FINAL PROGRAM

ICOP 2020

Italian Conference on Optics and Photonics

September 8-11, 2020

now online!

International Day of Light
16 May

Parma
Capitale Italiana della Cultura 2020

TOPICS

- Nano and Quantum Sciences
- Optical Communication Systems
- Optical Imaging and Sensing
- Laser and Nonlinear Optics
- Applications of Photonic Technology
- Emerging Topics

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Annamaria Cucinotta

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ICOP 2020

Parma, Italy
September, 8-11, 2020

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CHAIR WELCOME

The **Italian Conference on Optics and Photonics** aims to bring together researchers from all over Italy and worldwide, networking and exchanging their research developments in the field of Optics and Photonics, in a stimulating and multidisciplinary forum. The Conference will establish as a high-level meeting in the areas of Nano and Quantum Sciences, Optical Communication Systems, Optical Imaging and Sensing, Laser and Nonlinear Optics, Applications of Photonic Technology and new Emerging Topics. The program will feature invited lectures, oral and poster sessions. Due to the current restrictions caused by pandemic, the ICOP2020 has been organized as a virtual event. Presentations will be streamed "live" in the mornings from September the 8th to September the 11th in order to make the Italian Conference on Photonics 2020 accessible to our entire community.

IMPORTANT DATES

Submission Deadline: **31 January 2020** - Acceptance Notification: **30 March 2020**
Optional extended Paper submission: **30 September 2020**

CONFERENCE TOPICS

Nano and Quantum Sciences Quantum cryptography and communication, Quantum sensing/imaging/metrology and nanofabrication, Optical antennas and nanoantennas, Nano-optical cavities and waveguides

Optical Communication Systems Novel fibers, Active optical devices, Photonic integrated circuits, Digital transmission systems, Access, data center and optical networks

Optical Imaging and Sensing Bio-imaging and microscopy, Chemical, biochemical and physical sensors, Fiber sensors, Lab-on-chip, Optogenetics, Optofluidics, Image sensors

Laser and Nonlinear Optics Micro-structured and specialty optical fibres, Quantum confined lasers and laser components, Fiber lasers, Nonlinear optics and its applications

Applications of Photonic Technology Photonics in manufacturing, Organic electronics and photonics, Photonics for solar energy systems, Photonics for automotive and aerospace, Photonics for agri-food

Emerging Topics 3D Printed optics and additive photonic manufacturing, Digital optics for immersive displays, Neuro-inspired photonic computing, Photonics for free space, 5G and microwave applications

Conference Sessions

Tuesday, September 8, 2020

Plenary Session

Conference Chair: **Annamaria Cucinotta** – University of Parma
8:30 – 8:45

Session A1 - Plasmons and Metamaterials

8:45 – 9:35
Chair: Ivo Rendina

8:45 – 8:55

"STRATEGIES TO ENHANCE THE PHOTOSTABILITY OF PLASMONIC PARTICLES"

Fulvio Ratto[1*], Lucia Cavigli[1], Sonia Centi[1], Boris Khlebtsov[2], Alessio Milanesi[1,3], Claudia Borri[1], Patrizia Bogani[4], Nikolai Khlebtsov[2,5], Roberto Pini[1]

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We discuss strategies to improve the stability of photoacoustic conversion from gold nanorods by protecting their shape against overheating by the use of various containment shells, or the implementation of concepts for faster heat dissipation.

8:55 – 9:05

"NANOSCALE IMAGING OF PLASMON-EXCITON COUPLING IN AU-ZNO TETRAPODS"

Giovanni Bertoni[1], Filippo Fabbri[2], Marco Villani[3], Laura Lazzarini[3], Stuart Turner[4], Gustaaf Van Tendeloo[4], Davide Calestani[3], Silvija Gradečak[5], Andrea Zappettini[3], Giancarlo Salviati[3 *]

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We show nanoscale spectroscopy and mapping of plasmon-excition coupling in Au/ZnO nanostructure by STEM-EELS and STEM-CL. Interestingly, the Au plasmon resonance is localized at Au/vacuum interface, while the ZnO signal is localized inside Au nanoparticle.

9:05 – 9:15

"MONOLITHIC LITHIUM NIOBATE METASURFACES FOR MAGNETIC-DIPOLE DRIVEN SECOND-HARMONIC GENERATION"

L. Carletti [1,2,3,*], A. Zilli [4], F. Moia [5], A. Toma [5], M. Finazzi [4], M. Celebrano [4], C. De Angelis[2], D. N. Neshev [3]

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We demonstrate monolithic lithium niobate metasurfaces for enhanced second-harmonic generation in the visible spectrum. We predict a conversion efficiency up to 5×10-5, enabling applications to novel nonlinear and quantum light sources.

9:15 – 9:25

"HYPERBOLIC METASURFACES BY SELF-ASSEMBLED DIBLOCK COPOLYMERS"

Angelo Angelini[1], Irdi Murataj[1,2], Marwan Channab[1,2], Eleonora Cara[1], Natascia De Leo[1], Candido Fabrizio Pirri[2], Luca Boarino[1], Federico Ferrarese Lupi[1]
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9:25 - 9:35

"ULTRAFAST DICHROISM VIA PHOTOINDUCED SYMMETRY-BREAKING IN PLASMONIC METASURFACES"

Andrea Schirato[1,3], Margherita Maiuri[1,2], Andrea Toma[3], Remo Proietti Zaccaria[3,4], Paolo Laporta[1,2], Peter Nordlander[5,6], Giulio Cerullo[1,2,] Alessandro Alabastri[5], Giuseppe Della Valle[1,2*]
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We theoretically predict and show by ultrafast pump-probe experiments a sub-picosecond transient dichroism in a plasmonic metasurface driven by the inhomogeneous space-time dynamics of the photogenerated hot carriers.

Session B1 - Photonics for Cultural Heritage 1

Chair: Daniela Comelli
8:45 – 9:40

8:45 – 8:55

"COMBINED PHOTOACOUSTIC IMAGING TO DELINEATE THE INTERNAL STRUCTURE OF PAINTINGS"

Alice Dal Fovo[1*], George J. Tserevelakis[2], Krystalia Melessanaki[2], Athanasia Papanikolaou[2], Giannis Zacharakis[2], Raffaella Fontana[1]
1 Consiglio Nazionale delle Ricerche—Istituto Nazionale di Ottica (CNR-INO), Largo Enrico Fermi 6, 50125, Firenze, Italy
2 Foundation for Research and Technology Hellas, Institute of Electronic Structure and Laser (IESL-FORTH), N. Plastira 100, Heraklion, Crete, Greece

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Photoacoustic methods are tested for the 3D survey of painting artworks to achieve both the micrometric cross-sectional measurement of pictorial layers and the visualization of hidden underdrawings in a non-invasive way.

8:55 – 9:05

"**MORE THAN IMAGES: HOW MA-XRF MAPS AND HYPERSPECTRAL IMAGES WORK TOGETHER IN THE STUDY OF PAINTING MATERIALS"**

Anna Galli[1,2*], Michele Caccia[2], Simone Caglio[2], Letizia Bonizzoni[3], Michele Gironda[4], Roberto Alberti[4], Marco Martini[2]

1 CNR-IBFM, via Fratelli Cervi 93, Segrate (MI), Italy

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In the present work, we consider MA-XRF as an imaging technique; in this approach, we were able to get a deep synergy with the other imaging techniques, in particular with hyperspectral images.

9:05 – 9:15

"**IMAGE DATA FUSION APPLIED TO THE RECOGNITION OF PICTORIAL LAYERS"**

Giuseppe Bonifazi[1], Giuseppe Capobianco[1*], Rosalba Calvini[2], Silvia Serranti[1*]

1 Department of Chemical Engineering Materials & Environment (DICMA), La Sapienza – Rome University, Via Eudossiana 18, Rome, Italy 001842

2 Department of Life Sciences, University of Modena and Reggio Emilia, Pad. Besta - Via Amendola, 2, 42122, Reggio Emilia, Italy

*giuseppe.capobianco@uniroma1.it

Painting materials were investigated through two hyperspectral cameras adopting a data fusion approach, allowing to identify and characterize the pigment materials in a rapid, non-invasive and reliable way.

9:15 – 9:25

"VIS-NIR REFLECTANCE SPECTRA CLASSIFIER FOR PIGMENTS IN THE MOBARTECH PROJECT"

Letizia Bonizzoni[1*], Jacopo Melada[1], Rebecca Bonini[1], Ambra Cattaneo[1], Marco Gargano[1], Emanuela Grifoni[1], Nicola Ludwig[1]

1 Dipartimento di Fisica "Aldo Pontremoli", Università degli Studi di Milano, Via Celoria 16, Milano, Italy

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The present work presents the preliminary outcome of one of the tasks inside the MOBARTECH project; in detail, the creation of the prototype for a compact FORS spectrophotometer capable of automatically identifying pigments and dyes.

9:25 – 9:40

Invited paper: **"PHOTONICS AND MATERIAL HISTORY: INSIGHTS INTO OUR PAINTED HERITAGE"**

Austin Nevin[*1], Victoria Skallenberg[1], Marta Ghirardello[2], Maria Teresa Pullano[3], Ravit Linn[4], Iacopo Osticioli[5], Gianluca Valentini[2], Daniela Comelli[2]

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3 Göteborg Museum of Art, Götaplatsen 6, 412 56 Göteborg, Sweden

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9:45 – 10:00 Break

Session A2 - Optical Sensing I: Physical sensing

10:00 – 11.20
Chair: Francesco Baldini

10:00 – 10:10

"ENHANCING THE SPATIAL RESOLUTION OF CHIRPED-PULSE PHASE- SENSITIVE OPTICAL TIME-DOMAIN REFLECTOMETRY USING DIGITAL SUB-BAND SIGNAL PROCESSING"

Marcelo A. Soto[1*], Leonardo Marcon[2], Miguel Soriano-Amat[3], Luis Costa[3], Hugo F. Martins[4], Luca Palmieri[2], Miguel Gonzalez-Herraez[3]
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A method based on digital filtering and an additional optical carrier is here proposed to enhance the spatial resolution of chirped pulse φ-OTDR distributed sensors. Results demonstrate a 10-fold resolution improvement with minimum SNR impact.

10:10 – 10:20

"**INNOVATIVE CABLE DESIGN FOR DISTRIBUTED SENSING APPLICATIONS BASED ON STIMULATED BRILLOUIN SCATTERING"**

Filippo Bastianini[1], Paweł Bocheński[2], Raffaella Di Sante[3], Francesco Falcetelli[3], Diego Marini[4], Gabriele Bolognini[4*]
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3 Dept. of Industrial Engineering - DIN, Univ. of Bologna, via Fontanelle 40, Forlì 47100, Italy
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An innovative optical fibre cable designed for Brillouin sensing applications is presented. The stages of the project are discussed, and the cable performance are tested through numerical modelling and experiments.

10:20 – 10:30

"BRILLOUIN OPTICAL TIME DOMAIN ANALYSIS EMPLOYING A DOUBLY RESONANT SHORT CAVITY FIBER RING LASER WITH ACTIVE STABILIZATION"

L. Rossi[1,2], D. Marini[1], F. Bastianini[3], G. Bolognini[1*]
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2 Università degli Studi di Bologna, 40129 Bologna, Italy
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We employ a new Brillouin ring laser (BRL) source based on an actively stabilized doubly resonant short cavity layout for Brillouin optical time-domain analysis (BOTDA) sensing. Compared to BRL designs that we have previously demonstrated, it presents improved SNR, lower spectral bandwidth and pump-probe frequency shift values with high temporal stability.

10:30 – 10:40

"SUPERIMPOSED LONG PERIOD GRATINGS OBTAINED BY DISCRETIZED SINUSOIDAL REFRACTIVE INDEX PATTERN"

Cosimo Trono[1*], Federico Valeri[1,2], Francesco Baldini[1]

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2 Dipartimento di Fisica, Università degli Studi di Firenze, 50019 Sesto Fiorentino, Italy

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A novel technique for the inscription of superimposed long period gratings with arbitrary grating pitches, based on the discretization of an ideal continuous sinusoidal refractive index pattern is proposed and experimentally validated.

10:40 – 10:50

"STRUCTURAL VIBRATION SENSING IN A DEPLOYED PON INFRASTRUCTURE"

Ilaria Di Luch[1*], Maddalena Ferrari[1], Pierpaolo Boffi[1], Giuseppe Rizzelli[2], Haoyi Wang[2], Roberto Gaudino[2]

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Deployed Passive Optical Network (PON) infrastructures are proved to potentially support remote structural vibration monitoring while simultaneously downstreaming 10Gbit NRZ transmission.

10:50 – 11:00

"RADIATION DOSE MONITORING USING OFDR AND ENHANCED BACKSCATTERING OPTICAL FIBERS"

Massimo Olivero[1*], Alessandro Mirigaldi[1], Wilfried Blanc[2], Mourad Benabdesselam[2], Franck Mady[2], Carlo Molardi[3], Daniele Tosi[3], Alberto Vallan[1], Guido Perrone[1]

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2 Universitè Côte d'Azur - CNRS, Nice, France

3 Nazarbayev University, Astana, Kazakhstan

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An in-situ real-time dosimeter capable of evaluating both the cumulative dose and the radiation intensity profile is demonstrated using an enhanced back-scattering optical fibre interrogated with a high-resolution optical back-scattering reflectometer. Particular interesting are possible applications in the biomedical field, such as in tumour therapy.

