

Asia Communications and Photonics Conference (ACP) 2016
9th International Photonics and OptoElectronics Meetings (POEM 2016)
13th International Conference on Photonics and Imaging in Biology and Medicine (PIBM 2016)

Co-located and Jointly Organized
2-5 November, 2016
Shangri-La Hotel, Wuhan

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Welcome to Wuhan and to the Asia Communications and Photonics Conference

It is a great pleasure to invite you to participate in the Asia Communications and Photonics Conference (ACP) 2016 and share the latest news in communications and photonics science, technology and innovations from leading companies, universities and research laboratories throughout the world. ACP is now the largest conference in the Asia-Pacific region on optical communication, photonics and relevant technologies. ACP has been held annually tracing back to 2001 and jointly sponsored by OSA, SPIE, IEEE Photonics Society, COS and CIC. This year ACP is collocated and jointly organized with the 9th International Photonics and Optoelectronics Meetings (POEM 2016) and the 13th International Conference on Photonics and Imaging in Biology and Medicine (PIBM 2016).

The ACP technical conference features a full suite of plenary, invited, and contributed talks given by international academic and industrial researchers who are leaders in their respective fields. This year's conference will feature the following topics: Novel Fibers and Fiber-based Devices; Optical Transmission Systems, Subsystems and Technologies; Network Architectures, Management and Applications; Optoelectronic Devices and Integration; Optical Signal Processing and Microwave Photonics; Photonics for Energy; Ultrafast Photonics and Optical Storage; Photonics in Biology and Medicine. The conference will also include a wide spectrum of workshops, a Sino-French Forum, and industrial forums taking place on 1-2 November. With a conference program of broad scope and of the highest technical quality, ACP provides an ideal venue to keep up with new research directions and an opportunity to meet and interact with the researchers who are leading these advances. We have over 600 papers scheduled, including 120 invited and nine tutorial presentations made by many of the world's most prominent researchers from academia and industry. We

thank all the contributors and authors for making ACP a truly unique, outstanding global event.

Our conference highlight is the Plenary Session scheduled on the morning of Thursday, 3 November. Four outstanding, distinguished speakers will give presentations: Miles J. Padgett, *University of Glasgow, Scotland, UK*, will give a talk on *Light in a Twist: Optical Angular Momentum*; Alan E. Willner, *University of Southern California, USA*, will present on *Innovations Abound in Functional Optical Communications*; Lihong V. Wang, *Washington University in St. Louis, USA* will discuss *Photoacoustic Tomography: Ultrasonically Beating Optical Diffusion and Diffraction*; Jonathan Knight, *University of Bath, UK* will present on *Perfect Optical Fibers*. The Plenary session will also feature OSA's Light the Future Series speaker Steven Chu, *Nobel Laureate, former U.S. Secretary of Energy, OSA Fellow, OSA Honorary Fellow, USA*.

In addition to the regular technical sessions, 12 workshops, a Sino-French Forum, and 3 industry forums will also be held featuring around a hundred invited speakers. Most pre-conference workshops will be held on Wednesday, 2 November starting at 9:00AM. These workshops will be held free of charge to conference registrants. We would like to thank the workshop organizers and speakers for the excellent program.

Best Student Paper Awards sponsored by OSA will be given to students who are first authors and presenters of exceptional contributed talks. The selection will be made by the subcommittees during the conference. Awards will be presented during the Banquet on Friday, 4 November. The poster-only session will be held on Friday, 4 November from 10:30-12:30. This is a good chance for you to meet with the authors and discuss technical issues in-depth. Two best poster awards

sponsored by LUSTER LightTech Group Co., Ltd and selected by conference registrants will be given as well. This year, we also award two best paper awards sponsored by Huawei Technologies Co., Ltd. They will be presented during the Banquet.

In addition to the technical program, we have prepared a rich social program to facilitate meeting and networking with colleagues from all over the world. A conference reception and OSA 100th Anniversary Celebration will be held in the evening on 3 November. On the evening 4 November, we will hold a Banquet and Awards Ceremony for conference registrants.

It is an enormous task to organize a conference and it is impossible to succeed without the dedicated efforts of many supporters and volunteers. We are indebted to the entire Technical Program Committee led by Xinliang Zhang, *Wuhan National Laboratory for Optoelectronics & Huazhong University of Science and Technology, China*; Jie Luo, *Yangtze Optical Fibre and Cable Joint Stock Limited Company (YOFC)*; Jian Wang, *Wuhan National Laboratory for Optoelectronics & Huazhong University of Science and Technology, China*; Christophe Peucheret, *University of Rennes 1, France*; Naoya Wada, *National Institute of Information and Communications Technology, Japan* and the Subcommittee Chairs who have worked persistently throughout the whole year to invite speakers, solicit and review papers, organize the technical sessions which results in the excellent technical program. We also thank the staff and volunteers of Wuhan National Laboratory for Optoelectronics & Huazhong University of Science and Technology, and the professional societies from OSA, SPIE, IEEE Photonics Society, COS and CIC for organizing and sponsoring the event.

Sincerely,



Qingming Luo
Wuhan National Laboratory for
Optoelectronics & Huazhong University
of Science and Technology, China
General Chair



Ping Perry Shum
Nanyang Technological University,
Singapore
General Co-Chair



Alan E. Willner
University of Southern California, USA
General Co-Chair



Shaohua Yu
Member of Chinese Academy of
Engineering, Wuhan Institute of Post
and Telecommunications, China
General Co-Chair



Shaoqun Zeng
Wuhan National Laboratory for
Optoelectronics & Huazhong University
of Science and Technology, China
General Co-Chair

Committees

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Guangcan Guo, University of Science and Technology of China, China

Chaohui Ye, Wuhan National Laboratory for Optoelectronics, China

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Ping Perry Shum, Nanyang Technological University, Singapore

Alan E. Willner, University of Southern California, USA

Shaohua Yu, Wuhan Institute of Post and Telecommunications, China

Shaoqun Zeng, Wuhan National Laboratory for Optoelectronics & Huazhong University of Science and Technology, China

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Xinliang Zhang, Wuhan National Laboratory for Optoelectronics & Huazhong University of Science and Technology, China

Jie Luo, Yangtze Optical Fibre and Cable Joint Stock Limited Company (YOFC)

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

Christophe Peucheret, University of Rennes 1, France

Naoya Wada, National Institute of Information and Communications Technology, Japan

Steering Committee

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Connie J. Chang-Hasnain, University of California, Berkeley, USA

Arthur Chiou, Yang-Ming University, Taipei, China

Yun C. Chung, Korea Advanced Institute of Science and Technology, Korea

Sailing He, Zhejiang University, China; KTH, Sweden

Chennupati Jagadish, Australian National University, Australia

Christopher Jannuzzi, IEEE Photonics Society, USA

Thomas L. Koch, University of Arizona, USA

Ming-Jun Li, Corning Inc., USA

Xingde Li, Johns Hopkins University, USA

Xiang Liu, Huawei Technologies, USA

Chao Lu, The Hong Kong Polytechnic University, China

Qingming Luo, Wuhan National Laboratory for Optoelectronics & Huazhong University of Science and Technology, China

Qian Mao, Wuhan Research Institute of Posts and Telecommunications, China

Naomi Chavez, OSA, USA

Ping Perry Shum, Nanyang Technological University, Singapore

Yikai Su, Shanghai Jiao Tong University, China

Brian J. Thomas, SPIE, USA

Bingkun Zhou, Tsinghua University, China

Local Organizing Committee

Chair:

Song Xia, Wuhan National Laboratory for Optoelectronics & Huazhong University of Science and Technology, China

Co-Chair:

Hua Shi, Wuhan National Laboratory for Optoelectronics & Huazhong University of Science and Technology, China

Members:

Weiwei Dong, Wuhan National Laboratory for Optoelectronics & Huazhong University of Science and Technology, China

Xiao Cheng, Wuhan National Laboratory for Optoelectronics & Huazhong University of Science and Technology, China

Subcommittees

ACP Track 1: Novel Fibers and Fiber-based Devices

Chair:

Limin Tong, Zhejiang University, China

Co-Chair:

Xuewen Shu, Wuhan National Laboratory for Optoelectronics & Huazhong University of Science and Technology, China

Members:

Kin-Seng Chiang, The City University of Hong Kong, China

Qian Li, University of Toronto, Canada

Gang-Ding Peng, The University of New South Wales, Australia

Kunimasa Saitoh, Hokkaido University, Japan

Sze Y. Set, University of Tokyo, Japan

Sergei K Turitsyn, Aston University, UK

Tingyun Wang, Shanghai University, China

Libou Yuan, Harbin Engineering University, China

ACP Track 2: Optical Transmission Systems, Subsystems and Technologies

Chair:

Lianshan Yan, Southwest Jiaotong University, China

Co-Chairs:

Werner Rosenkranz, University of Keil, Germany

Qi Yang, Wuhan Research Institute of Post and Telecommunications, China

Members:

Di Che, The University of Melbourne, Australia

Ivan Djordjevic, University of Arizona, USA

Didier Erasme, Groupe télécommunications optiques Dept Communications & électronique, France

Hoon Kim, Korea Advanced Institute of Science and Technology, Korea

Juhao Li, Peking University, China

Colin McKinstrie, Applied Communication Sciences, USA

Periklis Petropoulos, University of Southampton, UK

Erwan Pincemin, Orange Lab, France
Qunbi Zhuge, Ciena Corporation and McGill University, Canada
André Richter, VPI Photonics, Germany
William Shieh, The University of Melbourne, Australia
Lilin Yi, Shanghai Jiaotong University, China
Changyuan Yu, Hong Kong Polytechnic University, China
Fan Zhang, Peking University, China
Darko Zibar, Technical University of Denmark, Denmark

ACP Track 3: Network Architectures, Management and Applications

Chair:

Xiaoping Zheng, Tsinghua University, China

Co-Chairs:

Dimitra Simeonidou, University of Bristol, UK
Ming Tang, Huazhong University of Science and Technology, China

Members:

Nan Hua, Tsinghua University, China
Changcheng Huang, Carleton University, Canada
Ignacio de Miguel, Universidad de Valladolid, Spain
Paolo Monti, Royal Institute of Technology, Sweden
Wenda Ni, Viscore Technologies Inc. , Canada
Gangxiang Shen, Soochow University, China
Domenico Siracusa, Create-Net, Italy
Yabin Ye, Huawei European Research Center, Germany
Fen Zhou, University of Avignon, France

ACP/POEM Joint Track 4: Optoelectronic Devices and Integration

Chair:

Siyuan Yu, University of Bristol, UK

Co-Chairs:

Kevin Williams, Eindhoven University of Technology, the Netherlands
Yu Yu, Wuhan National Laboratory for Optoelectronics & Huazhong University of Science and Technology, China

Members:

Daoxin Dai, Zhejiang University, China
Jonathan Klamkin, University of California Santa Barbara, USA
Yoshiaki Nakano, Tokyo University, Japan
Shu Namiki, National Institute of Advanced Industrial Science and Technology, Japan
Andrew Poon, The Hong Kong University of Science and Technology, China
Graham Reed, University of Southampton, UK
Gunther Roelkens, Ghent University, Belgium
Marc Sorel, Glasgow University, UK
Yikai Su, Shanghai Jiaotong University, China
Xi Xiao, Wuhan Research Institute of Posts and Telecommunications, China

ACP/POEM Joint Track 5: Optical Signal Processing and Microwave Photonics

Chair:

Gong-Ru Lin, Taiwan University, Taipei, China

Co-Chairs:

Chester Shu, The Chinese University of Hong Kong, China
Jianji Dong, Wuhan National Laboratory for Optoelectronics & Huazhong University of Science and Technology, China

Members:

Jose Azana, INRS-EMT, Canada
Antonella Bogoni, Scuola superiore Sant'Anna, Italy
Tsuyoshi Konishi, Osaka University , Japan
Ming Li, Institute of Semiconductors, Chinese Academy of Sciences, China
Barry Liam, Dublin City University, Ireland
Christina Lim, The University of Melbourne, Australia
Chao Lu, The Hong Kong Polytechnic University, China
David Marpaung, CUDOS, University of Sydney, Australia
Shilong Pan, Nanjing University of Aeronautics and Astronautics, China
Peng-Chun Peng, Taipei University of Technology, Taipei, China
Periklis Petropoulos, ORC, Southampton, UK
Jianming Tang, Bangor University, UK
Kenneth Wong, University of Hong Kong, China

