European Optical Society

Coherence for Europe ®

EOS Topical Meetings at Capri

5th EOS Topical Meeting on Optical Microsystems (OμS'13)

1st EOS Topical Meeting on Optics at the Nanoscale (ONS'13)

12 - 14 September 2013, Capri, Italy

FINAL PROGRAMME

Organised in cooperation with the Italian Branch of the EOS

with the endorsement of

Sponsors

Media Partner

Contents

VENUE

Capri is a beautiful and picturesque island in the Gulf of Naples that has been attracting countless visitors for thousands of years. Its mild climate, the numerous monuments and island highlights and last but not least the excellent Italian cuisine and wine culture make Capri a perfect location for high-quality EOS Topical Meetings in an enjoyable Mediterranean atmosphere. See also: www.capri.it

The 1st EOS Topical Meeting on Optics at the Nanoscale (ONS'13)

takes place at the:

Hotel La Residenza
Via Federico Serena, 22
80073 Capri (NA), Italy

phone +39 081 837 0833
fax +39 081 837 7564

info@laresidenzacapri.com
www.laresidenzacapri.com

The 5th EOS Topical Meeting on Optical Microsystems (OμS'13)

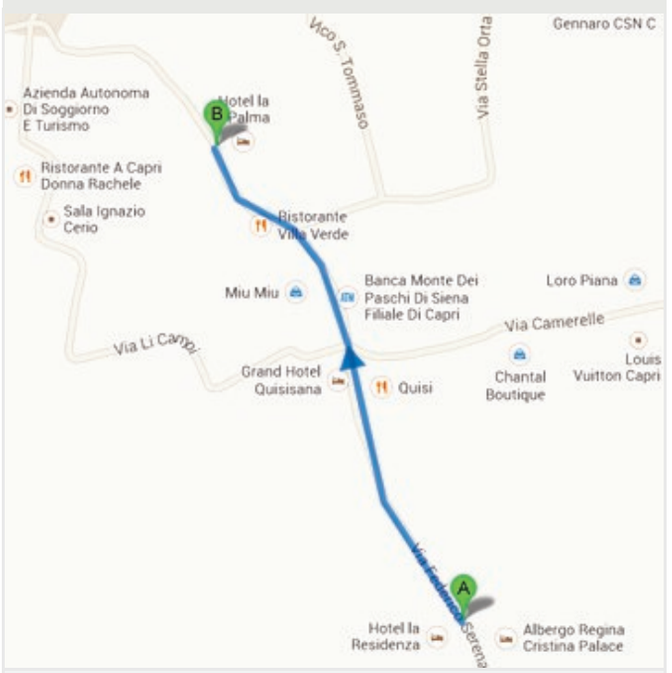
takes place at the:

Hotel LaPalma
Via V. Emanuele 39
80073 Capri (NA), Italy

phone +39 081 837 0133
fax +39 081 837 6966

congressi@lapalma-capri.com
www.lapalma-capri.com

DIRECTIONS BETWEEN THE VENUES



The two hotels are at walking distance (less than 100 meters).

GETTING AROUND AT CAPRI

Getting around at Capri
www.capri.com/en/come-muoversi

By car
Please note that during the tourist season (generally from Easter to the first weekend of November) non-resident vehicles are not allowed to circulate on the island of Capri. It is advisable to leave cars in one of the attended car parks close to the points of embarkation.

FURTHER INFORMATION

→ Directions to Capri island (by plane, car or train)
www.capritourism.com/en/how-to-reach-capri

→ Map of the island
www.capri.net/en/map

→ Tourist information
www.capritourism.com

INFORMATION FOR AUTHORS AND ATTENDEES

ORAL PRESENTATIONS

Time slots: Presenting authors are allotted 15 minutes (12 minutes presentation plus 3 minutes for discussion) in the session of ONS and 20 minutes (15 minutes presentation plus 5 minutes for discussion) in the sessions of OμS. Please plan your presentation accordingly to meet the allotted maximum.

Presentation upload: Speakers are requested to upload their presentation to the computer in the meeting room well in advance to their talk.

Presentation format: Please bring your presentation on a USB mass storage, CD-ROM or DVD and include all video files. File formats: ppt, pptx and pdf. A Windows-based presentation computer will be provided.

For Mac users: To make sure your presentation is displayed correctly, please:

- bring your presentation as pdf-file with fonts embedded or
- restrict yourself to Arial/Times New Roman (not Times)/Courier New (not Courier)/Symbol/Windings when creating your ppt- or pptx-file.

Technical equipment: All technical equipment (presentation computer, video projector, sound system, laser pointer) will be available on-site. It is also possible to use your personal laptop.

POSTER PRESENTATIONS

Poster authors are requested to be present at their posters during the official poster session. Please **prepare and print** your poster in advance to the conference. Poster set-up and removal is in the responsibility of the authors. Any posters left on the boards at the close of the poster session will be discarded. Poster numbers will be displayed on the poster boards to show authors where to place their poster.

The posters should have a size of DIN A1 (594 x 841 mm) or DIN A0 (841 x 1189 mm) preferably in a portrait format (not landscape format). Double sided tape and similar pads will be provided by the organizer. The size of the poster boards is 100 cm (width) x 120 cm (height).

The official poster session will be held on Thursday, 12th of September at 18.30 at the gardens of the hotel la Residenza together with the welcome cocktail.

REGISTRATION & FEES

At least one author of an accepted presentation is requested to register properly in advance to the conference.

Registration category	**Late / on-site** (after 5 Sept. 2013)	
Members of SIOF, EOS, AEIT, SIF, OSA and AIDAA	400 €	
Non-members *	530 €	
Student members of SIOF, EOS, AEIT, SIF, OSA and AIDAA	250 €	
Student non-members *	360 €	* incl. a one-year membership
One-day	170 €	in SIOF and EOS

EOS CONFERENCE DIGEST

The registration fee includes a USB-Stick with the complete volume of accepted abstracts (plenary, invited and contributed) of the two topical meetings - Optical Microsystems (OMS'13) and Optics at the Nanoscale (ONS'13) (ISBN 978-3-9815022-6-8).

Please note that the EOS does not publish conference proceedings with extensive papers. Authors who wish to publish in-depth papers are welcome to take advantage of the special publication offer for JEOS:RP (see the next paragraph). The publication offer for JEOS:RP is an option but no obligation.

BEST STUDENT PRESENTATION AWARD

Sponsored by Springer science+business media

The best student oral contribution and the best student poster presentation of each EOS Topical Meeting in Capri 2011 - Optical Microsystems (OMS'11) and Lasers (ETML'11) - will be awarded a diploma and a prize sponsored by Springer. All student oral and poster contributions are eligible to the prize. The criteria for the award are relevance, originality, scientific merit and clarity.

JEOS:RP SPECIAL PUBLICATION OFFER

EOS European Optical Society www.jeos.org

Authors can optionally submit a full manuscript of the accepted paper to the Journal of the European Optical Society Rapid Publications (JEOS:RP; www.jeos.org). The paper must be an original high-quality contribution connected to the Capri meetings.

Deadline: 30 September 2013. In case of acceptance authors receive a 20% discount on the publication rate.

SYNOPSIS

OμS'13 is the 5th edition of the international conference wholly dedicated to optical microsystems organized by the European Optical Society (EOS) and the Italian Society of Optics and Photonics (SIOF), Italian Branch of the EOS.

An optical microsystem can be defined as a complex system, able to perform one or more sensing and actuation functions, taking advantage of the progress in micro- and nano-technologies to integrate in a smart way optical devices with electronic, mechanical and sensing components. The increasing interest in this field arises from the perspective applications that would significantly improve the quality of life. The list of possibilities offered by these enabling technologies is very long and seems to increase day by day. Optical microsystems are finding applications not only in ICT, but also in biotechnologies, medicine, food and environmental monitoring, aerospace and automotive, homeland security, etc.

The conference programme will focus on fundamental as well as more applied topics. Biosensors, biochips and lab-on-chip, microfluidic and optofluidic systems, non-linear and quantum optical devices, silicon-based optoelectronics and MOEMS, chemical and physical optical microsensors, new characterization methods for materials and devices, novel imaging techniques, biomimetic devices and systems are among the hot topics of the conference.

GENERAL CHAIRS

Ivo Rendina
CNR-IMM (IT)

Eugenio Fazio
Univ. La Sapienza di Roma, IT

Pietro Ferraro
CNR-INOA, IT

OμS'13 is organised in cooperation with the Italian Branch of the EOS:

with the endorsement of

LOCAL ORGANISING COMMITTEE

- **Principia Dardano,** IMM-CNR
- **Edoardo De Tommasi,** IMM-CNR
- **Maria Antonietta Ferrara,** IMM-CNR
- **Ilaria Rea,** IMM-CNR
- **Melania Paturzo,** INO-CNR

PROGRAMME COMMITTEE

- **Ady Arie,** Tel-Aviv University (IL)
- **Mario Bertolotti,** Sapienza Università di Roma (IT)
- **Mathieu Chauvet,** Univ. Franche Comté (FR)
- **Stefano Cabrini,** Lawrence Berkeley National Lab. / Ca (US)
- **Giuseppe Coppola,** Consiglio Nazionale Ricerche (IT)
- **Giuseppe Cocorullo,** Università della Calabria (IT)
- **Ilaria Rea,** Consiglio Nazionale Ricerche (IT)
- **Richard De La Rue,** University of Glasgow (GB)
- **Maurizio De Rosa,** Consiglio Nazionale delle Ricerche (IT)
- **Hatice Duran,** TOBB University of Economics and Technology (TR)
- **Simonetta Grilli,** Consiglio Nazionale delle Ricerche (IT)
- **Mario Iodice,** Consiglio Nazionale delle Ricerche (IT)
- **Bahram Jalali,** UCLA / Ca (US)
- **Bahram Javidi,** University of Connecticut (US)
- **Fredrik Laurell,** The Royal Institute of Technology, KTH (SE)
- **Francesco Michelotti,** Sapienza Università di Roma (IT)
- **Germano Montemezzani,** Supelec, Metz (FR)
- **Wolfgang Osten,** University of Stuttgart (DE)
- **Melania Paturzo,** Consiglio Nazionale delle Ricerche (IT)
- **Angela Piegari,** ENEA (IT)
- **Demetri Psaltis,** EPFL (CH)
- **Graham Reed,** University of Southampton (GB)
- **Michael J. Sailor,** UC San Diego / Ca (US)
- **Ali Serpenguezel,** Koç University (TR)
- **Luigi Sirleto,** Consiglio Nazionale delle Ricerche (IT)
- **Ralph Peter Tatam,** Cranfield University (GB)
- **Zeev Zalevsky,** Bar-Ilan University (IL)

PLENARY SPEAKERS

Friday, 13 September 2013

9:00-9:40	**Spaser in Quantum Regime** *Mark Stockman, Georgia University (US)*
Hotel La Residenza	Nanoplasmonics deals with collective electron dynamics on the surface of metal nanostructures, which arises due to excitations called surface plasmons. Nanoplasmonics has numerous applications in science, technology, biomedicine, environmental monitoring, and defense. Until recently, all the effects, elements, and devices in nanoplasmonics have been passive: they use external optical energy, always losing a fraction of it to heat and leakage radiation. An active device generating energy directly on the nanoscale has been spaser (surface plasmon amplification by stimulated emission of radiation), which is a quantum amplifier and generator of coherent nanolocalized fields. We briefly review quantum theory of spaser as an ultrafast quantum generator and amplifier of nanoplasmonic fields. We present latest ideas: electrical spaser in the extreme quantum regime and graphene spaser.
14:30-15:00	**Pervasive Photonics: looking at the forest of Communications** Roberto Saracco, EIT ICT Labs (IT)
Pagano, Hotel La Palma	

INVITED SPEAKERS

Thursday, 12 September 2013

11:20-11:40	**Self-reporting Porous Si photonic crystals for rapid bacteria detection** *Ester Segal (Technion – Israel Institute of Technology, The Hebrew University of Jerusalem, IL)*
Pagano, Hotel La Palma	A new optical biosensor platform based on a two-dimensional (2D) lamellar photonic grating for rapid bacteria detection is presented. The biosensor consists of a 2D periodic structure of macro-porous silicon with a pore diameter of 1-3 μm, to allow facile entrapment of the bacteria cells inside the pores. Spontaneous bacteria capture within the pores induces measurable changes in the zero-order reflectivity spectrum collected from the periodic structure, allowing for label-free detection in real time. This proof-of-concept work provides a generic sensing platform that is applicable for rapid detection and identification of a variety of microorganisms and cells.
11:20-11:40	**Opto-mechanics with oscillating micro-mirrors** *Francesco Marin (Università di Firenze, IT)*
Relais, Hotel La Palma	We present two classes of Micro-Opto-Mechanical-Systems working in the 100kHz region and specifically developed to show at the same time low optical and mechanical losses. Thanks to parametric control of the optical spring, we achieve an enhanced stability in force detection and strong parametric mechanical squeezing. [OμS13_1569822245]
15:00-15:20	**Plasmonic Schottky detectors on silicon** *Pierre Berini (University of Ottawa, CA)*
Pagano, Hotel La Palma	Surface plasmon (SP) photodetectors combine a metallic nanostructure on which SPs may be excited, with a semiconductor structure such as a Schottky contact. Involvement of SPs in photodetection confers useful characteristics to detectors, such as enhanced photoresponse, and spectral or polarisation selectivity. One application of interest is the detection of sub-bandgap radiation in silicon at optical communications wavelengths for optical interconnect and sensing applications. Internal photoemission on metal-silicon Schottky contacts is a broadband detection mechanism suitable for such applications but it is inherently inefficient. Structuring Schottky contacts such that SPs are excited thereon results in enhanced absorptance and responsivity
15:00-15:20	**SIDH: Self-Interference Incoherent Digital Holography** *Myung Kim (University of South Florida, US)*
Relais, Hotel La Palma	Recent work on self-interference incoherent digital holography is reported, including full-color holographic imaging under natural light illumination, adaptive optics by incoherent digital holographic compensation of aberration, and applications in ophthalmic imaging. [OμS13_1569789633]
15:20-15:40	**How to reconstruct mechanical motion in cavity optomechanical systems** *Witlef Wieczorek*
Pagano, Hotel La Palma	
17:00-17:20	**Label free high throughput screening and cellular biomarker identification with digital holographic microscopy** *Pierre Marquet (EPFL, Centre de Neurosciences Psychiatriques, CH)*
Pagano, Hotel La Palma	Digital Holographic Microscopy (DHM) is an interferometric technique which generates quantitative phase images allowing to visualize transparent cells without the need of labelling or specialized multi-well plates. We have recently demonstrated the compatibility of DHM with screening applications through the automation of a DHM using standard 96 and 384 imaging plates. This opens the perspective for phenotypical and toxicological screening. We illustrate this aspect by profiling the response of cells line to a collection of 1200 FDA-approved drugs.

INVITED SPEAKERS

Thursday, 12 September 2013 - continued	
17:00-17:20	**Low-coherence interferometric microscopy and nanoscopy of fast dynamic processes** *Natan T Shaked (Tel Aviv University, IL)*
Relais, Hotel La Palma	We present unique low-coherence interferometric imaging techniques for quantitatively tracking the thickness profiles of dynamic processes in thousands of full frames per second, and with up to sub-nanometric accuracy. Applications include imaging of rapid biological cell phenomena, drug release, and lithography processes. [OµS13_1569787243]
17:20-17:40	**Electrospinning as technological route to active polymer nanofibers for photonics** *Dario Pisignano (Università del Salento, IT)*
Pagano, Hotel La Palma	Polymer micro- and nano-fibers realized by electrospinning show ease of fabrication, low costs, and excellent chemical and compositional flexibility. For these reasons, such nanostructures are ideal building blocks in order to realize active photonic components and to value the intrinsic points of strengths of light-emitting organic materials. Here we present the electrospinning technology as route to realize active polymer nanofibers made of conjugated polymers, blends, or low-molar-mass dye compounds used as dopant of viscoelastic polymer matrices. Light emission is achievable both in the visible and in the near infrared. Furthermore, for many active compounds we found that uniform and bright fibers can be obtained by adding organic salts to the electrospun solution without degrading the pristine optical properties of conjugated polymers. Realizable devices and applications of active polymer nanofibers include optically-pumped lasers, field effect transistors, polarized light-emitting sources throughout the visible range, and piezo-electric arrays usable as pressure and acceleration sensors.
17:20-17:40	**Optical Eigenmode in complex systems** *Michael Mazilu (University of St Andrews, GB)*
Relais, Hotel La Palma	Light propagating through complex optical systems can be described using a set of optical eigenmodes that define a family of coherent orthogonal beams. This decomposition allows for the optimisation of the light field to achieve, for example, optimal structured illumination for imaging, sub-diffraction focussing or optimal linear and angular momentum transfer to scattering microparticles. [OµS13_1569812663]
Friday, 13 September 2013	
09:40-10:00	**The great Gig in Optical microscopy: unlimited spatial resolution in far-field optical fluorescence microscopy** *Alberto Diaspro (Istituto Italiano di Tecnologia, IT)*
Pagano, Hotel La Palma	It is well known and established that, for the most popular imaging mode in optical microscopy, i.e. fluorescence, the diffraction barrier does no longer provide an unsurpassable limitation for resolution and localization accuracy. Here, we will discuss targeted and stochastic readout methods using both single and multiphoton excitation, in terms of resolution and localization precision accuracy. Individual molecule localization (IML) implemented within selective plane illumination microscopy (SPIM) will be addressed towards 3D super resolution imaging in thick biological samples. STED two-photon excitation microscopy will be discussed reporting about the possibility of using a single wavelength (SW) both for two-photon excitation and STED depletion by implementing a SW-2PE-STED microscope. Direct writing lithography at super resolution will be discussed along with the characterization of new fluorescent reporters, super-resolution oriented. A further topic will be related to the coupling of STED and Atomic Force Microscopy. [OµS13_1569813885]
09:40-10:00	**Space Photonics at ESA: Applications and Technology Challenges** *Errico Armandillo (European Space Agency, NL)*
Relais, Hotel La Palma	In the past twenty years we have witnessed a tremendous growth in Photonics and Opto-electronics technologies for Satellite applications: from spacecraft level to sensors and payload. The observations capabilities have increased enormously thanks to these new technologies as well as new observation capabilities have been made possible. The paper will review the use and applications of Photonics and Optolectronics in Space missions at the European Space Agency giving details and examples of missions and technologies spanning from Earth Observation, to Space Science and Deep Space missions, Navigation, Telecom and Human Space program. *[OµS13*_1569818517]
11:40-12:00	**An Optical Coulter Counter: Measuring cell volume using dye exclusion** *Ethan Schonbrun*
Pagano, Hotel La Palma	Accurate measurements of the physical dimensions of individual cells are valuable in order to better understand the morphology of normal and abnormal cell states. Phase sensitive techniques quantify the optical pathlength difference through the cell and are therefore dependent on the cell's unknown optical properties. Here, we present an optical method to measure cell geometry that is independent of the cell's optical properties and consequently is capable of quantifying the cell's absolute physical dimensions. This method is analogous to the electrical Coulter counter, where cells are suspended in an engineered fluid and passed through a confined detection region.
15:00-15:20	**Nanoparticle enhanced fiber platform for biosensing applications** *Stefano Selleri (University of Parma, IT)*
Pagano, Hotel La Palma	A novel photonic crystal fiber Bragg gratings biosensor for specific DNA target sequences detection is reported. Measurements revealed shift in reflected spectra only by using DNA complementary to the specific bio-probes previously immobilized inside the fiber, making this technology suitable for versatile biosensing platforms. [OµS13_1569791119]

INVITED SPEAKERS

Friday, 13 September 2013

15:00-15:20	**Computer holography: a perfect digital 3D technique for real and virtual objects** *Kyoji Matsushima (Kansai University, JP); Sumio Nakahara (Kansai University, JP)*
Relais, Hotel La Palma	Recent developments in computer holography are reviewed. In computer holography, the holographic fringe pattern is generated as a digital 2D image in extremely high-definition and printed by using a laser lithography system. The 3D scenes include CG model objects as well as physical objects captured by digital holography. [OμS13_1569821999]
16:40-17:00	**Structural colors in photonic glasses and bird feathers** Vinothan N. Manoharan (Harvard University, US)
Pagano, Hotel La Palma	Photonic glasses are disordered arrangements of dielectrics that can be made from glassy packings of colloidal particles. They can display structural colors arising from local correlations in the structure. We make such glasses from core-shell particles, and we measure the reflectivity as a function of wavelength and particle size. Unlike photonic crystals, these materials are not iridescent; the color remains constant over a wide range of orientations. Our samples display rich blues and greens, but they do not display red colors at any particle size. The same trend occurs in the colors of birds: whereas the colors of blue birds arise from the disordered pore structure of their feathers, there are no known red birds that use structural color instead of pigments. I will present experiments and theoretical arguments that attempt to shed some light on why red colors do not appear in disordered systems.
17:00-17:20	**Self-Organized Optical Waveguides Targeting Luminescent Objects in Photopolymers** *Tetsuzo Yoshimura (Tokyo University of Technology, JP)*
Pagano, Hotel La Palma	Self-Organized Lightwave NETwork (SOLNET) constructs self-organized optical waveguides. In reflective SOLNET with luminescent targets, when a write beam from an optical device enters a photopolymer, a luminescent target deposited on another optical device generates luminescence. In the region, where the write beam and the luminescence overlap, refractive index increases rapidly than that in the surrounding region, pulling the write beam to the luminescent target. Finally, by the self-focusing, a self-aligned optical waveguide is constructed between the optical devices, even when misalignments and core size mismatching exist. Experimental/theoretical results and applications to optical solder in optical interconnects within computers are described.