11:00 – 11:10

"AN OPTICAL FIBRE CABLE FOR DISTRIBUTED PRESSURE SENSING WITH HIGH RESOLUTION AND SENSITIVITY"

Luca Schenato[1*], Riccardo Veronese[2], Alessandro Pasuto[1], Andrea Galtarossa[2], Luca Palmieri[2]

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2 Department of Information Engineering, University of Padova, I-35121 Padova, ITALY

*luca.schenato@cnr.it

In this work, we present an optical fibre cable for distributed pressure sensing employing standard single-mode fibres. The cable can be interrogated with a distributed strain sensing interrogator, either based on Rayleigh or Brillouin scattering. By using an optical frequency domain reflectometer with 1 με of strain resolution on a cable prototype, we found that the spatial resolution is approx. 8.5 cm, and the pressure resolution and accuracy are approximately 5 Pa and 10 hPa, respectively.

11:10 – 11:20

"DETECTING DEBRIS FLOWS BY DISTRIBUTED ACOUSTIC SENSING"

Luca Schenato[1*], Pia R. Tecca[1], Andrea M. Deganutti[1], Hugo F. Martins[2], Andrés García-Ruiz[2], María del Rosario Fernández-Ruiz[2], Sonia Martín-López[2], Francesco Zarattini[3], Antonio Pol[3], Fabio Gabrieli[3], Riccardo Veronese[4], Gianluca Guerra[4], Gianluca Marcon[4], Andrea Galtarossa[4], Alessandro Pasuto[1], Miguel González-Herráez[2], Luca Palmieri[4]

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In this work, we have monitored some debris flows in an artificial inclined flume, instrumented with approx. 800 m of fiber, wound in 20 coils. The fiber was interrogated using a distributed acoustic sensing (DAS) system based on a chirped-pulses phase-sensitive optical time-domain reflectometer and the acquired signals were analyzed confirming the viability of DAS for debris flows monitoring.

Session B2 - Optical Networking Techniques

10:00 – 11:20

Chair: Paolo Serena

10:00 – 10:15

Invited paper: **"SMART-A: AN SDN APPLICATION FOR RECONFIGURING OPTICAL NETWORKS"**

Annalisa Morea, Nokia Italia, Vimercate (MB), Italy

10:15 – 10:30

Invited paper: **"OPTICAL FREQUENCY COMBS FOR SPECTRALLY EFFICIENT TRANSMISSION SYSTEMS"**

Liam Barry, Dublin City University, Dublin, Ireland

10:30 – 10:40

"OPENROADM-CONTROLLED SILICON PHOTONICS INTEGRATED RECONFIGURABLE SWITCH MATRIX"

Andrea Sgambelluri[1], Philippe Velha[1], Claudio J. Oton[1], Alessio Giorgetti[1], Antonio D'Errico[2], Stefano Stracca[2], Filippo Cugini[3*]

1: Scuola Superiore Sant'Anna, Pisa, Italy

2: Ericsson

3: CNIT, Pisa, Italy

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A fully packaged photonic integrated switch matrix including 1398 circuit elements interconnected in a 3-D stack is controlled through OpenROADM NETCONF/YANG Agent and experimentally validated in an ONOS-based SDN testbed encompassing OpenConfig-driven 100G pol-mux transponders.

10:40 – 10:50

"A NEW DEFRAGMENTATION ALGORITHM FOR DYNAMIC OPTICAL NETWORKS"

Marta Buffa[1*], Annalisa Morea[1], Federica Poli[2], Andrea Paparella[1]
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Three different strategies are proposed to mitigate the fragmentation issue and minimize the amount of occupied resources in dynamic optical networks. Strategies with rerouting accommodate up to 7% further traffic with respect to recoloring strategies.

10:50 – 11:00

"NETWORK ELEMENTS BASED ON A MODULAR APPROACH FOR MULTI-TB/S SUSTAINABLE MANs"

P. Parolari[1*], A. Gatto[1], M. Rapisarda[1], C. Neumeyr[2], M. Svaluto Moreolo[3], L. Nadal[3], J. M. Fabrega[3], N. Calabretta[4], R. Stabile[4], N. Tessema[4], G. Delrosso[5], S. Bhat[5], P. Boffi[1]
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The H2020 research project PASSION proposes an innovative photonic modular approach for the implementation of metropolitan area network elements, developing a photonic integrated transmitter with multi-Tb/s capacity and a switching node architecture featuring different levels of aggregation.

11:00 – 11:10

"CURRENT TRENDS TOWARDS PON SYSTEMS AT 50+ GBPS"

R. Gaudino[1*], P. Torres-Ferrera[1], H. Wang[1], M. Valvo[2], A. Pagano[2], R. Mercinelli[2], V. Ferrero[1]
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Next generation PON physical layer will target 50 Gbit/s/lambda while using significant lower bandwidth transceivers. In this paper, we review our results on best modulation formats and equalization strategies.

11:10 – 11:20

"NGAN OPTICAL NETWORKS: CONSTRUCTION OF INFRASTRUCTURES AND EVOLUTION OF OPTICAL CABLES"

Massimo Tarsi, TIM SpA -Verona

11:20 – 11:45 Break

Session A3 - Biomedical applications

11:45 – 12:50
Chair: Fulvio Ratto

11:45 – 12:00
Invited paper: **"NANOPHOTONICS FOR PRECISION MEDICINE: THE HOSPITAL IN THE NEEDLE AND A NEW INFRASTRUCTURE"**
Antonello Cutolo, Università Federico II, Napoli

12:00 – 12:10
"CIS-TRANS PHOTODYNAMICS OF BENZODIAZOPYRROLE DERIVATIVES IN VIEW OF BIOMEDICAL APPLICATIONS"
Carlo Altucci[1,5*], Concetta Imperatore[2], Mohammadhassan Valadan[1], Luciana Tartaglione[2,3], Marco Persico[2], Anna Ramunno[4], Marialuisa Menna[2], Marcello Casertano[2], Carmela Dell'Aversano[2,3], Manjot Singh[1], Maria Luisa d'Aulisio Garigliota[4], Francesco Bajardi[1,5], Elena Morelli[2], Caterina Fattorusso[2], Michela Varra[2*]
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Benzodiazopyrrole derivatives have been reported as microtubules targeting agents on colon cancer cells. Their irradiation at 435 nm is related to trans/cis isomerization and degree of cell growth inhibition. An investigation of their photo-responsive behaviour at different pH is reported.

12:10 – 12:20
"OPTICAL SETUP FOR SPECROSCOPY-BASED MONITORING OF BLOOD PARAMETERS DURING HAEMODIALYSIS"
Cristoforo Decaro[1*], Giovanni Battista Montanari[2], Alessio Giberti[2], Riccardo Molinari[3], Davide Bagnoli[4], Marco Bianconi[2], Gaetano Bellanca[1]
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In this work, the development of a spectroscopy-based optical setup for monitoring hematic parameters of blood is presented. Integration with machine learning techniques makes this device suitable for effective use during haemodialysis treatments.

12:20 – 12:30
"ANTIMICROBIAL EFFECT ON CANDIDA ALBICANS BIOFILM BY APPLICATION OF DIFFERENT WAVELENGTHS AND DYES AND THE SYNTHETIC KILLER DECAPEPTIDE KP"
E. Merigo[1,2 *], M. Chevalier[2], S. Conti[1], T. Ciociola[1], C. Fornaini[2], M. Manfredi[1], P. Vescovi[1], A. Doglio[2]
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This *in vitro* study aimed to test the application of different low fluence laser wavelengths with and without proper photosensitizing dyes on *Candida albicans* biofilm with or without a synthetic killer decapeptide (KP).

12:30 – 12:40

"SILK FIBROIN BASED OPTICAL FIBER DEVICES"

D. Vurro[1*], N. Korakas[2], M. Konstantaki[2], O. Tsilipakos[2], S. Selleri[3], A. Cucinotta[3], S. Pissadakis[2], S. Iannotta[1]

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Silk fibroin represents the most promising bio-material for optical devices. This work explores the development of optical sensors based on silk fibroin for several targets (e.g. alcohols).

12:40 – 12:50

"3D RECONSTRUCTION CUTTING AND SMART DEVICES FOR PERSONALISED MEDICINE"

Ruben Foresti[1,2*], Claudio Macaluso[1], Stefano Rossi[1], Stefano Selleri[3], Paolo Perini[1], Antonio Freyrie[1], Edoardo Raposio[4], Privato Fenaroli[5], Giorgio Concari[1], Massimo De Filippo[1] and Chiara Martini[1]

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The 5D printing of anatomical models requires smart devices to assure the continuous improvement. Thus, after functional elaboration, we printed and scanned 5 glenoids by CT, to obtain 5D models as potential surgical devices.

Session B3 - Space-division multiplexed and quantum communications

11:45 – 13:00

Chair: Pierpaolo Boffi

11:45 – 12:00

Invited paper: **"SPACE-DIVISION MULTIPLEXING IN OPTICAL FIBERS: CHALLENGES AND GOALS IN THE FRAMEWORK OF FIRST (FIBER-OPTIC INFRASTRUCTURE FOR SPACE-DIVISION MULTIPLEXED TRANSMISSION)"**

Antonio Mecozzi, Università dell'Aquila, Italy

12:00 – 12.10

"INTRA-MODE COUPLING LENGTH ANALYSIS IN FEW-MODE FIBERS"

Gianluca Guerra*, Gianluca Marcon, Riccardo Veronese, Marco Santagiustina, Andrea Galtarossa, Luca Palmieri

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A method to assess the coupling length within groups of degenerate modes in few-mode fibers is proposed and applied to a case scenario where a step-index fiber is affected by stress birefringence and core ellipticity.

12:10 – 12:20

"MACHINE LEARNING-ASSISTED GAIN DESIGN OF FEW-MODE FIBER RAMAN AMPLIFIERS"

Gianluca Marcon[1*], Gianluca Guerra[1], Riccardo Veronese[1], Andrea Galtarossa[1], Luca Palmieri[1], Marco Santagiustina[1]

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This work proposes a fast Machine Learning-based approach to design the gain spectrum of a Raman amplification scheme in few-mode optical fibers, suitable for next-generation spatial division multiplexing elastic optical networks.

12:20 – 12:30

"**MEASUREMENT OF STRESS-INDUCED MODAL BIREFRINGENCE IN FEW-MODE FIBERS"**

Riccardo Veronese*, Gianluca Guerra, Gianluca Marcon, Marco Santagiustina, Andrea Galtarossa, Luca Palmieri

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The temperature-induced effective refractive index variation on the LP11 mode group of a 6-modes few-mode fiber is measured distributedly along the fiber by means of spectral correlation analysis on the fiber's Rayleigh backscattered signal.

12:30 – 12:40

"COEXISTENCE OF QKD AND CLASSICAL WDM CHANNELS"

Paolo Martelli*, Marco Brunero, Alberto Gatto, Paola Parolari, Alberto Tosi, Mario Martinelli

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The coexistence of a cost-effective QKD solution with classical WDM channels has been experimented, allocating the QKD channel in the L band, while the conventional data channels are in the C band.

12:40 – 12:50

"QUANTUM KEY DISTRIBUTION IN OPTICAL NETWORKS"

Francesco Matera

Fondazione Ugo Bordoni, via del Policlinico 147, 00161, Rome, Italy

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This paper reports an investigation about the incorporation of Quantum Key Distribution systems into existing telecommunications infrastructures, analysing the solutions and performance in each network segment to define safe end-to-end physical paths compatible with the 5G slicing concept.

12:50 – 13:00

"NONLINEAR FREQUENCY-DIVISION MULTIPLEXING: THEORETICAL ASPECTS, NUMERICAL ALGORITHMS, AND EXPERIMENTAL DEMONSTRATION"

Stella Civelli (IEEE Best PhD Thesis Award) – Dottorato in Emerging Digital Technologies dell'Istituto TeCIP della Scuola Superiore Sant'Anna

Plenary Session

13:00 – 13:20

Invited paper: **"EVOLUTION OF RF OVER FIBER TECHNOLOGIES"**

Dalma Novak – Past President IEEE Photonics Society (2014-2015), Octane Wireless, USA

Wednesday, September 9, 2020

Plenary Session

8:30 – 8:45

Invited paper: **"LIGHT DIVERSITY MICROSCOPY. HOW WAVES AND PHOTONS CAN FORM BIOIMAGES AT THE NANOSCALE"**

Alberto Diaspro, Department of Physics, University of Genoa and Nanoscopy, IIT

Session A4 - Optical Imaging I: Applications

8:45 – 9:45

Chair: Pietro Ferraro

8:45 – 8:55

"A POLARIZED DIGITAL HOLOGRAPHIC APPROACH IN BIOLOGICAL AND MEDICAL RESEARCH"

Giuseppe Coppola[1], Maria Antonietta Ferrara[1*]

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A new, simple digital holography-based polarization microscope for birefringence imaging of biological cells is presented. This approach could open the way to a new class of label-free diagnostic tool in biological and medical research and diagnosis.

