IPRA / Nano

Integrated Photonics Research and Applications Topical Meeting (IPRA)

April 24-26, 2006

and

Nanophotonics Topical Meeting (NANO)

April 26-28, 2006

Collocated Topical Meetings and Tabletop Exhibit

The Mohegan Sun Hotel
Uncasville, Connecticut s

Sponsored by:

Optical Society of America

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About IPRA

Monday, April 24-Wednesday, April 26, 2006

The Integrated Photonics Research and Applications Topical Meeting will cover all aspects of research in integrated photonics featuring innovative science and engineering results on active and compound semiconductor devices, dielectric waveguides and waveguide devices, modeling and numerical simulation, and microphotonics. Application areas within the scope of this meeting include telecommunications, data communications, optical computing, optical storage, displays and sensing.

About NANO

Wednesday, April 26 – Friday, April 28, 2006

The Nanophotonics Topical Meeting will cover the generation, detection, and transport of optical fields and their interactions with matter on the “nanoscale”. The spatial confinement and control of light at this level leads to new and interesting phenomena in physics, chemistry and biology, that in turn may find numerous applications in information technology, telecommunications, environmental monitoring, biomedical science and instrumentation, and quantum information processing and communication. Topics covered in this year's meeting include both the science and engineering of materials, devices, and subsystems, on a scale ranging from individual atoms, molecules or their clusters, to that of subwavelength effective media and photonic crystals.

IPRA Meeting Topics

Topics to be covered:

Silicon or Other Group IV Waveguide Photonics: including SOI-based materials: Active, Light Emitters or Lasers Isolation, Amplifiers, Passives, Complex Circuits.

Active and Compound Semiconductor Devices : Active III-V semiconductor devices, compound semiconductor modulators, filters, switches, wavelength converters, VCSELs, planar amplifiers, photonic integrated circuits and optoelectronic integrated circuits, compound semiconductor WDM components, novel III-V quantum optoelectronic devices, III-V materials and processing for photonics, reliability advances and issues, emerging packaging technologies.

Dielectric and Polymer Waveguides and Waveguide Devices : Integrated planar waveguides, polymer-based waveguide devices, active/passive integrated components, switches, variable optical attenuators, modulators, filters, integrated isolators and circulators, planar dispersion compensators, materials and fabrication technologies for photonic integrated circuits, characterization of linear and nonlinear optical waveguide devices, micro-machines and micro-optic components, parallel optical interconnects, reliability advances and issues, novel assembly and manufacturing techniques, low-cost technology for polymer devices.

LiNbO 3 - and other Metal-Oxide-Based Switches and Modulators : Ultrahigh-speed, low-V p , devices, integrated scanners, new fabrication methods.

Modeling, Numerical Simulation and Theory : Optical-system modeling, numerical and semi-analytical methods for guided-wave optics, active, passive and nonlinear component modeling, WDM component design, advances in computational algorithms, physics and coupled models for integrated photonic circuits.

Microphotonics : Simulation, modeling and experimental characterization of microcavity and other high confinement structures, waveguides, resonators, filters, add-drop integrated optical circuits, metallic and metallodielectric waveguides.

Nano Meeting Topics

Inhomogeneous materials (e.g., composite dielectrics, semiconductors, metals and metallodielectrics)

- Anisotropic

- Dispersive
- Efficient light extraction
- Nonlinear optical materials
- Dynamically configurable

Nano-engineered devices for generation, transport, and detection of light

- Resonators
- Light sources
- Quantum information
- Modulators
- NANO-MEMS
- Biophotonics, Biological and chemical transducers and sensors
- Efficient mode matching

Nanofabrication technology

- Lithography techniques
- Growth and deposition approaches
- Self-organized methods
- Etching

Characterization tools on the nanoscale

Modeling and simulation tools

Photonic crystals, waveguides, and fibers

Nanoscale integration of planar, free-space, and mixed subsystems

IPRA Invited Speakers

Active and Compound Semiconductor Devices

ITuC1, **Photonic Integrated Devices for WDM Application,** *Kazutoshi Kato, Hiroki Itoh, Yoshio Itaya; NTT Photonics Lab, Japan.*

ITuC2, **Using Polarization in the Integration of Optoelectronic Devices,** *Jos van der Tol, U. Khalique, M. K. Smit; Eindhoven Univ. of Technology, Netherlands Antilles.*

ITuC3, **Monolithic Widely Tunable Packet Forwarding Chip in InP for All-Optical Label Switching,** *Vikrant Lal, Milan Masanovic, David Wolfson, Greg Fish, Daniel Blumenthal; Univ. of California at Santa Barbara, USA.*

ITuC4, **High Side-Mode-Suppression-Ratio Sapphire-Bonded Photonic Crystal Laser under Continuous-Wave Operation,** *Min-Hsiung Shih[1], Wan Kuang [1,2] Mahmood Bagheri[1], Adam Mock[1], San-Jun Choi[1], John D. O'Brien[1], P. Dan Dapkus[1]; [1]Dept. of Electrical Engineering/Electrophysics, Univ. of Southern California, USA, [2]Boise State Univ., USA.*

ITuG2, **Integrable Semiconductor Active Optical Isolators,** *Hiromasa Shimizu; Univ. of Tokyo, Japan.*

Dielectric and Polymer Waveguides and Waveguide Devices

IMB1, **Advances in PLC Technology for Wavelength Routing Applications,** *Robert Brainard, Barthelemy Fondeur, David J. Dougherty; JDS Uniphase, USA.*

IMC1, **Three-Arm Mach-Zehnder Interferometers,** *Andrea Melloni[1], G. Cusmai[2], R. Costa[2], F. Morichetti[2], M. Martinelli[2]; [1]Politecnico di Milano, Italy, [2]CoreCorn, Italy.*

IMG3, **Ultra-Low-Power Compact PLC-Based 40-Channel ROADM Subsystem,** *Louay Eldada, Reinald Gerhardt, Junichiro Fujita, Antonije Radojevic, Tomoyuki Izuhara, Ali Malek; DuPont Photonics Tech., USA.*

ITuD1, **Rare Earth Doped Polymeric Integrated Optical Devices,** *E. Y. B. Pun; City Univ. of Hong Kong, Hong Kong Special Administrative Region of China.*

ITuF1, **Efficient 3D Finite Element Simulation of Fiber-Chip Coupling,** *L. Zschiedrich 1, ,2, Reinhard Maerz 1, S. Burger 1, F. Schmidt[1]; [1]JCMwave GMBH, Germany, [2]Zuse Inst. Berlin, Germany.*

ITuG1, **Waveguide Optical Isolator Integratable to Photonic Devices,** *Tetsuya Mizumoto[1,2], Kazumasa Sakurai[1], Yuya Shoji[1], Hideki Saito[1]; [1]Tokyo Inst. of Tech., Japan, [2]OITDA, Japan.*

IWB1, **Advances in the Design of Microring-Based Photonic Devices,** *Otto Schwelb; Concordia Univ, Canada.*

Low Index Contrast Devices

IMB2, **Silicon as a Platform for Photonics Integration,** *Jean-Louis Malinge; Kotura, Inc., USA.*

Microphotonics

JWA4, **Quantum Cascade Photonic Crystal Microlasers for "Intra-Cavity" Mid-IR Spectroscopy of Biomolecules on a Chip,** *Raviv Perahia[1], Kartik Srinivasan[1], Oskar Painter[1], Virginie Moreau[2], Michael Bahriz[2], Raffaele Colombelli[2], Laurent Diehl[3], Marko Loncar[3], Ben Lee[3], Federico Capasso[3]; [1]Caltech, USA, [2]Inst. d'Electronique Fondamentale, Univ. Paris-Sud, France, [3]Harvard Univ., USA.*

IWC4, **Experimental Observation of Surface Plasmon-Polariton Waves in Deep Trench Metal Waveguides,** *Yinon Satuby, Meir Orenstein; Technion-Israel Inst. of Technology, Israel.*

Modeling, Numerical Simulation and Theory

IME1, **A Flexible Concept for Compact Integrated Optical Functionality,** *Phillip Sewell, Carl Styan, Ana Vukovic, Trevor M. Benson; Univ. of Nottingham, United Kingdom.*

IME2, **FEM Simulation Assisted Stress Engineering for Polarization Control in SOI Waveguide Components,** *Dan-Xia Xu, W. N. Ye, P. Cheben, A. Delâge, S. Janz, B. Lamontagne, M. J. Picard, E. Post; Natl. Res. Council of Canada, Canada.*

ITuA1, **Developments in FDTD as Applied to Photonics,** *Geoffrey W. Burr; IBM Almaden Res. Ctr., USA.*

Modulators

ITuB5, **CMOS Photonics,** *Cary Gunn; Luxtera, USA.*

Opening Session

IMA1, **Plenary Presentation I,** *Yoshinori Hibino; NTT Photonics Labs, Japan.*

IMA2, **Plenary Presentation II,** *Modest Oprysko; IBM, USA.*

IMA3, **Plenary Presentation III,** *Henryk Temkin; DARPA, USA.*

Silicon or Other Group IV Waveguide Photonics

IMD1, **Design, Fabrication and Application of Three Dimensional Dispersion Engineered Photonic Crystal Devices,** *Dennis Prather, Zhaolin Lu, Janusz A. Murakowski, Shouyuan Shi, Garrett J. Schneider, Christopher A. Schuetz, Peng Yao, Bhargav S. Citla; Univ. of Delaware, USA.*

IMD2, **Optical Bistability Based on the Carrier Dispersion Effect in SOI Ring Resonators,** *Qianfan Xu, Michal Lipson; Cornell Univ., USA.*

IMF1, **High Speed, Low Driving Voltage, Hermetically Packaged Polymer Modulators and Their Applications,** *Raluca Dinu, Dan Jin, Timothy Parker, Diyun Huang, Mary Koenig; Lumera Corp., USA.*

ITuE1, **Ultrahigh Bandwidth InP Transmitter PICs,** *Peter Evans, Radha Nagarajan, Masaki Kato, Vince Dominic, Jacco Pleumeekers, Andrew Dentai, Sheila Hurtt, Johan Bäck, Damien Lambert, Mark Missey, Atul Mathur, Sanjeev Murthy, Randal Salvatore, Charles Joyner, Richard Schneider, Mehrdad Ziari, Jeffrey Bostak, Mike Kauffman, Huan-Shang Tsai, Michael Van Leeuwen, Alan Nilsson, Robert Taylor, Stephen Grubb, David Mehuys, Fred Kish, David Welch; Infinera, USA.*

ITuH1, **All-Optical Wavelength Conversion Based on Nonlinear Optical Effects in Si Wire Waveguides,** *Hiroshi Fukuda, Koji Yamada, Tai Tsuchizawa, Toshifumi Watanabe, Hiroyuki Shinojima, Sei-ichi Itabashi; Nippon Telegraph and Telephone Corp., Japan.*

IWA1, **Technology for Silica- and Silicon-based Integrated Optics,** *Lech Wosinski; Royal Inst. of Technology (KTH), Sweden.*

IWA6, **Functional Silicon Wire Waveguides,** *Dries Van Thourhout, W. Bogaerts, P. Dumon, G. Roelkens, J. Van Campenhout, R. Baets; Ghent Univ.--IMEC, Belgium.*

NANO Invited Speakers

JWA1, **To Be Announced,** *Yurii Vlasov; IBM, T.J. Watson Res. Ctr., USA.*

JWA2, **Mid-Infrared Silicon Raman Lasers,** *Barham Jalali, Varun Raghunathan, Ramesh Shori, Oscar M. Stafsudd; Univ. of California at Los Angeles, USA .*

NWA1, **All-Optical Control of Photonic Crystal Nanocavities,** *Masaya Notomi, E. Kuramochi, T. Tanabe, A. Shinya, H. Taniyama, S. Mitsugi; NTT Basic Res. Labs, Japan.*

NWA6, **Photonic Crystal Nanocavities Positioned and Tuned for Cavity-QED,** *Kevin Hennessy[1], Antonio Badolato[2], Mete Atatüre[2], Atac Imamoglu[2], Evelyn Hu[1]; [1]Univ. of California at Santa Barbara, USA, [2]ETH-Hönggerberg, Switzerland .*

NWB1, **S-FIL Patterning of Photonics Substrates with Photonic Crystal Structures,** *Chris Jones, David Wang, Dwayne LaBrake; Molecular Imprints Inc., USA.*

NWC1, **Directly-Pumped All-Silicon Laser,** *Sylvain G. Cloutier, Chih-Hsun Hsu, Jimmy Xu; Brown Univ., USA.*

NWC3, **Micro- and Nano-Optics in Surface Emitting Lasers,** *Eric Johnson, O. V. Smolski, J. K. O'Daniel, A. Mehta, K. Shavitranuruk, P. Srinivasan, M. G. Moharam; Univ. of Central Florida, USA.*

NThA1, **Effect of Loss or Gain on Guided Mode Resonant Devices,** *Andrew Greenwell, Sakoolkan Boonruang, M. G. Moharam; School of Optics/CREOL, USA.*

NThB1, **Nanophotonics for Information Systems Integration,** *Shaya Y. Fainman, K. Tetz, R. Rokitski, U. Levy, C. H. Tsai, C. H. Chen, L. Pang, M. Nezhad, H. C. Kim, M. Abashin; Univ. of California at San Diego, USA.*

NThB6, **Strategies for Employing Surface Plasmons in Near-Field Optical Readout Systems,** *Greg Gbur; Univ. of North Carolina at Charlotte, USA.*

NThC1, **To Be Announced,** *David Carroll; Wake Forest Univ., USA.*

NThD1, **A Local View of Slow Light in Nanophotonic Structures,** *L. Kobus Kuipers; FOM Inst. for Atomic and Molecular Physics, The Netherlands.*

