]Heriot-Watt University (United Kingdom), [4]Imperial College London (United Kingdom), [5]Sorbonne Université (France), [6]Universita degli Studi di Trieste (Italy), [7]Freie Universitat (Germany)

We find enantiosensitive but non-dichroic signals in the 3D photoelectron angular distribution of chiral molecules upon multiphoton ionization with elliptically polarized light. The robustness of enantiosensitivity against ellipticity is an example of symmetry protection, opening unexplored opportunities for imaging ultrafast dynamics in chiral molecules with polarization-structured light.

11:50 INVITED TALK **Nonlinear Light-Matter Interactions for Ultrafast Chiral Detection in Confined Environments**

Stefanos Koufidis, Jacob Edginton, David Ayuso

Imperial College London (United Kingdom)

Conventional methods for detecting molecular chirality rely on weak magneto-electric effects and therefore offer limited sensitivity. Here we explore an alternative approach based on locally chiral light, which can produce strong enantio-sensitive responses within the electric-dipole approximation. We propose an implementation in microfluidics for detection of chiral molecules in solution.

12:10 INVITED TALK

Twisted light generates robust many-body states for practical quantum computing

F. J. Rodríguez[1], Luis Quiroga[2], Neil Johnson[3]

[1]Universidad de los Andes (Colombia), [2]Universidad de Los Andes (Colombia), [3]George Washington University (USA)

We present a scheme for using twisted light to generate many-body states in electronic nanostructures whose topological symmetries can provide enhanced robustness for practical quantum computing. Quadrupole type coupling enables access to internal spectra – breaking Kohn's theorem. Our findings are robust for screened and Coulomb interactions.

12:30

Dynamically Tuneable Helicity in Twisted Electromagnetic Resonators

Emma Paterson, Jeremy Bourhill, Michael Tobar, Maxim Goryachev

University of Western Australia (Australia)

We demonstrate real-time macroscopic control of electromagnetic helicity and resonant frequency in a rectangular cross-section microwave cavity resonator by dynamically twisting its conducting boundaries. The resulting mirror asymmetry induces magnetoelectric coupling between near-degenerate transverse electric and magnetic modes, generating helical hybrid eigenmodes with resonant frequencies proportional to their electromagnetic helicity.

1–O7 | Room 3051 | 10:50 - 12:30

SP5: Functional materials for tunable and reconfigurable photonics

Organized by: Sébastien Cueff and Yael Gutierrez

Chaired by: Sébastien Cueff and Yael Gutierrez

10:50 INVITED TALK

Polymer plasmons and gating for active metaoptics

Magnus Jonsson

Linkoping University (Sweden)

We will present our latest findings related to dynamic tuning of optical metasurfaces and nanophotonic devices based on redox-tunable conducting polymers.

11:10 INVITED TALK

Metamaterial devices and metalenses for optical beam steering

Daniele Melati[1], Sarra Salhi[1], Jian Cao[1], Gervasio D'Anzieri[1], Zindine Mokeddem[1], Hachim Lahbib[1], Warren Kut King Kan[1], Sandeep Yadav Golla[1], Constantine Papakonstantinou[1], Amir Hossein Masominia[1], Vivien[1], Ramos[1], Cassan[1], Cheben[2], Schmid[2], Xin[3], Ye[3]

[1]Université Paris-Saclay - CNRS (France), [2]National Research Council Canada (Canada), [3]Carleton University (Canada)

We present our work on metamaterial-integrated photonic devices for optical beam steering, including polarization-insensitive grating antennas and optical phased arrays. Moreover we discuss our work on singlet metalenses achieving broadband achromatic focusing and a large field of view.

11:30 INVITED TALK

Integrated Optical Phased Arrays for AR Displays, Biophotonics, Trapped Ions, & Beyond

Jelena Notaros

Massachusetts Institute of Technology (USA)

This talk will review our work on developing integrated optical-phased-array-based platforms, devices, and systems for applications in LiDAR sensing, augmented-reality displays, 3D printing, optical trapping for biophotonics, and trapped-ion quantum engineering.

11:50 INVITED TALK **Active and Reconfigurable Free-Space Photonics using Phase-Change Metamaterials**

C. David Wright[1], Joe Shields[1], Guoce Yang[2], Carlota Ruiz de Galarreta[1], Mengyun Wang[2], Stuart Kendall[1], Joe Pady[1], Nikolaos Farmakidis[1], David Phillips[1], Jacopo Bertolotti[1], Alù[3], Bhaskaran[2]

[1]University of Exeter (United Kingdom), [2]University of Oxford (United Kingdom), [3]The City College of New York (USA)

The design, simulation and experimental realisation of various phase-change metasurface devices for the active and reconfigurable control of light is described. Particular emphasis is placed on metasurfaces for free-space implementations of optical image processing, optical mode conversion and optical orbital angular momentum control.

12:10 INVITED TALK **Broadband Optical Properties and Thermal Stability of Thermal Evaporated GST and GSST Thin Films for Reconfigurable Metalens Applications**

João Borlido[1], Ricardo Machado[1], Bernardo Dores[1], José Rodrigues[1], Filipa Mota[1], Eliana Vieira[1], Julien Legendre[2], Ioannis Draganidis[2], Georgia Papadakis[2], Diogo Aguiam[3], Correia[1]

[1]University of Minho (Portugal), [2]ICFO-Institut de Ciencies Fotoniques (Spain), [3]International Iberian Nanotechnology Laboratory (Portugal)

GST and GSST enable tunable photonics but exhibit severe chemical and structural instability when uncapped at elevated temperatures. We quantify the magnitude of thickness, stoichiometry, crystallization, optical degradation in thermal evaporated GST and GSST films using EDS, XRD, topology, transmittance, and broadband ellipsometry, and discuss the implications for reconfigurable metalenses.

1–O8 | Room 3071 | 10:50 - 12:30

SP9: When 'meta' meets 'materials': innovative materials, fabrication, functionalities

Organized by: Dorota Pawlak and Virginie Ponsinet
Chaired by: Dorota Pawlak and Virginie Ponsinet

10:50 INVITED TALK **Nondestructive testing of metamaterials by Photoacoustic and Photothermal Techniques**

Roberto Li Voti, G. Leahu, E. Petronijevic, C. Skubisz, A. Maurizi, G. Lalle, G. Cesarini, M. C. Larciprete, M. Centini, A. Belardini, Sibilia

Sapienza Università di Roma (Italy)

Recent advancement in experimental Photoacoustic and Photothermal techniques has enabled a large number of interesting observations and understanding of heat transfer processes on metamaterials at the nanoscale

11:10 INVITED TALK **Exploiting strong confinement of light in hybrid self-assembled metamaterials**

Anton Bykov, Nicolas Spiesshofer, Charalambos Louca, Tabitha Jones, Lille Borresen, Nima Taghipour, Jeremy J. Baumberg

University of Cambridge (United Kingdom)

Plasmonic nanocavities can realise extreme confinement of light. Here we discuss hybrid metamaterials, produced by self assembly of quantum dots, metal nanocrystals, and plasmonic particles, stabilized by robust molecular scaffolds. These artificial structures harness plasmonic confinement to enable infrared sensing, control of emission, and hot carrier physics on the nanoscale.

11:30 INVITED TALK **Light and molecules at the nanoscale**

Pablo Alonso-González

Universidad de Oviedo (Spain)

In this talk, we will show the real-space visualization of directional-dependent strong coupling phenomena between nanolight and organic molecules (pentacene).

11:50 INVITED TALK **Publishing in Nature Portfolio**

Rachel Won

Nature Reviews Electrical Engineering (United Kingdom)

This talk will give you an overview of Nature Portfolio, with emphasis on Nature Reviews Electrical Engineering, before detailing the editorial and peer review processes for its research and review journals. The editorial criteria and editorial policies of these journals will also be presented.

12:10 INVITED TALK **Interband plasmonic elemental materials for sustainable nanophotonics: widening the spectral range**

Johann Toudert, Fernando Chacon-Sanchez, Rosalia Serna

Instituto de Optica (Spain)

We will show how interband transitions in semimetals and semiconductor nanostructures enable an alternative plasmonic response that expands from far-UV to the IR, therefore allowing the development of sustainable and reliable platforms for nanophotonics that will support advanced functionalities such as perfect absorption, structural coloration, and tunable optical response.

1–O9 | Room 3126 | 10:50 - 12:30

SP1: Metamaterials: novel trends and applications

Organized by: Tatjana Gric

Chaired by: Tatjana Gric

10:50 INVITED TALK **Design of Reconfigurable and Non-Reciprocal Soft-matter Photonic Devices**

Peter Ropač, Zala Korenjak, Matjaž Humar, Miha Ravnik

University of Ljubljana (Slovenia)

Using topology optimization and parametric design approaches we designed various reconfigurable photonic devices such as beam splitters, focusing elements, diffraction gratings, and devices with non-reciprocal transmission. Some devices are realized with liquid crystals using a novel method. We show strong agreement in performance of the simulated and realized devices.

11:10 INVITED TALK **High-Precision Nanofabrication and Characterization of Metamaterials Using ZEISS FIB-SEM Technology**

Olena Vertsanova, Martina Schenkel

Carl Zeiss Microscopy GmbH (Germany)

ZEISS electron microscopy is indispensable method in the discovery of materials with enhanced or novel properties, metamaterials, nanophotonic, quantum photonics, facilitating high-resolution imaging, detailed characterization, and nanofabrication. The ZEISS electron microscopy contributes significantly to the understanding and developing of novel materials and devices.

11:30 INVITED TALK **The interaction of nanoplasmonic hot carriers with adsorbates**

Johannes Lischner

Imperial College London (United Kingdom)

Highly energetic or "hot" electrons and holes generated from the decay of localized surface plasmons can be harnessed for applications in photocatalysis, photovoltaics and sensing. I will discuss the interaction of these hot carriers with adsorbed molecules and connect this to experimental observations of chemical interface damping of plasmons.

11:50 INVITED TALK

Nanostructured GLAD optical coatings for reflectance and birefringence control

Lina Grineviciute, Darija Astrauskyte, Lukas Ramalis

Center for Physical Sciences and Technology (Lithuania)

In this work the possibilities to engineer the inner nanostructures of individual layer and applications for the formation of coating-based AR-, HR-coatings, polarizers and phase retarders were proposed.

12:10 INVITED TALK

Lattice Resonances in Bipartite Arrays of Nanodisks

Juan Jose Alvarez Serrano[1], Vincenzo Aglieri[2], Juan Ramon Deop-Ruano[1], Muhammad Sohaib[2], Andrea Toma[2], Alejandro Manjavacas[1]

[1]IQF-CSIC (Spain), [2]Istitutol Italiano di Tecnologia (Italy)

Two-dimensional, bipartite arrays of nanostructures offer great potential for photonic technologies. By tuning the relative position of the two nanoparticles within the unit cell, we theoretically anticipate and experimentally verify lattice resonances with diverse optical properties, including super- and subradiant modes, noninteracting ones, and out-of-plane polarized resonances.

1–O10 | Room 4047 | 10:50 - 12:40

SP20: Nonlocal and nonlinear nanophotonics

Organized by: Gonzalo Álvarez-Pérez and Huatian Hu
Chaired by: Gonzalo Álvarez-Pérez and Huatian Hu

10:50 INVITED TALK

Metasurface-controlled external cavity tunable lasers

Zahra Basiri[1], Alessandro Tomasino[1], Gabriel Juelg[1], Andrea Lanfranchi[2], Ileana-Cristina Benea-Chelmus[3]

[1]Ecole Polytechnique Federale de Lausanne (Switzerland), [2]University of Genoa (Italy), [3]EPFL (Switzerland)

Tunable lasers are essential for optical communication, spectroscopy, and precision sensing. Many tunable laser systems rely on mechanical components, limiting speed and stability. Here, we demonstrate an external cavity semiconductor laser capable of achieving ultrafast frequency and amplitude modulation within a compact footprint without any moving parts.

11:10 INVITED TALK

Integrated Nonlinear Photonics for Compact Terahertz and Quantum Devices

Shima Rajabali

Delft University of Technology (The Netherlands)

In this talk, I will highlight our recent advancement in realizing terahertz photonic devices and electro-optic quantum transducers on a nonlinear integrated photonic platform.

11:30

GaAs nanowires as a tunable source of polarization-entangled photons

Elise Bailly-Rioufreyt[1], Zoya Polshchykova[1], Grégoire Saerens[1], Wenhe Jia[1], Helena Weigand[1], Thomas Dursap[2], Andreas Maeder[1], Philippe Regreny[2], Robert Chapman[1], Alexandre Danescu[2], Chauvin[2], Penuelas[2], Grange[1]

[1]ETH Zürich (Switzerland), [2]INSA Lyon (France)

This work introduces a novel approach for realizing a tunablenanoscale source of polarization-entangled photon pairs in thenear-infrared, using orthogonal GaAs nanowires. Photon pairsarise from type-0 spontaneous parametric down-conversion(SPDC) and the quantum state is adjustable via pumppolarization, enabling a continuous transition from entangled toseparable states.

11:45 INVITED TALK **Engineering Second Harmonic Polarization via Dual Guided-Mode Resonances in Metasurface-Decorated Thin-Film Lithium Niobate**

Chao Meng

University of Southern Denmark (Denmark)

We introduce a nonlocal nonlinear metasurface combining a plasmonic metasurface atop a lithium-niobate film, supporting two detuned, orthogonally propagating guided-mode resonances. This design enables compact, on-chip frequency conversion, allowing control of second-harmonic polarization chirality via rotation of the pump polarization.

12:05 INVITED TALK **Lattice Resonances in Periodic Arrays of Time-Modulated Scatterers**

Juan R. Deop-Ruano[1], María Blanco de Paz[2], Diego M. Solís[3], Alejandro Manjavacas[2]

[1]Instituto de Quimica-Fisica (IQF-CSIC)) (Spain), [2]Instituto de Quimica Fisica Blas Cabrera (IQF) (Spain), [3]University of Vigo (Spain)

In this work, we investigate lattice resonances in periodic arrays of time-modulated scatterers by modelling each scatterer as a harmonic oscillator with periodically varying optical properties. Our work establishes a simple theoretical framework for understanding collective lattice resonances in time-modulated arrays, enabling dynamic control and amplification of these modes.

12:25 **Probing Low-Frequency Excitations with Visible Light and Electron Beams**

Leila Rocio Prelat[1], Eduardo J. C. Dias[2], F. Javier García de Abajo[1]

[1]The Barcelona Institute of Science and Technology (Spain), [2]University of Southern Denmark (Denmark)

We introduce wave mixing cathodoluminescence, combining visible light and focused electron beams to probe low-frequency excitations with nanoscale resolution. Calculations for a retinal-coated silver nanorod show that far-infrared vibrational fingerprints are up-converted to visible sidebands, enabling electron microscopy in electron microscopes without low-frequency detectors.

1–O11 | Room 4050A | 10:50 - 11:50

SP19: Quantum Matter and Dynamics in Hybrid Metamaterial Platforms

Organized by: Khaled Mnaymneh
Chaired by: Khaled Mnaymneh

10:50 INVITED TALK **Engineering van der Waals Materials for Quantum Optical Emission**

Shengxi Huang

Rice University (USA)

We report new atomic engineering approaches on van der Waals materials to generate high quality single photon emitters. Our approaches include atomic substitution through plasma treatment, in-situ doping, and manipulating layer thickness and polarization. Such approaches have led to single photon emission with high purity, high brightness, and high stability.

11:10 INVITED TALK **Quantum Phononic Links for On-chip Long Range Coupling of Hole Spin Qubits on Silicon**

Maksym Myronov

The University of Warwick (United Kingdom)

Scalable semiconductor quantum computing requires coherent coupling between distant qubits. Quantum Phononic Links (QPLs) are engineered phononic waveguides in compressively strained germanium on silicon that mediate strain-based interactions between hole spin qubits. Harnessing strong spin-orbit coupling, QPLs enable frequency-selective, CMOS-compatible, long-range coherent coupling towards scalable quantum processors.

11:30 INVITED TALK **Topological plasmonics: A study of a non-Hermitian Su-Schrieffer-Heeger chain**

Flore Kunst

Max Planck Institute for the Science of Light (Germany)

I will present a framework to study the topology of coupled metallic nanoresonantors arranged in a Su-Schrieffer-Heeger geometry embedded in a dielectric. To correctly account for Ohmic losses, we use a non-Hermitian description allowing us to uncover boundary states, and compare our results to existing literature and full-wave numerics.

1–O12 | Room 4050A | 11:50 - 12:35

GEN14: Nanophotonics and Plasmonics Applications: Optical Antennas, Quantum Photonic Devices, and Beyond

11:50

Switching Quantum Dot Microresonators by Ultrafast Laser Pulses

Pietro Castronovo[1], Marco Reale[1], Susan A Rigter[2], Cherie R. Kagan[3], Christopher B Murray[3], Salvatore Lorenzo[1], Erik C. Garnett[2], Peter Schall[2], Emanuele Marino[1], Alice Sciortino[1], Messina[1]

[1]Università degli Studi di Palermo (Italy), [2]University of Amsterdam (The Netherlands), [3]University of Pennsylvania (USA)

The ultrafast optical control of microresonators remains underexplored despite many prospective applications in nanophotonics. We demonstrate that ultrafast optical pulses can reversibly modulate whispering-gallery resonances in quantum-dot superparticle microresonators due to combined electronic and thermal effects. The results suggest quantum dot superparticles as metamaterials for photonic switching and optoelectronic nanotechnologies.

12:05

Coupling-Controlled Exceptional Points in Intersubband Polaritonic Metasurfaces

Beomjoon Kim[1], Hyeongju Chung[1], Gerhard Boehm[2], Mikhail A. Belkin[2], Jongwon Lee[1]

[1]Ulsan National Institute of Science and Technology (UNIST) (Korea), [2]Technical University of Munich (Germany)

We present non-Hermitian degeneracies, specifically exceptional points (EPs), in geometry-controlled intersubband polaritonic metasurfaces consisting of two plasmonic resonators strongly coupled to intersubband transitions. By varying the resonator gap, we precisely control the coupling coefficient and demonstrate EP emergence near 9.74 μm through numerical simulations in the mid-infrared regime firstly.

12:20

Solving the Helmholtz equation with analog systems at telecommunications wavelengths

Ross Macdonald, Andrew Naylor, Victor Pacheco-Peña

Newcastle University (United Kingdom)

Solutions to PDEs in the form of the Helmholtz equation are produced at 193.41 THz by exploiting a network of dielectric waveguides with wave splitters and Bragg gratings. Numerical simulation results will be presented demonstrating the potential for this technique to produce accurate solutions to Dirichlet boundary value problems.

1–O13 | Room 5025 | 10:50 - 12:30

SYM5: Phononics and acoustic metamaterials

Organized by: Marco Miniaci, Jensen Li, Jean-Philippe Groby, Vincent Pagneux, Noé Jiménez, Stefano Laureti
Chaired by: Marco Miniaci, Jensen Li, Jean-Philippe Groby, Vincent Pagneux, Noé Jiménez, Stefano Laureti

10:50 INVITED TALK **Multifunctional Composite Metastructures for Vibration and Noise Control**

Yabin Jin

Fudan University (China)

This work presents multifunctional fiber reinforced composite metastructures for integrated vibration attenuation and noise reduction. By combining local resonance mechanisms with acoustic impedance engineering through additive manufacturing, lightweight load bearing structures achieve low frequency bandgaps, broadband sound absorption, and significantly enhanced structural stiffness.

11:10 INVITED TALK **Single-sensor vibration sensing enabled by disordered elastic metasurfaces**

Bing Li, Jianjie Zhang, Zhongzheng Zhang

Northwestern Polytechnical University (China)

Conventional sensing relies on dense sensors and sophisticated hardware. Recently, intelligent sensing provides a powerful tool to overcome this limitation. In this work, metasurfaces are synergistically integrated with intelligent sensing, a single-sensor vibration sensing framework is established, achieving high-fidelity vibration localization in aluminum, composite structures, and UAV propeller.

11:30 INVITED TALK **Prey-predator phononic properties in biocomposites**

Maroun Abi Ghanem

Universite Claude Bernard Lyon 1 (France)

This study explores phononic properties in two biological systems: nacrés "brick-and-mortar" structure and the mantis shrimp's Bouligand architecture. Experimental and numerical analyses reveal phononic bandgaps and anisotropic wave propagation, suggesting evolutionary advantages for impact resistance and mechanical protection.

11:50 INVITED TALK **Resonator Cascades in a 3D Lattice as a Broadband Acoustic Metamaterial**

Frieder Lucklum

Technical University of Denmark (DTU) (Denmark)

Cascading coupled resonators allows multiple frequency splitting, a common concept in electronic filters. Translating this idea to acoustic metamaterials leads to connected Helmholtz resonators in a 3D lattice, similar to elastic 3D mass-spring metamaterials. Analytical, numerical, and early experimental results demonstrate broadband sound absorption and sound insulation potential.

12:10 INVITED TALK **Transmission enhancement through a barrier induced by global and local mirror symmetries in periodic waveguides**

Elie Salemeh, Simon Félix, Vincent Pagneux

LAUM-CNRS (France)

We show a broadband enhancement of transmission through an opaque barrier placed at the center of a symmetric periodic waveguide. This enhancement is sensitive to subwavelength barrier displacements and, for symmetric unit cells, recurs at half-period shifts due to local symmetries.

1–O14 | Room 5039 | 10:50 - 12:30

SP17: Topological Insulator Metamaterials

Organized by: Giuseppina Simone

Chaired by: Giuseppina Simone

10:50 INVITED TALK **Reconfigurable Topological Insulators and Acoustic Devices Based on an Electroacoustic Material Platform**

Michael Leamy

University of Vermont (USA)

We present recent work on reconfigurable, electroacoustic topological insulators as a platform for enabling acoustic devices such as multiplexers/demultiplexers, transistors, logic gates, and single-bit memory. The theoretical underpinnings of the reconfigurable topological insulator will be discussed together with experimental results confirming multiple device operation.

11:10 INVITED TALK

A spectral localizer approach for Floquet insulators

Stephan Wong[1], Alexander Cerjan[1], Justin Cole[2]

[1]Sandia National Laboratories (USA), [2]University of Colorado (USA)

A spectral localizer methodology for diagnosing topology in Floquet insulators will be presented. This approach leverages local topological markers to probe topology in periodically driven lattice systems without time-reversal symmetry. Quantitative bounds on the range of topological protection can be proved.

11:30 INVITED TALK

Topological Metamaterials Driven Study of the Dielectric Response of the Cancerous Biological Tissue

Tatjana Gric

Vilnius Gediminas Technical University (Lithuania)

Cancerous tissues are treated as the disordered anisotropic media. The classical Maxwell-Garnett technique is utilized to evaluate an effective medium of the sample with no needs of human intervention. In this relation, the presented technique allows for the creation of the phantom tissue models for the usage in clinical applications.

11:50 INVITED TALK

Magnetic Response Enhancement in Topological Insulator Metamaterial Hybrid Layers

Qiang Sun[1], Eitan Dvorquez[2], Felipe A. Pinto[2], Mohan C. Mathpal[2], Jeronimo R. Maze[2], Brant C. Gibson[1], Andrew D. Greentree[1]

[1]RMIT University (Australia), [2]Pontificia Universidad Catolica (Chile)

We demonstrate that combining a topological insulator layer with an active metamaterial substrate strongly enhances the magnetic field induced by an electric point source. Optimized substrate parameters increase the response by over four orders of magnitude and extend the magnetic field into free space.

12:10 INVITED TALK

Terahertz non-linear optics in van der Waals topological insulator metamaterials

Miriam Serena Vitiello

CNR-NANO and Scuola Normale Superiore (Italy)

High-order harmonic generation (HHG) in solids-the frequency up-conversion of an optical signal-is governed by symmetries. Here, we demonstrate frequency up-conversion in the 6.4 (even-order)-9.7 (odd-order)THz frequency range. This results from bulk centro-symmetry (odd states) and symmetry breaking in the topological surface states (odd and even).

1–O15 | Room 5052 | 10:50 - 12:30

SYM2: New trends in nanophotonics and advanced materials

Organized by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han
Chaired by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

10:50 INVITED TALK

Engineering Electromagnetic Descriptors at the Nanoscale with Plasmonic Nanoantennas

Mario Zapata, Javier Aizpurua

Donostia International Physics Center (Spain)

We present a unified framework for engineering electromagnetic descriptors in plasmonic nanoantennas to control nanoscale light-matter interactions. Full-wave simulations show how geometry, symmetry, and lattice coupling tune LDOS, chirality, and decay channels. Nanogap cavities and surface-lattice-resonant arrays enable tailored emission, polarization selectivity, and vibrational sensing, validated experimentally.

11:10 INVITED TALK **Plasmon Assisted Up Conversion for High Performance Photochromic Smart Windows**

Ovidio Peña-Rodríguez[1], Chang Woo Kim[2], Edgardo Gabriel Santoro[1], Umapada Pal[3], Young Soo Kang[4]

[1]Universidad Politécnica de Madrid (Spain), [2]Pukyong National University (South Korea), [3]Benemérita Universidad Autónoma de Puebla (Mexico), [4]Korea Institute of Energy Technology (South Korea)

Photochromic smart windows can regulate solar radiation, but their performance is limited by the small ultraviolet fraction in sunlight. We report plasmonic yolk shell nanophosphors that convert visible light into ultraviolet emission. Integrated with tungsten oxide photochromic films, they significantly accelerate coloration kinetics and enhance optical contrast in smart windows.

11:30 INVITED TALK **Can Surface Plasmon Carry Heat?**

Jungmin Nam, Kuk Hyun Yun, Bong Jae Lee

KAIST (South Korea)

This presentation outlines our recent endeavors in developing an efficient heat spreader made of a nanoscale metallic film, beginning with experimental investigations to demonstrate in-plane heat transfer along a thin metal film via surface plasmon.

11:50 INVITED TALK **Hard and Soft: Exploiting Nanoplasmonics in Sensing Applications**

Luca De Stefano[1], Valeria Nocerino[2], Bruno Miranda[1], Principia Dardano[1]

[1]CNR ISASI (Italy), [2]University of Naples Federico II (Italy)

Optical (bio)sensors are based on materials that convert a (bio)molecular interaction occurring on their surface into a change in the values of the light impinging on them. Integrated optics, optical circuits on glass and silicon, has been the technology adopted in optical sensing until the advent of nanoplasmonics and metamaterials.

12:10 INVITED TALK **Polarization-Programmable Optics using Chiral Dielectric Metastructures**

Soo Jin Kim

Korea University (Korea)

We demonstrate symmetry broken dielectric metasurfaces that leverage the nonlocal guided mode resonances to enable efficient spin selective polarization control and chirality resolved detection. Moreover, we propose metastructures which produce globally biased optical chirality in the near and far field regime, supported by coupled mode design rules.

Lunch Break 12:30 - 14:00

1–O16 | Dargan Auditorium | 14:00 - 15:50

SP20: Nonlocal and nonlinear nanophotonics

Organized by: Gonzalo Álvarez-Pérez and Huatian Hu

Chaired by: Gonzalo Álvarez-Pérez and Huatian Hu

14:00 KEYNOTE TALK **Probing nanoscale optical nonlocal and nonlineareffects through free electrons**

Javier García de Abajo

ICFO-Institute of Photonics Sciences (Spain)

We explore how free electrons probe nanomaterials' nonlocal and nonlinear optical responses with unmatched spatial resolution, examining harmonic generation, Kerr nonlinearities, and interference of inelastically scattered electrons, while lateral deflections from finite momentum transfers reveal nonlocal effects.

14:30 INVITED TALK **Single-cycle optical nonlinearity of transparent conducting oxides explained**

Ieng-Wai Un[1], Subhajit Sarkar[2], Yonatan Sivan[3]

[1]South China Normal University (China), [2]Shiv Nadar University (India), [3]Ben-Gurion University (Israel)

We provide a quantitative model for the electro-optic response of transparent conducting oxides to single cycle intense pulses. We show that the interplay between spatio-temporal aspects of absorption, stimulated emission and multi-photon absorption can explain the weaker-than-before nonlinear response observed in experiments, as well as on the unexplained relaxation dynamics.

14:50 INVITED TALK **Enhancing the Kerr-effect in nonlinear media for mid-IR single-photon detection at room temperature**

Richarda Niemann[1], Ke-Sean J. Peter[1], Maxwell J. Tolchin[2], Jon-Paul Maria[2], Sahin Ozdemir[3], Nathaniel Kinsey[3], Durdu Guney[4], Joshua D. Caldwell[1]

[1]Vanderbilt University (USA), [2]Pennsylvania State University (USA), [3]Saint Louis University (USA), [4]Michigan Technological University (USA)

We present our work on maximizing the nonlinearity in CdO at its ENZ frequency to enhance the phase shift occuring due to the effective optical Kerr-effect tracing the ultimate goal of mid-IR single photon detection at room temperature. We discuss the nonlinear refractive index response to wavelength and angular tuning.

15:10 INVITED TALK **Mid-infrared nonlinearity in heavily-doped semiconductor nanoantennas and waveguides**

Michele Ortolani[1], Raffaella Polito[2], Maria Gambelli[1], Enrico Bau[3], Andreas Tittl[3], Luca Lucia[4], Adel Bousseksou[4], Raffaele Colombelli[4], Gregoir Beaudoin[4], Isabelle Sagnes[4], Hu[5], Alvarez-Perez[5], Ciraci[5], Talamas Simola[6], De Seta[6], Cibella[2], Mattioli[2], Notargiacomo[2], Pea[2], Venanzi[7], Giliberti[1]

[1]Sapienza University of Rome (Italy), [2]CNR (Italy), [3]Ludwig-Maximilian University (Germany), [4]Centre de Nanosciences et de Nanotechnologies (France), [5]Center for Biomolecular Nanotechnologies - IIT (Italy), [6]Roma Tre University (Italy), [7]Center for Life Nano and Neuro Sciences - IIT (Italy)

The hydrodynamic behaviour of free electrons generates strong nonlinear optical response when the effective mass is small, as in the n-type doped semiconductors InGaAs and Ge. We show nanoantennas and waveguides where the nonlinear response depends on carrier density, is resonant with antenna geometry, and tunable with a field-effect voltage.

15:30 INVITED TALK **Limitations and Opportunities in Second Order Nonlinear Optical Materials: The Role of the Penn Gap**

Jacob Khurgin

Johns Hopkins University (USA)

This study examines second-order nonlinear optical materials, highlighting the Penn gap as a key factor in predicting upper limits of $\chi(2)$. Results suggest that while improvements in the mid-infrared range are limited, significant potential exists for enhancement in the ultraviolet by combining a wide Penn gap with reduced bond polarity.

1–O17 | McNabb Theatre | 14:00 - 15:50

SYM5: Phononics and acoustic metamaterials

Organized by: Marco Miniaci, Jensen Li, Jean-Philippe Groby, Vincent Pagneux, Noé Jiménez, Stefano Laureti
Chaired by: Marco Miniaci, Jensen Li, Jean-Philippe Groby, Vincent Pagneux, Noé Jiménez, Stefano Laureti

14:00 INVITED TALK **Practical Design of Helmholtz Resonators Considering Geometry and Acoustic Losses**

Vicente Cutanda Henriquez, Frieder Lucklum

Technical University of Denmark (Denmark)

Helmholtz resonators (HRs) are widely used as a means toachieve sub-wavelength performance in acoustic metamaterials. HRs contain compliance, mass and loss elements. The balance of the three determines resonance frequency, bandwidth and absorption. We discuss how to implement HRs for better control, robustness and performance.

14:20 INVITED TALK **Radiation Control in Fluid-Loaded Metamaterial Waveguides with Space and Time Modulation**

Emanuele Riva[1], Alper Erturk[2]

[1]Politecnico di Milano (Italy), [2]Georgia Institute of Technology (USA)

We investigate leaky-wave radiation in fluid-loaded elastic waveguides equipped with spatially and temporally modulated resonators. Periodic modulation induces controlled wavenumber-frequency shifts that activate radiating Floquet harmonics inside the acoustic sound cone. The resulting radiation angle is tunable and is herein engineered to focus acoustic energy in the adjacent fluid.

14:40 KEYNOTE TALK **Metastructures for spatial signal processing and energy confinement**

Raffaele Ardito[1], Marcello Cazzola[1], Chiara Gazzola[1], Jacopo Maria De Ponti[1], Marco Miniaci[2], Prisca Viviani[1], Alberto Corigliano[1]

[1]Politecnico di Milano (Italy), [2]Politecnico di Torino (Italy)

This work critically discusses micro- and meso-scale graded metastructures as spatial signal processing platforms, with emphasis on achieving tonotopicity, advanced control of wave propagation, and elastic energy confinement. Illustrative examples include graded micro- and meso-scale arrays and bio-inspired, cyclically symmetric phononic pseudo-crystals.

15:10 INVITED TALK **Ultrafast Electronic and Acoustic Dynamics in Nanocrystalline Silicon**

Tânia Ribeiro[1], Tiago E. C. Magalhaes[1], Houssem Rezgui[1], Gloria Conte[1], Oili Ylivaara[2], Jouni Ahopelto[2], Clivia Sotomayor-Torres[1]

[1]INL - International Iberian Nanotechnology Laboratory (Portugal), [2]VTT Technical Research Centre of Finland Ltd (Finland)

In this work, we report the ultrafast electronic and acoustic dynamics of nanocrystalline silicon (nc-Si) thin films and membranes, investigating how structural and morphological changes impact phonon lifetimes.

15:30 INVITED TALK **Optical probing of the vibrational and thermal dynamics of single metal nanoparticles**

Nathan Berrit[1], Noelle Lascoux[1], Clément Panais[1], Sylvie Marguet[2], Natalia Del Fatti[1], Aurélien Crut[1]

[1]Université de Lyon (France), [2]Université Paris-Saclay (France)

The resonant optical response of single plasmonic nanoparticles enables efficient probing of their vibrational and thermal dynamics. Ultrafast pump-probe experiments and numerical simulations reveal how these dynamics depend on nanodisk and substrate properties, and demonstrate that vibrations and cooling produce distinct spectral signatures, enabling their selective detection.

1–O18 | Maharry Theatre | 14:00 - 15:45

SP15: Plasmonic Nanomaterials for Bio-diagnostics, Environmental Monitoring and Food Safety

Organized by: Lucia Petti and Massimo Rippa
Chaired by: Lucia Petti and Massimo Rippa

14:00 INVITED TALK **Vanadium Dioxide Nanoparticles: A Platform for Tuning Localized Surface Plasmons**

Michal Horák[1], Jiří Kabát[1], Rostislav Řepa[1], Jordan A. Hachtel[2], Peter Kepič[1], Vlastimil Křápek[1], Andrea Konečná[1], Tomáš Šikola[1]

[1]Brno University of Technology (Czech Republic), [2]Oak Ridge National Laboratory (USA)

We present a comprehensive modal analysis of single-phase and multi-phase vanadium dioxide nanoparticles using in-situ high-resolution electron energy loss spectroscopy. In addition to identifying individual plasmonic modes and bulk losses as a function of nanoparticle size, our focus is on capturing the dynamic nanoscale optical response throughout the metal-insulator transition.

TUE

14:20 **Correlation Spectroscopy based Nanobiosensor: Application for Cu-Zn Superoxyde Dismutase detection**

Mohand Chalal[1], Abdelhak Dhibi[2], Nordin FELIDJ[2], Nadia Djaker[1]

[1]Université Sorbonne Paris Nord (France), [2]Université Paris Cite (France)

Gold nanoparticles (GNP) are widely used in many fields, such chemistry and nanomedicine. Recently, scattering correlation spectroscopy is one of the most used techniques for GNP-biomolecules interaction characterization. The SCS correlation curve is very sensitive to Parameters such as molecules orientation, binding affinity and cooperativity regarding the GNP surface.

14:35 INVITED TALK **Decoding Intracellular Microenvironment by SERS**

Aleksandra Szaniawska, Agnieszka Girstun, Katarzyna Bogusz, Justyna Grzeda, Aleksandra Miszczak, Hubert Sobiech, Katarzyna Wlecial, Andrzej Kudelski

University of Warsaw (Poland)

Surface enhanced Raman spectroscopy is applied to probe intracellular pH at the nanoscale using plasmonic gold nanostructures functionalized with pH sensitive reporters. Comparative calibration in buffers cell media and living cells reveals how nanoparticle architecture and reporter chemistry shape sensor response to complex intracellular microenvironments.

14:55 INVITED TALK **Multimetallic plasmonic nanoparticles for colorimetric sensing**

Vincenzo Amendola

University of Padova (Italy)

Colorimetric sensors exploiting analyte-induced color changes are widely studied in plasmonic nanoparticles, especially gold. In functionalized colloids, analyte-triggered aggregation causes spectral shifts detectable by UV-Vis spectroscopy and visually. Similar effects occur in silver and rhodium nanoparticles, though less attractive. We compare these nanomaterials and outline unexplored opportunities for plasmonic sensing.

15:15 KEYNOTE TALK **Chirality in Light Matter interaction**

Giuseppe Strangi

Case Western Reserve University (USA)

Chiral metasurfaces enable strong control of light matter interaction at the nanoscale. Planar plasmonic architectures generate superchiral electromagnetic fields that enhance chiroptical responses beyond natural systems. These engineered platforms support enantioselective sensing, molecular spectroscopy, and quantum photonics by amplifying weak optical signatures of molecular chirality.

1–O19 | Room 3074 | 14:00 - 16:00

SYM1: Hybrid Nanomaterials and Metastructures for Photonics, Sensing and Energy

Organized by: Jérôme Plain, Alexander Govorov, Davy Gérard, Pedro Hernandez Martinez
Chaired by: Jérôme Plain, Alexander Govorov, Davy Gérard, Pedro Hernandez Martinez

14:00 INVITED TALK **Metasurfaces with phase singularity for sensorapplications: a theoretical and experimental study**

Theo Girerd, Sebastien Cueff, Fabien Mandorlo, Taha Benyattou, Xavier Letartre, Cécile Jamois, Lydie Ferrier, Lotfi Berguiga

Université Claude Bernard Lyon 1 (France)

Photonic structures with phase singularities are studied theoretically and experimentally for sensing applications. Our theoretical framework provides a better understanding of the phase behaviour near critical coupling. We demonstrated that the sensitivity and detection limit of the Goos-H¨anchen sensor can be improved theoretically by a factor of 100 000.

14:20 INVITED TALK **Flexible and Stackable Stickers to Prepare Quasi-3D Metasurfaces**

Shunsuke Murai, Koichi Okamoto

Osaka Metropolitan University (Japan)

We present a strategy for preparing quasi-three-dimensional metasurfaces using flexible and stackable metasurface stickers. The flexibility and stackability of the polymer-embedded metasurface stickers allow facile assembly of multilayer architectures, providing additional degrees of freedom for tailoring optical responses.

14:40 INVITED TALK **Tailoring Optical Dispersion using Nonlinear Geometric-phase Metasurfaces**

Mikko Huttunen[1], Madona Mekhael[1], Roman Calpe[2], Robert Fickler[1], Tommi Hakala[2]

[1]Tampere University (Finland), [2]University of Eastern Finland (Finland)

We demonstrate nonlinear metasurfaces utilizing nonlinear geometric phase, providing accurate phase control of nonlinear signals via adjusting the orientation of metasurfaces. Demonstrated metasurfaces could be used as thin coatings for nonlinear applications benefitting of dispersion fine-tuning, such as for frequency conversion of ultrashort pulses using very thin nonlinear materials.

15:00 INVITED TALK **Polarization-resolved nonlinear chiroptical scattering**

Ventsislav Valev

University of Bath (United Kingdom)

Recent reports of nonlinear chiroptical scattering include hyper-Rayleigh, hyper-Mie, hyper-Tyndall and hyper-Raman optical activity. All were observed as differences in scattered light intensity depending on the handedness of incident light and of the scatterers. We demonstrate that the polarization of the scattered light provides an independent set of chiroptical observables.

15:20 INVITED TALK **Sensing chiral molecules using achiral plasmonic metasurfaces: limitations and perspectives**

Obren Markovic[1], Shuhui Yang[1], Mathieu Nicolas[1], Catherine Schwob[1], Mathieu Mivelle[1], Guillaume Demesy[2], Nicolas Bonod[2], Souhir Boujday[1], Bruno Gallas[3]

[1]Sorbonne Université (France), [2]Aix-Marseille University (France), [3]INSP-CNRS (France)

Multipolar modes can be used to generate superchiral fields in the vicinity of plasmonic resonators. However, small systematic shape errors can produce linear polarization effects that can propagate in the CD to produce a spurious signal. Polarimetry allows estimating the sensitivity limits to the detection of chiral molecules.

15:40 INVITED TALK **Chiral surface plasmons and their spin-hall effect on top of helix arrays**

Paul de Bollivier[1], Vage Karakhanyan[1], Roland Salut[1], Miguel A. Suarez[1], Nicolas Martin[1], Thierry Grosjean[2]

[1]FEMTO-ST (France), [2]FEMTO-ST Institute (France)

We demonstrate the existence of a new type of surface plasmons supported by nanohelix arrays. A spin Hall effect is observed in the free-space outcoupling of these plasmons, revealing a spin-dependent deflection in the emitted radiation. These results highlight the chiral nature of the plasmonic modes sustained by nanohelix arrays.

1–O20 | Room 4050B | 14:00 - 15:00

SP4: Chiral fields and ultrafast chiral spectroscopy

Organized by: Jamal Berakdar and Andrei Afanasev
Chaired by: Jamal Berakdar and Andrei Afanasev

14:00 INVITED TALK **Attosecond Chiral Interferometry with Free Electron Lasers**

Davide Faccialà[1], J. Terentjevas[2], A. Senftleben[3], J. Mikosch[3], M. Ruberti[4], A. Schneider[2], M. Padovani[2], A. G. Lohr[2], A. Roos[2], P. Martin Maier[2], Flores[2], Heilemann[2], Christou[2], Ghosh[3], Oberti[5], Germeroth[3], Mirahmadi[2], Vozzi[1], Prince[6], Di Fraia[7], Patchkovskii[2]

[1]CNR - Istituto di Fotonica e Nanotecnologie (CNR-IFN) (Italy), [2]Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy (Germany), [3]University of Kassel (Germany), [4]Imperial College London (United Kingdom), [5]Politecnico di Milano (Italy), [6]Elettra Sincrotrone (Italy), [7]CNR - Istituto Officina dei Materiali (CNR-IOM) (Italy)

We show that two color phase-locked free-electron laser pulses induce interferometric and enantio-sensitive photoemission in propylene oxide. Our method isolates coherent chiral contributions, resolving individual multi-electron states. This provides direct access to chiral electronic currents on sub_x0002_femtosecond timescales.

14:20 INVITED TALK **Tailored laser fields for driving nonlinear interactions with chiral molecules**

Aude Rodriguez[1], Jacob Edginton[2], Alexander Löhr[3], Justas Terentjevas[3], Patricia Vindel-Zandbergen[4], Andrés Ordóñez[5], Josh Vogwell[6], Olga Smirnova[3], David Ayuso[6], Laura Rego[7]

[1]ICMM-CSIC (Spain), [2]Imperial College London (UNited Kingdom), [3]Max-Born-Institut (Germany), [4]New York University (USA), [5]Freie Universität Berlin (Germany), [6]Imperial College London (United Kingdom), [7]Instituto de Ciencia de Materiales de Madrid (ICMM-CSIC) (Spain)

Tailored laser fields are a powerful tool to investigate chirality. We show that the interaction of vector beams with chiral molecules results in topological chiral rings, where the handedness of the molecules is imprinted in the divergence of their light emission.

14:40 INVITED TALK **Controlling Intensity and Polarization at Deep Subwavelength Scale with Plasmonic Metastructures**

Viktor Podolskiy[1], Brandon Gomes[1], Jiaren Tan[2], Hooman Barati Sedeh[2], Yuruo Zheng[2], Jacob LaMountain[1], Sean Morrison[1], Anatoly Zayats[3], Natalia Litchinitser[2]

[1]University of Massachusetts Lowell (USA), [2]Duke University (USA), [3]King's College London (United Kingdom)

Recently, plasmonic multilayered structures have been utilized to generate skyrmionic distributions of optical spin fields with deep subwavelength scale. We explore relationship between the details of such distributions and the structural properties of the multilayer/metasurface systems

1–O21 | Room 4050B | 15:00 - 16:00

SP17: Topological Insulator Metamaterials

Organized by: Giuseppina Simone
Chaired by: Giuseppina Simone

15:00 INVITED TALK **Graphene and Topological Insulator Metamaterials for Terahertz Applications**

Klaas-Jan Tielrooij

Eindhoven University of Technology (The Netherlands)

Graphene and topological insulators have in common that photoexcitation with virtually any wavelength, including gigahertz (GHz) and terahertz (THz) light, can lead to highly efficient carrier heating. This carrier heat can be exploited to create novel metamaterial devices with applications in terahertz nonlinear photonics and terahertz photodetection for quality inspection.

15:20 INVITED TALK

Exceptional points can enable lower-Q modes to lase first

Julius Kullig[1], Qi Zhong[2], Jan Wiersig[1], Ramy ElGanainy[3]

[1]Otto-von-Guericke-Universität Magdeburg (Germany), [2]Michigan Technological University (USA), [3]Saint Louis University (USA)

Laser systems are expected to lase first in the highest-Q cavity mode under uniform pumping. We show this can fail near exceptional points (EPs): two lower-Q modes coalesce, forming a hybrid mode whose gain grows faster and reaches threshold before a competing higher-Q mode.

15:40 INVITED TALK

CVD-Synthesized $PtTe_2$ Nanoribbon Arrays for Tunable Mid-IR Polarized Photocurrent via SPP Control

Christian Martella, Alessandro Molle

CNR-IMM (Italy)

Here, we investigate experimental parameters for synthesizing engineered $PtTe_2$ microribbon arrays, enabling precise control of surface plasmon polariton excitation. This design selectively enhances mid-infrared polarization-sensitive photocurrent, with spectral tunability via ribbon array geometry

1–O22 | Room 3051 | 14:00 - 15:55

SP5: Functional materials for tunable and reconfigurable photonics

Organized by: Sébastien Cueff and Yael Gutierrez
Chaired by: Sébastien Cueff and Yael Gutierrez

14:00 INVITED TALK

Tailoring Surface Polaritons and Hyperbolic Polaritons in 2D materials with the Plasmonic Phase-Change Material In3SbTe2

Thomas Taubner, Lukas Conrads, Lina Jäckering, Matthias Wuttig

RWTH Aachen University (Germany)

We exploit the non-volatile insulator-to-metal transition of the plasmonic phase-change material In3SbTe2 for optical programming polariton resonators in hyperbolic 2d materials such as hBN and α-MoO3. The strongly confined resonance modes and highly-directional propagation are investigated with scanning near-field optical microscopy. This study enables rapid prototyping of reconfigurable polariton optics.

14:20

A Fabrication-Friendly All-optical Integrated Photonic Phase-change Memory with Plasmonic Enhancement

Joseph Pady[1], Junchao Song[1], Emanuele Gemo[2], Joe Shields[1], Stuart Kendall[1], Nikolaos Farmakidis[1], Harish Bhaskaran[3], Ivonne Bente[4], Wolfram Pernice[4], David Wright[1]

[1]University of Exeter (United Kingdom), [2]Politecnico di Torino (Italy), [3]University of Oxford (United Kingdom), [4]University of Münster (Germany)

The optical characteristics and device switching properties of a fabrication-friendly all-optical, plasmonically-enhanced phase-change memory are investigated through both finite-element modelling and a bespoke phase-change computational model. Rapid and low-energy (16 pJ to 50 pJ) optical switching is numerically demonstrated, and device optical contrast is enhanced through cascading multiple plasmonic nanoantennas.

14:35 INVITED TALK

Analysis of the fast dynamics of optical properties in phase change materials

Sebastian Walfort, Nils Holle, Julia Vehndel, Niklas Vollmar, Nils Weber, Joel Billermann, Martin Salinga

University of Münster (Germany)

We resolved the entire switching cycle of a single-element phase change material (PCM) in optical pump-probe measurements with femtosecond resolution. Based on ab-initio simulations we revealed a complex multi-step process, where the intermediate transient states exhibit distinct optical properties with even larger contrasts than those observed between crystal and glass.

14:55 INVITED TALK

Self-Consistent Optical-Thermal Modeling of VO2 Nanoparticles for Tunable Photonic Applications

Peter Kepič, Jiří Kabát, Tereza Bačová, Filip Ligmajer

Brno University of Technology (Czech Republic)

This study investigates the photothermal dynamics of VO2 nanostructures through numerical simulations. We identify "nonlinear ignition," in which plasmonic resonance triggers a positive feedback loop, leading to abrupt temperature and optical jumps at specific intensity thresholds. Additionally, we optimize VO2-integrated SiN waveguides, demonstrating high-performance on-chip modulation for energy-efficient photonic applications.

15:15 INVITED TALK

Semimetallic nanostructures as multifunctional materials for nanophotonics

Fernando Chacon-Sanchez, Johann Toudert, Rosalia Serna

Instituto de Optica IO-CSIC (Spain)

Bismuth and Antimony are semimetallic materials, that displays a versatility unmatched by most widespread materials for nanophotonics. It behaves as a plasmonic, high refractive index and phase change material simultaneously on different wavelengths. We will show the potential of Bi metasurfaces for structural coloring, sensing and photonics.

15:35 INVITED TALK

Phase transitions for tunable nanophononics

Sandeep Sathyan[1], Ornella Colmegna[1], Helmut Karl[2], Sébastien Cueff[3], Norberto Daniel Lanzillotti-Kimura[1]

[1]Université Paris-Saclay (France), [2]Universität Augsburg (Germany), [3]Universite Claude Bernard Lyon 1 (France)

We investigate coherent GHz acoustic phonons in VO_2 thin films using ultrafast pump-probe reflectivity across the phase transition. Distinct temporal and spectral changes reveal phase-dependent interaction mechanisms, supported by simulations. These results highlight VO_2 as a platform for tunable nanoacoustic resonators, reconfigurable phononic networks, and programmable optoacoustic devices for applications.

1–O23 | Room 3071 | 14:00 - 16:00

SP9: When 'meta' meets 'materials': innovative materials, fabrication, functionalities

Organized by: Dorota Pawlak and Virginie Ponsinet
Chaired by: Dorota Pawlak and Virginie Ponsinet

14:00 INVITED TALK

Chiroptical Emergence in Disordered Plasmonic Assemblies

Aso Rahimzadegan[1], Zihao Lu[2], Thomas G. Parton[3], Sinuhe Perea-Puente[3], Antonio Carone[3], Jessica Ma[4], Emeline Raguin[3], Bruno Frka-Petesic[5], Aurimas Narkevicius[5], Junyoung Kwon[6], Greer[5], Kotov[4], Vynck[7], Vignolini[3]

[1]Max Planck Institute (Germany), [2]University of Cambridge (Germany), [3]Max Planck Institute of Colloids and Interfaces (Germany), [4]University of Michigan (USA), [5]University of Cambridge (United Kingdom), [6]Pukyong National University (Korea), [7]Claude Bernard University Lyon 1 (France)

We demonstrate chiroptical activity in disordered ensembles of plasmonic nanospheres despite showing no chirality in their retrieved coordinates. Optical simulations verify the experimental results and reveal that the observed circular dichroism emerges from mesoscopic electromagnetic correlations rather than local chiral coupling, establishing a new paradigm for scalable self-assembled chiral metamaterials.

14:20 INVITED TALK

Designer metasurfaces from the bottom-up

Beniamino Sciacca

CNRS (France)

The development of cost-effective approaches to fabricate metasurfaces at a macroscopic scale is essential for their spread in industrially-relevant products. We show how templated assembly of colloidal building blocs, such as nanocubes, can be employed to fabricate functional metasurfaces with an arbitrary design.

14:40 INVITED TALK **Directed Self-Assembly of Block Copolymers for Ultra-High-Resolution Gold Metasurfaces and Photonic Crystals**

Achmad Putranto[1], Hong Li[1], Martin Kogelschatz[1], Guillaume Fleury[2], Sébastien Cavalaglio[1], Badreddine Smiri[1], David Fuard[1], Camille Petit-Etienne[1], Raphael Ramos[1], Redouane Borsali[1], Zelsmann[1]

[1]Université Grenoble Alpes (France), [2]Université de Bordeaux (France)

The self-assembly of block copolymers is used to fabricate sub-10 nm gold nanocrevices metasurfaces (that are used as sensitive and polarization-dependent SERS substrates) as well as 1D responsive photonic crystals

15:00 INVITED TALK **Engineered 3D Topological Eutectics: Tailoring Dirac-Rashba Interfaces via Directional Solidification for Advanced Spin-Orbitronics**

Kingshuk Bandopadhyay[1], Krzysztof Markus[1], Andrzej Materna[1], Federico Mazzola[2], Dorota Pawlak[1]

[1]ENSEMBLE3 (Poland), [2]CNR - SPIN (Italy)

We report the fabrication of Topological Insulator heterostructures using a scalable solidification method, achieving atomically smooth interfaces. ARPES data confirms that topological surface states coexist with giant-Rashba states. Observed charge transfer and robust electronic features establish this system as a premier platform for advancing spintronics, quantum computing, and next-generation optoelectronics.

15:20 INVITED TALK **Tamm plasmon laser diodes**

Joel Bellessa[1], Maël Laupretre[1], Clémentine Symonds[1], Jean Michel Benoit[1], Aristide Lemaitre[2]

[1]Université Claude Bernard Lyon 1 (France), [2]Université Paris-Saclay (France)

An electrically driven Tamm laser diode based on surface-confined Tamm plasmon modes is presented. The device integrates a silver microdisk with a quantum-well-embedded GaAs/AlAs distributed Bragg reflector supporting Tamm surface resonances. Additionally, the integration of metasurfaces into Tamm structures is described.

15:40 INVITED TALK **Photoluminescence Modulation in Self-Coupled Molecular Cavities**

Evan S. Hyunkoo Kang

Chungbuk National University (South Korea)

Self-coupled molecular cavities, formed by organic dye nanostructures without external resonators, enable tunable photoluminescence through geometry-controlled resonances. By combining experiments and FDTD simulations, we show that emission modulation arises from excitation-dependent nearfield enhancement and cavity-modified radiative quantum efficiency.

1–O24 | Room 3126 | 14:00 - 16:00

SP1: Metamaterials: novel trends and applications

Organized by: Tatjana Gric
Chaired by: Tatjana Gric

14:00 INVITED TALK **Scalable Metafibres for Advanced Imaging via On-Fibre Wavefront Engineering and Wavefront Shaping**

Fei He, Rafael Fuentes Dominguez, Terry Wright, George Gordon

University of Nottingham (United Kingdom)

Metasurfaces and diffractive optics integrated onto fibre tips can extend the capabilities of ultrathin imaging probes, but scalable fabrication remains a key challenge. We present transfer-fabricated metafibres and show how their combination with transmission-matrix wavefront shaping enables improved focusing, depth control, and advanced fibre-based imaging.

14:20 INVITED TALK

Nitride-based nanoparticles for metasurfaces

Ermelinda Salvaggio[1], Jérémie Béal[1], Gregory Abadias[2], Sophie Camelio[2], David Babonneau[2], Davy Gerard[1], Christophe Couteau[1], Jérôme Plain[1]

[1]European University of Technology Eut+ (France), [2]Université de Poitiers (France)

This work characterizes nitride-based nanoparticle arrays and shows that stoichiometry can be used to adjust their plasmonic and photothermal responses. Measurements and simulations reveal narrow, tunable, and robust plasmonic network resonances that show promise for nitride-based devices and metasurfaces.

14:40 INVITED TALK

Abnormal hot carrier thermalization at van Hove singularities in twisted bilayer graphene

Nianze Shang[1], Chen Huang[2], Kaihui Liu[2], Zhipei Sun[1]

[1]Aalto University (Finland), [2]Peking University (China)

We reveal abnormal hot carrier thermalization in twisted bilayer graphene at van Hove singularities using time-resolved ultrafast photoluminescence autocorrelation spectroscopy. A prolonged relaxation lifetime of approximately 600 femtoseconds is observed due to phonon bottleneck and interlayer charge redistribution, unveiling nonequilibrium dynamics in moiré-engineered graphene.

15:00 INVITED TALK

Wavelet-Fourier Modal Method for very Large-Beam Scattering in Photonics and Biophotonics

Kofi Edee

Institut Pascal (France)

We present a physics-based computational framework for wide-beam electromagnetic scattering in large-scale, aperiodic, and anisotropic media. A wide incident beam is represented as a superposition of localized beamlets propagated through overlapping subdomains, ensuring efficient computation and smooth field reconstruction in strongly heterogeneous and anisotropic structures.

15:20 INVITED TALK

Plasmon-Driven pn Junctions in Graphene Revealed by Raman Spectroscopy and Flexural Phonon Coupling

Maciej Wiesner[1], W. Strupinski[2], Jayanta Sarkar[3], Aleksandra Trzaskowska[1], Nojoon Myoung[4], Andriy Serebryannikov[1]

[1]Adam Mickiewicz University (Poland), [2]Warsaw University of Technology (Poland), [3]VTT Technical Research Centre (Finland), [4]Chosun University (Korea)

Raman spectroscopy tracks evolution of graphene G and 2D peaks near Au nanocylinders, revealing strain-correlated shifts, 2D splitting, and carrier-type inversion consistent with plasmon-driven lateral pn-junction formation on SiC. Flexural GHz nanopillar resonances enable acousto-plasmonic coupling and strain-mediated charge redistribution, defining a spectroscopic pathway toward META-scale nano-optoelectronic device control architectures.

15:40 INVITED TALK

Laser-induced formation of plasmonic nanostructures

Rodrigas Liudvinavicius, Kernius Vilkevicius, Evaldas Stankevicius

Center for Physical Sciences and Technology (FTMC) (Lithuania)

Plasmonic nanostructures enable strong light matter interactions and advanced optical functionalities but are commonly fabricated using costly and low throughput lithographic techniques. We demonstrate laser induced formation of plasmonic nanostructures using direct laser writing enabling single step chemical free large area fabrication suitable for scalable and cost-effective photonic applications.

1–O25 | Room 4047 | 14:00 - 16:00

SYM4: Chirality, magnetism, and magnetoelectricity: Separate phenomena and joint effects in metamaterial structures

Organized by: Eugene Kamenetskii

Chaired by: Eugene Kamenetskii

14:00 INVITED TALK **Nonlinear magnetization dynamics as a route to nonreciprocal phases, spin superfluidity, and analogue gravity**

Benedetta Flebus, Vincent Flynn

Boston College (USA)

Balancing dc spin torque against Gilbert damping stabilizes a self-organized spin-superfluid limit cycle in a chiral ferromagnetic multilayer. The resulting superflow is inherently nonreciprocal, enabling direction-selective magnon transport. In a comoving frame the long-wavelength dynamics map onto an effective acoustic metric, allowing sonic horizons and Hawking-like emission.

14:20 INVITED TALK **Breaking of time-reversal symmetry and Onsager reciprocity in chiral molecule interfaced with an environment**

Jonas Fransson

Uppsala University (Sweden)

It is demonstrated that the spin-configuration of a chiral molecule is enantiospecifically locked when coupled to an electron reservoir. Together with the molecular spin-orbit coupling, this dissipative coupling generates an effective spin-splitting of the molecular energy levels and facilitates stabilization of a chirality determined spin-configuration.

14:40 INVITED TALK **Nonlinear terahertz magnetoelectric coupling of electromagnons in multiferroics**

Youtarou Takahashi

The University of Tokyo (Japan)

Multiferroics of spin-driven ferroelectricity provide strong dynamical magnetoelectric coupling, leading to versatile nonreciprocal optical responses. Here, we show the nonlinear magnetoelectric coupling of spin excitations of multiferroics, electromagnons, by using the strong terahertz field. The different nonlinear responses, anharmonic coupling of electromagnons and higher harmonic generation, have been demonstrated.

15:00 INVITED TALK **Zero-frequency chiral magnonic edge states protected by non-equilibrium topology**

Rembert Duine[1], Pieter Gunnink[2], Joren Harms[3], Alexander Mook[4]

[1]Utrecht University (The Netherlands), [2]Johannes Gutenberg University Mainz (Germany), [3]Universitat Konstanz (Germany), [4]University of Munster (Germany)

Topological bosonic excitations must, in contrast to their fermionic counterparts, appear at finite energies. This is a key challenge for magnons, as it prevents excitation and detection of topologically-protected magnonic edge states and their use in magnonic devices. We show how the edge states can be lowered to zero frequency.

15:20 INVITED TALK **Gaussian quantum state preparation of ferromagnetic magnons**

Marco Brühlmann[1], Monika Mycroft[1], Yunyoung Hwang[2], Jorge Puebla[2], Rostyslav Serha[3], Andrii Chumak[3], Carlos Gonzalez Ballestero[1]

[1]TU Wien (Austria), [2]Kyoto University (Japan), [3]University of Vienna (Austria)

We theoretically show how Gaussian quantum magnonic states, both propagating and confined, can be prepared using only external drives, by harnessing the intrinsic magnon nonlinearity.

15:40 INVITED TALK **Symmetry Principles and Topology-Driven Design of Knot-Particle Metasurfaces**

Nadav Goshen, Yarden Mazor

Tel-Aviv University (Israel)

We present a topology and symmetry driven design framework, for single-layer bianisotropic metasurfaces based on knot particles. Knot topology ensures intrinsic electric-magnetic balance and strong chiral response, while controlled mirror-symmetry breaking enables hybrid chiral-omega coupling. Experiments validate efficient polarization rotation and tunable asymmetric scattering without multilayer architectures.

1–O26 | Room 4050A | 14:00 - 15:15

SP24: Cavity Quantum Materials and Polaritonic Devices: From Microscopic Theory to Functionality

Organized by: Yu Zhang
Chaired by: Yu Zhang

14:00 INVITED TALK **Polaritonic dark state delocalisation in conjugate polymers via beyond the light-line strong coupling**

Marie Rider

University of Bath (United Kingdom)

Strongly coupled light-molecule systems exhibit a small number of bright polaritonsand many dark polaritons at the molecular frequency. These states are only truly dark in systems with zero disorder. We propose how to distinguish dark states from uncoupled molecules, and extract information about their delocalisation properties.

14:20 INVITED TALK **Probing Cavity Polaritons via Scattering of Frequency-Entangled Biphoton States**

Andrei Piryatinski[1], Nishaant Jacobus[1], Sameer Dambal[1], Eric R. Bittner[2], Yu Zhang[1], Ajay R. S. Kandada[2]

[1]Los Alamos National Laboratory (USA), [2]Wake Forest University (USA)

We have developed scattering theory for frequencyentangledphoton pairs interacting with cavity polariton andbipolariton states. Within the Tavis-Cummings framework, weelucidate biphoton scattering signatures in the joint spectral amplitudeand entanglement entropy, demonstrating the techniquéspotential as a probe of polaritonic states in semiconductor andmolecular nanostructures.

14:40 **Cavity coupling of van der Waals heterostructures**

Gunda Kipp[1], Hope M Bretscher[2], Gaetan Membrez[1], Ethan Koskas[1], Lorenzo Graziotto[1], Felix Helmrich[1], Luca Somboli[1], Benedikt Schulte[2], Dorothee Herrmann[2], Kateryna Kusyak[2], Matthew W. Day[2], Kesavan[2], Matsuyama[2], Li[2], Langner[2], Hagelstein[2], Sturm[3], Potts[2], Eckhardt[2], Huang[3], Watanabe[4]

[1]ETH Zürich (Switzerland), [2]Max Planck Institute for the Structure and Dynamics of Matter (Germany), [3]Columbia University (USA), [4]National Institute for Materials Science (Japan)

Van der Waals heterostructures host strongly correlated phases tunable in situ via electrostatic gates. Their conductive layers, including the gates themselves, can form plasmonic self-cavities for terahertz light due to finite-size effects. Here we investigate how these effects enable cavity engineering in the ultrastrong coupling regime, with and without light.

14:55 INVITED TALK **Restoring Bloch's Theorem for Cavity Exciton Polaron-Polaritons**

Michael A. D. Taylor, Yu Zhang

Los Alamos National Laboratory (USA)

We introduce a hybrid photon–exciton–phonon quantum electrodynamics Hamiltonian to restore Bloch's theorem. The interchange of momenta between fermions and bosons breaks crystalline excitons' translational symmetry. Restoring said symmetry, we efficiently compute experimentally accessible observables, enabling investigations that elucidate material properties in strong coupling.

1–O27 | Room 4050A | 15:15 - 15:55

SP8: Bio-Inspired Nanophotonics

Organized by: Debashis Chanda
Chaired by: Debashis Chanda

15:15 INVITED TALK **Switchable nonlocal organic metasurfaces**

Dongqing Lin, Yulong Duan, Magnus Jonsson

Linköping University (Sweden)

We present two types of tunable collective lattice resonances (CLRs) through conducting polymer metasurfaces, with resonance wavelengths ranging from 4500 to 640 nm. Poly(3,4-ethylenedioxythiophene) nanoantenna arrays either form plasmonic CLRs by themselves or serve as “optical gate" to switch light confinement and Mie CLRs in low-index organic dielectrics.

15:35 INVITED TALK **Planar plasmonic chirality enabled by conductivity anisotropy in symmetric polymer structures**

Yulong Duan, Magnus P. Jonsson

Linköping University (Sweden)

We demonstrate planar chirality in fully mirror-symmetric polymer metasurfaces by coupling geometric symmetry with anisotropic conductivity. Rotating the in-plane conductivity tensor enables continuous tuning between achiral, left- and right-handed plasmonic responses, decoupling chirality from geometric asymmetry.

1–O28 | Room 5025 | 14:00 - 16:00

SYM2: New trends in nanophotonics and advanced materials

Organized by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han
Chaired by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

14:00 INVITED TALK **Meta-optics based multidimensional imager**

Fengjun Li, Zilan Deng, Xiangping Li

Jinan University (China)

Here we report the development of metasurface based integrated optics from polarization imaging to optoelectronic Stokes logic.

14:20 INVITED TALK **MetasurfaceDriven Control of Quantum Emitters: From Visible Nanolasers to Telecom Photonics**

Giovanni Mattei

University of Padua (Italy)

Engineered optical metasurfaces enable precise control of quantumemitter radiation at room temperature. We demonstrate three platforms: metallic nanoparticle arrays for coherent visible emission, slottedsilicon metasurfaces enhancing Er^3 emission at 1540 nm, and VO_2 phasechange films providing active tunability. These approaches advance scalable quantum photonic sources across visible and telecom bands

14:40 INVITED TALK **Two Distinct Quasi-Bound States in the Continuum in an Amorphous Silicon Metasurface**

Hicham Mangach, Pascal Szriftgiser, Gaëtan Lévêque, Yan Pennec, Bahram Djafari-Rouhani

Université de Lille (France)

Quasi-bound states in the continuum (QBICs) enable subwavelength light confinement with long photon lifetimes. Here, we demonstrate accidental and symmetry-protected QBICs in an amorphous silicon metasurface. The quality factor of the accidental QBIC reaches 10ˆ4, while the symmetry-protected QBIC approaches 10ˆ5.

15:00 INVITED TALK **Symmetry-Broken q-BIC Dielectric Metasurfaces for Enhanced Linear and Nonlinear Light-Matter Interactions**

Wen-Hui (Sophia) Cheng, Hung-Yi Wu, Tzu-Hsiang Liu, Hsin-Yu Shen

National Cheng Kung University (Taiwan)

We present a dielectric metasurface supporting q-BICs induced by controlled symmetry breaking. Strong mode interference enables high-Q resonances, enhanced photoluminescence, and boosted third-harmonic generation. By balancing field confinement and radiation coupling, the design offers an efficient platform for enhancing linear and nonlinear light-matter interactions in nanophotonic devices.

15:20 INVITED TALK **Self enhanced generative metasurface inverse design**

Mathys Le Grand[1], Pascal Urard[2], Loumi Trémas[2], Damien Maitre[2], Louis-Henri Fernandez-Mouron[2], Régis Orobtchouk[1]

[1]Institut des nanotechnologies de Lyon (France), [2]STMicroelectronics (France)

Inverse design of metasurfaces is hindered by complex structural-electromagnetic relationships and computationally expensive traditional optimization. While deep learning models offer solutions, they are limited by narrow training datasets. We propose using generative inverse design techniques to augment and diversify databases, significantly enhancing design space coverage and improving model generalization.

15:40 INVITED TALK **Spatial Fourier filtering with metagratings**

Mahmoud A. A. Abouelatta, Karim Achouri

EPFL (Switzerland)

Traditional 4f Fourier-optics are too bulky for integrated photonics. We present the first nanostructured metagrating providing high-fidelity angular filtering five orders of magnitude thinner than lens-based systems. By engineering dipolar resonances and Kerker-like interference, we achieve efficient spatial filtering, enabling ultra-compact, lens-free optical computing across the near-infrared.

1–O29 | Room 5039 | 14:00 - 15:45

SP16: Metamaterials and Metasurfaces as Platforms for Next-Generation Electromagnetics: Fundamentals, Applications and Future Trends

Organized by: David R. Smith and Okan Yurduseven

Chaired by: David R. Smith and Okan Yurduseven

14:00 INVITED TALK **Physical Neural Networksfor Wireless Communications**

Marco Di Renzo

CNRS-CentraleSupelec & King's College London (United Kingdom)

In this talk, we introduce wave-domain processing enabled by reconfigurable metasurfaces with the aim to redesign the physical layer of wireless communications. We will discuss the motivations, enabling technologies and our recent contributions in this emerging field of research.

14:20 INVITED TALK **Analysis and Simulation of Intrinsic Response Time of Time-Varying Metasurfaces**

Sheng Lei, Alex Man Hon Wong

City University of Hong Kong (China)

We investigate the causes of time delays for varactor-driven meta-atoms. Particularly, through theory, simulation and experiment, we study the electromagnetic response time of the meta-atom given fast switching signals. Our results pave way to designing fast time-varying metasurfaces whose modulation approaches or exceeds the frequency of the illumination wave.

14:40 INVITED TALK

Impedance Network Based Design of STAR Metasurfaces

Mohsen Khalily

University of Surrey (United Kingdom)

This paper presents an impedance network modeling framework for the efficient design of metasurfaces capable of simultaneous reflection and transmission control. The method predicts unit cell responses without iterative full-wave simulations and enables polarization=selective beam-steering and focusing at the same frequency. Theoretical and experimental results validate the proposed design approach.

15:00

Diffractive and Metasurface Networks for Visual Information Processing

Jingtian Hu[1], Yuxiang Sun[2], Fenglei Wang[1], Nanxing Chen[1]

[1]Harbin Institute of Technology (China), [2]Chinese University of Hong Kong (China)

This paper demonstrates a series of visual information processors based on diffractive and metasurface networks. In contrast to conventional digital image processing platforms, these optical structures are pre-sensor processors and can achieve tremendous acceleration of various vision-based tasks including morphological transformations, arithmetic operations, and content creations.

15:15

Transformer-based Neural Network Enabled Subpixel-Resolution in Wide-Field Meta-Microscope

Shanshan Hu, Tao Li

Nanjing University (China)

We propose and experimentally demonstrate a synergistic computational imaging framework that integrates a compact metalens microscope with a transformer-based neural network, which enables wide-field and subpixel resolution imaging without added optical complexity, illustrating a scalable and cost-effective approach to miniaturized and intelligent microscopy.

15:30

A Machine-Learning-Enabled Metasurface Adapting to the Environment

Thijs van Rossum[1], Thomas Koschny[2], Philippe Tassin[1]

[1]Chalmers University of Technology (Sweden), [2]Ames Laboratory-U.S. DOE (USA)

We propose a machine-learning-based adaptive algorithm for tunable metasurfaces in a changing environment. We use a neural network processing information from the metasurface to predict the environment, followed by another neural network to reconfigure it. We demonstrate this for a metasurface adapting to a beam with unkown angle of incidence.

1–O30 | Room 5052 | 14:00 - 16:00

SYM2: New trends in nanophotonics and advanced materials

Organized by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

Chaired by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

14:00 INVITED TALK

Subspace-protected topological phases

Masatoshi Sato

Kyoto University (Japan)

Symmetry is a key to controlling topological phases. In this talk, I will explain that an invariant subspace, a generalization of symmetry, protects topological phases with unconventional properties. I also discuss a possible realization of such subspace-protected topological phases in metamaterials.

14:20 INVITED TALK

Fluctuation-induced Hall-like lateral forces in a chiral-gain environment

Daigo Oue[1], Mário Silveirinha[2]

[1]RIKEN (Japan), [2]Instituto Superior Técnico-University of Lisbon (Portugal)

We predict a fluctuation-induced lateral force on a particle near a substrate under an electrostatic bias that induces chiral optical gain. The force arises from vacuum fluctuations in a non-Hermitian environment, is governed by the Berry curvature dipole, and enables directional momentum transfer without a magnetic field.

14:40 INVITED TALK

Topological Band Engineering in Plasmonic Systems

Yang Guo, Changzhi Gu, Ziyi Fu, Cai Luo

Institute of Physics-Chinese Academy of Sciences (China)

We present a tunable plasmonic grating based on the Su-Schrieffer-Heeger model for topological photonics in visible-range. Through geometric modulation, it facilitates topological band inversion with bound states in the continuum and exhibits a highly confined mid-gap interface state, promising for compact topological optical devices.

15:00 INVITED TALK

Finite-Barrier Bound States and Flat Bands Enabled by p-Orbitals

Tao Liu, Han-Rong Xia, Duanduan Wan, Meng Xiao

Wuhan University (China)

Orbital degrees of freedom provide a powerful route to engineer unconventional wave phenomena in photonic crystals. We show that porbital photonic lattices support finitebarrier bound states and rotationinduced flat bands. By controlling orbital orientation, multiple bands become fully degenerate and dispersionless, enabling robust mode localization and flexible photonic control.

