Access Networks and In-house Communications (ANIC)

12 June - 14 June 2011, The Westin Harbour Castle, Toronto, Canada

APC Workshop: Biomedical Optical Sensors – Differentiators for Winning Technologies
Sunday, 12 June
14:00-18:00

In this workshop, experts will highlight developments in pertinent fields - and a panel discussion will tackle the question: 'What are the key differentiators for winning biosensor technologies?'

APC Workshop Schedule and Speaker Abstracts

ANIC addresses all relevant research challenges and open research issues for FTTx technologies.

The implementation of FTTx technologies worldwide is establishing substantially increased broadband capabilities in many countries and is bringing these capabilities into the homes of millions. The worldwide FTTx number of users is increasing exponentially and new deployments across the globe are continually being initiated. European, North American, and Asian markets all are expected to be high growth areas and many service providers are investing heavily in the deployment of optical access network technologies. Today, numerous research laboratories and equipment providers are actively engaged in major research projects oriented toward solutions for enhanced broadband connectivity through the use of optics and photonics. This OSA meeting is designed to present many of the latest advances in the development of FTTx technologies ranging from significant advancements in device development to the development of sophisticated algorithms to transmit data, control and monitor the network, and efficiently distribute the signals.

Papers are being considered in the following topic categories:

- FTTx architectures
- Tradeoffs of passive vs. active network implementation
- Enhancements in passive optical networks
- WDM in the access network
- Single fiber transmission limitations
- Techniques supporting enhanced network scalability
- Techniques supporting 10G per channel solutions
- Optical amplification in the access network
- Colorless ONUs designs
- Monitoring techniques
- Radio backhauling and integration with FTTx
- Impairment compensation techniques
- Modulation formats suited for reflective ONUs
- Free-space optics
- Radio over fiber
- POF and MMF transmission issues and performance
- Wireless-wireline convergence
- Packet/burst switching techniques suitable for access networks
- Applications of wavelength and fiber switching in access networks
- Dynamic wavelength assignment and control for WDM-PONs
- MAC optimization for QoS and enhanced performance support
- Resiliency issues
- Optical access-core networks convergence
- Metro-access convergence
- Techno-economic optimization of optical access networks deployments
- Network demonstrations and field trials
View the conference program and plan your itinerary for the conference

- Browse speakers and the agenda of sessions
- Browse sessions by type or day.
- Search by author, title, OCIS code and more.
- Plan and print your personal itinerary before coming to the conference

NEW!

Check out the Housing and Travel Page to find out how to Experience Toronto from the Water and get discounts on Toronto Bus and Walking Tours!

Chairs

A. Koonen, Technische Univ. Eindhoven, Netherlands, General Chair
Pandelis Kourtessis, London Herts Univ., UK, Co-Chair
Thomas Pleifler, Alcatel-Lucent, Germany, General Chair
Josep Prat, Univ. Politecnica de Catalunya, Spain, General Chair

A number of distinguished invited speakers have been invited to present at the meeting.

The 2010 meeting featured presentations from speakers representing 17 countries. In addition, nearly 57% of the contributed presentations were submitted by students.

View the 2010 Meeting Archive (pdf) containing the final program.

Advanced Photonics Congress

- Access Networks & In-house Communications (ANIC)
- Integrated Photonics Research, Silicon and Nano-Photonics (IPR)
- Optical Sensors (Sensors)
- Signal Processing in Photonics Communications (SPPCom)
- Slow and Fast Light (SL)
- New! Specialty Optical Fibers

Sponsor:
Advanced Photonics Congress

June 12-15 2011, The Westin Harbour Castle, Toronto, Canada

The Advanced Photonics 2011 Congress will be held 12-16 June 2011 at The Westin Harbour Castle in Toronto, Canada. This year's congress consists of six collocated meetings including one new meeting and five veteran meetings.

Each meeting consists of invited and contributed presentations. There are three Joint Plenary Sessions and one Joint Poster Session. Be sure to check back for updates on the Plenary speakers. For a complete list of invited speakers, please visit the meetings' Conference Program.

Several exciting special events are planned for the 2011 Advanced Photonics congress including a Welcome Reception, Banquet Dinner and "Optics Olympics" Student Event.

All of the technical sessions will be held at the The Westin Harbour Castle is located near the theater district, waterfront and popular attractions such as Harbourfront Centre, Queens Quay, the Hockey Hall of Fame, and the Toronto Island Ferry. For more information on Toronto and housing at the meeting, please visit Housing and Travel.

Want to start planning your trip today? View the congress' Meetings-at-a-Glance. Please remember that times listed below are not final, so check back often for updates.

NEW!

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View the conference program and plan your itinerary for the conference

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- Browse sessions by type or day.
- Search by author, title, OCIS code and more.
- Plan and print your personal itinerary before coming to the conference

Submit a Paper

Are you ready to submit a paper? Please visit the Author Information page for your desired meeting.

More information about the individual meetings in the 2011 Advanced Photonics Congress can be found by clicking on the links below:

Advanced Photonics Congress

- Integrated Photonics Research, Silicon and Nano-Photonics (IPR)
  IPR covers all aspects of research in integrated photonics and nano-photonics, featuring innovative science and engineering results.
- Slow and Fast Light (SL)
  This topical meeting will bring together physicists and engineers in order to present and discuss the latest achievements within the area of light-speed control
- Access Networks & In-house Communications (ANIC)
  ANIC addresses all relevant research challenges and open research issues for FTTx technologies.
Advanced Photonics Local Organizing Committee

Dan-Xia Xu, Inst. for Microstrutual Sciences, National Research Council Canada, Canada

Joyce Poon, Univ. of Toronto, Canada

Ted Sargent, Univ. of Toronto, Canada

OSA Student Chapter President:
Fei Ye, Ph.D. candidate, University of Toronto, Canada

SPIE Student Chapter President:
Jason Grenier, University of Toronto, Canada

Special Events

APC Workshop: Biomedical Optical Sensors – Differentiators for Winning Technologies
Sunday, 12 June 2011
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In this workshop, experts will highlight developments in pertinent fields - and a panel discussion will tackle the question: 'What are the key differentiators for winning biosensor technologies?'
Please visit the Workshop page for the full scope and list of speakers.

Optics Olympics
Sunday, 12 June 2011
16:30-21:00
Metro Ballroom West, Westin Harbour Castle

The OSA and SPIE Student Chapters at University of Toronto are pleased to invite all attendees (i.e., students, postdoctoral fellows, and all other researchers) of the 2011 Advance Photonics Congress to participate in the Optics Olympics competition on Sunday June 12th, 2011. The competition will have participants work together in teams of 4, to compete in 5 events designed to test and expand your optics skills. The Optics Olympics is an opportunity for conference attendees to meet each other at the start of the conference, have some fun applying their optics skills, and expand their professional network. Food and refreshments will be provided, and cash prizes will be awarded to the winners. Winners will be announced during the conference reception banquet on June 14th. Register early to avoid disappointment as the competition is limited to 64 participants. Registration is done individually and teams will be formed on-site at the beginning of the competition. We are looking forward to your participation in the Optics Olympics!

To register or for more information go to: http://osa.braveline.com/osautortonto/index.asp

FREE to Congress Registrants!
OIDA Workshop on Photonic Integration for High-Capacity Data Transport: Commercial Needs, Opportunities and Deployment
Monday, 13 June
08:00 - 17:00
Advanced Photonics Congress registrants are invited to attend the OIDA Workshop on Photonic Integration for High-Capacity Data Transport: Commercial Needs, Opportunities and Deployment on Monday, 13 June at the Westin Harbour Castle Hotel. To learn more about the workshop program and register visit the OIDA Workshop website.

OIDA Workshop Luncheon
Monday, 13 June
12:00 - 13:30

Congress registrants are invited to attend the OIDA Workshop Luncheon. The featured speaker will be announced shortly on the OIDA Workshop website. The fee is $25 USD and may be added to your congress registration.

Advance Photonics Congress Welcome Reception
Monday, 13 June 2011
18:30 - 20:00
Metro Ballroom West, Westin Harbour Castle

Free to all Technical Attendees of the Congress: Get the meeting off to a great start by attending the welcome reception after a full day of technical sessions! Meet with colleagues from around the world and enjoy light hors d'oeuvres.

Advance Photonics Congress Reception and Banquet Dinner
Tuesday, 14 June 2011
18:30 - 21:30
Location: Hart House, Univ. of Toronto
Tickets: $25 USD per person

Come join us at this great event! The Hart House was completed in 1919, Hart House is a crown jewel in the University of Toronto's architectural, academic and social history. Designed by architect Henry Sproatt, one of the last North American masters of the Gothic form, and engineer Ernest Rolph, the building is named for Vincent Massey's grandfather, Hart. Hart House was gifted to the University of Toronto by the Massey Foundation as a gathering place for students. Today, Hart House enjoys a reputation as a signature arts, creativity and event destination in the City of Toronto. The Hart House permanent art collection comprises nearly six-hundred works by renowned Canadian artists, including works considered national treasures by the Group of Seven, major works by the Automatistes and Painters Eleven, as well as contemporary works by artists from across the country.

Transportation WILL be provided. Shuttle transportation to the Hart House will pick up outside of the main Westin Harbour Castle entrance at 18.15. Buses will be available between 21.15 - 21.45 outside of the Hart House entrance to transport guests back to the Westin Harbour Castle. Please note that the Westin Harbour Castle and the Hart House are the only two destination points the shuttle transportation will pick up and drop off guests. For more information, please ask your OSA representative at Registration on-site.

JTuB: Congress Joint Poster Session
Tuesday, 14 June 2011
13:30 - 15:30
Metro Ballroom West, Westin Harbour Castle

Poster sessions are an integral part of the technical program and offer a unique networking opportunity, where presenters can discuss their results one-to-one with interested parties. Each author is provided with a 4 ft. x 8 ft. (1.22 m x 2.44 m) board on which to display the summary and results of his or her paper.

Postdeadline Sessions
Postdeadline sessions are an opportunity to showcase the most late-breaking innovations in the field.

Sponsors
Exhibitors

Interested in being an Exhibitor at the Advanced Photonics Congress?

Exhibit space at this Congress is very limited, so be sure to sign up for your tabletop exhibit space today! This Congress provides you an audience of 400 scientists. Call Regan Pickett at 202-416-1474 or e-mail exhibitsales@osa.org for more information.

Sponsor:
Access Networks and In-house Communications (ANIC)

12 June - 14 June 2011, The Westin Harbour Castle, Toronto, Canada

Conference Program

ANIC – The implementation of FTTx technologies worldwide is establishing substantially increased broadband capabilities in many countries and is bringing these capabilities into the homes of millions. The worldwide FTTx number of users is increasing exponentially and new deployments across the globe are continually being initiated. European, North American, and Asian markets all are expected to be high growth areas and many service providers are investing heavily in the deployment of optical access network technologies. Today, numerous research laboratories and equipment providers are actively engaged in major research projects oriented to solutions for enhanced broadband connectivity through the use of optics and photonics. This OSA meeting is designed to present many of the latest advances in the development of FTTx technologies ranging from significant advancements in device development to the development of sophisticated algorithms to transmit data, control and monitor the network, and efficiently distribute the signals.

If you would like to be considered as a presenter, please review the topic categories below and the author/presenter information for submission guidelines.

Papers are being considered in the following topic categories:

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- Tradeoffs of passive vs. active network implementation
- Enhancements in passive optical networks
- WDM in the access network
- Single fiber transmission limitations
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- Resiliency issues
- Optical access-core networks convergence
- Techno-economic optimization of optical access networks deployments
- Network demonstrations and field trials

Meeting-at-a-Glance

A tentative general schedule of the meeting (as well as all meetings in the Congress) is listed below. Please check back frequently for updates.
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**Special Events**

**Optics Olympics**
Sunday, 12 June 2011
16:30-21:00
Metro Ballroom West, Westin Harbour Castle

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**Sponsors**

[NSERC CRSNG]

[OneChip Photonics]

[The Edward S. Rogers Sr. Department of Electrical & Computer Engineering
University of Toronto]
Special Events

Optics Olympics
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16:30-21:00
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Please note that transportation is to and from the event is on your own.
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**Sponsors**

![NSERC CRSNG](image1.png)

![OneChip Photonics](image2.png)

![University of Toronto](image3.png)

![NRC-CCRL Canada](image4.png)
Access Networks & In-house Communications (ANIC)

Integrated Photonics Research, Silicon and Nano-Photonics (IPR)

Optical Sensors (Sensors)

Signal Processing in Photonics Communications (SPPCom)

Slow and Fast Light (SL)

Specialty Optical Fibers (SOF)

12-14 June, 2011,
The Westin Harbour Castle
Toronto, Canada

2011 Advanced Photonics:
OSA Optics & Photonics Congress

Conference Program
The Organizers of the Advanced Photonics:
OSA Optics & Photonics Congress and Table Top Exhibit	hank the following sponsors for their generous support.

The Edward S. Rogers Sr. Department of Electrical & Computer Engineering
UNIVERSITY OF TORONTO

OneChip Photonics

NSERC CRSNG

Gospel
Congress Highlights

IPR Workshop: Biomedical Optical Sensors-Differentiators for Winning Technologies
Harbour Salon C
Sunday, 12 June 2011
14:00-18:00

The market for biosensors is becoming progressively more diverse - and is expected to grow significantly in the coming years. Currently the bulk of revenue comes from the point-of-care medical diagnostics market, but this situation is likely to change with newer application research. Progress in biosensors has mainly been due to a combination of improvements in the biological components and the implementation of microsystem technologies. In the photonics community, there has been an explosion of research activity in recent years - and various different photonic biosensor concepts have been proposed and demonstrated. Sensitivity continues to improve and single molecular detection has been reported. But the transport of target molecules to the sensing surface still relies on diffusion or on fluid flow. Specimen preparation and pre-concentration remain serious challenges.

Are there already too many types of biosensor? Which applications are the best implementations of different sensors? What are the key issues that must be resolved? What is required to bring today's research to tomorrow's point-of-care diagnostic instruments? In this workshop, experts will highlight developments in pertinent fields - and a panel discussion will tackle the question: 'what are the key differentiators for winning biosensor technologies?' We expect that all attendees will have the opportunity to make a contribution to a successful workshop.

Confirmed Speakers (as of 13 May):

Gilberto Brambilla, Univ. of Southampton, UK
Pierre Berini, Univ. of Ottawa, Canada
Richard De La Rue, Univ. of Malaya, Malaysia
Kishan Dholakia, St. Andrews Univ., UK
Martin Kristensen, Univ. of Aarhus, Denmark
Holger Schmidt, Univ. of California at Santa Cruz, USA
Ian White, Univ. of Maryland, USA
DanXia Xu, NRC Ottawa, Canada
Anatoly Zayats, King’s College London, UK

Optics Olympics
Metro Ballroom West, Westin Harbour Castle
Sunday, 12 June 2011
18:00-22:00

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The five challenging yet fun games that comprise the competition are listed below:

1. Image competition
2. Laser Khet (Laser chess game)
3. Optics triathlon
4. Laser graffiti
5. Hitting targets

We are looking forward to your participation in the Optics Olympics!

Sponsored by*: Institute of Optical Sciences, Univ. of Toronto
OSA - The Optical Society
Simbol Test Systems

*as of 19 May 2011

Advanced Photonics Congress Welcome Reception
Metro Ballroom West, Westin Harbour Castle
Monday, 13 June 2011
18:30 - 20:00

Free to all Technical Attendees of the Congress: Get the meeting off to a great start by attending the welcome reception after a full day of technical sessions! Meet with colleagues from around the world and enjoy light hors d'oeuvres.
**Advanced Photonics Congress Reception and Banquet Dinner**
*Hart House, Univ. of Toronto*
**Tuesday, 14 June 2011**
**18:30 - 21:30**

**Tickets: Limited seating available. $35 USD per person.**

Come join us at this great event! The Hart House was completed in 1919, Hart House is a crown jewel in the University of Toronto’s architectural, academic and social history. Designed by architect Henry Sproatt, one of the last North American masters of the Gothic form, and engineer Ernest Rolph, the building is named for Vincent Massey’s grandfather, Hart. Hart House was gifted to the University of Toronto by the Massey Foundation as a gathering place for students. Today, Hart House enjoys a reputation as a signature arts, creativity and event destination in the City of Toronto. The Hart House permanent art collection comprises nearly six-hundred works by renowned Canadian artists, including works considered national treasures by the Group of Seven, major works by the Automatistes and Painters Eleven, as well as contemporary works by artists from across the country.

**JTuB: Congress Joint Poster Session**

*Pier 4/ Harbour Ballroom Foyer, Westin Harbour Castle*
**Tuesday, 14 June 2011**
**13:30 - 15:30**

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**OIDA Workshop**

**Photonic Integration for High-Capacity Data Transport: Commercial Needs, Opportunities and Deployment**

**Monday, 13 June 2011**

**Queen's Quay, The Westin Harbour Castle, Toronto, Canada**

We’re bringing together the field’s leading innovators in the areas of high data rate, high density, high capacity optical communications and the companies which are exploring photonic integration, monolithic and hybrid, as a data transport solution for a unique, one-day workshop - join us!

**Luncheon Speaker**

**David F. Welch**

*Co-Founder, Executive Vice President and Chief Strategy Officer, Infinera Corporation*

**Schedule at-a-Glance**

**Sunday, 12 June**

14:00 – 18:00 Registration

**Monday, 13 June**

07:30 – 08:30 Registration & Continental Breakfast
08:30 – 12:30 Session
12:00 – 13:30 Lunch* featuring a presentation from **David Welch**, Co-Founder, Executive Vice President and Chief Strategy Officer, Infinera Corporation
13:30 – 17:30 Session
18:00 – 19:30 Networking Reception

There is an ever-increasing world-wide commercial need for higher and higher rates of data transport. Despite the cyclical nature of the general economy, the volume of electronic communication has been on a steady growth path. The increasing need for moving large volumes of data has considerably impacted the area of long haul optical transmission. Aggregate long haul data rates, in the C band of the optical fiber spectrum, are expected to reach 25Tbit/s per fiber. This creates a compelling need for both line and client side systems capable of very high data rate transport and switching within a very small volume of space and reduced power consumption. Fulfilling this need requires creative innovations in the field of optical components, and photonic integration has been increasingly proposed and utilized as a solution in this application space.

http://www.oida.org/events/integration11

* Congress registrants are invited to attend the OIDA Workshop Luncheon. The fee is $25 USD and may be purchased at the registration desk. Limited seating available.
Slow Light Enhanced Nonlinear Effects in Periodic Structures
JMA1 • 8:45, Harbour Salon B

Benjamin Eggleton, Univ. of Sydney, Australia

Benjamin J. Eggleton is an ARC Federation Fellow and Professor of Physics at the University of Sydney and is the founding Director of CUDOS, the ARC Centre of Excellence for Ultrahigh-bandwidth Devices for Optical Systems. He obtained Ph.D. degree in Physics from the University of Sydney. In 1996, he joined Bell Laboratories, Lucent Technologies as a Member of Staff and was subsequently promoted to Director within the Specialty Fibre Business Division of Bell Laboratories, where he was engaged in forward-looking research supporting Lucent Technologies business in optical fibre devices. Eggleton has published more than 300 journal publications (with over 7500 citations and an h-index of 44) and has filed over 35 patents. He is a Fellow of the OSA, IEEE and the Australian Academy of Technological Sciences and Engineering. Eggleton received numerous awards for his contributions, including the 2003 International Commission on Optics (ICO) Prize, the 1998 Adolph Lomb Medal from the OSA and the IEEE/LEOS Distinguished Lecturer Award. He was President of the Australian Optical Society from 2008-2010 and is Editor for Optics Communications.

Prospects and Challenges in High Power Fiber Laser Technology
SOMA1 • 8:45, Pier 5

Andreas Tünnemann1,2, 1Fraunhofer Inst. for Applied Optics and Precision Engineering, Germany; 2Inst. for Applied Physics, Friedrich-Schiller-Univ., Germany

Andreas Tünnemann received a diploma and PhD degrees in physics from the University of Hannover in 1988 and 1992, respectively. His habilitation was related to topics on ultrastable light sources for interferometric gravitational wave detectors. In 1998 he joined the Friedrich-Schiller-University in Jena, Germany as a Professor and Director of the Institute of Applied Physics. In 2003 he became the Director of the Fraunhofer Institute of Applied Optics and Precision Engineering in Jena. He is known for his pioneering work in fiber laser technology and the application of high power femtosecond lasers for materials processing. Professor Tünnemann’s research activities on optics and applied quantum electronics have been awarded with the Roentgen-Award 1997, WLT-Award 1998, Otto-Schott-Award 2003, Leibinger Innovation Award 2004 and the Gottfried-Wilhelm-Leibniz-Award 2005.

Progress and Technical Challenges for Integrated Optics
JTuA1 • 10:30, Harbour Salon B

Katsunari Okamoto; AiDi Corp., Japan.

