Advance Program

Joint Plenary Session

Monday, 14 January 2008

NETTUNO 4

08.30 - 10.00
Session PLE: JOINT PLENARY SESSION
Session Chair: TBD

PLE1 08.30 - 09.15

Photonic Crystal Fibers: A New Era in the Control of Light, P. St. J. Russell, *University of Erlangen-Nuremberg, Erlangen, Germany*

BIO: Philip Russell is Director of the Max-Planck Research Group for Optics, Information and Photonics and Professor of Physics at the University of Erlangen-Nuremberg, Germany. From 1996 to 2005 he was professor in the Department of Physics at the University of Bath, where he founded and led the Photonics & Photonic Materials Group. He obtained his M.A. (1976) and D.Phil. (1979) degrees at the University of Oxford and subsequently worked in research laboratories and universities in France, Germany and the USA. Since 1980 he has worked on the behaviour of light in periodically structured materials as well as on nonlinear optics, waveguides and optical fibres. He was the founder of the start-up company BlazePhotonics Ltd (April 2001 to August 2004), whose aim was the development and commercial exploitation of photonic crystal fibre. He has over 600 publications and is inventor on 37 patents covering in many aspects of photonics. He is a Fellow of the Royal Society, the Optical Society of America and the Institute of Physics (London) and has won several awards for his research.

ABSTRACT: Through their unique properties – often offering orders of magnitude improvement over previous technologies – photonic crystal fibres are giving rise to numerous new applications spanning many areas of science.

PLE2 09.15 - 10.00

Dispersion Control via Light Confinement for Efficient Nonlinear Optical Devices, A. L. Gaeta, *Cornell University, Ithaca, NY, USA*

ABSTRACT: The high effective nonlinearity and dispersion engineering associated with photonic nanowires made from glasses and semiconductors can be used for a wide variety of nonlinear optical applications ranging from ultralow power devices to the generation of single-cycle optical pulses.

10.00 – 10.30 COFFEE BREAK

Advance Program

Chip-Scale Nonlinear Optical Devices

Monday, 14 January 2008

ALL SESSIONS WILL BE HELD IN NETTUNO 5

10.30 - 12.00

Session MA1: NONLINEAR MATERIALS
Session Chair: Stefan Wabnitz, *Università degli Studi di Brescia, Brescia, Italy*

MA1.1 10.30 - 11.00 (Invited)
Nonlinear Materials for Integrated Ultra-Fast All-Optical Devices, B. Luther-Davies, D.-Y. Choi, A. Prasad, R. Wang, D. Bulla, C. Zha, *Australian National University, Canberra, ACT, Australia*, M. D. Pelusi, V. G. Ta'eed, M. R. E. Lamont, L. Fu, D. J. Moss, K. Finsterbusch, H. C. Nguyen and B. J. Eggleton, *CUDOS, University of Sydney, Sydney, NSW, Australia*

Processing of optical data entirely in the optical domain at speeds beyond those possible with electronics remains a significant challenge. Here I will review our progress on chalcogenide glass waveguides for all-optical processing.

MA1.2 11.00 - 11.30 (Invited)

Modification of Chalcogenide Glasses by Femtosecond Laser Pulses for the Fabrication of Highly Non-Linear 3D Photonic Devices, E. Romanova, T. M. Benson, A. B. Seddon, D. Furniss, N. Prasad, *University of Nottingham, Nottingham, UK*, A. Konyukhov, *Saratov State University, Saratov, Russia*, S. Muraviov, A. Andrianov and G. Gelikonov, *Russian Academy of Sciences, Nizhny Novgorod, Russia*

Theoretical and experimental efforts aimed at understanding the efficiency of using the method of femtosecond modifications for the fabrication of highly non-linear photonic structures in bulk chalcogenide glasses are reported.

MA1.3 11.30 - 12.00 (Invited)

Linear and Nonlinear Plasmonic Effects Modulated by a Metal-Insulator Transition, R. Haglund, E. U. Donev, L. C. Feldman, D. W. Ferrara, *Vanderbilt University, Nashville, TN, USA*, R. Lopez, *University of North Carolina, Chapel Hill, NC, USA*, J. Y. Suh and K. A. Tetz, *Vanderbilt University, Nashville, TN, USA*

Plasmonic effects — such as resonant absorption, second-harmonic generation and transmission through sub-wavelength hole arrays — can be modulated in nanocomposite structures in which the dielectric environment is switched by the metal-insulator transition in vanadium dioxide.