Saturday, 14 September 2013

09:30-10:00	**3D quantum integrated photonics** *Fabio Sciarrino (Sapienza Università di Roma, IT)*
Pagano, Hotel La Palma	Integrated photonic circuits have a strong potential to perform quantum information processing We will report the implementation of integrated quantum circuits, fabricated by femtosecond laser waveguide writing. We will discuss the perspectives of optical quantum simulation: the implementation of the boson sampling to demonstrate the computational capability of quantum systems and the development of integrated architecture with three-dimensional geometries. These results open new perspectives in different areas of quantum information, such as fundamental tests of quantum mechanics with increasing number of photons, quantum state engineering, quantum sensing and quantum simulation.
09:40-10:00	**Mid-infrared silicon photonic devices for sensing applications** *Goran Mashanovich (University of Southampton, GB)*
Relais, Hotel La Palma	We report several silicon photonic devices designed and fabricated to operate in the mid-infrared: rib, strip and slot waveguides, Multimode Interference (MMI) splitters, Mach-Zehnder Interferometers (MZIs), and multiplexers. We show that silicon on insulator (SOI) is a viable material platform for wavelengths up to 4 microns. [OμS13_1569789161]
10:00-10:30	**Keys to writing and submitting your papers** *Rachel Pei Chin Won*
Pagano, Hotel La Palma	Rachel will talk you through the concept of scientific detailed information and guidelines on scientific manuscript preparation and submission, as well as an overview of editorial process and the peer-review system. You will get to know what editors seek, how to write a good cover letter and a good scientific paper, how to review a manuscript and how to make an appeal.
11:30-12:00 **Pagano, Hotel La Palma**	**Laser and Photonic Market in the world** *Eugene Arthurs*
12:00-12:30 **Pagano, Hotel La Palma**	**Optics activities at the International Centre for Theoretical Physics in Trieste** *Joseph J. Niemela*
15:00-15:30	**Coherent phonon spectroscopy of the shearing mode in bilayer and few-layer graphene** *Davide Boschetto (ENSTA ParisTech/Ecole Polytechnique, FR)*
Pagano, Hotel La Palma	It is well known that graphite has a layered structure, with atoms forming a honeycomb lattice with strong covalent bonds within the layer, and with weak Van der Waals forces acting between the layers. A sample made of a single layer of graphite is called graphene, and it is the thinnest sample material known. When the sample is made of several layers, it is called multilayer graphene. Graphene is today the most promising material for ultrafast nanoelectronics because of its extremely high electrons mobility. All the transport properties in single layer and multilayer graphene are strongly dependent on the electrons and phonons dynamics, as well as on the electron-phonon interaction. Therefore, studying their dynamics is a key point to understand both the underlying physical properties and the way in which graphene can be implemented to existing and new devices.

SYNOPSIS

New properties in nanoscale structures can be dramati-cally tuned with size and shape of the nanostructures. Completely different optical behaviors are produced compared to the bulk counterparts, such as narrow line widths for emission, solar energy conversion, etc.

Indeed materials and applications require strong effort to develop spectros-copy and microscopy tools allowing visualization and manipulation of optical properties with nanoscale resolution.

Optics at Nanoscale is a Topical Meeting that covers a spectrum from applied to basic research of this domain providing a forum for all the aspects with the purpose of advancing the state-of-the-art of nanoscale optics.

LOCAL ORGANISING COMMITTEE

- **Principia Dardano,** IMM-CNR
- **Edoardo De Tommasi,** IMM-CNR
- **Maria Antonietta Ferrara,** IMM-CNR
- **Ilaria Rea,** IMM-CNR
- **Melania Paturzo,** INO-CNR

PROGRAMME COMMITTEE

- **M. Agio,** CNR-INO (IT)
- **F.A. Bovino,** Selex (IT)
- **S. Brasselet,** Institut Fresnel (FR)
- **K. Busch,** Humboldt-Universität (DE)
- **F. Gatti,** INFN (IT)
- **P. Lalanne,** Institut d'Optique (FR)
- **G. Shvets,** Univ. of Texas, Austin (US)
- **N. van Hulst,** ICFO, (ES)
- **A. Zayats,** King's College (GB)

GENERAL CHAIRS

Didier Felbacq, University of Montpellier (FR)

Vito Mocella, CNR-IMM, Napoli (IT)

Concita Sibilia, Sapienza Università di Roma (IT)

OμS'13 is organised in cooperation with the Italian Branch of the EOS:

with the endorsement of

PLENARY SPEAKERS

Friday, 13 September 2013

9:00-9:40 — **Spaser in Quantum Regime**
Mark Stockman, Georgia University (US)

Hotel La Residenza

Nanoplasmonics deals with collective electron dynamics on the surface of metal nanostructures, which arises due to excitations called surface plasmons. Nanoplasmonics has numerous applications in science, technology, biomedicine, environmental monitoring, and defense. Until recently, all the effects, elements, and devices in nanoplasmonics have been passive: they use external optical energy, always losing a fraction of it to heat and leakage radiation. An active device generating energy directly on the nanoscale has been spaser (surface plasmon amplification by stimulated emission of radiation), which is a quantum amplifier and generator of coherent nanolocalized fields. We briefly review quantum theory of spaser as an ultrafast quantum generator and amplifier of nanoplasmonic fields. We present latest ideas: electrical spaser in the extreme quantum regime and graphene spaser.

14:30-15:00 — **Pervasive Photonics: looking at the forest of Communications**
Roberto Saracco, EIT ICT Labs (IT)

Pagano, Hotel La Palma

INVITED SPEAKERS

Thursday, 12 September 2013

11:30-12:00 — **Hyperbolic metamaterials as a platform for quantum and nonlinear plasmonics**
Anatoly Zayats (King's College London, GB)

Hotel La Residenza

We will consider optical properties of hyperbolic metamaterials based on plasmonic nanorods with emphasis on their applications for controlling spontaneous one- and two-photon emission and nonlinearities. Polarisation manipulation and its nonlinear control in the metamaterials will be also discussed.

15:00-15:30 — **Nanofocusing with pyramidal structures**
Stefano Cabrini (The Molecular Foundry, US)

Hotel La Residenza

To exploit the potentialities of Nanophotonics, it is important to control the properties of the material at the nanometer scale, obtaining a good agreement between the experiments and the theory. Nanofabrication can open the way for new concept of devices. In this paper we will present a new plasmonic pyramidal antennas able to perform an efficient adiabatical optical compression.

16:30-17:00 — **The photonic wheel: demonstration of a state of light with purely transverse angular momentum via an optical nano-probing technique**
Andrea Aiello (Max Planck Institute - MPL, Universität Erlangen-Nürnberg, DE)

Hotel La Residenza

We generated a novel state of light that contains purely transverse angular momentum, the analogue of a spinning mechanical wheel. We realize this state, henceforth called the photonic wheel, by tight focusing of a suitably polarization-tailored light beam and measure it by using an optical nano-probing technique.

Friday, 13 September 2013

09:40-10:10 — **Nanooptics in subnanometric plasmonic gaps: from single molecule imaging to quantum tunneling**
Javier Aizpurua (Center for Materials Physics and DIPC, ES)

Hotel La Residenza

Metallic gaps with subnanometric separations provide an opportunity to exploit new physical phenomena in optics. The quantum nature of the free electrons at each side of the gap manifests itself through the presence of strong nonlocal effects and quantum tunneling modifying substantially the optical response.

11:15-11:45 — **Materials and fields at the nanoscale: design and engineering of photonic-plasmonic resonant nanostructures**
Luca Dal Negro (Boston University, US)

Hotel La Residenza

The ability to tailor light-matter interactions using metal-dielectric nanostructures is at the heart of nanoplasmonics and nano-optics technologies. Efficient approaches for nanoscale electromagnetic field enhancement, concentration and manipulation over desired spatial-spectral bandwidths and angular ranges are enabled by the exquisite control of propagating and non-propagating electromagnetic fields that is possible by the engineering of resonant optical nanomaterials.

INVITED SPEAKERS

Friday, 13 September 2013 - continued

15:15-15:45 **Synthetic optical materials for photonics applications**
Andrea Di Falco (University of St. Andrews, GB)

Hotel La Residenza

We discuss a collection of methods and approaches used to realize nanostructured materials with bespoke optical properties, for applications including biophotonics, energy harvesting and imaging. [ONS13_42]

17:15-17:45 **Plasmonics for quantum Information Processing**
Fabio Antonio Bovino (Quantum Optics Lab Selex-ES S.p.A, IT)

Hotel La Residenza

We report a Quantum Interference experiment on a Plasmonic Device able to discriminate the symmetry of a two-photon quantum state. This basic experimental study is the starting point to explore the possibility of using nanoscale "plasmonic circuits" for enhanced quantum information applications at telecom wavelengths.

Saturday, 14 September 2013

09:40-10:10 **Engineering metacrystals and flat optics with Bragg, Fermat, Huygens and Fresnel law**
Zeno Gaburro (Center of Neuroscience and Cognitive Systems, IIT, IT; University of Trento, IT; SEAS, Harvard University, US)

Hotel La Residenza

We have recently proposed a structure that generalizes classical Snell and Fresnel laws, based on "phase discontinuities". I provide a newer outlook on this structure, from four different and complementary points of view, referred to classical Bragg, Fermat, Huygens and Fresnel laws.

11:15-11:45 **PT-symmetric behavior arising in two coupled hybrid plasmonic-dielectric guides or in separate hybrid and dielectric guides**
H. Benisty (Institut d'Optique, FR)

Hotel La Residenza

Gain and loss can be arranged to swap with a symmetry of a structure, the so-called parity-time PT symmetry. In plasmonics, this gives rise to novel switching device opportunities. Two nano-optics examples show either gain and metal together in each guide of such devices, or the case of separate gain guide and metal guide.

15:00-15:30 **Nano-helices by Focused Ion Beam Induced-Deposition as Chiral Metamaterial in the NIR-VIS range**
Adriana Passaseo

Hotel La Residenza

Much progress were made to bring metamaterial structures to optical ranges of operation, but still many difficulties were found to miniaturize 3D chiral structures at the nanoscale. Here we present the nanofabrication technologies and propagation of light on 3-dimensional chiral nano-spirals arranged on a two-dimensional square lattice and operating in the visible and near-infrared range. The nanostructures were realized by Focused Ion Beam Induced Deposition and Focused Electron Beam Induced Deposition obtaining high flexibility in both, the geometrical control, array density and size. Optical measurements performed on the realized sample show a high circular polarization sensitivity in a wide range of optical frequencies.

Saturday, 14 September 2013 - JOINT SESSION

09:40-10:00 **Mid-infrared silicon photonic devices for sensing applications**
Goran Mashanovich (University of Southampton, GB)

Pagano, Hotel La Palma

We report several silicon photonic devices designed and fabricated to operate in the mid-infrared: rib, strip and slot waveguides, Multimode Interference (MMI) splitters, Mach-Zehnder Interferometers (MZIs), and multiplexers. We show that silicon on insulator (SOI) is a viable material platform for wavelengths up to 4 microns. [OμS13_1569789161]

15:00-15:30 **Coherent phonon spectroscopy of the shearing mode in bilayer and few-layer graphene**
Davide Boschetto (ENSTA ParisTech/Ecole Polytechnique, FR)

Pagano, Hotel La Palma

It is well known that graphite has a layered structure, with atoms forming a honeycomb lattice with strong covalent bonds within the layer, and with weak Van der Waals forces acting between the layers. A sample made of a single layer of graphite is called graphene, and it is the thinnest sample material known. When the sample is made of several layers, it is called multilayer graphene. Graphene is today the most promising material for ultrafast nanoelectronics because of its extremely high electrons mobility. All the transport properties in single layer and multilayer graphene are strongly dependent on the electrons and phonons dynamics, as well as on the electron-phonon interaction. Therefore, studying their dynamics is a key point to understand both the underlying physical properties and the way in which graphene can be implemented to existing and new devices.

ONS' 13 & OµS' 13 at a Glance

Hotel La Residenza	Pagano, Hotel La Palma	Relais, Hotel La Palma
ONS	**OµS I**	**OµS II**
THURSDAY, 12 September		
09:00 REGISTRATION OPENING		**Hotel La Palma**
10:00-11:00 Welcome Coffee		**Hotel La Palma**
11:00 WELCOME by the chairs		**Pagano, Hotel La Palma**
11:30-13:00 PLASMONICS	11:20-13:00 BIOPHOTONICS, BIOSENSORS & BIOCHIPS	11:20-13:00 OPTICAL MICROSENSORS & MICROSYSTEMS
13:00-15:00 Lunch break	13:00-15:00 Lunch break	13:00-15:00 Lunch break
15:00-16:00 IMAGING I	15:00-16:40 OPTICAL MICROSENSORS & MICROSYSTEMS	15:00-16:40 OPTICAL MICROSCOPY, IMAGING & CHARACTERIZATION METHODS
16:00-16:30 Coffee break	16:40-17:00 Coffee break	16:40-17:00 Coffee break
16:30-17:45 IMAGING II	17:00-18:20 BIOPHOTONICS, BIOSENSORS & BIOCHIPS	17:00-18:40 OPTICAL MICROSCOPY, IMAGING & CHARACTERIZATION METHODS
18:30-20:00 **POSTER SESSION AND WELCOME COCKTAIL** at the Gardens of the hotel la Residenza		
FRIDAY, 13 September		
8:50-9:30 PLENARY TALK **Spaser in Quantum Regime** Mark Stockman		**Hotel La Residenza**
09:40-10:55 PLASMONICS II	9:40-11:20 OPTICAL MICROSCOPY, IMAGING & CHARACTERIZATION METHODS	9:40-11:30 LIGHT FOR AEROSPACE
10:55-11:15 Coffee break	11:20-11:40 Coffee break	11:30-11:40 Coffee break
11:15-13:15 RESONANT PHENOMENA IN NANO-PHOTONICS	11:40-13:00 MICROFLUIDICS & OPTOFLUIDICS	11:40-13:00 NON-LINEAR & QUANTUM OPTICAL DEVICES AND TECHNOLOGIES
13:15-14:30 Lunch break	13:00-14:30 Lunch break	13:00-14:30 Lunch break
14:30-15:00 PLENARY TALK **Pervasive Photonics: looking at the forest of Communications** Roberto Saracco		Pagano, Hotel La Palma

Hotel La Residenza	Pagano, Hotel La Palma	Relais, Hotel La Palma
ONS	**OµS I**	**OµS II**
FRIDAY, 13 September - continued		
15:15-17:00 NANO-ENGINEERED MATERIALS AND DEVICES	15:00-16:20 BIOPHOTONICS, BIOSENSORS & BIOCHIPS	15:00-16:20 APPLICATIONS OF OPTICAL DEVICES & SYSTEMS
	16:20-16:40 Coffee break	16:20-16:40 Coffee break
17:00-15:15 Coffee break	16:40-18:20 MICROOPTICS & OPTICAL DEVICES BASED ON NOVEL CONCEPTS	16:40-18:20 APPLICATIONS OF OPTICAL DEVICES & SYSTEMS
17:15-19:00 PLASMONICS AND ACTIVE PLASMONICS		
20:30 GALA DINNER and AWARD CEREMONY at "da Paolino Lemon Trees" Restaurant		
SATURDAY, 14 September		
9:40-10:55 NANO-ENGINEERED MATERIALS AND DEVICES II	9:20-11:00 SIOF & OSA "FOR YOUNG" SESSION	9:40-11:00 SILICON PHOTONICS (JOINT WITH ONS'13)
10:55-11:15 Coffee break	11:00-11:30 Coffee break	11:00-11:30 Coffee break
11:15-13:15 DIELECTRIC NANOPHOTONICS	11:30-13:30 SIOF & OSA "FOR YOUNG" SESSION	11:30-12:50 OPTICAL MATERIALS FOR HYBRID AND MONOLITHIC INTEGRATION
13:15-15:00 Lunch break	13:30-15:00 Lunch break	
15:00-16:45 NANO-ENGINEERED MATERIALS AND CHARACTERIZATION	15:00-17:00 NANOPHOTONICS APPLICATIONS (JOINT WITH ONS'13)	
END OF EOS TOPICAL MEETINGS		

Notes

Thursday, 12 September

Hotel La Residenza	Pagano, Hotel La Palma	Relais, Hotel La Palma
ONS	OμS I	OμS II

09:00 REGISTRATION OPENING

10:00-11:00 Welcome Coffee

11:00 WELCOME by the chairs

Pagano, Hotel La Palma

11:30-13:00 PLASMONICS

11:30 **Invited Talk**

Hyperbolic metamaterials as a platform for quantum and nonlinear plasmonics

Anatoly Zayats (King's College London, GB)

We will consider optical properties of hyperbolic metamaterials based on plasmonic nanorods with emphasis on their applications for controlling spontaneous one- and two-photon emission and nonlinearities. Polarisation manipulation and its nonlinear control in the metamaterials will be also discussed.

12:00

Hybrid plasmonics using transparent conductive oxides

Otto Muskens (University of Southampton, GB); Martina Abb (University of Southampton, GB); Daniel Traviss (University of Southampton, GB); Yudong Wang (University of Southampton, GB); Kees De Groot (University of Southampton, GB); Pablo Albella (Center for Materials Physics CSIC-UPV/EHU and DIPC, ES); Javier Aizpurua (Center for Materials Physics CSIC-UPV/EHU and DIPC, ES)

We present recent results on the fabrication and optical response of hybrid plasmonic devices consisting of noble metals functionalized with transparent conducting oxides (TCOs). Highly-doped TCOs are of interest for plasmonic applications as they combine a high dc conductivity, metallic response in the infrared and dielectric properties at visible wavelengths. Here we investigate several aspects of TCO-metallic plasmonic hybrids, including work on ultrafast optical control of plasmonic nanoantenna-TCO hybrids and hybrid plasmonic effects near the bulk plasmon frequency of the TCO, characterized by a near-zero permittivity. [ONS13_55]

11:20-13:00 BIOPHOTONICS, BIOSENSORS & BIOCHIPS

11:20 **Invited Talk**

Self-reporting Porous Si photonic crystals for rapid bacteria detection

N. Massad-Ivanir (Technion – Israel Institute of Technology, IL); E. Tenenbaum (Technion – Israel Institute of Technology, IL), Y. Mirsky (The Hebrew University of Jerusalem, IL); E. Edrei (Technion – Israel Institute of Technology, IL); A. Nahor(The Hebrew University of Jerusalem, IL); A. Sa'ar (The Hebrew University of Jerusalem, IL); E. Segal (Technion – Israel Institute of Technology, The Hebrew University of Jerusalem, IL)

A new optical biosensor platform based on a two-dimensional (2D) lamellar photonic grating for rapid bacteria detection is presented. The biosensor consists of a 2D periodic structure of macro-porous silicon with a pore diameter of 1-3 μm, to allow facile entrapment of the bacteria cells inside the pores. Spontaneous bacteria capture within the pores induces measurable changes in the zero-order reflectivity spectrum collected from the periodic structure, allowing for label-free detection in real time. This proof-of-concept work provides a generic sensing platform that is applicable for rapid detection and identification of a variety of microorganisms and cells.

11:40

Gold Photonic Crystals and Photonic Quasi-Crystals for Reproducible Surface-Enhanced Raman Substrates

Lucia Petti (ICIB-CNR, IT); Rossella Capasso (ICIB-CNR, IT); Massimo Rippa (ICIB-CNR, IT); Pasquale Mormile (ICIB-CNR, IT); Marianna Pannico (ICTP-CNR, IT); Pietro La Manna (ICTP-CNR, IT); Pellegrino Musto (ICTP-CNR, IT)

In this paper we present efficient SERS substrates for plasmonic "label-free" nanobiosensors realized by electron beam lithograhy. We demonstrate that SERS enhancement factors of the order of ~107 can be reproducibly obtained using Au photonic quasi crystals arrays of nano-pillars. [OμS13_1569798169]

11:20-13:00 OPTICAL MICROSENSORS & MICROSYSTEMS

11:20 **Invited Talk**

Opto-mechanics with oscillating micro-mirrors

Francesco Marin, Università di Firenze (IT)

We present two classes of Micro-Opto-Mechanical-Systems working in the 100kHz region and specifically developed to show at the same time low optical and mechanical losses. Thanks to parametric control of the optical spring, we achieve an enhanced stability in force detection and strong parametric mechanical squeezing. [OμS13_1569822245]

11:40

Large Array of 2048 Tiltable Micromirrors for Astronomical Instrumentation

Frederic Zamkotsian (Laboratoire d'Astrophysique de Marseille, FR); Michael Canonica (MIT, US); Patrick Lanzoni (Laboratoire d'Astrophysique de Marseille, FR); Wilfried Noell (EPFL, CH)

Large arrays of 2048 tiltable micromirrors were designed, fabricated and tested for integration in future Multi-Object Spectrographs (MOS) for Astronomy. These single-crystal silicon 100x200 μm2 mirrors are exhibiting a surface flatness below 10nm, and could be successfully actuated before, during and after cryogenic cooling at 162K. [OμS13_1569790287]

12:00

Solution processable graphene-P3HT nanocomposite/n-type silicon photodetectors

Dana Cristea (IMT-Bucharest, RO); Cosmin Obreja (IMT-Bucharest, RO); Paula Obreja (IMT-Bucharest, RO); Raluca Gavrila (IMT-Bucharest, RO)

We demonstrate solution-processed photodetectors based on composite films from functionalized reduced graphene oxide (IRGO) and poly (3- hexylthiophene) on n-type silicon substrate. These devices show higher responsivities in UV-Vis-NIR than Si-based photodiodes (~5-10 times), and an extended wavelength range in IR, up to 1550 nm. [OμS13_1569821653]

Hotel La Residenza

ONS

11:30-13:00
PLASMONICS (continued)

12:15
Strong coupling of a plasmonic antenna lattice with surface modes on a dielectric multilayer
Andrea Lovera (EPFL, CH); Shourya Dutta-Gupta (EPFL, CH); Arash Farhang (EPFL, CH); Pietro Mandracci (Politecnico di Torino, IT); Fabrizio Giorgis (Politecnico di Torino, IT); Olivier Martin (EPFL, CH); Emiliano Descrovi (Politecnico di Torino, IT)
We report on the interaction of a lattice of plasmonic nano-antennas with a resonant dielectric multilayer sustaining narrow Bloch Surface Wave (BSW) resonances. Depending on the relative orientation antennas-BSW different coupling regimes are produced. In case of strong coupling, hybrid modes arise.

