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Tuesday, 25 September

Room: Fleming Auditorium

08:55-09:00 **OPENING BY THE GENERAL CHAIRS**

Hervé Lefèvre	**Paul Urbach**	**John Watson**
iXBlue (FR)	*TU Delft (NL)*	*University of Aberdeen (GB)*
General Chair	Deputy General Chair	Local Chair

09:00-09:45 **OPENING TALK**
Ronan Burgess
Deputy Head of the Photonics Unit of the European Commission (BE)

09:45-10:30 **PLENARY TALK | TOM 1**
Quantitative imaging in the eye
S. Marcos; Instituto de Optica, Consejo Superior de Investigaciones Científicas (ES).
The eye is a complex and fascinating optical system. The projection of visual scenes onto the retina is achieved by the cornea and the crystalline lens. Understanding the links between the structural and optical properties of the ocular components is critical to gain insights in mechanisms such as the corneal biomechanical response, crystalline lens accommodation and pres byopia. On the other hand, many clinical conditions and treatments involve corneal reshaping or replacement of the crystal line lens by artificial intraocular lenses. I will present advances in optical imaging techniques, including optical coherent tomography, which allow us not only to obtain images of the anterior segment of the eye of high resolution and at high speed, but also to obtain quantitative information critical for predictive evaluations and treatment guidance. [5878]....Pg. 1

10:30-11:00 Coffee break

Room 18

TOM 1

11:00
Introduction by the Chairs

11:05-12:35
OPTICAL COHERENCE TOMOGRAPHY I
Session Chair: M. Leahy, National University of Ireland, Galway (IE)

11:05 **Invited talk**
Need for Speed in functional and structural in-vivo optical coherence tomography
R.A. Leitgeb; Center for Medical Physics and Biomedical Engineering, Medical University Vienna (AT).
During the last twenty years the most impressive figure of technological advancement in optical coherence tomography has certainly been speed. First time domain OCT systems operated at a few tens of depth scans per second. Within a few years this improved to a few thousand scans per second however at the expense of depth range, axial resolution, and sensitivity. Whereas for time domain OCT this marked already the maximal achievable scan rate for imaging of biological tissue, Fourier domain OCT allowed for a quantum leap in imaging speed by several orders of magnitude. This was supported by technological developments of high-speed sensors as well as light sources. In particular wavelength swept lasers boosted the speed performance during the last years. Short cavity lasers are nowadays commercially available with 100KHz A-scan rates. With the principle of Fourier domain mode locking for wavelength tuning sources even MHz A-scan rates could be achieved. [6211]
Pg. 3

NOTES

Room: Gordon B

TOM 3

11:00
Introduction by the Chairs

11:05-12:35
PHOTONIC CRYSTALS AND CAVITIES
Session Chair: K. Busch, Humboldt-Universität zu Berlin (DE) & Max-Born-Institut (DE)

11:05 **STUDENT PRESENTATION**
Comb photonic crystal waveguides
C. Caer, X. Le Roux, E. Cassan; Institut d'Electronique Fondamentale, Univ. Paris-Sud, CNRS (FR).
We introduce a novel design of wide Slot Photonic Crystal Waveguides (SPCW) by tailoring the slot into a comb. This allows performing dispersion engineering in order to achieve slow light regime. This kind of device opens perspectives to realize nonlinear operating device by providing an ultra-high optical density while easing the filling of the slot due to its width. [5974]....Pg. 5

Room: Crombie A

TOM 4

11:00
Introduction by the Chairs

11:05-12:35
MICRO OPTICAL SYSTEMS I
Session Chair: N. Lindlein, University of Erlangen Nürnberg (DE)

11:05 **Invited talk**
Optotune tunable lenses and laser speckle reducers
C.F. Graetzel, M. Aschwanden; Optotune (CH).
This talk will cover tunable lens and laser speckle technology developed at Optotune. Soft polymers are employed to create adaptive optical components for applications in fields as diverse as imaging, projection and ophthalmology. [6066]....Pg. 7

NOTES

10:30-11:00 Coffee break

Room: Crombie B

TOM 5

11:00
Introduction by the Chairs

11:05-12:35
ORGANIC PHOTONICS I
Session Chair: D.G. Lidzey, University of Sheffield (GB)

11:05 **Invited talk**

Organic Small Molecules for Photonic Applications: From Solar Cells to Micro Lasers
R. Brückner, A.A. Zakhidov, M. Sudzius, R. Scholz, S.I. Hintschich, H. Fröb, V.G. Lyssenko, K. Leo, Institut für Angewandte Photophysik, TU Dresden (DE).
In this presentation, we summarize the progress on optoelectronic devices based on organic small molecules. We discuss the recent progress in efficiency and lifetime for organic LEDs and organic solar cells. We cover in detail recent work on novel laser structures: With organic microcavities containing metallic layers a novel class of hybrid devices is investigated. The high quality and low residual absorption of these structures enables us to investigate remarkably mode structures and various coherent phenomena. [6016].....Pg. 9

Room: Gordon A

TOM 6

11:00
Introduction by the Chairs

11:05-12:35
PLASMONICS AND POLARITONS
Session Chair: N. Panoiu, UCL (GB)

11:05 **Invited talk**

Modulation and propagation of high density polariton states
M.S. Skolnick; Department of Physics and Astronomy, University of Sheffield (GB).
New physics observed in high density polariton systems in semiconductor microcavities will be described. As well as a general overview, attention will be focussed on recent work on polariton condensates in periodic potentials, and the observation of single and multiple polariton soliton phenomena, in both cases stressing the importance the highly non-linear behaviour which underlies polariton physics. [5963].....Pg. 11

Room 10

TOM 7

11:00
Introduction by the Chairs

11:05-12:35
DIGITAL HOLOGRAPHY I
Session Chair: J. Watson University of Aberdeen (GB)

11:05 **Invited talk**

Optical Measurement Technologies for the Oil and Gas Industry
D. McStay, MCSC Ltd. (GB).
The range of optical technologies that have been deployed or are being investigated for measurement applications within the oil and gas industry will be reviewed. Factors that impact on the successful adoption of optical technologies will be outlined. [6115]...Pg. 13

NOTES

Room 18

TOM 1

11:35
Inter-B-scan Phase-Resolved Optical Frequency Domain Imaging of the Retina and Choroid
B. Braaf[1], K.A. Vermeer[1], K.V. Vienola[1], J.F. de Boer[1,2]; [1]Rotterdam Ophthalmic Institute (NL), [2]VU University, Department of Physics and Astronomy (NL).
Low blood flow velocities are hard to visualize with conventional phase-resolved optical coherence tomography. In this paper this problem is solved by phasedifference calculation from B-scans instead of successive A-scans. The vascular networks of the retina and choroid are visualized in a healthy volunteer. [6193].....Pg. 15

11:50 STUDENT PRESENTATION
Imaging of laser induced temperature increase in biological tissue via phase sensitive Optical Coherence Tomography
H. Spahr[1], H. Müller[2], L. Rudolph[1], C. Hain[2], R. Birngruber[1,2], G. Hüttmann[1,2]; [1]University of Lübeck, Institute of Biomedical Optics (DE), [2]Medical Laser Center Lübeck GmbH (DE).
Phase sensitive OCT enables the measurement of thermal expansion in laser irradiated tissue. From this the spatial temperature distribution and its temporal evolution can be estimated. This is demonstrated experimentally in silicone phantoms and enucleated porcine eyes. The thermal expansion of retinal tissue during photocoagulation is compared to optoacoustically measured temperatures. [6144].....Pg. 17

NOTES

Room: Gordon B

TOM 3

11:20
Coupling photonic crystal nanocavities in optical near-field field
L. Lalouat[1], B. Cluzel[1], K. Foubert[1,2], J. Dellinger[1], E. Picard[2], E. Hadji[2], D. Peyrade[3], F. de Fornel[1]; [1]Groupe d'Optique de Champ Proche, LRC CEA n°08-36, Laboratoire Interdisciplinaire Carnot de Bourgogne, UMR CNRS n°6303-Université de Bourgogne (FR), [2]Laboratoire Silicium Nanoélectronique Photonique et Structures, INAC/SP2M/SiNaPS, CEA (FR), [3]Laboratoire des Technologies de la Microélectronique, CNRS (FR).
Combining several high quality (high Q) factor and small volume (small V) nanocavities together may open innovative ways to control the light properties at the wavelength or the subwavelength scale. [6056].....Pg. 19

11:35
Strong lateral optical confinement in vertical microcavities
F. Ding, T. Stoferle, A. Knoll, R.F. Mahrt; IBM Research Zurich (CH).
We propose that lateral photon confinement in a vertical Fabry-Perot microcavity resonator can be engineered by designing submicron-sized defects inside the cavities. The enhanced three-dimensional confinement leads to a cavity mode volume of $\sim(\lambda/n)^3$ while maintaining a quality factor of $\sim 10^5$. [5999].....Pg. 20

11:50
Metallic nanostructures on ferroelectric domain patterns in laser crystals
E. Yraola, P. Molina, M.O. Ramírez, J.L. Plaza, C. de las Heras, L.E. Bausá; Dpto. Física de Materiales and Instituto Nicolas Cabrera, Universidad Autónoma de Madrid (ES).
Alternate ferroelectric domain structures in Nd^{3+} doped and pure $LiNbO_3$:MgO crystals are used as templates for the deposition of Ag metallic nanoparticles and Au thin films, respectively. The coupling between the surface plasmons and the optical properties of the ferroelectric substrates is demonstrated by the modification of both the emission of Nd^{3+} ions in the substrate due to Ag nanoparticles, and the reflectivity of Au on the PPLN crystals. [5998].....Pg. 22

Room: Crombie A

TOM 4

11:35 STUDENT PRESENTATION
Flexible and semi-automated characterization of tunable micro-lenses with variable apertures
P. Liebetraut, P. Waibel, S. Petsch, B. Aatz, H. Zappe, University of Freiburg – IMTEK (DE).
To cope with various aperture sizes and changing focal lengths upon actuation of tunable micro-optical devices, we present an aperture-variable measurement setup for transmissive wavefront sensing and focal length evaluation. The interferometer is also equipped with a Shack-Hartmann sensor for automated closed loop sensing. [5885].....Pg.24

11:50 STUDENT PRESENTATION
Simultaneous trapping and observation optics for micro-opto-fluidic systems
N. Sabitov, A. Grewe, S. Sinzinger, Technische Universität Ilmenau, Institute für Mikro- und Nanotechnologien IMN-MacroNano® (DE).
We present an innovative optical system for optical manipulation of microparticles in a micro fluidic channel system. A specifically designed lens allows for simultaneously trapping and observation of the micro particles using digital holographic method. [6143].....Pg. 26

Room: Crombie B

TOM 5

11:35 STUDENT PRESENTATION

Nanoimprinted polymer lasers pumped by light-emitting diodes

G.A. Turnbull[1], Y. Wang[1], G. Tsiminis[1], A.L. Kanibolotsky[2], P.J. Skabara[2], I.D.W. Samuel[1], [1]Organic Semiconductor Centre, SUPA, School of Physics and Astronomy, University of St Andrews (GB), [2]WestCHEM, Department of Pure and Applied Chemistry, University of Strathclyde (GB).

We report the demonstration of the first UV-nanoimprinted organic lasers with thresholds under 1 kW/cm^2, which enable them to be pumped by a pulsed light-emitting diode. We discuss optimised photonic designs for low threshold density lasing, and present the performance of these LED-pumped lasers. [6182]

Pg. 28

11:50

Flexible organic semiconductor DFB microlaser array

B. Guilhabert[1], N. Laurand[1], A. Kanibolotsky[2], P.J. Skabara[2], M.D. Dawson[1], [1]Institute of Photonics, University of Strathclyde (GB), [2]WestCHEM, Pure & Applied Chemistry, University of Strathclyde (GB).

The fabrication of mechanically flexible organic semiconductor laser (OSL) arrays with micron-size cavity elements is presented. A disks format is used to physically define the distributed-feedback (DFB) cavities to diameters from 10 to 80μm. Single micron- 80μm in size cavity laser emission at 534nm is demonstrated with threshold of 0.4μJ (260μJ/cm2). [6124].....Pg. 30

Room: Gordon A

TOM 6

11:35

Existence and stability of soliton-plasmon bound states

C. Milián[1], D.E. Ceballos-Herrera[2], D.V. Skryabin[1], A. Ferrando[3]; [1]University of Bath, Department of Physics (GB), [2]Universdad Autónoma de Nuevo León, Departmento de ciencias Físico Matemáticas (MX), [3]Universitat de València, Departament d'Òptica (ES).

Soliton-plasmon bound states, *soliplasmons*, appear naturally as propagating eigenmodes of nonlinear Maxwell's equations for a metal/dielectric/Kerr interface. The theoretical treatment of the system predicts the properties of the stationary solutions and the dynamics, which are in good agreement with first principle numerical modeling. [6169]

Pg. 32

11:50

Anderson Localization of Surface-Plasmon Polaritons in Arrays of Metallic Nanowires

F. Ye[1], B. Malomed[2], D. Mihalache[3], N.C. Panoiu[4]; [1]Department of Physics, Shanghai Jiao Tong University (CN), [2]Department of Physical Electronics, School of Electrical Engineering, Faculty of Engineering, Tel Aviv University (IL), [3]"Horia Hulubei" National Institute for Physics and Nuclear Engineering, Department of Theoretical Physics (RO), [4]Department of Electronic and Electrical Engineering, University College London (GB).

Anderson localization is a fundamental wave phenomenon occurring in various branches of physics. It was first predicted in solid state physics, where P.W. Anderson had found that the interference from multiple scatterings of the electron by random defects changes the original infinitely extended Bloch eigenmodes into exponentially localized modes. The Anderson localization was later extended to photons, and the true Anderson localization of light has been observed in randomly distorted one- and two-dimensional optical lattices. [6142].....Pg. 34

Room 10

TOM 7

11:35

Advances in submersible digital holography

J. Watson, N. Burns, School of Engineering, University of Aberdeen (GB).

In this paper, we describe some of the developments that have been made recently in submersible digital holography. We present some work on alternative geometries for recording of non-transparent targets and describe some of the results obtained on studies of plankton, bubbles, oil droplets and non-transparent targets. We will also report on the design and development of a new in-line configuration holocamera for deepsea deployment. [6092].....Pg. 36

11:50

Non-linear optimization for the reconstruction of wavefronts from gradient data

C. Falldorf, W. Li, C. von Kopylow, R.B. Bergmann, Bremer Institut für angewandte Strahltechnik (DE).

We present an approach to reconstruct wavefronts from gradient data obtained from a shear interferometer or a Hartmann screen. It is based on an iterative non-linear optimization procedure which provides noise dependent weighting of the measured gradients. Numerical investigations prove the method to work. In the presented case, the recovered wave front is significantly improved compared to standard methods. [6101]

Pg. 38

NOTES

Room 18

TOM 1

12:05 STUDENT PRESENTATION

Optical depth dependent dispersion compensation of a 'scan-free' time domain correlator for tomographic imaging

J. Méteau, L. Froehly; Université de Franche-Comté, Institut FEMTO-ST, UMR CNRS 6174, Département d'Optique PM Duffieux (FR).

Optical depth dependent dispersion compensation is experimentally demonstrated by using a static diffraction grating in a scan free time domain optical coherence tomography system leading to a full depth axial resolution of 4 μm in air. [5840]

Pg. 40

12:20

Retinal ultrawidefield OCT imaging at 6.7 MHz using an FDML laser

T. Klein, W. Wieser, R. André, C. M. Eigenwillig, R. Huber; Lehrstuhl für BioMolekulare Optik, Fakultät für Physik, Ludwig-Maximilians-Universität München (DE).

We demonstrate multi-MHz OCT for ultrawide-field imaging in less than a second, using different 1050nm FDML lasers at a sweep rates of up to 3.35MHz. In one configuration the imaging speed is doubled by a two-spot setup to 6.7MHz. The trade off in image quality caused by the increase in speed is discussed. [5900].....Pg. 42

NOTES

Room: Gordon B

TOM 3

12:05 Invited talk

Enhanced linear and nonlinear light-matter interaction in slow light photonic crystal waveguides.

T.F. Krauss; SUPA, School of Physics & Astronomy, University of St Andrews, St Andrews (GB).

Slow light photonic crystal waveguides offer the opportunity of enhancing both linear and the nonlinear optical effects; they uniquely combine resonant enhancement with sizeable bandwidth. We exemplify this opportunity by discussing progress in modulators, nonlinear devices and ultrafast tunable optical delay lines. [6167]

Pg. 44

Room: Crombie A

TOM 4

12:05

2D Optics on Bloch Surface Waves (BSWs) Based Platform: Polymer Lens and Prism

L. Yu, V. Paeder, T. Sfez, E. Logean, H.P. Herzig, Optics &Photonics Technology Laboratory (OPT), École Polytechnique Fédérale de Lausanne (EPFL) (CH).

In this work, we use a novel platform concept based on Bloch Surface Waves (BSWs) and manipulate the BSWs propagation with two-dimensional (2D) dielectric patterns deposited on it. The concept opens a way to realize 2D integrated all-optics systems including sensing functionalities. [6155].....Pg. 46

12:20

Dual Mode Indoor Optical Wireless Data Link Design using Micro-Optics For Robust Energy Efficient Operations

P.J. Marraccini[1], N.A. Riza[1,2], [1]University College Cork, Dept. Electrical and Electronic Engineering (IE), [2]University College Cork, Tyndall National Institute (IE).

Presented is a microoptics-based novel design power smart dual-mode optical transmitter that can operate simultaneously in the Line-of-Sight (LOS) mode and the Diffuse (DF) Mode or switch between the two modes. The power-data rate flexible design allows high data rates through the LOS mode along with robustness to blocking via DF mode. [5888].....Pg. 49

12:35-14:00 Lunch break (exhibition hall, Boyd Orr Suite)

Room: Crombie B	Room: Gordon A	Room 10	
TOM 5	TOM 6	TOM 7	NOTES
12:05 STUDENT PRESENTATION **Lasing from full polymer microcavity** *G. Canazza[1], M. Zavelani Rossi[2], F. Scotognella[2], G Lanzani[3], D. Comoretto[1], [1]Università di Genova, Dipartimento di Chimica e Chimica Industriale (IT), [2]Politecnico of Milano, Dipartimento di Fisica (IT), [3]Center for Nano Science and Technology (CNST), Istituto Italiano di Tecnologia (IIT) (IT).* We present a full polymer microcavity, composed by distributed Bragg reflectors made of alternating layers of cellulose acetate and polyvinylcarbazole, with an organic active material (F8BT) inside. Upon optical pumping we find laser emission, with low threshold, demonstrating a full plastic organic device. [5969].....Pg. 51	12:05 **Toward low power plasmon-soliton in planar nonlinear structures** *W. Walasik[1,2], Y. Kartashov[2], G. Renversez[1]; [1]Institut Fresnel, UMR CNRS, Université d'Aix-Marseille (FR), [2]ICFO, Universitat Politècnica de Catalunya (ES).* We study the propagation of nonlinear waves in Kerr nonlinear dielectric/dielectric/metal planar structures. We develop both 1D and 2D nonlinear vector models to design realistic configurations supporting low peak power (≈ 1GW/cm²) plasmon-solitons. Suchstructures are compatible with current chalcogenide waveguide technology. [5895].....Pg. 55	12:05 **Comparison the techniques of finding a best focusing plane of particle image reconstructed from digital hologram** *V.V. Dyomin, D.V. Kamenev, Tomsk State University, Radiophysics Department (RU).* To characterize the environments around the objects of the energy and production industries as well as to control some technological processes, various particles size, shape, location are to be measured, trajectory of particles movements (aerosols, plankton species, etc.) and their behavioral response should be controlled. So the particle coordinate precise measurement is very important. Comparison the techniques for the particle longitudinal coordinate measuring from digital hologram is presented. The coordinate evaluation is based on the finding the best focusing plane location of particle holographic image. Most precise methods are chosen by numerical calculation and experimentally. [5959].....Pg. 59	
12:20 **Investigation of the operational stability of amplifying poly (9,9-dioctylfluorene) active waveguide operating in air** *M. Anni, Dipartimento di Matematica e Fisica "Ennio de Giorgi", Università del Salento (IT).* The Amplified Spontaneous Emission (ASE) intensity decrease during pumping is investigated in amplifying poly (9,9-dioctylfluorene) active waveguide operating in air. The role of the active layer thickness and of the excitation density is discussed as well as the origin of the ASE quenching. [6052] Pg. 53	12:20 Post deadline submission **Observation of single and multiple vortex soliton states in vertical-cavity surface-emitting lasers with feedback** *J. Jimenez, Y. Noblet, T. Ackemann; SUPA and Department of Physics, University of Strathclyde (GB).* We observe the spontaneous formation of single and multiple vortex solitons in a self-focusing dissipative system, a broad-area vertical-cavity surface-emitting laser (VCSEL) with frequency-selective feedback by a volume Bragg grating. They are bistable and the transitions between different soliton structures are analyzed. [6436].....Pg. 57	12:20 STUDENT PRESENTATION **Comparative digital holographic microscope for wear detection at micro deep drawing tools** *S. Huferath-von Luepke, U. Zuch, P. Huke, C. von Kopylow, R. B. Bergmann, Bremer Institut für angewandte Strahltechnik - BIAS GmbH (DE).* We developed a holographic microscope to record wear on micro deep drawing tools using comparative digital holography. This setup is suitable for restricted access to the tools within a micro deep drawing machine. [5925].....Pg. 61	

12:35-14:00 Lunch break (exhibition hall, Boyd Orr Suite)

Room 18

TOM 1

14:00-16:00
OPTICAL COHERENCE TOMOGRAPHY II
Session Chair: J. de Boer, VU University (NL)

14:00 Invited talk
Microcirculation Imaging – Where Next?
M. Leahy, National University of Ireland, Galway (IE).
Our hospitals are dominated by the use of non-light microscopy for imaging of tissues and the macrocirculation. In general these technologies serve a small percentage of the world's seven billion inhabitants very well, but even in well developed countries, this approach to medical imaging cannot serve the future needs of society. Meanwhile, living longer has exacerbated the challenges of diabetes and cancer, which have their origins and clinical manifestation in the microcirculation. Physics has delivered extraordinary advances in almost every facet of modern life. Photonics promises to bring healthcare to the next level, as it is the only means to see cells and molecules in small, accessible, low cost and safe imaging systems. Recently high resolution label-free imaging of the microcirculation at clinically relevant depths and has become available in research labs. New imaging systems based e.g. on optical coherence tomography and photoacoustic microscopy take some hours to process 3D images of the microcirculation and often the images require significant 'touch-up'. [6290].....Pg. 63

14:30
Assessment of retinal nerve fiber layer attenuation coefficients from OCT data
K.A. Vermeer[1A], J. van der Schoot[1A,B], H.G. Lemij[1B], J.F. de Boer[1A,2]; [A]Rotterdam Ophthalmic Institute, [B]Glaucoma Service, [1]Rotterdam Eye Hospital (NL), [2]VU University Amsterdam (NL).
Recently, a method to derive the attenuation coefficient of the retinal nerve fiber layer from ophthalmic OCT images has been introduced, using the retinal pigment epithelium as a reference layer. We illustrate the strength of this method by showing that the attenuation coefficient is not affected by common OCT imaging artefacts. [6192].....Pg. 64

NOTES

Room: Gordon B

TOM 3

14:00-16:00
NANOPHOTONIC APPLICATIONS I
Session Chair: T.F. Krauss, University of St. Andrews (GB)

14:00
Nano-Lensing in Photothermal Single Particle Microscopy
M. Selmke, M. Braun, F. Cichos; University of Leipzig, Exp. Physics I, Molecular Nanophotonics (DE).
A novel theoretical and conceptual framework is presented for the quantitative and qualitative evaluation of single particle photothermal microscopy experiments. A rigorous modeling in the generalized Lorenz-Mie theory with a multilayered scatterer reveals a simple lensing mechanism. [5907].....Pg. 66

14:15 STUDENT PRESENTATION
Gold nanostructure assisted thermophoretic trapping of single nano-objects
M. Braun, F. Cichos; Universität Leipzig, Faculty of Physics and Earth Sciences, Institute for Experimental Physics I (DE).
We present a new technique that allows for the trapping of single or even multiple nano-objects by exploiting laser-controlled localized temperature fields. [5910].....Pg. 68

14:30
Optical and Thermal Characterization of Nanostructures by Photothermal Techniques
R. Li Voti, G.L. Leahu, M. Larciprete, C. Sibilia, M. Bertolotti; Dipartimento di Scienze di Base ed Applicate all'Ingegneria, Sapienza Università di Roma (IT).
Heat transport at nanoscale is of importance for many nanotechnology applications. The request to reduce the size of electronic devices and integrated micro/nano-electro-mechanical systems provides the main driving force behind the scientific research and technological advancement in nanotechnology. It is now widely accepted that the thermal management in nanosize devices becomes fundamental as the size of the device reduces. Thermal conduction in nanostructures plays a critical role in controlling the performances and stability of nanodevices. [6023].....Pg. 70

Room: Crombie A

TOM 4

14:00-16:00
MICRO OPTICAL SYSTEMS II
Session Chair: U.D. Zeitner, Fraunhofer IOF (DE)

14:00
Investigating reflow and wetting of non-circular nano-pillars to study nano-scale solid immersion lens fabrication
M.S. Kim[1], G. Osowecki[1], T. Scharf[1], E. Keeler[2], S. Rydberg[2]; W. Nakagawa[2], H.P.Herzig[1], [1]Optics & Photonics Technology Laboratory, Ecole Polytechnique Fédérale de Lausanne (EPFL) (CH), [2]Electrical and Computer Engineering Department, Montana State University (US).
We investigate the reflow and wetting phenomena of non-circular, *e.g.*, triangular and square, shaped nano-pillars of PMMA to fabricate nano-scale solid immersion lenses (SILs). Electron beam lithography (EBL) and thermal reflow are the core of the fabrication process. For the optical characterization at λ = 642 nm, nano-SILs are replicated on a transparent substrate by soft lithography. The focal spots produced by the nano-SILs show both spot-size reduction and peak-intensity enhancement, which are consistent with the immersion effect. [5996].....Pg. 71

14:15
Optical tweezers assembly line for the micro-assembly of complex zeolite nanocontainer structures
M. Woerdemann[1], M.Veiga-Gutiérrez[2], Á. Barosso[1], L. De Cola[2], C. Denz[1], [1]Institute of Applied Physics, [2]Physics Institute and Center for Nanotechnology (CeNTech), Westfälische Wilhelms-Universität Münster (DE).
An optical tweezers assembly line is presented that combines the versatile optical micromanipulation capabilities of holographic optical tweezers with a microfluidic plat-form in order to construct complex 2D and 3D assemblies of nanocontainers as e.g. zeolite L with photonic functionalities. [5971].....Pg. 73

Room: Crombie B

TOM 5

14:00-16:00
ORGANIC PHOTONICS II
Session Chair: R. Brückner, Institut für Angewandte Photophysik - IAPP (DE)

14:00 **Invited talk**
Intensity fluctuations of Bose-Einstein-condensed light in a dye microcavity
J. Klaers, University of Bonn, Institute for Applied Physics (DE).
In recent work, we have observed Bose-Einstein condensation of a two-dimensional photon gas in an optical microcavity. Here, the transversal motional degrees of freedom of the photons are thermally coupled to the cavity environment by multiple absorption-fluorescence cycles in a dye medium, with the latter serving both as a heat bath and a particle reservoir. Due to particle exchange between the photon gas and the dye molecules, grandcanonical experimental conditions are expected to be realized in this system. Under these conditions, a regime with strong fluctuations of the condensate number (fluctuation catastrophe) is theoretically expected, that is not observed in present atomic BEC experiments. I will give an update on our theoretical and experimental work. [6110].....Pg. 75

14:30
Control of laser characteristics in small-molecule organic dielectric microcavities
M. Sudzius, R. Brückner, M. Langner, C. Reinhardt, S.I. Hintschich, V.G. Lyssenko, H. Fröb, K. Leo, Institut für Angewandte Photophysik, Technische Universität Dresden (DE).
We report on the control of the spatial, temporal, and spectral characteristics of low threshold room-temperature organic dielectric microcavity lasers. A major impact on their emission properties is achieved by mechanical (fixed) or optical (dynamic) patterning of the organic cavity layer, made of Alq_3:DCM. [6012].....Pg. 77

Room: Gordon A

TOM 6

14:00-16:00
NONLINEAR LASER DYNAMICS
Session Chair: M. Sciamanna, SUPELEC (FR)

14:00 **Invited talk**
Mode-locked semiconductor with optical injection
G. Huyet, T. Habruseva, N. Rebrova, S. Hegarty; Tyndall National Institute, Cork, Ireland and Centre for Advanced Photonics and Process Analysis, Cork Institute of Technology (IE).
In this work, monolithic passively mode-locked lasers, based on InAs/GaAs quantum dot material, are studied and stabilised by means of external optical injection.
We demonstrate that optical injection can improve the properties of mode-locked lasers in terms of the time-bandwidth product, noise and pulse stability. Finally, a cascade of quantum dot mode-locked lasers is utilised in order to (i) clone coherence and performance characteristics of the master source and (ii) to obtain high quality wider frequency combs resulting in pulses of short duration. [6588].....Pg. 79

14:30
Passive mode locking of clockwise and counterclockwise emission directions in a ring semiconductor laser
A. Tierno, F. Gustave, S. Barland; Université de Nice Sophia Antipolis-CNRS, INLN - UMR7335 (FR).
We experimentally demonstrate passive mode locked operation in a macroscopic semiconductor ring laser. Due to its time constants and possibility of unidirectional operation, the system could be used for the generation of temporal cavity solitons. [5912].....Pg. 80

Room 10

TOM 7

14:00-16:00
SPECTROSCOPIC APPLICATIONS
Session Chair: O. Zielinski Carl von Ossietzky Universität Oldenburg (DE)

14:00
Multi-species and multi-parameter gas sensing using Multi-Mode Absorption Spectroscopy, MUMAS
M. Hamilton, H. Northern, A. Thompson, P. Ewart, Oxford University, Physics Department (GB).
A new method of absorption spectroscopy is introduced providing high spectral resolution and wide spectral coverage using a single multi-mode laser and a single detector. Simultaneous measurement of concentration of multiple species, CO, CO_2, N_2O and C_2H_2, together with temperature, and pressure is demonstrated. [5868].....Pg. 82

14:15 **STUDENT PRESENTATION**
Simultaneous detection of sulfates, nitrates and phosphates diluted in water by Raman Spectroscopy
K. Ben Mabrouk[1], T. Kauffmann[1], M. Marchetti[2], M. D. Fontana[1], [1]Laboratoire Matériaux Optiques, Photonique et Systèmes, Université de Lorraine et Supélec (FR), [2]Laboratoire Régional des Ponts et Chaussées de Nancy (FR).
The method of simultaneous detection of nitrates, sulfates and phosphates by Raman probe was proposed. The content of each pollutant was determined from an appropriate calibration. For nitrates, the detection limit was found to be 40ppm. [5873] Pg. 84

14:30
Optical Raman probe of chlorine determination in waste water
T. Kauffmann, K. Ben Mabrouk, M.D. Fontana, Laboratoire Matériaux Optiques, Photonique et Systèmes Université de Lorraine and Supélec (FR).
We propose to detect by Raman spectrometry the presence of chlorid anion in mixtures of salted solutions. Here is shown how Cl- influence the OH stretching band of the water spectrum and how its concentration is determined using chemometrics methods applied on Raman spectra recorded on mixtures in few seconds. [5845].....Pg. 86

NOTES

Room 18

TOM 1

14:45
Investigation of human cone outer segment renewal using SLO/OCT
M. Pircher[1], J.-S. Kroisamer[2], F. Felberer[1], U. Schmidt-Erfurth[2], C.K. Hitzenberger; [1]Center for Medical Physics and Biomedical Engineering, Medical University Vienna (AT); [2]Department of Ophthalmology, Medical University Vienna (AT).
The aim of this study was to investigate the ability of SLO/OCT to detect temporal changes of cone photoreceptors caused by outer segment renewal. Measurements on healthy volunteers showed changes in the cone outer segment lengths as well as changes in the backscattered intensity from the junction between inner and outer segments (IS/OS) and end tips of cone photoreceptors (ETPR). Moreover cracks or defects within the packing arrangement of the outer segment discs give rise to an OCT signal that can be tracked over time and can be used to estimate the renewal rate. [6180].....Pg. 88

15:00
Ophthalmic MHz OCT imaging of the anterior segment using a dispersion compensated FDML laser
W. Wieser[1], T. Klein[1], D.C. Adler[2], F. Trépanier[3], C.M. Eigenwillig[1], S. Karpf[1], J.M. Schmitt[2], R. Huber[1]; [1]Lehrstuhl für BioMolekulare Optik, Fakultät für Physik, Ludwig-Maximilians-Universität München (DE), [2]LightLab Imaging, a St. Jude Medical subsidiary (US), [3]TeraXion Inc. (CA).
We demonstrate MHz OCT at a wavelength of 1300nm for imaging the anterior segment of the human eye. Using a dispersion compensation element inside an FDML laser enables the required long coherence length. Performance, problems and advantages of ophthalmic MHz OCT of the anterior segment are discussed. [6054].....Pg. 90

NOTES

Room: Gordon B

TOM 3

14:45
Magnetic response of silicon nanoparticles in the visible spectral range
A.I. Kuznetsov[1], A.E. Miroshnichenko[2], Y.H. Fu[1], B. Luk'yanchuk[1]; [1]Data Storage Institute (SG), [2]Nonlinear Physics Centre, CUDOS, Australian National University (AU).
We experimentally demonstrate that silicon nanoparticles of different shapes and sizes exhibit strong magnetic dipole response in optical range, which can be continuously tuned throughout the whole visible spectra. It opens up new perspectives for fabrication of low-loss optical metamaterials. [5901].....Pg. 92

15:00 STUDENT PRESENTATION
Resonance quality, radiative/ohmic losses and modal volume of Mie plasmons
S. Derom[1], R. Vincent[2], G. Colas des Francs[1]; [1]Université de Bourgogne, Laboratoire Interdisciplinaire Carnot de Bourgogne (FR), [2]Université Technologique de Troyes, Institut Charles Delaunay (FR)
In this talk, we evaluate the mode volume and the quality factor associated to each of the localised plasmon modes supported by a spherical metallic particle (Mie plasmons). The coupling mechanisms and the implications for the design of nanosources are discussed. [6189].....Pg. 94

Room: Crombie A

TOM 4

14:30
Holographic manipulation of absorbing particles in air using arrays of optical bottle beams
C. Alpmann, M. Esseling, P. Rose, C. Denz, Institut für Angewandte Physik and Center for Nonlinear Science (CeNoS), Westfälische Wilhelms-Universität Münster (DE).
The combination of established techniques of holographic optical trapping with hollow intensity distributions in order to manipulate absorbing particles allows for the dynamic manipulation of absorbing particles along arbitrary paths. Its versatility is demonstrated by the simultaneous and dynamic trapping of multiple particles. [5939].....Pg. 96

