Welcome to Shanghai and to the 2014 Asia Communications and Photonics Conference

It is a great pleasure to invite you to participate in the Asia Communications and Photonics Conference (ACP) 2014 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 the largest conference 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.

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 Materials, Devices, and Integration; Novel Fibers and Fiber-based Devices; Optical Transmission Systems, Subsystems, and Technologies; Network Architectures, Management, and Applications; Biophotonics and Optical Sensors; Displays, Solid-State Lighting, Photovoltaics, and Energy-Efficient Photonics. The conference will also include a wide spectrum of workshops, and a special symposium on Advances and Trends in Fiber Optics and Applications which will be held on Tuesday afternoon and Thursday afternoon. 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 100 invited and six 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 Tuesday, 11 November. Four outstanding, distinguished speakers will give presentations. Professor Hequan Wu of the Chinese Academy of Engineering, China will present on The Strategy and Technology of Broadband China. Professor Masataka Nakazawa of Tohoku University, Japan will give a talk on Exabit Optical Communication Infrastructure Using 3M Scheme. Professor John Bowers from the University of California, Santa Barbara, USA will present on The Future of Hybrid Silicon Photonic Integrated Circuits. Professor Philip Russell from the Max-Planck Institute for the Science of Light, Germany will discuss the Frequency Conversion via Enhanced Light-matter Interactions in Fibre Microstructures.

In addition to the regular technical sessions, eight workshops will also be held featuring over forty invited speakers. These pre-conference workshops will be held on Tuesday, 11 November starting from 13:30. 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 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 13 November. The poster-only sessions will be held on Thursday afternoon 13:30-15:30. This is a good chance for you to meet with the authors and discuss technical issues in-depth.

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 on a cruise in the evening on 12 November. On the evening of Thursday, 13 November, we will hold a Banquet for conference registrants in the Seagull Palace. The banquet will feature delicious food, elegant music and beautiful views.

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 Shaohua Yu (Wuhan Research Institute of Posts and Telecommunications, China); Kazi Abedin (OFS Laboratories, USA); Zhangyuan Chen (Peking University, China); Tetsuya Kawanishi (NICT, Japan); Graham Reed (University of Southampton, UK) 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,

Graham Reed
University of Southampton, UK

Sincerely,

Graham Reed
University of Southampton, UK
Committees

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Ex-Chair of Chinese Optical Society
Hong Mei, Shanghai Jiao Tong University, China
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Track 4: Network Architectures, Management, and Applications

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Jason Jue, The University of Texas at Dallas, USA
Frank Chang, Inphi, USA
Jiajia Chen, Royal Institute of Technology, Kungliga Tekniska högskolan, Sweden

Track 5: Biophotonics and Optical Sensors

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José Luis Santos, University of Porto, Portugal
Guangnan Chen, National University of Singapore, Singapore
Zhuoqiang Ding, Zhejiang University, China
Nan-Kuang Chen, National United University, Taiwan, China

Track 6: Displays, Solid-State Lighting, Photovoltaics, and Energy-Efficient Photonics

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Peng Chen, Nanjing University, China
Lai Wang, Tsinghua University, China
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General Information

Conference Venue: Shanghai International Convention Center (SICC)
Address: 2727 Riverside Avenue, Lujiazui Area, Pudong, Shanghai, China

Transportation:

From Pudong Airport
By Maglev Train and Subway: Take Shanghai maglev train to Longyang Road Station (40 RMB), switch to subway Line-2 (Heading Xujingdong direction) to Lujiazui Station, walk to SICC (~850 m)
By Maglev Train and Taxi: Take Shanghai maglev train to Longyang Road Station (40 RMB), then take a taxi to SICC (~40 RMB in the day, ~50 RMB in the night)
By Taxi: ~160 RMB in the day, ~200 RMB in the night

From Hongqiao Railway Station/ Hongqiao Airport
By Subway: Take subway Line-2 (Heading Guanglan Road direction) to the Lujiazui Station, walk to SICC (~850 m)
By Taxi: ~90 RMB in the day, ~110 RMB in the night

From Shanghai Railway Station
By Subway: Take subway Line-1 (Heading Xinzhuang direction) to the People’s Square Station, switch to Line-2 (Heading Guanglan Road direction) to Lujiazui Station, walk to SICC (~850 m)
By Taxi: ~30 RMB in the day, ~40 RMB in the night

From Shanghai South Railway Station
By Subway: Take subway Line-1 (Heading Shanghai-Railway-Station direction) to the People’s Square Station, switch to Line-2 (Heading Guanglan Road direction) to Lujiazui Station, walk to SICC (~850 m)
By Taxi: ~60 RMB in the day, ~80 RMB in the night

The conference will take place in Shanghai International Convention Center (SICC), Shanghai, China. Shanghai, an open city on the coast and a famous historical and cultural city, is the gateway to the Yangtze delta. It is a municipality under the direct jurisdiction of the Central Government, the largest economic and trade center, a comprehensive industrial base and the leading port in China. Shanghai is well known in the world not only for its prosperous cosmopolitan features but also for its rich humanistic resources. The city has a wealth of ancient Chinese traditions. There are many attractions in the downtown area, including Huangpu River, Oriental Pearl TV Tower, Yuyuan Garden, and the special old streets and lanes. The convenient transportation, comfortable accommodation and colorful places of entertainment will enhance your stay in this fascinating city.
Registration:

Location:
The entrance lobby of SICC
Registration Hours:
12:00–18:00, Tuesday, 11 November
08:00–17:00, Wednesday, 12 November
08:00–17:00, Thursday, 13 November
08:00–17:00, Friday, 14 November

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.

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 - 2.3m (Height) X 1.0m (Length)
Set-up Time - 08:00 on Thursday, 13 November
Tear-down Time - 18:00 on Thursday, 13 November

Exhibition:
The ACP Exhibition is open to all attendees.
Location:
Mandarin Hall
Exhibition Hours:
08:00–17:00, Wednesday, 12 November
08:00–18:00, Thursday, 13 November
08:00–18:00, Friday, 14 November

Conference Materials:

ACP 2014 Technical Digest will be provided in a USB drive and not available in print form.
The ACP 2014 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's Optics InfoBase (http://www.opticsinfobase.org/) and IEEE Xplore Digital Library (http://www.ieee.org/web/publications/xplore/) after the conference. IEEE Xplore Digital Library and OSA’s Optics InfoBase are archived and indexed by INSPEC R and EI Compendex, where it will be available to the international technical community.

Social Activities:

Welcome Reception, Dragon Boat

The ACP 2014 welcome reception will be held on the “Dragon Boat” over Huangpu River on Nov.12, 2014. The Dragon Boat has an antique beautiful profile with twin bodies and twin dragons. The superstructure is in a shape of Chinese traditional pavilions. The broadside is decorated with golden twin dragons sparkling under the sunshine. In the night the dragons are vivid with ornamental festoon lighting interspersed. Cruising on the Huangpu River starts from the Bund, passing through the scenic spots of the New Bund, the Binjiang Avenue of Pudong New Area, the Oriental Pearl TV Tower and the People's Hero Memorial Column. Downstream along the river, you can see fascinating night view with row upon row of high-rises standing on both banks of the river and ships cruising one after another on the river.

Location: Dragon Boat
Time: 18:00 – 20:00, Wednesday, 12 November, 2014
Note: The conference finishes around 17:00. Please take the conference buses to the ferry from 17:00 to 17:30.

Conference Banquet, Seagull Palace

The ACP 2014 banquet will be held in the Seagull Palace on Nov.13, 2014. The banquet will feature delicious food, elegant music and beautiful views. Located aside the Huangpu River, Seagull Palace looks like a huge seagull flying on the waves, which make it become a symbol building in Shanghai. The food in Seagull Palace is as wonderful as the scenery outside. It serves a Shanghai-style food and is decorated in a western style. The seafood is especially good and popular, such as cinnamon snail, sweet roll seafood chowder, fish sandwiches lobster rolls in particular. Besides, Chinese traditional music performance will be presented at the banquet by SMEG Chinese Orchestra. The Best Student Paper Awards will also be presented at the banquet.

Location: Seagull Palace
Time: 18:30– 21:00, Thursday, 13 November, 2014
Note: Please walk to the Seagull Palace

OSA Student Lunch

Join OSA President Philip Bucksbaum and OSA CEO Elizabeth Rogan for a hosted student lunch at ACP on Thursday, 13 November. Students must email RSVP OSAevent@osa.org to reserve their place by 1 November (spaces are limited).

Location: Europe Hall (5F), Oriental Riverside Hotel Shanghai
Conference Highlights

Plenary Talks

Time: 09:00-12:00, Tuesday, 11 November
Venue: Room Auditorium

Topic: The Strategy and Technology of Broadband China
09:00-09:40
Prof. Hequan Wu
Chinese Academy of Engineering, China

Biograph: Hequan Wu, Academician of Chinese Academy of Engineering (CAE). He served as Vice-President and Chief Engineer of China Academy of Telecommunications Technology (CATT) and Vice-President of CAE. He is currently Vice-Director of the Advisory Committee for State Informatization (ACSI), Director of expert committee of Standardization Administration of China (SAC), Director of expert group of Internet of Things of China, Director of Communications S&T Committee of Ministry of Industry and Information Technology (MIIT). He is currently Director of an Executive Council of Internet Society of China (ISC) and Director of an Executive Council of China Communications Standards Association (CCSA), also Vice-Director of an Executive Council of China Institute of Communications (CIC) and Chinese Institute of Electronics (CIE) respectively. Prof. Wu has been appointed technical director of the new generation broadband wireless mobile communications network, one of the 16 major projects in the Outline of the National Program for Long- and Medium-term Scientific and Technological Development of China. He is Director of Experts Committee of China’s Next Generation Internet (CNGI) project. He is a senior member of IEEE.

Topic: Exabit Optical Communication Infrastructure Using 3M Scheme
09:40-10:20
Prof. Masataka Nakazawa
Tohoku University, Japan

Biograph: After receiving his Ph. D. from the Tokyo Institute of Technology in 1980, he joined NTT laboratory. He was a visiting scientist at MIT in 1984-1985. In 2001, he was appointed professor at Tohoku University, where he was the director of the RIEC. He engaged in research on erbium-doped fiber amplifiers (EDFA), optical solitons, ultrahigh-speed optical transmission, and ultrashort pulse lasers. Among them, regeneratively and harmonically mode-locked fiber laser in the 10-40 GHz region played an important role in high-speed transmission. Recently his research focuses on digital coherent transmission with his frequency-stabilized erbium fiber laser. He achieved 2048 QAM multi-level coherent transmission, which enabled a spectral efficiency of more than 14 bit/s/Hz. He has published 440 papers and presented 260 international conference presentations. He was the president of Electronics Society of the IEICE and the Board member of OSA and is now the Board member of the IEEE Photonics Society. Dr. Nakazawa is a Fellow of the OSA, IEEE, IEICE, and JSAP.

Abstract: The capacity of the optical communication infrastructure in backbone networks has increased a thousand-fold over the last twenty years. Despite this rapid progress, Internet traffic is continuing to grow at an annual rate of 40%. This means that in twenty years, we will need Petabit/s or even Exabit/s optical communication. In this talk, we present recent challenges and efforts toward achieving a hardware paradigm shift to overcome the capacity limitation imposed by the current optical communication infrastructure. We will overview the latest advances on the three “multi” technologies, i.e. multi-level transmission with ultrahigh spectral efficiency, space division multiplexing in multicore fibers, and mode division multiplexing with MIMO (multiple-input multiple-output).

Topic: The Future of Hybrid Silicon Photonic Integrated Circuits
10:40-11:20
Prof. John Bowers
University of California, Santa Barbara, USA

Biograph: John Bowers holds the Fred Kavli Chair in Nanotechnology, and is the Director of the Institute for Energy Efficiency and a Professor in the Departments of Electrical and Computer Engineering and Materials at UCSB. He is a cofounder of Aurrion, Aerius Photonics and Calient Networks. Dr. Bowers received his M.S. and Ph.D. degrees from Stanford University and worked for AT&T Bell Laboratories and Honeywell before joining UC Santa Barbara. Dr. Bowers is a member of the National Academy of Engineering and a fellow of the IEEE, OSA and the American Physical Society. He is a recipient of the OSA/IEEE Tyndall Award, the OSA Holonyak Prize, the IEEE LEOS William Streifer Award and the South Coast Business and Technology Entrepreneur of the Year Award. He and coworkers received the EE Times Annual Creativity in Electronics (ACE) Award for Most Promising Technology for the hybrid silicon laser in 2007.

Bowers’ research is primarily in optoelectronics and photonic integrated circuits. He has published ten book chapters, 600 journal papers, 900 conference papers and has received 54 patents. He has published 180 invited papers and conference papers, and given 16 plenary talks at conferences.
Topic: Frequency Conversion via Enhanced Light-matter Interactions in Fibre Microstructures
11:20-12:00

Prof. Philip Russell
Max-Planck Institute for the Science of Light, Germany

Biograph: Prof Philip Russell is a Director at the Max-Planck Institute for the Science of Light (MPL), a position he has held since January 2009 when MPL was founded. He was professor in the Department of Physics at the University of Bath from 1996 to 2005. He obtained his D.Phil. (1979) degree at the University of Oxford, spending three years as a Research Fellow at Oriel College, Oxford. In 1982 and 1983 he was a Humboldt Fellow at the Technical University Hamburg-Harburg (Germany), and from 1984 to 1986 he worked at the University of Nice (France) and the IBM TJ Watson Research Center in Yorktown Heights, New York. From 1986 to 1996 he was based mainly at the University of Southampton. His research interests currently focus on scientific applications of photonic crystal fibres and related structures. He is a Fellow of the Royal Society, the Optical Society of America (OSA) and the UK Institute of Physics and has won several international awards for his research including the 2013 EPS Prize for Research into the Science of Light, the 2005 Körber Prize for European Science, the 2005 Thomas Young Prize of the Institute for Physics (UK) and the 2000 OSA Joseph Fraunhofer Award/Robert M. Burley Prize. He is also OSA's 2014 President-Elect.

Abstract: Microstructuring offers remarkable opportunities for enhancing light-matter interactions in optical fibres. For example, extreme soliton self-compression of few 1 µJ, 50 fs, 800 nm pulses in gas-filled hollow-core photonic crystal fibre (PCF) leads to shock formation, resulting in generation of wavelength-tunable dispersive waves down to the vacuum-ultraviolet with efficiencies up to ~10%. Dispersion-tailored ZBLAN PCFs allow generation of supercontinua extending over three octaves (350 to 2500 nm) from 1 nJ pulses at 1042 nm. Chalcogenide "nano-spike" structures, made by pumping molten glass into silica capillaries at high pressure, can be used to generate coherent frequency combs in the mid-IR from a mode-locked Tm-doped fibre laser at 2 µm. And optical driving of the few-GHz acoustic resonances that exist in solid-core PCF has permitted stable passive mode-locking of a fibre ring laser at its 337th harmonic.

IEEE Photonics Society

Best Student Paper Awards

ACP 2014 is pleased to announce that this year’s Best Student Paper Awards on ACP will be sponsored by IEEE Photonics Society. There will be two grades for the Best Student Paper Awards this year:

1st Grade Awards, 8 recipients, 1000 US dollars for each
2nd Grade Awards, 14 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 candidate 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 Thursday, 13 November.

Poster Session

Time: 13:30-15:30, Thursday, 13 November
Venue: Mandarin Hall

Over 200 posters will be displayed during ACP 2014. 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.

Workshops

Time: 13:30-18:30, Tuesday, 11 November
Venue: Conference rooms at 3rd floor and 5th floor

There are eight workshops going to be held during ACP 2014. The topics cover the most interesting areas of photonics and communications. More than 60 speakers from both academia and industry will give their talks regarding the cutting edge technologies and advances.

- Workshop 1: Microwave photonics: devices, applications and prospects
- Workshop 2: Communications using orbital angular momentum of electromagnetics waves
- Workshop 3: High capacity optical transmission: What else is needed for coherent transmission? Is SDM life after coherent?
- Workshop 4: 3D displays
- Workshop 5: Silicon photonics
- Workshop 6: Hybrid nanoplasmonics: photons meet electrons in the nano-world to push optical communication beyond terabit horizon
- Workshop 7: Optical datacentre networks
- Workshop 8: Optical interconnection - from devices to systems applications

Special Symposium

Time: 13:30-17:30, 11 November (Symposium I)
13:30-17:00, 13 November (Symposium II)
Venue: Room 5BC (Symposium I)
Room 3E (Symposium II)

Special symposiums are going to be held during ACP 2014. The topic of the symposiums is Advances and Trends in Fiber Optics and Applications. The symposiums are organized by Prof. Rao Yunjiang, Prof. Sergei Turitsyn and Prof. Zinan Wang. Thirteen speakers from the field will give their talks during the conference.
Workshops

Workshop 1: Microwave photonics: devices, applications and prospects

Time: 13:30-17:30, Tuesday, 11 November
Venue: Room 5I

Organizers:

Introduction:
Microwave photonics based technology has been proposed for almost twenty years. It is believed that microwave photonics based devices and sub-systems have advantages over those based on physical electronics in terms of bandwidth and dynamic range. And so many kinds of microwave photonics devices and sub-systems have been proposed in journals, letters, etc., yet we don’t see their truly practical application up to now. The questions occur naturally: does those based on microwave photonics have vitality? How far can they go? The workshop will invite experts to discuss those questions.

Session I
1. 13:30 Prof. Andrew M. Weiner, Purdue University, USA
   Topic: Photonic RF-AWG extending to w-band
2. 14:00 Prof. Xiaoke Yi, University of Sydney, Australia
   Topic: Photonic processing of microwave/RF signals
3. 14:30 Prof. Jose Capmany, Universidad Politecnica de Valencia, Spain
   Topic: Graphene integrated microwave photonics

15:00-15:30 Coffee break

Session II
4. 15:30 Prof. Yabin Ye, Huawei Technologies Duesseldorf GmbH, Germany
   Topic: Converged advanced radio and optical transport structures
5. 16:00 Prof. Zhangyuan Chen, Peking University, China
   Topic: Widely tunable millimeter-wave optoelectronic oscillator with low phase noise
6. 16:30 Prof. Gong-Ru Lin, National Taiwan University, Taiwan, China
   Topic: Application of 40-GHz optoelectronic oscillator in bidirectional PSK/OOK transmission

17:00-17:30 Discussions

Workshop 2: Communications using orbital angular momentum of electromagnetic waves

Time: 13:30-18:30, Tuesday, 11 November
Venue: Room 3G

Organizers:

Introduction:
Communications using the orbital angular momentum (OAM) of light and radio waves has attracted much attention in recent years. OAM communications has demonstrated significant potential in terms of expanding the capacity of free space optical and RF transmission systems as well as fibre-based optical transmission systems. However, significant technical obstacles remain in all technological aspects that have to be overcome before the concept of OAM communications could be put in practical use.

The workshop will gather world experts working in the science of OAM and OAM communications, in order to explore the state-of-art, outstanding problems and issues, and future research directions at all layers of technologies involved in OAM communications, including:
- Fundamental principles of OAM communications
- Optical and RF OAM components
- Propagation of OAM modes in optical fibers and free space channels
- OAM signal transmission techniques
- Use of OAM domain for networking

Through these discussions, the workshop aims at providing a good overview of, and deep insight into, this newly emerging research area to the experts and attendants alike.

Session I
1. 13:30 Prof. Marc Sorel, University of Glasgow, UK
   Topic: Integrated OAM devices
2. 14:00 Prof. SBJ Yoo, University of California Davis, USA
   Topic: OAM mux/demux/switching/processing using 2D/3D photonic integrated circuits
3. 14:30 Prof. Xifeng Ren, China University of Science and Technology, China
   Topic: Photonic OAM in plasmonic structures
4. 15:00 Prof. Yidong Huang, Tsinghua University, China
   Topic: Optical orbital angular momentum encoder/decoder on silicon chip

15:30-16:00 Coffee break
Session II

5. 16:00 Prof. Sophie Larochelle, Laval University, Canada
   Topic: Optical fibers for OAM mode transmissions

6. 16:30 Prof. Chunqing Gao, Beijing Institute of Technology, China
   Topic: Measurement of orbital angular momentum state of light beam

7. 17:00 Prof. Xianmin Zhang, Zhejiang University, China
   Topic: Recent progress in orbital angular momentum (OAM) communication systems

8. 18:00 Prof. Ivan Djordjevic, University of Arizona, USA
   Topic: Multidimensional quantum teleportation and QKD based on photon angular momentum

Workshop 3: High capacity optical transmission: What else is needed for coherent transmission? Is SDM life after coherent?

Time: 13:30-17:30, Tuesday, 11 November
Venue: Room 3E

Organizer:

Introduction:
Traffic on the internet backbone has been increasing exponentially at a rate of 10 times every 5 years. Digital coherent optical communication is a success story that translated research into commercial deployment in a time span of five short years. The ultrafast pace of innovation in digital coherent transmission technology leads to the natural question of what else is needed or can be done for digital coherent transmission. This workshop will attempt to address this question.

As impressive as the development of digital coherent transmission technology may have been, it can only provide additive growth, on the order of a few b/s/Hz, to existing WDM networks. Space-division multiplexing (SDM) has been promoted as the next technology for the multiplicative growth in optical transmission capacity. This workshop will address all the hot-button issues related to SDM.

Session I: What Else Is Needed for Coherent Transmission

1. 13:30 Dr. Jianjun Yu, ZTE, USA
   Topic: How far can we go by advanced DSP

2. 13:45 Dr. Zhenning Tao, Fujitsu, China
   Topic: Algorithms for digital coherent transmission in dynamic WDM network

3. 14:00 Prof. Changyuan Yu, National University of Singapore, Singapore
   Topic: Carrier recovery for digital coherent transmission

4. 14:15 Dr. Tetsuya Miyazaki, NICT, Japan
   Topic: Expecting evolution from digital coherent & SDM technologies

5. 14:30 Panel Discussion I

Session II: Is SDM Life after Coherent

6. 15:00 Dr. Chongjin Xie, Bell Laboratories, USA
   Topic: Where and when do we need SDM?

7. 15:15 Dr. Yiran Ma, China Telecom, China
   Topic: What is required for SDM

15:30-16:00 Coffee Break

8. 16:00 Prof. William Shieh, University of Melbourne, Australia
   Topic: Challenges and promises of few-mode fiber transmission

9. 16:15 Dr. Takayuki Mizuno, NTT Network Innovation Laboratories, Japan
   Topic: Dense SDM (DSDM) for future scalable optical transport network

10. 16:30 Prof. Alan Lau, Hong Kong Polytechnic University, Hong Kong, China
    Topic: What could be the first commercial application of SDM?

11. 16:45 Panel Discussion II

Workshop 4: 3D displays

Time: 13:30-17:30, Tuesday, 11 November
Venue: Room 5J

Organizers:

Prof. Guifang Li
University of Central Florida, USA; Tianjin University, China

Prof. Yikai Su
Shanghai Jiao Tong University, China

Prof. Yongtian Wang
Beijing Institute of Technology, China

Introduction:
Three-dimensional (3D) display technologies have attracted worldwide attention and been developed vigorously since the blockbuster movie “Avatar” was released. Usually, 3D displays are classified into two types according to principles of stereopsis. One type is based on binocular disparity with glasses/helmet stereoscopic displays or parallax barriers/lens array. The other type, including holographic display, integral imaging display and volumetric display, is based on 3D scene reconstruction. Compared to stereoscopic display of 3D images, these techniques are true 3D displays that provide more depth perceptions. This workshop presents state-of-the-art 3D display technologies to address the current challenges and developments in the field.
Session I
1. 13:30 Prof. Yi-Pai Huang, National Chiao-Tung University, Taiwan, China  
   Topic: 3D floating display with air-touch system
2. 14:00 Prof. Qiong-hua Wang, Sichuan University, China  
   Topic: Two-view 3D displays
3. 14:30 Prof. Jun Xia, Southeast University, China  
   Topic: Holographic 3D display with scalable Fourier transformation

15:00-15:30 Coffee break

Session II
4. 15:30 Mr. Roger Hsu, Jasper Display, Taiwan, China  
   Topic: 4K LCoS 3D display application
5. 16:00 Prof. Bin Hu, Beijing Institute of Technology, China  
   Topic: Basic problems in colorful 3D holographic display
6. 16:30 Prof. Chaoping Chen, Shanghai Jiao Tong University, China  
   Topic: Holographic recording media for dynamic holographic display

17:00-17:30 Technical discussions

Workshop 5: Silicon photonics
Time: 13:30-18:20, Tuesday, 11 November  
Venue: Room 5H

Organizers:
Prof. Lin Yang  
Institute of Semiconductors, CAS, China  
Prof. Zhipeing Zhou  
Peking University, China
Prof. Sergei Popov  
KTH Royal Institute of Technology, Sweden  
Prof. Ari T. Friberg  
University of Eastern Finland, Finland

Introduction:
Silicon Photonics, a technology using silicon as a material platform to develop optoelectronic devices, has drawn great attention in recent years due to its promise of cost-effective optoelectronic integration using existing, high-volume CMOS fabrication technology. The main drive for the rapid development of silicon photonics has been its application in energy-efficient, high-speed optical communications, optical interconnects and optical computing. In the past decade, major silicon photonic building blocks have been developed and proven viable for these high-speed applications. At the same time, other unique optical properties of silicon have been employed for biomedical sensing, nonlinear optics, as well as mid infrared applications. The silicon photonics market is expected to grow even fast in the next decade, however, many challenges still remain. This workshop is to provide a forum for international experts to present and discuss their vision, recent progresses, and future challenges of Silicon Photonics and its applications. A series of invited presentations, covering a variety of subjects, are scheduled for this half-day workshop in Shanghai, China.

Session I
1. 13:30 Prof. Yasuhiro Arakawa, The University of Tokyo, Japan  
   Topic: Advances in silicon optical interposer with quantum dot lasers
2. 14:00 Dr. Laurent Vivien, CNRS, France  
   Topic: Silicon photonics in 300 mm platform
3. 14:30 Prof. Zhipeing Zhou, Peking University, China  
   Topic: Low energy considerations in silicon photonics
4. 15:00 Prof. Yongzhen Huang, Institute of Semiconductors, Chinese Academy of Sciences, China  
   Topic: Wavelength control and thermal management for multi-wavelength microlaser array bonded on SOI waveguide

15:30-15:50 Coffee break

Session II
5. 15:50 Prof. Roel Baets, Ghent University-IMEC, Belgium

Workshop 6: Hybrid nanoplasmonics: Photons meet electrons in the nano-world to push optical communication beyond terabit horizon
Time: 13:30-18:00, Tuesday, 11 November  
Venue: Room 5E

Organizers:
Prof. Sergei Popov  
KTH Royal Institute of Technology, Sweden  
Prof. Ari T. Friberg  
University of Eastern Finland, Finland

Introduction:
Plasmonics, subject dealing with simultaneous co-existence of collective electron oscillations and optical waves has demonstrated tremendous progress over recent decennium. One of the most fascinating features of this field, capability to “pack” optical waves down to nano-sized spatial localization that is absolutely unattainable with
classical optics/photonics approach, stimulated development of the daughter branch-nano-plasmonics. The latter, in turn, pushed ahead numerous applications in optical signal processing, nano-technology, bio-sciences, security systems, and integrated photonics chips for high-speed optical communication.

At this workshop, both fundamental and application aspects of nano-plasmonics will be discussed. For example, polarization and coherence of its optical counterpart, the near optical field, require substantially different treatment and description in comparison with classical approach. From application perspective, a proper sophisticated design of components and integrated circuits, as well as fabrication technology compatible with Si-photonics and semiconductor industry is a strong demand to realize all the potential of nano-plasmonics. Specific technology solutions to achieve high-speed (terabit and beyond) functionality for components implemented in optics communication will be discussed. The workshop is planned as half a day activity, with technical sessions consisting of invited talks given by experts from academia and industry. A panel discussion will be organized at the end where the audience and the speakers will have the possibility to interact by asking/answering questions.

Session I
1. 13:30 Prof. Misha Sumetsky, Aston University, UK
   Topic: Nanophotonics without nano-objects
2. 14:10 Prof. Ari Friberg, University of Eastern Finland, Finland
   Topic: Electromagnetic coherence in nano-photonics
3. 14:50 Prof. Lech Wosinski, Royal Institute of Technology, Sweden
   Topic: Is nanoplasmonics suitable for control and propagation of light in practical applications?

15:30-16:00 Coffee break

Session II
4. 16:00 Prof. Qiwen Zhan, University of Dayton, USA
   Topic: Sculptured optical fields and their interactions with nanoplasmonic structures
5. 16:40 Prof. Peter Török, Imperial college, UK
   Topic: Recent progress of optical DCN research at SCNU

Introduction:
To serve the “networked society,” a rapidly growing amount of data is stored, processed, computed, transmitted and instantly made available upon request. Users of these data range from large organizations (e.g., big enterprises, government, universities, etc.) to individual customers, who are increasingly relying on the services offered by datacentres. It is anticipated that the required bandwidth for an Exascale supercomputer node (i.e., a large-scale datacentre) will grow 20 times every 4 years. On the other hand, due to the thermal dissipation problem, the power consumption that can be afforded by the network equipment in the datacentres is only allowed to increase at a much lower rate. Obviously, keeping business as usual cannot sustain the future datacentre traffic. Optical fibre communication is by far the least energy-consuming and least costly technique to offer ultra-high capacity for telecommunication networks. It has also been considered as a promising transmission technology for future datacentre applications. This workshop will focus on the main trends in optical interconnection networks for datacentre applications. Possible future research directions will be discussed in order to achieve the following challenging goals:
- Ultra-high capacity for the datacentre to support the needs of the “networked society”.
- Improved energy-efficiency throughout all parts of the datacentre network.
- Flexible provisioning of connectivity for the datacentre in order to efficiently utilize network resources, support differentiated data flows and improve scalability.

Workshop 7: Optical datacentre networks
Time: 13:30-18:30, Tuesday, 11 November
Venue: Room 5D

Organizer:
Prof. Jiajia Chen
KTH Royal Institute of Technology, Sweden
Workshop 8: Optical interconnection - from devices to systems applications

Time: 13:30-17:45, Tuesday, 11 November
Venue: Room 5F

Organizers:

Prof. Tao Chu
Institute of Semiconductors, CAS, China

Dr. Takashi Mikawa
Advanced Photonics, Inc., Japan

Prof. Osamu Wada
Kobe University, Japan; JSPS Beijing Office, China

Introduction:
Explosive increase of broadband information as represented by big data is accelerating R&D of inter- and intra-cabinet optical interconnection to meet high-speed, low-energy and low-cost requirements of next generation photonic systems including data centers and high-performance computing (HPC) systems. This workshop addresses hot topics on building blocks of optical interconnection ranging from devices to real systems applications, i.e. VCSELs, modules, opto-electronic boards with optical waveguides, and optimized integration of these components enabling board level and chip-to-chip interconnections. On-going project and standardization activities towards practical realization will also be addressed. Finally, cutting-edge of silicon photonics will be discussed targeting near future high-performance optical interconnection systems applications.

Session I
13:30-13:35 Opening remarks
1. 13:35 Dr. Dimitris Apostolopoulos, ICCS/NTUA, Greece
   Topic: Photonic interconnect technologies towards next generation data centers and HPC
2. 14:00 Dr. Hideyuki Nasu, Furukawa Electric Co., Japan
   Topic: 1060-nm VCSEL-based parallel-optical modules
3. 14:25 Dr. Foo Cheong Yit, Advanced Photonics, Inc., Japan
   Topic: Optoelectronic boards, backplanes and AOCs for inter- and intra-cabinet applications
4. 14:50 Prof. James A. Lott, TU Berlin, Germany
   Topic: Present and future VCSELs for optical interconnects

5. 15:15 Prof. Osamu Ueda, Kanazawa Institute of Technology, Japan
   Topic: Reliability and degradation of oxide-confined 850 nm VCSELs

15:40-16:00 Coffee break

Session II
6. 16:00 Prof. David V. Plant, McGill University, Canada
   Topic: Silicon photonic enabled 400G/1T short reach optical interconnects for computing and communications
7. 16:25 Dr. Jonas Weiss, IBM Research Zurich, Switzerland
   Topic: Integration of optical interconnects and silicon photonics in next generation datacenters
8. 16:50 Prof. Yung-Jui (Ray) Chen, National Sun Yat-Sen University, Taiwan, China
   Topic: On the photon dynamics of micro-ring resonator
9. 17:15 Dr. Carlos A. Ramos, NRC, Canada
   Topic: Sub-wavelength engineering for integrated photonics

17:40-17:45 Closing remarks
Special Symposium

Advances and Trends in Fiber Optics and Applications

Organizer:

Introduction:
This special symposium covers several key issues concerning recent progress in Fiber Optics, including optical waveguides theory and design, fiber-optic for imaging, novel techniques for fiber sensing, random distributed feedback fiber lasers, etc. The goal of this special symposium is to provide an opportunity for scientists and researchers in the field of Fiber Optics to discuss recent advances and future trends in this important area.

Symposium I
Time: 13:30-17:30, Tuesday, 11 November
Venue: Room 5BC

Session I
Chair: Prof. Sergei Turitsyn
1. 13:30 Prof. Yunjiang Rao, University of Electronic Science and Technology, China
   Topic: Building a worldwide platform for collaborative research in fiber optics – the 111 project
2. 14:00 Prof. Luc Thevenaz, Swiss Federal Institute of Technology (EPFL), Switzerland
   Topic: Principle of high spatial resolution distributed Brillouin fibre sensing and review of several techniques
3. 14:30 Prof. Miguel Gonzalez Herraez, University of Alcalá, Spain
   Topic: Recent progress in phase-sensitive optical time-domain reflectometry
4. 15:00 Prof. David Webb, Aston University, UK
   Topic: Creating a mature polymer optical fibre grating sensor technology – the TRIPOD project

15:30-16:00 Coffee Break

Session II
Chair: Prof. Chris Xu
5. 16:00 Prof. Jianming Tang, Bangor University, UK
   Topic: DSP-enabled software-defined PONs
6. 16:30 Dr. Mary Elizabeth McCarthy, Aston University, UK
   Topic: Considerations for design of nonlinear fiber devices for optical phase conjugation
7. 17:00 Prof. Sergei Turitsyn, Aston University, UK
   Topic: Nonlinear technologies in coherent fiber-optic communications

Symposium II
Time: 13:30-17:00, Thursday, 13 November
Venue: Room 3E

Session I
Chair: Prof. Luc Thevenaz
1. 13:30 Prof. Micheal Sumetsky, Aston University, UK
   Topic: Slow light nanophotonics at the surface of an optical fiber
2. 14:00 Prof. Sergey Babin, Novosibirsk State University, Russia
   Topic: Novel laser sources based on Raman gain in fibers
3. 14:30 Dr. Marco Petrovich, University of Southampton, UK
   Topic: Development of hollow core photonic bandgap fibres for mid-infrared applications
4. 15:00 Dr. Dmitry Churkin, Novosibirsk State University, Russia & Aston University, UK
   Topic: Real-time measurements of intensity spatio-temporal and spatio-frequency dynamics in cavity-based systems

15:30-16:00 Coffee Break

Session II
Chair: Prof. Yunjiang Rao
5. 16:00 Prof. Chris Xu, Cornell University, USA
   Topic: Fiber-based sources for biomedical imaging
6. 16:30 Prof. Adrian Podoleanu, Kent University, UK
   Topic: Multiple paths interferometry for optical coherence tomography
Industry Forum

400G / 1T Optical Communication System and Test Measurement
Time: 13:30-18:00, Tuesday, 11 November
Venue: Room 3HIJ

Organizer:

Introduction:
Optical communication is communication at a distance using light to carry information. It can be performed visually or by using electronic devices. An optical communication system uses a transmitter, which encodes a message into an optical signal, a channel, which carries the signal to its destination, and a receiver, which reproduces the message from the received optical signal. In this forum, some advanced optical communication systems, components and measurements will be presented, in order to pave the bridge between the industry and scientific research in university.