15:20 INVITED TALK

Chirped Pulse Propagation and Control in Reverberant non-Hermitian Settings Enabled Through Complex Time Delay

Isabella Giovannelli, Thomas M. Antonsen, Steven Anlage

University of Maryland (USA)

Complex time delay (CTD), derived from frequency-domain scattering matrix data, predicts time shifts of reflected and transmitted time-domain pulses from multi-modal scattering systems. We extend these results to chirped-pulses and show that the pulse time shift is a combination of real and imaginary CTD, creating new opportunities for pulse control.

15:40 INVITED TALK

Chirality in Non-Hermitian Photonic Crystals

Masaya Notomi, Yuto Moritake, Taiki Yoda

Institute of Science Tokyo (Japan)

We study optical chirality arising from non-Hermitian nature of photonic crystals theoretically and experimentally. First, we reveal interesting interplay between topological singularity and 3D/2D chirality in non-Hermitian photonic crystals. Second, we show our recent results on propagating non-Hermitian skin effect in photonic crystals, and their application to chiral orbital-angular momentum.

Coffee Break 16:00 - 16:40

1–P2 | **Business School Concourse** | **16:00 - 16:30**

Poster Session II

P1

Hyperbolic SuperResonance and LongRange Quantum Entanglement

Evgeniy Narimanov[1], Eugene Demler[2]

[1]Purdue University (USA), [2]ETH Zurich (Switzerland)

Hyperbolic materials support extreme momentum electromagnetic modes that enable deeply subwavelength field confinement and reshape light-matter interaction. We report the discovery of hyperbolic superresonance, arising from clustered highwavenumber modes in finite hyperbolic structures, which enables strong and even ultrastrong light-matter coupling and mediates strong longrange interaction between quantum emitters.

P2

Nonlinear Interferometric Platform for Infrared Metasurface Characterization Towards Bound States in the Continuum

Vidya Prakash Muppalla, Kousik Bera, Brijesh Kumar, Srivatsa Murali, Anshuman Kumar Srivastava

IIT Bombay (India)

We demonstrate a stable nonlinear interferometric platform for infrared characterization using visible photon detection at 807 nm. The system enables phase-sensitive probing of infrared responses without direct infrared detection and provides a platform for studying high-Q metasurfaces and bound states in the continuum.

P3

Room-temperature strong coupling in metal-based organic microcavities for low-threshold micro-lasers

Andrea Betti[1], Eleonora Cara[2], Giulia Serrano[3], Natascia De Leo[2], Renato Torre[1], Alice Boschetti[2]

[1]European Laboratory for Non-Linear Spectroscopy (Italy), [2]Istituto Nazionale di Ricerca Metrologica (Italy), [3]Università degli Studi di Firenze (Italy)

Microscale coherent light sources are central to integrated photonics. We investigate supramolecular light-harvesting complexes embedded in metal microcavities. Strong exciton-polariton formation with large Rabi splitting is observed at room temperature. These results establish metal-based organic microcavities as scalable platforms for enhanced light-matter interaction and low-threshold polaritonic devices.

P4

Mid-infrared Hyperbolic Metamaterial for the Silicon-Germanium Technology Platform

Jon Schlipf[1], Enrico Talamas Simola[2], Fritz Berkmann[3], Leonetta Baldassare[4], Giovanni Capellini[1], Monica de Seta[2], Luciana di Gaspare[2], Inga Fischer[1], Damiano Marian[5], Michele Ortolani[4], Virgilio[5]

[1]IHP - Leibniz Institute for High Performance Microelectronics (Germany), [2]Università degli Studi Roma Tre (Italy), [3]BTU Cottbus-Senftenberg (Germany), [4]Sapienza Università di Roma (Italy), [5]Università di Pisa (Italy)

We present anisotropic metamaterials based on SiGelayers with alternating doping. They were grown by chemical-vapour deposition and characterized using Fourier-transform in-frared spectroscopy. Measured reflectance spectra show excellentagreement with full-wave simulations, indicating the presence ofa hyperbolic metamaterial near the plasma edge.

P5

Flat Band Skin Effect in Mechanical Metamaterials

Xulong Wang, Guancong Ma

Hong Kong Baptist University (China)

We report the flat-band skin effect (FBSE) in one-dimension non-Hermitian lattices, driven by the spectral topology of surrounding dispersive bands. The FBSE was experimentally observed in a non-Hermitian mechanical lattice. Our work reveals unique non-Hermitian localization and offers new perspectives on wave propagation.

TUE

P6

Harvesting Mechanical Energy Absorbed by Negative Poisson's Ratio Metamaterials

Jiazhen Zhang[1], Guobiao Hu[2], Hao Tang[2], Yaozi Zheng[2], Yaowen Yang[1]

[1]Nanyang Technological University (Singapore), [2]The Hong Kong University of Science and Technology (China)

Negative Poisson's ratio metamaterials exhibit high energy absorption under compression, but the absorbed energy is typically dissipated. This work demonstrates a piezoelectric framework that converts absorbed mechanical energy into electrical power. Experiments show 11 V peak storage voltage and 8.3×10 J harvested energy, sufficient for wireless transmission.

P7

Optical Control of Lasing Modes in Quantum Dot Superparticles

Marco Reale, Pietro Castronovo, Marco Cannas, Emanuele Marino, Alice Sciortino, Fabrizio Messina

University of Palermo (Italy)

We report excitation-controlled lasing from individual CdSe/CdS quantum dot superparticles. By tuning the pump wavelength, reversible selection of whispering-gallery modes is achieved. This provides a purely optical route to dynamically reconfigurable and compact microlasers.

P8

Observing Exceptional Lines in Scattering Matrices

Wenzhe Liu[1], Jingyi Zhao[1], Xinhao Wang[1], Lei Shi[1], Che Ting Chan[2], Jian Zi[1]

[1]Fudan University (China), [2]the Hong Kong University of Science and Technology (China)

We investigate topological singularities in scattering matrices of photonic structures in the visible spectrum. Using frequency and momentum as parameter space, we observe features consistent with exceptional lines through Mueller matrix spectroscopy. This approach enables investigation of non-Hermitian topology without complex structural requirements.

P9

Nanopopcorn-Based SERS Nanosensors for Intracellular pH Mapping

Katarzyna Bogusz, Katarzyna Wleciał, Agnieszka Girstun, Andrzej Kudelski, Aleksandra Szaniawska

University of Warsaw (Poland)

Surface enhanced Raman spectroscopy is investigated as a tool for probing intracellular pH and local chemical microenvironment using gold nanopopcorn nanostructures functionalized with pH sensitive Raman reporters. The work combines nanoparticle synthesis reporter comparison and cellular studies to evaluate how nanoscale architecture and biological environment determine intracellular SERS response.

P10

Magnetic Properties and Applications of Glass-coated Ferromagnetic Microwires

Valentina Zhukova, Paula Corte-Leon, Mihail Ipatov, Juan Maria Blanco, Arcady Zhukov

University of the Basque Country (Spain)

The impact of post-processing on magnetic properties and the giant magnetoimpedance (GMI) effect of Fe- and Co-based glass-coated microwires is evaluated. Frequency dependence of GMI ratio of studied microwires has been discussed considering frequency dependence of the skin penetration depth as well as magnetic anisotropy distribution within the metallic nucleus.

P11

A Biomimetic Photonic Structure Based on PROSPECT Model for High-Fidelity Vegetation Spectral

Mang Li, Linqi Huang, Zhaobo Feng, Xian Wang

Huazhong University of Science and Technology (China)

Inspired by vegetation microstructure and the PROSPECT model, we design a multilayer biomimetic photonic film with a fixed $[YbF3/ZnS]^2$/[Ge/ZnS] stack. By optimizing only the layer thicknesses, it accurately mimics diverse vegetation solar spectrums (380-2500 nm), validated by high spectral cosine value (SCA0.99).

TUE

P12

Topological Derivative Multiscale Approach for the Design of Broadband Epsilon-Near-Zero Metamaterials

Antonio Andre Novotny[1], Jorge Luz Filho[1], Felipe Pinheiro[2], Pablo Blanco[1]

[1]LNCC/MCT (Brazil), [2]UFRJ (Brazil)

We present an application of the topological derivative for the multiscale design of ENZ metamaterials. From the sensitivity of the effective macroscopic electric permittivity to microscale topological changes, we achieve a systematic design of ENZ composites across visible and near-infrared wavelengths. Nontrivial geometries are obtained, significantly broadening the ENZ bandwidth.

P13

Resonance Engineering in Bi_2Te_3 Mie Void Heterostructures

Zhuoyuan Lu, Kirill Koshelev, Pavel Tonkaev, Ziyu Chen, Dawei Liu, Wenkai Yang, Yuri Kivshar, Yuerui Lu

Australian National University (Australia)

Resonance engineering of Bi2Te3 Mie void resonators is presented, where air core cavities support surface localized modes governed by geometry. The resonance behavior and field confinement are experimentally probed using photoluminescence and second harmonic generation, revealing robust mode localization and continuous tunability at the single resonator level.

P14

Full-Stokes metagrating for dual-wavelength polarization imaging

Huanxin Liao, Zeyu Zheng, Han Gao

China Jiliang University (China)

Currently, metasurfaces with imaging elements for polarization imaging mostly work at a single wavelength, which is difficult to meet the application requirements for multi-wavelength/broadband in fields such as biomedical imaging or semiconductor detection. This study realizes a dual-wavelength polarization metagrating for high accuracy polarization imaging using multi-target optimization method.

P15

Multispectral imaging with a planar cavity-type metasurface for optical security

Dongkyun Kang, Jungwoo Pyo, Jaehyeong Kim, Hwajin An, Myeongkyu Lee

Yonsei University (Korea)

Planar cavity-type metasurface with color control unit and emission control unit enables simultaneous visible and infrared image recording via laser-induced phase change in Ge2Sb2Te5 layer. Fabricated on flexible substrates, bending-stable, with infrared-lossless color layers ensuring independent spectral control, it promises applications in optical security including authentication and anti-counterfeiting.

P16

Enhanced hot-carrier generation and dissociation in porous gold nanorods

Katarzyna Kluczyk-Korch, Tomasz Antosiewicz

University of Warsaw (Poland)

The enhanced photocatalytic performance of porous gold compared to bulk gold has been examined using atomistic simulations. A correlation has been identified between the larger number of low-coordinated surface gold atoms and an increased generation of hot carriers within the plasmonic nanostructure.

P17

Programmable synthetic frequency dimension platform for on-chip topological photonics

Xiaolong Su, Weiwei Liu, Bing Wang, Peixiang Lu

Huazhong University of Science and Technology (China)

More recently, photonic synthetic dimension has become an emerging paradigm. Specifically, the synthetic frequency dimension offers unique advantages due to flexibly reconfigurable gauge potential and long-range couplings. Here, we present the realization of programmable chiral edge states of the Hall ladder in synthetic frequency dimension.

TUE

P18

Angle-Induced Double Resonance of Quasi-Guided Modes for Enhanced Second-Harmonic Generation

Sooseong Ji, Jaesung Kim, Jongwon Lee

Ulsan National Institute of Science and Technology (Korea)

We experimentally demonstrate angle-tunable double-resonant second-harmonic generation in a dielectric metasurface supporting quasi-guided modes. By adjusting the incident angle source, simultaneous resonances at both the fundamental and second-harmonic wavelengths are achieved, resulting in a 27-fold enhancement of the SHG signal.

P19

Retrieving structural and optical parameters of 2D photonic crystals through angle-resolved spectroscopy: Addressing the electron microscope limitations

Anand Eswara Rao Aryasomayajula, Viswanath P

Centre for Nano and Soft Matter Sciences (CeNS) (India)

We demonstrated angle-resolved spectroscopy as precise, non-invasive metrology for characterizing self-assembled 2D photonic crystals in close-packed and non-close-packed states. By analyzing diffraction, retroreflection, and interference, we retrieved the structural parameters and effective refractive indices. This framework overcomes limitations of electron microscopy, such as need for conductive coatings and vacuum conditions.

P20

3D Stokes Polarimetry of Dipolar Near-Fields

Guillermo Serrera[1], Yael Gutiérrez[1], José J. Gil[2], Fernando Moreno[1]

[1]University of Cantabria (Spain), [2]Independent researcher (Spain)

Dipolar emitters constitute fundamental building blocks in nanophotonics, yet their polarization behavior outside the far-field approximation remains insufficiently characterized. In this work, we introduce the threedimensional Stokes formalism as a unified framework to describe the complete polarimetric landscape of dipolar radiation across the near, intermediate, and farfield regimes.

P21

Exciton-Plasmon Strong Coupling in Gold Nano-Bipyramid Arrays

Kseniia Mamaeva, Hodjat Hajan, Jamie Somers, Teodora Faraone, Colm Delaney, Larisa Florea, A. Louise Bradley

Trinity College Dublin (Ireland)

We demonstrate deterministic room-temperature strong coupling between single CdSe/ZnS quantum dots and gold nano-bipyramid tips using plasmon-triggered two-photon polymerization. Electron-beam-patterned bipyramid arrays guide QD-loaded resin to plasmonic hotspots. Scattering shows 265meV Rabi splitting and photoluminescence polariton emission, enabling a scalable route to bright nonlinear single-photon sources for integrated quantum photonics.

P22

Multimode Waveguiding Photonic-Crystal Gratings

Lucciano Antonio Letelier Carreño, Lina Grineviciute, Simas Melnikas, Kestutis Staliunas

Center for Physical Sciences and Technology (Lithuania)

We study multilayer photonic crystal gratings where stacked layers replicate a periodic surface, enabling multimode waveguiding and angular selective diffraction in reflection. An FDTD design approach reveals the role of period, index contrast and layer sequence. Samples fabricated by ion beam sputtering technology confirm narrowband angle-selective response under oblique illumination.

P23

Core-shell Au@PEtOx1-xPBuOxx Nanoparticle Colloids: Thermally Switching Optical Absorbers with Tuned LCST Point

Oleg Yeshchenko[1], Lea Daoud[2], Oles Fedotov[1], Pavlo Khort[1], Oksana Krupka[2]

[1]Taras Shevchenko National University of Kyiv (Ukraine), [2]Université d'Angers (France)

We focused on the study of thermo-controlled morphological transformations and optical switching phenomena in colloid solution of core-shell Au@PEtOx-stat-PBuOx and Au@PEtOx in water with gold core and statistical polymer shell of α-methyl-ω-hydroxy poly(2-ethyl-2-oxazoline)1-x-stat-poly(2-n-butyl-2-oxazoline)x and α-methyl-ω-hydroxy poly(2-ethyl-2-oxazoline) respectively using transmission electron microscopy, dynamic/electrophoretic light scattering, light absorption and SERS methods.

P24

Flexible and Programmable Semiconductor Plasmonic Platforms for Near-Infrared Meta-Optics

Debmalya Mukhopadhyay, Bivas Saha

Jawaharlal Nehru Centre For Advanced Scientific Research (India)

Semiconducting plasmonic platforms based on doped ScN and CdO thin films are demonstrated for near-infrared meta-optics. Flexible van der Waals heteroepitaxy enabled ScN exhibits tunable ENZ response, while Sc-doped CdO enables wide spectral programmability via carrier engineering. Attenuated total reflection reveals SPP modes, establishing complementary, low-loss, programmable plasmonic materials.

P25

A Dynamically Beam Steerable Metasurface Antenna with Sidelobe Suppression

Enez Furkan Cihan[1], Nursel Akçam[2]

[1]ASELSAN Inc. - Gazi University (Turkey), [2]Gazi University (Turkey)

A beam-steerable metasurface array antenna based on a substrate-integrated waveguide is presented. PIN diodes enable dynamic beam steering toward different directions. A modified sidelobe-suppression method is integrated with the steering scheme. The proposed antenna achieves up to 6 dB sidelobe reduction while steering the beam from -25° to $+30^\circ$.

P26

Polarization needle beam metalens for large-volume super-resolution photoacoustic neuroimaging in expanded tissue

Yongjae Jo, Inki Kim

Sungkyunkwan University (Korea)

Needle-beam metalens PAM combined with expansion microscopy improves effective resolution while preserving large-volume imaging. A modified phase enhances optical efficiency, doubling brightness. Fabricated 2 mm SiN metalens enables neuron-specific contrast via pigment labeling. Results show 4–20$\times$ resolution gain and quantitative neuronal analysis, highlighting potential for high-resolution 3D cellular imaging.

P27

Quantisation of polariton modes for dispersive resonators

Jakub Skorka, Ben Yuen, Angela Demetriadou

University of Birmingham (United Kingdom)

We describe a new way of quantising electromagnetic fields in the presence of dispersive, lossless resonators, based on normal mode expansion of the fields. This method is a generalisation of an existing approach, developed fornon-dispersive media.

P28

Deterministic Photon Addition in a Waveguide Mode

Kristina Malinowski[1], Holland Frieling[1], Benjamin Koltenbah[2], Pankaj Jha[3], Harry Atwater[1]

[1]Caltech (USA), [2]Boeing Technology Innovation (USA), [3]Syracuse University (USA)

We report on emitter-waveguide modeling results investigating stimulated emission during single photon addition. We design and fabricate a coupled emitter-waveguide device, representing significant progress towards an experimental demonstration of deterministic single photon addition.

P29

Flat band Engineering in Polymer Acoustic Lieb Lattices

Anusha Rehman[1], Riccardo C. Moroni[2], David Hutchins[1], Peter J. Thomas[1], Rudolf Roemer[1], Katarzyna Majewska[2], Stefano Laureti[3]

[1]University of Warwick (United Kingdom), [2]Institute of Fluid-Flow Machinery Polish Academy of Sciences (Poland), [3]University of Calabria (Italy)

Flat-band acoustic metamaterials enable interference-driven wave localization. Building on polymer Lieb-lattices operating in the ultrasonic-regime, a predictive scaling formulation for band tuning has been designed, together with extended Lieb architectures supporting multiple flat-bands. Mechanically reconfigurable auxetic-Lieb structures are also demonstrated. These approaches provide scalable and tunable platforms for multi-frequency acoustic-localization.

P30

Self-configuring linear diffractive optical networks for adaptive imaging through multimode fibres

Jérôme Don Jayamanne[1], José C. A. Rocha[1], Uné G. Būtaitė[1], Joel Carpenter[2], David B. Phillips[1]

[1]University of Exeter (United Kingdom), [2]The University of Queensland (Australia)

When light propagates through complex media, its spatial modes become scrambled, hindering imaging and data transmission. Here we experimentally demonstrate how a linear diffractive optical network can be adaptively trained in-situ to efficiently reverse such scattering across multiple modes simultaneously.

P31

Free-Electron Coupling to Surface Polaritons Mediated by Small Scatterers

Leila Rocio Prelat[1], Eduardo J.C. Dias[2], F. Javier García de Abajo[1]

[1]The Barcelona Institute of Science and Technology (Spain), [2]University of Southern Denmark (Denmark)

We show that small scatterers enable low-energy electrons to excite surface polaritons even when direct coupling is kinematically forbidden. Maximum emission occurs at an optimum scatterer–surface distance, while periodic arrays produce directional polaritonic Smith–Purcell emission. Hexagonal boron nitride disks provide a practical route to spectrally selective excitation of graphene plasmons.

P32

Long-range coupling through photonic molecules

Romina Abarca-Ramirez, Diego Roman-Cortes, Rodrigo Vicencio

Universidad de Chile (Chile)

We demonstrate the evanescent and resonant excitation of high transversal modes on long photonic molecules. By inserting the molecule as a link we observe long-range coupling of very distant waveguides. We use this on a one-dimensional lattice and demonstrate the emergence of a topological phase originated by third-order nearest-neighbour coupling.

1–O31 | Dargan Auditorium | 16:40 - 19:40

SYM1: Hybrid Nanomaterials and Metastructures for Photonics, Sensing and Energy

Organized by: Jérôme Plain, Alexander Govorov, Davy Gérard, Pedro Hernandez Martinez
Chaired by: Jérôme Plain, Alexander Govorov, Davy Gérard, Pedro Hernandez Martinez

16:40 KEYNOTE TALK **Kagome-Inspired Topological Photonics:From Lattice Design to Robust Control of Light**

Zhigang Chen

Nankai University (China)

I will present our recent advances in Kagome-inspired photonic lattices and their structural extensions, including super-honeycomb, breathing Kagome, disclination-based, and fractal-like geometries. These systems enable the realization of diverse topological states, such as higher-order boundary modes, vortex states carrying orbital angular momentum, and flatband-induced localization.

17:10 KEYNOTE TALK **Meta-optics based optomechanics**

Adeel Afridi, Bruno de Melo, Bin Lu, Nadine Meyer, Romain Quidant

ETH Zürich (Switzerland)

We discuss the use of metaoptics in optomechanics. By exploiting resonant silicon meta-atoms, we achieve enhanced optomechanical performance and deterministic control over optical forces. We show that engineering multipolar Mie resonances allows for switching between attractive and repulsive forces, directly mirroring the behavior of two-level systems.

17:40 INVITED TALK **Dielectric Mie Nanostructures and Metasurfaces for Quantum Emitter Control**

Antoine Azéma[1], Swaroop Palai[2], Jonas Muller[3], Etienne Palleau[4], Frank Fournel[5], Vincent Larrey[5], Guilhem Larrieu[3], Gonzague Agez[1], Jean-Marie Poumirol[1], Vincent Paillard[1], Wiecha[3], Ressier[4], Cuche[1]

[1]CEMES-CNRS (France), [2]LPCNO (India), [3]LAAS-CNRS (France), [4]LPCNO (France), [5]CEA-Leti (France)

Enhancing single-photon sources efficiency via optically resonant nanostructures is crucial for quantum communications. High-refractive-index dielectric nanostructures offer appealing optical properties through Mie resonances, with reduced absorption and compatibility with CMOS technology. This study explores experimentally and numerically how silicon nanoantennas and metasurfaces influence the photodynamics and directionality of quantum emitters

18:00 INVITED TALK **Precision Synthesis and Functionalization: Uniform, Size- and Shape-Tunable Gold and Silver Nanostructures for Advanced Platforms**

Kyoungweon Park, Aklilu Worku, Angela Campo, Richard Vaia

Air Force Research Laboratory (USA)

Silver nanostructures offer superior optical response over gold at a lower cost. However, scalable aqueous synthesis with precise size and shape control remains challenging. This talk presents advances in aqueous synthesis and robust functionalization, demonstrating how these scalable silver nanoplatforms can exceed gold's performance in real-world applications.

18:20 INVITED TALK **Photochemical Synthesis of Gold Nano- and Microplates on Substrates**

Svetlana Neretina, Brendan Nieukirk, Runze Tang

University of Notre Dame (USA)

We introduce a photochemical synthesis that yields periodic arrays of highly faceted gold nanoplates with deterministic shape control. Light-driven solution chemistry enables uniform, device-ready architectures compatible with large-area patterning. This approach provides a scalable platform for integrating plasmonic nano- and microplates into metasurfaces, optical components, and next generation photonic devices.

18:40 INVITED TALK

High-Q Band-folded Lattice Resonances for Low-threshold Lasing

Shaojun Wang

Soochow University (China)

We present dielectric metasurface nanolasers leveraging non-local lattice resonances and band-folding to achieve high-Q electric quadrupole modes with superior ffeld-gain overlap. Via Pancharatnam-Berry phase encoding, we enable lowthreshold, directional, circularly polarized lasing, offering a compact, full-polarization-controllable source for quantum photonics and sensing.

19:00 INVITED TALK

Chirality-Induced Response in Chiral Inorganic Materials

Yoshihiko Togawa

Osaka Metropolitan University (Japan)

Chirality-dependent generation, propagation, and transfer of angular momenta of the chiral phonons are demonstrated with chiral quartz crystals under the steady heat flow.

19:20 INVITED TALK

Self-assembly of Artificial Proteins as Scaffold for Advanced Nanophotonics

Liudmila Trotsiuk[1], Nathan Epalle[2], Rémi Chassagnon[1], Régis Parvaud[1], Valérie Marchi[3], Marielle Valerio-Lepiniec[2], Agathe Urvoas-Cisse[2], Philippe Minard[2], Erik Dujardin[1]

[1]Université Bourgogne Europe (France), [2]Université Paris-Saclay (France), [3]University of Rennes 1 (France)

We demonstrate a proof of concept for artificial protein assemblies as programmable scaffolds for the selective positioning of quantum emitters that opens new avenues for engineered light-matter interactions in nanophotonics.

1–O32 | McNabb Theatre | 16:40 - 19:00

SP20: Nonlocal and nonlinear nanophotonics

Organized by: Gonzalo Álvarez-Pérez and Huatian Hu
Chaired by: Gonzalo Álvarez-Pérez and Huatian Hu

16:40 INVITED TALK

Using material and structural resonances to shape photon pair emission by four-wave mixing

Hua Li, Omer Can Karaman, Valeria Vento, Giulia Tagliabue, Christophe Galland

EPFL (Switzerland)

Four-wave mixing (FWM) is a universal nonlinear process that can take place in any material under sufficiently strong optical excitation. We show how the polarization and spectra of quantum-correlated photon pairs produced by FWM can be tailored through the use of material resonances (phonon modes) and structural resonances (Mie-type modes).

17:00 INVITED TALK

Nonlinear Self-Action Driven by Quasi-Bound States in the Continuum

Alfonso Nardi[1], Sonia Freddi[2], Michael Scalora[3], Agostino Di Francescantonio[1], Johann Osmond[4], Attilio Zilli[1], Marco Finazzi[1], Michele Celebrano[1], Monica Bollani[2], Maria Antonietta Vincenti[3]

[1]Politecnico di Milano (Italy), [2]Consiglio Nazionale delle Ricerche (Italy), [3]Università degli Studi di Brescia (Italy), [4]ICFO-Institut de Ciencies Fotoniques (Spain)

We experimentally study nonlinear self-action in nonlocal metasurfaces supporting quasi-bound states in the continuum. Comparing picosecond and femtosecond excitation, we observe resonance-enhanced third-harmonic generation, sub-cubic scaling, and power-dependent spectral reshaping. Full-wave simulations attribute these effects to ultrafast resonance shifts from nonlinear refractive index modulation, highlighting high-Q confinement in nonlinear dynamics.

17:20 INVITED TALK **A Boundary Element Method Solver for Dispersive Feibelman Parameters in Plasmonics**

Ulrich Hohenester, Lorenz Huber

University of Graz (Austria)

We develop a computational Maxwell solver based on the boundary element method incorporating frequency dependent and dispersive Feibelman parameters, which accounts for nonlocal effects in plasmonic nanoparticles. Typical runtimes are comparable to those of normal simulations, and we discuss how to obtain the pertinent Feibelman parameters for realistic metals.

17:40 INVITED TALK **Nonlocal metasurfaces controlling the geometric phase and direction of light**

Adam Overvig

Stevens Institute of Technology (USA)

We discuss progress in the field of nonlocal metasurfaces to control the direction and light within a sharp spectral feature. We clarify the geometric phases involved and explore applications of symmetry-breaking design concepts to enhance resonant efficiency, unidirectionally scatter light, engineer topological cavities, and steer nonlinear harmonic generation.

18:00 INVITED TALK **Mapping Nonlocal Bulk Continuum to Few Surface Modes**

Runzhi Zou[1], Qiang Zhou[1], Pu Zhang[2], Xue-Wen Chen[1]

[1]Huazhong University of Science of Technology (China), [2]Huazhong University of Science and Technology (China)

The quasi-continuum of nonlocal bulk modes greatly complicates the optical responses of nanostructures and modal analysis. We establish a general framework to effectively map the nonlocal bulk continuum to few modes of an equivalent system, which admits the classical description and helps reveal physical insights from the complicated responses.

18:20 INVITED TALK **On An Integral-Equation Method in Quantum Hydrodynamics: Efficiency and Convergence Issues**

Christos Mystilidis[1], Xuezhi Zheng[2], Christos Tserkezis[1]

[1]University of Southern Denmark (Denmark), [2]Nanjing University of Aeronautics and Astronautics (China)

We present a Volume Integral Equation (VIE) method for the analysis of scattering from spherical nanoparticles (NPs) described by the Quantum Hydrodynamic Theory (QHT). Exploiting the inherent symmetries, we overcome significant computational bottlenecks and explore convergence issues by investigating the asymptotic behaviour of matrix elements.

18:40 INVITED TALK **Probing the extreme optical field around plasmonic nanocavities**

Hongli Zhou, Shunping Zhang

Wuhan University (China)

The fundamental limit of plasmonic field enhancement is a basic in nanophotonics. We probe the averaged electric field enhancement in a resonant Ag nanocavity reach > 1200 times in the hot spot and the vacuum field of a plasmonic mode is highly localized around a tip.

1–O33 | Maharry Theatre | 16:40 - 19:30

SP2: Parity-Time and quasi-normal modes in Photonics, Plasmonics, Acoustics

Organized by: Anatole Lupu and Henri Benisty
Chaired by: Anatole Lupu and Henri Benisty

16:40 INVITED TALK **Emergence of higher-order exceptional points in composite non-Hermitian quantum systems**

Jan Wiersig[1], Weijian Chen[2]

[1]Otto-von-Guericke Universität (Germany), [2]North Carolina State University (USA)

We investigate the emergence of higher-order exceptional points (EPs) in composite quantum systems formed by the tensor product of multiple subsystems, each exhibiting an EP. We determine the resulting spectral response strength, and show that the presence of the higher-order EP causes initially entangled states to disentangle during time evolution.

17:00 INVITED TALK **Light Trapping by Non-Hermitian Thin Films**

L. Grineviciute[1], I. Lukosiunas[2], J. Nikitina[1], I. Meskelaite[2], D. Gailevicius[2], Kestutis Staliunas[3]

[1]Center for Physical Sciences and Technology (Lithuania), [2]Vilnius University (Lithuania), [3]UPC-ICREA (Spain)

We consider non-Hermitically modulated thin films, with a periodic modulation of the surface, and the modulation of losses along the film. We show that the incident radiation, is unidirectionally trapped into a planar mode of the film, does not escape from the film, and is efficiently absorbed there.

17:20 INVITED TALK **Topological chiral edge modes in the continuum**

Li Ge

College of Staten Island (USA)

Chiral edge modes in topological states of matter were previously found in band gaps, which may be deformed and shifted as a function of the lattice momentum. Here we show that they can exist inside a bulk band instead, i.e., in the continuum.

17:40 INVITED TALK **Exceptional Nexus of Reflection Zeros and a Theory of Spectral Magnetization**

William Tuxbury[1], Adin Dowling[1], Shahid Iqbal[1], Mattis Reisner[1], Urlich Kuhl[2], Tsampikos Kottos[1]

[1]Wesleyan University (USA), [2]Universite Cote d'Azur (France)

Analogies with nematic spin theory enable a topological characterization of reflection zeros (RZs) in an SSH-like structure with parity-time and chiral-time symmetry. These symmetries enforce an exceptional nexus at the frequency origin, hosting a sixth-order exceptional point of RZs. Reflectance/transmittance measurements experimentally confirm the nexus.

18:00 INVITED TALK **Pumped and active dissipative media with non-Hermitian periodic potentials**

Salim Benadouda Ivars[1], Muriel Botey[1], Kestutis Staliunas[2], Ramon Herrero[1]

[1]Universitat Politecnica de Catalunya (UPC) (Spain), [2]ICREA (Spain)

The introduction of periodic non-Hermitian potentials in damped-driven and damped-active NonLinear Schrödinger Equation permits stabilization and accessibility of solitonic structures.

18:20 INVITED TALK

Phase conjugation and focusing in multimode non-Hermitian systems

Konstantinos Makris[1], Demetri Psaltis[2]

[1]FORTH (Greece), [2]Ecole Polytechnique Federale de Lausanne (Switzerland)

In the framework of non-Hermitian photonics, we examine two possible ways for constructing a focused spot inside a guided wave system (photonic lattices or multimode fibers) with distributed gain-loss. The first one is that of parity-phase conjugation and the second one that of singular value decomposed transmission matrices.

18:40

Sensing with complex Bragg gratings over parity-time states

Tianyi Hao, Pavel Cheben, Jens H. Schmid, Pierre Berini

University of Ottawa (Canada)

We analyze the sensitivity of non-Hermitian Hamiltonian gratings mapped onto a spherical (anti-) parity-time (PT) symmetry state space. We focus on sensing along trajectories defined by the spherical axes (r, θ, ϕ) of the PT sphere from initial states selected thereon.

18:55 INVITED TALK

Topology in space, time, and space-time

Alexander Szameit

University of Rostock (Germany)

19:15

Photonic neuromorphic computing using non-Hermitian zero modes in coupled nanolaser arrays

Kaiwen Ji[1], Giulio Tirabassi[2], Cristina Masoller[3], Ge Li[4], Alejandro M. Yacomotti[1]

[1]Laboratoire Photonique Numerique et Nanosciences (France), [2]Universitat Politecnica de Catalunya (Spain), [3]Universitat de Girona (Spain), [4]College of Staten Island (USA)

We propose a photonic neuromorphic computing architecture based on symmetry-protected robust zero modes. We experimentally demonstrate that even a small set of coupled nanolasers can implement non-convex boundaries, enabling the classification of highly compressed handwritten digits.

1–O34 | Room 3074 | 16:40 - 19:15

SP15: Plasmonic Nanomaterials for Bio-diagnostics, Environmental Monitoring and Food Safety

Organized by: Lucia Petti and Massimo Rippa

Chaired by: Lucia Petti and Massimo Rippa

16:40 INVITED TALK

Hybrid Photonic-Electronic Tapered Optical Fibers for Multimodal Neural Interfacing

Ferruccio Pisanello, Linda Piscopo, Barbara Spagnolo, Antonio Balena, Sneha Pottekad, Claudia Lattebovio, Giulio Mastrototaro, Muhammad Fayyaz Kashif, Cinzia Montinaro, Stella Aslanoglou, Kazemzadeh, Qualtieri, De Vittorio

Istitutol Italiano di Tecnologia (Italy)

We present a multifunctional tapered optical fiber platform for multimodal neural interfacing. Plasmonic nanostructures enable highly sensitive SERS detection of neurotransmitters and wavelength-selective photothermal modulation. Integrated microelectronic elements fabricated via two-photon lithography provide electrophysiological and temperature sensing, advancing hybrid photonic-electronic implantable tools for neurophotonics.

17:00 INVITED TALK **Mid-infrared Spectrochemical Detection on Pixeled SEIRA Metasurfaces using Azide vibrational Probes**

Emanuela Esposito[1], Federica Donadio[2], Valentina Di Meo[3], Gennaro Sanita[2], Alessio Crescitelli[2], Angela Oliver[4], Annamaria Sandomenico[4], Menotti Ruvo[4], Massimo Moccia[5], Vincenzo Galdi[5], Rendina[2]

[1]Institute of Applied Sciences and Intelligent Systems-ISASI-CNR (Italy), [2]CNR - Institute of Applied Sciences and Intelligent Systems (ISASI) (Italy), [3]CNR - Istituto Superconduttori (Italy), [4]CNR - Institute of Biostructures and Bioimaging (IBB) (Italy), [5]University of Sannio (Italy)

We demonstrate a SEIRA platform based on pixeled plasmonic metasurfaces and azide vibrational probes, enabling labelfree detection of intact analytes. An azidemodified Fab fragment immobilized on gold nanoantennas enables detection of Her2 at attomole levels with probespecific spectral shifts, achieving exceptional sensitivity.

17:20 INVITED TALK **Fluorescence-based chiral sensingwith silicon metasurfaces**

Tom Sistermans[1], Artemijs Krimovs[2], Robert Pal[2], Alberto G. Curto[1]

[1]Ghent University - IMEC (Belgium), [2]Durham University (United Kingdom)

Chiral molecules with opposite handedness can have strongly differing biological properties. Identifying chirality is, however, limited by low sensitivity, restricting detection to high concentrations and large sample volumes. To overcome this, we propose a silicon nanophotonics-based sensing technique to enhance the sensitivity of chiral molecular detection.

17:40 INVITED TALK **Smart materials for thermal management by utilizing environmental sensing**

Duncan Sutherland, Xavier Gonzalez

NANO Center Aarhus University (Denmark)

Solar conversion to heat in building interiors causes significant energy use through air-conditioning, contributing massively to global CO2 emission. A smart windows solutions based on plasmonics makes use of environmental sensing to dynamically modulate near infrared light entry as a function of solar intensity.

18:00 INVITED TALK **Resonant Heat Transfer for Efficient Off Grid Photothermal Desalination**

William Schmid, Qian Ye, Aleida Machorro-Ortiz, Peter Nordlander, Naomi J. Halas, Alessandro Alabastri

Rice University (USA)

Solar photothermal desalination is limited by latent heat. We demonstrate resonant heat transfer that recycles condensation heat back to the feed when counterflows are dynamically matched. With nanophotonic or plasmonic absorbers for high light to heat conversion, resonance increases fresh water output and enables off grid desalination.

18:20 INVITED TALK **Optical Forces Enhanced by Epsilon Near Zero Metamaterials for Nanoscale Manipulation**

Giovanna Palermo[1], Dante M. Aceti[2], Maria Grazia Donato[3], Onofrio Maragò[3], Giuseppe Strangi[4]

[1]University of Calabria (Italy), [2]NLHT Lab - University of Calabria (Italy), [3]CNR-IPCF (Italy), [4]Case Western Reserve University (Italy)

We study optical force enhancement near epsilon-near-zero metamaterials for nanoscale trapping and transport. By combining electromagnetic simulations and force evaluation, we identify conditions that maximize gradient and scattering forces under realistic illumination. The approach enables tunable optical manipulation in compact platforms, with relevance to lab on chip and photonics.

18:40 INVITED TALK **Micro and Nanolasers for Biomolecular Detection**

Soraya Caixeiro

University of Bath (United Kingdom)

Micro and nanolasers exhibit sharp optical resonances that make them powerful platforms for sensitive biomolecular detection. We demonstrate spectralshift sensing using surfacefunctionalised whisperinggallerymode microlasers, with goldnanoparticle coupling providing enhanced, labelfree sensitivity. This approach enables the detection of subtle molecular interactions and offers a versatile route toward compact, highprecision biosensing devices.

19:00

Low-Power Plasmonic Strategies for Nanoscale Analyte Transport and Trapping

Aliaksandra Rakovich[1], Marciano Palmo do Carmo[1], David Mack[2], Diane J. Roth[1], Miao Zhao[1], Ancin M. Devis[1], Francisco Rodriguez-Fortuño[1], Stefan A. Maier[3], Paloma A. Huidobro[4]

[1]King's College London (United Kingdom), [2]Imperial College London (United Kingdom), [3]Monash University, Imperial College London (Australia), [4]Universidad Autonoma de Madrid (Spain)

This work reports a low-power hybrid plasmonic platform for nanoscale analyte transport and trapping aimed at plasmonic biosensing applications. The platform integrates asymmetric nanoantenna arrays that enable rectified Brownian transport under modulated illumination with plasmonic bowtie electrodes that provide frequency controlled dielectrophoretic trapping and release, enabling spatially resolved analyte delivery.

TUE

1–O35 | Room 4050B | 16:40 - 19:20

SYM6: Advanced Techniques for Computational Electromagnetics

Organized by: Maha Ben Rhouma
Chaired by: Maha Ben Rhouma

16:40 INVITED TALK

Computational Nanophotonics for AR Optics: From Performance Targets to Artifact-Robust Designs

Christina Spaegele

Meta (USA)

Nanophotonic optics have the potential to enable compact, lightweight AR displays by enhancing wavefront control in wearable devices. This talk links AR system requirements to nanostructure design, discusses performance and fabrication challenges, and presents examples of nanophotonic design approaches developed to overcome artifacts and meet demanding AR display standards.

17:00 INVITED TALK

Optical Nonlinearities in Materials with Nonlocal Response

Gonzalo Alvarez-Perez[1], Huatian Hu[2], Cristian Ciracì[3]

[1]Italian Institute of Technology (Italy), [2]Istituto Italiano di Tecnologia (Italy), [3]Center for Biomolecular Nanotechnologies (Italy)

Heavily doped semiconductors and polar dielectrics enable strong mid-infrared nonlocal and nonlinear light-matter interactions. Hydrodynamic carriers and bulk plasmons enhance Kerr nonlinearities and optical bistability in tunable nanoantennas and hybrid waveguides. In polar dielectrics, anharmonic phonons generate intrinsically nonlinear phonon-polariton responses that can be strongly amplified in nanostructures.

17:20 INVITED TALK

Topologically structured doughnuts: optical skyrmions, superoscillations, and axion probes

Nikitas Papasimakis

University of Southampton (United Kingdom)

This talk will present recent developments on spatiotemporally structured toroidal pulses including their topological properties, exotic field configurations, superoscillatory behaviour, and non-trivial light-matter interactions.

17:40 INVITED TALK

A universal scattering anomaly near bound states in the continuum

Ya Yan Lu

City University of Hong Kong (China)

A bound state in the continuum (BIC) is an eigenmode with a frequency in the radiation continuum. When the system with a BIC is perturbed, scattering problems may exhibit unusual wave phenomena referred to as scattering anomalies. We identify a new and universal scattering anomaly associated with BICs.

18:00 INVITED TALK **Separating partially coherent light**

Charles Roques-Carmes

Stanford University (Austria)

We demonstrate the automatic separation of partially coherent light into its mutually orthogonal and incoherent components by variational processing in an integrated circuit. This process finds and measures the eigenvectors and eigenvalues of the coherency matrix, hence also completely measuring the partially coherent state, while leaving it intact after optimization.

18:20 INVITED TALK **Simulation and Optimization of Large-Scale Metasurfaces**

Jens Niegemann[1], Shin-Sung Kim[2], Thibault Leportier[1], Han-Hsiang (Michael) Cheng[3]

[1]Ansys (Canada), [2]Ansys (United Kingdom), [3]Ansys (Japan)

We demonstrate efficient simulation and optimization of millimeter-scale metasurfaces using GPU-accelerated finite-difference time-domain (FDTD) methods. Additionally, we show how optimized metasurfaces can be seamlessly integrated into system-level simulations through machine learning-based surrogate models, enabling rapid evaluation without repeated full-wave analysis

18:40 INVITED TALK **Photo-Excited Silicon-Based Quarter-Wave Plate for Terahertz Applications**

Shohei Tsuzuki, Jun Shibayama

Hosei University (Japan)

This article investigates a photo-excited silicon quarter-wave plate in the terahertz region. Using the finite-difference time-domain method, the performance of the quarter-wave plate is calculated with a focus on light emission intensity. Depending on the intensity, this device acts as either a quarter-wave plate or a blocking filter.

19:00 INVITED TALK **Time-Frequency Structured Light for Analog Processing of Broadband Waveforms**

Majid Goodarzi, Geunweon Lim, Connor Rowe, Benjamin Crockett, Xinyi Zhu, Hao Sun, Jose Azana

Institut National de la Recherche Scientifique (INRS) (Canada)

1–O36 | Room 3051 | 16:40 - 19:05

SP5: Functional materials for tunable and reconfigurable photonics

Organized by: Sébastien Cueff and Yael Gutierrez

Chaired by: Sébastien Cueff and Yael Gutierrez

16:40

Morphology-Directed Phase Change Metastructures: Tunable Optical Response and Energetics Without Lithography

Yedeng Fei, Tony Kong, Avik Mandal, Abbas Sheikh-Ansari, Behrad Gholipour

University of Alberta (Canada)

Glancing-angle deposition of phase change alloy creates self-assembled reconfigurable metastructures whose optical resonances and phase-transition energetics are co-programmed by morphology alone. At constant composition, deposition angle tunes effective permittivity, resonance wavelength, switching thresholds, and kinetics. This lithography-free platform establishes morphological control as a new design paradigm for active metamaterials.

16:55 INVITED TALK **Nanoresonators and metasurfaces for nonreciprocal photonics**

Sergey Kruk

Tampere University (Finland)

Nonreciprocity underpins signal routing in modern technology. While nonreciprocal electronic components - diodes, transistors - have been miniaturized to the nanoscale, nonreciprocal photonics remains bulky. We develop pathways towards nonreciprocal nanophotonics, enabling compact manipulation of amplitude, phase, and polarization of light, and opening new opportunities for integrated photonic systems.

17:15 INVITED TALK **Canalization-based super-resolution imaging using an individual van der Waals thin layer**

Jiahua Duan[1], Aitana Tarazaga Martín-Luengo[2], Christian Lanza[2], Stefan Partel[3], Kirill Voronin[4], Ana Isabel F. Tresguerres-Mata[2], Gonzalo Alvarez-Perez[5], Alexey Y. Nikitin[4], Javier Martín-Sánchez[2], Pablo Alonso González[2]

[1]Beijing Institute of Technology (China), [2]University of Oviedo (Spain), [3]Vorarlberg University of Applied Sciences (Austria), [4]Donostia International Physics Center (DIPC) (Spain), [5]IstitutoI Italiano di Tecnologia (Italy)

Phonon-polariton (PhP) canalization is diffractionless transport enabled by a flat isofrequency contour (IFC), previously achieved with twisted multilayers and angle-specific conditions. We remove stacks by tuning substrate permittivity to a specific negative value, flattening the alpha-MoO3 PhPs IFC on SiC and enabling shiftable super-resolution imaging to 1/220 free-space wavelength.

17:35 INVITED TALK **Room-temperature zero differential thermal emitters enabled by the controllable metal-insulator transition in rare-earth perovskite nickelates**

Luigi Matera[1], Laurent Divay[2], Luis Moreno Vicente-Arche[1], Manuel Bibes[1], Paolo Bortolotti[1], Julian Peiro[1], Lucia Iglesias[1]

[1]Thales - Université Paris-Saclay (France), [2]Thales Research and Technology (France)

In this work, we present room temperature zero differential thermal emitters based on strained Sm 1-x Nd x NiO3 thin films. By engineering the metal insulator transition, we obtain nearly constant long wavelength infrared emission over about 15 degrees Celsius, confirmed by outdoor thermal imaging experiments.

17:55 INVITED TALK **Coherent Spin-Photon Interfaces based on Molecular Rare-Earth SystemsDesigning Molecular Rare-Earth Spin-Photon Quantum Interfaces**

Diana Serrano

PSL University (France)

Rare-earth ions (REIs) are promising candidates for quantum hardware owing to their optically addressable, highly coherent spin states. Integrating these properties into scalable quantum architectures, however, remains challenging. Here, we introduce REI-based molecular materials that combine long optical and spin coherence with the synthetic versatility of coordination chemistry

18:15 INVITED TALK **The Old Brewster Effect Meets New Phase-Change Materials for Optical Switching**

Gonzalo Santos[1], Diego Pérez[1], Josef Resl[2], Maria Losurdo[3], Yael Gutiérrez[1], Fernando Moreno[1]

[1]Universidad de Cantabria (Spain), [2]Johannes Keppler University (Austria), [3]CNR ICMATE (Italy)

Phase-change materials enable optical switching devices with highly tunable optical behavior, ultrafast modulation speeds, and low energy requirements. In this work, we introduce a new optical amplitude switch that employs the phase-change material antimony trisulfide (Sb_2S_3) and exploits the Brewster-angle effect to achieve efficient, controllable modulation.

18:35

Near-Unity Optical Switching by Sb2S3/Si Hybrid Metasurfaces

Amin Zamani[1], Gabriel Sanderson[1], Meibao Qin[2], Lu Zhang[3], Qiwei Miao[3], Sara Moujdi[1], Ze Zheng[1], Mohammadhossein Momtazpour[1], Christopher J. Mellor[4], Wending Zhang[3], Mei[3], Mansouri[1], Xu[1], Rahmani[1]

[1]Nottingham Trent University (United Kingdom), [2]Nanchang Institute of Science and Technology (China), [3]Northwestern Polytechnical University (China), [4]University of Nottingham (United Kingdom)

We demonstrate high-throughput optical modulation in monolithic and hybrid Sb2S3/Si metasurfaces, where silicon-enhanced resonances enable 99% transmission modulation at telecom wavelengths using only 3% optically induced crystallization in Sb2S3. This phase transition also allows large-scale tuning of nonlinear emission, offering a versatile platform for reconfigurable linear and nonlinear nanophotonics.

18:50

Reproducible 2D Structural Color Platforms for Reliable pH Sensing Applications

Jing Qian, Yekaterina Tskhe, Luke Madden, Enrique Azuaje-Hualde, David Hoey, Louise Bradley, Larisa Florea, Colm Delaney

Trinity College Dublin (Ireland)

A well-designed 2D cube-array structural color platform was combined with a pH-responsive polymer to achieve sensitive optical pH sensing. The resulting color shift provides a reliable sensing element, offering a practical route toward integrating structural color architectures into real-world pH sensor devices.

1–O37 | Room 3071 | 16:40 - 19:30

SP9: When 'meta' meets 'materials': innovative materials, fabrication, functionalities

Organized by: Dorota Pawlak and Virginie Ponsinet
Chaired by: Dorota Pawlak and Virginie Ponsinet

16:40 INVITED TALK

Engineering Silicon Optical Properties via Metal-Assisted Chemical Etching

Gilles Bourret

University of Salzburg (Austria)

Metal-assisted chemical etching (MACE) enables scalable, solution-based nanostructuring of silicon with precise control over its optical response. This talk highlights key parameters to achieve homogeneous MACE and optimize field enhancement in silicon nanowire arrays, for SERS, photocatalysis, solar hydrogen generation, and microchip authenticaton.

17:00 INVITED TALK

Silicon metasurfaces for thermal control of classical and quantum light

Agostino Di Francescantonio, Omer Can Karaman, Giulia Tagliabue

EPFL (Switzerland)

We investigate resonant, thermo-optically reconfigurable silicon metasurfaces modulating light in the classical and quantum regime. Thermo-optic effect enables dynamic modulation of photon pairs and efficient control of the transmittance via engineering of heat and optical time scales, opening interesting avenues for optical modulation and computing.

17:20 INVITED TALK

Optical Metrology of Chiral and Strain Engineered Metasurfaces

Fabian Haake, Marcello Pozzi, Theresa Stecher, Henning Galinski

ETH Zurich (Switzerland)

Controlling local optical anisotropy is central to functional metasurfaces. This talk presents scanning reflectance anisotropy microscopy (SRAM) as a non-destructive tool with sub-degree phase sensitivity and diffraction-limited resolution. We demonstrate amplitude and phase mapping of chiral and symmetry-broken metasurfaces and strain-induced symmetry breaking in metasurfaces and conventional materials.

17:40 INVITED TALK

Geometry Matrix: From Physical Model to Computational Framework

Alonso Moreta[1], Mateo Perez[1], Karen Caicedo[2], Ashod Aradian[3], Alessandro Veltri[4]

[1]Universidad San Francisco de Quito (Ecuador), [2]Institute of Applied Sciences and Intelligent Systems (ISASI-CNR) (Italy), [3]Université de Bordeaux (France), [4]Università della Calabria (Italy)

The Geometry Matrix formalism provides a unified framework for modeling active plasmonic nanoparticles across quasi-static and Mie regimes. It enables prediction of emission thresholds, spectra, and modal instabilities in gain-assisted nanostructures. We present its implementation as a modular open library for reproducible nanophotonics modeling.

18:00 INVITED TALK

Phase Transition Driven Nanoparticle Assembly in Multicomponent Systems based on Liquid Crystals

Piotr Lesiak[1], Natalia Kasian[1], Anna Kozanecka-Szmigiel[1], Jan Bolek[1], Karol Kakarenko[1], Natalia Kowalska[2], Wiktor Lewandowski[2], Tomasz Woliński[1]

[1]Warsaw University of Technology (Poland), [2]University of Warsaw (Poland)

This work demonstrates the potential for creating patterns of nanoparticle groups formed in a liquid crystal base material. Nanoparticles coated with a carefully selected ratio of two types of ligands are used. This selection of materials allows for the control of the preferential positioning of nanoparticles within the liquid crystal.

18:20 INVITED TALK

Silicon Nanoparticle Monolayer Coating for Glossy, Non-Iridescent and Tunable Reflective Colors

Hiroshi Sugimoto, Jialu Song, Keisuke Moriasa, Mojtaba Karimi Habil, Minoru Fujii

Kobe University (Japan)

We report a core-shell architecture composed of Mie-resonant Si core and SiO2 shell for nanocoating that shows structural color with the total reflectance >70% experimentally. By leveraging this coating strategy, uniform color coatings on 3D objects, enabling diverse visual appearances, are demonstrated.

18:40 INVITED TALK

Nanometer-Precision Optical Metrology of Large Area Nanoimprinted Metasurfaces

Jaime Gomez Rivas[1], Masoumeh Goudarzi[1], Sunghwan Jo[2], Maira Perez Sosa[1], Yu-Chen Wei[1], Matthijs Berghuis[1], Mohammad Ramezani[3], Agustín Mihi[1]

[1]Eindhoven University of Technology (The Netherlands), [2]ICMAB-CSIC (Spain), [3]TeraNova B.V. (The Netherlands)

We present a non-destructive optical metrology method for wafer scale inspection of large area plasmonic metasurfaces. Angle resolved scatterometry implemented in a Fourier microscope enables nanometer sensitive mapping of structural uniformity. Comparison with simulations and microscopy links optical signatures to nanoscale variations in nanoparticle geometry.

19:00

Disorder silica microsphere coating for efficient sub-ambient radiative cooling

Jorge Burgos[1], Ares Lládos[2], Sara Nuñez-Sánchez[3], Ceferino López[3], Juliana Jaramillo[2], Pedro David García[3]

[1]Instituto de Ciencia de Materiales de Madrid (Spain), [2]UPC (Spain), [3]Material Science Institute of Madrid (ICMM) (Spain)

Passive radiative cooling rejects heat to outer space through the 8-13μm window, enabling subambient temperatures without power. We develop disordered SiO_2microsphere coatings combining >93% solar reflectance with strong midIR emissivity. Their microstructure, optical response, and outdoor thermal behavior are experimentally validated, confirming effective cooling under direct sunlight.

19:15

Metasurface Stickers for Tailoring Photoluminescence and Inducing Chirality

Shunsuke Murai, Koichi Okamoto

Osaka Metropolitan University (Japan)

Metasurface stickers-flexible, transferable nanoantenna arrays-enable post-fabrication control of light-matter interactions on diverse substrates. By stacking and twisting layers, photoluminescence can be enhanced, redirected, and spectrally tuned, while moiré coupling induces controllablechirality for reconfigurable optical functionalities.

1–O38 | Room 3126 | 16:40 - 19:55

SP1: Metamaterials: novel trends and applications

Organized by: Tatjana Gric
Chaired by: Tatjana Gric

16:40 INVITED TALK **Integration of metamaterial phase-shifting ICs in 3D-printed packages for wireless communication**

Adam Pander[1], Kentaro Soeda[2], Daisuke Kitayama[1], Hibiki Kagami[1], Yoshinori Yamaguchi[2], Kuniaki Konishi[2], Junji Yumoto[2], Hiroyuki Takahashi[1]

[1]NTT Device Technology Laboratories (Japan), [2]The University of Tokyo (Japan)

This study shows metamaterial phase-shifting integrated circuits with continuous 2π phase controllability operating at 300 GHz. To cope with the demand for high-density packaging in future beamforming devices, chips were mounted in hollow waveguide modules fabricated using a high-resolution 3D printer (RECILS). The phase-shifting characteristics were evaluated.

17:00 INVITED TALK **SuperResolution Interferometric Lithography Beyond the Diffraction Limit Enabled by a Tuneable Metasurface**

Mohammad Mahdi Jafarizadeh Jazi, Leila Yousefi

University of Sussex (United Kingdom)

To overcome the diffraction limit in optical lithography and achieve resolutions beyond this fundamental barrier, we propose a multi-mask interferometric lithography technique. In this approach, a tunable metasurface is employed to engineer the light passing through the masks, enabling the formation of the desired pattern on the photoresist.

17:20 **Prelude to the search for natural vibrations of tensegrity-inspired cellular metamaterials**

Anna Al Sabouni-Zawadzka, Adam Zawadzki, Wojciech Gilewski, Maciej Kołodziejczak

Warsaw University of Technology (Poland)

Two techniques for estimating the natural frequencies of tensegrity-inspired cellular metamaterials are presented and discussed. The first employs a standard frame/truss geometrically nonlinear finite element model implemented in ABAQUS. The second uses single-degree-of-freedom modelling based on experimental results for quasi-static compression. Examples focus on a four-strut simplex tensegrity-inspired lattice.

17:35 INVITED TALK **Constructive homogenization of dispersed random media**

Vladimir Mityushev

Cracow University of Technology (Poland)

The asymptotic analysis is applied to derive an analytical approximate formula for the macroscopic permittivity of 2D dispersed random composites. This formula extends the lower order Maxwell-Garnett approximation, revealing that many other popular formulas for dispersed media derived from effective medium approximations are asymptotically equivalent.

17:55 INVITED TALK **Design of an Airy-Beam-Generating Element Made with High-Refractive-Index and Low-Reflectance Metasurface in the 28 GHz Band**

Yuta Tanaka, Mahiro Ochiai, Takehito Suzuki

Tokyo University of Agriculture and Technology (Japan)

We demonstrate an Airy-beam-generating element designed for the 28 GHz band based on our original high-refractive-index, low-reflectance metasurface. The results indicate that this metasurface is broadly applicable to electromagnetic wave manipulation.

18:15 INVITED TALK **Electron-Driven Photon Sources for Ramsey Interferometry with Electron Beams**

Nahid Talebi

Kiel University (Germany)

Electron-driven photon sources provide compact platforms for probing decoherence dynamics of qubits in two-dimensional materials. Here, we demonstrate how both planar and 3D-printed architectures enable precise control over the properties of the emitted light.

18:35 INVITED TALK **Application of Metamaterials in Soft and Biodegradable Electronics**

Seung-Kyun Kang

Seoul National University (Korea)

Mechanical metamaterials enable new strategies for soft electronics-based implantable devices. Here, auxetic meta-architectures suppress Poisson-induced crack closure in crack-based strain sensors, achieving ultrasensitive detection of subtle biomechanical dynamics, including cerebral vascular pulsation. As an outlook, mechanically programmed meta-structures are introduced for ultrasound-driven, spatially controlled disassembly of transient implants.

18:55 INVITED TALK **High-efficiency nonlinear optical response of silicon based metasurfaces in the visible and UV spectrum**

Shroddha Mukhopadhyay[1], Crina Cojocaru[1], Maria Antonietta Vincenti[2], Michael Scalora[2], Jose Trull[1]

[1]Universitat Politècnica de Catalunya (Spain), [2]University of Brescia (Italy)

We investigate harmonic generation in silicon-based membranes and metasurfaces operating in the visible and UV spectrum. Our combined experimental-theoretical study reveals second, third, and higher harmonic generation up to the seventh order. Resonant field confinement in corresponding metasurfaces enable enhanced efficient UV emission and predictive design of nonlinear nanophotonic devices.

19:15 INVITED TALK **Multilayer Gap Plasmons in Periodic Perfect-Conductor-Dielectric Structures**

Michael Haftel[1], Justin Case[2], Anatoliy Pinchuk[1]

[1]University of Colorado (USA), [2]University of Colorado at Colorado Springs (USA)

We demonstrate that periodic multilayer perfect-conductor dielectric structures with subwavelength slits support propagating multilayer gap plasmons with tunable wavenumber spectra and interlayer phase coherence. The number of supported modes increases with layer number, enabling controllable field localization and propagation for advanced photonic and metamaterial device applications.

19:35 INVITED TALK **Multiphoton Luminescence and Second Harmonic Imaging in 2D Materials**

Arik Ahmed[1], J. Pierce Fix[2], Sheikh Parvez[2], Jane Peabody[2], Nicholas J. Borys[2], Steve Smith[1]

[1]South Dakota School of Mines and Technology (USA), [2]University of Utah (USA)

The relationship between nonlinear susceptibility and multi-layer stacking, orientation and material defects in 2D materials can be revealed by spectroscopic, polarization-resolved imaging. A spectrally-resolved multi-photon luminescence (MPL) and second harmonic generation (SHG) imaging microscope is used to examine the nonlinear optical properties of 2D materials and their heterostructures.

1–O39 | Room 4047 | 16:40 - 20:00

SYM4: Chirality, magnetism, and magnetoelectricity: Separate phenomena and joint effects in metamaterial structures

Organized by: Eugene Kamenetskii
Chaired by: Eugene Kamenetskii

16:40 INVITED TALK **Artificial Symmetry Design for Non-trivial Spin Topologies and Emergent Functionalities**
Jinxing Zhang

Beijing Normal University (China)
In this presentation, I will share with you one strategy for the symmetry design that can be extended into a broad variety of materials. We discover that space-inversion symmetry can be broken and accompanying "hybrid" Dzyaloshinskii-Moriya interaction can be driven by a graded strain in a correlated oxides, (La,Sr)MnO3.

17:00 INVITED TALK **Intrinsic Hyperbolic Anisotropy for Low-Loss Polarization Control and Chiral Light-Matter Interaction**
Antonio Ambrosio

Istitutol Italiano di Tecnologia (Italy)
Focusing on molybdenum oxychloride ($MoOCl_2$), we show that broadband hyperbolicity in the visible and near-infrared arises from a strongly anisotropic Drude response, yielding metallic and dielectric behavior along orthogonal crystal axes. This intrinsic symmetry breaking enables polarization-selective reflection and transmission as well as highly confined hyperbolic plasmon polaritons.

17:20 INVITED TALK **Pure moving optical media at microwave frequencies using magnetochiral metasurfaces**
Toshiyuki Kodama

Tohoku University (Japan)
We study microwave bianisotropies using magnetochiral (MCh) metasurfaces consisting of double Z-type gammadions with perpendicularly magnetized substrates. Combination of the metasurfaces with contraposition MCh metasurfaces cancels both the chiral-type bianisotropy and MO effect, resulting in pure moving optical media.

17:40 INVITED TALK **Rotation and Self-Ordering of Nanoparticles by Optical Forces Carrying Angular Momentum**
Hajime Ishihara

Ritsumeikan University (Japan)
We present optical manipulation of nanoparticles using focused beams carrying angular momentum. Generalized optical binding stabilizes rotational motion of nanoparticle assemblies and enables fusion-driven self-ordering via scattered-light interactions. We also analyze how stimulated recoil force (SRF) from resonant stimulated emission modifies optical-vortex-driven rotation, suggesting experimental signatures such as rotation reversal.

18:00 INVITED TALK **Photoinduced magnetic phase transitions in the Kondo-lattice model**
Masahito Mochizuki, Ryo Hamano

Waseda University (Japan)
We theoretically investigate photoinduced magnetic transitions in the cubic Kondo-lattice model and show that light irradiation drives a magnetic phase transition from ferromagnetic ground state to three-dimensional antiferromagnetic nonequilibrium steady state. This transition is induced by photoinduced pseudo half-filling of the exchange-split band and is accompanied by transient antiferromagnetic correlations.

18:20 INVITED TALK **GHz acoustic vortex for the manipulation of orbital angular momentum of light**

Alessandro Pitanti[1], Paulo Santos[2]

[1]University of Pisa (Italy), [2]Paul-Drude-Institut fur Forstekörperelektronik (Germany)

Acoustic perturbation of photonic structures enables dynamic modulation of light amplitude and phase at ultra high frequencies. By shaping acoustic fields, fast control of light angular momentum becomes possible. We report GHz acoustic vortices for advanced light modulators.

18:40 INVITED TALK **Analyzing Nanoscopic Light-Matter Interactions Using Reconfigurable Photonic Integrated Circuits**

Marko Šimić, Johannes Bütow, Jörg S. Eismann, Sarah Lindner, Peter Banzer

University of Graz (Austria)

The measurement and description of light-matter interactions at the nanoscale lie at the heart of most nano-optics applications. Here we present a combination of nano-optics experiments and reconfigurable photonic integrated circuits, establishing the basis for nanoscale particle localization and multipolar decomposition of scattered fields.

19:00 INVITED TALK **Magnetic Multipole Dependent Dichroism Arising from Vortex Light**

Akbar Salam

Wake Forest University (USA)

QED theory is used to calculate circular and vortex dichroism induced by structured light in a magnetically susceptible molecule. The magnetic dipole-quadrupole cross term arising from the interference of transverse and longitudinal magnetic fields results in non-vanishing dichroic effects, explaining the recent observation of helical dichroism in artificial propeller meta-molecules.

19:20 INVITED TALK **Emergent Spin-Orbital Berry Curvature Fluxes in pseudo-Nodal Semimetals**

Peter C. Schmitz[1], Dongwook Go[2], Yuriy Mokrousov[1]

[1]Peter Grünberg Institute 1 (Germany), [2]Korea University (Korea)

We investigate the relationship between singularities in the Spin-Orbital-texture and the Berry-curvature flux originating from avoided-crossing-manifolds in the Brillouin zone (Hotspots / Hotloops) and on the Fermi surface of analytic models and Van-der-Waals materials. Sources and Vortices seem to inter-convert by Spin-Orbit coupling analogous to Electromagnetism.

19:40 INVITED TALK **Dynamical orbital magneto-electric response in complex materials**

Yuriy Mokrousov

Forschungszentrum Jülich (Germany)

I will explore the idea that structurally complex materials can naturally develop non-local electronic orbital response to external magnetic fields, light and lattice vibrations, which allows to transform chirality - statically or dynamically inherent either to structure, spin order or electro-magnetic field - into prominent orbital magnetism.

1–O40 | Room 4050A | 16:40 - 18:55

SP8: Bio-Inspired Nanophotonics

Organized by: Debashis Chanda
Chaired by: Debashis Chanda

16:40 INVITED TALK **Spatial Memory of Hot Carriers in Disordered Plasmonic Structural Colors**

Manobina Karmakar[1], Ayon Jyoti Karmakar[2], Aritra Biswas[1], Mahdi Soudi[1], Tianyi Guo[1], Pablo Cencillo Abad[1], Prasanta Kumar Datta[2], Debashis Chanda[1]

[1]Ludwig-Maximilians-University (Germany), [2]Indian Institute of Technology Kharagpur (India)

We investigate disordered aluminum nanoparticle ensembles generating structural colors via localized gap-plasmons. Combining near-field imaging and ultrafast spectroscopy, we reveal that plasmon-induced hot carriers retain partial spatial-localization for hundreds of picoseconds. This unexpected spatial memory links disorder, confinement, and energy dynamics, offering new bio-inspired design principles for nanophotonic, hot-carrier devices.

17:00 INVITED TALK **Dynamically Tunable Structural Colors**

Aritra Biswas, Debashis Chanda

University of Central Florida (USA)

Over the last decade, dynamic color generation has been the subject of extensive research across various scientific disciplines. In this work, we demonstrate active color tuning based on phase modulation of a multilayer stack composed of a phase-changing material (PCM) and a high-index material on a reflective surface.

17:20 INVITED TALK **Metasurface tongues as universal liquid sensors**

Justin Sperling[1], Finlay Walton[1], Daniel Osborne[1], Badri Aekbote[1], Anthony Perri[2], Rebecca Setford[1], Hanyu Gao[1], Liam Wilson[1], Chad Sipperley[2], Rudolf Schick[2], Poursat[1], Gauchotte-Lindsay[1], Peveler[1], Clark[1]

[1]University of Glasgow (United Kingdom), [2]Spraying Systems Co. (USA)

We present a reusable plasmonic metasurface “tongue" that generates distinctive hyperspectral patterns for complex liquid mixtures through cross-reactive sensing. Simple machine learning enables both holistic quality assessment and targeted event detection. A single 24-element metasurface architecture supports universal deployment across diverse liquid-sensing tasks without bespoke receptors.

17:40 **Structural Dyes by Design: Physics-Guided Photonic Colour Modules on Commodity Substrates**

Hannah Sanford-Crane

MAAD Scientist Technologies Inc. (Canada)

Structural colour arises from nanoscale scattering rather than molecular absorption, but translating optical targets into chemically realizable materials remains difficult. Structural dyes address this using modular molecular shells on commodity particle cores as programmable optical layers, designed from first-principles scattering and attached to diverse substrates via silane and click-chemistry.

17:55 INVITED TALK **Strategies for Infrared Management and Thermal Insulation Inspired from Biological Organisms**

Amandine Marchand[1], Kevin Delmote[2], Olivier Deparis[2], Sébastien Mouchet[1]

[1]University of Mons (Belgium), [2]University of Namur (Belgium)

Nature provides advanced strategies for managing infrared radiation through micro and nanostructures. By studying biological examples, from insects to mammals, we derive principles for engineered materials enabling efficient insulation, passive cooling, and selective IR management. This work highlights how bioinspired designs support sustainable thermal technologies.

18:15 INVITED TALK **Reversible and Dynamic Photonic Bandgap Modulation via Chemical Reactions in Liquid Crystalline Polysaccharides**

Cecile Chazot[1], Simona Fine[1], Nina Hildenhagen[2], Bart Jan Ravoo[2]

[1]Northwestern University (USA), [2]Universität Münster (Germany)

We develop chemically responsive liquid crystalline polysaccharides whose hierarchical organization enables reversible modulation of photonic bandgaps. By coupling molecular transformations with selfassembly, we create dynamic photonic materials in which optical function is encoded at multiple length scales and tunable through targeted chemical reactivity, expanding design rules for adaptive soft matter.

18:35 INVITED TALK **Tunable "Meta"-Optical Fibers for Ultrawide-FieldBio-Imaging**

Howard Lee, Andrew Palmer, Yucheng Jin, Jin Yan, Harvey Lin, Albert Teoh, Emma Wallace-Wilmot, Sophia Turean

University of California (USA)

1–O41 | Room 5025 | 16:40 - 19:40

SYM2: New trends in nanophotonics and advanced materials

Organized by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han
Chaired by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

16:40 INVITED TALK **Foundry-Ready Multi Laser Terahertz Bandwidth Photonic Isolator via Electro-optic Synthetic Motion**

Kyunghun Han, Yiliang Bao, Junyeob Song, David Long, Sean Bresler, Daron Westly, Jason Gorman, Thomas LeBrun, Kartik Srinivasan, Vladimir Aksyuk

National Institute of Standards and Technology (USA)

We demonstrate a magnet-free, intrinsically broadband photonic isolator using electro-optic traveling-wave modulation to create synthetic motion across four waveguides, realizing dynamic rotating destructive interference that continuously cancels backward-propagating light. We show ≈30 dB isolation, >24 dB isolation across a 30 nm span, and >20 dB isolation for two lasers simultaneously.

17:00 INVITED TALK **Optical Phenomena in Time-Varying Transparent Conductors**

Marcello Ferrera, Wallace Jaffray, Sven Stengel

Heriot-Watt University (United Kingdom)

Transparent conductive oxides operating near the epsilon-near-zero regime provide a powerful platform for ultrafast time-varying photonics. We outline a unified framework for extreme optical nonlinearities spanning field engineering, quantum emission control, ultrafast polarisation manipulation, and spatio-temporal metamaterials

17:20 INVITED TALK **Femtosecond Laser Direct-Written Optical Fiber Microstructure Devices for Laser Applications**

Xuewen Shu

Huazhong University of Science and Technology (China)

We report our recent progress in the use of femtosecond lasers to fabricate various microstructures within optical fibers, including gratings and interferometric devices, and discuss their diverse applications in fiber laser systems.

17:40 INVITED TALK **Tailoring valley polarization and optical nonlinear effect in transition-metal dichalcogenides**

Mu Wang, Ruwen Peng

Nanjing University (China)

In this talk, we present the manipulation valley polarization and optical nonlinear effect in transition-metal dichalcogenides. The approaches achieve potential applications in developing low-dimensional optoelectronic materials and devices.

18:00 INVITED TALK **Advanced Manufacturing Tools for DataProcessing Fiber Photonics Fabrication**

Marcos D. Vozer Felisberto, Andrey Machnev, Thomas W. Burkle, Maxwell H. Jancich, Babak Seradjeh, Phillip Richerme, Alexander Gumennik

Indiana University Bloomington (USA)

By meltshaping multimaterial fiber cores, we demonstrate building blocks of fiberembedded photonics. Fiber photonics with data-processing capabilities could translate data on-the-fly across numerous computation platforms, including quantum and neuromorphic, each of which encodes data in a platform-specific form, thus enabling the integration of those platforms into the broader Internet.

18:20 INVITED TALK **Chiral Diffraction from Quasiperiodic Monotile Lattice Based on Aperiodic Hat Tiling**

Yuto Moritake

The University of Tokyo (Japan)

We experimentally investigated optical diffraction from a newly discovered aperiodic structure, an aperiodic monotile. The monotile tessellates two-dimensional space using a single tile shape. We fabricated a quasiperiodic lattice on a nanophotonic platform based on this monotile tiling and observed interesting chiral diffraction response unique to the monotile geometry.

18:40 INVITED TALK **Silicon Nitride Photonics for High-Performance Systems**

Frederic Gardes[1], Ilias Skandalos[1], Yaonan Hou[1], Dun Qiao[2], Huiwen Deng[3], X. Yu[3], Jaeseong Park[3], Chong Chen[3], Mingchu Tang[3], Michelle Paparella[1], Bao[1], Sandell[1], Dominguez Bucio[1], Moeyaert[4], Baron[4], Smowton[2], Liu[3], Seeds[3], Simos[5], Moschos[5], Moralis-Pegios[5]

[1]University of Southampton (United Kingdom), [2]Cardiff University (United Kingdom), [3]University College London (United Kingdom), [4]LTM CNRS (France), [5]AUTH (Greece)

We report the first QD SOA grown on silicon coupled to silicon nitride waveguides using a monolithic integration scheme. We also report complex photonic circuit programming using UV light trimming. These developments underscore significant strides in the field, paving the way for enhanced photonic device functionality and integration.

