Advance Program

Novel Waveguiding, Structures and Phenomena

Monday, 19 July 2010

ALL SESSIONS WILL BE HELD IN MIMOSA 2

09.00 - 10.00

Session MB1: NONLINEAR OPTICS I
Session Chair: Mordechai Segev, *Technion, Haifa, Israel*

MB1.1 09.00 - 09.30 (Invited)

Applications of Ultrafast, Ultralow Power Four-Wave Mixing on Chip, A. L. Gaeta, *Cornell University, Ithaca, NY, USA*

ABSTRACT NOT AVAILABLE

MB1.2 09.30 - 10.00 (Invited)

Photonic Chip based Nonlinear Optics for Tera-Bit per Second Processing, B. J. Eggleton, *CUDOS, University of Sydney, Sydney, NSW, Australia*

My talk reviews our recent progress developing photonic chip based optical waveform analyzers based on highly nonlinear dispersion engineered waveguides.

10.00 – 10.30 COFFEE BREAK

10.30 - 12.00

Session MB2: BALLISTIC
Session Chair: Jose J. Sanchez-Mondragon, *Instituto Nacional de Astrofísica, Optica y Electronica, Tonantzintla, Puebla, Mexico*

MB2.1 10.30 - 11.00 (Invited)

Semiconductor Nanodevices for Room Temperature THz Detection and Emission, J. Mateos, *University of Salamanca, Salamanca, Spain*

The use of novel device architectures such as slot-diodes and rectifying nano diodes based on both wide and narrow bandgap semiconductors is proposed for fabricating room-temperature solid-state continuous wave emitters (based on Gunn oscillations) and detectors at THz frequencies.

MB2.2 11.00 - 11.30 (Invited)

Femtosecond Time-Domain Experimental Characterization of Ballistic Transport in Semiconducting Nanostructures, R. Sobolewski, *University of Rochester, Rochester, NY, USA*

We present sub-picosecond time-domain (THz bandwidth) characterization of novel ballistic transport electronic devices operated at room temperature, using a photoconductive switch for picosecond electrical pulse excitation and a femtosecond temporal resolution electro-optic sampling technique.

MB2.3 11.30 - 12.00 (Invited)

Ballistic Transport in Nanostructures at Room Temperature, M. Margala, *University of Massachusetts Lowell, Lowell, MA, USA*

ABSTRACT NOT AVAILABLE

12.00 – 13.30 COFFEE BREAK

13.30 - 15.00

Session MB3: **BIOPHOTONICS**
Session Chair: Roman Sobolewski, *University of Rochester, Rochester, NY, USA*

MB3.1 13.30 - 14.00 (Invited)

Photonic Crystals for Information Processing and Sensing with the SOI Platform, P. M. Fauchet, *University of Rochester, Rochester, NY, USA*

The very small modal volume and large Q of 2-D photonic crystal microcavities make them very sensitive to minute changes in refractive index. Applications in optical signal processing and biosensing will be discussed.

MB3.2 14.00 - 14.30 (Invited)

Infrared and Terahertz Nanoscopy, R. Hillenbrand, *CIC nanoGUNE Consolider, Donostia-San Sebastian, Guipuxcoa, Spain*

We demonstrate nanoscale resolved IR and THz imaging by recording the elastically scattered light from the laser-illuminated tip of an atomic force microscope tip. Applications such as electronic and photonic device characterization will be presented.

MB3.3 14.30 - 15.00 (Invited)

Glass-Clad Crystal Fibers Based Ultrahigh Resolution Optical Coherence Tomography, C. C. Tsai, K.-Y. Hsu, Y. T. Wang, Y. S. Lin, D.-Y. Jheng, C. K. Chang, P. L. Huang, E. Sun, S.-L. Huang, *National Taiwan University, Taipei, Taiwan, R.O.C.* and P. S. Yeh, *National Taiwan University of Science and Technology, Taipei, Taiwan, R.O.C.*

Active crystal fibers can generate CW and near-Gaussian-shape milliwatt-level broadband emissions at 560 nm, 770 nm, and 1380 nm with 3-dB bandwidths of 98, 210, and 240 nm, respectively. They are eminently suitable for ultrahigh-resolution optical coherence tomography.