Session I
1. 13:30 Dr. Wenyu Zhao, China Academy of Telecom. Research (CATR), MIIT
   Topic: 400Gb/s technology and application in China
2. 13:50 Dr. Junjie Li, China Telecom Corporation Ltd. Beijing Research Institute
   Topic: Application of 200G / 400G transmission in carrier networks
3. 14:10 Dr. Ralf Stolte, Finisar
   Topic: Filtering and spectral analysis for advanced optical communication systems
4. 14:30 Dr. Dan Sadot, MultiPhy
   Topic: Leading low-cost 100G/400G metro and short reach transport solutions
5. 14:50 Dr. Yu Lu, APEX Technologies
   Topic: New generation OCSA: Ultra-high speed transmission system & pulsed laser characterizations
6. 15:10 Dr. André Richter, VPIphotonics
   Topic: Benefits of integrating numerical simulations and experiments for the design of high-speed systems

15:30-16:00 Coffee break

Session II
7. 16:00 Dr. Xiang Liu, Huawei Technologies
   Topic: TBD
8. 16:20 Dr. Xiongyan Tang, China Unicom Research Institute
   Topic: Present status and prospect of ultra-high speed optical transmission in China Unicom’s transport network
9. 16:40 Dr. Yongpeng Zhao, LUSTER LightTech Group
   Topic: 400G / 1T enabling technologies and test & measurement challenges
10. 17:00 Dr. Haiyang Hu, Keysight Technologies
    Topic: Test & measurement challenge for the next generation network interface
11. 17:20 Dr. Sung Hoon Im, Coherent Solutions Ltd.
    Topic: Generation and analysis of higher order modulation format optical signals

Panel Discussion 17:40-18:00
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<td>08:00–17:00</td>
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<tr>
<td>Opening Ceremony</td>
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<td>Room Auditorium</td>
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<tr>
<td>Plenary Session</td>
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<td>Workshops</td>
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<td>Conference rooms: 3rd floor and 5th floor</td>
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<tr>
<td>Symposium</td>
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<tr>
<td>Industry Forum</td>
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<td>Technical sessions</td>
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<td>Conference rooms: 3rd floor and 5th floor</td>
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<tr>
<td>Poster session</td>
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<td>Mandarin Hall</td>
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<tr>
<td>Industry Exhibition</td>
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<td>08:00–17:00</td>
<td>08:00–18:00</td>
<td>08:00–18:00</td>
<td>Mandarin Hall</td>
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<tr>
<td>Reception</td>
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<td>Dragon boat</td>
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<td>Banquet</td>
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<td>18:30–21:00</td>
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<td>Seagull palace</td>
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<td>Best student paper competition session</td>
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<td>08:00–10:00</td>
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<td>Conference rooms: 3rd floor and 5th floor</td>
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<td>OSA student lunch</td>
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<td>12:15–13:30</td>
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<td>Europe Hall (5F), Oriental Riverside Hotel Shanghai</td>
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<tr>
<td>Postdeadline papers</td>
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<td>16:00–18:00</td>
<td>Conference rooms</td>
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Note: All times reflect Beijing Time, please check with conference organizer during conference for schedule changes and updates.
### Agenda of Sessions

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

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<th>Conference Room 3E</th>
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<th>Conference Room 5BC</th>
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**Tuesday, 11 November**

**Explanation of Session Codes**

- **Meeting Name**
  - **A**: Asia Communications and Photonics Conference

- **Day of the Week**
  - **M**: Monday
  - **Tu**: Tuesday
  - **W**: Wednesday
  - **Th**: Thursday
  - **F**: Friday

- **Series Number**
  - 1 = First Series of Sessions
  - 2 = Second Series of Sessions

- **Session Designation**
  - (alphabetically)

- **Number**
  - (Presentation order within the session)

The first letter of the code designates the meeting. The second element denotes the day of the week (Wednesday=W, Thursday=Th, Friday=F). 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 AW3C.4 indicates that this paper is being presented on Wednesday (W) 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**.

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### Agenda of Sessions

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<th>Conference Room 5J</th>
<th>Conference Room 3HI</th>
<th>Conference Room 3G</th>
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<td>10:20–10:40</td>
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<td>10:40–12:00</td>
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<tr>
<td>12:00–13:30</td>
<td>Lunch Break</td>
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<tr>
<td>13:30–15:00</td>
<td>AW3A • Semiconductor Lasers</td>
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<td>AW31BA • Grating Couplers and Photonic Integrated Circuits</td>
<td>AW3C • New Fibers for Future Transmission</td>
<td>AW3D • Optical Fiber Sensing</td>
<td>AW3E • Digital Signal Processing I</td>
<td>AW3F • SDM Transmission I</td>
<td>AW3G • Free Space Communications</td>
<td>AW3H • Software Defined Elastic Optical Networks Tutorial (ends at 14:30)</td>
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<tr>
<td>15:00–15:30</td>
<td>Coffee Break</td>
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<tr>
<td>15:30–17:00</td>
<td>AW4A • Group III- Nitride Photonic Devices</td>
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<td>AW4B • Energy Efficient Emitters for Interconnects</td>
<td>AW4C • Fibers and Devices for SDM</td>
<td>AW4D • Brillouin-Based Fiber Sensing</td>
<td>AW4E • Network Subsystems</td>
<td>AW4F • High Capacity Transmission Systems</td>
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<td>AW4H • OFDM Techniques</td>
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<td>17:00–17:30</td>
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<td>18:00–20:00</td>
<td>Welcome Reception at Dragon Boat</td>
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<th>Conference Room 3HI</th>
<th>Conference Room 3G</th>
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08:00–10:00   
- ATh1A • Best Student Paper Award Competition (ends at 09:45)
- ATh1B • Plasmonics
- ATh1C • Fibers for Transmission and OAM
- ATh1D • Optical Fluorescence Microscopy/Spectroscopy
- ATh1E • Best Student Paper Award Competition
- ATh1F • Analog Signal Processing and Transmission
- ATh1G • Software Defined Networks I
- ATh1H • PON
- ATh1I • Best Student Paper Award Competition

10:00–10:30   
- Coffee Break around exhibition area

10:30–12:00   
- ATh2A • Heterogenous Integration (ends at 11:45)
- ATh2B • VCSELS
- ATh2C • Novel Fibers and Devices
- ATh2D • Digital Signal Processing II
- ATh2E • Radio Over Fiber I (ends at 11:45)
- ATh2F • TDMA-PON
- ATh2G • Tissue Optical Imaging
- ATh2H • Novel LED

12:00–13:30   
- Lunch Break

13:30–15:30   
- ATh3A • Poster Session, Mandarin Hall
- Special Symposium II (ends at 17:00)
- ATh3A • Poster Session, Mandarin Hall

16:00–18:00   
- ATh4A • Photonic Integration
- ATh4B • Optical Materials and Novel Devices
- ATh4C • New Perspective of Fibers
- ATh4D • Advanced Modulation Formats
- ATh4E • Long-Haul Transmission
- ATh4F • Software Defined Networks II
- ATh4G • Optical Transport Networks I
- ATh4H • Optical Coherence Tomography
- ATh4I • LED (ends at 17:45)

18:30–21:00   
- Conference Banquet at Seagull Palace
Asia Communications and Photonics Conference and Exhibition (ACP) — Agenda of Sessions

### Friday, 14 November

<table>
<thead>
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<th>Time</th>
<th>Conference Room 5BC</th>
<th>Conference Room 5H</th>
<th>Conference Room 3CD</th>
<th>Conference Room 3E</th>
<th>Conference Room 5DE</th>
<th>Conference Room 5F</th>
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<td>08:00–17:00</td>
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<tr>
<td>08:00–10:00</td>
<td>AF1A • Modulators and Switching</td>
<td>AF1B • Microresonators (ends at 09:45)</td>
<td>AF1C • Nano-Carbon-Based Mode-Locked Fiber Lasers</td>
<td>AF1D • Optical Diagnosis and Therapy</td>
<td>AF1E • Direct Detection &amp; Coherent Transmission</td>
<td>AF1F • High Capacity &amp; SDM Transmission II</td>
<td>AF1G • Software Defined Networks III</td>
<td>AF1H • Optical Transport Networks II</td>
<td>AF1I • Optical Fiber Sensors</td>
<td>AF1J • LED</td>
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<td>10:00–10:30</td>
<td>Coffee Break around exhibition area</td>
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<td>10:30–12:00</td>
<td>Single Photons and Metamaterials</td>
<td>AF2B • Active Devices for Networks</td>
<td>AF2C • Fiber Lasers</td>
<td>AF2D • Transmission Impairments</td>
<td>AF2E • Radio Over Fiber II</td>
<td>AF2F • Optical Trapping and Optical Microscopy</td>
<td>AF2G • Solar Cell &amp; Optics</td>
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<td>12:00–13:30</td>
<td>Lunch Break</td>
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<td>13:30–15:30</td>
<td>AF3A • Microwave Photonics</td>
<td>AF3B • Photonic Devices and Interconnects</td>
<td>AF3C • Nonlinearity in Fibers</td>
<td>AF3D • OAM Transmission and Signal Processing</td>
<td>AF3E • Elastic Networking</td>
<td>AF3F • Fiber Optical Sensors, Biosensors, and Other Optical Sensors (ends at 14:45)</td>
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<td>15:30–16:00</td>
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<td>Postdeadline I</td>
<td>Postdeadline II</td>
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### ACP 2014 — Wednesday, 12 November

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<td><strong>08:00–17:00</strong></td>
<td><strong>Registration Open</strong></td>
<td><strong>Industry Exhibition, Mandarin Hall</strong></td>
<td><strong>Opening Ceremony, Room Auditorium</strong></td>
<td><strong>Coffee Break</strong></td>
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<td><strong>08:00–17:00</strong></td>
<td><strong>Registration Open</strong></td>
<td><strong>Opening Ceremony, Room Auditorium</strong></td>
<td><strong>Coffee Break</strong></td>
<td><strong>Lunch Break</strong></td>
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<tr>
<td><strong>10:40–12:00</strong></td>
<td><strong>Plenary Session, Room Auditorium</strong></td>
<td><strong>Plenary Session, Room Auditorium</strong></td>
<td><strong>Plenary Session, Room Auditorium</strong></td>
<td><strong>Digital Signal Processing I</strong></td>
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<tr>
<td><strong>13:30–15:00</strong></td>
<td><strong>Tutorial</strong></td>
<td><strong>New Fibers for Future Transmission</strong></td>
<td><strong>Optical Fiber Sensing</strong></td>
<td><strong>Real-time Demonstrations of Software Reconfigurable Optical OFDM Transceivers Utilising DSP-based Digital Orthogonal Filters for Channel Multiplexing</strong></td>
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<tr>
<td><strong>13:30–15:00</strong></td>
<td><strong>Semiconductor Lasers</strong></td>
<td><strong>Micropolarization Beam Emitters</strong></td>
<td><strong>Digital Signal Processing I</strong></td>
<td><strong>Invited</strong></td>
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**AW3A • Semiconductor Lasers**  
Presider: Yi LUO; Tsinghua Univ., China

**AW3B • Grating Couplers and Photonic Integrated Circuits**  
Presider: Boon Ooi; King Abdullah Univ of Sci & Technology, Saudi Arabia

**AW3C • New Fibers for Future Transmission**  
Presider: Jian Wang; Huazhong Univ of Science and Technology, China

**AW3D • Optical Fiber Sensing**  
Presider: Kazuo Hotate; Univ. of Tokyo, Japan

**AW3E • Digital Signal Processing I**  
Presider: Lianshan Yan; Southwest Jiaotong Univ., China

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**AW3A.1 • 13:30**  
28×100GHz Wavelength Tunable Semiconductor Laser based on Cascaded Half-Wave-Coupled Rectangular Ring Resonators, Lin Wu, Xiaolu Liao, Zhipeng Hu, Jian-Jun He, Dept of Optical Engineering, Zhejiang Univ., China. We report our latest experimental results of a tunable semiconductor laser based on two cascaded half-wave-coupled rectangular ring resonators. Wavelength tuning of 28 channels with 100GHz spacing is demonstrated with side mode suppression ratio up to 41dB. The wavelength ranges from 1561.3nm to 1583.1nm.

**AW3B.1 • 13:30**  
Coupled Mode Analysis of Angular Grating-Based Optical Vortex Beam Emitters, Ning Zhang, Jianbo Zhu, Xinlin Cai, Siyuan Yu, Univ. of Bristol, UK; Sun Yat-sen Univ., China; Fudan Univ., China. We develop a model for angular grating-based optical vortex emitters based on the cylindrical coupled-mode theory. The guided and radiated modes are calculated, and the impact of grating size on the radiation power is discussed.

**AW3C.1 • 13:30**  
Multi-core Fiber for Space Division Multiplexing, Kunimasa Saitoh, Graduate School of Information Science and Technology, Hokkaido Univ., Japan. Multi-core fibers (MCFs) are expected as a good candidate for overcoming the capacity limit of current optical communication system. In this tutorial, technical challenges and prospect of uncoupled MCFs for space-division multiplexing (SDM) are presented.

**AW3D.1 • 13:30**  

**AW3E.1 • 13:30**  
Real-time Demonstrations of Software Reconfigurable Optical OFDM Transceivers Utilising DSP-based Digital Orthogonal Filters for Channel Multiplexing, Roger P. Giddings, Xiao Duan, Mario Bolea, Yun Ling, Saad Mansoor, Jianming Tang, Bangor Univ., UK; UESTC, China. Real-time OFDM transceivers with software-controlled reconfigurability and adaptability are experimentally demonstrated, for the first time, utilising FPGA-based digital orthogonal filters. Impacts of transceiver's networking operations on BER performance are examined in 25km SSMF IMDD systems.

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Kunimasa Saitoh is a Professor at Graduate School of Information Science and Technology, Hokkaido University, Japan. His research interests
ACP 2014 — Wednesday, 12 November

Conference Room 5F
13:30–15:00
AW3F • SDM Transmission I
Presider: TBD

Conference Room 5I
13:30–15:00
AW3G • Free Space Communications
Presider: Jie Zhan, Beijing University of Posts and Telecommunications, China

Conference Room 5J
13:30–15:00
AW3H • Software Defined Elastic Optical Networks Tutorial
Presider: Frank Effenberger; FutureWei Technologies, Inc., USA

Conference Room 3HI
13:30–15:00
AW3I • Optical Sensors
Presider: Long Jin; Jinan Univ., China

Conference Room 3G
13:30–15:00
AW3J • Growth & Characterization
Presider: Yi Luo; Tsinghua Univ., China

13:30–15:30
Lunch Break

AW3F.1 • 13:30

AW3G.1 • 13:30
Multi-Period Topology Planning for Microwave-Based Wireless Backhaul Networks, Anliang Cai’, Guangyi Qiao’, Yongcheng Li’, Lei Shi’, Gangxiang Shen’, ‘Soochow Univ., China; ‘Huawei Technology China. We consider multi-period optimal topology planning for microwave-based wireless backhaul networks. We develop an ILP model and an efficient heuristic algorithm. Our studies show that the proposed heuristic approach is efficient to plan for the multi-period microwave wireless backhaul network whose total cost is close to that of the ILP model.

AW3H.1 • 13:30
Invited
Software Defined Elastic Optical Networking in Temporal, Spectral, and Spatial Domains, S. J. Ben Yoo1, ‘Univ. of California Davis, USA. We will discuss architectures, systems, and technologies for elastic optical networking. Control and management planes, RMAs, defragmentation, and elastic space/time/frequency techniques involving OAWG and OAM will also be covered.

AW3I.1 • 13:30
Invited
Directional Control of Plasmonic Waves and Vortices for Potential Sensor Applications, Byoungho Lee1, Seung-Yeol Lee2, Kyukeun Lee3, ‘National Creative Research Center for Active Plasmonics Application Systems, Seoul National Univ., Republic of Korea. Various methods of using plasmonic directional launching and vortex generation for potential applications of surface plasmon resonance based sensors are described.

AW3J.1 • 13:30
Invited
Heteroepitaxial growth and characterization of compound semiconductors, Qixin Guo1, ‘Saga Univ., Japan. ZnTe layers were successfully grown on (0001) sapphire and GaAs substrates by metalorganic vapor phase epitaxy. The emission of THz radiation with a spectral distribution up to 40 THz was observed from the ZnTe layers. The structural and optical properties of the obtained ZnTe layers were reported.

S. J. Ben Yoo is a Professor of Electrical Engineering at University of California at Davis (UC Davis). His research at UC Davis includes future Internet, Software-Defined Cyberinfrastructure, elastic optical networking, heterogeneous net-
Temporary Grating Coupler Structures Using Localised Refractive Index Engineering, Rob P. Topley1, Gregorio Martinez-Jimenez2, Liam O’Faolain3, Noel Healy4, 5Sakellaris Mallis3, D. J. Thomson4, F.Y. Gardes1, Anna C. Peacock1, David N. R. Payne1, Goran Z. Mashanovich1, Graham T. Reed3, I/ORC, Univ. of Southampton, UK; 2School of Physics and Astronomy, Univ. of St. Andrews, UK; 3FCS, Univ. of Southampton, UK. We demonstrate an erasable grating coupler which allows optical device testing throughout the fabrication process without impairing final circuit performance. Refractive index variation is introduced using ion implantation and can be subsequently removed using laser annealing.

Recent Progress in Integrated Photonic Orbital Angular Momentum Devices, Siyuan Yu2, 3Slate Key Lab of Optoelectronic Materials and Technologies, 2SUN Yet-sen Univ., China; 3Photonic Group, Univ. of Bristol, UK. In this talk we present current progress in the research of integrated photonic orbital angular momentum devices summarised in theoretical, numerical and experimental fronts.

A C P 2 0 1 4 — W e d n e s d a y , 1 2 N o v e m b e r

AW3A.3 • 14:00
Wide Temperature Range Operation of 1.3-um Directly Modulated High Speed DFB Lasers, Hao Wang1, 2Wang Huitao1, Rui Kang Zhang1, Dan Lu1, Baoqin Wang1, Hangliang Zhu1, Wei Wang1, Chen Ji1, 1Inst. of Semiconductors, Chinese Academy of Science, China. We report the fabrication and systematic characterization of a high speed 1.3 um DFB laser with excellent 10G-85C performance: 3dB up to 26.1GHz, power up to 38mW, SMSR beyond 50dB.

AW3A.4 • 14:15
Thermally Tuned V-Cavity Tunable Laser with On-Chip Thin-Film Heater, Jianjun Meng1, Haoyu Deng1, Jian-Jun He1, 1Zhejiang Univ., China. We report a V-cavity tunable laser thermally tuned by an on-chip thin-film strip resistor. Thermal tuning of 15 channels with 100GHz spacing is demonstrated with side mode suppression ratio over 36dB.

AW3B.2 • 13:45
Invited
Microstructured Fibers Optimized for Transverse Load and Pressure Sensing, Thomas Geernaert1, Sanne Sulejmani2, Camille Sonnenfeld3, Geert Luypaerts2, Joris Degrieck1, Karima Chaht4, Martin Becker5, Hugo Thielsch5, 1Brussels Photonics Team, Vrije Universiteit Brussel, Belgium; 2Dept. of Materials Science and Engineering, Universiteit Gent, Belgium; 3Dept. of Electromagnetism and Telecommunications, Université de Mons, Belgium; 4Inst. of Photonic Technology, Germany. Microstructured fiber Bragg grating sensors allow measuring transverse strains and hydrostatic pressures with an order of magnitude higher sensitivity than conventional birefringent fibers. They have applications in pressure sensing, 3D strain measurements and disbond monitoring.

AW3B.3 • 14:00
Invited
Microstructured Fibers Optimized for Transverse Load and Pressure Sensing, Thomas Geernaert1, Sanne Sulejmani2, Camille Sonnenfeld3, Geert Luypaerts2, Joris Degrieck1, Karima Chaht4, Martin Becker5, Hugo Thielsch5, 1Brussels Photonics Team, Vrije Universiteit Brussel, Belgium; 2Dept. of Materials Science and Engineering, Universiteit Gent, Belgium; 3Dept. of Electromagnetism and Telecommunications, Université de Mons, Belgium; 4Inst. of Photonic Technology, Germany. Microstructured fiber Bragg grating sensors allow measuring transverse strains and hydrostatic pressures with an order of magnitude higher sensitivity than conventional birefringent fibers. They have applications in pressure sensing, 3D strain measurements and disbond monitoring.

AW3C.2 • 13:45
Stage-dependent Minimum Bit Resolution Maps of Full-parallel Pipelined FFT/IFFT for Real-time Optical OFDM Transceivers, Jianming Tang1, Junjie Zhang1, 2K. Wang2, Wenyuan Yuan3, Bin Yao3, Roger Giddings1, Min Wang2, 1Bangor Univ., UK; 2Key Lab of Specialty Fiber Optics and Optical Access Networks, Shanghai Univ., China. Maps of FFT/IFFT stage-dependent minimum bit resolutions against ADC/DAC resolutions and modulation formats are numerically identified and experimentally verified, which ease OOFDM transceiver designs and reduce FPGA logic resource usages without degrading overall transceiver performances.

AW3C.3 • 14:00
Digital Signal Processing Techniques Enabling Optical Fiber Transmission with Improved Performance, Xiang Liu1, 2America Research Center, Huawei Technologies, USA. We review recent progresses on the use of digital signal processing techniques to improve the overall performance of optical fiber transmission systems, in terms of spectral efficiency, sensitivity, flexibility, tolerance to fiber nonlinearity, and cost-effectiveness.

Xiang Liu is a Principal Engineer in Huawei’s America Research Center, focusing on next-generation optical access technologies. Prior to this, he was a Distinguished Member of Technical Staff at Bell Labs New Jersey, working on high-speed optical fiber communication. Xiang has authored/coauthored more than 270 journal and conference papers, with over 7,000 citations according to Google Scholar, and holds over 50 US patents. Dr. Liu is a Fellow of the OSA and an Associated Editor of Optics Express. He has served in the technical committees of several international optical communication conferences such as OFC, ACP, and WOCC.
Components that Enable Space Division Multiplexing, Nicolas K. Fontaine; ‘Alcatel-Lucent Bell Labs, USA. The success of spatial multiplexing depends on highly integrated and cost effective devices and components. We compare the strengths and weaknesses of SDM components including silicon photonics, 3D waveguides, all-fiber mode-multiplexers, and bulk-optics wavelength selective switches and gain equalizers.

Indoor High speed Non-Imaging MIMO-OFDM Visible Light Communication with White LEDs, Yiqian Chen, Chao Yang, Qi Yang, Wu Liu, Dawei Zhang; ‘Huazhong Univ. of Science and Technology, China; ‘Wuhan Research Inst. of Post & Tele, China. A practical indoor 2x2 Non-Imaging MIMO-OFDM VLC system based on white phosphor-LEDs is experimentally demonstrated for the first time. The overall data rate of 500 Mbit/s is achieved at beyond 2m with BER below the FEC threshold of 3×10⁻³.

Ultra-high sensitive integrated optical sensor based on triangular resonator with surface plasmon resonance, Young-Wan Choi, Geum-Yoon Oh; ‘Hong-Seung Kim; ‘Tae-Ryong Kim; ‘Doo-Gun Kim; ‘Chung Ang Univ., Republic of Korea. ‘Korea Photonics Technology Inst., Republic of Korea. We have proposed surface plasmon resonance(SPR)-combined triangular resonator for ultra-high sensitive sensor. InP-based triangular resonator, in which a gold thin film for SPR phenomenon is applied on a total internal reflection mirror, is designed and optimized.
Conference Room SBC

AW3A.5 • 14:30
A Directly Modulated Colorless Laser Diode for the M-ary-QAM OFDM Transmission, Cheng-Ting Tsai1, Min-Chi Cheng1, Yu-Chieh Chi1, Chung-Yu Lin1, Hong-Ru Lin1; ‘National Taiwan Univ., Taiwan. The M-ary-QAM OFDM transmission by using a directly modulated colorless laser diode with its noise suppressed and wavelength controlled by the external injection is demonstrated with a BER of $<3 \times 10^{-9}$ after the 25-km transmission.

AW3A.6 • 14:45
Mode Analysis for AlGaNAs/InP Square Microlasers Confined by P-electrode Metals or BCB Layer, Heng Long1, Ling-xiu Zou1, Jin-Long Xiao1, Xiao-meng Lv1, Yue-De Yang1, Yun Du1, Yong-Zhen Huang1; ‘Inst. of Semiconductors, Chinese Academy of Sciences, China. AlGaNAs/InP square resonator microlasers laterally confined by the p-electrode metals or BCB layer with a vertex output waveguide are investigated numerically and experimentally. Dual-mode operation is realized, which will be a promising microwave signal source.

Conference Room 5H

AW3B.4 • 14:30 Invited
Large Scale Switching and Polarization Control in Photonic Integrated Circuits on InP and Si, Yoshiaki Nakano1, Takuo Tanemura1; ‘Dept. of Electrical Engineering and Information Systems, Univ. of Tokyo, Japan. Our research on optical phased-array switches on InP and Si substrates is reviewed, including a strictly non-blocking 8×8 switch on InP. We demonstrate nanoseconds reconfiguration time, ultra-broad optical bandwidth covering the entire C-band, and error-free transmission of 40-Gbps (10-Gbps × 4ch) WDM signal. Then, our recent activity to manipulate polarizations in photonic integrated circuits is reviewed, such as development of half-ridge InP/InGaAsP polarization converters and their integration with active devices.

AW3C.2 • 14:30 Invited
Hollow Core Fibre Technology for Data Transmission, Francesco Poletti1, Gregory T. Janson1, Eric Numkami1, Reza S. Sardoughchi1, Yong Chen1, Natalie V. Wheeler1, Naveen K. Baddela1, John R. Hayes1, Tom Bradley1, Marco N. Petrovitch1, David J. Richardson1; ‘Optoelectronics Research Centre, Univ. of Southampton, UK. We review our recent progress in developing hollow core photonic bandgap fibers for high capacity data transmission. Novel numerical and characterization tools developed to improve fiber performance and yield will be discussed.

Conference Room 3CD

AW3D.3 • 14:30
Hybrid single-polarization fiber ring resonator and implications for resonant fiber optic gyro, Yuchao Yan1, Linglan Wang1, Huiian Ma1, Zhonghe Jin1, ‘Micro-Satellite Research Center, Zhejiang Univ., China. A novel hybrid single-polarization fiber ring resonator is demonstrated for reducing the polarization error in a resonant fiber optic gyro. A bias stability below 0.1°/h with an integration time of 100 s has been carried out.

AW3D.4 • 14:45
Characterization of in-line interferometric based temperature sensors in two-mode fibers, Yifei Wang2, An Li1, Xi Chen1, Qian Hu3, William Shieh2; ‘Victoria research Lab, Australia; 2The Univ. of Melbourne, Australia. We have experimentally demonstrated interferometric temperature sensors in two-mode fiber (TMF). A wavelength-temperature coefficient of -43.232 pm per degree centigrade has been characterized. Compared with the wavelength-temperature sensitivity of single-mode fiber (SMF) sensor, TMF sensor has its advantages of high sensitivity.

Conference Room 3E

Conference Room 5DE

15:00–15:30 Coffee Break around exhibition area
MIMO Transmission Over Multimode Fibers, Roland Ryf1, Nicolas K. Fontaine2, Alcatel-Lucent, USA. We present recent experimental results in mode-division multiplexed transmission over few-mode and conventional graded-index multimode fibers. We use photonic lanterns as mode multiplexers and coherent MIMO digital processing for the data recovery.

AW3G.4 • 14:30
An Indoor Positioning System Based on Cross-correlation in Visible Light Communication, Wu Lu1, Chao Yang1, Yiqin Chen2, Qi Yang1, Dawei Zhang1; 1Wuhan Research Inst. of Post & Tele, China; 2Huazhong Univ. of Science and Technology, China. The cross-correlation algorithm is adopted in an indoor optical positioning system using LEDs. After compensating the estimated distance, a max 11-cm positioning error is experimentally achieved with trilateration at 2 m distance.

AW3G.5 • 14:45
A Neighbor Discovery Protocol in Ultraviolet Wireless Networks, Yanbing Zhao1, Yong Zuo1, Heng Qin1, Xiaohui Zhang1, Qi An1, Jian Wu1; 1Beijing Univ. of Posts and Telecommunications, China. A credit-collection based neighbor discovery protocol with an efficient feedback mechanism for ultraviolet wireless networks is proposed. Simulations manifested that the protocol can provide good performance in terms of fast discovery speed.

Investigation of temperature independence in highly sensitive fiber strain sensor based on microfiber interferometer, Nan-Kuang Chen1,2, Shu-Wei Chuang1, Kuen-Yi He1, Yi-Ning Chen1; 1Dept. of Electro-Optical Engineering, National United Univ., Taiwan; 2Optoelectronics Research Center, National United Univ., Taiwan. We investigate temperature characteristics of strain sensors based on stretched abrupt-tapered microfiber with tapered diameter of 2.8μm. The strain sensitivity is significantly enhanced to 6.01 nm/με by properly choosing tapered diameter at a wavelength scale.

Mach-Zehnder Interferometer using Small Diameter Single Mode Fiber for Refractive Index Sensing, Farid Ahmed1, Martin Jun2, Hang-Eun Joe2, No-Cheol Park2, Byung-Kwon Min2; 1Mechanical Engineering, Univ. of Victoria, Canada; 2Mechanical Engineering, Yonsei Univ., Republic of Korea. Temperature insensitive Mach-Zehnder interferometer (MZI) based fiber-optic sensor is constructed by fusion splicing a small diameter single mode fiber between two regular single mode fibers (SMF). Refractive index sensitivity of the sensor is 53.24 nm/RIU.

15:00–15:30 Coffee Break around exhibition area
### Conference Room 5BC

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<tr>
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<td>A4W4A • Group III-Nitride Photonic Devices</td>
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<td>A4W4C • Energy Efficient Emitters for Interconnects</td>
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<td>President: Anjin Liu; Institute of Semiconductors, Chinese Academy of Sciences, China</td>
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<td>A4W4B • Energy Efficient Emitters for Interconnects</td>
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<td>President: Anjin Liu; Institute of Semiconductors, Chinese Academy of Sciences, China</td>
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<td>A4W4D • Brillouin-Based Fiber Sensing</td>
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<td>President: Luc Thevenaz; Ecole Polytechnique Federale de Lausanne, Switzerland</td>
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<td>15:30–17:00</td>
<td>A4W4 • Network Subsysytems</td>
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<td>President: Naoya Wada; NICT, Japan</td>
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**AW4A.1 • 15:30 Optical Gain and Absorption of 420 nm InGaN-based Laser Diodes Grown on m-plane GaN Substrate, Chao Shen, Tien Khee Ng, Bilal Janjua, Ahmed Alyamani, Munir M. El-Desouky, James Speck, Steven DenBaars, Boon Ooi, Electrical Engineering, King Abdullah Univ. of Science & Technology, Saudi Arabia; King Abdulaziz City for Science and Technology, Saudi Arabia; Materials Dept., Univ. of California, Santa Barbara, USA. Segmented contact method was utilized to measure the gain and absorption spectra at below and above threshold for 420nm m-plane InGaN/GaN laser diode with a comparatively higher peak modal gain of 29.2 cm-1.**

**AW4A.2 • 15:45 On-chip Optical Interconnects using InGaN Light-Emitting Diodes Integrated with Si-CMOS, Bing Wang, Li Zhang, Wenjia Zhang, Cong Wang, Kenneth E. Lee, Jurgen Michel, Soo-Jin Chua, Li-Shuihan Peh, Low Energy Electronic Systems, SMIIT, Singapore; Graduate School for Integrative Sciences and Engineering, National Univ. of Singapore, Singapore; School of Electrical and Electronic Engineering, Nanyang Technological Univ., Singapore; Microphotonics Center, Massachusetts Inst. of Technology, USA; Dept. of Electrical Engineering and Computer Science, Massachusetts Inst. of Technology, USA. We propose and design on-chip optical interconnects using InGaN light-emitting diode light source within an integrated process platform with Si-CMOS circuits. The device and system design, simulation, processing, and preliminary results are presented.**

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**James A. Lott is a professor at the Technische Universität Berlin (Germany). Educated in engineering and computer sciences at the University of California at Berkeley and at the University of New Mexico (USA), he was previously at Sandia National Laboratories, Intel, and a small scattering of Silicon Valley technology companies. He has been a visiting researcher at the NEC Optoelectronics Research Laboratories (Japan) and at the Samsung Electronics Company (Republic of Korea). He and his students and collaborators make scientific contributions in applied solid-state physics including nanophotonics, semiconductor materials, optoelectronic devices, and integrated circuits and systems.**

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**AW4C.1 • 15:30 Tutorial Energy Efficient Emitters for Computer Interconnects, J.A. Lott, P. Moser, D. Birnberg: Institut für Festkörperphysik und Zentrum für Nanophotonik, Technische Universität Berlin, Germany; King Abdulaziz University, Saudi Arabia. We review key design principles, modeling techniques, and state-of-the-art performance of vertical-cavity surface-emitting lasers (VCSELs) for use in computer optical interconnects (OIs). We compare our VCSELs to emerging, alternative nanolaser concepts.**

**AW4C.2 • 15:45 Elasticity for Dynamic Recovery in OTN Networks, Annalisa Morea, Gabriel Charlet, Dominique Verchere, Alcatel-Lucent, France. The new paradigm “just-enough recovery” leverages the datarate adaptation of elastic optical devices and the option to delay the delivery time of best-effort services. Service availability is maintained for gold traffic with ~35% cost reductions.**

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**AW4D.1 • 15:30 Fiber Distributed Brillouin Sensing with Optical Correlation Domain Techniques, Kazuo Hotate: The Univ. of Tokyo, Japan. By applying correlation domain techniques to Brillouin scattering in optical fibers, distributed sensing for strain and/or temperature has been realized with mm-order resolution, kHz-order sampling-rate, and random accessibility. Strain/temperature discriminative measurement has also been demonstrated.**

**AW4D.2 • 15:45 Coherent OFDM-PON using Intensity Modulation and Heterodyne Detection, Rong Hu, Qi Yang, Ming Luo, Jie Li, Xi Xiao, Cai Li, State Key Lab of Optical Comm. Technologies and Networks, Fiber Home, China. A computationally efficient coherent OFDM-PON is proposed using intensity modulation and heterodyne detection. No frequency and phase recoveries are needed. A 12.6-Gb/s transmission is demonstrated with 16-QAM format in the 12.5-GHz grid.**
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<td>AWF4 • High Capacity Transmission Systems</td>
<td>AWF4G • Data Center Networks</td>
<td>AWF4H • OFDM techniques</td>
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<td>President: Juerg Leuthold; ETH Zurich, Switzerland</td>
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<td>President: Byounghee Lee; Seoul National Univ., Korea, Republic of</td>
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**AWF4.1 • 15:30**
Non-Dispersion Compensated Transmission of 103-Gb/s Coherent PDM-OFDM/OQAM-128QAM Signal within 10-GHz Optical Grid over 240-km SSF, Zhiyue He1,2; Chao Li1,2; Ming Luo1,2; Qi Yang1,2; Shaohua Yu1; 1School of Optical and Electronic Info, Huazhong Univ. of Science and Technology, China; 2State Key Lab of Optical Comm. Technologies and Networks, Wuhan Research Inst. of Post & Telecommunication, China. We experimentally demonstrated a polarization division multiplexing (PDM) 103-Gb/s of OFDM/OQAM-128QAM signal over 240-km standard single mode fiber (SMF) within a 10-GHz optical grid without dispersion compensation using coherent detection. The spectral efficiency we achieved is as high as 10.73 bits/s/Hz.