12:30
Plasmon amplification in layered structures
Didier Felbacq (Université de Montpellier, FR); Brahim Guizal (University of Montpellier, FR)
We study a metallo-dielectric structure that can support modes that hybrid between confined guided modes and surface plasmons. By adding gain to the dielectric waveguide, it is shown that the losses inherent to the metal can be overcome. The possibility of amplifying the surface plasmons is studied. [ONS13_48]

12:45
Nonlinear light scattering from plasmonic nanostructures
A. Capretti (CNR-SPIN, IT, University of Naples Federico II, IT, Boston University, US); C. Forestiere (University of Naples Federico II, IT, Boston University, US); G.P. Pepe (CNR-SPIN, IT); L. Dal Negro (Boston University, US); G. Miano (University of Naples Federico II, IT); (CNR-SPIN, IT, University of Naples Federico II, IT, Boston University, US)
We investigate the second-order nonlinear scattering from plasmonic nanoparticles. The high-order multipolar contributions to the scattered radiation are shown to significantly vary with the particle size and the incident wavelength. Both the bulk and the surface contributions are separately addressed.

13:00-15:00 Lunch break
Hotel La Residenza

Pagano, Hotel La Palma

OμS I

11:20-13:00
BIOPHOTONICS, BIOSENSORS & BIOCHIPS (continued)

12:00
Sensitive detection of parathion pesticide by UV-activated antibody based biosensor
Riccardo Funari (University of Naples, IT); Bartolomeo Della Ventura (University of Rome, IT); Carlo Altucci (University of Naples, IT)
Photonic Immobilization Technique (PIT) has been used to develop an immunosensor for the detection of parathion. The UV-activated antibodies expose their antigen-binding sites once adsorbed onto a gold electrode of a Quartz Crystal Microbalance (QCM), thereby greatly increasing the detection efficiency. [OμS13_1569796273]

12:20
Direct concentration of molecules in very diluted solutions
Lisa Miccio (Istituto Nazionale di Ottica del CNR, IT); Oriella Gennari (Istituto Nazionale di Ottica del CNR, IT); Simonetta Grilli (Istituto di Ottica - CNR, IT); Sara Coppola (Istituto Nazionale di Ottica - CNR, IT); Veronica Vespini (Istituto Nazionale di Ottica - CNR, IT); Pietro Ferraro (INO, IT)
A novel 'Pyro-Electro-hydrodynamic' manipulation system is used as a pioneering portable instrument for detecting in-situ low concentrated analytes not detectable by traditional methods.
[OμS13_1569807343]

12:40
Silane Modified Porous Silicon Optical Devices For In Situ Oligonucleotides Synthesis And Detection
Monica Terracciano (IMM-CNR, IT); Luca De Stefano (IMM-CNR, IT); Nicola Borbone (University of Napoli Federico II, IT); Giorgia Oliviero (University of Napoli Federico II, IT); Gennaro Piccialli (University of Napoli Federico II, IT); Ilaria Rea (IMM-CNR, IT)
Porous silicon optical transducers are functional support for solid phase oligonucleotides synthesis. Chemical procedures for surface stabilization and passivation, based on silane deposition, have been successfully exploited. [OμS13_1569787255]

13:00-15:00 Lunch break
Hotel La Palma

Relais, Hotel La Palma

OμS II

11:20-13:00
OPTICAL MICROSENSORS & MICROSYSTEMS (continued)

12:20
Comparison of novel structures for label-free biosensing
Davide Gandolfi (University of Trento, IT); Francisco Aparicio Rebollo (University of Trento, IT); Mattia Signoretto (University of Trento, IT); Fernando Ramiro Manzano (University of Trento, IT); Lorenzo Pavesi (University of Trento, IT); Mher Ghulinyan (FBK – Bruno Kessler Foundation, IT); Georg Pucker (FBK – Bruno Kessler Fundation, IT); Laura Pasquardini (FBK – Bruno Kessler Foundation, IT); Cecilia Pederzolli (FBK – Bruno Kessler Foundation, IT)
We compare old and novel photonic structures for integrated label-free biosensors based on whispering gallery mode resonators. Our devices are fabricated with cheap standard lithography techniques and are functionalized with DNA-aptamers for their versatility and specificity
[OμS13_1569783683]

12:40
Photonic sensor based on the Vernier effect operating at 3.8 μm
Benedetto Troia (Politecnico di Bari, IT); Vittorio Passaro (Politecnico di Bari, IT)
A photonic sensor based on the Vernier effect and operating at the operative wavelength λop=3.8μm is investigated for the first time. The device is assumed to be fabricated on silicon-on-insulator (SOI) technology platform and based on slot waveguide optimized for homogeneous sensing in mid infrared. The Vernier architecture designed at 3.8μm exhibits an overall wavelength sensitivity as high as 15.5×10^3 nm/RIU, resulting in a minimum detectable cover refractive index change as low as 6.4×10^-4 RIU. [OμS13_1569822305]

Hotel La Residenza

ONS

15:00-16:00
IMAGING I

Invited Talk

15:00
Nanofocusing with pyramidal structures
Stefano Cabrini (The Molecular Foundry, US)
To exploit the potentialities of Nanophotonics, it is important to control the properties of the material at the nanometer scale, obtaining a good agreement between the experiments and the theory. Nanofabrication can open the way for new concept of devices. In this paper we will present a new plasmonic pyramidal antennas able to perform an efficient adiabatical optical compression.

15:30
Interferometric phase nanoscopy with molecular specificity
Natan T Shaked (Tel Aviv University, IL); Nir Turko (Tel Aviv University, IL); Anna Peled (Tel Aviv University, IL)
We propose adding molecular specificity and nanoscopy capabilities to wide-field interferometric phase microscopy of biological cells by recording the phase shifts caused by plasmon resonance of functionalized gold nanoparticles (AuNPs), photothermally heated by a laser and labeling targets of interest in the cells. [ONS13_35]

15:45
Sub-diffractive light confinement by a single diatom valve using optical eigenmodes
Luigi Lavanga (IMM-CNR, IT); Edoardo De Tommasi (National Research Council, IT); Anna Chiara De Luca (National Research Council, Institute of Protein Biochemistry, IT); Principia Dardano (IMM-CNR, IT); Mario De Stefano (Seconda Università di Napoli, IT); Luca De Stefano (IMM-CNR, IT); Ivo Rendina (CNR, IT); Kishan Dholakia (University of St. Andrews, GB); Michael Mazilu (University of St Andrews, GB)
We report the generation of sub-diffractive laser light focal spots in the far-field regime, using the optical eigenmode method and the improvement of its performance exploiting the focusing properties of a single valve of Arachnoidiscus genus diatom. [ONS13_25]

16:00-16:30 Coffee break

Pagano, Hotel La Palma

OμS I

15:00-16:40
OPTICAL MICROSENSORS & MICROSYSTEMS

Invited Talk

15:00
Plasmonic Schottky detectors on silicon
Pierre Berini (University of Ottawa, CA)
Surface plasmon (SP) photodetectors combine a metallic nanostructure on which SPs may be excited, with a semiconductor structure such as a Schottky contact. Involvement of SPs in photodetection confers useful characteristics to detectors, such as enhanced photoresponse, and spectral or polarisation selectivity. One application of interest is the detection of sub-bandgap radiation in silicon at optical communications wavelengths for optical interconnect and sensing applications. Internal photoemission on metal-silicon Schottky contacts is a broadband detection mechanism suitable for such applications but it is inherently inefficient. Structuring Schottky contacts such that SPs are excited thereon results in enhanced absorptance and responsivity

Invited Talk

15:20
How to reconstruct mechanical motion in cavity optomechanical systems
Witlef Wieczorek

15:40
Comparative analysis between two simple experimental configurations for SPR sensors in plastic optical fibers
Nunzio Cennamo (Second University of Naples, IT); Luigi Bibbò (Second University of Naples, IT); Laura Conte (Second University of Naples, IT); Luigi Zeni (Second University of Naples, IT)
In this work, two different experimental setups for an optical sensor system based on Surface Plasmon Resonance (SPR), at the interface of a liquid sample and a sandwich of a thin gold film and a dielectric buffer deposited on half of the exposed core of a plastic optical fiber, are presented. The goal is a comparative analysis between these simple experimental configurations. [OμS13_1569783679]

16:00
Optical Patterning of Graphene oxide by photo-thermal effect
Emanuele Orabona (University of Naples, IT); Antonio Ambrosio (CNR-SPIN, IT); Angela Longo (National Research Council, IT); Gianfranco Carotenuto (National Research Council, IT); Pasquale Maddalena (University of Naples Federico II, IT)
We describe optical patterning of graphene oxide by reduction to graphene-like carbon sheet using the photo-thermal effect. Graphene patterns with resolution near the diffraction limit have been realized from graphene oxide film. Perspectives about electronic applications are presented. [OμS13_1569798855]

Relais, Hotel La Palma

OμS II

15:00-16:40
OPTICAL MICROSCOPY, IMAGING & CHARACTERIZATION METHODS

Invited Talk

15:00
SIDH: Self-Interference Incoherent Digital Holography
Myung Kim (University of South Florida, US); Jisoo Hong (University of South Florida, US)
Recent work on self-interference incoherent digital holography is reported, including full-color holographic imaging under natural light illumination, adaptive optics by incoherent digital holographic compensation of aberration, and applications in ophthalmic imaging. [OμS13_1569789633]

15:20
Looking for humans through smoke and flames by infrared digital holography
Melania Paturzo (INO-CNR, IT); Massimiliano Locatelli (INO-CNR, IT); Eugenio Pugliese (INO-CNR, IT); Vittorio Bianco (INO-CNR, IT); Andrea Finizio (INO-CNR, IT); Lisa Miccio (INO-CNR, IT); Anna Pelagotti (INO-CNR, IT); Riccardo Meucci (INO-CNR, IT); Pietro Ferraro (INO-CNR, IT)
We show that imaging alive people through smoke and flames is possible by Digital Holography at far infrared. So far, the existing thermographic infrared cameras allows to see people through dense smoke, sensing the radiation emitted by human body. However, these devices are often blinded due to the flame emission, and the information of the targets beyond the flames is unavoidably lost. On the contrary, lensless Digital Holography at far infrared avoids the typical saturation of the camera detectors returning clear images of targets seen behind veils of smoke and curtains of flames. Moreover, we demonstrate that human-size holograms can be recorded, allowing to move this promising technology outside the lab for safety applications. [OμS13_1569823957]

15:40
Experimental modal analysis of a rectangular plate for structural damage identification
Aldo Minardo (Second University of Naples, IT); Agnese Coscetta (Second University of Nplaes, IT); Salvatore Pirozzi (Seconda Università degli Studi di Napoli, IT); Romeo Bernini (IREA-CNR, IT); Luigi Zeni (Second University of Naples, IT)
A Brillouin Optical Time-Domain Analysis sensor has been used to perform a modal analysis on an aluminum rectangular plate. Experimental results are in good agreement with numerical analysis. [OμS13_1569805917]

16:00
Quantitative phase imaging techniques for the study of human red blood cell related diseases
Youngchan Kim (KAIST, KR); Kyoohyun Kim (KAIST, KR); YongKeu Park (KAIST, KR)
We present recent developments in quantitative phase imaging (QPI) techniques for the study of red blood cell (RBC) related diseases. QPI measures three-dimensional refractive index tomograms of live human RBCs and dynamic fluctuations in RBC membrane. Several blood-related diseases including malaria and sickle-cell disease have been studied in the individual cell levels. [OμS13_1569796441]

Hotel La Residenza

ONS

16:30-17:45
IMAGING II

16:30 Invited Talk
The photonic Wheel: Demonstration of a state of light with purely transverse angular momentum via an optical nano-probing technique
Andrea Aiello (Max Planck Institute - MPL, Universität Erlangen-Nürnberg, DE); P. Banzer (Max Planck Institute - MPL, Universität Erlangen-Nürnberg, DE); M. Neugebauer (Max Planck Institute - MPL, Universität Erlangen-Nürnberg, DE); Ch. Marquardt (Max Planck Institute - MPL, Universität Erlangen-Nürnberg, DE); N. Lindlein (Max Planck Institute - MPL, Universität Erlangen-Nürnberg, DE); T. Bauer (Universität Erlangen-Nürnberg, DE); G. Leuchs (Max Planck Institute - MPL, Universität Erlangen-Nürnberg, DE)
We generated a novel state of light that contains purely transverse angular momentum, the analogue of a spinning mechanical wheel. We realize this state, henceforth called the photonic wheel, by tight focusing of a suitably polarization-tailored light beam and measure it by using an optical nano-probing technique.

17:00
Scattering super-lens: subwavelength light focusing and imaging via wavefront shaping in complex media
Jung-Hoon Park (KAIST, KR); YongKeu Park (KAIST, KR)
We present the scattering super-lens, a novel method utilizing elastic scattering to achieve sub-diffraction limited focusing and imaging using visible light. The subwavelength information at evanescent near-field are controlled by or transferred into propagating far-field components by elastic scattering from disordered nanoparticles. [ONS13_50]

Pagano, Hotel La Palma

OμS I

15:00-16:40
OPTICAL MICROSENSORS & MICROSYSTEMS (continued)

16:20
Lateral and axial resolution improvements and DLP introduction in Video-Confocal Microscopy
Pier Alberto Benedetti (IPCF-CNR, IT)
Novel, recently patented improvements in Video-Confocal Microscopy (VCM) offer increased spatial resolution in multidimensional fluorescence and reflection optical microscopy. Some innovative designs, based on DLP devices for spatial modulation of the illumination beam, have also recently been tested capable of increased performance with important simplifications and substantially reduced costs. [OμS13_1569792361]

16:40-17:00 Coffee break

17:00-18:20
BIOPHOTONICS, BIOSENSORS & BIOCHIPS

17:00 Invited Talk
Label free high throughput screening and cellular biomarker identification with digital holographic microscopy
Benjamin Rappaz (EPFL, BSF, CH); Gerardo Turcatti (EPFL, BSF, CH); Daniel Boss (EPFL, CH); Pascal Jourdain (EPFL, CH); Pierre Marquet (EPFL, Centre de Neurosciences Psychiatriques, CH);
Digital Holographic Microscopy (DHM) is an interferometric technique which generates quantitative phase images allowing to visualize transparent cells without the need of labelling or specialized multi-well plates. We have recently demonstrated the compatibility of DHM with screening applications through the automation of a DHM using standard 96 and 384 imaging plates. This opens the perspective for phenotypical and toxicological screening. We illustrate this aspect by profiling the response of cells line to a collection of 1200 FDA-approved drugs.

Relais, Hotel La Palma

OμS II

15:00-16:40
OPTICAL MICROSCOPY, IMAGING & CHARACTERIZATION METHODS (continued)

16:20
A new Confocal Microscope with a supercontinuum laser source for reflectance spectro-microscopy: multivariate analysis and interferential effects of hyperspectroscopic confocal reflectance imaging of living cells
Francesca Bertani (ISC CNR, IT); Elisabetta Botti (Università di Tor Vergata, IT); Francesco Cilloco (ISC CNR, IT); Antonio Costanzo (University of Rome La Sapienza, IT); Luisa Ferrari (ISC CNR, IT); Valentina Mussi (ISC CNR, IT); Stefano Selci (ISC CNR, IT)
The features of a new confocal reflectance microscope are presented with some recent results. The instrument is able to collect hyperspectral confocal images in a broad and continuous range from VIS to NIR and can be used for biological as well photonics applications whenever spectral responsivity on a very local scale is to be evaluated. [OμS13_1569789559]

17:00-18:40
OPTICAL MICROSCOPY, IMAGING & CHARACTERIZATION METHODS

17:00 Invited Talk
Low-coherence interferometric microscopy and nanoscopy of fast dynamic processes
Natan T Shaked (Tel Aviv University, IL)
We present unique low-coherence interferometric imaging techniques for quantitatively tracking the thickness profiles of dynamic processes in thousands of full frames per second, and with up to sub-nanometric accuracy. Applications include imaging of rapid biological cell phenomena, drug release, and lithography processes. [OμS13_1569787243]

Hotel La Residenza

ONS

16:30-17:45
IMAGING II

17:15
Near-field interactions involved in gold nanoparticles chain fed by a silicon waveguide
Aniello Apuzzo (University of Technology of Troyes, FR); Mickael Février (University of Technology of Troyes, FR); Rafael Salas-Montiel (University of Technology of Troyes, FR); Aurélien Bruyant (University of Technology of Troyes, FR); Alexei Chelnokov (CEA, FR); Gilles Lérondel (University of Technology of Troyes, FR); Béatrice Dagens (University of Paris-Sud, IEF, Orsay, FR); Sylvain Blaize (Univ. of Technology of Troyes, FR)
We present near-field measurements of transverse plasmonic wave propagation in a chain of gold elliptical nanocylinders fed by a silicon refractive waveguide at optical telecommunication wavelengths. Eigenmode amplitude and phase imaging by apertureless scanning near-field optical microscopy allows us to measure the local out-of-plane electric field components and to reveal the exact nature of the excited localized surface plasmon resonances. Furthermore, the coupling mechanism between subsequent metal nanoparticles along the chain is experimentally analyzed by spatial Fourier transformation on the complex near-field cartography, giving a direct experimental proof of plasmonic Bloch mode propagation along array of localized surface plasmons. Our work demonstrates the possibility to characterize multielement plasmonic nanostructures coupled to a photonic waveguide with a spatial resolution of less than 30 nm. This experimental work constitutes a prerequisite for the development of integrated nanophotonic devices. [ONS13_6]

17:30
Multi-dimensional optical imaging beyond the diffraction limit
Rafael Piestun (University of Colorado at Boulder, US)
Super-resolution far-field optical nanoscopy has made possible non-invasive biological imaging with resolution beyond the diffraction limit. However, with the development of new methods, new challenges in imaging at the molecular scale appear. Among them, imaging in three-dimensions is critical in most applications. The use of point spread function engineering and suitable estimation algorithms in localization based fluorescence microscopy enables resolution in the 20nm range. Another obstacle relates to the nature of the emission from single molecules, which show asymmetric dipole radiation patterns highly dependent on molecular orientation. Determining molecule orientation is important for sampling the local environment, sensing conformational changes, detecting chemical reactions, and to improve localization based super-resolution. We propose and demonstrate optical systems for estimating the location and 3D orientation of multiple fixed molecules in a wide field system. We further improve resolution by considering temporal and spatial characteristics of the emitters. [ONS13_57]

Pagano, Hotel La Palma

OμS I

17:00-18:20
BIOPHOTONICS, BIOSENSORS & BIOCHIPS

17:20 **Invited Talk**
Electrospinning as technological route to active polymer nanofibers for photonics
Dario Pisignano (Università del Salento, IT)
Polymer micro- and nano-fibers realized by electrospinning show ease of fabrication, low costs, and excellent chemical and compositional flexibility. For these reasons, such nanostructures are ideal building blocks in order to realize active photonic components and to value the intrinsic points of strengths of light-emitting organic materials. Here we present the electrospinning technology as route to realize active polymer nanofibers made of conjugated polymers, blends, or low-molar-mass dye compounds used as dopant of viscoelastic polymer matrices. Light emission is achievable both in the visible and in the near infrared. Furthermore, for many active compounds we found that uniform and bright fibers can be obtained by adding organic salts to the electrospun solution without degrading the pristine optical properties of conjugated polymers. Realizable devices and applications of active polymer nanofibers include optically-pumped lasers, field effect transistors, polarized light-emitting sources throughout the visible range, and piezo-electric arrays usable as pressure and acceleration sensors.

