Integrated Photonics and Nanophotonics Research and Applications (IPNRA)
Topical Meeting and Tabletop Exhibit

Technical Conference: July 12-17, 2009
Exhibition: July 13-15, 2009
Hilton Hawaiian Village Beach Resort & Spa
Honolulu, Hawaii, USA

PDP Submissions Deadline: June 17, 2009, 12:00 p.m. noon EDT (16.00 GMT)
Housing Deadline: June 9, 2009
Pre-Registration Deadline: June 18, 2009

Part of Advances in Optical Sciences:
OSA Optics & Photonics Congress

Featuring Three Collocated Topical Meetings:

Integrated Photonics and Nanophotonics Research and Applications (IPNRA)
Nonlinear Optics (NLO)
Slow and Fast Light (SL)

2009 Meeting Chairs

General Chairs
Mark Earnshaw, *Bell Labs*, *Alcatel-Lucent, USA*
Anand Gopinath, *Univ. of Minnesota, USA*

Program Chairs
Andrea Melloni, *Politecnico di Milano, Italy*
Liming Zhang, *Bell Labs, Alcatel-Lucent, USA*

About IPNRA

This year, the Integrated Photonics and Nanophotonics Research and Applications Topical Meeting will cover all aspects of research in integrated photonics and nanophotonics, featuring innovative science and engineering results. Topics include active and compound semiconductor devices; dielectric waveguides and waveguide devices; modeling and numerical simulation; integrated diffractive optics; microphotonics; and the generation, detection, and transport of optical fields on the “nanoscale.” Application areas within the scope of this meeting include telecommunications, information technology, optical computing, optical storage, displays, environmental monitoring, biomedical science and instrumentation, and quantum information processing and communication. Nanophotonics is on a scale ranging from individual atoms, molecules or their clusters, to that of subwavelength effective media and photonic crystals.

Topics to be Considered

- **Silicon or Other Group IV Waveguide Photonics** Including SOI-based materials – active, light emitters or lasers isolation, amplifiers, passives, and 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; and 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; and low-cost technology for polymer devices.
- **$LiNbO_3$ - and Other Metal-Oxide-Based Switches and Modulators:** Ultrahigh-speed; low-$V\pi$; devices; integrated scanners; and 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.
- **Inhomogeneous Materials (e.g., Composite Dielectrics, Semiconductors, Metals and Metallodielectrics):** Anisotropic; dispersive; efficient light extraction; nonlinear optical materials; and 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; and efficient mode matching.
- **Nanofabrication Technology:** Lithography techniques; growth and deposition approaches; self-organized methods; and etching.
- **Characterization Tools on the Nanoscale**
- **Modeling and Simulation Tools**
- **Photonic Crystals, Waveguides, and Fibers**
- **Nanoscale Integration of Planar, Free-Space, and Mixed Subsystems**

About Integrated Photonics and Nanophotonics Research and Applications

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We would like to encourage submissions in the following areas:

- **Silicon or Other Group IV Waveguide Photonics** Including SOI-based materials – active, light emitters or lasers isolation, amplifiers, passives, and complex circuits.
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Submissions Deadline: March 10, 2009, 12:00 p.m. noon EST (16.00 GMT)
Housing Deadline: June 9, 2009
Pre-Registration Deadline: June 18, 2009

Future Meetings

Integrated Photonics Research, Silicon Photonics, and Applications
Technical Conference: June 6-10, 2010
Westin La Paloma
Tucson, AZ

Sponsor: The Optical Society

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- **Nanoscale Integration of Planar, Free-Space, and Mixed Subsystems**

Program Committee

General Chairs

Mark Earnshaw, *Bell Labs*, *Alcatel-Lucent, USA*
Anand Gopinath, *Univ. of Minnesota, USA*

Program Chairs

Andrea Melloni, *Politecnico di Milano, Italy*
Liming Zhang, *Bell Labs, Alcatel-Lucent, USA*

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Mitsuru Takenaka, *Univ. of Tokyo, Japan*
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Andre de Lustrac, *IEF Orsay, France*
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Exhibitors

IPNRA

Tabletop Exhibit:
July 13-15, 2009

Topical Meeting:
July 12-17, 2009

IPNRA 2009 Exhibit Space Reservation Contract

Exhibit Space Reservation Contract (PDF, 58KB)

Note: You need Adobe Acrobat to view the PDF files above. If you do not already have this software, you can download Adobe Acrobat for free at the Adobe Web site.

Tabletop exhibit space will be $1,090 for Corporate Members and $1,250 for non-members and will include:

- One complimentary registration list
- One complimentary technical registration and two exhibit personnel registrations
- One copy of the meeting's proceedings

If you have questions about exhibiting at this topical meeting, please contact our exhibit sales staff at 202.416.1428 202.416.1428 or exhibitsales@osa.org.

Sponsorship Opportunities at IPNRA 2009

Increase your company's visibility among qualified attendees with a sponsorship at the event.

Current IPNRA Sponsorship Opportunities include:

- Coffee Break Sponsorships
- Reception Sponsorships
- Attendee Tote Bag Sponsorship
- Registration Material Inserts
- Advertising Signage Placements

Plus other customizable promotional opportunities

To find out more about one of the sponsorship opportunities listed above or to discuss a customized IPNRA promotional package or sponsorship, please contact Anne Jones at 202.416.1942 202.416.1942 or email exhibitsales@osa.org

Exhibitor Listings

ADVANCES in OPTICAL SCIENCES
2009 OSA OPTICS AND PHOTONICS CONGRESS

July 12-17, 2009
Honolulu, Hawaii USA

Collated Meetings:

Integrated Photonics and Nanophotonics Research and Applications (IPNRA)

Nonlinear Optics (NLO)

Slow and Fast Light (SL)

Altos Photonics
201 S. Wallace, Ste. B2C
Bozeman, MT 59715
P: 406.581.4662 or +1 866.658.5404
F: 909.363.8637
sales@altosphotonics.com
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Altos Photonics offers pulsed solid-state lasers and tunable systems for research and industrial application, as well as related components and accessories. Laser components include UV and IR optics, non-linear crystals (BBO, KTP, ZGP, KYW, KGW, etc), optical mounts, USB-controlled stages, and laser safety glasses. Altos Photonics sells and services products from EKSPLA, EKSMA, Light Conversion & Standa. Since 1997, we have been partnering with outstanding researchers throughout the Americas to better understand and manipulate materials using photonics.

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Suite 600-345
Atlanta, GA 30339-2919
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Swamp Optics offers compact, convenient devices for measuring ultrashort laser pulses in real time and which yield the most complete measurements ever and include the beam spatial profile and spatio-temporal distortions. Awards include an R&D100 award and a Circle of Excellence award. Swamp Optics also offers custom devices for nearly every pulse-measurement problem, and we recently introduced a compact pulse compressor automatically free of distortions and very inexpensive.

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Size doesn't matter.
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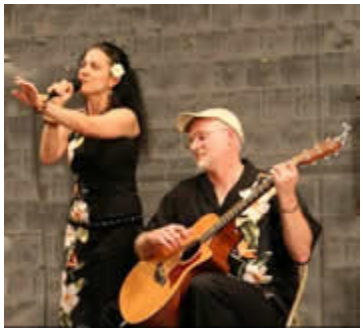
Thank you to the following organizations that provided grant funding:

- Air Force Office of Science Research (AFOSR)
- National Science Foundation (NSF)
- OSA Foundation

Special Events

Hawaiian Cultural Workshop for the OPC Summer Congress in Traditional & Modern Hula and Chants with Ka'iulani Visiko



Dates: Monday, July 13 and Tuesday, July 14, 2009
Time: 9:00–11:30 a.m.
Location: Hibiscus Suite, Kalia Executive Conference Center
There will be a 15 minute coffee break with Wayne “Kimo” Knox at 10:00 a.m.

On Tuesday, July 14, 2009, there will be an opportunity to perform what you learned in the workshop at the Conference Luau during Kimo and Ka'iulani's Cocktail Hour Concert.
Location: Rooftop of the Mid-Pacific Conference Center
****Note: Luau admission ticket required to participate. Additional tickets may be purchased at Registration until 6:30 p.m., Monday, July 13, 2009.****

For Ka'iulani's Workshop you'll need:

- Tank top or t-shirt
- Shorts or sarong
- Bare feet
- Notepad and pencil
- Much ALOHA and FUN!!

Open to members, family, and friends (Children 12 years old and under must have a parent present at all times).

For more information and any questions, visit www.GalleryKauai.com or contact Kimo and Ka'iulani by email, or call +1 585.313.1195 +1 585.313.1195 (cell).

Invited Speakers
Joint Integrated Photonics and Nanophotonics Research and Applications (IPNRA)/Nonlinear Optics (NLO) Session: Nonlinear Integrated Photonics

JTuA3, **Towards Sub-Wavelength Plasmonic Laser Devices**, Rupert Oulton[1], Volker J. Sorger[1], Thomas Zentgraf[1], Guy Bartal[1], Xiang Zhang[1,2]; *[1]Univ. of California at Berkeley, USA, [2]Material Sciences Div., Lawrence Berkeley Natl. Lab, USA*

JTuA6, **Wavelength Conversion in Semiconductor Waveguiding Devices**, Takashi Kondo, Tomonori Matsushita, Junya Ota, Kaori Hanashima, Ikuma Ohta, Hiroshi Ishikawa, Kengo Ban, Tae Woong Kim; *Univ. of Tokyo, Japan*

Joint Integrated Photonics and Nanophotonics Research and Applications (IPNRA)/Slow and Fast Light (SL) Session: Slow Light Effects in Integrated Photonics Structures

JMA1, **Dispersion-Controlled Slow Light in Photonic Crystal Waveguides**, Toshihiko Baba[1,2], Hirokazu Sasaki[1,2], Jun Adachi[1,2], Norihiro Ishikura[1], Yohei Hamachi[1,2], Koshiro Yamada[1], Yuji Saito[1,2]; *[1]Yokohama Natl. Univ., Japan, [2]CREST, JST, Japan*

JMA2, **Processing Light in Coupled Ring Resonators**, Francesco Morichetti[1,2], Carlo Ferrari[1], Antonio Canciamilla[1], Matteo Torregiani[1], Andrea Melloni[1], Antonio Samarelli[3], Richard De La Rue[3], Marc Sorel[3]; *[1]POLICOM - DEI Politecnico di Milano, Italy, [2]Fondazione Politecnico di Milano, Italy, [3]Dept. of Electronics and Electrical Engineering, Univ. of Glasgow, UK*

JMA5, **Ultra-Compact Switches and Modulators Based on Slow Light in Photonic Crystals**, Thomas F. Krauss[1], Daryl M. Beggs[1], Thomas P. White[1], Liam O'Faolain[1], Tobias Kampfrath[2], L. (Kobus) Kuipers[2]; *[1]Univ. of St. Andrews, UK, [2]FOM Inst. AMOLF, Netherlands*

Plenary Speaker

IMA1, **Photonics in Supercomputing: The Road to Exascale**, Jeffrey Kash; *IBM Res., USA*

Active Waveguide Devices Invited Speakers

IMC1, **High Speed Modulation of Hybrid Silicon Evanescent Lasers**, Daoxin Dai, Alex Fang, John Bowers; *Univ. of California at Santa Barbara, USA*

IMC6, **Active Ge Based Devices for Silicon Photonics**, Jurgen Michel, Jifeng Liu, Xiaochen Sun, Mark Beals, Lionel C. Kimerling; *MIT, USA*

ITuB1, **Optical Flip-Flops and Isolators for Digital Photonic Integrated Circuits**, Yoshiaki Nakano; *Univ. of Tokyo, Japan*

IWA3, **Integrated Transmitters and Transceivers for High-End Applications in WDM Optical Networks**, Larry A.Coldren; *Univ. of California at Santa Barbara, USA*

IWA4, **InP PICs for Advanced Modulation Format Transmission**, Masaki Kato, Peter Evans, Scott Corzine, Matthew Fisher, John Gheorma, Andrew Dentai, Randal Salvatore, Ilya Lyubomirsky, Alan Nilsson, Jeff Rahn, Radha Nagarajan, Corey Tsai, Babak Behnia, James Stewart, Doug Christini, Mark Missey, Augi Spannagel, Damien Lambert, Shashank Agashe, Paul Liu, Don Pavinski, Mike Reffle, Rick Schneider, Mehrdad Ziari, Chuck Joyner, Fred Kish, David Welch; *Infinera, USA*

Passive Waveguide Devices Invited Speakers

IMD3, **Recent Progress on Planar Lightwave Circuits for High Bit-Rate Transmission**, Yoshinori Hibino; *NTT Photonics Labs, NTT Corp., Japan*

IMD4, **Recent Progress in Planar Waveguide Spectometers**, Pavel Cheben[1], J. H. Schmid[1], M. Florjańczyk[2], P. J. Bock[3], D.- X. Xu[1], S. Janz[1], A. Delâge[1], J. Lapointe[1], B. Lamontagne[1], E. Post[1], A. Densmore[1], J. Albert[4], T. J. Hall[3], B. Solheim[2], A. Scott[2],[5]; *[1]Natl. Res. Council Canada, Canada, [2]York Univ., Canada, [3]Univ. of Ottawa, Canada, [4]Carleton Univ., Canada, [5]COM DEV Ltd., Canada*

ITuB2, **Integration of Passive and Active Components in InP-Based PICs**, Meint Smit, Xaveer Leijtens; *Technische Univ. Eindhoven, Netherlands*

ITuE1, **Low-Loss High Index Contrast SOI Waveguides: Expecting the Unexpected**, Tom Koch; *Lehigh Univ., USA*

IWB1, **Microring Resonator and Its Application to Hitless Wavelength Selective Switch Circuits**, Yasuo Kokubun; *Yokohama Natl. Univ., Japan*

Modeling, Numerical Simulation, and Theory Invited Speakers

IMG1, **Modeling of High-Power Pulse Compression and Soliton Formation in Hollow-Core Photonic Bandgap Fibers**, Jesper Lægsgaard, Peter J. Roberts; *Technical Univ. of Denmark, Denmark*

ITuD3, **Spectral Engineering of Deterministic Aperiodic Structures for Scattering, Localization and Enhancement of Optical Fields**, Svetlana V. Boriskina, Carlo Forestiere, Gary Walsh, Ashwin Gopinath, Sylvanus Lee, Luca Dal Negro; *Boston Univ., USA*