8:55 – 9:05

"SILICONE-BASED GEL PHANTOMS FOR MULTIMODAL IMAGING"

Fulvio Ratto*, Lucia Cavigli, Sonia Centi, Claudia Borri, Giada Magni, Andrea Barucci, Marina Mazzoni, Roberto Pini

Istituto di Fisica Applicata Nello Carrara, Consiglio Nazionale delle Ricerche, Via Madonna del Piano 10, 50019 Sesto Fiorentino, Firenze, Italy

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We present a new class of materials designed for performance assessment of optical, acoustic and photoacoustic technologies, which hold the potential for extension to even more medical imaging modalities, such as MRI and CT.

9:05 – 9:15

"A COMBINED EXPANSION MICROSCOPY AND CIDS APPROACH TO CHROMATIN DNA STUDY"

Riccardo Marongiu[1,2*], Aymeric Le Gratiet,[1], Luca Pesce[1,2,3], Paolo Bianchini[1], Alberto Diaspro[1,2]

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We propose a method to improve the contrast and signal to noise ratio in our Circular Intensity Differential Scattering (CIDS) microscope by coupling it with Expansion Microscopy (ExM) in what we name ExCIDS.

9:15 – 9:25

"IMAGE SIMULATION AND THE PATH FROM RAY OPTICS TO WAVE OPTICS AND REAL PHYSICAL DEVICES MODELING"

Cesare Tozzo, COMSOL S.r.l.
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Image Simulation allows to simulate the appearance produced by optical lens systems; aberrations, distortion, polarization and other effects can be accounted for to visually assess the quality of the optical system. It will be shown a practical usage case of a lens system and the corresponding Image Simulation study carried out by means of COMSOL Multiphysics and the set of automatic functionalities offered for such tasks. The theoretical device behavior will be naturally integrated with structural-thermal-optical performance (STOP) analyses to get thermal drift performance of the physical system under real thermal and mechanical usage conditions. In the final part of the presentation it will be shown how the same multiphysics concept permits COMSOL Multiphysics to extend into wave optics, light-matter interaction, plasmonic resonances, semiconductor devices modeling, and much more.

9:25 – 9:35

"COMBINED MULTISPECTRAL LASER SCANNING AND COHERENT 3D LIDAR IMAGING FOR REMOTE SENSING OF CROPS"

Muhammad N. Malik[1*], Fabio Falconi[2], Suzanne Melo[1], Mirco Scaffardi[2], Antonella Bogoni[1]
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2D multispectral differential absorption and range measurements demonstrate the evaluation of the moisture content spatial distribution and 3D shape reconstruction of an apple. The combined absorption-3D imaging meausrements proposed approach enables compact crops evaluation systems.

9:35 – 9:45

"**SPACE-TIME DIGITAL HOLOGRAPHY ENHANCES RESOLUTION AND FIELD OF VIEW FOR OPTICAL METROLOGY AND BIOIMAGING APPLICATIONS"**

Zhe Wang[1,2], Vittorio Bianco[1*], Melania Paturzo[1], Pietro Ferraro[1]
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We introduce STDH modality to record and process hybrid space-time representations. This allows improving resolution and Field of view with one single object scan. Different cells has been used as samples to verify this approach.

Session B4 - Young IEEE-SIOF 1: Optical nanobiosensing: current challenges and novel perspectives

8:45 – 9:45
Chair: Roberto Rella

8:45 – 8:55

"EXTENSIVE CHARACTERIZATION OF PATHOGENIC BACTERIAL SPECIES BY STED MICROSCOPY"

M. Lucidi[1*], S. G. Stanciu[2], D. E. Tranca[2], R. Hristu[2], A. M. Holban[3], L. Nichele[1], G. A. Stanciu[2], G. Cincotti[1]

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The cell morphology of eleven bacterial species has been characterized using STED microscopy. The KK114 dye stains both Gram-positive and Gram-negative species, and peculiar nanostructures of bacterial cells have been highlighted.

8:55 – 9:05

"MORPHO-FUNCTIONAL *IN VIVO* IMAGING OF BIOLOGICAL TISSUES BASED ON NIR TRANSILLUMINATION"

Valentina Bello[1*], Elisabetta Bodo[1], Sara Pizzurro[1]
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We present a NIR-VCSEL-based portable transillumination system for morpho-functional in vivo imaging of biological tissues. The setup has been successfully exploited for the analysis of human upper limbs and incubated chicken eggs.

9:05 -9:15

"AUTO AND CROSS CORRELATION MEASUREMENTS OF FEMTOSECOND LASER BEAMS IN SRS MICROSCOPE"

Rajeev Ranjan[1*], Behjat S. Kariman[1], Fabio Callegari[1], Ali Mohebi[1], Maria Antonietta Ferrara[2], Luigi Sirleto[2], Paolo Bianchini[1], Alberto Diaspro[1,3]
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In this paper auto and cross correlation measurements of three femtosecond laser sources, a Ti:Sapphire (Ti:Sa) oscillotor, a femtosecond synchronized optical parametric oscillator (OPO) and a second Harmonic Generator (SHG), by two photon absorption are reported.

9:15 – 9:25

"LABEL-FREE TIME-GATED *IN VIVO* IMAGING OF *HYDRA VULGARIS* WITH LUMINESCENT POROUS SILICON NANOPARTICLES AS LONG-LIVED PROBES"

C. Schiattarella[1,2*], R. Moretta[1], T. Defforge[3], G. Gautier[3], C. Tortiglione[4], B. Della Ventura[2], M. Terracciano[5], L. De Stefano[1], R. Velotta[2], I. Rea[1]
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Highly luminescent porous silicon nanoparticles are herein functionalized and exploited for high-contrast in vivo time-gated fluorescence imaging employing Hydra vulgaris as target organism.

9:25 – 9:35

"A MICROFLUIDIC APPROACH TO STUDY THE INTERACTIONS OF CYSTIC FIBROSIS PATHOGENS"

L. Nichele[1*], M. Lucidi[1], A. De Ninno[2], A. Gerardino[2], F. Bertani[2], D. Visaggio[3], P. Visca[3], G. Cincotti[1], L. Businaro[2]

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Two microfluidic devices have been designed and fabricated to study the interaction between the bacterial species Staphylococcus aureus and Pseudomonas aeruginosa, responsible for lung infections in cystic fibrosis patients.

9:35 – 9:45

"SIGE: A MATERIAL PLATFORM FOR NEAR AND MID-INFRARED PHOTONICS"

Andrea Ballabio[1], Jacopo Frigerio[1], Andrea Barzaghi[1], Enrico Talamas Simola[1] and Giovanni Isella[1] Qiankun Liu[2], Joan Manel Ramirez[2], Miguel Montesinos-Ballester[2], Vladyslav Vakarin[2] and Delphine Marris-Morini[2]

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9:45 – 10:15 Break

Session A5 - Poster 1

10:15 – 11:30

Chair: Daniel Milanese

"A NOVEL MAGNETIC FIELD SENSOR BASED ON FERROFLUIDS AND SPR-POF SENSORS"

Nunzio Cennamo[1*], Bruno Andò[2], Francesco Arcadio[1], Salvatore Baglio[2], Vincenzo Marletta[2], Luigi Zeni[1]

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A novel magnetic field sensor is obtained by a POF covered with ferrofluids connected in input to an SPR-POF-sensor. The magnetic field changes the light in input to the SPR-POF-sensor and modifying the SPR phenomenon.

"COPPER (II) DETECTION IN DRINKING WATER EXPLOITING A CHEMICAL SPR-POF SENSOR"

Nunzio Cennamo[1*], Maria Pesavento[2], Antonella Profumo[2], Daniele Merli[2], Lucia Cucca[2], Luigi Zeni[1]

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A selective sensor for copper(II) detection in drinking water, exploiting a self-assembled monolayer (SAM) of D,L-penicillamine on a Surface Plasmon Resonance (SPR) plastic optical fiber (POF) sensor platform has been developed and tested.

"STRAIN TRANSFER ESTIMATION FOR COMPLEX SURFACE-BONDED OPTICAL FIBRES IN DISTRIBUTED SENSING APPLICATIONS"

Filippo Bastianini[1], Paweł Bocheński[2], Raffaella Di Sante[3], Francesco Falcetelli[3], Diego Marini[4], Gabriele Bolognini[4*]

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In distributed sensing applications, the strain transfer from the host material to the optical fibre affects the level of accuracy. A novel analytical methodology applied to surface-bonded sensing cables is presented and verified experimentally.

"FIBER BRAGG GRATINGS EMBEDDED IN 3D-PRINTED PATCHES FOR SENSITIVITY ENHANCEMENT OF DEFORMATION MONITORING"

Pasquale Di Palma, Agostino Iadicicco, Stefania Campopiano*

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This paper reports a study of a 3D printed patch embedding a fiber Bragg grating. The patch design and fabrication with a 3D printer is described. Finally, sensitivity to temperature and strain are evaluated.

"NOVEL LONG PERIOD GRATINGS IN CHANNELED OPTICAL FIBERS"

Anubhav Srivastava[1], Flavio Esposito[1], João M. B. Pereira[2], Stefania Campopiano[1], Agostino Iadicicco[1,*]

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In this work we report about the fabrication and sensing properties of Long Period Gratings inscribed in specialty optical fibers with side holes by means of electric arc discharge technique.

"NANOPARTICLE-MEDIATED ENDOCYTOSIS OF MOLECULAR BEACONS AS THERANOSTIC AGENTS IN HUMAN CANCER CELLS"

B. Adinolfi[1*], S. Tombelli[1], C. Trono[1], A. Giannetti[1], M. Pellegrino[2], G. Sotgiu[3], G. Varchi[3], M. Ballestri[3], F. Baldini[1]

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Polymethylmethacrylate nanoparticles were exploited as nanocarrier of theranostic molecular beacons. Nanoparticle ability to promote internalization of the beacon, involvement of endocytosis in nanoparticle uptake, nanoparticle fate and localization, beacon localization on endoplasmic reticulum were demonstrated.

"FBG BASED TEMPERATURE SENSORS DIRECTLY EMBEDDED IN PCB ELECTRONIC BOARDS"

Cosimo Trono[1*], Francesco Petroni[2], Francesco Baldini[1]

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A PCB board equipped with an array of three FBGs for the monitoring of temperature, is described. The possibility of embedding the fiber directly inside the PCB or in very thin steel capillary is demonstrated.

"ENHANCED PHOTOLUMINESCENCE OF RADIATION-INDUCED COLOUR CENTRES IN LiF FILM DETECTORS"

F. Bonfigli[1], M.A. Vincenti[1], V. Nigro[1], E. Nichelatti[2], M. Piccinini[1], P. Gaudio[3], R. Rossi[3], R.M. Montereali[1*]

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Enhancement of the visible photoluminescence of colour centres induced by soft X-rays in LiF film imaging detectors was studied to investigate the effects of reflective substrates.

"OPTICAL FIBER TIP FUNCTIONALIZED BY COLLOIDAL PHOTONIC CRYSTAL AND GOLD NANO-PARTICLES FOR SERS SENSING"

Lucia Sansone[1], Marianna Pannico[2], Pellegrino Musto[2], Stefania Campopiano[3], Michele Giordano[1], Agostino Iadicicco[3*]

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This paper presents a functionalized optical fiber tip for SERS sensing in optodre configuration. It consists in metal-dielectric colloidal crystals fabricated directly onto fiber optic tip by successive depositions of PS and Au nanoparticles.

"ION-EXCHANGED GLASS MICRORODS FOR SERS DETECTION OF DNA"

C. D'Andrea[1*], S. Berneschi,[1*] A. Giannetti[1], F. Baldini[1], M. Banchelli[1], A. Barucci[1], N. G. Boetti[3], M. de Angelis[1], D. Janner[4], S. Pelli[1,2], R. Pini[1], D. Pugliese[4], D. Milanese[4,5], P. Matteini[1]

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Different chemical or physical deposition processes have been previously proposed to equip surfaces with a layer of plasmonic NPs to produce effective SERS responses. Here, we present a SERS biosensor obtained by an ion-exchange process in soda-lime glass microrods for efficient DNA detection.

"SILVER NANOWIRES ARRAYS AS SERS SUBSTRATE FOR BIOMOLECULES DETECTION"

Chiara Amicucci, Martina Banchelli, Cristiano D'Andrea, Daniele Ciofini, Marella de Angelis, Salvatore Siano, Roberto Pini, Paolo Matteini*

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Plasmonic substrates for SERS analysis require abiding by a number of characteristics in order to find application in basic research and sensing. Here we present a SERS-active substrate composed of assembled silver nanowires that satisfy most of the requirements and that can be used for effective detection of biomolecules.