15.00 – 15.30 **COFFEE BREAK**

15.30 - 17.00

Session MB4: **NONLINEAR OPTICS II**
Session Chair: Alexander L. Gaeta, *Cornell University, Ithaca, NY, USA*

MB4.1 15.30 - 16.00 (Invited)

Nonlinear Optics in Si Wires, R. M. Osgood, *Columbia University, New York, NY, USA*

ABSTRACT NOT AVAILABLE

MB4.2 16.00 - 16.30 (Invited)

Mid-Infrared Nonlinear Optics in Silicon Photonic Wire Waveguides, W. M. J. Green, *IBM Research, Yorktown Heights, NY, USA*, X. Liu, R. M. Osgood, *Columbia University, New York, NY, USA* and Y. A. Vlasov, *IBM Research, Yorktown Heights, NY, USA*

We demonstrate a broadband silicon mid-infrared optical parametric amplifier operating near λ = 2200 nm. The amplifier exhibits a maximum gain as large as 25 dB, and net off-chip gain greater than 13 dB.

MB4.3 16.30 - 17.00 (Invited)

Enhancement of Nonlinear Effects in Slow Light Photonic Crystal Waveguides, T. F. Krauss, *University of St. Andrews, St. Andrews, Fife, UK*

ABSTRACT NOT AVAILABLE

17.30 – 18.30 **Welcome Reception**

Tuesday, 20 July 2010

09.00 - 10.00

Session TuB1: **PLASMONICS I**
Session Chair: Paul Davids, *Sandia National Laboratories, Albuquerque, NM, USA*

TuB1.1 09.00 - 09.30 (Invited)

Nanoplasmonic Cavities and Waveguides: From Design Principles to Active Modulation and Gain, S. Maier, *Imperial College London, London, UK*

The design of plasmonic cavities and waveguides will be elucidated, focusing on new developments in nanoplasmonics such as coherent effects for cavity mode shaping, and hybrid structures including active materials for modulation and gain.

TuB1.2 09.30 - 10.00 (Invited)

Plasmonic Waveguiding and Focusing, B. Lee, I.-M. Lee, S. Kim, J. Park, Y. Lim, S.-W. Cho and H. Kim, *Seoul National University, Seoul, Korea*

We explore two main representative fields of plasmonics: plasmonic focusing and waveguiding. We overview and discuss several methods of focusing and waveguiding electromagnetic fields in subwavelength regime using plasmonics.

10.00 – 10.30 COFFEE BREAK

10.30 - 12.00

Session TuB2: PLASMONICS II
Session Chair: Stefan Maier, *Imperial College London, London, UK*

TuB2.1 10.30 - 11.00 (Invited)

Electrically Interfacing with Deep-Subwavelength Plasmonic Waveguides: Integrated Electrical Detection and Generation of MIM Gap Plasmons, P. Van Dorpe, *IMEC, Leuven, Belgium*

Nanophotonic waveguides based on surface plasmons have experienced a rapid development in terms of their design, fabrication and understanding of their plasmonic properties. For eventual applications it will be crucial to efficiently interface these waveguides with fast electronics. Therefore, we have looked both into an efficient detection and generation of surface plasmons in deep-subwavelength plasmon waveguides.

TuB2.2 11.00 - 11.30 (Invited)

Plasmonic Nanoantennas as Building Blocks for Ultracompact Photonic Devices, J. Aizpurua, N. Large, *Spanish Council for Scientific Research, Donostia-San Sebastian, Spain*, M. Abb and O. L. Muskens, *University of Southampton, Southampton, UK*

The concept of ultrafast optical switches based on the nonlinear response of loaded plasmonic nanoantennas is explored. A photoconductive semiconductor in the gap can be used to generate a free-carrier plasma which short circuits the antenna arms, resulting in strong modifications of the antenna resonances.

TuB2.3 11.30 - 11.45

Plasmonic Integrated Optics: Going the Last Few Microns, P. Davids, *Sandia National Laboratories, Albuquerque, NM, USA*

Plasmonic integrated optics is an attempt to bridge the length scale gap between optics and nanometer scale electronic devices. We present a hybrid optical interconnect scheme which utilizes low loss dielectric waveguides for global interconnection and plasmonic structures for local routing and mode manipulation.

