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

Photonic Crystal Fibers: Technology and Applications

Monday, 14 January 2008

ALL SESSIONS WILL BE HELD IN NETTUNO 4

10.30 - 12.00

Session MD1: PHOTONIC CRYSTAL FIBERS FOR LASERS AND AMPLIFIERS
Session Chair: Masashi Onishi, *Sumitomo Electric Industries, Yokohama, Kanagawa, Japan*

MD1.1 10.30 - 11.00 (Invited)
Photonic Crystal Fibres for High Power Applications, K. Mattsson*, Crystal Fibre A/S, Birkerod, Denmark*

Design of and results from kW level double-clad fibre lasers and multimode pump combiners based on photonic crystal fibre technology is presented.

MD1.2 11.00 - 11.15

Supercontinuum Generation from 1350 to 1700 nm by Nanosecond Pumping Near the Second Zero Dispersion Wavelength of a Photonic Crystal Fiber, A. Boucon*, University of Franche-Comte, Besançon, France*

We experimentally study supercontinuum generation in the nanosecond regime using a microstructured fiber with two zero dispersion wavelengths. Pumping at 1535 nm around the second zero-dispersion wavelength yields spectral broadening over 1350-1700 nm.

MD1.3 11.15 - 11.30

Improvement of the Pump Power Coupling in Double Cladding Photonic Crystal Fiber, G. Calo, A. D'Orazio, M. De Sario, L. Mescia, V. Petruzzelli, L. Allegretti, T. Palmisano and F. Prudenzano*, Politecnico di Bari, Taranto, Italy*

An optical coupler constituted by a Long-Period Grating written into the single-mode core of a Double-Cladding Photonic Crystal Fiber (DCPCF) is designed and refined. The optical coupler feasibility is numerically demonstrated.

MD1.4 11.30 - 12.00 (Invited)

Micro-Structured High Power Fibre Lasers & Amplifiers, J. D. Minelly, F. Di Teodoro, C. D. Brooks and S. Desmoulins*, Aculight Corporation, Bothell, WA, USA*

Microstructuring techniques, initially developed for photonic band gap fibers are being increasingly adapted for active fiber systems due to superior design space in effective area, polarization maintenance and dispersion control.

12.00 – 14.00 LUNCH BREAK

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 - 17.30
Session MD3: NUMERICAL DESIGN OF PHOTONIC CRYSTAL FIBER
Session Chair: Hugo E. Hernandez-Figueroa, *State University of Campinas, Campinas, São Paulo, Brazil*

MD3.1 16.00 - 16.30 (Invited)
Finite-Element Based Photonic Crystal Fiber Analysis: From Solid to Hollow Core Fibers, F. Poli, A. Cucinotta, M. Foroni and S. Selleri, *University of Parma, Parma, Italy*

Through different analysis results, it is demonstrated the effectiveness of the finite element method as a numerical tool to accurately analyze the properties of both solid core and hollow core photonic crystal fibers.

MD3.2 16.30 - 16.45

Design Optimization of Holey Fibers to Realize Zero Dispersion in 500 nm Band and Suppressed Higher-Order Modes Propagation, K. Imamura, K. Mukasa, R. Sugizaki, Y. Mimura and T. Yagi, *Furukawa Electric Co. Ltd, Ichihara, Chiba, Japan*

Design optimization of holey fiber with zero dispersion in visible region was performed. The zero dispersion wavelength was successfully shifted to 510 nm while suppressing propagation of higher-order modes.

MD3.3 16.45 - 17.00

Effective Method for Calculation of Radiation Loss and Dispersion in Fibers with Bragg Reflecting Claddings, E. I. Golant, *Fiber Optics Research Center, Moscow, Russia* and K. M. Golant, *Russian Academy of Sciences, Moscow, Russia*

A new approach is proposed for computer simulation of radiation losses in photonic crystal fibers with multilayer Bragg reflecting cladding based on exact finite-difference method for Maxwell equations in cylindrical coordinates.

MD3.4 17.00 - 17.30 (Invited)

Numerical Methods for the Design and Analysis of Photonic Crystal Fibres, P. J. Roberts, *Technical University of Denmark, Kgs. Lyngby, Denmark*

The numerical methods available for calculating the electromagnetic mode properties of photonic crystal fibres are reviewed. The preferred schemes for analyzing TIR guiding and band gap guiding fibres are contrasted.