12.00 – 14.00 LUNCH BREAK

SESSION IN NETTUNO 4

14.00 - 15.30

Session MD2: JOINT SESSION WITH PCF AND CHIP: HIGHLY NONLINEAR FIBERS
Session Chair: Kazunori Mukasa, *Furukawa Electric Co. Ltd, Ichihara, Chiba, Japan*

MD2.1 14.00 - 14.30 (Invited)
Deposition of Electronic and Plasmonic Materials Inside Microstructured Optical Fibers, P. J. A. Sazio, A. Amezcua Correa, C. Finlayson, J. Hayes, *University of Southampton, Southampton, UK*, T. Scheidemantel, N. Baril, B. Jackson, D.-J. Won, F. Zhang, E. Margine, V. Gopalan, V. Crespi and J. Badding, *Pennsylvania State University, University Park, PA, USA*

Functional materials such as bulk crystalline semiconductor structures inside MOF waveguides could lead to fibre devices with radically new electronic and photonic degrees of freedom. We report the growth of such materials inside MOF templates via a novel microfluidic high pressure chemical vapour deposition technique.

MD2.2 14.30 - 14.45

Photoluminescence Spectroscopy of Semiconductor Colloidal Quantum Dots in the Photonic Bandgap Fiber, M. Ohmori, *Toyota Technological Institute, Nagoya, Japan*, S. Kawanishi, *NTT Corporation, Atsugi, Kanagawa, Japan*, M. Tanaka, *Mitsubishi Cable Industries, Ltd., Amagasaki, Japan* and H. Sakaki, *Toyota Technological Institute, Nagoya, Japan*

We observed photoluminescence (PL) spectra in 735 and 535 nm region from CdTe and CdSe colloidal quantum dots (QDs) filling in the air hole of the photonic bandgap fiber (PBF). We show the PL of these QDs is efficiently transmitted in the PBF.

MD2.3 14.45 - 15.00

Dispersion Management in Highly Nonlinear, Carbon Disulfide Filled Holey Fibres, F. Poletti, A. Camerlingo, P. Petropoulos and D. J. Richardson, *University of Southampton, Southampton, UK*

We investigate dispersion control in holey fibres incorporating a highly nonlinear liquid. A liquid-core microstructured fibre with extremely high nonlinearity and flat dispersion at telecoms wavelengths is demonstrated.

MD2.4 15.00 - 15.30 (Invited)

High Third and Second Order Non Linearities of Chalcogenide Glasses and Fibers for Compact Infrared Non Linear Devices, F. Smektala, *Université de Bourgogne, Dijon, France*, J. Troles, P. Houizot, V. Nazabal, *University of Rennes 1, Rennes, France*, G. Boudebs, *Laboratoire Propriétés Optiques des Matériaux et Applications, Angers, France*, H. Zeghlache, *Université de Lille I, Villeneuve d'Ascq, France*, Y. Quiquempois, *University of Sciences and Technologies of Lille 1, Villeneuve d'Ascq, France* and G. Martinelli, *Université de Lille I, Villeneuve d'Ascq, France*

Due to their intrinsic nature, chalcogenide glasses present attractive nonlinearities from third and second order with values reaching 10 to 1000 times those of silica. We present a study of their properties and their shaping with the purpose to reach efficient devices in the infrared.

15.30 – 16.00 COFFEE BREAK

16.00 - 17.15

Session MA2: SILICON DEVICES
Session Chair: Ozdal Boyraz, *University of California - Irvine, Irvine, CA, USA*

MA2.1 16.00 - 16.30 (Invited)
Silicon Based Chip-Scale Nonlinear Optical Devices: Laser, Amplifier, and Wavelength Converter, H. Rong, S. Xu, S. Ayotte, *Intel Corporation, Santa Clara, CA, USA*, O. Cohen, O. Raday, *Intel Corporation, Jerusalem, Israel* and M. Paniccia, *Intel Corporation, Santa Clara, CA, USA*

Taking advantage of the high optical nonlinearity and strong light confinement in silicon waveguides, chip-scale nonlinear devices such as Raman lasers, amplifiers, and wavelength converters are realized. Performance and application potential of these devices are presented.

MA2.2 16.30 - 16.45

Non Linear Optical Properties of Silicon Nanocrystals for Applications in Photonic Logic Gates Devices, R. Spano, M. Cazzanelli, N. Daldosso, *University of Trento, Povo, Italy*, L. Tartara, J. Yu, V. Degiorgio, *University of Pavia, Pavia, Italy*, S. Hernandez, Y. Lebour, P. Pellegrino, B. Garrido, *University of Barcelona, Barcelona, Spain*, E. Jordana, J.-M. Fedeli, *Commissariat à l'Énergie Atomique, Grenoble, France* and L. Pavesi, *University of Trento, Povo, Italy*

A systematic study of Silicon nanocrystals (Si-ncs) nonlinearities at 1550nm was carried out in view of the realization of an all optical Mach-Zehender Inter-ferometer (MZI).