"SENSITIVITY ANALYSIS OF THE LOWEST ORDER CLADDING MODE OF LONG PERIOD FIBER GRATINGS"

Tanoy Kumar Dey[1*], Sara Tombelli[2], Palas Biswas[1], Ambra Giannetti[2], Nandini Basumallick[1], Francesco Baldini[2], Somnath Bandyopadhyay[1], Cosimo Trono[2]
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A long period fiber grating (LPFG) has been designed and fabricated in order to couple the LP0,2 cladding mode near turn around point (TAP), with the effect of maximum enhancement of the evanescent field of the sensor. The achieved sensitivity was 8751 nm/SRIU within an RI range of 1.333-1.3335, with a resolution of the order of 10-5 RIU.

Session B5 - Propagation effects in fiber-optic links

10:15 – 11:25
Chair: Cristian Antonelli

10:15 – 10:30
Invited paper: **"SIMULATION OF MULTIMODE NONLINEAR FIBER OPTICS"**
Jesper Lægsgaard, Technical University of Denmark, Denmark

10:30 – 10:40
"GAWBS SCATTERING EFFICIENCY ESTIMATION IN OPTICAL COMMUNICATION SYSTEMS"
Paolo Serena[1*], Federica Poli[1], Alberto Bononi[1], Alexis Carbó Meseguer[2], Jean-Christophe Antona[2]
1 Department of Engineering and Architecture, University of Parma, Parma, Italy
2 Alcatel Submarine Networks (ASN), Nozay, France
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An estimation technique is proposed to separate GAWBS power from other nonlinear impairments to calculate the total scattering efficiency in modern optical communication systems.

10:40 – 10:50
"IMPACT OF PERIODIC GAIN EQUALIZATION IN PRESENCE OF STIMULATED RAMAN SCATTERING"
Chiara Lasagni*, Paolo Serena, Alberto Bononi
Department of Engineering and Architecture, University of Parma, Parma, Italy
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We investigate the impact of periodic equalization of inter-channel stimulated Raman scattering on the nonlinear interference variance by exploiting a modified Raman-aware EGN model.

10:50 – 11:00

"NONLINEARITY ASSESSMENT IN LONG HAUL DISPERSION MANAGED FIBER OPTIC LINKS"

M. Ranjbar Zefreh[1], F. Forghieri[2], S. Piciaccia[2], P. Poggiolini[1*]
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The accuracy of the EGN model is investigated for a legacy dispersion-managed ultra-long-haul optical link by comparing its predictions with split-step simulations. The EGN model shows good accuracy in system performance prediction, when signal power depletion and ASE contribution to NLI are considered.

11:00 – 11:10

*"***ESTIMATION OF OUTAGE PROBABILITY IN PRESENCE OF POLARIZATION DEPENDENT LOSS"**

Chiara Lasagni*, Paolo Serena, Alberto Bononi
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We exploit a PDL-extended GN model to estimate the outage probability in ultra-long-haul optical links, focusing on the different impacts of PDL in the linear and nonlinear regime.

11:10 – 11:25

Invited paper: **"APPROACHING THE CLIFF: WHEN SPACE SWITCHING REPLACES WAVELENGTH SWITCHING"**

Peter J. Winzer – Nokia Bell Labs, Holmdel, USA

11:35 – 12:00 Break

Session A6 - Photonics for Cultural Heritage 2

12:00 – 12:50

Chair: Austin Nevin

12:00 – 12:10

"**A NOVEL HYPERSPECTRAL CAMERA FOR THE IMAGING OF ARTWORKS"**

Marta Ghirardello[1*], Daniela Comelli[1] , Gianluca Valentini[1] , Cristian Manzoni[2]
1 Polytecnic of Milan, Physics Department, Piazza Leonardo da Vinci 32, 20133 Milan, Italy
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Different artworks were investigated through a novel hyperspectral camera adopting time-gated photoluminescence imaging, allowing to identify and characterize the luminescent materials used in a rapid, non-invasive and reliable way.

12:10 – 12:20

"ASSESSMENT OF TIME GATED-LIF FOR THE CHARACTERIZATION OF FRESCOES AND PAINTED ARTWORKS: THE CASES STUDY OF THE ADAMO PROJECT"

M. Romani[1], F. Colao[2], R. Fantoni[2]
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2 ENEA-Italian National Agency for New Technologies, Energy and Sustainable Economic Development, 00044, Frascati, Rome, Italy

12:20 – 12:30

"LIF TECHNIQUE FOR NON-INVASIVE REMOTE ANALYSIS OF CH SURFACES: MARBLES, FRESCOES AND RESTORATION MATERIALS"

Luisa Caneve*, Valeria Spizzichino
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LIF scanning systems have been applied to analyse different kinds of artworks, like marbles and frescoes, allowing to obtain information on the surface composition and previous restoration actions.

12:30 – 12:40

"FACILITIES FOR *IN-SITU* PAINTING DIAGNOSTICS AND MONITORING"

A.Impallaria [1*], F.Petrucci [1]
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We present here an example of the application of two very well-known image diagnostics, X-ray radiograph and macro photography, attempting to be movable and easily used in museum environments.

12:40 – 12:50

"PL MICRO-IMAGING SUPPORTED BY FTIR MAPPING FOR THE STUDY OF HISTORICAL MUSICAL INSTRUMENTS"

Albano M.[1,2*], Comelli D.[1], Ghirardello M.[1], Fiocco G. [2,3], Malagodi M.[2,4]
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Multi-layered coating systems of historical violins were investigated through PL micro-imaging and FTIR-ATR mapping to identify and characterize the materials used by the ancient Cremonese Masters.

Session B6 - Young IEEE-SIOF 2: Optical nanobiosensing: current challenges and novel perspectives

12:00 – 12:50

Chair: Silvia Maria Pietralunga

12:00 – 12:10

"LAB-ON-FIBER OPTRODES INTEGRATED WITH SMART CAVITIES"

Federica Gambino[1], Martino Giaquinto[1], Anna Aliberti[1], Alberto Micco[1], Ruvo Menotti[2], Antonello Cutolo[3], Armando Ricciardi[1], Andrea Cusano[1,*]
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2 Institute of Biostructure and Bioimaging, National Research Council, I-80134, Napoli, Italy
3 Department of Electrical Engineering and Information Technology, University of Napoli Federico II, I-80125, Napoli, Italy
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A microgel film sandwiched between two gold layers is integrated onto the optical fiber tip to form a multifunctional Lab-on-Fiber optrode able to work as a sensor for small biomolecules detection, and as a nano-opto-mechanical-actuator.

12:10 – 12:20

"ORDERED ARRAY OF AU NANOSTRUCTURES: TUNABLE PLASMONIC PROPERTIES AND BIOSENSING APPLICATIONS"

Adriano Colombelli[1*], Maria Grazia Manera[1], Daniela Lospinoso[1], Roberto Rella[1]

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A simple and reproducible approach for the fabrication of highly ordered array of metal nanostructures by nano-sphere lithography (NSL) is presented, demonstrating their superior performances for biosensing applications.

12:20 – 12:30

"NANOCOMPOSITE PLASMONIC SENSORS FOR BIOMEDICAL APPLICATIONS"

B. Miranda[1,2], S. De Martino[3], R. Moretta[1], P. Dardano[1], I. Rea[1], C. Forestiere[2], L. De Stefano[1*]

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We analyze absorption spectra of spherical gold nanoparticles embedded in polyethylene glycol diacrylate. The designed wearable platforms could detect specific target analytes in localized surface plasmon resonance and fluorescence modes, in order to obtain a dual-mode sensor.

12:30 – 12:40

"**SPECTRAL INTERFEROMETRY-BASED DETECTION OF OPTICAL RESONANCES OF MICRO-CAPILLARIES"**

Valentina Bello[1*], Alberto Simoni[1]

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We propose a spectral interferometric method for the detection of the wavelength position of the optical resonances of low-cost micro-resonators. Measurements were carried out with a Michelson interferometer and a broadband light source.

12:40 – 12:50

"THERMO-PLASMONIC LAB-ON-FIVER OPTRODES"

Sofia Principe[1], Martino Giaquinto[1], Michele Riccio[2], Alberto Micco[1], Maria Alessandra Cutolo[1], Federica Piccirillo[1], Giovanni Breglio[2], Antonello Cutolo[2], Andrea Irace[2], Armando Ricciardi[1,*], Andrea Cusano[1,*]

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The thermoplasmonic overheating induced on a Lab-on-Fiber device, consisting in a gold nanostructure directly integrated onto the tip of an optical fiber, is analysed in terms of temperature distribution, temporal dynamics and spectral selectivity.

Plenary Session

13:00 – 13:10

In memory of Carlo Giacomo Someda

Andrea Galtarossa – University of Padua

Plenary Session

13:10 – 13:30

"Photonics in view of Horizon Europe"

Roberta Ramponi – IFN-CNR and Photonics21

Session A7 - Nano and Microstructures

8:30 – 9:50

Chair: Francesco Matera

8:30 – 8:40

"METAMORPHOSIS OF NANOSTRUCTURED LENSES: HYBRIDIZATION AND FREE-FORM METALENSES FOR TOTAL ANGULAR MOMENTUM CONTROL"

Filippo Romanato [1,2], Pietro Capaldo[1,2], Gianluca Ruffato [1,2]

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Moving from free-form refractive/diffractive optics to metalenses, novel tools for structuring optical materials are provided for the generation of nanostructured optical layouts. New optics are designed for the control of total angular momentum in structured light beams implementing basic and complex optical operations.

8:40 – 8:50

"**WAVELENGTH-SELECTIVE ROBUST FIBER COUPLER FOR HIGH-Q MICRO-RESONATORS"**

D. Farnesi*[1], F. Chiavaioli[1], F. Baldini[1], S. Berneschi[1], S. Soria[1], C. Trono[1], D. Laneve[2], M. C. Falconi[2], F. Prudenzano[2], G. Nunzi Conti[1,3]

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3 Centro Fermi, Museo Storico della Fisica e Centro Studi e Ricerche "Enrico Fermi", 00184 Roma, Italy

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We present results on the implementation of a robust fiber based system able to efficiently and selectively couple light to high-Q whispering gallery mode optical micro-resonators.

8:50 – 9:00

"**NOVEL TYPE OF HOLLOW-CORE FIBER: HYBRID FIBER"**

Fabio Giovanardi[1*], Federico Melli[2], Jonas H Osorio[3], Fetah Benabid[3], Luca Vincetti[2]

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A novel hollow-core fiber design is proposed for obtaining low loss and effective single-mode operation. Promising results are confirmed by theoretical simulations.

9:00 – 9:10

"QUANTITATIVE NANOSCALE ABSORPTION MAPPING OF TWO DIMENSIONAL MATERIALS"

Marco Negri[1], Luca Francaviglia[1], Dumitru Dumcenco[1,2], Matteo Bosi[3], Daniel Kaplan[4], Venkataraman Swaminathan[4], Giancarlo Salviati[3*], Andras Kis[2], Filippo Fabbri[5], Anna Fontcuberta y Morral[1]

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We develop a novel technique for mapping the absorption properties of 2D MoS2 and MoSe2 monolayers with nanoscale resolution by taking advantage of the underlying substrate cathodoluminescence emission.

9:10 – 9:20

"ALL THE MEASURES YOU CAN'T SEE – THE HARD LIFE OF A SMALL PHOTON"

Luca Porcelluzzi*, MKS Instruments – Ophir Brand
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THz radiation sources have become commercially available, enabling the industry to exploit the unique properties of THz waves as it combines both, radio waves and infra-red waves. To pave the way for many more potential THz applications adequate measuring technology is essential.
VCSELs today are widely used as light sources in sensing applications. While the benefits of VCSELS are indisputable, and the applications are wide, the development of these systems are still improving with respect to areas such as eye safety, power consumption, and overall system reliability. Knowing how the light source in these systems is behaving is critical to the success of the overall system.

9:20 – 9:30

"HELICAL GOLD NANOPARTICLE ASSEMBLIES: EMERGENCE OF PLASMONIC CHIRALITY"

Cristina Sissa[1*], Anna Painelli[1], K. George Thomas[2]
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Helical assemblies of gold nanoparticles are prepared on thermoresponsive organic templates, showing circularly dichroism response in the spectral region of the plasmon resonance.

9:30 – 9:40

"LEARNING HIGHLY DISTINCTIVE HOLOGRAPHIC FEATURES BOOSTS MICRO-PLASTICS RECOGNITION IN WATER SAMPLES"

Vittorio Bianco[1*], Pasquale Memmolo[1], Pierluigi Carcagnì[2], Francesco Merola[1], Melania Paturzo[1], Cosimo Distante[2], Pietro Ferraro[1]
1 National Research Council (CNR) of Italy, Institute of Applied Sciences and Intelligent Systems (ISASI), Via Campi Flegrei 34, 80078 Pozzuoli (NA), Italy.
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Here we combine Digital Holography microscopy with machine learning to identify with high accuracy microplastics within heterogeneous water samples. Highly distinctive coherent features are found to define a fingerprint for plastic items.