**AWF4.2 • 15:45**
Dispersion-Penalty-Free Transmission of a net 13.9-Gb/s 64QAM-OFDM Signal over 100-km SSF using a 1550-nm XFP-RF Transmitter with 2.5-GHz RF Bandwidth, Naresh Chand1, Xiang Liu1, Frank Effenberg1; 1America Research Center, Huawei Technologies, USA. Using a wavelength-tunable transmitter that monolithically integrates DBR laser, semiconductor optical amplifier and Mach-Zehnder modulator, we demonstrate net 13.9-Gb/s 64QAM-OFDM transmission over 100-km SSF with 28-dB loss budget and no dispersion penalty for flexible PON.

**AWF4.3 • 15:30**
Advanced Photonic Switching Technologies for Big Data Network Infrastructure, Qnui Huang; Inst. for Infocomm Research, Singapore. Abstract not available.

**AWF4.4 • 15:30**
Demonstration of Coexistence of Legacy Video and OFDM-PON in the Video Wavelength Band for Enhancing the Throughput and Flexibility of TDM PON Systems, Naresh Chand1, Xiang Liu1, Guokai Peng1, Lin Zhou1, Frank Effenberg1; 1Huawei Technologies, USA; 2Huawei Technologies, China. We experimentally demonstrated the coexistence of OFDM-PON with legacy video to more than double the aggregate downstream speed to >10Gb/s, achieving 26.6-dB loss budget after 20-km SSF transmission with no change to the video system.

**AWF4.5 • 15:45**
Software Reconfigurable Digital Filter Multiple Access PONs, Jianming Tang1,2, Marie Boileau3, Roger Giddings3; 1Bangor Univ., UK; Digital filter multiple-access PONs are, for the first time, proposed and evaluated, where ONUs share the medium by FPGA/ASIC-based orthogonal filters. Identical upstream performances, adaptability to link conditions and 10dB differential power ranges are achievable.

**AWF4.6 • 15:30**
High-performance Dual-frequency DBR Fiber Lasers for Sensing Applications, Long Jin1, Lirhao Cheng1, Yuh Liang1, Baorui Guan1, Jiaman Univ., China. This paper describes the fabrication, sensitivity characteristics, transducer design and multiplexing of fiber DBR heterodyning sensors, which simultaneously presents advantages including high measurement resolution/sensitivity, low demodulation cost, and the multiplexing capability.

**AWF4.7 • 15:30**
Epitaxy of InGaN random and digital alloys towards solar cells, Xinqiang Wang1,2, Xiantong Zheng1, Ping Wang1, Xin Rong1, Bo Shen1; 1School of Physics, Peking Univ., China; 2Peking Univ., China. In this talk, we will report the growth of random InGaN alloy. In addition, to improve crystalline quality of InGaN, digital InGaN alloy is proposed and the experimental result will be reported as well.
**Conference Room 5BC**

**AW4A.3 • 16:00** Invited

Electrically Injected InGaN/GaN Disk-in-Nanowire Lasers Monolithically Grown on (001) Silicon, Thomas Frost, Shafat Jahangir, Ethan Stark, Pallab K. Bhattacharya, Electrical Engineering and Computer Science, Univ. of Michigan, USA. The growth and characteristics of a monolithically grown, electrically injected InGaN/GaN disk in nanowire edge emitting green laser (λ = 533 nm) operating at room temperature are demonstrated.

**AW4A.4 • 16:30** Invited

Group III-Nitride Semiconductor Nanostructures for Novel Photonic and Quantum Photonic Applications, Yong-Hoon Cho, Je-Hyung Kim, Young-Ho Ko, Suk-Min Ko, Su-Hyun Gong, Inst. of Semiconductor Nanotechnology, Korea. We present group III-nitride semiconductor nanostructures grown on various types of GaN-based pyramid, annular, columnar, and tapered structures, together with their applications in broadband light emitting devices, unidirectional photonic diodes, and single photon sources.

**Conference Room 5H**

**AW4C.2 • 16:00** Invited

A Twelve-wavelength Hybrid Microdisk Laser Array Coupled to a SOI Bus Waveguide, Shao Shuai Sui, Ming-Ying Tang, Yun Du, Yue-De Yang, Yong-Zhen Huang, Inst. of Semiconductors, China. We report a twelve-wavelength hybrid microdisk laser array coupled to a SOI bus waveguide through DVS-BCB bonding technique. Twelve-wavelength output is achieved with channel spacing of about 1.3 nm, and the thermal resistance of 3.17 K/mW is predicted.

**Conference Room 3CD**

**AW4C.3 • 16:30**

A New and Simple Method for Crosstalk Estimation in Homogeneous Trench-Assisted Multi-Core Fibers, Feihong Ye, Jiajing Tu, Kunimasa Saitoh, National Institute of Information and Communications Technology, Japan. We present a new and simple method for inter-core crosstalk estimation in homogeneous trench-assisted multi-core fibers. The crosstalk calculated by this method agrees well with experimental measurement data for two kinds of fabricated 12-core fibers.

**Conference Room 3E**

**AW4D.2 • 16:00** Invited

Brillouin Light Scattering in Plastic Fibers, Yusuke Mazuno, Neisei Hayashi, Kentaro Nakamura, Precision and Intelligence Lab, Tokyo Inst. of Technology, Japan. We review the unique properties of Brillouin light scattering in plastic fibers at telecom wavelength, and present our recent research progress and future prospects on distributed strain/temperature sensing based on Brillouin scattering in plastic fibers.

**Conference Room 5DE**

**AW4E.3 • 16:15** Invited

Emergent Integration and Control of Multi-Vendor Optical Networks, Sugang Xu, Noboru Yoshikane, Masaki Shiraawa, Takehiro Tsutsumi, Hiroaki Harai, Yoshinari Awa, Naoya Wada, NICT, Japan; XDD R&D Labs Inc., Japan. We demonstrate the emergent integration and control of survivable multi-vendor optical systems after huge-disasters. Interconnecting surviving multi-vendor networks is not only feasible but also the most cost-efficient approach to the quick disaster recovery.
ACP 2014 — Wednesday, 12 November

Conference Room 5F

AW4F.3 • 16:00 • Invited
100 Gbps Multi-Band OFDM Transmission over 1000 km of G.652 Fibre and a Cascade of Five Sub-Wavelength OADMs, Mergdi Song1, Erwan Pincecin1, Julie Karaki1, Alain Poudoulec2, Nicephore Nicolas1, Michel Van der Keur3, Yves Jacquet3, Raphael Le Bidart1, Philippe Gravey1, Michel Morvan1, Gwillem Froc1, 1Orange Labs Networks, France; 2Telecom ParisTech, France; 3Telecom Bretagne, France. We study here the impact of sub-wavelength optical filtering on 100 Gbps coherent multi-band OFDM transmission system. Error-free transmission is achieved after 1000 km of uncompensated G.652 fibre line and a cascade of five optical add-drop multiplexers.

Conference Room 5I

AW4G.2 • 16:00 • Invited
Scalable Data Center Networks for Future Large-Scale Cloud Applications, Fei Xiao1, Yanli Zhang1, Yun Shi1, Changde Li1, Bin Wu1, Hong Wen1, Xiaohong Jiang1, Tianjin Univ., China; 2Univ. of Electronic Science and Technology of China, China; 3Beijing Inst. of Satellite Information Engineering, China; 4Future Univ. Hakodate, Japan. We propose a scalable DCN architecture with distributed placement of optical switches and racks to remove the key scalability constraints. It is adopted in a survivable network of DCNs to support large-scale cloud applications.

Conference Room 5J

AW4H.3 • 16:00 • Invited
A Flexible Allocation Fast OFDM Passive Optical Network System Based on Bit and Power Loading, Dongqiang Wang1,2, Cheng Lei1, Minghua Chen1,2, Hongwei Chen1,2, Sigang Yang1,2, Shihong Xie1,2, Tsinghua National Lab for Information Science and Technology, China; 2Electronic Engineering, Tsinghua Univ., China. We demonstrate an OFDM-PON system with bit and power loading. ONU s are allocated OFDM signals with different modulation formats and achieve almost the same system performance. A 10Gb/s transmission experiment is also established.

Conference Room 3HI

AW4L.2 • 16:00 • Invited
Towards Picoliter Microsensing in Fiber Optics, Nan-Kuang Chen1, Optoelectronics Research Centre, Taiwan. Abstract not Available

Conference Room 3G

AW4L.3 • 16:30 • Invited
Dual Core Optical Fiber for Distributed Brillouin Fiber Sensors, Ming-Jun Li1, Shenping Li1, James A. Derick1, Jeffery S. Stone1, Bruce C. Chow1, Kevin W. Bennett1, Dawn M. Sutherland1, Corning Incorporated, USA. A dual core optical fiber is designed and fabricated for simultaneous measurements of strain and temperature in distributed Brillouin sensors. Brillouin frequency shift difference of 120 MHz between the two cores is demonstrated.
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<td><strong>AW4D.4 • 16:45</strong></td>
<td><strong>AW4E.4 • 16:45</strong></td>
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<td>Configuration of an optical transmitter enabling wavelength- and mode-division multiplexed on-chip optical-interconnects, Daohin Dai, Zhejiang Univ., China. Configuration of an optical transmitter for realizing a two-dimensional hybrid multiplexing technology is proposed to enable the wavelength-division-multiplexing and mode-division-multiplexing technologies simultaneously.</td>
<td>Mode Converter with Polymer Long-Period Waveguide Grating, Yu Yang, Kaixin Chen, Wei Jin, Kim S. Chiang, The Key Lab of Optical Fiber Sensing and Communications, Education Ministry of China, Univ. of Electronic Science and Technology of China, China; Dept. of Electronic Engineering, City Univ. of Hong Kong, Hong Kong. We propose a mode converter between the two lowest-order core modes based on a polymer-waveguide long-period grating. Our fabricated device shows a conversion efficiency of 99% at ~1550nm with a thermal tuning sensitivity of ~5nV/°C.</td>
<td>Ultra-Simple Setup for Distributed Brillouin Sensing, Nisei Hayashi, Yosuke Mizuno, Kentaro Nakamura, Precision and Intelligence Lab, Tokyo Inst. of Technology, Japan. We develop a simple configuration of Brillouin optical correlation-domain reflectometry (BOCDR), named S-BOCDR, in which Fresnel-reflected light is used as reference light. After clarifying the theoretical performance limitations, a distributed strain measurement is demonstrated.</td>
<td>12.5-GHz Spaced Downstream Transmitter for Long Reach DWDM-PON, Yunhao Zhang, Zhao Zhou, Xiao shilin, Dept. of Electronic Engineering, Shanghai Jiao Tong Univ., State Key Lab of Advanced Optical Commmunication System and Networks, China. An downstream transmitter based on comb source and injection-seeding scheme is proposed for long reach DWDM-PON with 12.5-GHz channel spacing. RSOAs are used in OLT and 1.25-Gbps data is directly modulated on each channel. The experimental results show that transmission over 150-km SMF is achieved.</td>
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**NOTES**
Determination of Brillouin Dynamic Grating Spectrum Localized by the Correlation Domain Technique through Fourier Transformation, Rodrigo K. Yamashita¹, Masato Kishi¹, Kazuo Hotate¹, Electrical Engineering and Information Systems, Univ. of Tokyo, Japan. We propose a Fourier transformation based method to calculate the shape of Brillouin dynamic grating spectrum, when the grating is localized by the correlation domain technique. The simulation results match with experimental data reported previously.
Table 1: Schedule of Talks and Competitions at the Conference

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<td>08:00–09:45</td>
<td>ATh1A • Design and Fabrication of An 8x500GHz InP-Based Echelle Grating Wavelength Multiplexer, Ge Mu1, Lin Wu1, Jian-Jun He1, 2Dept. of Optical Engineering, Zhejiang Univ., China. We present an 8x500GHz echelle grating multiplexer on InGaAsP/InP platform in 1550nm wavelength band. The insertion loss of the device is 8.2dB and the adjacent channel crosstalk ranges from 20dB to 25dB.</td>
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<td>08:00–09:45</td>
<td>ATh1B • Plasmonics</td>
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<td>Presider: Cun-Zheng Ning; Arizona State Univ., USA</td>
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<td>08:00–10:00</td>
<td>ATh1C • Ultra-low Loss Fiber for 100G-based Trans-oceanic Transmission, Masaki Hirano1, Sumitomo Electric Industries Ltd., Japan. In order to realize trans-oceanic high capacity transmissions, the lowering of transmission loss of optical fiber is crucially important. In this paper, recent realization of pure-silica-core fibers having 0.15dB/km at 1550nm is discussed.</td>
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<td>08:00–10:00</td>
<td>ATh1D • Multiphoton imaging of mouse brain in vivo, Chris Xu1, 2School of Applied and Engineering Physics, Cornell Univ., USA. Deep tissue multiphoton microscopy (MPM) of mouse brain structure and function is presented. The challenges and opportunities for high spatial resolution, in vivo deep brain imaging are discussed.</td>
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<td>08:00–09:45</td>
<td>ATh1E • Best Student Paper Award Competition</td>
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<td>Presider: William Shieh; Univ. of Melbourne, Australia</td>
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<td>08:00–10:00</td>
<td>ATh1F • Bidirectional Arrayed Waveguide Grating (De)multiplexer Integrated with an Optical Interleaver for Doubling the Channels, Sitao Chen1, Xin Fu1, Yaosheng Shi1, Sailing He1, Daxin Dai1, 1Centre for Optical and Electromagnetic Research, State Key Lab for Modern Optical Instrumentation, Zhejiang Provincial Key Lab for Sensing Technologies, Zhejiang Univ., China. A novel wavelength division multiplexer is designed and demonstrated to achieve doubled channel number and halved channel spacing for an arrayed-waveguide grating by utilizing an optical interleaver integrated.</td>
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<td>08:00–10:00</td>
<td>ATh1G • A Sensitivity Improvement Channel Estimation Algorithm for Direct Detection OQAM-OFDM Systems, Lu Zhang1, Meihua Bi1, Xiaol Shilin1, Ling Liu1, Binlin Hu1, 1State Key Lab of Advanced Optical Communication System and Networks, Shanghai Jiao Tong Univ., China. We propose and experimentally demonstrate a novel channel estimation algorithm based on the interference-approximation preamble structure and frequency-averaging scheme used in offset-OQAM OFDM (OQAM-OFDM) system. The experimental results show that, in comparison with the traditional CE method, our scheme can achieve ~1.5dB sensitivity improvement.</td>
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### ACP 2014 — Thursday, 13 November

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<td><strong>08:00–09:45</strong></td>
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<td><strong>ATH1F</strong> • Analog Signal Processing and Transmission</td>
<td><strong>ATH1G</strong> • Software Defined Networks I</td>
<td><strong>ATH1H</strong> • PON</td>
<td><strong>ATH1I</strong> • Best Student Award Competition</td>
<td><strong>ATH1J</strong> • Best Student Paper Award Competition</td>
</tr>
<tr>
<td>Presider: Mengdi Song; Orange, France</td>
<td>Presider: Zuqing Zhu; Univ of Science and Technology of China, China</td>
<td>Presider: Weisheng Hu; Shanghai Jiao Tong University, China</td>
<td>Presider: Minghong Yang; Wuhan Univ. of Technology, China</td>
<td>Presider: Xinqiang Wang; Peking Univ., China</td>
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**ATH1F.1 • 08:00**
Removal of Dispersion Penalty of Time-Stretch Photonic Analog-to-digital Conversion System by Use of Chirped Intensity Modulator, Hongnian Li1, Wewen Zou1, Jianping Chen2; 1Dept. of Electronic Engineering, Shanghai Jiao Tong Univ., State Key Lab of Advanced Optical Communication Systems and Networks, China. A novel scheme using dual-output Z-cut intensity modulator with fixed chirp is demonstrated to remove dispersion penalty of time-stretch photonic analog-to-digital conversion system. A modified algorithm is presented to effectively recover the distorted signal.

**ATH1F.2 • 08:15**
Analog Filter Design Rules for Multilevel Polynary Signaling Generation, Juan Jose Vegas Olmos1, Francisco Javier Vaquero Cavallero1, Idelfonso Tafur Monroy1; 1Dept. of Photonics Engineering, Technical Univ. of Denmark, Denmark. Polynary signaling has gained attention lately due to its generation simplicity and reduced spectral usage. This paper presents a study on the requirements for analog filters for the generation of multilevel polynary signals with three to nine levels.

**ATH1H.1 • 08:00 Invited**
Strategy and development of PON and UniPON in China Mobile, Dechao Zhang1; China Mobile Research Inst., China. This paper illustrates the development of PON access network, the application scenarios and requirements on UniPON, and present a novel architecture of intelligent PON, which is the evolution of PON architecture and technologies.

**ATH1H.2 • 08:12**
Ultra-Sensitive Strain and Temperature Sensing Based on Single-Mode-Multimode-Single-Mode Structure Comprising Perfluorinated Plastic Optical Fibers, Goki Numata1, Nesei Hayashi2, Marie Tabaru1, Yosuke Mizuno3, Kentaro Nakamura; 1Precision and Intelligence Lab, Tokyo Inst. of Technology, Japan. We developed strain/temperature sensors based on modal interference in perfluorinated plastic fibers, and achieved ultra-high sensitivities of -112 pm/με and +49.8 nm/°K at 1300 nm, -12.9 and >1800 times higher than in silica multimode fibers.

**ATH1I.1 • 08:00**
Performance of a Dual-Polarization Fiber Laser Based Accelerometer with a Software Phase Lock Loop, Jun He1, Linghao Cheng1, Qiang Yuan1, Yali Liang1, Long Jin1, Bai-Ou Guan1; 1Jinan Univ., China. A fiber-optic accelerometer based on a dual-polarization fiber grating laser is demonstrated and its performance is measured through demodulation by a software phase lock loop, which achieves a minimum detectable acceleration of 42.2 μg.

**ATH1I.2 • 08:15**
A Design Method of Freeform Optical Surface Using the Mapping Obtained from Supporting Ellipsoids Algorithm, Bin Xu1, Hongtao Li2, Xianglong Mao1, Yanjun Han1, Yi Luo1; 1Electronic Engineering, Tsinghua Univ., China. A method based on the mapping of supporting ellipsoids is proposed for the design of smooth freeform optical surface lenses to achieve uniform illumination distributions. The RSD of 0.05 of the illumination and the light utilization efficiency of 98% are achieved for a square target.
Conference Room SBC

ATH1A.3 • 08:30
Generation of terahertz vortices by using metasurface with polarization dependent slits. Hailong Zhou, Jianli Dong, Xinliang Zhang, Wuhan National Lab for Optoelectronics, Huazhong Univ. of Science and Technology, China. We design a metasurface with circular sub-wavelength slits to generate THz orbital angular momentum beam. The mode purity can reach 0.92 and the polarization extinction ratio keep above 20 dB over the most bandwidth ranging from 0.3 to 3 THz.

ATH1A.4 • 08:45
High-power narrow-vertical-divergence photonic crystal laser diodes with optimized epitaxial structure. Lei Liu, Hongwei Qu, Jun Yein, Zhe Yang, Yufei Wang, Qilai Wang, Wan-hua Zheng, Chinese Acad Sci Inst of Semiconductor, China. 900 nm photonic crystal laser with optimized epitaxial structure are fabricated. Output power of 5.7 W under continuous wave test and 10.3 W under quasi-continuous wave test are reported with vertical divergence angles of ~10°.

Conference Room 5H

ATH1B.2 • 08:30 • Invited
Polariton Laser Diodes. Sven Hoefling, Christian Schneider, Matthias Amthor, Na Young Kim, Arash Rahimi-Iman, Ivan Savenko, Ivan Svelky, Vladimir Kalukasov, Martin Kamp, Stefan Reitzenstein, Lukas Worschech, Yoshitsugu Yamamoto, Alfred Forchel, Univ. of St Andrews, UK; Universität Würzburg, Germany; Stanford Univ., USA; Univ. of Iceland, Iceland; Nanyang Technological University, Singapore; Russian Academy of Science, Russian Federation. Exciton-polariton lasers are operated in the strong light matter coupling regime. They promise low threshold operation since population inversion is not inherently necessary. Hence they are of great interest for next generation coherent light sources.

Conference Room 3CD

ATH1C.2 • 08:30
A Fiber Figure of Merit for Uncompensated Nyquist-WDM Links Employing EDFA and/or Distributed Raman Amplification. Lu Feng, Jinle Qu, Shenzhen Univ., China. We have developed a dynamic fluorescence lifetime imaging system that is based on a pair of acousto-optic deflectors to measure the lifetime of fluorescent dye in live cancer cells for monitoring the apoptosis process.

Conference Room 5E

ATH1E.3 • 08:30
140 Gbit/s, 128 QAM LD-based Coherent Transmission over 150 km with an Injection-locked Homodyne Detection Technique. Yixin Wang, Shohini Beppu, Kasuke Kasai, Masato Yoshida, Masataka Nakazawa, Research Inst. of Electrical Communication, Tohoku Univ., Japan. We demonstrate a 140-Gbit/s, 128 QAM coherent optical transmission employing an LD-based injection-locked homodyne detection circuit. Low phase noise carrier-phase synchronization was achieved and a 140-Gbit/s data signal was successfully transmitted over 150 km.

Conference Room 3E

ATH1D.2 • 08:30 • Invited
Fast Flexible FLIM for Monitoring Dynamic Process in Living Cells. Wei Yan, Xiaofei Peng, Junle Qu, Shenzhen Univ., China. We have developed a dynamic fluorescence lifetime imaging system that is based on a pair of acousto-optic deflectors to measure the lifetime of fluorescent dye in live cancer cells for monitoring the apoptosis process.

ATH1A.5 • 09:00
Temperature-Stable Energy-Efficient High-Bit-Rate Oxide-Confinsed 980 nm VCSELs for Optical Interconnects. Hui Li, Philip Wolf, Philip Moser, Gunter Larisch, James A. Lott, Dieter Bimberg, Technical Univ. of Berlin, Germany; King Abdulaziz Univ., Saudi Arabia. Highly temperature-stable error-free data transmission at 38 Gb/s from 25 to 85 °C is achieved. Record low heat dissipation of 145 and 139 mJ/bit is achieved at 35 Gb/s at 25 and 85 °C, respectively.

Conference Room 5DE

ATH1E.4 • 08:45
Long-haul Transmission Performance Evaluation of Ultra-long Raman Fibre Laser Based Amplification Influenced by Second Order Co-pumping. Mingming Tan, Pavel Rosa, Ian D. Phillips, Paul Harper, Aston Inst. of Photonic Technologies, Aston Univ., UK. A transmission performance investigation using ultra-long Raman fibre laser based amplification with different co-pump power is presented. We attribute Q factor degradation to RIN of co-pump and induced fibre laser as well as increased SBS.

Conference Room 5DE

ATH1E.5 • 09:00
Experimental Demonstration of a Real-time OFDM System over 100km SMF Employing Directly Modulated Laser without Optical Amplification. Ming Chen, Jing He, Xian Wu, Lin Tang, Lin Chen, College of Computer Science and Electronic Engineering, Hunan Univ., China; School of Computer and Information Technology, Beijing Jiaotong Univ., China. We experimentally demonstrate a real-time QPSK-encoded OFDM long-reach system employing directly modulated laser without optical amplification. After transmitted over 100 km SMF with a BER of 3.8*10^-3, the power penalty is less than 1 dB.


**Conference Room 5F**

**ATH1F.3 • 08:30**

Integrated photonic signal processors for microwave photonics and optical communications: a progress review in TriPlexTM Si3N4 waveguide technology, Leiming Zhuang; 1Monash Univ., Australia. We provide a brief overview of recent progress in TriPlexTM Si3N4 waveguide technology for integrated photonic signal processors, with applications in microwave photonic and optical communication systems.

**Conference Room 5I**

**ATH1H.2 • 08:30**

10 Gbit/s PON Upstream Burst-mode Equalization Based on SOAs, Ali Emsiala; 1Quang Trung Le; 2Mohammadreza Malekzandil; 1Dieter Bruggmann; 1Franko Kueppers; 1Inst. for microwave Engineering and photonics, TU Darmstadt, Germany. This paper proposes a budget extender which is at the same time first power equalizer based on SOAs for upstream 10 Gbit/s PON that achieves 38 dB access budget and 16 Gb/d dynamic range compression.

**Conference Room 5J**

**ATH1H.3 • 08:45**

Experimental Demonstration of a Scalable Slicebased Transceiver for Optical Access Networks, Sandia Spotilla; 1Christoph Wagner; 2J. J. Vegas Olmos; 3Vojaceslav Bobrovs; 4Girts Ivanovs; 5Idelfonso Tafur Monroy; 1Inst. of Telecommunications, Riga Technical Univ., Latvia; 2DTU Fotonik, Dept. of Photonics Engineering, Technical Univ. of Denmark, Denmark. We experimentally demonstrate signal spectrum slicing technique, which is a promising solution to increase the data transmission bit rate in cost sensitive optical access networks without upgrading any existing electrical or optical components.

**Conference Room 3H1**

**ATH1I.4 • 08:30**

Using 1550 nm Laser Excited LiYF4: Er3+ Upconversion Nanoparticles for Deeper Bioimaging, Liliang Chu; 1Yuanxiang Wu; 2Jun Qian; 1Centre for Optical and Electromagnetic Research, Zhejiang Univ., China. Er3+-doped LiYF4 upconversion nanoparticles (UCNPs) excited by 1550 nm laser can achieve deeper imaging depth than Yb3+/Tm3+-doped NaYF4 UCNPs excited by 980 nm laser. Such UCNPs (LiYF4: Er3+) have great potentials for deep-tissue in vivo bioimaging.

**Conference Room 3G**

**ATH1J.3 • 08:30**

Study on The Optical Properties of GaN-Based Multiple Quantum Well Embedded in Nanostructures, Peng Chen; 1School of Electronic Science and Engineering, Nanjing Univ., China; 2Nanjing Univ. Inst. of Optoelectronics at Yangzhou, China. We report on the photoluminescent characteristics of InGaN/GaN multiple quantum well (MQW) embedded in nanostuctures with different porosity. The best one is the nanorod structure which shows 1.75 times of planar structure on quantum efficiency.
### Conference Room 5BC

**ATH1A.6 • 09:15**

Electrically Tuned Optical Add-Drop Multiplexers based on Parent-Sub Microring Structure on SOI Substrates, Xian Xiao¹, Xue Feng¹, Xiangdong Li¹, Yidong Huang², Electronic Engineering, Tonghua Univ., China. A four-channel electrically tuned integrated optical add-drop multiplexer based on parent-sub ring structure is demonstrated and characterized. The influence of electro-absorption caused by plasma dispersion effect is also discussed.

**ATH1A.7 • 09:30**

64-channel hybrid (de)multiplexer enabling wavelength- and mode-division multiplexing for on-chip optical interconnects, Jian Wang¹, Sitao Chen², Pengxin Chen¹, Yaotong Shi¹, Daoxin Dai¹, Zhejiang Univ., China. A silicon hybrid (de)multiplexer with 64 channels to enable wavelength- and mode-division multiplexing simultaneously is proposed and demonstrated for the first time. The hybrid (de)multiplexer has a 4-channel mode demultiplexer and four 16-channel arrayed-waveguide gratings.

### Conference Room 5H

**ATH1B.4 • 09:15**

Novel silicon Polarization Beam Splitter with a Horizontal Hybrid Nanoplasmonic Waveguide, Hao Wu¹, Xiaowei Guan¹, Daoxin Dai¹, Centre for Optical and Electromagnetic Research, State Key Lab for Modern-Optical Instrumentation, Zhejiang Provincal Key Lab for Sensing Technologies, Zhejiang Univ., China. A low-loss polarization beam splitter (PBS) with high performance based on a horizontal hybrid nanoplasmonic waveguide is proposed. The extinction ratios at central wavelength are 21.3 dB and 17.9 dB for TM and TE polarizations.

**ATH1B.5 • 09:30**

Ultra broadband, wide-angle, and Efficient Chirped-Nanoslits Antenna for Coupling Surface Plasmons, Kun Li¹, DaLin Liu¹, Anshi Xu¹, PenKung Univ., China. A novel ultra broadband, wide-angle, and efficient plasmonic antenna composed of chirped-nanoslits is proposed, with ultra-broad spectral full-width-half-maximum (FWHM) up to 800 nm, wide angular FWHM of 32 degree, and coupling efficiency more than 35%.

**ATH1C.5 • 09:30**

Brillouin amplification of light beams with orbital angular momentum, Chunyuan Mu¹, Zhihan Zhu¹, Hongyang Zhang¹, Zhejiang Univ., China. We present and demonstrate the amplification of light beams carrying orbital angular momentum (OAM) based on stimulated Brillouin scattering. High-efficiency (~50%) and high-gain (~10^9) Brillouin amplification of OAM modes are achieved.

**ATH1C.6 • 09:45**

Birefringence Redress in PMF with Arc Discharging and Application in Precision Quarter-waveplate Fabrication, Yuxuan Chen¹, Wei Yang¹, Mingwei Yang¹, Key Lab on Precision Opto-Mechatronics Technology of Ministry of Education, Beihang Univ., China; National Key Lab on Inertial Technology, Beihang Univ., China. The birefringence redress in conventional polarizer-maintaining fiber (PMF) and polarization-maintaining photonic crystal fiber (PM-PCF) was realized with arc discharging. A fiber waveplate fabrication setup was made and precision PM-PCF quarter waveplates (QWP) were fabricated.

**ATH1D.4 • 09:30**

Optical Micro-Tomographic Study of Babesia microti-Parasite Infected Red Blood Cells, Huayun Jia¹, ShuQing-Hui Hong², Long Ying³, Feng Zhu¹, Zhejiang Univ., China. We present and demonstrate the amplification of light beams carrying orbital angular momentum (OAM) based on stimulated Brillouin scattering. High-efficiency (~50%) and high-gain (~10^9) Brillouin amplification of OAM modes are achieved.

**ATH1D.5 • 09:45**

3-D quantitative tracking of phagosomes using quantitative phase microscopy, YongKeun Park¹, HyunJoo Park¹, Sung-Hee Hong², Sang-Eun Lee³, Physics, KAIST, Republic of Korea. We present a novel holographic microscopy, as noninvasive and label-free optical technique.

### Conference Room 3CD

**ATH1E.6 • 09:15**

Multilevel Nonbinary LDPC-Coded Modulation for High-Speed Optical Transmissions, Yeong Zhang¹, Ivan B. Djordjevic², Univ. of Arizona, USA. Multilevel nonbinary LDPC-coded modulation has been proposed to reduce decoding complexity while maintaining the large-coding-gain performance desired for high-speed optical transmissions. Simulation results show the proposed scheme outperforms bit-interleaved LDPC-coded modulation by 0.65 dB.

**ATH1E.7 • 09:30**

Demonstration of Analog Signal Transmission in an Orbital Angular Momentum (OAM) Multiplexing System, Shuhui Li¹, Long Yun¹, Chengcheng Gu⁴, Ning Li⁴, Jun Li⁴, Ji Wang⁵, Wuhan National Lab for Optoelectronics, China; State Key Lab of Optical Comm. Technologies and Networks, China. We propose and experimentally demonstrate analog signal transmission in an orbital angular momentum (OAM) multiplexing system. The spurious free dynamic range (SFDR) of the second-order harmonic distortion (SHD) and the third-order harmonic distortion (THD) are evaluated for each OAM channel.

**ATH1E.8 • 09:45**

40km error free optical stealth transmission experiment with an amplified spontaneous emission light source, Huatuo Zhu¹, Rong Wang¹, Tao Pu¹, Yinfang Chen¹, Tao Fang¹, Jilin Zheng¹, Guoniu Su¹, PLA Univ. of Science and Technology, China. A 2.5Gb/s optical steagantography system using an Amplified Spontaneous Emission light source was experimentally demonstrated over a 40km pubic channel. The ASE signal was modulated by intensive modulation and spectrum encoded by Wavelength Selective Switch.
Conference Room 5F

ATH1F.5 • 09:30
Broadband co-site and co-channel RF interference cancellation system, Qi Zhou 1, Hanlin Feng 2, Mable Fok 1, 'Lightwave and Microwave Photonics Lab, College of Engineering, Univ. of Georgia, USA; 2The State Key Lab of Advanced Optical Communication Systems and Networks, Shanghai Jiao Tong Univ., China. A broadband co-site and co-channel RF interference cancellation system is proposed and demonstrated. 57-dB and 37-dB cancellations are obtained over 10-MHz and 400-MHz bandwidths, respectively. The scheme works well for various frequency bands.