MA2.3 16.45 - 17.15 (Invited)

Raman Amplification and Lasing in Cladding-Pumped Silicon Waveguides, E. Brinkmeyer, M. Krause and H. Renner, *Technische Universität Hamburg-Harburg, Hamburg, Germany*

By guiding the pump power in an additional non-silicon cladding, Free-Carrier Absorption of the pump power in a silicon Raman amplifier can be mitigated, thereby enabling longer amplifiers with larger gain.

18.30 – 20.00 WELCOME RECEPTION

Tuesday, 15 January 2008

09.00 - 10.00

Session TuA1: PHOTONIC CRYSTALS
Session Chair: Barry Luther-Davies, *Australian National University, Canberra, ACT, Australia*

TuA1.1 09.00 - 09.30 (Invited)

Nonlinear and Adiabatic Control of Light in a Photonic Crystal Chip, M. Notomi, T. Tanabe, E. Kuramochi, A. Shinya, and H. Taniyama, *NTT Corporation, Atsugi-shi, Kanagawa, Japan*

Recent progress in ultrahigh-Q and ultrasmall cavities based on photonic-crystal slabs have impacts on various phenomena. We report our recent investigations of all-optical bistable switching/memory action toward all-optical logic, and novel adiabatic tuning phenomena (wavelength conversion, opto-mechanical energy conversion, and photon dynamic memory).

TuA1.2 09.30 - 09.45

Tristable All-Optical Flip-Flop using Coupled Nonlinear Cavities, K. Huybrechts, B. Maes, G. Morthier and R. G. Baets, *Ghent University, Ghent, Belgium*

We demonstrate symmetry breaking in a multistable system composed of three coupled nonlinear cavities. Using positive pulses it is possible to switch between the asymmetric states, thus resulting in tristable flip-flop behaviour. Coupled-mode theory gives analytical results and precise insight into the intricate dynamical behaviour.

TuA1.3 09.45 - 10.00

The Effect of Kerr Type Nonlinear Cladding on Coupling Between Ring and Bus Waveguides in Vertically Coupled Optical Ring Resonator, V. Bhairavabhatla and S. Talabattula, *Indian Institute of Science, Bangalore, Karnataka, India*

We present a modal analysis of vertically coupled optical micro ring resonator with Kerr type nonlinear cladding. The effect of nonlinear cladding on the coupling between bus and ring waveguides is studied. Significant variation in coupling is observed that can give optimization flexibility.

10.00 – 10.30 COFFEE BREAK

10.30 - 12.00

Session TuA2: Silicon Ultrafast Devices
Session Chair: Massimo De Vittorio, *University of Lecce, Lecce, Italy*

TuA2.1 10.30 - 11.00 (Invited)
Ultra Fast Silicon Photonic Devices, M. Lipson, *Cornell University, Ithaca, NY, USA*

ABSTRACT NOT AVAILABLE

TuA2.2 11.00 - 11.30 (Invited)

Dual-wavelength Mode-locked Laser in Silicon, E.-K. Tien, X. Sang, N. S. Yuksek, F. Qian and O. Boyraz, *University of California - Irvine, Irvine, CA, USA*

We show that inline silicon waveguides inside a laser cavity facilitate laser modelocking due to TPA and TPA-induced FCA, and it can also provide Raman amplification and dual wavelength lasing in the same silicon waveguide.

TuA2.3 11.30 - 12.00 (Invited)

Key Challenges in Practical Realization of Si Photonics Products, M. Asghari, B. J. Luff, D. Feng and J. Fong, *Kotura, Monterey Park, CA, USA*

In this paper we review the key challenges associated with the successful development of Si Photonic products. These will include issues such as device performance, wafer fabrication, on chip assembly and product packaging.

12.00 – 14.00 LUNCH BREAK

14.00 - 15.15

Session TuA3: Silica Devices
Session Chair: Richard M. Osgood, *Columbia University, New York, NY, USA*

TuA3.1 14.00 - 14.30 (Invited)

Silica-based Films and Multilayer Stacks for Lightwave Circuits Fabricated by Surface-Plasma Chemical Vapor Deposition, K. M. Golant, *Russian Academy of Sciences, Moscow, Russia*

Peculiarities of the application of SPCVD to the fabrication of doped silica films for the use in integrated optics are discussed. Photosensitive germanosilicate films, heavily erbium doped layers, multilayer film structures are considered as examples.