9:40 – 9:50

"PHOTONICS-BASED COHERENT DUAL-BAND 2X4 MIMO RADAR SYSTEM"

Salvatore Maresca[1], Leonardo Lembo[1,2], Filippo Scotti[3], Giovanni Serafino[1], Mirco Scaffardi[3], Antonio Malacarne[1], Paolo Ghelfi[3], Antonella Bogoni[1,3]

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In this paper the first coherent dual-band 2x4 MIMO radar experiment is presented. Range/cross-range maps demonstrate the higher cross-range resolution due to the coherence and the enhanced performance introduced by dual-band operation.

Session B7 - Optical Imaging II: Methods and devices

8:30 – 9:50

Chair: Gabriella Cincotti

8:30 – 8:45

Invited paper: **"SPECTROSCOPY AND IMAGING WITH AN ULTRA-STABLE COMMON-PATH INTERFEROMETER"**

Giulio Cerullo – Politecnico di Milano, Milan, Italy

8:45 – 9:00

Invited paper: **"NEAR-INFRARED (NIR) ORGANIC LIGHT-EMITTING DEVICES (OLEDS) IN THE "CENTURY OF PHOTONICS"**

Alessandro Minotto [1] Paul A. Haigh[2,3], Łukasz G. Łukasiewicz[4], Eugenio Lunedei[5], Daniel T. Gryko[4], Izzat Darwazeh[3], Franco Cacialli[1*]

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Organic semiconductors still provide a variety of opportunities and challenges for the development of photonics and optoelectronics. Emphasis will be placed on the potential of low-gap organic semiconductors for Near-infrared (NIR) applications.

9:00 – 9:10

"HIGH SPEED OCT SYSTEM USING EXTERNAL CAVITY LASER"

Aldo Righetti[1*], Maria Chiara Ubaldi[2], Giorgio Grasso[1]

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We describe a new concept for the implementation of a scanning laser for OCT applications with a capability of more than one spatial point in 1μs thanks to high speed E/O materials in a tunable etalon.

9:10 – 9:20

"COMPACT MODULES FOR DIGITAL HOLOGRAPHIC MICROSCOPY IN MICROFLUIDICS"

Melania Paturzo[1*], Teresa Cacace[1], Vittorio Bianco[1], Vito Pagliarulo[1], Biagio Mandracchia[1], Pietro Ferraro[1]

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We present a compact and cost-effective imaging module, implementing the interferometer architecture for off-axis digital holography on a commercial microfluidic chip and using a laser diode as light source.

9:20 – 9:30

"DYNAMICS OF OPTICAL VORTICES IN SPECKLE PATTERNS WITH SUBNANOMETRIC SPECTRAL RESOLUTION"

A. Di Donato[*], D. Mencarelli, G. Fabi, E. Pavoni, H. J. Christopher, L. Pierantoni, A. Morini, M. Farina

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By exploiting a novel quantitative imaging technique based on Synthetic Optical Holography, we describe with nanometric spectral resolution the dynamic behaviour of optical vortices in a speckle pattern varying the laser wavelength.

9:30 – 9:40

"PROTON BRAGG-CURVE IMAGING BY RADIOPHOTOLUMINESCENCE OF LITHIUM FLUORIDE THIN FILM RADIATION SENSORS"

R.M. Montereali[1], A. Ampollini[1], S. Libera[1], E. Nichelatti[2], V. Nigro[1], L. Picardi[1], M. Piccinini[1], C. Ronsivalle[1], M.A. Vincenti[1]

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Passive solid state radiation detectors based on the visible radiophotoluminescence of colour centres in lithium fluoride thin films grown on silicon substrates are investigated for imaging of full proton Bragg curves by fluorescence microscopy.

9:40 – 9:50

"PHOTOVOLTAIC MANIPULATION ON LN SURFACE: POLYMER, PARTICLES AND BIOLOGICAL SAMPLES"

Lisa Miccio[1*], Jaromir Behal[1,2], Martina Mugnano[1], Simonetta Grilli[1], Biagio Mandracchia[1], Francesco Merola[1], Pasquale Memmolo[1], Pietro Ferraro[1]

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Interplay between biological samples and Photovoltaic (PV) crystals opens new possibility in smart materials science. Cellular behaviors can be modified by DEP forces on PV surfaces. Living samples actively modify the electric-field inside PV substrates.

9:50 – 10:15 Break

Session A8 - Optical Sensing II: Physical sensing and components for optical sensing

10:15 – 11:05

Chair: Antonio d'Alessandro

10:15 – 10:25

"FIBER OPTIC SENSOR FOR RIVER LEVEL MONITORING"

Andrea Madaschi[1*], Maddalena Ferrario[1], Marco Brunero[1], Greta Tresoldi[2], Vladislav Ivov Ivanov[2], Azadeh Hojat[3], Pierpaolo Boffi[1], Laura Longoni[2], Luigi Zanzi[2]

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3 Shahid Bahonar University of Kerman

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Fiber Bragg Gratings (FBGs) were exploited in a laboratory scaled-levee demonstrating the feasibility of fiber optic sensors to detectdeformations of the levee body in response to water infiltration.

10:25 – 10:35

"TEMPERATURE SENSING WITH A BICHROMOPHORIC MACROCYCLE THROUGH FLUORESCENCE ENERGY TRANSFER"

Francesca Terenziani[*], Brunella Bardi, Irene Tosi, Federica Faroldi, Laura Baldini, Francesco Sansone

Dipartimento di Scienze Chimiche, della Vita e della Sostenibilità Ambientale, Università di Parma, Parco Area delle Scienze 17/A, 43124 Parma, Italy

** francesca.terenziani@unipr.it*

We report the first macrocycle-based ratiometric molecular thermometer exploiting the conformational thermosensitivity of a calixarene functionalized with two different chromophores performing fluorescence energy transfer.

10:35 – 10:45

"ORGANIC LIGHT-EMITTING TRANSISTOR AS NANOSCALE LIGHT SOURCE FOR OPTICAL SENSING"

Stefano Toffanin

Italian National Research Council, Institute for the Study of Nanostructured Materials (CNR-ISMN), Via Gobetti 101, 40129 Bologna

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We report on the definition and engineering of a new detection scheme to be use in optical biosensing by the unprecedented exploitation of inherent features of the organic optoelectronics and nanoplasmonics technologies building the overall system.

10:45 – 10:55

"SEGMENTED-WAVE ANALYSIS OF NANO-GRATINGS ON CURVED SURFACES"

Muhammad Fayyaz Kashif[1,*], Filippo Pisano[2], Antonio Balena[2,3], Marco Pisanello[2], Tiziana Stomeo[2], Massimo De Vittorio[2,3], Ferruccio Pisanello[2], Antonella D'Orazi o[1] and Marco Grande[1]

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In this paper, we investigate the gold nano-gratings on curved surfaces through numerical simulations. This study can be helpful to understand curvature induced effects in plasmonic devices.

10:55 – 11:05

"LAB-ON-FIBER ACCELEROMETERS BASED ON FIBER TIP OPTO-MECHANICAL CAVITIES"

F. A. Bruno[1], M. Pisco[1*],G. Gruca[2], N.Rijnveld[2], A. Cutolo[1], A. Cusano[1*]
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We developed "Lab on fiber" accelerometers based on micro-opto-mechanical cavities on the optical fiber tip. Cantilever and membrane based accelerometers were designed to operate in different frequency ranges. The performances of the fabricated probes have been characterized and the results are here discussed.

Session B8 - Poster 2

10:15 – 11:30

Chair: Giovanni Tartarini

"EFFICIENT SOLUTION OVERCOMING BIMODAL PROPAGATION IN 850NMVCSEL-BASED RADIO OVER G.652-FIBRE SYSTEMS"

Jacopo Nanni[1*], Lorenzo Baschieri[1], Andrea Giovannini[1,2], Jean-Luc Polleux[2], Jean-Marc Laheurte[2], Enrico Lenzi[3], Giovanni Tartarini[1]
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Conveniently exploiting commercial couplers designed for 1550nm, a Radio-over-Fibre link efficiently operating at 850nm over the standard G.652 single mode fibre is presented. Additional features entailed by the proposed solution are highlighted

"VERIFYING AN OPTICAL RECIRCULATION LOOP APPLICATION IN ADVANCED PHOTONICS-BASED MICROWAVE DEVICES"

Belkin M.E*, Fofanov D.A, Alyoshin A.V.
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Using modeling in VPIphotonics Design Suite and experimental verification, a detailed analysis of optical recirculation loop application in two key photonics-based microwave devices, such as a comb generator and super-wideband time-delay assembly, is carried out.

"TM:ER:YB:HO AMPLIFIED SPONTANEOUS EMISSION SOURCE OPERATING FROM 1480 NM TO 2100 NM"

Antonella Maria Loconsole[1], Mario Christian Falconi[1], Dario Laneve[1], Vincenza Portosi[1], Stefano Taccheo[2,3], Francesco Prudenzano[1*]
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A theoretical model of an amplified spontaneous emission source based on a Tm:Er:Yb:Ho co-doped germanate glass is presented. Preliminary results show that a broad spectrum ranging from 1480 nm to 2100 nm is obtained.

"RELATIVE INTENSITY NOISE MEASUREMENTS OF FEMTOSECOND LASER BEAMS IN SRS MICROSCOPE"

Rajeev Ranjan[1*], Behjat S. Kariman[1], Maria Antonietta Ferrara[2], Luigi Sirleto[2], Paolo Bianchini[1], Alberto Diaspro[1,3]
1 CHT @Erzelli, Nanoscopy, Istituto Italiano Di Tecnologia, Genova, Italy
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In this paper relative intensity noise measurements of three femtosecond laser sources, a Ti:Sapphire (Ti:Sa) oscillator, a femtosecond synchronized optical parametric oscillator (OPO) and a second Harmonic Generator (SHG), are reported and discussed.

"MULTIPHYSICS MODELLING OF PLASMONIC ORGANIC HYBRID E/O MODULATORS"

M. Ghomashi[1], A. Tibaldi[1,2*], F. Bertazzi[1,2], M. Vallone[1], M. Goano[1,2], G. Ghione[1]
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The abstract describes a coupled electrical-optical multiphysics simulation approach for Plasmonic Organic Hybrid Electro/Optic modulators. The simulated modulator figures of merit (I/O and frequency response) are discussed and compared with experimental results from the literature.

"WRITE-ONCE-READ-MANY (WORM) MEMORY DEVICE USING ECO-FRIEND INP/ZNS QUANTUM DOTS AND PVK COMPOUNDS"

Sae-Wan Kim, Na-Ri Kim, Jin-Beom Kwon, Ju-Seong Kim, Ma-Eum Han, Shin-Won Kang*
School of Electronics Engineering, College of IT Engineering, Kyungpook National University, 41566, Sankyuk-dong, Bukgu, Daegu, South Korea
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This paper is about write-once-read-many (WORM) memory device based on InP@ZnS quantum dots. Proposed memory device showed an 4.5X103 of ON/OFF ratio at -0.5 V and maintained same on/off ratios for more than 100 hours.

"HIGH SENSITIVE PBS QDS BASED SHORTWAVE INFRARED PHOTODETECTOR USING ZNO NPS"

Jin Beom Kwon, Sae Wan Kim, Ma Eum Han, Shin Won Kang*
School of Electronics Engineering, College of IT Engineering, Kyungpook National University, 1370 Sankyuk-dong, Daegu 702-701, South Korea
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PbS SWIR photodetectors with and without ZnO NPs were fabricated and their current–voltage (I–V) characteristics were measured. The maximum on/off ratio of the former was 1.946 times that of the latter.

"THERMALLY ACTIVATED DELAYED FLUORESCENCE: EXCITED STATE ENGINEERING"

D. K. Andrea Phan Huu*, Rama Dhali, Sangeeth Saseendran, Cristina Sissa, Francesca Terenziani, Anna Painelli
Department of Chemistry, Life Science and Environmental Sustainability, Parma University, Italy
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Recent results on fluorescent materials for organic LED based on thermally activated delayed fluorescence (TADF) are summarized.

"CHARACTERISATION OF MICROSCOPICAL ANISOTROPY OF BIOLOGICAL TISSUES BY POLARIZATION IMAGING"

Sidra Batool[1], Mehwish Nisar[1], Fabrizio Frezza[2], Fabio Mangini[3], Eugenio Fazio[1*]
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We have characterized anisotropic biological media by performing polarisation imaging. The optical anisotropy degree can be measured by the images. High resolution on the microscopic and nanoscopic alignment of structured media is characterized.