Conference Room 5I

ATH1G.3 • 09:30
OpenFlow-Controlled Revenue-Driven AR Service Provisioning in Software-Defined Elastic Optical Networks, Shoujiang Ma 1, Wei Lu 1, Cen Chen 1, Xiaolong Chen 1, Zhiqing Zhu 1, ‘Univ. of Science and Technology of China, China. We propose a control plane framework for realizing OpenFlow-controlled revenue-driven advance reservation (AR) provisioning in software-defined elastic optical networks (SO-EDONs), and design two AR provisioning algorithms to be implemented in it.

Conference Room 5J

ATH1H.3 • 09:30
A Hierarchical DBA Algorithm for High Fairness in TDM-PON, Tian Yu Wu 1, Panke Qin 1, Lujian Wang 1, Haozhi Yan 1, Xue Chen 1, ‘BUPH, China. An enhanced DBA algorithm based on hierarchical timetoslot allocation is theoretically analyzed and experimentally demonstrated. Experiment results prove that the algorithm can obviously improves the fairness with almost negligible throughput penalty in 40Gbps TDM-PON.

Conference Room 3G

ATH1J.6 • 09:15
Withdrawn

Conference Room 3H

ATH1J.7 • 09:30
GaN-based heterostructures grown on ZnO substrates: from polarity control to the fabrication of blue LEDs, Julien Brautl 1, Yuxiang Xia 1, 2, Benjamin Damilano 2, Philippe Vennéguès 3, Mohamed Al Khalfi 4, 5, Sébastien Chenot 1, Monique Teisseire 6, Matthieu Leroux 5, Jean-Michel Chauveau 4, 2, CNRS, France; 1Univ. of Nice Sophia-Antipolis, France. A substrate leading to growth process simplicity and original properties such as polarity design could be attractive for nitride based optoelectronics. The potential of ZnO substrates, including GaN polarity control and LED fabrication, is presented.

ATH1J.8 • 09:24
Optical sectioning with hybrid images to reconstruct in Fourier space, Yubo Duan 1, 2, Nanguang Chen 2, 3, 4, Biomedical Engineering, National Univ. of Singapore, Singapore; 2BiosyM, Singapore-MIT Alliance for Research & Technology (SMART), Singapore. Wide-field microscopy is efficient but lack of depth sectioning. A hybrid image reconstruction in Fourier space with the aid of undersampled focal modulation microscopy was proposed to obtain the sectioning capability for wide-field imaging.

ATH1J.9 • 09:36
Efficient Utilization of Spectrum in Fiber Sensing Network Based on All-optical Real-time Data Format Conversion, S. Luo 1, 2, Z. Wang 1, 2, Y. Hou 1, S. Liu 1, R. Ma 1, 2, Q. Yuan 1, 2, C. Ge 2, ‘College of Precision Instrument and Opto-electronics Engineering, Tianjin University, China; 2Key Laboratory of Opto-electronics Information Technology, Tianjin University, China. Spectral sensing signals are mapped into specific wavelength in time domain using all-optical wavelength converter, realizing common spectrum resource shared in several nodes of sensing network. Conversion of signals from one node is described experimentally.

Continued in next column

10:00–10:30 Coffee Break around exhibition area
**Conference Room 5BC**

**10:30–11:45**

**ATH2A • Heterogenous Integration**

Presider: Wan-hua Zheng; Chinese Acad Sci Inst of Semiconductor, China

**ATH2A.1 • 10:30**

Selective area growth of GaAs on silicon, Yunrui He, Jun Wang, Can Deng, Huiyang Hu, Qi Wang, Yongqing Huang, Xiaomin Ren; ‘BPU’, China. The epitaxial growth of GaAs on patterned Si(001) substrates by MOCVD is presented. Effect of growth temperature and V/I ratio on coalescence is investigated. Meanwhile, changing total pressure can reduce the polycrystals generated on mask.

**ATH2A.2 • 10:45**

Integrated III-V Optoelectronic Materials on Silicon by Aspect Ratio Trapping, Shiyun Li, Xuliang Zhou; Inst. of Semiconductors, Chinese Aca, China. High quality III-V materials have been demonstrated in SiO2 trenches on silicon via Metal-organic chemical vapor deposition using Aspect Ratio Trapping method. This approach shows promise for the fabrication of optoelectronic integrated circuits on Si.

**ATH2A.3 • 11:00**

Metallically Confined Hybrid III-V/Si Fabry-Pérot Lasers Based on Adhesive Bonding, Ming-Ying Tang, Shao Shuai Sui, Yun Du, Yue-De Yang, Yong-Zhen Huang; ‘State Key Lab on Integrated Optoelectronics, Inst. of Semiconductors, China. We report the metallically confined hybrid III-V/Si Fabry-Pérot lasers based on adhesive bonding. Continuous-wave lasing is achieved with a threshold current density of 1.59 kA/cm² for the hybrid laser with the length of 180 μm and the width of 7 μm.

**Conference Room 5H**

**10:30–12:00**

**ATH2B • VCSELs**

Presider: Dieter Bimberg; Technische Universität Berlin, Germany

**ATH2B.1 • 10:30**

Invited

Hybrid HCG VCSEL on Si, Connie J. Chang-Hasnain; ‘Univ. of California Berkeley, USA. Abstract not Available.

**ATH2B.2 • 11:00**

Thin-silicon-film platform for single-mode lasers, Vivek Krishnamurthy, Qian Wang, Jing Pu, Ter-Hoe Loh, Chee Wei Lee; ‘Advanced Concepts and Nanotechnology, Data Storage Inst., Singapore. Active layers directly-bonded onto thin-silicon-film exhibits good confinement ~15% and requires compact (<60μm) mode-transformer. DFB laser-on-thin-silicon-film study shows superior flexibility in designing coupling coefficient to reduce threshold current and increase slope efficiency by ~2–5x, compared to prior-arts.

**Conference Room 3CD**

**10:30–12:00**

**ATH2C • Novel Fibers and Devices**

Presider: Masaaki Hirano; Sumitomo Electric Industries Ltd, Japan

**ATH2C.1 • 10:30**

Invited

Metal-polymer Composite Fibres for Metamaterials Fabrication and their Applications, Alexander Argyros, Alessandro Tuna, Simon C. Fleming, Boris T. Kuhney; ‘Univ. of Sydney, Australia. We have used fibre drawing to fabricate a range of electric and magnetic metamaterials operating over a frequency range two orders of magnitude wide. I will present a review of our recent progress.

**ATH2C.2 • 11:00**

Fiber Draw Synthesis, Chong Hou, Yovel Fink; ‘Massachusetts Inst. of Technology, USA. Recently we have demonstrated the ability to synthesize new compounds in situ during the fiber drawing process thus addressing one of the key limitations of this process. I will present progress and discuss the opportunities for extending the architecture and materials selection of fibers through fiber draw chemical synthesis.

**Conference Room 5DE**

**10:30–12:00**

**ATH2D • Digital Signal Processing II**

Presider: Yves Jaouen; Telecom ParisTech, France

**ATH2D.1 • 10:30**

Invited

Experimental Demonstration of Half Cycle 64-QAM Nyquist-SCM Direct-Detection Optical Communication System with Data-aided Estimation and Overlap Frequency-domain Equalization, Danyu Li, Jing He, Jin Tang, Ming Chen, Lin Chen; ‘College of Computer Science and Electronic Engineering, Hunan Univ., China. A half cycle 64-QAM Nyquist-SCM PDM IM/DD optical communication system is experimentally demonstrated. The experimental results show that the 64-QAM Nyquist-SCM signal can be transmitted over 43-km SSMF with BER below FEC threshold of 2.4x10-2.

**ATH2D.2 • 10:45**

Invited

Digital Signal Processing in High Capacity Optical Communication Systems, Chongjin Xie; ‘Alcatel-Lucent, USA. We discuss digital signal processing techniques to generate and detect spectrally efficient Nyquist wavelength-division-multiplexed (WDM) signals for coherent optical communication systems.

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**Thursday, 13 November**

**ACP 2014 — Thursday, 13 November**

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**ATH2E.1 • 10:30**
Palm-Shaped Optical Spectrum Generation for Fiber-Wireless Integrated Communication with Dual-Band Millimeter Wave, Rui Lin1, Tang Ming1, Ruoxi Wang1, Songnan Pu1, Perry Ping Shum1, Deming Liu1, ‘HUST, China; ‘Nanyang Technological Univ., Singapore. We proposed and demonstrated a simple cost-effective palm shaped spectrum generation based on DPMZM in order to simultaneously generating dual-band MMWs and optical carrier, offering an alternative in integration of fiber and wireless communication in indoor and inter-building environments.

**ATH2E.2 • 10:45**
Coherent Detection of Multiband Phase Modulated Radio-Fiber Signals Using Bandpass Sampling, Minghua Cao1,2, Jiantang Jiang1, Kun Xu1, Yitang Dai1, Feifei Yin1, ‘Beijing Univ of Posts & Telecom, China; ‘School of Computer & Communication, Lanzhou Univ. of Technology, China. Bandpass sampling based coherent detection of multiband subcarrier multiplexed signals were experimentally demonstrated in optical phase modulated radio-over-fiber links. Two QPSK subcarrier signals were successfully transmitted and recovered after transmission over 50 km long fiber link.

**ATH2E.3 • 11:00**
VCSEL Based Radio-over-Fiber Link for the Low Frequency Aperture Array Receiver of the SKA, Weiss Jonas1, S&T, IBM Research, Switzerland. A VCSEL-based, radio over fiber link for the Low Frequency Aperture Array of the SKA interferometer is presented. The link SFDR measured is better than 76 dBHz/2Hz up to 8 km within a 50-350 MHz bandwidth.

**ATH2F.1 • 10:30**
Invited
TWDM-PON: System, Standards, and Key Technologies, Huafeng Lin1, Dekun Liu1, Yuanju Luo1, Frank Effenberger2, Ning Cheng2, ‘Huawei Technologies Co Ltd, China; ‘American Research Center, Huawei Technologies Co., Ltd., USA. As the successor of XG-PON, TWDM-PON can support smoothly migration and coexistence with GPON and XG-PON in the same ODN. The operation scheme, standard progress, key technologies, application scenarios and industrial status of TWDM-PON will be introduced in this paper.

**ATH2F.2 • 11:00**
Invited
FEMW Passive Optical Network, Cen Xia1, Amado M. Velázquez-Benítez1, Jose Enrique Antonio Lopez1, Wen He1, Axel Schulzgen1, Frank Effenberger2, Rodrigo Amezcua Correa1, Guifang Li1, ‘Univ. of Central Florida, CREOL, USA; ‘Fixed Access Network, Futurewei Technologies, USA; ‘College of Precision Instrument and Opto-Electronic Engineering, Tianjin Univ., China. We demonstrate the first few-mode PON network that can eliminate upstream combing loss. The PON architecture only requires direct detection because TDMA alleviates the need for mode demultiplexing even in the presence of mode crosstalk.

**ATH2G.1 • 10:30**
Invited
Multimodal Optical Imaging of Brain Functional Activity, Pengcheng Li1, Wuhan National Lab for Optoelectronics, China. Abstract not Available

**ATH2G.2 • 11:00**
Invited
Polarized Light Biosensing, Igor Megrinski1, ‘Univ. of Otago, New Zealand. Polarization-based optical techniques have become increasingly popular in the field of biomedical diagnosis. We demonstrate that Stokes vector of backscattered light depicted on Poincaré sphere can be used as a tool for non-invasive tissue biopsy.

**ATH2H.1 • 10:30**
Invited
Towards Performance Enhancement of InGaN/GaN LED by Exploring Localized Surface Plasmons, In-Hwan Lee1, ‘School of Advanced Materials Science & Engineering, Chonbuk National Univ., Republic of Korea. Localized surface plasmon (LSP) effects due to Ag and Ag/SiO2 nanoparticles (NPs) deposited on GaN/InGaN multiple quantum well (MQW) light-emitting diode (LED) structures are studied.

**ATH2H.2 • 11:00**
Invited
Monolithic Integration of III-nitride LEDs and Driver HEMT Transistors by MOCVD, Kei May Lau1, ‘Hong Kong Univ. of Science and Technology, Hong Kong. III-nitride based LED and HEMT monolithically integrated on a sapphire substrate have been demonstrated by MOCVD selective growth technique. The integrated HEMT-LED device with good device characteristics emit modulated blue light by the gate voltage.
A MOCVD SAG Technique for the Fabrication of 1.3-um Multi-channel DFB Laser Array, Fei Guo1, Key Lab of Semiconductor Materials, Inst. of Semiconductors, CAS, China. We report a simple SAG process for fabricating 1.3-um multi-channel DFB laser array. The laser array shows highly precise wavelength control and all channels show stable single mode operation with SMSR > 34 dB.

Heteroepitaxial growth and characterization of compound semiconductors, Qin Xin Guo1, Saga Univ., Japan. ZnTe layers were successfully grown on (001) sapphire and GaAs substrates by metalorganic vapor phase epitaxy. The emission of THz radiation with a spectral distribution up to 40 THz was observed from the ZnTe layers. The structural and optical properties of the obtained ZnTe layers were reported.

VCSLs with surface nanostructures, Anjin Liu1, Werner Hofmann1, Dieter Bimberg2, Institut für Festkörperphysik and Zentrum für Nanophotonik, Technische Universität Berlin, Germany. Finite-size high-contrast gratings (F-HCGs) and their applications are studied. F-HCGs have a low-Q resonant-guided mode, reducing mirror bandwidth for VCSELs. This mode enables additional applications for integrated VCSEL-HCG-based optical sensors.

Single-Frequency Vertical-External-Cavity Surface-Emitting Laser Exceeding 23 Watts, Fan Zhang1, Bernd Heinen1, Christoph Möller1, Matthias Wichmann1, Bernadette Kunert2, Arash Rahimi-Iman3, Stephan W. Koch3, Wolfgang Stolz3, Martin Koch1, Dept. of Physics and Material Sciences Center, Philippus-Universität Marburg, Germany; 1NASP III/V GmbH, Germany. In this work, we present a narrow-linewidth single-frequency semiconductor disk laser with a continuous-wave output power in excess of 23 W at a wavelength of 1030 nm.

Programmable Bandwidth-Variable Optical Temporal Differentiator Based on Linearly Chirped Fiber Bragg Grating and Digital Thermal Controller, Ruoxi Wang1, Tang Ming1, Hailiang Zhang1, Zhenhua Peng1, Lin Rui1, Fu Songnian1, Deming Liu1, Perry P Shum2, Next Generation Internet Access National Engineering Lab (NGIA), School of Optical and Electronic Information, Huazhong Univ. of Science and Technology, China; 1Photonics Centre of Excellence, School of Electrical and Electronic Engineering, Nanyang Technological Univ., Singapore. We experimentally demonstrate an all-fiber structured bandwidth variable second-order optical temporal differentiator based on linearly chirped fiber Bragg grating and digital thermal controller. The bandwidth can be reconfigured from 0.55 nm to 0.8 nm.

Minimizing distortion and enlarging group delay in Brillouin slow light systems by gain profile optimization, Liang Zhang1, Marcelo A. Soto1, Luc Thevenaz1, EPFL Swiss Federal Inst. of Technology, Switzerland; 1Shanghai Jiao Tong Univ., China. Optimal gain spectra minimizing distortion and enhancing delaying efficiency in linear slow light systems are predicted and experimentally validated by shaping the gain spectral profile in a Brillouin fiber amplifier.

Nonlinear Equalization in 40/112/224 Gbit/s Mixed Line Rate 15-Channel DP-QPSK and DP-16QAM Contiguous Spectrum Based Networks, Rameez Asif1, DTU Fotonik, Technical Univ. of Denmark, Denmark. We evaluated that in-line non-linear compensation schemes decrease the complexity of digital backpropagation and enhance the performance of 40Gbit/s mixed line rate network. Both grouped and un-grouped spectral allocation schemes are investigated.
ATH2E.4 • 11:15
1550nm Wavelength Division Multiplexing and Frequency Division Multiplexing in Radio-over-Fiber Transmission using OFDM Signals, Miku Teruya1, Koyu Chinen1; 1Okinawa National College of Technology, Japan. 1550nm OFDM WiMAX and WiFi RoF WDM and FDM were realized when wavelength spacing was larger than 0.1nm and frequency spacing was larger than the sum of two frequency-band-width of WiMAX and WiFi signals.

ATH2E.5 • 11:30
EVM Co-simulation of Optical Components and OFDM RoF System by Using P-parameter with Phase parameter, Koyu Chinen1; 1Okinawa National College of Nago, Japan. We propose new P-parameter by taking into account a phase noise parameter relating to laser oscillation to simulate the EVM for OFDM signal transmission system. Simulated EVM by using new P-parameter agreed with measured values.

ATH2F.4 • 11:30
Energy-efficient TWDM-PON with VCSEL ONUs, Maluge Pubuduni Imali Dias1,2, Dung Pham Van3, Luca Valcarenghi4, Elaine Wong1; 1National ICT Australia, Australia; 2Dept. of Electrical and Electronic Engineering, Univ. of Melbourne, Australia; 3Scuola Superiore Sant’Anna, Italy; 4Energy-efficient dynamic bandwidth and wavelength allocation framework using optimal number of wavelengths and sleep/doze mode is proposed for delay-constrained TWDM-PON with tunable 10Gbps-SC-VCSEL ONUs.

ATH2F.5 • 11:45
An Energy Efficient TWDM-PON Architecture with Dual Rate ONUs, Wei Wang1, Chengjun Li1, Wei Guo1, Weisheng Hu1; 1State Key Lab of Advanced Optical Communication Systems and Networks, Shanghai Jiao Tong Univ., China. Timed and wavelength division multiplexed passive optical network (TWDM-PON) has been widely accepted as a primary solution to NG PON2. We proposed a novel energy efficient TWDM-PON architecture with dual rate ONUs.

ATH2G.3 • 11:30
Multidimensional Tissue Fingerprint, Francesco S. Pavone1,2, Riccardo Cicchi3,4, Alfonso Crisci3,4, Vanita Pippinelli1,2; 1European Lab for Non-Linear Spectroscopy, Italy; 2National Inst. of Optics, National Research Council (INO-CNR), Italy; 3Division of Clinical, Preventive and Oncology Dermatology, Dept. of Critical Care Medicine and Surgery, Univ. of Florence, Italy; 4Division of Urology, Dept. of Critical Care Medicine and Surgery, Univ. of Florence, Italy; 5Division of Neurosurgery, Dept. of Neuro-sciences I, “Anna Meyer” Pediatric Hospital, Italy; 6Division of Pathology, Dept. of Critical Care Medicine and Surgery, Univ. of Florence, Italy; 7Dept. of Physics, Univ. of Florence, Italy. We developed two different probes for combined Raman-fluorescence spectroscopy on human tissues. The device was successfully used for diagnosing melanocytic lesions in a good agreement with histology and further tested on bladder and brain tissues.

ATH2H.3 • 11:30
A Study on 3D InGaN/GaN Nanorod LEDs, Hao-chung Kuo1,2, Shih-Pang Chang1, Da-Wei Lin3, Yuh-Jen Cheng1, Chun-Yen Chang1; 1Photons and Inst. of Electro-optical Engineering, National Chiao Tung Univ., Taiwan; 2Research Center for Applied Sciences, Academia Sinica, Taiwan; 3Electronics Engineering, National Chiao Tung Univ., Taiwan. We demonstrate two kinds of 3D LEDs structure: warm white emission nano-pyramid LEDs and tip-free nanorod LEDs. The characteristics of 3D LEDs were discussed, which could be a future innovation for solid state lighting.

12:00–13:30 Lunch Break

13:30–17:00 Special Symposium II, Conference Room 3E

1-2:30 Special Symposium II, Conference Room 3E
Non Polar GaN and (Ga,In)N/GaN Heterostructures Grown On A-Plane (1 1 -2 0) ZnO Substrates, Antoine Ogerreu1,2, Julien Brau1,2, Benjamin Damilano1, Monique Testeire1, Yuanfang Xia3, Philippe Verinegués4, CRHEA, France; 3Univ. of Nice-Sophia Antipolis, France. Non polar GaN is grown on (11-20) ZnO substrates by molecular beam epitaxy. The GaN quality is strongly improved by using a nitrogen plasma source for the buffer layer. Room temperature blue emitting (In,Ga)N/GaN quantum wells are demonstrated.

Direct Growth of GaAs-based Long-wavelength (1.55μm) InGaAs/InGaAsP multiple quantum wells Laser Wells Laser, Xiaobo Lu1, Youqing Huang1, Jun Wang1, Xiaofeng Duan1, Rui Kang1, Xiaomin Ren1, Xia Zhang1, Qi Wang1, Beijing Univ. of Posts and Telecomm., China; 1Inst. of Semiconductors, Chinese Academy of Sciences, China. InGaAs/InGaAsP multiple quantum wells structure materials are grown on semi-insulating GaAs substrates by MOCVD. A threshold current of 340mA and a slope efficiency of 0.23mA/W is obtained for a device with 1.5μm-wide stripe.

Fabrication and characteristics of self-supporting rolled-up InGaAs/GaAs microtubes array on GaAs (100), Zhihong Pan1, Qi Wang1, Yuxia Gao1, Xin Gu1, Guoming Mao1, Xiaomin Ren1, Xia Zhang1, Yongqing Huang1, State Key Lab of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunication, China. Self-supporting h0.2GA0.8As (15 nm)/GaAs (35 nm) microtubes array was fabricated on GaAs (100) through rolling up from U-shaped strained measles. The outer diameter of the microtube with extremely smooth wall is ~4.7 micron.

Investigation of Temperature-dependent Lasing and Optical Gain Characteristics of 1.3-μm InAs Quantum Dot Laser, Chongyang Liu1, Rui Wang2, Hong Wang1,3, Qianjiang Meng1,3, Kian Siong Ang1,3, 1Sematek Labs (TL@NTU), Singapore; 2Nanyang Technological Univ., Singapore; 3Bruker Singapore Pte. Ltd., Singapore; 4NVIDIA, Nanoelectronic Centre of Excellence, School of Electrical and Electronic Engineering, Nanyang Technological Univ., Singapore. Temperature-dependent lasing and optical gain characteristics were investigated on the InAs quantum dot lasers up to 120 C. The laser showed high performance and the gain bandwidth is found to be insensitive to the temperature.

Influences of Optical Feedback on the Operation of an EML Integrated with a Semiconductor Optical Amplifier, Fan Xia1, Wei Hong1, Junqiu Qi2, Wuhan National Lab for Optoelectronics, Huazhong Univ of Science and Technology, China. Influences of optical feedback on the operation of monolithic integrated EML-SOA have been investigated. We found that EML-SOA shows three different operation modes for different feedback levels determined by different facet reflection and bias current.

Intensity enhancement in the photoluminescence study of self-supporting InGaAs/GaAs microtubes, Yuxia Gao1, Qi Wang1, Zhihong Pan1, Xia Zhang1, Yongqing Huang1, Xiaomin Ren1; 1BUP, China. The room-temperature photoluminescence measurement has been used to characterize the optical properties of self-supporting InGaAs/GaAs microtubes. The PL show the intensity was enhanced for the self-supporting part comparing with the arm adhered to the substrate.

OR and NOR Logic Operations at 10 GHz Based on Carrier-depletion Silicon Micro-ring Resonators, Ping Zhou1, Jianfeng Ding1, Lin Yang1, Inst. of Semiconductors, Chinese Academy of Sciences, China. We report a 10 GHz OR/NOR directed logic device consisted of two cascaded silicon micro-ring resonators whose switching scheme is realized by reverse biased PN junction embedded in the ring waveguide. A novel coupler between semiconductor laser and TriPex waveguide with high efficiency, Yong Li1, Ming Li1, Chen Gong1, Hongwei Chen1, Hongwei Chen1, Chuangwei Chen1, Shuhong Xie1, Dept. of Electronic Engineering, Tsinghua Univ., China. We propose a compact, highly efficient and broadband coupler between semiconductor laser and the TriPex waveguide with efficiency of 97.9% (corresponding to loss of 0.092dB) at wavelength of 1550nm.

A fabrication-tolerant SOI polarization splitter-rotator with cascaded MMI couplers and an assisted bi-level taper, Jie Wang1, Ben Niu2, Haiyang Huang1, You Li1, Ming Li1, Zhen Sheng1, Aimin Wu2, Wei Li1, Xi Wang1, Shichang Zou1, Minghao Qiu1, Fuwai Gan1, Shanghai Inst. of Microsystem And Information Technology, Chinese Academy of Sciences, China; 2Purdue Univ., USA. We propose a fabrication-tolerant SOI polarization splitter-rotator with cascaded MMI couplers and an assisted bi-level taper. The performance remains very stable even for a large deviation of ±50 nm in terms of device sizes.

Y-branch edge coupler between cleaved single mode fiber and nano-scale waveguide on silicon-on-insulator platform, Xin Tu1, Hongyan Fu1, Dongyu Geng1, Communication Technologies Lab, Huawei Technologies Co., Ltd, China. A novel edge coupler between a cleaved fiber and a nano-scale waveguide is proposed. The simulated lowest coupling loss is 0.5 dB and 1.0 dB for TE and TM modes with large 3 dB alignment tolerance.

1060-nm single-mode DBR Laser with Improved Ridge Etch Depth Tolerance, Shaoyang Tan1, Zhenguang Liu1,2, Ji Niu1, Rui Kang1, Wei Wang1, Ji Chen1, Inst. of Semiconductors, CAS, China. We report a novel 1060-nm ridge waveguide high-power DBR laser with a large optical cavity optimized for relaxing etched-depth processing tolerance, GaAs/AlGaAs grating for simplifying material growth and double-trench lateral leakage waveguide for mode stability.

Chip integration in EMLs towards frequency shifting modulation, Miguel Iglesias Olmedo1,3, J. J. Vegas Olmos1, Westerberg2, Sergey Popov3, Idefonso Tafur Monroy1, Dept. of Photonics Engineering, Technical Univ. of Denmark, Denmark; 3Optics division, Ral Institut of Technology, Sweden. This paper presents a chip modeling and experimental results that support our vision of enabling frequency shift keying (FSK) exploiting the chip effect in externally modulated lasers (EMLs).

A 4x4 Echelle Grating Wavelength Router with Distributed Bragg Reflectors based on the SOI platform, Pingli Huang1, Jun Zou1, Ge Mu1, Xin Xiong1, Tingfeng Yang3, Jian-Jun He1, Dept. of Optical Engineering, Zhejiang Univ., China; 3College of Optical and Electronic Technology, China Jiliang Univ., China. A 4x4 echelle grating wavelength router with distributed Bragg reflectors based on silicon nanowire waveguides is presented. Cyclic spectral response is designed and experimentally demonstrated.

directed optical comparator based on two microring resonators, Guo Chunming1, Weimei Zhu2, Zhi Zou2, Zhihong Xia3, Jie Wang3, 1State Key Lab of Optical Comm. Technologies and Networks, 2Huaxia Communication Technologies, China; 3Nanjing Univ. of Aeronautics and Astronautics, China. A directed optical comparator based on thermo-optic effect is fabricated, which is composed of two microring resonators and a multimode interference (MMI) coupler. The device can compare two binary numbers at the speed of 10 kbps.

Broadband gain incorporating N compositional fluctuations for a GainNAs semiconductor optical amplifier, Xiao Sun1, 1Research and innovation center, Alcate-Lucent Shanghai Bili, China. A theoretical analysis of the broadband gain of GainNAs SOA has been developed considering N compositional fluctuations leading to QD-like behavior. The resulting material gain is broadened by adding the gain of the QD fluctuations.

Optical Delay Line based on Waveguide Mode Multiplexing, Anbang Xie1, Linjie Zhou2, Zhu Zou2, Jiaming Chen1, 1State Key Lab of Advanced Optical Communication Systems and Networks, Dept. of Electronic Engineering, Shanghai Jiao Tong Univ., China. We propose a novel optical delay line structure based on Bragg gratings-assisted waveguide mode multiplexing. Proof-of-concept simulations show that optical delay is increased by about three times using three waveguide modes.

Linear and Nonlinear Microwave Response of an Ultracompact Tunable Bandpass Microwave Photonic Filter Based on a Photonic Crystal Nanocavity, Yun Long1, Yong Zhang1, Chengqiu Gui1, Chao Li2, Qi Ying1, Jinsong Xie1, Jian Wang1, WNWLO, China; 1State Key Lab of Optical Comm. Technologies and Networks, China. We experimentally demonstrate a single bandpass microwave filter based on a photonic crystal nanocavity. Both linear and nonlinear operating characteristics of the device are investigated. A large tuning range of 4.5 to 18 GHz is obtained. Bistability of microwave response is also observed at a low power level (~2.6 dBm).

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On-Chip Scalable All-Optical Signal Converter of Advanced Modulation Format Signals Up to 256-QAM Based On Silicon Photonics Devices, Chengcheng Gu, Fei Xia, Jinguwen Ma, Jian Wang, Wuhan National Lab for Optoelectric, China. We propose and design an on-chip scalable all-optical signal converter from on-off-keying to advanced modulation format signals, up to 256-QAM, employing silicon photonics devices based on cross-phase modulation in silicon-organic hybrid slot waveguide. Performance is evaluated by error vector magnitude and bit error rate.

ATH3A.19

Physics of Si based Avalanche Detectors With Built-In Self-Quenching and Self-Recovering Capabilities, Hong Li, Xia Guo, Yunlei Ma, Beijing Univ. of technology, China. A silicon based single photon avalanche detector with a transient carrier buffer layer was designed. The buffer layer as an energy barrier tentatively stops avalanche-generated carriers. The device demonstrates self-quenching and self-recovering capabilities.

ATH3A.20

Anomalous Dispersion and Loss Analysis in Circular and Bragg Core Passive Silicon Waveguides, Md. Rezanul Haque Khandakar, The University of Melbourne, Australia. Influences of geometry to achieve anomalous dispersion with corresponding propagation loss are presented for circular and bragg core silicon waveguides. Enhanced dispersion with low loss (1.1-1.35 dB/cm) has potential to develop passive in-line nanoscale dispersion compensators.

ATH3A.21

High-contrast-gratings reflector based on SOI with large-angle beam steering ability, Wenjing Fan, Yongqiang Huang, Changlan Ma, Xiaofeng Duan, Xiaomin Ren, Qi Wang, Jun Wang, Xia Zhang, Shiwei Cai, Beijing Univ. of posts and communc, China. High-contrast-gratings reflector providing phase front control of transmitted light as well as high reflectivity is presented. The properties of the beam steering and transmission are numerically studied with the Finite Element Method (FEM). The results show that the reflectivity is 90.4% and the steering angle is 36.2510 degree.

ATH3A.22

Equivalent Circuit Model for InP-based Uni-Traveling-Carrier Photodiodes with Dipole-doped Structure, Qianqian Meng, Hong Wang, Bo Gao, Chongyang Liu, Kian Song Ang, Xin Guo, Jianjun Gao, Tsemak Lab, NTU, Nanyang Technological University, Singapore; School of Electrical and Electronic Engineering, Nanyang Technological University, Singapore; School of Electronic and Information Engineering, Xi’an Jiaotong Univ., China; School of Information Science and Technology, East China Normal University, China. An equivalent circuit model has been proposed to analyze the high performance of InP-based uni-traveling-carrier photodiodes (UTC-PDs) with novel dipole-doped structure. The validity of this model has been confirmed with experimental data.

ATH3A.23

Two-Dimensional Distance and Angle Location Nanoruler Using the Surface Plasmon Resonance, Wenqiang Li, Yan Zhang, Jian Wang, Jun Wen, Ruibo Luo, Wuhan National Lab for Optoelectronics, China. We design a two-dimensional ruler based on surface plasmon resonance (SPR) effect, whose light-scattering spectra shift when either the distance of two gold nanospheres or the angle between their axis and the polarization is changed.

ATH3A.36

A Flexible Microwave Photonic Frequency Conversion Scheme for Satellite Repeater Applications, Jie Yin, Yang Jiang, Kun Xu, Feifei Yin, Jiaceng Li, Beijing Inst. of Satellite Information Engineering, China; State Key Lab of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. We propose one novel frequency conversion system of changing the input RF frequency to four different ones by adjusting modulators’ electrical parameters, which needs only one frequency-fixed microwave source and can be applied in satellite repeaters.
Optical force based linear and wideband optical isolator, shuchen min1, hailong zhou, Shasha liao, Xinliang Zhang2, Jianji Dong3, 4Optoelectronic Devices and Integration, Wuhan National Lab for Optoelectronics, China. A linear and wideband optical isolator based on optical gradient force between two single-mode waveguides is proposed and numerically investigated. It is compatible with complementary metal-oxide semiconductor (CMOS) process, and has potential applications in highly integrated photonic information processing chip.

ATH3A.41 Fast and Effective Method to Distinguish the Polarizing Components Using a Polarizing Triangular Cyclic Interferometer, Raperpe Kanawon1, Chuchai Paowang2, Apichai Bhatraranond3, Ratchapak Chitaranet4, 5Faculty of Engineering, King Mongkut’s Univ. of Technology Thonburi, Bangkok, Thailand; 6Faculty of Science and Technology, Rajamangala Univ. of Technology Krungthep, Thailand; 7Faculty of Science, Mahidol Univ., Thailand. The application of the polarizing triangular cyclic interferometer to distinguish different types of polarizing components is investigated. The distinct output signals from polarizer and wave plates under examination can clearly be observed.

ATH3A.42 Tunable optical router based on microring resonator structures, Zhihua Yu1, 2China Univ. of Geosciences, China. The design and analysis of a novel non-blocking microring resonator-based optical switched router is reported, which can be used as a switch node to construct a large photonic routing network on chips. This router has a more compact structure in size, a lower loss and a lower optical power consumption.

ATH3A.43 Tunable Optoelectronic Oscillator based on ring resonator, Kefei Ren1, 2Rong Wang1, Tao Pu1, Tao Fang1, Jilin Zheng1, Dalai Chen3, 4PLA Univ. of Science and Technology, China. A novel continuously tunable optoelectronic oscillator (CEO) is proposed, in which ring resonator (RR) filter is used. Tunable range is about 40MHz and the frequency tuning can be realized by tuning the OTDL ring resonator.

ATH3A.44 Intersubband Transition in AlGaN/GaN step quantum wells at 3.5 µm, Xin Rong, Xiqiang Wang1, Guang Chen1, Pin Zhang, Xiantong Zheng2, Fujun Xu3, Bo Shen3, 3School of Physics, Peking Univ., China. We demonstrate intersubband absorption and photocurrent response at wavelength of 3.5 µm in nitride-based semiconductor step quantum step quantum wells structures, in which the internal electric field of step barrier layers is proved almost completely eliminated.