Room: Crombie B	Room: Gordon A	Room 10	
TOM 5	TOM 6	TOM 7	NOTES
14:45 STUDENT PRESENTATION **3-D investigation of 2-D organic microlaser emission: Shedding light on the edge effect** *C. Lafargue[1], S. Lozenko[1], C. Ulysse[2], C. Cluzel[3], J. Zyss[1], and M. Lebental[1], [1]Laboratoire de Photonique Quantique et Moléculaire, Ecole Normale Supérieure de Cachan (FR), [2]Laboratoire de Photonique et de Nanostructures (FR), [3]Laboratoire de Mécanique et de Technologie, Ecole Normale Supérieure de Cachan (FR).* Organic microlasers are used to investigate diffraction effects in the context of laser light emission. Out-coupled light is an accessible physical property to investigate the field state inside the cavity. We designed a mechanical setup capable to accurately detect their three-dimensional emission pattern. [6018].....Pg. 98	14:45 **Narrow Pulses and Square-Wave emission in a Vertical Cavity Surface Emitting Laser using polarisation degree of freedom** *M. Marconi, S. Barland, M. Giudici; Institut Non-Linéaire de Nice (FR).* We experimentally describe the polarisation dynamics in a single-transverse mode Vertical Cavity Surface-Emitting Laser (VCSEL) submitted both to polarisation-selective optical feedback and crossed polarisation reinjection (XPR). Depending on parameters, the VCSEL may emit narrow pulses or a regular square-wave signal. [6006] Pg. 102	14:45 STUDENT PRESENTATION **In-situ detection and characterization of polycyclic aromatic hydrocarbons (PAHs) in coastal and marine waters using spectrometric methods** *R. Ungermann[1,2,3], P. Rohde[2], D. Meier[1], D. Voß[1], O. Zielinski[1], [1]Institute for Chemistry and Biology of the Marine Environment, University of Oldenburg (DE), [2]University of Applied Sciences Bremerhaven (DE), [3]Max Planck Research Group for Marine Geochemistry (DE).* The pollution with oil and therein contained polycyclic aromatic hydrocarbons (PAHs) presents a serious threat for marine ecosystems and human health. We present the setup and results of two in-situ PAH optical sensing systems, based on time-resolved fluorescence and liquid core fiber optical technology. Furthermore, first approaches of a detection system for dissolved PAHs from bilge waters are presented. [6130].....Pg. 106	
15:00 STUDENT PRESENTATION **Flexible Polyimide-based Nanocomposite Laser** *C. Foucher[1], B. Guilhabert[1], A. Kanibolotsky[2], P.J. Skabara[2], N. Laurand[1], M.D. Dawson[1], [1]Institute of Photonics, University of Strathclyde (GB), [2]WestCHEM, Pure and Applied Chemistry Department, University of Strathclyde (GB).* A mechanically-flexible organic distributed feedback (DFB) laser based on the original combination of a polyimide material and organic nanoemitters is reported. The device demonstrates a 3.9-fold improvement in operation lifetime under ambient conditions compared to the equivalent laser made with pure organic emitters. [5860].....Pg. 100	15:00 **Analysis of birefringence controlled ultrafast polarization oscillations in spin vertical-cavity surface-emitting lasers** *M.Y. Li[1], T. Ackemann[2], N.C. Gerhardt[1], M.R. Hofmann[1]; [1]Photonics and Terahertz Technology, Ruhr-University Bochum (DE), [2]SUPA and Department of Physics, University of Strathclyde (GB).* Ultrafast oscillations of the circular polarization state are found in electrically pumped VCSELs perturbed by circularly polarized ps pulses paving the path towards ultrafast spin VCSELs. Several aspects of the dynamics are analysed theoretically and compared to experiments. [6164].....Pg. 104	15:00 STUDENT PRESENTATION **Adaptive Confocal approach to hyperspectral imaging** *A. Grewe, M. Hillenbrand, S. Sinzinger, TU Ilmenau, IMN MacroNano® (DE).* We discuss new concepts for hyperspectral imaging based on adaptive chromatic confocal sensors. Design, fabrication and characterization of a sensor system utilizing diffractive and/or refractive Alvarez phase plates are presented. [6081] Pg. 108	

Room 18

TOM 1

15:15
Efficient reconstruction for holoscopy
G. Hüttmann[1,2], D. Hillmann[2,3], G. Franke[1], C. Lührs[3], T. Claußen[1], P. Koch[3]; [1]University of Lübeck, Institute of Biomedical Optics (DE), [2]Medical Laser Center Lübeck GmbH (DE), [3]Thorlabs GmbH (DE).
The imaging speed of optical coherence tomography (OCT) is ultimately limited by the number of photons which can be collected in a given time. Holoscopy which combines Fourier domain full-field OCT (FD-FF-Oct) with digital holography optimizes the photon throughput by detecting photons from all depth of a 3-dimensional volume irrespectively of the numerical aperture. An efficient single-step reconstruction algorithm is presented which uses Fourier transforms on none-equidistantly sampled data. Volumetric images of biological tissues with 4-15 times increased speed. [6166]
Pg. 110

15:30 STUDENT PRESENTATION
Nanostructured Functionalized Silk as an Useful Biocompatible Material for Photonic Applications
S. Cavallini[1], S. Toffanin[1], M. Natali[1], S. Kim[2], V. Benfenati[2], R. Zamboni[2], D. Kaplan[3], F. Omenetto[2,3], M. Muccini[1,5]; [1]Istituto per lo Studio dei Materiali Nanostrutturati (ISMN-Bo), Consiglio Nazionale delle Ricerche (IT), [2]Department of Physics (US), [3]Department of Biomedical Engineering (US), [4]Istituto per la Sintesi Organica e la Fotoreattività, Consiglio Nazionale delle Ricerche (IT), [5]E.T.C. srl (IT).
Silk is a natural protein fiber that has recently emerged as a sustainable material for realizing optical, photonics and optoelectronic devices. We report lasing from functionalized silk in planar nanostructured lattice for biophotonic applications. [6132]
Pg. 112

16:00-16:30 Coffee break (exhibition hall, Boyd Orr Suite)

NOTES

Room: Gordon B

TOM 3

15:15
Photon nudging of self propelled Janus Particles
A. Bregulla[1], H. Yang[2], F. Cichos[1]; [1]University of Leipzig, Experimental Physics Department (DE), [2]Princeton University, Department of Chemistry (US).
We have developed a novel optical method to control the motion of single and multiple self propelled particles actively and independently. The method allows the trapping of single particles as well as their guided motion along pathways. It is based on a stochastic feedback and required a very low amount of energy input. [5983].....Pg. 114

15:30 Invited talk
Smart Nanoplasmonics for Chemistry and Biology
L. Na Liu; Department of Electrical & Computer Engineering, Rice University (US).
In this talk, I will present how to utilize smart nanoplasmonics for answering catalytic chemistry questions and constructing 3D nanostructures that exhibit intriguing plasmonic chirality.
I will first demonstrate antenna-enhanced hydrogen sensing at the single-particle level[1].
We place a single palladium nanoparticle near the tip region of a gold nanoantenna and detect the changing optical properties of the system upon hydrogen exposure. Antenna-enhanced single-particle sensing pushes the sensitivity of plasmonic gas sensors to an ultimate limit and opens up myriad possibilities for detecting optically inactive species in a controlled fashion. The single-particle sensing strategy will have profound significance for the optical observation of chemical reactions and catalytic activities on a single platform in nanoreactors, and has the potential to be extended to biochemical systems in the future. Moreover, antenna-enhanced sensing comprises a noninvasive and generalizable scheme that is applicable to a variety of physical and biochemical materials. [6284]
Pg. 116

Room: Crombie A

TOM 4

15:15 STUDENT PRESENTATION
Enhancing the electro-optic response in mid-infrared integrated beam combiners using photonic crystals
S. Heidmann[1], G. Ulliac[2], N. Courjal[2] and G. Martin[1], [1]Institut de Planétologie et d'Astrophysique de Grenoble (IPAG) (FR), [2]FEMTO-ST, Université de Franche-Comté (FR).
We present theoretical and experimental results on photonic crystals on $LiNbO_3$ waveguides and junctions developed for mid-infrared interferometry, showing that is possible to achieve high optical delays in micrometric devices, with low modulation voltages, due to group velocity reduction. [5894].....Pg. 117

15:30 STUDENT PRESENTATION
Optical security device for document protection using plasmon resonant transmission through a thin corrugated metallic film embedded on a plastic foil
J. Sauvage-Vincent[1, 2], Y. Jourlin[2], S. Tonchev[2], C. Veillas[2], Valéry Petiton[1], [1]Hologram.Industries (FR), [2]Laboratoire Hubert Curien (FR)
This paper will present an industrial application of the plasmon excitation for the document protection in a see through component. The use of a new kind of see-through effect based on the excitation of a Long Range Plasmon Mode has been prototyped in a compatible embodiment with security foil production processes. [6078].....Pg. 119

Room: Crombie B

TOM 5

15:15 STUDENT PRESENTATION
Continuously Tunable Solution-Processed Organic Distributed Feedback (DFB) Lasers by Horizontal Dipping
X.Liu[1,2], S. Klinkhammer[1,2], K. Huska[1], T. Mappes[2], U. Lemmer[1], [1]Light Technology Institute (LTI), Karlsruhe Institute of Technology (KIT) (DE), [2]Institute of Microstructure Technology (IMT), Karlsruhe Institute of Technology (KIT) (DE).
The fabrication and characterization of continuously tunable, solution-processed DFB lasers in the visible regime is reported. Continuous thin film thickness gradients were achieved by means of horizontal dipping of several conjugated polymer and small molecule solutions on large-scale surface gratings with different periods. [5858].....Pg. 121

15:30 STUDENT PRESENTATION
Control of Light Emission from Organic Light-Emitting Diodes by Photonic Microstructure
S. Zhang, G.A. Turnbull, I.D.W. Samuel; Organic Semiconductor Centre, School of Physics and Astronomy, University of St Andrews (GB).
Normally the emission pattern of organic light-emitting diodes (OLEDs) is close to Lambertian. We reportan approach to developovel OLEDs with directional emission. Wavelength-scale photonic microstructure wasapplied in narrow linewidth OLEDs,enablinglight to be directed in particular directions. [5864].....Pg. 123

15:45 STUDENT PRESENTATION
Ultrafast polariton relaxation dynamics in a strongly coupled J-aggregate microcavity
T. Virgili[1], D. Coles[2], A.M. Adawi[2], C. Clark[3], P. Michetti[4], S.K. Rajendran[1], D. Brida[1], D. Polli[1], G. Cerullo[1], D.G. Lidzey[2], [1]IFN, CNR Dipartimento di Fisica, Politecnico di Milano (IT), [2]Department of Physics and Astronomy, University of Sheffield (GB), [3]Helia Photonics Ltd. Rosebank Park (GB), [4]Institute of Theoretical Physics and Astrophysics, University of Würzburg (DE).
Using broadband visible 15-fs time duration pump & probe pulses, ultrafast relaxation dynamics of the upper(UP) and lower(LP) polariton states, and the role of the uncoupled exciton reservoir (ER), in a strongly coupled J-aggregate microcavity are studied at different angles of excitation and detection. [6063] Pg. 125

Room: Gordon A

TOM 6

15:15 STUDENT PRESENTATION
Optimal Operating Regime for Digital Optical Chaos Communications
S. Priyadarshi, Y. Hong, I. Pierce, K.A. Shore; School of Electronic Engineering, Bangor University (GB).
The aim of this work is to identify the optimum operating regime for digital transmission in a laser-diode based chaotic communications system. Ideal operating conditions, identified using the laser bias current as the control parameter, are found for 2GB/s message transmission and a modulation depth of about 2%. [6073].....Pg. 127

15:30 STUDENT PRESENTATION
Real-time Intensity and Frequency Dynamics of Semiconductor Lasers subject to Delayed Optical Feedback
X. Porte, D. Brunner, M.C. Soriano, I. Fischer; Inst. de Física Interdisciplinar y Sistemas Complejos, IFISC (UIB-CSIC), Campus Universitat de les Illes Balears (ES).
The destabilized emission of semiconductor lasers due to delayed optical feedback is characterized by simultaneously detecting intensity and frequency dynamics with high temporal and spectral resolution. Temporal information about frequency dynamics is extracted utilizing a heterodyne technique combined with a sliding Fourier Transformation. Our experiments provide new perspectives for the analysis, interpretation and utilization of complex laser dynamics. [6038] Pg. 129

15:45 STUDENT PRESENTATION
Nonlinear time-series analysis of low-frequency fluctuations in semiconductor lasers with optical feedback
A. Aragoneses[1], N. Rubido[2], T. Sorrentino[1], J. Tiana Alsina[1], M.C. Torrent[1], C. Masoller[1]; [1]Dept. de Física i Enginyeria Nuclear, Universitat Politecnica de Catalunya (ES), [2]School of Natural and Computing Sciences, University of Aberdeen, King's College (GB).
We study experimentally the dynamics of a semiconductor laser with optical feedback in the regime of low-frequency fluctuations. We show that ordinal analysis yields light into the underlying structure of the laser intensity dropouts and distinguishes signatures of determinism and stochasticity in the sequence of consecutive dropout events. [5924].....Pg. 131

Room 10

TOM 7

15:15
Laser-induced breakdown spectroscopy in turbulent combustion
J. Kiefer[1,2], Z.S. Li[3], M. Alden[3], [1]University of Aberdeen, School of Engineering (GB), [2]University of Erlangen-Nuremberg, Erlangen Graduate School in Advanced Optical Technologies (DE), [3]Lund University, Combustion Physics (SE).
A new approach for studying mixing and combustion phenomena in turbulent partially premixed flames using laser-induced breakdown spectroscopy (LIBS) is demonstrated. Beyond a composition analysis, statistical data are obtained concerning the probability to find cold or hot gas inside the measurements volume. [6139].....Pg. 134

NOTES

16:00-16:30 Coffee break (exhibition hall, Boyd Orr Suite)

Room 18

TOM 1

16:30-17:45
OPTICAL TRAPPING AND FORCES
Session Chair: F. Gunn-Moore, St. Andrews University (GB)

16:30
Holographic dumbbell: stability and force measurement
F. Marsà, A. Farré, M. Montes-Usategui, E. Martín-Badosa; Optical Trapping Lab - Grup de Biofotònica, Dept. de Física Aplicada i Òptica, Universitat de Barcelona (ES).
We present a dual-trap system which combines the versatility of holographic optical tweezers for sample manipulation and the possibility of precisely measuring the exerted force. We also demonstrate the superior stability of our dumbbell compared to commonly used systems. [5843]
Pg. 136

16:45 STUDENT PRESENTATION
Optical force measurements in living A549 cells
J. Mas, A. Farre, E. Martin-Badosa, M. Montes-Usategui; Optical Trapping Lab – Grup de Biofotonica. Dept. Fisica Aplicada i Optica, Universitat de Barcelona (ES).
Optical tweezers have proven to be a useful tool for trapping cell organelles *in vivo*. However, force measurements in such environments have not been fully exploited due the complexity of the trap calibration. Here we show *in vivo* force measurements obtained via light momentum changes in single-beam optical tweezers. [5948].....Pg. 138

NOTES

Room: Gordon B

TOM 3

16:30-18:30
NANOPHOTONICS APPLICATIONS II
Session Chair: L. Na Liu, Rice University (US)

16:30 Post deadline submission
Far-field diffraction pattern of a single circular aperture
J.-M. Yi[1], A. Cuche[1], F. de León-Pérez[2,3], A. Degiron[1], E. Laux[1], E. Devaux[1], C. Genet[1], J. Alegret[3], L. Martín-Moreno[3], T.W. Ebbesen[1]; [1]ISIS & icFRC, University of Strasbourg and CNRS (FR), [2]Centro Universitario de la Defensa de Zaragoza (ES), [3]Instituto de Ciencia de Materiales de Aragón and Departamento de Física de la Materia Condensada, CSIC-Universidad de Zaragoza (ES).
The far-field diffraction pattern of a single circular aperture is investigated both experimentally and theoretically. Authors study the transition between the well-known pseudo-scalar regime of large holes and the less-known vectorial regime of sub-wavelength ones. [6420]
Pg. 140

16:45
Analysis of hybrid dielectric-plasmonic slot waveguide structures with 3D Fourier Modal Methods
J. Čtyroký[1], P. Kwiecien[2], I. Richter[2]; [1]Institute of Photonics and Electronics AS CR, v.v.i. (CZ), [2]Faculty of Nuclear Sciences and Physical Engineering, Czech Technical University in Prague (CZ).
Properties of hybrid dielectric-plasmonic slot waveguide structures have been numerically analyzed using our in-house 3D Fourier Modal Methods. Results confirm that these waveguides combine strong field confinement with moderate propagation lengths and represent thus very promising building blocks for plasmonic devices. [6170]....Pg. 142

Room: Crombie A

TOM 4

16:30-18:30
DIFFRACTIVE OPTICAL ELEMENTS
Session Chair: M.R. Taghizadeh, Heriot-Watt University (GB)

16:30 Invited talk
From N^3 to N: pushing through the border between scalar and exact modeling methods
A.V. Tishchenko, O. Parriaux; H. Curien Laboratory UMR CNRS 5516, Lyon University at Saint-Etienne (FR).
Formulating diffraction/scattering problems from the standpoint of general sources opens an algorithmic path where powerful ultra-fast numerical schemes can extensively be used for the exact modeling of unusually large sections of optical systems which have so far been only accessible by scalar methods. Breaking through the N^3 time and N^2 memory barriers to a linear dependence will have an impact in DUV and EUV lithography, in possibly non-periodic large-NA DOEs as well as in light trapping/extracting scattering layers. [6206].....Pg. 144

Room: Crombie B

TOM 5

16:30-18:00
ORGANIC SOLAR CELLS I
Session Chair: M. Anni, Università del Salento (IT)

16:30
Panchromatic photoresponse of a low-bandgap polymer based hybrid solar cells using a light-harvesting antenna: comprehensive insights from femtosecond transient spectroscopy to device optimization
R.S.S.K. Raavi[1], G. Grancini[1,2], M. Maiuri[1], M. Alcocer[1], G. Lanzani[1,3], A. Petrozza[1], G. Cerullo[3], H.J. Snaith[2], [1]Center for Nano Science and Technology@Polimi, Istituto Italiano di Tecnologia (IT), [2]Oxford University, Department of Physics, Clarendon Laboratory (GB), [3]Dipartimento di Fisica, Politecnico di Milano (IT).
We present a detailed investigation on a significant increase in photocurrent and panchromatic photoresponse from bi-layer-hybrid solar cells based on a low-bandgap polymer (PCPDTBT) via ultrafast energy transfer from a light harvesting antenna molecule using sub-10fs-ns transient spectroscopy and device optimization. [6123]
Pg. 146

16:45 STUDENT PRESENTATION
Fabrication of organic photovoltaics and characterisation of intrinsic properties of PCDTBT and derivatives containing alkoxy sidegroups and/or various moieties along the backbone
D.C. Watters[1], Hunan Yi[2], S. Al-Faifi[2], A. Alghamdi[2], A. Iraqi[2], J. Kingsley[1], D.G. Lidzey[1], [1]University of Sheffield, Department of Physics and Astronomy (GB), [2]University of Sheffield, Department of Chemistry (GB).
We have fabricated organic photovoltaic devices using PCDTBT and derivatives as the active layer. When the thiophene moiety is substituted with selenophene a reduction in efficiency and hole mobility is observed. Alkoxy sidegroups on the benzothiadiazole results in improved solubility while maintaining high power conversion efficiencies. [6116].....Pg. 148

Room: Gordon A

TOM 6

16:30-18:30
OPTICAL PATTERNS AND LOCALIZED STRUCTURES
Session Chair: D. Skryabin, University of Bath (GB)

16:30 Invited talk
Non-linear hydrodynamics of microcavity polaritons: from superfluidity to dark soliton formation
A. Amo; Laboratoire de Photonique et Nanostructures, LPN/CNRS (FR).
Polaritons are the quasiparticle eigenstates of semiconductor microcavities in the strong coupling regime. As bosons, they can condensate into a macroscopically occupied quantum state, and show extraordinary non-linear phenomena like flow without friction, or the spontaneous formation of solitons and vortices. [5799].....Pg. 150

Room 10

TOM 7

16:30-18:00
DIGITAL HOLOGRAPHY II
Session Chair: W. Jüptner, University of Aberdeen (GB) and BIAS (DE)

16:30 Invited talk
High performance head-mounted displays realized by free-form optics
D. Cheng, Q. Wang, Y. Wang; Key Laboratory of Photoelectronic Imaging Technology and System, Ministry of Education, School of Optoelectronics, Beijing Institute of Technology (CN).
A head-mounted display (HMD) is a display device worn on the head that has a small display optic in front of each eye. It has many applications in training, simulation, engineering, science and entertainment. As HMDs become more and more popular in recent years, two major problems are receiving more attention than ever before. The first one is caused by the field of view (FOV) and resolution invariant limit, and the second is induced by the discrepancy between accommodation and convergence in a stereoscopic HMD. We propose using free-form optics to solve these problems. An eyepiece based on a wedge-shaped free-form surface (FFS) prism is designed with special settings. When two or more of the prisms are tiled together, the FOV of the HMD can be extended significantly while the resolution is kept at the original level. For the latter problem, two FFS prisms are used in our design, which generate two image planes with a fully overlapped FOV but with a 0.6 diopter difference of focal distance. [6455]
Pg. 153

NOTES

Room 18

TOM 1

17:00
Fully-Integrated Fluorescence-Activated Cell Sorter Fabricated by Femtosecond Laser
F. Bragheri[1], P. Minzioni[2], R. Martinez Vazquez[1], N. Bellini[1], P. Paiè[1], C. Mondello[3], R. Ramponi[1], I. Cristiani[2], R. Osellame[1]; [1]Istituto di Fotonica e Nanotecnologie (IFN) – CNR, Dipartimento di Fisica – Politecnico di Milano (IT), [2]Dipartimento di Ingegneria Industriale e dell'Informazione, Università degli Studi di Pavia (IT), [3]Istituto di Genetica Molecolare (IGM) – CNR (IT).
We present a fully integrated single cell sorter fabricated by femtosecond laser micromachining that allows fluorescence detection and optical sorting of cells inside a microfluidic channel by means of radiation delivered by integrated waveguides. [6041].....Pg. 155

17:15
Portable Optoelectronic Tweezers (OET), taking optical micromanipulation out of the optics lab
S.L. Neale, C. Witte, J.M. Cooper; University of Glasgow, Biomedical Engineering Research Division, School of Engineering (GB).
We report the development of a portable optical micromanipulation setup based on Optoelectronic Tweezers (OET). We show multiple microparticle manipulation in a setup that fits within a briefcase and demonstrate its potential for facilitating interdisciplinary science by reducing the effort required to explore new applications. [5848].....Pg. 157

NOTES

Room: Gordon B

TOM 3

17:00
Fluorescent source detection in disordered media
N. Irishina[1], M. Moscoso[1], R.Carminati[2]; [1]Instituto Gregorio Millán, Universidad Carlos III de Madrid (ES), [2]Institut Langevin, ESPCI ParisTech, CNRS (FR).
We show that the position of a fluorescent source in disordered media can be retrieved from its fluorescence lifetime and priory information about the scatterers positions. Numerical experiments in 2D show that the ill-posedness of the problem is reduced when the level of scattering is increased. [5805].....Pg. 159

17:15 STUDENT PRESENTATION
Light emission statistics in correlated random photonic nanostructures
N. de Sousa[1], J.J. Saenz[1], A. García-Martín[2], L.S. Froufe-Pérez[3]; [1]Departamento de Física de la Materia Condensada, Universidad Autónoma de Madrid (ES), [2]Instituto de Microelectrónica de Madrid, CSIC (ES), [3]Instituto de Estructura de la Materia, CSIC (ES).
The statistical properties of light transport and emission in disordered media has been a matter of intense research during the last century. Being the basis of coherent multiple scattering of waves well known, the phenomenon itself is not yet fully explored and understood. These multiple wave scattering effects are at the heart of emerging behaviors like Anderson localization of light and electrons, band structure in crystalline solids or photonic crystals (PhC), among many others. [6171].....Pg. 161

Room: Crombie A

TOM 4

17:00 Invited talk
Modal method in nanophotonics
P. Lalanne;
Institut d'Optique (FR).
Many micro-nanophotonic devices that are exploiting strong field confinements are fundamentally related to modes of translational invariant or of periodic waveguides.
After a rapid overview of the Modal Method for classical z-invariant and periodic waveguides that we use in our calculation, we will try to illustrate how important are mode concepts for designing or understanding nanophotonic devices, such as the role of plasmon in the extraordinary optical transmission, the analysis of slow-light transport in real photonic crystal waveguides (with fabrication imperfection). [6289].....Pg. 163

Room: Crombie B

TOM 5

17:00 STUDENT PRESENTATION

Air Processing of Organic Photovoltaics Utilising a MoOx Interface

E. Bovill, J. Griffin, T. Wang, J. Kingsley, A. Buckley, D. Lidzey, Department of Physics and Astronomy, University of Sheffield (GB).

Here we investigate the oxidation state, hygroscopicity and energy levels of thermally evaporated MoOx, using a number of techniques, with the intention to develop a protocol that results in stable MoOx films for use in ambient processed OPVs. [6096].....Pg. 164

Room: Gordon A

TOM 6

17:00

Vortex induced complex dynamics of optical patterns

N. Marsal, V. Caullet, D. Wolfersberger, M. Sciamanna; Supélec, OPTEL Research Group, Laboratoire Matériaux Optiques, Photonique et Systèmes (LMOPS - EA4423) (FR).

We prove numerically and experimentally that optical pattern formation can arise by using counterpropagating vortices. Such a beam carrying an orbital angular momentum is injected into a photorefractive single feedback system. We show that the nonlinear wave-mixing occurring inside the medium gives rise to different complex patterns with peculiar phase singularities and rotating dynamics. We demonstrate that the dynamics is induced by the vortex angular momentum and the rotation velocity depends on the vortex topological charge. [6003] Pg. 166

17:15 STUDENT PRESENTATION

Nonlocal feedback with input vortices

V. Caullet, N. Marsal, M. Sciamanna, D. Wolfersberger; Supélec, OPTEL Research Group, Laboratoire Matériaux Optiques, Photonique et Systèmes (LMOPS – EA4423) (FR).

We study experimentally a photorefractive single feedback system when the mirror is voluntary misaligned (nonlocal feedback) and an optical vortex is used as the pump beam. We show that different geometries can coexist in the resulting pattern and that the drifting and rotating dynamics can annihilate each other. [6173].....Pg. 168

Room 10

TOM 7

17:00

Developments in laser 3D measurement and imaging for Oil and Gas Industry Applications

A. Al-Obaidi[1], L. De Dominicis[2], D.McStay[1], G. Fornetti[2], M. Francucci[2], M. Ferri de Collibus[2], M. Guarneri[2], M. Nuvoli[2], [1]Smart Light Devices Limited (GB), [2]ENEA: Italian National agency for new technologies, Energy and sustainable economic development (IT).

The potential applications and challenges for two laser 3D imaging and measurement systems for inspection of surface and subsea oil and gas infrastructure are outlined. Laboratory and subsea deployments of the systems have shown them to be useful tools in assessing the status of oil and gas industry infrastructure. [5796].....Pg. 170

17:15

Point Source Based Model for the Inverse Numerical Reconstruction of Digital Holograms

E.N. Kamau, N. Wang, C. Falldorf, C. von Kopylow, R.B. Bergmann, Bremer Institut für angewandte Strahltechnik (DE).

We present a least square estimator for the inverse reconstruction of digital holograms based on a point source model. We apply this method to reconstruct a hologram resulting from light scattered by randomly distributed particles across a volume. In this proof-of-concept study we demonstrate that our method facilitates a much better reconstruction, as compared to conventional methods, and that it facilitates a particle/object localization with an accuracy on the order of a wavelength. [6091] Pg. 172

NOTES

Room 18

TOM 1

17:30
Studies on the interaction of laser beams with pendant droplets
M.L. Pascu, V. Nastasa, M. Boni, G.V. Popescu, I.R. Andrei; National Institute for Laser, Plasma and Radiation Physics (RO).
The generation of droplets containing distilled water or solutions of dyes, or solutions of chlorpromazine in pendant positions containing μl volumes of liquid is reported. The effects obtained on droplets by resonant and/or unresonant interaction of theirs with laser beams of suitable properties are measured, characterized and reported. [5842].....Pg. 174

NOTES

Room: Gordon B

TOM 3

17:30 STUDENT PRESENTATION
Quantitative study of radiative and non-radiative channels on disordered plasmonic films
A. Cazé, R. Pierrat, V. Krachmalnicoff, E. Castanié, Y. De Wilde, R. Carminati; Institut Langevin, ESPCI Paristech (FR).
We present a quantitative numerical study of the local density of states and its radiative and non-radiative components on disordered plasmonic films. We estimate the spatial extent of the modes in good agreement with experimental results. [5923]
Pg. 176

17:45 Invited talk
Discontinuous Galerkin Methods in Nano-Photonics
K. Busch; Humboldt-Universität zu Berlin, Institut für Physik, AG Theoretische Optik & Photonik (DE) & Max-Born-Institut (DE).
A review is provided of the current status of the Discontinuous Galerkin Time-Domain Finite-Element approach with an emphasis on nano-photonic systems. This includes the analysis of advanced spectroscopic tools such as electron energy loss spectroscopy and cathodoluminescence as well as advanced material models for plasmonics. [6404].....Pg. 178

Room: Crombie A

TOM 4

17:30
High performance asphere test CGHs with advanced alignment features
U.D. Zeitner[1,2], S. Scheiding[1], H.-C. Eckstein[1], F. Fuchs[1], S. Risse[1], [1]Fraunhofer Institute of Applied Optics and Precision Engineering (DE), [2]Friedrich-Schiller-University Jena, Institute of Applied Physics, Abbe Center of Photonics (DE).
Absolute measurement of the quality of aspherical mirror shapes including tilt and optical power became possible by the combination of ultra-precision diamond machining and specially designed test-CGHs. The approach is demonstrated by the example of a light-weight satellite telescope mirror. [6148]
Pg. 181

17:45
Design of diffractive optical elements for multiple wavelength image formation by gradient-based methods
C. Dankwart, C. Falldorf, C. von Kopylow, R.B. Bergmann, Bremer Institut für angewandte Strahltechnik (DE)
We present an approach to the design of diffractive optical elements for utilization with multiple wavelengths. It facilitates the generation of arbitrary intensities for each wavelength independently. We present simulations demonstrating a decrease of the reconstruction error of 15% compared to conventional methods. [6094].....Pg. 183

Room: Crombie B

TOM 5

17:30 STUDENT PRESENTATION

Improving Luminescent Solar Concentrator Energy Yields using Solid State Solvation

A.P. Green, A.R. Buckley; University of Sheffield, the Physics and Astronomy Department (GB).

Exhibited is the tuning of polar chromophore emission by Solid State Solvation (SSS) in the context of Luminescent Solar Concentrators (LSC). SSS increases Stokes Shift, $\Delta\lambda$, whilst retaining Photoluminescence Quantum Yield (PLQY), reducing optical losses and improving resonance with the solar cell EQE spectra. [6077].....Pg. 185

17:45 STUDENT PRESENTATION

Photoemission of Heterojunction Silicon Nanowire Based Solar Cell

M.Y. Bashouti[1], M. Pietsch[1], G. Brönstrup[1], J. Ristein[2], S. Christiansen[1]; [1]Max Planck Institute for the Science of Light, Physics department (DE), [2]Institut für Technische Physik, Universitdt Erlangen-Nürnberg (DE).

Molecules chemically attached to the silicon nanowire (SiNW) can tune the surface state density and electrons transporting through the SiNW heterojunction. To this end, we can control the band bending, surface photovoltaic, surface dipoles, Fermi level, work function and efficiency of the solar cell. [6065] Pg. 187

Room: Gordon A

TOM 6

17:30

Adler Locking of Laser Cavity Solitons Pinned by Defects

P. Paulau[1], C. McIntyre[2], Y. Noblet[2], W.J. Firth[2], P. Colet[3], T. Ackemann[2], G.-L. Oppo[2]; [1]TU Berlin, Institut für Theoretische Physik (DE); [2]ICS, SUPA and Department of Physics, University of Strathclyde (GB); [3]IFISC, (CSIC-UIB), Campus Universitat Illes Balears (ES).

Defects due to growth fluctuations in broad-area semiconductor lasers induce pinning and frequency shifts of laser cavity solitons. We theoretically and experimentally demonstrate frequency and phase locking of pinned laser solitons in VCSELs with frequency-selective feedback. The locking behavior is well described by the Adler model of coupled oscillators. [6150].....Pg. 189

17:45 STUDENT PRESENTATION

Opto-mechanical Transverse Patterns in Cold Atomic Gases

E. Tesio, G.R.M. Robb, T. Ackemann, W.J. Firth, G.-L. Oppo; ICS, SUPA and Department of Physics, University of Strathclyde (GB).

We discuss transverse optical pattern formation in a cavity containing a cloud of cold two-level atoms. Field non-uniformities affect the motional degrees of freedom of the atoms through the action of dipole forces. The resulting density modulations affect the refractive index and then feedback on the optical field to drive a spontaneous transverse instability. [5936] Pg. 191

Room 10

TOM 7

17:30

A Contour-based Automated Focusing Algorithm for the Localisation of Particles in Inline Holograms

N. Burns, J. Watson; School of Engineering, University of Aberdeen (GB).

Digital inline holography is a powerful technique for imaging of suspended particles down to around 10 micrometers diameter (with current sensor technology) in situations where 60 to 80% of the transmitted light can reach an image sensor unimpeded. Each hologram consists of a diffraction pattern caused by modulation of the direct reference beam component with components that are scattered or diffracted by particles in the recording volume. [6201] Pg. 193

17:45

Misalignment compensation in spatial light modulator based optical filtering techniques

M. Agour[1,2], C. Falldorf[1], C. v. Kopylow[1], R.B. Bergmann[1]; [1]Bremer Institut für Angewandte Strahltechnik (DE); [2]Physics Department, Aswan Faculty of Science (EG).

A new method for the compensation of misalignment in the spatial light modulator based optical linear filtering techniques is presented. It is based on the correlation of the wave fields generated across the input and the output planes of filtering setups. Experimental results are given to demonstrate the effectiveness of the method. [6278] Pg. 195

NOTES

Room 18

TOM 1

NOTES

Room: Gordon B

TOM 3

18:15 Post deadline submission

Sub-wavelength control of orbital angular momentum of light

F. Romanato[1,2,3], P. Zilio,[1,2], E. Mari[1,2], G. Parisi[1,2], T. Ongarello[1,2], D. Garoli[2], M. Massari[2], M. Carli[1,2], F. Tamburini[1,4]; [1]Department of Physics and Astronomy, Padova University (IT), [2]LaNN - Laboratory of Nanofabrication of Nanodevices (IT), [3]CNR-IOM, Istituto Officina dei Materiali (IT), [4]CIVEN (IT).