"DESIGN AND TEST OF SILICON PHOTONIC MACH-ZEHNDER INTERFEROMETERS FOR DATA TRANSMISSION APPLICATIONS"

Davide Badoni[1], Vincenzo Bonaiuto[2], Mauro Casalboni2, Fabio De Matteis[2], Giovanni Di Giuseppe[3], Luca Frontini[4], Roberto Gunnella[3], Valentino Liberali[5], Andreas Mai[6], Giovanni Paoluzzi[1], Paolo Prosposito[2], Andrea Salamon[1*], Gaetano Salina[1], Matteo Salvato[2], Fausto Sargeni[2], Sigurd Schrader[7], Alberto Stabile[5], Patrick Steglich[6]
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3 University of Camerino, Macerata, Italy
4 INFN Structure of Milano, Milan, Italy
5 University of Milano, Milan, Italy
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Silicon photonics is a rapidly emerging field in research and technology. Given its high diffraction index and low dispersion, silicon is an high quality optical material. On the other hand, VLSI CMOS compatible processes allow to design reliable photonic structures which can be easily integrated with standard integrated electronic circuits at affordable prices. Optical modulation is obtained in silicon photonic circuits with electro-optical effect (plasma dispersion) in two different kind of structures: the Mach-Zehnder interferometer and the ring resonator.
In a Mach-Zehnder interferometer optical signal modulation is obtained controlling with the electro-optical effect the interference condition between the two interferometer branches.
We designed a silicon photonics chip in standard VLSI CMOS compatible process implementing two different Mach-Zehnder interferometer configurations. Design and tests of these two interferometers are reported.

"AMORPHOUS SILICON IN-LINE PHOTODETECTOR FOR INTEGRATED PHOTONICS APPLICATIONS"

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We report on the tunability of the optical properties of amorphous silicon (a-Si), its integration on a photonic platform and operation as a visible range photodetector. We present the details on the experimental methods, optimization procedure, design, fabrication techniques and experimental characterization of the present photodetector operating over the optical gap bandwidth up to 700 nm wavelength.

11:30 – 11:45 Break

Session A9 - Nonlinear Optics

11:45 – 13:20
Chair: Costantino De Angelis

11:45 – 12:00
Invited paper: **"NONLINEAR FREQUENCY CONVERSION IN DIELECTRIC METASURFACES"**
Neshev Dragomi – Department of Electronic Materials Engineering, Australian National University

12:00 – 12:10
"NANOFABRICATION OF SILICON METASURFACES FOR THIRD HARMONIC GENERATION"

Luca Fagiani[1*], Erfan Mafakheri[1], Kirill Okhlopkov[2], Andrea Tognazzi[3], Attilio Zilli[4], Michele Celebrano[4], Maxim Shcherbakov[2], Andrey Fedyanin[2], Davide Rocco[3], Marco Finazzi4, Costantino De Angelis[3], Monica Bollani[1]
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We realized high quality silicon metasurfaces by e-beam lithography for controlling the spatial intensity distribution, polarization, and wavelength dependence of light beams generated by third-order nonlinearities.

12:10 – 12:20
"BOOSTING THIRD HARMONIC GENERATION IN SILICON METASURFACES"

Andrea Tognazzi[1,2*], Kirill Okhlopkov[3], Attilio Zilli[4], Davide Rocco[1,2], Michele Celebrano[4], Maxim R.Shcherbakov[3], Monica Bollani[5], Erfan Mafakheri[5], Luca Fagiani[5], Marco Finazzi[4], Andrey Fedyanin[3], Costantino De Angelis[1,2]
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In this work we propose a high-quality factor semiconductor nanoparticles array made of rectangular silicon waveguides. Our optimized metasurface can dramatically boost the third harmonic generated signal.

12:20 – 12:30

"STUDYING OF MULTIPLE-PEAKED SECOND HARMONIC GENERATION EMISSION IN SILICON WAVEGUIDE WITH INTERDIGITATED CONTACTS"

Chiara Vecchi[1*], Martino Bernard[2], Mher Ghulinyan[2], Lorenzo Pavesi[1]
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In this work we will report on second harmonic generation and on the influence of the variations of the sample geometry in periodically poled silicon waveguides.

12:30 – 12:40

"SEMICONDUCTOR METASURFACE REFRACTIVE INDEX SENSING VIA OPTICAL RADIATION PATTERN"

Marco Gandolfi[1,2*], Davide Rocco[1,2], Andrea Tognazzi[1,2], Luca Carletti[2,3], Camilla Baratto[1], Costantino De Angelis [1,2]
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An innovative sensing mechanism based on the variations in the sensor radiation diagram in correspondence of changes in the refractive index of the surrounding material is illustrated.

12:40 – 12:50

"ADVANCED MEASUREMENT TOOLS FOR NONLINEAR OPTICS"

Paolo Navaretti, Senior Application Scientist, Zurich Instruments AG.

Zurich Instruments is committed to deliver best-in-class dynamic signal instruments ranging from the medium-frequency (MF) up to the ultra-high-frequency (UHF) ranges. In this talk we present some advanced measurement techniques and tools to get the most out of nonlinear optics experiments

12:50 – 13:00

"MID-INFRARED SECOND HARMONIC GENERATION WITH GE QUANTUM WELLS GROWN ON SI"

J. Frigerio[1*], C. Ciano[2], A. Ballabio[1], E. Talamas-Simola[1], D. Chrastina[1], J. Allerbeck[3], J. Kuttruff[3], L. Zheng[4], E. Olsson[4], D. Brida[5], G. Isella[1], M. Virgilio[6] and M. Ortolani[7]
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6 Dipartimento di Fisica "E. Fermi", Università di Pisa, Largo Pontecorvo 3, I-56127 Pisa, Italy
7 Dipartimento di Fisica, Sapienza Universita di Roma, Piazzale Aldo Moro 5, I-00185 Rome, Italy
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We present the theoretical investigation and the experimental demonstration of second harmonic generation in the mid-infrared by holedoped Ge/SiGe asymmetric quantum wells. Possible applications in non-linear molecular sensing are discussed.

13:00 – 13:10

"HIGH ENERGY RAMAN SOLITON DYNAMICS IN MULTIMODE GRIN FIBERS"

M. Ferraro[1*], M. Zitelli [1], F. Mangini[2], D.S. Kharenko[3], A. Niang[2], R. Crescenzi[1], S. Wabnitz[1,3]

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We experimentally observed the fission of high energy femtosecond pulses in a GRIN standard fiber, leading to complex soliton dynamics with huge Raman frequency shifts

13:10 – 13:20

"INVESTIGATION OF LiAl4O6F:Mn PHOSPHORS AS REDEMITTING LIGTH CONVERTERS"

Angela Pirri[1], Guido Toci[2*], Vladimir Makhov[3], Nicholas Khaidukov[4], Barbara Patrizi[2], Maria Brekhovskikh[4], Matteo Vannini[2]

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Ceramic samples of LiAl4O6F phosphors doped with 1.0 mol.% manganese ions synthesizing by high-temperature solid-state reaction technique has been investigated as possible red-emitting light converters. Encouraging results are found.

Session B9 - Emergent topics

11:45 – 12:50

Chair: Federica Poli

11:45 – 12:00

Invited paper: **"RF-SPUTTERING FABRICATION OF GLASS-BASED SYSTEMS FOR FLEXIBLE PHOTONICS"**

Alessandro Chiasera – IFN-CNR-CSMFO Lab. And FBK Photonics Unit, Trento

12:00 – 12:10

"PHOTONIC IMPLEMENTATION OF AN ELEMENTARY UNIT OF ARTIFICIAL INTELLIGENCE BASED ON SOLITONIC WAVEGUIDES"

Alessandro Bile, Francesca Moratti, Eugenio Fazio*

Dip. Scienze di Base e Applicate per l'Ingegneria, Sapienza Università di Roma, via A. Scarpa 16, Roma, Italy

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This paper shows the implementation of photonic neuromorphic hardware based on solitonic waveguides able to perform reinforcement learning. Learning is based on recognizing an input state or a specific output that is highlighted by an external supervisor. For this reason, learning can be of two types: supervised or unsupervised. Both have been implemented in the proposed photonic circuit.

12:10 – 12:20

"LOW COST OFDR-BASED DELAY MEASURING SYSTEM FOR THE SQUARE KILOMETRE ARRAY RADIO-TELESCOPE"

Jacopo Nanni[1*], Camilla Battista[1], Enrico Lenzi[2], Simone Rusticelli[3], Jader Monari3, Federico Perini[3], Mark Waterson[4], Giovanni Tartarini[1]

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This paper presents a low-cost delay measuring system based on Optical Frequency Domain Reflectometry (OFDR) to beintegrated in the first prototype of the low frequency subsystem of the Square Kilometre Array radio telescope.

12:20 – 12:30

"PRELIMINARY STUDY ON DIFFUSE OWC FOR INTRA-CUBESAT COMMUNICATION"

E. Ertunc[*], A. Messa, L. Gilli, G. Cossu, M. Rannello, E. Ciaramella

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We experimentally design a diffuse optical wireless communication link for CubeSat applications. We present the bit error rate performance as a function of the received optical power after reflection from the wall.

12:30 – 12:40

"3D PRINTING BY TWO-PHOTON POLYMERIZATION"

S. Mckee[1*], A. Lutey[1], F. Poli[1], S. Selleri[1], L. Romoli[1], A. Fortunato[2], A. Cucinotta[1]

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Fabrication of 3D microstructures by two-photon polymerization is reported. This process exploits femtosecond laser pulses and a photo resist transparent at the laser wavelength (515 nm) that absorbs two photons at high intensity to polymerize.

12:40 – 12:50

"CONICAL MICROSTRUCTURES FOR GUIDING LIGHT IN LAB ON CHIP DEVICES"

Sara Coppola[*], Veronica Vespini, Giuseppe Nasti, Pietro Ferraro

Institute of Applied Sciences and Intelligent Systems ISASI CNR, Pozzuoli 80078, Italy,

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Here we propose the use of the pyro-electric effect for the fabrication of biocompatible and biodegradable microneedles and the interferometric characterization of the light guided through these microstructures.

Session A10 - Devices and quantum systems

8:30 – 9:55
Chair: Luca Vincetti

8:30 – 8:45
Invited paper: **"ON THE CONTROL OF RECONFIGURABLE PHOTONICS INTEGRATED CIRCUITS"**

A. Melloni, M. Milanizadeh, M. Petrini, D. Aguiar, F. Zanetto, G. Ferrari, M. Sampietro, F. Morichetti
Dipartimento di Elettronica, Informazione e Bioingegneria - Politecnico di Milano, Milano, 20133 Italy
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A collection of control, calibration, tuning and locking recipes for photonic integrated circuits are presented and discussed with focus on tunable, hitless, polarisation independent, optical add drop multiplexing devices and programmable meshes for automatic beam processing.

8:45 – 8:55
"TOWARDS CERTIFIED QRNG BASED ON SINGLE PARTICLE ENTANGLEMENT"

N. Leone[1*], S. Azzini[1], S. Mazzucchi[2], L. Pavesi[1]
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In this work we apply single-particle entanglement of photons to the generation of genuine random numbers. The certification of randomness is achieved through the measurements of the minimum entropy by the Bell's test.

8:55 – 9:05
"ALGEBRA OF LIGHT: MULTIPLICATION AND DIVISION OF ORBITAL ANGULAR MOMENTUM"

Gianluca Ruffato[1*], Filippo Romanato[1,2]
1 Department of Physics and Astronomy 'G. Galilei', University of Padova, via Marzolo 8, 35131 Padova, Italy
2 CNR-INFM TASC IOM National Laboratory, S.S. 14 Km 163.5, 34012 Basovizza, Trieste, Italy
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A novel and compact solution is presented to efficiently multiply or divide the orbital angular momentum (OAM) of light beams using a sequence of two phase-elements implementing a properly designed superposition of circular-sector transformations. The experimental tests confirm the capability of the multiplier optics to perform integer multiplication of the input OAM, while the designed dividers are demonstrated to correctly split up the input beam into a complementary set of OAM beams. These elements can find promising applications for the multiplicative generation of higher-order OAM modes, optical information processing based on OAM-beams transmission, and optical routing/switching in telecom.

9:05 – 9:15
"CDTE/ZNSE CORE-SHELL QDS: SYNTHESIS VIA A NEW APPROACH AND INVESTIGATING OPTICAL PROPERTIES"

Mehdi Molaei, Farzad Farahman, Masoud Karimipour
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In this research, CdTe QDs prepared using a microwave activated approach. Then via a simple UV-assisted approach CdTe QDs were shelled by ZnSe. CdTe QDs indicated a band edge emission which it indicates a red shift after ZnSe shell growth confirming formation of a tye I core-shell structure. Synthesized QDs were characterized by means of XRD, FESEM, EDAX, UV vis and PL analysis.

9:15 – 9:25

"NEAR-INFRARED EMISSION FROM SULFUR VACANCIES IN MoS2 MULTILAYER FLAKES"

F. Fabbri[1], E. Rotunno[2], E. Cinquanta[4], D. Kaplan[6], L. Lazzarini[3], M. Bernasconi[5], C. Ferrari[3], M. Longo[4], A. Molle[4], V. Swaminathan[6], G. Salviati[3]*

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We report on the experimental evidence, confirmed by ab-initio calculations, that sulfur vacancies give rise to a novel nearinfrared emission at 0.75 eV in MoS2 flakes and that ripplocations redshift the MoS2 indirect bandgap emission.

