Integrated Photonics and Nanophotonics Research and Applications (IPNRA)

Topical Meeting and Tabletop Exhibit

Collocated with:

Slow and Fast Light (SL)
Coherent Optical Technologies and Applications (COTA)
Quantum Entanglement and Decoherence: 3rd International Conference on Quantum Information (ICQI)

July 13-16, 2008

Boston Marriott Copley Place Hotel
Boston, Massachusetts, USA

Submission Deadline Extended: March 10, 2008 (12:00 p.m. noon EDT; 16.00 GMT)
Hotel Reservation Deadline: June 11, 2008
Pre-Registration Deadline: June 26, 2008

General Chairs
Hugo E. Hernandez-Figueroa, *Univ. Estadual de Campinas, Brazil*
Steven Spector, *MIT Lincoln Lab, USA*

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

Due to increasing delays in securing visas to the US, we strongly encourage international attendees to begin this process as early as possible (but no later than three months before the meeting) to ensure timely processing. Please refer to the Letters of Invitation section of this website for additional information.

View the Meeting Archives for IPNRA 2007 highlights.

Summer Optics and Photonics Congress

Join your colleagues July 13-16 in Boston, Massachusetts!

Collocated Topical Meetings

Coherent Optical Technologies and Applications (COTA)	Register Now
Integrated Photonics and Nanophotonics Research and Applications (IPNRA)	Register Now
Slow and Fast Light (SL)	Register Now
Quantum Entanglement and Decoherence: 3rd International Conference on Quantum Information (ICQI)	Register Now

Dates and Location	Important Deadlines
July 13-16, 2008 Boston Marriott Copley Place Hotel Boston, Massachusetts, USA	Submission Deadline Extended: March 10, 2008 (12:00 p.m. noon EDT; 16.00 GMT) Hotel Reservation Deadline: June 11, 2008 Pre-Registration Deadline: June 26, 2008

To find out more about how to exhibit at one of these meetings, please contact Anne Jones at 202.416.1942 or email ajones@osa.org. Reserve your exhibit space today!

Exhibitor

Discovery Semiconductor, Inc.
IPG Photonics
Optiwave
Photon Design
Photonics Spectra

Topics to be Discussed

COTA Topics

- Sources (i.e., high-power, narrow linewidth, phase-locked, stable, tunable)
- Phase preservation over temporal/spectral domains
- Receiver design
- Signal-detection techniques
- Phase locking techniques
- Phase estimation
- Phase, frequency and polarization modulators
- Phase-sensitive amplifiers
- Polarization management
- Data modulation formats/signaling/protocols
- Phase-sensitive systems

SL Topics

- **Physics of Light Control:**
  - Electromagnetically induced transparency
  - Coherent population oscillations
  - Four-wave mixing and parametric processes
  - Absorption or gain saturation
  - Stimulated Brillouin and Raman scattering
  - Passive and active manipulation in periodic structures and resonators
  - New schemes and physical effects
- **Materials and Engineered Structures for Light Control:**

- Free-space (spaceborne/airborne) communications
- Optical fiber communication systems and networks
- Analog links
- Secure communications
- Remote sensing
- Synthetic aperture Lidar/Ladar
- Fiber sensors
- Microsensing in spectroscopic applications
- Biosensing
- Statistical and cellular nature of biosensors
- Optical signal processing
- Arbitrary waveform generation and filtering
- A/D conversion
- Optical correlation
- Wavelength conversion

IPRNA Topics

- **Active Devices:** III-V semiconductor devices; silicon active devices; **LiNbO3 and other metal-oxide-based devices;** modulators; switches; wavelength converters; emitters; VCSELs; amplifiers; integrated scanners; quantum optoelectronic devices; complex circuits; new fabrication methods; materials and processing; reliability advances and issues.
- **Passive Devices and Integration: Dielectric, polymer, or semiconductor waveguide devices;** Integrated planar waveguides; active/passive integrated components; switches; variable optical attenuators; filters; resonators; integrated isolators and circulators; planar dispersion compensators; micro-optic components; optical interconnects; hybrid integration; reliability advances and issues; novel assembly and manufacturing techniques; emerging packaging technologies; testing and characterization; materials and fabrication technologies.

    - Metamaterials, including plasmonic structures
    - Photonic crystal waveguides and periodic structures
    - Optical fibers including holey fibers
    - Semiconductor nanostructures, including quantum wells and quantum dots
    - Saturable optical amplifiers and absorbers
    - BEC and hot vapor cells
    - Crystals and other solid-state materials
    - New materials and structures
- **Applications:**
    - Optical communications; all-optical buffers, routers, etc.
    - Microwave photonics; microwave filters and phased array systems
    - Sampling systems
    - Enhanced optical nonlinear response
    - Sensors and improved measurement systems
    - Figures-of-merit and fundamental limitations
    - New applications
- **Physics of Light Control:**
    - Electromagnetically induced transparency
    - Coherent population oscillations
    - Four-wave mixing and parametric processes
    - Absorption or gain saturation
    - Stimulated Brillouin and Raman scattering
    - Passive and active manipulation in periodic structures and resonators
    - New schemes and physical effects
- **Materials and Engineered Structures for Light Control:**
    - Metamaterials, including plasmonic structures
    - Photonic crystal waveguides and periodic structures
    - Optical fibers including holey fibers
    - Semiconductor nanostructures, including quantum wells and quantum dots
    - Saturable optical amplifiers and

- **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; simulation and modeling of photonic crystal, microcavity, and other high confinement structures; simulation and modeling of metallic and metallodielectric waveguides; advances in computational algorithms, physics and coupled models for integrated photonic circuits.
- **Nanophotonics:** Microcavity and other high confinement structures; photonic crystal waveguides and devices; photonic crystal fiber; **nano-engineered devices;** metallic and metallodielectric waveguide devices;resonators; filters; modulators; add-drop integrated optical circuits; light sources; quantum information; nano-MEMS; biophotonics; biological and chemical transducers and sensors; efficient mode matching; nanofabrication technology; growth and deposition approaches; self-organized methods; characterization tools on the nanoscale; **and nanoscale integration of planar, free-space, and mixed subsystems.**
- **Inhomogeneous Materials (e.g., Composite Dielectrics, Semiconductors, Metals and Metallodielectrics):** Anisotropic; dispersive; efficient light extraction; nonlinear optical materials; and dynamically configurable.

absorbers

    - BEC and hot vapor cells
    - Crystals and other solid-state materials
    - New materials and structures
- **Applications:**
    - Optical communications; all-optical buffers, routers, etc.
    - Microwave photonics; microwave filters and phased array systems
    - Sampling systems
    - Enhanced optical nonlinear response
    - Sensors and improved measurement systems
    - Figures-of-merit and fundamental limitations
    - New applications
- **Implementation Techniques:**
    - Experimental techniques
    - Theoretical techniques
    - Effective numerical simulation techniques
    - Experimental techniques
    - Theoretical techniques
    - Effective numerical simulation techniques

ICQI Topics

- Entanglement
- Decoherence
- Quantum imaging and lithography
- Quantum communication and cryptography, quantum channels, repeaters
- Algorithms, walks on graphs, spin chains, phase transitions, chaos and localization
- Emerging topics: cluster states, adiabatic quantum computing, topological quantum computing
- Optical and other implementations (linear optics, cavity QED, ion traps, solid state, etc.)
- Quantum state reconstruction, superresolution, metrology
- Storage and transfer of quantum information

About Integrated Photonics and Nanophotonics Research and Applications

July 13-16, 2008

Scope

The IPNRA 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.

Important Dates

Submission Deadline: March 3, 2008 (12:00 p.m. noon EST; 17.00 GMT)
Hotel Reservation Deadline: June 11, 2008
Pre-Registration Deadline: June 26, 2008

Integrated Photonics and Nanophotonics Research and Applications Meeting Topics

Topics to be covered include:

Active Devices: III-V semiconductor devices; silicon active devices; **LiNbO3 and other metal-oxide-based devices;** modulators; switches; wavelength converters; emitters; VCSELs; amplifiers; integrated scanners; quantum optoelectronic devices; complex circuits; new fabrication methods; materials and processing; reliability advances and issues.

Passive Devices and Integration: Dielectric, polymer, or semiconductor waveguide devices; Integrated planar waveguides; active/passive integrated components; switches; variable optical attenuators; filters; resonators; integrated isolators and circulators; planar dispersion compensators; micro-optic components; optical interconnects; hybrid integration; reliability advances and issues; novel assembly and manufacturing techniques; emerging packaging technologies; testing and characterization; materials and fabrication technologies.

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; simulation and modeling of photonic crystal, microcavity, and other high confinement structures; simulation and modeling of metallic and metallodielectric waveguides; advances in computational algorithms, physics and coupled models for integrated photonic circuits.

Nanophotonics: Microcavity and other high confinement structures; photonic crystal waveguides and devices; photonic crystal fiber; **nano-engineered devices;** metallic and metallodielectric waveguide devices; resonators; filters; modulators; add-drop integrated optical circuits; light sources; quantum information; nano-MEMS; biophotonics; biological and chemical transducers and sensors; efficient mode matching; nanofabrication technology; growth and deposition approaches; self-organized methods; characterization tools on the nanoscale; **and nanoscale integration of planar, free-space, and mixed subsystems.**

Inhomogeneous Materials (e.g., Composite Dielectrics, Semiconductors, Metals and Metallodielectrics): Anisotropic; dispersive; efficient light extraction; nonlinear optical materials; and dynamically configurable.

Technical Program Committee

General Chairs

Hugo E. Hernandez-Figueroa, *Univ. Estadual de Campinas, Brazil*
Steven Spector, *MIT Lincoln Lab, USA*

Program Chairs

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

IPNRA 1: Active Waveguide Devices

Liming Zhang, *Alcatel-Lucent, USA, **Subcommittee Chair***
Pietro Bernasconi, *Bell Labs, Alcatel-Lucent, USA*
Diana Huffaker, *Univ. of New Mexico, USA*
Chennupati Jagadish, *Australian Natl. Univ., Australia*
Yi Luo, *Tsinghua Univ., China*
Julien Nagle, *Thales Res. and Technology, France*
Hiromi Oohashi, *NTT Photonics Labs, Japan*
Maura Raburn, *Infinera, USA*
Meint Smit, *Technische Univ. Eindhoven, Netherlands*
Valery Tolstikhin, *OneChip Photonics Inc., Canada*
Ian White, *Cambridge Univ., UK*

IPNRA 2: Passive Waveguide Devices

Jürgen Michel, *MIT, USA, **Subcommittee Chair***
Mehdi Asghari, *Kotura, USA*
Louay Eldada, *DuPont Photonics Technology, USA*
Graeme Maxwell, *CiPhotonics, UK*
Attila Mekis, *Luxtera, USA*
Greg Nordin, *Brigham Young Univ., USA*
Hiroyuki Tsuda, *Keio Univ., Japan*
Michael Watts, *Sandia Natl. Labs, USA*
Chee Wei Wong, *Columbia Univ., USA*
Dan-Xia Xu, *Natl. Res. Council, Canada*

IPNRA 3: Modeling, Numerical Simulation, and Theory

Andrea Melloni, *Politecnico di Milano, Italy, **Subcommittee Chair***
Ben-Hur (Viana) Borges, *Univ. of São Paulo Brazil*
Hung-chun Chang, *Natl. Taiwan Univ., Taiwan*
Andrè Delage, *Natl. Res. Council, Canada*
G. Ronald Hadley, *Sandia Natl. Labs, USA*
Masanori Koshiba, *Hokkaido Univ., Japan*
Yehuda Leviatan*, Technion Israel Inst. of Technology, Israel*
Aziz Rahman, *City Univ., UK*
Frank Schmidt, *Konrad-Zuse-Zentrum für Informationstechnik Berlin, Germany*
Stefano Selleri, *Univ. of Parma, Italy*

IPNRA 4: Nanophotonic Devices and Applications

Richard DeLaRue, *Univ. of Glasgow, Scotland,* ***Subcommittee Chair***
Toshihiko Baba, *Yokohama Natl. Univ., Japan*
Andre de Lustrac, *IEF Orsay, France*
Richard Osgood, *Columbia Univ., USA*
Edward Sargent, *Univ. of Toronto, Canada*
Thomas Suleski, *Univ of North Carolina at Charlotte, USA*
Dries Van Thourhout, *Ghent Univ.—IMEC, Belgium*
Thomas White, *Univ. of St. Andrews, UK*
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Anatoly Zayats, *Queen's Univ. of Belfast, UK*

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Discovery Semiconductors, Inc. is an industry leader in manufacturing ultrafast, high optical power handling InGaAs photodetectors, RF over fiber optical receivers, balanced optical receivers and several custom products for applications ranging from analog RF links to ultrafast digital communications. Discovery's instrumentation includes their Lab Buddy and Optical Coherent Receiver System. Contact: Jay Magbitang.

IPG Photonics

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IPG manufactures fiber lasers and amplifiers for 1.0, 1.5 and 2.0 microns wavelengths. Output powers are from 100mWs to 50kW and available for CW or pulsed operation. For scientific applications linearly polarized and kHz linewidths products are available; for optical trapping, frequency doubling, free space communications. Industrial applications we provide diode Q-switched, and high power CW lasers; marking, welding, micro machining. Telecommunications we offer Raman and Erbium lasers and amplifiers; FTTH, CATV, ultra long haul. Contact Diana Ferreira, Sales. Tel: +1 508.373.1169, Fax: +1 508.373.1103. dferreira@ipgphotonics.com.

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Photon Design, founded 1992, provides a wide range of photonics software for integrated and fibre-based component design. Products include FIMMPROP–our revolutionary bi-directional optical propagation tool, FIMMWAVE – our famous mode solver, PICWave - our new active/passive photonic-IC circuit simulator, CrystalWave–photonic crystal simulator, OmniSim–general purpose 3D FDTD simulator.

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Photonics Spectra is the leading photonics magazine serving industries that use photonic technology: lasers, imaging, fiber optics, optics, electro-optics, and photonic component manufacturing. It presents the latest news articles and in-depth reports on photonics technology. It is distributed free to those who use or apply photonics.

The Organizers for the Summer Optics and Photonics Congress

wish to thank the following US Government Agencies

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Air Force Office of Scientific Research

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Special Events

Joint Plenary Sessions

Monday, July 14
8:00 a.m.–10:00 a.m.
Salon E

Photonic Entanglement in Quantum Communication and Quantum Computation
Anton Zeilinger, Univ. of Vienna, Austria
In the 1970s Anton Zeilinger started his work on the foundations of quantum mechanics with neutron interferometry. These experiments included confirmation of the sign change of a spinor phase upon rotation, precision tests of the linearity of the Schrödinger equation, and many other fundamental tests.

Going beyond single-particle phenomena, Zeilinger became interested in quantum entanglement, where his most significant contribution is the discovery of what is today called "GHZ states" and their experimental realization. These were the first instances of multi-particle entanglement ever investigated. Such states have become essential in fundamental tests of quantum mechanics and in quantum information science. Since then, Zeilinger has performed many experiments with entangled photons, including quantum teleportation, quantum cryptography, all-optical one-way quantum computation and a number of quantum gates. In single-particle interference, he has performed a number of experiments in atom interferometry and in quantum interference of large molecules, like C60 and C70. These included very detailed studies of quantum decoherence. The technological progress in all these fields is making new fundamental tests possible. Most recently, Zeilinger became interested in tests of Leggett-type nonlocal theories and in fundamental phenomena in quantum entanglement of ultracold atoms, to name two examples.

The most important stages in the career of Anton Zeilinger include the Technical University of Vienna, MIT, the Technical University of Munich, the University of Innsbruck, the Collège de France, the University of Vienna and the Austrian Academy of Sciences.

The Intimate Merger of Photonics and Computing
Ashok V. Krishnamoorthy, SUN Microsystems, USA
Ashok V. Krishnamoorthy currently serves as Distinguished Engineer and Senior Director with the Sun Microsystems Microelectronics Physical Sciences Center in San Diego, California. He leads Sun's photonics technology development effort and is the principal investigator on their DARPA UNIC program. Prior to this he was with AraLight as its President and CTO as part of a Lucent spinout, where he was responsible for leading product design and development for AraLight's optical interconnect products. He has also served as entrepreneur-in-residence at Lucent's New Venture group, and as a member of technical staff in the Advanced Photonics Research Department of Bell Labs where he investigated methods of integrating optical devices to Silicon VLSI circuits. He received the B.S. in engineering (Honors) from the California Institute of Technology, the M.S. in electrical engineering from the University of Southern California, and the Ph.D. in applied physics from the University of California at San Diego.

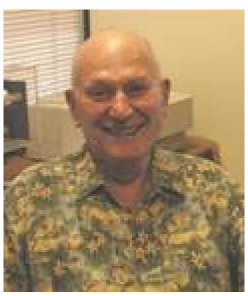
Dr. Krishnamoorthy serves on the technical advisory board for several optical technology start-ups and venture funds, and as a distinguished lecturer for IEEE/LEOS. He holds 40 patents and has contributed 150 technical publications, five book chapters and presented over 45 invited talks at international technical conferences. For his contributions to optoelectronics, and his service to technical societies, the Eta Kappa Nu society named him an outstanding young electrical engineer in 1999. He was awarded the 2004 international prize in optics by the ICO for his technical contributions to optics. He has also won several team awards, including Computerworld's 2005 horizon award for innovation. Most recently, he received the 2006 chairman's award for innovation by Sun Microsystems for his work on silicon optical interconnects for computing systems.

Tuesday, July 15
8:00 a.m.–10:00 a.m.

Salon E

Electro-Optic Modulation of Photons and Biphotons
Stephen E. Harris, Stanford Univ., USA.
Professor Stephen E. Harris received his B.S. in electrical engineering from Rensselaer Polytechnic Institute in 1959. In 1963 he became a member of the Stanford University faculty where he is now the Kenneth and Barbara Oshman Professor of Engineering with appointments in electrical engineering and applied physics. Professor Harris has advised about 60 Ph.D. students and is known for contributions to quantum optics, nonlinear optics and laser science.

Entanglement, Information Processing and Decoherence in Trapped Atomic Ions
David Wineland, NIST, USA
David Wineland received a bachelor's degree from the University of California at Berkeley in 1965 and his Ph.D. from Harvard University in 1970. After a postdoctoral appointment at the University of Washington, he joined NBS (now NIST), where he is the leader of the Ion-Storage Group (http://www.bldrdoc.gov/timefreq/ion) in the Time and Frequency Division at Boulder. The group's research has focused on laser cooling and spectroscopy of trapped atomic ions with applications to atomic clocks, quantum-limited metrology and quantum state control.



Coherence Cloning and Phase Controlled Apertures Using Optical Phase-Lock Loops
Amnon Yariv, Caltech, USA
Amnon Yariv is the Martin and Eileen Summerfield Professor of Applied Physics and Electrical Engineering at Caltech. He obtained the B.S. (1954), M.S. (1956) and Ph.D. (1958) in electrical engineering from the University of California at Berkeley. He went to Bell Telephone Laboratories, Murray Hill, New Jersey in 1959, joining the early stages of the laser effort. He came to the California Institute of Technology in 1964.

On the technical and scientific side, he took part (with various co-workers) in the discovery of a number of early solid-state laser systems, in proposing and demonstrating the field of semiconductor integrated optics, the suggestion and demonstration of the semiconductor distributed feedback laser and in co-pioneering the field of phase conjugate optics. His present research efforts are in the areas of nonlinear optics, semiconductor lasers and integrated optics with emphasis on communication and computation.