ACP/POEM Joint Track 6: Photonics for Energy

Chair:

Andriy Zakutayev, National Renewable Energy Laboratory, USA

Co-Chairs:

Jiang Tang, Wuhan National Laboratory for Optoelectronics & Huazhong University of Science and Technology, China
Hongwei Han, Wuhan National Laboratory for Optoelectronics & Huazhong University of Science and Technology, China

Members:

Jinsong Huang, University of Nebraska - Lincoln, USA
Edward H. Sargent, University of Toronto, Canada
Suhui Wei, Beijing Computational Science Research Center, China
Yanfa Yan, University of Toledo, USA

ACP/POEM Joint Track 7: Ultrafast Photonics and Optical Storage

Chair:

Min Gu, Royal Melbourne Institute of Technology University, Australia

Co-Chair:

Changsheng Xie, Wuhan National Laboratory for Optoelectronics & Huazhong University of Science and Technology, China

Members:

Martin Booth, Oxford University, UK
Zongsong Gan, Swinburne University of Technology, Australia
Peixiang Lu, Huazhong University of Science and Technology, China
Xiangshui Miao, Huazhong University of Science and Technology, China
Hao Ruan, Shanghai Institute of Optics and Fine Mechanics, China
Hongbo Sun, Jilin University, China
Xiaodi Tan, Beijing Institute of Technology, China
Takuo Tanaka, RIKEN, Japan

**ACP/PIBM Joint Track 8: Photonics in Biology and
Medicine**

Chair:

Jürgen Popp, Friedrich Schiller University Jena, Germany

Co-Chairs:

Valery V. Tuchin, Saratov State University, Russia

Pengcheng Li, Wuhan National Laboratory for
Optoelectronics & Huazhong University of Science and
Technology, China

Members:

Stephen Boppart, University of Illinois at Urbana-
Champaign, USA

Ewa Goldys, Macquarie University, Australia

Steven Jacques, Oregon Health & Science University, USA

Laura Marcu, University of California, Davis, USA

Thomas Mayerhöfer, Friedrich Schiller University Jena,
Germany

Francesco Pavone, European Laboratory for Non Linear
Spectroscopy, Italy

Junle Qu, Shenzhen University, China

David Sampson, The University of Western Australia,
Australia

Dick Sterenborg, Academic Medical Centre, The
Netherlands

Peng Xi, Peking University, China

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

General Information

Conference Venue: Shangri-La Hotel, Wuhan

Address: 700 Jian She Avenue, Hankou, Wuhan, 430015, China



Accessibility

Shangri-La Hotel, Wuhan is conveniently located in the heart of the Hankou business and financial district and is only a short 30-minute drive from Wuhan Tianhe International Airport, a 15-minute drive from Hankou Railway Station, a 30-minute drive from Wuchang Railway Station, and a 35-minute drive from Wuhan Railway Station. It is easily accessible from Metro Xianggang Road Station (Line 3). From the Exit A of the Metro Station, it only takes 4 minutes to get to the hotel.

Transportation

From Wuhan Tianhe International Airport

By Airport Line & Metro: take Airport Bus Line 3 from Terminal 2 to Jinjia Dun Bus Station, walk for 4 minutes and switch to Metro Line 2 (toward Optics Valley Square direction) from Hankou Railway Station to Fanhu Station, transfer to Metro Line 3 (toward Hongtu Road direction) and get off at Xianggang Road Station (Exit A), then walk to Shangri-La Hotel, Wuhan. (19 RMB)

By Taxi: 30-min drive (~70 RMB)

From Hankou Railway Station

By Metro: take Line 2 (toward Optics Valley Square direction) from Hankou Railway Station to Fanhu Station, transfer to the Line 3 (toward Hongtu Avenue) to Xianggang Road Station (Exit A), then walk to Shangri-La Hotel, Wuhan for 4 minutes. (2 RMB)

By Taxi: 15-min drive (~15 RMB)

From Wuchang Railway Station

By Metro: take Line 4 (toward Huangjinkou direction) from Wuchang Railway Station to Wangjiawan Station, transfer to Line 3 (toward Hongtu Avenue) to Xianggang Road Station (Exit A), then walk to Shangri-La Hotel, Wuhan for 4 minutes. (4 RMB)

By Taxi: 30-min drive (~35 RMB)

From Wuhan Railway Station

By Metro: take Line 4 (toward Huangjinkou direction) from Wuhan Railway station to Hongshan Square, transfer to Line 2 (toward Jinyintan direction) to Fanhu Station, then switch to Line 3 (toward Hongtu Avenue) to Xianggang Road Station (Exit A), then walk to Shangri-La Hotel, Wuhan for 4 minutes. (5 RMB)

By Taxi: 35-min drive (~55 RMB)

Registration

Location: Public area face to the escalator, 2nd Floor, Shangri-La Hotel, Wuhan

Hours:

08:30–18:00	Wednesday, 2 November
07:30–18:00	Thursday, 3 November
08:00–18:00	Friday, 4 November
08:00–16:00	Saturday, 5 November

Speaker Preparation

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

Poster Preparation

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

Location: Public area, 2nd Floor, Shangri-La Hotel, Wuhan

Poster Board Size – 1m (Length) *2.235m (Height)

Set-up Time: Thursday, November 3 from 09:00–18:00

Tear-down Time: Friday, November 4 from 12:30–18:00

Exhibition

The ACP Exhibition is open to all attendees.

Location: Public area, 2nd and 3rd Floor, Shangri-La Hotel, Wuhan

Hours:

09:00–18:00	Thursday, 3 November
08:00–18:00	Friday, 4 November
08:00–16:00	Saturday, 5 November

Coffee Breaks

10:40–11:00	Tuesday, 1 November
15:30–15:50	Tuesday, 1 November
10:30–11:00	Wednesday, 2 November
16:00–16:30	Wednesday, 2 November
11:00–11:15	Thursday, 3 November
16:00–16:30	Thursday, 3 November
10:30–11:00	Friday, 4 November
16:00–16:30	Friday, 4 November
10:30–11:00	Saturday, 5 November
15:30–16:00	Saturday, 5 November

Lunches

Three-day lunches (Nov. 3-5) in Shangri-La Hotel, Wuhan are INCLUDED ONLY in the registration fee for overseas delegates, overseas students and domestic delegates. And lunch tickets are provided within the badge.

Location: Café Wu, 1st Floor, or Shang Palace, 2nd Floor, Shangri-La Hotel, Wuhan

12:45–14:30	Thursday, 3 November
12:30–14:00	Friday, 4 November
12:30–14:00	Saturday, 5 November

Domestic students or others may purchase lunch tickets (120 RMB/day/person) at the Registration Desk.

There are many restaurants close to Shangri-La Hotel serving typical local food with favorable price.

Conference Materials

ACP 2016 Technical Digest will be provided in a USB drive and not available in print form. The ACP 2016 Technical Digest material is composed of the 3-page summaries of invited and accepted contributed papers. The Technical Digest material is included with a technical conference registration and can be found in your registration bag. The Digest will be available on OSA Publishing's Digital Library (<https://www.osapublishing.org/>) and IEEE Xplore Digital Library (<http://www.ieee.org/web/publications/xplore/>) after the conference. IEEE Xplore Digital Library and OSA Publishing's Digital Library are archived and indexed by INSPEC R and EI Compendex, where it will be available to the international technical community.

Social Activities

Welcome Reception

The ACP 2016 Welcome Reception & OSA 100th Anniversary Celebration will be held on 3 November, 2016. It is free to all the registered participants. Ticket is provided within the badge. And extra ticket could be purchased at the Registration Desk.

Location: Grand Ballroom (Han Kou, Wu Chang, and Han Yang), 2nd Floor, Shangri-La Hotel, Wuhan

Time: 18:30–21:30

Conference Banquet and Awards Ceremony

The ACP 2016 Banquet and Awards Ceremony will be held on 4 November. The OSA Best Student Paper Awards, Huawei Best Paper Awards, and Luster Best Poster Awards will be presented at the banquet.

The Banquet is INCLUDED ONLY in the registration fee for overseas delegates, overseas students and domestic delegates. The ticket is provided within the badge.

Domestic students or others may purchase Banquet ticket (300 RMB/person) at the Registration Desk.

Location: Grand Ballroom (Han Kou, Wu Chang, and Han Yang), 2nd Floor, Shangri-La Hotel, Wuhan

Time: 18:45–21:30

The Banquet is sponsored by Yangtze Optical Fibre and Cable Joint Stock Limited Company (YOFC).



Conference Highlights

Plenary Talks

Time: 8:30–12:45, Thursday, 3 November

Venue: *Grand Ballroom (Han Kou, Wu Chang, and Han Yang), 2nd Floor, Shangri-La Hotel, Wuhan*

Light in a Twist: Optical Angular Momentum

08:30–09:15



Miles J. Padgett

University of Glasgow, Scotland, UK

Biography: Miles Padgett holds the Kelvin Chair of Natural Philosophy at the University of Glasgow. He leads QuantIC, a quantum imaging centre and one of four Quantum Technology hubs in the UK. In 2001 he was elected a Fellow of the Royal Society of Edinburgh (RSE)

and in 2014 a Fellow of the Royal Society, the UK's National Academy. In 2009, with Les Allen, he won the Institute of Physics Young Medal, in 2014 the RSE Kelvin Medal and in 2015 the Science of Light Prize from the European Physical Society.

Innovations Abound in Functional Optical Communications

09:15–10:00



Alan E. Willner

University of Southern California, USA

Biography: Alan E. Willner received his Ph.D. from Columbia University (1988), worked at AT&T Bell Labs and Bellcore, and is currently the Steven & Kathryn Sample Chaired Professor of Engineering at the University of Southern California. Prof. Willner is a Member of the U.S.

Army Science Board and was Founder/CTO of Phaethon Communications. His honors include: Member of U.S. National Academy of Engineering; International Fellow of U.K. Royal Academy of Engineering; Presidential Faculty Fellows Award from White House; IEEE Eric Sumner Award;

Guggenheim, Packard, and Fulbright Fellowships; Optical Society Forman Engineering Excellence Award; IEEE Photonics Society Engineering Achievement Award; SPIE President's Award; Eddy Best Technical Paper Award from Pennwell; IEEE Globecom Best Paper Award; National Academy of Inventors; and Fellow of AAAS, IEEE, OSA and SPIE. Prof. Willner's activities include: Co-Chair of U.S. National Academies' Study on Optics & Photonics; President of IEEE Photonics Society, President of OSA; and Editor-in-Chief of Optics Letters and IEEE/OSA Journal of Lightwave Technology. He has >1100 publications, including 1 book, 30 U.S. patents, and 22 plenaries.

OSA's Light the Future Series: How Optics Will Revolutionize the World

10:00–11:00



Steven Chu

Nobel Laureate, former U.S. Secretary of Energy, USA

Biography: Steven Chu is the William R. Kenan, Jr., Professor of Physics and Professor of Molecular & Cellular Physiology in the Medical School at Stanford University. He has published 260 papers in atomic and polymer physics,

biophysics, biology, biomedicine, batteries, and holds 10 patents.

Dr. Chu was the 12th U.S. Secretary of Energy from January 2009 until the end of April 2013. As the first scientist to hold a Cabinet position and the longest serving Energy Secretary, he recruited outstanding scientists and engineers into the Department of Energy. He began several initiatives including ARPA-E (Advanced Research Projects Agency – Energy), the Energy Innovation Hubs, the U.S. – China Clean Energy Research Centers (CERC), and was tasked by President Obama to assist BP in stopping the Deepwater Horizon oil leak. Prior to his cabinet post, he was director of the Lawrence Berkeley National Laboratory and Professor of Physics and Molecular and Cell Biology at UC Berkeley. Previously he was the Theodore and Francis Geballe

Professor of Physics and Applied Physics at Stanford University, and head of the Quantum Electronics Research Department at AT&T Bell Laboratories.