NFA1, **Plasmonics--The New Wave of Chipscale Technologies!?,** *Mark Brongersma, Rashid Zia, Jon Schuler, Anu Chandran; Stanford Univ., USA.*

NFB1, **Metamaterial Nanocircuits in Optics,** *Nader Engheta; Univ. of Pennsylvania, USA.*

NFC1, **Microstructured and Nanostructured Fibers,** *Jonathan Knight, F. Luan, A. Wang, A. Cerqueira S. Jr.; Univ. of Bath, United Kingdom.*

Agenda of Sessions

Monday, April 24, 2006

Time	Event	Location
8:00 a.m.–10:00 a.m.	**IMA** • IPRA Opening Session	*Salon C2*
10:00 a.m.–10:30 a.m.	Coffee Break	*Salon C1*
10:30 a.m.–12:15 p.m.	**IMB** • Low Index Contrast Devices	*Salon B2*
10:30 a.m.–12:30 p.m.	**IMC** • Modeling/Design of Active/Passive Devices	*Salon C2*
2:00 p.m.–3:30 p.m.	**IMD** • Microphotonics	*Salon B2*
2:00 p.m.–3:30 p.m.	**IME** • Modeling of Waveguide Devices	*Salon C2*
3:30 p.m.–4:00 p.m.	Coffee Break	*Salon C1*
4:00 p.m.–5:30 p.m.	**IMF** • Polymer Devices I	*Salon B2*
4:00 p.m.–5:15 p.m.	**IMG** • Silica and Silicon Devices I	*Salon C2*

Tuesday, April 25, 2006

Time	Event	Location
8:00 a.m.–9:30 a.m.	**ITuA** • Numerical Methods	*Salon B2*
8:00 a.m.–10:00 a.m.	**ITuB** • Modulators	*Salon C2*
10:00 a.m.–10:30 a.m.	Coffee Break/Exhibits	*Salon C1*
10:30 a.m.–12:45 p.m.	**ITuC** • Active and Compound Semiconductor Devices	*Salon B2*
10:30 a.m.–12:00	**ITuD** • Polymer Devices II	*Salon*

p.m.		*C2*
2:00 p.m.–3:30 p.m.	**ITuE** • Sources	*Salon B2*
2:00 p.m.–3:30 p.m.	**ITuF** • Modeling/Design of Fibers	*Salon C2*
3:30 p.m.–4:00 p.m.	Coffee Break/Exhibits	*Salon C1*
4:00 p.m.–5:30 p.m.	**ITuG** • Integration and Isolators	*Salon B2*
4:00 p.m.–5:30 p.m.	**ITuH** • Silica and Silicon Devices II	*Salon C2*
5:30 p.m.–7:30 p.m.	IPRA Reception	*Salon D2/3*

Wednesday, April 26, 2006

Time	Event	Location
8:00 a.m.–10:00 a.m.	**JWA** • Joint Session on Frontiers in Ultrasmall Photonic Devices	*Salon C2*
10:00 a.m.–10:30 a.m.	Coffee Break/Exhibits	*Salon C1*
10:30 a.m.–12:30 p.m.	**IWA** • Silica and Silicon Devices III	*Salon B2*
10:30 a.m.–12:30 p.m.	**IWB** • Modeling/Design of Resonant Devices	*Salon C2*
10:30 a.m.–12:30 p.m.	**NWA** • Photonic Crystals I	*Salon B1*
2:00 p.m.–3:30 p.m.	**IWC** • Photonic Crystal and Plasmon Devices	*Salon B2*
2:00 p.m.–3:30 p.m.	**NWB** • Photonic Crystals II	*Salon B1*
3:30 p.m.–4:00 p.m.	Coffee Break/Exhibits	*Salon C1*
4:00 p.m.–5:15 p.m.	**NWC** • Sources	*Salon B1*
5:30 p.m.–7:00 p.m.	**JWB** • Joint IPRA/NANO Poster Session	*Salon B2*

Thursday, April 27, 2006

Time	Event	Location
8:30 a.m.–10:00 a.m.	**NThA** • Diffractive and Subwavelength Optics	*Salon C2*
10:00 a.m.–10:30 a.m.	Coffee Break/Exhibits	*Salon C1*
10:30 a.m.–12:30 p.m.	**NThB** • Plasmonics and Metamaterials I	*Salon C2*
2:00 p.m.–3:30 p.m.	**NThC** • Nanomaterials	*Salon C2*
3:30 p.m.–4:00	Coffee Break/Exhibits	*Salon C1*

p.m.		
4:00 p.m.–5:00 p.m.	**NThD** • Nanomeasurement and Nanometrology	*Salon C2*
5:00 p.m.–7:00 p.m.	NANO Reception	*Salon A1*

Friday, April 28, 2006

Time	Event	Location
8:00 a.m.–10:00 a.m.	**NFA** • Plasmonics and Metamaterials II	*Salon C2*
10:00 a.m.–10:30 a.m.	Coffee Break	*Salon C1*
10:30 a.m.–12:15 p.m.	**NFB** • Plasmonics and Metamaterials III	*Salon C2*
2:00 p.m.–3:30 p.m.	**NFC** • Photonic Crystal Fibers	*Salon C2*

Publications

Conference Program

The printed 2006 BIOMED Conference Program will contain general program information and abstracts of the paper summaries. At the meeting, each registrant will receive a copy of the printed Conference Program. Extra copies can be purchased at the meeting for US $100.

Technical Digest

The 2006 BIOMED Technical Digest on CD-ROM will contain PDFs of paper summaries presented during the meeting as they were submitted by the authors. At the meeting, each registrant will receive a copy of the Technical Digest on CD-ROM. Extra copies can be purchased at the meeting for US$ 100.

Program Agenda

Monday, April 24, 2006		
8:00 a.m.–10:00 a.m.	**IMA • IPRA Opening Session**	*Salon C2*
10:00 a.m.–10:30 a.m.	**Coffee Break/Exhibits**	*Salon C1*
10:30 a.m.–12:15 p.m.	**IMB • Low Index Contrast Devices**	*Salon B2*
10:30 a.m.–12:30 p.m.	**IMC • Modeling/Design of Active/Passive Devices**	*Salon C2*
2:00 p.m.–3:30 p.m.	**IMD • Microphotonics**	*Salon B2*
2:00 p.m.–3:30 p.m.	**IME • Modeling of Waveguide Devices**	*Salon C2*
3:30 p.m.–4:00 p.m.	**Coffee Break/Exhibits**	*Salon C1*
4:00 p.m.–5:30 p.m.	**IMF • Polymer Devices I**	*Salon B2*
4:00 p.m.–5:15 p.m.	**IMG • Silica and Silicon Devices I**	*Salon C2*
Tuesday, April 25, 2006		
8:00 a.m.–9:30 a.m.	**ITuA • Numerical Methods**	*Salon B2*
8:00 a.m.–10:00 a.m.	**ITuB • Modulators**	*Salon C2*
10:00 a.m.–10:30 a.m.	**Coffee Break/Exhibits**	*Salon C1*
10:30 a.m.–12:45 p.m.	**ITuC • Active and Compound Semiconductor Devices**	*Salon B2*
10:30 a.m.–12:00 p.m.	**ITuD • Polymer Devices II**	*Salon C2*
2:00 p.m.–3:30 p.m.	**ITuE • Sources**	*Salon B2*
2:00 p.m.–3:30 p.m.	**ITuF • Modeling/Design of Fibers**	*Salon C2*
3:30 p.m.–4:00 p.m.	**Coffee Break/Exhibits**	*Salon C1*
4:00 p.m.–5:30 p.m.	**ITuG • Integration and Isolators**	*Salon B2*
4:00 p.m.–5:30 p.m.	**ITuH • Silica and Silicon Devices II**	*Salon C2*
5:30 p.m.–7:30 p.m.	**IPRA Reception**	*Salon A2/3*
Wednesday, April 26, 2006		
8:00 a.m.–10:00 a.m.	**JWA • Joint Session on Frontiers in Ultrasmall Photonic Devices**	*Salon C2*
10:00 a.m.–10:30 a.m.	**Coffee Break/Exhibits**	*Salon C1*
10:30 a.m.–12:30 p.m.	**IWA • Silica and Silicon Devices III**	*Salon B2*
10:30 a.m.–12:30 p.m.	**IWB • Modeling/Design of Resonant Devices**	*Salon C2*
10:30 a.m.–12:30 p.m.	**NWA • Photonic Crystals I**	*Salon B1*
2:00 p.m.–3:30 p.m.	**IWC • Photonic Crystal and Plasmon Devices**	*Salon B2*
2:00 p.m.–3:30 p.m.	**NWB • Photonic Crystals II**	*Salon B1*
3:30 p.m.–4:00 p.m.	**Coffee Break/Exhibits**	*Salon C1*
4:00 p.m.–5:15 p.m.	**NWC • Sources**	*Salon B1*
5:30 p.m.–7:00 p.m.	**JWB • Joint IPRA/NANO Poster Session**	*Salon B2*
Thursday, April 27, 2006		
8:30 a.m.–10:00 a.m.	**NThA • Diffractive and Subwavelength Optics**	*Salon C2*
10:00 a.m.–10:30 a.m.	**Coffee Break/Exhibits**	*Salon C1*
10:30 a.m.–12:30 p.m.	**NThB • Plasmonics and Metamaterials I**	*Salon C2*
2:00 p.m.–3:30 p.m.	**NThC • Nanomaterials**	*Salon C2*
3:30 p.m.–4:00 p.m.	**Coffee Break/Exhibits**	*Salon C1*
4:00 p.m.–5:00 p.m.	**NThD • Nanomeasurement and Nanometrology**	*Salon C2*
5:00 p.m.–7:00 p.m.	**NANO Reception**	*Salon A1*
Friday, April 28, 2006		
8:00 a.m.–10:00 a.m.	**NFA • Plasmonics and Metamaterials II**	*Salon C2*
10:00 a.m.–10:30 a.m.	**Coffee Break/Exhibits**	*Salon C1*
10:30 a.m.–12:15 p.m.	**NFB • Plasmonics and Metamaterials III**	*Salon C2*
2:00 p.m.–3:30 p.m.	**NFC • Photonic Crystal Fibers**	*Salon C2*

Notes

Abstracts

●Sunday, April 23, 2006●

Uncas Ballroom Foyer
3:00 p.m.–6:00 p.m.
Registration Open

●Monday, April 24, 2006●

Uncas Ballroom Foyer
7:00 a.m.–5:00 p.m.
Registration Open

IMA • IPRA Opening Session

Salon C2
8:00 a.m.–10:00 a.m.
IMA • IPRA Opening Session
Robert Scarmozzino; RSoft Inc., USA, Presider

IMA1 • 8:00 a.m. **●Invited●**
Plenary Presentation I, *Yoshinori Hibino; NTT Photonics Labs, Japan.*

IMA2 • 8:40 a.m. **●Invited●**
Plenary Presentation II, *Modest Oprysko; IBM, USA.*

IMA3 • 9:20 a.m. **●Invited●**
Plenary Presentation III, *Henryk Temkin; DARPA, USA.*

Salon C1
10:00 a.m.–10:30 a.m.
Coffee Break/Exhibits

IMB • Low Index Contrast Devices

Salon B2
10:30 a.m.–12:15 p.m.
IMB • Low Index Contrast Devices
Mark Earnshaw; Lucent Technologies, USA, Presider

IMB1 • 10:30 a.m. **●Invited●**
Advances in PLC Technology for Wavelength Routing Applications, *Robert Brainard, Barthelemy Fondeur, David J. Dougherty; JDS Uniphase, USA.* Design advances have dramatically improved the performance of Planar Lightwave Circuit (PLC) Reconfigurable Optical Add-Drop Multiplexers (ROADM). Methods used to reduce insertion loss, widen filter passbands, and improve chip yields will be discussed.

IMB2 • 11:00 a.m. **●Invited●**
Silicon as a Platform for Photonics Integration, *Jean-Louis Malinge; Kotura, Inc., USA.* No Abstract Provided

IMB3 • 11:30 a.m.
Compact Arrayed-Waveguide Grating Using Air Trench and High Mesa Structures, *Tom Y. Fan, Jiro Ito, Takanori Suzuki, Hiroyuki Tsuda; Keio Univ., Japan.* Compact arrayed-waveguide grating (AWG) with small bend waveguides using air trench and high mesa structures was proposed. The 8-channel, 100-GHz-spacing silica AWG was fabricated and the size was about 1/4 of the conventional AWG.

IMB4 • 11:45 a.m.
Novel Deep Glass Etched Microring Resonators Based on Silica-on-Silicon Technology, *Haiyan Ou[1], Karsten Rottwitt[1], Hugh Philipp[2]; [1]COM Ctr., Univ. of Denmark, Denmark, [2]Cornell Univ., USA.* Microring resonators fabricated in silica-on-silicon technology using deep glass etching are demonstrated. The fabrication procedures are introduced and the transmission spectrum of a resonator is presented.

IMB5 • 12:00 p.m.
Anomalous Birefringence in Annealed Si-Rich Silicon Dioxide, *Michael A. Stolfi[1], Luca Dal Negro[1], Jurgen Michel[1], Xiaoman Duan[1], Lionel C. Kimerling[1], John Haavisto[2]; [1]MIT, USA, [2]Charles Stark Draper Lab, USA.* We have observed a large birefringence of 0.039 in annealed Si-rich SiO_2 thin films deposited on silica substrates. The birefringence is correlated with the light emission and structural properties of the films.