Dr. Yariv is a member of the American Physical Society, Phi Beta Kappa, the American Academy of Arts and Sciences, the National Academy of Engineering, the National Academy of Sciences, a Fellow of the Institute of Electrical and Electronics Engineers and the Optical Society of America. He was the recipient of the 1980 Quantum Electronics Award of the IEEE, the 1985 University of Pennsylvania Pender Award, the 1986 Optical Society of America Ives Medal, the 1992 Harvey Prize, the 1998 OSA Beller Medal, an honorary doctorate, December 2000 from Ben Gurion University of the Negev, Israel and received a Laurea Honoris Causa, September 2007 from Universitá degli Studi dell'Aquila. Dr. Yariv was a founder and chairman-of-the-board of ORTEL Corporation (acquired by Lucent Technologies in 1998), and is a founder and a board member of a number of startup companies in the optical communications field.

Joint Poster Session

Monday, July 14
6:30 p.m.–8:00 p.m.
Salon F
A total of 79 posters will be presented during the joint poster session.

Congress Reception

Tuesday, July 15
6:30 p.m.–8:00 p.m.
Salon F
Join your colleagues for a joint reception to include attendees of all four meetings. Hors d'oeuvres, beer and wine will be served.

IPNRA Special Session and Roundtable Discussion

ITuE • Computer Aided Design for Integrated and Nano Photonics
Tuesday, July 15
4:30 p.m.–6:30 p.m.
Salon A/B

A special session for photonic commercial software developers, followed by a roundtable discussion is planned as part of IPNRA and all congress registrants are welcome to attend. The main photonic software companies such as RSoft, Optiwave, Photon Design and JCMWave will be represented. Topics to be discussed include:

- Technical challenges
- Assessment and validation of algorithms/software (standardization/normalization)
- Convergence of technologies (wireless-photonics, displays-photonics, etc.)

The session will conclude with a roundtable discussion focusing on additional non-technical aspects such as:

- Interaction with academy
- Job opportunities
- Vision of the market

Invited presentations:

Addressing Photonic Applications via a Broad Range of Integrated Simulation Methods, *Robert Scarmozzino, E. Heller, M. Bahl; RSoft Design Group, Inc., USA*

Designing Active Photonic Integrated Circuits Using TDTW, *Dominic F. Gallagher; Photon Design, UK*

Multi-Disciplinary Simulation of Electro-Opto-Thermal Networks Using a SPICE-Like Framework, *Pavan Gunupudi1, Tom Smy1, Jackson Klein2, Jan Jakubczyk2; 1Carleton Univ., Canada, 2Optiwave Systems, Canada*

JCMsuite: An Adaptive FEM Solver or Precise Simulations in Nano-Optics, *Sven Burger, Lin Zschiedrich, Jan Pomplun, Frank Schmidt; JCMwave, Germany*

Integrated Photonics and Nanophotonics Research and Applications Invited Speakers

A. Active Waveguide Devices

IMA1, **Compact Advanced Modulation Format InP Modulators and Receivers,** *Chris Doerr; Bell Labs, Alcatel-Lucent, USA.*

IMA4, **InP Mach-Zehnder Modulators for Advanced Modulation Formats,** *Nobuhiro Kikuchi; NTT Basic Res., Japan.*

IMC1, **III-V/Silicon Photonics: Technology and Integrated Devices,** *Gunther Roelkens, Liu Liu, Joost Brouckaert, Joris Van Campenhout, Frederik Van Laere, Dries Van Thourhout, Roel Baets; IMEC- Ghent Univ., Belgium.*

IWC1, **Digital vs. Analog Photonic Integration,** *Martin Hill[1], M. K. Smit[1], Peter Crombez[2], Carel van der Poel[2]; [1]COBRA—TU Eindhoven, Netherlands, [2]NXP Semiconductor, Netherlands.*

IWC2, **Photonic Integrated Circuits for Communications, Signal Processing and Computing Applications,** *S. J. Ben Yoo; Univ. of California at Davis, USA.*

IWC5, **Photonic Integrated Circuits for Optical Routing and Switching Applications,** *Milan L. Masanovic, Emily F. Burmeister, Anna Tauke-Pedretti, Brian R. Koch, Matthew M. Dummer, Joseph A. Summers, Jonathon S. Barton, Larry A. Coldren, John E. Bowers, Daniel J. Blumenthal; Univ. of California at Santa Barbara, USA.*

IWE1, **Nanostructure Patterned Active Regions for Semiconductor Diode Lasers,** *James Coleman; Univ. of Illinois at Urbana-Champaign, USA.*

B. Passive Waveguide Devices

IME1, **Si Photonics Integrated Circuits: Path to Commercial Reality,** *Mehdi Asghari; Kotura, Inc., USA.*

ITuC1, **Integrated Optical Bio Sensors,** *Igal Brener; Sandia Natl. Labs, USA.*

ITuC2, **Polymeric Optical Wire-Bonding for Planar Lightwave Circuit Packaging,** *Roberto R. Panepucci, Abdullah J. Zackariya, Tao Liu; Florida Intl. Univ., USA.*

ITuD2, **A Nanophotonic Interconnect for High-Performance Many-Core Computation,** *Ray Beausoleil[1], J. Ahn[2], N. Binkert[2], A. Davis[2], D. Fattal[1], M. Fiorentino[1], N. P. Jouppi[2], M. McLaren[3], C. M. Santori[1], R. S. Schreiber[2], S. M. Spillane[1], D. Vantrease[2], Q. Xu[1]; [1]Information and Quantum Systems, Hewlett-Packard Labs, USA, [2]Exascale Computing, Hewlett-Packard Labs, USA, [3]Exascale Computing, Hewlett-Packard Labs, UK.*

ITuD3, **Intrachip Photonic Network for Multicore Communications,** *Mark Beals; MIT, USA.*

C. Modeling, Numeric Simulation and Theory

IMB5, **Plasmonic Components and Devices,** *Olivier J. F. Martin; Swiss Federal Inst. of Technology Lausanne (EPFL), Switzerland.*

IME2, **Rethinking Photonics Design and Manufacture: Offshoring, Material Platforms and the Future of Integration,** *Erica Fuchs; Carnegie Mellon Univ., USA.*

IMF2, **Micro- and Nano-Optical Modeling of Organic LED,** *Norbert Danz, Michael Flämmich, Dirk Michaelis, Christoph A. Wächter; Fraunhofer Inst. für Angewandte Optik und Feinmechanik, Germany.*

IMF5, **Flexible Modelling Approaches for Nanophotonics,** *Phillip Sewell, Trevor M. Benson, Ana Vukovic; Univ. of Nottingham, UK.*

ITuA6, **Circuit Theory and Microphotonic Circuit Design: From Resonant Filters to Light-Powered Nanomachines,** *Milos A. Popovic, Peter T. Rakich, Tymon Barwicz, Marcus S. Dahlem, Fuwan Gan, Charles W. Holzwarth, Henry I. Smith, Franz X. Kärtner, Erich P. Ippen; MIT, USA.*

ITuE1, **Addressing Photonic Applications via a Broad Range of Integrated Simulation Methods,** *Robert Scarmozzino, E. Heller, M. Bahl; RSoft Design Group, Inc., USA.*

ITuE2**, Designing Active Photonic Integrated Circuits Using TDTW,** *Dominic F. Gallagher; Photon Design, UK.*

ITuE3, **Multi-Disciplinary Simulation of Electro-Opto-Thermal Networks Using a SPICE-Like Framework,** *Pavan Gunupudi[1], Tom Smy[1], Jackson Klein[2], Jan Jakubczyk[2]; [1]Carleton Univ., Canada, [2]Optiwave Systems, Canada.*

ITuE4, **JCMsuite: An Adaptive FEM Solver or Precise Simulations in Nano-Optics,** *Sven Burger, Lin Zschiedrich, Jan Pomplun, Frank Schmidt; JCMwave, Germany.*

IWA1, **Electrical Network Approach to Synthesizing Coupled-Cavity Optical Devices,** *Vien Van; Univ. of Alberta, Canada.*

IWB1, **Microstructured Fibers: Modelling, Design and Applications,** *Annamaria Cucinotta, Federica Poli, Davide Passaro, Stefano Selleri; Univ. of Parma, Italy.*

D. Nanophotonic Devices and Applications

IMD1, **Nonlinear Switching in High-Q Photonic Crystal Nanocavities,** *Takasumi Tanabe, Akihiko Shinya, Eiichi Kuramochi, Masaya Notomi; NTT Basic Res. Labs, NTT Corp., Japan.*

IMD6, **Multiscale Fabrication and Properties of Photonic Nanostructures,** *Teri Odom; Northwestern Univ., USA.*

ITuB1, **Membrane Microlasers and Their Integration,** *Christian Seassal; INL-CNRS, Ecole Centrale de Lyon, Univ. of Lyon, France.*

ITuD1, **Nanoscale Silicon Photonic Networks-on-Chip for Multicore Processors Communications,** *Keren Bergman; Columbia Univ., USA.*

IWD1, **Engineering of Charge and Light Transport at the Micro and Nanoscale for Low-Cost, Large-Area Solar Cells**
Peter Peumans; Stanford Univ., USA.

Agenda of Sessions

	Salon E	Salons A/B	Salons C/D	Salon G	Salons H–J
Sunday, July 13					
4:00 p.m.–6:00 p.m.	Registration Open (Atrium Foyer)				
Monday, July 14					
7:00 a.m. – 6:00 p.m.	Registration Open (Atrium Foyer)				
8:00 a.m.–10:00 a.m.	JMA • Monday Plenary Session				
10:00 a.m.–10:30 a.m.	Coffee Break (Salon Foyer)				
10:30 a.m.–12:30 p.m.	IMA • Transmitters and Other Devices	IMB • Plasmonic Structures	CMA • Components I	SMA • EIT and Quantum Information	QMA • Entanglement I
12:30 p.m.–2:00 p.m.	Lunch Break				
2:00 p.m.–4:00 p.m.	IMC • Active Silicon Devices	IMD • Photonic Crystal Cavities and Waveguides	CMB • Waveform Synthesis	SMB • Metamaterials	QMB • Entanglement II
4:00 p.m.–4:30 p.m.	Coffee Break (Salon Foyer)				
4:30 p.m.–6:30 p.m.	IME • Silicon Photonic Components	IMF • Nanophotonic Structures	CMC • Components II	SMC • Applications in Optical Communications	QMC • Optical and Other Implementations I
6:30 p.m.–8:00 p.m.	JMB • Joint Poster Session (Salon F)				
Tuesday, July 15					
7:30 a.m.–5:00 p.m.	Registration Open (Atrium Foyer)				
8:00 a.m.–10:00 a.m.	JTuA • Tuesday Plenary Session				
10:00 a.m.–10:30 a.m.	Coffee Break (Salon Foyer)				
10:30 a.m.–12:30 p.m.	ITuA • Planar Lightwave Circuits and Filters	ITuB • Microlasers and Emission	CTuA • Imaging I	STuA • Semiconductor Structures and CPO Effects	QTuA • Entanglement III
12:30 p.m.–2:00 p.m.	Lunch Break				
2:00 p.m.–4:00 p.m.	ITuC • Sensors and Lightwave Circuits	ITuD • Multi-Core Photonics and Simulations	CTuB • Imaging II	STuB • Gratings and Coupled Resonators	QTuB • Quantum Imaging and Emerging Topics
4:00 p.m.–4:30 p.m.	Coffee Break (Salon Foyer)				
4:30 p.m.–6:30 p.m.		ITuE • Computer Aided Design for Integrated and Nano Photonics	CTuC • Analog Photonics	STuC • Slow Light in Optical Fibers	QTuC • Decoherence and Algorithms
6:30 p.m.–8:00 p.m.	Conference Reception (Salon F)				
Wednesday, July 16					
7:30 a.m. – 5:00 p.m.	Registration Open (Atrium Foyer)				
8:00 a.m.–10:00 a.m.	IWA • Micro-Resonators and Lightwave Devices	IWB • Modeling Optical Fibers and Waveguides	CWA • Coherent Communications I	SWA • Fundamental Limitations and New Applications	QWA • Entanglement IV
10:00 a.m.–10:30 a.m.	Coffee Break (Salon Foyer)				
10:30 a.m.–12:30 p.m.	IWC • Photonic Integration	IWD • Solar Cells and Nanostructures	CWB • Coherent Communications II (ends at 12:45 p.m.)	SWB • Metamaterials and Photonic Crystals	QWB • Optical and Other Implementations II, Quantum State Reconstruction, Storage I
12:30 p.m.–2:00 p.m.	Lunch Break				
2:00 p.m.–4:00 p.m.	IWE • Active Structures	IWF • Simulations, Photonic Devices and Materials	CWC • Coherent Communications III (ends at 4:15 p.m.)	SWC • Photonic Crystals	QWC • Quantum Communication
4:00 p.m.–4:30 p.m.	Coffee Break (Salon Foyer)				
4:30 p.m.–6:30 p.m.	IWG • Waveguide Components (ends at 5:45 p.m.)	IWH • Resonant Structures (ends at 5:45 p.m.)		SWD • Slow Light in Atomic Vapors (ends at 6:00 p.m.)	QWD • Metrology, Storage II and Transfer of Quantum Information; Emerging Topics

Integrated Photonics and Nanophotonics Research and Applications (IPNRA)

Abstracts

• Sunday, July 13 •

Atrium Foyer
4:00 p.m.–6:00 p.m.
Registration Open

• Monday, July 14 •

Atrium Foyer
7:00 a.m.–6:00 p.m.
Registration Open

JMA • Joint Plenary Session I

Salon E
8:00 a.m.–10:00 a.m.
JMA • Joint Plenary Session I

8:00 a.m.
Opening Remarks, *Conference Chairs (COTA, Slow Light, and ICQI).*

8:15 a.m.
ICQI Plenary
Photonic Entanglement in Quantum Communication and Quantum Computation, *Anton Zeilinger; Univ. Wien, Austria.*

9:00 a.m.
Opening Remarks, *Conference Chair (IPNRA).*

9:05 a.m.
IPNRA Plenary
The Intimate Merger of Photonics and Computing, *Ashok V. Krishnamoorthy, SUN Microsystems, USA.*

Salon Foyer
10:00 a.m.–10:30 a.m.
Coffee Break

Salon E

10:30 a.m.–12:30 p.m.
IMA • Transmitters and Other Devices
Maura Raburn; Infinera Corp., USA, Presider

IMA1 • 10:30 a.m. **Invited**
Compact Advanced Modulation Format InP Modulators and Receivers, *Chris Doerr; Bell Labs, Alcatel-Lucent, USA.* We present recent work on high-speed monolithic InP devices for advanced modulation formats, including optical differential quadrature phase-shift keying, optical quadrature amplitude modulation, and optical polarization-division multiplexing.

Salons A/B

10:30 a.m.–12:30 p.m.
IMB • Plasmonic Structures
Thomas J. Suleski; Univ. of North Carolina at Charlotte, USA, Presider

IMB1 • 10:30 a.m. **Invited**
Plasmonic Waveguide Devices and Networks, *Harry Atwater; Caltech, USA.* No abstract available.

Salon E

IMA2 • 11:00 a.m.
Widely Tunable 40 Gbps Transmitter Utilizing a High-Impedance Traveling-Wave EAM and SG-DBR Laser, *Matthew M. Dummer, Jonathan Klamkin, John P. Mack, Larry A. Coldren; Univ. of California at Santa Barbara, USA.* A tunable transmitter featuring an SG-DBR laser is integrated with an undercut-etched, high impedance traveling-wave EAM. This device demonstrates 40 Gbps operation with >8.5 dB extinction over 25 nm tuning with 2.1 V drive.

IMA3 • 11:15 a.m.
Semiconductor Two-Photon Laser: Ultra-Short Pulses and Wide Tuneability, *Noam Kaminski, Alex Hayat, Pavel Ginzburg, Meir Orenstein; Dept. of Electrical Engineering, Technion, Israel.* Nonlinear two-photon gain in semiconductor is shown to compress pulses from hundreds of femto-seconds down to several optical cycles. Contentious-wave two-photon laser central wavelength can be adjusted over an ultra-wide spectrum by tuneable cavities.

IMA4 • 11:30 a.m. Invited
InP Mach-Zehnder Modulators for Advanced Modulation Formats, *Nobuhiro Kikuchi; NTT Basic Res., Japan.* We have developed InP-based Mach-Zehnder modulators suitable for advanced modulation formats. We confirmed 40-Gbit/s NRZ signal generation and a 220-km 10 Gbit/s optical duobinary transmission. We also demonstrated a DQPSK modulator operating at 80 Gbit/s.

IMA5 • 12:00 p.m.
Mach-Zehnder Interferometer Based on Collimation Effect of Photonic Crystal, *Hoang Nguyen, Sven Rogge, Jaap Caro, Emile van der Drift, Huub Salemink; Kavli Inst. of Nanoscience, Delft Univ. of Tech., Netherlands.* A Mach-Zehnder interferometer based on photonic crystal is designed utilizing collimation effect and line defects with the aim to realize a switchable band-pass filter for optical telecommunication. The fabrication contains e-beam lithography and plasma etching.

IMA6 • 12:15 p.m.
Compact 1×8 Mode-Conversion-Type Optical Coupler with a Low Interchannel Imbalance for Monolithically Integrated SOA Gate Switch, *Seok-Hwan Jeong, Shinsuke Tanaka, Susumu*

Salons A/B

IMB2 • 11:00 a.m.
Novel Discrete Modes in Highly Asymmetrical Plasmonic Waveguides, *Nikolai Berkovitch, Meir Orenstein, Stephen G. Lipson; Technion, Israel.* Highly asymmetrical plasmonic waveguides exhibit guiding in dimensions below the expected cutoff. A new family of discrete guided modes of asymmetrical waveguides with losses is found which assists in nano plasmonic guiding.

IMB3 • 11:15 a.m.
Supermodes of Plasmonic Wedges in Structured Waveguides, *David Arbel, Meir Orenstein; Technion, Israel.* In many plasmonic waveguides, modes are determined by the complex coupling of wedges within the structure. We examine systematically the mode stemming from wedge coupling and subsequently validate experimentally the generation of such modes.

IMB4 • 11:30 a.m.
Photonic Integration with Dielectric-Loaded SPP Waveguides, *Alexey V. Krasavin[1], Padraig M. Bolger[1], Anatoly V. Zayats[1], Tobias Holmgaard[2], Sergey I. Bozhevolnyi[2], Laurent Markey[3], Alain Dereux[3]; [1]Queen's Univ. of Belfast, UK, [2]Aalborg Univ., Denmark, [3]Univ. de Bourgogne, France.* We present full 3-D numerical modelling as well as experimental demonstration of highly efficient and compact integrated photonic circuit components based on dielectric-loaded surface plasmon polariton waveguides.

IMB5 • 11:45 a.m. Invited
Plasmonic Components and Devices, *Olivier J. F. Martin; Swiss Federal Inst. of Technology Lausanne (EPFL), Switzerland.* Different plasmonic components are investigated numerically and experimentally: strip waveguides, V-groove waveguides and plasmonic antennas. Emphasis is put both on the modelling requirements and on practical applications in optical signal processing and biosensing.