9:25 – 9:35

"QUANTIFICATION OF INFORMATION LOSS AND RECOVERY IN NONLOCAL PMD COMPENSATION"

Gabriele Riccardi[1*], Brian T. Kirby[2], Daniel E. Jones[2], Cristian Antonelli[1] and Michael Brosdky[2,3]

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We propose a new treatment of polarization-mode dispersion (PMD) nonlocal compensation in the framework of quantum information theory, and we quantify its beneficial effect in terms of restoration of concurrence and quantum mutual information.

9:35 – 9:45

"FIRST LASER ACTION OF A 4*%at.* Tm:Y3ScAl4O12 CERAMIC MATRIX"

Angela Pirri[1], Guido Toci[2*], Jiang Li[3, 4], Yagang Feng[3, 4], Zewang Hu[3, 4], Barbara Patrizi[2], Xiaopu Chen[3,4], Jiabei Wei[3,4], Hongming Pan[3,5], Xiaoying Li[3,5], Xing Zhang[3,5], Sha Su[3,5], Matteo Vannini[2]

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We report the first laser emission of a 4 at.% Tm:Y3ScAl4O12 ceramic fabricated by solid-state reaction combined with vacuum sintering method. The role played by Sc3+ ions on the laser performance is studied.

9:45 – 9:55

"OPTOMECHANICAL DYNAMICS OF RESONANT MICROCAVITIES"

Davide Mencarelli*, Christopher H. Joseph, Nicola Pelagalli, Andrea Di Donato, Luca Pierantoni, Marco Farina

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In this work, we present a numerical method to show the optomechanical dynamics in resonant microcavities. A rigorous model is proposed to solve the electromagnetic/mechanical system. The model is tested by means of analysing optomechanical performance of a corrugated Si-based nanobeam.

Session B10 - Applications of Photonic Technology

8:30 – 9:55

Chair: Stefano Selleri

8:30 – 8:45

Invited paper: **"LUMINANCE HOMOGENEITY EVALUATION ON AUTOMOTIVE REAR LAMPS: DEVELOPMENT AND VALIDATION OF AN ANALYTICAL METHOD BASED ON EYE PERCEPTION"**

Sara Paroni*, Alessandro Londero, Marco Svettini

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Luminance homogeneity has become an important feature in Rear Lamps design, therefore its evaluation needs special attention during development phases; the paper shows a route to the definition of objective analytical criterium, eye-perception based.

8:45 – 8:55

"INTEGRATED WAVE-METER IN SILICON PHOTONICS, A CASE STUDY: DFB STABILITY AND UNDER DIRECT MODULATION"

Yisbel Eloisa Marin, Stefano Faralli, Claudio J. Oton, Fabrizio di Pasquale, Philippe Velha

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We present an application of an integrated high-resolution wave-meter where a DFB laser directly modulated is characterized in terms of wavelength position as a function of time and confronted to a commercial spectrometer.

8:55 – 9:05

"ANALYSIS OF ETCH DEPTH FOR POLARIZATION-FREE DIRECTIONAL COUPLERS"

A.E. Kaplan[1, 4, *], J.J.G.M. van der Tol[2], P. Bassi[3], G. Bellanca[1]

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We analyze etch depth as a design parameter to realize integrated polarization independent directional couplers. The coupling coefficients of TE and TM polarizations are investigated by manipulating the etch depth in coupler section.

9:05 – 9:15

"LOW DRIVING VOLTAGE OPTICAL SWITCH BASED ON NEMATIC LIQUID CRYSTAL WAVEGUIDES EMBEDDED IN POLY(DIMETHYLSILOXANE)"

Antonio d'Alessandro*, Rita Asquini
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We present a photonic switch made of liquid crystals infiltrated in poly(dimethylsiloxane) slides. The device can switch nearinfrared wavelengths with an extinction ratio above 16dB in either outputs by applying a voltage below 1.8 V.

9:15 – 9:25

"OPTICAL MULTILAYER FOR THERMAL ENERGY CONVERSION"

Carmine D'Alessandro[1,2], Davide De Maio[1,2], Daniela De Luca[1,3], Emiliano Di Gennaro[3], Mariano Gioffrè[1], Mario Iodice[1], Marilena Musto[2], Antonio Caldarelli[1,2], Roberto Russo[1,*]
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Control of emissivity in optical multilayer is of fundamental importance to optimize thermal conversion efficiency of high vacuum flat solar thermal panels. Results obtained on Chromium Oxide based multilayer will be presented and discussed.

9:25 – 9:35

"PROBING THE PHOTOPHYSICS OF LEAD-HALIDE HYBRID PEROVSKITE JUNCTIONS UNDER VERY INTENSE OPTICAL IRRADIANCE"

Silvia M. Pietralunga[1,2 *], Gabriele Irde[2,3], Alex J. Barker [2], James M. Ball [2,4], Vittorio Sala [2,3], Maurizio Zani [3], Annamaria Petrozza[2], Guglielmo Lanzani[2,3], Alberto Tagliaferri[2,3]
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Laser-assisted Time-Resolved Scanning Electron Microscopy and Photoluminescence were jointly applied to show that the recovery dynamics of photophysics in lead-halide hybrid perovskite junctions, at irradiances up to 500 suns, crucially depends on selective contacts type.

9:35 – 9:45

"Advances in LiDARs for airborne and spaceborne applications"

L. Carrà*, G. Piccinno, Bright Solutions S.R.L.
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LiDARs have gained widespread application in a number of different spaceborne and airborne remote sensing devices, taking advantage of robustness, compactness and energy efficiency of industrial-grade laser systems, specifically customized and tailored for operation in demanding harsh environment. Recent advances in airborne and spaceborne LiDAR projects employing industrial solid-state lasers will be reviewed.

9:45 – 9:55

"ULTRASHORT PULSE LASER SCRIBING OF THIN FILM SOLAR CELLS"

Fabio Giovanardi[1*], Francesco Bissoli[2], Edmondo Gilioli[2], Massimo Mazzer[2], Selleri Stefano[1]

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Preliminary tests of picosecond laser scribing in CuInGaSe2 solar cells manufacturing have been performed. SEM image and EDAX analysis confirm the scribing quality, while the comparison with mechanically scribed solar cells are in progress.

9:55 – 10:15 Break

Session A11 - Components and devices for optical communications

10:15 – 11:45

Chair: Mario Martinelli

10:15 – 10:25

"NEAR-INFRARED ERBIUM/SILICON SCHOTTKY PHOTODETECTORS INTEGRATED WITH A SILICON-ONINSULATOR WAVEGUIDE"

T. Crisci[1*], L. Moretti[1], M. Gioffrè[2], G. Coppola[2], M. Iodice[2], M. Casalino[2]

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In this work we have investigated the performance of photodetectors at 1550nm based on the internal photoemission effect through Erbium/Silicon Schottky junctions integrated with silicon-on-insulator (SOI) waveguides.

10:25 – 10:35

"AN 8×30 GB/S INP MONOLITHICALLY INTEGRATED DIRECTLY MODULATED TRANSMITTER"

G. Contestabile[1], F. Bontempi[1], and N. Andriolli[1,2]

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A high-speed integrated 8-channel transmitter fabricated using a generic InP integration platform is reported. The directly modulated lasers on a 100 GHz grid have 21 GHz bandwidth and operate up to 30 Gb/s per channel.

10:35 – 10:45

"DIRECTLY-MODULATED VCSEL-BASED TRANSMITTER FOR OPTICAL METRO NETWORKS"

M. Rapisarda[1*], A. Gatto[1], P. Parolari[1], F. Lipparini[1], C. Neumeyr[2], P. Boffi[1]

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Application of DMT-DM VCSELs to coherent-detection based MAN network is demonstrated both experimentally and by simulations, allowing reaches of hundreds of km for 50 Gb/s target capacity.

10:45 – 10:55

"MACHINE LEARNING IN SOA OPTICAL COMMUNICATION SYSTEMS"

Francesco Matera*

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The performance of cascaded optical communication systems with in line semiconductor optical amplifiers is evaluated by means of machine learning approaches based both on a regression model and an artificial neural network.

10:55 – 11:05

"DEMONSTRATION OF OPTICAL WIRELESS LINKS FOR ON-CHIP COMMUNICATIONS"

Jacopo Nanni[1*], Marina Barbiroli[1], Franco Fuschini[1], Ali Emre Kaplan[1,2], Gaetano Bellanca[2], Jinous Shafiei Dehkordi[2], Velio Tralli[2], Badrul Alam[3], Giovanna Calò[3], Vincenzo Petruzzelli[3]

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This work presents experimental results of on-chip optical communications between dielectric antennas realized on a Silicon on Insulator technology. The observed fast fading effects call for ray-tracing modeling of the propagation channel.

11:05 – 11:15

"80 GHZ BEATNOTE GENERATION IN A SINGLE TAPERED DISTRIBUTED FEEDBACK HYBRID III-V / SILICON LASER"

F. Grillot[1,5*], G. Callado[1,2], T. Vérolet[3], J. Decobert[3], C. Jany[4], K. Hassan[4], S. Malhouitre[4], D. Make[3], A. Coquiard[4], S. Combrié[2], A. Shen[3], A. de Rossi[2]

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A 80 GHz beatnote is reported from a III-V on silicon distributed feedback laser having a large quality factor. These results pave the way for all-optical microwave generation using compact and energy efficient semiconductor devices.

11:15 – 11:25

"4-QAM 100 MBPS WIRELESS TRANSMISSION AT 20 GHZ CARRIER FREQUENCY ENABLED BY A GRAPHENE OPTOELECTRONIC MIXER"

Alberto Montanaro[1], S. Marconi[1,2], M. A. Giambra[1], M. Midrio[3], V. Mišeikis[4,5], M. Artiglia[1], V. Sorianello[1], A. D'Errico[6], C. Coletti[4,5], M. Romagnoli[1]

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We report on a wireless transmission of a 4-QAM 100Mbps sequence at 20 GHz carrier frequency, implemented using a graphene optoelectronic device at the transmitter stage. The proposed scheme promises very high wireless transfer rates using mm-wave carrier frequency which can be easily generated by optical beating in the device itself.

11:25 – 11:35

"PECVD SILICON OXYCARBIDE FOR INTEGRATED PHOTONICS"

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We report on CMOS compatible high-refractive-index contrast Silicon Oxycarbide (SiOC) waveguides for integrated optic applications. This photonic platform exhibits wide refractive index tunability, high thermo-optic coefficient K=4.58x10 -5 °C -1,high TPA threshold 5.57 x 10-3 GW/cm2 and also high nonlinear refractive index 3.29 x 10-14 cm2/W.

11:35 – 11:45

"SILICON INTEGRATED LASER SOURCES WITH INDEPENDENT WAVELENGHT TUNING"

G. De Angelis[1*], A. Bigongiari[1,2], A. Serrano[3], M. Chiesa[3], D. Rotta[3], S. Tirelli[3], A. Nottola[3], G.B. Preve[1,3], L. Tallone[1], M. Artiglia[1], F. Testa[2], M. Romagnoli[1]
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Successful integration of multiple laser sources in a single photonic chip is demonstrated for a four channel laser array and a polarization agnostic source where the output wavelength of each source is tuned independently via micro-heaters.

Session B11 - Poster 3

10:15 – 11:30
Chair: Francesco Morichetti

"1070 NM FIBER LASER SHORT PULSES LASER IRRADIATION ON ZIRCONIA SURFACE: MORPHOLOGICAL, CHEMICAL, THERMAL AND MECHANICAL ANALYSIS"

C. Fornaini[1,2*], F. Poli[1], E. Merigo[2], A. Lutey[1], A. Cucinotta[1], M. Chevalier[2], N. Brulat[2,] S. Mckee[1], G. Trevisi[3]
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This in vitro study aimed to observe the effect of 1070 nm fiber short pulses laser on zirconia samples by morphological analysis (profilometry, SEM), thermal recording (FBG), elemental composition (EDX) and strength bond (mechanical tests)

"EFFECT OF THE BUFFER LAYER THICKNESS ON SPR D-SHAPED POF SENSORS IN CHEMICAL APPLICATIONS BASED ON MIPS"

Letizia De Maria[1*], Maria Pesavento[2], Nunzio Cennamo[3], Paola Zuppella[4], Luigi Zeni[3]
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An investigation for optimizing the buffer layer thickness in SPR sensors to operate in the refractive index range used for chemical industrial applications with MIPs.

"SENSITIVITY ENHANCEMENT IN DISTRIBUTED ACOUSTIC SENSORS BY OPERATION AT 850-NM WAVELENGTH"

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In this work, we show that the SNR in distributed acoustic measurements can be enhanced by employing a coherent OTDR configuration operating at 850 nm wavelength, instead of the more conventional 1550 nm wavelength. The proposed approach has the advantage that it is can be adopted in already deployed fiber-optic cables.

"IMPLEMENTATION OF NEUROMORPHIC ACTIVATION FUNCTION WITHIN SURFACE PLASMON POLARITON CIRCUITS"

Hamed Tari, Alessandro Bile, Francesca Moratti, Eugenio Fazio*
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This research deals with simulation of a neuromorphic structure by implementation of a nonlinear medium as a control gate of Surface Plasmon Polariton propagation. Intensity of the input light is the key parameter for the gate control.