IMC • Modeling/Design of Active/Passive Devices

Salon C2
10:30 a.m.–12:30 p.m.
IMC • Modeling/Design of Active/Passive Devices
Janet L. Jackel; Telcordia Technologies, Inc, USA, Presider

IMC1 • 10:30 a.m. **●Invited●**
Three-Arm Mach-Zehnder Interferometers, *Andrea Melloni[1], G. Cusmai[2], R. Costa[2], F. Morichetti[2], M. Martinelli[2]; [1]Politecnico di Milano, Italy, [2]CoreCorn, Italy.* Integrated-optical Mach-Zehnder with three arms own remarkable and attractive properties for applications in both linear and nonlinear field. Robustness, compactness, optical performances and flexibility are improved at expense of a small increase of circuit complexity.

IMC2 • 11:00 a.m.
Second Harmonic Generation of Surface Plasmon Polaritons Scattered by Metallic Nanostructures, *Lina Cao, Nicolae C. Panoiu, Richard M. Osgood; Columbia Univ., USA.* We study the linear and nonlinear scattering of surface plasmons by metallic nanostructures. In both cases, we determined both the near-field distribution of the electromagnetic field as well as the characteristics of the emitted radiation.

IMC3 • 11:15 a.m.
All-Optical Switching in Waveguides Using Spatial EIT Concepts, *Pavel Ginzburg, Meir Orenstein; Technion, Israel.* Three variations of all-optical waveguide switches are presented, all based on spatial arrangements inspired by EIT concepts. By employing only linear effects, control of an optical signal is achieved with indefinitely weak optical gate.

IMC4 • 11:30 a.m.
Realization of High Mode Confinement in Nanometer Thin Low-Index Media by Multiple Stacked Slot Waveguides, *Ning-Ning Feng, Jurgen Michel, Lionel C. Kimerling; Materials Processing Ctr., MIT, USA.* A multiple stacked slot waveguide structure is proposed for realizing high optical mode confinement in nanometer thin low-index media. A 45% confinement factor has been achieved in 250nm wide and 5nm thin multiple low-index layers.

IMC5 • 11:45 a.m.
Conversion of a Signal Wavelength in a Dynamically Tuned Resonator, *Stefan F. Preble, Michal Lipson; Cornell Univ., USA.* We show that the wavelength of light confined in a resonator can be controlled with a linear change of the refractive index in a time shorter than the cavity lifetime.

IMC6 • 12:00 p.m.
A Unified Device Model for Carrier Dispersion Based Si Waveguide Modulators with Different Core Sizes, *Dawei Zheng, Cheng-chih Kun, Hongbing Lei, Hong Liang, Joan Fong, B. T. Smith; Kotura, Inc., USA.* Proper Shockley-Read-Hall carrier lifetime and interfacial recombination velocity values were introduced to model Si waveguide modulators of two different core sizes. Comparison with the common approach of introducing an effective carrier lifetime was made.

IMC7 • 12:15 p.m.
Nano Modes of Metal Wedge Guided Plasmon Polaritons, *Eyal Feigenbaum, Meir Orenstein; Technion, Israel.* Optical plasmon-polariton modes confined in both transverse dimensions to significantly less than wavelength are exhibited in open waveguides structured as sharp metal wedges. Novel analysis presents wedge modes distinct in field distribution and dispersion.

IMD • Microphotonics

Salon B2
2:00 p.m.–3:30 p.m.
IMD • Microphotonics
Jurgen Michel; MIT, USA, Presider

IMD1 • 2:00 p.m. **•Invited•**
Design, Fabrication and Application of Three Dimensional Dispersion Engineered Photonic Crystal Devices, *Dennis Prather, Zhaolin Lu, Janusz A. Murakowski, Shouyuan Shi, Garrett J. Schneider, Christopher A. Schuetz, Peng Yao, Bhargav S. Citla; Univ. of Delaware, USA.* Three-dimensional self-collimation and subwavelength-imaging by full 3D negative refraction were experimentally demonstrated by 3D dispersion engineering. The experiment realized microwave electromagnetic trapping and manipulation of neutral particles using the full 3D negative-refraction flat lens.

IMD2 • 2:30 p.m. **•Invited•**
Optical Bistability Based on the Carrier Dispersion Effect in SOI Ring Resonators, *Qianfan Xu, Michal Lipson; Cornell Univ., USA.* We measure optical bistability in a micron-size silicon ring resonator based on the free-carrier dispersion effect in silicon. Optical transfer function of the resonator shows hysteresis loop with less than 10 mW input optical power.

IMD3 • 3:00 p.m.
Nonreciprocal Micro-Ring Resonator for the Miniaturization of Optical Waveguide Isolators, *Naoya Kono, Masanori Koshiba; Graduate School of Information Science and Technology, Hokkaido Univ., Japan.* By introducing nonreciprocal phase shifts into a micro-ring resonator, we propose a new design for the miniaturization of optical waveguide isolators. The operation of this nonreciprocal device is demonstrated by using a finite element method.

IMD4 • 3:15 p.m.
Sub-Wavelength Mode Volumes in Silicon Optical Nanocavities, *Jacob T. Robinson, Stefan Preble, Michal Lipson; Cornell Univ., USA.* We demonstrate a reduction of effective mode volume to the order of 0.01 $(\lambda/2n)^3$ using dielectric discontinuities that enhance the local electric field in Silicon optical nanocavities.

IME • Modeling of Waveguide Devices

Salon C2
2:00 p.m.–3:30 p.m.
IME • Modeling of Waveguide Devices
Otto Schwelb; Concordia Univ, Canada, Presider

IME1 • 2:00 p.m. **•Invited•**
A Flexible Concept for Compact Integrated Optical Functionality, *Phillip Sewell, Carl Styan, Ana Vukovic, Trevor M. Benson; Univ. of Nottingham, UK.* A methodology for the design of functional integrated optical components is presented. Parallel Genetic Algorithm optimisation of a multiple scattering model is used to produce desired functional elements tailored to a given specification.

IME2 • 2:30 p.m. **•Invited•**
FEM Simulation Assisted Stress Engineering for Polarization Control in SOI Waveguide Components, *Dan-Xia Xu, W. N. Ye, P. Cheben, A. Delâge, S. Janz, B. Lamontagne, M. J. Picard, E. Post; Natl. Res. Council of Canada, Canada.* We review the use of cladding stress to control the polarization properties in SOI waveguide components. Simulation and experimental results on polarization-independent AWGs and ring resonators, as well as polarization splitter and filters are presented.

IME3 • 3:00 p.m.
3D Analysis of Plasmonic Waveguides Using a Fourth-Order Accurate Finite Difference Subsampling Technique, *Bobo Hu, Phillip Sewell, James G. Wykes, Ana Vukovic, Jun Jun Lim, Trevor M. Benson; George Green Inst. for Electromagnetics Res., Univ. of Nottingham, UK.* A fourth order accurate finite-difference subsampling technique is newly developed to analyze the 3D nanoscale plasmonic waveguide, and its advantages in computational efficiency and accuracy are validated through comparison with several conventional techniques.

IME4 • 3:15 p.m.
Analysis of a Surface Plasmon Resonance Waveguide Sensor Using the BPM with the Complex Padé Approximant, *Jun Shibayama, Taichi Takeuchi, Tomohide Yamazaki, Junji Yamauchi, Hisamatsu Nakano; Hosei Univ., Japan.* A Kretschmann-type surface plasmon resonance waveguide sensor is analyzed using the BPM with the complex Pade approximant. The maximum absorption wavelength increases by 13 nm, when the analyte refractive index is increased by 0.004 units.

Salon C1
3:30 p.m.–4:00 p.m.
Coffee Break/Exhibits

IMF • Polymer Devices I

Salon B2
4:00 p.m.–5:30 p.m.
IMF • Polymer Devices I
Richard W. Ridgway; Optimer Photonics, Inc., USA, Presider

IMF1 • 4:00 p.m. **•Invited•**
High Speed, Low Driving Voltage, Hermetically Packaged Polymer Modulators and Their Applications, *Raluca Dinu, Dan Jin, Timothy Parker, Diyun Huang, Mary Koenig; Lumera Corp., USA.* We report on Vπ around 1.5 V achieved in hermetically packaged devices fabricated with an advanced EO polymer core, on RF data up to 40GHz, and extinction ratio data at voltages as low as 0.25V.

IMF2 • 4:30 p.m.
Four-Waveguide Variable Optical Attenuator, *David Nippa, Steven Risser, Melissa Dixon, Richard Higgins, Dirk Schoellner, Louis Vassy; Optimer Photonics, Inc., USA.* A liquid-crystal electrooptic top cladding material is placed over a silica waveguide to form a 4 mm-long variable optical attenuator that provides 15 dB extinction, 4 ms response time, and less than 1 dB PDL.

IMF3 • 4:45 p.m.
Polymer-Silica Hybrid 1 x 2 Thermooptic Switch with Low Crosstalk, *Dong-Min Yeo, Sang-Yung Shin; Korea Advanced Inst. of Science and Technology, Republic of Korea.* A new polymer-silica hybrid thermooptic switch with a significantly low crosstalk is demonstrated. The refractive indexes of polymer and silica vary in the opposite direction with temperature. Using this characteristics, we reduce the crosstalk.

IMF4 • 5:00 p.m.
Fully-Integrated 4-Bit True Time Delay Module Using Polymer Optical Switches and Waveguide Delay Lines, *Xiaolong Wang[1], Brie Howley[1], Maggie Y. Chen[2], Panoutsopoulos Basile[3], Ray T. Chen[1]; [1]Univ. of Texas at Austin, USA, [2]Omega Optics, USA, [3]Naval Undersea Warfare Ctr., USA.* A fully-integrated 4-bit true time delay module using polymer waveguide switches and delay lines is proposed. The module achieves small phase errors less than 0.75°, 120nm optical bandwidth and low power consumption of only 143mW.

IMF5 • 5:15 p.m.
A Compact and Fast Photonic True-Time-Delay Beamformer with Integrated Spot-Size Converters, *Francisco M. Soares, Fouad Karouta, E. J. Geluk, Johan Van Zantvoort, Meint Smit; Technical Univ. of Eindhoven, The Netherlands.* Spot-size converters, based on a vertical taper, have been successfully integrated with electro-optic MZI switches. A chip containing a matrix of switches has been fabricated. The fiber-chip coupling loss via the SSCs is 3.5 dB.

IMG • Silica and Silicon Devices I

Salon C2
4:00 p.m.–5:15 p.m.
IMG • Silica and Silicon Devices I
Siegfried Janz; Natl. Res. Council Canada, Canada, Presider

IMG1 • 4:00 p.m.
3-D Integrated Vernier Filters in Silicon, *Prakash Koonath, Tejaswi Indukuri, Bahram Jalali; Dept. of Electrical Engineering, Univ. of California at Los Angeles, USA.* Three-dimensionally integrated microdisk resonators have been employed to realize Vernier filters in Silicon. Cascaded configuration of vertically-coupled microdisk resonators with dissimilar radii increases the free spectral range of filters from 5.5 nm to 23 nm.

IMG2 • 4:15 p.m.
Large Diameter, CMOS-Manufacturable Photodetectors for over 2 Gbps Polymer Optical Fiber Applications, *Wojciech P. Giziewicz, Lionel C. Kimerling, Jurgen Michel; MIT, USA.* Lateral p-i-n photodetectors were fabricated in a CMOS-compatible process. The 200μm diameter devices had a bandwidth of 1.7 GHz, suitable for 2.5 Gbps operation. An unexpected illumination intensity dependance was observed and confirmed by simulation.

IMG3 • 4:30 p.m. **•Invited•**
Ultra-Low-Power Compact PLC-Based 40-Channel ROADM Subsystem, *Louay Eldada, Reinald Gerhardt, Junichiro Fujita, Antonije Radojevic, Tomoyuki Izuhara, Ali Malek; DuPont Photonics Tech., USA.* We propose a 40-channel ROADM subsystem based on polymer and silica planar lightwave circuits. It exhibits ultra-low power consumption and compact size, while meeting the requirements for high optical performance, high reliability, and low cost.

IMG4 • 5:00 p.m.
Waveguide Embedded in Silicon Inverse Opal, *Jang-Uk Lee, Kang-Hyun Baek, Chris Olson, Dong Myong Kim, Anand Gopinath; Univ. of Minnesota, USA.* Waveguides embedded in a Si-inverse opal, with a bandgap centered at 1.55 μm wavelength, have been simulated. Transmitted power spectrum and power loss calculations have been performed with different waveguide materials using the FDTD method.

●Tuesday, April 25, 2006●

Uncas Ballroom Foyer
7:30 a.m.–5:00 p.m.
Registration Open

ITuA • Numerical Methods

Salon B2
8:00 a.m.–9:30 a.m.
ITuA • Numerical Methods
G. Ronald Hadley; Sandia Natl. Labs, USA, Presider

ITuA1 • 8:00 a.m. **●Invited●**
Developments in FDTD as Applied to Photonics, *Geoffrey W. Burr; IBM Almaden Res. Ctr., USA.* The capabilities and limitations of the finite-difference time-domain (FDTD) method for modeling nanophotonic and plasmonic devices are reviewed. Straightforward modifications which can extend these capabilities and finesse limitations are discussed.

ITuA2 • 8:30 a.m.
Wide-Angle Beam Propagation Method Based on High-Accuracy Finite-Difference Formulas, *Hua Zhang[1], Ning-Ning Feng[2], Wei-Ping Huang[1]; [1]McMaster Univ., Canada, [2]MIT, USA.* It is demonstrated that the wide-angle beam propagation method based on the fourth-order finite-difference formula can provide accurate results for strongly guiding waveguides even with coarse grids, while keeping high efficiency.