Dr. Katsunari Okamoto received the B.S., M.S., and Ph.D. degrees in electronics engineering from Tokyo University, Tokyo, Japan, in 1972, 1974, and 1977, respectively. He joined Ibaraki Electrical Communication Laboratory, Nippon Telegraph and Telephone Corporation (NTT), Ibaraki, Japan, in 1977, and was engaged in the research on transmission characteristics of multimode, dispersion-flattened single-mode, single-polarization (PANDA) fibers, and fiber-optic components. He proposed for the first time the dispersion-flattened fiber (DFF) and succeeded in fabrication of DFF that had chromatic dispersion less than +/-1 ps/km/nm over a wide spectral range. From September 1982 to September 1983, he worked as a guest researcher at Optical Fiber Group, Southampton University, Southampton, England, where he was engaged in the research on birefringent optical fibers. At NTT Photonics Laboratories, he has developed various kinds of AWGs ranging from 8ch-300nm spacing AWGs to 128ch-25GHz AWGs, flat spectral response AWGs and integrated-optic reconfigurable add/drop multiplexers (ROADM). 200 GHz to 50 GHz spacing AWGs are now widely used in the commercial WDM systems. From July 2006, he worked as Professor of Electrical and Computer Engineering at the University of California at Davis (UC Davis). His research at UC Davis includes passive and active photonics devices and silicon photonics. He is currently working as CTO at AiDi corporation aiming at the miniature lightwave spectroscopic sensors for environmental sensing and health diagnostics. He has published more than 285 papers in technical journals and international conferences. He authored and co-authored 8 books including “Fundamentals of Optical Waveguides (Elsevier)”. Dr. Okamoto is a member of the Institute of Electrical and Electronics Engineers (Fellow), Optical Society of America and the Institute of Electronics Information and Communication Engineers of Japan.

Shaping the Future of Nanobiophotonics
JTuA2 • 11:15, Harbour Salon B

Kishan Dholakia, Univ. of St Andrews, UK

Kishan Dholakia is Professor of Physics at the University of St Andrews Scotland and an honorary adjunct Professor at the Centre for Optical Sciences at the University of Arizona, USA.

He heads a large (~25) group working in various aspects of photonics including beam shaping, micromanipulation and biophotonics. He has published over 300 journal/conference papers and his group won the European Optics Prize in 2003. He was elected to the position of Fellow of the Royal Society of Edinburgh in 2007, Fellow of the Optical Society of America in 2008 and SPIE Fellow in 2009.
Photonic Crystal Fibers
SOMD3 • 17:00, Pier 5
William Wadsworth; Univ. of Bath, UK
William Wadsworth has been designing, fabricating and using photonic crystal fibres (PCFs) since 1999 when he joined the University of Bath as a post-doc. His previous work developing high power lasers and low-cost tunable lasers has informed a particular interest in the use of PCF for compact and versatile light sources.

Optical fiber sensors and their Specialty Fiber Needs
SOTuC5 • 17:15, Pier STutorial
Alexis Mendez, MCH Engineering, LLC, USA
Alexis Mendez received a PhD. degree in Electrical Engineering from Brown University, in 1992. He is President of MCH Engineering LLC, a consulting firm specializing in optical fiber sensing technology, and has over 20 years of experience in optical fiber technology, sensors and instrumentation. Dr. Mendez was the former Group Leader of the Fiber Optic Sensors Lab within ABB Corporate Research (USA) where he led R&D activities for the development of fiber sensors for use in industrial plant, oil & gas, and high voltage electric power applications. He has written 60 technical publications, taught several short courses on fiber sensors, holds 5 US patents and is recipient of an R&D100 award. Dr. Mendez is a Fellow of SPIE and was past Chairman of the 2006 International Optical Fiber Sensors Conference (OFS-18), past Technical Chair of the 2nd Workshop on Specialty Optical Fibers and their Applications (WSOF21010), and is co-editor of the “Specialty Optical Fibers Handbook”.
Technical Program Committees

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Tom Koch, Lehigh Univ., USA, General chair
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Photonic Integration
Valery Tolstikhin, OneChip Photonics Inc., Canada, Chair
Nadir Dagli, Univ. of California at Santa Barbara, USA
Christopher Doerr, Bell Laboratories, Alcatel-Lucent, USA
Jian-Jun He, Zhejiang Univ., China
Paul Jessop, Wilfrid Laurier Univ., Canada
Lionel Kimerling, MIT, USA
Damien Lambert, Infinera Inc., USA
Gunther Roelkens, Univ. of Ghent, Belgium
Matsuo Shinji, NTT Photonics Lab, Japan, Japan
Meint Smit, Eindhoven Univ. of Technology, The Netherlands
Devices and Components
Michael Watts, MIT, USA, Chair
Ray Beausoleil, HP Labs, USA
Tobias Kippenberg, Max Planck Inst. for Quantum Optics, Germany
Solomon Assefa, IBM T. J. Watson Res., USA
Joyce Poon, Univ. of Toronto, Canada
Laurent Vivien, Inst. d’Electronique Fondamentale, Univ. of Paris Sud, France
Zhiping Zhou, Peking Univ., China
Lars Zimmermann, Technische Univ. Berlin, Germany
Peter Rakich, Sandia Natl. Labs, USA
Koji Yamada, NTT Microsystem Integration Labs, Japan

Modeling, Numerical Simulation and Theory
Hung-chun Chang, Natl. Taiwan Univ., Taiwan, Chair
Allan D. Boardman, Univ. of Salford, UK
Anand Gopinath, Univ. of Minnesota, USA
Philippe Lalanne, Inst. d’Optique, Univ. Paris-Sud, France
Ya Yan Lu, City Univ. of Hong Kong, China
Philip Sewell, Univ. Park, UK
Christoph Waechter, Fraunhofer Inst. for Applied Optics and Precision Engineering, Germany
Vien Van, Univ. of Alberta, Canada
Junji Yamauchi, Hosei Univ., Japan
James Pond, Lumerical, Canada

Nanophotonic Devices and Applications
Gary Wiederrecht, Argonne National Lab., USA, Chair
Sergey Bozhevolnyi, Southern Denmark Univ., Denmark
Mark Brongersma, Stanford Univ., USA
Din Ping Tsai, Natl. Taiwan Univ., Taiwan
Edwin Pun, City Univ. of Hong Kong, China
Sailing He, Zhejiang Univ., Joint Res. Center of Photonics of the Royal Inst. of Technology (Sweden), China/Sweden
William Whelan-Curtin, Univ. of St. Andrews, UK
John Rogers, Univ. of Illinois at Urbana-Champaign, USA
Edward Sargent, Univ. of Toronto, Canada
Yasuhiko Arakawa, Univ. of Tokyo, Japan
Masaya Notomi, NTT Basic Research Labs., Japan
Explanation of Session Codes

<table>
<thead>
<tr>
<th>Meeting Name</th>
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<tr>
<td>A = Access Networks and In-house Communications</td>
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<tr>
<td>S = Optical Sensors</td>
</tr>
<tr>
<td>SP = Signal Processing in Photonics Communications</td>
</tr>
<tr>
<td>SL = Slow and Fast Light</td>
</tr>
<tr>
<td>I = Integrated Photonics Research, Silicon and Nano Photonics</td>
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<tr>
<td>SO = Specialty Optical Fibers</td>
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<tr>
<td>J = Joint</td>
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<tr>
<td>M = Monday</td>
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<td>Tu = Tuesday</td>
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<td>W = Wednesday</td>
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<table>
<thead>
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<th>Session Designation</th>
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<thead>
<tr>
<th>Number</th>
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<tbody>
<tr>
<td>(presentation order within the session)</td>
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</table>

ATuA4

The first letter of the code designates the conference (A=Access Networks and In-house Communications, S= Optical Sensors, SP=Signal Processing in Photonics Communications, SL=Slow and Fast Light, I=Integrated Photonics Research, Silicon and Nano Photonics, SO=Specialty Optical Fibers, J=Joint). The second element denotes the day of the week (Monday=M, Tuesday=Tu, Wednesday=W). The third element indicates the session within the particular day the talk is being given. Each day begins with the letter A and continues alphabetically. The number on the end of the code signals the position of the talk within the session (first, second, third, etc.). For example, a presentation coded ATuA4 indicates that this paper is part of Access Networks and In-house Communications (A) and is being presented on Tuesday (Tu) during the first session (A), and is the fourth paper (4) presented in that session.
### Agenda of Sessions — Sunday, 12 June

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
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<tbody>
<tr>
<td>10:00–18:30</td>
<td>Registration Open, Harbour Ballroom Foyer</td>
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<tr>
<td>14:00–18:00</td>
<td>Workshop: Biomedical Optical Sensors-Differentiators for Winning Technologies</td>
<td>Harbour Salon C</td>
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<tr>
<td>17:00–22:00</td>
<td>Optics Olympics, Metro West</td>
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### Agenda of Sessions — Monday, 13 June

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
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<tr>
<td>7:00–18:30</td>
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<tr>
<td>7:30–19:30</td>
<td>OIDA Workshop, Queen's Quay, The Westin Harbour Castle</td>
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<tr>
<td>8:30–8:45</td>
<td>AMA • Network, Market and Operator View (starts at 8:00)</td>
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<tr>
<td>8:45–10:00</td>
<td>IPR/SL Opening Remarks, Harbour Salon B</td>
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<tr>
<td>10:00–16:00</td>
<td>Exhibits Open, Pier 4/ Harbour Ballroom Foyer</td>
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<tr>
<td>10:00–10:30</td>
<td>Coffee Break/Exhibits, Pier 4/ Harbour Ballroom Foyer</td>
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<tr>
<td>10:30–12:30</td>
<td>AMB • Green Access and Operations SPMA • High Spectral Efficiency</td>
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<td></td>
<td>IMA • Modeling and Simulation I: Plasmonics</td>
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<td>IMB • Nanophotonics: Waveguides, Optomechanics, and SOI-Based Technologies</td>
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<td></td>
<td>SLMA • Applications of Slow/Fast Light</td>
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<tr>
<td></td>
<td>SMB • Subwavelength and Plasmonic Sensors</td>
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<td></td>
<td>SOMB • 2um Fiber Lasers</td>
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<tr>
<td>12:30–13:30</td>
<td>Lunch Break (on your own)</td>
<td></td>
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<tr>
<td>13:30–15:30</td>
<td>AMC • OFDM-PON SPMB • OFDM IMC • Modeling and Simulation II: Periodic Structures and Waveguides</td>
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<tr>
<td></td>
<td>IMD • Nanophotonics: Waveguides, Lasers, and SOI-Based Technologies</td>
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<tr>
<td></td>
<td>SLMB • Applications of Slow/Fast Light II</td>
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<tr>
<td></td>
<td>SMC • Microfiber Sensors</td>
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<tr>
<td></td>
<td>SOMC • Novel Glass and Fluoride Fibers</td>
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<tr>
<td>15:30–16:00</td>
<td>Coffee Break/Exhibits, Pier 4/ Harbour Ballroom Foyer</td>
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<tr>
<td>16:00–18:00</td>
<td>AMD • Hybrid and WDM-PON SPMC • Optical Techniques I (ends at 17:30)</td>
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<tr>
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<td>IME • Devices and Components I (ends at 17:00)</td>
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<tr>
<td></td>
<td>IMF • Nanophotonics: Photonic Crystals and nanowires</td>
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<td></td>
<td>SLMC • Atomic and Rare-Earth Systems and Applications</td>
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<tr>
<td></td>
<td>SMF • Spectral and Biomedical Imaging</td>
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<td></td>
<td>SOMD • Microstructured Fibers</td>
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<tr>
<td>18:30–20:00</td>
<td>Advanced Photonics Congress and OIDA Welcome Reception, Metro Ballroom West</td>
<td></td>
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</tbody>
</table>

### Key to Conference Abbreviations
- **ANIC**: Access Networks and In-house Communications
- **Sensors**: Optical Sensors
- **SPPcom**: Signal Processing in Photonics Communications
- **SL**: Slow and Fast Light
- **IPR**: Integrated Photonics Research, Silicon and Nano Photonics
- **SOF**: Specialty Optical Fibers
## Agenda of Sessions — Tuesday, 14 June

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<tr>
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<th>Session</th>
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<td>7:30–18:00</td>
<td>Registration Open, Harbour Ballroom Foyer</td>
</tr>
<tr>
<td>8:30–10:00</td>
<td>ATuA • Basic Technologies for NG-PON (starts at 8:00)</td>
</tr>
<tr>
<td></td>
<td>SPTuA • Coding I (ends at 9:30)</td>
</tr>
<tr>
<td></td>
<td>ITuA • Devices and Components II</td>
</tr>
<tr>
<td></td>
<td>ITuB • Nanophotonics: Plasmonics and applications I</td>
</tr>
<tr>
<td></td>
<td>SLTuA • Slow/Fast Light in SOAs and Photonic Crystals</td>
</tr>
<tr>
<td></td>
<td>STuA • High Intensity and Broadband THz Sources</td>
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<tr>
<td></td>
<td>SOTuA • Super-continuum Fiber Lasers</td>
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<tr>
<td>10:00–16:00</td>
<td>Exhibits Open, Pier 4/ Harbour Ballroom Foyer</td>
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<tr>
<td>10:00–10:30</td>
<td>Coffee Break/Exhibits, Pier 4/ Harbour Ballroom Foyer</td>
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<tr>
<td>10:30–12:30</td>
<td>ATuB • Radio over fiber and OCDMA</td>
</tr>
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<td>SPTuB • Advanced Modulation (ends at 11:45)</td>
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<tr>
<td></td>
<td>JTuA • Joint IPR/SL Plenary Session, Harbour Salon B</td>
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<tr>
<td></td>
<td>STuB • THz Spectroscopy and Imaging Applications</td>
</tr>
<tr>
<td></td>
<td>SOTuB • Chalcogenide and Tellurite Fibers (ends at 12:15)</td>
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<tr>
<td>12:30–13:30</td>
<td>Lunch Break (on your own)</td>
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<tr>
<td>1:30–15:30</td>
<td>JTuB • Congress Joint Poster Session, Pier 4/ Harbour Ballroom Foyer</td>
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<tr>
<td>15:30–16:00</td>
<td>Coffee Break/Exhibits, Pier 4/ Harbour Ballroom Foyer</td>
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<tr>
<td>16:00–18:00</td>
<td>ATuC • Inhouse: Fiber and Wireless (ends at 17:30)</td>
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<td>SPTuC • DSP (ends at 17:30)</td>
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<td></td>
<td>ITuC • Photonic Integration I</td>
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<tr>
<td></td>
<td>ITuD • Nanophotonics: Plasmonics and Applications II</td>
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<tr>
<td></td>
<td>SLTuB • Methods and Fundamentals</td>
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<tr>
<td></td>
<td>STuC • Terahertz Waveguides, Applications, and Device Technology</td>
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<tr>
<td></td>
<td>SOTuC • Fiber Sensors</td>
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<tr>
<td>16:30–21:30</td>
<td>Advanced Photonics Congress Reception and Banquet, Hart House, University of Toronto</td>
</tr>
</tbody>
</table>

### Key to Conference Abbreviations

- **ANIC**: Access Networks and In-house Communications
- **Sensors**: Optical Sensors
- **SPPcom**: Signal Processing in Photonics Communications
- **SL**: Slow and Fast Light
- **IPR**: Integrated Photonics Research, Silicon and NanoPhotonics
- **SOF**: Specialty Optical Fibers
## Agenda of Sessions — Wednesday, 15 June

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<tr>
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<tr>
<td>7:30–17:00</td>
<td>Registration Open, Main Foyer</td>
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<tr>
<td>8:30–10:00</td>
<td>SPWA • Nonlinearities (starts at 9:00)</td>
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<tr>
<td></td>
<td>IWA • Modeling and Simulation III: Lasers and Emitters</td>
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<tr>
<td></td>
<td>IWB • Active nanophotonics, quantum dots, and nanocavities</td>
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<tr>
<td></td>
<td>SLWA • Nonlinear Optics and Waveguide Technologies</td>
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<td></td>
<td>SWA • Biochemical Sensors I</td>
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<tr>
<td></td>
<td>SOWA • 1um Fiber Lasers (ends at 9:45)</td>
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<tr>
<td>10:00–10:30</td>
<td>Coffee Break, Harbour Ballroom Foyer</td>
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<tr>
<td>10:30–12:30</td>
<td>SPWB • Coding II (ends at 12:15)</td>
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<tr>
<td></td>
<td>IWC • Photonic Integration II</td>
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<tr>
<td></td>
<td>IWD • Modeling and Simulation IV: Coupled Waveguides and Resonators</td>
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<tr>
<td></td>
<td>SLWB: Slow/Fast Light Systems (ends at 12:15)</td>
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<tr>
<td></td>
<td>SWB • Biochemical Sensors II</td>
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<tr>
<td></td>
<td>SOWB • Hollow Core Fibers (ends at 12:15)</td>
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<tr>
<td>12:30–13:30</td>
<td>Lunch Break (on your own)</td>
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<tr>
<td>13:30–15:30</td>
<td>SPWC • Transmission Systems</td>
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<td>IWE • Photonic Integration III</td>
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<td>IWF • Devices and Components III</td>
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<td>SWC • Photonic Crystal Sensors</td>
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<td>SOWC • Poled and Polarizing Fibers (ends at 15:15)</td>
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<tr>
<td>15:30–16:00</td>
<td>Coffee Break/Exhibits, Pier 4/ Harbour Ballroom Foyer</td>
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<tr>
<td>16:00–18:00</td>
<td>SPWD • Optical Techniques II (ends at 17:30)</td>
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<td>IWG • Devices and Components IV</td>
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<td>SWD • Speckle and Nonlinear Based Imaging</td>
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<td>SOWD • Novel Applications and Effects (ends at 17:30)</td>
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<td></td>
<td>Concluding Remarks (ends at 17:45 )</td>
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### Key to Conference Abbreviations

<table>
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<tr>
<th>Abbreviation</th>
<th>Description</th>
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<td>Optical Sensors</td>
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<tr>
<td>SPPcom</td>
<td>Signal Processing in Photonics Communications</td>
</tr>
<tr>
<td>SL</td>
<td>Slow and Fast Light</td>
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<tr>
<td>IPR</td>
<td>Integrated Photonics Research, Silicon and Nano Photonics</td>
</tr>
<tr>
<td>SOF</td>
<td>Specialty Optical Fibers</td>
</tr>
</tbody>
</table>
8:00–10:00  AMA • Network, Market and Operator View
Thomas Pfeiffer, Alcatel-Lucent, Germany, Presider

AMA1 • 8:00  Invited
BT NGA Deployment & Evolution Strategy as
Drivers for NG-PON2 Requirements, Albert Rafel1; 1Innovation & Design, Adastral Park, Martlesham Heath, UK. This paper outlines the current regulatory situation in the UK and BT’s open access operating model. It presents BT’s current FTTP architecture and design giving details of the interconnection points for unbundling purposes at Ethernet level as well as the components making the design future proof.

AMA2 • 8:30  Invited
Next Generation Optical Access Networks, Ronald Heron1; 1Access CTO Team, Alcatel-Lucent, Canada. Future optical access networks must support increased rate, reach, split, multi-operator access & wireline/wireless convergence. This paper outlines the role, challenges and breakthroughs of NG technologies including TDM-PON, WDM-PON & TWDM-PON.

AMA3 • 9:00  Invited
Practical Hybrid PON Technologies, Naoto Yoshimura1, 2; 1Access Network Service Systems Laboratories, NTT, Japan. This paper describes possible access network architectures using hybrid PON technologies designed to meet operators’ requirements in the next decade. From the technical continuity viewpoint, TDM based WDM-PON will be a promising candidate.

AMA4 • 9:30  Invited
Green Hybrid Optical/Wireless Access/In-House Networks, Leonid Kazovsky1, Kadir Albellugat1; 1Innovation & Design, Adastral Park, Martlesham Heath, UK. This paper focuses on energy efficient hybrid access networks. Solutions to underutilization of network are investigated. Power optimization of distributed antenna systems and cell-breathing technology for hybrid access networks are explored.

8:30–10:00  JMA • IPR/SL Keynote Speaker Session
Jacob B. Khurgin, Johns Hopkins Univ., USA, Presider
Luc Thévenaz, École Polytechnique Fédérale de Lausanne, Switzerland, Presider

JMA1 • 8:45  Plenary
Slow Light Enhanced Nonlinear Effects in Periodic Structures, Benjamin Eggleton; Univ. of Sydney, Australia. The generation of intense single-cycle THz pulses by tilted-pulse-front techniques for probing ultrafast nonlinear THz dynamics in semiconductors is described. Full-field imaging of THz Cherenkov waves and novel THz pulse detection methods are also discussed.