18.30 – 20.00 WELCOME RECEPTION

Tuesday, 15 January 2008

09.00 - 10.00
Session TuD1: JOINT SESSION WITH PCF AND FOPA
Session Chair: Kunimasa Saitoh, *Hokkaido University, Sapporo, Japan*

TuD1.1 09.00 - 09.30 (Invited)

Parametric Amplification in Photonic Crystal Fibres, J. D. Harvey, S. Murdoch, J. Chen, R. Leonhardt and G. K. L. Wong, *University of Auckland, Auckland, New Zealand*

Photonic crystal fibres have reinvigorated the study of parametric amplification in optical fibres through their special properties. Experimental results are presented for a range scalar and vector four wave mixing processes in photonic crystal fibres.

TuD1.2 09.30 - 10.00 (Invited)

Parametric Generation of Entangled Photon Pairs in Fibers, J. G. Rarity*, University of Bristol, Bristol, UK*

Four-wave mixing in micro-structured fibres can be a versatile source of time correlated and entangled photon pairs. Here we review the prospect of using these sources to develop all optical quantum logic functions.

10.00 – 10.30 COFFEE BREAK

10.30 - 12.00

Session TuD2: Supercontinuum Generation in Photonic Crystal Fiber
Session Chair: Satoki Kawanishi, *NTT Corporation, Atsugi, Kanagawa, Japan*

TuD2.1 10.30 - 11.00 (Invited)
Thinking Outside the Envelope: New Perspectives for Nonlinear Fiber Optics, J. M. Dudley*, University of Franche-Comte, Besancon, France*, G. Genty*, Tampere University of Technology, Tampere, Finland* and P. Kinsler*, Imperial College London, London, UK*

We review the theory and numerical modelling of pulse propagation in highly nonlinear fiber waveguides under conditions where sub-cycle and carrier-phase sensitive propagation effects are expected to play an important role. A preliminary comparison with experiments studying nonphasematched third harmonic generation is reported.

TuD2.2 11.00 - 11.15

Single-Sided Supercontinuum Generation by High Order Mode Excitation in a Photonic Crystal Fibre, L. Tartara, V. Degiorgio*, University of Pavia, Pavia, Italy*, R. Cherif and M. Zghal*, Engineering School of Communication of Tunis, Ariana, Tunisia*

We report about a novel kind of supercontinuum generation in a photonic crystal fibre in which the spectral broadening occurs only on the blue side of the pump wavelength.

TuD2.3 11.15 - 11.30

Supercontinuum Generation in Ultra-Low-Loss Silica Nanoweb Fibres, A. V. Podlipensky*, University of Erlangen-Nuremberg, Erlangen, Germany*, P. Szarniak, M. Scharrer*, Max Planck Institute, Erlangen, Germany*, N. Joly*, University of Sciences and Technologies of Lille 1, Villeneuve d'Ascq, France* and P. St. J. Russell*, University of Erlangen-Nuremberg, Erlangen, Germany*

We present fabrication and characterization of ultra-low-loss (0.6 dB/m) glass nanowebs in fibre form. Generation of broad band supercontinuum in the fs regime is reported and discussed.

TuD2.4 11.30 - 11.45

UV Enhancement of Supercontinuum Generation by Dual Wavelength Tunable Femtosecond Laser in Photonic Crystal Fiber, Y.-W. Chen*, National Chiao Tung University, Hsinchu, Taiwan, R.O.C.*, J.-H. Lin, K.-H. Lin*, National Taipei University of Technology, Taipei, Taiwan, R.O.C.* and W.-F. Hsieh*, National Chiao Tung University, Hsinchu, Taiwan, R.O.C.*

We theoretically investigate the blue light enhancement by the dual wavelength tunable Ti:sapphire laser in PCF. The blue light becomes broadened and extended to the short wavelength due to the cross phase modulation.

TuD2.5 11.45 - 12.00

Extended Blue Side of Flat Supercontinuum in PCFs with a CW Yb Fiber Laser, A. Mussot, A. Kudlinski*, University of Sciences and Technologies of Lille 1, Villeneuve d'Ascq, France*, T. Sylvestre, J. C. Beugnot*, University of Franche-Comte, Besancon, France*, M. Gonzalez-Herraez*, Universidad de Alcal, Madrid, Spain* and G. Bouwmans*, University of Sciences and Technologies of Lille 1, Villeneuve d'Ascq, France*

We report the generation of a strong and flat supercontinuum with a CW Yb fiber laser at 1066 nm. By pumping just above the zero dispersion wavelength of the fiber, we were able to extend the spectrum toward short wavelengths thanks to an efficient dispersive