17:40
Optical tweezers in combination with digital holographic microscopy for 3D visualization and analysis of in-vitro cells
Lisa Miccio (Istituto Nazionale di Ottica del CNR, IT); Francesco Merola (Istituto Nazionale di Ottica del CNR, IT); Pasquale Memmolo (Istituto Nazionale di Ottica del CNR, IT); Pietro Ferraro (INO, IT)
we propose to use the quantitative phase-contrast map, obtained from the digital holograms of in-vitro cells recorded in microscope configuration, in order to investigate both 3D positions and 3D morphological changes. [OμS13_1569807363]

Relais, Hotel La Palma

OμS II

17:00-18:40
OPTICAL MICROSCOPY, IMAGING & CHARACTERIZATION METHODS

17:20 **Invited Talk**
Optical Eigenmode in complex systems
Michael Mazilu (University of St Andrews, GB)
Light propagating through complex optical systems can be described using a set of optical eigenmodes that define a family of coherent orthogonal beams. This decomposition allows for the optimisation of the light field to achieve, for example, optimal structured illumination for imaging, sub-diffraction focussing or optimal linear and angular momentum transfer to scattering microparticles. [OμS13_1569812663]

17:40
Pyro-electrohydrodynamic fabrication of biodegradable microneedles for personalized medicine
Raffaele Vecchione (Italian Institute of Technology, IT)
A common optical material like Litium Tantalate, has been advantageously exploited for its pyroelectric properties to electro-draw, by local heating, a solution of a biopolymer material (PLGA) in order to fabricate biodegradable microneedles. The latter are well known in the pharmaceutical field as effective and pain-free microsystems employed for transdermal vaccination and drug delivery. Unfortunately, present production technologies have proved quite problematic due to either high temperature either complex and long evaporation procedure or low shape reproducibility. On the contrary with our approach microneedles are formed at room temperature, free from stamps and in a reproducible way. In addition, for the first time, microneedle fabrication is made easy, making way for home-made patches and customized therapies. On-demand and cost-effective microneedles could be obtainable in-situ directly at the point of care, thus replacing the traditional syringes. [OμS13_1569823823]

Hotel La Residenza	Pagano, Hotel La Palma	Relais, Hotel La Palma
ONS	**OμS I**	**OμS II**
16:30-17:45 **IMAGING II** (continued)	17:00-18:20 **BIOPHOTONICS, BIOSENSORS & BIOCHIPS** (continued)	17:00-18:40 **OPTICAL MICROSCOPY, IMAGING & CHARACTERIZATION METHODS** (continued)
	18:00 **Label-free biochemical characterization of bovine sperm cells using Raman microscopy** *Stefano Managò (IBP-CNR, IT); Giuseppe Coppola (CNR-IMM, IT); Antonella Ferrara ((CNR-IMM, IT); Luigi Sirleto (CNR-IMM, IT); Ivo Rendina (CNR, IT); Pietro Ferraro (INO, IT); Roberto Puglisi (Istituto Sperimentale Spallanzani, IT); Donatella Balduzzi (Istituto Sperimentale Spallanzani, IT); Andrea Galli (Istituto Sperimentale Spallanzani, IT); Anna Chiara De Luca (National Research Council, Institute of Protein Biochemistry, IT)* Raman spectroscopy is a non-invasive technique that allows the biochemical analysis of the cellular components. This technique is based on the inelastic scattering of laser photons upon interaction with the sample molecules. It allows the characterization of the properties and molecules structure from their stretching and bending vibrational transitions. For these reasons, Raman spectroscopy has been used as a powerful tool to investigate different biological tissues and living cells. In this paper, we present a Raman spectroscopy-based method for sensitive biochemical characterization of bovine sperm cells. By analysing separate Raman spectra from the nucleus, acrosomal vesicle and tail of single sperm cells, we are able to identify characteristic Raman features associated with DNA, protein and lipid molecular vibrations for discriminating among different locations inside the cell with submicrometric resolution (~0.3μm). We demonstrate that our Raman spectroscopy facilitates spectral assignment and increases detection sensitivity, opening the way for novel bio-imaging platforms. [OμS13_1569790885]	18:00 **Hyperspectral imaging of cells in flow** *Giuseppe Di Caprio (Harvard University, US); Diane Schaak (Harvard University, US); Ethan Schonbrun (Harvard University, US)* We present a system that collects hyperspectral images of cells travelling through a microfluidic channel, using a single monochrome camera and a linear variable bandpass filter. [OμS13_1569791285] 18:20 **Numerical approaches for extended focus image in digital holography** *Marcella Matrecano (Istituto Nazionale di Ottica- CNR, IT); Melania Paturzo (CNR-Istituto Nazionale di Ottica, IT); Pietro Ferraro (INO, IT)* Limited depth of field (DOF) is one of the main shortage for many optical imaging systems. In this work, some techniques proposed over the years to overcome the limited DOF constraint of the holographic systems and to obtain a completely in-focus representation of the objects are exposed and compared. [OμS13_1569805355]

18:30-20:00 POSTER SESSION and WELCOME COCKTAIL
at the Gardens of the hotel la Residenza

Notes

Hotel La Residenza	Pagano, Hotel La Palma	Relais, Hotel La Palma
ONS	OμS I	OμS II

08:50-09:30 **PLENARY TALK**

Hotel La Residenza

Spaser in Quantum Regime

Mark Stockman, (Georgia State University, US)

Nanoplasmonics deals with collective electron dynamics on the surface of metal nanostructures, which arises due to excitations called surface plasmons. Nanoplasmonics has numerous applications in science, technology, biomedicine, environmental monitoring, and defense. Until recently, all the effects, elements, and devices in nanoplasmonics have been passive: they use external optical energy, always losing a fraction of it to heat and leakage radiation. An active device generating energy directly on the nanoscale has been spaser (surface plasmon amplification by stimulated emission of radiation), which is a quantum amplifier and generator of coherent nanolocalized fields. We briefly review quantum theory of spaser as an ultrafast quantum generator and amplifier of nanoplasmonic fields. We present latest ideas: electrical spaser in the extreme quantum regime and graphene spaser.

09:40-10:55 PLASMONICS II

Invited Talk

09:40

Nanooptics in subnanometric plasmonic gaps: from single molecule imaging to quantum tunneling plasmonics

Javier Aizpurua (Center for Materials Physics and DIPC , ES)

Metallic gaps with subnanometric separations provide an opportunity to exploit new physical phenomena in optics. The quantum nature of the free electrons at each side of the gap manifests itself through the presence of strong nonlocal effects and quantum tunneling modifying substantially the optical response.

10:10

Coupled wave analysis using a multimodal admittance

Simon Felix (Université du Maine, FR); Agnes Maurel (Institut Langevin, FR); Jean-Francois Mercier (POems, ENSTA, FR)

A formulation of a multimodal method (or coupled wave analysis) is obtained for gratings made of a penetrable material. The method uses an admittance matrix, solution of a Riccati equation, that makes the numerical implementation stable and efficient. Also, limiting cases allow for an explicit integration, here exemplified in the case of the Wood anomalies. [ONS13_15]

10:25

Plasmonic fields and optical forces

Antoine Canaguier-Durand (University of Strasbourg, FR); Aurélien Cuche (CEMES, University of Toulouse, FR); James Hutchison (ISIS, University of Strasbourg, FR); Éloïse Devaux (ISIS, University of Strasbourg, FR); Cyriaque Genet (ISIS, University of Strasbourg, FR); Thomas Ebbesen (ISIS, University of Strasbourg, FR)

After a theoretical investigation of the optical forces exerted by surface plasmons in the dipolar as well as multipolar regimes, we demonstrate experimentally their potential for the optical sorting of nanoparticles, and for the observation of negative refraction on photonic crystals. [ONS13_44]

09:40-11:20 OPTICAL MICROSCOPY, IMAGING & CHARACTERIZATION METHODS

Invited Talk

09:40

The great Gig in Optical microscopy: unlimited spatial resolution in far-field optical fluorescence microscopy

Alberto Diaspro (Istituto Italiano di Tecnologia, IT)

It is well known and established that, for the most popular imaging mode in optical microscopy, i.e. fluorescence, the diffraction barrier does no longer provide an unsurpassable limitation for resolution and localization accuracy. Here, we will discuss targeted and stochastic readout methods using both single and multiphoton excitation, in terms of resolution and localization precision accuracy. Individual molecule localization (IML) implemented within selective plane illumination microscopy (SPIM) will be addressed towards 3D super resolution imaging in thick biological samples. STED two-photon excitation microscopy will be discussed reporting about the possibility of using a single wavelength (SW) both for two-photon excitation and STED depletion by implementing a SW-2PE-STED microscope. Direct writing lithography at super resolution will be discussed along with the characterization of new fluorescent reporters, super-resolution oriented. A further topic will be related to the coupling of STED and Atomic Force Microscopy. [OμS13_1569813885]

10:00

A new 3D particle tracking and cell mechanics investigation by Digital Holographic Microscopy and Holographic Optical trapping

Francesco Merola (Istituto Nazionale di Ottica del CNR, IT); Lisa Miccio (Istituto Nazionale di Ottica del CNR, IT); Pasquale Memmolo (Istituto Nazionale di Ottica del CNR, IT); Pietro Ferraro (INO, IT); Sabato Fusco (IIT-CRIB, IT); Paolo Netti (IIT-CRIB, IT)

Digital Holography is employed to analyze in a completely and non-invasive way the cell mechanics of live and unstained cells subjected to appropriate stimuli. The potentialities of DH are employed to measure all the parameters useful to understand the deformations induced by external and controlled stress in living cells. [OμS13_1569807471]

10:20

High dynamic range vision system for wireless capsule endoscopy

Monica Vatteroni (The BioRobotics Institute of Scuola Superiore Sant'Anna, IT); Carmela Cavallotti (The BioRobotics Institute of Scuola Superiore Sant'Anna, IT); Hieu Tran Trung (The BioRobotics Institute of Scuola Superiore Sant'Anna, IT); Arianna Menciassi (Scuola Superiore Sant'Anna, IT)

Aim of this work is the development of a custom vision system for capsule endoscopy enabling real time data stream. Core of the system is a custom imager purposely developed for the target application which presents high dynamic range capability in condition of controlled light environment. [OμS13_1569799099]

09:40-11:30 LIGHT FOR AEROSPACE

Invited Talk

09:40

Space Photonics at ESA: Applications and Technology Challenges

Errico Armandillo (European Space Agency, NL)

In the past twenty years we have witnessed a tremendous growth in Photonics and Opto-electronics technologies for Satellite applications: from spacecraft level to sensors and payload. The observations capabilities have increased enormously thanks to these new technologies as well as new observation capabilities have been made possible. The paper will review the use and applications of Photonics and Optolectronics in Space missions at the European Space Agency giving details and examples of missions and technologies spanning from Earth Observation, to Space Science and Deep Space missions, Navigation, Telecom and Human Space program. [OμS13_1569818517]

10:00

Whispering gallery mode resonators for aerospace microwave photonics systems

Remi Henriet (FEMTO-ST Institute, FR); Aurelien Coillet (FEMTO-ST Institute, FR); Khaldoun Saleh (FEMTO-ST Institute, FR); Patrice Salzenstein (FEMTO-ST Institute, FR); Luca Furfaro (FEMTO-ST Institute, FR); Maxime Jacquot (FEMTO-ST Institute, FR); Kien Phan Huy (FEMTO-ST Institute, FR); Laurent Larger (FEMTO-ST, University of Franche-Comte, FR); Yanne Chembo (FEMTO-ST Institute, FR)

Optoelectronic oscillators are photonic systems intended to generate ultra-stable microwave signals for aerospace applications. In this work, we present an architecture based on whispering gallery mode resonators. We optimize their design in order to obtain Q-factors that are high enough for the targeted applications. [OμS13_1569784509]

Hotel La Residenza

ONS

09:40-10:55
PLASMONICS II

10:40
Plasmonic engineering of local effective index for transformation optics applications
Natalia Dubrovina (University of Paris Sud, FR); Anatole Lupu (University of Paris Sud, FR); Xavier Le Roux (University of Paris Sud, FR); André de Lustrac (Institut d'Electronique Fondamentale - Université Paris-Sud, FR)
In this paper we study some configurations of metallic metamaterials in guided wave configurations to explore the possibility of their use for transformation optics applications in the near-infrared domain (λ=1.5μm). The experimentally investigated hybrid metamaterial structure is made of 2D array of 200×50×50nm gold cut wires located on the top of high index silicon on insulator (SOI) waveguide. The experimental and modelling results show that composite waveguide effective index and propagation losses can be accurately controlled through the engineering of metamaterial properties. The possibility for controlling at the nanoscale the local effective index can be used in transformation optics applications in near infrared domain. [ONS13_51]

10:55-11:15 Coffee break

11:15-13:15
RESONANT PHENOMENA IN NANO-PHOTONICS

11:15 **Invited Talk**
Materials and fields at the nanoscale: design and engineering of photonic-plasmonic resonant nanostructures
Luca Dal Negro (Boston University, US)
The ability to tailor light-matter interactions using metal-dielectric nanostructures is at the heart of nanoplasmonics and nano-optics technologies. Efficient approaches for nanoscale electromagnetic field enhancement, concentration and manipulation over desired spatial-spectral bandwidths and angular ranges are enabled by the exquisite control of propagating and non-propagating electromagnetic fields that is possible by the engineering of resonant optical nanomaterials.

Pagano, Hotel La Palma

OμS I

09:40-11:20
OPTICAL MICROSCOPY, IMAGING & CHARACTERIZATION METHODS (continued)

10:40
A label free approach for drug treatment response using Coherent Anti- Stokes Raman Scattering
Imran Patel (University of Cambridge, GB); Christian Steuwe (Cambridge University, GB); Joan Boren (University of Cambridge, GB); Greg Shaw (University of Cambridge, GB); Alexander Schreiner (University of Cambridge, GB); David Neal (University of Cambridge, GB); Kevin Brindle (University of Cambridge, GB); Stefanie Reichelt (University of Cambridge, GB); Sumeet Mahajan (University of Southampton, GB)
Lipids are essential in cellular biology; the metabolism of lipids, specifically lipid droplets has shown to play a role in cancer growth and also as an indicator of apoptosis. Using Coherent anti-stokes Raman scattering (CARS) microscopy lipids can be imaged specifically in a label-free manner. We obtain both quantitative and qualitative information by CARS imaging of lipid droplets to investigate drug induced lipid metabolism. LNCaP and HCT166 cell lines were treated with a fatty acid synthase inhibitor (a test drug) and etoposide (a common anti-cancer drug), respectively. CARS images were acquired using the CH2 (2845 cm-1) vibrational mode and quantified using MATLAB. Inhibition of fatty acid synthase revealed significant decrease in cellular lipid droplets, whilst apoptosis induction using etoposide significantly increased lipid droplets. These approaches show the potential of CARS as a non-invasive assay to screen drugs based upon effects on lipid metabolism and potentially in-vivo treatment response. [OμS13_1569790263]

11:00
Maxwell equations symmetry for ellipsometric analysis of inhomogeneous materials
Andrea Buono (Universita' di Napoli Parthenope, IT); Mario Iodice (Istituto per la Microelettronica e Microsistemi IMM, IT); Ivo Rendina (CNR, IT); Ferdinando Nunziata (Università di Napoli Parthenope, IT); Maurizio Migliaccio (Universita' Napoli Parthenope, IT)
In this paper we illustrate how the structure of the ellipsometric Mueller Matrix can be exploited to analyze the type and the grade of impurities present in various samples examined, from semiconductors to metals. Tests are made by using a spectroscopic ellipsometric apparatus.
[OμS13_1569801611]

11:20-11:40 Coffee break

Relais, Hotel La Palma

OμS II

09:40-11:30
LIGHT FOR AEROSPACE (continued)

10:20
Optical materials and coatings under particle irradiation in Space
Ilaria Di Sarcina (ENEA, IT); Maria Luisa Grilli (Enea, Optical Coatings Laboratory, IT); Francesca Menchini (ENEA, IT); Angela Piegari (ENEA, IT); Salvatore Scaglione (ENEA, IT); Anna Sytchkova (Enea, Optical Coatings Laboratory, IT); Danilo Zola (ENEA, Optical Coatings Laboratory, IT)
Thin-film materials and optical coatings for space instrumentation have been exposed to irradiation of gamma rays, neutrons and protons. The resistance to the space environment has been tested by measuring their spectral transmittance before and after exposure to such particles. A variation of the optical properties of silicon oxide in the ultraviolet spectrum, has been detected and attributed to a stoichiometry change. [OμS13_1569796745]

10:40
Design, fabrication, and optical characterization of miniaturized next generation optical gyroscopes
M.N. Armenise (Politecnico di Bari, IT); C. Ciminelli (Politecnico di Bari, IT); F. Dell'Olio (Politecnico di Bari, IT)
Recent results on next generation chip-scale photonic gyroscopes are reported in this paper. The optical characterization of two high-Q cavities for gyroscope applications is discussed. Some new concepts for enhancing the resolution of the miniaturized angular velocity sensors are presented, too.

11:00
Design of an optical system for fluid science experiment on board a sounding rocket: Chemical Wave in Soret Effect
Wassilis Tzevelecos (Université libre de Bruxelles, BE); Luigi De Filippis (Università degli Studi di Napoli - Federico II, IT); Santolo Manzone (Università Federico II Napoli, IT)
Our experiment will measure the thermodiffusion process inside a binary mixture of water ethylene-glycol using a modified Fizeau interferometer on board the REXUS sounding rocket. This process, called Soret effect, consists in a concentration gradient resulting from the application of a temperature gradient to a homogeneous mixture. CWIS team objective is to measure the Soret coefficient from the transient of the thermodiffusion process acquiring experimental data during few tens of seconds instead of long experimental period. This strong change in the concentration gradient at the beginning of the thermodiffusion process is called Chemical Wave and it was never observed, only theorized. [OμS13_1569785527]

11:20
YOUNG RESEARCHER AWARD FOR PHOTONICS IN AEROSPACE

11:30-11:40 Coffee break

Hotel La Residenza

ONS

11:15-13:15
RESONANT PHENOMENA IN NANO-PHOTONICS (continued)

11:45
Random laser from engineered nanostructures obtained by surface tension driven lithography
Neda Ghofraniha (CNR-IPCF, IT); Ilenia Viola (CNR-NANO-Lecce, IT); Giuseppe Gigli (Università del Salento, IT); Claudio Conti (Dipartimento di Fisica- La Sapienza, IT)
Polymeric and low-molecular weight organic compounds are considered innovative and promising materials because they are efficient light emitters in a wide spectral range, biodegradable, chemically stable, low cost and easily usable for deposition on rigid and flexible substrates. Here we demonstrate the random laser emission from scattering nano-aggregates of a thiophene based molecule, obtained in a controlled way by a simple soft lithography technique, that allows to obtain organic mini-lasers of different shapes and importantly to tailor the structure of the random lasers at the nanoscale by finely tuning the supramolecular self assembly of the organic dye. Our results open the way to the fabrication of one-component organic lasers with no external resonator and with desired shape and efficiency by using surface tension driven lithographic techniques. [ONS13_39]

12:00
Multiple Fano resonances in monolayer metallic shells
Zhuo Chen (Nanjing University, CN)
We investigate the appearance and properties of multiple Fano resonances arising from the interference between broad sphere-like plasmon modes and substantially narrower void plasmon modes resonant over the same range of energies in two-dimensional hexagonal non-close-packed arrays of metallic shells. [ONS13_28]

12:15
Periodicity can control coupling strength in a Fano lattice
Chen Yan (EPFL, CH); Olivier Martin (Ecole Polytechnique Federale de Lausanne, CH)
We investigate experimentally and theoretically the role of periodicity on the optical response of plasmonic arrays that exhibit a Fano lineshape. We show that periodicity, which determines the near-field coupling between neighboring structures, has a dramatic influence and can be used to tune the coupling strength in the system. [ONS13_33]

Pagano, Hotel La Palma

OμS I

11:40-13:00
MICROFLUIDICS & OPTOFLUIDICS

Invited Talk

11:40
An Optical Coulter Counter: Measuring cell volume using dye exclusion
Ethan Schonbrun
Accurate measurements of the physical dimensions of individual cells are valuable in order to better understand the morphology of normal and abnormal cell states. Phase sensitive techniques quantify the optical pathlength difference through the cell and are therefore dependent on the cell's unknown optical properties. Here, we present an optical method to measure cell geometry that is independent of the cell's optical properties and consequently is capable of quantifying the cell's absolute physical dimensions. This method is analogous to the electrical Coulter counter, where cells are suspended in an engineered fluid and passed through a confined detection region.

12:00
Imaging through turbid media by digital holography
Melania Paturzo (CNR-INO, IT); Vittorio Bianco (CNR-INOA, IT); Andrea Finizio (CNR-INOA, IT); Pasquale Memmolo (Università di Napoli Federico II, IT); Donatella Balduzzi (Istituto Sperimentale Spallanzani, IT); Andrea Galli (Istituto Sperimentale Spallanzani, IT); Roberto Puglisi (Istituto Sperimentale Spallanzani, IT); Pietro Ferraro (CNR-INOA, IT)
We show that clear amplitude imaging and quantitative phase contrast mapping is achievable in turbid microfluidics by Digital Holography. The Doppler effect is the key to discard the contribution of the turbid medium. Different turbid media are used in the experiments, i.e. milk and blood. [OμS13_1569823785]

Relais, Hotel La Palma

OμS II

11:40-13:00
NON-LINEAR & QUANTUM OPTICAL DEVICES AND TECHNOLOGIES

11:40
Raman amplifier based on Si-nc
Maria Antonietta Ferrara (IMM-CNR); Luigi Sirleto (IMM-CNR); Ivo Rendina (IMM-CNR)
Nonlinear optics at nanoscale is a recent fascinating research field. Stimulated Raman scattering in electrons-confined and photons-confined materials is of great importance from both fundamental and applicative point of view. In this work, experimental investigations of stimulated Raman scattering in amorphous silicon nanoparticles and in silicon nanocrystals are reported. Stimulated Raman scattering is measured in three different samples. For each of them, a significant enhancement of Raman gain and a significant reduction in threshold power are demonstrated. Our findings indicate that nanostructured materials show great promise for Si-based Raman lasers.