Dr. Chu has numerous awards including the 1997 Nobel Prize in Physics for the laser cooling and atom trapping, shared with Claude Cohen-Tannoudji and William Phillips. He holds 26 honorary degrees and is a member of the National Academy of Sciences, the American Philosophical Society, the American Academy of Arts and Sciences, the Academia Sinica, and is a foreign member of the Royal Society, the Royal Academy of Engineering, the Chinese Academy of Sciences, and the Korean Academy of Sciences and Technology.

Photoacoustic Tomography: Ultrasonically Beating Optical Diffusion and Diffraction

11:15–12:00



Lihong V. Wang

Washington University in St. Louis, USA

Biography: Lihong Wang earned his Ph.D. degree at Rice University, Houston, Texas under the tutelage of Robert Curl, Richard Smalley, and Frank Tittel. He currently holds the Gene K. Beare Distinguished Professorship of Biomedical Engineering at Washington University

in St. Louis. His book entitled "Biomedical Optics: Principles and Imaging," one of the first textbooks in the field, won the 2010 Joseph W. Goodman Book Writing Award. He also edited the first book on photoacoustic tomography and co-authored a book on polarization. He has published 450 peer-reviewed articles in journals, including Nature (Cover story), Science, PNAS, and PRL, and has delivered 440 keynote, plenary, or invited talks. His Google Scholar h-index and citations have reached 104 and 43,000, respectively. His laboratory was the first to report functional photoacoustic tomography, 3D photoacoustic microscopy (PAM), photoacoustic endoscopy, photoacoustic reporter gene imaging, the photoacoustic Doppler effect, the universal photoacoustic reconstruction algorithm, microwave-induced thermoacous-

tic tomography, ultrasound-modulated optical tomography, time-reversed ultrasonically encoded (TRUE) optical focusing, nonlinear photoacoustic wavefront shaping (PAWS), compressed ultrafast photography (100 billion frames/s), Mueller-matrix optical coherence tomography, and optical coherence computed tomography. In particular, PAM broke through the long-standing diffusion limit on the penetration of optical microscopy and reached super-depths for noninvasive biochemical, functional, and molecular imaging in living tissue at high resolution. Dr. Wang has received 37 research grants as principal investigator, with a cumulative budget of over \$47M. He is a Fellow of the AIMBE, Electromagnetics Academy, IEEE, OSA, and SPIE. He is the Editor-in-Chief of the Journal of Biomedical Optics. He chairs the annual conference on Photons plus Ultrasound, and was a chartered member of an NIH Study Section. Wang serves as the founding chair of the scientific advisory boards of two companies which have commercialized photoacoustics. He received the NIH's FIRST, NSF's CAREER, NIH Director's Pioneer, and NIH Director's Transformative Research awards. He also received the OSA C.E.K. Mees Medal, IEEE Technical Achievement Award, IEEE Biomedical Engineering Award, SPIE Britton Chance Biomedical Optics Award, and Senior Prize of the International Photoacoustic and Photothermal Association for "seminal contributions to photoacoustic tomography and Monte Carlo modeling of photon transport in biological tissues." An honorary doctorate was conferred on him by Lund University, Sweden. His lab is transitioning to Caltech.

Perfect Optical Fibers

12:00–12:45



Jonathan Knight
University of Bath, UK

Biography: Jonathan Knight is a Professor in the Department of Physics at the University of Bath in the United Kingdom. He obtained his PhD at Cape Town and did postdoctoral research at the Ecole Normale Supérieure in Paris and at the Optoelectronics Research

Centre in Southampton. His interests are in the photonics of microstructured materials. During his time at Bath he has developed a leading group in the area of novel optical fiber design, fabrication and demonstration, and he has published widely on these topics. Current activities are aimed at developing these structures to outperform conventional optical fibers in a number of application areas.

OSA Best Student Paper Awards

ACP 2016 is pleased to announce that this year's Best Student Paper Awards on ACP will be sponsored by OSA:

Best Student Paper Awards, 4 recipients, 3000 RMB (Chinese Yuan) for each

To be eligible for the award, a student must be the first author of the paper and declare his/her student candidature during online submission; and the student must give the presentation at the conference by himself/herself. The selection will be made by the subcommittees during the conference. The awards will be granted at the conference banquet in the evening of Friday, 4 November.



Huawei Technologies Co., Ltd. Best Paper Awards

ACP 2016 is pleased to announce that this year's Best Paper Awards on ACP will be sponsored by Huawei Technologies Co., Ltd:

Best Paper Awards, 2 recipients, 3000 RMB (Chinese Yuan) for each

The selection will be made by the TPC chairs and subcommittee chairs during the conference. The awards will be granted at the conference banquet in the evening of Friday, 4 November.



Poster Session

Time: 10:30–12:30, Friday, 4 November

Venue: Public area, 2nd Floor, Shangri-La Hotel, Wuhan

Over 160 posters will be displayed during ACP 2016. The poster session is designed to provide an opportunity for selected papers to be presented in greater visual detail and facilitate vivid discussions with attendees. Authors will remain in the vicinity of the bulletin board for the duration of the session to answer questions.

LUSTER LightTech Group Co., Ltd Best Poster Awards

ACP 2016 is pleased to announce that this year's Best Poster Awards on ACP will be sponsored by LUSTER LightTech Group Co., Ltd:

Best Poster Awards, 2 recipients, 3000 RMB (Chinese Yuan) for each

The selection will be based on the voting of conference delegates. The awards will be granted at the conference banquet in the evening of Friday, 4 November.



T

Workshops and Forums

ATu1A • JORCEP Workshop Joint Research Center of Photonics & Joint Centre of Advanced Photonics Research Combined Workshop 2016

Time: 09:00–17:30, Tuesday, 1 November

Venue: Huang Shi Room, 2nd Floor, Shangri-La Hotel,
Wuhan

Organizers:

Erik Forsberg, Zhejiang University, China

Sailing He, Zhejiang University, China, Royal Institute of
Technology, Sweden, South China Normal University, China

Lech Wosinski, Royal Institute of Technology, Sweden

Hon Tsang, Chinese University of Hong Kong, China

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

Introduction:

The Sino-Swedish Joint Research Center of Photonics (JORCEP) has since 2003 been an ever evolving research and educational collaboration between several Swedish and Chinese universities that annually organizes a multi-disciplinary workshop to promote its joint research. Continuing the success from 2015, the workshop is also this year combined with the annual workshop of that of the Zhejiang University - Chinese University of Hong Kong Joint Centre of Advanced Photonics Research.

09:00–09:20 Sailing He, Royal Institute of Technology,
Sweden/Zhejiang University, China/South China Normal
University, China

Topic: Some recent activity and progress at COER

09:20–09:40 Xuewen Chen, Huazhong University of Science
& Technology, China

Topic: Efficient interfacing of single quantum emitter, optical
antenna and light

9:40–10:00 Sune Svanberg, Lund University, Sweden/South
China Normal University, China

Topic: Laser spectroscopy applied to environmental and
ecological monitoring

10:00–10:20 Katarina Svanberg, Lund University, Sweden/
South China Normal University, China

Topic: Laser spectroscopy applied to medicine and food
safety

10:20–10:40 Lech Wosinski, Royal Institute of Technology,
Sweden

Topic: JORCEP cooperation project: Plasmonic waveguides
and devices

10:40–11:00 Coffee Break

11:00–11:20 Li Shen, Wuhan National Laboratory for Opto-
electronics & Huazhong University of Science & Technology,
China

Topic: Group IV semiconductor waveguides for nonlinear
applications in the mid-infrared regime

11:20–11:40 Daoxin Dai, Zhejiang University, China

Topic: Silicon nanophotonic integrated devices for on-chip
multiplexing and switching

11:40–12:00 Liu Liu, South China Normal University, China

Topic: Devices based on densely packed waveguide arrays
on silicon

12:00–12:20 Lena Wosinska, Royal Institute of Technology,
Sweden

Topic: Energy consumption aspects of optical 5G transport
networks

12:20–13:30 Lunch

13:30–13:50 Shiming Gao, Zhejiang University, China

Topic: Silicon-based all-optical wavelength conversion and
multicasting for advanced modulation formats

13:50–14:10 Jiajia Chen, Royal Institute of Technology,
Sweden

Topic: Real-time service migration in fog computing en-
hanced connected vehicles

14:10–14:30 Hon Tsang, Chinese University of Hong Kong,
China

Topic: Progress towards terabit/s mode-division-multiplexed
silicon photonic interconnects

14:30–14:50 Zhechao Wang, Ghent University, Belgium

Topic: III-V lasers on silicon: Monolithic and Heterogeneous

14:50–15:10 Jian Wang, Wuhan National Laboratory for
Optoelectronics & Huazhong University of Science & Tech-
nology, China

Topic: Chip-scale light manipulation using integrated nano-
photonic devices

15:30–15:50 Coffee Break

15:50–16:10 Xiankai Sun, Chinese University of Hong Kong,
China

Topic: Spin-orbit interaction of light in photonic nanowave-
guides: a proposal of graphene-based optical isolators

16:10–16:30 Yaosheng Shi, Zhejiang University, China

Topic: High-Q photonic crystal nanobeam cavities on silicon

16:30–16:50 Ke Xu, Harbin Institute of Technology, China

Topic: Highly functional device optimization using a fast-
searching method

16:50–17:10 Elena Vasileva, Royal Institute of Technology,
Sweden

Topic: Organic/polymer materials for applications in photon-
ics

17:10–17:30 Qijie Xie, Chinese University of Hong Kong,
China

Topic: Electrically-controllable repetition rate multiplication
of optical pulses generated by cavity-less approach

17:10–17:30 Yu Yu, Wuhan National Laboratory for Opto-
electronics & Huazhong University of Science & Technology,
China

Topic: Large bandwidth and high power Ge PDs and their
applications

YOFC Workshop Applications of New Optical Fibers in Communication and Sensing

Time: 14:00–18:00, Wednesday, 2 November

Venue: Beijing-Hall Hilton Wuhan Optics Valley, No. 9
Chunhe Road Huashan Eco. City, Wuhan

Organizers:



Liangming Xiong

State Key Laboratory of
Optical Fiber and Cable
Manufacture, YOFC, China



Perry Shum

School of EEE, Nanyang
Technological University,
Singapore

Introduction:

In the past few years, much research effort has been devoted to the development of new optical fibers for further enhancing the quality and the capacity of optical transmission, in particular, ultra-low loss fibers, large-effective-area fibers, few-mode fibers, multi-core fibers, and hollow-core fibers. Meanwhile, the applications of these new optical fiber have been attracting more and more research interest in communication and sensing. This workshop provides an overview of some of these application research and development not only in academia but also in industry.

Speakers:

Junjie Li, *Optical Communication Research Center in Beijing Research Institute, China Telecom, China*

Topic: The Present Situation of Quantum Encrypted Communication and Its Expectation to Transmission Media

Shikui Shen, *Network Technology Research Institute, China Unicom, China*

Topic: G.654.E Fiber and Cable Trial in Terrestrial Transport Application

Wenyu Zhao, *China Academy of Information and Communications Technology (CAICT), China*

Topic: Application of 400G and Beyond High Bitrate Systems in China

Chao Lu, *The Hong Kong Polytechnic University, China*

Topic: Development of Future Long Haul and Short Reach Systems

Nicolas K. Fontaine, *Bell Laboratories, Nokia, USA*

Topic: Space-division Multiplexing in Multi-Mode Fibers

Kyunghwan (Ken) Oh, *Yonsei University, Korea*

Topic: Amplifier Design Issues in Mode Division Multiplexing Potential Contributions of Hollow Optical Fiber

Perry Shum, *Nanyang Technological University, Singapore*

Topic: Sensing Applications of Optical Fibers

Xiaobin Hong, *Beijing University of Posts & Telecommunications, China*

Topic: Distributed Fiber Optical Sensor—From Laboratory to Industry.

