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Welcome to Hong Kong and to the Asia Communications and Photonics Conference

It is a great pleasure to invite you to participate in the Asia Communications and Photonics Conference (ACP) 2015 and share the latest news in communications and photonics science, technology and innovations from leading companies, universities and research laboratories throughout the world. ACP is now one of the largest conferences in the Asia-Pacific region on optical communication, photonics and relevant technologies. ACP has been held annually tracing back to 2001 and jointly sponsored by OSA, SPIE, IEEE Photonics Society, COS and CIC. This year ACP is colocated and jointly organized with International Conference on Information Photonics and Optical Communications (IPOC), another major conference in the area.

The ACP technical conference features a full suite of plenary, invited, and contributed talks given by international academic and industrial researchers who are leaders in their respective fields. This year’s conference will feature the following topics: Optoelectronic Integration, Devices and Materials; Novel Fibers and Fiber-based Devices; Optical Transmission Systems, Subsystems, and Technologies; Network Architectures, Management, and Applications; Biophotonics and Optical Sensors; Optical Signal Processing and Microwave Photonics. The conference will also include a wide spectrum of workshops, and an industrial forum on Towards Ultra-high Speed Metro and Data Center Networks: Demand, Challenge & Technology in the afternoon of Sunday, 22 November. With a conference program of broad scope and of the highest technical quality, ACP provides an ideal venue to keep up with new research directions and an opportunity to meet and interact with the researchers who are leading these advances. We have over 550 papers scheduled, including 106 invited and nine tutorial presentations made by many of the world’s most prominent researchers from academia and industry. We thank all the contributors and authors for making ACP a truly unique, outstanding global event.

Our conference highlight is the Plenary Session scheduled on the morning of Saturday, 21 November. Four outstanding, distinguished speakers will give presentations: Professor Ernst H. K. Stelzer of the Goethe Universität, Frankfurt am Main, Germany will present on Light Sheet-based Fluorescence Microscopy (LSFM, SPIM, DSLM) - a Paradigm Shift in Modern Light Microscopy; Professor Vahala, Jenkins Professor and Professor of Applied Physics at Caltech, will give a talk on The Technology and Science of Optical Micro-resonators: Integrated Optical Clocks to Phonon Lasers; Dr. Frank J. Effenberger, Vice President and Fellow, Fixed Access Network Laboratory, Futurewei Technologies, Inc. will present on The Influence of Industrial Trends on Optical Access; Professor Peter Krüger from the School of Physics and Astronomy, University Park, The University of Nottingham, United Kingdom will discuss Harnessing Quantum Gases with Light and Magnetic Fields: Atomic Quantum Sensors.

In addition to the regular technical sessions, eight workshops and a special symposium on Novel Optical Networks in 5G Era organized by Huawei Technologies Co. Ltd. will also be held featuring over fifty invited speakers. These pre-conference workshops will be held on Friday, 20 November starting from 09:00. In addition, a special workshop will be organized on Thursday, 19 November at Jinan University. These workshops will also be held free of charge to conference registrants. We would like to thank the workshop organizers and speakers for the excellent program.

Best Student Paper Awards sponsored by IEEE Photonics Society will be given to students who are first authors and presenters of exceptional contributed talks. The selection will be made by the subcommittees during the conference. Awards will be presented during the Banquet on 23 November. The poster-only session will be held on Sunday morning from 10:00–11:30. This is a good chance for you to meet with the authors and discuss technical issues in-depth. Two best poster awards sponsored by OSA and selected by conference delegates will be given as well. This year, we will also award three best paper awards sponsored by Luster LightTech Corp. They will be presented during the Banquet.

In addition to the technical program, we have prepared a rich social program to facilitate meeting and networking with colleagues from all over the world. A conference reception will be held in the evening on 21 November. On the evening of Monday, 23 November, we will hold a Banquet for conference registrants in the Chancellor Room of the Hong Kong Convention and Exhibition Centre.

It is an enormous task to organize a conference and it is impossible to succeed without the dedicated efforts of many supporters and volunteers. We are indebted to the entire Technical Program Committee led by Hwayaw Tam (The Hong Kong Polytechnic University, Hong Kong SAR); Kun Xu (Beijing University of Posts and Telecommunications, China); Pierpaolo Ghiggino (Talentour, Italy); Naoya Wada (NICT, Japan) and the Subcommittee Chairs who have worked persistently throughout the whole year to invite speakers, solicit and review papers, organize the technical sessions which results in the excellent technical program. We also thank the staff and volunteers of the professional societies from OSA, SPIE, IEEE Photonics Society, COS and CIC for organizing and sponsoring the event.

Sincerely,

Yuefeng Ji
General Co-Chair

Jie Luo
State Key Laboratory of Optical Fiber and Cable Manufacture Technology, China
General Co-Chair

Chao Lu
The Hong Kong Polytechnic University, Hong Kong SAR
General Chair

Ken-Ichi Kitayama
Osaka University, Japan
General Co-Chair

Naoya Wada
NICT, Japan
General Co-Chair

Talentour, Italy

Pierpaolo Ghiggino

Yuefeng Ji
Beijing University of Posts and Telecommunications, China
General Co-Chair

Dr. Frank J. Effenberger
Futurewei Technologies, Inc.

Professor Peter Krüger
The University of Nottingham, United Kingdom
Committees

Honorary Chairs
Alexander Ping-Kong Wai, The Hong Kong Polytechnic University, Hong Kong SAR
Xiaomin Ren, Beijing University of Posts and Telecommunications, China

General Chairs
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Jie Luo, State Key Laboratory of Optical Fiber and Cable Manufacture Technology, China
Yuefeng Ji, Beijing University of Posts and Telecommunications, China
Ken-Ichi Kitayama, Osaka University, Japan

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Kun Xu, Beijing University of Posts and Telecommunications, China
Pierpaolo Ghiggino, Talentour, Italy
Naoya Wada, NICT, Japan

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Prof. Arthur Chiou, National Yang-Ming University, Taiwan, China
Prof. Yun C. Chung, Korea Advanced Institute of Science and Technology, Korea
Prof. Sailing He, Zhejiang University, China; KTH, Sweden
Prof. Chennupati Jagadish, Australian National University, Australia
Prof. Thomas L. Koch, University of Arizona, USA
Dr. Ming-Jun Li, Corning Inc., USA
Prof. Xingde Li, Johns Hopkins University, USA
Dr. Xiang Liu, Huawei Technologies, USA
Prof. Chao Lu, The Hong Kong Polytechnic University, China
Prof. Qingming Luo, Huazhong University of Science and Technology, China
Prof. Qian Mao, Wuhan Research Institute of Posts and Telecommunications, China
Naomi Chavez, OSA
Prof. Xiaomin Ren, Beijing University of Posts and Telecommunications, China
Prof. Ping Perry Shum, Nanyang Technological University, Singapore
Prof. Yikai Su, Shanghai Jiao Tong University, China
Prof. Brian J. Thomas, SPIE
Prof. Bingkun Zhou, Tsinghua University, China

Local Arrangement Committee
Chair:
Dr. Feng Li, The Hong Kong Polytechnic University, Hong Kong SAR

Members:
Dr. Xian Zhou, The Hong Kong Polytechnic University, Hong Kong SAR/University of Science and Technology Beijing
Dr. Kangping Zhong, The Hong Kong Polytechnic University, Hong Kong SAR
Dr. Jinhui Yuan, The Hong Kong Polytechnic University, Hong Kong SAR/Beijing University of Posts and Telecommunications
Dr. Liang Wang, The Hong Kong Polytechnic University, Hong Kong SAR

Subcommittees
Track 1: Optoelectronic Integration, Devices and Materials
Chair:
Hon Ki Tsang, The Chinese University of Hong Kong, Hong Kong SAR

Co-Chairs:
C-Lin Pan, National Tsing-Hua University, Taiwan
Kevin A. Williams, Eindhoven University, Netherlands

Members:
Andrew Poon, Hong Kong University of Science and Technology, Hong Kong SAR
Danzia Xu, National Research Council, Canada
Zhou Zhiping, Peking University, China
Y. Nakano, Tokyo University, Japan
Joyce Poon, University of Toronto, Canada
Cun-Zheng Ning, Arizona State University, USA
Shou-Jinn Chang, National Cheng Kung University, Taiwan
Hao-chung (Henry) Ku, National Chiao Tung University, Taiwan
Ray-Hua Horng, National Chung Hsing University, Taiwan
Tetsuya Kawanishi, Waseda University, Japan

Track 2: Novel Fibers and Fiber-based Devices
Chair:
Limin Tong, Zhejiang University, China

Co-Chairs:
Kenneth Wong, The University of Hong Kong, Hong Kong SAR
Aping Zhang, The Hong Kong Polytechnic University, Hong Kong SAR

Members
C.Y. Chung, Gwangju Institute of Science and Technology, Korea
Gang-Ding Peng, The University of New South Wales, Australia
Morten Ibsen, University of Southampton, UK
Kevin P. Chen, University of Pittsburgh, USA
Xinliang Zhang, Huazhong University of Science and Technology, China
Yunjiang Rao, University of Electronic Science and Technology, China
Alexandre Kudlinski, University Lille 1, France
Baojun Li, Sun Yat-sen University, China
Akira Shirakawa, University of Electro-Communications, Japan
Track 3: Optical Transmission Systems, Subsystems, and Technologies

Chair:
Alan Pak Tao Lau, The Hong Kong Polytechnic University, Hong Kong SAR

Co-Chairs:
Neda Cvijetic, NEC Labs America, USA
Gabriella Bosco, Politecnico di Torino, Italy
Yuki Yoshida, Osaka University, Japan

Members:
Naoto Yoshimoto, Chitose Institute of Science and Technology, Japan
Sander Jansen, ADVA, Germany
Antonio Teixeira, DETI, Instituto de Telecomunicacoes, Portugal
Philipp Schindler, Infinera, USA
Yoshinari Awaji, NICT, Japan
Toshihiko Hirooka, Tohoku University, Japan
Zhaohui Li, Jinan University, China

Track 4: Network Architectures, Management, and Applications

Chair:
Gangxiang Shen, Soochow University, China

Co-Chairs:
Lena Wosinska, KTH, Sweden
Calvin CK Chan, Chinese University of Hong Kong, Hong Kong SAR
Jie Zhang, Beijing University of Posts and Telecommunications, China

Members:
Carmen Mas Machuca, Technical University Munich (TUM), Germany
Carla Raffaelli, University of Bologna (UNIBO), Italy
Anna Tzanakaki, University of Bristol, UK
Paolo Monti, KTH, Sweden
Wende Zhong, NTU, Singapore
Ori Gerstel, Sedona Systems, Israel
Bartlomiej Kozicki, Alcatel-Lucent Bell Labs, Belgium
Ioannis Tomokos, Athens Information Technology Center (AIT), Greece
Hua Nian, Tsinghua University, China
Weiqiang Sun, Shanghai Jiao Tong University, China
Zuqing Zhu, University of Science and Technology, China
Huiying Xu, Huawei Technology, China
Yiran Ma, China Telecom, China
Lei Guo, Northeast University, China
Massimo Tornatore, Politecnico di Milano, Italy
Darli Mello, University of Campinas (Unicamp), Brazil
Xueqing Wei, Fiberhome, China

Track 5: Biophotonics and Optical Sensors

Chair:
Mike Somekh, The Hong Kong Polytechnic University, Hong Kong SAR

Co-Chair:
Aaron Ho, Chinese University of Hong Kong, Hong Kong SAR

Members:
Dong Hyun Kim, Yonsei University, Korea
Andrei Kabashin, Polytechnique Montreal, Canada
Melissa Mather, The University of Nottingham, UK
Kevin K. Tsia, The University of Hong Kong, Hong Kong SAR
Klaus Suhling, King’s College London, UK
Wei R. Chen, University of Central Oklahoma, USA
Junle Qu, Shenzhen University, China

Track 6: Optical Signal Processing and Microwave Photonics

Chair:
Chester Shu, Chinese University of Hong Kong, Hong Kong SAR

Co-Chairs:
Sai Tak Chu, City University of Hong Kong, Hong Kong SAR
Alessia Pasquaoli, University of Sussex, UK
Jianping Yao, University of Ottawa, Canada

Members:
Shilong Pan, Nanjing University of Aeronautics and Astronautics, China
Hao Chi, Zhejiang University, China
Gong-Ru Lin, National Taiwan University, Taiwan
Xiaoke Yi, University of Sydney, Australia
David Moss, RMIT, Australia
Francesca Parmigiani, University of Southampton, UK
Chao Wang, University of Kent, UK
Ping Piu Kuo, UC San Diego, USA
Mable Fok, University of Georgia, USA
Guifang Li, University of Florida, USA
Hung Nguyen Tan, AIST, Japan
Guo-Wei Lu, Tokai University, Japan
Ju-Han Lee, University of Seoul, Korea
Lawerence Chen, McGill University, Canada
Jose Azana, INRS-EMT, Canada
General Information

Conference Venue: Hong Kong Convention and Exhibition Centre (HKCEC), Hong Kong
Address: No. 1 Expo Drive, Wanchai, Hong Kong

Accessibility

The Hong Kong Convention & Exhibition Centre (HKCEC) is easily accessible from MTR (metro system in Hong Kong) Wanchai Station, or Wanchai Ferry Pier. It is about a 10 minute walk from the MTR station or ferry pier.

If you are arriving from the airport, you can:

- By Bus – take route no. A11 or E11 to Wanchai and change to route no. 40M to the HKCEC (estimate 80 min)
- By Airport Express & MTR - from Airport Station to Hong Kong Station and switch to Wanchai Station (estimate 40 min)
- By Taxi – estimate 40 min

The conference will take place in the Hong Kong Convention and Exhibition Centre which is a major landmark located in the heart of Hong Kong on Victoria Harbour. Its vast curtain of glass and 40,000 square-metre aluminum roof is sculpted to echo a seabird soaring in flight. Internationally known as HKCEC, this world-class convention and exhibition centre was voted Best Convention and Exhibition Centre in Asia for the ninth time by industry awards in 2012. The HKCEC is connected to two world class hotels: The Grand Hyatt Hong Kong and the Renaissance Harbour View Hotel.

Registration

Registration Hours and Location:

<table>
<thead>
<tr>
<th>Time</th>
<th>Date</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>14:00–17:00</td>
<td>Thursday, 19 November</td>
<td>Room CD634, The Hong Kong Polytechnic University</td>
</tr>
<tr>
<td>09:00–17:00</td>
<td>Friday, 20 November</td>
<td>Foyer, Concord Room, Renaissance Hong Kong Harbor View Hotel (Preregistration only) and Foyer, Room S221, HKCEC (On-site and preregistration)</td>
</tr>
<tr>
<td>08:00–18:00</td>
<td>Saturday, 21 November</td>
<td>Theatre Foyer, Theatre 1, Hong Kong Convention and Exhibition Centre (HKCEC)</td>
</tr>
<tr>
<td>08:00–12:00</td>
<td>12:00–18:00</td>
<td>Foyer, Theatre 1, HKCEC Room N201, HKCEC</td>
</tr>
<tr>
<td>08:30–18:00</td>
<td>Sunday, 22 November</td>
<td>Room N201, HKCEC</td>
</tr>
<tr>
<td>08:30–18:00</td>
<td>Monday, 23 November</td>
<td>Room N201, HKCEC</td>
</tr>
</tbody>
</table>

Poster Preparation

Authors should prepare their poster before the poster session starts. The poster must not exceed the boundaries of the display board and A0 size is recommended. Authors are required to be standing by their poster for the duration of their allocated session to answer questions and further discuss their work with attendees. No shows will be reported to Conference management and these papers will not be published.

Poster Board Size – 2.1m (Height) X 0.95uim (Length)
Set-up Time – 09:30 on Sunday, 22 November
Tear-down Time – 18:00 on Sunday, 22 November

Exhibition

The ACP Exhibition is open to all attendees.
Location: N201, HKCEC

Exhibition Hours:

<table>
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<tr>
<th>Time</th>
<th>Date</th>
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<tbody>
<tr>
<td>13:00–18:00</td>
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</tr>
<tr>
<td>08:30–17:00</td>
<td>Monday, 23 November</td>
</tr>
</tbody>
</table>

Conference Materials

ACP 2015 Technical Digest will be provided in a USB drive and not available in print form. The ACP 2015 Technical Digest material is composed of the 3-page summaries of invited and accepted contributed papers. The Technical Digest material is included with a technical conference registration and can be found in your registration bag.

The Digest will be available on OSA Publishing’s Digital Library (https://www.osapublishing.org/) and IEEE Xplore Digital Library (http://www.ieee.org/web/publications/xplore/) after the conference. IEEE Xplore Digital Library and OSA Publishing’s Digital Library are archived and indexed by INSPEC R and EI Compendex, where it will be available to the international technical community.

Speaker Preparation

All oral presenters should check in at the corresponding session room at least thirty minutes prior to their scheduled talk to upload and check their presentation. No shows of the oral presentation will be reported to Conference management and these papers will not be published.
Social Activities

Welcome Reception
The ACP 2015 welcome reception will be held on 21 November, 2015.
Location: HKCEC, Room N201
Time: 18:00–19:00, Saturday, 21 November, 2015

Conference Banquet and Closing Ceremony
The ACP 2015 Banquet and Closing Ceremony will be held in the Chancellor Room of the Hong Kong Convention and Exhibition Centre on 23 November. Chinese food will be served. The Best Student Paper Awards, Luster Best Paper Award and Best Poster Award will be presented at the banquet.
Location: Chancellor Room, HKCEC
Time: 19:00–21:00, Monday, 23 November, 2015

Visit Program
A visit program will be organized to the Photonics Research Centre, The Hong Kong Polytechnic University on 19 November, 2015.
Location: Please gather at CD634, The Hong Kong Polytechnic University, Hung Hom, Kowloon
Time: There will be three sessions at 14:00, 15:00 and 16:00, Thursday, 19 November, 2015
Their own. By now, he has published more than 250 papers and was granted several patents that secure the intellectual property of at least three commercially available optical instruments. He has received several prizes and honors. In January 2015 light sheet-based fluorescence microscopy was honored as “Method of the Year 2014” by Nature Methods.

**Ernst H. K. Stelzer**

Biograph: Ernst H.K. Stelzer is the Professor for Physical Biology and Advanced Light Microscopy at the Goethe University (Frankfurt am Main, Germany) since March 2011. He concentrates his efforts on applications and further developments of advanced light microscopies in the modern life sciences, working on various aspects and applications of three-dimensional cell biology, lateral root development in Arabidopsis thaliana and the embryogenesis of Tribolium castaneum. New instruments allow scientists to observe and manipulate biological specimens efficiently, with high precision and high spatio-temporal resolution. From 1987-2011, he was a Scientific Group Leader at the European Molecular Biology Laboratory (EMBL, Heidelberg, Germany), most lately in the Cell Biology and Biophysics Unit. Ernst Stelzer has been working in physics, optics, biophysics, cell biology, molecular biology, plant biology and developmental biology for more than 30 years. He has contributed to conventional fluorescence microscopy, confocal fluorescence microscopy, 4Pi- and theta-microscopy, optical tweezers and levitation, laser ablation and light sheet-based fluorescence microscopy. His publications continue to influence optics, biophysics, cell biology, developmental biology and plant biology. In more general terms, he is particularly interested in developing three-dimensional microscopies that enable observations under close-to-natural conditions as a function of time. Many of his former Diploma and Ph.D. students as well as Postdocs continue to pursue successful academic careers of their own.

**Professor Peter Krüger**

Biograph: Professor Peter Krüger holds the Chair of Cold Atom Physics and Quantum Optics at the University of Nottingham, UK. He is the scientific leader of the Midlands Ultracold Atom Research Centre and the UK National Quantum Technology Hub in Sensors and Metrology at Nottingham. His research focuses on the microscopic control and manipulation of ultracold atomic gases with optical and magnetic fields. After pioneering work on the development of atom chips, i.e. integrated devices for atomic quantum gases in analogy to the ubiquitous electronic microchips, his current interest continues to cover a broad spectrum ranging from fundamental physics questions to translational applied technology. Key contributions to the understanding of complex quantum systems include thermalization in one-dimensional, and phase transitions in two-dimensional systems. To facilitate technology development, he has introduced schemes for coherent atom-optical devices, such as waveguides, beam splitters and interferometers, as well as compact cold atom sources integrating photonic, electronic, and atomic components. Current quantum sensor work includes optical magnetometry, magnetic microscopy, and accelerometers (gravity and rotation sensors). Krüger’s body of work has been published in a wide range of topical and interdisciplinary journals, has received 4,000 citations and he has received awards from the Humboldt foundation and the European Union.
**Topic: The Influence of Industrial Trends on Optical Access**

11:50–12:40

**Dr. Frank J. Effenberger**
Vice President and Fellow, Fixed Access Network Laboratory, Futurewei Technologies, Inc., USA

**Biograph:** After completing his doctoral work in 1995, Dr. Effenberger worked at Bellcore, where he analyzed all types of access network technologies, especially passive optical networks. He witnessed the early development of the FSAN initiative and the APON standard. In 2000, he moved to Quantum Bridge Communications, where he managed the system engineering group. This work supported the development and standardization of advanced optical access systems based on B-PON and G-PON technologies. In 2006, he became Director of FTTx in the advanced technology department of Futurewei Technologies USA. He remains heavily involved in standards work, and in 2008, he became the chairman of ITU-T Q2/15. He and his team work on forward-looking fiber and copper access technologies, including the 10G EPON, XG-PON, and 40G-PON. Notably, his team supported the world’s first trials of XG-PON and 40G-PON. In 2011, he was named as Huawei Fellow, and in 2012 was promoted to VP of access research. In 2015, he was named as a Fellow of both the OSA and the IEEE. He holds 60 US patents.

**IEEE Photonics Society Best Student Paper Awards**

ACP 2015 is pleased to announce that this year’s Best Student Paper Awards on ACP will be sponsored by IEEE Photonics Society:

**Best Student Paper Awards, 10 recipients, 500 US dollars for each**

To be eligible for the award, a student must be the first author of the paper and declare his/her student candidature during online submission; and the student must give the presentation at the conference by himself/herself. The selection will be made by the subcommittees during the conference. The awards will be granted at the conference banquet in the evening of Monday, 23 November.

**Luster LightTech Corp. Best Paper Awards**

ACP 2015 is pleased to announce that this year’s Best Paper Awards on ACP will be sponsored by Luster LightTech Corp:

**Best Paper Awards, 3 recipients, 1000 US dollars for each**

The selection will be made by the TPC chairs and subcommittee chairs during the conference. The awards will be granted at the conference banquet in the evening of Monday, 23 November.

**Poster Session**

Time: 10:00–11:30, Sunday, 22 November
Venue: Room N201, HKCEC

Over 150 posters will be displayed during ACP 2015. The poster session is designed to provide an opportunity for selected papers to be presented in greater visual detail and facilitate vivid discussions with attendees. Authors will remain in the vicinity of the bulletin board for the duration of the session to answer questions.

**OSA Best Poster Awards**

ACP 2015 is pleased to announce that this year’s Best Poster Awards on ACP will be sponsored by OSA:

**Best Poster Awards, 2 recipients, 500 US dollars for each**

The selection will be based on the voting of conference delegates. The awards will be granted at the conference banquet in the evening of Monday, 23 November.

**Workshops**

**Symposium on Novel Optical Networks in 5G Era**

**Workshop 1: Recent Advances in Optical Fiber and Specialty Fibers**

**Workshop 2: Recent Advances in Optical Fiber Sensors**

**Workshop 3: Closing the Gap to Shannon Limit: What is Next for Nonlinearity Compensation in Optical Communication?**

**Workshop 4: Short Reach Optical Communication Systems**

**Workshop 5: Silicon Photonics - Technology Challenges and Applications**

**Workshop 6: Nanophotonics and Related Technologies (NART)**

**Workshop 7: What Are the Next Spotlights for Optical and Radio Frequency Orbital Angular Momentum Beams?**

**Workshop 8: Recent Advances in Space-Division Multiplexing (SDM)**
Special Workshop

**Topic:** Workshop on Next Generation Optical Interconnection Techniques
Time: 09:00–15:15, 19 November
Venue: Jinan University, Meeting Room, 4th Floor, Alumni Building

IPOC Special Tutorial

**Time:** 14:30–16:00, 22 November
Venue: Room N204/205, HKCEC

Xiaomin Ren, Beijing University of Posts and Telecommunications, will discuss the Latest Novel Understandings of Electron States Architectures in Crystalline Materials and Likely of the Whole Physics.

Industry Forum

**Topic:** Towards Ultra-high Speed Metro and Data Center Networks: Demand, Challenge & Technology
Time: 14:30–18:10, November 22, 2015
Place: Room N207, HKCEC

ACP 2015’s Industry Forum will present you the latest advances in the field of ultra-high speed metro and data center networks by distinguished speakers from the industry. The forum will cover products, technologies and applications from both technical and business perspectives.
Special Workshop

Topic: Workshop on Next Generation Optical Inter-Connection Techniques

Time: 09:00–15:15, 19 November, 2015
Venue: Jinan University, Meeting Room, 4th Floor, Alumni Building, Huangpu Road West 601, Guangzhou, China

Organizers:
Zhaohui Li, Jinan University, Guangzhou, China
Weiping Liu, Jinan University, Guangzhou, China
Chao Lu, The Hong Kong Polytechnic University, Hong Kong SAR

Session I:
Session Chair: Xiangjun Xin, Beijing University of Posts and Telecommunications, Beijing, China

09:00–9:30 Siyuan Yu, Sun Yat-sen University, China
A review of recent progress in OAM communications and related technologies

09:30–10:00 Chongjin Xie, Alibaba, inc.
Optical interconnect technologies in datacenters

10:00–10:15 Tea Break

10:15–10:45 Po Dong, Alcatel–Bell Labs
Silicon photonic integrated circuits

10:45–11:15 Xiang Zhou, Google Inc.
DATA center optics: requirements and challenges

11:15–11:45 Yikai Su, Shanghai Jiaotong University
Silicon Photonic Devices for Signal Modulation, Filtering and Analog Processing

11:45–14:00 Tea Break

Session II
Session Chair: Zhaohui Li, Jinan University, Guangzhou, China

14:00–14:30 LiangChuan Li, Huawei Co. Ltd.
Non-Orthogonal Optical Transmission WDM Systems

14:30–15:00 Ming Li, Institute of Semiconductors, CAS
All-optical integrated analog signal processing

15:00–15:30 Yange Liu, Nankai University
Mode excitation and conversion in few-mode fibers and their applications

15:30–15:45 Tea Break

15:45–16:15 Zuqing Zhu, University of Science and Technology, China
Service Provisioning in Multi-Domain SD–EONs

16:15–16:45 Yu Yu, Huazhong University of Science & Technology
Large bandwidth and high power Germanium photodetector

16:45–17:15 Ning Liu, Huawei Co. Ltd.
The Trend of Next Generation Metro Optical Network
Symposium and Workshops

Symposium on Novel Optical Networks in 5G Era

Time: 09:00–17:00, 20 November
Venue: Concord Room, Renaissance Harbour View Hotel

Organizers:
Deng Ning, Huawei Technologies Co. Ltd

Introduction:
The 1-day symposium is expected to have a morning session and afternoon session, focusing on presentations and discussions on novel optical networks and technologies for ‘all-optical’ (e.g. novel ROADM/WSS/OXC technologies and networks; what will be the practical next-generation ‘all-optical’ networking; enhanced packet-optical networks, etc.), 4G/5G transport (e.g. C-RAN, front/back hauling, etc.) and DCI (e.g. DC intra/inter connect architecture/technology, low-cost DWDM and transmission, etc.). The symposium will comprise invited talks, Q&A discussion, panel discussion, networking event, etc.

The invited speakers include experts from telecom operators, internet service providers, universities and institutes, system and device/chip vendors and industry consulting firm. ACP and Huawei cordially invite experts from these organizations to present views, join in the discussion, and together shape the future of the industry.

Detail Program
Morning session: Next generation WDM architecture and ‘all-optical’ network
09:30–12:00 Invited presentations, Q&A
• Current optical transport industry status and outlook from consulting firm
• Operator’s view on all-optical / core networking
• System vendor’s view on all-optical / core networking
Tea break
• All-optical or future networking architecture & technologies (1)
• All-optical or future networking architecture & technologies (2)
12:00–12:30 Panel discussion
12:30–14:00 Lunch break

Afternoon session: Novel optical networks and technologies for emerging 5G and DCI
14:00–16:30 Invited presentations, Q&A
• Operator’s view on optical transport for 5G and/or DCI
• System vendor’s view on 5G / DCI transport
• Component vendor’s view on 5G / DCI transport
Tea break
• Optical technologies for 5G/DCI/short-reach (1)
• Optical technologies for 5G/DCI/short-reach (2)
16:30–17:00 Panel discussion

Workshop 1: Recent Advances in Optical Fibers and Specialty Fibers

Time: 9:00–12:00, 20 November
Venue: Concord Room II, Renaissance Harbour View Hotel

Organizers:
Liangming Xiong
State Key Laboratory of Optical Fiber and Cable Manufacture Technology, YOFC, Wuhan, China

Kin-Seng Chiang
Department of Electronic Engineering, City University of Hong Kong

Introduction:
In recent years, much research effort has been devoted to the development of new optical fibers for further enhancing the quality and the capacity of optical transmission, in particular, ultra-low loss fibers, large-effective-area fibers, few-mode fibers, and multicore fibers. Meanwhile, many specialty fibers based on new materials and new structures have been developed for specific applications in a wide range of areas, such as metrology, sensing, lasers, and optical signal processing. This workshop provides an overview of some of these developments by putting together a series of presentations given by experts from industry and academia.
Speakers:

Opening Address: Prof. Jie Luo, Director of State Key Laboratory of Optical Fiber and Cable Manufacture Technology and the CTO of YOFC

Dr. Yiran Ma, Beijing Research Institute, China Telecom Co. Ltd. China
Topic: Advanced fiber helps optical transmission to go faster and longer

Dr. Nicolas Fontaine, Bell Labs, Alcatel-Lucent, USA
Topic: Space-division Multiplexing in Multi-Mode Fibers

Prof. Ming Tang, Wuhan National Laboratory for Optoelectronics & school of Optical and electronic information, Huazhong University of Science and Technology, China.
Topic: Multicore fiber based SDM technology for transmission, signal processing and sensing applications

Dr. Ming-Leung Vincent Tse, Photonics Research Center, Department of Electrical Engineering, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong, China.
Topic: Special Structured Optical Fibers for Sensing Applications

Dr. Erik Schartner, the Institute for Photonics and Advanced Sensing (IPAS), The University of Adelaide, Australia
Topic: Optical fibers for chemical and medical sensing applications

Dr. Darren D. Hudson, Centre for Ultrahigh bandwidth Devices for Optical Systems (CUDOS), Institute of Photonics and Optical Science (IPOS), School of Physics, University of Sydney, Australia
Topic: Mode-locked fiber lasers in the mid-IR

Dr. Edson Haruhico Sekiya and Prof. Kazuya Saito, Frontier Materials Laboratory, Toyota Technological Institute
Topic: Investigation of NIR emission in Bi, Sb, Pb and Sn doped silica glasses aiming optical fiber amplifier and laser

Prof. Meisong Liao, R&D Center of High Power Laser Component, Shanghai Institute of optics and Fine Mechanics, Chinese Academy of Sciences, China
Topic: Highly nonlinear photonic crystal fibers for supercontinuum generation in given band

Dr. Shangran Xie, Max Planck Institute for the Science of Light
Topic: Applications of fiber “nanospike” on low-threshold supercontinuum generation and optomechanical self-stabilization

Workshop 2: Recent Advances in Optical Fibre Sensors
Time: 13:45–17:00, 20 November
Venue: Concord Room II, Renaissance Harbour View Hotel

Organizers:

Kazuo Hotate, University of Tokyo, Japan
Topic: Distributed Strain and/or Temperature Sensing based on Fiber Brillouin Optical Correlation Domain Techniques - Performances and Applications

Byoungho Lee, Seoul National University, Korea
Topic: Plasmonics and Metasurfaces for Potential Sensor Applications

Robert McLaughlin, University of Western Australia, Australia
Topic: A Microscope-in-a-needle: Fibre-optic Probes for Biomedical Applications

Anna G. Mignani, CNR-IFAC, Sesto F.no (FI), Italy
Topic: Raman Spectroscopy for Food Fingerprinting

Hwa-Yaw TAM, The Hong Kong Polytechnic University, Hong Kong
Topic: Smart Railway Monitoring Systems based on Fibre Bragg Grating Sensing Networks

Limin Tong, Zhejiang University, China
Topic: Nanofibre Optical Sensors

Wei Jin
Depart of Electrical Engineering, The Hong Kong Polytechnic University, Hong Kong SAR, China

John Canning
School of Chemistry, The University of Sydney, Australia

Introduction:
After nearly four decades of research, optical fibre sensor technologies are gradually becoming mature. Some sensors have successfully moved out from the laboratory to real-world applications while novel concepts and techniques are still being researched for creating new types of sensors and improving the performance of existing sensors. This workshop invites some of the world-leading experts to talk about the state-of-the-art and future trends in some selected areas of research and development, including distributed Brillouin sensors with millimetre spatial resolution, fibre Bragg grating sensors for smart railways, Raman spectroscopy for food fingerprinting, optical fibre OCT probes for biomedical applications, and sensors based on plasmons and micro/nano fibre. The workshop will include presentation and discussion sessions and we welcome people of relevant interest to attend and join the discussions.
Workshop 3: Closing the Gap to Shannon Limit: What is Next for Nonlinearity Compensation in Optical Communication?

Time: 09:00–12:00, 20 November
Venue: Room S227, HKCEC

Organizers:

Sergei Popov
Royal Institute of Technology
KTH, Sweden

Darko Zibar
DTU Fotonik, Technical University of Denmark

Lech Wosinski,
Royal Institute of Technology
KTH, Sweden

Introduction:

This workshop will focus on the challenges and recent advances in nonlinearity compensation. The focus will also be on the actual benefits of various compensation schemes, from a transponder manufacturer's point of view. Currently, commercially available high-speed optical communication systems are employing advanced modulation formats (e.g. 16QAM), digital coherent detection for impairment compensation, and signal demodulation. Several methods for performing nonlinearity compensation including digital backpropagation, phase conjugation and nonlinear post-equalization have been demonstrated. However, the achievable gain is < 2 dB for multi-channel scenario. In this workshop, we will look into the most recent efforts on nonlinearity mitigation. Furthermore, we consider novel methods for nonlinearity compensation including inverse scattering theory and Bayesian tracking, and discuss how they can be adopted for the nonlinearity mitigation in optical communication. The idea is to combine ideas concepts different fields such as information theory, machine learning and statistical control theory.

Speakers:

Dr. Andre Richter, VPI Photonics, Germany
Topic: Integrated simulation and design environment for SDM applications

Prof. Gunnar Jacobsen, Swedish ICT – Acreo, Sweden
Topic: Impact of Phase Noise in High Capacity Optical Coherent Transmission Systems

Dr. Marco Secondini, Scuola Superiore Sant Anna, Italy
Topic: What is the Shannon Limit in Fiber Optical Communications?