12:00
Nonlinear perfect absorption
Subhasish Dutta Gupta (School of Physics, IN); Kothakapu Nireekshan Reddy (University of Hyderabad, IN)
We study coherent perfect absorption (CPA) and critical coupling (CC)in stratified media with a Kerr nonlinear layer. Nonlinearity is shown to inhibit both CPA and CC in a perfectly tuned linear structure. We derive the sufficient conditions for CPA and draw a parallel with nonlinear wave guides. [OμS13_1569790485]

Hotel La Residenza

ONS

11:15-13:15
RESONANT PHENOMENA IN NANO-PHOTONICS (continued)

12:30
A new analysis of guided mode resonances in negative refracting photonic crystals
Silvia Romano (CNR-IMM, IT); Ivo Rendina (CNR, IT); Stefano Cabrini (Molecular Foundry, Lawrence Berkeley National Laboratory, Berkeley, US); Vito Mocella (CNR, IT)
Guided mode resonances (GMRs) in grating waveguide structures have been known since 1902 and during these last years, many works have been devoted to analyzing and studying this phenomenon and a large number of new applications appeared. In this paper we present a new set of extremely accurate measurements of GMRs coupled in a 2D photonic crystal structure, with a negative refractive index at 1550 nm. Specifically, very sharp resonances are observable in the reflection spectrum characterized by a full-width (FWHM) of less than 2 nm. In addition to the classical measurements of the reflected signal, for the first time, we report the imaging of the radiation coupled into the structure, monitoring the light travelling into the structure with a IR camera. Finally, we present a new physical model of the phenomenon, which completes the already known phenomenological analysis. The experimental data shows an excellent agreement with mentioned theory. [ONS13_21]

12:45
Enhanced transmission through gratings: Compositional and geometrical effects
Agnes Maurel (Institut Langevin, FR)
Broadband enhanced transmission through sub-wavelength gratings is analyzed in terms of homogenized medium. The maximum transmission occur at an incident angle depending on the characteristics of the grating, a limiting case being the Brewster angle. Geometrical effects are taken into account, beyond the usually considered filling fraction. ONS13_14

13:00
Nano antennae focusing of OAM-plasmonic vortex
F. Romanato (University of Padova, LaNN, CNR-IOM, IT); M. Carli (University of Padova, LaNN, IT); P. Zilio (LaNN, IT); D. Garoli (LaNN, IT); M. Massari (LaNN, IT)
We investigate the coupling between a holey plasmonic vortex lens and nanoantennae placed inside the hole. Depending on spiral chirality and polarization of the impinging wave, different resonant patterns can be obtained by conveniently arranging the antennae in the hole. Results for two relevant cases are shown, together with the fabrication of the designed structures.

13:15-14:30 Lunch break
Hotel La Residenza

Pagano, Hotel La Palma

OμS I

11:40-13:00
MICROFLUIDICS & OPTOFLUIDICS (continued)

12:20
Hybrid silicon-polymer optofluidic chip with integrated solid core waveguides
Genni Testa (CNR IREA, IT); Gianluca Persichetti (CNR IREA, IT); Romeo Bernini (IREA-CNR, IT)
An hybrid silicon-poly(dimethysiloxane) (PDMS) liquid core antiresonant reflecting optical waveguide (ARROW) optofluidic platform is reported. In order to improve the collection efficiency, solid core hybrid ARROW for collecting signal have been suitably integrated in the polymeric part in a self-aligned configuration with the optofluidic ARROW channel containing the sample to be tested. The hybrid platform has been fabricated by a two separate fabrication process, where the bottom part was fabricated by bulk micromachining and the top part by soft lithography process. The great advantage of this configuration is the possibility to integrate the microfluidic system in the top polymer part, which can be easily fabricated and reconfigured using low-cost and fast fabrication approaches.The potential of the device for sensing application has been demonstrated by fluorescence measurements on liquid sample flowing in the ARROW optofluidic channel. [OμS13_1569806097]

12:40
Dynamics of chain of optically coupled micro droplets
Thomas Crouzil (University of Bordeaux I, FR); Mathias Perrin (University of Bordeaux, FR)
We study the properties of a chain of liquid droplets in air, with low index contrast (<0.5), and trapped by two laser beams. We show that such object have optical properties analoguous to those of photonic crystals (band gaps / permitted band). In some configurations, we can observe dynamical states, where the droplets, as well as the beam transverse profile, evolve in a periodic way, at low frequency (~ 0.01 Hz). [OμS13_1569789791]

13:00-14:30 Lunch break
Hotel La Palma

Relais, Hotel La Palma

OμS II

11:40-13:00
NON-LINEAR & QUANTUM OPTICAL DEVICES AND TECHNOLOGIES (continued)

12:20
Optical frequency comb generation via cascading quadratic nonlinearity
Markku Vainio (University of Helsinki, FI); Ville Ulvila (University of Helsinki, FI); Chris Phillips (ETH Zurich, CH); Lauri Halonen (University of Helsinki, FI)
We report a new method for optical frequency comb generation. The method is based on cascading quadratic optical nonlinearity in a microstructured (periodically poled) MgO-doped lithium niobate crystal, which is placed inside a continuous-wave pumped optical parametric oscillator. [OμS13_1569821957]

12:40
Chaos-assisted, broadband trapping of light
Changxu Liu (King Abdullah University of Science and Technology, SA); Andrea Di Falco (University of St. Andrews, GB); Thomas Krauss (University of York, GB); Andrea Fratalocchi (King Abdullah University of Science and Technology, SA)
By combining analytic theory, parallel ab-initio simulations and experiments, we demonstrate how to exploit chaos to dramatically enhance light trapping performances.FDTD simulations show that chaotic resonators exhibit energy increases up to 600% with respect to classical counterparts. We conduct experiments in 2D photonic crystals and demonstrate the underlying physics of the phenomenon, and we develop a possible application with 3D deformed polystyrene microspheres. [OμS13_1569786293]

Hotel La Residenza	Pagano, Hotel La Palma	Relais, Hotel La Palma
ONS	**OμS I**	**OμS II**

14:30-15:00 **PLENARY TALK** — Pagano, Hotel La Palma

Pervasive Photonics: looking at the forest of Communications
Roberto Saracco

ONS

15:15-17:00
NANO-ENGINEERED MATERIALS AND DEVICES

15:15 — Invited Talk
Synthetic optical materials for photonics applications
Andrea Di Falco (University of St. Andrews, GB)
We discuss a collection of methods and approaches used to realize nanostructured materials with bespoke optical properties, for applications including biophotonics, energy harvesting and imaging. [ONS13_42]

15:45
Efficient method for the analysis of light scattering and spontaneous emission enhancement by a nanoresonator
Qiang Bai (IOGS, FR); Mathias Perrin (University of Bordeaux, FR); Christophe Sauvan (IOGS, FR); Jean-Paul Hugonin (Institut d'Optique, FR); Philippe Lalanne (LP2N, FR)
We have constructed a simple method to obtain the complex frequency quasi normal modes of a nanoparticle. Then, the fields that are excited around the particle (by an incoming plane wave, or a by point dipole placed nearby) can be expanded easily on these modes. Finally, with a few numerical computations, one can get the Purcell factor for any dipole position, frequency, orientation. The scattering cross section of any incoming wave is derived in the same way. A comsol based software will be given at the conference. [ONS13_27]

OμS I

15:00-16:20
BIOPHOTONICS, BIOSENSORS & BIOCHIPS

15:00 — Invited Talk
Nanoparticle enhanced fiber platform for biosensing applications
Alessandro Candiani (University of Parma, IT); Sara Giannetti (University of Parma, IT); Hussein Salloom (University of Baghdad, IT); Michele Sozzi (University of Parma, IT); Alex Manicardi (University of Parma, IT); Hadi Janabi (University of Baghdad, IQ); Roberto Corradini (University of Parma, IT); Annamaria Cucinotta (University of Parma, IT); Stefano Selleri (University of Parma, IT)
A novel photonic crystal fiber Bragg gratings biosensor for specific DNA target sequences detection is reported. Measurements revealed shift in reflected spectra only by using DNA complementary to the specific bio-probes previously immobilized inside the fiber, making this technology suitable for versatile biosensing platforms. [OμS13_1569791119]

15:20
Biomolecular sensing for cancer diagnostics using highly reproducible SERS substrates
Anna Chiara De Luca (National Research Council, Institute of Protein Biochemistry, IT); Peter Reader-Harris (School of Physics and Astronomy, University of St Andrews, GB); Michael Mazilu (University of St Andrews, GB); Stefano Managò (IBP-CNR Institute of Protein Biochemistry - National Research Council, IT); Stefania Mariggiò (Institute of Protein Biochemistry, Consiglio Nazionale delle Ricerche, IT); Daniela Corda (Institute of Protein Biochemistry, Consiglio Nazionale delle Ricerche, IT); Andrea Di Falco (University of St. Andrews, GB)
We have developed a rapid, sensitive and quantitative method for identification of glycerophosphoinositol (GPI) in multicomponent mixtures using surface-enhanced Raman spectroscopy (SERS). SERS performance of Au-fishnet substrates was analysed by studying its reproducibility and signal enhancement. This method was applied to the in-vitro sensing of GPI molecules, associated with thyroid cancer. We show that the spectral reproducibility of Ag-fishnet based SERS substrates is sufficient for quantitative analysis of GPI in multicomponent mixtures. [OμS13_1569791099]

OμS II

15:00-16:20
APPLICATIONS OF OPTICAL DEVICES & SYSTEMS

15:00 — Invited Talk
Computer holography: a perfect digital 3D technique for real and virtual objects
Kyoji Matsushima (Kansai University, JP); Sumio Nakahara (Kansai University, JP)
Recent developments in computer holography are reviewed. In computer holography, the holographic fringe pattern is generated as a digital 2D image in extremely high-definition and printed by using a laser lithography system. The 3D scenes include CG model objects as well as physical objects captured by digital holography. [OμS13_1569821999]

15:20
BER decreased by controlling defocus aberration component in angle multiplexed holographic memory
Tetsuhiko Muroi (Japan Broadcasting Corporation (NHK), JP); Nobuhiro Kinoshita (Japan Broadcasting Corporation (NHK), JP); Koji Kamijo (Japan Broadcasting Corporation (NHK), JP); Yoshimasa Kawata (Shizuoka University, JP); Hiroshi Kikuchi (Japan Broadcasting Corporation (NHK), JP)
We controlled the defocus aberration component in the reference beam to compensate for hologram distortion by evaluating the reproduced data bit brightness and deviation. We found that a controlled wavefront for a data page could decrease the BERs of all data pages in angle multiplexed holograms. [OμS13_1569784183]

Hotel La Residenza

ONS

15:15-17:00
NANO-ENGINEERED MATERIALS AND DEVICES (continued)

16:00
Applications of sub 100 nm STED Lithography in Nano- and Biophotonics
Richard Wollhofen (Johannes Kepler University Linz, AT); Moritz Wiesbauer (Upper Austria University of Applied Sciences, AT); Kurt Schilcher (Upper Austria University of Applied Sciences, AT); Jaroslaw Jacak (Johannes Kepler University Linz, AT); Thomas Klar (Johannes Kepler University Linz, AT)
Two photon polymerization is the only technique that allows 3D mask-free fabrication of submicron structures. Adding stimulated emission depletion (STED), we achieve single feature sizes below 60 nm in all three dimensions. Possible applications range from biotechnology (protein functionalized chips) to metamaterials. [ONS13_26]

16:15
BaTiO3 Photonic Crystal Electro-Optic Devices for 50 GHz Applications
Bruce Wessels (Northwestern University, US); Jianheng Li (Northwestern University, US); Zhifu Liu (Northwestern University, US)
Due to an exponential increase of information processing and communications traffic requirements, there are needs for active devices for photonic integrated circuits that operate at 50 GHz and above. One way to increase the bandwidth of an EO modulator is to decrease its size. In this paper, we report the simulation, design, fabrication and characteristics of a millimeter scale, EO modulator operating in the V-band at a wavelength of 1550 nm based on BaTiO3 thin film platform. Using two-dimensional photonic crystal (PhC), decreasing its length and optimizing device design based on our recent simulations of EO and microwave characteristics 50 GHz devices were demonstrated. The modulators at high frequencies of 20 to 50 GHz showed peaks in the EO response that were attributed to microwave resonances.

Pagano, Hotel La Palma

OμS I

15:00-16:20
BIOPHOTONICS, BIOSENSORS & BIOCHIPS (continued)

15:40
Optical monitoring of proteins-glucose interaction using hybrid bio/non-bio interfaces
Alessandro Caliò (IMM-CNR, IT); Ilaria Rea (IMM-CNR, IT); Jane Politi (IMM-CNR, IT); Sara Longobardi (University of Napoli Federico II, IT); Luca De Stefano (IMM-CNR, IT);
We propose a bio/non-bio hybrid interface between porous silicon and hydrophobin proteins for optical monitoring of glucose interaction. Several optical techniques have been used and results demonstrated glucose binding ability. [OμS13_1569787257]

16:00
Functionalized hollow core fibers for biosensing applications
Alessandro Candiani (University of Parma, IT); Sara Giannetti (University of Parma, IT); Hussein Salloom (University of Baghdad, IT); Michele Sozzi (University of Parma, IT); Alex Manicardi (University of Parma, IT); Hadi Janabi (University of Baghdad, IQ); Roberto Corradini (University of Parma, IT); Annamaria Cucinotta (University of Parma, IT); Stefano Selleri (University of Parma, IT)
The frequency modulation of photonics bandgaps due to refractive index change using peptide nucleic acid- functionalized hollow core photonic crystal fibers is demonstrated. The results prove the feasibility to use hollow core microstructured fibers for biosensing applications.
[OμS13_1569791045]

Relais, Hotel La Palma

OμS II

15:00-16:20
APPLICATIONS OF OPTICAL DEVICES & SYSTEMS (continued)

15:40
Holographic Interferometry for the preservation of cultural heritage. Characterization of hidden defects on frescoes and paintings on wood by ESPI method
Giovanni Arena (CNR - INO, IT)
Electronic Speckle Pattern Interferometry (ESPI) is a valuable NDT method for Cultural Heritage diagnostics in art preservation. In this work we show its application for the structural characterization and for revealing hidden defects in a wooden panel painting and in a fresco model.
[OμS13_1569823769]

16:00
Analysis of FSO Communication Links for Mid and Far infrared wavelengths
Rajan Miglani (Lovely Professional University, IN)
Atmospheric attenuations pose biggest challenge in implementing Free Space Optical Communication (FSO) links. Studying atmospheric attenuation as function of cumulative aerosol particle size distribution gives more reliable results rather than taking meteorological visibility as lone factor. Theoretically speaking, wavelengths of Mid IR and Far IR region may exhibit higher immunity against atmospheric attenuation against lower spectral regions but however in practical terms, the effect of totality of system and link parameters negates any such inherit advantage which means that considering the dynamic microenvironment, FSO link does not exhibit any attenuation immunity using higher spectral bands. Increase in transmitted optical power and higher receiver sensitivity along with appropriate selection of photo detector not only improves BER of system but also increases the range of communication. [OμS13_1569788451]

16:20-16:40 Coffee break

Hotel La Residenza

ONS

15:15-17:00
NANO-ENGINEERED MATERIALS AND DEVICES (continued)

16:45
Nanoplasmonics and surface enhanced spectroscopies
Pierre-Michel Adam (university of Technology of Troyes, FR)
Plasmonics is a field connected to optics dealing with the properties and applications of surface plasmons which are modes of metal dielectric interfaces. Nanoplasmonics concerns the excitation, manipulation and detection of the surface plasmons at the nanometric scale. It has highly potential applications for ultrasensitive biochemical sensing. Surface enhanced spectroscopies are the ultimate sensor tools as they can reach single molecule sensitivity. We will present in this paper our results towards the realization of highly controllable and reproducible nanoplasmonics substrates. [ONS13_13]

17:00-17:15 Coffee break

17:15-19:00
PLASMONICS AND ACTIVE PLASMONICS

17:15 Invited Talk
Plasmonics for quantum Information Processing
Fabio Antonio Bovino (Quantum Optics Lab Selex-ES S.p.A, IT)
We report a Quantum Interference experiment on a Plasmonic Device able to discriminate the symmetry of a two-photon quantum state. This basic experimental study is the starting point to explore the possibility of using nanoscale "plasmonic circuits" for enhanced quantum information applications at telecom wavelengths.

Pagano, Hotel La Palma

OμS I

16:40-18:20
MICROOPTICS & OPTICAL DEVICES BASED ON NOVEL CONCEPTS

16:40 Invited Talk
Structural colors in photonic glasses and bird feathers
Vinothan N. Manoharan (Harvard University, US)
Photonic glasses are disordered arrangements of dielectrics that can be made from glassy packings of colloidal particles. They can display structural colors arising from local correlations in the structure. We make such glasses from core-shell particles, and we measure the reflectivity as a function of wavelength and particle size. Unlike photonic crystals, these materials are not iridescent; the color remains constant over a wide range of orientations. Our samples display rich blues and greens, but they do not display red colors at any particle size. The same trend occurs in the colors of birds: whereas the colors of blue birds arise from the disordered pore structure of their feathers, there are no known red birds that use structural color instead of pigments. I will present experiments and theoretical arguments that attempt to shed some light on why red colors do not appear in disordered systems.

17:00 Invited Talk
Self-Organized Optical Waveguides Targeting Luminescent Objects in Photopolymers
Tetsuzo Yoshimura (Tokyo University of Technology, JP)
Self-Organized Lightwave NETwork (SOLNET) constructs self-organized optical waveguides. In reflective SOLNET with luminescent targets, when a write beam from an optical device enters a photopolymer, a luminescent target deposited on another optical device generates luminescence. In the region, where the write beam and the luminescence overlap, refractive index increases rapidly than that in the surrounding region, pulling the write beam to the luminescent target. Finally, by the self-focusing, a self-aligned optical waveguide is constructed between the optical devices, even when misalignments and core size mismatching exist. Experimental/theoretical results and applications to optical solder in optical interconnects within computers are described.

17:20
Nozzle-less electrospinning for high precision printing and patterning at nanoscale
Sara Coppola (INO-CNR, IT); Pietro Ferraro (INOA-CNR, IT); Veronica Vespini(INO-CNR, IT); Oriella Gennari (INO-CNR, IT); Simonetta Grilli (INO-CNR, IT); Andrea Camposeo (Center for Biomolecular Nanotechnologies UNILE, IIT, IT);Dario Pisignano (Università del Salento, IT); Paolo Netti (IIT Napoli, IT); Maurizio Ventre (University of Naples, IT)
In the present work we show an unconventional but very simple approach, a nozzle-less and electrode-less pyro-electrodynamic spinning for direct fabrication of 2D full-ordered patterns. Two different applications are described as possible exploitations in biotechnology and photonics, photonic waveguide and cell patterning. [OμS13_1569823755]

Relais, Hotel La Palma

OμS II

16:40-18:20
APPLICATIONS OF OPTICAL DEVICES & SYSTEMS

16:40
New two-photon sculpting of light and matter for nanobiophotonics and parallel optogenetics
Jesper Glückstad (Technical University of Denmark, DK)
Contemporary microscopy demands functionalities, not only for observing micro- and nanoscopic phenomena, but also for reaching into and manipulating mesoscopic constituents. This postdeadline contribution is two-fold describing the newest uses of proprietary strongholds we currently are establishing at DTU Fotonik on new means of sculpting of both light and matter for probing at the smallest scales. [OμS13_1569820281]

17:00
Impact Damage Evaluation on CFP by means of Electronic Speckle Pattern Interferometry
Alessandra Rocco (Istituto Nazionale di Ottica - CNR, IT); Marcella Matrecano (Istituto Nazionale di Ottica- CNR, IT); Vito Pagliarulo (Istituto Nazionale di Ottica- CNR, IT); Vincenza Antonucci (CNR, Istituto per i Materiali Compositi e Biomedici, IT); Maria Rosaria Ricciardi (CNR, Istituto per i Materiali Compositi e Biomedici, IT); Valentina Lopresto (Università Federico II, DICMAPI, IT); Pietro Ferraro (INO, IT)
In this work, we present an application of Electronic Speckle Pattern Interferometry (ESPI): through real-time surface illumination by visible laser, the ESPI technique allows the non-contact, non-destructive detection of micro-deformations, micro-cracks, residual stress and delaminations which can result useful into the aeronautic field of barely visible damage detection. [OμS13_1569799371]

17:20
Optical fiber sensors for radiation dosimetry
Saverio Avino (CNR-INO, IT); Vittoria D'Avino (CNR-IBB, IT); Antonio Giorgini (CNR-INO, IT); Roberto Pacelli (Consiglio Nazionale delle Ricerche, IT); Raffaele Liuzzi (Consiglio Nazionale delle Ricerche, IT); Paolo De Natale (CNR-INO, IT); Gianluca Gagliardi (CNR - National Optics Institute (INO), IT); Laura Cella (Consiglio Nazionale delle Ricerche, IT)
Radiation dosimetry plays a fundamental role in cancer treatment. The effectiveness of radiation therapy strongly depends on the accuracy of the dose delivered in patient tissues. Here we report on a passive optical fiber dosimeter based on a Fiber Bragg Grating sensor. The obtained sensitivity is already suitable for real applications. [OμS13_1569792019]

Hotel La Residenza

ONS

17:15-19:00
PLASMONICS AND ACTIVE PLASMONICS (continued)

17:45
A hybrid plasmonic semiconductor laser
Daniele Costantini (Institut d'Optique, FR); Leo Greusard (ESPCI, FR); Adel Bousseksou (IEF, FR); Yannick De Wilde (ESPCI, FR); Benjamin Habert (Institut d'Optique, FR); Francois Marquier (Institut d'Optique, FR); Jean-Jacques Greffet (Institut d'Optique, FR); Francois Lelarge (Alcatel Thales III-V Lab, FR); Jean Decobert (Alcatel-Thales III-V Lab, FR); Guang-Hua Duan (Alcatel Thales III-V Lab, FR); Raffaele Colombelli (IEF, FR)
The laser device we demonstrate operates (at λ=1.3 μm) on a hybrid plasmonic mode. The device operates by electrical injection at room temperature. The near-field imaging of the laser facet provides evidence of the stimulated emission into the hybrid mode and confirms the prediction of the numerical simulations.