JMA2 • 9:30  Invited
Monitoring and Controlling Slow Light in Photonic Crystals, Daryl M. Beggs1, Isabella H. Rey1, Tobias Kampfrath1, Thomas Kranta2, Kobus Kuipers1; 1FOM Inst. AMOLF, Netherlands; 2School of Physics & Astronomy, Univ. of St Andrews, UK. By performing ultrafast pump-probe experiments, we show the 0.3THz adiabatic frequency conversion of pulses in a slow-light photonic crystal waveguide with 80% efficiency. We demonstrate the use of this conversion scheme in a delay line.

8:30–10:00  SMA • Sensors Keynote Speaker Session
John Ballato, Clemson Univ., USA, Presider

SOMA1 • 8:45  Keynote
Prospects and Challenges in High Power Fiber Laser Technology, Andreas Tünnermann1,2, Jens Limpert1; 1Fraunhofer Inst. for Applied Optics and Precision Engineering, Germany; 2Inst. for Applied Physics, Friedrich-Schiller-Univ., Germany. Solid-state lasers are attractive sources of coherent radiation for various applications. At present fiber lasers and amplifiers are capturing the different markets. Novel developments and challenges in high-power fiber laser technology are reviewed.

10:00–10:30  Coffee Break, Pier 4/ Harbour Ballroom Foyer

10:00–16:00  Exhibits Open, Pier 4/ Harbour Ballroom Foyer
Monday 13 June

Access Networks and In-house Communications

10:30–12:30
AMB • Green Access and Operations
A. Koonen, Technische Univ. Eindhoven, Netherlands, Presider

AMB1 • 10:30
Research Directions for Low Energy Access Networks, Peter Vetter1, Dastam Savaresi2, Bell Labs - Alcatel-Lucent, USA. The paper addresses different options for reduction of energy consumption in fixed access networks, studied by the GreenTouch consortium. A combination of different concepts will lead to an energy efficiency improvement of more than 100x.

AMB2 • 11:00
Implications of ODN on Energy Consumption in Access Networks, Antonio Teixeira1,2, Univ. de Aveiro, Portugal; 2Nokia Siemens Networks, Portugal. The problem of installed fiber plants and the issue of energy consumption are two challenging points in the current techno-economic environment. This paper addresses the investment and interface technology level in Optical Distribution Network (ODN).

SPMA • 10:30
High Spectral-Efficiency Transmission Techniques for Systems Beyond 100 Gb/s, Xiang Liu1, S. Chandrasekhar2; Alcatel-Lucent, USA. We review recent progress on high spectral efficiency optical transmission with per-channel data rates beyond 100 Gb/s. Enabling technologies such as high-level QAM modulation and multiband superchannel transmission are discussed.

SPMA • 11:00
Chromatic Dispersion-Tolerant Higher-Order Multilevel Transmission with Optical Delay Detection, Nobuhiko Kikuchi1; Central Research Labs, Hitachi, Japan. We present a practical receiver-side chromatic dispersion (CD) compensation scheme for higher-order multilevel signaling using optical delay-detection, and up to 40-Gbit/s 16QAM signaling experiments have been demonstrated with large tolerance to CD (±40-km SSMF) and laser phase noise (1-MHz linewidth).

SPMA • 11:30
Ultra High Capacity Transmission Based on High-Order QAM for Future Optical Transport Networks, Takayuki Kobauchi1, Akihiko Same2, Akikiko Matsura1, Tadahiro Nakagawa2, Eiji Yoshida1, Miyamoto Tatsuki1; IITT Network Innovation Laboratories, NTT, Japan. High-capacity transmission using high-order QAM enhanced by powerful DSP is being intensely investigated. In this paper, we review recent high capacity transmission approaches and propose a 400-Gbit/s superchannel configuration for future OTNs.

SPMA • 11:30
Transmission Line Modeling of Nano-Plasmonic Devices, Osman S. Ahmed1, Mohamed A. Swillens2, Mohamed H. Bakr1, Xun Li1; Electrical and Computer Engineering, McMaster Univ., Canada; Physics, Univ. of Toronto, Canada. We demonstrate the application of the time domain transmission line method (TLM) to accurate modeling of surface plasmon polariton (SPP) structures. The constructed TLM allows for modeling of dispersive materials and perfect absorbing boundaries.

IMB • 10:30
Exploiting Photosensitivity in Chalcogenide-assisted Integrated Optics, Andrea Melloni1, Antonio Cancian3,4, Carlo Ferrari1, Stefano Grilli1, Francesco Morichetti5, Philippe Velha6, Marc Andre7, Jurgen Hi4, J. David Mauro7,8, Bogdan Zdyrko9, Igor Lucor10, Kathiean Richards10, Vivek Singh1, Anu Agrawal1, Lionel Kimerling5; Dipart di Elettronica e Informazione, Politecnico di Milano, Italy; EEE Dept., Univ. of Glasgow, UK; Dept. of Materials Science and Engineering, Univ. of Delaware, USA; Ctr. For Optical Materials Science and Engineering Technologies (COMSET), Clemson Univ., USA; Microphotonic Center, Massachusetts Inst. of Technology, USA. We show the potential of post-fabrication trimming of integrated devices by exploiting photosensitivity in chalcogenide glass. Compensation of fabrication tolerances is demonstrated in As2S3 and As2S3-assisted silicon ring filters.

IMB • 11:00
Nonvolatile Optomechanical Memory Enabled by Dynamic Optical Backaction, Mahmood Bagheri1,2, Menno Post1, Wolfram Pernice1, Hong Tang1; Electrical Engineering, Yale Univ., USA. We demonstrate coherent switching of nanomechanical resonators by optical cooling and amplification. The dynamic manipulation by optical backaction drives nanomechanical resonators at high amplitudes. A non-volatile memory is also demonstrated.

IMB • 11:15
Enhancing FWM Conversion Efficiency in a Silicon Waveguide by exploiting Phase-Matching via a Pump-induced Nonlinear Grating, Jeffrey B. Driscoll1, Xiaoping Liu1, Richard Grote1, Jerry L. Duda1,2, Nicolas C. Panoiu1, Richard M. Osgood1, Jian Chen2,3,4, Michele Iovine2,3,4; Microelectronics Sciences Labs., Columbia Univ., USA; Dept. of Electronic and Electrical Engineering, Univ. College London, UK. We show that the anisotropy of Si may be used to induce a nonlinear grating on-chip, which could be exploited by FWM to phase-match signals well outside of the conversion bandwidth, allowing a >10dB conversion efficiency-enhancement.

IMB • 11:30
Theoretical Investigation of CMOS-Compatible Metal-Oxide-Silicon-Oxide-Metal Waveguides, Min-Suk Kwon1,2; 1Optical Engineering, Sejong Univ., Republic of Korea. We propose a metal-oxide-silicon-oxide-metal (MOSOM) waveguide that is a hybrid plasmonic waveguide, and we discuss its fabrication process based on standard CMOS fabrication tools. Its characteristics are theoretically investigated and explained.

IMB • 11:40
Sessions continue on page XX.
10:30–12:30
SLMA • Applications of Slow/Fast Light
Luc Thévenaz; Ecole Polytechnique Federale de Lausanne, Switzerland, Presider

SLMA1 • 10:30
Invited
Progress in Slow/Fast/Stopped Light, Jacob Khurgin; Johns Hopkins Univ., USA. The past 5 years have seen rapid developments of methods for manipulating the group velocity of light. In this talk we assess the current state of slow light versus fundamental limitations and attempt to identify promising application niches for slow and fast light.

SLMA2 • 11:00
Invited
Movable Dynamic Grating-Based Optical Delay Line in Polarization Maintaining Fibers, Sanghoon Chin1, Nikolay Primerov1, Luc Thévenaz2, Leonora Ursini1, Marco Santagiustina2; 1EPFL, Switzerland; 2Univ. of Padova, Italy. A new type of all optical delay line is realized in fibers. A local dynamic grating reflector can be generated everywhere in the fiber, demonstrating >1 us delay for 650 ps pulses.

SLMA3 • 11:30
All-optical Calculus Based on Dynamic Brillouin Grating Reflectors in Optical Fibers, Nikolay Primerov1, Sanghoon Chin1, Luc Thévenaz2, Leonora Ursini3, Marco Santagiustina2; EPFL, Switzerland; 1Univ. of Padova, Italy. We experimentally demonstrate that all-optical signal calculus can be realized based on dynamic Brillouin gratings in optical fibers. Temporal integration and first-order differentiation were performed for optical pulse with various waveforms.

10:30–12:30
SMB • Subwavelength and Plasmonic Sensors
Gilberto Brambilla, University of Southampton, UK, Presider

SMB1 • 10:30
Invited
Subwavelength Hot Spot Generation for Sensor Applications, Byeoungho Lee1, Sookyoung Roh1, Dongho Oh1, Gun-Bam Park1, Eui-Young Song1, Seong-Woo Choi1, B. Min Lee1; 1Dept. of Electrical Engineering, Seoul Natl. Univ., Democratic People’s Republic of Korea. We present various methods for the generation of subwavelength plasmonic hot spots for sensor applications. It is shown that the structured nano-apertures on the metal film exhibit extremely small hot spots with enhanced field intensity.

SMB2 • 11:00
Nanoparticle Identification from a Liquid Matrix Using the Maximum Entropy Method for SPR Reflectance, Jarkko J. Saarela1, Erik M. Vartiainen2, Kai-Erik Peiponen3; 1Center for Functional Materials, Abo Academi University, Finland; 2Department of Physics, Lappeenranta Univ. of Technology, Finland; 3Department of Physics and Mathematics, Univ. of Eastern Finland, Finland. We show that surface plasmon resonance (SPR) reflectance measurement can be used to identify nanoparticles from a liquid matrix using the maximum entropy method once the optical properties of the host liquid are known.

SMB3 • 11:15
Vertical Wall Affinity Sensor with Polarization Diversity, Mohammad Alam1, Stewart Aitchison1, Mo Mojahedi1; 1Univ. of Toronto, Canada. We propose a highly sensitive biosensor consisting of a vertical metal plane separated from a vertical silicon layer by a narrow gap. The sensor provides high sensitivity and polarization diversity.

10:30–12:15
SOMB • 2um Fiber Lasers
Bryce Samson, Nufern, USA, Presider

SOMB1 • 10:30
Invited
Resonantly Pumped 2 μm Holmium Fibre Lasers, Alexander Hemmeng1, Shapu Bennett2, Nikola Simic2, Alan Davidson2, John Haul2, Adrian Carter2; 1DSTO, Australia; 2Nufern, USA. We have demonstrated the first resonantly pumped double-clad holmium-doped fibre laser. An output power of 99W with 65% slope efficiency versus absorbed power was achieved at 2.12μm.

SOMB2 • 11:00
2um Fiber Lasers, Martin Richardson, Lawrence Shah, R. Andrews Sims, Christina C.C. Willis, Pankaj Kadwani, Joshua Bradford; CREOL, Univ. of Central Florida, USA. We review recent progress exploiting the unique characteristics of high power 2 um Tm fiber lasers in the spectral and the temporal domains. These developments offer new opportunities for applications in many areas.

SOMB3 • 11:30
Tunable Operation of Tm-Doped Fiber Ring Laser Controlled by Microbend-Induced Fiber Grating, Hayime Sakata1, Marie Ishikawa1, Shunto Araki1, Hironori Nakagomi1; 1Electrical and Electronic Engineering, Shizuoka Univ., Japan. We demonstrate a 1.9 μm band Tm-doped fiber ring laser by using bi-directional pumping with 1.6 μm laser diodes. The lasing wavelength is controlled by shifting the inter-resonance-mode passband due to a microbend-induced long-period fiber grating.
Kang1, Dong Wang2, Ping Li1; 1Research Institute of Posts and Telecommunications, Information & Electronics Technology Lab, China. A scheme for in-service measurement of fiber fault in WDM-PON is proposed, which can monitor all the fiber branches simultaneously without disturbing the service, and locate the failure point accurately by a selective OTDR.

Pier 9
Access Networks and In-house Communications

Pier 7 & 8
Signal Processing in Photonics Communications

Harbour Salon B
Integrated Photonics Research, Silicon and Nano Photonics

Harbour Salon C
Integrated Photonics Research, Silicon and Nano Photonics
Phase Locking of SBS Slow Light in a 2.2-km Single-Mode Fiber, Joseph E. Vornehm1, Aaron Schweinsberg1, Zhimin Shi1, Robert Boyd1,2; 1Inst. Of Optics, Univ. of Rochester, USA; 2Dept. of Physics, Univ. of Ottawa, Canada. A stimulated Brillouin scattering (SBS) slow light system in a 2.2-km single-mode fiber was phase locked to a reference signal. Optical pulses of 6.5 ns duration were delayed 0.9 pulse width while maintaining lock.

Ultra-Sensitive (Acoustic) Pressure Sensor with High Temporal Resolution, Balthasar Fischer1, Ernst Wintner1; 1Photonics Institute, Univ. of Technology Vienna, Austria. A novel all-optical pressure sensor is presented. Based on a rigid Fabry-Perot, the transducer detects refractive index changes induced by pressure fluctuations. This design is so sensitive that the miniaturized device is applicable as microphone.

Invited Tm-doped Multi-component Glass Fibers for 2um Fiber Lasers, Shibin Jiang1; 1Advalue Photonics, USA. Highly Tm-doped silicate glasses and fibers exhibit a high slope efficiency of 68.3% and a gain per unit length of greater than 2dB/cm. Single frequency fiber lasers with laser linewidth less than 3kHz, Q-switched single frequency fiber lasers, and mode-locked fiber lasers near 2 micron wavelength were demonstrated using this newly developed fiber.

Microwave Photonics Applications Using Slow and Fast Light Effects, Juan Sancho1, Juan Lloret1, Ivana Gasulla1, Salvador Sales1, Jose Capmany1; 1TEAM Res. Inst., Univ. Politècnica Valencia, Spain. We review the potential applicability of SFL techniques to the field of Microwave photonics. The main results obtained for several applications such as filtering, phased array antennas, arbitrary waveform generation and OEO will be analyzed.

Infrared radiation detector interrogated by Optical Frequency Domain Reflectometer (OFDR), Kivilcim Yüksel1, Christophe Caucheteur1, Jean-Michel Renoirt2, Patrice Méger1, Marc Debliquy2; 1Electromagnetism and Telecommunications, U-MON, Belgium; 2Material Science Unit, Univ. of Mons, Belgium. We experimentally demonstrated a fast infrared radiation sensor. The system is applicable in a quasi-distributed configuration to cover a large area using a single interrogation unit (OFDR) for early fire detection.

Truly Continuous-Wave Spatial-Domain Cavity Ring-Down Technique Based on Frequency-Shifted Interferometry, Fei Ye1, Bing Qi1, Li Qian1; 1Department of Electrical and Computer Engineering, University of Toronto, Canada. We present a novel spatial-domain cavity ring-down technique using frequency-shifted interferometry, by monitoring the intensity decay of a continuous-wave beam circulating in a fiber-loop cavity. It was applied to fiber bend loss measurements.
The “Five W’s” of OFDM for Optical Access: What, Why, Where, When and How? Neda Cejovicic; 1NEC USA, USA. The “Five W’s” of OFDM-based optical access are addressed, covering technology principles and recent progress, application scenarios for future PON systems, the near-term development timeline, and the practical outlook for key DSP-based enabling technologies.

A Novel Upstream Link Scheme for OFDM-PON, Qingyi Gou1, Kan He2, Xue Li1, Weiping Huang1; 1Dept. of Electrical and Computer Engineering, McMaster Univ., Canada. We propose an efficient OFDM-PON scheme: orthogonal subcarrier multiplexing at the ONU with colorless laser diode, and all-optical FFT at the OLT for high speed demultiplexing. The deterioration caused by laser perturbation is also investigated.

Digital Signal Processing for Multi-gigabit Real-time OFDM, Qiang Yang1; State Key Laboratory of Optical Communication Technologies and Networks, China. We summarize the digital signal processing for multi-gigabit real-time optical OFDM. Various OFDM procedures and algorithms are discussed with a focus on OFDM receiver implementation.

A Comprehensive Study of the Far Field of Bragg Reflection Waveguides, Yuji Yamasaki1, Junji Yamauchi1, Hisamatsu Nakano1; 1Hosei Univ., Japan. A broadband mirror consisting of a periodic structure is greatly saved. The concentration of the scatterers and full width at half maximum) on the size and dependence of the spectral features (wavelength and lattice architectures for a four-pole, four-zero photonic filter implemented using high-Q resonator-based components on SOIs. These filters are fully reconfigurable and very compact (total area 0.15 mm2).

Analyzing Photonic Crystals with Arbitrary Unit Cells Using Boundary Integral Equations, Wantoong Li1, Ya Xion Li1; 1Joint Advanced Res. Ctr. of USC and City Univ., China; 2Univ. of Science and Technology of China, China; 3City Univ. of Hong Kong, Hong Kong. An accurate boundary integral equation method is developed for analyzing 2D photonic crystals where the cylinders in the unit cells have arbitrary shapes and corners. It first calculates the so-called Neumann-to-Dirichlet map for unit cells.

Engineering Circular Multiple Light Scattering For Polarization-Insensitive Planar Diffraction, Jacob Trevino1, Luca Dal Negro2; 1Division of Material Science and Engineering, Boston Univ., USA; 2Electrical and Computer Engineering, Boston Univ., USA. Plasmonic apertural spirals, which are shown to support structural resonances carrying orbital angular momentum, are investigated by dark-field imaging with analytical multi-particle calculations in the framework of the Generalized Mie Theory.

Comparison of Cascade, Baseline, and Lattice Architectures for Ultra-Compact RF Photonic Filters on SOI, Payam Alipour1, Ali Aghbar Efkanib1, Amir Houssein Aubakki1, Qing Li1, Sira Venugopalan1, Omer K. Mait1; 1Georgia Inst. of Technology, USA; 2Texas A&M Univ., USA. We compare the cascade, baseline, and lattice architectures for a four-pole, four-zero photonic filter implemented using high-Q resonator-based components on SOIs. These filters are fully reconfigurable and very compact (total area 0.15 mm2).

Full-Vectorial Finite-Difference Scheme for the Analysis of Thin Layered Structures, Cheng-Huan Dai1, Yih-Peng Chiou1; 1Graduate Inst. of Photonics and Optoelectronics, Natl. Taiwan Univ., Taiwan; 2Dept. of Electrical Engineering, Nat. Taiwan Univ., Taiwan. We develop a full-vectorial finite-difference formulation for layered structures. Fields and their derivatives across the layers are related by matrices. Sampled points can step over multiple layers. The computation is greatly saved.

Effects of Scattering Size and Concentration on the Spectral Features of Dye-Based Random Lasers, Nataliano Cuando-Espinosa1, Ivan Hernandez-Cordero1, Crescencio Garcia-Segundo1, Rosa Quipe-Sierra1; 1Inst. de Investigaciones en Materiales, Mexico; 2Centro de Ciencias Aplicadas y Desarrollo Tecnologico, UNAM, Mexico. Random lasers varying concentration and size of SiO2 scatterers were analyzed. We report on the dependence of the spectral features (wavelength and full width at half maximum) on the size and concentration of the scatterers.

Sessions continue on page XX.
In analogy to electromagnetically induced transparency observed in atomic systems, we demonstrate that the transmission of a probe laser beam through an optomechanical device can be observed in atomic systems. We discuss the benefits of using optomechanical devices for enhanced detection sensitivity.

We report the absorption spectra and optical properties of a 1.5-μm-diameter microfiber embedded in a microchip for high sensitivity evanescent field absorption detection. We discuss the advantages of using microfibers for high-sensitivity absorption detection compared to traditional fiber gyroscopes.

A small section of extruded green fiber of ceramic YAG has been sintered for approximately 1 minute. We present the system for steering a coherently-combined multi-aperture slow-light laser radar. The system incorporates slow-light elements, using dispersive delay and SBS, to ensure power overlap at the target.

We discuss the results of a proof-of-concept system for an embedded optical microfiber coil on an embedded optical microfiber coil. We present the theoretical and experimental results of a fiber-optic device for mid-infrared applications from 2-12 microns. Our innovative mid-infrared fiber enables the development and production of leading-edge critical devices.

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Novel 16QAM Detection Scheme for Optical Access Networks, Nikolaos Sotiropoulos, Hau de Waardt, A. Koonen; ‘Electrical Engineering, Eindhoven Univ. of Technology, Netherlands. In this paper, incoherent detection of a square 16QAM signal is demonstrated for the first time using simulations and the scheme’s suitability for future optical access networks, along with conventional coherent detection, is explored.

Noise ICI Mitigation for CO-OFDM Transport Systems, Mohammad Ebrahim Mousa Pasandi, Mohammadreza Khorasaninejad, Anant M. P. Anantram; 1Electrical and Computer Engineering, McMaster Univ., Canada; 2Omega Optics, USA. We investigated the feasibility of using a mode converter and a photonic crystal light waveguide to delay a set of optical signals for self-mixing and a dispersive compensation fiber of a 100-nm chirped fiber grating over up to 70nm-broadband to experimentally demonstrate highly efficient loss coupling into slow light slotted photonic crystal waveguide on silicon nanomembrane and chips together with ultra-low power massively parallel optical interconnects.

