ACP 2013

Asia Communications and Photonics Conference

- 12-15 November 2013
- Beijing Conference Center, Beijing, China

IPOC 2013 International Conference on Information Photonics and Optical Communications

Co-located and Jointly Organized

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Sponsored by

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IEEE Photonics Society is focused on advancing the interests of its members and the laser, optoelectronics, and photonics professional community by: providing opportunities for information exchange, continuing education, and professional growth; publishing journals, sponsoring conferences, and supporting local chapter and student activities; formally recognizing the professional contributions of members; representing the laser, optoelectronics, and photonics community and serving as its advocate within the IEEE, the broader scientific and technical community, and society at large. Visit the IEEE Photonics Society (formerly LEOS) at www.PhotonicsSociety.org

SPIE is the international optics and photonics society founded in 1955 to advance light-based technologies. Serving the interests of its more than 235,000 active constituents representing 155 different countries, SPIE acts as a catalyst for collaboration among technical disciplines for information exchange, continuing education, publishing opportunities, patent precedent, and career and professional growth. As the organizer and sponsor of approximately 25 major conferences and education programs annually in North America, Europe, Asia, and the South Pacific, SPIE provides publishing, speaking, and learning opportunities on emerging technologies. SPIE contributes more than $3.2 million annually in scholarships, grants, and other programs sup-porting research and education around the world. For more information, visit www.spie.org

中国光学学会 The Chinese Optical Society

Founded in December 1979, the Chinese Optical Society (COS) is a nongovernmental organization of scientific and technological workers in the field of optics and optical engineering. It is a subsidiary society of the China Association for Science and Technology (CAST).
The mission of COS consists of:
To contribute to the progress of optical science and technology in China
To popularize knowledge in the field of optics
To promote collaboration with the international optical community
To recognize and award Chinese scientists who have made outstanding contributions to optics
To organize training programs
For more information about COS, please visit: www.cncos.org

中国通信学会 CHINA INSTITUTE OF COMMUNICATIONS

China Institute of Communications (CIC) is a non-profit institution formed, on a voluntary basis, by professionals and organizations in the communications science and technology circle in China. It is registered according to law at the Ministry of Civil Affairs. CIC serves as a bridge linking the government with the communications science and technology community. Under the guidance of the China Association for Science and Technology (CAST) and the Ministry of Industry and Information Technology (MIIT), ClC provides intermediary services of scientific and technological nature in the field of communications. For more information about CIC, please visit: www.china-cic.org.cn

Support by

国家自然科学基金委员会
National Natural Science Foundation of China

The National Natural Science Foundation of China (NSFC) was established under the ratification of the State Council on February 14, 1986. Since the establishment of NSFC, an advanced science funding system including the evaluation and funding mechanisms has been comprehensively introduced and implemented. NSFC has gradually established its funding system focusing on the three categories of programs of research promotion, talent fostering and infrastructure construction for basic research. Along with the increasing investment to basic research by the government, the budget for the National Natural Science Fund has been increased from 80 million RMB in 1986 to 10.4 billion RMB in 2010 which has significantly improved the funding environment for basic research and the funding for individual projects has been gradually raised. For more information, visit www.nsfc.gov.cn

Table of Contents

Welcome to Beijing!
Welcome to ACP/IPOC' 2013!

Dear all participants and friends,

It is a great pleasure to heartily welcome you to Beijing for attending the global academic event in the area of photonics and optical communications, ACP'2013, and the co-located IPOC'2013!

Asia Communications and Photonics Conference (ACP, as the mergence of APOC and AOE) is the premier conference in the Asia-Pacific region on photonics and relevant technologies including photonic materials and devices, communication and network technologies, sensing technologies, biophotonic technologies, illumination technologies, photovoltaic technologies and other photonic technologies regarding energy issues. ACP has been held annually tracing back to 2001 when it was launched as APOC in Beijing. It has been jointly sponsored by OSA, SPIE, IEEE Photonics Society, COS and CIC. Co-located and jointly organized with ACP'2013 is IPOC'2013, i.e. International Conference on Information Photonics and Optical Communications in 2013. IPOC is a biennial conference initiated and sustained by the State Key Laboratory of Information Photonics and Optical Communications (at Beijing University of Posts and Telecommunications, briefly BUPT, Beijing, China). The first IPOC was held in 2011 in Singapore. For both conferences of this year, the local organizers are two state key laboratories of China, namely, the above mentioned one at BUPT and the State Key laboratory of Fibre and Cable Manufacture Technologies (at Yangtze Optical Fibre and Cable Company Ltd., briefly YOFC, Wuhan, China). Great supports have been given to the conferences by the Ministry of Science and Technology of China, the Ministry of Education of China, the National Natural Science Foundation of China, the last year's ACP-LOC, BUPT, YOFC, Tsinghua University, Peking University, Beijing Jiaotong University and Institute of Semiconductors (Chinese Academy of Sciences).

As we know, the most ancient "system" of optical communication should be the fire beacons of the Great Wall. Whereas, the modern optical fiber communications came into being just in early 1970s mainly owing to the inventions of the double-heterostructure semiconductor lasers and the low loss optical fibers. Since then, optical communications and photonic technologies have manifested dramatic development by leaps and bounds. Now, as we are in Beijing and enjoying our stay so closely with the Great Wall, we should ask a question in historical sense - what will emerge in the future? It is believed that our ACP, as one of the top-level platforms to share the latest advancements and to exchange inspiring ideas, could answer this essential and challenging question insightfully year by year and lead to significant impacts on the future technologies.

In ACP/IPOC'2013, a special symposium in memory of beloved Dr. Tingye Li will be organized; 9 outstanding scientists and experts will deliver their plenary talks; the total number of the presentations for all the six Tracks is 650, including 135 invited talks and 515 accepted contributed papers (out of 673 regular submissions). Meanwhile, we will have 5 highlighted Workshops with 48 presentations and 3 hot-topic Industry Forums with 34 talks; we will also have a Technological Exhibition jointly facilitated by 19 Exhibitors. Finally, 63 postdeadline-paper submissions have been received. Based on all these efforts made by all of us and all the precious supports given by the relevant authorities, institutions and high-tech enterprises, we wish our conferences a great success!

Beijing is the capital of China with a long, glorious and legendary history. Actually, it is not only the political centre, but also an economic centre, a cultural centre as well as a science and technology centre of the country. Beijing is also really attractive with its incomparable charm and beauty. Again, we would like to stress that Beijing is the birthplace of ACP (initially known as APOC). So, we sincerely hope you will enjoy the conferences and your stay in Beijing.

Faithfully yours,

General Chair:

REN, Xiaomin
Beijing University of Posts and Telecommunications, China

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Institute of Radio Engineering and Electronics, Russia

LIU, Xiang
Bell Laboratories, USA

SHUM, Ping Perry
Nanyang Technological University, Singapore

JAGADISH, Chennupati
Australian National University, Australia

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- LI, Xingde, Johns Hopkins University, USA
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- LUO, Qingming, Huazhong Univ. of Science and Technology, China (also Repr. of SPIE)
- MAO, Qian, Wuhan Research Institute of Posts and Telecom., China (also Repr. of CIC)
- MIRABAL, Kristin K., OSA
- REN, Xiaomin, Beijing University of Posts and Telecom., China (also Repr. of COS)
- SHUM, Ping Perry, Nanyang Technological Univ., Singapore (also Repr. of IEEE Photonics Society)
- SU, Yikai, Shanghai Jiao Tong University, China
- THOMAS, Brian J., SPIE
- ZHOU, Bingkun, Tsinghua University, China (also Repr. of COS)

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Yangtze Optical Fibre and Cable Co. Ltd., China

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Beijing University of Posts and Telecommunications, China

CIARAMELLA, Ernesto
Scuola Superiore Sant'Anna, Italy

WOSINSKA, Lena
Royal Institute of Technology, Sweden

Assistant Chair:

ZHANG, Jie
Beijing University of Posts and Telecommunications, China

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Beijing University of Posts and Telecommunications, China

Co-Chair:

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Yangtze Optical Fibre and Cable Co. Ltd., China

Assistant Chair:

ZHANG, Min
Beijing University of Posts and Telecommunications, China

• ACP/IPOC Joint Track 1:

Materials, Devices and Optoelectronic Integ Ration

Chair:
ZHANG, Liming, Alcatel-Lucent Bell Labs, USA

Co-chairs:
XU, Dan-Xia, NRC Institute for Microstructural Sciences, Canada
YU, Zhongyuan, Beijing University of Posts and Telecommunications, China
LIN, Gong-Ru, National Taiwan University, Taiwan, China

• ACP/IPOC Joint Track 2:

Novel Fibers and Fiber-based Devices

Chair:
OH, Kyunghwnan, Yonsei University, Korea

Co-chairs:
BALLATO, John, Clemson University, USA
HE, Zuyuan, Shanghai Jiao Tong University, China
THEVENAZ, Luc, EPFL Swiss Federal Institute of Technology, Switzerland
YAMSHITA, Shinji, University of Tokyo, Japan

• ACP/IPOC Joint Track 3:

Optical Transmission Systems, Subsystems and Technologies

Chair:
LU, Chao, The Hong Kong Polytechnic University, Hong Kong, China

Co-chairs:
WANG, Ting, NEC, USA
YAN, Lianshan, Southwest Jiaotong University, China
WADA, Naoya, NICT, Japan
ROSENKRANZ, Werner, University of Kiel, Germany

• ACP/IPOC Joint Track 4:

Network Architectures, Management, and Applications

Chair:
SHEN, Gangxiang, Soochow University, China

Co-chairs:
ZHANG, Jie, Beijing University of Posts and Telecommunications, China
WU, Jing, Communications Research Centre Canada, Canada
WONG, Elaine, University of Melbourne, Australia
TZANAKAKI, Anna, Athens Information Technology, Greece

• ACP Track 5:

Biophotonics and Optical Sensors

Chair:
POPP, Jürgen, Friedrich Schiller University Jena, Germany

Co-chairs:
ANDERSSON-ENGELS, Stefan, Lund University, Sweden
TIAN, Jie, Institute of Automation, Chinese Academy, China
RUBINZSTEIN-DUNLOP, Halina, University of Queensland, Australia
MATTHEWS, Dennis L., University of California-Davis, USA

• ACP Track 6:

LEDs, Photovoltaics, and Optoelectronics in Energy

Chair:
TANSU, Nelson, Lehigh University, USA

Co-chairs:
YOON, Euijoon, Seoul National University, Korea
KUO, Hao-Chung, National Chiao-Tung University, Taiwan, China
WANG, Shumin, Chalmers University of Technology, Sweden

Local Organizers:

State Key Laboratory of Information Photonics and Optical Communications (Beijing University of Posts and Telecommunications) China

State Key Laboratory of Optical Fiber and Cable Manufacture Technology (Yangtze Optical Fibre and Cable Co. Ltd) China

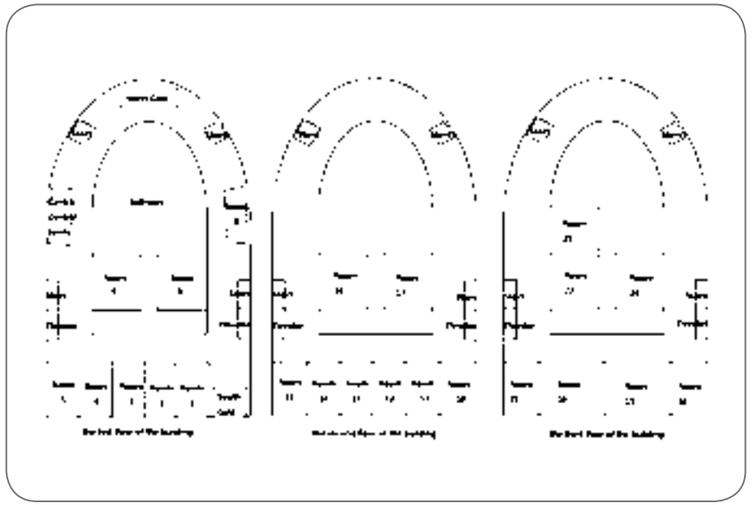
Tsinghua University

Peking University

Beijing Jiaotong University

Institute of Semiconductors CAS

The distribution of conference room in Beijing Conference Center



Beijing City Map

Beijing Subway Map

General Information

Map of Beijing Conference Center

Location

Beijing Conference Center
http://www.beijinghuiyizhongxin.com
Address: 88 West Laiguangying Road, Chaoyang District, Beijing, China
Phone: 86-10-8490 1199
Email: bcc@china.com.cn

Taxi Call:86-10-96106/96103/96109
Emergency Call: 120/999
eBeijing, the Official Website of the Beijing Government: http://www.ebeijing.gov.cn/

Registration

The Hall of Conference Building

Registration Hours

Tuesday, 12 November . . . . . 08.30 – 24.00
Wednesday, 13 November . . . . . 07.00 – 18.00
Thursday, 14 November . . . . . 07.30 – 17.00
Friday, 15 November . . . . . 08.00 – 11.00

Best Student Paper Competition

Wednesday, 13 November . . . . . 16:00 – 18:00
Please refer to the individual conference programs for detailed presentation information. Awards will be presented during the Conference Banquet on Thursday evening (14 November) at Great Hall of the People.

Poster Session

Room 19, Friday, 15 November . . . . . 09:00 – 11:30
This session is designed to provide an opportunity for selected papers to be presented in greater visual detail and facilitate vivid discussions with attendees. Authors should remain by their posters for the duration of the session to answer questions.

Citation Information

All accepted papers of ACP/IPOC 2013, submitted via OSA-provided online submission system, with complete abstract of 3 pages, will be archived on Optics InfoBase and EI Compendex.

Conference Exhibition
Location: Room 20 - Exhibition

11.13 Wednesday 09:30-17:30
11.14 Thursday 09:30-17:30
11.15 Friday 09:30-17:30

Conference Banquet

Thursday, 14 November . . . . . 19:00 – 21:00

Great Hall of the People
*Banquet Tickets required

Tickets can also be purchased for RMB ¥600 at the registration desk.
We offer free buses to Great Hall of the People.
Free Buses will departure from the Parking Area of Conference Building, at 17:20.

Welcome Reception

Wednesday, 13 November . . . . . 18:40 – 20:40
East Restaurant, Beijing Conference Center
All registrants are invited to attend the Welcome Reception with the Reception Tickets.

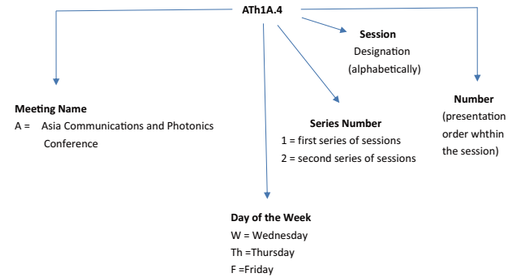
Lunch

Tuesday-Friday, 12-15 November
You can just enjoy your lunch during the lunch break of the conference. We offer you Buffet (100 RMB /person) for Lunch.
If you have not prepaid for the Buffet on your online registration, please feel free to buy tickets for them on the Reception Desks of the conference.

Contact Us

If you need help, you can contact our conference affair group:
Mr. Shanguo Huang +86-13693578265
Mr. Ying Yu +86-18601369081
Ms. Xuejiao Li +86-13811858816

Explanation of Session Codes



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 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 ATh1A.4 indicates that this paper is being presented on Thursday (Th) in the first series of sessions (1), and is the first parallel session (A) in that series and the fourth paper (4) presented in that session.

Tuesday 12 November

Room 10 Workshop	Room 11 Workshop	Room 12 Workshop	Room 13 Workshop	Room 14 Workshop
Registration Open 08:00am-24:00				
Workshop 1 Silicon Photonics 13:30-18:00	**Workshop 2** New Fibre Technologies and Applications 13:30-18:00	**Workshop 3** Microwave Photonics 09:00-18:00	**Workshop 4** Operational Aspects in Fiber Access and Mobile Backhaul Networks 13:30-18:00	**Workshop 5** Next Generation All-Optical Networks 13:30-18:30

Agenda of Sessions

Wednesday 13 November

Room 2 - Track 1	Room 3 - Track 1	Room 4 - Track 2	Room 5 - Track 2	Room 10- Track 3	Room 11 - Track 3	Room 12 - Track 3
Registration Open 07:00 - 18:00						
Opening Ceremony - BALLROOM (08:30-08:50) **AW1A Plenary Session & Special Symposium in Memory of Dr. Tingye Li - BALLROOM** **08:50-10:20** Memorial Remarks (08:50-09:40) Plenary Presentation 1 - WILLNER Alan (09:40-10:20)						
Coffee Break 10:20-10:30						
AW2A Plenary Session & Special Symposium in Memory of Dr. Tingye Li - BALLROOM **10:30-12:30** Plenary Presentation 2 - CHANG-HASNAIN Connie (10:30-11:10) Plenary Presentation 3 - I Chih-Lin (11:10-11:50) Plenary Presentation 4 - LUO Qingming (11:50-12:30)						
Lunch Break 12:30-13:30						
AW3A Track1 - Silicon Photonics I 13:30-15:30	AW3B Track 1 -Semiconductor Lasers 13:30-15:30	AW3C Track 2 - Advanced Fiber Optic Waveguides I 13:30-15:30	AW3D Track 2 - Fiber Optic Photonic Devices I 13:30-15:30	AW3E Track 3 - Space Division Multiplexing 13:30-15:30	AW3F Track 3 - DSP Algorithm 13:30-15:30	AW3G Track 3 - Components and Fibre for Future Optical Networks 13:30-15:30
Coffee Break around Exhibition Area 15:30-16:00						
AW4A Track 1 - Best Student Paper Competition 16:00-18:00	AW4B Track 1 - Photonic Crystals 16:00-18:00	AW4C Track 2 - Novel Optical Material for Fiber Optics I 16:00-18:00	AW4D Track 2 - Fiber Optic Platform for Sensing 16:00-18:00	AW4E Track 3 - Best Student Paper Competition 16:00-18:00	AW4F Track 3 - Challenges Towards Next Generation Transmission 16:00-18:00	AW4G Track 3 - PON and Short Reach Systems 16:00-18:00
Welcome Reception - East Restaurant 18:40-20:40						

Room 13 - Track 4	Room 14 - Track 4	Room 15 - Track 5	Room 18 - Industrial Forum	Room 21 - Industrial Forum	Room 22 - Track 6	Room 20 - Exhibition
Registration Open 07:00 - 18:00						
Opening Ceremony - BALLROOM (08:30-08:50) **AW1A Plenary Session & Special Symposium in Memory of Dr. Tingye Li - BALLROOM** **08:50-10:20** Memorial Remarks (08:50-09:40) Plenary Presentation 1 - WILLNER Alan (09:40-10:20)						
Coffee Break 10:20-10:30						
AW2A Plenary Session & Special Symposium in Memory of Dr. Tingye Li - BALLROOM **10:30-12:30** Plenary Presentation 2 - CHANG-HASNAIN Connie (10:30-11:10) Plenary Presentation 3 - I Chih-Lin (11:10-11:50) Plenary Presentation 4 - LUO Qingming (11:50-12:30)						
Lunch Break 12:30-13:30						
AW3H Track 4 - Network Virtualization 13:30-15:30	AW3I Track 4 - Broadband Access Networks I 13:30-15:30	AW3J Track 5 - Spectroscopy 13:30-15:30	AW3L Industry Forum on Optical Communication Systems, Components and Measurements 13:30-15:30	AW3M Industry Forum on 100+Gb/s Optical Transmission Technologies Systems and Developments 13:30-15:30	**Special Session for Re-scheduled Plenary Talk by DENBAARS Steve** **13:30-14:10** AW3K Track 6 - Internal Quantum and Wall Plug Efficiencies in LEDs 14:10-16:10	Conference Exhibition
Coffee Break around Exhibition Area 15:30-16:00						
AW4H Track 4 - Best Student Paper Competition 16:00-18:00	AW4I Track 4 - Software Defined Networks 16:00-18:00	AW4J Track 5 - Best Student Paper Competition 16:00-18:00	AW4L Industry Forum on Optical Communication Systems, Components and Measurements 16:00-18:00	AW4M Industry Forum on 100+Gb/s Optical Transmission Technologies Systems and Developments 16:00-18:00	Coffee Break 16:10-16:20 AW4K Track 6 - Novel Solar Technology I 16:20-18:20	
Welcome Reception - East Restaurant 18:40-20:40						

Agenda of Sessions

Thursday 14 November

Room 2 - Track 1	Room 3 - Track 1	Room 4 - Track 2	Room 5 - Track 2	Room 10- Track 3	Room 11 - Track 3	Room 12 - Track 3
Registration Open 07:30 - 17:00						
ATh1A Plenary Session - BALLROOM **08:30-10:10** Plenary Presentation 5 - BIMBERG Dieter (08:30-09:20) Plenary Presentation 6 - XUE Qikun (09:20-10:10)						
Coffee Break 10:10-10:20						
ATh2A Plenary Session - BALLROOM **10:20-12:00** Plenary Presentation 7 - GERSTEL Ori (10:20-11:10) Plenary Presentation 8 - VISSERS Maarten (11:10-12:00)						
Lunch Break 12:00-13:30						
ATh3A Track1 - Silicon Photonics II 13:30-15:30	ATh3B Track 1 - Nano Photonics 13:30-15:30	ATh3C Track 2 - Novel Optical Material for Fiber Optics II 13:30-15:30	ATh3D Track 2 - Fiber Light Sources I 13:30-15:30	ATh3E Track 3 - Access and Short Reach Systems II 13:30-15:30	ATh3F Track 3 - Microwave Photonics 13:30-15:30	ATh3G Track 3 - Radio over Fiber Systems 13:30-15:30
Coffee Break around Exhibition Area 15:30-16:00						
ATh4A Track 1 - Plasmonic Devices 16:00-17:00	ATh4B Track 1 Title to be Announced 16:00-17:00	ATh4C Track 2 - Advanced Fiber Optic Waveguides II 16:00-17:00	ATh4D Track 2 - Fiber Optic Phase Measurement and Nonlinear Soliton 16:00-17:00	ATh4E Track 3 - Nonlinear Compensation 16:00-17:00	ATh4F Track 3 - Amplification Techniques 16:00-17:00	ATh4G Track 3 - Visible Light Communication 16:00-17:00
Conference Banquet: Great Hall of the People 19:00-21:00						

Room 13 - Track 4	Room 14 - Track 4	Room 15 - Track 5	Room 22 - Track 6	Room 21 - Tracks 5 & 6	Room 18 - Industrial Forum	Room 20 - Exhibition
Registration Open 07:30 - 17:00						
ATh1A Plenary Session - BALLROOM **08:30-10:10** Plenary Presentation 5 - BIMBERG Dieter (08:30-09:20) Plenary Presentation 6 - XUE Qikun (09:20-10:10)						
Coffee Break 10:10-10:20						
ATh2A Plenary Session - BALLROOM **10:20-12:00** Plenary Presentation 7 - GERSTEL Ori (10:20-11:10) Plenary Presentation 8 - VISSERS Maarten (11:10-12:00)						
Lunch Break 12:00-13:30						
ATh3H Track 4 - Optical Networks and Applications I 13:30-15:30	ATh3I Track 4 - Datacenter Networks 13:30-15:30	ATh3J Track 5 - Microscopy I 13:30-15:30	ATh3K Track 6 - Novel Systems for Lighting Vision 13:30-15:30	ATh3L Track 5 - PDT/PET 13:30-15:30	ATh3M Industry Forum on Transport SDN: How Far from Real Application? 13:30-15:30	Conference Exhibition
Coffee Break around Exhibition Area 15:30-16:00						
ATh4H Track 4 - Broadband Access Networks II 16:00-17:00	Tutorials on VPI Techniques 16:00-17:00	ATh4I Track 5 - Superresolution 16:00-17:00	ATh4J Track 6 - White LEDs Technologies 16:00-17:00	ATh4K Track 6 - Thermoelectric Technologies 16:00-17:00	ATh4L Industry Forum on Transport SDN: How Far from Real Application? 16:00-17:00	
Conference Banquet: Great Hall of the People 19:00-21:00						

Agenda of Sessions

Friday 15 November

Room 2 - Track 1 & PDP	Room 3 - Track 1 & PDP	Room 4 - Track 2 & PDP	Room 5 - Track 2 & PDP	Room 10 - Track 3	Room 11 - Tracks 3 & 6	Room 12 Tracks 3 & 6	Room 13 - Track4	Room 14 - Track 4	Room 15 - Track 5	Room 18 - Tracks 3	Room 21 - Track5	Room 19 - Poster Sessions	Room 20 - Exhibition
Registration Open 08:00 - 11:00													
AF1A Track 1 - Photonics Integration I 08:00-10:00	AF1B Track 1 - Active Components 08:00-10:00	AF1C Track 2 - Recent Status of Fiber Lasers 08:00-10:00	AF1D Track 2 - Fiber Optics for Monitoring and Transmission 08:00-10:00	AF1E Track 3 - Direct Detected OFDM 08:00-10:00	AF1K Track 6 - Novel Solar Technology II 08:00-10:00	AF1L Track 6 - Light Extraction Efficiency in LEDs 08:00-10:00	AF1H Track 4 - Elastic Optical Transmissions 08:00-10:00	AF1I Track 4 - Network Protection 08:00-10:00				AF1P Poster Sessoin 09:00-11:30	
Coffee Break around Exhibition Area 10:00-10:30													
AF2A Post-Deadline 10:30-12:30	AF2B Post-Deadline 10:30-12:30	AF2C Post-Deadline 10:30-12:30	AF2D Post-Deadline 10:30-12:30	AF2E Track 3 - Advanced High Capacity Transmission 10:30-12:30	AF2F Track 3 - PON Systems 10:30-12:30	AF2G Mini Symposium I 10:30-12:30	AF2H Mini Symposium II 10:30-12:30	AF2I Track 5 - Microscopy II 10:30-12:30					
Lunch Break 12:30-13:45													
AF3A Track 1 - Graphene Photonics 13:45-15:30	AF3B Track 1 - Infrared Devices 13:45-15:30	AF3C Track 2 - Fiber Based Transmission and Signal Processing 13:45-15:30		AF3D Track 3 - Technologies for Future Transmission Systems 13:45-15:30		AF3F Track 3 - New Applications 13:45-15:30	AF3G Track 4 - Energy-Efficient Networking 13:45-15:30		AF3I Track 5 - OCT 13:45-15:30	AF3E Track 3 - Highly Efficient Transmission Technology 13:45-15:30	AF3H Track 5 - Sensors I 13:45-15:30		Conference Exhibition
Coffee Break around Exhibition Area 15:30pm-16:30													
AF4A Track 1 - Novel Devices and Applications 16:00-18:00	AF4B Track 1 - Photonic Integration II 16:00-18:00	AF4G Track 4 - Elastic Optical Networks 16:00-18:00		AF4C Track 3 - Novel Techniques for Optical Transmission 16:00-18:00		AF4E Track 3 - Optical Networks 16:00-18:00	AF4F Track 4 - Optical Networks and Applications II 16:00-18:00		AF4I Track 5 - Scattering Techniques 16:00-18:00	AF4D Track 3 - Metro and Access Networks 16:00-18:00	AF4H Track 5 - Sensors II 16:00-18:00		

Wednesday 13 November, 08:50-12:30
BALLROOM
09:40-10:20

T.echnologies in Li.ghtwave Communications: Innovations (and Their Needs) Abound

WILLNER Alan E.
University of Southern California, USA

Abstract: Due in large part to the vision and leadership of Tingye Li, optical communications has achieved dramatic growth by a continuous stream of innovations. This presentation will highlight some key trends and advances in the area of high-capacity, multiplexed optical communication systems.

Biography: WILLNER Alan E. has worked at AT&T Bell Labs and Bellcore, and he is the Steven & Kathryn Sample Chair in Engineering at the University of Southern California. He received the Int'l Fellow of the U.K. Royal Academy of Engineering, NSF Presidential Faculty Fellows Award from the White House, IEEE Eric Sumner Award, Guggenheim Fellowship, Packard Fellowship, OSA Forman Engineering Excellence Award, and IEEE Photonics Society Engineering Achievement Award. He has served as Co-Chair of U.S. National Academies Study on Optics & Photonics, President of IEEE Photonics Society, Co-Chair of OSA Science & Engineering Council, General Co-Chair of CLEO, and Editor-in-Chief of Optics Letters, IEEE/OSA J. of Lightwave Technology and IEEE J. of Selected Topics in Quantum Electronics. He is Fellow of AAAS, IEEE, OSA and SPIE, and he has >1000 publications in optical technologies.

10:30-11:10

Flat Photonics Using High Contrast Metastructures

CHANG-HASNAIN Connie J.
University of California/ Berkeley, USA

Abstract: A new class of planar optics has emerged using near-wavelength period gratings with a large refractive index contrast. This seemingly simple structure lends itself to extraordinary properties, which can be designed top-down based for integrated optics on a silicon substrate. In particular, the near-wavelength gratings with large index contrast wiht its surrounding materials are referred as high-contrast gratings (HCG). The extraordinary features include an ultra broadband ($\Delta\lambda/\lambda$>30%) high reflectivity (>99%) reflector for surface-normal incident light. Another feature is a high quality-factor resonance (Q>107) with surface-normal emission. We incorporated HCG as a replacement of conventional distributed Bragg reflectors (DBR) in vertical cavity surface emitting lasers (VCSELs) over a wide wavelength range from 850-nm to 1550-nm. We also demonstrated high-Q cavity with surface-normal input/output beam using a single HCG layer. This resonator is formed without a Fabry-Perot cavity!

By varying HCG dimensions, the reflection phase can be changed, which can be used to control the VCSEL wavelength. Most interestingly, a curved wave front can be obtained by locally changing each grating dimension. This leads to planar, single-layer lens and focusing reflectors with high focusing power, or arbitrary transmitted wavefront generator which can be used to split or route light.

The HCG can be designed to provide reflection and resonances for incident light at an oblique angle as well. A hollow-core waveguide can be made with two parallel HCGs with light guided in-between. The phase of reflection coefficient can be designed such that slow light can be obtained in a hollow-core waveguide. Finally, light propagation can be switched efficiently from surface-normal direction to an in-plane index-guided waveguide and vice versa.

In this talk, I will review the physical insights of the extraordinary properties and show that HCG can be easily designed using simple guidelines for chip-scale optics.

Biography: CHANG-HASNAIN Connie J. is the John R. Whinnery Chair Professor in the Electrical Engineering and Computer Sciences Department and Chair of the Nanoscale Science and Engineering (NSE) Graduate Group at the University of California, Berkeley. She received her Ph.D. from the same university in 1987. Prior to joining the Berkeley faculty, Dr. Chang-Hasnain was a member of the technical staff at Bellcore (1987–1992) and Associate Professor of Electrical Engineering at Stanford University (1992–1996). She is an Honorary Member of A.F. Ioffe Institute, a Chang Jiang Scholar Endowed Chair Professor at Tsinghua University, a Visiting Professor of Peking University and National Chiao Tung University.

Professor Chang-Hasnain's research interests range from semiconductor optoelectronic devices to materials and physics, with current foci on nano-photonic materials and devices for chip-scale integrated optics. She has been honored with the IEEE David Sarnoff Award (2011), the OSA Nick Holonyak Jr. Award (2007), the IEEE LEOS William Streifer Award for Scientific Achievement (2003), and the Microoptics Award from Japan Society of Applied Physics (2009). Additionally, she has been awarded with a National Security Science and Engineering Faculty Fellowship by the Department of Defense (2008), a Humboldt Research Award (2009), and a Guggenheim Fellowship (2009). She was a member of the USAF Scientific Advisory Board, the IEEE LEOS Board of Governors, OSA Board of Directors, and the Board on Assessment of NIST Programs, National Research Council. She was the Editor-in-Chief Journal of Lightwave Technology 2007-2012.

11:10-11:50

Pearls of 5G

I Chih-Lin
China Mobile, China

Biography: I Chih-Lin winner of CCCP "National 1000 talent" program, Chief Scientist of China Mobile, Head of Green Communication Research Center (GCRC) of China Mobile Research Institute (CMRI), is in charge of advanced wireless communication R&D effort of CMRI.

Dr. I received her Ph.D. degree from Electrical Engineering Department of Stanford University in 1987. She joined wireless communication fundamental research department of AT&T Bell Labs, and has been one of the pioneers in CDMA technologies. With almost 30 years experience in wireless communication area, Dr. I worked in various world-class companies and research institutes, including: Headquarter of AT&T, as Director of Wireless Communications Infrastructure and Access Technology; ITRI of Taiwan, as Director of Wireless Communication Technology Department; Hong Kong ASTRI, as VP and GD of Communications Technology Domain.

Dr. I has been a Board member of IEEE ComSoc, the Director of IEEE ComSoc Meetings and Conferences Board, and the Chair of Steering Committee of IEEE Wireless Communications and Networking. She has also been the Chair of Steering Committee of ASTRI-Tsinghua MBC Joint Research Lab, the Chair of Advisory Committee of ECE Dept of HKUST, the Honorary Director of AWTRC of CAS-ICT, and the Chinese State Council Foreign Expert in communication technologies, etc.

11:50-12:30

Optical Imaging with High Resolution for Brain Activity Map

LUO Qingming
Huazhong University of Science and Technology, China

Biography: LUO Qingming is a Vice President of Huazhong University, China, the Deputy Director of Wuhan Nantional Laboratory of Optoelectronics and a Steering Committee Member of ACP 2013. He is one of the leading scientists of biophotonics in China. The invitation to him has made the plenary talks cover almost all the tracks of our conference.

Thursday 14 November, 08:30-12:00
BALLROOM
08:30-09:20

Green Nanophotonics for Future Datacom and Ethernet Networks

BIMBERG Dieter
Technical University of Berlin, Germany

Abstract: Novel semiconductor edge and vertical surface emitting lasers and amplifiers based on nanostructures present the physical layer of future communication systems which demand larger and larger bandwidths up to multi Tb/sec and dramatically increased energy efficiency.

Biography: BIMBERG Dieter received the Diploma in physics and the Ph.D. degree from Goethe University, Frankfurt, in 1968 and 1971, respectively. From 1972 to 1979 he held a Principal Scientist position at the Max Planck-Institute for Solid State Research in Grenoble/ France and Stuttgart. In 1979 he was appointed as Professor of Electrical Engineering, Technical University of Aachen.

Since 1981 he holds the Chair of Applied Solid State Physics at Technical University of Berlin. He was elected in 1990 Excecutive Director of the Solid State Physics Institute at TU Berlin, a position he hold until 2011. Since 2004 he is director of the Center of Nanophotonics at TU Berlin. From 2006 -2011 he was the chairman of the board of the German Federal Government Centers of Excellence in Nanotechnologies.

His honors include the Russian State Prize in Science and Technology 2001, his election to the German Academy of Sciences Leopoldina in 2004 and to the Russian Academy of Sciences in 2011, as Fellow of the American Physical Society and IEEE in 2004 and 2010, respectively, the Max-Born-Award and Medal 2006, awarded jointly by IoP and DPG, and the William Streifer Award of the Photonics Society of IEEE in 2010.

He has authored more than 900 papers, 22 patents, and 6 books resulting in more than 27,000 citations worldwide and a Hirsch factor of 73.

His research interests include the growth and physics of nanostructures and nanophotonic devices, ultrahigh speed photonic devices for the future Terabus and + 100 G Ethernet, single/entangled photon emitters for quantum cryptography and ultimate nanomemories based on quantum dots.

09:20-10:10

Experimental realization of quantum anomalous Hall effect

XUE Qikun
Tsinghua University, China

Abstract: Anomalous Hall effect (AHE) was discovered by Edwin Hall in 1880. In this talk, we report experimental observation of the quantized version of AHE, the quantum anomalous Hall effect (QAHE) in thin films of Cr-doped (Bi,Sb)2Te3 magnetic topological insulator grown on SrTiO3 by molecular beam eptaxy. At zero magnetic field, the gate-tuned anomalous Hall resistance exhibits a quantized value of h/e2 accompanied by a significant drop of the longitudinal resistance. The longitudinal resistance vanishes under a strong magnetic field whereas the Hall resistance remains at the fully quantized value. The realization of QAHE paves a way for developing low-power-consumption electronics and magneto-electric devices.

The work was carried out in collaboration with Ke He, Yayu Wang, Xucun Ma, Shuaihua Ji, Lili Wang, Jinfeng Jia, Li Lu, Xi Dai, Zhong Fang, and Shoucheng Zhang.

Biography: Prof. XUE Qikun was born in 1963 and graduated with a major in optics from Shandong University in 1984. He received his Ph. D in condensed matter physics from Institute of Physics, The Chinese Academy of Sciences (CAS) in 1994. From 1994 to 2000, he worked as a research associate at Institute for Materials Research, Tohoku University, Japan. From 1996 to 1997, he worked as a visiting Assistant Professor at North Carolina State University, USA. In 2000, he became a professor at Institute of Physics, CAS. He became a chair professor at Department of Physics, Tsinghua University in 2005. He was elected into The Chinese Academy of Sciences in 2005. He was the Chair of Department of Physics and the Dean of School of Sciences from 2010 to 213, and became the Vice President in 2013. He is now on the Editorial Advisory Board of Applied Physics Letters, Journal of Applied Physics, and Physical Review B, and the Editor-in-Chief of Nano Research and Surf. Rev.& Lett.The main research interests of Prof. Xue are in the following areas: (1) Low temperature scanning tunneling microcopy/spectroscopy; (2) Low dimensional superconductivity; (3) Topological insulators and spintronics; (4) Molecular beam epitaxy of low-dimensional quantum structures and nanostructus.

Prof. Xue has authored/coauthored more than 330 papers, which include 5 papers in Science, 31 papers in Physical Review Letters. He has presented more than 100 plenary/keynote/invited talks at international meetings/ conferences, such as the American Physical Society March Meeting (1996, 2005, 2010, 2012). He received the TWAS Prize in Physics in 2010.

10:20-11:10

The Age of Multi-Layer Networking

GERSTEL Ori
Cisco, Israel

Abstract: Service provider networks are increasingly challenged by capacity per fiber and cost per bit, yet there is no transmission related innovation in sight that promises to alleviate these bottlenecks. We believe that the solution lies in tight collaboration between the optical layer and IP layer, allowing for much more efficient use of the available resources at both layers.

Biography: GERSTEL Ori is a Principal Engineer at Cisco, where he is responsible for identifying opportunities for integration of routers and transport technologies. Before joining Cisco in 2002, Ori held senior architecture positions at Tellabs and Nortel, where he architected the first mesh optical network and the first fully switched optical network respectively. He started his work in optical networking at IBM, where the first commercial DWDM system was developed. For his contribution, he was awarded the grade of IEEE Fellow.

Ori authored over 80 papers in international conferences and journals and over 35 patents on optical networks. He served as conference committee member and co-chair of several communication conferences and has been regularly invited to teach short courses and attend panels. He also serves as editor-in-chief for the primary journal for optical networking (JOCN) and as a steering committee member for the OFC/NFOEC conference. Ori holds a Ph.D. degree from the Technion.

11:10-12:00

New methods for connection control in multi service optical transport networks

VISSERS Maarten
Huawei Technologies Co., Ltd

Abstract: The emerging multi service optical transport networks are multi-domain, multi-layer and multi-technology (L0/L1 OTN, L2 Ethernet/MPLS-TP) transport networks for which service providers demand a unified, converged and programmable network management and a unified and open connection control. This presentation addresses the latest developments in the management and control layer that support this demand.

Biography: VISSERS Maarten is a technical director in the European R&D Centre of Huawei Technologies sinceApril 2008. He is currently responsible for the technical aspects of the evolution of the multi service opticaltransport network towards a flexible optical transport network with logical centralised network managementand connection and flow control.Prior to

this he has been responsible for the technical aspects of the multi-service evolution of the opticaltransport network and packet transport technologies towards one globalmulti-technology packet optical converged transport network.

He holds a masters degree in Electrical Engineering, digital systems from the Technical Universityof Eindhoven, The Netherlands obtained in 1982.Prior to joining Huawei Technologies he worked at Philips Telecommunication Industry, AT&T,Lucent Technologies, Alcatel and Alcatel Lucent.

Since 1991 he actively contributed to PDH, SDH, ATM, OTN, ASON, T-MPLS/MPLS-TP, Ethernet and Transport SDN standards development in ITU-T, ETSI, IEEE 802.1,IETF, MEF and ONF. He is an expert in functional modelling, fault management, performancemonitoring, protection switching, overhead and OAM for connection monitoring and networknode interface specifications. He is a vice chair of the Optical Transport Working Group in ONF. He is the editor of a number of OTN, Ethernet and Transport SDNstandards in ITU-T and ONF and has been the editor of severalSDH and T-MPLS standards in ETSI and ITU-T.

Wednesday 13 November, 13:30-14:10, Room 22

Energy Savings Potential of GaN LEDs for Energy Efficient Lighting and Future Research Directions

DENBAARS S. P., J. S. Speck, S. Nakamura
University of California Santa Barbara, USA

Abstract: LEDs fabricated from gallium nitride have lead to the realization of high-efficiency white solid-state lighting. At UCSB's Solid State Lighting and Energy Center we have fabricated advanced GaN white LEDs structures which exhibit luminous efficacy greater than 170 lm/Watt, and external quantum efficiencies higher than 50%. This has helped enabled LEDs lighting to compete with traditional lighting technologies such as incandescent and CFL. A review of the energy savings potential of LED based lighting compared to traditional technologies will be addressed. The U.S. Department of Energy estimates that in 2030 the energy savings from LED lighting in the U.S. alone would amount to over $250 billion in energy savings.

Biography: DENBAARS S. P. is a Professor of Materials and Co-Director of the Solid-State Lighting Center at UC Santa Barbara. Professor DenBaars joined UCSB in 1991 and currently holds the Mitsubishi Chemical Chair in Solid State Lighting and Displays. From 1988-1991 Prof. DenBaars was a member of the technical staff at Hewlett- Packard's Optoelectronics Division involved in the growth and fabrication of visible LEDs. Specific research interests include growth of wide-band gap semiconductors (GaN based), and their application to Blue LEDs and lasers and energy efficient solid state lighting. This research has lead to over 650 scientific publications and over 120 U.S. patents on electronic materials and devices. He has been awarded a NSF Young Investigator award, Young Scientist Award of the ISCS, is an IEEE Fellow, IEEE AronKressel Award (w/ Prof. James Speck), Visiting Professor of the Institute for Advanced Studies (IAS) HKUST, and recently elected to National Academy of Engineering(2012).

Tuesday 12 November, 09:00-18:00

Conference Room 10
13:30-18:00

Silicon Photonics

Organizer:

Prof. ZHOU Zhiping
Peking University, China

Co-Organizer:

Prof. YANG Lin
Institute of Semiconductors, Chinese Academy of Sciences

Abstract: 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 comuting. 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 one-day workshop in Beijing, China.

Invited talks:

- 13:30-14:00 **Jurgen Michel,** *Massachusetts Institute of Technology, USA*
  "Monolithic Lasers and Athermal Filters: Critical Elements for Silicon Photonics."
- 14:00-14:30 **Kazumi Wada,** *University of Tokyo, Japan*
  "Selective-area growth of Germanium on Silicon."
- 14:30-15:00 **Hon Ki Tsang,** *The Chinese University of Hong Kong, China*
  "Graphene on Silicon suspended membrane waveguides."
- 15:00-15:30 **Zhiping Zhou,** *Peking University, China*
  "Plasmonic Devices for Silicon Photonics."
- 15:30-16:00 **Coffee Break**
- 16:00-16:30 **Po Dong, Bell Labs,**
  Alcatel-Lucent, USA
  "Silicon optical coherent modulators."
- 16:30-17:00 **Jung H. Shin,** *Korea Advanced Institute of Science and Technology, Korea*
  "Resonators and biosensors."
- 17:00-17:30 **Minghao Qi,** *Purdue University, USA*
  "Silicon optical diodes and transistors."
- 17:30-18:00 **Lin Yang,** *Institute of Semiconductors, Chinese Academy of Sciences, China*
  "On-chip optical matrix processor."

Conference Room 11
13:30-18:00

New Fibre Technologies and Applications

Organizer:

Dr. XIONG Liangming
Yangtze Optical Fiber and Cable Co. Ltd., China

Co-Organizers:

Prof. SHUM Ping
Director, NTRC,Nanyang Technological University, Singapore

Prof. TANG Ming
Huazhong University of Science and Technology, China

Abstract: This workshop is focused upon new fibre technologies and the related applications, including novel fibers for high-capacity transmission, polymer fibers, fiber sensors, fiber lasers, fiber interferometers, fiber-based dispersion compensation, and so on.

Invited talks:

- 13:30 – 13:55 **Dr. Ming-Jun Li,** *Corning fellow, Corning Incorporated*
  "Novel Optical Fibers for High-capacity Transmission Systems"
- 13:55 – 14:20 **Prof. Chengliang Zhang,** *Deputy chief engineer of China Telecom Beijing Research Institute*
- 14:20 – 14:45 **Prof. Luc Thévenaz,** *Head of the Group for Fibre Optics GFO, School of Engineering,Swiss Federal Institute of Technology (EPFL)*
  "Performance and limits of Brillouin distributed sensors"
- 14:45 – 15:10 **Dr. Qiang Wu,** *Principal Investigator, Photonics Research Centre, School of Electronic and Communications Engineering, Dublin Institute of Technology*
  "SMS fibre interferometer and its application in sensing"
- 15:10 – 15:35 **Dr.Xiaobin Hong,** *Associate Professor, Beijing University of Posts & Telecommunications*
  "Techonologies of distributed fiber optic sensors"
- 15:35 – 16:00 Coffee Break
- 16:00 – 16:25 **Prof. Yunjiang Rao,** *Dean of School of Communication & Information Engineering, Director of Key Lab of Optical Fiber Sensing & Communications of Ministry of Education,University of Electronic Science and Technology of China*
  "Random fiber laser based on dispersion compensated fiber"
- 16:25 – 16:50 *Prof. Meisong Liao, Member of "Hundred Talents Program" of CAS,Shanghai Institute of Optics and Fine Mechanics (SIOM), Chinese Academy of Science (CAS)*
  "Supercontinuum generation in highly nonlinear microstructured fibers and multi-component glass"
- 16:50 – 17:15 **Prof. Yunghwan (Ken) Oh,** *Associate Dean of College of Science, Department of Physics, Director of Photonic Device Physics Laboratory, Yonsei University*
  "One hole, one ring in optical fiber: versatile platform for photonic device"
- 17:15 – 17:40 **Prof. Chen Ji,** *Professor, Semiconductor Institute, Chinese Academy of Sciences*
  "InP based photonic integrated circuit for optical datacom applications"
- 17:40 – 18:05 **Dr. Alexander Argyros,** *Senior Research Fellow, Institute of Photonics and Optical ScienceSchool of Physics, THE UNIVERSITY OF SYDNEY*
  "Composite metal-polymer fibres for sensing and metamaterials"

Conference Room 12
09:00-18:00

Microwave Photonics

Organizer:

Prof. YAO Jianping
University of Ottawa, Canada

Co-Organizers:

Prof. XU Kun
Beijing University of Posts and Telecommunications, China

Prof. PAN Silong
Nanjing University of Aeronautics and Astronautics, China

Abstract: Microwave photonics (MWP) is an interdisciplinary field that studies the interactions between microwave and optical waves for the generation, processing, control, distribution and measurement of microwave, millimeter-wave and THz-frequency signals. It brings significant added value to a wide variety of applications such as high-speed wireless communications, radar, sensors, and modern instrumentation.
This microwave photonics workshop consists of 11 invited talks, covering recent advances in this area, ranging from hybrid and chip level integration of microwave photonic components, microwave and Terahertz wave signal generation, microwave and millimeter wave signal processing, radio over fiber wireless communication systems and networks, to innovative applications of microwave photonics. Possible future research directions will be discussed.

Session I Devices for Microwave Photonics
Session Chairs:

YAO Jianping, *University of Ottawa, Canada*
CHEN Hongwei, *Tsinghua University, China*

- 09:00-09:10 **Kun Xu,** *BUPT, China*
  "An introduction to the IROF project(National Basic Research Program of China)"
- 09:10-09:40 **Lawrence Chen,** *McGill, Canada*
  "Silica and silicon-on-insulator waveguide devices for microwave photonics"
- 09:40-10:10 **Loic Morvan,** *Thales, France*
  "Low noise single and dual-frequency lasers for microwave to terahertz photonics"
- 10:10-10:30 Coffee Break
- 10:30-11:00 **Chris Roeloffzen,** *University of Twente, Netherlands*
  Recent advancements in silicon nitride based integrated microwave photonics
- 11:00-11:30 **Yifei Li,** *UMass Dartmouth, USA*
  "Photonic integrated circuits in radar frontend applications"
- 11:30-12:00 **SaschaFedderwitz,** *u²t Photonics, Germany*
  "Optoelectronic Components in microwave photonic systems"

Session II Microwave Photonics Subsystem
Session Chair:

PAN Shilong, *Nanjing University of Aeronautics and Astronautics, China*

- 13:30-14:30 **Jose Capmany,** *Universitat Politecnica de Valencia, Spain*
  "Integrated microwave photonics(Tutorial)"
- 14:30-15:00 **Avinoam Zadok,** *Bar-Ilan University, Israel*
  "Sharp and tunable microwave-photonic filters based on stimulated Brillouin scattering"
- 15:00-15:30 **Yannis Le Guennec,** *INP Grenoble, France*
  "Broadband optical millimeter-wave generation and wireline transmission over WDM-PON"
- 15:30-16:00 **Coffee Break**

Session III Advanced Applications of Microwave Photonics
Session Chair:

CHEN Minghua, *Tsinghua University, China*

- 16:00-16:30 **Gee-Kung Chang,** *Georgia Tech, USA*
  "Cooperative architecture of optical and wireless communications for emerging 5G wireless applications"
- 16:30-17:00 **Tadao Nagatsuma,** *Osaka University, Japan*
  "Continuous-wave terahertz imaging and spectroscopy based on telecom photonics"
- 17:00-17:30 **Christina Lim,** *University Melbourne, Australia*
  "Transport strategies for high capacity fiber-wireless links in a world of digital optical networks"
- 17:30-18:00 **Linlin Ge,** *University of New South Wales, Australia*
  "The Australian national broadband network and near-real-time satellite remote sensing"

Conference Room 13
13:30-18:30

Operational Aspects in Fiber Access and Mobile Backhaul Network

Organizer:

CHEN Jiajia
Royal Institute of Technology KTH, Sweden

Co-Organizers:

MONTI Paolo
Royal Institute of Technology KTH

URBAN Patryk
Ericsson AB, Sweden

Shoichi Hanatani
Hitachi, Japan

Abstract: Fiber access networks have already been widely considered as a promising solution to handle the ever-increasing capacity demand from a growing number of users and devices as well as many new bandwidth-consuming applications. By 2012, optical distribution networks have been rolled out by 150+ operators in more than 70 countries. The well-established popularity of fiber-optic technologies in residential/business fixed access and increased attention from mobile backhaul providers are driving the need for reduction of operational complexity.

This workshop will focus on the main trends in optical access and mobile backhaul networks with respect to operational aspects such as: open access, supervision, fault management, service provisioning and maintenance, energy consumption, migration,as well as their associated cost drivers. From the technical point of view, the impact of different architectural options on network operation will be considered. Possible future research directions will be discussed.

Invited talks:

- 13:35 – 14:05 **Thomas Pfeiffer,** *Bell-Labs, Alcatel-Lucent , Germany*
  "Managing the Optical Infrastructure of Open Access Networks"
- 14:05 – 14:35 **Huafeng Lin,** *Huawei, China*
  "Innovation Leads the Future of PON: Software Defined FlexPON"
- 14:35 -15:05 **Marc Wuilpart,** *University of Mons, Belgium*
  "Rayleigh-based Characterisation Techniques for the Monitoring of Passive Optical Networks"
- 15:05 – 15:35 **Lena Wosinska,** *KTH Royal Institute of Technology, Sweden*
  "Next Generation Fiber Access Network Architectures: What is the Best Option?"