Nanophotonic Devices and Applications Invited Speakers

IME3, **Nanocolumn Light Emitters from Ultraviolet to Red and InGaN/GaN Nanocolumn Arrays**, Katsumi Kishino[1,2], Akihiko Kikuchi[1,2], Hiroto Sekiguchi[1,2], Shunsuke Ishizawa[1,2]; *[1]Sophia Univ., Japan, [2]CREST, JST, Japan*

IME4, **Entangled Photon Pair Sources Fabricated from InAs Quantum Dots**, David A. Ritchie[1], R. M. Stevenson[2], R. J. Young[2], A. J. Hudson[1,2], D. J. P. Ellis[2], A. J. Bennett[2], P. Atkinson[1], K. Cooper[1], C. A. Nicoll[1], A. J. Shields[2]; *[1]Univ. of Cambridge, UK, [2]Toshiba Res. Europe Ltd., UK*

IMF3, **Single Quantum Dot Laser with Photonic Crystal Nanocavity**, Masahiro Nomura, Satoshi Iwamoto, Yasuhiko Arakawa; *Univ.of Tokyo, Japan*

IMF4, **High Quality Factor Photonic Crystal Nanobeam Cavities and Their Applications**, Marko Loncar; *Harvard Univ., USA*

ITuA3, **Nanotechnology from the Bottom up: Light-Directed Synthesis of DNA Molecules**, Franco Cerrina; *Boston Univ., USA*

ITuA4, **Cavity Optomechanics at the Micro- and Nanoscale**, G. Anetsberger[1], A. Schliesser[1], R. Rivière[1], O. Arcizet[1], T.J. Kippenberg[1,2]; *[1]Max-Planck-Inst. für Quantenoptik, Germany, [2]École Polytechnique Fédérale de Lausanne, Switzerland*

ITuC5, **Silicon Nanophotonics: The Optical Spice Rack**, Michal Lipson; *Cornell Univ., USA*

IWD1, **Coupling of Quantum Dots in 3-D Photonic Crystals**, Kanna Aoki; *Metamaterials Lab, RIKEN, Japan*

	Tapa I	Tapa II	Tapa III	Honolulu I-II	Honolulu III
Sunday, July 12					
3:00 p.m.–6:00 p.m.	**Registration Open,** *Palace Lounge*				
Monday, July 13					
7:00 a.m.–6:30 p.m.	**Registration Open,** *Palace Lounge*				
8:00 a.m.–10:00 a.m.	**NMA • Nonlinear Optics in Semiconductors, Glasses and Crystals**	**NMB • Spatial Effects**			**SMA • Fundamental Issues**
8:00 a.m.–8:45 a.m.			**IMA • IPNRA Plenary**		
9:00 a.m.–10:00 a.m.			**IMB • Highlights of IPNRA 2009 Contributed Papers**		
10:00 a.m.–10:30 a.m.	**Coffee Break/Exhibits,** *Palace Lounge*				
10:00 a.m.–4:30 p.m.	**Exhibits Open,** *Palace Lounge*				
10:30 a.m.–12:30 p.m.	**NMC • Nonlinear Optics Plenary I**		**IMC • Silicon Photonics and Hybrid Material Integrated Devices**	**IMD • Filter Technologies**	**SMB • Applications I**
12:30 p.m.–2:00 p.m.	**Lunch** (on your own)				
2:00 p.m.–4:00 p.m.	**NMD • Photonic Crystals and Periodic Nanomaterials**	**NME • Plasmonics**	**JMA • Joint IPNRA/SL Session: Slow Light Effects in Integrated Photonics Structures**	**IME • Nanophotonic Sources**	
4:00 p.m.–4:30 p.m.	**Coffee Break/Exhibits,** *Palace Lounge*				
4:30 p.m.–6:30 p.m.			**IMF • Q-Dot Emitters, PhC Lasers, Microcavities, Coupling**	**IMG • Modeling and Simulation**	**SMC • Fiber-Based Slow Light**
Tuesday, July 14					
7:30 a.m.–6:30 p.m.	**Registration Open,** *Palace Lounge*				
8:00 a.m.–10:00 a.m.	**NTuA • Entanglement, Squeezing and Quantum Memories**	**ITuA • Sensitive Nanophotonics**	**JTuA • Joint IPNRA/NLO Session: Nonlinear Integrated Photonics**	**STuA • Atomic Systems**	
10:00 a.m.–10:30 a.m.	**Coffee Break/Exhibits,** *Palace Lounge*				
10:00 a.m.–11:30 a.m.	**JTuB • Joint Poster Session I,** *Palace Lounge*				
10:00 a.m.–1:00 p.m.	**Exhibits Open,** *Palace Lounge*				
11:30 a.m.–1:00 p.m.	**NTuB • Nonlinear Optics Plenary II**	**ITuB • Photonic Devices and Integration I**	**ITuC • Silicon Nanophotonics**	**STuB • Applications II**	
1:00 p.m.–2:30 p.m.	**Lunch (on your own)**				
2:30 p.m.–4:30 p.m.	**NTuC • Nonlinear Optics in Microresonators**	**ITuD • Modeling and Simulation II**	**ITuE • Novel Waveguides and Photonic Sensors**	**STuC • Photonic Structures and Semiconductors**	
4:30 p.m.–5:00 p.m.	**Coffee Break,** *Palace Lounge*				
5:00 p.m.–6:30 p.m.	**Postdeadline Paper Sessions,** *See Postdeadline Papers book for schedule and locations*				
7:00 p.m.–10:00 p.m.	**Conference Luau,** *Lagoon Green*				

	Tapa I	Tapa II	Tapa III	Honolulu I-II
Wednesday, July 15				
7:30 a.m.–4:30 p.m.	**Registration Open,** *Palace Lounge*			
8:00 a.m.–10:00 a.m.	**NWA • Terahertz and Ultrafast**	**NWB • Novel Effects in Atoms, Molecules and Metals**	**IWA • Photonic Devices and Integration II**	**SWA • Photonic Structures**
10:00 a.m.–10:30 a.m.	**Coffee Break/Exhibits,** *Palace Lounge*			
10:00 a.m.–11:30 a.m.	**JWA • Joint Poster Session II,** *Palace Lounge*			
10:00 a.m.–2:30 p.m.	**Exhibits Open,** *Palace Lounge*			
11:30 a.m.–1:30 p.m.	**NWC • Current Trends in Nonlinear Optical Materials**	**NWD • Advances in Frequency Conversion, High Energy Lasers, and Laser Dynamics**	**IWB • Resonator Circuits and their Applications**	**JWB • Joint NLO/SL Session: Slow Light Applications in Nonlinear Optics**
1:30 p.m.–2:30 p.m.	**Lunch** (on your own)			
2:30 p.m.–4:30 p.m.	**IWC • Modeling and Simulation III**	**IWD • 3-D Photonic Crystals, Novel Fabrication Techniques**		
7:30 p.m.–9:00 p.m.	**Registration Open,** *Palace Lounge*			
7:30 p.m.–9:30 p.m.	**NWE • Squeezing and Biphoton States**			
Thursday, July 16				
7:30 a.m.–1:00 p.m.	**Registration Open,** *Palace Lounge*			
8:00 a.m.–10:15 a.m.	**NThA • Parametric Processes and Oscillators**			
10:15 a.m.–10:45 a.m.	**Coffee Break,** *Palace Lounge*			
10:45 a.m.–1:00 p.m.	**NThB • Advances in Quasi-Phase-Matched Interactions**			
7:30 p.m.–9:00 p.m.	**Registration Open,** *Palace Lounge*			
7:30 p.m.–9:30 p.m.	**NThC • Generating E&M Radiation: Visible, UV, X-Ray and Gamma Rays**			
Friday, July 17				
7:30 a.m.–1:00 p.m.	**Registration Open,** *Palace Lounge*			
8:00 a.m.–10:15 a.m.	**NFA • Self Focusing and Filaments**			
10:15 a.m.–10:45 a.m.	**Coffee Break,** *Palace Lounge*			
10:45 a.m.–1:00 p.m.	**NFB • Applications of Nonlinear Optics**			

Key to Shading	
IPNRA Sessions	
NLO Sessions	No Shading
SL Sessions	
Joint Sessions	

Integrated Photonics and Nanophotonics Research and Applications (IPNRA) Abstracts

•Sunday, July 12, 2009•

Palace Lounge
3:00 p.m.–6:00 p.m.
Registration Open

•Monday, July 13, 2009•

Palace Lounge
7:00 a.m.–6:30 p.m.
Registration Open

IMA • IPNRA Plenary

Tapa III
8:00 a.m.–8:45 a.m.
Mark Earnshaw; Bell Labs, Alcatel-Lucent, USA, Presider
Anand Gopinath; Univ. of Minnesota at Minneapolis, USA, Presider

IMA1 • 8:00 a.m. **Plenary**
Photonics in Supercomputing: The Road to Exascale, *Jeffrey Kash; IBM Res., USA.* Optical interconnects in present and future supercomputers are reviewed, emphasizing Exaflop performance circa 2020, which is 1000X today's Petaflop computers. Power, density and cost requirements become increasingly stringent, ultimately driving the need for on-chip optics.

IMB • Highlights of IPNRA 2009 Contributed Papers

Tapa III
9:00 a.m.–10:00 a.m.
Mark Earnshaw; Bell Labs, Alcatel-Lucent, USA, Presider
Anand Gopinath; Univ. of Minnesota at Minneapolis, USA, Presider

IMB1 • 9:00 a.m.
An 8x8 Monolithic Tunable Optical Router (MOTOR) Chip in InP, *Steven C. Nicholes, Milan L. Mašanović, Erica Lively, Larry A. Coldren, Daniel J. Blumenthal; Univ. of California at Santa Barbara, USA.* We demonstrate 10 Gbps error free operation through multiple ports of an InP monolithic tunable optical router consisting of eight input wavelength converters and an 8x8 passive arrayed-waveguide grating router.

IMB2 • 9:15 a.m.
Spiral Cavity Si Wire Resonators as Label-Free Biosensors, *Dan-Xia Xu, A. Densmore, J. H. Schmid, R. Ma, M. Vachon, S. Janz, R. McKinnon, J. Lapointe, A. Delâge, E. Post, P. Cheben; Natl. Res. Council Canada, Canada.* We demonstrate densely folded spiral cavity resonator with Q > 20,000 and an area of 30 μm × 30 μm. We show that extended cavity length increases Q and improves the fabrication robustness of resonators.

IMB3 • 9:30 a.m.
Label-Free Biosensing Utilizing Ultrasmall Photonic Crystal Nanolaser, *S. Kita[1,2], Y. Nishijima[3], H. Misawa[3], T. Baba[1,2]; [1]Yokohama Natl. Univ., Japan, [2]CREST, JST, Japan, [3]Hokkaido Univ., Japan.* We demonstrate label-free biosensing using GaInAsP photonic crystal nanolaser with a nanoscale modal volume. We performed the real-time observation of specific binding of BSA protein from the lasing wavelength shift.

IMB4 • 9:45 a.m.
Analysis of a Plasmonic Microcavity Using the Frequency-Dependent LOD-FDTD Method, *Jun Shibayama, Ryoji Ando, Akifumi Nomura, Junji Yamauchi, Hisamatsu Nakano; Hosei Univ., Japan.* A simple frequency-dependent FDTD is developed with a trapezoidal recursive convolution technique and is applied to the analysis of plasmonic microcavities. Tunable properties of the resonance wavelength are obtained with varying an air core width.

Palace Lounge
10:00 a.m.–10:30 a.m.
Coffee Break/Exhibits (Exhibits open 10:00 a.m.–4:30 p.m.)

IMC • Silicon Photonics and Hybrid Material Integrated Devices

Tapa III
10:30 a.m.–12:30 p.m.
Nadir Dagli; Univ. of California at Santa Barbara, USA, Presider

IMC1 • 10:30 a.m. **Invited**
High Speed Modulation of Hybrid Silicon Evanescent Lasers, *Daoxin Dai, Alex Fang, John Bowers; Univ. of California at Santa Barbara, USA.* High speed modulation results and analysis of hybrid silicon evanescent lasers is described. It should be possible to achieve a 3dB-bandwidth over 50 GHz and a data rate of 50 Gbit/s.

IMC2 • 11:00 a.m.
The Use of Deep-Level Dopants in Silicon-on-Insulator Optical Waveguide Modulators , *Dylan F. Logan[1], Paul E. Jessop[1], Andrew P. Knights[1], Russell Gwilliam[2]; [1]McMaster Univ., Canada, [2]Surrey Ion Beam Ctr., Univ. of Surrey, UK.* The dependence of silicon's absorption coefficient at 1.55 μm on the charge state of deep levels is modeled and measured experimentally. Improved designs for *p-i-n* rib waveguide modulators based on this effect are presented.

IMC3 • 11:15 a.m.
Enhancing Thermal Reconfiguration Speed for Silicon Photonics Applications, *Amir H. Atabaki, Ali A. Eftekhar, Siva Yegnanarayanan, Ali Adibi; Georgia Tech, USA.* The reconfiguration speed of silicon photonic devices is enhanced by optimizing thin-film microheaters. We show theoretically and experimentally that narrower heaters, thinner buried oxide layers, and LPCVD SiN over-cladding can improve the reconfiguration speed.

IMC4 • 11:30 a.m.
Hybrid-Integrated Tunable Laser Using Polymer Microring-Resonator-Based Add-Drop Filter and Reflective SOA, *Ho Lee, Gunwoo Kim, Suhyun Kim, Youngchul Chung; Dept. of Electronics and Communications Engineering, Kwangwoon Univ., Republic of Korea.* We proposed a novel tunable laser hybrid-integrated with a polymer double-ring-resonator add-drop filter reflector. This tunable laser exhibited SMSR of 26dB, FWHM of 0.03nm, and tuning range of about 17nm.

IMD • Filter Technologies

Honolulu I-II
10:30 a.m.–12:30 p.m.
Meint Smit; Technische Univ. Delft, Netherlands, Presider

IMD1 • 10:30 a.m.
Multimode Waveguide-Cavity Integrated Optics for Sensors Based on Fringe Visibility Detection, *Alexander C. Ruege, Ronald M. Reano; Ohio State Univ., USA.* We demonstrate a sensor platform based on fringe visibility detection of the interaction of a two-mode waveguide coupled to a ring cavity. Glucose solution yields a fringe visibility change of 1.57 per weight percent.

IMD2 • 10:45 a.m.
Broadband Integrated Spectrometers in Silicon-Nitride for Spectral Analysis in Sensing Applications, *Babak Momeni, Ehsan Shah Hosseini, Ali Adibi; Georgia Tech, USA.* Silicon-nitride (SiN) spectrometers are proposed for efficient spectral analysis in integrated sensing systems. Planar SiN spectrometers are demonstrated in the visible wavelength range, and a cascaded implementation is proposed to extend the operation wavelength range.