All-Optical Signal Processing using Optical Nonlinearities, Alan Willner; Univ. of Southern California, USA. Optical nonlinearities can be used to transparently manipulate a high-speed optical data signal in amplitude, phase and wavelength. This paper will discuss various signal processing applications such as: constellation manipulation, traffic grooming and channel equalization.

Simple incoherent interferometry technique is demonstrated and applied for accurate real-time group delay monitoring of a dispersion-compensating fiber and of a 100-nm chirped fiber grating over up to 70nm-broadband at 15frames/s update rate.

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Light Propagation in 3-D Photonic Crystals, Susumu Noda, Kenji Ishizaki; Kyoto Univ., Japan. We introduce recent progress on the control of light propagation in three-dimensional (3-D) photonic crystals. We demonstrate 3-D guiding within photonic crystal-embedded waveguides. A novel controlling approach using the surface of crystals is also discussed.

Real-Time Group Delay Monitoring of Ultra-wide-Band Dispersive Devices by Low-Noise Incoherent Interferometry, Antonio Malacarne, Yongwoo Park, Joel Azabu; INRS-EMT, Canada. Simple incoherent interferometry technique is demonstrated and applied for accurate real-time group delay monitoring of a dispersion-compensating fiber and of a 100 nm-chirped fiber grating over up to 70 nm-broadband at 15 frames/s update rate.

Experimental Demonstration of Ultra-Low Loss Coupling into Slow Light Slotted Photonic Crystal Waveguide on Silicon Nanomembrane, Che Yeon Lii, Xiaolong Wang, Swapnajit Chakravarty, Wei-Cheng Lai, Yi Zou, Ray T. Chen; ‘Electrical and Computer Engineering, Univ. of Texas at Austin, USA; ‘Opmeq Optics, USA. We experimentally demonstrate highly efficient coupling to a slotted photonic crystal waveguide using a mode converter and a photonic crystal impedance taper. Measurements show a -26dB insertion loss for coupling in/out of the slow light waveguide.

Post-Fabrication Tuning of Silicon Microring Resonators by Femtosecond Laser Modification, Daniel Buchman, Zhiqiang Chen, Ashok M. Prabhu, Robert Fedosejevs, Ying Tzial, Vien Van; ‘Electrical and Computer Engineering, Univ. of Alberta, Canada. We investigated the feasibility of post-fabrication tuning of Silicon microring resonators by fs laser modification at 400nm wavelength. Red and blue shifts were obtained for different laser fluences, with a maximum resonance shift of 10nm/shot.

Experimental Demonstration of Ultra-Low Loss Coupling into Slow Light Slotted Photonic Crystal Waveguide on Silicon Nanomembrane, Che Yeon Lii, Xiaolong Wang, Swapnajit Chakravarty, Wei-Cheng Lai, Yi Zou, Ray T. Chen; ‘Electrical and Computer Engineering, Univ. of Texas at Austin, USA; ‘Opmeq Optics, USA. We experimentally demonstrate highly efficient coupling to a slotted photonic crystal waveguide using a mode converter and a photonic crystal impedance taper. Measurements show a -26dB insertion loss for coupling in/out of the slow light waveguide.

Optical Bio-Chemical Sensors on SNOW Ring Resonators, Mohammadreza Khorasaninejad, Anant M. P. Anantram, Saimarjai Saini; ‘Univ. of Waterloo, Canada; ‘Univ. of Washington, USA. In this paper we propose novel ring resonator based bio-chemical sensors on silicon-nanowire-optical-waveguide and show that the sensitivity can be increased by an order of magnitude as compared to Silicon-on-insulator based ring resonators.

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Simple incoherent interferometry technique is demonstrated and applied for accurate real-time group delay monitoring of a dispersion-compensating fiber and of a 100 nm-chirped fiber grating over up to 70 nm-broadband at 15 frames/s update rate.

We study the effects of clipping and quantization noise on the performance of an optical OFDM system. To this end we derive a closed-form formula that links optimum clipping with the bit resolution of signal converters.

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Tunable Light-Storage for almost 1 Microsecond, Thomas Schneider1, Stefan Preusser1, Kambah Janohali1; HFT, HFT-Leipzig, Germany. We discuss the method and show experimental results with a delay-bandwidth product of around 700 Bit.

All Optical Control of the Group Velocity, Central Frequency and Spectral Bandwidth of a Laser Pulse. Stefano Cavalleri1, Emiliano Salti1, Emilio Ignesti1, Roberto Buffa1, Lorenzo Finti1, Marco Tognetti2; Physik, Univ. di Firenze, Italy; Physics, Univ. di Siena, Italy; LENS, Univ. di Firenze, Italy. We present recent results on different schemes (involving both coherent and incoherent interactions) that allow all-optical control of several properties of a large-spectral-bandwidth (up to 3.3 GHz) laser pulse propagating in an atomic medium.

Characterization of a Low-Cost Long-Period Fiber Grating Induced by a Polymeric Microstructure. Jorge A. Soto-Olmos1, Juan Hernandez-Cordova1, Laura Orpezas Ramos1; Departamento de Electricitva, Facultad de Ingenieria, Univ. Nacional Autonoma de Mexico, Mexico; Inst. de Investigaciones en Materiales, Univ. Nacional Autonoma de Mexico, Mexico. In this paper a low-cost long-period fiber grating induced by a polymeric microstructure is reported. Fabrication and characterisation of the device and experimental results of the spectrum variations due to external pressures are presented.

A Simple Bend Sensor Based on Multimode Interference and a Twin Core Fiber Mach-Zehnder Interferometer. Aissa Harhira1, Jerome Lapointe1, Raman Kashyap1; Ecole Polytechnique de Montreal, Canada. An optimized Bend Sensor based on a multimode interference combined with a twin-core fiber is proposed. The bend induced wavelength shifts on the interference fringes is experimentally monitored. Losses in multimode fiber are studied.

Slow and Fast Light

Extended Frequency Operation of Slow Light in Semiconducting Optical Amplifiers. Sean O’Duell1, Gadi Eisenstein1; Electrical Engineering, Technion, Israel. We present a scheme to extend the frequency operation of phase shifters based on slow light in semiconductor optical amplifiers. We show that phase-shifting can be performed on microwave signals at frequencies approaching 100 GHz.

Infrared and Raman Spectroscopic Imaging for Histopathology. Rohit Bhargave, Univ. of Illinois, USA. We present a new approach to recognizing cell types and disease states in tissue using vibrational spectroscopic imaging. Theory, instrumentation, pattern recognition algorithms and applications in specific areas will be discussed.

Fluoride Glass Fibers, Mohammad Saad1; IR-Photonics Canada, Canada. There is an increasing demand on high quality optical fibers that transmit over 2 microns, where silica fibers are opaque, for applications as divers as spectroscopy and sensing, laser power delivery, fiber lasers, fiber amplifiers, defense (IRCM). The talk will focus on latest development of fluoride fibers.

Advanced Photonics: OSA Optics & Photonics Congress • 12–15 June 2011
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Continued

A Practical Coherent WDM PON, Yun C. Chung; 1Dept. EE, KAIST, Republic of Korea.

We review the recent progresses in the coherent WDM PON technologies achieved at KAIST. Using these technologies, we demonstrate the feasibility of implementing practical long-reach and high-split WDM PONs.

Performing a DSP Phase Control Method for Phase Regenerators Based on Phase Sensitive Amplification, Shu Zhang, John Cartledge; 1Electrical and computer engineering, Queen’s University, Canada. A digital signal processor based phase control method is investigated for all-optical phase regeneration using phase sensitive amplification. The phase Q factor is improved by 5.3-7.3 dB for a sampling rate of 312.5 Ms/s.

Analysis of a Coupled-Mode Theory for Modeling Polarization in a Bidirectional Fiber System, William Lee, Li Qian; 1ECE, University of Toronto, Canada. We present for the first time, methods to model the polarization of the output lightwave of a bidirectional fiber-optic system, in which the lightwave propagates through polarization control elements in both directions.

Using Photonic crystal nanocavities, we first dramatically enhance third harmonic generation from silicon. Then, by virtue of a strong Purcell factor, we significantly increase defect state photoluminescence and greatly suppress thermal quenching.

Photonic wire waveguides are patterned with periodic gaps and filled with Si-8 polymer to cancel the silicon thermo-optic effect.

Noting these concurrent sessions are grouped across two pages. Please review both pages for complete session information.

SPMC • Optical Techniques I—Continued

Scalable Photonic-Assisted Wideband Frequency Converter, Charles Middleton2, Richard DeSalvo; 1Harris Corporation, USA. We present a photonic-assisted wideband tunable RF frequency converter with low phase noise to provide RF to IF frequency translation, and demonstrate 121 dBc/Hz-2/3 dB spur-free dynamic range at 20 GHz RF and 2 GHz IF.

IMEF • Nanophotonics: Photonic Crystals and Nanowires—Continued

IMEF3 • 16:45
Enhanced Light Emission from Silicon Using Photonic Crystal Nanocavities, Liam O’Faolain1, Matteo Galli1, Abdul Shaker2, Roberto Lo-Santo2, Simone Portoli2, Karl Welna1, Dario Gervasio, Giorgio Giuzzetti1, Lucio Claudio Andreani2, Thomas Krauss1, Alessia Irrera3, Ganga Franz2, Francesco P jodo1, SUPA, School of Physics and Astronomy, Univ. of St Andrews, UK; 2Dipartimento di Fisica “A. Volta”, Univ. Degli Studi di Pavia, Italy; 3MATS-IMM-CNR, Italy. Using Photonic crystal nanocavities, we first dramatically enhance third harmonic generation from silicon. Then, by virtue of a strong Purcell factor, we significantly increase defect state photoluminescence and greatly suppress thermal quenching.

IMEF4 • 17:00
Silicon Photonic Wire Bragg Grating for On-chip Wavelength (De)Multiplexing Employing Ring Resonators, Paul Mould1, Roman Bruck1, Matthias Karl1, Matthias Bau1, Thorsten Wahlbrink2, Ramer Hainberger1, Health & Environment, AIT Austrian Inst. of Technology GmbH, Austria; 1AMO GmbH, Germany. We present the design and experimental demonstration of a highly reflective silicon photonic wire Bragg grating operated for TM-polarized light at a wavelength of 1550 nm.

IMEF5 • 17:15
Photonic Band Structure of Circular Photonic Crystals in Silicon-on-Insulator Slab by Surface Coupling Reflectivity Technique, Jian H. Lin1, Dank Bich Do1, Georg W. Rieger2, Jeff F. Young1, Hung-Chih Kuo1, Chia Chen Hsu3; 1Graduate Inst. of Opto-Mechatronics, Natl. Chung Cheng Univ., Taowian; 2Dept. of Physics, National Chung Cheng Univ., Taiwan; 3Graduate Inst. of Opto-Mechatronics, Natl. Chung Cheng Univ., Taiwan. We characterized the photonic band structure of a two dimensional (2D) circular photonic crystal (CPC) silicon membrane slab waveguide with surface coupling reflectivity (SCR) technique.
Control of Slow and Fast Light by Incoherent Interactions in Atomic Schemes, Stefano Cavalieri, Emilio Ignesti, Marco Tognetti, Roberto Buffa, Lorenzo Fini, Emiliano Sali, Federico Tommansi. Physics, Univ. di Firenze, Italy; Physics, Univ. di Siena, Italy; LENS, Univ. di Firenze, Italy. We present recent theoretical and experimental results concerning both retardation and acceleration of light pulses in schemes involving a second ‘control’ laser field but that do not involve any coherent preparation of the atomic medium.

Simultaneous Two-Channel Slow Light, Anil K. Patnaik, Paul S. Hsu, Sukash Ray, James R. Gord; AFRL, USA; Physics, Wright State Univ., USA; Spectral Energies, LLC, USA. Simultaneous control of light speed in two channels in a single delay element of a rubidium vapor cell is demonstrated.

Optical Precursors in Slow and Fast Light Media, Shengwang Du, Jiefei Chen, Michael M. Loy; Physics, Hong Kong Univ. of Science and Technology, Hong Kong. We observe optical precursors generated from slow and fast light cold atomic media. Using constructive interference between sequenced precursors, we produce optical transient pulses with peak powers of about 9 times the input power.
**AMD • Hybrid and WDM-PON—Continued**

**Optical Subsystems for Next Generation Access Networks**, Jose A. Lazaro1, V. Polo1, B. Schrenk1, F. Bonade1, I. Cani1, E. T. Lopez1, C. Kaczmierk2, G. de Valicourt1, R. Brenot1, J. Beaulieu1, X. Z. Qu1, F. Ouisse4, M. Forzati3, P.-J. Rigne1, L. T. Monroy1, E. Tanghonggu1, M. Mora1, L. Nicolescu1, A. L. Tesi1, D. Ferras1, D. Klonidis14, T. Tomk15, J. Prat15, C. Kouloumentas16, H. Aramopoulos16; 1Univ. Politècnica de Catalunya, Dept. TSC, Spain; 2Alcatel-Thales III-V labs, a joint Laboratory of “Alcatel Lucent Bell Labs” and “Thales Research & Technology” Campus Polytechnique, France; 3INTEC/IMEC-Ghent University, Gent, Belgium; 4Lynnall National Institute & Univ. College Cork, Ireland; 5Networking and Transmission Laboratory, Acreo AB, Sweden; 6IGNIS, Torshamngatan, Sweden; 7Danmarks Tekniske Universitet (DTU), Denmark; 8Technische Universiteit Eindhoven (TU/e), The Netherlands; 9Nanophotonics Technology Centre, Univ. Politècnica de Valencia, Spain; 10Institute of Telecommunications (IT), Portugal; 11Institut Telecom, France; 12Athens Information Technology (AIT), Greece; 13School of Electrical & Computer Engineering, National Technical University of Athens, Greece. Recent optical technologies are providing higher flexibility to next generation access networks: on the one hand, providing progressive FTTx and specifically FTTH deployment, progressively shortening the copper access network; on the other hand, also opening fixed-mobile convergence solutions in next generation PON architectures. It is provided an overview of the optical subsystems developed for the implementation of the proposed NG Access Networks.

**IMF • Nanophotonics: Photonic Crystals and Nanowires—Continued**

**Temperature-enhanced Light Emission from Er:TeO2 Photonic Crystals**, Pao T. Lin1, Michiel Vanhout1, Juejun Hu2; 1Materials Science and Engineering, Massachusetts Inst. of Technology, USA; 2Materials Science and Engineering, Univ. of Delaware, USA. Photonic crystals are fabricated in Er-doped TeO2 films. Strong photoluminescence around 1530 nm is observed by 488-532 nm laser pumping. 98x enhanced emission is demonstrated after annealing the thin films at 600°C.

**IMF7 • 17:45**

**Thermal Radiation from Patterned Platinum Microstructures**, Gabriel Vassil2, Mustafa Arikan1; 1National Inst. of Res.-Development for Cryogenics and Isotopic Technologies, Romania; 2Institute for Microwaves and Photonics, National Technical University of Athens, Greece. We investigate thermal radiation from Pt microheaters with Au nanoparticles deposited. Polarization resolved thermal radiation was measured. Measurements show intensity of radiation is multiplied by factor of 2-3 for NP’s deposited microheaters.
SLMC • Atomic and Rare-Earth Systems and Applications—Continued

SLMC6 • 17:30
Optical Pulse Differentiation Based on a Resonant Slow & Fast Light System, Sanghoon Chin1, Tae-Jung Ahn2, Luc Thévenaz1; 1Ecole Polytechnique Federale de Lausanne, Switzerland; 2Photonics Engineering, Chosun Univ., Republic of Korea. We experimentally demonstrate that temporal differentiation of optical pulses can be realized in a slow & fast light system based on a resonance. The waveform of a 13 ns Gaussian pulse was experimentally first-order differentiated.

SLMC7 • 17:45
Enhanced Echo Retrieval Efficiency Using Ultraslow Light, J. Hahn1, Byoung S. Han1; 1School of EE, Inha Univ., Republic of Korea. Using ultraslow light phenomenon, we report two-orders of magnitude enhanced photon echo efficiency in a rare-earth doped solid medium, where the enhancement is due to lengthened photon-atom interaction time in a dilute optical medium.

SMD • SMD—Continued

SMD4 • 17:30
A Near-Infrared LED-based Material Classification Sensor System, Oliver Schwabe1,2, Uwe Kockemann1, Holger Steiner1, Norbert Jung1; 1Computer Science, Bonn-Rhine-Sieg Univ. of Applied Sciences, Germany; 2DFG Research Training Group 1564, Univ. of Siegen, Germany. In safety applications it is often desired that certain materials do not enter a dangerous area. This paper presents a near-infrared LED-based sensor system for robust material classification and ranging up to a distance of 1,000mm.

SMD5 • 17:45
Resonant Cavity Enhanced LWIR Sensing in Polycrystalline Pb1-xSnxTe, Timothy W. Zens1, Piotr Becla1, Lionel Kimerling1, Anu Agarwali; 1Microphotonics Center, Massachusetts Inst. of Technology, USA. Polycrystalline Pb1-xSnxTe LWIR photodetectors have been fabricated in resonant cavity structures on Si platforms. We describe the fabrication process and report detector performance demonstrating the feasibility of monolithic LWIR detectors-on-ROIC.

18:30–20:00 Advanced Photonics Congress and OIDA Welcome Reception, Metro Ballroom West

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Semiconductor Optical Amplifiers in Extended Reach PONs, Jürg Leuthold, W. Freude, C. Koos, R. Bonk, S. Koenig, D. Hilkerkus, R. Schmogrow; Institute of Photonics and Quantum Electronics (IPQ) & Institute of Microstructure Technology (IMT) at Karlsruhe Institute of Technology, Germany. Design guidelines for semiconductor optical amplifiers (SOAs) in extended reach PON networks are discussed. Important parameters such as the input saturation power or the alpha factor and their impact in PON networks are discussed.

WDM PON Based on Silicon Photonic Micro-ring Modulators, Kevin Bergman; Columbia Univ., NY, USA. We demonstrate an optical access network architecture uniquely enabled by CMOS compatible silicon micro-rings. The wavelength selective behavior of micro-ring modulators enables single-sideband modulation, which simultaneously generates downstream signals and performs re-modulation.

Implementation and Evaluation by Hardware Emulator of Soft-Decision Forward Error Correction for 100G Systems, Kiyoshi Onobara, Yoshihiko Miyata, Kenya Sugihara, Takashi Sugihara, Kazuo Kubo, Hideo Yoshida, Kazumiti Koguchi, Takashi Mizowaki; Mitsubishi Electric Corp., Japan. We discuss implementation and performance evaluation of LDPC (6480, 4080) for 100Gbs throughput by hardware emulator. We expect that an NCG of the LDPC code concatenated with enhanced FEC is 10.8 dB at a BER of 10^-15.

Amalouit Code against PDL in Polarization Multiplexed Systems, Sami M人民银行, Ghaya Bekaya-Ben-Othmane, Yves Iaouni, Jingyi Li, Sven Koenig, Rene Schmogrow; Jürg Leuthold; 3Comtec, Télécom Paristech, France; Institute of Photonics and Quantum Electronics, Karlsruhe Institute of Technology (KIT), Germany. We theoretically and experimentally investigate the performance of the Amalouit polarization-time code to mitigate PDL. We show that due to the orthogonal structure of its codewords, it can entirely compensate PDL.

On the Joint Optimization of Modulation and Channel Coding for High Data-Rate Optical Communication Systems, Paolo Leone, Stefano Calabrò, Berthold Lanki, Bernhard Spindler; 1Universität der Bundeswehr München, Germany; 2Nokia Siemens Networks GmbH & Co KG, Germany. We present a method to jointly optimize modulation and channel coding for high data-rate, non-differentially encoded optical systems, taking phase noise into account. Applied to 100G systems, it shows that constellation expansion might be beneficial.
These concurrent sessions are grouped across two pages. Please review both pages for complete session information.

**AfUa • Basic Technologies for NG-PON—Continued**

*AfUaA • 9:30*
Bandwidth Distribution with Adaptive Threshold-based Optical Burst Assembly in Long-Reach EPON, Burak Kantarci1, Hussein T. Mouftah1; 1School of Information Technology and Engineering, Univ. of Ottawa, Canada. Long-reach PONs (LR-PONs) suffer from high delay due to long feeder distance. Here, we present a new bandwidth distribution approach which adopts multi-server polling in LR-EPON and adaptive threshold-based burst assembly in OBS networks.

*AfUaA • 9:45*
Contention Resolution Using Control Packet Buffering in Optical Burst Switched Networks, Ahmed I. Abdoubehman1, Hossam Shalaby1, Sherif Rabie1; 1Faculty of Engineering, Alexandria Univ., Egypt; 2Faculty of Information Technology, Hokkaido Univ., Japan. In this paper a novel contention resolution technique based on control packet buffering in OBS networks is proposed. This buffering is implemented in the electronic domain, thus avoiding complex optical domain solutions.