AW2E • Workshop 1: Twisting Light with Orbital Angular Momentum (OAM): Advances and Opportunities

Time: 14:30-18:00, Wednesday, 2 November

Venue: Xiang Yang Room, 3rd Floor, Shangri-La Hotel,
Wuhan

Organizers:



Alan E. Willner

University of Southern
California, USA



Miles J. Padgett

University of Glasgow,
Scotland, UK



Jian Wang

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

Introduction:

In the 1600s, Kepler guessed that the momentum of sunlight caused the tail of comet to always point away from the sun. It is known as the linear momentum or translational momentum. In the early 1900s, Poynting deduced that circularly polarized light carries an angular momentum or rotational momentum. It is known as the spin angular momentum

(SAM). Circularly polarized light has an SAM of $\pm\hbar$ per photon, where \hbar is the reduced Planck constant. In the 1930s, Darwin indicated that more complicated transitions required an angular momentum exchange between light and atom corresponding to integer multiples of \hbar . In 1992, Allen and co-workers recognized that a light beam having helical phasefronts also carried an angular momentum. It is known as orbital angular momentum (OAM). Helically phased light has an OAM of $l\hbar$ per photon, where the twisting rate l is the topological charge value. Momentum, angular momentum, SAM and OAM are all fundamental physical quantities of light. In recent years, twisting light with OAM has received increasing interest and given rise to many developments in astronomy, manipulation, trapping, tweezer, microscopy, imaging, sensing, nonlinear interactions and quantum entanglement. Very recently, twisting light has also seen its potential applications in rotational Doppler effect, slow light, and data information transfer for optical communications.

This workshop aims to explore the fundamental aspects of OAM and its wide applications through invited presentations and panel discussions sessions. The discussions will focus on the state-of-the-art advances and future opportunities in OAM-carrying twisted light and applications in various areas. The topics of relevance include but are not limited to:

- Fundamental principles and properties of OAM-carrying twisted light beams
- Different kinds of special light beams (Laguerre-Gaussian beams and Bessel beams with phase singularity, vector beams with polarization singularity, etc.)
- Generation, propagation, processing and detection of OAM-carrying twisted light beams.
- Twisting light with OAM for free-space and fiber-based optical communications.
- Twisting light with OAM for quantum information processing.
- Twisting light with OAM for manipulation, trapping, tweezer, spanner.
- Twisting light with OAM for microscopy, imaging, sensing.

- Twisting light with OAM for rotational Doppler effect, slow light.
- Twisting light with OAM for nonlinear interactions.
- Twisting light with OAM for astronomy and deep-space exploration.
- Twisting electromagnetic waves with OAM (radio wave, microwave, terahertz wave, etc.) and their applications.

We sincerely welcome scientists, students and industry representatives of relevant interest to attend and join the workshop.

Speakers:

Miles J. Padgett, *University of Glasgow, Scotland, UK*
Topic: When all modal sets are not equal: the information capacity of Laguerre-Gaussian modes

Takashige Omatsu, *Chiba University, Japan*
Topic: Twisting light can twist materials

Xinlun Cai, *Sun Yat-sen University, China*
Topic: Integrated devices for OAM multiplexing

Zhaohui Li, *Shecheng Gao, Jinan University, China/Sun Yat-sen University, China*
Topic: Fast switchable orbital angular momentum sorting scheme for a high capacity density optical router

Xianming Zhang, *Zhejiang University, China*
Topic: Plane spiral RF waves for communication and detection

Alan E. Willner, *University of Southern California, USA*
Topic: Perspectives on using OAM multiplexing and encoding for communications

Ivan B. Djordjevic, *Zhen Qu, University of Arizona, USA*
Topic: OAM-based optical transmission over strong atmospheric turbulence channels

Jian Wang, *Wuhan National Laboratory for Optoelectronics & Huazhong University of Science and Technology, China*
Topic: Advances in structured light modulation for data information transfer

Xiaocong Yuan, *Shenzhen University, China*
Topic: Cylindrical vector beams for optical communication

AW1A • Workshop 2: Silicon Photonics

Time: 09:00–12:30, Wednesday, 2 November

Venue: *En Shi Room, 3rd Floor, Shangri-La Hotel, Wuhan*

Organizers:



Zhiping Zhou
Peking University, China



Jinsong Xia
Wuhan National Laboratory for Optoelectronics & Huazhong University of Science and Technology, China

Introduction:

Silicon Photonics, a chip size optical solution using silicon as a material platform to develop and fabricate 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 and interconnects for high performance computing systems. In the past decade, major silicon photonics building blocks have been developed and proven viable for these high-speed applications. At the same time, other unique optical properties of silicon have been employed for biomedical sensing, nonlinear optics, as well as mid infrared applications. The silicon photonics market is expected to grow even fast in the next decade, however, many challenges still remain. This workshop is to provide a forum for international experts to present and discuss their vision, recent progresses, and future challenges of Silicon Photonics and its applications. A series of invited presentations, covering a variety of subjects, are scheduled for this half-day workshop in Wuhan, China.

Speakers:

Jurgen Michel, *Massachusetts Institute of Technology, USA*
Topic: Critical Elements for Silicon Photonics

Po Dong, *Bell Labs, Alcatel Lucent, USA*
Topic: Silicon Photonics for Wavelength-Division Multiplexing applications

Ching-Fuh Lin, *Taiwan University, Taipei, China*
Topic: Silicon Photonics for Communication and Chemical Detection

Xiaolu Song, *Huawei Technologies Co., Ltd, China*
Topics: Silicon Photonics for High Density Optical Interconnections

Iñigo Artundo, *VLC Photonics, Spain*
Topic: Latest Trends in Fabless Photonic Integration for Silicon Photonics

Koji Yamada, *The National Institute of Advanced Industrial Science and Technology (AIST), Japan*
Topic: TBD

AW1E & AW2H • Workshop 3: Optics Technology for Sensing Applications (OTSA)

Time: 09:00–17:30, Wednesday, 2 November
Venue: Shi Yan Room, Basement (B1), Shangri-La Hotel, Wuhan

Organizers:



Minghong Yang
Wuhan University of Technology, China



Marco Petrovich
University of Southampton, UK



Anna Grazia Mignani
CNR-Institute of Applied Physics 'Nello Carrara', Italy

Introduction:

In the recent nearly four decades of research, optical sensor technologies have gradually developed from the experimental stage to the practical applications. Some sensors have successfully moved out from the laboratory to real-world applications which are playing an important role in the fields of fire alarm, bridge monitoring, high way monitoring and so on. This workshop invites some of the world-leading experts to talk about the state-of-the-art and future trends in some selected areas of research and development, including femtosecond laser processing of optical fibres for

sensing and components, optical sensor bubbles, fiber-top sensors in the life sciences, nanosphere lithography for all fiber SERS probes, and optical fibre sensors for measuring physical parameters in medical applications. The workshop will include presentation and discussion sessions and we welcome people of relevant interest to attend and join the discussions.

Speakers:

Brian Culshaw, *Strathclyde University, UK*
Topic: Fibre Optic Sensing – A perspective on a half century of progress

David Webb, *Aston University, UK*
Topic: Applications of polymer fibre Bragg gratings.

Anna Grazia Mignani, *CNR-Institute of Applied Physics 'Nello Carrara', Italy*
Topic: Fingerprinting food by optical spectroscopy – the photonic tasting

Sile Nic Chormaic, *OIST Graduate University, Japan*
Topic: Sensing in a Bubble

Heidi Ottevaere, *Vrije Universiteit Brussel (VUB), Belgium*
Topic: Multifunctional polymer optofluidic chips

Juergen Popp, *Leibniz Institute of Photonic Technology e.V. Jena, Germany*
Topic: Vibrational spectroscopic biosensing

Davide Iannuzzi, *University of Amsterdam, The Netherlands*
Topic: Fiber-top sensors in the life sciences: looking at cells and tissues with a gentle touch

Marco Pisco, *University of Sannio, Italy*
Topic: Nanosphere lithography for all fiber SERS probes

Johannes Roths, *Munich University of Applied Sciences, Germany*
Topic: Elasticity Characterization of Cartilage by Optical Fiber Bragg Grating-Based Indentation Experiments

Elfed Lewis, *University of Limerick, Ireland*
Topic: Optical fibre sensors for measuring physical parameters in medical applications

AW1B • Workshop 4: Optical Networking in the 5G Era: Challenges and Opportunities

Time: 09:00–12:30, Wednesday, 2 November

Venue: Sui Zhou Room, 3rd Floor, Shangri-La Hotel, Wuhan.

Organizers:



Rentao Gu

Beijing University of Posts and Telecommunications, China



Paolo Monti

KTH Royal Institute of Technology, Sweden

Introduction:

Towards “Networked society” goal by 2020, 5G mobile communication is on its fast track in recent years. In the future mobile communications, 10~100 times data rate per user and 10~100 times connected devices will generate about 1000 times mobile data traffic. At the same time, 5G also supports low-speed and long-lived traffic (such as for sensors). The mixed traffic pattern will challenge the capacity and flexibility of optical networks greatly. And the low latency requirement and ultra-dense cell scenario require novel architecture in the mobile network. What the future optical networks should be like for the future mobile communication will be discussed in this workshop. The invited speakers will present the view on this topic from industry and academia.

Speakers:

Yabin Ye, Huawei Technologies Duesseldorf GmbH, Germany

Topic: OWC/FSO technologies for 5G mobile networks

Lena Wosinska, KTH Royal Institute of Technology, Sweden

Topic: Energy Consumption Aspects of Optical 5G Transport Networks

Weisheng Hu, Shanghai Jiaotong University, China

Topic: Soft stacked PON for soft C-RAN

Chien Aun Chan, The University of Melbourne, Australia

Topic: Network energy efficiency of mobile applications and services

Nan Hua, Tsinghua University, China

Topic: Future large-scale optical networks for low-latency applications.

Rentao Gu, Beijing University of Posts and Telecommunications, China

Topic: Intelligent Converged Access Network for Future Mobile Communication.

Darli Mello, University of Campinas (UNICAMP), Brazil

Topic: Spectrally Efficient Fronthaul Architectures for a Cost-Effective 5G C-RAN.

Zuqing Zhu, University of Science and Technology of China, China

Topic: Advancing Economics of Multi-Domain Software-Defined Elastic Optical Networks: Gaming among Brokers

AW1C • Workshop 5: Optical Communications Exploiting the Space Domain: Recent Advances and Future Challenges

Time: 09:00–12:30, Wednesday, 2 November

Venue: Xiang Yang Room, 3rd Floor, Shangri-La Hotel, Wuhan.

Organizers:



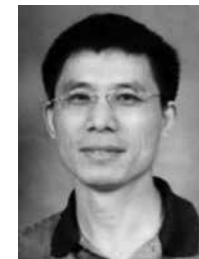
Jian Wang

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



Siyuan Yu

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



Guifang Li

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

Introduction:

Optical communications are all about the exploitation of different physical dimensions of light waves, including complex

amplitude, frequency (or wavelength), time, polarization, etc. Conventional techniques in optical communications such as wavelength-division multiplexing (WDM), time-division multiplexing (TDM) and polarization-division multiplexing (PDM) have almost reached their scalability limits. Space domain is the only known physical dimension left and space-division multiplexing (SDM) seems the only option to further scale the transmission capacity and spectral efficiency of optical communications. In recent years, few-mode fiber (FMF), multi-mode fiber (MMF), multi-core fiber (MCF) and few-mode multi-core fiber (FM-MCF), the promising candidates for SDM, have been widely used in optical fiber communications. The challenges would be efficient (de)multiplexer (e.g. photonic lantern), amplifiers, and multiple-input multiple-output (MIMO) signal processing techniques. Integration will be the trend and the key to SDM. Meanwhile, free-space and underwater optical communications have also exploited the space domain to increase the transmission capacity and spectral efficiency. The challenges would be long-distance transmission limited by propagation loss, divergence, scattering and turbulence. Very recently, helically phased light beams carrying orbital angular momentum (OAM) have also seen potential applications both in free-space and fiber-based optical communications. Actually, different mode bases such as linearly polarized (LP) modes and OAM modes can be employed for SDM. Additionally, SDM could also be used in chip-scale photonic interconnects and data center optical interconnects. Remarkably, the information capacity limits in SDM-assisted optical communications systems are also of great importance to be studied and discussed.