ITuA3 • 8:45 a.m.
Analysis of Leaky Optical Waveguides Using Pseudospectral Methods, *Po-Jui Chiang, Hung-chun Chang; Natl. Taiwan Univ., Taiwan Republic of China.* The perfectly matched layers are incorporated into the full-vectorial multidomain pseudospectral waveguide mode solver for accurately determining the complex effective indices of leaky optical waveguides. Holey fibers are analyzed and compared with other methods.

ITuA4 • 9:00 a.m.
Discrete Reflectivity Minimized Layer for Truncating Unbounded Domains, *Ya Yan Lu; City Univ. of Hong Kong, Hong Kong Special Administrative Region of China.* The discrete reflectivity minimized layer (DRML) is a technique for terminating unbounded domains for numerical simulations of wave propagation problems. The DRML is designed for the discretized system directly based on minimizing the discrete reflectivity.

ITuA5 • 9:15 a.m.
A Finite Difference Mode Solver Based on Domain Decomposition, *Yue Xia Huang, Ya Yan Lu; City Univ. of Hong Kong, Hong Kong Special Administrative Region of China.* We develop a finite difference domain decomposition mode solver in connection with the Rayleigh Quotient Iteration. The required number of operations in each iteration is significantly reduced by the domain decomposition technique.

ITuB • Modulators

Salon C2
8:00 a.m.–10:00 a.m.
ITuB • Modulators
Steven Spector; MIT, USA, Presider

ITuB1 • 8:00 a.m.
Optical Modulation Using Depletion-Mode PN-Junctions in Thin Silicon-On-Insulator Waveguides, *Mark A. Webster, Robert M. Pafchek, Guhan Sukumaran, Thomas L. Koch; Lehigh Univ., USA.* We report on depletion-mode pn-junction based silicon optical modulation in thin silicon-on-insulator material. An effective index change of approximately -2E-5 was measured in a fabricated device and compared with simulations.

ITuB2 • 8:15 a.m.
Low Insertion Loss, High-Speed Silicon Electro-Optic Modulator Design, *Fuwan Gan, Franz X. Kärtner; MIT, USA.* A high-speed CMOS-compatible Mach-Zehnder electro-optic modulator with graded doping profile for minimum optical loss and maximum modulation speed is investigated, with operating frequency 32GHz, low insertion loss of 3dB and low figure of merit $V\pi L$=6Vmm.

ITuB3 • 8:30 a.m.
Ultra-Small Mach-Zehnder Interferometer Devices in Thin Silicon-on-Insulator, *Hua Zhang, Marco Gnan, Nigel P. Johnson, Richard M. De La Rue; Univ. of Glasgow, UK.* We report computational and experimental demonstration of Mach-Zehnder interferometers made in Silicon-on-Insulator material, with dimensions as small as 8x4.13 μm. Experimental observation of π phase-shift cancellation is achieved by controlling the asymmetry of the structure.

ITuB4 • 8:45 a.m.
Traveling-Wave High-Speed Silicon Modulator, *Dazeng Feng, Dawei Zheng, Tom Smith; Kotura Inc., USA.* We have designed a high-speed traveling-wave modulator on SOI by varying the depletion region of reverse biased p-n junctions. Both small-signal 3dB bandwidth and large-signal eye diagram simulations demonstrate NRZ signal modulation exceeding 40 Gbps.

ITuB5 • 9:00 a.m. **●Invited●**
CMOS Photonics, *Cary Gunn; Luxtera, USA.* Luxtera has integrated complete WDM transceivers within CMOS die under DARPA s EPIC program. Luxtera will discuss design details and measurements from a monolithic 40Gb transceiver. Modulator drivers and TIAs are integrated with the optical components.

ITuB6 • 9:30 a.m.
Electrically Tunable Chip-Scale Semiconductor Microdisk Phase Modulators, *Andrew Stapleton, Stephen Farrell, Louis Christen, Zhen Peng, Alan Willner, John O'Brien, Daniel Dapkus; Univ. of Southern California, USA.* We have demonstrated a 12-micron radius InP optical microdisk resonator functioning as a phase modulator in an external Mach-Zehnder interferometer. The device's small $V\pi$ characteristic make it attractive as a low power chip scale modulator.

ITuB7 • 9:45 a.m.
Design and Optimization of High-Speed Low-Drive Voltage GaAs/AlGaAs Substrate-Removed Electro-Optic Modulators, *Jae Hyuk Shin, Nadir Dagli; Univ. of California at Santa Barbara, USA.* Finite element simulations were made to optimize the design of high-speed substrate-removed GaAs/AlGaAs electro-optic modulators. The results indicate velocity matched 30 Ω modulators with 2.2 V-cm drive voltage and bandwidth larger than 40 GHz.

Salon C1
10:00 a.m.–10:30 a.m.
Coffee Break/Exhibits

ITuC • Active and Compound Semiconductor Devices

Salon B2
10:30 a.m.–12:45 p.m.
ITuC • Active and Compound Semiconductor Devices
Tetsuya Mizumoto; Tokyo Inst. of Tech., Japan, Presider

ITuC1 • 10:30 a.m. **●Invited●**
Photonic Integrated Devices for WDM Application, *Kazutoshi Kato, Hiroki Itoh, Yoshio Itaya; NTT Photonics Lab, Japan.* The integration of optical semiconductor devices such as lasers, photodetectors, wavelength multiplexers/demultiplexers and optical amplifiers/gates realizes the wavelength tunable function required for WDM systems. We describe several monolithic integrated devices being developed for WDM applications.

ITuC2 • 11:00 a.m. **•Invited•**

Using Polarization in the Integration of Optoelectronic Devices, *Jos van der Tol, U. Khalique, M. K. Smit; Eindhoven Univ. of Technology, Netherlands Antilles.* The development of integrated polarization converters permits the use of polarization for increasing the functionality of Photonic Integrated Circuits (PICs). In this paper one example, active/passive integration based on manipulation of polarization, is presented.

ITuC3 • 11:30 a.m. **•Invited•**

Monolithic Widely Tunable Packet Forwarding Chip in InP for All-Optical Label Switching, *Vikrant Lal, Milan Masanovic, David Wolfson, Greg Fish, Daniel Blumenthal; Univ. of California at Santa Barbara, USA.* In this paper, we describe a monolithically integrated tunable optical packet forwarding chip in InP. The chip consists of a differential Mach-Zehnder Interferometer SOA tunable 40 Gbps wavelength converter integrated with an electro-refractive modulator for 10 Gbps label modulation. Error free performance and dynamic forwarding of asynchronous variable length packets is reported.

ITuC4 • 12:00 p.m. **•Invited•**

High Side-Mode-Suppression-Ratio Sapphire-Bonded Photonic Crystal Laser under Continuous-Wave Operation, *Min-Hsiung Shih[1], Wan Kuang[1,2], Mahmood Bagheri[1], Adam Mock[1], San-Jun Choi[1], John D. O'Brien[1], P. Dan Dapkus[1]; [1]Dept. of Electrical Engineering/Electrophysics, Univ. of Southern California, USA, [2]Boise State Univ., USA.* Sapphire-bonded photonic crystal lasers were fabricated and characterized under room temperature continuous wave operation, and a side-mode-suppression-ratio of 28 dB was observed. Lasing modes and spectra agree with theoretical prediction from three-dimensional finite-difference time-domain method.

ITuC5 • 12:30 p.m.

10 Gb/s Monolithically Integrated, Photocurrent Driven Wavelength Converter with Widely Tunable SGDBR Laser and Optical Receiver, *Matthew N. Sysak, James W. Raring, Jonathon S. Barton, Matthew Dummer, Anna Tauke-Pedretti, Henrik N. Poulsen, Daniel J. Blumenthal, Larry A. Coldren; Univ. of California at Santa Barbara, USA.* A monolithically integrated photocurrent driven wavelength converter is fabricated and characterized. Bit-Error-Rate measurements at 10Gb/s show 1dB power penalties over 32nm with extinction ratios between 8.5-9.5dB. Input power is -11dBm and conversion efficiency is +13dB.

ITuD • Polymer Devices II

Salon C2
10:30 a.m.–12:00.pm..
ITuD • Polymer Devices II
Presider to Be Announced

ITuD1 • 10:30 a.m. **•Invited•**

Rare Earth Doped Polymeric Integrated Optical Devices, *E. Y. B. Pun; City Univ. of Hong Kong, Hong Kong Special Administrative Region of China.* Polymeric integrated optical components are attractive due to the material unique and distinct properties, and ease of processing. In this talk, the recent progress in rare earth doped polymeric waveguide devices will be described.

ITuD2 • 11:00 a.m.

Thermal Characteristics of Thin Film VCSELs for Fully Embedded Chip-to-Chip Guided-Wave Optical Interconnection, *Jinho Choi, Ray T. Chen; Univ. of Texas at Austin, USA.* The thermal characteristics of a thin film VCSEL are studied both theoretically and experimentally. The theoretical analysis of thermal via effects is performed to determine optimized thickness range of VCSEL for the fully embedded structure.

ITuD3 • 11:15 a.m.

Design, Fabrication and Integration of Micro/Nano-Scale Optical Waveguides and Devices for Optical Printed Circuit Board Application, *El-Hang Lee, S. G. Lee, B. H. O, S. G. Park; INHA Univ., Republic of Korea.* We present an overview of our work on the theory, design and fabrication of generic and application-specific optical printed circuit boards (O-PCBs) based on the miniaturization, interconnection and integration of micro-photonic devices.

ITuD4 • 11:30 a.m.

Photopolymer Waveguide to Fiber Coupling via 3D Direct-Write Lithography, *Charles D. Anderson, Robert R. McLeod, Matthew W. Grabowski, Amy C. Sullivan; Univ. of Colorado at Boulder, USA.* We demonstrate a novel fiber to waveguide coupling in which fiber ends are encapsulated in photopolymer and located by specialized microscopes. Optical waveguides are formed directly off of the fiber cores via 3D direct-write lithography.

ITuD5 • 11:45 a.m.

3D Direct-Write Waveguides in Diffusion Photopolymers, *Matthew W. Grabowski, Amy C. Sullivan, Robert R. McLeod; Univ. of Colorado, USA.* Three-dimensional direct-write lithography can be used to pattern waveguides into diffusion photopolymer using low-power CW lasers as an alternative to femtosecond writing in glass. We show that polymer chemistry permits significant control of waveguide shape.

ITuE • Sources

Salon B2
2:00 p.m.–3:30 p.m.
ITuE • Sources
James Coleman; Univ. of Illinois, USA, Presider

ITuE1 • 2:00 p.m. **•Invited•**

Ultrahigh Bandwidth InP Transmitter PICs, *Peter Evans, Radha Nagarajan, Masaki Kato, Vince Dominic, Jacco Pleumeekers, Andrew Dentai, Sheila Hurtt, Johan Bäck, Damien Lambert, Mark Missey, Atul Mathur, Sanjeev Murthy, Randal Salvatore, Charles Joyner, Richard Schneider, Mehrdad Ziari, Jeffrey Bostak, Mike Kauffman, Huan-Shang Tsai, Michael Van Leeuwen, Alan Nilsson, Robert Taylor, Stephen Grubb, David Mehuys, Fred Kish, David Welch; Infinera, USA.* We present a review of high-density, dense wavelength-division-multiplexed, photonic integrated circuits with aggregate data rates up to 400Gbit/s. We also discuss the tradeoffs in scaling these devices to higher channel counts and higher data rates.

ITuE2 • 2:30 p.m.

Active-Passive Component Integration on Quantum Dot Material--Extended Cavity Broad Area Quantum Dot Lasers, *Wei K. Tan[1], Catrina A. Bryce[1], John H. Marsh[2], Mikhail V. Maximov[3], Andrey G. Gladyshev[3], Sergey S. Mikhrin[4], Nikita Yu Gordeev[3]; [1]Univ. of Glasgow, UK, [2]Intense Ltd., UK, [3]A.F. Ioffe Inst., Polytechnicheskaya, Russian Federation, [4]NL Nanosemiconductor GmbH, Germany.* Integration of a passive waveguide within a quantum dot laser is demonstrated using quantum dot intermixing. The passive waveguide improves the farfield characteristics of the wide-stripe broad-area gain-guided laser.

ITuE3 • 2:45 p.m.

Coherently Controlled Time Delay Line and DFB Laser Based on a Single Electromagnetically Induced Photonic Band Gap Structure, *Seyed M. Sadeghi[1], Wei Li[2], Xun Li[1], Wei-Ping Huang[1]; [1]Dept. of Electrical and Computer Engineering, McMaster Univ., Canada, [2]Dept. of Chemical and Engineering Physics, Univ. of Platteville-Wisconsin, USA.* We utilize localized optical modes in electromagnetically induced photonic band gaps to propose a structure acting as a coherently controlled time delay line or DFB laser. These functionalities are controlled by a single infrared laser.

ITuE4 • 3:00 p.m.

Lasing Behavior of InAs Quantum Dot Micro-Cavities as a Function of Wavelength and Temperature, *Tian Yang[1], Samuel Lipson[2], Adam Mock[1], John D. O'Brien[1], Dennis G. Deppe[2]; [1]Univ. of Southern California, USA, [2]Univ. of Texas at Austin, USA.* The lasing threshold and slope efficiency of InAs quantum dot microdisks and photonic crystal L3 micro-cavities change as a function of lasing wavelength and temperature. We report on these dependencies and give explanations.