19:00 INVITED TALK **Spatiotemporal Metasurface for Unconventional Control of Electromagnetic Waves**

Anatoly Efimov[1], Chun-Chieh Chang[1], Simo Pajovic[2], Wilton J. M. Kort-Kamp[2], Hou-Tong Chen[1], Diego A. R. Dalvit[2], Abul Azad[2]

[1]Center for Integrated Nanotechnologies (USA), [2]Los Alamos National Laboratory (USA)

Lorentz reciprocity fundamentally limits the performance of photonic systems by enforcing reciprocal energy exchange between source and detector, which manifests as the symmetry of the scattering matrix. We design and fabricate a graphene-based integrated photonic structure and experimentally demonstrate nonreciprocal scattering from a metasurface modulated at gigahertz frequencies.

19:20 INVITED TALK

Copper-based plasmonic nanohole arrays for electromagnetic field enhancement

Madiha Amrani[1], Tô Nguyet[2], Gaëtan Lévêque[2], Mohamed El Ghafiani[1], E. H. El Boudouti[1], Yan Pennec[2], Rabah Boukherroub[2], Bahram Djafari-Rouhani[2]

[1]Université Mohammed I (Morocco), [2]Université Lille (France)

Localized surface plasmon resonance (LSPR) in copper nanoholes enhances local electromagnetic fields at the nanoscale. We investigate the effects of lattice period, hole size, and film thickness on field enhancement, analyzing both localized and propagating plasmonic modes. Optimized nanostructure designs offer potential applications in electrocatalysis and other plasmon-assisted processes.

1–O42 | Room 5039 | 16:40 - 18:55

GEN25: Metasurfaces: Flat Optics, FSS, HIS, and Beyond

16:40

Reconfigurable Optical Imaging via a Wavelength-Driven Multifunctional Metasurface

Hongliang Li[1], Yang Xiao[1], Yuning Ye[2], Jisen Wen[2], Xuechao Yu[1]

[1]Suzhou Institute of Nano-Tech and Nano-Bionics (China), [2]Zhejiang University (China)

Wavelength-multiplexed metasurfaces enable compact multifunctional imaging but often suffer from inter-channel crosstalk. Here, we demonstrate a wavelength-driven metasurface for switchable dual-mode imaging. The device generates a focused beam at 450 nm and a vortex beam at 532 nm, enabling bright-field and edge-enhanced imaging within a single ultrathin platform.

16:55

SuperLattice Plasmon Mode in a Grating of 2D Electron Strips

Alexey Shuvaev[1], A. R. Khisameeva[1], V. M. Muravev[2], K. R. Dzhikirba[2], A. A. Zabolotnykh[3], P. A. Gusikhin[2], M. S. Ryzhkov[1], D. A. Khudaiberdiev[1], A. S. Astrakhantseva[2], I. V. Kukushkin[2], Pimenov[1]

[1]Vienna University of Technology (Austria), [2]Institute of Solid State Physics (Russia), [3]Kotelnikov Institute of Radio-engineering and Electronics of the RAS (Russia)

We report an experimental observation of a new plasmon mode in the metasurface made up of two-dimensional electron system strips. A collective effect from the superlattice, along with lateral screening between the strips are the key properties of the novel resonance. The developed analytical approach accurately describes the observed behavior.

17:10

Strong Coupling between quasi-bound states in the continuum and monolayer WS_2 on a Si_3N_4 metasurface

Yongliang Zhang[1], Oisin McCormack[1], Na Jia[1], Hodjat Hajian[1], Jack Dobie[1], Justin Schulz[1], Xia Zhang[2], Owen Moynihan[3], Brain Corbett[3], A. Louise Bradley[1]

[1]Trinity College Dublin (Ireland), [2]Northeastern University (China), [3]Tyndall National Institute (Ireland)

We designed a tunable quasi-BIC metasurface using machine learning. Strong coupling with monolayer WS_2 achieved 29.3meV Rabi splitting, increased to 35.64meV via a PMMA layer. The PMMA enhanced transmission and the electric field. The PL and Raman intensities increased 5.9-fold and 2.4-fold respectively, confirming metasurface-enhanced light-matter interactions.

17:25

Wafer-scale fabrication of quartz-monolithic metalenses for the ultraviolet

Jaewon Jang[1], Hui Jae Cho[2], Yeonsang Park[1]

[1]Chungnam National University (South Korea), [2]National NanoFab Center (South Korea)

We fabricated 8-inch wafer-scale, quartz-monolithic ultraviolet metalenses operating at 325 nm using ArF photolithography. This platform circumvents the scarcity of high-index dielectrics that are CMOS-compatible and transparent in ultraviolet, while maintaining high optical efficiency. This work presents a cost-effective pathway for scalable manufacturing of highly compact ultraviolet optical systems.

17:40

Colorimetric thermography by a long-infrared dual-band metalens

Zhendong Luo[1], Peng Zhang[2], Yang Zhao[2], Mu Ku Chen[1]

[1]City University of Hong Kong (Hong Kong), [2]University of Science and Technology of China (China)

Colorimetric thermography enables emissivity-independent temperature measurement but requires bulky optics. We present a compact dual-band metalens for LWIR colorimetric thermography at 9.5 and 12.5 μm. It images low-emissivity objects and measures temperature without presetting emissivity, reducing errors by 50.16% (60-180°C), enabling compact multi-target IR systems.

17:55

Passive and Reconfigurable Terahertz Logic Metasurfaces via Frequency and Orientation Multiplexing

Mohammadhossein Momtazpour[1], Lei Xu[1], Dou Feng[2], Anjali Chaudhary[3], Dominic Craske[1], Costas Tsakonas[1], Cuifeng Ying[1], Demosthenes Koutsogeorgis[1], Miguel Navarro-Cía[2], Mohsen Rahmani[1]

[1]Nottingham Trent University (United Kingdom), [2]University of Birmingham (United Kingdom), [3]Indian Institute of Technology Delhi (India)

We demonstrate a terahertz metasurface platform capable of implementing up to five distinct logic operations within a single passive architecture, representing a record level of multifunctionality. The system enables low-power operation and scalable THz signal processing, advancing the transition from electronic to optical logical decision-making.

18:10

Nanoparticle detection and directional light emission based on whispering-gallery microcavities

Youling Chen

Institute of Semiconductors - CAS (China)

Single-molecule detection is demonstrated using the plasmonic-enhanced interface modes in a whispering-gallery microbubble resonator. Moreover, a deformed circular-side triangular microresonator is fabricated. Unidirectional light emission is experimentally demonstrated, which changes drastically upon the binding of a nanoparticle, predicting applications in electrically pumped, portable and highly sensitive far-field detection of nanoparticles.

18:25

Tunable Emission Enhancement in Ge Filmsthrough All-Dielectric Metasurfaces

Jon Schlipf[1], Diana Ryzhak[1], Giovanni Capellini[1], Paul Oleynik[2], Yuji Yamamoto[1], Inga Fischer[1]

[1]IHP - Leibniz Institute for High Performance Microelectronics (Germany), [2]BTU Cottbus-Senftenberg (Germany)

We show photoluminescence enhancement up to afactor of 43 with respect to unetched layers in Ge all-dielectricmetasurfaces. Our results point to band-to-band recombinationas the dominant emission mechanism. Emission peaks correspondto multipole modes of coupled Mie resonators, and are controlledby lateral nanostructuring.

18:40

Deep-UV Photonic-Crystal Surface-Emitting Lasers with Sub-Degree Beam Divergence

Philippe Tassin, Dogukan Apaydin, Hjalmar Andersson, Lukas Uhlig, Sarina Graupeter, Joachim Ciers, Giulia Cardinali, Erik Strandberg, Tim Wernicke, Michael Kneissl, Schwarz, Haglund

Chalmers University of Technology (Sweden)

We demonstrate the first optically pumped deep-ultraviolet photonic-crystal surface-emitting lasers operating below 280 nm. By optimizing the photonic crystal's filling factor, single-mode emission at 279 nm with sub-degree beam divergence is achieved. These results establish PCSELs as a promising platform for high-beam-quality, high-power deep-UV semiconductor lasers.

1–O43 | Room 5052 | 16:40 - 19:40

SYM2: New trends in nanophotonics and advanced materials

Organized by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han
Chaired by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

16:40 INVITED TALK **Plasmonic Nanostars: Engineering Optical Tunability for Enhanced Efficiency**

Nicolas Pazos Perez

Universitat Rovira i Virgili (Spain)

We investigate the controlled epitaxial growth of silver and gold onto preformed gold nanostars, enabling precise tuning of their optical response while preserving branched morphology. Adjusting the plasmon resonance position and silver content, SERS enhancing properties can be maximized by nearly two orders of magnitude compared to conventional gold nanostars.

17:00 INVITED TALK **Temporal Dispersion Effects in Optical Spectra of Exciton-Plasmon Systems at Strong Coupling**

Sancenia Johnson, Gabrielle Williams, Tigran Shahbazyan

Jackson State University (USA)

We show that temporal dispersion of the metal dielectric function significantly modifies the shape of scattering spectra of quantum emitters strongly coupled to surface plasmons by shifting spectral weight towards lower energy polaritonic band.

17:20 INVITED TALK **High-Entropy Alloy-Based Metasurfaces for plasmon absorber in mid infrared wavelength**

Yoshiaki Nishijima, Makoto Ohashi, Yuya Hoshimiya

Yokohama National University (Japan)

We experimentally determined the complex permittivity of a high-entropy alloy (HEA) composed of five noble metals: Au, Ag, Cu, Pd, and Pt and light metals like Al and Mg. The measurements were conducted across a broad wavelength spectrum, spanning ultraviolet, visible, and mid-infrared regions.

17:40 INVITED TALK **Miniaturized Full-Color Waveguide Combiner for AR Headsets: Wide Field-of-View and High Resolution via Compound Metagratings**

Oksana Shramkova

Université de Strasbourg (France)

This work presents a multi-layer metagrating design for single-waveguide near-eye displays, achieving a wide field of view (FoV) while reducing waveguide thickness. The approach enables high-resolution imaging by accommodating large lateral dimensions for the in-coupled grating, optimizing compatibility with advanced light engines

18:00 INVITED TALK **Enhancing the Sensitivity of Low-cost Zero-Reflection Metasurfaces for Clinical Translation**

Nurten Koc[1], Ali Belarouci[2], Serap Aksu[1]

[1]Koc University (Turkey), [2]University of Lyon (France)

Zero-reflection metasurfaces hold great promise for clinical translation. Towards this, we manufacture the metasurfaces using optimized adhesion materials with minimum optical loss. We demonstrate their large area homogenous nanofabrication using modified laser lithography and showed detection of brain metastasis relevant biomarkers in serum.

18:20 INVITED TALK **Photonic integrated circuits on fiber tips for lab-on-fiber sensing**

Arthur Bouamra[1], Pieter Vijn[1], René van Veldhoven[1], Jui-Hung Chen[2], Shuo-Yen Tseng[2], Andrea Fiore[1]

[1]Eindhoven University of Technology (The Netherlands), [2]National Cheng Kung University (Taiwan)

We present the integration of high-Q ring resonators onto fiber tips. These sensors feature efficient coupling and high quality factors, combining the power of nanophotonics with the versatility of fiber sensing.

18:40 INVITED TALK **Attosecond Extreme-Ultraviolet Skyrmion Pulses from High Harmonic Generation**

David Marco, Luis Plaja, Carlos Hernandez-Garcia

Universidad de Salamanca (Spain)

19:00 INVITED TALK **Nanoscale Photonic Topological Insulators**

Xiaoyong Hu

Peking University (China)

Nanoscale photonic topological insulators, providing an excellent platform for information processing, are restricted by the experimental precise control of coupling strength between nanostructure lattices. We proposed new method of coupling strength controlling, and realized nanoscale plasmonic Aubry-André-Harper topological insulator and reconfigurable silicon micro-ring photonic topological insulator.

19:20 INVITED TALK **Exciton-Photon-Phonon Interactions in Ultra-High-Q 2D-Material Nanocavities**

Chenjiang Qian

Institute of Physics (CAS) (China)

We fabricated 2D-material nanobeam cavities with ultra-high Q-factor over 2×10 and generate boron vacancies in the pristine hBN. This allows the observation of novel phonon-induced light-matter interactions involving multiple degrees of freedom.

2 Wednesday, July 15, 2026

2–O1 | Dargan Auditorium | 08:30 - 10:15

Plenary Session II

08:30 PLENARY TALK **Materials-Driven Photonics: Toward Tunable and Extreme Light Control**

Alexandra Boltasseva

Purdue University (USA)

We study tailorable and dynamically tunable properties of transparent conducting oxides (TCOs) and transition metal nitrides (TMNs) for applications in all-optical modulators and flat optics. We also investigate metal-to-insulator transition in ultra-thin TMN films operating in the so-called transdimensional regime.

09:05 PLENARY TALK **Precision nanogap metamaterials for tracking bioanalytes using SERS and SEIRA**

Jeremy J. Baumberg

University of Cambridge (United Kingdom)

I will discuss a range of recent key advances that give robust, repeatable, and recleanable nanogap plasmonic sensors, as well as midIR metamaterials enabling real-time flow electrochemistry.

09:40 PLENARY TALK **Quadratic Nanomaterials for On-Chip Classical and Quantum Devices**

Rachel Grange

ETH Zurich (Switzerland)

Here I will present our recent progress in top-down fabrication of lithium niobate devices and bottom-up approaches, including the assembly of randomly oriented nanocrystals and sol-gel processes, to generate nonlinear classical and quantum signals. Finally, I will describe how these platforms are suited for nonlinearities in machine learning.

Coffee Break 10:15 - 10:55

2–P1 | Business School Concourse | 10:15 - 10:45

Poster Session III

P1

Low-Contrast Bound States in the Continuum Metasurfaces Enabling Single Nanoparticle Sensing

Keisuke Watanabe[1], Samuel Crowther[2], Masanobu Iwanaga[1], Frank Vollmer[2], Tadaaki Nagao[1]

[1]National Institute for Materials Science (NIMS) (Japan), [2]University of Exeter (United Kingdom)

We present real-time sensing of single polystyrene nanoparticles using low-contrast bound states in the continuum metasurfaces with ultrahigh quality factors. Strongly confined electric fields in the shallow-etched geometry interact with virus-sized particles with a diameter of 100 nm, enabling the experimental observation of discrete wavelength steps.

P2

Autoregressive Transformer for Inverse Design of Optical Multilayer Thin-Film Structures

Kewen Ding, Peng Dai, Mike Pivnenko, Daping Chu

University of Cambridge (United Kingdom)

We propose an encoder-decoder Transformer for inverse design of optical multilayer thin-film structures. A decoupled tokeniser predicts materials and thicknesses as separate tokens, achieving 1 nm thickness resolution. The model attains a mean absolute error of 0.0785 on 50,000 test samples at 511 designs per second.

P3

Plasmonic nanocavities for quantum light emitters and sensing applications

Khizar Shah, Ning Liu

University of Limerick (Ireland)

Plasmonic nanocavities enable strong light-matter interaction for quantitative SERS and single-photon emission. Single-crystal Ag microplate NPOM cavities exhibit reproducible maximum SERS near monolayer 4-ATP coverage (1 μM, EF $\approx$ 10). On single-crystal Au microplates, site-defined nanocavities incorporating quantum dots and Au nanospheres establish controlled emitter-cavity coupling toward deterministic single-photon platforms.

P4

Externally Driven Quantum Dynamics in Plasmonic Nanocavities

Ishita Jena, Angus Crookes, Ben Yuen, Angela Demetriadou

University of Birmingham (United Kingdom)

Plasmonic nanocavities strongly couple to quantum emitters, but controlling this excitation with external illumination can be challenging. We propose a system of two couple nanocavities each hosting a single quantum emitter, to control the quantum dynamics of the system. This paves the way towards engineering quantum states in plasmonic systems.

P5

Long-Wavelength Infrared Dual-Polarization Metalens for Enhanced Thermal Imaging Details

Lianjie Xu, Peng Zhang, Yang Zhao

University of Science and Technology of China (China)

Conventional polarization imaging requires complex bulky systems. Overcoming this, we present a large aperture long wave infrared dual polarization metalens. Fabricated via cost effective laser direct writing, our compact single shot device simultaneously resolves orthogonal polarization signatures, streamlining detection and paving the way for real time polarization thermal imaging.

P6

Hyperbolic metamaterials for efficient single photon emission

Manobina Karmakar[1], Pavel Klok[2], Katarina Rovenská[2], Peter Kepič[2], Thomas Possmayer[3], Beáta Idesová[2], Filip Ligmajer[2], Leonardo Menezes[3]

[1]Ludwig-Maximilians-University of Munich (Germany), [2]Brno University of Technology (Czech Republic), [3]Ludwig-Maximilians-Universitat Munchen (Germany)

Hyperbolic metamaterials (HMMs) offer ultrahigh photonic density of states for enhancing solid-state single-photon emitters. Using electromagnetic simulations, we evaluate Purcell factors and photon collection efficiencies for metal-dielectric stacks coupled to emitters. We show that high Purcell enhancement often accompanies strong non-radiative losses, while surface gratings significantly improve far-field photon out-coupling.

P7

Dual-Band Beam-Switching Cavity-Excited Antenna Based on Scattering Constellations

Yumeng Wang, Zeqiang Lin, Alex Man Hon Wong

City University of Hong Kong (China)

A mechanically reconfigurable dual-band cavity-excited antenna is designed with metallic rod scattering constellations. Its reconfigurability relies on modulated rod distribution. An algorithm optimizes the constellation, enabling 0°/30° beam switching at both 7GHz and 12 GHz, validated by full-wave simulations with precise beam control.

P8

Time-varying Metamaterials on a Drone Rotor Blade

Pavel Ginzburg[1], Dmytro Vovchuk[1], Anna Mikhailovskaya[1], Konstantin Grotov[1], Mikhail Tsukerman[1], Omer Tsidki[1], Sergey Geyman[1], Mykola Khobzei[2], Vladyslav Tkach[2], Toms Salgals[3], Muračova[3], Bobrovs[3]

[1]Tel Aviv University (Israel), [2]Yuriy Fedkovych Chernivtsi National University (Ukraine), [3]Riga Technical University (Latvia)

Rotation provides a practical route to time-varying scattering, enabling signal encoding and recognition. We tag rotor blades with angle-dependent metamaterial superscatterers that, in motion, generate a strong, shaped micro-Doppler signature for improved drone detectability. Meta-learning inverse design optimizes RCS, bandwidth, and angles, validated in lab and outdoor flight tests.

P9

Probing Strongly Coupled Multi-Resonant Plasmonic Cavities and Excitons in ITR-PEEM

Sacha Schwarz[1], Raphael Gherman[2], Alex Currie[1], Jean-François Bryche[2], Guillaume Beaudin[2], Dominique Drouin[2], Serge Ecoffey[2], François Fillion-Gourdeau[1], Pierre Levesque[1], Paul Charette[2], MacLean[1]

[1]Infinite Potential Laboratories (Canada), [2]Université de Sherbrooke (Canada)

We present strong coupling between excitonic and both localized and delocalized plasmonic modes in the near-field of a multi-resonant nanoparticle-on-mirror array integrated with a WSe2 monolayer using interferometric time-resolved photoemission electron microscopy.

P10

Metallic Nanohelices as Chiral Metasurfaces & Applications in Chiral Sensing

Thu Hac Huong Le

National Institute of Advanced Industrial Science and Technology (AIST) (Japan)

This study presents a wafer-scale self-assembly approach for the fabrication of metallic helices by engineering the residual stresses and gradient strains in thin films, which induce spontaneous folding and twisting. The resulting nanohelices, with submicrometer radii, exhibit pronounced chiroptical responses in the infrared regime, enabling practical applications in chiroptical spectroscopies.

P11

Surface Light Localization in Topological Multilayers

Eva Otero[1], Ivan Toftul[2], Yuri Kivshar[2], Crina Cojocaru[1], Jose Trull[1]

[1]Universitat Politècnica de Catalunya (Spain), [2]Australian National University (Australia)

We numerically and experimentally study a photonic multilayer with SSH geometry supporting localized edge states. Comparison between two structures with identical periodicity but different topological phases show edge states only in the nontrivial phase. An absorber layer confirms the mode is confined to the surface rather than the bulk.

P12

Retrieving colors hidden in a grey Fabry-Pérot cavity through coherent absorption

Giuseppe Emanuele Lio[1], Giulio Carotta[2], Lorenzo Lavista[3], Andrea Camposeo[1], Giacomo Venturi[4], Agnese Guernieri[5], Alessandro Pitanti[3], Simon A. R. Horsley[6], Giuseppe C. La Rocca[7], Alessandro Tredicucci[3], Zanotto[1]

[1]Istituto Nanoscienze - CNR (Italy), [2]Universita di Pisa (Switzerland), [3]Universita di Pisa and Istituto Nanoscienze - CNR (Italy), [4]Universita di Pisa (USA), [5]Universita di Pisa (Italy), [6]University of Exeter (United Kingdom), [7]NEST (Italy)

A dielectric slab coated with thin metal films is the prototypical Fabry-Pérot cavity, featuring defined reflectance and transmittance spectral resonances. Here we challenge this common acquisition, showing that an appropriately chosen metal coating washes out the Fabry-Pérot resonances, that can be however fully retrieved by a coherent absorption measurement.

P13

Broadband tunable second-harmonic generation using local-to-nonlocal intersubband polaritonic metasurfaces

Jaesung Kim[1], Gerhard Boehm[2], Mikhail A. Belkin[2], Jongwon Lee[1]

[1]UNIST (Korea), [2]Technical University of Munich (Germany)

We demonstrate local-to-nonlocal intersubband polaritonic metasurfaces that enable broadband two-dimensional control of second-harmonic generation. A local resonance enhances excitation at the fundamental frequency, while a nonlocal resonance governs dispersive emission at the second harmonic. Voltage and incident angle independently modulate the SH spectral response, enabling broadband two-dimensional control of SHG.

P14

Detection and Quantification of Mid-Infrared through Raman thermometry in Plasmonic Bi-layer Metasurface

Anju Sajan, Christopher Sumner, Rohit Chikkaraddy

University of Birmingham (United Kingdom)

Room temperature manipulation of mid-infrared radiation is hindered by weak light-matter coupling and thermal dissipation. We design and fabricate a plasmonic bilayer resonant metasurface that enhances absorption in the mid-IR and enables quantitative evaluation of the resulting temperature rise, offering a pathway toward improved photonic sensing and thermal detection.

P15

Fundamental Limits to the Design of AchromaticMetasurfaces

Nicolas Kossowski[1], Roman Buisine[1], Adelin Patoux[1], Rémi Colom[1], Patrice Genevet[2], Samira Khadir[1]

[1]Université Côte d'Azur (France), [2]Colorado School of Mines (USA)

This work establishes rigorous conditions for designing achromatic metasurfaces, defining two regimes: achromatic (unitary Strehl ratio) and pseudo-achromatic (near-achromatic behavior via aberration compensation). It derives size limits and performance metrics, validated using FDTD simulations, to guide the design of broadband metasurfaces for applications like augmented reality and imaging.

P16

Transmissive Metasurface for Efficient Underwater Sound Focusing with a Wide Incident Angle

Jin-Chen Hsu[1], Jia-Feng Lai[1], Jia-Hong Sun[2]

[1]National Yunlin University of Science and Technology (Taiwan), [2]Chang Gung University (Taiwan)

An underwater acoustic metasurface for wide-angle and efficient focusing in transmission mode is designed. Numerical results show that the metasurface can focus oblique-incident waves up to 45° at the same power level as the normal-incident case. The metasurface also exhibits good achromatic capability with a large spatial incident angle view.

P17

Revolutionizing semiconducting SERS application for resistant pollutants via nanoarchitectonics

Yunqing Kang[1], Yusuke Yamauchi[1], Julio Gutiérrez Moreno[2], Olga Guselnikova[3]

[1]Nagoya University (Japan), [2]Barcelona Supercomputing Center (Spain), [3]Vienna University of Technology (Austria)

Amorphous Rh-Se mesoporous nanospheres synthesized via micellar self-assembly enable semiconducting SERS substrates with tunable composition, curvature, and amorphization, achieving sensitive detection of hexachlorobenzene and Teflon microplastics through electronic modulation, challenging high-surface-area paradigms and guiding design of advanced metal-selenium sensing materials for catalysis and electronics applications beyond conventional semiconductors worldwide.

P18

High-performance Wide-angle Metalens for Optical Receiver

Wei-Hsiang Lai, Pin Chieh Wu

National Cheng Kung University (Taiwan)

In this work, we present a 940nm metalens designed for integration with CCDs, enabling a significant reduction in system volume. The proposed metalens features a wide field of view of 93° while maintaining high modulation transfer function (MTF) performance. This ultra-compact solution enhances light collection efficiency for near-infrared optical receivers.

P19

Structural Coloring via Hyperuniform Arrays of Tapered Si Nanostructures on Glass

Hanna Kylhammar, Mikko Kjellberg, Srinivasan Anand

KTH Royal Institute of Technology (Sweden)

Highindex dielectric nanostructures provide a route to structural coloration without pigments. Here, we demonstrate color tuning in hyperuniform arrays of amorphous silicon nanodisks by controlling the nanodisks' sidewall angle, which results in a shift in the spectral position of the resonant scattering. Charged sphere lithography enables scalable hyperuniform pattern generation.

P20

Structural Colour Transmission of Novel Superimposed Gratings Fabricated via Two-Photon Polymerisation

Jamie Somers, Jing Qian, Colm Delaney, Pascal Landais, Louise Bradley

Trinity College Dublin (Ireland)

Direct laser writing continues to develop for photonic applications. The technique can produce complex structures using low refractive index polymer materials. The superimposed phase grating structure presented demonstrates improved colour saturation across the visible spectrum, with examples shown at 390 nm, 470 nm and 700 nm.

P21

Physically intuitive coupling engineering for realizing the proposed spectral response at the resonator with drop waveguide

Yae Jun Kim, Yu Sung Choi, Jae Won Ahn, Jae Woong Yoon

Hanyang University (Korea)

We present an analytically guided coupling engineering framework that maps coupling parameters to spectral characteristics in a resonator with a drop waveguide. By designing wavelength dependent coupling trajectories, we realize broadband uniform resonance output at the drop port and broadband critical coupling at the bus port.

P22

Direct Laser Writing of Ag-Au Thin Films for Plasmonic Sensing Platform

Kernius Vilkevičius, Tomas Rakickas, Evaldas Stankevičius

Center for Physical Sciences and Technology (Lithuania)

Periodic plasmonic nanostructures were fabricated on silver, gold, and silver-gold thin films using single ultrashort laser pulses. Grating-coupled resonances exhibit sharp spectral peaks and a high refractive-index sensitivity up to 930 nm/RIU. The Ag-Au nanobump arrays demonstrate enhanced performance stability and repeatability, highlighting their potential for scalable plasmonic sensing platforms.

P23

Spatially coherent quantum dot emission using guided mode resonances

Nimisha Ramprasad, Harry Atwater

Caltech (USA)

We design guided-mode-resonant gratings to enable spatially coherent quantum-dot emission in the visible, with applications to emissive luminescent solar concentrators. This single-mode waveguide device enables high angular selectivity and asymmetric diffraction, establishing a new architecture for off axis focusing, enabling high efficiency concentrators.

P24

Tunable Thermal Emissivity for Thermal Infrared Camouflage Enabled by a Zigzag Metallic Glass Structure

Yu-Ching Shih, Wei-Han Wang, Chia-Hsuan Lee, Hsuen-Li Chen

National Taiwan University (Taiwan)

Precise control of thermal infrared emissivity is critical for thermal management. Here, a single-layer zigzag metallic glass film fabricated by glancing angle deposition is demonstrated to provide precisely tunable emissivity. The structure induces strong optical anisotropy, enabling continuous emissivity modulation and effective thermal infrared camouflage of heated objects.

P25

Guiding synthetic chiral light for compact and efficient chiroptical sensing

Alexander Löhr[1], Justas Terentjevas[1], Patricia Vindel-Zandbergen[2], David Ayuso[3], Misha Ivanov[1], Olga Smirnova[1]

[1]Max Born Institute (Germany), [2]New York University (USA), [3]Imperial College London (United Kingdom)

Hollow capillaries offer a practical route to synthetic chiral light by guiding a stable, near-phase-matched three-dimensional field generated by standard two-color femtosecond Ti:sapphire pulses. This enables enantio-sensitive sum-frequency emission from sub-nanomole gas-phase samples, while phase cycling isolates the chiral signal in a background-free channel, enabeling compact photonic chiral sensing.

P26

Stabilization of Whispering Gallery Microresonators by Hidden Solvent Dynamics

Marco Reale, Antonino Madonia, Simonpietro Agnello, Marco Cannas, Emanuele Marino, Alice Sciortino, Fabrizio Messina

University of Palermo (Italy)

Whispering-gallery microresonators offer ultrasensitive optical fingerprints but can suffer from long-term spectral drifts. Combining experiments and modeling, we trace this instability to slow solvent release from quantum-dot-loaded polystyrene microparticles. Harnessing this understanding, we develop a simple stabilization protocol that locks resonances, enabling reliable WGM-based photonic labels, sensors, and microscale self-trackers.

P27

Chiral sensing along dielectric waveguides: effective index splitting and mode coupling

Alice de Corte[1], Tom T. C. Sistermans[2], Ankit K. Singh[2], Bjorn Maes[1], Alberto G. Curto[2]

[1]University of Mons (Belgium), [2]Ghent University (Belgium)

The sensitive detection of chiral molecules is essential in biochemistry. We present a framework for understanding both optical rotation and circular dichroism in dielectric waveguides coated with chiral molecules. Our approach incorporates the Pasteur parameter into a mode solver to predict an effective index splitting explained by mode coupling theory.

P28

Pole expansion of the optical scattering matrix via rescaled scattering channels

Elias Fösleitner[1], Adrià Canós Valero[1], Zoltan Sztranyovszky[2], Egor Muljarov[3], Kirill Koshelev[4], Thomas Weiss[1]

[1]University of Graz (Austria), [2]University of Birmingham (United Kingdom), [3]Cardiff University (United Kingdom), [4]Australian National University (Australia)

The pole expansion of the optical scattering matrix provides a fast and insightful route to investigate nanophotonic systems. However, conventional scattering channels from Mie theory result in matrices that exponentially diverge in the complex frequency plane, preventing simple pole expansions. We discuss different rescaling approaches to regularize the scattering channels.

P29

Space-time modulation based on an underwater acoustic metasurface

Han Jia, Yuzhen Yang

Institute of Acoustics CAS (China)

Here, we design a prototype of space-time acoustic metasurface (STAM), consisting of a reflective piezoelectric array controlled by a field-programmable gate array. Leveraging the spatiotemporally programmable phases of the STAM, we experimentally achieve Doppler-like chirp modulation and space-time modulation with deterministic frequency and momentum shifts of waterborne acoustic waves.

P30

Can real motion be synthetically emulated?

Kyan Louisia, Francisco J. Rodríguez-Fortuño

King's College London (United Kingdom)

Advances in spatiotemporal material modulation have enabled synthetic motion, emulating electromagnetic responses of moving objects without physical displacement. We assess how faithfully synthetic motion reproduces true motion, using both Galilean and Lorentz protocols. By analysing wave reflection and hybrid real-synthetic motion, we isolate which dynamical effects are genuinely reproduced.

P31

Reaching Unilateral Asymmetric Radiation in Bilayer Metasurfaces

Ruhao Pan, Bo Wang, Junjie Li

Institute of Physics - CAS (China)

2–O2 | **Dargan Auditorium** | **11:00 - 12:30**

SYM2: New trends in nanophotonics and advanced materials

Organized by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han
Chaired by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

11:00 KEYNOTE TALK **Keynote Lecture by Eli Yablonovitch**

Eli Yablonovitch

University of California, Berkeley (USA)

Keynote lecture by Eli Yablonovitch (University of California, Berkeley). Title and abstract to be confirmed.

11:30 INVITED TALK **Breakdown of the Kirchhoff's law of thermal radiation by a spatiotemporally modulated nonreciprocal metasurface**

Diego Dalvit[1], Anatoly Efimov[2], Chun-Chieh Chang[2], Simo Pajovic[1], Wilton Kort-Kamp[1], Dongsung Kim[1], Hou-Tong Chen[2], Abul Azad[2]

[1]Los Alamos National Laboratory (USA), [2]Center for Integrated Nanotechnologies (USA)

Kirchhoff's law of thermal radiation fundamentally limits the efficiency of photonic systems. We report the demonstration of spatiotemporally modulated nonreciprocal mid-infrared metasurfaces enabling the violation of the Kirchhoff's law at room temperature. We develop a theoretical framework to relate nonreciprocal scattering under spatiotemporal modulation with unequal absorptivity and emissivity.

11:50 INVITED TALK **Theory of Dispersive Space-Time Interfaces**

Alessandra Contestabile[1], Maria Antonietta Vincenti[2], Giuseppe Castaldi[3], Michael Scalora[2], Marcello Ferrera[4], Vincenzo Galdi[3], Carlo Rizza[1]

[1]University of L'Aquila (Italy), [2]University of Brescia (Italy), [3]University of Sannio (Italy), [4]Heriot-Watt University (United Kingdom)

We study the scattering of waves at an interface characterized by Lorentzian-dispersion and an abrupt change in its parameters. Novel frequency components are generated at the system's eigenmodes. This enables coupling between propagating and evanescent waves, allowing surface-wave modes to be excited from the far field without spatially structured media.

12:10 INVITED TALK **Programmable Broadband Nonlinear Infrared Imaging with Dielectric Metasurfaces**

Ze Zheng

Nottingham Trent University (United Kingdom)

We demonstrate broadband infrared imaging enabled by nonlinear wave mixing in a resonant dielectric metasurface. A pump beam at the resonant wavelength can enhance infrared-to-visible conversion, allowing detection with a conventional visible camera. Dynamic phase modulation of the pump via a spatial light modulator enables programmable, multifunctional, and reconfigurable imaging.

2–O3 | McNabb Theatre | 11:00 - 12:30

SP13: Commercialization of Metasurface and Nanophotonic Devices

Organized by: Matthew Singer
Chaired by: Matthew Singer

11:00 INVITED TALK **Advancing Radiative Cooling Technologies Beyond the Lab: Challenges and Opportunities**

Jyotirmoy Mandal

Princeton University (USA)

Radiative cooling technologies have seen a surge in research over the last decade, and the commercialization of multiple variants. However, adoption of high-performance radiative coolers at large scales remains to be achieved. This talk will discuss some technical and market-related challenges, and the author's participation in this area.

11:20 INVITED TALK **Building the Innovation Pipeline: Leveraging Princeton Core Facilities and Statewide Resources for Photonics Commercialization**

Alexander Norman

Princeton University (USA)

Princeton Materials Institute is the home to two large core facilities: the Micro/nanofabrication center (MNFC) and the Imaging and Analysis Center (IAC). Core facilities are used across the community to accelerate research and help steer ultimate product development. The broader innovation ecosystem in this area will also be highlighted.

11:40 KEYNOTE TALK **Scaling the Metasurface Market: From Flat Optics to Sensor-Integrated Intelligence**

Rob Devlin

Metalenz (USA)

From lab breakthrough to mass-market deployment, this presentation explores the commercialization of metasurfaces at Metalenz-highlighting key drivers, technical challenges, and emerging applications. Metasurfaces are no longer just flat optical elements; they are evolving into system-level platforms for intelligent perception, enabling more perceptive, accurate, and efficient vision systems.

12:10 INVITED TALK **Azopolymer photomorphing as holographic lithography for reconfigurable structured surfaces**

Marcella Salvatore, Stefano Luigi Oscurato

University of Naples Federico II (Italy)

Azopolymers capture the inherent vectorial nature of the light in the form of reversible surface reliefs. Tailored intensity and polarization patterns directly map into operating surfaces, without requiring development or etching. We outline here the general phenomenology of azopolymer photomorphing and its potential routes for scalable photonic manufacturing.

2–O4 | Maharry Theatre | 11:00 - 12:30

SYM3: Advanced passive and active metasurfaces and zero-index materials

Organized by: Howard Lee, Pin Chieh Wu, Wen-Hui (Sophia) Cheng
Chaired by: Howard Lee, Pin Chieh Wu, Wen-Hui (Sophia) Cheng

11:00 INVITED TALK **Plasmonic Semiconductor Laser Particles Across Surface-Supported, Metal-Coated, and Metalattice Configurations**

Sangyeon Cho

Harvard Medical School (USA)

We report plasmonic semiconductor laser particles across three configurations: surface-supported nanocavities enabling coherent emission from 130 nm particles, metal-coated geometries introducing hinge-localized plasmonic modes with enhanced emission, and metalattice-embedded particles supporting stable multimode lasing via internal scattering, all governed by cavity geometry and Purcell-enhanced interactions.

11:20 INVITED TALK **Nanofocusing of Orbital Angular Momentum Beams for Chirality Imaging**

Zhenrong Zhang

Baylor University (USA)

This talk presents a fiberintegrated plasmonic platform that nanofocuses fiberguided vortex modes. I will outline the design, simulation, fabrication, and characterization of plasmonic OAM probes and an integrated OAM-metasurface system that couples vortex beams into a Si-Ag helical metastructure for enhanced chirality sensing.

11:40 INVITED TALK **Cross-Shaped Metasurface for Advanced Spectral-Scanning LiDAR**

Hongyan Fu, Yaqi Han

Tsinghua University (China)

We present a reflective cross-shaped aluminum metasurface that enables polarization-controlled wide-angle beam steering for spectral-scanning LiDAR. The metasurface employs a metal-insulator-metal configuration and exploits the Pancharatnam-Berry (PB) geometric phase to achieve broadband phase modulation and circular polarizaiton conversion within an ultrathin form factor.

12:00 KEYNOTE TALK **Wavefront Shaping and Harnessing Coherence with Guided Mode Metastructures**

Julie Belleville, Martin Thomaschewski, Komron Shayegan, Yae-Chan Lim, Gloria Halka, Arun Nagpal, Nimisha Ramprasad, Lior Michaeli, Harry Atwater

California Institute of Technology (USA)

Guided mode metastructures are key building blocks for design of electro-optic active metasurfaces for wavefront shaping, and in metasurfaces that enable spatial coherence in the far field radiation emitted from thermal radiation sources and luminescent emitters.

2–O5 | Room 3074 | 11:00 - 12:40

META Quantum Nanophotonics Workshop

Organized by: Ortwin Hess
Chaired by: Ortwin Hess

11:00 INVITED TALK **Engineering Quantum Light with Perovskite Quantum Dots**

Yury Rakovich[1], Alexey Nikitin[2], Virginia Martínez-Martínez[3], Andrey Rogach[4], Igor Aharonovich[5]

[1]Materials Physics Center (Spain), [2]Donostia International Physics Center (Spain), [3]Universidad del País Vasco (Spain), [4]City University of Hong Kong (China), [5]University of Technology Sydney (Australia)

Perovskite quantum dots (PCDs) have emerged as efficient room-temperature quantum light sources. This invited talk presents recent advances in controlling single- and multiphoton emission using plasmonic metasurfaces, doping, and van der Waals encapsulation, enabling reversible emission switching and enhanced photostability for practical quantum photonic applications.

11:20 INVITED TALK **Telecom-wavelength quantum nanophotonics with self-assembled quantum dots**

Nir Rotenberg

Queen's University (Canada)

This talk introduces novel telecom-wavelength quantum dots, grown by chemical beam epitaxy in indium phosphide. These bright emitters generate photons in the telecom O- and C-bands with near-transform-limited (i.e. highly coherent) transitions. Nanophotonic structures are fabricated about these quantum dots, controlling and enhancing their interaction with photons.

11:40 INVITED TALK **Subradiant entangled states in plasmonics and the quantization of radiative systems**

Angela Demetriadou

University of Birmingham (United Kingdom)

Significant advances have been achieved in quantum nanoplasmonics in recent years. We demonstrate that, under appropriate conditions, plasmonic nanocavities can support the formation of subradiant entangled states between quantum emitters. In addition, we introduce an exact and complete second-quantization framework for open photonic systems with intrinsic radiative losses.

12:00 INVITED TALK **Enhanced Plasmon-Emitter Coupling and Emission at the Single-Molecule Level**

R. Margoth Cordova Castro

University of Ottawa (Canada)

We show that using Purcell enhanced emitters coupled to high LDOS metamaterials and detected at the single-molecule level, can serve to translate very minute changes in the electromagnetic environment and in nanopositions impossible to detected, to measurable signals such as bright point sources.

12:20 INVITED TALK **Quantum optical metasurfaces for photon pair generation**

Igal Brener

Sandia National Labs (USA)

Resonant dielectric metasurfaces with multiple engineered modes, especially high-Q qBICs, enable efficient nonlinear conversion and quantum-light generation without bulk phase matching. They provide control of biphoton polarization, allow two-photon interference between overlapping SPDC channels, and, via symmetry-designed nonlocal quadromer lattices, yield orders-of-magnitude enhancement of four-wave mixing.

2–O6 | Room 4050B | 11:00 - 12:35

SP15: Plasmonic Nanomaterials for Bio-diagnostics, Environmental Monitoring and Food Safety

Organized by: Lucia Petti and Massimo Rippa
Chaired by: Lucia Petti and Massimo Rippa

11:00 INVITED TALK **Disordered Plasmonic Metasurfaces: From Scalable Fabrication to Imaging Applications**

Doeun Kim[1], Juhwan Kim[2], Gyurin Kim[2], Youn Ju Na[1], Hyeon-Ho Jeong[1]

[1]Gwangju Institute of Science and Technology (Korea), [2]GIST (Korea)

Disordered plasmonic metasurfaces provide scalable alternatives to lithographic nanophotonics, creating dense hotspots and robust structural colors. We overview rapid wafer-scale electrostatic nanoparticle assembly and highlight imaging-oriented functions including imaging-based molecular sensing, optical security authentication, and emerging opportunities toward label-free bioimaging.

11:20 INVITED TALK **Flowthrough Raman readout in plasmonic nanopores for sequencing applications**

Francesco De Angelis

Istitutol Italiano di Tecnologia (Italy)

Inspired by nanopore sequencing, we developed Raman sequential readout strategies based on plasmonic nanopores. Molecules are delivered electrophoretically while real-time Raman spectra are recorded. We identified four DNA nucleotides and multiple amino acids at single-monomer level, achieving 89% nucleotide discrimination accuracy and angstrom-scale spatial resolution, corresponding to only 4 nucleotides.

11:40 **Silver Bullet - Vaterite-Based Metamaterials for Controllable ROS Generation in Biomedicine**

Pavel Bezrukov[1], Hani Barhum[2], Pavel Ginzburg[1]

[1]Tel Aviv University (Israel), [2]Triangle Research and Development Center (Israel)

Light-activated vaterite-silver nanoparticle metamaterials enable precise, localized ROS production for photodynamic therapy. Silver plasmonic effects extend visible-light absorption (400-700nm), enhancing oxygen activation under mild irradiation, while the porous vaterite host stabilizes and uniformly distributes AgNPs, ensuring controlled radical generation and biocompatibility.

11:55 INVITED TALK **Free-Electron-Driven Chip-Scale Mercury-Free Broadband UV Light Sources with Ultrahigh Germicidal Efficiency**

Vijay Kumar Sharma, Hilmi Volkan Demir

Nanyang Technological University Singapore (Singapore)

We demonstrate a breakthrough free-electron-driven, compact, chip-scale, mercury-free ultraviolet platform delivering spectrally engineered broadband emission precisely centered at the DNA absorption maximum (262 nm). The devices enable unprecedented single-source log-9 microbial reduction while providing $\geq$20 mW optical output, 4-6% efficiency, exceptional operational stability, and robust performance across wide temperature conditions.

12:15 INVITED TALK **Towards Point-of-Care and Food Safety Applications of SERS for Shiga Toxin Detection**

Alessia Milano[1], Amalia D'Avino[1], Valentina Marchesano[1], Domenico Sagnelli[1], Massimo Rippa[1], Bryan Guilcapi[1], Lu Zhou[2], Maurizio Brigotti[3], Gianluigi Ardissino[4], Stefano Morabito[5], Petti[1]

[1]Institute of Applied Sciences and Intelligent Systems "E. Caianiello" CNR (Italy), [2]Shandong First Medical University (China), [3]Università di Bologna (Italy), [4]Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico (Italy), [5]Istituto Superiore di Sanita (Italy)

We present a low-cost SERS-based sensing platform for the detection and discrimination of Shiga toxins in clinical and food-related matrices. The approach enables label-free toxin typing with clinically relevant sensitivity and shows potential for translational applications ranging from patient diagnostics to food safety monitoring.

2–O7 | Room 3051 | 11:00 - 12:40

SP11: Nano-Lasers, Spasers, and Nanostructures with Quantum Elements

Organized by: Alessandro Veltri and Ashod Aradian
Chaired by: Alessandro Veltri and Ashod Aradian

11:00 INVITED TALK **Temporal coherence properties of an aluminum nanocone lattice laser**

Tiziana Cesca[1], Elizabeth Mendoza-Sandoval[1], Giuseppe Pirruccio[2], Giovanni Mattei[1]

[1]University of Padova (Italy), [2]Universidad Nacional Autonoma de Mexico (Mexico)

This work investigates the roomtemperature temporal coherence properties of a solidstate plasmonic nanolaser made of a hexagonal array of tapered aluminum nanocones coupled to a dyedoped polymer film. The device shows exceptionally long coherence, with a measured coherence time of 30 ps and a corresponding coherence length of 8.8 mm.

11:20 INVITED TALK **Quantum Nonlinear Response of Emitter Lattices**

Blas Durá-Azorín[1], Antonio I. Fernandez-Dominguez[1], Alejandro Manjavacas[2]

[1]Universidad Autónoma de Madrid (Spain), [2]Instituto de Quimica Fisica Blas Cabrera (IQF) (Spain)

We theoretically study the optical response of a coherently driven periodic lattice of quantum emitters. Unlike lattices of classical resonators, we find that a resonant plane wave can populate excitonic Bloch states with parallel wavevectors different from that of the incident field, including states lying outside the light cone.

11:40 INVITED TALK **Robust Perovskite Quantum Dots for Microcavity Photonics**

Yu-Hsun Chou

National Cheng Kung University (Taiwan)

Quantum confined perovskite quantum dots integrated with optical microcavities exhibit remarkable environmental stability and versatile emission behavior at room temperature. We report sustained luminescence in water, temperature dependent excitonic responses, cavity enhanced emission, and strong light matter interactions, establishing a robust platform for nanoscale photonics and stable quantum light emitters.

12:00 INVITED TALK **Chiral light from exceptional points in a coupled nanolaser ring array**

Kaiwen Ji[1], Melissa Hedir[2], Ramy El Ganainy[3], Li Ge[4], Alejandro M. Giacomotti[5]

[1]Université Bordeaux (France), [2]CNRS (France), [3]Saint Louis University (USA), [4]College of Staten Island (USA), [5]CNRS/LP2N (France)

We propose and experimentally demonstrate an orbital angular momentum nanolaser array arranged in a ring geometry on an InP-based photonic crystal membrane.Our approach leverages exceptional-point singularities with net phase circulation. These results demonstrate a robust and scalable strategy for engineering compact, phase-locked laser arrays with controllable angular momentum output.

12:20 INVITED TALK **Assembled Nanocrystal Lattice Nanolasers**

Mindaugas Juodėnas[1], Nadzeya Khinevich[1], Gvidas Klyvis[1], Domantas Peckus[1], Joel Henzie[2], Tomas Tamulevičius[1], Sigitas Tamulevičius[1]

[1]Kaunas University of Technology (Lithuania), [2]National Institute for Materials Science (Japan)

We demonstrate a plasmonic nanolaser utilizing template-assembled monocrystalline silver nanocubes to minimize absorptive losses. This approach achieves lasing at 574 nm, proving material crystallinity outweighs perfect geometric order. Furthermore, transient absorption spectroscopy reveals how coherent optomechanical vibrations modulate the lattice resonance, highlighting intrinsic stability factors in self-assembled nanophotonics.

2–O8 | Room 3071 | 11:00 - 12:40

SP21: New trends in light-matter interaction at the nanoscale

Organized by: Carlos Alberto Maciel Escudero, Jorge Olmos Trigo and Mario Zapata Herrera
Chaired by: Carlos Alberto Maciel Escudero, Jorge Olmos Trigo and Mario Zapata Herrera

11:00 INVITED TALK **The Impact of Dark Excitons on Polariton Spatiotemporal Dynamics in 2D Semiconductors**

Jamie Fitzgerald, Roberto Rosati, Ermin Malic

Philipps-University Marburg (Germany)

We investigate phonon-driven exciton polariton transport in monolayer MoSe2 at ambient temperatures. Three distinct regimes are identified: initial sub-ps ballistic-like expansion, few-ps transient superdiffusion, and a slow exciton-limited diffusion after thermalization. This work will help trigger and guide future experimental studies on phonon-mediated polariton transport in 2D semiconductors.

11:20 INVITED TALK **Electrical excitation of surface plasmons and light**

Elizabeth Boer-Duchemin

Université Paris-Saclay (France)

We use the inelastic tunneling current from a biased tunneling junction to locally and electrically excited surface plasmons on gold nanostructures.

11:40 INVITED TALK **Organic Hyperbolic Metamaterials and Nanostructures for Light-Matter Interactions**

Sara Núñez Sánchez

Instituto de Ciencia de Materiales de Madris - CSIC (Spain)

We present allorganic excitonic nanostructures and hyperbolic metamaterials based on Jaggregates, enabling tunable permittivity, ENZ behaviour, and polaritonic coupling. These organic platforms and nanostructures can establish the playground for flexible, metalfree photonics and metamaterials.

12:00 INVITED TALK **Brewster Quasi-BICs in Out-of-Plane Symmetry Broken Nanodisk Metasurfaces**

Beatriz Castillo[1], Lucia Hidalgo-Orteaga[1], Antonio García-Martín[1], Diego Romero Abujetas[2], José Antonio Sánchez-Gil[1]

[1]CSIC (Spain), [2]Universidad de Castilla-La Mancha (Spain)

While traditional BICs are symmetry-protected at normal incidence, breaking out-of-plane symmetry by tilting meta-atoms give rise to Brewster quasi-BICs. These states achieve a profound mirror asymmetry due to dipolar hybridization. Depending on the angle, the metasurface exhibits either total transparency or strong excitation while remaining cloaked from far-field reflection.

12:20 INVITED TALK **Electron-beam spectroscopy simulations using the T-matrix method**

Elli Stamatopoulou, Carsten Rockstuhl

Karlsruhe Institute of Technology (Germany)

Advanced computational tools describing electron interactions with nanostructured materials are crucial for designing and interpreting experiments. Here, we report a generalized T-matrix scattering formalism to study observables in electron-beam spectroscopy. This method is implemented in the Python package treams_ebeam, and demonstrated while studying different nanophotonic materials of contemporary interest.

2–O9 | Room 3126 | 11:00 - 12:40

SYM5: Phononics and acoustic metamaterials

Organized by: Marco Miniaci, Jensen Li, Jean-Philippe Groby, Vincent Pagneux, Noé Jiménez, Stefano Laureti
Chaired by: Marco Miniaci, Jensen Li, Jean-Philippe Groby, Vincent Pagneux, Noé Jiménez, Stefano Laureti

11:00 INVITED TALK **Coherent control of acoustic phonons in phononic waveguides**

Chushuang Xiang, Edson Rafael Cardozo de Oliveira, Sathyan Sandeep, Konstantinos Papatryfonos, Martina Morassi, Luc Le Gratiet, Abdelmounaim Harouri, Isabelle Sagnes, Aristide Lemaitre, Omar Ortiz, Esmann, Lanzillotti-Kimura

Université Paris Saclay (France)

We demonstrate 20 GHz phonon transport over 20 μm in a phononic waveguide based on GaAs/AlAs multilayers. By introducing two excitation laser pulses to drive distinct phonon sources, we achieve coherent control of the propagating phonons through spatio-temporal interference.

11:20 INVITED TALK **Wave Transport in Valley Phononic Crystals**

Myung-Joon Lee, Il-Kwon Oh

Korea Advanced Institute of Science and Technology (Korea)

We examine how interface orientation affects wave transport in valley phononic crystals. Bulk dispersion calculations, supercell models, and full field simulations are used to compare junction geometries. This work provides a conservative baseline for interpreting angle-dependent transmission variations in lattice waveguides.

11:40 INVITED TALK **Wave-packet dynamics in nonreciprocal metamaterials**

Bertin Many Manda[1], Sayan Jana[1], Dimitrios J. Frantzeskakis[2], Vassos Achilleos[3], Lea Sirota[1]

[1]Tel Aviv University (Israel), [2]University of Athens (Greece), [3]Le Mans University (France)

I present recent results on the dynamics of wave packets in non-Hermitian nonreciprocal lattices. I discuss mechanisms behind wave amplification, acceleration, and wave jumps, and show how nonlinear interactions modify transport and produce dynamical phase transitions. Possible applications of these results for controlling wave propagation are also discussed.

12:00 INVITED TALK **Adaptive ultrabroadband flexural-wave absorption enabled by piezoelectrically modulated elastic metasurface**

Houyou Long, Zhiwang Zhang, Ying Cheng, Xiaojun Liu

Nanjing University (China)

We present a piezoelectrically modulated non-Hermitian elastic metasurface enabling tunable electromechanical damping, converting vibrations into electrical energy dissipated via shunt-induced Ohmic losses. With an RLC circuit and adaptive sensor-controller switching among three broadband shunts, we experimentally realize an ultrabroadband flexural-wave absorber, achieving 93.9% average absorption from 900 to 3800Hz.

12:20 INVITED TALK **Collective Near-Field Photon Transport in Disordered Si/SiO_2 Nanogranular Metamaterials**

Michel Kazan

American University of Beirut (Lebanon)

Disordered assemblies of polar-dielectric nanoparticles can support collective surface-phonon-polaritonic modes enabling photon-mediated energy transport beyond classical diffusion. Using optothermal Raman thermometry, we demonstrate that near-field radiative coupling dramatically enhances thermal conductivity in dense oxidized silicon nanopowders. The results reveal emergent thermal-metamaterial behavior arising from mesoscopic hybridization of surface phonon polaritons.

2–O10 | Room 4047 | 11:00 - 12:40

SYM4: Chirality, magnetism, and magnetoelectricity: Separate phenomena and joint effects in metamaterial structures

Organized by: Eugene Kamenetskii
Chaired by: Eugene Kamenetskii

11:00 INVITED TALK **Towards compact microfluidic chips for efficient chiral recognition**

David Ayuso

Imperial College London (United Kingdom)

We present a route towards developing compact microfluidic platforms for efficient chiral sensing and manipulation. Our approach relies on creating synthetic chiral light inside compact microfluidic microchannels, so that the engineered light field can interact with liquid samples carrying chiral molecules in a highly enantiosensitive manner.

11:20 INVITED TALK **Excitonic Charge Density Waves in Moire Ladders**

Paula Mellado[1], Javiera Cabezas[2], Francisco Muñoz[2]

[1]Universidad Adolfo Ibáñez (Chile), [2]Universidad de Chile (Chile)

We analyze a half-filled four-band ladder with a relative shift between legs that generates a moiré supercell and narrows minibands near the Fermi level. Short-range interactions produce an excitonic incommensurate CDW with a gapped Higgs mode and neutral phasons„ suggesting an excitonic origin for HfTe3.

11:40 INVITED TALK **RKKY-like interactions between two magnetic skyrmions**

Xiangrong Wang

The Chinese University of Hong Kong (China)

Interaction between two tilted skyrmions changes from replusion to attraction periodically with skyrmion-skyrmion distance along certain direction, akin to the Ruderman-Kittel-Kasuya-Yosida (RKKY) interaction. The essential physics is behind a previously unrecognized universal wavy tail in the skyrmion spin texture. The RKKY-like interaction is universal for all tilted skyrmions.

12:00 INVITED TALK **Microwave radiation from high chirality vortex dynamics.**

Feodor Ogrin

University of Exeter (United Kingdom)

This is a model which uses 3D finite-difference-time-domain approach together with Landau-Lifshits-Gilbert equation to find the exact solutions for electromagnetic radiation from magnetic vortex structures in cylindrical elements. Here we demonstrate the spectrum of radiation and explore the collective excitation properties within a macroscopic pattern.

12:20 INVITED TALK **Feedback effects of electromagnetic interactions in bianisotropic media**

Kei Sawada

RIKEN (Japan)

An effective theory is developed for metamaterials exhibiting bianisotropy, with particular emphasis on magnetoelectricity and chirality classified by the space-time inversion symmetry. This approach gives a framework for representing the susceptibility functions including feedback effects due to magnetoelectric couplings.

2–O11 | Room 4050A | 11:00 - 12:35

SYM1: Hybrid Nanomaterials and Metastructures for Photonics, Sensing and Energy

Organized by: Jérôme Plain, Alexander Govorov, Davy Gérard, Pedro Hernandez Martinez
Chaired by: Jérôme Plain, Alexander Govorov, Davy Gérard, Pedro Hernandez Martinez

11:00 INVITED TALK **Self-assembled Plasmonic Metamaterials with Hyperbolic Dispersion for Applications in Sensing**

Anastasiia Zaleska, Mayela Romero-Gomez, Anatoly Zayats, Wayne Dickson

King's College London (United Kingdom)

Plasmonic metamaterials with hyperbolic dispersion are characterized by a transition from elliptic to hyperbolic dispersion at a tunable epsilon near zero frequency. Their self-assembled fabrication provides unique opportunities for tailoring their constituents, but importantly, hybridizing them with functional layers for ultrasensitive sensing.

11:20 **Metasurfaces for photon management in a thermophotovoltaic system**

Vadim Zakomirnyi, Anna Rumyantseva, Sergei Kostcheev, Demetrio Macias, Renaud Bachelot, Davy Gerard

Université de Technologie de Troyes (France)

Metasurfaces can tailor thermal radiation to improve thermophotovoltaic efficiency. This work studies a metasurface acting as a spectral filter that suppresses unwanted radiation while transmitting useful near-infrared photons (1.8 μm) for low-bandgap photovoltaic cells. Simulations reveal resonant field localization in the nanostructure, producing selective transmission.

11:35 INVITED TALK **Broadband Infrared Unidirectional Absorption by non-Hermitian Multilayer Structure**

Wakana Kubo

Tokyo University of Agriculture and Technology (Japan)

We demonstrate a non-Hermitian four-layer structure exhibiting broadband unidirectional absorption in the infrared region. By precisely designing layer thicknesses, directional absorption is achieved over a wide spectral range. This approach offers a promising route toward thermal management applications, such as infrared heat-shielding and thermal smart window technologies.

11:55 INVITED TALK **Enhancing Interfacial Charge Transport in Gold Nanoparticle@Conductive Polymer Hybrids via N-Heterocyclic Carbene Linkers**

Ningwei Sun

Leibniz Institute of Polymer Research Dresden (Germany)

N-Heterocyclic carbenes (NHCs) have emerged as a unique class of ligands for gold nanoparticles (Au NPs), combining strong metal binding with intrinsic electronic conductivity. Here, we present a synthetic strategy by employing amino-functionalized NHC-Au complexes with in situ oxidative polymerization of polyaniline (PANI) to yield electronically coupled Au NP@NHC-PANI hybrids.

12:15 INVITED TALK **Revising Model Reactions in Plasmonic Chemistry**

Olga Guselnikova

TU Wien (Austria)

Progress in plasmonic chemistry demands reliable model reactions to elucidate energy transfer, mechanisms, and materials discovery. We show PNTP azo coupling on Au nanoparticles is unsuitable, as plasmonic heating induces Au-S cleavage and thiol oxidation. We propose alkoxyamine homolysis, offering simpler kinetics, identifiable products, and robust mechanistic interpretation for catalysis

2–O12 | Room 5025 | 11:00 - 12:40

SP20: Nonlocal and nonlinear nanophotonics

Organized by: Gonzalo Álvarez-Pérez and Huatian Hu
Chaired by: Gonzalo Álvarez-Pérez and Huatian Hu

11:00 INVITED TALK **Hydrodynamic model for nonlocal electrodynamics effects in ultra-confined plasmons**

André Jorge Chaves[1], Tiago Barbosa[2], Line Jelver[3], Simão Cardoso[1], Diego Costa[4], Leonardo Campos[5], Ingrid Barcelos[6], N. Asger Mortensen[3], Nuno Peres[1]

[1]University of Minho (Portugal), [2]Aeronautics Institute of Technology (Brazil), [3]University of Southern Denmark (Denmark), [4]Universidade Federal do Ceara (Brazil), [5]Universidade Federal de Minas Gerais (Brazil), [6]Centro Nacional de Pesquisa em Energia e Materiais (Brazil)

Using a quantum hydrodynamic model, we show that hyperbolic plasmon-polaritons in few-layer black phosphorus are strongly renormalized by nonlocal effects. We further demonstrate that nonlocal electrodynamics is essential to describe plasmon-phonon-polariton dispersion in twisted bilayer graphene on talc obtained from SNOM measurements.

11:20 INVITED TALK **Nonlocal and Nonlinear Effects in Plasmonics from a Time-Dependent Density Functional Theory Perspective**

Antton Babaze[1], Javier Aizpurua[2], Andrei G. Borisov[3]

[1]University of the Basque Country (Spain), [2]Donostia International Physics Center DIPC (Spain), [3]Université Paris-Saclay (France)

Using time-dependent density functional theory, we study electron dynamics in metallic nanostructures under different excitation conditions, including continuous-wave illumination, ultrashort pulses, quantum emitters, and fast electron beams, and investigate the role of nonlocality, nonlinearity, and other quantum phenomena in the excitation of plasmonic resonances, harmonic generation and nanoscale electron transport.

11:40 INVITED TALK **High-field THz nonlinear nanophotonics at TELBE with Dirac metasurfaces and time-varying media**

Thales de Oliveira

Helmholtz-Zentrum Dresden-Rossendorf (Germany)

Intense terahertz fields combined with subwavelength confinement enable nonlinear nanophotonics in which ultrafast carrier relaxation and transport shape the response. I will review recent results obtained at the high-field THz facility TELBE on harmonic generation in grating-graphene metamaterials topological-insulator metasurfaces, and other plasmonic metasurfaces.

12:00 INVITED TALK **Dynamic and Intelligent Plasmonics: Unveiling Molecular Transport, Optomechanical Control, and Deep Learning-Enhanced Sensing**

Wen Chen[1], Haoran Liu[1], Tao He[1], Huatian Hu[2], Christophe Galland[3], Hongxing Xu[4]

[1]East China Normal University (China), [2]Center for Biomolecular Nanotechnologies (Italy), [3]EPFL (Switzerland), [4]Henan Academy of Sciences (China)

We report breakthroughs in functionalizing plasmonic nanocavities. Beyond static hotspots, we reveal ligand-capped nanogaps as open quasi-2D nanofluidic channels facilitating molecular exchange. We further demonstrate mid-infrared-to-visible optomechanical upconversion and introduce physics-guided deep learning to reconstruct broadband spectra from dark-field images, redefining the limits of nanophotonic interrogation.

12:20 INVITED TALK **Controlling the optical response of 2D semiconductors with THz pulses**

Tommaso Venanzi[1], Marzia Cuccu[2], Edith Wietek[2], Xiaoxiao Sun[3], Raul Perea-Causin[4], Samuel Brem[5], Daniel Erkensten[5], Takeshi Taniguchi[6], Kenji Watanabe[6], Ermin Malic[5], Helm[2], Winnerl[3], Chernikov[2]

[1]Technical University of Dresden (TUD) (Germany), [2]TUD Dresden University of Technology (Germany), [3]Helmholtz-Zentrum Dresden-Rossendorf (Germany), [4]Stockholm University (Sweden), [5]Philipps-Universitat Marburg (Germany), [6]National Institute for Materials Science (NIMS) (Japan)

We use THz pulses to manipulate the optical response of MoSe2 and WSe2 monolayers, and MoSe2/WSe2 heterostructures. This method can be used to control excitonic populations on ultrafast time-scales, to access optical-driven nonlinear properties of matter and to design photonic devices with THz switches.

2–O13 | Room 5039 | 11:00 - 12:40

SYM6: Advanced Techniques for Computational Electromagnetics

Organized by: Maha Ben Rhouma

Chaired by: Maha Ben Rhouma

11:00 INVITED TALK **Efficient Numerical Modeling of Casimir-Lifshitz Forces in Graphene-Based Nanostructures**

Youssef Jeyar[1], Brahim Guizal[2], Mauro Antezza[2]

[1]Laboratoire Charles Coulomb - CNRS (France), [2]CNRS-Universite de Montpellier (France)

Casimir-Lifshitz interactions in graphene gratings are studied using the Fourier Modal Method with Local Basis Functions (FMM-LBF). This method overcomes slow convergence and instabilities of standard FMM for TM-polarized fields, accurately capturing high-order diffraction, multiple scattering, and graphene strip effects.

11:20 INVITED TALK **Near-field focusing and amplification of tip-substrate radiative heat transfer**

Milo Vescovo, Philippe Ben-Abdallah, Riccardo Messina

Universite Paris-Saclay (France)

By studying the spatially resolved near-field radiative heat transfer between a nanoscale probe and a substrate, we show that introducing a thin polar film atop a non-dispersive substrate leads to enhancement and lateral focusing of the heat exchange, offering a route toward the control of heat transfer at he nanoscale.

11:40 INVITED TALK **Time Modulation of Near-Field Radiative Heat Transfer**

Mauro Antezza

University of Montpellier (France)

We develop a theory to study how a fast periodic modulation of a generic control variable affecting the near-field radiative heat coupling between two bodies produces a correction on the slow thermal dynamics.

12:00 INVITED TALK **Numerical advances in the computation of radiative heat transfer between nanostructures**

Brahim Guizal, Omar Tada, Mauro Antezza, Youssef Jeyar

Montpellier University (France)

Simulating radiative heat transfer between nanostructures can be very demanding in terms of computational resources even with Fourier methods which are known to be very efficient for handling such structures, especially lamellar ones. For that case, we propose a method that leads to a further reduction of the computational load.

12:20 INVITED TALK **BIC-Enhanced Partial LDOS in Terahertz Metasurfaces**

Jie Ji[1], D. Peeters[1], W. Holman[1], T. X. Hoang[2], D. van Mechelen[1], J. Gomez Rivas[1], Jose Sanchez-Gil[3]

[1]Eindhoven University of Technology (The Netherlands), [2]A*STAR (Singapore), [3]Instituto de Estructura de la Materia-CSIC (Spain)

This work uses terahertz near-field microscopy to reveal how quasi-bound states in the continuum enhance the partial local density of optical states in finite metasurfaces. Experiments and simulations show strong, spatially confined PLDOS enhancement that saturates with array size, establishing practical limits and design rules for THz quasiBIC engineering.

2–O14 | Room 5052 | 11:00 - 12:35

SYM2: New trends in nanophotonics and advanced materials

Organized by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

Chaired by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

11:00 INVITED TALK **Novel Materials for UV Plasmonic Nanostructures**

Michael Foltýn, Tomáš Šikola, Michal Horák

Brno University of Technology (Czech Republic)

We present a study of novel plasmonic materials, focusing on nanostructured non-noble metals at the single-particle level. We demonstrate the spectral tunability of their localized surface plasmon resonances. In particular, we investigate gallium, bismuth, lead, and tin.

11:20 INVITED TALK **Enhancing and directionally controlling the photoluminescence of 2D materials using plasmonic nanocavities**

Fajun Xiao

Northwestern Polytechnical University (China)

We report particle-on-mirror plasmonic nanocavities enabling precise control of excitation, emission, and photon routing at the nanoscale. Record-large photoluminescence enhancement, tunable exciton-plasmon coupling, large strain-induced exciton energy shifts, high collection efficiency, and highly directional emission are demonstrated in two-dimensional WSe2 and InSe systems with engineered cavity modes and directivity.

11:40 INVITED TALK **Plasmonic Enhancement of Second Harmonic Generation from a van der Waals Crystal**

Hong Liu

A*STAR (Singapore)

It has been reported that niobium oxide dichloride (NbOCl2) crystal exhibits giant optical nonlinearity. We developed a plasmonic resonator insensitive to polarization to acquire strong local field amplification, which achieves fivefold enhancement of second harmonic generation (SHG) intensity. It provides a robust pathway toward high-performance, miniaturized nonlinear quantum light source.

12:00 **Resolving Surface Plasmon Dispersion with Fabry-Pérot-Assisted Extraordinary Optical Transmission**

Youssef El Badri[1], Hicham Mangach[2], Mustapha Bahich[1], Yan Pennec[2], Bahram Djafari-Rouhani[2], Younes Achaoui[1]

[1]Moulay Ismail University (Morocco), [2]IEMN (France)

We present a numerical study showing the reconstruction of SPP dispersion diagram of a metal-dielectric interface from extraordinary optical transmission resonances in gratings with subwavelength Fabry-Pérot apertures. By varying periodicity, each device probes distinct momentum states, enabling reconstruction of the SPP dispersion in close agreement with eigenmode solutions.

12:15 INVITED TALK **3D topological photonics: 3D Chern photonic insulators and electromagnetic axions**

Chiara Devescovi[1], Antonio Morales-Perez[2], Maia G. Vergniory[3], Aitzol Garcia Etxarri[1]

[1]Basque Foundation for Science (Spain), [2]Donostia International Physics Center (Spain), [3]Université de Sherbrooke (United Kingdom)

Lunch Break 12:30 - 14:00

2–O15 | Dargan Auditorium | 14:00 - 15:50

SYM2: New trends in nanophotonics and advanced materials

Organized by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han
Chaired by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

14:00 KEYNOTE TALK **Metamaterials at Crossroads: from Quantum to Space-Time Photonics**

Vladimir Shalaev

Purdue University (USA)

We discuss quantum photonics based on the recently discovered single-photon emitters in silicon nitride and the avalanche-enhanced optical modulation in silicon at single-photon intensities. Then, we show that transparent conducting oxides (TCOs) operating in the near-zero index (NZI) regime can enable extreme time-varying media.

14:30 INVITED TALK **Exciton Polarons in 2D semiconductors**

Carlos Alberto Maciel Escudero, Giuseppe Meneghini, Jamie Fitzgerald, Ermin Malic

Philipps-Universität Marburg (Germany)

We investigate exciton polaron formation in 2D semiconductors. By solving the Dyson equation, we obtain polaron energies and identify the regime were polaronic effects, such as renormalized group velocity, effective masses and transport, become significant. Our work provides a systematic microscopy and material specific theory to investigate polaron physics.

14:50 INVITED TALK **Shining Light on 2D Antiferromagnets**

Viktoriia Radovskaia, Mengxing Na, Theo H. Rasing, Alexey V. Kimel, Dmytro Afanasiev

Radboud University (The Netherlands)

Ultrafast resonant orbital excitation of transition-metal (TM) ions offers a powerful approach to drive spin dynamics in 2D van der Waals (vdW) materials. In this work, we investigate mixed 2D systems containing different TM ions. Our findings demonstrate the mixing of TM species as a versatile strategy for engineering photomagnetism.

15:10 INVITED TALK **Chiral Photonic Environments for Coherent Control of Valley Excitons**

Hassan Lamsaadi[1], Aurélien Cuche[2], Hugo Lourenço Martins[2], Vincent Paillard[3], Sébastien Weber[2], Jean Marie Poumirol[4], Gonzague Agez[3]

[1]INSA Toulouse (France), [2]CEMES CNRS (France), [3]Toulouse University (France), [4]CEMES - CNRS (France)

Valley coherence encodes quantum information in the relative phase of inequivalent momentum valleys, yet controlled intervalley coupling at room temperature remains challenging in monolayer semiconductors. We demonstrate that chiral liquid crystals enable nearfield coupling between excitons via helicityselective Bragg reflection accompanied by spinflip, offering a scalable route toward valleytronic functionalities.

15:30 INVITED TALK **Optical Properties Tuning of Quantum Emitters in WSe2 Monolayers**

Javier Martín-Sánchez

Universidad de Oviedo (Spain)

We demonstrate strain control of quantum emitters in WSe_2 monolayers using piezoelectric actuators. Applied voltage enables reversible tuning of emission energy and brightness while preserving single photon purity. Strain modifies the excitonic potential landscape, enabling exciton redistribution. These results establish strain engineering as a tool for tunable photonic devices.

2–O16 | McNabb Theatre | 14:00 - 15:10

META Quantum Nanophotonics Workshop

Organized by: Ortwin Hess

Chaired by: Ortwin Hess

14:00 INVITED TALK **Ultrasensitive nanothermometry with single organic dye molecules**

Mohammad Musavinezhad, Jan Renger, Stephan Gotzinger, Alexey Shkarin, Vahid Sandoghdar

Max Planck Institute for the Science of Light (Germany)

We use single organic dye molecule at cryogenic temperatures as a readout of the state of a nearby two-level system (TLS). The temperature dependence of the TLS behavior allows us to perform nanoscale thermometry with sub-millikelvin sensitivity. We report on the detection of sub-picowatt heat generation from a single molecule.

14:20 INVITED TALK **Thermalization of photons in disordered scattering media**

Valentina Krachmalnicoff, L. Soncin, Y. De Wilde, R. Pierrat, R. Carminati

ESPCI - Paris PSL (France)

We show the first demonstration of photon thermalization in a scattering medium interacting with Rhodamine molecules. Scattering and fluorophores' absorption and emission cycles drive dramatic changes of the emission spectrum. A delicate balance between these phenomena leads to an emission spectrum following a Bose-Einstein distribution with a non-vanishing chemical potential.