12.00 – 14.00 LUNCH BREAK

14.00 - 15.30

Session TuD3: Photonic Bandgap Fibers
Session Chair: Anders Bjarklev, *Technical University of Denmark, Kgs. Lyngby, Denmark*

TuD3.1 14.00 - 14.30 (Invited)

Photonic Bandgap Fibers for High-Power CW and Pulsed Applications, S. Fevrier, D. D. Gaponov, P. Roy*, University of Limoges, Limoges Cedex, France*, C. Lecaplain, G. Martel, A. Hideur*, Université de Rouen, Saint Etienne du Rouvray, France*, M. E. Likhachev*, Russian Academy of Sciences, Moscow, Russia*, M. Yashkov and M. Salganskii*, Russian Academy of Sciences, Nizhny Novgorod, Russia*

In the reach for high-power large mode area fibers are routinely used. Photonic bandgap fibers can be engineered so that a single mode can be propagated in a large core fiber. High-power cw or pulsed bandgap lasers can then be elaborated.

TuD3.2 14.30 - 14.45

Hollow Core Photonic Bandgap Fibre for Truly Single Mode Operation, F. Poletti, M. N. Petrovich, A. van Brakel and D. J. Richardson, *University of Southampton, Southampton, UK*

Based on extensive numerical simulations we fabricate a 3-cell core photonic bandgap fibre. Robust single mode guidance is observed even after metre length propagation.

TuD3.3 14.45 - 15.00

Phase-Locked Anti-Stokes Raman Generation in Gas-Filled Hollow-Core Photonic Crystal Fibers, A. Nazarkin and P. St. J. Russell, *University of Erlangen-Nuremberg, Erlangen, Germany*

We show that the efficient non-phase-matched anti-Stokes Raman generation observed in gas-filled hollow-core PCF can be explained by "phase locking" of the interacting fields leading to the establishment of a phase difference independent of the optical path.

TuD3.4 15.00 - 15.30 (Invited)

Solid-Core Photonic Bandgap Fiber and Its Future Potential, G. Bouwmans, V. Pureur, A. Betourne, Y. Quiquempois, L. Bigot, M. Perrin and M. Douay, *University of Sciences and Technologies of Lille 1, Villeneuve d'Ascq, France*

We present recent progress in the field of Solid-Core Photonic Bandgaps Fibers in terms of designs, losses and their possible applications (laser sources, second or third harmonic generation…).

15.30 – 16.00 COFFEE BREAK

16.00 - 17.15
Session TuD4: PHOTONIC CRYSTAL FIBER APPLICATIONS
Session Chair: Tanya M. Monro, *University of Adelaide, Adelaide, SA, Australia*

TuD4.1 16.00 - 16.30 (Invited)
Wide-Band and High-Speed Transmission Over Photonic Crystal Fibre, K. Nakajima, K. Kurokawa, T. Matsui and K. Tajima, *NTT Corporation, Tsukuba, Ibaraki, Japan*

This paper reviews recent progress on low loss photonic crystal fibre (PCF) and its application as a transmission medium. Endlessly single-mode PCF is beneficial for realizing future wide-band and high-speed optical network.

TuD4.2 16.30 - 16.45

Single-Polarization Photonic Crystal Fibers Based on Resonant Coupling Phenomenon, Y. Tsuchida, K. Saitoh and M. Koshiba, *Hokkaido University, Sapporo, Japan*

We propose a design method for single-polarization photonic crystal fibers with improved beam quality by introducing the resonant coupling between the central core and the elliptical cores arranged on either side of the core.

TuD4.3 16.45 - 17.00

Dispersive Properties of Rocking Filters in Highly Birefringent Photonic Crystal Fiber, L. Zang, M. S. Kang, G. J. Pearce, M. Scharrer, S. Rammler and P. St. J. Russell, *University of Erlangen-Nuremberg, Erlangen, Germany*

We study the dispersive properties of the eigenmodes of rocking filters produced in highly birefringent photonic crystal fibers. The dispersion changes dramatically close to filter resonance. Rocking filters provide more flexibility in dispersion engineering.

TuD4.4 17.00 - 17.15

Realization of Zero Dispersion in a 1.0μm Band using Hole-Assisted Fibers (HAFs), R. Miyabe, *Furukawa Electric Co. Ltd, Ichihara, Chiba, Japan*

We designed and fabricated the single-mode HAFs having zero dispersion in the 1.0μm band. By optimizing the profile of the HAFs, we successfully widen a usable wavelength range towards a 1.0μm band.