TuB2.4 11.45 - 12.00

Controlled Placement of Spherical Nanoparticles into Array for Biosensing, H. M. Chen, L. Pang, M. Gordon, H. Gudjonson and Y. Fainman, *University of California - San Diego, La Jolla, CA, USA*

Spherical nanoparticles are formed and aligned in a periodic array by placing them onto nanohole array. These structures have been shown theoretically to have very narrow linewidth and improved sensitivity for biosensing applications.

12.00 – 13.30 LUNCH BREAK

13.30 - 15.00

Session TuB3: FIBER BASED DEVICES
Session Chair: Yeshaiahu Fainman, *University of California - San Diego, La Jolla, CA, USA*

TuB3.1 13.30 - 14.00 (Invited)

Fiber Optical Parametric Devices, H. L. Fragnito, *State University of Campinas, Campinas, Spain*

ABSTRACT NOT AVAILABLE

TuB3.2 14.00 - 14.15

Fabrication of SU8/SWCNT Films as Saturable Absorbers, I. Hernandez-Romano, *Instituto Nacional de Astrofísica, Optica y Electronica, Tonantzintla, Puebla, Mexico*, D. A. May-Arrioja, *Autonomous University of Tamaulipas, Reynosa, Tamaulipas, Mexico*, J. J. Sanchez-Mondragon, *Instituto Nacional de Astrofísica, Optica y Electronica, Tonantzintla, Puebla, Mexico* and P. J. Delfyett, *University of Central Florida, Orlando, FL, USA*

We report the fabrication of novel SU8/SWCNT composite materials as saturable absorbes. A passive mode-locked laser producing 871 fs pulses with a repetition rate of 21.26 MHz is demonstrated using this SA film.

TuB3.3 14.15 - 14.30

Tunable Light Sources in the Visible and Near Infrared based on Fiber Taper Coupled Photonic Crystal Nanocavities, G. Shambat, Y. Gong, K. Rivoire, J. Lu, *Stanford University, Stanford, CA, USA*, S. Yerci, R. Li, *Boston University, Boston, MA, USA*, F. Hatami, *Humboldt University, Berlin, Germany*, L. Dal Negro, *Boston University, Boston, MA, USA* and J. Vuckovic, *Stanford University, Stanford, CA, USA*

Photoluminescence at 1.53 um from Er:SiN_x on silicon photonic crystal cavities was extracted via fiber tapers with 2.5x greater collection efficiency compared to free space emission. Fibers were also used to demonstrate a 10 nm tuning range of 750nm SHG emission from GaP cavities.

TuB3.4 14.30 - 14.45

Optofluidically Tunable Multimode Interference Erbium Doped Fiber Laser, D. A. May-Arrioja, *Autonomous University of Tamaulipas, Reynosa, Tamaulipas, Mexico*, J. E. Antonio-Lopez, I. Hernandez-Romano, J. J. Sanchez-Mondragon, *Instituto Nacional de Astrofísica, Optica y Electronica, Tonantzintla, Puebla, Mexico* and P. LiKamWa, *University of Central Florida, Orlando, FL, USA*

An optofluidically tunable multimode interference (MMI) fiber laser is demonstrated. This scheme allows for a tuning range of almost 40 nm, and a SNR better 47 dBm by simple changing the level of a liquid around the multimode fiber.

TuB3.5 14.45 - 15.00

Ferrule Material Dependence of Stress Sensitivity of a Variable Optical Frequency Filter Made of Fiber Fabry-Perot Etalon, M. Tateda, *Chiba University, Chiba, Japan* and M. Dong, *Chiba University, Chiba, Chiba, Japan*

Stress sensitivity of three types of fiber Fabry-Perot etalons (FFPEs) designed for optical frequency filters is investigated, whose ferrules have different Young's modulus. The stress sensitivity of transmission frequency revealed inverse proportionality to Young's modulus.