14:40 KEYNOTE TALK **Highly Nonlinear Photonic Materials Based on Metamaterials, Plasmonics, and Nanostructuring**

Robert Boyd

University of Rochester (USA)

This contribution reviews advances in the development of highly nonlinear materials by the combination of methods devised from the fields of metamaterials, plasmonics, and structured surfaces. We also review how these materials have led to the development of new photonics applications, including applications in quantum information technologies.

2–O17 | Maharry Theatre | 14:00 - 15:50

SYM6: Advanced Techniques for Computational Electromagnetics

Organized by: Maha Ben Rhouma

Chaired by: Maha Ben Rhouma

14:00 INVITED TALK **High-Speed Chemical Identification Enabled by Terahertz Parametric Wavelength Conversion**

Kosuke Murate[1], Sota Mine[2], Kodo Kawase[1]

[1]Nagoya University (Japan), [2]RIKEN (Japan)

We demonstrate simultaneous generation of more than ten terahertz (THz) wavelengths using parametric generation and detection. Spectroscopic information is acquired in real time as camera images, enabling instantaneous sample identification via image recognition. The system allows rapid chemical sensing with strong potential for practical THz applications.

14:20 INVITED TALK

Theory and experiments on GaN waveguide polariton lasers

Olha Bahrova[1], Valentin Develay[2], I. Septembre[3], D. Bobylev[3], Christelle Brimont[2], L. Doyennette[4], B. Alloing[5], H. Souissi[6], E. Cambril[6], S. Bouchoule[6], Ackemann[7], Zuniga Perez[8], Guillet[2], Malpuech[9], Solnyshkov[1]

[1]Institut Pascal (France), [2]University of Montpellier (France), [3]Université Clermont Auvergne (France), [4]Université de Montpellier (France), [5]Université Cote d'Azur (France), [6]Université Paris-Saclay (France), [7]University of Strathclyde (United Kingdom), [8]Universite Cote d'Azur (France), [9]Universite Clermont Auvergne (France)

GaN waveguide polariton lasers are very promising for applications. We discuss recent experimental results and their theoretical description, including cw and pulsed mode-locked polariton lasing, the formation of single and multiple solitons in ridge waveguides, and also bound states in the continuum (BIC) and associated solitons in modulated waveguides.

14:40 INVITED TALK

Information and inference in photonic sensors

Zin Lin

Virginia Tech (USA)

We will present our recent efforts on analyzing and optimizing information and inference in various photonics sensors, imagers, and processors.

15:00 INVITED TALK

Modeling Nanoplasmonics with a Fully Atomistic Approach

Tommaso Giovannini

University of Rome Tor Vergata (Italy)

We present a classical electromagnetic model to simulate the plasmonic response of realistic nanostructures. The approach accounts for intraband and interband effects and includes a description of quantum tunneling. Its coupling with a quantum mechanical (QM) description of molecular adsorbates allows for a cost-effective, yet accurate modeling of plasmon-mediated chemistry.

15:20 KEYNOTE TALK

Inverse designed, densely integrated classical and quantum photonics

Jelena Vuckovic

Stanford University (USA)

Recent breakthroughs in photonics design, along with new nanofabrication approaches and heterogeneous integration play crucial roles in building photonics for applications including optical interconnects and quantum technologies. This design breakthrough is named photonic inverse design, and refers to efficiently searching through the space of all possible photonic device geometries.

2–O18 | Room 3074 | 14:00 - 16:00

SYM1: Hybrid Nanomaterials and Metastructures for Photonics, Sensing and Energy

Organized by: Jérôme Plain, Alexander Govorov, Davy Gérard, Pedro Hernandez Martinez

Chaired by: Jérôme Plain, Alexander Govorov, Davy Gérard, Pedro Hernandez Martinez

14:00 INVITED TALK

Chemical Reactions Driven by Plasmonic Hot Carriers

Seunghoon Lee

Dong-A University (Korea)

Plasmonic hotspots generate hot carriers that drive chemical transformations, while enhanced fields enable in situ SERS readout. We demonstrate visible-light degradation of polyethylene microplastics by Au nanoparticle clusters and CPL-driven chiral growth from achiral Au nanocubes, arising from asymmetric hot-electron distributions and validated by CDS and SEM.

14:20 INVITED TALK **Locally asymmetric plasmonic photocatalysis driven by light's polarization**

Lucas Vazquez Besteiro

CINBIO - Universidade de Vigo (Spain)

Light-to-matter chirality transfer can modify achiral plasmonic structures illuminated with circularly polarized light, inducing chiral growth on achiral plasmonic seeds by photocatalytically imprinting the reduced symmetry of the local fields onto the nanoparticle. We will discuss how different energy-transfer mechanisms can drive such asymmetric geometric transformations, discussing recent experimental demonstrations.

14:40 INVITED TALK **Circular Dichroism Enhancement via CPLInduced Chiral Growth of Core-Shell Plasmonic Particles**

Koichiro Saito, Yoshie Ishikawa

National Institute of Advanced Industrial Science and Technology (AIST) (Japan)

Synthesizing chiral plasmonic nanoparticles under circularly polarized light avoids the need for chiral molecules. However, their gfactors have remained low. Here, we achieve an approximately eightfold enhancement of the gfactor by inducing chiral Ag growth on MnO_2coated gold nanorods.

15:00 INVITED TALK **Single-Particle Spectroscopy on Chiral Plasmonic Nanostructures**

Wei-Shun Chang[1], Angel Thomas[1], Vidhi Singla[1], Oscar Avalos Ovando[1], Manita Khatri[1], Misbah ul Ain[1], Trang Nguyen[1], Tamie Vo[1], Alexander Govorov[2]

[1]University of Massachusetts Dartmouth (USA), [2]Ohio University (USA)

We present a novel approach for a chiral dark-field spectromicroscopy that enables high-throughput, artifact-free measurements of plasmonic nanostructures at the single-particle level. This method reliably quantifies the intrinsic chirality of nanoparticles and elucidates plasmon-coupled circular dichroism in hybrid plasmonic systems.

15:20 INVITED TALK **Plasmonic Nanosensor for Force Sensing in Live Cells**

Won Park

University of Colorado Boulder (USA)

This paper presents a novel force sensor based on plasmonic modulation of upconverted luminescence. The short-range nature of plasmonic interaction enables high sensitivity. The nanosensor was used to monitor the cell-substrate interaction in live cell culture. It reveals mechanical forces in sub-cellular resolution.

15:40 INVITED TALK **Optical Activity Modulation in Chiral Metasurfaces using Structured Light**

Paula Laborda Lalaguna[1], Shun Hashiyada[2], Nikolaj Gadegaard[1], Jörg B. Götte[1], Stephen M. Barnett[1], Kayn A. Forbes[3], Yoshito Y. Tanaka[2], Malcolm Kadodwala[1]

[1]University of Glasgow (United Kingdom), [2]Hokkaido University (Japan), [3]University of East Anglia (United Kingdom)

We demonstrate a real-time, all-optical method for tuning optical activity in chiral metasurfaces without altering the metasurface geometry. By employing tightly focused circularly polarized Laguerre–Gaussian beams carrying different combinations of spin and orbital angular momentum, we achieve dynamic control of the dichroism through selective excitation of optically dark multipolar modes.

2–O19 | Room 4050B | 14:00 - 16:00

SP15: Plasmonic Nanomaterials for Bio-diagnostics, Environmental Monitoring and Food Safety

Organized by: Lucia Petti and Massimo Rippa
Chaired by: Lucia Petti and Massimo Rippa

14:00 INVITED TALK **Engineering FRET mechanism via plasmonic systems for ultra-sensitive biosensing**

Vincenzo Caligiuri[1], Olga Favale[1], Ferdinanda Annesi[2], Angela Candreva[2], Massimo La Deda[2], Marco Filice[3], Marzia Marciello[3], Antonio De Luca[4]

[1]University of Calabria (Italy), [2]CNR Nanotec UOS Rende (Italy), [3]Complutense University of Madrid (Spain), [4]Università della Calabria (Italy)

We report a biological FRET platform based on engineered bacteria enabling direct spectro temporal mapping of donor and acceptor dynamics. By tuning protein spacing and coupling to plasmonic systems, we modulate energy transfer efficiency and excited state kinetics, establishing a route toward plasmon assisted biointegrated optical sensing.

14:20 INVITED TALK **Low-Cost Flexible SERS Platforms for On-Site Detection of Bacterial and Viral Pathogens in Wastewater**

Amalia D'Avino, Alessia Milano, Valentina Marchesano, Bryan Guilcapi, Domenico Sagnelli, Massimo Rippa, Lucia Petti

ISASI-CNR (Italy)

We present low-cost flexible SERS platforms for label-free detection of Escherichia coli and rotavirus in wastewater. The platforms combine high plasmonic performance with mechanical conformability and system integrability, enabling portable and on-site pathogen monitoring. The approach offers a scalable alternative to rigid and highly engineered sensors for environmental surveillance applications.

14:40 INVITED TALK **Pesticide Recognition in Water Using Silver Plasmonic SERS Nanostructures Assisted by PCA**

Massimo Rippa[1], Alessia Milano[1], Valentina Marchesano[1], Domenico Sagnelli[1], Bryan Guilcapi[1], Amalia D'Avino[1], Anna De Girolamo Del Mauro[2], Lucia Petti[1]

[1]Institute of Applied Sciences and Intelligent Systems "E. Caianiello" CNR (Italy), [2]Italian National Agency for New Technologies (Italy)

A silver plasmonic SERS nanostructure is presented for the recognition of pesticides in water. Fingerprint spectra of fipronil, imidacloprid, and thiram are acquired and analyzed using principal component analysis, enabling clear label-free discrimination and demonstrating the potential of the platform for water quality monitoring.

15:00 INVITED TALK **On-chip biosensing by Surface Plasmon Resonance of antibiotic and insecticide residues in real samples**

Salvatore Moschetto[1], Kelment Zahoaliaj[1], Mario Prosa[1], Andrea Lorenzoni[1], Jeroen Peters[2], Stefano Toffanin[1], Erik Beji[2], Margherita Bolognesi[1]

[1]National Research Council (Italy), [2]Wageningen University and Research (The Netherlands)

We demonstrate a Surface Plasmon Resonance biosensor chip, based on organic optoelectronics and a biofunctionalized nanoplasmonic grating, capable of being used as a reusable, semi-automated and semi-quantitative screening test for sulfonamide antibiotics in milk and neonicotinoid-class insecticides in soil, at concentrations down to the maximum residue levels.

15:20 INVITED TALK **Topological Bound States in the Continuum in Photonic Crystal Slabs for Label-Free Biosensing**

Karen Caicedo[1], Silvia Romano[1], Gianluigi Zito[1], Ivo Rendina[1], Vito Mocella[2]

[1]National Research Council (CNR) (Italy), [2]CNR-ISASI (Italy)

We exploit bound states in the continuum in silicon nitride photonic crystal slabs for ultra-sensitive label-free biosensing and food safety applications. Dispersion engineering and topological analysis of high-Q resonances enable trace detection of biomolecules and mycotoxins, including ochratoxin A, with record limits of detection.

15:40 INVITED TALK **Hybrid Plasmonic-Photonic Platforms for Enhanced Biosensing and Optical Information Processing**

Alessio Buzzin, Nicolas Hanine, Lorenzo Giannini, Michela Baiocchi, Angelica Focardi, Ahmadreza Alaeddini, Badrul Alam, Rita Asquini

Sapienza Università di Roma (Italy)

Plasmonic nanomaterials, metasurfaces and integrated photonic circuits enable compact biosensing platforms. Recent advances in waveguide-integrated sensors, plasmonic nanoarrays and metasurface-based architectures are discussed, highlighting their potential for lab-on-chip diagnostics and sensing applications in environmental monitoring, food safety and biomedical analysis.

2–O20 | Room 3051 | 14:00 - 15:35

SP11: Nano-Lasers, Spasers, and Nanostructures with Quantum Elements

Organized by: Alessandro Veltri and Ashod Aradian
Chaired by: Alessandro Veltri and Ashod Aradian

14:00 INVITED TALK **Vortex nanolaser based on a photonic disclination cavity**

Hong-Gyu Park

Seoul National University (Korea)

We demonstrate wavelength-scale, low-threshold, vortex and anti-vortex nanolasers in an optical cavity formed by a topological disclination. The optical vortices of the lasing modes are identified by measuring polarization-resolved images, Stokes parameters, and self-interference patterns. We measure topological charges of 1 and 2 in C5 and C6 disclination cavities, respectively.

14:20 INVITED TALK **Optical Response of Active Plasmonic Nanoshells with Retardation and Gain Saturation Effects**

Luis Cerdán

Instituto de Química Física Blas Cabrera (CSIC) (Spain)

In this communication, we report a semianalytical model to analyze plasmonic nanoshells with gain including retardation (radiative and dynamic depolarization corrections), that is valid for any strength of the pump and probe fields. We analyze the retardation effects on both in its laser performance and its nonlinear optical response.

14:40 INVITED TALK **Fast Modulation in Plasmonic Nanolasers: Gain-Switched Dynamics**

Mateo Perez[1], Karen Gabriela Caicedo Santamaria[2], Melissa Infusino[3], Ashod Aradian[4], Alessandro Veltri[5]

[1]Universidad San Francisco de Quito (Ecuador), [2]ISASI - CNR (Italy), [3]Istituto per i Processi Chimico-Fisici (Italy), [4]University of Bordeaux (France), [5]University of Calabria (Italy)

Plasmonic nanoshell spasers enable nanoscale coherent emission via gain-assisted compensation of metal losses. Here we map turn-on and gain switching: turn-on becomes nearly universal in saturation, spectral dynamics are asymmetric with a “shark-tail” intensity signature, and sinusoidal pumpmodulation induces synchronized inversion-emission oscillations near threshold that broaden with increasing gain.

15:00 INVITED TALK **Controlling light-matter interactions with engineered nanolaser patterns**

Dávid Vass, Miklós Waldhauser, Virág Szünstein, András Szenes, Balazs Bánhelyi, Mária Csete

University of Szeged (Hungary)

Control of light-matter interaction is demonstrated in 3D arrays of nanoresonators (i) filled with, (ii) randomly arranged and embedded into, (iii) composing multilayer complex metamaterials and coated by appropriate gain medium. Spectral engineering of passive nanoresonator configurations and optimization of dye-concentration - pump-E-field parameters enables to tailor complete lasing characteristics.

15:20 **Design for a qBIC laser based on a TiO2metasurface**

Justin Schulz, Jack Dobie, Yongliang Zhang, A. Louise Bradley

Trinity College Dublin (Ireland)

We propose a design for a linear polarizable laser inthe visible wavelength range. Consisting of a TiO2 metasurfacewith a pronounced quasi-bound state in the continuum (qBIC)and utilising high quantum yield colloidal quantum dots as again material.

2–O21 | Room 3071 | 14:00 - 16:00

SP21: New trends in light-matter interaction at the nanoscale

Organized by: Carlos Alberto Maciel Escudero, Jorge Olmos Trigo and Mario Zapata Herrera

Chaired by: Carlos Alberto Maciel Escudero, Jorge Olmos Trigo and Mario Zapata Herrera

14:00 INVITED TALK **Within and Beyond the Photon Beam: 3D Electrokinetic MappingtoManipulation of Optical Matter**

Roger Bresoli Obach[1], B. Louis[2], J. Hofkens[2], H. Masuhara[3], M. I. Marques[4], J. Olmos[4], R. Delgado-Buscalioni[4]

[1]Universitat Ramon Llull (Spain), [2]KU Leuven (Belgium), [3]NYCU (Taiwan), [4]Universidad Autonoma de Madrid (Spain)

We present a mappingtomanipulation framework for optical matter that couples fast 3D imaging with electrokinetic control. Using dielectrophoresis and tailored electrodes, we map particle trajectories, quantify flows, and then program selective assembly, transport, and sorting beyond the photon beam. The approach enables speciesselective patterning, sequence writing, and reconfigurable colloidal devices

14:20 INVITED TALK **Quantitative Analytical Model for Scattering-type Scanning Near-field Optical Spectroscopy**

Kirill Voronin[1], Rainer Hillenbrand[2], Alexey Nikitin[1]

[1]Donostia International Physics Center (Spain), [2]CIC nanoGUNE (Spain)

We present an accurate analytical solution for the prolate spheroid model of the scattering-type scanning near-field optical microscopy in the quasi-electrostatic limit. The model is developed and experimentally validated for calculating near-field spectra of bulk and layered samples, and can be extended to more complex nanostructures.

14:40 INVITED TALK **Tailoring the Optical Properties of Random Metasurfaces for Multifunctional Applications**

Alejandro Reyes-Coronado, Jonathan A. Urrutia-Anguiano, Isabel Y. Rojas-Martinez

Universidad Nacional Autonoma (Mexico)

We demonstrate versatile light control using random metasurfaces modeled via the Coherent Scattering Model. By exploiting multipolar interference in disordered metallic and dielectric nanostructures, we achieve angle-independent structural colors, broadband reflection suppression, and phase-sensitive sensing. Our results establish random metasurfaces as robust, scalable alternatives to periodic systems.

15:00 INVITED TALK

Active light steering with electron beams

Eduardo Dias[1], Álvaro Rodríguez-Echarri[2], Theis Rasmussen[1], F. Javier García de Abajo[3], Joel D. Cox[1]

[1]University of Southern Denmark (Denmark), [2]AMOLF - Center for Nanophotonics (The Netherlands), [3]ICFO - The Institute of Photonic Sciences (Spain)

By engineering a periodic non-uniform 1D array, we are able to steer the cathodoluminesce generated by a passing electron beam. We further demonstrate how to control such emission actively using disks of fluence-controlled phase-changing materials or electrostatically tunable graphene ribbons.

15:20 INVITED TALK

Multi-Electron Effects in Free-Electron Beams: Light Generation and Electron-Electron Correlations

Valerio Di Giulio, Rudolf Haindl, Armin Feist, Claus Ropers

Max Planck Institute for Multidisciplinary Sciences (Germany)

We predict and experimentally demonstrate Coulomb-driven crystallization in few-electron pulses and explore how discrete symmetry can emerge even in continuous beams. This reveals crystal-like ordering and enables new regimes for electron microscopy. We further study the quantum statistics of light emitted by such beams also modulated by a laser field.

15:40 INVITED TALK

Free electrons shape light, light shapes free electrons

Alvaro Rodriguez Echarri

AMOLF (The Netherlands)

Swift electrons enable nanoscale light-matter interaction beyond optical diffraction. In electron energy-loss spectroscopy and cathodoluminescence, electrons generate optical excitations, whereas in photon-induced near-field electron microscopy incoming light reshapes electronic states. We present a wave-based perspective highlighting the reciprocal roles of light and free electrons in nanophotonic systems.

2–O22 | Room 3126 | 14:00 - 16:00

SYM5: Phononics and acoustic metamaterials

Organized by: Marco Miniaci, Jensen Li, Jean-Philippe Groby, Vincent Pagneux, Noé Jiménez, Stefano Laureti
Chaired by: Marco Miniaci, Jensen Li, Jean-Philippe Groby, Vincent Pagneux, Noé Jiménez, Stefano Laureti

14:00 INVITED TALK

Coupled Inertial Amplification and Local Resonance Band Gaps

Cetin Yilmaz

Bogazici University (Turkey)

Band gaps below the Bragg limit can be generated through local resonance and inertial amplification methods. A lever-type inertial amplification mechanism with a local resonator at its tip is analyzed. Due to their coupling, a single band gap is formed below what could be achieved by the individual mechanisms.

14:20 INVITED TALK

Verification of a two-fold topological phase transition ruled by third-nearest-neighbor hoppings

Rafael Mendez-Sanchez[1], Yonatan Betancur-Ocampo[1], Bryan Manjarrez-Montañez[1], Angel Martínez-Argüello[2], Alejandro Franco-Medrano[3], Enrique Flores-Olmedo[3], Gabriela Báez[3]

[1]Universidad Nacional Autónoma de México (Mexico), [2]Benemerita Universidad Autonoma de Puebla (Mexico), [3]Universidad Autonoma Metropolitana-Azcapotzalco (Mexico)

A coupled-resonator phononic cis-polyacetylene, presenting a two-fold topological transition is studied experimentally. The artificial molecule is governed by a tight-binding model similar to that of condensed matter. The design was done through numerical simulations using finite elements. The machined molecule was characterized using acoustic resonant spectroscopy.

14:40 INVITED TALK **Transient Growth Boundaries in Nonnormal Lattices**

Ioannis Kiorpelidis, Konstantinos G. Makris

University of Crete (Greece)

We investigate transient growth in the Hatano-Nelson model with uniform loss. By analyzing the nonnormality of the Hamiltonian, we identify a boundary separating the regions of transient amplification and monotonic decay. Notably, increasing only the system size N can trigger a transition between the two regions.

15:00 INVITED TALK **Non-reciprocal communication with signal amplification**

Xinxin Guo[1], Zhenwei Xu[1], Ulrich Kuhl[2], Nicolas Noiray[1]

[1]ETH Zurich (Switzerland), [2]Université Côte d'Azur (France)

In this work, we present a compact acoustic circulator that enables signal-amplified non-reciprocal transmission of time-varying information via binary encoding. The nonlinear synchronization between the input wave and a spinning limit cycle is leveraged, leading to strong non-reciprocity not only in transmitted energy but also in information accuracy.

15:20 INVITED TALK **From Acoustic Spin, Elastic Spin to Phonon Spin**

Jie Ren

Tongji University (China)

Spin angular momentum was once limited to transverse waves. We build a unified framework for acoustic, elastic and phonon spin. We demonstrate intrinsic spin, hybrid spin, locking effects and chiral transport, and reveal phonon spin selectivity and circular dichroism, laying the foundation for spin physics in metamaterials and structured waves.

15:40 INVITED TALK **When acoustic artificial structures meet artificial intelligence: AI-empowered acoustic metamaterials**

Bin Liang

Nanjing University (China)

In this talk, I will introduce some of our recent advances obtained by coalescing acoustic artificial structures and artificial intelligence, including on-demand design of versatile acoustic metamaterials and realization of acoustic passive neural networks and single-signal imaging. I will also mention the applications of acoustic metamaterials in several important scenarios.

2–O23 | Room 4047 | 14:00 - 16:00

SYM4: Chirality, magnetism, and magnetoelectricity: Separate phenomena and joint effects in metamaterial structures

Organized by: Eugene Kamenetskii
Chaired by: Eugene Kamenetskii

14:00 INVITED TALK **Chiral Metamaterials with Twisted Metallic Wire Structures**

Ming-Li Chang, Che Ting Chan

The Hong Kong University of Science and Technology (China)

Some chiral metallic photonic crystal exhibits unusual band structures. We show that chiral metallic twisted wire bundle structures can host zero frequency solutions at off-.

14:20 INVITED TALK **When Chirality Protection Fails: Bulk-Mediated Reflection of Surface Spin Waves**

Oleksandr Serha

University of Kaiserslautern-Landau (Germany)

Chirality protects Damon-Eshbach surface spin waves against direct backscattering, yet this protection breaks down in thick magnetic films. We show that reflection proceeds via bulk-mode conversion, producing localized energy deposition. Thermal imaging, Brillouin light scattering, and simulations directly resolve this bulk-mediated reflection pathway.

14:40 INVITED TALK **Symmetry Behavior of Chiral Disorder Metamaterials**

Simone Zanotto

Istituto Nanoscienze - CNR (Italy)

Metamaterials properties are strongly determined by symmetry. In particular, chirooptical effects are expected in systems that lack any mirror plane. Less is known about systems trat are locally asymmetric but globally symmetric, due to randomization. Here we show data about chiral metamaterials with rotational, positional, and racemic disorder.

15:00 INVITED TALK **Pushing micro-focused BLS to the Nanoscale: Modeling and Nanophotonic Enhancement for Magnon Detection**

Ondřej Wojewoda[1], Michal Urbánek[2]

[1]Massachusetts Institute of Technology (USA), [2]Brno University of Technology (Czech Republic)

Magnonics studies spin waves and their quasiparticles, magnons, often with use of micro-focused Brillouin light scattering (BLS). We develop a model describing BLS signal formation and use it to design dielectric nanoresonators, which enabled detection of nanoscale spin waves and allowed mapping of the dispersion relation across unprecedented ranges.

15:20 INVITED TALK **Momentum Space Enabled Functionalities in Chiral Metasurfaces**

Alexander Antonov[1], Connor Heimig[1], Tao Jiang[1], Dmytro Gryb[1], Leonardo de S Menezes[1], Maxim Gorkunov[2], Andreas Tittl[1]

[1]Ludwig-Maximilians-Universität München (Germany), [2]National University of Science and Technology 'MISIS' (Russia)

We study metasurfaces with quasi-bound state in the continuum with gutter-like dispersion remaining maximum chiral over broad areas of the momentum space. We employ them across different material platforms - van der Waals and polymer-based nanostructures - to demonstrate the formation of chiral exciton-polaritons and to engineer maximally chiral flatbands.

15:40 INVITED TALK **Topology Optimized Aluminum Chiral Nanogap Antennas for DUV Circular Dichroism Enhancement**

Atsushi Taguchi

Hokkaido University (Japan)

We present topology optimized aluminum chiral nanogap antennas operating at 266 nm in the deep ultraviolet. A stable inverse design scheme for metallic structures was developed. The optimized antenna exhibits strong near-field dissymmetry and high enhancement, making it a promising platform for sensitive DUV circular dichroism spectroscopy.

2–O24 | Room 4050A | 14:00 - 16:00

SP13: Commercialization of Metasurface and Nanophotonic Devices

Organized by: Matthew Singer

Chaired by: Matthew Singer

14:00 INVITED TALK **Agentic photonic simulation with Tidy3D**

Zongfu Yu

Flexcompute Inc. (USA)

We integrate agentic AI with Tidy3D to automate photonic design. LLM-based agents manage geometry and convergence, optimizing high-dimensional spaces autonomously. This framework minimizes engineering overhead and maximizes performance, utilizing cloud-based FDTD for rapid, self-evolving workflows. We demonstrate efficacy through autonomous, multi-functional gradient metasurface optimization

14:20 INVITED TALK **A Scalable Structural-Color Nanocavity Platform for Stain-Free Digital Pathology**

Qizhe Chen, Qiaoqiang Gan

KAUST (Saudi Arabia)

We introduce a scalable structural-color nanocavity platform for stain-free digital pathology. The planar nanocavities-on-silicon design avoids nanopatterning, enables wafer-scale manufacturing, and operates with standard optical microscopes. By minimizing system modification and cost, this platform supports large-scale deployment and AI-compatible histological imaging.

14:40 INVITED TALK **Compact multi-functional imaging systems using meta-optics**

Arka Majumdar

University of Washington (USA)

I will present our research effort on meta-optical computational imaging, with particular focus on broadband imaging and low power/ latency computer vision. Additionally, I will discuss the opportunities and challenges of creating sub-wavelength spatial light modulators for imaging exploiting meta-optics.

15:00 INVITED TALK **Inverse Designed Flat Optics for Extended Depth of Focus Laser Beam Shaping**

Rajesh Menon[1], Apratim Majumder[1], Tina M. Hayward[1], Nicole Brimhall[2], Vishwa Pal[3], Kamal P. Singh[4]

[1]University of Utah (USA), [2]Oblate Optics, Inc. (USA), [3]Indian Institute of Technology Ropar (India), [4]Indian Institute of Science Education and Research Mohali (India)

Inverse designed flat optics enable compact generation of long depth of focus laser beams for micromachining and structured light. We report multilevel diffractive lenses that maintain focused femtosecond spots over twenty millimeters, extend plasma channels to fifty five millimeters, and generate nondiffracting bottle beams over more than five centimeters.

15:20 INVITED TALK **Twenty Years of Research in Subwavelength Grating Metamaterial Integrated Photonics:From Fundamentals to Real-World Impact**

J. Gonzalo Wanguemert Perez[1], Alejandro Ortega-Moñux[2], Robert Halir[2], Pavel Cheben[3], Jens H. Schmid[3], José Dario Sarmiento-Merenguel[1], Alejandro Maese-Novo[1], Pablo Ginel-Moreno[1], Iñigo Molina-Fernández[2]

[1]University of Málaga (Spain), [2]Universidad de Malaga (Spain), [3]National Research Council Canada (Canada)

This invited talk reviews some of the joint contributions from the University of Málaga and the National Research Council of Canada to subwavelength grating metamaterial waveguides. Particular emphasis is placed on how this research led to AGPhotonics, a University spin-off focused on integrated-photonics solutions for free-space optical wireless communications.

15:40 INVITED TALK **Photonic Band Gap Robustness of Stealthy Hyperuniform Metamaterials**

Manuel Gallego[1], Uzair Malik[1], Yezhezi Zhang[1], Michael A. Klatt[2], Claire F. Gmachl[1]

[1]Princeton University (USA), [2]German Aerospace Center (Germany)

We design, simulate, and fabricate stealthy hyperuniform metasurfaces of variably shaped silicon pillars for the mid-IR. Simulations reveal large photonic band-gaps (PBG) approximately 37% in width. Measurements show enhanced reflection regions around 950-1020 cm$-$1 corresponding to the PBG location for all geometries, confirming band-gap robustness to variations in pillar cross-section.

2–O25 | Room 5025 | 14:00 - 16:00

SP20: Nonlocal and nonlinear nanophotonics

Organized by: Gonzalo Álvarez-Pérez and Huatian Hu
Chaired by: Gonzalo Álvarez-Pérez and Huatian Hu

14:00 INVITED TALK **Phonon-Enhanced Sum-Frequency Generation Spectro-Microscopy of Hexagonal Boron Nitride**

Niclas S. Mueller[1], Alexander P. Fellows[2], Nasim Mirzajani[2], Purbita Kole[1], Mira Kreßler[1], Kyoungpyo Lee[3], Ben John[2], Andrew E. Naclerio[4], Tao Yang[2], Christian Carbogno[2], Gharagozloo-Hubmann[1], Baláž[2], Kowalski[4], Heenen[2], Scheurer[2], Reuter[2], Caldwell[4], Wolf[2], Kusch[1], Li[3], Kidambi[4]

[1]Freie Universität Berlin (Germany), [2]Fritz Haber Institute of the Max Planck Society (Germany), [3]University of Texas at Austin (USA), [4]Vanderbilt University (USA)

We demonstrate 800-fold enhancement of the second-order nonlinear response of hexagonal boron nitride (hBN) monolayers by a mid-IR phonon. This enables rapid imaging of the usually invisible monolayers with sum-frequency generation microscopy, revealing their crystal orientation. Furthermore, we characterize the nonlinear response of buried hBN interfaces with artificial stacking.

14:20 INVITED TALK **Remote Nonlinear Imaging of Hyperbolic Phonon Polaritons using Sum-Frequency Microscopy**

Richarda Niemann[1], Gonzalo Álvarez-Pérez[2], Ana-Izabel Tresguerres-Mata[3], Enrique Teran-Garcia[3], Dorotheé Mader[4], Niclas Sven Mueller[4], Sören Wasserroth[4], Martin Wolf[4], Aitana Tarazaga Martín-Luengo[3], Javier Martín-Sánchez[3], Alonso-Gonzáles[3], Paarmann[4]

[1]Fritz-Haber Institut der Max-Planck-Gesellschaft (USA), [2]Istitutol Italiano di Tecnologia (Italy), [3]University of Oviodo (Spain), [4]Fritz-Haber Institut der Max-Planck-Gesellschaft (Germany)

Sum-frequency generation (SFG) wide-field spectro-microscopy of thin flakes of the biaxial van der Waals crystal α-MoO3 placed on an AlN substrate is used to remotely image hyperbolic phonon polaritons propagating within SFG-inactive α-MoO3, through their fields leaking into the inversion-broken AlN substrate.

14:40 INVITED TALK **Prospects to bypass metal nonlocal phenomena using phonon-polaritons**

Jacob Terndrup Heiden[1], Eduardo J. C. Dias[1], Minhyuk Kim[2], Martin Nørgaard[1], Vladimir A. Zenin[1], Sergey G. Menabde[3], Hu Young Jeong[2], N. Asger Mortensen[1], Min Seok Jang[3]

[1]University of Southern Denmark (Denmark), [2]Ulsan National Institute of Science and Technology (Korea), [3]Korea Advanced Institute of Science and Technology (Korea)

Under extreme confinement of light, omission of nonclassical response often yields big discrepancies between classical predictions and measurements. Here, we show that phonon-polaritons in hexagonal boron nitride screened by gold can be confined unobstructed by nonlocal phenomena, even for phase velocities approaching the Fermi velocities of electrons in gold.

15:00 INVITED TALK **A Hybrid Finite Element - Wave Expansion Approach for the Quantum Hydrodynamic Response of 2D Structures**

Xuezhi Zheng

Nanjing University of Aeronautics and Astronautics (Switzerland)

We present a hybrid framework for linear optical response of 2D metallic nanostructures governed by the quantum hydrodynamic model. The method couples finite elements inside a circular fictitious boundary with cylindrical wave expansion externally, enforcing interface conditions. Results agree well with analytical benchmarks.

15:20 INVITED TALK **Nonreciprocal plasmons in nanostructured graphene**

Joel Cox

University of Southern Denmark (Denmark)

We investigate nonreciprocal plasmon polaritons in electrically and magnetically biased graphene nanoribbons and carbon nanotubes. Quantum confinement and edge-termination effects strongly modify drift-induced nonreciprocity, while magnetoplasmons enable propagation-dependent coupling to circularly polarized emitters. These results establish one dimensional graphene platforms for actively controlled and chiral nanoscale light-matter interactions.

15:40 INVITED TALK **Quantum Plasmonics in Metals and Emerging Applications of Graphene Plasmons**

P. André Gonçalves

University of Southern Denmark (Denmark)

We review progress in quantum plasmonics and present analytical expressions for mesoscopic scattering coefficients of metallic cylinders, discussing how quantum nonlocal effects influence plasmon resonances and light-matter interactions. We then show that graphene plasmons can be leveraged to probe ultrafast thermoelectric phenomena and control donor-acceptor energy-transfer rates in nanoribbon structures.

2–O26 | Room 5039 | 14:00 - 16:00

SYM3: Advanced passive and active metasurfaces and zero-index materials

Organized by: Howard Lee, Pin Chieh Wu, Wen-Hui (Sophia) Cheng

Chaired by: Howard Lee, Pin Chieh Wu, Wen-Hui (Sophia) Cheng

14:00 INVITED TALK **Broadband Metamaterial Absorbers for Highly Sensitive Molecular Detection**

Takuo Tanaka

RIKEN (Japan)

Broadband metamaterial absorbers were applied to ultra-sensitive molecular sensing applications. 3D coaxial metamaterial absorber was developed and applied for the multiple gas sensing with a zepto-molar sensitivity.

14:20 INVITED TALK **Timetronics vs Electronics**

Venugopal Raskatla[1], Jinxiang Li[2], Giorgio Adamo[1], Kevin MacDonald[1], Nikolay Zheludev[1]

[1]University of Southampton (United Kingdom), [2]Nanyang Technological University (Singapore)

Can nano-mechanical computers be scaled to the nanoscale and compete with electronic architectures? We report the timetron as a central building block for mechanical computation based on the concept of a time crystal, which can be switched with femtojoule-scale energies and sustained with only a few femtowatts of optical power.

14:40 INVITED TALK **Generalized Lorentz Framework for Active Semiconductor Plasmonics at the Deep Nanoscale**

Xuewen Chen

Huazhong University of Science and Technology (China)

We report a generalized Lorentz framework to efficiently capture various nonclassical effects in multiscale three-dimensionally nanostructured semiconductors with arbitrary energy-momentum dispersion relations. The framework enables quantitative treatment of carrier nonlocality, surface accumulation and depletion, and Landau damping under electrical control and widely varying doping densities.

15:00 INVITED TALK **Topological metasurface for wavefront manipulation**

Qinghua Song

Tsinghua Shenzhen International Graduate School (China)

In this talk, we will present topological metasurface based on exceptional points and their applications in wavefront manipulation. Unconventional arbitrary polarized exceptional point and zero-eigenvalue exceptional point are demonstrated.

15:20 INVITED TALK **Metasurface-Enabled Solid-State Photon Sources**

Fei Ding

University of Southern Denmark (Denmark)

We propose general approaches to designing versatile solid-state photon sources using on-chip quantum-emitter-coupled metasurfaces. This platform enables us to generate spatially propagating photon streams with arbitrary directionality, polarization, and wavefronts via designed metasurfaces.

15:40 INVITED TALK **Continuous-Wave Chiral Exciton-Polariton Lasers Across the Visible and Infrared**

Siying Peng

Westlake University (China)

By exploiting strong light-matter coupling in chiral 2D perovskites, we demonstrate room-temperature, continuous-wave circularly polarized lasing across visible and infrared spectra.

2–O27 | Room 5052 | 14:00 - 16:00

SYM2: New trends in nanophotonics and advanced materials

Organized by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han
Chaired by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

14:00 INVITED TALK **Dirac-Polariton Bose-Einstein Condensation at Room Temperature via Bound States in the Continuum in a WS_2 Monolayer**

Bruno Miranda[1], Silvia Romano[1], Scott Duhey[2], Aidar Kemelbay[2], Arian Gashi[2], Vito Mocella[1], Ivo Rendina[1], Adam M. Schwartzberg[2], Gianluigi Zito[1]

[1]National Research Council (Italy), [2]Lawrence Berkeley National Laboratory (USA)

Room-temperature exciton-polariton Bose-Einstein condensation is demonstrated in a WS_2 monolayer using BIC-enabled Dirac-mode confinement. Strong coupling with 60 meV Rabi splitting persists above threshold. Topological polariton superfluids, negative-mass self-trapping, discrete Dirac-gap condensates, and pump-tunable spectra enable reconfigurable, integrable quantum photonic platforms at ambient conditions.

14:20 INVITED TALK **Janus Vortex Meta-Laser**

Lili Gui, Yiyuan Xu, Hao Chen, Kun Xu

Beijing University of Posts and Telecommunications (China)

We demonstrate a Janus vortex meta-laser, which enables simultaneous asymmetric and full 2π phase modulation of two counter-propagating beams, owing to the asymmetric-symmetric hybrid configuration of the intracavity Janus metasurface.

14:40 INVITED TALK **SPDC in Thin-Film LN: From Tunable Polarization Entanglement to Doubly-Resonant Metasurfaces**

Maximilian Weissflog[1], Saniya Shinde[1], Shaun Lung[1], Jinyong Ma[2], Sina Saravi[3], Thomas Pertsch[1], Andrey Sukhorukov[2], Frank Setzpfandt[1]

[1]Friedrich Schiller University Jena (Germany), [2]The Australian National University (Australia), [3]Paderborn University (Germany)

We experimentally show a new mechanism for directly generating and tuning polarization entanglement for spontaneous parametric down-conversion (SPDC) in thin-film lithium niobate (TFLN), which relies on its three-fold rotational crystal symmetry. Furthermore, we demonstrate a nonlocal LN metasurface that supports frequency-tunable, degenerate and non-degenerate SPDC with doubly-resonant enhancement.

15:00 INVITED TALK **Engineering Second-Harmonic Generation in a Lithium Niobate Metasurface**

Mengxin Ren, Lun Qu, Lu Bai, Lin Li, Wei Wu, Jingjun Xu

Nankai University (China)

Metasurfaces have emerged as promising platforms for enhancing second-harmonic generation (SHG). Lithium niobate, particularly crystalline thin-film lithium niobate on insulator (LNOI), has recently gained considerable attention as an enabling material for metasurface-based nonlinear devices. In this talk, we will present our recent works on engineering SHG from lithium niobate metasurfaces.

15:20 INVITED TALK **Closed-form conditions for parametric amplification in open photonic time crystals**

Adrià Canós Valero[1], Sergei Gladyshev[1], David Globosits[2], Stefan Rotter[2], Egor A. Muljarov[3], Thomas Weiss[1]

[1]University of Graz (Austria), [2]Vienna University of Technology (TU Wien) (Austria), [3]Cardiff University (United Kingdom)

We develop an exact theory of photonic modes in 'open photonic time crystals', radiative nanoresonators with periodically time-modulated material properties. Our framework allows deriving analytical conditions for realizing parametric amplification in systems of arbitrary shape and size. We leverage our insights to design micro- and nanoscale parametric amplifiers.

15:40 INVITED TALK **Controlling Quantum Light with Engineered Nanophotonic Structures**

Hamidreza Siampour

Queen's University Belfast (United Kingdom)

This talk presents recent advances in engineered nanophotonic structures for controlling quantum light from solid-state emitters. Topics include enhanced spontaneous emission, directional coupling, and chip-scale light-matter interfaces in plasmonic and semiconductor photonic architectures, with applications in integrated quantum communication, sensing, and scalable on-chip quantum photonic technologies.

Coffee Break 16:00 - 16:40

2–P2 | Business School Concourse | 16:00 - 16:30

Poster Session IV

P1

Resonant dielectric metasurfaces in Silicon Nitride for enhanced third harmonic generation in the UV

Shroddha Mukhopadhyay[1], Maria Antonietta Vincenti[2], Radu Malureanu[3], Crina Cojocaru[1], Michael Scalora[2], Jose Trull[1]

[1]Universitat Politècnica de Catalunya (Spain), [2]University of Brescia (Italy), [3]DTU Nanolab (Denmark)

We present a combined experimental-theoretical study of third harmonic generation (THG) in plasma-etched silicon nitride metasurface gratings. Compared to a planar membrane, the resonant structures exhibit polarization-selective TE and TM responses. Under ultrafast near-infrared excitation, strong electromagnetic field localization enables two orders of magnitude THG enhancement, enabling efficient visible-to-UV upconversion.

P2

Transfer Learning for Data-Efficient Modeling of Composite Metasurface Unit Cells

Alexander Wolff, Lukas Mueller, Steffen Klingel, Marco Rahm

RPTU Kaiserslautern-Landau (Germany)

Training data is scarce when developing neural networks to model geometry-dependent scattering parameters of metamaterials. By applying transfer learning, we reduced the training data required for a neural surrogate model of a tunable composite metasurface more than twentyfold and demonstrate the approach's generalizability across different composite and fundamental structures.

P3

Quantum Nanophotonic Control in Non-Perturbative Light-Matter Coupling Regimes

Erika Cortese[1], Johannes Bürger[2], Simone Di Muzio[2], Dario Ballarini[2], Simone De Liberato[2]

[1]University of Southampton (United Kingdom), [2]CNR Nanotec (Italy)

Non-perturbative light–matter coupling in quantum nanophotonic platforms enables control of decay, dissociation, and electromagnetic confinement beyond geometry. We illustrate this across atomic, molecular, and nanophotonic systems, highlighting how structured multi-mode coupling provides new handles for controlling quantum optical functionality and spatial field distributions.

P4

Effects of TE-TM splitting on bistability and nonlinear spin dynamics in resonantly driven spinor exciton-polaritons

Ting Wei Chen[1], Szu-Cheng Cheng[2]

[1]National Pingtung University (Taiwan), [2]Chinese Culture University (Taiwan)

We study TE-TM splitting effects on resonantly driven spinor exciton-polariton bistability. TE-TM coupling modifies thresholds, hysteresis, and spin composition, suppressing circular polarization under elliptical pumping. Pump momentum and dispersion curvature govern nonlinear regimes. The intermediate branch is unstable but can show slow growth, enabling long-lived transient switching dynamics.

P5

Spatial Electric-Field-Induced Chiral Discrimination in Planar Plasmonic Nanostructures

Chung-Kai Tseng[1], Tang-Chun Liu[1], Almudena Marti-Morant[2], Chao-Yi Tai[1]

[1]National Central University (Taiwan), [2]Universite de Lorraine (France)

In this work, we investigate the relationship between chiral dependent forces on chiral particles and the spatial distribution of electric fields that generate optical chiral field. Through analysis on planar plasmonic structures, we identify specific electric field distributions that significantly enhance the contrast between chiral dependent and independent forces.

P6

Parity-Time Symmetric Waveguide Coupler

Indre Meskelaite[1], Darius Gailevicius[1], Kestutis Staliunas[2]

[1]Vilnius University (Lithuania), [2]Universitat Politècnica de Catalunya (Spain)

A parity-time symmetric waveguide coupler, enabling nonreciprocal coupling between the propagating modes of the waveguides, is proposed. The optical system is studied numerically via coupled-mode theory analysis and finite-difference time-domain simulations, revealing multiple different regimes of light coupling.

P7

Acoustic Spin Skyrmion Molecule Lattices Enabling Stable Transport and Flexible Manipulation

Lei Liu, Xiujuan Zhang, Ming-Hui Lu, Yan-Feng Chen

Nanjing University (China)

We introduce a skyrmion molecule lattice, where pairs of skyrmions with opposite polarizability are symmetry locked into stable molecule configurations. Using a boundary engineering technique, we also achieve deterministic control over skyrmion creation, deformation, annihilation, and polarizability inversion.

P8

Towards Tunable Nanophotonics Filters using Quantum Confined Stark Effect

Tanneguy Blandin[1], Mathieu Arribat[1], Antoine Monmayrant[1], Aurélie Lescestre[1], Jean-Yves Duboz[2], Olivier Gauthier-Lafaye[1]

[1]LAAS-CNRS (France), [2]CNRS-CRHEA (France)

We experimentally demonstrate the refractive index modulation of a n-i-n doped GaAs/AlGaAs Quantum Confined Stark Effect based structure.Usage of a similar structure for the fabrication of Cavity Resonator Integrated Guided-Mode Resonance Filter (CRIGF) is demonstrated.The loss induced by the GaAs contact layers are evaluated.

P9

Near-field observation of energy transfer in nonlocalmetasurfaces

Jie Ji, Wouter Holman, Djero Peeters, Jaime Gomez Rivas

Eindhoven University of Technology (The Netherlands)

We demonstrate dipole-dipole energy transfer mediated by nonradiative bound states in the continuum in a terahertz metasurface. Using a custom THz near-field microscope, highly anisotropic long-range spatiotemporal coherence is revealed, enabling directional energy transfer and opening new pathways for controlling light-matter interactions at the mesoscale.

P10

Enhanced Strong Coupling in Two-Dimensional Dichalcogenide Materials and a Bowtie Nanoantenna Plasmonic Array

Na Jia[1], Bhera Ram Tak[1], Luke Doolan[1], Yongliang Zhang[1], Riley Gatensby[2], Jonathan N. Coleman[1], Richard Hobbs[1], A. Louise Bradley[1]

[1]Trinity College Dublin (Ireland), [2]The University of Dublin (Ireland)

We demonstrate large strong coupling between a Au bowtie nanoantenna array enabling and monolayer WS_2. Using a PMMA layer to engineer the dielectric environment enhances local fields and increases the Rabi splitting from 84 to 135 meV, visible in both scattering and emission spectra. Experimental results agree well with simulations.

P11

Non-Local Non-Abelian pumping on Photonic Chips

Qingyang Mo[1], Wange Song[1], Zhongfu Li[2], Jiajun Li[1], Tao Li[2], Shuang Zhang[1]

[1]The University of Hong Kong (Hong Kong), [2]Nanjing University (China)

We report the observation of non-local non-Abelian pumping, achieving non-commutative transfer among three topological edge states across opposite boundaries on silicon photonic chips.

P12

Optical detection of single sub-15 nm objects using elastic scattering strong coupling

MohammadReza Aghdaee, Melissa J. Goodwin, Oluwafemi S. Ojambati

University of Twente (The Netherlands)

Nano-objects smaller than 15 nm exhibit extremely low scattering cross-sections, posing a significant challenge for optical detection. Here we demonstrate a strong coupling of elastic scattering between a nano-object and a plasmonic nanocavity. This approach allows us to detect individual objects with diameters down to 1.8 nm inside the nanocavity.

P13

Structural diversity of pentatwinned plasmonic nanoparticles

Ana Sánchez-Iglesias, Marek Grzelczak

Centro de Fisica de Materiales CSIC-EHU (Spain)

We report a universal approach to the colloidal synthesis of high-quality pentatwinned plasmonic nanoparticles with tailored optical properties.

P14

Inducing anisotropy in time via spacetime interfaces

Andrew Naylor, Victor Pacheco-Peña

Newcastle University (United Kingdom)

Four-dimensional media have become an interesting paradigm for the manipulation of wave propagation in multiple dimensions. Here, we present a mechanism to induce isotropic-to-anisotropic time interfaces from entirely isotropic spacetime modulations.

P15

Efficient and predictive photon-pair emission from a lithium niobate nano-resonator

Alberto Paniate[1], Michael Poloczek[2], Attilio Zilli[3], Vitaly Sultanov[2], Yigong Luan[3], Tomas Santiago-Cruz[2], Luca Carletti[4], Marco Finazzi[3], Marco Genovese[1], Ivano Ruo-Berchera[1], Ferrera[5], Toma[5], Monticone[6], Celebrano[1], Chekhova[2]

[1]Max Planck Institute for the Science of Light (Germany), [2]Friedrich-Alexander-Universitat (Germany), [3]Politecnico di Milano (Italy), [4]University of Brescia (Italy), [5]Istitutol Italiano di Tecnologia (Italy), [6]Cornell University (USA)

Subwavelength-nonlinear nanostructures enable compact SPDC-based quantum light sources, but progress has been limited by missing predictive models. This work extends a quasi-normal-mode framework to realistic conditions and validates it experimentally on a lithium-niobate bullseye nano-resonator, demonstrating predictive design through record photon-pair rates and accurate spatial and spectral characterization.

P16

Spatial Dispersion in Optical Properties of Planar Lattices of Plasmonic Nanoparticles Revealed by Müller Matrix Ellipsometry

Eugene Bortchagovsky[1], Dai Fang[2], Monika Fleischer[2], Dietrich R. T. Zahn[3]

[1]V. Lashkaryov Institute of Semiconductor Physics of NAS (Ukraine), [2]Eberhard Karls Universität Tübingen (Germany), [3]Chemnitz University of Technology (Germany)

We demonstrate the vital role of spatial dispersion in the optical properties of planar ordered lattices of plasmonic nanoparticles, which cannot be described by any standard dielectric tensor, and demonstrate the orientational dependence of the optical properties opening a new way for tuning their optical response by the orientation.

P17

Fundamental Study on Lamb Wave Control Using Resonator-Based Acoustic Metasurfaces

Kent Hora, Toshihiko Sugiura

Keio University (Japan)

Previous studies numerically demonstrated that lamb-wave propagation can be suppressed by controlling boundary conditions using resonator-based acoustic metasurfaces. This study aims to experimentally verify this effect and explore its application to a pseudo band-pass filter, demonstrating attenuation characteristics and the feasibility of such filtering using resonator-based metasurfaces.

P18

Waveguide-Driven Nanoparticle-on-Mirror Nanocavities for Integrated On-Chip Raman Spectroscopy

Daniel Arenas Ortega, Elena Pinilla Cienfuegos, Alejandro Martínez

Universidad Politècnica de Valencia (Spain)

We demonstrate integrated Raman spectroscopy using a nanoparticle-on-mirror (NPoM) on top of a silicon nitride waveguide. TM modes efficiently excite the NPoM, producing strong nanogap-enhanced signals. Nanoparticles significantly enhance molecular Raman peaks, enabling sensitive, on-chip detection and potential chiral sensing. Guided measurements show with TM polarization 1.5$\times$ stronger than TE.

P19

Inverse-Designed Ultra-Compact 1 x 3 Beam Splitter on a Cladding-Free Photonic Crystal Platform

Jinseong Bae[1], Donghyun Park[1], Minjin Kim[1], Sejeong Kim[2], Haejun Chung[1]

[1]Hanyang University (Korea), [2]Sungkyunkwan University (Korea)

We demonstrate the first inverse-designed multi-port splitter for cladding-free photonic crystal waveguides, achieving 99.99% transmittance with 30:39:30% power splitting across three outputs within a 1.4 $\times$ 4.2 2 footprint. Adjoint-based topology optimization with fabrication-aware projection filtering maintains 50 nm minimum feature size, enabling ultra-high density photonic integration without cladding layers.

P20

Tunable nonlinearities of nonlocal free-electron gas in plasmonic heavily doped semiconductors

Huatian Hu[1], Gonzalo Alvarez-Perez[2], Antonio Valletta[3], Marialilia Pea[3], Michele Ortolani[3], Cristian Ciraci[2]

[1]University of Southern Denmark (Denmark), [2]Center for Biomolecular Nanotechnologies (Italy), [3]Consiglio Nazionale delle Ricerche (Italy)

Nonlocal free-electron dynamics have a substantial contribution to the optical nonlinearity in heavily doped semiconductor systems, and is very tunable. We applied hydrodynamic method to explored the tunability third-harmonic generation and optical Kerr bistability.

P21

Thermally Addressable Au/PDLC Multilayer metamaterial: A Platform for Tunable Epsilon-Near-Zero Response

Vimala Sridurai[1], Geetha G. Nair[2]

[1]The University of Manchester (United Kingdom), [2]Centre for Nano and Soft Matter Sciences (India)

We report a five- layer gold and polymer dispersed liquid crystal multilayer metamaterial exhibiting sub unity permittivity in the optical regime. Using spectroscopic ellipsometry and effective medium theory, we characterize this Epsilon near zero phenomenon. This architecture serves as a foundational platform for thermally switching the system toward hyperbolic dispersion.

P22

Wrinkle-Mediated Plasmonic Metasurfaces for Large-Area Photoresponsive Devices

Swagato Sarkar, Tobias A. F. Koenig, Andreas Fery

Leibniz Institute of Polymer Research Dresden (Germany)

Wrinkle-mediated plasmonic metasurfaces provide a scalable route to anisotropic light-matter interaction without complex lithography. Here, large-area 1D plasmonic gratings fabricated via mechanical instabilities and oblique-angle metal deposition are presented. Surface plasmon polaritons and localized plasmon modes enable deformation-stable optical sensing and photoresponsive device functionalities.

P23

Enhancing Plasmonic Metasurface Performance via Nanogap Engineering

Aleksandra Szymańska, Andrzej Kudelski, Agata Królikowska

University of Warsaw (Poland)

A plasmonic metasurface based on Core-Shell-Like Nanostructures (CSLNs) enables precise nanogap engineering over macroscopic areas. CSLN arrays with single-nanometer gaps were fabricated, exhibiting tunable plasmonic resonances from the ultraviolet to the near-infrared. Nanogap-induced field enhancement governs optical and sensing performance, enabling sensitive, reproducible molecular detection validated by SERS spectroscopy.

P24

Leveraging Stochastic Textures in Chiral Nematics for multi-modal Physical Unclonable Functions (PUFs)

Mauro Daniel Luigi Bruno[1], Giuseppe Nicoletta[1], Roberto Caputo[1], Maria Penelope De Santo[1], Riccardo Cristoforo Barberi[1], Antonio Ferraro[2]

[1]Università della Calabria (Italy), [2]Consiglio Nazionale delle Ricerche - Istituto di Nanotecnologia (Italy)

These studies explore the potential of Liquid Crystals (LCs) for the realization of security system based on the paradigm of Physical Unclonable Functions (PUFs). By exploiting the nature of LCs and their sensitivity to external stimuli, we generate unique optical "feature" through different pathways.

P25

Synergistic Multi-loss Mechanisms in a Nested Metastructure for Low-frequency Broadband Absorption

Kai Cui, Xian Wang

Huazhong University of Science and Technology (China)

To address the challenge of low-frequency broadband microwave absorption, this study proposes a composite nested honeycomb metastructure. By integrating dielectric loss units with a magnetic loss gradient framework, ultra-wideband absorption from 1.2 to 18 GHz is achieved within only 10mm thickness, providing an effective approach for advanced absorbers.

P26

Genetic Algorithm-based 3D-Metamaterials for Radar Range Extension

Dmytro Vovchuk[1], Dmitry Dobrykh[1], Konstantin Grotov[1], Anna Mikhailovskaya[1], Mykola Khobzei[2], Vladyslav Tkach[2], Anton Kharchevskii[1], Toms Salgals[2], Vjaceslavs Bobrovs[2], Pavel Ginzburg[1]

[1]Tel Aviv University (Israel), [2]Riga Technical University (Latvia)

Drone utilization increases air traffic and complicates detection of low-RCS UAVs. We propose evolutionarily designed multilayer metamaterial structure of coupled electric and magnetic resonators that produce broadband end-fire backscattering. The compact structure achieves 1 m^2 RCS at 10 GHz with >10% bandwidth, improving radar detection range by 1.5-5-fold range detectability.

P27

Noble Metal Nanostructures On Chip For SERS Based Sensing Applications Fabricated Via Electrochemical Deposition

Mohd Asif, Merbin John, Vaibhav Chaturvedi, Anuj Dhawan

Indian Institute of Technology (IIT) Delhi (India)

We fabricated noble-metal nanostructures on chip for SERS-based sensing applications using electrochemical-deposition. The chips are analyzed using a SERS-active chemical pMBA. The nanostructures were fabricated using gold and silver precursor solutions and a mixture of these solutions. A large improvement in SERS-enhancement was observed when a mixed solution was used.

P28

Exploring the coupling of TPMSs: What utility canthey provide?

Alonso Cuartero Mondoño[1], Andrea Bergamini[2]

[1]EMPA - Federal Institute of Technology Zurich (ETHZ) (Switzerland), [2]EMPA (Italy)

Triply Periodic Minimal Surfaces offer lightweight, high-symmetry architectures with tunable mechanical properties. This study computationally investigates deformation coupling in TPMS-based beams under static and dynamic loading. Results reveal morphology-dependent behaviors. Coupling can be tailored via geometric modifications, enabling multifunctional, shape adaptive structural design.

P29

High-Index Plasmonic Metamaterials for Mid-Infrared Upconversion

Caleb Todd[1], Nicolas Spiesshofer[1], Zoltan Sztranyovszky[2], Rakesh Arul[1], Angela Demetriadou[2], Jeremy Baumberg[1]

[1]University of Cambridge (United Kingdom), [2]University of Birmingham (United Kingdom)

A self-assembled plasmonic metamaterial composed of aggregated gold nanoparticles promotes nonlinear mixing between mid-infrared and visible light. By enhancing and co-localizing the fields in nanometer gaps containing $\chi(2)$-active molecules, sum-frequency generation is observable even from low-power CW illumination. This offers an avenue for broadband, room-temperature mid-infrared detection.

P30

Eigenmodes of Finite Rectangular Lattices

Jussi Kelavuori[1], Roman Calpe[2], Benjamin Asamoah[2], Tommi Hakala[2], Mikko Huttunen[1]

[1]Tampere University (Finland), [2]University of Eastern Finland (Finland)

2–O28 | Dargan Auditorium | 16:40 - 19:10

SYM4: Chirality, magnetism, and magnetoelectricity: Separate phenomena and joint effects in metamaterial structures

Organized by: Eugene Kamenetskii

Chaired by: Eugene Kamenetskii

16:40 KEYNOTE TALK **Advances in Ferronics**

Gerrit Bauer

Tohoku University (Japan)

Compared to magnetic materials, the dynamics of the ferroelectric order has received little attention from the scientific community. Here I review recent progress in understanding ferrons, the elementary excitations of the ferroelectric order.

17:10 INVITED TALK **Detection of spin polarized currents by spin-torque skyrmion resonance in a frustrated magnet**

Amir Capua

The Hebrew University of Jerusalem (Israel)

We present a current-driven skyrmion-resonance technique excited by self-induced spin-torque in Fe3Sn2. When a DC current is passed through the crystal, the skyrmion resonance linewidth is modulated. Planar Hall measurements suggest a small contribution of the real-space spin texture in the electronic transport in addition to a primary k-space contribution.

17:30 INVITED TALK **On the relation between local optical chirality andcircular dichroism in enantiomeric sensing**

Diana Shakirova[1], Adrià Canós Valero[1], Thomas Weiss[2]

[1]University of Graz (Austria), [2]Univerisity of Graz (Austria)

The local optical chirality provides information on how single molecules absorb left- and right-handed circularly polarized light. It might as well seem appropriate to optimize this quantity for enhancing the circular dichroism of chiral media in the vicinity of nanoresonators. We show that this is in general not correct.

17:50 INVITED TALK **Spin-Wave Amplification via Phase-Transition-Driven Temporal Interfaces**

Pawel Gruszecki, Krzysztof Sobucki

Adam Mickiewicz University (Poland)

We show that temporal modulation of magnetic field near phase transitions enables giant spin-wave amplification. Combining temporal-interface scattering with phase-transition-driven instability near an exceptional point, we achieve up to 175-fold gain. In this slow-instability regime, the growth rate scales linearly with Gilbert damping, so dissipation enhances rather than suppresses amplification.

18:10 INVITED TALK **Strong Coupling of Chiral Magnons in Altermagnets**

Peng Yan

UESTC (China)

We show that the dipole-dipole interaction can induce the strong coupling between exchange magnons with opposite chiralities in altermagnets, manifesting as a significant level repulsion in the magnon spectrum. Crucially, the predicted magnon-magnon coupling is highly anisotropic, and observable in practical experiments. These exotic features are absent in conventional antiferromagnets.

18:30 INVITED TALK **Relationship between Antiferromagnetic Spin Pumping and Magnetic Resonance**

Masahiro Sato, Hogara Watanabe

Chiba University (Japan)

We develop a microscopic theory for spin pumping in antiferromagnets, by using the nonequilibrium Green's function and spin-wave theory. We find the relationship between the pumped spin current and the spin precession of magnetic resonance. It enables us to explain fundamental natures of spin pumping in different phases of antiferromagnets.

18:50 INVITED TALK **Chiral structures nanofabrication with optical skyrmions**

Takashige Omatsu

Chiba University (Japan)

We herein demonstrate the nanofabrication of chiral surface structures with optical skyrmions which manifest Mobius strip shaped polarization textures with a circular polarization point defect at a focal plane.

2–O29 | McNabb Theatre | 16:40 - 18:55

SP6: Quantum metaphotonics

Organized by: Fei Ding and Sergey Bozhevolnyi

Chaired by: Fei Ding and Sergey Bozhevolnyi

16:40 **SRS-free surface-emitted hyper-entangled quantum states generation in metamaterial-coated silica tapered optical nanofibers for quantum computing and cryptography**

Abderrahim Azzoune[1], Osama Mahfoudia[1], Hamza Hasnaoui[2], Hocine Medjadba[1], Hamza Gouasmia[1], Oussama Laouedj[1]

[1]Ecole Militaire Polytechnique (Algeria), [2]University of Trento (Italy)

We propose a Raman-free, fiber-integrated source of hyper-entangled quantum states based on a metamaterial-coated tapered silica nanofiber. Enhanced surface nonlinearities enable efficient SPDC with polarization and frequency-bin entanglement at telecom wavelengths, offering a scalable platform for quantum computing and cryptography.

16:55 INVITED TALK **Scalable Quantum Information Platform Enabled by Metasurface**

Lin Li

East China Normal University (China)

We present an integrated nanophotonic approach to scale quantum information using metalens arrays across both discrete and continuous variable regimes. Our results establish metalens arrays as a robust, compact, and scalable foundation for future large-scale quantum communication and distributed computing.

17:15 INVITED TALK **Integrated Single-Photon Emitters with Plasmonic Nanostructure**

Keyu Jin, Lian Shen

Zhejiang University (China)

Integrated single-photon emitters (SPEs) face scalability hurdles due to intrinsic randomness in orientation and positioning. We propose V-shaped plasmonic nanoantennas, designed via transformation optics, to enhance emission and extraction. This approach overcomes stochastic bottlenecks, enabling deterministic, large-scale integration of SPEs essential for high-performance, reusable quantum communication and computing systems.

17:35 INVITED TALK **Metastructure with Quantum Emitter Enabled Compact Photon Source**

Chunying Guan[1], Tianshuo Lyu[2], Jinhui Shi[1], Sergey I. Bozhevolnyi[2], Fei Ding[3]

[1]Harbin Engineering University (China), [2]University of Southern Denmark (Denmark), [3]Eastern Institute of Technology (China)

We numerically and experimentally investigate a metastructure with quantum emitter to generate chip-scale orbital angular momentum photon source. The dependences of such photon source on polarization and orbital angular momentum value have been studied in details. This work opens promising avenues for realizing on-chip optical source.

17:55 INVITED TALK

Non-Reciprocal Photon-Pair Generation from Nonlinear Metasurfaces

Jinyong Ma[1], Xiwen Qiu[2], Tongmiao Fan[2], Tuomas Haggren[2], Hark Hoe Tan[2], Chennupati Jagadish[2], Andrey Sukhorukov[2]

[1]Shenzhen University (China), [2]Australian National University (Australia)

Photon-pair generation from ultra-thin nonlinear metasurfaces opens new possibilities for quantum technologies. We reveal that the quantum photon states can exhibit a strongly non-reciprocal behaviour, where the generation rate and quantum entanglement can dramatically vary depending on which side of the metasurface the pump light is incident from.

18:15 INVITED TALK

Advancements in high-power, quantum cascade lasers at room temperature

Chaofan Zhang, Ming Lv, Jun Wang

National University of Defense Technology (China)

We reveal quantum cascade lasers (QCL) emitting at mid-infrared with high CW peak power up to 6.3 W at room temperature (298 K). High beam quality is achieved by single transverse mode with CW power of 4 W at 298 K.

18:35 INVITED TALK

Metamaterials with Varactors: Manipulating Spoof Surface Plasmon Polaritons

Jinhui Shi, Zhaoqi Jiang, Zheng Zhu, Wenjia Li, Chunying Guan

Harbin Engineering University (China)

We experimentally demonstrate that a spin-dependent programmable plasmonic metamaterial can manipulate the propagation of surface spoof surface plasmon polaritons (SSPP) wave. The spin and coding information are used to independently control frequency and space routing, respectively. Our findings provide a surface EM wave platform for multi-channel signal communication systems.

2–O30 | Maharry Theatre | 16:40 - 19:10

SYM6: Advanced Techniques for Computational Electromagnetics

Organized by: Maha Ben Rhouma
Chaired by: Maha Ben Rhouma

16:40 INVITED TALK

Understanding and Designing High Harmonic Generation from Nanostructured Surfaces

Gavin Crowder, Jesse Thompson, Lora Ramunno

University of Ottawa (Canada)

High harmonic generation from solids and nanostructured surfaces is of recent interest, including to harness and control light into the XUV. I will present our progress on simulating this complex nonlinear interaction within nanostructured environments, where propagation and near field effects are crucial to device design and understanding experiments.

17:00 INVITED TALK

Inverse design frameworks towards realistic freeform flat optics

Joao Cunha, Filipe Camarneiro, Diogo Aguiam

International Iberian Nanotechnology Laboratory (Portugal)

Inverse design of flat optics typically requires the simulation and optimization of systems described by over millions of parameters, which is computationally challenging. Addressing this, we introduce an open source inverse design framework and investigate its suitability in handling large parameter spaces and its most suitable optimization algorithm approaches.

17:20 KEYNOTE TALK

Thermal Photonics in Nonreciprocal and Time-Modulated Many-Body Systems

Philippe Ben Abdallah

CNRS (France)

This talk explores thermal photonics in nonreciprocal many-body systems, revealing novel heat-flow control via spin-caloritronic effects. I also present a phase-tunable Floquet approach to manipulate radiative heat transfer, enabling directional flow, reversible pumping and reconfigurable flux in time-modulated networks, paving the way for programmable thermal photonic devices.

17:50 INVITED TALK

Nonlocal metasurfaces for Quantitative Phase Microscopy

Ann Roberts

The University of Melbourne (Australia)

Metasurfaces offer significant promise in imaging applications where operations are performed on an optical field carrying information about a sample. In particular, they can facilitate phase contrast imaging of transparent objects in a compact platform. Here we discuss the application of nonlocal metasurfaces to the quantification of phase.

18:10 INVITED TALK

Realization of Photonic Parallel Spaces and Overlapping Optical Devices

Yun Lai

Nanjing University (China)

We demonstrate the realization of photonic parallel spaces, i.e. meta-structures that behave as distinct effective media-with different refractive indices, impedances, or anisotropy-within the same physical space. This mechanism enables physically overlapping optical devices that operate independently, as if they exist in different dimensions.

18:30 INVITED TALK

Adaptive Tapering Strategy for Waveguide Dielectric Laser Accelerators under Pulsed Operation

Davide Guarnera[1], Hatou Yvelin Donkeng[2], Roberta Palmeri[3], Giorgio Sebastiano Mauro[4], Nunzio Salerno[1], Alberto Bacci[4], Santi Concetto Pavone[1], Giuseppe Torrisi[5], Andrea Locatelli[2], Gino Sorbello[1]

[1]University of Catania (Italy), [2]University of Brescia (Italy), [3]University Mediterranea of Reggio Calabria (Italy), [4]National Institute for Nuclear Physics (Italy), [5]National Institute for Nuclear Physics-LNS (Italy)

We introduce a general time-domain adaptive approach that guarantees continuous synchronization between the pulsed accelerating field and particle motion in a tapered waveguide accelerator. Flexibility and accuracy of the methodology are illustrated through numerical examples with long and short pulses, as well as pulse trains.

18:50 INVITED TALK

Electromagnetic analysis of disordered metasurfaces: density of states and BSDF

Miao Chen, Louis Forestier, Yuhao Xu, Philippe Lalanne

Institut d'Optique Graduate School (France)

We review our current effort to model disordered metasurfaces, with a focus on statistical quasinormal mode (QNM) analysis and a numerical framework for computing the bidirectional scattering distribution function (BSDF).

2–O31 | Room 3074 | 16:40 - 19:20

SYM1: Hybrid Nanomaterials and Metastructures for Photonics, Sensing and Energy

Organized by: Jérôme Plain, Alexander Govorov, Davy Gérard, Pedro Hernandez Martinez
Chaired by: Jérôme Plain, Alexander Govorov, Davy Gérard, Pedro Hernandez Martinez

16:40 INVITED TALK **Enhanced Photoluminescence through Excitation - Surface Lattice Resonance Coupling in Aluminum Metasurfaces**

Ali Sraj[1], Eloise Garcelon[1], Jerome Martin[1], Davy Gérard[1], Liudmila Trotsiuk[1], Alexandre Chevillot-Biraud[2], Stephanie Lau-Truong[2], Nordin Felidj[2], Anne-Laure Buadrion[1]

[1]Université de Technologie de Troyes (France), [2]ITODYS (France)

We demonstrate high photoluminescence (PL) enhancement from colloidal quantum dots (QDs) using aluminum (Al) metasurfaces by matching excitation wavelengths to Surface Lattice Resonances (SLR). By tuning lattice periods, we prove excitation-SLR coupling is the dominant mechanism. These findings provide a robust framework for designing high-efficiency QD-based nanophotonic devices.

17:00 INVITED TALK **Van der Waals metasurfaces from strong coupling to topology**

Andreas Tittl

LMU Munich (Germany)

Van der Waals metasurfaces have redefined nanoscale light-matter interactions by merging structural design flexibility with deterministic atomic-layer assembly. Leveraging quasi-bound states in the continuum, we demonstrate a progression from high-Q visible resonators and intrinsic strong coupling to nonlinearities in heterostructure metasurfaces and topological charge splitting for robust polaritonic flatband formation.

17:20 INVITED TALK **Colloidal Photonic Crystal Slabs for Hybrid Plasmon Photon Mode Engineering in Sensing and Energy Applications**

Swagato Sarkar[1], Tobias A. F. Koenig[1], Larysa Baraban[2], Andreas Fery[3]

[1]Leibniz Institute of Polymer Research Dresden (Germany), [2]Helmholtz-Zentrum Dresden-Rossendorf (Germany), [3]Leibniz Institute of Polymer Research Dresden (IPF) (Germany)

Hybrid plasmonic photonic metasurfaces enable strong field confinement with reduced optical losses, but scalable implementations remain challenging. This work presents colloidal photonic crystal slabs as a versatile platform for engineering hybrid modes. Applications ranging from charge transfer and photocatalysis to surface-enhanced Raman scattering and biosensing are demonstrated.

17:40 INVITED TALK **Permittivity-Engineered Dielectric Media of Hybrid Nanomaterials and Tunable Microcavity Metastructures for Enhanced Exciton-Light Interactions**

Pedro Ludwig Hernandez-Martinez, Hilmi Volkan Demir

Nanyang Technological University (NTU) (Singapore)

We present hybrid nanomaterial platforms that combine permittivity engineered dielectric media with tunable photonic metastructures to control excitonic interactions. Near-zero epsilon environments enable dramatic enhancement of nonradiative energy transfer between quantum emitters, while multiresonant microcavity arrays support room-temperature exciton polaritons in colloidal nanoemitters with strong coupling and tunable light-matter interactions

18:00 INVITED TALK **Hybrid Oxide-Phase-Change Heterostructures for Thermally Tunable Mid-Infrared Photonics**

Daniele Ceneda[1], Martina Mercurio[1], Roberto Macaluso[2], Nunzio Timpanaro[2], Marco Centini[1], Maria Cristina Larciprete[1]

[1]Sapienza Universita di Roma (Italy), [2]University of Palermo (Italy)

We present our research activity on hybrid oxide heterostructures, in particular combining strongly anisotropic molybdenum trioxide, MoO_3, with thermochromic vanadium dioxide, VO_2.

18:20 INVITED TALK **When Grain Boundaries Create Plasmons: Localized Resonances in Hyperdoped polysilicon films**

Mohamad Bahsoun[1], Jesse Groenen[1], Sebastien Joulié[1], Cecile Marcelot[1], Robin Cours[1], Sebastien Kerdiles[2], Mathieu Opprecht[2], Caroline Bonafos[1], Jean-marie Poumirol[3], Jean-marie Poumirol[3]

[1]University Toulouse (France), [2]University of Grenoble-Alpes (France), [3]CEMES (France)

We report an innovative approach for fabricating large-area, silicon-based plasmonic metasurfaces without engineered nanostructures. We show that hyperdoped polysilicon layers annealed under out-of-equilibrium conditions, exhibit enhanced light-matter tunable interactions. These remarkable optical properties originate from naturally formed metal-dielectric interfaces at grain boundaries, which support localized surface plasmon resonances.