IMB6 • 12:15 p.m.
Study of the Sidelobe Suppression in a Plasmon Waveguide Grating Filter Using the LOD-FDTD Method, *Jun Shibayama, Akifumi Nomura, Ryo Takahashi, Junji Yamauchi, Hisamatsu*

Salon E

Yamazaki, Shuichi Tomabechi, Ayahito Uetake, Mitsuru Ekawa, Ken Morito; Fujitsu Ltd., Japan. We designed a 1×8 mode conversion-type optical coupler and experimentally demonstrated that the monolithically integrated SOA gate switch that uses it has low interchannel gain imbalance (<1.8 dB) and a high fiber-to-fiber gain (>14.5 dB).

12:30 p.m.–2:00 p.m.
Lunch Break

2:00 p.m.–4:00 p.m.
IMC • Active Silicon Devices
Diana Huffaker; Ctr. for High Technology Materials, USA, Presider

IMC1 • 2:00 p.m. Invited
III-V/Silicon Photonics: Technology and Integrated Devices, *Gunther Roelkens, Liu Liu, Joost Brouckaert, Joris Van Campenhout, Frederik Van Laere, Dries Van Thourhout, Roel Baets; IMEC- Ghent Univ., Belgium.* III-V/Silicon photonics comprises the heterogeneous integration of a III-V layer on top of an SOI waveguide circuit. We elaborate on the bonding technology used and on the fabrication of III-V/Silicon integrated circuits.

IMC2 • 2:30 p.m.
Integrated GeSi Electro-Absorption Modulators on SOI, *Jifeng Liu[1], Sarah Bernardis[1], Jing Cheng[1], Rong Sun[1], Mark Beals[1], Lionel C. Kimerling[1], Jurgen Michel[1], Andrew T. Pomerene[2]; [1]MIT, USA, [2]BAE Systems, Semiconductor Technology Ctr., USA.* We demonstrate 1.2 GHz waveguide-integrated GeSi electro-absorption modulators on SOI platform with an extinction ratio of >7 dB over a broad wavelength range of 1510-1552 nm and an ultralow energy consumption of 50 fJ/bit.

IMC3 • 2:45 p.m.
CMOS-Compatible Wideband Silicon Modulator, *Steven J. Spector[1], Michael W. Geis[1], Gui-Rong Zhou[2], Matt E. Grein[1], Robert T. Schulein[1], Fuwan Gan[2], Mios A. Popovic[2], Jung U. Yoon[1], Donna M. Lennon[1], Erich P. Ippen[2], Franz X. Kaertner[2], Theodore M. Lyszczarz[1]; [1]MIT Lincoln Lab, USA, [2]MIT, USA.* A Mach-Zehnder based silicon optical modulator has been demonstrated with a bandwidth of 26 GHz and a $V\pi L$ of 2 V·cm. The design of this modulator does not require an epitaxial overgrowth.

IMC4 • 3:00 p.m.
High-Speed Large Area Ge on Si Photodetectors, *Jing Cheng, Wojciech Giziewicz, Jifeng Liu, Ching-Yin Hong, Lionel C. Kimerling, Jurgen Michel; MIT, USA.* We design and demonstrate GHz large area lateral Ge on Si p-i-n photodetectors with a significant bandwidth improvement over vertical junction devices of the same area for direct coupling with >100μm diameter polymer optical fibers.

Salons A/B

Nakano; Faculty of Engineerring, Hosei Univ., Japan. A plasmon waveguide filter with an apodized grating is numerically investigated to suppress sidelobes in the transmission spectrum using the unconditionally stable finite-difference time-domain method based on the locally one-dimensional scheme.

12:30 p.m.–2:00 pm.
Lunch Break

2:00 p.m.–4:00 p.m.
IMD • Photonic Crystal Cavities and Waveguides
Richard Osgood; Columbia Univ., USA, Presider

IMD1 • 2:00 p.m. Invited
Nonlinear Switching in High-Q Photonic Crystal Nanocavities, *Takasumi Tanabe, Akihiko Shinya, Eiichi Kuramochi, Masaya Notomi; NTT Basic Res. Labs, NTT Corp., Japan.* All-optical switching is achieved at an extremely low energy by using silicon photonic crystal nanocavities with a large Q/V. They present the possibility of fabricating all-optical photonic integrated logic gates on a chip.

IMD2 • 2:30 p.m.
Slotted Photonic Crystal Waveguides and Cavities, *Andrea Di Falco, Liam O' Faolain, Thomas F. Krauss; School of Physics and Astronomy, UK.* We demonstrate experimentally slow-light factor in excess of 100 and spatio-temporal confinement with quality factor up to Q=7000 in suspended slotted photonic crystal waveguides and cavities, where light is confined in extremely small air volumes.

IMD3 • 2:45 p.m.
Advancing the Performance of One-Dimensional Photonic Crystal/Photonic Wire Micro-Cavities in Silicon-on-Insulator, *Ahmad Rifqi Md Zain, Marc Sorel, Richard De La Rue; Univ. of Glasgow, UK.* We present new results that demonstrate advances in the performance achievable in photonic crystal/photonic wire micro-cavities. In one example, a quality-factor value as high as 147,000 has been achieved experimentally at a useful transmission level.

IMD4 • 3:00 p.m.
Investigation on High Quality Factor 12-Fold Quasi-Photonic Crystal Microcavities with Different Central Post Sizes, *Tsan-Wen Lu, Chung-Chuan Tseng, Yi-Yu Tsai, Po-Tsung Lee; Dept. of Photonics and Inst. of Electro-Optical Engineering, Taiwan.* We investigate the variations of modal properties of 12-fold quasi-photonic crystal microcavities sustaining whispering-gallery (WG) mode with different central post sizes. WG mode lasing action with quality factor of 8,400 and 420nm post is achieved.

Salon E

IMC5 • 3:15 p.m.
Band-Engineered Ge as Gain Medium for Si-Based Laser, *Xiaochen Sun[1], Jifeng Liu[1], Lionel C. Kimerling[1], Jurgen Michel[1], Thomas L. Koch[2]; [1]MIT, USA, [2]Lehigh Univ., USA.* Optical gain and net material gain via direct bandgap transition at around 1550nm of the tensile-strain band-engineered n-type Ge has been analyzed. Photoluminescence spectra measured at room temperature confirm the theoretical predictions.

IMC6 • 3:30 p.m.
Design of Ultra-Small Polarization Splitter Based on Silicon Wire Waveguides, *Masaaki Komatsu, Kunimasa Saitoh, Kuniaki Kakihara, Masanori Koshiba; Hokkaido Univ., Japan.* We propose a novel design of ultra-small polarization splitter based on silicon wire waveguides. Numerical simulations show that a 12-µm-long polarization splitter with the extinction ratio better than -20 dB in entire C-band is achievable.

IMC7 • 3:45 p.m.
Dispersion Engineering in Silicon Photonic Wires Using Thin Si_3N_4 Conformal Dielectric Coating, *Xiaoping Liu[1], William M. J. Green[2], I-Wei Hsieh[1], Jerry I. Dadap[1], Yurii A. Vlasov[2], Richard M. Osgood, Jr.[1]; [1]Columbia Univ., USA, [2]IBM T.J. Watson Res. Ctr., USA.* We investigate numerically dispersion engineering in silicon photonic wires using conformal Si_3N_4 coatings. We analyze the impact of coating thickness upon the group-velocity-dispersion and effective waveguide nonlinearity, and show broadband four-wave-mixing gain in engineered waveguides.

Salon Foyer
4:00 p.m.–4:30 p.m.
Coffee Break

4:30 p.m.–6:30 p.m.
IME • Silicon Photonic Components
Steven Spector; MIT, USA, Presider

IME1 • 4:30 p.m. **Invited**
Si Photonics Integrated Circuits: Path to Commercial Reality, *Mehdi Asghari; Kotura, Inc., USA.* An assessment of key technical challenges and benefits associated with commercial realization of Si Photonics Integrated Circuits is provided with a review of conflicting needs associated with its implementation in telecom, data-com and interconnect applications.

Salons A/B

IMD5 • 3:15 p.m.
Ultra-High Quality Factor Silicon Nitride Planar Microdisk Resonators for Integrated Photonics in the Visible Range, *Ehsan Shah Hosseini, Siva Yegnanarayanan, Ali Adibi; Georgia Tech, USA.* Ultra-high-quality (>5x10^6) microdisk resonators are demonstrated in a Si_3N_4 platform at 655nm with integrated in-plane coupling waveguides on a Si substrate. Critical coupling to first-order radial mode is demonstrated using pedestal layer to control coupling.

IMD6 • 3:30 p.m. **Invited**
Multiscale Fabrication and Properties of Photonic Nanostructures, *Teri Odom; Northwestern Univ., USA.* This paper describes how soft interference lithography, a multiscale patterning technique, can generate new types of plasmonic structures with unexpected optical properties. Theoretical modeling of these photonic metal nanostructures is in excellent agreement with experiment.

Salon Foyer
4:00 p.m.–4:30 p.m.
Coffee Break

4:30 p.m.–6:30 p.m.
IMF • Nanophotonic Structures
Richard DelaRue; Univ. of Glasgow, UK, Presider

IMF1 • 4:30 p.m.
An Efficient Method for Analyzing Two-Dimensional Photonic Crystal Devices, *Zhen Hu[1,2,3], Ya Yan Lu[1]; [1]City Univ. of Hong Kong, Hong Kong, [2]Joint Advanced Res. Ctr., Univ. of Science and Technology of China and City Univ., China, [3]Univ. of Science and Technology of China, China.* For 2-D photonic crystal devices, an improved Dirichlet-to-Neumann map method is developed by incorporating an operator marching scheme to reduce memory requirement and the Bloch mode expansion technique for structures with partial periodicity.

IMF2 • 4:45 p.m. **Invited**
Micro- and Nano-Optical Modeling of Organic LED, *Norbert Danz, Michael Flämmich, Dirk Michaelis, Christoph A. Wächter;*

Salon E

IME2 • 5:00 p.m. **Invited**

Rethinking Photonics Design and Manufacture: Offshoring, Material Platforms and the Future of Integration, *Erica Fuchs; Carnegie Mellon Univ., USA.* No abstract available.

IME3 • 5:30 p.m.

High Efficiency SOI Fiber-to-Waveguide Grating Couplers Fabricated Using CMOS Technology, *Gunther Roelkens[1], Diedrik Vermeulen[1], Dries Van Thourhout[1], Roel Baets[1], Stephane Brision[2], Philippe Lyan[2], Pauline Gautier[2], Jean-Marc Fedeli[2]; [1]Ghent Univ., Belgium, [2]CEA/LETI-MINATEC, France.* -2.6dB coupling efficiency between a silicon-on-insulator waveguide circuit and a single mode optical fiber was obtained, based on a grating coupling structure fabricated in a CMOS line. The -1dB optical bandwidth is 50nm.

IME4 • 5:45 p.m.

Implementation of Silicon Microphotonic Devices in a Geographically-Distributed Fiber Optic Network, *J. T. Robinson[1], J. D. Marconi[2], N. Sherwood-Droz[1], A. Cerqueira, Jr.[2], Hugo H. Figueroa[2], H. L. Fragnito[2], Michal Lipson[1]; [1]Electrical and Computer Engineering Dept., Cornell Univ., USA, [2]Optics and Photonics Res. Ctr., Unicamp, IFGW, Brazil.* We experimentally investigate the performance of silicon microphotonic devices for filtering 10Gb/s data sent through a 40km fiber path from a real geographically-distributed fiber optic network.

IME5 • 6:00 p.m.

Wide Temperature Range Operation of Resonant Silicon Electro-Optic Modulators, *Sasikanth Manipatruni, Rajeev Dokania, Bradley Schmidt, Jagat Shakya, Alyssa Apsel, Michal Lipson; Cornell Univ., USA.* We demonstrate wide-temperature range operation of a micron-size high-speed silicon electrooptic modulator over a temperature range of 15 K. We show that modulation can be maintained by varying the bias current to counter temperature changes.

Salons A/B

Fraunhofer Inst. für Angewandte Optik und Feinmechanik, Germany. The optical performance of organic LED can be optimized by using diffractive and/or refractive structures. Simulation of such complex systems requires mixed modeling of the emission from thin film stacks, diffractive, and refractive elements.

IMF3 • 5:15 p.m.

Analyzing Second Harmonic Generation in Photonic Crystals by Dirichlet-to-Neumann Maps, *Lijun Yuan, Ya Yan Lu; City Univ. of Hong Kong, Hong Kong.* A numerical method is developed for analyzing second harmonic generation in 2-D photonic crystals. The method makes use of the DtN maps of the unit cells to significantly reduce the total number of unknowns.

IMF4 • 5:30 p.m.

Construction of Band Edge Diagrams for 2-D Photonic Crystals with Arbitrary 3-D Anisotropy by the Finite Element Method, *Sen-ming Hsu, Hung-chun Chang; Natl. Taiwan Univ., Taiwan.* A full-vectorial finite element method based eigenvalue algorithm is developed for the band structure analysis of two-dimensional photonic crystals with arbitrary three-dimensional anisotropy under the out-of-plane wave propagation. The band edge diagram is then constructed.

IMF5 • 5:45 p.m. **Invited**

Flexible Modelling Approaches for Nanophotonics, *Phillip Sewell, Trevor M. Benson, Ana Vukovic; Univ. of Nottingham, UK.* We discuss challenges facing designers of photonics-simulation software. Flexibility, accuracy and scale are still the principal drivers for research. We consider the role of numerical schemes today and in the context of future generalized optimizations.

Salon E

IME6 • 6:15 p.m.
Ultrashort Polarization Splitter Using Silicon Photonic Wires, *Byung-Ki Yang, Sang-Yung Shin, Daming Zhang; KAIST, Republic of Korea.* An ultrashort polarization splitter based on the zero-gap directional coupler is proposed and realized. Its interference section is 8.8 μm long. The extinction ratio for both TE- and TM-like polarizations is 16 dB.

Salons A/B

IMF6 • 6:15 p.m.
The Influence of Au Nanoparticles on the Electronic and Thermo-Optical Nonlinearities of a Colloidal System, *Rogério Souza[1], Márcio A R C Alencar[2], Eid C. da Silva[3], Mário R. Meneghetti[3], Jandir M. Hickmann[2]; [1]CEFET-AL, Brazil, [2]Optics and Materials Group - Optma, Inst. de Física, Univ. Federal de Alagoas, Brazil, [3]Inst. de Química e Biotecnologia, Univ. Federal de Alagoas, Brazil.* The influence of gold nanoparticles on the thermo-optical and electronic optical properties of a highly stable biocompatible colloid was investigated. The results indicate that local and nonlocal optical properties can be engineered in nanostructured systems.

JMB • Joint Poster Session

Salon F
6:30 p.m.–8:00 p.m.
JMB • Joint Poster Session

JMB34
Feasibility of a Silicon-Based Guided-Wave Optical Microphone, *Masashi Ohkawa, Manabu Hayashi, Hiroyuki Nikkuni, Noriyuki Watanabe, Takashi Sato; Niigata Univ., Japan.* Feasibility of a silicon-based guided-wave optical microphone was examined in this study. The fabricated microphone has a 10mm×10mm×40μm diaphragm and single-mode waveguides on the diaphragm. The microphone successfully detected sound pressure of 80dB-SPL at 1kHz.

JMB35
Chirped Multilayer Mirror Based on Silicon Nitride (Si_3N_4) with Air-Gap Interlayers, *Igor A. Sukhoivanov[1], Oleksiy V. Shulika[2], Sergii O. Yakushev[2], Sergey I. Petrov[2], Volodymyr V. Lysak[3]; [1]Univ. of Guanajuato, Mexico, [2]Kharkov Natl. Univ. of Radio Electronics, Ukraine, [3]Gwangju Inst. of Science and Technology, Republic of Korea.* Chirped multilayer mirror based on silicon nitride with air-gap interlayers is proposed and designed. The mirror provides high reflectivity and good dispersion properties in the range 400-1200 nm supporting the few-cycle pulses processing.

JMB36
Color Filter Based on a Subwavelength Silicon Grating, *Yeo-Taek Yoon[1], Hong-Shik Lee[1], Sang-Shin Lee[1], Sang-Hoon Kim[2], Ki-Dong Lee[2]; [1]Kwangwoon Univ., Republic of Korea, [2]LG Electronics Inst. of Technology, Republic of Korea.* A color filter using a subwavelength grating in silicon was realized with the laser interference lithography technique. The device worked as a blue filter centered at 460 nm with 90-nm bandwidth and 40% transmission.

JMB37
Synthetic Opal Matrices—New Material for Nonlinear Optics, *Anna D. Kudryavtseva, Nikolay V. Tcherniega; Lebedev Physical Inst., Russian Acad. of Sciences.* Photonic Flame Effect (PFE) properties were investigated experimentally in opal matrices and nanocomposites. Dependence of the PFE on the refractive index contrast of nanocomposite was shown. Stimulated Raman scattering has been obtained in photonic crystal.

JMB38
Engineering Surface Plasmon-Polaritons with Hetero-Dielectric Nanolayers for Ultra-Long Range Propagation, Anomalous Dispersion, and Nanoscale Confinement, *Junpeng Guo, Ronen Adato; Univ. of Alabama in Huntsville, USA.* We report our investigations of using hetero-dielectric nanolayers to engineer and control the attenuation, confinement, and dispersion of symmetric surface plasmon-polariton modes along thin metal film and finite width metal strip plasmon-polariton waveguides.

JMB39
A 2-D Square Rods-in-Air Photonic Crystal Optical Switch, *Huazhong Wang[1], Weimin Zhou[2], Jim P. Zheng[1]; [1]Dept. of Electrical and*

Computer Engineering, Florida A&M Univ. and Florida State Univ., USA, [2]Sensors and Electron Devices Directorate, ARL, USA. A 2-D square rods-in-air photonic crystal optical switch is proposed. Simulations show that up to 82.76% of incident transverse magnetic Gaussian point source energy can be switched into a channel vertical to source channel.

JMB40

Power Splitters with Different Output Power Levels Based on Photonic Crystal Waveguide Directional Coupler, *Afshin Ghaffari, Mehrdad Djavid, Faraz Monifi, Mohammad Sadegh Abrishamian; K.N.Toosi Univ. of Technology, Iran.* Here, properties of wideband photonic crystal power splitter with different power levels based on directional coupling are investigated. Different power levels are achieved by changing the coupling length and the radius of the coupling rods.

JMB41

Low-Loss Insulator-Metal-Insulator SPPs Bragg Reflector, *Jian-wei Mu, Wei-ping Huang; McMaster Univ., Canada.* A novel Surface plasmon polariton grating structures based on insulator-metal-insulator has been proposed and the comparable performances with reported structure have been investigated by rigorous numerical method.

JMB81

Use of a Ring Resonator-Based Modulator for the Measurement of Subpicosecond Optical Waveforms with Oscilloscopes, *Naum K. Berger; Technion – Israel Inst. of Technology, Israel.* Measuring 800 fs optical pulses with a conventional fast oscilloscope is numerically demonstrated. Temporal superresolution is achieved due to modulation of the pulses by a ring resonator-based traveling-wave modulator and the appropriate processing of oscillograms.

JMB1-JMB9 can be found in the COTA abstracts.
JMB10-JMB33 can be found in the Slow Light abstracts.
JMB42-JMB80 can be found in the ICQI abstracts.