- 15:35-16:30 Coffee Break

- 16:00 – 16: 30 **Ching-Sheu Wang,** *Chunghwa Telecom, Taiwan, China*
  "Fiber Wireless Consolidate: The Broadband Network Evolution Beyond Light-Era"
- 16:30 – 17:00 **Andrew Pratt,** *Ericsson AB, Sweden*
  "CPRI Front Haul Networks: Transmission Requirements & Link Monitoring"
- 17:00 – 17:30 **Guangquan Wang,** *China Unicom, China*
  "Next Generation Metro WDM: Unified Access Solution for FMC"
- 17:30 – 18:00 **Martin Maier,** *Institut National de la Recherche Scientifique (INRS) , Canada*
  "Unifying FiWi and LTE-A HetNets: Challenges and Opportunities of WiFi Offloading and FTTX Backhaul Sharing"

Conference Room 14
13:30-18:30

Next Generation All-Optical Networks

Organizer:

Prof. SHEN Gangxiang
Soochow University, China

Co-Organizer:

Prof. ZHANG Jie
BUPT, China

Abstract: To support fast Internet traffic growth, optical transport networks need to increase capacity in an efficient manner. For better capacity efficiency, new-generation optical transmission techniques such as optical orthogonal frequency division multiplexing (O-OFDM) and Nyquist WDM have been extensively investigated, and optical networks that take advantage of these new spectrum-efficient transmission techniques (termed "elastic optical networks") are also being widely studied. These advances are reflected from the levels of optical components such as bandwidth-variable wavelength selective switch (WSS), subsystems such as bandwidth-variable reconfigurable add/drop multiplexer (ROADM), to networks such as OpenFlow-based network control plane and associated network-level design and optimization. This workshop aims to harvest these recent progresses. Opinions from both academia and industry (including operators, component and equipment vendors) will be sought for a broad ranging debate. Specifically, the following (but not limited to) research aspects will be discussed:

- Cost-effective bandwidth-variable optical transponders and transmission techniques
- Bandwidth-variable WSS techniques and ROADM architectures
- Control plane and technique for elastic optical networks
- Network design and survivability of elastic optical networks
- Testbeds and standardization for next-generation all-optical networks

Invited talks:

- 13:30 – 14:00 **Prof. Biswanath Mukherjee (IEEE Fellow),** *UC-Davis, USA*
  "The Future of Optical Networking and Applications"
- 14:00 – 14:30 **Prof. David Plant (IEEE/OSA Fellow),** *McGill University, Canada*
  "The Converging Requirements and Commensurate Leveraging Opportunities of Long-Haul and Short Reach Fiber Optic Communications"
- 14:30 – 15:00 **Prof. S. J. Ben Yoo (IEEE/OSA Fellow),** *UC-Davis, USA*
  "Software Defined Elastic Optical Networks for future Cyber infrastructure"
- 15:00 – 15:30 **Dr. Szilard Zsigmond,** *Alcatel Lucent*
  "Network Transformation - Challenges in Optical Domain"

- 15:30 – 16:00 Coffee Break

- 16:00 – 16:30 **Dr. Haiyi Zhang,** *China Academy of Telecom. Research, China*
  "Optical Network Technology and Standard Evolution in China"
- 16:30 – 17:00 **Hui Li, Yongli Zhao, Jie Zhang, Yuefeng Ji,** *BUPT, China*
  "Research on the Flexible Architecture and Enabling Technologies for All Optical Switch Networks"
- 17:00 – 17:30 **Dr. Qi Yang,** *Wuhan Research Institute of Posts and Telecommunications, Wuhan, China*
  "Ultra high speed, ultra large capacity, and ultra-long haul coherent optical transmission technology"
- 17:30 – 18:00 **Xiong Qianjing** *Huawei, China*
  "Ultra high capacity all optical switching system, architecture and applications"
- 18:00 – 18:30 **Dr. Jianjun Yu,** *ZTE, USA*
  "Advanced DSP algorithm for faster than Nyquist WDM Signal"

Industry Forums

Wednesday 13 November, 13:30-18:00

Conference Room 18
13:30-18:00

Optical Communication Systems, Components and Measurements

Organizer:

Dr.YAO, Yi
LUSTER LightTech Company, China

Abstract: 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.

Invited talks:

- 13:30-13:50 **Dr.Jian Yuan,** *Hengtong Group*
  "The cogitation for the transition and innovation of Hengtong Group"
- 13:50-14:10 **Dr. Yongpeng Zhao,**
  LUSTER LightTech Group
  "Evolution of ultrahigh Speed (100G & beyond) Optical Transmission System and Test & Measurement Platform"
- 14:10-14:30 **Dr. David S tahl,** *Fraunhofer Heinrich Hertz Institute*
  "Key Building Blocks and Parameters for Evaluation of Next Generation Transmission Systems Beyond 100G"
- 14:30-14:50 **Dr. Yu Lu,** *APEX Technologies*
  "Spectral and temporal advanced optical modulation formats characterizations methods"
- 14:50-15:10 **XUERUI SUN,** *EXFO*
  "The technology and Challenge of 100G and beyond test& measurement from the lab to the field"
- 15:10-15:30 **Dr. André Richter,** *VPIphotonics*
  "Exploring Transmission Format Alternatives for Flexible Coherent Optical Systems"

- 15:30-16:00 Coffee Break

- 16:00-16:20 **Dr. K V Reddy,** *PriTel*
  "Ultrafast Optical Light Sources"
- 16:20-16:40 **JUERGEN, BECK,** *Agilent*
  "Challenge or opportunity? Addressing your future high speed transmit Barriers"
- 16:40-17:00 **Dr. Sung Hoon Im,** *Coherent Solutions Ltd*
  "Choosing the right OMA for your application and requirements"
- 17:00-17:20 **Dave Slack Sr.,** *Tektronix Inc*
  "Advances in Test and Measurement for Coherent Optical Communications"
- 17:20-17:40 **Weidong Ma,** *Accelink Technologies Co., Ltd.,China*
  "Planar lightwave circuit technology and its applications"
- Panel Discussion 17:40-18:00

Conference Room 21
13:30-18:00

100+Gb/s Optical Transmission Technologies, Systems, and Deployments

Organizer:

Dr. LIU Xiang
Bell Labs, Alcatel-Lucent, USA

Co-Organizer:

Dr. ZHANG Xiaohong
Alcatel-Lucent Shanghai Bell, China

Abstract: To support the ever-increasing capacity demand of optical communications, the traffic in backbone networks has been increasing at a rate of over 60% per year recently. Wavelength-division multiplexed (WDM) systems with channel data rates of 100 Gb/s and beyond have developed and deployed worldwide. This industry forum is dedicated to present the current status of deployment of 100-Gb/s coherent optical transmission systems in the Asia-Pacific region, and discuss enabling technologies for future deployment of 400-Gb/s and 1-Tb/s WDM systems. A series of invited presentations, covering a rich variety of topics ranging from technologies, systems, to deployments, are scheduled for this one-day event. Many internationally renowned experts in the field of high-speed optical transmission, including speakers from leading service providers as China Mobile, China Telecom, China Unicom, and NTT, and leading system manufacturers such as Adva and Alcatel-Lucent, will be presenting at this forum and leading panel discussions.

Session 1 13:30-15:00

- **Naoto Yoshimoto,** *NTT, Japan*
  "NTT's Access Technologies and Deployments"
- **Han Li,** *China Mobile, China*
  "China Mobile's Strategy and Deployment of 100G"
- **Junjie Li,** *China Telecom, China*
  "China Telecom's Strategy and Deployment of 100G"
- **Guangquan Wang,** *China Unicom, China*
  "China Unicom's 100G Deployment"
- **Wenyu Zhao,** *China Academy of Telecommunication Research*
  "China's 400GE Considerations"
- **Xiaohong Zhang,** *Alcatel-Lucent Shanghai-Bell, China*
  "Alcatel-Lucent's 100G Transmission Test and Deployment in China"

Session 1 Panel Discussion 15:00-15:30

Coffee Break 15:30-16:00

Session 2 16:00-17:30

- **Masahito Tomizawa,** *NTT, Japan*
  "Evolution and Deployments of 100G Coherent Optical Communication Systems"
- **Michael Eiselt,** *ADVA, Germany*
  "Adaptive Coherent Transceivers for 100G/400G"
- **S. Chandrasekhar,** *Bell Labs, Alcatel-Lucent, USA*
  "1-Tb/s Superchannel Transmission"
- **Honghai Wang,** *Yangtze Optical Fibre & Cable, China*
  "R&D on New Fibers for 100+Gb/s"
- **Hao Chen,** *Corning, China*
  "New Fiber Choices for 100+Gb/s Transmission"
- **Benyuan Zhu,** *OFS, USA*
  "Next-Generation Fibers and Amplifiers for 400G and Beyond"

Session 2 Panel Discussion 17:30-18:00

Thursday 14 November, 13:30-17:00
Conference Room 18

Transport SDN: How Far from Real Application?

Organizer:

Dr.FENG, Zhiyong
Huawei Technologies Co.Let., China

Co-Organizer:

Jianrui Han
Huawei Technologies Co., Ltd., China

Abstract: Driven by an ever-growing demand for bandwidth, operators want higher transmission rate and greater network resource efficiency to lower the cost per bit, as well as more flexibility in adapt to data-centric services such as video, Internet, DCI services. Transport SDN is expected to be a good solution to meet these requirements to offer programmable and efficient control of optical transport network. But how far is transport SDN away from real application?This workshop will attempt to shed light on the real application and benefits of transport SDN. In this workshop, Industry and academic will review the latest state of optical technologies. Service provider will analyze current traffic optimization requirement and needs of the future transport network. Top carriers will look forward SDN's potential use and evolution route in large carrier networks. This workshop will also attempt to discuss on transport SDN's application scenario and benefits & challenge for customers and operators.

- 13:30-13:45 **Ruiquan Jin,** *China Telecom, China*
  "The Application of Transport SDN in Carriers' Network"
- 13:45-14:00 **Guoying Zhang,** *China Academy of Telecom Research, MIIT ,China*
  "Evolution towards Software Defined Optical Transport Network"
- 14:00-14:15 **Lei Wang,** *China Mobile ,China*
  "Requirement and Architecture of S-PTN and SDN2.0"
- 14:15-14:30 **Maarten Vissers,** *European Research Center of Huawei , Netherlands*
  "ONF Transport SDN"
- 14:30-14:45 **Xi Wang,** *Fujitsu Laboratories of America, USA*
  "Software Defined Flexible Grid Optical Networks"
- 14:45-15:00 **Jianrui Han,** *Huawei, China*
  "Transport SDN: Faster to the Future"
- 15:00-15:15 **Yajun Wang,** *Tellabs, USA*
  "Metro Transport SDN: Challenges and Technology Readiness"
- 15:15-15:30 **Ian Clarke,** *Finisar Shanghai, China*
  "Building the next generation of linecards: the pleasure and pain of integration"

- 15:30-16:00 Coffee Break

- 16:00-16:15 **Brandon Collings,** *JDS Uniphase, USA*
  "A Single Effective ROADM Architecture for CD and CDC Applications"
- 16:15-16:30 **Chao Lu,**
  T*he Hong Kong Polytechnic University, China*
  "Technology for SDN implementation"
- 16:30-16:45 **Yongli Zhao,** *Beijing University of Posts and Telecommunications, China*
  "Application and Benefits of SDN based Control Technology in Dynamic Optical Networks"

- 16:45-17:00 Panel Discussion

Wednesday 13 November
Ballroom: 08:30-12:30

08:30-8:50: Opening Ceremony

Plenary Session
AW1A Plenary Session & Special Symposium in Memory of Dr. Tingye Li----------08:50—10:20
Presider: LIU xiang, YAN Lianshan
08:50-9:40: Memorial Remarks
09:40-10:20: **Plenary Presentation 1,** WILLNER Alan E.
10:20-10:30: **Coffee Break**

AW2A • Plenary Session & Special Symposium in Memory of Dr. Tingye Li----------10:30—12:30
Presider: LIU xiang; YAN Lianshan
10:30-11:10: **Plenary Presentation 2, CHANG-HASNAIN Connie J.**
11:10-11:50: **Plenary Presentation 3, I Chih-Lin**
11:50-12:30: **Plenary Presentation 4 , LUO Qingming**

Lunch Break ----------12:30—13:30

Room 2-----Track 1-----Wen.13:30—15:30
AW3A • Silicon Photonics I
Presider: Jens Schmid, NRC Canada, Canada

AW3A.1 • 13:30
All-optical sigal processing with SOI-based microring resonators(Invited Paper), Xinliang Zhang[1]; [1]Huazhong Univ. of Science and Technology, China. All-optical signal processing with SOI-based microring resonators is discussed in this paper. Those functions such as format conversion, logic operation, photonic differentiator and differential euqation solver were demonstrated based on linear and nonlinear effects.

AW3A.2 • 14:00
Silicon Meets Photonics, Asaf Somekh[1]; [1]Compass-EOS, Israel. Copper-based chip-to-chip and chip-to-board interconnect is a bottleneck: it can't support the high bit rates of stronger processing cores. Silicon photonics uses a direct optical connection between elements. We will explore the implications and deployments of this innovative technology.

AW3A.3 • 14:15
Self-coupled microring resonator with multiple split resonances, Xi Yin[1], Jiayang Wu[1], Xiaowen Sun[1], Liang Zhang[1], Pan Cao[1], Fei Li[1], Xinhong Jiang[1], Xiaofeng Hu[1], Yikai Su[1]; [1]Shanghai Jiao Tong Univ., China. We propose and experimentally demonstrate a self-coupled microring resonator with multiple split resonances at certain wavelengths. By changing the phase shift along the feedback loop, variable numbers of split resonances can be obtained.

AW3A.4 • 14:30
High-Q Comb Slot Photonic Crystal Cavities in SOI photonics, Charles Caer[1], Xavier Le Roux[1], Laurent Vivien[1], Eric Cassan[1]; [1]Universite de Paris-Sud XI, France. The properties of slot photonic crystal waveguide cavities designed to reinforce light-matter interactions by maximizing the so-called Q/V factor are theoretically and experimentally investigated. Slot photonic crystal cavities filled by an index liquid and exhibiting Q factors around 60 000 are reported.

AW3A.5 • 14:45
A New Concentric Micro-ring Structure with High Side-mode Suppression and Deep Transmission Notches, Bing Hu[1], Yongqing Huang[1], Xiaofeng Duan[1], Jinhua Hu[1], Yubin Li[1], Xiaomin Ren[1], Xia Zhang[1], Qi Wang[1]; [1]State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. A concentric micro-ring resonator with different waveguide width was investigated. This optimized structure can eliminate the resonance effect between rings. Meanwhile, the resonant frequency shift is improved when used in sensing.

AW3A.6 • 15:00
Ultracompact Onchip Photonic Differentiator Based on Silicon Microdisk Resonator, Dingshan Gao[1,] Jianji Dong[1], Ting Yang[1], Li Liu[1]; [1]Wuhan National Laboratory for Optoelectronics,School of Optical and Electronic Information, Huazhong Univ. of Science and Technology, China. An ultracompact onchip photonic differentiator by silicon-on-insulator microdisk resonator is proposed and fabricated. The diameter of the microdisk is only 10 micron. A Gaussian pulse of 20 picoseconds is input to demonstrate the photonic differentiation functions.

AW3A.7 • 15:15
Low Power-consuming Variable Optical Attenuator with a Reflective Mach-Zehnder Interferometer on Silicon, Sitao Chen[1], Yaocheng Shi[1], Daoxin Dai[1]; [1]Centre for Optical and Electromagnetic Research, State Key Laboratory for Modern Optical Instrumentation, Zhejiang Provincial Key Laboratory for Sensing

Technologies, Zhejiang Univ., China. A novel Low power-consuming variable optical attenuator (VOA) on silicon is demonstrated by using a reflective Mach-Zehnder interferometer (MZI). The power consumption is only 10.8mW to achieve an extinction ratio as high as 35.5dB.

Coffee Break ----------15:30—16:00

Room 2-------Track 1----Wen.16:00—18:00
AW4A • Best Student Paper Competition
Presider: Liming Zhang, Alcatel-Lucent Bell Labs, USA

AW4A.1 • 16:00
High-Efficiency Grating Couplers for Integration into a High-Performance Photonic BiCMOS Process, Stefan Lischke, Benjamin Wohlfeil[2], Dieter Knoll[1], Lars Zimmermann[1], Christian Mai[1], Yuji Yamamoto[1], Steffen Marschmeyer[1], Karsten Voigt[2], Bernd Tillack[1,2]; [1]IHP GmbH, Germany; [2]HFT4, Technische Universität Berlin, Germany. We present high-efficiency fiber-to-chip grating couplers with a coupling loss of about -1.5dB only, whose structure and fabrication flow facilitate an easy integration in a high-performance, photonic BiCMOS process.

AW4A.2 • 16:15
CW pumping correlated photon pair generation in micro-ring, Yuan Guo[1], Wei Zhang[1], Ning Lv[1], Qiang Zhou[1], Yidong Huang[1], Jiangde Peng[1]; [1]Electronic Egineering, Tsinghua Univ., China. 1.5um correlated photon pair generation under CW pumping in silicon micro-ring cavity is realized, The maximum ratio between the coincident and accidental coincident counts (CAR) is up to 240 under a coincidence time bin width of 5ns.

AW4A.3 • 16:30
10-Gb/s 53.1-km BPSK transmission of silicon Mach-Zehnder modulator, Tiantian Li[1], Junlong Zhang[1], Huaxiang Yi[1], Wei Tan[1], Qifeng Long[1], Zhiping Zhou[1], Xingjun Wang[1], Hequan Wu[1]; [1]Peking Univ., China. 25Gb/s BPSK modulation was presented employing 2mm Si Mach-Zehnder (MZ) modulator, by which the BPSK transmission was demonstrated through 53.1-km Single Mode Fiber (SMF) in 10 Gb/s under 6Vpp driving voltage.

AW4A.4 • 16:45
A Low-cost Hybrid 16-channel 100GHz-spacing Multi-wavelength Laser for WDM-PON OLT, Hao Chen[1,2], Weidong Ma[1,2], Li Ding[2], Hu Zhu[2]; 1State Key Laboratory of Optical Communication Technologies and Networks, China; [2]Accelink Technologies Co., Ltd., China. A low-cost L-band multi-wavelength laser is fabricated in hybrid method. It consists of four 4-channel semiconductor optical amplifier arrays and an array waveguide grating. The 16 channel lasing operation and dynamic characters have been shown.

AW4A.5 • 17:00
A Novel Wide Wavelength Spacing Dual-Mode DFB Laser, Shaoyang Tan1, Teng Zhai1, Dan Lu1, Ruikang Zhang1, Wei Wang1, Chen Ji1; 1Key Laboratory of Semiconductor Materials Science, Inst. of Semiconductors, Chinese Academy of Sciences, China. We have demonstrated a dual-mode DFB laser lasing at around 1060 nm, with a wide wavelength spacing of 18 nm, which can be serving as a laser source for THz generation technology.

AW4A.6 • 17:15
Direct Modulation of Widely Tunable V-Cavity-Laser for Low-Cost WDM Access Networks, Jianjun Meng1, Hongli Zhu1, Sen Zhang1, Li Zou1, Jian-Jun He1; 1Department of Optical Engineering, Zhejiang Univ., China. We demonstrate direct modulation in compact widely tunable V-cavity-laser. Dynamic mode hopping is avoided and well-open eye diagrams were measured for 2.5Gbps and 5Gbps after 50km and 20km transmissions, respectively.

AW4A.7 • 17:30
All-Optical 9.35 Gb/s Wavelength Conversion in an InP Photonic Crystal Nanocavity, Dragana Vukovic1, Yi Yu[1], Mikkel Heuck[1], Sara Ek[1], Nadezda Kuznetsova[1], Pierre Colman[1], Evarist Palushani[1], Jing Xu[1], Kresten Yvind[1], Leif K. Oxenløwe[1], Jesper Mørk[1], Christophe Peucheret[1]; [1]Technical Univ. of Denmark, Denmark. Wavelength conversion of a 9.35 Gb/s RZ signal is demonstrated using an InP photonic crystal H0 nanocavity. A clear eye is observed for the converted signal showing a pre-FEC bit error ratio down to 10-3.

AW4A.8 • 17:45
Compact Q-enhanced bandpass filter based on EIT-like effect accompanying an application for APL, Hongchen Yu[1], Minghua Chen[1], Pengxiao Li[1], Sigang Yang[1], Hongwei Chen[1], Shizhong Xie[1]; [1]Tsinghua Univ., China. A compact bandpass filter employing EIT-like effect has been realized with a bandwidth about 4.8GHz and 27 times enhancement in Q. The SFDR of a downconverted APL based on this filter is 103.9 dB-Hz2/3.

Room 3-------Track 1---Wen.13:30—15:30
AW3B • Semiconductor Lasers
Presider: Jin-yu Mo, Oclaro, Inc., USA

AW3B.1 • 13:30
Application of Nanoimprint Lithography in Fabrication of Semiconductor Laser, jianyi zhao[1,2], Xin Chen[1,2], Ning Zhou[2], Xiaodong Huang[2], Wen Liu[1]; [1]Wuhan National Laboratory for Optoelectronics, Huazhong Univ. of Science and Technology, China; [2]R&D [3], Accelink Technologies Company, China. We report the first fabrication of monolithically integrated sixteen-channel DFB laser array for WDM-PON system, four-channel laser array for CWDM system and tunable laser with digital-concatenated-grating using nanoimprint technology.

AW3B.2 • 13:45
Cavity Enhanced Nonlinearity in Injection-locked Semiconductor Ring Lasers, huanlu li[1], Xinlun Cai[1], Zexin Kang[2], Ning Zhang[1], Siyuan Yu[1]; [1]Electrical and Electronics, Univ. of Bristol, UK; [2]Electrical and Electronics, Beijing Jiaotong Univ., China. Third order nonlinearity in semiconductor ring lasers has been numerically analysed. Compared with Fabry-Perot lasers, semiconductor ring lasers are 4 times more efficient in four-wave mixing processes, due to its travelling-wave nature.

AW3B.3 • 14:00
Linewidth in quantum cascade lasers(Invited Paper), Qijie Wang[1,2], Tao Liu[1]; [1]School of Electrical and Electronic Engineering, Nanyang Technological Univ., Singapore; [2]School of Physical and Mathematical Sciences, Nanyang Technological Univ., Singapore. In this talk, we will first discuss the intrinsic linewidth of quantum cascade lasers (QCLs) mainly caused by fundamental thermodynamic fluctuation. Then, we will discuss the dynamics of coherent interaction and resonant-tunneling transport effects on the linewidth of QCLs.

AW3B.4 • 14:30
A Novel Method for Photonic Generation of Millimeter-wave Signals with Optical Injection Locked Microring Laser, dong Liu[1], ChangZheng Sun[1], Bing Xiong[1], Yi Luo[1]; [1]Tsinghua Univ., China. By injection locking two adjacent longitudinal modes of the microring laser to the sidebands of phase modulated light, stable millimeter carrier with low phase noise is generated. The scheme requires no isolator or circulator, and has the potential to be implemented with a single monolithically integrated chip.

AW3B.5 • 14:45
Sigle Ring Tunable Laser Based on Two-Section Active Vertical Coupler, Ruiying Zhang[2,1]; [1]Suzhou Inst. of Nano-tech & Nano-bionics, China; [2]Department of Electrical & Electronic Engineering, Univ. of Bristol, UK. Flexible coupled single ring tunable laser is demonstrated. The threshold current, free spectrum range and lasing wavelength are tuned with the coupling current. Their tuning mechanism is further verified by the extracted modulated gain spectrum.

AW3B.6 • 15:00
An Electrically Driven Polariton Laser(Invited Paper), Arash Rahimi-Iman1, Christian Schneider[1], Na Young Kim[2,3], Julian Fischer[1], Ivan G. Savenko[4,5], Matthias Amthor[1], Lukas Worschech[1], Vladimir D. Kulakovskii[6], Ivan A. Shelykh[4,5], Martin Kamp[1], Stephan Reitzenstein[1,7], Alfred Forchel[1], Yoshihisa Yamamoto[2,8], Sven Höfling[1]; [1]Technische Physik, Physikalisches Institut and Wilhelm Conrad Röntgen Research Center for Complex Material Systems, Universität Würzburg, Germany; [2]E. L. Ginzton Laboratory, Stanford Univ., USA; [3]Inst. of Industrial Science, Univ. of Tokyo, Japan; [4]Science Inst., Univ. of Iceland, Iceland; [5]Division of Physics and Applied Physics, Nanyang Technological Univ., Singapore; [6]Inst. of Solid State Physics, Russian Academy of Science, Russian Federation; [7]Institut für Festkörperphysik, Technische Universität Berlin, Germany; [8]National Inst. of Informatics, Hitotsubashi, Japan. A new type of electrically pumped semiconductor laser has been demonstrated which promises an energy efficient laser operation: Recent achievements in the field of ‘polariton-laser' development are presented and an outlook is given.

Coffee Break ----------15:30—16:00

Room 3------Track 1-----Wen.16:00—18:00
AW4B • Photonic Crystals
Presider: Gong-Ru Lin, National Taiwan Univ., Taiwan, china

AW4B.1 • 16:00
Design and fabrication of hollow core slow light slot photonic crystal waveguides for nonlinear optics, Charles Caer[1], Xavier Le Roux[1], Jérémy Oden[2], Laurent Vivien[1], Nicolas Dubreuil[2], Eric Cassan[1]; [1]Universite de Paris-Sud XI, France; [2]Institut d'Optique, France. W(Invited Paper)e report our recent efforts for the design and fabrication of comb slot photonic crystal waveguides in SOI photonics. Issues related to their dispersion, loss, and X(3) properties are reported.

AW4B.2 • 16:15
Design of a Chalcogenide Waveguide Amplifier Based on a Photonic Crystal with Compound Lattice, Du yuzhou[1]; [1]School of Physics & Optoelectronic Engineering, Dalian Univ. of Technology, China. We have designed a 2D complex photonic crystal waveguide amplifier in chalcogenide material GaLaS. The photonic crystal waveguide can allow light to travel at both wavelengths of 1530 nm for signal and 980 nm for pump.

AW4B.3 • 16:30
Focusing Subwavelength Grating Couplers(Invited Paper), Zhenzhou Cheng[1], Hon K. Tsang[1]; [1]Dept of Electronic Engineering, The Chinese Univ. of Hong Kong, Hong Kong. We describe focusing subwavelength gratings (SWGs) for coupling to silicon suspended membrane waveguides. We discuss different types of SWG for different applications including mid-infrared waveguides, apodized gratings for simultaneous coupling of two polarizations and broadband couplers.

AW4B.4 • 17:00
Photonic Crystal Nanobeam Cavity with Stagger Holes for Ultrafast Direct Modulation, Yongzhuo Li[1], Kaiyu Cui[1], Xue Feng[1], Yidong Huang[1], Zhilei Huang[1], Fang Liu[1], Wei Zhang[1]; [1]Tsinghua Univ., China. A photonic crystal nanobeam cavity with stagger-holes in InP/InGaAsP heterostructure is proposed for ultrafast direct modulation. The modulation bandwidth for the proposed nano-light-emitting-diode could be over 60 GHz with optimal Q (2150) and Veff (2.3(λ0/2n)3).

AW4B.5 • 17:15
Wavelength-Space Tunable Dual-wavelength Fiber Laser Based on an Opto-DMD and the Photonic Crystal Fiber, Li Yan[1], Xinzhu Sang[1], Binbin Yan[1], Wang Tao[1], Zhang Di[1], Xia Zhang[1], Jinhui Yuan[1], Kuiru Wang[1]; [1]IPOC, China. A wavelength-space tunable dual-wavelength fiber laser for millimeter wave signal processing is demonstrated based on an Opto-DMD and the PCF. The wavelength spacing can be experimentally tuned from ~20 GHz to ~135 GHz.

AW4B.6 • 17:30
Silver nanospirals: 3D chiral metamaterials(Invited Paper), Fan Bai[1], Zhifeng Huang[1,2]; [1]Physics, Hong Kong Baptist Univ., Hong Kong; [2]Inst. of Advanced Materials, Hong Kong Baptist Univ., Hong Kong. Chiral silver nanospirals were deposited by low-substrate-temperature glancing angle deposition (LTs-GLAD), exhibiting a series of circular dichroism (CD) in 200-800 nm. Electromagnetic simulation was carried out to explore plasmonic principle.

Room 4------Track 2-----Wen.13:30—15:30
AW3C • Advanced Fiber Optic Waveguides I
Presider: Libo Yuan, Harbin Engineering Univ., China

AW3C.1 • 13:30
Few-mode fiber for mode-division-multiplexed transmission with MIMO DSP(Invited Paper), Takayoshi Mori[1], Taiji Sakamoto[1], Masaki Wada[1], Takashi Yamamoto[1], Fumihiko Yamamoto[1]; [1]NTT Corporation, Japan. We review recent work on few-mode fibers for mode-division-multiplexed transmission with MIMO DSP and introduce our demonstrations of a low DMD 4 LP mode fiber and DMD compensation transmission line.

AW3C.2 • 14:00
Impact of Structural Distortions on the Loss Properties of Hollow-Core Photonic Bandgap Fibers, Eric Rodrigue Numkam Fokoua[1], David J. Richardson[1], Francesco Poletti[1]; [1]Optoelectronics Research Centre, Univ. of Southampton, UK. We present a systematic method for designing hollow-core photonic bandgap fibers with arbitrary structural distortions. Finite element simulations reveal that while some distortions are detrimental, rearranging the core surround may significantly reduce the loss.

AW3C.3 • 14:15
Self-supporting polymer pipes for low loss single-mode THz transmission, Xiao Mingfei[1], Liu Jing[2], Zhang Wei[1], Shen Jingling[2], Huang Yidong[1]; [1]Electronic Engineering, Tsinghua Univ., China; [2]Physics, Capital Normal Univ., China. A self-supporting polymer pipe is proposed for THz wave transmission. Theoretical analysis and experiment shows that it can support single-mode transmission at THz band. The measured attenuation coefficient of the single HE11 mode transmission is no more than 3dB/m.

AW3C.4 • 14:30
Multicore Fibers: From Nonlinear Optical Switching to Mode-Division Multiplexing(Invited Paper), Kin Seng Chiang[1]; [1]Department of Electronic Engineering, City Univ. of Hong Kong, Hong Kong. The paper presents an overview of the development of multicore fibers for various applications over the last 30 years, from the early studies on nonlinear optical switching to the most recent applications in space-division multiplexing and mode-division multiplexing.

AW3C.5 • 15:00
Ring Fibres Supporting Transmission of Modes with Orbital Angular Momentum, Zhengqian Zhong[1], Xuyang Wang[2], Yanfeng Zhang[1], Yujie Chen[1], Siyuan Yu[1]; [1]School of Physics and Engineering, Sun Yat-sen Univ., China; [2]Merchant Venturers School of Engineering, Univ. of Bristol, UK. Ring fibres capable of supporting a series of azimuthal modes while maintaining radial single-mode are designed. These modes are orthogonal that may provide the reduced intermode crosstalk and thus enable fiber-optic communications using multi-modes.

AW3C.6 • 15:15
Enhanced second-harmonic generation based on surface nonlinearity in slot nanofibers, Wei Luo[1], Wei Guo[1], Wei Hu[1], Fei Xu[1], Yanqing Lu[1]; [1]College of Engineering and Applied Sciences, Nanjing Univ., China. Enhancement of the surface second-harmonic generation in optical nanofibers by slot structure is demonstrated numerically. This so-called slot nanofiber is promising to provide a competing platform for ultra-tiny fiber lasers including ultraviolet and visible light.

Coffee Break ----------15:30—16:00

Room 4-----Track 2-----Wen.16:00 —18:00
AW4C • Novel Optical Material for Fiber Optics I
Presider: Tingyun Wang, Shanhai Univ., China

AW4C.1 • 16:00
Chalcogenide-silica fibers - a novel base for nanophotonic devices(Invited Paper), Markus Schmidt[1,2], Nicolai Granzow[2], Philip Russell[2]; [1]Inst. of Photonic Technology, Germany; [2]Max Planck Inst. for the Science of Light, Germany. In my presentation I will review our recent results on hybrid chalcogenide-silica waveguides with the focus on nanotapers, band gap guidance and mid infrared super continuum generation.

AW4C.2 • 16:30
High Crystalline Semiconductor Core Silica Fiber, Na Chen[1], Xiaoli Li[1], Zhenyi Chen[1], Fufei Pang[1], Tingyun Wang[1]; [1]Key Laboratory of Specialty Fiber Optics and Optical Access Networks, Shanghai Univ., China. Semiconductor-core silica-cladding optical fibers were fabricated using rod in tube method. Raman spectrum reveals the core to be highly crystalline and the propagation loss measured is around 5.7-7dB/cm in the wavelength range of 1.47-1.62μm.

AW4C.3 • 16:45
High Nonlinear Fluorotellurite Glass Fiber, Huan Zhan[1,2], Aidong Zhang[1], Jianli He[1], Tengfei Shi[1], Jinhai Si[2], Aoxiang Lin[1]; [1]Xi'an Inst of Optics and Precision Mech, China; [2]Xi'an Jiaotong Univ., China. We report on the fabrication of water-free fluorotellurite glass fiber with high nonlinearity. By the continuous-wave self-phase modulation method, the nonlinear refractive index n2 is estimated to be 1.4×10-18 m2/W at 1550 nm.

AW4C.4 • 17:00
Development on advanced functional optical materials and fibers(Invited Paper), Yasushi Fujimoto[1]; [1]Inst. of Laser Engineering, Osaka Univ., Japan. This paper introduces our developing new concept of advanced functional optical materials and fibers, such as, Bi-doped silica glass and fiber, short-length optical fiber lasers, and rare-earth doped waterproof fluoride glasses and fibers.

AW4C.5 • 17:30
Bismuth-doped silica fiber fabricated by atomic layer deposition doping technique, Pupu Wang[1], Jianxiang Wen[1], Yanhua Dong[1], Fufei Pang[1], Tingyun Wang[1], Zhenyi Chen[1]; [1]Shanghai Univ., China. We fabricated Bi-doped silica fiber by atomic layer deposition doping technique. The refractive index difference of fiber is 0.58 %. The absorption peak is at 500 nm, 700 nm, 800 nm, and 1000 nm. The fluorescence peak is 1130 nm.

AW4C.6 • 17:45
Graphene-Covered-Microfiber as Saturable Absorber for Wavelength-Tunable Passive Mode-Locking, Xiaoying He[1], DongNing Wang[2]; [1]Shanghai Ultra-Precision Optical Manufacturing Engineering Center and Department of Optical Science and Engineering, Fudan

Univ., China; [2]Department of Electrical Engineering, The Hong Kong Polytechnic Univ., Hong Kong. A novel graphene saturable absorber is used in fiber laser for optical pulse generation. Such saturable absorber is created by tightly attaching the graphene film onto the surface of microfiber based on its evanescent field.

Room 5-----Track 2-----Wen. 13:30—15:30
AW3D • Fiber Optic Photonic Devices I
Presider: Yunqi Liu, Shanghai Univ., China

AW3D.1 • 13:30
Laser-oriented growth of long polymer tip for scanning optical applications, xin hua zeng[1,2], Wei Luo[1,2], Cheng Chen[1,2], Shouguo Zheng[1], Shizhuang Weng[1,2], Miao Li[1,2], Zede Zhu[1,2], Yuan Yuan[1], Lei Chen[1], Huiyi Gao[1], Zelin Hu[1], Jun Dong[1], Haodong Zhang[1], Weihui Zeng[1], Li Wan[1]; [1]Inst. of Intelligent Machine, Chinese Academy of Sciences, China; [2]Univ. of Science and Technology of China, China. We report on the laser-oriented growth of a polymer probe with a length of hundreds microns at the end of a single mode fiber. It has a high L/r ratio of 250 and a very low loss of 0.31 dB in optical transmission. It can be applied as an efficient scanning optical source and photo-detector.

AW3D.2 • 13:45
Fluid-filled photonic crystal fiber modal interferometer utilizing long period grating, Wei Huang[1], Yange Liu[1], Zhi Wang[1], Bo Liu[1], Lie Lin[1]; [1]Key Laboratory of Optical Information Science and Technology, Inst. of Modern Optics, Nankai Univ., China. A novel modal interferometer with high temperature sensitivity based on a long period grating inscribed in two-mode water-filled photonic crystal fiber is proposed. The device promises potential applications in sensing and wavelength filter system.

AW3D.3 • 14:00
Novel Optical Fiber Devices Based on Long Period Gratings(Invited Paper), Krishan Thyagarajan[1]; [1]India Inst. of Technology Delhi, India. Long period gratings (LPGs) have found wide applications as wavelength filters, sensors etc. The talk presents recent work in novel LPG designs for tailoring wavelength filtering characteristics, as sensors, channel isolation filters and wavelength interrogators.

AW3D.4 • 14:30
Optical generation of tunable microwave signals based on an Opto-DMD processor and photonics crystal fiber, wang tao[1]; [1]BUPT, China. Frequency-tunable microwave signals are generated by controlling an Opto-DMD processor in a fiber laser. 17 and 27.5 GHz carrier waves are demonstrated with reconfigurable diffraction gratings to steer dual-wavelength lasing without any mechanically shift.

AW3D.5 • 14:45
Fabrication and Characterization of Bragg Gratings in Polymer Optical Fibers using 248 nm Irradiation, Rajkumar Ramakrishnan[1], Sunish Mathews[1], Ginu Rajan[3], Yuliya Semenova[2], Farrell Gerald[2], Balaji Srinivasan[1]; [1]Electrical Engineering, Indian Inst. of Technology Madras, India; [2]Photonics Research Centre, Dublin Inst. of Technology, Ireland; [3]Univ. of New South Wales, Australia. In this paper, we report the fabrication of Bragg gratings in singlemode polymer optical fibers using 248 nm irradiation through a careful tailoring of the ultraviolet pulsed laser parameters to achieve a grating in the bulk region without significant surface ablation.

AW3D.6 • 15:00
Microwave Photonic Filters Based on Multi-longitudinal-mode Fiber Lasers(Invited Paper), Xinhuang Feng[1], Yuan Cao[1], Feng Li[2], Ruichen Tao[1], Bai-Ou Guan[1]; 1Inst. of Photonics Technology, Jinan Univ., China; [2]Department of Electronics and Information Engineering, The Hong Kong Polytechnic Univ., China. In this paper, we present our recent results in microwave photonic filters based on multi-longitudinal-mode fiber lasers. Theoretical analysis and experiments were carried out, and the experimental results show excellent agreement with the numerical simulations.

Coffee Break ----------15:30—16:00

Room 5------Track 2----Wen.16:00 —18:00
AW4D • Fiber Optic Platform for Sensing
Presider: Balaji Srinivasan, Indian Inst. of Technology, Madras, India

AW4D.1 • 16:00
Cascaded Transverse Microchannel Fibre Device, Yicheng Lai[1], Yen Peng Seah[2], Chi Lun Wong[1], Jin Xue[1], Zhen Feng Wang[2]; 1Data Storage Inst., A*STAR, Singapore; [2]Singapore Inst. of Manufacturing Technology, A*STAR, Singapore. A low-loss fibre device configuration that allows direct manipulation of core-propagating light based on designed integrated microchannels array is demonstrated. Architectures with long light-channel interaction lengths for effective device implementation are highlighted experimentally.

AW4D.2 • 16:15
Magnetic Field Vector Sensor Based on Tilted Fiber Bragg Grating Sealed with Ferrofluid, Miao Yinping[1]; [1]Tianjin Univ. of Technology, China. a magnetic field sensor is proposed based on tilted fiber Bragg grating (TFBG) and ferrofluid. The transmission response of the sensor depends on the angle θ between the magnetic orientation and the polarization direction of TFBG.

AW4D.3 • 16:30
Ultrahigh resolution optical fiber strain sensor for crustal deformation measurement(Invited Paper), Qingwen Liu[1]; [1]State Key Laboratory of Advanced Optical Communication Systems and Networks, Shanghai Jiao Tong Univ., China. Optical fiber sensors provide potential tools for geophysical research. We reported an optical fiber quasi-static strain sensor with ultrahigh resolution and large measurement range. The field experimental result in crustal deformation measurement was also introduced.

AW4D.4 • 17:00
All-fiber Magnetometer Based on Sagnac Loop and Magnetic Fluid, Wei Lin[1], Yinping Miao[2], Bo Liu[1], Hao Zhang[1], Yange Liu[1], Binbin Song[1]; [1]Ministry of Education, Inst. of Modern Optics, Nankai Univ., China; [2]Tianjin Univ. of Technology, China. An All-fiber magnetometer based on sagnac loop and magnetic fluid is proposed in this paper. The transmission spectral characteristics have been analyzed and exhibit a behavior of logistic function in wavelengths of 1544nm and 1550nm.

AW4D.5 • 17:15
Fiber Optic Surface Plasmon Resonance Biochemical Sensor Based on Hybrid Nanostructure and Nanofilm Solution(Invited Paper), Wei Peng[1], Yuzhang Liang[1], shengwei Meng[1], Jean-Francois Masson[1]; [1]Dalian Univ. of Technology, China. We present our progress about fiber optic surface plasmon (SPR) sensor for high-sensitivity multichannel biological and chemical measurement. Based on subwavelength metal-dielectric sensing modeling, we conduct several hybrid designs of nanostructured metal grating and multilayer nanofilms to enhance the sensor sensitivity. Our experiments demonstrate the developed SPR sensors can find their applications.

Room 10-----Track 3----Wen.13:30—15:30
AW3E • Space Division Multiplexing
Presider: Chongjin Xie, Alcatel-Lucent Bell Labs

AW3E.1 • 13:30
Compensation of Mode Coupling of Mode-Division Multiplexing Transmission System with MIMO CMA, Xin Zhang[1], Yan Li[1], Wentao Du[1], Fangzheng Zhang[1], Yanli Bao[1], Wei Li[1], Jian Wu[1]; [1]State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. We simulate a mode-division multiplexing transmission system with 4×4 MIMO structure, mainly considering the impact of constant linear mode coupling in the channel. W, and utilize multimode CMA to restore emission signal.

AW3E.2 • 13:45
Mode Multiplexer and Demultiplexer for Space-Division Multiplexing in Free Space and Fiber Optic Communication, Shoam Shwartz[1], Michael Golub[1], Shlomo Ruschin[1]; [1], Israel. We designed and fabricated DOEs for optical multimode communication. The concept of generating functions was applied to develop multichannel spatial filters. Experiments confirm feasibility for transmission of temporal signals with spatial modes in multimode fiber.

AW3E.3 • 14:00
Critical Devices and Subsystems Enabling Space Division Multiplexing(Invited Paper), An Li[1], Xi Chen[1], William Shieh[1]; [1]The Univ. of Melbourne, Australia. Space-division multiplexing (SDM) based on few-mode fiber is an attractive solution to overcome the capacity limit of single-mode fiber. In this paper, we review the recent progress on the devices and subsystems for SDM transmission.

AW3E.4 • 14:30 Tutorial
Space-division-multiplexing, Guifang Li[1], Benyuan Zhu[2]; [1]Univ. of Central Florida, USA; [2]OFS Optics, USA. Abstract not available.

Coffee Break ----------15:30—16:00

Room 10----Track 3----Wen.16:00 —18:00
AW4E • Best Student Paper Competition
Presider: Lianshan Yan, Southwest Jiaotong University

AW4E.1 • 16:00
Generation of Ultra-flat Optical Frequency Comb Using Cascaded DPMZMs, Ning Wang[1], Yan Li[1], Yu Ji[1], Neng Shu[1], Jian Wu[1], Jintong Lin[1]; [1]State Key Laboratory of Informational Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. We experimentally demonstrated the generation of ultra-flat optical frequency comb with tunable frequency spacing using cascaded DPMZMs. A 25-lines stable optical spectrum with unwanted-mode suppression ratio of 20dB and power fluctuation of 0.75dB is generated.

AW4E.2 • 16:15
Holographic wavefront sensing and correction for free space optical communications, Feng Feng[1], Ian H. White[1], Timothy D. Wilkinson[1]; [1]Department of Engineering, Univ. of Cambridge, UK. Using holographic techniques and a tapered laser, an optical wireless communication system with 4.6 degree angular coverage, 1.25GHz modulation bandwidth and the capability of sensing and correcting aberrations within system and from atmosphere is reported.

AW4E.3 • 16:30
A UWB over Fiber System based on a Tunable Single Passband Microwave Photonic Filter, Gang Chen[1], Huan Wu[1], Shilong Pan[1]; [1]Nanjing Univ Aeronautics & Astronautics, China. A simple and stable UWB-over-fiber system based on a tunable single-passband microwave photonic filter is proposed. Transmission of the UWB signals in 20-km fiber and wireless link results in power penalties around 1 dB.

AW4E.4 • 16:45
Experimental Demonstration of 1.2 Tb/s Optical PDM SCFDM Superchannel Multicasting by HNLF, Yuanxiang Chen[1], Juhao Li[1], Paikun Zhu[1], Yingying Xu[1], Bingli Guo[1], Fan Zhang[1], Yongqi He[1], Zhangyuan Chen[1]; [1]Peking Univ., China. 3-fold [1.2] Tb/s optical PDM SCFDM and OFDM superchannel multicasting by HNLF are experimentally demonstrated and compared in this paper. The OSNR penalty of the newly generated SCFDM superchannel is 0.5 dB lower than that of OFDM superchannel at the BER of 10-3.

AW4E.5 • 17:00
1 Tb/s WDM-OFDM-PON over 20km SSMF with Polarization Interleaving and Multi-band, Bangjiang Lin[1], Juhao Li[1], Hui Yang[1], Yangsha Wan[1], Yuanbao Luo[1], Yongqi He[1], Zhangyuan Chen[1]; [1]Peking Univ., China. [1]Tb/s WDM-OFDM-PON with 50 GHz channel spacing is demonstrated, adopting the polarization interleaving and multi-band schemes. The transmission penalty induced by fiber nonlinearity is investigated by numerical simulations.

AW4E.6 • 17:15
An Optically Controlled Beamforming Network Using Phase Shifters based on Single Sideband Polarization Modulation, Yamei Zhang[1], Yonggang Zhou[1], Fushen Li[1], Huan Wu[1], Dan Zhu[1], Shilong Pan[1]; [1]Nanjing Univ Aeronautics & Astronautics, China. A simple optically controlled beamforming network is proposed and demonstrated based on single sideband polarization modulation. RF beam steering using a 4-element linear patch antenna array operating at 14GHz is experimentally verified.

AW4E.7 • 17:30
Bit and Power Loading Strategy for OFDM-PON with Uniform Transmission Performance, Ying Yu[1], Cheng Lei[1], Minghua Chen[1], Hongwei Chen[1], Sigang Yang[1], Shizhong Xie[1]; [1]Tsinghua Univ., China. An experiment of bit loading according to time-varying data rate in OFDM-PON is achieved, meanwhile power loading is applied to keep uniform transmission performance, and reference value and variation trend for power loading is studied.

AW4E.8 • 17:45
Simultaneous both inter-symbol and inter-channel interference mitigation for Sub-Nyquist WDM Superchannel Systems, Xiang Meng[1], Fu Songnian[1], Feng Zhenghua[1], Tang Ming[1], Shum Ping[1,2], Liu Deming[1]; [1]Huazhong Univ. of Science and Technology, China; [2]School of EEE, Nanyang Technological Univ., Singapore. A filtering bandwidth insensitive joint signal processing is proposed for sub-Nyquist superchannel. Both ICI and ISI cancellation are achieved over a wide range of filter bandwidth for 50GHz-spaced 56 GBaud PM-QPSK superchannel

Room 11-----Track 3----Wen.13:30—15:30
AW3F • DSP Algorithm
Presider: William Shieh, University of Melbourne

AW3F.1 • 13:30
Beyond 100 Gb/s: Advanced DSP Techniques Enabling High Spectral Efficiency and Flexible Optical Communications(Invited Paper), Alan Pak Tao Lau[1], Yuliang Gao[1], Qi Sui[1], Dawei Wang[2], Chao Lu[2]; [1]Photonics Research Center, Department of Electrical Engineering, The Hong Kong Polytechnic Univ., China; [2]Photonics Research Center, Department of Electronic and Information Engineering, The Hong Kong Polytechnic Univ., China. We discuss recent advances in DSP techniques for long-haul systems beyond 100Gb/s as well as adaptive transmissions supporting software-defined flexible transponders and elastic optical networks(EON).

AW3F.2 • 14:00
Modified Timing Synchronization Methods for CO-OFDM System Stressed by CD and PMD, Lingzi Wang[1], Tang Xianfeng[1], Zhang Xiaoguang[1], Xia Zhang[1,2], Xi Lixia[1]; [1]State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China; [2]The Key Laboratory of Optical Communications Science & Technology in Shandong Province, Liaocheng Univ., China. Two modified timing synchronization methods are proposed for coherent optical OFDM system to solve the ambiguity problem in Park's and Minn's methods. It is confirmed that the proposed modified Park's method can obtain higher time estimation accuracy, and the modified Minn's method is more robust both to CD and PMD.

AW3F.3 • 14:15
Linewidth-Tolerant and Low Complexity Carrier Phase Estimation Based on Phase Linear Interpolation, Kang Ping Zhong[1], Tang Jun Li[1], Sun Jian[1], Nan Jia[1], Mu Guang Wang[1]; [1]State Key Laboratory of All Optical Network & Advanced Telecommunication Network, Beijing Jiaotong Univ., China. A linewidth tolerant and low complexity carrier phase estimation algorithm is proposed by using phase linear interpolation. The performance of proposed phase linear interpolation based CPE algorithm can achieve comparable performance to the sliding window based algorithms, while the hardware complexity is reduced by a factor of 40.

AW3F.4 • 14:30
A Novel Algorithm for SSBI Mitigation in a DD-SSB-OFDM Transmission System, Pengfei Yang[1], Shi Hu[1], Xue Chen[1]; [1]Beijing Univ of Posts & Telecom, China. A novel DSP algorithm for mitigating SSBI is proposed. By theoretical analysis and simulation, the proposed algorithm could improve the sensitivity by 3-dB and lower the requirement of CSPR by 4-dB in a DD-SSB-OFDM system.

AW3F.5 • 14:45
A Modified Cascaded Multi-Modulus Algorithm for Blind Polarization De-Multiplexing of High Order QAM Optical Signals, Jun Ma[1], Dawei Wang[1], Changjian Guo[2]; [1]Center for Optical and Electromagnetic Research, Zhejiang Univ., China; [2]Center for Optical and Electromagnetic Research, South China Normal Univ., China. We propose a modified cascaded multi-modulus algorithm (M-CMMA) for blind polarization de-multiplexing of high order QAM signals in coherent optical receivers. M-CMMA has a lower OSNR penalty, a faster convergence speed and a smaller steady-state error compared with constant modulus algorithm (CMA) and modified constant modulus algorithm (M-CMA).

AW3F.6 • 15:00
Channel Estimation Using Data-Dependent Superimposed Training for Single-Carrier Coherent Optical Systems, liu haipeng[1,2], Zhang Han[1,2], Guo Changjian[1,2]; [1]South China Normal Univ., China; [2]Centre for Optical and Electromagnetic Research, China. We show that by using data-dependent superimposed training and an iterative feedback algorithm, residual CD, PMD, polarization rotation and frequency offset can be compensated efficiently in single carrier coherent optical systems, without any bandwidth loss.

AW3F.7 • 15:15
Laser-Linewidth-Tolerant and Low-Complexity Two-Stage Carrier Phase Estimation for M-QAM with Coherent Detection, Xiaofei Su[1], Zhaomin Zhang[1], Xia Zhang[1,2], Zhang Xiaoguang[1], Lixia Xi[1], Wenbo Zhang[1,3]; [1]State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China; [2]Shandong Provincial Key Laboratory of Optical Communication Science and Technology, Liaocheng Univ., China; [3]School of Science, Beijing Univ. of Posts and Telecommunications, China. In this paper, we propose a novel two-stage carrier phase estimation (CPE) algorithm for M-QAM. As compared to the BPS algorithm, the complexity of the novel algorithm can be reduced by factor of about 3.

Coffee Break ----------15:30—16:00

Room 11----Track 3----Wen.16:00— 18:00
AW4F • Challenges Towards Next Generation Transmission
Presider: Yanjun Zhu, Huawei Technologies USA

AW4F.1 • 16:00
Capacity in Nonlinear Fiber Transmission Systems(Invited Paper), Andrew Ellis[1], M. A. Sorokina[1], S. Sygletos[1], S. K. Turitsyn[1]; [1]Aston Univ., UK. We review the nonlinear channel capacity of optical fiber communication systems using both linear and nonlinear amplifiers. We show that the capacity of a nonlinear transmission system employing linear optical amplifiers can be enhanced by over 300% by using all optical regeneration

AW4F.2 • 16:30
Experimental Investigation of Wavelength Division Multiplexing Secure Communications with Chaotic Optical Channel, Chen Xiaolei[1], Chang Wei[1], Yin Hongxi[1], Zhao Qingchun[1], Yue Hehe[1]; [1]Lab of Optical Communications and Photonic Technology, School of Information and Communication Engineering, Dalian Univ. of Technology, China. The wavelength division multiplexing (WDM) between chaotic optical secure channel and conventional fiber-optic channel, and WDM between two chaotic optical channels are experimentally realized, in which each channel carries a 1.25-Gbits/s message.

AW4F.3 • 16:45
Reduced-Guard-Interval Coherent Optical OFDM Employing Digital Sub-Band-Demultiplexing, deng shanqin[1], Yi Xingwen[1], Mingliang Deng[1], Yu Zhenming[1], Yang Qi[2], Ming Luo[2], Qiu Kun[1]; [1]UESTC, China; [2]State Key Lab of Optical Communication Technology and Networks, China. Using digital sub-band-demultiplexing, we experimentally demonstrate an efficient 66.7-Gb/s RGI-OFDM transmission scheme. Experimental results show that the overhead of cyclic prefix is reduced from 26.9% to 11.1%, which cannot be received by conventional OFDM.

AW4F.4 • 17:00
Multi-granularity Optical Subband Switching between Nyquist-SCFDE and DFT-Spread-OFDM Superchannel, Rui Ding[1], Fan Zhang[1]; [1]Peking Univ., China. We experimentally demonstrate multi-granularity optical subband switching functionality with less than 1.6-dB error vector magnitude penalty between 8*44.1 Gb/s PDM-16-QAM Nyquist superchannel and 4*31.5Gb/s PDM-QPSK DFT-Spread-OFDM superchannel.

AW4F.5 • 17:15
A Parallel DSP Structure for Real-Time Coherent Optical OFDMSystem Beyond 100Gbps, Yaochao Liu[1], Zheng Yan[1], Xue Chen[1], Qiwei Liu[1]; [1]Beijing Univ. of Posts and Telecomm, China. In this paper,a parallel DSP structure and modified DSP algorithms for real-time coherent optical OFDM system beyond 100Gbps is proposed, which can reduce the requirement of DSP-chip clock speed by three orders of magnitude compared with serial system.

Room 12----Track 3----Wen.13:30 —15:30
AW3G • Components and Fiber for Future Optical Networks
Presider: Xiaoguang Zhang, BUPT, China

AW3G.1 • 13:30 Tutorial
Recent Advances in Transmission Fibers for Next Generation Optical Network(Invited Paper), Benyuan Zhu[1]; [1]OFS Laboratories, USA. This paper discusses the recent development of low-loss ultra-large-area fibers for beyond 100-Gbit/s coherent long-haul systems and their impacts on transmission performance. The performance of state-of-the-arts multicore fibers for space-division-multiplexing transmissions will be presented.