IMD3 • 11:00 a.m. **Invited**
Recent Progress on Planar Lightwave Circuits for High Bit-Rate Transmission, *Yoshinori Hibino; NTT Photonics Labs, NTT Corp., Japan.* Planar lightwave circuit (PLC) technology has been contributing greatly to the construction of high bit-rate and long distance optical transmission systems. This paper reviews recent advances on such PLC-based optical devices.

IMD4 • 11:30 a.m. **Invited**
Recent Progress in Planar Waveguide Spectrometers, *Pavel Cheben[1], J. H. Schmid[1], M. Florjańczyk[2], P. J. Bock[3], D.-X. Xu[1], S. Janz[1], A. Delâge[1], J. Lapointe[1], B. Lamontagne[1], E. Post[1], A. Densmore[1], J. Albert[4], T. J. Hall[3], B. Solheim[2], A. Scott[2,5]; [1]Natl. Res. Council Canada, Canada, [2]York Univ., Canada, [3]Univ. of Ottawa, Canada, [4]Carleton Univ., Canada, [5]COM DEV Ltd., Canada.* We introduce several types of new waveguide spectrometers, namely a high-resolution 50-channel AWG spectrometer, a 40-channel broadband AWG spectrometer, a Si-wire sidewall grating multiplexer, and the first planar waveguide Fourier-transform spectrometer.

IMC • Silicon Photonics and Hybrid Material Integrated Devices (continued)

IMC5 • 11:45 a.m.
Determination of Wafer and Process Induced Resonant Frequency Variation in Silicon Microdisk-Resonators, *William A. Zortman, Michael R. Watts, Douglas C. Trotter; Sandia Natl. Labs, USA.* By comparing the frequency deviations of the TE and TM modes of identically designed silicon microdisk-resonators across a wafer, we demonstrate that layer thickness non-uniformity is the dominant cause of fabrication-induced microdisk-resonator frequency deviation.

IMC6 • 12:00 p.m. **Invited**
Active Ge Based Devices for Silicon Photonics, *Jurgen Michel; MIT, USA.* Some of the crucial building blocks for Si photonics are high performance photodetectors, modulators, and efficient light sources. High quality Ge epitaxial films on Si have opened new possibilities for high performance CMOS compatible devices.

IMD • Filter Technologies (continued)

IMD5 • 12:00 p.m.
Design of Ultra-Small Polarization Splitter Based on a Resonant Coupling between Silicon Wire and Slot Waveguides, *Masa-aki Komatsu, Kunimasa Saitoh, Kuniaki Kakihara, Masanori Koshiba; Hokkaido Univ., Japan.* We propose an ultra-small polarization splitter based on a resonant tunneling phenomenon. Numerical simulations show that a 16-μm-long polarization splitter with extinction ratio better than -20 dB on the entire C-band is achievable.

IMD6 • 12:15 p.m.
Compact Add/Drop Filters Using Etched Beam Splitter and Total Internal Reflection Mirrors, *Byungchae Kim, Yu-Chia Chang, Nadir Dagli; Univ. of California at Santa Barbara, USA.* We present compact optical add-drop filters based on etched beam splitters and total internal reflection mirrors in weakly guiding GaAs/$Al_{0.9}Ga_{0.1}As$ waveguides. Resonators with circumference of 70 μm have 11.5 nm FSR and 4.2 dB ER.

12:30 p.m.–2:00 p.m.
Lunch (on your own)

JMA • Joint IPNRA/SL Session: Slow Light Effects in Integrated Photonics Structures

Tapa III
2:00 p.m.–4:00 p.m.
Wayne Sorin; Univ. of Melbourne, Australia, Presider

JMA1 • 2:00 p.m. **Invited**
Dispersion-Controlled Slow Light in Photonic Crystal Waveguides, *Toshihiko Baba[1,2], Hirokazu Sasaki[1,2], Jun Adachi[1,2], Norihiro Ishikura[1], Yohei Hamachi[1,2], Koshiro Yamada[1], Yuji Saito[1,2]; [1]Yokohama Natl. Univ., Japan, [2]CREST, JST, Japan.* Photonic crystal slow light waveguides are demonstrated with a large delay-bandwidth product over 100, picosecond pulse transmission and tunable delay. The nonlinear enhancement based on the slow light pulse is also presented.

IME • Nanophotonic Sources

Honolulu I-II
2:00 p.m.–4:00 p.m.
Yeshaiahu Fainman; Univ. of California at San Diego, USA, Presider

IME1 • 2:00 p.m.
Towards an Integrated Narrowband Source for Quantum Information: Photon Pair Generation in a Silicon Racetrack Resonator, *Stéphane Clemmen[1], Kien Phan Huy[2], Wim Bogaerts[3], Roel G. Baets[3], Philippe Emplit[1], Serge Massar[1]; [1]Univ. Libre de Bruxelles, Belgium, [2]Univ. de Franche-Comté, France, [3]Ghent Univ. - IMEC, Belgium.* We present evidence of time correlated photon pairs generated by the four-wave mixing process in a silicon racetrack cavity. A coincidence measurement and an emission spectrum are presented and discussed.

JMA • Joint IPNRA/SL Session: Slow Light Effects in Integrated Photonics Structures (continued)

JMA2 • 2:30 p.m. Invited

Processing Light in Coupled Ring Resonators, *Francesco Morichetti[1,2], Carlo Ferrari[1], Antonio Canciamilla[1], Matteo Torregiani[1], Andrea Melloni[1], Antonio Samarelli[3], Richard De La Rue[3], Marc Sorel[3]; [1]POLICOM - DEI Politecnico di Milano, Italy, [2]Fondazione Politecnico di Milano, Italy, [3]Dept. of Electronics and Electrical Engineering, Univ. of Glasgow, UK.* The state-of-the-art of coupled resonator optical waveguides made of chains of ring resonators in glass and SOI platforms is reviewed. Issues concerning technology, design, limits and applications in the linear and nonlinear regime are discussed.

JMA3 • 3:00 p.m.

All Optical Switching in Silicon-on-Insulator Photonic Wire Nano-Cavities, *Michele Belotti[1], Matteo Galli[1], Dario Gerace[1], Lucio C. Andreani[1], Giorgio Guizzetti[1], Ahmad R. Md Zain[2], Nigel P. Johnson[2], Marc Sorel[2], Richard M. De La Rue[2]; [1]Univ. degli Studi di Pavia, Italy, [2]Univ. of Glasgow, UK.* All optical switching in a silicon-on-insulator wire with a 1-D photonic crystal nanocavity with ultra-high quality factor operating at telecom wavelengths is presented. Switching is performed with control pulse energy of only 20 fJ.

JMA4 • 3:15 p.m.

Recent Advances in "Trapped Rainbow" Techniques for Stopping Light, *Kosmas Tsakmakidis, Ortwin Hess; Advanced Technology Inst., Univ. of Surrey, UK.* We provide an overview of "trapped rainbow" techniques for stopping light. We show that guided modes with real propagation constant and complex frequency can be "trapped rainbow"-stopped even in the presence of waveguide losses.

JMA5 • 3:30 p.m. Invited

Ultracompact Switches and Modulators Based on Slow Light in Photonic Crystals, *Thomas F. Krauss[1], Daryl M. Beggs[1], Thomas P. White[1], Liam O'Faolain[1], Tobias Kampfrath[2], L. (Kobus) Kuipers[2]; [1]Univ. of St. Andrews, UK, [2]FOM Inst. AMOLF, Netherlands.* Photonic crystal slow light waveguides enable modulators with high speed and large bandwidth. Group indices of 30-40 are achieved with low loss and we demonstrate modulators of <100 μm length with switching times of 3ps.

IME • Nanophotonic Sources (continued)

IME2 • 2:15 p.m.

Interference of Photons from a Weak Laser and a Quantum Dot, *Anthony J. Bennett[1], Raj B. Patel[1,2], Christine A. Nicoll[2], David A. Ritchie[2], Andrew J. Shields[1]; [1]Toshiba Res. Europe Ltd., Cambridge Res. Lab, UK, [2]Univ. of Cambridge, UK.* We have measured correlations between photons emitted by a weak laser and a single quantum dot; sources with different statistics. A reduction at time zero is observed indicating photon interference, results are compared to theory.

IME3 • 2:30 p.m. Invited

Nanocolumn Light Emitters from Ultraviolet to Red and InGaN/GaN Nanocolumn Arrays, *Katsumi Kishino[1,2], Akihiko Kikuchi[1,2], Hiroto Sekiguchi[1,2], Shunsuke Ishizawa[1,2]; [1]Sophia Univ., Japan, [2]CREST, JST, Japan.* InGaN-based nanocolumn LEDs from ultraviolet to red were fabricated through self-assembly of nanocolumns by rf-MBE. Uniform arrays of InGaN/GaN nanocolumns were grown demonstrating the controlled emission color from blue to red with changed nanocolumn diameter.

IME4 • 3:00 p.m. Invited

Entangled Photon Pair Sources Fabricated from InAs Quantum Dots, *David A. Ritchie[1], R. M. Stevenson[2], R. J. Young[2], A. J. Hudson[1,2], D. J. P. Ellis[2], A. J. Bennett[2], P. Atkinson[1], K. Cooper[1], C. A. Nicoll[1], A. J. Shields[2]; [1]Univ. of Cambridge, UK, [2]Toshiba Res. Europe Ltd., UK.* We have fabricated and optimized triggered sources of entangled photon pairs using self-assembled InAs quantum dots. After optimization, a fidelity to the ideal entangled state of over 90% has been achieved.

IME5 • 3:30 p.m.

Surface Plasmon Assisted Broadband Emission from Nanostructured Metal-Insulator-Metal Tunnel Junctions, *Jiayu Chen, Damien Ancukiewicz, Li Wang, Ravinder Jain; Univ. of New Mexico, USA.* Broadband emission from visible to near-IR and an upraised peak at high applied voltages is observed from Al-AlO_x-Au tunnel junctions. We argue that it results from an interaction with surface plasmons excited at metal-air interface.

JMA • Joint IPNRA/SL Session: Slow Light Effects in Integrated Photonics Structures (continued)

IME • Nanophotonic Sources (continued)

IME6 • 3:45 p.m.
Curvature Dependence of Lasing Wavelength in a Flexible InGaAsP Microdisk Cavity, *Kung-Shu Hsu[1,2], Wan Kuang[3], Yao-Chen Wang[1,4], Yi-Chun Yang[1], Shih-Kuo Tsai[1,4], Yu-Chen Liu[1,4], Zi-Chang Chang[1,4], Meng-Chyi Wu[4], Min-Hsiung Shih[1,2]; [1]Academia Sinica, Taiwan, [2]Natl. Chiao Tung Univ., Taiwan, [3]Dept. of Electrical and Computer Engineering, Boise State Univ., USA, [4]Natl. Tsing Hua Univ., Taiwan.* Compact InGaAsP microdisk cavities were fabricated on a flexible polydimethylsiloxane substrate. The lasing of the flexible microdisk was obtained with a low threshold. The curvature dependence of lasing wavelength was also characterized by bending cavity.

Palace Lounge
4:00 p.m.–4:30 p.m.
Coffee Break/Exhibits

IMF • Q-Dot Emitters, PhC Lasers, Microcavities, Coupling

Tapa III
4:30 p.m.–6:30 p.m.
Kanna Aoki; RIKEN, Japan, Presider

IMF1 • 4:30 p.m.
Design and Fabrication Techniques for a Mid-Infrared Photonic Crystal Defect Cavity in Indium Antimonide, *Jonathan R. Pugh[1], Daniel Ho[1], Peter J. Heard[1], Geoff R. Nash[1,2], Tim Ashley[2], John G. Rarity[1], Martin J. Cryan[1]; [1]Univ. of Bristol, UK, [2]QinetiQ, Malvern Technology Ctr., UK.* Simulation results and fabrication details are presented for a two-dimensional $Al_xGa_yIn_{1-x-y}Sb$ photonic crystal membrane defect cavity. Peak emission is predicted at λ=3.372μm with a Q factor of 26233 for an optimized membrane thickness of 1000nm.

IMF2 • 4:45 p.m.
Quality Factor Dependence on Vertical Slab Structure in Photonic Crystal Double Heterostructure Resonant Cavities, *Adam Mock, John O'Brien; Univ. of Southern California, USA.* The quality factor of photonic crystal heterostructure cavities with different vertical cladding geometries and photonic crystal hole etch depths is analyzed numerically. Symmetric cladding layers and deep etching are shown to improve the quality factor.

IMF3 • 5:00 p.m. Invited
Single Quantum Dot Laser with Photonic Crystal Nanocavity, *Masahiro Nomura, Satoshi Iwamoto, Yasuhiko Arakawa; Univ. of Tokyo, Japan.* We demonstrate a single quantum dot laser using a photonic crystal nanocavity. A low quantum dot density (~0.4/cavity) resulted in clear single quantum dot feature and distinct phase transition into lasing in photon correlation measurements.

IMG • Modeling and Simulation

Honolulu I-II
4:30 p.m.–6:30 p.m.
G. Ronald Hadley; Rio Grande Photonics LLC, USA, Presider

IMG1 • 4:30 p.m. Invited
Modeling of High-Power Pulse Compression and Soliton Formation in Hollow-Core Photonic Bandgap Fibers, *Jesper Lægsgaard, Peter J. Roberts; Technical Univ. of Denmark, Denmark.* We model the formation and self-frequency shift of solitons in a hollow-core photonic bandgap fiber. Extraction of clean femtosecond pulses by long-pass filtering in fibers with different air pressures is investigated.

IMG2 • 5:00 p.m.
Characterisation of Terahertz Wave Confinement in Quantum Cascade Lasers, *B. M. A. Rahman, Huda Tanvir, N. Kejalakshmy, A. Agrawal, C. Themistos, K. T. V. Grattan; City Univ. London, UK.* Terahertz quantum cascade laser waveguides were characterized using the vector finite element method. Waveguides based on GaSb/AlGaSb multiple quantum well structures were simulated, for which detailed mode profiles, power confinement and loss factors are shown.

IMF • Q-Dot Emitters, PhC Lasers, Microcavities, Coupling (continued)

IMF4 • 5:30 p.m. **Invited**

High Quality Factor Photonic Crystal Nanobeam Cavities and their Applications, *Marko Loncar; Harvard Univ., USA.* Wavelength-scale and high-Q photonic crystal resonators made in various materials (Si, Si_3N_4, III-Vs) will be discussed. Their application in novel single-photon sources, as well as for nonlinear wavelength conversion at single-photon level, will be presented.