NOTES

• Tuesday, July 15 •

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

JTuA • Joint Plenary Session II

Salon E
8:00 a.m.–10:00 a.m.
JTuA • Joint Plenary Session II

8:00 a.m.
Slow Light Plenary
Electro-Optic Modulation of Photons and Biphotons, *Stephen E. Harris; Stanford Univ., USA.*

8:40 a.m.
ICQI Plenary
Entanglement, Information Processing and Decoherence in Trapped Atomic Ions, *David J. Wineland; NIST, USA.*

9:20 a.m.
COTA Plenary
Coherence Cloning and Phase Controlled Apertures Using Optical Phase-Lock Loops, *Amnon Yariv; Caltech, USA.*

Salon Foyer
10:00 a.m.–10:30 a.m.
Coffee Break

Salon E

10:30 a.m.–12:30 p.m.
ITuA • Planar Lightwave Circuits and Filters
Mehdi Asghari; KOTURA, Inc., USA, Presider

ITuA1 • 10:30 a.m.
Demonstration of a Reconfigurable 8-Bit Optical Correlator Filter Using High-Index-Contrast Silica Waveguides, *Mahmoud S. Rasras[1], Inuk Kang[1], Mihaela Dinu[1], Jim Jaques[2], Niloy Dutta[2], Alfonso Piccirilli[2], Mark A. Cappuzzo[1], Evans Chen[1], Louis T. Gomez[1], Annjoe Wong-Foy[2], Steven Cabot[2], Lawrence Buhl[1], Gregory Johnson[2], Sanjay S. Patel[1]; [1]Bell Labs, Alcatel-Lucent, USA, [2]LGS, Bell Labs Innovations, USA.* We present a compact reconfigurable 8-bit optical matching filter fabricated using 4% delta high-index-contrast silica-on-silicon waveguides. We demonstrate its working by successfully correlating 8-bit binary phase-shift keyed patterns.

ITuA2 • 10:45 a.m.
8-Channel WDM Optical Interconnect Device Using Add-Drop Multiplexers Integrated in a Thin-Film Waveguide, *Kenji Kintaka[1], Junji Nishii[1], Shunsuke Murata[2], Shogo Ura[2]; [1]Natl. Inst. of Advanced Industrial Science and Technology, Japan, [2]Kyoto Inst. of Technology, Japan.* Eight-channel thin-film-waveguide WDM optical interconnect device with free-space-wave add-drop

Salons A/B

10:30 a.m.–12:30 p.m.
ITuB • Microlasers and Emission
Richard DelaRue; Univ. of Glasgow, UK, Presider

ITuB1 • 10:30 a.m. Invited
Membrane Microlasers and Their Integration, *Christian Seassal; INL-CNRS, Ecole Centrale de Lyon, Univ. of Lyon, France.* We present various micro-nanophotonic devices based on the III-V on silicon heterogeneous integration scheme. We particularly focus on microdisk lasers integrated onto silicon wire waveguide, and on "2.5-D" photonic crystal based surface emitting microlasers.

Salon E

multiplexers consisting of focusing grating couplers (FGCs) and distributed Bragg reflectors was demonstrated for the first time by improvement of the FGC coupling efficiency.

ITuA3 • 11:00 a.m.
Tunable Optical Dispersion Compensator Using a Hybrid-Lens Structure in an Arrayed-Waveguide Grating, *Yuichiro Ikuma, Hiroyuki Tsuda; Keio Univ., Japan.* A tunable optical dispersion compensator using a hybrid-lens structure in an arrayed-waveguide grating is proposed. The total dispersion can be controlled from -115 ps/nm to +182 ps/nm with a temperature change of 55 °C.

ITuA4 • 11:15 a.m.
Monolithic WDM Filter in Silicon-on-Insulator for Diplexer/Triplexer Application, *Dazeng Feng, Ning-Ning Feng, Hong Liang, Wei Qian, Cheng-Chih Kung, Joan Fong, Mehdi Asghari; Kotura Inc., USA.* We have designed and fabricated a 1.49μm/1.55μm WDM filter in Silicon-on-Insulator (SOI) platform. The filter is realized by Fourier-transform-based MZIs. The fabricated filter has <0.2dB ripple over 20nm flat pass-band and <0.3dB excess loss.

ITuA5 • 11:30 a.m. **Invited**
Advanced PLC Filter and Integration Technologies, *Matt Pearson; Enablence Technologies Inc., Canada.* We demonstrate our low-cost, silicon-based PLC platform which includes a compact on-chip grating technology with extremely wide free-spectral range, and passive hybridization of high-performance lasers and photodetectors.

ITuA6 • 12:00 p.m. **Invited**
Circuit Theory and Microphotonic Circuit Design: From

Salons A/B

ITuB2 • 11:00 a.m.
Controlling Nanowire Emission Profile Using Conical Taper, *Niels Gregersen[1], Torben R. Nielsen[1], Jesper Mørk[1], Julien Claudon[2], Jean-Michel Gérard[2]; [1]DTU Fotonik, Dept. of Photonics Engineering, Denmark, [2]CEA-Grenoble/INAC/SP²M/Lab Nanophysique et Semiconducteurs, France.* The influence of a conical taper on nanowire light emission is studied. For nanowires with divergent output beams, the introduction of tapers improves the emission profile and increases the collection efficiency of the detection optics.

ITuB3 • 11:15 a.m.
Double-Heterostructure Photonic Crystal Lasers with Reduced Threshold Pump Power and Increased Slope Efficiency Obtained by Quantum Well Intermixing, *Ling Lu, Eui Hyun Hwang, John O'Brien, P. Daniel Dapkus; Univ. of Southern California, USA.* Double-Heterostructure photonic crystal microcavity lasers were fabricated in which much of the photonic crystal mirror region was disordered by quantum well intermixing. An increased slope efficiency and a reduced threshold pump power was obtained.

ITuB4 • 11:30 a.m.
Strong Luminescence in 1500 nm from HgTe Colloidal Quantum Dots Infiltrated in a Photonic Crystal Lattice, *Pablo A. Postigo[1], Héctor Martínez[1], Iván Prieto[1], Vladimir Lesnyak[2], Nikolai Gaponik[2]; [1]Inst. de Microelectronica de Madrid, Spain, [2]TU Dresden, Germany.* We report the measurement at room temperature of strong and linearly polarized photoluminescence emission in 1550 nm on HgTe colloidal quantum dots infiltrated inside photonic crystal slabs.

ITuB5 • 11:45 a.m.
High-Purcell Factor, Ultra-Small Mode Volume Quasi-H1 Photonic Crystal Defect Lasers in InGaAsP Membrane, *Yi-Chun Yang[1], Chun-Jung Wang[2], Yu-Chen Liu[3], Zi-Chang Chang[3], Kung-Shu Hsu[4], Yen-Chun Tseng[2], Jen-Inn Chyi[2], Meng-Chyi Wu[3], Po-Tsung Lee[4], Min-Hsiung Shih[1]; [1]Res. Ctr. for Applied Sciences, Academia Sinica, Taiwan, [2]Dept. of Electrical Engineering,Natl. Central Univ., Taiwan, [3]Dept. of Electrical Engineering,Natl. Tsing Hua Univ., Taiwan, [4]Dept. of Photonics, Natl. Chiao Tung Univ., Taiwan.* The ultra-small mode volume, high-Q quasi-H1 photonic crystal cavity was demonstrated in InGaAsP membrane. The lasing properties of the cavity were characterized. The operated mode and profile were analyzed with the finite-difference time-domain method.

ITuB6 • 12:00 p.m.
Two-Dimensional Surface Emitting Photonic Crystal Laser

Salon E

Resonant Filters to Light-Powered Nanomachines, *Milos A. Popovic, Peter T. Rakich, Tymon Barwicz, Marcus S. Dahlem, Fuwan Gan, Charles W. Holzwarth, Henry I. Smith, Franz X. Kärtner, Erich P. Ippen; MIT, USA.* Physically intuitive coupled-mode and equivalent electrical-circuit theories are described for synthesis of nanophotonic resonator/interferometer circuits, including a new phase law for general 4-ports. Synthesis of self-adaptive (highly-nonlinear) optomechanical systems based on light forces is introduced.

12:30 p.m.–2:00 p.m.
Lunch Break

2:00 p.m.–4:00 p.m.
ITuC • Sensors and Lightwave Circuits
Attila Mekis; Luxtera Inc., USA, Presider

ITuC1 • 2:00 p.m. **Invited**
Integrated Optical Bio Sensors, *Igal Brener; Sandia Natl. Labs, USA.* We will present our recent progress on 1) waveguide-based sensor arrays that can operate as high density immunoassay sensors for detection of proteins and other biomolecules in solution, 2) metamaterial and plasmonic-based chem-bio sensors.

ITuC2 • 2:30 p.m. **Invited**
Polymeric Optical Wire-Bonding for Planar Lightwave Circuit Packaging, *Roberto R. Panepucci, Abdullah J. Zackariya, Tao Liu; Florida Intl. Univ., USA.* Flexible SU8 optical waveguide coupling to on-chip waveguides is investigated numerically for single mode, and experimentally for multimode waveguides. An optical wire-bonding platform enabling optical coupling from fiber-ribbon connectors to planar lightwave circuits is proposed.

Salons A/B

with Hybrid Triangular-Graphite Structure, *Luis Javier Martínez[1], Héctor Martínez[1], Iván Prieto[1], Pablo A. Postigo[1], Christian Seassal[2], Pierre Viktorovitch[2]; [1]Inst. de Microelectronica de Madrid, Spain, [2]Inst. des Nanotechnologies de Lyon (INL), France.* Laser emission of a compact surface-emitting microlaser, optically pumped and operating at 1.5 µm at room temperature is presented. The two-dimensional photonic crystal is conformed in a hybrid triangular-graphite lattice designed for vertical emission.

ITuB7 • 12:15 p.m.
Characterization of the Resonant Third-Order Nonlinear Susceptibility of Si-Doped GaN/AlN Quantum Wells and Quantum Dots at 1.5 µm, *S. Valdueza-Felip[1], F.B. Naranjo[1], M. González-Herráez[1], H. Fernández[2], J. Solís[2], F. Guillot[3], E. Monroy[3], M. Tchernycheva[4], L. Nevou[4], F. H. Julien[4]; [1]Grupo de Ingeniería Fotónica (GRIFO), Dept. de Electrónica, Univ. de Alcalá, Spain, [2]Inst. de Óptica, C.S.I.C., Spain, [3]Equipe Mixte CEA, Ctr. Natl. de la Recherche Scientifique, Nanophysique et Semiconducteurs, INAC/SP2M/NPSC CEA-Grenoble, France, [4]Inst. d´Electronique Fondamentale, Ctr. Natl. de la Recherche Scientifique, France.* We report third order optical nonlinearity around 1500nm of GaN/AlN QW and QD. Intersubband transitions show a high $X^{(3)}$ value and an ultrafast nonlinear response, rendering these nanostructures suitable for all-optical switching and wavelength-conversion applications.

12:30 p.m.–2:00 p.m.
Lunch Break

2:00 p.m.–4:00 p.m.
ITuD • Multi-Core Photonics and Simulations
Jurgen Michel; MIT, USA, Presider

ITuD1 • 2:00 p.m. **Invited**
Nanoscale Silicon Photonic Networks-on-Chip for Multicore Processors Communications, *Keren Bergman; Columbia Univ., USA.* We explore how recent advances in nanoscale silicon photonic technologies can be exploited for developing on-chip optical interconnection networks that address the bandwidth and power challenges presented for the communications infrastructure in multicore processors.

ITuD2 • 2:30 p.m. **Invited**
A Nanophotonic Interconnect for High-Performance Many-Core Computation, *Ray Beausoleil[1], J. Ahn[2], N. Binkert[2], A. Davis[2], D. Fattal[1], M. Fiorentino[1], N. P. Jouppi[2], M. McLaren[3], C. M. Santori[1], R. S. Schreiber[2], S. M. Spillane[1], D. Vantrease[2], Q. Xu[1]; [1]Information and Quantum Systems, Hewlett-Packard Labs, USA, [2]Exascale Computing, Hewlett-Packard Labs, USA, [3]Exascale Computing, Hewlett-Packard Labs, UK.* We describe the results of a design study of DWDM on-chip and off-chip nanophotonic interconnects and device technologies that could improve

Salon E

ITuC3 • 3:00 p.m.
Sensitive and Compact Silicon Wire Evanescent Field Molecular Sensors, *D.-X. Xu, A. Densmore, P. Waldron, S. Janz, J. Lapointe, A. Delage, G. Lopinski, T. Mischki, P. Cheben, J. H. Schmid; Natl. Res. Council of Canada, Canada.* Densely folded silicon wire waveguide evanescent field sensors demonstrate high sensitivity and compact foot-print. Real time monitoring of molecular binding resolves ~0.2% of a protein monolayer, corresponding to a mass of ~5 femtograms.

ITuC4 • 3:15 p.m.
Two-Dimensional Photonic Crystal Slot Microcavity Sensor for Virus-Sized Particle Detection, *Mindy R. Lee[1], Benjamin L. Miller[2], Philippe M. Fauchet[3]; [1]Inst. of Optics, Univ. of Rochester, USA, [2]Dept. of Dermatology, Univ. of Rochester, USA, [3]Inst. of Optics, Dept. of Electrical and Computer Engineering, Univ. of Rochester, USA.* We theoretically and experimentally demonstrate a new sensor design that consists of a 2-D silicon slot photonic crystal microcavity and is capable of detecting virus-sized particles.

ITuC5 • 3:30 p.m.
Design and Optimization of Surface Plasmon Resonance Based Biosensor for the Detection of *E. coli*, *Muttukrishnan Rajarajan[1], Tuffail Dar[1], Christos Themistos[1], Aziz Rahman[1], Kenneth Grattan[1], Joseph Irudayaraj[2]; [1]City Univ., UK, [2]Purdue Univ., USA.* Finite element analysis based on the vector H-field formulation and incorporating the perturbation technique is used to optimize a surface plasmon resonance based fiber optic sensor for the detection of *E coli*.

ITuC6 • 3:45 p.m.
Generalized Treatment of Optically Induced Forces and Potentials in Optomechanically Variable Photonic Circuits, *Peter T. Rakich, Milos A. Popovic; MIT, USA.* We establish a fundamental relationship between the phase and amplitude responses of an optomechanically variable photonic circuit and the forces and potentials produced by light. These results are illustrated through resonant and nonresonant multi-port systems.

Salon Foyer
4:00 p.m.–4:30 p.m.
Coffee Break

Salons A/B

computing performance by a factor of 20 above industry projections over the next decade.

ITuD3 • 3:00 p.m. Invited
Intrachip Photonic Network for Multicore Communications, *Mark Beals; MIT, USA.* No abstract available.

ITuD4 • 3:30 p.m.
Temperature Dependence Analysis of Photonic Devices, *V. F. Rodríguez-Esquerre[1], J. P. Da Silva[2], C. E. Rubio-Mercedes[3], J. J. Isídio-Lima[1], H. E. Hernández-Figueroa[4]; [1]CEFET-BA, Brazil, [2]UFERSA, Brazil, [3]UEMS, Brazil, [4]UNICAMP, Brazil.* The chromatic-dispersion of an ultra-flattened optical fiber and the resonant-wavelength of a microring-filter were computed for several temperatures by using temperature-dependent Sellmeier coefficients in combination with efficient finite-element approaches. Both parameters exhibited linear-dependence with temperature.

ITuD5 • 3:45 p.m.
Using the Penalty Method for Imposing Boundary Conditions in the Pseudospectral Optical Waveguide Mode Solver, *Po-Jui Chiang[1], Nai-Hsiang Sun[2], Hung-chun Chang[1]; [1]Natl. Taiwan Univ., Taiwan, [2]I-Shou Univ., Taiwan.* A penalty method for imposing boundary conditions at material interfaces is considered in the recently developed multidomain pseudospectral optical waveguide mode solver. The method is demonstrated to offer better numerical convergency and stability.

Salon Foyer
4:00 p.m.–4:30 p.m.
Coffee Break

NOTES

Salons A/B

4:30 p.m.–6:30 p.m.
ITuE • Computer Aided Design for Integrated and Nano Photonics
Hugo Enrique Hernandez-Figueroa; UNICAMP, Brazil, Presider

ITuE1 • 4:30 p.m. **Invited**
Addressing Photonic Applications via a Broad Range of Integrated Simulation Methods, *Robert Scarmozzino, E. Heller, M. Bahl; RSoft Design Group, Inc., USA.* Presented here is an integrated set of methods for device simulation (FDTD, BPM, FEM, RCWA, EME, PWE), calculation of multiple physical processes (electro/thermo/stress-optic and active carrier transport), high-performance computing, and multilevel connection to system simulation.

ITuE2 • 4:45 p.m. **Invited**
Designing Active Photonic Integrated Circuits Using TDTW, *Dominic F. Gallagher; Photon Design, UK.* We present a new photonic circuits simulator PICWave based on the TDTW method, capable of modelling both active and passive photonic circuits. We illustrate its performance with reference to an SOA based all-optical 2R regenerator.

ITuE3 • 5:00 p.m. **Invited**
Multi-Disciplinary Simulation of Electro-Opto-Thermal Networks Using a SPICE-Like Framework, *Pavan Gunupudi[1], Tom Smy[1], Jackson Klein[2], Jan Jakubczyk[2]; [1]Carleton Univ., Canada, [2]Optiwave Systems, Canada.* This paper presents a method to simulate coupled multi-disciplinary problems using a single-engine approach by embedding system characteristics of optoelectronic devices relating to each energy domain in a SPICE-like simulation framework.

ITuE4 • 5:15 p.m. **Invited**
JCMsuite: An Adaptive FEM Solver or Precise Simulations in Nano-Optics, *Sven Burger, Lin Zschiedrich, Jan Pomplun, Frank Schmidt; JCMwave, Germany.* We present the finite-element solver JCMsuite for Maxwell-type, time-harmonic scattering, eigenvalue and resonance problems. We report on the current status and discuss application examples like the precise computation of leaky modes in photonic crystal fibers.

A round table discussion will conclude the last hour of this session, 5:30 p.m.–6:30 p.m.

Salon F
6:30 p.m.–8:00 p.m.
Conference Reception

• Wednesday, July 16 •

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

Salon E

8:00 a.m.–10:00 a.m.
IWA • Micro-Resonators and Lightwave Devices
Greg Nordin; Univ. of Alabama at Huntsville, USA, Presider

IWA1 • 8:00 a.m. **Invited**
Electrical Network Approach to Synthesizing Coupled-Cavity Optical Devices, *Vien Van; Univ. of Alberta, Canada.* Generalized electrical network approach for synthesizing multiple-coupled micro-resonator devices of the most general two-dimensional coupling topology is presented. Complex device coupling topologies are also presented to highlight their various potential applications in spectral engineering.

IWA2 • 8:30 a.m.
Integrated HIC High-Q Resonators in Chalcogenide Glass, *Juejun Hu[1], Nathan Carlie[2], Ning-Ning Feng[1], Laeticia Petit[2], Anuradha Agarwal[1], Kathleen Richardson[2], Lionel Kimerling[1]; [1]MIT, USA, [2]Clemson Univ., USA.* We have demonstrated the first planar waveguide-coupled chalcogenide glass micro-resonators using a CMOS-compatible lift-off technique. The microdisk resonators support whispering-gallery-mode (WGM) with cavity Q exceeding 2×10^5, the highest Q reported in chalcogenide resonators.