ATH3A.45 Mode Analysis for Unidirectional Emission Mirroring Lasers, Xu-Wen Ma1, Xiao-meng Lv1, Yong-Zhen Huang1, Yue-De Yang1, Jin-Long Xiao2, Yun Du1, 1Chinese Academy of Sciences; Inst. of Semiconductors, China. We have investigated the mode characteristics numerically and experimentally for unidirectional emission microring lasers with different ring widths. The results indicate that the introduction of the inside wall can modify the mode Q factors and suppress the higher-order transverse modes.

ATH3A.46 Design of Easy-Fabricated Low-Loss Strip- to- Slot Waveguide Mode Converter, Qiang Yan1, Xuecheng Shi1, Shiming Gao1, 1Centre for Optical and Electromagnetic Research, State Key Lab of Modern Optical Instrumentation, Zhejiang Univ., China. A compact strip-to-slot waveguide mode converter is proposed, to realize the purpose of easy fabrication, whose minimum dimension is as large as 100 nm. A >99% conversion efficiency is achieved with conversion length of <20 μm.

ATH3A.47 All-Optical Wavelength Conversion Using Widely Tunable V- Cavity Semiconductor Laser, Yu Zhu1, Yingcheng Wu1, 1Institute of Technical Physics, Beijing Jiaotong Univ., China; 2Beijing Jiaotong Univ., China. A simple wavelength converter exploiting injection-induced wavelength switching in V-cavity laser. A 2.5Gb/s non-return-to-zero (NRZ) channel-to-channel wavelength conversion has been modeled using time-domain traveling-wave method and well-open eye diagrams have been experimentally measured.

ATH3A.48 Research of high performance Ge/Si avalanche photodiodes for single-photon detection, Chong Li1, Chunji Xue1, Xia Guo1, 1Beijing Univ. of technology, China; 2Inst. of Semiconductors, Chinese Academy of Sciences, China. A separate- absorption-charge multiplication Ge/Si avalanche photodiode was designed. The devices have high current at low reverse bias, because of surface impurity and rough sidewall. A guard-ring structure and in-situ doping was introduced to decrease leakage-current.

ATH3A.49 Broadband Bragg Grating Mirror Based on Circular and Horizontal Slot Silicon Waveguides for TM Mode, Yong Wang1, 2Elijotum Skafidas2, 3Victoria Research Lab, National ICT Australia Ltd., Australia; 4Dept. of Electrical and Electronic Engineering, Univ. of Melbourne, Australia. A circular Bragg grating mirror based on horizontal slot waveguides are proposed for the fundamental TM-mode. 3D-FDTD simulation results show that high reflectance of >0.9 and a broad 1 dB-bandwidth of >120 nm can be achieved.

ATH3A.50 High-Order Mode Polarization Rotator for All Optical SDM-PDM Signals Processing, Yaguang Qin1, Yu Xu1, Mengyuan Ye1, Jinghui Zou1, Guanyu Chen2, Xinliang Zhang3, 1Wuhan National Lab for Optoelectronics and School of Optical and Electrical Information, Huazhong Univ. of Science and Technology, China. A polarization rotator that converts the input TE1 mode to TM1 mode is proposed and demonstrated theoretically. The conversion efficiency is higher than 90% over the C-band, with excess loss as low as 0.35db.

ATH3A.51 Structure Optimization of Resonant Cavity-Enhanced Uni-Travelling Carrier Photodiode for High Quantum Efficiency and Wide Optical Bandwidth, Miao Di1, Bing Xiong1, 2Changzheng Sun1, Luo Yi1, 3Dept. of Electronic Engineering, Tsinghua National Lab for Information Science and Technology, Tsinghua Univ., China; 4State Key Lab on Integrated Optoelectronics, China. Resonant cavity-enhanced uni-travelling carrier photodiode structure with optimized distributed Bragg reflector (DBR) mirror and absorber-layer was proposed. The device is expected to achieve high quantum efficiency of 89% and wide optical bandwidth of 23 nm.

ATH3A.52 Low loss broadband waveguide crosswave for Silicon-on-insulator optical interconnect, Yanjuan Liu1, Xin Tu1, Huixiao Ma2, Hongyan Fu3, Dongyu Geng4, 5HUAWEI, China. We demonstrated a waveguide crossing with an average simulation loss of 0.03 db and a crosstalk of over 43.8 db. It also exhibits a good performance process tolerance with 3D-FDTD simulation.

ATH3A.53 On-chip Optical Mode Multicasting Using Ta- pered Directional Coupler, Zhengtao Zhang1, Jian Wang1, Chengcheng Gui1, 1Wuhan National Lab for Optoelectronics, Huazhong Univ. of Science and Technology, China. We propose an on-chip optical mode multicasting device with three channels by using tapered directional couplers. The simulation results show efficient modes excitation and effective mode multicasting with a less than 0.4 dB insertion loss.

ATH3A.54 Design of a Compact Controllable Graphene- Assisted Broadband Polarizer, Zhongqiao Zhang1, Jian Wang1, Xiao Hu1, Chengcheng Gui1, Jing Du1, 1Wuhan National Lab for Optoelectronics, Huazhong Univ. of Science and Technology, China. We propose compact polarizers based on graphene-silicon ridge and slot waveguides. By applying voltage on the graphene, an over 30 dB TE/TE extinction ratio over 100 nm broadband is achieved on both the waveguides theoretically.

ATH3A.55 A Highly Flexible Circular Antenna Array Generating Phase/Amplitude/Polarization- Steerable Radio Vortex Beams, Zhuyou Li1, Long Zhu2, Jian Wang1, 3Huazhong University Science&Technology, China. We present a highly flexible tunable circular antenna array generating radio vortex beam at 2.4 GHz. By manipulating the polarization, phase and amplitude, the antenna array can generate orbital angular momentum (OAM) carried beams, multiplexed OAM carried beams, cylindrical vector beams, and OAM carrying beams with polarization singularity.

ATH3A.56 Integrated compact vertical cavity surface emitting orbital angular momentum laser, Yuan Zhao1, Jian Wang1, 2Wuhan National Lab for Optoelectron, China. We propose a new method for generating OAM states by growing SPP structure on the top of traditional VCSEL. Moreover, we design a conceptual 2-D OAM emitting array taking the advance of VCSELs easy-to-integrate feature to generate different states including fractional states simultaneously.

ATH3A.57 Poling field strength dependent photoluminescence of dispersed red-19, Kwang-Sun Kang1, 2New and Renewable Energy, Kyungil Univ., Republic of Korea. Photoluminescence of dispersed red-19 (DR-19) was strongly dependent on the poling field strength. Poling of DR-19 and TO2 films were started in partial liquid state and were poled in between 3.5 and 5.0 kV.

ATH3A.58 Universal dispersion relation for plasmon modes in graphene-coated nanowire, Yixiao Gao1, Guobin Ren1, Bofeng Zhu2, Lin Huang3, Shusheng Jian4, 1Inst. of Lightwave Technology, Beijing Jiaotong Univ., China. A universal scaling law to describe dispersion relation of plasmon modes in graphene-coated nanowire (GNW) is presented, which could be applied to obtain the dispersion relation of GNW with any radius without further extensive calculation.
**MANDARIN HALL**

**ATH3A.59**
Design of Graphene Electro-Absorption Modulator Based on Long-Range Hybrid Plasmonic Slot Waveguide, Xiao Hu, Chengcheng Gui, Jian Wang, Wuhan National Lab for Optoelectronics, China. The designed graphene modulator takes advantages of both traditional long-range surface plasmon polariton waveguide and hybrid plasmonic waveguide. The optical bandwidth of such modulators exceeds 15 THz (C band) with figure of merit 215.

**ATH3A.60**
Design of an Opto-Mechanical On-Chip 1 x 2 Optical Switch, Xuhui Li, Zhouyu Li, Long Zhu, Jian Wang, Huazhong Univ. of Sci. and Tech., China. A novel design of optical switch driven by opto-mechanical effect is presented. Utilizing optimized device geometries with strong opto-mechanical interactions allows us to flexibly control the direction of output signal, enabling an opto-mechanical on-chip 1x2 optical switch.

**ATH3A.61**
Withdrawn

**ATH3A.62**
Spin-dependent polaritonic flip-flop in semiconductor microcavity, Fan Wang, Wei Li Zhang, Yunjing Rao, Xiao Min Wu, Univ. of electronic science and technology of China, China. Utilizing the bistability of microcavity polaritons, flip-flop operations are proposed which triggered by the change of pump field. To avoid the negative pulse, a linearly polarized pulse is injected as the reset signal.

**ATH3A.63**
Generation of Single-Cycle THz Radiation in Thin VO2 Films Undergoing Metal-Insulator Phase Transition, Petr Solyankin1, Artem Sidorov1, Alexander P. Shkurinov1, Mikhail N. Easukov1, Luo Qin2, Keaja Wang1, Xicheng Zhang2, M.V.Lomonosov Moscow State Univ., Russian Federation; 1Inst. on Laser and Information Technologies of the Russian Academy of Sciences (ILIT RAS), Russian Federation; 2Wuhan National Lab For Optoelectronics, Huazhong Univ. of Science & Technology, China. A transformation optical coupler for mono-mode THz radiation is demonstrated. According to three-dimensional simulations, the coupler supports a high power transmission efficiency and low reflection.

**ATH3A.64**
Widely Tunable Optical Filters Based on Liquid crystal-Filled Multiple-Slot Microcoring Resonators with Large Fabrication Tolerance, Jing Dai1; Huazhong Univ. of Science & Technology, China. We proposed a tunable optical filter based on multiple-slot microring resonators with wide tuning range and large fabrication tolerance. The liquid crystal is used as a cladding. Simulation results show a tuning range of 81.4 nm and an ultrawide drive voltage of 5 V.

**ATH3A.65**
Diffractive waveplates based on polarization holography, Peng Cai1, Changshun Wang1, Fuli Zhao1, Pengfei Zeng1, Mu Qing1, State Key Lab of Advanced Optical Communication Systems and Networks, Shanghai Jiao Tong Univ., China. Diffractive waveplates based on polarization holographic gratings were fabricated. The characteristics of the diffractive waveplates were demonstrated by measuring the diffraction efficiency and surveying the conversion of the polarization state of the probe beam.

**ATH3A.66**
A Transformation Optical Coupler for Monochromatic Integration in InGaAsP/InP System, Kaisheng Chen1, Zhiyong Huang2, Guoxiong Dong1, Xinliang Zhang1, Wuhan National Lab for Optoelectronics & School of Optical & Electronic Information, Huazhong Univ. of Science and Technology, China. An ultra-compact vertical coupler in an asymmetric twin-waveguide integration configuration in InGaAsP/InP material system is designed using transformation optics. The coupler supports a high power transmission efficiency and low reflection.

**ATH3A.67**
Computational Investigation of THz Surface Plasmon Modulation with Optical Injection of Free Carriers, Tao Yang1, Yuan Zhou1, Yuan-yi Li1, Chao Xu1, Wei Huang1, Xing-ao Li1, Yi-qiang Qin1, Yong-yuan Zhu1, Ho-pui Ho1, Nanjing Univ. of Posts & Telecommunications, China; "Nanjing Tech. Univ., China; "Nanjing Univ., China; "The Chinese Univ. of Hong Kong, Hong Kong. Optical modulation of THz SPPs propagating in the surface of semiconductor is investigated. The modulation bandwidth is estimated to be in GHz order, thus leading to the possibility of communication applications using the THz baseband.

**ATH3A.68**
Dynamic control of broadband slow wave in graphene-based waveguides, Ran Hao1, Xia Min Jin1, Er Ping Li1, Zhejiang Univ., China. We proposed and numerically analyzed here for the first time an extremely broadband slow surface wave in a graphene-based waveguide. Our results suggest that graphene may be a very promising slow light medium, promoting future slow light devices based on graphene.

**ATH3A.69**
Repetition Rate Multiplication of Pseudorandom Bit Sequences Based on TOADs, Zhenhai Su1, Zhi Wang1, Chengyong Wu2, Fu Wang2, Guangdong Liu1, Qin Lin1, Yangtian Jia1; Beijing Jiaotong Univ., China. We demonstrate a scheme for repetition rate multiplication of PRBS based on TOAD, and obtain quadrupling of 500Mbs PRBS to 2Gb/s experimentally. Longer period and higher bit rate can be implemented with this scheme.

**ATH3A.70**
Characterization of Arraysed Waveguide Grating by Fabry-Perot Interferometric Method, songtao liu1, Xilin Zhang1, Dan Li1, Ruikang Zhang1, Wei Wang1, Chen Ji1, Inst. of Semiconductor, CAS, China. An improved measurement technique for characterizing the on-chip loss of InP-based arrayed waveguide grating is demonstrated. The results match well with that of the conventional test method, but with higher measurement efficiency and less uncertainties.

**ATH3A.71**
Ultra-flatt and low dispersion over near-infrared regime in horizontal silicon nitride slot waveguide, Lijian Xu1, Xiaochang Ni1, Jing He1, Hao Chong1, 1School of Electronic Engineering, Tianjin Univ. of Technology and Education, China; 2College of Precision Instrument & Opto-electronics Engineering, Tianjin Univ., China. A strip slot hybrid silicon nitride waveguide is designed to provide an ultra-flat and low dispersion. The dispersion is 0.7 ps/nm/km over 812 nm with two zero dispersion wavelengths in near-infrared regime.

**ATH3A.72**
Broadband terahertz metamaterial absorber based on planar square-spiral antenna, Shiga Feng1, Huazhong Univ. of Science and Technology, China. We demonstrate a broadband terahertz metamaterial absorber with planar square-spiral antenna structure. The bandwidth of absorber is as large as 5.26 THz and absorption keeps high for different polarizations and oblique angles.

**ATH3A.73**
Large pulse-energy passive harmonically mode-locked Raman fiber ring laser at 1.65-μm band, Jingjuan Zhou1, Aiping Luo2, Zhihao Luo1, Xudong Wang1, Xinhuan Feng1, Bai-ou Guan1, Jian Univ, China, 2South China Normal Univ., China. We propose and demonstrate a dual-wavelength single-frequency fiber laser with switchable wavelength spacing based on graphene saturable absorber and a WaveShaper. The linewidths of the two wavelengths are both narrower than 7.3 kHz.

**ATH3A.77**
Chirped Microwave Waveform Generation Based on Reconstruction of the Required Frequency Response, Dali Chen1, Rong Wang2, Tao Fu1, Tao Fang1, Peng Xiang1, Jing Zheng1, PLA Univ. of Science and Technology, China. A novel approach to generating chirped microwave signal by using a photonic microwave delay-line filter (PMDLF) is proposed. A design example of a 37-tap PMDLF is provided, and generation of the desired signal is demonstrated by numerical simulations.

**ATH3A.78**
Dual-wavelength single-frequency fiber laser based on graphene saturable absorber, Jingjuan Zhou1, Aiping Luo2, Zhihao Luo1, Xudong Wang1, Xinhuan Feng1, Bai-ou Guan1, Jian Univ, China, 2South China Normal Univ., China. We propose and demonstrate a dual-wavelength single-frequency fiber laser with switchable wavelength spacing based on graphene saturable absorber and a WaveShaper. The linewidths of the two wavelengths are both narrower than 7.3 kHz.

**ATH3A.79**
A long cavity graphene-based mode-locked fiber laser for high pulse energy output, Xiaoying He1, Tao Chen1, Dong Ning Wang2, Xiangchao Zhang1, Hao Zhang1, Min Xu1, Shanghai Ultra-Precision Optical Manufacturing Engineering Center Fudan Univ., China; 2Dept. of Electrical Engineering, The Hong Kong Polytechnic Univ., Hong Kong. A few-layer graphene attached on the MOPA master laser is used in a long cavity fiber laser for ultrafast soliton pulse generation. Due to the large light-graphene interaction, it has high pulse energy of ~3.2 nJ.
Demonstration of a Widely Tunable Microwave Signal Generator based on Dual-Polarization Fiber Grating Laser, Yuan Qiang, Inst. of Photonics Technology, China. We demonstrate the implementation of a widely tunable microwave signal generator based on a dual-polarization fiber grating laser. The frequency is continuously tuned from 1.6 to 15.7 GHz.

High power, hybrid fiber/solid-slab ultraviolet picosecond pulse laser system with high stability, Wei Chen, Ming-Ie Hu, Qianqi Cai, Taijun Univ., College of Precision Instruments and Opt. China; ‘Laize photonics corporation, China. The 1064nm pulse seed is generated from a compact all-polarization-maintaining fiber amplifier and amplified by a solid-state slab laser. And 355nm output pulses with average power of 3.5W are acquired through nonlinear optical effects.

Reconfigurable Pass-band Microwave Photonic Filter Using Frequency Combs and Stimulated Brillouin Scattering, Dening Wang, Yongkang Dong, Yongzhang Zhai, Wei Gao, Zhiwei Lu, National Key Lab of Science and Technology on Tunable Laser, Harbin Inst. of Technology, China; ‘Optics Information Science and Technology, Harbin Univ. of Science and Technology, China. A reconfigurable pass-band microwave photonic filters with a 3-4B bandwidth from 3.4 MHz to 306.8 MHz and a tuning range of 3 – 20 GHz is demonstrated based on frequency combs and stimulated Brillouin scattering.

Performance of Few-mode EDFAs in Optical Space-Division Multiplexed Communication Systems, Hesham Youssf1, 2, Ziad El-Salhin1, Adel El-Zohab1; 1Department of Information Technology, Institute of Graduate Studies and Research, Alexandria University, Egypt; 2Telecom Egypt Company, Egypt. We report a novel tailored few-mode erbium doped fiber amplifier with mode-selective bidirectional pumping. We successfully demonstrate up to 10 spatial modes with zero differential group delay, and a BER below 10-10 at 100 Gba/s.

Demonstration of a Standing Spiral Polarization Wave, Xuang Xu, Yixin Zhu, Kun Qu, Institute of Physics, China. We proposed and verified a novel structure for implementing all-optical binary pattern recognition. The proposed scheme adopts a novel “proof-by-contradiction” method to achieve fast and reliable pattern recognition with no operational bit rate limitation.

Fabrication of Chiral Fiber Bragg Gratings with a Standing Spiral Polarization Wave, Huaxing Xu, Li Yang, China Academy of Electronics and Information Technology, China; ‘Deptment of Electronic Engineering and Information Science, Univ. of Science and Technology of China, China. We propose a method to fabricate chiral fiber Bragg gratings. By the method, we can prepare gratings with spiral interference axes by using the interference of counterpropagating circularly polarized beams of the same handedness in photosensitive alignment material fibers.
ATH3A.99 Effective Mode Field Diameter Definition and Splice Loss Estimation of LP11 Mode in Few Mode Fibers, Kazuo Ozaki, Masaharu Ohashi, Hirokazu Kubota, Yuki Miyoshi, Osaka Prefecture Univ., Japan. We propose a definition of the effective mode field diameter (MFD) of LP11 mode in few mode fibers (FMFs). The splice loss between LP11 modes is successfully estimated by the MFD and a correction factor.

ATH3A.98 Spectral compression of 200 fs pulse in nonlinear optical fibers with exponentially increasing dispersion, Mengfeng Li, Qian Li, Peking Univ. Shenzen Graduate School, China. We demonstrate efficient spectral compression of chirp-free femtosecond pulse at 1550nm wavelength in a dispersion exponentially increasing fiber. A high spectral compression factor of 25 can be achieved.

ATH3A.100 Multi-pulse compression in nonlinear optical fibers with exponentially decreasing dispersion, Wei Li, Qian Li, Ping kong Wei, Peking Univ. Shenzen Graduate School, China; The Hong Kong Polytechnic Univ., Hong Kong. We demonstrate multi-pulse compression in nonlinear optical fibers with exponentially decreasing dispersion. Three chirped-casine pulses coalesce into a single pulse with a compression factor of 10.2.

ATH3A.101 Physical Interpretation of Strange Crosstalk in W-type Multi-Core Fiber, Shinya Shinohara, Yuki Miyoshi, Hirokazu Kubota, Masaharu Ohashi, ’1-1, Nakaku Gakuentyo, Japan. We clarify the physical interpretation of the strange crosstalk of W-type multi-core fiber. We also investigate theoretically the effect of the inner cladding depth and width on the crosstalk of the W-type MCF.

ATH3A.102 Generation of Pseudo-Random Optical Signals using the Fiber Recirculating Loops, Yasuhiro Tsutsumi, Yuto Omori, Kazuki Kikawa, Masaharu Ohashi, Ikuko Yamashita, Joji Maeda, Tokyo Univ. of Science, Japan; Osaka Prefecture Univ., Japan; The Kansei Electric Power CO., INC., Japan. A simple technique for generating pseudo-random optical signals suitable for correlation-based OTDR is proposed and properties of the generated signals are numerically demonstrated. Moreover, out of the signals generated, three are successfully carried out.

ATH3A.103 Photoabsorption of Few Atoms Using Photonic Crystal Cavity Based on Nanofiber, Pengfei Zhang, Jameesh Keloth, Kali Nayak, Khaloz Hakuta, Center for Photonic Innovations, Univ. of Electro-Communications, Japan. We demonstrate enhanced light-matter interaction in nanofiber based photonic crystal cavity. We show the absorption of the guided mode can be enhanced up to 53% for an average atom number of 4.7 around nanofiber cavity.

ATH3A.104 Bi-Directionally-Pumped Few-Mode EDFA, Zhihong Zhang, Bingping Guo, Ningbo Zhao, Xiaoying Li, Guifang Li, College of Precision Instrument and Opto-electronics Engineering, Tianjin Univ., China; CREOL, The College of Optics & Photonics, Univ. of Central Florida, USA. We present a model for the performance of bi-directionally-pumped few-mode EDFAs for the first time. Bi-directionally pumping can realize the best trade-off among metrics important for SDM including gain, noise figure and power conversion efficiency.

ATH3A.105 Full-duplex 64-QAM-OFDM at 18 Gbit/s with colorless FPLD injection-locked by reusing DBFLD/EAM carrier, Yu-Chen Chi, Yi-Cheng Lu, Cheng-Ting Tsai, Min-Chi Cheng, Guang Wu, Graduate Inst. of Photonics and Optoelectronics, Dept. of Electrical Engineering, National Taiwan Univ., Taiwan. Full-duplex 64-QAM-OFDM with up-stream colorless FPLD injection-locked by reusing down-stream DBFLD/EAM carrier can provide ultra-low RIN of -107dbcHz to achieve SNR of 22.9 dB and receiving sensitivity of -8 dBm under FEC required BER.

ATH3A.106 Symmetric 100-Gb/s DSP-Enhanced TWDMPON, Bangjiang Lin, Jiahou Li, Tao Hu, Duo Li, Dawei Ge, Yongqi He, Zhangyuan Chen; pku, China. We propose a 100-Gb/s DSP-enhanced TWDMP-APON architecture. The RSOA are used to enhance the sensitivity of downstream OFDM signals, while SFCD is used for upstream transmission to reduce the complexity and cost of access network.

ATH3A.107 Rayleigh Noise Mitigation in Channel-reuse 10Gb/s XA DWDM-PON Employing Optical Beat Noise-based Self Wavelength Managed Tunable Laser, Zhiguo Zhang, Xu Jiang, State Key Lab of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. We propose an optical beat noise-based wavelength difference detection method and a RB noise mitigation method relying on wavelength shift between upstream and downstream used in tunable laser-based channel-reuse DWDM-PON system. The feasibility is also experimentally verified.

ATH3A.108 Stable fiber delivery of millimeter wave signal by fast phase compensation system, Xiaocheng Wang, Hong Kong Polytechnic Univ., Hong Kong. We demonstrate stable fiber delivery of millimeter wave millimeter wave signal with a compression ratio of 20:1 and a phase error of less than 1 degree over a distance of 2 km.

ATH3A.109 Performance Analyses of LDPC-Coded Orbital Angular Momentum (OAM) Optical Communications in a Multi-Bending Ring Fiber, Jiaxing Zhou, Shuhui Li, Xiao Hu, Jun Liu, Jian Wang, Huazhong Univ. of Sci. & Tech., China. We numerically analyze the propagation effects of orbital angular momentum (OAM) multiplexed optical system in a multi-bending fiber. In combination with variable LDPC codes, we get a relatively fault-tolerable coding gain of more than 8 dB compared to an uncoded system.

ATH3A.110 Bessel Beam Multiplexing for Free-Space Optical Communications Assisted by 6×6 MIMO Equalization, Zhidan Xu, Key Lab of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. We propose a training-aided Bessel beam multiplexing optical system assisted by 6×6 MIMO equalization in free-space optical communications. The channel crosstalk and the bit-error rate (BER) of multiplexing system are comprehensively evaluated.

ATH3A.111 Polarization Dependent Gain/Loss induced Nonlinear Phase Noise in Digital Optical Communication Systems, Junhe Zhou, Philippe Gallois, Jiaoming Wang, Hong Kong Univ., China; TELECOM ParisTech, Ecole Nationale Supérieure des Télécommunications, CNRS, LTCI UMR, France. Polarization dependent loss (PDL) will introduce statistical power variations. This effect will accumulate during the signal transmission and induce random phase shift due to the nonlinear effects in optical fibers. This phenomenon is studied analytically in the paper with the verifications from the numerical simulations.

ATH3A.112 Inter-frame Iterative Carrier Frequency Offset Estimation for CO-OFDM System, Peikun Zhu, Fu Zhao, Jiahui Su, Keping Xiao, Shangxiang Chen, Yongge He, State Key Lab of Advanced Optical Communication Systems and Networks, Peking Univ., China. We propose a training-aided inter-frame iterative frequency offset estimation (II-FOE) method for CO-OFDM system, the complexity of which is significantly reduced by only estimating sign of FO in each iteration.

ATH3A.113 A Visible Light Communications System with 220MHz Bandwidth Based on Pre-emphasis and Post-equalization Technologies, Mingjun Zhang; Beijing Univ. of Posts & Telecom, China. We propose a visible light communications system based on pre-emphasis and post-equalization technologies. 220MHz E/O bandwidth is achieved with good frequency response flatness. A 53.3Mbits OOK transmission experiment shows the system has good communication performance.
Mandarin Hall

ATh3A.122

Experimental Demonstration of 40G Multi-

plexing and Demultiplexing functions for the 40G/10G TDM-PON experimental system, Xiaoyan Wang, Liqian Wang, Xue Chen, Haoran Yan, Panke Qin, State Key Lab of Information Photonics and Photonics Communications, BUP, China. The functions of 40G multiplexing/demultiplexing module for the 40G/10G TDM-PON experimental system are designed and implemented. The overall feasibility and performance metrics of the system's 40G multiplexing/demultiplexing functions are experimentally verified over our test.

ATh3A.123

Investigation of Nyquist OTDM System Per-

formance with a Rectangular Optical Nyquist filter, Liang Zhang, Li Huo, Caiyun Lou, Electronic Engineering, Tsinghua Univ., China. We have simulated the rectangular Nyquist filter based Nyquist OTDM transmission and investigated several factors including amplifier noise, initial phase differences between adjacent channels, the demultiplexing pulse offset and modulation formats.

ATh3A.124

A Novel Byte-Interleaver for Eliminating Cor-

relation of Errors in OTUK Signals, Zilong He, Wentao Liu, Xue Chen, Bailin Shen, Zhiqiu Zhang, State Key Lab of Information Photonics and Optical Communications, Beijing Univ of Posts & Telecom, China; ZTE Corporation, China. A new Byte-Interleaver with low complexity is proposed to eliminate correlation of errors in OTUK signals. By using the Byte-Interleaver as Error-Decorator, the resistance of GFE to correlated errors in OTUK signals is improved.

ATh3A.125

Design Trade-offs for Cost-effective Multimode Fiber Channel Equalizers in Optical Data Center Applications, Kai Xu1, Bo Wang, Guy Torfs, Xin'an Wang, Johan Bauwelinck, Xin Yin, Electronics and computer engineering, Peking Univ., China; information technology (INTEC), Ghent Univ., Belgium. A 10-Gb/s transmission over 1-km standard multimode fiber for data center applications is case-studied in terms of the design considerations for low-complexity and cost-effective equalizers which can increase the reach of multimode fiber links.

ATh3A.126

PAPR Reduction Based on Signal Scrambling and Discrete Hartley Transform in Optical OFDM Systems, Lin Chen, Yong Fang, Qinghua Huang, School of Electronic and Information Engineering, Shanghai Univ. of Electric Power, China; School of Communication and Information Engineering, Shanghai Univ., China. A signal scrambling based on discrete Hartley transform is proposed for optical OFDM, which discrete Hartley transform is used to generate real signal. The novel scheme has better PAPR performance and lower computational complexity.

ATh3A.129

Experimental demonstration of a RGB-LED based visible light communication system employing Carrierless Amplitude and Phase modulation, Zhixiong Wang, Chi Nani, Dept. of Communication Science and Engineering, FUDAN Univ., China. In this paper we experimentally demonstrate a 450Mbps RGB-LED based visible light communication system employing Carrierless Amplitude and Phase modulation. We simulate the performance of constant modulus algorithm (CMA) and Cascaded Multi-Modulus Algorithm (CMAA).

ATh3A.130

Assessment of Extended Kalman Filtering Based Simultaneous Polarization and Phase Tracking for PDM-16QAM, Cao Guoliang, Yang Yanyu, Kang Ping Zhong, Cui Lantao, Rong Ning, Jian Gu, Yao Yong, Dept. of Electronic and Information Engineering, Harbin Inst. of Technology, China; Dept. of Electronic Engineering, Hong Kong Polytechnic Univ., China. This paper introduces extended Kalman filtering based polarization and phase tracking for PDM-16QAM signal. The performance is numerically studied in terms of OSNR penalty on phase noise, polarization rotation, residual frequency offset, residual dispersion and polarization mode dispersion.

ATh3A.132

A Novel Preamble-based Synchronization Method for Coherent Optical OFDM, Qirui Fan, Jing He, Ming Chen, Lin Chen, College of Computer Science and Electronic Engineering, Hunan Univ., China. A novel preamble structure synchronization method based on adaptive Nyquist filtering technique is proposed for coherent optical OFDM systems. Simulation result shows that the proposed method performs well in timing synchronization and frequency synchronization.

ATh3A.133

Photonic Assisted Broadband Instantaneous Frequency Measurement, Quanruan Shi, Yiyang Gu, Zijian Kang, Jiijing Hu, Feng Fan, Xiuyou Han, Mingshan Zhao 1School of Physics & Optoelectronic Engineering, Dalian Univ. of Technology, China. The instantaneous microwave frequency measurement with amplitude comparison functions is proposed and experimentally demonstrated. From the proof-of-concept experiment, the measurement demonstrates a frequency accuracy of about ±150 MHz in the frequency range of 1-20 GHz.

ATh3A.136

Optical transmission link between microproces-
sors and memories, Daxin Lui1, Qinfen Hao, Central Research Inst., Huawei, China. We demonstrated a high-efficient optical transmission link between microprocessors and memories. Error-free memory operational message transmission is achieved by using this link, and an operating system runs well on the optically interconnected computing system.
Mandarin Hall

ATH3A.137 Multichannel-Mixed OOK and DPSK Format Transmission Performance between Midspan TDCM and OPC System, Imeza Ismail1, Quang Nguyen-The1, Motoharu Matsur2a, Naoto Kishi1
1Dept. of Communication Engineering and Informatics, The Univ. of Electro-Communications, Japan. We demonstrated the transmission performance between the midspan of tunable-dispersion-compensator-module(TDCM) and optical-phase-conjugate-OPC) with specially using multichannel-mixed OOK and DPSK format. The OPC scheme has the advantage over the pen-
alties performance compared to TDCM scheme.

ATH3A.138 Sensitivity of a Pulsed Local Oscillator Coherent Optical Receiver, Application to the linear optical sampling, Philippe Gallion1, Christophe Gosset1, Xin You1, Junhe Zhou2, 1Telecom ParisTech , Ecole Nationale Superieure des Telecommunications et CNRS LTCI (UMR 5141), France; 2Tongji Univ., China. We derive the Er-
or Vector Magnitude for signal measurements performed by a pulsed local oscillator coherent optical receiver. Best achievable sensitivity is discussed in terms of Signal-to-Noise Ratio and Error Vector Magnitude.

ATH3A.139 Channel Estimation with Weighed Intra-symbol Averaging in Coherent Optical Transmission Systems, Suje Fani1, Jian Wu2, Yan Li1, Miao Yu1, 1Beijing Univ. of Posts and Telecommunications, China. A frequency-domain channel estimation with weighed intra-symbol averaging (WISA) technique has been presented in this paper. Simulation results demonstrate that the WISA based channel estimation surpasses intra-symbol averaging based channel estimation by 13.3%.

ATH3A.140 6.144 Gb/s Transmission in Wavelength Agility Optical Access Network for C-RAN with Directly Modulated Tunable DBR Laser, Kuo Zhang1, Hao He2, Yuan Liu3, WeiJia Du3, Weisheng Hu1; 1State Key Lab of Advanced Optical Com-
munication Systems and Networks, Shanghai Jiao Tong Univ., China. Directly modulated tunable DBR laser is a feasible optical source in wave-
length agility optical access network in C-RAN. Transmission at 6.144Gb/s NRZ signal over 20km SMF is experimentally confirmed, with tunability over ten channels.

ATH3A.141 Positioning based on LED visible light commun-
ation utilizing MIMO-MRC algorithm, Yinfan Xu1, Chi Nan2; Fudan Univ., China. We report a novel indoor positioning scheme based on MIMO LED VLC system applying space diversity receiver. The simulation results show that the BER performance can be greatly enhanced by using MIMO-MRC algorithm.

ATH3A.142 Mode and Wavelength Allocation in Multi-
Dimensional Optical Networks, Yongli Zhao1, Jiawei Han1, Yuanlong Tan1, Ruijie Zhu1, Jie Zhang1; 1Beijing Univ of Posts & Telecom, China; 2Korea Advanced Inst. of Science and Technology, Republic of Korea. Different physical dimensions are to be excavated to improve fiber-optic transmission capacity, which make resource allocation problem more and more complex. Multi-dimen-
sional resource model is built, on which four mode and wavelength allocation algorithms are proposed and evaluated.

ATH3A.143 Automatic Topology Discovery and Control Paths Establishment in TPhs ET SDN, Yang Zhao1, Xue Chen2, Futoshi Yang1; 1State Key Lab of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. In this paper, by-layer discovery is proposed to realize topology automatic discovery and optimal control paths establishment. Switches could be discovered while a short time, control-
ler gets the shortest control paths respectively to each switch.

ATH3A.144 Design of High-performance SDN Controller, Wenxing Ma1, Shuhe Sun2, Bushe Lei3, Heyu Wang4, Peng Wang5; 1State Key Lab of Informa-
tion Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China; 2Beijing Research Inst., Beijing Univ. of Posts and Telecommunications, China. Architecture and core processing logic of a high-performance modular SDN controller using ingenious mechanism is proposed in this paper. And the high-performance SDN controller is running well in China Telecom Cloud Computing Key Lab.