IMF5 • 6:00 p.m.

Wavelength Conversion by Interband Transition in a Double Heterostructure Photonic Crystal Cavity, *Amin Khorshidahmad, Andrew G. Kirk; McGill Univ., Canada.* Intermodal transition by ultrafast tuning of a heterostructure photonic crystal cavity over a relative frequency range of 25% is numerically demonstrated. Mode selection is achieved by symmetry and the inherently wide spectral separation of resonances.

IMF6 • 6:15 p.m.

Investigation of a Tapered Fiber-Photonic Crystal Waveguide Coupler: Technology and Spectroscopy, *Raymond Sarkissian, Stephen Farrell, John O'Brien; Univ. of Southern California, USA.* A spectrometry technique based on a full four port modeling and measurement of a tapered fiber-photonic crystal waveguide coupler is proposed and technology implications of utilized fabrication techniques are investigated.

IMG • Modeling and Simulation (continued)

IMG3 • 5:15 p.m.

Post-Process Removal of Spurious Fabry-Pérot Oscillations in Measurements of Transmission Spectra, *Michael J. Strain[1], Marco Gnan[2], Richard M. De La Rue[1], Marc Sorel[1]; [1]Univ. of Glasgow, UK, [2]Univ. of Bologna, Italy.* A post-processing tool for suppression of unwanted Fabry-Pérot fringes in integrated optic device transmission measurements is presented. The method is shown to perform better than a shifting window averaging technique on various Bragg grating spectra.

IMG4 • 5:30 p.m.

Systematic Engineering of Waveguide-Resonator Coupling for Silicon Microring/Microdisk Resonators, *Mohammad Soltani, Siva Yegnanarayanan, Qing Li, Ali Adibi; Georgia Tech, USA.* Systematic engineering of waveguide-resonator coupling for optimum phase-matching and fieldoverlap is proposed. Adding a thin silicon pedestal layer underneath the resonator dramatically improves the coupling. Critical coupling to resonators with different Qs (10,000-3,000,000) are demonstrated.

IMG5 • 5:45 p.m.

Efficient Modeling of Erbium-Doped Waveguide Amplifiers Using Adaptive Multi-Step Iterative Methods, *Anish Bekal, Balaji Srinivasan; Indian Inst. of Technology Madras, India.* We discuss the use of predictor-corrector adaptive Adam-Bashforth method using Generalized Lagrange polynomial for modeling the population dynamics in compact erbium-doped waveguide amplifiers. This results in considerable reduction of computation time compared to conventional methods.

IMG6 • 6:00 p.m.

Modified Finite-Difference Formula for the Analysis of a Step-Index Waveguide with a Tilted Interface, *Junji Yamauchi[1], Seiji Harada[1], Shingo Kobori[2], Hisamatsu Nakano[1]; [1]Hosei Univ., Japan, [2]Advanced Technology R&D Ctr., Mitsubishi Electric Corp., Japan.* A 3-point finite-difference formula is derived for the analysis of a step-index waveguide with a tilted interface. The formula is suitable for the use of the alternating-direction implicit method.

IMG7 • 6:15 p.m.

Numerical Study on the Improvement of Light Extraction Efficiency by Silver Film with Periodic Air Slit Array, *Yizhu Lin, Fanmin Kong, Kang Li; School of Information Science and Engineering, Shandong Univ., China.* Owing to reflection, light extraction efficiency remains low for luminous devices by spontaneous emission; through FDTD simulation, we found silver film with periodic air slit array could contribute to the improvement and proposed a configuration.

• Tuesday, July 14, 2009 •

Palace Lounge
7:30 a.m.–6:30 p.m.
Registration Open

ITuA • Sensitive Nanophotonics

Tapa II
8:00 a.m.–10:00 a.m.
Andrea Melloni; Politecnico di Milano, Italy, Presider

ITuA1 • 8:00 a.m.
Design Guidelines for Optical Resonator Biochemical Sensors, *Juejun Hu, Xiaochen Sun, Anu Agarwal, Lionel C. Kimerling; MIT, USA.* Analagous to the widely accepted photodetector figure-of-merit (FOM), detectivity D*, we introduce a new sensor system FOM, the time-normalized sensitivity S*, to enable quantitative, cross-technology-platform comparison between resonator sensors with distinctive architectures and interrogation configurations.

ITuA2 • 8:15 a.m.
Progress toward Microcantilever Array Sensors Enabled by In-Plane Photonic Readout, *Gregory P. Nordin, Seunghyun Kim, Jong Wok Noh, Weisheng Hu, Ryan Anderson, Stan Ness, Bryan Haslam, William Dahlquist, Jack Dong; Brigham Young Univ., USA.* We report the design, fabrication and characterization of differential waveguide splitters for transduction of microcantilever deflection for sensor applications. Our approach is scalable to permit hundreds to several thousand microcantilevers on a single chip.

ITuA3 • 8:30 a.m. **Invited**
Nanotechnology from the Bottom up: Light-Directed Synthesis of DNA Molecules, *Franco Cerrina; Boston Univ., USA.* Maskless photolithography and light-protected phosphoramidite precursors are used to generate large libraries of DNA oligonucleotides. We discuss merits and challenges of using these "oligos" as building blocks for the "bottom-up" synthesis of complex DNA structures.

ITuA4 • 9:00 a.m. **Invited**
Cavity Optomechanics at the Micro- and Nanoscale, *G. Anetsberger[1], A. Schliesser[1], R. Rivière[1], O. Arcizet[1], T. J. Kippenberg[1,2]; [1]Max-Planck-Institut für Quantenoptik, Germany, [2]École Polytechnique Fédérale de Lausanne, Switzerland.* Using resolved-sideband laser cooling, a micromechanical oscillator is cooled to an average occupation of 63 quanta, and simultaneously measured close to the limit imposed by the Heisenberg uncertainty principle. Extending cavity optomechanics to the nanoscale is demonstrated using a nanomechanical oscillator dispersively coupled to an optical microresonator.

JTuA • Joint IPNRA/NLO Session: Nonlinear Integrated Photonics

Tapa III
8:00 a.m.–10:00 a.m.
Tal Carmon; Univ. of Michigan, USA, Presider

JTuA1 • 8:00 a.m.
Room Temperature Operation of Subwavelength Metallo-Dielectric Lasers, *Maziar P. Nezhad, Aleksandar Simic, Olesya Bondarenko, Boris Slutsky, Amit Mizrahi, Liang Feng, Vitaliy Lomakin, Yeshaiahu Fainman; Univ. of California at San Diego, USA.* Lasing is demonstrated in optically pumped InGaAsP-SiO_2-aluminum structures, where both the resonator and the optical mode are subwavelength in all three dimensions. In the smallest case, a 550nm diameter InGaAsP disk exhibits lasing at 1390nm.

JTuA2 • 8:15 a.m.
The Nonlinear Optical Response of Transparent Metal-Dielectric Multilayer Structures, *Canek Fuentes-Hernandez[1], Lazaro A. Padilha[2], Joel M. Hales[1], Daniel Owen [1], Jungbae Kim[1], Scott Webster[2], Seth R. Marder[1], Joseph W. Perry[1], David J. Hagan[2], Eric W. Van Stryland[2], Bernard Kippelen[1]; [1]Georgia Tech, USA, [2]Univ. of Central Florida, USA.* We report on the nonlinear optical properties of metal-dielectric multilayer structures with peak transmittance of 75%, spectral bandwidths up to 360 nm, and up to 20× larger nonlinear optical response than their component materials.

JTuA3 • 8:30 a.m. **Invited**
Towards Sub-Wavelength Plasmonic Laser Devices, *Rupert F. Oulton[1], Volker J. Sorger[1], Thomas Zentgraf[1], Guy Bartal[1], Xiang Zhang[1,2]; [1]Univ. of California at Berkeley, USA, [2]Material Sciences Div., Lawrence Berkeley Natl. Lab, USA.* We show that a hybrid of semiconductor nanowire and metallic surface modes produces an efficient laser device with $\lambda^2/100$ mode area and discuss the broader impact of plasmon-based light sources and integrated optical components.

JTuA4 • 9:00 a.m.
A Radio Frequency Spectrum Analyser with Terahertz Bandwidth Based on a Highly Nonlinear As_2S_3 Chalcogenide Glass Waveguide, *Mark Pelusi[1], Feng Luan[1], Trung Vo[1], Mike Lamont[1], Steven Madden[2], Douglas Bulla[2], Duk-Yong Choi[2], Barry Luther-Davies[2], Benjamin Eggleton[1]; [1]Ctr. for Ultrahigh Bandwidth Devices for Optical Systems, School of Physics, Inst. for Photonic Optical Systems, Univ. of Sydney, Australia, [2]Ctr. for Ultrahigh Bandwidth Devices for Optical Systems, Laser Physics Ctr., Res. School of Physics and Engineering, Australian Natl. Univ., Australia.* We demonstrate an all-optical RF spectrum analyser with >2.5THz bandwidth based on cross-phase modulation in a dispersion-engineered, nonlinear As_2S_3 rib waveguide.

ITuA • Sensitive Nanophotonics (continued)

ITuA5 • 9:30 a.m.
Optical Near-Field Distribution around Nano Hemi-Shell Periodic Structure for SERS Applications, *Tetsuo Sakai[1], Eric Diebold[2], Yuji Nishizawa[1], Yuto Tanaka[1], Kevin Vora[2], Eric Mazur[2], Minoru Obara[1]; [1]Keio Univ., Japan, [2]Harvard Univ., USA.* Raman spectroscopy is done to investigate the optical properties of 2-D nano-hemi-shell arrays consisting of small polystyrene particles coated with gold. The field distribution around nano-structures using femtosecond laser pulse irradiation is experimentally measured.

ITuA6 • 9:45 a.m.
Design and Nanofabrication of Deterministic Aperiodic Substrates for Surface-Enhanced Raman Scattering (SERS), *Ashwin Gopinath, Svetlana V. Boriskina, Björn M. Reinhard, Luca Dal Negro; Boston Univ., USA.* In this work we theoretically and experimentally study morphology dependent SERS enhancement in periodic and aperiodic metal nanoparticle arrays. This work demonstrates SERS enhancement factors ~10^7 using engineered, reproducible, deterministic-aperiodic arrays of Au nano-triangles.

Palace Lounge
10:00 a.m.–10:30 a.m.
Coffee Break/Exhibits

JTuA • Joint IPNRA/NLO Session: Nonlinear Integrated Photonics (continued)

JTuA5 • 9:15 a.m.
Ultrafast Optical Waveform Characterization and Generation Using a Four-Wave Mixing Time Lens on a Silicon Chip, *Reza Salem, Mark A. Foster, Yoshitomo Okawachi, Alexander L. Gaeta, Amy C. Turner-Foster, Michal Lipson; Cornell Univ., USA.* We demonstrate two temporal imaging systems using a four-wave-mixing-based time lens. High-speed performance monitoring using a temporal magnification system and high-speed NRZ packet generation using a temporal compression system are demonstrated.

JTuA6 • 9:30 a.m. **Invited**
Wavelength Conversion in Semiconductor Waveguiding Devices, *Takashi Kondo, Tomonori Matsushita, Junya Ota, Kaori Hanashima, Ikuma Ohta, Hiroshi Ishikawa, Kengo Ban, Tae Woong Kim; Univ. of Tokyo, Japan.* Wavelength conversion via quadratic optical nonlinearity in AlGaAs-based waveguiding devices will be presented. Efficient quasi-phase-matched nonlinear conversions are demonstrated in periodically inverted AlGaAs waveguides. A novel device utilizing birefringence in thin high-index-contrast waveguide is proposed.

JTuB • Joint Poster Session I

Palace Lounge
10:00 a.m.–11:30 a.m.

JTuB1
Eu^{3+} Doped Polymers for Optical Amplification, *K. C. Tsang, E. Y. B. Pun; City Univ. of Hong Kong, Hong Kong.* Eu^{3+} doped NOA polymers have been synthesized and characterized optically. Optical amplification at 612nm wavelength has been demonstrated, and a signal enhancement of ~18.3dB has been measured for a 5mm long device.

JTuB2
Interference Enhanced Directional Lasing through Surface Micro-Structures, *YuanYao Lin[1], Chih-Yao Chen[1], Jin-Shan Pan[2], Tsin-Dong Lee[3,4], Ray-Kuang Lee[1]; [1]Natl. Tsing Hua Univ., Taiwan, [2]TrueLight Corp., Taiwan, [3]Natl. Yunlin Univ. of Science and Technology, Taiwan, [4]Industrial Technology Res. Inst., Taiwan.* We demonstrate that surface-assisted micro-structures can tailor the modes and resulting emission from a dynamic localized VCSEL at room temperature. The coherent superposition of whispering gallery and dynamic localized modes are observed and reported.

JTuB3
Surface-Emitting QDs Laser with a Monolithically Integrated Grating Outcoupler, *Oleg V. Smolski[1], Viktor O. Smolski[1], Yigit O. Yilmaz[1], Eric G. Johnson[1], Jason O'Daniel[2]; [1]Univ. of North Carolina at Charlotte, USA, [2]CREOL, Univ. of Central Florida, USA.* Grating coupled surface emitting laser diodes were designed and fabricated from a 1270nm InAs QDs epi. The integrated outcoupler's characteristics were compared with the grating simulation data. The advanced emitter's performance enhanced the device applications.

JTuB4
Filling of Slot Waveguides with Versatile Material Systems Using Atomic Layer Deposition, *Tapani Alasaarela[1,2], Antti Säynätjoki[1], Petri Stenberg[3], Markku Kuittinen[3], Seppo Honkanen[1]; [1]Helsinki Univ. of Technology, Finland, [2]Beneq Oy, Finland, [3]Dept. of Physics and Mathematics, Univ. of Joensuu, Finland.* We introduce Atomic Layer Deposition (ALD) for versatile filling of slot waveguides. We demonstrate filling of test structures with combination of TiO_2 and Al_2O_3 layers and calculate the properties of dual-material filled slot waveguides.

JTuB5
Compact Etched Beam Splitters in Weakly Guiding GaAs/AlGaAs Waveguides, *Byungchae Kim, Yu-Chia Chang, Nadir Dagli; Univ. of California at Santa Barbara, USA.* Compact etched beam splitters in weakly guiding waveguides are designed, fabricated and characterized. 2-D FDTD calculations and experimental trends agree for varying incidence angle and gap dimension. Measurements indicate 10-30% power transmission over submicron area.