IWA3 • 8:45 a.m.
A Compact Chromatic Dispersion Compensator Using Unequal and Mutually-Coupled Microring Resonators, *Lin Zhang[1], Muping Song[2], Jeng-Yuan Yang[1], Raymond G. Beausoleil[3], Alan E. Willner[1]; [1]Univ. of Southern California, USA, [2]Zhejiang Univ., China, [3]HP Labs, USA.* We propose ultra-small silicon microring-based dispersion compensators, with -530 ps/nm dispersion over 8.5 μm and power fluctuation of 0.15 dB. Equivalent dispersion is up-to 6.23×10^{10} ps/nm/km. Dispersion slope compensation is also achieved.

IWA4 • 9:00 a.m.
Design and Optimization of Devices for C-Band Photonic-Crystal Waveguide Interleaver with Flattened Pass-Band, *Lorenzo Rosa, Kunimasa Saitoh, Kuniaki Kakihara, Masanori Koshiba; Grad. School of Information Science and Technology, Hokkaido Univ., Japan.* We investigate the optimization of a C-band photonic-crystal waveguide (PCW) interleaver with flattened pass-band, using coupled-resonator optical waveguides (CROW). A genetic algorithm (GA) is employed for optimizing the filter devices for high transmittivity and flatness.

Salons A/B

8:00 a.m.–10:00 a.m.
IWB • Modeling Optical Fibers and Waveguides
Ronald Hadley; Sandia Natl. Labs, Presider

IWB1 • 8:00 a.m. **Invited**
Microstructured Fibers: Modelling, Design and Applications, *Annamaria Cucinotta, Federica Poli, Davide Passaro, Stefano Selleri; Univ. of Parma, Italy.* The finite element method has been successfully applied to analyze the properties of microstructured fibers. Their geometrical and physical characteristics have been designed in order to obtain the features suitable for specific applications.

IWB2 • 8:30 a.m.
Characterization of a Teflon PCF for THz Frequency Applications by Using the Finite Element Method, *Kejalakshmy Namassivayane, B.M. Azizur Rahman, Arti Agrawal, Ken Grattan; City Univ., UK.* A finite element based full-vectorial modal solution approach has been developed to identify single mode operation of Teflon photonic crystal fibers and to characterize their modal and bending losses in the THz frequencies.

IWB3 • 8:45 a.m.
Single-Mode Large-Mode-Area Leakage Channel Fibers with Octagonal Symmetry, *Lorenzo Rosa[1], Kunimasa Saitoh[1], Yukihiro Tsuchida[1], Shailendra Kumar Varshney[1], Masanori Koshiba[1], Federica Poli[2], Davide Passaro[2], Annamaria Cucinotta[2], Stefano Selleri[2], Luca Vincetti[3]; [1]Div. of Media and Network Technologies, Hokkaido Univ., Japan, [2]Univ. of Parma, Italy, [3]Univ. of Modena e Reggio Emilia, Italy.* A novel design for large-mode-area leakage channel fibers with a single ring of air-holes organized with octagonal symmetry has been proposed, obtaining lower bending loss and guided mode distortion with respect to hexagonal symmetry fibers.

IWB4 • 9:00 a.m.
Finite-Element and Boundary Integral Method for Analysis of Open Dielectric Waveguides, *Hyoungsuk Yoo, Anand Gopinath; Univ. of Minnesota, USA.* To analyze dielectric waveguides, the vector finite-element method is used in the interior region while boundary integral equations are applied in the exterior region. The propagation constant has been obtained by an iterative method.

Salon E

IWA5 • 9:15 a.m.
Stratified Photonic Crystal Demultiplexer, *Amin Khorshidahmad, Andrew G. Kirk; McGill Univ., Canada.* Using diffraction compensation, a compact wide-band coarse wavelength division demultiplexer in a stratified heterostructure photonic crystal is proposed. With almost diffraction limited beam sizes, seven-fold size reduction is achieved compared to a convectional S-vector superprism.

IWA6 • 9:30 a.m.
Highly Sensitive Compact On-Chip Micro-Interferometers, *Maysamreza Chamanzar, Babak Momeni, Ali Adibi; Georgia Tech, USA.* Photonic crystals (PCs) are used in a two-wave interference architecture to enhance the spectral sensitivity of on-chip optical interferometers. The proposed interferometers are shown to have applications in sensing and spectroscopy.

IWA7 • 9:45 a.m.
T-Shaped Channel-Drop Filters Using Photonic Crystal Ring Resonators, *Mehrdad Djavid, Faraz Monifi, Afshin Ghaffari, Mohammad Sadegh Abrishamian; K.N.Toosi Univ. of Technology, Iran, Islamic Republic of.* We demonstrate a new type of 2-D photonic crystal T-shaped channel-drop filter using ring-resonator with high normalized transmission; we investigate parameters which affecting resonant frequency in these filters. FDTD method concludes output efficiency over 95%.

Salon Foyer
10:00 a.m.–10:30 a.m.
Coffee Break

10:30 a.m.–12:30 p.m.
IWC • Photonic Integration
Pietro Bernasconi; Bell Labs, Alcatel-Lucent, USA, Presider

IWC1 • 10:30 a.m. **Invited**
Digital vs. Analog Photonic Integration, *Martin Hill[1], M. K. Smit[1], Peter Crombez[2], Carel van der Poel[2]; [1]COBRA—TU Eindhoven, Netherlands, [2]NXP Semiconductor, Netherlands.* In this presentation, analog integration is reviewed, digital integration is discussed and a comparison is made between photonics and electronics.

IWC2 • 11:00 a.m. **Invited**
Photonic Integrated Circuits for Communications, Signal Processing and Computing Applications, *S. J. Ben Yoo; Univ. of California at Davis, USA.* This paper describes PICs realized on semiconductor platforms (InP, Si, etc) to support future communication and computing systems integrated on a chip. Integration of lasers, mux/demux, micro-resonators, optical switches will be described.

Salons A/B

IWB5 • 9:15 a.m.
A Modified Semivectorial Beam-Propagation Method Retaining the Longitudinal Field Component, *Junji Yamauchi, Yuta Nito, Hisamatsu Nakano; Faculty of Engineering, Hosei Univ., Japan.* The formulation of the beam-propagation method is revisited, taking into account the effects of the longitudinal field component. The improvement is demonstrated through the analysis of a vertically tapered rib waveguide.

IWB6 • 9:30 a.m.
Novel Frequency Domain Approach for the Analysis of Photonic Devices in Cylindrical Coordinates, *C. E. Rubio-Mercedes[1], V. F. Rodríguez-Esquerre[2], H. E. Hernández-Figueroa[3]; [1]UEMS, Brazil, [2]CEFET-BA, Brazil, [3]UNICAMP, Brazil.* A novel scheme based on a finite element method (FEM) in conjunction with the perfectly matched layers (PML) for the analysis of discontinuities in photonic devices with cylindrical symmetry is proposed and validated.

IWB7 • 9:45 a.m.
A Quasi-Crystal Spiral Photonic Crystal Fiber: Modal Solutions and Dispersion Properties, *Arti Agrawal, N. Kejalakshmy, F. Tian, B. M. A. Rahman, K. T. V. Grattan; City Univ., UK.* A novel quasi crystal spiral design for a Photonic Crystal Fiber is optimized by the Finite Element method. The fiber dispersion can be designed to have large negative values by tuning the design parameters.

Salon Foyer
10:00 a.m.–10:30 a.m.
Coffee Break

10:30 a.m.–12:30 p.m.
IWD • Solar Cells and Nanostructures
Edward Sargent; Univ. of Toronto, Canada, Presider

IWD1 • 10:30 a.m. **Invited**
Engineering of Charge and Light Transport at the Micro and Nanoscale for Low-Cost, Large-Area Solar Cells, *Peter Peumans; Stanford Univ., USA.* No abstract available.

IWD2 • 11:00 a.m.
Ultracompact Plasmonic Waveguide Bend Based on Nanoscale Cavity Resonance, *Jaeyoun Kim, Yu Liu; Iowa State Univ., USA.* It is well-known that incorporating resonant cavities into dielectric waveguide bends can improve their transmission efficiency. Using 3-D simulations, we demonstrate that the technique can generate ~3dB improvement in ultracompact plasmonic waveguide bends as well.

Salon E

IWC3 • 11:30 a.m.
High-Power High-Linearity Modified Uni-Traveling Carrier Photodiodes, *Andreas Beling, Huapu Pan, Hao Chen, Joe C. Campbell; Univ. of Virginia, USA.* We demonstrate a modified uni-traveling carrier photodiode (MUTC-PD) with a record-high third-order intercept point of 52dBm at 75mA and 300MHz. To further enhance the dynamic range we propose a monolithically integrated traveling wave MUTC-PD array.

IWC4 • 11:45 a.m.
Photonic Chip Recirculating Buffer for Optical Packet Switching, *Emily F. Burmeister, John P. Mack, Henrik N. Poulsen, Milan L. Mašanović, Biljana Stamenić, Daniel J. Blumenthal, John E. Bowers; Univ. of California at Santa Barbara, USA.* The first on-chip optical buffer is demonstrated with up to 64 ns of delay with 98% packet recovery. The recirculating buffer is implemented using a fast, InP-based switch butt-coupled to a low-loss silica waveguide delay.

IWC5 • 12:00 p.m. **Invited**
Photonic Integrated Circuits for Optical Routing and Switching Applications, *Milan L. Masanovic, Emily F. Burmeister, Anna Tauke-Pedretti, Brian R. Koch, Matthew M. Dummer, Joseph A. Summers, Jonathon S. Barton, Larry A. Coldren, John E. Bowers, Daniel J. Blumenthal; Univ. of California at Santa Barbara, USA.* We report on the latest advances in implementation of integrated photonic components required for optical routing: wavelength converters, optical buffers, and mode-locked lasers.

12:00 p.m.–2:00 p.m.
Lunch Break

Salons A/B

IWD3 • 11:15 a.m.
Design and Analysis of Metal Slab Waveguide Reflector for Substrate Removed Nanowire Waveguides, *Changwan Son, Byungchae Kim, Jaehyuk Shin, Nadir Dagli; Univ. of California at Santa Barbara, USA.* Metal slab waveguide reflectors for nanowire waveguides are designed and simulated. The reflection coefficient can be controlled by adjusting the gap and length of the reflector. Reflection coefficients higher than metal coated facets are possible.

IWD4 • 11:30 a.m.
Retardation Effects to the Rescue of Particle Plasmon-Based Nano-Cavities, *Eyal Feigenbaum, Meir Orenstein; Technion, Israel.* ultra-small modal volume of $\sim 10^{-4} \cdot \lambda 3$ with relatively enhanced Q-factors is obtained when a particle-plasmon is modified to accumulate retardation effects, although the field propagation length is only few tens of nanometer.

IWD5 • 11:45 a.m.
The Nano Plasmonic Slotline and Coplanar Waveguides and Their Edge Guiding, *Yinon Stav, Nikolai Berkovitch, Meir Orenstein; Technion, Israel.* Slotlines and Coplanar plasmonic waveguides at the nanometric regime are studied both theoretically and experimentally, including their mutual coupling. Edge guiding in these structures enables relatively long plasmon propagation (tens of micrometers).

IWD6 • 12:00 p.m.
3-D Numerical Simulations of Light Scattering from 2-D Silver-Nanorod Hexagonal Arrays Embedded in Nano-Gap Substrates, *Bang-Yan Lin[1], Chun-Hao Teng[2], Hung-chun Chang[1]; [1]Natl. Taiwan Univ., Taiwan, [2]Natl. Cheng Kung Univ., Taiwan.* Light scattering from hexagonal-lattice silver-nanorod arrays embedded in nano-gap substrates are simulated using a high-accuracy 3-D pseudospectral time-domain numerical scheme. A more realistic Drude-Lorentz material model is numerically implemented to facilitate efficient computation.

IWD7 • 12:15 p.m.
Reduced Basis Method for Nano Optical Simulations, *Jan Pomplun, Frank Schmidt; Zuse Inst. Berlin, Germany.* We explain the reduced basis method for the finite element simulation of nano optical problems which allows to obtain rigorous solutions of the electromagnetic field for large parameterized problems in very short time.

12:00 p.m.–2:00 p.m.
Lunch Break

Salon E

2:00 p.m.–4:00 p.m.
IWE • Active Structures
Mark Earnshaw; Alcatel-Lucent, USA, Presider

IWE1 • 2:00 p.m. **Invited**
Nanostructure Patterned Active Regions for Semiconductor Diode Lasers, *James Coleman; Univ. of Illinois at Urbana-Champaign, USA.* We describe a nanoscale selective area epitaxy process for uniform patterned quantum dot growth and present laser device results for both conventional quantum dot lasers and a novel inverted quantum dot (nanopore) laser structure.

IWE2 • 2:30 p.m.
Enhanced Electro-Optic Phase Modulation in InGaAs Quantum Posts, *JaeHyuk Shin, Hyochul Kim, Pierre M. Petroff, Nadir Dagli; Univ. of California at Santa Barbara, USA.* Phase modulation of self-assembled InGaAs quantum posts were studied at 1500 nm. Enhancement of 29% over devices containing InGaAs quantum wells of similar composition was observed indicating significant electro-optic coefficient increase in quantum posts.

IWE3 • 2:45 p.m.
Low-Loss Ultra-Compact GaAs/AlGaAs Substrate Removed Waveguides, *JaeHyuk Shin, Yu-Chia Chang, Nadir Dagli; Univ. of California at Santa Barbara, USA.* Substrate removed GaAs/AlGaAs optical waveguides with propagation loss as low as 1 dB/cm was demonstrated using lifted-off Si for index loading. Loss components were identified, minimized and measured propagation loss correlated well with calculations.

IWE4 • 3:00 p.m.
Ultrafast Optical Beam Deflection in a GaAs Planar Waveguide by a Transient, Optically-Induced Prism Array, *Chris H. Sarantos, John E. Heebner; Lawrence Livermore Natl. Lab, USA.* We demonstrate a novel, ultrafast single-shot optical beam deflection technique based on an array of transient, optically induced prisms within a GaAs planar waveguide, enabling

Salons A/B

2:00 p.m.–4:00 p.m.
IWF • Simulations, Photonic Devices and Materials
Andrea Melloni; DEI, Italy, Presider

IWF1 • 2:00 p.m.
Waveguide Microgripper Power Distribution, *Tao Liu, Jose A. Martinez, Amit Bhanushali, Roberto R. Panepucci; Florida Intl. Univ., USA.* We studied the factors affecting the power distribution across the waveguide facet of novel microgrippers. Knife edge measurements, microscopy imaging and 2-D–FDTD numerical simulations are carried to study the effects of specifications of series microgrippers.

IWF2 • 2:15 p.m.
Effect of Implementation of a Bragg Reflector in the Photonic Band Structure of the Suzuki-Phase Photonic Crystal Lattice, *Pablo A. Postigo[1], Luis J. Martínez[1], Alfonso R. Alija[1], Matteo Galli[2], Juan F. Galisteo-López[2], Lucio C. Andreani[2], Christian Seassal[3], Pierre Viktorovitch[3]; [1]Inst. de Microelectronica de Madrid, Spain, [2]Dept. di Fisica "A. Volta," Univ. di Pavia, Italy, [3]Inst. des Nanotechnologies de Lyon (INL), France.* We report the change in the photonic band structure of the Suzuki-phase photonic crystal slab when transversal symmetry is broken by an underlying Bragg reflector, and an enhancement on the photoluminescence up to seven times.

IWF3 • 2:30 p.m.
Removing the Bandwidth Limitation in Slow-Light Mach-Zehnder Modulators, *Sean P. Anderson, Ashutosh R. Shroff, Philippe M. Fauchet; Inst. of Optics, Univ. of Rochester, USA.* We show that modulators using slow-light Mach-Zehnder interferometers can be miniaturized, but at the price of bandwidth. We offer guidelines to replace this tradeoff with a more favorable one between length reduction and manufacturing variation.

IWF4 • 2:45 p.m.
Thermally Tunable Ferroelectric Thin Film Photonic Crystals, *Pao T. Lin[1], Bruce W. Wessels[1], Alexandra Imre[2], Leonidas E. Ocola[2]; [1]Northwestern Univ., USA, [2]Ctr. for Nanoscale Materials, Argonne Natl. Lab, USA.* Thermally tunable PhCs are fabricated from ferroelectric thin films. Photonic band structure and temperature dependent diffraction are calculated by FDTD. 50% intensity modulation is demonstrated experimentally. This device has potential in active ultra-compact optical circuits.

IWF5 • 3:00 p.m.
Simulation, Fabrication and Measurement of Infrared Frequency Selective Surfaces, *David W. Peters, L. I. Basilio, A. A. Cruz-Cabrera, W. A. Johnson, J. R. Wendt, S. A. Kemme, S. Samora; Sandia Natl. Labs, USA.* We show reflection and transmission measurements from frequency selective surfaces over a broad angular and wavelength range in the midwave infrared and

Salon E

experimental measurement of signals with sub 3 ps temporal resolution.

IWE5 • 3:15 p.m.
General and Efficient Method for Calculating Modulation Responses and Noise Spectra of Active Semiconductor Waveguides, *Søren Blaaberg, Filip Öhman, Jesper Mørk; Technical Univ. of Denmark, Denmark.* We present a theoretical method for obtaining small-signal responses in a spatially resolved active semiconductor waveguide including finite end-facet reflectivities and amplified spontaneous emission. RF-modulation responses and output noise spectra of an SOA are shown.

IWE6 • 3:30 p.m.
One-Dimensional Photonic Crystal and Photoconductive PbTe Film for Low Cost Resonant-Cavity-Enhanced Mid-Infrared Photodetector, *Jianfei Wang[1], Juejun Hu[1], Xiaochen Sun[1], Anuradha M. Agarwal[1], Desmond R. Lim[2], Lionel C. Kimerling[1]; [1]MIT, USA, [2]DSO Natl. Labs, Singapore.* We demonstrate and characterize both one-dimensional photonic crystal monolithically integrated on a Si platform, and thermally evaporated PbTe film with room temperature photoconductivity, which are key components for low cost resonant-cavity-enhanced mid-infrared photodetectors.

IWE7 • 3:45 p.m.
Influence of Pure Dephasing on Emission Spectra from Quantum Dot-Cavity Systems, *Andreas N. Rasmussen, Troels S. Jørgensen, Philip T. Kristensen, Jesper Mørk; DTU Fotonik, Dept. of Photonics Engineering, Denmark.* We model the effect of dephasing on a QD-cavity QED system. The emission peaks are found to display surprising intensity shifts as the rate of dephasing is increased. This effect could explain recent experimental results.

Salon Foyer
4:00 p.m.–4:30 p.m.
Coffee Break

4:30 p.m.–5:45 p.m.
IWG • Waveguide Components
Dan-Xia Xu; Natl. Res. Council of Canada, Canada, Presider

IWG1 • 4:30 p.m.
Polarization-Selective Tunable Delay in Coupled-Resonator Optical Delay-Lines, *Francesco Morichetti[1], Carlo Ferrari[2], Andrea Melloni[2], Mario Martinelli[1]; [1]CORECOM, Italy, [2]Politecnico di Milano, Italy.* We experimentally demonstrate that an integrated reconfigurable coupled-resonator optical waveguide can introduce a continuously tunable delay between two data-streams with orthogonal polarization states. Applications to polarization-division multiplexing transmission systems at several Gbit/s bit-rates are discussed.