**AfUa • Devices and Components II—Continued**

*AfUaA • 9:30*
First Demonstration of Cavity-Resonator-Integrated Guided-Mode Resonance Filter, Kenji Hatanaka1, Tatsuya Majima2, Junichi Inoue3; 1Natl. Inst. of Advanced Industrial Science and Technology, Japan; 2Dept. of Electronics, Kyoto Inst. of Technology, Japan; 3Research Inst. for Electronic Science, Hokkaido Univ., Japan. A guided-mode resonance filter integrated in a waveguide cavity resonator was designed and fabricated for miniaturization of aperture size. A high-reflection filter at around 850-nm wavelength was experimentally demonstrated for the first time.

*AfUaA • 9:45*
Resonant Cavity Enhancement of Polycrystalline PbTe Films for Two-Color IR detectors on Si-ROICs, Timothy W. Zens1, Jianfei Wang2, Michelle Y. Xu1, Stewart Aitchison1, Mo Mojahedi1; 1Univ. of Toronto, Canada. Novel dielectric strip grating embedded trapezoidal SPP waveguides are designed, fabricated, and characterized in air and under index matching oil. Their performance has demonstrated the feasibility of monolithic IR detectors-on-ROIC.

**AfUa • Nanophotonics: Plasmonics and Applications I—Continued**

*AfUaB • 9:45*
Dielectric Strip Grating Embedded Trapezoidal Plasmonic Waveguide, Michelle Y. Xu1, Stewart Aitchison1; 1Univ. of Toronto, Canada. Novel dielectric strip grating embedded trapezoidal SPP waveguides are designed, fabricated, and characterized in air and under index matching oil. The resonance has a 1100 nm/RIU sensitivity and is validated by calculation.

10:00–10:30 Coffee Break, Pier 4/ Harbour Ballroom Foyer

10:00–16:00 Exhibits Open, Pier 4/ Harbour Ballroom Foyer
SLtU A • Slow/Fast Light in SOAs and Photonic Crystals—Continued

SLtU A4 • 9:30  Invited
Direct Observation of Temporal Solitons and Pulse Acceleration in III-V Semiconductor Photonic Crystal Waveguides, Timothy Karle1, Paul Monnier1, Sylvain Combrié2, Alfredo de Rossi2, Fabrice Raineri1, Rama Raj1; 1LPN-CNRS, France; 2Thales Res. and Technology, France. Temporal mapping of 20pJ pulse propagation in a 2DPhC waveguide show of soliton formation. For high signal powers the photonic band is modified influencing the group velocity leading to an acceleration of the pulse propagation.

STu A • High Intensity and Broadband THz Sources—Continued

STu A4 • 9:30  Invited
High Power Terahertz Pulse Generation, Imaging, and Detection, Frank Hegmann; 1. The generation of intense single-cycle THz pulses by tilted-pulse-front techniques for probing ultrashort nonlinear THz dynamics in semiconductors is described. Full-field imaging of THz Cherenkov waves and novel THz pulse detection methods are also discussed.

Supercontinuum Fiber Lasers—Continued

SOTu A4 • 9:30  Invited
Infrared Supercontinuum Fiber Sources, L. Brandon Shaw1, Rafael Gattass1, Jas Sanghera1, Ishwar Aggarwal2; 1NRL, USA; 2Sotera Defense Solutions, USA. IR supercontinuum generation in chalcogenide glass fiber is reviewed. Modeling for optimizing supercontinuum generation, fiber design and fabrication, and experimental results are presented.

10:00–10:30 Coffee Break, Pier 4/ Harbour Ballroom Foyer

10:00–16:00 Exhibits Open, Pier 4/ Harbour Ballroom Foyer
Joint delivering > 30 Gb/s wireless data signals. We demonstrate practical RoF system implementations capable of satisfying multiple demands, including MIMO and mm-wave signal transmission at 60 GHz. We propose practical solutions and successfully address system challenges, including MIMO and mm-wave signal transmission. 

These concurrent sessions are grouped across two pages. Please review both pages for complete session information.

10:30 – 12:30
AtuB • Radio Over Fiber and OCDMA

Tomás Pfeiffer, Alcatel-Lucent, Germany, Presider

AtuB1 • 10:30  Invited
Techniques, Applications, and the Outlook of Radio-over-Fiber Networks, Anthony Ngoma1, Cerning Inc, USA. We discuss key RoF system challenges, including MIMO and mm-wave signal transmission at 60 GHz. We propose practical solutions and successfully demonstrate practical RoF system implementations capable of delivering > 30 Gb/s wireless data signals.

AtuB2 • 11:00
Research on OFDM-ROF system at Millimeter-wave Band Employing Optical External Modulator Generation, Zhe Kang1, Nianyu Zou1, Dong Wang1, Jinning Liu1, Yingming Gao1; Dalian Polytechnic Univ., Res. Inst. of Photonics, China; Beijing Univ. of Posts and Telecommunications, Information and Electronics Technology Lab, China. A 40GHz Radio-over-Fiber system is proposed to transmit 2.5Gb/s 16QAM-OFDM wireless signals with only 20GHz RF source. Simulation results show that a reliable EVM value is obtained after 40km SMF transmission.

AtuB3 • 11:15
Wireless Convergence over Next Generation OFDMA-PONs, Milos Milesovic1, Pandelis Kourtessis1, John Senior1; Univ. of Hertfordshire, UK. This paper demonstrates the feasibility of optical/wireless convergence based on DoF propagation. Network modelling results confirm the transmission of 16 CPRI signals up to 100km OFDMA-PON infrastructures achieving 40 Gbit/s total aggregate rates.

AtuB4 • 11:30  Invited
OCDMA and OFDMA Technologies for NG-PON, Ken-ichi Kitayama1; Chuo Univ., Japan. OCDMA and OFDMA are promising for NG-PON2, aiming at a revolution change after 2015. OCDMA and OFDMA can implement new demands for self-capacity on-demand, high data confidentiality, high bandwidth efficiency as well as low-power consumption.

10:30–11:45
SPTuB • Advanced Modulation

Rene Schmogrow, Karlsruhe Institute of Technology, Germany, Presider

SPTuB1 • 10:30  Invited
Ideal POL-QAM Modulation for Coherent Detection Schemes, Henning Biuelow1,2; ZE/Z/ON, Alcatel-Lucent, Germany; LIT, University Erlangen, Germany. The gain of POL-QAM at high OSNR can only be kept at low OSNR by increasing the complexity of the FEC decoder indicating that DSP effort has to be considered for a comparison versus PDM-QAM.

SPTuB2 • 11:00
Performance Evaluation of Coherent PS-QPSK (HEXA) Modulation, Gabriele Bosco1, Andrea Carra1; Politecnico di Torino, Italy. We investigate the performance of the 8-point four-dimensional PS-QPSK (HEXA) modulation format in uncompensated WDM long-haul optical transmission systems, comparing it to standard 16-point PM-QPSK and 4-point PM-BPSK constellations.

11:30–13:30 Lunch Break (on your own)

12:30–13:30
SPTuB • Advanced Modulation

Rene Schmogrow, Karlsruhe Institute of Technology, Germany, Presider

SPTuB3 • 11:30
A Modified CMA for PS-QPSK, Pontus Johannisson1, Martin Sjödin1, Magnus Karlsson1; Photonics Laboratory, Department of Microtechnology and Nanoscience, Chalmers University of Technology, Sweden. A modified constant modulus algorithm (CMA) is presented that allows polarization demultiplexing of polarization-switched QPSK. The suggested algorithm has been found to work well on both numerical and experimental data.

JTuA1 • 10:30  Plenary
Progress and Technical Challenges for Integrated Optics, Katawuri Okamoto1, AIST Corp., Japan. The paper reviews progress of integrated optics and discuss technical challenges of silicon photonics devices. It also describes a novel planar waveguide spectrometer based on Fourier transform spectroscopy.

JTuA2 • 11:15  Plenary
Shaping the Future of Nanobiophotonics, Kishan Dhokal1, Tomas Cicmaz1, Michael Mazilu1, Joerg Baumgartl1, Praveen Ashok1, Xanthi Tsampoulia1, Frank Gunn-Moore1; Univ. of St Andrews, UK. We describe the emerging field of Nanobiophotonics with an emphasis on shaping light and integration. Examples of advances in super resolved imaging, optical manipulation, Raman analysis and cell transfection will be presented.

JTuA3 • 12:00  Plenary
Slotted Photonic Crystal Slow Light Modulators, Juerg Leuthold1, W. Freude1, K. Koin1, L. Alett1, D. Korns1, R. Palmer1, J.M. Briscoe1; Institute of Photonics and Quantum Electronics (IPQ) & Institute of Microstructure Technology (IMT) at Karlsruhe Institute of Technology, Germany. CMOS-compatible electro-optic modulators offering highest-speed signal processing with little power consumption are reviewed. Emphasis is given to slotted photonic crystal modulators fabricated by taking advantage of the silicon-organic hybrid platform.
STuB1 • 10:30

Science and Technology in the Submillimeter with High Resolution Techniques, Frank C. De Lucia\(^1\), \(^2\); \(^1\) Physics, Ohio State University, USA. With emphasis on high-resolution systems, the interaction of the physics of the spectral region with the physics of applications will be discussed. It will be shown how this leads to optimal choices of system strategies.

STuB2 • 11:00

Ultrafast Imaging of Terahertz Pulse Generation by Cherenkov Radiation in LiNbO\(_3\), Zhenyou Wang\(^1\); \(^1\) Physics department, University of Alberta, Canada. We demonstrate full-field imaging of terahertz waves induced by a point focused terahertz pulse in lithium niobate. The group velocities of the optical and THz pulses as well as the Cherenkov radiation angle are directly measured.

STuB3 • 11:15

Spatio-temporal Characteristics of THz Emission at the Subwavelength Scale via Optical Rectification, Sze Phing Ho\(^1\), Matteo Clerici\(^1\), Marco Peccianti\(^1\), Fabrizio Buccioni\(^1\), A. Buscemi\(^1\), Tsuneyuki Ooka\(^1\), Jalil Ali\(^1\), Roberto Morandotti\(^1\); \(^1\) NRS Energie, Matériaux et Télécommunications, Canada; \(^2\) IPFC-CNRS, UOS Roma, Italy; \(^3\) INET, University of Fudanma, Italy; \(^4\) Nanophotonics Research Alliance, Universiti Teknologi Malaysia, Malaysia. Highly localized THz emission via optical rectification in thin nonlinear crystals is a promising method for subwavelength microscopy. We present here the peculiar THz spatio-temporal characteristics induced by the non-paraxial generation regime.

STuB4 • 11:30

Time and Frequency-resolved Terahertz Microscopy with a Photoconductive Near-field Probe, Jan Wallauer\(^1\), Alex Orterer\(^1\), Andreas Böter\(^1\), Stefan Waschlowski\(^1\), Markus Walther\(^1\); \(^1\) Physics, University Freiburg, Germany. Using a photoconductive antenna as scanning THz near-field probe we demonstrate mapping of electric and magnetic fields close to microstructures. Our approach visualizes the near-fields with sub-ps temporal and sub-wavelength spatial resolution.

STuB5 • 11:45

Dielectric Properties of Heavy Oils Using Terahertz Time-Domain Spectroscopy, Amin Kahai\(^1\), Ayesheshim Ayesheshim\(^1\), Lyubov Titova\(^1\), Zhenyou Wang\(^1\), Patrice Abivin\(^2\), Yuesheng Cheng\(^2\), Kentaro Inoue\(^2\); \(^1\) Physics, Ohio State University, USA. \(^2\) Computer Engineering, McGill University, Canada. We report the photo-inscription of Bragg gratings in chalcogenide (A\(2\)Se\(3\)) fibers tapered down to 1 \(\mu\)m. A transmission dip of < 30 dB at a wavelength of 1573 nm is achieved after 9 minutes of exposure time with 633 nm light.

STuB6 • 12:00

Towards 1-mW THz Photonic Devices with Low-Cost Laser Drivers, Elliott Brown\(^1\); \(^1\) Wright State University, USA. A growing number of applications in the THz field require more power, efficiency, affordability, and reliability from time- and frequency-domains sources alike. We have developed efficient photonic devices that can be driven by fiber mode-locked and cw-diode lasers, respectively. The average power of the PC switches is approaching 1 mW.

STuB1 • 10:30

Applications of Chalc Fibers, Dan Hewak\(^1\), E. Kahn\(^1\), C. C. Huang\(^1\); \(^1\) University of Southampton, UK. Chalcogenide glass optical fibers have been extensively studied since 1967, when sulphide based fibers and their potential applications were first proposed. In this paper we describe our current work on the fabrication and application of chalcogenide fiber and our vision for their practical implementation in the future.

STuB2 • 11:00

Chalcogenide Microstructured Optical Fibers for IR Photonics, Jean-Luc Adam\(^1\), Johann Troila\(^1\), Laurent Brilland\(^1\); \(^1\) U. of Rennes-CNRS, France; \(^2\) Perjo, France. Chalcogenide glasses show broad IR transparency and high NL refractive index. Singlemode chalcogenide microstructured fibers were obtained with losses around 0.3dB/m in the mid-IR. Fibers with small or large effective mode areas were demonstrated.

STuB3 • 11:30

Chromatic Dispersion Engineering in Chalcogenide Microporous Fibers for the Middle-infrared, Bora Urg\(^1\), Maxim Skorobogaty\(^1\); \(^1\) Engineering physics, Ecole Polytechnique de Montreal, Canada. Tuning of the microporosity in the core of chalcogenide fibers provides extensive dispersion engineering that allows red-shifting of zero-dispersion points and flattened dispersion profiles. The porosity also significantly lowers propagation losses.

STuB4 • 11:45

Bragg Grating in Sub-wavelength Chalcogenide Wires, Baja Ahmed\(^1\), Martin Rochette\(^1\); \(^1\) Electrical and Computer Engineering, McGill University, Canada. We report the photo-inscription of Bragg gratings in chalcogenide (A\(2\)Se\(3\)) fibers tapered down to 1 \(\mu\)m. A transmission dip of < 30 dB at a wavelength of 1573 nm is achieved after 9 minutes of exposure time with 633 nm light.

STuB5 • 12:00

Tungstate-Tellurite Optical Fibers for Special Applications, Alexey Kovalapov\(^1\), Yurii Yatsenko\(^1\), Vitaly Nazaryants\(^1\), Maxim Astapovich\(^1\), Victor Photoshchenko\(^1\), Alexander Mesier\(^1\), Vitaly Menyuga\(^1\), Gennady Snapinti\(^1\), Mikhail Churbanov\(^2\), Evgeny Dianov\(^2\); \(^1\) Fiber Optics Research Center of RAS, Russian Federation; \(^2\) Institute of Chemistry of High-Purity Substances, Russian Federation. Different types of optical fibers with losses less than 100 dB/km were produced from high-purity tungstate-tellurite glasses. The microstructured fiber for supercontinuum generation in the range 3-5 \(\mu\)m with optical loss of 4 dB/m has been fabricated.

10:30–12:15

SOTuB • Chalcogenide and Tellurite Fibers

John Ballato, Clemson Univ., USA, Presider

Invited

Applications of Chalc Fibers, Dan Hewak\(^1\), E. Kahn\(^1\), C. C. Huang\(^1\); \(^1\) University of Southampton, UK. Chalcogenide glass optical fibers have been extensively studied since 1967, when sulphide based fibers and their potential applications were first proposed. In this paper we describe our current work on the fabrication and application of chalcogenide fiber and our vision for their practical implementation in the future.

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Tungstate-Tellurite Optical Fibers for Special Applications, Alexey Kovalapov\(^1\), Yurii Yatsenko\(^1\), Vitaly Nazaryants\(^1\), Maxim Astapovich\(^1\), Victor Photoshchenko\(^1\), Alexander Mesier\(^1\), Vitaly Menyuga\(^1\), Gennady Snapinti\(^1\), Mikhail Churbanov\(^2\), Evgeny Dianov\(^2\); \(^1\) Fiber Optics Research Center of RAS, Russian Federation; \(^2\) Institute of Chemistry of High-Purity Substances, Russian Federation. Different types of optical fibers with losses less than 100 dB/km were produced from high-purity tungstate-tellurite glasses. The microstructured fiber for supercontinuum generation in the range 3-5 \(\mu\)m with optical loss of 4 dB/m has been fabricated.

12:30-13:30 Lunch Break (on your own)
Joint Poster Session

**JTuB1**

Fast Light in Erbium Doped Fibers Based on Coherent Population Oscillations with Nonlinear Negative Absorption, Francesco Arrieta-Yáñez, Sonia Melle, Oscar G. Calderón; Optics, Universidad Complutense de Madrid, Spain. Supemultiproval propagation of signals (wavelengths 1536.787 nm) in erbium-doped fibers without additional pump is demonstrated. We explain this phenomenon within the coherent population oscillations model in a medium with nonlinear negative absorption.

**JTuB2**

Amplitude-Preserving Tunable Pulse Delay in AllGaAs-InP Active Ring-Resonators, Andrea Melleri, Antonio Canciamilla, Carlo Ferrari, Francesco Morricetti, Gabor Mezni, Marc Soref; Polilcom - Dipartimento di Elettronica e Informazione, Politecnico di Milano, Italy. School of Engineering, Univ. of Glasgow, UK. We report on the use of active waveguides to compensate for losses in reconfigurable delay lines based on ring resonators. Pulse delay in both transparency and amplification regimes is demonstrated.

**JTuB3**

Simultaneous Slow and Fast Light, Bin Luo, Hong Guo; School of Electronic Engineering and Computer Science, Peking Univ., China. Simultaneous slow and fast light requires rf field [Opt. Lett. 35, 64 (2010)], which is inconvenient. We suggest that the rf field can be replaced by lights and thus, the phenomena can be realized optically.

**JTuB4**

Destructive Interference of Dark Resonances in a Room Temperature Tripod System, Santosh Kumar, Thomas Langprete, Fabien Bretanaker, Rupamajuri Ghosh, Fabienne Goldfarb, Jawaharlal Nehru Univ., India; Lab. Ame Cotton, France. We explore the response of a tripod system in J1E under excitation by perpendicularly polarized pump and probe beams in the presence of a transverse magnetic field. Destructively interfering dark resonances are observed and interpreted.

**JTuB5**

Few-cycle Self-Induced Transparency Solitons, YuanTao Lee, J Hong Chan, Ray-Kuang Lee; Inst. of Photonics Technologies, National Tsing Hua Univ., Taiwan. We reveal the existence of few-cycle optical self-induced transparency soliton family in a two-level absorbing system in slow- and fast-light regime. The effects of number of cycles on area theory and pulse group velocity are elucidated.

**JTuB6**

Localized Dynamic Brillouin Gratings Permanently Induced by Chalcogen Materials, Santagiquista, Leonora Ursini; Dept. of Information Engineering, CNIT, Univ. of Padova, Italy. A method to permanently induce localized, dynamic Brillouin gratings is proposed and numerically demonstrated. It exploits the threshold correlation of chaotic laser signals.

**JTuB7**

Novel Highly Nonlinear Composite Tellurite Microstructured Optical Fibers for SC Generation, Zhiqiang Yuan, Meizong Liu, Xin Yan, Xingguo Gao, Katsuhiko Suzuki, Yutaka Ohtani; Toyota Technological Inst., Japan. We prepared a novel composite tellurite MOFs consisting of two different glasses as core and clad to freely control chromatic dispersion. Broad and flattened SC spectra were demonstrated in the fiber under femtosecond laser pumping.

**JTuB8**

Enhanced Low-Index Field Confinement by Radially Stratified Micro Optical Fibers, Wenfu Zhang, Jianwei Ma, Wenping Huang, Wei Zhao; State Key Lab. of Transient Optics and Photonics, Xian Inst. of Optics and Precision Mechanics, Chinese Academy of Sciences, China; Graduate School of the Chinese Academy of Sciences, China; Electrical and Computer Engineering, McMaster Univ., Canada. The ring micro-fiber is studied. The calculating results show that light can be concentrated in nanometer-thin low-index rings with very high confinement efficiency.

**JTuB9**

High-Purity Tungstate-Tellurite Glasses and Single-Mode Fibers: Fabrication and Studies, Vitaly Dorofeev, Alexander Moiseev, Mikhail Churbanov, Billy Richards; Fibre Optics Research Center, Graz, Austria. A method to fabricate single-mode optical fibers with excellent characteristics is investigated. The results show that the fibers can be used for high-speed communication applications.

**JTuB10**

Modeling and Design Optimization of Discrete Mode Lasers for High Speed Single-Mode Operation in Optical Communication Networks, Yu Li, Xingguo Gao, Shao Tsai, Way-Seen Wang; Electrical and Computer Engineering, McMaster Univ., Canada. The design and optimization of single-mode lasers for high-speed communication systems are discussed. The results show that the lasers can be used for high-speed communication applications.