This workshop will focus on the recent advances and future challenges in optical communications exploiting the space domain. Topics of relevance include but are not limited to:

- Fundamental principles, novel methods, apparatus and architectures of SDM.
- Enabling SDM techniques using spatial modes in different mode bases.
- Enabling special fibers for SDM.
- Enabling photonic integrated devices for SDM.
- Enabling amplifiers for SDM.
- Efficient (de)multiplexing techniques for SDM.

- Enabling techniques for MIMO-assisted SDM and MIMO-free SDM.
- Propagation impairments in fiber, free-space and underwater optical communications using SDM.
- Chip-scale photonic interconnects and data center optical interconnects using SDM.
- SDM transmission experiments using few-mode fiber, multi-mode fiber, multi-core fiber, and few-mode multi-core fiber.
- Fiber-based, free-space and underwater SDM transmission experiments using OAM multiplexing.
- Optical switching, optical signal processing and various networking functions in SDM optical communications.
- Information capacity limits in SDM-assisted optical communications systems.

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

Speakers:

Guifang Li, *University of Central Florida, USA/Tianjin University, China*
Topic: TBD

Haoshuo Chen, *Bell Lab, USA*
Topic: SDM amplifiers can be a more cost-effective parallel amplification solution

Lianshan Yan, *Southwest Jiaotong University, China*
Topic: Exploring the polarization freedom to support high-spectral-efficient data transmission

Yves Jaouen, *Renaud Gabet, Telecom ParisTech, Université Paris Saclay, France*
Topic: OLCI technique for complete dispersion characterization of few-mode fibers

Siyuan Yu, *University of Bristol, UK/Sun Yat-sen University, China*
Topic: Scalability of mode division multiplexing transmission systems

Jian Wang, *Wuhan National Laboratory for Optoelectronics & Huazhong University of Science and Technology, China*
Topic: Progress in fiber-based data-carrying twisted light transmission and processing

Juhao Li, *Peking University, China*
Topic: Mode division multiplexing: how far can we go toward low modal crosstalk

Qi Mo, *Fiberhome Telecommunication Technologies Co. Ltd, China*
Topic: Design and fabrication of specialty fibers for spatial-division multiplexing

Xiaoguang Zhang, *Beijing University of Posts and Telecommunications, China*
Topic: Optical fiber designs for OAM based mode division multiplexing

AW2D • Workshop 6: 2D Material on Waveguide Devices and Applications

Time: 14:30–18:00, Wednesday, 2 November

Venue: Xian Tao Room, 3rd Floor, Shangri-La Hotel, Wuhan

Organizers:



Fengnian Xia
Yale University, USA



Ke Xu
Harbin Institute of Technology, China



Zhenzhou Cheng
University of Tokyo, Japan

Introduction:

The emerging two-dimensional (2D) materials have shown an increasing popularity in material science and engineering. This new class of material has attracted a great deal of attention due to their intriguing properties for electronics and optics. A wide range of applications could be explored by the integration of waveguide devices and 2D materials including high speed optoelectronics, ultrafast/nonlinear optics, sensing and so on. Optical fiber, photonic nanowire, plasmonic structure and other waveguide technologies will be a strong plus to boost the development of 2D materials.

In this workshop, both fundamental topics and application issues on 2D material plus waveguide technologies will be discussed. A great lineup of speakers will deliver invited talks on some of the most interesting topics in this field. The

challenges and opportunities for 2D material on waveguide devices will be discussed by the speakers together with the audiences.

All the scholars, students and the industrial representatives interested in the relevant areas are welcome!

Speakers:

14:30–15:00 Sze Yun Set, *The University of Tokyo, Japan*
Topic: Nano-Carbon Materials for Photonics and Laser Applications

15:00–15:30 Qiaoliang Bao, *Soochow University, China*
Topic: Photonics of two-dimensional materials: graphene and beyond

15:30–16:00 Feng Miao, *Nanjing University, China*
Topic: Electronic transport and device applications of 2D materials

16.00–16:30 Coffee Break

16:30–17:00 Han Zhang, *Shenzhen University, China*
Topic: Nonlinear and bio-photonics based on graphene and black phosphorus

17:00–17:30 Xiankai Sun, *The Chinese University of Hong Kong, China*
Topic: Integrated optical isolators with hybrid graphene/silicon photonics technology

AW2C • Workshop 7: Ultra-High-Capacity Long-Haul Optical Transmission System

Time: 14:30–18:00, Wednesday, 2 November

Venue: Huang Shi Room, 2nd Floor, Shangri-La Hotel, Wuhan

Organizers:

Xiangjun Xin, *Beijing University of Posts and Telecommunications, China*

António Teixeira, *University of Aveiro, Portugal*

Bo Liu, *Beijing University of Posts and Telecommunications, China*

Introduction:

In year 2013, Beijing University of Post and Telecommunications and a few universities, companies attended national

863 program "Research and development of ultra-high-speed long-distance optical system", we researched and exchange technology to make model and simulations about Tbps-kilometres optical transmission system, successfully developed related high-performance low-complexity ODSP and hybrid soft/hard decision FEC algorithm, developed ODSP chip, electronic crossing chip and 200G ASIC chip etc. Also, we designed and developed essential modules such as Tbps high-speed interconnect backplane, board of transceiver modules, line monitoring module etc. Finally, we developed Tbps-level equipment OSN9800 and applied it into Tbps-kilometres mirror-link experimental platform in the lab and real-time online processing demonstration project. Through link reconnaissance, machine room design, online test and service bearer, we achieved Tbps-kilometres optical transmission from Wuhan to Shanghai that support voice/video calls, and there is no bit error over 24 hours.

Speakers:

Ming Tang, *Huazhong University of Science and Technology, China*

Topic: Geometric manipulation in time-frequency plane enabling efficient coherent transmission system

Yaojun Qiao, *Beijing University of Posts and Telecommunications, China*

Topic 1: Gauss Noise Model of Four-wave Mixing Effect in Super-channel Optical Fiber Transmission System

Topic 2: Optical performance monitoring for high speed optical fiber communication system

Bo Liu, *Beijing University of Posts and Telecommunications, China*

Topic: Single Channel Tbps thousand-kilometre optical transmission demonstration project from Wuhan to Shanghai

Xingwen Yi, *University of Electronic Science and Technology of China, China*

Topic: Coherent Optical OFDM Transmissions Using Phase-Conjugated Subcarrier Pairs

Zhaohui Li, *Jinan University, China/Sun Yat-Sen University, China*

Topic: Spectrally Efficient Frequency Division Multiplexing for Optical Communication System

AW2B • Workshop 8: Towards Next Generation Optical Networks: Evolution and Challenges

Time: 14:30–18:00, Wednesday, 2 November

Venue: Sui Zhou Room, 3rd Floor, Shangri-La Hotel, Wuhan

Organizers:



Gangxiang (Steven) Shen
Soochow University, China



Xiaoping Zheng
Tsinghua University, China



Ning Deng
Huawei Technologies Co.,
Ltd., China



Lena Wosinska
KTH Royal Institute of
Technology, Sweden

Introduction:

Today's optical networks are facing challenges and opportunities. First, from the traffic distribution point of view, today's networks demonstrate an increasing asymmetric trend of traffic flows between node pairs. With the popularity of content delivery and the wide deployment of data centers, we are seeing a huge amount of data leaving a backbone node attached to a content source (e.g., a huge data center) while the amount of traffic heading to the node with the content source is subtle. This trend would become even clearer with increasing popularity of bandwidth-intensive video applications. At the same time, more flexible and scalable optical networking technologies are fast evolving at the levels from components to systems. For example, the

next generation of wavelength selective switch (WSS) can support finer spectrum granularities (e.g., 5 GHz) compared to the ITU fixed grid standard with M \times switching capability. These new features can offer the contentionless capacity for a colorless, directionless, and contentionless (CDC) ROADM in a cost-efficient way. Moreover, carriers start to pay more attention to the new fiber technology with an ultra-low loss and a large effective area, which is able to significantly enhance the transmission distance of a lightpath before signal regeneration in backbone networks. Nonetheless, though the fabrication technique for this type of fiber has become mature, it is still under debate whether or not the vast deployment of this type of fibers should be started due to the high cost. Thus, this workshop will address these challenges and opportunities. We will discuss the following research aspects:

- (1) How should an optical network be evolved to most efficiently fit the increasing asymmetric traffic pattern as well as low-latency and high-bandwidth requirement of the traffic flows?
- (2) Would a new type of optical network architecture such as a flexible optical network with ultra-dense (UD) frequency granularities be the future solution for the 4K video and 5G communication era?
- (3) How should we take advantage of the new switching capabilities of WSS to build and gradually deploy CDC ROADMs in the optical network?
- (4) When and how should we widely deploy the next-generation ultra-low-loss and large-effective-area fibers in the optical backbone network?
- (5) Other challenges related to optical network evolution.

Speakers:

Keni-ichi Sato, Nagoya University, Japan

Topic: What are the keys to create flexible, scalable and cost-effective OXC/ROADM?

Jia Wei, Huawei Technologies Co., Ltd., China

Topic: Ultra dense wavelength switching for all-optical ROADM networks

Yiran Ma, China Telecom Co. Ltd. Beijing Research Institute, China

Topic: Flexible optical network for emerging services

Luis Velasco, Universitat Politecnica de Barcelona (UPC), Spain

Topic: How data analytics can be used to improve the network performance: Some use cases

Qi Yang, Wuhan FiberHome International Technologies Co., Ltd., China

Topic: 100Gb/s Optical direct detection OFDM over 100-km SSMF for the future metro networks

Krzysztof Walkowiak, Wroclaw University of Science and Technology, Poland

Topic: Evolution of Optical Networks - New Challenges in Optimization

Darli Mello, University of Campinas (Unicamp), Brazil

Topic: Capacity limits in SDM-based submarine networks

AW2A • Workshop 9: On-chip Light-matter Interaction: Physics and Devices

Time: 14:30–18:00, Wednesday, 2 November

Venue: En Shi Room, 3rd Floor, Shangri-La Hotel, Wuhan

Organizers:



Daoxin Dai
Zhejiang University, China



Yu Yu
Wuhan National Laboratory
for Optoelectronics &
Huazhong University of
Science and Technology,
China

Introduction:

In the past years, ultra-high dense photonic devices with high performances have been very attractive for realizing large-scale photonic integrated circuits to satisfy the increasing demands of photonic-networks-on-chip and labs-on-chip. Basically, the manipulation of on-chip light-matter interactions plays one of the most important key roles for

realizing high-performance integrated photonic devices. In particular, enhancement of the on-chip light-matter interactions is very helpful to improve the energy conversion between photons and atoms, so that it is possible to realize high-efficiency on-chip photonic devices whose footprint and power-consumption are reduced significantly. This workshop will focus on the challenges and recent advances in the field of on-chip light-matter interactions, including the physics and devices. The topics include the on-chip light emission, on-chip nonlinear photonics, ultra-high Q optical cavities, nano-optomechanics, and laser micro-fabrication.

Speakers:

Huiyun Liu, *University College London, UK*

Heteroepitaxy of III-V/Si quantum dots lasers: the path to merge optics and electronics

Yikai Su, *Shanghai Jiaotong University, China*

Nonlinear optics in silicon-graphene integrated devices

Hon-Ki Tsang, *Chinese University of Hong Kong, China*

Enhanced nonlinear effects in silicon pedestal waveguides

Lin Zhang, *Tianjing University, China*

Topic: On-chip nonlinear photonics

Lin Yang, *Institute of Semiconductor, CAS, China*

Silicon based optical matrix processor for parallel computing

Yunfeng Xiao, *Peking University, China*

Microcavity sensing for single nanoparticle detection

Xiankai Sun, *Chinese University of Hong Kong, China*

Topic: Nano-optomechanics

Qidai Chen, *Jilin University, China*

Femto-second laser nanofabrication for high-performance optoelectronic devices

Christophe Peucheret, *University of Rennes 1, France*

Nonlinear signal processing on integrated platforms

AW3A • Workshop 10: How to make the editor like your paper?