Dr. Pawel Rosa, Institute of Optics, IO-CSIC, Spain
Topic: Advanced Raman Architecture for Nonlinear Compensation Using Optical Phase Conjugation

Prof. Polina Bayvel, University College of London, UK
Topic: Overcoming fibre nonlinearities to enhance the achievable transmission rates in optical communication systems

Prof. Alan P. T. Lau, The Hong Kong Polytechnic University, Hong Kong SAR, China
Topic: Communications Through Nonlinear Fiber-Optic Channels Using Nonlinear Frequency Division Multiplexing

Workshop 4: Short Reach Optical Communication Systems

Time: 13:30–17:00, 20 November
Venue: Room S227, HKCEC

Organizers:

Zhaohui Li
Jinan University, China

Kangping Zhong
The Hong Kong Polytechnic University, Hong Kong SAR, China

Introduction:

With the rapidly increasing data traffic in data centers, mobile front-haul/back-haul and high speed optical access networking and other short reach optical applications, current optical interconnect systems is expected to be insufficient in the near future. Some research show that the growing bandwidth demand from optical interconnects will be much more than that from the long-haul optical transmission in the near future. However, compared to long-haul optical transmission systems, optical interconnects are more sensitivity to system cost, components footprint and power consumption. In this workshop, the invited speakers will present the state-of-art and future trends in visible light communications (VLC) and short reach MMF/SMF transmission systems in many aspects including advanced low cost transmitter and receiver, advanced modulation formats, WDM/Polarization multiplexing techniques, digital signal processing (DSP) techniques, coherent detection/direct detection. Challenges in future optical short reach systems will also be discussed. We welcome people of relevant interest to attend and join the workshop.
Speakers:
Dr. Zhao Jian, Tyndall National Institute and University College Cork, Ireland
Topic: Advanced formats and subsystems for short-reach applications

Prof. Yi Lilin, Shanghai Jiaotong University, Shanghai, China
Topic: Recent research progress on NG-EPON

Dr. Liu Xiang, Huawei, USA
Topic: Advanced modulation and detection schemes for next-generation PON

Dr. Zhong Kangping, The Hong Kong Polytechnic University, Hong Kong
Topic: PAM-4 for Short Reach Optical Communication Systems

Prof. Tang Ming, Huazhong University of Science & Technology, China
Topic: Coding and modulation technique in DDO-OFDM based short-medium optical interconnect

Dr. Li Jianping, Jinan University, China
Topic: Multimode-multiplexing based technology for low-cost short reach optical interconnect

Dr. Lu Xiaofeng, Technical University of Denmark
Topic: Optical Vortices Techniques for Short Range Data Communications

Prof. Zabih (Fary) Ghassemlooy, University of Northumbria at Newcastle, UK
Topic: Visible light Communications – A green Technology with Multiple Functionalities

Prof. Chow Chi-Wai, National Chiao Tung University
Topic: Short-Reach Light Emitting Diode (LED) based Visible Light Communications (VLC)

Workshop 5: Silicon Photonics – Technology Challenges and Applications
Time: 09:00–13:00, 20 November
Venue: Room S228, HKCEC

Organizers:
Hon Ki Tsang
The Chinese University of Hong Kong

Zhiping Zhou
Peking University

Introduction:
The rapid development of silicon photonics has been driven by the potential of silicon photonics for energy-efficient, high-speed optical interconnects in computing and by the opportunities of new applications in telecommunications and sensors based on the advantage of low-cost large-volume manufacturing that is possible from CMOS foundries. In this workshop we discuss some of the technology challenges and the real applications for silicon photonics that have emerged in the market place. This workshop is to provide a forum for researchers on silicon photonics to present and discuss their vision, recent progresses, and future challenges and applications.

Speakers:
Prof. S.J. Ben Yoo, University of California at Davis
Topic: Heterogeneous 2D/3D integration for future microsystems

Dr. Po Dong, Alcatel Lucent
Topic: Silicon photonics for high-capacity advanced modulation formats

Dr. Laurent Vivien, University of Paris Sud
Topic: Recent Advances in Pockels Effect in Silicon

Dr. Yuriy Fedoryshyn, ETH Zurich
Topic: Dense Integration of Plasmonic Modulators for Compact High-speed Optical Interconnects

Prof. Lech Wosinski, Royal Institute of Technology (KTH)
Topic: Technological Challenges in Si Nanophotonic and Plasmonic Fabrication

Prof. Pavel Cheben, National Research Council, Canada
Topic: Subwavelength engineering for silicon photonics

Prof. Graham Reed, University of Southampton
Topic: Single Crystal SiGe on Insulator

Hon Ki Tsang
The Chinese University of Hong Kong
Zhiping Zhou
Peking University
Lin Yang
Institute of Semiconductors, Chinese Academy of Sciences

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Workshop 6: Nanophotonics and Related Technologies (NART)

Time: 14:30–18:30, 20 November
Venue: Room S228, HKCEC

Organizers:

Speakers:
Prof. Darren Bagnall, UNSW, Sydney, Australia
Topic: Antireflection and light-trapping in photovoltaics

Prof. Daoxin Dai, Zhejiang University, Hangzhou, China
Topic: Graphene-silicon nanophotonic integrated circuits

Prof. A. W. Poon, HKUST, Hong Kong SAR, China
Topic: Surface-state absorption induced photocurrent generation in silicon waveguides and microrings in 1300/1550nm wavelengths

Prof. Hon K. Tsang, CUHK, Hong Kong SAR, China
Topic: Hybrid Integration of 2-D materials on optical waveguides

Dr. Pavel Cheben, National Research Council, Canada
Topic: Subwavelength grating engineered nanostructures for integrated optics

Prof. JianJun. He, Zhejiang University, Hangzhou, China
Topic: Single Electrode Controlled Fast Wavelength Channel Switching in Tunable V-Cavity Laser Fabricated with Quantum Well Intermixing Technology

Prof. A.V. Zayats, King’s College London, UK
Topic: Nonlinear Hyperbolic Materials

Introduction:
This workshop will focus on the fundamentals, recent advances and applications of nanophotonics and related technologies. Latest achievements in nanotechnology allow for studying and implementation of new, interesting effects in nano-scale photonics, new ways of controlling the interaction between guided modes and electronic excitations and light-matter interaction in nanostructures. Photonic integrated circuits technology have been given much attention in recent years and the rapid development of the photonic integration technology is showing great promises for the implementation in the next generation devices for optical communication, interconnects and sensing. This workshop aims to provide a forum for international experts to present and discuss the visions and perspectives of these technologies including recent progresses and future prospects and challenges for applications.

Workshop 7: What Are the Next Spotlights for Optical and Radio Frequency Orbital Angular Momentum Beams?

Time: 09:00–12:00, 20 November
Venue: Room S226, HKCEC

Organizers:

Shengguo Huang
State Key Laboratory of Information Photonics and Optical Communications, Beijing University of Posts and Telecommunications, China

Jian Wang
Wuhan National Laboratory for Optoelectronics, Huazhong University of Science and Technology, China

Siyuan Yu
1Photonics Group, Merchant Venturers School of Engineering, University of Bristol, UK
2State Key Laboratory of Optoelectronic Materials and Technologies and School of Physics and Engineering, Sun Yat-sen University, China

Introduction:
Orbital angular momentum (OAM) is a physical property of the photon or electromagnetic (EM) wave that has attracted much attention in recent years. Although the simplest OAM
beams can be scalar fields, EM waves or photons carrying OAM are often vectorial fields with spatially varying polarization, therefore also carrying spin angular momentum (SAM) and known as cylindrical vectorial vortices (CVVs). For potential applications at both optical and RF frequencies, the generation, manipulation, propagation and detection of various OAM – carrying beams or photons are of fundamental importance. The unbounded OAM mode space has already shown significant promise in information transmission, both in mode multiplexed classical data transmission and in quantum communications. The complex interaction between OAM beams (especially CVVs) and matter could lead to important new applications in areas such as imaging and remote sensing, particulate manipulation, biophotonics, etc. This workshop aims to explore the direction of research in the fundamental aspects of OAM and its applications through invited presentations and panel discussions sessions. The discussions will focus on the state-of-the-art advances and in particular will discuss future research directions in OAM-carrying beams and their applications in various areas. The topics address will include but not limited to:

- Fundamental principles of OAM beams
- Schemes and components for generating, manipulating and detecting OAM beams
- Obstacles and solutions in the propagation of OAM beams
- Classical data communications using OAM
- Quantum photonic information applications of high dimensional OAM states
- Imaging and remote sensing using OAM
- Manipulation, control and analysis of macro – and microscopic matter using OAM beams
- Deep space exploration using OAM beams
- RF and terahertz OAM applications

Speakers:

Prof. Juan. P. Torres, Universitat Politecnica de Catalunya, Spain
Topic: Optical Doppler Shift with Structured Light: A New Tool to Measure Flow Vorticity and Transverse Particle Movement

Prof. Bosen Shi, University Of Science and Technology of China, China
Topic: Quantum Storage of Orbital Angular Momentum State

Prof. Zhiyuan Zhou, University Of Science and Technology of China, China
Topic: Highly Efficient Frequency Conversion and Splitting of Orbital Angular Momentum Carrying Light

Prof. Xilun Cai, Sun Yat-sen University, China
Topic: Photonic Integrated Circuits for Generation and Manipulation of Light’s Orbital Angular Momentum

Prof. Jian Wang, Huazhong University of Science and Technology, China
Topic: Flexible Spatial Light Modulation Using Phase-Only Elements

Prof. Xiaoceng Yuan, Shenzhen University, China
Topic: Dynamic DOES for OAM Interconnections

Prof. Zizheng Cao, Eindhoven University of Technology, Netherland
Topic: Photonics Assisted Broadband RF-OAM Generation and Detection: Operation Principle and Integrated Solution

Prof. Xinlu Gao, Beijing University of Posts and Telecommunications, China
Topic: The Generation, Detection and Application of the RF-OAM Beams Based on Microwave Photonics Technology

Prof. Xianming Zhang, Zhejiang University, China
Topic: Possible Applications of RF Orbital Angular Momentum

Workshop 8: Recent Advances in Space-Division Multiplexing (SDM)

Time: 14:00–18:00, 20 November
Venue: Room S226, HKCEC

Organizers:

Jian Wang
Wuhan National Laboratory for Optoelectronics, Huazhong University of Science and Technology, China

Siyuan Yu1,2
1Photonics Group, Merchant Venturers School of Engineering, University of Bristol, UK
2State Key Laboratory of Optoelectronic Materials and Technologies and School of Physics and Engineering, Sun Yat-sen University, China

Guifang Li1,2
1CREOL, The College of Optics & Photonics, University of Central Florida, USA
2College of Precision Instrument and Opto-Electronic Engineering, Tianjin University, Tianjin, China
**Introduction:**

Space-division multiplexing (SDM) is considered to be a promising technique addressing the capacity crunch. SDM allows for continuous increase of aggregate transmission capacity and spectral efficiency of optical communications. Multi-core fiber (MCF) and few-mode fiber (FMF) are two attractive candidates widely used in SDM optical fiber communications. SDM explores the physical dimension of transverse spatial structure which is termed the spatial multiplexing of separated optical fields in a MCF or few linearly polarized (LP) modes in an FMF. In addition to MCF and FMF, the concept of SDM can be further extended with great flexibility as the transverse spatial structure of a light beam can take many different forms. Twisted light beam carrying orbital angular momentum (OAM) which is related to the transverse spatial phase structure has attracted increasing interest in SDM optical communications. The OAM-carrying light beams have a helical phase front which is twisting along the direction of propagation, so-called twisted light beams. Remarkably, one distinct feature of OAM, in principle, is the unlimited and intrinsically orthogonal states, i.e. multiple twisted light beams with different twisting rates or OAM states are inherently orthogonal with each other, which can be used for SDM by OAM multiplexing. Very recently, OAM-based SDM has also seen great success both in fiber and free-space optical communications with improved transmission capacity and spectral efficiency.

This workshop will focus on the recent advances in SDM. Topics of relevance include but are not limited to:

- Design, modeling, fabrication and characterization of multi-core fiber, few-mode fiber, multi-core few-mode fiber, multi-mode fiber, OAM fiber and other special fibers for SDM.
- Spatial light modulator (SLM), photonic lantern, and photonic integrated devices for SDM. Multi-core and few-mode fiber amplifiers.
- Efficient multiplexing and demultiplexing techniques for SDM.
- Analyses on linear and nonlinear impairments in fiber and turbulence in free space.
- Coding algorithm, multiple-input multiple-output (MIMO) digital signal processing, and other equalization techniques for SDM.
- SDM-assisted chip-scale photonic interconnects and data center optical interconnects.
- System transmission experiments of SDM using multi-core fiber, few-mode fiber, multi-core few-mode fiber, and multi-mode fiber.
- Fiber-based and free-space system transmission experiments of SDM using OAM multiplexing.
- SDM networking applications with multi-core fiber, few-mode fiber, multi-core few-mode fiber, multi-mode fiber and OAM fiber.

This workshop will include invited presentations and panel discussions sessions. We sincerely welcome scientists, students and industry representatives of relevant interest to attend and join the workshop.

**Speakers:**

**Prof. Siyuan Yu,** ¹Photonics Group, Merchant Venturers School of Engineering, University of Bristol, UK ²State Key Laboratory of Optoelectronic Materials and Technologies and School of Physics and Engineering, Sun Yat-sen University, China

Topic: A Summary of Research Progress in OAM Communications Funded by the National 973 Program

**Prof. S. J. Ben Yoo,** University of California, Davis, USA

Topic: Space Division Multiplexing by 2D/3D Photonic Integrated Circuits for OAM Mux/Demux/Conversion

**Mr. Yongxiong Ren,** University of Southern California, USA

Topic: Challenges and Opportunities in using Orbital Angular Momentum for Communication Links

**Prof. Jian Wang,** Huazhong University of Science and Technology, Wuhan, China

Topic: Recent Progress in Space-Division Multiplexing using Orbital Angular Momentum (OAM) Modes

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¹CREOL, The College of Optics & Photonics, University of Central Florida, USA; ²College of Precision Instrument and Opto-Electronic Engineering, Tianjin University, Tianjin, China

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**Prof. Guifang Li,** ¹CREOL, The College of Optics & Photonics, University of Central Florida, USA; ²College of Precision Instrument and Opto-Electronic Engineering, Tianjin University, Tianjin, China

Topic: TBD

**Dr. Akihide Sano,** NTT Network Innovation Laboratories, NTT Corporation, Japan

Topic: Multi-Core Few-Mode Fiber Transmission Technology

**Dr. Nicolas K. Fontaine,** Bell Laboratories, Alcatel-Lucent, USA

Topic: Space-Division Multiplexing in Multi-Mode Fibers

**Dr. Ezra Ip,** NEC Labs America, USA

Topic: Elliptical Core Few-Mode Fibers for MIMO-Less Intra-Data Center Transmission
IPOC Special Tutorial

Topic: Latest Novel Understandings of Electron States Architectures in Crystalline Materials and Likely of the Whole Physics

Time: 14:30–16:00, 22 November
Venue: N204/205, HKCEC

Speaker:

Xiaomin Ren, Beijing University of Posts and Telecommunications

Biograph: IET Fellow (since 2010); Professor and Vice President of Beijing University of Posts and Telecommunications (BUPT), Beijing, China, since 1993 and 1996, respectively; Director of the State Key Laboratory of Information Photonics and Optical Communications at BUPT and of its predecessor, a homonymic ministry-level key laboratory, since 2011 and 2003, respectively. He received his Ph.D. degree in Electronic Science and Technology (on Photonics and Optical Communications) from BUPT in 1989. Then he joined BUPT and works with BUPT up to now. During 1994 to 1996, he worked first as a Senior Visiting Scholar in Centro Studi E Laboratori Telecomunicazioni (CSELT), Turin, Italy, and then as a Visiting Senior Research Fellow in the Microelectronics Research Center, University of Texas at Austin. He has been a Standing Director of Chinese Optical Society since 2006 and an Associate Editor of IEEE/OSA Journal of Lightwave Technology since 2010. He was a winner of the National Outstanding Young Scientist Fund (NNSF, China) in the year of 1996. He served for a period from 1998 to 2011 as a Member, mostly as a Deputy Head, of two National 863 Expert Groups in different areas successively, first in the Information Area and then in the New Materials Area (personally in charge of the researches regarding optoelectronics), under the National 863 (High Tech) Program of China. He had been the Chief Scientist of the National 973 Research Projects (twice, one initial and one continued) on optoelectronics from 2003 to 2014 under the National 973 (Basic Research) Program of China. He has made his efforts and contributions to steer and organize a number of international conferences for a long time. He was the General Chair of 2013 Asia Communications and Photonics Conference (ACP 2013) and is a Honorary Co-Chair of ACP 2015. He was just now elected as the Chairman of the ACP Steering Committee. He has also been an executive director of Zh. I. Alferov Russian-Chinese Joint Laboratory of Information Optoelectronics and Nanoheterostructures under the direct leadership of Nobel Laureate, Prof. Zh. I. Alferov. His research interests include novel III-V semiconductor nanoheterostructures, high quality metamorphic epitaxy of semiconductor materials, new compatible material systems for heterogeneous integrations, novel semiconductor/fiber based microstructures and optoelectronic devices, Integrated optoelectronics (PIC and OEIC) and advanced optical communication technologies. Quite recently (since 2012), he has also paid great attention to fundamental physics.
Industry Forum

Topic: Towards Ultra-high Speed Metro and Data Center Networks: Demand, Challenge & Technology

Time: 14:30–18:10, November 22, 2015
Place: Hong Kong Conference and Exhibition Center (HKCEC), Room N207

Chairman:

Co-chairman:

ACP 2015’s Industry Forum will present you the latest advances in the field of ultra-high speed metro and data center networks by distinguished speakers from the industry. The forum will cover products, technologies and applications from both technical and business perspectives.

Session I
14:30 Dr. Xiang Zhou, Google
Topic: Ultra-high Speed Optical Interconnection in Data Centers
14:50 Dr. Xiang Liu, Huawei
Topics: Prospects on Ultra-broadband Access and Short Reach Optics in 5G Era
15:10 Avi Shabtai, MultiPhy
Topics: Advanced DSP based 100G/400G Solutions for Data Center Connectivity
15:30 Dr. Rangchen Yu, Oplink
Topics: Intra- and Inter- Data Center Optical Networking Solutions for 100Gbps and Beyond
15:50 Chris Cole, Finisar
Topics: 400G Ethernet and 50G PAM4 Technology Status

Session II
16:30 Dr. Chongjin Xie, Alibaba
Topic: Optical Technology for High-Speed Data Center Networks
16:50 Xiaohong Zhang, Alcatel-Lucent Shanghai Bell
Topic: High Capacity DCI Solution in the Pipeline
17:10 Richard Jensen, Polatis
Topic: Optical Switching: A Key to Next Generation Data Center
17:30 Akito Nishimura, Fujikura
Topic: Optical Passive Components for High Speed Data Centers
17:50 Dr. Thomas Lee, SHF
Topic: Development of High Speed Test and Measurement Solutions for High Speed Data Centers

Biographies of Speakers

Dr. Xiang Zhou is currently a Tech Lead within Google platform advanced technology group, working on next-generation optical interconnection technologies. Prior to joining Google on 2013, he had been with AT&T Labs-Research (Middletown, NJ, USA) for 12 years, conducting research on various aspects of long-haul optical transmission and photonic networking technologies, including Raman amplification, polarization-and reflection-related impairments, optical power transients control (in dynamic optical networks), advanced modulation formats and digital signal processing for high-speed transmission (100Gb/s, 400Gb/s and beyond). Between 1999 and 2001, he was with Nanyang Technological University, Singapore as a Research Fellow, doing research on optical CDMA and wide-band Raman amplification. Xiang Zhou received his Ph.D degree in electrical engineering from Beijing University of Posts & Telecommunications in 1999. Dr. Zhou has extensive publications in top journals and conferences in his field including several record-setting 'hero' results, which have received wide media reports. He holds 36 US patents with 15 more pending. He is an OSA fellow, and currently serves as an associate editor of Optics Express. He also served on the technical program committee for a number of IEEE, OSA and SPIE technical conferences.

Dr. Xiang Liu is the Director of Optical Access Networks Department at Futurewei Technologies, Huawei R&D, USA, focusing on next-generation optical access technologies. Dr. Liu had been a Distinguished Member of Technical Staff at Bell Labs New Jersey, working on high-speed optical fiber communications. He has authored/coauthored over 280 journal and conference papers, and holds over 60 US patents. He is a Fellow of the OSA and an Associated Editor of Optics Express. He has served as TPC Chairs in international communications conferences such as The Optical Fiber Communication Conference and Exposition (OFC), ACP, and Wireless and Optical Communication Conference (WOCC).

Mr. Avi Shabtai is Chief Executive Officer (CEO) of MultiPhy, a fabless semiconductor company providing cutting edge DSP based ICs at 100 Gb/s for Data Center connections. Avi has over 20 years of management experience in the telecommunications industry with expertise in semiconductors, systems and solutions. Prior to joining MultiPhy, Avi established and served as General Manager of Private and...
Alternative Networks Line of Business at Alvarion (NASDAQ: ALVR). During his time at Alvarion, Avi also served as Vice President (VP) Marketing & Strategy, leading the WIMAX business and product strategy and marketing activities of a $250 million annual business unit. Prior to Alvarion, Avi held senior Research & Development (R&D) and management positions at Tiaris, Metalink (NASDAQ: MLTL) and an elite R&D unit of the Israeli Ministry of Defense. Avi holds B. Sc and M. Sc. degrees in Electrical Engineering (EE) from the Technion, Israel Institute of Technology, and is a SMP Graduate of the Technion Institute of Management.

Dr. Rangchen Yu is currently VP of Business Development and General Manager of Active Products at Oplink, a leading optical communication solution provider, and a fully owned subsidiary of Molex. Prior to joining Oplink in 2009, Dr. Yu was Global VP of product development of Source Photonics, and VP of Datacom and Telecom, Fiberxon (acquired by MRV). Dr. Yu also served various engineering and management positions with networking companies such as Agility Communications and SDL (both acquired by JDSU). Prior to joining optical networking industry, he conducted research in novel electronic material and devices at Princeton University and University of Illinois at Urbana-Champaign. Dr. Yu obtained his B. Sc. degree in Physics from Peking University, and Ph. D. of Solid State Physics from University of Pennsylvania.

Mr. Chris Cole is a Director at Finisar Corp., Sunnyvale, California where he is architecting and leading the development of 50 Gb/s, 100 Gb/s and 400 Gb/s optical standards and transceivers. He received a B.Sc. in Aeronautics and Astronautics, and B.Sc. and M.Sc. in Electrical Engineering from the Massachusetts Institute of Technology. At Hughes Aircraft Co. (now Boeing SDC) and then M.I.T. Lincoln Laboratory, Chris contributed to multiple imaging and communication satellite programs such as Militar. Later, he consulted on telecom ASIC architectures and designs for Texas Instruments DSP Group and Silicon Systems Inc. (now Maxim). Chris was one of the architects of the Sequoia coherent imaging ultrasound platform at Acuson Corp. (now Siemens Ultrasound), where he also managed hardware and software groups. As a principal consultant with the Parallax Group he carried out signal processing analysis and product definition for several imaging and communication systems. At BBN, a Finisar acquisition, Chris developed 10 Gb/s and 40 Gb/s optical transceivers. He is a Senior Member of the IEEE.

Dr. Chongjin Xie received his M.Sc. and Ph.D. degrees from Beijing University of Posts and Telecommunications, China in 1996 and 1999, respectively. From 1999 to 2001, he worked at Photonics laboratory, Chalmers University of Technology in Gothenburg, Sweden for one and half years to conduct post-doctorate research. He joined Bell Labs, Lucent Technologies (now Alcatel-Lucent) in Holmdel, New Jersey, USA in 2001, and was a Distinguished Member of Technical Staff, doing research on optical communication systems and networks. He joined Alibaba Group in 2014, working on data center optical technologies. He has authored and co-authored more than 200 journal and conference publications, and two book chapters. He is an associate editor of Journal of Lightwave Technology, and has served in many conferences as chairs, Technical Program Committee (TPC) chairs or TPC members. Dr. Xie is a senior member of IEEE and a fellow of OSA.

Mr. Xiaohong Zhang is currently a Senior Product Manager of Alcatel-Lucent IP/Optics product in China. He works for the OTN product management, and focuses on high speed optical transmission, OTN product strategy definition and product evolution.

Mr. Richard Jensen is currently Vice President of Architecture at Polatis, and has over 25 years of experience working in optical communications. Before joining Polatis, he was a Technology Director at Sycamore Networks working on emerging optical networking architectures and transmission technologies. In addition, he has over 15 years of engineering and management experience in undersea systems at AT&T Bell-Labs working on ultra-long haul undersea transmission systems.

Mr. Akito Nishimura is Group Manager of Fiber Optic Network Product R&D Department at Fujikura Ltd. He is responsible for developing optical components for optical inter-connection. During his 23-year career with Fujikura, he developed optical multi fiber connectors for telecommunications and data communications. He holds a Master’s degree in Mechanical Engineering from Ibaraki University, Japan.

Dr. Thomas Lee is currently VP Marketing of SHF Communication Technologies AG. He has been with SHF since 2002 after a career with Nortel Network’s optical system research laboratory in Harlow UK, where he was involved in the investigation of high speed optical transmission systems at 40 Gb/s. In SHF, he is currently involved in the development of high speed BER test and measurement equipment targeting R&D applications in data and optical communications for 400 Gb/s and beyond.
Conference Directory
HKCEC meeting room N200series

Nov. 21
12:00-19:00, Registration (N201, For all types)
13:00-18:00, Industry Exhibition (N201)
14:00-18:00, Technical sessions (N202-N210)
18:00-19:00, Welcome Reception (N201)

Nov. 22
8:30-18:00, Registration (N201, For all types)
8:30-18:00, Industry Exhibition (N201)
8:30-18:00, Technical Sessions (N202-N210)
10:00-11:30, Poster Sessions (N201)
14:00-18:00, Industry Forum (N207)

Nov. 23
8:30-18:00, Registration (N201, For all types)
8:30-16:00, Industry Exhibition (N201)
## Conference Schedule

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<tbody>
<tr>
<td><strong>Registration</strong></td>
<td>14:00–17:00¹</td>
<td>09:00–17:00²,³</td>
<td>08:00–18:00⁴</td>
<td>08:30–18:00⁵</td>
<td>08:30–17:00¹</td>
<td>1. Room CD 634, The Hong Kong Polytechnic University</td>
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<td>2. Foyer, Concord Room, Renaissance Hong Kong Harbor View Hotel</td>
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<td>3. Foyer, Room S221, HKCEC</td>
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<td>4. Foyer, Theatre 1, HKCEC</td>
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<td>5. Room N201, HKCEC</td>
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<tr>
<td><strong>Visit to The Photonica Research Centre</strong></td>
<td>14:00–17:00 (every hour)</td>
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<td>The Hong Kong Polytechnic University</td>
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<tr>
<td><strong>Special Workshop</strong></td>
<td>09:00–15:15</td>
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<td>Jian University, Meeting Room, 4th Floor, Alumni Bldg.</td>
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<tr>
<td><strong>Workshops</strong></td>
<td>09:00–18:30</td>
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<td>Concord Room, Renaissance Hong Kong Harbor View Hotel</td>
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<tr>
<td><strong>Symposium</strong></td>
<td>09:00–18:30</td>
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<td>Concord Room, Renaissance Hong Kong Harbor View Hotel</td>
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<tr>
<td><strong>Industry Exhibition</strong></td>
<td>13:00–18:00</td>
<td>08:30–18:00</td>
<td>08:30–17:00</td>
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<td>Room N201, HKCEC</td>
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<tr>
<td><strong>Opening and Plenary Session</strong></td>
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<td>08:30–12:40</td>
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<td>Theater 1, HKCEC</td>
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<tr>
<td><strong>Technical sessions</strong></td>
<td>14:00–18:00</td>
<td>08:30–18:00</td>
<td>08:30–16:00</td>
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<td>Rooms N202-N210, HKCEC</td>
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<tr>
<td><strong>Industry Forum</strong></td>
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<td>14:30–18:10</td>
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<td>Room N207, HKCEC</td>
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<tr>
<td><strong>Welcome Reception</strong></td>
<td>18:00–19:00</td>
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<td>Room N201, HKCEC</td>
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<tr>
<td><strong>Poster Session</strong></td>
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<td>10:00–11:30</td>
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<td>Room N201, HKCEC</td>
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<tr>
<td><strong>Best Student Paper Competition Session</strong></td>
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<td>08:30–12:30</td>
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<td>Rooms N204/205 &amp; N211</td>
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<tr>
<td><strong>IPOC Special Tutorial</strong></td>
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<td>14:30–16:00</td>
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<td>Room N204/205, HKCEC</td>
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<tr>
<td><strong>Postdeadline Papers</strong></td>
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<td>16:30–18:30</td>
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<td>Rooms N202/N203 and N211/N212, HKCEC</td>
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<tr>
<td><strong>Banquet and Closing Ceremony</strong></td>
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<td>19:00–21:00</td>
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<td>Chancellor Room, HKCEC</td>
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</table>

**Note:**
All times reflect Hong Kong time. Please check with conference organizer during conference for schedule changes and updates.
Thursday, November 19

14:00–17:00  
Registration Open, CD634, The Hong Kong Polytechnic University, Hung Hom, Hong Kong

09:00–15:15  
Special Workshop on Next Generation Optical Inter-Connection Techniques  
Meeting Room, 4th Floor, Alumni Building  
Jinan University, Guangzhou, China  
Huangpu Road West 601, Guangzhou, China

14:00–17:00  
Visit to The Photonics Research Centre, The Hong Kong Polytechnic University  
(From 14:00–17:00 every hour)

Explanation of Session Codes

The first letter of the code designates the meeting. The second element denotes the day of the week (Saturday=S, Sunday=Su, Monday=M). The third element indicates the session series in that day (for instance, 1 would denote the first parallel sessions in that day). Each day begins with the letter A in the fourth element and continues alphabetically through a series of parallel sessions. The lettering then restarts with each new series. The number on the end of the code (separated from the session code with a period) signals the position of the talk within the session (first, second, third, etc.). For example, a presentation coded AS3C.4 indicates that this paper is being presented on Saturday (S) in the third series of sessions (3), and is the third parallel session (C) in that series and the fourth paper (4) presented in that session.

Invited papers are noted with Invited.  
Tutorial papers are noted with Tutorial.
## Agenda of Sessions

### Friday, November 20

<table>
<thead>
<tr>
<th>Time</th>
<th>Concord Room</th>
<th>Concord Room II &amp; III</th>
<th>Room S227</th>
<th>Room S228</th>
<th>Room S226</th>
</tr>
</thead>
<tbody>
<tr>
<td>09:00–17:00</td>
<td>Registration Open, Foyer, Concord Room, Renaissance Hong Kong Harbor View Hotel (Pre-registration only) and Foyer, Room S221, HKCEC</td>
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#### 09:00–12:30

- **Symposium on Novel Optical Networks in 5G Era** (09:00-12:30)
- **Recent Advances in Optical Fiber and Specialty Fibers** (09:00-12:00)
- **Closing the Gap to Shannon Limit: What is Next for Nonlinearity Compensation in Optical Communication?** (09:00–12:00)
- **Silicon Photonics – Technology Challenges and Applications** (09:00–13:00)
- **What Are the Next Spotlights for Optical and Radio Frequency Orbital Angular Momentum Beams?** (09:00–12:00)

#### 10:30–11:00

**Coffee Break, Foyer, Concord Room, Renaissance Hong Kong Harbor View Hotel and Foyer, Room S221, HKCEC**

#### 12:30–14:00

**Lunch Break, On Your Own**

#### 14:00–18:30

- **Symposium on Novel Optical Networks in 5G Era** (14:00-17:00)
- **Recent Advances in Optical Fiber Sensors** (13:45-17:00)
- **Short Reach Optical Communication Systems** (14:00–18:00)
- **Nanophotonics and Related Technologies (NART)** (14:30–18:30)
- **Recent Advances in Space-Division Multiplexing (SDM)** (14:00–18:00)

#### 15:30–16:00

**Coffee Break, Foyer, Concord Room, Renaissance Hong Kong Harbor View Hotel and Foyer, Room S221, HKCEC**
## Agenda of Sessions

### Saturday, 21 November

<table>
<thead>
<tr>
<th>Time</th>
<th>Location</th>
<th>Details</th>
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<tbody>
<tr>
<td>08:00–19:00</td>
<td>Room N202</td>
<td>08:00–12:00 Registration Open, Theatre Foyer, Theatre 1, 12:00–19:00, N201 Foyer, HKCEC</td>
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<tr>
<td>08:30–10:30</td>
<td>Room N204/205</td>
<td>Opening and Plenary Session, Theatre 1, HKCEC</td>
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<td>Opening – 20 minutes</td>
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<td>Plenary Presentation 1 – 50 minutes</td>
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<td>Plenary Presentation 2 – 50 minutes</td>
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<td>10:30–11:00</td>
<td>Room N201, HKCEC</td>
<td>Coffee Break, Room N201, HKCEC</td>
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<tr>
<td>11:00–12:40</td>
<td>Room N201, HKCEC</td>
<td>Plenary Session, Theatre 1, HKCEC</td>
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<td>Plenary Presentation 3 – 50 minutes</td>
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<td>Plenary Presentation 4 – 50 minutes</td>
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<tr>
<td>12:40–14:00</td>
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<td>Lunch Break, On Your Own</td>
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<tr>
<td>13:00–18:00</td>
<td>Room N201, HKCEC</td>
<td>Industry Exhibition, Room N201, HKCEC</td>
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<tr>
<td>14:00–15:30</td>
<td>Room N201, HKCEC</td>
<td>Coffee Break around Exhibition Area, Room N201, HKCEC</td>
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<tr>
<td>15:30–16:00</td>
<td>Room N201, HKCEC</td>
<td>Coffee Break around Exhibition Area, Room N201, HKCEC</td>
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<tr>
<td>16:00–18:00</td>
<td>Room N201, HKCEC</td>
<td>Coffee Break around Exhibition Area, Room N201, HKCEC</td>
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<tr>
<td>18:00–19:00</td>
<td>Room N201, HKCEC</td>
<td>Welcome Reception, Room N201, HKCEC</td>
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### Agenda of Sessions

**Asia Communications and Photonics Conference and Exhibition (ACP) — Agenda of Sessions**

#### Sunday, 22 November

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
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<tbody>
<tr>
<td>08:30–18:00</td>
<td>Registration Open, Room N201, HKCEC</td>
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<tr>
<td>08:30–18:00</td>
<td>Industry Exhibition, Room N201, HKCEC</td>
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<tr>
<td>08:30–10:00</td>
<td>ASu1A • Optical Materials, ASu1B • Photonic Integrated Circuits II</td>
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<td>ASu1C • Fiber Lasers I, ASu1D • Plasmonics and Metamaterials</td>
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<td>ASu1E • Transceivers I (ends at 9:45), ASu1F • High Spectral Efficiency Modulation Formats</td>
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<td>ASu1G • Access Networks II (ends at 9:30), ASu1H • ONoC, FSO, VLC, Hybrid OPS/OCS</td>
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<td>ASu1I • Therapeutics and In Vivo Imaging, ASu1J • Radio Over Fiber I</td>
</tr>
<tr>
<td>10:00–11:30</td>
<td>ASu2A • Poster Session, Room N201, HKCEC</td>
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<tr>
<td>10:30–11:00</td>
<td>Coffee Break, Room N201, HKCEC</td>
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<tr>
<td>11:30–13:00</td>
<td>ASu3A • Photonic Integrated Circuits III, ASu3B • Semiconductor Lasers</td>
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<td>ASu3C • Fiber Lasers II (ends at 12:45), ASu3D • Nanomaterials for THz Devices (ends at 12:45)</td>
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<td>ASu3E • Access Networks for Next Generation Wireless (ends at 12:45), ASu3F • DSP for Nonlinear Fiber Transmissions</td>
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<td>ASu3G • Fi-Wi Networks, ASu3H • SDN and Network Design (ends at 12:30)</td>
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<td>ASu3I • Sensors and Biosensing II (ends at 12:30), ASu3J • Radio Over Fiber II</td>
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<tr>
<td>13:00–14:30</td>
<td>Lunch Break, On Your Own</td>
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<tr>
<td>14:30–16:00</td>
<td>ASu4A • Integrated Nonlinear Optics, IOPC Special Tutorial</td>
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<td>Latest Novel Understandings of Electron States Architectures in Crystalline Materials and Likely of the Whole Physics</td>
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<td>ASu4B • Specialty Optical Fiber, Industry Forum ASu4C • Data Center Optics</td>
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<td>ASu4D • Coherent Optical Signal Processing (TRACK 6), ASu4E • SDN and EON II (ends at 15:45)</td>
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<td>ASu4F • SDN, ASu4G • Label Free Techniques (ends at 15:45), ASu4H • Modulation and Multiplexing Techniques</td>
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<td>16:00–16:30</td>
<td>Coffee Break around Exhibition Area, Room N201, HKCEC</td>
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<td>16:30–18:00</td>
<td>ASu5A • Photodetectors, ASu5B • Optical Modulators, ASu5C • Novel Fiber Devices I</td>
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<td>Industry Forum ASu5D • Spatial Division Multiplexing II, ASu5E • Transceivers II</td>
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<td>ASu5F • Network Survivability, ASu5G • Software Defined Hardware, ASu5H • Ultrasounds and Pressure Sensing (ends at 17:30)</td>
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<td>ASu5I • Optical Sources and Detectors</td>
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<td>Time</td>
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<td>08:30–17:00</td>
<td>Registration Open, Room N201, HKCEC</td>
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<td>08:30–17:00</td>
<td>Industry Exhibition, Room N201, HKCEC</td>
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<td>08:30–10:30</td>
<td>AM1A • Polarization &amp; Spatial Multiplexing Devices</td>
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<td>10:30–11:00</td>
<td>Coffee Break around Exhibition Area, Room N201, HKCEC</td>
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<tr>
<td>11:00–12:30</td>
<td>AM2A • Quantum Dot and Nanowire Devices and Photodetectors</td>
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<td>12:30–14:00</td>
<td>Lunch Break, On Your Own</td>
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<tr>
<td>14:00–16:00</td>
<td>AM3A • Devices for Optical Interconnects</td>
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<tr>
<td>16:00–16:30</td>
<td>Coffee Break around Exhibition Area, Room N201, HKCEC</td>
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<tr>
<td>16:30–18:30</td>
<td>Postdeadline Session, Rooms N202/N203 and N211/N212, HKCEC</td>
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<tr>
<td>19:00–21:00</td>
<td>Banquet and Closing Ceremony, Chancellor Room, HKCEC</td>
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# ACP 2015 — Saturday, 21 November