**JTuB11**

Enhanced Absorption of Ultrathin Film a-Si Solar Cell Based on Ultrathin Metal Grating, Sangjin Lee, Sangin Kim, Jaijin Lee, Hanjo Lim; Ajou Univ., Republic of Korea. We present an enhanced absorption solar cell composed of a thin metal film embedded between a metal reflector and an ultrathin metal grating. Absorption improvement for both TE and TM polarizations is achieved.

**JTuB12**

Surface Roughness Effect on Q-Factor of Ge Whispering Gallery Mode Microdisk Resonator, SeungYong Choe, Kotaro Kato, Ayungwae Yim, Evan B. Pickett, Namkoo Park, Theodore I. Kamins; Byung-Gook Park; James S. Harris; Electrical Engineering, Stanford Univ., USA. In this paper, the surface roughness effect on Q-factor of Ge whispering gallery mode microdisk resonator is thoroughly investigated by 2-D and 3-D FDTD simulations with variations on roughness indices.

**JTuB13**

Reactive Index Profiling of an Optical Waveguide with Optical Path Perturbation, KazuHuan Tsai, San-Yi Ting, Wun-Shao Tsai; Dept. of Applied Materials and Optoelectronics Engineering, Natl. Chi-Nan Univ., Taiwan. Two-dimensional index profile of an optical fiber is reconstructed with the measured differential optical path difference. The results show that the method is effective for optical fiber profiling.

**JTuB14**

Design Optimization of High Performance Single-mode Fabry-Perot Lasers Based on Quantum Dots Materials, Lanxin Deng, Lin Han, Yuanping Xi, Xun Li, Weiping Huang; Electrical and Computer Engineering, McMaster Univ., Canada. The design and optimization of single-mode Fabry-Perot lasers are discussed. The results show that the lasers can be used for high-speed communication applications.

**JTuB15**

Benzocyclobutene Multimode Interference Power Splitters Fabricated by Ultraviolet Laser Illumination, Yu-Shaan Cheng, Wen-Shao Tsai, Woy-Sern Wang; Graduate Inst. of Photonics and Optoelectronics, National Taiwan Univ., Taiwan; Dept. of Applied Materials and Optoelectronics Engineering, Natl. Chi-Nan Univ., Taiwan; Dept. of Electrical Engineering, Natl. Taiwan Univ., Taiwan. Various MMI power splitters fabricated by laser illumination on benzocyclobutene are compared. The results show that the devices can be fabricated with high accuracy, short time, and good controllability.
JTu821
Numerical Simulations of Temperature Dependence of High Efficiency Multi-Junction Solar Cells Under Concentrated Sunlight, Jeffrey Wheeldon1, Alex W. Walker1, Olivier Theriault1, Mark Enad1, Karin Hinzer1; 1Univ. of Ottawa, Canada. The temperature dependence of GaInP/GaAs/Ge multi-junction solar cells are numerically modeled. The temperature dependence of the solar cell dark current and the spectral sensitivity of the solar cell are demonstrated.

JTu822
Automatic Extraction of Chirp Parameter of DFB Laser, Lin Han1, Yefeng Wen1, Weiping Huang1; 1Electrical and Computer Engineering, McMaster Univ., Canada. A new method is proposed for extracting DFB laser chirp parameter by fitting the side-band strengths ratio curve obtained from spectrum measurement. It is validated by comparing with the result obtained from fiber dispersion measurement.

JTu823
High Power Pulse Trains Envelop Severance in Quasi-Phase-Matched Waveguide, Shih-Chiang Lin1; 1I-SHOU Univ., Taiwan. A method of 2-ps pulse trains generation in QPM waveguide is proposed. The mechanism of pulse train envelop severance, due to group velocity mismatched, is studied.

JTu824
Step Index POF Link Power Budget Calculation Today and Tomorrow, Olaf Ziemann, S. Loquai, Roman Kruglov; Univ. of Nueremberg, Germany. The correct calculation of the optical power budget is very important for the present standardization. This paper will present a present example and will show options for future improvements with optimized components.

15:30-16:00 Coffee Break, Pier 4/ Harbour Ballroom Foyer

NOTES
These concurrent sessions are grouped across two pages. Please review both pages for complete session information.

16:00–18:00
**AfuC • Inhouse: Fiber and Wireless**
Jürg Leuthold, KIT, Germany; Presider

**AfuC1 • 16:00**
Options for a 1 Gbit/s Standard POF Interface Report on the German Standardization Activities, Olaf Ziemann; Christian-Alexander Bunger; Juri Vinogradov; S. Loquai; Roman Kruglof; Univ. Nuernberg, Germany. A German standardization group works since Sep. 2009 on a guideline for a future 1 Gbit/s POF interface. This paper will summarize the recent activities and will present the current status.

16:00–17:30
**SPfuC • DSP**
Gabriella Bosco, Politecnico di Torino, Italy, Presider

**SPfuC1 • 16:00**
Integrated Carrier Phase and Frequency Estimation for Coherent Detection based on Multi-Symbol Differential Detection (MSDD), Moshe Nazarathy; Netta Sigror; Igor Tsynkov; EE, Technion, Israel. We present new results on MSDD carrier recovery for optical coherent detection. The frequency and phase estimation functions are jointly accomplished with lowest complexity, high performance and automatic adaptation to the channel statistics.

16:00–18:00
**ItuC • Photonic Integration I**
Valery Tolstikhin; OneChip Photonics Inc., Canada, Presider

**ItuC1 • 16:00**
Large-Scale Monolithic Integration of PM-QPSK Modulation Architecture in 500 Gb/s Transmitters, Scott Gorzelnik; Peter Evans; Matthew Fisher; Andrew Dentai; Ranjanie Mathiya; Pandalal Salvatore; Adam James; Pavel Studenkov; Eva Strelecka; Thomas Vallant; Forrest Wedgewick; Matthias Kunte; Vikrant Lal; Masaki Kato; Maura Rabari; Agus Spangnoli; Wayne Williams; Shashank Agase; Arnold Chen; Damien Lambert; John Thornton; Doug Christina; Dan Pavinski; Parnazije Samsa; Ramanjung Zhang; Tumpong Lee; Babak Behnia; Jeffrey Bastak; Vince Dominici; Alan Nilsson; Brian Taylor; Jeff Rahn; Glad Goldfarb; Vinasak Dangui; Mike Van Leuven; Hans Sani; Kuang-Tuan Wei; Matthew Mitchell; Iacov Psuemekeri; Mark Missey; Rudra Nagaranjan; Rick Schneider; James Stewart; Mike Refile; Tim Butrie; Charles Joyner; Charles Joyner; Mehrdad Ziaei; Fred Klost; Dave Welch; Infineon, USA. We describe the monolithic integration of 10 InP-based phase-modulated transmitter channels employing polarization multiplexing and quadrature phase-shift keying coherent modulation format to provide an aggregate 500Gbps bandwidth on a single chip.

16:00–18:00
**ItuD • Nanophotonics: Plasmonics and Applications II**
Jeremy Baumberg; Univ. of Cambridge, UK, Presider

**ItuD1 • 16:00**
Active and Passive Surface Plasmon Photonics, Pierre Berini; SITE, Univ. of Ottawa, Canada. Recent progress on integrated surface plasmon components is reviewed. Passive and active plasmonic functions, such as modulation, amplification and lasing, detection, and sensing are discussed.

16:30–18:00
**ITuD2 • 16:30**
A Silicon Lens for Integrated Free-Space Optics, David Fattal; Jingfei Li, Zhen Peng; Marco Fiorentini; Raymond G. Beausoleil; HP Labs, USA. We introduce a CMOS-compatible plano-lens made of a hexagonal array of silicon posts, with a diameter distribution tailored to produce an arbitrary transmitted waveform, opening the way to the integration of 3-D optical systems.

16:45–18:00
**ITuD3 • 16:45**
Guided-Mode Resonance Enabled Absorption in Amorphous Silicon for Thin-Film Solar Cell Applications, Tanzina Khulusi; Jaewoong Yoon; Weishuai Wu; Mehrdad Shokouhi; Serami; Robert Magnusson; EE, Electrical Engineering, Univ. of Texas at Arlington, USA. Nanoscale patterns with 300 nm periods fabricated on thin films of amorphous silicon on glass substrates. Around 50% integrated absorption enhancement compared to unpatterned silicon reference samples is observed for the 400–950 nm wavelength range.

17:00–18:00
**ITuD4 • 17:00**
Filter Response of Feedback Plasmonic Junctions, Mohamed A. Swillam; Amir S. Helmy; ECE, Univ. of Toronto, Canada. We propose a novel filter structure for plasmonic circuits. The proposed structure is based on creating a feedback junction. The unique characteristics of the structure are analyzed using a simple and accurate analytical model.
These concurrent sessions are grouped across two pages. Please review both pages for complete session information.

16:00–18:00
S卢B • Methods and Fundamentals
Byoung Ham, Inha Univ., South Korea, Presider

S卢B1 • 16:00 Invited
Understanding Propagation Loss in Slow Light Waveguides, Sebastian A. Schulz, William Whelan-Curtin, Isabella H. Roy, Thomas Krasser; School of Physics and Astronomy, Univ. of St Andrews, UK. Engineering dispersion and loss in photonic crystal waveguides allows us to control propagation up to moderate group indices. Novel results on over-engineered waveguides give insights into loss vs. both propagation constant and group index.

S卢B2 • 16:30
Coupled-Resonator Optical Waveguides (CROWs) Based on Grating Resonators with Modulated Bandgap, Hsi-Chun Liu, Christos Santos, Amnon Yariv; Electrical Engineering, Technion, Israel; ‘Technische Physik, Univ. of Kassel, Germany. We theoretically study CROWs based on modulated grating resonators. The defect sections between resonators control the coupling coefficients and frequency detuning. The transmission spectra of CROWs rely on a proper choice of the defect length.

S卢B3 • 16:45
Slow Light Using Cross Modulation in a Quantum Dash Semiconductor Optical Amplifier, Sebastian A. Schulz, William Whelan-Curtin, Isabella H. Roy, Thomas Krasser; School of Physics and Astronomy, Univ. of St Andrews, UK. The transition from a TEM-like mode to a plasmon-like mode in a Parallel Plate Waveguide, Engho Lin, Rajind Mendir, Daniel Wittman, Rice University, USA. We experimentally characterize the spatial mode inside a finite-width parallel-plate waveguide using a subwavelength probe. We observe a transition from a TEM-like spatial mode at low frequencies to a plasmon-like mode at high frequencies.

16:00–18:15
S卢C • Terahertz Waveguides, Applications, and Device Technology
Markus Walther; Univ. Freiburg, Germany, Presider

S卢C1 • 16:00 Invited
The Transition from a TEM-like Mode to a Plasmon-like Mode in a Parallel Plate Waveguide, Engho Lin, Rajind Mendir, Daniel Wittman; Rice University, USA. We experimentally characterize the spatial mode inside a finite-width parallel-plate waveguide using a subwavelength probe. We observe a transition from a TEM-like spatial mode at low frequencies to a plasmon-like mode at high frequencies.

S卢C2 • 16:30
Suspended Core Subwavelength Fibers for Practical Low-loss Terahertz Guidance, Bora Ung, Mathieu Razé, Anna Machorava, Markus Walther, Maxim Skorobogatiy; Engineering physics, Ecole Polytechnique de Montreal, Canada; Materials Research Center, University of Freiburg, Germany. We describe fabrication of polymer suspended core fibers (porous & non-porous cores) for terahertz guiding, and their characterization via near-field THz microscopy. These novel fibers enable convenient handling and mode isolation from perturbations.

S卢C3 • 16:45
Suspended Core Polyethylene Fiber for Bio-sensing Applications in the Terahertz Region, Anna Machorava, Mohammad Zoureb, Maxim Skorobogatiy; ‘Genie Physique, Ecole Polytechnique de Montreal, Canada; ‘Institut National de la Recherche Scientifique, Canada. For the first time we demonstrate the possibility of using suspended core polyethylene fibers for the sensing of E.coli. Diameter of fiber is 5.1 mm, it has 150 µm suspended core which is strongly isolated from the environment.

16:00–18:00
SOTuC • Fiber Sensors
Alexis Mendez; MCH Engineering, USA, Presider

SOTuC1 • 16:00
Challenges in deploying fiber based systems for oil and gas sensing, Dominic Tavernier;.

SOTuC2 • 16:30
Optical fibers with hermetic coating for high temperature applications, Valery Kozlov, Jose Koh, Kevin Bennett, Paul Sanders, Trevor MacDonald; ‘Science and Technology, Corning Inc., USA; ‘Qores LLC, USA. Optical fibers with carbon coating and high temperature protective coating were tested at temperatures up to 200C and hydrogen pressures up to 400psi to study carbon coating hermetic properties at elevated temperatures.

SOTuC3 • 16:45
Development of a Novel Cladding-doped Optical Fiber with Au Metal Nano-particles for Surface Plasmon Resonance Sensor Applications, Seongmin Ju, Pranom R. Watekar, Seongmao Jeong, Youngwoong Kim, Hyung Sun Kim, Pramod Jeon, Cheol Jin Kim; Won-Taek Har; Graduate Program of Photonics and Applied Physics/Department of Information and Communications, Gwangju Institute of Science and Technology, Republic of Korea; School of Electronics Engineering, VIT University, India; ‘Department of Ceramic Engineering, Gyeongsang National University, Republic of Korea. A novel optical fiber having its cladding doped with Au metal nano-particles was developed. The enhanced surface plasmon resonance without using metal thin film on the fiber surface was obtained.

SOTuC4 • 17:00
Visible Light Emitting Optical Fibers using Up-Conversion, Michael Bass, John Balla1; ‘Clemson University, USA; ‘University of Central Florida, USA; ‘bdDisplays, LLC, USA. Optical fibers are described that emit visible light along their length when particulate up-converters in the cladding are excited by light from semiconductor light sources propagating in the core and leaking into the cladding.

Sessions continue on page XX.
A free space optical chaotic communication system for the secure transmission of a digital signal and its performance is investigated including indoor infrared channel impairments. The computational load of block CMA equalizers is addressed. Compared to the adaptive CMA, we show block approaches increase the convergence speed by ~10 but only the complexity by ~4 in 112Gbit/s PolMux 16QAM systems.

High n-type Doping for Ge Lasers. Jonathan Besette, Rodolfo E. Camacho-Aguilar, Yan Cai, Lionel Kimerling, Jurgen Michel. We present evidence of enhanced n-type doping of epitaxial Ge-on-Si for integrated light emitting devices. SIMS, Hall Effect, and photoluminescence measurements confirm dopant concentrations as high as 4 × 10¹⁹ cm⁻³ with efficient PL emission.

Organic and Hybrid Plasmonic Nanostructures for Energy Conversion. Gary P. Wiederrecht, Ali Adibi. Recent advances for photoinduced charge separation in nanostructures are discussed. Both organic and organic plasmonic hybrid nanostructures are described. Ultrafast electronic coupling in the hybrid nanostructures is also observed.

On-chip Nanofocusing Using a Hybrid Plasmonic-Dielectric Tapered Waveguide. Ye Luo, Ali Adibi, Maysamreza Chamanez, Ali Eshghi Eftekhar. We present a novel on-chip plasmonic nanofocusing technique based on tapering the metal layer of a hybrid Si-Au waveguide. Input optical energy becomes strongly concentrated and highly localized at the metallic tip.
SLTuB • Methods and Fundamentals—Continued

SLTuB5 • 17:15
Electromagnetic Energy Velocity in Slow Light, Marco Santagustina; Dept. of Information Engineering, CNIT - Univ. of Padova, Italy. Group and electromagnetic energy velocities in structural and material slow light are compared. They are equal for structural slow light; the enhancement of linear and nonlinear effects depends on energy velocity.

SLTuB6 • 17:30
On Fast Light and Signal Detection Latency, Levent Kayili, Mohammad Mojahedi; Edward S. Rogers Sr., Dept. of Electrical and Computer Engineering, Univ. of Toronto, Canada. Through the calculation of time-varying error probability, we show that a reduction in signal latency can be obtained in a practical active medium with negative group velocity (negative group delay) in the presence of noise.

SLTuB7 • 17:45
Myths and Reality of the “Slow” and “Fast” Light, Valeri Kovalev, Nadezhda Kotova; Physics, Heriot-Watt Univ., UK; P.N. Lebedev Physical Inst., Russian Federation. Experimentally observed pulse delays usually attributed to the group velocity phenomenon cannot be such since not all necessary conditions for this phenomenon are met. Observations are accountable for by nonlinearity of resonant absorption or gain.

StuC • Terahertz Waveguides, Applications, and Device Technology—Continued

StuC5 • 17:30
Ultrafast THz Pulse Shaping: Generation of Half-cycle Pulse from Multi-cycle THz Pulse, Mostafa Shalaby, Marco Peccianti; Luca Razzari, Gargi Sharma, Tsuneyuki Otaki, Roberto Marandotti; INRS-EMT, Canada; Institute for Chemical and Physical Processes, Italy; Italian Institute of Technology, Italy. Using optical pump/THz probe technique in InP, we demonstrate ultrafast slicing of a multi-cycle THz pulse into single- and half-cycle THz pulses.

StuC6 • 18:00
Dynamics of Noise in THz Photomixers as a Receiver Sensor, Barmak Heshmat, Hamid Pahlevaninezhad, Jinye Zhang, Thomas Edward Darcie; University of Victoria, Canada. We present an analytical estimation and experimental measurement of noise spectral density and noise average power in THz photomixers as receivers in heterodyne THz sensing. This includes generation-recombination, thermal, and flicker noise.

SOTuC • Fiber Sensors—Continued

SOTuC5 • 17:15
Tutorial
Optical fiber sensors and their Specialty Fiber Needs, Alexis Mendes; MCH Engineering, LLC, USA. This tutorial will review the basic principles, applications, and specialty fiber needs for optical fiber sensors. Key technical trends will be identified along with relevant commercial opportunities and challenges.

18:30–21:30 Advance Photonics Congress Reception and Banquet, Hart House, Univ. of Toronto
Nonlinearity Compensation using Digital Backward Propagation

Eduardo Mateo1, Fatih Yaman1, Ting Wang1, Gjanfaj LP2; 1NEC Laboratories America, USA; 2CRED, The college of Optics and Photonics, University of Central Florida, USA. Compensation of fiber impairments using advanced DPS techniques will play a fundamental role in future communications systems. In particular, technologies for nonlinearity compensation using digital backward propagation are discussed in this paper.

Reducing the Complexity of Electronic Pre-compensation for the Nonlinear Distortions in a Directly Modulated Laser

Abdullah S. Kacer1, John Cartledge1, Kim Roberts2; 1Electrical and Computer Engineering, Queen’s University, Canada; 2Ciena Corporation, Canada. A simplified expression relating the required input current for a directly modulated laser to a target output optical power is obtained and used experimentally in mitigating the laser nonlinear distortion by digital signal processing.

Numerical Simulation of Dicke Superradiance in a Semiconductor Laser Device

Xuhan Guo1, Kevin A. Williams1, Vojtech E. Ollé1, Adrian Wonfor1, Richard V. Penty1, Jan H. White1; 1Dept. of Engineering, Univ. of Cambridge, UK. This paper reports a theoretical model for Dicke Superradiance in semiconductor laser devices. Simulations agree well with previously-observed superradiance properties and are used to optimize driving conditions and device geometry.

Erbium-Doped Chalcogenide Glass Micro-Disks as Monolithic Mid-IR Laser Sources

Fahed M. Alah1, Ibraim Dian2, Haijun Hu3, Anu Agarwal4, Lienel Kimelings1; 1Materials Science and Engineering, Masdar Inst. of Science and Technology, United Arab Emirates; 2Chalcogenides, University of Central Florida, USA; 3Department of Materials Science and Engineering, Univ. of Delaware, USA. The feasibility of Mid-Infrared (MIR) laser in Erbium-doped Gallium Lanthanum Sulfide (GLS) micro-disk was investigated. Based on state-of-the-art Chalcogenides micro-disk resonators parameters, lasing was simulated and shown to be possible.
On the Implementation of Soft-Decision Decoders for High-Speed Optical Transmission, Ivan Djordjevic; Electrical and Computer Engineering, University of Arizona, USA. We describe large-girth LDPC codes suitable for high-speed optical transmission and several reduced-complexity (RC) LDPC-decoding algorithms. We evaluate quantization effect BER performance degradation and discuss corresponding FPGA implementation.

Quasi-Cyclic LDPC based on PEG Construction for Optical Communications, Sami Muntaz, Ghaya Rekaya-Ben Othman, Yves Jasour; Comete, Telecom Paristech, France. A new construction of quasi-cyclic LDPC codes based on the progressive edge-growth algorithm is presented. These codes perform better than most LDPC codes proposed for optical transmissions and design parameters can be chosen without constraint.

BICM and TCM Comparison in 100 Gbps Optical Coherent Links in Nonlinear Regime, Tommaso Foggi, Roberto Magri; CNIT, Italy; Ericsson S.p.A., Italy. The popular single-carrier QPSK modulation format is compared with 8PSK BICM and TCM schemes in 100 Gbps optical links in linear and nonlinear regime, with or without inline dispersion compensation.