15.00 – 15.30 COFFEE BREAK

15.30 - 17.00

Session TuB4: Wave Propagation
Session Chair: Miguel Torres-Cisneros, *University of Guanajuato, Salamanca, Gto., Mexico*

TuB4.1 15.30 - 16.00 (Invited)

Super-Resolution and Recovery of Sparse Sub-Wavelength Images, M. Segev, *Technion, Haifa, Israel*

ABSTRACT NOT AVAILABLE

TuB4.2 16.00 - 16.30 (Invited)

Optical Airy Beams and Bullets, D. N. Christodoulides, *University of Central Florida, Orlando, FL, USA*

ABSTRACT NOT AVAILABLE

TuB4.3 16.30 - 16.45

Optical Wave Breaking Cancellation in the Far Dispersion Field of Optical Fiber, I. A. Sukhoivanov, *University of Guanajuato, Salamanca, Gto., Mexico*, S. O. Iakushev, S. Petrov and O. V. Shulika, *Kharkov State University of Radio Electronics, Kharkov, Ukraine*

We show that optical wave breaking effect occurring in nonlinear optical fibers during ultrashort pulse propagation is cancelled in the far field of dispersion and fades away gradually over the propagation distance. This is accompanied by pulse reshaping from initial Gaussian shape towards parabolic pulse.

TuB4.4 16.45 - 17.00

Nonlinear Photonic Crystal for Optical Power Limiting, I. V. Guryev, *Kharkov State University of Radio Electronics, Kharkov, Ukraine*, I. A. Sukhoivanov, E. Alvarado-Mendez, M. Trejo-Duran, J. A. Andrade-Lucio, R. Rojas-Laguna, O. Ibarra-Manzano and J. Estudillo Ayala, *University of Guanajuato, Salamanca, Guanajuato, Mexico*

We present investigations of the nonlinear photonic crystals which possess optical power limiting effect which may be useful at the input of all-optical photonic integrated circuits. Parameters of the structures were found as well as radiation intensities and wavelengths the power stabilization is observed at.

Wednesday, 21 July 2010

09.00 - 10.00

Session WB1: **INTEGRATED OPTICS I**
Session Chair: Mario Dagenais, *University of Maryland, College Park, MD, USA*

WB1.1 09.00 - 09.30 (Invited)

Silicon Optomechanics, J. Roels, B. Maes, R. G. Baets and D. J. Van Thourhout, *Ghent University, Gent, Belgium*

Optomechanics might provide the key to realize various signal processing functions on a chip. In this proceeding we focus on silicon Nano-Optomechanical Systems (NOMS) and provide an overview of several types of optomechanical devices.

WB1.2 09.30 - 09.45

Cavity-Enhanced Quasi-Phase-Matched Wavelength Conversion in Silicon Ring Resonators: Two Approaches, N. Vermeulen, *Vrije University Brussels, Brussels, Belgium*, J. E. Sipe, *University of Toronto, Toronto, Canada*, C. Debaes and H. Thienpont, *Vrije University Brussels, Brussels, Belgium*

We propose a design for a silicon ring Raman converter and a silicon ring parametric converter where quasi-phase-matching occurs automatically because of the ring structure and where the intra-ring optical fields are resonantly enhanced.

WB1.3 09.45 - 10.00

Nonlinear Optics and Group Velocity Dispersion Engineering in Silicon Nitride Waveguides, D. T. H. Tan, K. Ikeda, P.-C. Sun and Y. Fainman, *University of California - San Diego, La Jolla, CA, USA*

We demonstrate normal and anomalous dispersion engineering as well as self phase modulation induced pulse spectral broadening in silicon nitride waveguides. Nonlinear losses are shown to be absent up to peak intensities of 12GW/cm^2.

10.00 – 10.30 **COFFEE BREAK**

10.30 - 12.00

Session WB2: **INTEGRATED OPTICS II**
Session Chair: Richard M. Osgood, *Columbia University, New York, NY, USA*

WB2.1 10.30 - 11.00 (Invited)

100 Gbit/s Electro-Optic Modulator and 56 Gbit/s Wavelength Converter for DQPSK Data in Silicon-Organic Hybrid (SOH) Technology, W. Freude, J. Leuthold, L. Alloatti, T. Vallaitis, D. Korn, R. Palmer, C. Koos, *Karlsruhe Institute of Technology, Karlsruhe, Germany*, P. Dumon, R. G. Baets, *Ghent University, Gent, Belgium*, B. Breiten, F. Diederich, *Swiss Federal Institute of Technology Zurich, Zurich, Switzerland*, J.-M. M. Brosi, *Karlsruhe Institute of Technology, Karlsruhe, Germany*, M. L. Scimeca, I. Biaggio, *Lehigh University, Bethlehem, PA, USA*, A. Barklund, R. Dinu, *GigOptix Inc., Bothell, WA, USA* and J. Wieland, *GigOptix-Helix AG, Zurich, Switzerland*

CMOS-compatible silicon photonics combined with covers of chi(2) or chi(3)-nonlinear organic material allows electro-optic modulators and all-optical wavelength converters for data rates of 100 Gbit/s and beyond. The devices are not impaired by free carriers.