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<thead>
<tr>
<th>Conference Room N202</th>
<th>Conference Room N204/205</th>
<th>Conference Room N208</th>
<th>Conference Room N207</th>
<th>Conference Room N211</th>
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<tbody>
<tr>
<td><strong>Registration Open, 08:00–12:00</strong> Foyer, Theatre 1, HKCEC and 12:00–19:00, Room N201, HKCEC</td>
<td><strong>08:30–10:30</strong> Opening and Plenary Session, Theatre 1, HKCEC Opening – 20 minutes Plenary Presentation 1 – 50 minutes Plenary Presentation 2 – 50 minutes</td>
<td><strong>10:30–11:00</strong> Coffee Break, Room N201, HKCEC</td>
<td><strong>11:00–12:40</strong> Plenary Session, Theatre 1, HKCEC Plenary Presentation 3 – 50 minutes Plenary Presentation 4 – 50 minutes</td>
<td><strong>12:40–14:00</strong> Lunch Break, On Your Own</td>
</tr>
<tr>
<td><strong>13:00–18:00</strong> Industry Exhibitor, Room N201, HKCEC</td>
<td><strong>14:00–15:30</strong> AS3A • Heterogeneous Integration and Device Fabrication Presider: Kei May Lau; Hong Kong Univ. of Science and Technology, USA</td>
<td><strong>14:00–15:30</strong> AS3B • Microcavities and Performance Estimation Presider: Andrew Poon; Hong Kong Univ. of Science &amp; Technology, Hong Kong</td>
<td><strong>14:00–15:30</strong> AS3C • Nonlinear Fiber Optics I Presider: Morten Ibsen; Univ. of Southampton, UK</td>
<td><strong>14:00–15:30</strong> AS3D • FEC Coding Presider: Kenichi Uto, Mitsubishi Electric Corporation, Japan</td>
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<tr>
<td><strong>14:00–15:30</strong> AS3E • Long-Reach Access and Metro Systems Presider: Hoon Kim, KAIST, Korea</td>
<td><strong>14:00–15:30</strong> AS3A.1 • Invited 2D and 3D Heterogeneous Photonic Integration for Future Microsystems, S. J. Ben Yoo; Electrical and Computer Engineering, Univ. of California, USA. We will discuss 2D and 3D heterogeneous integration technologies aiming at realizing microsystems for applications in future communication, computing, and imaging systems. The 3D photonic integrated circuit (PIC) platform exploits direct inscribing of arbitrarily shaped waveguides using femtosecond lasers.</td>
<td><strong>14:00–15:30</strong> AS3B.1 • Invited Optically Induced Transparency in a Micro-cavity, Yuanlin Zheng1, Jianfan Yang1, Zhenhua Shen1, Jianjun Cao1, Xianfeng Chen1, Wenjie Wan1, Shanghai Jiao Tong Univ., China. Optically induced transparency in an optical microresonator is observed by introducing four-wave mixing gain to couple nonlinearly two isolated resonances of the micro-cavity. Its optical-controlling capacity and non-reciprocity characteristics are also demonstrated.</td>
<td><strong>14:00–15:30</strong> AS3C.1 • Invited Novel Light-Matter Interactions in Photonic Crystal Fibres, Philip S. Russell1, Max Planck Inst. for the Science of Light, Germany. PCFs offer remarkable control over light-matter interactions. Examples include generation of ultra-broadband supercontinua from infrared pulses, strong optomechanical effects, twisted PCFs that preserve orbital angular momentum in sign and magnitude and VUV generation in gases.</td>
<td><strong>14:00–15:30</strong> AS3D.1 • Invited Turbo Product Coded Modulation and Error Flare Control for Optical Fiber Transmission Systems, Yi Cai1, ZTE Optics Labs, USA. We propose a turbo-product-coded modulation scheme with performance exceeding the claimed theoretical limit on state-of-the-art SPC-LDPC scheme. We experimentally demonstrate 2460km 4.8bits/s/Hz transmission of a turbo-product-coded 40Gb/s 16-QAM modulation. We investigate error flare control with union-bound evaluation.</td>
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<td><strong>14:00–15:30</strong> AS3E.1 • Invited Deployment Scenario of Mode Division Multiplexing in Metro Area Network, Ken-ichi Kitayama1, Nikolaos P. Diamantopoulos1, Akhiro Maruta1, Yuki Yoshida1, Dept. Electr. Electr. and Info. Sys, Osaka Univ., Japan. A deployment scenario of mode division multiplexing (MDM) in metro ring network using few-mode fibers (FMFs) is presented. A novel mode-unbundled ROADM demonstrates the finest data granularity, and bi-directional transmission can circumvent the MIMO DSP.</td>
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<td>Time</td>
<td>Session Description</td>
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<td>Presiders/Authors</td>
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<td>14:00–15:30</td>
<td><strong>AS3F</strong> • Long-haul Transmissions I <strong>Invited</strong></td>
<td>Conference Room N212</td>
<td>Alan Pak Tao Lau, The Hong Kong Polytechnic Univ., Hong Kong</td>
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<tr>
<td>14:00–15:30</td>
<td><strong>AS3G</strong> • 5G Transport Networks <strong>Invited</strong></td>
<td>Conference Room N206</td>
<td>Lena Wosinska; Kungliga Tekniska Hogskolan, Sweden</td>
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<tr>
<td>14:00–15:30</td>
<td><strong>AS3H</strong> • Access Networks I <strong>Invited</strong></td>
<td>Conference Room N203</td>
<td>Jiajia Chen; Kungliga Tekniska Hogskolan, Sweden</td>
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<tr>
<td>14:00–15:30</td>
<td><strong>AS3I</strong> • Microscopy for Living Systems <strong>Invited</strong></td>
<td>Conference Room N209</td>
<td>Michael Somekh, The Hong Kong Polytechnic Univ., Hong Kong</td>
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<tr>
<td>14:00–15:30</td>
<td><strong>AS3J</strong> • Optical Wavelength Conversion <strong>Invited</strong></td>
<td>Conference Room N210</td>
<td>Guo-Wei Lu; Natl. Inst. of Info. &amp; Comm. Tech., Japan</td>
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**AS3F.1 • 14:00 Invited**
Optimum Design of Hybrid Raman-EDFA System to Maximize Aggregate Capacity, Yu Sun1, Jin-Xing Cai1, Hongbin Zhang1, Hussam Batshon1, Oleg Sinkin1, Carl Davidson1, Dmitri Foursa1, Alexei Pilipetski1; TE Subsea Communications, USA. Optimizing the aggregate capacity in a broad-band system is a challenging task. We review the optimization of a hybrid Raman-EDFA system design and demonstrate a record capacity of 54 Tbps over 9,150 km.

**AS3G.1 • 14:00 Invited**
Data and Control Plane Solutions for an Optical 5G Transport, Paolo Monti1; Kungliga Tekniska Hogskolan, Sweden. This tutorial analyzes the key data and control architectural challenges for designing a flexible optical 5G transport infrastructure able to adapt in a cost efficient way to the requirements coming from a number of envisioned future 5G services.

**AS3H.1 • 14:00 Invited**
Applications of Self-Seeded Reflective Semiconductor Optical Amplifiers in Access Networks and Beyond, Elaine Wong1; Kungliga Tekniska Hogskolan, Sweden. We show that (a) large improvements in transmission capacity and reach have been achieved since the first proposal, and (b) its role as a colorless source in PON has evolved, extending into the metro, local area, and mobile segments.

**AS3I.1 • 14:00 Invited**
Label-free Super-resolution Optical Microscopy of Cellular Dynamics, Thomas Huser1,2, Henning Hachmeister1, Christian Pilger1, Viola Monkmöller1, Wolfgang Hubner1, Simon Hennig1, Marcel Muller1, Gerd Webusch1; Dept. of Physics D3, Universität Bielefeld, Biomolecular Photonic Group, Germany; 2Dept. of Internal Medicine, Univ. of California, USA. We demonstrate super-resolved structured illumination microscopy (SR-SIM) of Raman-active samples with 100 nm spatial resolution. By combining SR-SIM with coherent Raman scattering, even biological samples can be visualized with doubled spatial resolution.

**AS3J.1 • 14:00 Invited**
Broadband Wavelength Conversion: Towards Versatile Mid IR Signal Generation, Camille-Sophie Bres1; Ecole Polytechnique Federale de Lausanne, Switzerland. We report recent results on the generation of versatile short-wave infrared sources relying on highly efficient broadband wavelength conversion. Various architectures based on the integrated association of nonlinear and amplifying media will be presented.
A thermally-tuning silicon-on-insulator micro-disk resonator with a flexible graphene-based ultra-thin heater is demonstrated. The experimental results show graphene heaters have excellent performances on the heating efficiency and the temporal response.

A reconfigurable non-blocking 5-port optical router based on microring resonators, Hao Jia1, Yunchou Zhao1, Yuhao Xia1, Qiaoshan Chen1, Lei Zhang1, Jianfia Wang2, Christine Tremblay1, Lawrence R. Chen2, Detlef Suikat1, Laurent Schmalen1, Vahid Aref1, Detlef Rössner1, Bell Laboratories, Alcatel-Lucent, Germany. We report the current status of forward error correction schemes and show how close we can operate to some theoretical limits taking into account the size of the codes. Finally, we compare some spatially-coupled codes.

A low energy electronic systems.

A Yellow InGaP Light Emitting Diode Epitaxially Grown on Si Substrate, Cong Wang1, Bing Long1, Kenneth Eng Kian Lee1, Soon Fatt Yoon1, Jurgen Michel1, Low Energy Electronic Systems IRG, Singapore-MIT Alliance for Research and Technology, Singapore; 2School of Electrical and Electronic Engineering, Nanyang Technological Univ., Singapore; 3Department of Materials Science and Engineering, Massachusetts Inst. of Technology, USA. A yellow InGaP light emitting diode (LED) emitting at 590 nm epitaxially grown on Si substrate with SiGe and GaAsP buffer layers is demonstrated. Characterizations of the epitaxy growth and device fabrication are presented.

Performance Measurements of Silicon Photonic Optical Add-Drop Multiplexers Using Angled Fiber Couplers, Abdoulkader Ali Houfaneh1, Junbia Wang1, Christine Tremblay1, Lawrence R. Chen2, Electrical Engineering Dept., École de technologie Supérieure, Canada; 2Elect. and Inst. Technologie Supérieure, Canada; 3School of Electrical and Electronic Engineering, Nanyang Technological Univ., Singapore; 4Department of Materials Science and Engineering, Massachusetts Inst. of Technology, USA. A multi-channel optical add/drop multiplexer based on sampled Bragg gratings in a Mach-Zehnder interferometer in silicon photonics. A BER of less than 1x10^-14 for a dropped channel is obtained over a 38 hour period, verifying long term stability and performance.

A thermally-tuning silicon-on-insulator micro-disk resonator with a flexible graphene-based ultra-thin heater is demonstrated. The experimental results show graphene heaters have excellent performances on the heating efficiency and the temporal response.

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### Conference Room N202

#### A3A.4 • 15:15
Free-standing Silicon Membrane Microstructures for Transferable Masks, Yunxiao Li1, Yujie Chen1, Yanzhe Zhang1, Zengkai Shao1, Lin Liu1, Chunhuang Yang1, Hui Chen1, Siyuan Yu1; Sun Yat-sen Univ., China. We produce silicon membrane (220 nm in thickness) with microstructures as hard masks and have transferred them on to a diamond plate, which is useful for further applications for pattern etching or hybrid photonic integration.

### Conference Room N204/205

#### A3B.5 • 15:15
BER Calculation in Photonic Systems Containing Stripe or Photonic Crystal Silicon Waveguides, Jie You1, Spyros Lavdas1, Nicolae Panoiu1; Univ. College London, UK. We introduce a theoretical method to calculate bit error rates in photonic systems containing silicon waveguides and analyze two particular cases: a single-mode optical waveguide with uniform cross section and a slow-light photonic crystal waveguide.

### Conference Room N208

#### A3C.3 • 15:15
Experimental demonstration of simultaneous high-spatial-resolution and sweep-free Brillouin optical time-domain analysis using phonon pre-excitation, Xin-Hong Jia1, Cong Xu2, Han-Qing Chang1; Sichuan Normal Univ., China; ‘Beijing Univ. of Posts and Telecommunications, State Key Laboratory of Information Photonics and Optical Communication, China. Simultaneous high spatial resolution and sweep-free Brillouin optical time-domain analysis sensor using phonon pre-excitation is proposed and demonstrated. The spatial resolution can be enhanced considerably using this method (better than ~60 cm).

### Conference Room N207

#### A3E.5 • 15:15
A Method of Adaptive Equalization and Polarization Division De-multiplexing Aided by Control Signal for Burst-mode Coherent Receivers, Junlei Yu1, Liqian Wang1, Ping Liao2, Zheng Yan1, Xiaoxu Cui1, Xue Chen1, Yangning Ji2, Dongdong Shang2, Qi Zhang2, Yingfeng Liu2; Beijing Univ. of Posts & Telecom, China; ‘ZTE Corporation, China. We propose a method of adaptive equalization and polarization division de-multiplexing for burst-mode coherent receivers aided by control signal. The 128 Gbps PDM-QPSK experiment shows that the proposed method could reduce 50% convergence time compared with traditional method.

### Conference Room N211

#### A3F.5 • 15:15
Coffee Break around Exhibition Area, Room N201, HKCEC

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### NOTES

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### Conference Room N212

**AS3H.5 • 15:15**
Reach Extension of High-Capacity LR-PONs in Chain Configuration of Distributed Amplifier Structure, Elias Giacoumidis1, Jinlong Wei1, Giuseppe Talli2, Nick Doran3, David Payne4;
1CUDOS, Univ. of Sydney, Australia; 2Optical Networking SE, ADVA, Germany; 3Tyndall National Inst., Univ. College Cork, Ireland; 4Aston Inst. of Photonic Technologies, Aston Univ., UK.
We show 100-Gb/s single-channel transmission in LR-PONs with at least 512 way split and up to 160 km total distance is feasible by means of "chained" cable with amplifier solutions, and appropriate FIR filter designs.

### Conference Room N206

### Conference Room N203

### Conference Room N209

### Conference Room N210

**AS3J.4 • 15:15**
Phase Erasure and Wavelength Conversion Using Silicon Nonlinear Waveguide With Reverse Biased PIN Junctions, Guanyu Chen1, Yu Yu1, Chunlei Sun1, Beibei Wu1, Xinliang Zhang1;
1Wuhan National Laboratory for Optoelectronics & School of Optical and Electronic Information, Huazhong Univ. of Science and Technology, China. We demonstrate the optical phase erasure and wavelength conversion of 10 Gb/s phase shift keying signal based on the non-transparency four-wave-mixing (FWM) simultaneously using the integrated silicon waveguide with reverse biased PIN junction.

### 15:30–16:00 Coffee Break around Exhibition Area, Room N201, HKCEC

### NOTES

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### Conference Room N202

**16:00–18:00**  
**AS4A** • Optical Routers and Switching  
*Presider: Daoxin Dai, Zhejiang Univ., China*

### Conference Room N204/205

**16:00–18:00**  
**AS4B** • Photonic Integrated Circuits I  
*President: Hon Tsang, The Chinese University of Hong Kong, Hong Kong*

### Conference Room N208

**16:00–18:00**  
**AS4C** • Nonlinear Fiber Optics II  
*President: Sigang Yang, Tsinghua University, China*

### Conference Room N207

**16:00–17:15**  
**AS4D** • Short Reach Systems  
*President: Xiang Zhou, Google, Inc., USA*

### Conference Room N211

**16:00–18:00**  
**AS4E** • Spatial Division Multiplexing I  
*President: Ezra Ip, NEC Labs America, USA*

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**AS4A.1 • 16:00**  
**Invited**  
Silicon Photonic MEMS Switch: A New Path to High Port Count Switches, Ming C. Wu1, EECS Dept., Univ. of California Berkeley, USA. Large-scale integrated photonic switches (64×64) have been realized by combining silicon photonics with efficient MEMS switching mechanisms. These switches are based on passive crossbar architecture, which is fundamentally more scalable than other switches.

**AS4A.2 • 16:30**  
Fast and accurate calibration method for large-port-count Si-wire PILOSS optical switch, Satoshi Suda1, Ken Tanizawa2, Keijiro Suzuki3, Hiroyuki Matsura4, Kazuhiro Ikeda4, Shu Namiki4, Hitoshi Kawashima1; 1AIST, Japan. We propose a calibration method for N×N Si-wire path-independent-insertion-loss (PILOSS) optical switches with thermo-optic Mach-Zehnder-interferometer (MZI) element switches. Calibration for a 32×32 switch is numerically demonstrated with an error less than 1% within an hour.

**AS4B.1 • 16:00**  
**Tutorial**  
Silicon Photonic integrated Circuits, Po-Dong1, Bell Labs, Alcatel-Lucent, USA. In this talk, we review the technical merits of silicon photonic devices and integrated circuits, which have benefited from high-index-contrast silicon waveguides, a high integration level of various optical functions on the same chip, and mature complementary metal-oxide semiconductor (CMOS) fabrication techniques. These technical merits assure silicon photonics as a disruptive optical technology that will achieve low-cost and compact optical modules for data communications, with applications such as chip-scale optical interconnects, short-reach communications in datacenters and supercomputers, and metro-/long-haul optical transmissions. In particular, we review silicon photonic circuits for wavelength-division multiplexing (WDM) transmitters, WDM receivers, coherent optical transmitters and coherent receivers, photonic networks-on-chip, and silicon photonic light sources.

**AS4B.2 • 16:30**  
Periodic All-Fibre Devices for Optical Frequency Conversion and Generation, Morten Ibisen1, Jindan Shi1, Shaf-ul Alam2, Eleeong Lim2, Costantino Costantino3, Peter Kazansky4, David J. Richardson1; 1ORC, Univ. of Southampton, UK; 2SPI Lasers UK Ltd., UK. In this talk we will review some of the latest advances in the use of fibre Bragg gratings and periodically poled fibre devices to access and generate high efficiency light sources in new wavelength bands.

**AS4C.1 • 16:00**  
**Invited**  
Topographic Optical Fibers: A New Degree of Freedom in Nonlinear Optics, Arnaud Mussot1; 1Univ. Lille 1 Laboratoire PhLAM, France. We investigate theoretically and experimentally basic nonlinear effects such as soliton propagation or modulation instability in what we called topographic optical fibers. We show that in these fibers which parameters are longitudinally modulated over a scale of a few meters, new dynamics are observed. As a consequence it adds a new degree of freedom in nonlinear optics and allows to experimentally explore original phenomena.

**AS4C.2 • 16:30**  
**Invited**  
30 Gb/s 2×2 MDM-DD-OFDM Transmission over 200m Conventional MMF Link without MIMO Compensation, Jiawei Luo1, Jianping Liu1, Qiu Sui2, Zhaohui Li1, 1Photonics Engineering, Technical Univ. of Denmark, Denmark. Stokes-based processing permits complete and phase-insensitive characterization of the field’s SOP, readily unlocking polarization diversity in transmission systems where DD is desired. We present an overview on Stokes notions and most recent achievements in this context.

**AS4D.1 • 16:00**  
**Invited**  
Stokes Space in Direct-Detection Data Transmission Systems, Jose Estaran1,2, Xiaofeng Li1,2, Darko Zibar1, Idelfonso Tafur Monroy1,2; 1Photonics Engineering, Technical Univ. of Denmark, Denmark. Stokes-based processing permits complete and phase-insensitive characterization of the field’s SOP, readily unlocking polarization diversity in transmission systems where DD is desired. We present an overview on Stokes notions and most recent achievements in this context.

**AS4D.2 • 16:30**  
30 Gb/s 2×2 MDM-DD-OFDM Transmission over 200m Conventional MMF Link without MIMO Compensation, Jiawei Luo1, Jianping Liu1, Qiu Sui2, Zhaohui Li1, 1Photonics Engineering, Technical Univ. of Denmark, Denmark. Stokes-based processing permits complete and phase-insensitive characterization of the field’s SOP, readily unlocking polarization diversity in transmission systems where DD is desired. We present an overview on Stokes notions and most recent achievements in this context. The error-free transmission of unidirectional over 200m OM3 MMF link under FEC-limit is achieved without using MIMO DSP compensation.

**AS4E.1 • 16:00**  
**Tutorial**  
Space-Division Multiplexing - The Next WDM?, Peter J. Winzer1,2; 1Bell Labs, Alcatel-Lucent, USA. With the demand for network capacity approaching fundamental fiber capacity limits, scaling systems in the wavelength domain is insufficient. The use of parallel spatial paths with high levels of integration is an inevitable next step.
AS4F.1 • 16:00
An Efficient Equalization Method with Improved Modal Dispersion Tolerance for CO-SCFDE FMF Transmission, Yu Tian1, Juhao Li1, Yingchao Xin1, Paikun Zhu1, Yuanxiang Chen1, Shilin Xiao1, Meihua Xu1; 1Huawei Technologies Co Ltd, China; 2Shanghai Jiao Tong Univ., China. Modal dispersion is one of the key impairments for few-mode fiber transmission. We propose a modified equalization method for CO-SCFDE system, which has better tolerance to modal dispersion and slightly increased computational complexity.

AS4F.2 • 16:15
Blind and Simultaneous Polarization and Phase Recovery for Time Domain Hybrid QAM Signals Based on Extended Kalman Filtering, Wen Jiang1, Qun Zhang1, Guoliang Cao1, Kangping Kong1; 1Research Lab of Elec., Massachusetts Inst. of Technology, USA. Future optical networks will integrate multi-layer functions in a fast adapting infrastructure. When data and control dynamics speed-up by 10-4, the entire architecture, from physical to application layers, must be redesigned to be scalable.

AS4G.1 • 16:00
Frontiers of Optical Networks, Vincent W. Chan1; Research Lab of Elec., Massachusetts Inst. of Technology, USA. Future optical networks will integrate multi-layer functions in a fast adapting infrastructure. When data and control dynamics speed-up by 10-4, the entire architecture, from physical to application layers, must be redesigned to be scalable.

AS4G.2 • 16:30
Dynamic Routing over Unified Topology for Coordinated IP+ Optical Networks, Huiying Zou1, 1Huawei Technologies Co Ltd, China. A unified topology routing algorithm for coordinated IP+Optical networking is presented taking physical constraints into consideration. Test results indicate a 19% reduction in blocking rate and 16% reduction in utilization rate over the conventional layer-by-layer VNT routing approach.

AS4H.1 • 16:00
Software Defined Elastic Optical Networking with Spectrum Engineering for BBU Cloud Interconnection, Jie Zhang1, Jiawei Zhang1, Xiaosong Yu1, 1Beijing Univ of Posts & Telecom, China. We focus on BBU cloud interconnection issue in C-RAN, introduce a software-defined elastic optical networking architecture with Spectrum Engineering to provide flexible and virtualized optical paths, and present a SD-EON testbed to verify the performance.

AS4H.2 • 16:30
Optimal Resource Allocation in Distance-Adaptive Few-Modes Backbone Networks with Flexible Grid, Cristina Rotondo1, Pierpaolo Boffi1, Paolo Martelli1, Massimo Tomatore1, Achille Pattavina1, 1Politecnico di Milano, Italy. For the optimization of RSA in few-mode flexi-grid networks, we derive distance-adaptive reaches for few-mode transmission and optimally solve the RSA problem to explore the tradeoff between spectrum and transceivers, varying modulation formats and baud-rate assignment.

AS4I.1 • 16:00
Hybrid graphene-microfiber devices and their application for sensing, Fei Xu1, 1National Laboratory of Solid State Microstructures and College of Engineering and Applied Sciences, Nanjing Univ., China. Graphene is an excellent material for microfiber functionalization. Its extraordinary properties allow the prompt use of graphene-microfiber hybrid devices for numerous optical applications ranging from polarization controlling, all-optical signal processing to physical, chemical and biological sensing.

AS4I.2 • 16:30
An All Quartz Fiber-Optic Acceleration Sensor Based on Incident-Angle Sensitive Detection Mechanism, Jie Hu1, Hui Huang1, Tingting Zhan1, Ji Zhang1, Dongsheng Li1, Yan Yu1, Bo Qu1, 1Dalian Univ. of Technology, China. This paper presents an all quartz fiber-optic acceleration sensor of which the temperature coefficient was 0.006dB/K. Based on incident-angle sensitive detection mechanism, a sensitivity of 83.4dB/g was achieved with a detection limit of 100μg.

AS4J.1 • 16:00
Tutorial
Optical Signal Processing and Ultrabroadband Microwave Photonics using Microresonators, Andrew M. Weiner1, Minghao Qi1, 1School of Elect & Comp Eng, Purdue Univ., USA. Selected applications of optical microresonators are reviewed, with emphasis on examples from Purdue Univ., including radio-frequency and optical arbitrary waveform generation, optical nonreciprocity, and generation of optical frequency combs.

AS4J.2 • 16:30
Tutorial
Invited
Waveform Generation, Optical Nonreciprocity, and Applications of Optical Microresonators, Andrew M. Weiner1, Minghao Qi1, 1School of Elect & Comp Eng, Purdue Univ., USA. Selected applications of optical microresonators are reviewed, with emphasis on examples from Purdue Univ., including radio-frequency and optical arbitrary waveform generation, optical nonreciprocity, and generation of optical frequency combs.
We demonstrate a 16×16 silicon optical switch consisting of 56 thermo-optic MZI switches in a Benes architecture. The chip size is 7×3.6 mm². The on-chip insertion loss is <5 dB and the crosstalk is <20 dB.

Silicon Optical Routers for Photonic Networks-4-port optical routers constructed by this method. We propose a universal method for constructing an N-port non-blocking optical router, which has minimum optical switches and therefore is more compact and more power-efficient. We demonstrate the 4- and 5-port optical routers constructed by this method.

Highly coherent supercontinuum generation with picosecond pulses by using pulse compression in a stepwise decreasing dispersion fiber, Ke Liu1, Qian Li1, Peking Univ. Shenzhen Graduate School, China. We demonstrated highly coherent supercontinuum generation from a picosecond pulse. Effective pulse compression occurs in a stepwise decreasing dispersion fiber, and the compressed pulse can be used for a highly coherent supercontinuum generation.

Simultaneous compression and coherent combination of multiple optical pulses in the same pulse train using nonlinear optical fibers, Wei Lu1, Qian Li1, Ping Kong A. Wai 1,2; 1Peking Univ. Shenzhen Graduate School, China; 2The Hong Kong Polytechnic Univ., Hong Kong. We demonstrate simultaneous compression and coherent combination of multiple optical pulses in nonlinear optical fibers with exponentially decreasing dispersion. Five chirped hyperbolic secant pulses coalesce into a single pulse with nearly hyperbolic secant pulse shape.

8-dimensional Lattice Optimized Formats in 25-Gbaud/s VCSEL based IM/DD Optical Interconnections, Xiaofeng Lu1, Idelfonso Tafur Monroy2; 1Department of Photonics Engineering, Technical Univ. of Denmark, Denmark; 2ITMO Univ., Russian Federation. Temporarily combined 4- and 8-dimensional lattice grids optimized modulation formats for VCSEL based IM/DD short-reach optical inter-connections has been proposed and investigated numerically together with its conventional counterpart PAM-4.

We demonstrated highly coherent supercontinuum generation from a picosecond pulse shape coalesce into a single pulse with nearly hyperbolic secant pulse shape.
AS4A.5 • 17:45
Reconfigurable nonblocking 5-port silicon thermo-optic optical router based on Mach-Zehnder optical switches, Yunchou Zhao, Hao Jia, Yuhan Xia, Quoshan Chen, Lei Zhang, Jianfeng Ding, Lin Yang; 1State Key Laboratory on Integrated Optoelectronics, Inst. of Semiconductors, Chinese Academy of Sciences, China. We demonstrated a reconfigurable non-blocking five-port silicon thermo-optic optical router, which is composed of 8 Mach-Zehnder optical switches. The optical signal-to-noise ratio is characterized and wavelength division multiplexing data transmission has been performed.

AS4B.3 • 17:30
Low Polarization-Dependent-Loss Silicon Photonic Trident Edge Coupler Fabricated by 248 nm Optical Lithography, Xin Tu, Patrick Dumas, Ming Li, Dominic Goodwill, Hongyan Fu, Dongyu Geng, Eric Bernier; 1Huawei Technologies Co., Ltd., China; 2Huawei Technologies Canada Co. Ltd., Canada. Trident edge couplers were fabricated using optical lithography. TE and TM coupling loss with lensed fiber were improved by 0.2 dB and 0.3 dB compared to a single-taper coupler. PDL was improved by 0.1 dB.

AS4A.4 • 17:45
Grating Coupler between Perfectly-Vertical Fiber and Si Wire Waveguide Using Tilted Membrane Structure, Liu Lu, Chenchao Zhang, Chichao Jin; 1South China Academy of Advanced Optoelectronics, South China Normal Univ., China. A grating coupler on silicon-on-insulator waveguide for perfectly-vertical fiber is proposed based on tilted membrane structure. A peak coupling efficiency of 40% and 1dB bandwidth of 40nm are obtained for perfectly-vertical fiber. Back-reflections to the SOI waveguide mode and the fiber mode are 2.7% and 2.2%, respectively.

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AS4C.5 • 17:30
Magnetic-field Measurement Using Magneto-optic Nonlinear Optical Loop Mirror, Feng Wen, Bao-Jian Wu, Xing-yu Zhou, Yong Geng, Kun Qiu; 1Univ. of Electronic Science and Technology of China, Key Lab of Optical Fiber Sensing and Communications, Ministry of Education, China. Magnetic-field measurement is achieved in the magneto-optic nonlinear optical loop mirror (MO-NOLM), which the Faraday and Kerr nonlinear effects of fibers are considered. The maximum magnetic-field sensitivity is 263.93dB/T with the pump power of 24.8dBm.

AS4C.6 • 17:45
High Resolution Optical Spectrum Measurement Utilizing a Dual-stage SBS-based Filter, Ke Zhang, Changjian Ke, Deng Pan, Deming Liu; 1National Engineering Laboratory for Next Generation Internet Access System, Huazhong Univ. of Science and Technology, China; 2School of Optical and Electronic Information, Huazhong Univ. of Science and Technology, China. A dual-stage SBS-based filter for high resolution optical spectrometry is proposed. By mitigating the deterioration resulted from the gain saturation and the out-of-band signal components, a spectral resolution of ~25 MHz and a sensitivity of ~65 dBm are achieved simultaneously.

AS4E.4 • 17:30
Towards Higher Density Space Division Multiplexed Transmission Systems, Chigo M. Okonkwo; 1Eindhoven Univ. of Technology, Technische Universiteit Eindhoven, Netherlands. By exploiting compact multiplexers, advanced coding and multi-input multiple output digital signal processing schemes, high spatial channel count to achieve high capacity transmission in emerging state-of-the-art multi-mode and/or multicore few-mode fibers is demonstrated.
Demonstration of Optical Signal to Noise Ratio Monitoring Based on Sagnac Interferometer in Polarization Division Multiplexed Systems, Yan Li1, Yi Yu2, Zhuan Xu1, Changyuan Yu3, Pooi-yuen Kam1, National Univ. of Singapore, Singapore; National Univ. of Singapore (Suzhou) Research Inst., China. In this paper, we demonstrate the OSNR monitoring method using Sagnac interferometer (SI) in polarization division multiplexed (PDM) systems. The proposed method is investigated with power mismatch, polarization dependent loss (PDL) and filtering frequency offset.

A Cooperative Electronic and Optical Network: Architecture and Key Technologies, Weisheng Hu1, Tong Ye1, Lilin Yi2, Weiqiang Sun1, Hao He1, Shanghai Jiao Tong Univ., China. This paper will discuss the characteristics and role of the electronic and photonic technologies for the future networks, including mega data center network, backbone and metro network, and broadband access network as well.

Sparse-Splitting Multicasting in Elastic Optical Networks, Krzysztof Walkowski1, Andrzej Kasprzak1, Massimo Tomatone1, Wroclaw Univ. of Technology, Poland; Department of Electronics, Information, and Bioengineering, Politecnico di Milano, Italy. The impact of the sparse-splitting constraint on static multicast traffic optimization in Elastic Optical Networks is studied. Results of numerical experiments are presented to show the impact in terms of spectrum and regenerator usage.

A novel Bi-Directional Brillouin time domain analyzer (BD-BOTDA) is proposed and experimentally demonstrated by simultaneously detecting Brillouin signals over each half of the whole fiber at two wavelengths separately, achieving over 80 km sensing range with 2m spatial resolution.

Cross-phase Modulation (XPM)-induced All Optical Switching in a Coupling-tuned Silicon Ring Resonator, Xiaomeng Sun1, Mahmoud Jazayerifar1, Linjie Zhou2, Lars Zimmermann1, Klaus Pertermann1, Technische Universität Berlin, Germany; Shanghai Jiao Tong Univ., China. We numerically investigate an ultrafast all-optical switching device with an integrated silicon micro-ring and a Mach-Zehnder (MZ) coupler. The device exhibits pico-second switching speed with only 0.09π of phase shift achieved by cross-phase modulation (XPM).

Demonstration of BGP Interworking in Hybrid SPTN/IP Networks, Junjie Zang1, Ren Tao Gu1, Han Li1, Youqiang Hu1, Lei Wang1, Yueling Ji1, Qin Li1, Jie Zhang1, Lin Bai1, Beijing Univ. of Posts and Telecomm, China; China Mobile Research Inst., China. This paper proposes BGP interworking and inter-communication architecture and mechanisms for hybrid SPTN/IP, and the extended Ryu based controllers realize BGP information sharing between SPTN network islands and IP networks in a multi-domain testbed.

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Sparse-Splitting Multicasting in Elastic Optical Networks, Krzysztof Walkowski1, Andrzej Kasprzak1, Massimo Tomatone1, Wroclaw Univ. of Technology, Poland; Department of Electronics, Information, and Bioengineering, Politecnico di Milano, Italy. The impact of the sparse-splitting constraint on static multicast traffic optimization in Elastic Optical Networks is studied. Results of numerical experiments are presented to show the impact in terms of spectrum and regenerator usage.

A novel Bi-Directional Brillouin time domain analyzer (BD-BOTDA) is proposed and experimentally demonstrated by simultaneously detecting Brillouin signals over each half of the whole fiber at two wavelengths separately, achieving over 80 km sensing range with 2m spatial resolution.

Cross-phase Modulation (XPM)-induced All Optical Switching in a Coupling-tuned Silicon Ring Resonator, Xiaomeng Sun1, Mahmoud Jazayerifar1, Linjie Zhou2, Lars Zimmermann1, Klaus Pertermann1, Technische Universität Berlin, Germany; Shanghai Jiao Tong Univ., China. We numerically investigate an ultrafast all-optical switching device with an integrated silicon micro-ring and a Mach-Zehnder (MZ) coupler. The device exhibits pico-second switching speed with only 0.09π of phase shift achieved by cross-phase modulation (XPM).