Soft Differential Decoding with Non-redundant Error Correction for Dispersion Managed Optical Transmission System, Zhuangdong Zhang, Fabiu N. Hauke, Chia-Ming Li, Yanqun Zhu, Yaming Li, Fei Zhu, Yuheng Bai; Ottawa RE&D Center, Huawei Technologies, Canada; Europe Research Center, Huawei Technologies, Germany; US RE&D Center, Huawei Technologies, USA. Considering DSP implementation constraints, we demonstrate that soft differential decoding with NEC provides the best performance when co-propagating 10G-PDM-QPSK with 10G OOK channels over dispersion managed links at 50GHz channel.

Physical Layer Constraints in Dynamic Optical Mesh Networks, at Higher Bit-rates, Danish Rafique, Andrew D. Ellis; Tyndall National Institute, Ireland, Ireland. We demonstrate that addition of higher-order modulation formats and increased network flexibility significantly degrades the through traffic due to severe X effects, in a WDM optical transport network employing dynamic 28Gbaud mQ transponders.

Experimental Demonstration of PDL Mitigation using Polarization-Time Coding in PDM-OFDM Systems, Sami Muntaz, Jingbo Li, Soo Koeng, Yves Jasour, Rene Schmogrow, Ghaya Rekaya-Ben Othman; Jurek Leuthold; Comete, Telecom Paristech, Paris, France; Institute of Photonics and Quantumelectronics, Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany. For the first time, we demonstrate experimentally that PDL can be highly mitigated by the use of Polarization-Time coding in OFDM transmissions. We show that Silver code performs better than Golden and Alamouti codes.
We present the crossed-polarization analysis of guided modes in photonic crystal slab biosensors. A good agreement between experimental resonance peaks and theoretical modeling is presented, revealing high-Q values in these biosensors.

Optical Resonance Sensing in Surface Bloch Modes on Woodpile Photonic Crystals

We study the loss mechanisms in novel antiresonant hollow core fibres and demonstrate the importance of optimising the air-cladding thickness and reducing the node size. Based on these rules we fabricate fibres with wide-bandwidth and low-loss.

Invited

Simplified Brillouin fiber slow light systems in loss regime using step current modulation

We review the recent progress on hollow-core fiber for transmission of CO2 laser radiation, Alexey Kosolapov1, Andrei Pryanikov1, Alexander Birzukov1, Maxim Astapovich1, Vladimir Shiryaev2, Gennady Snopatin2, Victor Piotruchenko1, Mikhail Charbonier1, Boggy Danov1; 1Fiber Optics Research Center of RAS, Russian Federation; 2Institute of Chemistry of High-Purity Substances, Russian Federation. A new, technologically simple structure of hollow-core optical fiber is proposed; the propagation of CO2 laser radiation in a hollow-core chalcogenide glass fiber is demonstrated.

Hollow-Core Fiber for Transmission of CO2 Laser Radiation

We present experimental sensing results achieved using a novel technique based on the use of photonic bandgap structures where only the output power from a broadband source is monitored, providing a real-time and low-cost system.

Sensing Technique for the Development of Real-time and Low-cost Biosensors Using Photonic Bandgap Structures

Confinement Loss of Tube Lattice and Kagome Fibers

We review the recent progress on hollow-core photonic crystal fibers and its integrated form of photonic microcavities in both their design and fabrication and in their applications in Raman fiber lasers.

Gas Raman Lasers in Hollow-core Fibers

Anatomically simple structure of hollow-core optical fiber is proposed; the propagation of CO2 laser radiation in a hollow-core chalcogenide glass fiber is demonstrated.

Hollow-Core Fiber for Transmission of CO2 Laser Radiation

We report the recent progress on hollow-core photonic crystal fibers and its integrated form of photonic microcavities in both their design and fabrication and in their applications in Raman fiber lasers.

Simplified Brillouin fiber slow light systems in loss regime using step current modulation

Confinement Loss of Tube Lattice and Kagome Fibers

Invited

Low Loss Antiresonant Hollow core Fibres

We review the recent progress on hollow-core photonic crystal fibers and its integrated form of photonic microcavities in both their design and fabrication and in their applications in Raman fiber lasers.

Gas Raman Lasers in Hollow-core Fibers

Invited

These concurrent sessions are grouped across two pages. Please review both pages for complete session information.

10:30–12:15

SLWB • Slow/Fast Light Systems

10:30–12:30

SWB • Biochemical Sensors II

10:30–12:15

SOWB • Hollow Core Fibers

1Ecole Polytechnique Federale de Lausanne, Switzerland.
2Sorbonne University, Paris, France; 3Institute of Chemistry of High-Purity Substances, Russian Federation. A new, technologically simple structure of hollow-core optical fiber is proposed; the propagation of CO2 laser radiation in a hollow-core chalcogenide glass fiber is demonstrated.

Invited
IWC • Photonic Integration II—Continued

IWC5 • 12:00
Heterogeneous Integrated InGaAsSb Detectors on SOI Waveguide Circuits for Short-Wave Infrared Applications, Nannicha Hattasan1, Gassenq Alban1, Bart Kayken1, Laurent Cerutti2, Jean-Baptiste Rodriguez2, Eric Toumain2, Gunther Roelkens1; 1Univ. of Gent - DTIEC, Belgium; 2Univ. Montpellier 2, France. We present evanescently coupled, heterogeneous integrated InGaAsSb photodetectors on SOI waveguide circuits for short-wave infrared applications. A responsivity of 0.13 A/W is obtained at a wavelength of 2.17µm. The dark current is 3.5 µA at -1V.

IWC6 • 12:15
Hybrid Transmitter Cells for DWDM Systems, Hua Zhang1, Matt Pearson1, Serge Bidnyk1, Ashok Balakrishnan1; 1Enablence Technologies Inc., Canada. A compact 10 Gb/s transmitter cell for 100 Gb/s DWDM transmission has been successfully developed using hybrid PLC technology. It is confirmed that the hybrid transmitter cell provides high performance on output power and wavelength stabilization.

IWD • Modeling and Simulation IV: Coupled Waveguides and Resonators—Continued

IWD6 • 12:00
Design of One-Dimensional Photonic Crystal Coupled Resonator Optical Waveguides Embedded in Air-Slot Waveguide, Yuki Kawaguchi1, Kunimasa Saitoh1, Masanori Koshiba1; 1Hokkaido Univ., Japan. We propose design methods of slow-light slot waveguide based on one-dimensional photonic crystal coupled resonator optical waveguides (1-D PC-CROWs). We show that slot waveguides proposed here realize small group velocity and low-loss simultaneously.
SLWB • Slow/Fast Light Systems—Continued

SLWB6 • 12:00
Loss-induced dead zone in CROW rotation sensor, Roman Novitski1, Jacob Scheuer1, Ben Z. Steinberg1; 1Tel-Aviv Univ., Israel. We study the properties of a lossy coupled resonator optical waveguide subjected to rotation. A loss-induced dead zone is found at low rotation rates while no impact is found for high rotation rates.

SWB • Biochemical Sensors II—Continued

SWB6 • 12:00
Liquid filled hollow core photonic bandgap fiber sensor, Hang Qu1, Bora Ung1, Maksim Skorobogatiy1; 1Ecole Polytechnique de Montreal, Canada. We propose a low-refractive-index-contrast hollow-core Bragg fiber sensor operating with a resonant sensing principle. Clear transmission spectrum shifts are obtained when filling the fiber with liquid analytes of different refractive indices.

SWB7 • 12:15
Optical Current Transducers Incorporating Polymeric Integrated Optical Chip, Min-Cheol Oh1, Woo-Sung Chae1, Kyung-He Kim1, Jun-Whee Kim1; 1Electrical Engineering and Cogno-Mechatronics Engineering, Pusan National University, Republic of Korea. Various optical devices are integrated on a single chip to construct optical current transducers based on polarization rotated reflection interferometry, which consists of couplers, polarizers, polarization converters, and TO phase modulators.

12:30-1:30 Lunch Break (on your own)
Signal Processing in Photonics Communications

Pier 7 & 8

13:30–15:30
SPWC • Transmission Systems

SPWC1 • 13:30
Digital Signal Processing for Coherent Optical Communications: Current State of the Art and Future Challenges, Kim Roberts; ‘Ciena, Canada. This paper reviews examples of signal processing for current coherent transmission systems and the challenges faced by system designers to realize increased bit rates.

SPWC2 • 14:00
Optical Fiber Capacity at its Limits: From Spectrally Efficient Modulation to Spatial Multiplexing, Peter WINZER; ‘Alcatel-Lucent Bell Labs, USA. We will discuss the state-of-the-art in high-spectral-efficiency optical transmission systems as well as their theoretical and practical scalability limits. We will then examine spatial multiplexing as an energy- and cost-efficient method to scale beyond WDM.

Harbour Salon B

13:30–15:30
IW • Photonic Integration III

IWE1 • 13:30
Silicon Mid-Infrared Photonic Integrated Circuits, Richard Soref; ‘Sensors Directorate, Air Force Res. Lab., USA. A review of recent progress in Si-based MIR on-chip components and PICs is given. We survey new OEC technologies, hybrid and monolithic laser/detector integration, waveguiding, plasmo-photons, and spectrometer-on-a-chip applications.

IWE2 • 14:00
Integrated-Optic OFDM Demultiplexers Using Silica PLC-Based DFT and FFT Circuits, Kichi Takaguchi; NTT Photonics Labs., NTT Corp., Japan. I report recent advances on our integrated-optic OFDM demultiplexers. I describe the configuration, operating principle, and characteristics of the demultiplexers, which consist of optical FFT and DFT circuits fabricated with PLC technology.

IWE3 • 14:30
Integrated GaN Photonic Circuits on Silicon (100) for Second Harmonic Generation, Chi Xiong; Wolfram Pernice; Kevin Rui; Carsten Schuck; Kuijngan Fong; Tomas Palacios; Hong Yang; ‘Electrical Engineering, Yale Univ., USA; ‘Electrical Engineering, Massachusetts Inst. of Technology, USA. Second order optical nonlinearity is demonstrated in silicon architecture through heterogeneous integration of single-crystalline gallium nitride on silicon (100) substrates. The γ nonlinear susceptibility is measured to be as high as 16.4±7.0 pm/V.

IWE4 • 14:45
Deep-level Mediated Silicon Micro-ring Power Monitors, Dylan Logan; Philippe Velha; Marc Sorel; Richard De La Rue; Andrew Knight; Paul E. Joyce; ‘Engineering Physics, McMaster Univ., Canada; ‘Electronics and Electrical Engineering, Univ. of Glasgow, UK; ‘Wilfrid Laurier Univ., Canada. Deep-level mediated photodiode power monitors were integrated onto the ports of a silicon waveguide micro-rings operating at 1550 nm. Demonstrated feasibility of rapid, on-chip diagnostic measurements is presently optimized to 20 mA/W/DB.

Harbour Salon C

13:30–15:30
IW • Devices and Components III

IWF1 • 13:30
Silicon-Organic Hybrid (SOH) Electro-Optical Devices, Christian Koo; Luca Alliossi; Dietmar Koret; Robert Palmer; David Hillerkus; Jieyi Li; Anna Barklund; Baluhas Dixit; Joerg Wieland; Maryse Fournier; Jean-Marc Fedeli; Hui Yu; Vim Bogger; Pieter Damron; Roel Baets; Wolfgang Freude; Jürg Leuthold; ‘Inst. of Photonics and Quantum Electronics (IQE), Karlsruhe Inst. of Technology (KIT), Germany; ‘GigOptix Inc., USA; ‘CEA / LETI, France; ‘Photonics Research Group, Ghent Univ., Belgium. Silicon-organic hybrid integration enables electro-optical devices that combine high modulation speed with low power consumption. We give an overview on SOH modulator concepts, underlying material systems, and recent experimental demonstrations.

IWF2 • 14:00
Germanium on Silicon Lasers and Detectors, Jurgen Michel; ‘Massachusetts Inst. of Technology, USA. This paper discusses the most recent advances of Germanium photodetectors and lasers that can be monolithically integrated into a Silicon CMOS process.

IWF3 • 14:30
Waveguide-based Mid-Infrared Up-Conversion Detectors, Kai-Daniel F. Büchter; Harald Herrmann; Wolfgang Sahle; ‘Applied Physics, Univ. of Paderborn, Germany. Nonlinear optical up-conversion detectors for 3.4 µm radiation are realized using Ti:PPMn waveguides. Both, sum-frequency and difference-frequency generation are investigated. Overall power conversion efficiencies of more than 8% are achieved.

IWF4 • 14:45
Nonlinear Notch Blue-Shift in AlGaAs Bragg Grating Waveguides, Pamela Tannouri; Michael J. Strain; Matteo Clerici; Marco Piossanti; Alessia Pasqualet; ‘Sze Phing Ho; ‘Ian Rowe; ‘Ka-taryna Rutkowski; Marc Sorel; Roberto Marandotti; ‘INRS-EMT, Canada; ‘Univ. of Glasgow, UK; ‘IPCF-CNR, Italy; ‘Univ. of Technology, Malaysia; ‘Warsaw Univ. of Technology, Poland. We present an investigation on the nonlinear dynamics of intense pulses in an AlGaAs Bragg waveguide and we report the experimental observation of an intensity dependent blue-shift of the Bragg notch spectral line.
### Optical Sensors

#### 13:30–15:30

**SOWC • Photonic Crystal Sensors**

Limin Tong, Zhejiang University, China, Presider

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Title</th>
<th>Authors</th>
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<tr>
<td>13:30</td>
<td>SOWC1</td>
<td>Invited</td>
<td>Metamaterials, Plasmonics, and Nanofluidics for Ultrasensitive Spectroscopy and Bio-detection, Hatice Altug¹, Ahmed Ali Yamik², A. E. Cetin¹, A. Artar¹, M. Huang⁴; ¹Department of Electrical and Computer Engineering, Boston University, USA; ²Photonic Center, Boston University, USA. We will present on-chip integrated plasmonic and metamaterial systems for ultrasensitive spectroscopy and biodetection. We will also introduce opto-fluidic systems for targeted analyte delivery as well as for optical trapping and manipulation.</td>
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<td>14:00</td>
<td>SOWC2</td>
<td>Self-optimized Metal Coatings for Fiber Plasmonics by Electroless Deposition, Aliaksandr Bialiayeu¹, Christophe Caucheteur¹, Nor Ahamad³, Anatoli Ioannou³, Jacques Albert⁴; ¹Electronics, Carleton U., Canada; ³Electromagnetism and Telecom Unit, Université de Mons, Belgium; ⁴Chemistry, Carleton U., Canada. Observation of the polarization dependent loss spectrum of a tilted fiber Bragg grating during electroless deposition of gold on the fiber allows the process to be stopped exactly when the surface Plasmon resonances are maximized.</td>
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<td>14:15</td>
<td>SOWC3</td>
<td>Role of Localized Surface Plasmon Resonance in Various Nano-structures for Sensing, Taerin Canagasabey¹, Yoon-Myung Lee¹, Can Jeong Lee¹, Cana Seo¹, Si-Joon Kim¹, Young-Joon Kim¹, Byeong-Seok Lee¹, Dong-Jin Lee¹; ¹Department of Electrical and Computer Engineering, Seoul National University, Republic of Korea. We numerically investigate the role of localized surface plasmon resonance produced at diverse nano-structures when illuminating visible light for enhanced sensing. The comparisons of optical properties in various nanostructures are illustrated.</td>
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<td>14:30</td>
<td>SOWC4</td>
<td>A New Optical Bio-sensor: Wet-chemical Synthesis and Surface Treatment of Nanocrystalline ZnS:Mn ¹xS: Mn ²x, Byungsoo Lee¹, Byungsoo Lee², Byungsoo Lee³; ¹Inter-University Semiconductor Research Center and School of Electrical Engineering, Seoul National University, Republic of Korea. The fluorescence is significantly lower in an identical, but unpoled, fiber. Peridically-poled silica fiber pumped at 775 nm; it is a noise contribution to correlated photon pair generation. The fluorescent signal is significantly lower in an identical, but unpoled, fiber.</td>
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<td>14:45</td>
<td>SOWC5</td>
<td>High Refractive-index-contrast Polymer Waveguide Platform for Excitation and Sensing in Aqueous Environments, Bjorn Agranovson¹, Hamid Keshmiri², Jennifer Haldalson², Kristjan Leerson¹; ¹Department of Physics, Science Institute, Iceland. A polymer waveguide platform, applicable to a wide range of biophotonic applications, which rely on evanescent-wave sensing or excitation in aqueous solutions, is presented. The platform offers a high level of integration and functionality.</td>
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### Specialty Optical Fibers

#### 13:30–15:15

**SOWC • Poled and Polarizing Fibers**

John Marciainte, Univ. of Rochester, USA, Presider

<table>
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<th>Time</th>
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<th>Title</th>
<th>Authors</th>
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<tr>
<td>13:30</td>
<td>SOWC1</td>
<td>Invited</td>
<td>Highly Polarizing Single-Mode Optical Fiber for Sensing Applications, Bill Jacobson¹, Abdel Soufiane²; ¹Verrillon Inc, USA. We demonstrate a high performance, highly manufacturable Single-Polarization Fiber (PZF), which offers a wide polarization bandwidth, very high polarization extinction ratio, and consistent performance within lot and from lot-to-lot. We will also discuss on-going R&amp;D projects involving PZF.</td>
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<td>14:00</td>
<td>SOWC2</td>
<td>Relating DC-Field to Induced Nonlinear Susceptibility in Periodically Poled Silica Fiber, Christopher A. Sapiano¹, Stewart Atchison¹, Li Quan¹; ¹Electrical and Computer Engineering, University of Toronto, Canada. The relationship between DC-fields and effective second order nonlinearity is studied. DC-induced processes are modeled and fitted against equivalent natural second order processes. Insight is provided into the disparity between bulk glass and fiber.</td>
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<td>14:15</td>
<td>SOWC3</td>
<td>Observation of Background Fluorescence in a Poled Fiber, Eric Y. Zhu¹, Zhiyuan Tang¹,², Edward A. Lee¹, Kim Kow¹, Li Quan¹, Lukas G. Holt¹, Marcia Lucchese³; ²John E. Sipe¹, Costantino Corbari³; ³Dipartimento di Fisica “A. Volta”, Universita degli Studi di Pavia, Italy; ²Optoelectronics Research Centre, University of Southampton, UK; ³School of Physics, University of Sydney, Australia. We observe broadband fluorescence (1260–1610 nm) in a peridically-poled silica fiber pumped at 775 nm; it is a noise contribution to correlated photon pair generation. The fluorescence is significantly lower in an identical, but unpoled, fiber.</td>
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<td>14:30</td>
<td>SOWC4</td>
<td>Tapered Fiber Devices with Azopolymer Coating, Amado Manuel Velázquez-Benítez¹, Juan Hernandez-Cardenas¹; ¹Instituto de Investigaciones en Materiales, UN, Mexico. Azopolymer coated fiber devices are demonstrated for in-fiber polarization control using an external laser beam. When placed in a fiber cavity, photo-induced birefringence on these devices modifies the spectral and polarization of fiber lasers.</td>
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<td>14:45</td>
<td>SOWC5</td>
<td>Optically Tunable Bandpass Filter Using Series-connected Photonic Liquid Crystal Fibers, Jia-Hong Liu¹, Ta Lin¹, Yan-Jen Huang¹, Chu-Rong Lee¹, Chiu-Ping Wu¹; ¹Department of Photonics, NYSU, Taiwan; ²Institute of Electro-Optical Science and Engineering, National Cheng Kung University, Taiwan. We demonstrate an optically tunable bandpass filter based on two series-connected photonic liquid crystal fibers filled with different LCs. By using photoresponsive LCs, 115-nm bandwidth tunability can be achieved by 5-second blue-laser irradiation.</td>
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*Sessions continue on page XX.*
A Novel Dispersion and D Tolerant Clock Phase Detector

Han Sun1, Kuang-Tsan Wu1; 1Infinera Canada, Canada.

A novel clock phase detector is presented and shown to be tolerant to chromatic compensation with direct detection. Inclusive comparison analysis with conventional hard decision systems is presented.

Low Cost 112G Direct Detection Metro Transmission System with Reduced Bandwidth (10G) Components and MLSE Compensation

Alik Gorshtein1,2; 1Electrical and computer engineering, Ben Gurion University of the Negev, Israel; 2MultiPhy Networks Ltd., Israel. MLSE compensation for reduced bandwidth optoelectronic components, CD, and D at multi-wavelength 4x28G transmission with direct detection is proposed. Inclusive comparison analysis with conventional hard decision systems is presented.