18:40 INVITED TALK **Ultrafast switching from strong to weak coupling in hybrid plasmonic-photonic microcavities**

Benedict Morris[1], Sergei Kostcheev[2], Luis Dos Santos[1], Khanh-Van Do[1], Anna Rumyantseva[2], Shuwen Zeng[2], Renaud Bachelot[2], Bruno Palpant[1]

[1]LuMIn - Université Paris-Saclay (France), [2]Université de Technologie de Troyes (France)

Ultrafast optical absorption can modify the optical properties of gold nanoparticles. We exploit this subpicosecond reversible change to explore strong coupling physics in a plasmonic-photonic microcavity. We show that our hybrid system can be tuned from strong to weak coupling by all optical pumping, opening new pathways for sensing applications.

19:00 INVITED TALK **In-plane Directed Power Flow in Anisotropic Hyperbolic Materials**

Eric Seabron[1], Eric Jackson[1], Michael Meeker[1], Andrew Lang[1], Rhonda Stroud[1], Daniel C. Ratchford[1], Brandon K. Durant[1], Xitlali G. Suarez[1], Chase Ellis[1], Joseph Tischler[2]

[1]Naval Research Laboratory (USA), [2]University of Oklahoma (USA)

We harness the anisotropic nature of Calcite to modify and control the light-matter interactions in the mid-IR. We introduce hyperbolic Calcite as a polar dielectric with in-plane anisotropic permittivity as a platform that supports cavity-like volume phonon polaritons with significant modal volume compression due to the Calcités hyperbolic dispersion.

2–O32 | Room 4050B | 16:40 - 18:40

SP15: Plasmonic Nanomaterials for Bio-diagnostics, Environmental Monitoring and Food Safety

Organized by: Lucia Petti and Massimo Rippa

Chaired by: Lucia Petti and Massimo Rippa

16:40 INVITED TALK **DNA identification using surface-enhanced Raman spectroscopy and surface plasmon resonance**

Andrzej Kudelski

University of Warsaw (Poland)

Surface plasmon resonance and surface-enhanced Raman scattering spectroscopy are promising methods for detection of specific DNA fragments. Example applications of these two techniques in DNA analysis is presented. Sensitivity of both methods in the identification of six the most popular in Poland variants of BRCA1 gene mutations is compared.

17:00 INVITED TALK **Thermal management of plasmonic nanoparticles using 2D materials for single-molecule biosensing**

Peter Zijlstra

Eindhoven University of Technology (The Netherlands)

I will discuss simulations and experiments on the use of hexagonal boron nitride (hBN) thin flakes as a new class of nanoscale heat spreaders to efficiently mitigate plasmonic heating of single gold structures in aqueous environments.

17:20 INVITED TALK **Electronic precursors to bond formation and controller reaction pathways in single-molecule junctions**

Kristina Rusimova

University of Bath (United Kingdom)

We investigate how probe proximity modifies interfacial electronic structure in single-molecule junctions on Si(111)-(7×7). Building on equilibrium interface-state measurements and controlled single-molecule reactivity, we integrate optical and electronic probes to examine how hybridized junction states influence energy redistribution and competing reaction pathways at room temperature.

17:40 INVITED TALK **Photonics on multimode optical fibers**

Linda Piscopo[1], Di Zheng[2], Muhammad Fayyaz Kashif[2], Annabella La Grasta[2], Tadele Orbula Otomalo[2], Liam Collard[3], Alessandra Corrado[2], Antonio Balena[4], Cinzia Montinaro[2], Massimo De Vittorio[2], Pisanello[2]

[1]Italian Institute of Technology (Italy), [2]Center for Biomolecular Nanotechnologies (Italy), [3]King' s College London (United Kingdom), [4]Sorbonne University (France)

We describe a platform that optimizes coupling between guided modes in multimode fibers and photonic structures on the facet, either metalenses or plasmonic nanoparticles. Using wavefront shaping, we control light propagation to enhance imaging, SERS, and thermoplasmonic heating, demonstrating the potential of compact fiber-based probes for minimally invasive biological interfacing.

18:00 INVITED TALK **Plasmonic nanofibers for neurochemical monitoring**

Jean-Francois Masson, Maryam Hojjat Jodaylami, Ailsa Geddis

Université de Montréal (Canada)

The use of plasmonic optical fibers allows to design sensors for many neurochemicals and neuroproteins. These fibers combine enhancement from the fiber acting as an optical element (resonator and microlens) and from the plasmonic materials. The presentation will show their application for the detection of neuroproteins and neurotransmitters

18:20 INVITED TALK **Self-Assembly Nanostructures for Highly Sensitive SERS Platforms**

Maria Alessandra Cutolo[1], Francesco Galeotti[2], Sara Spaziani[3], Giuseppe Quero[4], Mohammed Janneh[3], Alberto Micco[1], Andrea Irace[5], Giovanni Breglio[5], Marco Pisco[3], Andrea Cusano[3]

[1]Centro Regionale Information Communication Technology (Italy), [2]Istituto di Scienze e Tecnologie Chimiche "G. Natta" (Italy), [3]University of Sannio (Italy), [4]University of Molise (Italy), [5]University of Naples Federico II (Italy)

Self-assembly Plasmonic nanostructures provide a scalable bottom-up approach for engineering surfaces with controlled localized surface plasmon resonances. Techniques such as nanosphere lithography and hierarchical sphere assembly enable ordered arrays and dense nanogaps, generating intense and reproducible electromagnetic hot spots for SERS and biosensing applications.

2–O33 | Room 3051 | 16:40 - 19:20

SYM2: New trends in nanophotonics and advanced materials

Organized by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

Chaired by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

16:40 INVITED TALK **Advancements in Silicon Nitride Platform**

Khaled Mnaymneh

National Research Council Canada (Canada)

Silicon nitride photonics enables low loss quantum integrated optics. We report a fabrication flow combining stoichiometric LPCVD SiN waveguides, oxide windows, and lithographically defined V g rooves t o s upport fi ber packaging and heterogeneous integration without sacrificing t he l ow loss optical platform.

17:00 INVITED TALK **Electrostatic Repulsion as a Governing Mechanism in Near- and Far-Field Optical Binding of Gold Nanoparticles**

Marques Manuel

Universidad Autonoma de Madrid (Spain)

This work shows that electrostatic interactions play a key role in optically bound particle configurations in fluids. Combining experiments and modeling, it reveals that weaker electrostatic repulsion favors near-field alignment with the light polarization, while stronger repulsion leads to far-field perpendicular arrangements. Simulations quantitatively match the experimental observations.

17:20 INVITED TALK **Foundry Enabled Chip-scale Photonics Technology and Applications**

Yeshaiahu (Shaya) Fainman

University of California San Diego (USA)

In this talk we will discuss recent progress in developing CMOS compatible nonlinear optical materials as well as examples of foundry enabled silicon photonic circuits and systems. Specifically, we will review silicon photonics-based Fourier transform spectrometer that can bring broadband operation and fine resolution to the chip scale.

17:40 INVITED TALK **Wide-angle Nonreciprocal Thermal Emitters with Strong Contrast Between Absorptivity and Emissivity**

Georgios Veronis[1], Md Tanvir Emrose[1], Ming Zhou[2], Gabriel Nedelea[1], Roya Ebrahimi Meymand[1], Shanhui Fan[2]

[1]Louisiana State University (USA), [2]Stanford University (USA)

We present multilayer aperiodic structures based on Weyl semimetals that maximize the nonreciprocal contrast over broad spectral and angular ranges. The strong broadband and wide-angle nonreciprocal response of the proposed structures highlights their potential in thermal photonic applications, including directional thermal emission, radiative energy control, thermophotovoltaics, and thermal management.

18:00 INVITED TALK **Compact High-Q Photonic Crystal Cavities with Improved Robustness to Disorder**

Nicoletta Granchi[1], Camilla Gonzini[2], Matteo Lodde[3], Gabriele Calusi[1], René P. J. van Veldhoven[3], Andrea Fiore[3], Guillermo Arregui[4], Francesca Intonti[1]

[1]University of Florence (Italy), [2]European Laboratory for Non-Linear Spectroscopy (LENS) (Italy), [3]Eindhoven University of Technology (The Netherlands), [4]Swiss Federal Institute of Technology Lausanne (EPFL) (Switzerland)

Compact photonic crystal cavities enable dense integration but typically require large footprints to achieve high Q-factors, increasing sensitivity to fabrication disorder. We present high-Q, small-footprint cavities optimized through a non-Hermitian perturbation theory framework, where periodicity breaking enhances resilience to fabrication-induced disorder as demonstrated by the near-field scanning optical microscopy experiment.

18:20 INVITED TALK **Graded-index metamaterials for on-chip control over mode exchange**

Raquel Fernández de Cabo[1], Alejandro Sánchez Sánchez[2], Daniele Melati[3], Carlos Alonso Ramos[3], Aitor Villafranca Velasco[4], David González Andrade[2]

[1]Institute of Photonic Sciences (ICFO) (Spain), [2]Universidad de Málaga (Spain), [3]Université Paris-Saclay (France), [4]Consejo Superior de Investigaciones Científicas (Spain)

Conventional mode converters fully exchange optical power between two orthogonal modes, limiting multimode systems that require engineered modal power distributions. We present a passive silicon mode converter that enables geometrically defined conversion ratios using graded-index subwavelength metamaterials. Fifteen distinct and well-controlled conversion levels are demonstrated across the 1500-1600nm bandwidth.

18:40 INVITED TALK **Mechanistically Guided Plasmonic Dendrites for Selective CO_2 Reduction**

Anjalie Edirisooriya[1], Zelio Fusco[1], Ning Lyu[2], Christin David[2], Fiona Beck[1]

[1]Australian National University (Australia), [2]Friedrich-Schiller-Universität Jena (Germany)

Dendritic plasmonic catalysts enable light-driven CO_2 reduction by co-localising optical hot-spots and active surface sites. This invited contribution presents a guided strategy progressing from model systems to scalable Au and Cu dendrites. Wavelength-resolved studies reveal how optical modes and near-fields control charge transfer, enabling wavelength- and material-selective multi-electron CO_2 reduction.

19:00 INVITED TALK **Metaphotonic Convergence: Bridging Optics, Life Science, and Engineering**

Inki Kim

Sungkyunkwan University (South Korea)

This talk presents a comprehensive overview of breakthroughs in metasurfaces across hyperspectral imaging, ultrafast metaphotonic PCR, metalenses for single-molecule detection, scalable roll-to-roll manufacturing of visible metalenses, and metalenses for 3D photoacoustic imaging. Together, these advances demonstrate how metasurfaces are reshaping optics, bridging fundamental physics with biomedical applications and precision healthcare.

2–O34 | Room 3071 | 16:40 - 18:40

SP21: New trends in light-matter interaction at the nanoscale

Organized by: Carlos Alberto Maciel Escudero, Jorge Olmos Trigo and Mario Zapata Herrera
Chaired by: Carlos Alberto Maciel Escudero, Jorge Olmos Trigo and Mario Zapata Herrera

16:40 INVITED TALK **Scaling Up Light-Matter Interactions - Challenges in Fabrication**

Rijil Thomas

AMO GmbH (Germany)

Advances in microscale-to-nanoscale light-matter interactions redefine the limits of photonics, leading to a paradigm-shift in photonic technologies. However, bridging the gap between laboratory breakthroughs and scalable real-world systems remains a challenge. At AMO GmbH, we address these challenges by developing fabrication processes that enable scalable realization of these emerging technologies.

17:00 INVITED TALK **Directional Energy Delivery at the Nanoscale: The Iris-Gated Approach for Photothermal Applications**

Javier González-Colsa[1], Jose M. Saiz[1], Alfredo Franco[1], Dolores Ortiz[1], Francisco González[1], Fernando Bresme[2], Pablo Albella[1]

[1]University of Cantabria (Spain), [2]Imperial College London (United Kingdom)

We present an IrisGated Core-Double-Shell nanostructure, capable to generating directional thermal asymmetry operating in the first biological window. It redirects up to 67% of the conductive heat flux and enhances local surface power density by 50%. Transient analyses confirm persistent asymmetry, enabling controlled anisotropic heating for photothermal therapies.

17:20 INVITED TALK **Chiral Cavities Made from Lattices of Highly Electromagnetically-Chiral Scatterers**

Lukas Rebholz, Carsten Rockstuhl, Ivan Fernandez-Corbaton

Karlsruhe Institute of Technology (Germany)

Chiral cavities are required to harness light-matter interactions for the optical control of chirality, especially in molecular processes. We computationally study chiral cavities assembled from metasurface mirrors featuring optimized electromagnetically-chiral scatterers. Our aim is to provide the necessary environment for applications such as maximizing enantioselective effects for chiral molecules.

17:40 INVITED TALK **Novel quantum effects in (Surface-Enhanced) Raman Scattering from molecular systems**

Adrian Juan-Delgado[1], Ruben Esteban[2], Lukas A. Jakob[3], Jean-Baptiste Trebbia[4], Shu Hu[3], Rakesh Arul[3], Roberto A. Boto[5], Quentin Deplano[4], Philippe Tamarat[4], Rémi Avriller[6], Mueller[7], Martın-Cano[1], Huidobro[1], Baumberg[3], Lounis[4], Aizpurua[8]

[1]Universidad Autonoma de Madrid (Spain), [2]Centro de Fısica de Materiales (CSIC-UPV/EHU) (ES), [3]University of Cambridge (United Kingdom), [4]Université de Bordeaux (France), [5]Donostia International Physics Center (Spain), [6]Université de Strasbourg (France), [7]Fritz-Haber-Institute of the Max-Planck-Society (Germany), [8]DIPC - University of the Basque Country (Spain)

We discuss novel effects in molecular Raman scatteringunveiled using quantum-mechanical frameworks. For example,we demonstrate that quantum coherence can influenceStokes emission from two molecules interacting via dipole-dipolecoupling. We also identify collective effects in the Raman signalgenerated by many molecules confined within a plasmonicnanocavity.

18:00 INVITED TALK **Light management in high-refractive index semiconductor nanowires**

Nicklas Anttu

Åbo Akademi University (Finland)

High refractive index nanowires find use for example for fluorescence-based biosensors and solar cells. In such biosensors, both excitation and emission properties can be enhanced, while in nanowire solar cells, different types of light-trapping can enhance absorption. We present recent results from both types of applications.

18:20 INVITED TALK **Enhanced and Helicity-Preserved Raman Scattering with Mie-Resonant Silicon Nanospheres**

Mojtaba Karimi Habil, Hiroshi Sugimoto, Daisuke Shima, Hiroto Shinomiya, Minoru Fujii

Kobe University (Japan)

We investigate Raman intensity and degree of circular polarization (DOCP) in few-layer MoS_2 coupled to Mie resonances of silicon nanospheres (Si NSs). The results show that, the helicity of OC vibrational mode in Si NS/MoS_2 is preserved at electric dipole (ED), magnetic dipole (MD), and magnetic quadrupole (MQ) resonances.

2–O35 | Room 3071 | 18:40 - 19:10

GEN22: Chiral and Hyperbolic Metamaterials

18:40

Inverse Faraday Effect and Gyrotropy in Time-Varying ENZ Films

Domenico de Ceglia[1], Carlo Rizza[2], Michael Scalora[1], Maria Antonietta Vincenti[1], Wallace Jaffray[3], Sven Stengel[3], Marcello Ferrera[3]

[1]University of Brescia (Italy), [2]University of L'Aquila (Italy), [3]Heriot-Watt University (United Kingdom)

We investigate the origin of inverse Faraday effect and gyrotropy in epsilon-near-zero films under circularly polarized excitation. We compare four theoretical frameworks: isotropic third-order nonlinearity; Hertel's plasma model with time-averaged charge-velocity interaction; nonlinear free-electron hydrodynamics; mass-varying Drude theory. Common mechanisms and key differences are discussed.

18:55

Carrier Drift Modulation and Hyperbolic Time Crystals

Evgeniy Narimanov[1], Boris Shapiro[2]

[1]Purdue University (USA), [2]Technion (Israel)

Carrier Drift Modulation imparts a transient drift momentum to free carriers using fewcycle optical excitation, producing strong anisotropy in nominally isotropic conductors. This ultrafast mechanism enables hyperbolic dispersion and supports timeperiodic amplification, offering a practical route to lowloss hyperbolic media in standard semiconductor platforms.

2–O36 | Room 3126 | 16:40 - 19:15

SYM5: Phononics and acoustic metamaterials

Organized by: Marco Miniaci, Jensen Li, Jean-Philippe Groby, Vincent Pagneux, Noé Jiménez, Stefano Laureti
Chaired by: Marco Miniaci, Jensen Li, Jean-Philippe Groby, Vincent Pagneux, Noé Jiménez, Stefano Laureti

16:40 INVITED TALK **Wide-area Topological Higher-order Modes in Heterostructured Kagome Phononic Crystal**

Yusuke Hata, Yuri Fukaya, Kenji Tsuruta

Okayama University (Japan)

We designed wide-area elastic waveguides based on higher-order topological modes in a heterostructured Kagome lattices consisting of trivial and nontrivial domains. We numerically demonstrated that interface modes as well as corner modes are broadened leading to more efficient energy storage than at the corners of the conventional structure.

17:00 INVITED TALK **Complex Topological Phases Driven by Beyond-Nearest-Neighbor Interactions**

Amir Rajabpoor Alisepahi[1], Siddhartha Sarkar[2], Kai Sun[2], Jihong Ma[1]

[1]University of Vermont (USA), [2]University of Michigan (USA)

We reveal unconventional topological states driven by beyondnearestneighbor interactions, inaccessible to conventional windingnumber methods. We introduce a local windingnumber characterization derived from Berry connections and validate it experimentally using laserassisted measurements on designed metamaterials, confirming the method's predictive power for complex topological phases.

17:20 INVITED TALK **Space-multiplexing Metalens for Multiple Ultrasonic Bessel Vortex Beams**

Jie Zhu, Qian Cheng

Tongji University (China)

The fine fabrication of metalens allows the leverage of spatial multiplexing to manipulate multi-channel ultrasonic beams independently. We experimentally demonstrate four-channel ultrasonic Bessel vortex beams as examples, showcasing great agreement with simulation results on topological charge and radiation direction. Our work offers more possibilities in designing functional ultrasound devices.

17:40 INVITED TALK **Experimental Investigation of Resonant Microdisks for the Creation of a Multiple-Scattering Acoustic Medium**

Ch. Ghaisas, S. C. Baltogiannis, Y. Zhang, D. Garcia, B. Tallon, L. Belliard, Olga Boyko

Institut des Nanosciences de Paris (France)

18:00 INVITED TALK **Sub-THz electromechanics and optomechanics**

Hong Tang

Yale University (USA)

18:20 INVITED TALK **Omnidirectional and anomalous acoustic absorptionwith an array of wiremeshes**

Juan Pablo Escudero, Jean-Philippe Groby, Vincent Pagneux

LAUM (France)

18:40 INVITED TALK **Finite-Size Effects in Mechanical Metamaterials: The Role of Interfaces**

Svenja Hermann

Technische Universität Dortmund (Germany)

19:00 **Mode conversion for elastic waves via temporal interfaces**

Cong Chen, Zhanyu Li, Xiaoming Zhou, Gengkai Hu

Beijing Institute of Technology (China)

We demonstrate perfect mode conversion between longitudinal and transverse elastic waves using an isotropic-anisotropic-isotropic temporal interface. This phenomenon arises from distinct phase accumulation of the two eigenmodes. For physical realization, a piezoelectric lattice with shunting circuits is proposed. These findings provide a new route for wave control via temporal interfaces.

2–O37 | Room 4047 | 16:40 - 18:00

SP14: Towards chiral and magnetoelectric quantum electrodynamics

Organized by: Eugene Kamenetskii

Chaired by: Eugene Kamenetskii

16:40 INVITED TALK **Mechanisms of noise immunity in quantum nonlinear and nonreciprocal dynamics**

Nicholas Rivera

Cornell University (USA)

Noise immunity: observables weakly sensitive to dominant noise, can extend photonic devices ultimate quantum limits of sensitivity and performance. We present a new mechanism of noise immunity based on nonlinear nonreciprocal Kerr lattices that directionally route injected noise, preserving squeezing via non-Hermitian topology and a non-Hermitian skin effect.

17:00 INVITED TALK **Triangular cross-section Möbius resonators: electromagnetic helicity and experimental observation of mode-dependent Berry phases**

Jeremy Bourhill, Emma Paterson, Maxim Goryachev, Michael Tobar

The University of Western Australia (Australia)

We experimentally demonstrate two distinct spin redirection Berry phases in a single triangular Möbius microwave resonator. Fractional azimuthal mode numbers and frequency shifts relative to symmetric cavities confirm geometric phase accumulation linked to electromagnetic helicity.

17:20 INVITED TALK **Gyrotropic cavity-induced quantum phase transitions in a quantum ring.**

Loic Remolif, Ivan Iorsh

Queen's University (Canada)

If quantum ring is placed in gyrotropic cavity, total current in the ground state changes discontinuously with light-matter coupling even if there is no flux penetrating the ring. These discontinuities can be directly probed via the spectral and statical properties of the radiation emitted by the system under coherent drive

17:40 INVITED TALK **Spin-selective Structural Phase Transitions in Chiral Crystals Driven by Chiral Phonon Condensation**

Shun Asano, Youichi Yanase

Kyoto University (Japan)

We predict novel structural phase transitions unique to chiral crystals, where the renormalization of chiral phonon frequency by the electron-phonon coupling depends on their handedness. Consequently, soft mode encoding phonon angular momentum induces spin-selective Peierls gaps in the electronic band, entailing a helical spin density wave and chiral lattice distortion.

2–O38 | Room 4047 | 18:00 - 19:15

GEN26: Metamaterial-Based Devices

18:00

Monolithic integrated meta-mirror color filter for 5K PPI OLED pixel

Chi-Sun Hwang, Yong Hae Kim, Hyunsu Cho, Sunghoon Hong

ETRI (Korea)

Reflective-type color filters based on meta-atoms were monolithically integrated into the OLED pixel structure. The meta-mirror was optically and electrically integrated with the OLED pixel cavity. The OLED pixel pitch was 4.8 μm, corresponding to 5,000 PPI.

18:15

Extreme field enhancement and anapoles in high-index tunable metamaterials

Zoltan Sztranyovszky[1], Nicolas Spiesshofer[2], Caleb Todd[2], Rakesh Arul[2], Jeremy J. Baumberg[2], Angela Demetriadou[1]

[1]University of Birmingham (United Kingdom), [2]University of Cambridge (United Kingdom)

We show that metamaterials made from gold nanoparticles self-assembled in layered aggregates with nanometer-sized gaps, exhibit remarkably high refractive index. When the aggregate is shaped into a disc it forms a resonator that hosts an anapole, which combined with the field enhancementfrom the nanogaps results in extreme light-matter interactions.

18:30

Wavelength-insensitive Snapshot Stokes Polarimetric Imaging Based on Cascaded Metausrfaces

Xuanguang Wu, Peng Li

Northwestern Polytechnical University (China)

A single-shot, wavelength-insensitive Stokes polarimetric imaging method using cascaded metasurfaces is proposed. Integrating two geometric-phase gratings in a 4f system enables broadband spin splitting and cross-interference. This method enables full-Stokes measurements under multi-wavelength, low-coherence light.

18:45

High-Efficiency Off-Grid-Positioned Metasurface Color Router for Sub-Micron CMOS Image Sensors

PoHan Fu, Chin-Chuan Hsieh

Visera Technologies (Taiwan)

We propose off-grid-positioned metasurface replacing traditional microlenses in 540 nm $\times$ 540 nm Bayer-pattern CMOS image sensors. By optimizing cylindrical meta-atom diameters and off-grid coordinates, our design efficiently routes visible light to corresponding color filters, mitigating severe diffraction and significantly enhancing overall optical efficiency.

19:00

Thermal information encryption based on composite metasurfaces comprising volatile and non-volatile phase-change materials

Jungwoo Pyo, Dongkyun Kang, Jaehyeong Kim, Hwajin An, Myeongkyu Lee

Yonsei University (Korea)

This work presents thermal encryption using composite metasurfaces integrating VO_2 (volatile) and GST (nonvolatile) phase-change materials. The composite architecture combines high-density encoding via GST crystallization with temperature-driven VO_2 tuning, achieving sequential thermal cloaking. Demonstrations of multi-stage, temperature-key cloaking patterns highlight the potential of this platform for authentication and anti-counterfeiting applications.

2–O39 | Room 4050A | 16:40 - 19:20

SP13: Commercialization of Metasurface and Nanophotonic Devices

Organized by: Matthew Singer
Chaired by: Matthew Singer

16:40 INVITED TALK **Application focused meta-surface design: workflow, methods & examples**

Lieven Penninck, Chris Beckerleg, Bavo Robben

PlanOpSim (Belgium)

Large volume metasurface applications are now a commercial reality. In this contribution we outline the engineering methods and workflows that enable design of metasurface products not demonstrators. This includes efficient design cycles, design-for-manufacture and system integration. Popularization of these methods will allow broad adaptation of metasurfaces in the optical industry.

17:00 INVITED TALK **Metal oxide metasurfaces elaborated by nanoimprint and derived methods**

David Grosso[1], B. Kerzabi[1], M. Abbarchi[1], M. Putero[2], A. Gourdin[1], M. Bouabdellaoui[1], E. Daher[1], L. Weber[1]

[1]SOLNIL (France), [2]Institut of Materials Microelectronics and Nanosciences of Provence (France)

Sol-gel chemistry combined to direct nanoimprint lithography was developed to elaborate robust metal-oxide metasurfaces. This presentation shows that such a combination enables the facile production of various types of metasurfaces with materials specifically developed to cover a wide span of refractive index and an exceptional transparency.

17:20 INVITED TALK **Moxtek's 25 Years of Commercializing Inorganic UV-VIS-NIR Meta-Optics: From Wire Grid Polarizers and Waveplates to Advanced Metasurfaces**

Matthew George, Daniel Bacon-Brown, Jason Jex, Bradley Williams

MOXTEK Inc. (USA)

Moxtek has a robust volume production line capable of supplying meta-optics across a broad spectral range. By leveraging E-beam Lithography for high-fidelity mastering and Nanoimprint Lithography for scalable replication, combined with proprietary high-aspect-ratio etching, we achieve critical dimensions and feature densities previously not available for mass production.

17:40 INVITED TALK **Scalable Metasurface Photonics for Quantum Computers and Sensors**

Amit Agrawal

University of Cambridge (United Kingdom)

We demonstrate the use of metasurface for realization of an alignment-free magneto optical trap with fully integrated multi-color metasurface photonics. We characterize the metasurface functionality and performance, and facilitate laser cooling for realization of compact quantum sensors. We further demonstrate the potential of this technology in commercial quantum systems.

18:00 INVITED TALK **Metasurface Electrodes for Enhanced Light-Matter Interactions in Organic Light-Emitting Materials and Devices**

Deirdre O'Carroll, Sneha Sreekumar, Keshan Perera, Haydee Pacheco

Rutgers University (USA)

For light-emitting applications, metasurfaces can be coupled to semiconductor films to increase luminescence quantum-yield, rate, and directionality of photon emission. In this presentation, our research on improving light extraction efficiency and photostability of organic semiconductor thin films using plasmonic metasurfaces will be presented.

18:20 INVITED TALK **Plasmonically powered organic light emitting devices for advanced display applications**

Haridas Mundoor, Michael Fusella, Gearht VanVoorhis, Mathew Philippou, Renata Saramak, Vinod Menon, Nicholas Thompson, Mike Weaver, Julie Brown

Universal Display Corporation (USA)

Plasmonic OLEDs, which utilize plasmonic effects to control light emission, demonstrate enhanced performance compared to traditional devices. Here, we present our recent results and discuss their potential applications in both current and future display technologies.

18:40 INVITED TALK **Applications of azopolymers in planar diffractive optics and dynamic microstructure lithography**

David McGee, Christopher Baker, Coleman Huetz, Brielle Zemer

The College of New Jersey (USA)

Structured light from a spatial light modulator can programmably drive a real-time photomechanical response in azopolymer films. This new platform can print a variety of planar diffractive optics, including linear, circular and chirped gratings, dynamic diffractive elements, and structured color elements.

19:00 INVITED TALK **Metaoptics metrology using a wave front sensor**

Matthieu Ansquer, Nolan Chan, Benoit Wattellier

PHASICS (France)

We present a solution for metasurface optical metrology based on wave front sensing. We use quadriwave lateral shearing interferometry, on which all PHASICS products are based. This commercial solution is easily integrated in academic laboratories for upstream studies but also in industrial metrology labs or in production lines.

2–O40 | Room 5025 | 16:40 - 19:15

SP20: Nonlocal and nonlinear nanophotonics

Organized by: Gonzalo Álvarez-Pérez and Huatian Hu

Chaired by: Gonzalo Álvarez-Pérez and Huatian Hu

16:40 INVITED TALK **Quantum Hydrodynamic Theory with a frequency-dependent kinetic-energy kernel in real-space**

Lucian A. Constantin[1], Fabio Della Sala[2]

[1]CNR-IMM (Italy), [2]Institute for Microelectronics and Microsystems (CNR-IMM) (Italy)

We have developed a frequency-dependent kinetic-energy functional for the Quantum Hydrodynamic Theory (QHT), which is non-empirical and can be implemented in a real-space framework. We show results for metallic nanoparticles and compare to full Time-Dependent Density Functional Theory (TD-DFT).

17:00 INVITED TALK **Shaping Light and Matter in Non-Perturbative Light-Matter Coupling Regimes**

Erika Cortese[1], Johannes Bürger[2], Simone Di Muzio[2], Dario Ballarini[2], Simone De Liberato[2]

[1]University of Southampton (United Kingdom), [2]CNR Nanotec (Italy)

Non-perturbative multi-mode light–matter coupling modifies physical properties beyond those set by geometry. We demonstrate this across three platforms: resonant laser fields stabilize ionizing atomic transitions against continuum decay;cavity coupling suppresses photodissociation in molecular cations; and co-localized superstrong coupling in visible nanophotonic waveguides enables in-situ spatial control of electromagnetic field distributions.

17:20 INVITED TALK **Geometric Phase Wavefront Shaping in Nonlinear Meta-Optics: From Tensor-Driven Phase to Nonlocal Metasurfaces**

Luca Carletti

University of Brescia (Italy)

Nonlinear metasurfaces enable compact frequency conversion while shaping the generated wavefront. We outline two complementary routes: tensor driven phase control in AlGaAs metasurfaces for second-harmonic beam steering and structured light, and nonlocal resonant Silicon metasurfaces for third-harmonic generation that combine high quality factors with efficient beam steering.

17:40 INVITED TALK **Quantum and emitter-size effects in emitter-plasmon interactions**

Tadele Orbula Otomalo[1], Gabriel Gil[2], Gonzalo A-Perez[1], Huatian Hu[1], Ferruccio Pisanello[1], Stefano Corni[2], Fabio Della Sala[1], Cristian Ciraci[1]

[1]Istitutol Italiano di Tecnologia - IIT (Italy), [2]Institute for Microelectronics and Microsystems (CNR-IMM) (Italy)

We combine density functional and quantum hydrodynamic theories to study how molecular size and quantum tunnelling jointly affect the emitter-plasmon interaction in a plasmonic dimer. Compared with a point-dipole-based model, pronounced deviations arise at sub-nanometer separations, and the onset gap for tunnelling-induced quenching is over three times larger.

18:00 INVITED TALK **Tunability of nonlinear plasmonics in nanostructured 2D materials**

Line Jelver, Joel D. Cox

University of Southern Denmark (Denmark)

We employ first-principles simulations to investigate how localized plasmons in nanostructured 2D materials can be leveraged to drive strong nonlinear optical processes, spanning both perturbative frequency conversion and high-harmonic generation. We identify multiple pathways to enhance nonlinear light-matter interactions through either electrostatic doping, heterostructure engineering, or ultrafast photothermal activation.

18:20 INVITED TALK **Excitation of Dark Modes and Multipole Plasmons via Surface-Response Function**

Fan Yang

Sichuan University (China)

The dark mode can be excited by far-field illumination when surface electronic quantum effects are considered, which are modeled by the Feibelman d-parameter. On the other hand, multipole plasmons can be excited and engineered via surface nonlinearity.

18:40 INVITED TALK **Electro-Optic Phonon Polaritons**

Michael Spencer[1], Olga Minakova[2], Maximilian Frenzel[2], Joanna M. Urban[2], Martin Wolf[2], Sebastian F. Maehrlein[2]

[1]Fritz Haber Institute (Germany), [2]Fritz Haber Institute of the Max Planck Society (Germany)

We report on local electro-optic sampling of phase-resolved phonon-polariton electrodynamics inside of cryogenically cooled, high-quality terahertz (THz) quartz cavities. With our novel detection scheme, we isolate the light and matter components of the polariton signal, thereby measuring the full eigenvector of the phonon-polariton, in contrast to conventional THz transmission measurements.

19:00

Nonlocal Optical Response of Phonon-Polaritonic Nanoparticles

Yina Wu[1], Fadil Iyikanat[1], Vahagn Mkhitaryan[2], Eduardo J. C. Dias[1], Andrea Konečná[3], Jordan A. Hachtel[4], F. Javier García de Abajo[1]

[1]ICFO-Institut de Ciencies Fotoniques (Spain), [2]Purdue University (USA), [3]Brno University of Technology (Czech Republic), [4]Oak Ridge National Laboratory (USA)

We report dramatic nonlocal optical effects in hexagonal boron nitride nanoparticles using electron energy-loss spectroscopy. Local dielectric theories fail to describe observed bulk modes and surface-mode splitting. Atomistic simulations incorporating long-range dipole-dipole interactions successfully reproduce experimental spectra, highlighting the critical role of nonlocality at the nanoscale.

2–O41 | Room 5039 | 16:40 - 19:00

SYM3: Advanced passive and active metasurfaces and zero-index materials

Organized by: Howard Lee, Pin Chieh Wu, Wen-Hui (Sophia) Cheng
Chaired by: Howard Lee, Pin Chieh Wu, Wen-Hui (Sophia) Cheng

16:40 INVITED TALK

Cryogenic Metalensed Single-Element SNSPD for Quantum Technologies

Amir Targholizadeh, Grigoriy Nikulin, Pankaj Jha, Pankaj Jha

Syracuse University (USA)

We introduce an all-dielectric metasurface flat-optics platform operating at cryogenic temperatures ($\{}sim$ 4 K) and integrated with superconducting nanowire single-photon detectors (SNSPDs). This integration enables miniaturization without sacrificing detection efficiency, thereby preserving the benefits of shorter pixels.

17:00 INVITED TALK

Octave-Spanning Terahertz Quarter-Wave Plates Based on Over-Coupled Fabry-Perot Resonances in Reflective Metal-Dielectric-Metal Metasurfaces

Tae Gwan Park, Chun-Chieh Chang, Hou-Tong Chen

Los Alamos National Laboratory (USA)

We demonstrate metal-dielectric-metal reflective metasurfaces for high-performance broadband THz quarter-wave plates. Four complementary designs operating at 45 degree incidence collectively span 0.25-3 THz. Each device provides near-octave bandwidth with axial ratio below 3-dB and polarization conversion efficiency above 80%. Experiments agree with simulations, confirming scalable broadband THz polarization control.

17:20 INVITED TALK

Rigorous and approximate electromagnetic simulators for free-form light-emitting device optimization

Min Seok Jang

KAIST (Korea)

This presentation discusses overcoming challenges in free-form light-emitting device optimization via three methods: the diffraction matrix method, differentiable RCWA, and neural operators. These tools enable efficient, robust design of next-generation, high-performance optical technologies.

17:40 INVITED TALK

Building Uncooled Infrared Camera based on One Atom Thick Graphene

Debashis Chanda

University of Central Florida (USA)

The talk will outline a novel strategy for uncooled, tunable, multispectral infrared detection. One atom thick graphene offers an alternative mechanism bypassing material bandgap restriction. Further, the ability of carrier concentration modulation on graphene via external voltage offers dynamic spectral selectivity for “color” night vision/sensing.

18:00 INVITED TALK **Enhancing Light-Matter Coupling via Topology Optimized Cavities on 2D Excitonic Material**

Brandon Triplett[1], Davide Cassara[2], Morris M. Yang[1], Karthik Pagadala[1], Federico Capasso[2], Vladimir M Shalaev[1], Alexandra Boltasseva[1]

[1]Purdue University (USA), [2]Harvard University (USA)

We design and fabricate dielectric cavities with extreme subwavelength transverse mode sizes of 30-40 nm and couple them to excitonic material WSe2. We show tenfold photoluminescence enhancement, which corresponds to 103 normalized enhancement when accounting for deeply subwavelength mode volumes. The approach offers increased far-field collection efficiency and scalable integration.

18:20 INVITED TALK **Engineering spontaneous emission with metasurfaces**

Benjamin Vest

Institut d'Optique (France)

Light-emitting metasurfaces enable direct control of emission from incoherent sources without bulky filtering. We design and realize photoluminescent metasurfaces where emitters couple to engineered leaky modes using a Kirchhoff-based absorptivity approach seeking critical coupling condition. Experiments demonstrate directional beams below 20° FWHM and efficient structured light generation.

18:40 INVITED TALK **Out-of-equilibrium nonlinear optical dynamics in ultraviolet epsilon-near-zero materials**

Matteo Silvestri[1], Luca Assogna[1], Davide Tedeschi[1], Carino Ferrante[2], Andrea Marini[1]

[1]University of L'Aquila (Italy), [2]Consiglio Nazionale delle Ricerche (Italy)

We theoretically model out-of-equilibrium nonlinear optical dynamics due to collision-driven nonlinearity in ultraviolet epsilon-near-zero materials, particularly sodium and aluminum, exploring their potential for the development of table-top extreme ultraviolet radiation sources and integrated spectroscopy schemes.

2–O42 | Room 5052 | 16:40 - 19:20

SYM2: New trends in nanophotonics and advanced materials

Organized by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

Chaired by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

16:40 INVITED TALK **Cavity-Enhanced Superfluorescence and Lasing Transitions in Two-Dimensional Single-Crystal Perovskite Superlattices**

Jae Yong Suh

Michigan Technological University (USA)

We report cavity-enhanced superfluorescence in pure two-dimensional (2D) perovskite single crystals. Unlike disordered thin films, these superlattices enable clean collective emission. Using Maxwell Bloch equations, we analyze the superfluorescence lasing phase transition and Burnham Chiao ringing within a microcavity, providing a framework for room temperature quantum optoelectronic devices.

17:00 INVITED TALK **Towards Realization of Ideal Anapole Excitations**

Radoslaw Kolkowski, Matti Kaivola, Sagar Sehrawat, Andriy Shevchenko

Aalto University (Finland)

We present an alternative approach based on the scattering-current multipole expansion to describe anapole excitations in photonic nanostructures. Using the method, we derive the exact anapole condition, opening the way towards design and realization of perfect anapoles.

17:20 INVITED TALK **Material and Device Optimizations for Wavelength-Selective Infrared Devices**

Tadaaki Nagao[1], Keisuke Watanabe[2], Thien Duc Ngo[2]

[1]National Institute for Materials Science (Japan), [2]International Center for Materials Nanoarchitectonics (MANA) (Japan)

We introduce our research on the development of infrared devices with high wavelength-selectivity. The strategy for selecting appropriate materials as well as optimizing device geometries are presented based on electronic band structure calculation and electromagnetic simulations. The devices can be applied to narrowband photothermal converters and ultrahigh Q value biosensors.

17:40 INVITED TALK **Hybrid Photonic Crystal Platforms: Enabling High-Efficiency Photonic Devices and Novel Functionalities**

Tae-Yun Lee, Hansol Lee, Lakjong Jeong, Heonsu Jeon

Seoul National University (Korea)

By combining passive backbones with active materials, hybrid photonic crystal (PhC) platforms facilitate devices with superior performance and novel functionalities. Planar resonant cavities provide similar physical effects but offer a simpler alternative in terms of design and manufacturing.

18:00 INVITED TALK **Limited Size Object Microscopy - Smaller Objects, Higher Resolution**

Giorgio Adamo[1], Taeyong Chang[2], Eng Alk Chan[2], Nikolay I. Zheludev[1]

[1]University of Southampton (United Kingdom), [2]Nanyang Technological University (Singapore)

We show that the sole knowledge of an object's limited size allows to achieve far-field label-free resolution beyond the Abbe-Rayleigh diffraction limit: higher resolution is achieved for smaller objects. We experimentally image subwavelength-size nanoparticles with $\lambda/8$ resolution. Furthermore, by adopting a physics-consistent learning model we can increase resolution to $\lambda/13$.

18:20 INVITED TALK **Subwavelength metamaterials for modal and thermo-optic control in silicon interferometers**

Aitor Villafranca Velasco[1], Irene Olivares[1], Irena Stolic[1], Raquel Fernández de Cabo[2], Alejandro Sánchez-Sánchez[3], Daniele Melati[4], Carlos Alonso-Ramos[4], David González-Andrade[3]

[1]CSIC (Spain), [2]ICFO (Spain), [3]Universidad de Málaga (Spain), [4]Université Paris-Saclay (France)

Subwavelength metamaterials are becoming essential building blocks for the next generation of photonic integrated circuits. In this work, we explore their potential for loss reduction and thermo-optic control in advanced interferometers for the silicon-on-insulator platform.

18:40 INVITED TALK **Competing Lattice and Defect Dynamics Govern Terahertz-Driven Ferroelectricity in Quantum Paraelectric SrTiO3**

Jingbo Qi

University of Electronic Science and Technology of China (China)

Our work unravel that the quantum paraelectric SrTiO3 upon excitation of intense terahertz pulses is governed by previously unrecognized competition between lattice distortions, defect pinning, and dipolar ordering. Coherent antiferrodistortive modes can suppress symmetry breaking on picosecond scales, while defects frustrate long-range order, allowing ferroelectricity only in pristine regions.

19:00 INVITED TALK **Thermalization Speed of Highly Multimode Nonlinear Systems**

Emmanouil Theodoros Kokkinakis[1], Konstantinos G. Makris[2], Demetrios N. Christodoulides[3]

[1]University of Crete/FORTH (Greece), [2]University of Crete (Greece), [3]University of Southern California (USA)

Within the field of optical thermodynamics, weakly nonlinear multimode optical systems evolve toward a Rayleigh Jeans distribution.We show that identical conserved power and internal energy do not uniquely determine thermalization. Initial states with the same equilibrium distribution can thermalize at very different distances, in correlation to their short-distance chaotic response.

3 Thursday, July 16, 2026

3–O1 | Dargan Auditorium | 08:30 - 10:00

SYM2: New trends in nanophotonics and advanced materials

Organized by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han
Chaired by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

08:30 INVITED TALK **Lasers that run cool on their own**

Chun-Wei Chen[1], Michel J. F. Digonnet[2], John Ballato[3], Peter D. Dragic[4], Martin Bernier[5], Enkeleda Balliu[6]

[1]University of Bath (United Kingdom), [2]Stanford University (USA), [3]Clemson University (USA), [4]University of Illinois Urbana-Champaign (USA), [5]Université Laval (Canada), [6]HÜBNER Photonics (Sweden)

08:50 INVITED TALK **Perovskite Superfluorescence and High Temperature Macroscopic Quantum Effects**

Kenan Gundogdu

NC State University (USA)

09:10 KEYNOTE TALK **Engineering Strong Light-Matter Coupling in Dielectric Metasurfaces**

Y. Zhang, X. Zhang, K. Mamaeva, N. Jia, J. Schulz, J. Dobie, Louise Bradley

Trinity College Dublin (Ireland)

09:40 INVITED TALK **Reversible metal electrodeposition for high-contrast active optical and metamaterials**

Po-Chun Hsu

University of Chicago (USA)

3–O2 | McNabb Theatre | 08:30 - 10:00

SP14: Towards chiral and magnetoelectric quantum electrodynamics

Organized by: Eugene Kamenetskii
Chaired by: Eugene Kamenetskii

08:30 KEYNOTE TALK **QED of Chiral Waveguides Coupled to Quantum Emitters**

Girish Agarwal

Texas A & M University (USA)

Waveguide QED is a quantum platform in which photons mediate long range interactions in a one dimensional channel. This talk highlights waveguide QED with quantum emitters, emphasizing quantum interference (Fano minima and transparency), chiral interactions, quantum nonreciprocity, and steady state entanglement, together with squeezed bath stabilization and dissipative phase transitions.

09:00 INVITED TALK **Deterministic generation of a large-scale multi-photon GHZ state**

David Gershoni

Technion - Israel Institute of Technology (Israel)

We present a novel device based on a semiconductor quantum dot embedded in a photonic microcavity, which deterministically generate at gigahertz rate, strings of indistinguishable single photons in a Greenberger-Horn-Zeilinger (GHZ) multiphoton entangled state with entanglement length surpassing a dozen photons, providing valuable resources for quantum communication and computing.

09:20 INVITED TALK **Exponentially-enhanced sensing with a frequency-encoded bosonic Kitaev chain**

Paul-Édouard Blanchard[1], Alexander McDonald[2], Philippe St-Jean[1]

[1]Université de Montréal (Canada), [2]Université de Sherbrooke (Canada)

We experimentally realize a bosonic Kitaev chain by encoding the corresponding Hamiltonian in the resonant modes of a frequency comb. We harness the inherent nonreciprocal propagation of light in frequency space to detect a small microwave tone with a signal-to-noise ratio that scales exponentially with system size.

09:40 INVITED TALK **Enhanced Microwave-to-Optical Quantum Transduction with Optomechanical Nanobeam Heterostructures**

Akihiko Sekine, Ryo Murakami, Yoshiyasu Doi

Fujitsu Limited (Japan)

Achieving a high transduction efficiency and a low added noise simultaneously is essential for the realization of quantum state transfer between distant superconducting qubits. We show theoretically that introducing optomechanical nanobeam heterostructures can improve the transduction efficiency and lower the added noise of the microwave-to-optical quantum transduction in optomechanical systems.

3–O3 | Maharry Theatre | 08:30 - 10:00

SYM1: Hybrid Nanomaterials and Metastructures for Photonics, Sensing and Energy: Celebrating the Contributions of Prof. Hiromi Okamoto to Nanoscale Chiro-Optics

08:30 KEYNOTE TALK **Chiro-Optical Micro-/Nano-Imaging and Near-Field Interaction**

Hiromi Okamoto

Institute for Molecular Science (Japan)

We developed chiral photoinduced force microscopy (PiFM) to visualize nanoscale chiro-optical responses using circularly polarized light. Chiral and achiral plasmonic nanostructures were imaged, revealing local chiral fields and probe-induced chirality. This approach enables nanometer-scale chiro-optical imaging beyond conventional near-field techniques.

09:00 INVITED TALK **Chiral sensing with dielectric nanophotonics**

Alberto G. Curto

Ghent University - IMEC (Belgium)

Chiral molecules can have different biological functionalities depending on their handedness. Identifying chirality, however, is limited by low sensitivity, restricting detection to high concentrations and large volumes. We present several experimental and theoretical examples of dielectric metasurfaces and waveguides to enhance the sensitivity of chiral molecular detection.

09:20 INVITED TALK

Smart ways to achieve tunable chiral assemblies

Ziwei Zhou[1], Ningwei Sun[1], Nina Tverdokhleb[1], Artur Movsesyan[2], Anja Maria Steiner[1], Patrick T. Probst[1], Vaibhav Gupta[1], Bo Yin[3], Nicolas Pazos-Perez[4], Ramon A. Alvarez-Puebla[4], Hofmaier[1], Müller[1], Merlitz[1], Guskova[1], Yingling[5], Lissel[1], Konig[1], Wang[2], Govorov[6], Kotov[7], Fery[1]

[1]Leibniz-Institut für Polymerforschung Dresden (Germany), [2]University of Electronic Science and Technology of China (China), [3]Ansys Inc (USA), [4]Universitat Rovira i Virgili (Spain), [5]North Carolina State University (USA), [6]Ohio University (USA), [7]University of Michigan (USA)

Chiral nanomaterials enable advanced optics, sensing and catalysis, yet laboratory fabrication of non-mirror-symmetric structures often demands delicate, equipment-intensive steps. We present simple, efficient routes to tunable plasmonic chirality by assembling achiral nanoparticles with abundant chiral biomolecules. These bio-guided assemblies transfer and amplify chirality, yielding switchable chiral responses without complex lithography.

09:40 INVITED TALK

Near-Field Optical Chirality on Achiral Gold Nanoparticles under Linear Polarization

Minyu Chen[1], Sylvie Marguet[2], Davy Gérard[1], Lucas Vázquez Besteiro[3], Safi Jradi[1], Alexander Govorov[4], Tao Xu[5], Renaud Bachelot[1]

[1]University of Technology of Troyes (France), [2]Universite Paris Saclay (France), [3]Universidade de Vigo (Spain), [4]Ohio University (USA), [5]Shanghai University (China)

It is shown that linearly polarized light can generate and control chiral near fields in geometrically achiral gold nanotriangles. Using plasmon-assisted 2-photon polymerization, near fields are recorded as permanent polymer structures. Polarization and wavelength tuning reveal transitions between achiral and chiral configurations linked to different plasmonic modes and symmetry breaking.

3–O4 | Room 3074 | 08:30 - 10:10

SYM3: Advanced passive and active metasurfaces and zero-index materials

Organized by: Howard Lee, Pin Chieh Wu, Wen-Hui (Sophia) Cheng
Chaired by: Howard Lee, Pin Chieh Wu, Wen-Hui (Sophia) Cheng

08:30 INVITED TALK

Dynamic Surface-Lattice Resonance Metasurface for Time-Varying Photonics

Jonathan Weber[1], Adam Ball[1], Dhruv Fomra[1], Sumit Goswami[2], Benjamin Diroll[3], Thirumalai Venkatesan[2], Nathaniel Kinsey[4]

[1]Virginia Commonwealth University (USA), [2]Oklahoma University (USA), [3]Argonne National Laboratory (USA), [4]Saint Louis University (USA)

We realize and study the nonlinear response of a surface-lattice-resonance structure coupled to a TCO, illustrating a 30x reduction in saturation irradiance and the presence of spectral fringes of positive/negative extinction due to time varying effects.

08:50 INVITED TALK

Chalcogenide Metamaterials for High-Speed Tunable Photonics

Jesse Frantz[1], Arash Nemati[2], Jason Myers[1], Robel Bekele[1], Vinh Nguyen[1], Yajun Gao[2], Adam Overvig[3], Andrea Alù[2]

[1]U.S. Naval Research Laboratory (USA), [2]City University of New York (USA), [3]Stevens Institute of Technology (USA)

We describe the design, fabrication, and testing of a leaky-wave metasurface that is tunable at femtosecond speeds. The device incorporates an arsenic sulfide thin film, leveraging its Kerr nonlinearity to achieve tuning. It is designed to focus light to a point with a position that varies with pump power.

09:10 INVITED TALK

New Materials for Large Scale, Roll-to-Roll Metasurfaces

Vivian Ferry

University of Minnesota (USA)

We have developed an additive, roll-to-roll printing method for large-area metamaterial fabrication, based on a combination of nanoimprint lithography and ink delivery, which selectively infills the patterned features. We use this method to pattern light emitters, including anisotropic quantum dots, and study the polarization state of the photoluminescence.

09:30 INVITED TALK **Dual-layer metasurfaces supporting bound states in the continuum for torque sensing**

Alexander Schossmann[1], Michael Tofferl[1], Maximilian Saiko[1], Alexander Bergmann[1], Peter Banzer[2]

[1]Graz University of Technology (Austria), [2]University of Graz (Austria)

Highly precise measurement on moving objectsremains challenging, yet crucial for e-mobility, robotics, andrelated fields. In our work, we utilize resonant metasurfacesfor telemetric torque sensing. We show that tunable dual-layermetasurfaces supporting (quasi-) bound states in the continuumoffer unprecedented access to motion parameters, essential fordeveloping robust next-generation sensors.

09:50 INVITED TALK **Time Reflection of Guided Light in Optically Switched Metasurfaces: Generating Magnetic Field on the Nanoscale**

Shivakh Rawat, Samyobrata Mukherjee, Gennady Shvets

Cornell University (USA)

Time-varying dielectric metasurfaces supporting sharp optical resonances with non-trivial electromagnetic fields distribution is used for realizing temporal interfaces for metasurface-guided waves (MGWs). We demonstrate that such time-interfaces can be used to generate large, highly localized quasi-static magnetic fields inside the metasurfaces that persist after the departure of the time-scattered MGWs.

3–O5 | Room 4050B | 08:30 - 10:10

SYM2: New trends in nanophotonics and advanced materials

Organized by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

Chaired by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

08:30 INVITED TALK **Generation of Quasi-Non-Diffracting Möbius Rings**

Yueyi Yuan, Na Ri, Yuxiang Wang, Guohui Yang, Kuang Zhang

Harbin Institute of Technology (China)

This paper presents a method for generating approximately non-diffracting polarized Möbius rings, which remain stable over a propagation distance from 1λ to 100λ, with a transmission efficiency exceeding 60%.

08:50 INVITED TALK **Programmable Nanophotonics with the Plasmonic Phase-Change Material In3SbTe2**

Lukas Conrads, Matthias Wuttig, Thomas Taubner

RWTH Aachen University (Germany)

We summarize our current research in active nanophotonics using the plasmonic phase-change material In3SbTe2 (IST) which exhibits a non-volatile insulator-to-metal transition upon crystallization. We highlight optical programming of functional metasurfaces for emissivity-shaping and infrared beam-shaping including holography, as well as tailoring polaritons on polar crystals and doped semiconductors.

09:10 INVITED TALK **Tailorable Light Driven Reaction with Phase-changing Material Metasurface**

Ning Lyu[1], Anjalie Edirisooriya[2], Dawei Liu[2], Zelio Fusco[2], Shenyou Zhao[3], Fiona Beck[2], Christin David[1]

[1]Friedrich-Schiller-Universitat Jena (Germany), [2]Australian National University (Australia), [3]Xi'an University of Posts and Telecommunications (China)

Phase-change metasurfaces are applied to manipulate light-driven reactions, enabling tunability using a Sb2S3 cavity. Plasmonic resonance supported by a Au nanodisk array determines the excited-electron population, and, when coupled with the tunable cavity, results in a 2.4-fold modulation of product yield, which illustrates the potential for reversible catalytic control.

09:30 INVITED TALK **Non-Reciprocal Silicon Photonic Resonators with 2D $CuCrP_2S_6$**

Mahmoud Rasras, Ghada Dushaq

New York University Abu Dhabi (United Arab Emirates)

A compact non-reciprocal photonic device is demonstrated by integrating a two-dimensional magnetic material with silicon microring resonators. Magnetic ordering induces directional asymmetry with low loss and high isolation. The device operates in the transverse electric mode and supports broadband operation relevant to short-wavelength infrared photonic systems.

09:50 INVITED TALK **Hot Carriers in Balance: Molecularly Functionalised Nanogaps Resolve Wavelength-Dependent Plasmonic Charge Generation**

Ishaan Lohia[1], Santiago Rodríguez-Jiménez[1], Charlie Readman[1], Christine Joy Querebillo[1], Rowena Davies[1], Gregory Q. Wallace[1], Duncan Graham[2], Erwin Reisner[1], Bart de Nijs[1]

[1]University of Cambridge (United Kingdom), [2]University of Strathclyde (United Kingdom)

Self-assembled, broadband absorbing nanoparticle films with 1 nm plasmonic nanogaps reveal wavelength-dependent hot carrier generation. Carriers are tracked at steady-state timescales using electrochemical photovoltage spectroscopy. Molecular control over carrier extraction is demonstrated through chemical functionalisation of nanogaps. Plasmon-enhanced hot electron generation extends from visible to near-infrared wavelengths (>800 nm).

3–O6 | Room 3051 | 08:30 - 10:05

SP10: Non-Hermitian Photonics - Topological, Disordered and Quantum systems

Organized by: Konstantinos Makris & Li Ge
Chaired by: Konstantinos Makris & Li Ge

08:30 INVITED TALK **Non-Ergodic Extended Phase for Electromagnetic Waves in 3D Non-Hermitian Disordered Media**

Marcus Prado[1], Romain Bachelard[2], Robin Kaiser[3], Felipe Pinheiro[4]

[1]Institut Langevin (France), [2]UFSCar (Brazil), [3]Université Côte d'Azur (France), [4]Universidade Federal do Rio de Janeiro (Brazil)

We demonstrate a Non-Ergodic Extended phase with fractal states for electromagnetic waves in 3D non-Hermitian disordered systems. Unlike scalar waves that localize, electromagnetic waves remain in the fractal phase due to their vector nature, enabling anomalous light transport without spatial correlations.

08:50 INVITED TALK **Anomalous surface response in a non-Hermitian Weyl semimetal**

Yidong Chong[1], Shuxin Lin[1], Rimi Banerjee[1], Zheyu Cheng[1], Kohei Kawabata[2], Baile Zhang[1]

[1]Nanyang Technological University (Singapore), [2]University of Tokyo (Japan)

The profound connection between band topology and field theoretic anomalies has recently been generalized to the non-Hermitian (NH) case. We show that the NH anomaly is mediated by exotic continuum Landau modes (CLMs), giving rise to a dramatically higher density of surface states scaling with the volume, not surface area.

09:10 **Solitons Mediated by Skin-Mode Localization and Band Nonreciprocity**

Kun Ding

Fudan University (China)

By clarifying a classification criterion intrinsic to the non-Hermitian skin effect, we distinguish two soliton families supported in non-Hermitian lattices and further construct the soliton threshold diagram as a function of nonreciprocity and dimensionality.

09:25 INVITED TALK **Minimum energy and photon content in PT symmetric metamaterials**

John Pendry

Imperial College London (United Kingdom)

We ask 'how much energy does it cost to break time reversal symmetry and transition to a PT symmetric state?' and 'can a PT symmetric system have a 'ground staté with no photons present?' in a space-time crystal. The expectation of energy content is always increased on breaking symmetry.

09:45 INVITED TALK **The spontaneous disentanglement hypothesis and causality**

Eyal Buks

Technion (Israel)

The hypothesis that disentanglement spontaneously occurs inquantum systems is motivated by some outstanding issues in the foundations of quantum mechanics. However, for some cases, spontaneous disentanglement may violate causality by enabling superluminal signaling. A way to avoid this conflict with the causality principle is proposed.

3–O7 | Room 3071 | 08:30 - 09:50

SP22: Surface-Enhanced Raman Scattering: Integrating Theoretical and Experimental Perspectives

Organized by: Chiara Deriu, Tommaso Giovannini, Chiara Cappelli and Laura Fabris
Chaired by: Chiara Deriu, Tommaso Giovannini, Chiara Cappelli and Laura Fabris

08:30 INVITED TALK **SERS Chemosensing of Metal Ions: Transduction Strategies and Interface Design**

Luca Guerrini

Universitat Rovira i Virgili (Spain)

Due to the intrinsic Raman silence of monoatomic species, SERS-based detection of metal ions necessarily relies on indirect strategies that translate coordination chemistry into a measurable spectroscopic response. This contribution presents a concise overview of key transduction mechanisms and interface design principles enabling effective SERS chemosensing of metal ions.

08:50 INVITED TALK **SERS behavior of the antiepileptic drug cenobamate**

Lydia Federica Gervasini[1], Annachiara D'Urso[2], Emilio Ciusani[2], Alessia Cutri[1], Sebastiano Trusso[3], Paolo Maria Ossi[4], Andrea Lucotti[1], Matteo Tommasini[1]

[1]Politecnico di Milano (Italy), [2]Fondazione IRCCS Istituto Neurologico C. Besta (Italy), [3]CNR (Italy), [4]Università di Messina (Italy)

Surface-Enhanced Raman Spectroscopy (SERS) is a sensitive technique that has the potential to be implemented in Therapeutic Drug Monitoring protocols for anti-epileptic drugs, reducing the time and cost of High-Performance Liquid Chromatography (HPLC) methods.

09:10 INVITED TALK **Time-Dependent Surface Enhanced Raman Scattering Simulations**

Giulia Dall'Osto[1], Stefano Corni[2]

[1]Elettra Sincrotrone Trieste (Italy), [2]University of Padova (Italy)

We present a time-dependent theoretical approach to simulate plasmon-enhanced Raman spectra. By propagating the vibronic wave function of a molecule coupled to a plasmonic nanoparticle, we capture the real-time Raman response and field interactions, enabling quantitative modeling aligned with experimental setups.

09:30 INVITED TALK **Operando SERS: From Molecular Spectroscopy to Plasmon-Driven Photochemistry**

Shashank Kumar Gahlaut, Ilko Bald, Radwan M. Sarhan, Biswajit Bhattacharyya

University of Potsdam (Germany)

Operando SERS is a promising tool to investigate light-driven chemical transformations on plasmonic nanoparticles. Hybrid nanostructures are investigated to reveal structure-dependent catalytic behavior. In particular, chiral gold helicoids allow efficient control of reaction rates using circularly polarized light. Beyond noble metals, $CuFeS_2$ has been investigated as an emerging visible-light photocatalyst.

3–O8 | Room 3126 | 08:30 - 09:50

SYM5: Phononics and acoustic metamaterials

Organized by: Marco Miniaci, Jensen Li, Jean-Philippe Groby, Vincent Pagneux, Noé Jiménez, Stefano Laureti
Chaired by: Marco Miniaci, Jensen Li, Jean-Philippe Groby, Vincent Pagneux, Noé Jiménez, Stefano Laureti

08:30 INVITED TALK **Elastic Willis Metamaterials: Parameter Characterization and Wave Matching Application**

Joo Hwan Oh

Seoul National University (South Korea)

This paper presents complementary studies on elastic Willis metamaterials. First, a parameter retrieval method considering mode coupling in elastic solids is proposed for analyzing complex elastic Willis metamaterials. The proposed method can characterize arbitrary Willis metamaterials with mode conversion. Then, wave matching application with Willis metamaterials is introduced.

08:50 INVITED TALK **Nanocrystalline Silicon for Optomechanics**

Gloria Conte[1], Omid R. Ranjbar-Naeini[1], Manjunath Balagopalan[1], Cristiana F. Alves[1], Oliver Schraidt[1], Oili Ylivaara[2], Jouni Ahopelto[2], Clivia M. Sotomayor-Torres[1]

[1]International Iberian Nanotechnology Laboratory (INL) (Portugal), [2]VTT Technical Research Centre of Finland (Finland)

Nanocrystalline silicon is a promising material for nano-opto-electro-mechanical metamaterials to be integrated into information and communication technology platform. The preparation of nanocrystalline silicon has an impact on properties associated with grain sizes and grain boundaries, which influence the mechanical quality factor of one-dimensional nanoresonators, among others.

09:10 INVITED TALK **On the Interpretation of Aeroacoustic Metadevice Performance in Terms of Spacetime Curvature**

Giada Colombo, Umberto Iemma

Roma Tre University (Italy)

Acoustic metamaterials enable tailored manipulation of sound waves, yet their extension to aeroacoustic environments remains challenging due to background flow effects. This work investigates spacetime curvature arising from non-uniform flows and spatially varying properties in phase-gradient metasurfaces, providing insight toward robust design of fully integrated aeroacoustic metamaterials.

09:30 INVITED TALK **Tunable Manipulation of Acoustic/Elastic Waves by Metamaterials/Metasurfaces**

Yan-Feng Wang, Yue-Sheng Wang

Tianjin University (China)

Tunable acoustic/elastic wave manipulation is of great essential to the practical application of metamaterials/metasurfaces. In this presentation, we will introduce our recent work on this topic.

3–O9 | Room 4047 | 08:30 - 09:50

SYM4: Chirality, magnetism, and magnetoelectricity: Separate phenomena and joint effects in metamaterial structures

Organized by: Eugene Kamenetskii
Chaired by: Eugene Kamenetskii

08:30 INVITED TALK **Magnetoelectric effects in truly and falsely chiral media**

Omar Jesus Franca Santiago, Stefan Yoshi Buhmann

Universität Kassel (Germany)

Three magnetoelectric effects are presented here. Purcell effect is studied in chiral media, quantum friction in chiral media and topological insulators, and Vavilov-Cherenkov radiation in topological insulators. How parity and time-reversal symmetry breaking allow to understand their differences in the context of true and false chirality is investigated.

08:50 INVITED TALK **Resonances and reversal in local and global chirality responses**

Itamar Kimchi

Georgia Tech (USA)

We theoretically study local chirality responses and discuss several surprising results. These include a chirality reversal generated by isolated chiral or magnetic defects. We also discuss diagnosis of local chirality through extensions of local marker and relation to spectral localizer, loop current patterns, orbital magnetization, and subspace chirality.

09:10 INVITED TALK **Topological polarization textures and emergent chirality in ferroelectric materials**

Svitlana Kondovych

IFW Dresden (Germany)

Ferroelectric materials can host complex patterns of electric polarization, which arise from electrostatic interactions and nanoscale confinement and can exhibit switchable chirality. Understanding how these topological polar textures form and can be controlled opens new possibilities for designing functional materials and next-generation electronic devices.

09:30 INVITED TALK **From Skyrmions to Twistons to Hopfions: Topological Textures Beyond Homotopy Groups of Spheres**

Maria Azhar[1], Sandra Shaju[1], Ross Knapman[1], Alessandro Pignedoli[1], Yijie Shen[2], Karin Everschor-Sitte[1]

[1]University of Duisburg-Essen (Germany), [2]Nanyang Technological University (Singapore)

Topology provides a unifying language for structured fields across optics, magnetism, and metamaterials. We demonstrate that homotopy-based classifications are incomplete when backgrounds are non-uniform, and introduce a flux-tube linking framework that captures mixed and fractional topology. The approach enables systematic classification of three-dimensional textures across physical platforms.

3–O10 | Room 4050A | 08:30 - 10:15

SP18: Inverse design, topology optimization, and machine learning

Organized by: Philippe Tassin
Chaired by: Philippe Tassin

08:30 INVITED TALK **Algorithm-driven Design for Functionally Multiplexed Metasurfaces**

Wei Ma, Yuhang Wang

Zhejiang University (China)

We present an algorithm-driven strategy to automatically design metasurfaces for functionally multiplexed light manipulation. Our metasurface design pipeline comprises iterative optimization steps, integrating gradient-based optimization or heuristic algorithms enhanced by machine learning models. This approach has been experimentally validated using multi-channel holograms, focusing lenses, and wavelength routers.

08:50 INVITED TALK **Large-Scale Photonic Inverse Design for Co-Optimized Photonic Systems**

Geun Ho Ahn

Stanford University (USA)

Scaling photonic inverse design from isolated components to deployable systems requires optimization frameworks that capture multi-block interactions, enforce foundry manufacturability, and remain computationally tractable at large design scale. I will describe a co-optimized inverse-design methodology that leads to performance improvements, and highlight inverse designs in foundry photonic systems.

09:10 **Generative Design of Frequency Selective Surfaces with a Gradient-Guided Diffusion Model**

Yiming Li, Yang Zhao

University of Science and Technology (China)

We propose a Frequency Selective Surface (FSS) designer for the 4-18 GHz range based on a generative diffusion model that directly produces level-set parameters. By incorporating a gradient-guidance method, our approach significantly enhances design efficiency, ensures pattern manufacturability, and broadens the model's design exploration, all without compromising accuracy.

09:25 **Resolution and Robustness Bounds for Reconstructive Spectrometers**

Yidong Chong[1], Changyan Zhu[1], Hsuan Lo[2], Jianbo Yu[1], Qi Jie Wang[1]

[1]Nanyang Technological University (Singapore), [2]Massachusetts Institute of Technology (USA)

Reconstructive spectrometers are devices that combine complex scattering with inference. We argue that their reconstruction error is governed by Fisher information, and can be expressed via the spectral correlation length, mean transmittance, and the number of frequency and measurement channels. This numerically-validated theory also predicts the conditions for superresolution.

09:40 **Symmetry-Informed Deep Learning for Scattering Parameter Prediction**

Viktor Aadland Lilja, Philippe Tassin

Chalmers University of Technology (Sweden)

Deep learning surrogate models can accelerate modeling of electromagnetic devices by several orders of magnitude, but usually require very large amounts of training data. We show that neural networks can be made more data efficient by utilizing symmetries of Maxwell's equations.

09:55 INVITED TALK **Inverse design of OPA beam steering correction meta optics**

Joao Cunha, Filipe Camarneiro, Joao Borlido, Patrícia C. Sousa, Diogo Aguiam

INL - International Iberian Nanotechnology Laboratory (Portugal)

Optical phased arrays (OPA) are promising solid-state integrated photonic technologies for compact beam steering targeting free-space optical telecommunication and sensing applications. In this work we present an inverse design framework to optimize silicon nitride meta optics to straighten the curved OPA radiation pattern and expand the field of view coverage.

3–O11 | Room 5025 | 08:30 - 10:10

SP7: Enhanced light-matter interactions: fundamentals and sensing applications

Organized by: Guillermo Acuna, Peter Zijlstra and Hiroshi Sugimoto

Chaired by: Guillermo Acuna, Peter Zijlstra and Hiroshi Sugimoto

08:30 INVITED TALK **Nanomaterials and Nanostructures for Semi-Transparent and Color Photovoltaics**

Ilya Sychugov

KTH Royal Institute of Technology (Sweden)

Large-area luminescence solar concentrators with metal nanoclusters and Si quantum dots feature high visible light transparency (70-80%) and generate 1 W of electrical power under 1 sun. A sub-monolayer of silicon nanospheres, as selective Mie scatterers, improves device efficiency and color-neutrality, and can be used for color photovoltaics.

08:50 INVITED TALK **AI-driven Design and Synthesis of Plasmonic Nanoparticles**

Jose Luis Montaño-Priede[1], Ana Sánchez-Iglesias[1], Anish Rao[2], Marek Grzelczak[1]

[1]CSIC-EHU (Spain), [2]CSIC-EHU (India)

Here, we report the use of open- and closed-loop pipelines for the synthesis and in silico design of gold nanoparticles, using global optimization algorithms (Bayesian optimization) to identify optimal experimental conditions for nanoparticle synthesis and to determine optimal dimensions for enhanced plasmonic performance.

09:10 INVITED TALK **Engineering Optical Sensitivity in Plasmonic Metasurfaces: from LSPR to high-Q Surface Lattice Resonances**

Kartikey Pandey, Mathias Dolci, Yun Luo, Stéphanie Lau-Truong, Sarra Gam-Derouich, Alexandre Chevillot-Biraud, Nordin Felidj, Claire Mangeney

Université Paris Cité (France)

In this work, we design plasmonic metasurfaces supporting surface lattice resonances (SLRs) and tailor their design to control optical modes and achieve high quality factors. Refractive index sensing measurements are performed to assess the sensitivity associated with different resonance modes, highlighting the potential of engineered SLRs for efficient plasmonic detection.

09:30 INVITED TALK **Engineering High-Q Dielectric Metasurfaces for Enhanced Light-Matter Interaction and Multimodal Biosensing**

Jose Francisco Algorri[1], Dimitris Zografopoulos[2], Luis Rodriguez-Cobo[1], Adolfo Cobo[1], Mohammed Janneh[3], Patrizio Vaiano[3], Marco Pisco[3], Andrea Cusano[3]

[1]Universidad de Cantabria (Spain), [2]Aristotle University of Thessaloniki (Greece), [3]University of Sannio (Italy)

To overcome fabrication vulnerabilities of traditional BICs in dielectric metasurfaces, we analyze robust high-Q resonances within fully symmetric unit cells. By comparing localized multipolar states in hollow nanocuboids against delocalized Surface Lattice Resonances in solid cuboids, we delineate fundamental fabrication and performance trade-offs to optimize real-world nanophotonic sensors.

09:50 INVITED TALK **Magneto-Optical Control of Longitudinal Components in Structured Optical Vortex Fields**

Koray Koksal

University of York (United Kingdom)

THU

3–O12 | Room 5039 | 08:30 - 10:10

SYM6: Advanced Techniques for Computational Electromagnetics

Organized by: Maha Ben Rhouma

Chaired by: Maha Ben Rhouma

08:30 INVITED TALK **How many channels can a photonic device support?**

Paul Virally[1], Pengning Chao[2], Alessio Amaolo[3], Alejandro Rodriguez[3], Sean Molesky[1]

[1]Polytechnique Montreal (Canada), [2]Massachusetts Institute of Technology (USA), [3]Princeton University (USA)

We develop a general method to bound the ordered singular values (channel amplitudes) of the electromagnetic Green function or W-operator for arbitrarily structured linear photonic systems. The approach yields computable, quantitatively predictive, upper bounds on the n^{th} singular value that capture the complexity of multi-channel tradeoffs and competing scattering effects.

08:50 INVITED TALK **The photonic gearbox: ultra-high local density of states via cylindrical-symmetry breaking**

Alessio Amaolo

Princeton University (USA)

We introduce the "Photonic Gearbox," a cavity design leveraging discrete rotational symmetry for potential super-exponential LDOS scaling. By computing fundamental limits for cylindrically symmetric structures, we empirically demonstrate the gearbox exceeds these bounds. This rigorously proves that symmetry breaking unlocks performance regimes strictly inaccessible to conventional cavity geometries.

09:10 INVITED TALK **Multiscale simulations of electronic excitations of molecules coupled to plasmonic nanostructures**

Stefano Corni

University of Padua (Italy)

Multiscale models for coupling electronic excitations and localized surface plasmon excitations have been developed, based on boundary element methods approaches for the plasmonic nanostructures. Here such models will be presented and the latest developments discussed, particularly in relation to quantization of the nanoparticle response.