Demonstration of BGP Interworking in Hybrid SPTN/IP Networks, Junjie Zang1, Ren Tao Gu1, Han Li1, Youqiang Hu1, Lei Wang1, Yueling Ji1, Qin Li1, Jie Zhang1, Lin Bai1, Beijing Univ. of Posts and Telecomm, China; China Mobile Research Inst., China. This paper proposes BGP interworking and inter-communication architecture and mechanisms for hybrid SPTN/IP, and the extended Ryu based controllers realize BGP information sharing between SPTN network islands and IP networks in a multi-domain testbed.
Sunday, 22 November

ACP 2015 — Sunday, 22 November

08:30–10:00
ASu1A • Optical Materials
Presider: Siyuan Yu, University of Bristol, UK and Sun Yat-sen University, China

ASu1A.1 • 08:30
Innovative Materials and Processing Approaches for Nanostructured Photonic Systems, Fabien Sorin1, Arthur LeBris4, Barbara Brudieu1,2, Fatah Maloum2, François Guillemot3, Jeremie Teisseire1, Thierry Gacon1; 1LPMC-CNRS Ecole Polytechnique, France; 2CNRS/Saint-Gobain Recherche, France; 3PCRS, Saint-Gobain Recherche, France; 4Inst. of Materials, Ecole Polytechnique Fédérale de Lausanne, Switzerland. We demonstrate innovative simple and scalable fabrication approaches to realize large area nanostructured Photonic systems. We show in particular novel all-dielectric Distributed Bragg Reflectors and the template dewetting of a thin Silver layer to realize ordered metallic nanostructures.

ASu1B • Photonic Integrated Circuits II
Presider: Graham Reed; Univ. of Southampton, UK

ASu1B.1 • 08:30
Invited
Multi-functional Silicon Photonic Integrated Circuits with Ultra-compact Arrayed-waveguide Gratings, Daoxin Dai1; 1Center for Optical & electromagnetic resea, Zhejiang Univ., China. This paper gives a review for the recent work on silicon photonic integrated circuits based on ultra-compact arrayed-waveguide gratings (AWGs), e.g., hybrid (de)multiplexers with multi-wavelengths and multimodes or dual-polarizations, reconfigurable optical add-drop multiplexers integrating AWGs with optical switches, etc.

ASu1C • Fiber Lasers I
Presider: Andy Chong; Univ. of Dayton, USA

ASu1C.1 • 08:30
Invited
Nonlinear Deep Tissue Imaging with Advanced Soliton Sources, Chris Xu1; 1School of Applied and Engineering Physics, Cornell Univ., USA. Deep tissue multiphoton microscopy (MPM) using solitons generated from optical fibers are reviewed. The main characteristics of the excitation source for deep tissue MPM, such as wavelength, pulse energy, and repetition rate, are discussed.

ASu1D • Plasmonics and Metamaterials
Presider: Ci-Ling Pan; National Tsing Hua Univ., Taiwan

ASu1D.1 • 08:30
Invited
Plasmonic Metamaterials for Nanophotonics, Anatoly Zayats1; 1Department of Physics, King’s College London, UK. Hyperbolic plasmonic metamaterials will be discussed for achieving active nanophotonic functionalities. The focus will be on the applications in tailoring ultrafast nonlinear optical properties, controlling light emission, subwavelength waveguiding, and polarisation and dispersion management.

ASu1E • Transceivers I
Presider: Zhaohui Li, Jinan Univ., China

ASu1E.1 • 08:30
Experimental 32Gbaud OFDM transmission using a 3-bit DAC, Nuno M. Andre1, Hadrien Louchet1, Volker Filsinger2, Erik Hansen2, Andre Richter1; 1VPIphotonics, Germany; 2SHF Communication Technologies, Germany. We experimentally accomplish high baudrate OFDM transmission using a 60Gbaud-capable 3-bit DAC. We investigate the strategies necessary to achieve successful electrical and optical transmission and determine the limitations of OFDM transmission for higher resolutions.

ASu1E.2 • 08:45
Polarization-Diversity All-Optical Modulation Format Conversion from QPSK to BPSK Using FWM, Naho Yoshikawa1, Rina Ando1, Hiroki Kirishkawa1, Nobuo Goto1, 1Tokushima Univ., Japan. The authors have previously proposed all-optical modulation format conversion system from QPSK to BPSK. Since the performance depends on the incident signal’s polarization, we propose a polarization-diversity system to realize polarization independent operation.

ASu1A.2 • 08:45
Optimization of optical gain in composite materials containing Rh6G dye and gold nanoparticles, Elena Vasileva1, Fei Ye1, Aleksandrs Marinins2, Sebastián Etcheverry1,2, Muhammet Toprak1, Sergei Popov1; 1Materials and Nano Physics, Royal Inst. of Technology, Sweden; 2Applied Physics, Royal Inst. of Technology, Sweden; 2Fiber Optics, Acreo Swedish ICT AB, Sweden. The existence of metal nanoparticles in a dye material can lead not only to quenching or enhancement of dye luminescence, or random lasing action, but also to the change of the fundamental material characteristic as optical gain.

ASu1B.1 • 08:30
Invited
Multi-functional Silicon Photonic Integrated Circuits with Ultra-compact Arrayed-waveguide Gratings, Daoxin Dai1; 1Center for Optical & electromagnetic resea, Zhejiang Univ., China. This paper gives a review for the recent work on silicon photonic integrated circuits based on ultra-compact arrayed-waveguide gratings (AWGs), e.g., hybrid (de)multiplexers with multi-wavelengths and multimodes or dual-polarizations, reconfigurable optical add-drop multiplexers integrating AWGs with optical switches, etc.

ASu1E.1 • 08:30
Experimental 32Gbaud OFDM transmission using a 3-bit DAC, Nuno M. Andre1, Hadrien Louchet1, Volker Filsinger2, Erik Hansen2, Andre Richter1; 1VPIphotonics, Germany; 2SHF Communication Technologies, Germany. We experimentally accomplish high baudrate OFDM transmission using a 60Gbaud-capable 3-bit DAC. We investigate the strategies necessary to achieve successful electrical and optical transmission and determine the limitations of OFDM transmission for higher resolutions.
Asia Communications and Photonics Conference (ACP) • 19 November 2015–23 November 2015 • Page 43

ACP 2015 — Sunday, 22 November

**Conference Room N201, HKCEC**

08:30–18:00 Registration Open, Room N201, HKCEC

08:30–18:00 Industry Exhibition, Room N201, HKCEC

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**Conference Room N206**

08:30–10:00

ASu1F • High Spectral Efficiency Modulation Formats
Presider: Xian Zhou, University of Science and Technology Beijing, China & The Hong Kong Polytechnic University

ASu1G • Access Networks II
Presider: Calvin C. K. Chan; The Chinese Univ. of Hong Kong, Hong Kong

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**Conference Room N209**

08:30–10:00

ASu1H • OnOc, FSO, VLC, Hybrid OPS/OCs
Presider: Jie Zhang; Beijing Univ of Posts & Telecom, China

ASu1I • Therapeutics and In Vivo Imaging
Presider: Melissa Mather, Keele University, UK

ASu1J • Radio over Fiber I
Presider: Christina Lim, University of Melbourne, Australia

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**Conference Room N210**

08:30–10:00

ASu1J.1 • 08:30

A 60-GHz RoF System Providing 5-Gbps BPSK Signal Employing LMS Equalizer, Siming Liu1, Yanbin Kou1, Huiping Tian1, Si Liu1, Daquan Yang1, Yuefeng Ji1; 1Beijing Univ. of Post and Telecom, China. A 60-GHz RoF system transmitting 5-Gbps BPSK signal employing LMS equalizer is experimentally demonstrated. The results prove that the LMS equalizer with appropriate parameters can substantially improve the BER performance of the system.

ASu1J.2 • 08:45

Demonstration of 4Gbit/s Duobinary Ka-Band Hybrid Photonic-Wireless Transmission, Simon Rommel1, Lilin Yi1, Mengyue Shi1, Idelfonso Tafur Monroy1, Juan Jose. Vegas Olmos1; 1Department of Photonics Engineering, Technical Univ. of Denmark, Denmark; 2State Key Laboratory of Advanced Optical Communication Systems and Networks, Shanghai Jiao Tong Univ., China. We demonstrate transmission of a 4Gbit/s duobinary signal over a Ka-band hybrid photonic-wireless link consisting of 12.5km SMF and 2m wireless distance, using RF carrier frequencies aligned with the Ka-band spectrum allocations for mobile communications.

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**Conference Room N212**

08:30–10:00

ASu1F.1 • 08:30

Invited Improving Spectral Efficiency in Direct-Detected OFDM System, Kai-Ming Feng1, Jhih-Heng Yan2, You-Wei Chen1, Wei-Ren Peng1; 1Inst. of Communications Engineering, National Tsing Hua Univ., Taiwan; 2Inst. of Photonics Technologies, National Tsing Hua Univ., Taiwan; 3Huawei Technologies Co. Ltd., USA. The direct-detected optical OFDM spectral efficiency has been enhanced with three reviewed solutions, a multiband scheme, a receiver DSP scheme, and a PDM scheme. A self-polarization diversity PDM scheme guarantees SE enhancement with conventional receivers.

ASu1G.1 • 08:30

Invited Mode-Division Multiplexed Access Networks, Guifang Li1; 1Bldg. 53, Univ. of Central Florida, USA. Single-mode splitters lack conservation of degrees of freedom and when they are used in PONs, they introduce combining losses. The arrival of few-mode optics can eliminate the combining loss and thus improve PON size.

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**Conference Room N203**

08:30–10:00

ASu1H.1 • 08:30

A Nesting Ring Optical Network on Chip (OnOc) Architecture for Multi-chip System, Wenhe Li1, Shenguo Huang1, Yu Zhou1, Shan Yin1, Jie Zhang1, Wanyi Gu1; BUPT, China. We propose a novel architecture of optical network-on-chip (OnOc) for multi-chip systems, which includes intra-chip network and chip-to-chip network. Simulation results show that the architecture have good performance on throughput and End-to-End (ETE) delay.

ASu1H.2 • 08:45

A New Optical Network-on-Chip Architecture for Chip Multiprocessor, Xiuhua Li1, Kang Wang1, Ke Chen1, Huaxi Gu1, Liang Song1, Qinfen Hao1; State Key Lab of IISN, China; 2Huawei Technologies Co Ltd.; China. A screwy torus topology (STorus) is proposed to improve the performance of network that memory access oriented. STorus divides an optical network into two subnets. Comparisons between STorus and mesh are made, connecting with 4 memory controllers.

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**Conference Room N212**

08:30–10:00

ASu1I.1 • 08:30

Invited InCVAX - A Biophotonics Approach Based Cancer Therapy, Wei R. Chen1; 1Univ Central Oklahoma, USA. A biophotonics based in situ autologous whole cell cancer vaccine (inCVAX) is developed to induce systemic tumor-specific immune responses using a combination of local laser phototherapy and immunotherapy.

ASu1I.2 • 08:45

A Demonstration of 4Gbit/s Duobinary Ka-Band Hybrid Photonic-Wireless Transmission, Simon Rommel1, Lilin Yi1, Mengyue Shi1, Idelfonso Tafur Monroy1, Juan Jose. Vegas Olmos1; 1Department of Photonics Engineering, Technical Univ. of Denmark, Denmark; 2State Key Laboratory of Advanced Optical Communication Systems and Networks, Shanghai Jiao Tong Univ., China. We demonstrate transmission of a 4Gbit/s duobinary signal over a Ka-band hybrid photonic-wireless link consisting of 12.5km SMF and 2m wireless distance, using RF carrier frequencies aligned with the Ka-band spectrum allocations for mobile communications.
ASu1A.4 • 09:15
Improving Performance of Organic Solar Cells with PEG-coated Gold Nanorods Doped in the Active Layer, Feiqing Long1, Yanxi Cui1, Yuying Hao1, Qiuqiang Zhan1, Qinyun Sun2, Furong Zhu3, Jiajian Chen1, Qiyuan Liu1. 1Tianjin Univ. of Technology, China; 2Hong Kong Baptist Univ., Hong Kong; 3South China Normal Univ., China. It is demonstrated that the performance of organic solar cells can be improved by doping PEG-coated Gold Nanorods in the active layer with 10.6% increase in the power conversion efficiency.

ASu1A.5 • 09:30
Electro-optical response of PF3T nanofibers in liquid solution, Gleb Lobov1, Yichen Zhao1, Aleksandrs Marinins2, Min Yan1, Jianjiao Li1, Muhammad Toprak1, Abhilash Sugunan2, Lars Thylén1,2, JSPS Research Fellow, Japan. We designed an all-plasmonic or OFDM Receivers, Qi Wu1, Junjie Zhang1, ‘Shanghai Univ., China. An optimized full-parallel variable-length FFT design for software-defined Optical OFDM Receivers, Qi Wu1, Junjie Zhang1, ‘Shanghai Univ., China. An optimized full-parallel variable-length up to 1024-point FFT design for software-defined optical OFDM transceivers is proposed. FFT stage-dependent optimized bit resolution maps are identified which can effectively release hardware resource requires and direct practical applications.
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<td><strong>ASu1A.6 • 09:45</strong></td>
<td><strong>ASu1B.5 • 09:45</strong></td>
<td><strong>ASu1C.4 • 09:45</strong></td>
<td><strong>ASu1D.5 • 09:45</strong></td>
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<td>Anti-Glare and Depolarized Nano-Porous Anodic Aluminum Oxide Film, Cheng-Hsuan Hsieh¹, Yung-Hsiang Lin¹, Chun-Wei Tseng¹, Gong-Ru Lin¹; National Taiwan Univ., Taiwan. Anti-glare and depolarized features of nano-porous anodic aluminum oxide (AAO) film with controllable porosity are demonstrated with porosity dependent scattering angle of 4° accompanied with increased TM/TE polarization ratio of 0.47 obtained under TE incidence.</td>
<td>Silicon Slot Waveguide with Low Transmission and Bending Loss at ~ 1 μm, Xingdong Li¹, Xue Feng¹, Yidong Huang¹; Tsinghua Univ., China. Silicon slot waveguide operating at 1064 nm is experimentally demonstrated. The transmission loss and bending loss are measured as 6.0 dB/cm and 4.1 dB/180°. Tunable slot micro-ring with Q factor of 3400 is fabricated.</td>
<td>A Versatile Mode-locked Fiber Laser with Dynamic Patterns of Soliton Pairs, Xin Zou¹, Ming Li¹, Jifang Qiu¹, Jindan Shi¹, Jian Wu¹; BUPT, China. The dynamic patterns of soliton pairs of two-pulse, second-order harmonic mode-locking and “giant pulses” in a mode-locked fiber laser due to birefringence of the EDF were obtained by just adjusting the polarization controller inside cavity.</td>
<td>Dielectric-loaded Surface Plasmon Polariton Waveguide with Bending Structure, Asahi Sumimura¹, Masashi Ota¹, Masashi Fukuhara¹, Motoki Ito¹, Ryo Watanabe¹, Yuya Ishii¹, Mitsuo Fukuda¹; Toyohashi Univ. of Technology, USA; JSPS, Japan. The optimum structure of bent SiO₂-loaded surface plasmon polariton waveguides was investigated using simulations and experiments to reveal that it yielded 8.0 μm radius of curvature and 30° bending angle.</td>
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<td><strong>ASu1G.4 • 09:45</strong></td>
<td><strong>ASu1H.6 • 09:45</strong></td>
<td><strong>ASu1I.5 • 09:45</strong></td>
<td><strong>ASu1J.5 • 09:45</strong></td>
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<td>Integrated Allocation of Time, Virtual Subcarrier and Modulation Format for Improving Energy Efficiency of OFDMA-PONs, Xiaoxue Gong, Lei Guo, Yejun Liu; Northeastern Univ., China. A novel dynamic virtual subcarrier scheduling solution is designed by us, for the purpose of improving the energy efficiency in the Passive Optical Network (PON) based on Orthogonal Frequency Division Multiplexing Access (OFDMA).</td>
<td>Quasi-static Time-slot Allocation in Hybrid Optical Packet/Circuit Switched Networks, Wenjiao Liao, Weiqiang Sun, Shilin Xiao, zhangxiao feng; Shanghai Jiao Tong Univ., China. We propose a quasi-static time-slot allocation scheme in hybrid optical packet/circuit switched networks. We study the utilization and latency performance of this scheme. Both the theoretical and simulation results verify the superiority of this scheme over conventional packet switched networks.</td>
<td>New Insight of Depth-Dependent Corneal Stroma, Sheng-Lin Lee, Po-Sheng Hu, Vladimir A. Hovhannisyan, Yang-Fan Chen, Chen-Yuan Dong; National Taiwan Univ., Taiwan. To understand the nature of corneal structure, Second Harmonic Generation (SHG) microscopy was utilized to reveal new insight of corneal stromal collagen fibers (lamellae). Results showed similar pattern existing in pared eyes.</td>
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A Mushroom Dual-absorption Partially Deleted Absorber Photodetector, Chao Kang1, Yongqiang Huang1, Feng Liu1, Jiarui Fei1, Qingtao Chen1, Kai Liu1, Xiaofeng Duan1, Qi Wang1, Jun Wang1, Xia Zhang1, Xiaomin Ren1; 1IPCC, Beijing Univ. of Posts and Telecommunications, China. High-speed, high-saturation and low-capacitance are presented by mushroom dual-absorption partially depleted absorber photodetector. This photodetector achieved 3dB bandwidth as wide as 37.2GHz, quantum efficiency of 52%, DC saturation current of 550nA. And, the capacitance decreased apparently.

Design of Asymmetrical Silicon Waveguide Grating by Introducing the Scattering Loss, Shuang Zheng1, Jian Wang1; 1Wuhan National Laboratory for Optoelect, China. We present a simple design of asymmetric silicon waveguide grating by introducing the scattering loss. Numerical simulations show asymmetric reflection and transmission for the 16×16 Benes-type optical switching matrices. The theoretical model is verified by the 40Gb/s DQPSK experiment. The cross-talk range for the 16×16 Benes-type optical switching chips is calculated.

Highly Coherent Supercontinuum Generation in ALGaAs-on-Insulator Waveguide at Telecommunication Wavelength, Chao Mei1, Jinhui Yuan1,2, Kun Li2, Zhenhua Ren1, Youmin Liu1, Rui Li1, Xinzhu Sang1, Chongxiu Yu1; 1Beijing Univ. of Posts and Telecomm, China; 2Photonics Research Centre, Department of Electronic and Information Engineering, The Hong Kong Polytechnic Univ, Hong Kong. We propose a high refractive index contrast ALGaAs-on-insulator waveguide. The simulation results show that highly coherent supercontinuum over the ~50 dB bandwidth of 1350 nm can be generated when the pump wavelength is 1550 nm.

Optimization of High Speed and High Saturation Unis-Traveling-Carrier Photodiode, feng liu1, Yongqiang Huang1, Chao Kang1, Qingtao Chen1, Xiaofeng Duan1, Kai Liu1, Qi Wang1, Xia Zhang1, Jun Wang1, Xiaomin Ren1; 1Beijing Univ. of Posts and Telecommunications, China. We demonstrate an optimized high speed and high saturation uni-traveling-carrier photodiode. Theory and simulation study indicate that bandwidth and saturation current of the optimized device with 420nm absorption layer are 53 GHz and 120mA respectively.

A novel demultiplexing photodetector integrated with concentric circular subwavelength gratings, Xinye Fan1, Chenglin Bai1, Xia Zhang2, Qiuguo Wang3, Hengying Xu1, 1Liaocheng Univ., China. A novel demultiplexing photodetector integrated with concentric circular subwavelength gratings has been designed and simulated. The device has a peak quantum efficiency of 90% around 1550 nm and good performance in the spectral response.

Feasible Coupling Design for Compact Optical Frequency Comb based on A Fused-quartz Micro-resonator, Tze-An Lu1, Hsin-Feng Chen2, Yuh-Chuan Cheng3, Yi-Cheng Chuang4, Po-Er Hsu4, 1Industrial Technology Research Inst., Taiwan. Optical comb spacing of 2.5 nm was generated from fused-quartz micro-resonator with Q ~ 100. An electromagnet is utilized to connect between a translation stage and the micro-resonator holder temporally for performing a portable design.

Ultra-broadband low dispersion over mid-infrared regime in germanium-on-silicon waveguide, Lijuan Xu1, Xiaochang Ni1, Bowen Liu1, Mingjie Hu1; 1TUTE, China; 2Tianjin Univ., China. The designed germanium-on-silicon waveguide illustrates an ultra-broadband (~4190 nm), ultra-flat (a flatness of 0.0055) and low chromatic dispersion (~23 ps/nm/km) in mid-infrared wavelength region.

Ultra-broadband low dispersion over mid-infrared regime in germanium-on-silicon waveguide, Lijuan Xu1, Xiaochang Ni1, Bowen Liu1, Mingjie Hu1; 1TUTE, China; 2Tianjin Univ., China. The designed germanium-on-silicon waveguide illustrates an ultra-broadband (~4190 nm), ultra-flat (a flatness of 0.0055) and low chromatic dispersion (~23 ps/nm/km) in mid-infrared wavelength region.

A novel demultiplexing photodetector with integrated concentric circular subwavelength gratings, Xinye Fan1, Chenglin Bai1, Xia Zhang2, Qiuguo Wang3, Hengying Xu1; 1Liaocheng Univ., China. A novel demultiplexing photodetector integrated with concentric circular subwavelength gratings has been designed and simulated. The device has a peak quantum efficiency of 90% around 1550 nm and good performance in the spectral response.

Valence Band Anticrossing in InP-Bi nanowires, Lijuan Wu1, Lihong Han1, Xiaoyan Li1, Pengfei Lu1, Shumin Wang2; 1Beijing Univ. of Posts and Telecom., China; 2Shanghai Inst. of Microsystem and Information Technology, China; 3Shanghai Inst. of Microsystem and Information Technology, China. Bandgap bowing trend in InP-Bi, have been studied in the framework of the valence-band anticrossing model. The alloys exhibit a strong reduction in the band gap and an increase in the spin-orbit splitting energy with increasing Bi concentration.
A novel compact polarization beam splitter based on a graphene-embedded directional coupler, Tian Zhang, Lin Chen, Wuhan National Lab for Optoelectronics, China. A polarization beam splitter, utilizing two silicon waveguides with and without graphene multilayer embedded, is demonstrated with high extinction ratios (18.2 and 21.2 dB) and low ILs (0.18 and 0.36 dB) for two outputs, respectively.

ASuA.29

Broadband and polarization insensitive 3 dB coupler based on tapered three-guide structure, Yuchan Luo, Mengyuan Ye, Yu Yu, Xianlong Zhang, Wuhan National Laboratory for Optoelectronics & School of Optical and Electronic Information, Huazhong Univ. of Science and Technology, China. We propose a broadband and polarization insensitive 3 dB coupler based on tapered three-guide structure on the silicon-on-insulator platform. The coupler has a wide bandwidth (~100nm) for both polarizations and has a large fabrication tolerance.

ASuA.28

Microring Resonator Based All Optical NAND Gate and design of NOT gate using microring resonators. Obtained results 0.20W (high level) with ER>10 dB is proposed.

ASuA.27

Vertically Stacked Silicon Nitride Coupled Microdisk Resonators, Chenxuan Yin, Jian Jia, Zengkai Shao, Yanfeng Zhang, Pengfei Xu, Lin Liu, Chunchuan Yang, Hui Chen, Yue Chen, Siyuan Yu, Sun Yat-sen Univ., China. We investigate novel vertically-coupled SiN microdisk resonators formed by multiple SiN microdisk resonators stacked on top of each other separated by interleaving SiO2 layers with experimental results on optical coupling near 1550 nm.

ASuA.26

Ultra-compact and broadband tunable mid-infrared tapered multimode interference splitter based on graphene plasmonic waveguide, Ruiwei Zheng, Dingshan Gao, Jianji Dong, Wuhan National Lab for Optoelectronics, China. State Key Laboratory on Integrated Optoelectronics, College of Electronic Science and Engineering, Jilin Univ., China. We design an ultra-compact (0.52μm×1μm) and broadband tunable (6μm to 9μm) tapered multimode interference splitter in mid-infrared based on graphene plasmonic waveguides. The device is easy to be fabricated on chip.

ASuA.24

Polarization insensitive echelle grating demultiplexer based on 3-μm SOI platform, Pingli Huang, Mu Ge, Tingtang Lang, Jian-Jun He, Zhejiang Univ., China; College of Optical and Electronic Technology, China. We present a compact, low crosstalk and polarization insensitive echelle grating demultiplexer with a 20 nm channel spacing using a 3-μm silicon-on-insulator (SOI) platform. The device can be applied to the 40GBase-UR4 Ethernet systems.

ASuA.23

Ultra-compact and broadband tunable mid-infrared tapered multimode interference splitter based on graphene plasmonic waveguide, Ruiwei Zheng, Dingshan Gao, Jianji Dong, Wuhan National Lab for Optoelectronics, China. State Key Laboratory on Integrated Optoelectronics, College of Electronic Science and Engineering, Jilin Univ., China. We design an ultra-compact (0.52μm×1μm) and broadband tunable (6μm to 9μm) tapered multimode interference splitter in mid-infrared based on graphene plasmonic waveguides. The device is easy to be fabricated on chip.

ASuA.22

SOI-based arrayed waveguide grating router with grating couplers fabricated in a single shallow etching step, Yang Chen, Jun Zou, Tingtang Lang, Jian-Jun He, Zhejiang Univ., China; College of Optical and Electronic Technology, China. We experimentally demonstrate a 8×8 arrayed waveguide grating router (AWGR) based on silicon-on-insulator (SOI) platform. The minimum insertion loss and crosstalk are 1.90 dB and -15 dB, respectively.

ASuA.21

Double-slit and square-slit interferences by orbital angular momentum beams, Hailong Zhou, Dongshi Fu, Dongxu Chen, Pei Zhang, Jianji Dong, Wuhan National Laboratory for Optoelectronics, Huazhong Univ. of Science and Technology, China; Key Laboratory for Nonequilibrium Synthesis and Modulation of Condensed Matter, Department of Applied Physics, Xi’an Jiaotong Univ., China. When the orbital angular momentum (OAM) beam illuminates an arc slit, a focused spot is generated and has a linear displacement in the far field. This feature is beneficial to detect the hybrid OAM modes.

ASuA.20

Moosheffer diffraction by an arc slit to detect hybrid orbital angular momentum modes, Hailong Zhou, Dongshi Fu, Dongxu Chen, Pei Zhang, Jianji Dong, Wuhan National Laboratory for Optoelectronics, Huazhong Univ. of Science and Technology, China; Key Laboratory for Nonequilibrium Synthesis and Modulation of Condensed Matter, Department of Applied Physics, Xi’an Jiaotong Univ., China. When the orbital angular momentum (OAM) beam illuminates an arc slit, a focused spot is generated and has a linear displacement in the far field. This feature is beneficial to detect the hybrid OAM modes.

ASuA.19

Absorption Enhancement in Thin-film Organic Solar Cells through Electric and Magnetic Resonances in Organic Metamaterial, Zhang Chen, Zhou Weizhong, Yi Ningbo, Sun Shang, Xiao Shumin, Song Qinghai, Key Laboratory of Nanoscience and Technology, Shenzhen Graduate School, Shenzhen University, China; Key Laboratory of Advanced Nanomaterials and Technology, Ministry of Education, China. The magnetic resonance of gold-graphene hybrid diabolo antennas has been tuned from 32.3 um to 9.8 um via free carrier injection, and magnetic field enhancement can also be as high as 12% and 140%.

ASuA.18

Mid-infrared Tunable Magnetic Response in Graphene-based Diabolo Nanoantennas, Yi Ningbo, Liu Zhengxian, Sun Shang, Qinghai Song, Shumin Xiao, Key Laboratory of Nanoscience and Technology, Shenzhen Graduate School, Shenzhen University, China; Key Laboratory of Advanced Nanomaterials and Technology, Ministry of Education, China. The magnetic resonance of gold-graphene hybrid diabolo antennas has been tuned from 32.3 um to 9.8 um via free carrier injection, and magnetic field enhancement can also be as high as 12% and 140%.

ASuA.17

Ultra-wide Angle Unidirectional Plasmonic Coupler Based on Chirped Ridge Grating, Dalin Liu, Fan Lui, Anshi Xu, Peking Univ., China; Inst. of Spacecraft System Engineering, China. A novel coupling scheme for unidirectionally coupling of surface plasmons over a broad angle range is proposed, the large APWHM up to 60° is achieved by cascading the grating resonance angle pair and asymmetric excitation peak.
Sollston self Compression in a Tapered Chalco- 
ride Horizontal Slant Waveguide with Low 
Peak Pulse Power, Shuai Kang1, Jinshui Yuan2, 
Kun Wang1, Binbin Yan1, Zhe Kang1, Xue Kang1, 
Feng Li1, Xinhua Sang1, Changyu Yu1. (Beijing 
Univ. of Posts and Telecommunications, China; 
Hong Kong Polytechnic Univ., China). A pulse 
compression scheme in tapered chalcogenide 
horizontal slot waveguide is proposed. The 
compression factor of more than 100 times in a 
1.4 cm-long waveguide is achieved with the peak 
pulse power of 7.6 W.

Novel High-Power Zero-Bias Operational Uni-
traveling Carrier Photodetectors with InAlAs/ 
InGaAs Heterojunction, Huang1, Xiaomin Ren1, 
Xiaofeng Duan1, Kai Liu1, Jiarui Fei1. (Univ of 
Electronic Sci & Tech of China, China). A 1.4 cm-
long waveguide is achieved with the peak 
compression scheme in tapered chalcogenide 
Comb, On the Intrinsic Randomness of Kerr Frequency 
ASu2A.36 
Combinatorics, Beijing Univ of Posts and Telecom-
munications, China. A novel uni-traveling carrier 
photodetector with InAlAs blocking layer was 
proposed and researched. The proposed UTC-
photodetector with InAlAs blocking layer was 
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Highly sensitive twist sensor based on CO2-
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Dual-wavelength Q-switched erbium-doped 
laser fiber based on linear cavity, Yanli Ran1, Li 
Xi1, Jialai Rohallahnejad1, Yiyang Luo1, Deming 
Liu1, Huazhong Univ of Science & Technology, 
China. This paper proposes a compact linear 
cavity Q-switched erbium-doped fiber laser of 
dual-wavelength with a low pulse repetition fre-
quency range of 1-20 kHz and a pulse train with 
1.3 μm pulse width at 20 kHz.

Fiber-based microcylindar resonator for con-
trolled and stable coupling, Yongchao Dong, 
Xueying Jin1, Kui Wang1. Department of Preci-
sion Machinery and Precision Instrumentation, 
Univ. of Science and Technology of China, China. 
Controlled and stable coupling between a fiber 
taper and cylinder resonator fabricated from a 
normal fiber is demonstrated. The axial quantiza-
tion of the modes is achieved with numerical simu-
lation, which is in agreement with experiments.

Gain and noise characteristics of dual-pump 
non-degenerative phase-sensitive fiber optical 
parametric amplifier, Fangyong Yu1, 
Lihong Han1, Jinshi Yuan1, Xi Liu1, State Key 
Laboratory of Information Photonics and Opti-
cal Communications, Beijing Univ of Posts and 
Telecommunications, China. The highly nonlinear 
photonic crystal fibers (PCFs) are used as the gain 
media. The bandwidth of proposed PS-FOPA 
reaches ~100nm. The NF of 0.2dB and the gain of 
20.59dB are achieved within the telecommu-
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Terahertz generation using passively mode-locked Yb-doped fiber laser, Moon Sik Kong1, Sang-Pil Han2, Namye Kim3, Ki Won Moon4, Kyung Hyun Park5, Min Yong Jeon6; 1Physics, Chung Nam National Univ., Korea (the Republic of); 2THz Photonics Creative Research Center, ETRI, Korea (the Republic of). We successfully demonstrate a THz generation using low-temperature grown InGaAs photoconductive antenna pumped by a Yb-doped mode-locked femtosecond fiber laser. We achieved fast Fourier transform amplitude spectrum with a bandwidth of 1.5 THz.

Gain equalization of few mode amplifiers using Er3+-doped fibers designed with a refraction index trench, Zhenhui Zhang1, Qinghua Zhao1, Ningbo Zhao1, Xiaoying Li1, Tianjun Un1, China. We present cladding pumped few mode EDFAs supporting up to ten mode groups. The differential modal gain can be decreased to less than 1 dB by properly designing Er3+-doped fibers.

Design of a Circular Photonic Crystal Fiber Supporting OAM Modes, Hu Zhang1, Wenbo Zhang1, Lixia Xi1, Xiaoyang Yang2, Beiying Liu3, Shuang Yu1, Beiying Un1, China. We designed a circular photonic crystal fiber (C-PCF) supporting 12 in formation bearing states. Mode density profile, dispersion, confinement loss and nonlinearity of the fiber were investigated. The benefits of wide bandwidth, low loss and all OAM modes having the same size are verified based on numerical analyses.

Broad-band Sense Based on Two Line-infiltrat ed Photonic Liquid Crystal Fibers, Xiaoxi Li1, Yan-Ge Li1, Zhong Wang1, Nankai Univ., China. A broad-band tunable sensor has been proposed by selecting photo-infiltrated liquid crystal fiber with liquid crystal. Experimental results show the position of the bandgap is nearly complementary before and after the cleaning point of liquid crystal from 600nm to 1700nm.

Repetition Rate-tunable Q-switched Fiber Laser Using a CW-end Embedded Fiber Optic Coupler, Joonhooi Koo1, Ju Han2, School of Electrical and Computer Engineering, Univ. of Seoul, Korea (the Republic of). We experimentally demonstrate flexible control of the pulse repetition rate in a passively Q-switched fiber lasers using a carbon nanotube-embedded fiber-optic tunable coupler as a passive Q-switch. It is shown that the pulse repetition rate can readily be tuned from 13 to 21 kHz by mechanically adjusting the cross-coupling ratio of the coupler.

ASu2A.59

Chaotic Pulsation of Soliton Bunch in a Partially Mode-locked Fiber Laser, Wenjing Zhao1, Zhenhong Wang1, Zhong Wang2, Yang Li2, Guang Yang3, Shengchun Wang1, Nankai Univ., Inst. of Modern Optics, China. We report experimental observation of soliton branch state which quasi-periodically arises in mode-locked fiber laser with nonlinear polarization rotation and net anomalous dispersion. Broadband spectrum implies this chaotic behavior could be related to Raman effect.

ASu2A.60

Line-by-Line Inscription of Phase-Shifted Fiber Bragg Gratings with Femtosecond Laser, Bo Huang1, Xuewen Shu1, Wuhan National Laboratory for Optoelectronics, Huazhong Univ. of Science and Technology, China. The four-order PSFBGs with the phase-shift values of π, 2π and 3π/2 are realized by line-by-line (LbL) technique with a femtosecond laser. The birefringences of the two LbL-inscribed PSFBGs are measured to be 2.0×10−3, 2.4×10−3, respectively.

ASu2A.61

Two-channel Fiber Bragg Grating Fabricated By Femtosecond Laser and Its Application In Switchable Dual-wavelength Erbium-doped Fiber Laser, Fangyong Yu1, Lihong Han2, Jinhui Yuan3, Zhanglei 4, Xuewen Shu1, Huazhong Univ. of Science and Technology, China; 2Aston University, UK; 3Huazhong University of Science and Technology, China; 4Shanghai Univ., China. We report the wavelength deterministic dual-wavelength fiber laser based on Bragg grating and its application. The dual-wavelength fiber laser has been achieved by utilizing the fabricated TC-FBG, stable and switchable dual-wavelength fiber laser at room temperature is demonstrated.

ASu2A.62

Wavelength dependance of the PLC-based 3-mode demultiplexer, Keita Kataoka1, Hirokazu Kubota1, Yuji Miyoshi2, Ohashi Masaharu1, Okasaki Prefecture Univ., Japan. We propose a PLC-based 3-mode demultiplexer and numerically investigate the wavelength dependance of the insertion loss of the demultiplexer. A numerical investigation of a wavelength dependant insertion loss for the proposed demultiplexer are presented.