Salons A/B

compare to computational models using EIGERTM, a method-of-moments code.

IWF6 • 3:15 p.m.
Backward-Propagating-Slow-Light in Inverted Plasmonic Taper, *Eyal Feigenbaum, Meir Orenstein; Technion, Israel.* Modes in plasmonic metal-dielectric-metal structure, at frequencies exceeding the surface plasmon frequency can be simultaneous slow-light, have backward phase propagation and exhibit inverse cutoff characteristics compared to regular photonic characteristics.

IWF7 • 3:30 p.m.
Estimating Total Quality Factor of 2-D Photonic Crystal Slab Cavities with 2-D Simulation Techniques, *Tao Liu, Roberto R. Panepucci; Florida Intl. Univ., USA.* We propose a fast numerical method to evaluate total quality factor of photonic-crystal-slab-based microcavity. Cavity mode and in/out plane losses are calculated by 2-D–FDTD and 3-D–PWE methods. Results are compared with Full 3-D–FDTD simulations.

IWF8 • 3:45 p.m.
Efficient Approach for 3-D Full Vectorial Sensitivity Analysis Using ADI-BPM, *Mohamed A. Swillam, Mohamed H. Bakr, Xun Li; McMaster Univ., Canada.* A novel approach for sensitivity analysis using the 3-D full vectorial beam propagation method based on alternative direction implicit technique is proposed. Our approach is efficient, simple, easy to implement and has second order accuracy.

Salon Foyer
4:00 p.m.–4:30 p.m.
Coffee Break

4:30 p.m.–5:45 p.m.
IWH • Resonant Structures
Azizur B. M. Rahman; City Univ., UK, Presider

IWH1 • 4:30 p.m.
Confinement Analysis in Symmetric and Asymmetric Nanoscale Slab Slot Waveguides, *Qun Zhang[1], Changbao Ma[2], Edward Van Keuren[2]; [1]Minnesota State Univ., USA, [2]Georgetown Univ., USA.* Using the recently derived analytical TM modal field expression and the transcendental dispersion relation for a general nanoscale asymmetric slab slot waveguide, the confinement performance in symmetric vs. asymmetric geometries was systematically analyzed and compared.

Salon E

IWG2 • 4:45 p.m.
Non-Hermitian Quantum Mechanics for Linear Photonic Logic, *Vita Vishnyakov, Pavel Ginzburg, Alex Hayat, Meir Orenstein; Dept. of Electrical Engineering, Technion, Israel.* Unidirectional interference is proposed for controlling strong fields by weak ones, based on Maxwell-Schrödinger equation analogies. Electromagnetic equivalents of EIT under non-Hermitian Hamiltonian result in low-power linear photonic logic with unidirectional optical gratings.

IWG3 • 5:00 p.m.
Thermo-Optical Compensation in High-Index-Contrast Waveguides Using Polymer Claddings, *Winnie N. Ye[1], Jurgen Michel[1], Louay Eldada[2], Deepti Pant[2], Rong Sun[1], Po Dong[3], Michal Lipson[3], Lionel C. Kimerling[1]; [1]MIT, USA, [2]DuPont Photonics Technologies, USA, [3]Cornell Univ., USA.* We present the design and fabrication of temperature-insensitive high-index-contrast waveguides using acrylate polymer claddings. The large negative thermo-optic coefficient of the polymers effectively compensates the intrinsic positive thermo-optic effects induced from the waveguide core.

IWG4 • 5:15 p.m.
Dependence of Silicon-on-Insulator Waveguide Loss on Lower Oxide Cladding Thickness, *Adam Mock, John D. O'Brien; Univ. of Southern California, USA.* Silicon-on-insulator waveguide propagation and bending loss as a function of lower oxide cladding thickness is investigated using the finite-difference time-domain method. Certain non-rectangular waveguide cross-sections can reduce substrate loss.

IWG5 • 5:30 p.m.
Compact Slow-Wave Structures with Maximally-Flat Group Delays Based on Circular Arrays of Microring Resonators, *Vien Van[1], Tie-Nan Ding[2], Warren N. Herman[2], Ping-Tong Ho[2]; [1]Univ. of Alberta, Canada, [2]Univ. of Maryland, USA.* Cyclical propagation of light in circular arrays of microring resonators is exploited to realize efficient slow-wave structures with large group-delay enhancements. Devices with maximally-flat group-delay responses are designed for applications in dispersionless optical delay elements.

Salons A/B

IWH2 • 4:45 p.m.
A Wavelength Division Demultiplexer Based on T-Shaped Channel-Drop Filters Based on Heterostructure Photonic Crystals with Three Outputs, *Mehrdad Djavid, Afshin Ghaffari, Faraz Monifi, Mohammad Sadegh Abrishamian; K. N.Toosi Univ. of Technology, Iran.* In this paper, we demonstrate a new type of photonic crystal wavelength division demultiplexing based on ring resonator; FDTD method concludes output efficiency above 94%. The structure contains two different values of dielectric constant (Heterostructure).

IWH3 • 5:00 p.m.
Calculation and Correction of Coupling-Induced Resonance Frequency Shifts in Traveling-Wave Dielectric Resonators, *Qing Li, Siva Yegnanarayanan, Amir Atabaki, Ali Adibi; Georgia Tech, USA.* We study the CIFS effect in traveling-wave resonators. The physical source of CIFS is revealed and an efficient semi-analytical approximation method for 3-D structures is provided. Method to correct CIFS is also proposed.

IWH4 • 5:15 p.m.
Optical Bistability in Novel Retro-Reflector Based Semiconductor Micro-Ring Lasers, *Zhuoran Wang[1], Guohui Yuan[1], Siyuan Yu[2]; [1]Dept. of Electrical and Electronic Engineering, UK, [2]Dept of Electrical and Electronic Engineering, UK.* Optical bistability are achieved in novel semiconductor ring lasers based on retro-reflector cavities downsized to equivalent ring radius of 26 μm and 16μm at room temperature. L-I curves and optical spectra are observed.

IWH5 • 5:30 p.m.
Optical Transmission in Horizontal Slot Waveguides, *Rong Sun[1], Po Dong[2], Ning-ning Feng[1], Ching-yin Hong[1], Michal Lipson[2], Jurgen Michel[1], Lionel C. Kimerling[1]; [1]MIT, USA, [2]Cornell Univ., USA.* Horizontal single and multiple slot waveguides and ring resonators consisting of deposited amorphous silicon and silicon dioxide are demonstrated. Their waveguide propagation loss, optical confinement, and thermo-optic effects are studied.

Key to Authors and Presiders
(**Bold** denotes Presider or Presenting Author)

A
Abrishamian, Mohammad Sadegh—IWA7, IWH2, JMB40
Achiam, Yaakov—CWB6
Adamczyk, Olaf—CWB4
Adamson, Robert B. A.—**QWB2**
Adato, Ronen—JMB38
Adibi, Ali—IMD5, IWA6, IWH3
Agarwal, Anjali—**CWB7**
Agarwal, Anuradha M.—IWA2, IWE6
Agarwal, Girish S.—JMB48, QTuB5
Aggarwal, Vaneet—JMB46
Agrawal, Arti—IWB2, **IWB7**
Aguirre, José—QWC2
Ahn, J.—ITuD2
Aiello, Andrea—QMB5
Alencar, Márcio A.—IMF6
Alija, Alfonso R.—IWF2
Almendros, M.—QTuA3
Alonso, Rafael—CMC5
Alsing, Paul M.—**JMB69**
Altepeter, Joseph B.—**QMA4**
Amirloo, Jeyran—JMB54
Anderson, Sean P.—**IWF3**
Andhariya, Nidhi M.—JMB19
Andreani, Lucio C.—IWF2, SWC3
Andrekson, Peter—**CMB3**
Andrés, M. V.—JMB21
Antón, Miguel A.—JMB16, JMB31, JMB32, STuB6
Aolita, L.—JMB56
Apsel, Alyssa—IME5
Arbel, David—**IMB3**
Arcizet, Olivier—CMA1, **SWA6**
Arrieta-Yáñez, Francisco—**JMB31**
Arroyo Carrasco, Maximino L.—**JMB6**
Artoni, Maurizio—**JMB17**
Asghari, Mehdi—**IME1**, **ITuA**, ITuA4
Ash, W M.—CTuA4
Aspelmeyer, Markus—QWC5
Assefa, Solomon—**SWB2**
Atabaki, Amir—IWH3
Atkinson, John J.—CTuC4
Atwater, Harry—**IMB1**
Atzmon, Yuval—CWB5
Avron, Joseph E.—QTuA5

B
Baets, Roel—IMC1, IME3, SWC3
Bahder, Thomas B.—JMB57
Bahl, M.—ITuE1
Bakr, Mohamed H.—IWF8
Bandyopadhyay, Somshubhro—QTuA1
Banwell, Tom—CWB7
Bao, Xiaoyi—**STuC2**
Barbieri, Cesare—QWC5
Barros, Daniel J. F..—CWB1
Barton, Jonathon S.—IWC5
Barwicz, Tymon—ITuA6
Basilio, L. I.—IWF5
Bastin, Thierry—JMB42, JMB48, QTuB5
Beals, Mark—IMC2, **ITuD3**
Beausoleil, Raymond G.—**ITuD2,** IWA3
Beling, Andreas—**IWC3**
Bellini, Marco—**QWA2**
Belmonte, Aniceto—**CWA3**
Benmoussa, Adil—JMB62
Benson, Trevor M.—IMF5
Berger, Naum K.—**JMB81**
Bergmair, Michael—JMB44
Bergman, Keren—**ITuD1**
Bergou, János—JMB65, QTuA4
Berkovitch, Nikolai—**IMB2**, **IWD5**
Bernardis, Sarah—IMC2
Bernasconi, Pietro—**IWC**
Betancur, Rafael A.—**JMB3, JMB67**
Bhandare, Suhas—CWB4
Bhanushali, Amit—IWF1
Bianco, Giuseppe—QWC5
Bina, Matteo—**JMB71**
Binkert, N.—ITuD2
Birnbaum, Kevin M.—CTuC7
Bisker, Gili—QTuA5
Blaaberg, Søren—**IWE5**
Blair, Steve—STuB5
Blumenthal, Daniel J.—IWC4, IWC5, SMC6
Bolger, Padraig M.—IMB4
Bonato, Cristian—QMB1, QWC5
Bonora, Stefano—JMB64, QMB1
Bordonalli, Aldario C.—**JMB9**
Borges, C. V. S.—JMB56
Bortolozzo, Umberto—**STuA6**
Botero, Alonso—**JMB68**
Bowers, John E.—CTuC3, IWC4, IWC5
Boyd, Robert W.—JMB47, JMB49, QTuB3, STuA3, SWA3
Boyer, Vincent—QWA5
Bozhevolnyi, Sergey I.—IMB4
Brambilla, Enrico—QTuB2
Braun, A.—QTuB7
Brener, Igal—**ITuC1**
Bretenaker, Fabien—CMA5, **SMA4**
Briant, Tristan—QWD5
Brision, Stephane—IME3
Broadbent, Curtis J.—**QTuB3**, **SMA3**
Brodsky, Misha—CWC5
Brosi, Jan M.—**SWC3**
Brouckaert, Joost—IMC1
Brunel, Marc—CMA5
Buhl, Lawrence—ITuA1
Burger, Sven—**ITuE4**
Burmeister, Emily F.—**IWC4**, IWC5
Byeon, Clare C.—JMB72

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Cabrera-Granado, Eduardo—STuB6, **STuC3**
Cadena, G.—CWC5
Cai, W.—SMB1
Cakir, Ozgur—**JMB63**
Calderbank, Robert—JMB46
Calderón, Oscar G.—JMB16, JMB31, **JMB32**, STuB6, STuC3
Camacho, Ryan M.—SMA3, SWD4, SWD5
Campbell, Joe C.—IWC3
Capmany, Jose—**STuC**
Cappuzzo, Mark A.—ITuA1
Capraro, Ivan—JMB64
Carlie, Nathan—IWA2
Caro, Jaap—IMA5
Carreño, Fernando—JMB16, JMB31, JMB32, STuB6
Carvalho, André R. R.—**JMB53**
Casagrande, Federico—JMB71
Caspani, Lucia—QTuB2
Cassemiro, Katiúscia N.—JMB43
Castaneda, Roman E.—JMB3
Cerqueira, Jr., A.—IME4
Chaganava, Irakli—JMB2
Chamanzar, Maysamreza—**IWA6**
Chan, Kam Wai C.—**JMB49**
Chan, Vincent—**CWA1**
Chaneliere, Thierry—SMA4
Chang, Hung-chun—**IMF4**, **ITuD5**, **IWD6**
Chang, Yu-Chia—IWE3
Chang, Zi-Chang—ITuB5
Chang-Hasnain, Connie—STuA4
Cheben, P.—ITuC3
Chen, Evans—ITuA1
Chen, Hao—IWC3
Chen, J. H.—JMB29
Chen, Jun—QMA4, QWC4
Chen, Y. K.—**CTuC**
Chen, Yaohui—JMB12, **JMB14,** STuA5

Chen, Yi—JMB20, **JMB22**
Chen, Yong-Fan—**SMA6**
Chen, Yu—**CTuB3**
Chen, Zhangyuan—JMB8
Chen, Zhe—**CMA6**, CMC7
Chen, Zhongping—**CTuB**
Cheng, Jing—IMC2, **IMC4**
Chettiar, U.—SMB1
Chi, S.—JMB29
Chiang, Po-Jui—ITuD5
Chin, Sanghoon—**JMB10**, **SMC3**, STuC5
Cho, KiYoung—JMB20, JMB22
Cho, Pak S.—CWA4, **CWB6**
Chuang, Shun L.—**SWA**
Chuang, Yu-Lin—**JMB74**
Chudasama, Bhupendra N.—JMB19
Chyi, Jen-Inn—ITuB5
Clark, Alexander—QWB5
Clark, John W.—JMB44
Clark, Thomas—**CTuC1**
Claudon, Julien—ITuB2
Cohadon, Pierre-François—**QWD5**
Coldren, Larry A.—CTuC3, IMA2, IWC5
Coleman, James—**IWE1**
Coudreau, Thomas—QMA5
Crombez, Peter—IWC1
Cruz-Cabrera, A. A.—IWF5
Cucinotta, Annamaria—**IWB1**, IWB3

D
da Silva, Eid C.—IMF6
Da Silva, J. P.—ITuD4
Dadap, Jerry I.—IMC7
Dagli, Nadir—IWD3, IWE2, IWE3
Dahl, Katrin—JMB23
Dahlem, Marcus S.—ITuA6
Danz, Norbert—**IMF2**
Danzmann, Karsten—JMB23, JMB24
Dapkus, P. Daniel—ITuB3
Dar, Tuffail—ITuC5
D'Auria, Virginia—**QMA5**
David, Martin—SMA4
Davidson, Nir—SWD2, SWD3
Davis, A.—ITuD2
De La Rue, Richard—**IMD3**
De Martini, Francesco—QWC3
Deeg, Andreas—QMB4
Delage, A.—ITuC3
DelaRue, Richard—**IMF**, **ITuB**
Delgado, Aldo—QWC2
Del'Haye, Pascale—CMA1
DeMille, David—QMC1
Dennis, Michael—CTuC1
Densmore, A.—ITuC3
Dereux, Alain—IMB4
Deutsch, Miriam—**SMB2**
Di Falco, Andrea—**IMD2**
Dick, John—CTuC7
Diddams, Scott—CMA3, CMA4
Ding, Tie-Nan—IWG5
Dinu, Mihaela—ITuA1
Djavid, Mehrdad—**IWA7**, **IWH2**, JMB40
Djordjevic, Ivan B.—**CWC2**
Doerr, Chris—**IMA1**
Dokania, Rajeev—IME5
Dolfi, Daniel—CMA5, **CMB**
Dolgaleva, Ksenia—**JMB47**
Dong, Po—IWG3, IWH5, SWA4
Dou, Liang—JMB8
Doyle, John M.—QMC1
Dubin, F.—QTuA3
Dummer, Matthew M.—**IMA2**, IWC5
Dumon, Pieter—SWC3
Dutta, Niloy K.—CMA6, CMC7, ITuA1
Duxbury, Geoffrey—**JMB27**

E
Earnshaw, Mark—**IWE**
Eisaman, Matthew D.—**JMB51**, **QWC4**
Ekawa, Mitsuru—IMA6
Eldada, Louay—IWG3
Eliel, Eric R.—**QMB5**, **SMB4**
Elman, V.—QTuB7
Erkmen, Baris I.—QTuB6
Eschner, Juergen—**QTuA3**
Etemad, Shahab—CWB7
Etrich, Christoph—SWC5
Evers, Jörg—**QTuB4**, **SWB6**
Ezquerro, Jose Miguel—**JMB16**

F
Fabre, Claude—QMA5
Fan, Jingyun—JMB51, QWC4
Fan, Shanhui—QWA4, **SMB**, STuB3
Fattal, D.—ITuD2
Fauchet, Philippe M.—ITuC4, IWF3
Fazio, Rosario—**QMA2**, **QMB**
Fedeli, Jean-Marc—IME3
Fedotov, Vassili A.—SMB5
Feigenbaum, Eyal—**IWD4**, **IWF6**, **SWB4**
Feng, Dazeng—ITuA4
Feng, Ning-Ning—**ITuA4**, IWA2, IWH5
Ferguson, Dan R.—CTuA5
Fernández, H.—ITuB7
Ferrari, Carlo—IWG1, STuB4
Feuer, Mark D.—CWC5
Fiddy, Michael A.—**SMB6**, SWB5
Figueroa, Hugo H.—**IME4**
Filip, Radim—QWC3
Fiorentino, M.—ITuD2
Firstenberg, Ofer—**SWD2**, SWD3
Flämmich, Michael—IMF2
Fleischhauer, Michael—**SMA2**
Fong, Joan—ITuA4
Foster, Mark A.—CMC3, **CMC4**
Fragnito, H. L.—IME4
Franson, James D.—JMB59, **QMC2**, QWB4
Fredkin, Donald R.—SWD2
Freude, Wolfgang—SWC3
Fuchs, Erica—**IME2**
Fulconis, Jeremie—**QWB5**

G
Gaeta, Alexander L.—CMC3, CMC4, **SWD1**
Galisteo-López, Juan F.—IWF2
Gallagher, Dominic F.—**ITuE2**
Galli, Matteo—IWF2
Gallion, Philippe—CWC4, JMB77
Gan, Fuwan—IMC3, ITuA6
Gao, Yan—JMB8
Gaponik, Nikolai—ITuB4
Garces, Ignacio—CMC5
Garcia-Patron, Raul—**QWC6**
Gatti, Alessandra—**QTuB2**, **QWA**
Gauthier, Daniel J.—STuC3, **SWD**
Gautier, Pauline—IME3
Gavenda, Miroslav—QWC3
Gehr, R.—QTuA3
Gehring, George—STuA3
Geis, Michael W.—IMC3
Geraghty, David F.—**CMC3**, CMC4
Gérard, Jean-Michel—ITuB2
Gerry, Christopher C.—**JMB62**
Gershoni, David—QTuA5
Ghaffari, Afshin—IWA7, IWH2, **JMB40**
Gheorghiu, Vlad—**JMB66**
Ghosh, Joyee—SMA4
Ghosh, Rupamanjari—SMA4
Gilbert, Gerald—**JMB46**
Gilles, Herve—SMA4
Ginzburg, Pavel—IMA3, IWG2, JMB60, QMC7, QWB6
Giovannetti, Vittorio—QTuB6
Giziewicz, Wojciech—IMC4
Gmachl, Claire—**STuA2**
Goldfarb, Fabienne—SMA4
Goldfarb, Gilad—**CWB3**
Goldschmidt, Elizabeth A.—JMB51, QWC4
Gomes, Ricardo A. P.—JMB9
Gomez, Louis T.—ITuA1
González-Herráez, Miguel—**ITuB7, STuC1**
Gopinath, Anand—IWB4
Govindan, Vishnupriya—**STuB5**
Grattan, Kenneth T. V.—ITuC5, IWB2, IWB7
Green, William M. J.—IMC7, SWB2
Gregersen, Niels—**ITuB2**
Grein, Matt E.—IMC3