ATH3A.145 Photonic Generation of Power Efficient Millimeter-wave UWB Signals with Dual-band Operation Consideration, Peng Xiang1, Dali Chen1, Yuxuan Li1, Tao Pu1; 1College of Informa-
communications Engineering, PLA Univ. of Science and Technology, China. A novel approach to photonic generation of 24GHz/50GHz dual band millimeter-wave UWB signals is proposed. Simulation results show that the generated UWB signals can efficiently exploit the spectrum limit allowed by FCC mask.

ATH3A.146 Algorithm for Hybrid Optical Fiber-Wireless Photonic Channel Allocation for Millimeter-waveband 5G Networks, Alberto Gomez-Gonzalo1, Juan Jesus Vegas Olmos2, Idefonso Tafur Moran2; 1Dept. of Photonics Engineering, Technical Univ. of Denmark, Denmark. This paper presents a performance assessment of an algo-
rithm for hybrid wireless-optical photonic channel allocation in 5G using radio-over-fiber with active delivery. Simulations show reductions of network blocking probability in 98% of the tested cases.

ATH3A.147 M2I-based Non-blocking SOI Switches, Moham-
med Shafiqul Hai1, Peicheng Liao1, Mehrdad Mir Shafiei1, Odibo Lironob- Labouteur2; 1Electrical and Computer Engineering, McGill Univ., Canada. An 8×8 M2I based rearrangeable non-blocking Bene's switching matrix is designed on a SOI platform. Error free performance (BER of 10^-12) is obtained with switching times of 6 ns and power penalty less than 1 dB.

ATH3A.148 Novel Detection in OTRD data based on a method combining Correlation Matching with STFT, Heng Kong1, Qian Zou1, Weilin Xie1, Yi Dong2, Cheng Ma1, Weisheng Hu1; 1State Key Lab of Advanced Optical Communication System and Networks, Shanghai Jiao Tong Univ., China. This paper proposes a method of detecting and localizing events in optical time-domain reflectometry (OTDR). This method is based on Correlation Matching and Short Time Fourier Transform (STFT), and achieves a higher accuracy and efficiency.

ATH3A.149 Spectrum Division Algorithm based on Service Bandwidth in Elastic Optical Networks, Yachao Shi1, Jie Zhang1, Yongli Zhao1, Bowen Chen1, Guoying Zhang1; 1State Key Lab of Informa-
tion Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China; 2China Academy of Telecommunication Research of MIIT, China. A novel spectrum division algorithm is proposed by considering dividing spectrum based on service bandwidth. Numerical results show that this algorithm performs well in reducing the blocking probability.

ATH3A.150 Effects of Sleep Period Limitation on QNU Power Saving in QoS-Aware Cyclic Sleep Con-
trol, Yoshali Maneyama1, Ryogo Kubo1; 1Dept. of Electronics and Electrical Engineering, Keio Univ., Japan. We discuss the effects of sleep period limitation on the quality of service (QoS) and the power-saving performance of an Ethernet passive optical network (EPON) system when our pro-
posed QoS-aware cyclic sleep controller is used.

ATH3A.151 Store Wait Forward: a Storage-based Routing Algorithm for Optical Networks, Chao Sun1, Wei Guo1, Zhe Liu1, Weisheng Hu1; 1State Key Lab of Advanced Optical Communication Systems and Networks, Shanghai Jiao Tong Univ., China. Equipping network nodes with storage capacity, a routing algorithm named Store Wait Forward (SWF) is proposed in this paper for circuit switched optical networks. The benefit of reduced block-
ing rate is illustrated through simulation results.

ATH3A.152 A Novel Virtual Network Embedding Algo-
rithm with Load Balancing in Elastic Optical Networks, Dan Pan1, Shangguo Huang1, Shan Yin1, Min Zhang1, Yongli Zhao1, Jie Zhang1, Yongqi He1, Wenyi Gu1; 1State Key Lab of Information Photonics and Optical Communication, BUPT, China; 2State Key Lab of Advanced Optical Com-
munications and Networks, Peking Univ., China. This paper proposes a novel load balancing algorithm for virtual network embedding problem in elastic optical networks. Simulation results show the algorithm achieves a better tradeoff between balancing spectrum resource load and reducing spectrum usage.

ATH3A.153 Novel Energy-Saving Design to Enable Green Multi-radio Fiber-Wireless Access Networks, Pengchao Han1, Yejun Liu1, Lei Guo1, Yinpeng Yu1, Linzong Zhang1; 1College of Information Science and Engineering, Northeastern Univ., China. This paper focuses on the high energy consumption of fiber-wireless access networks, and proposes energy-saving algorithms towards different parts of the networks. The OPINET is employed in simulation to verify the effectiveness of proposed algorithms.

ATH3A.154 Effect of Computational Delay on the Conver-
gence Property of Digital Optical Burst-mode Receivers with Parallel and Pipelined Design, Xinyu Liu1, Bo Xu1; 1Key lab of optical fiber sens-
ing and communication network, Ministry of Education, UESTC, China. Parallel digital signal processing (DSP) with pipelined structure is pro-
posed for 112 Gb/s optical burst-mode receiver (BMR). The effect of computational delay on the convergence speed of the equalizer and the overall performance of the BMR is studied.

ATH3A.155 Modeling of Information Asynchronization Caused by Packet Loss and Its Effect on Dis-
tributed Optical Networks, Haisui Liu1, Nan Hua1, Yanhe Li1, Xiaoping Zheng1; 1Electronic Engineering, Tsinghua Univ., China. We propose a model to analyze the influence of information asynchronization on networking performance. We also derive the relationship between packet loss rate and blocking probability. The experimental results agree well with the analytical model.
A novel WDM-based multi-channel wavelength intelligent optical network (MIN) is proposed for next-generation access networks. The MIN is able to dynamically allocate wavelength channels and network resources to support diverse traffic demands and service requirements. The MIN architecture is designed based on the principles of multi-channel wavelength division multiplexing (MC-WDM) and intelligent optical networks (ION), and it is composed of wavelength routers, wavelength switches, and wavelength converters. The proposed MIN architecture is able to dynamically allocate wavelength channels and network resources to support diverse traffic demands and service requirements.

We present a new multi-channel wavelength intelligent optical network (MIN) for next-generation access networks. The MIN is able to dynamically allocate wavelength channels and network resources to support diverse traffic demands and service requirements. The MIN architecture is designed based on the principles of multi-channel wavelength division multiplexing (MC-WDM) and intelligent optical networks (ION), and it is composed of wavelength routers, wavelength switches, and wavelength converters. The proposed MIN architecture is able to dynamically allocate wavelength channels and network resources to support diverse traffic demands and service requirements.
A Novel Angle-of-Arrival Based Position Estimation Scheme using Visible Light in Indoor Positioning Systems, Yinan Hou, Xiaohui shi, Meihan Bi, Yu zexi, Yuankai xue, 1Shanghai jiao tong Unv, China. We propose a novel angle-of-arrival (AOA) based indoor positioning scheme using visible light. Simulation results show the mean of AOA estimation error is ~0.49 degrees and the mean positioning error is ~2.34 cm.

ATh3A.185

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ATh3A.195

Refractive index Sensitivity of nano-film coated over-coupled long-period fiber gratings, Fang zou, Yungi liu, Shan zhu, Chuanli deng, Tingen Wang, 1Shanghai, Univ, China. The evolution of the resonance wavelength and the grating contrast as a function of the surrounding index for nano-film coated long-period fiber gratings was investigated theoretically. The vectorial analysis of four-layer cylindrical waveguide was utilized.

Methane detection studies based on gas in scattering media absorption spectroscopy, Yuan dian, Hongze lin, Chunsheng yan, 1Dept. of Optical Engineering, Zhejiang Univ, China. We investigate methane detection with a compact and low-cost system using gas in scattering media absorption spectroscopy. A linear correlation of 0.998 between measured and calculated concentration and a sensitivity of 100 ppm is achieved.

Amperic force based magnetic field sensor utilizing a microfiber coupler, Shaosheng yan, Ye chen, Fei xu, Yanqiang lu, 1nanjing Univ, China. An Ampere force based magnetic field sensor is fabricated by adhering a microfiber coupler to an aluminum (Al) wire. The effect of Ampere force renders the blueshift of the oscillating spectrum of the microfiber coupler.

Phase-sensitive optical time-domain reflectometry assisted by gated ramam amplification, Yi zhou, Zinan Wang, Li zhang, Jin li, Han Wu, Yi li, Jiajia zeng, Yunjiang Rao, 1Univ. Electronic Sci. & Tech. of China, China. We apply the gated ramam amplification (RA) to the phase-sensitive optical time-domain reflectometry. This technique provides a simple way to suppress the ASE noise coming from RA, and provide the equivalent amplification effect as CW Raman pumping.

A Novel Optical Fiber Electric Field Sensor, Qingwen liu, zhen zhang, xinyu fan, jianbing du, lin ma, ziyuan he, 1State Key Lab of Advanced Optical Communication Systems and Networks, Shanghai jiao tong Univ, China. A high sensitivity electric field optical fiber sensor was reported for the measurement of strong electric field, avoiding the impact on the electric field and the risk of electric shock.

Microfiber Bragg Grating Hydrogen Sensors, Lingjuan Chen, 1Inst. of photonics technology, China. In this work, we present a Palladium based hydrogen sensors based on the fabrication of Bragg gratings into optical microfibers. The reflection peak of a grating with a diameter of 3.3 μm can shift by -1.08 nm when exposed to hydrogen with a concentration of 5%, as a result of the evanescent field interaction with the coated Palladium film. Photos polarization transformation based on double-exposure polarization in an azobenzene copolymer, Pengfei zeng, Changshun Wang, fuli zhaot, Pengcai, Mu qing, 1Shanghai jiao tong Univ, China. Two images were stored by double-exposure polarization holoography and could be reconstructed individually or simultaneously. The brightness and the polarization of the deflected images were found to be dependent on the polarization of the readout beam.
Mandarin Hall

**ATH3A.196**
Longitudinal Spatial Response of a Dual-Polarization Fiber Laser to Magnetic Field Based on Faraday Effect, Li Yu1, Linghao Cheng1, Zhenqiang Chen1, Yihi Liang1, Long Jin1, Bai-Ou Guan1; Inst. of Photonics Technology, Ji Nan Univ., China. The spatial response of a dual-polarization fiber grating laser to magnetic field based on Faraday effect is measured, which shows a characteristic in Gaussian profile with a peak at the center of the laser cavity.

**ATH3A.197**
Hydroxypropyl Cellulose Coated Assembled Microfiber Loop Sensors, Liu Linghui1, Long Jin1, Jie Li1, Ran Yang1, Bai-Ou Guan1; Inst. of Photonics Technology, China. This work demonstrates a high-substituted cellulose (H-HPC) coating method to maintain geometries of devices formed by strong stress. Its feasibility is verified by forming a loop sensor with heavily twisted silica microfiber. Microfiber. This method is greatly beneficial for further development of integrated microphotonic platforms with complex structures.

**ATH3A.198**
Method to suppress the north-seeking error by bias drift and angle random walk with fiber optic gyroscopes, Qingxiang Zhang1, Chuan-duan Yang1, Ziyu Wang1; Peking Univ., China. The paper proposes an enhanced multi-position method based on a rotation scheme of increasing step angle to suppress the north-seeking error caused by both bias drift and angle random walk at the same time.

**ATH3A.199**
Relative humidity sensor based on S-tapered fiber coated with polyvinyl alcohol, Hailang Liu1, Hao Zhang1, Bo Liu1, Yingping Mao1, Lie Lin1; 'Nankai Univ., China; 'Tianjin Univ. of Technology, China. A fiber-optic relative humidity sensor based on S-tapered fiber coated with polyvinyl alcohol has been proposed. Experiment results show that it has a good linearity from 77%RH to 97.2%RH with the maximum sensitivity of 0.122 dB/%RH.

**ATH3A.200**
Refractive index sensitivity enhancement by bending fiber taper modal interferometer, Li-Peng Sun1, Jie Li1, Long Jin1, Bai-Ou Guan1; 'Jinan Univ., China. We study the bending effect of a taper-based modal interferometer on the interference fringes and refractive index sensitivity. The sensitivity is increased by 3.48 times and reaches 1192.7 nm/R1-unit as curvature increases from 0 to 0.283 mm-1.

**ATH3A.201**
Oxidation detection of ascorbic acid using SERS, Jing Huang1, Xin Leng1, Yuxue Bai1, Shupeng Liu1, Zhenyi Chen1, Na Chen1; 'Key Lab of Specialty Fiber Optics and Optical Access Networks, School of Communication and Information Engineering, Shanghai Univ., China. Raman spectroscopy was applied to analyze the spectra of normal and oxidized ascorbic acid. It distinguished the normal ascorbic acid from oxidized ones by the intensity of fluorescence background and peaks of the SERS spectra.

**ATH3A.202**
Coherent BOTDA with Phase Modulated Probe Light and IQ Demodulation, Zonglei Li1, Lianshan Yan1, Liyang Shao1, Wei Pan1, Bin Luo1; Southwest Jiaotong Univ., China. Coherent BOTDA with phase modulated probe light is proposed and demonstrated. Brillouin gain spectrum (BGS) information is amplitude modulated on the GHz frequencies to reduce baseband noise perturbations and increase the spatial resolution to 2-meter.

**ATH3A.203**
UVA-induced autofluorescence spectroscopy in ophthalmology, Vladimir Salmin1, Victor Gar’kavenko1, Julia Levchenko1, Diana Skomorokha1, Ekaterina Vladimirova1, Anastasiya Solovieva1, Anastassiya Topakova1, Victor Lazarenko1; Krasnoyarsk State Medical Univ., Russian Federation. UVA-induced autofluorescence spectroscopy of human lens predicts the ultrasound dose in cataract phacoemulsification by estimation of cataract opacity. UVA-induced autofluorescence spectra of limb zone correlate to hypoxic alterations induced by contact lenses wearing.

**ATH3A.204**
Quantification of absolute blood velocity using LDA, Maniya Borozdova1, Ivan Fedosov1, Valery V. Tuchin1; ‘Saratov State Univ., Russian Federation. Novel method of signal processing to minimize the effect of undesirable light scattering on Doppler frequency shift estimation for blood flow velocity measurements, has been tested in vivo and using various phantom of blood vessels.

**ATH3A.205**
An optical fiber hydrogen sensor based on annealing enhanced palladium yttrium alloy nano-film, Song Han1, Huazhong Univ. of Science & Tec, China. pd-Y hydrogen sensitive nano-film was deposited by co-sputuring and annealed to improve sensitivity and stability. It was measured by transmission method. Sensitivity of 8 mV was obtained for 1000 ppm of hydrogen in the ambient.
Mandarin Hall

**ATH3A.206**

Ultrasensitive temperature sensor based on whispering gallery mode resonance in bent coated optical fiber loop, Jun He, Yiping Wang, Changui Liao, Guolu Yin, Shen Liu, Jiangtao Zhou, Kaiming Yang, Bing Sun, Jing Zhao, Guanjun Wang. Key Lab of Optoelectronic Devices and Systems of Ministry of Education and Guangdong Province, College of Optoelectronic Engineering, Shenzhen Univ., China. We demonstrated a simple ultrasensitive temperature sensor based on WGM resonance in a bent coated SMF loop. Temperature-dependent loss peaks were observed, and a maximum sensitivity of -4.81 nm/degree was achieved.

**ATH3A.207**

Withdrawn.

**ATH3A.208**

Advanced digital image processing for in vivo analysis of blood flow in capillary network, Maxim Kurochkin, Polina Timoshina, Ivan Fedosov, Valery V. Tuchin. ‘Optics and Biophotonics, Saratov State Univ., Russian Federation. Original methods were developed for digital image stabilization, segmentation of capillaries and in vivo particle image velocimetry based blood flow velocity measurements. Optical system and advanced software for in vivo capillary blood flow visualization is presented.

**ATH3A.209**

Design Method of a Guided-wave Optical Pressure Sensor Based on Dependences of Sensitivity and Resonance Frequency on Diaphragm Dimensions, Masashi Ohkawa, Takashi Sato, Hiroyuki Nikkuni. ‘Tokyo National College of Technology, Japan. Designing a silicon-based guided-wave optical pressure sensor, consisting of a diaphragm and a waveguide across the diaphragm, was considered based on dependences of sensitivity and resonance frequency on diagram dimensions.

**ATH3A.210**

Optical Holographic Identification of Bacterial Species at the Single-bacterium Level, Young-Ju Jo, Jae-Hwang Jung, Hyun-Joo Park, Yong-Keun Park. ‘Dept. of Physics, KAIST, Republic of Korea. We present a single-shot bacterial species identification scheme at the single-bacterium level. Employing quantitative phase imaging and Fourier transform light scattering, we systematically establish the fingerprints of each species resulting the cross-validation accuracy of ~95%.

**ATH3A.211**

The Effects of Water Absorption and Temperature Dependency of the POF for Refractive Index sensing, Jing Ning, Teng Chuan’en, Wang Pengfei, Farrell Gerald’, Zheng Jie’. ‘State Key Lab on Integrated Optoelectronics, College of Electronic Science and Engineering, Jilin Univ., China; Photonics Research Center, School of Electronic and Communications Engineering, Dublin Inst. of Technology, Ireland. A refractive index sensor is proposed based on a micro-plastic optical fiber with a macrobending structure. The performance and the effects of water absorption and temperature dependency of the sensor are studied both theoretically and experimentally.

**ATH3A.212**

Temperature sensor and switch based on one-dimensional photonic crystal with a Kerr nonlinear defect layer, Rongjun Zhang, Juan Zhang, Shanghai Univ., China; Shanghai Univ., China. A new concept of high-sensitivity temperature sensor and bistable switch is proposed based on the nonlinear spectra response of one-dimensional photonic crystal structures with a Kerr defect layer.

**ATH3A.213**

Distributed acoustic mapping based on self-interferometry of phase-OTDR, Chen Wang, Ying Shang, Xiaohui Liu, Chang Wang, Gang-Ding Peng. ‘Shandong Provincial Key Lab of Optical Fiber Sensing Technologies, Laser Inst. of Shandong Academy of Sciences, China; School of Electrical Engineering & Telecommunications, The Univ. of New South Wales, Australia. We demonstrate a distributed sensing system based on interferometer with the phase optical time domain reflectometry (p-OTDR) for acoustic measurement. The experiment shows that our system can recreate the different acoustic sources with different intensities.

**ATH3A.214**

Single Chip Phosphor-Free White Light-Emitting Diodes Driven by Variable Current, Jiadong Yu, Lai Wang, Di Yang, Jiuyan Zheng, Zhibiao Hao, Yi Luo. ‘Dept. of Electronic Engineering, Tsinghua Univ., China. Single chip phosphor-free LED has been applied to achieve white light through variable drive current using the persistence of vision effect. The CRI have been increased from 49 (constant current) to 58 (variable current).

**ATH3A.215**

A differential carrier lifetime analysis on GaN-based LED’s quantum efficiency, Xiao Meng, Lai Wang, Jiadong Yu, Zhibiao Hao, Yi Luo. ‘Dept. of Electronic Engineering, Tsinghua Univ., China. By measuring external quantum efficiency and differential carrier lifetimes of blue and green GaN-based light-emitting diodes depending on injection current, efficiency droop effect is proposed to be related to both carrier leakage and Auger recombination.

**ATH3A.216**

Ultraviolet and Blue Light’s Modulation from Subwavelength GaN Membrane Grating, Gangyi Zhu, Yongjun Wang. ‘School of Communication and Information Engineering, Nanjing Univ. of Posts and Telecommunications, China. GaN grating serves as an optical resonator and modulate the optical characteristics. The PL experimental results demonstrated the modulation of the ultraviolet and blue range from GaN grating, which is consistent with reflectance mapping.

**ATH3A.217**

Applications of MLPFG to Security and Health Monitoring Sensors Utilizing Its Polarization Dependent Loss (PDL), Yuki Okuno, Yuki Miyoshi, Hirokazu Kubota, Masaharu Ohashi. ‘Osaka Prefecture Univ., Japan. We investigate the sensing system of stress, impact, and vibration utilizing the large PDL of MLPFG for the security and health monitoring. We also successfully detect the output power change due to the applied disturbances.
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<th>Conference Room 5BC</th>
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| **ATH4A** • Photonic Integration  
Presider: James Lott; Technische Universität Berlin, Germany | **ATH4B** • Optical Materials and Novel Devices  
Presider: Yong-Hee Lee; Korea Advanced Inst of Science & Tech | **ATH4C** • New Perspective of Fibers  
Presider: Miguel Gonzalez Herraez; universidad de alcala, Spain | Special Symposium II | **ATH4D** • Advanced Modulation Formats  
Presider: Werner Rosenkranz; Christian-Albrechts-Universität zu Kiel, Germany |

**ATH4A.1 • 16:00 Invited**  
Si-Ge-silica photonic integration platform for high-performance photonic systems, Koji Yamada1,2, Tai Tsuchizawa1, Hidekata Nishii1,2, Rui Kou1,2, Tatsuru Hirotaka1,2, Kotaro Takeda1,2, Mitsuo Usui1, Kota Okazaki1,2, Hiroshi Fukuda1, Yasuhiro Ishikawa1, Kazumi Wada1, Takashi Yamamoto1,  
1Device Technology Labs, NTT Corporation, Japan; 2Nanophotonics Center, NTT Corporation, Japan.  
For medium/long-distance data communications applications, we have developed a photonic integration platform, on which high-performance silica-based passive devices, compact, high-speed silicon/germanium-based active devices, and high-speed electronic circuits can be integrated on a silicon chip.

**ATH4B.1 • 16:00 Invited**  
Optical Materials and Interconnects, David Plant1, McGill Univ., Canada. We present recent advances in silicon photonic and DSP enabled long haul (100-1000’s of km) and short reach (0.5-10’s of km) fibre optic transmission systems.

**ATH4C.1 • 16:00 Invited**  
Quantum Photonics With Optical Nanofibers, Kohzo Hakata1, ‘Univ of Electro-Communications, Japan. Recent progress of quantum photonics with optical nanofibers is reported. Key issue is to create 1D photonic crystal structures on optical nanofibers. Possible extension of photonic crystal nanofibers to cavity QED is also discussed.

**ATH4C.2 • 16:15**  
Low Cost 400GE Transceiver for 2km Optical Interconnect using PAM4 and Direct Detection, Kang Ping Zhang1, Wei Chen1, Qi Sun1, Jiangwei Man1, Alan Pak Tao Lau1, Chao Lu1, Li Zeng2,  
1Dept of Electric and Information Engineering, The Hong Kong Polytechnic Univ., Hong Kong; 2Fixed Network R&D Dept., Huawei Technologies Co., Ltd., China. A low cost 4x112Gbps PAM4 based scheme has been proposed for implementing 400GE 2km interconnect. Single channel experiment with 25Gbps devices is implemented to verify the proposed scheme. A receiver sensitivity of -7.1dBm is realized using direct-detection faster than Nyquist technique.

**ATH4D.1 • 16:00**  
Experimental Demonstration of Low Penalty OFDM/QAM 64/128/256/512-QAM Data Transmission in a Silicon Microring Resonator, Chengcheng Gui1, Chao Li1,2, Qi Yang1, Jian Wang1,  
1Wuhan National Lab for Optoelect; China; 2State Key Lab of Optical Comm. Technologies and Networks, China. We experimentally demonstrate low penalty transmissions of OFDM/QAM m-QAM signals through a silicon microring resonator. The transmission impairment caused by the offset is studied. Moreover, 191.17-Gbit/s simultaneous 8-channel WDM OFDM/QAM 25a-QAM transmission in a silicon microring resonator is demonstrated.

**ATH4D.2 • 16:15**  
Low Cost 400GE Transceiver for 2km Optical Interconnect using PAM4 and Direct Detection, Kang Ping Zhang1, Wei Chen1, Qi Sun1, Jiangwei Man1, Alan Pak Tao Lau1, Chao Lu1, Li Zeng2,  
1Dept of Electric and Information Engineering, The Hong Kong Polytechnic Univ., Hong Kong; 2Fixed Network R&D Dept., Huawei Technologies Co., Ltd., China. A low cost 4x112Gbps PAM4 based scheme has been proposed for implementing 400GE 2km interconnect. Single channel experiment with 25Gbps devices is implemented to verify the proposed scheme. A receiver sensitivity of -7.1dBm is realized using direct-detection faster than Nyquist technique.
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| 16:00-18:00 | ATH4E • Long-Haul Transmission  
Presider: Chongjin Xie; Alcatel-Lucent | ATH4F • Software Defined Networks II  
Presider: Jiajia Chen; Kungliga Tekniska Högskolan, Sweden | ATH4G • Optical Transport Networks I  
Presider: Xueqin Wei; Fiberhome Technologies Group, China |  
| 16:00-18:00 | ATH4H • Optical Coherence Tomography  
Presider: Dennis Matthews; Univ. of California Davis, USA |  
| 16:00-17:45 | ATH4I • LED  
Presider: Hao-chung Kuo; National Chiao Tung Univ., Taiwan, China |  

**ATH4E • 16:00**  
A Single-channel 40 Gbit/s Digital Coherent QAM Quantum Stream Cipher Transmission over 480 km, Masataki Nakazawa, Masato Yoshida, Toshikiko Hirooka, Tohoku Univ., Japan. We demonstrate a single-channel 40-Gbit/s QAM quantum stream cipher transmission over 480 km. By using a multi-bit encoded scheme and digital coherent transmission techniques, record data-capacity and transmission-distance of secure optical communication have been successfully realized.

**ATH4F • 16:00**  
Virtual Optical Network Provisioning for Software-defined Optical Networks, Xi Wang, Qiong Zhang, Inwoong Kim, Paparoa Palachala, Motoyoshi Sekiya, Fujitsu Labs of America Inc, USA. Virtual Optical Network service is considered the new killer app in Software-defined Optical Networks. This paper describes the general workflow of VON provisioning in SDON, a mapping pattern-based VON provisioning procedure and its performance evaluation.

**ATH4G • 16:00**  
Nonlinear Distortion Compensation for Optical Communications, Chi-Hao Cheng, Jie Pan, Xiaoqi Han, Miami Univ., USA; Georgia Inst. of Technology, USA; InvenSense, USA. Nonlinear signal distortion has become a major performance limiting factor in optical communication systems. In this paper, nonlinear compensator based on Volterra filters is introduced.

**ATH4H • 16:00**  
Minimally-Invasive Optical Platform for Surgical Guidance and Neuroscience Research, Yu Chen, Univ. of Maryland at College Park, USA. We developed needle-based optical imaging systems to extract structural, functional and Doppler information, which not only provides surgery guidance but also allows us to access deep brain tissues for neuroscience research.

**ATH4I • 16:00**  
Tutorial  
Analysis of Recombination Mechanisms in InGaN-Based Light-Emitting Diodes from Electrical and Optical Characterizations, Dongsoo Shin, Dept. of Applied Physics, Hanyang Univ., Republic of Korea. Various techniques that can give useful information on the nonradiative recombination mechanisms in InGaN-based light-emitting diodes are discussed. Characterization techniques range from the simple current-voltage and light-current measurements to more sophisticated temperature-dependent methods.

**ATH4E.2 • 16:15**  
Real-time Single Laser based 3.2 Tb/s (32×100-Gb/s) PM-QPSK Transmission using Coherent Detection Over 2,080-km SSMF, Ming Luo, Zhang Zhang, Chao Li, Junbo Xu, Yan Cheng, Duan Liu, Xu Zhang, Jie Li, Zhihe He, Rong Hu, Qi Yang, Shadhua Yu, State Key Lab of Optical Comm. Technologies and Networks, Wuhan Research Inst. of Posts and Telecommunications, China; Fiberhome Telecommunication Technologies Co., Ltd, China. In this paper, we real-time transmitted 32×100-Gb/s PM-QPSK modulated signal over 2,080-km standard single mode fiber (SSMF) using coherent detection based on 100G transponder with 31.78 Gbaud/s. 32 WDM channel sources are generated by a single laser source on a 32 GHz grid and yield a spectral efficiency of 3.11 b/s/Hz.

Dr. Yu Chen is an Associate Professor of Bioengineering at the University of Maryland, College Park, USA. Dr. Chen received his B.S. degree in Physics from Peking University in 1997, and his Ph.D. degree in Bioengineering from University of Pennsylvania in 2003.

Dr. Chen’s research interests encompass the areas of biomedical photonics and imaging, including optical coherence tomography (OCT), multiphoton microscopy (MPM), needle-based endoscopy, and biomedical applications such as kidney imaging, brain mapping, and cancer detection. He has led numerous research projects funded by NIH and NSF. He has published more than 60 peer-reviewed papers. Dr. Chen is a Fellow of the American Society for Laser Medicine and Surgery.
**Conference Room SBC**

**ATHA.A.2 • 16:30**

**Mach-Zehnder Interferometers Cascaded and Tunable Interleaver Based on Silica-on-Silicon Waveguide, Weifeng Jiang**, Xiaohan Sun, Southeast Univ., China. A tunable and flat-pass-band interleaver is demonstrated based on cascaded Mach-Zehnder Interferometers (CMZIs) and fabricated on Silica-on-Silicon waveguide. The experimental results show the interleaver with flat-pass-band and extinction ratio of ~18dB.

**ATHA.B.3 • 16:45**

**Tunable Lithium-Niobate Optical Waveguide Interleaver, Kaixin Chen, Yanlin Zheng, Kin S. Chiang**

'School of Communication and Information Engineering, Univ. of Electronic Science and Technology of China, China; 'Dept. of Electronic Engineering, City Univ. of Hong Kong, China. We propose a tunable lithium-niobate Mach-Zehnder type waveguide interleaver. Our fabricated device offers a channel spacing of ~0.75 nm, a maximum channel isolation of ~22 dB, and an electrical wavelength-tuning sensitivity of ~0.2 nm/V.

**Conference Room 5H**

**ATHB.C.2 • 16:30**

**Invited**

**Infrared Thermal Emission from Joule-Heated Graphene with Defects, Anna Kozlowska**, Grzegorz Gawlik, Roman Szweczyk, Anna Piatkowska, Aleksandra Krajewska; 'Inst. of Electronic Mat. Technology, Poland; 'Inst. of Metrology and Biomedical Engineering, Warsaw Univ. of Technology, Poland. The influence of mechanical defects on the thermal properties of Joule heated graphene samples is investigated. Modeling and experimental results reveal the hot spots attributed to non-uniform heating due to the mechanical defects of graphene.

**Conference Room 3CD**

**ATHC.D.4 • 17:00**

**Invited**

**Topographic Optical Fibers: New Perspectives in Guided Optics, Arnaud Mosset**, Maxime Droques, Matteo Conforti, Xie Wang, Damien Bigourd, Kenneth Wong, Gerard Bouwmans, Marc Douay, Laurent Bigot, Yves Quemerais, Stephano Trillo, Gilbert Martellini, Alexandre Kudlinski; 'Univ Lille 1 Laboratoire PhLAM, France; 'Dept. of Electrical and Electronic Engineering, The Univ. of Hong Kong, Hong Kong; 'Dipartimento di Ingegneria, Universit di Ferrara, Italy. We investigatemodal instability in optical fibers which opto-geometrical parameters oscillate along the propagation axis. These “topographic” fibers provide an additional degree of freedom leading to multiple modulation instability side lobes. Experimental results are confirmed by analytical and numerical ones.

**Conference Room 5E**

**ATHD.B.3 • 16:30**

**Invited**

**Dimensioning RS Codes for Mitigation of Phase Noise Induced Cycle Slips in DQPSK Systems, Miu Young Leong**, Knuud J. Larsen, Gunnar Jacobsen; 'Acreo Swedish ICT, Sweden; 'KTH Royal Inst. of Technology, Sweden; 'Technical Univ. of Denmark (DTU), Denmark; 'Aston Univ., UK. We present a semi-analytical method for dimensioning Reed-Solomon codes for coherent DQPSK systems with laser phase noise and cycle slips. We evaluate the accuracy of our method for a 28 Gb/s system using numerical simulations.
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<td><strong>ATH4E.3 • 16:30</strong></td>
<td><strong>ATH4G.2 • 16:30</strong></td>
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<td>Invited Coded Modulation for Undersea Optical Fiber Communications, Hongbin Zhang1, Hussam Batshon1; 1Tyco Subsea Communications, USA. We present an overview of single parity check based bit interleaved coded modulation in fiber optic systems. Coded modulation achieves high SNR sensitivity and large Euclidean distance and enables absolute phase detection without pilot symbols.</td>
<td>Benchmarking of different WSS and MCS sizes in OXCs, Thierry Zami1, Marco Bertolani1, Annalisa Morea2, Alcatel-Lucent, France; Bell Labs France, Alcatel-Lucent, France. We show how the size and the contention property of the add/drop blocks in the optical nodes impact the quantity of devices in the CONUS WDM network with incremental traffic.</td>
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<td><strong>ATH4F.2 • 16:30</strong></td>
<td><strong>ATH4G.3 • 16:45</strong></td>
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<td>Multi-Stratum Resources Integration Resilience with for Software Defined Data Center Interconnect based on IP over Elastic Optical Networks, Hui Yang1, Lei Cheng1, Jiajin Wu1, Yongli Zhao1, Jie Zhang2, Jianrui Han2, Lin Yi1, Young Lee1; Beijing Univ of Posts &amp; Telecom, China; 2Huawei Technologies Co., Ltd., China. We propose a multi-stratum resources integration resilience (MSRIR) architecture for services in software defined data center interconnect based on IP over elastic optical networks. The feasibility and efficiency are verified on OpenFlow-based control plane.</td>
<td>OSNR Monitoring Based on Low-cost Coherent Scanning Receiver and Reference Spectrum Technique, Dawei Wang1, Jiandiao Cao1, Yingyan Peng1, Huixiao Ma1, Hongyan Fu1, Deying Geng1, Jianping Li1, Zhushu Li1; Huawei Technologies, China; 2Jinan Univ., China. An OSNR monitoring method based on low-cost coherent scanning receiver and reference spectrum technique is proposed. Experimental results show that high OSNR estimation accuracy can be achieved for 400Gbps/100Gbps hybrid transmission.</td>
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<td><strong>ATH4F.4 • 17:00</strong></td>
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<td>Field Deployment of Advanced Photonic Technologies for Ultra-High Bit Rate and Ultra-Long Reach Terrestrial WDM Transmission in Brazil, Bertrand Ciesla1, Philippe Perrier1, Herve A. Fervier2, Do-Il Chang1, Sergey Burstev1, Hector De Pedro1, Wayne Pelouch1; 1Xtera Communications, Inc., USA. 100G deployments in the Amazon rainforest and over aged fiber plants are reported. Raman amplification enabled both bridging very long spans and minimizing the amount of non-lineairities in the line fiber.</td>
<td>Invited Advanced Technologies for Unrepeatered Transmission Systems and their Applications, Do-Il Chang1, Wayne Pelouch1, Sergey Burstev1, Bertrand Ciesla1, Philippe Perrier1, Herve A. Fervier1; 1Xtera Communications Inc USA, USA. This paper reviews the key basic technologies, with a specific focus on distributed Raman amplification, required for long-reach, high-capacity unrepeatered optical transmission systems. We also report several experimental demonstrations with record capacity and reach combinations.</td>
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<td><strong>ATH4I.2 • 16:30</strong></td>
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<td>Importance of the radiative recombination rate to efficiency droop in InGaN-based light-emitting diodes, Jong-In Shin1, Hyunsung Kim1, Dongsoo Shin2; 1Electronics &amp; Communication Eng., Hanyang Univ., Republic of Korea; 2Applied Physics, Hanyang University, ERICA campus, Republic of Korea. Experimental efficiency droop phenomena have been consistently explained by the saturation of the radiative recombination rate in InGaN quantum well at low current and subsequent increase in the nonradiative recombination rates at high current.</td>
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<td><strong>ATH4I.3 • 17:00</strong></td>
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<td>Investigation of Efficiency Droop in the InGaN-based Light Emitting Diodes, Rayming Lin1; 1. Abstract not Available</td>
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Asia Communications and Photonics Conference (ACP) • 11 November 2014–14 November 2014 • Page 43
Characteristics of saturable absorption of MoS2 films in the visible to near-infrared range, Fengqiu Wang1, Shuo Xu2, Yanyan Feng1, Yao Li1, Xiaoyan Zhang1, Yongbing Xu1, Jun Wang2. School of Electronic Science and Engineering, Nanjing Univ., China; 2Shanghai Inst. of Optics and Fine Mechanics, Chinese Academy of Science, China. MoS2 films consisting mainly of few-layer MoS2 nanosheet-plates are fabricated. Tunable Z-scan measurement reveals strong saturable absorption (~70% modulation depth) around 500 nm, demonstrating the potential of MoS2 for visible laser mode-locking and optical switching.