"PROTOTYPE DESIGN AND PRELIMINARY TESTS FOR ON LINE, REAL TIME SAG MONITORING OF HIGH VOLTAGE OVERHEAD LINES"

Elena Golinelli[1*], Gian Mario Ogliari[1], Daniele Bartalesi[1], Umberto Perini[2]
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A new optical system, based on image analysis, is being ad-hoc developed in RSE for the on line monitoring of the clearance to ground of overhead power line conductors and to study both winter ice sleeve formation and summer overheating.

"PEROXIDES DETECTION IN EXTRA VIRGIN OLIVE OIL (EVOO) BY PLASMONIC NANOHOLES TRANSDUCERS"

A. Colombelli[1*], M.G. Manera[1], D. Lospinoso[1], V. M. Paradiso[2], F. Longobardi[3], L. Tommasi[4], R. Rella[1]
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Evaluation of the peroxides concentration in EVOO have been performed by monitoring the variation in the plasmonic resonance of a suitable nanoholes structure and comparison the results with laboratory standard methodologies.

"SMART DEVICES FOR BIONIC DESIGN AND PROCESS DATA SCHEDULING"

Ruben Foresti[1,2*]
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2 CERT, Centre of Excellence for Toxicology Research, University of Parma, Italy
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The artificial intelligence requires scheduled process data to support the bionic design. We implemented and described some empirical cases describing a new method to assure the continuous improvement via smart devices.

"RELIABILITY OF UV SOLAR-BLIND PHOTODETECTORS BASED ON ε-GA2O3"

C. Borelli[1*], A. Baraldi[1], M. Bosi[2], A. Bosio[1], V. Montedoro[1], A. Parisini[1], M. Pavesi[1], L. Seravalli[2], S. Vantaggio[1], R. Fornari[1]
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Performance of ε-Ga2O3 as active layer for UV solar-blind detector is presented. By using un-doped films, UV/Visible rejection ratio at least of 104 is obtained via planar configuration.

"SMART ABSORBANCE ANALYSIS OF FROZEN FOOD PROPERTIES"

Fabio Giovanardi[1,2*], Michele Sozzi[2], Alessandro Tonelli[3], Alessandro Candiani[3], Stefano Selleri[1,2]
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This work shows a methodology to analyse and monitor the properties of frozen food along the cold chain process. The pigment colour is extracted through a simple procedure and analysed by means of a low-cost spectroscopy device.

11:45 – 12:00 Break

Session A12 - Fiber Lasers

12:00 – 13:25
Chair: Francesco Prudenzano

12:00 – 12:15
Invited paper: **"TM IN HIGH POWER FIBRE LASERS: A PERTURBATION APPROACH"**
Michalis Zervas – Optoelectronics Research Centre, University of Southampton, UK

12:15 – 12:25
"LASER EMISSION AND SPECTROSCOPIC CHARACTERIZATION OF Yb:(Y,Sc)2O3 CERAMICS"
A. Pirri[1], G. Toci[2*], R.N. Maksimov[3,4], B. Patrizi[2], L.R. Basyrova[5], V.V. Osipov[3], V.A. Shitov[3], E.V. Tikhonov[3], M. Vannini[2]
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We demonstrated for the first time efficient laser action in a (Yb0.058Sc0.508Y0.434)2O3 mixed ceramics fabricated by vacuum sintering of laser ablated nanopowder, with an output power of 5 W at 1086 and slope efficiency 61.3%

12:25 – 12:35
"WIDEBAND OPTICAL AMPLIFIER BASED ON MULTIPLE DOPANTS CO-DOPING GERMANATE GLASS"
Antonella Maria Loconsole[1], Mario Christian Falconi[1], Dario Laneve[1], Vincenza Portosi[1], Stefano Taccheo[2,3], Francesco Prudenzano[1*]
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A Tm:Er:Yb:Ho co-doped germanate glass fiber, pumped at 980 nm, is simulated to design a novel wideband optical amplifier in the range 1440 – 2110 nm.. The optical gain is optimized by using a Particle Swarm Optimization (PSO).

12:35 – 12:45
"THERMAL EFFECTS ON OPTICAL AMPLIFICATION IN 16-CORE MCFS"
S. Mckee[1*], L. Rosa[2], F. Poli[1], S. Selleri[1], L. Vincetti[2], A. Cucinotta[1]
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We investigate the impact of thermal effects, due to the quantum defect in the optical amplification process, on the performance of 16-core Yb-doped multicore fibres designed for high-power lasing and amplification applications.

12:45 – 12:55

"FEW-OPTICAL-CYCLE PULSE GENERATION BASED ON A NON-LINEAR FIBER COMPRESSOR PUMPED BY A LOW-ENERGY YB:CALGO ULTRAFAST LASER"

Lisa Marta Molteni[1,2,*], Federico Pirzio[3], Cristian Manzoni[2,1], Gianluca Galzerano[2,1], Paolo Laporta[1,2], Antonio Agnesi[3]

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Pulse compression in a normal dispersion photonic-crystal fiber is investigated with an ultrafast Yb:CaGdAlO4 laser. After a simple and power-efficient prism-pair compressor pulses as short as 14.9 fs with 29 mW average power are produced.

12:55 – 13:05

"RARE EARTH DOPED PHOSPHATE FIBRE AMPLIFIER AT 1.5 µm for LIDAR"

Daniel Milanese[1*], Nadia G. Boetti[2], Omri Moschovits[3], Diego Pugliese[4], Amiel Ishaaya[3], Duccio Gallichi-Nottiani[4], Davide Janner[4]

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The research work reports on the design and fabrication of a compact optical fibre amplifier operating at 1.5 µm. A novel Yb/Er co-doped phosphate glass was developed and the optical fibre preform fabricated by rod-in-tube technique.

13:05 – 13:15

"THERMAL EFFECTS IN ASYMMETRIC YB-DOPED 4-CORE FIBERS"

Federica Poli[1*], Jesper Lægsgaard[2], Annamaria Cucinotta[1], Stefano Selleri[1]

1 Department of Engineering and Architecture, University of Parma, I-43124 Parma, Italy

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The impact of thermal effects on supermodes of Yb-doped multi-core fiber amplifiers with an asymmetric core refractive index profile has been studied through numerical simulations based on the finite element method.

13:15 – 13:25

"LOW INTENSITY NOISE ULTRAFAST YB-DOPED FIBER AMPLIFIER"

Francesco Canella[1,2*], Lisa Marta Molteni[1,3], Simone Cialdi[4,2], Paolo Laporta[1,3], Nicola Coluccelli[1,3] and Gianluca Galzerano[3,1]

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Low noise and low cost Yb-doped fiber amplifier is presented. Average output power levels in excess of 2W in the near-infrared spectral region without significant noise intensity degradation are demonstrated using ~2mW input average power.

Session B12 - Optical Sensing III: Chemical and Biochemical sensing

12:00 – 13:20
Chair: Luigi Zeni

12:00 – 12:15
Invited paper: **"DEVELOPMENT OF NOVEL PHOTONIC BIOSENSING TECHNOLOGIES"**
Nabok Alexei- Sheffield Hallam University, Sheffield, UK

12:15 – 12:30
Invited paper: **"PLASMONIC PLASTIC OPTICAL FIBER SENSORS FOR PFAS DETECTION IN WATER"**
Chiara Perri – Università degli Studi della Campania L. Vanvitelli, Aversa (CE), Italy

12:30 – 12:40
"A NOVEL PLATFORM FOR HIGHLY SENSITIVE DETECTION OF MOLECULAR INTERACTIONS BASED ON OPTICAL FIBER META-TIPS"
M. Consales[1*], G. Quero[1*], S. Spaziani[1*], M. Principe[1,2], A. Micco[1], V. Galdi[1], A. Cutolo[1], A. Cusano[1*]
1 Optoelectronic Division - Department of Engineering, University of Sannio, Benevento, Italy
2 Centro Regionale Information Communication Technology, Benevento, Italy
* consales@unisannio.it, a.cusano@unisannio.it

We report on a novel biosensing platform, based on the integration of a plasmonic metasurface on the tip of a single-mode optical fiber, able to detect biomolecular interactions with very high sensitivity.

12:40 – 12:50
"NEW FRONTIERS OF SINGLE-MOLECULE SENSING BY PLASMON-ENHANCED FLUORESCENCE"
A. Colombelli[1], M. Cesaria[1], S. Scarano[2], M. Minunni[2], A. Creti[1], M. Lomascolo[1], R. Rella[1], M. G. Manera[1*]
1 CNR-IMM Lecce section, strada prov.le Lecce-Monteroni, Lecce, Italy
2 Dipartimento di chimica, Università di Firenze, via della Lastruccia, Firenze, Italy
*mariagrazia.manera@cnr.it

Plasmon-enhanced fluorescence (PEF) is a remarkable tool with ultra-high sensitivity for detection and imaging down to the single-molecule level offering enhanced emissions and decreased lifetimes, with resolutions significantly better than the diffraction limit.

12:50 – 13:00
"GOLD NANOSTRUCTURED SURFACE FOR THE DETECTION OF CONTAMINANTS IN WATER"
M. Giardino[1], D. Pugliese[1], D. Janner[1,2*]
1 Dipartimento di Scienza Applicata e Tecnologia, Politecnico di Torino, Torino, 10129, Italy
2 National Interuniversity Consortium of Materials Science and Technology (INSTM), Florence, Italy
*davide.janner@polito.it

We will report on the realization of cost-effective SERS probes for portable systems for the detection of contaminants in water reaching sensitivities below 300 part-per-trillion.

13:00 – 13:10

"DNA SENSING WITH HOLLOW CORE FIBERS"

F. Melli[1*], F. Giovanardi[2], R. Corradini[3], F. Benabid[4], A. Cucinotta[2], L. Vincetti[1]

1 Department of Engineering "Enzo Ferrari", University of Modena and Reggio Emilia, via Vivarelli 10, Modena, Italy

2 Dep. of Engineering and Architecture, University of Parma, Parco Area delle Scienze, 181/A, Parma, Italy

3 Department of Chemistry, Life Sciences and Environmental Sustainability, Parco Area delle Scienze, 11/A, Parma, Italy

4 Xlim Research Institute, Université de Limoges, Limoges 87060, France

*federico.melli@unimore.it

We report first results about the use of Hollow-Core Inhibited-Coupling Fibers as DNA sensors. Experimental results show these kind of fibers can be infiltrated with solutions containing the DNA generating a bio-layer on silica-air surfaces.

13:10 – 13:20

"MODELING OF CHROMATIN DNA USING CIRCULAR INTENSITY DIFFERENTIAL SCATTERING"

Muhammad Waseem Ashraf[1,2*], Aymeric Le Gratiet[2], Riccardo Marongiu[1,2], Alberto Diaspro[1,2]

1 DIFILAB, Department of Physics, University of Genoa, Via Dodecaneso 33, 16146 Genoa, Italy

2 Nanoscopy, CHT Erzelli, Istituto Italiano di Tecnologia, Via Enrico Melen 83, Building B, 16152 Genoa, Italy

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To know about higher order structure of chromatin, the chromatin fibre has been modeled as helices and circular intensity differential scattering, m03 element of Mueller matrix, has been computed by varying different parameters of the helices.

Plenary Session

13:30 – 13:40

Closing remarks

Annamaria Cucinotta, Stefano Selleri, Federica Poli – University of Parma

Program at glance

ICOP 2020
Italian Conference on Optics and Photonics
September 8-11, 2020

	Tuesday, September 8		Wednesday, September 9		Thursday, September 10		Friday, September 11		
8:30	Plenary - Welcome		Plenary		*Session A*	*Session B*	*Session A*	*Session B*	8:30
	Session A	*Session B*	*Session A*	*Session B*	A7 - Nano and Microstructures	B7 - Optical Imaging II: Methods and devices	A10 - Devices and quantum systems	B10 - Applications of Photonic Technology	
	A1 - Plasmons and metamaterials	B1 - Photonics for Cultural Heritage 1	A4 - Optical Imaging I: Applications	B4 - Young IEEE-SIOF 1 - Optical nanobiosensing: current challenges and novel perspectives					
	Break	*Break*	*Break*	*Break*	*Break*	*Break*	*Break*	*Break*	
	A2 - Optical Sensing I: Physical sensing	B2 - Optical Networking Techniques	A5 - Poster 1	B5 - Propagation effects in fiber-optic links	A8 - Optical Sensing II: Physical sensing and components for optical sensing	B8 - Poster 2	A11 - Components and devices for optical communications	B11 - Poster 3	
	Break	*Break*	*Break*	*Break*	*Break*	*Break*	*Break*	*Break*	
	A3 - Biomedical applications	B3 - Space-division multiplexed and quantum communications	A6 - Photonics for Cultural Heritage 2	B6 - Young IEEE-SIOF 2 - Optical nanobiosensing: current challenges and novel perspectives	A9 - Nonlinear Optics	B9 - Emergent topics	A12 - Fiber Lasers	B12 - Optical Sensing III: Chemical and Biochemical sensing	
13:30	Plenary		Plenary				Plenary - Closing remarks		13:30

ICOP 2020

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