AW3G.2 • 14:00
Stochastic Analysis of Channel Transmission Matrix for Optical Fibers with Gradually Varying Birefringence Model, Qian Hu[1], William Shieh[1]; [1]Department of Electrical and Electronic Engineering, The Univ. of Melbourne, Australia. We provide a stochastic analysis of channel matrix for fibers with gradually evolving birefringence axis. A close-form autocorrelation function of channel matrix is obtained applicable to a wide range of local birefringence and autocorrelation length.

AW3G.3 • 14:15
Components for Future Optical Networks Based on Few-Mode Fiber(Invited Paper), Erza Ip[1]; [1]NEL Labs America, USA. We investigate components for few-mode fiber transmission, including a few-mode erbium-doped fiber amplifier using dopant profile design and pump control to achieve gain equalization, and a few-mode wavelength-selective switch based on a spatial light modulator.

AW3G.4 • 14:45
Distributed Optic Amplification Based on Random Fiber Lasers(Invited Paper), Yun-Jiang Rao[1]; [1]School of Communication & Information Engineering, Univ. of Electronic Science and Technology of China, China. The gain and noise characteristics of distributed Raman amplification (DRA) based on random fiber lasers (RFL) are experimentally investigated and the results show that RFL-based DRA could offer low-noise and stable DRA for long-distance transmission.

Coffee ----------15:30—16:00

Room 12-----Track 3----Wen.16:00—18:00
AW4G • PON and Short Reach Systems
Presider: Jesper Jensen, Technical University of Denmark

AW4G.1 • 16:00
High Performance Optical Data Links using Hybrid CAP/QAM Transmitter/Receiver Scheme(Invited Paper), Jinlong Wei[1], Jonathan Ingham[1], Qixiang Cheng[1], David Cunningham[2], Richard V. Penty[1], Ian H. White[1]; [1]Department of Engineering, Univ. of Cambridge, UK; [2]Avago Technologies, UK. We experimentally demonstrate the first optical data link at 20Gb/s using hybrid CAP-4/QAM-4 with transmission over 4.3km SSMF and a power penalty ~1.5dBo at BER=1e-9. The hybrid CAP-4/QAM-4 link significantly outperforms a reference PAM-4 link.

AW4G.2 • 16:30
Remodulation scheme based on a two-section reflective SOA, Guiying Jiang[1], Lirong Huang[1]; [1]Huazhong Univ. of Science and Technology, Wuhan National Laboratory for Optoelectronics, China. A simple remodulation scheme based on a two-section reflective semiconductor optical amplifier (RSOA) functioning as a cascaded data-eraser and optical modulator is proposed. By optimizing parameters, the upstream transmission performance can be well improved.

AW4G.3 • 16:45
10 Gbps Five Levels Polibinary Signaling for Short Range and Access Networks, Juan Jose Vegas Olmos[1], Lau Frejstrup Suhr[1], Bomin Li[1], Idelfonso Tafur Monroy[1]; [1]Department of Photonics Engineering, Technical Univ. of Denmark, Denmark. This paper presents a novel five level polibinary signaling modulation and experimentally demonstrates 10 Gbit/s generation and transmission up to 20 Km utilizing only 1.8GHz bandwidth.

AW4G.4 • 17:00
An Accurate Symbol Synchronization Technique for IMDD optical OFDM, Qiwei Chen[1], Xuelin Yang[1], Hao He[1], Weisheng Hu[1]; [1]Shanghai Jiao Tong Univ., China. A novel training sequence is designed for symbol synchronization in IMDD Optical OFDM. Accurate symbol synchronization is demonstrated based on symbol boundary detection and cross-correlation, which has the advantage of low computation complexity.

AW4G.5 • 17:15
Statistical Analysis of the Performance of Zero-padded and Cyclic-prefixed OFDM over Multimode Fibers, Haoshuo Chen[1], Ton Koonen[1]; [1]COBRA Inst., Eindhoven Univ. of, Netherlands. The transmission performance of cyclic-prefixed (CP) and zero-padded (ZP) OFDM over multimode fibers (MMFs) is statistically analyzed. It is demonstrated that ZP-OFDM is less sensitive to modal dispersion in MMF links and outperforms CP-OFDM

AW4G.6 • 17:30
Comparison of Carrierless Amplitude-Phase (CAP) and Discrete Multitone (DMT) Modulation, Maisara Binti Othman[1],[2], Tien Thang Pham[2], Xu Zhang[3], Lei Deng[4], Jesper B. Jensen[2], Idelfonso Tafur Monroy[2]; [1]Department of Communication Engineering, UTHM, Malaysia; [2]Department of Photonics Engineering, Denmark Technical Univ., Denmark; [3]State Grid Corporation of China, Tianjin Elect. Power Corp. Wujin Road 39, China; [4]National Engineering Laboratory for Next Generation Internet Access System, China. We compare the transmission of 1.25~Gb/s CAP-16 and 909.2~Mb/s 16-QAM-DMT modulation formats over 2.4 km of MMF with 850 nm DM-VCSELs. CAP displays 0.7-1.1~dB better sensitivity than DMT in this experiment.

Room 13-----Track 4----Wen.13:30—15:30
AW3H • Network Virtualization
Presider: Brigitte Jaumard, Concordia Univ., Canada

AW3H.1 • 13:30
Virtual Optical Network Mapping in Flexible-Grid Optical Networks(Invited Paper), Jason P. Jue[1]; [1]Univ. of Texas at Dallas, USA. In this talk, we address issues related to the composition of virtual optical networks (VONs) over a physical optical network infrastructure that is subject to physical-layer constraints. Several techniques for VON mapping in flexible-grid optical networks, with the objective of minimizing equipment and infrastructure cost, are explored. Additional important

issues, such as VON survivability and VON composition over multi-domain optical networks are discussed.

AW3H.2 • 14:00
Optical Network Virtualization(Invited Paper), Shuping Peng[1], Reza Nejabati[1], Dimitra Simeonidou[1]; [1]Electrical and Electronic Engineering, Univ. of Bristol, UK. Optical network virtualization enables the provisioning of application-specific virtual optical networks (VONs) as infrastructure services. VON composition methods over the Mixed-Line-Rate optical WDM network are introduced, taking into account the optical layer constraints.

AW3H.3 • 14:30
Optical Time Slice Switching (OTSS): An All-Optical Sub-Wavelength Solution Based on Time Synchronization, Nan Hua[1], Xiaoping Zheng[1]; [1]Tsinghua Univ., China. We propose an all optical time slice switching (OTSS) architecture. With time synchronization and repetitive time slices structure, OTSS can obtain global available time slots information and realize contentionless sub-wavelength switching without optical buffers.

AW3H.4 • 14:45
Buffered Deflection Routing in Optical Network-on-Chip, Na Zhang[1], Huaxi Gu[1], Zheng Chen[1], Ke Chen[1]; [1]Xidian Univ., China. A novel optical Network-on-Chip (NoC) using buffered deflection routing is proposed, and the effect of different number of buffers is also investigated. It efficiently decreases the probability of deflection, thus lowing the maximum insertion loss.

AW3H.5 • 15:00
A High-Performance Optical Network-on-chip Architecture Based on Sub-network Division, Ke Chen[1], Huaxi Gu[1], Zheng Chen[1], Na Zhang[1]; [1]Xidian, China. A novel optical network-on-chip architecture with its communication protocol is proposed. The whole network can be divided into several subnets utilizing WDM technology. It well reduces the network congestion and achieves considerable performance.

AW3H.6 • 15:15
Room Division Multiplexing Mechanism for Indoor Visible Light Communication Network, Zhitong Huang[1]; [1]BUPT IPOC, China. A room division multiplexing (RDM) mechanism is presented to increase the network throughput for indoor multi-room visible light communication. The corresponding user localization and switching-area based handoff mechanisms are designed for implementation.

Coffee Break ----------15:30—16:00

Room 13----Track 4----Wen.16:00 —18:00
AW4H • Best Student Paper Competition
Presider: Pin-Han Ho, Univ. of Waterloo, Canada

AW4H.1 • 16:00
Full FPGA-Based Implementation of an Energy Efficient ONU with Cooperative Cyclic Sleep, Dung Pham Van[1], Luca Valcarenghi[1], Michele Chincoli[2], Piero Castoldi[1]; [1]TeCIP Inst., Scuola Superiore Sant'Anna, Italy; [2]CNIT, Italy. A full FPGA-based implementation of an energy efficient ONU featuring cooperative cyclic sleep is presented. Evaluations show that the ONU successfully switches between states and maximal energy saving is achieved without violating delay requirements.

AW4H.2 • 16:15
Experimental Demonstration of Latency-aware Software Defined Networking for OpenFlow-based Optical Interconnect in Intra-Datacenter Networks, Hui Yang[1], Jie Zhang[1], Yongli Zhao[1], Yuefeng Ji[1], Jianrui Han[2], Yi Lin[2], Shaofeng Qiu[2], Young Lee[2]; [1]Beijing Univ of Posts & Telecom, China; [2]Huawei Technologies Co., Ltd., China. We propose a novel latency-aware software defined networking (LaSDN) architecture for OpenFlow-based optical interconnect in intra-datacenter networks based on latency-aware service strategy. The overall feasibility and efficiency are experimentally verified on our testbed.

AW4H.3 • 16:30
Risk Analysis of Integrated Fiber-Wireless Smart Grid Communications Infrastructures Powered by Positive Energy Buildings, Ramzi CHARNI[1], Martin Maier[1]; [1]Optical zeitgeist laboratory, INRS, Canada. Emerging positive energy buildings may be exploited for the implementation of smart grid communications infrastructures. We study the risks related to solar power intermittency and random fiber cuts in terms of service penalty and TCO.

AW4H.4 • 16:45
Protection Approach for Passive Optical Network Considering Compromise between Deployment Cost and Recovery Efficiency, Yejun Liu[1], Lei Guo[1], Yue Zong[1], Lincong Zhang[1]; [1]Northeastern Univ. (China), China. This paper addresses the survivability of passive optical network. A protection approach is proposed for the compromise between deployment cost and recovery efficiency. Simulation results demonstrate the effectiveness of the proposed approach.

AW4H.5 • 17:00
Adaptive Lightpath FEC Selection in an Optical Network, Yongcheng Li[1], Hua Dai[1], Gangxiang Shen[1], Sanjay K. Bose[2]; [1]Soochow Univ., China; [2]Indian Inst. of Technology, India. We propose a new adaptive FEC selection scheme to choose different FEC types for each lightpath based on their OSNRs. An ILP model is developed to evaluate the performance in terms of served lightpath demands and required FEC overheads. The proposed scheme can significantly reduce the required FEC overhead compared to the non-adaptive scheme.

AW4H.6 • 17:15
Spectrum- and Energy-Efficient Multicasting over Multicast-Incapable EONs with Member-Only Flexible Relay, Xiahe Liu[1], Long Gong[1], Zuqing Zhu[1]; [1]School of Information Science and Technology, Univ of Science and Technology of China, China. We propose to enable multicast in elastic optical networks that only have multicast-incapable nodes by using member-only flexible relay. Compared with the traditional overlay multicast, the proposed scheme can be spectrum- and energy-efficient.

AW4H.7 • 17:30
On Achieving All-Optical and Signaling-Free Failure Restoration under Dynamic Traffics(Invited Paper), Pin-Han Ho[1], Wei He[1], János Tapolcai[2], Bin Wu[3]; [1]Univ. of Waterloo, Canada; [2]Budapest Univ. of Technology and Economics, Hungary; [3]Univ. of Missouri, USA. This talk is on a novel dynamic survivable routing scheme, namely DJH. The proposed scheme is featured by a joint design for the optical layer monitoring plane and survivable routing, where monitoring trails (m-trails) are launched and can possibly reuse the spare capacity reserved for protection lightpaths (P-LPs). We will demonstrate how the proposed scheme determines the working lightpath (W-LP) and the corresponding P-LP(s), along with the configuration of the alarm code table (ACT) at each node, for each newly arrived connection request, where the targeted all-optical restoration can be fully ensured. Extensive simulation is conducted to examine the proposed DJH scheme in terms of blocking probability and compare it with a couple of previously reported counterparts, namely a p-Cycle based dynamic routing scheme and a failure dependent protection (FDP) based survivable routing scheme without considering all-optical monitoring.

Room 14-----Track 4----Wen.13:30—15:30
AW3I • Broadband Access Networks I
Presider: Gangxiang Shen, Soochow Univ., China

AW3I.1 • 13:30
FiWi Access Networks and the Golden Age: From Installation to Deployment in a Sustainable Third Industrial Revolution Economy(Invited Paper), Martin Maier[1]; [1]INRS, Canada. Deploying fiber-wireless (FiWi) access networks installed for broadband access, fiber backhaul sharing, and WiFi offloading of cellular networks across economic sectors is key to unleashing a sustainable global golden age and Third Industrial Revolution economy.

AW3I.2 • 14:00
SODALES: An Integrated Wired-Wireless Open Access Architecture(Invited Paper), Sergi Figuerola[1], Carlos Bock[1], Jordi Ferrer[1], Eduard Escalona[1], Joan Antoni Garcia-Espin[1]; [1]Distributed Applications and Networks Area, Fundació i[2]CAT, Spain. This paper presents an active convergent wired-wireless architecture, which provides Gigabit fixed and radio access. With the development of an advanced Control and Management Plane, the network supports Open Access operation and OAM features.

AW3I.3 • 14:30
Techno-Economic Evaluation of FTTH Migration for a Network Provider: Comparison of NG-AON and TWDM-PON, Marlies Van der Wee[1], Koen Casier[1], Kun Wang[2], Sofie Verbrugge[1], Mario Pickavet[1]; [1]Ghent Univ. - iMinds, Belgium; [2]Acreo - Swedish ICT, Sweden. This paper studies the business case of migration from legacy FTTH networks like active star Ethernet and GPON towards NG-AON and TWDM-PON for a network provider, evaluating its techno-economic viability and suggesting possible improvements.

AW3I.4 • 14:45
Downstream ONU Buffer Modeling for Fiber to the Drop Point, Elliott Gurrola[1], Michael P. McGarry[1], Yuanqiu Luo[2], Ning Cheng[2]; [1]Department of Electrical and Computer Engineering, Univ. of Texas at El Paso,

USA; [2]American Research Center, Huawei Technologies USA, USA. We derive tools to limit the buffering at the ONU in a hybrid XG-PON/VDSL network. We find that per digital subscriber line (DSL) downstream traffic shapers at the OLT can be used to limit buffering requirements at the ONU.

AW3I.5 • 15:00
A TCP Throughput-improving Dynamic Bandwidth Allocation Scheme for 10G EPON, Yingying Cao[1], Liqian Wang[1], Xue Chen[1]; [1]State Key Lab of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. A TCP throughput-improving DBA scheme based on optimum polling cycle is proposed in this paper. In the proposed DBA, the optimum polling cycle is adjusted according to the average TCP transmission window of 10G EPON system. It is shown by simulation results that the proposed DBA can improve upstream TCP throughput of 10G EPON by at least 13%.

AW3I.6 • 15:15
OpenFlow-Based Control Architecture for Mobile Free Space Optical Networks, Lingnan Gao[1], Yongli Zhao[1], Xingbin Yin[1], Jie Zhang[1]; [1]State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Post and Telecommunication, China. We propose a methodology for the deployment of the mobile free-space optical network based on OpenFlow-based control architecture and a new routing scheme for this architecture. Experimental evaluation result suggests the feasibility of this architecture.

Coffee Break ----------15:30-16:00

Room 14-----Track 4----Wen.16:00—18:00
AW4I • Software Defined Networks
Presider: Philip Ji, NEC Labs America, USA

AW4I.1 • 16:00
Software Defined Elastic Optical Networking(Invited Paper), S.J. Ben Yoo[1]; [1]UC Davis, USA. We discuss a new software defined networking paradigm based on elastic optical networking which exploits flexible resource utilization and facilitates virtualization of physical layer. Optical supervisory channel enables adaptive network operation equipped with observe-analyze-act cycle.

AW4I.2 • 16:30
Achieving Inter-Connection in Multi-Domain Heterogeneous Optical Network: from PCE to SDON(Invited Paper), Xiaoping Zheng[1], Nan Hua[1]; [1]Tsinghua Univ., China. This paper reviews current architectural solutions (GNMS, E-NNI, PCE, etc.) for multi-domain heterogeneous networks, and indicates their advantages and disadvantages. To overcome their shortcomings, novel software defined optical network (SDON) architectures are envisaged.

AW4I.3 • 17:00
Contrasting Centralized versus Distributed Control of Filterless Optical Networks(Invited Paper), Christine Tremblay[1], Paul Littlewood[2], Michel P. Belanger[3]; [1]Ecole de technologie superieure, Canada; [2]Ciena Corp., USA; [3]Ciena Corp., Canada. This presentation reviews the performance differences of centralized and distributed control schemes and discusses how a Software Defined Network (SDN) controller appears as the most efficient method of configuring and running filterless optical networks.

AW4I.4 • 17:30
Experimental Demonstration of Hierarchical Controlled Software Defined Networking (HC-SDN) Deployed with PCE Protocol for Large Scale Multi-domain Flexi-Grid Optical Networks, Yongli Zhao[1], Jie Zhang[1], Lingnan Gao[1], Huibin Zhang[2]; [1]Beijing Univ of Posts & Telecom, China; [2]Beijing Aerospace Automatic Control Inst., China. A large scale multi-domain flexi-grid optical networks testbed with 200 nodes is experimental demonstrated based on hierarchical controlled software defined networking (HC-SDN), which is deployed with PCE protocol. Experimental results including lightpath provisioning latency, blocking probability, and spectrum utilization are given and analyzed.

AW4I.5 • 17:45
SIG: Solution to TCP Incast in SDN Network Based Openflo w Protocol, Jianhua Xu[1], Hongxiang Guo[1], Jian Wu[1], Jintong Lin[1], DongXu Zhang[1], Gang Chen[1], Xingping Zhang[1], Chao Chen[1]; [1]BUPT, China. TCP incast refers to the drastic goodput collapse in many-to-one communication prototype. We propose and demonstrate a solution named SIG (sending in group) to address incast in SDN network, and stable goodput is achieved.

Room 15-----Track 5----Wen.13:30—15:30
AW3J • Spectroscopy
Presider: Juergen Popp, Inst. of Photonic Technology, Germany

AW3J.1 • 13:30
Biomedicine with Surface Enhanced Raman Scattering (SERS) (Invited Paper), Malini Olivo[1,2], Dinish U.s.[1], Douglas Goh[1]; [1]Bio-Optical Imaging Group, Agency for Science Technology and Research (A*STAR), Singapore; [2]School of Physics, National Univ. of Ireland Galway, Ireland. Recently SERS is progressed as a sensitive biosensing modality due to the 'fingerprint' Raman spectra from analyte molecules. We present our recent achievements in sensitive biomarker sensing using SERS in a chip and fiber based platforms.

AW3J.2 • 14:00
Chip-based Isolation of Pathogens for Subsequent Raman Spectroscopic Identification, Susanne Pahlow[1,2], Sandra Kloss[1], Petra Roesch[1], Karina Weber[1,2], Juergen Popp[1,2]; [1]Inst. of Physical Chemistry and Abbe Center of Photonics, Friedrich-Schiller-Univ. Jena, Germany; [2]Spectroscopy and Imaging, Inst. of Photonic Technology, Germany. A Raman chip, which enables isolation of a large variety of bacteria based on their analogue cell wall surface structures, is presented. Identification of the microorganisms is achieved using Raman microspectroscopy.

AW3J.3 • 14:15
Tapered Nanoprobe for Remote SERS Sensor in Aqueous Solution, Zhangmin Dai[1], Zhenyi Chen[1], Na Chen[1], Lianxin Li[1], Shupeng Liu[1], Fufei Pang[1], Tingyun Wang[1], Bo Lu[2]; [1]Shanghai Univ., Key Laboratory of Specialty Fiber Optics and Optical Access Networks, Shanghai Univ., China; [2]Shanghai Univ., Laboratory for Microstructures, China. The fiber probe with nanoscale tip of 59.1 nm was fabricated. The Raman spectra of R6G molecules were detected by remote sensing. Nanoprobes modified with gold-nanoparticles perform double enhancing effect compared with probes without substrate.

AW3J.4 • 14:30
Applications of Laser Spectroscopy to Meet Challenges in Medicine(Invited Paper), Katarina Svanberg[1,2]; [1]Department of Oncology, Lund Univ., Sweden; [2]Centre for Optical and Electromagnetic Research, South China Normal Univ., China. Laser based spectroscopic techniques can be used in the detection and therapy of human diseases. Examples from oncology as well as from the specialities of ear, nose and throat and pediatrics will be given.

AW3J.5 • 15:00
Laser Spectroscopy in Remote Sensing(Invited Paper), Sune R. Svanberg[1,2]; [1]Lund Laser Centre, Lund Univ., Sweden; [2]Center for Optical and Electromagnetic Research, South China Normal Univ., China. Remote sensing applications at long and short ranges using laser spectroscopic techniques are discussed with examples from the environmental monitoring, ecology, cultural heritage and food safety areas.

Coffee Break ----------15:30—16:00

Room 15-----Track 5----Wen.16:00—18:00
AW4J • Best Student Paper Competition
Presider: Juergen Popp, Inst. of Photonic Technology, Germany

AW4J.1 • 16:00
Subwavelength Light Control via Wavefront Shaping in Complex Media, Jung-Hoon Park[1], Chunghyun Park[1], HyeonSeung Yu[1], Jimin Park[2], Seungyong Han[1], Jonghwa Shin[1], SeungHwan Ko[1], Ki Tae Nam[2], Yong-Hoon Cho[1], YongKeun Park[1]; [1]Korea Advanced Inst of Science & Tech, Republic of Korea; [2]Seoul National Univ., Republic of Korea. We demonstrate subwavelength light focusing using multiple scattering through complex media. Due to the large degree of freedom, the subwavelength focus can be constructed at arbitrary positions without restrictions induced by the supporting structure.

AW4J.2 • 16:15
Megahertz-scan-rate quantitative tissue imaging by interferometric time-stretch microscopy, Andy K. S. Lau[1], Terence T. W. Wong[1], Kenneth K. Y. Wong[1], Kevin K. Tsia[1]; [1]Electrical and Electronic Engineering, The Univ. of Hong Kong, Hong Kong. We demonstrate interferometric time-stretch microscopy for quantitative tissue imaging at an ultrahigh speed line-scan rate of 1MHz and with cellular resolution - representing a step forward for realizing high-throughput whole-slide tissue refractometry.

AW4J.3 • 16:30
A New Surface Plasmon Biosensor Featured by Quadratic V-groove Gratings, Guei Hsu Zhou[1], Ming Chang Lee[1], Gwo Bin Lee[2], Ching Jyu Wu[2], Cheng Tse Zhou[1], huan ting Chou[1]; [1]Photonic technologies, Tsing Hua, Taiwan; [2]Power Mechanical Engineering, Tsing Hua, Taiwan. A new quadratic V-groove surface plasmon grating sensor is proposed and shows a narrower spectral bandwidth, compared with conventional

rectangular gratings with the same grating aspect ratio. The experimental result confirmed improved sensor resolution.

AW4J.4 • 16:45
Optical tomography for dense scattering media using DLP based structured illumination, Daifa Wang1, He Jin[1], Deyu Li[1]; [1]School of Biological Science and Medical Engineering, Beihang Univ., China. This article introduces an optical tomography system for dense scattering media, where DLP based structured illumination is adopted. Compared to conventional wide field approach, structured light processing obtained much better image resolution.

AW4J.5 • 17:00
Optofluidic Cytometer for Characterization of Circulating Tumore Cell, Jinhong Guo[1]; [1]Nanyang Technological Univ., Singapore. In this paper, we demonstrate a low cost and compact optofluidic cytometer which is able to characterize the biological cells by analyzing multiple phenotypical and biochemical parameters.

AW4J.6 • 17:15
Quantitative Phase Imaging Using Swept Source, Jaehwang Jung[1], Jaeduck Jang[1], YongKeun Park[1]; [1]KAIST, Republic of Korea. We demonstrate a technique to obtain quantitative field information in the broad visible wavelength range. We verified the capability of the system by measuring the refractive indices dispersion of polystyrene microspheres and BSA solution.

AW4J.7 • 17:30
A Strain Insensitive Temperature Sensor Based on In-fiber Integrated Multipath Interferometer, Zhiyong Zhao[1,2], Fang Yang[1,2], Tang Ming[1,2], Fu Songnian[1,2], Feng H. Wei3, Jun W. Tong[3], Shum Ping[1,2], Liu Deming[1,2]; [1]Wuhan National lab for Optoelectronics (WNLO), Huazhong Univ. of Sci&Tech (HUST), China; [2]Next generation Internet Access National Engineering lab (NGIA), school of optical and electronic information, Huazhong Univ. of Sci&Tech (HUST), China; [3]State Key Laboratory of Optical Fiber and Cable Manufacture Technology, Yangtze Optical Fiber and Cable Company Ltd. R&D center, China. We proposed and experimentally demonstrated an in-fiber integrated multipath interferometer using all-solid multi-core fiber for temperature sensing applications. A high temperature sensitivity of 130.6pm/centigrade and a record low strain-to-temperature cross sensitivity of 1.95×10-3 centigrade/με were achieved.

AW4J.8 • 17:45
Infrared perfect metamaterial absorber and its potential application as strain sensor, nannan wu[1], Huiping Tian[1], Hongzhan Liu[1,2], Yuefeng Ji[1]; [1]State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ of Posts & Telecom, China; [2]Laboratory of Nanophotonic Functional Materials and Devices, South China Normal Univ., China. Here we demonstrate an infrared metamaterial structure, which can realize perfect absorption of infrared ray independent of polarizations and incidence angle. Besides, the properties of the structure used as a strain sensor are also researched.

Room 18-------Industrial Forum-----Wen.13:30—18:00
AW3L • Optical Communication Systems, Components and Measurements

Room 21-------Industrial Forum ----Wen.13:30—18:00
AW3M • 100+Gb/s Optical Transmission Technologies Systems and Developments

Room 22----------Track 6----------Wen. 13:30—18:20
13:30—14:10: Special Session for Re-scheduled Plenary Talk by DENBAARS Steve
Presider: SHUM, Ping

14:10—16:10: AW3K • Internal Quantum and Wall Plug Efficiencies in LEDs
Presider: Hongping Zhao, Case Western Reserve Univ., USA

AW3K.1 • 14:10
Internal and External Efficiencies in InGaN-Based Light-Emitting Diodes(Invited Paper), Nelson Tansu[1], Chee-Keong Tan[1], Peifen Zhu[1], Guangyu Liu[1], Jing Zhang[1], Hongping Zhao[1]; [1]Lehigh Univ., USA. The paper will review the physics and key advances in the fields of III-Nitride light-emitting diodes, specifically on approaches to address internal quantum efficiency, extraction efficiency, and efficiency droop in emitters.

AW3K.2 • 14:55
Effects of Pre-annealed Nickel Contact Layer on LED Device Performance using Ni/Ag-based p-type Contacts, Wing Cheung Chong[1], Kei May Lau[1]; [1]ECE, HKUST, Hong Kong. Effects of pre-annealed Ni contact layer on the blue LED device characteristics using Ni/Ag-based p-type contacts were investigated. It can effectively suppress reverse leakage current without affecting the forward voltage of LEDs.

AW3K.3 • 15:10
Mesa-height Dependent Quantum Efficiency Characteristics of InGaN Micro-LEDs, Chao Shen[1], Tien Khee Ng[1], Chun Hong Kang[1], Boon S. Ooi[1]; [1]Electrical Engineering, King Abdullah Univ of Sci & Technology, Saudi Arabia. The mechanisms of mesa-height dependent efficiency and efficiency droop of blue InGaN/GaN micro-LED is presented. Device with a large etch-depth (> 1.3 μm) shows significant strain relief with aggravated current crowding.

AW3K.4 • 15:25
Resonant Plasmonic Enhancement of InGaN/GaN LED using Periodically Structured Ag Nanodisks, Ahmed Fadil[1], Daisuke Iida[2], Xiaolong Zhu[1], Yiyu Ou[1], Yuntian Chen[1], Carsten Dam-Hansen[1], Paul Michael Petersen[1], Haiyan Ou[1]; [1]Department of Photonics Engineering, Technical Univ. of Denmark, Denmark; [2]Department of Materials Science and Engineering, Meijo Univ., Japan. Ag nanodisks are fabricated on GaN-based LED to enhance emission efficiency. Nanosphere lithography is used to obtain a periodic nano-structure, and a photoluminescence enhancement of 2.7 is reported with Ag nanodisk diameter of 330 nm.

AW3K.5 • 15:40
Surface Plasmon Coupled Light-emitting Diode(Invited Paper), Horng-Shyang Chen[1], Yang Kuo[1], Chun-Han Lin[1], Chia-Feng Chen[1], Wang-Hsien Chou[1], Min-Hsuan Chiu[1], Pei-Ying Shih[1], Chia-Ying Su[1], Che-Hao Liao[1], Chieh Hsieh[1], Chih-Yen Chen[1], Yean-Woei Kiang[1], Chih-Chung Yang[1]; [1]National Taiwan Univ., Taiwan. The fundamental phenomena, basic principles, and device fabrication and characterization of surface plasmon coupled InGaN/GaN quantum-well light-emitting diode are reviewed, including experimental demonstrations and theoretical/numerical studies.

Coffee Break ----------16:10—16:20

Room 22----Track 6-----Wen.16:20—18:20
AW4K • Novel Solar Technology I
Presider: Shumin Wang, Chalmers Univ. of Technology, Sweden

AW4K.1 • 16:20
III-V Nanowire-based Solar Cells on Si and Graphene(Invited Paper), Xiuling Li[1]; [1]Univ. of Illinois, USA. Overcoming lattice matching restrictions for conventional heteroepitaxy, solar cells based on III-V compound semiconductor nanowires grown on silicon and graphene substrates will be demonstrated.

AW4K.2 • 16:50
Enhanced Light Harvesting of Nitride-Based Nano-Pillars Covered with ZnO Using Indium-Tin-Oxide Nano-Whiskers, Lung-Hsing Hsu[1, 3], Chien-Chung Lin[2], Hsin-Ying Lee[4], Pei-Cheng Yu[3], Jhih-Kai Huang[3], Hao-chung Kuo[3]; 1Inst. of Lighting and Energy Photonics, National Chiao-Tung Univ., Taiwan; [2]Photonic System, National Chiao-Tung Univ., Taiwan; [3]Electro-Optical Engineering, National Chiao-Tung Univ., Taiwan; [4]Electro-Optical Science and Engineering, National Cheng Kung Univ.., Taiwan. The nano-whisker of ITO deposited with oblique evaporation method has been investigated in nitride-based nano-pillars. This hybrid structure of ITO nano-whiskers above ZnO medium enhances the broadband and angle-independent anti-reflection in the range between 380 nm and 800 nm.

AW4K.3 • 17:05
Super Meta-Absorber for Ultra-Thin OPV Films, Kai Liu1, Haifeng Hu1, Dengxin Ji[1], Xie Zeng[1], Haomin Song[1], Suhua Jiang[2], Qiaoqiang Gan[1]; [1]Department of Electrical Engineering, Univ. at Buffalo, USA; [2]Department of Materials Science, Fudan Univ., China. We computationally explore a wide-angle and polarization-insensitive super absorption based on a hybrid metamaterial absorber consisting of an ultra-thin organic photovoltaic layer between top metallic nanopatterns and a bottom metallic plate.

AW4K.4 • 17:20
Absorption enhancement of In0.83GaAs photodetector with metallic hole arrays, Binzong Xu[1], Jietao Liu[1], Weimin Wang[1], Yun Xu[1], Qing Wang[1], Guofeng Song[1], Xin Wei[1]; [1]Inst. of Semiconductors, Chinese Academy of Sciences, China. In this summary, metallic hole arrays is attached to the capping layer of the In0.83GaAs photodetector. By comparing with planar metallic film, simulation results show that a 1.5 times absorption enhancements is achieved.

AW4K.5 • 17:35
Properties of Dilute-Nitride-Antimonide Materials

Grown by Metalorganic Vapor Phase Epitaxy (MOVPE) for Solar Cell Application(Invited Paper), Luke J. Mawst[1], TaeWan Kim[1], Toby Garrod[1], Thomas Kuech[2], K. Kim[3], JaeJin Lee[3], S. D. LaLumondiere[4], Yongkun Sin[4], W. T. Lotshaw[4], S. C. Moss[4], R. Tatavarti[5]; [1]Electrical and Computer Engineering, Univ. of Wisconsin, USA; [2]Chemical and Biological Engineering, Univ. of Wisconsin, USA; [3]Electrical and Computer Engineering, Ajou Univ., Republic of Korea; [4]Electronics and Photonics Lab, The Aerospace Corporation, USA; [5]MicroLink Devices, Inc, USA. Bulk dilute-nitride-antimonide materials are grown by MOVPE nominally lattice-matched to the GaAs substrate with bandgap energies in the 1-1.25eV range. Single-junction solar cells demonstrate a peak efficiency of 7.22% with high open circuit voltages (Voc=0.72V).

Thursday 14 November

Plenary Session
Ballroom, Thurs. 08:30—12:30

ATh1A • Plenary Session ----------08:30—10:00
Presider: WOSINSKA Lena
08:30-09:20: **Plenary Presentation 5,** BIMBERG Dieter
09:20-10:10: **Plenary Presentation 6,** XUE Qikun
10:10-10:20: **Coffee Break**

ATh2A • Plenary Session----------10:20-12:00
Presider: JI Yuefeng
10:20-11:10: **Plenary Presentation 7,** GERSTEL Ori
11:10-12:00: **Plenary Presentation 8,** VISSERS Maarten

Lunch Break ----------12:00—13:30

Room 2----Track 1-----Thurs.13:30—15:30
ATh3A • Silicon Photonics II
Presider: Junfeng Song, Inst. of Microelectronics, Singapore

ATh3A.1 • 13:30
High speed and high efficient silicon modulators, Jinzhong Yu[1], Hao Xu[1], Xianyao Li[1], Xi Xiao[1], Zhi-Yong Li[1], Yude Yu[1]; [1]Chinese Acad Sci Inst of Semiconductor, China. Our recent works on silicon modulators are reviewed on this summary. Methods for achieving both high modulation speed and efficiency are introduced including PN junction optimization, traveling-wave electrode design and novel optical structure application

ATh3A.2 • 14:00
High bandwidth Silicon Mach-Zehnder modulator with 1 V.cm VπL, Qifeng Long[1], Wei Tan[1], Junlong Zhang[1], Huaxiang Yi[1], Tiantian Li[1], Zhiping Zhou[1], Xingjun Wang[1]; [1]Peking Univ., China. We demonstrated a carrier-depletion type silicon Mach-Zehnder modulator with 3dB bandwidth beyond 23GHz, as well as with modulation efficiency VπL of ~1 V.cm. 30Gb/s modulation eye diagram was observed with S/N ~9.6dB.

ATh3A.3 • 14:15
Subwavelength Scale InAlGaAs/InP Aluminum-silica Core-shell Laser, Jin-Long Xiao[1], Chu-Cai Guo[1,2], Yue-De Yang[1], Yong-Zhen Huang[1]; [1]State Key Laboratory on Integrated Optoelectronics, Inst. of Semiconductors, Chinese Academy of Sciences, China; [2]College of Optoelectric Science and Engineering, National Univ. of Defense Technology, China. Three-dimensional-subwavelength aluminum/silica coated InAlGaAs/InP circular nanolasers are demonstrated with continuous-wave optical pumping. Lasing emission at 1.485 μm with threshold of 0.7 mW is observed from a laser with gain core radius of 670 nm.

ATh3A.4 • 14:30
Waveguide InGaAs MSM Photodetector for Chip-Scale Optical Interconnects on III-V CMOS Photonics Platform, Yongpeng Cheng[1], Y. Ikku[1], O. Ichikawa[2], T. Osada[2], M. Hata[2], M. Takenaka[1], S. Takagi[1]; [1]The Univ. of Tokyo, Japan; [2]Sumitomo Chemical Company Ltd., Japan. InGaAs MSM photodetectors monolithically integrated with InP waveguides on SiO2/Si are demonstrated using III-V CMOS photonics platform. 20-μm-long InGaAs PD exhibits high responsivity of > 1.05 A/W and broadband operation, enabling chip-scale WDM optical interconnects.

ATh3A.5 • 14:45
Heterogeneous III-V/silicon photonic integrated circuits(Invited Paper), Gunther Roelkens[1]; [1]INTEC, Ghent Univ., Belgium. In this paper we review our work in the field of III-V/silicon photonic integrated circuits operating in the communication wavelength window. Heterogeneously integrated lasers on silicon waveguide circuits using adhesive and molecular bonding are described.

Coffee Break ----------15:30—16:00

Room 2-----Track1----Thurs.16:00—17:00
ATh4A • Plasmonic Devices
Presider: Zhongyuan Yu, Beijing Univ of Posts & Telecommunications, China

ATh4A.1 • 16:00
Hybrid plasmonics for computer interconnects(Invited Paper), Lech Wosinski[1], Fei Lou[1], Lars Thylen[1,2]; [1]School of ICT, The Royal Inst. of Technology (KTH), Sweden; [2]Hewlett-Packard Laboratories, USA. Hybrid plasmonic waveguide structures allows for sub-wavelength light confinement while keeping propagation losses on an acceptable level. Design and experimental realization of ultra-compact hybrid plasmonic devices based on a silicon platform are presented.

ATh4A.2 • 16:30
Ultra-compact Broadband TM-pass Polarizer Using a Silicon Hybrid Plasmonic Waveguide Grating, Xiaowei Guan[1], Peipeng Xu[1], Yaocheng Shi[1], Daoxin Dai[1]; [1]Zhejiang Univ., China. An ultra-compact TM-pass polarizer with a footprint of 0.55 × 3.9 μm2 is demonstrated utilizing a grating with a hybrid plasmonic waveguide. The polarizer has a band > 100 nm for 12 dB extinction ratio

ATh4A.3 • 16:45
Efficient mid-to-near-infrared second harmonic generation based on silicon-organic hybrid plasmonic waveguides, Zhang Jihua[1,2], Eric Cassan[2], Xinliang Zhang[1]; [1]Wuhan National Laboratory for Optoelectronics & School of Optical and Electronic Information, Huazhong Univ. of Science and Technology, China; [2]Institut d' Electronique Fondamentale, Université Paris-Sud, France. We propose an efficient second harmonic generation (SHG) from mid-infrared (~ 3.1 μm) to near-infrared band (~ 1.55 μm) in a silicon-organic hybrid plasmonic waveguide. The supported SHG enables small fabrication-error sensitivity and large bandwidth. The efficiency is as large as 4.4% for a pumping power of 50 mW.

Room 3----Track 1-----Thurs.13:30—15:30
ATh3B • NanoPhotonics
Presider: Gong-Ru Lin, National Taiwan Univ., Taiwan, China

ATh3B.1 • 13:30
Recent Progress in Sub-Wavelength Metallic Cavity Nanolasers(Invited Paper), Cun-Zheng Ning[1]; [1]School of Electrical, Computer, and Energy Engineering, Arizona State Univ., USA. Recent progress in nanolasers with sub-wavelength metallic cavities will be described, from initial conception of core-shell structures, through the understanding of loss compensation in plasmonic waveguides, to the recent demonstration of room temperature CW operation.

ATh3B.2 • 14:00
Plasmonic Enhancement of Wide-linewidth Emitters with Nanostrip Metallic Waveguide, Hong Zhang[1], Chao Zhang[1], Xue Feng[1], Kaiyu Cui[1], Fang Liu[1], Yidong Huang[1]; [1]Department of Electronic Engineering, Tsinghua Univ., China. Plasmonic enhancement of spontaneous emission with a nanostrip metallic waveguide is evaluated. Purcell factor increases dramatically with narrowing strip width while enhancement of the waveguide offers strong tolerance to wide-linewidth emitters.

ATh3B.3 • 14:15
Surface States Effect on the Large Photoluminescence Redshift in GaN Nanostructures, Ahmed Ben Slimane[1], Adel Najar[1], Tien Khee Ng[1], Damian P. San-Román-Alerigi[1], Dalaver Anjum[2], Boon S. Ooi[1]; [1]Photonics Laboratory, King Abdullah Univ. of Science and Technology, Saudi Arabia; [2]Advanced Nanofabrication and Imaging Core-Lab, King Abdullah Univ. of Science and Technology, Saudi Arabia. We report on the large photoluminescence redshift observed in GaN nanostructures fabricated using electroless etching method. The nanostructures emitted violet visible-light with increasing optical excitation power, the mechanism was attributed to the surface states effect.

ATh3B.4 • 14:30
Ultrafast, Energy-Efficient Photonic Switches Based on Semiconductor Nanostructures(Invited Paper), Osamu Wada[1,2], Chaoyuan Jin[3]; 1JSPS Beijing Office, Libary of Chinese Academy of Science, China; [2]CREATE, Kobe Univ., Japan; [3]COBRA Research Inst., Eindhoven Univ. of Technology, Netherlands. Fundamental limit in photonic switches is first discussed by considering both optical nonlinearity and cavity confinement effect. Then recent demonstration of ultrafast, energy-efficient operation of quantum dot-based vertical cavity all-optical switches is described.

ATh3B.5 • 15:00

Fabrication and Electrical Properties of GaAs Nanowire Core-Shell p-n Arrays, Xin Yan[1], Xia Zhang[1], Junshuai Li[1], Jiangong Cui[1], Liang Li[1], xiong chen[1], Yongqing Huang[1], Xiaomin Ren[1]; [1]State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. GaAs nanowire core-shell p-n arrays are grown by metal organic chemical vapor deposition. The structure exhibits good rectification behavior, with an onset voltage of 0.4 V and rectification ratio of 60 at 1 V.

ATh3B.6 • 15:15
Spin-orbit coupling effect in Bi-doped GaAs nanowires, Pengfei Lu[1], Lu Ding[1], Huawei Cao[1], Zhongyuan Yu[1]; [1]BUPT, China. The electronic and optical properties of GaAsBi nanowires are investigated. The insertion of Bi atom leads to hybridization of Ga/As/Bi p states which contributes a lot around Fermi level and the band gap shrinks.

Coffee Break ----------15:30—16:00

Room 3----Track 1-----Thurs.16:00—17:00
ATh4B • Convergence of Photonics and Electronics Manufacturing
Presider: Jens Schmid, NRC Canada, Canada

ATh4B.1 • 16:00
Convergence of Photonics and Electronics Manufacturing (Invited Paper), Thomas L. Koch[1]; [1]*Univ. of Arizona, USA.*

Conference Room 4----Track 2----Thurs.13:30—15:30
ATh3C • Novel Optical Material for Fiber Optics II
Presider: Limin Tong, Zhejiang Univ., China

ATh3C.1 • 13:30
Towards in-fiber silicon photonics(Invited Paper), Noel Healy[1], Pier Sazio[1], Priyanth Mehta[1], Shen Li[1], Todd Day[2], John Badding[2], Anna Peacock[1]; [1]Optoelectronics Research Centre, UK; [2]Penn State Univ., USA. The state of the art of silicon optical fibers fabricated via the high pressure chemical deposition technique will be reviewed. The optical transmission properties of step index silicon optical fibers will be presented. In addition, alternative complex fiber geometries that permit sophisticated control of the propagating light will be introduced.

ATh3C.2 • 14:00
Graphene film for broadband mode-locked fiber lasers, Bo Fu[1], Yi Hua[1], Xiaosheng Xiao[1], Changxi Yang[1]; [1]Department of Precision Instruments, Tsinghua Univ., China. We report on three kinds of fiber lasers (Yb-, Er- and Tm:Ho-doped) mode-locked by the same graphene saturable absorber sample. The central wavelengths of the mode-locked fiber lasers are 1035, 1564 and 1098 nm, respectively.

ATh3C.3 • 14:15
Passive harmonic mode-locking of soliton fiber laser using monolayer graphene as a saturable absorber, Handing Xia[1], HE-PING LI[1], Zegao Wang[1], Xiaoxia Zhang[1], Yuanfu Chen[1], Yong Liu[1]; [1]Univ of Electronic Science & Tech China, China. We present passive harmonic mode-locking of soliton fiber ring laser using monolayer graphene as a saturable absorber. The ^{11}th harmonic of the fundamental repetition frequency is demonstrated with pulse duration of 0.87 ps.

ATh3C.4 • 14:30
Recent developments and perspectives of multimaterial optoelectronic fibres(Invited Paper), Fabien Sorin[1]; [1]Inst. of Materials, Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland. Multimaterial optoelectronic fibres have recently emerged as a novel class of fibre devices. In this talk I will review the fabrication strategies and recent developments of optoelectronic fibres, and give some perspectives for new directions in this field.

ATh3C.5 • 15:00
Generation photon triplets in mid-infrared by third order spontaneous parametric down conversion in micro-fiber, Tianye Huang[1,2], Zhifang Wu[1,2], Xuguang Shao[1], Jing Zhang[1], Lam Quoc Huy[1], Huizi Li[1], Ping Shum[1]; [1]School of Electrical and Electronics Engineering, Nanyang Technological Univ., Singapore; [2]CINTRA CNRS/NTU/THALES, Singapore. We present a method for generating photon triplets in mid-infrared in a length of micro-fiber. By intermodal phase-matching, we show that the photon creation rate can achieve 1.6 triplets/s in 1-m fiber with 1-W pump power.

ATh3C.6 • 15:15
Selectively Filled Photonic Crystal Fibers with High-index Ionic Liquids, jing wang[1], Zhi Wang[1], Yange Liu[1], Tingting Han[1]; [1]Key Laboratory of Optical Information and Technology, Ministry of Education and Inst. of Modern Optics,Nankai Univ., China. The selectively filled photonic crystal fibers (PCFs) with high-index ionic liquids (ILs)arerealized. Resonant coupling and thermal-tunning properties of these PCFs are theoretically and experimentally investigated.

Coffee Break ----------15:30—16:00

Room 4-----Track 2-----Thurs.16:00—17:00
ATh4C • Advanced Fiber Optic Waveguides II
Presider: Kin Seng Chiang, Department of Electronic Engineering, City Univ. of Hong Kong, Hong Kong

ATh4C.1 • 16:00
Recent scientific applications of micro/nano-structured silica optical waveguides(Invited Paper), Myeong Soo Kang[1]; [1]Department of Physics, Korea Advanced Inst. of Science and Technology, Republic of Korea. I will discuss some recent experimental studies on novel types of light-matter interactions in micro/nano-structured silica optical waveguides, in particular focusing on new nonlinear optomechanical effects and their applications.

ATh4C.2 • 16:30
Optical attenuators based on fluid-filled photonic crystal fibers, Yiping Wang[1], Hartmut Bartelt[2], Jens Kobelke[2], Wolfgang Ecke[2], Reinhardt Willsch[2], Changrui Liao[1], Xiaoyong Zhong[1], Zhengyong Li[1], Jiangtao Zhou[1], Yingjie Liu[1]; [1]Key Laboratory of Optoelectronic Devices and Systems of Ministry of Education and Guangdong Province, Shenzhen Univ., China; [2]Inst. of Photonic Technology, Germany. We report a thermo-optic attenuator by means of filling a fluid into air holes of a solid-core photonic crystal fiber. Such an attenuator can perform a 30dB attenuation operation of the transmitted light near 1200 nm via a small temperature adjustment of ±10°C.

ATh4C.3 • 16:45
Polarization-selective Couplings in Chiral Long-period Gratings Based on Eccentric Elliptical-Core Fibers, Yuting Zhang[1], Huaxing Xu[1], Li YANG[1]; [1]USTC, China. Mode couplings in chiral long-period fiber gratings based on eccentric elliptical-core fibers are studied. Their plentiful circular-polarization-selectivity properties are expounded by the angular-matching condition, and then demonstrated by the following numerical simulations.

Room 5----Track 2-----Thurs.13:30—15:30
ATh3D • Fiber Light Sources I
Presider: Luc Thevenaz, Ecole Polytechnique Federale de Lausanne, Switzerland

ATh3D.1 • 13:30
Superluminal signal conversion based on stimulated Brillouin scattering in an optical fiber ring lasing cavity, liang zhang[1], Li Zhan[1], Jinmei Liu[1], Gaomeng Wang[1], Fangying Tao[1], Taohu Xu[1], Qishun Shen[1]; [1]Department of Physics and Astronomy, State Key Lab of Advanced Optical Communication Systems and Networks, Key Laboratory for Laser Plasmas (Ministry of Education), Shanghai Jiao Tong Univ., China. We demonstrate the superluminal propagation of both Stokes and pump waves based on stimulated Brillouin scattering, which indicates that the "backwards-in-time" effect can be copied to other wavelength signals through optical nonlinear effects.

ATh3D.2 • 13:45
Flat-amplitude multiwavelength Brillouin-Raman fiber laser in a linear cavity utilizing cascaded fibers, Han Wu[1], Zinan Wang[1], Xinhong Jia[1], Mengqiu Fan[1], Yi Li[1], Peiyun Li[1], Yeyu Zhu[1]; [1]Univ. Electronic Sci. & Tech. of China, China. We experimentally demonstrate a 42nm flat-amplitude multiwavelength Brillouin-Raman fiber laser with 525 Stokes lines by combining dispersion compensating fiber and standard single mode fiber. In addition, the discrepancies in power level and linewidth between neighboring channels are diminished in this scheme.

ATh3D.3 • 14:00
High power and widely tunable Raman fiber laser at ~1.6 um(Invited Paper), Deyuan Shen[1], Jun Liu[2], Dingyuan Tang[3], Dianyuan Fan[2,3]; [1]Department of Optical Science and Engineering, Fudan Univ., China; [2]Shanghai Inst. of Optics and Fine Mechanics, Chinese Academy of Sciences, China; [3]School of Physics and Electronic Engineering, Jiangsu Normal Univ., China. We report on a high power Ramam fiber laser with operating wavelength tunable from 1645nm to 1675nm using a volume-Bragg-grating. A maximum output power of 11 W was achieved with a slope efficiency of 65%.

ATh3D.4 • 14:30
Complete Power Conversion in the Cascaded Fiber Optical Parametric Amplifier by Inserting the Idler-Phase-Shifters, Zhanyong Liu[1], Chongxiu Yu[1], Xinzhu Sang[1], Kuiru Wang[1], Jinhui Yuan[1], Binbin Yan[1], Boyuan Jin[1]; [1]State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. A novel gain enhancement scheme for the fiber-optic parametric amplifiers is

reported in this paper. By inserting the idler-phase-shifters among several segments of highly nonlinear fibers, complete power conversion of pump-to-signal can be obtained.

ATh3D.5 • 14:45
Phase Shifted Fiber Bragg Grating Fabrication Techniques and Their Laser Applications, Yuanhong Yang[1,2], Xuejing Liu[2], Wei Jin[1]; [1]Laboratory of Precision Opto-mechatronics Technology, Beihang Univ., China; [2]Laboratory on Inertial Science and Technology, Beihang Univ., China. Two flexible techniques for fabricating phase shifted fiber Bragg gratings(PSFBG) were proposed and investigated experimentally. With these techniques, a distributed feedback fibre laser with a linewidth of 1.16 kHz and a tunable fiber ring laser were attained.

ATh3D.6 • 15:00
Crystalline fiber based broadband light sources(Invited Paper), Kuang-Yu Hsu[1], Dong-Yo Jheng[1], Shih-Chang Wang[1], Chien-Chung Tsai[1], Tuan-Shu Ho[1], Sheng-Lung Huang[1], Pinghui S. Yeh[2]; [1]Graduate Inst. of Photonics and Optoelectronics, National Taiwan Univ., Taiwan; [2]Department of Electronic Engineering, National Taiwan Univ. of Science and Technology, Taiwan. Few-mode crystalline fibers with broadband emissions in various wavelength ranges covering ultraviolet to near infrared are developed for core and clad pumping schemes. Applications using these cw and direct laser-diode-pumped sources will be addressed.

Coffee Break ----------15:30—16:00

Room 5----Track 2-----Thurs.16:00—17:00
ATh4D • Fiber Optic Phase Measurement and Nonlinear Soliton
Presider: Shinji Yamashita, Univ. of Tokyo, Japan

ATh4D.1 • 16:00
Demonstration of the existence of distinctly different phase relationships of higher-order bound solitons, qi wang[1], Xin Zhao[1], Zheng Gong[1], Zheng Zheng[1]; [1]School of Electronic and Information Engineering, Beihang Univ., China. Through intracavity loss and PC orientation tuning, different phase relationships of higher-order bound solitons have been stably generated from a passively mode-locked fiber laser for the first time based on a carbon nanotube modelocker.

ATh4D.2 • 16:15
Soliton self-frequency shift and two-stage spectral compression for resolution improvement of all-optical ADC, Jinlu Liu[1], HE-PING LI[1], Xionggui Tang[1], Shang Jian Zhang[1], Yong Liu[1]; [1]Univ of Electronic Science & Tech China, China. We demonstrate a soliton self-frequency shift of ~150 nm and two-stage spectral compression in nonlinear fibers with femtosecond pulses. Experimental results indicate that a resolution of 6 bits for all-optical ADC can be achieved.

ATh4D.3 • 16:30
Phase noise compensated optical frequency domain reflectometry and its applications(Invited Paper), Xinyu Fan[1,2], Fumihiko Ito[1]; [1]NTT Access Network Service Systems Laboratories, NTT Corporation, Japan; [2]State Key Laboratory of Advanced Optical Communication Systems and Networks, Shanghai Jiao Tong Univ., China. Phase-noise-compensated optical frequency domain reflectometry (PNC-OFDR), which provides a capability to achieve a very high-resolution measurement over a long range, is reviewed in this paper. Its principle and applications are also introduced and discussed.