A new class of Plasmonic Vortex Lens allow to control at sub-wavelength scale the Orbital Angular Momentum of Surface Plamon Polaritons (SPP). We show the possibility to perform SPP preserving the OAM states and exploting for efficient focusing effects. The design, fabrication and characterization of different nano sctructures configuration is presented. [6434]

Pg. 197

Room: Crombie A

TOM 4

18:00

Holographic lithography utilizing pulsed ultraviolet lasers and diamond-turned diffractive optical elements

S. Kibben, M. Koerdt, C. Dankwart, F. Vollertsen; BIAS - Bremer Institut für angewandte StrahltechnikGmbH (DE).

The applicability of diamond-turned diffractive optical elements (DOEs) for projection lithography with pulsed ultra violet (UV) laser sources with reduced spatial coherence has been demonstratedfor the first time. [5980]

.....Pg. 199

18:15

Evidence of high and sharp plasmonic resonant reflection from free-floating continuous undulated metal film

Y. Jourlin, S. Tonchev, C. Veillas, O. Parriaux, H. Curien Laboratory, Lyon University at Saint-Etienne (FR), *on leave from the ISSP, Bulgarian Academy of Sciences (BG).*

High resonant TM reflection is exhibited on a free-floating undulated continuous gold film with the mediation of the long range plasmon mode excited under normal incidence. The first clear evidence of plasmonic abnormal reflection is reported. [6126]

.....Pg. 201

18:30 20:30 **WELCOME RECEPTION**
Open to all EOSAM attendees and exhibitors

Room: exhibition hall, Boyd Orr Suite

18:45 **WELCOME SPEECH**
Councillor Len Ironside CBE, Aberdeen City Council (GB)

Room: Crombie B	Room: Gordon A	Room 10	
TOM 5	TOM 6	TOM 7	NOTES
	18:00 STUDENT PRESENTATION **Excitability and drifting laser localised structures** *M. Turconi, M. Giudici, S. Barland; Université de Nice Sophia Antipolis, CNRS UMR7335 (FR).* We show experimentally in a system of coupled broad area lasers that the non lasing state can bifurcate locally towards an infinite period and finite amplitude limit cycle, which is the condition for the generation of excitable localize structures. We show that this limit cycle is due to the periodic nucleation and drift of localised states. [6017].....Pg. 203 18:15 **Generation and control of cavity solitons by means of photorefractive soliton electro-activation** *C. Rizza[1], L. Columbo[1], F. Prati[1], M. Brambilla[2], G. Tissoni[3]; [1]Dipartimento di Scienza e Alta Tecnologia, Università dell'Insubria (IT), [2]Dipartimento Interateneo di Fisica, Politecnico di Bari (IT), [3]Institut Non Lineaire de Nice, CNRS, Université de Nice Sophia Antipolis, UMR 7335 (FR).* We consider a hybrid system consisting of a centrosymmetric photorefractive crystal in contact with a vertical cavity surface emitting laser. We numerically demonstrate that by electro-activation of solitonic waveguides previously imprinted into the crystal, cavity solitons can be turned on and shifted with controlled velocity across the transverse laser section, on the scale of tens of nanoseconds. Applications to optical information encoding and processing can be envisaged. [6108].....Pg. 205		

18:30 20:30 **WELCOME RECEPTION** **Room:** exhibition hall, Boyd Orr Suite
Open to all EOSAM attendees and exhibitors

18:45 **WELCOME SPEECH**
Councillor Len Ironside CBE, Aberdeen City Council (GB)

Wednesday, 26 September

Room 18

TOM 1

09:00-10:45
MICROSCOPY & HOLOGRAPHY
Session Chair: G. von Bally, Westfaelische Wilhelms-Universität Münster (DE)

09:00 **Invited talk**
Non linear imaging of electrical activity in intact tissues
F. Pavone; European Laboratory for Non-Linear Spectroscopy (LENS), University of Florence (IT).
The central nervous system can process a tremendous amount of information, which is encoded in terms of action potential (AP) and transmitted between neurons at synapses. A central question in neuroscience is how simple processes in neurons can generate cognitive functions and form complex memories like those experienced by humans and animals. In principle, if one were able to record from all the neurons in a network involved in a given behavior, it would be possible to reconstruct the related computations. This is not possible with current techniques. Here, we demonstrate how, by means of a customized random access microscope, in combination with a novel voltage sensitive dye, was possible to simultaneously record action potential in real time from clusters of Purkinje cells in acute cerebellar slices. These results show the strength of this technique in describing the temporal dynamics of neuronal assemblies, opening promising perspectives in understanding the computations of neuronal networks. [6279].....Pg. 207

09:30
Self Interference Fluorescence Microscopy
M. de Groot[1], C.L. Evans[2], J.F. de Boer[1]; [1]Institute for Lasers, Life and Biophotonics, VU University Amsterdam (NL); [2]Wellman Center for Photomedicine, Massachusetts General Hospital (US).
We present a novel 3D fluorescence imaging technique that allows depth localization of fluorescent markers without depth scanning. The technique uses a phase plate to introduce a modulation on the fluorescence spectrum. The phase of this modulation uniquely determines the depth location of the source. [6165].....Pg. 208

Room: Fleming Auditorium

TOM 2

09:10-10:45
SI PHOTONIC COMPONENTS I
Session Chair: C. Falldorf, BIAS - Bremer Institut für angewandte Strahltechnik GmbH (DE)

09:10
Introduction by the Chairs

09:15
Chaotic broadband photonic crystal resonators
A. Di Falco[1], T.F. Krauss[1], A. Fratalocchi[2]; [1]University of St. Andrews, School of Physics and Astronomy, St. Andrews (GB), [2]PRIMALIGHT, King Abdullah University of Science and Technology (KAUST), Faculty of Electrical Engineering, Applied Mathematics and Computational Science (SA).
We present the design and experimental results of chaotic photonic crystal microresonators realised in silicon on insulator platform. The resonators support broadband long lifetime resonances in the near infrared region. [6121].....Pg. 210

09:30 **Invited talk**
Silicon optical modulators for high data rate applications
F.Y. Gardes[1], D. Thomson[1], G.T. Reed[1], J-M. Fédéli[2], L. O'Faolain[3], Kapil Debnath[3] T.F. Krauss[3], L. Lever[4], Z. Ikonic[4], R. Kelsall[4]; [1]ECS/ORC, University of Southampton (GB), [2]CEA-LETI, Minatec, CEA-Grenoble (FR), [3]School of Physics & Astronomy, University of St Andrews (GB), [4]Institute of Microwaves and Photonics, University of Leeds (GB).
In this work we describe the carrier depletion MZI modulators, slow wave structures for modulation enhancement and the QCSE modulator which are under development in the UK Silicon Photonics project and European project HELIOS. [6277] Pg. 212

Room: Gordon B

TOM 3

09:00-10:45
NANOPHOTONIC APPLICATIONS III
Session Chair: Y. Kivshar, Australian National University (AU)

09:00 **Invited talk**
Plasmonic Metamaterials for Multi-functional Mid-IR Biosensing
H. Altug[1,2], S. Aksu[2], A.E. Cetin[1], R. Adato[1], A. Artar[1], G. Shvets[3], C. Wu[3], A.B. Khanikaev[3]; [1]Department of Electrical and Computer Engineering, Boston University (US), [2]Material Science and Engineering Division, Boston University (US), [3]Physics Department, University of Texas at Austin (US).
Sensing proteins and identifying their interactions is fundamental to our understanding of cellar biology and could contribute to the early diagnosis and treatment of diseases.
We will demonstrate plasmonic metamaterials can be used to realize advanced spectroscopy tools that can extract structural and functional information of proteins. [6251].....Pg. 214

09:30 **STUDENT PRESENTATION**
Patchwork of sub-wavelength antennasfor photon sorting and wideband absorption
C. Koechlin[1,2], P. Bouchon[2], F. Pardo[1], R. Haïdar[2], J.-L. Pelouard[1]; [1]Laboratoire de Photonique et de Nanostructures (LPN-CNRS) (FR), [2]ONERA - The French Aerospace Lab (FR).
We present theoretical and experimental evidence that Metal-Insulator-Metal (MIM) resonators can be combined within the same subwavelength period and behave as uncoupled antennas. These structures thus allow for an efficient photon collection, with a soting between the resonators that leads to an omnidirectional broadband absorption. [5828].....Pg. 216

Room: Crombie A

TOM 4

09:00-10:45
UNCONVENTIONAL OPTICAL EFFECTS
Session Chair: O. Parriaux, Université de Saint Etienne Jean Monnet (FR)

09:00 **Invited talk**
Optical parametric oscillations in whispering gallery resonators
Ch. Marquardt; Institut für Optik, Information und Photonik, University of Erlangen-Nuremberg (DE) & Max Planck Institute for the Science of Light (DE).
Optical whispering gallery mode resonators (WGM) offer high quality factors over a broad wavelength range. I will review recent advances in using crystalline WGMs with strong second order nonlinearities to reach highly efficient and tunable nonlinear processes in a very compact and stable setup. [6457] Pg. 218

09:30 **STUDENT PRESENTATION**
A tilted polarizer as a tool for detecting the geometric spin Hall effect of light
J. Korger[1,2], A. Aiello[1,2], V. Chille[1,2], C. Wittmann[1,2], P. Banzer[1,2], N. Lindlein[2], Ch. Marquardt[1,2], G. Leuchs[1,2], [1]Max Planck Institute for the Science of Light (DE), [2]Institute for Optics, Information and Photonics, University Erlangen-Nuremberg (DE).
The geometric spin Hall effect of light is a fundamentally novel beam shift phenomenon. For the first time, we demonstrate experimentally that polarization-dependent absorption from nano-particles allows for observing this effect. [5862].....Pg. 220

Room: Crombie B

TOM 5

09:00-10:45
ORGANIC SOLAR CELLS II
Session Chair: D. Comoretto, Università di Genova (IT)

09:00 **Invited talk**
Signals Mimicking the Retinal Cells from Photoexcitation of Bulk Heterojuction Polymer device structures
K.S. Narayan, V. Gautam; Jawaharlal Nehru Centre for Advanced Scientific Research (IN).
Advances in organic electronics based devices pave a route to access and monitor biological sensory processes. We emphasise the role of organic electronics in developing devices with implications in vision related ailments and artificial retina components. Semiconducting polymer device structures can operate as photoreceptor-type sensors in aqueous environment, and can be used as stimulation elements upon interfacing with other retinal neurons like the ganglion cells. We recently demonstrated a single-pixel, single-layer structure (instead of multiple-layer stacks) with an active layer consisting of bulk heterojuction polymers, which is capable of distinguishing multiple colors without an external bias. The methodology essentially relied on in wavelength-specific, displacement-current transient characteristics and polarity of the response upon photoexcitation. We discuss other recent developments from our laboratory in this direction. [6216].....Pg. 222

09:30
Organic position sensitive photodetectors based on wedge donoracceptor bilayers with complementary thickness
J. Cabanillas-Gonzalez[1], O. Peña-Rodríguez[2], M. Schmidt[2], M.I. Alonso[2], A.R. Goñi[2], M. Campoy-Quiles[2], [1]Instituto Madrileño de Estudios Avanzados en Nanociencia (IMDEA-Nanociencia) (ES), [2]Institut de Ciència de Materials de Barcelona (ICMAB-CSIC), Esfera UAB (ES).
We develop organic position sensitive photodetectors by incorporating a lateral thickness gradient in the active layers of a bilayer-like structure. As the thicknesses of the CuPc and C_{60} layers are varied, the optical electric field distribution is modified. This results in a position dependent spectral photoresponse in the advanced geometry. [6074]
Pg. 223

Room: Gordon A

TOM 6

09:00-10:45
NONLINEAR OPTICAL SIGNAL PROCESSING
Session Chair: J. Dudley, University Franche-Comté (FR)

09:00
Extended self-similar pulse evolution in an Er fiber laser
H. Liu, F. Wise; Cornell University, Applied and Engineering Physics (US).
An Er fiber laser with self-similar evolution in the gain medium and continued parabolic pulse propagation in a passive fiber is demonstrated experimentally and theoretically. [6043]
Pg. 225

09:15
Nonlinear-dispersive similariton for ultrafast photonics
L.K. Mouradian[1], A.S. Zeytunyan[1], G.L. Yesayan[1], F. Louradour[2], A. Barthélémy[2], R. Zadoyan[3]; [1]Yerevan State University, Ultrafast Optics Laboratory (AM), [2]XLIM-UMR 6172 Université de Limoges/CNRS (FR), [3]Technology & Applications Center, Newport Corporation (US).
Generation of broadband similariton and its applications to urgent problems of ultrafast photonics, such as femtosecond signal temporal and spectral focusing, control, imaging and characterization are presented, based on our experiments and suported by the concept of similariton-induced temporal lens. [5968].....Pg. 227

09:30
Tapered photonic crystal fibers for blue-enhanced supercontinuum generation
U. Møller[1], S.T. Sørensen[1], C. Larsen[1], P.M. Moselund[2], C. Jakobsen[2], J. Johansen[2], C.L. Thomsen[2], O. Bang[1,2]; [1]DTU Fotonik – Department of Photonics Engineering, Technical University of Denmark (DK), [2]NKT Photonics A/S (DK).
Tapering of photonic crystal fibers is an effective way of shifting the blue edge of a supercontinuum spectrum down in the deep-blue. We discuss the optimum taper profile for enhancing the power in the blue edge. [5908].....Pg. 229

Room 10

TOM 7

09:00-10:45
INDUSTRIAL SYSTEM
Session Chair: V.V. Dyomin Tomsk State University (RU)

09:00 **Invited talk**
Hybrid laser arc welding of pipes and pipelines
G.A. Turichin, I.A. Tzibulsky, E.A. Valdaitseva; Polytechnic University (RU).
The experiments of pipe steel hybrid laser-MAG welding have been made with 15-kW fiber laser. Experiments and simulation of weld bath behaviour as well as its oscillation spectra approved the self-oscillation nature of melt pool behavior. The welding mode influence of melt pool stability and weld seam quality has also been observed. [6154]
Pg. 231

09:30 **Post deadline submission**
High Throughput High Accuracy Laser Soldering of optoelectronic chips
T. Vahrenkamp, A. Weber, D. Rose, S. Heinicke, M. Seyfried; ficonTEC Service GmbH (DE).
A fast and high accurate approach for the assembly of opto electronic chips was developed and demonstrated based on a laser soldering process. This new technology will serve the needs of future silicon photonics applications. [6437].....Pg. 233

NOTES

Wednesday, 26 September

Room 18	Room: Fleming Auditorium	Room: Gordon B	Room: Crombie A
TOM 1	TOM 2	TOM 3	TOM 4
09:45 **STED Microscope with Phase Contrast** *M.A. Lauterbach, M. Guillon, V. Emiliani; University Paris Descartes, Neurophysiology and New Microscopies Laboratory, CNRS UMR8154, INSERM S603 (FR).* We implement phase contrast into a STED (STimulated Emission Depletion) microscope. Phase contrast is also employed in a confocal scanning version for registration with the STED images. Imaging of weak phase objects in one label-free phase-contrast and one high-resolution STED channel is demonstrated. [6021].....Pg. 235		09:45 **Molecularly lithography and plasmonic engineering to visualize individual binding events by eye** *A.W. Clark, J.M. Cooper; University of Glasgow, School of Enginering (GB).* We report a new plasmonic biosensing technique allowing visualisation of single binding events by eye. Combining direct-write fabrication with molecular nanopatterning we use molecular interaction to position individual nanoparticles around single nanostructures, effecting a visible colour-shift in plasmonic scattering. [5991].....Pg. 241	09:45 STUDENT PRESENTATION **Generation of optical vortices in liquid crystal light-valves** *R. Barboza[1,3], U. Bortolozzo[1], S. Residori[1], M.G. Clerc[2], G. Assanto[3], [1]INLN, Université de Nice Sophia-Antipolis (FR), [2]Departamento de Física, FCFM, Universidad de Chile (CL), [3]NooEL – Nonlinear Optics and Optoelectronic Lab, University Roma Tre (IT).* We demonstrate the reliable and controlled generation of optical vortex beams via selective illumination of a homeotropic liquid crystal light-valve. The topological defects created by the Fréedericksz transition behave as optical spin-orbit converters and different topological charges can be induced depending on the polarization of the input beam. [6010].....Pg. 245
10:00 STUDENT PRESENTATION **Towards modelling and dynamically monitoring infection scenarios at the single cell level using a biophotonic holographic workstation** *Á. Barroso-Peña[1], B. Kemper[2], M. Woerdemann[1], L. Dewenter[1], A. Vollmer[2], Robin Schubert[2], G. von Bally[2], A. Mellmann[3], C. Denz[1]; [1]Institute of Applied Physics, University of Muenster (DE), [2]Center for Biomedical Optics and Photonics, University of Muenster (DE), [3]Institute of Hygiene, University of Muenster (DE).* A novel biophotonic holographic workstation is presented that is capable of optical positioning multiple bacteria on defined areas of the host cell surface while simulta-neous quantitative monitoring of three dimensional dynamics and cell morphology by digital holographic multi-focus phase microscopy is provided. [6103].....Pg. 237	10:00 **Amorphous silicon subwavelength functional elements for free-space waves** *T. Kaempfe, S. Tonchev*, O. Parriaux; University of Lyon, Lab. H. Curien UMR CNRS 5516 (FR), *on leave from the ISSP, Bulgarian Academy of Sciences (GB).* Whereas microstructured silicon is mostly envisaged today for confining the optical field in subwavelength channels and the optical path within small areas of a 2D space, we show here through three examples how diverse can be the optical functions exerted by subwavelength amorphous silicon structures on free space waves. [6084] Pg. 239	10:00 **Radio-labeled QDs: synthesis and processing for bioapplication** *C. Waurisch[1], D. Bargheer[2], S. G. Hickey[1], P. Nielsen[2], A. Eychmüller[1]; [1]TU Dresden, Physical Chemistry/Electrochemistry (DE), [2]UKE Hamburg, Department of Biochemistry and Molecular Cell Biology (DE).* For reliable and highly sensitive quantification of QDs *in vivo* hydrophobic Mn:^{65}ZnSe/ZnS as well as CdSe/CdS/ZnS core/shell nanoheterostructures have been labeled with γ-counting isotopes of ^{65}Zn. For biological applications the obtained QDs have been embedded into lipid micelles or coated by an amphiphilic polymer. [5986].....Pg. 243	10:00 **Bright and dark helices of light** *O. Steuernagel, School of Physics, Astronomy, and Mathematics, University of Hertfordshire (UK).* Laser light can interfere to form bright and dark helices of light, their pitch length is of the order of the light's wavelength. Here dark helices of vanishing intensity are studied, they are less constrained by optical resolution limits than bright helices, have greater definition and can be used as blue-detuned atom-optical helical wave guides. [5884].....Pg. 247

Room: Crombie B

TOM 5

09:45 STUDENT PRESENTATION

Study of Inverted Organic Photovoltaic Devices Based on Blends of Regioregular Poly(3-hexylthiophene) and Poly(9,9-dioctylfluorene-*co*-benzothiadiazole) by Confocal Laser Microscopy

A. Perulli[1], S. Lattante[1], M. Anni[2]; [1]*Dipartimento di Ingegneria dell'Innovazione, Università del Salento (IT),* [2]*Dipartimento di Matematica e Fisica "Ennio De Giorgi", Università del Salento (IT).*

We investigated the correlation between device efficiency, local morphology and composition of the active layer in inverted organic photovoltaic devices based on regioregular poly(3-exylthiophene) (P3HT) and poly (9,9-dioctylfluorene-*co*benzothiadiazole) (F8BT) blends deposited from different solvents. [5988].....Pg. 249

10:00

Rationalizing Phase Transitions with Thermal Annealing Temperatures for P3HT:PCBM Organic Photovoltaic Devices

A.J. Pearson[1], P.E. Hopkinson [2], T. Wang [1], A.M. Donald [2], D.G. Lidzey [1], [1]*Department of Physics, University of Sheffield (GB),* [2]*Department of Physics, University of Cambridge (GB).*

We have studied a range of organic photovoltaic devices (OPVs) based on a thin-film blend of P3HT and PCBM. Comparing device studies with a characterization of the thermal transitions of the blend, we can provide a mechanistic description of the optimum annealing temperatures necessary to improve the operational efficiency of a device. For as-cast P3HT:PCBM blend thin-films we evidence two glass transition temperatures, tentatively corresponding to the existence of two compositionally different amorphous states. We demonstrate that an improvement in device efficiency only occurs once the film has been heated above the upper apparent glass transition temperature of the blend. If annealing is performed above the optimum temperature, excessive phase-separation and a partial reduction in film optical density leads to a general decrease in device efficiency. Both of these characteristic temperatures are dependent upon the composition of the blend. [5870].....Pg. 251

Room: Gordon A

TOM 6

09:45

Dispersion of nonlinearity and modulation instability in sub-wavelength semiconductor waveguides

A.V. Gorbach, X. Zhao, D.V. Skryabin; *Centre for Photonics and Photonic Materials, University of Bath (GB).*

Tight confinement of light in sub-wavelength waveguides induces substantial dispersion of their nonlinear response. We demonstrate that this dispersion of nonlinearity can lead to the modulational instability in the regime of normal group velocity dispersion (GVD) through the mechanism independent from higher order dispersions of linear waves. [5871].....Pg. 253

10:00 Invited talk

Nonlinear and linear optical signal processing for Tbit/s communications

J. Schröder[1], Y. Paquot[1], T.D. Vo[1], M. Pelusi[1], S. Madden[2], B. Luther-Davies[2], B.J. Eggleton[1]; [1]*Centre for Ultrahigh Bandwidth Devices for Optical Systems (CUDOS), The School of Physics, The University of Sydney (AU);* [2]*Centre for Ultrahigh Bandwidth Devices for Optical Systems (CUDOS), Laser Physics Center, The Autralian National University (AU).*

The combination of linear and nonlinear optical processing promises to overcome some of the challenges of high symbol rate communications. In this talk I will review some of our work of combining Fourier-domain optical processing with nonlinearity based measurements for automatic impairment monitoring and compensation. [5898].....Pg. 255

Room 10

TOM 7

09:45 STUDENT PRESENTATION

Laser micromachining of thin film materials

M. Sozzi[1], C. Catellani[1], A. Cucinotta[1], S. Selleri[1], D. Menossi[2], R. Dharmadasa[2], A. Bosio[2]; [1]*University of Parma, Information Engineering Department (IT),* [2]*University of Parma, Physics Department (IT).*

Pulsed lasers can be used for the ablation of different materials. In this work laser radiation at 1064nm, and 515nm, has been employed in order to perform the laser scribing of thin film solar cells. [5951].....Pg. 257

10:00

Determination of the Thermally Induced Lens in Laser Processing Heads by Means of a Reference Welding Process

T. Graf, R. Weber, A. Heß, C. Thiel, M. Schäfer, *University of Stuttgart, Institut für Strahlwerkzeuge (IFSW) (DE).*

In order to monitor the thermally induced beam distortions of laser processing heads especially when subjected to high-brightness beams and used in "dirty" environment we propose to use a simple laser welding process that can be performed without special training and avoids the use of expensive and involved diagnostics equipment. [5835].....Pg. 259

NOTES

Room 18

TOM 1

10:15
3D localization and tracking of gold particles in biological environment using digital holography
F. Verpillat, P. Desbiolles, M. Gross; Laboratoire Kastler Brossel, ENS, UPMC-Paris6, CNRS UMR 8552 (FR), Laboratoire Charles Coulomb, CNRS UMR 5221, Universite Montpellier II (FR).
Using the dark field holographic microscopy we track gold particles in brownian motion in living cells. First results are presented. The particles remain confined to a region a few microns in size. We interpret this as a cage effect related to the cell structure. [6013].....Pg. 261

10:30
Holographic images of 3T3 cells labeled with 40nm gold particules.
F. Joud[1], F.Verpillat[1], M.Atlan[2], M. Gross[3]; [1]Laboratoire Kastler Brossel, ENS, UPMC-Paris6, CNRS UMR 8552 (FR), [2]Institut Langevin, ESPCI ParisTech, CNRS UMR 7587 (FR), [3]Laboratoire Charles Coulomb, CNRS UMR 5221, Université Montpellier II (FR).
By using digital holography, we have imaged and localize in 3D gold $d = 40$nm particules in living cells. By using a better preparation of the sample, the image quality is highly improved. Results are presented. [6031].....Pg. 263

Room: Fleming Auditorium

TOM 2

10:15
SOI Biosensor for Multi Parameter Analysis
M. Jäger[1], J. Bruns[1], E. Ehrentreich-Förster[2], K. Petermann[1]; [1]Technische Universität Berlin, Fachgebiet Hochfrequenztechnik (DE), [2]Fraunhofer Institut für Biomedizinische Technik (DE).
Simple CMOS compatible technology is used to develop a new bio sensor device. It consists of an array of ring resonators with heater structures that are coupled to a single waveguide. This device is able to perform a multi parameter analysis of a biological sample by applying different modulation frequencies to the different rings. [5827].....Pg. 265

10:30
Micro Heaters fabrication on silicon nitride and its application for all pass filter with tunable coupler for extinction ratio tuning
A. Griol[1], N. Sánchez[1], L. Bellieres[1], J. Hurtado[1], J. Ayucar[1], M. Rizquez[1], F. López-Royo[1], J. Martí[1], F. Cuesta-Soto[2], M. Rodrigo[2], A. Canciamilla[3], A. Melloni[3]; [1]Nanophotonics Technology Center, Universitat Politècnica de València (ES), [2]DAS Photonics (ES), [3]Dip. Electronica e Informazione, Politecnico di Milano (IT).
We demonstrate thermal tuning in silicon nitride technology. Fabrication of waveguides and structures consisting of all pass filters (APF) was carried out by e-beam as well as photolithography techniques whilst the microheaters on the silicon oxide uppercladding were fabricated by e-beam lithography and lift-off processes. [6131].....Pg. 267

Room: Gordon B

TOM 3

10:15
Expanding the toolbox for optical manipulation and detection of metal nanoparticles
M. Dienerowitz, G. Gibson, M. Lee, R. Bowman, M.J. Padgett; SUPA, University of Glasgow, School of Physics and Astronomy (GB).
We present a holographic tweezers workstation to optically trap and spectroscopically characterise metal nanoparticles. We explore the capabilities of video-based tracking for nanoparticle position detection with darkfield microscopy and investigating their Brownian motion with Differential Dynamic Microscopy. [6048].....Pg. 269

STUDENT PRESENTATION
Post deadline submission

10:30
Excitation of Metallic Nano-Cavities by a Silicon Waveguide for Localized Sensing Applications
G.D. Osowiecki[1], A. Cosentino[1], Q. Tan[1], A. Naqavi[1], V. Paeder[1], Matthieu Roussey[2], H.P. Herzig[1]; [1]Optics & Photonics Technology Laboratory, Ecole Polytechnique Fédérale de Lausanne (EPFL) (CH); [2]Department of Physics and Mathematics, University of Eastern Finland (FI).
Strong Electric-field enhancement in small volumes is the key for label-free single-molecule sensing. We have investigated the excitation of single and multiple metallic nano-cavities by evanescent wave coupling in the near-infrared by a silicon wire waveguide. [6439].....Pg. 271

Room: Crombie A

TOM 4

10:15
Wood's anomalies and excitation of cyclic Sommerfeld resonances in microstructured optical fibers
A.D. Pryamikov, A.S. Biriukov; Fiber Optics Research Center of Russian Academy of Sciences (RU).
In this paper we consider a process of excitation of long ranged cyclic Sommerfeld waves (CSWs) and cyclic Sommerfeld resonances (CSRs) which lead to a formation of analog of Wood's anomalies under light propagation in all solid band gap fibers and hollow core microstructured fibers with negative curvature of the core boundary. [6087]
Pg. 273

10:45-11:15 Coffee break (exhibition hall, Boyd Orr Suite)

Room: Crombie B

TOM 5

10:15
Characterization of the Vertical Phase Separation of Polymer/ Fullerene Blends by Confocal Laser Microscopy
S. Lattante[1], A. Perulli[1], M. Anni[2], [1]Università del Salento, Dipartimento di Ingegneria dell'Innovazione (IT), [2]Università del Salento, Dipartimento di Matematica e Fisica "Ennio De Giorgi" (IT).
Confocal Laser Microscopy has been used as a non invasive tool for characterizing the vertical phase separation of the blend of regioregular poly(3-hexylthiophene) (P3HT) and phenyl-C61-butyric acid methyl ester (PCBM) with different concentration ratio. The effect of PTFE filtering of the initial solution has also been investigated. [5972].....275

10:30 STUDENT PRESENTATION
High Performance Bulk Heterojunction Polymer Solar Cells Spray-Cast in Air
T. Wang[1], N. Scarratt[1], H. Yi[2], A. Brook[1], A. Iraqi[2], R.A.L. Jones[1], D.G. Lidzey[1], [1]Department of Physics and Astronomy, University of Sheffield (GB), [2]Department of Chemistry, University of Sheffield (GB).
This work discusses bulk heterojunction polymer solar cells with the active layer deposited using a spray-casting technique. The morphology of the active layer is tuned via casting solvent, film thickness and substrate temperature. Using a PCDTBT:$PC_{70}BM$ blend as the active layer material, a high power conversion efficiency of 4.9% is achieved. [5957].....Pg. 277

Room: Gordon A

TOM 6

10:30
Nonlinear processing and slow light in liquid crystal light valves
S. Residori[1], U. Bortolozzo[1], J.P. Huignard[2], [1]INLN, Université de Nice Sophia-Antipolis, CNRS (FR), [2]Jphopto (FR).
Nonlinear optical processing are realized via wave-mixing in liquid crystal light-valves. Slow-light effects occur by two-wave mixing taking place in the Raman-Nath diffraction regime and with light pulses slowed at group velocities as low as 0.2 mm/s. Applications for very high sensitivity interferometers and adaptive holography are presented. [5930].....Pg. 279

Room 10

TOM 7

10:15
Enhanced defect detection strategy for composite materials with fiber-optic imaging laser Doppler vibrometry.
J. Kilpatrick, A. Apostol, V. Markov; Advanced Systems and Technologies Inc. (US).
In this paper we highlight the unique advantages of imaging laser Doppler vibrometry (ILDV) over conventional scanning laser Doppler vibrometry (SLDV) for certain diagnostic applications in the automotive and aerospace industries. We discuss, in particular, ILDV for rapid data capture and damage detection in composite materials. [5816]...Pg. 281

10:30
Simulation study of deflectometry systems
W. Li[1], J. Burke[2], A. Gesierich[1], C.v. Kopylow[2], [1]Vereinigte Elektronik-Werkstätten GmbH (VEW) (DE), [2]Bremer Institut für Angewandte Strahltechnik GmbH (BIAS) (DE).
We present a simulation study of a deflectometry (or fringe reflection) system. With the given parameters of camera, display and object, the distorted reflection fringes as well as the phases are simulated. Some measurement errors are studied. The results can be used for measurement system design and evaluation algorithm development. [5993].....Pg. 283

NOTES

10:45-11:15 Coffee break (exhibition hall, Boyd Orr Suite)

Wednesday, 26 September

Room: Fleming Auditorium

11:15-12:00 **PLENARY TALK | TOM 6**
Femtosecond Fiber Lasers Based on Dissipative Processes
F.W. Wise; Cornell University, Department of Applied Physics (US).
Pulse shaping in lasers with only normal dispersion components will be explained. The performance of lasers that generate dissipative solitons or self similar pulses will be described. These new pulse evolutions underlie simple designs with major performance advances over prior fiber lasers. [5798].....Pg. 285

12:00-12:45 **PLENARY TALK | TOM 4**
Microoptics an update
J. Jahns; FernUniversität in Hagen, Chair of Micro and Nanophotonics (DE)
After more than two decades of rapid progress, the field of microoptics has developed to a mature state with numerous commercial applications. Here, an overview will be presented regarding the evolution of the field in the past, the current status, and about potential future directions. [5982].....Pg. 287

12:45-13:00 **Single-shot spectroscopy of optical modulation instability** **Post deadline submission**
TOM 6
D.R. Solli[1,2], G. Herink[2], B. Jalali[1,3], C. Ropers[1,2]; [1]University of California, Los Angeles, Department of Electrical Engineering (US), [2]CRC Physics and Materials Physics Institute, University of Göttingen (DE), [3]California Nano Systems Institute (CNS) (US).
We acquire single-shot modulation instability spectra at megahertz repetition rates. The pulse-resolved data reveal latent spectral features that are normally unseen in time-averaged measurements. A statistical analysis shows that the features tend to assume an anti-bunched distribution in both the spectral and temporal domains. [6435].....Pg. 288

13:00-15:10 **Lunch break & POSTER SESSION I**
Room: exhibition hall, Boyd Orr Suite

Room: Fleming Auditorium

15:10-17:30
GRAND CHALLENGES OF PHOTONICS | JOINT SESSION
Chairs: Fredrik Laurell, KTH Royal Institute Technology (SE)
Paul Urbach, University of Delft (NL)

15:10
Introduction by the Chairs

15:15-16:00 **PLENARY TALK**
Prospects for Laser FUsion ENERGY
C. Edwards; S.T.F.C. Rutherford Appleton Laboratory (GB).
The HiPER (Europe) and LIFE (U.S.) projects have been established to build upon the achievement of first ignition, leading to demonstration of commercially viable power production within the next 15 to 20 years.
This presentation will discuss the advantages of Laser Energy, explain some of the basic physics principles of the process and explore the key requirements for the technology programme which leads to commercial energy production. [6456].....Pg. 290

16:00-16:15 **PLENARY TALK**
Disaster Prevention by Photonics - Toward Realization of Safe and Secure Society
Y. Tanaka, T. Kurokawa; Tokyo University of Agriculture and Technology (JP).
The Great Earthquake and Tsunami that hit Japan on March 11, 2011 caused about 20,000 dead and missing people, and also caused Japan 's worst nuclear accident at Fukushima Daiichi. Now is the time for creating the ultimate technology that really contributes to avoid the tragedy to happen again. This is "the disaster prevention photonics", whose recent development in Japan will be introduced. The goal of the disaster prevention photonics is to develop and fuse the technologies of
- highly-sensitive optical sensors for environmental monitoring, including climate change and diastrophism that might lead to disaster,
- photonic devices that work even under adverse conditions such as radiation environment, and
- photonic network that really functions at the time of disaster. [6281].....Pg. 291

16:45-17:30 **PLENARY TALK**
Graphene for Photonics and Optoelectronics
A. Ferrari, University of Cambridge (GB).
The richness of optical and electronic properties of graphene attracts enormous interest. So far, the main focus has been on fundamental physics and electronic devices. However, it has also great potential in photonics and optoelectronics, where the combination of its unique optical and electronic properties can be fully exploited, the absence of a bandgap can be beneficial, and the linear dispersion of the Dirac electrons enables ultra-wide-band tunability. The rise of graphene in photonics and optoelectronics is shown by several recent results, ranging from solar cells and light emitting devices, to touch screens, photodetectors and ultrafast lasers. [6408].....Pg. 292

18:00-20:00 **EOS Annual General Assembly Room: Fleming Auditorium**
Open to all EOS members, EOSAM attendees and exhibitors

Presidential Talk: Vector wave holography and its application to optical mass storage
Toyohiko Yatagai, Utsunomiya University (JP)
Former President of the Optical Society of Japan (OSJ)

Presidential Talk: The 3D light field display technique
Liu Xu, Zhejiang University (CN)
Vice President of the Chinese Optical Society (COS)

EOS Prize & Fellows Ceremonies

Thursday, 27 September

Room 18

TOM 1

09:00-10:30
OPTOPORATION & MANIPULATION
Session Chair: A. Heisterkamp, Friedrich Schiller University Jena (DE)

09:00 **Invited talk**
Photoporation of cells
F.J. Gunn-Moore; School of Biology, University of St Andrews (GB).
Photoporation (or any derivations of [laser-] or [optical-] or [opto-] or [photo-] AND [poration] or [-permeabilisation] or [-puncture] or [-perforation]): The generation of a transient hole or holes on the plasma membrane (or cell wall) of a cell usually for the purpose of optical injection. [6106].....Pg. 293

Room: Fleming Auditorium

TOM 2

09:00-10:30
Si PHOTONIC COMPONENTS II
Session Chair: F. Gardes, University of Southhampton (GB)

09:00
Design and simulation of three-dimensional optical polymer waveguide devices for photonic on-chip application
M. Schröder, M. Bülters, R.B. Bergmann; BIAS - Bremer Institut für angewandte Strahltechnik (DE).
New lithography techniques like direct laser writing make it possible to create free-formed three-dimensional polymer structures. This development has a high potential for photonic on-chip applications like optical waveguides and routing. Here, we present the characterizations of some functional optical waveguide devices due to three-dimensional simulation studies. [5916].....Pg. 295

09:15
Three dimensional optical components on IC surfaces for on -chip communication
M. Bülters, M. Schröder, R.B. Bergmann; BIAS - Bremer Institut für angewandte Strahltechnik (DE).
We present an innovative concept for the implementation of three dimensional optical waveguide components suitable for CMOS integration. The technology can be used for a high efficient integration of optical components on IC surface at wafer- or die-level. First implementation results will be demonstrated. [5914].....Pg. 297

Room: Gordon B

TOM 3

09:00-10:30
PLASMONICS APPLICATION
Session Chair: M. Bertolotti, Università La Sapienza di Roma (IT)

09:00 **Invited talk**
Quantum Interference on Plasmonic Circuits
F.A. Bovino[1], K. Leosson[2], P. Laporta[3]; [1]SELEX-SI, Quantum Optics Lab (IT), [2]Univ. of Iceland, Science Institute (IS), [3]Politecnico di Milano, Dip. Di Fisica (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.* [6160].....Pg. 299

Room: Crombie A

TOM 4

09:00-10:30
SUBWAVELENGTH STRUCTURES
Session Chair: S. Sinzinger, TU Ilmenau (DE)

09:00 **Invited talk**
Antireflective Sub-Wavelength Structures for Lenses, Microlens Arrays and Diffractive Optical Elements
R. Brunner[1], Ch. Morhard[2], C. Pacholski[2], J. Spatz[2,3], [1]University of Applied Sciences Jena (DE), [2]Max Planck Institute for Intelligent Systems, Stuttgart (DE), [3]University of Heidelberg, Heidelberg (DE).
Laterally structured antireflective (AR) sub-wavelength surfaces offer significant advantages compared to classical layer based AR-coatings. As a basic technology block copolymer micelle nanolithography (BCML) allows various possibilities to fabricate sub-wavelength structures with tailored effective material properties. Beyond high-performance optical lenses, BCML also allows the structuring of microlens-arrays and diffractive gratings. [6181].....Pg. 301

Room: Crombie B

TOM 5

09:00-10:30
ORGANIC ELECTRONICS
Session Chair: W. Barford, University of Oxford (GB)

09:00 Invited talk
Development of Organic Semiconductors for new Opto-electronic Devices
A. Facchetti, Polyera Corporation (US).
Printed electronics is a new technology envisioning the fabrication of electronic devices using printing methodologies instead of conventional photolitography employed in the silicon industry. In this presentation I will describe the design rationale, synthesis, characterization, of several organic semiconducting polymers for printed thin-film transistors (TFTs) and photovoltaic cells (OPVs) and understand their charge-transport characteristics as a function of the device architecture/interface modifications. Particularly I will descibe the realization of organic thin-film transistors with electron mobilities > 3 cm2/Vs for printed devices and > 7 cm2/Vs for single crystal-based devices. Furthermore, OPV cell with efficiencies >9% are demonstrated. Finally, new materials for light emitting transistors will be presented. [6288]
Pg. 303

Room: Gordon A

TOM 6

09:00-10:30
OPTICAL SOLITONS
Session Chair: A. Szameit, Friedrich Schiller University Jena (DE)

09:00
Spontaneous spatial fractal patterns in simple linear and nonlinear optical cavities
G.S. McDonald[1], J.M. Christian[1], J.G. Huang[2], T.M. Walsh[1], C. Bostock[1]; [1]University of Salford, Materials & Physics Research Centre (GB), [2]University of Glamorgan, Faculty of Advanced Technology (GB).
We present an overview of our research on the fractal-generating properties of two distinct optical cavities: fractal eigenmodes of linear systems with inherent magnification, and spontaneous spatial fractals in nonlinear systems. Our latest research focuses on "kaleidoscope" lasers and nonlinear ring-resonator geometries. [5821].....Pg. 304

09:15 STUDENT PRESENTATION
Frequency-controlled soliton steering in nematic liquid crystals
A. Piccardi[1], A. Alberucci[1], O. Buchnev[2], M. Kaczmarek[2], I.C. Khoo[3]; G. Assanto[1]; [1]University "Roma Tre", Nonlinear Optics and OptoElectronics Lab (NooEL) (IT), [2]University of Southampton, School of Physics and Astronomy (GB), [3]Pennsylvania State University (US).
We exploit the electro-optic response of a dual frequency nematic liquid crystal to obtain large steering of nonlinearly self-confined beams, i.e. nematicons, by means of the applied bias frequency. Patterned electrodes ensure the reorientation of the liquid crystal director and the corresponding change in walk-off. [5958].....Pg. 306

Room 10

TOM 7

09:00-10:30
ENVIRONMENTAL SENSING I
Session Chair: D. McStay, MCSC Ltd. (GB)

09:00 Invited talk
Fiber Optics Sensing Systems For In-Well Applications In The Oil And Gas Industry – The Value Delivered Today, And Emerging Capabilities
Brian Drakeley; Weatherford International Ltd. (US)
The focus of this presentation will be on in-well applications of fiber optics sensing systems in the oil and gas industry. [6287]
Pg. 308

NOTES

Room 18

TOM 1

09:30 **Invited talk**

Novel tumour vaccination strategies in spontaneously occurring animal models

H. Murua Escobar, University of Veterinary Medicine Hannover (DE).

Vaccination of nucleic acid constructs or functionalised cells are key technologies in the development of gene therapeutic approaches. Several different kinds of conventional strategies have been developed to deliver these target molecules into the respective cells types. These strategies can be roughly subdivided in chemical (e.g. liposomes, calcium phosphate, transfection reagents), physical (e.g. electroporation, micro injection, particle guns), and viral mediated approaches. While several of these techniques work fine in vitro the achieved efficiencies in vivo are -with some exceptions- unsatisfying or bare considerable risks. Recently, novel techniques and agents as opto-/photoporation and nanoparticles have been introduced offering an alternative and multiple possibilities to enhance the current strategies. [6446].....Pg. 310

10:00

Fast cell-selective optogenetic modification of primary neurons using femtosecond optical transfection

M. Antkowiak[1], K. Dholakia[2], F. Gunn-Moore[1]; [1]SULSA, University of St Andrews, School of Biology (GB), [2]SUPA, University of St Andrews, School of Physics & Astronomy (GB).