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ASu2A.64

Chromatic Dispersion Estimation of High Order Mode Based on Wavelength Dependence of Effective Area, Kazuho Ozaki1, Ohashi Masaharu1, Yuji Miyoshi2, Hirokazu Kubota1, Okasaki Prefecture Univ., Japan. We propose a chromatic dispersion estimation of high order modes based on wavelength dependance of effective area. It is shown that the chromatic dispersion of LPx-mode in two-mode fiber is successfully estimated by our technique.

ASu2A.65

Measurement of Cutoff Wavelength in Few-Mode Multi-Core Fiber (FM-MCF), Takuro Otsawa1, Ohashi Masaharu1, Yuji Miyoshi2, Hirokazu Kubota1, Katsuo Takenaga1, Shoichiro Matsui2, Okasaki Prefecture Univ., Japan; 3Fujikura, Japan. We propose a definition of the cutoff wavelength of high order mode in FM-MCF and its measurement technique. The cutoff wavelength of high order mode in FM-MCF is successfully estimated by the proposed method.

Design and Analysis of the Hole-Assisted few mode fiber with ultra-low differential mode group delay (DMGD), Jiaja Zhao1, Borui Li1, Ming Tang1, Songnian Fu1, Deming Liu1, Perry Ping Shum1, Shuang Liu1, Next Generation Internet Access National Engineering Lab (NGIA), School of optical and electronic information, Huazhong Univ. of Science and Technology, China. A hole-assisted graded-index few mode fiber supporting 4 LP-modes with ultra-low DMGD. Less than 16ps/km across the C-band has been achieved and the sign of DMGD can be tailored by air holes’ structure.

Research of Fiber Static Fatigue Parameter Measurement Based On Acoustic Sensor Detection, Mengxun Sun1,2, Jinxing Li1, Zhixiong He1, Weiguang Wang1, State Key Laboratory of Optical Fiber and Cable Manufacture Technology, China; Yangtze Optical Fiber and Cable Joint Stock Company Ltd, China. Here fiber static fatigue parameter is measured according to two-point bending method based on acoustic sensor detection, the detailed measurement method is optimized, comparison of static and dynamic fatigue parameter is also included in this paper.
ASu2A.70 Fiber Bragg Grating Inscription in Four Core Fibers and Their Sensing Applications, Changle Wang, Zhijun Yan, Qizhen Sun, Lin Zhang, Aixin Inst. of Photonic Technologies, Aston Univ., UK; School of Optical and Electronic Information, and National Engineering Laboratory for Next Generation Internet Access System, Huazhong Univ. of Science and Technology, China. We inscribe FBGs in all cores of four core fiber simultaneously and investigate their thermal, strain and bending (both direction and magnitude) responses. The influence of fiber core distance on bending sensitivity is also discussed.

ASu2A.71 Multidimensional tuning of optofluidic ring resonator, Song Zhu, Lei Shi, Yang Liu, Xibiao Xu, Xinliang Zhang, Wuhan National Laboratory for Optoelectronics, China. A novel multidimensional tuning method is demonstrated. The extinction ratio (ER) and the resonant wavelength were tuned by different mechanism. This can enrich the tuning flexibility and broaden the OPR’s application range.

ASu2A.72 Study of an Improved 80×360-Gb/s Nyquist-WDM Transmission System Based on Nonbinary LDPC Coding, Zhihui Cheng, Chenglin Bai, Xiaowei Zhang, Wentao Sun, Beihang Univ. of Science and Technology, China. We present a novel nonbinary LDPC coding and PM 64-QAM technique to study our 80×360-Gb/s Nyquist-WDM coherent detection system, resulting in 2.76dB improvement in BER performance and a high SE of 11.63 bits/Hz.

ASu2A.73 Enhanced Asymmetrically Clipped Optical OFDM for Next Generation PONs, Mohammad Mohammadi, Mai Banawan, Ziad A. El-Sahn, Photonic Group, Electrical Engineering Department, Alexandria Univ., Egypt. We successfully demonstrate a novel enhanced asymmetrically clipped optical OFDM (eACO-OFDM) solution over a PON link. The proposed technique doubles the spectral efficiency of conventional ACO-OFDM at the expense of a slight increase in complexity.

ASu2A.74 A Time-saving and Highly-Accurate Brillouin Characteristic Dispersion Estimation Method for Coherent Optical Communication System, Anlin Yi, Southwest Jiaotong Univ., China. A time-saving and highly-accurate dispersion estimation method for coherent optical communication system is demonstrated. Experimental results show only ~7s estimation time is required to achieve similar accuracy compared to previous scan/search CD estimation techniques.

ASu2A.75 Phenomenological Formula for Modelling of Physical Layer Impairments in Elastic Optical Networks, Suhaile Al-Awai, Ali Fattahi, Richard Schatz, Xiaodan Pang, Oskars Ozolins, Gunnar Jacobsen, Sergey Popov, Jiajia Chen, Electrical Engineering, Univ. of Technology, Israel; KTH (Royal Inst. of Technology), Sweden; Network and Transmission Laboratory, Aalto University, Finland; Swedish ICT AB, Sweden. An empirical model is introduced to estimate impact of physical layer impairments in elastic optical networks, which can be used to evaluate transmission quality. The model has been verified experimentally with accuracy beyond (97.3%).

ASu2A.76 Nonlinear Propagation in Multicore Fiber Transmission Link Based on Coupled Mode Analysis, Lian Xiang, Gangxiang Shen, Jingyi Gao, Soochow Univ., China. We present a general model for describing nonlinear propagation in multicore fiber transmission link. Results show that chromatic dispersion can mitigate crosstalk of nonlinear phase and Kerr nonlinearity will bring crosstalk of nonlinear phase.

ASu2A.77 Nonlinear Distortion in Nyquist OTDM scheme using optical correlation detection, Kensuke Yoshida, Yui Miyoshi, Takahiro Oguro, Hirokazu Kubota, Osamu Marasa, Osaka Prefecture Univ., Japan. We investigate a nonlinear distortion in Nyquist OTDM scheme using optical correlation detection. We also clarify an absolute chromatic dispersion around 2.5 ps/km/nm and a small group delay factor maximize the OSNR penalty at 160 Gbaud.

ASu2A.78 Based on Cross-correlation Function OSNR Monitoring Technique for PM-QPSK System in Presence of Fiber Nonlinearities, Yau Jin, Lixi Xi, Donghe Zhao, Xiaoguang Zhang, Dongwei Pan, Wenbo Zhang, Xianfeng Tang, BUPT, China. A novel optical signal-to-noise ratio (OSNR) monitoring method in presence of fiber nonlinearities optical transmission system is proposed, which based on the cross-correlation function between two symbols of the signal. The results show that this technique can monitor the OSNR of 112-Gb/s PM-QPSK signals with accuracy of 0.86 dB.

ASu2A.79 Dual-mode Injection-locked Colorless Laser Diode with 64-QAM OFDM for 5G MIMOOF at 39 GHz, Hua-Yang Wang, Yu-Cheh Chi, Cheng-Ting Tsai, Gong-Ru Lin, Graduate Inst. of Photonics and Optoelectronics, and the Department of Electrical Engineering, National Taiwan Univ., Taiwan. A dual-mode injection-locked laser diode directly modulated by 24-Gbit/s 64-QAM OFDM data for 5G MIMOOF is demonstrated to provide 39.9 GHz beating microwave carrier with 37.5 dB CNR and 42 M-Hz linewidth at a BER of 1.35×10^-6.

ASu2A.80 Polarization switchable single/multi-wave-length fiber ring laser with an intra-cavity all fiber Lyot filter, Zhijun Yan, Qizhen Sun, Chengbo Mou, Zhongyuan Sun, Kaiming Zhou, Lian Zhang, Aston Univ., Aston Institute of Photonic Technologies, UK; Huazhong Univ. of Science and Technology, China. We demonstrate a polarization switchable single/multi-wavelength fiber ring laser based on an intra-cavity all fiber Lyot filter. The laser can operate at single/multi-wavelength by adjusting polarization controller, and givessingle polarization output.

ASu2A.81 A multi-rate regular QC-LDPC scheme for optical communication based on Finite Geometries, Chi Chen, Lijian Wang, Xue Chen, Dongdong Wang, Chen Ju, Zhiguo Zhang, Beijing Univ. of Posts and Telecommunications, China. We propose a multi-rate regular QC-LDPC scheme for code rate adaptive optical communication systems based on Finite Geometries. Compared with codes proposed in recent standards, the codes have lower error floor and better performance at high code rate.

ASu2A.82 Comparison of LDPC and Turbo Codes in Ultraviolet Wireless Communication Systems, Qi An, Yong Zuo, Jinnan Zhang, Heng Qin, Yinhui Liu, Dong Zhang, Jin Wu, BUPT, China. This paper compares LDPC and Turbo codes in ultraviolet wireless communication systems. Simulation results show the former can achieve better bit error rate (BER) performance with lower complexity than the latter for long length codes.

ASu2A.83 Error Performance of SWN Quantum Receiver for QPSK Coherent-State Discrimination, Tian Chen, Bing Zhu, Department of Electronic Engineering and Information Science, Univ. of Science and Technology of China, China. For the QPSK coherent-state discrimination, error performances of the SWN quantum receiver with on-off detectors are analyzed, which can be improved, especially for weak signals when the sequential probing order and displacement parameter are optimized.

ASu2A.84 Training Symbol Assisted Optical Signal-to-Noise Ratio Monitoring Technique for DDO-OFDM Systems, Zhenhua Feng, Liangyun Zhang, Ming Tang, Shuang Gao, Calvin C. K. Chan, Songnian Fu, Qiong Wu, Li Borui, Ruoxu Wang, Rui Lin, Perry Ping Shum, Deming Liu, Huazhong Univ. of Science & Technology, China, Department of Information Engineering, The Chinese Univ. of Hong Kong, China; School of EEE, Nanyang Technological Univ., Singapore. A high-accuracy training symbol assisted optical signal-to-noise ratio (OSNR) monitoring technique for DDO-OFDM systems is proposed and demonstrated with less than 0.42dB estimation error in an 8.78Gb/s QPSK-OFDM system over 40km SSMF transmission.

ASu2A.85 Directly Modulated WDM-FDM OFDM Signals Externally Modulated with IEEE802.11ac Signals at a MZM, Miki Teruya, Koyo Chinen, Kotoya Irie, Ichiko Kinjo, Electronics and Communication, Okinawa National College of Technology. Japan. Directly modulated 1550nm OFDM and FM signals were multiplexed with two wavelengths and intensity modulated by SGHz 256QAM IEEE802.11ac at MZM. The lower EVM and RCE were achieved with a lower optical spacing than 0.1nm.

ASu2A.86 A Novel OFDM-PON Scheme Using Signal-to-Noise Beat Interference Cancellation Receiver with Balanced Detection, Jianxin Ma, Wei Zhu, Yi Zhang, Qin Wang, Beijing Univ. of Posts & Telecom, China. A novel multi-band OFDM-PON architecture using signal-to-noise beat interference cancellation receivers based on balanced detection (ICRBD) at both the optical line terminal (OLT) and the optical network units (ONU) is proposed and verified by simulation.
Cheng3, Richard V. Penty3, Ian H. White3, Helmut PolSK-PPM-MQAM modulation over gamma-transmission distances study 100Gbps links over OM2, OM3 and OM4 fiber. We-Jose . Vegas Olmos 1, Idelfonso Tafur Monroy 1; Bruno Cimoli 1DTU, Denmark.

4-pulse-position modulation (4-PPM) based on (De-)MUXs and standard SMFs at C-band are investigated in WDM short-range multimode-fibers. We experimentally demonstrate a novel 8-channel 10Gbps-scaled UDWDM-PON system with highest downstream data rate of 10Gbps per user over 42 km SSMF transmission employing carrierless amplitude and phase(CAP) modulation and direct detection.

The results show that with Cassegrain-shielding ratio increases the coupling efficiency will decrease, but the impact will decrease with the communication distance and turbulence intensity increase.

Optimization of super pixel for higher order mode excitation in mode-division multiplexing system, Chengxiu Ma1, Song Yu1, Mingsing Lan1, Chanyong Cai1, Song Nie1, Wangyi Gu1; Beijing Univ Posts & Telecommunications, China. A phase settings of super pixel based on phase-only spatial light modulation is proposed for amplitude and phase modulation. Using the concept of super pixel, many higher order fiber modes are excited precisely.

Optimization of Design of Cassegrain Antenna for Space Laser Communication, Yuan Hu1; CUST, China. In this study, we analyzed the relationship between the divergence angle and antenna parameters with central obstructions. Then, we optimized the design of a Cassegrain antenna and experimentally evaluated its performance in long-distance laser communications.

Experimental Demonstration of Reconfigurable NxN Joint Optical Angular Momentum (OAM) and Space Switching Fabric Using A Single Spatial Light Modulator (SLM), Jun Liu1, Shui Li1, Long Zhu1, Jian Wang1; Wuhan National Lab for Optoelectronics, China. By employing a single spatial light modulator, we propose and demonstrate a NxN joint optical angular momentum (OAM) and space switching fabric. 4+4 OAM mode switching, space switching and joint OAM and space switching are all demonstrated in the experiment.

Cost-Optimized Design of Survivable Flexible Bandwidth Optical Networks, Bowen Chen1, Xiaolong Wang1, Yongli Zhao1, Jie Zhang1; So-Shadow, China; 2Beijing Univ. of Posts & Telecommunications, State Key Laboratory of Information Photonics and Optical Communications, China. We develop a hybrid-protection approach (HPA) and a dedicated-protection approach (DPA) to optimize the network cost in a survivable flexible bandwidth optical network. Simulation results show that HPA significantly can reduce network cost compared to DPA.

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A Flexible Multi-band Microwave Photonic Frequency Conversion Scheme for Satellite Repeater Applications, Jie Yin1, Xuemei Bi1, Kun Xu1, Guowen Wang1, Jinhui Yuan1; 

"All-optical correlator based on modal dispersion in multimode fiber. A correlator of the mask and input signal is achieved at the output. The correlator is nearly independent of the wavelength and bandwidth of input signal. Adjusting slits on the mask, the target patterns can be achieved.

A Novel Scheme of Generating Qubits in Continuous Optical Field, Feifei Yin1, 2, Jianqiang Li2, Fei Shi1, Kun Xu1, Guowen Wang1, Jinhui Yuan1; 

"A novel scheme of generating high-speed optical logic gate XOR based on a single i/Q modulator and direct detection, Xianfeng Tang1, 2, Beijing Univ. of Posts & Telecom. China. We propose a novel scheme of realizing all-optical XOR based on a single i/Q modulator and direct detection by adjusting bias voltages of the two arms, peak-power voltages of the driving signals and the phase shift. Experiments are successfully carried out at the bit rate of 1 Gbit/s with extinction ratio higher than 11 dB.

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A Novel Polytomous Microwave Photonic Frequency Conversion Scheme, Jie Yin1, Xuemei Bi1, Kun Xu1, Guowen Wang1, Jinhui Yuan1;
ASu2A.126
Generation of mid-infrared wavelengths by high-order soliton fission and dispersive wave in a chalcogenide-silicon slot waveguide, Xue Kang1, Jinhu Yuan2, Kuiru Wang3, Binbin Xu4, Chongxiu Yu1, Qiao Zhong1, Chongxiu Yu1, Kuiru Wang1, Peng Li1, Xinhua Sang1, chonghua yu1, BUP, China; 2Hong Kong Polytechnic Univ., China. A chalcogenide-silicon slot waveguide is designed to generate the mid-infrared wavelengths by high-order soliton fission and dispersive wave. The tunable range and conversion efficiency can be up to 500 nm and over 40%, respectively.

ASu2A.127
High Quality Recovery of Double Random Phase Optical Encryption Based on Compressive Sensing, Zhidong Chen1, Xinhu Sang1, Xueei Cao1, (Beijing Univ Posts & Telecommunications, China). A decryption method based on CS is presented to retrieve the image from a double random phase digital holographic encrypted system. By applying CS to decrypt the incomplete hologram, signal can be ideally recovered.

ASu2A.128
A Depth Map-Generation Method Based on Geometric Information and Grab Cut Matting, Zheng Liu1, Xinhu Sang1, Nan Guo1, Duo Chen1, Qiao Zhong1, Chonghua Yu1, Kuiru Wang1, Binbin Yuan1, Jinhu Yuan2, Wenhua Dou1, Liquan Xiao1, 1Beijing Univ. of Posts and Telecommunications, China; 2National Univ. of Defense Technology, China. The conversion of existing 2D to 3D videos is important in 3D display. A depth extraction method based on geometric information and grab cut matting is presented, which can generate depth maps with high quality.

ASu2A.129
Integrated Photonic Generation of Microwave-Multiplicated Signal and Amplitude-Shift Keying Signal, Yun Long1, Linjie Zhou1, Jian Wang1, Wuhan National Laboratory for Optoelectronics, China; State Key Laboratory of Optical Comm. Technologies and Networks, China. We experimentally demonstrate a simple and compact photonic scheme to obtain frequency-multiplicated microwave signal based on a single integrated silicon Mach–Zehnder modulator (MZM). Using the fabricated integrated MZM, we also demonstrate the feasibility of microwave amplitude-shift keying (ASK) modulation based on integrated photonic approach.

ASu2A.130
A microwave photonic filter with multiple independently tunable passbands, Long Huang1, Xiangfei Chen1, Tao Pu1, Daile Chen1, Peng Xiang1, Nanning Univ., China; PLA Univ. of Science and Technology, China. We propose a novel microwave photonic filter with multiple independently tunable passbands based on an incoherent broadband optical source. A proof-of-concept experiment is performed. An MPF with two passbands is experimentally demonstrated.

ASu2A.131
Broadband Optical Nonreciprocal Transmission Using a Nonlinear Attenuator Cascaded with a Linear Attenuator, Yun Long1, Xiao Hu1, Jian Wang1, Wuhan National Laboratory for Optoelectronics, China. We propose a approach to realize integrated optical nonreciprocal transmission (ONT) using a nonlinear attenuator and a linear attenuator. In a proof-of-concept experiment based on single-mode fiber, we realize large nonreciprocal transmission ratio. Our architecture may provide an answer to the challenge of ONT in photonic integrated circuits.

ASu2A.132
Suppression Ratio Tunable Microwave Photonic Filter Based on a Silicon Photonic Crystal Nanocavity, Yun Long1, Yong Zhang1, Han Zhang1, Jingsong Xia1, Jian Wang1; Wuhan National Laboratory for Optoelectronics, China. We propose a simple approach to realize ultracompact suppression ratio tunable microwave photonic filter based on a silicon photonic crystal (PhC) nanocavity with shallow resonance. Using a conventional modulation scheme with only a single phase modulator, the suppression ratio of the proposed MPF can be tuned from about 10 dB to beyond 60 dB.

ASu2A.133
Optical-fiber intrusion detection method based on Leffere-loop and bidirectional POTDR-C technique, Carolina Franciscangeli1, Claudio Frade1, Fabiano Fructu1, PCPP, Brazil; 2Unicamp, Brazil. We validated a novel optical-fiber intrusion sensor proposal based on Leffere-loop and bidirectional polarization Optical Time-Domain Reflectometer (pOTDR) technique. Disturbances along 5 m fiber section inside 9 km perimeter were localized within 18 m resolution.

ASu2A.134
Withdrawn.

ASu2A.135
Safety Monitoring System of Optical Cable Cross Connection Cabinet Using FBG-based Fiber Optic Sensor, Cilin Lu1, Zhiguo Zhang1, Zhirong Liu1, Luming Li2; 1Beijing Univ. of Posts and Telecommunications, China; 2University of Missouri, U.S.A. This paper is for monitoring real-time ice thickness of transmission lines, proposing a method based on fiber Bragg grating and strain difference model. The experiment results show that average deviation is less than 0.5 mm.

ASu2A.139
Numerical Simulations of Optical Near-field Probes, Lei Chen1, Yumin Liu1, Zhongyuan Yu2; 1Beijing Univ. of Posts and Telecommunications, China; 2University of California, Berkeley, USA. Laser-irradiated metal tips probes and aperture probes are simulated by the finite element method. The expected local-field enhancement and high-light throughput are obtained by modeling with optimized geometric parameters, optical forces related formulas are also elaborated.

ASu2A.136
Qualitative Analysis of CO(NH)2 Composition for Skin Secretion Detection Based on Near Infrared Spectroscopy, Jianfei Liu1, Lizhu Dong1; 1Beijing Univ. of Posts and Telecommunications, China; 2Hebei Univ. of Technology, China. CO(NH)2 composition at surface of human body have direct relationship with human physical condition. It demonstrates the relationship between composition temperature and near infrared spectroscopy spectrum based on least squares method.

ASu2A.137
Demonstration of Correlation Peak Profiling in Frequency Correlated Brillouin Optical Time Domain Analysis, Bhargav Somepalli1, Deepa Venkitesh1, Balaji Srivasan2; 1IIT Madras, India. We propose a combination of frequency correlation and temporal gating techniques to map the correlation peaks, investigate their tunability through simulations and experiments. Correlation peaks in 1 km fiber are tracked with 100 ns pulses.

ASu2A.138
Application of strain difference model and FBG sensor to power transmission line ice monitoring, Zhirong Liu1, Zhiguo Zhang1, Cilin Lu1, Luming Li2; 1Beijing Univ. of Posts and Telecommunications, China; 2University of Missouri, U.S.A. Application of strain difference model and FBG sensor to power transmission line ice monitoring, Zhirong Liu1, Zhiguo Zhang1, Cilin Lu1, Luming Li2; 1Beijing Univ. of Posts and Telecommunications, China; 2University of Missouri, U.S.A. This paper derives a novel model to describe the Brillouin interaction in Brillouin optical time domain analysis with arbitrarily modulated pump. Then the Brillouin gains spectra of phase-shift pulse and Brillouin echo are calculated and analyzed.

ASu2A.140
Modeling of Brillouin optical time domain analysis with arbitrarily modulated pump, Xiaobo Tu1, Qiao Sun2, Zhou Meng1; 1National Univ. of Defense Technology, China; 2Nanjing Univ. of Science and Technology, China. This paper derives a novel model to describe the Brillouin interaction in Brillouin optical time domain analysis with arbitrarily modulated pump. Then the Brillouin gains spectra of phase-shift pulse and Brillouin echo are calculated and analyzed.

ASu2A.141
Tapered Optical Fiber Polymerized with 4-vinylphenylboronic Acid for Glucose Sensing, Chao Huang1, Xueting Cao2, Lei Chen1, Nana Li1, Qi Liang1, Xiaolan Sun1, Zesheng An2; 1The Key Lab of Specialty Fiber Optics and Optical Access Networks, Shanghai Univ., China; 2Institute of Nanochemistry and Nanobiology, Shanghai Univ., China. We report a miniature glucose sensor that consists of a tapered optical fiber polymerized with thin 4-vinylphenylboronic acid polymer film. The intensity of light reflected from the fiber tip increases with the concentration of glucose solution exceeding from 0 mM to 60 mM.

ASu2A.142
Organic Vapor Sensing with Silicon Quantum-Dot-Coated Optical Fiber, Zhi-Hong Zhang1, Shao-Yi Wu1, Cheng-Chun Ding1, Xiao-Hong Chen2; 1School of Physical Electronics, Univ. of Electronic Science and Technology of China, China; 2School of Physics and Chemistry, Research Center for Advanced Computation, Xiuhua Univ., China. Silicon quantum dots coupled to an optical fiber was used as a probe to detect organic vapors for sensing applications. The sensor shows a high sensitivity and specificity due to the surfaces of the dots.

ASu2A.143
Phase-sensitive OTDR system based on self-mixing demodulation, Hainjun He1, Li-Yang Shao1; 1Southwest Jiaotong Univ., China. A self-mixing signal demodulation method has been proposed for the phase-sensitive OTDR system. The experiment has been implemented to prove the proposed method by simultaneously determining the frequency and location of the vibration interference on a 10km fiber.
ASu2A.144 Multiplexed Fiber-optic Methane Sensors Based on Optical Coherence Domain Reflectometry, Shun Li, Xin y. Fan, Qing w. Liu, Zu y. He, 1 State Key Lab of Advanced Optical Communication Systems and Networks, Shanghai JiaoTong Univ., China. We propose a simple fiber-optic sensing technology for real-time multi-channel monitoring of methane concentration based on optical coherence domain reflectometry by synthesis of optical coherence function, and demonstrated three compact gas cells spliced in series.

ASu2A.145 Practical Pattern Recognition System for Distributed Optical Fiber Intrusion Monitoring System Based on Phase-Sensitive Coherent OTDR, Cong Gao2, Xin y. Fan1, Qing w. Liu1, Zu y. He1, Shanghai Jiaotong Univ., China. A perimeter security monitoring system based on O-OTDR is proposed. By using support vector machine (SVM) through a three-dimensional feature vector, an identification accuracy rate of 92.62% on average for five events is achieved.

ASu2A.146 Performance enhancement of phase-demodulated O-OTDR with signal processing, Song Wang1, Li Zhang1, Yi Li1, Mengjue Fan1, Zinan Wang1, Yuan-Jiang Rao1, Univ. Electronic Sci. & Tech. of China, China; 2Guizhou Power Grid Information and Communication Company, China. An 86 km long OTDR system with 20m spatial resolution has been experimentally demonstrated with direct detection. Co-pumping 2nd Raman amplification based on random fiber lasing is used to amplify the pulse probe along the fiber, significantly extends sensing distance.

ASu2A.147 High sensitive sensing characteristics of surface plasmon coupling gratings, Rui Ma1, Yumin Liu1, Zongyuan Yu1, Keyanlou 339, Beijing Univ. of Posts and Telecommunications, China. We propose a application of end-fire coupling gratings as sensor of refractive index. The refractive index sensitivity can reaching 2000 nm/RIU. This work has potential for designing refractive index sensors and other surface plasmon devices.

ASu2A.148 Fully Distributed Optical Fibre Sensors For Seismic Wave Detection, Gaosheng Fang1, Yuanwei Xu1, Fang Li1, Inst. Semiconductors, CAS, China. A fully distributed optical fibre sensors based on OTDR is proposed. Experiments are carried out to detect seismic wave signal, which demonstrate our solution is an effective technical solution for energy service.

ASu2A.149 Intelligent Distributed Acoustic Sensing System Based on O-OTDR and Phase Generated Carrier Algorithm, Xu1, Yuanwei1, Gaosheng Fang1, Fang Li1, Inst. Semiconductor, CAS, China. We propose an intelligent distributed acoustic sensing system based on phase generated carrier algorithm and O-OTDR. Experiments are carried out to demonstrate the feasibility of the system with correct demodulation and flat frequency response.

ASu2A.150 An 86 km direct detection POTDR with co-pumping 2nd Raman amplification based on random fiber lasing, Yuanwei Zheng1, Yi Li1, Zhenshi Sun2, Mengjue Fan1, Haining Wu1, Zinan Wang1, Yuan-Jiang Rao1, Univ. Electronic Sci. & Tech. of China, China; 2Guizhou Power Grid Information and Communication Company, China. An 86 km long POTDR system with 20m spatial resolution has been experimentally demonstrated with direct detection. Co-pumping 2nd Raman amplification based on random fiber lasing is used to amplify the pulse probe along the fiber, significantly extends sensing distance.

ASu2A.151 Enhanced BOTDA Performance by Using Commercial Optical Coherent Receiver and Digital Signal Processor, Liang Wang1, Nan Guo1, Kangping Zhong1, Xian Zhu1, Chao Jin1, Chao Lu1, HuaWen Tam1, Hong Kong Polytechnic Univ., Hong Kong. We have demonstrated the use of commercial optical coherent receiver and digital signal processor to receive and process the BOTDA sensing signal. The configuration enables communication compatible coherent reception of BOTDA signal with enhanced performance.

ASu2A.152 All-Fiber In-Line SNS Structure Liquid Level Sensor, Yongqiang Wen1, Li X1a, Yanli Ran1, Jialal Roholahnejadi1, Deming Liu1, Huazhong Univ of Science & Technology, China. In this paper we demonstrate a liquid level optical fiber sensor based on SNS structure with a water level range of 280mm, 26.6pm/mm sensitivity and 0.9994 linearity.

ASu2A.153 Inclination Control of Laser Beam for Environmental Sensing Network with Optical Wireless Terminal, Kyo Yoshitaka1, Kochi Univ. of Technology, Japan. We demonstrate method to scan laser beam and find optical wireless terminal, which collects environmental information around the terminal, such as temperature and humidity. We implement thresholding and labeling algorithm to identify the terminal.

ASu2A.154 Metal-Waveguide-Capillary Based Photometer-Application to Ultra-sensitive Detection of Red Liquid Samples, Min Bai1, Hui Huang1, Jian Hao1, Ji Zhang1, Haibo Wu1, Bo Qi1, Dalian Univ. of Technology, China. Trace analysis of liquid samples has wide applications in life science and environmental monitoring. In this paper, a compact and low-cost photometer based on metal-waveguide-capillary(MWC) was developed for ultra-sensitive absorbance detection.

ASu2A.155 Improvement of depth resolution in optical coherence tomography of dispersive medium with multiple reflections, Takarai Fujimoto1, 1Kochi Univ. of Technology, Japan. We propose and demonstrate a numerical method to improve depth resolution for dispersive medium in Fourier domain optical coherence tomography. Our method can numerically cancel out the dispersion effect without any additional components.

ASu2A.156 Measuring Three-Dimensional Reflective Index Maps of Injection-Molded Plastic Lenses Using Optical Diffraction Tomography, Kyoohyun Kim1, YongKeun Park1, KAIST, Korea (the Republic of). We present a novel technique to measure 3-D internal structures of optical plastic lenses. Using optical diffraction tomography with sample rotation, 3-D refractive index distribution of plastic lenses is reconstructed with high spatial resolution.

ASu2A.157 Withdrawn.

ASu2A.158 Hybrid application of complex wavefront shaping optical coherence tomography and optical clearing agents for the penetration depth enhancement, Hyoseong Yu1, Jaehyun P. Lee1, YoungJu Jo1, Young Jeong1, Varley Tuchin1, YongKeun Park1, Department of Physics, Korea Advanced Inst. of Science and Technology, Korea (the Republic of), Department of Bio and Brain Engineering, Korea Advanced Inst. of Science and Technology, Korea (the Republic of), Saratov State Univ., Russian Federation. We demonstrate that simultaneous application of optical clearing agents (OCA) and complex wavefront shaping in a spectral domain optical coherence tomography (SD-OCT) system can provide significant enhancement in the penetration depth. The concurrent applications of two methods successfully operate in tissue phantom and ex vivo mouse ear imaging.

ASu2A.159 Label-free analysis and identification of white blood cell population using optical diffraction tomography, Jonghee Yoon1, Kyoohyun Kim1, Min-hee Kim1, YoungJu Jo1, Suk-Jo Kang1, YongKeun Park1, 1Physics, KAIST, Korea (the Republic of), 2Biological science, KAIST, Korea (the Republic of). We present a label-free method for analysis and identification of mouse white blood cell(WBC) populations using 3-dimensional refractive index(RI) tomograms. RI tomogram provides biochemical and structural information of WBCs, which enables classification of WBC subtypes.
ASu3A.1 • 11:30  
Facilitating an Integrated Silicon Photonics Platform, Graham T. Reed1, Li Ke1, David Thompson1, Shenghao Liu1, Peter R. Wilson1, Youfang Hu1, Robert T. Topley1, Frederic Gardes2, Ali Z. Khoth1, Steven T. Stankovic3, Reynolds Scott3, Colin J. Mitchell4, G Martinez-Jimenez1, Liam O’Faolain1, Noel Healy1, Sakarellis Malis1, Anna Peacek1, Goran Z. Madsanovich2; 1Univ. of Southampton, UK; 2EEE, Univ. of Bath, UK; 3Physics and Astronomy, St Andrews, UK. This paper summarises our recent work on an integrated silicon modulator and driver to achieve up to 30Gb/s with an extinction ratio in excess of 4dB, a fabrication tolerant multiplexer, and a device to facilitate wafer scale testing.

ASu3B.1 • 11:30  
Non-periodic high contrast gratings reflector providing phase front control of the reflected light as well as high reflectivity of the fabricated mirror was demonstrated to have excellent beam focusing ability. The fabricated mirror was suggested and experimentally investigated. The high-phase-contrast gratings reflector providing phase front control, high contrast gratings reflector and focusing ability, with focusing ability, Wenjing Fang1, Yongqing Peacock1, Reynolds Scott3, Graham T. Reed1, Li Ke1, David Thompson1, Shenghao Liu1, Peter R. Wilson1, Youfang Hu1, Robert T. Topley1, Frederic Gardes2, Ali Z. Khoth1, Steven T. Stankovic3, Reynolds Scott3, Colin J. Mitchell4, G Martinez-Jimenez1, Liam O’Faolain1, Noel Healy1, Sakarellis Malis1, Anna Peacek1, Goran Z. Madsanovich2; 1Univ. of Southampton, UK; 2EEE, Univ. of Bath, UK; 3Physics and Astronomy, St Andrews, UK. This paper summarises our recent work on an integrated silicon modulator and driver to achieve up to 30Gb/s with an extinction ratio in excess of 4dB, a fabrication tolerant multiplexer, and a device to facilitate wafer scale testing.

ASu3B.2 • 12:00  
Non-periodic high contrast gratings reflector with focusing ability, Wenyong Fang1, Yongqing Huang1, Yaping Lin1, 1State Key Laboratory of Information Photonics and Optoelectronics Communications, Beijing University of Posts and Telecommunications, China. High contrast gratings (HCGs) focusing reflector providing phase front control of the reflected light as well as high reflectivity is suggested and experimentally investigated. The fabricated mirror was demonstrated to have excellent beam focusing ability.

ASu3C.1 • 11:30  
Efficient Parametric Conversion for High Power Mid-infrared Laser Output, Yongyang Shen1, Peipei Jiang1, Bo Wu1, Chengzhui Hu1, Jie Wang1, 1College of Optical Science and Engineering, Zhejiang Univ., China. We report some of our recent work on the ps pulse bunch mid-IR laser output at 3.8 μm through the quasi-synchronized pump scheme. Efficient parametric conversion was realized with a maximum average output power of 7.5 W at 3.8 μm and the conversion efficiency of 16%.

ASu3C.2 • 12:00  
Duell based laser structure grown by LP-MOCVD using InGaP as p-doped cladding layer, Xin Gu1, Ga Wang1, Xiaomin Ren1, Hao Liu1, Guiying Mao1, Shiwei Cai1, Xia Zhong1, Yongqing Huang1; 1BUPT, China. A dot-in-well structure with InGaP p-doped cladding layer was grown by LP-MOCVD. The investigation of replacing the AlGaAs cladding layer by InGaP as well as the optical properties of laser structure has been demonstrated.

ASu3D.1 • 11:30  
Nanostructured Transparent Conducting Oxides: Characteristics and Applications in the THz Frequency Range, Ci-Ling Pan1, 1Dept. of Physics, National Tsing Hua Univ., Taiwan. Transparent conducting oxides (TCOs), with high optical transparency and excellent electrical conductivities, form a group of technologically important materials. For example, indium tin oxide (ITO) thin films are widely used as electrode materials in optoelectronic devices for visible wavelengths. It is well-known, however, that ITO thin films exhibit high reflectance and strong absorption in the terahertz (THz) frequency range. Recently, ITO nanomaterials have attracted a lot of attention, because of its omnidirectional and broadband anti-reflection characteristics in the visible and near infrared. These can be used effectively as functional transparent electrodes in the THz frequency range as well. In this tutorial, we will present the fabrication and characterization of several TCOs, including ITO nanomaterials, graphene, and several types of bulk TCO thin films, e.g., AZO and AYZO, for THz applications. Performance of THz phase shifters with ITO nanomaterials and graphene as transparent electrodes are presented. A graphene-based phase shifter can achieve a phase shift of π/2 at 1.0 THz with an operating voltage of ~2.2 V (rms) which is the lowest driving voltage reported for such devices, to the best of our knowledge.