ITuE5 • 3:15 p.m.
Low Saturation Design of Nonlinear Electroabsorption Devices, *Yu Chen, Seyed M. Sadeghi, Wei-Ping Huang; McMaster Univ., Canada.* Low saturation power is the key to apply electroabsorption devices in optical signal processing. We show light-hole excitonic transition excited by optical transverse magnetic mode can reduce the saturation power by a factor of three.

ITuF • Modeling/Design of Fibers

Salon C2
2:00 p.m.–3:30 p.m.
ITuF • Modeling/Design of Fibers
Stefano Selleri; Univ. of Parma, Italy, Presider

ITuF1 • 2:00 p.m. **•Invited•**
Efficient 3D Finite Element Simulation of Fiber-Chip Coupling, *L. Zschiedrich[1,2], Reinhard Maerz[1], S. Burger[1], F. Schmidt[1]; [1]JCMwave GMBH, Germany, [2]Zuse Inst. Berlin, Germany.* A novel, finite element frequency-domain formulation for scattering problems is presented. It includes vectorial edge elements, adaptive discretization of the interior domain and of the perfectly matched layers, and allows for inhomogeneous exterior domains like waveguides. The advantages for ber-to-chip coupling problems will be demonstrated.

ITuF2 • 2:30 p.m.
Realization of Polarization-Independent Splitters Based on Highly-Birefringent Dual Core Photonic Crystal Fibers, *Kunimasa Saitoh, Nikolaos Florous, Masanori Koshiba; Hokkaido Univ., Japan.* We propose and numerically demonstrate the operation of a novel type of polarization-independent splitter based on photonic crystal fiber. The proposed splitter is an excellent candidate for performing wavelength de-multiplexing operation at 1.30μm and 1.55μm.

ITuF3 • 2:45 p.m.
Bent-Waveguide Modeling of Large-Mode-Area, Double-Clad Fibers for High-Power Lasers, *G. Ronald Hadley, Roger L. Farrow, Arlee V. Smith; Sandia Natl. Labs, USA.* We have developed analytical and numerical models to address propagation of light through bent fiber amplifiers, including the mode distortion that results from fiber bending, and changes in beam profile resulting from self-focusing.

ITuF4 • 3:00 p.m.
Step Index Holey Fiber for Ultra-Flattened Chromatic Dispersion, *J. P. da Silva[1,2], V. F. Rodriguez-Esquerre[2], H. E. Hernandez-Figueroa[2]; [1]CESET, Univ. of Campinas, Brazil, [2]DMO-FEEC, Univ. of Campinas, Brazil.* A novel concept to obtain ultra-flattened-chromatic-dispersion-optical-fibers by introducing a small air-hole at the core of a conventional-step-index-optical-fiber is presented. The proposed structure exhibits a simple geometry, and has been analyzed through a vectorial finite-element method.

ITuF5 • 3:15 p.m.
Fiber Vector Modesolver--Improvements to the Efficient 4x4 Matrix Method, *Steven R. A. Dods; Optiwave Systems, Canada.* A numerical technique for finding vector modes on cylindrical structures consisting of concentric layers of loss-less dielectric is implemented by the method of Yeh and Lindgren. This paper reports three improvements to this method.

Salon C1
3:30 p.m.–4:00 p.m.
Coffee Break/Exhibits

ITuG • Integration and Isolators

Salon B2
4:00 p.m.–5:30 p.m.
ITuG • Integration and Isolators
John O'Brien; Univ. of Southern California, USA, Presider

ITuG1 • 4:00 p.m. **•Invited•**
Waveguide Optical Isolator Integratable to Photonic Devices, *Tetsuya Mizumoto[1,2], Kazumasa Sakurai[1], Yuya Shoji[1], Hideki Saito[1]; [1]Tokyo Inst. of Tech., Japan, [2]OITDA, Japan.* We developed a technique of bonding magneto-optic garnets to III/V semiconductors for integrating an optical isolator with semiconductor photonic devices. Some approaches to realize an isolator with a laser diode will be presented.

ITuG2 • 4:30 p.m. **•Invited•**
Integrable Semiconductor Active Optical Isolators, *Hiromasa Shimizu; Univ. of Tokyo, Japan.* We have demonstrated semiconductor active waveguide optical isolators based on the nonreciprocal loss shift in semiconductor optical amplifier waveguides with ferromagnetic metals for monolithically integrable semiconductor waveguide optical isolators.

ITuG3 • 5:00 p.m.
TM-mode AlGaInAs/InP Amplifying Waveguide Optical Isolator with 12.7dB Isolation, *Wouter Van Parys[1], Dries Van Thourhout[1], Roel Baets[1], Beatrice Dagens[2], Jean Decobert[2], Odile Le Gouezigou[2], Dalila Make[2], Reinier Vanheertum[3], Liesbet Lagae[3]; [1]Dept. of Information Technology (INTEC), Ghent Univ.-IMEC, Belgium, [2]Alcatel Thales III-V Lab, France, [3]Interuniversitair Micro Electronica Centrum IMEC vzw, Belgium.* We present the development of a monolithically integratable optical isolator. The device is a semiconductor optical amplifier with magnetized ferromagnetic metal contact. 12.7dB isolation and optical transparency are demonstrated. The spectral dependence is studied.

ITuG4 • 5:15 p.m.
A Single Etch-Step Polarization Splitter on InP/InGaAsP with Increased Width Tolerance, *Luc M. Augustin[1], Jos J.G.M. van der Tol[1], Rabah Hanfoug[1], Wim de Laat[2], Michel van de Moosdijk[2], Meint K. Smit[1]; [1]COBRA Res. Inst., The Netherlands, [2]ASML, The Netherlands.* A novel passive polarization splitter is fabricated, based on a tapered directional coupler. Modal birefringence is employed to selectively couple one polarization. The fabricated device shows splitting ratio larger than 95% in agreement with simulations.

ITuH • Silica and Silicon Devices II

Salon C2
4:00 p.m.–5:30 p.m.
ITuH • Silica and Silicon Devices II
Michal Lipson; Cornell Univ., USA, Presider

ITuH1 • 4:00 p.m. **•Invited•**
All-Optical Wavelength Conversion Based on Nonlinear Optical Effects in Si Wire Waveguides, *Hiroshi Fukuda, Koji Yamada, Tai Tsuchizawa, Toshifumi Watanabe, Hiroyuki Shinojima, Sei-ichi Itabashi; Nippon Telegraph and Telephone Corp., Japan.* We present three types of all-optical wavelength converters using nonlinear optical effects in silicon wire waveguides. All converters use just a simple silicon wire and the optical power normally employed in telecommunications systems.

ITuH2 • 4:30 p.m.
Broad-Bandwidth Optical Amplification and Efficient Wavelength Conversion in Silicon Waveguides, *Mark A. Foster, Amy C. Turner, Jay E. Sharping, Bradley S. Schmidt, Michal Lispon, Alexander L. Gaeta; Cornell Univ., USA.* We use phase-matched four-wave mixing in appropriately designed silicon waveguides to demonstrate optical amplification over a 29 nm range and efficient wavelength conversion in the range from 1511 nm to 1591 nm.

ITuH3 • 4:45 p.m.
Picosecond Cross-Phase Modulation in Si Photonic Wire Waveguides, *I-wei Hsieh[1], Xiaogang Chen[1], Jerry I. Dadap[1], Nicolae C. Panoiu[1], Richard M. Osgood[1], Sharee J. McNab[2], Yurii A. Vlasov[2]; [1]Columbia Univ., USA, [2]IBM, USA.* We demonstrate strong cross-phase modulation in Si photonic wire waveguides using picosecond pulses. The tight optical confinement of wire waveguides enhances the nonlinearity, allowing a scheme for all-optical control of optical pulses.

ITuH4 • 5:00 p.m.
Predicaments in CW Operation of Silicon Raman Lasers and Amplifiers,
Dimitrios Dimitropoulos, Sasan Fathpour, Bahram Jalali; Dept. of Electrical Engineering, Univ. of California at Los Angeles, USA. We examine limitations of carrier removal with a p-n junction in Raman devices, namely, ineffectiveness at high optical intensities due to the applied field being screened, electrical heat dissipation and the possibility of thermal instability.

ITuH5 • 5:15 p.m.
Reflections in Silicon on Insulator (SOI) Waveguides and Ring Resonators,
Steven J. Spector, Theodore M. Lyszczarz, Michael W. Geis, Jung U. Yoon, Donna M. Lennon, Sandra J. Deneault; MIT Lincoln Lab, USA. Unwanted reflections in SOI waveguides are investigated. In a typical waveguide, 2.5 % of the propagation loss is actually being reflected backwards. Unless corrected, this leads to artifacts in the performance of ring resonator devices.

Salon A2/A3
5:30 p.m.–7:30 p.m.
IPRA Reception

●Wednesday, April 26, 2006●

Uncas Ballroom Foyer
7:00 a.m.–5:00 p.m.
Registration Open

JWA • Joint Session on Frontiers in Ultrasmall Photonic Devices

Salon C2
8:00 a.m.–10:00 a.m.
JWA • Joint Session on Frontiers in Ultrasmall Photonic Devices
Richard Osgood; Columbia Univ., USA, Presider

JWA1 • 8:00 a.m. **●Invited●**
To Be Announced, *Yurii Vlasov; IBM, TJ Watson Res. Ctr., USA.* No Abstract Provided

JWA2 • 8:30 a.m. **●Invited●**
Mid-Infrared Silicon Raman Lasers, *Barham Jalali, Varun Raghunathan, Ramesh Shori, Oscar M. Stafsudd; Univ. of California at Los Angeles, USA.* Silicon is arguably the best Raman medium for the mid-wave infrared spectrum. This new technology can expand the application space of silicon photonics beyond data communication and into biochemical sensing, laser medicine, and LIDAR.

JWA3 • 9:00 a.m.
Fabrication Control of the Resonance Frequencies of High-Index-Contrast Microphotonic Cavities, *Tymon Barwicz, Milos A. Popovic, Peter T. Rakich, Michael R. Watts, Franz X. Kaertner, Erich P. Ippen, Henry I. Smith; MIT, USA.* Microphotonic filters require precise control of the relative resonance frequencies of integrated dielectric micro-cavities. Using high-index-contrast microring resonators, we present, demonstrate, and analyze techniques allowing small and accurate corrections of resonance frequencies at fabrication.

JWA4 • 9:30 a.m. **●Invited●**
Quantum Cascade Photonic Crystal Microlasers for "Intra-Cavity" Mid-IR Spectroscopy of Biomolecules on a Chip, *Raviv Perahia[1], Kartik Srinivasan[1], Oskar Painter[1], Virginie Moreau[2], Michael Bahriz[2], Raffaele Colombelli[2], Laurent Diehl[3], Marko Loncar[3], Ben Lee[3], Federico Capasso[3]; [1]Caltech, USA, [2]Inst. d'Electronique Fondamentale, Univ. Paris-Sud, France, [3]Harvard Univ., USA.* The design and fabrication of quantum cascade photonic crystal surface emitting lasers in the mid infrared for intra-cavity spectroscopy and integration with microfluidic delivery is presented.

Salon C1
10:00 a.m.–10:30 a.m.
Coffee Break/Exhibits

IWA • Silica and Silicon Devices III

Salon B2
10:30 a.m.–12:30 p.m.
IWA • Silica and Silicon Devices III
Christi Madsen; Texas A&M Univ., USA, Presider

IWA1 • 10:30 a.m. **●Invited●**
Technology for Silica- and Silicon-Based Integrated Optics, *Lech Wosinski; Royal Inst. of Technology (KTH), Sweden.* This paper reviews silica-on-silicon and silicon-on-insulator fabrication technologies in application to wavelength-division multiplexing optical communication systems. Whereas SOS components are becoming commercially available, technology for high index contrast silicon-on-insulator devices is now under active research.

IWA2 • 11:00 a.m.
A Shallow-Etched Distributed-Grating Wavelength Demultiplexer in SOI, *Eric Bisaillon[1], Dan T. H. Tan[2], Jacques Laniel[1], Aju Jugessur[1], Lukas Chrostowski[2], Andrew G. Kirk[1]; [1]McGill Univ., Canada, [2]Univ. of British Columbia, Canada.* A shallow-etched, distributed grating is proposed as a wavelength demultiplexer. Modeling results predict up to 94% efficiency over a 120nm wavelength range. Early fabrication results, using electron-beam lithography and electron-cyclotron-resonance single-step etching, are presented.

IWA3 • 11:15 a.m.
Integrated Polarization Converter Made of Sputtered Inorganic Ta_2O_5 and Silica Sol-Gel Thin Films, *Thomas Mangeat[1], Ludovic Escoubas[1], Francois Flory[1], Marc De Micheli[2], Paul Coudray[3], Luc Roussel[1]; [1]Inst. Fresnel, France, [2]Moduloptic S.A., France, [3]KLOE SA, France.* A ridge waveguide technology, exhibiting high polarization dependency, is developed to fabricate a new efficient multi-section passive polarization rotator. Theoretical polarization conversion efficiency of 98% at 1.55 μm is expected with excess losses below 0.1dB.

IWA4 • 11:30 a.m.
Intensity and Polarization Modulation by Electrical Biasing of a Conductive Optical Waveguide, *Michael W. Geis, Steven J. Spector, Donna M. Lennon, Jung U. Yoon, Matthew E. Grein, Theodore M. Lyszczarz; MIT Lincoln Lab, USA.* Intensity and polarization modulation of 1.5 μm radiation in silicon waveguides is obtained by applying a bias voltage to the waveguide. Water absorption and surface states on the waveguide cause this effect.