TuA3.2 14.30 - 14.45

Experimental Parabolic Pulse Generation with an Active Dispersion Decreasing Fiber, C. Finot, *Université de Bourgogne, Dijon, France*, A. Guryanov, *Chemistry of High Purity Substances, Nizhny Novgorod, Russia*, A. Sysoliatin, *Fiber Optics Research Center, Moscow, Russia* and S. Wabnitz, *Università degli Studi di Brescia, Brescia, Italy*

We experimentally demonstrate the use of an hybrid configuration to generate parabolic pulses. We combine dispersion decrease with distributed gain. This leads to several benefits on the parabolic generated pulses compared with a passive configuration.

TuA3.3 14.45 - 15.15 (Invited)

Optical Frequency Comb Generation from Monolithic Microcavities, T. Kippenberg, *Max Planck Institute for Quantum Optics, Garching, Germany*

ABSTRACT NOT AVAILABLE

Wednesday, 16 January 2008

09.00 - 10.00

Session WA1: SEMICONDUCTOR AND QUANTUM DEVICES
Session Chair: Mehdi Asghari, *Kotura, Monterey Park, CA, USA*

WA1.1 09.00 - 09.30 (Invited)

1.3 Micron High Modal Gain Quantum Dot Lasers, A. Salhi, M. T. Todaro, V. Tasco, *University of Lecce, Lecce, Italy*, L. Martiradonna, R. Cingolani, *National Nanotechnology Laboratory of CNR-INFM, Lecce, Italy*, A. Passaseo and M. De Vittorio, *University of Lecce, Lecce, Italy*

High saturation modal gain InAs/InGaAs quantum dot (QD) lasers operating at 1.3 micron have been successfully demonstrated, thus enabling high frequency operation, high temperature stability and ultra-small cavity lasers.

WA1.2 09.30 - 09.45

Carrier Density Dynamics in Semiconductor Lasers Subject to Dual Optical Injection, N. M. Al-Hosiny, *University of Taif, Taif, Saudi Arabia*

The dynamics of carrier density in semiconductor lasers subject to dual and single optical injection are compared, with special emphasis on the secondary locking region that lies outside the conventional locking bandwidth

WA1.3 09.45 - 10.00

Application of Quantum Optical Effects in Switching, G. Manzacca and G. Cincotti, *Università degli Studi Roma Tre, Rome, Italy*

We investigate through a formalism similar to a coupled mode theory in time, the behavior of a system composed by a direct coupled cavity with inside it a quantum dot in cascade configuration. We derive the conditions for which switching can be achieved.

10.00 – 10.30 COFFEE BREAK

10.30 - 11.45

Session WA2: SOLITONS AND SUPERCONTINUUM
Session Chair: Haisheng Rong, *Intel Corporation, Santa Clara, CA, USA*

WA2.1 10.30 - 11.00 (Invited)

Modulation-Instability and Pulse-Train Generation in a Highly Nonlinear Bragg Grating, N. J. Baker, M. A. F. Roelens, *CUDOS, University of Sydney, Sydney, NSW, Australia*, S. Madden, B. Luther-Davies, *Australian National University, Canberra, ACT, Australia*, C. de Sterke and B. J. Eggleton, *CUDOS, University of Sydney, Sydney, NSW, Australia*

The strong photosensitivity and nonlinearity of chalcogenide glass makes this material an ideal platform for Bragg soliton devices. We present the first nonlinear grating experiment in an integrated chalcogenide waveguide.

WA2.2 11.00 - 11.15

Three-Wave Trapponic Solitons for Tunable High-Repetition Rate Pulse Train Generation, F. Baronio, M. Conforti, *Università degli Studi di Brescia, Brescia, Italy*, A. Degasperis, *University of Rome "La Sapienza", Rome, Italy* and S. Wabnitz, *Università degli Studi di Brescia, Brescia, Italy*

We demonstrate that the mixing of a Zakharov-Manakov soliton with a quasi-continuous wave signal may lead to the generation of a soliton with variable speed (*trappon*). Trappons may provide a novel mechanism of cavity-less ultra-short tunable pulse train generation.

WA2.3 11.15 - 11.45 (Invited)

Supercontinuum Generation in Silicon Photonic Wires, I. Hsieh, X. Chen, X. Liu, J. I. Dadap, N. C. Panoiu, C.-Y. Chou, *Columbia University, New York, NY, USA*, F. Xia, W. Green, Y. A. Vlasov, *IBM Research, Yorktown Heights, NY, USA* and R. M. Osgood, *Columbia University, New York, NY, USA*

We observe spectral broadening of more than 350 nm upon propagation of ultrashort pulses in a 4.7-mm-long silicon-photonic-wire waveguide near the zero-group velocity dispersion wavelength. The output spectral characteristics are shown to be consistent, in part, with higher-order soliton radiative effects.

END OF PROGRAM