JTuB6
A Reflective Mirror with Spherical Lens Arrays for Multi-Channel Optical Interconnectors, *Sang-Pil Han, Young-Tak Han, Sang-Ho Park, Jang-Uk Shin, Yong-Soon Paek; ETRI, Republic of Korea.* We present a reflective mirror with spherical lens arrays (RMS) for multi-channel optical interconnectors. The coupling loss from a 9/125μm SMF to a 62.5/125μm MMF of the RMS samples is measured to be about 0.22dB.

JTuB7
Sensitivity Dependences of Silicon-Based Guided-Wave Optical Flow Sensors, *Masashi Ohkawa, Yusuke Kudo, Masafumi Adachi, Takashi Sato; Niigata Univ., Japan.* Sensitivity dependences of a silicon-based guided-wave optical flow sensor were examined experimentally. The flow sensor has a diaphragm with a small hole, and its operation is based on Bernoulli's theorem and the elasto-optic effect.

JTuB8
Plastic Optical Pressure Sensors Using a Flexible Polymer Waveguide, *Jun-Whee Kim, Kyung-Jo Kim, Min-Cheol Oh; Pusan Natl. Univ., Republic of Korea.* Optical pressure sensors based on the radiation coupling between a channel waveguide and a flexible polymer waveguide are proposed. From the fabricated sensor device, significant optical power modulation was observed depending on the contact pressure.

JTuB9
Colorful Photonic Band Gap Fiber-Based Textiles for Illumination and Sensing Applications, *Bertrand Gauvreau[1], Ning Guo[1], Kathy Schicker[2], Katherine Stoeffler[1], Abdellah Ajji[3], Charles Dubois[1], Maksim Skorobogatiy[1]; [1]École Polytechnique de Montréal, Canada, [2]Univ. of the Arts London, UK, [3]Industrial Materials Inst., Canada.* Polymer Bragg fiber-enabled, color changing photonic textiles for illumination and sensing applications are demonstrated. Such textiles show intrinsic and uniform lateral light extraction and evolutive visuals using both passive and active color control.

JTuB10
Polarization Independent, Low Loss, Low Crosstalk Si Wire Waveguide Crossing, *Daiki Tanaka, Yuichiro Ikuma, Hiroyuki Tsuda; Keio Univ., Japan.* Polarization independent Si wire waveguide crossing with the offset structure is proposed. For both TE and TM modes, this crossing has low transmission loss and low crosstalk.

JTuB11
Electrically Biased Birefringent Silicon Waveguides, *Montasir Qasymeh, Sergey A. Ponomarenko, Michael Cada; Dalhousie Univ., Canada.* We show that the polarization evolution and the shape of ultrashort pulses, propagating in birefringent silicon waveguide, can be dually efficiently controlled by a static electric field, applied across the waveguide, and the input intensity.

JTuB12
On-Chip Group Velocity Dispersion Compensation Using Coupled Chirped Vertical Gratings, *Dawn T. H. Tan, Kazuhiro Ikeda, Yeshaiahu Fainman; Univ. of California at San Diego, USA.* Coupled chirped vertical gratings are proposed for on-chip group velocity dispersion compensation. The device is studied using finite-difference time domain simulations and fabricated. The device circumvents the need for directional couplers to redirect compensated data.

JTuB13–JTuB24 can be found in the Nonlinear Optics (NLO) abstracts.
JTuB25–JTuB28 can be found in the Slow and Fast Light (SL) abstracts.

ITuB • Photonic Devices and Integration I

Tapa II
11:30 a.m.–1:00 p.m.
Valery Tolstikhin; OneChip Photonics Inc., Canada, Presider

ITuB1 • 11:30 a.m. Invited
Optical Flip-Flops and Isolators for Digital Photonic Integrated Circuits, *Yoshiaki Nakano; Univ. of Tokyo, Japan.* For better handling of optical labels and payloads in photonic networks, digital photonic integrated circuits (PICs) are demanded. This paper reviews research on semiconductor all-optical flip-flops and waveguide optical isolators as building blocks for future large-scale PICs.

ITuB2 • 12:00 p.m. Invited
Integration of Passive and Active Components in InP-Based PICs, *Meint Smit, Xaveer Leijtens; Technische Univ. Eindhoven, Netherlands.* Application specific photonic ICs (ASPICs) can be realized by integrating a small set of basic active and passive building blocks. In this presentation we will focus on the passive building blocks that are required.

ITuC • Silicon Nanophotonics

Tapa III
11:30 a.m.–1:00 p.m.
Tom Koch; Lehigh Univ., USA, Presider

ITuC1 • 11:30 a.m.
Concentric Microdisk Design for a Two-Stage Silicon Laser, *Brandon F. Redding, Tim Creazzo, Elton Marchena, Shouyuan Shi, Dennis Prather; Univ. of Delaware, USA.* We propose an electrically pumped two-stage laser based on concentric Si-nc and Er:SiO_2 microdisks. We present simulations of the pump and lasing modes and experimentally demonstrate excitation of the pump mode in the proposed device.

ITuC2 • 11:45 a.m.
Implementation of Single and Coupled Resonator Filters Using Ultimate Miniaturized Silicon Microdisk Resonators, *Mohammad Soltani, Qing Li, Siva Yegnanarayanan, Ali Adibi; Georgia Tech, USA.* Resonator-based filters using silicon microdisks scaled to ultimate miniaturization (radius~1.5-2 micron) close to radiation limit are demonstrated. High-Q (~150,000) and single-mode operation in each microdisk enables low insertion-loss and large free-spectral-range filters.

ITuC3 • 12:00 p.m.
SOI Based Photonic Crystal Polarization Converter for Terahertz Frequency Applications, *Khadijeh Bayat[1], Sujeet K. Chaudhuri[1], Safieddin Safavi-Naeini[1], Mahdi F. Baroughi[2]; [1]Univ. of Waterloo, Canada, [2]South Dakota State Univ., USA.* Photonic crystal slab waveguide polarization converter was designed and simulated using 3-D-FDTD method. Polarization conversion efficiency higher than 90% was achieved within the frequency band of 584-605 GHz. The structure was fabricated on SOI wafer.

ITuB • Photonic Devices and Integration I (continued)

ITuB3 • 12:30 p.m.
High Peak Power Efficient Edge-Emitting Photonic Crystal Nanocavity Lasers, *Ling Lu, Adam Mock, Eui Hyun Hwang, John O'Brien, Paul Daniel Dapkus; Univ. of Southern California, USA.* Record room temperature single-mode edge-emitted peak power was collected from L3 and finite-waveguide photonic crystal nanocavity quantum well membrane lasers. Peak power levels of 230 and 540μW were collected from L3 and finite-waveguide edge-emitters, respectively.

ITuB4 • 12:45 p.m.
Polarization Proximity Effect in Isolator Crystal Pairs, *Yoav Linzon, Marcello Ferrera, Luca Razzari, Alain Pignolet, Roberto Morandotti; INRS-Énergie et Matériaux, Univ. du Québec, Canada.* We experimentally studied the polarization dynamics of near infrared light transmitted through magnetooptic YIG isolator crystal pairs using modified balanced detection and observed a proximity effect where the saturation field is significantly reduced.

1:00 p.m.–2:30 p.m.
Lunch (on your own)

ITuC • Silicon Nanophotonics (continued)

ITuC4 • 12:15 p.m.
Backscattering in Slow Light Waveguides, *Francesco Morichetti[1,2], Antonio Canciamilla[1], Matteo Torregiani[1], Andrea Melloni[1], Liam O'Faolain[3], Daryl M. Beggs[3], Thomas F. Krauss[3], Antonio Samarelli[4], Marc Sorel[4], Richard M. De La Rue[4]; [1]POLICOM - DEI Politecnico di Milano, Italy, [2]Fondazione Politecnico di Milano, Italy, [3]School of Physics and Astronomy, Univ. of St. Andrews, UK, [4]Dept. of Electronics and Electrical Engineering, Univ. of Glasgow, UK.* Backscattering and its dependence on group index is experimentally studied in ring-resonators and photonic crystals. Independently of the structure, the behavior of optical devices can be dramatically modified as backscattered power increases with group index.

ITuC5 • 12:30 p.m. Invited
Silicon Nanophotonics: The Optical Spice Rack, *Michal Lipson; Cornell Univ., USA.* Silicon is evolving as a versatile photonic platform with multiple functionalities that can be seamlessly integrated. We have recently demonstrated the ability to guide and switch multiple wavelength sources at GHz bandwidths, in optomechanical as well as opto-fluidics devices.

ITuD • Modeling and Simulation II

Tapa II
2:30 p.m.–4:30 p.m.
Frank Schmidt; Zuse Inst. Berlin, Germany, Presider

ITuD1 • 2:30 p.m.
Complex Jacobi Iteration for 3-D Helmholtz Analysis of Metallic Structures, *G. Ronald Hadley[1], David W. Peters[2]; [1]Rio Grande Photonics, LLC, USA, [2]Sandia Natl. Labs, USA.* The complex Jacobi iterative method was recently developed for Helmholtz analysis of normal dielectrics. Here we update the derivation to allow metallic structures and apply the method to analyze mid-IR transmission through a frequency-selective surface.

ITuE • Novel Waveguides and Photonic Sensors

Tapa III
2:30 p.m.–4:30 p.m.
Pavel Cheben; Natl. Res. Council Canada, Canada, Presider

ITuE1 • 2:30 p.m. Invited
Low-Loss High Index Contrast SOI Waveguides: Expecting the Unexpected, *Tom Koch; Lehigh Univ., USA.* This talk reviews experimental and analytical work in our quest for low-loss, high-index-contrast silicon-on-Insulator (SOI) waveguides, yielding a number of intriguing effects that range from bizarre polarization characteristics to remarkable fundamental quantum electrodynamic phenomena.

ITuD • Modeling and Simulation II (continued)

ITuD2 • 2:45 p.m.
Fast, Accurate and Stable Scattering Calculation Method with Application to Finite Sized Photonic Crystal Waveguides, *Philip T. Kristensen, Peter Lodahl, Jesper Mørk; DTU Fotonik, Dept. of Photonics Engineering, Technical Univ. of Denmark, Denmark.* We present a multipole solution to the Lippmann-Schwinger equation for electromagnetic scattering in inhomogeneous geometries. The method is illustrated by calculating the Green's function for a finite sized two-dimensional photonic crystal waveguide.

ITuD3 • 3:00 p.m. Invited
Spectral Engineering of Deterministic Aperiodic Structures for Scattering, Localization and Enhancement of Optical Fields, *Svetlana V. Boriskina, Carlo Forestiere, Gary Walsh, Ashwin Gopinath, Sylvanus Lee, Luca Dal Negro; Boston Univ., USA.* We present the results of the analysis and optimization of deterministic aperiodic structures which can be used for a variety of applications including lasers, label-free biosensing, enhanced light emitters, and substrates for surface-enhanced Raman scattering.

ITuD4 • 3:30 p.m.
Analyzing Diffraction Gratings by Neumann-to-Dirichlet Maps and Boundary Integral Equations, *Yumao Wu[1,2], Ya Yan Lu[2]; [1]Univ. of Science and Technology of China, China, [2]City Univ. of Hong Kong, Hong Kong.* A new method for analyzing diffraction gratings is developed based on integral equations and Neumann-to-Dirichlet maps. The method shares the advantages of existing integral equation methods, but avoids the quasi-periodic Green's function.

ITuD5 • 3:45 p.m.
Modeling Two-Dimensional Anisotropic Photonic Crystals by Dirichlet-to-Neumann Maps, *Huan Xie[1,2], Ya Yan Lu[2]; [1]Univ. of Science and Technology of China, China, [2]City Univ. of Hong Kong, Hong Kong.* For 2-D photonic crystals involving anisotropic media and circular cylinders, we derive analytic solutions in the unit cells, construct the Dirichlet-to-Neumann (DtN) maps and calculate band structures with new eigenvalue problem formulations involving smaller matrices.

ITuE • Novel Waveguides and Photonic Sensors (continued)

ITuE2 • 3:00 p.m.
Advantages of Angled Sidewalls in Slot Waveguides, *Antti Säynätjoki, Tapani Alasaarela, Amit Khanna, Lasse Karvonen, Ari Tervonen, Seppo Honkanen; Helsinki Univ. of Technology, Finland.* Advantages of angled sidewalls in slot waveguides are discussed. Enhanced vertical optical confinement in such waveguides is shown. Filling of an angled-sidewall slot structure with conformal growth by atomic layer deposition is discussed and demonstrated.

ITuE3 • 3:15 p.m.
Selectively Patterned Notch Filter Waveguides for Optofluidic Biosensors, *Philip Measor[1], Brian S. Phillips[2], Yue Zhao[2], Aaron R. Hawkins[2], Holger Schmidt[1]; [1]Univ. of California at Santa Cruz, USA, [2]Brigham Young Univ., USA.* An integrated filter utilizing liftoff-based selective patterning is designed, fabricated, and demonstrated. The waveguide acts as a notch filter in the collection path of an optofluidic device and exhibits $\Delta\lambda$~1.4nm and ~22dB rejection over 18mm.

ITuE4 • 3:30 p.m.
The Design and Analysis of (MASH)-ARROW for Liquid Core Optical Waveguiding, *Jiwon Lee, Jaeyoun Kim; Iowa State Univ., USA.* A Multi- and Single- layer Hybridized Anti-Resonant Reflection Optical Waveguide (MASH)-ARROW, is proposed to introduce a novel mechanism for 2-D planar liquid core waveguiding and analyzed with finite element method for optofluidic sensing applications.

ITuE5 • 3:45 p.m.
Nanopore Fabrication in Hollow Integrated Waveguides, *Matthew R. Holmes[1], Mikhail Rudenko[2], Philip Measor[2], Tao Shang[1], Holger Schmidt[2], Aaron R. Hawkins[1]; [1]Brigham Young Univ., USA, [2]Univ. of California at Santa Cruz, USA.* We demonstrate the fabrication of micropores/nanopores in hollow antiresonant reflecting optical waveguides (ARROWs) through a combination of reactive ion etching and focused ion beam etching. Optical loss measurements indicate insignificant change in the waveguide loss.