09:30 INVITED TALK **Manipulating waves with metamaterials in multiple dimensions (x,y,z)/(x,y,z,t)**

Victor Pacheco-Peña

Newcastle University (United Kingdom)

We exploit metamaterials to control wave propagation in multiple dimensions. Studies include the calculation of mathematical operations such as partial differential equations in space as well as the emulation of time refracted waves using metamaterials that are time dependent.

09:50 INVITED TALK **Miexciton enhanced fluorescence in monolayer WS2 /Si Huygens metasurface**

Junichi Takahara

The University of Osaka (Japan)

We demonstrate Miexciton enhanced fluorescence in monolayer WS2 coupled with Silicon Huygens metasurface. We observed 18-fold enhancement of photoluminescence from A-exciton in monolayer WS2 in intermediate coupling regime.

3–O13 | Room 5052 | 08:30 - 10:10

SYM2: New trends in nanophotonics and advanced materials

Organized by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han
Chaired by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

08:30 INVITED TALK **From Simulation to Design: AI-Solvers andAI-Optimizers for Electromagnetics**

Raphael Pestourie

Georgia Tech (USA)

The integration of artificial intelligence with computational electromagnetics is shifting design from simulation-driven iteration toward knowledge-driven discovery. This summary categorizes AI-Solvers that accelerate physics simulation and AI-Optimizers that reduce design complexity through learned geometric representations, enabling trustworthy, scalable, and transferable electromagnetic device optimization across emerging engineering applications.

08:50 INVITED TALK **Topology Optimization on Weakly-confining InP Platform Enables Ultra-compact Low-loss Triplexer**

Hao Jiang, Yijun Chen, Shuang Zheng, Minming Zhang

Huazhong University of Science and Technology (China)

We demonstrate an ultra-compact InP triplexer for combo-PON using boundary adjoint optimization. The 92-μm device achieves <0.8 dB insertion loss across three bands, overcoming weak confinement limitations. Simulations confirm high fabrication tolerance, enabling high-density monolithic integration.

09:10 INVITED TALK **Topology Optimized High-Q Photonic Crystal Resonators for the THz Band**

Stephen Hanham

Imperial College London (United Kingdom)

This work presents a topology optimization framework for designing two-dimensional slab photonic crystal resonators for the terahertz band. The method generates manufacturable resonators with high Purcell factors and sub-diffraction-limited modal volumes, while explicitly enforcing fabrication constraints through minimum feature size control and geometric filtering.

09:30 INVITED TALK **Intelligent Nanofabrication for Nanophotonics: Quantifying and Understanding Process Variability**

Wenhan Zhang, Ben Mills, Kevin MacDonald

University of Southampton (United Kingdom)

Fabrication variability is an inherent challenge in nano-manufacturing. We present a bi-directional variational autoencoder - a graphical generative model - that simulates a realistic distribution of process outcomes for a given input design, enabling quantitative analysis of principal deviation modes, and thus well-informed design and process parameter optimisation.

09:50 INVITED TALK **Manipulating matter with vector twisted light**

Mohamed Babiker

University of York (United Kingdom)

Recent research on the influence of higher order (vector) twisted light on matter immersed in such light has led to a variety of novel effects involving dielectric and magnetcic particles. This presentation describes the principles, methodology and the resullts that have recently emerged in a number of interseting scenarios.

Coffee Break 10:00 - 10:40

3–P1 | Business School Concourse | 10:00 - 10:30

Poster Session V

P1

Efficient bio-sensor based on terahertz metasurface

Pradeep Tiwari, Deepak Kala, Maciej Sakowicz

Institute of High Pressure Physics PAS (Poland)

Terahertz metasurfaces enable safe, label-free biosensing with sensitivity to water and weak molecular interactions. Micrometer gaps concentrate fields, overcoming wavelength-biomatter mismatch. Simulations show that low-index PMP substrates maximize response. An H-split metasurface achieve 800 GHz/RIU, experimentally validated with BSA, delivering 31.25 ug/mL LOD via reduced mode volume.

P2

All-Dielectric Slotted-Disk Metasurface Sensor Based on quasi-Bound States in the Continuum

Jack Dobie, Oisin McCormack, Yongliang Zhang, Justin Schulz, Louise Bradley

Trinity College Dublin (Ireland)

An all-dielectric slotted-disk metasurface sensor supporting quasi-bound states in the continuum is presented. Symmetry-breaking enables high-Q resonance with strong, external E-field confinement, producing high refractive index sensitivity and figure-of-merit while offering a scalable platform for nanophotonic sensing application.

P3

Single-Particle Study of Spin Crossover Compounds for Reconfigurable Photonic Integration

Lucas Mascaro Burguera[1], Ramón Torres Cavanillas[2], Alejandro Regueiro[2], J. Ignacio Echevarría[3], Eugenio Coronado[1], Jorge Parra[1], Pablo Sanchis[4], Javier Hernández Rueda[3], Elena Pinilla Cienfuegos[4]

[1]Universitat Politecnica de Valencia (Spain), [2]Universitat de Valencia (Spain), [3]Universidad Complutense de Madrid (Spain), [4]Universitat Politècnica de València (Spain)

We demonstrate single particle characterization of spin crossover nanoparticles using a quadrupole Paul trap combined with polarization resolved optical scattering. Laser and pressure control reveal reversible volumetric expansion and bistability. Integration into silicon micro ring resonators confirms their potential as active materials for reconfigurable integrated photonic devices.

P4

MidInfrared Metasurfaces for ExosomeBased Liquid Biopsy in Hepatocellular Carcinoma

Riccardo Di Santo[1], Benedetta Niccolini[1], Flavio Di Giacinto[1], Marco De Spirito[1], Raffaella Polito[2], Andrea Notargiacomo[2], Michele Ortolani[3], Alessandra Di Gaspare[4], Fabrizio Pizzolante[1], Gabriele Ciasca[1], Pea[2]

[1]Università Cattolica del Sacro Cuore (Italy), [2]Consiglio Nazionale delle Ricerche IFN-CNR (Italy), [3]Sapienza University of Rome (Italy), [4]CNR - Istituto Nanoscienze and Scuola Normale Superiore (Italy)

We propose a doubleresonant midinfrared plasmonic metasurface for labelfree spectroscopic analysis of circulating exosomes in hepatocellular carcinoma. The device is designed to enhance protein vibrational bands and to provide a refractiveindexsensitive readout, as a candidate characterization module for a future exosomebased liquid biopsy platform.

P5

Transfer of optical angular momentumby free electrons

Javier García de Abajo

ICFO-Institute of Photonics Sciences (Spain)

We discuss the generation and probing of confined optical modes with definite amounts of angular momentum, as well as the use of free electrons to mediate the transfer of optical angular momentum between different structures

P6

Polarization dynamics of waves propagating in complex media: application to moving media

Aymeric Braud, Renaud Gueroult

Université de Toulouse (France)

We use an extended geometrical optics theory to derive an evolution equation for polarization in complex media. Considering moving media, we show that motion affects polarization via new spin-orbit mechanisms. Because they arise from properties bestowed to the medium by motion, these effects should also manifest in static complex media.

P7

Design of exotic plasmonic lattice dispersions

Joel Lehikoinen, Päivi Törmä

Aalto University (Finland)

We use the empty lattice approximation to design plasmonic nanoparticle arrays with exotic dispersions. As a case example, we study the bullseye lattice made out of individual nanoparticles, and show analytically and numerically that it has similar beaming properties as plasmonic bullseye antennas.

P8

Parity Resolved Origin Optimization for Efficient Multipolar Modeling of Metasurfaces

Hossein Allahverdizadeh, Karim Achouri

Ecole Polytechnique Federale de Lausanne (Switzerland)

Understanding and controlling metasurface scattering often relies on multipolar descriptions, but redundant higher-order moments can unnecessarily increase model complexity. Here, we identify optimal decomposition origins for even and odd parity components to suppress excess multipoles, enabling accurate reproduction of the full scattering response using a reduced, dipolar-level description.

P9

Colloidal lithography for correlated disorder light-trapping structures

Laura de Almeida[1], Jean-Baptiste Doucet[1], Guilhem Almuneau[1], Stephane Collin[2], Inès Revol[1]

[1]LAAS-CNRS (France), [2]Universite Paris-Saclay (France)

We demonstrate that, using colloidal lithography with carboxyl-functionalized polystyrene particles, we can control the correlations in the particle arrangement and tune the pseudo-period between 260 and 980 nm. Such correlated disordered nanostructures show promise in enhancing light scattering outside the escape cone and effectively trapping light in solar cells.

P10

Hybrid Silica-Perovskite Microcavities for High Quality-Factor Whispering-Gallery Resonance

Luke Cording[1], Christian Johnson-Richards[1], Hei Chit Leo Tsui[1], Pablo Docampo[2], Noel Healy[1]

[1]Newcastle University (United Kingdom), [2]Ikerbasque (Spain)

Current realisations of perovskite whispering-gallery mode resonators suffer from relatively low qualityfactor, restricted coupling geometries, and instability in air. Wepresent a high-Q hybrid microcavity platform that addresses allthree of the bottlenecks in state-of-the-art perovskite resonators,providing a route to accessing the promising optical propertiesof perovskites.

P11

Thermal optical and mechanical tuning in all-silicon and hybrid nanopillars

Víctor González Morote[1], David Alonso-Tomas[1], Nestor Eduardo Capuj[2], Albert Romano-Rodriguez[1], Daniel Navarro-Urrios[1]

[1]University of Barcelona (Spain), [2]Universidad de La Laguna (Spain)

Nanopillar optomechanical cavities are sensitive to absorption driven heating. We compare monolithic silicon and hybrid pillars with a silicon dioxide base using optical tuning and pump probe readout. Thermal simulations, including full cavity models, identify dominant dissipation pathways and relate them to thermooptic shifts and changes in transduced mechanical spectra.

P12

Thermo-Optical Spatial Light Modulators: Towards Imaging Through Scattering Media

Hasan Sawan[1], Hadrien Robert[1], Yannick Bertschy[2], Josep M Panades[1], Jose G. Guirado[2], Gilles Tessier[1], Romain Quidant[2], Pascal Berto[1]

[1]Sorbonne Université (France), [2]ETH Zürich (Switzerland)

We report a compact transmission-mode wavefront shaping device based on thermo-optical actuators arrays. We propose a strategy to increase the actuator density, characterize and model their temporal dynamics and implement overdrive strategies to reduce response times. Finally, we demonstrate the devicés potential for light focusing through scattering media

P13

Meta-devices based on liquid photonic devices

Yin Zhou[1], Zihan Geng[2], Mu Ku Chen[1]

[1]City University of Hong Kong (Hong Kong), [2]Tsinghua University (China)

Metasurfaces demonstrate unprecedented advantages in multi-functional imaging, but their tunability is still severely limited in the visible band. Joint optimization of metasurfaces and liquid photonic devices can enable tunable, multifunctional imaging, opening new avenues for metasurface development.

P14

Breaking Reciprocity with Self-Oscillators

Alexander Stoychev, Ulrich Kuhl, Nicolas Noiray

ETH Zürich (Switzerland)

We demonstrate nonreciprocal acoustic scattering by using weakly nonlinear self-oscillators whose internal synchronization state controls the system behavior, without bias, modulation, or strong nonlinearity. The meta-atom scattering is modeled by modified nonlinear coupled mode theory and validated experimentally. A two meta-atom unit cell yields directional transmission and reflection.

P15

Scattering properties of a cylindrical scatterer with time-modulated permittivity

Jiaruo Yan[1], Ioannis Katsantonis[1], Mohamed Mostafa[2], Viktar Asadchy[2], Maria Kafesaki[1]

[1]FORTH-IESL (Greece), [2]Aalto University (Finland)

We investigate the scattering behavior of a cylinder,with infinite length, whose permittivity is periodically modulated in time. By exploiting the interference among scatteringcoefficients associated with different temporal harmonics andmultipolar orders, the radiation pattern can be engineeredthrough appropriate adjustment of the modulation parameters.

P16

Generalized Space-Time reconfigurable Metasurfaces in synthetic dimension

Yinglan Li, Chengzhi Qin, Bing Wang, Peixiang Lu

Huazhong University of Science and Technology (China)

We implement a synthetic discrete photonic lattice based on a dual fiber loop system and construct reconfigurable temporal metasurface within this platform. By introducing linear phase modulation at temporal interfaces, we experimentally realize discrete-light temporal refraction and perfect imaging. We further observe refraction and reflection in spatial and spatiotemporal metasurfaces.

P17

Self-Assembled Aligned Carbon Nanotube Micropolarizer Array For Mid-Infrared

Zhiyu Chen[1], Yang Zhao[2]

[1]University of Science and Technology (China), [2]University of Science and Technology (USA)

We fabricated CNT films with controllable alignment by tuning the density of active catalyst particles and studied the relationship between self-assembled film polarization and alignment. We further developed a one-step strategy using asymmetric capillary forces induced by rational catalyst patterning to simultaneously assemble CNT films with orthogonal orientations.

P18

Ultrashort Bright Envelope Solitons in Ferromagnetic Metamaterials Placed in High-Intensity Magnetic Biased Fields

Feodor Yu. Ogrin[1], Alexandra V. Zhabova[1], Mariya D. Amel'chenko[1], Sergei V. Grishin[2], Sergei A. Nikitov[1]

[1]University of Exeter (United Kingdom), [2]Saratov State University (Russia)

The paper presents numerical simulation results of the ultrashort bright envelope solitons in a normally magnetized parallel-plate waveguide completely filled with a nonlinear ferromagnetic metamaterial. It is shown that in high-intensity magnetic biased fields, the soliton width of an “extraordinary” slow forward electromagnetic wave reaches several hundreds of picoseconds.

P19

Robust Design of a Reconfigurable Linear-to-Circular Polarization Metasurface via LHS

Gregorio J. Molina-Cuberos[1], Ángel J. García-Collado[2], Ismael Barba[3], José Margineda[1]

[1]Universidad Murcia (Spain), [2]Universidad Católica de Murcia (Spain), [3]Universidad de Valladolid (Spain)

A design-space exploration of a mechanically reconfigurable linear-to-circular polarization (LTC) metasurface is presented. Latin Hypercube Sampling with full-wave simulations is employed to map broadband LTC behavior beyond single-point optimization. Extended high-performance regions and a bandwidth–robustness trade-off are identified, enabling selection of tolerant and reliable metasurface designs.

P20

Designing high refractive index 2D photonic architectures for low threshold multiband lasing

Ana Conde-Rubio, Juan Ramón Deop Ruano, Luis Cerdán, Alejandro Manjavacas, Antonio Agustín Mihi Cervelló

ICMAB-CSIC (Spain)

High-refractive-index (HRI) dielectrics are gaining interest for compact lasers as a low-loss alternative to plasmonics. We demonstrate a scalable low-cost method to fabricate HRI photonic architectures consisting of arrays of holes in polymer films coated with TiO_2. When the resonances overlap the dye emission, the system exhibits low-threshold multiband lasing.

P21

Misaligned Honeycomb Sandwich Structure for Broadband Sound Insulation

Yuzhen Yang, Jun Yang, Han Jia

Institute of Acoustics CAS (China)

Misaligned honeycomb sandwich structures (MHSS) overcome mid-to-low frequency sound insulation limits of conventional designs by reducing shear stiffness while maintaining bending stiffness. This shifts or suppresses coincidence frequency, improving sound transmission loss without added mass or thickness. Analytical, numerical, and experimental results confirm MHSS effectiveness.

P22

Inverse Designed Metasurfaces for SpatiallyIsolated Optical Skyrmions

Donghyun Park[1], Jinseong Bae[1], Jiwoo Kim[1], Sejeong Kim[2], Haejun Chung[1]

[1]Hanyang University (Korea), [2]Sungkyunkwan University (Korea)

Optical skyrmions exhibit structured polarization textures, but extended side lobes hinder spatial isolation. We design a compact silicon metasurface generating a spatially confined skyrmion using a truncated Bessel target and full-wave adjoint optimization. The device achieves field overlap above 88 percent and skyrmion number 0.97 at 1550 nm.

P23

Uniformity-Enhanced Gas-Phase Catalyst Etching of Silica Glass for Metalens Fabrication

Yusuke Kataoka, Kohei Sano, Yoshitaka Ono, Yasuo Hayashi

AGC Inc. (Japan)

We investigate gas-phase catalyst etching of silica glass under reduced pressure for metalens fabrication. Vacuum conditions improve etching uniformity by enhancing reactive gas diffusion, while reducing etch rate. High-aspect-ratio, vertically etched nanoscale structures with excellent uniformity are demonstrated, indicating suitability for visible and ultraviolet metalens applications.

P24

Interparticle Spacing-Driven Ultrafast Dynamics in Gold Nanoparticle Superlattices

Pietro Castronovo[1], Cristian Gonzalez[2], Giuseppe Ammirati[3], Shengsong Yang[2], Daniele Catone[3], Alessandra Paladini[3], Patrick O'Keeffe[3], Cherie K. Kagan[2], Christopher B. Murray[2], Antonio Emanuele[1], Marino[1], Messina[1], Sciortino[1], Sciortino[1]

[1]University of Palermo (Italy), [2]University of Pennsylvania (USA), [3]Istituto di Struttura della Materia - CNR (Italy)

The collective optical response of plasmonic nanoparticle assemblies is strongly governed by interparticle interactions. Here, we investigate gold nanoparticle superlattices with tunable interparticle spacing, demonstrating that reduced spacing induces a plasmon blueshift and slows electron-phonon relaxation due to enhanced near-field coupling and hot-carrier population.

P25

Optimization of Broadband Sound Absorber Consisting of Helmholtz Resonator Array

Jia-Hong Sun[1], Yu-Shao Chang[2], Jin-Chen Hsu[2]

[1]Chang Gung University (Taiwan), [2]National Yunlin University of Science and Technology (Taiwan)

This paper studied the optimization of Helmholtz resonator arrays to achieve broadband high absorption. The interaction between adjacent resonant cavities was studied using finite-element methods. Then genetic algorithm combined with the theoretical model helps optimize arrays of nine resonators. A 0.95 averaged absorption was observed in the 300-490 Hz range.

P26

Independent control of dispersion band and linewidth of guided-mode resonances by using dual-ridge unit-cell structures

Joong Hyeon Pyo[1], Yu Sung Choi[1], Robert Magnusson[2], Jae Woong Yoon[1]

[1]Hanyang University (Korea), [2]University of Texas - Arlington (USA)

We present a dual-ridge unit cell enabling deterministic, independent tuning of guided-mode resonance frequency and linewidth. A closed-form parametric search space maps geometry to spectral metrics, removing trial-and-error. The framework supports multi-metric design and uncovers emergent non-Hermitian and topological features, including exceptional points and Fermi arcs.

P27

Causality and free-space propagation for the second quantization of radiative nanophotonic systems

Luke Hands, Ben Yuen, Angela Demetriadou

University of Birmingham (United Kingdom)

We introduce a new framework for quantizing radiative nanophotonic systems with arbitrarily positioned quantum emitters. The framework produces free-space propagation and decay terms, enforcing causality. Applying our framework to spherical nanoparticles captures position-dependent, non-Markovian dynamics, providing a complete picture of near- and far-field interactions essential for designing quantum nanophotonic devices.

P28

Optically Transparent Metasurface Reflector for Radar Visibility Enhancement of Vehicles

Sergei Geiman[1], Dmytro Vovchuk[1], Denis Kolchanov[1], Mykola Khobzei[2], Vlad Tkach[2], Vjaceslavs Bobrovs[2], Hagit Gilon[3], Eyal Cohen[3], Eran Yungar[3], Pavel Ginzburg[1]

[1]Tel Aviv University (Israel), [2]Riga Technical University (Latvia), [3]DR Utilight Ltd (Israel)

Automotive radar detection depends on vehicle radar cross-section (RCS), yet modern vehicles lack dedicated reflectors. We propose an optically transparent metasurface integrated on the rear windshield, formed by conductive wires satisfying the first Bragg condition. A 10×10 cm^2 prototype achieves 90% optical transparency and an RCS of 8 m^2.

P29

Light emission from metals - photluminescence and electroluminescence

Imon Kalyan[1], Ieng-Wai Un[1], Kaiqiang Lin[2], John M. Lupton[2], Sebastian Bange[2], Yonatan Sivan[3]

[1]Ben-Gurion University of the Negev (Israel), [2]Universitat Regensburg (Germany), [3]Ben-Gurion University (Israel)

We provide a single line analytic theory for photoluminescence and electroluminescence from metal nanostructures under CW and pulsed illumination which allows us to explain a long series of seemingly contradicting experimental reports. We then describe the signature of our predictions in old and new measurements.

P30

Topological Transitions in Bilayer Photonic CrystalSlabs

Bo Wang, Junjie Li

Institute of Physics - CAS (China)

3–O14 | Dargan Auditorium | 10:40 - 12:20

SYM2: New trends in nanophotonics and advanced materials

Organized by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

Chaired by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

10:40 INVITED TALK

Boosting nonlinear optical response in resonant metal-dielectric metasurfaces at visible and UV spectrum

Crina Cojocaru[1], Shroddha Mukhopadhyay[1], Michael Scalora[2], Jose Trull[1]

[1]Universitat Politècnica de Catalunya (Spain), [2]University of Brescia (Italy)

11:00 INVITED TALK

Plasmon-Induced Fluorescence Enhancement in Aminoporphyrin Thin Film Coupled with Gold Nanocubes Array

Giuseppe Di Maio[1], Roberto Termine[1], Caterina Damiano[2], Emma Gallo[2], Massimo La Deda[3]

[1]CNR (Italy), [2]University of Milan (Italy), [3]University of Calabria (Italy)

11:20 INVITED TALK **Advancements in Chiral Nanophotonics via Block Copolymer Supramolecular Assembly and Plasmonic Antenna-Reactor Catalysis**

Dong Ha Kim

Ewha Womans University (Korea)

11:40 INVITED TALK **A New Effective Medium Approximation for Nanostructure on a Layered Films**

Kotaro Kajikawa

Institute of Science Tokyo (Japan)

12:00 INVITED TALK **Tailoring Light-Sound Interactions in Photonic Integrated Circuits**

Moritz Merklein

The University of Sydney (Australia)

3–O15 | McNabb Theatre | 10:40 - 12:40

SYM2: New trends in nanophotonics and advanced materials

Organized by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

Chaired by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

10:40 KEYNOTE TALK **Plasmonic HfN-Gated Monolayer MoS_2 for Giant Trion Modulation and Scalable Optoelectronic Devices**

Yu-Jung Lu

Academia Sinica (Taiwan)

We demonstrate a chip-scale, gate-tunable light-emitting platform that integrates scalable monolayer MoS2 with a HfN plasmonic gate electrode. The favorable band alignment enables giant trion modulation, yielding a PL modulation depth of 24%.

11:10 KEYNOTE TALK **Nanorobots Steered by Light**

Bert Hecht

University of Würzburg (Germany)

Plasmonic nanoantennas can be used to redirect scattered light, causing momentum transfer via photon recoil. By exploiting different degrees of freedom of light, such as helicity and photon energy, several antennas can be driven selectively with minimal crosstalk to neighboring structures even at subwavelength distance.

11:40 INVITED TALK **Self-powered refractory NIR plasmonic photodetectors with compact, broadband, and quantitative spectroscopy**

Eslam Abubakr[1], Saito Saito[2], Hironori Suzuki[2], Tetsuo Kan[1]

[1]The University of Electrocommunications (Japan), [2]IMRA JAPAN CO., LTD. (Japan)

This paper presents a self-powered, chip-scale near-infrared spectroscopic device with broadband, filter-free detection with high responsivity, spectral selectivity, and proportional intensity scaling. Broadband detection covering the NIR spectrum, surpassing conventional Si-bandgap limitations, operating at room temperature and zero bias, with high correlation when benchmarked against commercial FTIR measurements.

12:00 INVITED TALK **Bound-State-in-the-Continuum Lasing Modes inInGaAs Nanowire Photonic Crystals**

Bogdan-Petrin Ratiu[1], Ji Tong Wang[2], Kyle S. Netherwood[1], Nicolae-Coriolan Panoiu[2], Li Qiang[1], Sang Soon Oh[1]

[1]Cardiff University (United Kingdom), [2]University College London (United Kingdom)

We experimentally demonstrate bound-state-in-the-continuum lasing modes in deformed honeycomb-lattice nanowire photonic crystals. From the spatial distribution of local polarization, we extract and identify the associated topological charges of the lasing modes.

12:20 INVITED TALK **Circularly polarized Raman scattering for optical spin detection in silicon metasurfaces**

Guillermo Serrera[1], Rasmus H. Godiksen[2], Lex M. Dedding[2], Tom T.C. Sistermans[3], Ershad Mohammadi[2], T. V. Raziman[2], Søren Raza[4], Pablo Albella[1], Alberto G. Curto[5]

[1]University of Cantabria (Spain), [2]Eindhoven University of Technology (The Netherlands), [3]Ghent University - IMEC (Belgium), [4]Technical University of Denmark (Denmark), [5]Ghent University (Belgium)

We use polarization-resolved Raman scattering to probe optical spin in silicon metasurfaces under circular excitation. By tuning disk size and wavelength, we observe strong Raman enhancement with far field polarization losses. Simulations show that quadrupolar resonances spatially varying near fields that depolarize the emitted Raman signal.

3–O16 | Maharry Theatre | 10:40 - 12:30

SYM3: Advanced passive and active metasurfaces and zero-index materials

Organized by: Howard Lee, Pin Chieh Wu, Wen-Hui (Sophia) Cheng
Chaired by: Howard Lee, Pin Chieh Wu, Wen-Hui (Sophia) Cheng

10:40 INVITED TALK **All-glass metasurface laser optics based on self-generation of nano-particles**

Eyal Feigenbaum

Lawrence Livermore National Laboratory (USA)

Metasurface could advance high-power laser optics, by filamentation damage mitigation, throughput enhancement, and system complexity and price reduction. We present approach based on self-generation of sacrificial nano-particle mask followed by directional etching to pattern metasurfaces on fused-silica glass. We demonstrate an ultra-broadband spectrum antireflective layer, waveplate, and optical lens elements.

11:00 INVITED TALK **Flat Optics with Computational Imaging for Biomedical Applications**

Sunil Vyas, Cheng Hung Chu, J. Andrew Yeh, Yuan Luo

National Taiwan University (Taiwan)

This talk presents advancements in structured light and meta-optics for biomedicine. Key topics include quantitative cell imaging, LSFM with metalenses, and computational resolution enhancement. We demonstrate how fusing meta-optical design with computational frameworks establishes a new frontier for high-fidelity, next-generation biomedical applications.

11:20 INVITED TALK **Nonlocal Meta-Optics: Addressing Fundamental Scaling Constraints in Imaging Systems**

Bohan Zhang, Yuanmu Yang

Tsinghua University (China)

This talk explores nonlocal meta-optics to bypass traditional imaging size constraints. By engineering momentum-space (k-space), the researchers decoupled system thickness from resolution, achieved label-free super-resolution, and enabled high-dimensional sensing. These advancements pave the way for ultra-compact, wafer-scale photonic systems for 3D vision and metrology.

11:40 INVITED TALK **Nanophotonic Devices and Metasurfaces using High Mobility Transparent Conductive Oxides**

Sudipta Biswas, Saika Muntaha Bari, Sandra Achieng, Alan Wang

Baylor University (USA)

High mobility transparent conductive oxides (HMTCOs) offer exclusive advantages compared with traditional indium-tin oxide in terms of lower optical loss, stronger plasma dispersion and more prominent epsilon-near-zero effect. We demonstrate high performance nanophotonic microring resonator modulators and metasurface-based optical filters gated by hydrogen-doped indium oxide with mobility above 100 cm2/V-s.

12:00 KEYNOTE TALK **Semiconductor metasurfaces for enhanced nonlinearities and control of single photon emission**

Igal Brener

Sandia National Labs (USA)

We integrate epitaxial GaAs quantum dots into III- V semiconductor metasurfaces for efficient, position-tolerant light extraction and tunable functionality. Huygens designs boost collected photoluminescence tenfold and enable bunched and super-bunched emission. Symmetry-engineered quadromer lattices provide multiresonant qBIC control and greatly enhance four-wave mixing and nonlinear optical phenomena.

3–O17 | Room 3074 | 10:40 - 12:40

SYM1: Hybrid Nanomaterials and Metastructures for Photonics, Sensing and Energy

Organized by: Jérôme Plain, Alexander Govorov, Davy Gérard, Pedro Hernandez Martinez

Chaired by: Jérôme Plain, Alexander Govorov, Davy Gérard, Pedro Hernandez Martinez

10:40 INVITED TALK **The Interaction of Vortex Light with Chiral Assemblies**

Thierry Verbiest, Weizhen Liu, Yovan de Coene

KU Leuven (Belgium)

In this work we investigated the interaction of vortex light carrying orbital angular momentum with chiral nanomaterials.

11:00 INVITED TALK **In situ plasmon-induced polymerization of chiral polymer thin films for enantioselective sensing in fM range**

Amine Khitous[1], Céline Molinaro[1], Olivier Soppera[2]

[1]Universite de Haute Alsace (France), [2]Université de Haute Alsace (France)

Harnessing plasmonic near-fields, we grow chiral molecularly imprinted nanolayers exactly where light probes matter. The resulting chiral plasmonic interfaces enable absolute enantioselective sensing with sub-femtomolar sensitivity.

11:20 INVITED TALK **Surface Lattice Resonance Engineering via Plasmonic Nanoparticle Self-assembly, Transfer, and Laser Treatment**

Tomas Tamulevičius[1], Gvidas Klyvis[1], Klaudijus Midveris[1], Muhammad Haris[1], Tomas Klinavičius[1], Asta Tamulevičienė[1], Mindaugas Juodėnas[1], Domantas Peckus[1], Joel Henzie[2], Sigitas Tamulevičius[1]

[1]Kaunas University of Technology (Lithuania), [2]National Institute for Materials Science (Japan)

Broad LSPRs in noble-metal nanostructures are engineered by arranging nanoparticles into well-defined arrays, where scattered light couples into plasmonic lattices. Self-assembly, transfer, and laser treatment of chemically synthesized nanoparticles onto thin films enable wave-guided SLRs with multiple high-Q-factor modes, thereby enabling applications in photonics, sensing, and anticounterfeiting.

11:40 INVITED TALK **Emission of Quantum Dots within Plasmonic Patch Arrays sustained by Surface Lattice Resonance**

Agnes Maitre, Hugo Saint-Olive, Fengzhi Gu, Louis Agard, Willy Daney de Marcillac, Thomas Pons

Sorbonne Université (France)

We study both esperimentally and theoretically arrays of plasmonic patch antennas, exhibiting ultra thin surface lattice resonance modes. Those modes will be coupled to quantum dot in order to engineer their fluorescence.

12:00 INVITED TALK **Thermoplasmonics-driven polymerization from the macroscale to the nanoscale**

Céline Molinaro[1], Amine Khitous[1], Mathieu Bastide[1], Sylvie Marguet[2], Olivier Soppera[1]

[1]Université de Haute Alsace (France), [2]Université Paris-Saclay (France)

We developed a thermopolymerizable formulation that polymerizes above 130°C. Using continuous wave and femtosecond laser illuminations, we generated millimetric polymer dots (collective heating) and nanometric shells (confined heating) on dense gold nanoparticles. Surprisingly, on colloidal nanotriangles, directional polymer lobes were formed, challenging the assumption of uniform temperature distribution within nanoparticles.

12:20 INVITED TALK **Photothermal effects in metal layers**

Benoit Rogez[1], Quanbo Jiang[1], Zakaria Marmri[2], Franck Thibaudau[2], Jerome Wenger[2], Guillaume Baffou[2]

[1]Université de Technologie de Troyes (France), [2]Aix Marseille University (France)

Photothermal heating of gold layers is often neglected given its low absorption and good thermal conductivity. This picture is, however, not always true, and we have recently shown, both experimentally and theoretically, that photothermal heating of gold films can have unexpected behaviour and effects when working at the nano-scale

3–O18 | Room 4050B | 10:40 - 12:40

SP21: New trends in light-matter interaction at the nanoscale

Organized by: Carlos Alberto Maciel Escudero, Jorge Olmos Trigo and Mario Zapata Herrera

Chaired by: Carlos Alberto Maciel Escudero, Jorge Olmos Trigo and Mario Zapata Herrera

10:40 INVITED TALK **Color Routing and Beam Steering of Single-Molecule Emission with a Spherical Silicon Nanoantenna**

Maria Sanz-Paz[1], Nicole Siegel[2], Guillermo Serrera[3], Javier Gonzalez-Colsa[3], Fangjia Zhu[2], Karol Kolataj[2], Minoru Fujii[4], Hiroshi Sugimoto[4], Pablo Albella[3], Guillermo Acuna[2]

[1]Sorbonne Université (France), [2]University of Fribourg (Switzerland), [3]University of Cantabria (Spain), [4]Kobe University (Japan)

Nanoscale photon sources exhibit a dipole-like emission pattern, limiting their incorporation into on-chip devices. Nanoantennas can control their radiation pattern, but often involve lossy plasmonic nanoparticles. Here, we show that a single dielectric nanoparticle can direct the emitted light of a nearby nanoemitter, allowing for geometrical and spectral light routing.

11:00 INVITED TALK **Theoretical characterization of tip-enhanced nanocavities for active control of vibrational signals**

Isabel Pascual Robledo[1], Philippe Roelli[2], Iris Niehues[3], Javier Aizpurua[4], Rainer Hillenbrand[2]

[1]CSIC-UPV/EHU (Spain), [2]CIC nanoGUNE BRTA (Spain), [3]University of Munster (Germany), [4]Basque Foundation for Science (Spain)

We present an in-operando controllable platform for vibrational upconversion using tip-enhanced nanoparticle-on-mirror nanocavities. Simulations and experiments show that combining a s-SNOM tip with a visible-resonant NPoM form a cascaded nanolens system that enables the enhancement of sum-frequency generation signals from molecule-filled nanogaps up to 14 orders of magnitude.

11:20 INVITED TALK **Imaging the spatial distribution of tunneling-induced luminescence beyond the diffraction limit of light**

Elysé Laurent[1], Ricardo Javier Peña Roman[2], Sarah Miller[1], Aditi Raman Moghe[3], Etienne Lorchat[4], Séverine Le Moal[1], Elizabeth Boer-Duchemin[1], Luiz Fernando Zagonel[2], Stéphane Berciaud[3], Eric Le Moal[1]

[1]Université Paris-Saclay (France), [2]State University of Campinas-UNICAMP (Brazil), [3]Université de Strasbourg (France), [4]NTT Research (USA)

An iterative deconvolution algorithm is used to resolve, beyond the diffraction limit of light, the spatial distribution of radiatively recombining excitons excited in a transition metal dichalcogenide monolayer by current tunneling under the tip of a scanning tunneling microscope.

11:40 INVITED TALK **Photonic time crystals assisted by high-Q resonances**

Puneet Garg[1], Viktar Asadchy[2], Carsten Rockstuhl[1]

[1]Karlsruhe Institute of Technology (Germany), [2]Aalto University (Finland)

Photonic time crystals generally require a high modulation amplitude of the time-varying permittivity to show detectable momentum bandgaps. We demonstrate that by efficiently trapping light in time-varying metasurfaces using their high-Q resonances, even with weak permittivity modulation, noticeable bandgaps can be achieved.

12:00 INVITED TALK **Nanoscale heat flow in laser-heated silicon nanospheres probed by pump-probe cathodoluminescence**

Saskia Fiedler[1], Evelijn Akerboom[2], Théo Soler[2], Loriane Monin[2], Hiroshi Sugimoto[3], Minoru Fujii[3], Wiebke Albrecht[2], Albert Polman[2]

[1]AMOLF (The Netherlands), [2]NWO-Institute AMOLF (The Netherlands), [3]Kobe University (Japan)

Cathodoluminescence (CL) spectroscopy in a scanning electron microscope enables nanometer-scale optical characterization. We study Mie resonances in silicon nanospheres using hyperspectral and pump-probe CL. Laser heating inside the SEM induces thermo-optic shifts, whose nanosecond dynamics are tracked via synchronized electron pulses, demonstrating Mie resonances as nanoscale thermometry probes.

12:20 INVITED TALK **Infrared Magnetoplasmonics in Transparent Conductive Oxide Nanocrystals**

Alessio Gabbani

University of Pisa (Italy)

Magnetoplasmonics is a promising strategy for active nanophotonics. Here, we demonstrate that transparent conductive oxide nanocrystals (NCs) enable superior tunability of carrier parameters through defect engineering. Exploiting these NCs, we achieve enhanced magnetic circular dichroism and Faraday rotation in the near infrared, and further demonstrate their photochemical modulation.

3–O19 | Room 3051 | 10:40 - 12:25

SP10: Non-Hermitian Photonics - Topological, Disordered and Quantum systems

Organized by: Konstantinos Makris & Li Ge
Chaired by: Konstantinos Makris & Li Ge

10:40

Machine Learning for Drawing Phase Diagrams of Nonlinear Optical Resonators with 1D Su-Schrieffer-Heeger Lattice

Chukwunaedum Patrick Izediuno[1], Ghada Alharbi[1], Zeeshan Ahmad[2], Stephan Wong[3], Sang Soon Oh[1]

[1]Cardiff University (United Kingdom), [2]Bentham Instruments Ltd. (United Kingdom), [3]Sandia National Laboratories (USA)

Identifying dynamical phases in nonlinear systems is a central challenge in nonlinear dynamics, particularly for complex nonlinear optical systems. Here, we propose two machine-learning approaches-augmented dynamic mode decomposition and a convolutional neural network-to construct phase diagrams of the Su-Schrieffer-Heeger model with Kerr nonlinearity.

10:55

Programmable Anisotropic Exceptional Points in Passive Multiport Scattering Networks

Kaiyuan Wang, Niall Byrnes, Matthew Foreman

Nanyang Technological University (Singapore)

Exceptional points are spectral degeneracies of non-Hermitian operators. We show that a passive multiport network can be programmed to exhibit exceptional-point behaviour in a measured-port subspace, even though the full scattering matrix is unitary. By tuning internal phases, we engineer anisotropic eigenvalue splitting and prescribe sensitivity directions in parameter space.

11:10 INVITED TALK

Measurement-Induced Crossover of Quantum Jump Statistics in Postselection-Free Many-Body Dynamics

Kazuki Yamamoto[1], Ryusuke Hamazaki[2]

[1]Institute of Science Tokyo (Japan), [2]RIKEN (Japan)

We find a nontrivial crossover of subsystem fluctuations of quantum jumps in many-body systems under continuous measurement. Whereas the fluctuations exhibit the conventional volume law following Poissonian statistics for sufficiently weak measurement strength, anomalous yet universal scaling law exhibiting super-Poissonian statistics appears for strong measurement strength.

11:30 INVITED TALK

Topological insulator-based quantum optical sensor arrays

Harry Zheng, Arnab Banerjee, Peter Bermel

Purdue University (USA)

Topological insulator (TI) materials like InBi2Se3 are highly sensitive to external electrical & magnetic fields, both at RF and optical frequencies, making for an emerging quantum sensing platform. In this work, we calculate the optical conductivity of TIs using Quantum Espresso, and design optical sensing devices and arrays.

11:50

Scattering Properties of non-Hermitian Resonant Systems Explored Through the Generalized Wigner-Smith Operator

Nadav Shaibe, Jared Erb, Thomas M. Antonsen, Steven Anlage

University of Maryland (USA)

We explore uses of the generalized Wigner-Smith operator in understanding the scattering properties of non-Hermitian systems with many embedded parametric perturbers. We focus on the statistical properties of complex parametric derivatives of the scattering matrix and compare them to those of the Wigner-Smith time delay, both obtained from experiments.

12:05 INVITED TALK

Topological perfect transition in one-dimensional multi-orbital photonic lattices

Polette Parra-Palavecino, Diego Roman-Cortes, Rodrigo Vicencio

Universidad de Chile (Chile)

We study one-dimensional (1D) photonic lattices on a topologically trivial phase for S mode excitation. We demonstrate how the excitation of dipolar P states together with the engineering of the coupling angle induce a zero dimerization regime on a SSH-like model, including the emergence of an all flat band regime.

3–O20 | Room 3071 | 10:40 - 12:15

SP22: Surface-Enhanced Raman Scattering: Integrating Theoretical and Experimental Perspectives

Organized by: Chiara Deriu, Tommaso Giovannini, Chiara Cappelli and Laura Fabris
Chaired by: Chiara Deriu, Tommaso Giovannini, Chiara Cappelli and Laura Fabris

10:40 INVITED TALK **Triple-Coupled Unified Resonance-Driven SERS in Gold Nanoflower-WS2 (AuWS2) Complexes with DFT Insights into Charge-Transfer Mechanism**

Ashwani Kumar Verma, Laura Fabris

Politecnico di Torino (Italy)

Synergistic analyte-substrate interactions govern charge-transfer (CT) resonance-driven chemical enhancement in surface-enhanced Raman spectroscopy (SERS). We demonstrate triple-coupled resonance in gold nanoflower-tungsten disulfide (AuWS2) by integrating LSPR, CT, and molecular resonances. Combined experimental and DFT insights reveal CT complex excitation- and molecular resonance-facilitated CT, enabling superior two-dimensional (2D) SERS sensing platforms.

11:00 INVITED TALK **Materials for Surface-Enhanced Raman Spectroscopy Detection of Per- and Polyfluoroalkyl Substances in Aqueous Film-Forming Foams**

Chuntao Wang, Kushal Biswas, Sangmin Jeong, Anila Bello, Dhimiter Bello, Michael Ross

University of Massachusetts Lowell (USA)

Rapid identification of PFAS in complex mixtures is critical for environmental monitoring and remediation. We use concave cubic gold nanoparticles for SERS detection of six MassDEP-regulated PFAS at ppm levels. The platform enables quantitative analysis, chain-length differentiation, and identification in real AFFFs, validated by mass spectrometry for field-deployable screening applications.

11:20 INVITED TALK **From AI Design to SERS Spectral Shaping and Nanoplastics Detection with Metal Film over Nanospheres**

Cosmin Farcau, Ioana Cârdan, Ana Maria Mihaela Gherman, Fran Nekvapil

National Institute for Research and Development of Isotopic and Molecular Technologies (Romania)

Here, we present our recent results concerning the investigation and exploitation of metal film over nanosphere (MFoN) SERS substrates, spanning from rational, AI-driven plasmonic design to fundamental studies on spectral shaping induced by focusing / defocusing, and issues related to real-world analytical applications in nanoplastic detection.

11:40 **Plasmonic Nanopore Geometry Effects in Flow-Through Single-Molecule SERS**

Kirill Khabarov[1], Xinxin Liu[2], Ilaria Micol Baldi[1], Frank Niklaus[2], Francesco De Angelis[1]

[1]Italian Institute of Technology (Italy), [2]KTH Royal Institute of Technology (Sweden)

We investigate the influence of plasmonic nanopores geometry on flow-through single-molecule SERS during electrophoretic molecular delivery. Using microsecond-resolved SPAD detection, we compare circular, slit, and V-shaped nanopores. Experiments and simulations show enhanced SERS efficiency for the slit and V-shaped pores, highlighting geometry as a key parameter for SERS-based molecular sensing.

11:55 INVITED TALK **Simulating Surface-Enhanced Spectroscopies: The ωFQFμ Model**

Pablo Grobas Illobre[1], Tommaso Giovannini[2], Chiara Cappelli[3]

[1]Scuola Normale Superiore (Italy), [2]University of Rome Tor Vergata (Italy), [3]Scuola Normale Superiore di Pisa (Italy)

We present a multiscale quantum and classical framework for simulating surface enhanced spectroscopies of molecules near plasmonic substrates. The method combines quantum molecular response with an atomistic classical electromagnetic description of metals. We demonstrate accurateand efficient prediction of surface enhanced Raman signals of molecules on realistic plasmonic substrates.

3–O21 | Room 3126 | 10:40 - 12:40

SYM5: Phononics and acoustic metamaterials

Organized by: Marco Miniaci, Jensen Li, Jean-Philippe Groby, Vincent Pagneux, Noé Jiménez, Stefano Laureti
Chaired by: Marco Miniaci, Jensen Li, Jean-Philippe Groby, Vincent Pagneux, Noé Jiménez, Stefano Laureti

10:40 INVITED TALK **Acoustic Purcell effects in phase-transitioning nanodroplets**

Chengzhi Shi

University of Michigan (USA)

We present a new strategy to achieve acoustic Purcell effect through perfluorocarbon nanodroplets (PFCnDs) to boost ultrasound emission. A theoretical framework for nanodroplet-enhanced Purcell effect is developed and experimentally confirmed. By tailoring the acoustic environment, we achieve an acoustic Purcell factor surpassing previous designs by two orders of magnitude.

11:00 INVITED TALK **Generalization of exceptional point: high-dimensional coalescing non-Hermitian spaces**

Guancong Ma

Hong Kong Baptist University (China)

We present the generalization of exceptional point, called “exceptional deficiency," characterized by the coalescence of two high-dimensional non-Hermitian linear spaces. At this condition, exceptional physics appears over a spectral continuum without fundamental limitations on bandwidths. The exceptional deficiency is experimentally realized using an active phononic crystal.

11:20 INVITED TALK **On the Quest of a Boundary Integral Formulationfor Aeroacoustics of Metacontinua in CurvedSpacetime**

Umberto Iemma, Giada Colombo

Roma Tre University (Italy)

Boundary Integral Equation (BIE) methods rely on the self-adjointness of the governing differential operator, which is lost in presence of a non-uniform mechanical properties. This contribution focuses on the challenges in the identification of a design-oriented strategy to derive an integral equation formulation valid for aeroacoustic analysis on curved spacetime.

11:40 INVITED TALK **Band-structure calculations of phononic crystals in the hard-scatterer limit**

Arkadii Krokhin, Dmitrii Shymkiv

University of North Texas (USA)

It is well known that the hard-scatterer limit leads to the appearance of non-physical features in the band structure of phononic crystals when calculated numerically using the plane-wave expansion method. We show that these numerical difficulties arise from a mathematical singularity in the corresponding eigenvalue problem for sound waves.

12:00 INVITED TALK **Optical imaging of sub-GHz acoustic waves in topological phononic crystals**

Osamu Matsuda

Hokkaido University (Japan)

The acoustic wave propagation in valley topological phononic crystal samples is studied using the time-resolved two-dimensional optical imaging technique. With the single frequency electronic excitation as well as the broad band optical excitation, the topologically protected robust wave-guiding is observed.

12:20 INVITED TALK **Trapping GHz Rayleigh Waves with Phononic Crystals**

Daniel Torrent[1], Liangshu He[1], Fernando Soldevila[1], Yabin Jin[2], Pawel Packo[3], Agustín Mihi[4]

[1]Universitat Jaume I (Spain), [2]Fudan University (China), [3]AGH University of Kraków (Poland), [4]Institute of Materials Science of Barcelona (ICMAB-CSIC) (Spain)

We report optical pump probe measurements of surface acoustic waves in patterned silicon. Ordered hole arrays support long lived symmetry protected resonances, while disordered structures exhibit broadband trapping of acoustic waves in the gigahertz range. These results demonstrate complementary mechanisms for controlling phonon confinement using order and disorder.

3–O22 | Room 4047 | 10:40 - 12:40

SYM4: Chirality, magnetism, and magnetoelectricity: Separate phenomena and joint effects in metamaterial structures

Organized by: Eugene Kamenetskii
Chaired by: Eugene Kamenetskii

10:40 INVITED TALK **Local and non-local phenomena in curvilinear and 3D magnets**

Oleksandr Pylypovskyi

Helmholtz-Zentrum Dresden-Rossendorf e.V. (Germany)

The shape of a ferromagnet maps its geometric parameters (locally defined principal curvatures) and topologic features (connectivity and number of holes) to its magnetic state. The resulting phenomena include topological patterning and states with multiple chiral characteristics. We discuss reflections of local and nonlocal geometric features on global magnetic state.

11:00 INVITED TALK **Emergent Magnetoelectricity in Stacked VdW Magnets**

Yong P. Chen

Tohoku University (Japan)

We discuss our recent magneto-optical (MOKE) and magneto-transport (tunneling) experiments on stacked and/or twisted (Moire) structures (both homo and hetero) between vdW/2D layered antiferromagnets such as CrI3 and CrCl3, revealing novel magnetoelectric behaviors in new regimes of magnetism (e.g. non-collinear Moire magnetism), with potential spintronic/magnetic and optical/optoelectronic device applications.

11:20 INVITED TALK **Chiral Polaritonics and Molecular Lasing: Concept, Challenges, and future Directions**

Kai Mueller[1], Denis Baranov[2], Christian Schaefer[3]

[1]Technische Universitat Dresden (Germany), [2]Moscow Institute of Physics and Technology (Russia), [3]TU Wien (Austria)

We present a theoretical framework for molecularlight-matter interactions in chiral resonators and few-emitternanolasing. Using analytical and first-principles approaches, wereveal how strong coupling, vibrational structure, and emit-ter number govern enantiomer discrimination and laser per-formance, providing design principles for chiral control andmolecular-scale photonic devices.

11:40 INVITED TALK **Persistent Energy Fluxes and Angular momentum in Non-reciprocal Electromagnetic Systems**

Ivan Latella

University of Barcelona (Spain)

We investigate persistent energy fluxes and electromagnetic angular momentum in non-reciprocal systems at thermal equilibrium. We show that a divergence-free mean Poynting vector arises from thermal and vacuum fluctuations, with vacuum contributions dominating. This flux persists even at zero temperature, so it does not necessarily represent flow of heat.

12:00 INVITED TALK **Photonics for Thermal Management in Photovoltaics**

George Perrakis[1], Anna Tasolamprou[2], Maria Kafesaki[3]

[1]FORTH (Greece), [2]University of Athens and FORTH (Greece), [3]FORTH and University of Crete (Greece)

Effective heat mitigation remains a central challenge for photovoltaic (PV) technologies, directly influencing conversion efficiency, operational stability, and device lifetime. In this work, by exploiting radiative cooling and spectrally engineered optical responses, we demonstrate cooling coating structures providing significant temperature reductions and measurable efficiency gains across different PV architectures.

12:20 INVITED TALK **On the efficiency of enantiomer separation using optical evanescent fields near waveguides**

Sebastian Golat, Francisco J. Rodriguez-Fortuno

King's College London (United Kingdom)

I will present analytical estimates for sorting time, throughput, and achievable purity in all-optical enantiomer separation driven by chiral dipolar forces near waveguides. By combining a symmetry-based force decomposition with drift-diffusion dynamics in liquids, I obtain closed-form performance limits applicable to arbitrary dipolar molecules and nanoparticles under realistic experimental conditions.

3–O23 | Room 4050A | 10:40 - 12:40

SP14: Towards chiral and magnetoelectric quantum electrodynamics

Organized by: Eugene Kamenetskii

Chaired by: Eugene Kamenetskii

10:40 INVITED TALK **Cavity control of Kondo physics in two-dimensional materials**

Jun Mochida, Yuto Ashida

The University of Tokyo (Japan)

We theoretically investigate a cavity control of magnetic materials, including the Kondo effect in quantum impurities and heavy-fermion systems realized in two-dimensional materials. We show the possibility of enhancing Kondo effect and controlling quantum phases using vacuum fluctuations of quantized electromagnetic fields.

11:00 INVITED TALK **Induced angular momentum from axion electrodynamics of metals and insulators**

Flavio Nogueira[1], Anastasiia Chyzhykova[2], Vira Shyta[2]

[1]IFW Dresden (Germany), [2]Institute for Theoretical Solid State Physics (Germany)

Axion electrodynamics describes the electromagnetic response of certain topological materials, including three-dimensional topological insulators and Weyl semimetals. Here we discuss the application to Weyl semimetals and a mechanical effect induced by the axion response in topological insulators.

11:20 INVITED TALK **Large topological magneto-optical effect from atomic-scale skyrmion-like texture**

Yoshihiro Okamura

University of Tokyo (Japan)

We report the large spontaneous magneto-optical Kerr effect solely from scalar spin chirality of all-in-all-out state in quasi-two-dimensional triangular-lattice compound CoNb3S6. Over the entire measured energy region from 55 to 2000 meV, the topological effect dominates the optical response, whose figure of merit largely exceeds other magnets.

11:40 INVITED TALK **Valley assisted Orbital angular momentum of light detection**

Jiang Hao, Yan Zhang, Weibo Gao

Nanyang Technological University (NTU) (Singapore)

Here, we report the interaction between the orbital angular momentum of twisted light (beam) with the valley degree of freedom in monolayer WSe2. We find that the DoP of 1L-WSe2 can be tuned directly by the OAM number l. This direct DoP-tuning scheme successfully enables on-chip OAM detection.

12:00 INVITED TALK **Extraction of Circularly Polarized Single Photons from Linearly Polarized Emitters**

Sarah Lindner, Peter Banzer

University of Graz (Austria)

We target direct extraction of single photons with controlled circular polarization from linearly polarized emitters. We exploit the near-field features of linear dipole emitters to couple the emitters to waveguides, establishing a foundation for efficient, orientation-controlled extraction of circularly polarized single photons at the nanoscale applications.

12:20 INVITED TALK **Bulk-Edge Correspondence in Photonic Spacetime Insulators**

João Câmara Serra[1], Rudin Kraja[2], Foster Sabatino[2], Alexander Khanikaev[2], Mário Silveirinha[3]

[1]Instituto de Telecomunicações (Portugal), [2]University of Central Florida (USA), [3]University of Lisbon (Portugal)

Unlike general space-time crystals, periodic travelling-wave modulations possess a continuous translation symmetry and exhibit a truly insulating bulk response. This work analyzes the bulk-edge correspondence in such systems and reveals some unusual properties of the topological edge channels, such as a geometry-dependent Doppler effect and codirectional reflection mechanisms.

3–O24 | Room 5025 | 10:40 - 12:40

SP7: Enhanced light-matter interactions: fundamentals and sensing applications

Organized by: Guillermo Acuna, Peter Zijlstra and Hiroshi Sugimoto

Chaired by: Guillermo Acuna, Peter Zijlstra and Hiroshi Sugimoto

10:40 INVITED TALK **Nanoimprinted Chiral Photonic Architectures for Circularly Polarized Photoluminescence**

Agustin Mihi, Jose Mendoza-Carreño, Xiaoyu Qi, Luis A. Pérez, Miquel Garriga, Isabel Alonso

ICMAB-CSIC (Spain)

Soft nanoimprint lithography enables the scalable fabrication of nanophotonic architectures with high-resolution and over large areas. Here we demonstrate how the technique can be extended to create chiral metasurfaces (dielectric and metallic) exhibiting strong circular dichroism which can be transferred to nearby emitters to produce circularly polarized photoluminescence.

11:00 INVITED TALK **Photoelectrochemical Chiral Nanofabrication by Circularly Polarized Light**

Takuya Ishida[1], Tetsu Tatsuma[2]

[1]Utsunomiya University (Japan), [2]The University of Tokyo (Japan)

We demonstrate bottom-up chiral nanofabrication driven by circularly polarized light (CPL). CPL-induced chiral near-field distribution around plasmonic nanoparticles enables site-selective growth via photoelectrochemical reactions, leading to chiral nanostructures. Extending this concept to magneto-chiral nanocomposites yields directional dichroism under static magnetic fields, providing a scalable route to nonreciprocal metamaterials.

11:20 INVITED TALK **Mie Voids for Refractive Index Measurement of Unknown Water under High-Pressure**

Hiromasa Niinomi[1], Hiroki Nada[2], Tetsuya Hama[3], Kazuhiro Gotoh[4], Yumiko Kodama[1], Tomoya Oshikiri[1], Masaru Nakagawa[1], Yuki Kimura[5]

[1]Tohoku University (Japan), [2]Tottori University (Japan), [3]The University of Tokyo (Japan), [4]Niigata University (Japan), [5]Hokkaido University (Japan)

We developed a novel method for refractive index (RI) sensing of materials under high-pressure using Mie voids fabricated on a 4H-SiC anvil in an anvil cell, enabling in-situ local measurement of RI in materials under high-pressure inaccessible by conventional methods including unknown water at interfaces between water and high-pressure ices.

11:40 INVITED TALK **Exploring the Origins of Circular Dichroic Optical Forces at the Nanoscale**

Junsuke Yamanishi

The University of Osaka (Japan)

We investigate the microscopic origin of circular dichroic optical forces at the nanoscale using photoinduced force microscopy. We reveal three distinct contributions: intrinsic material chirality, local chirality in achiral assemblies, and probe-induced symmetry breaking. Our results establish a unified framework for interpreting circular dichroic optical forces in near-field measurements.

12:00 INVITED TALK **Ultimate Magneto-Optical Bounds at the Nanoscale**

Jorge Olmos

Universidad Autonoma de Madrid (Spain)

In this talk, we demonstrate the existence of an ultimate upper bound in magneto-optics. We derive a simple expression for this fundamental limit and show that it can be reached only by non-absorbing nanoparticles.

12:20 INVITED TALK **A single photon source for the THz regime**

Diego Martin Cano[1], Caspar Groiseau[2], Antonio Fernandez-Dominguez[1], Miguel Angel Martinez-Garcia[1], Carlos Sanchez Munoz[3]

[1]Universidad Autónoma de Madrid (Spain), [2]Chalmers University of Technology (Sweden), [3]Institute of Fundamental Physics IFF-CSIC (Spain)

We propose a feasible single-photon source that performs over the THz frequency regime based on a single quantum polar emitter coupled to a nanocavity. We demonstrate nonclassical photon correlations showing the single photon nature of its emission as well as the nonlinear production of multiphoton pairs.

3–O25 | Room 5039 | 10:40 - 12:40

SYM6: Advanced Techniques for Computational Electromagnetics

Organized by: Maha Ben Rhouma
Chaired by: Maha Ben Rhouma

10:40 INVITED TALK **Radiative heat transfer measurements at small scales in systems involving several bodies**

Victor Guillemot[1], Ana I. F. Tresguerres-Mata[1], Riccardo Messina[2], Valentina Krachmalnicoff[1], Remi Carminati[1], Philippe Ben-Abdallah[2], Wilfrid Poirier[3], Yannick De Wilde[4]

[1]Universite PSL (France), [2]Université Paris-Saclay (France), [3]Laboratoire National de Metrologie et d'Essais (LNE) (France), [4]Université PSL (France)

We present measurements of small-scale radiative heat transfer of a glass microsphere immersed in a thermal bath facing three different planar substrates (SiO_2, SiC, Au), or another microsphere, under vacuum, with different temperatures within the system. We reveal many-body contributions and a subtle competition between near-field and far-field heat transfer.

11:00 INVITED TALK **Scattering Symmetries in Metagratings**

Karim Achouri

EPFL (Switzerland)

We develop a simple formalism to connect the spatial symmetries of a metagrating unit cell and lattice to the shape of its scattering matrix. We use it to explain the emergence of extrinsic chirality in metagratings. And also to design metagratings exhibiting a step function response in momentum space.

11:20 INVITED TALK **Application of Spatial Symmetries in Plasmonic Lattice Design**

Kristian Arjas[1], Grazia Salerno[2], Päivi Törmä[3]

[1]Trinity College Dublin (Ireland), [2]Università di Pisa (Italy), [3]Aalto University (Finland)

We utilise mathematical group theory and symmetry analysis to develop a quasicrystal design method, which is used to realise lasing from bound states in the continuum with high topological charges. Additionally, we show how these tools can be used for generating momentum space Hamiltonians with interesting topological characteristics.

11:40 INVITED TALK **Enabling Meta-surface Design with Neural Network Technologies.**

Denis Rideau, Mathys Le Grand, Damien Maitre, Loumi Tremas, Habib Mohamad, adam Fuchs, Pascal Urard, Valerie Serradeil, James Downing

STMicroelectronics (France)

Meta-surfaces, made of subwavelength nanostructures, enable ultra-thin optical components but are challenging to design at millimeter scale using conventional FDTD. We propose an AI-driven framework based on convolutional neural network emulators that support gradient-descent and generative design, improving efficiency, accuracy, and scalability for large-scale meta-surface optics.

12:00 INVITED TALK **Machine Learning Optimization of Chiral Photonic Metasurface with Neural Network Pipeline and Evolutionary Strategies**

Arash Rahimi-Iman

Justus-Liebig-Universität Gießen (Germany)

To improve the design and performance of photonic metasurfaces with chiral reflection, we demonstrate an optimization framework that integrates deep learning with genetic algorithms. Our refined pipelines employ neural networks and evolutionary strategies to better balance chiral dichroism and reflectivity toward fast design exploration and high-performance results with hybrid methods.

12:20 INVITED TALK **Advanced electromagnetic simulations for free electrons and nanoscale optical fields**

Javier García de Abajo

ICFO-Institute of Photonics Sciences (Spain)

Free electrons enable mapping and controlling nanoscale optical fields, advancing spatiotemporal and spectral microscopy. While analytical methods suffice for simple geometries, complex structures require numerical simulations. We discuss advanced techniques to simulate electron-light interactions illustrated through phenomena such as the generation and probing of non-classical light states.

3–O26 | Room 5052 | 10:40 - 12:35

SYM2: New trends in nanophotonics and advanced materials

Organized by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han
Chaired by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

10:40 INVITED TALK **Optics of 3D Second-Harmonic Photonic Crystals from Colloidal Self-Assembly Templating**

Thomas Kainz[1], Ülle-Linda Talts[2], Rachel Grange[2], Ullrich Steiner[1], Viola Vogler-Neuling[1]

[1]University of Fribourg (Switzerland), [2]ETH Zürich (Switzerland)

We present optical measurements on inverse opals with controlled second-harmonic generation within a fabrication-tunable photonic stopband. We create scalable, 3D, second-order photonic crystals with unprecedented domain sizes (over 100 unit cells), overcoming previous limitations by combining colloidal self-assembly of polystyrene opals for templating and sol-gel barium titanate chemistry for replication.

11:00 INVITED TALK **Nonlinear Quantum Photonics with Engineered Epsilon-Near-Media (ENZ) Nanostructures**

Luca Dal Negro[1], Tornike Shubitidze[1], Smridhi Chawla[1], Riccardo Franchi[1], Marco Ornigotti[2]

[1]Boston University (USA), [2]Tampere University (Finland)

Epsilon-near-zero materials and nanostructures feature highly nonlinear responses that enable novel metamaterials and devices with enhanced bandwidth and sensitivity. We present our work on the design and demonstration of hybrid plasmonic-photonic structures with enhanced optical nonlinearity driven by plasmon-polariton Tamm states and bound states in the continuum (BICs).

11:20 INVITED TALK **Nonlinear Resonant Chiral Metasurfaces for All-Optically Tunable Generation of Classical and Quantum Light**

Maxim Gorkunov, Alena Mamonova

National University of Science and Technology “MISiS” (Russia)

Nonlinear-optical processes in dielectric metasurfaces are drastically enhanced by quasi-bound states in the continuum. Their exceptional spectral and polarization selectivity opens up broad prospects for all-optical control. We discuss nonlinear generation of classical harmonics and quantum-entangled photons continuously tunable by varying the pump wave characteristics.

11:40 **Semiconductor Nanocrystal Optoelectronics for Classical and Quantum Light Generation**

Hilmi Volkan Demir

NTU Singapore (Singapore)

Here we will provide an integrated overview of our recent advances in colloidal quantum well (CQW) materials and devices, spanning their heterostructure designs and integration into metadevices. We will present examples of CQW-based photonic structures and devices for classical and quantum light generation.

11:55 INVITED TALK **III-Nitrides based Integrated Nonlinear Photonics**

Changzheng Sun, Bing Xiong, Jian Wang, Lai Wang, Zhibiao Hao, Yanjun Han, Hongtao Li, Lin Gan, Yi Luo

Tsinghua University (China)

III-nitrides, including AlN and GaN epitaxially grown on sapphire, are an attractive platform for integrated nonlinear photonics. We present our recent work on nonlinear optics in AlN/GaN microresonators and waveguides, including Kerr comb generation, optical parametric oscillation (OPO), stimulated Raman scattering (SRS), and supercontinuum generation (SCG).

12:15 INVITED TALK **Solution-Processed Quantum Light Sources Spanning the Visible to the Infrared**

Jennifer Hollingsworth, Eric G Bowes, Han Htoon

Los Alamos National Laboratory (USA)

By synthetically controlling colloidal semiconductor nanocrystal heterostructure we have made significant progress toward an ideal quantum emitter - on-demand (blinking- and bleaching-free), high-purity, room-temperature, spectrally tunable (blue-visible to telecommunications wavelengths) single-photon sources. More recently, we have engineered brightness (emission speed and directionality), chirality, polarization and photon indistinguishability through advanced nanointegration.

Lunch Break 12:30 - 14:00

3–O27 | Dargan Auditorium | 14:00 - 16:00

SYM2: New trends in nanophotonics and advanced materials

Organized by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

Chaired by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

14:00 INVITED TALK **Photonic cluster state Generation from a Telecom-Emitting Quantum Dot**

Giora Peniakov, Reza Hekmati, Johannes Michl, Mohamed Helal, Moritz Meinecke, Jochen Kaupp, Yorick Reum, Andreas Pfenning, Sven Höfling, Tobias Huber-Loyola

Julius-Maximilians-Universität Würzburg (Germany)

14:20 INVITED TALK **Harnessing Effective Medium Birefringence for Broadband Chirality Generation in Resonant Metasurfaces**

Chloe Doiron, Andrew Kim, Lisa Hackett, Sadhvikas Addamane, Taisuke Ohta, Alexander Cerjan

Sandia National Laboratories (USA)

14:40 INVITED TALK **Beyond the Hype: AI as a Real Tool in Photonics**

Mehdi Keshavarz Hedayati, Amir Ghasemi

Durham University (United Kingdom)

15:00 INVITED TALK **Liquid crystalline polymer photonics for all-optical signal modulation**

Sara Nocentini[1], Daniele Martella[2], Francesco Riboli[2], Camilla Parmeggiani[2], Diederik Wiersma[2]

[1]National Institute of Metrological Research (Italy), [2]European Laboratory for Non-linear Spectroscopy (LENS) (Italy)

15:20 INVITED TALK **Nano-imaging of 2D MoS_2 on gold nanostripes by tip-enhanced photoluminescence**

Antonino Foti[1], Giorgio Zambito[2], Maria Caterina Giordano[2], Khouloud Abid[1], Aleix Guell[3], Razvigor Ossikovski[3], Cristiano D'Andrea[4], Francesco Buatier de Mongeot[2], Pietro Giuseppe Gucciardi[1]

[1]CNR - IPCF Istituto per lo Studio dei Processi Chimico-Fisici (Italy), [2]University of Genova (Italy), [3]Ecole Polytechnique (France), [4]CNR - IFAC (Italy)

15:40 INVITED TALK **Micron Scale Spontaneous Parametric Down Conversion in Periodically Poled Layered Semiconductors**

Leone Di Mauro Villari[1], Andrea Alessandrini[1], Benjamin Braun[2], Simone Paganelli[1], Chiara Trovatello[3], Lee Rozema[2], Andrea Marini[1]

[1]University of L'Aquila (Italy), [2]University of Vienna (Austria), [3]Politecnico di Milano (Italy)

THU

3–O28 | McNabb Theatre | 14:00 - 15:50

SYM2: New trends in nanophotonics and advanced materials

Organized by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han
Chaired by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

14:00 KEYNOTE TALK **Photonic Time Crystals: Transport, Emission, Squeezing**

Bumki Min

KAIST (Korea)

Photonic time crystals provide a unified setting for studying wave transport, light-matter interaction, and quantum fluctuations in driven media. Here we show that seemingly different phenomena in these systems, including transport, emission, and squeezing, can be understood within a common Floquet framework that connects classical and quantum descriptions.

14:30 INVITED TALK **Topology and Applications of Radiation Asymmetry in Vertically-Symmetry-Broken Bilayer Metagratings**

Jian-Wen Dong[1], Zepeng Zhuang[2], Haolong Zeng[1]

[1]Sun Yat-sen University (China), [2]Fudan University (China)

We propose a pseudo-polarization picture to investigate the radiation asymmetry in bilayer metagratings and reveal the hidden topological mechanism in governing the evolution of radiation asymmetry. Furthermore, a complete phase diagram for realizing arbitrary spectrum intensity via radiation asymmetry is derived, demonstrating a pathway to break the intrinsic dispersion locking.

14:50 INVITED TALK **Metasurfaces for Laser Cooling and Trapping of Atoms and Integrated Cold-Atom Platforms**

Thu H. H. Le[1], Ryohei Takei[1], Sota Kagami[2], Akafumi Takamizawa[1], Yuichi Kurashima[1], Taisei Motomura[1]

[1]National Institute of Advanced Industrial Science and Technology (AIST) (Japan), [2]NEC-AIST Quantum Technology Cooperative Research Laboratory (Japan)

This study presents a scheme of using geometric-phase metasurfaces to cool neutral atoms and assembly them into arrays of individually trapped atoms. We exploit the ability of metastructures in controlling the phase, amplitude, and polarization of light with sub-wavelength resolution to generate tailored wavefronts for cooling and trapping of atoms.

15:10 INVITED TALK **Polymer-Based Passive Radiative Cooling Films for Thermal Management**

Emma Spotorno[1], Paola Stagnaro[2], Lucia Conzatti[2], Roberto Utzeri[2], Simona Losio[2], Francesco Bisio[3], Michele Magnozzi[4], Maurizio Canepa[4]

[1]Università Degli Studi di Genova (Italy), [2]CNR-SCITEC (Italy), [3]CNR-SPIN (Italy), [4]Universita degli Studi di Genova (Italy)

Polymer based passive radiative coolers incorporating silica microspheres are investigated to enhance infrared emissivity. Films are fabricated and characterized by infrared spectroscopy. Thermal performance is evaluated through temperature dynamics measurements under controlled conditions. Compared to the pure polymer, microsphere filled samples exhibit enhanced emissivity and improved radiative cooling performance.

15:30 INVITED TALK **Laser Processing of Metallic Surfaces for Radiative Cooling and Autonomous Dew Water Harvesting**

Pablo Pou-Alvarez[1], Anne Mongruel[2], Mónica Fernandez-Arias[3], Antonio Riveiro[3], Daniel Beysens[2], Juan Pou[3]

[1]Universidade de Vigo (Spain), [2]ESPCI Paris - PSL University (France), [3]University of Vigo (Spain)

Laser micropatterning enables aluminum surfaces to achieve high infrared emissivity and superhydrophilic wetting for passive radiative cooling and autonomous dew harvesting. Laser-textured samples reach emissivity up to 0.95, promote stable filmwise condensation, and enhance capillary drainage. Outdoor experiments show up to 70 percent higher dew yield than state-of-the-art commercial condensers

3–O29 | Maharry Theatre | 14:00 - 15:50

SP14: Towards chiral and magnetoelectric quantum electrodynamics

Organized by: Eugene Kamenetskii

Chaired by: Eugene Kamenetskii

14:00 INVITED TALK **Polarizations Underdescribe Vectorial Electromagnetic Waves**

Wei Liu

National University of Defense Technology (China)

We reveal polarizations underdescribe vectorial electromagnetic waves and a complementary perspective of instantaneously field vectors is indispensable. With a joint perspective of polarization fields and instantaneous vector fields, we discover: radiation patterns without dark directions of zero radiation must have both points of circular polarizations and lines of linear polarizations.

14:20 INVITED TALK **Time-Varying Metamaterials for Synthetic Motion**

Satoshi Tomita

Tohoku University (Japan)

We demonstrate time-varying magnetic metamaterials at GHz frequencies using ferromagnetic permalloy (Ni80Fe20). The experimental results are reproduced via numerical simulation, verifying that frequency conversion observed is caused by time modulation of magnetic permeability. The present study opens a door to magnetoelectric metamaterials with synthetic motion for probing quantum vacuum effects.

14:40 KEYNOTE TALK **Electric Dipole Moments via Electromagnetic Duality**

Michael Tobar

The University of Western Australia (Australia)

We present a duality-based framework that maps EDM physics onto Zeeman structure. Stark-induced dipoles are represented through a magnetic current description of microscopic polarization, while intrinsic dipoles remain tied to spin. A Bohr scale dipole unit and pseudo angular momentum organize dipole operators and selection rules.

15:10 INVITED TALK **Inverse Design in Nanophotonics: From Diffusion Models to Time-Domain Adjoint Optimizations**

Mingyu Park[1], Seunghyun Lee[1], Jinseong Bae[1], Donghyun Kim[1], Chanik Kang[1], Kyungmin Kim[1], Donghyun Park[1], Dongjin Seo[2], Soobin Um[3], Haejun Chung[1]

[1]Hanyang University (Korea), [2]Yale University (USA), [3]Kookmin University (Korea)

This talk presents nanophotonic inverse design methods, ranging from physics-guided diffusion models to time domain adjoint optimization. We demonstrate broadband metalenses, multi-functional AR waveguide couplers, and angle-robust CMOS color routers. Emphasis is placed on scalable, fabrication-aware optimization methods for nanophotonic inverse design.

15:30 INVITED TALK **Cavity quantum materials: Cavity-altered superconductivity and beyond**

Michael Sentef

University of Bremen (Germany)

Cavity quantum materials enable control of superconductivity and other collective phases through structured electromagnetic environments. Recent experiments on κ-(BEDT-TTF)2Cu[N(CN)2]Br/hBN show cavity-altered superconductivity without optical driving. More broadly, fluctuation engineering with hyperbolic, multimode, and chiral photonic platforms offers new routes to tune pairing, symmetry, topology, and correlated quantum matter.