Room 10---Track 3----Thurs.13:30—15:30
ATh3E • Access and Short Reach Systems II
Presider: Hongwei Chen, Tsinghua University, China

ATh3E.1 • 13:30
Modulation Formats for Beyond-100Gbps Ethernet Optical Links-A Review of Research(Invited Paper), Jesper B. Jensen[1], Miguel I. Olmeido[1], Idelfonso Tafur Monroy[1]; [1]Department of Photonics Engineering, DTU - Technical Univ. of Denmark, Denmark. The current increase in data-centers traffic and cloud-based services presents a formidable challenge for optical interconnects. We examine these challenges, and review recent breakthroughs in advanced modulation formats formats for intensity modulation - direct detection.

ATh3E.2 • 14:00
A Multi-level BiCMOS Timing Recovery System for Electronic Dispersion Compensation of 11.1Gb/s Fiber Optic Links, Salam Elahmadi[1], Jomo Edwards[1], Matthias Bussman[1], Dalius Baranauskas[1], Denis Zelenin[1]; [1]Menara Networks, USA. A multi-level timing recovery based on the MMSE algorithm and fabricated in a SiGe process, is shown experimentally to recover accurate symbol timing from a distorted signal produced by a 400-Km uncompensated SMF fiber link.

ATh3E.3 • 14:15
Adaptability-Enabled Significant Improvement in Capacity versus Reach Performance of Real-Time Dual-Band Optical OFDM Transmissions over OM1/OM2 MMF Systems, Emilio Hugues Salas[1], Qianwu Zhang[2], Roger P. Giddings[1], Min Wang7, Jianming Tang[1]; [1]School of Electronic Engineering, Bangor Univ., UK; [2]Key Laboratory of Specialty Fiber Optics and Optical Access Networks, Shanghai Univ., China. Using adaptive bit/power loading, 20.125Gb/s@100m and 19.625Gb/s@1000m (20Gb/s@100m and 19.375Gb/s@1000m) robust transmissions of real-time dual-band OOFDM signals are experimentally demonstrated in OM2(OM1) MMFs. >19Gb/s@1000m OOFDM transmissions are feasible in any legacy MMFs.

ATh3E.4 • 14:30
10 Gb/s Upstream Transmission in TWDM PON Using Duobinary and PAM-4 Modulations with Directly Modulated Tunable DBR Laser, Ning Cheng[1], Xuejin Yan[1], Naresh Chand[1], Frank Effenberger[1]; [1]American Research Center, Huawei Technologies USA, USA. 10Gb/s upstream transmissions in C-band over 40km are demonstrated for symmetric TWDM PON system using tunable DBR lasers. Compared to NRZ, duobinary and PAM-4 signals with direct modulation result in significantly lower dispersion penalty (~1dB).

ATh3E.5 • 14:45
Next generation of long-reach coherent WDM/TDM access network leveraging tunable directly modulated hybrid silicon lasers, Guilhem de Valicourt[1]; [1]Alcatel-Lucent, Bell Labs, France. We demonstrate 10 Gbit/s symmetric WDM/TDM PON based on high output power hybrid III-V/silicon tunable laser. At the OLT, coherent detection allows long-reach transmission over 100-km single-mode fiber with high optical budget beyond 35 dB.

ATh3E.6 • 15:00
OFDM for Data Center(Invited Paper), Dayou Qian[1], Philip Ji[1], Ting Wang[1]; [1]NEC Labs America, USA. We propose and experimentally demonstrate a novel all-optical DCN architecture that combines a passive cyclic arrayed waveguide grating (CAWG) core router with orthogonal frequency division multiplexing (OFDM) modulation and parallel signal detection (PSD) technologies.

Coffee Break ----------15:30—16:00pm

Room 10---Track 3----Thurs.16:00—17:00
ATh4E • Nonlinear Compensation
Presider: Fan Zhang, Peking Univ. China

ATh4E.1 • 16:00
Nonlinear Compensation beyond Conventional Perturbation Based Algorithms, Zhenning Tao[1], Liang Dou[1], Ying Zhao[1], Weizhen Yan[1], Tomofumi Oyama[2], Shoichiro Oda[2], Takahito Tanimura[2], Takeshi Hoshida[3], Jens Rasmussen[2]; [1]Fujitsu R&D Center, China; [2]Fujitsu Laboratories, Japan; [3]Fujitsu Limited, Japan. Perturbation based nonlinear compensations are important implementable low complexity algorithms. Several further efforts including reducing the complexity, increasing the accuracy, extending to 16QAM modulation format and new benefits of nonlinear compensation are reviewed in this paper.

ATh4E.2 • 16:30
SPM Compensation in Superchannel Based on Optical Frequency Combs, Luo zhengyu[1], Yi Xingwen[1], Zhang Jing[1], deng shanqin[1], Qiu Kun[1]; [1]UESTC, China. We discuss the validity of SPM compensation in superchannel using optical frequency combs. The simulation results demonstrate that the performance of SPM compensation in multiple sub-bands system could be comparable to that in single-band system.

ATh4E.3 • 16:45
Digital Post-Compensation of Nonlinearity in Intensity Modulated Analog Photonic Links, Yan Cui[1], Yitang Dai[1], Feifei Yin[1], Kun Xu[1], Yuefeng Ji[1], Jintong Lin[1]; [1]State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ of Posts & Telecom, China. A novel digital post-compensation based linearization technique is demonstrated in intensity-modulated photonic link. A suppression of 42 dB in the third-order intermodulation component is achieved, which is attractive for nonlinear analog photonic link.

Room 11---Track 3----Thurs.13:30—15:30
ATh3F • Microwave Photonics
Presider: Zhaohui Li, Jinan University, China

ATh3F.1 • 13:30
Tunable amplitude-and phase-modulated microwave generation based on a fiber Sagnac interferometer, Shuang Liu[1], Zuping Qian[1], Rong Wang[1], Tao Pu[1]; [1]PLA

Univ. of Science and Technology, China. A photonic approach for generating an amplitude- and phase-modulated microwave signal with tunable frequency and modulation bit-rate is proposed. The novel technique is investigated theoretically. The generation of amplitude- and phase-modulated microwave signals is demonstrated.

ATh3F.2 • 13:45
A Simple Optical Binary Phase-coded UWB Signal Generation Scheme, Long-Sheng Tan[1], Fei Wang[1]; [1]Chongqing Univ. of Technology, China. A simple all-optical binary phase-coded ultra-wideband (UWB) signal generation scheme using a DWDM-based frequency discriminator for multi-user communications is proposed. Encoding, decoding and transmission in fiber links of bipolar-phase UWB pulses are numerically investigated.

ATh3F.3 • 14:00
Continuously Tunable Microwave Phase Shifter with Capability of Frequency Doubling Based On Spectral Shaping Technique, Feng Zhenghua[1], Lin Rui[1], Fu Songnian[1], Tang Ming[1], Shum Ping[1,2], Liu Deming[1]; [1]Next Generation Internet Access National Engineering Lab, Huazhong Univ. of Science and Technology, China; [2]School of EEE, Nanyang Technological Univ., Singapore. A tunable microwave phase shifter with microwave frequency doubling is experimentally demonstrated based on photonic spectral shaping technique. Continuous phase shift of 360° is achieived with flat amplitude response from 20 GHz to 40 GHz.

ATh3F.4 • 14:15
Single-pass-band microwave photonic filter based on polarization division multiplexing incorporating polarization modulation, Hui Wang[1], Ninghua Zhu[1], Jianyu Zheng[1], Wenhui Sun[1], Ningbo Huang[1], Wei Li[1], Liang Xie[1], Ming Li[1], Ming Li[1]; [1]Chinese Academy of Sciences, China. on the polarization division multiplexing and the polarization modulation incorporating a DCF, a novel single-pass-band microwave photonic filter is demonstrated. Experimental results verify the theoretical analysis with a tunability ranging from 0- to 20-GHz.

ATh3F.5 • 14:30
Two-dimensional optical architecture for true time-delay beam forming in phased array antennas, Yongfeng Wei[1,3], Chaowei Yuan[1], Shanguo Huang[2], Xinlu Gao[2], qian wang[2], Wanyi Gu[2]; [1]School of Information and Communication Engineering, BUPT, China; [2]State Key Laboratory of Information Photonics and Optical Communications, BUPT, China; [3]Department of Electronic Information Engineering, Inner Mongolia Univ., China. A two-dimensional optical architecture for true time-delay (TTD) beam forming in a phased array antenna is proposed. The architecture based on the compact fiber grating prism (FGP) has potential for large scale system implementations.

ATh3F.6 • 14:45
Influence of Harmonic Distortions of Driving Signal on Chirp Parameter Measurement of Mach-Zehnder Modulator - Experimental Verification -, Takahiro Hayashi[1], Hiroyuki Toda[1], Tetsuya Kawanishi[2]; [1]Doshisha, Univ., Japan; [2]Photonic Network Research, Inst., Japan. In this paper, we describe the influence of harmonic distortions of RF driving signal on chirp parameter measurement of a Mach-Zehnder modulator. The influence was experimentally verified for the first time.

ATh3F.7 • 15:00
Tunable Millimeter-wave Generation Based on An Optically Tunable Frequency-Doubling Optoelectronic Oscillator, Huanfa Peng[1], Xiaopeng Xie[1], Cheng Zhang[1], TAO SUN[1], Peng Guo[1], Xiaoqi Zhu[1], Lixin Zhu[1], Weiwei Hu[1], Zhangyuan Chen[1]; [1]Peking Univ., China. An optically tunable frequency-doubling optoelectronic oscillator is proposed and experimentally demonstrated. A frequency tunable range from 40.78 to 57.12 GHz of the millimeter-wave signals is obtained in the experiment.

ATh3F.8 • 15:15
Photodiode-induced second harmonic distortion cancelling using SSB modulation of phase modulator, Yafei Sun[1], Lianshan Yan[1], Zhiyu Chen[1], Yinghui Guo[1], Wei Pan[1], Bin Luo[1], Xihua Zou[1]; [1], China. Single sideband (SSB) based on phase modulator to suppressing photodiode-induced second harmonic nonlinearities was proposed and experimentally demonstrated. Result shows that ~13dBm suppression of second harmonic distortion accompanies with ~20dB dynamic range improvement is achieved.

Coffee Break ----------15:30—16:00pm

Room 11---Track 3----Thurs.16:00—17:00
ATh4F • Amplification Techniques
Presider: Ming Tang, Huazhong Univ of Science and Technology, China

ATh4F.1 • 16:00
Comparison of Amplification Schemes Using a Wide Range of Fiber Parameters and System Nonlinearity Tolerance, Lufeng Leng[1]; [1]New Yok City College of Technology, CUNY, USA. We compare amplification schemes using various fibers and system nonlinearity tolerance. We show the diminishing advantage of all-Raman as nonlinearity tolerance improves; for certain fibers the hybrid Raman/EDFA could perform better than the counter-pumped all-Raman.

ATh4F.2 • 16:15
Phase Regeneration of PDM Signals using Phase Sensitive Amplification, Weili Yang[1], Junfeng Wang[1], Yu Yu[1], Mengyuan Ye[1], Yaguang Qin[1], Bingrong Zou[1], Xinliang Zhang[1]; [1]Wuhan National Lab for Optoelectronics, Huazhong Univ. of Science and Technology, China. Phase regeneration for PDM signals using the PSA is proposed and analyzed. By choosing orthogonal dual pumps with different wavelengths, the phase regeneration for an 80Gb/s PDM RZ-PSK signals can be achieved successfully.

ATh4F.3 • 16:30
Parametric Amplification, Duplication and Frequency Conversion of Optical Signals(Invited Paper), Colin McKinstrie[1]; [1]Bell Labs, Alcatel-Lucent, USA. I will review the physics of parametric amplification and frequency conversion, and describe three recent applications of parametric devices: (a) low-noise four-fold multicasting, (b) hybrid amplification and (c) quantum-state-preserving frequency conversion for quantum communication systems.

Room 12-----Track 3-----Thurs.15:30—16:30
ATh3G • Radio over Fiber Systems
Presider: Jianqiang Li, Beijing Univ of Posts & Telecommunications, China

ATh3G.1 • 13:30
Multi-Gigabit Capacity W-band Hybrid Wireless-Photonic Transmission Link, Juan Jose Vegas Olmos[1], Xiaodan Pang[1], Alexander Lebedev[1], Idelfonso Tafur Monroy[1]; [1]Technical Univ. of Denmark, Denmark. We present a 10-meter bidirectional fiber-wireless-fiber system at 81/86-GHz (W-band). The fiber transmission amounts for 36-km, whereas the wireless transmission for 10-m, achieving BER performance below the 7% FEC limit for both downstream and upstream.

ATh3G.2 • 13:45
A Novel PAPR Reduction Algorithm Based on Precoding Techniques Applied in 60GHz OFDM-RoF System, Yanjin Wang[1], Xinying Li[1], Li Tao[1], Yiguang Wang[1], Yuan Fang[1]; [1]Communication Science and Engineering, Fudan Univ., China. A 60GHz RoF system with precoded 16QAM-OFDM signals is experimentally demonstrated. The results prove that precoding can reduce the PAPR of OFDM signals by at least 2.5dB and improve receiver sensitivity by at least 2dBm as well.

ATh3G.3 • 14:00
Performance Improvement in RoF Links Based on Optical Carrier Suppression using a Phase-Shifted FBG, Chen Xu[1], Juan Ni[1], Shilie Zheng[1], Hao Chi[1], Xiaofeng Jin[1], Xianmin Zhang[1]; [1]Department of Information Science and Electronic Engineering, Zhejiang Univ., China. A new scheme is proposed and demonstrated which uses a phase-shifted FBG as an optical filter to suppress the optical carrier of DSB signal in RoF links, providing improved performance and flattened RF gain response.

ATh3G.4 • 14:15
A hybrid lightwave subcarrier CATV/16-QAM/16-QAM OFDM transmission system, Chun-Cheng Lin[1], Ying-Pyng Lin[1], Po-Yi Wu[1], Hai-Han Lu[1], Tai-Wei Jhang[1], Cheng-Ling Ying[2]; [1]National Taipei Univ. of Technology, Taiwan; [2]Department of Electronic Engineering, Jinwen Univ. of Science and Technology, Taiwan. A hybrid lightwave subcarrier CATV/16-QAM/16-QAM OFDM transmission system employing light injection/optoelectronic feedback techniques and photonic crystal fiber (PCF) is proposed and demonstrated.

ATh3G.5 • 14:30
Transmission of GNSS Signals over Bidirectional Fiber Link with Compact Remote Antenna Unit, Juan Wei[1], Yonggang Zhou[1], Xixi Song[1], Shilong Pan[1]; [1]Nanjing Univ Aeronautics & Astronautics, China. A compact, cost-effective and polarization insensitive bidirectional optical link for GNSS-based aircraft attitude determination or structural health monitoring system is proposed and demonstrated. The system has a reduced system error for relative hardware delay monitoring.

ATh3G.6 • 14:45
Distribution of 1.5-Gbps HD Video using Beamforming-based Radio over Fiber System,

Zhenzhou Tang[1], Shilong Pan[1]; [1]Nanjing Univ Aeronautics & Astronautics, China. A stable beamforming-based RoF system with PolM-based dispersion compensation and optoelectronic-oscillator-based photonic microwave downconversion for the distribution of 1.5-Gbps 720P HD video in a 25-km wired and 1.6-m wireless link is proposed and experimentally demonstrated.

Coffee Break ----------15:30—16:00

Room 12---Track 3----Thurs.16:00—17:00
ATh4G • Visible Light Communication
Presider: Zabih Ghassemlooy, Northumbria Univ., UK

ATh4G.1 • 16:00
Enhanced Signal Processing and System Configurations for Visible Light Communication(Invited Paper), Jian Chen[1,2], Yang Hong[1], Jianhua Shen[1], Changyuan Yu[2,3]; [1]Nanjing Univ. of Posts and Telecommunications, China; [2]National Univ. of Singapore (Suzhou) Research Inst., China; [3]National Univ. of Singapore, Singapore. For the consideration of putting indoor visible light communication into practical applications, great efforts should be done in enabling signal processing techniques and modulation schemes. This paper reports recent ideas for such advanced system configurations.

ATh4G.2 • 16:30
Laser Diode-Based High Speed Visible Light Communication Using DMT-OOFDM, rong hu[1], Chao Yang[1], Xiao Xiao[1], Daojun Xue[1], Qi Yang[1], Shanhong You[2]; [1]State Key Laboratory of Optical Communication Technologies and Networks, China; [2]School of Electronic & Information Engineering, Soochow Univ., China. A single channel 1.53-Gb/s visible light transmission has been experimentally demonstrated. With the help of DMT-OOFDM, a maximum capacity distance product of 6.13-Gb/s*m is achieved by using IM/DD.

A**Th4G.3 • 16:45**
140Mbit/s Single-Channel Visible Light Communications Link Based on Discrete-Multitone Modulation, Kun Chen[1], Minglun Zhang[1], Yangan Zhang[1]; [1]Beijing Univ. of Posts and Telecomm, China. In this paper, we report a visible light communication link operating at 140Mbit/s by using discrete-multitone modulation and with a bit-error ratio below 2×10^(-3).

Room 13-----Track 4-----Thurs.13:30—15:30
ATh3H • Optical Networks and Applications I
Presider: Jie Zhang, Beijing Univ of Posts & Telecom, China

ATh3H.1 • 13:30
An End to End Architecture for Ubiquitous Super-Fast Broadband(Invited Paper), David B. Payne[1,2]; [1]Trinity College, Ireland; [2]Aston Univ., UK. There is growing pressure to ensure that future broadband networks are both super fast and ubiquitously available to all users without the need for large government subsidies, this requires a radical change to network architectures.

ATh3H.2 • 14:00
Simplifying the Path to a Profitable Next-Generation Network(Invited Paper), Robert Keys[1]; [1]BTI Systems, Canada. A dynamic optical layer simplifies service delivery and management of packet optical networks. It offers service providers the tools they need to effectively, efficiently and easily grow their network today and in the future.

ATh3H.3 • 14:30
Leveraging the Real Benefits of Fibers in Access by Virtualizing the Optical Layer(Invited Paper), Thomas Pfeiffer[1]; [1]Alcatel-Lucent Deutschland, Germany. The ultimate benefit of fibers in the access space is beyond bare provisioning of high capacities to customers. It is rather the wide range of possible utilization and business models - enabled by virtualization and flexibilization of the physical layer - that differentiates optics from copper and wireless infrastructures in access and that will finally help make this market segment more attractive for investments. Different sharing and virtualization models for the optical layer will be introduced and related operational aspects will be discussed.

ATh3H.4 • 15:00
Incremental network design with wavelength planning on backup path provisioning in WDM mesh networks, Qingshan Li[1]; [1]The 28th Research Inst. of CETC, China. An incremental capacity allocation with wavelength planning problem is investigated and an efficiency mathod is proposed to maximize the number of backup path provisioned services in wavelength unconvertible WDM mesh networks.

ATh3H.5 • 15:15
A Novel Optical Network Reliability Evaluating Algorithm with OBDD Based on Boolean Function by Network Topology, Di Qiao[1], Fei Xiong[2]; [1]School of Information and Telecommunication Engineering, Beijing Univ. of Posts and Telecommunications, China; [2]State Grid Information & Telecommunication Co.,Ltd, China. This paper propose an optimization OBDD algorithm for evaluating the reliability of optical network physical topology on the basis of the laws of Boolean function (BF-OBDD). Experiment results show the efficiency of BF-OBDD.

Coffee Break ----------15:30—16:00

Room 13----Track 4----Thurs.16:00—17:00
ATh4H • Broadband Access Networks II
Presider: Martin Maier, Institut National de la Recherche Scientifique (INRS), Canada

ATh4H.1 • 16:00 Tutorial
Green Mobile Backhaul in Heterogeneous Wireless Deployments, Paolo Monti[1], J. Costa[1], F. Farias[1], M. Fiorani[1], M. Nilson[1], S. Tombaz[1], A. Västberg[1], Lena Wosinska[1]; [1]KTH Royal Inst. of Technology, Sweden. This tutorial first introduces and describes different backhaul technological and architectural options (i.e., fiber-, microwave-, and copper-based), then it discusses their impact on the energy consumption of current and future heterogeneous mobile wireless access deployments.

ATh4H.2 • 16:30
A Novel Optimization Model for Cost-Effective LRPON Infrastructure Deployment, Lin Lin[1], Bin Lin[2], Pin-Han Ho[1]; [1]Univ. of Waterloo, Canada; [2]Dalian Maritime Univ., China. This paper investigates network planning and dimensioning for LRPONs by formulating a novel ILP. Numerical results are presented, which illustrate the cost-effectiveness of LRPON infrastructure deployment to support future fast-growing FTTP service.

ATh4H.3 • 16:45
An Adaptive Point Coordination Function Mechanism for WLAN-Over-Fiber-Based Distributed Antenna Systems, Yuting Fan[1], Jianqiang Li[1], Kun Xu[1], Xun Lu[1], Hao Chen[1], Yitang Dai[1], Yuefeng Ji[1], Jintong Lin[1]; [1]Beijing Univ. of Posts and Telecommunications, China. In this paper, we present an adaptive Point Coordination Function (PCF) to improve the throughput performance of Radio-over-fiber distributed antenna systems. Simulation results show that the adaptive PCF has better performance than Distributed Coordination Function(DCF).

Room 14----Track 4----Thurs.13:30--15:30
ATh3I • Datacenter Networks
Presider: Biswanath Mukherjee, UC Davis

ATh3I.1 • 13:30
On the Scalability of the FISSION: Flexible Interconnection of Scalable Systems using Integrated Optical Networks Framework for Data-centers(Invited Paper), Ashwin Gumaste[1]; [1]IIT Bombay, India. We evaluate engineering aspects of our recently proposed, near-infinitely scalable data-center architecture called Fission or Flexible Interconnection of Scalable Systems using Integrated Optical Networks. A simulation study validates the architecture.

ATh3I.2 • 14:00
An SDN framework for the orchestration of cloud and network services across datacentres, Nicola Ciulli[1], Gino Carrozzo[1], Giada Landi[1], Giacomo Bernini[1]; [1]Nextworks, Italy. Network control architectures of datacentres and backbone/transit domains are deeply changing with Software Defined Networking. This paper presents an architectural framework for end-to-end cloud service orchestration across datacentre, metro and core network infrastructures. OCIS codes: (060.4250) Networks, (060.1155) All-optical networks

ATh3I.3 • 14:30
Task Assignment and Scheduling in Optical Grids(Invited Paper), Brigitte Jaumard[1], Ali Shaikh[1]; [1]Computer Science and Software Engineering, Concordia Univ., Canada. Optical grid networks gained widespread acceptance among research and business communities. We propose an exact task assignment and scheduling model for advance reservations in order to allocate grid resources. Some preliminary results are presented.

ATh3I.4 • 15:00
Tech-economic Analyses of Optical Switching in Datacenter, Xiuzhong Chen[1], Guoying Zhang[1], Haiyi Zhang[1], Junling Xiang[2], Shaofeng Qiu[2], Rui Wang[3]; [1]China Academy of Telecom. Research, MIIT, China; [2]Networks Research Department, Huawei Technologies Co., Ltd.,, China; [3]Department of Computer Science, Univ. of California Davis, USA. Will optical switching

be successful in datacenter? This work compares various optical switching schemes with electrical switching scheme in datacenters from the perspective of cost and power consumption based on the most recent data from industry, and draws the trend of optical switching in datacenters based on our quantitative results.

ATh3I.5 • 15:15
Energy-Efficient Virtual Data Center Mapping, long luo[1], Yan Kai[1], Hongfang Yu[1], Dan Liao[1]; [1]UESTC, China. In this paper, the problem of energy-efficient VDC mapping is addressed. With considering both servers power consumption and inter-VMs communication, a heuristic algorithm 2EM is proposed to solve it. Simulation shows our algorithm performs better than LOCO.

Coffee Break ----------15:30pm—16:00pm

Room 14----------Thurs.16:00—17:00
Tutorials on VPI Techniques

Room 15----------Track 5----------Thurs.13:30—15:30
ATh3J • Microscopy I
Presider: Francesco Pavone, European Lab for Non-Linear Spectroscopy

ATh3J.1 • 13:30
Characterisation of Upconversion Nanoparticles for Imaging(Invited Paper), Judith M. Dawes[1], Jiangbo Zhao[1], Zhenda Lu[1], Yadong Yin[1], Lixin Zhang[1], Aaron McKay[1], Christopher McRae[1], James Piper[1], Dayong Jin[1], Ewa M. Goldys[1]; [1]MQ Photonics Research Centre, Dept of Physics and Astronomy, Macquarie Univ., Australia. By controlling the size of Yb,Er, doped upconversion nanoparticles, we obtain varying emission lifetimes and emission ratios of green and red light, which we explain by modelling of excited state decay mechanisms.

ATh3J.2 • 14:00
Multicolor two-photon microscopy for in vivo immunology, Ling Fu[1]; [1]Wuhan National Lab for Optoelectronics, China. By pumping pulses from the Ti:Sapphire oscillator through the HNPCF, a linear compressible continuum is generated to achieve multicolor TPEF imaging. In vivo multicolor images demonstrate the potential applications to immunology study.

ATh3J.3 • 14:30
Non-invasive optical imaging of tissue morphology and microcirculations in vivo, Ruikang K. Wang[1]; [1]Univ. of Washington, USA. We will show the ability of optical microangiography to visualize tissue blood flow at the microcirculation level, which is important in a variety of biomedical applications

ATh3J.4 • 15:00
Fourier Ptychographic Microscopy: A Method for Pushing Standard Microscope Beyond Its Physical Limitations(Invited Paper), Changhuei Yang[1]; [1]California Inst. of Technology, USA. I will report a method termed Fourier Ptychographic Microscopy (FPM), that effectively transforms a 2X standard microscope into a general microscope with 20X resolution and a field-of-view of ~120 mm2.

Coffee Break ----------15:30—16:00

Room 15-------Track 5------Thurs.16:00—17:00
ATh4I • Superresolution
Presider: Changhuei Yang, Caltech, Optofluidics Bo Huang, UCSF, USA

ATh4I.1 • 16:00
STED optical super-resolution microscopy with fluorescent NV-centers, Xusan Yang[1], Hao Xie[1], Xuanze Chen[1], Yujia Liu[1,2], Yan-Kai Tzeng[3], Huan-Cheng Chang[3], Wen-Di Li[4], Peng Xi[1]; [1]Peking Univ., China; [2]Dept. of Biomedical Engineering, Shanghai Jiao Tong Univ., China; [3]Inst. of Atomic and Molecular Sciences, Academia Sinica, Taiwan; [4]Department of Mechanical Engineering, Univ. of Hong Kong, Hong Kong. Fluorescent nano-diamond (FND) has been imaged as a photostable inorganic dye, with large stimulated emission cross-section. FND nanoparticles as well as bulk FNDs grown in a large diamond have been studied with our STED system.

ATh4I.2 • 16:30
Quantum probing of living cells(Invited Paper), Vincent Daria[1,2], Michael Taylor[3,4], Jiri Janousek[2], Joachim Knittel[3], Boris Hage[5], Hans Bachor[2], Warwick Bowen[3]; [1]John Curtin School of Medical Research, The Australian National Universtiy, Australia; [2]Department of Quantum Science, The Australian National Universtiy, Australia; [3]Department of Physics, Univ. of Queensland, Australia; 4Centre for Engineered Quantum systems, Univ. of Queensland, Australia; 5Inst. für Physik, Univerität Rostock, Germany. In this talk, I will show the use of quantum-correlated light to enhance the spatial resolution for probing naturally occurring biological processes in living cells.

Room 22---Track 6-----Thurs.13:30—15:00
ATh3K • Novel Systems for Lighting Vision
Presider: Chih-Chung Yang, National Taiwan Univ., Taiwan, China

ATh3K.1 • 13:30
Smart Lighting Vision and Technologies(Invited Paper), Robert F. Karlicek[1]; [1]Rensselaer Polytechnic Inst., USA. Lighting systems with sensors and digital control are often called "Smart Lighting" systems. Emerging trends in illumination and controls will create future lighting systems that "think", offering illumination systems with radically new features and capabilities.

ATh3K.2 • 14:30
UV LED with QD for display and lighting application(Invited Paper), Hao-chung Kuo[1], Kuo-Ju Chen[1], Hsin-Chu Chen[1], Chien-Chung Lin[2], Kai-An Tsai[3], Hsin-Han Tsai[1], Shih-Hsuan Chien[1], Bo-Siao Cheng[1], Yung-Jung Hsu[3], Min-Hsiung Shih[4], Chih-Hao Tsai[4], His-Hsin Shih[5]; [1]National Chiao Tung Univ., Taiwan; [2]Inst. of Lighting and Energy Photonics, Taiwan; [3]Department of Materials Science and Engineering, National Chiao Tung Univ., Taiwan; [4]Research Center for Applied Sciences, Academia Sinica, Taiwan; [5]Cilin Technology, Taiwan. White Quantum-Dot-Based light-emitting with HFO2/SiO2 distributed bragg reflector structure is demonstrated by pulse spray method with excellent optical characteristic and high stability, which can provide an alternative approach in display technology.

ATh3K.3 • 15:00
Ion Implantation Technology Applied to GaN Based Light Emitting Diodes(Invited Paper), W. C. Lai[1]; [1]National Cheng Kung Univ., Taiwan. The shallow depth and selective area ion implantation has been performed on the GaN/sapphire template and sapphire substrate. The after grown GaN layer on the implanted GaN/sapphire template and sapphire substrate shows the selected growth characteristics. The selective growth character could be used to create the shapes of the GaN layer for the applications of the opto-electrical devices.

Coffee Break ----------15:30—16:00

Room 22---Track 6---Thurs.16:00—17:00
ATh4J • White LEDs Technologies
Presider: Hao-chung Kuo, National Chiao Tung Univ., Taiwan, China

ATh4J.1 • 16:00
Nanocrystal Optoelectronics for Quality Lighting and Displays(Invited Paper), Hilmi V. Demir[1,2], Swee Tiam Tan[1]; [1]Nanyang Technological Univ., Singapore; [2]UNAM-Inst. of Materials Science and Nanotechnology, Bilkent Univ., Turkey. We review the recent advances in color-conversion LEDs integrating nanophosphors of semiconductor quantum dots for quality lighting and displays in our group.

ATh4J.2 • 16:30
Blue, green, and yellow LEDs grown on Si substrates(Invited Paper), Xinbo Zou1, Wing Cheung Chong[1], Ka Ming Wong[1], Jun Ma[1], Kei-May Lau[1]; [1]Hong Kong Univ. of Science and Technology, Hong Kong. Device results of blue, green, and yellow GaN-based LEDs grown on Si substrates will be reported. To the best of our knowledge, these devices exhibit the highest LOP reported in the scientific literature thus far.

Room 21----Track 5----Thurs.13:30—15:30
ATh3L • PDT/PET
Presider: Malini Olivo, National Univ. of Ireland Galway, Ireland

ATh3L.1 • 13:30
NIR Triggered Upconversion Nanoparticle Based Drug Delivery Systems For Photodynamic Therapy(Invited Paper), Yueqing Gu[1,2], Sisi Cui[1,2]; [1]Biomedical Engineering, China Pharmaceutical Univ., China; [2]Biomedical Engineering, China Pharmaceutical Univ., China. The aim of this study is to present a multifunctional nanoplatform which consists of upconversion nanoparticles (UCNPs) and photosensitizer Zinc (II) phthalocyanine (ZnPc) for deep tumor PDT.

ATh3L.2 • 14:00
Laser-activated hybrid films for tissue repair and controlled drug release(Invited Paper), Roberto Pini[1], Paolo Matteini[1], Fulvio Ratto[1], Francesca Rossi[1], Sonia Centi[2], Francesca Tatini[1]; [1]Inst. of Applied Physics, CNR, Italy; [2]Clinical Physiopathology, Univ. of Florence, Italy. Light stimulation produced by a laser source can be

used to "activate" biomaterials hybridized with suitable nanoparticle transducers. We present two exemplary laser-activated biomaterials we developed and characterized for tissue repair and drug delivery applications

ATh3L.3 • 14:30
Laser Immunotherapy for Cancer Treatment(Invited Paper), Wei R. Chen[1]; [1]Engineering and Physics, Univ. of Central Oklahoma, USA. The root cause of cancer is a failed or compromised host immune system. Laser immunotherapy, using photothermal interaction and immunological stimulation, induces a tumor-specific immune response. Pre-clinical and clinical results indicate that laser immunotherapy could be an effective method to treat late-stage, metastatic cancers.

ATh3L.4 • 15:00
Trans-PET: The LEGO for Scientists(Invited Paper), Qingguo Xie[1]; [1]Huazhong Univ. of Science and Technology, China. We have developed all-digital, modularized PET detectors to build PET systems with great freedom, like building models from LEGO bricks. Such systems can be customized for different applications and enjoy significant flexibility, scalability, and upgradability.

Coffee Break ----------15:30—16:00

Room 21----------Track 6---------Thurs.16:00—17:00
ATh4K • Thermoelectric Technologies
Presider:

ATh4K.1 • 16:00
MBE growth of Bi^2Te3 for thermoelectrics(Invited Paper), Yuxin Song[1,2]; [1]Microtechnology and Nanoscience, Chalmers Univ. of Technology, Sweden; [2]State Key Laboratory of Functional Materials for Informatics, Shanghai Inst. of Microsystem and Information Technology, Chinese Academy of Science, China. Molecular beam epitaxy of Bi^2Te^3 on various substrates for thermoelectric applications is investigated. High quality Bi^2Te^3 thin films were achieved with very low carrier density and record high carrier mobility.

ATh4K.2 • 16:30
Development of III-Nitride Thermoelectric Characterizations and Materials(Invited Paper), Jing Zhang[1,2], Nelson Tansu[1]; [1]Dept. of Electrical and Computer Engineering, Center for Photonics and Nanoelectronics, Lehigh Univ., USA; [2]Dept. of Physics, St. John's Univ., USA. The pursuit of III-Nitride based thermoelectric material will be presented from materials, simulations, and device characterizations. The use of superlattice approach for achieving improved thermoelectric material will also be discussed.

Room 18-----Industrial Forum ----Thurs.13:30—17:00
ATh3M • Transport SDN: How Far from Real Application?

Friday 15 November

Room 2----------Track 1----------Fri.08:00—10:00
AF1A • Photonic Integration I
Presider: Daoxin Dai, Zhejiang Univ., China

AF1A.1 • 08:00
Interchannel crosstalk characteristics of an integrated WDM receiver based on a Si-Ge-silica photonic platform, Hidetaka Nishi[1,2], Rai Kou[1,2], Kotaro Takeda[1,2], Tai Tsuchizawa[1,2], Tatsurou HIraki[1,2], Mitsuo Usui[1], Toru Miura[1], Yasuhiko Ishikawa3, Kazumi Wada[3], Hiroshi Fukuda[1], Koji Yamada[1,2], Tsuyoshi Yamamoto[1]; [1]NTT Microsystem Integration Labs., NTT Corp., Japan; [2]Nanophotonics Ctr., NTT Corp., Japan; [3]Department of Materials Engineering, Univ. of Tokyo, Japan. Interchannel crosstalk characteristics of a highly-integrated silicon-photonic WDM receiver are experimentally investigated. The high-frequency electrical crosstalk is well suppressed to about -20 dB by introducing the electrically-isolated structure based on a Si-Ge-silica photonic platform.

AF1A.2 • 08:15
Silicon-on-Insulator Mode (de)Multiplexer for On-Chip Mode-Division Multiplexing, Huiye Qiu[1,2], Hui Yu[1], Yichang Jin[1], Jianyi Yang[1], Xiaoqing Jiang[1]; [1]Zhejiang Univ., China; [2]Longyan Univ., China. We propose a simple 1×4 silicon mode (de)multiplexer based on multimode grating-assisted-couplers. Due to the contra-directional coupling, precise control of the coupling strength and the coupling length are not needed.

AF1A.3 • 08:30
Silicon photonic integrated devices for optical interconnects(Invited Paper), Di Liang1, Géza Kurczveil[1], Chin-Hui Chen[1], Marco Fiorentino[1], Zhen Peng[1], Raymond Beausoleil[1]; [1]HP Labs, USA. We present our latest update on key components in the integrated Si photonic interconnect system, including hybrid Si microring lasers, Si microring modulators, hybrid Si photodetector and passive waveguide devices.

AF1A.4 • 09:00
Ultra-compact Reflective Si-nanowire Arrayed-waveguide grating (de)multiplexer with Straight Arrayed waveguides and Bragg Reflectors, Xin Fu[1], Li Jin[1], Yaocheng Shi[1], Daoxin Dai[1]; [1]Zhejiang Univ., China. An ultra-compact arrayed waveguide grating (AWG) with straight arrayed-waveguides and Bragg reflectors is designed and demonstrated experimentally. The AWG has 400GHz channel spacing and 9 channels. The footprint of the array part is only 130×100μm2.

AF1A.5 • 09:15
Design of Athermal AWGs Employing Temperature Compensators Based on Silicon Nanowires, Guanting Chen[1], Tingting Lang[1,2], Jun Zou[1], Jian-Jun He[1]; [1]Centre for Integrated Optoelectronics , State Key Laboratory of Modern Optical Instrumentation, Zhejiang Univ., China; [2]College of Optical and Electronic technology, China Jiliang Univ., China. A new method of athermal silicon AWGs is presented. AWG's slab regions are utilized as temperature compensators, using silicone as upper-cladding. The temperature dependence is eliminated with a relatively large fabrication tolerance.

AF1A.6 • 09:30
Subwavelength Gratings for Silicon Photonic Integration(Invited Paper), Jens Schmid[1], Pavel Cheben[1], Jean Lapointe[1], Siegfried Janz[1], Przemek Bock[1], Dan-Xia Xu[1], Marc Ibrahim[2], Winnie Ye[2]; [1]Information and Communications Technologies, National Research Council Canada, Canada; [2]Department of Electronics, Carleton Univ., Canada. We review our recent results on subwavelength grating structures for engineering the refractive index of silicon waveguides. Various applications are presented, such as fiber-chip coupling, waveguide crossings and athermal waveguides with a polymer-silicon hybrid core.

Coffee Break ----------10:00—10:30
AF2A Post-Deadline 10:30—12:30
Lunch Break ----------12:30—13:45

Room 2----------Track 1----------Fri.13:45—15:30
AF3A • Graphene Photonics
Presider: Koji Yamada, NTT Microsystem Integration Laboratories, Japan

AF3A.1 • 13:45
Graphene-cladding-microfiber all-optical modulator(Invited Paper), Limin Tong[1], Wei Li[1], Bigeng Chen[1]; [1]Zhejiang Univ., China. By coating a few-layer-graphene film on the surface of a subwavelength-diameter microfiber that is tapered down from a standard optical fiber, we demonstrated an all-optical ultrafast modulator operating around 1.5-um wavelength with response time of about 2 ps.

AF3A.2 • 14:15
Tunable Graphene Plasmonics Waveguide, Benlong Lin[1], Lihong Han[1], Zhongyuan Yu[1], Huijie Zhao[1], Xiaoyu Jia[1]; [1]Beijing Univ. of Posts and Telecommunications, China. To exploit the extraordinary properties of graphene for the optoelectronic applications, we investigate the dispersion characteristics of the graphene plasmonics waveguide. Our result indicates that the effective index and propagation length can be tuned by the conductivity of graphene.

AF3A.3 • 14:30
Tunable terahertz optical antennas based on graphene bowtie structures, Jinlong Wang[1], Lihong Han[1], Zhongyuan Yu[1], Benlong Lin[1]; [1]IPOC, BUPT, China. Highly tunable optical bowtie antennas in teraherz range are proposed, which employ grapheme plasmons using numerical simulations. The resonance frequency of graphene antennas and the field enhancement factor are calculated compared to that of the metallic antenna with the same size.

AF3A.4 • 14:45
Growth of Centimeter-scale, Highly-ordered, and Continuous Graphene on Si-Layer/Metal Surfaces(Invited Paper), Hongjun Gao[1], Shixuan Du[1], Haiming Guo[1], Yeliang Wang[1]; [1]Chinese Academy of Sciences Inst. of Physics, China. Graphene (G), a two-dimensional crystal of carbon atoms arranged in the honeycomb structure, shows extraordinary physical properties such as outstanding electronic mobility, higher than silicon or copper, it is one of the strongest materials found in nature, only comparable to diamond, and at the same time one of the softest, being a unique example of a metallic membrane. We have developed a new strategy for graphene growth on metallic Ru(0001) followed by silicon-layer intercalation that not only weakens the interaction of graphene with the metal substrate but also retains its superlative properties. This G/Si/Ru architecture, produced by silicon-layer intercalation

approach (SIA), was characterized and experiments have shown the high structural and electronic qualities of this new composite, and the striking differences between this material from graphene obtained by previous methods. The SIA eliminates the need for the graphene transfer and also allows for an atomic control of the distance between the graphene and the metal gate, opening doors for a new generation of graphene-based materials with tailored properties.

AF3A.5 • 15:15
Behaviours of Background Carrier Concentration in MOCVD-Grown GaAs on Si, Jun Wang[1]; [1]Beijing University of Posts and Telecommunications, Beijing, China. We report the behavious of the background carrier in the MOCVD-grown GaAs/Si films. The results demonstrate the thermal annealing and mass flow rates of arsine have great effects on the background carrier concentration in epilayers.

Coffee Break ----------15:30—16:00

Room 2----------Track 1----------Fri.16:00—18:00
AF4A • Novel Devices and Applications
Presider: Zhongyuan Yu, BUPT, China

AF4A.1 • 16:00
Started with the Energy Level Dispersion: the Past One Year (Invited Paper), Xiaomin Ren[1]; [1]BUPT, China. This talk is an anniversary summary of the works on the theory of electron-states-architecture(ESA) and its dimensionality in a crystalline material, on the assumptions of the energy-level dispersion(ELD), the spatial extension shrinkage(SES) and the covariant divergence-convergence duality(C-DCD) for real objects, on the idea of the lower limit velocity (LLV), on the proof of the existences of the LLV and the upper one (ULV), and eventually on the modifications of Schrödinger equation, Newtonian equation and the theory of relativity.

AF4A.2 • 16:30
Effect of different buffer layers and superlattice intermediate layers on GaAs/Si(001), yifan wang[1], Qi Wang[1], Zhigang Jia[1], Xiaoyi Li[1], Can Deng[1], Yingce Yan[1], Xiaomin Ren[1], Jun Wang[1], Shiwei Cai[1], Yongqing Huang[1]; [1]State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. The epitaxy of GaAs/Si(001) has been carried out via inserting different buffer layers and different SLSs by MOCVD. High quality epilayers were obtained by AlAs buffer layer and GaAs0.85P0.15/GaAs SLS.

AF4A.3 • 16:45
Micro-photoluminescence Characteristics of Single Self-rolled-up InGaAs/GaAs Microtubes Fabricated on Si (100), Eryang Wang[1], Qi Wang[1], Bochang Li[1], Zhigang Jia[1], yifan wang[1], Xiaoyi Li[1], Xiaomin Ren[1], Yongqing Huang[1], Xiaofeng Duan[1]; [1]BUPT, China. We have successfully fabricated InGaAs/GaAs microtubes on Si(100). Optical properties has been measured by micro-photoluminescence spectra at 80K, and the PL peak position of the microtube shows a little redshift (~3nm) relative to that of the as grown structure.

AF4A.4 • 17:00
Study of Plasmonic Analogue of EIT Effect based on Hybrid Plasmonic Waveguide System, Xu Sun[1], Fei Lou[1], Lech Wosinski[1]; [1]Royal Inst. of Technology, Sweden. Electromagnetically induced transparency (EIT) effect has been theoretically demonstrated using hybrid plasmonic waveguide system, composed of two stripe-shaped resonators in form of resonant stubs with different lengths located on each side of the HP waveguide.

AF4A.5 • 17:15
A Stretched-rod Nanobeam Cavity with High Optomechanical Coupling Rate, Zhilei Huang[1], Kaiyu Cui[1], Yongzhuo Li[1], Shichao Chen[1], Xue Feng[1], Yidong Huang[1]; [1]Electronic Engineering, Tsinghua Univ., China. An optomechanical nanobeam cavity with high coupling rate of 2.84 MHz is proposed by enhancing moving boundaries effect with a stretched-rod, which shows possibilities to increase the optomechanical coupling rate effectively.

AF4A.6 • 17:30
A Novel Real-time System for Polarization Detection and Analysis in Optical Fiber Communications, Ye Yu[1], Yangan Zhang[1], Xueguang Yuan[1], qingxiang hou[1]; [1]State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecomm, China. A labVIEW-based real-time measurement system for polarization detection and analysis was developed. Measurement error less than 2% and user-friendly interface prove that this system is a high accurate and functional tool.

AF4A.7 • 17:45
Photonic Radio-Frequency Phase Detector based on Radio-Frequency to Intermediate-Frequency Phase Mapping, Dongning Sun[1], Yi Dong[1], Siwei Wang[1], Zongyang Xia[1], Weilin Xie[1], Hongxiao Shi[1], Lilin Yi[1], Weisheng Hu[1]; [1]State Key Laboratory of Advanced Optical Communication Systems and Networks, Shanghai Jiao Tong Univ., China. A photonic radio-frequency phase detector based on radio-frequency (RF) to intermediate-frequency mapping is demonstrated, and the theoretical principle of the design is explained.

Room 3----------Track 1----------Fri.08:00—10:00
AF1B • Active Components
Presider: Yu Yu, Wuhan National Lab for Optoelectronics, China

AF1B.1 • 08:00
Intermixing Technologies for Small VCSELs and Fine Oxidation Structures(Invited Paper), Tomoyuki Miyamoto[1]; [1]Precision and Intelligence Lab, Tokyo Inst. of Technology, Japan. The applications of the hetero-interface intermixing technologies are reported. The quantum well intermixing is attractive for carrier confinement of the VCSEL. The intermixing of the AlAs layer is useful for control of the oxidation rate.

AF1B.2 • 08:30
Widely Tunable Semiconductor Laser Based on Double Half-Wave-Coupled Rectangular Ring Resonators, Lin Wu[1], Zhipeng Hu[1], Jian-Jun Meng[1], Jian-Jun He[1]; [1]Zhejiang Univ., China. A widely tunable semiconductor laser based on double half-wave-coupled rectangular ring resonators is designed and simulated. By employing the Vernier effect between the rectangular ring resonators, a large tuning range of 40nm is achieved, while the corresponding threshold gain difference and the SMSR is 4.5cm-1 and 46dB, respectively.

AF1B.3 • 08:45
Lateral cavity surface emitting laser based on high contrast grating, Wan-hua Zheng[1], Aiyi Qi[1], Yufei Wang[1], Hongwei Qu[1], Lei Liu[1], Chuanlong Ma[1], Yejin Zhang[1]; [1]Chinese Acad Sci Inst of Semiconductor, China. We present a single mode lateral cavity surface emitting laser based on high contrast grating. Electrically driven high output power of 3.94 mW and divergence angle of 7.4° lasing action are obtained at room temperature.

AF1B.4 • 09:00
Composition tuning bandgap of CdSxSe1-x colloidal semiconductor Quantum dots, Yun Xing2, Jia Song[2], Yuehua An[1,2], Peigang Li[1,2], Zhenping Wu[1,3], Weihua TANG[1,3], Jinghua Xiao[1,3]; [1]School of Science, beijing Univ. of posts and communic, China; [2]Department of Physics, zhejiang Sci-Tech Univ., China; [3]State Key Laboratory of Information Photonics & Optical Communication, Beijing Univ. of posts and Telecommunications, China. Colloid chemistry method was used to to synthesis CdSxSe1-x quantum dots with different contents. The results show that the synthesized QDs is zinc blende structure, the particle size is about 3~4 nm in diameter, the band gap was tuned from 1.72 to 2.42 eV by increasing the content of S.

AF1B.5 • 09:15
Improving the Luminescence Properties of Multi-stacked InAs/GaAs Quantum Dots by GaAsP Strain-reducing Layer, Zhiqiang Bian1, Qi Wang[1], Zhigang Jia[1], Pan Zhihong[1], Xiaomin Ren[1], Shiwei Cai[1], Jun Wang[1], Yongqing Huang[1]; [1]State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. The growth of InAs/GaAs quantum dots was investigated with GaAsP as a strain-reducing layer. Room-temperature photoluminescence demonstrated the improvement in luminescence properties for multi-stacked QDs with a linewidth of 60emV at 1.1μm wavelength.

AF1B.6 • 09:30
Mutual Locking between Integrated Semiconductor Lasers for the Generation of Tunable and Narrow Linewidth RF Signal, Ning Zhang[1,2], Xinlun Cai[2], Siyuan Yu[1,2]; [1]Department of Electrical and Electronic Engineering, Univ. of Bristol, UK; [2]School of Physical Science and Engineering Technologies, Sun Yat-sen Univ., China. An integrated optical device consisting of two DFB lasers injecting into one SRL has been investigated numerically. The three lasers achieve mutual locking and beating between the output generates tunable and narrow linewidth RF signal.

AF1B.7 • 09:45
Active Fabry-Perot Resonator for Photonic Temporal Integrator, Ningbo Huang[1], Ninghua Zhu[1], Reza Ashrafi[2], Xin Wang[1], Wei Li[1], Lixian Wang[1], Jose Azana[2], Ming Li[1]; [1]Chinese Academy of Sciences, China; [2]INRS-EMT, Canada. A photonic temporal integrator based on an active Fabry-Perot cavity is proposed and investigated. Key feature of this device is that the integration time window is tunable and could be extended to be infinitely long.

Coffee Break ----------10:00—10:30
AF2B Post-Deadline 10:30—12:30
Lunch Break ----------12:30—13:45

Room 3----------Track 1----------Fri.13:45—15:30
AF3B • Infrared Devices
Presider: Yong-Zhen Huang, Chinese Academy of Sciences, China

AF3B.1 • 13:45
Bands Structure and Magneto-Transport Properties in n Type Narrow Gap Semimetallic, Two-Dimensional and Far-Infrared Detector HgTe/CdTe Superlattice, Aomar Idbaha[1], Abdelhakim Nafidi[1], Bernabé M. Soucase[2], Migue[1] Alfonso Mollar García[2]; [1]Physics, Faculty of Sciences, Univ. Ibn Zohr, Morocco; [2]Physics, Laboratory of Optoelectronics, Universitat Politècnica de Valencia, Spain. We report here correlations between high magnetic field magneto-transport properties and bands structure in HgTe (d1=40 nm)/CdTe(d2=15 nm) superlattice. Our study shows that this sample is a narrow gap semimetallic, two-dimensional and far-infrared detector.

AF3B.2 • 14:00
Temperature Induction of a resonant state and transition semiconductor-Semimetal in Bands Structure and Electronic Transport in HgTe/CdTe Nanostructure Superlattice, Aomar Idbaha[1], Abdelhakim Nafidi[1], Bernabé M. Soucase[2], Migue[1] Alfonso Mollar García[2]; 1Physics, LPMC Nano Re, Univ. Ibn Zohr, Morocco; [2]physics, Laboratory of Optoelectronics, Universitat Politècnica de Valencia, Spain. We report here manifestation of resonant state and transition semiconductor-semimetal inducted by temperature in magneto-transport properties and bands structure in HgTe (d1=40 nm)/CdTe(d2=15 nm) superlattice. This sample is narrow gap semimetallic, two-dimensional and far-infrared detector.

AF3B.3 • 14:15
GeSn near infrared photodetectors, Buwen Cheng1, Dongliang Zhang[1], Shaojian Su[2], Xu Zhang[1], Chunlai Xue[1], Chuanbo Li[1], Guangze Zhang[1], Qiming Wang[1]; [1]State Key Lab on Integrated Optoelectronics, Inst. of Semiconductors, CAS, China; [2]College of Information Science and Engineering, Huaqiao Univ., China. GeSn p-i-n photodetectors grown on Si and Ge substrates by molecular beam epitaxy were fabricated. The photodetector on Ge has a low dark current density of 6.1mA/cm2 and extends the operating wavelength to about 2 um.

AF3B.4 • 14:45
A Filterless Optical Millimeter-Wave Generation based on Frequency 16-tupling, Xiaogang Chen[1], Zhaoxu Liu[1], Chao Jiang[1], Dexiu Huang[2]; [1]College of Science, China Three Gorges Univ., China; [2]Wuhan National Laboratory for Optoelectronics (WNLO),Huazhong Univ. of Sci & Tech, China. A novel scheme is proposed for frequency 16-tupling millimeter-wave generation based on two cascaded integrated dual-parallel Mach-Zehnder modulators (MZM) without optical filtering. Moreover, impact of MZM bias drift on optical mm-wave generation is analyzed.

AF3B.5 • 15:00
Noval dilute bismides for IR optoelectronics applications(Invited Paper), Shumin Wang[1],[2], Yuxin Song[1], Kai Wang[1], Yi Gu[1], Huan Zhao[2], Xiren Chen3, Hong Ye[2], Haifei Zhou[1], Chuanzheng Kang[1], Yaoyao Li[1], Cunfang Cao[1], Liyao Zhang[1], Jun Shao3, Qian Gong[1], Yonggang Zhang[1]; [1]Department of Microtechnology and Nanoscience, Chalmers Univ. of Technology, Sweden; [2]State Key Laboratory of Functional Materials for Informatics, Shanghai Inst. of Microsystem and Information Technology, Chinese Academy of Sciences, China; [3]Shanghai Inst. of Technical Physics, Chinese Academy of Sciences, China. We review recent progresses on growth and characterizations of novel bismides GaSbBi, InSbBi, InAsBi, InPBi and InGaAsBi by molecular beam epitaxy. These exotic materials reveal interesting physical properties that are attractive for IR optoelectronics applications.