Time: 19:30–21:30, Wednesday, 2 November

Venue: *En Shi Room, 3rd Floor, Shangri-La Hotel, Wuhan*

Organizer:

Zhen Wang, *Wuhan National Laboratory for Optoelectronics & Huazhong University of Science and Technology (China)*

Introduction:

To improve the skill of scientific writing for junior author, Editor, Jianfang Yin from Chinese Laser Press will be invited by Editorial Office of Frontiers of Optoelectronics for beginning author of scientific paper to make a presentation on how to make the editor like your paper. She will share some information on what kind of manuscript is attractive for journal editors, what kind of manuscript is quite tricky for the editor, how to improve the manuscript by writing tips and the common problems of scientific writing and so on.

Speaker:

Jianfang Yin, *Chinese Laser Press, China*

AW1G & AW2G • Sino-French Forum The 6th Sino-French Optoelectronics Forum

Time: 09:00–18:00, Wednesday, 2 November

Venue: *Xiao Gan Room, Basement (B1), Shangri-La Hotel, Wuhan*

Organizers:



Xinliang Zhang

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



Beatrice Dagens

Paris-Sud University, France



Guoli Tu

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



Eric Cassan

Paris-Sud University, France

Introduction:

The 6th Sino-French Optoelectronics Forum will be held on November 2, as an important part of ACP 2016 conference. This forum is organized under the Sino-French research network (GDRI), by Prof. Beatrice Dagens, Prof. Eric Cassan from Paris-Sud University, France and Prof. Xinliang Zhang, Prof. Guoli Tu from Huazhong University of Science and Technology, China. The forum will include an academic

presentation part and followed by a round table discussion about the possible student exchanges and the topic of the next year meeting (one hour or less). The academic presentation part (the main one) will be organized around the topic of advanced optical materials and nanophotonics, with the following sub-topics:

- Advanced optical materials for communication, energy harvesting and sensing,
- Surface plasmonic and nanophotonic devices,
- Ultrafast optics.

One French and one Chinese professors will each give a 45min short course, and other more scientifically focused presentations or posters will be added to the two short course presentations. The audience will be enlarged to all interested students.

Speakers:

Beatrice Dagens, *Paris-Sud University, France*

Topic: Advanced Planar Device Based on Localized Surface Plasmons

Stefan Haacke, *University of Strasbourg, France*

Topic: Ultrafast Spectroscopy of Functional Materials for Solar Energy Conversion

Christophe Peucheret, *University of Rennes 1, France*

Topic: Linear and Nonlinear All-optical Signal Processing Using Nano- and Micro-Photonic Devices

Eric Cassan, *Paris-Sud University, France*

Topic: Third-Order Nonlinear Optics in Silicon Photonics

Lei Zhou, *Fudan University, China*

Topic: Electromagnetic Metasurfaces: Physics and Applications

Jianji Dong, *Wuhan National Laboratory for Optoelectronics & Huazhong University of Science and Technology, China*

Topic: Recent Advances on Integrated Microwave Photonic Devices

Lei Wang, *Wuhan National Laboratory for Optoelectronics & Huazhong University of Science and Technology, China*

Topic: New Host Materials Based on Diazacarbazole for High-Performance OLED

Yi Wang, *Wuhan National Laboratory for Optoelectronics & Huazhong University of Science and Technology, China*

Topic: Hybrid Graphene-Silicon Waveguides for Nonlinear Photonics

AW1F • Industry Forum 1: Optical Networking towards 2020

Time: 09:00–12:30, Wednesday, 2 November

Venue: *Jing Men Room, Basement (B1), Shangri-La Hotel, Wuhan*

Organizers:

Xiang Liu, *Huawei USA, USA*

Chengbin Shen, *Shanghai Research Institute of China Telecom, China*

Introduction:

This special Huawei-sponsored ACP'16 workshop aims to provide a platform for participants worldwide to discuss the technical challenges and opportunities facing our optical networking industry in the cloud era towards year 2020 and beyond. This 1/2-day event will be addressing various aspects of future optical networks for access, metro, core and data-center applications, aiming to meet the ever-increasing communication demands driven by emerging services such as 4K/8K, 4.5G, cloud-based network-on-demand, and VR/AR. Invited speakers from leading industrial and academic institutions will be presenting and sharing their visions. This workshop will be open to all participants of ACP 2016.

Topics to be addressed include but are not limited to:

- Service providers' views on next-generation optical networking
- Access: 100G-PON standardization, enabling technologies and components
- Metro: Transport SDN/NFV/Interoperability, Metro-WDM, 100G CFP/CFP2
- Core: 100+G transceivers, Tb/s superchannels, flexible-grid WDM, OXC/ROADM
- Data center: inter-data-center network, intra-data-center network, low-cost 100G

We look forward to the active participation of researchers, engineers, and business leaders to together contribute to the continued success of optical networking research and development in the years to come.

Speakers:

Chengbin Shen, *Shanghai Research Institute of China Telecom, China*

Topic: China Telecom's re-architecture of Optical Networks

Jiawei Zhang, *Beijing University of Posts and Telecommunications, China*

Topic: The Convergence of Radio and Optical Access Networks in the 5G Era

Huafeng Lin, *Huawei Technologies, China*

Topic: PON Convergence: Trend and Progress

Lilin Yi, *Shanghai Jiao Tong University, China*

Topic: Enabling Technology for 100G PON

Kanping Zhong, *The Hong Kong Polytechnic University, China*

Topic: Advanced Techniques for Short Reach Systems

Di Che, *University of Melbourne, Australia*

Topic: Towards Coherent Short-reach Optical Transmission: Is there an Opportunity

AW2F • Industry Forum 2: Future Trend of Optical Interconnection in Data Center and HPC and All Optical Switching

Time: 14:30–18:00, Wednesday, 2 November

Venue: Jing Men Room, Basement (B1), Shangri-La Hotel, Wuhan

Organizers:



Yates Yao
LUSTER LightTech
Group Co. Ltd, Beijing,
China



Jianhui Zhou
Finisar Corporation,
Sunnyvale, California, USA

Introduction:

The bandwidth of data center and optical network is growing rapidly driven by big data, cloud computing, internet of things (IOT), 4K/8K super high resolution video and virtual reality. Flexible and high bandwidth and low delay required by these emerging applications, together with SDN and NFC are accelerating the transformation of data center and optical network architectures.

This year's edition of the industry forum will present you the latest trend of data center & HPC optical interconnection, and optical switching by distinguished speakers from the industry. The forum will cover products and applications from both technical and business perspectives.

Speakers:

Sai Chen, Network Research Dept, Alibaba, China
Topic: White Box Optics for Data Center Network

Zhengbin Pang, School of Computer, NUDT, China
Topic: Improvements of Tianhe-2 Interconnect and Challenges for the Next Generation

Bin Li, HPC Division, Sugon, China
Topic: Interconnect Design of Silicon Cube Supercomputer

Chris Cole, Advanced Development, Finisar, USA
Topic: 200 and 400 Gb/s Datacom Optics

Yongpeng Zhao, FOCI Business Unit, LUSTER LightTech, China
Topic: DSP Enabled Low Cost 100G/400G Mega Data Center Interconnection Solution

Yunbo Li, China Mobile Research Institute, China
Topic: Developing New Optical Switching Technology to Construct High-Performance Infrastructure Networks for DC

Jun Ma, Network Business Unit, Fiberhome, China
Topic: Challenges and Opportunities in the Optical Interconnection of Data Center

Tao Chu, Institute of Semiconductors, CAS, China
Topic: High Speed Silicon Photonic Interconnection and Switching in DC and HPC

Hua Zhang, FOCI Business Unit, LUSTER LightTech, China
Topic: All Optical Switching Application and Trend in Hyper-scale Data Center

AW1D • Industry Forum 3: Pitch Conference for Photonics and Optoelectronics

Time: 09:00–12:30, Wednesday, 2 November

Venue: Xian Tao Room, 3rd Floor, Shangri-La Hotel, Wuhan

Organizers:

Qian Liu, Wuhan National Laboratory for Optoelectronics & Huazhong University of Science and Technology, China

Dao Han, Wuhan Industrial Institute for Optoelectronics, China

Jie Zhang, Yucheng Fund Management Company, China

Introduction:

The Pitch Conference is held during the ACP/POEM 2016 and features scientific results for transferring and high-tech industrializations of all the photonics and optoelectronics areas. The event focuses on the communication not only for funding opportunities for start-ups, but for having you and your work taken seriously by industry professionals.

- A Network of Investors

Director from DaChen, the Fortune Capital (Top 10 VC in China) will make a speech on what angel investors look for when considering deals.

Other funds, including but not limited to those, such as Private Equity Investment Company (北京信中利), Cowin Capital (深圳同创伟业), and Northern Light VC (北极光创投) will be invited.

- A Pitch for Start-Ups & Entrepreneurs

Utilizing the popular “TED Show” format, the founders from start-ups or the leaders representing R&D teams who are interested in industries will pitch to angel investors and the audience.

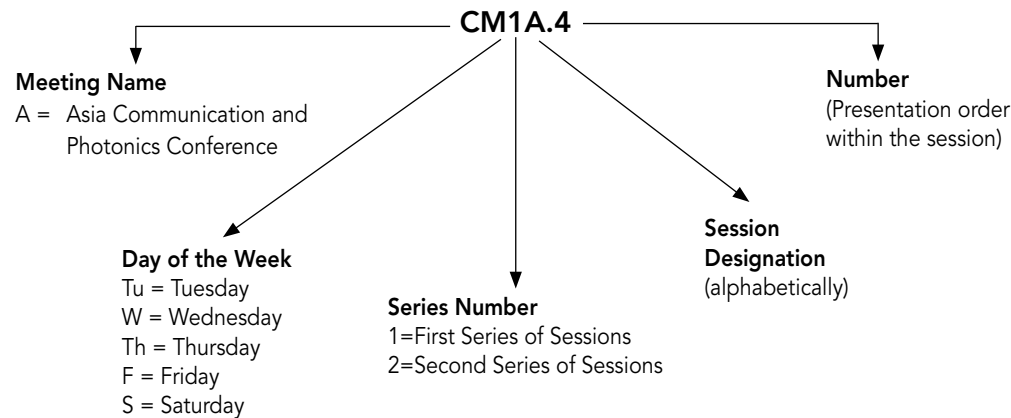
- WHO SHOULD ATTEND

Researchers who are interested in industrial applications
Entrepreneurs who need an access to capital
Investors who want to see up & coming businesses
Students who want to learn more about entrepreneurship... you can't miss it!

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

Tuesday, 1 November	
09:00–12:20	ATu1A • JORCEP Workshop, Huang Shi, F2
10:40–11:00	Coffee Break, 2nd Floor, Shangri-La Hotel, Wuhan
12:20–13:30	Lunch Break
13:30–17:30	ATu2A • JORCEP Workshop, Huang Shi, F2
15:30–15:50	Coffee Break, 2nd Floor, Shangri-La Hotel, Wuhan

Explanation of Session Codes



The first letter of the code designates the meeting. The second element denotes the day of the week (Tu=Tuesday, Wednesday=W, Thursday=Th, Friday=F, S=Saturday). The third element indicates the session series in that day (for instance, 1 would denote the first parallel sessions in that day). Each day begins with the letter A in the fourth element and continues alphabetically through a series of parallel sessions. The lettering then restarts with each new series. The number on the end of the code (separated from the session code with a period) signals the position of the talk within the session (first, second, third, etc.). For example, a presentation coded AW3C.4 indicates that this paper is being presented on Wednesday (W) in the third series of sessions (3), and is the third parallel session (C) in that series and the fourth paper (4) presented in that session.