All-optical modulation and nonlinear absorption in germanium-on-silicon waveguides near the 2 μm wavelength regime, Li Shen1, Noel Healy2, Collin J. Mitchell1, Jordi S. Penades1, Milos Nedeljkovic1, Goran Z. M. M. Shannon1, Anna C. Peacock1. Optoelectronics Research Centre, Univ. of Southampton, UK. Low loss germanium-on-silicon waveguides are characterized over -2 to -3 μm and demonstrated for all-optical modulation based on free-carrier absorption. The results indicate the suitability of this platform for optical processing in the mid-infrared.

Influence of Gamma-ray irradiation on the spectral properties of Bi-doped silica fibers, Jie Wang1, Jianxiang Wen1, Dong Yanhua1, Lin Liu1, Fulen Peng1, Luo yanyun1, Gang-Ding Peng1, Zhenyi Chen1, Wang Tingyun1, Shanghai Univ., China; 2Univ. of New South Wales, Australia. After Bi-doped silica fiber is irradiated, its absorption peaks intensity at 520, 700, and 800 nm increase, and the fluorescence intensity at 920-1650 nm increases with 980 nm pumping, while decreases with 532 nm pumping.

A cascaded acousto-optic tunable filter configuration has been proposed by employing two MgF2 sandwiches to separate the acoustic modulation regions. Experimental results show that the resonance peak loss exhibits sinusoid-like dependence on the grating spacing.

Recent Advances in telecommunication avalanche photodiode with nanosized multiplication region, Shibao Zhang1, Yanli Zhao2, Wuhan National Lab for Optoelectronics, China. This paper reviews recent advances in telecommunication avalanche photodiodes with nanosized multiplication region. A new low noise avalanche photodiode based on InP traditional material has been proposed for high speed optical communication.

Recent Developments of Optical Transceiver Modules for 100G and beyond 100G Long-Distance Transport, Bingbing Wu1, Wenyi Zhao1, Haizhi Zhang1, CATR, China. This paper contributes an overview and our considerations on the recent standard and technical developments of 100G and beyond 100G client as well as line side optical transceiver modules for long-distance DWDM transport applications.

A novel mode switching method for opto-electronic oscillator based on Bias Control, Qian Wei1, Song Yu1, Tianwei Jiang1, Jin Li1, Wanyi Gu1, Beijing Univ of Posts & Telecom, China. We propose a novel mode switching method for multi-frequency optoelectronic oscillator (MF-OEO). We experimentally demonstrate it can detect two sets of interleaved low power signals by switching the bias voltage of Mach-Zehnder modulator (MZM).

Grating-spacing-dependent spectral characteristics of single-mode-fiber-based cascaded acousto-optic tunable filters, Shoumin Kang1, Hao Zhang1, Bo Liu1, Yingping Mao2, Inst. of Modern Optics, Nankai Univ., China; 2School of Electronic Information Engineering, Tianjin Univ. of Technology, China. A cascaded acousto-optic tunable filter configuration has been proposed by employing two MgF2 sandwiches to separate the acoustic modulation regions. Experimental results show that the resonance peak loss exhibits sinusoid-like dependence on the grating spacing.
Conference Room 5F

ATME 6 • 17:30
Invited
Raman Amplification for Ultra-large Bandwidth and Ultrahigh Bit Rate Submarine and Terrestrial Long-haul WDM Transmission, Herve A. Fevrier1, Do-Il CHANG1, Sergey Butsetev1, Philippe Perrier1, Wayne Pelouch1, Bertrand Clecsa1, William Szeio1, Edwin Zak1, Hector de Pedro1, Xtera Communications Inc., USA. At a time when Raman amplification is recognized as a key enabler for high-capacity optical networking, this paper reviews recent capacity and reach advances for terrestrial and submarine long-haul optical communications.

Conference Room 5I

Conference Room 5J

Conference Room 3HI

Conference Room 3G

ATME 5 • 17:15
Unrepeatered DP-QPSK transmission over 350 km standard fibre using URFL based amplification, Pawel Rosa1, Mingming Tan1, Ian D. Philips1, Son Le Thai1, Juan Diego Ania-Castanon1, Stylianos Sygletos1, Paul Harper1,1 Aston Inst. of Photonic Technologies, Aston Univ., UK,10-OSIC, Instituto de Optica, Spain. Unrepeatered 115.6 Gbit/s per channel WDM DP-QPSK transmission with novel URFL based amplification is demonstrated. Transmission of 1.4 Tb/s was possible in 350 km link and 2.2 Tb/s was achieved in 325 km without employing ROPA or specialty fibres.

ATTH 6 • 17:45
Cross-layer Restoration with Software Defined Networking in IP over Optical Networks, Junni Deng1, Yongqi Zhao1, Jie Zhang1, Haoran Chen1, Jialin Wu1, Huibin Zhang2,1 State Key Lab of Information Photonics and Optical Communications at Beijing Univ. of Posts and Telecommunications, China; 1Beijing Aerospace Automatic Control Inst., China. We present a novel cross-layer restoration with OpenFlow protocol in IP over Optical network. Required Openflow interactions are detailed. Simulations show that recovery success rate is improved and resilience time decreases compared to conventional restoration.
### ACP 2014 — Friday, 14 November

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<td><strong>08:00–10:00</strong> AF1A • Modulators and Switching</td>
<td><strong>08:00–09:45</strong> AF1B • Microresonators</td>
<td><strong>08:00–10:00</strong> AF1C • Nano-Carbon-Based Mode-Locked Fiber Lasers</td>
<td><strong>08:00–10:00</strong> AF1D • Optical Diagnosis and Therapy</td>
<td><strong>08:00–10:00</strong> AF1E • Direct Detection &amp; Coherent Transmission</td>
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<td>Presider: TBD</td>
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<td>Presider: Shinji Yamashita; Univ. of Tokyo, Japan</td>
<td>Presider: Nanguang Chen; National Univ. of Singapore, Singapore</td>
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<td><strong>AF1.1 • 08:00</strong> Silicon high-speed BPSK modulator: design and optimization, Jinting Wang, Linjie Zhou, Haike Zhu, Qianqian Wu, Rui Yang, Lei Liu, Tao Wang, Jianping Chen, Dept. of Electronic Engineering, Shanghai Jiao Tong Univ., State Key Lab of Advanced Optical Communication, China. We report 20 Gb/s binary phase shift keying (BPSK) modulation in a silicon Mach-Zehnder modulator integrated with a single-drive push-pull electrode. The device is optimized using a distributed circuit model.</td>
<td><strong>AF1.1 • 08:00</strong> Ultra-strongly sub-Poissonian photon generation in three coupled microcavities containing a quantum dot, Wen Zhang, Zhongyuan Yu, Yumin Liu, State Key Lab of Information Photonics and Optical Communications (Beijing Univ. of Posts and Telecommunications), China. We report 20 Gb/s binary phase shift keying (BPSK) modulation in a silicon Mach-Zehnder modulator integrated with a single-drive push-pull electrode. The device is optimized using a distributed circuit model.</td>
<td><strong>AF1.1 • 08:00</strong> Graphene, Topological Insulator and Other 2-dimensional Layered Materials for Ultra-fast Laser Photonics, Hang Zhang, 1. Abstract not Available</td>
<td><strong>AF1.1 • 08:00</strong> Optical Single-Sideband WDM Nyquist 32-QAM SC-FDE Transmission system with Direct Detection, Rongshan Wang, Kaifeng Zou, Dan Wang, Fan Zhang, Zhangyuan Chen, State Key Lab of Advanced Optical Communication System and Networks, Peking Univ., China. 125 Gbit/s optical single side band (OSSB) Square-J2QAM wavelength-division-multiplexed direct detection over 75.1 km SMF transmission has been successfully demonstrated with a subcarrier frequency band of 2.9 GHz and a channel frequency grid of 12.5 GHz.</td>
<td><strong>AF1.1 • 08:00</strong> Multi-stage M-QAM Carrier Phase Estimation Using Crossed Constellation Transformation in Coherent Optical Communication System, Xiaofei Su, Dongwei Pan, Xiaoguang Zhang, Xia Xi, Xianfeng Tang, State Key Lab of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecomm, China. We present a multi-stage M-QAM CPE scheme based on the CCF algorithm. The linewidth-symbol rate of 1E-4 and 4E-5 are obtained for 28-Gbaud 16-QAM and 64-QAM coherent optical communication systems respectively with 1dB penalty at BER=3.8E-3.</td>
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<td><strong>AF1.2 • 08:15</strong> 50 Gb/s silicon QPSK modulator with single-drive push-pull traveling wave electrodes design, Haik Zhu, Linjie Zhou, Tao Wang, Lei Liu, Yanyang Zou, Jinting Wang, Qianqian Wu, Anbang Xie, Rui Yang, Zuxiang Li, Xinwan Li, Jianping Chen, Shanghai Jiao Tong Univ., China; Huawei Technology, China. We demonstrate a silicon QPSK modulator consisting of two nested Mach-Zehnder interferometers with 3.5 mm long traveling-wave electrodes. 50 Gb/s QPSK modulation is achieved with power consumption of 9.3 pJ/bit.</td>
<td><strong>AF1.2 • 08:15</strong> Design, fabrication and optimization of silicon slot photonic ring resonators, Weiwei Zhang, Samuel F. Sema Otalvini, Xavier Le Roux, Laurent Vivien, Eric Cassan, Institut d’Electronique Fondamentale, Université Paris-Sud CNRS UMR 8622 Bat. 220, Centre Scientifique d’Orsay, 91405 Orsay, France, France. The design and fabrication of slot SOI micro-ring resonators are rigorously investigated by improving input taper coupling efficiency, minimizing ring bend/propagation losses and optimizing the quality factors through oxidation/de-oxidation processes.</td>
<td><strong>AF1.2 • 08:15</strong> Withdrawn</td>
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**AF1.1**

Silicon high-speed BPSK modulator: design and optimization, Jinting Wang, Linjie Zhou, Haike Zhu, Qianqian Wu, Rui Yang, Lei Liu, Tao Wang, Jianping Chen, Dept. of Electronic Engineering, Shanghai Jiao Tong Univ., State Key Lab of Advanced Optical Communication, China. We report 20 Gb/s binary phase shift keying (BPSK) modulation in a silicon Mach-Zehnder modulator integrated with a single-drive push-pull electrode. The device is optimized using a distributed circuit model.

**AF1.1**

Ultra-strongly sub-Poissonian photon generation in three coupled microcavities containing a quantum dot, Wen Zhang, Zhongyuan Yu, Yumin Liu, State Key Lab of Information Photonics and Optical Communications (Beijing Univ. of Posts and Telecommunications), China. We report 20 Gb/s binary phase shift keying (BPSK) modulation in a silicon Mach-Zehnder modulator integrated with a single-drive push-pull electrode. The device is optimized using a distributed circuit model.

**AF1.1**

Graphene, Topological Insulator and Other 2-dimensional Layered Materials for Ultra-fast Laser Photonics, Hang Zhang, 1. Abstract not Available

**AF1.1**

Optical Single-Sideband WDM Nyquist 32-QAM SC-FDE Transmission system with Direct Detection, Rongshan Wang, Kaifeng Zou, Dan Wang, Fan Zhang, Zhangyuan Chen, State Key Lab of Advanced Optical Communication System and Networks, Peking Univ., China. 125 Gbit/s optical single side band (OSSB) Square-J2QAM wavelength-division-multiplexed direct detection over 75.1 km SMF transmission has been successfully demonstrated with a subcarrier frequency band of 2.9 GHz and a channel frequency grid of 12.5 GHz.

**AF1.1**

Multi-stage M-QAM Carrier Phase Estimation Using Crossed Constellation Transformation in Coherent Optical Communication System, Xiaofei Su, Dongwei Pan, Xiaoguang Zhang, Xia Xi, Xianfeng Tang, State Key Lab of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecomm, China. We present a multi-stage M-QAM CPE scheme based on the CCF algorithm. The linewidth-symbol rate of 1E-4 and 4E-5 are obtained for 28-Gbaud 16-QAM and 64-QAM coherent optical communication systems respectively with 1dB penalty at BER=3.8E-3.
## ACP 2014 — Friday, 14 November

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<td>AF1I • Optical Fiber Sensors</td>
<td>AF1J • LED</td>
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<td><strong>Presider:</strong> Jian Wang; Huazhong Univ of Science and Technology, China</td>
<td><strong>Presider:</strong> Xueqin Wei; Fiberhome Technologies Group, China</td>
<td><strong>Presider:</strong> Weisheng Hu, Shanghai Jiao Tong University, China</td>
<td><strong>Presider:</strong> Nan-Kuang Chen; Optoelectronics Research Centre, Taiwan, China</td>
<td><strong>Presider:</strong> Qixin Guo; Saga Univ., Japan</td>
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<tr>
<td>AF1.1 • 08:00 • <strong>Invited</strong> A Novel 64-QAM Optical Transmitter Driven by Binary Signals</td>
<td>AF1G.1 • 08:00 • <strong>Invited</strong> The Future of Network Management and Transport SDN Controller</td>
<td>AF1H.1 • 08:00 • <strong>Invited</strong> All-optical Multi Microring Network-on-chip</td>
<td>AF1I.1 • 08:00 • <strong>Invited</strong> Optical Fiber Sensors with Coatings as Sensitive Elements</td>
<td>AF1J.1 • 08:00 • <strong>Tutorial</strong> Characteristics of Nitride Devices Prepared by Pulsed Sputtering, Hiroshi Fujikoka; The Univ of Tokyo, Japan; JST, Japan. We will compare basic characteristics of nitride devices prepared by pulsed sputtering with those by MOCVD and we will show that low growth temperature of PSD is quite advantageous for fabrication of various devices.</td>
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<td>AF1F.2 • 08:15 Dynamic of 1.12 Tbit/s WDM Flex-Coherent Super-Channels in Multi-Core Fiber Transmission</td>
<td>AF1.1 • 08:00 • <strong>Invited</strong> Dynamic of 1.12 Tbit/s WDM Flex-Coherent Super-Channels in Multi-Core Fiber Transmission, Raneez Assif, Feihong Ye, Toshihiro Moroika; DTU Fotonik, Technical Univ. of Denmark, Denmark. We numerically report on the dynamics of intra-core non-linear effects in 1.12 Tbit/s super-channel flex-coherent transmission over 640 km multi-core fiber link. The system is evaluated with DP-QPSK and DP-16QAM modulations co-propagating.</td>
<td>AF1I.1 • 08:00 • <strong>Invited</strong> Parametric Amplifier Improving Coherence for Optical Fiber Sensing, J. Wang, Jinnan Zhang; Beijing Univ of Posts &amp; Telecom, China. We propose a parametric amplifier for improving the coherence for optical fiber sensing.</td>
<td>AF1J.1 • 08:00 • <strong>Tutorial</strong> Characteristics of Nitride Devices Prepared by Pulsed Sputtering, Hiroshi Fujikoka; The Univ of Tokyo, Japan; JST, Japan. We will compare basic characteristics of nitride devices prepared by pulsed sputtering with those by MOCVD and we will show that low growth temperature of PSD is quite advantageous for fabrication of various devices.</td>
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</tbody>
</table>
AF1A.3 • 08:30  Withdrawn
AF1B.3 • 08:30  Invited
1 Gbps directed optical decoder based on two microring resonators, Qiaoshan Chen¹, Zhang Fanfan¹, Lei Zhang¹, Tian Yonghui¹, Ping Zhou¹, Jianfeng ding¹, Lin Yang¹, 'State Key Lab on Integrated Optoelectronics, Inst. of Semiconductors, Chinese Academy of Sciences, China. We implement decoding function based on two cascaded microring resonators, which are both modulated through the carrier-injection modulation in forward biased PN junctions embedded around the MRRs. Bitwise operations at 1Gbps are demonstrated successfully.

AF1B.4 • 08:45
Experimental Performance Evaluation of Analog Signal Transmission in a Silicon Microring Resonator, Jing Dui¹, Yun Long¹, Chengcheng Gu¹, Qi Yang¹, Jian Wang¹, 'Huazhong Univ. of Sci. and Tech., China; 'State Key Lab of Optical Comm. Technologies and Networks, China. We experimentally evaluate analog signal transmission in a microring resonator. The analog signal format is affected by the silicon waveguide when the wavelength is outside 3-dB bandwidth while by the microring when inside 3-dB bandwidth.

AF1A.4 • 09:00
Switching gain in low power MZI-based all-optical switch, Vivek Krishnamurthy¹, Yijing Chen¹, Qian Wang¹, ’Advanced Concepts and Nanotechnology, Data Storage Inst., Singapore; ’Electrical and Computer Engineering, National Univ. of Singapore, Singapore. We design length, operating wavelength and operating intensities of MZI-based all-optical switch with semiconductor arms to demonstrate switching gain when input signal intensity <0.25x the pump intensity. Switching speed is further enhanced using push-pull technique.

AF1B.5 • 09:00
Demonstration of a 3-bit digital-to-analog converter based on silicon microring resonators, Jianfeng ding¹, Qiaoshan Chen¹, Lei Zhang¹, 'State Key Lab on Integrated Optoelectronics, Inst. of Semiconductors, CAS, China. We propose an N-bit optical digital-to-analog converter based on silicon microring resonators. As a proof of concept, a 3-bit optical digital-to-analog converter is demonstrated at a speed of 500 MSample/s.

AF1C.3 • 09:00
Low-timing-jitter Mode-Locked Fiber Laser Based on Graphene Oxide PVA Thin Film as Saturable Absorber, Kan Wu¹, Xiaohui Li², Yonggang Wang¹, Qijie Wang¹, Perry Ping Shum¹, Jianping Chen¹, 'Shanghai Jiao Tong Univ., China; 'Nanyang Technological Univ., Singapore; 'X’ian Inst. of Optics and Precision Mechanics, Chinese Academy of Sciences, China. We demonstrate a mode-locked fiber laser based on graphene oxide saturable absorber at 1550nm. The laser has a timing jitter of 53fs (100Hz to 100kHz). The contribution from the slow saturable absorber is also investigated.

AF1D.3 • 09:00  Invited
Fundamental Studies of Photodynamic Therapy: Recent Advances in China, Buhong Li¹, 'Key Lab of Optoelectronic Science and Technology for Medicine of Ministry of Education, Fujian Provincial Key Lab for Photonics Technology, Fujian Normal Univ., China. The recent advances in fundamental studies of photodynamic therapy (PDT) in China, mainly including the investigations on new photosensitizers and the non-invasive optical techniques for monitoring dosimetric parameters are reviewed. Furthermore, the future perspectives for PDT fundamental studies will be briefly discussed.

AF1E.3 • 08:30  Invited
Perturbative Propagation Models for Coherent Systems, Paolo Serena¹, Alberto Bononi¹, 'Information Engineering, Universita degli Studi di Parma, Italy. We review the basics of perturbation models and discuss the main implications in modeling the variance of the nonlinear interference. A modulation format dependent theoretical model for the perturbative interference is proposed.

AF1E.4 • 09:00
Volterra-based Nonlinear Compensation in 400 Gb/s WDM Multiband Coherent Optical OFDM Systems, Vassiliki Vgenopoulou¹, Abdelkerim Amar¹, Mengdi Song¹, Erwan Pinzemin¹, Ioannis Roudas¹, Yves Jaqueur¹, 'Electrical and Computer Engineering, Univ. of Patras, Greece; 'Institut Telecom/Telecom Paris Tech, France; 'Orange Labs Networks, France. We apply a 3rd-order inverse Volterra series nonlinear equalizer to a 400 Gb/s WDM multiband PM-16QAM OFDM signal. IVST-NLE provides a 0.6 dB Q-factor improvement and 1 db nonlinear threshold increase compared to linear equalization.
AF1F.3 • 08:30
Multi-core Multi-mode Dense Space Division Multiplexing for Ultra-high Spectral Efficiency Transmission Systems, Takayuki Mizuno1, Hide-hiko Takara1, Akhile Sano1, Yutaka Miyamoto1, NTT Network Innovation Labs, Nippon Telegraph & Telephone Corp, Japan. This paper describes our recent work on dense space division multiplexing (DSDM) over a multicore few-mode fiber. We show that using both multi-core and multi-mode is an effective approach towards ultra-high capacity transmission systems.

AF1G.2 • 08:30
Unified Control for IP over Optical Transport Networks Based on Software-Defined Architecture, Zhizhen Zhong1,2, Xiaohui Chen3, Nan Hua1, Yanhe Li1, Xiaoping Zheng2,1 ‘National Lab for Tsinghua Information Science and Technology, China; 2Dept. of Electronic Engineering, Tsinghua Univ., China; 3School of Communication and Information Engineering, Univ. of Electronic Science and Technology of China, China; Fiber-home Telecommunication Technologies Co Ltd, China. We proposed a software-defined unified control architecture for IP over optical transport networks. A successful network experiment of end-to-end dynamic connection establishment is implemented across both IP and OTN layers with the scheme.

AF1G.3 • 08:45
User-controlled QoE Adjustment based on Software Defined Networking, Wenwu Zhang1, Wei Guo2, Chengjun Li1, Yuan Wen1, Shanghai Jiao Tong Univ., China. We proposed a novel Broadband Remote Access Server (BRAS) architecture with Software Defined Networking (SDN) to help the user to adjust the bandwidth for the specific service, and improve the users’ Quality of Experience (QoE).

AF1H.3 • 08:45
A stable, Label-free Silica Fiber Taper Interferometer Biosensor Based on Mesoporous Fe3O4@SiO2 Nanospheres, Yinyin Huang1, Kuo-Ju Chen2, Hao-chung Kuo2, Chiao Tung Univ., Taiwan. We proposed a silica fiber taper interferometer biosensor based on mesoporous Fe3O4@SiO2 nanospheres coated fiber taper interferometer is presented. And the special selectivity of SiO2 film improves concentration sensitivity reaching to 1.0524 nm/log M with good linearity.

AF1I.1 • 09:00
Efficient BER estimation for simulation of coherent transmission systems including digital signal processing and forward-error-correction, Hadrien Louchet1,4, Andre Richter1,4, VPIphotonics, Germany. We show how the Importance Sampling method can be used to accurately estimate the bit-error-rate of coherent transmission systems including digital signal processing and forward-error-correction under non-thermal channel assumption.

AF1I.2 • 09:00
Impact of the filter alignment on the ultra-long dual-sideband BOTDA with balanced detection, Jie Li1, Zinan Wang1, Li Zhang1, Jiajia Zeng1, Li Li1, Mengqiu Fan1, Xinhong Jia1, Yunjiang Rao1, Univ. Electronic Sci. & Tech. of China, China. We experimentally demonstrate a 20km fiber-loop sensing BOTDA utilizing balanced detection and bi-directional first-order Raman amplification, and we also discuss the effect of the filter alignment on the dual sideband separation before balanced detection.

AF1I.3 • 09:00
The colloidal quantum dots and their application on hybrid optoelectronic devices, Chien-Chung Lin1, Kuo-Ju Chen1,2, Hau-Vie Han1, Quan-Yu Wang1, Hao-chung Kuo1,2, Inst. of Photonic System, National Chiao Tung Univ., Taiwan; 1Dept. of Photonics, National Chiao Tung Univ., Taiwan; 2Inst. of Lighting and Energy Photonics, National Chiao Tung Univ., Taiwan. Nano-particles with light-emitting capabilities are applied to enhance the performance of traditional optoelectronic devices. Different techniques to deploy these particles, such as pulsed spray, are used, and the enhanced characteristics with different designs are reported.
AF1A.5 • 09:15
1×4 Tunable Bandwidth Wavefront Selective Switch based on Liquid Crystal on Silicon, Dequan Xie1,2, Quan You1, Zichen Liu1, Lingheng Meng1, Qi Yang1, Shaohua Yu1, Huazhong Uni. of Science and Technology, Wuhan National Lab for Optoelectronics, School of Optical and Electronic Information, China; 2Wuhan Research Inst. of Posts and Telecommunications, State Key Lab of Optical Comm. Technologies and Networks, China. We experimentally demonstrate a 1×4 tunable bandwidth wavelength selective switch (TBWSS) based on liquid crystal on silicon (LCOS). 15GHz minimum bandwidth and 7GHz bandwidth setting resolution are observed respectively.

AF1A.6 • 09:30
Non-invasive Methods for Measurement of Carotenoids in Mammalian Skin, Junlong Zhang1, Junlong Zhang1, Xingjun Wang1,2,3,4,5, Junlong Zhang1, Xingjun Wang1,2,3,4,5, Jian Wang1,2,3,4,5. 1Graduate Inst. of Photonics and Optoelectronics, 2State Key Lab of Advanced Optical Communication Systems and Networks, Peking Univ., China. Silicon Mach-Zehnder modulators were used in IM-DD advanced optical communications. 6.25 Gb/s Nyquist-16, 32, and 64-Quadrature Amplitude Modulation optical signals were generated. 160 km transmission of 100 Gb/s WDM Nyquist-16QAM signals were also demonstrated.

AF1B.6 • 09:15
Novel Optical Filter Based on High-order Microring Resonators with Bent Couplers, Pengxin Chen1, Sito Chen1, Xiaowei Guan1, Yaochong Shi1, Daixin Dai1, 1Centre for Optical and Electromagnetic Research, State Key Lab for Modern Optical Instrumentation, Zhejiang Provincial Key Lab for Sensing Technologies, Zhejiang Univ., China. A five-order microring resonator filter using bent directional couplers is proposed and demonstrated and a box-like filter response is achieved with low excess loss (~1.0dB) and high out-of-band extinction ratio (~35dB). The thermal tunability is also demonstrated.

AF1B.7 • 09:30
Ultra-compact Optically-Controlled Tunable Microwave Photonic Filter Based on a Nonlinear Silicon Microring Resonator, Yun Long1, Han Zhang1, Chao Li1, Chengcheng Gui1, Qi Yang1, Jian Wang1, 1WNLO, China, 2State Key Lab of Optical Comm. Technologies and Networks, China. We experimentally demonstrate an ultra-compact optically-controlled tunable microwave photonic filter based on a nonlinear silicon microring resonator. By adjusting the pump light power, the central frequency of the filter can be tuned from 5.27 to 12.47 GHz. Experimental results to prove the concept are provided.

AF1C.4 • 09:15
Numerical investigation of vector dissipative solitons in a graphene mode-locked fiber laser, Chang Xue1, HE-PING LI1, Handing Xia2, Jianfeng Li2, Yong Liu2, 1Univ of Electronic Science & Tech China, China. We numerically investigate the characteristics of vector dissipative solitons (VDSs) in a graphene mode-locked fiber ring laser. The results show that the polarization rotation locked VDSs can be formed in the fiber laser.

AF1C.5 • 09:30
Passive Mode-Locking of Erbium Doped Fiber Laser with Nano-scale Carbon Black based Saturable Absorber, Jui-Yung Lo1, Yong-Hsiang Lin1, Ting-Hui Chen1, Zhe-Chuan Feng2, Long-Ru Lin1, 1Graduate Inst. of Photonics and Optoelectronics, Dept. of Electrical Engineering, National Taiwan Univ., Taiwan. With nano-scale carbon black powder based saturable absorber, the passive mode-locking of erbium doped fiber laser is demonstrated to deliver stably shortened pulse-width of 417.5 fs and spectral linewidth of 6.4 nm.

AF1C.6 • 09:45
Minimum Saturable Absorption Contrast for Stable Mode-locked Fiber Lasers, Jinwoo Jeon1,2, Hyunju Kim1, Inho Sung1,2,3,4, 1Univ of Seoul, Republic of Korea. We conducted a numerical investigation on the minimum modulation depth of a saturable absorber, which is essentially needed for the generation of stable optical pulses from a passively mode-locked fiber laser cavity.

AF1D.4 • 09:30
Non-invasive Methods for Measurement of Carotenoids in Mammalian Skin, Maxim Davrin1,2,3,4,5, Juergen Lademann1,2,3,4,5, 1Dermatology, Charite - Universitaetsmedizin Berlin, Germany. Cutaneous carotenoids could mirror the current redox status of epidermis and should be investigated in vivo. Optical methods are indispensable in this regard. This paper summarizes methods used for non-invasive measurement of cutaneous carotenoids.

AF1E.6 • 09:30
Dispersion-independent Transmissions Through Direct Single Sideband Modulation Using a Dual-Electroabsorption Modulated Laser, Didier Erasme1, Thomas Anfray1, Mohamed E. Chabbi1, Khalil Kechaou1, Juan Petit1, Guy Aubry1, 1TJPOT wil/EPF, 2Laboratoire d’Electronique, de Physique et de Matériaux, Thales Research and Technology, 3III-V Lab, Comm. Lab of “Alcatel-Lucent Bell Labs France”, “Thales Research and Technology” and “CEA Leti”, France. Single-sideband Intensity Modulation-Direct Detection systems are known for providing range extension of dispersion limited optical transmis- sions. A monolithically integrated dual RF access electro-absorption modulated laser (D-EML) has been developed and tested exhibiting record performance.
**AF1F.5 • 09:30**

**Phase Conjugated Twin Waves in 8×21×224 Gbit/s DP-16QAM Multi-core Fiber Transmission**, Rameez Asif, Feihong Ye, Toshihito Morikawa, OTU Fotonic, Technical Univ. of Denmark, Denmark. Efficient suppression of non-linear interactions has been numerically analyzed via phase conjugated twin waves in 8×21×224 Gbit/s multi-core fiber transmission. Results show a Q-factor improvement of 2.8 dB, consequently doubling the transmission distance.

**AF1G.6 • 09:45**

**Transmission of 40 Gb/s Over 55 m Multimode Fiber Using 12 GHz Bandwidth System Based on Vertical-Cavity Surface-Emitting Laser**, Marek G. Chacinski, Nicolaé Chtica, Richard Schätz, Urban Westergren, 6TE Connectivity, Sweden. Error free transmission (E-12) over 55 m long standard MMF at 40 Gb/s data rate is demonstrated with moderate signal conditioning on the VCSEL. The VCSEL has a 3-dB bandwidth of 15 GHz resulting in system bandwidth of 12 GHz, giving 3.3 bit/s/Hz coding efficiency.

**AF1H.6 • 09:45**

**Optimal Regenerator Sharing for Lightpath Protection in 100G Optical Networks**, Jinhua Zhao, Yufei Wang, Feng Zeng, Lei Shi, Huawei Network Research, China. This paper proposes a novel lightpath protection scheme that maximizes regenerator sharing together with an optimization algorithm for backup path pre-computation. Test results suggest more than 20% regenerator savings over shared backup path protection.

**AF1H.5 • 09:30**

**TDM-based Interferometric Technique for Maintain-reduced WDM Quantum Key Distribution Network**, Leixian Zhu, Lichao He, Yongmei Sun, Yuefeng Ji, Beijing Univ. of Posts and Telecommunications, China. We propose a novel TDM-based interferometric technique for maintain-reduced WDM-QKD network using optical circulator. With acceptable control costs, we exhibit stable and efficient operation for 48 hours, resulting in low-cost configuration with same performance.

**AF1H.7 • 09:45**

**Digital Signal Processing for a Closed-Loop Resonant Fiber Optic Gyro**, Linglan Wang, Yuchao Yan, Huilian Ma, Zhonghe Jin, Zhejiang Univ., China. A digital signal processor for a closed-loop resonant fiber optic gyro (ROFG) is implemented on an FPGA. The detection limit is 9.95×10^{-4}deg/s in an ROFG.

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**10:00–10:30 Coffee Break around exhibition area**
AF2A • 10:30
Towards quantum computing and quantum networking with solid-state single spins and single photons, Chaoyang Lu1, Univ. of Science and Technology of China, China. I will describe our recent experiments on robust and deterministic generation of single photons from single quantum dots with near-unity indistinguishability, Greenberger-Horne-Zeilinger-type spin-photon entanglement and quantum state transfer between single photons and single spins.

AF2A.1 • 10:30
Exploiting RSOA for Uplink Transmission with Coherent Detection for Low Cost UDWF-PON, Guang Yang Chu1, Adolfo Lerín2, Ivan Cano1, Victor Pol2, Jesus Alejandro Tabares1, Josep Prat1, Universitat Politècnica de Catalunya, Spain. Upstream phase modulation exploiting low cost reflective semiconductor optical amplifier (RSOA) at ONU is applied for simplified coherent detection through DFAs as local lasers at ONU and at OLT.

AF2A.2 • 10:45
A New Model for Understanding One-Photon Luminescence from Single Gold Nanorods, Keyu Xiao1, Guowei Lu2, Physics and Astronomy, Macquarie Univ., Australia; Physics, Peking Univ., China. We experimentally and theoretically studied the photon luminescence from a single gold nanorod. Our theory explains the main features of the photon-luminescence radiation and is in good agreement with experimental observations.