ITuD • Modeling and Simulation II (continued)

ITuD6 • 4:00 p.m.
Photonic Crystal Laser Threshold Analysis Using 3-D FDTD with a Material Gain Model, *Adam Mock, John O'Brien; Univ. of Southern California, USA.* A derivation of threshold modal gain based on energy conservation and applicable to photonic crystal microcavities is presented. This result is investigated using 3-D FDTD simulations which include a spatially varying and dispersive gain model.

ITuD7 • 4:15 p.m.
Analysis of Open Dielectric Waveguides Using Pseudoinverse Penalty Method, *Hyoungsuk Yoo, Anand Gopinath; Univ. of Minnesota, USA.* The vector finite-element method in the interior and the boundary integral equation of the exterior domain are investigated to analyze open dielectric waveguides. The simultaneous solutions of propagating modes are obtained by the pseudoinverse method.

ITuE • Novel Waveguides and Photonic Sensors (continued)

ITuE6 • 4:00 p.m.
Finite Thickness Metal-Insulator-Metal Structure for Waveguide Based Surface Plasmon Resonance Biosensing, *Yifen Liu, Jaeyoun Kim; Iowa State Univ., USA.* We designed an asymmetric, finite thickness metal-insulator-metal (f-MIM) structure supporting surface plasmon-polariton (SPP) modes with high effective index. Combining f-MIM modes and polymer waveguide modes leads to a sensing scheme ideally suited for liquid-phase analytes.

ITuE7 • 4:15 p.m.
Single Trench GaInAsP Waveguide Mode Converter, *Sang-Hun Kim, Tetsuya Mizumoto; Tokyo Inst. of Technology, Japan.* A TE-TM mode converter is fabricated in a single trench GaInAsP waveguide by a single-masking and etching process. A mode conversion efficiency of 76% is obtained in a 210-μm long trench section.

4:30 p.m.–5:00 p.m., Coffee Break, *Palace Lounge*

5:00 p.m.–6:30 p.m., Postdeadline Paper Sessions, *See Postdeadline Papers book for schedule and locations*

7:00 p.m.–10:00 p.m., Conference Luau, *Lagoon Green*

NOTES

•Wednesday, July 15, 2009•

Palace Lounge
7:30 a.m.–4:30 p.m.
Registration Open

IWA • Photonic Devices and Integration II

Tapa III
8:00 a.m.–10:00 a.m.
Maura Raburn; Infinera Corp., USA, Presider

IWA1 • 8:00 a.m.
InGaAsP/InP Based Flattened Ring Resonators with Etched Beam Splitters, *Erik J. Norberg, John S. Parker, Uppili Krishnamachari, Robert S. Guzzon, Larry A. Coldren; Univ. of California at Santa Barbara, USA.* A novel flattened ring resonator design utilizing Etched Beam Splitters (EBS) in InGaAsP/InP is purposed and demonstrated. A multiple-thickness hard mask that compensates for RIE-lag realizes waveguides and EBS in a single etch step.

IWA2 • 8:15 a.m.
Single Port Optical Switching in Integrated Ring Resonators, *John S. Parker, Yung-Jr. Hung, Erik J. Norberg, Robert S. Guzzon, Larry A. Coldren; Univ. of California at Santa Barbara, USA.* We have experimentally investigated single-port injection-triggered switching in a new class of semiconductor ring lasers with integrated gain, phase and passive waveguide sections as a building-block for all-optical signal processing such as high-speed analog-to-digital conversion.

IWA3 • 8:30 a.m. **Invited**
Integrated Transmitters and Transceivers for High-End Applications in WDM Optical Networks, *Larry A. Coldren; Univ. of California at Santa Barbara, USA.* Integration platforms initially developed for widely-tunable lasers have recently been extended to single-chip transmitters and transceivers by incorporating optical amplifier-photodiode receivers with these transmitters. Results from these and other InP-based photonic ICs will be presented.

IWA4 • 9:00 a.m. **Invited**
InP PICs for Advanced Modulation Format Transmission, *Masaki Kato, Peter Evans, Scott Corzine, Matthew Fisher, John Gheorma, Andrew Dentai, Randal Salvatore, Ilya Lyubomirsky, Alan Nilsson, Jeff Rahn, Radha Nagarajan, Corey Tsai, Babak Behnia, James Stewart, Doug Christini, Mark Missey, Augi Spannagel, Damien Lambert, Shashank Agashe, Paul Liu, Don Pavinski, Mike Reffle, Rick Schneider, Mehrdad Ziari, Chuck Joyner, Fred Kish, David Welch; Infinera Corp., USA.* InP photonic integrated circuits (PICs) for advanced modulation format transmission, which enable high spectral efficiency, reduced complexity, high reliability, and low power consumption, will be reviewed.

IWA5 • 9:30 a.m.
Conversion of Phase-Modulated Signals to Amplitude-Modulated Signals in SOAs Due to Mirror Reflections, *Søren Blaaberg, Jesper Mørk; Technical Univ. of Denmark, Denmark.* We present theoretical results that show conversion of phase modulated signals to amplitude modulated signals in an SOA. Large-signal and small-signal calculations show significant conversion responses caused by even minute reflections at the end mirrors.

IWA6 • 9:45 a.m.
Wide Bandwidth Design of Ultra-Low Voltage Substrate-Removed Electro-Optic Mach-Zehnder Intensity Modulators, *Selim Dogru, JaeHyuk Shin, Nadir Dagli; Univ. of California at Santa Barbara, USA.* Wide bandwidth design of recently demonstrated 0.3 V V_π substrate removed electro-optic modulators is described. 30 GHz bandwidth with V_π substantially lower than 1 V should be possible.

Palace Lounge
10:00 a.m.–10:30 a.m.
Coffee Break/Exhibits (Exhibits open 10:00 a.m.–2:30 p.m.)

JWA • Joint Poster Session II

Palace Lounge
10:00 a.m.–11:30 a.m.

JWA1
Room Temperature Continuous-Wave Operation of Two-Dimensional Photonic Crystal Nanolaser on a Sapphire Substrate, *Yu-Chen Liu[1,2], Yi-Chun Yang[1], Zi-Chang Chang[1,2], Meng-Chyi Wu[2], Min-Hsiung Shih[1,3]; [1]Academia Sinica, Taiwan, [2]Natl. Tsing Hua Univ., Taiwan, [3]Natl. Chiao Tung Univ., Taiwan.* An ultrasmall photonic crystal defect laser had been fabricated on a sapphire substrate. The room temperature continuous-wave (CW) lasing near 1550 nm had been achieved with a low threshold.

JWA2
Near-Field Property of the Plasmonic Optical Antennas, *Hao Xie, Fanmin Kong, Kang Li; Shandong Univ., China.* The electric field of nanoparticle optical antenna is studied by three-dimensional electromagnetic calculation. Huge electric field enhancement is excited at the gap and found to be dependent on gap size, length and radius.

JWA3
Out-Coupling Enhancement of OLEDs Using Organic Diffraction Gratings Placed on Top of ITO Electrode, *Ji-Hyang Jang, Min-Cheol Oh; Pusan Natl. Univ., Republic of Korea.* By incorporating diffraction grating structure in the middle of the OLED layers, the luminance efficiency is improved by 73%. The grating fabricated on the ITO is highly compatible with the conventional OLED fabrication process.

JWA4
Nonlinear Surface Plasmons in "Semiconductor THz Photonic Circuits" Using Ponderomotive Forces, *Pavel Ginzburg, Alex Hayat, Nikolai Berkovitch, Meir Orenstein; Technion-Israel Inst. of Technology, Israel.* Nonlinear propagation of THz surface plasmons on semiconductors, stemming from ponderomotive forces, may serve as important ingredient in active integrated THz photonics. High-power THz modes exhibit high order nonlinearity, "slow light," nonlinear cutoff, reduced wavelength.

JWA5
Surface Plasmon Resonance-Like Integrated Sensor at Terahertz Frequencies for Gaseous Analytes, *Alireza Hassani, Maksim Skorobogatiy; École Polytechnique de Montréal, Canada.* Plasmon-like excitation at the interface between highly porous fiber covered with a ferroelectric layer and gaseous analyte is demonstrated theoretically in terahertz regime. 1.3e-4RIU sensitivity to changes in the gaseous analyte refractive index is predicted.

JWA6
Spectral, Amplitude and Phase Sensitivity of a Plasmonic Gas Sensor in a Metallic Photonic Crystal Slab Geometry, *Lina Shi, Andrei Kabashin, Maksim Skorobogatiy; École Polytechnique de Montréal, Canada.* Using FDTD we investigate amplitude and phase reflective properties of a metallic photonic crystal gas sensor comprising a two-dimensional array of gold disks placed onto a thin gold film resting on a dielectric substrate.

JWA7
Effect of Rod Inaccuracy on Genetic-Algorithm-Designed C-Band Photonic-Crystal Waveguide Interleavers, *Lorenzo Rosa, Kunimasa Saitoh, Kuniaki Kakihara, Masanori Koshiba; Hokkaido Univ., Japan.* We investigate the effect of construction inaccuracies on C-band photonic-crystal waveguide (PCW) interleavers with flattened pass-band, designed through the employment of single- and multi-objective genetic algorithm (GA) approaches.

JWA8
Multiplexed FBG Interrogation System on a Silicon Chip, *Xuan Wang, Roberto R. Panepucci; Florida Intl. Univ., USA.* We demonstrated a novel system based on integrated silicon thermooptic tunable filter(s) for interrogating multiplexed FBG sensor array. The system is compact, low cost and with high resolution when multiplexed.

JWA9
All-Angle Negative Refraction for Blue Light with Nanophotonic Device Application, *Monika Rajput, Ravindra Sinha, Swati Rawal; Delhi College of Engineering, Univ. of Delhi, India.* All-angle negative refraction (AANR) for blue light is achieved in a new design of metallo-dielectric photonic crystal (MDPC) with its strong potential of nanophotonic device application in nano-technology and nano-optics.

JWA10
Modeling Femtosecond Phase Deviations by Nonlinear Gain Dynamics in Semiconductor Optical Amplifiers, *Claudio Crognale, Antonella Di Giansante; TechnoLabs S.p.A., Italy.* Extreme phase features of 100fs pump and probe optical pulses in a SOA have been numerically investigated taking into account the different impacts of the ultrafast nonlinear gain dynamics on the fields phase modulation.

JWA11
Optic Switching in Nonlinear Metal-Insulator-Metal Plasmonic Bragg Reflectors, *Yu Liu, Jaeyoun Kim; Dept. of Electrical and Computer Engineering, Iowa State Univ., USA.* We present several nonlinear λ/4-shifted metal-insulator-metal Bragg reflectors. Optic switching and optical bistability in the proposed structures is investigated by Finite Difference Time Domain simulation. Our results show a feasible way for constructing optical switches.

JWA12
Optimizer Based on Parallel Computational Intelligence with Parallel FDTD and Application for Nanophotonic Design, *Qian Wang[1], Seng Tiong Ho[1,2]; [1]Data Storage Inst., Agency for Science, Technology and Res., Singapore, [2]Northwestern Univ., USA.* Powerful and efficient optimizer is developed, which incorporates parallel particle swarm optimization with parallel FDTD. It reduces the optimization time significantly as comparing to conventional approaches. This optimizer is introduced and demonstrated for nanophotonic design.

JWA13
Jitter-Free Nanospheres Optical Disk Storage with Buffer Ring, *Chikara Egami, Naoto Nishimura, Satoshi Ota; Shizuoka Univ., Japan.* An optical disk storage composed of nanospheres with buffer rings is proposed for high density recording without jitter. Nonlinear organic dyes were doped in the nanospheres as recordable bits. A new process has been devised.

JWA14–JWA25 can be found in the Nonlinear Optics (NLO) abstracts.
JWA26–JWA29 can be found in the Slow and Fast Light (SL) abstracts.

IWB • Resonator Circuits and their Applications

Tapa III
11:30 a.m.–1:30 p.m.
Dan-Xia Xu; Natl. Res. Council Canada, Canada, Presider

IWB1 • 11:30 a.m. **Invited**
Microring Resonator and its Application to Hitless Wavelength Selective Switch Circuits, *Yasuo Kokubun; Yokohama Natl. Univ., Japan.* The recent progress in the microring resonator filters using high index contrast (HIC) optical waveguides is reviewed and its application to the hitless wavelength selective switch achieved by the author's group is mainly described.

IWB2 • 12:00 p.m.
Novel Fabrication of Sub-Wavelength High Aspect Ratio Metal/Dielectric Gratings on InP Semiconductor Platforms, *Erica Lively, Jonathon S. Barton, Daniel J. Blumenthal; Univ. of California at Santa Barbara, USA.* We demonstrate the first reported fabrication of metal gratings using inverse dielectric patterning with greater than 3:1 aspect ratio. The fabrication method, grating pitch measurements, and potential to realize theoretically predicted devices are discussed.

IWB3 • 12:15 p.m.
Silicon Photonic Guided Mode Resonance Filter for Evanescent Field Molecular Sensing , *Jens H. Schmid, William Sinclair, Siegfried Janz, Jean Lapointe, Daniel Poitras, Trevor Mischki, Gregory Lopinski, Philip Waldron, Pavel Cheben, André Delâge, Adam Densmore, Dan-Xia Xu; Natl. Res. Council Canada, Canada.* We present experimental and theoretical results of label-free molecular sensing with the TM mode of a 0.22 μm thick silicon slab waveguide used in a guided mode resonance configuration.

IWB4 • 12:30 p.m.
Cavity-Enhanced Photosensitivity in Chalcogenide Glass, *Juejun Hu[1], Anu Agarwal[1], Lionel C. Kimerling[1], Matteo Torregiani[2], Francesco Morichetti[2], Andrea Melloni[2], Nathan Carlie[3], Laeticia Petit[3], Kathleen Richardson[3]; [1]MIT, USA, [2]Politecnico di Milano, Italy, [3]Clemson Univ., USA.* Cavity-enhanced photosensitivity of As_2S_3 chalcogenide glass films is measured using planar micro-disk resonators. We observed infrared index trimming by 1550 nm wavelength light, cavity instability and confirmed the absence of two photon absorption.

IWB5 • 12:45 p.m.
$Ge_{11.5}As_{24}Se_{64.5}$ Glass: A New Material for the Fabrication of Highly Nonlinear ($\gamma \approx 33{,}000 W^{-1}km^{-1}$) Dispersion Engineered Waveguides, *Barry Luther-Davies, Amrita Prasad, Xin Gai, Khu Vu, Steven Madden, Duk-Yong Choi, Douglas Bulla, Rongping Wang; Ctr. for Ultrahigh Bandwidth Devices for Optical Systems, Australian Natl. Univ., Australia.* We report the properties of a $Ge_{11.5}As_{24}Se_{64.5}$ chalcogenide glass and demonstrate that dispersion-engineered rib waveguides can be fabricated in this material with nonlinear parameters >30,000$W^{-1}km^{-1}$: the highest value yet reported for a glass planar waveguide.