We demonstrate optogenetic modification of selected primary cortical neurons using femtosecond laser mediated optical transfection. We enhance further the functionality of this technique by using fast three-dimensional laser beam steering and shaping enabling a "point-and-shoot" user-friendly modification of neural circuits. [6125].....Pg. 311

Room: Fleming Auditorium

TOM 2

09:30 **Invited talk**

Plasmonic filters for Digital Imaging

D.R.S. Cumming[1], Q. Chen[1], S. Collins[2], D. Chitnis[2]; [1]University of Glasgow, School of Engineering (GB), [2]University of Oxford, Department of Engineering (GB).

The ability to control optical filter functions using surface plasmon resonance/surface plasmon polaritons makes it possible to eliminate traditional dye-doped polymer filters for digital imaging focal plane arrays. In this presentation we describe the design and implementation of new colour imaging technologies. [6107].....Pg. 313

10:00

Design, realization, and characterization of a silicon photonics coherent mixer for PDM-QPSK optical communications

R. Orobtchouk[1], P. Labeye[2], X. Hu[1], S. Malhouitre[2], P. Grosse[2], J.-M. Fedeli[2]; [1]Institut des Nanotechnologies de Lyon (INL), CNRS UMR5270, Université de Lyon, INSA-Lyon, Bât "Blaise Pascal" (FR), [2]CEA-LETI, Minatec, CEA-Grenoble (FR).

Integration of optical routing basic building blocks of a DQPSK receiver is demonstrated in CMOS silicon-on-insulator (SOI) technology. Experimental results show a maximum deviation of the phase shift of ±2.3° and an imbalance between the 4 outputs lower than 10%. [5931] Pg. 315

Room: Gordon B

TOM 3

09:30

Giant optical nonlinearity with few incident photons on a quantum dot-micropillar device

V. Loo[1,2], C. Arnold[1], A. Dousse[1], A. Lemaître[1], I. Sagnes[1], O. Krebs[1], P. Voisin[1], P. Senellart[1], L. Lanco[1,2]; [1]Lab. de Photonique et de Nanostructures, CNRS (FR), [2]Université Paris Diderot - Paris 7, Dép. de Physique (FR).

Giant optical nonlinearity is observed both under continuous-wave and pulsed excitation in a quantum dot-micropillar device. A record nonlinearity threshold of only 8 incident photons per pulse is demonstrated, paving the way for the realization of all-optical switches triggered by single-photon pulses. [5911].....Pg. 317

09:45 **Post deadline submission**

Plasmonic crystals for improving the performance of highly efficient sources

G. Lozano[1], S.R.K. Rodríguez[1], M.A. Verschuuren[2], J. Gómez-Rivas[1,3]; [1]Center for Nanophotonics, FOM Institute AMOLF, c/o Philips Research Lab. (NL); [2]Philips Research Laboratories (NL), [3]COBRA Research Institute, Eindhoven University of Technology (NL).

It is generally believed that plasmonic structures only provide benefits for light emission when used with low quantum efficiency (QE) emitters. Herein we demonstrate a very large emission increase (up to 60-fold for unpolarized emission in defined directions) using emitters developed for SSL applications with an intrinsic QE close to one. [6422] Pg. 319

10:00

Surface plasmon polariton amplification upon electrical injection: towards deep-subwavelength active plasmonic devices

D.Yu. Fedyanin[1], A.V. Krasavin[2], A.V. Arsenin[1], A.V. Zayats[2]; [1]Moscow Institute of Physics and Technology (State University), Lab. of Nanooptics and Femtosecond Electronics, Dep. of General Physics (RU), [2]King's College London, Nano-optics and Near-field Spectroscopy Group, Dep. of Physics (GB).

We present a novel scheme of surface plasmon polariton (SPP) amplification upon electrical injection that gives a possibility to integrate pumping and plasmonic waveguides and cavities on the same chip. This opens the prospects for realization of compact on-chip optical interconnects, nanoscale coherent SPP and light sources, detectors and modulators. [6147].....Pg. 321

Room: Crombie A

TOM 4

09:30

Development of large diameter elliptical graded nanostructured microlens

R. Buczynski[1,2], A.J. Waddie[1], J. Nowosielski[1,3], A. Filipkowski[1,2], D. Pysz[2], R. Stepien[1], M.R. Taghizadeh[1]; [1]Heriot-Watt University, School of Engineering and Physical Sciences (GB), [2]Institute of Electronic Materials Technology, Dept. of Glass, (PL), [3]University of Warsaw, Faculty of Physics, (PL).

In this paper, we demonstrate the feasibility of using the nanostructured micro-optics technology to create a large diameter quantised elliptical microlens with internal structure feature sizes much smaller than the wavelength of the incident light. [6177].....Pg. 323

09:45

Broadband Nanostructured Form Birefringent Material

A.J. Waddie[1], A. Filipkowski[1], J. Nowosielski[1], R. Buczynski[2], M.R. Taghizadeh[1], [1]Institute of Photonic and Quantum Sciences, School of Engineering and Physical Science, Heriot-Watt University (GB), [2]Institute of Electronics Materials Technology (ITME) (PL).

The nanostructured micro-optics fabrication technology, which exploits the techniques used in the fabrication of photonic crystal fibre, can be used to create a wide range of optical components. In this paper, we demonstrate the applicability of the method to the creation of a form birefringent material with customised material parameters and verify that the manufactured components are capable of providing flat birefringence over a significant wavelength range. [6111].....Pg. 325

10:00 **STUDENT PRESENTATION**

Simulation of the wave propagation behind a sub-wavelength metal axicon polarizer generating radial polarization

W. Iff, N. Lindlein; University of Erlangen, Chair of Optics and Erlangen Graduate School in Advanced Optical Technologies (SAOT) (DE).

The propagation of time-harmonic vectorial wave modes requires the simulation of two components of the electric field. Here, a method combining ray tracing and vectorial free space propagation using the angular spectrum of plane waves is used for the special case of light behind an element generating radial polarization. [6140].....Pg. 327

Room: Crombie B

TOM 5

09:30 STUDENT PRESENTATION

Survey of metal oxides for use in organic electronic devices

J. Griffin, A.R. Buckley, University of Sheffield, Department of Physics and Astronomy (GB).

A combination of ultraviolet photoelectron spectroscopy (UPS), X-ray photoelectron spectroscopy (XPS) and absorption spectroscopy have been used to characterise metal oxides. These metal oxides have then been placed within organic electronic devices to compare performance as charge buffer layers. [6178] Pg. 329

09:45 STUDENT PRESENTATION

Efficient energy transfer between a GaN thin film and polyfluorene

R. Jayaprakash[1,2], P. Corfdir[3], B. Deveaud[3], E. Monroy[4], M. Kaliva[1], G. Stavrinidis[2], N.T. Pelekanos[1,2]; [1]Materials Science and Technology Department, University of Crete (GR); [2]Microelectronics Research Group, IESL-FORTH (GR); [3]Institut de Photonique et d'Electronique Quantiques, Ecole Polytechnique (CH), [4]CEA-CNRS Group of Nanophysics and Semiconductors, CEA/INAC/SP2M (FR).

Förster Resonance Energy Transfer (FRET) has been observed, between a thin film of GaN and polyfluorene, at remarkable efficiencies of 73% for free GaN A-excitons, despite the absence of carrier confinement at the surface. [5881].....Pg. 331

10:00

n-Type Semiconducting Polymer Fibers for Flexible Electronics

E.V. Canesi[1], A. Luzio[1], A. Bianco[2,3], M. Caironi[1], C. Bertarelli[1,3]; [1]Center for Nano Science and Technology@PoliMi, Istituto Italiano di Tecnologia (IT), [2]INAF – Osservatorio Astronomico di Brera (IT), [3]Dipartimento di Chimica, Materiali ed Ingegneria Chimica (IT).

Electrospun fibers of poly{[N,N-bis(2-octyl-dodecyl)-naphthalene-1,4,5,8-bis(dicarboximide)-2,6-diyl]-alt-5,5-(2,2-bithiophene)} (P(NDI2OD-T2)) are tested in bottom-contact bottom gate transistors showing high performance. [6061].....Pg. 333

Room: Gordon A

TOM 6

09:30 STUDENT PRESENTATION

In-plane interaction of spatial solitons with bias-tuned interfaces

A. Alberucci[1], A. Piccardi[1], R. Barboza[1], O. Buchnev[2], M. Kaczmarek[2], G. Assanto[1]; [1]University "Roma Tre", Nonlinear Optics and OptoElectronics Lab (NooEL) (IT), [2]University of Southampton, School of Physics and Astronomy (GB).

We discuss planar interaction of spatial solitons with dielectric interfaces in nematic liquid crystals, controlling the height of the refractive barrier by external bias. We demonstrate both soliton refraction and reflection. The in-plane geometry allows maximizing the overall deflection, reaching 55° for oblique incidence. [5950].....Pg. 335

09:45 STUDENT PRESENTATION

Localized spatial structures in a titanium-sapphire laser

M. Romanelli, N. Barré, M. Brunel, M. Vallet; Institut de Physique de Rennes, Université Rennes I - CNRS UMR 6251 (FR).

We show experimentally that, under off-axis pumping, the near-field pattern of a titanium-sapphire laser consists in two localized, well-separated structures in the laser medium. These structures display some features typical of cavity solitons: they are bistable, and their spatial separation and mutual coherence can be controlled by changing the experimental geometry. [6002].....Pg. 337

10:00 Invited talk

Solitons and the Anderson localization

V. Folli[1], C. Conti[2,1]; [1]Institute for Complex Systems (ISC-CNR), UOS Sapienza (IT), [2]University Sapienza, Department of Physics (IT).

We review our recent results on the effect of nonlinearity on Anderson states in a one-dimensional model. We report on the interplay between solitons and disorder, including the effect of a nonlocal nonlinearity. [5918].....Pg. 339

Room 10

TOM 7

09:30

Optical non-destructive testing methods

P. Huke, C.v. Kopylow, R.B. Bergmann; BIAS - Bremer Institut für angewandte Strahltechnik GmbH (DE).

In this paper we give an overview on optical non-destructive testing methods and provide a categorization from the viewpoint of an operator, developer or distributor. Furthermore, we show experimental results obtained using methods developed in our institute. [5964].....Pg. 341

09:45

Test installation of first wireless infrared gas detector for oil and gas industry

B. Fismen[1], H. Sagberg[1], N. Aakvaag[2], L. Borgen[1], P. Nordbryhn[1], K. Sandven[1], S. Carlsen[3]; [1]GasSecure AS (NO), [2]SINTEF (NO), [3]Statoil ASA (NO).

Infrared hydrocarbon gas detectors are an essential safety barrier at oil and gas installations, but cabled power complicates installation. A detector with low-power optical design based on a MEMS gives several years of reliable battery operation. The detector has been tested successfully at an onshore gass processing plant for a period of four months. [6068].....Pg. 343

10:00

Qualifying parabolic mirrors with deflectometry

W. Li[1], A. Heimsath[2], J. Burke[3], C.v. Kopylow[3], R.B. Bergmann[3], [1]Vereinigte Elektronik-Werkstätten GmbH (VEW) (DE), [2]Fraunhofer-Institut für Solare Energiesysteme (ISE) (DE), [3]BIAS - Bremer Institut für angewandte Strahltechnik GmbH (DE).

Deflectometry is a gradient technique that lends itself very well to testing polished optical surfaces, with sensitivity in the nm range. Recent advancements have even enabled accurate measurement of absolute shapes by gradient integration, as we show by way of results from mirrors for concentrating solar applications and telescopes. [5989].....Pg. 345

NOTES

Thursday, 27 September

Room 18

TOM 1

10:15
Development of a model for central nervous system regeneration in the roundworm *C. elegans*
S.H. Chung[1,2], C.V. Gabel[1,2]; [1]Boston University School of Medicine, Department of Physiology and Biophysics, [2]Boston University Photonics Center (US).
We establish a model in the roundworm *C. elegans* for lesion conditioning, a well-known but poorly-understood form of neuronal regeneration in the mammalian central nervous system. Using laser surgery, calcium imaging, and optogenetics we relate lesion conditioning to a type of aberrant neuronal outgrowth in *C. elegans*. [6095]
Pg. 347

Room: Fleming Auditorium

TOM 2

10:15 STUDENT PRESENTATION
Experimental confirmation of universal relations for microring resonators in SOI technology
W.J. Westerveld[1,2], J. Pozo[2], R.A. Nieuwland[2], S.M. Leinders[3], K.W.A. van Dongen[3], M. Yousefi[4], H.P. Urbach[1]; [1]Optics Research Group, TU Delft (NL), [2]TNO (NL), [3]Laboratory of Acoustical Imaging, TU Delft (NL), [4]Photonic Sensing Solutions (NL).
In 2000, Yariv published elegant universal relations for coupling of light between microresonators and dielectric waveguides. We experimentally confirm these using microring resonators in SOI technology with small bend radii of 1.5μm. [5995].....Pg. 349

Room: Gordon B

TOM 3

10:15
Multimodal SPASER emission of polyhedral nanoparticles
N. Ghofraniha[1], P. André[2,3], A. Di Falco[2], C. Conti[4,5]; [1]IPCF-CNR, UOS Roma Kerberos, Università La Sapienza (IT; [2]School of Physics and Astronomy (SUPA), University of St Andrews (GB); [3]Chemistry and Materials Physics Building, RIKEN (JP); [4]Dep. of Physics, University Sapienza (IT); [5]Ist. for Complex-Systems CNR, UOS Sapienza, University Sapienza (IT).
The SPASER is a nanometer scale source of intense coherent optical fields with applications ranging from biomedicine to lithography, from microscopy to information technology. Plasmonic stimulated emission of light is obtained when the electronic losses due to absorption are compensated by an optically active medium surrounding the metal nanoparticles. [6128].....Pg. 351

Room: Crombie A

TOM 4

10:15 STUDENT PRESENTATION
Oversimplification of plasmonic lenses design based on wave interferences method
Q. Lévesque[1,2], P. Bouchon[1,2], F. Pardo[1], R. Haïdar[2], J.-L. Pelouard[1], [1]Laboratoire de Photonique et de Nanostructures (LPN-CNRS) (FR), [2]Onera – The French Aerospace Lab (FR).
Plasmonic lenses are based on complex combination of various nanoscale slits. We show that their design can be strongly simplified, and that a 5-slit structure allows keeping the same performances thanks to a wave interferences method. [5880]
Pg. 354

10:30-11:00 **Coffee break** (exhibition hall, Boyd Orr Suite)

Room: Fleming Auditorium

11:00-11:45 **PLENARY TALK | TOM 3**
Light, Electrons, Metastructures, and Metasystems
N. Engheta; University of Pennsylvania, Department of Electrical and Systems Engineering (US).
In this talk, I will give an overview of some of our most recent work on metastructures that function as platforms for metasystems, resulting in novel functionalities and new characteristics. I will also discuss our recent results in development of the concept of optical metatronics metamaterial inspired optical nanocircuitry. [5967].....Pg. 356

11:45-12:30 **PLENARY TALK | TOM 5**
Playing with Microcavities
G. Gigli; University of Salento, Department of Mathematics and Physics; CNR Institute of Nanoscience, National Nanotechnology Laboratory; Italian Institute of Technology, Center for Biomolecular Nanotechnology (IT).
In this talk 1D Microcavities are discussed as tool for exploring novel physical effects and applications as the light matter coupling regime is varied. [6454].....Pg. 358

12:30-12:45 **TOM 3**
A scanning resonant dipole-antenna probe Post deadline submission
L. Neumann[1], J. van 't Oever[1], N.F. van Hulst[1,2]; [1]ICFO – Institute of Photonic Sciences (ES), [2]ICREA – Instutució Catalana de Recerca i Estudis Avançats (ES).
We present a resonant dipole antenna fabricated at the end of a tapered fibre, acting as a scanning probe with 35nm FWHM spatial confinement and 16 times signal enhancement. [6415].....Pg. 359

12:45 15:00 **Lunch break & POSTER SESSION II**
Room: exhibition hall, Boyd Orr Suite

Room: Crombie B	Room: Gordon A	Room 10	
TOM 5	TOM 6	TOM 7	NOTES
10:15 **Crystal packing and lattice phonons in molecular materials for electronics and opto-electronics** *A. Girlando[1], M. Masino[1], A. Bacchi[1], D. Crocco[1], A. Brillante[2], I. Bilotti[2], R.G. Della Valle[2], E. Venuti[2], [1]Parma Univ., Dip. Chimica G.I.A.F. and INSTM-UdR PR (IT), [2]Bologna Univ., Dip. Chim. Fis. Inorg. and INSTM-UdR BO (IT).* We illustrate the use of Raman spectroscopy, coupled to lattice dynamics calculations, to fully characterize the low-frequency phonons of organic semiconductors, and the corresponding coupling to the charge carriers. Identification of different polymorphs and of phase purity of the crystalline phase is also possible. [5837].....Pg. 361			

10:30-11:00 **Coffee break** (exhibition hall, Boyd Orr Suite)

NOTES

Room 18

TOM 1

15:00-17:00
IMAGING & SENSING
Session Chair: C. Geisler, Laser-Laboratorium Goettingen e.V. (DE)

15:00
Modulated Raman spectroscopy: a promising biophotonics tool for early cancer diagnosis
A.C. De Luca[1,2], M. Mazilu[1], P.C. Ashok[1], A. Riches[3], S.C. Herrington[3], K. Dholakia[1]; [1]SUPA-School of Physics and Astronomy, University of St Andrews (GB); [2]Institute of Protein Biochemistry, Consiglio Nazionale delle Ricerche (IT), [3]School of Medicine, Medical and Biological Sciences Building, University of St Andrews (GB).
A new modulation method allowing the suppression of the fluorescent background and the improvement of the spectral quality of the Raman data is reported. In this work, by analyzing separate spectra from normal urothelial and bladder cancer cell lines we show that our modulation method facilitates spectral assignment and increases detection sensitivity and specificity. [6105].....Pg. 363

15:15 STUDENT PRESENTATION
Multifractal analysis of laser Doppler flowmetry and bio-impedancemetry signals for an integrated analysis of the cardiovascular system
E. Guerreschi[1,2], A. Humeau-Heurtier[2], S. Bricq[1,2], G. Mahe[3], G. Leftheriotis[3]; [1]LUNAM Université, Groupe Esaip (FR), [2]LUNAM Université, Laboratoire d'Ingénierie des Systèmes Automatisés (LISA), Université d'Angers (FR), [3]LUNAM Université, Laboratoire de Physiologie et d'Explorations Vasculaires, UMR CNRS 6214-INSERM U1083, Centre Hospitalier Universitaire d'Angers (FR).
Laser Doppler flowmetry signals (from the peripheral cardiovascular system, CVS) associated with bio-impedance signals (from the central CVS) are processed via multifractal analyses in order to provide an integrated study of the CVS. Situations at rest and after a vasodilator administration (glycerin trinitrate) are studied. [6086].....Pg. 365

Room: Fleming Auditorium

TOM 2

15:00-16:00
NONLINEAR Si PHOTONICS
Session Chair: R.B. Bergmann, BIAS - Bremer Institut für angewandte Strahltechnik GmbH (DE)

15:00 Invited talk
Second-order nonlinear silicon photonics
F. Bianco[1], M. Cazzanelli[1], M. Ghulinyan[2], G. Pucker[2], L. Pavesi[1]; [1]Nanoscience Laboratory, Department of Physics, University of Trento (IT), [2]Advanced Photonics & Photovoltaics Unit, Bruno Kessler Foundation (IT).
The crystalline centro-symmetry of silicon inhibits the second-order dipolar nonlinear susceptibility $\chi^{(2)}$. Some ways to overcome this limitation are reviewed in this talk. [5909].....Pg. 367

Room: Gordon B

TOM 3

15:00-17:00
NANO ANTENNAE
Session Chair: N. Engheta, University of Pennsylvania (US)

15:00
Selective suppression of Fabry-Pérot resonances in surface plasmon polariton cavities via the spatial control of losses
D. O'Connor[1], C. McPolin[1], S.S. Choi[2], G.A. Wurtz[1], A.V. Zayats[1]; [1]Nano-optics and Near-field Spectroscopy Group, Department of Physics, King's College London (GB), [2]Department of Nanoscience, SunMoon University (KR).
In this work we present experimental evidence of the existence of Fabry-Pérot resonances in pyramidal-shaped plasmonic cavities. We show how the structure can be used to selectively excite/suppress specific cavity resonances, providing means for applications in multiplexed sensors and ultra-integrated plasmonic sources. [5975].....Pg. 370

15:15
Purcell Factor of Plasmonic Nanoantennas
C. Sauvan[1], J.P. Hugonin[2], P. Lalanne[1]; [1]Laboratoire Photonique Numérique et Nanosciences, Université Bordeaux 1, Institut d'Optique, CNRS (FR),[2]Laboratoire Charles Fabry, Institut d'Optique, CNRS, Université Paris-Sud (FR).
The Purcell factor ($3Q\lambda^3/4\pi^2V$) is a widely used figure of merit for spontaneous emission in optical cavities. However, in dissipative systems such as plasmonic nanoantennas, the Local Density of Optical States (LDOS) cannot be described with the standard Purcell factor expression. We generalize the definition of the mode volume V to dissipative systems, for which losses can be due to absorption and/or radiation, and we apply the generalized formalism to single and coupled nanoantennas. We discuss the physical mechanisms responsible for the appearance of Fano resonances in the LDOS of coupled resonators. [5992]
Pg. 372

Room: Crombie A

TOM 4

15:00-17:45
OPTICAL FABRICATION AND MEASUREMENT
Session Chair: H. Zappe, University of Freiburg (DE)

15:00 STUDENT PRESENTATION
Fabrication and optical characterization of 2D ferroelectric domain patterns in Yb^{3+} doped $LiNbO_3$
L. Mateos, M.O. Ramírez, L.E Bausá; Departamento Física de Materiales, Universidad Autónoma de Madrid (ES).
Square lattices of inverted domains ranging from 1 to 20 µm have been obtained in Yb^{3+}:$LiNbO_3$. Confocal µ-Raman, µ-Fluorescence and Second Harmonic Generation (SHG) were employed to characterize the patterns. Spectroscopic images of domains and domain walls and tunable Cerenkov type SHG are demonstrated. [5937]
Pg. 374

15:15 STUDENT PRESENTATION
Creation of multiperiodic and defect photonic structures using optical multiplexing techniques
M. Boguslawski, A. Kelberer, P. Rose, C. Denz; Institut für Angewandte Physik and Center for Nonlinear Science (CeNoS), Westfälische Wilhelms-Universität Münster (DE).
In this contribution we suggest an elaborate method to optically induce multiperiodic structures by implementing an intuitive holographic multiplexing technique. This technique is further applied to induce photonic lattices revealing local defects. [5956]
Pg. 376

Room: Crombie B

TOM 5

15:00-17:00
ORGANIC PHOTOPHYSICS
Session Chair: A. Facchetti, Polyera Corporation (US)

15:00 Invited talk
Exciton Dynamics in Conformationally Disordered Polymers
W. Barford, University of Oxford, Physical and Theoretical Chemistry Laboratory (GB).
The dynamics of photoexcitations in conformationally disordered polymers are investigated via various theoretical models. Ultrafast intra-chain dynamical localization to vibrationally relaxed states and slower Förster-type migration of vibrationally relaxed states between chromophores are discussed. [5977]
Pg. 378

Room: Gordon A

TOM 6

15:00-17:00
NONLINEAR OPTICAL MATERIALS
Session Chair: G.-L. Oppo, University of Strathclyde (GB)

15:00 STUDENT PRESENTATION
Direct measurement of the near-field super resolved focused spot in an InSb thin layer
A. da Costa Assafrao[1], A.J.H. Wachters[1], M. Verheijen[1], A.M. Nugrowati[1], S.F. Pereira[1], H.P. Urbach[1], M.-F. Armand[2], S. Olivier[2]; [1]Optics Research Group, Department of Imaging Science and Technology, Delft University of Technology (NL), [2]CEA-Leti (FR).
We combined near field microscopy, confocal microscopy and time resolved pumpprobe technique to directly measure the induced sub-diffraction limited spot in the nearfield regime generated in a InSb thin layer. The measured spot size was found to be dependent on the laser power and a decrease of 25% (100nm) was observed. [6209].....Pg. 380

15:15
Noncollinear second-harmonic generation by femtosecond laser-induced phase gratings in lithium niobate
J. Imbrock, M. Ayoub, W. Horn, C. Denz; Institute of Applied Physics and Center for Nonlinear Science (CeNoS), University of Muenster (DE).
Noncollinear second-harmonic generation is induced by a one dimensional phase grating which is directly written into a lithium niobate wafer by femtosecond laser pulses. The efficiency, bandwidth, and tuning characteristic of this integrated nonlinear photonic beam splitter device are examined. [6175]
Pg. 383

NOTES

Room 18

TOM 1

Room: Fleming Auditorium

TOM 2

15:30
Micro-structuring of silicon wafer surface by femtosecond laser pulses at high repetition rates for photovoltaic applications
G. Nava[1], R. Osellame[2], G. Lanzani[1,2], R. Ramponi[1,2], K.C. Vishnubhatla[1]; [1]Center for Nano Science and Technology@PoliMi, Istituto Italiano di Tecnologia (IT), [2]Istituto di Fotonica e Nanotecnologie (IFN) – CNR and Dipartimento di Fisica, Politecnico di Milano (IT).
Laser texturing of Silicon substrate surface was performed by femtosecond laser at high repetition rates. By optimizing various fabrication parameters, very high absorbance in the visible region was obtained from the micro-structured silicon wafer as compared to the unstructured wafers. [6136].....Pg. 387

Room: Gordon B

TOM 3

15:30 **Invited talk**
Femtosecond Control of NanoAntennas: from plasmonics to natural systems
N. van Hulst, ICFO – The Institute of Photonic Sciences, ICREA – Institució Catalana de Recerca i Estudis Avançats (ES).
Plasmonic and molecular antennas both control light at the Nanoscale. We present recent advances on fs spectral phase control of nanofabricated optical antennas and natural antenna complexes. [6285].....Pg. 391

Room: Crombie A

TOM 4

15:30 **STUDENT PRESENTATION**
Analytic Phase retrieval in Coherent Fourier Scatterometry from the far field intensity maps
N. Kumar[1], S. Roy[1], O. El. Gawhary[1,2], S. F. Pereira[1], H.P. Urbach[1]; [1]Delft University of Technology, Optics Research Group, Imaging Science and Technology (NL), [2]VSL Dutch Metrology Institute (NL).
Under suitable conditions, focused beam Coherent Fourier Scatterometry (CFS) can increase the accuracy of optical scatterometry technique. Analytic relations for the phase difference between the diffracted orders are derived from the far field intensity maps. Phase dependent analysis of grating parameters is presented. [5981]
Pg. 393

15:45 **STUDENT PRESENTATION**
Mid infrared waveguide spectroscopy for cocaine detection in liquid environments
Y.-C. Chang[1], P. Wägli[2], V. Paeder[1], A. Homsy[2], L. Hvozdara[1], P. van der Wal[2], J. Di Francesco[1], N.F. de Rooij[2], H.P. Herzig[1]; [1]Ecole Polytechnique Fédérale de Lausanne (EPFL), Institute of Microengineering (IMT), Optics & Photonics Technology Laboratory (OPT) (CH), [2]Ecole Polytechnique Fédérale de Lausanne (EPFL), Institute of Microengineering (IMT), The Sensors, Actuators and Microsystems Laboratory (SAMLAB) (CH).
A germanium strip waveguide on a silicon substrate is integrated with a microfluidic chip to detect cocaine in tetrachloroethylene solutions. In the evanescent field of the waveguide, cocaine absorbs the light at 5.8µm, which is emitted from a quantum cascade laser. The lowest measured concentration is 100µg/ml. [6025]
Pg. 385

15:45
Subsurface modification in monocrystalline silicon by multiphoton processes - analytical model and first results
V.V. Parsi Sreenivas, M. Bülters, R.B. Bergmann; BIAS - Bremer Institut für angewandte Strahltechnik (DE).
Mono-crystalline silicon can be modified at the subsurface level by tightly focussing ultrashort infrared laser pulses, thereby exploiting its nonlinear properties. We develop an analytical model by treating the changes in the dielectric constant as small perturbations during the multiphoton absorption of laser pulses and investigate its effects under different approximations. We also present a few initial results demonstrating subsurface modification capabilities. [6020]
Pg. 389

15:45 **STUDENT PRESENTATION**
Polarization Effects in Coherent Fourier Scatterometry
S. Roy, N. Kumar, S.F. Pereira, H.P. Urbach, Optics Research Group, Department of Imaging Science and Technology, Delft Institute of Technology (NL).
Coherent Fourier Scatterometry (CFS) is a promising candidate for high accuracy nanometrology, as this method offers accuracy, convenience of measurement and fast processing time simultaneously. It has already been shown that CFS provides better sensitivity[3] when unpolarized field is detected. In this work we investigate how CFS behaves for different polarization combinations between incident and detected field. [5985]
Pg. 395

Room: Crombie B

TOM 5

15:30
Comprehensive spectroscopic investigation on the role of intermolecular charge transfer states in Solid-state dye sensitized solar cells in a low band gap dye
R.S.S.K. Raavi[1], P. Docampo[2], M. Alcocer[1], H.J. Snaith[2], A. Petrozza[1]; [1]Center for Nano Science and Technology@Polimi, Istituto Italiano di Tecnologia (IT), [2]Oxford University, Department of Physics, Clarendon Laboratory (GB).
Employing various spectroscopic techniques (fs-cw) we study the role of intermolecular charge transfer (CT) states in solid-state dye sensitized solar cells employing a low bandgap dye and titania electrodes. Our studies show these CT states plays a major role in the overall photon to current conversion. [6159]
Pg. 397

15:45
Charge recombination and quenching mechanisms in organic field effect light-emitting transistors
S. Toffanin[1], W.W.A. Koopman[1], M. Natali[1], M. Muccini[1,2]; [1]Consiglio Nazionale delle Ricerche - Istituto per lo Studio dei Materiali Nanostrutturati (CNR-ISMN) (IT), [2]E.T.C. srl (IT).
The investigation of non-radiative exciton processes is fundamental for improving the light-emission efficiency of organic light-emitting transistors. Here we demonstrate the use of PL quenching confocal microscopy for study local exciton quenching in the channel of an organic field-effect transistor. [6133].....Pg. 399

Room: Gordon A

TOM 6

15:30 STUDENT PRESENTATION
Energetic and spectral properties of triple photon down-conversion in a phase-matched $KTiOPO_4$ crystal
A. Dot[1], A. Borne[1], B. Boulanger[1], P. Segonds[1], C. Félix[1], K. Bencheikh[2], J.A. Levenson[2]; [1]Institut Néel, Centre National de la Recherche Scientifique – Université Joseph Fourier (FR), [2]Laboratoire de Photonique et de Nanostructures, CNRS-UPR 20 (FR).
We performed the study of the spectral and energetic properties of triple photons generated by a third order down-conversion parametric process in a KTP crystal pumped at 532nm and stimulated around 1662nm. Our model takes into account the spectrum linewidth of the beams and a parasitic Kerr effect. [6122].....Pg. 401

15:45
Temperature change of PPLN crystal during second harmonic generation of Yb-doped fiber laser radiation
O.A. Ryabushkin[1,2,3], A.V. Konyashkin[1,2,3], D.V. Myasnikov[2,3], V.A. Tyrtyshnyy[1,2]; [1]Kotelnikov Institute of Radio-engineering and Electronics of RAS (RU), [2]NTO «IRE-Polus» (RU), [3]Moscow Institute of Physics and Technology (State university) (RU).
Temperature dependence of nonlinear-optical crystal on laser power in the course of frequency conversion was measured using crystal piezoelectric resonance. Dramatic temperature change of crystal was observed near temperature of phase matching condition where second harmonic is efficiently generated. [5867]
Pg. 403

NOTES

Room 18

TOM 1

16:00 STUDENT PRESENTATION

Optical fiber grating devices for label-free DNA detection

A. Candiani, M. Sozzi, A. Cucinotta, S. Selleri; University of Parma, Department of Information Engineering (DII) (IT).

We report on optical fiber grating sensors for label-free DNA detection. The all in-fiber biosensors, functionalized with Peptide Nucleic Acid (PNA), are able to detect DNA strands at concentrations between 10nM and 120nM, inducing significant spectral modulations in the transmitted signal. [5978].....Pg. 405

16:15 STUDENT PRESENTATION

Twin-Focus Photothermal Correlation Spectroscopy

R. Schachoff, M. Selmke, M. Braun, F. Cichos; University of Leipzig, Faculty of Physics and Earth Sciences, Institute for Experimental Physics I (DE).

We introduce a new correlation spectroscopy technique for the study of local dynamical processes with single molecule sensitivity. The technique is based on photothermal absorption microscopy which provides a split-focus geometry. This twin-focus is introduced to considerably extend current correlation techniques. [6009].....Pg. 407

Room: Fleming Auditorium

TOM 2

16:00-18:00

Si PHOTONICS AND OTHER ELEMENTS

Session Chair: G. Reed, University of Southampton (GB)

16:00 Invited talk

Group IV photonics: Carbon nanotubes and silicon, a good combination

L. Vivien, N. Izard, A. Noury, E. Gaufrès, X. Le Roux; Institut d'Electronique Fondamentale – Univ. Paris Sud – CNRS UMR8622 (FR), *Now at R. Martel's group, Univ. Montréal (CA).*

Strong luminescence and optical gain in carbon nanotubes based layer at wavelengths around 1.3 µm have been demonstrated. Their integration on silicon platform to develop a new class of optoelectronic devices has also been studied. [6187].....Pg. 409

Room: Gordon B

TOM 3

16:00 STUDENT PRESENTATION

Coherent Control of Nanoantennas using Optical Eigenmodes

S. Kosmeier, A. di Falco, A.C. De Luca, K. Dholakia, M. Mazilu; University of St Andrews, School of Physics & Astronomy (GB).

Decomposing the light field into Optical Eigenmodes (OEi), we shape the illumination of an array of nanoantennas in order to selectively address one or more antennas with variable intensity. This method enables the flexible generation of optical landscapes which minimise crosstalk between the individual nanoantennas. [6062].....Pg. 411

16:15 STUDENT PRESENTATION

Magnetic and Electric Multipolar Interactions with Optical Antennas

A.G. Curto[1], M. Kuttge[1], G. Volpe[1], T.H. Taminiau[1], M.P. Kreuzer[1], R. Quidant[1,2], N.F. van Hulst[1,2]; [1]ICFO – The Institute of Photonic Sciences (ES), [2]ICREA – Institucio Catalana de Estudis Avançats (ES).