ASu3D.3 • 12:00  
Wideband Tunable Narrowband Terahertz Source Based on Difference Frequency Generation from Parameter Light Source, Zhaohui Wu1, Jing Zhang1, Lifan Hu1, Haoyang Meng1, 1Univ. of Science and Technology of China. We report some of the recent progress of the THz source based on difference frequency generation from parameter light source. A narrow-band tunable terahertz generation system from 1 THz to 2 THz is built based on difference frequency generation pumped by all-fiber highly coherent dual-wavelength laser sources from optical parametric process.
Transmissions, Eigenvalue Division Multiplexing for Optical Capacity of Nonlinear Fibre Channels and I will discuss recent progress in this field. The non-linear Fourier transform, also known as eigenvalue communications, is a coding, transmission and signal processing technique that makes positive use of the nonlinear Kerr effect in fibre channels. I will discuss recent progress in this field.

A capacity of Nonlinear Fibre Channels and

Efficient Architecture Supporting Coordinated Multipoint Transmission in Mobile Networks, Moztigan Mahlouj1, Lena Wosinska1, Jiayi Chen1; Kungliga Tekniska Högskolan, Sweden. High-capacity architecture is proposed aiming to fulfill stringent latency constraint for coordinated multipoint transmission in mobile networks. It offers obviously lower delay, cost and energy consumption as well as better resiliency than the conventional solutions.

A gold nanoparticle amplified fiber tapered biosensor based on mesoporous silica based nanospheres, Mingfei Ding1, Bai-Ou Guan1; Jinan Univ., China. We present a label-free and sensitivity-improved fiber tapered biosensor based on mesoporous Ag/βSiO2 nanospheres, which is amplified by gold nanoparticle. And the special silica based nano-film improves DNA concentration sensitivity reaching to 1.388 nm/plex and its application in high resolution 100 nm.

ASu3I.2 • 11:45 Linearization of broadband frequency sweep for temperature tuned DFB laser using an optoelectronic feedback loop, Jie Qin1, Qian Zhou1, Weilin Xie1,2, Yi Dong1, Weisheng Hu1; 1The Univ. of Hong Kong, Hong Kong; 2Laboratoire Aimé Cotton, CNRS-Université Paris Sud 11-ENS Cachan, Campus d’Orsay, France. We demonstrate an all-fiber optoelectronic feedback amplifier for the optical coherence tomography system with low illumination optical power for bio-sample. A 15-dB sensitivity enhancement is obtained in a spectral bandwidth of spanning over 100 nm.

ASu3I.3 • 12:00 Proactive Performance Monitoring in Software Defined Networking. Lian-Kuan Chen1, Hong-Ling Lin2, Chongjin Xie1, Hong Kong Polytechnic Univ., Hong Kong; 1Kungliga Tekniska Högskolan, Sweden. To facilitate fast performance monitoring, proactive monitoring in Software Defined Networking is proposed and different monitoring strategies are discussed. The reduction of the acquisition time and the additional blocking probability induced are investigated.

A Hybrid Fiber-Wireless Integration: Transport Schemes vs Energy Consumption, Christina Lim1; 1Univ. of Melbourne, Australia. In this paper, we review the work we have conducted in the study of energy consumption of fiber-wireless network based on the different wireless transport schemes.

ASu3J.1 • 11:30

A Gold Nanoparticle Amplified Fiber Tapered Biosensor Based on Mesoporous Silica Based Nanospheres, Mingfei Ding1, Bai-Ou Guan1; Jinan Univ., China. We present a label-free and sensitivity-improved fiber tapered biosensor based on mesoporous Ag/βSiO2 nanospheres, which is amplified by gold nanoparticle. And the special silica based nano-film improves DNA concentration sensitivity reaching to 1.388 nm/plex and its application in high resolution 100 nm.

ASu3J.2 • 12:00 High-Precision Microwave Phase Transfer and Remote Synchronization Using Frequency Combs, Jungwon Kim1; 1Korea Advanced Inst. of Science & Tech, Korea (the Republic of). We show high-precision microwave phase transfer and remote synchronization by delivering frequency combs. Relative frequency instability of 7.7×10^-14 and 5-s fs (over 8-h) between two 2.856-GHz microwave sources separated by 2.3 km fiber link are demonstrated.
ASu3A.3 • 12:15
Sidewall-Grating-Assisted Polymer Waveguide Directional Coupler for Forward Coupling of Fundamental Modes, Yan Wang1, Kaixin Chen2, Lingfang Wang2, Kin S. Chiang1,2;1City Univ. of Hong Kong, Hong Kong, 2The Key Laboratory of Optical Fiber Sensing and Communications, Univ. of Electronic Science and Technology of China, China. We demonstrate a sidewall-grating-assisted directional coupler for coupling between the fundamental modes of a few-mode waveguide and a single-mode waveguide. The maximum coupling efficiency is ~99% with a thermal tuning sensitivity of 2.6 nm/°C for the wavelength.

ASu3B.3 • 12:15
Mode control for microcylinder laser with non-uniform pumping, Yue-De Yang1, Jin-Long Xiao1, Zhi-Xiong Xiao1, Hai-Zhong Weng1, Yong-Zhen Huang1;1Inst Semiconductor, CAS, China. We study the mode characteristics in microcylinders with a lossy area, which can suppress whispering-gallery modes and generate high-Q coupled modes. Single-mode operation is achieved in the 15-μm radius microcylinder laser with non-uniform electrical pumping.

ASu3B.4 • 12:30
1650-nm-band Tunable V-Cavity Semiconductor Laser, Haoyu Deng1, Yuan Zhuang1, Jian-Jun He1;1Zhejiang Univ., China. We present a 1650-nm-band wavelength tunable V-cavity semiconductor laser for applications in methane detection. The laser does not require grating or epitaxial regrowth. A tuning range of over 16nm is achieved, with side mode suppression ratio (SMSR) above 30dB.

ASu3C.4 • 12:30
Laser phase noise measurement by using an adjustment-free Michelson interferometer based on 3×3 optical coupler, Dan Xu1, Fei Yang1, Dijun Chen1, Haiwen Cai1, Ronghui Qu1;1Chinese Academy of Sciences, USA. An adjustment-free laser phase and frequency noise measurement based on Michelson interferometer composed of 3×3 optical coupler was proposed. The differential/instantaneous phase and frequency fluctuation PSD of an NKT fiber laser were measured and discussed.

ASu3D.2 • 12:30
Withdrawn.

ASu3E.4 • 12:15
Invited
Bandwidth-Efficient Mobile Fronthaul Transmission for Future 5G Wireless Networks, Xiang Liu1, Huaiyu Zeng1, Naresh Chand1, Frank Effenberger1;1Huawei R&D, USA. We review recent advances in bandwidth-efficient mobile fronthaul transmission where multiple wireless signals are aggregated and transmitted with their spectral bandwidths unchanged. Applying this technique to future 5G wireless networks with massive-MIMO is also discussed.

ASu3A.4 • 12:30
Invited
Back-end Photonics for Silicon-based Integrated Photonic Platform, Koji Yamada1;1Natl Inst. of Adv. Industrial Science and Technology, Japan. Advanced functionality integration using add-on waveguide systems on a silicon photonic platform is reviewed. The add-on waveguide systems, made of silicon-rich silica, silicon oxy-nitride, silicon nitride and amorphous silicon, are constructed by back-end-on-line (BEOL) process technologies.

ASu3B.5 • 12:45
Wide Wavelength Tuning in V-Coupled-Cavity Laser integrated with a Fabry-Perot Filter, Xiaolu Liao1, Jian-Jun He1;1Zhejiang Univ., China. We report our experimental results on a V-coupled cavity semiconductor tunable laser integrated with a Fabry-Perot tunable filter. Wavelength tuning of 43 channels with 100GHz spacing is demonstrated with side mode suppression ratio around 40dB.

ASu3C.3 • 12:15
A Novel Bismuth-Doped Fiber Laser for CW Operation between 1625 and 1775 nm, Sergei V. Firstov1, Sergey Alyshev1, Konstantin Rimkin1, Mikhail Melkumov1, Evgeny Danov1;1Fiber Optics Research Center, Russian Federation. A new continuous-wave all-fiber bismuth-doped laser with output radiation ranging from 1625 to 1775 nm has been developed. A maximum achieved efficiency and output power were 33% and 1.05 W, correspondingly.

ASu3D.2 • 12:30
Withdrawn.
supports our numerical results in that the eigenvalues detecting of propagated high order multi-solitons are very sensitive to the receiver amplitude and phase imbalances.

We investigate the high order multi-solitons and the sensitivity to the receiver amplitude and phase imbalances. Numerical simulations show that the eigenvalues detecting of multi-eigenvalue on-off keying modulated NFDM transmission systems. The results show that the eigenvalues detecting of propagated high order multi-solitons are very sensitive to the receiver amplitude and phase imbalances.

Optimized SVM-based Decision Processor for 16QAM Coherent Optical Systems to Mitigate NLPN
An analytical model of NLPN, Dan Shi1, Yiping Li1,2,3,4,5,6,7; 1Beijing Univ Posts & Telecommunications, China. Based on the cross-validation and grid-search, a parameter optimization method for SVM-based decision processor is proposed. Compared with random selection scheme, the performance is improved significantly, and the BER reaches lower than $3 \times 10^{-4}$.

Novel Virtual Network Embedding Algorithm Based on QoS Satisfaction for Fiber-Wireless Access Network
Jiajun Ren1, Xiaoyan Li1,2,3; 1Beijing Univ Posts & Telecommunications, China. This paper focuses on the virtual network embedding problem in fiber-wireless access network, and proposes an algorithm for the embedding of virtual networks with different QoS requirements. Simulation results verify the effectiveness of proposed algorithm.

An M-ary SVM-Based Detection for 16-QAM RoF System with Data-Dependent Cross Modulation Distortion
Dan Li1,2, Song Yu1, Tianwei Jiang1, Yi Han1, Wanyi Gu1; 1University of Melbourne, Australia; 2Melbourne Networked Society Institute, Australia. This paper presents an optimized deployment framework of hybrid fiber wireless networks integrating with connectivity, delay, capacity, and survivability constraints. Simulation results demonstrate the feasibility of this framework in the context of an urban deployment.
### Conference Room N202

**ASu4A • Integrated Nonlinear Optics**  
*Presider: David J. Moss, Australia*

#### ASu4A.1 • 14:30  
**Invited**  
New CMOS Compatible Platforms for Integrated Nonlinear Optics, David J. Moss1;2;  
1Micro-Nano Research Facility, RMIT Univ., Australia; 2Electrical and Computer Engineering, RMIT Univ., Australia. This paper reviews recent progress in CMOS-compatible platforms for nonlinear optics including amorphous silicon and Hydex, highlighting their new capabilities such as on-chip optical frequency comb generation and ultrafast optical pulse generation and measurement.

### Conference Room N204/205

**IPoC Special Tutorial**  
Latest Novel Understandings of Electron States Architectures in Crystalline Materials and Likely of the Whole Physics

### Conference Room N207

**ASu4B • Specialty Optical Fiber**  
*Presider: Chris Xu; Cornell Univ., USA*

#### ASu4B.1 • 14:30  
**Invited**  
Recent Research and Development Progress on Photonic Specialty Fiber, Weijun Tong1;2;  
1YOFC, China; 2State Key Laboratory of Optical Fiber and Cable Manufacture Technology, China. Specialty fiber has important applications in optical fiber devices. YOFC’s recent progress on specialty fibers like coupler fiber, device-type PMF, active fiber for fiber lasers and so on will be demonstrated.

### Conference Room N208

**ASu4C • Data Center Optics**  
*Presider: Tomoo Takahara, Fujitsu Limited, Japan*

#### ASu4C.1 • 14:30  
**Invited**  
Optical Interconnects in Data Centers, Chongjin Xie;  
Ali Infrastructure Service, Alibaba Group, China. We discuss optical interconnect technologies for intra-datacenter networks and show that with the network speed moving up to 100Gb and 400G, no single technology can satisfy the need of all datacenters.
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<td>Presider: Lei Guo; Northeastern Univ. (China), China</td>
<td>Presider: Wei Chen, Univ. of Central Oklahoma, USA</td>
<td>Presider: Christina Lim; Univ. of Melbourne, Australia</td>
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**ASu4D.1 • 14:30**

Coherent Signal Processing: Fundamentals and Applications, Stojan Radic1; ECE Dept./Univ. of California, San Diego, USA. Hybrid, photonics-electronics signal processing is becoming increasingly important with introduction coherent modulation formats. Bridging the speed- and dissipation-gap imposed by electronics, hybrid processor has widespread use in communications, sensing and general computing.

**ASu4E.1 • 14:30**

Invited Tutorial Survivable Multicast Routing and Spectrum Assignment in Light-Tree-Based Elastic Optical Networks, Anliang Cai1, Moshe Zukerman1, Rongping Lin2, Gangxiang Shen2; 1EE Dept., City Univ. of Hong Kong, Hong Kong; 2School of Electronic and Information Engineering, Soochow Univ., China. We formulate MILP models and develop efficient heuristic algorithms for survivable multicast routing and spectrum assignment in light-tree based elastic optical networks considering physical layer impairments. Numerical results demonstrate the performance of our heuristics.

**ASu4F.1 • 14:30**

Experimental Demonstration and Assessment of Multi-Domain SDTN Orchestration Based on Northbound API, Hui Ding4, Guoying Zhang4,1, Yunbo Li2, Ruixue Gong2, Zhengxin Guo2; 1Information Photonics and Optical Communication Inst., Beijing Univ. of Posts and Telecommunications, China; 2China Mobile Research Inst., China; 3Beijing Univ. of Posts and Telecommunications, China; 4China Academy of Information and Communication Research, China. We present the experimental demonstration of a multi-domain SDTN network orchestration architecture through northbound interface. The interoperability among different vendor OTN equipment via the control NBI is successfully validated and orchestration performance is assessed.

**ASu4F.2 • 14:45**

Demonstration of Hierarchical Control for Multi-domain and Multi-vendor Software-defined Packet Transport Network, Xinjun Liu1, Rentao Gu1, Han Li1, Yanxia Tan1, Lei Wang2, Lin Bai1, Qin Li1, Jie Zhang1, Yuefeng Jia1; Beijing Univ. of Posts and Telecomm, China; 2China Mobile Research Inst., China. We demonstrate a hierarchical controller architecture for multi-domain and multi-vendor packet transport networks using enhanced Ryu controller, allowing dynamic load balancing and fast path protection, which are validated in a multi-vendor SPTN testbed.

**ASu4G.1 • 14:30**

Invited Quantitative Phase Imaging Techniques for the Study of Pathophysiology of Cells and Tissues, Yongkeun Park1; Department of Physics, Korea Advanced Inst of Science & Tech, Korea (the Republic of). We will discuss about the recent technical developments for measuring three dimensional refractive index distributions of individual biological cells and tissues. In particular, we will present optical techniques which convert an existing optical microscope into a quantitative phase microscope.

**ASu4H.1 • 14:30**

Invited Fractional-OFDM Transmission for Time/Frequency Multiplexing in Elastic Networks, Tsuyoshi Konishi1, Takuya Murakawa1, Tomotaka Nagashima1, Satoshi Shimizu2, Makoto Hasegawa1, Kuninori Hattori1, Takeshi Okuno1, Shinji Mino1, Akira Higuma1, Naoya Wada1, Hiroyuki Ueno1, Gabriella Cincotti5; 1Graduate School of Engineering, Osaka Univ., Japan; 2NICT, Japan; 3NTT Electronics, Japan; 4Tokyo Inst. of Technology, Japan; 5Univ Roma Tre, Italy. We have demonstrated a hybrid OFDM/N-OTDM using an time/frequency grid based on Fractional-OFDM to exploit latent flexibility in multiplexing for elastic networks. This scheme allows us to switch either OFDM or N-OTDM at a receiver.
ASu4A.2 • 15:00
Enhanced self-phase modulation in silicon suspended membrane waveguides, Yaqing Zhang1, Zhenzhou Cheng1, Linghi Li1, Bingqiang Zhu1, Jiaqi Wang1, Wen Zhou1, Xinnu Wu1, Hon K. Tsang1; 1The Chinese Univ. of Hong Kong, Hong Kong. We experimentally compared the self-phase modulation (SPM) in conventional silicon-on-insulator (SOI) waveguides and silicon suspended membrane waveguides (SMWs) by measuring the spectral broadening of optical pulses. Enhanced SPM was observed in SMWs.

ASu4A.3 • 15:15
Non-degenerate Two-photon Absorption in Silicon Waveguides, Young Zhang1, Chad Husko1, Simon Lefrancis1, Isabella H. Rey1, Thomas Krauss1, Jochen S. Schroeder1, Benjamin Eggleton1; 1Univ. of Sydney, Australia; 2Center for Nanoscale Materials, Argonne National Laboratory, USA; 3School of Electrical and Computer Engineering, RMIT, Australia; 4Department of Physics, Univ. of York, UK. We investigated non-degenerate two-photon absorption in silicon waveguides using a probe-pump scheme. An analytic solution of the probe is derived and a simple approach is provided to experimentally extract the effect of each loss on the pump and probe powers.

ASu4A.4 • 15:30
Optical Absorption and Thermal Nonlinearities in Graphene-on-Silicon Nitride Microring Resonators, Jiaqi Wang1, Zhenzhou Cheng1, Ke Xu1, Chester C.T. Shu1, Hon K. Tsang1; 1Department of Electronic Engineering, The Chinese Univ. of Hong Kong, Hong Kong; 2School of Electronic and Information Engineering, Harbin Inst. of Technology, Shenzhen Graduate School, China. We study thermal nonlinearities of graphene-on-silicon nitride (Si3N4) microring resonators. The resonance lineshapes are experimentally compared between 40 μm- and 70 μm-long graphene integrated Si3N4 microring resonators at different input optical powers.

ASu4B.2 • 15:00
3D printing optical fibre preforms, John Harding1, John Canning1, 3D printing of optical fibre preforms, 1Yanxuan Guo1, Zhenzhou Cheng1, Ke Xu1, Jiaqi Wang1, Hon K. Tsang1; 1The Chinese Univ. of Hong Kong, Hong Kong. We experimentally compared the self-phase modulation (SPM) in conventional silicon-on-insulator (SOI) waveguides and silicon suspended membrane waveguides (SMWs) by measuring the spectral broadening of optical pulses. Enhanced SPM was observed in SMWs.

ASu4B.3 • 15:15
Graded-Index Few-Mode Multi-Core Fiber with Dual-Ring Structure, Jiajing Tu1, Keping Long1, Kunimasa Saitoh1; 1Univ. of Sci & Tech Beijing, China; 2Hokkaido Univ., Japan. We proposed a two-mode supporting multi-core fiber with dual-ring structure. The maximum XT11-11 achieves -33 dB/100km, maximum R10 is 11.03 cm, and RCMF reaches 15.28.

ASu4B.4 • 15:30
Ultra-low loss fiber with segmented-core and depressed inner cladding, Marzieh Poumaury1, Ali Zamin1, Dae Seung Moon2, Kyunghwan Oh1; 1Yonsei Univ., Korea (the Republic of); 2Samsung Electronics Co, Korea (the Republic of); 3School of Mechanical Engineering, Korea (the Republic of). A new ultra-low loss fiber is numerically proposed. We have shown loss of less than 0.3dB/km at 1310nm, 0.18dB/km at 1550nm for step-index fibers which consist of conventional glass compositions while satisfying ITU-G.652.D attributes.

ASu4C.2 • 15:00
Comparing 52 Gbps Duobinary and 4-PAM Transmission Over 100m OM-3 Fiber With 25 GHz Class VCSELS, Lau Suhr1, Ilya Lyubomirsky1, Henry Daghghiam1, Chris Kocot1, Idefonso Tafur Marruy1, Juan Jose. Vegas Olmos2, 1Technical Univ. of Denmark, Denmark; 2Finisar Corp, USA. This paper compares VCSEL based transmission of 52 Gbps duobinary-NRZ and 4-PAM over 100m OM-3 fiber employing a linear equalizer in the receiver.

ASu4C.3 • 15:15
Towards 100 Gb/s Serial Optical Links over 300m of Multimode Fibre Using Single Transverse Mode 850nm VCSEL, Bo Wu1, Xian Zhou2, Nikolay Ledentsov1, Jun Luo1, 1Huawei Technologies Co., Ltd, China; 2Hong Kong Polytechnic Univ., China; 3V System GmbH, Germany. 100Gbps over 100m, 75Gbps (200m), and 72Gbps (300m) transmission is achieved at BER <5e-3 using single mode VCSEL and DMT modulation with received optical power of -5 dBm. 100Gbps is evaluated by reducing coupling loss.

ASu4C.4 • 15:30
Data Center Optics: the emerging scaling challenges, Xiang Zhou1, 1Google inc, USA. This talk will present an overview on large data center interconnection network metrics and the emerging scaling challenges.
Coherent Optical Signal Processing using Optical Emission Lasers as Modulation Elements for Filtering using Combs and Vertical Cavity Surface-Absorbed Arbitrary Waveform Generation and Matched Signal Processing. We demonstrate sampling, Quantitative characterization of neurotoxicity effects on individual neuron cells using optical diffraction tomography. Jonghee Yoon1, Su-A Yang2, Kyohyun Kim1, Yongkeun Park1; 1Physics, KAIST, Korea (the Republic of); 2Biological science, KAIST, Korea (the Republic of). We perform quantitative analysis of neurotoxicity effects induced by MPP+ on individual neuron cells (SH-SY5Y) using optical diffraction tomography. Neurotoxic effects of MPP+ on SH-SY5Y cells were characterized by quantitative structural and biochemical information obtained from measured three-dimensional refractive index distributions.

Multi-layer SDN Control with Smart Service Provision Strategy for Core Packet Optical Networks, Yu Zhou1, Shanguo Huang1, Shan Yin1, Jingkai Meng1, Michael G. Somekh1; 1Electronic and Information Engineering, Hong Kong Polytechnic University, Hong Kong. In this paper, we demonstrate that by employing vortex beam illumination and radial polarization one can perform multiple phase step measurement in one single measurement using our recently developed confocal surface plasmon microscope.

Quantitative characterization of neurotoxicity effects on individual neuron cells using optical diffraction tomography. Jonghee Yoon1, Su-A Yang2, Kyohyun Kim1, Yongkeun Park1; 1Physics, KAIST, Korea (the Republic of); 2Biological science, KAIST, Korea (the Republic of). We perform quantitative analysis of neurotoxicity effects induced by MPP+ on individual neuron cells (SH-SY5Y) using optical diffraction tomography. Neurotoxic effects of MPP+ on SH-SY5Y cells were characterized by quantitative structural and biochemical information obtained from measured three-dimensional refractive index distributions.

Quantitative characterization of neurotoxicity effects on individual neuron cells using optical diffraction tomography. Jonghee Yoon1, Su-A Yang2, Kyohyun Kim1, Yongkeun Park1; 1Physics, KAIST, Korea (the Republic of); 2Biological science, KAIST, Korea (the Republic of). We perform quantitative analysis of neurotoxicity effects induced by MPP+ on individual neuron cells (SH-SY5Y) using optical diffraction tomography. Neurotoxic effects of MPP+ on SH-SY5Y cells were characterized by quantitative structural and biochemical information obtained from measured three-dimensional refractive index distributions.

Quantitative characterization of neurotoxicity effects on individual neuron cells using optical diffraction tomography. Jonghee Yoon1, Su-A Yang2, Kyohyun Kim1, Yongkeun Park1; 1Physics, KAIST, Korea (the Republic of); 2Biological science, KAIST, Korea (the Republic of). We perform quantitative analysis of neurotoxicity effects induced by MPP+ on individual neuron cells (SH-SY5Y) using optical diffraction tomography. Neurotoxic effects of MPP+ on SH-SY5Y cells were characterized by quantitative structural and biochemical information obtained from measured three-dimensional refractive index distributions.
### Conference Room N202

**ASu4A.5 • 15:45**

Four Wave Mixing in a CMOS Compatible 5th Order Cascaded Ring Resonators, Li Jin¹, Alessia Pasquazi², Luigi Di Lauro², Marco Peccianti², Brent E. Little³, David J. Moss³, Roberto Morandotti⁴, Sai Tak Chu¹;

¹Department of Physics and Materials Science, City Univ. of Hong Kong, Hong Kong; ²Department of Physics and Astronomy, Univ. of Sussex, UK; ³X’ian Inst. of Optics and Precision Mechanics of CAS, China; ⁴School of Electrical and Computer Engineering, RMIT Univ., Australia; ⁵INRS - Énergie, Matériaux et Télécommunications, Canada.

Four-wave mixing in a thermal tunable 5th order cascaded CMOS compatible ring resonators is experimentally and numerically investigated. Flat bandwidth conversion of 3.1GHz is obtained for a range of parameter.

### Conference Room N204/205

### Conference Room N208

**ASu4B.5 • 15:45**

A Supermode Fiber with Strong Mode Coupling for Space-Division Multiplexing, Jin Luo¹, Mei Sang¹, Ningbo Zhao¹, Jian Zhao¹, Guifang Li¹²; ¹Tianjin Univ., China; ²Univ. of Central Florida, USA.

A supermode fiber is designed with appropriate parameters to obtain large mode field overlap. Bending and tilted long-period gratings are introduced to achieve strong mode-coupling and significantly reduce the DMD in space-division multiplexing.

### Conference Room N207

### Conference Room N211

### 16:00–16:30  Coffee Break around Exhibition Area, Room N201, HKCEC
### Conference Room N212

**ASu4F.6 • 15:45**

Degree-Prior Distance-Adaptive Virtual Network Embedding Algorithm over Flex-Grid Optical Network, Futao Yang\(^1\), Jie Zhang\(^1\), Lei Wang\(^1\), Xue Chen\(^1\), Yang Zhao\(^1\); \(^1\)State Key Lab of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China; \(^2\)School of Physical Science and Technology, Anshan Normal Univ., China.

We propose a heuristic algorithm about virtual network embedding over flex-grid optical network to improve the utility efficiency of network. Evaluation shows it obtains better performance than current corresponding algorithm.

### Conference Room N206

**ASu4H.5 • 15:45**

Ultra-wideband Monocycle Pulses Amplitude Modulation Based on Integrated Microring Modulator, Xinru Wu\(^1\); \(^1\)The Chinese Univ. of Hong Kong, China.

We experimentally demonstrate an approach for UWB monocycle pulses generation and modulation simultaneously with an integrated microring modulator. 2.5 Gb/s amplitude modulated monocycle pulses are modulated with a pattern without zero padding.

### Conference Room N203

16:00–16:30  **Coffee Break around Exhibition Area, Room N201, HKCEC**
### Conference Room N202

**ASu5A • Photodetectors**  
Presenter: Toshimasa Umezawa; National Inst of Information & Comm Tech, Japan

**ASu5A.1 • 16:30**  
**Invited**  
Bias-free high-baud-rate UTC-PD for high-density implementations in parallel photonics, Toshimasa Umezawa1, Atsushi Matsumoto1, Kouichi Akahane1, Atsushi Kanno1, Naokatsu Yamamoto2, Tetsuya Kawanishi1; 14-2-1, Nukuri-Kita Mach, National Inst of Information & Comm Tech, Japan; 2Waseda Univ., Japan. We discussed crosstalk issues on parallel photonics assuming high-density integration and these solutions. RF crosstalk has become a more serious problem than optical crosstalk. A bias free photoreceiver was proposed and fabricated.

### Conference Room N204/205

**ASu5B • Optical Modulators**  
Presenter: Hon Tsang; Chinese Univ. of Hong Kong, Hong Kong

**ASu5B.1 • 16:30**  
**Invited**  
Silicon Photonics Based on Ge/SiGe Quantum Well Structures, Delphine Marris-Morinet1, Papa-chaya Chaisakul1, Jacopo Frigerio1, Mohamed-Said Rouifed2, Vladislav Vakarin1, Daniel Chris-tina1, Xavier Le Roux1, Giovanni Iesila1, Laurent Vivien1; 1Université Paris-Sud / IEF - CNRS, Université Paris-Sud 11, France; 2-Less, Politecnico Di Milano, Italy. Ge/SiGe Quantum well structures have a strong potential to revolutionize silicon photonics. This paper reviews recent works including high speed modulator and photodetector, QW engineering to tune the wavelength and waveguide integration.

### Conference Room N208

**ASu5C • Novel Fiber Devices I**  
Presenter: Yonghang Shen; Zhejiang Univ., China

**ASu5C.1 • 16:30**  
**Invited**  
In-fiber Silicon Microspheres, Limin Xiao1, Noel Healy2, Zandy Webber2, Thomas Hawkins3, Max Jones4, John Ballato4, Ursula Gibson5, Anna Peacock6; 1Dept. of Optical Science and Engineering, Fudan Univ., China; 2Optoelectronics Research Centre., Univ. of Southampton, UK; 3Department of Physics and Astronomy, Univ. of Southampton, UK; 4Department of Material Science and Engineering, Clemson Univ., USA; 5Department of Science and Technology, Norway. We have proposed and demonstrated an approach to fabricate integrated-in-fiber silicon microspheres, which have nearly atomically smooth surface roughness < 0.16 nm. The hybrid structure forms a cavity with high temperature sensitivity ~ 80 pm/°C.

### Conference Room N207

**ASu5D • Spatial Division Multiplexing II**  
Presenter: Yoshinari Awaji, NICT, Japan

**ASu5D.1 • 16:30**  
**Invited**  
Space Division Multiplexing for Optical Networks, Ezra Ip1, Giovanni Milione1, Yue-Kai Huang1, Ting Wang1; 1NEC Laboratories America Inc, USA. We review few-mode fiber transmission in terms of how DSP complexity and mode-dependent gain scales with the number of spatial modes. FMF may be most suitable for short-reach applications where MIMO equalization and inline amplification are not required.

### Conference Room N211

**ASu5H • In-fiber Silicon Microspheres**  
Presenter: Wei-Wei Chen; 1Dept. of Optical Science and Engineering, Egypt-Japan Univ. of Science and Technology, Egypt; 2Electronics and Communications Engineering, Egypt-Japan Univ. of Science and Technology, Egypt. In this talk, we introduce the novel reflectometry with high spatial resolution and long range, which is nominated optical pulse compression reflectometry (OPCR). The working principle, numerical simulation, and state-of-the-art experimental achievements of the OPCR are demonstrated.

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**ASu5D.2 • 17:00**  
Performance of Space-Division Multiplexed Systems Adopting Multi-Core Fibers and Receiver Diversity, Mai Sanawan1, Amira Hus-sen1, Ziad A. El-Salh1; 1Department of Electrical Engineering Department, Photonics Group, Egypt; 2Electronics and Communications Engineering, Egypt-Japan Univ. of Science and Technology, Egypt. The performance of MCF-based systems with MRC receiver diversity is studied at different levels of inter-core crosstalk. We demonstrate improvement in system performance at high values of crosstalk with the need for extensive MIMO-DSP.
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**ASuSE.1 • 16:30  Invited**
High Speed Coherent Transmission for Next-generation Optical Transport Networks, Akhide Sano1, Munehiko Nagatani1, Yutaka Miyamoto2, ‘NTT Network Innovation Laboratories, Japan. This paper describes high speed transmission technologies for 400 Gb/s and 1 Tb/s channel transport over optical networks. High baud rate QAM signal generation based on electrical synthesis and broadband coherent detection enable simple and cost-effective transponder implementation.

**ASuSF.1 • 16:30  Invited**
Disaster Resilience in SDN: A Case Study, Rakhee Tiwari1, Sedef Savas2, M. Farhan Habib2, Pulak Chowdhury1, Biswanath Mukherjee1, ‘Comp. Sci. Dept., Univ. of California Davis, USA. Disaster-aware provisioning strategies have been proposed to mitigate the damage of large-scale disasters in optical networks. In this study, we analyze the performance of SDN under a disaster scenario through a network emulation using Mininet.

**ASuSG.1 • 16:30 Invited**
Flexible Edge Nodes enabled by Hybrid Software Defined Optics & Networking, Juan Jose Vegas Olmos1, Victor Mehrer1, Idelfonso Tafur Monroy1, ‘Isted Plads, Technical Univ. of Denmark, Denmark. This paper presents our vision on flexible edge nodes for future networks and our efforts to combine software defined optics and software defined networking to optimize the overall performance and user experience.

**ASuSI.1 • 16:30 Invited**
Stabilize the Regeneratively Mode-Locked Fiber Laser based on a Polarization Maintained Dual-loop Structure, Zhengwu Wei1, Dan Zhu2, ShiLong Pan1, ‘Nanjing Univ Aeronautics & Astronautics, China. A novel stable regeneratively mode-locked fiber laser based on a polarization maintained dual-loop structure is proposed. Stable 10-GHz optical pulse train is successfully generated with a side-mode suppression ratio of 58.4 dB being simultaneously realized.

**ASuSI.2 • 16:45**
Numerical Investigation on Frequency-modulated Continuous-wave Dynamics in a Semiconductor Laser, Jun-Ping Zhuang1, Xiao-Zhou Li1, Song-Sui Li1, Sze-Chun Chan1, ‘Department of Electronic Engineering, City Univ. of Hong Kong, China; ‘State Key Laboratory of Millimeter Waves, City Univ. of Hong Kong, China. The nonlinear dynamical period-one oscillation of a semiconductor laser under a modulated optical injection is numerically investigated for photonic generation of frequency-modulated continuous-wave (FMCW) signals. The sweep range and sweep rate of the generated FMCW signals are both tunable.

**ASuSI.3 • 17:00 Invited**
Silicon Photonics Receivers for Advanced Modulation Formats, Giampiero Contestabile1, ‘Scuola Superiore Sant’Anna, Italy. Three compact silicon-photonics integrated receivers are presented. Two circuits are for the detection of DPSK signals. The third one is a coherent receiver with a novel architecture without waveguide-crossing. Results up to 28Gbaud are reported.

**ASuSI.4 • 17:00**
Silicon Photonics Receivers for Advanced Modulation Formats, Giampiero Contestabile1, ‘Scuola Superiore Sant’Anna, Italy. Three compact silicon-photonics integrated receivers are presented. Two circuits are for the detection of DPSK signals. The third one is a coherent receiver with a novel architecture without waveguide-crossing. Results up to 28Gbaud are reported.

**ASuSH.1 • 17:00 Invited**
Cell Imaging With Sub-Optical Wavelength Ultrasound, Matthew Clark1, Leonel Marques1, Emilija moradi1, Fernando Perez-Cota1, Richard J. Smith1, Kevin F. Webb1, ‘Applied Optics, Univ. of Nottingham, UK. At very high frequencies, in the GHz region, the wavelength of ultrasound falls below that of visible light offering an intriguing way to enhance the imaging resolution and gain new contrast for live cell imaging.

**ASuSH.3 • 17:00 Invited**
High-performance fiber laser ultrasound detectors, Liang Yu1, Long Jin1, Linghao Cheng1, Bai-Ou Guan1, ‘Jinan Univ., China. We present highly sensitive ultrasound detection by use of a single mode fiber grating laser with a diameter of 66 μm, by measuring the variation of beat frequency between the two orthogonal polarizations. Based on the phase-locked loop demodulation, a noise-equivalent pressure (NEP) as low as 138 Pa over 100 MHz has been achieved.

**ASuSI.4 • 17:00 Invited**
Silicon Photonics Receivers for Advanced Modulation Formats, Giampiero Contestabile1, ‘Scuola Superiore Sant’Anna, Italy. Three compact silicon-photonics integrated receivers are presented. Two circuits are for the detection of DPSK signals. The third one is a coherent receiver with a novel architecture without waveguide-crossing. Results up to 28Gbaud are reported.

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Silicon Photonics Receivers for Advanced Modulation Formats, Giampiero Contestabile1, ‘Scuola Superiore Sant’Anna, Italy. Three compact silicon-photonics integrated receivers are presented. Two circuits are for the detection of DPSK signals. The third one is a coherent receiver with a novel architecture without waveguide-crossing. Results up to 28Gbaud are reported.
Conference Room N202

**ASuSA.3 • 17:15**

**AlGaInP photodetectors for underwater communication systems**, Jeng Shuh Cheong1, Liang Qiao1, Aina N. Baharudin2, Jo Shien Ng3, Andrej Kysa4, John P. David1; 1Univ. of Sheffield, UK. We describe an AlInP avalanche photodiode with a narrow spectral response at -480nm, the peak transmission wavelength in deep water. The device has a peak responsivity of 30A/W at a gain of -20.