3–O30 | Room 3074 | 14:00 - 16:00

SYM1: Hybrid Nanomaterials and Metastructures for Photonics, Sensing and Energy

Organized by: Jérôme Plain, Alexander Govorov, Davy Gérard, Pedro Hernandez Martinez

Chaired by: Jérôme Plain, Alexander Govorov, Davy Gérard, Pedro Hernandez Martinez

14:00 INVITED TALK **Operando Quantification and Mapping of Interfacial Charge-Transfer Efficiency in Hybrid Materials**

Olivier Henrotte

Ludwig-Maximilians-Universität (Germany)

Hybrid semiconductor-metal photocatalysts often show strong activity, yet the fraction of photogenerated carriers that reaches the solid-liquid interface and drives redox chemistry remains poorly quantified. Herein, I will present operando, spatially resolved quantification of interfacial charge-use efficiency across hybrid systems.

14:20 INVITED TALK **Symmetry breaking bu biomolecules in chiral nanophotonics**

Malcolm Kadodwala

University of Glasgow (United Kingdom)

Chiral biomolecules adsorbed on enantiomorphic silicon metasurfaces break mirror symmetry by perturbing electromagnetic boundary conditions. This interfacial coupling forms meta-diastereomers, hybrid states whose linear and circular dichroism depend on combined molecular and structural handedness. The resulting stereostructural sensitivity enables discrimination of protein conformation and antibody-antigen binding without near-field enhancement mechanisms.

14:40 INVITED TALK **Chiral Shape Transformation of Colloidal Silver Nanostructures using Circularly Polarized Light**

Gil Markovich[1], Daniel Feferman[1], Bar Reuven[1], Monika Ghalawat[1], Lucas Besteiro[2], Alexander Govorov[3]

[1]Tel Aviv University (Israel), [2]University of Vigo (Spain), [3]Ohio University (USA)

Localized plasmon induced galvanic replacement reaction in colloidal silver nanostructures was used to transform their shape using circularly polarized light illumination. We break their shape symmetry and obtain chiral nanostructures exhibiting substantial circular dichroism. Electric field induced nanostructure alignment facilitates such symmetry breaking, using circularly or linearly polarized light.

15:00 INVITED TALK **Molecular Bridges in MXenes: Tunable Charge Transport and Chemiresistive Sensing**

Yudhajit Bhattacharjee

Leibniz-Institut für Polymerforschung Dresden (Germany)

Molecular cross-linking enables precise tuning of MXene interlayer spacing and interfaces using homologous diamines. Structural analysis and DFT confirm length-dependent spacing, which governs charge transport by modulating inter-flake coupling. The engineered films show selective chemiresistive responses, particularly to water vapor, demonstrating how molecular design controls transport and sensing in MXenes

15:20 INVITED TALK **Controlling Polaritonic Contributions to Material Properties**

Matthew Sheldon

University of California (USA)

We show that engineered plasmonic cavities can control how light matter coupling contributes to material behavior. Across recent studies, cavity symmetry and optical state density reshape polariton character, radiative energy transport, and thermoelectric response. These results establish photonic design as a route to tuning spectroscopy, chemistry, and charge transport.

15:40 INVITED TALK **Experimental benchmark of AI-Optimized, Reconfigurable, All-Optical Plasmonic Arithmetic and Logic Units**

Amine Khitous, Nicolas Gros, Léo Martin, Florian Dell'Ova, José Valderrama-Botia, Aurélie Bertaux, Ouassila Narsis Labbani, Gérard Colas des Francs, Christophe Nicolle, Alexandre Bouhelier, Dujardin

Université Bourgogne Europe (France)

The recent realization of all-optical 1-bit ALUs in single plasmonic cavities highlights the need for designs supporting higher Boolean complexity. We developed a hybrid AI approach that optimizes cavity geometry and excitation beyond intuitive designs. Here, we experimentally validate AI-designed ALUs and benchmark their performance for future complex optical processors.

3–O31 | Room 4050B | 14:00 - 15:30

GEN11: Plasmonics and Nano-Optics

14:00 **Epsilon-near-zero mode in highly doped GaN thin films**

Julia Ingles-Cerrillo[1], Maria Villanueva-Blanco[1], Benjamin Damilano[2], Stéphane Vézian[2], Miguel Montes Bajo[1], Adrian Hierro[1]

[1]Universidad Politecnica de Madrid (Spain), [2]Université Côte d'Azur (France)

We analyze the plasmonic properties of highly doped GaN thin films on Si, and show that they exhibit low optical losses and frequencies up to 3 μm. We identify the epsilon-near-zero (ENZ) and near-zero-index (NZI) regions and demonstrate the ENZ character of the polaritonic mode near the plasma frequency.

14:15 **Symmetry enhanced modal design for magnetic emission from plasmonic core-satellite resonators**

Joshua Davis[1], Sébastien Bidault[2], Mathieu Mivelle[3], Mona Tréguer-Delapierre[4], Alexandre Baron[5]

[1]Centre de Recherche Paul Pascal (France), [2]Institut Langevin (France), [3]Institut des NanoSciences de Paris (France), [4]ICMCB (France), [5]Institut Universitaire de France (France)

Realistic highly symmetric dielectric-metal core-satellite particles are proposed as promising structures to enhance magnetic dipole emission. Magnetic Purcell factors in excess of 200, low losses, robustness to emitter orientation and placement, are all achieved. Quasi-normal modes enhance the optimization, while mode volumes reveal the physics behind the exceptional structure properties.

14:30 **A Magnetic Monopole Antenna**

Benoît Reynier[1], Xingyu Yang[2], Bruno Gallas[2], Sébastien Bidault[3], Mathieu Mivelle[2]

[1]University of Fribourg (Switzerland), [2]Sorbonne Université (France), [3]PSL University (France)

We propose and demonstrate a photonic nanoantenna that behaves as a radiating magnetic monopole. A half-nanoslit in a semi-infinite gold film creates a single enhanced magnetic pole that radiates efficiently. An effective magnetic charge formalism confirms its monopolar behavior, enabling magnetic-field engineering from visible to GHz frequencies.

14:45

Nanostructured Cd(Zn)O for mid-infrared, near-field enhancement

Miguel Montes Bajo[1], Pablo Ibañez-Romero[1], Javier Yeste[2], Eduardo Martínez Castellano[1], Maria Villanueva-Blanco[1], Andrea C. Illana[1], Fernando Gonzalez-Posada[3], Thierry Taliercio[3], Vicente Muñoz-Sanjosé[2], Adrian Hierro[1]

[1]Universidad Politécnica de Madrid (Spain), [2]Universitat de Valencia (Spain), [3]University of Montpellier (France)

Cd(Zn)O alloys have arguably the best figure of merit for plasmonics in the mid-infrared. However, reports on Cd(Zn)O nanostructures are scarce. This works presents our results on Cd(Zn)O self-assembled nanoparticles and top-down processing of nanostructures with a focus on the near field enhancement.

15:00

Tunable coupling between conducting polymer nanoantennas and epsilon-near-zero thin films

Suraya Kazi, Yulong Duan, Magnus Jonsson

Linköping University (Sweden)

Epsilon-near-zero thin films offer unconventional for optics including nonlinear applications. While metal nanostructures can enhance these effects through strong coupling, their fixed permittivity restricts tunability. By replacing metal with a conducting polymer, we can reversibly tune this coupling. Such hybrid system allows for on-demand optical functionalities for reconfigurable nanophotonics.

15:15

Numerical Simulations of Radiation Pressure and Hot Zones in Plasmonic Porous Nanoparticles

Alejandro Ramos Romero[1], Ana Lilia Gonzalez[2]

[1]Benemerita Universidad Autonoma de Puebla (Mexico), [2]Benemérita Universidad Autónoma de Puebla (Mexico)

We studied the plasmonic response of porous nanoparticles (PNs) using DDA. The hot zones inside and outside the PNs are shown for paraboloidal pores of different depths. We also explored the effect of the medium occupying the pores on the hot zone distribution and radiation pressure.

3–O32 | Room 4050B | 15:30 - 16:10

SP12: Plasmonics and Nanophotonics: Fundamentals and Applications

Organized by: Hong Wei

Chaired by: Hong Wei

15:30 INVITED TALK

Highly-efficient realization of room-temperature strong coupling quantum states

Xue-Hua Wang[1], Wei Li[1], Renming Liu[2]

[1]Sun Yat-sen University (China), [2]Henan University (China)

15:50 INVITED TALK

Twist photonics in 2D materials

Yunyun Dai

Beijing Institute of Technology (China)

3–O33 | Room 3051 | 14:00 - 16:00

SYM5: Phononics and acoustic metamaterials

Organized by: Marco Miniaci, Jensen Li, Jean-Philippe Groby, Vincent Pagneux, Noé Jiménez, Stefano Laureti
Chaired by: Marco Miniaci, Jensen Li, Jean-Philippe Groby, Vincent Pagneux, Noé Jiménez, Stefano Laureti

14:00 INVITED TALK **Color Holographic Imaging Based on an Acoustic Metasurface**

Hong-Gen Chen[1], Hao-Wen Dong[2], Yue-Sheng Wang[1]

[1]Tianjin University (China), [2]Beijing Institute of Technology (China)

An inverse design framework of acoustic metasurfaces for color holographic imaging is established based on the optimization method. The frequency-selective elements with the required phase-shift and transmittance are customized. The layout of the elements is optimized to achieve color holographic imaging. The design is verified through numerical simulations and experiments.

14:20 INVITED TALK **Odd active solids**

Anton Souslov

University of Cambridge (United Kingdom)

This work focuses on novel phenomena and design principles for active materials with so-called odd elastic moduli, which are composed of non-reciprocal springs. Our results point to the design of novel soft machines at the macroscale, and guide the miniaturization of non-reciprocal metamaterials to the colloidal scale.

14:40 INVITED TALK **Phononic Topological Waveguides for Gigahertz Applications**

Monika Devi Koijam[1], Yan Pennec[1], Clivia M. Sotomayor Torres[2], Bahram Djafari-Rouhani[1]

[1]IEMN (France), [2]INL International Iberian Nanotechnology Laboratory (Portugal)

We investigate topological properties of phononic waveguide interfaces, demonstrating robust propagation with negligible backscattering at gigahertz (GHz) frequencies. Forward and backward wavevector components are distinguished using Spatial Fourier transform thus, enabling the evaluation of backscattering and verification of the robustness of the excited topological mode.

15:00 KEYNOTE TALK **Topological Phononic and Photonic Modes in Optomechanic Crystals**

Nouh Krai[1], Hicham Mangach[1], Abdellatif Gueddida[1], Gaëtan Lévêque[1], Yan Pennec[1], Marco Miniaci[2], Bahram Djafari Rouhani[3]

[1]University of Lille (France), [2]Politecnico di Torino (Italy), [3]IEMN (France)

In this work we present a theoretical investigation of structures that simultaneously support localized topological phononic and photonic modes, enabling enhanced optomechanical interactions. Two platforms are considered: (i) a one-dimensional nanobeam engineered within the framework of the Su-Schrieffer-Heeger (SSH) model and (ii) a two-dimensional honeycomb membrane.

15:30 **Quantum Valley Hall-Based Continuously Tunable Phononic Wave Coupler**

Keita Funayama, Kenichi Yatsugi, Hiroya Tanaka, Hideo Iizuka

Toyota Central R&D labs. (Japan)

We experimentally investigate a MEMS-based topological elastic wave coupler using the quantum valley Hall effect. By utilizing frequency-dependent wave localization at bridge boundaries, we achieve continuously tunable transmission coefficients within a bandgap. Furthermore, we successfully demonstrate topologically protected digital data transfer using frequency shift keying modulation within this coupler.

15:45

Helmholtz Resonator-Induced All-Angle Self-Collimation in Square-Lattice Sonic Crystals

David Ramirez Solana, Muhammad Gulzari

University College Dublin (Ireland)

In this work, we demonstrate that Helmholtz resonators (HRs) embedded within square-lattice sonic crystals (SCs) can induce all-angle self-collimation (AASC) of acoustic waves over broad frequency ranges-a phenomenon previously achievable only in rectangular lattices or with elliptical scatterers.

3–O34 | Room 3071 | 14:00 - 16:00

SP23: Nanoscale Phononics : Energy Transport, Light-Matter Coupling, and Emerging Applications

Organized by: Jérémie Margueritat and Aurélien Crut
Chaired by: Jérémie Margueritat and Aurélien Crut

14:00 INVITED TALK

Inelastic light scattering by metallic nanocrystals: symmetry, shape and chirality

Lucien Saviot

CNRS - Université Bourgogne Europe (France)

Inelastic light scattering spectra of metallic nanocrystals depend strongly on shape, elasticity, and environment. To assign the observed features, numerical approaches are presented to calculate the vibrations by taking advantage of the symmetries including for core-shell nanocrystals and to calculate the spectra with application to chiral shapes.

14:20 INVITED TALK

Driving giant monochromatic THz strain waves in metal heterostructures by electronic pressure

Matias Bargheer

University of Potsdam (Germany)

Nanolayered metal superlattices are thermoacoustic metamaterials, in which we drive giant THz strain waves by ultrafast optical excitation across the visible spectrum. Electronic stress at metal-metal interfaces actuates the coherent phonons faster than the electron-phonon coupling time. Ultrafast x-ray diffraction probes phonons way beyond the optical skin depth.

14:40 INVITED TALK

Modeling the Acousto-Plasmonic Coupling: Raman Energy Density Framework

Nicolas Large

University of Texas at San Antonio (USA)

We present a theoretical study of the interactions between conned acoustic vibrations and localized surface plasmons in metallic nanoparticles. We introduce a new physical quantity, the Raman energy density, which is a local quantity that serves as a tool for the study of Raman scattering mediated by plasmons in nanoparticles.

15:00 INVITED TALK

Energy transport and switching in finite disordered networks

Yann Chalopin

CentraleSupelec/CNRS (France)

We examine how disorder and localization shape vibrational energy transport in finite networks. A multiterminal conductance framework reveals sparse communication backbones whose reorganization under small perturbations produces switch like responses without thermodynamic criticality. The same physical picture connects disordered solids, metamaterials, and allosteric proteins.

15:20 INVITED TALK **Energy transfer from hot holes to phonons in photoexcited Germanium: ultrafast heating of Raman-active modes**

Jelena Sjakste, Raja Sen, Nathalie Vast

Ecole Polytechnique (France)

We present our recent collaborative work on coupled hole and phonon dynamics in photoexcited germanium, which was studied by time-resolved Raman spectroscopy as well as by DFT calculations. Our time-dependent model based on DFT data can describe the observed changes in temperature of Raman-active optical modes on picosecond time scale.

15:40 INVITED TALK **Unveiling Acoustic Phonon Dynamics via Time-Resolved Brillouin Spectroscopy of optophononic Resonators**

Carlos Montenegro, Elham Mehdi, Sandeep Sathyan, Edson Rafael Cardozo de Oliveira, Isabelle Sagnes, Martina Morassi, Aristide Lemaître, Norberto Daniel Lanzillotti-Kimura

Université Paris-Saclay (France)

Acoustic phonon engineering in microstructures enables applications in optoelectronics, simulations, and quantum technologies. We develop time-resolved Brillouin spectroscopy of GaAs/AlAs optophononic microresonators using single-photon detectors. Exploiting double optical resonance enhances pump-probe Brillouin scattering and enables efficient filtering of weak signals, providing a platform to investigate confined sub-THz phonon dynamics.

3–O35 | Room 3126 | 14:00 - 14:35

SP22: Surface-Enhanced Raman Scattering: Integrating Theoretical and Experimental Perspectives

Organized by: Chiara Deriu, Tommaso Giovannini, Chiara Cappelli and Laura Fabris

Chaired by: Chiara Deriu, Tommaso Giovannini, Chiara Cappelli and Laura Fabris

14:00 INVITED TALK **Zwitterionic polymeric coacervates as plasmonic boxes for one-pot SERS biomarkers detection in biofluids**

Caterina Dallari[1], Francesca Torrini[1], Luisa Ponticelli[2], Silvia Bagnoli[3], Benedetta Nacmias[3], Valentina Bessi[3], Francesco Saverio Pavone[2], Paolo Arosio[4], Caterina Credi[1]

[1]National Research Council (Italy), [2]European Laboratory for Non-Linear Spectroscopy (LENS) (Italy), [3]University of Florence (Italy), [4]ETH Zürich (Switzerland)

We develop zwitterionic polymeric coacervates as antifouling plasmonic boxes for one-pot SERS sensing in complex biofluids. Local enrichment of selected targets and Raman-active gold nanoparticles increase signal-to-noise ratio of at least 10-fold, enabling limits of detection below nM range in plasma and cerebrospinal fluid, as demonstrated with the amyloid-beta 1-42.

14:20 **Theoretical Investigation of Vibrational Imaging Induced by Electronically Forbidden Transitionsin Tip-Enhanced Raman Scattering**

Mamoru Tamura[1], Hiroyuki Ikagawa[2], Hajime Ishihara[3]

[1]Kwansei Gakuin University (Japan), [2]The University of Osaka (Japan), [3]Ritsumeikan University (Japan)

We developed a theoretical framework for visualizing vibrational modes in tip-enhanced Raman scattering based on resonance Raman processes. In particular, by exploiting electronically forbidden excitations, we showed that the resulting spatial distribution of vibrational signals can differ fundamentally from that obtained via conventional allowed transitions.

3–O36 | Room 3126 | 14:35 - 15:40

SP3: New Advances in Metamaterials and Their Functional Applications

Organized by: Weiren Zhu, Zhenfei Li and Jin Zhang

Chaired by: Weiren Zhu, Zhenfei Li and Jin Zhang

14:35

Geometric Tailoring of Anisotropic Metamaterials for Elastic Wave Steering

Jianlong Chen, Dong Yan, Chao Wan, Guangyan Liu, Kai Zhang

Beijing Institute of Technology (China)

We propose a geometric design methodology for architected microstructures achieving highly anisotropic stiffness without altering material composition. This enables decoupled control of axial and shear moduli, facilitating directional wave control, mode conversion, and energy confinement. An annular metastructure demonstrates superior azimuthal wave trapping compared to isotropic counterparts.

14:50 INVITED TALK

Direct tensor processing with coherent light

Yufeng Zhang[1], Kaizhi Wang[2], Zhipei Sun[1], Xuhan Guo[2]

[1]Aalto University (Finland), [2]Aalto University (China)

We propose a parallel optical matrix-matrix multiplication scheme implemented using a single propagation of coherent light, and extend it to tensor-matrix multiplication via wavelength multiplexing. Building on this framework, we investigate its application in different optical neural network architectures and its potential deployment in metasurface devices.

15:10

Diffractive Optical Elements Empowered Spectropolarimetry via Single-Shot Imaging

Bing Lei, Jianyu Weng, Xiaoyu Cao, Zong Xiang, Xinyu Ma, Jie Li, Zhe Xie, Wei Wang, Jianhua Shi

National University of Defense Technology (China)

We propose a novel broadband polarimeter by employing a metasurface-based diffractive optical element and a vortex retarder to convert polychromatic waves into structured vector beams. Experimental validation demonstrates exceptional measurement accuracy, with RMS errors below 1% for each Stokes component across the visible range (400-700 nm).

15:25

Deep-Subwavelength Spoof Localized Surface Plasmons for Enhanced Sensing

Xuanru Zhang

Southeast University (China)

This talk reports the path from the fundamental physics of SLSP sensing to integrated systems. The combination of deep-subwavelength SLSPs and non-Hermitian exceptional-point physics creates a powerful sensing enhancement scheme. The ultracompact SLSP sensing system envisions the way for portable and robust equipment for biomedical diagnostics and environmental monitoring.

3–O37 | Room 4047 | 14:00 - 16:00

SYM4: Chirality, magnetism, and magnetoelectricity: Separate phenomena and joint effects in metamaterial structures

Organized by: Eugene Kamenetskii

Chaired by: Eugene Kamenetskii

14:00 INVITED TALK

Nonreciprocal nonlinear magneto-optical metasurfaces

Jialong Wang, Dongchen Ma, Yi Shuai, Jun Qin, Qing Zhang, Lei Bi

University of Electronic Science and Technology of China (China)

We report nonreciprocal second harmonic generation in a-Si/Ce:YIG based all-dielectric magneto-optical metasurfaces. Despite of negligible nonreciprocity at the fundamental wavelength, large SHG intensity contrast up to 3.6 times was observed for forward and backward propagation, attributed to the nonreciprocal magneto-optical second order susceptibility of Ce:YIG boosted by guided mode resonance.

14:20 INVITED TALK **Bottom-Up Engineered Hybrid Plasmonic Broken L-Shaped Metamaterial Platforms Reveal Broadband Enhanced Optical Chirality**

Ufuk Kilic[1], Raymond Smith[1], Shawn Wimer[1], Yousra Traouli[1], Sema G. Kilic[1], Eva Schubert[1], Christos Argyropoulos[2], Mathias Schubert[1]

[1]University of Nebraska Lincoln (USA), [2]University Park (USA)

We experimentally demonstrate and theoretically verify bottom-up engineered hybrid plasmonic broken L-shaped metamaterial platforms exhibiting broadband enhanced optical chirality. Two-step glancing angle deposition enables robust control of structural handedness. The resulting hybrid Si-Ag nanocolumnar architectures support strong spin-dependent plasmonic coupling and enhanced chiral near fields spanning the near-infrared to ultraviolet.

14:40 INVITED TALK **Microwave Coherent Storage Based on the Cavity Electromechanical System**

Tiefu Li

Tsinghua University (China)

We demonstrate coherent microwave signal storage in a cavity electromechanical system. 55ms storage time has been experimentally realized. This result shows potential of cavity electromechanical systems with high-quality factors for the application in quantum storage devices for quantum computers.

15:00 INVITED TALK **Theory of Electric Polarization in Inhomogeneous Crystals Based on the Quantum Transport Equation**

Shuichi Murakami[1], Yuta Suzuki[2], Nobuhiro Arai[2], Manato Fujimoto[1], Yang Gao[3], Di Xiao[4]

[1]University of Tokyo (Japan), [2]Institute of Science Tokyo (Japan), [3]University of Science and Technology of China (China), [4]Univeristy of Washington (USA)

We study the polarization in a crystal induced by a perturbation linear in the coordinates. We establish the quantum transport equation for insulators with slow modulations in space and time, and calculate current and charge densities. From this result, we obtain the formula for the electric polarization and orbital magnetization.

15:20 INVITED TALK **Quantum materials in chiral cavities**

Ceren Dag

Harvard University (USA)

I review the recent advances in the field of chiral cavity quantum materials and present a perspective on the future prospects. Chiral cavities have recently been fabricated, opening the doors to test theoretical predictions. This perspective elaborates on some of the current theoretical challenges in the field.

15:40 INVITED TALK **Magnetic Helicity of Chiral Molecules**

Ivanina Ilieva, Christof Holzer, Carsten Rockstuhl, Ivan Fernandez-Corbaton

Karlsruhe Institute of Technology (Germany)

Magnetic helicity, stored in static matter, is the counterpart to the electromagnetic helicity of free radiation fields. Here, we study the magnetic helicity of different chiral molecules. We extend the current formalism, which deals with the magnetization coming from electron spin, to include the stationary currents in the system.

3–O38 | Room 4050A | 14:00 - 16:00

SYM3: Advanced passive and active metasurfaces and zero-index materials

Organized by: Howard Lee, Pin Chieh Wu, Wen-Hui (Sophia) Cheng
Chaired by: Howard Lee, Pin Chieh Wu, Wen-Hui (Sophia) Cheng

14:00 INVITED TALK **Harnessing Epsilon-Near-Zero Effects: Fiber Lasers, Thermo-Optic Dynamics, and Beyond**
Qian Li

Peking University (China)
A comprehensive overview of our research endeavors on ENZ photonics is presented. Specifically, we will discuss the photonic system through the demonstration of a fiber laser cavity incorporating indium tin oxide nanolayers and our investigations on thermo-optic ENZ effects in indium tin oxide nanolayers.

14:20 INVITED TALK **Deciphering Chirality via Super-Resolution Near Field Chiral Absorption**
Yang Zhao

University of Illinois Urbana-Champaign (USA)
Recent advances in decoupled optical force microscopy instrumentation and signal decomposition will be discussed, highlighting improvements in measurement accuracy, the ability to resolve ultrafast thermomechanical dynamics, and enhanced spatial resolution beyond that achievable with conventional scanning probe techniques.

14:40 INVITED TALK **Probing Molecular Dynamics in Optical Nanocavities: Decoding Ensemble Signatures**
Hector Pascual Herrero, Joni Spencer, Alvine Yu, Elizabeth M. Y. Lee, Regina Ragan

University of California (USA)
Spectral signatures from molecular ensembles in optical nanocavities are analyzed using a reaction-informed computational framework which integrates density functional theory-based Raman calculations and ab initio molecular dynamics. Observed vibrational spectra and simulated molecular trajectories resolve ligand dynamics in nanocavities; these systems can be used to decode signals from biological systems.

15:00 INVITED TALK **Unconventional Semiconductors forSwitchable Photonics**
Marina Leite

University of California Davis (USA)
We demonstrate reversible and multi-state changes in mid-infrared (MIR) transmission of inorganic halide perovskites with opposite polarity under light and heat. This opposite response results from a polaron-like lattice distortion under illumination (reducing transmission), and from the material's negative thermo-optic coefficient combined with lattice expansion from heat (increasing transmission).

15:20 INVITED TALK **Can Nanostructures and Metasurfaces Affect the Casimir Force?**
Jeremy Munday

University of California (USA)
The Casimir force arises from quantum electromagnetic fluctuations and depends on the broadband optical response of interacting materials. This talk examines whether nanostructures-often designed for narrowband optical control-can meaningfully modify Casimir interactions. Experiments with engineered nanostructures illustrate how geometry and broadband electromagnetic response jointly determine fluctuation-induced forces.

15:40 INVITED TALK **Confinement-Induced Nonlocality and Optical Nonlinearity in Transdimensional Plasmonics**

Igor Bondarev

North Carolina Central University (USA)

The latest experimental and theoretical studies will be reviewed for the electromagnetic properties of the new emerging plasmonic transdimensional material platform, including the optical nonlinearity enhancement due to the confinement-induced EM response nonlocality in the epsilon-near-zero region.

3–O39 | Room 5025 | 14:00 - 15:55

SP7: Enhanced light-matter interactions: fundamentals and sensing applications

Organized by: Guillermo Acuna, Peter Zijlstra and Hiroshi Sugimoto

Chaired by: Guillermo Acuna, Peter Zijlstra and Hiroshi Sugimoto

14:00 INVITED TALK **Optically Enhancing or Detecting Single Molecules on DNA Origamis**

Sebastien Bidault

Institut Langevin - CNRS (France)

We demonstrate how plasmonic dimers on DNA origamis are a versatile platform to sense or detect single molecules. In particular, we develop a colorimetric biosensor for single DNA strands with femtomolar sensitivity and single-mutation specificity. We also demonstrate bright single photon sources with picosecond lifetimes at room temperature.

14:20 INVITED TALK **Modelling the Purcell Enhancement on Nonlocal Metasurfaces**

Joshua T. Y. Tse[1], Taisuke Enomoto[2], Shunsuke Murai[1], Katsuhisa Tanaka[2]

[1]Osaka Metropolitan University (Japan), [2]Kyoto University (Japan)

Spontaneous emission of photons can be enhanced with metasurfaces. Yet, accurately predicting the enhancement factor has presented a challenge for empirical systems. We proposed a versatile analytical model that describes the Purcell effect of metasurfaces coupled with a photoluminescence thin film with spectral parameters.

14:40 INVITED TALK **Structural colours using transition metal dichalcogenide nanostructures**

Ida Juliane Bundgaard, Yonas Lebsir, Catarina Ferreira, Christos Tserkezis

University of Southern Denmark (Denmark)

We introduce transiton metal-dichalcogenide (TMD) nanostructures as a promising platform for the realization of structural colours. Processing of semianalytically calculated reflectance spectra of TMD nanosphere arrays shows a wide range of colours, which are obtained simply through tailoring the radius and separation of spheres in the array.

15:00 INVITED TALK **Probing protein dynamics using plasmonic metasurface**

Oluwafemi S. Ojambati

University of Twente (The Netherlands)

Plasmonic metasurface enhances optical fields in sub-diffraction-limited mode volume. Here, we harness the enhanced optical field to probe dynamics of freely diffusing proteins above a plasmonic metasurface. The beauty of our approach is that it also enables label-free spectroscopy of freely diffusing single proteins, elucidating parameters that modify the dynamics.

15:20 INVITED TALK **Tip-Enhanced Sum Frequency Generation: Nonlinear Molecular Responses and Electrophotonic Effects Observed beyond the Diffraction Limit**

Atsunori Sakurai, Shota Takahashi, Tatsuto Mochizuki, Toshiki Sugimoto

Institute for Molecular Science (Japan)

Tip-enhanced sum-frequency generation (TE-SFG) beyond the diffraction limit is achieved using a scanning tunneling microscope (STM), enabling nanoscale vibrational detection with spatial resolution smaller than 30 nm, molecular orientation analysis, and >107 signal enhancement. Furthermore, giant signal enhancement was observed under an applied bias between the STM tip and substrate.

15:40 **Few-molecule nonlinear vibrational spectroscopy with dual-resonant plasmonic nanocavities**

Christophe Galland[1], Zhiyuan Xie[1], Nobuaki Oyamada[1], Francesco Ciccarello[1], Wen Chen[2]

[1]EPFL (Switzerland), [2]East China Normal University (China)

We implement high-resolution coherent nonlinear vibrational sum- and difference-frequency spectroscopy from 860 to 1670 cm-1 on dual-resonant antennas under ambient conditions, with commercial continuous-wave lasers. The spectra exhibit interference between resonant (vibrational) and nonresonant (electronic) contributions to the second-order nonlinear response, previously accessible only under pulsed excitation.

3–O40 | Room 5039 | 14:00 - 16:00

SYM6: Advanced Techniques for Computational Electromagnetics

Organized by: Maha Ben Rhouma
Chaired by: Maha Ben Rhouma

14:00 INVITED TALK **Machine-Learning Assisted Design of Tunable Metasurfaces**

Alexander Wolff, Lukas Mueller, Janis Krieger, Lars Franke, Ralf Stemler, Steffen Klingel, Marco Rahm

RPTU Kaiserslautern-Landau (Germany)

We present three machine-learning-assisted design strategies for tunable metasurfaces. We use a neural network to optimize a metasurface for dual-frequency beam steering, employ transfer learning for reduction of simulation costs for composite unit cells and use a physics-informed model to design a metasurface for independent amplitude and phase control.

14:20 INVITED TALK **Cooperative absorption in random particulate media: achieving spectral selectivity**

Cédric Blanchard[1], Cristina Gila[2], Timothée Guerra[1], Olivier Rozenbaum[1]

[1]Universite d'Orléans (France), [2]Universidad de Oviedo (Spain)

We present a predictive framework for engineering optical functionalities in disordered systems using a T-matrix multiple-scattering approach. Cooperative many-body interactions enable near-perfect absorption at a target frequency with suppressed off-resonant absorption, turning disorder into a controllable design parameter.

14:40 INVITED TALK **Deep Learning-Enhanced Dual-Comb Ghost Imaging with Minimally Invasive Probes**

Myoung-Gyun Suh

NTT Research (USA)

We present a dual-comb ghost imaging approach using wavelength-multiplexed speckle patterns delivered through a single-core fiber and detected by a single-pixel sensor for snapshot imaging without scanning. A transformer-based reconstruction enables high-fidelity, video-rate imaging with minimal hardware, supporting compact, minimally invasive optical probes.

15:00 INVITED TALK **Nonreciprocal Surface Plasmons in a Metasurface Formed by Magnetically Biased Plasmonic Cylinders**

Ioannis Katsantonis[1], Costas Valagiannopoulos[2], Anna Tasolamprou[3]

[1]FORTH (Greece), [2]National Technical University of Athens (Greece), [3]National and Kapodistrian University of Athens (Greece)

We study a metasurface formed by magnetically biased plasmonic cylinders supporting nonreciprocal magneto-plasmonic modes. Using a magnetized Drude model and cylindrical wave analysis, the electromagnetic response of the structure is investigated. The metasurface exhibits asymmetric dispersion and directional surface plasmon propagation, enabling tunable nonreciprocal behavior.

15:20 INVITED TALK **Photoluminescence of Pyrolytic Carbon Dots on Plasmonic Metasurfaces**

Pierre Berini

University of Ottawa (Canada)

The decay of plasmons into energetic carriers in metals and their harvesting leads to new reaction pathways in photochemical processes on the surface. We observe visible enhanced photoluminescence from carbon dots on Ag gratings catalysed and pumped by plasmons. We emphasize computational modelling aspects that capture the principal observed phenomena.

15:40 INVITED TALK **Advancing Machine Learning-Assisted Quantum Photonic Device Design and Optimization**

Alexander V. Kildishev, Vladimir M. Shalaev, Alexandra Boltasseva, Yuheng Chen, Vaishnavi Iyer, Pranshu Maan

Purdue University (USA)

Machine learning provides a unified framework for high-dimensional quantum coherence forecasting and photonic design. We use anticipatory modeling to reduce spectral diffusion in solid-state emitters, minimizing spectral shifts. With advances in surrogate-based inverse design for rapid co-optimization of emitter-circuit interfaces, we lay the groundwork for robust, multiplexed quantum networks.

3–O41 | Room 5052 | 14:00 - 16:00

SYM2: New trends in nanophotonics and advanced materials

Organized by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han
Chaired by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

14:00 INVITED TALK **Van der Waals hybrid photonic devices**

Yuichiro Kato

RIKEN (Japan)

Two-dimensional layered materials offer unique optical properties and seamless integration with nanophotonic structures through van der Waals interactions. By hybridizing these materials with optical cavities, versatile and reconfigurable photonic devices with enhanced functionality can be realized, enabling new opportunities for nanoscale light-matter interaction and integrated photonics.

14:20 INVITED TALK **Tunable resonances in doubly anisotropic, high-index MoS2 nanoplatelets**

Bingying You, Tom Sistermans, Alberto Curto

Ghent University (Belgium)

Optical anisotropy plays a crucial role in the manipulation of light. Transition metal dichalcogenides possess both high refractive index and high birefringence, opening opportunities to tailor Mie resonances. Here, we investigate optical resonances in MoS2 nanoplatelets with both geometrical and refractive index anisotropies to control light scattering.

14:40 INVITED TALK

Near field imaging and spectroscopy of complex stacking of semiconductors

Laure Tailpied[1], Clément Gureghian[2], Frederic Fossard[3], Jean-Sebastien Mérot[3], Fernando Gonzalez-Posada-Flores[4], Jean-Baptiste Rodriguez[4], Gregory Vincent[3], Thierry Taliercio[4], Baptiste Fix[1]

[1]ONERA (France), [2]Sorbonne Université (France), [3]Université Paris Saclay (France), [4]Université de Montpellier (France)

Improvement of nanostructured infrared photodetectors based on increasingly complex semiconductors epitaxies requires feedback on the optical parameters of each layer. Here, SNOM imaging and spectroscopy on a cleaved facet is used to characterize the cut-off frequency of type II superlattice, the doping level of heavily doped semiconductors and surface plasmons.

15:00 INVITED TALK

All-Solid Multicore Fibre Probe for Background-Free Raman Spectroscopy

Stephanos Yerolatsitis[1], Thomas Wright[1], András Kufcsák[2], Alexandra Adams[3], Tom Quinn[3], Sohan Seth[3], Kevin Dhaliwal[3], James Stone[1]

[1]University of Bath (United Kingdom), [2]Heriot-Watt University (United Kingdom), [3]University of Edinburgh (United Kingdom)

We demonstrate a sub-millimetre all-solid multicore fibre probe for Raman Spectroscopy. By utilising a multicore fibre design and a differential dopant approach, we were able to suppress inter-core crosstalk and therefore reduce the generation of Silica Raman background. This fibre probe enables fluorescence-free Raman spectra reconstruction of highly fluorescence samples.

15:20 INVITED TALK

Multilevel Spatial Programming of Photonic Devices with Phase-Change Materials

Chirine Saadi[1], Capucine Laprais[1], Fouad Bentata[1], Xavier Letartre[1], Guillaume Saint-Girons[1], Patrice Genevet[2], Nicolas Baboux[1], Lotfi Berguiga[1], Sébastien Cueff[1], Ecole Centrale de Lyon[1]

[1]STMicroelectronics (France), [2]Colorado School of Mines (USA)

We exploit phase-change materials such as GST and Sb2S3 to propose and demonstrate original programmable and multilevel functionalities in integrated photonic devices such as photonic circuits and metasurfaces.

15:40 INVITED TALK

Topological Eutectic Heterostructure Plasmonic Metasurfaces for THz Lasing and Amplification

Konstantinos Kouderis[1], Anousha Khamsavi[1], Kingshuk Bandopadhyay[1], Hamid Reza Darabian[1], Dorota A. Pawlak[1], Chao Tang[2], Victor Ryzhii[2], Taiichi Otsuji[1]

[1]ENSEMBLE3 (Poland), [2]Tohoku University (Japan)

A topological Dirac semimetal/semiconductor eutectic lamellar heterostructure is introduced to a grating-gate planar transistor as a new 'striped' channel material to configure a two-dimensional active plasmonic metasurface. It effectively suppresses the oblique plasmon modes, killers for instability-driven terahertz lasing and amplification. Its novel concept, physics, and device implementation are addressed.

Coffee Break 16:00 - 16:40

3–P2 | **Business School Concourse** | **16:00 - 16:30**

Poster Session VI

P1

Controlling topologically-protected edge states via synthetic space manipulation in photonic crystals

Bartosz Janaszek[1], Tomasz Śmiarowski[2], Anna Tyszka-Zawadzka[1], Paweł Szczepański[1]

[1]Warsaw University of Technology (Poland), [2]National Institute of Telecommunications (Poland)

We propose a design framework for controlling topologically protected edge states, illustrated by Tamm Plasmon Polaritons in 1D planar photonic crystals. By emulating Weyl points in synthetic-parameter space, robust interface modes can be engineered on demand. This strategy opens up new pathways toward resilient, multifunctional photonic platforms.

P2

Phase-Change Extraordinary Optical Transmission Metasurfaces for Reconfigurable Spatial Filtering in the Mid-Infrared

Stuart Kendall, Joe Shields, Joe Pady, Carlota Ruiz de Galarreta, Jacopo Bertolotti, C. David Wright

University of Exeter (United Kingdom)

Reconfigurable spatial filters comprising phase-change materials integrated into extraordinary optical transmission metasurfaces are designed and fabricated. Near-zero transmission in the crystalline state coupled with high amorphous transmission deliver spatial filters that can be written and re-written. Example functionalities of reconfigurable high and low-pass spatial filters are demonstrated.

P3

Structural and Electronic Transitions in Pure and Au-Decorated VO2 Nanoporous Thin Films under Thermal and Photothermal Excitations

Claudia Pernilla Hallqvist[1], Charlotte Lea Oceane Nani[1], Edoardo Casadei[1], Cristina Mancarella[1], Francesco Bisio[2], Michele Magnozzi[3], Maurizio Canepa[3], Andrea Li Bassi[1]

[1]Politecnico di Milano (Italy), [2]CNR-SPIN Genova (Italy), [3]Università di Genova (Italy)

Vanadium dioxide (VO2) nanoporous films and Au-VO2 nanocomposites were fabricated by pulsed laser deposition. The nanoporous VO2 shows anisotropic optical properties and a thermally driven structural-phase and insulator-to-metal transition. Incorporating Au nanoparticles enables photothermal activation of the structural-phase transition under continuouswave illumination, demonstrating a pathway toward switchable VO2based photonic devices.

P4

Separating, purifying and decoding elastic waves by mimicking a cochlea on a thin plate

Yun Shi[1], Meiying Zhao[1], Yongquan Liu[2], Bing Li[1]

[1]Northwestern Polytechnical University (China), [2]Xi'an Jiaotong University (China)

Realizing cochlear functions for elastic waves in solids holds great promise, but related research has not yet been reported. We experimentally realize an elastic cochlea on a plate, achieving broadband flexural wave harvesting (5.8-21.8 kHz), high-Q sensing, and frequency demultiplexing for advanced energy harvesting and signal processing in solids.

P5

300-μm Gaussian Beams from Meta-Grating Couplers for Ultra-Stable Lasers

Max Schittenhelm, Mika Gaedtke, Steffen Sauer, Sebastian Häfner, Stefanie Kroker

TU Braunschweig (Germany)

We present a framework for interfacing an ultrastable laser resonator with photonic integrated circuits via low-noise resonator mirrors and show initial simulation and experimental results of large-area grating couplers with near-Gaussian beam diameters of 300 μm at λ = 1.55 μm on an SOI-platform.

P6

Equivalent Circuit Analysis of a Time-Varying Edge-Coupled Split-Ring Resonator

Theocharis Manassis, Guido Valerio, Theodosios Karamanos

Sorbonne Université (France)

This paper presents an equivalent circuit model of a time-varying Edge-Coupled Split-Ring Resonator. Time modulation is imposed by a varactor diode connected between the two rings of the scatterer and enables the generation of scattered wave harmonics, as predicted by the provided circuit model.

P7

Elimination of Beam Walk-off in Second Harmonic Generation

Edvinas Aleksandravičius[1], Darius Gailevičius[1], Kęstutis Staliūnas[2]

[1]Vilnius University (Lithuania), [2]Universitat Politècnica de Catalunya (Spain)

We show that periodic modulation of the refractive index of a nonlinear material on the wavelength scale can modify the angular dispersion of the interacting waves. This modification improves the phase-matching conditions and can significantly reduce beam walk-off. As a result, the efficiency of second-harmonic generation can be enhanced.

P8

Temporal Interfaces in a Kretschmann-Raether Geometry

Harry Donegan, Miraculous Joseph Bhaseen, Francisco Rodríguez-Fortuño, Anatoly Zayats

King's College London (United Kingdom)

We explore the conversion of a surface plasmon polariton (SPP) into propagating radiation due to a time-varying plasma frequency. We consider a temporal interface using integral transforms and finite-difference-time-domain (FDTD) simulations to benchmark the results. We apply these results to an instantaneous frequency shift in indium tin oxide.

P9

Zero-angle polarizers based on periodically structured dielectric thin films

Julianija Nikitina[1], Rytis Buzelis[1], Kestutis Staliunas[2], Lina Grineviciute[1]

[1]Center For Physical Sciences ant Technology (Lithuania), [2]ICREA (Lithuania)

Zero angle of incidence polarizers in reflection/transmission based on Fano resonances in periodically nanostructured dielectric thin films are analyzed. Its main optical characteristics for 1064 nm wavelength are investigated in the context of laser applications, including laser damage evaluation with a discussion of resonance-related electric field distribution.

P10

Reverse Design of Reflective Acoustic Metasurfaces Based on Intelligent Algorithms

Mengqi Jiang, Haoxiang Li, Biao Wang, Jiaming Zhang, Jie Hu

Nanjing Forestry University (China)

This paper proposes a reverse design method based on A, and employs a pair of coiling-up spatial structures with a π reflection phase difference as binary (0/1) coding elements. Accordingly, the phase distribution of the metasurface is directly mapped onto a binary sequence and "on-demand design" is realized.

P11

Optimising Microwave Cavities for nonzero Helicity with Machine Learning

Emma Paterson, Jeremy Bourhill, Maxim Goryachev

University of Western Australia (Australia)

We present a machine-learning-driven inverse design framework that replaces heuristic cavity design with boundary-shape optimisation to engineer three-dimensional microwave resonators supporting large electromagnetic helicity. This approach systematically explores complex parameter spaces, revealing non-intuitive high-helicity geometries, and is demonstrated on smooth, edge-free cavity families using two gradient-free optimisation strategies.

P12

Automated SEM-Based Metrology for Wafer-Scale Characterization of Nanostructured Metamaterials

Naga Anirudh Peyyety[1], E. Butzen[2], I. Harder[2], T. Waldsauer[1], S. Bauerdick[1], K. Gieb[1]

[1]GenISys GmbH (Germany), [2]Max Planck Institute for Science of Light (Germany)

We present an automated scanning electron microscopy workflow for characterization of nanostructured metamaterials. The approach combines layout-based navigation, robust alignment, and autofocus to enable reproducible wafer-scale measurements. Measurements demonstrate high throughput acquisition, consistent critical dimension (CD) extraction, and statistical analysis capabilities suitable for metamaterial design, fabrication optimization, and process monitoring.

P13

Mode and Pitch Multiplexed Guided-Mode Resonance Active Metasurfaces, for Multi-Wavelength Control

Julie Belleville, Martin Thomaschewski, Harry Atwater

Caltech (USA)

We report designs for multi-wavelength operation of active metasurfaces, based on guided-mode resonances on tunable electro-optic thin films. We simulate diffractive switching efficiencies of 60% at 625 and 545 nm for titanium dioxide multi-mode waveguides on thin-film barium titanate and demonstrate three-wavelength control through two superposed perturbation pitches.

P14

Floquet-Engineered Switching of Dissipation between Driven and Undriven States

Hidemasa Yamane

Osaka Research Institute of Industrial Science and Technology (Japan)

We study two atoms coupled to a continuum and analytically reveal a mechanism for selective dissipation induced by external driving. By tuning only the driving parameters, an undriven atom can decay remotely while the driven atom remains long-lived. Numerical simulations demonstrate controllable switching between dissipation and suppression.

P15

Polarisation Conversion in Bulk Hyperbolic Crystals

Katherine Stevens, Rebecca Craig, Mark Cunningham, Sonja Franke-Arnold, Rair Macedo

University of Glasgow (United Kingdom)

We investigate polarisation control of an infrared beam reflected off the surface of a hyperbolic crystal. We illustrate the mechanism using calcite as our example material. We calculate the reflection coefficients using the 4x4 transfer matrix method, and from this obtain the Stokes vector which characterises the reflected beam.

P16

Towards a BIC-based optomechanical polarization modulator

Chiara Brugnoni[1], Giuseppe Emanuele Lio[1], Grazia Salerno[1], Simone Zanotto[2], Alessandro Tredicucci[1], Alessandro Pitanti[1]

[1]University of Pisa (Italy), [2]CNR-Nanoscience Institute Pisa (Italy)

This work proposes a polarization modulator in theinfrared range, exploiting optomechanical interaction of Bound-states-In-the-Continuum (BICs) electromagnetic resonances andvibrational modes in MicroElectroMechanical Systems (MEMS).BICs topological nature, forming polarization vortices in thereciprocal space, enables rapid polarization switching throughcontrolled mechanical tilting of the device.

P17

Design of a Porous PolydimethylsiloxaneMetamaterial for Passive Daytime Radiative Cooling

Nigar Namazzade, Alexandre Baron

University of Bordeaux (France)

Passive daytime radiative cooling is studied usingporous polydimethylsiloxane with spherical air voids. Dependentscattering Monte Carlo simulations and full wave parameterretrieval quantify solar reflectance and thermal emissivity. Athigh porosity, an optimal void radius near 1.4 micrometersmaximizes net cooling and enables temperature drops up to 6Kat ambient temperature.

P18

Parametric studies to approximate configurations optimal for asymmetrical responses

Miklós Waldhauser, Ákos Sebők-Papp, Dávid Vass, András Szenes, Balázs Bánhelyi, Mária Csete

University of Szeged (Hungary)

Multilayer metamaterial, consisting of periodic Babinet-complementary miniarray patterns in convex-concave-convex layers, was subject of parametric studies, by varying the configuration and topological parameters to achieve better Faraday-isolator properties. Wavelength dependent azimuthal orientation uncovers trade-off between nonreciprocal rotation and asymmetric transmission. Appropriate combination of crucial topological properties results in improvement.

P19

Wavelength-Guided Plasmonic Control of CO_2 Reduction: From Model Nanostructures to Gold Dendritic Electrodes

Anjalie Edirisooriya[1], Manuka Suriyage[1], Zelio Fusco[1], Ning Lyu[2], Shenyou Zhao[3], Christin David[4], Fiona Beck[1]

[1]Australian National University (Australia), [2]Friedrich-Schiller-Universität Jena (Germany), [3]Xi'an University of Posts and Telecommunications (China), [4]University of Applied Sciences Landshut (Germany)

Selective CO_2 reduction to multi-carbon products requires localized excitation and repeated electron transfer. We present a wavelength-guided plasmonic strategy linking controlled optical modes in gold nanostructures to scalable gold dendritic electrodes. Structure-optical relationships identified in simplified geometries are translated to complex morphologies, enabling optical control of CO_2 reduction processes.

P20

Meta-lenses phase characterization by phase retrieval

Jialuo Cheng[1], Bowen Liu[2], Yin Zhou[3], Lei Shi[2], Zihan Geng[3], Mu Ku Chen[1]

[1]City University of Hong Kong (Hong Kong), [2]Fudan University (China), [3]Tsinghua University (China)

A robust multi-distance phase retrieval system based on optical field scanning is presented to characterize metalens phase modulation. Validated in the near-infrared spectrum, our method analyzes focal length, aberrations, and defect impacts. We also demonstrate phase variation across different media (air vs. ethanol), offering a straightforward tool for metalens optimization.

P21

Elasticity-Driven Wrinkled PDMS Structures for Tailoring Optical Properties Across the Hyperspectral Range

Urszula Malecka, Patrycja Wytrych, Tomasz Stefaniuk

University of Warsaw (Poland)

We present a controllable and scalable approach for fabricating tunable photonic structures based on patterned PDMS and angle-dependent PVD deposition. The optical response of structures can be tailored across the hyperspectral range by applying mechanical strain after fabrication. This strategy enables precise control of properties and supports versatile optical devices.

P22

Ultrasonic Needle Beam Generation in Water Using a Complex-Amplitude-Encoded Polymer Trapped-Air Acoustic Mirror

Hafiz Muhammad Imran[1], Marco Ricci[2], Rocco Zito[1], Stefano Laureti[2]

[1]University of Calabria (Italy), [2]Sapienza Università di Roma (Italy)

This research presents a complex amplitude encoded reflective acoustic mirror integrating super-unit phase encoding with parabolic geometry to generate ultrasonic needle beams in water. The PLA mirror with trapped air combines phase modulation and geometric focusing, enabling extended depth of focus and controlled beam shaping for underwater imaging.

P23

Optical properties of Ge metasurfaces realized on a Si photonics platform for wavelength-selective absorption

Paul Oleynik[1], Wei-Han Chen[2], Jon Schlipf[2], Oliver Skibitzki[2], Christian Wenger[2], Inga Anita Fischer[1]

[1]BTU Cottbus-Senftenberg (Germany), [2]IHP- Leibniz Institute for High Performance Microelectronics (Germany)

We report optical characterization results of complementary-metal-oxide-semiconductor compatible Ge metasurfaces fabricated on 200 mm SOI wafers. Optical properties of our metasurfaces are geometry-dependent and exhibit a large degree of homogeneity across the wafer. The metasurfaces will be used in wavelength-dependent photodetectors directly integrated on the Si photonics platform.

P24

Cd(Zn)O gap antennas on polar substrates

Maria Villanueva-Blanco[1], Pablo Ibañez-Romero[1], Julia Ingles-Cerrillo[1], Javier Yeste[2], Vicente Muñoz-Sanjosé[2], Maria del Carmen Martínez-Tomás[2], Miguel Montes Bajo[1], Adrian Hierro[1]

[1]Universidad Politécnica de Madrid (Spain), [2]Universitat de Valencia (Spain)

CdO stands out as the best plasmonic semiconductor in the mid infrared. Here, we evaluate its plasmonic characteristics on two polar substrates, SiC and sapphire, and show large enhancements of the near-field from the interaction between surface phonon polaritons from the substrate and localized surface plasmon polaritons from CdO stripes.

P25

Optical responses from zero optical-path-length object

Da Yong Lee[1], Moongul Byun[1], Robert Magnusson[2], Jae Woong Yoon[1]

[1]Hanyang University (Korea), [2]University of Texas (USA)

We address a fundamental question - What is the ultimately minimal embodiment of optical objects that produce useful optical effects? We show that such an object does not require non-zero physical and optical-path-length volume. Two-dimensional polarizing sheets are minimal optical objects and practically realizable using 2D materials or polarizing ceramics.

P26

The effect of microstructure on the build orientation and mechanical properties of Ti64 lattices by SLM

Hazzaa Alqurashi

Umm AlQura University (Saudi Arabia)

SLM-manufactured Ti-6Al-4V lattice structures were investigated to examine mesostructure effects on microstructure and mechanical properties. Columnar grain structures were observed, with anisotropic orientation near inner surfaces. Build orientation and post-treatment influenced elastic behaviour. Numerical modelling confirmed that microstructural inhomogeneity affects lattice stiffness through varied material orientations.

P27

Switchable n-type conducting polymer nanoantennas

Suraya Kazi, Pravallika Bandaru, Yulong Duan, Shangzhi Chen, Magnus Jonsson

Linköping University (Sweden)

We establish ntype conducting polymer poly(benzodifurandione) (PBFDO) as a switchable organic plasmonic system. In doped state, PBFDO becomes optically metallic above 700nm and supports plasmonic resonances when nanostructured, which can be reversibly turned on/off electrically/chemically. This stretches the horizon and functionalities of plasmonics for dynamic metasurfaces and adaptive optical devices.

P28

Double-Plane Metalenses Enabling Generation, Sorting, and Axial/Helical Self-Healing of Multidimensional Vector Beams

Andrea Vogliardi[1], Daniele Bonaldo[1], Simone Dal Zilio[1], Vittorio Apolloni[1], Gianluca Ruffato[1], Filippo Romanato[2]

[1]University of Padova (Italy), [2]Padova Univ (Italy)

We demonstrate spin-decoupled metasurfaces enabling compact generation and manipulation of multidimensional vector beams. Independent control of circular polarizations produces propagation-dependent effects including polarization beating and axial/helical self-healing. Wafer-scale silicon metalenses and integrated meta-doublets allow generation, sorting, multiplication, division of multi mode beams, extending q-plate concepts toward multifunctional structured-light photonic platforms.

P29

Finite Element Simulation of Strain Measurement in Auxetic Materials via FBG Sensors

Katarzyna Majewska[1], Riccardo Carlo Moroni[2]

[1]Institute of Fluid-Flow Machinery-Polish Academy of Sciences (Poland), [2]Institute of Fluid-Flow Machinery-Polish Academy of Sciences (Italy)

Auxetic materials are increasingly used in biomedical and aerospace applications. Fibre Bragg grating sensors are well-known in non-destructive testing for their precision. This work simulates a tensile test of two auxetic specimens with embedded sensors and compares the results with experimental data to validate the model.

P30

Actively Tunable EIT in Strongly Coupled Toroidal Terahertz Metamaterials

Lavi Kumar Vaswani[1], Bhagwat Singh Chouhan[2], Rohith K. M.[2], Sirsendu Ghosal[1], Anuraj Panwar[2], P. K. Giri[2], Gagan Kumar[2]

[1]Jaypee Institute of Information Technology (India), [2]Indian Institute of Technology Guwahati (India)

Active controlled metamaterials are crucial for advancement of terahertz technology. This study demonstrates actively tunable electromagnetically induced transparency, achieved by modulating phase of vanadium dioxide through temperature variation. Active transmission modulation of approximately 85% is observed. These results indicate strong potential for developing active components in toroidal terahertz photonics.

P31

Vortex Excited Plasmon Resonances in Metal Nanodisks Governed by Symmetry and Size

Daisuke Tanaka[1], Kayn Forbes[2], David Andrews[2]

[1]Oita College (Japan), [2]University of East Anglia (United Kingdom)

Optical vortices with different total angular momentum excite LPRs in gold nanodisks, studied by DDA. In circular disks, resonance wavelengths depend strongly on diameter and show an optimal excitation band. In polygonal disks, rotational symmetry controls excitable modes, and spectra switch with even/odd angular-momentum parity.

P32

Lithium Niobate Photonic Moiré Superlattice forTelecoms Wavelengths

Romae Grierson-Copeland, Christian Richards-Johnson, Noel Healy

Newcastle University (United Kingdom)

A 2D simulation studying photonic Moiré superlattices made fromtriangular lattices of holes in lithium niobate is conducted. Field enhancement is observed due to flatbands in the photonic bandstructure. The lattice constant has a negative correlation with the flatband frequency, with 576nm enhancing the field at telecoms wavelengths in simulation.

3–O42 | Dargan Auditorium | 16:40 - 19:00

SYM2: New trends in nanophotonics and advanced materials

Organized by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

Chaired by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

16:40 INVITED TALK **Visible-Near Infrared Hyperbolic Polariton along Hyperbolic Metamaterials' interface**

Jingbo Sun, Ji Zhou

Tsinghua University (China)

17:00 INVITED TALK **Quantum photonic sources based on 2D materials**

Xifeng Ren

University of Science and Technology of China (China)

17:20 INVITED TALK **Transition to thermalization in photonic lattices**

Nikolaos Efremidis[1], Zhigang Chen[2], Guowen Yang[2], Jiale Wang[2], Yichuan Chen[2]

[1]University of Crete (Greece), [2]Nankai University (China)

17:40 INVITED TALK **Fundamental Passive Components for Topological Photonic Integrated Circuits**

Tomohiro Amemiya[1], Qianshuo Wang[1], Liyan Hu[1], Raku Yamaji[1], Xingxiang Wang[2], Xiao Hu[2]

[1]Institute of Science Tokyo (Japan), [2]Shanghai University (China)

18:00 INVITED TALK **Plasmonic tunnel junction electroluminescence: Effects of magnetic fields and resonant cavities**

Douglas Natelson[1], Shusen Liao[1], Ken Ssennyimba[1], Jaime Abad-Arredondo[2], Qian Ye[1], Alessandro Alabastri[1], Antonio Fernández-Domínguez[2], Francisco García-Vidal[2], Kexin Xie[1]

[1]Rice University (USA), [2]Universidad Autonoma de Madrid (Spain)

18:20 INVITED TALK **Ultra-weak force measurement with optical levitation in vacuum**

Yu Zheng, Long Wang, Yuan Tian, Fang-Wen Sun

University of Science and Technology of China (China)

18:40 INVITED TALK **Coherent Terahertz Light Generation, Modulation, and Detection with Layered Superconducting Quantum Metamaterials**

Mingqi Zhang[1], Samane Kalhor[1], Haonan He[1], Yongyu Zou[1], Maryam Allamki[1], Toshiaki Hattori[1], Takanari Kashiwagi[2], Kaveh Delfanazari[1]

[1]University of Glasgow (United Kingdom), [2]University of Tsukuba (Japan)

3–O43 | McNabb Theatre | 16:40 - 17:40

Tutorial

16:40

Chiro-Optical Microscopy - Near-Field and Far-Field

Hiromi Okamoto

Institute for Molecular Science (Japan)

Chiro-optical microscopy enables spatially resolved analysis of material chirality. This tutorial reviews near-field and far-field chiro-optical microscopic techniques, including aperture-type methods, photoinduced force microscopy, and high-precision CD imaging, and summarizes their applications to nano- and micro-scale chiral materials.

3–O44 | McNabb Theatre | 17:40 - 19:00

SYM2: New trends in nanophotonics and advanced materials

Organized by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

Chaired by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

17:40 INVITED TALK

Magnonic Waveguide Networks for Spin-wave Computing

Rudolf Bratschitsch

University of Münster (Germany)

We demonstrate a maskless approach for fabricating spin-wave waveguides using focused silicon ion implantation. Using spatially resolved Faraday rotation microscopy, we directly image spin-wave propagation and extract dispersion relations, decay lengths, and mode profiles. To demonstrate scalability, we fabricate a large spin-wave network, paving the way for magnonic integrated circuits.

18:00 INVITED TALK

Machine Learning for Inverse Design

Philippe Tassin

Chalmers University of Technology (Sweden)

I will present an overview of our work on using machine learning for inverse design in nanophotonics, with emphasis on free-form inverse design, the use of machine learning in inverse design, physics-informed neural networks, and adaptive metamaterials.

18:20 INVITED TALK

Wave-Based Photonic Computing: From Complexity-Driven Reservoirs to Engineered Phase Encoding

Gerard McCaul[1], Girish Tripathy[1], Luana Olivieri[1], Giulia Marcucci[2], Juan Sebastian Totero Gongora[1]

[1]Loughborough University (United Kingdom), [2]LumiAIres Ltd (United Kingdom)

We present a unified framework for optimising photonic reservoir computing, combining nonlinear substrates and engineered encoding layers. Using gain-controlled multimode fibres, we identify structural complexity as a task-independent design metric. Complementarily, we demonstrate that deliberate phase wrapping beyond $[0, 2\pi)$ dramatically enhances expressivity via synthetic Fourier mode generation and mixing.

18:40 INVITED TALK

Light-Driven Order: Shift and Injection Raman Forces Driving Coherent Phonons

Habib Rostami, J. Luke Pimlott

University of Bath (United Kingdom)

3–O45 | Maharry Theatre | 16:40 - 18:30

SYM5: Phononics and acoustic metamaterials

Organized by: Marco Miniaci, Jensen Li, Jean-Philippe Groby, Vincent Pagneux, Noé Jiménez, Stefano Laureti
Chaired by: Marco Miniaci, Jensen Li, Jean-Philippe Groby, Vincent Pagneux, Noé Jiménez, Stefano Laureti

16:40 KEYNOTE TALK **Modeling boundary effects in acoustic metamaterials by a relaxed micromorphic continuum**

Angela Madeo

TU Dortmund University (Germany)

To accurately describe elastic wave propagation in these materials characterized by their heterogeneities or microstructures, it is essential to adopt non-local or enriched modeling approaches. In this context, we propose the relaxed micromorphic model (RMM), which effectively captures these phenomena by treating the material as continuum with enriched kinematics.

17:10 INVITED TALK **Ultrafast nanomechanics of single MoS2 nanotubes**

Francesco Banfi

Université Lyon 1 (France)

Single MoS_2 nanotubes are examined using ultrafast, non-contact all-optical photoacoustic microscopy with picosecond temporal and submicron spatial resolution. Elastic modes in the tens of GHz are observed, and their dependence on structural features provides insight into the nanotubes' mechanical properties and internal morphology.

17:30 INVITED TALK **Eigenmode steering with time-varying acoustic metamaterials**

Wai Chun Wong, Gregory Chaplain, Jensen Li

University of Exeter (United Kingdom)

We introduce a spatiotemporal gain-loss framework for eigenmode steering in coupled acoustic resonators. Cross-coupled feedback conserves total energy while directing the system toward selected modal states. Temporal modulation enables programmable transitions and energy routing, offering a route to reconfigurable metamaterials and analog information processing.

17:50 INVITED TALK **Self-Organized Multimode Phonon Lasing in a Silicon Optomechanical Nanobeam**

David Alonso Tomás[1], Daniel Navarro-Urrios[2]

[1]Universitat de Barcelona (Spain), [2]University of Barcelona (Spain)

We report self-organized multimode phonon lasing in a silicon optomechanical nanobeam driven by intrinsic optical self-pulsing. Strongly competing mechanical modes are simultaneously amplified without external modulation, producing periodic, quasi-periodic, and chaotic dynamics. The results establish self-induced coherent pumping as a compact route toward integrated multi-frequency phononic sources.

18:10 INVITED TALK **Localization and antilocalization of sound in a phononic crystal with symmetric disorder**

Jose Sanchez-Dehesa[1], Francisco Cervera[1], Martin Ibarias[1], Dmitrii Shymkiv[2], Arkadii Krokhin[2]

[1]Universitat Politecnica de Valencia (Spain), [2]University of North Texas (USA)

The set of eigenstates is numerically calculated for a disordered phononic crystal with an axis of mirror symmetry. The states are well localized due to strong disorder in orientation of asymmetric scatterers. However, mirror symmetry allows either symmetric or antisymmetric solutions that leads to two localized peaks for each eigenstate.

3–O46 | Room 3074 | 16:40 - 19:00

SYM1: Hybrid Nanomaterials and Metastructures for Photonics, Sensing and Energy

Organized by: Jérôme Plain, Alexander Govorov, Davy Gérard, Pedro Hernandez Martinez
Chaired by: Jérôme Plain, Alexander Govorov, Davy Gérard, Pedro Hernandez Martinez

16:40 INVITED TALK **Hybrid AI design of reconfigurable and compactplasmonic Arithmetic and Logic Units**

Amine Khitous, Nicolas Gros, Léo Martin, Florian Dell'ova, Aurélie Bertaux, Ouassila Labbani Narsis, Gérard Colas des Francs, Christophe Nicolle, Alexandre Bouhelier, Erik Dujardin

Université Bourgogne Europe (France)

We describe the concept of all-opticalarithmetic and logic units (ALU) in single plasmonic cavities. Thefirst prototype showed the addition of two 1-bitnumbers and all 2-input logic gates. We introduce a new hybrid AI approach to design ALU and improve their Boolean performance.

17:00 INVITED TALK **Modeling and Design of Nonlinear Metastructures for All-Optical Modulation and THz Generation**

Giulia Crotti, Unai Arregui Leon, Pietro Baldin, Andres Valladares Y Tacchi, Andrea Schirato, Giuseppe Della Valle

Politecnico di Milano (Italy)

Nonlinear metastructures combining nanoscale electromagnetic resonances and material nonlinearities, offer unprecedented opportunities in photonics. Here, we review our recent results in the field, where finite-element-method numerical analysis is exploited to model and design a variety of nonlinear metastructures, for the ultrafast all-optical control and THz generation.

17:20 INVITED TALK **All-Dielectric Photo-Thermo-Optical Metasurfaces for All-Optical Spatio-Temporal Wavefront Control**

Gopal Narmada Naidu, Giulia Tagliabue

EPFL (Switzerland)

All-dielectric photo-thermo-optical metasurfaces could enable high-speed all-optical spatiotemporal wavefront control. We demonstrate reconfigurable metasurface optical responses driven by thermo-optic nonlinearities and present an inverse thermal design framework for programmable temperature profiles. Together, these capabilities advance dynamic meta-optics, photothermal catalysis, for photonic and energy applications.

17:40 INVITED TALK **Light-Printed Chiral Plasmonic Nanorosettes with Electrochemically Modulated Chiroptical Activity**

Yingying Cai[1], Jihyo Ha[2], Nicholas A. Kotov[2]

[1]Leibniz Institut für Polymerforschung Dresden e.V. (Germany), [2]University of Michigan (USA)

Circularly polarized light enables scalable chirality printing, yet parameter control is limited. We use gold nanoparticles to mediate silver photoreduction into chiral nanorosettes on substrate, independently tuning size and particle areal density. Subsequent electrodeposition of semiconductive copper oxide enables continuous tunning of chiroptical bands from visible to near-inferred region.

18:00 INVITED TALK **Near-Field Coupling in Plasmonic Nanoarrays: Tailoring Radiative and Non-Radiative Losses Through Gap Engineering**

Benedict Morris, Bruno Palpant

Université Paris-Saclay (France)

Absorption losses in plasmonic nanoparticles limit their performance in many optical and photonic applications by dissipating energy as heat and damping resonance strength. Using finite-difference time-domain simulations (FDTD), we demonstrate that near-field coupling in dense, periodic nanoparticle arrays can significantly mitigate these losses.

18:20 INVITED TALK **Single plasmon transport in 1D nanowire**

Gérard Colas des Francs

Université Bourgogne Europe (France)

Waveguide quantum electrodynamics (wQED) explores the interaction between emitters and guided modes in e.g. optical nanofibers and plasmonic nanowires. We develop adedicated formalism that naturally introduces coupling constant into a non Hermitian effective Hamiltonian. This facilitates the physical interpretation of plasmon transport including the role of propagation losses.

18:40 INVITED TALK **Multiplexed label-free (bio)molecular analytics using plasmonic nanoparticles**

Tomas Lednicky, Guilherme Lopes, Baihui Li, Matthias Urban, Andrea Csaki, Wolfgang Fritzsche

Leibniz Institute of Photonic Technology (IPHT) (Germany)

3–O47 | Room 4050B | 16:40 - 19:15

SP12: Plasmonics and Nanophotonics: Fundamentals and Applications

Organized by: Hong Wei

Chaired by: Hong Wei

16:40 INVITED TALK **Chiral Plasmonic Nanoparticles**

Jianfang Wang

The Chinese University of Hong Kong (Hong Kong)

Chiral plasmonic Au nanoparticles are synthesized and demonstrated for chiral optical switching, chiral fluorescence emissions, circularly polarized organic light-emitting devices (CP-OLEDs), and photonic spin-Hall effect.

17:00 INVITED TALK **Controllable Self-Assembly of Gold Nanoparticles with Concave Geometries**

Limin Qi

Peking University (China)

The nanoparticles with concave geometries emerge as unique nanoscale building blocks for the construction of nanoparticle assemblies with novel structures and unique photonic properties. This presentation summarizes our recent work on controllable self-assembly of concave gold nanoparticles, such as supercrystal engineering of gold nanoarrows and chiral self-assembly of gold nanodumbbells.

17:20 **Quantum Quasinormal Mode Theory for Spatio-Temporally Resolved Magnetodielectric Cavity Quantum Electrodynamic**

Lars Meschede[1], Daniel D. A. Clarke[2], Ortwin Hess[2]

[1]Trinity College Dublin (Ireland), [2]The University of Dublin (Ireland)

The rapidly evolving ability to harness quantum effects in various cavity quantum electrodynamics (cQED) architectures demands a rigorous theory for the investigation of inherently non-Hermitian systems. We present a quasinormal mode quantization scheme for electromagnetic resonators and demonstrate its capabilities for spatio-temporal studies and characterization of non-trivial cQED systems.

17:35 INVITED TALK **Deep-Subwavelength Mode Manipulation in Spoof Localized Surface Plasmons**

Xuanru Zhang

Southeast University (China)

This talk presents deep-subwavelength mode manipulation using spoof localized surface plasmon (SLSP) resonators in both PCB and CMOS technologies. We will discuss an on-chip skyrmion oscillator in $\lambda_0/865$, and SLSP sensors and sensing systems with enhanced sensitivity. These advances enable ultra-compact, high-sensitivity integrated circuits for biomedical sensing applications.

17:55 INVITED TALK **Twisted Moiré Photonic Superlattice Lasers**

Jun Guan

The Chinese University of Hong Kong (China)

We demonstrate how moiré photonic superlattices, where two periodic photonic lattices are overlaid with a twist angle, provide a powerful platform to manipulate light-matter interactions. By designing moiré superlattice cavities, we achieved laser beam steering from compact devices.

18:15 INVITED TALK **Transition Metal-CO Bond: sigma-bonding or pi-bonding?**

Zhen-Chao Dong

University of Science and Technology of China (China)

By exploiting sub-nanometer resolved tip enhanced Raman spectroscopy (TERS), we identify the bonding type between transition metal (M) and CO molecule (namely, s-donation or p-back donation) at the single-bond level through vibrational Stark effects under an external electric field, an issue theoretically well understood but experimentally very hard to achieve.

18:35 INVITED TALK **Universal detection of layer-breathing modes in two-dimensional materials enabled by plasmonic nanocavity**

Miao-Ling Lin, Heng Wu, Ping-Heng Tan

Institute of Semiconductors-CAS (China)

We demonstrate a universal plasmon-enhanced Raman spectroscopy strategy using gold/silver nanocavities to detect layer-breathing modes in multilayer graphene, hBN, and their heterostructures. By developing an electric-field-modulated interlayer bond polarizability model, we quantitatively explain the observed intensity profiles with synergistic roles of localized plasmonic field enhancement and interfacial polarizability modulation.

18:55 INVITED TALK **Spatiotemporal Imaging of Surface Phonon Polariton Focusing Dynamics**

Xihang Shi[1], Tomer Bucher[2], Hanan Herzig Sheinfux[2], Arthur Niedermayr[2], Ido Kaminer[2]

[1]Sun Yat-sen University (China), [2]Technion (Israel)

3–O48 | Room 3051 | 16:40 - 18:00

SP14: Towards chiral and magnetoelectric quantum electrodynamics

Organized by: Eugene Kamenetskii
Chaired by: Eugene Kamenetskii

16:40 INVITED TALK **Theoretical prediction and experimental testing of photon emission directionality in spontaneous and stimulated emission**

Valerica Raicu, Michael Stoneman

University of Wisconsin-Milwaukee (USA)

A mathematical framework for quantization of the electromagnetic fields emitted by single dipole radiators is presented. The theory predicts directionality of photon emission probability and light-induced electromagnetic wave collapse, which will be tested using an experimental setup currently under development.

17:00 INVITED TALK **Landau polaritons and cavity-driven attractive interactions in single and bilayer graphene**

Giacomo Scalari, Elsa Jöchl, Felix Helmrich, Lucy Hale, Lorenzo Graziotto, Atac Imamoglu, Tobia Nova, Jerome Faist

ETH Zürich (Switzerland)

We demonstrate ultrastrong coupling between highly subwavelength THz resonators and high quality, HBN encapsulated single and bilayer graphene. The presence of gates allows the study of coupling strength as a function of carrier density and , in the case of bilayer, bandgap tuned in the 0-7 THz range.

17:20 INVITED TALK **MEQED and Bianisotropy**

Eugene Kamenetskii

Ben Gurion University of the Negev (Israel)

Near field bianisotropy is associated with violations of P and T symmetry and the problem of cross polarization coupling energy - ME energy. The quantum behavior of bianisotropic metamaterials arises from quantum effects in ME meta atoms. These fundamental challenges lead to the development of ME quantum electrodynamics (MEQED).

17:40 INVITED TALK **Quantum Noise Spectroscopy of Chiral Quantum States**

Benjamin Lawrie

Oak Ridge National Laboratory (USA)

We explore critical dynamics in the presence of competing ferromagnetic and antiferromagnetic interactions with all-optical spin-based quantum sensing protocols in variable temperature and variable magnetic-field environments.