Light-matter interaction usually occurs through the electric dipole response of nanoscale material constituents. Here we present two examples of light-matter interactions at the nanoscale where magnetic dipole or electric quadrupole moments are dominant due to the multipolar response of tailored optical antennas. [6099].....Pg. 413

Room: Crombie A

TOM 4

16:00 STUDENT PRESENTATION

Phase retrieval from focused field: optimal position of measurement

A. Polo, S.F. Pereira, H.P. Urbach, Delft University of Technology, Department of Imaging Science and Technology, Optics Research Group (NL).

Phase aberrations in an optical system can be evaluated by phase-retrieval procedure by taking several through-focus intensity measurements. In this work we investigate the potential to obtain the phase information by one single intensity measurement to perform fast and robust retrieval. [5844].....Pg. 415

16:15

Resolution Enhancement for Advanced Mask Aligner Lithography using phase-shifting photomasks

T. Weichelt[1], U. Vogler[3], L. Stuerzebecher[1], R. Voelkel[3], U. D. Zeitner[1,2], [1]Friedrich Schiller University Jena, Institute of Applied Physics, Abbe Center of Photonics (DE), [2]Fraunhofer Institute for Applied Optics and Precision Engineering (DE), [3]SUSS MicroOptics SA (CH).

The application of the phase-shift method is a possible way to enhance the resolution when binary masks reach their limits, e.g.in case of 3-5 µm features using a proximity gap of 30 µm. By applying the phase-shift method, a printing resolution of 1.5 µm half-pitch was achieved while retaining the same mask-wafer-distance. [6153] Pg. 417

16:30

Sub-Micrometer period diffraction grating generated by i-line mask-aligner lithography

Y. Bourgin[1], L. Stürzebecher[1], T. Käsebier[1], F. Fuchs[2], T. Harzendorf[2], U. D. Zeitner[1,2], [1]Friedrich Schiller University Jena, Institute of Applied Physics Abbe Center of Photonics (DE), [2]Fraunhofer Institute for Applied Optics and Precision Engineering (DE).

A method based on a binary phase mask combined with a suitable illumination set-up is used to fabricate sub-micrometer diffraction gratings by using proximity i-line mask-aligner lithography. This demonstrates that sub-wavelength structures can be made by using mask-aligner lithography. [6033] Pg. 419

Room: Crombie B

TOM 5

16:00
Dynamic Microscopy Study of Ultrafast Charge Transfer in Hybrid P3HT: hyper-branched CdSe Nanoparticle Blend for Photovoltaics
G. Grancini[1,A], M. Biasiucci[2], R. Mastria[3], F. Scotognella[1,A], F. Tassone[4], D. Polli[1], G. Gigli[3,5], G. Lanzani[1,4]; [1]Dipartimento di Fisica, Politecnico di Milano (IT), [2]NNL-CNR Nanoscience Institute c/o Dip. Fisica Ed. G. Marconi, La Sapienza University (IT) and Electronical Engineering Department, Tor Vergata University (IT), [3]NNL-CNR Nanoscience Institute, Dip. Ingegneria Innovazione, Università del Salento (IT), [4] Center for NanoScience and Technology CNST-IIT@POLIMI (IT), [5]IIT, CBN (IT).
We present a spectroscopic investigation on a new hyper-branched Cadmium Selenide nanocrystals (CdSe NC): Poly(3-hexylthiophene) (P3HT) blend, as a potentially good active component in hybrid photovoltaics. Combined ultrafast transient absorption spectroscopy and morphological investigations by means of an Ultrafast Confocal Microscope reveal a strong influence of the complex local structure on the photogenerated carrier dynamics. [6072]
Pg. 421

16:15
Photophysics of Stand-alone P3HT:PCBM interfaces: an insight into Charge photogeneration
A.R. Srimath Kandada[1], G. Grancini[2], A. Petrozza[2], S. Perissinotto[2], D. Fazzi[2], R.S.S. Kumar[2], G. Lanzani[1,2], [1]Dipartimento di Fisica (IT), [2]Center for Nano Science and Technology @ Polimi, Istituto Italiano di Tecnologia (IT).
A novel technique based on multiple pass scheme presented here, enables us to perform transient absorption (TrAMP) on stand-alone interfaces of P3HT:PCBM. Our experiments provide a clear evidence of the presence of the interfacial CT state and elucidate its role in charge photo-generation. [6040]
Pg. 423

Room: Gordon A

TOM 6

16:00
Effect of fifth nonlinear polarization on exciton Rabi oscillation in GaAs/$Al_xGa_{1-x}As$ double heterostructure thin films
O. Kojima[1], K. Goi[1], T. Kita[1], T. Isu[2]; [1]Department of Electrical and Electronic Engineering, Kobe University (JP), [2]Center for Frontier Research of Engineering, The University of Tokushima (JP).
We report effects of the generation of the fifth nonlinear optical polarization, measured by a six-wave-mixing technique, on the third optical nonlinear polarization observed as the degenerate four-wave-mixing signal in GaAs/$Al_{0.3}Ga_{0.7}As$ double heterostructure thin films. [5790].....Pg. 425

16:15
Isolated XUV pulse generation in Mn plasma
R.A. Ganeev[1,2], T. Witting[1], C. Hutchison[1], F. Frank[1], M. Tudorovskaya[3], M. Lein[3], W.A. Okell[1], A. Zair[1], J.P. Marangos[1], J.W.G. Tisch[1]; [1]Blackett Laboratory, Imperial College London (GB), [2]Institute of Electronics (ZU), [3]Institut für Theoretische Physik and Centre for Quantum Engineering and Space-Time Research (QUEST), Leibniz Universität Hannover (DE).
We report studies of high-order harmonic generation in laser-produced manganese plasmas using 3.5 fs laser pulses. The measured spectra exhibit resonant enhancement of a small spectral region around the 31st harmonic (~50 eV). [5831]
Pg. 427

NOTES

Room 18

TOM 1

Room: Fleming Auditorium

TOM 2

16:30
Er^{3+}/silicon nanocrystals co-doped devices: From a light emitting diode to an injected slot waveguide
A. Tengattini[1], A. Anopchenko[1], N. Prtljaga[1], D. Gandolfi[1], M. Cazzanelli[1], J. M. Ramìrez[2], F. Ferrarese Lupi[2], Y. Berencén[2], D. Navarro-Urrios[2], O. Jambois[2], B. Garrido[2], J.-M. Fedeli[3], L. Pavesi[1]; [1]Nanoscience Laboratory, Department of Physics, University of Trento (IT), [2]Department of Electronics, University of Barcelona (ES), [3]CEA / Léti, Minatec (FR).
Metal-oxide-semiconductor light emitting diodes are fabricated by means of a silicon rich oxide layer with Er^{3+} ions implantation. High infrared external quantum efficiency values are achieved. The same active material is used to build an electrically pumped horizontal slot waveguides, in order to get an optical on-chip amplifier. [6191].....Pg. 431

16:45
Oxide-free heteroepitaxial bonding of InP- based quantum wells to Si
A. Talneau, C. Roblin, A. Itawi, O. Mauguin, L. Largeau, G. Beaudouin, I. Sagnes, G. Patriarche; Laboratoire de Photonique et de Nanostructures (FR).
Oxide-free Monolithic Integration of InP-based materials on Si will allow lasers and optical amplifiers operating at 1.55μm to be efficiently included in photonic integrated circuits. Patterned surfaces will be preserved, thus adding more specific designs. We demonstrate GaInAs quantum wells bonded to Si, with an atomic-plane-thick reconstruction across the InP-Si interface. [6047].....Pg. 433

Room: Gordon B

TOM 3

16:30
Coherent control of subwavelength light localization in coupled plasmonic nanoresonators.
S. Tuccio, M. Centini, A. Benedetti, C. Sibilia; Dipartimento di Scienze di Base e Applicate per l'Ingegneria (SBAI), Sapienza Università di Roma (IT).
We report results on the possibility of subwavelength coherent control of light in coupled plasmonic nanoresonators on dielectric waveguides. We also show the possibility to efficiently inject a guided mode into a planar dielectric waveguide by collecting the radiation emitted by wire sources placed into the resonators. [6176].....Pg. 435

16:45
$\chi^{(2)}$ processes in electrically contacted optical gap antennas: second harmonic generation and optical rectification
A. Stolz, J. Berthelot, A. Bouhelier; Laboratoire Interdisciplinaire Carnot de Bourgogne UMR -CNRS 6303, Université de Bourgogne (FR).
We study photon-assisted processes in electrically-contacted optical gap antenna obtained by electromigration on metallic nanowire. Using nonlinear confocal microscopy, we observed strong $\chi^{(2)}$ gap responses in the form of SHG and optical rectification. Tunnelling characteristics inform the induced photoemission processes. [5839].....Pg. 437

Room: Crombie A

TOM 4

16:45
Nano-Moulding of Rough Glass Surfaces for Dosed Optical Scattering
C. Doering, E. Hein, M. Oulad Saiad, H. Fouckhardt; Kaiserslautern University of Technology, Physics Department, Integrated Optoelectronics and Microoptics Research Group (DE).
Glass surfaces can be roughened in a defined way by reactive ion etching (RIE). Different morphologies have previously been achieved this way by varying RIE process parameters. Each morphology shows specific optical scattering characteristics. The surface morphologies can be nano-moulded (by casting) into an elastomer by a two-step process with high shape fidelity. Thus both glass and elastomer surface show nearly the same optical scattering behaviour. [5804].....Pg. 439

17:00
Photochromic Materials for Optical Interferometry
A. Bianco[1,2], G. Pariani[1], M. Quintavalla[1], R. Castagna[2,3], C. Bertarelli[2]; [1]INAF – Osservatorio Astronomico di Brera (IT), [2]Dipartimento di Chimica, Materiali ed Ingegneria Chimica, Politecnico di Milano (IT), [3]Center for Nano Science and Technology@PoliMi, Istituto Italiano di Tecnologia (IT).
Photochromic materials have been designed for making active elements to be used in interferometric tools. In particular, Rewritable Computer Generated Holograms have been obtained as reference surfaces in optical testing and a fully adaptable photochromic Point Diffraction Interferometer has been realized and tested. [5970].....Pg. 441

17:00
STUDENT PRESENTATION AWARD & END OF TOM 1

17:00-17:30 Coffee break (exhibition hall, Boyd Orr Suite)

Room: Crombie B

TOM 5

16:30 STUDENT PRESENTATION

Charge-transfer vs local excitations: a case study

C. Sissa[1], L. Grisanti[1], F. Terenziani[1], V. Calabrese[2], M. Cavazzini[2], S. Quici[2], A. Painelli[1]; [1]Università di Parma & INSTM, Dipartimento di Chimica GIAF (IT), [2]Istituto di Scienze e tecnologie Molecolari , Consiglio Nazionale delle Ricerche (CNR) (IT).

A detailed spectroscopic and theoretical investigation of 8-*N,N*-dibutylamino-2-azachrysene is presented to describe the role of charge transfer and local excited states in determining the optical behavior. [5960]

Pg. 443

16:45

Essential-State Models for Polymethine Dyes: Symmetry Breaking and Optical Spectra

F. Terenziani[1], A. Painelli[1], O. Przhonska[2]; [1]Dipartimento di Chimica GIAF, Università di Parma and INSTM-UdR Parma (IT), [2]Institute of Physics, National Academy of Science (UA), CREOL: College of Optics and Photonics, University of Central Florida (US).

Optical spectra of a few families of symmetric polymethine dyes are analyzed based on an essential-state model. The model reproduces the anomalous evolution with solvent polarity of experimental absorption band-shapes, as well as the intense twophoton absorption towards the (nominally two-photon forbidden) lowest excited state. [5857].....Pg. 445

Room: Gordon A

TOM 6

16:30

Enhancement of nonlinear-optical effects in a 2D magnetoplasmonic crystal

D. Gheorghe[1], I. Razdolski[1], E.Th. Papaioannou[2], A.V. Kimel[1], A. Kirilyuk[1], Th. Rasing[1]; [1]Radboud University Nijmegen, Institute for Molecules and Materials (NL), [2]Department of Physics and Astronomy, Uppsala University (SE).

Surface plasmon excitation in a Co-based 2D magnetoplasmonic crystal was found to strongly enhance second harmonic generation (SHG). Transversal Kerr effect studies have shown huge changes of the SH magnetic contrast, indicating resonant behaviour of the nonlinear-optical susceptibility. [5794]

Pg. 447

16:45 STUDENT PRESENTATION

Nonlinear excitation of nitrogen-vacancy centres in nanodiamonds

I.P. Ivanov, X. Li, M. Gu; Swinburne University of Technology, Centre for Micro-Photonics, Faculty of Engineering and Industrial Sciences (AU).

For the first time, we report on the nonlinear optical excitation of nitrogen-vacancy (NV) centres in nanodiamonds by a femtosecond pulsed infrared laser source. Their two-photon absorption cross-sections have been characterised using the nonlinear fluorescence. [5808].....Pg. 449

NOTES

17:00-17:30 Coffee break (exhibition hall, Boyd Orr Suite)

NOTES

Room: Fleming Auditorium

TOM 2

16:00-18:00
SI PHOTONICS AND OTHER ELEMENTS (continued)
Session Chair: G. Reed, University of Southampton (GB)

17:30 **Invited talk**
Silicon-Organic Hybrid - a path towards active silicon photonic devices
J. Leuthold, C. Koos, W. Freude, L. Alloatti, R. Palmer, D. Korn, J. Pfeifle, M. Lauermann; Institute of Photonics and Quantum Electronics (IPQ) and Institute of Microstructure Technology (IMT), Karlsruhe Institute of Technology (KIT) (DE).
We will review the possibilities offered by silicon if combined with organics. In particular we will discuss progress on silicon organic hybrid modulators, phase shifters, lasers and silicon nonlinear devices. [6441]
Pg. 451

Room: Gordon B

TOM 3

17:30-19:15
PLASMONICS APPLICATION II
Session Chair: A.V. Zayats, King's College London (GB)

17:30
Magnetoelectric interference as the mechanism of light funneling into nanoscale structures
F. Pardo[1], P. Bouchon[2], C. Koechlin[1,2], B. Portier[1,2], R. Haïdar[2,3], J.L. Pelouard[1]; [1]LPN -CNRS, Lab. De Photonique et de Nanostructures (FR), [2]ONERA-The French Aerospace Lab. (FR), [3]École Polytechnique, Département de Physique (FR).
The key phenomena of light funneling toward a target is the magnetoelectric interference of the incident wave with the evanescent field built around it. We will explore the avenue opened by this new paradigm, especially for the design of arbitrarily small optical antennas, having however a cross-section of about λ^2. [6055].....Pg. 454

17:45
Anomalous refraction in metal nanowires metasurface
A. Belardini[1], F. Pannone[1], G. Leahu[1], M. C. Larciprete[1], M. Centini[1], C. Sibilia[1], C. Martella[2], M. Giordano[2], D. Chiappe[2], F. Buatier de Mongeot[2]; [1]Dipartimento di Scienze di Base ed Applicate per l'Ingegneria, Sapienza Università di Roma (IT); [2]Dipartimento di Fisica, Università di Genova and CNISM (IT).
Here we report the evidence of anomalous refraction, measured by a quadrant detector, that arises from an array of self-organized metallic nanowires with sub-wavelength periodicity. [6186].....Pg. 456

TOM 4

17:15 **Invited talk**
Snapshot Imaging Spectrometers
E. Dereniak, University of Arizona College of Optical Science (US).
This presentation will discuss the development of spectrometer imagers using new optical designs based on 2-D arrays. The goal of our research is to develop instruments capable of discriminating objects in biological tissue and within the human eye, requiring real-time continuous full field coverage in four dimensions (x,y,λ,t). [6589]
Pg. 458

17:45
STUDENT PRESENTATION AWARD & END OF TOM 4

Room: Crombie B

TOM 5

17.30-18.45
ORGANIC AND HYBRID LEDs
Session Chair: G. Gigli, University of Salento (IT)

17:30 STUDENT PRESENTATION
Microstructures for enhancing the outcoupling efficiency of white organic light emitting diodes
T. Bocksrocker, J. Preinfalk, A. Pargner, F. Maier-Flaig, C. Eschenbaum, U. Lemmer; Karlsruhe Institute of Technology (KIT), Light Technology Institute (DE).
We demonstrate a method to fabricate high quality microlens arrays to significantly reduce the losses due to substrate modes in OLEDs. Furthermore we have developed a simple approach to efficiently couple out waveguide modes without changing the OLED characteristics based on micropillars embedded in the ITO. [5990].....Pg. 460

17:45 STUDENT PRESENTATION
Hybrid Silicon Quantum Dot Light Emitting Diodes (Si-LEDs)
F. Maier-Flaig[1], M. Stephan[1], T. Bocksrocker[1], J. Rinck[2], A.K. Powell[3], G.A. Ozin[4], U. Lemmer[1]; [1]Karlsruhe Institute of Technology (KIT), Light Technology Institute (LTI) (DE), [2]Karlsruhe Institute of Technology (KIT), Center of Functional Nanostructures (CFN) (DE), [3]Karlsruhe Institute of Technology (KIT), Institute for Inorganic Chemistry (IAOC)/Institute of Nanotechnology (INT) (DE), [4]University of Toronto, Department of Chemistry (CA).
In this contribution we report on efficient hybrid light emitting diodes (Si-LEDs) based on colloidally stable silicon quantum dots (SiQDs) and organic semiconductors. We present the optoelectronic properties of these devices and discuss the optimization strategies. [6051].....Pg. 462

Room: Gordon A

TOM 6

17.30-19:15
NONLINEAR OPTICAL WAVEGUIDES
Session Chair: C. Denz, University of Muenster (DE)

17:30 Invited talk
Simulating relativistic phenomena in optical waveguide arrays
A. Szameit[1], M. C. Rechtsman[2], J. M. Zeuner[1], F. Dreisow[1], A. Tünnermann[1], M. Segev[2], S. Nolte[1]; [1]Institute of Applied Physics, Abbe School of Photonics, Friedrich Schiller University (DE), [2]Solid State Institute, Technion – Israel Institute of Techology (IL).
In contrast to popular belief it is possible to emulate a relativistic Dirac equation in classical paraxial optical waveguide arrays. Here, we present emulations of relativistic effects, such as *Zitterbewegung*, *Klein-tunneling* and *relativistic magnetic Landau-levels* in various structures, including the so-called "optical graphene". [6196].....Pg. 464

NOTES

Room: Fleming Auditorium

Room: Gordon B

NOTES

TOM 2

18:00-19:30
Ge/Si PHOTONICS
Session Chair: T.F. Krauss, SUPA, University of St. Andrews (GB)

18:00 **Invited talk**
Ge on Si Photonics Platform for Photonic Integrated Circuits
D.J. Paul, M. Sorel, P. Velha, M. Strain, K. Gallacher, A. Samarelli, D. Dumas; University of Glasgow, School of Engineering (GB).
To move Si photonics from the laboratory to functional applications, process modules that can be integrated into complete systems are required. We demonstrate LEDs, photodetectors, waveguides, tunable filters, coupled resonators and gratings on Si potentially allowing applications in healthcare, telecoms, sensing and security markets.
[6161].....Pg. 465

18:30 **STUDENT PRESENTATION**
High responsivity photodetectors in evaporated Ge-on-Si
V. Sorianello, M. Paglia, L. Colace, G. Assanto; University "Roma Tre", Nonlinear Optics and OptoElectronics Lab (NooEL) (IT).
Germanium on Silicon has become a well-established technology for the fabrication of high performance near-infrared photodetectors for Silicon photonics. We present Ge-on-Si photodetectors grown by thermal evaporation, comparable in performance with *p-i-n* detectors prepared by CVD. [6005]
Pg. 467

TOM 3

18:00 **STUDENT PRESENTATION**
Observation of Waveguiding-Mie Scattering Interference at GaAs Nanowires by Second Harmonic Generation
G. Brönstrup[1], R. Grange[2], A. Sergeyev[2], M. Kiometzis[1], S. Christiansen[1], J. Richter[2], T. Pertsch[2], A. Tünnermann[2,3], C. Leiterer[4], W. Fritzsche[4], C. Gutsche[5], A. Lysov[5], W. Prost[5], F.-J. Tegude[5]; [1]Max Planck Institute for the Science of Light (DE), [2]Friedrich-Schiller-Universität Jena, Institute of Applied Physics, Abbe Center of Photonics (DE), [3]Fraunhofer Institute of Applied Optics and Precision Engineering (DE), [4]Institute of Photonic Technology, Nanobiophotonics (DE), [5]University of Duisburg-Essen, Solid State Electronics Department and CeNIDE (DE).
We show that second harmonic generation (SHG) in GaAs nanowires (NWs) can experimentally be used to display in an optical microscope the electrical field distribution at their surfaces. We demonstrate and visualize the interference of a guided wave with Mie scattered light which is supported by a completely analytical model.
[6037].....Pg. 469

18:15
Deep-subwavelength imaging of the modal dispersion of light
R. Sapienza[1,2], J. Renger[2], M. Kuttge[2], N.F. van Hulst[2,3], T. Coenen[4], A. Polman[4]; [1]Department of Physics, King's College London (GB), [2]ICFO-Institut de Ciencies Fotoniques(ES), [3]ICREA-Institució Catalana de Recerca i Estudis Avancats (ES), [4]Center for Nanophotonics, FOM Institute for Atomic and Molecular Physics (AMOLF) (NL).
Numerous optical devices and technologies such as lasers, light-emitting diodes, and quantum optical devices rely on the controlled coupling of a local point emitter to its photonic environment, which is governed by the local density of optical states (LDOS). This coupling, either to the far field or to well-defined optical modes, is maximized when the source is placed at a position where the local density of optical states (LDOS) is highest. Key demonstrations of this effect are e.g. the enhanced spontaneous emission of quantum dots in the field maximum of a photonic crystal cavity or the directional emission in the proximity of a metallic nanoantenna.
[5807].....Pg. 471

NOTES

Room: Crombie B

TOM 5

18:00 STUDENT PRESENTATION
Strong coupling in an organic polariton light emitting diode
N. Christogiannis, D.M. Coles, D.G. Lidzey; The University of Sheffield, Department of Physics and Astronomy (GB).
We present the fabrication of a strongly coupled organic LED microcavity containing a J-aggregated layer of a TDBC dye that acts as both the electron-hole recombination layer and the strongly coupled medium. We characterise the angular-dependent and integrated external electroluminescence emission from the cavities and discuss fundamental mechanisms at play. [5928].....Pg. 472

18:15 STUDENT PRESENTATION
Energy transfer in weakly coupled hybrid nanostructures: plasmonic effects
S. Kawka, G.C. La Rocca; Scuola Normale Superiore (IT).
We study theoretically the plasmonic enhancement of the resonant energy transfer from a Wannier exciton in a quantum well to a Frenkel exciton of a molecular crystal overlayer. [5994].....Pg. 474

18:30 STUDENT PRESENTATION
High efficiency and low power consumption Driver for AMOLED display with compensation
S.Saad[1], L. Hassine[2]; [1]Group of Electronics and Quantum Physics, Faculty of Sciences of Tunis (TN), [2]National Institute of Applied Sciences and Technology (TN).
A new proposed compensation driver pixel circuit is developed for an active-matrix organic light-emitting-diode (AMOLED) display and their efficiency is verified in compared with the conventional configuration with 2 TFTs. This circuit based on OLED and on poly-crystalline silicon thin-film transistor (poly-Si TFTs). [6156].....Pg. 476

Room: Gordon A

TOM 6

18:00
Nonparaxial refraction laws in optics: from non-Kerr interfaces to waveguide arrays
J.M. Christian[1], G.S. McDonald[1], E.A. McCoy[1], J. Sánchez-Curto[2], P. Chamorro-Posada[2]; [1]University of Salford, Materials & Physics Research Centre (GB), [2]Universidad de Valladolid, ETSI Telecomunicación (ES).
Angular effects play a central role in essentially all non-trivial optical configurations, and can be well-described within a Helmholtz-type nonparaxial framework. We report recent results modelling spatial solitons interacting with cubic-quintic material interfaces, and extend related considerations to periodically-patterned optical media. [5820] Pg. 478

18:15 STUDENT PRESENTATION
Airy beam induced optical waveguide router
P. Rose, F. Diebel, M. Boguslawski, C. Denz; Institut für Angewandte Physik and Center for Nonlinear Science (CeNoS), Westfälische Wilhelms-Universität Münster (DE).
We present a new all-optical routing scheme based on the Airy beam family. The demonstrated router has individually addressable output channels and can be used as optically induced splitter with configurable outputs as well. [5941].....Pg. 480

18:30 STUDENT PRESENTATION
Achromatic and reconfigurable adiabatic light transfer in photoinduced waveguides
C. Ciret[1], V. Coda[1], A.A. Rangelov[2], D.N. Neshev[3], G. Montemezzani[1]; [1]Laboratoire Matériaux Optiques, Photoniques et Systèmes (LMOPS), Université de Lorraine and Supélec (FR), [2]Department of Physics, Sofia University (GB), [3]Nonlinear Physics Center, Australian National Univ. (AU).
Adiabatic light transfer over multiple states is verified experimentally using properly designed reconfigurable photoinduced waveguide array structures. The robustness of the process is demonstrated by varying the number of waveguides in the array as well as the probe wavelength. [6044].....Pg. 482

NOTES

	Room: Fleming Auditorium	Room: Gordon B	
NOTES	TOM 2	TOM 3	NOTES
		18:30 **Invited talk** **Light Control in Nanophotonics Structures and Metamaterials** *Y. Kivshar; Nonlinear Physics Center and Center for Ultra-high Bandwidth Devices for Optical Systems (CUDOS), Research School of Physical Sciences and Engineering, Australian National University (AU) & National Research University of Information Technologies, Mechanics and Optics (RU).* We review our recent theoretical and experimental results on the light shaping and control in plasmonics and metamaterial structures. In particular, we discuss several effects associated with generation and manipulation of Airy plasmons, subwavelength focusing and shaping of light in nonlinear nanoparticle arrays, and unidirectional radiation and generalized Fano effects in arrays of core-shell nanoparticles. [6127].....Pg. 487	
	18:45 **Ge/Si Single Photon Avalanche Diodes** *N.J. Pilgrim[1], H. Rafferty[1], L.J.M. Lever[1], Z. Ikonic[1], R.W. Kelsall[1], G. Intermite[2], R.E. Warburton[2], G.S. Buller[2], M. Myronov[3], D.R. Leadley[3], N.P. Owens[4], Y. Hu[4], G.T. Reed[4]; [1]University of Leeds, Institute of Microwaves & Photonics (GB), [2]Heriot-Watt University, Department of Physics (GB), [3]University of Warwick, Department of Physics (GB), [4]University of Southampton, School of Electronics and Computer Science (GB).* Germanium-on-silicon single photon avalanche diodes (SPADs) have been designed for 1.55μm operation, based on direct Ge seed layer growth on Si substrates. Monte Carlo simulations demonstrate the impact of the heterojunction and Ge background doping on transient carrier transport, and their contribution to timing jitter. [6117] Pg. 484		
	19:00 **Invited talk** **Ge/SiGe Quantum Confined Stark Modulators** *R.W. Kelsall, University of Leeds (GB).* The Quantum Confined Stark Effect in Ge/SiGe quantum well structures is described, along with its application in silicon-based electroabsorption modulators. Device performance is analysed, and designs for integration with silicon-on-insulator photonics are presented. Pg. 486	19:00 **Optical near-field imaging of cloaked wave fronts at telecommunication wavelength** *G. Scherrer[1], M. Kadic[2], M. Hofman[3], X. Mélique[3], D. Lippens[3], O. Vanbésien[3], W. Smigaj[2], B. Gralak[2], S. Guenneau[2], B. Cluzel[1], E. de Fornel[1]; [1]OCP-ICB, UMR CNRS 6303 (FR), [2]Institut Fresnel, CNRS Université Aix-Marseille (FR), [3]IEMN, UMR CNRS 8520, Université Lille 1 (FR).* We report the experimental demonstration of a cloak of invisibility at telecommunication wavelength (around 1.55μm) and for the p polarization. The cloak is a dielectric carpet based on transformation optics1,2: a two dimensional (2D) variation of the effective index of refraction is designed by using quasi conformal mapping. For the experimental configuration, an incident quasi plane wave illuminates a reflective surface, leading to the generation of a standing wave pattern between the incident and reflected waves. [5947].....Pg. 489	

Room: Gordon A

NOTES

TOM 6

18:45
Unified description of Brillouin scattering in micro- and nanostructured waveguides based on the electrostrictive force
J-C. Beugnot, T. Sylvestre, H. Maillotte, V. Laude; Institut FEMTO-ST, Université de Franche-Comté, CNRS UMR 6174 (FR).
We provide a unified model of Brillouin scattering in engineered micro and nanoscale waveguides based on the electrostrictive force. We further apply this model for an arbitrary cross-section photonic crystal fibre and found a very good agreement with experimental measurements.
[6135].....Pg. 491

STUDENT PRESENTATION

19:00 Post deadline submission
Demonstration of stimulated Raman scattering in the evanescent field of a tapered nanofiber
L. Shan[1], G. Pauliat[1], L. Tong[2], S. Lebrun[1]; [1]Laboratoire Charles Fabry, Institut d'Optique, CNRS, Université Paris-Sud (FR), [2]State Key Lab of Modern Optical Instrumentation, Department of Optical Engineering, Zhejiang University (CN).
We present the first experimental demonstrations of stimulated Raman scattering in the evanescent field of a tapered nanofiber. Given the large choice of available materials for the medium surrounding the nanofibers, this demonstration opens the way to the exploration of a new class of experiments and devices.
[6433].....Pg. 493

NOTES

NOTES	Room: Fleming Auditorium TOM 2	Room: Gordon B TOM 3	NOTES
		09:00-10:45 **NANOPHOTONICS APPLICATIONS IV** *Session Chair: R. Sapienza, King's College London (GB)*	
		09:00 **Invited talk** **Si/Ge quantum well photonics and waveguide-integrated detectors** *L. Vivien[1], D. Marris-Morini[1], P. Chaisakul[1], M.-S. Rouifed[1], J. Frigerio[2], G. Isella[2], D. Chrastina[2], L. Virot[1,3,4], J-M. Hartmann[3], E. Cassan[1], C. Baudot[4], F. Boeuf[4], J-M. Fédéli[3]; [1]Institut d'Electronique Fondamentale, Univ. Paris-Sud, CNRS UMR 8622 (FR), [2]L-NESS, Dipartimento di Fisica del Politecnico di Milano (IT), [3]CEA, LETI, Minatec Campus (FR), [4]STMicroelectronics, Silicon Technology Development (FR).* We report the recent developments on bulk germanium and Ge/SiGe quantum well approach for light detection and modulation. High speed optoelectronic devices in waveguide configuration have been demonstrated at wavelength from 1.3µm to 1.6µm and a complete study is presented. [6188] Pg. 497	
	09:15-10:45 **WAVEGUIDES FOR SI PHOTONICS** *Session Chair: M. Bülters, BIAS - Bremer Institut für angewandte Strahltechnik (DE)*		
	09:15 **Post deadline submission** **Suspended Membrane Waveguide on Silicon-on-insulator for Midinfrared Wavelengths** *X. Chen[1], Z. Cheng[2], H.K. Tsang[2], G.Z. Mashanovich[1], G.T. Reed[1]; [1]University of Southampton, Optoelectronics Research Centre, Southampton (GB), [2]The Chinese University of Hong Kong, Dept. of Electronic Engineering (CN).* We characterised waveguides, resonators and grating couplers based on suspended membrane waveguide fabricated on silicon-on-insulator (SOI) for mid-infrared applications. The requirement on the dimensions of the membrane waveguide for longer wavelength is explored. [6438] Pg. 495		

Room: Crombie B

TOM 5

09:00-10:30
NEW SYSTEMS AND MATERIALS FOR PHOTONICS
Session Chair: D.G. Lidzey, University of Sheffield (GB)

09:00 **Invited talk**
Charge modulation micro-spectroscopy in high mobility organic transistors
N. Martino, V. D'Innocenzo, A. Luzio, M.R. Antognazza, A. Petrozza, M. Caironi; Center for Nano Science and Technology @PoliMi, Istituto Italiano di Tecnologia (IT).
For a better understanding of the physics of organic field-effect transistors (OFETs), techniques allowing to directly probe the nanometer thin accumulated channel at the dielectric-semicondutor interface and to investigate the relationship between thin films micro-structure and charge transport properties are very desirable. To this extent, probing techniques capable of providing local information regarding mobility, field and charge distribution along the channel of a working device are greatly beneficial. [6195]
Pg. 499

Room: Gordon A

TOM 6

09:00-10:45
NONLINEAR OPTICAL EFFECTS
Session Chair: R. Vilaseca, UPC (ES)

09:00 **STUDENT PRESENTATION**
Second harmonic generation in CVD graphene: Structural symmetry and role of external influence
A.Y. Bykov[1], A.I. Maydykovsky[1], M.G. Rybin[2], E.D. Obraztsova[2], T.V. Murzina[1]; [1]Moscow State University, Department of Physics (RU), [2]A.M. Prokhorov General Physics Institute (RU).
We present detailed nonlinear-optical study of multilayer graphene as is and subjected to steady electric current and uniaxial strain. Symmetry of the second harmonic signal was analyzed and a significant change in its magnitude under the application of electric current and strain was observed. [6022].....Pg. 501

09:15
Optical Second Harmonic Generation in Chiral *G*-shaped Metamaterials
I.A. Kolmychek[1], E.A. Mamonov[1], T.V. Murzina[1], V.K. Valev[2], T. Verbiest[2], A.V. Silhanek[3];[1]Department of Physics, Moscow State University (RU), [2]Molecular Electronics and Photonics, INPAC, Katholieke Universiteit Leuven (BE), [3]Nanoscale Superconductivity and Magnetism, Pulsed Fields Group, INPAC, Katholieke Universiteit Leuven (BE).
Chirality in quadratic optical response of planar *G*-shaped metamaterials' arrays is studied. Features of the second harmonic generation (spectra, polarization, coherence) reflected from the similar samples with different handedness are discussed. [5883].....Pg. 503

Room 10

TOM 7

09:00-10:50
ENVIRONMENTAL SENSING II
Session Chair: J. Kiefer, University of Aberdeen (GB)

09:00 **Invited talk**
Characterization and quantification of gas and oil seeps from subsea imaging
O. Zielinski; University of Oldenburg, Institute for Chemistry and Biology of the Marine Environment (DE).
Hydrocarbon releases, either natural or due to anthropogenic activities, are of major relevance for the marine environment. Methods and instrumentation developed to characterize and quantify these gas and oil seeps will be presented and discussed along with challenges and future trends. [6100].....Pg. 505

Room 18

Workshop

09:00-10:45
SESSION I
Session Chair: P. Urbach, Delft University of Technology (NL)

09:00
Welcome

09:05
Introduction by the Chairs

09:15 **Invited talk**
Identify and anticipate skill needs towards the optimization of training course offers
E. Boeri, L. Sarger; PYLA platform, Bordeaux University and French Cluster «Route des Lasers» (FR).
PYLA presents here a survey conducted in France in the field of medical applications of lasers. From a methodological point of view, this sector offers the advantage of being based on the different leverage effects that may impact the building of a training offer: technological, economic, legal, sociological. [6402].....Pg. 507

NOTES	Room: Fleming Auditorium TOM 2	Room: Gordon B TOM 3	NOTES
	09:30 STUDENT PRESENTATION **Hot-Wire Chemical Vapour Deposition for Integrated Silicon Waveguide Devices** *T. Ben Masaud[1], A. Tarazona Labrador[1,2], G. Mashanovich[1], G.T. Reed[1], H.M.H. Chong[1]; [1]University of Southampton, Nano Research Group, Electronics & Computer Science, Faculty of Physical & Applied Sciences (GB), [2]Echerkon Technology Limited (GB).* We have investigated a low cost hot-wire chemical vapour deposition technique to produce high quality thin film silicon epitaxial layer for waveguide device applications. Raman shift results show that silicon crystal grain size deposited on insulators can be controlled with process optimisation. [6145].....Pg. 509	09:30 **CdSe-CdZnS-ZnS quantum dots ink for DFB up-converted lasers** *F. Todescato[1], I. Fortunati[1], R. Bozio[1], J.J. Jasieniak[2], G. Della Giustina[3], G. Brusatin, R. Signorini[1]; [1]Dep. of Chemical Science & U.R. INSTM, University of Padova (Italy), [2]CSIRO Division of Materials Science & Engineering Ian Wark Laboratory (AU), [3]Dep.of Mechanical Engineering, Material Sector & U.R. INSTM University of Padova (IT).* In this work we present the development of a solution deposited up-converted distributed feedback (DFB) laser prototype. It is based on sol-gel silica/germania imprinted microcavity and on CdSe-CdZnS-ZnS quantum dot as optical gain material embedded in a sol-gel zirconia matrix. [5830].....Pg. 514	
	09:45 STUDENT PRESENTATION **Silicon devices for the 3-4 µm wavelength range** *M. Nedeljkovic[1], M.M. Milosevic[2], T.M. Ben Masaud[1], E. Jaberansary[1], H.M.H. Chong[1], G.T. Reed[1], G.Z. Mashanovich[1]; [1]University of Southampton, ECS, FAPS (GB), [2]University of Surrey, Electronic Engineering (GB).* Mid-infrared waveguides, MMIs and racetrack resonators based on silicon on insulator platform have been designed, fabricated and characterised at the 3.7-3.8 µm wavelength range. Propagation loss of 5.9 dB/cm was measured for submicron silicon waveguides. [6149].....Pg. 511	09:45 STUDENT PRESENTATION **Tunable Sub-bandgap silicon based light source at room temperature** *A. Shakoor[1], R. Lo Savio[2], P. Cardile[3], S.L. Portalupi[2], D. Gerace[2], K. Welna[1], G. Franzò[3], F. Priolo[3], T.F. Krauss[1], M. Galli[2], L. O'Faolain[1]; [1]SUPA, School of Physics and Astronomy, University of St. Andrews (GB), [2]Dip. di Fisica "A. Volta," Università di Pavia (IT), [3]CNR-IMM MATIS and Dip di Fisica e Astronomia, Università di Catania (IT).* We demonstrate a nano silicon light source that operates at room temperature, has very narrow (<0.5nm) and tunable emission line in the entire telecommunication band, is small and has the possibility of electrical pumping. [5962].....Pg. 517	
	10:00 STUDENT PRESENTATION **Losses in Slotted Photonic Crystal Waveguides** *M.G. Scullion[1], A. Di Falco[1], M. Massarì[2], S.A. Schultz[1], F. Romanato[2], T.F. Krauss[1]; [1]University of St Andrews, School of Physics and Astronomy (GB), [2]LANN Laboratory for Nanofabrication of Nanodevices (IT).* Slotted photonic crystal waveguides promote strong light-matter interactions in regions of low refractive index. We characterize the loss mechanisms that limit their performance, and show reduced coupling loss with a novel resonant coupler and propagation losses comparable to standard slot waveguides for given geometry. [6079] Pg. 512	10:00 STUDENT PRESENTATION **Electrically-Driven Surface Plasmon Polariton Sources Based On Organic And Inorganic Semiconductors** *R. McCarron[1], W. Dickson[1], P. Stavrinou[2], S. Maier[2], D.D.C Bradley[2], A.V. Zayats[1]; [1]King's College London, Dep. of Physics (GB), [2]Imperial College London, Dep. of Physics (GB).* The nano-scale generation of surface plasmon polaritons has been observed in electrically-driven structures with either organic or inorganic active emission layers. Experimental and computational analysis of the electrical and optical properties of these devices will be discussed with a view to fabrication of a nano-plasmonic source. [5829] Pg. 519	

Room: Crombie B

TOM 5

09:30 STUDENT PRESENTATION

Photoinduced surface patterning of azobenzene-functionalized dendrons, dendrimers and dendronized polymers - a comparative study

J. Vapaavuori[1], A. Priimagi[1,2], E. Kasemi[3], A.D. Schluter[3], N. Canilho[4], R. Mezzenga[3], A.J. Soininen[1], J. Ruokolainen[1], O. Ikkala[1], M. Kaivola[1]; [1]Department of Applied Physics, Aalto University (FI), [2]Chemical Resources laboratory, Tokyo Institute of Technology (JP), 3ETH Zurich (CH), [4]University of Fribourg (CH).