**ASuSA.4 • 17:30**

**Wide Spectral Range InP-based Photodetectors with High Speed**, Zheng Liu1, Yongqing Huang1, Jianu Fei1, Kai Liu1, Xiaofeng Duan1, Jun Wang1, Qi Wang1, Xiaomin Ren1, Shiwei Cai1; 1State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. A novel InP-based photodetector (PD) with high speed in 850 to 1550nm spectral range is proposed. Simulation studies indicate that the bandwidth is 62.5GHz, 61.7GHz, and 60.3GHz respectively at 850nm, 1310nm, and 1550nm wavelength excitations.

**ASuSB.3 • 17:15**

**Low-power 20Gb/s Modulator with an Integrated Loop Mirror**, Fatemah Soltani1, Michael Menard2, Andrew G. Kirk1; 1Electrical and Computer Engineering, McGill Univ., Canada; 2CofAMic Research Center, Univ. of Quebec at Montreal (UQAM), Canada. The large signal characterization of a loop mirror Mach-Zehnder interferometer (MZI) is reported. We demonstrate that this device is capable of 20Gb/s modulation at reduced power requirements in comparison to a conventional MZI.

**ASuSC.3 • 17:30**

**Experimental Demonstration of New Modulation Instability Bands in a Dispersion Oscillating Fiber Cavity**, François Coppe1, Matteo Conforti1, Alexandre Kudlinski1, Stefano Trillo1, Arnaud Mussot1; 1Université Lille 1 Laboratoire PhLAM, France; 2Università di Ferrara, Italy. We experimentally study modulational instability in a dispersion oscillating passive fiber ring cavity. This dispersion profile leads to new high-frequency gain bands that can be used for the generation of ultra-high repetition rate pulse trains.

**ASuSC.4 • 17:45**

**Phase Matching in Fiber Optical Parametric Amplifiers using Randomly Birefringent Fibers**, Shaohao Wang1, Xiuchun Xu1, Ping Kong A. War1; 1Fuzhou Univ., China; 2The Hong Kong Polytechnic Univ., Hong Kong. A comprehensive theoretical model to investigate phase matching in FOPAs using randomly birefringent fibers is developed. Nonlinear effect was shown to compensate PMD-induced phase mismatch and generate larger polarization pulling effect in FOPAs than FRAs.

**ASuSD.3 • 17:15**

**A Feasible Adaptive Recursive Least Square Frequency-Domain Algorithm for Equalization of Mode-Division Multiplexed Fiber Transmission**, Liqun Yang1, Xi yaw Zhao2, Yifang Bai2, Quifang Li1, 2The College of Precision Instruments and Opto-electronic Engineering, Tianjin Univ., China; 3CREOL, The College of Optics & Photonics, Univ. of Central Florida, USA Minor Outlying Islands; 4Infinera Corporation, USA Minor Outlying Islands. We propose an overlap-save-based adaptive recursive-least-square frequency-domain equalization (RLS-FDE) for mode-division-multiplexing fiber-link. It has manageable computation complexity and is robust with laser phase noise. Its performance was simulated on two-mode transmission in comparison to LMS-FDE.

**ASuSD.4 • 17:30**

**A Novel MIMO DSP based on Matrix Transformations for Joint Few-mode/Multi-core Optical Transmission System**, Bo Liu1, Lijia Zhang1, Qingzhong Zhang1, Xinjun Xion1; 1Beijing Univ of Posts & Telecom, China. This paper proposes and demonstrates a novel MIMO equalization DSP to suppress the crosstalk between different modes and cores in SDM transmission system. Improved complexity and OSNR are obtained in the demonstration.

**ASuSD.5 • 17:45**

**OSNR penalties for non-zero skew in space-division multiplexed transmission link with self-homodyne detection**, Ruben S. Luis1, Benjamin J. Puttnam1, Yoshinari Awaji1, Naoya Wada1; 1National Inst Info & Comm Tech (NICT), Japan. We experimentally investigate the impact of non-zero signal–PT skew in SDM links using self-homodyne detection, finding that nanosecond delays can strongly impact performance with MHz transmitter linewidths, but aided by shorter carrier phase recovery block-lengths.
ASuSE.3 • 17:15
Re-use of Low Bandwidth Equipment for High Bit Rate Transmission Using Signal Slicing Technique, Christoph Wagner1,2, Sandis Spolitis3, Juan Jose. Vega Olmos4, Vjačeslavs Bobrovskis4, Idefonso Tafur Monroy5, 1Department of Photonics Engineering, Technical Univ. of Denmark, Denmark; 2ADVA Optical Networking SE, Germany; 3Inst. of Telecommunications, Riga Technical Univ., Latvia. Massive fiber-to-the-home network deployment requires never ending equipment upgrades operating at higher bandwidth. We show effective signal slicing technique, which can re-use low-bandwidth opto-electronic components for optical communications at higher bit rates.

ASuSF.4 • 17:30 Invited
Flexible Modulation for Elastic Optical Networks, Norman Svensson1, Damian A. Moreira2, ‘ClariPhy, USA; ‘ClariPhy Argentina S.A., Argentina. We present and compare state-of-the-art programmable modulation and coding techniques that efficiently utilize bandwidth and SNR on emerging elastic optical networks.

ASuSF.3 • 17:15
Traveling Repairman Problem to Restore Virtual Networks in All-Optical Networks after a Disaster, Chen Ma1,2, Sedef Savas1, Xinbo Wang2, Jie Zhang1, Yongli Zhao1, Guanjun Gao1, Bishwanath Mukherjee1, 1Beijing Univ. of Post and Tele., China; 2Univ. of California, Davis, USA. Transparency of all-optical networks (AONs) causes more severe damage from disasters, and overlaid virtual networks may experience disconnectivity and/or outages. We investigate repair scheduling considering failure localization limitations of AONs, hence minimizing their overall effect.

ASuSF.5 • 17:45
Energy-Efficient Survivability for Core Networks using Dual-Homing, Sandu Abeywickrama1, Elaine Wong1, Marjua Furdek1, Paolo Monti2, Lena Wosinska3, 1National ICT Australia, Univ. of Melbourne, Australia; 2ICT School, KTH Royal Inst. of Technology, Sweden. This paper studies the energy efficiency of exploiting dual-homing to provide core network survivability. Simulation results show reductions in the number of utilized wavelengths, suggesting significant energy saving opportunities in the core network.

ASuSG.3 • 17:30 Invited
Benefits and Enabling Technology for Hardware Virtualization in Optical Networks, Masahiko Jimbo1,2, Kagawa Univ., Japan. We describe the hardware virtualization in optical networks as an enabler of truly automated optical path provisioning to accelerate the speed of service based on transponder and regenerator examples.

ASuSH.3 • 17:15
Remote sensing of pressure inside microfluidic channels using light scattering in Scotch tape, KyungDuk Kim1, Hyeonseung Yu1, Joonyoung Koh2, Jung Hoon Shin1, Wonhee Lee1, YongKeun Park1, Physics Department, Korea Advanced Inst. of Science and Technology, Korea (the Republic of); 2Graduate School of Nanoscience and Technology, Korea Advanced Inst. of Science and Technology, Korea (the Republic of). We propose a simple but effective optical method exploiting light scattering in optically inhomogeneous Scotch tape for measuring the hydrostatic pressure inside a microfluidic channel. After a calibration, the resolution below 0.1 kPa is achieved in a remote sensing scheme.
AM1A.1 • 08:30 Tutorial
Passive and Active Building Blocks for Space-Division-multiplexed Optical Networks, Haoshuo Chen; Alcatel-Lucent Bell Labs, USA. We introduce currently emerging passive and active components including space multiplexers, optical amplifiers, wavelength selective switches and gain equalizers to enable space division multiplexing. We compare the strengths and weaknesses of different space-multiplexer schemes.

AM1B.1 • 08:30 Tutorial
Random Fiber Lasers and Applications, Yun-Jiang Rao; School of Comm & Inform Eng., UESTC, Univ of Electronic Science & Tech China, China. Recent advances in research and applications of random fiber lasers, which are substantially different with conventional fiber lasers due to their unique features of modeless and temperature-insensitivity, are reviewed systematically.

AM1B.2 • 08:45
Silicon mode (de)multiplexer based on densely packed waveguide array (DPWA), Kaixuan Chen, Sitao Chen, Shipeng Wang, Suya Wang, Chenzhao Zhang, Xiaojian Dai, Li Li; South China Normal Univ., China. A five-mode densely packed waveguide array and (de)multiplexer on Si are demonstrated for space division multiplexing. Insertion losses of –0.8 dB and cross-talks of –22 dB have been obtained experimentally for a device with multiplexing and demultiplexing structures.

AM1C.1 • 08:30 Tutorial
Advanced Phase-Shifted Fiber Gratings and Their Applications to Comb Filter and Fiber Sensors, Hongpu Li; Faculty of Engineering, Shizuoka Univ., Japan. Recent developments on phase-shifted fiber Bragg gratings and phase-shifted long-period fiber gratings have been reviewed. Based on these two kinds of gratings, a comb filter and several fiber sensors have been proposed and experimentally demonstrated.

AM1C.2 • 08:45
Undersampled Digital PAM Subcarrier Modulation for Optical Camera Communications, Lijun Song, Pengfei Luo, Min Zhang, Zabih Ghassemiroy, Dahai Han, Hua Le Minh; Beijing Univ of Posts and Telecomms, China. We develop an optical camera communication system utilizing the under-sampled digital PAM subcarrier modulation using two LEDs. We show that the proposed system can realize 100bps data transmission over a transmission range up to 50 m.
## ACP 2015 — Monday, 23 November

### Conference Room N212

**08:30–10:30**
**AM1F • PON I**
**Presider:** Yuki Yoshida, Osaka Univ., Japan

**08:30–10:15**
**AM1G • Optical Control and Processing of RF Signals**
**Presider:** Jungwon Kim; Korea Advanced Inst of Science & Tech, Korea (the Republic of)

**08:30–10:30**
**AM1H • Datacenter Networks**
**Presider:** Zuqing Zhu; Univ of Science and Technology of China, China

**08:30–10:15**
**AM1I • Manipulation and Sensors**
**Presider:** Michael Somekh, The Hong Kong Polytechnic Univ., Hong Kong

**08:30–10:30**
**AM1J • Optical Signal Processing I**
**Presider:** Guifang Li; Univ. of Central Florida, USA

### Conference Room N206

**08:30–10:30**
**AM1F.1 • 08:30**
**25-Gb/s and 40-Gb/s Faster-than-Nyquist PON Based on Low-Cost 10G-Class Optics, Jiangwei Man, Shengmeng Fu, Wei Chen, Jianhe Gao, Xiang Liu, Li Zeng; Fixed Network Research Department, Huawei Technologies Co. Ltd, China; Futurewei Technologies, Huawei R&D USA, USA.**
We propose downstream transmission of 25-Gb/s and 40-Gb/s Faster-than-Nyquist signals based on NRZ and PAM4 for high-capacity PON using low-cost 10G optics, respectively achieving -23.9 dBm and -20 dBm receiver sensitivities after 20-km SSMF.

**08:30–10:15**
**AM1G.1 • 08:30 Invited**
**Quadratic Optical Phase Modulation for RF Frequency Down-Conversion, Yifei Li, Longtao Xu, Shilei Jin; '285 Old Westport Rd, Univ. of Massachusetts Dartmouth, USA.**
In this paper we examine the mechanism behind intense quadratic phase modulation of quantum well phase modulator and determine its feasibility for efficient frequency down-conversion for coherent RF/Photonic links.

**08:30–10:30**
**AM1H.1 • 08:30 Invited**
**Energy Efficient Resource Provisioning in Dis-aggregated Data Centres, Houraa Mohammad Ali, Ahmed Laweyy, Taisir E. Elgorashi, Jaafar Elminghani; School of Electronic and Electrical Eng, Univ. of Leeds, UK.**
In this paper we discuss the new paradigm of disaggregated servers (DS) and present our energy efficient heuristic for the energy minimization of virtual machine (VM) placement in data centres implementing the DS approach.

**08:30–10:15**
**AM1I.1 • 08:30 Invited**
**Switching and Logic Manipulation of Droplets and Dielectric Nanoparticles in Micro-nano-fluidics System, Guanghui Wang, Zhoufeng Ying, Dongying Zhang, Wenzhang Jiao, Aaron Ho, Ying Huang, Xuping Zhang; Nanjing Univ., China; Chinese Univ. of Hong Kong, Hong Kong; Inst. of Microelectronics, A*STAR, Singapore.**
Switching and logic manipulation are very important for large scale integration of lab-on-a-chip system. In this talk, we demonstration this kind of manipulation in centrifugal microfluidics and silicon photonics based nanofluidics system.

**08:30–10:30**
**AM1J.1 • 08:30 Invited**
**Temporal Cavity Solitons: From All-optical Memories to Microresonator Frequency Combs, Miro J. Erkintalo, Jae K. Jang, Karen E. Webb, Kathy Luo, Stuart G. Murdoch; The Univ. of Auckland, New Zealand.**
We review recent experimental and theoretical work on temporal cavity solitons in macroscopic fibre cavities and monolithic microresonators. In addition to reviewing basic characteristics of cavity solitons, we will discuss their role in optical memories and microresonator frequency combs.

### Conference Room N203

**08:30–18:00**
**Registration Open, Room N201, HKCEC**

**08:30–17:00**
**Industry Exhibition, Room N201, HKCEC**

### Conference Room N209

**08:30–10:30**
**AM1F.2 • 08:30**
**Experimental demonstration of 100/40 Gb/s OFDM-PON with Bi-directional Low-cost Coherent Detection, Yina Huang, Mingzi Mao, Rujian Lin, Caixia Kuang, Qianwu Zhang, Yingxiong Song, Yingchun Li, Jian Chen, Min Wang; Shanghai Univ., China.**
A 100/40 Gb/s OFDM-PON with bi-directional low cost/complexity self-coherent homodyne detection is experimental demonstrated by using centralized optical comb with 0.1 nm wavelength interval to provides both the signal-carrier and the local oscillation light waves.
A Novel Full Polarisation Controller Integrated Monolithically with a Semiconductor Laser, Muhammad Azhar Naeem1, Kamran Abid1; 1Univ. of the Punjab, USA. A full polarisation controller integrated monolithically with a semiconductor laser is reported. Conversion efficiency from transverse electric to transverse magnetic is obtained around 50 to 68 %. The device is fabricated on InP/AlGaInAs MQW hetero-structure.

Actively Stabilized Silicon Microrings Integrated with Surface-state-assembly Photodetectors at 1310 nm Using a Slope-Detection Method, Yu Li1, Andrew W. Poon1; 1Hong Kong Univ. of Science & Technology, Hong Kong. We demonstrate actively stabilized silicon microrings based on such an APD operating up to 25 Gb/s is demonstrated.

Compact Frequency-modulation Pulsed Single-frequency Fiber Laser, Shanhu Xi1, Yuanfei Zhang1, Zhaoming Feng1, Changsheng Yang1, Zhongmin Yang1; 1State Key Laboratory of Luminous Materials and Devices and Inst. of Optical Communication Materials, South China Univ. of Technology, China. A compact frequency-modulation Q-switched single-frequency fiber laser has been demonstrated at 1.0 μm utilizing a piezoelectric transducer. Hundreds-of-megahertz frequency-tuning range is achieved and the highest peak power of the pulse reaches almost 7.0 W.

AM1A.4 • 09:15
Sub-3V Germanium Waveguide Avalanche Photodiode based 25 Gb/s at 1310 nm Optical Receiver, Hongtao CHEN1, Jochem Verbiest1, Peter Verheyen1, Peter De Heyn1, Guy Lepage2, Jeroen De Coster2, Philippe Absil2, Bart Moeneclaey2, Xin Yin1, Johan Bauwelinck1, Joris Van Campenhout1, Gunther Roelkens1; 1Ghent Univ., Belgium; 2IMEC, Belgium. We demonstrate low-voltage waveguide-coupled germanium avalanche photodetectors (APDs) with a gain×bandwidth product of 140 GHz at -5 V. An optical receiver based on such an APD operating up to 25 Gb/s is demonstrated.

AM1A.5 • 09:30
A Highly Sensitive Sensor Based on a Novel Helical Long Period Fiber Grating Written in the Rotated Fiber by CO2 laser, Liang Zhang1,2, Yunhe Zhao1, Yunji Liu1, Tingyun Wang1, 1Shanghai Univ., China; 2Nanjing Xiaozhuang University, China. A new type helical long-period fiber grating (HLFG) was fabricated and its sensing characteristics were investigated experimentally. Compared with conventional long-period gratings with the same period, the HLFGs had much higher torsion and strain sensitivity.

AM1B.3 • 09:00
30-GHz directly modulation DFB laser with narrow linewidth, Zhike Zhang1, Jianguo Liu1, Yu Liu1, Jinjin Guo1, Haqing Yuan1, Jinhua Bai1, Ninguang Zhu1, 1Inst. of Semiconductors, CAS, China. We report a 1.3mm 30-GHz directly modulation distributed feed-back laser with narrow linewidth of 130kHz and high side-mode suppression ratio of 52dB. The output power is more than 18mW at 100mA and the input 1-dB compression point is showed with different frequencies.

AM1B.4 • 09:15
AM1B.5 • 09:30
Conference Room N202
Conference Room N204/205
Conference Room N208
Conference Room N207
Conference Room N211
AM1C.2 • 09:30
Invited
Compact Frequency-modulation Pulsed Single-frequency Fiber Laser, Shanhui Xu1, Yuanfei Zhang1, Zhaoming Feng1, Changsheng Yang1, Zhongmin Yang1; 1State Key Laboratory of Luminous Materials and Devices and Inst. of Optical Communication Materials, South China Univ. of Technology, China. A compact frequency-modulation Q-switched single-frequency fiber laser has been demonstrated at 1.0 μm utilizing a piezoelectric transducer. Hundreds-of-megahertz frequency-tuning range is achieved and the highest peak power of the pulse reaches almost 7.0 W.

AM1D.2 • 09:00
Invited
Fibers for System-on-Fiber Applications, Kevin P. Chen1, Ming-Jun Li1, Sheng Huang1; 1Univ. of Pittsburgh, USA; 2Corning Inc., USA. This paper reports ultrafast laser direct writing of optical components in multi-core rectangular shape fibers for sensing and fiber laser applications. We will discuss efforts to turn optical fibers from one-dimensional devices to three-dimensional devices.

AM1D.3 • 09:30
Invited
Long Reach RFID-over-Fiber Distribution and Collection Network, Peter Madsen1, Lau Suh1, Sebastian Rodriguez2, Juan Jose . Vegas Olmos1, Idefonso Tafur Morey1; 1Technical Univ. of Denmark, Denmark. This paper presents an RFID-over-Fiber wireless track and trace system using active RFID tags. This paper demonstrates a system, operating over distances up to 30km of optical fiber and 50m of wireless readability.

AM1E.3 • 09:00
Invited
Pass-band shape monitor for minimizing impact of signal filtering in cascaded ROADM, Guoxiu Huang1, Shoichiro Oda1, Setsuo Yoshida1, Kyo-suke Sone1, Goy Nakagawa2, Tomohiro Yamachi1, Yuuki Aoki2, Zhenning Tao3, C. Rasmussen Jens1; 1Fujitsu Laboratories Ltd., Japan; 2Fujitsu Limited, Japan; 3Fujitsu R&D Center, Japan. High speed and low cost optical pass-band shape monitor with frequency modulated CW light was proposed for cascaded ROADM networks. We experimentally confirmed that this method can achieve high accuracy even with fewer monitor points.

AM1E.4 • 09:15
Pass-band shape monitor for minimizing impact of signal filtering in cascaded ROADM, Guoxiu Huang1, Shoichiro Oda1, Setsuo Yoshida1, Kyo-suke Sone1, Goy Nakagawa2, Tomohiro Yamachi1, Yuuki Aoki2, Zhenning Tao3, C. Rasmussen Jens1; 1Fujitsu Laboratories Ltd., Japan; 2Fujitsu Limited, Japan; 3Fujitsu R&D Center, Japan. High speed and low cost optical pass-band shape monitor with frequency modulated CW light was proposed for cascaded ROADM networks. We experimentally confirmed that this method can achieve high accuracy even with fewer monitor points.

AM1E.5 • 09:30
Polarization Rotation Tolerant PDM-VLC by Asymmetric MIMO system, Sung-Jin Kim1, Do-Hoon Kwon1, Se-Hoon Yang1, Sang-Kook Han1; 1Yonsei Univ., Korea (the Republic of). We propose and experimentally demonstrate asymmetric MIMO system for PDM based VLC system to overcome performance degradation due to vulnerability of polarization to rotation and expand PDM to rotation-tolerant VLC system.
AM1F.5 • 09:30
Experimental Demonstration of Radio Frequency Orbital Angular Momentum Multiplexed Communication System Using Microwave Photonic Demultiplexer, Mingjiang He1, Bingchi Liu1, Jie Liu1, Ziyang Hu1, Yiling Chen1, Wei Le1, Li Zhang1, Zinan Li1, Qian Wang1, Song Wang1, Naitian Xue1, Xianyang Qian1, Mengqiu Fan1, Yi Li1, Yun-Jiang Rao1, Lifeng Cao1, “Univ. Electronic Sci. & Tech. of China, China. We propose a novel 20Gb/s WDM-PON upstream transmission scheme using 4-PAM modulated free-running 1550nm VCSEL and adaptive Single-Carrier Frequency-Domain Equalization (SC-FDE). A transmission distance of 20km is achieved in direct detection system.

AM1F.4 • 09:15
Mitigation of Timing Offset Effect in OFDMA-PON Uplink, Sun-Young Jung1, Sang-Min Jung1, Hyoun-goon Park1, Sang-Kook Han1, Yongseki Univ., Korea (the Republic of). Timing offset effect generated in OFDMA-PON uplink due to path difference between ONUs is experimentally analyzed, and performance improvement by mitigating offset effect in asynchronous reception is also experimentally demonstrated based on CP extension and FBMC.

AM1F.3 • 09:00
A Symbol Synchronization Method Based on Gold Sequences for Real-time Upstream OFDMA-PON, Han Dun1, Bingyao Cao1, Chen Qian1, Yingzhun Li1, Zhen Zhang1, Qianwu Zhang2, “Shanghai Univ., China. A symbol synchronization method based on single carrier modulated Gold sequences for upstream OFDMA-PON is demonstrated which shows that precise synchronization requirements can be effectively released.

AM1G.2 • 09:00
All-Optical Single-Wavelength Photonic Microwave Quadrature Filter, Yuan Cao1, Enxin Chen2, Xudong Wang2, Xinhuang Peng1, Bai-Ou Guan1, “Jinan Univ., China; 2School of Engineering and Information Technology, Charles Darwin Univ., Australia. A photonic microwave quadrature filter based on splitting a single-wavelength optical signal into two with the desired optical phases, is presented. Results demonstrate a wideband quadrature filter with very small phase ripples of $\pm 0.15^\circ$.

AM1G.3 • 09:15
The First Experiment to Transmit RF Data in OAM Mode with Optical-assisted Circular Antenna Arrays, Mutong Xie1, Mengyang Zhao1, Xinli Gao1, Shangguo Huang1, Ziheng Cao1, Jinghua Xiao1, Wangyi Gu1, “Beijing Univ. of Posts and Telecommunications, China; 2Eindhoven Univ. of Technology, Netherlands. We conducted the first experiment to transmit an RF IQ signal in OAM mode by OCAA, to prove that OAM modes coexist with IQ modulation and could be measured. Directionality and transmission quality is assessed.

AM1G.1 • 09:30
Experimental Measurement of I/Q Demodulation and Homodyne Detection using a 90° Optical Phase Difference, Li Zhang1, Zinan Wang1, Song Wang1, Naitian Xue1, Xianyang Qian1, Mengqiu Fan1, Yi Li1, Yun-Jiang Rao1, “Univ. Electronic Sci. & Tech. of China, China. We propose a new phase demodulation scheme for phase-sensitive Optical Time-Domain Reflectometry (OTDR). The technique is based on IQ demodulation and homodyne detection using a 90° optical hybrid. Both the theoretical analysis and the experimental demonstration are presented.
We propose a grating-free, simple-design cascaded device allowing on cascading a surface-corrugated grating and a fabricate a waveguide mode converter based of Hong Kong, Hong Kong. We experimentally demonstrate a robust and fast polarimeter based on spatial phase modulation arising in liquid crystal on silicon (LCOS). Without any mechanical rotation, accurate characterization of various state of polarization (SOP) is achieved.

**Conference Room N202**

**AM1A.3 • 09:45**
A Robust and Fast Polarimeter Based on Spatial Phase Modulation of Liquid Crystal on Silicon (LCOS), Zhikun Hong1, Lei Zhu1, Songnian Fu1, Ming Tang1, Perry Ping Shum1, Deming Liu1; 1Hua Zhong Univ Of SciTech, China; 2School of EEE, Nanyang Technological Univ., Singapore. We experimentally demonstrate a robust and fast polarimeter based on spatial phase modulation arising in liquid crystal on silicon (LCOS). Without any mechanical rotation, accurate characterization of various state of polarization (SOP) is achieved.

**AM1A.4 • 10:00**
Mode Rotator with Two Cascaded Waveguide Gratings, Wei Jin1, Xin S. Chang1; 1City Univ. of Hong Kong, Hong Kong. We propose and fabricate a waveguide mode converter based on cascading a surface-corrugated grating and a sidewall-corrugated grating. This device allows the LP01, LP11a, and LP11b modes to convert among themselves in a cyclical manner.

**Conference Room N204/205**

**AM1B.6 • 09:45**
Sampling Rate Independent Resolution Upgrade for All-Optical Analog-to-Digital Conversion, Tomotaka Nagashima1, Makoto Hasegawa1, Tsuyoshi Konishi1; 1Osaka Univ., Japan. We experimentally apply a proposed sampling rate independent resolution upgrade approach to 10 GS/s 3 bit all-optical ADC system and demonstrate 1 bit resolution upgrade with keeping the original sampling rate.

**AM1B.7 • 10:00**
Low RF Complexity Photonically Enabled Indoor and Building-to-Building W-Band Wireless Link, Simon Rommel1, Lucas C. Cavalcante1, Juan Jose1, Vegas Olmos1, Idefonso Tafarroj Monroy1; 1Department of Photonics Engineering, Technical Univ. of Denmark, Denmark. We demonstrate W-band wireless transmission over distances covering both indoor and building-to-building scenarios with a setup of reduced complexity in the RF domain, employing a passive wireless transmitter and envelope detection at the receiver.

**Conference Room N208**

**AM1C.3 • 10:00**
Internal modulation of random fiber laser with polarization switching, Han Wu1, Zinan Wang1, Menggui Fan1, Yunqi Li1, Li Zhang1, Yi Li1, Yun-Jiang Rao1; 1Univ. Electronic Sci. & Tech. of China, China; 2The Inst. of Optics, Univ. of Rochester, USA. We experimentally demonstrate the polarization-driven internal modulation of the forward-pumped random fiber laser. By inserting the polarization switch (PSW) in the loop mirror, the lasing output can be modulated as the pulsed signal with high extinction ratio.

**AM1C.4 • 10:15**
Master-to-slave dual-mode injection-locked colorless FPLD pair for MMWof-OFDM-PON, Shuo Chang1, Hsiang-Yu Chen1, Yu-Chieh Chi1, Gong-Ru Lin1; 1National Taiwan Univ., Taiwan. Dual-mode injection-locked colorless FPLD pair for MMWof-OFDM-PON is demonstrated with RIN of -103 dBc/Hz to generate optical and 46.4-GHz microwave carriers for 24-Gbit/s 64-QAM OFDM data transmission with receiving power sensitivity of -8.3 dBm.

**AM1C.5 • 10:15**
Cascaded Raman random fiber laser assisted by Fresnel reflection, Menggu Fan1, Han Wu1, Zinan Wang1, Yi Li1, Yunqi Li1, Li Zhang1, Yun-Jiang Rao1; 1Univ. Electronic Sci. & Tech. of China, China; 2The Inst. of Optics, Univ. of Rochester, USA. We propose a grating-free, simple-design cascaded Raman random fiber laser assisted by Fresnel reflection. The simulation and the experimental results confirm the effectiveness of weak reflection on laser generation, and the linearly output with 48% slope efficiency is demonstrated at the 2nd order Stokes wavelength.

**AM1D.4 • 09:45**
An 8-TDM inline fiber Fabry-Perot Sensor Array Based on Ultra-Weak Fiber Bragg Gratings, Peng Jiang1; 1National Univ. of Defense Technology, China. An inline 8-TDM sensor array based on ultra-weak FBGs was presented. The background noise of the sensor array can reach -100 dB/√Hz at 2 kHz for all the 8 TDM channels. The multi-reflection induced crosstalk of > 97% between the sensors can be < -38 dB for 150 measurements.

**AM1D.5 • 10:00**
Long Period Grating in Multicore Fiber and Its Application for Measurement of Temperature and Strain, Ruoxiu Wang1, Li Duan1, Ming Tang1, Songnian Fu1, Peng Zhang1, Zhenhua Feng1, Li Borui1, Tong Weijun1, Deming Liu1, Perry Ping Shum1; 1School of Optical and Electronic Information, Next Generation Internet Access National Engineering Lab (NGIA), China; 2Yangzte Optical Fibre and Cable Company Ltd(YOFC), China; 3Nanyang Technological Univ., Singapore. We experimentally realized long period gratings (LPGs) in multicore fibers by using commercial fusion splicer with electric arc discharges method. The resonant depths offer the capabilities for achieving measurement of temperature and strain.

**Conference Room N207**

**AM1E.7 • 10:00**
Demonstration of 1-to-72 Multicasting (8 Wavelengths × 9 Orignal Angular Momentum Modes) of DMT QPSK Signal in a Free-space IM-DD System, Yixiao Zhu1, Kaiheng Zou1, Dan Wang1, Fan Zhang1; 1Peking Univ., China. We investigate the performance of free-space discrete multi-tone (DMT) modulation and direct detection system. 1-to-72 multicasting (8 wavelengths × 9 OAM modes) of 17.875 Gb/s DMT QPSK signal is demonstrated and the BER of all 72-fold channels are below 2×10^-3.

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### Conference Room N212

**AM1F.6 • 09:45**  
An Energy Saving Strategy for OFDM-PON Based on ONU Data Identification, Zhexu Xue1, Junjie Zhang1, Chen Qian1, Bingyao Cao1, Qianwu Zhang1; Key Laboratory of Specialty Fiber Optics and Optical Access Networks, Shanghai Univ., China. An energy saving strategy for OFDM-PON is realized by inserting ONU ID symbols in downstream frame to make sure each ONU only process its own data but not all the revived signals.

**AM1F.7 • 10:00**  
An Effective Sampling Frequency Offset Compensation Method for OFDMA-PON, Tuifeng Cai1, HAN Dun1, Yingchun Li1, Zhen Zhang1; Shanghai Univ., China. A sampling frequency offset compensation method based on frequency domain correlation of long training symbols for OFDMA-PON is experimentally demonstrated which shows 100ppm of sampling frequency offset can be used to construct higher resolution DACs and the complexity is expected to be reduced by half.

### Conference Room N206

**AM1G.5 • 09:45**  
Two-bit Photonic Digital-to-Analog Conversion Unit based on Polarization Multiplexing, Fangzheng Zhang1, Bingdang Gao1, Shilong Pan1; Nanjing Univ Aeronautics & Astronautics, China. A 2-bit photonic digital-to-analog conversion unit is proposed and experimentally demonstrated based on polarization multiplexing. It can be used to construct higher resolution DACs and the complexity is expected to be reduced by half.

**AM1F.8 • 10:15**  
An ONUs Requesting based Full-Range Dynamic Bandwidth Allocation for OFDMA-PON With SLA and CoS, Yafan Li1, Chen Qian1, Bingyao Cao1, Junji Zou1, Rujun Lin1, Min Wang1; Shanghai Univ., China. An ONUs requesting based full-range dynamic bandwidth allocation for OFDMA-PON with SLA and CoS is proposed to enhance the QoS of the system with adaptive cycle time scheme more effectively.

### Conference Room N203

**AM1H.4 • 09:45**  
Virtual-Pod-Assisted Resource Assignment in Elastic All-Optical Switching Intra-Datcenter Networks, Limei Peng1, Gangxiang Shen2, Aiyou Xu1; Aoyou Univ, Korea (the Republic of); Soochow Univ., China. We propose efficient resource assignment schemes based on virtual-pod (V-Pod) and node migration in elastic all-optical switching intra-datacenter networks (Intra-DCNs). Simulation results show that the proposed schemes can significantly reduce the service request blocking probability and improve computing and storage (CS) resource utilization.

**AM1H.5 • 10:00**  
Capacity Extension of Software Defined Data Center Networks With Jellyfish Topology, Victor Mehmeri1, Juan Jose Vegas Olmos1; Delft University of Technology, Netherlands. We present a performance analysis of Jellyfish topology with Software-Defined commodity switches for Data Center networks. Our results show up to a 2-fold performance gain when compared to an equivalent Layer 2 switching implementation.

**AM1H.6 • 10:15**  
Experimental Demonstration of Flexible Content Placement to Provide K-Content Connectivity in SDN-Enabled Data Center Optical Networks, Xin Li1, Shangguo Huang1, Shiyi Yu1, Yu Zhou1, Haibin Huang1, Yongyi Zhao1, Jie Zhang1; State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. We define k-content connectivity as the reachability of at least one content from any point of a Data Center network against multi-failures. We demonstrate flexible content placement to provide k-content connectivity through SDN-enabled OTN and IP networks between Data Centers.

### Conference Room N209

**AM1I.5 • 09:45**  
Optical switch for particle manipulation using a ring-assisted Mach-Zehnder interferometer, Wenxiang Jiao1, Guanghui Wang1, Xuping Zhang1, Aaron Ho1, Ying Huang1; Nanjing Univ., China; The Chinese Univ. of Hong Kong, China; Inst. of Microelectronics, ASTAR, Singapore. Ring-assisted Mach-Zehnder interferometer (RAMZI) is proposed for particles switching and manipulation in micro-fluidic applications. Simulations show that significant modulation can be achieved by tuning effective index of the ring up to only ~7×10⁻⁴.

**AM1I.6 • 10:00**  
Power-referenced refractometer based on fiber-to-fiber evanescently coupling and Optical switch for particle manipulation using a ring-assisted Mach-Zehnder interferometer, Mehmet Mehmet1, Juan Jose Vegas Olmos1; Delft University of Technology, Netherlands. We propose efficient resource assignment schemes based on virtual-pod (V-Pod) and node migration in elastic all-optical switching intra-datacenter networks (Intra-DCNs). Simulation results show that the proposed schemes can significantly reduce the service request blocking probability and improve computing and storage (CS) resource utilization.

### Conference Room N210

**AM1J.4 • 10:00**  
Tunable-Bandwidth Optical Parametric Amplifier Based on Intermodal Four-Wave Mixing in a Few-Mode Fiber, Rui Guo1, Xiaoqiu Zhu2, Cheng Zhang1, Juha Li1, Weiwei Hu1, Zhangyuan Chen1; Peking Univ., China. An optical parametric amplifier based on intermodal four-wave mixing in few-mode fibers is proposed. The results show that tunable amplification bandwidth from 1GHz to 60GHz can be realized by changing the wavelength of the pumps.

**AM1J.5 • 10:15**  
Reconfigurable Optical XOR Logic Gate of Phase-Modulated Signals with Multicast Functionality through FWM in SOA, Gazi Sharif1, Jun Qin2, Hongxiang Wang2, Yufeng Ji1, Shigeru Yamaguchi1; Tokai Univ., Japan; Beijing Univ. of Posts and Telecommunications, China. Reconfigurable optical XOR logic gate of phase-modulated signals with multicast functionality is proposed and experimentally demonstrated through FWM in single SOA. Three of four input signals are flexibly combined to participate in the XOR operations.