Coffee Break ----------15:30—16:00

Room 3----------Track 1---------Fri.16:00—18:00
AF4B • Photonic Integration II
Presider: Bing Xiong, Tsinghua Univ., China

AF4B.1 • 16:00
Planar waveguide grating devices(Invited Paper), Jian-Jun He[1]; [1]Department of Optical Engineering, Zhejiang Univ., China. We present our recent work on arrayed waveguide grating (AWG) and echelle diffraction grating (EDG) devices for optical communications, including polarization-dispersion compensated silicon-on-insulator AWGs with angled star-couplers and uniform-loss cyclic wavelength routers.

AF4B.2 • 16:30
Design and Simulation of an N×N Echelle Grating Wavelength Router, Ge Mu[1], Lin Wu[1], Yingchen Wu[1], Jian-Jun He[1]; [1]Zhejiang Univ., China. we report the simulation results of a 4×4 wavelength router based on echelle grating with a cyclic spectral response. The device has a small size of 1.3mm×1.2mm for a channel spacing of 400GHz at 1550nm wavelength band.

AF4B.3 • 16:45
4 x 25 GB/s Receiver Photonic Integrated Circuits in InP for Applications in Data Center Interconnects, Fang Wu[1]; [1], Canada. 4x25Gb/s space and wavelength division multiplexing receiver chips, based on a multi-guide vertical integration platform in InP, are presented. With the state-of-the-art performance and smallest footptrint size in class, they are well suited for use in 100Gb/s fiber-optics interconnects.

AF4B.4 • 17:00
Integrated photonic orbital angular momentum devices: progress, potential applications, and future issues(Invited Paper), Siyuan Yu[1],[2], Xinlun Cai[1]; [1]Photonic Research Group, Univ. of Bristol, UK; [2]State Key Laboratory of Optoelectronic Materials and Technologies, School of Physics and Engineering, Sun Yat-Sen Univ., China. A comprehensive review will be given over the recent developments in integrated photonic orbital angular momentum devices. Challenges posed by various applications will be discussed in order to derive a technological development roadmap.

AF4B.5 • 17:30
Low Cost, Precision, Passive-Alignment Technique for 100 Gb/s DP-QPSK receiver, Lingjie Wang[1],[2], Yanli Zhao[2], Wen Liu[2]; 1Hunan Science and Technology Economy Trade Vocation College, China; [2]Huazhong Univ. of Science and Technology, China. We propose and develop a passive alignment technique of 4 output waveguides of PLC-based 90° OH and a 1×4 PD array. This alignment technique only uses an infrared CCD camera and an infrared light.

AF4B.6 • 17:45
Low Noise and Wideband Optical Frequency Comb Generation Based on an Optoelectronic Oscillator, Xiaopeng Xie[1], TAO SUN[1], Cheng Zhang[1], Huanfa Peng[1], Peng Guo[1], Lixin Zhu[1], Weiwei Hu[1], Zhangyuan Chen[1]; [1]Peking Univ., China. We propose a scheme to generate wideband optical frequency comb and low phase noise microwave signal simultaneously by incorporating an optical frequency comb generator in an optoelectronic oscillator. 12.5 and 25 GHz combs are generated and phase noise are investigated.

Room 4----------Track 2----------Fri.08:00—10:00
AF1C • Recent Status of Fiber Lasers
Presider: Kyunghwan Oh, Yonsei Univ., Korea, Republic of

AF1C.1 • 08:00
High Power Pulsed Fiber Lasers(Invited Paper), Pu Wang[1]; [1]Beijing Univ. of Technology, China

AF1C.2 • 08:30
Dark states ultra-long fiber laser (UFL) for practically secure key distribution(Invited Paper), Jacob Scheuer[1], Omer Kotlicki[1]; [1]Tel-Aviv Univ., Israel. We demonstrate a new UFL key distribution system which quenches lasing process in its secure states, providing enhanced security. Ranges of 500km with bit-rates of 0.5kbps are feasible. Spectral/temporal attack strategies are analyzed in details.

AF1C.3 • 09:00
Phase-locked multicore fiber lasers for power and energy scaling(Invited Paper), Akira Shirakawa[1]; [1]Univ of Electro-Communications, Japan. Multicore fiber is a promising architecture for power scaling of fiber lasers by coherent beam combining. We are investigating multicore photonic-crystal fiber lasers for efficient, all-fiber phase locking. The recent our activities will be reviewed.

AF1C.4 • 09:30
Applications of ultralong cavity and random-distributed feedback Raman fiber Lasers: a review(Invited Paper), Juan Diego Ania Castañon[1]; [1]Instituto de Óptica, CSIC, Spain. Ultralong Raman fiber lasers have shown their potential in a number of applications, from high-speed optical communications to optical fiber sensing. In this talk we will review the basic concepts behind ultralong fiber lasers and explore some of their current and future areas of exploitation.

Coffee Break ----------10:00—10:30
AF2C Post-Deadline 10:30—12:30
Lunch Break ----------12:30—13:45

Room 4----------Track 2---------Fri.13:45—15:00
AF3C•Fiber Based Transmission and Signal Processing
Presider: Yong Liu, Univ. of Electronic Science and Technology of China, China

AF3C.1 • 13:45
Chromatic Dispersion Compensated 25Gb/s Multimode VCSEL Transmission Assisted with a MMF Jumper(Invited Paper), Xin Chen[1], Ming-Jun Li[1], Jason E. Hurley[1], Dale R. Powers[1]; [1]Science and Technology Division, Corning Incorporated, USA. We propose a scheme of using special MMF jumper to provide desired DMD characteristics and chromatic dispersion compensation for a MMF link. 25 Gb/s VCSEL transmission results and additional estimate of jumper length are presented.

AF3C.2 • 14:15
Cost-Efficient SOI Hybrid Coherent Receiver, Sascha Fedderwitz[1], Tino Brast[1], Karsten Voigt[2], Giovani Preve[3], John Lazarou[4], Stefanos Dris[4], Paraskevas Bakopoulos[4], Hercules Avramopoulos4, Lars Zimmermann[5], Andreas Steffan1; [1]u[1]t Photonics AG, Germany; [1]TU Berlin, Germany; [3]Universitat Politécnica de Valencia, Spain; [4]National Tech. Univ. of Athens, Greece; [5]IHP, Germany. A coherent receiver comprising optical SOI based 90°-hybrids with hybrid integrated photodetector arrays is presented. It is demonstrated that the coherent receiver is suitable for reception of 22Gbaud dual-polarization QPSK signals over standard single-mode fiber.

AF3C.3 • 14:30
Novel scheme photonic millimeter-wave signal generation using four-wave mixing in SOA and RSOA-based Colorless-ONU with FBG, Zhuo Liu[1], Min Zhang[1], Yueying Zhan[1], Mingtao Liu[1], Xue Chen[1]; [1]Beijing Univ of Posts & Telecom, China. A new bidirectional WDM-RoF with colorless ONU system based on RSOA is proposed and demonstrated. The 2.5Gb/s 60 GHz wireless signal, 2.5Gb/s wired signal and upstream signal are transmitted 20km fiber successfully.

AF3C.4 • 14:45
Performance Comparison of Microwave Photonic Filters Based on Coherent and Incoherent Structures, yi wang[1], Xiaofeng Jin[1], Xianmin Zhang[1], Shilie Zheng[1], Hao Chi[1]; [1]Department of Information Science & Electronic Engineering, Zhejiang Univ., China. Two different microwave photonic filters are proposed in this paper, with one working in the incoherent regime and the other in the coherent regime. Their performance is then compared theoretically and experimentally.

Coffee Break ----------15:30—16:00

Room 4----------Track 4---------Fri.16:00—18:00
AF4G • Elastic Optical Networks
Presider: Lei Guo, Northeastern Univ., China

AF4G.1 • 16:00
On Minimization of the Spectrum Usage in Elastic Optical Networks with Joint Unicast and Anycast Traffic (Invited Paper), Krzysztof Walkowiak[1], Roza Goscien[1], Miroslaw Klinkowski[2]; [1]Systems and Computer Networks, Wroclaw Univ. of Technology, Poland; [2]National Inst. of Telecommunications, Poland. The paper proposes a Tabu Search algorithm for Routing and Spectrum Allocation with joint unicast and anycast traffic in Elastic Optical Networks (EONs). Numerical experiments are presented to verify the algorithm and show main features of EONs with anycast traffic.

AF4G.2 • 16:30
Addressing Spectrum Fragmentation in Flexible Grid Optical Networks (Invited Paper), Xi Wang1, Qiong Zhang[1], Inwoong Kim[1], Paparao Palacharla[1], Kyosuke Sone[2], Yasuhiko Aoki[3]; [1]Fujitsu Laboratories of America, USA; [2]Fujitsu Laboratories, Ltd., Japan; [3]Fujitsu Limited, Japan. Spectrum fragmentation is an intrinsic issue in flexible grid optical networks and requires systematic countermeasures. This paper describes measures for fragmentation minimization, metrics for fragmentation assessment, and techniques for hitless defragmentation.

AF4G.3 • 17:00
Routing and Spectrum Assignment for Cube-based Intra-Datacenter Elastic Optical Networks, Gongxi Wan[1], Gangxiang Shen[1], Limei Peng[1], Chunming Qiao[2]; [1]Soochow Univ., China; [2]Univ. at Buffalo, USA. We propose to apply the cube-based elastic optical network to the intra-datacenter network. Its related routing and spectrum assignment (RSA) problem is studied, in which a new load-balanced route selection strategy is proposed.

AF4G.4 • 17:15
A Fairness-Improving Spectrum Allocation Scheme in Flexible Optical Networks, Yan Wang[1], Songwei Ma[1], Bingli Guo[1], Xin Chen[1], Juhao Li[1], Zhangyuan Chen[1], Yongqi He[1]; [1]Peking Univ., China. Service fairness of traffic with different granularities in flexible optical networks is addressed, and correspondingly a spectrum allocation scheme is proposed. Simulation results imply that it achieves service fairness without significant overall blocking performance changes.

AF4G.5 • 17:30
Optimal Planning for Electronic Traffic Grooming in IP over Elastic Optical Networks, Anliang Cai[1], Gangxiang Shen[1], Limei Peng[1]; [1]School of Electronic and Information Engineering, Soochow Univ., China. We develop a mixed integer linear programming (MILP) model to investigate the benefit of electronic traffic grooming in IP over elastic optical networks. Numerical results show that traffic grooming helps improve the network throughput.

AF4G.6 • 17:45
A Novel Blocking Probability Balance Scheme to Improve Network Performance for SLICE Network, Jinyu Wang[1]; [1]Beijing Key Laboratory of Network System Architecture and Convergence, Beijing Univ. of Posts and Telecommunications, China. We proposed a novel blocking probability (BP) balance scheme called BPB to improve SLICE network performance under dynamic traffic, by not only considering network's average BP value but also balancing each node's individual BP value.

Room 5----------Track 2---------Fri.08:00—10:00
AF1D • Fiber Optics for Monitoring and Transmission
Presider: Zuyuan He, Shanghai Jiao Tong Univ., China

AF1D.1 • 08:00
Simultaneous measurement of temperature and strain by using on a linearly chirped fiber Bragg grating with a slanted reflection spectrum, Hongpu Li[1], Peng Wang[1]; [1]Shizuoka Univ., Japan. A novel power-interrogated FBG sensor that allows for the simultaneous measurement of temperature and strain is proposed and experimentally demonstrated. The FBG proposed here is simultaneously used as both the sensing and the interrogating element.

AF1D.2 • 08:15
Cascading Filters Allying with the Residual Perturbation Noise Compensator for Compensating the Fiber Dispersion and Nonlinear Effect, Xing Fan[1], Rui Zhu[1], Dahai Han[1]; [1]State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. Cascading of a CD-FIR filter, a Volterra series adaptive filter and an adaptive RP-noise compensator is suggested in this paper to mitigate a fiber's a combination of nonlinear and dispersion.

AF1D.3 • 08:30
Photonic Crystal Fibres for Pressure Measurement(Invited Paper), Hwa Yaw Tam[1]; [1]Photonics Research Centre, Electrical Engineering Department, Hong Kong Polytechnic Univ., Hong Kong. Novel photonic crystal fibres designed for the realization of fibre-optic sensors to measure pressure in harsh environment will be discussed. Experimental results using a supper-lattice polarization-maintaining PCF and a twin-core PCF will be presented.

AF1D.4 • 09:00
Low-loss Bending-insensitive Single-mode Optical Fiber for High Speed Communication System, Wei Chen[1], Shiyu Li[1], Qi Mo[1], Wenyong Luo[1], Dongxiang Wang[1], Qiong Lei[1]; [1]FiberHome Telecommunication Technologies CO. LTD,State Key Laboratory of Optical Communication Technologies and Networks,, China. A novel kind of low-loss single-mode optical fiber was designed and fabricated, which has superior anti-bending performance and good compatibility with the present optical fibers of constructed networks.

AF1D.5 • 09:15
Investigation on the Wavelength Dependent Crosstalk of Multicore Fibers, Li Borui[1], Fu Songnian[1], Tang Ming[1], Feng H. Wei[2], Jun W. Tong[2], Shum Ping[1,3], Liu Deming[1]; [1]Huazhong Univ. of Science and Technology, China; [2]State Key Laboratory of Optical Fiber and Cable Manufacture Technology, Yangtze Optical Fibre and Cable Company Ltd, China; [3]School of EEE, Singapore. We investigate the wavelength dependent crosstalk of MCF. After fabrication and characterization, we find that the crosstalk increases with the operation wavelength at rate of 0.1dB/nm for both homogeneous MCF and quasi-homogeneous MCF.

AF1D.6 • 09:30
Multicore EDFA for Space Division Multiplexing by Utilizing Cladding-pumped Technology(Invited Paper), Yukihiro Tsuchida[1], Hiroshi Matsuura[2], Masateru Tadakuma[1], Ryuichi Sugizaki[1]; [1]FITEL Photonics Laboratory, Furukawa Electric Co., Ltd., Japan; [2]Tohoku Gakuin Univ., Japan. Amplification characteristics of double-clad multicore EDFA are reviewed. Cladding-pumping configuration, which has possibilities for

reducing power consumption and downsizing, is demonstrated.

Coffee Break ----------10:00—10:30
AF2D Post-Deadline 10:30—12:30
Lunch Break ----------12:30—13:45

Room 10----------Track 3----------Fri.08:00—10:00
AF1E • Direct Detected OFDM
Presider: Liangchuan Li, Huawei Technologies

AF1E.1 • 08:00
Improving Spectral Efficiency and Receiving Sensitivity in a Direct-Detected OFDM System(Invited Paper), Kaiming Feng[1,3], Wei-Reng Peng[2], Jhih-Heng Yan3, You-Wei Chen[3]; [1]Inst. of Communications Engineering, National Tsinghua Univ., Taiwan; [2]KDDI R&D Laboratories, Inc., Japan; [3]Inst. of Photonics Technologies, National Tsing Hua Univ., Taiwan. In this paper, we'll review some latest results in improving the spectral efficiency and receiving sensitivity in both the electronic and optical domains of a direct-detected optical OFDM signal.

AF1E.2 • 08:30
Training Symbol Assisted Signal-to-Signal Beat Noise Cancellation for Direct Detected Optical OFDM Systems, Xi Chen[1], Di Che[1], An Li[1], Jiayuan He[1], Yifei Wang[1], Qian Hu[1], William Shieh[1]; [1]Univ. of Melbourne, Australia. We propose an algorithm for signal-to-signal-beat-noise (SSBN) cancellation in direct detection optical OFDM systems. Experimental results show that by using our proposed algorithm, the OSNR sensitivity can be improved by more than 8 dB.

AF1E.3 • 08:45
Overcoming MZM nonlinearity with null shifting technique in direct detection optical OFDM system, hongxian chen[1], Jing He[1], Jin Tang[1], Ming Chen[1], Jiangnan Xiao[1], Lin Chen[1]; [1]Key Laboratory for Micro/Nano Opto-Electronic Devices of Ministry of Education, School of Information Science and Engineering, Hunan Univ., China. Reducing the distortion to signal ratio (DSR) of MZM with null shifting scheme to overcome nonlinearity is proposed in DD-OOFDM system. Experimental results demonstrate that the system performance is improved obviously.

AF1E.4 • 09:00
Peak-to-Average Power Ratio reduction technique using a novel clipping and frequency domain filtering based on DCT/IDCT for IM/DD Optical OFDM systems with Fiber Bragg Grating, Mangone FALL[1], Jin Tang[1], Lin Chen[1]; [1]Hunan Univ., China. We propose a novel clipping and filtering based on DCT/IDCT in IM/DD optical OFDM with fiber Bragg grating. The experimental results show that receiver sensitivity can be improved by more than 2dB.

AF1E.5 • 09:15
A Novel Scheme of 100Gbps IM-DD-VSB Optical OFDM System, Cheng Ju[1], Xue Chen[1], Zhiguo Zhang[1], Pengfei Yang[1], Shi Hu[1]; [1]BUPT, China. We propose a novel 100Gbps intensity-modulated and direct-detected vestigial-sideband optical OFDM scheme for low cost next generation metro transport networks, and have experimentally demonstrated this scheme feasible by a 8Gbaud signal over 67.5km SMF transmission.

AF1E.6 • 09:30
Signal-to-Signal Beat Noise Cancellation for Direct Detection Optical OFDM System Based on Block-wise Signal Phase Switching, An Li[1], Di Che[1], Xi Chen[1], Qian Hu[1], Yifei Wang[1], William Shieh[1]; [1]The Univ. of Melbourne, Australia. We propose two novel algorithms for cancellation of signal-to-signal beat noise in direct-detection optical orthogonal frequency-division multiplexing (OFDM) systems based on block-wise signal-phase-switching (SPS). The effectiveness and tolerance of the proposed algorithms are analyzed.

AF1E.7 • 09:45
Real-time Bias Control for Optical OFDM Transmitter, Xu Zhang[c], Yuanxiang Wang[1], Xiao Xiao[1], Cai Li[1], Chao Li[1], Zhaohui Li[2], Qi Yang[1], Shaohua Yu[1]; [1]State Key Laboratory of Optical Communication Technologies and Networks,, Wuhan Research Inst. of Post & Telecommunication, China; [2]Inst. of Photonics Technology,, Jinan Univ., China. A real-time auto bias control circuit for the optical OFDM I/Q modulator with bias dithering is implemented. The Q factor is stabilized at ~24 dB during the 36 hours measurement with negligible OSNR penalty.

Coffee Break ---------- 10:00—10:30

Room 10----------Track 3----------Fri.10:30—12:30
AF2E • Advanced High Capacity Transmission
Presider: Chao Lu, Hong Kong Polytechnic University, China

AF2E.1 •10:30
Multi-Dimensional Modulation Formats for Adaptive Optical Transmission(Invited Paper), Michael H. Eiselt[1], Annika Dochhan[1], Helmut Griesser[1]; [1]ADVA Optical Networking AG, Germany. We review several multi-dimensional modulation formats and present experimental results for a 3-dimensional simplex format, yielding a better OSNR tolerance than DP-BPSK.

AF2E..2 • 11:00
Terabit Superchannel Optical Transmission Based on Low-Baud-Rate Subcarrier Nyquist WDM(Invited Paper), Yanjun Zhu[1]; [1]Huawei Technologies USA, USA. We discuss terabit superchannel transmission exploring low-baud-rate Nyquist pulse shaped subcarriers. This technique can enable the transmission with much smaller propagation penalty, while having the potential of significant reduction of power consumption.

AF2E..3 •11:30
Quasi Real-Time 230-Gbit/s Coherent Transmission Field Trial over 820 km SSMF Using 57.5-Gbaud Dual-Polarization QPSK, Tianhua Xu[1,2], Jie Li[2], Anders Djupsjöbacka[2], Richard Schatz[1], Gunnar Jacobsen[2], Sergei Popov[1]; [1]School of Information and Communication Technology, Royal Inst. of Technology, Sweden; [2]Networking and Transmission Laboratory, Acreo Swedish ICT AB, Sweden. We demonstrate [2]30-Gbit/s (57.5-Gbaud) polarization-multiplexed QPSK coherent transmission over 820 km field-installed SSMF with quasi real-time DSP, without resorting to ETDM. BER performance well below FEC error-free threshold (2×10^-3) at 2^31-1 PRBS length was achieved.

AF2E..4 • 11:45
First Experimental Demonstration of Real-Time End-to-End Multi-Band 25.25Gb/s Optical OFDM Transmission over 300m OM2 MMFs Employing 4GS/s DACs/ADCs, Roger P. Giddings[1], Emilio Hugues-Salas[1], Qianwu W. Zhang[2,1], Jianming M. Tang[1]; [1]School of Electronic Engineering, Bangor Univ., UK; [2]Key Laboratory of Specialty Fiber Optics and Optical Access Networks, Shanghai Univ., China. Record-high real-time 25.25Gb/s OOFDM transmissions over 300m MMFs are achieved using a baseband and IQ modulated passband. The adaptive bit/power-loaded, independently power-optimised sub-bands are combined to intensity modulate an EML. All sub-bands exhibit similar performance.

AF2E..5 • 12:00
Performance Sensitivity of Dispersion Compensation-free All-optical OFDM Transmission Systems to Electro-absorption Modulator-based Sampling Gate Width, Hongbo Zhang[1]; [1]UESTC, China. Numerical simulations are undertaken to investigate the impact of electro-absorption modulator-based sampling gate width on the performance sensitivity of dispersion compensation-free AOOFDM systems. Results show that CD significantly increases the sensitivity to the gate width.

Lunch Break ---------- 12:30—13:45

Room 10----------Track 3----------Fri.13:45—15:30
AF3D • Technologies for Future Transmission Systems
Presider: Henning Buelow, Alcatel-Lucent, USA

AF3D.1 • 13:45
The Nonlinear Effects in Coherent Optical Transmission System (Invited Paper), Yaojun Qiao[1], Yanfei Xu[1], Zhe Wang[1], Wenhui Qian[1], Hongzhan Liu[1], Yuefeng Ji[1]; [1]Beijing Univ. of Posts and Telecommunications, China. A detailed research description about the fiber nonlinearity which includes the Gordon and Mollenauer effect, the cross phase modulation and the statistical characterization of nonlinear noise from single carrier to multi-carrier is analyzed.

AF3D.2 • 14:15
Crosstalk-managed multicore fiber transmission with the capacity beyond 1 Pbit/s (Invited Paper), Yutaka Miyamoto[1]; [1]NTT network innovation laboratories, Japan. This paper reviews the recent progress in high-capacity optical transport system using crosstalk-managed space division multiplexing based on multi core fiber. The advantages and issues of the capacity scaling beyond 1 Pbit/s are discussed.

AF3D.3 • 14:45
Analysis of the influence of laser linewidth on RFS-based Optical Comb Generation, Jianrui Li[1], Lixia Xi[1], Jiachuan Lin[1], Xia Zhang[1,2], Zhang Xiaoguang[1], Hongqiao Cheng[1]; [1]Beijing Univ. of Posts and Telecommunications, China; [2]Liaocheng Univ., China. The laser linewidth influence on tone-to-noise ratio(TNR) and flatness of optical comb generated by recirculating frequency shifter(RFS) are theoretical analyzed and experimental demonstrated. The results show optical comb performance will improve using narrower laser linewidth.

AF3D.4 • 15:00
Coherent Wavelength Conversion Based on Cascaded SSB Modulator and Semiconductor Optical Amplifier, Jianping Li[1], Tao Gui[1], Yuan Bao[1], Xinhuan Feng[1], Zhaohui Li[1], Zanhong Wu[2]; [1]Inst. of Photonics Technology, Jinan Univ., China; [2]Guangdong Power Diapatching and Controlling Center, China. Coherent wavelength conversion for 40-Gb/s 4-QAM optical OFDM signal based on cascaded single-side-band modulator and semiconductor optical amplifier has been demonstrated. Simulation results show that the error-free wavelength conversion can be achieved with optimized parameters.

AF3D.5 • 15:15
Beating 3-dB Loss Limit of Direct Reconciliation Continuous-variable Quantum Key Distribution by Using a Noiseless Linear Amplifier, Yichen Zhang[1], Mingyang Xu[1], Shulong Han[1], Tianyi Wang[1], Song Yu[1], Wanyi Gu[1]; [1]The State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. We propose a method to improve the secret key rate and maximum transmission distance of direct reconciliation continuous variable quantum key distribution protocol by inserting a noiseless linear amplifier at the output of quantum channel.

Coffee Break ---------- 15:30—16:00

Room 10----------Track 3----------Fri.16:00—18:00
AF4C • Novel Techniques for Optical Transmission
Presider: Alan Pak Tao Lau, The Hong Kong Polytechnic Univ., China

AF4C.1 • 16:00
Experimental Analysis of Transmission and Soft Decoding of Optimized 4D Constellations (Invited Paper), Henning Buelow[1], Xiaofeng Lu[1,2], Laurent Schmalen[1]; [1]Bell Labs, Alcatel-Lucent, Germany; 2LHFT, MAOT, Univ. Erlangen, Germany. Different 4D constellation alternatives to PM-8QAM were experimentally investigated exhibiting up to 1-dB improvement at 5E-3 SER. Iterative decoding of LDPC coded 4D constellation POLQAM (6PolSK-QPSK) provided up 4.8-dB gain (3.8E-3, 30-percent overhead).

AF4C.2 • 16:30
Experimental Demonstration of a Single Channel 44.7 Gb/s Coherent Optical Dual-polarization 256-QAM OFDM/OQAM Transmission, Qi Yang[1]; [1]State Key Laboratory of Optical Comm., China. We experimentally demonstrate a dual-polarization coherent optical 256-QAM OFDM/OQAM transmission at back-to-back with the bit rate of 44.7Gb/s. The spectral efficiency is as high as 11.64 bit/s/Hz.

AF4C.3 • 16:45
Laser Phase Noise Mitigation Based On Adaptive MSDD in CO-OFDM Systems, wei liao[1], Jie Zhang[1], Guanjun Gao[1], Sai Chen[1], Lei Wang[2]; [1]Inst. of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China; [2]ZTE Corporations, China. We propose an adaptive MSDD method for compensating the laser phase noise in CO-OFDM systems. Simulation results show 0.8 dB improvement on OSNR penalty compared to CPE method for 40 Gb/s QPSK signals with FFT size of 128, in presence of 1 MHz laser widths.

AF4C.4 • 17:00
Mitigation of Noise Spread in CO-SCFDM System using Efficient Channel Estimation, Paikun Zhu[1], Juhao Li[1], Yuanxiang Chen[1], Yingying Xu[1], Bangjiang Lin[1], Bingli Guo[1], Yongqi He[1], Zhangyuan Chen[1]; [1]Peking Univ., China. We present ISFA, TDP and LMMSE-based channel estimation methods for noise spread mitigation in CO-SCFDM system. The simulation results show that LMMSE and TDP method achieves better linear and nonlinear noise tolerance.

AF4C.5 • 17:15
Multidimensional Optical Transmission, Ivan B. Djordjevic[1,2]; [1]ECE Dept., Univ. of Arizona, USA; 2Institut für Mikrowellentechnik und Photonik, TU Darmstadt, Germany. A multidimensional hybrid coded-modulation (CM) scheme enabling beyond 1 Pb/s serial optical transport is described. This CM scheme employs both electrical basis functions (orthogonal prolate spheroidal wave functions) and optical basis functions (spatial modes).

AF4C.6 • 17:30
Application of Beyond Bound Decoding for High Speed Optical Communications, Bomin Li[1], Knud J. Larsen[1], Juan Jose Vegas Olmos[1], Darko Zibar[1], Idelfonso Tafur Monroy[1]; [1]Technical Univ. of Denmark, Denmark. This paper studies the application of beyond bound decoding method for high speed optical communications. This hard-decision decoding method outperforms traditional minimum distance decoding method, with a total net coding gain of 10.36 dB.

Room 11----------Track 6----------Fri.08:00—10:00
AF1K • Novel Solar Technology II
Presider: Hilmi Demir, Nanyang Technological Univ., Singapore

AF1K.1 • 08:00
Ultrathin GaAs Solar Cells: From the Revised Detailed-balance and Semi-analytical Models to the Experimental Demonstration(Invited Paper), Yong-Hang Zhang[1]; [1]Arizona State Univ., USA. This talk will start with a revised detailed-balance model and a semi-analytical model for solar cells with finite thickness and then the demonstration of 300 nm thick GaAs solar cells with efficiencies over 19%.

AF1K.2 • 08:30
Plasmonic nanoparticles enhanced dye-sensitized solar cells, Fang Liu[1], Qi Xu[1], Yidong Huang[1]; [1]Tsinghua Univ., China. The plasmonic enhanced dye-sensitized-solar-cells (DSCs) with Au@PVP core-shell nano-spheres and Au-Ag alloy popcorn-shaped nanoparticles are investigated. It is demonstrated the efficiency of DSCs are increased by more than 30%.

AF1K.3 • 08:45
Dual-Cavity Resonance for Broadband and Wide angle Absorption Enhancement in Thin Film Solar Cells, Guangyao Su[1], Fangwang Gou[1], Chuanhong Liu[1], Zhaoyu Zhang[1]; [1]Peking Univ. Shenzhen Grad School, China. A grating structure based on cavity resonance was proposed to broadband light absorption enhancement in a-Si thin film solar cells. Dual-cavity resonance is excited for better light harvesting especially in long wavelength range.

AF1K.4 • 09:00
Materials and Devices of Wafer-bonded Four-junction Solar Cells(Invited Paper), Hui Yang[1]; [1]Suzhou Inst. of Nanotech and Nanobionics, CAS, China. In this talk, I will present the recent progress of wafer-bonded four-junction solar cells in SINANO, including material growth, novel device fabrication art and related device analysis.

Coffee Break ---------- 10:00—10:30

Room 11----------Track 3----------Fri.10:30—12:30
AF2F • PON Systems
Presider: Naoto Yoshimoto, NTT Yokosuka R&D Center, Japan

AF2F.1 • 10:30
Direct-Detection Optical OFDM Superchannel for LR-PON Using Comb Regeneration, rong hu[1], Qi Yang[1], Xiao Xiao[1], Ming Luo[1], Tao Gui[2], Zhaohui Li[2], Shanhong You[3]; 1State Key Laboratory of Optical Communication Technologies and Networks, China; [2]Inst. of Photonics Technology, Jinan Univ., China; [3]School of Electronic & Information Engineering, Soochow Univ., China. We propose and experimentally demonstrate a 105-Gb/s downstream transmission of DDO-OFDM superchannel for long reach PON by using comb regeneration, 100-km and 1:64 split is achieved with more than 5-dB power margin.

AF2F.2 • 10:45
Enabling low latency video distribution directly on the physical layer in passive optical networks, Lau Frejstrup Suhr[1], Juan Jose Vegas Olmos[1], Jose Estaran[1], Idelfonso Tafur Monroy[1]; [1]Department of Photonics Engineering, Technical Univ. of Denmark, Denmark. We report on a dual system in which one uncompressed HD video channel and a 10 Gbps duobinary signal are simultaneously transmitted using a single O-band VCSEL over different types and length of fibers

AF2F.3 • 11:00
Energy-efficient Selective Sampling Receiver for OFDMA-PON, Jun Li[1], Hao He[1], Meihua Bi[1], Yuehua Tian[1], Weisheng Hu[1]; [1]State Key Laboratory of Advanced Optical Communication Systems and Networks,Shanghai Jiao Tong Univ., China, China. We propose an energy-efficient selective sampling receiver, which only samples when the incoming data targets to the ONU. The experimental and numerical results indicate ~84% energy can be saved compared with traditional receivers in OFDMA-PON.

AF2F.4 • 11:15
Timing Advance Tracking for Coherent OFDMA-PON Upstream System, Christian Ruprecht[1], Kai Habel[2], Johannes von Hoyningen-Huene[1], Yingkan Chen3, Norbert Hanik[3], Werner Rosenkranz[1]; 1Univ. of Kiel, Germany; [2]Heinrich-Hertz Institut, Germany; [3]Technische Universität München, Germany. A synchronization algorithm for coherent OFDMA-PON

upstream is proposed. The feasibility of the tracking functionality is experimentally investigated. A differential delay of up to 37.6 ns was tracked and could be compensated at the ONU.

AF2F.5 • 11:30
Power Budget Improvements using Grouped Pilot Channel Estimation for OFDM-PON, Yuehua Tian[1], Meihua Bi[1], Hao He[1], Jun Li[1], Weisheng Hu[1]; [1]State key Laboratory of Advanced Optical Communication Systems and Networks Shanghai Jiao Tong Univ., China. We present an efficient grouped pilot channel estimation algorithm (GP-CE) in OFDM-PON system. Experimental results show that the proposed algorithm achieve as much ~4dB power budget improvements in comparison with other common algorithms.

AF2F.6 • 11:45
Dynamic Transmission Capacity Allocation for Sub-band-access OFDM-PON System, Qiang Guo[1], Cheng Lei[1], Minghua Chen[1], Hongwei Chen[1], Sigang Yang[1], Shizhong Xie[1]; [1]Department of Electronic Engineering, Tsinghua Univ., China. In this paper, a dynamic transmission capacity allocation scheme for sub-band-access OFDM-PON system is proposed for the time-varying transmission capacity requirements of the ONUs, based on which, a 10Gb/s OFDM-PON system is also successfully established.

AF2F.7 • 12:00
Fiber Fault Magnitude Recognition in Passive Optical Network(Invited Paper), Patryk J. Urban[1]; [1]Ericsson Research, Sweden. A method to interpret the trace from an Optical Time Domain Reflectometer is proposed. It is capable of retrieving a true loss event magnitude from a masked signature. It supports various architectures of Passive Optical Network.

Lunch Break ----------12:30—13:45

Room 18----------Track 3----------Fri.13:45—15:30
AF3E • Highly Efficient Transmission Technology
Presider: Ivan Djordjevic, Univ. of Arizona, USA

AF3E.1 • 13:45
Mitigation of EEPN in Long-Haul n-PSK Coherent Transmission System Using Modified Optical Pilot Carrier, Tianhua Xu[1,2], Gunnar Jacobsen[2], Sergei Popov[1], Jie Li[2], Sergey Sergeyev[3]; [1]School of Information and Communication Technology, Royal Inst. of Technology, Sweden; [2]Networking and Transmission Laboratory, Acreo Swedish ICT AB, Sweden; 3School of Engineering and Applied Science, Aston Univ., UK. We present the compensation of the equalization enhanced phase noise (EEPN) in the long-haul n-level phase shift keying (n-PSK) coherent optical transmission system, by employing a scheme of phase modulated optical pilot carrier.

AF3E.2 • 14:00
Signal Detection by Using M-ary Support Vector Machine for 16-QAM Coherent Optical Systems with Nonlinear Phase Noise, Minliang Li[1], Song Yu[1], Zhixiao Chen[1], Jie Yang[1], Yi Han[1], Wanyi Gu[1]; [1]State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. We introduce a nonlinear phase noise (NLPN) mitigation scheme based on the M-ary support vector machine (SVM) for 16-QAM coherent optical systems. This scheme can perform better than existing methods while no information of the link is required.

AF3E.3 • 14:15
Experimental Demonstration of 80.4-Gb/s Reduced-Guard-Interval CO-OFDM Transmission over 5440-km SSMF, Mingliang Deng[1], Yi Xingwen[1], Yu Zhenming[1], deng shanqin[1], Qiu Kun[1]; [1]UESTC, China. We analyze the overlap size for IBI free in RGI-CO-OFDM using OFDE and experimentally demonstrate an efficient 80.4-Gb/s dual-polarization RGI-CO-OFDM transmission over 5440-km SSMF. The OSNR penalty is 0.9 dB at BER of 3.8×10-3.

AF3E.4 • 14:30
Impact of SOA-Induced Nonlinear Impairments in CO-OFDM and Nyquist Sinc-Pulse Transmission, Mahmood Abdul Hameed[1], Maurice O'Sullivan[2], Rongqing Hui[1]; [1]Electrical Engineering & Computer Science, Univ. of Kansas, USA; [2]Ciena Inc., Canada. We present experimental comparison of performance degradations of 20 Gb/s coherent optical OFDM and single carrier Nyquist pulse modulated systems due to the nonlinearity of a semiconductor optical amplifier.

AF3E.5 • 14:45
Ultra High Spectral Efficiency and Ultra High Capacity Transmission over Transoceanic Distances Using Nyquist Spectral Shaping (Invited Paper), Georg Mohs[1]; [1]TE SubCom, USA. Using advanced digital signal processing, we shape the waveform of our transmission signal to achieve unique spectral properties and high receiver sensitivity. We transmit 30Tb/s capacity over 7,200km and 21Tb/s capacity over 10,300km.

Coffee Break ----------15:30—16:00

Room 18----------Track 3----------Fri.16:00—18:00
AF4D • Metro and Access Networks
Presider: Jinlong Wei, University of Cambridge

AF4D.1 • 16:00
100-Gb/s Directly Modulated VCSELs for Metro Networks (Invited Paper), Chongjin Xie[1], Po Dong[1]; [1]Alcatel-Lucent Bell Labs, USA. We discuss various 100-Gb/s technologies for metro networks, and show that directly modulated single-mode 1.5-µm VCSELs combined with digital coherent detection is a promising technology for 100-Gb/s metro applications.

AF4D.2 • 16:30
A Novel Approach for Transmission of 56 Gbit/s NRZ Signal in Access Network Using Spectrum Slicing Technique, Sandis Spolitis[1], Juan Jose Vegas Olmos[2], Vjaceslavs Bobrovs[1], Girts Ivanovs[1], Idelfonso Tafur Monroy[2]; [1]Inst. of Telecommunications, Riga Technical Univ., Latvia; [2]DTU Fotonik, Department of Photonics Engineering, Technical Univ. of Denmark, Denmark. We present the spectrum slicing and stitching concept for high-capacity low optics complexity optical access networks. Spectrum slicing and stitching of a 56 Gbit/s NRZ electrical signal is experimentally demonstrated for the first time

AF4D.3 • 16:45
10Gb/s Burst Mode Upstream OFDM PON, lei zhou[1,2], Naresh Chand[1,2]; [1]Advance Optical Access Network Research Center, Huawei Technologies, China; [2]Huawei US R&D Center, Armenia. we present the experimental data of 10Gb/s burst mode upstream OFDM PON using dynamic burst detection threshold algorithm and pre-emphasis burst by burst. A 26 dB optical power budget is obtained based on IM/DD and commercial available 2.5 GHz optics suggesting that OFDM could be a viable low cost option for 10 Gb/s upstream.

AF4D.4 • 17:00
Experimental Demonstration of Low-Cost S- / C-Band Broadcast-Overlay in WDM-PON, Stephan Pachnicke[1], Annika Dochhan[1], Markus Roppelt[1], Michael H. Eiselt[1], Joerg-Peter Elbers[2]; [1]ADVA Optical Networking SE, Germany; [2]ADVA Optical Networking SE, Germany. We present an experimental study on downstream broadcast overlay in WDM-PON systems using a low-cost reflective semiconductor optical amplifier (RSOA) as broadband signal source. Reach and achievable bitrate are compared for S- and C-Band overlay.

AF4D.5 • 17:15
Engineering Metro/Regional Networks for 400G, Richard Younce[1], Julia Larikova[1], Yajun Wang[1]; [1]Tellabs, USA. Architectural alternatives for metro/regional networks with 400G transmission based on 100, 200, and 400Gb/s superchannel transmission. Reach results are derived for practical metro/regional networks. The results provide clear direction for node and network architectural decisions.

AF4D.6 • 17:30
Upstream Transmission of 10-Gb/s NRZ Signal Generated by Bandwidth-Limited RSOA Utilizing Optical Equalizer, Danshi Wang[1], Min Zhang[1]; [1]Beijing Univ of Posts & Telecom, China. We experimentally demonstrate a 10-Gb/s operation of bandwidth-limited RSOA, where a fiber Bragg grating (FBG) is used as an optical equalizer to improve the RSOA modulation bandwidth from 1.2 GHz to 8 GHz and suppress the pattern dependence.

Room 12----------Track 6----------Fri.08:00—10:00
AF1L • Light Extraction Efficiency in LEDs
Presider: Nelson Tansu, Lehigh Univ., USA

AF1L.1 • 08:00
III-nitride Microdomes for High Efficiency Light-Emitting Diodes and Concentrator Photovoltaics(Invited Paper), Hongping Zhao[1], Lu Han[1], Tyler A. Piedimonte[1]; [1]Department of Electrical Engineering and Computer Science, Case Western Reserve Univ., USA. Uniform III-nitride microdomes were fabricated based on a low cost and scalable self-assembled approach. Our studies show that III-nitride microdomes significantly enhance light extraction efficiency in light-emitting diodes and light collection efficiency in solar cells.

AF1L.2 • 08:30
Far-field self-focusing and -defocusing radiation behaviors of the nanostructure LED due to negative refraction(Invited Paper), Yu-Feng Yin[1], Yen-Chen Lin[1], Jianjang Huang[1]; [1]Graduate Inst. of Photonics

and Optoelectronics, National Taiwan Univ., Taiwan. Negative refraction was demonstrated in the visible wavelength range by two-dimensional (2D) photonic crystals inscribed at the peripheral of a GaN-based light-emitting diode (LED). Self-collimated behaviors in TE polarization were observed in the far-field measurement.

AF1L.3 • 09:00
Numeric Study of Quasi-Random Roughened Surface on Light Extraction of GaN LED, yizhu lin[1], Duanyang Liu[1], Yinghua Du[1], Xiujun Lun[1], Wei Wang[1]; [1]BUCT, China. In this work, a roughened surface increasing the light output of LED was highlighted in numeric simulation. The roughening pattern was generated by imposing definite number of random distortions on the surface of LED.

AF1L.4 • 09:15
Nanotechnological Approaches for Improved Light Output in InGaN/GaN LEDs(Invited Paper), In-Hwan Lee[1]; [1]Chonbuk National Univ., Korea. Nanotechnological approaches have been widely explored for improved light output in InGaN/GaN light emitting diodes (LEDs). In this talk, I will introduce the application of graphene as a transparent electrode in nanorod LED, of SiO2 nanoparticle for high optical extraction, and of Ag/SiO2 nanoparticle for a localized surface plasmon LED.

AF1L.5 • 09:45
Improvement in light output power of GaN-based LED with Edge-bonded configuration, Hung-Shen Chu[1], Kuo-Ju Chen[1], Shih-Hsuan Chien[1], Chien-Chung Lin[2], Min-Hsiung Shih[3], Hao-chung Kuo[1]; [1]National Chiao Tung Univ., Taiwan; [2]Inst. of Lighting and Energy Photonics, Taiwan; [3]Research Center for Applied Sciences, Academia Sinica, Taiwan. The edge-bonded GaN LED is fabricated with batwing-like radiation pattern, which increases 15% light output compared to the conventional GaN LED due to enhanced-side light emission application.

Coffee Break ---------- 10:00–10:30
AF2G Mini Symposium I 10:30–12:30
Lunch Break ---------- 12:30–13:45

Room 12----------Track 3----------Fri.13:45–15:30
AF3F • New Applications
Presider: Jian Chen, Nanjing Univ. of Post and Telecommunication; China

AF3F.1 • 13:45
High Resolution Optical Spectrum Characterization Using Optical Channel Estimation and Optical Frequency Combs Technique (Invited Paper), Zhaohui Li[1], Wenjing Zhou[1,2], Tao Gui[1], Yuan Bao[1], Jianping Li[1], Xinhuan Feng[1], Weiping Liu[2], Chao Lu[3], Zanhong Wu[4]; [1]Inst. of Photonics Technology, Jinan Univ., China; [2]Department of EE, Jinan Univ., China; [3]Photonics Research Centre, The Hong Kong Polytechnic Univ., Hong Kong; [4]Guang Dong Power Diapatching and Controlling Center, China. Characterization of passive optical components based on optical-frequency-combs and optical-channel-estimation using OFDM signals has been proposed firstly. Simulation results show a realized demonstration with the measured range and resolution of ~260 GHz and 19.5MHz respectively.

AF3F.2 • 14:15
Pedestal-free Dual-wavelength Optical Gaussian Pulse Generator, Qiang Wang[1], Li Huo[1], Yanfei Xing[1], Caiyun Lou[1], Bingkun Zhou[1]; [1]Electronic Engineering, Tsinghua Univ., China. 25-GHz C-band tunable dual-wavelength Gaussian pulse generator using a dual-parallel Mach-Zehnder modulator and a Mamyshev reshaper is demonstrated. The generated pulse is multiplexed to 100-Gb/s OTDM signal for 100-km error-free transmission.

AF3F.3 • 14:30
A Compressed Optical Vector Network Analyzer Based On Two Tunable Coherent Optical Frequency Combs, Ziping Zhang[1], Yitang Dai[1], Li Yan[1], Kun Xu[1], Yuyang Gao[1], Jianqiang Li[1], Yuefeng Ji[1], Jintong Lin[1]; [1]Beijing Univ of Posts & Telecom, China. We propose and experimentally demonstrate an optical vector network analyzer by using two tunable coherent optical frequency combs. The compression ratio as high as nearly 1000 times and tunable measured bandwidth is achieved.

AF3F.4 • 14:45
Theoretical and experimental analysis of multi-carriers based on Re-circulating Frequency Shifter, Yuanjie Li[1], Zufeng Liu[1], Ji Zhou[1], Yaojun Qiao[1], Yuefeng Ji[1]; [1]School of Information and communication Engineering, BUPT, China. We first theoretically study the principle of RFS; then set up the experiment to generate 50 carriers with frequency space 12.5GHz and 20GHz respectively, compare their performance measured by the stability and flatness.

AF3F.5 • 15:00
High Tone-to-Noise Ratio Optical Comb Generation by Noise Suppression Using an Asymmetric Mach-Zehnder Interferometer, Xia Zhang[1,2], Jiachuan Lin[1], Lixia Xi[1], Zhang Xiaoguang[1], Bai Chenglin[2]; [1]State Key Laboratory of Information Photonics and Optical Communications,Beijing Univ. of Posts and Telecommunications, China; [2]Liaocheng Univ., China. A novel scheme for optical comb generation to enhance tone-to-noise ratio (TNR) is proposed. According to theoretical analysis, 20-tone and 50-tone optical combs with the TNR as high as 37.5dB were generated by this improved scheme.

AF3F.6 • 15:15
Phase Noise Performance Improvement for EDFA-Based Coupled Optoelectronic Oscillator utilizing Balanced Detection, Huanfa Peng[1], Cheng Zhang[1], Xiaopeng Xie[1], Tao Sun[1], Peng Guo[1], Xiaoqi Zhu[1], Lixin Zhu[1], Weiwei Hu[1], Zhangyuan Chen[1]; [1]Peking Univ., China. A coupled optoelectronic oscillator (COEO) utilizing balanced detection is proposed and experimentally demonstrated. A 10-dB improvement of phase noise performance at 10-kHz offset can be obtained compared to the traditional single detection.

Coffee Break ---------- 15:30—16:00

Room 12----------Track 3----------Fri.16:00—18:00
AF4E • Optical Networks
Presider: Min Zhang, BUPT, China

AF4E.1 • 16:00
Demonstration of a Novel Twin 10x10 WSS for Application in a Flexible Spectrum, Colorless and Directionless ROADM, Martin Matthews[1], Shona McGowan[1], Peter Roorda[1], Sheldon McLaughlin[1], Stephen Daniels[1], Azmina Somani[1], Brandon Collings[2]; [1]JDSU, Canada; [2]JDSU, USA. We propose a novel flexible spectrum colorless-directionless ROADM node that incorporates a twin MxN WSS (2 independently switched devices). A prototype LCoS-based twin 10x10 WSS is demonstrated and insertion loss, isolation performance is reported.

AF4E.2 • 16:15
OFDM Subcarrier-Based Label Scheme in WDM Optical Packet Switching Networks, Xu Zhou[1], Fuding Zhang[1], Ningbo Zou[1], Chen Zhu[1], Xiaohan Sun[1]; [1]Southeast Univ., China. We propose an OFDM subcarrier-based label scheme in WDM-OPS networks. The analysis show the impact of time deviation and phase errors on the performance can be alleviated by the cyclic prefix and pilot tone.

AF4E.3 • 16:30
A Novel Dynamic Bandwidth Allocation Algorithm for FTTR-based All-Optical Burst Ring, Shaoliang Luo[1], Xue Chen[1], Xintian Hu[1], Xiaoxu Cui[1], Lei Wang[2], Sheping Shi[2]; [1]State key lab of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China; [2]ZTE corporation, China. A centralized Dynamic Bandwidth Allocation (DBA) algorithm for all-optical burst ring is proposed to offer sub-wavelength switching granularity without collisions. High bandwidth utilization and low-latency are gained through dynamically Optical Burst assignment and timeslot mapping.

AF4E.4 • 16:45
Experimental Demonstration of Software Defined Path for Optical Network, Bei Cao[1], Jinyu Wang[1], Junhu Guo[1], Hui Li[1], Yuefeng Ji[1]; [1]Beijing Key Laboratory of Network System Architecture and Convergence, Beijing Univ. of Posts and Telecommunications, China. We propose Software Defined Path (SDP) architecture based on OpenFlow (OF) technique, to achieve optical layer optimization and control flexibility. The experimental result shows the optimization and flexibility along optical path through a centralized controller.

AF4E.5 • 17:00
Trading Quality of Transmission for Improved Blocking Performance in All-Optical Networks, Ajmal Muhammad[1], Cicek Cavdar[2], Lena Wosinska[2], Robert Forchheimer[1]; [1]Linkopings Universitet, Sweden; [2]ONLab, Royal Inst. of technology, Sweden. We propose a connection provisioning strategy in dynamic all-optical networks, which exploit the possibility to allow a tolerable signal quality degradation during a small fraction of holding-time resulting in a significant improvement of blocking performance.

AF4E.6 • 17:15
Extinction Ratio and BER Estimation of a Three Degree ROADM Node with Different WSS Placement, Sina Fazel[1], Mounia Lourdiane[2], Catherine Lepers[1]; [1]Electronics and Optics, Inst. Mines-Telecom/Telecom SudParis, CNRS UMR 5157 SAMOVAR, France; 2Telecommunications, Networks and Services, Inst.

Mines-Telecom/Telecom SudParis, CNRS UMR 5157 SAMOVAR, France. We compare two architectures to design a ROADM node based on WSS placement. Extinction ratio, sideband suppression and BER are evaluated and compared to choose the well-adapted architecture for a 3 degree ROADM node.

AF4E.7 • 17:30
SDN for Carrier Networks (Invited Paper), Andreas Gladisch[1]; [1]*DEUTSCHE TELEKOM AG, Germany. Abstract not available.*

Room 13----------Track 4----------Fri.08:00—10:00
AF1H • Elastic Optical Transmissions
Presider: Yang Qi, Wuhan Research Institute of Posts and Telecommunications, China

AF1H.1 • 08:00
Advanced Hardware and Software for Tb/s Agile Optical Networks(Invited Paper), David Plant[1]; [1]Dept. of Electrical And Computer Engineering, McGill Univ., Canada. We describe advances in next generation of hardware (e.g. Silicon-Photonic transceivers; DAC/ADC) and software (e.g. programmable DSP) to enable Agile Optical Networks, networks that adapt to link conditions to maximize throughput and efficiency.

AF1H.2 • 08:30
Chromatic Dispersion Monitoring of Optical OFDM Signals in Flexible Optical Networks(Invited Paper), Calvin C.K. Chan[1]; [1]The Chinese Univ. of Hong Kong, Hong Kong. A chromatic dispersion monitoring scheme for flexible optical OFDM networks is presented. Coded label subcarriers are added to the signal spectrum and dispersion monitoring is performed via direct detection, followed by electronic correlation procedures.

AF1H.3 • 09:00
Demonstration of Elastic Optical Networks Based on OFDM/SCFDM Subbands(Invited Paper), Zhangyuan Chen[1], Yuanxiang Chen[1], Juhao Li[1], Paikun Zhu[1], Yingying Xu[1], Bingli Guo[1], Yongqi He[1]; [1]State Key Lab of Advanced Optical Communication Systems & networks, Peking Univ., China. Elastic optical networks (EON) based on OFDM/SCFDM subbands are proposed in this paper. We verify the ROADM and switching functionality for individual subband on optical superchannel that consists of multi subbands. 400 Gb/s optical superchannel multicasting and flexible superchannel conversion that covers the whole C-band are experimentally demonstrated.

AF1H.4 • 09:30
Adaptive Transmissions in Elastic Optical OFDM Systems, Bo Wang[1], Pin-Han Ho[1]; [1]Department of Electrical and Computer Engineering, Univ. of Waterloo, Canada. By considering nonlinear effects of Mach-Zehnder modulator (MZM) and amplified spontaneous emission (ASE) noise due to optical amplifiers, a novel adaptive transmission strategy in Elastic Optical OFDM Systems is developed and the corresponding optimization problem is formulated.

Coffee Break ---------- 10:00—10:30
AF2H Mini Symposium I 10:30—12:30
Lunch Break---------- 12:30—13:45

Room 13----------Track 4----------Fri.13:45—15:30
AF3G • Energy-efficient Networking
Presider: Elaine Wong, Univ. of Melbourne, Australia

AF3G.1 • 13:45
Impact of Energy Efficient Schmes on Virtualized TWDM PONs (Invited Paper), Luca Valcarenghi[1], Yuki Yoshida[2], Akihiro Maruta[2], Piero Castoldi[1], Ken-ichi Kitayama[2]; [1]Scuola Superiore S. Anna, Italy; [2]Dept. of Electrical, Electronic and Information Eng., Osaka Univ., Japan. This papers analyzes the potential energy savings that the utilization of energy efficient schemes in TWDM PON can provide.Moreover, it highlights how such schemes can impact TWDM PON virtualization methods, proposing possible solutions.

AF3G.2 • 14:15
Energy Audit Models for Telecommunications Networks and Services (Invited Paper), Chien A. Chan[1], Elaine Wong[1], Andre Gygax[1], Christopher Leckie[1], Ampalavanapillai Nirmalathas[1], Kerry Hinton[1]; [1]Centre for Energy-Efficient Telecommunications (CEET), The Univ. of Melbourne, Australia. We present a case study on assessing the energy consumption of a service and discuss the challenges involved in making such assessments.