The formation of photoinduced surface-relief gratings was studied in a new set of azobenzene-containing dendritic complexes. Of the three molecular architectures studied – dendrons, dendrimers and dendronized polymers – dendrimers were found to be the most favourable for the surface-relief inscription process. [5855].....Pg. 521

09:45

Hybrid electro-optic polymer modulators and biophotonic sensors based on sol-gel silica waveguides

Y. Enami[1], J. Luo[2], A.K.-Y. Jen[2]; [1]Research Institute for Nanodevice and Bio Systems, Hiroshima University (JP), [2]Department of Materials Science and Engineering, University of Washington (US).

We demonstrated hybrid electro-optic (EO) polymer modulators and biophotonic sensors based on a sol-gel silica waveguide. Photostable EO polymers were recently employed for the novel directional coupler modulators and multilayer slot waveguide modulators for ultra-low half wave voltage. We also briefly mention a biophotonic waveguide sensor using living protein in the sol-gel silica waveguide. [5813].....Pg. 523

Room: Gordon A

TOM 6

09:30

Strong third-harmonic generation in silicon nitride films

T. Ning[1], H. Pietarinen[1], O. Hyvärinen[2], J. Simonen[2], G. Genty[1], M. Kauranen[1]; [1]Dep. of Physics, Tampere University of Technology (FI), [2]Optoelectronics Research Centre, Tampere University of Technology (FI).

We demonstrate strong third-harmonic generation in silicon nitride films. The $\chi^{(3)}$ susceptibility in silicon nitride films, determined by the Maker-fringe method, is two orders of magnitude larger than that of fused silica, and about twenty times larger than that previous reported values in silicon nitride. The result has a significant importance to future on-chip photonic devices. [5976] Pg. 525

09:45

Strong multipole contribution to second-harmonic generation from silicon nitride films

R. Czaplicki[1], G.P. Lakshmi Narayanan[1], T. Ning[1], H. Pietarinen[1], O. Hyvärinen[2], J. Simonen[2], G. Genty[1], M. Kauranen[1]; [1]Tampere University of Technology, Dep. of Physics, Optics Laboratory (FI), [2]Tampere University of Technology, Optoelectronics Research Centre (FI).

We show that second-harmonic generation from amorphous silicon nitride films has both dipole and higher-multipole contributions. Our results suggest that the highermultipole contribution is larger than that of any other material. [5944].....Pg. 527

Room 10

TOM 7

09:30 STUDENT PRESENTATION

Optical properties of water under high pressure

L. Weiss[1,2,3], A. Tazibt[1], A. Tidu[3], M. Aillerie[2]; [1]Centre de Recherche, d'Innovation et de Transfert Technologique en Jet Fluide (FR), [2]Lorraine University & Supelec, Laboratoire Matériaux Optiques Photonique et Systèmes (FR), [3]Lorraine University, Laboratoire d'Etude des Microstructures et Mécanique des Matériaux (FR).

The refractive index and polarizability of water are precisely determined in the visible light range as a function of the pressure until 250 MPa by means of a new measurement technique and setup using special pipe tee included in an interferometer optical arrangement. [6004].....Pg. 529

09:45 STUDENT PRESENTATION

Micro-Nano Integration of a III-N Nanowire Based Opto-chemical Detector

R. Kleindienst[1], V. Cimalla[2], M. Eickhoff[3], A. Grewe[1], U. T. Schwarz[2], J. Teubert[3], S. Sinzinger[1]; [1]Technische Universität Ilmenau, IMN MacroNano, (DE), [2]Fraunhofer IAF, Dept. Optoel. Modules (DE), [3]Justus-Liebig-Universität Gießen, I. Physikalisches Institut (DE).

Due to the highly sensitive photoluminescence (PL) response to hydrogen (H_2) and oxygen (O_2), III-N nanowire heterostructures (NWHs) can be applied as opto-chemical transducers. In our contribution we describe the optical design and the fabrication of a robust and compact micro optical system realizing the integration of electro-optical components and NWHs. The potential of our approach is evaluated by profilometric characterizations and an investigation of the optical performance. Furthermore, we discuss the application as highly sensitive sensor system with fully integrated all optical readout for H_2- or O_2-concentrations in the ppm regime. [6071].....Pg. 531

Room 18

Workshop

09:45 Invited talk

Continuing education at Institut d'Optique *Graduate School*

J.-L. Meyzonnette;
Institut d'Optique GS (FR).

IO*GS* is one of the French academic institutions which offer a wide program of continuing education courses in optics/photonics. Besides its traditional catalogue of courses held at its own site, it proposes also training sessions at industrial sites, participates in the European program SMETHODS and starts e-learning sessions. [5938] Pg. 533

	Room: Fleming Auditorium	Room: Gordon B	
NOTES	TOM 2	TOM 3	NOTES
	10:15 **On the peculiar attenuation of Single-Mode Periodic Waveguides** *A. Baron[1], S. Mazoyer[1], W. Smigaj[1], P. Lalanne[1,2]; [1]Laboratoire Charles Fabry, Institut Optique, CNRS, Université Paris-Sud (FR), [2]Laboratoire Photonique Numérique et Nanosciences, Université Bordeaux 1, CNRS, Institut Optique (FR).* On ensemble average, the transmission T of guided modes decays exponentially with the waveguide length due to small imperfections, enabling the definition of the attenuation coefficient $\alpha = -\langle \ln(T) \rangle / L$. As shown, this exponential-damping law is not valid for periodic monomode waveguides, especially as the group velocity decreases. [6011] Pg. 535	10:15 **Four-wave mixing in Silicon slot waveguides coated with Titanium Dioxide using Atomic Layer Deposition** *M. Roussey[1], P. Stenberg[1], L. Karvonen[2], A. Säynätjoki[2], A. Tervonen[2], S. Honkanen[1], M. Kuittinen[1]; [1]University of Eastern Finland, Department of Physics and Mathematics (FI), [2]Aalto-university, Department of Micro and Nanosciences (FI).* We present here the simulation and fabrication of Silicon slot waveguides filled with Titanium Dioxide taking advantage of its nonlinear properties. We then demonstrate how four-wave mixing can be enhanced and confined into subwavelength photonic structures. [5949] Pg. 539	
	10:30 **Mid-Infrared Photonic Crystal Waveguides in SOI** *C. Reimer[1,2], M. Nedeljkovic[3], D.J.M. Stothard[2], G.Z. Mashanovich[3], T.F. Krauss[2]; [1]Dept. of Physics, Karlsruhe Institute of Technology (KIT) (DE), [2]SUPA, School of Physics & Astronomy, University of St. Andrews (GB), [3]School of Electronics & Computer Science, University of Southampton (GB).* We demonstrate the design, fabrication and characterization of mid-infrared photonic crystal waveguides on a silicon-on-insulator platform, showing guided modes in the wavelength regime between 2.9 and 3.9µm. [6172].....Pg. 537	10:30 **High-order optical nonlinearities in dye sensitized DNA** *V.I. Vlad[1], I. Dancus[1], A. Petris[1], T. Bazaru Rujoiu[1], I. Rau[2], F. Kajzar[2], A. Meghea[2]; [1]National Institute for Laser Plasma and Radiation Physics, Department of Lasers (RO), [2]POLITEHNICA University of Bucharest, Department of Applied Physical Chemistry and Electrochemistry (RO).* The aim of this work is to investigate the nonlinear optical properties of dye sensitized DNA using femtosecond lasers. For this we are measuring the nonlinear refractive indices of the DNA + cetyltrimethylammonium (CTMA) doped with Rhodamine 610 (Rh), Disperse Red 1 (DR1) and Nile Blue (NB) dyes in water and butanol, at different concentrations. In this summary we are presenting our preliminary results underlining the interesting behaviour of the refractive index changes in these samples due to the excitation of high-order nonlinearities. [5946].....Pg. 541	
	10:45 **STUDENT PRESENTATION AWARD & END OF TOM 2**		

Room: Crombie B

TOM 5

10:00 STUDENT PRESENTATION

Photochromic switches for a new approach to light energy harvesting

C. Bertarelli[1,2], R. Castagna[1,2], M. Garbugli[2], S. Perissinotto[2], G. Pariani[3], A. Bianco[1,3], G. Lanzani[2,4]; [1]Dipartimento di Chimica, Materiali ed Ingegneria Chimica, Politecnico di Milano (IT), [2]Center for Nano Science and Technology@PoliMi, Istituto Italiano di Tecnologia (IT), [3]INAF - Osservatorio Astronomico di Brera (IT), [4]Dipartimento di Fisica, Politecnico di Milano (IT).

An electret which directly converts the photon energy into electric energy by exploiting the reversible light-triggered change in dipole moment of photochromic diarylethenes is demonstrated. [6050].....Pg. 543

10:15

Influence of the ligands on the electronic states of a CdSe nanocrystal

T. Virgili[1], A. Calzolari[2], I. Suárez López[1], B. Vercelli[3], G. Angella[3], G. Zotti[3], A. Ruini[2], A. Catellani[2], F. Tassone[4]; [1]Istituto di Fotonica e Nanotecnologie (IFN) CNR, Dipartimento di Fisic and Politecnico di Milano (IT), [2]CNR-NANO Centro S3 (IT), [3]IENI, CNR C.so Stati Uniti 4 (IT), [4]CNST of IIT@polimi (IT).

Using femtosecond pump probe experiments along with a density functional theoretical approaches, we studied the molecular-induced origin of observed long lived charged states in a layer-by-layer structure obtained by the alternation of CdSe nanoparticles and poly(p-styrene sulphonic acid). [5929] Pg. 545

10:30

STUDENT PRESENTATION AWARD & END OF TOM 5

Room: Gordon A

TOM 6

10:00 STUDENT PRESENTATION

Widely and continuously tunable Optical Parametric Oscillator up to 4.8 µm based on 5%MgO: PPLN crystal cut as a cylinder

V. Kemlin[1], D. Jegouso[1], J. Debray[1], B. Menaert[1], P. Segonds[1], B. Boulanger[1], H. Ishizuki[2], T. Taira[2]; [1]Institut Néel Centre National de la Recherche Scientifique – Université Joseph Fourier (FR), [2]Laser Research Center for Molecular Science, Institute for Molecular Science (JP).

An Optical Parametric Oscillator based on a 5%MgO:PPLN crystal engineered as a cylinder is reported. The cylinder is 5 mm thick with a 38 mm diameter. Continuous tuning is achieved from 1.35 µm up to 4.8 µm at room temperature. First energetical characterizations are presented. [5987].....Pg. 547

10:15 Invited talk

Energy transfer in low dimension nonlinear waveguide arrays for telecommunications and fibre lasers

S. Turitsyn; Aston University (GB).

A theory of coherent optical field propagation and energy transfer in low dimension array of coupled nonlinear waveguides. It is demonstrated that in the array with non-equal cores (e.g. with the central core) the stable steady-state coherent multi-core propagation is possible only in the nonlinear regime - with a power controlled phase matching. The developed theory of energy transfer in nonlinear discrete systems is rather generic and has a range of potential applications including both high power fibre lasers and ultra-high -capacity optical communication systems. [6286].....Pg. 549

Room 10

TOM 7

10:00 STUDENT PRESENTATION

Aanderaa pCO_2 fluorescence lifetime optodes in studies of the marine environment

D. Atamanchuk[1], P.J. Thomas[2], J. Hovdenes[3], A. Apostolidis[4], A. Tengberg[1,3], P.O.J. Hall[1]; [1]Department of Chemistry and Molecular Biology, University of Gothenburg (UGOT) (SE), [2]Christian Michelsen Research AS (NO), [3]Aanderaa Data Instruments AS (NO), [4]PreSens Precision Sensing GmbH (DE).

Aanderaa pCO_2 optode sensors are aimed to monitor pCO_2 (partial pressure of CO_2 gas) in aquatic environments. The sensors have already demonstrated longterm stability and accuracy sufficient to understand biogeochemical processes in natural waters. The optodes will to be used to monitor geological carbon storage systems (CSS) for potential CO_2 leakages. [6190] Pg. 550

10:15

Advances in Hybrid Design Optical Sensors for Hazardous Environments of Energy Systems

N.A. Riza, University College Cork, Dept. Electrical and Electronic Engineering (IE), University College Cork, Tyndall National Institute (IE).

Presented is a summary of recent advances in novel hybrid design optical sensors for hazardous environments of energy production systems. These include temperature and pressure sensors using Silicon Carbide (SiC), shape and liquid level sensors using electronically agile lenses, and high dynamic range imagers using digital MEMS and agile lenses. [5889].....Pg. 552

10:30

Synthetic Bio-photonic Sensors for Subsea Oil and Gas Monitoring Applications

D. McStay[1], P. Quinn[2], [1]MCSC Ltd., [2]King's College London (GB).

The potential for molecularly imprinted polymers to form the basis of highly specific and robust sensors for use in a subsea environment is outlined.
A molecularly imprinted polymer sensor read using Raman spectroscopy is described. [6114] Pg. 554

10:45 Closure talk

W. Jüptner, BIAS - Bremer Institut für Angewandte Strahltechnik (DE)

STUDENT PRESENTATION AWARD & END OF TOM 7

Room 18

Workshop

10:15 Invited talk

Hands-on training in Nonimaging Optics for SME's: the SMETHOD experience

P. Benitez, J.C. Miñano; Universidad Politécnica de Madrid (ES).

A 5-day training in Nonimaging Optics for European SME's employees was carried out in June 2012 in the framework of the FP7 funded Support Action "SMETHODS". The training combined theoretical introduction and hands-on practice. The experience was very positive, and the lessons learned will improve the next scheduled sessions. [6445].....Pg. 556

10:45-11:15 **Coffee break** (exhibition hall, Boyd Orr Suite)

Room: Fleming Auditorium

11:15-12:00 **PLENARY TALK | TOM 7**

Optical Systems as an Enabling Technology for Ocean and Atmospheric Sciences and How We Understand Our Environment

C.N. McLean, Office of Oceanic and Atmospheric Research, National Oceanic and Atmospheric Administration (US).

The presentation will focus on the opportunity how much we know of our global environment with largely an ocean focus, and how very recent some major revelations have been made about the planet. Only a few decades have passed since the discovery of geologic formations containing quite alien life forms, which has led to the re-constitution of our understanding of life on Earth and how it evolved. Ocean optics will continue to contribute to this understanding. [6184].....Pg. 558

12:00-12:45 **PLENARY TALK | TOM 2**

Silicon Photonics and the Future of Photonic Integration

M.J. Wale; Oclaro Technology Ltd. (GB).

Photonic integration is a breakthrough technology, enabling a wide range of applications to be addressed with compact, high-functionality, reliable and power efficient components that can be manufactured in a highly cost-effective manner. This talk seeks to set developments in silicon photonics in the context of wider technological developments and trends, show how developments in generic technology platforms could drive a revolution in cost and availability, offer some thoughts and sug gestions about how silicon can best be applied and discuss a possible future in which silicon and III-V semiconductor technolo gies could converge to offer even more exciting possibilities for the industry and applications community. [6282].....Pg. 559

12:45-13:00 **TOM 2**

Post Testing Removal of Amorphous Silicon Bragg Gratings Post deadline submission

R. Topley[1], R. Loiacono[2], G. Mashanovich[1], R. Gwilliam[2], S.J. Henley[2], G. Lulli[3], R. Feldesh[4], R. Jones[5], G.T. Reed[1]; [1]Southampton University (GB), [2]Advanced Technology Institute, FEPS, University of Surrey (GB), [3]Istituto per la Microelettronica ed i Microsistemi (IT), [4]Numonyx Memory Solution (IL), [5]Photonics Technology Labs, Intel Corporation (US).

We present empirical results of Bragg gratings, formed utilising an implantation technique to introduce disorder into the crystalline lattice. An extinction ratio of 35dB is demonstrated at 1350nm. Subsequent removal of the imposed lattice disorder is demonstrated using both laser and oven based techniques. [6424].....Pg. 560

13:00-13:45 **Lunch break** (exhibition hall, Boyd Orr Suite)

Room: Gordon B

NOTES

TOM 3

13:45-16:00
NANOPHOTONICS
Session Chair: R.M. De La Rue, University of Glasgow (GB)

13:45 Invited talk

Infrared sensing of small quantities of organic material using asymmetric split-ring resonator (ASRR) arrays

R.M. De La Rue[1,2], N.P. Johnson[2], B. Lahiri[3], S.G. McMeekin[4]; [1]University of Malaya, Malaysia (MY), [2]University of Glasgow (UK), [3]National Institute for Standards and Technology (US), [4]Glasgow Caledonian University, (GB).

Arrays of asymmetric split-ring resonators (ASRRs) exhibit both resonant reflection peaks and trapped-mode resonant behaviour. Deposition of polymethylmethacrylate thin films on such ASRR arrays produces both general shifts in the reflection spectrum and highlights Lorentz-Fano resonances characteristic of the molecular structure. [6409]
Pg. 562

NOTES

10:45-11:15 **Coffee break** (exhibition hall, Boyd Orr Suite)

NOTES

13:00-13:45 **Lunch break** (exhibition hall, Boyd Orr Suite)

NOTES

Room: Gordon A

TOM 6

13:45-16:15
APPLICATIONS OF NONLINEAR OPTICS
Session Chair: K.A. Shore, Bangor University (GB)

13:45 STUDENT PRESENTATION
Randomness and Random Walks in Supercontinuum Generation
B. Wetzel[1], S. Turitsyn[2], K.J. Blow[2], F. Dias[3], J.M. Dudley[1]; [1]Université de Franche-Comté-UMR 6174 CNRS, FEMTO-ST (FR), [2]Aston University, Aston Institute of Photonic Technologies (GB), [3]University College Dublin, School of Mathematical Science (IE).
The noise properties of supercontinuum generation are of wide interest in pure and applied physics. In this contribution we describe recent work where we interpret supercontinuum intensity and phase fluctuations in this way in terms of random walk processes, and we discuss applications to random number generation. [6028].....Pg. 564

NOTES

Room 18

Workshop

13:45-16:00
SESSION II
Session Chair: P. Chavel, Institut d Optique/CNRS (FR)

13:45 Invited talk
Case study: Webinars New methods for qualification in optical technologies
I. Zajons; LZH Laser Akademie GmbH (DE).
This talk will report about the experiences by LZH Laser Akademie GmbH and AT-Fachverlag with the recently launched webinar programme. Technical and organizational issues as well as feedback by the speakers and the audience will be presented. Advantages and disadvantages compared to classical seminars and short course will be discussed. [6210].....Pg. 566

Room: Gordon B

NOTES

TOM 3

14:15
Nanoscale structuring by optical interference and their potential for energy harvesting and semicon applications
V.M. Murukeshan; Center for Optical and Laser Engineering (COLE), School of Mechanical and Aerospace Engineering, Nanyang Technological University (SG).
Optics technology targeting energy sector, biomedical and semiconductor industries in the recent past has seen the challenging trend to achieve smaller features or devices with micro- or nano-scale features. This demands automatically the need for achieving the forecasted sub-30nm fabrication methodologies and hence the push for smaller dimension has posed many challenges. In this context, many conventional techniques have been revisited by researchers with modified original contributions. Apart from the above, a new branch of near- field optical concepts for improving patterning resolution has started developing which have been receiving considerable attention for its ability to produce high density sub-wavelength features. [5865]
Pg. 568

14:30 STUDENT PRESENTATION
Limit of absorption enhancement in solar cells with guided modes
A. Naqavi[1,2], F.-J. Haug[1], T. Scharf[2], H.P. Herzig[2], C. Ballif[1]; [1]Photovoltaics and Thin Film Electronics Laboratory, Ecole Polytechnique Fédérale de Lausanne (EPFL) (CH), [2]Optics & Photonics Technology Laboratory, Ecole Polytechnique Fédérale de Lausanne (EPFL) (CH).
We investigate the impact of guided modes on the absorption enhancement in solar cells. By considering a dielectric thin film, we show that the absorption can be enhanced beyond the previous predictions even after averaging over wide wavelength ranges. [6075].....N/A

NOTES

Room: Gordon A

NOTES

TOM 6

14:00 STUDENT PRESENTATION

A laser diode for integrated photon pair generation at telecom wavelength

A. Orieux[1], G. Boucher[1], A. Eckstein[1], E. Galopin[2], A. Lemaître[2], C. Manquest[1], I. Favero[1], G. Leo[1], S. Ducci[1]; [1]Université Paris Diderot, Sorbonne Paris Cité, Laboratoire Matériaux et Phénomènes Quantiques, CNRS-UMR 7162 (FR), [2]Laboratoire de Photonique et Nanostructures, CNRS-UPR20 (FR).

We report on electrically pumped Bragg mode lasing at 775 nm at room temperature in an AlGaAs structure designed for type-II modal phase-matching showing a second harmonic generation efficiency of 35 %$W^{-1}cm^{-2}$. [6137].....Pg. 571

14:15 Invited talk

Semiconductor source of entangled photons at room temperature

A. Orieux[1], G. Boucher[1], A. Eckstein[1], E. Galopin[2], A. Lemaître[2], C. Manquest[1], I. Favero[1], G. Leo[1], S. Ducci[1]; [1]Université Paris Diderot, Sorbonne Paris Cité, Laboratoire Matériaux et Phénomènes Quantiques, CNRS-UMR 7162 (FR), [2]Laboratoire de Photonique et Nanostructures, CNRS-UPR20 (FR).

We demonstrate the first III-V semiconductor source of polarization entangled photons at room temperature. The photons are emitted at 1.55 mm ; their state is quantified by performing a quantum tomography measurement and by deriving the two -photon density matrix. This work opens the way to a new generation of devices for quantum information. [6138].....Pg. 573

Room 18

NOTES

Workshop

14:15 Post deadline submission

General tendencies of internationalization of education in optical design

I. Livshits, V. Vasilyev; NRU ITMO (RU).

The target of current research is to follow and understand general tendencies of education in optical design. Experience of international cooperation in this field is presented. EU project SMETHODS is described as successful way for interuniversity work between six European and one Russian university. [6431] Pg. 575

Room: Gordon B

NOTES

TOM 3

14:45 STUDENT PRESENTATION

Coupling light into planar waveguide by plasmonic nanoparticles: direct optical measurement

A. Pennanen, J.J. Toppari; University of Jyväskylä, Department of Physics, Nanoscience Center (FI).

Coupling of light into thin high refractive index substrates by plasmonic particles has been studied widely for application in solar cells. Here we present, to our knowledge, the first direct optical measurement of localized surface plasmon coupling into high refractive index waveguide. [6069].....Pg. 580

15:00 STUDENT PRESENTATION

Controlled Plasmonic Excitations in Anisotropic Media at Visible Wavelengths

N. Vasilantonakis, M. Nasir, J.-S. Bouillard, W. Dickson, G.A. Wurtz, A.V. Zayats; Nano-optics and Near-field Spectroscopy Group, Department of Physics King's College London (GB).

We examine the surface plasmon polariton propagation between a thin gold film and an anisotropic porous alumina slab and show that the dispersion and the effective index of the surface polaritons mode can be controlled by changing the porosity of the anisotropic layer. [5847]
Pg. 582

NOTES

Room: Gordon A

NOTES

TOM 6

14:45 STUDENT PRESENTATION
Efficient pulse excitation of a nonlinear microcavity
J. Oden, S. Trebaol, N. Dubreuil; Laboratoire Charles Fabry, Institut d'Optique, CNRS, Université Paris Sud (FR).
Nonlinear microcavities are known to exhibit an intensity-dependent refractive index. This effect causes a mismatch between the resonance of the cavity and the input pulse frequency, resulting in a limitation of the energy coupling efficiency. We show here that a phase shaping of the input pulse allows to maintain the benefit of light localization. [5955]
Pg. 584

15:00 STUDENT PRESENTATION
Nonlinear imaging with confocal and interferometric SHG microscopy using a broadband 1550 nm fs-fiber laser
A. Prylepa[1,2], J. Duchoslav[1,2], K. Hingerl[2], D. Stifter[1,2]; [1]Christian Doppler Laboratory for Microscopic and Spectroscopic Material Characterization (CDL-MS-MACH) (JP), [2]Center for Surface and Nanoanalytics (ZONA) Johannes Kepler University Linz (AT).
A confocal and interferometric second harmonic generation (SHG) microscope combined with linear low-coherence imaging capabilities was developed by using a broadband femtosecond fiber laser at 1550 nm and applied for the investigation of materials surfaces and subsurfaces. [6088].....Pg. 586

Room 18

NOTES

Workshop

14:45
Panel discussion (moderator and invited speakers)
Moderation: Małgorzata Kujawińska, Warsaw University of Technology (PL).

16:00
END OF WORKSHOP

Room: Gordon B

NOTES

TOM 3

15:15 STUDENT PRESENTATION
Plasmonic circuitry: Synchronous recording of electron transport and plasmon propagation in crystalline metal nanowires
M.X. Song[1], A. Thete[2], J. Berthelot[1,3], D.G. Zhang[4], G. Colas-des-Francs[1], E. Dujardin[2], A. Bouhelier[1]; [1]Laboratoire Interdisciplinaire Carnot de Bourgogne, CNRS UMR 6303, Université de Bourgogne (FR), [2]CEMES CNRS UPR (FR), [3]ICFO-Institut de Ciencies Fotoniques (ES), [4]Department of Optics and Optical Engineering, University of Science and Technology of China (CN).
By synchronous recording surface plasmon propagation and current/voltage characteristics in silver nanowires, the effective index and propagation loss are determined as a function of biasing condition and demonstrate the limiting factors for co-propagating plasmons and electrons simultaneously in a nanowire circuitry. [5815]
Pg. 588

15:30
Surface plasmon-polaritons in structures with monolayer graphene
Yu.V. Bludov, N.M.R. Peres, M.I. Vasilevskiy; Centro de Física, Universidade do Minho (PT).
Coupling of an external electromagnetic wave to surface plasmon-polaritons (SPPs) in graphene can be achieved by using either an attenuated total reflection scheme or a diffraction grating and can be tuned by controlling the carrier density. We shall discuss the physics and possible applications of SPPs in graphene based structures. [5952]
Pg. 590

NOTES

Room: Gordon A

NOTES

TOM 6

STUDENT PRESENTATION

15:15 Post deadline submission

OCDMA Receiver with in-Built all-Optical Clock Recovery

S.K. Idris, T.B. Osadola, I. Glesk; Department of Electronic and Electrical Engineering, University of Strathclyde (GB).

An optical CDMA receiver with incorporated all-optical clock recovery to eliminate signal jitter is demonstrated. Its performance was tested on a 17km field based testbed for incoherent 2D-WH/TS OCDMA transmission. BER improvement of 7.5dB was achieved. [6432].....Pg. 592

15:30

Filtering of an Optical Frequency Comb with Stimulated Brillouin Scattering

J. Galindo-Santos[1], M. Alcon-Camas[2], A. Carrasco-Sanz[3], S. Martin-Lopez[1], P. Corredera[1]; [1]Instituto de Óptica, Consejo Superior de Investigaciones Cientificas (ES), [2]Dpto. Tecnología Fotónica, ETSI Telecomunicación, UPM (ES), [3]Dpto. de Óptica, Facultad de Ciencias, Universidad de Granada (ES).

An optical filtering technique based on SBS has been implemented to isolate one tooth of a stabilized optical frequency comb. The isolated frequency obtained is ex-tremely narrow in comparison with the pump laser and is two orders of magnitude more stable, making it very useful for calibrating wavelength meters in optical com-munications and for remote comparison of optical frequency combs. [5933] Pg. 594

NOTES

Room: Gordon B

NOTES

TOM 3

15:45
Surface nanophotonics with Bloch waves on dielectric multilayers
E. Descrovi[1], M. Ballarini[1], F. Frascella[1], A. Angelini[1,2], A. Lovera[3], E. Enrico[2],T. Sfez[4], N. De Leo[2], P. Mandracci[1], H.P. Herzig[4], O.J.F. Martin[3], F. Michelotti[5], F. Giorgis[1]; [1]Politecnico di Torino, Department of Applied Science and Technology (IT), [2]National Institute of Metrological Research (IT), [3]Ecole Polytechnique Fédérale de Lausanne (EPFL), Nanophotonics and Metrology Laboratory (CH), [4]Ecole Polytechnique Fédérale de Lausanne (EPFL), Optics & Photonics Technology Laboratory Neuchâtel (CH), [5]SAPIENZA Università di Roma, Department of Basic and Applied Sciences for Engineering (IT).
Planar mutilayers sustaining either TE or TM polarized Bloch Surface Waves (BSWs) offer new opportunities for management of light at the nanoscale. We will discuss how BSWs can be exploited in guiding and confining light on nanometric relieves, enhancing fluorescence emission and providing additional features for plasmonic nano-antennas. [6109].....Pg. 596

16:00
STUDENT PRESENTATION AWARD & END OF TOM 3

NOTES

Room: Gordon A

NOTES

TOM 6

15:45
Čerenkov-type second-harmonic spectroscopy of random nonlinear photonic structures
J. Imbrock[1], P. Roedig[1], M. Ayoub[1], K. Koynov[2], C. Denz[1]; [1]Institute of Applied Physics and Center for Nonlinear Science (CeNoS), University of Muenster (DE), [2]Max-Planck Institute for Polymer Research (DE).
We present an experimental method to determine the mean length and diameter of ferroelectric domains in random nonlinear photonic structures. The spectrum of reciprocal grating vectors is measured by a novel Čerenkov-type second harmonic signal detection method. [6152]
Pg. 598

16:00
Femtosecond Non-Paraxial Accelerating Beams Applied to Curved Micromachining
A. Mathis, F. Courvoisier, L. Froehly, L. Furfaro, M. Jacquot, J.M. Dudley; [1]FEMTO-ST Institute, Department of Optics P.M. Duffieux, UMR CNRS 6174, Université de Franche-Comté (FR).
We report on the generation and modeling of arbitrary non-paraxial accelerating beams and demonstrate straightforward femtosecond laser processing with arbitrary convex trajectory in glass and silicon with side curvature radius as small as 56 µm. [6157].....Pg. 600

16:15
STUDENT PRESENTATION AWARD & END OF TOM 6

NOTES

Poster presentations

Room: exhibition hall, Boyd Orr Suite

TOM 1 POSTER SESSION I — WEDNESDAY, 26 September 13:00 - 15:10

TOM1_5953_001
Diagnostic imaging of the Iridocorneal Angle for evaluation of Angle-closure glaucoma
V.M. Murukeshan[1], V.K. Shinoj[1,2], M. Baskaran[2], T. Aung[2]; [1]Center for Optical and Laser Engineering, School of MAE, Nanyang Technological University (SG), [2]Singapore Eye Research Institute & Singapore national Eye Center (SG).
Glaucoma is an eye disease associated with an increase in intraocular pressure which can lead to lead to blindness. The closed-angle or angle-closure glaucoma is related to closure of iridocorneal angle (ICA) corresponding to the area between the iris and cornea. The width of the ICA is associated with the drainage of aqueous humor from eye's anterior chamber. A wide angle permits adequate drainage of aqueous humor through the trabecular meshwork (TM)region provided the TM region is not obstructed. A narrow angle may obstruct the drainage system and at certain unfavorable conditions, can lead to acute angle-closure attack resulting in emergency care. Hence imaging of the region associated with the ICA is one of the thrust research area in vision research. This paper in this context briefly overviews some of the recent developments in high resolution imaging of anterior chamber angle. This will be followed by evaluation of the same using a probe based scheme developed by the authors. Both theoretical investigations and experimental validation of the same will be discussed in detail.
Pg. 602

TOM1_6001_002 STUDENT PRESENTATION
Discrimination of single yeast cells with Raman spectroscopy: Saccharomyces cerevisiae and Kluyveromyces lactis
J.T. Heldens[1], D.K. Leenman[1], M.A.H. Luttik[2], P.A.S. Daran-Lapujade[2], J.T. Pronk[2], J. Caro[1]; [1]Delft University of Technology, Kavli Institute of Nanoscience and Department of Quantitative Imaging (NL), [2]Delft University of Technology, Kluyver Centre for Genomics of Industrial Fermentation and Department of Biotechnology (NL).
On the basis of Raman spectra of single cells we demonstrate clear discrimination of two yeast species, viz. *Saccharomyces cerevisiae* and *Kluyveromyces lactis*. The spectra have been measured with a laser tweezers Raman set-up, while they have been analysed with principle component analysis and linear discriminant analysis.....Pg. 604

TOM1_6134_003
Towards a real-time quantitative endoscopy
L. Criante[1], E. Stenta[2], F. Simoni[2]; [1]Center for Nano Science and Technology Istituto Italiano di Tecnologia (IT), [2]Università Politecnica delle Marche, Dept.SIMAU (IT).
We propose a new optimized optical fiber technology making available a real-time quantitative measurements during endoscopic surgery or examination. Based on the optical FOLCI technique the sensor provides very sensitive and precise measurements of size of the hollow organ in a non invasive way and without any calibration.....Pg. 606