Invited papers are noted with **Invited**

Plenaries are noted with **Plenary**

Tutorials are noted with **Tutorial**

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

Wednesday, 2 November

08:30–18:00	Registration, Public area face to the escalator, 2nd Floor, Shangri-La Hotel, Wuhan								
	Room: En Shi, F3 Workshop	Room: Sui Zhou, F3 Workshop	Room: Xiang Yang, F3 Workshop	Room: Xian Tao, F3 Industry Forum	Room: Shi Yan, B1 Workshop	Room: Jing Men, B1 Industry Forum	Room: Xiao Gan, B1 Sino-French Forum		
09:00–12:30	AW1A • Workshop: Silicon Photonics	AW1B • Workshop: Optical Networking in the 5G Era: Challenges and Opportunities	AW1C • Workshop: Optical Communications Exploiting the Space Domain: Recent Advances and Future Challenges	AW1D • Industry Forum: Pitch Conference for Photonics and Optoelectronics	AW1E • Workshop (part I): Optics Technology for Sensing Applications (OTSA)	AW1F • Industry Forum: Optical Networking towards 2020	AW1G • Sino- French Forum (part I)		
10:30–11:00	Coffee Break, Public area, Basement and 3rd Floor, Shangri-La Hotel, Wuhan								
12:30–14:30	Lunch Break								
14:00–18:00	YOFC Workshop: Applications of New Optical Fibers in Communication and Sensing, Beijing-Hall Hilton Wuhan Optics Valley, No. 9 Chunhe Road Huashan Eco. City, Wuhan								
	Room: En Shi, F3 Workshop	Room: Sui Zhou, F3 Workshop	Room: Huang Shi, F2 Workshop	Room: Xian Tao, F3 Worshop	Room: Xiang Yang, F3 Workshop	Room: Jing Men, B1 Industry Forum	Room: Xiao Gan, B1 Sino-French Forum	Room: Shi Yan, B1 Workshop	
14:30–18:00	AW2A • Workshop: On-chip Light- matter Interaction: Physics and Devices	AW2B • Workshop: Towards Next Generation Optical Networks: Evolution and Challenges	AW2C • Workshop: Ultra-High-Capacity Long-Haul Optical Transmission System	AW2D • Workshop: 2D Material on Waveguide Devices and Applications	AW2E • Workshop: Twisting Light with Orbital Angular Momentum (OAM): Advances and Opportunities	AW2F • Industry Forum: Future Trend of Optical Interconnection in Data Center and HPC and All Optical Switching	AW2G • Sino- French Forum (part II)	AW2H • Workshop (part II): Optics Technology for Sensing Applications (OTSA)s	
16:00–16:30	Coffee Break, Public area, Basement, 2nd and 3rd Floor, Shangri-La Hotel, Wuhan								
18:00–19:30	Dinner								
19:30–21:30	AW3A - Workshop: How to make the editor like your paper?								

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

Thursday, 3 November												
07:30–18:00	Registration , <i>Public area face to the escalator, 2nd Floor, Shangri-La Hotel, Wuhan</i>											Exhibition Area
08:00–08:30	Opening Ceremony , <i>Grand Ballroom (Han Kou, Wu Chang, and Han Yang), 2nd Floor, Shangri-La Hotel, Wuhan</i>											
08:30–12:45	ATH1A • Plenary and Light the Future Session , <i>Grand Ballroom (Han Kou, Wu Chang, and Han Yang), 2nd Floor, Shangri-La Hotel, Wuhan</i>											
11:00–11:15	Coffee Break & Poster Preview & Exhibition , <i>Public area, 2nd and 3rd Floor, Shangri-La Hotel, Wuhan</i>											
12:45–14:30	Lunch Break , <i>Café Wu, 1st Floor, or Shang Palace, 2nd Floor, Shangri-La Hotel, Wuhan</i>											
	Room: En Shi, F3	Room: Sui Zhou, F3	Room: Huang Shi, F2	Room: Han Yang, F2	Room: Xian Tao, F3	Room: Wu Chang, F2	Room: Han Kou, F2	Room: Shi Yan, B1	Room: Jing Men, B1	Room: Xiao Gan, B1	Room: Xiang Yang, F3	Conference Exhibition
14:30–16:00	ATH2A • Photonics and Novel Devices	ATH2B • Novel Fibers and Applications I	ATH2C • SDM & OAM Transmission I	ATH2D • Digital Signal Processing I	ATH2E • SDM Network and Node	ATH2F • Silicon-based Light Source	ATH2G • Silicon Photonics (ends at 16:15)	ATH2H • Si Waveguide Based Data Processing	ATH2I • Perovskite Solar Cells I	ATH2J • Optical Storage for Big Data	ATH2K • Spectroscopic Methods (ends at 16:15)	
16:00–16:30	Coffee Break & Poster Preview & Exhibition , <i>Public area, Basement, 2nd and 3rd Floor, Shangri-La Hotel, Wuhan</i>											
	Room: En SHI, F3	Room: Sui Zhou, F3	Room: Huang Shi, F2	Room: Han Yang, F2	Room: Xian Tao, F3	Room: Wu Chang, F2	Room: Han Kou, F2	Room: Shi Yan, B1	Room: Jing Men, B1	Room: Xiao Gan, B1	Room: Xiang Yang, F3	
16:30–18:00	ATH3A • Fiber Lasers I	ATH3B • Optical Fiber Technology	ATH3C • Advanced Modulation Formats & Multiplexing Schemes	ATH3D • Visible Light and Free-Space Communications	ATH3E • Data Center Networks	ATH3F • Active Devices	ATH3G • Nonlinear Optics and Applications	ATH3H • Microwave Photonic Devices and Links	ATH3I • Perovskite Solar Cells II	ATH3J • Ultrafast Photonics and Its Applications	ATH3K • Sensors	
18:30–21:30	Welcome Reception & OSA 100th Anniversary Celebration , <i>Grand Ballroom (Han Kou, Wu Chang, and Han Yang), 2nd Floor, Shangri-La Hotel, Wuhan</i>											

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

Friday, 4 November

08:00–18:00	Registration, Public area face to the escalator, 2nd Floor, Shangri-La Hotel, Wuhan											Exhibition Area	
	Room: En SHI, F3	Room: Sui Zhou, F3	Room: Huang Shi, F2	Room: Han Yang, F2	Room: Xian Tao, F3	Room: Wu Chang, F2	Room: Han Kou, F2	Room: Shi Yan, B1	Room: Jing Men, B1	Room: Xiao Gan, B1	Room: Xiang Yang, F3		
08:30–10:30	AF1A • OTDR Technology and Optical Applications	AF1B • Sensors and Biosensing	AF1C • Short-Reach Transmission & Access Networking I	AF1D • SDM & OAM Transmission II	AF1E • Fiber-wireless Convergence Networks I	AF1F • Laser Technology	AF1G • Spatial Multiplexing Devices	AF1H • Microwave Photonic Signal Processing	AF1I • New Concepts for Solar Energy Conversion	AF1J • Novel Optical Approaches for Data Storage	AF1K • Therapeutical Methods		
10:30–12:30	AF2A • Poster Session & Coffee Break & Exhibition, Public area, Basement, 2nd and 3rd Floor, Shangri-La Hotel, Wuhan												
12:30–14:00	Lunch Break, Café Wu, 1st Floor, or Shang Palace, 2nd Floor, Shangri-La Hotel, Wuhan												
	Room: Sui Zhou, F3	Room: Huang Shi, F2	Room: En SHI, F3	Room: Han Yang, F2	Room: Xian Tao, F3	Room: Wu Chang, F2	Room: Han Kou, F2	Room: Shi Yan, B1	Room: Jing Men, B1	Room: Xiao Gan, B1	Room: Xiang Yang, F3		Conference Exhibition
14:00–16:00	AF3A • Best Student Paper Competition (Tracks 1, 2, 3,8)	AF3B • Best Student Paper Competition (Track 4-7) (ends at 15:45)	AF3C • Fiber Sensors and Gratings (ends at 16:15)	AF3D • Long-Haul & High Capacity Transmssion	AF3E • Fiber-wireless Convergence Networks II	AF3F • Modulator & Photodetector	AF3G • Devices for optical inter-connection	AF3H • Communication Data Format Processing	AF3I • Thin Film Solar Cells (ends at 15:45)	AF3J • Holographic Data Storage and Micro-Photonics	AF3K • Imaging I		
16:00–16:30	Coffee Break & Exhibition, Public area, Basement, 2nd and 3rd Floor, Shangri-La Hotel, Wuhan												
	Room: En SHI, F3	Room: Han Yang, F2	Room: Huang Shi, F2	Room: Xian Tao, F3	Room: Han Kou, F2	Room: Wu Chang, F2	Room: Jing Men, B1	Room: Shi Yan, B1	Room: Xiao Gan, B1	Room: Sui Zhou, F3	Room: Xiang Yang, F3		
16:30–18:00	AF4A • Fiber Lasers II	AF4B • Coding & Optimization	AF4C • Device Enabled Functionalities	AF4D • Optical Switching	AF4E • Optical Vortex	AF4F • Transceivers	AF4G • Optical Measurement Techniques	AF4H • Optical Data Processing	AF4I • Laser Fibers and Waveguides	AF4J • Imaging II	AF4K • Imaging III		
18:45–21:30	Banquet & Adwards Ceremony, Grand Ballroom (Han Kou, Wu Chang, and Han Yang), 2nd Floor, Shangri-La Hotel, Wuhan												

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

Saturday, 5 November												
08:00–16:00	<i>Registration, Public area face to the escalator, 2nd Floor, Shangri-La Hotel, Wuhan</i>											Exhibition Area
	Room: En SHI, F3	Room: Han Yang, F2	Room: Huang Shi, F2	Room: Sui Zhou, F3	Room: Xian Tao, F3	Room: Wu Chang, F2	Room: Han Kou, F2	Room: Shi Yan, B1	Room: Jing Men, B1	Room: Xiao Gan, B1	Room: Xiang Yang, F3	
08:30–10:30	AS1A • Fiber Lasers III	AS1B • Data Center & Indoor Networking	AS1C • Digital Signal Processing II	AS1D • Optical Access Networks	AS1E • Network Technology and Application	AS1F • Optical Sources and Applications	AS1G • Novel Devices and Applications	AS1H • Frequency-Time Domain Signal Processing	AS1I • Hybrid Perovskite: Single Crystals and Nanocrystals	AS1J • Novel Optical Recording and Application of Ultrafast Optics (ends at 10:15)	AS1K • Imaging IV	
10:30–11:00	<i>Coffee Break & Exhibition, Public area, Basement, 2nd and 3rd Floor, Shangri-La Hotel, Wuhan</i>											Conference Exhibition
	Room: En SHI, F3	Room: Han Yang, F2	Room: Huang Shi, F2	Room: Xian Tao, F3	Room: Xiao Gan, B1	Room: Wu Chang, F2	Room: Han Kou, F2	Room: Shi Yan, B1	Room: Jing Men, B1	Room: Sui Zhou, F3	Room: Xiang Yang, F3	
11:00–12:30	AS2A • Novel Fiber and Micro-fabrication	AS2B • Performance Monitoring & Optimization	AS2C • Transmitter & Receiver Technology	AS2D • Elastic Optical Networks	AS2E • Optical Signal Processing (Starts at 10:45 and ends at 12:45)	AS2F • Polarization Handling and Applications	AS2G • Manipulation and Plasmonics	AS2H • Waveform Processing	AS2I • Electro-Optics and Optical Sampling	AS2J • Imaging V	AS2K • Imaging VI	
12:30–14:00	<i>Lunch Break, Café Wu, 1st Floor, or Shang Palace, 2nd Floor, Shangri-La Hotel, Wuhan</i>											
	Room: En SHI, F3	Room: Han Yang, F2	Room: Huang Shi, F2	Room: Xian Tao, F3	Room: Han Kou, F2	Room: Wu Chang, F2	Room: Jing Men, B1			Room: Sui Zhou, F3	Room: Xiang Yang, F3	
14:00–15:30	AS3A • Novel Fibers and Applications II	AS3B • Covergence of Wireless and Optics	AS3C • Short-Reach Transmission & Access Networking II	AS3D • Software Defined Systems and Networks (Ends at 15:45)	AS3E • Sensing & Monitoring	AS3F • Passive Devices (Ends at 15:45)	AS3G • Photonic Microwave Filtering Technology			AS3H • Imaging VII	AS3I • Imaging VIII	
15:30–16:00	<i>Coffee Break & Exhibition, Public area, 2nd Floor, Shangri-La Hotel, Wuhan</i>											
	Room: Han Yang, F2	Room: Wu Chang, F2										
16:00–17:30	AS4A • Postdeadline Session	AS4B • Postdeadline Session										

ACP 2016 — Thursday, 3 November

08:00–18:00 **Registration**, Public area face to the escalator, 2nd Floor, Shangri-La Hotel, Wuhan

08:00–08:30 **Opening Ceremony**, Grand Ballroom (Han Kou, Wu Chang, and Han Yang), 2nd Floor, Shangri-La Hotel, Wuhan

08:30–12:45 **ATH1A • Plenary and Light the Future Session**, Grand Ballroom (Han Kou, Wu Chang, and Han Yang), 2nd Floor, Shangri-La Hotel, Wuhan

ATH1A.1 • 08:30 **Plenary**

Light in a Twist: Optical Angular Momentum, Miles J. Padgett; *University of Glasgow, Scotland, UK*. In 1992 Allen et al. recognized that light beams carrying an orbital angular momentum, in addition to the photon spin, could be created in the laboratory. This twist can be generated using lenses, or holograms encoded onto liquid crystal displays. Both whole beams and single photons can carry this twist, or transfer it to particles causing them to spin. In this talk I will introduce the underlying properties and discuss a number of manifestations of orbital angular momentum. These various demonstrations by our own group and others highlight how optics still contains surprises and opportunities for micro-manipulation, novel imaging modalities and high bandwidth communication in both the classical and quantum worlds. Our most recent work considers how a rotational form of the classical Doppler effect might be used to sense the rotation of distant bodies, even when the linear effect is zero.