Griffiths, Robert B.—JMB66
Guha, Saikat—QTuB6
Guillot, F.—ITuB7
Gunupudi, Pavan—ITuE3
Guo, Hong—**JMB15**, **JMB30**
Guo, Junpeng—**JMB38**
Gushterov, Aleksander—SMA5

H
Haase, A.—QTuA3
Habibian, Hessam—**JMB44**
Hadley, Ronald—**IWB**
Häffner, Hartmut—**QWA1**
Halder, Matthaeus—QWB5
Ham, Byoung Seung—JMB20, JMB22, JMB25, **JMB28**
Hammer, Dan X.—CTuA5
Hamrick, Michael—JMB46
Hansen, Per L.—**JMB11**
Hanson, Frank—**CTuA**
Harris, Stephen E.—**JTuA1**
Harston, Geof—CWB6
Hau, Lene V.—**SMA**
Hay, Kenneth G.—JMB27
Hayashi, Manabu—JMB34
Hayat, Alex—IMA3, IWG2, **JMB60**, **QMC7**, QWB6
He, Bing—**JMB65**, **QTuA4**
Heebner, John E.—IWE4
Heiblum, Moty—QTuC2
Heidmann, Antoine—QWD5
Heller, E.—ITuE1
Hemmati, Hamid—**CWA**
Hendrickson, Scott M.—JMB59, **QWB4**
Henkel, Florian—QMB4
Henker, Ronny—STuC4
Hennrich, M.—QTuA3
Herman, Warren N.—IWG5
Hernández-Figueroa, Hugo E.—ITuD4, **ITuE,** IWB6
Hess, Ortwin—SMB3
Hickmann, Jandir M.—**IMF6**, **SWC6**
Hill, Martin—IWC1
Hillery, Mark—**QTuC5**, **QWC**
Hingerl, Kurt—JMB44
Ho, Keang-Po—**CWC**
Ho, Ping-Tong—IWG5
Ho, Yu Yeung (Kenny)—**CMB4**
Hocke, Fredrik—QMB4
Hoffmann, Sebastian—**CWB4**
Hollberg, Leo—CMA3, CMA4
Holman, Kevin W.—**CMB1**
Holmgaard, Tobias—IMB4
Holzwarth, Charles W.—ITuA6
Holzwarth, Ronald—CMA1
Hong, Ching-Yin—IMC4, IWH5
Hope, Joseph J.—JMB53
Horne, Christopher K.—**JMB26**
Houmark, Jakob—**JMB13**
Howell, John C.—QTuB3, SMA3, SWD4, SWD5
Hradil, Zdenek—**QTuC**, **QWB1**
Hsieh, I-Wei—IMC7
Hsu, Kung-Shu—ITuB5
Hsu, Sen-ming—IMF4
Hu, C. Y.—**QWB7**
Hu, Juejun—**IWA2**, IWE6
Hu, Zhen—**IMF1**
Huang, Wei-ping—JMB41
Huffaker, Diana—**IMC**
Huguenin, Jose Augusto O.—JMB45, **JMB56**
Huignard, Jean-Pierre—CMA5, STuA6
Hwang, Eui Hyun—ITuB3

I
Iftimia, Nick—CTuA5
Ikuma, Yuichiro—**ITuA3**
Ilichev, Igor—CMC2
Iliew, Rumen—**SWC5**
Imre, Alexandra—IWF4
Ingel, Robert P.—SMB6
Ip, Ezra—CWB1
Ippen, Erich P.—IMC3, ITuA6
Irudayaraj, Joseph—ITuC5
Isídio-Lima, J. J.—ITuD4

J
Jackel, Janet—CWB7
Jacobs, B. C.—QMC2
Jakob, Christian—QMB4
Jakubczyk, Jan—ITuE3
Janz, S.—ITuC3
Jaques, Jim—ITuA1
Jauho, Antti-Pekka—JMB13
Jedrkiewicz, Ottavia—QTuB2
Jennewein, Thomas—QWC5
Jeong, Mun Seok—JMB72
Jeong, Seok-Hwan—**IMA6**
Jex, Igor—JMB55, **QTuC4**
Jiang, W. J.—JMB29
Johanning, M.—QTuB7
Johansson, Leif A.—**CTuC2**, CTuC3
Johnson, Gregory—ITuA1
Johnson, W. A.—IWF5
Jordan, Andrew N.—**QMC6**
Jørgensen, Troels S.—IWE7
Jouppi, N. P.—ITuD2
Julien, F. H.—ITuB7
Julsgaard, Brian—QWB3
Junker, Markus—STuC4
Juodawlkis, Paul W.—**CMA2**

K
Kaertner, Franz X.—IMC3
Kahn, Joseph M.—CWA3, **CWB1**
Kakihara, Kuniaki—IMC6, IWA4
Kaminski, Noam—**IMA3**, SWB4
Kamli, Ali A.—**QMC4**
Kang, Hoonsoo—**JMB72**
Kang, Inuk—ITuA1
Kanou, Tomochika—**SMC4**
Kanter, Gregory S.—CMB5
Kao, W. C.—JMB29
Kärtner, Franz X.—ITuA6
Kaushik, Sumanth—CMB1, CTuA2
Kavaya, Michael J.—**CTuA3**
Keitel, Christoph H.—SWB6
Kejalakshmy, N—IWB7
Keller, Gaelle—QMA5
Kemme, S. A.—IWF5
Khorshidahmad, Amin—**IWA5**
Khoury, Antonio Z.—**JMB45,** JMB56
Khurgin, Jacob B.—CWA4, **SWA1**
Kiesel, Nikolai—QMB2, QMC3
Kiffner, Martin—QTuB4
Kikuchi, Kazuro—**CWB**
Kikuchi, Nobuhiro—**IMA4**
Kildishev, A. V.—SMB1
Kilian, Patrick—JMB69
Kim, Byungchae—IWD3
Kim, Hyochul—IWE2
Kim, Jaeyoun—**IWD2**
Kim, Jong Su—JMB72
Kim, M. K.—**CTuA4**
Kim, Sang-Hoon—JMB36
Kim, YongKab—JMB26
Kimerling, Lionel C.—IMC2, IMC4, IMC5, IWA2, IWE6, IWG3, IWH5
Kimmel, Shelby—QTuA1
Kintaka, Kenji—**ITuA2**
Kippenberg, Tobias J.—**CMA1**, SWA6
Kirk, Andrew G.—IWA5
Kir'yanov, Alexander V.—JMB21
Kiss, Tamas—JMB55, QTuC4
Klamkin, Jonathan—CTuC3, IMA2
Klein, Jackson—**ITuE3**
Knigavko, Anton N.—JMB18, JMB21, JMB33
Knight, Peter—**SMA1**
Ko, Do-Kyeong—JMB72
Ko, Wai S.—STuA4
Koch, Brian R.—IWC5
Koch, Thomas L.—IMC5
Kocher, David G.—CMB1
Komatsu, Masaaki—**IMC6**
Koos, Christian—SWC3
Koshiba, Masanori—IMC6, IWA4, IWB3
Kozlov, Alexander—CMC2
Krasavin, Alexey V.—**IMB4**
Krauss, Thomas F.—IMD2, SWC4
Krischek, Roland—QMC3
Kristensen, Philip T.—IWE7
Kröll, Stefan—QWB3
Krug, Michael—QMB4

Kudryavtseva, Anna D.—**JMB37**
Kuhn, Aurélien—QWD5
Kumar, Pradeep—JMB75
Kumar, Prem—CMB5, QMA4
Kung, Cheng-Chih—ITuA4
Kunihiro, Takashi—SMC4
Kuramochi, Eiichi—IMD1, SWC1
Kurizki, Gershon—**QTuC1**
Kuzmin, Nikolay V.—SMB4

L
La Rocca, Giuseppe C.—JMB17
Lai, Yinchieh—JMB73
Lamata, Lucas—JMB48
Landau, Mayer A.—**JMB61**
Langford, Nigel—JMB27
Lapointe, J.—ITuC3
Lasobras, Javier—CMC5
Lastra, Freddy A. Peres—JMB58
Lau, Alan P. T.—CWB1
Laurat, Julien—QMA5
Lauterbach, Kai-Uwe—STuC4
Lavrinenko, Andrei—SWB3
Le Floch, Albert—CMA5
Le Gouet, Jean-Louis—SMA4
Lederer, Falk—SWC5
Lee, Chia Hsien—CTuC5, CTuC6, JMB4, JMB5
Lee, Hong-Shik—JMB36
Lee, Jongmin—JMB72
Lee, Ki-Dong—JMB36
Lee, Mindy R.—**ITuC4**
Lee, Myungjun—**SWA5**
Lee, Po-Tsung—IMD4, ITuB5
Lee, Ray-Kuang—**JMB73**, JMB74
Lee, Sang-Shin—**JMB36**
Lennon, Donna M.—IMC3
Lesnyak, Vladimir—ITuB4
Lett, Paul D.—QWA5
Leuchs, Gerd—**QWD1**
Leung, Debbie—**QWC1**
Leuthold, Juerg—**CMC**, SWC3
Li, Guifang—CWB3
Li, Juntao—SWC4
Li, Luming—JMB15
Li, Qiang—SMC5
Li, Qing—**IWH3**
Li, Xiao—JMB30
Li, Xun—IWF8
Liang, Hong—ITuA4
Lim, Desmond R.—IWE6
Lima, G.—QWC2
Lin, Bang-Yan—IWD6
Lin, C. T.—JMB29
Lin, Pao T.—**IWF4**
Lin, Wen-I—CTuC5, CTuC6, JMB4, JMB5
Lindner, Netanel H.—QTuA5
Lipson, Michal—CMC4, IME4, IME5, IWG3, IWH5, **STuB**, SWA4
Lipson, Stephen G.—IMB2
Liu, Fangfei—SMC5
Liu, Hsi-Chun—STuB1
Liu, Jifeng—**IMC2**, IMC4, IMC5
Liu, Liu—IMC1
Liu, Tao—ITuC2, IWF1, IWF7
Liu, Xiang—**CWB2**
Liu, Xiaoping—**IMC7**
Liu, Yu—IWD2, JMB30
Liu, Yu-Chen—ITuB5
Lively, Erica D.—**SMC6**
Lloyd, Seth—QTuB6
Lopez, Carlos E.—JMB58
Lopez, Francisco—CMC5
Lopinski, G.—ITuC3
Lu, Hai-Han—**CTuC5**, **CTuC6**, **JMB4**, **JMB5**
Lu, Ling—**ITuB3**
Lu, Tsan-Wen—**IMD4**
Lu, Ya Yan—IMF1, IMF3
Luceri, V—QWC5
Lugiato, Luigi A.—QTuB2
Lukin, Mikhail D.—QMC1
Lulli, Alfredo—JMB71
Luo, Bin—JMB30
Lvovsky, Alexander—**QWD2**
Lyan, Philippe—IME3
Lysak, Volodymyr V.—JMB35
Lyszczarz, Theodore M.—IMC3

M
Ma, Changbao—**IWH1**
Ma, Shaozhen—CMA6, **CMC7**
Maccone, Lorenzo—QTuB6
Mack, John P.—IMA2, IWC4
Mahalu, Diana—QTuC2
Majedi, A. Hamed—JMB54
Malik, Mehul—JMB49
Malinovsky, Vladimir S.—**JMB70**
Manipatruni, Sasikanth—**IME5**, **SWA4**
Marcinkevicius, Saulius—**SMA5**
Marconi, J. D.—IME4
Marian, Paulina—**JMB76**
Marian, Tudor A.—JMB76
Marino, Alberto M.—**QWA5**
Markey, Laurent—IMB4
Martin, Olivier J. F.—**IMB5**
Martinelli, Marcelo—JMB43
Martinelli, Mario—IWG1
Martínez, Héctor—ITuB4, ITuB6
Martinez, Jose A.—IWF1
Martínez, Luis Javier—ITuB6, IWF2
Maruta, Akihiro—SMC4
Mašanović, Milan L.—IWC4, **IWC5**
Maser, Andreas—JMB42
Mataloni, Paolo—**QWA3**
Matsumoto, Masayuki—**CWC6**
McCormick, Colin F.—SWC6
McLaren, M.—ITuD2
McManamon, Paul—**CTuA1**
Mehta, R. V.—JMB19
Meiman, Yehuda—CWA4, CWB6
Meirom, Eli A.—**QTuA5**
Mekis, Attila—**ITuC**
Melle, Sonia—JMB16, JMB31, JMB32, **STuB6**, STuC3
Melloni, Andrea—**IWF**, IWG1, **STuB2**, STuB4
Mel'nikov, Igor V.—**JMB18**, **JMB21**, **JMB33**
Méndez Otero, Marcela M.—JMB6
Mendieta, Francisco J.—CWC4, JMB77
Meneghetti, Mário R.—IMF6
Menendez, Ronald—CWB7
Michaelis, Dirk—IMF2
Michel, Jurgen—IMC2, IMC4, IMC5, **ITuD**, IWG3, IWH5
Migdall, Alan—JMB51, QWC4
Miller, Benjamin L.—ITuC4
Miller, David A. B.—**SWA2**
Milman, Perola—JMB45
Mischki, T.—ITuC3
Mitchell, M.—QTuA3
Mock, Adam—**IWG4**
Mogilevtsev, Dmitri—QWB1
Moiseev, Sergey A.—QMC4
Molinelli, Chiara—QWD5
Momeni, Babak—IWA6
Monifi, Faraz—IWA7, IWH2, JMB40
Monken, Carlos H.—**QMA1**
Monroy, E.—ITuB7
Morehead, James J.—SWC6
Morichetti, Francesco—**IWG1**, **STuB4**
Morito, Ken—IMA6
Mørk, Jesper—ITuB2, IWE5, IWE7, JMB11, JMB12, JMB13, JMB14, STuA5, SWB3
Morvan, Loic—**CMA5**
Mu, Jian-wei—**JMB41**
Mujat, Mircea—**CTuA5**
Munro, W. J.—QWB7
Murata, Shunsuke—ITuA2

N
Nagali, Eleonora—QWC3
Nakano, Hisamatsu—IMB6, IWB5
Namassivayane, Kejalakshmy—IWB2
Naranjo, F. B.—ITuB7
Nazarathy, Moshe—**CWA4**, **CWB5**
Neifeld, Mark A.—SWA5
Neiman, David—QMC7, QWB6
Nelson, Lynn E.—CWC5
Nemoto, Kae—**QWD3**
Neuhauser, W.—QTuB7
Nevou, L.—ITuB7
Newbury, Nathan R.—CMA4, **CTuB4**
Nguyen, Hoang—**IMA5**

Nielsen, Torben R.—ITuB2, JMB13, **SWB3**
Nikkuni, Hiroyuki—JMB34
Nishii, Junji—ITuA2
Nito, Yuta—**IWB5**
Noé, Reinhold—CWA4, CWB4
Nomura, Akifumi—**IMB6**
Nordin, Greg—**IWA**
Notomi, Masaya—IMD1, **SWC1**
Nussenzveig, Paulo A.—**JMB43**

O
O'Brien, Jeremy L.—QWB5, QWB7
O'Brien, John D.—ITuB3, IWG4
Obolashvili, Nino—JMB1
Occhipinti, Tommaso—JMB64
Ocola, Leonidas E.—IWF4
Odom, Teri—**IMD6**
Oemrawsigh, Suman S. R.—QMB5
O'Faolain, Liam—IMD2, SWC4
Oh, Jungmi—**CWC5**
Ohkawa, Masashi—**JMB34**
Öhman, Filip—IWE5, JMB12, JMB14, STuA5
Okulov, Alexey Y.—**JMB78**
Orenstein, Meir—IMA3, IMB2, IMB3, IWD4, IWD5, IWF6, IWG2, JMB60, QMC7, QWB6, SWB4
Orth, Peter P.—SWB6
Osgood, Jr., Richard M.—IMC7, **IMD**
O'Sullivan, Malcolm N.—JMB49
Otey, Clayton R.—**STuB3**

P
Pachos, J.—QMB2
Pádua, Sebastiao—QWC2
Painter, Oskar—QMC5
Pan, Huapu—IWC3
Panepucci, Roberto R.—**ITuC2**, **IWF1**, **IWF7**
Pant, Deepti—IWG3
Papasimakis, Nikitas—**SMB5**
Pappert, Stephen—**CMA**
Pascazio, Saverio—**QTuA**
Passaro, Davide—IWB1, IWB3
Patel, Rajesh J.—**JMB19**
Patel, Sanjay S.—ITuA1
Patra, Ardhendu Sekhar—CTuC5, CTuC6, JMB4, JMB5
Pearson, Matt—**ITuA5**
Peng, P. C.—**JMB29**
Pernechele, Claudio—QWC5
Pertsch, Thomas—SWC5
Pesala, Bala—**STuA4**
Peters, David W.—**IWF5**
Petit, Laeticia—IWA2
Petroff, Pierre M.—IWE2
Petrov, Mikhail—CMC2
Petrov, Sergey I.—JMB35
Petrova, Svetlana—JMB1
Peumans, Peter—**IWD1**
Peveling, Ralf—CWB4
Pfau, Timo—CWB4
Piccirilli, Alfonso—ITuA1
Pillet, Gregoire—CMA5
Piro, N.—QTuA3
Pittman, Todd B.—**JMB59**, QWB4
Poel, Mike V. D.—JMB11
Pohlner, R.—QMB2
Poli, Federica—IWB1, IWB3
Polyakov, Sergey V.—QWC4
Pomerene, Andrew T.—IMC2
Pomplun, Jan—ITuE4, IWD7
Pooser, Raphael C.—QWA5
Popovic, Milos A.—IMC3, **ITuA6**, ITuC6
Porrmann, Mario—CWB4
Pors, Bart-Jan—QMB5
Postigo, Pablo A.—**ITuB4**, **ITuB6**, **IWF2**
Poulsen, Henrik N.—IWC4
Povinelli, M. L.—STuB3
Prabhakar, Anil—**JMB75**
Prieto, Iván—ITuB4, ITuB6
Prosvirnin, Sergey L.—SMB5
Pugatch, Rami—SWD2, SWD3
Purtseladze, Anna—JMB2

Q
Qian, Li—CMB4, CMC6
Qian, Wei—ITuA4
Qiu, Min—SMC5
Quetschke, Volker—**CMC1**
Quraishi, Qudsia—**CMA3**