TOM1_6146_004 STUDENT PRESENTATION
High-throughput optical injection of mammalian cells using a Bessel beam
H.A. Rendall[1], R.F. Marchington[5], B. Balagopal[1], G. Bergmann[6], Y. Arita[1], A. Heisterkamp[2], F.J. Gunn-Moore[4], K. Dholakia[1]; [1]University of St. Andrews, Department of Physics (GB), [2]Friedrich Schiller University, Institute of Applied Optics (DE), [3]University of St. Andrews, School of Medicine (GB), [4]University of St. Andrews, School of Biology (GB), [5]University of St. Andrews, SUPA, School of Physics and Astronomy (GB), Max Planck Institute for Gravitational Physics (DE).
We present high throughput optical injection of mammalian cells with propidium iodide using a microfluidic platform. The microfluidic chip combines two-dimension hydrodynamic focusing of cells with a parallel, femtosecond Bessel beam. This allows for higher flow rates to be used whilst delivering the necessary laser dose.....Pg. 608

TOM 1 POSTER SESSION II — THURSDAY, 27 September 12:45 - 15:00

TOM1_5846_005 STUDENT PRESENTATION
Femtosecond Photoporation of Intact BY-2 Suspension Cells
C.A. Mitchell[1], S. Kalies[2], A. Heisterkamp[3], L. Torrance[4], A. Roberts[4], F. Gunn-Moore[5], K. Dholakia[1]; [1]University of St. Andrews, Department of Physics (GB), [2]Laser Zentrum Hannover e.V. (DE), [3]Friedrich Schiller University, Institute of Applied Optics (DE), [4]James Hutton Institute, Cell and Molecular Sciences (GB), [5]University of St. Andrews, School of Medicine (GB).
Successful femtosecond photoporation of plant cells has been demonstrated for the first time. Membrane impermeable substances have been optically injected into intact tobacco BY-2 cells whilst still retaining cell viability.....Pg. 610

TOM1_5915_007
LED and DPSS laser visual stimuli for evaluation of lutein and zeaxanthin macular pigment caused light extinction in human retina
M. Ozolinsh[1,2], P. Paulins[1]; [1]University of Latvia (LV), [2]Institute of Solid State Physics, University of Latvia (LV).
DPSS lasers and LEDs are used to develop heterochromatic flicker photometry setups for detecting macular pigments lutein and zeaxanthin. Light source emission spectra are selected to distinguish these pigment concentration levels in retina macula area due to their local absorption maxima in blue spectral region.....Pg. 612

NOTES

Room: exhibition hall, Boyd Orr Suite

TOM 2 POSTER SESSION II — THURSDAY, 27 September 12:45 - 15:00

TOM2_5966_001 STUDENT PRESENTATION
Spectral broadening enhancement in silicon waveguides through pulse shaping: physical insight
D. Castelló-Lurbe[1], E. Silvestre[1], P. Andrés[1], V. Torres-Company[2,3]; [1]Departament d'Òptica, Universitat de València (ES), [2]School of Electrical and Computer Enginnering, Purdue University (US), [3]Departament de Física, Universitat Jaume I (ES).
Spectral broadening of pulsed light in silicon waveguides is usually inhibit due to some adverse effects related to free carrier production. In this work, we discuss how to overcome these detrimental effects by using positive skew input pulses.....Pg. 614

TOM2_6440_002 Post deadline submission
Design of Mach-Zehnder interferometer sensor with calibration waveguide
M. Kusko; National Institute for Research and Development in Microtechnologies (RO).
A Mach-Zehnder interferometer refractometric sensor has been designed for a monotonic sensor response if the analyte medium refractive index varies from 1.33 to1.36. The proposed sensor has a calibration waveguides to eliminate the influence ot the source power fluctations or the coupling misalignment.....Pg. 616

TOM2_6425_003 Post deadline submission
Planar Bragg gratings in Silicon on Insulator fabricated using oxide synthesis
P.M. Waugh[2], R. Topley[3], R. Loiacono[1], N.G. Emerson[1], G.T. Reed[3]; [1]Advanced Technology Institute, University of Surrey (GB), [2]Kimathi University (KE), [3]ORC, Southampton University (GB).
Two approaches have been used to demonstrate planar Bragg gratings, oxygen implantation and thermal oxidisation. Extinction ratios of 6.8dB and 8.5 dB are demonstrated respectively. This is comparable to the performance of early etched Bragg gratings in SOI.....Pg. 618

TOM 3 POSTER SESSION I — WEDNESDAY, 26 September 13:00 - 15:10

TOM3_5817_001
Geometrical invisibility cloaking invisible light
H. Ichikawa, M. Oura; Ehime University, Faculty of Engineering, (JP).
Achromatic optical cloaking is shown to be possible with the mere principle based on geometrical optics. Although its effect is approximate, what is observed with naked eyes is striking. The proposed technique would have applications not only in cloaking but also such as metrology.....Pg. 620

TOM3_5849_002 STUDENT PRESENTATION
Dynamic Surface-Enhanced Raman Spectroscopy of multidomain proteins
T. Brulé[1], H. Yockell-Lelièvre[1], A. Bouhelier[1], J. Margueritat[1], L. Markey[1], A. Dereux[1], R. Quidant[2], R. Seigneuric[3], C. Garrido[3], E. Finot[1]; [1]Laboratoire Interdisciplinaire Carnot de Bourgogne UMR CNRS 6303, Université de Bourgogne (FR), [2]ICFO-Institut de Ciènces Fotòniques (ES), [3]Heat Shock protein and Cancer INSERM UMR 866 IFR 100, Faculty of Medicine (FR).
The SERS gives the protein's fingerprint. In case of multidomain proteins, the standard way to study them is not really suited because of the different origins of SERS signal. That is why we have developed a method taking account of the molecular fluctuations which allow studying only few molecules in a solution.....Pg. 622

TOM3_5861_003 STUDENT PRESENTATION
On sculptured thin films as platforms for optical sensing
S.S. Jamaiana[1], T.G. Mackaya[2]; [1]School of Mathematics and Maxwell Institute for Mathematical Sciences, University of Edinburgh (GB), [2]NanoMM-Nanoengineered Metamaterials Group, Department of Engineering Science and Mechanics, Pennsylvania State University (US).
Two independent modes of optical sensing based on sculptured thin films (STFs) were explored numerically in semi-empirical studies. One mode involved chemiluminescent emission whereas the other involved surface-plasmon-polariton waves. Both studies suggest that STFs are promising platforms for optical sensing applications.....Pg. 624

TOM3_5876_005
Plasmon-induced terahertz galvano- plasmonic response in a two-dimensional electron system gated by a periodic metal grating
D.V. Fateev, V.V. Popov, S.A. Nikitov; Kotelnikov Institute of Radio Engineering and Electronics, Russian Academy of Science, Saratov (RU), Saratov State University (RU).
Terahertz galvanoplasmonic response in a two-dimensional electron system gated by a periodic metal grating with an asymmetric unit cell is studied theoretically. It is shown that applying DC electric current leads to tremendous increase of the galvanoplasmonic response.....Pg. 626

TOM3_5896_006
Direct Measurement of the Radiation Pattern of a Nanoantenna Dipole Array
J. Stokes[1], P.Bassindale[2], J.W. Munns[2], Y. Yu[1], Z.H. Yuan[6], G.S. Hilton[1], J.R. Pugh[1], A. Yang[1], A. Collins[4], P.J. Heard[3], R.Oulton[1,5], A. Sarua[5], M. Kuball[5], A.J. Orr-Ewing[4], M.J. Cryan[1]; [1]Department of Electronic and Electrical Engineering, [2]Bristol Centre for Functional Nanomaterials, [3]Interface Analysis Centre, [4]School of Chemistry, [5]School of Physics, University of Bristol (GB), [6]Guizhou University For Nationalites, Guiyang (CN).
Scanning microphotoluminescence is used to characterise the fluorescence from a dye-loaded polymer deposited on a 5 x 5 nano-antenna dipole array. Vertical and horizontal scans show anisotropic emission patterns. Pg. 628

TOM3_5902_007
Template guided gold clusters nanostructuting
D.A. Grynko[1] , M.A. Zabolotny[2], M.Yu. Barabash[3], Yu.M. Barabash[4]; [1]Institute of Semiconductor Physics NAS of Ukraine, Kyiv (UA), [2]Kyiv National Taras Shevchenko University (UA), [3]Technical Center of NAS of Ukraine (UA), [4]Institute of Physics NAS of Ukraine, Kyiv (UA).
Template is a functionally organized in space mikroinstrument to direct physical and chemical processes of nanoobjects selforganization in space and time by interaction with its surface via the local field. Strong, spatially organized electrostatic field of template influence the nucleation and diffusion transport of nanoparticles.....Pg. 630

TOM3_5906_008
Direct measurement of ultrahigh optical Q-factors of individual liquid microdroplets using tapered optical fiber waveguides
Y. Karadag, A. Jonáš, M. Mestre, A. Kiraz; Koç University, Dept. of Physics (TR).
Ultrahigh quality factors of the optical whispering gallery modes of surface–supported microdroplets were directly measured via tapered optical fibers. Quality factors up to 1.85×10^6 were observed for glycerol-water droplets with radii < 200 μm.....Pg. 632

TOM3_5920_009
Optical reflective Galois scattering plates
M. Jaax[1], B. Lägel[2], S. Wolff[2], H. Fouckhardt[1]; Kaiserslautern University of Technology, [1]Physics Department, Integrated Optoelectronics and Microoptics Research Group, [2]Nano Structuring Center, Kaiserslautern (DE).
Surfaces structured with binary Galois reliefs scatter incoming waves in a wide range of solid angles. The Galois array design is already well known for acoustic waves. To date, this concept has not been investigated in the context of THz frequencies or optical wavelengths. Here, a proof of concept is presented that shows that Galois surfaces are excellent light diffusers.....Pg. 634

Room: exhibition hall, Boyd Orr Suite

TOM3_5954_011 STUDENT PRESENTATION
Nanoparticle trapping and structuring on the surface of photovoltaic lithium niobate crystals and waveguides
H. Burgos[1], M. Jubera[1], A. García-Cabañes[1], F. Agulló-López[1,2], M. Carrascosa[1]; [1]Universidad Autónoma de Madrid, Dept. Física de Materiales (ES), [2]CMAM, Universidad Autónoma de Madrid, (ES).
Micro/nanoparticle trapping and structuring on the surface of $LiNbO_3$ crystals and optical waveguides has been observed. Conductive and dielectric particles have been periodically structured up to periods of a few microns. The role of the deposition method and illumination geometry has been investigated.
Pg. 636

TOM3_5979_012 STUDENT PRESENTATION
Analytical reverse engineering of index maps for the design of all-dielectric metamaterials
E. Cassan, K. Van Do, C. Caer; Institut d'Electronique Fondamentale, Univ. Paris-Sud, CNRS (FR).
An analytical method is proposed for the design of all-dielectric metamaterials at optical frequencies as an alternative to the formalism of transformation optics. It is applied to the design of broadband weakly-open in-plane light trajectories like logarithmic spirals in the silicon on insulator photonics technology which could be hardly described by the use of coordinate transforms...Pg. 638

TOM3_6008_014 STUDENT PRESENTATION
Optimization of light absorption in semiconductor nano-pillar array solar cells
B. Dev Choudhury[1], E. Ebraert[1,2], S. Anand[1]; [1]KTH- The Royal Institute of Technology, School of Information and Communication Technology (SE), [2]Vrije Universiteit Brussel (BE).
We present a detailed analysis and optimization of light absorption in Si, InP and GaAs (air gap and dielectric planarized) nano-pillar (NP) arrays using finite difference time domain (FDTD) method. For maximum absorption, optimal values of diameter and spacing were in the range 150-250 nm and 300-400 nm, respectively.....Pg. 640

TOM3_6019_015 STUDENT PRESENTATION
$LiNbO_3$ Bragg gratings with giant aspect ratios
C. Guyot[1], N. Courjal[1], G. Ulliac[1], B. Guicharchaz[1], H. Lu[1], B. Sadani[1], M.-P. Bernal[1], F. Baida[1]; [1]Département d'Optique P.M. Duffieux, Institut FEMTO-ST UMR 6174 CNRS Université de Franche-Comté, Besançon (FR).
We present $LiNbO_3$ Bragg gratings with an aspect ratio of 8 and beyond. The gratings are integrated in ridge waveguides by focused ion beam (FIB) milling. The preliminary optical characterizations confirm that the gratings behave as reflectors.....Pg. 642

TOM3_6034_017
Phase visualization by using layered metamaterials
R. Kasztelanic, A. Pastuszczak, M. Stolarek, R. Kotyński; University of Warsaw, Faculty of Physics, Warsaw (PL).
We describe layered metal-dielectric metamaterials using the model of a linear-shift-invariant system. In a computer simulation we demonstrate that this kind of metamaterial behaves similarly to high-pass spatial filter and it is possible to use it for phase visualization.....Pg. 644

TOM3_6046_018
Using photonic crystal nanocavities as near-field optical tweezers
C. Renaut[1,2,3], B. Cluzel[1], J. Dellinger[1], L. Lalouat[1], E. Picard[2], D. Peyrade[3], E. Hadji[2], F. de Fornel[1]; [1]Groupe d'Optique de Champ Proche - LRC CEA n DSM-08-36, Laboratoire Interdisciplinaire Carnot de Bourgogne, UMR CNRS 6303, Université de Bourgogne (FR), [2]Laboratoire Silicium Nanoélectronique Photonique et Structures, INAC/SP2M/SiNaPS, CEA (FR), [3]CNRS/UJF-Grenoble [1]/CEA LTM (FR).
Silicon On Insulator (SOI) optical nanoresonators achieve spectral and spatial confinement of the electromagnetic field. These small modal volumes nanocavities carry driven optical forces paving the way to emerging applications in optomechanics and lifescience. In this work, we report optical trapping and assembly experiments of micrometer-sized dielectric particles (1µm in diameter) leaning on the near-field distribution of two evanescently coupled nanocavities.....Pg. 646

NOTES

TOM3_6053_019
Hyperspectral near-field imaging of light bending in a graded photonic crystal
J. Dellinger[1], B. Cluzel[1], F. de Fornel[1], K.V. Do, E. Cassan; [1]Groupe d'Optique de Champ Proche, Laboratoire Interdisciplinaire Carnot de Bourgogne, UMR CNRS 6303 (FR), [2]IEF - Université Paris Sud (FR).
Artificial materials at optical frequencies have raised a strong interest in the last years, including photonic metamaterials, graded photonic crystals, and simple gradient index structures. The main common objective of these approaches is achieving a tight control of the electromagnetic guided-wave fields to play with light properties and propose versatile optical functions. In this general context, photonic crystals (PCs) and gradual photonic crystals (GPhCs) working in the diffraction regime, i.e. close to the photonic crystal (PhC) bandgap are good candidates to control the path and the dispersion of light beams on a chip.
In this work, we report the observation of the fascinating mirage effect in a silicon GPhC using a hyperspectral scanning near-field optical microscope (Hyp-SNOM). The Hyp-SNOM allows a spectrally and spatially continuous near-field imaging of the complex electromagnetic waves dispersion inside the GPhCs, and thus giving back insight into the physics underlying the reported phenomena. The experimental observations are compared to the numerical predictions based on 3D planewaves calculations of the GPhCs dispersion diagram and Hamiltonian Optics propagation of light.....Pg. 647

TOM3_6058_020
Hyperspectral near-field imaging for nanophotonics
J. Dellinger, L. Lalouat, B. Cluzel, F. de Fornel; Groupe d'Optique de Champ Proche, Laboratoire Interdisciplinaire Carnot de Bourgogne, UMR CNRS 6303 (FR).
The scanning near-field optical microscopy (SNOM) is used to analyze optical phenomena at the sub-wavelength scale such as light localization and propagation in photonic crystals or plasmonic devices. In any case, SNOM experiments rely on the positioning of a local probe in the optical near field of a given structure and on the detection of the surrounding evanescent
waves. Depending on the nature of the probe or on the optical detection method, the detected physical properties are the spatial distributions of the amplitude and phase or the intensity of the electric and magnetic components of the probed field. In this paper, we present the implementation of an innovative hyperspectral near-field imaging method which aims to detect both spectral and spatial properties of an optical nanosystem at the subwavelength scale.
Pg. 648

Room: exhibition hall, Boyd Orr Suite

TOM3_6060_021
Near-field interactions between a photonic crystal nanocavity and a near-field probe
L. Lalouat[1], B. Cluzel[1], K. Foubert[1,2], J. Dellinger[1], M. Ding[3], G. Brambilla[3], E. Picard[2], E. Hadji[2], D. Peyrade[4], F. de Fornel[1]; [1]Groupe d'Optique de Champ Proche LRC CEA n 08-36, Laboratoire Interdisciplinaire Carnot de Bourgogne, UMR CNRS n 6303-Université de Bourgogne (FR), [2]Laboratoire Silicium Nanoélectronique Photonique et Structures, INAC/SP2M/SiNaPS, CEA (FR), [3]Optoelectonics Research Centre, University of Southampton (GB), [4]Laboratoire des Technologies de la Microélectronique, CNRS (FR).
Semiconductor photonic crystal resonators have attracted much attention over the last recent years. Their potential for high quality (high Q) factor in small volume (small V) cavities opens innovative ways to control light. As proposed theoretically few years ago, the near-field probes permit to tune their resonances opening the route towards near-field probes opto-mechanical devices.
Pg. 649

TOM3_6070_022
Plasmon-like Surface States in Negative Refractive Index Metamaterials: an Experimental Characterization
E. De Tommasi[1], A. C. De Luca[2], P. Dardano[1], S. Cabrini[3], I. Rendina[1], V. Mocella[1]; [1]National Council for Research, Institute for Microelectronics and Microsystems, Department of Naples (IT), [2]National Council for Research, Institute for the Biochemistry of Proteins, Naples (IT), [3]Molecular Foundry, Lawrence Berkeley National Laboratory (US).
Surface states at the boundary of a negative refractive index metamaterial have been theoretically predicted and their angular dispersion experimentally reconstructed by means of a typical evanescent field coupling technique based on the use of a high refractive index prism. Possible applications in biochemical sensing schemes are proposed.....
Pg. 650

TOM3_6097_023
Assessment of novel ingredients within Fourier modal methods
P. Kwiecien[1], I. Richter[1], J. Čtyroký[2]; [1]Department of Physical Electronics, Faculty of Nuclear Sciences and Physical Engineering, Czech Technical University in Prague (CZ), [2]Institute of Photonics and Electronics AS CR (CZ).
Based on two our algorithms of Fourier modal methods (FMM), we investigated several alternative approaches to (correct) Fourier factorization rules, and to the adaptive spatial resolution (ASR) techniques. Their practical applicability is demonstrated on several examples of photonic and/or plasmonic nanostructures.....
Pg. 652

TOM3_6112_024 STUDENT PRESENTATION
Optical Properties of Rhodium 2,2'-Biimidazole Carbonyl Complex
B. Chandra[1], E. Laurila[2], H. Lajunen[1], J. Turunen[1], P. Vahimaa[1], M. Haukka[2]; [1]University of Eastern Finland, Department of Physics and Mathematics (FI), [2]University of Eastern Finland, Department of Chemistry (FI).
The optical properties of Rhodium 2,2'-Biimidazole Carbonyl crystals are investigated using ellipsometric measuring techniques. The crystals are shown to be strongly anisotropic over a band of visible wavelengths.....
Pg. 654

TOM3_6158_025
Ionising Radiation Detectors and Dosimeters based on Quantum Dots
R. Baharin[1], P.R. Hobson[1], D.E. Leslie[2], D.R. Smith[1]; [1]Brunel University, School of Engineering & Design, Uxbridge (GB), [2]Brunel University, School of Sport & Education (GB).
We report measurements of the effect on the fluorescent emission of commercially produced CdSe/ZnS quantum dots of 2.5 nm, 3.3 nm and 6.3 nm size in toluene, following exposure to 1 MeV gamma irradiation and 6 MeV electron irradiation in the range 0.1-110 Gy. A prototype radiation dosimeter using these is presented.....
Pg. 656

TOM3_6419_051 Post deadline submission
The core modes of all solid photonic band gap fibers as bound states in the continuum
A.D. Pryamikov; Fiber Optics Research Center of Russian Academy of Sciences (RU).
In this paper we propose a new hypothesis of out of plane band gap formation in all solid photonic band gap (PBG) fibers. One considers the process of the core mode formation as a result of excitation of continuous mode spectrum of single dielectric rod of the cladding. In this case, the core modes are the transverse resonances of a set of radiation modes decoupled from the continuum provided that the phase matching conditions between the propagation constant of the core mode and propagation constants of the continuous modes are fulfilled.....
Pg. 658

TOM3_6417_052 Post deadline submission
Plasmonic Coupling to Microoptical Systems
C.A. Jones, A.G. Edelmann; Optical Information Technology, University of Hagen (DE).
With increased prevalence of plasmonics it will become more necessary to perform complex operations on the transmitted information. One simple way of achieving this on optical signals is in the Planar Integrated Free Space Optics (PIFSO) technology. It is to be shown how PIFSO can be coupled with plasmonics.....
Pg. 661

STUDENT PRESENTATION
TOM3_6411_053 Post deadline submission
Nanophotonic device based on gold nanoparticles for biomedical applications
R. Iovine, L. La Spada, L. Vegni; "RomaTre" University, Department of Applied Electronics (IT).
An LSPR (Localized Surface Plasmon Resonance) sensor, based on near field interaction of coupled nanoinclusions, arranged in array configuration, is proposed. The sensor is designed to detect in/organic compounds by refractive index measurements. The results demonstrate that the proposed sensing platform is suitable for biomedical applications in the near infrared frequency region.
Pg. 663

STUDENT PRESENTATION
TOM3_6410_054 Post deadline submission
Multipole approach to optical nanomaterials
P. Grahn, A. Shevchenko, M. Kaivola; Aalto University, Department of Applied Physics (FI).
We present a convenient theoretical model for the design and characterization of optical nanomaterials in terms of electromagnetic multipole moments that light can excite in the structural units of the material...
Pg. 665

NOTES

Room: exhibition hall, Boyd Orr Suite

TOM 3 **POSTER SESSION II** THURSDAY, 27 September 12:45 - 15:00

TOM3_5806_026
Optimization of GaAsSb/GaAs quantum dot lasers
T.H. Loeber, C. Heisel, J. Strassner, J. Richter, D. Hoffmann, H. Fouckhardt; Kaiserslautern University of Technology, Physics Department, Integrated Optoelectronics and Microoptics Research Group (DE).
Efficient electrically pumped GaAsSb quantum dot (QD) lasers on GaAs substrate are realized. For further improvement of the devices growth procedure and processing are optimized. The claddings and the doping concentrations are controlled during growth by reflectance anisotropy spectroscopy (RAS).....Pg. 667

TOM3_5809_027
Characterization of flexible holographic imprints in urea-silicate and amine-alcohol-silicate matrices with embedded metal nanoparticles.
S.D. Moreira[1,2], C.J.R. Silva[1], M.F.M. Costa[2], L.A.S.A. Prado[3], M. de Jesus M. Gomes[2]; [1]Department of Chemistry, Universidade do Minho (PT), [2]Center of Physics, Universidade do Minho (PT), [3]Institute of Polymer and Composites, TU Hamburg-Harburg (DE).
This work reports the synthesis and characterization of the optical elastic thermal and dimensional properties of transparent gels based on a hybrid matrix obtained by sol-gel method. Sol-gel method is an adequate method to produce highly transparent and stable materials where different types of components could be dispersed, such as nano-sized metal nanoparticles (gold and silver), promoting the enhancement of the original matrix optical properties. This work was focused on the optimization of preparative routines to obtain materials for the development of high resolution gratings by replica molding technique.....Pg. 669

TOM3_5810_028
Grating-assisted LR-SPP coupling: introducing 3D numerical analysis
M.P. Bolzoni[1], G.G. Gentili[1], S.M. Pietralunga[2]; [1]Politecnico di Milano, Dip. Elettronica e Informazione (IT), [2]CNR-IFN (IT).
A full-wave Finite Element Method 3D numerical analysis of grating-assisted coupling of Long-Range Surface Plasmon Polariton modes into strip waveguides is introduced. For an input Gaussian beam and 1D grating coupler, comparison with commonly used 2D approximated analysis shows marked differences in coupling efficiency estimate.
Pg. 670

TOM3_5819_029
Fiber Bragg Grating Based Surface Plasmon Resonance Biosensors
P.T. Arasu[1], A.S.M. Noor[1,2], Y. Al-Qazwini[1], B.I. Onn[1]; [1]Wireless and Photonic Network Research Center, Faculty of Engineering University Putra Malaysia (MY), [2]Department of Computer and Communications System Engineering Faculty of Engineering University Putra Malaysia (MY).
A fiber Bragg grating (FBG) based surface Plasmon resonance (SPR) sensor is investigated using 2-D finite difference time domain (FDTD) simulation. The sensitivity of the sensor with and without gratings is observed as well as the effect of changing the grating distance on the resonant wavelength.
Pg. 672

TOM3_5836_030
Resonant coupling between surface polaritons and QD excitons in metal-QD heterostructures
Yu.V. Bludov, M.I. Vasilevskiy; Centro de Física, Universidade do Minho (PT).
Coupling of plasmon-polaritons propagating along the interface between a metal and a dielectric layer containing embedded nanocrystal (NC) quantum dots (QDs), to excitons confined in the QDs is studied theoretically. It is shown that this coupling produces a considerable effect on the optical properties of the heterostructure.....Pg. 674

TOM3_5854_031
Tunable liquid-crystal long-range plasmonic stripe waveguides
R. Beccherelli, D.C. Zografopoulos; Consiglio Nazionale delle Ricerche; Istituto per la Microelettronica e Microsistemi (CNR-IMM) (IT).
The optical properties of gold stripe waveguides enhanced with a liquid-crystal overlayer are theoretically investigated. It is shown that by proper selection of material and structural parameters extensive tunability of modal effective index, area and losses can be achieved via the electro-optic control of the nematic molecules.
Pg. 676

TOM3_5869_032 STUDENT PRESENTATION
Nanocone-based sensor for blood disease detection
L. La Spada, R. Iovine, L. Vegni; University of "RomaTre", Department of Applied Electronics (IT).
In this paper the design of a gold conic nanoparticle array is proposed. New analytical formulas are obtained in order to describe their resonant behavior. The numerical results suggest that the proposed structure can be used as a sensing platform for the detection of blood diseases.
Pg. 678

TOM3_5903_033
Formation of inclined wavefront through planar stacked hole array
T. Matsui[1], A. Miura[1], T. Nomura[1], H. Fujikawa[1], K. Sato[1], N. Ikeda[2], D. Tsuya[2], M. Ochiai[2], H. T. Miyazaki[2], and Y. Sugimoto[2]; [1]Toyota Central R&D Labs., Inc., Aichi (JP), [2]National Institute for Materials Science, Tsukuba (JP).
Transmission phase control is experimentally demonstrated using stacked metal-dielectric hole arrays with a two-dimensional geometric design. Inclined wavefront through planar structure, for beam steering application, is also proposed. Inclined wavefront is realized by the use of the element which have gradually changing hole shapes in-plane.....Pg. 680

TOM3_5917_034
Plasmonic structures on photonic crystals: preparation and characterization
V. Robbiano[1,2], M.C. Giordano[2], C. Martella[2], F. Buatier de Mongeot[2], D. Comoretto[1]; [1]Università degli Studi di Genova, Dipartimento di Chimica e Chimica Industriale, Genova (IT), [2]Università degli Studi di Genova, Dipartimento di Fisica, Genova (IT).
We report on the optical response of gold nanocrescents evaporated over artificial opals. Nanocrescents shows three resonances due to their specific shape. When plasmonic resonances spectrally overlap to the photonic stop band of the opals, a dramatic change in its spectral position and dispersion is observed.....Pg. 682

TOM3_5919_035 STUDENT PRESENTATION
Near UV nanoplasmonics of radially symmetric metal-dielectric structures
K. Ushakova, S.F. Pereira, H.P. Urbach; Delft University of Technology, Faculty of Applied Sciences, Department of Imaging Science & Technology, Optics Research Group (NL).
Surface plasmons in the near UV wavelength range in radially symmetric metaldielectric structures consisting of sub wavelength concentric nanoslit grooves are inspected by applying 1D grating and coaxial metal-dielectric-metal waveguide models.
Pg. 684

Room: exhibition hall, Boyd Orr Suite

TOM3_5921_036
In-plane remote optical excitation of semiconducting single-walled carbon nanotube by propagating surface plasmon
P. Rai[1], J. Berthelot[1], N. Hartmann[2], A. Hartschuh[2], A. Bouhelier[1]; [1]Laboratoire Interdisciplinaire Carnot de Bourgogne, CNRS UMR 6303, Université de Bourgogne (FR), [2]Department Chemie and CeNS, Ludwig-Maximilians-Universität München (DE).
We present propagating surface plasmon polariton (SPP) coupled exciton generation in semiconducting single-walled carbon nanotube (SWNT) at room temperature. Our results demonstrate that nanotube can act as a sensor for propagating SPP in metal structure and enables the routes towards integration of plasmonic and nanophotonic circuits based on carbon nanotubes (CNTs).
Pg. 686

TOM3_5945_037 STUDENT PRESENTATION
Near-field optical imaging of dielectric-loaded surface plasmonpolariton waveguides using optical feedback on erbium fiber laser
M. Roblin[1], S. Girard[1], M. Laroche[1], H. Gilles[1], C. Dufour[1], J. Cardin[1], U. Lüders[2]; [1]Centre de recherche sur les Ions, les Matériaux et la Photonique (CIMAP), UMR, 6252 CEA-CNRS-ENSICAEN, Université de Caen (FR), [2]CRISMAT, Laboratoire de cristallographie et sciences des matériaux, UMR 6508, CNRS-ENSICAEN, Université de Caen (FR).
Heterodyne optical feedback on class-B solid state laser is applied for characterizing dielectric-loaded surface plasmon-polariton waveguides (DLSPPW) at telecom wavelength. Near-field optical images recorded on a series of DLSPPWs are
compared to numerical models (mode-solver and finite-difference time-domain).
Pg. 688

TOM3_6000_038
Gain in Rayleigh scattering from nanoparticles trapped in photonic crystal membranes
J.O. Grepstad[1,2,3], P. Kaspar[4], O. Solgaard[5], I.-R. Johansen[2], A.S. Sudbø[3,6]; [1]Department of Electronics and Telecommunications, Norwegian University of Science and Technology, Trondheim (NO), [2]SINTEF ICT, Microsystems and Nanotechnology (NO), [3]University Graduate Center (NO), [4]Electronics Laboratory, ETH Zurich, (CH), [5]E.L. Ginzton Laboratory, Stanford University (US), [6]Department of Physics, University of Oslo (NO).
Rayleigh scattering of light by nanoparticles in free space can be increased by placing the particles in the holes of a photonic crystal membrane, making them more visible in a microscope. We show in simulations that the scattering gain can be as large as a factor of 10 in the hole-center, and even larger near the hole wall.....Pg. 690

TOM3_6032_040 STUDENT PRESENTATION
Fabrication of GaAs nanopillars with optimized design for enhanced sunlight absorption
R. Sanatinia, K.M. Awan, S. Naureen, E. Ebraert, B.D. Choudhury, S. Anand; School of Information and Communication Technology, KTH Royal Institute of Technology (SE).
GaAs nanopillar arrays are fabricated based on a design optimized for solar light absorption by 3D finite difference time domain simulations. The pillars fabricated using nanosphere lithography and dry etching show a dramatic decrease in total reflectivity and a 2-fold improvement in photoluminescence after surface passivation.
Pg. 692

TOM3_6036_041
Laser emission from core or shell transitions in self-assembled microcavities of CdSe/CdS colloidal quantum rods
M. Zavelani-Rossi[1], R. Krahne[2], G. Della Valle[1], F. Scotognella[1], S. Longhi[1], I. Franchini[3], S. Girardo[3], D. Pisignano[3], L. Manna[2] G. Lanzani[1,4], F. Tassone[4]; [1]Dipartimento di Fisica Politecnico di Milano, IFN-CNR (IT), [2]Fondazione Istituto Italiano di Tecnologia (IT), [3]NNL-CNR-Ist. Nanoscienze, Dip. di Ingegneria dell'Innovazione e Dip. Di Matematica e Fisica, Università del Salento, Lecce (IT), [4]Center for Nano-Science and Technology (IT).
We show laser action, in the red or in the green, from transitions in the *core* or in the *shell* of colloidal CdSe/CdS nanorods (NRs). The laser micro-resonator is obtained merely by self-assembling of the NRs following capillary jet deposition of NR solution. The laser has low pump threshold and its behavior is fully modeled.....Pg. 694

TOM3_6045_042
Silica-coated tilted fiber Bragg grating for anion recognition
E. Malheiro[1], L. Melo[1], R. Pinto[2], J. Rodrigues[3], A. Farinha[3], N. J. Alberto[1], L. Bilro[1], T. Trindade[2], J. Tomé[3], R.N. Nogueira[1]; [1]Instituto de Telecomunicações (PT), [2]University of Victoria, Department of Mechanical Engineering (CA), [2]Universidade de Aveiro, CICECO Complexo de Laboratórios Tecnológicos (PT), [3]Universidade de Aveiro, Departamento de Química (PT).
In this work, it is presented the influence of a silica nanofilm onto a tilted fiber Bragg grating (TFBG) for anion recognition. A TFBG was tested before and after silica coating regarding different chloride concentrations. The results show that this technique improves the TFBG's sensitivity towards chloride detection.....Pg. 696

TOM3_6057_043 STUDENT PRESENTATION
Fabrication and optical properties of single and bimetallic periodic array of different noble metals
A. Mansourian, M. Nasir, W. Dickson, D. O'Connor, R. McCarron, G. Wurtz, A.V. Zayats; Nano-optics and Near-field Spectroscopy Group, Department of Physics, King's College London (GB).
We discuss the design and fabrication details and electro-deposition of periodic arrays of different noble metals such as gold, silver and nickel into the pores of an aluminium oxide membrane prepared by two step anodization. The optical properties of these structures are characterised.....Pg. 698

TOM3_6067_044 STUDENT PRESENTATION
Enhanced Nonlinear Optical Effects with a self-collimating photonic crystal
S. Romano[1], I. Rendina[1], S. Cabrini[2], V. Mocella[1]; [1]CNR-IMM – Unità di Napoli (IT), [2]Molecular Foundry, Lawrence Berkeley National Laboratory (US).
Negative refraction in dielectric photonic crystals (PhC) allows phenomena that are impossible with conventional optics, such as a self-confinement of the radiation. In this paper we show how this property can lead to an enhancement of up-conversion field in Er^{3+} nanoparticles drop-casted on a PhC surface.....Pg. 700

TOM3_6090_045
Surface plasmon polariton-controlled tunable quantum-dot emission
P. Törmä, R.J. Moerland, H.T. Rekola, G. Sharma, A.-P. Eskelinen, A.I. Väkeväinen; Aalto University, Department of Applied Physics (FI).
In many cases, the emission wavelength of the quantum dots is fixed after manufacturing, allowing no control over the in situ emission properties. Here, we showfully optical, insitutunability of the emission wavelength of quantum dots, with shifts of over 30 nm, employing Surface Plasmon Polaritons to control the emission wavelength.
Pg. 703

Poster presentations

Room: exhibition hall, Boyd Orr Suite

TOM3_6098_046
Single-layer Multifrequency Plasmonic Cloak
J. Zhang[1,2], A. Zayats[1]; [1]King's College London, Department of Physics (GB), [2]Technical University of Denmark, Department of Photonics Engineering-DTU Fotonik (DK).
We propose to use single layer plasmonic covers with non-uniform thickness to reduce the total scattering cross section of cylindrical objects at multiple frequencies. Analytical studies based on transformation optics and numerical simulations are performed to demonstrate the functionality of this cloak.
Pg. 705

TOM3_6102_047
High Q micro ring resonator with implemented hollow core defects for optical sensing
M. Gabalis, D. Urbonas, R. Petruskevicius; Center for Physical Sciences and Technology (LT).
By implementing defects into the micro ring resonator we are able to "localize" E field in analyte and achieve high Q-factor. "Localization" of light in analyte enhances the biosensing and high Q-factor increases the accuracy in detecting the wavelength shift.....Pg. 707

TOM3_6118_048
Giant enhancement of terahertz radiation by stimulated generation of plasmons in a planar array of graphene microcavities
O.V. Polischuk[1,2], V.V. Popov[1,2], A. Davoyan[1], V. Ryzhii[3], T. Otsuji[3], M.S. Shur[4]; [1]Kotelnikov Institute (Saratov Branch), Russian Academy of Sciences (RU), [2]Saratov State University (RU), [3]Research Institute for Electrical Communication, Tohoku University (JP) [4]Department of Electrical, Computer, and Systems Engineering, Rensselaer Polytechnic Institute (US).
We consider the amplification of THz wave by stimulated generation of resonant plasmons in a planar periodic array of graphene plasmonic microcavities in a self-consistent electromagnetic approach. The amplification of THz wave enhances by several orders of the magnitude at the plasmon resonance frequencies.....Pg. 709