AF3G.3 • 14:45
Sleep/Doze Controlled Dynamic Bandwidth Allocation Algorithm with Bayesian Estimation, Maluge Pubuduni Imali Dias[1], Elaine Wong[1]; [1]National ICT Australia, Victoria Research Laboratory, Department of Electrical and Electronic Engineering, The Univ. of Melbourne, Australia. A just-in-time DBA algorithm exploiting Bayesian estimation to estimate the average packet inter-arrival time and sleep/doze durations for sleep/doze ONUs is proposed, achieving energy-savings of up to 72% and with delay values that can support delay-sensitive applications.

AF3G.4 • 15:00
Energy-Efficient Opaque IP over WDM Networks with Survivability and Security Constraints, Yunlei Liu[1], Gangxiang Shen[1], Sanjay K. Bose[2]; [1]Soochow Univ., China; [2]Indian Inst. Technology, India. Mixed deployment of sleep-enabled and non-sleep-enabled router cards is suggested at each node of an IP over WDM network along with survivability and security constraints. A green network that reduces energy consumption (by up to 28% for an example network) is designed compared to a network where the router cards are not sleep-enabled.

AF3G.5 • 15:15
Single Receiver Dynamic Bandwidth Allocation (SR-DBA) Algorithm for Local Storage based VoD delivery, Sandu Abeywickrama[1], Elaine Wong[1]; [1]Department of Electrical and Electronic Engineering, Univ. of Melbourne, Australia. In this paper, we present a single receiver based dynamic bandwidth allocation algorithm to address the QoS performance and energy efficiency of local storage based VoD delivery over future PONs.

Coffee Break ---------- 15:30—16:00

Room 13----------Track 4----------Fri.16:00—18:00
AF4F • Optical Networks and Applications II
Presider: Calvin C. K. Chan, The Chinese Univ. of Hong Kong, Hong Kong, China

AF4F.1 • 16:00
Reconfigurable Switching Technologies in Optical Networks: From Core to Submarine to Data Centers (Invited Paper), Philip Ji[1]; [1]NEC Laboratories America, USA. In this paper, various reconfigurable optical switching technologies and hardware are reviewed. The applications of reconfigurable optical switching in terrestrial core networks, submarine networks, and data center networks are analyzed and compared.

AF4F.2 • 16:30
(Invited Paper), Jie Zhang[1]; [1]Beijing Univ of Posts & Telecom, China

AF4F.3 • 17:00
Delivering Data More Efficiently in the Big Data Era (Invited Paper), Weiqiang Sun[1], Fengqin Li[1], Da Feng[1], Weisheng Hu[1]; [1]State Key Lab of Advanced Optical Communication Systems and Networks, Shanghai Jiao Tong Univ., China. We propose a data delivery model called SSS, which seamlessly integrates switching and storage capacity with scheduling. With SSS, data can be delivered more efficiently through the network.

AF4F.4 • 17:30
Optimal Time-Dependent Spectrum Sharing between Neighboring Elastic Optical Channels over a Single Link, Xiaowei Zhao[1], Anliang Cai[1], Gangxiang Shen[1], Sanjay K. Bose2; [1]Soochow Univ., China; 2Indian Inst. of Technology, China. Considering the time-dependent bandwidth characteristic of elastic optical channels, we develop an ILP optimization model to optimally order a set of elastic optical channels on a single link so as to maximally share optical spectra between neighboring channels for time-dependent traffic demands and minimize the total required spectrum.

AF4F.5 • 17:45
A Waveplane-Based Regenerator Placement Approach for Minimizing Numbers of Regenerators and Wavelengths, Gangxiang Shen[1], Chuanjun Wu[2], Jixiong Dong[2]; [1]Soochow Univ., China; [2]Huawei, China. We develop a waveplane-based regenerator placement algorithm for static lightpath demand. Results indicate that the algorithm can reduce not only the number of required regenerators but also the number of wavelengths used compared to the traditional independent three-step algorithm.

Room 14----------Track 4----------Fri.08:00—10:00
AF1I • Network Protection
Presider: Lena Wosinska; Kungliga Tekniska Hogskolan , Sweden

AF1I.1 • 08:00 Tutorial
Network Adaptability from Disaster Disruptions and Cascading Failures, Biswanath Mukherjee[1]; [1]UC Davis, USA. This tutorial will cover a telecom backbone network's adaptability to survive disasters. Topics include: disaster preparedness (risk-aware provisioning); content connectivity (vs. network connectivity); service survivability; etc. by exploiting dynamic re-provisioning, multipath routing, and data replication.

AF1I.2 • 08:30
Fault Monitoring for Multi-operator and Multi-service WDM PON, Jiajia Chen[1], Sunil Poudel[1], Patryk J. Urban[2]; [1]School of ICT, KTH Royal Inst. of Technology, Sweden; [2]Ericsson Research, Ericsson AB, Sweden. We propose fault supervision mechanisms for open WDM PON, where multiple operators could co-exist and deliver different services on a common fibre plant. The feasibility of such schemes has been validated by evaluating transmission performance.

AF1I.3 • 08:45
Spectrum-Aware Approaches for Dedicated-Path Protection with Joint Failure Probability in Flexible Bandwidth Optical Networks, Bowen Chen[1,2], Jie Zhang[1], Yongli Zhao[1], Jason P. Jue[2], Chen Ma[1], Shanguo Huang[1], Wanyi Gu[1]; [1]Beijing Univ of Posts & Telecom, China; [2]Department of Computer Science, Erik Jonsson School of Engineering and Computer Science, The Univ. of Texas at Dallas, USA. We develop an ILP model and a spectrum-aware dedicated-path protection (SADP) algorithm to minimize the frequency slots consumed in flexible bandwidth optical networks. Simulation results show that ILP and SADP minimize frequency slot consumption.

AF1I.4 • 09:00
Applying Ring Cover Technique to Elastic Optical Networks, Yue Wei[1], Gangxiang Shen[1], Sanjay K. Bose[2]; [1]Soochow Univ., China; [2]Indian Inst. Technology, India. We apply the ring cover technique to elastic optical networks. We develop an Integer Linear Programming (ILP) model to minimize the required protection capacity and the overall link spectra used in the entire network.

AF1I.5 • 09:15
Partial Protection with Full Bandwidth Restoration by OpenFlow-based Control Plane in Flexi-Grid Optical Networks, Yin Zhang[1], Shanguo Huang[1], Yu Zhou[1], Bingli Guo[2], Min Zhang[1], Yongli Zhao[1], Jie Zhang[1]; [1]BUPT, China; [2]Peking Univ., China. We propose a novel OpenFlow based recovery mechanism for Flexi-Grid optical networks, called partial protection full bandwidth restoration (PP-FBR), based on the implement of protection and restoration mechanisms. Our experimental results demonstrate feasibility of our recovery mechanisms and the PP-FBR's high spectrum efficiency.

AF1I.6 • 09:30
Multi-Link Faults Location Based on Credibility Model in All Optical Networks, Ming X. Du[1]; [1]Beijing Univ of Posts & Telecom, China. Two heuristic algorithms based on credibility model are presented to solve multi-link faults location in all optical networks. Simulations demonstrate these algorithms have an outstanding performance in terms of location accuracy on multi-link faults location.

AF1I.7 • 09:45
Disaster-Resilient Optical Datacenter Networks based on Fast Complete Graph Embedding Mechanism, xin li[1], Shanguo Huang[1], Jie Zhang[1], Yongli Zhao[1], Wanyi Gu[1]; [1]State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunitions, China. We proposes a fast complete graph embedding mechanism for recovering interrupted cloud services delivered by optical datacenter networks under natural disasters. The proposed embedding mechanism minimizes the connection disruption and duration by parallel light-paths migration.

Coffee Break ---------- 10:00—10:30

Room 14----------Track 5----------Fri.10:30—12:30
AF2I • Microscopy II
Presider: Ruikang Wang, Univ. of Washington, USA

AF2I.1 • 10:30
Collagen Order in Tissue Disease(Invited Paper), Francesco S. Pavone[1]; [1]European Laboratory for Non-Linear Spectroscopy, Italy. Second Harmonic Generation Microscopy nowadays has been developed for applications in many fields, such as cell imaging or tissue analysis, both for lab or clinical use.

AF2I.2 • 11:00
Digital optical phase conjugation for delivering two-dimensional images through turbid media, Timothy Hillman[1], Toyohiko Yamauchi[2], Wonshik Choi[3], Ramachandra Dasari[1], Zahid Yaqoob[1], YongKeun Park[4]; [1]MIT, USA; [2]Hamamatsu Photonics, Japan; [3]Korea Univ., Republic of Korea; 4Physics, KAIST, Republic of Korea. We propose and experimentally demonstrate digital optical phase conjugation implementation for delivering two-dimensional images through turbid media. Employing a ring interferometer, the optical alignment of matching the wavefront measurement and shaping has effectively been solved

AF2I.3 • 11:15
Synthetic Fourier Transform Light Scattering, KyeoReh Lee[1], Hyeon-Don Kim[2], Kyoohyun Kim[1], YoungChan Kim[1], YongKeun Park[1]; [1]Physics, KAIST, Republic of Korea; [2]Mechanical Enginerring, KAIST, Republic of Korea. We present a method to measure extended scattering information from individual microscopic samples. Selectively synthetizing scattered light with different illumination conditions, the angle range is extended up to twice the numerical aperture.

AF2I.4 • 11:30
Methods on Improving Sampling Depth of Laser Speckle Contrast Imaging of Blood Flow(Invited Paper), Pengcheng Li[1], YangYang Li[1], Heng He[1], Ying Tang[1], Ming Chen[1]; [1]Britton Chance Center for Biomedical Photonics, Huazhong Univ. of Science and Technology, China. Laser speckle contrast imaging has been widely attempted to detect the blood flow changes in biological tissues, such as brain, skin, retina and so on with high spatial and temporal resolution. However, this technique suffers from the problem of shallow sampling depth of blood flow, which mainly reflects the superficial blood flow of biological tissue. Here recent technical progresses on improving the sampling depth of laser speckle contrast imaging were reviewed and discussed.

AF2I.5 • 12:00
Spectroscopic angle-resolved light scattering of individual micro-sized objects, Jae-hwang Jung[1], Jaeduck Jang[2], KyeoReh Lee[1], Kyoohyun Kim[1], YongKeun Park[1]; [1]KAIST, Republic of Korea; [2]Samsung Advanced Inst. of Technology, Republic of Korea. We present a novel spectro-angular light scattering measurement technique. The spectro-angular dependency of scattering intensities from individual micro-sized samples was measured by using a spectroscopic quantitative phase microscopy and Fourier-transform light scattering method.

AF2I.6 • 12:15
A Facile Supercontinuum-based Method for Broadband Spectrally Resolved Stimulated Raman Scattering Microscopy, Qiuqiang Zhan[1], Yuxiang Zhao[1], Poyen Lin[2], Fujen Kao[2]; [1]South China Academy of Advanced Optoelectronics, South China Normal Univ., China; [2]Inst. of Biophotonics, National Yang-Ming Univ., Taiwan. We for the first time proposed a facile supercontinuum-based broadband (theoretically above 3500 cm-1) stimulated Raman scattering spectral bioimaging microscopy. The sample of water-lipid mixture was spectrally resolved imaging with efficient time-delay adjustment.

Lunch Break ---------- 12:30—13:45

Room 21----------Track 5----------Fri.13:45—15:30
AF3H • Sensors I
Presider: Vincent Daria, The Australian National Universtiy

AF3H.1 • 13:45
Fiber plasmonics on the basis of metallic nanowires(Invited Paper), Markus Schmidt[1,2], Patrick Uebel[2], Sebastian Bauerschmidt[2], Philip Russell[2]; [1]Inst. of Photonic Technology, Germany; [2]Max Planck Inst. for the Science of Light, Germany. By filling the holes of microstructured optical fibers with particular materials, we implement plasmonic fibers showing hybridized plasmonic excitations with a sophisticated near field polarization, spiralling plasmonic modes and localized plasmonic resonances.

AF3H.2 • 14:15
Sensitivity Enhanced Strain Measurement Based on an FBG Sensor Assisted by Frequency Chirp Magnification, Jiangbing Du[1], Zuyuan He[1]; [1]State Key Lab of Advanced Optical Communication Systems and Networks, Department of Electronic Engineering,, Shanghai Jiao Tong Univ., China. We utilize frequency chirp magnification for enhancing the strain sensitivity of an FBG sensor. Ultra-highly sensitive strain measurement has been achieved with 5.40 pm/με strain sensitivity, which has been enhanced by a factor of five.

AF3H.3 • 14:30
A Fiber-Optic Sensor System using a Balanced Sagnac Interferometer and an EDFA-Based Chaotic Fiber Ring Laser for Acoustic Detection of Partial Discharges, Lutang Wang[1]; [1]Shanghai Univ., China. A fiber-optic acoustic sensor system using a chaotic fiber ring laser for generating the depolarized light and a balanced Sagnac interferometer for high-sensitivity partial discharges sensing is demonstrated. Basic operation principle is described and experimental results are presented.

AF3H.4 • 14:45
High spatial resolution sensing using Brillouin optical time domain analyzer pumped by ultra-long

fiber laser with a ring cavity, Cheng-Xu Yuan[1], Zinan Wang[1], Xin-Hong Jia[1], Jin Li[1], Xiao-Dong Yan[1], An-Bin Cui[1]; [1]Univ. Electronic Sci. & Tech. of China, China. We demonstrated distributed sensing with 3m spatial resolution and strain/temperature accuracy of 28με/1.4°C covering 94km fiber, using Brillouin optical time domain analyzer pumped by ultra-long fiber laser with a ring cavity.

AF3H.5 • 15:00
Refractive Index Sensitivity of Gold Coated Tilt Long-Period Fiber Gratings Using Electrostatic Self-Assembly Technology, Yuchen Zhao[1], Yunqi Liu[1]; [1]School of Communication and Information Engineering, Shanghai Univ., China. We demonstrate the fabrication of the gold coated tilt long-period fiber gratings. The grating resonance wavelength was found to shift toward longer wavelength with increasing surrounding index, which is opposite to that of bare gratings.

AF3H.6 • 15:15
A Cost-Effective Optical Fiber Sensor Network Exploiting Brillouin Beat Frequency Shift, Siyadong Xiong[1], Chenglong Liu[1], Chao Peng[1], Zhengbin Li[1]; [1]Peking Univ., China. Exploiting Brillouin beat frequency shift, we propose a cost-effective configuration of sensor node, which has a potential to be applied in constructing the optical fiber sensor network, replacing the costly and complex conventional methods.

Coffee Break ---------- 15:30—16:00

Room 21----------Track 5----------Fri.16:00—18:00
AF4H • Sensors II
Presider: Markus Schmidt, Inst. of Photonic Technology, Germany

AF4H.1 • 16:00
A high-speed FBG demodulation method based on a large-dispersion actively mode-locked laser, Jiawei Mei[1], Xiaosheng Xiao[1], Changxi Yang[1]; [1]Tsinghua Univ., China. A large-dispersion actively mode-locked laser is proposed to produce linear-giant-chirp pulse, which can determine strain of the FBG as a temporal shift of reflective pulse. The demodulation speed can be as fast as 30 MHz.

AF4H.2 • 16:15
Fiber-optic chemical probe based on titled fiber Bragg grating inscribed in the thin-core fiber, Bobo Gu[1], Wenliang Qi[1,2], Jie Zheng[1,2], Ping Shum[1,2], Feng Luan[1,2]; [1]School of Electrical and Electronics Engineering, Nanyang Technological Univ., Singapore; 2CINTRA CNRS/NTU/THALES, Singapore. A novel chemical probe based on the tilted fiber Bragg grating inscribed in the thin-core fiber has been proposed. High sensitivity and temperature immunity of our proposed sensor are experimentally demonstrated via cost-effective power detection.

AF4H.3 • 16:30
High Sensitivity Fiber-optic Surface Plasmon Resonance Sensor Based On Multi-alternating Metal Layers, shengwei Meng[1], Yanjie Wang[1], Yun Liu[1], Xiuxin Liu[1], Wei Peng[1]; [1]Dalian Univ. of Technology, China. A novel fiber-optic SPR sensor with multi-alternating metal layers is presented. Numerical simulation results show that the structure has higher sensitivity than the traditional SPR sensor and a wider detecting range of refractive index.

AF4H.4 • 16:45
A QEPAS sensor with a ~1.37μm DFB laser, Ping Gong[1], Liang Xie[1], Rui Wang[1], Huixia Yang[1]; [1]Inst. of Semiconductors, China. We demonstrate a QEPAS sensor using a ~1.37μm DFB laser as light source and a quartz tuning fork as a transducer to detect water vapor concentration in the air.

AF4H.5 • 17:00
Method to Monitor Atmospheric Atomic Mercury by a Differential Absorption Lidar System, Guangyu Zhao[1], Xiuxiang Wu[1], Shiming Zhu[1], Liang Mei2,3, Sune R. Svanberg[1,4]; [1]Centre for Optical and Electromagnetic Research, South China Normal Univ., China; [2]Centre for Optical and Electromagnetic Research, Zhejiang Univ., China; [3]Joint Research Center of Photonics, Zhejiang Univ.-Royal Inst. of Technology-Lund Univ., China; [4]Physics Department, Atomic Physics Division, Lund Univ., Sweden. A differential absorption lidar (DIAL) system has been developed for atomic mercury concentration monitoring and applied in ambient air monitoring in Guangzhou, China. A 24-hour measurement on background atomic mercury has been performed.

AF4H.6 • 17:15
Integrated Bio-sensor Based on SPP-Dielectric Hybrid Coupler, Fang Liu[1], Boyu Fan[1], Yidong Huang[1]; [1]Tsinghua Univ., China. An integrated sensor utilizing short range surface plasmon polariton mode is realized and applied for detecting ultra-thin layer as well as biomolecule with rather high sensitivity.

Room 15----------Track 5----------Fri.13:45—15:30
AF3I• OCT
Presider: Roberto Pini, CNR - Inst. of Applied Physics Florence, Italy

AF3I.1 • 13:45
Sixteen years of Doppler optical coherence tomography (Invited Paper), Zhongping Chen[1]; [1]Beckman Laser Inst., Univ. of California Irvine, USA. The advances in Doppler OCT over the last sixteen years will be reviewed. The recent applications of Doppler OCT for quantifying the flow, imaging the vasculature, evaluating the vibration organ, and optical coherence elastography will be discussed.

AF3I.2 • 14:15
Optical Coherence Tomography for Live Optical Imaging of Mammalian Embryos (Invited Paper), Kirill Larin[1]; [1]Univ. of Houston, USA. Because of the ease in generating transgenic/gene knock out models and accessibility to early stages of embryogenesis, mouse and rat models have become invaluable to studying the mechanisms that underlie human birth defects. To study precisely how structural birth defects arise, Ultrasound, MRI, microCT, Optical Projection Tomography (OPT), Optical Coherence Tomography (OCT) and histological methods have all been used for imaging mouse/rat embryos. However, of these methods, only OCT enables live, functional imaging with high spatial resolution. Here we demonstrate advantages of OCT for live imaging of mammalian embryos at different developmental stages (ranging from E7.5 to E19.5) with nearly cellular resolution ex vivo and in utero.

AF3I.3 • 14:45
Fiber-optic needle probes: Applications in deep tissue imaging (Invited Paper), Robert McLaughlin[1], Dirk Lorenser[1], David D. Sampson[1,2]; [1]Optical + Biomedical Engineering Laboratory, Univ. of Western Australia, Australia; [2]Centre for Microscopy, Characterisation & Analysis, Univ. of Western Australia, Australia. Fiber-optic needle probes are miniaturized all-fiber imaging devices encased within a needle. We describe recent innovations, including phase masks for extended depth of focus, and double-clad fiber for simultaneous acquisition of OCT and fluorescence images.

AF3I.4 • 15:15
Broadband photon time of flight spectroscopy: advanced spectroscopic analysis for ensuring safety and performance of pharmaceutical tablets, Faisal Kamran[1], Otto Højager Attermann Nielsen[2,3], Stefan Andersson-Engels[4], Dmitry Khoptyar[4]; [1]Department of Photonics Engineering, Technical Univ. of Denmark, Denmark; [2]NKT Photonics A/S, Denmark; 33Department of Informatics and Mathematical Modelling, Technical Univ. of Denmark, Denmark; 4Department of Physics, Lund Univ., Sweden. We report on extended spectroscopic analysis of pharmaceutical tablets performed with broadband photon time-of-flight absorption/scaring spectroscopy. Precise monitoring of absorption and scattering spectra enables cost-efficient monitoring of key safety and performance parameters of the drugs.

Coffee Break---------- 15:30—16:00

Room 15------Track 5-----Fri.16:00—18:00
AF4I • Scattering Techniques
Presider: Wei Chen, Univ. of Central Oklahoma, USA

AF4I.1 • 16:00
Applications of Singular Optics in Biomedicine (Invited Paper), Sean J. Kirkpatrick[1]; [1]Michigan Technological Univ., USA. Optical phase singularities are locations in a scattered optical field where the intensity of the field is zero and the phase is undefined. The statistics of these singularities offer methods for assessing the dynamics of biological systems.

AF4I.2 • 16:30
Enhanced biosensing based on chemical or mechanical optical clearing (Invited Paper), Dan Zhu[1], Valeriy V. Tuchin[2]; [1]Britton Chance Center for Biomedical Photonics, Huazhong Univ. of Science and Technology, China; [2]Inst. of Optics and Biophotonics, Saratov State Univ., Russian Federation. Both the chemicals and mechanical stress can reduce the scattering of tissue or background noise, which enhances the ability of optical biosensing. This presentation summarizes the principles and applications of tissue optical clearing.

AF4I.3 • 17:00
Differentiating Early Oral Cancer from Normal Oral Tissue Using Diffuse Reflectance Spectroscopy, Yu-Wen Chen[1], Yu-Kai Liaw[1], Hsin-Ru Hung[2], Pau-Choo Chung[2], Sheng-Hao Tseng[1]; [1]Department of Photonics,

National Cheng-Kung Univ., Taiwan; [2]Inst. of Computer and Communication Engineering, National Cheng-Kung Univ., Taiwan. We determined the in-vivo optical properties of oral cancer tissue of hamsters using our diffusing probe. We observed that the absorption and scattering of cancer and normal sites were distinct in the 500-800nm spectral range.

AF4I.4 • 17:15
Dependence of the Capillary/Vessel Spatial Pattern Estimated by Measuring Diffuse Reflectance Spectra on the Hemoglobin Concentration Level, Rajesh V. Kanawade[1,2], Johannes Haeussermann[1], Florian Klämpfl[1], Michael Schmidt[1,2], Florian Stelzle[2,3]; [1]Inst. of Photonic Technologies, Germany; [2]Clinical Photonics Lab, Erlangen Graduate School in Advanced Optical Technologies (SAOT),, Germany; [3]Department of Oral and Maxillofacial Surgery, Univ. Hospital Erlangen,, Germany. The goal of this research is to study the behavior of the blood vessel density/spatial pattern estimated by measuring diffuse reflectance spectra depending on hemoglobin concentrations level for the application of early sign of the clinical shock detection.

Room 19----------Poster Sessions-----Fri.09:00—11:30
AF1P.1 • ACP/IPOC Joint Track 1: Materials, Devices, and Optoelectronic Integration

AF1P.1.1
A Compact Crossing for Silicon-Based Slot-Waveguide, Yin Xu[1], Jiayuan Wang[1], Jinbiao Xiao[1], Xiaohan Sun[1]; [1]School of Electronic Science and Engineering, Southeast Univ., China. A compact silicon-based slot-waveguide crossing is proposed and designed by using a finite difference time domain method. The key structural parameters and final transmission properties of the structure are presented.

AF1P.1.2
A Novel Polarizer Based on the Near-wavelength High Contrast Grating, Yafang Zhou[1], Yongqing Huang[1], Xiaofeng Duan[1], Ling Zhao[1], Xiaomin Ren[1], Xia Zhang[1], Qi Wang[1]; [1]Stake Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. A polarizer using near-wavelength high contrast gratings (NW-HCGs) is designed and analysed. At 1550nm, the reflectivity for TM light is as high as 96.71%, meanwhile, the transmittivity for TE light is 98.91%.

AF1P.1.3
1×2 SOI-based Splitter Using High Contrast Grating Hollow-Core Waveguide, Ping Xue[1], Yunjie Li[1], Te Chen[1], Weiwei Hu[1]; [1]Peking Univ., China. The 1×2 splitter using high contrast grating hollow-core waveguide is designed and fabricated on Silicon-On-Insulator. The experiment results present its good performance on beam splitting and polarization maintaining.

AF1P.1.4
Phase Shifter Design based on Guided-Mode Resonance in High-Contrast Grating, Hanxing Zhang[1,2], Chao Peng[1,2], Weiwei Hu[1,2]; [1]State Key Laboratory of Advanced Optical Communication Systems and Networks, China, China; [2]Peking Univ., China. We focus on the analysis of the guided-mode resonance effects, especially the high-Q mode, in high index-contrast gratings. By utilizing this mode, we propose and design a new kind of phase shifter.

AF1P.1.5
Wideband slow light in one-dimensional chirped silicon grating waveguide with round-corners, Deng Peng[1], Jin Hou[1], Boya Li[1], Chunyong Yang[1], Zhiyou Zhong[1], Shaoping Chen[1]; [1]Hubei Key Laboratory of Intelligent Wireless Communications, College of Electronics and Information Engineering, South-central Univ. for Nationalities, China. One-dimensional chirped silicon grating waveguide with round-corners has been designed to obtain wideband slow light. Wide bandwidth up to 9.6-nm slow light with group index of 40.7 can be obtained in an optimized waveguide.

AF1P.1.6
Photonic crystal one-way ring resonator, Hongliang Ren[1], Jinghong Zhang[1]; [1]Zhejiang Univ. of Technology, China. We have presented a design of a PC one-way ring resonator. The numerical simulation results are calculated by using FEM, which shows that the direction of PC one-way ring resonator mode can be changed by altering the direction of the external magnetic field.

AF1P.1.7
A Compact Integrated Spectrometer Based on SU-8 Polymer Using Echelle Diffraction Grating, Xiang Xia[1], Tingting Lang[2], Jian-Jun He[1]; [1]State Key Laboratory of Modern Optical Instrumentation, Zhejiang Univ., China; [2]College of Optical and Electronic technology, China Jiliang Univ., China. A compact echelle diffraction grating spectrometer based on SU-8 polymer waveguides is designed and simulated. This EDG spectrometer has a size of only 6mm × 11mm, and can be fabricated by using photolithography process without additional etching process. The spectral resolution is 0.25 nm.

AF1P.1.8
Analysis of second order nonlinear effects in strained silicon, Pedro Damas[1], Xavier Le Roux[1], Eric Cassan[1], Nicolas Izard[1], Delphine Marris-Morini[1], Alain Bosseboeuf[1], Philippe Lecoeur[1], Thomas Maroutian[1], Laurent Vivien[1]; [1]Intitut d'Électronique Fondamentale, France. In this paper we propose a model to efficiently compare different structures for improvement of performance of strain-induced second order nonlinear effects in silicon devices, along with some preliminary experimental results based on Pockels effect.

AF1P.1.9
A Compact Polarization Beam Splitter based on Silicon-on-Insulator, Mei Yin[1], Yawen Huang[1], Huaxiang Yi[1], Wei Yang[1], Yanping Li[1], Xingjun Wang[1], Hongbin Li[1]; [1]Peking Univ., China. This letter proposes a compact cascaded MMI-based polarization beam splitter on silicon-on-insulator, which demonstrates 20 nm bandwidth for transverse-electric polarization and 35 nm bandwidth for transverse-magnetic polarization with extinction ratio more than 20 dB experimentally.

AF1P.1.10
The reflector and coupler using high-contrast subwavelength grating for silicon-photonics light source, Hua Wu[1,2], Mingfu Han[1], Xia Guo[1]; [1]Beijing Univ. of Technology, China; [2]GanNan Normal Univ., China. This paper focuses on reflector and coupler for silicon-photonics light source. A novel scheme is proposed by using subwavelength high-contrast grating. Simulation results show good performances of the proposed scheme.

AF1P.1.11
Integrated GHz silicon photonics interconnect with perfectly vertical coupling interface, zanyun zhang[1], beiju huang[1,2], Zan Zhang[1], Hongda Chen[1]; [1]State Key Laboratory of Opto-electronics, Inst. of semiconductors, Chinese Academy of Sciences, China; [2]State Key Laboratory of Opto-electronics, Tsinghua Univ., China. A novel silicon photonics interconnect was proposed and demonstrated, integrated with a bidirectional vertical grating coupler, optical modulator and germanium waveguide photodetector. Point-to-point optical interconnection with data rate of 3Gb/s was demonstrated.

AF1P.1.12
Delay Equalization via the Series-cascaded Fractal Topological Structure combined with CROW microring resonators, Xiaobei Zhang[1], Fan Gu[1]; [1]Shanghai Univ., China. This paper proposes the structure of series-cascaded fractal topological structure combined with CROW microring resonators for the delay equalization, with characteristics as functions of coupling coefficients and loss studied.

AF1P.1.13
Linear PNP Silicon EO Modulator for Analog Applications, Tianshuo Zhang[1], Pengfei Wu[1], Zhaoran Huang[1]; [1]Electrical, Computer and Systems Engineering, Rensselaer Polytechnic Inst., USA. In this paper we analyze the linearity of a PNP structure based silicon electro-optic modulator. This modulator has shown a high spur free dynamic range (SFDR) of 99.8dB and a relatively low optical loss of 4dB.

AF1P.1.14
Growth and Fabrication of MWIR Dual-color Focal Plane Array Based on Type-II InAs/GaSb Superlattice, Guo Wei Wang[1], Wei Xiang[1], Yingqiang Xu[1], Liang Zhang[2], Zhenyu Peng[2], Yanqiu Lv[2], Junjie Si[2], Juan Wang[1], Junliang Xing[1], Zhengwei Ren[1], Zhichuan Niu[1]; [1]State Key Laboratory of Superlattices and Microstructures, Inst. of Semiconductors, Chinese Academy of Sciences, China; [2]Luoyang Optical Electronics Development Center, China Airborne Missile Academy, China. We presented a fabrication of MWIR dual-color FPA based on type-II InAs/GaSb strain layer superlattice (SLs). The red and blue channel FPA devices with 128×128 pixels showed a 50% cutoff wavelength of 3.1μm and 4.73μm, the average blackbody detectivity of the detectors are 2.8 × 1010cmHz1/2/W and 1.3× 1010 cmHz1/2/W at 77K separately.

AF1P.1.15
Numerical Simulation of the Uni-traveling Carrier Photodiode with GaAsSb/InP Heterojunction, Ge Zang[1], Yongqing Huang[1], Xiaomin Ren[1], Xiaofeng Duan[1], Shiwei Cai[1], Xia Zhang[1], Qi Wang[1], Jun Wang[1]; [1]Beijing Univ. of Posts and Telecommunications, China. A kind of GaAsSb/InP uni-traveling carrier photodiode has been simulated by using a 2D drift-diffusion

approach. The simulated bandwidth based on the modified structure could reach 106.6GHz at reverse bias of 2V.

AF1P.1.16
High-Efficiency Planar InGaAs Photodetector, Yang Luo1, Yongqing Huang1, Xiaomin Ren1, Xiaofeng Duan1, Shiwei Cai1, Xia Zhang1, Qi Wang1, Jun Wang1; 1Beijing Univ. of Po, China. A high-efficiency planar vertical-illuminated photodetector (VPD) was fabricated. The 3-dB bandwidth was 8.5 GHz at 1550 nm. The experimental measurement results obtained good agreement with simulation results.

AF1P.1.17
The Effect of InGaAs/GaAs Superlattices on GaAs Epilayer Grown on Si (100) Substrate, Xiaoyi Li[1], Qi Wang[1], Yifan Wang1, Zhigang Jia[1], Xiaomin Ren[1], Jun Wang[1], Shiwei Cai[1], Xia Zhang[1], Yongqing Huang[1], Xiaofeng Duan[1]; [1]State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. High-quality GaAs epilayers on Si substrates have been obtained by insertion of InGaAs/GaAs superlattices combined with thermal cycle annealing. The crystallinity of GaAs epilayer has been investigated by DCXRD, AFM and TEM.

AF1P.1.18
Design and fabrication of an InP-based arrayed waveguide grating, Xilin Zhang[1], Ruikang Zhang[1], Dan Lu[1], Baojun Wang[1], Chen Ji[1]; [1]Key Laboratory of Semiconductor Materials Science, Inst. of Semiconductor, Chinese Academy of Science, China. A 8-channel, 200 GHz channel spacing InP arrayed waveguide grating was designed and simulated by 2D FD-BPM method. The device shows the insertion loss is about -8 dB, and the crosstalk is below -16 dB.

AF1P.1.19
High Power Distribute Feedback Lasers Emitting Near a Wavelength of 1064 nm, Teng Zhai[1], Shaoyang Tan[1], Ruikang Zhang[1], Dan Lu[1], Baojun Wang[1], Daibing Zhou[1], Lingjuan Zhao[1], Chen Ji[1], Wei Wang[1]; [1]Key Laboratory of Semiconductor Materials Science, Inst. of Semiconductor, Chinese Academy of Science, China. 1064 nm distribute feedback lasers have been demonstrated with > 250 mW output power based on 1 mm and 2 mm cavity length. The 2 mm diode has a large kink-free current above 700 mA.

AF1P.1.20
Fabrication of Optical Switch Based on Nanocrystalline VO2 Thin Film with Low Phase Transition Temperature, Xiqu Chen[1], Qiang Lv[1], Xinjian Yi[2]; [1]School of Electrical & Electronic Engineering, Wuhan Polytechnic Univ., China; 2Wuhan National Laboratory for Optoelectronics, China. By using surface micromachining technique, an optical switch based on nanocrystalline VO2 film with low phase transition temperature is designed and fabricated. Measured results show that the optical switch can realize its switching function.

AF1P.1.21
InP-Based 5×14 Shallow-ridged Arrayed Waveguide Grating Using for PIC-Transmitter, Can Zhang[1], Liangshun Han[1], Song Liang[1], Hongliang Zhu[1], Wei Wang[1]; [1]Chinese Acad Sci Inst of Semiconductor, China. A 5×14 AWG with a channel spacing of 200 GHz is demonstrated. Measured insertion losses are 10 dB with a crosstalk level 15 dB. The AWG is promising for the multiplexer in PIC transmitter.

AF1P.1.22
980nm Polarization controlled single mode VCSEL, Mingfu Han[1], Hua Wu[1], WANG wenjuan[1], Xia Guo[1]; [1]Beijing Univ. of Technology, China. we fabricated 980nm vertical cavity surface emitting lasers with diamond shaped oxidation aperture of diameter 3μm. Polarization stable single fundamental mode output was achieved under whole current range at temperature changed from 15C to 55C.

AF1P.1.23
Fabrication and characterization of photo-detector based on CdSe0.5S0.5 quantum dots, Jia Song[3], Yun Xing[3], Yuehua An[2,1], Peigang Li[1,3], Weihua TANG[1,2], Jinghua Xiao[1,2]; [1]School of Science, beijing Univ. of posts and communic, China; [2]State Key Laboratory of Information Photonics & Optical Communication, beijing Univ. of posts and communic, China; [3]Department of physics, Center for Optoelectronics Materials and Devices,, zhejiang Sci-Tech Univ., China. A photo-detector was fabricated using colloidal CdSe0.5S0.5 quantum dots (QDs) in diameter about 7 nm by assembling QDs into electrodeswith 20 micrometer separation using dielectrophoresis (DEP) process. An obvious photoconductive behavior was observed, demonstrated a capable of potential application in optoelectronics device.

AF1P.1.24
Nano Spiral Stripes Formation on Diamond Surface Employing a High Repetition Rate Femtosecond Laser System, Shutong He[1], Minglie Hu[1], Chingyue Wang[1]; [1]Ultrafast Laser Laboratory, Key Laboratory of Opto-electronic Information Technical Science of Ministry of Education, College of Precision Instruments and Opto-electronics Engineering, Tianjin Univ., China. Nano ripples at the inside wall of the ablation hole and nano spiral stripes form on nature diamond surfaces by using high repetition rate femtosecond laser. The formation regimes of the ripples are studied.

AF1P.1.25
Optimized SOA Carrier Characteristics for All-Optical NRZ Wavelength Conversion Using a Sagnac Loop, Jin Wang[1], Chen Gao[1], Ji Xu[1], Long Yin[1]; [1]Nanjing Univ. of Posts and Telecomm, China. The regenerative property of all-optical NRZ wavelength conversion using an SOA-based Sagnac loop was checked. We find that SOAs having a carrier recovery time between 2 and 3 times of one bit duration are preferred.

AF1P.1.26
Photorefractive Parametric Excitation in Compound Semiconductor, Sunayana Mahajan[1]; [1]Northern India Engineering College, India. A large second-order susceptibility and gain-coefficient is achieved by excitation of coherent polaron-mode in photorefractive compound-semiconductor at B = 0.3Tesla and 77K, the results are consistent and successfully describe the photorefractive parametric amplification in compound-semiconductor.

AF1P.1.27
Advanced Numerical and Close-Form Solutions for Local Gain and Refractive Index of Quantum-Dot Semiconductor Optical Amplifiers in Steady State, Yiwei Peng[1], Zhongyuan Yu[1], Xiaotao Guo[1], Yumin Liu[1], Donglin Wang[1], Long Zhao[1]; [1]IPOC, BUPT, China. Based on 2M+1 (M=40 for example) rate equations, advanced numerical solutions with a much faster speed of computation for gain and refractive index of quantum-dot semiconductor optical amplifiers in steady state have been presented.

AF1P.1.28
A Novel Compact QPSK/16QAM Modulator Based on Two Multimode Interference Couplers, Junhe Zhou[1], Philippe Gallion[2]; [1]Electronics science and engineering, Tongji Univ., China; [2]TELECOM ParisTech, Ecole Nationale Supérieure des Télécommunications, France. In this paper, a novel compact QPSK/16QAM modulator is proposed. The modulator is composed of two cascaded multimode interference (MMI) couplers. By modulating the four arms between the two MMI couplers, QPSK/16QAM signals are generated.

AF1P.1.29
The LP-MOCVD growth of BGaAs alloys with different gallium precursors, Zhigang Jia[1], Qi Wang[1], Xiaomin Ren[1], Yifan Wang[1], Yingce Yan[1], Shiwei Cai[1], Xia Zhang[1], Yongqing Huang[1]; [1]Beijing Univ. of Posts and telecomm, China. BGaAs alloys have been grown on GaAs substrate with different Ga precursor, TMGa and TEGa. With TEGa, it can grow at a lower temperature, and obtain a higher boron content than that grown with TMGa.

AF1P.1.30
An InP-Based High-Performance Graded Doping PIN Photodetector for Optical Communications, Yanli Bao[1], Yongqing Huang[1], Yang Luo[1], Xiaofeng Duan[1], Xia Zhang[1], Qi Wang[1], Xiaomin Ren[1]; [1]State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. A vertical-illuminated PIN photodetector with graded energy band and graded doping is proposed. With a 350-nm-thick absorption layer, the quantum efficiency is 86%, 3-dB bandwidth is 70GHz and maximal bandwidth-efficiency product is obtained at 1550nm.

AF1P.1.31
1.53μm EML Fabricated by Ion-Implantation Induced QWI with Etching Implant Buffer Layer, Liangshun Han[1], Song Liang[1], Hongliang Zhu[1], Can Zhang[1], Wei Wang[1]; [1]Inst. of Semiconductors, CAS., China. We present a 1.53μm electroabsorption modulated distributed feedback laser (EML) fabricated by ion-implantation induced quantum well intermixing (QWI) with etching implant buffer layer. This simple QWI technique can suppress band-edge shift of laser region. The EML exhibits a 18dB@-5 V DC extinction ratio.

AF1P.1.32
The effect of drying method on the morphology of III-V microtubes, Bochang Li[1], Qi Wang[1], Xiaomin Ren[1], Shiwei Cai[1], Yongqing Huang[1]; [1]Inst. of information photonics and optical communications, Beijing Univ. of Posts and Telecommunications, China.

Through the adoption of critical point drying, doubly curved regions (DCR) observed on the III-V microtubes vanished. This process verified that the DCR does not result from the natural release of the residual strain energy.

AF1P.1.33
High Gain Quantum Dots Fiber Amplifier over O-band Based on Tapered Fiber Coupler, Juanjuan Chen[1], Xiaolan Sun[1], Rong Dai[1], Wei Zhou[1], Zesheng An[1], Tingyun Wang[1]; [1]Shanghai Univ., China. An O-band Quantum Dots fiber amplifier based on tapered fiber coupler coated with PbS QDs-doped film was proposed. A maximum signal gain of 24 dB at 1310 nm with 100 nm bandwidth was obtained experimentally.

AF1P.1.34
Experimental Investigation on the Nonlinear Dynamics of a Semiconductor Laser Subject to Dual-Beam Optical Injection, Li Fan[1],[2], Zheng-Mao Wu[1], Jia-Gui Wu[1], Tao Deng[1], Xi Tang[1], Xiao-Li Ren[1], Guang-Qiong Xia[1]; [1]School of Physical Science and Technology, Southwest Univ., China; [2]School of Electronic and Information Engineering, Southwest Univ., China. Nonlinear dynamics of a semiconductor laser subject to dual-beam optical injection are studied experimentally. For three cases of dual-beam detuning frequency, some typical dynamical states and complete mappings of dynamics scenarios are specified.

AF1P.1.35
Design and Analysis of Hybrid Integrated High-Speed Mushroom Vertical PIN Photodetector, Kerui Zhang[1], Yongqing Huang[1], Xiaofeng Duan[1], Xia Zhang[1], Qi Wang[1], Xiaomin Ren[1]; [1]State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. We demonstrate a high-speed InGaAs/InP vertical PIN photodetector which is integrated on a GaAs/AlGaAs F-P filter cavity using an undercut mushroom mesa structure to significantly reduce the diode RC constant. A 3dB bandwidth of 110 GHz and a quantum efficiency of 68% are simultaneously obtained at 1.55 μm wavelength.

AF1P.1.36
Polarization independent optical parametric amplification in periodically poled LiNbO3, Guang-hao Shao[1], Xiao-shi Song[1], Fei Xu[1], Yanqing Lu[1]; [1]Nanjing Univ., China. We propose a scheme to realize arbitrarily polarized light optical parametric amplification in a periodically poled Lithium Niobate using quasi-phase matching. The domain structure should be well-designed with suitable electric field applied on selected sections.

AF1P.1.37
Polarization rotation in bilayered plasmonic metamaterials, Xingchen Liu[1], Shengwu Yu[1], Yiqun Xu[1], Chunying Guan[1], Zhengping Wang[1], Jin-hui Shi[1],[2]; [1]Harbin Engineering Univ., China; [2]Southeast Univ., China. A linear polarization rotator is constructed by using two pairs of planar SRR structures with a certain twist angle. Numerical results show that chiral metamaterial can achieve strong optical activity of linearly polarized electromagnetic waves.

AF1P.1.38
Optical properties of Yb3+-doped photonic crystal fiber with powder melting technology, chao wang1, Guiyao Zhou[1],[2], Wei Zhang[2], Changming Xia[2], Yuanyuan Zhao[1]; [1]The Key Laboratory for Special Fiber and Fiber Sensor of Hebei Province, Yanshan Univ., China; [2]Laboratory of Nanophotonic Functional Materials and Devices, South China Normal Univ., China. The Yb3+-doped PCF is prepared by powder melting technology based on high temperature plasma furnace. The optical properties are good and the background attenuation is less than 0.5dB/m. The peak shifts to longer wavelength as the length increases.

AF1P.1.39
Effect of dangling bonds on the doped GaAs nanowires, Jiangong Cui[1], Xia Zhang[1], Xin Yan[1], Xiaolong Lv[1], Junshuai Li[1], Yongqing Huang[1], Xiaomin Ren[1]; [1]Beijing Univ. of Posts and Telecommunications, China. We have investigated the effect of surface dangling bonds on the doped GaAs nanowires by the first-principle density functional calculation. Our results show that the surface dangling bonds prefer to deactivate the p-type dopants.

AF1P.1.40
Thermoluminescence and two-wavelength excited photoluminescence of Ba3Si6O12N2:Eu2+ phosphor, Li Tingting[1], Kamata Norihiko[1]; [1]Graduate School of Science and Engineering, Saitama Univ., Japan. In addition to thermoluminescence analysis, we superposed a below-gap excitation light for Ba3Si6O12N2:Eu2+ and detected a nonradiative center by observing photoluminescence intensity increase. Such low density centers in phosphors became detectable by the optical method.

AF1P.1.41
Simulation of a Single GaAs Nanowire Axial p-i-n Solar Cell, Liang Li[1], Xin Yan[1], Xia Zhang[1], Junshuai Li[1], Xiong Chen[1], Yongqing Huang[1], Xiaomin Ren[1]; [1]State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. The electrical and photovoltaic properties of a single GaAs nanowire axial p-i-n solar cell are simulated. The open-circuit voltage, short-circuit current and power-conversion efficiency are calculated to be 0.93 V, 56 pA and 4.03%, respectively.

AF1P.1.42
The analysis of interface states in PIN photodetector using cross-finger structure, zhou hongyi[1], Xin Xin Luan[1], Xia Guo[1]; [1]Beijing Univ. of Technology, China. Built the equivalent circuit by the rule of carriers changed with bias in PIN photodetector using cross-finger structure, tested the C-V/C-f curve, and analysis every part of capacitance, then get the accurate interface states parameters.

AF1P.1.43
Structural and optical properties of β-Ga2O3 thin films on sapphire, Zhenping Wu[1], Peigang Li[1], Weihua TANG[1]; [1]Physics, Beijing Univ. of Posts and Telecommunications, China. We have successfully fabricated epitaxial β-Ga2O3 thin films on sapphire substrates. The RHEED observations have revealed that a layer-by-layer growth of Ga2O3 was achieved at optimized deposition conditions. The optical properties of the films were derived from measurements, at normal incidence, of transmittance and reflectance.

AF1P.1.44
The optical properties of (PbS)n cluster structures on the silica fiber materials, Yanhua Dong[1], Jianxiang Wen[1], Long Li[1], Fufei Pang[1], Zhenyi Chen[1], Tingyun Wang[1]; [1]Shanghai Univ., China. The optical properties of (PbS)n clusters (n=1-9) were studied theoretically. PbS was prepared on silica fiber materials by atomic layer deposition (ALD) technique. Theoretical calculations on absorption spectra were basically agreed with the experimental results.

AF1P.1.45
Optical Parallel Transmission Lines with Nanometer Light Localization and Dynamic Controls, Wei Du[1], Ran Hao[1], Erping Li[1]; [1]zhejiang Univ., China. We have demonstrated a novel optical parallel transmission line constructed by multi-channel surface plasmon-polariton waveguides based on cross-index-modulation mechanism, which may find application in the field of nano-optical integrated circuits.

AF1P.1.46
A new plasmonic coupler for MDM waveguide based on the metallic voids, Zhijun He[1], Fan Lu[1], Kun Li[1], Dalin Liu[1], Anshi Xu[1]; [1]Peking Univ., China. We proposed a new type of plasmonic coupler for the metal-dielectric-metal (MDM) plasmonic waveguide using the periodic metallic voids. The resonance modes in the voids and the performance of the coupler were analyzed and discussed

AF1P.1.47
Mode Analysis of Metal-coated Nanoring Resonator, Ming-Ying Tang[1], Yong-Zhen Huang[1], Qi-Feng Yao[1], Xin Jin[1], Shao-Shuai Sui[1], Jin-Long Xiao[1]; [1]State Key Laboratory on Integrated Optoelectronics, Inst. of Semiconductors, CAS, China. Mode characteristics of nanoring resonators laterally confined by isolation and metallic layers are investigated by solving the eigenvalue equations. The results indicate that the metallic layer can increase the mode Q factors and the introduction of an isolation layer can further increase mode Q factors.

AF1P.1.48
Ultranarrow Band and High Transmittivity Response Filter with Subwavelength Grating Structure, Hongyu Fan[1], Yongqing Huang[1], Xiaofeng Duan[1], Xiaomin Ren[1], Qi Wang[1], Xia Zhang[1], Shiwei Cai[1]; [1]State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. The Si-based high-performance filter realized by the introduction of the subwavelength grating structure has been designed. The transmittivity of this subwavelength grating filter is as high as 99.73% at 1550nm with the FWHM=0.09 nm.

AF1P.1.49
Efficient Unidirectional Optical Coupling for Hybird Plasmonic Waveguide, Fan Lu[1], Kun Li[1], Zhijun He[1], Dalin Liu[1], Anshi Xu[1]; [1]Peking Univ., China. A new type of efficient and unidirectional optical coupler composed of periodic nanoslits is proposed for hybrid plasmonic waveguide. The operation principle and performance

were analyzed and discussed. The coupling efficiency more than 50%, extinction ratio better than 18dB with incidence angle θ=12° was achieved at λ= 1550nm.

AF1P.1.50
Thin Film Dual Band Metamaterial Absorber Based on Gold Triangular Patches, Peiqian Tong[1], Shou Zhang[1], Yanxia Cui[1], Yinyue Lin[1], Ting Ji[1], Yuying Hao[1]; [1]Taiyuan Univ. of Technology, China. We report the design of a thin film dual band metamaterial absorber based on metal/insulator/metal multilayer structures with the top metallic layer periodically carved into triangular shaped patches.

AF1P.1.51
Designing a Thin Film Beam Collimator Based on a Metal/dielectric Multilayer Structure, Shou Zhang[1], Guohui Li[1], Yanxia Cui[1,2], Yuying Hao[1], Feng Zhang[2], Sailing He[2]; [1]Key Laboratory of Advanced Transducers and Intelligent Control System (Ministry of Education), College of Physics and Optoelectronics, Taiyuan Univ. of Technology, China; [2]Centre for Optical and Electromagnetic Research, JORCEP (KTH-ZJU Joint Center of Photonics), Zhejiang Univ., China. A compound plasmonic structure made of metal/dielectric multilayers and a shallow metallic grating is introduced to collimate light. Such design is advantageous in fabrication than the bull's eye structure.

AF1P.1.52
Integral invariance of reflective spectrum for weak-coupled waveguide Bragg grating, Rui Liu[1]; [1]Nanjing Univ., China. The integral invariance of the reflective spectrum is revealed for weak-coupled waveguide Bragg grating. The integral of the reflective spectrum of arbitrary grating profile nearly maintains constant when the reflective index modulation is uniform.

AF1P.1.53
Efficient injection of light into slow light slot photonic crystal waveguides using an asymmetric directional coupler scheme, Yameng Xu[1,2], Charles Caer[2], Xinliang Zhang[1], Eric Cassan[2]; [1]Wuhan National Laboratory for Optoelectronics, Huazhong Univ. of Sci and Tech, China; [2]Institut d' Electronique Fondamentale, Université Paris-Sud, France. An asymmetric directional coupler (ADC) scheme for the efficient injection of light into slow light slot photonic crystal waveguides is proposed and investigated using finite-difference time-domain simulation.

AF1P.1.54
Comparison of three-dimensional nano-optical Yagi-Uda antenna and backfire antenna, Pengjv Wang[1], Zhongyuan Yu[1], Yumin Liu[1], Chunwei Ye[1], Jie Wang[1]; [1]BUPT, China. We present three-dimensional nano-optical Yagi-Uda antenna and backfire antenna, a great improvement in gain coefficient and beamwidth is showed, the angular emission is highly directed also.

AF1P.1.55
On-chip nonmaximally entangled photon source through domain-engineering of nonlinear optical waveguide, Yang Ming[1], Zijian Wu[1], Zhaoxian Chen[1], Fei Xu[1], Yanqing Lu[1]; [1]Nanjing Univ., China. We propose to integrate the electro-optic (EO) tuning function into entangled photons generation process in a domain-engineered lithium niobate (LN) waveguide. Through suitable domain designs, we realize the generation of electro-optically tunable nonmaximally mode-entangled photon state.

AF1P.1.56
Parallelized Wavelet-Based Finite-Difference Time-Domain Model for Analyzing Optical Resonators, Jin Wang[1], Xiyan Jiang[1], Ji Xu[1], Yunqing Lu[1], Long Yin[1]; [1]Nanjing Univ. of Posts and Telecomm, China. The wavelet-based finite-difference time-domain method has been parallelized to solve physical problems with large dimensions, e.g. optical resonators. Such a parallelized model achieved a significant reduction in the computation time and the used memory.

AF1P.1.57
Design of Photonic Crystal Slab Waveguides Based on Chalcogenide Glass, Shufeng Li[1], YuZhou Du[1], Cuicui Liang[1], Dan W. Hewak[2], Kevin Huang[2]; [1]School of Physics & Optoelectronic Engineering, Dalian Univ. of Technology, China; [2]Optoelectronics Research Centre, Univ. of Southampton, UK. The photonic band gap and its properties were investigated for 2D photonic crystal slab with a triangular lattice of air hole. The design parameters of photonic crystal slab waveguide based on chalcogenide GaLaS were obtained operating at a wavelength of 1.53 micron miter.

AF1P.1.58
Group velocity enhancement analysis in photonic crystal coupled cavity waveguides, Leila Sadat Rahimifard[1], Hassan Kaatuzian[1], Mohammad Danaie[2]; [1]Amirkabir Univ. of technology, Islamic Republic of Iran; 2Semnan Univ., Islamic Republic of Iran. Here enhanced PhC CCWs are our concern which is improving group velocity bandwidth product. The results of simulations based on PWE demonstrate that the maximum GBP occurs at ra=0.3a and storage time per unit length is 1ms/36000m.