IWB6 • 1:00 p.m.
Active Guided-Mode Resonant Subwavelength Gratings, *David W. Peters[1], Aaron V. Gin[1], Shanalyn A. Kemme[1], Jon F. Ihlefeld[1], Ronald D. Briggs[1], Joel R. Wendt[1], Tony R. Carter[2], Sally Samora[2]; [1]Sandia Natl. Labs, USA, [2]Sandia Staffing Alliance, USA.* We design and fabricate guided-mode resonant subwavelength gratings using an active layer of barium titanate. Loss mechanisms in the metal and in the guiding layer are investigated. Modeling and experimental results are shown.

IWB7 • 1:15 p.m.
Liquid Crystal Photonic Bandgap Fiber Based Compact Electrically Tunable Long Period Grating Device, *Lei Wei[1], Thomas Tanggaard Alkeskjold[2], Anders Bjarklev[1]; [1]DTU Fotonik, Dept. of Photonics Engineering, Technical Univ. of Denmark, Denmark, [2]Crystal Fibre A/S, Denmark, Denmark.* We demonstrate a compact electrically tunable long period grating device based on a photonic crystal fiber infiltrated with a nematic liquid crystal. The spectral loss dips are tuned electrically and show strong polarization dependence.

1:30 p.m.–2:30 p.m.
Lunch (on your own)

IWC • Modeling and Simulation III

Tapa I
2:30 p.m.–4:30 p.m.
Vien Van; Univ. of Alberta, Canada, Presider

IWC1 • 2:30 p.m.
Analysis of THz Antiresonant Reflecting Tube Waveguides, *Chih-Hsien Lai[1,2], Chi-Kuang Sun[1], Hung-chun Chang[1]; [1]Natl. Taiwan Univ., Taiwan, [2]Hwa Hsia Inst. of Technology, Taiwan.* Modal patterns, modal indices, and attenuation constants of the air-core THz tube waveguides are numerically investigated. Analysis of results confirms that guiding mechanism of the leaky core modes is that of the antiresonant reflecting guiding.

IWC2 • 2:45 p.m.
A Full-Vectorial Finite-Difference Eigenmode Solver for Anisotropic Optical Waveguides with Arbitrary Permittivity Tensor, *Ming-Yun Chen, Hung-chun Chang; Natl. Taiwan Univ., Taiwan.* A finite-difference frequency-domain (FDFD) method based full-vectorial eigenmode solver is developed for analyzing anisotropic optical waveguides with arbitrary permittivity tensor. Guided modes on liquid-crystal-filled optical waveguides with different liquid-crystal molecular orientations are solved and discussed.

IWC3 • 3:00 p.m.
The Effect of Choosing PML Reflection-Coefficient Value on Numerical Accuracy in the Pseudospectral Leaky Waveguide Mode Solver, *Po-Jui Chiang[1], Nai-Hsiang Sun[2], Hung-chun Chang[3]; [1]Natl. Kaohsiung Univ. of Applied Sciences, Taiwan, [2]I-Shou Univ., Taiwan, [3]Natl. Taiwan Univ., Taiwan.* It is shown that suitable choice of the reflection-coefficient value of uniaxial perfectly matched layers is essental for achieving high-accuaracy analysis of leaky waveguide modes using the full-vectorial multidomain pseudospectral mode solver.

IWD • 3-D Photonic Crystals, Novel Fabrication Techniques

Tapa II
2:30 p.m.–4:30 p.m.
Richard De La Rue; Univ. of Glasgow, UK, Presider

IWD1 • 2:30 p.m. **Invited**
Coupling of Quantum Dots in 3-D Photonic Crystals, *Kanna Aoki; Metamaterials Lab, RIKEN, Japan.* Coupling of electrons and photons in a three dimensionally confined system was experimentally demonstrated with quantum dots embedded in a point defect cavity of a three dimensional photonic crystal.

IWD2 • 3:00 p.m.
Engineering Quantum Dot Surfaces in Solution-Processed Optoelectronics: Chemical Optimization of Photodetector and Photovoltaic Device Performance, *Aaron R. Barkhouse, Jason P. Clifford, Andras G. Pattantyus-Abraham, Larissa Levina, Edward H. Sargent; Univ. of Toronto, Canada.* We report that spin-cast colloidal quantum dot devices depend sensitively on exquisite control over surface passivation. We use these findings to quadruple infrared phovotovoltaic efficiency and build the first megahertz-frequency solution-cast photodiode.

IWC • Modeling and Simulation III (continued)

IWC4 • 3:15 p.m.
Effect of Nonlinear Phase on the Passive Phase Locking of an Array of Fiber Lasers of Random Lengths, *Erik J. Bochove; AFRL, Kirtland Air Force Base, USA.* We find support for the idea that the nonlinear phase shift can force the spontaneous locking of the output of an array of fiber lasers or regenerative amplifiers with random length differences.

IWC5 • 3:30 p.m.
Temperature Stability of a CMOS-Compatible Single-Arm Microring Optical Filter with MOS Cross-Section, *Chih T'sung Shih, Zei Wei Zeng, Shiuh Chao; Natl. Tsing Hua Univ., Taiwan.* We introduce the numerical analysis of the temperature stability of a single-arm microring that has a MOS rib-waveguide cross-section with 25.5μm outer radius. The temperature coefficient of the resonant wavelength was found to be 0.088nm/^{0}C.

IWC6 • 3:45 p.m.
Analysis of Enhanced Transmission through an Annular Slit Surrounded by Periodic Grooves, *Junji Yamauchi, Bungo Murakami, Tatsuya Iguchi, Hisamatsu Nakano; Hosei Univ., Japan.* The body-of-revolution finite-difference time-domain method is employed to analyze the transmission through an annular slit surrounded by periodic grooves in a sliver film. A Bragg reflector is added at the outermost circumference.

IWC7 • 4:00 p.m.
Chebyshev Collocation Dirichlet-to-Neumann Map Method for Diffraction Gratings, *Dawei Song[1,2], Ya Yan Lu[2]; [1]Univ. of Science and Technology of China, China, [2]City Univ. of Hong Kong, Hong Kong.* An efficient method for diffraction gratings is developed based on Dirichlet-to-Neumann (DtN) maps. A Chebyshev collocation method is used with a compact fourth order finite difference scheme to calculate DtN map efficiently.

IWC8 • 4:15 p.m.
Plasmonic Waveguide Resonators Based on Hexagonal Structures, *Z. H. Han[1,2], E. Y. B. Pun[1], S. He[2,3]; [1]City Univ. of Hong Kong, Hong Kong, [2]Zhejiang Univ., China, [3]Royal Inst. of Technology, Sweden.* Hexagonal plasmonic waveguide resonators have been proposed and studied using finite difference time domain method. Numerical simulations show that these resonators exhibit unique subwavelength characteristics and added flexibilities compared to rectangular plasmonic resonators.

Palace Lounge
7:30 p.m.–9:00 p.m.
Registration Open

IWD • 3-D Photonic Crystals, Novel Fabrication Techniques (continued)

IWD3 • 3:15 p.m.
Fabrication of Large Area "Woodpile" Photonic Crystal Structures for Near IR, *Neilanjan Dutta[1], Peng Yao[1], Shouyan Shi[1], Ahmed Sharkawy[2], Ozgenc Ebil[2], Eric Kelmelis[2], Dennis W. Prather[1]; [1]Univ. of Delaware, USA, [2]EM Photonics Inc., USA.* We have fabricated large area 3-D polymer photonic crystals by modifying planar lithography to achieve exposure confinement and multiple resist application. This fabrication process allows arbitrary defect introduction and is suitable for batch fabrication.

IWD4 • 3:30 p.m.
Efficient Spin Filter Based on Non-Magnetic Semiconductor GaNAs, *X. J. Wang[1], I. A. Buyanova[1], F. Zhao[2], D. Lagarde[2], A. Balocchi[2], Z. Marie[2], C. W. Tu[3], J. C. Harmand[4], Weimin M. Chen[1]; [1]Linköping Univ., Sweden, [2]Univ. de Toulouse, France, [3]Univ. of California at La Jolla, USA, [4]Lab de Photonique et Nanostructures, France.* We provide experimental demonstration of a novel defect-engineered, efficient and switchable spin filter from GaNAs to generate, amplify and detect electron spin polarization at room temperature without a magnetic material or external magnetic fields**.**

IWD5 • 3:45 p.m.
Holographic Realization of Two-Dimensional Photonic Crystal Structures on Silicon Substrates, *Yung-Jr. Hung, San-Liang Lee, Yen-Ting Pan; Dept. of Electronic Engineering, Natl. Taiwan Univ. of Science and Technology, Taiwan.* We successfully realize submicron-scale photonic crystals on silicon substrates with good quality by laser holography technique. The use of antireflection layers is crucial for realizing submicron photonic crystals with good uniformity over a large area.

IWD6 • 4:00 p.m.
Slot Waveguides with a Flattened Near-Zero Dispersion and a Small Effective Mode Area, *Lin Zhang[1], Yang Yue[1], Yinying Xiao-Li[1], Ray G. Beausoleil[2], Alan E. Willner[1]; [1]Dept. of Electrical Engineering, Univ. of Southern California, USA, [2]HP Labs, USA.* We propose a dispersion-flattened silicon slot waveguide for on-chip nonlinear applications, which exhibits a flat near-zero dispersion within ±150 ps/nm/km over a 244-nm wavelength bandwidth. Its effective mode area is as small as 0.04 μm^2.

IWD7 • 4:15 p.m.
Tailoring the Filter Response of 2-D Photonic Crystal Microcavity Filters Embedded in Ridge Waveguides, *Aju S. Jugessur, James Dou, J. Stewart Aitchison; ECTI, Faculty of Applied Science and Engineering, Univ. of Toronto, Canada.* 2-D photonic crystal microcavity filters have been fabricated using electron-beam lithography and reactive ion etching. The size and shape variation of the holes in such devices provide effective techniques to tailor the filter response.

Key to Authors and Presiders

(**Bold** denotes Presider or Presenting Author)

Integrated Photonics and Nanophotonics Research and Applications (IPNRA)/ Nonlinear Optics (NLO)/Slow and Fast Light (SL)
Postdeadline Paper Abstracts

•Monday, July 13, 2009•

NMD • Photonic Crystals and Periodic Nanomaterials

Tapa I
2:00 p.m.–4:00 p.m.
Steve Blair; Univ. of Utah, USA, Presider

PDNMD1 • 2:00 p.m.
Influence of Hole Sizes and Adhesion Layers on the Third-Harmonic Generation from Sub-Wavelength Apertures, *Xiaojin Jiao, Tingjun Xu, Steve Blair; Dept. of Electrical and Computer Engineering, Univ. of Utah, USA.* Third-harmonic generation from arrays of sub-wavelength apertures is measured. Strong angular dependence of THG is observed, which roughly corresponds to that of fundamental transmission. Influence of hole size and adhesion layers is also experimental studied.

•Tuesday, July 14, 2009•

NTuA • Entanglement, Squeezing and Quantum Memories

Tapa I
8:00 a.m.–10:00 a.m.
Akira Furusawa; Univ. of Tokyo, Japan, Presider

PDNTuA2 • 8:30 a.m.
Experimental Realization of a Multi-Player Quantum Game, *Joseph B. Altepeter[1], Matthew A. Hall[1], Milja Medic[1], Monika Patel[1], David A. Meyer[2], Prem Kumar[1]; [1]Northwestern Univ., USA, [2]Univ. of California at San Diego, USA.* We implement a multi-player quantum public-goods game using only bipartite entanglement and two-qubit logic. Within measurement error, the expectation per player follows predicted values as the number of players is increased.

PDPA • Nonlinear Optics Postdeadline Session I

Tapa I
5:00 p.m.–6:00 p.m.
Jens Rauschenberger; Max-Planck-Inst. of Quantum Optics, Germany, Presider

PDPA1 • 5:00 p.m.
40-Gbit/s Optical Data Exchange between WDM Channels Using Second-Order Nonlinearities in PPLN Waveguides, *Jian Wang, Scott Nuccio, Xiaoxia Wu, Omer Yilmaz, Lin Zhang, Irfan Fazal, Jeng-Yuan Yang, Yang Yue, Alan Willner; Univ. of Southern California, USA.* We demonstrate 40-Gbit/s optical data exchange between WDM channels based on second-order nonlinearities in a periodically-poled Lithium-niobate (PPLN) waveguide. Channel-selective data exchange of four WDM signals is shown, which introduces ~4 dB penalty.

PDPA2 • 5:15 p.m.
Experimental Verification of Two-Tone Amplification in Single Frequency Fiber Amplifiers, *Clint Zeringue, Iyad Dajani, Chunte Lu, Ahmed Lobad, Christopher Vergien; AFRL, USA.* We present experimental verification of a novel technique to suppress SBS in narrow linewidth fiber amplifiers. This technique relies on seeding with a combination of broad- and narrow-linewidth laser beams allowing favorable laser gain competition.

PDPA3 • 5:30 p.m.
Wavelength Conversion and 9-Fold Multicasting of a 21.4 Gbit/s DPSK Data Channel Using Supercontinuum Generation, *Omer F. Yilmaz, Scott Nuccio, Zahra Bakhtiari, Xiaoxia Wu, Jian Wang, Lin Zhang, Alan Willner; Univ. of Southern California, USA.* We demonstrate wavelength conversion and 9-fold multicasting of a 21.4-Gbit/s DPSK signal using supercontinuum generation. Multicasting is accomplished using a polarization based periodic filter for spectral slicing. Power penalties <3dB are achieved for all channels.

PDPA4 • 5:45 p.m.
X-Ray View of Dressed Atoms, *Ernest Glover[1], Marc Hertlein[1], Steve Southworth[2], Tom Allison[3], Jeroen van Tilborg[1], Elliot Kanter[2], Bertold Krässig[2], H. R. Varma[2], Bruce Rude[1], Robin Santra[2,4], Ali Belkacem[1], Linda Young[2]; [1]Lawrence Berkeley Natl. Lab, USA, [2]Argonne Natl. Lab, USA, [3]Univ. of California at Berkeley, USA, [4]Univ. of Chicago, USA.* We report, to our knowledge, the first dressed absorption spectrum at an X-ray probe wavelength. An ultrafast optical pulse induces transparency for X-rays, demonstrating a promising route to femtosecond X-ray pulse shaping and measurement.