3–O49 | Room 3071 | 16:40 - 18:50

SP23: Nanoscale Phononics : Energy Transport, Light-Matter Coupling, and Emerging Applications

Organized by: Jérémie Margueritat and Aurélien Crut
Chaired by: Jérémie Margueritat and Aurélien Crut

16:40 INVITED TALK **Plasmon-Enhanced Brillouin Light Scattering Investigations of Acoustoplasmonic Metasurfaces**

Thomas Vasileiadis

Adam Mickiewicz University (Poland)

Acoustoplasmonic metasurfaces (APMs) combine plasmonic and phononic resonances to enhance optomechanical interactions. This talk will present APMs offering plasmon-enhanced Brillouin light scattering (BLS) and optomechanics for propagating surface acoustic waves. Plasmon-enhanced BLS can result from plasmonic coupling between adjacent nanostructures or colocalization of plasmonic and acoustic fields on nanostructured surfaces.

17:00 INVITED TALK **Nanostructuration for Ultra-High Frequency Acoustic Wave Emission and Detection using Femtosecond Laser Pulses**

Arnaud Devos

IEMN CNRS (France)

Picosecond acoustics uses ultrafast lasers to generate and detect ultra-high-frequency acoustic waves, which are ideal for thin-film characterization, but is inherently limited to longitudinal modes. To overcome this limitation, we have developed two distinct nano-structuring approaches that enable transverse wave generation, along with adapted optical detection schemes.

17:20 INVITED TALK **Thermal Metamaterial Design for Phonon Heat Management at Low Temperature**

Boris Brisuda[1], Jon Canosa Diaz[2], Thierry Crozes[1], Jean-François Robillard[2], Olivier Bourgeois[1]

[1]Institut NEEL - CNRS (France), [2]IEMN (France)

This study explores nanoscale phonon (heat) flux control-critical for quantum tech and thermal management. Using a nanostructured SiN ribbon with staggered triangles, we demonstrated thermal rectification at 900 mK; the heat flow being favored toward triangle tips which seems to be related to ballistic phonon flow in anisotropic structures.

17:40 INVITED TALK **Acoustic Phonons, Vibronic Coupling, and Room-Temperature Super-Radiance in Engineered, Icosahedral Virus Capsids**

Bogdan Dragnea

Indiana University (USA)

Dye-decorated icosahedral viruses spontaneously synchronize after pulsed excitation, producing a super-radiant burst at room temperature. The underlying mechanisms enabling super-radiance at room temperature-despite the presence of collisional dephasing and inhomogeneous broadening remain unresolved. Experimental insights from time-resolved spectroscopy, suggest a vibronic coupling model and key design parameters for future applications.

18:00 INVITED TALK **Approaching Ultimate Quality Factors in Nanomechanical Resonators Made of Silicon Carbide**

Eva Weig

Technical University of Munich (Germany)

Silicon carbide (SiC) is an outstanding platform for high-quality nanomechanical resonators, combining intrinsic material quality with the possibility of dissipation dilution engineering. We compare resonators made of 4H-SiC and 3C-SiC, demonstrating routes to ultrahigh Q-factors, suitable for spin-mechanics and spin-cavity optomechanics applications.

18:20 **SAW guiding with a weakly bonded layer**

Maroun Abi Ghanem

Universite Claude Bernard Lyon 1 (France)

We demonstrate adhesion-driven guiding of 100MHz surface acoustic waves (SAWs) using weakly bonded biobased films on gold substrates. Laser ultrasonics reveal tunable phononic bandgaps and thermally “written” SAW channels, achieving lateral confinement over 600μm. This approach enables simple, reconfigurable, and sustainable SAW waveguides.

18:35 **Non-Diffusive Nanoscale Phonon Heat Transport in 2D Materials**

Sebin Varghese[1], Jordi Tur Prats[2], Albert Beardo[2], Francesc Xavier Alvarez[2], Klaas-Jan Tielrooij[1]

[1]Eindhoven University of Technology (The Netherlands), [2]Autonomous University of Barcelona (Spain)

Heat transport at the nanoscale and in nanoscale materials can differ from conventional, diffusive heat transport. Here we use spatiotemporal microscopy to follow heat in space and time and observe highly viscous heat transport in two-dimensional semiconductors toward the monolayer limit, which we attribute to combined hydrodynamic and thermoelastic effects.

3–O50 | Room 3126 | 16:40 - 18:40

SYM2: New trends in nanophotonics and advanced materials

Organized by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han
Chaired by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

16:40 INVITED TALK **Spatio-Temporal Metalattices in ENZ Transparent Conductors**

Sven Stengel[1], Wallace Jaffray[1], Farhan Ali[2], Mustafa Ozlu[3], Colton B. Fruhling[3], Maria A. Vincenti[4], Domenico de Ceglia[4], Michael Scalora[4], Alexandra Boltasseva[3], Vladimir M. Shalaev[3], di Falco[2], Ferrera[1]

[1]Heriot-Watt Univeristy (United Kingdom), [2]University of St. Andrews (United Kingdom), [3]Purdue University (USA), [4]University of Brescia (Italy)

We demonstrate a spatio-temporal photonic metalattice formed by combining a static metagrating with a transient lattice written by two-beam interference in a low-index transparent conductor. The structure is revealed via internally generated third-harmonic diffraction.

17:00 INVITED TALK **All-optical Differentiators by Dielectric Metasurfaces**

Cheng Zhang

Huazhong University of Science and Technology (China)

I will present a new type of all-optical differentiators based on dielectric metasurfaces, which is designed through point spread function engineering and performs differential operations over target objects in direct-imaging mode.

17:20 INVITED TALK **Spectral Design of Disordered Photonic Metamaterials**

Aaron Shih[1], Mathias Casiulis[2], Stefano Martiniani[2], Frank Scheffold[1]

[1]University of Fribourg (Switzerland), [2]New York University (USA)

We create disordered structures exhibiting specific spectral features, from stealthy hyperuniformity to completely new structures, “gyromorphs", that exhibit rotational order alongside translational disorder. We evaluate their optical properties using a coupled dipoles method and show how specific optical responses may be reached by optimizing for features in the structure factor.

17:40 INVITED TALK **Wave Localisation in Aperiodic and Correlated Disorder Photonic Structures**

Marian Florescu, Alex Meek, Kriss Stokkereit

University of Southampton (United Kingdom)

We study electromagnetic wave transport and localisation in aperiodic and correlated disordered structures in one and two dimensions. Ensemble simulations show that correlated disorder tunes transparency, localisation, and band gap formation. A minimum spacing constraint stabilises short range structure and enables controlled localisation

18:00 INVITED TALK **Bulk-radiation Correspondence in Radiative Photonic Lattices**

Xinyi Yuan[1], Grazia Salerno[2]

[1]Aalto University (Finland), [2]Universita di Pisa (Italy)

We develop a non-Hermitian model to describe the guided and leaky modes of photonic crystal slabs. We investigate the concept of bulk-radiation correspondence in the vicinity of the high symmetry points. The results show that the comparability is not universal and completely breaks down around bound states in the continuum.

18:20 INVITED TALK **Imaging-based, time-resolved detection of rare microparticles in continuous flow**

Raphael Hauer[1], Christian Hill[2], Ulrich Hohenester[3]

[1]Universität Graz (Austria), [2]BRAVE Analytics GmbH (Austria), [3]University of Graz (Austria)

We introduce an imaging-based microfluidic sensor for continuous, time-resolved detection and sizing of rare microparticles in flow. Incoherent illumination and an imaging geometry ensuring full-volume focus yield sharp transit images. Automated subtraction, tracking and flow-normalized counting provide calibration-free concentrations and size distributions, enabling real-time monitoring of distribution tails dynamically.

3–O51 | Room 4047 | 16:40 - 18:40

SYM4: Chirality, magnetism, and magnetoelectricity: Separate phenomena and joint effects in metamaterial structures

Organized by: Eugene Kamenetskii

Chaired by: Eugene Kamenetskii

16:40 INVITED TALK **Homogenization of multicomponent chiral metamaterials**

Wolf Luis Mochán[1], Guillermo P. Ortiz[2], Andrea López-Reyna[3]

[1]Universidad Nacional Autonoma de Mexico (Mexico), [2]Universidada Nacional del Nordeste (Argentina), [3]Universidad Autónoma del Estado de Morelos (Mexico)

We generalize a technique borrowed from QM to calculate the macroscopic non-local dielectric response of a multicomponent metamaterial in the retarded regime in terms of a projected Green's function. We apply the formalism to find the photonic bands of a Reusch-Bouligand structure, a natural layered chiral photonic crystal.

17:00 INVITED TALK **Hot-Electron Generation and Photoinduced Chirality in Plasmonic Nanocrystals**

Alexander Govorov

Ohio University (USA)

This talk will cover the following:
Plasmonic hot spots efficiently generate energetic ("hot") electrons, which can be utilized in photochemistry and photodetection. Colloidal nanocrystal assemblies and metastructures with plasmonic resonances significantly amplify the chiroptical responses of biomolecules (e.g., circular dichroism) and can induce chiral morphologies through photochemical processes.

17:20 INVITED TALK **Tailoring Smith-Purcell radiation using moiré photonic crystals and chiral materials**

Thomas Delplace, Loris Cavenaile, Bjorn Maes

University of Mons (Belgium)

Dielectric gratings provide interesting opportunities to shape Smith-Purcell radiation, which is emitted when an electron passes close by a periodic structure. We describe various designs that influence the direction, efficiency and wavelength of the emission, amongst others via moiré photonic crystals and the inclusion of chiral materials.

17:40 INVITED TALK **Plasmonic Spatio-Temporal Weak Measurement**

Sahil Sahoo, Andre Yaroshevsky, Dima Cheskis, Yuri Gorodetski

Ariel University (Israel)

We present a comprehensive study on the spatiotemporal weak measurement of a chiral ultrafast optical pulse. A chiral vector wave packet is generated by transmitting a laser pulse via birefringent. Employing time-resolved leakage radiation microscopy, we examine how the complex weak value is manifested in the pulse propagation.

18:00 INVITED TALK **Geometric Phase Modulation in Circularly Birefringent Plasmonic Structures**

Pasha Goz, Akash Das, Andre Yaroshevsky, Yuri Gorodetski

Ariel University (Israel)

18:20 INVITED TALK **Giant Magneto-Impedance Effect in Magnetic Microwires: Challenges, Advances and Perspectives**

Arcady Zhukov[1], Alvaro Gonzalez[1], Paula Corte-Leon[1], Jesus Olivera[2], Valentina Zhukova[1]

[1]University of Basque Country (Spain), [2]Universidad Autónoma de Santo Domingo (Spain)

3–O52 | Room 4050A | 16:40 - 18:10

SYM3: Advanced passive and active metasurfaces and zero-index materials

Organized by: Howard Lee, Pin Chieh Wu, Wen-Hui (Sophia) Cheng

Chaired by: Howard Lee, Pin Chieh Wu, Wen-Hui (Sophia) Cheng

16:40 INVITED TALK **Novel Metaphotonic Structures for Enhanced Light-matter Interaction**

Seyed Enjavi, Reza Marzban, Ashkan Zandi, Amin Khavasi, Saeed Javadizadeh, Hamed Abiri, Abhirupa Saha, Ali Adibi

Georgia Tech (USA)

This talk is focused on using on-chip metaphotonic elements to enable a series of new integrated photonic structures that enhance light-matter interaction. It is shown that optimally designed metaphotonic elements increase the intensity and shape the wavefront of optical field at the interaction region to enhance light-matter inetraction.

17:00 INVITED TALK **Low-Power Optical Extreme Learning Using Incoherent Light with Data Reverberation**

Xingjie Ni

The Pennsylvania State University (USA)

We report an optical extreme learner that uses incoherent light and data reverberation in a tailored cavity to generate nonlinear transformations without intrinsic optical nonlinear materials. The system outperforms linear digital baselines on image classification and XOR tasks while remaining compact, low power, and scalable.

17:20 **Graphene-based Acive Metasurface for Mid-IR Transmission Modulation**

Jinseok Kong, Heonhak Ha, Junhyung Kim, Jiwon Kang, Min Seok Jang

Korea Advanced Institute of Science and Technology (Korea)

We report a graphene-based active metasurface achieving a 73.3% transmission modulation efficiency. An analytic circuit model elucidates the resonance mechanism controlled by Fermi levels. This high-efficiency platform overcomes previous limitations, enabling ultra-compact, on-chip spectroscopic systems.

17:35 **Experimental demonstration of perfect elastic-wave absorption in non-Hermitian piezoelectric metagratings**

Bochen Ren, Bing Li

Northwestern Polytechnical University (China)

We demonstrate a non-Hermitian piezoelectric metagrating enabling tunable and nearly perfect elastic-wave absorption. By coupling piezoelectric units with external LR circuits and a feedback sensor-actuator loop, the system achieves robust broadband absorption in beams and plates, providing a compact platform for practical non-Hermitian wave control.

17:50 INVITED TALK **Squeezing Light Fields for Ultrafast Detectors and Single Photon Sources**

Maiken Mikkelsen

University of Copenhagen (Denmark)

THU

3–O53 | Room 5025 | 16:40 - 17:20

SP7: Enhanced light-matter interactions: fundamentals and sensing applications

Organized by: Guillermo Acuna, Peter Zijlstra and Hiroshi Sugimoto

Chaired by: Guillermo Acuna, Peter Zijlstra and Hiroshi Sugimoto

16:40 INVITED TALK **Optical Fields with Spatially Modulated ChiralityToward Chiral Trapping and Separation**

Atsushi Kamegaya, Shun Hashiyada, Yoshito Tanaka

Hokkaido University (Japan)

We experimentally realize an optical field with spatially uniform energy density and periodically sign-reversing optical chirality using two orthogonally polarized beams. Polarimetric imaging confirms chirality fringes without intensity modulation. Circular dichroism mapping of chiral gold nanoparticles reveals position dependent enantioselective interaction, evidencing optical chirality gradients toward chiral selective trapping.

17:00 INVITED TALK **Ultrasensitive label-free miRNA sensing realized by a Q-tunable plasmonic metasurface**

Daiki Kawasaki, Takuo Tanaka

RIKEN (Japan)

In this report, we developed a plasmonic metasurface biosensor of which sensitivity is tunable to match the required limit of detection and dynamic range in miRNA detection in human serum. Our metasurface biosensor is promising as reliable and ultrasensitive biosensing platform for simple and rapid diagnostic technologies.

3–O54 | Room 5025 | 17:20 - 18:20

GEN31: Photonic Crystals and Electromagnetic Bandgap Structures

17:20 **Perovskite Anti-Resonant Reflection Optical Waveguide Fibre**

Christian Johnson-Richards, Luke Cording, Noel Healy

Newcastle University (United Kingdom)

The use of meta-structures in fibre waveguides has allowed for designs that can improve light-matter interaction. In this work we present numerical characterisation of a perovskite ARROW fibre based on a commercially available fused silica template. It is shown to operate close to telecoms wavelengths and support low transmission loss.

17:35 **Effects of randomness on self-assembled photonic crystals**

Duanduan Wan

Wuhan University (China)

Randomness arising from thermal noise is almost inevitable in self-assembled colloidal crystals and is generally believed to be detrimental to photonic band gaps (PBGs). In this talk, I will present a counterintuitive example in which randomness actually enhances PBGs and discuss its effects on the width of PBGs.

17:50

Field Localization and Gap Soliton Formation in Dispersion Dependent Photonic Gaps in Photonic Hypercrystals

Munazza Zulfiqar Ali

University of the Punjab (Pakistan)

Photonic Hypercrystals manifest the combination of properties exhibited by hyperbolic metamaterials and photonic hypercrystals. The red shifted, blue shifted and plasmon polariton gaps appear in different frequency regions due to the type of dispersion offered by hyperbolic metamaterial. Gap soliton formation and field localization inside these gaps is explored here.

18:05

Emergence of Rashba Spin-Orbit Coupling in Staggered-Gyromagnetic Photonic Crystals

Yao-Ting Wang[1], Wenlong Gao[2], Hua-Shin Lin[1]

[1]National Sun Yat-sen University (Taiwan), [2]Eastern Institute of Technology (China)

We report the Rashba spin-orbit coupling in a staggered-gyromagnetic photonic crystal with a modified honeycomb lattice. We confirm the emergence of a Rashba band structure and helical spin textures. Through both simulation and k-p theory. A positive-negative refraction through this structure has also been demonstrated.

3–O55 | Room 5039 | 16:40 - 18:40

SYM6: Advanced Techniques for Computational Electromagnetics

Organized by: Maha Ben Rhouma

Chaired by: Maha Ben Rhouma

16:40 INVITED TALK

Photonic driven dual-mode thermoregulation: from static to dynamic design evolution

Muluneh G. Abebe[1], Eva Loccufier[2], Jozefien Geltmeyer[2], Karen De Clerck[2], Bjorn Maes[1]

[1]UMONS (Belgium), [2]Ghent University (Belgium)

Maintaining comfort with photonic thermal-management textiles can reduce energy use for heating and cooling in residential and office buildings. Here, we outline the design cycle of a passive dual-mode thermoregulation fabric based on dynamic emissivity modulation, highlighting key photonic architectures, their limitations, and the strategies used to achieve dimensional stability.

17:00 INVITED TALK

From Design to Fabrication: Limits & Manufacturing Tolerances in Optical Metasurfaces and Meta-Modulators

Sonia Freddi[1], Alfonso Nardi[2], Michael Scalora[3], Agostino Di Francescantonio[2], Sofia Martins[4], Johann Osmond[4], Attilio Zilli[4], Marco Finazzi[2], Michele Celebrano[2], Maria Antonietta Vincenti[3], Bollani[1]

[1]Consiglio Nazionale delle Ricerche (CNR) (Italy), [2]Politecnico di Milano (Italy), [3]University of Brescia (Italy), [4]ICFO-Institut de Ciencies Fotoniques (Spain)

The study tackles making metasurfaces reliably manufacturable, focusing on EBL and RIE constraints. It compares continuous and pseudo-Bosch etching by etch rate, sidewall angle, and roughness. It also models allowable fabrication tolerances, linking geometric deviations to Q, efficiency, uniformity, and provides practical guidelines to improve design robustness and process stability.

17:20 INVITED TALK

Useful and detrimental thermal radiationin near-field energy-conversion devices such as thermophotovoltaics

P-Olivier Chapuis

CNRS - INSA Lyon (France)

We report on three types of near-field energy-conversion devices, namely thermophotovoltaics, thermophotonics and thermal rectennae. All of them involve partial conversion of thermal radiation into electrical power above a certain energy threshold, namely the bandgap for the two first types of devices, and detrimental thermal-radiation exchange below this threshold.

17:40 INVITED TALK **Conformable Holographic Metasurface for Augmented Reality and biomedical applications**

Yuhui Gan, Andrea Di Falco

University of St Andrews (United Kingdom)

We report on the design, fabrication and characterization of metasurfaces for AR and biomedical applications.

18:00 INVITED TALK **Dynamically Reconfigurable Waveguide-Fed Metasurface Apertures: From Theory to Application**

David R. Smith

Duke University (USA)

Dynamically reconfigurable metasurfaces represent an early and ongoing commercialization success. The metasurface architecture is versatile and can be readily integrated into beam-steering systems across the electromagnetic spectrum. We describe here the fascinating electromagnetic properties of the metasurface elements and how they drive the overall aperture performance of metasurface devices.

18:20 INVITED TALK **Low-Dimensional Polaritons Thermal Radiation**

Sebastian Volz

CNRS - CEA - Ecole Polytechnique (France)

We introduce a new type of thermal radiation which is confined in two dimensions and can be emitted by thermal waveguides. The existence and the properties of those film-polaritons will be demonstrated then the experimental measurement of the corresponding heat flux will be presented.

3–O56 | Room 5052 | 16:40 - 18:40

SYM2: New trends in nanophotonics and advanced materials

Organized by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

Chaired by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

16:40 INVITED TALK **Designing non-Hermitian media via real-valued coordinate transformations**

Ivor Krešić[1], Konstantinos Makris[2], Ulf Leonhardt[3], Stefan Rotter[1]

[1]Vienna University of Technology (Austria), [2]University of Crete (Greece), [3]Weizmann Institute of Science (Israel)

Transformation optics provides conceptually simpleand computationally economical ways to design ele-ments such as lenses, waveguides and cloaks. We have developedtheoretical methodologies which use non-conformal coordi-natetransformations and field mappings to achieve cloaking and in-duced transparency. The usual requirements on metamaterialindex are here replaced by non-Hermiticity.

17:00 INVITED TALK **Long-lived subradiance via cavity-mediated collective interaction**

Kyu-Young Kim[1], Jin Hee Lee[1], Woong Bae Jeon[1], Dong Hyun Park[1], Suk-In Park[2], Jin Dong Song[2], Changhyoup Lee[3], Je-Hyung Kim[1]

[1]Ulsan National Institute of Science and Technology (UNIST) (South Korea), [2]Korea Institute of Science and Technology (KIST) (South Korea), [3]Hanyang University (South Korea)

We demonstrate strong collective emission from a cavity-mediated steady-state subradiant state. In a tailored photonic environment with balanced cavity dissipation and emitter coupling strength, we observe strong photon bunching with elongated decay, which are key signatures of steady-state subradiance. Our approach paves the way for generating and harnessing quantum correlations.

17:20 INVITED TALK

3D printed coupled micro-potentials for photonic quantum gases

Julian Schulz[1], Kirankumar Karkihalli Umesh[2], Sven Enns[1], Frank Vewinger[3], Georg von Freymann[1]

[1]Leibniz Universität Hannover (Germany), [2]Heidelberg University (Germany), [3]Universität Bonn (Germany)

3D printed micro potentials in a dye-filled micro cavity allow to study Bose Einstein condensation of photons in almost arbitrary potential landscapes. We exemplary demonstrate the influence of dimensionality on the thermodynamic properties as well as topologically protected states for these driven-dissipative quantum systems.

17:40 INVITED TALK

Artificial magnetism and passivity in plasmonic clusters with spatial dispersion

Ranjeet Dwivedi[1], Kevin Vynck[1], Alexandre Baron[2], Ashod Aradian[2]

[1]University Claude Bernard (France), [2]Universite de Bordeaux (France)

We show that the optical response of dense, random, spherical clusters made of plasmonic nanoparticles can be efficiently described as that of equivalent, homogeneous spheres of the same size, made of an effective, spatially dispersive medium displaying artificial magnetism. Passivity requirements for the obtained effective media will be discussed.

18:00 INVITED TALK

DNA origami-based photonic crystals for visible light

Gregor Posnjak, Tim Liedl

LMU Munich (Germany)

We use DNA origami to design colloidal particles which controllably assemble into intricate lattices such as the diamond structure with periodicities on the order of hundreds of nanometers. Coating the structures with high-refractive index materials leads to complete 3D photonic band gaps in the visible.

18:20 INVITED TALK

Polarization control of photons with photonic crystal devices

Xiulai Xu

Peking University (China)

We present experimental demonstration in chiral and polarization-controlled quantum photonics based on topological photonic crystal waveguides and photonic molecules. By engineering cavity-waveguide interfaces and coupled-cavity supermodes, robust chiral light-matter interaction, directional single-photon routing, and enhanced emitter-photon coupling are achieved, offering scalable routes toward integrated quantum photonic circuits.

Conference Dinner 20:00 - 23:00

4 Friday, July 17, 2026

4–O1 | Maharry Theatre | 08:25 - 09:55

SYM6: Advanced Techniques for Computational Electromagnetics

Organized by: Maha Ben Rhouma

Chaired by: Maha Ben Rhouma

08:25 KEYNOTE TALK **Hybrid Techniques for Inverse Design and Knowledge Discovery in Large-scale Multifunctional Nanophotonic Devices**

Reza Marzban, Jamshid Hassanpour, Jiu Chang, Hamed Abiri, Ali Adibi

Georgia Tech (USA)

This talk is focused on a new class of inverse design tools for large-scale nanophotonic structures by combining rigorous gradient-based techniques with machine learning tools. By combining these two classes of design tools, dimensionality of the design space and the computation requirement can be reduced by 2-3 orders of magnitude.

08:55 INVITED TALK **Thin-film lithium niobate channel waveguides: numerical analysis and perturbational modelling**

Manfred Hammer, Behnood Taheri, Henna Farheen, Jens Förstner

Paderborn University (Germany)

The crystal configuration, symmetry, and the onchip orientation affect the modal properties of anisotropic waveguides based on TFLN / LNOI technology. Beyond the direct numerical analysis, the hybridization of guided modes and the related conversion of polarization can be understood, also fully quantitatively, in terms of coupled mode theory.

09:15 INVITED TALK **Unconventional Geometric Phases in Optics**

Shubo Wang

City University of Hong Kong (China)

We present two advances expanding the geometric phase paradigm. We show that the Pancharatnam-Berry phase can arise from the transverse spin of surface waves and enable on-chip wavefront manipulation. Furthermore, we report a new type of geometric phase-the Riemann-Silberstein phase-induced by SU(4) evolution in 4D polarization space.

09:35 INVITED TALK **Adaptive photonics with phase-change materials: multiphysics modelling and design**

Dmitry Chigrin

RWTH Aachen University & AMO GmbH (Germany)

Phase change materials are materials in which phase transitions can be induced rapidly and reversibly, resulting in significant changes in the physical properties of these materials. Here we report on our recent developments towards a multiphysics description of adaptive photonic components based on phase change materials.

4–O2 | Room 3074 | 08:25 - 10:00

SP23: Nanoscale Phononics : Energy Transport, Light-Matter Coupling, and Emerging Applications

Organized by: Jérémie Margueritat and Aurélien Crut
Chaired by: Jérémie Margueritat and Aurélien Crut

08:25 INVITED TALK **The optomechanics way to probe a single living cell**

Hilario Boggiano, Louis Waquier, Cherif Belacel, Ivan Favero

Université Paris Cité (France)

Optomechanical sensors offer higher sensitivity and time resolution. Here we open a new window in the measurement of a single living cell. We investigate cell rheology at high frequencies unexplored so far and resolve fluctuating processes in the membrane at the sub-microsecond scale, two decades faster than prior techniques.

08:45 INVITED TALK **Surface Acoustic Waves and Spin Waves interaction in iron thin film**

Pauline Rovillain[1], Anupam Sharma[1], Florian Millo[1], Louis Christienne[1], Jean-Yves Duquesne[1], Mahmoud Eddrief[1], Franck Fortuna[2], Laura Thévenard[1], Catherine Gourdon[1], Massimiliano Marangolo[1]

[1]Sorbonne Université (France), [2]Université Paris-Saclay (France)

We investigate surface acoustic wave-induced ferromagnetic resonance in magnetic thin films. By measuring the magnetic-field and angular dependence of Rayleigh SAW velocity variations, extract the magnetoelastic coupling. A non-reciprocal acoustic response is also observed at resonance, highlighting the potential of tunable magnetoelastic devices.

09:05 INVITED TALK **Anisotropic phonon dynamics at the nanoscale in a nanophononic SiN membrane**

Valentina Giordano[1], Silvia Mazzoleni[1], Stéphane Pailhès[1], Filippo Bencivenga[2]

[1]Universite Claude Bernard Lyon 1 (France), [2]ELETTRA (Italy)

We report the investigation of phonon dynamics in nanophononic membranes with square and rectangular lattices of holes, at phonons wavelengths comparable with the nanostructure lengthscale. We unveil the signature of lattice anisotropy both on phonon energies and lifetimes, and identify its microscopic origin at the light of finite element simulations.

09:25 INVITED TALK **Experimental realization of Algorithm-designed Nanophononic Metasurfaces**

Michele Diego, Matteo Pirro, Jade Hardouin, Gabrielle Mazevet-Schargrod, Junior Rognon, Byunggi Kim, Roman Anufriev, Masahiro Nomura

The University of Tokyo (Japan)

Nanophononic metamaterials are key components for controlling acoustic signals in nanotechnology. Here, we present automated, algorithm-driven strategies for realizing phononic metasurfaces based on inverse-design and hyperuniform architectures. The resulting designs are fabricated and experimentally characterized, validating the predicted phononic properties and demonstrating the effectiveness of algorithm-designed metastructures.

09:45 **Acoustic vibrations of single gold nanodisks supported on solid substrates**

Nathan Berrit[1], Clément Panais[1], Noëlle Lascoux[1], Sylvie Marguet[2], Natalia Del Fatti[1], Aurélien Crut[1]

[1]Universite de Lyon (France), [2]CEA Paris-Saclay (France)

Metallic mechanical nanoresonators' performancesare often limited by their strong acoustic damping. Here, weconduct optical pump-probe time-resolved spectroscopy to studythe vibrational dynamics of single gold nanodisks supported ondifferent solid substrates. We study the impact of the nanores-onators' morphology, the substrate composition and thickness onthese dynamics.

4–O3 | Room 4050B | 08:30 - 10:05

SYM2: New trends in nanophotonics and advanced materials

Organized by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han
Chaired by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

08:30 INVITED TALK **Autonomous Agentic Systems for MetamaterialDesign and Research**

Willie Padilla

Duke University (USA)

The evolution from large language models (LLMs) to agentic systems has created a new frontier of scientific discovery; We present an autonomous agentic framework that automates the complete end-to-end workflow of electromagnetic metamaterial inverse design, including the development of the forward surrogate model itself.

08:50 INVITED TALK **Coherent Thermal Wavefront Manipulation Using Hierarchical Metasurfaces**

Yungui Ma

Hangzhou City (China)

Although thermophotonic advances enable directional thermal emission, arbitrary wavefront control remains elusive. Here, we present a general meta-emitter design with lossy and lossless boundaries coupled via single-mode waveguides, converting incoherent thermal emission into coherent surface waves for tailored wavefront shaping.

09:10 INVITED TALK **Progress in the development of efficient Quantum Dot based room temperature THz sources**

Edik Rafailov

Aston University (United Kingdom)

Quantum-dot semiconductor structures are emerging as promising materials for compact THz sources due to their broadband gain and ultrafast carrier dynamics. We demonstrate enhanced CW and pulsed THz emission using nanoantenna-integrated photoconductive antennas, enabling efficient room-temperature operation and positioning QD-based devices for next-generation THz applications.

09:30 INVITED TALK **Single-shot polarization-resolved microscopy of nanomaterials**

Julien Flamant[1], Nathan Ullberg[2], Baptiste Marthy[2], Khosro Kamali[3], Patrick Ferrand[2], Mikael Käll[3], Guillaume Baffou[4]

[1]Universite de Lorraine (France), [2]Aix Marseille University (France), [3]Chalmers University (Sweden), [4]Université de Lorraine (France)

We introduce an optical microscopy approach capable of retrieving the complex vectorial electromagnetic field at the image plane (that is, intensity, phase, and polarization of light) in a single acquisition. The method combines a polarization-sensitive camera with a two-dimensional diffraction grating (cross-grating) placed in close proximity to the image sensor.

09:50 **Multifunctional Optical Metasurfaces and Their On-Chip Integration**

Bo Xiong, Minjun Xie

Zhejiang University (China)

Using dielectric deflective metasurfaces, we propose a novel out-of-plane modulation scheme. The metasurface is used to deflect vertical incident light to an oblique angle. This deflection introduces a lateral wave vector component. Overall, the integration of the metasurface and subwavelength grating enables a new vertical coupling scheme with high efficiency.

4–O4 | Room 3051 | 08:25 - 10:05

SYM2: New trends in nanophotonics and advanced materials

Organized by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han
Chaired by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

08:25 INVITED TALK **Photonic Inverse Design using differentiable electromagnetic solver for CMOS image sensors and Photonic Integrated Circuits**

Hyun Sung Park, Jaekwan Kim, Subeom Song, Junho Lee, Yongseob Yun, Sungmo Ahn, Choonlae Cho, Sooyeon Lee, Sookyoung Roh, Seokho Yun

Samsung Electronics Co., Ltd. (Korea)

We implement differentiable electromagnetic solvers for gradient-based inverse design of various optical systems. The differentiable eigenmode expansion solver is applied to photonic integrated circuits, and the differentiable RCWA solver to metasurfaces for mobile image sensors. Analytic derivatives combined with automatic differentiation enable fast and accurate large-scale optimization.

08:45 INVITED TALK **On-chip Integrated Intelligent Photonic Computing**

Kun Liao

Peking University (China)

We report advances in photonic neural networks that broaden functionality, increase computational complexity, and improve system-level integration for practical intelligent photonic computing, paving the way toward highly integrated and scalable next-generation intelligent photonic computing chips.

09:05 INVITED TALK **Localization and diffusive transport in photonic correlated disorder materials**

Nicoletta Granchi[1], Gabriele Calusi[1], Kris Stokkereit[2], Matteo Lodde[3], Camilla Gonzini[1], Andrea Fiore[3], Marian Florescu[4], Francesca Intonti[1]

[1]University of Florence (Italy), [2]University of Surrey (United Kingdom), [3]Eindhoven University of Technology (The Netherlands), [4]University of Southampton (United Kingdom)

We investigate a special class of disordered photonic heterostructures, hyperuniform disordered (HuD) photonic structures, that allows to deterministically tailor Anderson localization and diffusive transport.

09:25 INVITED TALK **Optofluidic Metasurfaces for Ultrasensitive Biosensing**

Hao Wang[1], Mahmoud Elsawy[2], Arash Nemati[1], Nanzhong Deng[1], Yue Xiao[1], Ashish Pandey[1], Gregory Roberts[1], Stephane Lanteri[2], Haogang Cai[1]

[1]New York University Grossman School of Medicine (USA), [2]New York University (USA)

Optical metasurface-based biosensors integrated with microfluidics represent a key platform technology for biosensing and diagnostics. Here, we present two novel meta-sensors for ultrasensitive, real-time biosensing in the visible spectrum: a q-BIC high-Q dielectric metasurface fabricated by electron beam lithography, and a scalable plasmonic metasurface fabricated by high-throughput nanosphere lithography.

09:45 INVITED TALK **Optical Properties of Twisted Bilayer Graphene**

Tobias Stauber[1], Miguel Sánchez Sánchez[1], Igor Vasilevskiy[1], José González[2]

[1]Instituto de Ciencia de Materiales de Madrid (Spain), [2]Instituto de Estructura de la Materia (Spain)

We discuss optical properties of twisted bilayer graphene obtained from an interacting atomistic tight-binding model including lattice relaxation. Apart from the charge response, we will also calculate the magnetic and chiral response.

4–O5 | Room 3071 | 08:25 - 10:05

SP12: Plasmonics and Nanophotonics: Fundamentals and Applications

Organized by: Hong Wei
Chaired by: Zhen-Chao Dong

08:25 INVITED TALK **Optical imaging based on metasurfaces**

Shuming Wang

Nanjing University (China)

By using the end-to-end method, the real time facial recognition based on transversely dispersive metalens array has been achieved. By employing an inverse-design method, we demonstrate a pixel-level metasurface-based Bayer-type colour router, with the brightness twice as high as that of a commercial camera.

08:45 INVITED TALK **Graphene Plasmon-Enhanced Infrared Sensing in Aqueous Environments**

Xiaoxia Yang

National Center for Nanoscience and Technology (China)

Tunable graphene plasmon-enhanced infrared spectroscopy enables ultrasensitive detection of nanoscale biomolecules in aqueous environments by suppressing water background and achieving strong field confinement, allowing in situ probing of molecular fingerprints and dynamic processes.

09:05 INVITED TALK **Rational Design and Applications of Intrinsically Chiral Plasmonic Nanoparticles**

Xiaolu Zhuo[1], Yilin Chen[1], Shengyan Wang[1], Zhongyi Chen[1], Ruiqian Zhang[1], Jianfang Wang[2]

[1]The Chinese University of Hong Kong (China), [2]The Chinese University of Hong Kong (Hong Kong)

We initiated our research with colloidal synthesis of intrinsically chiral plasmonic nanoparticles and explored how they respond to external stimuli, including polymer encapsulation and shell engineering, to modulate their far-field and near-field chiroptical characteristics. Furthermore, we demonstrated their preliminary applications for circularly polarized luminescence, enantioselective sensing, and valleytronic devices.

09:25 INVITED TALK **Plasmonic Control of Dark Excitons and Valley Coherence in TMDC Monolayers under Ambient Conditions**

Lei Shao

Sun Yat-sen University (China)

We demonstrate the use of plasmonic nanocavities to enable control of dark excitons and valley coherence in monolayer WSe2 under ambient conditions. With the help of a Au nanodisk-based nanocavity, the dark exciton emission is switched on with 22-fold enhancement and valley coherence is achieved through strong plasmon-exciton coupling.

09:45 INVITED TALK **Interaction between Plasmonic Nanostructures and 2D Semiconductor Materials**

Hong Wei

Institute of Physics CAS (China)

In this presentation, I will introduce our research on the coupling systems of plasmonic nanostructures and monolayer or few-layer transition metal dichalcogenides.

4–O6 | Room 3126 | 08:25 - 10:05

SYM4: Chirality, magnetism, and magnetoelectricity: Separate phenomena and joint effects in metamaterial structures

Organized by: Eugene Kamenetskii
Chaired by: Eugene Kamenetskii

08:25 INVITED TALK **Microscopic Hopfield Theory of Hyperbolic Phonon Polaritons in Layered Materials**

Yu Zhang

Los Alamos National Laboratory (USA)

Hyperbolic phonon polaritons in biaxial van der Waals crystals (e.g., α-MoO3) are extremely confined and anisotropic, yet usually modeled with fitted Lorentz permittivities. We present a gauge-consistent microscopic Hopfield theory linking DFPT lattice inputs to LO–TO splitting, dielectric response, slab dispersion, and twist-controlled inter-slab hybridization via Green-function coupling.

08:45 INVITED TALK **Photoelectron chiral dichroism from tailored light: symmetry and helicity**

Ofer Neufeld

Technion Israel Institute of Technology (Israel)

Symmetry plays a key role in light-matter interactions, including in chiral systems. Still, a group theory for photoelectron chiral dichroism (PECD) has not been developed prior. Here I will present the first such theory, also leading to novel selection rules in PECD from tailored-light, and PECD geometries without helical driving

09:05 INVITED TALK **Evaluating Surface-Enhanced Chiroptical Spectroscopy on Nanostructured Aluminum Substrates in the Deep-UV**

Bjoern Reinhard

Boston University (USA)

Scalable fabrication of aluminum nanostructures with tunable resonances in the UV provides opportunities for surface enhanced spectroscopies in which electronic transitions of molecular systems and plasmon resonances overlap. This presentation provides an overview of fabrication strategies and discusses advantages and challenges in applications for chiral molecular sensing.

09:25 INVITED TALK **Nonreciprocal Neural Networks for Decoupled Bidirectional Computing via Magneto-Optical SSPP Transmission Lines**

Xiaomeng Li, Enzong Wu, Hongsheng Chen, Zuojia Wang

Zhejiang University (China)

We demonstrate nonreciprocal neural networks inspired by biological directionality, to achieve compact decoupled bidirectional computing. Enhanced magneto-optical effects are leveraged in TE mode spoof surface plasmon polariton (SSPP) transmission lines, providing independent forward global perception and backward localized response. We also discuss how this nonreciprocal framework enables miniaturization and reconfiguration.

09:45 INVITED TALK **Spin relaxation near surfaces via gyromagnetic coupling to Rayleigh vorticity baths**

Mamoru Matsuo[1], Hiroshi Funaki[2], Ryotaro Sano[2], Ai Yamakage[2], Tatsuhiko Ikeda[2]

[1]University of Chinese Academy of Sciences (China), [2]Keio University (Japan)

We study near-surface spin relaxation due to coupling to Rayleigh-wave vorticity set by elastic boundary conditions at a traction-free surface. This gyromagnetic spin-vorticity coupling provides a geometry-dependent channel for low-temperature longitudinal relaxation, distinct from thermally activated two-phonon processes, and shapes transverse coherence through a super-Ohmic vorticity spectrum.

Coffee Break 10:00 - 10:40

4–P1 | Business School Concourse | 10:00 - 10:30

Poster Session VII

P1

Anomalous Reflecting Nonlocal Metasurfaces

Marten Musiol, Liam Shelling Neto, Steffen Sauer, Sebastian Häfner, Stefanie Kroker

TU Braunschweig (Germany)

This work presents an optimized nonlocal metasurface for anomalous reflection at a wavelength of 1550 nm. Using optimization and Bezier-defined geometries, we achieved 90.92% reflectivity at 38.5°. This approach enables compact, on-chip folded beam paths for gas sensing and enhanced rubidium and cesium isotope analysis by significantly increasing interaction lengths.

P2

Effective Optical Response of Multilayer Thin Films Using a Single-Layer Model for Photonic Applications

Mohammad Al-Kuhaili, Reem Abubaker

King Fahd University of Petroleum and Minerals (Saudi Arabia)

A single-layer model is proposed to extract effective optical constants of multilayer thin films from transmittance spectra. Applied to MoO_3/WO_3 bilayers, the method accurately describes the optical response and shows excellent agreement with effective-medium theory, providing a simple approach for photonic and electromagnetic applications.

P3

Single-photon generation from strongly coupled Au-metasurface-WSe2 monolayers via photon blockade

Andergachew Berhe[1], Haroldo Hattori[1], Andrey Miroshnichenko[2]

[1]The University of New South Wales (Australia), [2]University of New South Wales (Australia)

In this study, we demonstrated the application of quantum nanophotonics, specifically single-photon emission, in a strongly coupled Au plasmonic metasurface and a monolayer of WSe2 at room temperature. The demonstrated SPE has high purity with an equal-time second-order correlation function, g(2) (τ=0) = 0.00035 at cavity drive = 0.5 meV.

P4

Fabry-Pérot and Friedrich-Wintgen Bound States inthe Continuum in a Plasmonic Double T-Cavity

Amina Rezzouk[1], Soufyane Khattou[1], Madiha Amrani[1], Adnane Noual[1], E. H. El Boudouti[1], Bahram Djafari-Rouhani[2]

[1]Université Mohammed I (Morocco), [2]Université de Lille (Morocco)

We demonstrate the coexistence of twin Friedrich-Wintgen and Fabry-Pérot bound states in the continuum in a plasmonic metal-insulator-metal double Tcavity. Analytical Green's function formalism and finite-element simulations reveal the existence of multi-BICs and their transformation to Fano resonance for sensing and filtering.

P5

Auxetic Materials for Biomimicry: Designing for Tendon-Like Behavior

Riccardo Carlo Moroni, Katarzyna Majewska

Institute of Fluid-Flow Machinary PAS (Poland)

Tendon healing is slow and rarely restores full functionality. Studies show that in the toe region, up to 2% deformation, tendons behave as auxetic materials. This work aims to optimize a 2D re-entrant auxetic cell to replicate tendon Poisson ratio and stiffness for improved biomechanical performance.

P6

Multi-frequency Amplification of Underwater Acoustic Signals

C. W. Park[1], H. J. Lee[1], J. H. Park[2], W. Choi[1]

[1]Korea Research Institute of Standards and Science (KRISS) (South Korea), [2]University of Science and Technology (UST) (South Korea)

Underwater detection of airborne sound is challenging because acoustic waves significantly attenuate when propagating from air into water. We present a meta-acoustic sensor combining a piezoelectric element and a perforated 3D-printed cavity. Quarter-wave resonance selectively amplifies weak airborne acoustic signals at multiple target frequencies underwater while suppressing background noise.

P7

Flexible Plasmonic Polymeric Membranes Embedding Gold Nanoparticle Clusters for Advanced Biosensing

Federica Granata[1], Maria Laura Coluccio[2], Francesco Gentile[2], Giuseppe Coppola[3]

[1]National Research Council-ISASI (Italy), [2]University of "Magna Graecia" of Catanzaro (Italy), [3]Institute of Applied Science and Intelligent System - CNR (Italy)

A flexible plasmonic substrate was developed through a scalable, low-cost process based on ultrathin PDMS membranes with micropatterned amorphous silicon, enabling stable gold nanoparticle integration and reliable biosensing based on fluorescence microscopy and Raman spectroscopy.

P8

Temporal Coupled Mode Theory for a Single Floquet-Sheet Resonator

Yao-Ting Wang, Hsu-Hui Chou

National Sun Yat-sen University (Taiwan)

We develop a Temporal Coupled-Mode Theory specifically tailored for a single Floquet-sheet resonator. Our model explicitly captures the resonant coupling between the 0th-order channel and the -1st-order channel. The theory remains robust even when intrinsic material loss is incorporated. This framework offers a platform for designing time-varying photonic interfaces.

P9

Photonic Fiber Bragg Grating Sensor Network for Detection and Micro-Doppler Characterization of Small UAVs

Rodions Marstupa[1], Aleksandrs Olins[1], Mykola Khobzei[1], Vladyslav Tkach[1], Serhii Haliuk[1], Sandis Migla[1], Toms Salgals[1], Vjaceslavs Bobrovs[1], Dmytro Vovchuk[2]

[1]Riga Technical University (Latvia), [2]Tel Aviv University (Israel)

This work presents a fiber Bragg grating sensor network for detection and motion analysis of low-slow-small unmanned aerial vehicles. Spatiotemporal responses of distributed sensors are processed using STFT and FFT to identify drone trajectories and extract propeller micro-Doppler signatures. Experiments demonstrate reliable detection and estimation of rotor rotation characteristics.

P10

Beam Steering in the Sub-Terahertz Band Using a Microbridge-Array Based Reconfigurable Intelligent Surface

Steffen Klingel, Lars Franke, Marco Rahm

RPTU Kaiserslautern-Landau (Germany)

We present a MEMS-based reconfigurable intelligentsurface (RIS) with switchable microbridges for sub-THzbeam control. Simulations demonstrate a phase tuning range of300° at 100GHz with a reflection magnitude over 0.9 and ausable bandwidth exceeding 4GHz. A 10x10 unit cell prototypewas fabricated, demonstrating the feasibility of our design.

P11

Thermal Control of Q-factor in Terahertz quasi-BIC Metasurfaces via Lanthanum M-type Hexaferrites

Rohith K. M.[1], Suchandra Biswas[1], Bhairov Kumar Bhowmik[2], Pamu Dobbidi[1], Gagan Kumar[1]

[1]Indian Institute of Technology Guwahati (India), [2]Tampere University (Finland)

We report a novel Lanthanum M-type hexaferrite exhibiting thermally tunable terahertz dielectric properties to actively control the Q-factor of a narrow resonance in quasi bound-state-in-continuum metasurface. A 46.8% change in Qfactor can be achieved for a temperature variation of 119 K in simulation using the experimental data of the material.

P12

Design and modeling of plasmonic nanostructures for SPR based sensing in UV-B spectral region

Vaibhav Chaturvedi, Mohd Asif, Anuj Dhawan

Indian Institute of Technology (IIT) Delhi (India)

Simulations of plasmonic nanostructures for SPR based sensing were carried out such that the plasmon resonances were in the UV-B spectral region. The structures contained patterned nanohole arrays in an aluminum thin film. Shifts in plasmon resonance wavelengths were observed on changing the refractive index materials or biolayers.

P13

Optical Magnetic-Field-Gated Criticality in Photon Avalanching Quantum Processes

Benoît Reynier[1], Natalie Fardian-Melamed[2], Eric Charron[3], Filippo Calavaro[3], Bleuenn Belz[3], Artiom Skripka[4], Sébastien Bidault[5], Emory Chan[4], P. James Schuck[2], Mathieu Mivelle[3]

[1]Sorbonne Université (Switzerland), [2]Columbia University (USA), [3]Sorbonne Université (France), [4]Lawrence Berkeley National Laboratory (USA), [5]ESPCI Paris (France)

We demonstrate active control of photon avalanching in thulium-doped nanoparticles by engineering the optical magnetic field within a nanocavity. Using near-field positioning, we decouple avalanche threshold from cooperativity, reversibly tuning the nonlinearity from 15 to 62, establishing the optical magnetic field as a decisive control parameter for collective photonic criticality.

P14

Single-metasurface-enabled binocular vision for 4D imaging

Xuanyu Wu, Peng Li

Northwestern Polytechnical University (China)

Inspired by binocular vision, we propose a metasurface for single-shot four-dimensional imaging. Using polarization multiplexing and Airy beams, spin-decoupled point spread functions generate disparity-like images correlated with depth. Combined with reconstruction algorithms, the system simultaneously retrieves three-dimensional structure and polarization information within a compact imaging platform.

P15

TMOKE Enhancement via Hybrid Fabry-Perot-Plasmonic Modes in Magnetoplasmonic Multilayers

Elkin Sepúlveda[1], Edgar J. Patino[1], Mario Zapata[2]

[1]University of Los Andes (Colombia), [2]Donostia International Physics Center (Spain)

We demonstrate enhanced transverse magneto-optical Kerr effect (TMOKE) in magnetoplasmonic multilayers via hybrid Fabry-Perot-plasmonic modes. Coupling evanescent plasmonic fields with propagating cavity resonances enables co-localized field enhancement within the magneto-active layer. Tuned multilayer heterostructures exhibit stronger TMOKE than single-mode designs, confirmed by modeling, simulations, and experiments.

P16

Assessing Monolithic and Thin-Film Silicon Metasurfaces for Ultrafast Pulse Applications

Klaudijus Midveris, Gvidas Klyvis, Erika Jonaitytė, Tomas Klinavičius, Andrius Žutautas, Mindaugas Juodėnas

Kaunas University of Technology (Lithuania)

This study evaluates crystalline and amorphous silicon metasurfaces as compact optics for ultrafast lasers. Using a 1030 nm, 270 fs laser, both platforms demonstrated over 90% spatial shaping efficiency and near-zero temporal dispersion, preserving pulse duration. Although moderate damage thresholds limit high-fluence use, this proves their relevance for low-power applications.

P17

The Topography Makes the Potential: A Covariant Wave Equation for Surface Plasmon Polaritons on Arbitrary Weakly Curved Interfaces

Florian Bönsel, Flore K. Kunst

Max-Planck-Institute for the Science of Light (Germany)

Surface plasmon polaritons on weakly curved metal-dielectric interfaces acquire curvature-induced dynamics absent on flat surfaces. We derive an intrinsic surface Helmholtz equation by reducing Maxwell's equations with curvature-corrected boundary conditions. The resulting geometric potential enables eigenmode, spectral, and scattering analysis on arbitrary smooth manifolds and structured curved lattice-like landscapes.

P18

Interference Induced Complex Nonlinearities in Metal-ITO Metasurfaces

Christopher Stevens[1], Matthew Klein[1], Ashley Luo[1], Dennis Walker[1], Joshua Hendrickson[2], Ivan Avrutsky[3], Shivashankar Vangala[2], Maxim Sukharev[4]

[1]KBR (USA), [2]Air Force Research Laboratory (USA), [3]Wayne State University (USA), [4]Arizona State University (USA)

We show that Lorentz-dispersive nonlinearities are essential to describe the second- and third-harmonic responses from a metal-ITO metasurface with high fidelity. Details of a nonlinear-oscillator model that yields closed form angular dependences for second- and third-harmonic generation to describe the experimentally measured angular resolved spectra are presented.

P19

Observation of enhanced trap state emission from perovskite nanocrystals in plasmonic nanocavities

MohammadReza Aghdaee, Mathis van de Voorde, Gobert Heesink, Rebecca Saive, Oluwafemi S. Ojambati

University of Twente (The Netherlands)

Plasmonic nanocavities create extreme electromagnetic environments that can reshape emission pathways in semiconductors. Here, we show that CsPbCl3:Yb3+ perovskite nanocrystals embedded in plasmonic nanocavities exhibit trap-state emission that is absent in nanocrystals outside nanocavity. Time-resolved measurements reveal nanosecond-scale lifetimes, indicating the efficient activation of radiative channels under strong plasmonic confinement.

P20

Mixing Lateral Casimir Forces: Rotating Particle Above a Moving Surface

Stéphane Azar, Francisco J. Rodríguez-Fortuño

King's College London (United Kingdom)

We study the lateral Casimir force experienced by a particle rotating above a planar surface in uniform motion. Working with fluctuational electrodynamics, we investigated the conditions under which the total lateral Casimir force vanishes under different regimes and analysed to what extent it mimics a classical wheel rolling.

P21

Fast Computation of Hot-Spot-Enhanced Hot-Carrier Generation in Plasmonic Nanoclusters

Pablo M. Uribe-Pizarro[1], Alan McGaughey[2], Francisco Ramirez-Cuevas[3]

[1]Adolfo Ibañez University (Chile), [2]Carnegie Mellon University (USA), [3]Universidad Adolfo Ibañez (Chile)

Plasmon-induced photochemistry exploits metallic nanostructures to concentrate light into localized electromagnetic energy, enabling new photochemical pathways. Hot-carrier generation is inherent to plasmonic nanoparticles and enhanced by morphology, and interparticle coupling; We target the latter in nanoclusters via an efficient semi-analytical framework connecting plasmon modes to energy-resolved yields for photocatalytic design.

FRI

P22

Room-Temperature Lasing in quasi-2D Perovskite Coupled with High-Q Plasmonic Metasurfaces

Yen-Yu Wang[1], Ning-Hao Lee[1], Lin-Chyn Yuan[1], Chia-Yu Lai[1], Jia-Wern Chen[2], Chen-Yu Wang[1], Tzu-Yu Peng[1], Chu-Chen Chueh[1], Yu-Jung Lu[1]

[1]National Taiwan University (Taiwan), [2]Research Center for Applied Sciences (Taiwan)

We demonstrate room-temperature lasing in a quasi-2D perovskite integrated with a high-Q plasmonic metasurfaces supporting a Γ-point quasi-bound state in the continuum mode. To clarify the nature of the lasing mode, we analyze the emission characteristics using polarization-resolved k-space spectroscopy and compare them with the calculated photonic band structure.

P23

Tip-Enhanced High-Harmonic Generation in an STM Nanojunction Driven by Mid-Infrared Pulses

Atsunori Sakurai, Shota Takahashi, Tatsuto Mochizuki, Tsuneto Kanai, Toshiki Sugimoto

Institute for Molecular Science (Japan)

The fourth- and fifth-harmonic generation of mid-infrared pulses (3500 nm), accompanied by a broad luminescence from the gap-mode plasmon excitation in an STM nanojunction, was observed through the tip-enhanced process. This demonstrates that mid-IR field enhancement and visible plasmon resonance work together efficiently in tip-enhanced high-harmonic generation at the nanoscale.

P24

Enhanced Raman scattering on tip-on-mirror platforms

Víctor Camús[1], Daniel Arenas-Ortega[2], Alejandro Martínez[2], Elena Pinilla-Cienfuegos[2], Ana Cros[1], Núria Garro[1]

[1]Universitat de València - ICMUV (Spain), [2]Universitat Politècnica de València - NTC (Spain)

Comparative studies of nanoplasmonic cavities formed in the interspace between gold microdisks and either a gold-coated AFM tip or a gold nanoparticle are presented based on enhanced Raman scattering of molecular self-assembled monolayers. These measurements deepen our understanding of plasmonic interactions and contribute to new sensing and photonic devices.

P25

Ultranarrow Linewidth Surface Lattice Resonances in Aluminum Bowtie Metasurfaces

Bhera Ram Tak, Robert O'Meara, Nebras Alattar, Hodjat Hajian, Richard G. Hobbs

Trinity College Dublin (Ireland)

We report surface lattice resonances in the 460 to 580 nm range in aluminum bowtie nanoantennas fabricated by electron beam lithography. Without post-annealing or symmetric refractive index material coating, fabricated arrays exhibit ultra-narrow 3.4 nm linewidth. These metasurfaces can support strong coupling for photocatalysis and quantum emitters.

P26

Plasmonic Response in Mg-Al Bimetallic Nanoparticles

Marwan Alam, Katarzyna Kluczyk-Korch, Tomasz Antosiewicz

University of Warsaw (Poland)

First-principles study of Mg-Al icosahedral clusters (0-100\{}% Al) reveals starkly different photoabsorption spectra for clustered vs. random atomic arrangements. Random alloys exhibit a single, progressively broadening peak that evolves continuously from Mg to Al character. However, clustered configurations display multiple distinct peaks. Composition and atomic ordering enable controlled plasmonic properties.

P27

Plasmonic Fiber Tip-Enhanced Raman Spectroscopy based on Shear-Force Near-Filed Microscopy

Zhonglin Xie, Chao Meng, Ting Mei, Wending Zhang

Northwestern Polytechnical University (China)

This study integrates a plasmonic fiber tip (PFT) with radial vector mode excitation into a shear-force SNOM-TERS platform. The PFT significantly enhances electric field intensity and gradient, enabling non-destructive chirality mapping of single-walled carbon nanotubes via multiple-order phonon vibrational modes and Kataura plot correlation for chirality index (n, m)

P28

Physics-Guided Inverse Design of Broadband Low-Frequency Underwater Acoustic Metamaterials

Krupali Donda, Vatsal Patel, Yash Shah, Vimi Patel

Adani University (India)

Broadband low-frequency acoustic absorption isconstrained by large wavelengths and high-dimensional design-complexity. We propose a physics-guided inverse design framework using a Conditional Invertible Neural Network (cINN)for a 20-parameter multilayer acoustic metamaterial absorber.Trained on one million Latin Hypercube Sampling (LHS) samplesand validated via Transfer Matrix Method (TMM), it achieves< 0.3% error.

P29

Nonlinear Topological States in Photonic Crystals: Modal Structure and Dynamics

Tomasz Śmiarowski

Warsaw University of Technology (Poland)

P30

The Fabrication of Lithium Niobate Nanostructures with Their Applications in Nonlinear Metalens

Junjie Li, Bo Wang, Ruhao Pan

Institute of Physics - CAS (China)

4–O7 | Maharry Theatre | 10:40 - 12:35

SYM6: Advanced Techniques for Computational Electromagnetics

Organized by: Maha Ben Rhouma
Chaired by: Maha Ben Rhouma

10:40 INVITED TALK **High-Fidelity Fullwave Solvers and Reduced-Order Models for the Design of Complex Nanostructured Photonic Devices**

Mahmoud Elsawy, Alexis Gobe, Stéphane Lanteri

Inria (France)

In this contribution, we review our recent works aiming at the development of high-fidelity fullwave solvers and reduced-order modelsfor studying nanoscale light-matter interactions. Additionally, wealso discuss ML-based inverse design strategies for shaping theseinteractions through optimization of geometrical features ofnanostructures.

11:00 INVITED TALK **Advanced in Topology Optimization for Metaphotonics and Integrated Optics**

Antonio Calà Lesina

Leibniz University Hannover (Germany)

Inverse-design approaches based on topology optimization enable the discovery of fully three-dimensional nanophotonic structures with free-form geometries that transcend human intuition and achieve optical functionalities beyond the reach of conventional design strategies. This talk presents recent advances from my group in topology optimization for nanophotonics, meta-optics, and integrated optics.

11:20 INVITED TALK **Quantum Nonlinear Optics of Epsilon-Near-Zero Materials**

Sonia Alipour[1], Tornike Shubitidze[2], Riccardo Franchi[2], Luca Dal Negro[2], Marco Ornigotti[1]

[1]Tampere University (Finland), [2]Boston University (USA)

Using the Green's tensor quantization method, we describe nonlinear optical processes in epsilon-near-zero (ENZ) materials from a full quantum perspective. As an example, we discuss several geometries and nonlinear processes. Our findings shed new light on the feasibility of single photon ENZ-based devices for quantum technologies.

11:40 INVITED TALK **SCRIBEed GRIN-Lenses by Topology Optimization**

Rasmus Christiansen[1], Dajie Xie[2], Paul Braun[2]

[1]Technical University of Denmark (Denmark), [2]University of Illinois at Urbana- Champaign (USA)

High-efficiency compact GRIN metalenses, tailored for fabrication by SCRIBE, are designed using density-based topology optimization. Superior performance is demonstrated experimentally compared to traditional diffractive lenses of (near) identical dimensions, revealing the potential of combining SCRIBE with inverse design to realize improved optical devices fabricated using low-index contrast materials.

12:00 INVITED TALK **Engineering Optical Nonlinearities Using Nanostructured Materials**

Luca Razzari

Centre Énergie Matériaux Télécommunications (INRS-EMT) (Canada)

In this talk, I present nanostructuring approaches to tailor the nonlinear optical response of dielectric thin films. I discuss a phase-change platform (GSST) suitable for the mid-infrared range. Finally, I show that metasurface engineering modifies the nonlinear susceptibility of amorphous silicon, controlling the polarization of the generated light.

12:20

Radiative decay of surface plasmon propagating in thin metal film

Arkadii Krokhin, Andrey Bozhko

University of North Texas (USA)

A narrow transition layer between metal and dielectric contains epsilon-near-zero surface (ENZ) formed by spill-out electrons and surface roughness. Electromagnetic field of surface plasmon leaks through the ENZ point leading to radiative attenuation. Here the radiative lossesof surface plasmon are calculated for a thin metal film.

4–O8 | Room 3074 | 10:40 - 11:10

SP23: Nanoscale Phononics : Energy Transport, Light-Matter Coupling, and Emerging Applications

Organized by: Jérémie Margueritat and Aurélien Crut
Chaired by: Jérémie Margueritat and Aurélien Crut

10:40

Vibrational dynamics of self-assembled nanoparticles

Mohammad Imran Shaik, Nicholas Blanchard, Benoit Mahler, Jérémie Margueritat

Université Lyon 1 (France)

We measure interaction-induced vibrational modes in nanoparticle assemblies down to 20nm and show that the Johnson-Kendall-Roberts (JKR) contact-mechanics model breaks down below 100nm, coinciding with emergence of disordered, weakly connected networks and transition to percolation scaling that establishes mechanical connectivity as the governing mechanism in this regime.

10:55

Mapping electrostatic and Casimir forces above metallic nanostructures using suspended nanowires

Lucas Judéaux, Philip Heringlake, Hugo Weltz, Cattleya Dousset, Benjamin Pigeau, Olivier Arcizet

Institut Néel - CNRS (France)

We optically probe the vibrations of an ultrasensitive force sensor, a suspended silicon carbide nanowire to map the lateral electrostatic and proximity forces experienced above a metallic nanostructure. We probe and compensate the electrostatic forces at each position above the sample and spatially map the lateral Casimir force field.

4–O9 | Room 4050B | 10:40 - 12:30

SYM2: New trends in nanophotonics and advanced materials

Organized by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han
Chaired by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

10:40 INVITED TALK **Fast and High efficiency photo-thermal conversion in optical nanocavity**

Giuseppe Nicoletta[1], Giuseppe Emanuele Lio[2], Roberto Caputo[1], Antonio Ferraro[3]

[1]University of Calabria (Italy), [2]University of Pisa (Italy), [3]Consiglio Nazionale delle Ricerche - Istituto di Nanotecnologia (Italy)

The generation of heat at the micro/nanoscale is growing research field due to their breakthrough application in nanochemistry, medical and life science. Here we investigate the photothermal conversion ability and applications of an optical nanocavity. A temperature increase higher than 550°C is obtained with an intensity of only 75 mW/mm2.

11:00 INVITED TALK **Ultra-Fast Optical Response of Al:ZnO Metasurfaces in the near infrared range**

Stefania Benedetti[1], Tersilla Virgili[2], Luca Bursi[1], Michele Guizzardi[2], Andrea Villa[3], Alessandro di Bona[1], Sergio D'Addato[1], Andrea Mescola[1], Gian Carlo Gazzadi[1], Arrigo Calzolari[1]

[1]CNR Istituto Nanoscienze (Italy), [2]CNR (Italy), [3]Politecnico Di Milano (Italy)

Aluminum-doped ZnO (AZO) is a promising material for photonic applications because of its tunable plasmonic response and the low optical losses in the near-infrared (NIR). We have investigated the role of nanostructuration in the ultrafast optical response and in the dynamics of electron populations of engineered AZO metasurfaces.

11:20 INVITED TALK **Ultrafast Optical Dynamics of Photoinduced PhaseTransitions in VO2 Thin Films and Metamaterial**

Yael Gutierrez[1], Saul Vazquez-Miranda[2], Shirly Espinoza[2], Mateusz Rebarz[2], Zhen Zhang[3], Shriram Ramanathan[3], Helmut Klar[4], Jose M. Saiz[2], Sebastien Cueff[5]

[1]Universidad de Cantabria (Spain), [2]The Extreme Light Infrastructure ERIC (Czech Republic), [3]Purdue University (USA), [4]Universitat Augsburg (Germany), [5]Ecole Centrale de Lyon (France)

We employ ultrafast time-resolved spectroscopic ellipsometry to investigate photoinduced insulator-to-metal transitions in VO2 thin films and in a VO2 metamaterial . The transitions are triggered by femtosecond laser pulses and probed with sub-picosecond temporal resolution, enabling direct tracking of the troptical response.

11:40 INVITED TALK **Polarization-Controlled Lattices of Sub-Wavelength Photonic Spin Skyrmions**

Andrei Afanasev

The George Washington University (USA)

We theoretically analyze properties of topological spin textures of optical fields characterized by spin orientation in all three dimensions and described in terms of Bloch merons and skyrmions. Formation of isolated skyrmions, their lattices and their propagation in space are described.

12:00 **Polarisation control in time-varying low-index films**

Wallace Jaffray[1], Sven Stengel[1], Alexandra Boltasseva[2], Vladimir M. Shalaev[2], Maria Antonietta Vincenti[3], Domenico de Ceglia[3], Michael Scalora[3], Carlo Rizza[4], Marcello Ferrera[1]

[1]Heriot-Watt University (United Kingdom), [2]Purdue University (USA), [3]University of Brescia (Italy), [4]University of L'Aquia (Italy)

We present an all-optical strategy for ultrafast, reconfigurable polarisation control using subwavelength epsilon-near-zero transparent-conductor films. Femtosecond pumping transiently reshapes the carrier plasma to induce birefringence, dichroism, and pump-helicity-dependent optical activity within a single unpatterned platform, enabling broadband, sub-picosecond polarisation transformations compatible with compact integrated photonics.

12:15

Tunable Achiral Metamaterial Substrates for Enantiomer Detection

Maryam Mirahmadi[1], Ali Douaki[1], Vincenzo Caligiuri[2], Denis Garoli[1], Roman Krahne[1]

[1]Italian Institute of Technology (Italy), [2]Universitá della Calabria (Italy)

We use tilted achiral metal-dielectric-metal nanocavities in which the top metal layer is patterned into a nanohole array as spectrally tunable metamaterial substrates for enantiomer detection. By combining circular dichroism experiments with simulations, we elucidate the different contributions to the chirality enhancement.

4–O10 | Room 3051 | 10:40 - 12:15

SYM2: New trends in nanophotonics and advanced materials

Organized by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han
Chaired by: Junsuk Rho, Hakjoo Lee, Namkyoo Park, Seong Ok Han

10:40 INVITED TALK

Label-free and Label-based approaches for tapered fiber photometry in the deep brain

Massimo De Vittorio, Ferruccio Pisanello

Istituto Italiano di Tecnologia (Italy)

Tapered fiber photometry can be exploited for depth-resolved deep-brain recording using fluorescent reporters and in label-free Raman approaches to probe the intrinsic molecular composition without exogenous markers. Combined with plasmonic enhancement, these approaches offer complementary strategies to investigate neural dynamics and tissue composition in vivo.

11:00 INVITED TALK

Self-Hybridized Exciton-Polaritons in Two-Dimensional-Perovskite Microcrystals

Martina Borreani[1], Alexander Schleusener[1], Sudhir K. Saini[1], Lin-Han Li[2], Miao-Ling Lin[2], Ping-Heng Tan[2], Vincenzo Caligiuri[3], Roman Krahne[1]

[1]Italian Institute of Technology (Italy), [2]Institute of Semiconductors - CAS (China), [3]Università della Calabria (Italy)

We fabricate highly regular 2D perovskite microcrystals by recrystallization that function as optical cavities and sustain strong light-matter interaction. The cavity modes and polariton dispersion are governed by the non-linear wavelength dependence of the refractive index, leading to slow light propagation at the band edge.

11:20 INVITED TALK

Direct Nanoimprint Lithography as an Additive Full-Wafer Manufacturing Platform for All-Inorganic Metaoptics and AR Waveguides

James Watkins

University of Massachusetts (USA)

We fabricate all-inorganic, high-efficiency metalenses, metasurfaces, and AR waveguides on full-wafer platforms with cycle times of less than 5 minutes/wafer via additive nanoimprint lithography using nanoparticle dispersion inks. With recent advances, we achieve refractive indices up to 2.6, which enhance device performance in the visible and near IR..

11:40 INVITED TALK

Synthesis of Colloidal Nanoalloys by Ultrafast Laser Irradiation

Andrés Guerrero Martínez, Guillermo González Rubio

Universidad Complutense de Madrid (Spain)

Colloidal nanoalloys synthesized by ultrafast laser irradiation offer tunable optical and catalytic properties driven by localized surface plasmon resonances. Femtosecond pulses enable controlled reshaping and alloying, avoiding fragmentation typical of longer pulses. This approach provides precise control over composition and structure, linking synthesis conditions with functional performance in advanced nanomaterials.

12:00

Flat Optics for Multispectral Grafted Vortex Beams and OAM Combs

Hammad Ahmed, Xianzhong Chen

Heriot-Watt University (United Kingdom)

We present a compact flat-optics platform capable of generating and tuning multispectral grafted vortex beams together with azimuthally engineered OAM combs. By coherently superimposing multiple helical phase distributions, the system produces optical beams with tailored topological charges and multispectral OAM spectra, creating new opportunities in optical encryption and particle manipulation.

4–O11 | Room 3071 | 10:40 - 11:55

SYM1: Hybrid Nanomaterials and Metastructures for Photonics, Sensing and Energy

Organized by: Jérôme Plain, Alexander Govorov, Davy Gérard, Pedro Hernandez Martinez

Chaired by: Jérôme Plain, Alexander Govorov, Davy Gérard, Pedro Hernandez Martinez

10:40 INVITED TALK

Plasmon-induced spin selectivity for controlling reaction intermediates in relevant chemical transformations

Karolina Kukrálová

UCT Prague (Czech Republic)

Chiral-induced spin selectivity (CISS) is a well-known phenomenon where molecular chirality filters electron spins. This lecture proposes Plasmon-Induced Spin Selectivity (PISS) as an electromagnetic analogue. We demonstrate how chiral plasmonic fields align spins during transitions, utilizing this mechanism to drive and control spin-dependent chemical transformations in nanostructured environments.

11:00 INVITED TALK

EC-SERS - a combination of electrochemistry and Raman spectroscopy for selective detection of organic contaminants in complex water matrices

Jana Rosenkranzova

University of Chemistry and Technology Prague (Czech Republic)

Pharmaceutical contaminants in wastewater are a growing environmental concern. Electrochemical surface-enhanced Raman spectroscopy (EC-SERS) with mesoporous gold sensitively detects trace organics by electrochemically controlling analyte selective accumulation on plasmon active surface, enhancing spectral intensity, and reducing matrix interference on SERS-active nanostructures. Several model pharmaceutical pollutants to assess analytical performance.

11:20 INVITED TALK

Advancements in laser photo-acoustic spectroscopy towards imaging of absorption and chirality in nanostructures and metamaterials

Emilija Petronijevic

Sapienza University of Rome (Italy)

We use photo-acoustic effect do reveal scattering-free absorption signals at the nanoscale. We present microscope-enriched laser photo-acoustic spectroscopy with a full tunability of a conventional chiro-optical set-up.

11:40

Automated computation on AI-designed all-optical Boolean microprocessors by an interfacial robot driving a non-linear optical bench.

Léo Martin[1], Alice Nyaga[1], Fayçal Houssaini[1], Amine Khitous[1], Nicolas Gros[2], Aurélie Bertaux[2], Ouassila Narsis Labbani[2], Gérard Colas des Francs[1], Christophe Nicolle[2], Alexandre Bouhelier[1], Mohand-Ousaid[3], Dujardin[1]

[1]Universite Bourgogne Europe (France), [2]Université Bourgogne Europe (France), [3]FEMTO-ST Institute (France)

We demonstrate BOTAI, an interfacial robot that autonomously controls a multi-beam non-linear optical setup for all-optical computing. The system interprets instructions from a hybrid artificial intelligence to position laser beams on plasmonic structures and acquire non-linear photoluminescence response, achieving automated Boolean arithmetic and logic operations with sub-100 nm positioning accuracy.

4–O12 | Room 3126 | 10:40 - 11:15

SYM4: Chirality, magnetism, and magnetoelectricity: Separate phenomena and joint effects in metamaterial structures

Organized by: Eugene Kamenetskii
Chaired by: Eugene Kamenetskii

10:40 INVITED TALK **An Electromagnetically Driven Vaterite-based Panacea Platform**

Pavel Ginzburg, Hani Barhom, Andrey Machnev, Andrey Ushkov, Denis Kolchanov, Pavel Bezrukov

Tel Aviv University (Israel)

Nano-engineered drug delivery capsules represent a milestone in advancing precision medicine. We introduce metamaterial drug-delivery capsules based on golden and magnetized vaterite and demonstrate how electromagnetic control enables a unified light- and magnetic-based theranostic paradigm. Beyond optical activation, we add magnetic-field-guided propulsion to address long-standing bottlenecks in in vivo targeting.

11:00 **Extrinsic-Chiral Flatband Metasurface Generating Photons with Tunable Quantum Entanglement**

Alena Mamonova, Maxim Gorkunov

National University of Science and Technology “MISiS” Russia (Russia)

We consider extrinsic-chiral nonlinear dielectric metasurfaces based on AlGaAs nanorod dimers supporting quasi-bound states in the continuum as sources of quantum-entangled photon pairs. We show that subtle tuning of the wave pumping spontaneous parametric down-conversion continuouslytransforms the pairs from maximum entangled Bell states to unentangled product states.

Lunch Break 12:35 - 14:00

End of Conference
12:35 - 13:15

Author Index

A

B

C

D

E

F

G

H

I

J

K

L

M

N

O

P

Q

R

S

T

U

V

W

X

Y

Z