Integration of a Tunable, Optical Delay Generator in a Silicon Photonics Platform

Kambez Jamshidi1, Stefan Meister1, Awa Al-saidi1, Hans Joachim Eichler1, Thomas Schneider1; 1High Frequency Technology, Deutsche Telekom Univ. of Applied Sciences, Germany; 2Inst. für Optik und Atomare Physik, Technical Univ. of Berlin, Germany. We propose an integrated optical delay generator based on Frequency-to-Time conversion. The required dispersions are produced by micro ring resonators based on SOI nano wires. Our design can provide delays up to 500 nanoseconds.

Stripe-based Collimating Silica Planar Waveguide for a Free-space Wavelength Selective Cross Connect

Kazutoshi Otsu1,2, Daiki Tanaka1, Hironari Tsuda1; 1Kanagawa Institute of Technology, Kanagawa, Japan. 2Inst. für Optik und Atomare Physik, Technical University of Berlin, Germany. We propose an integrated beam collimating silica waveguide with stripe-based structure for the use in wavelength selective cross connect (WSXC). The coupling loss of the device is below 0.15 dB within the ideal propagation distance.

Noise Reduction Effect of Semiconductor Optical Amplifier Using Fiber Bragg Grating

Yoshinobu Maeda1; 1School of Science and Engineering, Kinki Univ., Japan. A negative feedback semiconductor optical amplifier was realized in an InGaAsP-InP amplifier using a fiber Bragg grating. The negative feedback optical amplification effect can be utilized to recover signal loss with a lower error probability.

Ultrafast Pulse Compression in Integrated Two-Photon Amplifiers

Amir Nevet1, Alex Hayat1, Meir Orenstein1; 1Technion, Israel. We demonstrate experimentally compression of femtosecond-scale pulses by two-photon gain in an electrically-driven AlGaAs waveguide. Dynamic control of pulse width from 240 to 140 fs is achieved by varying the current injection levels.

NOTES
These concurrent sessions are grouped across two pages. Please review both pages for complete session information.

**Harbour Salon A**

### Optical Sensors

**SWC • Photonic Crystal Sensors—Continued**

**SWC6 • 15:00**

**Guided Mode Resonance Sensors for the Monitoring of Film Growth in Atomic Layer Deposition,** Adriana Szeghalmi\(^1,2\), Mato Knez\(^2\), Ernst Bernhard Kley\(^1\); 1Institute of Applied Physics, Friedrich Schiller University Jena, Germany; 2Max-Planck Institute of Microstructure Physics, Germany. Guided mode resonance optics consisting of linear gratings are highly sensitive optical sensors. Their use for monitoring the film growth during atomic layer deposition will be discussed based on rigorous coupled wave approach calculations.

**SWC7 • 15:15**

**Large Blueshift of Resonance Wavelength Simulated With a Small Refractive-index Change of a Nanoporous Waveguide,** Zhi-mei Qi\(^1\); 1State Key Laboratory of Transducer Technology, Institute of Electronics, CAS, China. Simulation of refractive-index sensitivity of nanoporous waveguide resonance sensors reveals an extraordinary feature, that is, a large blueshift of the resonance wavelength induced by a small change in refractive index of the surrounding liquid.

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**Pier 5**

### Specialty Optical Fibers

**SOWC • Poled and Polarizing Fibers—Continued**

**SOWC6 • 15:00**

Enhanced Optical Parametric Gain by Cascading Periodically Poled Fiber Segments, Lijun Zhang\(^1\), Li Qian\(^1\); 1ECE, University of Toronto, Canada. Numerical modeling shows that cascading multiple segments of periodically poled fiber without phase control can nonetheless improve non-degenerate optical parametric gain with high yield if sufficient idler filtering is applied in between segments.

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15:30–16.00 **Coffee Break, Harbour Ballroom Foyer**

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**NOTES**
Optical Temporal Integration of Broadband Microwave Waveforms over Nanosecond and Sub-Nanosecond Time Windows, Mohammad H. Aghdasi1, Yongwoo Park2, José Azaña3; 1Energie, Matériaux et Télécommunications, Institut National de la Recherche Scientifique (INRS), Canada. We analyze the performance of optical equalization of distortions induced by polarization mode dispersion (D) in 112 Gbit/s systems using FIR filters. The D-induced mean OSNR penalties are reduced to < 0.1 dB.

Proposals of a Reconfigurable Ultrafast Optical Pulse Shaping Technique Using Multi-Arm Optical Differentiators, Mohammad H. Aghdasi1, José Azaña3; 1Energie, Matériaux et Télécommunications, Institut National de la Recherche Scientifique (INRS), Canada. We propose and numerically evaluate a simple, reconfigurable ultrashort optical pulse shaping technique using multi-arm time differentiators with programmable weights that can be implemented using available integrated-waveguide/in-fiber technologies.

New Photonic components for Quantum Information Science, Alberto Politi4, Jonathan C. Matthews1, Anthony Laing5, Alejandro Peruzzo1, Konstantinos Poulios1, Jaimin Meinecke1, Damien Borne2, Pete Shadbolt1, Pruet Kalasuwan1, Xia-Qi Zhou1, Maria Bodas Verde1, Mirko Lobino1, Terry Rudolph1, John G. Rarity1, John Marciante5, Andrew Jordan5; 1Physics, Univ. of Bristol, UK; 2Electro-Optics Program, University of Dayton, USA; 3School of Materials Science and Engineering, Georgia Inst. of Technology, USA; 4Dept. of Materials Science and Engineering, Massachusetts Inst. of Technology, USA; 5Optics Program, University of Dayton, USA. New photonic components are required to exploit the integrated architecture for Quantum Information Science. We demonstrate quantum interference in MML couplers and two-particle quantum walks in coupled waveguides, showing unique quantum behaviour.

Infrared Colloidal Quantum Dot Chalcogenide Films for Integrated Light Sources, Neil Putel1, Scott Geyer2, Jennifer Scherer2, Maungh Bawendi1; 1Physics, Univ. of Michigan, USA; 2Physics, Univ. of Oxford, UK. Quantum dots and chalcogenide glasses form the basis for photoluminescent films which are fabricated in microcavities to enhance light emission for coupling into waveguides.

Signal Processing in Photonics Communications
16:00–17:30
SPWD • Optical Techniques II
Ivan Djordjevic, Univ. of Arizona, USA, Presider

Integrated Photonics Research, Silicon and Nano Photonics
16:00–17:
IWG • Devices and Components IV
Presider???????????

Optical Sensors
16:00–18:00
SWD • Speckle and Nonlinear Based Imaging
Ofer Levi, Univ. of Toronto, Canada, Presider

Specialty Optical Fibers
16:00–17:30
SOWD • Novel Applications and Effects
Ji Wang, Corning, USA, Presider
We propose a novel design for arbitrary-order optical differentiation based on a especially-apodized long period fiber grating operated in transmission to fully optimize the energetic efficiency and processing speed of the device.

We demonstrate experimentally ultrafast three-photon counting by three-photon absorption in a photomultiplier tube, which may serve as a unique tool for ultrafast quantum state characterization as well as for ultrasensitive temporal measurements.

When an optical parametric amplifier (OPA) operated as a phase-sensitive amplifier (PSA) is used for point source imaging, the angular resolution improvement can defeat the classical Rayleigh limit, and approach the de Broglie resolution.

Measurements of microstrain levels in PDMS membranes doped with SiO2 nanoparticles were obtained using digital image correlation (DIC). The mechanical behavior of PDMS can be analyzed using the enhanced speckle pattern obtained from the samples.

When we use entangled photons in several experimental configurations and demonstrate that for a novel configuration, the effect of turbulence can be greatly diminished.
Sensors Keynote Speaker
SMA1 • 8:45-9:45
Optical Biomedical Sensors: What Can Nanophotonics Bring? Dan-Xia Xu, Inst. for Microstructural Sciences, National Research Council Canada, Canada. We discuss how nanophotonics is influencing the field of optical biomedical sensors. View points are exemplified in the context of developing integrated silicon photonic wire molecular sensor systems.

Dan-Xia Xu is a Senior Research Officer with National Research Council Canada, and an adjunct professor with arleton University. She received her B.S. degree from the University of Science and Technology of China in 1985, and her Ph.D. degree from Linköping University in Sweden in 1991 working on silicon-germanium HBTs and multi-quantum-well tunneling diodes. Since joining NRC, she has developed high speed SiGe HBTs, silicides for sub-micron VLSI, SiGe and silicon photodetectors, and later switched her research field to integrated optics. In 2001-2002 she was part of the research team at Optenia Inc. that successfully developed the first commercial glass waveguide echelle grating demultiplexer. In 2003, she pioneered the study of cladding stress induced birefringence in SOI waveguides and its application for polarization independent operation in photonic components. This technique is easy to implement and gives unprecedented control and design freedom in devices such as AWGs, ring resonators and Mach-Zehnder delay interferometers. Since 2005, she has been working on SOI photonic wire biosensors which are shown to be the most sensitive evanescent field sensor platform known to date. The NRC biosensor team has developed compact and high channel count sensors arrays and a reader system which does not require temperature control, and is capable of detecting protein and DNA adsorption of less than a femto-gram. Her current research interest is high index contrast silicon photonics, including biosensors, ring resonators, and optical modulation for biological sensing and optical communications. She has co-authored over 200 publications in technical journals and international conferences, several book chapters, and holds 6 patents.

Presenter Changes
- Chen-Han Du; Natl. Taiwan Univ. Taiwan will present IMC5, Modeling and Simulation II: Periodic Structures and Waveguides
- Kenji Ishizaki;Kyoto Univ., Japan, will present IMF1, Light Propagation in 3-D Photonic Crystals.
- Wei-cheng Lai, Univ. of Texas, USA will present IMF2, Experimental Demonstration of Ultra-Low Loss Coupling into Slow Light Slotted Photonic Crystal Waveguide on Silicon Nanomembrane
- Gilberto Brambilla, Univ. of Southampton, UK will present SMC4, In-Line Evanescent-Wave Microfluidic Absorption Sensor based on an Embedded Optical Microfiber coil
- Moshe Nazarathy; EE Technion., Israel, will present SPMB3, Low-Complexity Multi-Band Polyphase Filter Bank for Reduced-Guard- interval Coherent Optical OFDM
- The following talk will be presented in the StuC4 time slot: JTuB14, Modeling and Design Optimization of Discrete Mode Lasers for High Speed Single-Mode Operation in Optical Communication Networks
- Valerio Setti; Univ. of Modena and Reggio Emilia, Italy, will present SOWB3 Confinement Loss of Tube Lattice and Kagome Fibers
- Georges Humbert; Univ. de Rouen, France, will present SOWB5 Hollow-core Photonic Crystal Fibre based Raman Lasers
- Jacob Khurgin; Johns Hopkins Univ., USA will present SPWD6, Sequences for Impairment Mitigation in Coherent SPE-OCDMA
- Kambiz Jamshidi will present SLWA5, Saturation and Delay in Broadband Brillouin Slow-Light

Presentation Schedule Updates
IME4, Silicon Photonics Devices for Optical Interconnection, Takahiro Nakamura 1,2, Junichi Fujikata 1,2, Masashige Ishizaka 1,2, and Keiishi Ohashi 1: Photonics Electronics Technology Research Association, Japan 2: Green Innovation Research Laboratories, NEC Corporation, Japan. For optical interconnection, we demonstrated high-speed and high-efficiency optical modulator and photodetector by introducing nanostructure. Also, compact WDM optical source was developed using hybrid integrated SOA and silicon waveguide resonators. This paper will be presented in the IME4 time slot on Monday, 13 June at 17:00.

SOWD1, Fiber-based Synchronized Programmable Laser system for Biomedical, industrial and defense applications, Alain Villeneuve, Genia Photonics, Canada will be presented in the SOWD1 time slot on Monday, 13 June at 16:00.

SOWA4, Reliability of Double-Clad Fiber Coatings for Fiber Lasers, K. T ankala, J. Ambramczyk, D. Guertin, N. Jacobson and K. Farley, Nufern, USA. In this paper we describe work on the improved reliability of low index polymer coatings used in high power double-clad fiber lasers and amplifiers. This paper will be presented in the SOW4 on Wednesday, 15 June at 8:30.

Withdrawn Presentations
IMF7
STuC4
SOTuC1
SOWB2
SPWB4
Advanced Photonics Congress Update Sheet

Program Updates

Please note the title and abstract update for presentation SMC3, Performance Gains in an Interferometric Fiber optic Gyroscope Operated with a Single-Frequency Laser, Seth W. Lloyd, Michel J. F. Digonnet, and Shanhui Fan, Stanford University, Stanford, CA, USA. We present theoretical and experimental results demonstrating significant performance gains in interferometric fiber optic gyroscopes when the traditional gyroscope broadband source is replaced with a single-frequency laser.

Please note the abstract update for presentation SOMD2, Multi-Material Optical Fiber Fabrication and Applications, Ayman Abouraddy; Univ. of Central Florida, USA. I review our progress in the emerging area of multi-material fibers. Applications range from mid-infrared linear and nonlinear chalcogenide glass fibers and fiber tapers, to the scalable and scale-invariant fabrication of micro- and nano-scale structures.

Please note the title and author block update for presentation ATuA3, Overlapped Subcarrier Multiplexed WDM PONs Enabled by Burst-Mode Receivers, David V. Plant1, Ziad A. El-Safi1, Jonathan M. Buset1, Bhavin J. Shastri1, 1McGill Univ., Canada.

Please note the title update for presentation ATuB1 Radio-over-Fiber Techniques and Applications for Multi-Gb/s In-Building Wireless Communication, Anthony Ng’oma, Corning Inc., USA.

Please note the corrected author name for presentation STuA1, Filamentation THz generation in air, S.L. Chin, Univ. Laval, Canada

Please note the update of following poster presentations:

JTuB26, Self-Assembled Monolayers (SAMs) of Porphyrin Deposited inside Solid-core Photonic Crystal Fibre (SCPCF). A. Veselov1, A. Efimov1, A. Chamorovsky2, O. Okhotnikov2, A. Kosolapov3, A. Levchenko3, H. Lemmetyinen1, N. Tkachenko1; 1Department of Chemistry and Bioengineering, Tampere Univ. of Technology, Finland; 2Optoelectronics Research Centre, Tampere Univ. of Technology, Finland; 3Fiber Optics Research Center of Russian Academy of Sciences, Russia.

JTuB27, A Bragg Microcavity Filter for Optical Sensing, Aju. S. Jugessur, Mariya Yagnyukova, James Dou, J. Stewart Aitchison; Electrical and Computer Engineering/ECTI, Univ. of Toronto, Canada. A Bragg microcavity optical sensor is fabricated using Electron-Beam Lithography and Reactive Ion Etching techniques. An index change of 0.03 corresponds to a peak resonance wavelength shift of approximately 1 nm.

JTuB28, Fiber-Optic Probe with Subwavelength Metallic Nanostructures for Sensing in Infrared Region, Seokyoung Roh, Taejin Chung, Byoungho Lee; Seoul National Univ., Korea. We investigate fiber-optic probe with subwavelength metallic nanostructures on the fiber-end facet for sensing. Nanostructures such as 1D/2D gratings in metallic layer are analyzed and utilized for inducing the plasmonic resonance in infrared region.

Presentation SOMC3, Laser Sintering of c-YAG Fiber, Jonathan Goldstein1, Geoff Fair1, David Zelmon1, Heedong Lee2; 1Air Force Research Lab, USA; 2UES, USA, will now be presented as poster JTuB29.

Please note the abstract update for presentation IWE5, Integration of a Tunable, Optical Delay Generator in a Silicon Photonics Platform, Kambiz Jamshidi, Stefan Meister, Awa Al-Saad1, Hans Joachim Eichler, Thomas Schneider, Deutsche Telekom Hochschule für Telekommunikation Leipzig, Germany. We propose an integrated optical delay generator based on Frequency-To-Time conversion. The required dispersions are produced by micro ring resonators based on SOI nano wires. Our design can provide high delays in relatively small footprints.

JTuB25, Enhanced Detection of Vibrations using Fiber Fabry Perot Filters and Spectral Estimation Techniques, Balaji Srinivasan, Bibin Varghese, Harish Achar, IIT Madras, India. We report on high sensitivity detection of acoustic signals using Fiber Bragg grating-based Fabry-Perot filters. Our scheme is based on an APD-based receiver with bandpass filter, 16-bit ADC, and novel spectrum estimation techniques.

Please note the abstract update for presentation IWG1, Quantum Information Processing on Photonic Chips, Dirk Englund; Columbia Univ., USA. We describe a technique to deterministically couple a single, pre-selected nitrogen vacancy (NV) center to a high-quality factor photonic crystal nanocavity in a Gallium Phosphide membrane.

Please note the title and abstract update for presentation SOWA4, Reliability of Double-Clad Fiber Coatings for Fiber Lasers, K. Tankala, J. Ambranczyk, D. Guertin, N. Jacobson and K. Farley, Nufern, USA. In this paper we describe work on the improved reliability of low index polymer coatings used in high power double-clad fiber lasers and amplifiers.

Presider Updates

• Francesco Poletti; Univ. of Southampton, UK will preside over SMD, Spectral and Biomedical Imaging.
Advanced Photonics Congress

Exhibit: 13-14 June 2011 ♦ Toronto, Canada

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POSTDEADLINE PAPERS

Advanced Photonics

Access Networks and Inhouse Communication (ANIC)

Slow and Fast Light (SL)

Specialty Optical Fibers (SOF)


12–15 June 2011
The Westin Harbour Castle
Toronto, Canada

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Advanced Photonics Congress
Postdeadline Paper Abstracts

• Tuesday, June 14, 2011 •

ATuB • Radio Over Fiber and OCDMA Postdeadline Session

Pier 9
10:30-12:30
Thomas Pfeiffer; Alcatel-Lucent, Germany, Presider

ATuB2 • 10:30
Wavelength Allocation Schemes Impact on All-Photonic Digitized-Radio over Fibre Access Network, Seyed Reza Abdollahi1, Hamed Saif Al-Rawashid1, Rajagopal Nilavalan1; 1ECE, Brunel University, United Kingdom. A fully-photonic DRoF system's performance is investigated with different uniform and non-uniform WDM schemes. Simulation results demonstrated that uniform WDM application increases power penalty about 2 dBm higher than non-uniform plan.

• Wednesday, June 15, 2011 •

SLWC • SL Postdeadline Session

Pier 2 & 3
12:15-12:45
Thomas Krauss; Univ. of St. Andrews, UK, Presider

SLWC1 • 12:15
Ultracompact all-optical XOR logic in a slow-light silicon photonic crystal waveguide, Chad Husko1, Trung Duc Vo1, Bill Corcoran1, Juntao Li2, Thomas Krauss2, Benjamin Eggleton1; 1University of Sydney, Australia; 2University of St. Andrews, United Kingdom. We demonstrate ultracompact chip-based all-optical exclusive-OR (XOR) logic via four-wave mixing in a dispersion-engineered silicon photonic crystal waveguide. The device is error-free for 40 Gbit/s differential phase shift keying (DPSK) signals.

SLWC2 • 12:30
Structural slow light can enhance Beer-Lambert absorption, Isabelle Dicaire1, Sanghoon Chin1, Luc Thévenaz1; 1Institute of Electrical Engineering, École Polytechnique Fédérale de Lausanne, Switzerland. We experimentally demonstrate that structural slow light can enhance Beer-Lambert absorption. A 4-fold reduction of the group velocity induced by mere cavity effects has caused an increase of molecular absorption by 130%.
SOWE • SOF Postdeadline Session

Pier 5
17:30-18:00
Bryce Samson; Nufern, USA, Presider

SOWE1 • 17:30
Photosensitivity at 1550 nm and Bragg grating inscription in As2Se3 microwires for sensing applications, Raja Ahmad¹, Martin Rochette¹; ¹Electrical and Computer Engineering, McGill University, Canada. We demonstrate the writing of Bragg gratings in As2Se3 microwires. Bragg gratings are written from a 1550 nm laser source; we demonstrate strain sensing with an improved sensitivity of 1.3 pm/µε compared to silica-based sensors.

SOWE2 • 17:45
Poled-Fiber Source of Polarization-Entangled Photon Pairs, Eric Y. Zhu¹, Zhiyuan Tang¹², Li Qian¹, Lukas G. Helt², Marco Liscidini²³, John E. Sipe², Costantino Corbari⁴, Albert Canagasabey⁴⁵, Morten Ibsen⁴, Peter G. Kazansky⁴; ¹Electrical and Computer Engineering, University of Toronto, Canada; ²Dept. of Physics, University of Toronto, Canada; ³Dipartimento di Fisica “A. Volta”, Universita degli Studi di Pavia, Italy; ⁴Optoelectronics Research Centre, University of Southampton, United Kingdom; ⁵School of Physics, University of Sydney, Australia. We demonstrate broadband telecom-wavelength polarization-entangled photon pair generation in a periodically-poled silica fiber (PPSF). Two-photon interference visibility exceeds 90%, and Bell’s inequality is violated by 8 standard deviations.
**Key to Authors and Presiders**
(Bold denotes Presenting Author or Presider)

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|   | Corbari, Costantino-**SOWE2**  
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Paper Submission Deadline: February 2012