AF1P.2 • ACP/IPOC Joint Track 2: Novel Fibers and Fiber-based Devices

AF1P.2.1
Fabrication of Cerium-Doped Silica Scintillating Fiber Based on Sol-Gel and Powder-in-Tube Technique, Shiyang Lin[1], Qiang Guo[1], Fufei Pang[1], Zhenyi Chen[1], Tingyun Wang[1], Tianshi Li[2], Songyuan Jiang[2], Jigang Gong[2], Xiuying Zhu[2]; [1]Key Laboratory of Specialty Fiber Optics and Optical Access Networks, School of Communication and Information Engineering, Shanghai Univ., China; [2]GWDC Wireline Logging Company, China. Cerium-doped fibers were fabricated through powder-in-tube technique. The sol-gel powders doped with Cerium were characterized by using XRF, FTIR and Raman spectra. The scintillating fiber shows sensitivity to gamma ray radiation.

AF1P.2.2
Design and Optimization of Multi-core Fibers with Low Crosstalk and Large Effective Area, Fang Yang[1,2], Jingchi Cheng[1,2], Ming Tang[1,2], Fu Songnian[1,2], Feng H. Wei[3], Yu Cheng[3], Jun W. Tong[3], Ping Shum[3], Liu Deming3; [1]Wuhan National lab for Optoelectronics (WNLO), HUST, China; [2]School of Optical and Electronic Information, Next Generation Internet Access National Engineering Lab (NGIA),Huazhong Univ. of Science and Technology (HUST), China; 3Yangtze Optical Fiber and Cable Company Ltd. R&D center, China. We performed intensive simulation work to find out key parameters which have a great influence on crosstalk in multi-core fibers. The design of core pitch, core/trench profile were optimized simultaneously.

AF1P.2.3
Bending Loss in Embedded-Core Hollow Fiber, Chunying Guan[1], Shuqiang Li[1]; [1]Harbin Engineering Univ., China. The bending losses in an embedded-core hollow fiber (ECHF) are investigated experimentally. The results show that the bending loss of the embedded-core hollow fiber has a strong directional dependence due to the non-circular symmetric structure.

AF1P.2.4
Optical Signal Phase Reconstruction for WDM System by Employing Twin-Core Fiber based Differentiator, Haidong You[1,2], Tigang Ning[1], Wei Jian[1], Jing Li[1], xiaodong wen[1]; [1]Key Lab of All Optical Network & Advanced Telecommunication Network of EMC, Beijing Jiaotong Univ., China; [2]Science and Information College, Qingdao Agricultural Univ., China. A technique based on twin-core fiber based differentiator (TCFD) for recovering phase profile of WDM signal from intensity measurements is presented. The key significance is that the phase profiles can be reconstructed for each channel.

AF1P.2.5
Thermal induced birefringence of the PbS doped silica fiber, Li Chen[1], Fufei Pang[1], Yi Huang[1], Yanhua Dong[1], Jianxiang Wen[1], Tingyun Wang[1]; [1]Shanghai Univ., China. A PbS doped fiber was proposed and fabricated for temperature sensor application. The sensitivity of the fiber birefringence to temperature is 0.068 rad/K/m which is 8 times larger than SMF.

AF1P.2.6
Theoretical Design and Experimental Demonstration of Photonic Crystal Fibers Operating for Parametric Generation Near 1.06 µm, Doudou Gou[1], Sigang Yang[1], Lei Zhang[1], Xiaojian Wang[1], Hongwei Chen[1], Minghua Chen[1], Shizhong Xie[1], Wei Chen[2], Wenyong Luo[2]; [1]Tsinghua National Laboratory for Information Science and Technology (TNList), Department of Electronic Engineering, Tsinghua Univ., China; [2]FiberHome Telecommunication Technologies CO. LTD, China. We demonstrate for the first time a systematic procedure for design, fabrication and confirmation of photonic crystal fibers operating for Parametric Generation near 1.06 µm.

AF1P.2.7
Mid-Infrared Fluorescence of Ho-doped Water-free Fluorotellurite Glasses, Jianli He[1], Huan Zhan[1], Zhiguang Zhou[1], Aidong Zhang[1], Aoxiang Lin[1]; [1]Xi'an Inst of Optics and Precision Mech, China. Ho3+-doped water-free fluorotellurite glasses and fiber canes were reported. Comparable long fluorescence lifetimes of 0.81 ms at 2.85 µm and 10.01 ms at 2.04 µm were obtained.

AF1P.2.8
Vibration Monitoring based on a compact LPFG with a heat-shrinkable tube, Yuki Okuno[1], Yasuhiro Tsutsumi[1], Masaharu Ohashi[1], Yuji Miyoshi[1], Hirokazu Kubota[1], Ikuo Yamashita[2]; [1]Osaka Prefecture Univ.,

Japan; [2]Kansai Electric Power Co.Inc., Japan. We demonstrate an on-line vibration monitoring technique by using a compact LPFG with a heat-shrinkable tube. We successfully measure the vibration characteristics of such objects as steel rods and steel pipes using vibration monitoring technique.

AF1P.2.9
Distributed Optical Amplification by Ultra-Long Fiber Ring Laser, Xin-Hong Jia[2,1]; [1]Sichuan Normal Univ., China; [2]Univ. of Electronic Science and Technology of China, China. We proposed a novel distributed Raman amplification (DRA) scheme by ultra-long fiber laser pumping within a ring cavity. The key point is that the pumping efficiency degradation for linear cavity pumping could be avoided.

AF1P.2.10
Proposal of Center Core Pumped Multi-core Erbium-doped Fibers, Hiroki Nakatani[1], Yuji Miyoshi[1], Hirokazu Kubota[1], Masaharu Ohashi[1]; [1]Osaka Prefecture Univ., Japan. We propose 6+1 core EDF for simultaneous pumping. The power coupling from the center core to the six surrounding cores occurs in a certain wavelength range, which ensures low-power crosstalk at the signal wavelength.

AF1P.2.11
Dispersion Properties of Hole-assisted Dual Concentric Core Fibers with Various Center Core Profiles, Yuichi Tsujiwaki[1], Hirokazu Kubota[1], Yuji Miyoshi[1], Masaharu Ohashi[1]; [1]Osaka Prefecture Univ., Japan. We evaluated the group velocity dispersion (GVD) of hole-assisted dual concentric core fibers (DCCFs) with α-index center core. Parabolic center core DCCF exhibited a 20% higher GVD than step-index core DCCF at the resonance wavelength

AF1P.2.12
Microstructure core photonic crystal fiber for blue extension of supercontinuum generation, Ben X. Zhang[1,2], Feng H. Wei[1,2], Ting Y. Zhang[1,2], Jun W. Tong[1], Li N. Dai[2], Yan J. Li[2]; [1]State Key Laboratory of Optical Fiber and Cable Manufacture Technology, Yangtze Optical Fiber and Cable Company Ltd. R&D center, China; [2]Wuhan National Laboratory of Optoelectronics, School of Optical and Electronic Information, Huazhong Univ. of Science and Technology, China. A photonic crystal fiber (PCF) with nanosize airholes in the core is designed for the blue extension of supercontinuum generation. Simulated results show an improvement of >60 nm comparing common PCF.

AF1P.2.13
Tunable Single-polarization single-mode photonic crystal fiber based on two air holes infiltration, Junqi Guo[1], Yange Liu[1], Zhi Wang[1]; [1]Key Laboratory of Optical Information Science and Technology, Inst. of Modern Optics, Nankai Univ, China. Single-polarization single-mode fiber is obtained by selectively filling two holes of a polarization maintain photonic crystal fiber, with polarization extinction ratio more than 15 dB and high sensitivity temperature tunability characteristic.

AF1P.2.14
Proposal of Sampled Brillouin Dynamic Gratings, Jin-Jin Guo[1], Ninghua Zhu[1], Ningbo Huang[1], Ye Deng[1], Wei Li[1], Xin Wang[1], Jianguo Liu[1], Ming Li[1]; [1]Chinese Academy of Sciences, China. We first report and numerically investigate sampled Brillouin dynamic gratings (SDBG) realized in optical fibers. The introduction of sample as an extra degree of freedom opens up possibilities for frequency control of stimulated Brillouin scattering.

AF1P.2.15
Design and Simulation of Large-Mode-Area Solid-Core Bragg Fiber, Lu Li[1], Aidong Zhang[1], Huan Zhan[1], Jianli He[1], Zhiguang Zhou[1], Aoxiang Lin[1]; [1]Xi'an Inst of Optics and Precision Mech, China. Solid-core Bragg fiber was proposed as a competitive solution for high power laser delivery. The optimized fiber is with effective area of 400 μm2 and low loss of 3 dB/km at 1.08 μm.

AF1P.2.16
Observation of optically controlled pulse delay via stimulated Brillouin scattering in photonic crystal fibers, Wei Wei[1], Xia Zhang[1], Hui Yu[1], Yongqing Huang[1], Xiaomin Ren[1]; [1]State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. By adjusting pump power, tunable pulse delay is experimentally demonstrated via stimulated Brillouin scattering in highly nonlinear photonic crystal fibers. Maximum pulse delay of 0.76 pulse width is obtained when pump power is 162.6 mW.

AF1P.2.17
Spectral purification and stabilization of an acousto-optic tunable filter based on water-filled solid-core microstructured fiber, Minghui Qiu[1], Hao Zhang[1], Yinping Miao[2], Bo Liu[1], Lihui Liu[3]; [1]Inst. of Modern Optics, Nankai Univ., China; [2]School of Electronics Information Engineering, Tianjin Univ. of Technology, China; [3]Department of Optic-Electronic Engineering, School of Information Science and Technology, Beijing Inst. of Technology, China. Compared with its air-filled counterpart, experimental results show that the acousto-optic tunable filter employing water-filled microstructured fiber exhibits certain red shift in resonance wavelength as well as spectral purification and stabilization for particular acoustic frequency.

AF1P.2.18
Selective-filling on a tapered silica photonic crystal fiber with new transmission characteristics, Yange Liu[1], Mingming Luo[1], Zhi Wang[1]; [1]Inst. of Modern Optics, Nankai Univ, China. We change the transmission characteristics of silica fiber with air holes by tapering with pressure-assist. The changes in dispersion introduced by tapering are analyzed by observing the resonance spectrum introduced by selective-filling the fiber.

AF1P.2.19
Refractive index sensitivity of tilted long period fiber gratings, Xiaobei Zhang[1], Yang Li[1]; [1]Shanghai Univ., China. We simulate and demonstrate the refractive index sensing properties of tilted long period fiber gratings (TLPFG) in fiber tapers, which shows different refractive index sensitivity with the same tilt angle when its period is different.

AF1P.2.20
Background Noise of Hollow-core Photonic Bandgap Fiber Gas Cell Used in Frequency Stabilized Lasers, Chongde Huang[1], Dijun Chen[1], Haiwen Cai[1], Ronghui Qu[1]; [1]Shanghai Key Laboratory of all Solid-State Laser and Applied Techniques, Shanghai Inst. of Optics and Fine Mechanics, China. Hollow-core photonic bandgap fibers are used to make gas cells for frequency stabilized lasers. Far-field instability due to inter-mode interference is observed. Intensity variations with laser frequency and temperature of different gas cell configurations are investigated.

AF1P.2.21
A Single Mode Optical Fiber with Large Effective Area, Runhan Wang[1,2], Hongyan Zhou[1,2], Shengya Long[1,2]; [1]State Key Laboratory of Optical Fiber and Cable Manufacture Technology, China; [2]Yangtze Optical Fiber and Cable Company Ltd., China. A single mode optical fiber with a ring core structure to obtain an enlarged effective area up to over 150μm2 is reported. With a trench assisted refractive profile design and coating process optimization, the micro-bending performance is also improved.

AF1P.2.22
Investigation on Single-mode Transmission of Terahertz Wave Triangle Core Photonic Crystal Fibers, Shanglin Hou[1], Peng Yuan[1], Liu Yanjun[1], Jingli Lei[1], Yujie Zhao[2]; [1]School of Science, Lanzhou Univ. of Technology, China; [2]Belie College of Engineering and Technology, Lanzhou City Univ., China. The single mode cutoff frequency of a novel Terahertz triangle core photonic crystal fiber is investigated. The results show that the Terahertz frequency range of the single-mode can be adjusted by the fiber parameters.

AF1P.2.23
Multipath Interference Phenomenon in Bend Insensitive Fiber, Hongyan Zhou[1,2], Lei Zhang[1,2], Shengya Long[1,2], Jing Li[1,2], Jie Luo[1,2]; [1]State Key Laboratory of Optical Fiber and Cable Manufacture Technology, China; [2]Yangtze Optical Fiber and Cable Company Ltd., China. We measured Multi Path Interference (MPI) phenomenon in our bend-insensitive fiber and ultra bend-insensitive fiber with different cutoff wavelengths. Their MPI values are lower than the threshold (-30dB), which ensures system stability.

AF1P.2.24
Theoretical modeling and experimental verification of Optical Parametric Amplifier Based on Photonic Crystal Fiber at 1 μm Band, Xiaojian Wang[1]; [1]Tsinghua Univ., China. We demonstrate an effective algorithm to simulate fiber optical parametric amplifier operating at 1 μm band based on photonic crystal fiber and the simulation results coincide well with the experimental results.

AF1P.2.25
Numerical Analysis of Dual-Core Optical Fiber Crosstalk via Supermode Theory, Gaozhu Peng[1], Jia Zhang[1], Ming-Jun Li[1]; [1]Corning Incorporated, USA. Numerical analysis of crosstalk for dual-core fibers is performed via the supermode theory. The method is compared with the coupled mode theory. Core distance, index difference, and bending effects are studied.

AF1P.2.26
Bandgap Mechanism in All Solid Microstructured Fibers with Linear Arrayed Structure, Chunying Guan[1], Yaowu Wen[1]; [1]Harbin Engineering Univ., China. An all-solid microstructured fiber with a linear arrayed structure is characterized. The plane wave expansion method (PWM) and finite element method (FEM) are used to analyze the band-gap properties, birefringences and confinement losses.

AF1P.2.27
A Novel Time-delay Compensation Scheme Utilizing a Linearly Chirped Fiber Bragg Grating in Photonics Analog-to-digital Conversion, Tao Wang[1], Zhe Kang[1], Jinhui Yuan[1], Ye Tian[1], Xinzhu Sang[1], Chongxiu Yu[1]; [1]bupt, China. We propose a novel lumped time-delay compensation scheme for coding synchronization. By the characteristics of a linearly chirped fiber Bragg grating, the time-delay of different quantized pulses can be accurately compensated with a simple structure

AF1P.2.28
Investigation on a V-shape photonic crystal fiber with high birefringence and nonlinearity, Lixiao Li[1], Chongxiu Yu[1], Jinhui Yuan[1], Shuai Wei[1]; [1]Beijing Univ. of Posts & Telecom, China. A highly birefringent and nonlinear photonic crystal fiber with a V-shape simplified structure is proposed and analyzed by the fully vectorial finite element method. It will have important applications in the nonlinear optics and biophotonics.

AF1P.2.29
Nano-film Coated Cascaded Long Period Fiber Gratings for the Refractive Index Measurement, Fang Zou[1], Yunqi Liu[1], Yanhua Dong[1], Yuchen Zhao[1], Qiang Guo[1], Tingyun Wang[1]; [1]Shanghai Univ., China. We demonstrate the refractive index sensing of cascaded long period fiber gratings coated with nano-film. Atomic layer deposition was adopted for the coating of the nano-film. High sensitivity and wide dynamic range can be achieved.

AF1P.2.30
The Comparison Study of Optimization of Fiber Bragg Grating, Ying Zhou[1], Song Jianfei2; [1]Fujian Normal Univ., China; 2Central South Univ., China. A comparative study of different synthesis methods for fiber Bragg grating is presented, including genetic algorithm, Layer peeling algorithm, PSO algorithm and least square method. The results show a combination of these method is more efficient.

AF1P.2.31
Slow Light in Three-core Microstructured Optical Fiber, Xingsong Pan[1], Xia Zhang[1], Wei Wei[1], Huifang Ma[1], Yongqing Huang[1], Xiaomin Ren[1]; [1]State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. We propose a three-core microstructured-optical-fiber (MOF) for slow-light propagation that delays 2-ps-pulse by 56.65ps with broadening factor being 2. Compared with two-core MOF, it generates smaller pulse broadening with almost the same time delay.

AF1P.2.32
A Low-Loss Lens-Coupling connection technique between PCF and SMF with High-Strength, lu zhang[1], Di Zhang[2]; [1]Shandong Univ., China; [2]Accelink Technologies Inc., China. The lens-coupling Photonic crystal fiber (PCF) connection technique can effectively eliminate the mismatch loss between two different fibers. 0.44 dB connection loss between single-mode PCF and G.652 fiber was achieved with high-strength and good-repeatability.

AF1P.2.33
Refractive Index Sensing with a Macro-bending Structure of the Multimode Micro Plastic Optical Fiber, Ning Jing[1], Chuanxin Teng[1], Jie Zheng[1], Pengfei Wang[2], Gerald Farrell[2]; [1]State Key Laboratory of Integrated Optoelectronics, College of Electronic Science and Engineering, Jilin Univ., China; [2]Photonics Research Center, School of Electronic and Communications Engineering, Dublin Inst. of Technology, Ireland. A Refractive index (RI) sensor was fabricated with a multimode micro plastic optical fiber (mPOF) with macro-bending structures, which RI sensing resolution can reach 10-5 order. The experiments results agree with the simulation.

AF1P.2.34
Experimental Investigation of Wavelength-tunability of All-normal-dispersion Yb-doped Mode-locked Fiber Lasers, Xiaosheng Xiao[1], Yi Hua[1]; [1]Tsinghua Univ., China. The wavelength-tunability of all-normal-dispersion Yb-doped mode-locked fiber laser is experimentally investigated. It is demonstrated that the tunable range is affected by the length of Yb-doped fiber and total cavity length significantly.

AF1P.2.35
Evolution of Ultra-short Pulses Transmitting in Fiber Kerr Cavity, Shuo Li[1], Wei Cao[1], Zhi Wang[1], Yange Liu[1], Tingting Han[1]; [1]Nankai Univ., China. We numerically simulate the evolution of picosecond pulses transmitting in fiber Kerr cavities. Results show that output fields of the fiber Kerr cavity can be modulation instability (MI), cavity solitons (CS) and multi-peak pulses, depending on different dispersion, cavity detuning and input initial conditions.

AF1P.2.36
Effects of Third-order Dispersion on Self-Similar Pulse Compression in Nonlinear Fibers, Qian Li[1], Hui Huang[1], Huiling Lu[1], Shendong Zhang[1]; [1]Peking Univ. Shenzhen Graduate School, China. We investigate the effects of third order dispersion on the self-similar optical pulse compression in nonlinear fibers with exponentially decreasing dispersion.

AF1P.2.37
Spectral Compression of Femtosecond Pulses in Dispersion Flattened and Dispersion Exponentially Increasing Fibers, Qian Li[1], Hui Huang[1]; [1]Peking Univ. Shenzhen Graduate School, China. We demonstrate efficient spectral compression of 200 fs pulses using a dispersion flattened and dispersion exponentially increasing fiber of 1 km in the 1550 nm wavelength region. A high spectral compression factor of 18 is achieved.

AF1P.2.38
Simulations of mid-IR super-continuum generation with 1.55microns pump in ZBLAN fiber, Wei Cao[1], Zhi Wang[1], Yange Liu[1], Guang Yang[1]; [1]Key Laboratory of Optical Information an, China. In this paper, we numerically investigate the mid-IR super-continuum generation in ZBLAN fiber followed by a section of silica single mode fiber (SMF) pumped by 1.55 microns pulse. The evolution of pump pulses in these fibers is presented by solving the generalized nonlinear Schrodinger equation.

AF1P.2.39Highly Sensitive Strain Sensor Based on Cladding-Etched All-Fiber Acousto-Optic Tunable Filter, Chao Liu[1], Li Pei[1], Yiqun Wang[1], Sijun Weng[1], Shaowei Yu[1]; [1]Key Laboratory of All Optical Network and Advanced Telecommunication Network of Ministry of Education, Inst. of Lightwave Technology, Beijing Jiaotong Univ., China. A highly sensitive strain sensor based on cladding-etched all-fiber acousto-optic tunable filter is demonstrated. The strain sensor has a linear wavelength shift response to the different strains, and the sensitive of about 0.1nm/με, is achieved.

AF1P.3 • ACP/IPOC Joint Track 3: Optical Transmission Systems, Subsystems, and Technologies

AF1P.3.1
Generation of a high-bit-rate optical millimeter wave, Hongjun Zheng[1,2], Shanliang Liu[1], Weisheng Hu[2], Xin Li[1]; [1]Shandong Provincial Key Laboratory of Optical Communication Science and Technology, School of Physical Science and Information Engineering, Liaocheng Univ., China; [2]State Key Laboratory of Advanced Optical Communication Systems and Networks, School of Electronic Information and Electrical Engineering, Shanghai Jiao Tong Univ., China. We propose a novel experimental system of optical millimeter wave with high-bit-rate. The system band is 40GHz, the high-bit-rate is 10 Gbps. The experimental results show that this is a good methodology to generate optical millimeter wave with efficient noise suppression and high-bit-rate.

AF1P.3.2
Precoding Research on Vector Signal 16QAM Applied in the Frequency Doubling Scheme of ROF Link, Ruanbin Zhang[1]; [1]State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. A phase and amplitude precoding method is proposed for 16QAM which is applied on the proposed frequency doubling scheme. A precoding 10MSym/s 16QAM carrier signal at 6GHz is demonstrated and the normal constellation is achieved.

AF1P.3.3
Microwave Photonic Down-conversion based on a Wideband Tunable Optoelectronic Oscillator, TAO SUN[1], Cheng Zhang[1], Xiaopeng Xie[1], Peng Guo[1], Xiaoqi Zhu[1], Huanfa Peng[1], Lixin Zhu[1], Weiwei Hu[1], Zhangyuan Chen[1]; [1]Peking Univ., China. We present a novel microwave photonic down-conversion system based on a wideband tunable optoelectronic oscillator. Microwave signals from 14.8 to 31.0 GHz are down-converted to 1 GHz successfully. The conversion gain is about -55 dB.

AF1P.3.4
Slow light and distortion of arbitrary waveform periodic signal in the Erbium-doped Fiber, Fu Wang[1],

Chongqing WU[1], Zhi Wang[1], Guodong Liu[1], Yaya Mao[1]; [1]School of Science, Inst. of Optical information, China. Indicated that slow light in EDF is always concomitance with waveform distortion. A new definition of the fractional delay is proposed considering the distortion to evaluate slow light, which is from experiment and theoretical analysis.

AF1P.3.5

LUT-Based Performance Estimation for Reconfigurable Non-Dispersion Managed WDM Systems, Hadrien Louchet[1], Igor Koltchanov[1], André Richter[1], Yabin Ye[2], Gernot Goeger[2], Xiaogen Xu[2], Enbo Zhou[2], Sen Zhang[2]; [1]VPIphotonics, Germany; [2]Huawei Technologies, Germany. We show how the nonlinear performance of reconfigurable WDM systems over non-dispersion-managed links can be accurately estimated using two-dimensional look-up-tables. Experimental validation is reported for 43Gb/s DP-QPSK and 45Gb/s DP-BPSK WDM systems.

AF1P.3.6

QoS Supported Dynamic Bandwidth Allocation Algorithm for Next Generation EPON with Network Coding, Pei Wei[1], Rentao Gu[1], Zhitong Huang[1], Yuefeng Ji[1]; [1]Beijing Univ. of Posts and Telecoms, China. A QoS supported dynamic bandwidth allocation (DBA) algorithm (QDBA) is proposed in next generation EPON with network coding. Simulation results show that QDBA performs better in QoS support as compared with two other DBA algorithms.

AF1P.3.7

10 Mbps Ethernet Access for Indoor Personal Local Area Network based on a Phosphorescent White LED, Honglei Li[1], Xiongbin Chen[1], Danying Tang[1], Hongda Chen[1]; [1]State Key Laboratory of Integrated Optoelectronics, Inst. of semiconductors, CAS, China. This paper reports a visible light communication application system realizing 10 Mbps Ethernet access for indoor personal area network based on a phosphorescent white LED, operating with high signal to noise ratio (>45 dB).

AF1P.3.8

Low-rank Matrix Sensing in the Photonic Domain and All-optical Measurement Structure, Yi Cen[1], Rentao Gu[1], Yuefeng Ji[1]; [1]Beijing Univ. of Posts and Telecommunications, China. We propose a spatio-temporal measurement approach and the corresponding all-optical circuit structure to achieve dimensionality reduction for the high dimension redundant data in the optical layer via the theory of low-rank matrix completion.

AF1P.3.9

Study on DCT-based Modulation Scheme utilizing 4-ASK-OFDM in Next-Generation PON, Yanan Li[1], Yuanjie Li[1], Yaojun Qiao[1], Hongzhan Liu[1], Yuefeng Ji[1]; [1]State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. We propose an uplink DCT based 4ASK-OFDM scheme for the next-generation PON to improve the spectrum efficiency.The SNR penalty of the proposed scheme is 1.8dB smaller than that of the conventional QPSK-OFDM system at FEC limit.

AF1P.3.10

WiFi Signal Distribution over Multimode Fiber PON, Marcin Kowalczyk[1], Lukasz Maksymiuk[1], Jerzy Siuzdak[1]; [1]Inst. of Telecommunications, Warsaw Univ. of Technology, Poland. For the first time we present a successful deployment of WiFi distribution system employing RAUs over MMF PON. We show experimental data confirming network operation in a real environment condition (faculty building).

AF1P.3.11

Novel Multiple Access Interference Elimination based on Mach-Zehnder Modulator for OCDMA Networks, Yinfang Chen[1], Rong Wang[1], Tao Pu[1], Peng Xiang[1], Huatao Zhu[1], Tao Fang[1], Jilin Zheng[1]; [1]Inst. of Communications Engineering, China. A Mach-Zehnder modulator based novel electro-optical time gating for eliminating multiple access interference in OCDMA networks is proposed. It is successfully investigated in both an 8-user 2D WHTS system and a 3-user TPE system.

AF1P.3.12

Effect of PDL and Second-order PMD on the Optical PMD Compensation and polarization-multiplex receiver in high-speed systems, lu zhang[1]; [1]School of Information Science and Engineering, Shandong Univ., China. We find that the depolarization effect of second-order PMD on signal's DOP would be more distinct even if the total PDL vector changes a little. Modifications to their destructions on DOP-feedback PMD compensation are discussed.

AF1P.3.13

Performance Studies of Advanced QC-LDPC Codes Applied to CO-OFDM System, Nui Huijuan[1,2], Bai Chenglin[1,2], He Feifei[1,2], Xu Hengying[1,2], Wang Qiuguo[1,2], Zhang Xia[1,3]; [1]School of Physics Science and Information Technology, China; [2]Shandong Key Laboratory of Optical Communication Science and Technology, China; [3]Beijing Univ. of Posts and Telecommunications Beijing Univ. of Posts and Telecommunications, China. Error Platform Phenomenon always occurs at a low BER in communication system with general QC-LDPC codes. The cyclic decomposition technique can avoid this trouble. The paper shows that the modified QC-LDPC codes have good performances.

AF1P.3.14

Dispersion compensation True Time Delay system based on four-wave-mixing employing dual-wave adjustment theory, Qi Yu[1], Yunlong Song[1], Fengkai Bian[1], He Wen[1], Hanyi Zhang[1], Xiaoping Zheng[1], Pingkun Zhou[1]; [1]Electronic Engineering, Tsinghua National Laboratory for Information Science and Technology, China. A novel dispersion compensation True Time Delay system was proposed and demonstrated to improve the bandwidth from 8GHz to 26.5GHz. And a dual-wave adjustment theory was proposed and employed in the system.

AF1P.3.15

A Scheme of 6-PolSK Modulation for Atmospheric Laser Communication, Xueguang Yuan[1], Jinnan Zhang[1], Yangan Zhang[1], Minglun Zhang[1]; [1]Beijing Univ of Posts & Telecom, China. A novel modulation scheme of 6-PolSK for atmospheric laser communication is proposed. Theoretical analysis and simulation results show that the transmission performance and the bandwidth efficiency are improved considerably compared with OOK modulation.

AF1P.3.16

Influence of SBS on UWB Impulse Radar Pulses and Echoes Distributed Bidirectionally Over Fiber, xiyin yan[1]; [1]BUAA Univ., China. Performance of bidirectional UWB-over-fiber radar system with SBS effect is investigated. It is found that the input power should be at least 3dB below the SBS threshold to reduce the influences of Stokes waves.

AF1P.3.17

Chaotic Correlation Optical Time Domain Reflectometry Using Wideband Chaotic Light from a SOA Ring, Di Huang[1], Li Xia[1], Liu Deming[1]; [1]National Engineering Laboratory for Next Generation Internet Access System, Huazhong Univ. of Science and Technology, China. We propose a chaotic correlation optical time domain reflectometry (CCOTDR) based on a semiconductor optical amplifier (SOA) ring structure. The CCOTDR realizes a range-independent resolution of 1.66cm and its dynamic range is 25km at least.

AF1P.3.18

A Modulation-Format-Free Ditherless Bias Control Technique for MZ Modulator with Monitoring the Slope Value of Average Output Optical Power, Yupeng Li[1], Yangan Zhang[1], Yongqing Huang[1], Yanfei Hao[1], Jinjing Tao[1]; [1]State Key Laboratory of Information Photonics & Optical Communications, Beijing Univ of Posts & Telecom, China. We propose a novel simple and cost-effective bias control scheme for MZ modulator with monitoring the slope value of the output optical power of the MZM, and demonstrate its effectiveness with experiments. The system BER performance has been observed for 72 hours without degradation.

AF1P.3.19

Multi-wavelength generation based on a mode-locked fiber laser using carbon nanotube and fiber Fabry-Perot filter, Yuanwu Wang[1], Li Xia[1], Chengliang Yang[1], Liu Deming[1]; [1]Huazhong Univ. of Science and Technology, China. A novel configuration which employs a carbon nanotube (CNT) and spectrum-slicing technique for 33 wavelengths generation with 0.2 nm spacing among the power uniformity of 2.3 dB is proposed and demonstrated for the first time.

AF1P.3.20

Polarization-Dependent Loss Monitoring in Stokes Space in a Digital Coherent Optical Receiver, Yu Zhenming[1], Yi Xingwen[1], Mingliang Deng[1], Chen Xuemei[1], Qiu Kun[1]; [1]UESTC, China. We propose a novel and simple method that estimates polarization-dependent loss (PDL) in Stokes space in a digital coherent optical receiver. It is applicative to all single carrier and OFDM systems.

AF1P.3.21

Influence of Data Modulation Process on the Performance of Tunable Optical Frequency Comb (TOFC) RoF-PON system, Yu Xiang[1]; [1]Univ of Electronic Science & Tech China, China. We theoretically

analyze and demonstrate the influences of two different data modulation processes on RoF-PON system. The results show that the second modulation method can improve the dispersion tolerance and guarantees a better performance.

AF1P.3.22
Investigation of a Novel Modulation Scheme of (6PolSK)-QPSK Signal in High-speed Optical Transmission System, ding ding[1]; [1]IPOC of BUPT, China. PS-QPSK is the most power efficient modulation formats in coherent transmission systems. (6PolSK)-QPSK not only benefits from PS-QPSK but also offers a better spectral efficiency. A novel scheme of 6PolSK-QPSK modulation scheme is proposed and the principle of the scheme is described in detail.

AF1P.3.23
Capacity Analysis for Indoor Visible Light Communication Systems, Te Chen[1], Lu Liu[1], Weiwei Hu[1]; 1State Key Laboratory of Advanced Optical Communication Systems and Networks, Peking Univ., China. This paper analyzes the channel characteristics of indoor VLC systems, and presents the upper capacity bound under indoor circumstance. Solution towards higher data rate is also discussed.

AF1P.3.24
Polarization-Dependent Principal Mode of Twofold Degenerate Modes Propagation over a Few-Mode Fiber, Liujiao Deng[1], Jie Zhang[1], Jiawei Han[1,2], Wanyi Gu[1]; [1]State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China; [2]Electrical Engineering, Korea Advanced Inst. of Science and Technology, Republic of Korea. A weakly-coupled few-mode fiber used for Mode-division Multiplexing transmission is designed, and the polarization-dependent principal mode-related properties of the twofold degenerate LP11/21 modes propagation are compared in terms of DGD and power distribution.

AF1P.3.25
Frequency estimation based on fast Fourier transform for QAM signals in optical transmission systems, Wu Liu[1], Chao Yang[1]; [1]Wuhan Research Inst. of Post & Tele, China. A frequency estimation method is presented based on fast Fourier transform of the symbol's phase angle. The method does not require removing modulated data phase and can be used for QAM constellations.

AF1P.3.26
Pump RIN Induced Impairment in Raman Amplified Coherent Optical Communication System using 16-QAM, Jingchi Cheng[1,2], Fang Yang[1,2], Ming Tang[1,2], Fu Songnian[1,2], Shum Ping[1,3], Liu Deming[1,2]; [1]Wuhan National lab for Optoelectronics (WNLO), Huazhong Univ. of Sci. & Tech., China; [2]Next Generation Internet Access National Engineering Lab (NGIA), School of Optical and Electronic Information,, Huazhong Univ. of Sci. & Tech., China; [3]School of EEE, Nanyang Technological Univ., Singapore. Pump RIN induced relative intensity noise and relative phase noise in Raman amplified coherent optical communication system using 16-QAM modulation format are analyzed. 0.1 dB Q-penalty will be caused by -120 dB/Hz pump RIN.

AF1P.3.27
Interference Mitigation in Indoor LEDs-Based Visible Light Communication Systems Employing Alamouti STBC with CAP Modulation, Fang-Ming Wu[1], Zhen-Yu Chen[2], Chia-Chien Wei[2], Chun-Ting Lin[1]; [1]Inst. of Photonic System, National Chiao Tung Univ., Taiwan; [2]Department of Photonics, National Sun Yat-sen Univ., Taiwan. This work employs Alamouti space-time block coding to mitigate interference in indoor VLC systems, while the usage of multiple LEDs to cover wider range could induce the multipath interference. Under the interference between two 2-m apart LEDs, 150-Mbps 4-CAP signals can achieve the BER of <2×10-3 over 3.2-m air transmission.

AF1P.3.28
Numerical Study of a DFB Semiconductor Laser With Multi-Corrugation-Pitch-Modulated(MCPM) Structure Based On Reconstruction-Equivalent-Chirp (REC) Technology, Weichun Li[1]; [1]Nanjing Univ., China. A Multi-corrugation-pitch-modulated(MCPM) distributed feedback semiconductor laser is proposed based on the Reconstruction-Equivalent-Chirp (REC) technology. The numerical study shows that the laser's optical intensity distribution is uniform and SMSR is high, which can suppress spatial-hole-burning effect.

AF1P.3.29
Higher Order Modulation For BB84 QKD Protocol, Swati Bhugra[1], Pradeep K. Kumar[1]; [1]Centre For Lasers & Photonics, IIT KANPUR, India. We propose a novel implementation of BB84 protocol using optical 8-PSK modulation. Homodyne detection at the receiver allows exchange of two key bits/transmission.

AF1P.3.30
A Flexible All-Optical OFDM Network Coding Architecture for multicast in Elastic Optical Networks, Lijun Li[1,2], Rentao Gu[1], Yuefeng Ji[1], Lin Bai[1], Zhitong Huang[1]; [1]Beijing Univ. of Posts and Telecommunications, China; 2Taiyuan Univ. of Science and Technology, China. An all-optical OFDM network coding architecture is proposed for flexible bandwidth allocation supporting multi-granularity multicast traffic transmission in elastic optical networks. The network efficiency, flexibility and configurability are improved, which are verified in relevant simulations.

AF1P.3.31
Impact of Pilot Positions on RF-Pilot based XPM Compensation for CO-OFDM Systems, Xingyi Wu[1], Jie Zhang[1], Guanjun Gao[1], Sai Chen[1], Lei Wang[2]; [1]State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China; 2ZTE Corporations, China. We investigate the influence of pilot positions on the performance of RF-pilot based cross-phase modulation (XPM) compensation for CO-OFDM systems. Simulation results show 1dB performance discrepancy by changing the positions of pilots.

AF1P.3.32
Coherent Crossed Frequency to Time Mapping and Its Application to Microwave Photonic Signal Generation, Hengyun Jiang[1], Lianshan Yan[1], Jia Ye[1], Zhiyu Chen[1], Wei Pan[1], Bing Luo[1], Xihua Zou[1]; [1]Southwest Jiaotong Univ., China. Coherent crossed frequency to time mapping (CFTTM) is proposed aided by intersymbol interference in the process of coherent frequency to time mapping. Photonic arbitrary waveform generation as well as modulated signal generation is demonstrated without the need of signal averaging.

AF1P.3.33
Coherent Long Reach OIDMA-PONs Enabled By Electronic Dispersion Compensation, Eslam A. El-Fiky[1], Ziad El-Sahn[1], Hossam Shalaby[2]; [1]faculty of engineering, Egypt; [2]Egypt-Japan Univ. of Science and Technology, Egypt. We present a coherent optical interleave-division multiple-access (OIDMA) technique with electronic dispersion compensation that can be employed in next generation long reach PONs with large number of users at a reasonably low launch power.

AF1P.3.34
Spacing Switchable Flat Broadband Optical Comb Generation Based on Cascaded Electro-optical Modulator, Rui Lin[1], Zhenhua Feng[1], Ming Tang[1], Fu Songnian[1], Shum Ping[1,2], Liu Deming[1]; [1]Next Generation Internet Access National Engineering Lab (NGIA), School of Optical and Electronic Information, Huazhong Univ of Science and Technology, China; 2School of EEE, Nanyang Technological Univ., Singapore. We experimentally demonstrateda wideband and spacing switchable optical frequency comb (OFC) generation by cascadingbasedphase and intensity modulators. 12.5 GHz and 8.33 GHz OFC are experimentally realized.

AF1P.3.35
Photonic generation of UWB doublet pulse with semiconductor amplifier and optical delay line, Yuan Huang[1]; [1]Hunan Univ., China. A novel method to generate optical ultra-wideband (UWB) doublet pulse using a semiconductor optical amplifier (SOA) and an optical delay line is investigated. The UWB doublet pulses with FCC mask can be generated by adjusting the time of the optical delay line. The method is simple and cost-effective.

AF1P.3.36
A Low-complexity Dynamic Bandwidth Allocation Algorithm for OBRing, Xiaoxu Cui[1], Xintian Hu[1], Xue Chen[1], Shaoliang Luo[1], Lei Wang[2], Sheping Shi[2]; [1]State Key Lab of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China; [2]ZTE corporation, China. A dynamic bandwidth allocation algorithm with low complexity to utilize the bandwidth resource effectively in optical burst ring is proposed. Simulation results show the algorithm could achieve high bandwidth utilization on the sub-wavelength granularity.

AF1P.3.37
Fragmentation-based Dynamic Multicast Routing and Spectrum Assignment Algorithm in Spectrum-sliced Elastic Optical Path Networks, Xiaoxu Liu[1]; [1]Beijing Univ. of Posts and Telecomm, China. We define the fragmentation based on the blocking probability and propose a fragmentation-based dynamic multicast routing and spectrum assignment (FBDM-RSA) algorithm in spectrum-sliced elastic optical path (SLICE) networks.

AF1P.3.38
Experimental Demonstration of WDM-OFDM-PON Using Optical-frequency-comb Source, Yangsha Wan[1],

Juhao Li[1], Bangjiang Lin[1], Yuanbao Luo[1], Hui Yang[1], Yongqi He[1], Zhangyuan Chen[1]; [1]Peking Univ., China. We proposed and experimentally demonstrate a carrier-distributed WDM-OFDM-PON scheme in which all the optical wavelengths are generated by a single optical-frequency-comb source, achieving cost-efficient colorless transmission.

AF1P.3.39

Adaptive CD Estimation Algorithms Based on Modified GCT Method for Nyquist-WDM Systems, Hongyan Liu[1], Dawei Wang[1], Changjian Guo[2]; [1]Center for Optical and Electromagnetic Reseach, Zhejiang Univ., China; [2]Center for Optical and Electromagnetic Research, South China Normal Univ., China. We present two effective chromatic dispersion (CD) estimation and compensation algorithms for Nyquist-WDM systems and compare the performance with four existing methods. Simulation results show that the proposed algorithms can offer better performance for Nyquist signals.

AF1P.3.40

Analysis of Singularity Problem from CMA Induced by PDL in Polarization Demultiplexing, Li Lu[1,2], Yu Lei[2], Jianming Lei[2], Xuecheng Zou[2], Wen Sheng[1]; 1Air Force Early Warning Academy, China; [2]Research Center for VLSI and Systems, Huazhong Univ. of Science and Technology, China. In coherent optical communications, the relationship between the singularity problem and polarization dependent loss when using constant modulus algorithm for adaptive polarization demultiplexing are proposed. A theoretical quantitative description of this relationship is given. The simulation results prove the validity of the theoretical analysis.

AF1P.3.41

AWG and Remotely Pumped EDFA based Wavelength-selectable Self-seeded Fabry-Perot Laser Source with High Mode-locked Stability, Zhiguo Zhang[1], Xue Chen[1], Liqian Wang[1], Min Zhang[1]; [1]Beijing Univ of Posts & Telecom, China. A wavelength-selectable laser source employing self-seeded Fabry-Perot laser diode, array waveguide gratings (AWG) and remotely pumped EDFA (RP-EDFA) for uplink transmission in wavelength-division-multiplexed passive optical network (WDM-PON) systems is proposed and experimentally validated.

AF1P.3.42

Low complex MP2P OLT Receiver Structure for Uplink Transmission in OFDMA-PON Systems Supporting Dynamic Subcarrier Allocation, Junchao Chen[1], Yingchun Li[1], Yingxiong Song[1], Cuiping Ni[1]; [1]Shanghai Univ., China. A low complex OLT receiver structure in uplink of MP2P OFDMA-PON systems is proposed. Simulation results demonstrated the ability of achieving symbol and clock synchronizations of each ONU in uplink transmission and supporting DSA algorithm.

AF1P.3.43

A Novel High Efficient Implement of LDPC on FPGA, Peng Z. Zhen[1,2], Jinnan Zhang[1], Jinjing Tao[1], Yangan Zhang[1], Xueguang Yuan[1]; [1]BUPT_IPOC, China; [2]State Key Laboratory of Information Photonics and Optical Communications, BUPT_IPOC, China. In this paper we propose a novel, high efficient fully programmable FPGA encoder architecture to the π-rotation LDPC. The results shows that this method is practicable and with less resource consumption.

AF1P.3.44

A Novel Structure of 4-PolSK System Using on Free-Space Optical Communications, Yiming Lin[1], Jinjing Tao[1], Xueguang Yuan1, Yangan Zhang[1], Jinnan Zhang[1]; [1]BUPT, China. Compared to 2-PolSK, M-PolSK can raise transmission efficiency, but using Stokes parameters receiver increases the complexity of entire system. A novel structure of 4-PolSK without using Stokes parameters receiver is proposed in this paper.

AF1P.3.45

Volterra-Model-Based Nonlinear Compensator with Kronecker Product for OFDM-PON System, Zhenlong Lu[1], Junhua Wang[1], Yanzan Sun[1], Min Wang[1], Chenhao Qi[2], Yong Fang[1]; [1]School of Communication and Information Engineering, Shanghai Univ., China; [2]School of Information Science and Engineering, Southeast Univ., China. Nonlinear fiber effects of OFDM-PON systems with coherent detector are investigated. They can be suppressed by Volterra-model-based nonlinear compensator with Kronecker product. Simulations show that the effects can be reduced dramatically.

AF1P.3.46

Field Measurement and Analysis of Receiver Sensitivity of an AlGaN -Based UV Communication System, Yuan Bingjie[1], Min Zhang[1], Dahai Han[1]; [1]State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. AlGaN is promising material of UV detectors. In this paper an AlGaN-based ultraviolet receiver system is demonstrated. Noise level of the detector is measured and a digital filtering method is advised to improve receiver sensitivity.

AF1P.3.47

A PAPR Reduction Algorithm Based on Orthogonal Segmented Phase Rotation in 16APSK-CO-OFDM Beyond 100Gb/s for Nonlinearity Tolerance Improvement, Yuling Chao[1], Zheng Yan[1], Xue Chen[1]; [1]Beijing Univ. of Posts and Telecommunications, China. We propose a phase vectors construction on the basis of 16APSK modulation which can effectively reduce PAPR with low complexity. The simulation result demonstrates that the improvement of nonlinearity tolerance is 1dB.

AF1P.3.48

Monitoring of I/Q and Pulse Carving Misalignment for RZ-QPSK Generation with Phase Trajectory, He Wen[1], Wang Ye[1], Xiaoping Zheng[1], Hanyi Zhang[1], Bingkun Zhou[1]; [1]Tsinghua Univ., China. Phase trajectory is proposed for simultaneously monitoring the misalignment of I/Q data and pulse carver/data in an RZ-QPSK transmitter. A quantitative relationship between the phase trajectory and the misalignment is obtained and verified by experiment.

AF1P.3.49

10-Gbps RSOA-Based Transmission in WDM-PON with ESD-VSS based electronic Equalizers, baoqi huang[1]; [1]Beijing Univ. of Posts and Telecomm, China. Proposed and simulated in this paper is 10-Gbps bidirectional transmission in WDM-PON, with band width limited RSOA utilized as colorless ONU and error signal difference based variable step size (ESD-VSS) algorithm used in electronic equalization at OLT.

AF1P.3.50

Performance Analysis of LDPC Codes with I-D Filter in NLOS UV Communication System, Yansong Zhang[1], Xiang Zhang[1], Xueyuan Zhao[1], Haobo Zhang[1], Dahai Han[1]; [1]State Key Lab of IPOC, Beijing Univ. of Posts and Telecommunication, China. The performance of UV NLOS communication system is affected by solar noise and great pass loss, therefore we simulated this system with the I-D filter and LDPC code to verify their effect in this system.

AF1P.3.51

The QPSK Modulated Atmospheric Optical Communication System in Atmospheric Turbulence, Jinjing Tao[1], Yangan Zhang[1], Jinnan Zhang[1], Xueguang Yuan[1], Yupeng Li[1], Yongqing Huang[1]; [1]State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. The performance of the atmospheric optical communication system employing quadrature phase-shift keying (QPSK) modulation format over atmospheric turbulence channels was experimentally investigated in this paper.

AF1P.3.52

16-QAM Signal Generation and Constellation Monitoring by Software Synchronized Linear Optical Sampling, He Wen[1], Kuantong Chen[1], Xiaoping Zheng[1]; [1]Electronics Engineering, Tsinghua Univ., China. Cascaded dual-parallel MZMs is used to generate 10-Gsymbol/s 16-QAM signal. The constellation is re-constructed by software synchronized linear optical sampling with an 8-ps width compressed linear chirp pulse at 7.31-GHz repetition rate.

AF1P.3.53

Digital Pre-Distortion of Radio-over-Fiber Links for Multi-Bands Signal Transmission, Tengyu Chen1, Jianqiang Li[1], Hao Chen[1], Kun Xu[1], Yitang Dai[1], Feifei Yin[1], Yuefeng Ji[1], Jintong Lin[1]; [1]State Key Laboratory of Information Photonics and Optical Communication, Beijing Univ. of Post and Telecommunication, China. A novel digital pre-distortion scheme was proposed to linearize Radio over Fiber links used for multi-band RF signal transmission. The experimental results indicate a distinct performance improvement in terms of error vector magnitude.

AF1P.3.54

Experiment Investigation of Silicon Hybrid Plasmonic Waveguides, Chao Xu[1], Yan Li[1], Cheng Zeng[2], Hui Yu[1], Jianyi Yang[1], Xiaoqing Jiang[1]; [1]Zhejiang Univ., China; [2]Wuhan National Laboratory for Optoelectronics, China. The silicon hybrid plasmonic waveguides have been demonstrated experimentally, including the straight SP waveguide with the propagation loss 0.6 dB/um and MMI-crossing with the crosstalk 26dB.

AF1P.3.55

Study on Extinction Ratio of 4-RZ-ASK Signal Generated by Optical Parametric Amplification, xia min[1], Jinhui Yuan[1], Chongxiu Yu[1], Sang Xinzhu[1], Kuiru

Wang[1], Binbin Yan[1], Zhe Kang[1]; [1]State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. Extinction ratio of 4-RZ-ASK signal generated by optical parametric amplification is studied. It is demonstrated that the extinction ratio of input signal and pump power have significant effects on the extinction ratio of output signal.

AF1P.3.56
20 Gb/s Coherent Free-Space Optical Communication System With QPSK Modulation, binbin Luo[1], Yan Li[1], Tong Xu[1], Jizhao Zang[1], Jian Wu[1], Jintong Lin[1]; [1]State Key Laboratory of Informational Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. We experimentally demonstrate the 20 Gb/s free-space coherent optical transmission using QPSK modulation. The distortion induced by atmospheric turbulence can be compensated by DSP algorithms. The BER could achieve 1E-9 at about -10dBm.

AF1P.3.57
Minimizing system noise in multi-channel sampling of OFDM system, Chen Kuantong[1], He Wen[1], Xiaoping Zheng[1], Hanyi Zhang[1]; [1]Department of Electronic Engineering, Tsinghua Univ., China. A general analysis on the system noise in multi-channel sampling of OFDM system shows that the noise characterized by a newly-defined system parameter can be minimized by optimizing the system structure and parameters.

AF1P.3.58
Security Analysis of Chaos-Based Optical Communications Utilizing Independent Component Analysis, Qingchun Zhao[1], Hongxi Yin[1], Nan Zhao[1]; [1]Dalian Univ. of Technology, China. The chaos-based optical communications is analyzed using the method of independent component analysis (ICA). The results reveal that the chaos modulation is more confidential than chaos masking. While chaos shift keying is most confidential.

AF1P.3.59
High-Speed Real-Time Optical OFDM Transmission System Based on Asynchronous Clock, Chaoxing Xu[1], Min Wang[1], Yingxiong Song[1], Lihui Yu[1]; [1]Shanghai Univ., China. A high speed real-time optical OFDM transmission system based on asynchronous clock is proposed. Experimental results shows the BER performance of sampling clock offset compensation and the optical OFDM system.

AF1P.3.60
Effects of Optical Filters on 10-Gb/s RSOA-Based Upstream Transmission in WDM-PON System, Min Ju[1], Shilin Xiao[1], Weiqiang Sun[1], Meihua Bi[1], Zhao Zhou[1], Tao Qi[1]; [1]Shanghai JiaoTong Univ., China. In this paper, we study the effects of different optical filters on 10-Gb/s upstream transmission using a low-bandwidth reflective semiconductor optical amplifier (RSOA), including super Gaussian filter, fiber Bragg grating filter and delay interferometer.

AF1P.3.61
The Research and Implementation of Optical Frequency Comb Generator for OFDM-PON, Jian Chen[1], Mingzhi Mao[1], Yingchun Li[1], Yingxiong Song[1], Rujian Lin[1], Junchao Chen[1], Min Wang[1]; [1]Shanghai Univ., China. We realized a novel structured optical frequency comb generator used two cascade IM-MZMs for OFDM-PON and other next-generation optical access network. Experimental program can generate stable 16 intervals 12.5GHz flat comb spectrum and realized simply.

AF1P.3.62
Control of Optical Power in Optical Beamforming Networks Based on Broadband Optical Source and Chirped Fiber Grating, qian wang[1], Shanguo Huang[1], Yongfeng Wei2, Xinlu Gao[1], Chao Gao[1], Wanyi Gu[1]; [1]State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China; 2Electronic Information Engineering, Inner Mongolia Univ., China. The impact of optical power control in optical beamforming networks (OFBNs) based on broadband optical source is analyzed . The improvement of a scheme with variable optical attenuators (VOA) using weighting functions is proved by simulation.

AF1P.3.63
AC-LED based Visible Light Communication Systems Using Multiple Transmitter Design for Reducing Latency, Y. Liu[1], C. Yeh[2,3], C W. Chow[1]; 1Department of Photonics, National Chiao Tung Univ., Taiwan; [2]Information and Communications Research Laboratories, Industrial Technology Research Inst. (ITRI), Taiwan; [3]Graduate Inst. of Applied Science and Engineering, Fu Jen Catholic Univ., Taiwan. This work demonstrates by employing multiple alternating-current light-emitting-diode (AC-LED) communication modules, the transmission gap in time-domain caused by the LED threshold voltage can be filled up for achieving lower latency.

AF1P.3.64
Novel Interpolation scheme for Sampling Clock Synchronization in Optical OFDM Systems, Junchao Chen[1], Yingchun Li[1], Yingxiong Song[1], Qianwu Zhang[1,2]; [1]Shanghai Univ., China; [2]Bangor Univ., UK. A cost-effective sampling clock synchronization scheme based on interpolation algorithm is proposed and implemented via FPGA. A 2.5-Gb/s FPGA-based OOFDM receiver with presented scheme demonstrated its synchronization performance, high cost-effectiveness, and suitability for practical application.

AF1P.3.65
A Method of Combining PPC and ACE to Reduce PAPR in CO-OFDM System, Jianfei LIU[1], Meilong Yu[1], Xiangye Zeng[1], Mengjun Wang[1], Jia Lu[1]; [1]School of Information Engineering, Hebei Univ. of Technology, China. A method combining PPC and ACE is proposed, and uses constellation point pre-adjustment to further reduce the PAPR. When CCDF is10-3 , approximately 4.2dB improvement in PAPR is achieved with no BER degradation.

AF1P.3.66
Accurate and Robust Timing and Frequency Synchronization for Coherent Optical Communication Systems, Lingchen Huang[1], Changjian Guo[2], Dawei Wang[1], Longling Dai[2]; [1]Zhejiang Univ., China; [2]South China Normal Univ., China. We propose an accurate and narrow-band-interference tolerant timing and frequency synchronization method for polarization-division-multiplexed (PDM) coherent optical systems. This method provides accurate estimates even at low signal-to-noise ratio (SNR) and long distance optical fiber channel.