18:00
Reversible strong coupling in silver nanoparticle arrays using photochromic molecules
Anne Laure Baudrion (University of Technology of Troyes, FR); Alessandro Veltri (University of Calabria, FR); Alexandre Bouhelier (University of Burgundy, FR); Pierre-Michel Adam (university of Technology of Troyes, FR); Renaud Bachelot (University of Technology of Troyes, FR)
We demonstrate a reversible strong coupling regime between a dipolar surface plasmon resonance (DSPR) of silver nanoparticles and the excited state of photochromic molecules, resulting in a clear Rabbi splitting in DSPR. The reversibility is illustrated by cycling the molecules between their two isomeric forms.
[ONS13_59]

Pagano, Hotel La Palma

OμS I

16:40-18:20
MICROOPTICS & OPTICAL DEVICES BASED ON NOVEL CONCEPTS (continued)

17:40
Microscopic characterization of conical structures on polycarbonate surface induced by Arf laser
Hassan Ehsani amri (University of Islamic Azad nour, IR); Sahar Sheikh kazemi (University of Islamic Azad Tehran, IR)
photoablation of polymer by pulsed excimer laser radiation is commonly believed to be a controlled layer by layer removal process. In the present paper, polycarbonate (PC) surface were processed with 193nm ArF laser irradiation at fluences 24-62 mJ/cm^2 and 1-100 laser pulse numbers. Noticeable changes on surface of sample were observed through scanning electron microscopy (SEM). In these situation microcones patterns according to radiation hardening modle were formed on PC surfaces. It has shown that the geometrical shape (apex angle and base diameter) of microcones were affected by the laser fluences. So that by increasing the applied fluences the microcones became sharper and their base diameter tend to increase.
[OμS13_1569788415]

18:00
Near UV ZnO LED coupled to QD based phosphors
Camilla Baratto (CNR-IDASC, IT); Guido Faglia (University of Brescia, IT); Isabella Concina (University of Brescia, IT); Elisabetta Comini (University of Brescia, IT); Giorgio Sberveglieri (University of Brescia, IT)
Nearly all white LEDs sold today use a blue GaN/InGaN LED plus a yellow phosphor. To obtain a warmer white light containing some red light is desirable: a better route to higher quality white light might be to use a near-UV LED plus red, green, and blue phosphors. A candidate to develop near-UV LEDs is ZnO: vertically aligned ZnO nanowires (NWs) with diameter ranging from 20 to 200nm have been deposited on p-GaN. The high quantum yield (QY) and high degree of color (size) tuning reported for quantum dots (QDs) make them an obvious target of investigation for white LEDs. We synthesized CdE series by hot injection method using oleic acid as stabilizing agent, to be integrated with the near-UV ZnO based LEDs. First tests of coupling with QDs to ZnO will be presented as an effective route towards white LEDs.
[OμS13_1569792921]

Relais, Hotel La Palma

OμS II

16:40-18:20
APPLICATIONS OF OPTICAL DEVICES & SYSTEMS (continued)

17:40
The use of a nephelometric instrument to investigate crystallization processes
Angelo Chianese (Sapienza Università di Roma, IT); Valerio Bonacquisti (OptSensor Srl, IT); Mariapaola Parisi (Sapienza University of Rome, IT); Victor Tchieda (Sapienza University of Rome, IT)
Turbidimetry is a very useful technique to detect the appearance and disappearance of solid particles in a liquid solution. Such kind of measurements may be used to identify the nucleation point and the solubility point in a crystallization process. This work shows the use of a nephelometric instrument to investigate a crystallization process in terms of metastable zone width, i.e. the temperature difference between nucleation and solubility points. The used instrument was produced by the OPT Sensor company, a spin off of Sapienza University of Rome, and is based on the laser light diffraction. The high resolution in terms of NTU of the instrument allowed the detection of the nucleation and solubility temperatures with an accuracy of 0,2 °C.
[OμS13_1569798869]

18:00
Progressive Phase Conjugation and Selective Extraction of Six Different Speckle Patterns in Multi-Mode Fiber
Atsushi Okamoto (Hokkaido University, JP); Yuki Hirasaki (Hokkaido University, JP); Tomohiro Maeda (Hokkaido University, JP); Akihisa Tomita (Hokkaido University, JP); Kunihiro Sato (Hokkai-Gakuen University, JP)
We developed a progressive phase conjugate technology in which the phase conjugation is performed electrically without the need for a coherent reference beam by fusion of reference-free phase detection and phase modulation. We successfully performed dynamic selective extraction of six different wavefronts that distorted after passing through the optical fiber.
[OμS13_1569790771]

Hotel La Residenza	Pagano, Hotel La Palma	Relais, Hotel La Palma
ONS	OμS I	OμS II

17:15-19:00
PLASMONICS AND ACTIVE PLASMONICS
(continued)

18:15
Water-Dispersed Quantum Dots of Coordination Polymers with Strong Photoluminescence
Huibiao Liu (Institute of Chemistry, Chinese Academy of Sciences, CN); Yongjun Li (Institute of Chemistry, Chinese Academy of Sciences, CN); Yuliang Li (Institute of Chemistry, Chinese Academy of Sciences, CN)
The coordination polymers PZn QDs were successfully prepared, which exhibit the excellent water dispersibility, high photoluminescence, outstanding photostability, and remarkable biocompatibility. The PZn QDs are remarkably efficacious for long-term cell imaging. [ONS13_8]

18:30
Near Dispersionless modes and anti-crossings of in-plane surface plasmon modes in 3-layer structure with 2-d dielectric pattern on top
Sachin Kasture (Tata Institute of Fundamental Research, IN); Prasanta Mandal (Tata Institute of Fundamental Research, IN); Venu Gopal Achanta (Tata Institute of Fundamental Research, IN)
We present dispersionless surface plasmon polariton modes at the unpatterned dielectric-metal-dielectric structure with 2-dimensional dielectric pattern on top. This structure also shows anti-crossings due to coupling of in-plane plasmon modes. Experimental results are supported by theoretical results based on SPP dispersion calculations and coupled mode theory for anti-crossing widths. [ONS13_19]

18:45
Near-infrared plasmonic activity in In-doped ZnO nanowires
Arrigo Calzolari (CNR-Nanoscienze, Centro S3, IT); Alice Ruini (Universita' di Modena, IT); Alessandra Catellani (CNR-Nanoscienze, Centro S3, IT)
We present a first principles investigation of the optical and plasmonic properties of In-doped ZnO nanowire. We show that the presence of metal impurities imparts to nanowires optoelectronic properties typical of transparent conducting oxides (TCOs) and induces plasmonic activity in the wires. [ONS13_65]

Notes

20:30 GALA DINNER and AWARD CEREMONY
at "da Paolino Lemon Trees" Restaurant

Hotel La Residenza

ONS I

09:40-10:55
NANO-ENGINEERED MATERIALS AND DEVICES II

09:40 Invited Talk
Engineering metacrystals and flat optics with Bragg, Fermat, Huygens and Fresnel law
Zeno Gaburro (Center of Neuroscience and Cognitive Systems, IIT, IT; University of Trento, IT; SEAS, Harvard University, US)
We have recently proposed a structure that generalizes classical Snell and Fresnel laws, based on "phase discontinuities". I provide a newer outlook on this structure, from four different and complementary points of view, referred to classical Bragg, Fermat, Huygens and Fresnel laws.

10:10
Innovative sensing architectures based on symmetry breaking of grating-coupled surface plasmon resonance
Gianluca Ruffato (Veneto Nanotech, IT); Elisabetta Pasqualotto (University of Padova, IT); Agnese Sonato (University of Padova, IT); Gabriele Zacco (Veneto Nanotech, IT); Davide Silvestri (University of Padova, IT); Margherita Morpurgo (University of Padova, IT); Alessandro De Toni (University of Padova, IT); Filippo Romanato (University of Padova, IT)
A novel compact architecture exploiting the symmetry breaking of grating-coupled surface plasmon resonance (SPR) in conical mounting is presented. In this setup a plasmonic grating is azimuthally rotated in order to support the excitation of high-sensitivity surface plasmon polaritons (SPPs). At SPP resonance, a scan of the incident polarization is performed before and after the binding event and the phase term of the output trend is exploited as sensing parameter. The mechanical complexity of the SPR system is significantly reduced and a resolution down to 5*10-7 refractive index units is assured. An experimental test on an assembled prototype is presented and applied to the detection of binding events on the grating surface (avidin/biotin reaction, DNA/PNA probes). Experimental data are successfully compared to simulation results with Chandezon's method. [ONS13_23]

Pagano, Hotel La Palma

OμS I

09:20-11:00
SIOF & OSA "FOR YOUNG" SESSION

09:20
Opening remarks
Angela Piegari (SIOF president , IT)

09:30 Invited Talk
3D quantum integrated photonics
Fabio Sciarrino (Sapienza Università di Roma, IT)
Integrated photonic circuits have a strong potential to perform quantum information processing We will report the implementation of integrated quantum circuits, fabricated by femtosecond laser waveguide writing. We will discuss the perspectives of optical quantum simulation: the implementation of the boson sampling to demonstrate the computational capability of quantum systems and the development of integrated architecture with three-dimensional geometries. These results open new perspectives in different areas of quantum information, such as fundamental tests of quantum mechanics with increasing number of photons, quantum state engineering, quantum sensing and quantum simulation.

10:00 Invited Talk
Keys to writing and submitting your papers
Rachel Pei Chin Won
Rachel will talk you through the concept of scientific detailed information and guidelines on scientific manuscript preparation and submission, as well as an overview of editorial process and the peer-review system. You will get to know what editors seek, how to write a good cover letter and a good scientific paper, how to review a manuscript and how to make an appeal.

Relais, Hotel La Palma

ONS II | OμS II

09:40-11:00
SILICON PHOTONICS (JOINT WITH ONS'13)

09:40 Invited Talk
Mid-infrared silicon photonic devices for sensing applications
Goran Mashanovich (University of Southampton, GB)
We report several silicon photonic devices designed and fabricated to operate in the mid-infrared: rib, strip and slot waveguides, Multimode Interference (MMI) splitters, Mach-Zehnder Interferometers (MZIs), and multiplexers. We show that silicon on insulator (SOI) is a viable material platform for wavelengths up to 4 microns. [OμS13_1569789161]

10:00
Micro-resonators on Bloch surface waves sustaining multilayer
Elsie Barakat (EPFL, CH); Libo Yu (EPFL, CH); Hans Peter Herzig (EPFL, CH)
We theoretically demonstrate the feasibility of micro-resonators on Bloch surface wave-sustaining multilayer by studying the key parameters. A quality factor of 2x104 in a 40 micrometer-disk resonator is achieved. We prove that the studied multilayer is a robust platform for 2D optics that would pave the way for new integration in photonic chips. [OμS13_1569794897]

Hotel La Residenza

ONS I

09:40-10:55
NANO-ENGINEERED MATERIALS AND DEVICES II (continued)

10:25
Bulk Optical Metamaterials by Microfluidic Evaporation
Alex Baron (University of Bordeaux, FR); Antonio Iazzolino (CNRS, Rhodia, LOF, FR); Kévin Ehrhardt (CNRS, Université de Bordeaux, FR); Jean-Baptiste Salmon (CNRS, Rhodia, LOF, FR); Ashod Aradian (Centre de Recherche Paul Pascal, FR); Vasyl Kravets (University of Manchester, FR); Alexander Grigorenko (University of Manchester, FR); Jacques Leng (CNRS, Rhodia, LOF, FR); Aurélie Le Beulze (CNRS, ICMCB, FR); Mona Treguer-Delapierre (CNRS, ICMCB, FR); Miguel A. Correa-Duarte (Universidad de Vigo, ES); Philippe Barois (CRPP - University of Bordeaux, FR)
We present homogeneous optical metamaterials assembled via a microfluidic evaporation technique which enables a high degree of bulkiness with a depth-to-particle-size ratio that exceeds 600, thus surpassing state-of-the-art realizations by one order of magnitude. [ONS13_37]

10:40
Second harmonic generation characterization of Au plasmonic nanoparticles on top of a monolayer of self-ordered dielectric nanospheres
Concita Sibilia (Universita' di Roma La Sapienza, IT)
We present the measurements of the optical second harmonic generation both with linear polarization and with circular polarization arose from 2D photonic structure formed by ordered dielectric nanospheres partially covered by thin Au layer. Such measurements show the presence of a geometrical induced chiral response. [ONS13_47]

10:55-11:15 Coffee break

11:15-13:15
DIELECTRIC NANOPHOTONICS

Invited Talk

11:15
PT-symmetric behavior arising in two coupled hybrid plasmonic-dielectric guides or in separate hybrid and dielectric guides
H. Benisty (Institut d'Optique, FR), M. Besbes (Institut d'Optique, FR), A. Lupu(Univ Paris Sud, FR), A. Degiron (Univ Paris Sud, FR)
Gain and loss can be arranged to swap with a symmetry of a structure, the so-called parity-time PT symmetry. In plasmonics, this gives rise to novel switching device opportunities. Two nano-optics examples show either gain and metal together in each guide of such devices, or the case of separate gain guide and metal guide.

Pagano, Hotel La Palma

OμS I

09:20-11:00
SIOF & OSA "FOR YOUNG" SESSION (continued)

10:30
Activities of the SIOF student chapter
Marco Giambra

10:45
OSA student chapters and EPS young minds in Italy
Antigone Marino

11:00-11:30 Coffee break

Relais, Hotel La Palma

ONS II | OμS II

09:40-11:00
SILICON PHOTONICS (JOINT WITH ONS'13) (continued)

10:20
Highly integrated photonic crystal - slot waveguide cavity
Matthieu Roussey (University of Eastern Finland, FI); Petri Stenberg (University of Eastern Finland, FI); Seppo Honkanen (University of Eastern Finland, FI); Markku Kuittinen (University Of Eastern Finland, FI)
We present here the simulation, fabrication and characterization of Silicon merged photonic crystal - slot waveguides filled with Titanium dioxide. Through this study we demonstrate the potential of such a device for strong field localization. [OμS13_1569790847]

10:40
Plasmonic nano-antennas as integrated coherent absorbers on SOI waveguides for modulators and all-optical switches
Roman Bruck (University of Southampton, GB); Otto Muskens (University of Southampton, GB)
The interaction of light guided in single-mode SOI wire waveguides with plasmonic nano-antenna structures on top of such waveguides, and the performance of these antenna structures as coherent absorbers for modulators and all-optical switches is explored. The absorption, scattering, reflection and transmission spectra of gold and aluminum antenna-loaded waveguides was calculated by means of 3D finite-difference time-domain simulations for single waves propagating along the waveguide, as well as for standing wave scenarios composed from two counterpropagating waves. The investigated waveguide configurations showed losses smaller than 1% and extinction ratios greater than 15 dB for modulator and switching applications, as well as plasmon effects such as strong field enhancement and localization in the antenna region. The proposed plasmonic coherent absorbers can be utilized for ultracompact all-optical switches in coherent networks as well as modulators and can find applications in sensing or in increasing nonlinear effects. [OμS13_1569797499]

Hotel La Residenza

ONS I

11:15-13:15
DIELECTRIC NANOPHOTONICS
(continued)

11:45
Photon management by Bloch Surface Waves on structured one dimensional photonic crystal
Angelo Angelini (Politecnico di Torino, IT); Emanuele Enrico (Istituto Nazionale di Ricerca Metrologica, IT); Natascia De Leo (Istituto Nazionale di Ricerca Metrologica, IT); Peter Munzert (Fraunhofer IOF, DE); Luca Boarino (Istituto Nazionale di Ricerca Metrologica, IT); Francesco Michelotti (Sapienza Universita di Roma, IT); Fabrizio Giorgis (Politecnico di Torino, IT); Emiliano Descrovi (Politecnico di Torino, IT)
Fluorescence diffraction assisted by Bloch Surface Waves (BSW) is experimentally demonstrated by using linear and circular subwavelength gratings on dielectric multilayers. Fluorescence is near-field coupled to BSW and then diffracted as it propagates on the multilayer far away from a local excitation area. [ONS13_11]

12:00
Experimental characterization of waveguide directional coupler on Bloch Surface waves sustaining multilayer
Libo Yu (Optics & Photonics Technology Laboratory, École Polytechnique Fédérale de Lausanne (EPFL), CH); Elsie Barakat (EPFL, CH); Hans Peter Herzig (EPFL, CH)
2D (thickness < l/15) polymer waveguide couplers, fabricated on Bloch surface wave sustaining multilayer, are experimentally demonstrated using near-field microscopy. Experimental results of both first and second modes are achieved. We theoretically analyzed the impacts of the waveguide parameters on the coupling property. [ONS13_45]

12:15
Plasmon-like surface states in negative refractive index metamaterials: towards all-dielectric, loss-free nanophotonic platforms
Edoardo De Tommasi (IMM-CNR, IT); Anna Chiara De Luca (National Research Council, Institute of Protein Biochemistry, IT); Silvia Romano (IMM-CNR, IT); Stefano Cabrini Lawrence Berkeley National Lab. / Ca (US); Ivo Rendina (IMM-CNR, IT); Vito Mocella (IMM-CNR, IT)
We report on our recent results in theoretical prediction, numerical estimation, and experimental characterization of surface optical states at the boundary of a negative refractive index photonic crystal slab. These states, being characterized by spatial distributions and dispersion curves typical of a surface plasmon but not being supported by metallic substrates, could open the way to loss-free, all-dielectric nanophotonics as an alternative to plasmonics, which usually suffer from strong absorption in the visible and near-IR regions of the em spectrum and related energy dissipation. Possible applications in sensing and SERS-like schemes are finally envisaged.