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**10:30–11:00 Coffee Break around Exhibition Area**

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**Conference Room N202**

11:00–12:30
AM2A • Quantum Dot and Nanowire Devices and Photodetectors
Presider: Naokatsu Yamamoto; National Inst Information & Comm Tech, Japan

**AM2A.1 • 11:00**
Advanced Photonic ICT Devices and Their System Applications Using Quantum-Dot Technology, Naokatsu Yamamoto1, Kouichi Akahane2, Toshimasa Umezawa2, Atsushi Matsumoto3, Atsushi Kannai4, Tetsuya Kawanishi5, Tomohiro Kita6, Hirohito Yamada7; 1Waseda Univ., Japan; 2‘National Inst. of Informations and Communications Technology, Japan; 3Tohoku Univ., Japan. Quantum-dot nanotechnology is attractive for use in advanced photonic devices that will augment the available optical-frequency resources and will increase the number of wavelength channels usable by wired and wireless networks in short/middle-range communication systems.

**AM2A.2 • 11:30**
Single Mode InAs/InP Quantum-dot Microcavity Lasers, Jin-Long Xiao1, Yue-De Yang1, Shuai Luo1, Hai-Ming Ji1, Tao Yang1, Yong-Zhen Huang1; 1Inst. of Semiconductors, CAS, China. InAs/InP quantum dot (QD) microcylinder lasers with an output waveguide are fabricated. Single-mode lasing wavelength of 1441 nm with side-mode suppression ratio around 24 dB is achieved from QD excited states emission.

**Conference Room N204/205**

11:00–12:30
AM2B • Best Student Award (Track 2 and 5)
Presider: Aaron Ho, The Chinese University of Hong Kong, Hong Kong

**AM2B.1 • 11:00**
Surface Plasmon Enhanced Microscopy Using Periodic and Aperiodic Nanostructures for Super-resolved Cell Imaging, Taehwong Son1, Wonju Lee1, Donghyun Kim2; 1School of Electrical and Electronic Engineering, Yonsei Univ., Korea (the Republic of). We investigate surface plasmon enhanced microscopy using periodic nanohole apertures and nanoislands. The measured resolution was estimated to be on the order of 20 nm on nanoparticle arrays and 135 nm on random nanoislands.

**AM2B.2 • 11:15**
Ultrafast 2-D microscopic imaging technology, Yuxi Wang1, Hongwei Chen1, Fangjian Xin1, Minghua Chen1, Siagang Yang1, Tsinghua Univ., China. We here present an ultrafast imaging system based on the theory of space-spectrum-time mapping of laser pulse. This imaging system is experimentally demonstrated to be capable to work at a frame rate as high as 20 MHz.

**Conference Room N208**

11:00–12:30
AM2C • Fiber Lasers IV
Presider: Arnaud Mussot; Univ. Lille 1 Laboratoire PhLAM, France

**AM2C.1 • 11:00**
Raman Dissipative Solitons: A New Approach to Generate High-energy Femtosecond Pulses at New Wavelengths, Sergey A. Babin1,2,3; 1Inst. of Automation and Electrometry RAS, Russian Federation; 2Novosibirsk State Univ., Russian Federation. A review of recent results on generation, optimization and coherent combining of high-energy Raman dissipative solitons of different Stokes orders, obtained by synchronous pumping in PM fiber cavity of normal-dispersion dissipative soliton laser, is given.

**Conference Room N207**

11:00–12:30
AM2D • Optical Fiber Sensors II
Presider: Yun-Jiang Rao; Univ of Electronic Science & Tech China, China

**AM2D.1 • 11:00**
Highly Sensitive Optical Fibre Gas Sensors, Wei Jin1, Hong Kong Polytechnic Univ., China. Fibre-based photothermal and photoacoustic sensors have demonstrated ppb – ppm level detection limit. The use of optical fibres and near infrared semiconductor lasers would allow compact and cost-effective sensors with remote detection capability.

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**Conference Room N202**

11:00–12:30
AM2A • Quantum Dot and Nanowire Devices and Photodetectors
Presider: Naokatsu Yamamoto; National Inst Information & Comm Tech, Japan

**AM2A.1 • 11:00**
Advanced Photonic ICT Devices and Their System Applications Using Quantum-Dot Technology, Naokatsu Yamamoto1, Kouichi Akahane2, Toshimasa Umezawa2, Atsushi Matsumoto3, Atsushi Kannai4, Tetsuya Kawanishi5, Tomohiro Kita6, Hirohito Yamada7; 1Waseda Univ., Japan; 2‘National Inst. of Informations and Communications Technology, Japan; 3Tohoku Univ., Japan. Quantum-dot nanotechnology is attractive for use in advanced photonic devices that will augment the available optical-frequency resources and will increase the number of wavelength channels usable by wired and wireless networks in short/middle-range communication systems.

**AM2A.2 • 11:30**
Single Mode InAs/InP Quantum-dot Microcavity Lasers, Jin-Long Xiao1, Yue-De Yang1, Shuai Luo1, Hai-Ming Ji1, Tao Yang1, Yong-Zhen Huang1; 1Inst. of Semiconductors, CAS, China. InAs/InP quantum dot (QD) microcylinder lasers with an output waveguide are fabricated. Single-mode lasing wavelength of 1441 nm with side-mode suppression ratio around 24 dB is achieved from QD excited states emission.

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**Conference Room N204/205**

11:00–12:30
AM2B • Best Student Award (Track 2 and 5)
Presider: Aaron Ho, The Chinese University of Hong Kong, Hong Kong

**AM2B.1 • 11:00**
Surface Plasmon Enhanced Microscopy Using Periodic and Aperiodic Nanostructures for Super-resolved Cell Imaging, Taehwong Son1, Wonju Lee1, Donghyun Kim2; 1School of Electrical and Electronic Engineering, Yonsei Univ., Korea (the Republic of). We investigate surface plasmon enhanced microscopy using periodic nanohole apertures and nanoislands. The measured resolution was estimated to be on the order of 20 nm on nanoparticle arrays and 135 nm on random nanoislands.

**AM2B.2 • 11:15**
Ultrafast 2-D microscopic imaging technology, Yuxi Wang1, Hongwei Chen1, Fangjian Xin1, Minghua Chen1, Siagang Yang1, Tsinghua Univ., China. We here present an ultrafast imaging system based on the theory of space-spectrum-time mapping of laser pulse. This imaging system is experimentally demonstrated to be capable to work at a frame rate as high as 20 MHz.

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**Conference Room N208**

11:00–12:30
AM2C • Fiber Lasers IV
Presider: Arnaud Mussot; Univ. Lille 1 Laboratoire PhLAM, France

**AM2C.1 • 11:00**
Raman Dissipative Solitons: A New Approach to Generate High-energy Femtosecond Pulses at New Wavelengths, Sergey A. Babin1,2,3; 1Inst. of Automation and Electrometry RAS, Russian Federation; 2Novosibirsk State Univ., Russian Federation. A review of recent results on generation, optimization and coherent combining of high-energy Raman dissipative solitons of different Stokes orders, obtained by synchronous pumping in PM fiber cavity of normal-dispersion dissipative soliton laser, is given.

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**Conference Room N207**

11:00–12:30
AM2D • Optical Fiber Sensors II
Presider: Yun-Jiang Rao; Univ of Electronic Science & Tech China, China

**AM2D.1 • 11:00**
Highly Sensitive Optical Fibre Gas Sensors, Wei Jin1, Hong Kong Polytechnic Univ., China. Fibre-based photothermal and photoacoustic sensors have demonstrated ppb – ppm level detection limit. The use of optical fibres and near infrared semiconductor lasers would allow compact and cost-effective sensors with remote detection capability.
AM2E.1 • 11:00
A Full Monitoring Scheme for Long-reach TWDM PONs, Min Cen1, Jiajia Chen2, Veronique Moeyaert1, Patrice Megret1, Marc Wulpart1; ‘Université de Mons, Belgium, ‘KTH Royal Inst. of Technology, Sweden. We propose a simple system that realizes for the first time full monitoring functionality for long-reach PON. Theoretical analysis and experimental validation demonstrate the proposed scheme is capable of providing accurate fault localization.

AM2E.2 • 11:15
Planning for Passive Optical Network Deployment with K-means Clustering-based Approach, Hao Chen1, Yongsheng Liu1, Gangxiang Shen1, Xiaoliang Chen1, Cen Chen1, Daoyun Hu1, Shoujiang Ma1, Zuqing Zhu1; ‘Univ of Science and Technology of China, China. We propose a K-means clustering-based approach to plan for the deployment of greenfield passive optical networks (PON) aiming to minimize the total deployment cost. Studies show that the proposed approach is effective to significantly reduce the deployment cost compared to a benchmark random-cut approach.

AM2E.3 • 11:30
Multi-Domain Fragmentation-Aware RSA Operations through Cooperative Hierarchical Controllers in SD-EDNs, Xiaoliang Chen1, Cen Chen1, Daoyun Hu1, Shoujiang Ma1, Zuqing Zhu1; ‘Univ of Science and Technology of China, China. This paper investigates lightpath provisioning with fragmentation-aware routing and spectrum assignment across multiple software-defined elastic optical network (SD-EON) domains, with a hierarchical controller framework. The system design is implemented and demonstrated in a multi-national SD-EON control plane testbed.

AM2F.1 • 11:00
High-Speed Direct-Detection WDM PON Using RSOA and Optical/Electrical Equalization, Hoon Kim1, ’Electrical Engineering, KAIST, Korea (the Republic of). We present high-speed WDM-PON systems utilizing reflective semiconductor optical amplifiers and direct detection. We employ the polar RZ format and optical/electrical equalization techniques to maximize the performance of the highly band-limited devices.

AM2F.2 • 11:30
Energy-efficient Optical Network Units with Simplified FFT Operation in Direct-detection OFDM PON, Boyu Liu1, Jizong Yamaguchi1, Daiyang Wu1, Qingming Zhu1, Xiaofeng Hu1, Ciyuan Qiu1, Yikai Su1; ‘Univ of Science and Technology of China, China. We propose and experimentally demonstrate simplified FFT operation to improve the energy efficiency of ONU in OFDM PON. Our proposal can achieve an energy saving of 14.6% compared to the conventional OFDM PON.

AM2G.1 • 11:00
Photonic-based Coherent Multiband Radars, Francesco Laghezza1, Filippo Scotti2, Daniel Ononi3, Paolo Ghelfi2, Antonella Bogoni1; ‘TeCIP Inst., Scuola Superiore Sant’Anna of Pisa, Italy, ‘National Laboratory of Photonics Networks, CNIT, Italy. This paper presents the first multiband photonics-based radar transceiver, reporting on the first demonstrator of fully coherent dual band radar able to manage multiple simultaneous coherent radio signals at different frequencies.

AM2G.2 • 11:30
Narrowing of IP Band Pass Filter Bandwidth in Spurious Suppressed Opto-Electronic Microwave Oscillator, Takashi Yamaguchi1, Hiroki Morimoto1, Hiroaki Toda1; ‘Doshisha Univ., Japan. We examine the influence of the narrow IF BP on phase noise of spuriously suppressed opto-electronic microwave oscillators. We found that the phase noise cancellation is effective only within the bandwidth of the IF BP.

AM2H.1 • 11:00
High-Speed Optical Signal Processing Using Time Lenses, Michael Galili1, Hao Hu1, Pengyu Guan1, Kasper M. Røge1, Leif K. Oxenløwe1; ‘DTU Fotonik Department of Photonics, Denmark. This paper will discuss time lenses and their broad range of applications. A number of recent demonstrations of complex high-speed optical signal processing using time lenses will be outlined with focus on the operating principle.

AM2H.2 • 11:30
Phase Sensitive Amplifiers Using PPLN Waveguides and Their Applications, Masaki Asobe1, Takeshi Umeki1, Hirokazu Takenouchi1, ‘Dept. of Electrical and Electronic Engineering, Tokai Univ., Japan; ‘NTT Device Technology Labs., Japan. Phase sensitive amplifiers are attracting a lot of interest because of their low noise characteristics and phase noise reduction capability. In this talk, we will review recent advances in PSA using periodically poled LiNbO3 waveguide.
A Single InP Nanowire Room-Temperature Photodetector, Xin Yan1, Junshuai Li1, Fukuan Sun1, Xia Zhang1, Xiaomin Ren1; 1Beijing Univ Posts & Telecommunications, China. We have fabricated a single InP nanowire photodetector, which has an extremely low conduction current in dark and shows resistor-like linear conduction behavior under illumination. A highest responsivity was obtained as 1.58×10^3 A/W.

A Single InP Nanowire Room-Temperature Photodetector, Junshuai Li1, Bang Li1, Xin Yan1, Fukuan Sun1, Xia Zhang1, Xiaomin Ren1; 1Beijing Univ Posts & Telecommunications, China. A room-temperature photodetector based on a single zinc-blende InP nanowire is fabricated, which shows a remarkable photoresponsivity of 0.1 A/W under 532 nm laser excitation at a low power density of 150 μW cm⁻².

Six Mode Erbium-doped Fiber Amplifier Using Mode Selective Photonic Lantern, Gisela Lopez-Galmiche1,2, Zeinab Sanjabi Ezzati1, Luis A. Herrera Padilla1, Amado M. Velazquez Benitez1, Jorge Rodriguez-Asamoz1, Enrique Antonio-lopez2, Jose J. Sanchez-Mondragon1, Cedric Geniet1, Pierre Sillard1, Guifang Li1, Axel Schulzgen1, Chigo Okonkwo1, Rodrigo Amezcua-Correa1,1 Inst Nat Astrofisica Optica Electronica, Mexico; 2CREOL, Univ. of Central Florida, USA; 3DICIS, Universitario de las Americas, Mexico; 4 Prysmian Group, France; 5COBRA Research Inst., Nanyang Technological Univ., Singapore; 6Phoenix Photonics, UK. We experimentally characterize the characteristics of Rayleigh backscattering arising in few-mode fiber (FMF) using a mode selective all-fiber photonic lantern whose mode transfer matrix is measured through an easy implementation of back-reflection configuration.

Femtosecond Inscription of Long-period and Fiber Bragg Gratings for Harsh-environment Sensors and High-Power Lasers Applications, Sergey A. Babin1, Alexander V. Dostovalov1, Alexey Wolf1, Alexandr Parygin1; 1Inst Nat Astrofisica Optica Electronica, Mexico. Femtosecond laser point-by-point direct writing may serve as a method for LPGs writing enables creating efficient polarization-robust laser mirrors and sensors. Proposed slit beam shaping method for LPGs writing enables creating efficient polarization-maintaining fiber filters.

Quantum efficiency enhanced InGaAs/InP photodetector with polarization insensitive subwavelength gratings, Yongqing Huang1, Wenjing Fang1, Xiaofeng Duan1, Yehong Li1, Jiarui Fei1, Kai Liu1, Jun Wang1, Qi Wang1, Shwei Cai1, Xiaomin Ren1; 1Beijing Univ Posts & Telecommunications, USA. A polarization insensitive periodical subwavelength grating and a photodetector incorporating this grating were proposed and fabricated. The quantum efficiency of the photodetector was improved 50% by incorporating an achieved grating with more than 80% reflectivity.

Experimental Characterization of Rayleigh Backscattering in Few-Mode Fiber Using All-Fiber Photonic Lanterns, Dawei Yu1,2, Songnian Fu1, John v. Weerdenburg1, Ziheng Caor1, Ming Tang1, Perry Shum1, Deming Liu1, Ian Giles1, Ton Koonen1, Chigo Okonkwo1; 1National Engineering Laboratory for Next Generation Internet Access System, School of Optical and Electronic Information, Huazhong Univ. of Science and Technology, Netherlands; 2Photonics Centre of Excellence, Nanyang Technological Univ., Singapore; 3Phoenix Photonics, UK. We experimentally characterize the characteristics of Rayleigh backscattering using FMF with a mode selective all-fiber photonic lantern whose mode transfer matrix is measured through an easy implementation of back-reflection configuration.

A Wind Speed Monitoring Method Based on Fiber Bragg Grating Displacement Sensor, Zhiming Liu1, Zhiqua Zhang1, Clini Liu1, Luming Li1; 1Beijing Univ. of Posts and Telecommunications, China; 2Information and Communications branch, Jiangxi Electric Power Company, China. This paper proposes a method based on FBG displacement sensor for monitoring real-time wind speed. Compared with standard anemometer, the precision of the method is about 0.5 m/s.
### Conference Room N211

**AM2E.4 • 11:45**

Chaotic WDM-PON with Symmetrical Subcarrier Modulation Multiplexing, Jing Wang1, Ning Jiang1, Chenpeng Xue1, Kun Qiu1, Qianyi Yang1, USETC, China. A novel passive optical network configuration based on synchronization of WDM chaotic signals and symmetrical subcarrier modulation multiplexing is introduced. The proposed scheme can greatly improve the physical layer security and enhance the communication capacity.

**AM2E.5 • 12:00**

A novel wavelength sharing TWDM-PON architecture with tunable laser and multi-free-spectral-range AWGR, Yuan Liu1, Hao He1, Kuo Zhang1, Weisheng Hu1, Shanghai Jiao Tong Univ., China. We propose and experimentally demonstrate a novel TWDM-PON architecture with shared tunable laser and multi-free-spectral-range AWGR. It supports wavelength sharing within the same and among different ODNs. 40Gbps capacity and 40dB power budget are achieved.

### Conference Room N212

**AM2F.3 • 11:45**

A low complexity of PAPR reduction scheme in the IM-DD optical OFDM system based on fast Hartley transform, Lijun Ma1,2, Hua Li1,2, Hangzhou Dianzi Univ., China; College of Computer Science and Electronic Engineering, Key Laboratory for Micro-/Nano-Optoelectronic Devices of Ministry of Education, Hangzhou Dianzi Univ., China. We propose and experimentally demonstrate a novel NBPSO on DSI for PAPR reduction in an IM-DD OFDM system based on FHT. The experimental results show that receiver sensitivity can be improved by more than 2dB.

**AM2F.4 • 12:00**

PAPR Reduction and Nonlinear Impairment Mitigation by Frequency Guard Band-Tone Reservation for DD-OFDM, Jiaoyang Wu1, Jingzong Peng1, Boyu Liu1, Jiyang Wu1, Qingming Zhu1, Ceyuan Qiu1, Yikai Su2, Shanghai Jiao Tong Univ., China. A novel OFDM PAPR reduction scheme by exploiting frequency guard band (FGB) is proposed and experimentally demonstrated. Effective mitigation of nonlinear impairments is validated and BER improvement of 2.6dB is achieved over 50-km fiber transmission without sacrificing data rate.

**AM2F.5 • 12:15**

Experimental Demonstration of a Novel PON System Using Multi-dimensional CAP-OFDM Technique, Lu Shi1, Jiale He1, Lei Deng1, Ming Tang1, Songqian Cui1, Deming Liu1, Perry Ping Shum1, Huazhong Univ. of Sci. & Tech., China; Nanyang Technological Univ., Singapore. We experimentally demonstrate a novel CAP-OFDM-PON system, in which four OFDM channels of 1.25 Gb/s bitrate per channel are multiplexed using four-dimensional CAP filters. Both reliability and flexibility of multiple ONUs’ access have been obtained.

**AM2G.3 • 11:45**

Influence of Slow Light on Optoelectronic Oscillators based on Stimulated Brillouin Scattering, Huafu Peng1, Cheng Zhang1, Yongchi Xu1, Livin Zhu1, Weixue Hu1, Zhangyuan Chen1, Ping Shum2,1, Peking Univ., China. 48.9-ns delay via slow light in optoelectronic oscillators based on stimulated Brillouin scattering is experimentally measured by side-modes shifting in the phase noise curve. The result demonstrates a potential fine tuning approach in optoelectronic oscillators.

### Conference Room N206

**AM2G.4 • 12:00**

An analytical model of the injection-locked optoelectronic oscillator, Zhonghua Zhou1, School of Electronic Science and Engineering, China. We propose a new scheme of an optoelectronic oscillator (OEO) based on injection locking (IL) technique. The side mode suppression ratio is more than 40dB and the phase noise at low offset frequencies is reduced.

### Conference Room N210

**AM2H.3 • 12:00**

A Wide Pull-in Range OPLL System Using an Optical Voltage Controlled Oscillator, Ding Ding1,2, Zhang Yang’an1, Yongqing Huang1, Limeng Wang1, IPOC of BUPT, China. We firstly apply an easy but powerful frequency pulling module to an SC-OPLL system and successfully demonstrate a high-dynamic OPLL operation with a pull-in range as wide as 2.4GHz.

**AM2H.4 • 12:15**

Self-Oscillating Optical Frequency Comb Generator Based on an Optoelectronic Oscillator, Xinruan Xu1, Jian Dai1, Zhongguo Wu1, Yitang Dai1, Feifei Yin1, Yue Zhou1, Jianqiang Li1, Kun Xu1, Beijing Univ. of Posts and Telecomm, China. A self-oscillating optical frequency comb generator based on an optoelectronic oscillator was demonstrated. We generated a nine-line optical frequency comb and a 10GHz microwave signal with phase noise of -115dBc/Hz at 10 kHz offset.
Zehnder Switch Chips for Optical Networks

Increasing Capacity of Silicon Photonic Mach-Zehnder Switch Cells for a DWDM Network Circuit Switch and for Switch Matrices Constructed of Mach-Zehnder Components. We analyze the optical performance of scalable topologies, and optimized photonic switch fabrics require low-loss and low-crosstalk. Silicon photonic technologies Canada, Canada.

Current suitable for 28 Gbps PAM4 modulation and >10 GHz 3 dB modulation response at 2 mA VCSEL designs with <0.25 nm RMS line width.

Energy efficient Laser Enterprise, Switzerland.

Invited contributions are presented covering the CL-band.

Obtained for the wavelength tunable range equalized stable short pulses up to 40GHz are demonstrated for mode-locked fiber lasers.

Amplitude-laser using a bismuth-based nonlinear erbium-doped fiber. The cavity length is 6m. Amplitude-laser using a bismuth-based highly nonlinear erbium-doped fiber. The cavity length is 6m. Amplitude-equalized stable short pulses up to 40GHz are obtained for the wavelength tunable range covering the CL-band.

Annecy and Grenoble, France. We present a record 77 x 200 Gb/s C-band only unrepeated transmission experiment over 355 km, applying a booster at the transmitter side and a ROPA with third-order Raman pumping at the receiver end.

Digital signal processing is going on spreading from long reach systems to short reach systems. Especially Discrete Multi-Tone is an attractive technology for short reach optical transmission systems. In this paper we review this technology.
AM3F.1 • 14:00 Invited
Hybrid Optical Phase Quantization for All-optical Signal Processing, Takayuki Kurosui, Hung Nguyen Tan, Karen Solis-Trapala, Shu Namiki, Satoshi Suda; 1Tokyo Inst. of Technology, Japan. 1Natl Inst of Adv Industrial Sci & Tech, Japan. Recent progress in all-optical signal processing based on the novel hybrid optical phase squeezer (HOPS) is presented. After reviewing the principle, we experimentally demonstrate various configurations of HOPS to phase-regenerate BPSK signal and QPSK signal.

AM3G.1 • 14:00 Invited
Planning of Optical Networks Based on Programmable ROADM, Marija Furdek1, Matija Dzanko, Nina Skorin-Kapov2, Lena Wosinska3; 1Faculty of Electrical Engineering and Computing, Univ. of Zagreb, Croatia; 2Univ. Center of Defense, San Javier Air Force Base, Spain. Synthetic programmable ROADMs enable great architectural flexibility and offer remarkable opportunities for network optimization. This paper summarizes the benefits and network planning challenges introduced by this technology and outlines optimization approaches to utilize its advantages.

AM3G.2 • 14:30
A Proposal and Analytical Investigation of Optical Comparison-Operation Scheme for Viterbi Decoding, Yohei Aikawa1, Hironori Ueno1, Hiroshi Akaishi1, Shinya Nishimori1; 1Tokyo Inst. of Technology, Japan. We propose an optical comparison-operation scheme in Viterbi decoding for realizing optical FEC technologies. We analytically obtained net coding gain close to the conventional scheme with less processing number of calculation steps for QPSK-modulated signals.

AM3H.1 • 14:00 Invited
Massive Orbital Angular Momentum Channels for High Capacity Optical Communication Using Optical Vortex Gratings, Xiaoceng Yuan1, Shenzhen Univ., China. We demonstrate orbital angular momentum (OAM) based optical interconnect using optical vortex grating. We achieve 160Tbit/s data transmission by 10 individual OAM channels multiplexing. We also demonstrate high-speed switch and multicast of 49 OAM channels.

AM3H.2 • 14:30
Sensitivity-improved plasmonic fiber-optic reflectometer based on differential measurement between cut-off and plasmonic resonances, Jiao Qiu1, Xuhui Yuan1, Linzi Han1, Xiaoyu Qiu1, Liang Guo1; 1Jinan Univ., China. Based on differential intensity measurement between the cut-off and Plasmonic resonances of an Au-coated tilted fiber Bragg grating, reflectometer with R1 sensitivity of 920 dB/RIU over the range of 1.332 to 1.357 has been achieved.

AM3I.1 • 14:00 Invited
Cancellation of Nonlinear Impairments in Fiber Optic Transmission Systems, Nikola Alic1, Univ. of California, USA. Nonlinear crosstalk has been a main capacity-limiting impairment in fiber optic transmission for at least 20 years. In this contribution we present successful cancellation of nonlinear interaction enabling longer reach and higher capacity systems.

AM3I.2 • 14:30
Approaching Complete Cancellation of Nonlinearity in WDM Transmission Through Optical Phase Conjugation, Karen Solis-Trapala1, Mark Pelusi1, Hung Nguyen Tan2, Takashi Inoue1, Satoshi Suda1, Shu Namiki1; 1Univ. of Sydney, Australia. We review transformative effects of phase conjugation in transmission: the feasibility of complete nonlinearity cancellation in WDM transmission via an idealized system design, and the recovery of a DP-64QAM signal in a field-deployed legacy-fiber link.
AM3A.3 • 14:45  
Spectral Compression of All-normal-dispersion Mode-locked Fiber Laser, Yi Hua1, Xiaosheng Xiao1, Tsinghua Univ., China. Spectral compression of all-normal-dispersion mode-locked fiber lasers is investigated numerically and experimentally. The spectral compression ratio could be up to 10, and picosecond pulses with clean and narrow spectrum is obtained by optimizing the setup.

AM3B.3 • 14:45  
All Fiber Broadband Mode Multiplexer Based on Mode Rotator and Tapered Mode Selective Coupler, Xinlin Zeng1, Yan Li1, Yonghang Qu1, Hui Zhong1, Beijing Univ. of Posts & Telecommunications, China. We present the design of a microstructured fiber for optical communications with orbital angular momentum (OAM) modes, which can effectively avoid the excitation of linearly polarized (LP) modes with its unique air-core and air-coated structure.

AM3A.4 • 15:00  
Wavelength-Tunable Mode-Locked Erbium Fiber Laser Based on Phase-Shifted Long-Period Gratings, Jie Wang1, A. Ping Zhang1, Yonghong Shen1, Hwa Yew Tam1, Ping Kong A. Wai2, Department of Electrical Engineering, The Hong Kong Polytechnic Univ., China. A wavelength-tunable mode-locked erbium fiber laser based on a phase-shifted long-period grating is presented. Output wavelength is tuned over ~20 nm through heating the grating. The corresponding pulse duration varies from 0.91 to 1.3 ps.

AM3B.5 • 15:15  
Stable Nanosecond Chirp-free Pulse Generation with Ultra-narrow Bandwidth from a Passively CW Mode-locked Fiber Laser, Chen Jin1, Siqiang Yang1, Xiaojian Gu1, Shihong Xie1, Tsinghua Univ., China. A stable nanosecond chirp-free pulse generation with ultra-narrow bandwidth is established from a passively mode-locked erbium-doped fiber laser with a homemade fiber Bragg Grating as the intra-cavity filter and careful intra-cavity dispersion management introduced.

AM3C.3 • 15:00  
Nonlinearity Tolerance of 1.28Tb/s 16QAM Nyquist-WDM Superchannel Transmission, Wanli Guo1, Jiahao Huo1, Kangping Zhong1, Liang Wang1, Jinhui Yuan1, Huiquan Cheng2, Keping Long3, Alan Pak Tao Lau1, Chao Lu1, Univ of Science & Technology Beijing (USTB), China. A simple MIMO DSP-based receiver is proposed for polarization multiplexing IM-DD system in short reach communication systems. The performance of the proposed receiver is demonstrated in a 224Gb/s PDM-PAM4 10km IM-DD transmission system.

AM3D.3 • 14:45  
Nonlinearity Tolerance of 1.28Tb/s 16QAM Nyquist-WDM Superchannel Transmission, Wanli Guo1, Jiahao Huo1, Kangping Zhong1, Liang Wang1, Jinhui Yuan1, Huiquan Cheng2, Keping Long3, Alan Pak Tao Lau1, Chao Lu1, Univ of Science & Technology Beijing (USTB), China. A simple MIMO DSP-based receiver is proposed for polarization multiplexing IM-DD system in short reach communication systems. The performance of the proposed receiver is demonstrated in a 224Gb/s PDM-PAM4 10km IM-DD transmission system.

AM3E.3 • 14:45  
Invited Talk: Polarization and Mode-Diversity in Fiber Communication Systems, Lu Jiang1, 2, A. Ping Zhang1, Yonghang Qu1, Hui Zhong1, Beijing Univ. of Posts & Telecommunications, China. A 102 Gbit/s short range optical data link for inter-datacenter interconnect using MultiCAP and CMA_DDLMS algorithm is presented and demonstrated. The results show that MultiCAP signal in inter-datacenter interconnect system can be transmitted over 40-km SSMF with BER below FEC threshold of 7%.

AM3E.4 • 15:00  
Design and Implementation of Blind Equalization Algorithm for Multiband CAP Modulation in High Speed and High Spectral Efficiency Optical Data Link, Panliang Li1, Min Zhang2, Danshi Wang3, Beijing Univ. of Posts and Telecommunications, China. A 102 Gbit/s short range optical data link for inter-datacenter interconnect using MultiCAP and CMA_DDLMS algorithm is proposed and demonstrated. The results show that MultiCAP signal in inter-datacenter interconnect system can be transmitted over 40-km SSMF with BER below FEC threshold of 7%.
A Novel Optical Carrier Phase Estimation Technique Based on Viterbi-Viterbi and QPSK Partitioning for 16-QAM, Heba Shehata1, Mai Banawan1, Ziad A. El-Sahn1; "Alexandria Univ., Egypt. We propose a novel carrier phase estimation based on two-stage Viterbi-Viterbi and QPSK partitioning for 16-QAM. Simulation shows that the proposed algorithm is highly tolerant to laser linewidth with a reduced cycle slip probability.

High-contrast recognition of QPSK coded labels by optical waveguide circuit with non-linear thresholders, Tadashi Kondo1, Hiroki Ki- shikawa1, Nobuo Goto1; "Tokushima Univ., Japan. Our previously reported passive waveguide circuits recognizing PSK labels limited the number of recognizable labels due to its low contrast at the outputs. In this paper, we propose the improved circuits utilizing optical nonlinear thresholders.

High-sensitivity humidity sensor based on microfiber Sagnac interferometer, Li-Peng Sun1, Zhixin Liu1, Long Jin1, Yang Ran1, Bai-Ou Guan1; "Peking Univ., China. A relative humidity (RH) sensor based on a high-birefringence (Hi-Bi) Sagnac interferometer is proposed and demonstrated. By inserting a Hi-Bi Panda fiber into the Hi-Bi microfiber Sagnac loop, the sensitivity is enhanced significantly.

High-sensitivity microfiber interferometric hydrogen sensors, Zhipeng Yu1, Long Jin1, Yang Ran1, Bai-Ou Guan1; "Peking Univ., China. We present highly sensitive hydrogen detection by means of microfiber Mach-Zehnder interferometer. Its transmission spectrum blue shifts by 0.92 nm when exposed to hydrogen with a concentration of 5%, as a result of the strong evanescent field interaction with the Palladium coating.
Impact of Analog Interface Bandwidth of Pluggable Analog Coherent Optics on Performance of 100G DP-QPSK System, HyunDo Jung1, Chun Ju Youn1, Seo-Young Lee1, Young-Tak Han1, Joong-Seon Choe1, Won-Seok Han1, Jong-Hoi Kim1, Yong-Hwan Kwon1; ETRI, Korea (the Republic of). We evaluate the performance degradations of 100G DP-QPSK signals by lossy analog interface between DSP and the pluggable module, controlling ICR bandwidth. Depending on ICR bandwidth, the performance of 100G DP-QPSK signals shows ~2.5dB OSNR penalty (BER:1e-3) at 32GBd.

Passive Mode-Locking at 1.8 μm Using a High-Order Microring Resonator in a Figure Eight Fiber Laser, Kwong Shing Tsang1,2, Li Jin3, Victor Ho1, Jack Cheung1, Alexia Pasquazi1, Ray Man1, Sai Tak Chu1, Ping Kang A. Wai1; Photonics Research Center and Department of Electronic and Information Engineering, The Hong Kong Polytechnic Univ., Hong Kong; 1Amonics Limited, Hong Kong; 2Department of Physics and Materials Sciences, City Univ. of Hong Kong, Hong Kong; 3Department of Physics and Astronomy, Univ. of Sussex, UK. We demonstrated a 1.81 μm modelocked figure eight laser using an integrated 11-th order microring resonator. Mode-locked train centered at 1.81 μm with repetition rate of 9.09 MHz is achieved.

All-optical Intensity Modulation Based on Silicon Core Fiber, Haoyan Zheng1, Na Chen1, Ziwen Zhao1, Fufei Pang1, Zhenyi Chen1, Tingyun Wang1; Key Laboratory of Specialty Fiber Optics and Optical Access Networks, Shanghai Univ., China. An all-optical intensity modulation scheme is proposed by using silicon core fiber Fabry-Perot (F-P) cavity. Intensity of 1535nm light is modulated by 976nm laser and the maximum intensity modulation depth achievable is estimated above 10dB.

Signal Power Asymmetry Optimisation for Optical Phase Conjugation Using Random DFB Laser Raman Amplification, Pawel Rosa1, Son Thai Le1, Giuseppe Rizzelli1, Mingming Tan2, Juan D. Ania-Castanon1; 1Instituto de Óptica, Spain; 2AIP, Aston Univ., UK. We numerically optimise in-span signal power asymmetry in advanced Raman amplification schemes, reaching 3% over 62 km SMF, and evaluate its impact on the performance of systems using mid-link OPC using 7×15 16QAM Nyquist-spaced WDM-PDM.
Conference Room N206

AM3F.6 • 15:30
Dependence of Noise Tolerance on Depth of Learning in BPSK Label Processing Using Complex-Valued Neural-Network, Hanayo Fujimoto¹, Hiroki Kishikawa¹, Nobuo Goto¹, Shin-ichiro Yanagiya¹, Tokushima Univ., Japan. Optical neural-network to process PSK labels for photonic routing is proposed, which consists of optical amplifiers, phase shifters and nonlinear thresholders. Noise tolerance for incident labels is improved by reducing learning depth for weights.

Conference Room N203

AM3H.6 • 15:30
Surface Plasmon Resonance Sensor Based on a Polymer Waveguide with a Copper Thin-Film Overlay, Satyendra K. Mishra¹, Bing Zou¹, Kin S. Chiang¹, City Univ. of Hong Kong, Hong Kong. We investigate theoretically and experimentally a refractive-index sensor based on surface plasmon resonance with a copper thin-film overlay deposited on a polymer waveguide. The sensor shows a very high sensitivity of about 37 μm/RIU.

Conference Room N209

AM3I.4 • 15:30
Precisely Experimental Optimization of FWM based All-Optical Amplitude Reshaping, Heng Zhou¹, Ming-le Liao¹, Kun Qiu¹, Xing-yu Zhou¹, Univ. of Electronic Science and Technology of China, China. A strong optimization method for fiber FWM based all-optical amplitude reshaping is experimentally demonstrated. Greatly enhanced amplitude reshaping performance with biggest ER improvement ever reported by fiber FWM process is achieved.

16:00–16:30
Coffee Break around Exhibition Area

16:30–18:30
Postdeadline Session, Rooms N202/N203 and N211/N212, HKCEC

19:00–21:00
Banquet and Closing Ceremony, Chancellor Room, HKCEC