IWA5 • 11:45 a.m.
Ultrafast Pulse Propagation in Dispersion Engineered Silicon Wires, *Xiaogang Chen[1], Nicolae C. Panoiu[2], Iwei Hsieh[1], Jerry Dadap[2], Richard M. Osgood[2]; [1]Dept. of Electrical Engineering, Columbia Univ., USA, [2]Dept. of Applied Physics, Columbia Univ., USA.* We present the first full theoretical study of femtosecond pulse propagation in silicon wires. Dispersion of the silicon wire can be engineered and lead to different pulse dynamics.

IWA6 • 12:00 p.m. **●Invited●**
Functional Silicon Wire Waveguides, *Dries Van Thourhout, W. Bogaerts, P. Dumon, G. Roelkens, J. Van Campenhout, R. Baets; Ghent Univ.--IMEC, Belgium.* We will demonstrate recent progress in Silicon nanowire based devices such as AWG's and lattice filters and show their performance is rapidly reaching a level useful for practical applications. Next we will show how the functionality of the passive nanowires can be improved by different approaches including heterogeneous integration with InP-based materials and different overlays such as liquid crystal and colloidal nanocrystals.

IWB • Modeling/Design of Resonant Devices

Salon C2
10:30 a.m.–12:30 p.m.
IWB • Modeling/Design of Resonant Devices
Andrea Melloni; Politecnico di Milano, Italys, Presider

IWB1 • 10:30 a.m. **●Invited●**
Advances in the Design of Microring-Based Photonic Devices, *Otto Schwelb; Concordia Univ, Canada.* Recent developments in the configuration, design principles and performance characteristics, but excluding advances in fabrication technology, of microring-based photonic devices will be described. Applications include filters, dispersion compensators, multiplexers, mirrors, interferometers and sensors.

IWB2 • 11:00 a.m.
Zero-n Photonic Band-Gaps in Binary Photonic Crystal Superlattices, *Nicolae C. Panoiu[1], Richard M. Osgood[1], Shuang Zhang[2], Steven R. J. Brueck[2]; [1]Columbia Univ., USA, [2]Univ. of New Mexico, USA.* We demonstrate that photonic superlattices of alternating layers with positive refractive index and photonic crystals with negative effective refractive index, present a photonic gap at frequencies where the spatial average of the refractive index vanishes.

IWB3 • 11:15 a.m.
Compact Micro Resonators with Etched Beam Splitters and Total Internal Reflection Mirrors, *Byungchae Kim, Nadir Dagli; Univ. of California at Santa Barbara, USA.* We propose etched beam splitters as input/output couplers for micro-resonators and analyze feasibility of this idea using numerical simulation. We investigate characteristics of compact add/drop filters using etched beam splitters and total internal reflection mirrors.

IWB4 • 11:30 a.m.
Optical Characterization of Planar Photonic Crystal Structures with Elliptically-Elongated Veins: A Generalized Fourier-Mathieu Multipole Expansion Technique, *Nikolaos J. Florous, Kunimasa Saitoh, Masanori Koshiba; Div. of Media and Network Technologies, Hokkaido Univ., Japan.* An efficient analytical approach based on an extension of the scattering-matrix technique is introduced for characterizing planar photonic crystal resonant-cavities composed of elliptical veins. Extensive numerical results for various configurations will be presented.

IWB5 • 11:45 a.m.
Fighting Mode-Profile Scattering Losses at Bragg Mirror Interfaces, *Philippe Velha[1], Philippe Lalanne[2], David Peyrade[1], Jean-Paul Hugonin[2], Jean-Claude Rodier[2], Emmanuel Hadji[3]; [1]Lab des Technologie de la Microélectronique, CNRS-CEA, France, [2]Inst. d'Optique CNRS, France, [3]Lab Silicium Nanoélectronique Photonique et Structure, DRFMC, CEA, France.* When a guided-wave impinges onto a Bragg mirror, a fraction of the light is not reflected and is radiated into the claddings. We present a conceptual tool and its experimental validation for removing these losses.

IWB6 • 12:00 p.m.
A Novel Beam Propagation Method for Solving Band Diagrams of Photonic Crystals, *Bang-Yan Lin[1], Chun-Hao Teng[2], Hung-chun Chang[1]; [1]Natl. Taiwan Univ., Taiwan Republic of China, [2]Natl. Cheng Kung Univ., Taiwan Republic of China.* A novel method using imaginary-axis beam propagation for solving the eigenvalue problem of photonic crystals is developed. The methodology is demonstrated by collaborating with a high-order numerical scheme on the calculation of band diagrams.

IWB7 • 12:15 p.m.
Analytical Analysis of Coupled-Ring Reflectors Based on Symmetry Arguments, *Nadir Dagli[1], Youngchul Chung[2]; [1]Univ. of California at Santa Barbara, USA, [2]Kwangwoon Univ., Republic of Korea.* The reflection coefficient for a coupled-ring reflector is derived using the superposition of symmetric and anti-symmetric modes and the transmission formula of the single ring resonator. Analytical expressions were found for single reflection peak condition.

NWA • Photonic Crystals I

Salon B1
10:30 a.m.–12:30 p.m.
NWA • Photonic Crystals I
Oskar Painter; Caltech, USA, Presider

NWA1 • 10:30 a.m. **•Invited•**
All-Optical Control of Photonic Crystal Nanocavities, *Masaya Notomi, E. Kuramochi, T. Tanabe, A. Shinya, H. Taniyama, S. Mitsugi; NTT Basic Res. Labs, Japan.* We recently achieved ultra-high-Q cavities in Si-photonic-crystal slabs, and applied photonic-crystal nanocavities for all-optical nonlinear control. This system leads to all-optical digital-processing chips and novel ways of dynamic controlling light, such as adiabatic wavelength conversion.

NWA2 • 11:00 a.m.
Superprism Effect: Physics, Modeling and Fabrication, *Wei Jiang, Li Wang, Xiaonan Chen, Yongqiang Jiang, Lanlan Gu, Ray T. Chen; Univ. of Texas at Austin, USA.* A general, rigorous theory of photonic crystal refraction is developed for both ordinary crystallographic surfaces and quasi-periodic surfaces. A wavelength demultiplexer is designed based on the superprism effect. Fabricated photonic crystals are presented.

NWA3 • 11:15 a.m.
Photonic-Crystal-Waveguide-Based Silicon Mach-Zehnder Modulators, *Lanlan Gu[1], Wei Jiang[2], Yongqiang Jiang[1], Xiaonan Chen[1], Ray Chen[1]; [1]Univ. of Texas at Austin, USA, [2]Omega Optics Inc., USA.* An ultra-compact photonic-crystal silicon Mach-Zehnder Modulator is proposed based on the plasma dispersion effects. Transient time response of the device is simulated using semiconductor device simulator MEDICI. An efficient optical modulation has been experimentally demonstrated.

NWA4 • 11:30 a.m.
Highly Tunable Waveguides and Bends Based on Graded Photonic Crystals, *Emmanuel Centeno, Kevin Vynck, David Cassagne; Groupe d'Etude des Semiconducteurs, France.* We present a general concept of graded photonic crystals, whose changes in the lattice periodicity curve the light at the micrometer scale. As an example, we provide a design for frequency-selective tunable bending.

NWA5 • 11:45 a.m.
Optimization of Diffractive Elements for Fabricating 3-D Photonic Crystals with Interference Lithography, *Markus E. Testorf[1], Thomas J. Suleski[2], Yi-Chen Chuang[2]; [1]Dartmouth College, USA, [2]Univ. of North Carolina at Charlotte, USA.* The formation of intensity patterns in three dimensions is considered as a method for fabricating photonic structures. Suitable optimization algorithms are discussed for designing diffractive elements to generate the required diffraction patterns.

NWA6 • 12:00 p.m. **•Invited•**
Photonic Crystal Nanocavities Positioned and Tuned for Cavity-QED, *Kevin Hennessy[1], Antonio Badolato[2], Mete Atatüre[2], Atac Imamoglu[2], Evelyn Hu[1]; [1]Univ. of California at Santa Barbara, USA, [2]ETH-Hönggerberg, Switzerland.* We use AFM nano-oxidation to spectrally tune photonic crystal (PC) cavity modes. This method can compensate for PC fabrication imperfections to restore polarization-undetermined photonic states useful for polarization-entangled quantum bits.

IWC • Photonic Crystal and Plasmon Devices

Salon B2
2:00 p.m.–3:30 p.m.
IWC • Photonic Crystal and Plasmon Devices
Presider to Be Announced

IWC1 • 2:00 p.m.
Sub-Wavelength Imaging of Light Confinement and Propagation in Soi Based Photonic Crystal Devices, *Benoit Cluzel[1], Loic Lalouat[2], Emmanuel Picard[1], Davy Gerard[2], Thomas Charvolin[1], Frederique de Fournel[2], Emmanuel Hadji[1]; [1]CEA Grenoble, France, [2]CNRS/LPUB, France.* A light source is coupled into photonic crystal devices and a near field optical probe is used to observe the electromagnetic field propagation and distribution at a sub-wavelength scale. Bloch modes are clearly observed.

IWC2 • 2:15 p.m.
Micro-Machining of DNA Linked 2D Colloidal Photonic Crystals Using a Nd:YAG Laser, *Ramazan Asmatulu, Sejong Kim, Robin Bright, Phillip Yu, Fotios Papadimitrakopoulos, Harris Marcus; Inst. of Materials Science, Univ. of Connecticut, USA.* DNA linked 2D colloidal photonic crystals were micromachined using a pulsed laser to creat controlled line defect and hexagonal shapes. 2D photonic crystals were initially self-assembled via 1.8 μm polystyrene microspheres on functionalized glass substrates.

IWC3 • 2:30 p.m.
Engineering Dispersive Properties of Polymer-Based Photonic Crystals, *Peng Yao, Shouyuan Shi, Caihua Chen, Ahmed Sharkawy, Eric Kelmelis, Dennis W. Prather; EM Photonics, USA.* We present practical lattice configurations and devices built from low-index polymers and detail our work in fabricating these devices. These techniques allow for the creation of a variety of novel PhCs for new applications areas.

IWC4 • 2:45 p.m. **(Invited)**
Experimental Observation of Surface Plasmon-Polariton Waves in Deep Trench Metal Waveguides, *Yinon Satuby, Meir Orenstein; Technion-Israel Inst. of Technology, Israel.* Modes of SPP waveguide based on a trench engraved in a thick (400nm) gold layer are experimentally demonstrated for the first time. The patterns and polarization are compared to slots and stripes waveguide plasmons.

IWC5 • 3:15 p.m.
Effect of Hole Diameter Inaccuracy on Tapers between Photonic-Crystal and Wire Waveguides, *Lorenzo Rosa, Matteo Foroni, Federica Poli, Annamaria Cucinotta, Stefano Selleri; Univ. of Parma, Italy.* The performance of tapered interfaces between photonic-crystal and wire-waveguides can be impaired by as much as 35% by diameter inaccuracies of the taper holes. The effect is studied for 2√3Λ- and 3√3Λ-size wire-waveguides.

NWB • Photonic Crystals II

Salon B1
2:00 p.m.–3:30 p.m.
NWB • Photonic Crystals II
Greg Nordin; Brigham Young Univ., USA, Presider

NWB1 • 2:00 p.m. •Invited•
S-FIL Patterning of Photonics Substrates with Photonic Crystal Structures, *Chris Jones, David Wang, Dwayne LaBrake; Molecular Imprints Inc., USA.* SFIL/R patterning has been used to pattern 100 nm photonic crystal structures on substrates commonly used in the photonics industry. A lithography process is demonstrated through hard mask patterning including on die patterned wafers.

NWB2 • 2:30 p.m.
Coherent Photonic Lattices Formed by Active Nanostructures, *Seyed M. Sadeghi, Xun Li, Wei-Ping Huang; Dept. of Electrical and Computer Engineering, McMaster Univ., Canada.* A coherently induced photonic lattice caused by interaction of a laser field with a periodic arrangement of active nanostructures is proposed. This suggests spatial modulation of regions exhibiting electromagnetically induced transparency with enhanced refractive indexes.

NWB3 • 2:45 p.m.
Study of the Quality Factor of Micropillar Cavity, *Guillaume Lecamp[1], Philippe Lalanne[1], Jean-Paul Hugonin[1], Spyros Varoutsis[2], Remy Braive[2], Stéphane Laurent[2], Aristide Lemaître[2], Gilles Patriarche[2], Isabelle Sagnes[2], Isabelle Robert-Philip[2], Izo Abram[2]; [1]Inst. d'Optique, CNRS, France, [2]Lab de Photonique et de Nanostructures, CNRS, France.* We study micropillar cavity and we show that their Q-factor can exhibit an oscillatory behavior. We provide an analysis of the physical mechanisms at the origin of these oscillations and a comparison with experimental measurements.

NWB4 • 3:00 p.m.
Slow Light Propagation in Waveguides with Strong Anisotropy, *Evgenii Narimanov, Leonid Alekseyev; Princeton Univ., USA.* We demonstrate slow light propagation in dielectric waveguides with strong anisotropy (epsilon_parallel > 0, epsilon_perp < 0).

NWB5 • 3:15 p.m.
Compact Arrayed Waveguide Grating Demultiplexers Based on Amorphous Silicon Nanowires, *Liu Liu[1,2,3], Daoxin Dai[2], Matteo Dainese[1,4], Lech Wosinski[1,3,5], Sailing He[2,6]; [1]Dept. of Microelectronics and Information Technology, Royal Inst. of Technology (KTH), Sweden, [2]Ctr. for Optical and Electromagnetic Res., Zhejiang Univ, China, [3]Joint Res. Ctr. of Photonics of the Royal Inst. of Technology (Sweden) and Zhejiang Univ. (China), China, [4]Replisaurus Technologies AB, Sweden, [5]Kista Photonics Res. Ctr., Stockholm, Sweden, [6]Div. of Electromagnetic Theory, Alfven Lab, Royal Inst. of Technology, Stockholm, Sweden.* A novel and flexible technology for ultra compact AWGs based on amorphous silicon nanowires is presented. A 4×4 AWG with a total dimension of 50×50μm was fabricated. 11nm channel spacing and -10dB crosstalk was obtained.