PDPB • Nonlinear Optics Postdeadline Session II

Tapa II
5:00 p.m.–6:15 p.m.
Concita Sibilia; INFM, Dept. di Energetica, Univ. di Roma, Italy, Presider

PDPB1 • 5:00 p.m.
Synthesis and Characterization of Sol-Gel Based Nanostructured Cr(III)Doped ITO Films on Glass, *Prasanta K. Biswas, Susmita Kundu, Sunirmal Jana, Dipten Bhattacharya; Central Glass and Ceramic Res. Inst., India.* Sol-gel based Cr(III) doped quantum sized (2-10 nm) indium tin oxide films were deposited on glass and cured at different temperatures. Absorption and photoluminescence study shows a strong quantum confinement effect and exciton phonon interaction.

PDPB2 • 5:15 p.m.
Two Photo-Absorption Property of Metal Complexes Tethered with Azo Dyes, *Ubaldo M. Neves[1], Leonardo De Boni[1], Cleber R. Mendonça[1], Zhihong Ye[2], Xiu R. Bu[2]; [1]Inst. de Física de São Carlos, Brazil, [2]Clark Atlanta Univ., USA.* Schiff base compounds have been prepared possessing azo dye units. The two-photon absorption properties are evaluated, which reveals the additive property as a result of non-detrimental dipole-dipole interaction between dye chromophores.

PDPB3 • 5:30 p.m.
Two-Photon-Fluorescence Correlation Measurements of Picosecond Optical Pulses Generated from a 405-nm GaInN Laser Diode, *Shunsuke Kono[1], Takao Miyajima[2], Masaru Kuramoto[2], Masao Ikeda[1,2], Hiroyuki Yokoyama[1]; [1]New Industry Creation Hatchery Ctr., Tohoku Univ., Japan, [2]Advanced Material Labs, Sony Corp., Japan.* Intensity auto-correlation measurements using two-photon fluorescence from a GaN crystal were performed on picosecond optical pulses from a 405-nm GaInN laser diode excited by intense electric pulses. The estimated pulse duration was 10 ps.

PDPB4 • 5:45 p.m.
Polarization-Diverse Parametric Processes in Zincblende Crystals, *Paulina S. Kuo[1], Konstantin L. Vodopyanov[2], Martin M. Fejer[2]; [1]NIST, USA, [2]Stanford Univ., USA.* Quasi-phasematched, non-birefringent nonlinear materials, like orientation-patterned GaAs, allow efficient mixing of diverse polarization states. We investigate parametric processes in these materials, including the six coupled-wave equations that describe them and implications for all-optical signal processing.

PDPB5 • 6:00 p.m.
Vortex Spatiotemporal Optical Solitons in Nonlinear Optical Fibers, *Robabeh Talebzadeh; Azarbaijan Univ. of Tarbiat Moallem, Iran, Islamic Republic of.* We investigate possibility of forming spatiotemporal vortex solitons in inhomogeneous dispersive nonlinear-optical fibers using a graded-index kerr medium. We use a variational approach to solve NLS-equation and show they can be stabilized under certain conditions.

PDPC • Joint IPNRA/SL Postdeadline Session

Honolulu I-II
5:00 p.m.–6:15 p.m.
Liming Zhang; Bell Labs, Alcatel-Lucent, USA

PDPC1 • 5:00 p.m.
Polarization Dependent Pulse Distortion in Stimulated Brillouin Scattering Slow Light Systems, *Avi Zadok[1], Sanghoon Chin[2], Elad Zilka[3], Avishay Eyal[3], Luc Thévenaz[2], Moshe Tur[3]; [1]Caltech, USA, [2]Ecole Polytechnique Fédérale de Lausanne, Switzerland, [3]Tel Aviv Univ., Israel.* Stimulated Brillouin scattering slow light delay is shown to introduce an inherent polarization mode dispersion, which can dominate the broadening and distortion of signal pulses. The effect is demonstrated in both simulations and experiments.

PDPC2 • 5:15 p.m.
High-*Q* Photonic Crystal Chalcogenide Cavities by Photosensitive Post Processing, *Michael W. Lee[1], Christian Grillet[1], Snjezana Tomljenovic-Hanic[1], Dave Moss[1], Benjamin J. Eggleton[1], Xin Gai[2], Steve Madden[2], Duck Y. Choi[2], Douglas Bulla[2], Barry Luther-Davies[2]; [1]CUDOS, School of Physics, Univ. of Sydney, Australia, [2]CUDOS, Laser Physics Ctr., Australian Natl. Univ., Australia.* We present the first demonstration of a high-*Q* (~60000) photonic crystal (PhC) cavity formed post-fabrication by locally modifying the refractive index of a PhC made of a photosensitive chalcogenide glass.

PDPC3 • 5:30 p.m.
Monolithic Dual-Mode DFB Laser for Tunable Continuous-Wave THz Generation, *Namje Kim[1], Jaeheon Shin[1], Chul Wook Lee[1], Eundeok Sim[1], Sang-Pil Han[1], Yongsoon Baek[1], Dae-Su Yee[2], Min Young Jeon[3], Kyung Hyun Park[1]; [1]Electronics and Telecommunications Res. Inst., Republic of Korea, [2]Ctr. for Safety Measurement, KRISS, Republic of Korea, [3]Chungnam Natl. Univ., Republic of Korea.* We report a monolithic dual-mode DFB laser operating in the 1550-nm range as an optical beat source for tunable THz generation. The THz emission from InGaAs photomixers is continuously tuned from 0.17 to 0.49 THz.

PDPC4 • 5:45 p.m.
Nano-Photonic Electro-Optic Polymer Modulator Based on Photonic Band Gap Engineering, *Xiaolong Wang[1], Swapnajit Chakravarty[1], Boem Suk Lee[2], Cheyun Lin[2], Jingdong Luo[3], Alex K.Y Jen[3], Ray T. Chen[2]; [1]Omega Optics, Inc., USA, [2]Microelectronics Res. Ctr., Univ. of Texas at Austin, USA, [3]Dept. of Materials Science and Engineering, Univ. of Washington, USA.* A nano-photonic electro-optic polymer modulator based on shifting the band diagram of the photonic crystal waveguide is presented. Simulations results show that the device is as short as 20μm and consumes only 25fJ/bit energy.

PDPC5 • 6:00 p.m.
Low-Voltage, Vertical-Junction, Depletion-Mode, Silicon Mach-Zehnder Modulator with Complementary Outputs, *Michael Watts, William A. Zortman, Douglas C. Trotter, Ralph W. Young, Anthony L. Lentine; Sandia Natl. Labs, USA.* We demonstrate a new silicon depletion-mode vertical *p-n* junction phase-modulator implemented in a lumped-element Mach-Zehnder modulator configuration enabling an ultra-low $V_{\pi}L$ of ~1V·cm and 10Gb/s non-return-to-zero (NRZ) data transmission with wide-open complementary output eye diagrams.

•Wednesday, July 15, 2009•

JWA • Joint Poster Session II

Palace Lounge
10:00 a.m.–11:30 a.m.

PDJWA30
Slow Light in a Parametrically Amplifying Medium, *Nobuhito Hayashi, Akihiko Fujisawa, Masaharu Mitsunaga; Kumamoto Univ., Japan.* We theoretically study propagation behavior of probe (signal) and Stokes (idler) pulses under a strong coupling beam. The analyses predict that both pulses are parametrically amplified and delayed by about a pulsewidth.

PDJWA31
Laser Induced Absorption Spectra Properties of Ethyl Red Doped Film and Its Applications for Optical Switch Based Two Beams Mutual Modulation, *Zhaofeng Hao[1,2], Wenqiang Lu[1], Chunping Zhang[1], Jianguo Tian[1]; [1]Nankai Univ., China, [2]Columbia Univ., USA.* The absorption spectra of the samples were measured and the difference of nonlinear refractive index distribution curve was simulated using the Kramers-Kronig relation. Additionally, the transmission intensity mutual modulations of the two beams were studied.

PDJWA32
Fano Resonances in Saturable Waveguide Arrays, *Uta Naether, Daniel E. Rivas, Manuel A. Larenas, Mario I. Molina, Rodrigo A. Vicencio; Univ. de Chile, Chile.* We study the main properties of nonlinear localized modes in a waveguide array with an embedded nonlinear saturable impurity. We scatter a wave against the modes, discovering transmission suppression, which we connect to Fano resonances.

PDJWA33
Chaos and Pulses Packages in Current Modulated VCSELs, *J.H. Talla Mbé, Sifeu Takougang Kingni, Paul Woafo; Univ. of Yaoundé I, Cameroon.* We numerically study the dynamics of VCSELs based on the current-dependent gain model subjected to current modulation. Striking dynamics appears: pulses packages and chaotic behaviour.

PDJWA34
Coherent Control of Fluorescence Intensity with Shaped Femtosecond Pulses in Organic Molecules, *P. H. D. Ferreira, L. Misoguti, C. R. Mendonça; Inst. de Física de São Carlos, Brazil.* This paper presents a study of the coherent control of fluorescence intensity by two-photon absorption via genetic algorithm in Y-shaped molecules. Using a spatial light modulator, we were able to enhance the fluorescence intensity of two of these molecules.

•Friday, July 17, 2009•

NFA • Self Focusing and Filaments

Tapa I
8:00 a.m.–10:15 a.m.
Jay E. Sharping; Univ. of California at Merced, USA, Presider

PDNFA2 • 8:30 a.m.
745 fs Resolution Single-Shot Recording at 2.1 Tsample/s and 104 Mframes/s Using Temporal Imaging, *Vincent J. Hernandez[1], Corey V. Bennett[1], Bryan D. Moran[1], Alexander D. Drobshoff[1], Carsten Langrock[2], Derek Chang[2], Martin M. Fejer[2], Morten Ibsen[3]; [1]Lawrence Livermore Natl. Lab, USA, [2]Stanford Univ., USA, [3]Optoelectronics Res. Ctr., Univ. of Southampton, UK.* We demonstrate temporal imaging with -42.6x time magnification of 200 ps frames with subpicosecond resolution for waveforms containing 2.5 Gb/s modulated picosecond pulses. 852 GHz signal bandwidth is captured single-shot at 104 MHz frame rates.

NFB • Applications of Nonlinear Optics

Tapa I
10:45 a.m.–1:00 p.m.
Daniel Gauthier; Duke Univ., USA, Presider

PDNFB8 • 12:45 p.m.
Fiber Based Multiphoton Microscope Using a Fiber Femtosecond Laser and MEMS Scanning Probe, *Gangjun Liu[1], Zhongping Chen[1], Khanh Kieu[2], Frank W. Wise[2]; [1]Univ. of California at Irvine, USA, [2]Dept. of Applied Physics, Cornell Univ., USA.* We developed a fiber based MPM that integrates an all-normal-dispersion femtosecond fiber laser, double cladding photonic crystal fiber, and a MEMS scanning probe. SHG and two photon excited fluorescence images of biological sample were demonstrated.

NOTES

Key to Authors and Presiders

(**Bold** denotes Presider or Presenting Author)

Advances in Optical Sciences:
OSA Optics & Photonics Congress
UPDATE SHEET

Withdrawals:

Integrated Photonics and Nanophotonics Research and Applications: IMG7, ITuD3, JWA2, JWA10
Nonlinear Optics: NMD1, NTuA2, JWA11, JWA25, NFA2
Slow and Fast Light: JWA28

Presentation Updates:

NFB8, **Three-Dimensional Microfabrication by Single Pulse Femtosecond Laser through Binary Phase Hologram,** *Masahiro Yamaji, Hayato Kawashima, Jun'ichi Suzuki, Shuhei Tanaka; New Glass Forum, Tsukuba Res. Consortium, Japan*, will be presented by Masahiro Yamaji at 8:15 a.m.–8:30 a.m. during session NFA, Self Focusing and Filaments.

Correction to Program:

The name of one of the authors of **IMF3**, **Single Quantum Dot Laser with Photonic Crystal Nanocavity**, is misspelled in the program book. The correct spelling is *Masahiro Nomura*.

An author was omitted from **IWD3**, **Fabrication of Large Area "Woodpile" Photonic Crystal Structures for Near IR**. The corrected author block is as follows: *Neilanjan Dutta[1], Peng Yao[1], Shouyuan Shi[1], Ahmed Sharkawy[2], Ozgenc Ebil[2], Eric Kelmelis[2], Dennis W. Prather[1], Elton Marchena[1]; [1]Univ. of Delaware, USA, [2]EM Photonics Inc., USA.*

Presider Updates:

Takunori Taira; Laser Res. Ctr. for Molecular Science, Inst. for Molecular Science, Japan will preside over session **NWA**, **Terahertz and Ultrafast**.

Michael E. Gehm; Univ. of Arizona, USA will preside over the joint Nonlinear Optics/Slow and Fast Light session **JWB**, **Slow Light Applications in Nonlinear Optics**.

Presenter Changes:

IMC1, **High Speed Modulation of Hybrid Silicon Evanescent Lasers**, will be presented by *Daoxin Dai; Univ. of California at Santa Barbara, USA.*

ITuE6, **Finite Thickness Metal-Insulator-Metal Structure for Waveguide Based Surface Plasmon Resonance Biosensing,** will be presented by *Jiwon Lee; Iowa State Univ., USA.*

NTuC2, **Coupling Dynamics of Quantum Dots in a Liquid-Crystal-Tunable Microdisk Resonator**, will be presented by *Cedrik Meier; Univ. of Paderborn, Germany.*

NWC3, **Integration of Extraordinary Nonlinear Optical Materials into Silicon Photonics, Plasmonics and Metamaterial Devices**, will be presented by *Philip A. Sullivan; Univ. of Washington, USA.*

NWD4, **Spectral Filtering Highly-Chirped Pulses in All-Normal Dispersion Fiber Lasers**, will be presented by *Nathan Kutz; Dept. of Applied Mathematics, Univ. of Washington, USA.*

NFA7, **Enhanced Third Harmonic Generation in Few-Cycle Femtosecond Filaments Modulated by Filament Non-Collinear Interaction**, will be presented by *Jian Wu; East China Normal Univ., China.*

NFB4, **Imaging Resolution Improvement Using Transverse Phase Amplification**, will be presented by *Igor Jovanovic; Purdue Univ., USA.*

POSTDEADLINE PRESENTATIONS: Please see the postdeadline papers book for times and locations of postdeadline paper presentations. Postdeadline papers will be presented throughout the week in various oral and poster sessions.

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