AF2A.3 • 11:00 • Invited
First Principle Study of Nanolasers: Photon Statistics and Laser Threshold, Weng-W. Chau1, Frank Jahnke2, Christopher Gies2, Sandia National Labs, USA; Inst. for Theoretical Physics, Bremen Univ., Germany. A semiconductor quantum-optical theory is developed and applied to address questions involving thresholdless lasing and increasing single-photon production rate. Excitation dependences of intensity, coherence time, photon autocorrelation function and carrier spectral hole burning are described.

AF2B • 10:30
Active Devices for Networks
Presider: Tao Chu; Institute of Semiconductor, Chinese Academy of Sciences, China

AF2B.1 • 10:30
Exploiting RSOA for Uplink Transmission with Coherent Detection for Low Cost UDWF-PON, Guang Yang Chu1, Adolfo Lerín2, Ivan Cano1, Victor Pol2, Jesus Alejandro Tabares1, Josep Prat1, Universitat Politècnica de Catalunya, Spain. Upstream phase modulation exploiting low cost reflective semiconductor optical amplifier (RSOA) at ONU is applied for simplified coherent detection through DFAs as local lasers at ONU and at OLT.

AF2B.2 • 10:45
Fast Gain Recovery of All-Optical Switches Based on Multiple Cascaded SOAs, Peng Zhou1, Xuelin Yang1, Xianon Hu1, Weisheng Hu2, Dept. of Electrical Engineering, Shanghai Jiaotong Univ., China. The gain recovery dynamics of multiple cascaded SOAs are measured, which shows a factor of 10 times shorter for three cascaded SOAs. The simulations in time-domain and frequency-domain are presented and agreed with the measurements.

AF2B.3 • 11:00 • Invited
All-Optical NRZ-DPSK to RZ-OOK Modulation Format Conversion for Multicasting Based on a Single SOA, Tong Cao1, Liao Chen1, Yu Xu2, Xiuliang Zhang1, Wuhan National Lab for Optoelectronics, China. We propose and experimentally demonstrate all-optical NRZ-DPSK to RZ-OOK modulation format conversion for wavelength multicasting based on a single SOA. Using T-XPM effect in SOAs, a 1.38 dB penalty power at BER of 10⁻⁹ can be achieved.

AF2B.4 • 11:15
The Feasibility of Building Large Scale Optical Switches Using a Novel MZI-SOA Hybrid Approach, Xiquan Cheng, JinLong Wei, Adnan Worfor, Richard V Penty, Ian N. White, Engineering Dept., Univ. of Cambridge, UK. For the first time, the feasibility of nanoscale large-scale optical switches is demonstrated using a novel MZI-SOA hybrid approach. In a filter-free recirculating loop, the potential performance of up to 128x128 port switch is demonstrated.

AF2C • 10:30
Fiber Lasers
Presider: Ju Han Lee; Univ. of Seoul, Korea, Republic of

AF2C.1 • 10:30 • Invited
High Power Photonic Crystal Fiber Lasers and Their Applications, Ming-lee Hu1, Tianjin Univ., China. A brief review of recent work on high power femtosecond fiber laser oscillator, amplifier and their applications is presented. The linear and nonlinear propagation of femtosecond laser in the photonic crystal fiber are demonstrated.

AF2C.2 • 11:00
Dissipative Soliton (DS) Pulse Stability Against ASE-Noise in Normal Dispersion Fiber Laser Based on a Slow Saturable Absorber (SA), Cong Xu1,2, Yitang Dai1, Kun Xu1,1, Beijing Univ of Posts & Telecom, China; Sichuan Normal Univ., China. Intra-cavity ASE-noise is demonstrated to be the key factor of DS pulse stability in normal-dispersion fiber laser. Excessive ASE-noise can make DS become noise-like pulse like overlarge nonlinearity does, even when the nonlinearity is properly.

AF2C.3 • 11:15 • Invited
Filter Shape and Birefringence Detuned Dual-Band Mode Lockable Er-Doped Fiber Laser with Flexible Wavelengths, Chi-Cheung Yang1, Sheng-Fong Lin2, Gong-Ru Lin3, Graduate Inst. of Photonics and Optoelectronics, Dept. of Electrical Engineering, National Taiwan Univ., Taiwan. The erbium-doped fiber laser passively mode-locked with nonlinear polarization rotation shows dual-band selectivity at 1570/1600 nm and central wavelength tunability of 3.5/6.5 nm via intra-cavity filtered gain profile and fiber birefringence detuning.

AF2D • 10:30
Transmission Impairments
Presider: Changyuan Yu; National Univ. of Singapore, Singapore

AF2D.1 • 10:30
Performance Analysis of Two Slipless Carrier Phase Estimation Schemes, Haiquan Cheng1, Jian Wu1, Yan Li1, Deming Kong, Jiahao Zang, Jintong Lin1, Beijing Univ. of Posts and Telecommunications, China. Two Slipless CPE schemes applied to 28 Gbaud QPSK systems are compared. By simulations it’s possible to mitigate CS with 0.39% overhead for the Blind CPE + PAPU scheme within TdB penalty at 10⁻³.

AF2D.2 • 10:45 • Invited
Characterization of Nonlinear Interactions in Mode-Multiplexed Systems, Georg Rademacher1, Stefan Warm1, Klaus Petermann2, Dept. of High Frequency Technology-Photonics Research Group, Technische Universität Berlin, Germany. We present the fundamental effects behind intermodal nonlinear interaction in multi-mode fibers. The derived theory is applied to characterize the impairments of nonlinear interaction on the transmission quality of an exemplary optical MDM system.
### Conference Room 5I

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<th>Time</th>
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<tr>
<td>10:30–12:00</td>
<td>AF2E  • Radio Over Fiber II</td>
<td>President: Frank Chang; Inphi Corporation, USA</td>
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**AF2E.1 • 10:30**
Invited

The definition of “mobile front-haul” discussed in ITU-T is introduced. “Radio-over-X" as a generalized concept of transmission systems collaborated with radio links and "modulation-symbol-format maintaining transmission" as an efficient transmission scheme are also newly proposed.

### Conference Room 3HI

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<th>Time</th>
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<tr>
<td>10:30–12:00</td>
<td>AF2F  • Optical Trapping and Optical Microscopy</td>
<td>President: TBD</td>
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**AF2F.1 • 10:30**
Invited
*Optical Trapping with Plasmonic Nano-islands*, Aaron Ho-pui Ho; *Chinese Univ. of Hong Kong*, Hong Kong.

**AF2F.2 • 11:00**
Invited
*Parametric spectro-temporal analyzer (PASTA) for ultrafast spectroscopy and its microscopic application*, Kenneth Kin-Yip Wong, Chi Zhang, Xiaoming Wei, Kevin Tsia; *Univ. of Hong Kong*, Hong Kong.

We present an ultrafast optical spectrometer with flexible observation range (telescope/wide-angle), achieves the sharpest resolution of 5 pm (<1 GHz), and the widest observation range of 9 nm, with 100-MHz frame rate. It further shows promising application beyond spectroscopy in combination with time-stretch microscopy.

### Conference Room 3G

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<th>Time</th>
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<tr>
<td>10:30–12:00</td>
<td>AF2G  • Solar Cell &amp; Optics</td>
<td>President: Kei May Lau; <em>Hong Kong Univ. of Science and Technology</em>, Hong Kong, China</td>
</tr>
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</table>

**AF2G.1 • 10:30**
Invited
*Carrier Diffusion and Mid-Way Recombination in GaInP2/GaAs Multijunction Photovoltaic Device*, Su Xu, Zhuo Deng, Jiqiang Ning, Rongxin Wang, Hui Yang; *Dept. of Physics*, *The Univ. of Hong Kong*, China.

In this invited talk, we report the latest comprehensive optical characterization of diffusion and mid-way recombination of minority carriers in GaInP2/GaAs double-junction tandem solar cells with micro-electroluminescence spectroscopy and imaging surveying.

**AF2G.2 • 11:00**
Invited

Different low-cost and flexible transparent electrode technologies, such as metal thin films (dielectric-metal-dielectric), metal nanowires (Ag and Cu), polymers and carbon nanotubes are studied and applied in small molecule-based organic solar cells and OLEDs.

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**AF2E.2 • 11:00**
*A Novel RoF Architecture with Optical DSB-SC Mm-wave Signal Generation Via Frequency Twelvetupling and Wave-length Reuse for Uplink Transmission*, Hong Wen, Shengqi Peng, Rui Zhou, Heng Zhou; *College of Computer and Communication*, Hunan Univ. of Technology, China.

In this paper, we propose a novel architecture for full-duplex radio-over-fiber system. The optical DSB-SC mm-wave signal with frequency-twelvetupling is generated via an optical dual-parallel Mazz-Zehnder modulator, while one optical sideband of the generated optical DSB-SC mm-wave signal is remodulated with upstream data for uplink transmission.

**AF2E.3 • 11:15**
*Full-Duplex RoF Link with Seamless Convergence and High-Speed Broadband Wireless Access*, Chao Gao, Shanguo Huang, Jinhua Xiao, Xinlu Gao, Qian Wang, Yongfeng Wei, Wensheng Zhai, Wenjing Xu, Wanyi Gu; *Beijing Univ. of Posts and Telecommunications*, China.

Full-duplex ROF link with seamless convergence and high-speed broadband wireless access is proposed. The simulation of V-band (62-40GHz) and conventional 802.11n (2.4GHz) with 16QAM signal transmission shows that our novel schedule maintains quite good performance.
Meta-materials with zero refractive index, Xueqin Huang1, Che Ting Chan1, Hong Kong Univ of Science & Technology, Hong Kong. We show that two/three-dimensional photonic crystals with accidental-degeneracy-induced conical dispersion at k=0 derived from monopole and dipole excitations (electric and magnetic dipoles) can serve as zero-refractive-index materials with simultaneously zero permittivity and permeability.

Optimizing Reflective Semiconductor Optical Amplifier as Phase Modulator for Low Cost Colorless ONU with 3x3 Homodyne Detection, Guang-Yong Chu1, Victor Polo1, Adolfo Lerrín1, Ivan Cano1, Josep Piat1, Universitat Politècnica de Catalunya, Spain. Overcome the limited modulation bandwidth of low cost uncooled To-can packaged ROA (<400 MHz) and operate it at 3.125 Gb/s using homodyne techniques with the optimal performance for phase modulation via measured characteristics.

A Self-feedback Colorless Fabry-Perot Laser Diode for 5 Gbit/s DWDM-PON, Huang-Yu Chen1, Yu-Chuan Su1, Yu-Chieh Chi1, Gong-Ru Lin1, Graduate Inst. of Photonics and Optoelectronics, and the Dept. of Electrical Engineering, National Taiwan Univ., Taiwan. A remote-control-free self-feedback colorless FP-LD transmitter with fiber Bragg grating based single-mode reflector is demonstrated for up to 5 Gbit/s DWDM-PON transmissions after 25 km with the aid of additional data-erased fiber loop.

Multi-wavelength Single-Polarization All-fiber Lasers Based On In-fiber Polarizers, Lixian Wang1, Charles-Gabriel Deslauriers1, Sophie LaRochelle1, Centre d’ Optique, Photonique et Laser (COPL), Université Laval, Canada. We demonstrate a multi-wavelength single-polarization fiber laser with an all-fiber configuration. The laser mainly consists of a distributed Fabry-Pérot multi-wavelength fiber laser and a 45° tilted fiber gratings which provides a polarization-dependent feedback.

Single-Longitudinal-Mode Brillouin/Erbium Fiber Laser with High Linewidth-Reduction Ratio, Bowen Li1, Xiaoming Wei1, Xie Wang1, Kenneth Kin-Yip Wong1, The Univ. of Hong Kong, Hong Kong. Saturable-absorber-based auto-tracking filter is incorporated in Brillouin/erbium fiber laser (BEFL) to achieve single-longitudinal-mode (SLM) operation. It has a linewidth-reduction ratio of 33.3 and a tuning range over the entire C-band.

Characterization of Distributed Raman Amplification-induced Amplitude and Phase Impairments on Unrepeated Coherent Transmission Links, Xiaodan Pang1, Atalla El-Taher2, Richard Schatz2, Sergei Popov1, Gunnar Jacobsen1, Sergey Sergeyev1, Network and Transmission Lab, Acreo Swedish ICT AB, Sweden; 2Optics division, Royal Inst. of Technology (KTH), Sweden. We experimentally characterize the distributed Raman amplification induced amplitude and phase impairments and evaluate the performance dependence of unrepeat 28 Gbaud 16QAM coherent transmissions over standard single mode fiber.
### Conference Room 5I

**AF2E.4 • 11:30**

A simple microwave photonic downconverter with high conversion efficiency based on a polarization modulator, Tingting Zhang¹,², Fangzheng Zhang¹, Xiangfei Chen², Shilong Pan¹; ¹Nanjing Univ. of Aeronautics and Astronautics, China; ²Nanjing Univ., China. A simple microwave photonic downconverter is proposed and experimentally demonstrated based on a single polarization modulator. The conversion gain can reach 10.74 dB and the spur-free dynamic range is 99.79 dB/Hz/3.

**AF2E.5 • 11:45**

An optical true-time-delay unit for independent beamforming of multiple RF signals, Xingwen Ye¹, Fangzheng Zhang¹, Shilong Pan¹; ¹Nanjing Univ. of Aeronautics and Astronautics, China. A multi-beamforming unit based on optical true-time-delay and microwave photonic filters, which can work in both transmit and receive mode, is proposed. Controllable delays up to ~1.4 ns with a ~69-ps step are experimentally demonstrated.

### Conference Room 3HI

**AF2F.3 • 11:30** **Invited**

Acquiring high-quality high-speed images of zebrafish using line scan focal modulation microscopy, Shilpa Pant¹, Nanguang Chen¹; ¹National Univ. of Singapore, Singapore. We have developed line scan focal modulated microscopy, a proprietary technique highly suitable for Zebrafish imaging. It features parallel light sheet illumination and parallel detection, leading to much improved imaging speed.

**AF2G.3 • 11:30** **Invited**

Withdrawn

### Conference Room 3G

12:00–13:30 Lunch Break
Tunable Photonic Microwave Generation using Self-Injection-Locked Monolithic Dual-wavelength Semiconductor Laser, Bixue Pan, Dan Li, Liping Yu, Limeng Zhang, Lingjian Zhao; Key Lab of Semiconductors, Materials Science, Inst. of Semiconductors, Chinese Academy of Science, China. A tunable narrow-linewidth photonic microwave generation scheme using monolithic dual-wavelength amplified feedback laser under self-injection is proposed and demonstrated. Photonic microwave ranging from 29 to 37.6 GHz with linewidth below 4 kHz is realized.

AF3A.2 • 13:45
Frequency-Doubled and Phase-Encoded RF Signal Generation Based on Orthogonally Polarized Carrier-suppressed Double Sideband Modulation, Yamei Zhang, Fangsheng Zhang, Shilong Pan; Nanjing Univ. of Aeronautics and Astronautics, China. A novel approach to generating wideband frequency-doubled and phase-coded RF signals is proposed based on orthogonally polarized carrier-suppressed double sideband modulation. Phase-coded RF signals at 18 and 30 GHz are experimentally generated and evaluated.

AF3A.3 • 14:00 • Invited
Integrated Uni-Traveling-Carrier Photodiodes with High Responsivity and Wide Bandwidth for Microwave Photonics, Bing Xiong, Changsheng Sun, Yi Luo; Dept. of Electronic Engineering, Tsinghua Univ., China. Back-to-back integrated uni-traveling-carrier photodiodes with high responsivity of 0.83 A/W and wide electric bandwidth over 40 GHz are realized. Resonant cavity-enhanced uni-traveling-carrier photodiodes are optimized for high responsivity and wide optical bandwidth over 20 nm.

AF3B.1 • 13:30 • Invited
Silicon Photonic Devices for Optical Interconnections, Tao Chu; Inst. of Semiconductor, CAS, China. Abstract not available.

AF3B.2 • 14:00
High Index Contrast Circular Bragg Reflector on Silicon-On-Insulator with Flat and Broadband Spectrum, Shi Tao Guo, Yang Wang, Ke Wang, Etisatios Skafidas; National ICT Australia Ltd (NICTA) - Victoria, Australia; Dept. of Electrical and Electronic Engineering, The Univ. of Melbourne, Australia. In this paper, we propose a deeply etched high refractive index contrast circular Bragg reflector. Results show that 0.975 peak reflection and over 316 nm operation bandwidth (<5% variation) can be achieved simultaneously.

AF3B.3 • 14:15
Scalable Optical Multicasting and Receiver for Networks-on-Chip, Ke Xu, Zhenzhou Cheng, Hon Ki Tsang; Chinese Univ. of Hong Kong, Hong Kong. We investigate the scalable low-latency multicasting of packets replicated by four-wave mixing and detected by high extinction ratio integrated tunable receivers. Error free transmission of 100Gb/s multicast packets at three different wavelengths was measured.

AF3C.1 • 13:30 • Invited
High Index and Subwavelength Core Optical Fibers for Photonic Devices, Shahram Afshar; Inst. for Photonics and Advanced Sensing, Univ. of Adelaide, Australia. Theory of light propagation in high index and subwavelength waveguides will be presented and used to discuss different linear and nonlinear processes in these waveguides and their potential applications in photonic devices.

AF3C.2 • 14:00
Nonlinear Interferometer based on Dual-Pump Dual-Signal Four-Wave Mixing, Kuei Fu, Chester Shu; Dept. of Electronic Engineering, the Chinese Univ. of Hong Kong, Hong Kong. We demonstrate a dual-pump, dual-signal four-wave mixing (FWM) interferometer. The FWM generates phase-insensitive and phase-sensitive idlers. The phase-sensitive idlers can potentially be used in photonic exclusive-NOR and exclusive-OR operations, photonic correlators, and photonic microwave filters.

AF3C.3 • 14:15
8-Bit Optical Quantization based on Soliton Self-Frequency Shift, Pushan Xiao, Ying Chen, Kan Wu, Jianping Chen, Xiangning Chen; Shanghai Jiao Tong Univ., China; Academy of Equipment, China. We discuss the potential of high-precision optical quantization based on soliton self-frequency shift. For a soliton pulse with optimal \( 1 = 150 \) fs wide, 8-bit quantization is achievable with current optical technologies.
**Conference Room 3HI**  
13:30–13:45  
AF3F.1  
Magnetic field sensor utilizing rectangular-microfiber-based Sagnac loop interferometer, Zhihua Tan, Li-Peng Sun, Jie Li, Yuryun Huang, Bai-Ou Guan.

**Conference Room 5DE**  
13:30–13:50  
AF3D.1  
Demonstration of Free-Space Nyquist Signals Transmission Employing Orbital Angular Momentum, Dan Wang, Yuxiao Zhu, Fan Zhang, State Key Lab of Advanced Optical Communication Systems & Networks, Peking Univ., China. We investigate the performance of free-space Nyquist signals, including 3 OAM beams with each carrying 3 Nyquist-WDM wavelengths. Each channel is encoded with 23.2 Gbit/s 16-QAM signal, providing an aggregate capacity of 208.8 Gbit/s.

**Conference Room 5I**  
13:30–13:50  
AF3E.1  
Flexible Traffic-aware OXC Architecture for Hybrid WDM Network and Elastic Optical Network, Xin Chen, Juhao Li, Paikun Zhu, Rushi Tang, Jing Guan, Zhaoyuan Chen, Yongqi He, Peking Univ., China. We propose a novel flexible traffic-aware OXC architecture for hybrid WDM and elastic optical network. The simulation results show that the proposed OXC can save CAPEX significantly while providing similar blocking performance as C/D/C OXCs.

**Conference Room 5I**  
13:30–13:50  
AF3E.2  
 Elastic Optical Networks for Effective Content Distribution, Krysztof Walkowiak, Rozga Goscien, Wojciech Kmiencik, Miroslaw Klinkowski, Wroclaw Univ. of Technology, Poland, National Inst. of Telecommunications, Poland. The paper examines several content distribution scenarios in Elastic Optical Networks (EONs). Numerical experiments are presented to verify the proposed approaches and compare EONs against classical WSONs in terms of various performance metrics including cost and spectrum.

**Conference Room 5I**  
13:30–13:50  
AF3E.3  
Protection Path-Based Hitless Spectrum Defragmentation for Elastic Optical Networks: 1+1 Path Protection, Chao Wang, Gangxiang Shen, Limei Peng, Soochow Univ., China; Ajou Univ., Republic of Korea. We propose a protection path-based spectrum defragmentation approach to improve the spectrum utilization of an elastic optical network. Results show that the proposed approach can significantly improve spectral efficiency compared to the case without defragmentation.

**AF3F.2**  
Parabolic Model-based Ice Thickness Monitoring of Power Transmission Line Employing FBG Sensors, Chao Wang, Xiaowei Chao Wang, Wuhan National Lab for Optoelectronics, Huazhong Univ. of Science and Technology, China.

**AF3F.3**  
Magnetic core-shell nanoparticle enhanced SPR biosensor for immunoassay, Guo Xiaowei, Univ. of electronic science and tech, China. A magnetic-nanoparticle (Fe3O4@Au) enhanced SPR biosensor is presented. A large sensor response was measured in an immunoassay experiment detecting Interleukin 17A, which is 18 times higher than that for direct format and 3.5 fold higher than for traditional sandwich format.

**AF3E.4**  
Energy-Efficient Virtual Optical Network Mapping over Converged Data Centers and Elastic Optical Networks, Bowen Chen, Jie Zhang, Yongqi Zhao, Yachao Shi, School of Electronic and Information Engineering, Soochow Univ., China; State Key Lab of Information Photonics and Optical Communications, Beijing Univ of Posts & Telecom, China. We develop a virtual link priority mapping (LPM) algorithm and a virtual node priority mapping (NPM) algorithm to save power consumption. Simulation results show that LPM can significantly improves energy efficiency compared to NPM.

**AF3F.4**  
Sensitivity enhancement by all-fiber optical parametric amplifier for bioimaging at 1.0 micron, Xiaoming Wei, Andy K. S. Lau, Ying Xie, Chi Zhang, Arnaud Mussot, Alexandre Kudinski, Kevin Tsia, Kenneth Kin-Yip Wong, Dept. of Electrical and Electronic Engineering, The Univ. of Hong Kong, China; CNRS-Universite Lille 1, PhD/IRCICA USR 3380/UMR 8523, France. We demonstrate sensitivity enhancement by all-fiber optical parametric amplifier for bioimaging application at 1.0 micron, incorporated with the coherently-generated idler component, which provides an extra 3-dB gain over a bandwidth of 20 THz.

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**AF3D.2**  
Performance Evaluation of Fractional Orbital Angular Momentum (OAM) based LDPC-Coded Free-Space Optical Communications with Atmospheric Turbulence, Jiaying Zhou, Zhihan Xu, Jian Wang, Huazhong Univ. of Sci. & tech., China. We analyze the effects of atmospheric turbulence on fractional orbital angular momentum (OAM) multiplexed FSO communication system. Assisted by variable low-density parity-check (LDPC) codes, we get a significant coding gain of more than 10 dB compared to an uncoded system.

**AF3D.3**  
Review of Spectrally Efficient Optical Communications Using Orbital Angular Momentum Multiplexing, Jian Wang, Wuhan National Lab for Optoelectronics, Huazhong Univ. of Science and Technology, China. We review recent progress in spectrally efficient optical communications using orbital angular momentum (OAM) multiplexing. By delivering multi-carrier multi-level modulation signals over pol muxed 22 OAM modes, we demonstrate ultra-high spectral efficiency of 230 bit/s/Hz.

**AF3E.1**  
Review of Spectrally Efficient Optical Communications Using Orbital Angular Momentum Multiplexing, Jian Wang, Wuhan National Lab for Optoelectronics, Huazhong Univ. of Science and Technology, China. We review recent progress in spectrally efficient optical communications using orbital angular momentum (OAM) multiplexing. By delivering multi-carrier multi-level modulation signals over pol muxed 22 OAM modes, we demonstrate ultra-high spectral efficiency of 230 bit/s/Hz.
### Conference Room 5BC

**AF3A.4 • 14:30**

Photonic Microwave Generation Using Microdisk Lasers Subject to Optical Injection, Ling-Xiu Zou, Yi-Qiong Zhang, Bo-Li Liu, Xiao-meng Lu, and Hong Long, Yue-De Yang, Jin-Long Xiao, Yu Du, Inst. of Semiconductors, Chinese Academy of Sciences, China. Nonlinear dynamics and photonic microwave generation are investigated for a 7-μm-radius AlGaNAs-InP microdisk laser under optical injection. The photonic microwave around 20 GHz with a linewidth of 540 KHz is generated for the microdisk laser with optoelectronic feedback.

**AF3A.5 • 14:45**

Widely Tunable Dual Loop Optoelectronic Oscillator based on a Single-Bandpass Microwave Photonic Filter and a Recirculating Delay Line, Huanfa Peng, Xiaopeng Xie, Cheng Zhang, Tao Sun, Peng Guo, Feiya Chen, Linxin Zhu, Weimei Hu, Zhangyuan Chen, Peking Univ., China. A wideband tunable dual loop Optoelectronic Oscillator based on a single-bandpass microwave photonic filter and a recirculating delay line is proposed and experimentally demonstrated. A tunable frequency range from 10.23 to 26.69 GHz is obtained.

**AF3A.6 • 15:00**

Implementation of W-band orthogonal OSSB modulation using a quantum dot mode-locked laser incorporating a polarization modulator, Jianyu Zhang, Wenting Wang, Wenhui Sun, Ting Su, Xin Wang, Jianguo Liu, Ninghua Zhu, The State Key Lab on Integrated Optoelectronics, Institute of Semiconductors, Chinese Academy of Sciences, China; The State Key Lab of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. Orthogonal optical single-sideband modulation working at W-band based on the effects of mode-locking and polarization modulation is proposed and demonstrated. It could be used in the microwave photonic systems to improve the performance and break through the bandwidth restriction.

**AF3A.7 • 15:15**

Precise Optical Frequency Shift Based on Radio-frequency Driven Single-sideband Modulator, Shuyuan Liu, Zhaoying Wang, Yunze Hou, Sha Luo, Guan Yuan, Rui Ma, Chunfeng Ge, Tianjin Univ., College of Precision Instrument and Optoelectronics Engineering, China; Key Lab of Edification Technology (Tianjin Univ.), China. By using Radio-frequency (RF) driven single-sideband (SSB) modulator, precise frequency shift of single-wavelength and multi-wavelength fiber laser are both realized. Frequency shift resolution is controlled within 10MHz-20GHz and 20MHz-18GHz respectively by the RF signal.

### Conference Room 5H

**AF3B.4 • 14:30**

Chip-Level Interconnections Realized Via the Laser-Induced Forward Transfer Technique, Kamal Kaur, Jeroen Missinne, Geert Van Steenberge, UGent, Belgium. In this paper, successful flip-chip bonding and DC characterization of single photodiode and VCSEL chips via Laser-Induced Forward Transfer (LIFT) printed micro-bumps of indium, silver nano-particle (AgNP) based inks and pastes, is reported.

**AF3B.5 • 14:45**

Fabrication of all shallowly etched silicon reflection-type arrayed-waveguide gratings with one stigmatic point, Keq Ma, Qiangsheng Huang, Jianhao Zhang, Sitao Chen, Xin Fu, Daowen Dai, Xiaocheng Shi, Kaixuan Chen, Jianxin Chen, Liu Liu, Sailing He, Zhejiang Univ., China; South China Normal Univ., China. We design, fabricate and measure an all shallowly etched reflection-type silicon arrayed waveguide grating (R-AWG) with one stigmatic point, which contributes to reducing the crosstalk of R-AWG.

**AF3B.6 • 15:00**

A robust and fabrication tolerant (de)multiplexer on the SOI platform, Graham T. Reed, Optoelectronics Research Centre, Univ. of Southampton, UK. We recently demonstrated the angled multimode interferometer (AMMI) as a wavelength (de) multiplexer for 4 channels. We have now extended the device application to eight channels via interleaving, and we propose denser integration via ring resonator enhancement.

**AF3B.7 • 15:15**

Fast Stochastic Simulation of Silicon Waveguide with Non-Gaussian Correlated Process Variations, Tsui-Wei Weng, Zheng Zhan, Zhan Su, Luca Danieli, EECS, MIT, USA. In this paper, we develop an efficient statistical simulation technique based on stochastic collocation for silicon photonic processes with non-Gaussian correlated random parameters. Our algorithm has achieved 57-times speedup compared with standard Monte-Carlo simulation.

### Conference Room 3CD

**AF3C.4 • 14:30**

Raman scattering enhancement characteristic of La-doped silica fiber, Xiaohui Kong, Zhenyi Chen, Na Chen, Shupeng Liu, Bo Lu, and Tingyun Wang, Shandong Univ., China. The Raman scattering enhancement characteristic of LaCl3 and LaF3-doped silica fiber were researched. The experimental results show that doping can enhance the optical fiber Raman scattering intensity, and have a good Raman scattering enhancement effect.

**AF3C.5 • 14:45**

Optimization of thermal poling in double-anode optical fiber, Lin Huang, Guobin Ren, Yan Zhang, Key Lab of All Optical Network & Advanced Telecommunication Network of EMC, Beijing Jiaotong Univ., China; Inst. of Lightwave Technology, Beijing Jiaotong Univ., China. We present a theoretical investigation on thermal poling of double-anode optical fiber. It is found that an optimized asymmetrical double-anode provides larger $\chi(2)$, while the symmetrical configuration lead to zero $\chi(2)$ in poled fiber.

**AF3C.6 • 15:00**

New Prospect of Soft Glass Optical Fibers, Yasutake Ohishi, Toyota Technological Inst., Japan. New microstructured optical fiber are developed using highly nonlinear soft glasses. Chromatic dispersions can be controlled better than conventional MOFs. Performances of supercontinuum and optical parametric gain are presented.
AF3D.4 • 14:30 Dual-channel Format Conversion from DQPSK to DPSK Based on FWM in a Single SOA, Danshi Wang1, Min Zhang1,2 *Beijing Univ. of Posts and Telecommunications, China. We experimentally demonstrate the dual-channel wavelength conversion and format conversion from 2×25 Gbps DQPSK signals to 2×12.5 Gbps DPSK based on FWM in SOA using only one pump. About 0.5-dB sensitivity improvement at FEC threshold for DPSK1 is achieved and 0.4-dB power penalty is paid for DPSK2.

AF3D.5 • 14:45 Phase Noise Cancellation Polarization-Insensitive All-Optical Wavelength Conversion of DFTS-PDM-OFDM-8/16/32QAM Signals Using Coherent Dual-Pumps, Chao Li1,2, Ming Luo1, Zhixue He1,2, Haibo Li1, Rong Hu1, Shanhong You1, Qi Yang1, Shaohua Yu1,2 *School of Optical and Electronic Information, Huazhong Univ. of Science and Technology, China; 1State Key Lab of Optical Comm. Technologies and Networks, Wuhan Research Inst. of Posts and Telecommunications, China; 2School of Electronic and Information Engineering, Soochow Univ., China. We experimentally demonstrated phase noise cancellation polarization-insensitive all-optical wavelength conversion (PNC-P-AWC) of 10.03 Gbaud DFTS-PDM-OFDM 8QAM (55.7-Gbaud), 16QAM (74.3-Gbaud) and 32QAM (92.9-Gbaud) signals based on FWM in HNLF by using coherent DFB dual-pumps. Negligible OSNR penalties are observed after wavelength conversion.

AF3D.6 • 15:00 Coherent Optical OFDM Transmission Based on Phase-conjugated twin waves, Dengeke Zeng1 *Key Lab of Optical Fiber Sensing and Communications, UESTC, China. We propose a novel OFDM transmission system based on phase-conjugated twin waves (PCTW). Numerical simulations are performed to verify its performance and its much larger tolerance to the dispersion fluctuation compared with its single-carrier counterpart.

AF3D.7 • 15:15 NRZ-DPSK-to-RZ-DPSK Format Conversion with Multiple-Function Using Raman Adiabatic-Soliton Compressor, Imreza Ismail1, Motoharu Matsuura1, Naoto Kishi1 *Dept. of Communication Engineering and Informatics, The Univ. of Electro-Communications, Japan. A multiple-function optical signal generator including waveform-conversions, picosecond width-tunable, and signal-regeneration of differential-phase-shift-keying(DPSK) format was experimentally demonstrated. We achieved negative power penalty below 1.9-dB with picosecond width-tunable input-output of the regenerated converted RZ-DPSK signal.

AF3E.5 • 14:30 Multipath Protection Scheme in OpenFlow-based Elastic Optical Networks, Yitian Jin1, Jiangtao Zhou1 *Beijing Univ of Posts & Telecom, China. We propose a multipath OpenFlow-based protection scheme for elastic optical networks. Required OpenFlow protocol extensions are detailed. Experimental results demonstrate the feasibility of our proposed protection scheme in OpenFlow-based elastic Optical Networks.

AF3E.6 • 14:45 An Optimization Model for Dynamic Bulk Provisioning in Elastic Optical Networks, Jun He1,2, Rong Hu1,2, Jie Zhang1 *Key Lab of Optoelectronic Devices and Systems of Ministry of Education and Guangdong Province, College of Optoelectronic Engineering, Shenzhen Univ., China. We demonstrated an ultra-simple and compact refractive index (RI) sensor based on fiber Michelson interferometer. This intensity-modulated RI sensor exhibited a high sensitivity of -202.46 dB/RIU and eliminated the cross-sensitivity between RI and temperature.

AF3E.7 • 15:00 p-Cycle Protection Approach with Maximum Spectrum Sharing in Elastic Optical Networks, Ying Pan1,2, Jie Zhang1, Yongli Zhao1, Bowen Chen1,2, Chao Chen1, Guoying Zhang1,2, Guangjun Luo1,2 *State Key Lab of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China; 1China Academy of Telecommunication Research, China; 2School of Electronic and Information Engineering, Soochow Univ., China. In this paper, a p-Cycle protection approach with maximum spectrum sharing is proposed to reduce spectrum consumption. Simulation results show the proposed approach achieves lower blocking probability and resource redundancy than that without spectrum sharing.

AF3E.8 • 15:15 Service-Aware Protection with Bandwidth Squeezing against Disaster in Elastic Optical Datacenter Networks, Zilian Jin1,2, Jie Zhang1, Yongli Zhao1, Chao Chen1,2, Ruying He1,2, Yang Wang1, Xin Li1, *State Key Lab of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China; 1Information Communication Research Lab, China Electric Power Research Inst., China. We propose a novel service-aware protection (SAP) with bandwidth squeezing against disaster in elastic optical datacenter networks. The simulation results show that proposed scheme has a better performance in blocking rate and spectrum resource utilization.

15:30–16:00 Coffee Break around exhibition area

16:00–18:00 Postdeadline Session