AF1P.3.67
Analytical Results on the Performance of Coarse-Step DBP Based Intra-Channel Nonlinearity Compensators, Guanjun Gao[1], Jie Zhang[1], Wang Lei[2], Wanyi Gu[1]; [1]Key Labs of Information Photonics and Optical Communications, Beijing Univ of Posts & Telecom, China; [2]ZTE Coorporations, China. An analytical expression for transmission performance of coherent optical systems with coarse-step DBP based nonlinearity compensation is derived. The Q factors discrepancy between analytical and simulations results are within 0.8 dB for various configurations.

AF1P.3.68
Equivalent expression of a Class of Timing Phase Estimator Employing Second-Order Statistics, Lingchen Huang[1], Dawei Wang[1], Changjian Guo[2]; [1]Zhejiang Univ., China; [2]South China Normal Univ., China. We prove analytically and numerically that four non-data-aided symbol timing estimators employing second order statistics for optical coherent receivers are all approximately equivalent. Simulation results further confirm their equivalence in terms of the estimation variances and BER.

AF1P.3.69
A Novel Modulation Scheme of PS-RZ-QPSK Signal in High-speed Optical Transmission System, jinnan Zhang[1], Yue Gu[2], ding ding[1], peng Z. zhen[1], Jinjing Tao[1], Xueguang Yuan[1]; [1]Beijing Univ. of Posts and Telecommunications, China; [2]Network Operation Supporting Center, China Mobile Group Beijing Co.,Ltd, China. A novel modulation scheme of PS-RZ-QPSK signal is proposed. The scheme can achieve a better transmission performanceand proves showing the feasibility of novel modulation scheme.

AF1P.3.70
Joint Blind Equalization and Carrier Phase Estimation in 16-QAM Optical Coherent Receiver for Long Reach Passive Optical Networks, Md Mosaddek Hossain Adib[1], Md. Ibrahim Khalil[1], Arshad M. Chowdhury[1,2], Gee-Kung Chang[2]; [1]Department of Electrical Engineering and Computer Science, North South Univ., Bangladesh; [2]School of Electrical and computer Engineering, Georgia Inst. of Technology, USA. We propose and demonstrate a blind adaptive algorithm in 16-QAM optical coherent receiver for LR-PON. Our analysis result shows that our proposed algorithm can jointly achieve BER of 10-3 with less than 1.7dB OSNR penalty for ΔυT of 10-5 with 1360ps/nm impairments.

AF1P.3.71
Full-duplex lightwave transport systems based on long-haul SMF and optical free-space transmissions, Chun-Cheng Lin[1], Ying-Pyng Lin[1], Po-Yi Wu[1], Hai-Han Lu[1], Kuan-Hung Wu[1], Sheng-Siang Ruan[1]; [1]National Taipei Univ. of Technology, Taiwan. Over an 80-

km single-mode fiber (SMF) and 2.4 m optical free-space transmissions, impressive bit error rate (BER) performance is obtained for long-haul fiber link and finite free-space transmission distance.

AF1P.3.72
Performance of Non-Line-of-Sight Ultraviolet Spatial Diversity Reception in Turbulence, Yong Zuo[1], Houfei Xiao[1], Heng Qin[1], Yanbing Zhao[1], Xiaohui Zhang[1], Jian Wu[1]; [1], China. Atmospheric turbulence can significantly impair link performance of the non-line-of-sight ultraviolet communication system. To mitigate turbulence-induced fading, this paper analyzes two spatial diversity reception schemes, including the maximum-likelihood and the optimal combining schemes.

AF1P.3.73
A novel hybrid ring tree TDM/WDM -PON with cost-effective fault protection, Chen He1, Xintian Hu[1], Zhiguo Zhang[1], Xue Chen[1]; [1]bupt, China. A cost-effective fault protection scheme for hybrid TDM/WDM PON is proposed. Our scheme has the characteristic of low cost per unit bandwidth and fast recovery time while keeping connection availability at an acceptable level.

AF1P.3.74
Cascaded Polynomial Nonlinearity Model for Microwave Photonic System, Jinhui Luo[1], Shangyuan Li[1], Xiaoping Zheng[1], Hanyi Zhang[1], Bingkun Zhou[1]; [1]Tsinghua National Laboratory for Information Science and Technology, China. In this paper, we describe optical and electrical modules in microwave photonic system using polynomial model, by which the IP3 of a cascaded-system is derived from single-stage modules, and verified experimentally.

AF1P.3.75
Optical Wired and Wireless Integrated Access Network Using MASK-MQAM-OFDM Coding, J. Sung[1], C. Hsu[1], C. Yeh[2,3], C W. Chow[1]; [1]Department of Photonics, National Chiao Tung Univ., Taiwan; 2Information and Communications Research Laboratories, Industrial Technology Research Inst. (ITRI), Taiwan; [3]Graduate Inst. of Applied Science and Engineering, Fu Jen Catholic Univ., Taiwan. A high spectral-efficiency M-ary amplitude-shift-keying M-ary quadrature-amplitude-modulation orthogonal-frequency-division-multiplexing (MASK-MQAM-OFDM) coding is proposed. Hence, optical wired and wireless systems can be integrated seamlessly.

AF1P.3.76
Proposal of Digital Coherent Superposition of Optical OFDM Subcarrier Pairs in the Presence of Phase Noise, Xingwen Yi[1], Qi Yang[1], Kun Qiu[1]; [1]Uni of Elec Science & Tech of China, China. We propose digital coherent superposition of optical OFDM subcarrier pairs with Hermitian symmetry to mitigate phase noise. Both in theory and simulation, we show that the inter-carrier-interference resulted from phase noise can be reduced.

AF1P.3.77
Channel Estimation Using Superimposed Training for Coherent Optical OFDM Systems, Changjian Guo[1], Zhang Han[1], Lingchen Huang[2]; [1]South China Normal Univ., China; [2]Zhejiang Univ., China. We demonstrate by simulation that the superimposed training based channel estimation scheme can achieve similar performance as compared with conventional schemes, without any loss in bandwidth. An iterative decision feedback algorithm is also developed to enhance the channel estimation.

AF1P.3.78
Newman Phase Sequence Pre-coding for PAPR Reduction in Optical OFDM Systems, Dai Longling[1], Changjian Guo[1], Lingchen Huang[1]; [1]South China Normal Univ., China. We show through simulation that by using Newman Phase Sequence, the PAPR value of the OFDM signals can be significantly reduced and an OSNR gain of 8 dB is achieved.

AF1P.3.79
Bidirectional 10Gb/s/λ Long-reach WDM-PON Using Remotely Pumped Erbium-Doped Fiber Amplifier and Wavelength Tunable Laser-based Colorless ONU, Yingjie Zhang[1], Zhiguo Zhang[1], Qiwei Liu[1], Xue Chen[1]; [1]BUPT, China. A bidirectional 10Gb/s long-reach WDM-PON using remotely pumped erbium-doped fiber amplifier and wavelength tunable laser based colorless ONU is proposed and demonstrated in this paper. A receiver sensitivity of -20dBm after 50km SMF transmission is obtained.

AF1P.3.80
Digital Signal Post-Compensation of a Downconverting Analog Photonic Link Based on DP-QPSK MZM, NIU ZHENG[1], Pengxiao Li[1], Minghua Chen[1], Hongwei Chen[1], Shizhong Xie[1], Sigang Yang[1]; [1]Electronic Engineering, TSINGHUA UNIV., China. A downconverting analog photonic link based on DP-QPSK MZM is proposed. The IMD3s are suppressed by more than 16dB using two recovered signals in the digital domain and an SFDR of 114 dB-Hz2/3 is achieved.

AF1P.3.81
Millimeter-wave Signal Point to Point Communication Using Frequency Quadrupling Technique, Feng Zhou[1], Ran Hao1, Boyu Xu[1], Xiaofeng Jin[1], Xianmin Zhang[1], Shilie Zheng[1], Hao Chi[1]; [1]Department of Information Science & Electronic Engineering, Zhejiang Univ., China. This study proposes a millimeter-wave(mm-wave) signal point to point communication system using frequency quadrupling technique, generation and transmission of 40 GHz mm-wave signal over fiber and in air are successfully experimentally demonstrated.

AF1P.3.82
Theoretical Study on Quasi-OSSB Modulation for Long Distance Transmission Application, Peng Guo[1], TAO SUN[1], Anshi Xu[1], Zhangyuan Chen[1]; [1]Peking Univ., China. Quasi optical single sideband (Q-OSSB) modulation is theoretically investigated for the first time. Q-OSSB modulation by using strong optical injection-locked semiconductor lasers is also analyzed based on our theory and amplifier model.

AF1P.3.83
Broadband Convergence of 60GHz-RoF and WDM-PON Based on FWM in SOA and FBG for Bidirectional Access Network with Colorless ONU, Yueying Zhan[1], Min Zhang[1], Zhuo Liu[1], Mingtao Liu[1], Xue Chen[1]; [1]Beijing Univ. of Posts & Telecom., China. A scheme of new bidirectional WDM-RoF with colorless ONU system based on RSOA is proposed and demonstrated. The performances are evaluated and the results will present useful insight for the next generation optical-wireless access network.

AF1P.4•ACP/IPOC Joint Track 4: Network Architectures, Management, and Applications

AF1P.4.1
Modeling the Impact of ROADM Intra-Node Add/Drop Contention on Optical Network Performance, Li Gao[1], Yongcheng Li[1], Gangxiang Shen[1]; [1]Soochow Univ., China. We develop an analytical model for evaluating the lightpath blocking performance of an optical network with ROADM intra-node add/drop contention. The analytical model can approximately predict the simulation results. Also, the study indicates that properly raising contention factor can greatly improve the blocking performance.

AF1P.4.2
Controller Cooperation-Based Lightpath Provisioning in OpenFlowPCE Integrated CP Multi-domain WSONs, Zaimeng Qiu[1], Shanguo Huang[1], Xiaoshuang Li[1], Yongli Zhao[1], Jie Zhang[1], Wanyi Gu[1]; [1]State Key Laboratory of Information Photonics and Optical Communications of BUPT, China. To improve the potential scalability of large-scale multi-domain optical networks, a new architecture for lightpath provisioning in Multi-domain Wavelength Switched Optical Network is proposed. The overall feasibility and performance are discussed in this paper.

AF1P.4.3
Accurate Time and Frequency Transmission Infrastructure in the Czech Republic, Josef Vojtech[1], Vladimir Smotlacha[1]; [1]CESNET, Czech Republic. Article summarizes the reasons for building of infrastructure dedicated to transfer of accurate time and frequency in the Czech Republic. It shows achieved results and indicated necessary steps for further stability improvements.

AF1P.4.4
Traffic Localization with Direct communication between BSs for LTE architecture, Yan Shi[1], Wei Jian[1], Pei Zhang[1]; [1]China Unicom, China. In this paper, the traffic localization, with the direct communication between different BSs, has been proposed and the SDN controller has also been presented to control and manage the traffic routing.

AF1P.4.5
A new priority strategy for OBS networks, Shuo Li[1], Meiqian Wang[1], Wing-Ming Wong[1], Moshe Zukerman[1]; [1]Electronic Engineering, City Univ. of Hong Kong, Hong Kong. We evaluate the performance of a combination of burst segmentation, Emulated-OBS and least remaining hop-count first priority algorithm in optical burst switching networks based on the criteria of effective utilization and goodput.

AF1P.4.6
Dynamic Routing and Spectrum Allocation with Modulation Format Conversion in Flexible Optical WDM Networks, Shan Yin[1], Shanguo Huang[1], Min Zhang[1], Bingli Guo[2], Yongqi He[2], Jie Zhang[1], Wanyi Gu1; [1]State Key Laboratory of Information Photonics

and Optical Communications, Beijing Univ of Posts & Telecom, China; [2]State Key Laboratory of Information Photonics and Optical Communications, Peking Univ., China. This paper proposes a dynamic routing and spectrum allocation scheme in the FWDM networks with modulation format conversion ability at intermediate nodes. The scheme reduces blocking probabilities of the networks without requiring additional bandwidths or changing the existing traffic.

AF1P.4.7
Priority-oriented Spectrum Defragmentation Algorithm Aiming to Maintain the Network Performance, Juan Zhang[1], Min Zhang[1], Shanguo Huang[1]; [1]State Key Lab. of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. Proposed in this paper is a novel priority-oriented defragmentation algorithm in flexible bandwidth optical networks. Simulationresults show that it is able to reduce the blocking rate meanwhile maintain thenetwork performance.

AF1P.4.8
Differentiated Quality-of-Protection Provisioning with Probabilistic SRLG in Flexi-Grid Optical Networks, Jinyan Liu[1], Jie Zhang[1], Yongli Zhao[1], Chen Ma[1], Hui Yang[1], Wei Li[2], Jin Xin[2], Baojing Chen[2]; [1]State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China; [2]Gansu electric power corporation information & communication company, China. We define a new index named Service Failure Probability (SFP) with Probabilistic SRLG. An algorithm named SFP-oriented shared-path protection is proposed to provide differentiated Quality-of-Protection. Simulations show the algorithm works well in providing differentiated SFP.

AF1P.4.9
Protection Scheme Based on Wireless Rerouting for Survivable Fiber-Wireless Access Network, Yinpeng Yu[1], Yejun Liu[1], Lei Guo[1]; [1]Northeastern Univ. (China), China. This paper focuses on the survivability of Fiber-Wireless (FiWi) access network. A protection scheme is proposed to tolerate the failure of distribution fiber based on wireless rerouting. Simulation results show good performance of proposed scheme.

AF1P.4.10
Restoration in Impairment-Aware Elastic Optical Networks Employing Flexible Transmitter/Receiver Controllered by OpenFlow Protocol, Liang Yuting[1], Bingli Guo2; [1]Beijing Univ. of Posts and Telecomm, State Key Laboratory of Information Photonics and Optical Communication, China; 2Peking Univ., State Key Laboratory of Advanced Optical Communications and Networks, China. We demonstrate the lightpath restoration in impairment-aware OpenFlow-based control plane for elastic opticalnetworks. With proper protocol extensions, the networks can adjust the modulation formatdynamically. The performance is experimentally verified.

AF1P.4.11
Dynamic Subcarrier Assignment for OFDM-PON Network Based on RSOA, Zhuo Liu[1], Min Zhang[1], Jun Jiang[1], Yueying Zhan[1], Xue Chen[1]; [1]Beijing Univ of Posts & Telecom, China. A novel Dynamic Subcarrier Assignment (DSA) algorithm is proposed to support RSOA based OFDM-PON, namely Service based Polling in Pipeline (SPP) DSA. Performance of SPP is studied and compared with traditional algorithm.

AF1P.4.12
Link Weight Design For Green IP Networks, Jing Wu[1], Yan Kai[1], Hongfang Yu[1], Dan Liao[1]; [1]Univ of Electronic Science & Tech China, China. In this work, we study the link weight design problem for green IP networks and propose an iterative modifying link weight heuristic algorithm to solve it. Our goal is to make IP traffics power-efficiently route by link weight design and the result is fine.

AF1P.4.13
MMTD net -A Novel Optical Circuit Switch Architecture for Data Center Networks, Qian Kong[1], Shanguo Huang[1], Yu Zhou[1], Min Zhang[1], Yongli Zhao[1], Bingli Guo[2], Jie Zhang[1], Wanyi Gu[1]; [1]State Key Laboratory of Information Photonics and Optical Communication, Beijing Univ of Posts & Telecom, China; [2]State Key Laboratory of Advanced Optical Communications and Networks, Peking Univ., China. We propose an optical interconnection architecture in both economy and energy efficiency called as MMTD net (MEMs based Multi-Tier Data center network). Numerical results show that this architecture is highly scalable, with low blocking probability and latency.

AF1P.4.14
A Novel Dynamic Optical Grooming Algorithm in Flexible Bandwidth Optical Networks, Ling Zhang[1]; [1]State Key Laboratory of Information Photonics and Optical Communications, bupt, China. In this paper, we investigate the dynamic case of optical grooming in flexible bandwidth optical networks, and propose a novel dynamic optical grooming algorithm called Consecutive Spectrum based Optical Grooming (CSOG). Simulation results show that the blocking probability can be reduced and resource utilization can be improved.

AF1P.4.15
Pre-Configured Cube (p-Cube) Structure against Multi-Link Failures in Server-Centric Datacenters, Chen Ma[1], Jie Zhang[1], Yongli Zhao[1], Ying Pan[1], Hui Yang[1], Shanguo Huang[1], Wanyi Gu[1], Wei Li[2], Xin Jin[2], Baojing Chen[2]; [1]IPOC, Beijing Univ. of Post and Tel., China; [2]Information & Communication Company, Gansu Electric Power Corporation, China. In this paper, p-Cube is proposed to deal with multi-link failures in server-centric datacenter, and heuristic algorithms are proposed. Simulation shows that p-Cube has better performance than p-Cycle at resource utilization rate and protection rate.

AF1P.4.16
A Novel Energy-Efficiency Algorithm in Impairment-Aware Flexible-Grid Optical Networks, Huibin Zhang[1], Bowen Chen[2], Jie Zhang[2]; [1]Beijing Aerospace Automatic Control Inst., China; [2]Beijing Univ of Posts & Telecom, China. We propose an energy-aware algorithm based on impairment-aware information (EAIA) to improve the energy efficiency in flexible-grid optical networks. Simulation results validate that our proposed EAIA algorithm have higher energy efficiency than traditional energy-aware algorithm without impairment information.

AF1P.4.17
Cross Layer Design for Software Defined IP over WDM Network with Energy Proportionality and Network Reliability Considerations, Yuming Gao[1], Shanguo Huang[1], Di WU[1], Xingbin Yin[1], Xiaobing Niu[2], Mingyan Ren[2], Xuefeng Lin[2]; [1]State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China; [2]ZTE Corporations, China. A kind of cross layer control architecture is proposed for IP over WDM networks based software defined networking (SDN), in which a traffic grooming strategy is proposed considering energy conservation, resource utilization, and network reliability.

AF1P.4.18
A Provident Spectrum Defragmentation based on Virtual Concatenation in Elastic Optical Networks, Weigang Hou[1], Lei Guo[1]; [1]Northeastern Univ. (China), China. The elastic optical networking has become a promising solution of allocating continuous frequency slots according to spectrum demand. A provident spectrum defragmentation is presented through virtual concatenation, and it outperforms conventional push-pullmethods by simulations.

AF1P.4.19
A Hybrid Wifi-Modbus Wireless Smart Meter Reading Scheme Based On Radio-Over-Fiber Systems, zhengang he[1], Jianqiang Li[1], Kun Xu[1], Tengyu Chen[1], Hao Chen[1], Yitang Dai[1], Feifei Yin[1], Jintong Lin[1]; [1]Beijing Univ. of Posts and Telecommunications, China. A new smart meter reading system is proposed based on radio-over-fiber through combining WiFi with wireless Modbus protocol to solve shortcomings of traditional technology. Based on this system, high-speed, flexible, safe communication can be achieved.

AF1P.4.20
Hierarchical Spectrum Assignment Algorithms Optimistic for the Large Capacity Trend of Networks, Juan Zhang[1], Min Zhang[1], Shanguo Huang[1]; [1]State Key Lab. of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. Proposed in this paper are hierarchical spectrum assignment (HSA) algorithms for flexible bandwidth optical networks. Simulations demonstrate that HSA with large section segment outperforms First Fit especially with the large capacity development trend of network.

AF1P.4.21
A High Speed Service Identification Scheme for 10G EPON System, Liqian Wang[1], Jia Zhuang[1], Ting Peng[1], Yingying Cao[1], Chun Su[1], Xue Chen[1]; [1]Beijing Univ. of Posts and Telecomm, China. This paper proposes a high speed real-time service identification scheme which can identify bidirectional flows with more than 90% accuracy and 10Gbps throughput in 10G EPON system.

AF1P.4.22
Performance Analysis of IEEE 802.11 Distributed Coordination Function in Low-Load Simulcast Radio-Over-Fiber-Based Distributed Antenna Systems, Xun

Lu[1], Jianqiang Li[1], Yuting Fan[1], Kun Xu[1], Yitang Dai[1], Feifei Yin[1], Yuefeng Ji[1], Jintong Lin[1]; [1]Information Photonics and Optical Communication, Beijing Univ. of Posts & Telecoms, China. The performance of IEEE 802.11 distributed coordination function is numerically investigated in simulcast radio-over-fiber-based distributed antenna systems (RoF-DAS). The study offers an important reference to the practical design of a simulcast WLAN RoF-DAS.

AF1P.4.23
A Smart Metering System Architecture Based on Radio over Fiber Technology, Shuang Song[1], Jianqiang Li[1], Kun Xu[1], zhengang he[1], Yitang Dai[1], Yuefeng Ji[1], Jintong Lin[1]; [1]State key Laboratory of Information Photonics and Optical Communication, BUPT, China. In this paper, we propose to use Radio over Fiber technology in metering network which can make full use of the fiber resources laid by power companies and expand the coverage through wireless signal.

AF1P.4.24
Implementing Available Bandwidth Detection and Adaption: A Spectrum-Resource-Diffusion Routing Scheme in Flexible Grid Optical Networks, Yuchen Zeng[1], Nan Hua[1], Xiaoping Zheng[1], Hanyi Zhang[1], Bingkun Zhou[1]; [1]Tsinghua Univ., China. We propose a novel distributed path-vector routing scheme in flexible grid optical networks. This scheme further exploits the flexibility of flexible grid optical networks through the detection and adaptation of available bandwidth with polynomial complexity.

AF1P.4.25
A Security-Enhanced EPON Network Architecture with Compatible QKD Function, Hao Wen[1], Zhefu Wu[1], Hongliang Ren[1], Yali Qin[1]; [1]zhejiang uni. of techno., China. We here present a novel security-enhanced EPON architecture with the promising QKD function. Using the special branch device and alternative TDMA in upstream, it brings the co-existence between QKD and EPON. Experiment shows that under the QBER safe limit, the mean secure key rate can reach up to 2.12kbps over 20km while EPON functions normally.

AF1P.4.26
A Trajectory Sync-prediction Handoff Method for High Speed Railway Communications, Wenxuan Hu[1]; [1]South-Central Univ. for Nationaliti, China. An opto-electronic joint fast handoff scheme based on RoF network and road vehicle position sync-prediction process is proposed for train wide-band communication. Simulation results show great performance in overcoming the situation of handoff-intensive.

AF1P.4.27
THE STUDY OF SHARED-PATH PROTECTION ALGORITHMS WITH SRLG CONSTRAINT IN WDM MESH NETWORK, Pei Zhang[1], Jianquan Wang[1]; [1]China Unicom Research Inst., China. The aim of the shared-protection algorithms with Shared Risk Link Group (SRLG) constraint is to search working route and protecting route that are disjoint from SRLGs. In this paper, two shared-protection algorithms will be presented.

AF1P.4.28
Joint Routing Scheme in Intelligent Radio over Fiber Networks (I-RoF), Shang Zhijie[1]; [1]School of Information and Telecommunication Engineering, Beijing Univ. of Posts and Telecommunications, China. This paper proposes a Joint routing scheme (JRS) applied in Intelligent Radio over Fiber (I-RoF) networks. Simulation shows that JRS can effectively decrease the average packet delay at most 9.5% compared with traditional routing scheme.

AF1P.4.29
A Novel PCE Architecture based on Cloud Computing for Inter-domain Path Computation in Multi-domain Optical Network at Large Scale, Panke Qin[1], Xue Chen[1]; [1]Beijing Univ. of Posts and Telecommunications, China. A novel cloud computing based PCE architecture is proposed for optimal inter-domain path computation in multi-domain optical networks. The simulation indicates that this PCE-Cloud architecture can realize fast routing and path computation of cross-domain.

AF1P.4.30
An Improved Fairness-Aware Dynamic Spectrum Allocation Scheme in Elastic Optical Networks, Songwei Ma[1], Bingli Guo[1], Xin Chen[1], Zhangyuan Chen[1], Yongqi He[1]; [1]Peking Univ., China. This paper investigates the service fairness problem in elastic optical networks and correspondingly proposes a forecast-based fairness-aware spectrum allocation scheme. Simulation results show that consistent service fairness performance is achieved without significant blocking performance deterioration.

AF1P.4.31
Bandwidth Scheduler Considering End-Systems' Effective Transfer Rate in Optical Transport Networks, Wang Bin[1], Wei Guo[1], Weisheng Hu[1]; [1]Shanghai Jiao Tong Univ., China. We propose a bandwidth scheduler considering both network bandwidth resource and effective transfer rate due to end-system's limitation for less transfer finishing time and better bandwidth utilization, using Stochastic Approximation and verify it with simulation.

AF1P.4.32
Round Robin Ring for Metro Wireless Backhaul Networks, Chang Cao[1,2], Haijing Fu[1], Jianquan Wang[3], Xiongyan Tang[3], Yongjun Zhang[1]; [1]Key Laboratory of Information Photonics, China; [2]Postdoctoral Workstation, China United Network Communications Co.,Ltd., China; [3]China Unicom Research Inst., China. We propose a round robin based metro ring, by analyzing the network operating and bandwidth allocation mechanisms. Then, we build a simulation testbed, and compare RR-ring with MSTP and PTN. Simulation results show that as for transmission efficiency, RR-ring outperforms MSTP, and is comparable to PTN.

AF1P.4.33
Registration Efficiency in TWDM-PON Systems with User Migration, Jun Li[1], Hongyang Yang[1], Weiqiang Sun[1], Weisheng Hu[1]; [1]ShanghaijiaotongUniv., China. In this paper, we investigate the registration efficiency in Time and Wavelength Division Multiplexed PON (TWDM-PON) systems with user migration and obtain an optimal number of migrated ONUs to achieve maximum registration efficiency.

AF1P.4.34
A Novel RSA Scheme for Multicast in Elastic Optical Networks with Modulation Format Conversion, Xi Song[1], DongXu Zhang[1], Hongxiang Guo[1], Wentao Du[1], Yan Li[1], Jian Wu[1]; [1]BUPT IPOC, China. We propose an RSA scheme for multicast considering all-optical modulation format conversion in the elastic optical networks. Simulation results show that adopting modulation format conversion can significantly reduce blocking probability.

AF1P.4.35
Experimental Demonstration of Anycast Applied in SDN based Data Centers Networks based on PTN+OTN, Di WU[1], Shanguo Huang[1], Xingbin Yin[1], Lingnan Gao[1], Xiaobing Niu[2], Xuefeng Lin[2], Mingyan Ren[2]; [1]State Key Lab of IPOC from BUPT, China; [2]ZTE Corporation, China. In order to dynamically allocate virtual network resources in heterogeneous networks that interconnect data centers, an experiment verified solution based on SDN architecture combining network virtualization technique with the idea of Anycast is proposed in this contribution.

AF1P.4.36
LRF-FE: A Novel Dynamic Wavelength and Bandwidth Allocation Scheme in Time- and Wavelength-Division Multiplexed Passive Optical Networks, Shang Zhijie[1]; [1]School of Information and Telecommunication Engineering, Beijing Univ. of Posts and Telecommunications, China. This paper proposes a large request first-fair excess (LRF-FE) scheme applied in time- and wavelength-division multiplexed passive optical networks. Simulation shows LRF-FE effectively reduces network delay, improves bandwidth utilization and fairly allocates resource to ONUs.

AF1P.4.37
Crosstalk model for Optical Network-on-Chips using WDM, Jing Zhang[1], Huaxi Gu[1], Zheng Chen[1], Ke Chen[1]; [1]communications enginering, Xidian Univ., China. A crosstalk analysis model for optical network-on-chip based on WDM is proposed. The crosstalk noise and signal-to-noise-ratio of multiple wavelengths networks are analyzed. And a case study is presented to evaluate the proposed crosstalk model.

AF1P.4.38
Intelligent Multipath Access in Fiber-Wireless (FiWi) Network with Network Virtualization, Shan He[1], Guochu Shou[1], Yihong Hu[1], Zhigang Guo[1]; [1]Beijing Univ. of Posts and Telecommunications, China. We apply network virtualization to remove the differences between heterogeneous networks in Fiber-Wireless (FiWi) network to establish intelligent multipath access through the flexible use of virtual networks (VNs) deployed in virtual resource manager (VRM).

AF1P.5•ACP Track 5: Biophotonics and Optical Sensors

AF1P.5.1
Non-contact Micro Vibration Measurement System Based on Optical Fiber Michelson Interferometer, Chuanqi Xing[1], Zhenguo Jing[1], Wei Peng[1]; [1]Dalian Univ.

Of Technology, China. In this paper, an optical fiber Michelson interferometer is used to realize non-contact micro vibration measurement. The frequency response range of 1~1KHz and the displacement resolution of 1nm in vibration measurement are implemented.

AF1P.5.2
Research of PZT Modulation Factor with High Precision and Stability Based on J1/J3 Method, gaosheng fang[1], Tuanwei Xu[1], Yuting Li[1], Fang Li[1]; [1]Insistute of Semiconductors, Chinese Academy of Sciences, China. We introduced a new algorithm to calculate the PZT modulation factor based on J1/J3 method. With this method to calculate C value in the fiber sensing system, we can obtian high property in PGC demodulation.

AF1P.5.3
Wavelet analysis in distributed optical fiber temperature sensor, Xiaobing Li[1], Jiangtao Guo[1]; [1]State Key Laboratory of Optical Fibre and Cable Manufacture Technology, China. The paper reviews the technology of wavelet analysis using in distributed optical fiber temperature sensor, by which the temperature resolution improves up to 4 times.

AF1P.5.4
A High-Resolution Demodulation Scheme for FBG Sensors, Min Xue[1], Xingwei Ye[1], Yongjiu Zhao[1], Shilong Pan[1]; [1]Nanjing Univ Aeronautics & Astronautics, China. A demodulation scheme with a resolution of 0.78 MHz for FBG sensors is proposed and demonstrated. A FBG sensor system for weight measurement is constructed. A measurement resolution of 0.42 mg is achieved.

AF1P.5.5
Plasmonic properties of gold nanotorus and nanoring: single and dimer structures, Hui Gong[1], Yumin Liu[1], Zhongyuan Yu[1], Xiu Wu[1], Haozhi Yin[1]; [1]BUPT, China. We investigate the plasmonic resonant spectrum of gold single nanotorus and nanoring and the corresponding dimers. Dimer nanoring structures is characterized narrower line width and higher Purcell factor, making it suitable for high sensitivity sensing.

AF1P.5.6
Fabrication of a Miniature Fiber-optic EFPI Pressure Sensor, Yana Shang[1], Zhenzhen Li[1], Na Chen[1], Zhenyi Chen[1], Qiang Guo[1], Shupeng Liu[1], Tingyun Wang[1]; [1]Shanghai Univ., China. A miniature(Φ300μm) fiber optic EFPI pressure sensor using SU-8 photoresist is fabricated. Both pressure and temperature characteristics have been studied, and it shows a good linearity within 100~700Pa with a sensitivity of 0.765nm/kPa.

AF1P.5.7
Improvement of the sensitivity of gas detection by signal processing method in frequency domain, CHEN XI[1], Xiaopeng Dong[1]; [1]Lightwave Technology, Xiamen Univ., China. A novel method to improve sensitivity of gas detection by a signal processing spectrum average method in frequency domain is presented in this paper. The results revealed the minimum detectable concentration of C2H2 is 50ppm.

AF1P.5.8
Dual-head LPFG Sensor for Oil Density Change Detection, Hong Han[1], Weihong Bi[1], Guangwei Fu[1], Xinghu Fu[1]; [1]The Key Laboratory for Special Fiber and Fiber Sensor of Hebei Province, Yanshan Univ., China. A packaged Dual-head Long Period Fiber Grating (LPFG) sensor is proposed and experimentally demonstrated. This sensor can reduce bend and temperature factors effectively. Thereby, this system can be used to detect oil density change.

AF1P.5.9
Deformation Detection System of Subway Tunnel Based on Digital Image Processing, Weining Lu[1]; 1State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. A non-contact system based on digital image processing is designed to detect tunnel's deformation. Experimental results show this system can provide high-precision and continuous detection, providing effective guarantee for the safety operation of subway tunnel.

AF1P.5.10
Refractive index measurement of liver tissue with long period fiber grating Michelson refractometric sensor, Meimei Chen[1], Na Chen[1], Shupeng Liu[1], Qiang Guo[1], Zhenyi Chen[1], Tingyun Wang[1]; [1]Key Lab of Specialty Fiber Optics and Optical Access Networks, Shanghai Univ., China. This paper describes using long-period grating Michelson refractometric sensor to measure the refractive index change of porcine liver during laser-induced interstitial thermotherapy. Experimental results show that the refractive index of denatured liver tissue is changed significantly.

AF1P.5.11
A Method to Extend the Absorption Length for Optical Fiber Gas Sensor, Kuanglu Yu[1,3], Chongqing WU2, Yao Zhao[1], Chao Lu[3], Chaonan Pan[2], Zhi Wang[2]; [1]Inst. of Information Science, Beijing Jiaotong Univ.., China; [2]Inst. of Optical Information, Beijing Jiaotong Univ., China; [3]The Photonic Research Centre, EIE, the Hong Kong Polytechnic Univ.., Hong Kong. The Dual Loop Optical Buffer was explored in sensing. Not only could each probe's absorption length, hence its sensitivity, be flexibly adjusted and boosted, but also the probes' numbers can be changed according to needs.

AF1P.5.12
Ultra-high-transmittance and High-extinction-ratio Biosensor Based on Photonic Crystal Slab Using H2-type Resonator, jian zhou[1], Huiping Tian[1], Hongzhan Liu[2], Yi Yang[1], Guansheng Shen[1], Qi Liu[1], Yuefeng Ji[1]; [1]Beijing Univ. of Posts and Telecommunications, tate Key Laboratory of Information Photonics and Optical Communications, China; [2]South China Normal Univ., School of information and communication Engineering, China. we demonstrate a novel nanoscale photonic crystal biosensor. The proposed biosensor consists of H2-type resonator center-coupled to photonic crystal slab waveguide. Transmittance over 98% and extinction ratio exceeds 25 dB are observed, respectively.

AF1P.5.13
Denoising Chaotic Time Series Using Local Projection Method with Kernel PCA Preprocessing, Wei Ji[1], Nian fang[1], Lutang Wang[1], Zhaoming Huang[1]; [1]Key Laboratory of Specialty Fiber Optics and Optical Access Networks, Shanghai Univ., China. We improved the local projection denoising effect of chaotic time series with high noise level by adding a Kernel Principal component analysis (PCA) preprocessing to reduce the dependence of the denoising effect to the neighborhood radius. The case study results in the Lorenz system show that the proposed method is effective.

AF1P.5.14
Label-free optical quantification of protein interactions using two cascaded-microring resonators-based waveguide sensors, Chang Yang[1], Mingyu Li[1], Qiushun Li[2], Wenfei Dong3, Jian-Jun He[1]; [1]State Key Laboratory of Modern Optical Instrumentation, Zhejiang Univ., China; [2]Key Biosensor Laboratory of Shandong Province, Biology Inst. of Shandong Academy of Sciences, China; 3Suzhou Inst. of Biomedical Engineering and Technology, Chinese Academy of Sciences, China. A high sensitive optical sensor with integrated two cascaded micro-ring resonators is investigated experimentally. The biotin film is immobilized on the surface of the sensing ring to detect different concentrations of streptavidin.

AF1P.5.15
Error-reduction methods for shape measurement of low reflectivity specular surfaces by temporal phase unwrapping, Yuxiang Wu[1,2], Huimin Yue[1,2], Biyu Zhao[1,2], Zhonghua Ou[1,2], Yong Liu[1,2]; [1]School of Optoelectronic Information, UESTC, China; [2]School of Optoelectronic Information, State Key Laboratory of Electronic Thin Films and Integrated Devices, China. In phase measuring deflectometry, the measurement accuracy is relatively low with low reflectivity surface. Based on temporal phase unwrapping, two main noises are reduced to improve accuracy by least-square method and 3-frame method.

AF1P.5.16
Accelerometer Based on the FBG Inscribed in a Twin-Core Fiber, Xiaoyan He[1], Xiaopeng Dong[1], Juan Su[1]; [1]Lightwave Technology,School of Information Science and Technology, Xiamen Univ., China. A fiber optic accelerometer based on the FBG inscribed in a far separated twin-core fiber is investigated in this paper. The sensitivity and resonant frequency of the accelerometer are obtained as 0.354nm/g and 14Hz, respectively.

AF1P.5.17
The Transmission Characteristics of Surface Plasmon Polaritons in Double Rings Symmetric Structure Resonator, Xi Chen[2,3], Peilin Lang[1,2], Ru Zhang[1,2], Ting Zhong[1,2]; [1]The State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications(BUPT), China; [2]School of Science, Beijing Univ. of Posts and Telecommunications(BUPT), China; 3School of Ethnic Minority Education, Beijing Univ. of Posts and Telecommunications(BUPT), China. A nanoscale waveguide structure coupled with two rings is reported. We use 2D FDTD method to simulate the transmission characteristic of SPPs in this structure. Results show it can act as a SPPs band-pass filter.

AF1P.5.18
Experiment and Analysis of Polarization Independent Optical Fiber Perimeter Sensing System, Xuhui Wang[1],

Xiaopeng Dong[1]; [1]Inst. of Lightwave Technology, School of Information Science and Technology, Xiamen Univ., China. The problem of polarization decline has extensively existed in interferometric fiber optical sensors. In this paper depolarization effect applied on perimeter sensing system is discussed theoretically and experimentally to improve signal fading and distortion.

AF1P.5.19
Studies on fruit ageing by fluorescence spectroscopy and diode laser absorption spectroscopy, Hao Zhang[1], Jing Huang[1], Guangyu Zhao[1], Sune R. Svanberg[1,2], Katarina Svanberg[1,2]; [1]South China Normal Univ., China; [2]Lund Univ., Sweden. A combination of fluorescence spectroscopy and diode laser absorption spectroscopy is used to investigate ageing processes in fruits, where the changes of chlorophyll content and molecular oxygen concentration are mainly studied.

AF1P.5.20
Microfiber Coupler Based Biosensor for Immunoglobulin G Antigen Detection, Lin Bo[1], Christy C. O'Mahony[2], Pengfei Wang[1], Yuliya Semenova[1], Gerald Farrell[1]; [1]Photonics Research Centre, Dublin Inst. of Technology, Ireland; [2]Biomedical Diagnostics Inst., Dublin City Univ., Ireland. We demonstrated a label-free biosensor based on a tapered optical microfiber coupler. By immobilizing immunoglobulin G antibody on the surface, the microfiber coupler could detect the matched immunoglobulin G antigen with high sensitivity and selectivity.

AF1P.5.21
Optical fiber sensor based on capillary wall for high sensitive refractive index measurement, Liu Yun[1]; [1]Dalian Univ. of Technology, China. We present a novel fiber-optic refractive index (RI) capillary wall based sensor. A short piece of fused-silica micro capillary (FSC) which acts as a sensing element spliced between single mode fibers (SMFs) to fabricate the sensor.

AF1P.5.22
Boosting Goos-Hanchen shift from a Bloch surface wave structure by optimizing excitation angles, shuna li[1,2], Jiansheng Liu[1], Yuhang Wan[1], Weijing Kong[1], Yu Sun[1], Zheng Zheng[1]; [1]School of Electronic and Information Engineering, Beihang Univ., China; 2National key laboratory for electronic measurement technology, North Univ. of China, China. The Goos-Hänchen shift is studied via varying the theoretical model of photonic crystal structure. The giant GH shift is obtained when resonant angle near the critical angle, and enhanced about an order of magnitude.

AF1P.5.23
Analysis of Scale Factor Error for Open-loop Fiber Optic Gyroscope with A Digital Signal Processing System, Zhongwei Tan[1], Chuanchuan Yang[1], Ziyu Wang[1]; [1]Peking Univ., China. We research the effect of the instability of the modulation depth and the nonlinearity of the modulating signal on the scale factor error for open-loop fiber optic gyroscope with a digital signal processing system.

AF1P.6•ACP Track 6: LEDs, Photovoltaics, and Optoelectronics in Energy

AF1P.6.1
Windmill-shaped α-Si Nanowire Solar Cell, Yumin Liu[1], Xiu Wu[1], Zhongyuan Yu[1], Hui Gong[1], Haozhi Yin[1]; [1]IPOC of BUPT, China. We propose a solar cell structure with periodic units composed by seven α-Si blades and look like a windmill. A 11% absorption enhancement averaged at wavelength range-300nm-800nm can be obtained without any other light-trapping device.

AF1P.6.2
Efficient Spatiotemporal Stereo Matching, Nan Guo[1], Xinzhu Sang[1], Xin Fan[1], Xunbo Yu[1], Yuanfa Cai[1], Duo Chen[1], Chongxiu Yu[1]; [1]State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ of Posts & Telecom, China. An efficient spatiotemporal stereo matching method is proposed based on the edge-preserving filter and two-pass scan paradigm, which improves matching accuracy and maintains disparity sequences' temporal consistency.

AF1P.6.3
Absorption Enhancement in Organic Solar Cells Based on the Plasmonic Hot Spot Effect, Ye Zhang[1], Wenyan Wang[1], Yanxia Cui[1], Zhanfeng Li[1], Ting Ji[1], Yuying Hao[1]; [1]Taiyuan Univ. of Technology, China. By introducing metallic nanostrips in organic solar cells with the excitation of the plasmonic hot spot effect, we improve light absorption in active layer by 24 % in comparison with the corresponding planar device.

AF1P.6.4
The application of photonic crystal in solar cells, Xu Zhang[1]; [1]Zhengzhou Univ., China. A Photovoltaic solar cell is designed based on a absorbing layer made of a two-dimensional photonic crystal(PC). The geometry of the PC patterned as square, hexagonal and honeycomb is proposed and compared.

AF1P.6.5
Investigation of the GaInP quantum dots for light emitters, Hwa Sub Oh[1]; [1]Korea Photonics Technology Inst., Republic of Korea. In this study, we investigate the behaviors of morphological and optical characteristics on the composition of Ga0.33In0.67P material and demonstrate the performance of a device emitting at around 700 nm using quantum dot (QD)-based LEDs.

AF1P.6.6
Implementation and Experimental Demonstration of Multiple Receptions in Solar-blind UV Communications, Xinyong Wang[1], Min Zhang[1], Dahai Han[1], xufeng wang[1], Zhu Rui[1]; [1]State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. Multiple receptions experiments are conducted to evaluate the BER performances with two and arrayed four receivers, in case of various distances and Tx/Rx elevation angles. Results show that multiple receptions can improve BER performance evidently.

AF1P.6.7
Implementation and Field Trial of Direct Sequence Spread Spectrum in Ultraviolet Communication, Lu Jiao[1], Min Zhang[1], Dahai Han[1], Pengfei Luo[1], Lu Yu[1]; [1]Beijing Univ. of Posts and Telecom, China. Ultraviolet communication system with Direct Sequence Spread Spectrum (DSSS) technique is realized by FPGA and tested to improve the system performance. The experimental results show that DSSS is able to improve the performance evidently.

AF1P.6.8
Performance Improvement Method for Visible Light Communication System by Using Kaiser Window, Ang Li[1], Min Zhang[1], Dahai Han[1], Yang Xiang[1], Shuo Yang[1]; [1]State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. An indoor visible light communication system is designed and demonstrated. To improve the system performance, a Kaiser window is designed and implemented in FPGA. Experiment results show that Kaiser window is able to effectively improve the system performance.

AF1P.6.9
RS Code-Based Error Correction and PPM Modulation Scheme for Visible Light Communication System, xufeng wang[1], Min Zhang[1], Han Dahai[1], Xinyong Wang[1], Haobo Zhang[1]; [1]State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. A PPM-based VLC system is implemented and measured. At the distance of 1.5 m to 2.8 m, the BER is less influenced by the illuminance of receiver. RS-based FEC extends the distance to 2.2 m with BER lower than 10-6.

AF1P.6.10
FPGA-based design and implementation of an OFDM transmitter for VLC system, Lu Yu[1], Min Zhang[1], Dahai Han[1], Yang Xiang[1], Mingming Liu[1]; [1]State Key laboratory of Information Photonics and Optical Communications, Beijing Univ. of Post and Telecommunication, China. A visible light communication system is demonstrated in which the transmitter is based on FPGA and tested with off-the-shelf blue LED. This transmitter can work at 40Mbit/s. Experiment proves the validity of this design.

AF1P.6.11
Effect of Cosmic Dust on Ultraviolet Deep Space Communication, Cheng Li[1], Min Zhang[1], Pengfei Luo[1], Qing Li[1], Xue Chen[1], Dahai Han[1], Guohua Wu[1], Yang Xiang[1]; [1]BUPT, China. For the exploration of ultraviolet deep space communication, we analyze the character of channel with cosmic dust and discuss the technical feasibility. The results are helpful for advancing the research in related field.

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Post-Deadline Paper Sessions

AF2A, 10:30-12:30, Nov. 15

AF2A.1, 10:30-11:45, Nov. 15
1868599 On the Validity of the Newly Proposed Bivergentum Mechanics: One Ready-for-Long Evidence and Two Intriguing Predictions
Xiaomin Ren *Beijing University of Posts and Telecommunications, China*

AF2A.2, 10:45-11:00, Nov. 15
1865501 A CMOS Photonic Chip for Rapidly Reconfigurable RF Arbitrary Waveform Generation
Jian Wang *Purdue University, USA*

AF2A.3, 11:00-11:15, Nov. 15
1862799 On-chip Si optical interconnect with 8-channel hybrid (de)multiplexer enabling mode- and polarization-division-multiplexing simultaneously
Jian Wang *Zhejiang University, China*

AF2A.4, 11:15-11:30, Nov. 15
1866641 Broadband high photoresponse graphene photodetector
Yongzhe Zhang *North China Electric Power University, China*

AF2A.5, 11:30-11:45, Nov. 15
1870823 High-speed silicon Mach-Zehnder optical modulator with large optical bandwidth
Lin Yang *Institute of Semiconductors, Chinese Academy of Sciences, China*

AF2A.6, 11:45-12:00, Nov. 15
1859736 Compact and low-loss optical 90 hybrid based on silicon-on-insulator
Yanping Li *Peking University, China*

AF2A.7, 12:00-12:15, Nov. 15
1869152 Size and Surface Effects on Transient Photoconductivity in CdS Nanobelts Probed by Optical Pump-Terahertz Probe Spectroscopy
Xinhai Zhang *South University of Science and Technology of China*

AF2A.8, 12:15-12:30, Nov. 15
1870815 Surface-induced self-organization of gold nanorods into predesigned patterns in liquid crystals
Qingkun Liu *Zhejiang University, China*

AF2B, 10:30-12:30, Nov. 15

AF2B.1, 10:30-10:45, Nov. 15
1862309 Multipath Interference Phenomenon in Bend Insensitive Fiber
Hongyan Zhou *Yangtze Optical Fiber and Cable Company Ltd., China*

AF2B.2, 10:45-11:00, Nov. 15
1870281 Energy-time Entanglement Generation in Optical Fibers under Continuous Wave Pumping
Shuai Dong *Shanghai Institute of Microsystem and Information Technology, China*

AF2B.3, 11:00-11:15, Nov. 15
1870852 The Design of Polarization Insensitive Avalanche Photodiode for 100-Gb/s (4×25 Gb/s) Optical Transmission
Yanli Zhao *Huazhong University of Science and Technology, China*

AF2B.4, 11:15-11:30, Nov. 15
1871206 First Field Demonstration of Network Function Virtualization via Dynamic Optical Networks with OpenContrail and Enhanced NOX Orchestration
Yiming Yu *Beijing University of Posts and Telecommunications, China,*

AF2B.5, 11:30-11:45, Nov. 15
1869838 A Traffic Tracing-based IP/Optical Convergence Approach
Bingli Guo *Peking University, China*

AF2B.6, 11:45-12:00, Nov. 15
1871081 Pre-Configured Cube (p-Cube): Optimal Protection Structure against Simultaneous Dual-Link Failure in Multi-Dimensional Node based Optical Networks
Chen Ma *Beijing University of Posts and Telecommunications, China,*

AF2C, 10:30-12:30, Nov. 15

AF2C.1, 10:30-11:45, Nov. 15
1861245 Generation of 1.024-Tb/s Nyquist-WDM Phase-Conjugated Twin Vector Waves through Polarization-Insensitive Optical Parametric Amplification Enabling Transmission over 4000-km Dispersion-Managed TWRS Fiber
Xiang Liu *Bell Labs, Alcatel-Lucent, USA*

AF2C.2, 10:45-11:00, Nov. 15
1869780 Ultra Long-Haul Transmission of a 1-Tb/s LDPC-Coded DFT-S OFDM-8PSK Superchannel over 12,160 km
Qi Yang *State Key Laboratory of Optical Communication Technologies and Networks, China*

AF2C.3, 11:00-11:15, Nov. 15
1870439 First Demonstration of Symmetric 40-Gb/s TWDM-PON with 100-km Passive Reach and 1024-Split using Direct Modulation and Direct Detection
Lilin Yi *Shanghai Jiao Tong University, China*

AF2C.4, 11:15-11:30, Nov. 15
1871122 Demonstration of Simultaneous 1-to-34 Multicasting of OFDM/OQAM 64-QAM Signal from Single Gaussian Mode to Multiple Orbital Angular Momentum (OAM) Modes
Shuhui Li *Huazhong University of Science and Technology, China*

AF2C.5, 11:30-11:45, Nov. 15
1871025 Optical sinc-shaped Nyquist pulses with very low roll off generated from a rectangular frequency comb
Luc Thevenaz *EPFL Swiss Federal Institute of Technology, Switzerland*

AF2C.6, 11:45-12:00, Nov. 15
1871065 Demonstration of Energy-Efficient and Format-Transparent Digital Signal Processing for Tb/s Flexible Transceiver
Qunbi Zhuge *McGill University, Montreal, Canada*

AF2D, 10:30-12:30, Nov. 15

AF2D.1, 10:30-10:45, Nov. 15
1869904 All-optical Regulation of Cellular Processes
Hao He *Tianjin University, China*

AF2D.2, 10:45-11:00, Nov. 15
1871165 Probing Localized Surface Plasmon Resonance Sensitivity Enhancement of Film-Coupled Nanoparticles
Wei Peng *Dalian University of Technology, China*

AF2D.3, 11:00-11:15, Nov. 15
1868766 Controllable damage on a single mitochondrion by femtosecond laser irradiation
Yintao Wang *Tianjin University, China*

AF2D.4, 11:15-11:30, Nov. 15
1871219 Surface Plasmon Resonance Sensor based on Light Guiding Flexible Fused Silica Capillary Tubing
Wei Peng *Dalian University of Technology, China*

AF2D.5, 11:30-11:45, Nov. 15
1848543 Multiple Plasmonic Nanostructures Solar Cells
Wallace Choy *University of Hong Kong, Hong Kong, China*

AF2D.6, 11:45-12:00, Nov. 15
1866239 Computer-generated Fresnel Hologram Using Multiple Angular Orthogonal Projection Images
Xuemei Cao *Beijing University of Posts and Telecommunications, China*

AF2D.7, 12:00-12:15, Nov. 15
1869195 Efficient Monolithic Multi-cell GaAs Converter for High Power Space Laser Transmission
Tao He *Beijing Institute of Technology, China*

AF2D.8, 12:15-12:30, Nov. 15
1869747 A color temperature tunable WW/CW LED cluster with extrahigh color rendering and high luminous efficacy
Guoxing He *Dong Hua University, China*

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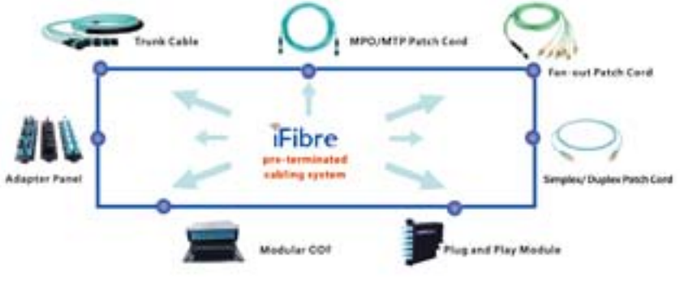

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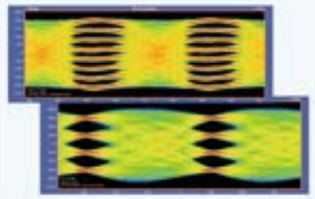
- 通过示波器验证和分析宽带OFDM电信号



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- 同时支持多载波系统测试
- 图形用户界面，控制常用的仪器功能：
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  - 调制分析:EVM、星座图、Q因子等
  - 支持用户自定义数据以及在线误码测量

OM5110高级偏振复用参考相干光源

- 测试相干光接收机
- 用于多载波超通道系统的发射机测试

OM2210相干接收机(ICR)校准源

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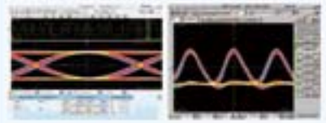

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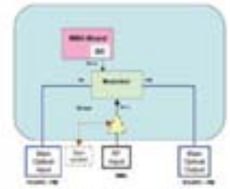

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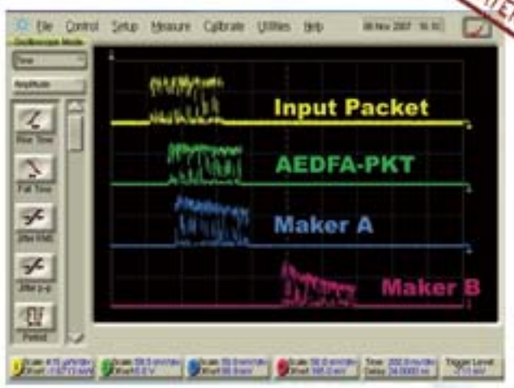

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