Salon C1
3:30 p.m.–4:00 p.m.
Coffee Break/Exhibits

NWC • Sources

Salon B1
4:00 p.m.–5:15 p.m.
NWC • Sources
Robert Magnusson; Univ. of Connecticut, USA, Presider

NWC1 • 4:00 p.m. •Invited•
Directly-Pumped All-Silicon Laser, *Sylvain G. Cloutier, Chih-Hsun Hsu, Jimmy Xu; Brown Univ., USA.* We report laser emission from novel nano-engineered all-silicon structures, originating from A-center mediated phononless (direct) recombination allowing the population inversion. TEM shows regions with high-density of structural defects, most likely responsible for the emission.

NWC2 • 4:30 p.m.
Nanotexturing in Ultraviolet Light-Emitting Diodes for Enhanced Light Extraction, *Thomas J. Suleski, Yi-Chen Chuang, D. Jeremy Spivey, Paolo Batoni, Edward B. Stokes; Univ. of North Carolina at Charlotte, USA.* We discuss the use of nanotextured surfaces to increase the light extraction efficiency of ultraviolet light emitting diodes (UV-LEDs). Design approaches, fabrication processes and challenges, and initial experimental results are discussed.

NWC3 • 4:45 p.m. •Invited•
Micro- and Nano-Optics in Surface Emitting Lasers, *Eric Johnson, O. V. Smolski, J. K. O'Daniel, A. Mehta, K. Shavitranuruk, P. Srinivasan, M. G. Moharam; Univ. of Central Florida, USA.* This paper investigates surface emitting lasers using nano- and micro-optics integration for spatial and spectral beam control. Specific results will be presented for beam shaping, anti-reflection coatings and intergrated-wavelength locking schemes for high power devices.

JWB • Joint IPRA/NANO Poster Session

Salon C1
5:30 p.m.–7:00 p.m.
JWB • Joint IPRA/NANO Poster Session

JWB1
Improved Interface Formulation for the Finite-Difference Time-Domain Simulation, *Yih-Peng Chiou; Graduate Inst. of Electro-Optical Engineering/Natl. Taiwan Univ., Taiwan Republic of China.* Interface conditions at an abrupt discontinuity are adopted for the FDTD simulation. The improved formulation is validated by measuring the spurious reflection from a matched layer, which is several order lower than the untreated scheme.

JWB2
On the Application of the Transfer Matrix Method to Integrated Optics Simulations, *Michaël Ménard, Andrew G. Kirk; McGill Univ., Canada.* We present an algorithm based on the transfer matrix method to calculate filter responses in integrated optical circuits. Its application to deep-etched Bragg mirrors is demonstrated and it is compared with other methods.

JWB3
Metal-Loaded TE/TM Polarization Splitter Consisting of Embedded Waveguides with Slightly Different Core Widths, *Tomohide Yamazaki, Hideaki Aono, Junji Yamauchi, Hisamatsu Nakano; Hosei Univ., Japan.* A TE/TM polarization splitter, in which the metal-loaded core is slightly widened, is analyzed using the beam-propagation method. An extinction ratio of > 25 dB is obtained at a wavelength of 1.55 μm.

JWB4
Study of Optical-Feedback Using an Integrated Laser-Modulator/Amplifier Device, *Xiaomin Jin[1], Alan Hsu[2], Shun-Lien Chuang[3]; [1]California Polytechnic State Univ., USA, [2]Sandia Natl. Labs, USA, [3]Univ. of Illinois at Urbana-Champaign, USA.* We study optical-feedback effects using an integrated laser-modulator/amplifier. Our experiment and theory are agree well and provide interesting results of feedback effects on optical spectrum, spatial-hole burning, the photon density profile, and the microwave modulation.

JWB5
Improvement of Insertion Loss and Temperature Dependence of Polymeric AWG, *Jong-Moo Lee[1], Yong-Soon Baek[1], Kwang-Ryong Oh[1], Hyung-Jong Lee[2]; [1]ETRI, Republic of Korea, [2]ChemOptics, Republic of Korea.* We present a 16-channel polymeric AWG on silicon substrate with insertion loss as low as 3.1dB, and a free-standing polymeric AWG with the temperature-dependent wavelength deviation as low as 0.1nm from 20 to 80°C.

JWB6
A 10 GBPS Interchip Optical Interconnection Module for Optical Circuit Board Application, *Hyun-Shik Lee, Shinmo An, S. G. Lee, B. H. O, S. G. Park, El-Hang Lee; Inha Univ., Republic of Korea.* We report on fabrication of a 10 Gbps optical interconnection module that can be used as optical printed circuit board (O-PCB) for CPU-and-memory optical interconnection to replace serialized electrical bus signal in a computer system.

JWB7
Photonic Crystal Wavelength Division Demultiplexing via Coupling through Variably-Sized Defect Cavities, *John W. Zeller, Faquir C. Jain; Univ. of Connecticut, USA.* A four-channel ~1.55 μm wavelength division demultiplexer utilizing a novel coupling mechanism involving resonant defect cavities in a two-dimensional photonic crystal is presented. Finite-difference time-domain simulations produced spectral peaks with 3.4 to 5.2 nm linewidths.

JWB8
Multi-Line Guided Mode Resonant Filters with Controlled Spectral Separation, *Sakoolkan Boonruang, Andrew Greenwell, M. G. Moharam; College of Optics and Photonics/CREOL, USA.* Two-dimensional guided mode resonant filter with multiple wavelength resonances is presented. Wide spectral separation between resonances up to 23% of the short resonant wavelength is achieved by modifying the grating periodicity and other physical dimensions.

JWB9
Modeling Photonic Crystal Fibers for Use in Quantum Cryptography Systems, *Aparicio Carranza[1], Casimer DeCusatis[2]; [1]New York City College of Technology, USA, [2]IBM Corp., USA.* In this paper, we report computer simulations of photonic crystal fibers and attempts to minimize their polarization mode dispersion. This is expected to improve performance of quantum cryptography systems.

JWB10
Study of Thermal and Optical Properties of SiO_2/GaN Opals by Photothermal Deflection Technique, *Grigore Leahu[1], Raffaella Ostuni[1], Enrico Tomaselli[1], Roberto Li Voti[1], Concita Sibilia[1], Mario Bertolotti[1], V. Golubev[2], D. A. Kurdyukov[2], Cefe Lopez[3]; [1]Univ. di Roma "La Sapienza", Italy, [2]Ioffe Physicothecnical Inst., Russian Acad. of Sciences, Russian Federation, [3]Inst. de Ciencia de Materiales de Madrid, Spain.* The thermal and optical properties of the SiO_2/GaN synthetic opals are studied by photothermal deflection technique. This technique, used in different configurations, allows to determine the effective thermal diffusivity and the absorption spectra.

●Thursday. April 27,2006●

Uncas Ballroom Foyer
7:30 a.m.–5:00 p.m.
Registration Open

NThA • Diffractive and Subwavelength Optics

Salon C2
8:30 a.m.–10:00 a.m.
NThA • Diffractive and Subwavelength Optics
Thomas J. Suleski; Univ. of North Carolina at Charlotte, USA, Presider

NThA1 • 8:30 a.m. **●Invited●**
Effect of Loss or Gain on Guided Mode Resonant Devices, *Andrew Greenwell, Sakoolkan Boonruang, M. G. Moharam; School of Optics/CREOL, USA.* Narrowband guided mode resonant (GMR) devices incorporating layers having a uniform gain or uniform loss are investigated. Resonances having enhanced reflection and transmission or enhanced absorption are observed for incorporated gain or loss layers respectively.

NThA2 • 9:00 a.m.
Gaussian-Beam Leaky-Mode Resonance in Strongly Modulated Waveguide Gratings, *S. M. Millett, Y. Ding, R. Magnusson; Univ. of Connecticut, USA.* The leaky-mode resonance properties of strongly modulated waveguide gratings under Gaussian beam incidence are numerically studied. The extent to which such broadband resonant filter elements effectively resonate narrow beams is quantified.

NThA3 • 9:15 a.m.
Semianalytical Formulation of Leaky-Mode Resonance in Periodic Elements with Asymmetric Profiles, *Y. Ding, R. Magnusson; Univ. of Connecticut, USA.* The properties of resonant leaky modes at the second stopband are investigated with a semianalytical model applicable to asymmetric-profile gratings. The dispersion properties and guided-mode resonance features are in excellent agreement with exact formulation.

NThA4 • 9:30 a.m.
Design, Fabrication and Characterization of Subwavelength Based Slab Lens in Silicon, *Uriel Levy[1], Maxim Abashin[1], Kazuhiro Ikeda[1], Chia-Ho Tsai[1], Yeshaiahu Fainman[1], Ashok Krishnamoorthy[2], John Cunningham[2]; [1]Univ. of California at San Diego, USA, [2]Sun Microsystems, USA.* We experimentally demonstrate a novel slab lens realized by etching 1-D subwavelength periodic structures into a Silicon slab. A graded index profile is achieved by gradually modifying the duty cycle of the structure.

NThA5 • 9:45 a.m.
Guided-Mode Resonance Elements Fabricated by Microcontact Printing Method, *K. J. Lee, R. Magnusson; Univ. of Connecticut, USA.* Guided-mode resonance devices fabricated by microcontact printing methods are described. This fabrication process using elastomeric molds and UV curable polymers is simple and cost-effective. Initial results provide resonant elements useful in sensor applications.

Salon C1
10:00 a.m.–10:30 a.m.
Coffee Break/Exhibits

NThB • Plasmonics and Metamaterials I

Salon C2
10:30 a.m.–12:30 p.m.
NThB • Plasmonics and Metamaterials I
Philippe Lalanne; Inst. d'Optique Théorique et Appliquée, France, Presider

NThB1 • 10:30 a.m. **●Invited●**
Nanophotonics for Information Systems Integration, *Shaya Y. Fainman, K. Tetz, R. Rokitski, U. Levy, C. H. Tsai, C. H. Chen, L. Pang, M. Nezhad, H. C. Kim, M. Abashin; Univ. of California at San Diego, USA.* We describe nanophotonic components and devices utilizing form birefringence, photonic crystals, surface plasmons and quantum dots. These devices can be integrated for realization of information systems for various applications.

NThB2 • 11:00 a.m.
Plasmonic Ultra-Confinement in Linear and Nonlinear Photonic Devices, *Eyal Feigenbaum, Meir Orenstein; Technion, Israel.* The "plasmonic" effect is harnessed for novel nano-components, encompassing ultra high confinement of light fields. The effect is exhibited for both dielectric cylinder and a nonlinear Kerr slab in between metal plates.

NThB3 • 11:15 a.m.
Resonator-Less Optical Memory in Nanoparticles, *Bruno F. Soares, Maxim Bashevoy, Kevin F. MacDonald, Fredrik Jonsson, Nikolay I. Zheludev; Univ. of Southampton, UK.* For the first time it is shown that nanoparticles undergoing a light-induced structural transformation are inheritably bistable, and we have demonstrated the complete cycle of all-optical writing, reading and erasing information in gallium nanoparticles.

NThB4 • 11:30 a.m.
Enhanced Raman Scattering in a 10 Attoliter Nanohole, *Jerome Wenger[1], Jose Dintinger[2], Nicolas Bonod[1], Evgueni Popov[1], Pierre-François Lenne[1], Thomas W. Ebbesen[2], Herve Rigneault[1]; [1]Inst. Fresnel CNRS, France, [2]ISIS, France.* We give the first report of Raman spectroscopy performed inside a single nanoaperture filled with a solution of Raman-active molecules and show a signal enhancement for a diameter-to-wavelength ratio close to the fundamental mode cut-off.

NThB5 • 11:45 a.m.
C-shaped Nano-Aperture-Enhanced Germanium Photodetector, *Liang Tang, David A. B. Miller, Ali K. Okyay, Joseph A. Matteo, Yin Yuen, Krishna C. Saraswat, Lambertus Hesselink; Stanford Univ., USA.* We present a C-shaped nano-aperture-enhanced Ge photodetector that shows 2~5 times photocurrent enhancement over that from a square aperture of the same area at 1310 nm. We demonstrate the polarization dependence of C aperture photodetector.

NThB6 • 12:00 p.m. **●Invited●**
Strategies for Employing Surface Plasmons in Near-Field Optical Readout Systems, *Greg Gbur; Univ. of North Carolina at Charlotte, USA.* We have undertaken a systematic theoretical study of several strategies for applying surface plasmon effects in a near-field optical readout system using an exact Green's tensor formulation. Advantages and disadvantages of each strategy are discussed.

NThC •Nanomaterials

Salon C2
2:00 p.m.–3:00 p.m.
NThC1 •Nanomaterials
Presider to Be Announced

NThC1 • 2:00 p.m. **●Invited●**
To Be Announced, *David Carroll; Wake Forest Univ., USA.* No Abstract Provided.

NThC2 • 2:30 p.m.
White Light Emissions from Complex Core-Shell Nanoparticles, *J. R. DiMaio, B. Kokuoz, J. Ballato; Clemson Univ., USA.* White light emissions are observed from rare-earth doped LaF_3 nanoparticles that possess core/multi-shell architectures. By engineering the thickness and distance between the shells that are individually doped, energy transfer and the cumulative emissions are controlled.