R
Rabl, Peter—**QMC1**
Raburn, Maura—**IMA**
Rahman, B. M. Azizur—ITuC5, **IWB2,** IWB7, **IWH**
Rajarajan, Muttukrishnan—**ITuC5**
Rakich, Peter T.—ITuA6, **ITuC6**
Rall, David—CTuC4
Ramaswamy, Anand—CTuC2, **CTuC3**
Rarity, John G.—QWB5, QWB7
Rasmussen, Andreas N.—**IWE7**
Rasras, Mahmoud S.—**ITuA1**
Razavi, Mohsen—**JMB54**
Rehacek, Jaroslav—QWB1
Reithmaier, Johann P.—SMA5
Residori, Stefania—STuA6
Retamal, Juan C.—JMB58
Richardson, Kathleen—IWA2
Rinkleff, Rolf-Hermann—**JMB23**, **JMB24**
Rippe, Lars—QWB3
Roa, Luis—QWC2
Roberts, Kim—**CWC1**
Robinson, J. T.—IME4
Rocco, Alessandra—JMB24
Rodríguez Méndez, Diana—JMB6
Rodríguez-Esquerre, V. F.—**ITuD4**, **IWB6**
Rodwell, Mark J.—CTuC2, CTuC3
Roelkens, Gunther—**IMC1**, **IME3**
Rogge, Sven—IMA5
Rohde, F.—QTuA3
Rohrlich, Daniel—**QTuC2**
Romero, Guillermo E. S.—JMB58
Ron, Amiram—SWD2, SWD3
Rosa, Lorenzo—**IWA4**, **IWB3**
Rosenblum, Serge—QMC7, **QWB6**
Rosenfeld, Wenjamin—**QMB4**
Rossi, Alfredo—**SWC2**
Rubin, Mark A.—**CTuA2**
Rubio-Mercedes, C. E.—ITuD4, IWB6
Rudolph, Terry G.—**QMB3**
Ruggiero, Jerome—SMA4

S
Saavedra, Carlos—**QWC2**
Sabban, Manuel—CWC4, **JMB77**
Saitoh, Kunimasa—IMC6, IWA4, IWB3
Saleh, Bahaa—**QMA**
Salem, Reza—CMC3, CMC4
Salemink, Huub—IMA5
Sales, Salvador—JMB12, STuA5
Salik, Ertan—CTuC7
Samora, S.—IWF5
Sanders, Barry C.—QMC4
Santagiustina, Marco—STuC6
Santori, C. M.—ITuD2
Santos, Marcelo F.—**JMB79**
Sarantos, Chris H.—**IWE4**
Sargent, Edward—**IWD**
Sasaki, Masahide—**QMA3**
Sato, Takashi—JMB34
Scardicchio, Antonello—**QTuA2**
Scarmozzino, Robert—**ITuE1**
Schenato, Luca—**STuC6**
Schenk, John O.—SMB6, SWB5
Schleich, Wolfgang—**QTuB**, **QTuC3**
Schliesser, Albert—CMA1, SWA6
Schmid, Christian—QMB2, QMC3
Schmid, J. H.—ITuC3
Schmidt, Bradley—IME5
Schmidt, Frank—ITuE4, **IWD7**
Schneider, Thomas—**STuC4**
Schoelkopf, Robert J.—QMC1
Schreiber, R. S.—ITuD2
Schuck, C.—QTuA3
Schulein, Robert T.—IMC3
Schweinsberg, Aaron—STuA3
Sciarrino, Fabio—**QWC3**
Seassal, Christian—**ITuB1**, ITuB6, IWF2

Sedgwick, Forrest G.—**STuA1**, STuA4
Selleri, Stefano—IWB1, IWB3
Sergienko, Alexander V.—JMB57, **QMB1, QMC**
Severiano Carrillo, Israel—JMB6
Sewell, Phillip—**IMF5**
Shah Hosseini, Ehsan—**IMD5**
Shakya, Jagat—IME5
Shalaev, Vladimir M.—**SMB1**
Shamray, Alexander—**CMC2**
Shapiro, Jeffrey H.—QTuB6, QWC6
Shaverdova, Valentina—**JMB1**
Sheldon, Colin—CTuC2
Shen, Jung-Tsung—**QWA4**
Sherwood-Droz, N.—IME4
Shi, Zhimin—STuA3, **SWA3**
Shibayama, Jun—IMB6
Shieh, William—**CWA2**
Shih, Min-Hsiung—ITuB5
Shih, P. T.—JMB29
Shih, Yanhua—**QTuB1**, **QWB**
Shin, Heedeuk—JMB47, QTuB3, **STuA3**
Shin, Jaehyuk—IWD3, **IWE2**, **IWE3**
Shin, Sang-Yung—IME6
Shinya, Akihiko—IMD1
Shpantzer, Isaac—CWA4, CWB6, **CWC3**
Shroff, Ashutosh R.—IWF3
Shuker, Moshe—SWD2, **SWD3**
Shulika, Oleksiy V.—**JMB35**
Shyu, Ming-Huei—CTuC5, CTuC6, JMB4, JMB5
Silva, Reginaldo—JMB9
Simon, David S.—**JMB57**
Sipe, John E.—JMB47
Smit, M. K.—**IWC1**
Smith, Henry I.—ITuA6
Smy, Tom—ITuE3
Solano, Enrique—JMB42, JMB48
Solís, J.—ITuB7
Soljacic, Marin—**SWB1**, **SWC**
Solli, Daniel R.—SWC6
Someda, Carlo G.—STuC6
Son, Changwan—**IWD3**
Song, Muping—IWA3
Sorel, Marc—IMD3
Souza, Carlos Eduardo R.—JMB45, JMB56
Souza, Rogério—IMF6
Spani Molella, Luca—JMB23, JMB24
Spector, Steven J.—**IMC3, IME**
Spillane, S. M.—ITuD2
Srinivasan, Kartik—**QMC5**
Stamenić, Biljana—IWC4
Stav, Yinon—IWD5
Stefanak, Martin—**JMB55**, QTuC4
Steinberg, Aephraim M.—QWB2
Stephenson, G. J.—JMB69
Strekalov, Dmitry V.—CTuC7
Stroud Jr., Carlos R.—JMB61
Su, Yikai—**SMC5**
Sukhoivanov, Igor A.—JMB35
Suleski, Thomas J.—**IMB**
Summers, Joseph A.—IWC5
Sun, Hongzhi—CMA6, CMC7
Sun, Nai-Hsiang—ITuD5
Sun, Rong—IMC2, IWG3, **IWH5**
Sun, Xiaochen—**IMC5**, IWE6
Swillam, Mohamed A.—**IWF8**

T
't Hooft, Gert W.—QMB5, SMB4
Takagahara, Toshihide—JMB63
Takahashi, Ryo—IMB6
Tamburini, Fabrizio—QWC5
Tan, Si-Hui—**QTuB6**
Tanabe, Takasumi—**IMD1,** SWC1
Tanaka, Shinsuke—IMA6
Tang, Wenzhuo—JMB15
Taniyama, H.—SWC1
Tarasashvili, Vladimir—**JMB2**
Tauke-Pedretti, Anna—IWC5
Taylor, Michael G.—CWB3
Tchebotareva, Anna L.—SMB4
Tcherniega, Nikolay V.—JMB37
Tchernycheva, M.—ITuB7
Teng, Chun-Hao—IWD6
Themistos, Christos—ITuC5
Thévenaz, Luc—JMB10, SMC3, **STuC5, SWB**
Thiel, Christoph—**JMB42**, **JMB48**, QTuB5
Tian, F—IWB7
Timoney, N.—QTuB7
Toliver, Paul—CWB7
Tomabechi, Shuichi—IMA6
Torres-Ruiz, Fabian—QWC2
Treps, Nicolas—QMA5
Tsai, Yi-Yu—IMD4
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Yang, Jeng-Yuan—IWA3
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Yang, Yi-Chun—**ITuB5**
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Yuan, Lijun—**IMF3**
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Yvind, Kresten—JMB11

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Zoller, Peter—QMC1
Zschiedrich, Lin—ITuE4
Zubairy, M. Suhail—QTuB4

2008 OSA Summer Optics & Photonics Congress Update Sheet and Addendum

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CMA2 — *Paul W. Juodawlkis[1], Jason L. Plant[1], Fred J. O'Donnell[1], Leo J. Missaggia[1], Robin K. Huang[1], Joseph P. Donnelly[1], John B. Schlager[2], William Swann[2], Nathan R. Newbury[2], Sangyoun Gee[3], Sarper Ozharar[3], Franklyn Quinlan[3], Peter J. Delfyett[3]; [1]MIT Lincoln Lab, USA, [2]Natl. Inst. of Standards and Technology, USA, [3]CREOL, Univ. of Central Florida, USA.*

SWC2 — *Alfredo Rossi[1], S. Combrié[1], Q. V. Tran[1], C. Husko[1], G. Vadalà[1], P. Hamel[2], R. Gabet[2], Y. Jaouën[2], A. Parini[3], Y. Gottesman[3], F. Raineri[4]; [1]Thales Res. and Technology, France, [2]GET/Telecom Paris, France, [3]Inst. Natl. des Télécommunications, France, [4]Lab de Photonique et de Nanostructures, France.*

JMB1 — This poster will be presented by *Irakli Chaganava; Georgian Technical Univ., Georgia.*

Updated Titles
CWB1 — **Compensation of Chromatic Dispersion and Nonlinearity Using Simplified Digital Backpropagation**
CWC1 — **Real-Time 46 Gb/s Coherent System**
IMC7 — **Dispersion Engineering in Silicon Photonic Wires Using Thin Si_3N_4 Conformal Dielectric Coating**
QMA2 — **Decoherence and Entanglement for Quantum Critical Baths**
QWD2 — **Electromagnetically-Induced Transparency and Squeezed Light**
QWD3 — **Qubus Computation and Its Applications to Hybrid Quantum Repeaters**
STuA1 — **Novel Chirp and Compensate Scheme to Enhance Fast Light in a Semiconductor Optical Amplifier**
STuA2 — **Negative Refraction in a Semiconductor Metamaterial in the Mid-Infrared**
JMB35 — **Chirped Multilayer Mirror Based on Silicon Nitride (Si_3N_4) with Air-Gap Interlayers**
JMB67 — **Simulation of the Quantum Decoherence Effect for $^{79}Br^{85}Rb$**

Updated Papers
CTuA6 • 12:30 p.m.–1:00 p.m. (Invited)
Quantitative Phase Imaging of Cells and Tissues, *Gabriel Popescu; MIT, USA.* We developed novel imaging techniques for quantifying optical phase shifts produced by cells and tissues with unprecedented accuracy. This approach provides information about structure and dynamics at the nanometer and millisecond scales, with broad range of biomedical applications, including cell membrane dynamics, cell growth, and tissue diagnosis.

CWA5 • 9:45 a.m.
Optical Interconnects for Petaflops Supercomputers, *Hirsch Mandelberg; Lab for Physical Sciences, Univ. of Maryland, USA.* We discuss the requirements for an optical interconnect system capable of providing the multi-petabit/sec bandwidth, operating in a cryogenic-to-room-temperature environment, necessary for a petaflops supercomputer based on Josephson junction processors and memory.

A full summary of paper CWA is attached.

Updated Presiders
CTuB — *Yu Chen; Univ. of Maryland, USA.*

New Presiders to be announced on-site: CMB, CMC, CWB, CWC, IMB, ITuC, IWA, IWD, QMB, SMB, STuA, STuC

Withdrawals
QMA2, SMA5, JMB53, JMB75

Optical Interconnects for Petaflops Supercomputers

Hirsch I. Mandelberg
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Abstract: A new program has been initiated for the development of the technologies necessary to construct a petaflops supercomputer based on Josephson junction processors and memory. The requirements for an optical interconnect system capable of providing the necessary multi-petabit/sec bandwidth, operating in a cryogenic-to-room-temperature environment, will be discussed, along with some of the options being considered.

1. Superconducting Technology Assessment

The challenges to extending the delivered computing capabilities of semiconductor technology through Moore's Law, while manageable in the short term, may prove difficult or possibly impractical in the long term. Even now, the complex interplay of power and performance is resulting in significant changes in previous trends. Clock rates of commodity microprocessors are flattening even as multi-core chips are emerging as the norm for next generation systems. While conventional wisdom has dictated an assumption of continued adherence to the pure CMOS tradition of the last decade and more, the supercomputing community must consider the possibility of alternative technologies, at least in combination with more conventional devices. New architecture structures and programming models may also need to be considered to exploit the potential of such advances.

A panel of superconducting experts was challenged by the National Security Agency to do an independent assessment of the future of Rapid Single Flux Quantum (RSFQ) superconductor circuits to address the 2010-2015 petaflops system challenges of the high end user community. RSFQ logic exhibits operational properties in terms of performance and power that now positions it as a potential future leader among alternative digital technologies to augment semiconductor components in hybrid systems. But it is also challenged by lack of maturity and commercial market as well as its reliance on extreme operational temperature regimes. RSFQ technology may deliver clock rates in excess of an order of magnitude greater than that of the corresponding semiconductor logic and with dramatically reduced power requirements. Nonetheless, in spite of decades of research and experience with small fabrication lines, it has not managed to challenge the prevailing semiconductor technologies. However, the increasing difficulties to sustaining current level of growth in density and performance of CMOS within practical power constraints may change this. Critical issues of technology and architecture and how RSFQ may contribute effectively to future supercomputing next decade were considered. Six major areas were addressed: 1) superconductor technology, 2) micro-architecture using RSFQ, 3) hybrid memory systems, 4) system architecture incorporating superconductor components, 5) interconnects and system input/output and 6) system integration. The results of this study were reported at Supercomputing 2005 [1], and are available online [2].

2. Optical Input/Output Requirements

In petaflops-scale computer systems, the processor to memory and processor to processor data rates are enormous; the estimated bidirectional bandwidth requirement is 32 Petabits/s. The use of RSFQ digital circuits with clock frequencies exceeding 50 GHz imposes challenges resulting from the increasing differential between memory cycle time and processor clock. Reduced time-of-flight (TOF) latency motivates the use of cryogenic memory close to the processor. Providing the required bandwidth between room-temperature electronics and the cryogenic RSFQ processor elements requires careful engineering of the balance between the thermal load on the cryogenics and the number, type, bandwidth, and active elements of the lines providing input/output (I/O). The major interconnection, data communication, and I/O needs of a petaflops-scale system based on cryogenic RSFQ technology are: 1) high throughput data input to the cryogenic processors and/or memory at 4 K, 2) high throughput output from the 4 K operating regime to room-temperature system elements such as secondary and archival storage, and 3) communication between processor elements within the 4 K processing system at data rates commensurate with the processor clock rate.

While RSFQ processors allow construction of a compact (~1 m^3) processing unit, a superconductor petaflops-scale computer is a very large machine, on the scale of tens of meters, with high data bandwidth requirements. For example, a particular architecture may require more than half a million data streams at 50 Gbps each between the superconductor processors and room-temperature memory. One potential solution is to use optical interconnect technologies.

The main issue to be dealt with is the electrical power requirement for communicating from the 4K environment to room temperature considering the currently achievable refrigeration efficiency of 0.1%. For example, using a figure of 3mW/GHz achieved using VCSELS [3] would require 30 kW in the cryogenic environment, or 30 MW of power if the VCSELs were at 4K. This does not include power for interface amplifiers to go from RSFQ circuit output voltages of 5 mV to that needed to drive the VCSELs. This compares to 4 MW for the entire RSFQ processor. This power level arises from 4096 separate processors each dissipating about 1 watt at 4K. One envisioned solution to this is to generate the photons at room temperature, and modulate them at an intermediate temperature (30K-40K) with a refrigeration efficiency of 2%, which is electrically connected to the 4K processor. This is shown in Figure 1.

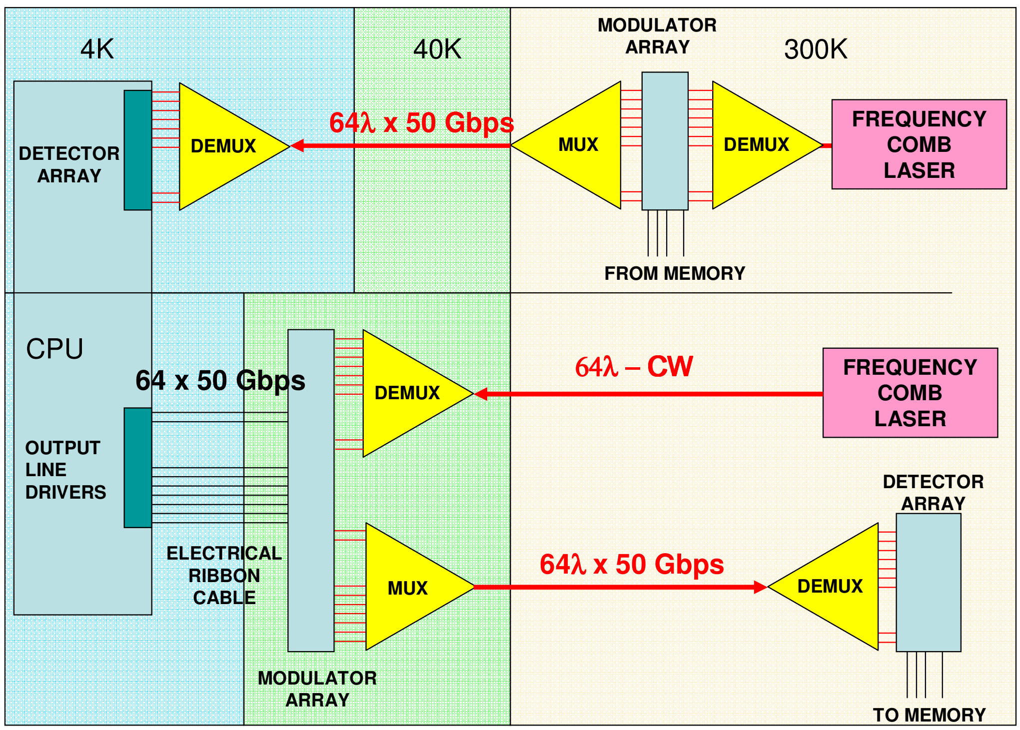

Figure 1: A 3 fiber, 64 wavelength, 50 Gbps DWDM System for bidirectional transmission totaling 6.4 Tbps between each of 4096 superconductor processors at 4K and mass memory at 300K**.**

Low power can be achieved in a number of ways. One is to reduce the voltage levels required to drive the low temperature operation modulators. Another is to use high order modulation techniques to reduce the operating frequency of each modulator, and thereby the drive voltage required. While this increases the number of modulators, it improves the spectral efficiency, and reduces the overall power. This also opens other options, which will be discussed. It should be noted that with the short distances involved, transmission impairments are not an issue and coherent optical receivers are greatly simplified.

3. References

[1] T. Sterling, M. Dorojevets, B. Smith, T. Van Duzer, A. Silver "Superconducting Technology Assessment Panel Session", Super Computers 2005, Seattle, WA, November 12-18, 2005
[2] www.nitrd.gov/pubs/nsa/sta.pdf
[3] C. Kromer, G. Sialm, C. Berger, T. Morf, M.L. Schmatz, F. Ellinger, D. Erni, G-L Bona, H. Jackel, "A 100 mW 4/spl times/10Gb/s transceiver in 80-nm CMOS for high density optical interconnects", IEEE Journal of Solid State Circuits, **23**, 2667-2679 (2005).