Pagano, Hotel La Palma

OμS I

11:30-13:30
SIOF & OSA "FOR YOUNG" SESSION

11:30 **Invited Talk**
Laser and Photonic Market in the world
Eugene Arthurs

12:00 **Invited Talk**
Optics activities at the International Centre for Theoretical Physics in Trieste
Joseph J. Niemela

Relais, Hotel La Palma

OμS II

11:30-12:50
OPTICAL MATERIALS FOR HYBRID AND MONOLITHIC INTEGRATION

11:30
Improving Opto-electronic Neural Stimulation with Micro-LED arrays and micro-optics
Lionel Chaudet (Imperial College London, GB); Mark Neil (Imperial College London, GB); Patrick Degenaar (Newcastle University, GB); Kamyar Mehran (Newcastle University, GB); Rolando Berlinguer-Palmini (Newcastle University, GB); Pleun Maaskant (Tyndall, IE); Peter Lanigan (Scientifica Ltd, GB)
This work reports developments of systems to further our understanding of both brain and visual function and is part of the European project, OptoNeuro. We present the design and implementation of a projection and micro-optics system for use with a micro-LED array to improve the fill-factor by collecting a larger proportion of the LED emission and directing it correctly and efficiently to the sample plane. The micro-optics were designed and implemented at the end of a projection system or integrated directly on top of the Micro-LED array. It allows an increase of the fill-factor from 2 % to more than 78 % and a ten fold improvement of the light reaching the sample. [OμS13_1569791043]

11:50
Fabrication and Characterization of Zirconium - doped Periodically Poled Lithium Niobate
Gianluca Pozza (University of Padova, IT); Maria Vittoria Ciampolillo (University of Padova, IT); Marco Bazzan (University of Padova, IT); Nicola Argiolas (University of Padova, IT); Annamaria Zaltron (University of Padova, IT); Cinzia Sada (University of Padova, IT); Giovanni Nava (University of Pavia, IT); Paolo Minzioni (University of Pavia, IT)
We present our results about the fabrication of periodically poled structures on bulk Zirconium doped Lithium Niobate crystals (Zr:PPLN) to be used as a frequency doubling device by Quasi Phase-Matching (QPM). A high temperature poling setup allows for the successful fabrication of PP structures on bulk-doped crystals. [OμS13_1569791701]

Hotel La Residenza

ONS I

11:15-13:15
DIELECTRIC NANOPHOTONICS
(continued)

12:30
Light Trapping with Nanospheres in Solar Cells
Paul Leu (University of Pittsburgh, US)
Nanosphere coatings have the potential to not only enhance solar efficiencies in silicon thin film solar cells without introducing additional surface recombination, but also reduce manufacturing processes and costs. These nanosphere coatings enhanced the absorption and efficiency in the silicon across a wide range of silicon thicknesses due to both antireflection and light trapping. We use simulations to determine the enhancement in this light trapping. [ONS13_16]

12:45
Frequential and temporal analysis of two-dimensional photonic crystals for absorption enhancement in organic solar cells
Sophie Fasquel (University of Bordeaux, FR)
We propose a study of the role of a two-dimensional photonic crystal (PC) in an organic solar cell. In particular, we use some specific resonant modes of the PC, that are not guided modes, to favor light trapping in the absorbing medium. The increase of optical path in the active layer causes an increase of absorption at some particular frequencies. A full frequantial - temporal analysis has been made to highlight the correspondence between absorption enhancement and PC resonant modes, in a thin absorbing slab. In addition we present designs that would broaden the absorption spectrum of the bulk material. Finally, we study a complete solar cell made of a 50nm-thick active layer, and an ITO electrode. In such device, the well known trade-off between carrier extraction and light absorption can appear as a constraint. We obtain a high absorption level, provided the electrode is structured as a PC. [ONS13_36]

13:00
Mesoscopic light transport near Anderson localization in semiconductor nanowire mats
Otto Muskens (University of Southampton, GB); Tom Strudley(University of Southampton, GB); Tilman Zehender (University of Eindhoven, NL); Erik P.A. Bakkers (Technical University of Eindhoven, NL)
Using methods from statistical optics, we show that transport through dense semiconductor nanowire mats is governed by only a small number of open transmission channels. Nanowire mats are important new materials for applications in light emission and solar cells. The GaP nanowires are amongst the strongest scattering materials in the world, with a mean free path as small as 0.2 micrometers. We find that light transport through the nanowire mat is strongly correlated and is characterized by only 4 individual open transmission channels. Our results show unambiguously that large mesoscopic interference corrections, a precursor of strong or Anderson localization, are accessible in three dimensional nanophotonic media.

13:15-15:00 Lunch break

Pagano, Hotel La Palma

OμS I

11:30-13:30
SIOF & OSA "FOR YOUNG" SESSION
(continued)

12:30
Naples young minds Activities
Roberta Caruso

12:50
Naples OSA chapter Activities
Lucio Rossi

13:10
Naples SIOF student chapter scientific Activities
Stefania Torino & Shomnath Bhowmick

13:30-15:00 Lunch break

Relais, Hotel La Palma

OμS II

11:30-12:50
OPTICAL MATERIALS FOR HYBRID AND MONOLITHIC INTEGRATION
(continued)

12:10
Long-range plasmonic electro-optic directional coupler switches
Romeo Beccherelli (Consiglio Nazionale delle Ricerche, IT)
We propose optical switches based on long-range plasmonic directional couplers, which are controlled via the electro-optic effect of nematic liquid crystal layers. Both horizontal and vertical configurations are discussed, providing a comparison in terms of key-performance characteristics, such as coupling length, switching voltage, insertion losses, and crosstalk.
[OμS13_1569798515]

12:30
Vertical and lateral DCM-based organic microlasers
Markas Sudzius (Technische Universitaet Dresden, DE); Tim Wagner (Technische Universitaet Dresden, DE); Andreas Mischok (Technische Universitaet Dresden, DE); Robert Brückner (Technische Universitaet Dresden, DE); Kai Schmidt (Technische Universitaet Dresden, DE); Vadim Lyssenko (Technische Universitaet Dresden, DE); Hartmut Fröb (Technische Universitaet Dresden, DE); Karl Leo (Technische Universitaet Dresden, DE)
We characterize organic vertical-cavity surface emitting lasers and distributed-feedback lasers using optical spectroscopy techniques. The corresponding lasing thresholds, output powers, confinement factors etc. are compared and different photon loss mechanisms in the cavity and their influence to the lasing characteristics are discussed.
[OμS13_1569791117]

Hotel La Residenza

ONS I

15:00-16:45
NANO-ENGINEERED MATERIALS AND CHARACTERIZATION

Invited Talk

15:00
Nano-helices by Focused Ion Beam Induced-Deposition as Chiral Metamaterial in the NIR-VIS range
Adriana Passaseo
Much progress were made to bring metamaterial structures to optical ranges of operation, but still many difficulties were found to miniaturize 3D chiral structures at the nanoscale. Here we present the nanofabrication technologies and propagation of light on 3-dimensional chiral nano-spirals arranged on a two-dimensional square lattice and operating in the visible and near -infrared range. The nanostructures were realized by Focused Ion Beam Induced Deposition and Focused Electron Beam Induced Deposition obtaining high flexibility in both, the geometrical control, array density and size. Optical measurements performed on the realized sample show a high circular polarization sensitivity in a wide range of optical frequencies.

15:30
Spectroscopic Ellipsometry biosensing by using coupled plasmonic nanospheres
Yia-Chung Chang (Research Center for Applied Sciences, Academia Sinica, TW); Huai-Yi Xie (Research Center for Applied Sciences, Academia Sinica, TW); Rakesh Moirangthem (Max-Planck-Institut fur Eisenforschung, DE)
We study the effects of DNA sequences attached on close-packed Au nanoparticles by using spectroscopic ellipsometry combined with accurate theoretical modeling. The comparison of experiment with theory allows precise determination of the effective thickness of DNA coverage and the average separation between Au nanoparticles.

15:45
Total Internal Reflectance Ellipsometry for Metal-Dielectric Interfaces
Anna Sytchkova (Enea, Optical Coatings Laboratory, IT); Danilo Zola (ENEA, Optical Coatings Laboratory, IT); Marco Angelo Giambra (Enea, Otical Coatings Laboratory, IT); Maria Luisa Grilli (Enea, Optical Coatings Laboratory, IT); Angela Piegari (ENEA, IT)
Non-destructive probing of metal-dielectric interfaces in ultrathin metal-oxide heterostructures is possible by the optical measurement technique of Total Internal Reflectance Ellipsometry (TIRE) in Otto configuration. We propose and discuss the approach to sample characterization, including measurement setup and modeling.
[ONS13_58]

Pagano, Hotel La Palma

ONS II | OµS I

15:00-17:00
NANOPHOTONICS APPLICATIONS (JOINT WITH ONS'13)

Invited Talk

15:00
Coherent phonon spectroscopy of the shearing mode in bilayer and few-layer graphene
Davide Boschetto (ENSTA ParisTech/Ecole Polytechnique, FR)
It is well known that graphite has a layered structure, with atoms forming a honeycomb lattice with strong covalent bonds within the layer, and with weak Van der Waals forces acting between the layers. A sample made of a single layer of graphite is called graphene, and it is the thinnest sample material known. When the sample is made of several layers, it is called multilayer graphene. Graphene is today the most promising material for ultrafast nanoelectronics because of its extremely high electrons mobility. All the transport properties in single layer and multilayer graphene are strongly dependent on the electrons and phonons dynamics, as well as on the electron-phonon interaction. Therefore, studying their dynamics is a key point to understand both the underlying physical properties and the way in which graphene can be implemented to existing and new devices.

15:30
Reciprocity breaking in a photonic material caused by ultrafast nonlinear dynamics
Otto Muskens (University of Southampton, GB); Martina Abb (University of Southampton, GB); Timmo Van der Beek (AMOLF, NL); Thomas Wellens (University of Freiburg, DE)
Light transport in nanostructured photonic materials is governed by strong multiple scattering, resulting in photonic bands, light trapping, and diffuse transport phenomena. Here, we show ultrafast control over light transport through a spatially and temporally non-uniform laser excitation. We demonstrate that adiabatic control over light paths can be achieved, which gives rise to a breaking of reciprocity of light paths in the medium. Ultrafast dephasing and reciprocity breaking hold promise for nanophotonic switches, ultrafast nanoscale and random lasers, and control of light trapping and localization.
[OµS13_1569797459]

15:45
Solid Supramolecular Architecture of a Perylene Diimide Derivative for Fluorescent Enhancement
Yongjun Li (Institute of Chemistry, Chinese Academy of Sciences, CN); Huibiao Liu (Institute of Chemistry, Chinese Academy of Sciences, CN); Yuliang Li (Institute of Chemistry, Chinese Academy of Sciences, CN)
A new p-phenylenevinylenelinked perylene diimide has been self-assembled for the formation of zero-dimensional molecular aggregate structures of nanospheres and vesicles through solvent tuning. The emission intensity of these aggregates increased with elongation of the laser irradiation time.
[OµS13_1569786321]

Notes

Hotel La Residenza

ONS I

15:00-16:45
NANO-ENGINEERED MATERIALS AND CHARACTERIZATION (continued)

16:00
Broadband telecom transparency of semiconductor-coated metal nanowires: more transparent than glass
Luis Froufe-Pérez (Instituto de Estructura de la Materia, ES); Ramón Paniagua-Domínguez (Instituto de Estructura de la Materia, ES); Diego R. Abujetas (Instituto de Estructura de la Materia, ES); Juan J. Sáenz (Universidad Autónoma de Madrid, ES); José A. Sánchez-Gil (Instituto de Estructura de la Materia, ES)
Metallic nanowires (NW) coated with semiconductors are proposed as means to produce transparent conductors at Infrared telecommunication wavelengths. This effect is robust against changes in polarization, angle of incidence, and also holds for relatively dense periodic or random arrangements. [ONS13_49]

16:15
Controlling growth of molecular crystal aggregates for efficient optical waveguides
Yuliang Li (Institute of Chemistry, Chinese Academy of Sciences, CN)
Controllable crystal aggregate structures which show highly uniform crystal tubule, rod and cubic like architectures were achieved and the well-defined microrods exhibit outstanding optical waveguide properties. [ONS13_12]

16:30
Surface-enhanced Raman analysis of red blood cell membrane with high spatially-reproducible nano-patterned substrate obtained by block-copolymer self-assembly
Gianluigi Zito (University of Naples Federco II, IT); Alden Dochshanov (University of Naples Federico II, IT); Giulia Rusciano (University of Naples Federico II, IT); Giuseppe Pesce (University of Naples Federico II, IT); Antonio Sasso (University of Naples Federico II, IT)
We report on the fabrication of ordered ultrahigh-density templates of nano-textured Ag-particles applied for spectroscopic surface-enhanced Raman imaging of red blood cells (RBCs). Glass basic substrate allows working in back scattering configuration permitting real time monitoring, via microscopy, of the RBCs on which Raman measurements are carried out. A SERS 'display' is achieved with an ultra-high uniform Raman enhancement (< 5% over centimeter scale) that is promising for innovative and reliable SERS applications in biomedicine. The template is applied for surface-enhanced Raman analysis of the red blood cell membrane in confocal micro-Raman configuration. The substrates demonstrate to have SERS imaging potential of the RBC membrane thanks to the uniformity of the nano-textured substrate. [ONS13_64]

Pagano, Hotel La Palma

ONS II | OµS I

15:00-17:00
NANOPHOTONICS APPLICATIONS (JOINT WITH ONS'13)
(continued)

16:00
Polymeric photonic crystal electrode to be used in flexible organic LED structures
Lucia Petti (ICIB-CNR, IT); Massimo Rippa (ICIB-CNR, IT); Rossella Capasso (ICIB-CNR, IT); Giuseppe Nenna (UTTP ENEA Portici Research Centre, IT); Anna De Girolamo Del Mauro (UTTP ENEA Portici Research Centre, IT); Maria Grazia Maglione (UTTP ENEA Portici Research Centre, IT); Giuseppe Pandolfi (UTTP ENEA Portici Research Centre, IT); Carla Minarini (UTTP ENEA Portici Research Centre, IT)
This paper presents a novel strategy to fabricate two-dimensional poly(3,4 ethylenedioxythiophene):poly(styrene sulfonate) (PEDOT:PSS) photonic crystals (PCs) combining electron beam lithography (EBL) and plasma etching (PE) processes. [OµS13_1569798745]

16:15
THz spatial light modulators based on hybrid metamaterials
N. Chikhi (University of Naples "Federico II", IT); M. Lissitskii (Institute of Cybernetics "E. Caianiello", CNR, IT); V. Tkachenko (Institute SPIN, CNR, IT); A. Andreone (University of Naples "Federico II", Institute SPIN, CNR, IT)
A large frequency tunability can be achieved by combining a planar metamaterial with a liquid crystal (LC) having a relatively high birefringence. The device is based on the exploitation of the LC molecule reorientation to change the permittivity of different capacitors present in the unit cells based on Split Ring Resonators. The whole system is designed to obtain a maximum signal frequency shift up to 8% around the operational frequency of 1 THz. T Spectroscopy measurements show a good agreement between electromagnetic simulations and experimental data. The possible application of the structure as a Spatial Light Modulator is discussed.
same material by using Atomic Layer Deposition (ALD).

16:30
Enhanced photocurrent in layers of PbS quantum dots within plasmonic bull's eye structures
S. L. Diedenhofen (ICFO, ES); D. Kufer (ICFO, ES); T. Lasanta (ICFO, ES); G. Konstantatos (ICFO, ES)
The plasmonic resonances of Au bull's eye structures are determined optoelectronically by measuring the spectrally resolved photocurrent from PbS quantum dots positioned in the center of the bull's eye structure. We show a ~4-fold enhancement of the photocurrent as a result of tailoring their plasmonic resonance. [ONS13_1569820719]

Notes

16:45
Low propagation loss titanium dioxide waveguides by using Atomic Layer Deposition
M. Häyrinen (University of Eastern Finland, FI); M. Roussey (University of Eastern Finland, FI); Vishal Gandhi (University of Eastern Finland, FI); P. Stenberg (University of Eastern Finland, FI); A. Säynätjoki (Helsinki University of Technology, FI); L. Karvonen (Helsinki University of Technology, FI); M. Kuittinen (University of Eastern Finland, FI); S. Honkanen (University of Eastern Finland, FI);
We investigate the propagation losses in titanium dioxide waveguides. Low losses of 5.0 dB/cm are measured. The losses are further decreased down to 2.4 dB/cm by reducing the sidewall roughness of the structures. This is achieved by re-coating with the same material by using Atomic Layer Deposition (ALD). [ONS13_1569821251]

POSTER SESSION | Thursday, 12 September, 18:30-20:00 | Gardens of the hotel la Residenza

5th EOS Topical Meeting on Optical Microsystems (OμS'13)

Analytical Model for wideband THz sources and detectors based on Optical Rectification and Electro-Optic Sampling
Alessandro Tomasino (University of Palermo, IT); Antonino Parisi (University of Palermo, IT); Salvatore Stivala (University of Palermo, IT); Riccardo Pernice (University of Palermo, IT); Luciano Curcio (University of Palermo, IT); Alfonso C. Cino (University of Palermo, IT); Alessandro Busacca (Universita' di Palermo, IT); Marco Peccianti (INRS-EMT, CA); Roberto Morandotti (INRS-EMT, CA)
An analytical model describing a laser based set-up for wideband THz generation and detection is presented. Particular attention is focused on the main broadband phenomena, which occur when THz radiations have to be handled. [OμS13_1569798553]

Imaging with refractive variable-focus fluidic lenses in optical microscopy
Jiri Novak (Czech Technical University in Prague, CZ); Pavel Novak (Czech Technical University in Prague, CZ); Antonin Miks (Czech Technical University in Prague, CZ)
Fluidic variable-focus lenses and microlenses give a possibility to design non-conventional optical systems which change their parameters (focal length, magnification, etc.) in a continuous way without a need for mechanical movements of lenses. We present an analysis of design possibilities and experimental verification of implementation of refractive variable-focus fluidic lenses in optical microscopy imaging system [OμS13_1569775249]

Investigation of induced changes in refractive index and Mid-Infrared spectrum of sio2 thin film On polycarbonate created by Vis -IR laser irradiation
Hassan Ehsani amri (University of Islamic Azad nour, IR); Mahmoud Ghoranneviss (University of Islamic Azad Tehran, IR)
In this paper the effect of Vis-IR laser irradiation at various energy densities on near infrared spectrum and refractive index of sio2 thin film onto polycarbonate substrate was reported. Based on the transmittance data, the dispersion of refractive index of sample in the range of 400-800nm has been studied by applying analytical formulas (Swanepoel method). It was found that at high energy density (50.35j/cm2), the refractive index of sample has more increased. The highest increase in refractive index (0.1) has found for the sample that irradiated by 532nm laser beam with 50.35j/cm2 energy density. The changes in near infrared spectra are interpreted by overtones and combination bonds theory. [OμS13_1569788845]

A low cost sensor based on molecularly imprinted polymer and surface plasmon resonance in plastic optical fibers for the detection of small molecules
Nunzio Cennamo (Second University of Naples, IT); Girolamo D'Agostino (University of Pavia, IT); Maria Pesavento (University of Pavia, IT); Luigi Zeni (Seconda Università degli Studi di Napoli, IT)
In this work, a Molecularly Imprinted Polymer (MIP) has been used in connection with surface plasmon resonance transduction in Plastic Optical Fiber (POF) for the selective detection of small molecules. The proposed device has been experimentally tested for the detection of nicotine (3-[(2S)-1-methylpyrrolidin-2-yl]pyridine). The goal is a selective detection of small molecules (nicotine, in this case) with a simple experimental configuration. [OμS13_1569792087]

Simulation, Design and Development of Chameleon optical mimetic system
Morteza Hassanpour Amiri (Amirkabir University of Technology, IR); Hassan Kaatuzian (AmirKabir University of Technology, IR)
In this research we have designed and developed an optical mimetic system to mimic the natural camouflage behavior of a chameleon. [OμS13_1569791017]

Cleair: a new fully automated instrument to measure the concentration of fine dusts in air
Valerio Bonacquisti (OptSensor Srl, IT); Michele Lopiano (OptSensor Srl, IT); Angelo Chianese (Sapienza Università di Roma, IT); Eugenio Fazio (Sapienza Università di Roma, IT)
Cleair is a sophisticated monitoring instrument that counts the amount of particulate contamination in air and hence the particulate concentration in air. Cleair is useful in a facility or in an environment that needs to continuously monitor the quality of air without an operator. The air inlet selects the dimension of the dust (PM10, PM2.5) and by a pump deposits the particulate matter, with a sampling period between 3h and 24h, on filters automatically handled and retained after the measurement in a reservoir. The measurement, which is performed by a sophisticated optical system that determines the attenuation of a light radiation through the deposited dust, is very accurate and not affected by the presence of humidity. Both the sampling and the optical measurement are fully automated. Here a measurement campaign is presented, compared with the traditional gravimetric measurement. [OμS13_1569798403]

Towards a high-precision optical frequency standard in space by cavity-enhanced laser stabilization with molecular gasses
Alberto Stochino (Stanford University, US); John Lipa (Stanford University, US); Shailendhar Saraf (Stanford University, US); Si Tan (Stanford University, US); Saps Buchman (Stanford University, US)
We present here our current effort to advance the development of a laser stabilization scheme that has very low noise into a unit that is low power and compact, and can be used in space for missions requiring extreme performance in optical frequency stabilization. [OμS13_1569794313]

Quantitative video-rate holographic imaging of surface acoustic waves for non-destructive testing of composite plates
Francois Bruno (CNRS, FR); Jerome Laurent (CNRS, FR); Claire Prada (ESPCI, FR); Daniel Royer (CNRS, UMR7587, FR); Michael Atlan (CNRS, UMR7587, FR)
We report quantitative video-rate optical imaging of nanometric out -of-plane surface vibrations with a parallel laser Doppler measurement scheme on a sensor array. It allows narrowband imaging of surface acoustic waves. Our approach is based on time-averaged heterodyne holography in off-axis and frequency-shifting conditions. we used a coherent frequency-division multiplexing technique with a dual local oscillator to measure both sidebands simultaneously. Experimental images of mechanical vibration amplitudes versus excitation at audio frequencies will be presented. The proposed imaging technique is single-frequency but tunable throughout the available range of local oscillator frequency shifts (DC-10 MHz, with Bragg cells). This technique can be used for real-time integrity monitoring of composite plates. [OμS13_1569797923]

Compact and flexible electro-optical characterization system
Hieu Tran Trung (The BioRobotics Institute of Scuola Superiore Sant'Anna, IT); Carmela Cavallotti (The BioRobotics Institute of Scuola Superiore Sant'Anna, IT); Monica Vatteroni (The BioRobotics Institute of Scuola Superiore Sant'Anna, IT); Arianna Menciassi (Scuola Superiore Sant'Anna, IT)
This contribution presents the development of a complete characterization system for image sensors over an input power of 6-decade in different wavelength ranges The used design approach for the optical modules makes the system compact, flexible,reliable, and easy to setup, to be used in different application scenarios. [OμS13_1569798803]

POSTER SESSION | Monday, 26 September, 19:15-20:30 | The patio of the hotel la Residenza