WB2.2 11.00 - 11.15

Tailoring Optical Forces in Waveguides Through Radiation Pressure and Electrostriction, P. T. Rakich, P. Davids, *Sandia National Laboratories, Albuquerque, NM, USA* and Z. Wang, *Massachusetts Institute of Technology, Cambridge, MA, USA*

Detailed analysis of both radiation pressure and electrostrictive forces generated in high-index contrast optical waveguides is presented. Through analysis of the material- and geometry-dependent design degrees of freedom, we show that the magnitude and distribution of such optical forces is highly tailorable.

WB2.3 11.15 - 11.30

The Connection Between Radiation Pressure and Dispersion in Dielectric Waveguides, P. T. Rakich, P. Davids, *Sandia National Laboratories, Albuquerque, NM, USA* and Z. Wang, *Massachusetts Institute of Technology, Cambridge, MA, USA*

We show that radiation pressure generated within silicon waveguides can be computed exactly and simply from the waveguide dispersion. Exact agreement is found between the optical forces computed using waveguide dispersion and with the Maxwell stress tensor.

WB2.4 11.30 - 11.45

Engineering Optical Forces in Waveguides and Cavities Based on Optical Response, P. T. Rakich, *Sandia National Laboratories, Albuquerque, NM, USA*, Z. Wang, *Massachusetts Institute of Technology, Cambridge, MA, USA* and M. A. Popović, *University of Colorado at Boulder, Boulder, CO, USA*

We present a new treatment of optical forces, revealing that the forces in virtually any lossless optomechanically variable systems can be computed exactly and simply from only the optical phase and amplitude response of the system.

WB2.5 11.45 - 12.00

Multiport AWG-based Dispersion Compensators, N. Stelmakh and M. Vasilyev, *University of Texas at Arlington, Arlington, TX, USA*

We discuss multiport spectrally periodic dispersion-compensating arrayed-waveguide-grating (AWG) devices, which integrate multiple on-chip compensators sharing the same AWG elements. The new designs are advantageous in terms of compactness, insertion loss, and amplitude response flatness.

12.00 – 13.30 LUNCH BREAK

13.30 - 15.15

Session WB3: INTEGRATED OPTICS III
Session Chair: Daniel A. May-Arrioja, *Autonomous University of Tamaulipas, Reynosa, Tamaulipas, Mexico*

WB3.1 13.30 - 14.00 (Invited)

High Efficiency, High Power, Room-Temperature Operation, Interband Cascade Lasers, M. Dagenais, *University of Maryland, College Park, MD, USA*

ABSTRACT NOT AVAILABLE

WB3.2 14.00 - 14.30 (Invited)

Compound Semiconductor Nanowires for Next Generation Optoelectronics, J. Chennupati, *Australian National University, Canberra, ACT, Australia*

GaAs, InAs and InP based nanowires were grown epitaxially on (111)B substrates by metalorganic chemi-cal vapor deposition. Growth mechanism, microstructure and optical properties of these nanowires will be dis-cussed in this talk.

WB3.3 14.30 - 15.00 (Invited)

Nanophotonics for Information Systems Applications, Y. Fainman, A. Simic, O. Bondarenko, B. Slutsky, A. Mizrahi and M. P. Nezhad, *University of California - San Diego, La Jolla, CA, USA*

The field of photonics finds applications in information technology, health care, lighting, and sensing. This paper explores the role of nanotechnology with focus on nanophotonics in dielectric, matal, and semiconductor inhomogeneous metamaterials and devices for optical communications, information and signal processing, and sensing.

WB3.4 15.00 - 15.15

A Delta-k Electro-Optic Switch using a Multi-Channel Directional Coupler based on an Organic Crystal OH1, R. J. McCosker and G. E. Town, *Macquarie University, North Ryde, Australia*

We describe a novel delta-k electro-optic switch for 1310 nm using a multi-channel directional coupler structure. The switch employs an organic optical crystal OH1 for the cladding layer.

END OF PROGRAM