TOM3_6179_049
Three-dimensional photonic crystal for light beam collimation
M. Peckus[1], L. Maigyte[2], J. Trull[2], V. Mizeikis[3], M. Malinauskas[4], S. Juodkazis[5], C. M. Cojocaru[2], M. Rutkauskas[4], V. Sirutkaitis[4], K. Staliunas[2,6]; [1]Center for Physical Sciences and Technology (LT), [2]Departament de Física i Enginyeria Nuclear, Universitat Politècnica de Catalunya (ES), [3]Division of Global Research Leaders (Research Institute of Electronics) Shizuoka University (JP), [4]Laser Research Center, Dep. of Quantum Electronics, Vilnius University (LT), [5]Swinburne University of Technology, Centre for Micro-Photonics (H38) (AU), [6]Institució Catalana de Reserca i Estudis Avançats (ICREA) (ES).
We report and analyze experimental observation of the formation of a narrow, well collimated laser beam behind the woodpile photonic crystal. We show that the collimation depends on the input laser beam focusing conditions and discuss the experimental results.....Pg. 711

TOM3_6183_050
Negative-index metamaterials in real world: light self-collimation, solar cells and phase sensitive SPR ellipsometry
V. Mocella[1], P. Dardano[1], S. Romano[1], E. De Tommasi[1], A.C. De Luca[2], I. Rendina[1], S. Cabrini[3]; [1]National Council for Research, Institute for Microelectronics and Microsystems (IT), [2]National Council for Research, Institute for the Biochemistry of Proteins (IT), [3]Molecular Foundry, Lawrence Berkeley National Laboratory (US).
We illustrate our applications of photonic crystal based metamaterials: the large scale light propagation without diffraction, the light trapping for solar cells and the enhancement of the classical SPR, using a phase-ellipsometry technique without prism or grating coupling.....Pg. 713

NOTES

TOM 4 POSTER SESSION I WEDNESDAY, 26 September 13:00 - 15:10

TOM4_5791_001
Pulse repetition interval-based excess fraction (PRIEF) method and its measurement accuracy
D. Wei[1], H. Matsumoto[2]; [1]Global Centers of Excellence Program for Mechanical Systems Innovation, School of Engineering, the University of Tokyo (JP); [2]Department of Precision Engineering, the University of Tokyo (JP).
A novel approach for an analysis of the measurement accuracy of the pulse repetition interval-based excess fraction (PRIEF) method is proposed. The proposed approach is introduced by focusing on an analogy between the PRIEF method and the conventional length-measurement methods, which are white-light method and excess fraction method. The result of the analysis will be presented.....Pg. 715

TOM4_5792_002
Application of multi pulse trains interference to observation of atmospheric turbulence over meter order
D. Wei[1], H. Matsumoto[2]; [1]Global Centers of Excellence Program for Mechanical Systems Innovation, School of Engineering, the University of Tokyo (JP); [2]Department of Precision Engineering, the University of Tokyo (JP).
A novel interferometric technique using multi pulse trains interference is developed to observe the atmospheric turbulence over 1.5 meter and 3 meter. The measured distribution of the atmospheric turbulence over 3 meter was compared to that of 1.5 meter to decide the achievement of steady state of the temperature of air over 3 meter. This technique can be used to decide the stability of the temperature of air over a long distance.....Pg. 717

TOM4_5811_003
Liquid Crystal Optical Control for Solution Production Industries
S.K. Stafeev, M.G. Tomilin, A.A. Zinchik; St.-Petersburg University of Information Technologies, Mechanics and Optics, Physics Department (RU).
The solution properties study is important problem in medicine, biology, chemistry, security, beverage foods. In many cases the structure homogeneity of solid components determines solution characteristics. For detecting solution production quality control of solid components structure with liquid crystals (LCs) is suggested.....Pg. 719

Room: exhibition hall, Boyd Orr Suite

TOM4_5812_004 STUDENT PRESENTATION
The method of determining the average size of the inhomogeneities in nanoporous glasses
D.N. Vavulin, A.V. Alfimov, A.V. Panteleev, E.M. Aryslanova, S.A. Chivilikhin; Saint-Petersburg State University of Informational Technologies, Mechanics and Optics, Department of Photonics and Optoinformatics (RU).
In this paper, we propose a method for determining the size of nanoscale inhomogeneities in scattering and absorbing medium by comparing the theoretical and experimental dependences of the transmission medium on different wavelength of the light. The method was tested on a sample of nanoporous glass.....Pg. 720

TOM4_5825_005 STUDENT PRESENTATION
Optical characterization of thin films non-uniform in thickness using multi-sample method of imaging spectroscopic reflectometry
D. Nečas[1,2], I. Ohlídal[2], D. Franta[1,2], M. Ohlídal[3], J. Vodák[3], P. Nádaský[3]; [1]Masaryk University, CEITEC, Plasma Technologies (CZ), [2]Masaryk University, Faculty of Science, Department of Physical electronics (CZ), [3]Brno University of Technology, Faculty of Mechanical Engineering, Institute of Physical Engineering (CZ).
Within imaging spectroscopic reflectometry, the simultaneous treatment of local spectral reflectances in individual pixels of a CCD camera serving as the detector of a self-made two-channel spectrophotometer allows determining the optical constants and local thickness distribution of thin films exhibiting thickness area non-uniformity.....Pg. 722

TOM4_5838_006
Realization of Bessel Beams Using Diffractive Chrome Structures
G. Ehret, B. Andreas; Physikalisch-Technische Bundesanstalt (DE).
Bessel beams, which are mathematical solutions of the Helmholtz equation, are "non-diffracting" optical beams. In practice only approximations of these beams can be realized. With two different methods we modelled the generation and propagation of real beams and compared the results with corresponding experiments.....Pg. 724

TOM4_5841_007 STUDENT PRESENTATION
Enhancement of Luminescence with Resonance Waveguide Grating
A. Partanen[1], I. Koshevoy[2], T. Saastamoinen[1], J. Mutanen[1], H. Lajunen[1], M. Kuittinen[1]; [1]University of Eastern Finland, Department of Physics and Mathematics (FI), [2]University of Eastern Finland, Department of Chemistry (FI).
In this study two resonance waveguide gratings with different structures were designed to enhance luminescence effect. The optimization and the fabrication steps of the gratings are described. The theoretical enhancement of the energy densities inside the luminescent material are 1100- and 360-fold for the two gratings.....Pg. 726

TOM4_5852_008 STUDENT PRESENTATION
Direct laser fabrication of diffractive optical elements in fused silica
M. Pfeifer, F. Jahn, S. Weissmantel, B. Steiger; University of Applied Sciences Mittweida (DE).
Results of our investigations on direct laser fabrication of diffractive optical elements (DOE's) in fused silica by mask projection technology using a fluorine laser will be presented. In particular, it will be shown that DOE's for the shaping of laser beams can be produced.....Pg. 728

TOM4_5859_009
Polarimetric imaging via compressive sampling
V. Durán[1,2], P. Clemente[1,3], M. Fernández[1,2], E. Tajahuerce[1,2], J. Lancis[1,2], P. Andrés[4]; [1]I-NIT, Universitat Jaume I (ES); [2]GROC•UJI, Departament de Física, Universitat Jaume I (ES), [3]SCIC, Universitat Jaume I (ES), [4]Departamento de Óptica, Universitat de València (ES).
We present an optical system that exploits a commercial (non-pixelated) polarimeter to perform spatially resolved measurements of the Stokes parameters of light. This fact is possible by applying the theory of compressive sampling to the data collected by the polarimeter. A proof of concept is demonstrated with the aid of a polarization object that generates an inhomogeneous polarization distribution.....Pg. 730

TOM4_6162_010
Wideband resonance reflectors in the visible spectrum
T. Saastamoinen, M. Surakka, M. Kuittinen; University of Eastern Finland, Department of Physics and Mathematics (FI).
We present wideband resonance waveguide reflectors providing nearly 100% reflectance over a range of several tens of nanometres at the visible wavelengths. The reflectors are based on multilayer design consisting of layers of high and low index materials with a binary grating etched through the stack.....Pg. 732

TOM4_5913_011
Photochromic recording on nitrogen vacancy centres in nanodiamond-dispersed photopolymers
J. Storteboom, X. Li, M. Gu; Centre for Micro-Photonics, Faculty of Engineering and Industrial Sciences, Swinburne University of Technology (AU).
We report on the optical recording using the photochromism of nitrogen vacancy (NV) centres in nanodiamond-dispersed photopolymers. Intense laser irradiation induced conversion between negative and neutral charge states of NV centres is observed. Application of this photochromism in optical memory is demonstrated.....Pg. 734

NOTES

Room: exhibition hall, Boyd Orr Suite

TOM 4 **POSTER SESSION II** THURSDAY, 27 September 12:45- 15:00

TOM4_5814_012
Laser 3D internal machining of polymers
F. Rey-García[1], C. Bao[1], C. Gómez-Reino[1], G.F. De La Fuente[2]; [1]University of Santiago of Compostela, Dpto. Física Aplicada, UA Microóptica & Óptica GRIN (ES); [2]Instituto de Ciencia de Materiales de Aragón (ICMA-CSIC), Laboratorio de Aplicaciones del Láser (ES).
The Laser Backwriting process was employed for the internal tri-dimensional machining of polymeric plates of polycarbonate (PC) and polyethyleneterefthalate (PET) immersed in water. A Nd:YVO_4 laser emitting nanopulses at fundamental wavelength (1064 nm) was employed.....Pg. 736

TOM4_5887_014
Holographic anisotropy of molecular glassy films
A. Ozols, V. Kokars, P. Augustovs, K. Traskovskis, D. Saharov; Riga Technical University, Faculty of Material Science and Applied Chemistry (LV).
Photoinduced anisotropy is experimentally studied in three molecular glassy films synthesized in our Faculty and containing diphenylamine based azochromophores in comparison with an chalcogenide a-As_2S_3 film. Novel holographic method was applied in both transmission and reflection modes. Pg. 738

TOM4_5943_016 STUDENT PRESENTATION
Spectral Response for Optical Biosensor Based on Intrinsic Fabry-Pérot Cavity
C. Benmouhoub[1,2], A. Zegadi[2], G. Ulliac[1], K. Ghoumid[1,3], T. Gharbi[1]; [1]Franche-Comté University, LOPMD Department (FR); [2]Ferhat Abbas University, Electronic Department (DZ); [3]National School of Applied Sciences (MA).
In the present work, we propose a prototype biosensor, using a Fabry-Pérot (FP) cavity as basic configuration. The integrated optical structure is sensitive to refractive index change induced due to the interaction of the evanescent field with a biological specimen placed inside the FP cavity.....Pg. 740

TOM4_5965_017
Manufacturing of Freeform Mirror by Milling and Enhancing its UV/VIS Characteristics by ALD SiO_2 Coating
J. Mutanen[1], S. Kivi[2], J. Väyrynen[3], M. Toivainen[2], A. Partanen[1], J. Laukkanen[1], V. Prokofiev[1], P. Pääkkönen[1], M. Juuti[2], M. Kuittinen[1], K. Mönkkönen[3]; [1]University of Eastern Finland, Department of Physics and Mathematics (FI); [2]VTT Technical Research Centre of Finland (FI); [3]North Karelia University of Applied Sciences (FI).
In this study two aluminium and brass free-form mirrors from CNC pre-machined molds were micro-milled by ultra precision diamond machine tool and ALD SiO_2 coatings added to enhance the optical characteristics of the mirrors in UV/VIS region. The optical characterists of the mirrors and function of the mirror system were tested.....Pg. 742

TOM4_6029_018
Electro-optically tunable waveguide Bragg gratings in Lithium Niobate integrated by femtosecond laser pulses
W. Horn, S. Kroesen, C. Denz; Institute of Applied Physics & Center for Nonlinear Science, University of Muenster (DE).
We demonstrate the fabrication of electro-optically tunable, type-II Bragg gratings in Lith-ium Niobate wafers. The waveguide is structured periodically to achieve narrow-band reflections in the c-band. An electric field is used to achieve electro-optic tuning of the reflection maximum by $\Delta\lambda = 625$ pm. Pg. 744

TOM4_6035_019
Modeling surface profiles of arbitrary initial shape in reflow process
R. Kasztelanic[1], M. Barański[1,2]; [1]University of Warsaw, Faculty of Physics (PL); [2]UFR Sciences et Techniques, Institute FEMTO-ST (FR).
We present a finite-element method to calculate 3D surface profiles of microelements fabricated in the melting-resist technology (reflow process). The initial geometry of the microelements in the reflow process can be arbitrary. So, our model takes into account temperature distribution, viscosity, surface tension and gravity.....Pg. 746

TOM4_6089_020
Evaluation of scatterometry for characterisation of hybrid optics
A. Lassila[1], B. Bodermann[2], J. Turunen[3], P.-E. Hansen[4], M. Wurm[2], S. Siitonen[5], T. Saastamoinen[3], H. Husu[1], V. Korpelainen[1]; [1]Mittatekniikan Keskus (FI); [2]Physikalisch-Technische Bundesanstalt (DE); [3]University of Eastern Finland (FI); [4]Dansk Fundamental Metrolog (DK); [5]Nanocomp Oy Ltd (FI).
Within a European joint research project it is aimed to develop fast and simple methods based on scatterometry for process development and quality control of both diffractive and diffractive-refractive optics in industrial environments. We describe the status and the intended goals of this project and present first results.....Pg. 748

TOM4_6093_021 STUDENT PRESENTATION
Embedding grating mirror in resonant cavity-enhanced absorber structures for mid-infrared detectors applications
M. Zohar[1,2], M. Auslender[1], S. Hava[1], L. Faraone[3]; [1]Ben-Gurion University of the Negev, Department of Electrical and Computer Engineering (IL); [2]Sami Shamoon College of Engineering, Department of Electrical and Electronics Engineering (IL); [3]The University of Western Australia, School of Electrical, Electronic and Computer Engineering (AU).
One grating mirror structure is considered for a dielectric Fabry-Perot cavity to enhance the optical absorption in a thin semiconductor layer embedded within the resonant cavity. In this design, the front mirror is a grating structure which acts as a nearly perfect retroreflection and the back mirror is quarter-wave stack.....Pg. 750

TOM4_6113_022
Microlens Arrays for Single Photon Avalanche Diodes within the MiSPIA Project
A.J. Waddie[1], A. McCarthy[1], S. Tisa[2], S. Bellisai[3], G.S. Buller[1], M.R. Taghizadeh[1]; [1]Institute of Photonic and Quantum Sciences, School of Engineering and Physical Science, Heriot-Watt University (GB); [2]Micro Photon Devices (IT); [3]Dipartimento di Elettronica e Informazione, Politecnico di Milano (IT).
Single photon avalanche diodes (SPADs) are optoelectronics devices capable of producing measureable photocurrent from the incidence of a single photon. In this paper, we investigate the improvements in light gathering efficiency that can be gained by the placement of a large fill-factor microlens array on top of a customised SPAD array. A preliminary tolerance analysis of the lens array reveals that the improvements in light gathering efficiency are relatively insensitive to both placement accuracy and incident wavelength.....Pg. 752

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Room: exhibition hall, Boyd Orr Suite

TOM 4 POSTER SESSION II — THURSDAY, 27 September 12:45 - 15:00

TOM4_6418_023 Post deadline submission
Azopolymeric films surface nanostructuration as surface relief gratings
N. Hurduc[1], I. Apostol[2], V. Damian[2], D. Apostol[2]; [1]Technical University „Gh.Asachi" Iasi, Department of Natural and Synthetic Polymers (RO); [2]National Institute for Laser, Plasma and Radiation Physics, (RO).
We have analysed the possibility to create integrated optical elements in two types of azo-polymer films by surface structuration and formation of surface relief gratings (SRG). Surface nanostructuration and laser irradiation parametrs are studied.
Pg. 754

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TOM 5 POSTER SESSION I — WEDNESDAY, 26 September 13:00 - 15:10

TOM5_5940_001
Development of ZnO-polystyrene nanocomposite suitable for the preparation of plastic distributed Bragg reflectors (DBR)
P. Lova[1], L. Boarino[2], D. Antonioli[3], M. Laus[3], G. Urbinati[4], T. Losco[4], M.C. Ungureanu[4], V. Caratto[1,5], M. Ferretti[1,5], F. Marabelli[4], D. Comoretto[1]; [1]Università degli Studi di Genova, Dipartimento di Chimica e Chimica Industriale (IT), [2]Istituto Nazionale di Ricerca Metrologica (INRIM) (IT), [3]Università del Piemonte Orientale, Dipartimento di Scienze della Vita (IT), [4]Università degli Studi di Pavia, Dipartimento di Fisica "A. Volta" (IT), [5]CNR-SPIN (IT).
We report on the preparation of polystyrene (PS) matrices loaded by ZnO nanoparticles (NP) synthetized by solvothermal reaction. The refractive index of loaded matrices is increased with respect to that of bare polystyrene without affecting its processability. Good optical quality polymer DBR have been indeed prepared by spin coating.
Pg. 756

TOM5_6129_002 STUDENT PRESENTATION
All-Organic Photonic Crystal Gate Dielectric with High Extraction Efficiency into OLET
M. Natali[1], S. Toffanin[1], S. Cavallini[1], F. Scotognella[2], M. Muccini[1,3]; [1]Institute for Nanostructured Materials (ISMN), National Research Council (IT), [2]Department of Physics, Politecnico di Milano (IT), [3]E.T.C. srl (IT).
We report the implementation of functionalized gate dielectric in OLET devices.
Pg. 758

TOM5_6198_003 STUDENT PRESENTATION
Controlling Morphology of Polymer: Polymer Blends for Solar Cells Using Nanowire Formation and Molecular Weight Variation
S. Wood[1], J.S. Kim[1], D.T. James[1], C. Wing Tsoi[1], C.E. Murphy[2], J.-S. Kim[1]; [1]Department of Physics and Centre for Plastic Electronics, Imperial College London (GB), [2]National Physical Laboratory (NPL) (GB).
The relationship between thin film morphology and photovoltaic device performance of polymer:polymer blends is investigated. We find that the photocurrent is limited by optical and charge transport properties of the blend layer inducing geminate and non-geminate loss mechanisms, which can be reduced by morphological control.....Pg. 760

TOM 5 POSTER SESSION II — THURSDAY, 27 September 12:45 - 15:00

TOM5_5874_005
1D polymer photonic crystals doped with photochromic materials: optical characterization
L. Occhi[1], C. Toccafondi[2], R. Castagna[3,4], C. Bertarelli[3,4], M. Canepa[2], D. Comoretto[1]; [1]Università di Genova, Dip23,4 artimento di Chimica e Chimica Industriale (IT), [2]Università di Genova, CNISM and Dipartimento di Fisica (IT), [3]Politecnico di Milano, Dipartimento di Chimica, Materiali e Ingegneria Chimica "G. Natta" (IT), [4]Istituto Italiano di Tecnologia, Center for Nano Science and Technology@PoliMi (IT).
We report on the optical characterization of diarylethene-based photochromic polyester (p-dae). Its complex refractive index is determined by ellipsometry during the isomerization process. Polymer Distributed Bragg Reflectors and microcavities doped with p-dae are prepared by spin-coating and optical characterized.....Pg. 762

TOM5_5863_006 STUDENT PRESENTATION
Bis-Pyrrolyl Benzo[1,2,5]Thiadiazole Based Alternating Polymers for Application in Solar Cells
M. Almeataq, A. Iraqi; Department of Chemistry, University of Sheffield (GB).
Low energy gap alternating copolymers comprising bis-pyrrolyl benzo[1,2,5]-thiadiazole and carbazole or fluorene repeat units have been prepared successfully for use as electron donors in bulk heterojunction solar cells using PCBM as an acceptor. The photophysical and electrochemical properties of these copolymers are presented.
Pg. 764

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Room: exhibition hall, Boyd Orr Suite

TOM 6 POSTER SESSION I — WEDNESDAY, 26 September 13:00 - 15:10

TOM6_5822_001
Spatial dispersion and spatiotemporal solitons in cubic-quintic optical waveguides
R. Cowey, G. Lancaster, J.M. Christian, G.S. McDonald; University of Salford, Materials & Physics Research Centre (GB).
We report on fresh developments in the field of spatiotemporal optical solitons. A host of new analytical and numerical predictions for light pulses in nonlinear waveguides will be detailed, which have a simple physical interpretation. Tantalizing connections to Einstein's special relativity theory have also been uncovered.....Pg. 766

TOM6_5824_002
Helmholtz dark spatial optical solitons for a defocusing saturable nonlinearity
M.J. Lundie[1], J.M. Christian[1], G.S. McDonald[1], P. Chamorro-Posada[2]; [1]University of Salford, Materials & Physics Research Centre (GB), [2]Universidad de Valladolid, ETSI Telecomunicación (ES).
We report on our latest developments in the field of Helmholtz soliton theory: the derivation of exact dark spatial optical solitons for a defocusing saturable nonlinearity. A raft of new physical predictions is made, and extensive analysis (via both mathematical and computational methods) investigates solution properties.....Pg. 768

TOM6_5872_003
Spatiotemporal Soliton Formation in Coupled Arrays of SOI Waveguides
O.K. Staines, A.V. Gorbach, G.D. Hobbs, D.V. Skryabin, W.J. Wadsworth, J.C. Knight; Centre for Photonics and Photonic Materials, Department of Physics, University of Bath (GB).
We present theoretical studies of spatiotemporal solitons ("light bullets") in coupled silicon nanowaveguide arrays conducted at pump wavelengths greater than 2μm where two-photon absorption effects in silicon are substantially reduced.....Pg. 770

TOM6_5984_005 STUDENT PRESENTATION
Optimization of nonlinear swift-heavy ion irradiation waveguides against propagation losses and photorefractive optical damage
M. Jubera[1], J. Villarroel[1], A. García-Cabañes[1], J.Olivares[2,3], M. Carrascosa[1]; [1]Universidad Autónoma de Madrid, Dept. Física de Materiales (ES), [2]CMAM, Universidad Autónoma de Madrid (ES), [3]Instituto de Optica, CSIC (ES).
Recent work to reduce propagation losses and to characterize and control photorefractive damage in novel shift-heavy LiNbO3 ion irradiation waveguides is reported. Propagation losses lower than 0.5 dB/cm has been achieved. Photorefractive damage has been characterized and significantly reduced by heating up to 75°C.....Pg. 772

TOM6_6059_006
Two-centre model applied to photorefractive beam degradation in $LiNbO_3$ planar waveguides
A. Alcázar[1], J. B. Ramiro[1], A. Méndez[1], J. Villarroel[2], A. García-Cabañes[2], M. Carrascosa[2]; [1]Universidad Politecnica de Madrid, Dept. Aerotecnia (ES), 2 Universidad Autonoma de Madrid, Dept. Fisica de Materiales (ES).
Photorefractive beam degradation in $LiNbO_3$ planar waveguides has been investigated through a nonlinear beam propagation method. The simulations use a two-centre model (Fe^{2+}/Fe^{3+} and $Nb_{Li}^{4+}/Nb_{Li}^{5+}$). The obtained results help to explain the variety of recent experimental data including self-defocusing and filamentation.....Pg. 774

TOM6_6141_007
Photovoltaic current in nanoparticles of lithium niobate
J.B. Ramiro, A. Méndez, A. Alcázar; Universidad Politécnica de Madrid, Depto Aerotecnia (ES).
Photovoltaic current in lithium niobate nanoparticles has been analized by Monte Carlo simulations. The role of particle size, geometry and Fe doping has been investigated and possible biological implications are discussed.....Pg. 776

TOM6_6076_008 STUDENT PRESENTATION
Investigation of TM Surface Guided Modes in a Cylindrical Metal Clad Nano-Structure Laser
Z. Abdul Sattar, K.A. Shore; Bangor University, School of Electronic Engineering (GB).
We investigate properties of TM surface guided modes in a cylindrical metal clad nano-structure. A multi-layered geometry is utilized to determine the effect of gain variation on TM surface guided modes.
Pg. 778

TOM6_6163_009
Spatial emission structures in vertical-cavity surface-emitting lasers with feedback from a volume Bragg grating
T. Ackemann, Y. Noblet; SUPA and University of Strathclyde, Physics department (GB).
We investigate the spatial properties of broad-area vertical-cavity surface-emitting lasers with frequency-selective feedback by a volume Bragg grating. Length scales and shapes of patterns are analyzed quantitatively. It is also addressed how deviations from the self-imaging condition affect the pattern formation.....Pg. 780

TOM6_6430_020 Post deadline submission
First complete phase-matching study of the Langatate LGT
E. Boursier, P. Segonds, B. Boulanger, B. Ménaert, J. Debray; Institut Néel CNRS Université Joseph Fourier (FR).
We identified the piezoelectric crystal La3Ga5.5Ta0.5O14 (LGT) as a new material for nonlinear optics from 0.5 μm to 6.5 μm. We performed the first complete theoretical and experimental study of quadratic sum- and differencefrequency generations The simultaneous fit of angular data allow the Sellmeier equations to be refined over the entire transparency range. Efficiencies measurements will lead to the determination of the non linear coefficient.....Pg. 782

TOM6_6426_021 Post deadline submission
Wigner flow reveals topological features of quantum dynamics
O. Steuernagel, D. Kakofengitis, G. Ritter; School of Physics, Astronomy, and Mathematics, University of Hertfordshire (GB).
In quantum dynamics traditionally the evolution of wave functions, say Wigner's function, is studied. We identify the flow that is the quantum analog of classical Liouville flow. It reveals new features of quantum dynamics, extra complexity, introduces topological order into quantum dynamics and shows similarities with singular optics.....Pg. 784

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Room: exhibition hall, Boyd Orr Suite

TOM 6 POSTER SESSION II — THURSDAY, 27 September 12:45 - 15:00

TOM6_5850_010 STUDENT PRESENTATION
Probing the Mechanism of Green Emission in ZnO Nanowires by Ultrafast Spectroscopy
M. Li, G. Xing, T.C. Sum; Division of Physics & Applied Physics, School of Physical & Mathematical Sciences, Nanyang Technological University (SG).
The nature of the green emission (GE) centers, recombination mechanism and interband hole-trapping to the GE-centers in ZnO nanowires have been extensively studied by various ultrafast spectroscopies.....Pg. 786

TOM6_5851_011 STUDENT PRESENTATION
Optimal nanofiber dimensions for stimulated Raman scattering in the evanescent field
L. Shan[1], G. Pauliat[1], L. Tong[2], S. Lebrun[1]; [1]Laboratoire Charles Fabry, Institut d'Optique, CNRS, Université Paris-Sud (FR), [2]State Key Lab of Modern Optical Instrumentation, Department of Optical Engineering, Zhejiang University (CN).
In nanofibers, the guided mode presents a strong evanescent field. We investigate the Raman interaction between this field and a liquid surrounding the nanofiber. Our modeling demonstrates that the Raman conversion is obtained with nanofiber lengths an order of magnitude lower than for liquid core photonic crystal fibers.....Pg. 788

TOM6_5853_012
Quasi-soliton formation in silicon nanowires with engineered dispersion profile
D.C. Zografopoulos[1], R. Beccherelli[1], E.E. Kriezis[2]; [1]Consiglio Nazionale delle Ricerche, Istituto per la Microelettronica e Microsistemi (CNR-IMM) (IT), [2]Department of Electrical and Computer Engineering, Aristotle University of Thessaloniki (GR).
Soliton-like propagation of fs pulses in dispersion-engineered silicon photonic wires is theoretically investigated. Quasi-soliton propagation is demonstrated for 100-fs pulses over large propagation lengths for a realistic patterned silicon wire of optimally engineered group-velocity dispersion (GVD) profile.....Pg. 790

TOM6_5905_014
Pyroelectrically induced 2D waveguide channels and 1D photonic lattices in lithium niobate: some features and light self-action
A. Parkhanyuk[1], A. Markin[1], D. Kortushanov[1], V. Shandarov[1], F. Chen[2]; [1]State University of Control Systems and Radioelectronics (RU), [2]School of Physics, Shandong University (CN).
Both, two-dimensional waveguide channels and one-dimensional photonic lattices are optically induced in lithium niobate exploiting the contribution of pyroelectric effect. The discrete diffraction of light beams and the storage time of these waveguide structures within the crystal bulk are experimentally investigated.....Pg. 792

TOM6_5942_015
Formation of spatially localized self-trapping light structures in Plexiglas-based photopolymers
E. Tolstik[1], O. Romanov[2], V. Matusevich[1], A. Tolstik[2], R. Kowarschik[1]; [1]Friedrich Schiller University, Institute of Applied Optics (DE), [2]Belarusian State University, Physical Department (BY).
The possibility of the generation of light self-trapping structures in polymeric media based on polymethylmethacrylate (PMMA) with homogenously distributed photosensitive phenanthrenequinone (PQ)-molecules is predicted theoretically and examined experimentally by applying laser sources in the blue-green spectral range.....Pg. 794

TOM6_6007_016 STUDENT PRESENTATION
Numerical stability analysis of solitary waves in one- and two-dimensional periodic structures
A. Savickas[1], E. Gaižauskas[1], K. Staliūnas[2]; [1]Vilnius University, Laser Research Center (LT), [2]Universitat Politecnica de Catalunya, Departament de Fisica i Enginyeria Nuclear (ES).
One-dimensional band gap soliton instability was numerically investigated at the middle of the band gap due to four wave mixing. Soliton instability was analized both in the frame of microscopic model, and quasi-soliton with its shadow. One-dimensional case was compared with bessel lattices in two dimensions.....Pg. 796

TOM6_6030_017
Simplified architectures with homodyne detection for high capacity Lippmann data storage
G. Pauliat; Laboratoire Charles Fabry, Institut d'Optique, CNRS, Université Paris-Sud (FR).
Lippmann interference architectures are alternatives to holographic memories for high capacity data storage. We propose a homodyne scheme for these systems, which simplifies their use.....Pg. 798

TOM6_6120_018 STUDENT PRESENTATION
Energy Shedding during Nonlinear Focusing of Gaussian Beams
C. Travis[1], G.L. Oppo[1], G. Norris[2], G. McConnell[2]; [1]University of Strathclyde, Department of Physics (GB), [2]University of Strathclyde, SIPBS (GB).
Self focusing of intense Gaussian beams of light in nonlinear media is accompanied by the shedding of energy as the beam undergoes reshaping. Using the Nonlinear Schrödinger equation, a comparison of the energy shedding in media with cubic and saturating nonlinearities is presented for both continuous wave and pulsed input.
Pg. 800

TOM6_6197_019
DWDM Distribution of Photon Pairs Produced by Sponaneous Parametric Down Conversion
J. Ghalbouni, I. Agha, E. Diamanti, R. Frey, I. Zaquine; Institut Télécom/Télécom Paristech, CNRS-LTCI (FR).
We have experimentally implemented the distribution of photon pairs through a telecom DWDM filter. Using the measured counts and coincidences between symmetric channels, the maximum fringe visibility that can be obtained with polarization entangled photons is evaluated.....Pg. 802

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Poster presentations

Room: exhibition hall, Boyd Orr Suite

TOM 7 POSTER SESSION I — WEDNESDAY, 26 September 13:00 - 15:10

TOM7_5832_001
Surface shape reconstruction of located small object
E.V. Buryi; Bauman Moscow State Technical University, Laboratory of laser information system (RU).
The reconstruction method of surface remote small object based on multiposition registration of long range portraits was proposed.
Pg. 804

TOM7_5856_002 STUDENT PRESENTATION
Real-time lock-in threshold tracking of ring laser gyro
Z. Fan, H. Luo, G. Lu, S. Hu; College of Optoelectronic Science and Engineering, National University of Defense Technology (CN).
By evaluating the lost information in the lock-in traverse moment, a new lock-in threshold measurement method for mechanically dithered ring laser gyro (RLG) is proposed. This method, which is based on Kalman filter, can evaluate the lock-in threshold and its variation real-time in working condition with mechanical dither.....Pg. 806

TOM7_6014_003
Time resolved Imaging of a vibrating clarinet reed by Sideband Digital Holography
F. Verpillat[1], M. Atlan[2], F. Joud[1], M. Gross[3]; [1]Laboratoire Kastler Brossel, ENS, UPMC-Paris6, CNRS UMR 8552 (FR), [2]Institut Langevin, ESPCI ParisTech, CNRS UMR 7587 (FR), [3]Laboratoire Charles Coulomb, CNRS UMR 5221, Université Montpellier II (FR).
We reconstruct the instantaneous velocities maps of a vibrating clarinet reed by combining Sideband Digital Holography with stroboscopic illumination synchronized with the vibration motion.....Pg. 808

TOM7_6064_004
Pilot model of submersible camera for plankton digital holography
V.V. Dyomin, I.G. Polovtsev, A.S. Olshukov, D.V. Kamenev; Tomsk State University, Radiophysics Department (RU).
Pilot model of submersible holographic camera is presented which is designed for digital holographing the plankton in habitat. Optical scheme, camera-control unit, and system for data transmission to ocean surface are founded. Preliminary experimental results on plankton holographing are presented.
Pg. 810

TOM7_6151_005
Raman Spectroscopy for Process Monitoring in the Energy and Production Industry
F.M. Zehentbauer, H. Struthers, E.J. Bain, J. Kiefer; University of Aberdeen, School of Engineering (GB).
The use of Raman spectroscopy for process monitoring is demonstrated in a direct methanol fuel cell and a distillation column. The spectroscopic method provides a tool for chemical composition measurements with high accuracy and precision. In the fuel cell, a simultaneous electrochemical analysis allows multiple parameter monitoring.....Pg. 811

NOTES

TOM 7 POSTER SESSION II — THURSDAY, 27 September 12:45 - 15:00

TOM7_5833_006 STUDENT PRESENTATION
Reconstruction of 3D-scenes with means of registered long-range portraits
P.V. Arakcheev, E.V. Buryi, A.S. Maryanina, D.A. Semerenko; Bauman Moscow State Technical University, Laboratory of Laser Information System (RU).
The reconstruction method of object and underlying surface of located volume part was suggested. The method is based on analysis of long-range portraits obtained during slow scanning of the located volume with knife-edge laser beam in two mutually perpendicular directions.....Pg. 813

TOM7_5834_007
Contour reconstruction of located object with parameters of 4th order correlation function of laser radiation scattered field registered with matrix photodetector
P.V. Arakcheev, D.A. Semerenko, A.S. Maryanina, S.I. Nazarov, E.V. Buryi; Bauman Moscow State Technical University, Laboratory of Laser Information System (RU).
The method of contour reconstruction of located object was proposed and investigated using a physical model. This method is based on estimation of object angular dimensions using parameters of 4th order correlation function of radiation field.....Pg. 815

TOM7_5879_008
Mirror movements-induced equivalent rotation effect in ring laser gyros
G. Lu, H. Luo, Z. Fan, S. Hu, Y. Huang, J. Tang; Department of Optoelectronic Engineering, College of Optoelectrics Science and Engineering, National, University of Defense Technology (CN).
In this letter, equivalent rotation effect induced by mirrors' movements in ring laser gyros is investigated. When one spherical mirror is pushed forward and the other is pulled backward, an equivalent rotation of the closed-loop optical path is induced. The equivalent rotation rate is proportional to the velocities of the mirrors' movements.
Pg. 817

TOM7_6205_009
Optical Fibre Based Multiparameter Sensing For Subsea Applications
R. Pawar[1], R. Prabhu[2]; [1]School of Engineering, Robert Gordon University (GB), [2]IDeaS Research Institute, Robert Gordon University (GB).
Use of optical fibres for multiparameter sensing in subsea applications has been investigated. The sensing approach is based on Raman's and Fluorescence spectroscopy. Some of the initial theoretical and experimental results will be presented in this paper.....Pg. 819

TOM7_6185_010 STUDENT PRESENTATION
Laser Induced Breakdown Spectroscopy for Identification and Quantification of Elemental Composition of Subsea Structures
O. Ogoghodo, T. Thevar, University of Aberdeen, School of Engineering (GB).
Laser Induced Breakdown Spectroscopy (LIBS) is a well established technique for material characterisation. However, there has not been a comprehensive study on the viability of using LIBS for subsea applications, in particular at high pressures of deep ocean. This paper will present some initial results of our work in this area....Pg. 821

TOM7_6416_011 Post deadline submission
Multiplexing ability in digital holography for application to recording ultrashort phenomena
H. Hu[1], P. Chavel[1], Z. Ma[2], H. Zhai[2], Y. Yang[2]; [1]Laboratoire Charles Fabry, UMR 8501, Institut d'Optique, CNRS, Univ Paris Sud 11 (FR); [2]Institute of Modern Optics, Nankai University (CN).
The limiting factors to the number of independent images that can reasonably be multiplexed in one digital hologram are analytically and numerically investigated for the carrier wave angular multiplexing scheme. It is concluded that tens of frames are a realistic figure for the multiplexing capacity of typical current sensors.
Pg. 823