Efficient biochemical sensing with Bragg serpentine ring resonators
Carlo Edoardo Campanella (CNR-ITIA, IT); Gianluca Gagliardi (CNR -INO, IT); Clarissa Martina Campanella (Boston University, US)
Since last decades, miniaturized sensors have been employed for clinical analysis, healthcare, and environmental monitoring. The properties of minimal intrusiveness and capability to be easily implanted into human body or placed in an harsh environment without modifying the surrounding conditions, make them really attractive on the market. One of the most fascinating platforms that fulfills these characteristics is represented by optical resonant cavities, also referred to as whispering gallery mode (WGMs) sensors. Here we propose a novel geometry relying on a Bragg serpentine ring resonator for the quantitative detection of a specific analyte in solution.
[OμS13_1569791935]

RISSOR: Refractive-Index Surface-Soliton Sensor
Thomas Fiumara (Sapienza Università di Roma, IT); Eugenio Fazio (Sapienza Università di Roma, IT)
A novel integrated sensor is presented. It is an hybrid configuration, combining together traditional rib waveguides connected together by a superficial soliton channel. Such photonic circuit is able to detect modifications in the cladding refractive index because of three main processes: 1) variation of the coupling between rib and soliton waveguides, 2) variation of the light diffraction at the end of the rib waveguide and 3) the evanescent wave in the soliton channel. High sensitivity is numerically shown. [OμS13_1569797851]

Numerical simulations of electro-optically-active amorphous silicon photonic-crystal waveguides
Sandro Rao (Università degli Studi Mediterranea, IT); Francesco Della Corte (University Mediterranea of Reggio Calabria, IT)
Simulation results of a Mach-Zehnder interferometer based on 2D-photonic crystal (PhC) waveguides are reported. The design takes into account the tunability property of the hydrogenated amorphous silicon (a-Si:H) refractive index in order to obtain PhC geometries which do not require critical fabrication processes.
[OμS13_1569795821]

Self-assembly of long carbon-based wires by electrode-free dielectrophoresis
Oriella Gennari (INO-CNR, IT);Simonetta Grilli (INO-CNR, IT); Sara Coppola (INO-CNR, IT); Vito Pagliarulo (INO-CNR, IT); Veronica Vespini (INO-CNR, IT); Pietro Ferraro (INO-CNR, IT)
A one-step process for chaining carbon-based nanoparticles into long wires, embedded in different polymer matrices, through an electrode-free approach, is developed. The electric field gradients, responsible for the dipole-dipole interaction, are generated through spontaneous charge templates arising pyroelectrically onto functionalized ferroelectric crystals. An attractive advantage of this technique is that the entire process involves only conventional drop-casting of the particle suspension and successive heating. The characterization shows that the wiring effect can be controlled by different process parameters, including surface charge configuration, particles concentration and polymer viscosity. Depending on the process conditions, wires up to 4 mm long have been formed spontaneously. Since the anisotropic structures in polymers are highly desirable for enhancing the thermal and/or the electrical conductivity, the electrode-free nature of this technique would improve the scaling down and the versatility of those interconnections that can find applications in many fields, such as electronics, sensors and biomedicine.
[OμS13_1569823797]

A new method of holographic 3D tracking of micro-objects exploiting their morphological features
Pasquale Memmolo (INO-CNR, IT)
Two different strategies of holographic three-dimensional (3D) tracking are presented. The first one is suitable for highly symmetrical micro-objects and is achieved by a compact holographic microscope that can ensure both accurate 3D tracking and quantitative phase-contrast imaging simultaneously. Instead the second method is directly designed to take account of the morphological changes of micro-objects, introducing a new morphological operator for the calculation of the transverse coordinates of tracked objects.
[OμS13_1569823815]

Total internal reflection Holographic Microscopy in a birefringent medium
Alejandro Calabuig Barroso (INOA-CNR, IT)
A new microscopy technique named total internal reflection holographic microscopy (TIRHM) is capable to retrieve quantitative phase images of cell-substrate interfaces, adhesions, and tissue structures close to the surface of a prism. We use a birefringent medium as microscope slide and study different kind of materials. Results will be mentioned and future works proposed.
[OμS13_1569823771]

Emission-absorption pyrometric technique for quantitative measurements of the gas turbine inlet temperature
Sergio Musazzi (Ricerca Sistema Energetico, IT)
The paper describes an innovative pyrometric technique for the measurement of the gas turbine inlet temperature (TIT). The technique is based on the detection of the radiation emitted in a narrow wavelength band by the CO2 molecules present in the combustion gas. Preliminary results relevant to laboratory tests will be presented. [OμS13_1569791105]

An Integrated Electromagnetic Field Sensor based on a Symmetric Optical Interferometer
Mario Medugno (Consiglio Nazionale delle Ricerche, IT); Ivo Rendina (CNR, IT)
We propose an integrated optical device enabling an affordable electromagnetic field sensing in the Fresnel region from the ELF band up to the GHz UHF band, suitable for near-field monitoring of critical communication structures. [OμS13_1569796799]

Two-PBS (polarization-beam-splitter) polarization isolating Switches
Qu Yang (Harbin Institute of Technology, CN)
A Two-PBS (polarization-beam-splitter) polarization isolating Switches used in monostatic antenna lidar system is proposed in the paper. The method of Two-PBS(polarization-beam-splitter) polarization Isolating is used to increase the extinction ratio of the system and reduce the stray light caused by the reflection from the end-face. The output power and polarization of the beam from the key points of the system are calculated by using the polarization analyzing system (Thorlabs Instrumentation TXP5004). The results show that extinction ratio of the Two-PBS (polarization-beam-splitter) polarization isolating switches comes close to the extinction ratio of the system optical elements, and the power of stray light caused by reflection from the end-face is approximately zero.
[OμS13_1569791383]

POSTER SESSION | Thursday, 12 September, 18:30-20:00 | Gardens of the hotel la Residenza

Self-assembling of liquid crystal droplets on lithium niobate substrates driven by pyroelectric effect
Francesco Merola (Istituto Nazionale di Ottica del CNR, IT); Pietro Ferraro (INO, IT); Simonetta Grilli (Istituto di Ottica - CNR, IT); Sara Coppola (Istituto Nazionale di Ottica - CNR, IT); Veronica Vespini (Istituto Nazionale di Ottica - CNR, IT)
Drops of LC are firstly uniformly fragmented in smaller droplets by heating the sample. Then, driven by pyroelectric fields obtained by the thermal stimulus applied to the LN substrate, the fragmented drops are self-assembled on the substrate according to the underneath ferroelectric domain patterned structures. Successively, during cooling, droplets move outside or inside the domains, depending on the side of the LN crystal, i.e. on the sign of the inverted domains. [OμS13_1569808269]

Nanometric surface probing with ultra-cold atoms
Murtaza Ali Khan (University of Florence, IT)
We are developing a versatile experimental platform where cold 87Rb atoms can be trapped in close proximity to a nanostructure surface. We intend both to use cold atoms as sensitive surface probes as well as exploring strong coupling schemes to e.g. photonic waveguides in order to realize novel quantum devices. [OμS13_1569820473]

High-speed investigation of dynamic liquid jets by Digital Holography
Luigi Battista (INO-CNR, IT); Oriella Gennari (INO-CNR, IT); Lisa Miccio (INO-CNR, IT); Veronica Vespini (INO-CNR, IT); Sara Coppola (INO-CNR, IT); Simonetta Grilli (INO-CNR, IT); Pietro Ferraro
A deep investigation on the dynamics of the liquid jets released during pyro- electrohydrodynamic dispensing method has been performed by means of a Digital Holography (DH) technique and an high-speed camera; moreover, the phenomenon of liquid dispensing with different kinds of drop (i.e. DNA solution, almond oil and polystyrene latex beads dispersion) is here compared and reported. [OμS13_1569823971]

New solutions for phototherapy illuminators: a LED-driven model
Francesco Fabbrizzi (University of Florence, IT); Giovanni Romano (University of Florence, IT); Alessio Gnerucci (University of Florence, IT); Antonio Conti (University of Florence, IT); Franco Fusi (University of Florence, IT)
In the last years, the field of phototherapy devices applied to skin diseases has taken advantage of the ever growing advancement of new light sources. Non-coherent sources are increasingly entering the market and the medical practice. Still they may suffer from problems like spatial non-uniformity, limited efficiency due to non-optimized spectral emission, difficulties in the treatment of large areas (>50cm^2). We propose a model for a low cost LED-bases illuminator, with specific attention to the study of the best geometry giving the greatest intensity and intensity uniformity. Work consisted into two parallel and complementary approaches: a theoretical study of the best geometry for LED sources and an empirical study of a simple illuminator model, realized by use of commercially available LED strips and a light diffuser. [OμS13_1569822785]

Solar sails: backscattering effect on thrust modeling
Giulio Maddalena (Sapienza University of Rome, IT); Federica Bonetti (Sapienza University of Rome, IT); Christian Circi (Sapienza University of Rome, IT); Salvatore Scaglione (ENEA, IT); Danilo Zola (ENEA, IT); Giovanni Vulpetti (International Academy of Astronautics, FR)
Since the first space missions for exploring the outer Space, rocket propulsion has been acting as the key propulsive mean. However, it suffers from several limitations. In a rocket (by definition), power source and propellant must be on-board, and it can provide limited energy, even though the thrust acceleration can be high. For the future high-energy space missions, spacecraft mass would be considerably high with high-cost, prohibitive in many envisaged cases of advanced space missions. In addition, if one uses gravity-assist manoeuvres for missions requiring very high terminal speeds, transfer time becomes very long, and the launch opportunities results very low in number.

Microfluidic devices for sperm chemotaxis assay
Stefania Torino (IMM-CNR, IT); Noemi Ciccarelli (CFA, IT); Gianfranco Coppola (CFA, IT); Loredana Di Matteo (CFA, IT); Roberta Dale (CFA, IT); Antonio De Simone (S. Te. Bi. srl, Aversa (CE), IT); Giancarlo Abbate (S. Te. Bi. srl, Aversa (CE), IT); Umberto Martinelli (S. Te. Bi. srl, Aversa (CE), IT); Ivo Rendina (IMM-CNR, IT); Brian Dale (CFA, IT); Giuseppe Coppola (IMM-CNR, IT)
Microfluidic devices provide a powerful platform for biological assays. In the field of the in vitro fertilization the sperm screening is an essential step. Sperm exhibits chemotaxis in the presence of hormones, the oocyte microenvironment, and follicular and oviductal fluids. The presence of defects in sperm chemotaxis may cause men infertility. This means that sperm chemotaxis assay could be used as a diagnostic tool for men infertility. Microfluidics technology gives the possibility to realize systems in which well-controlled spatial and temporal gradients are obtained. These devices can be used in order to perform sperm chemotaxis assay by generating precise chemical gradients of chemoattractans in the microchannels.

Carbon Based Wires assembling using Pyroelectric Effect controlled by means of Titanium μ-Heaters
Shomnath Bhowmick (IMM-CNR, IT); Oriella Gennari (INO-CNR, IT); Simonetta Grilli (INO-CNR, IT); Sara Coppola (INO-CNR, IT); Vito Pagliarulo (INO-CNR, IT); Veronica Vespini (INO-CNR, IT); Pietro Ferraro (CNR-INOA, IT); Gentile Gennaro (INO-CNR, IT); Pierfrancesco Cerrut (INO-CNR, IT); Cosimo Carfagna (INO-CNR, IT); Mariano Gioffre (IMM-CNR, IT); Veronica Ambrogi (INO-CNR, IT); Giuseppe Coppola (IMM-CNR, IT);
Pyroelectric effect of ferroelectric crystals has been recently employed to align carbon-based nanoparticles into long wires, embedded in different polymer matrices. In fact, it is observed that the carbon-based nano particles self-assemble along the electrical field lines, generated through spontaneous charge templates arising pyroelectrically onto ferroelectric crystals. In order to control the pyroelectric effect to assure a repeatable assembling, we fabricate a micro-heater on one side of the ferroelectric crystal surface and deposit aluminium triangular tips on the other side. Application of a short heat pulse through micro-heater produces spontaneous electron charge on the other side of ferroelectric crystal surface causing the carbon Nano particle assembling along the flow of electron charges between aluminium tips. Several simulations have been carried out to evaluate the dependence of both the micro-heater and aluminium tips shape on the pyroelectric effect.

POSTER SESSION | Thursday, 12 September, 18:30-20:00 | Gardens of the hotel la Residenza

1st EOS Topical Meeting on Optics at the Nanoscale (ONS'13)

Dicke model of graphene cavity QED
Francesco Pellegrino (Scuola Normale Superiore, IT)
The Dicke model of cavity quantum electrodynamics is approximately realized in condensed matter when the cyclotron transition of a two-dimensional electron gas is nearly resonant with a cavity photon mode. We develop the theory of graphene cavity cyclotron resonance. [ONS13_4]

Optical Characterisation of Nd123 and Gd1212 Superconductors in the Normal State: Preliminary Studies for Plasmonics and Metamaterials Fabrication
Marcello Gombos (CNR-IMM, IT); Silvia Romano (CNR-IMM, IT); Ivo Rendina (CNR, IT); Giovanni Carapella (Università degli Studi di Salerno, IT); Ciancio Regina (CNR-IOM, IT); Vito Mocella (CNR, IT)
Dissipative losses, due to poor conductivity of most used metals, strongly limit high frequencies applications of metamaterials and plasmonic structures. High temperature superconductors (HTSC) provide a possible approach to this problem, being HTSC plasmonic materials at nonzero temperature. Negative dielectric constant and variety of charge carriers (electrons or holes) are very attractive features for plasmonic applications. Characterization of HTSC optical parameters is then necessary. We performed FTIR and ellipsometry measurements on NdBa2Cu3O7-d (Nd123) and GdSr2RuCu2O8-d (Gd1212) superconductors in optical and near infrared regime. YBCO-like Nd123 presents high Tc (96K), and very interesting magnetic properties. Gd1212 is even more interesting for metamaterials use, due to the coexistence, in its elementary cell, of magnetic order (TcM ≈ 135K) and superconductivity (Tc ≈ 40K). We performed normal state measurements on Melt-Textured bulk samples, which present the best superconducting properties. Results confirm the promising features of considered materials; further analyses are in progress. [ONS13_20]

Visible-light photocurrent enhancement tuned with plasmonic resonance in Au nanoparticles/TiO2 composite films
Wen Dong (Soochow University, CN)
Au nanoparticles-loaded titanium dioxide (TiO2) photoelectrodes exhibited plasmon-enhanced photocurrent generation in the visible wavelength region. The photocurrent enhancement may result from the plasmon-assisted electron transfer reaction from Au nanoparticles to TiO2. [ONS13_29]

Organic-molecule-based single photon sources: sensing and communicating at the nanoscale
Sahrish Rizvi (LENS Università di Firenze, IT); Andrea Tabani (LENS Università di Firenze, IT); Giacomo Mazzamuto (LENS Università di Firenze, IT); Sofia Pazzagli (LENS Università di Firenze, IT); Francesco Saverio Cataliotti (LENS Università di Firenze & Dip. Energetica, Università di Firenze, IT); Costanza Toninelli (LENS Università di Firenze & CNR-INO, Sesto Fiorentino, IT)
In this work, we show the coupling of a versatile system of organic emitters to different kinds of surfaces and photonic nanostructures, such as graphene monolayers, metallic surfaces and disordered photonic structures. In particular we investigate energy-transfer mechanisms and long-range dipole-dipole interaction, mediated by photonic modes. [ONS13_34]

Directional and spectrally selective IR thermal emitters
Daniele Costantini (Institut d'Optique, FR); Jean-Paul Hugonin (Institut d'Optique, FR); Francois Marquier (Institut d'Optique, FR); Jean-Jacques Greffet (Institut d'Optique, FR)
Standard IR thermal emitters such as globars or hot membranes are quasi-isotropic and broad-band. Here, we report the design of a spectrally selective and directional IR thermal source. The design takes advantage of surface waves resonances. [ONS13_40]

Depth resolved imaging of skin lesions
Pasquale Ferrara (Istituto Nazionale di Ottica, (CNR), IT); Anna Pelagotti (Istituto Nazionale di Ottica, (CNR), IT); Leonardo Pescitelli (Istituto Nazionale di Ottica, (CNR), IT); Gianni Gerlini (Azienda Sanitaria 10 - Firenze, IT); Alessandro Piva (University of Florence, IT); Lorenzo Borgognoni (Azienda Sanitaria 10 - Firenze, IT)
A new device for early diagnosis of melanomas has been developed using a multispectral imaging system acquiring high spatial and spectral resolution images in the visible, and NIR range. The acquired images have been correlated with dermoscopic and histopathological data. Differences between healthy skin and melanoma lesions have been investigated. [ONS13_43]

Evolution of the structural, stress and optical properties of hydrogenated nanocrystalline silicon thin films fabricated by hot-wire CVD at different deposition pressures
Christopher Arendse (University of the Western Cape, ZA); Theo Muller (University of the Western Cape, ZA); Clive Oliphant (National Metrology Institute of South Africa, ZA)
We examine the correlation between the structural and optical properties of hydrogenated nanocrystalline silicon fabricated by hot-wire chemical vapour deposition at different process pressures. The films were either under compressive or tensile stress depending on the deposition time and pressure. The optical band gap and refractive index are tuneable depending on the crystalline volume fraction. The relationship between the deposition process, nanostructural properties and optical properties is discussed. [ONS13_52]

Thylakoids: electro-chemical-mechanical nano-filters for light. A numerical model
Alessandro Ronca (Sapienza Università di Roma, IT); Eugenio Fazio (Sapienza Università di Roma, IT)
Thylakoids are those biological structures of plant leaves inside which chlorophyll photosynthesis as well as ATP production take place. Thylakoids are usually engrouped into stacks behaving like optical nano-filters. According to the illumination such nano-filters varies their dimensions and consequently their performances. A numerical model is presented that simulates such light dependence according to the electro-chemical-mechanical-optical behaviours of thylakoids. [ONS13_62]

Improving Illuminant Estimation by Entropy Weighting
Zhao Hongwei (Jilin University, CN); Baoyu Zhou (Jilin University, CN); Pingping Liu (Jilin University, CN)
We propose three types of entropy to weight illuminant estimation which based on pixel, orientation and color separately. And compare our methods with others, also combine them with Color-SIFT descriptors for image matching and retrieval. Experimental results show our algorithms could correct light source and avoid object colors biased toward colors of the light source, also enhance illumination invariance. [ONS13_60]

ABOUT EOS

History

The European Optical Society (EOS) was founded in 1991. The purpose of the society is to contribute to progress in optics and related sciences, and to promote their applications at the European and international levels, by bringing together individuals and legal entities involved in these disciplines and their applications. EOS is a not for profit organisation and serves as the joint forum for all individuals, companies, organisations, educational institutions, and learned and professional societies, who recognise the opportunity and challenge that a common European base provides for the development of optics in its broadest sense. EOS organises recognized topical meetings, conferences, workshops and other events, publishes journals and is an important player on the European level. 22 national optical societies and a great number of individuals and companies are currently members of EOS (www.myeos.org).

EOS membership - Join us and...

- Be a part of the umbrella organisation of the national optical societies in Europe
- Connect with colleagues from all over Europe and beyond
- Contribute to strengthening Europe's future in optics and photonics
- Stay up-to-date about European Research Funding
- Benefit from discounts on EOS events and publications in the EOS online journal JEOS:RP
- Receive the Annual EOS Member Directory - your guide to the European optics and photonics community

Activities

- Organisation of topical meetings, workshops and conferences, and endorsement of other scientific events
- Operation of a virtual platform for the European optics and photonics community at www.myeos.org
- Focus Groups and Student Clubs (as of 2011)
- Publication of JEOS:RP, the electronic Journal of the European Optical Society - Rapid Publications (www.jeos.org)
- Bi-monthly electronic member newsletter
- Representation of the optics and photonics community on the European level (Photonics21 Technology Platform)
- Annual award of the EOS Prize

Membership modes and fees

Individual membership

Annual fee: 50 €

Individual membership through an EOS Branch

Every member of an EOS Branch is automatically an individual member of the EOS, too, with all benefits.
Annual fee: included in the Branch membership fee

Student membership

Annual fee: 10 €

Associate membership through an EOS Affiliated Society

Every member of an EOS Affiliated Society is automatically an associate member of the EOS, too, but with limited benefits.
Annual fee: included in the Affiliated Society membership fee

Upgrade for associate members

Upgrade to an individual EOS membership with full benefits.
Annual fee: 12.50 €

Corporate membership through an EOS Branch or Affiliated Society

Annual fee: 200 €

Direct corporate membership

Annual fee: 300 €

How to join?

To join the EOS as an individual, student or corporate member, please see our website at **www.myeos.org/members**.

Questions?

Please contact the EOS office at **info@myeos.org**.

JOURNAL OF
THE EUROPEAN
OPTICAL SOCIETY
RAPID PUBLICATIONS

European Optical Society

www.jeos.org
Journal of The European Optical Society Website

www.myeos.org
The European Optical Society Website

Publish your research

....with JEOS:RP

> open access journal

> rapid publication

> professional peer-review

> publicity & international readership

> listed with ISI Journal Citation Reports

> individual author support

> reasonable publication rates

Regardless the length of the articles, the regular publication rates are:

350 € for EOS members*

400 € for non-members

* Associate members are requested to upgrade to a full membership first (12.50 €/year).

JEOS:RP - the Online Journal of the European Optical Society Rapid Publications
Contact and more information:
jeos-rp@myeos.org

www.jeos.org