NThC3 • 2:45 p.m.
ZnCdSe-ZnSe Cladded Quantum Dots Using Photoassisted Microwave Plasma Enhanced Metalorganic Chemical Vapor Deposition for Lasers and Electroluminescent Phosphors, *Angel Rodriguez[1], Rongfu Li[1], Lauren Vitti[1], Prakash Yarlagadda[1], Fotis Papadimitrakopoulos[1], Wenli Huang[2], John Ayers[1], Faquir Jain[1]; [1]Univ. of Connecticut, USA, [2]US Military Acad., USA.* We have grown

pseudomorophic ZnCdSe-based cladded quantum dots in a novel reactor process. Photoluminescence and X-Ray diffraction data have been used to estimate dot dimensions. The optical gain was simulated using an excitonic model.

NThC4 • 3:00 p.m.
Anomalous Absorption of Silicon Nanocrystals in Silicon-Rich $SiO_{1.25}$ Matrix Precipitated by CO_2 Laser Annealing, *Chun-Jung Lin[1], Gong-Ru Lin[1], Yu-Lun Chueh[2], Li-Jen Chou[2]; [1]Dept. of Photonics and Inst. of Electro-Optical Engineering,Natl. Chiao Tung Univ., Taiwan Republic of China, [2]Dept. of Materials Science and Engineering, Natl. Tsing Hua Univ., Taiwan Republic of China.* The structural aspects, the luminescent and optical properties and localized synthesis of 4.2-5.6 nm-nc-Si in Si-rich $SiO_{1.25}$ film by a direct-writing CO_2 laser rapid-thermal-annealing at the ablation threshold intensity of 5.8 kW/cm² are demonstrated.

NThC5 • 3:15 p.m.
Enhanced Electroluminescence of Si-Rich SiO_x Based MOS Diode by Interfacial Precipitated Si Nano-Pyramids, *Chun-Jung Lin, Chi-Kuan Lin, Gong-Ru Lin; Dept. of Photonics and Inst. of Electro-Optical Engineering, Natl. Chiao Tung Univ., Taiwan Republic of China.* The interfacial Si nano-pyramid-enhanced electroluminescence of an ITO/SiO_x/p-Si/Al MOS diode is demonstrated with turn-on voltage, threshold current, output power, and lifetime of 50 V, 1.23 mA/cm², 30 nW, and 10 hrs, respectively.

Salon C1
3:30 p.m.–4:00 p.m.
Coffee Break/Exhibits

NThD • Nanomeasurement and Nanometrology

Salon C2
4:00 p.m.–5:00 p.m.
NThD • Nanomeasurement and Nanometrology
Jeff DiMaio; Clemson Univ., USA, Presider

NThD1 • 4:00 p.m. **•Invited•**
A Local View of Slow Light in Nanophotonic Structures, *L. Kobus Kuipers; FOM Inst. for Atomic and Molecular Physics, The Netherlands.* Local phase-sensitive and time-resolved measurements reveal the Bloch nature of light inside photonic crystal waveguides. Moreover, ultraslow light (speed < c/1000) is observed. Higher-order dispersion may be detrimental for slow light applications in photonic crystals.

NThD2 • 4:30 p.m.
Polarization Mode Coupling and Emitted Optical Fields in Apertureless Scanning Near-Field Optical Microscopy Probes, *Wataru Nakagawa[1], Luciana Vaccaro[1], Hans Peter Herzig[1], Christian Hafner[2]; [1]Inst. of Microtechnology, Switzerland, [2]Swiss Federal Inst. of Technology Zurich, Switzerland.* We investigate the effect of structured and quasi-random defects in the metal coating of apertureless microfabricated SNOM probes on polarization mode coupling in the probe and on the emitted optical fields using rigorous modeling tools.

NThD3 • 4:45 p.m.
Optical Surface Microscopy with a Moving Microsphere, *Misha Sumetsky, Yury Dulashko, David J. DiGiovanni; OFS Labs, USA.* We suggest, experimentally demonstrate and theoretically study a near field probe in the form of an optical microsphere resonator, which performs local surface sensing with whispering gallery modes.

Salon A1
5:00 p.m.–7:00 p.m.
NANO Reception

●Friday, April 28, 2006●

Uncas Ballroom Foyer
7:30 a.m.–3:00 p.m.
Registration Open

NFA • Plasmonics and Metamaterials II

Salon C2
8:00 a.m.–10:00 a.m.
NFA • Plasmonics and Metamaterials II
Nader Engheta; Univ. of Pennsylvania, USA, Presider

NFA1 • 8:00 a.m. **●Invited●**
Plasmonics--The New Wave of Chipscale Technologies!? *Mark Brongersma, Rashid Zia, Jon Schuler, Anu Chandran; Stanford Univ., USA.* Metallic nanostructures have received considerable attention for their ability to manipulate light at the nanoscale. Near-field optical measurements and electromagnetic simulations are presented that highlight the limitations and capabilities of such structures.

NFA2 • 8:30 a.m.
Optical Response of Nanostructured Surfaces: Experimental Investigation of the Composite Diffracted Evanescent Wave Model, *John Weiner[1], Guillaume Gay[1], Olivier Alloschery[1], Henri Lezec[2], Bruno Viaris de Lesegno[3], Colm O'Dwyer[4]; [1]Univ. Paul Sabatier, France, [2]Univ. Louis Pasteur, France, [3]Lab Aimé Cotton, France, [4]Tyndall Natl. Inst., Ireland.* We present here a series of measurements on very simple one-dimensional (1-D) subwavelength structures with the aim of testing key properties of the surface waves predicted by the plasmon polariton or diffracted wave models.

NFA3 • 8:45 a.m.
Surface Plasmon Generation at Nanoslit Apertures, *Philippe Lalanne, Jean-Paul Hugonin, Jean-Claude Rodier; Inst. d'Optique, CNRS, France.* We study the scattering of light by a single subwavelength slit in a real metal screen and provide a microscopic description of the excitation probability of surface plasmons at the slit apertures.

NFA4 • 9:00 a.m.
Polarization-Sensitive Extraordinary Transmission through Periodic Arrays of Crossed Nano-Slits Mediated by Local Surface Plasmons, *Ryan M. Roth[1], Nicolae C. Panoiu[1], Matthew M. Adams[1], Richard M. Osgood[1], John. B. Warren[2]; [1]Columbia Univ., USA, [2]Brookhaven Natl. Lab, USA.* We demonstrate the polarization-dependant, local-plasmon-enhanced transmission characteristics of light incident on a periodic array of customized, nanoscale cruciform patterns. These characteristics are simulated; the patterns are fabricated on Au and Ag films using electron-beam lithography.

NFA5 • 9:15 a.m.
Bloch-Mode Coupling to Analyze Periodic Slits in Metallic Film, *Yong Xie, Armis Zakharian, Jerome Moloney, Masud Mansuripur; Univ. of Arizona, USA.* We use Bloch modes to study the interaction between light and periodic structures by matching the tangential fields at the air-grating interface. Wood and surface plasmon anomalies are successfully predicted by this method.

NFA6 • 9:30 a.m.
Numerical Simulations of Plasmonic Transmission Lines, *Aloyse Degiron, David R. Smith; Duke Univ., USA.* We present simulations of plasmonic transmission lines consisting of metal strips embedded in dielectric media. Our numerical method is based on calculating the eigenmodes using a finite-element method as will be illustrated by several examples.

NFA7 • 9:45 a.m.
Spectral and Angular Response of Metal-Dielectric Nano-Cylinders, *Markus E. Testorf, Ursula J. Gibson; Dartmouth College, USA.* Numerical simulations are use to determine the optical response of nano-cylinders. The wavelength dispersion caused by plasmon resonances is investigated as the means to decouple the angular response of diffractive elements from their spectral response.

Salon C1
10:00 a.m.–10:30 a.m.
Coffee Break/Exhibits

NFB • Plasmonics and Metamaterials III

Salon C2
10:30 a.m.–12:15 p.m.
NFB • Plasmonics and Metamaterials III
Shaya Y. Fainman; Univ. of California at San Diego, USA, Presider

NFB1 • 10:30 a.m. **●Invited●**
Metamaterial Nanocircuits in Optics, *Nader Engheta; Univ. of Pennsylvania, USA.* Using the properties of metamaterials, we develop the concept of optical "lumped" nanocircuit elements, such as nanoinductors, nanocapacitors, and nanoresistors at optical wavelengths, and we extend this idea to more complex circuits forming near-field nanoelectronics.

NFB2 • 11:00 a.m.
Planar Dielectric Lens for 3D Imaging, *Leonid Alekseyev, Evgenii Narimanov; Princeton Univ., USA.* We demonstrate 3D imaging using a planar dielectric system based on strongly anisotropic dielectric material. The proposed planar dielectric lens is capable of subwavelength resolution and doesn't rely on either magnetic response or periodic patterning.

NFB3 • 11:15 a.m.
Reflection and Transmission at a Nonlinear Interface with Thin Transition Layer of Negative Index Material, *Ildar R. Gabitov[1], Natalia M. Litchinitser[2], Andrei I. Maimistov[3]; [1]Univ. of Arizona, USA, [2]Univ. of Michigan, USA, [3]Moscow Engineering Physics Inst., Russian Federation.* The effects of a sub-wavelength layer of negative index material (NIM) on transmission and reflection properties of light propagation through a nonlinear interface are investigated. Dispersion relations for multilayered structures incorporating NIMs are analyzed.

NFB4 • 11:30 a.m.
Left-Handed Modes and Effective Mode Length in Planar Metal-Clad Nanoscale Waveguides, *Orion Crisafulli, Jessie Rosenberg, Oskar Painter; Caltech, USA.* By calculating the global power flux and energy density of modes of a planar dielectric waveguide with metal cladding, we show that some modes exhibit left-handed behavior and effective mode lengths below the diffraction limit.

NFB5 • 11:45 a.m.
Magnetic Mirror on Optical Frequency, *Alexander S. Schwanecke[1], Yifang Chen[2], Vassili A. Fedotov[1], Vyacheslav V. Khardikov[3], Pavel L. Mladyonov[3], Sergey L. Prosvirnin[3], Alexandra V. Rogacheva[1], Nikolay I. Zheludev[1]; [1]EPSRC NanoPhotonics Portfolio Ctr., School of Physics and Astronomy, Univ. of Southampton, UK, [2]Central Microstructure Facility, Rutherford Appleton Lab, UK, [3]Inst. of Radio Astronomy and Kharkov Natl. Univ., Ukraine.* We report demonstration of an optical magnetic mirror achieved by nanostructuring a metal surface. In contrast to normal mirrors, it inflicts only small change to the phase of a reflected wave, offering intriguing applications.

NFB6 • 12:00 p.m.
Analysis of Hierarchy in Optical Near-Fields Based on Angular Spectrum Representation, *Makoto Naruse[1], Tetsuya Inoue[2], Hirokazu Hori[3]; [1]Natl. Inst. of Information and Communications Technology, Japan, [2]Yamanashi Industrial Technology College, Japan, [3]Univ. of Yamanashi, Japan.* Optical near-fields exhibit different behavior at different scales, which allows designs of hierarchical systems. Based on the angular spectrum representation, hierarchy in optical near-fields is theoretically analyzed and its application to memory retrievals are demonstrated.

NFC • Photonic Crystal Fibers

Salon C2
2:00 p.m.–3:30 p.m.
NFC • Photonic Crystal Fibers
Eric Johnson; Univ. of Central Florida, USA, Presider

NFC1 • 2:00 p.m. **•Invited•**
Microstructured and Nanostructured Fibers, *Jonathan Knight, F. Luan, A. Wang, A. Cerqueira S. Jr.; Univ. of Bath, UK.* The optical fiber drawing process makes it straightforward to incorporate two-dimensionally structured materials into optical fibers. We use structured materials to demonstrate several new waveguide designs which illustrate the potential for improved performance.

NFC2 • 2:30 p.m.
Photonic Crystal Fiber Array for True-Time-Delay Structured X-Band Phased Array Antenna Systems, *Yongqiang Jiang[1], Tao Ling[1], Maggie Y. Chen[2], Ray T. Chen[1]; [1]Univ. of Texas at Austin, USA, [2]Omega Optics, USA.* Tunable optical true-time-delay modules based on highly dispersive photonic crystal fibers were demonstrated to provide continuous radio frequency squint-free beam scanning for X-band phased array antenna systems.

NFC3 • 2:45 p.m.
Dispersion in Optical Fibers With Scaled Microstructure, *Graham E. Town; Macquarie Univ., Australia.* Dispersion in a novel microstructured optical fiber in which the cladding structure scales with distance from the core is analyzed. The fiber's properties diverge from those of standard microstructured fibers at long wavelengths.

NFC4 • 3:00 p.m.
Fabrication Conditions for Randomly Microstructured Polymer Optical Fibers, *Rodney M. Chaplin, Graham E. Town, Michael J. Withford, David Baer; Macquarie Univ., Australia.* Microstructured polymer optical fiber was fabricated in which bubbles were randomly distributed in the cladding to both guide and scatter light. The effect of fabrication conditions on the fiber structure and properties is discussed.

NFC5 • 3:15 p.m.
Design of Twin Core Fluorine-Doped Photonic Crystal Fiber Directional Coupler Incorporating Elliptical Air-holes, *Shailendra K. Varshney, Kunimasa Saitoh, Nikoloas J. Florous, Masanori Koshiba; Hokkaido Univ., Japan.* Using an accurate simulator based on full-vectorial finite element method, we demonstrate the operation of a novel type of photonic crystal fiber coupler with inherently flattened wavelength (900-nm) and polarization-insensitive coupling characteristics.

Key to Authors and Presiders