Wednesday, 16 January 2008

09.00 - 10.00
Session WD1: PHOTONIC CRYSTAL FIBER SENSORS
Session Chair: TBD

WD1.1 08.30 - 09.00 (Invited)

Photonic Crystal Fibers for Sensing Applications, W. Urbanczyk, T. Martynkien, M. Szpulak, G. Statkiewicz, A. Anuszkiewicz, J. Olszewski, G. Golojuch, M. Szczurowski, *Wroclaw University of Technology, Wroclaw, Poland*, J. Wojcik, P. Mergo, M. Makara, *Maria Curie-Sklodowska University, Lubin, Poland*, T. Nasilowski, F. Berghams and H. Thienpont, *Vrije University Brussels, Brussels, Belgium*

We will review selected properties of PCFs, which enable their metrological applications. A special focus will be on sensing capabilities of the highly birefringent PCFs such as birefringence dispersion, polarizing features, sensitivity to hydrostatic pressures, temperature, and strain.

WD1.2 09.00 - 09.15

Bio-Sensor based on a Hollow-Core Bragg Fiber, D. Passaro, M. Foroni, F. Poli, A. Cucinotta, S. Selleri, *University of Parma, Parma, Italy*, J. Lægsgaard and A. Bjarklev, *Technical University of Denmark, Kgs. Lyngby, Denmark*

By studying the effect of the DNA layer deposited inside the fiber core and cladding holes on the confinement loss spectrum, the feasibility of a hollow-core Bragg fiber bio-sensor has been demonstrated.

WD1.3 09.15 - 09.30

Generation of Ultra-broadband Chirped and Constant Long-Period Grating Using Photonic Crystal Fiber, H.-R. Chen, *National Chiao Tung University, Hsinchu, Taiwan, Taiwan, R.O.C.*, K.-H. Lin, J.-H. Lin, *National Taipei University of Technology, Taipei, Taiwan, R.O.C.* and W.-F. Hsieh, *National Chiao Tung University, Hsinchu, Taiwan, R.O.C.*

Long-period gratings (LPGs) are generated in bended PCF by using constant period corrugated devices. The mechanically induced LPGs show center wavelength tuning over 800 nm with tunable 3-dB bandwidth from 10 nm to 300 nm.

WD1.4 09.30 - 10.00 (Invited)

Gas-Phase Photonic Materials, F. Benabid, *University of Bath, Bath, UK*

We report on the recent progress made on the understanding of the guidance mechanism in hollow-core photonic crystal fiber, on the photonic microcells and their use for coherent optics with atomic vapor and on the development of the first CW Raman gas-fiber-laser.

10.00 – 10.30 COFFEE BREAK

10.30 - 11.30

Session WD2: PHOTONIC CRYSTAL FIBER TECHNOLOGY AND MATERIALS
Session Chair: Ryszard Buczynski, *Warsaw University, Warsaw, Poland*

WD2.1 10.30 - 11.00 (Invited)

Post-Processing and Tapering of PCFs, S. Leon-Saval, *University of Sydney, Sydney, NSW, Australia*, T. A. Birks, A. Witkowska, K. Lai, and W. J. Wadsworth, *University of Bath, Bath, UK*

New methods have been developed in post-processing and tapering of PCFs to achieve a variety of low-loss optical devices. Interfacing between waveguides with very different properties and highly efficient mode convertors are presented.

WD2.2 11.00 - 11.15

Metal Nanowire Arrays in Photonic Crystal Fibers, L. N. Prill Sempere, M. A. Schmidt, H. K. Tyagi, C. C. Poulton and P. St. J. Russell, *University of Erlangen-Nuremberg, Erlangen, Germany*

Metallic nanowire arrays are created by pumping molten metal into the hollow channels of silica glass PCF. Measurements show that, at certain wavelengths, the core-guided light couples to leaky surface plasmon modes on the nanowires.

WD2.3 11.15 - 11.30

Review of Novel Glass Photonic Crystal Fibres, A. B. Seddon, D. Furniss, L. Zheng, E. V. Bekker and T. M. Benson, *University of Nottingham, Nottingham, UK*

Photonic crystal fibres (PCFs) offer unprecedented control over waveguide dispersion. Most development to date has centred upon silica glass PCFs. Here we review the state-of–the-art of PCFs made from novel glasses.

WD2.4 11.30 - 12.00 (Invited)

Advances in Hollow Core Photonic Band-Gap Fiber Technology, K. W. Koch, *Corning, Inc., Corning, NY, USA*

ABSTRACT NOT AVAILABLE

END OF PROGRAM