ATH1A.2 • 09:15 **Plenary**

Innovations Abound in Functional Optical Communications, Alan E. Willner; *University of Southern California, USA*. Optical communication systems have achieved great success over the past several decades in terms of capacity growth and deployment. Looking into the future, optical communications continues to innovate, with advances in functionality, reconfigurability, integrability, and stability. This presentation will highlight recent innovations and future potential of high-capacity and highly functional systems that may make use of optical signal processing, being a broadly defined term.

ATH1A.3 • 10:00 **OSA | 100**

OSA's Light the Future Series: How Optics Will Revolutionize the World, Steven Chu; *Nobel Laureate, former U.S. Secretary of Energy, USA*. From energy to biomedicine, optics and photonics research will have a profound effect on the global economy and our everyday lives. Batteries will store renewable energy for on demand usage. Medical diagnostics tools will become more mobile, bringing improved healthcare opportunities to remote locations. Many innovations will stretch beyond our planet. With the discovery of gravitational waves by the global team of scientists working on LIGO, optics is expanding scientific frontiers. This talk will touch on the predictions for optics inventions that will revolutionize the world.

11:00–11:15 **Coffee Break & Poster Preview & Exhibition**, Public area, 2nd and 3rd Floor, Shangri-La Hotel, Wuhan

ATH1A.4 • 11:15 **Plenary**

Photoacoustic Tomography: Ultrasonically Beating Optical Diffusion and Diffraction, Lihong V. Wang; *Washington University in St. Louis, USA*. Photoacoustic tomography has been developed for in vivo functional, metabolic, molecular, and histologic imaging by physically combining optical and ultrasonic waves. Broad applications include early-cancer detection and brain imaging. High-resolution optical imaging is limited to superficial imaging within the optical diffusion limit of the surface of scattering tissue. By synergistically combining light and sound, photoacoustic tomography provides deep penetration at high ultrasonic resolution and high optical contrast.

ATH1A.5 • 12:00 **Plenary**

Perfect Optical Fibers, Jonathan Knight; *University of Bath, UK*. State-of-the-art single-mode optical fibers have exceptional performance, but they are far from perfect. As well as imposing distortions on the transmitted light through the effects of dispersion and nonlinearity, they have fundamental limitations such as their spectral transparency and material breakdown. This talk will explore how much better we can do by using the alternative waveguide physics of optical fibers with a hollow core.

12:45–14:30 **Lunch Break**, Café Wu, 1st Floor, or Shang Palace, 2nd Floor, Shangri-La Hotel, Wuhan

ACP 2016 — Thursday, 3 November

08:00–18:00 **Registration**, Public area face to the escalator, 2nd Floor, Shangri-La Hotel, Wuhan

08:00–08:30 **Opening Ceremony**, Grand Ballroom (Han Kou, Wu Chang, and Han Yang), 2nd Floor, Shangri-La Hotel, Wuhan

08:30–12:45 **ATH1A • Plenary and Light the Future Session**, Grand Ballroom (Han Kou, Wu Chang, and Han Yang), 2nd Floor, Shangri-La Hotel, Wuhan

ATH1A.1 • 08:30 **Plenary**

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ATH1A.2 • 09:15 **Plenary**

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ATH1A.3 • 10:00 **OSA | IOO**

OSA's Light the Future Series: How Optics Will Revolutionize the World, Steven Chu; *Nobel Laureate, former U.S. Secretary of Energy, USA*. From energy to biomedicine, optics and photonics research will have a profound effect on the global economy and our everyday lives. Batteries will store renewable energy for on demand usage. Medical diagnostics tools will become more mobile, bringing improved healthcare opportunities to remote locations. Many innovations will stretch beyond our planet. With the discovery of gravitational waves by the global team of scientists working on LIGO, optics is expanding scientific frontiers. This talk will touch on the predictions for optics inventions that will revolutionize the world.

11:00–11:15 **Coffee Break & Poster Preview & Exhibition**, Public area, 2nd and 3rd Floor, Shangri-La Hotel, Wuhan

ATH1A.4 • 11:15 **Plenary**

Photoacoustic Tomography: Ultrasonically Beating Optical Diffusion and Diffraction, Lihong V. Wang; *Washington University in St. Louis, USA*. Photoacoustic tomography has been developed for in vivo functional, metabolic, molecular, and histologic imaging by physically combining optical and ultrasonic waves. Broad applications include early-cancer detection and brain imaging. High-resolution optical imaging is limited to superficial imaging within the optical diffusion limit of the surface of scattering tissue. By synergistically combining light and sound, photoacoustic tomography provides deep penetration at high ultrasonic resolution and high optical contrast.

ATH1A.5 • 12:00 **Plenary**

Perfect Optical Fibers, Jonathan Knight; *University of Bath, UK*. State-of-the-art single-mode optical fibers have exceptional performance, but they are far from perfect. As well as imposing distortions on the transmitted light through the effects of dispersion and nonlinearity, they have fundamental limitations such as their spectral transparency and material breakdown. This talk will explore how much better we can do by using the alternative waveguide physics of optical fibers with a hollow core.

12:45–14:30 **Lunch Break**, Café Wu, 1st Floor, or Shang Palace, 2nd Floor, Shangri-La Hotel, Wuhan

Room: En SHI, F3

14:30–16:00
ATH2A • Photonics and Novel Devices
Presider: Liang Dong; Clemson Univ., USA

Room: Sui Zhou, F3

14:30–16:00
ATH2B • Novel Fibers and Applications I
Presider: Limin Tong, Zhejiang University, China

Room: Huang Shi, F2

14:30–16:00
ATH2C • SDM & OAM Transmission I
Presider: Lianshan Yan; Southwest Jiaotong Univ., China

Room: Han Yang, F2

14:30–16:00
ATH2D • Digital Signal Processing I
Presider: Qi Yang, WRI, China

Room: Xian Tao, F3

14:30–16:00
ATH2E • SDM Network and Node
Presider: Yabin Ye; Huawei Technologies Duesseldorf GmbH, Germany

ATH2A.1 • 14:30 Tutorial

Harnessing Stimulated Brillouin Scattering in Photonic Integrated Circuits for Signal Processing, Benjamin J. Eggleton¹; ¹*Univ. of Sydney, Australia*. On-chip Stimulated Brillouin scattering (SBS) is the focus of current research because of its potential for integration of a variety of important photonic functionalities. Here, we demonstrate record high chip-based SBS of over 50dB net-gain which allows for advanced microwave photonic signal processing applications.

ATH2B.1 • 14:30 Invited

Ultrathin Optical Fibers for Particle Trapping and Manipulation, Aili Maimaiti^{1,2}, Viet Giang Truong¹, Sile Nic Chormaic¹; ¹*Okinawa Inst of Science & Technology, Japan*; ²*Univ. College Cork, Ireland*. We present experimental and theoretical results on chains of microparticles optically bound in the evanescent field of ultrathin optical fibers that can support the fundamental, LP_{01} , and first group, LP_{11} , of higher order fiber modes.

ATH2C.1 • 14:30

Crosstalk-aware Routing, Spectrum, and Core Assignment in Elastic Optical Networks with Multi-core Fibers, Qiuyan Yao¹, Hui Yang¹, Yongli Zhao¹, Ruijie Zhu¹, Jie Zhang¹, Jing wu¹; ¹*BUPT, China*. We make a specific analysis about the transmission crosstalk in elastic optical networks with multi-core fibers. Based on the proposed concept of spare spectrum availability (SSA), a crosstalk-aware routing, spectrum, and core assignment (RSCA) algorithm is presented to improve the spectrum resource utilization and reduce blocking.

ATH2C.2 • 14:45

Free Space to Single Mode Fiber Coupling Efficiency Improvement using Wave-front Sensor-less Adaptive Optics, Beibei Li¹, Yan Li¹, Donghao Zheng¹, Deming Kong¹, Jian Wu¹; ¹*Beijing Univ. of Posts and Telecommunications, China*. We demonstrate that a wave-front sensor-less adaptive optics system based on SPGD algorithm improves fiber coupling efficiency by 2.0 dB, 5.6 dB and 12.1 dB under weak, moderate and strong turbulence, respectively.

ATH2D.1 • 14:30

Generation and Detection of 170.49-Gb/s Single Polarization IM/DD Optical OFDM Signals Enabled by Volterra Nonlinear Equalization, Yicheng Zheng¹, Junwei Zhang¹, Xuezhi Hong¹, Changjian Guo¹; ¹*South China Normal Univ., China*. We demonstrate the generation and detection of 170.49-Gb/s single-wavelength and single-polarization IM/DD optical OFDM signals using Volterra-based two-step nonlinear equalization. A line rate of 164.35-Gb/s is achieved after 2-km of fiber transmission.

ATH2D.2 • 14:45

Self-Cancellation of Sampling Frequency Offset in Adaptively Modulated IMDD-OFDM Systems, Ming Chen¹, Qinghui Chen², Rui Deng², Hui Zhou¹, Zhiwei Zheng¹, Jing He², Lin Chen²; ¹*College of Physics and Information Science, Hunan Normal Univ., China*; ²*College of Computer Science and Electronic Engineering, Hunan Univ., China*. We propose and experimentally demonstrate a phase rotation modulation-based SFO self-cancellation scheme in adaptively modulated IMDD-OFDM systems. Phase rotations induced by up to 200 ppm SFO can be corrected with negligible impact on transmission performance.

ATH2E.1 • 14:30 Invited

Mode-division-multiplexing Passive Optical Network Based on Low-crosstalk Few-mode Fiber and Components, Juhao Li¹, Tao Hu¹, Fang Ren¹, Dawei Ge¹, Zhengbin Li¹, Zhangyuan Chen¹, Yongqi He¹; ¹*Peking Univ., China*. In this paper, we discuss the concepts of multidimensional PONs and MDM optical switching networks. Thanks to low-modal crosstalk FMF, mode MUX/DeMUX and FMCs, no coherent detection or complex MIMO DSP is required.

Room: Wu Chang, F2

14:30–16:00
ATH2F • Silicon-based Light Source
Presider: Siyuan Yu; Univ. of Bristol, UK

ATH2F.1 • 14:30 **Tutorial**
Silicon-based III-V Quantum-dot Lasers for Silicon Photonics, Huiyun Liu¹; ¹*Univ. College London, UK*. Monolithically integrating III-V lasers on Si is the most promising solution for light sources on silicon. We demonstrated the first long lifetime for telecommunications-wavelength InAs/GaAs quantum-dot laser monolithically grown on silicon substrates.

Room: Han Kou, F2

14:30–16:00
ATH2G • Silicon Photonics
Presider: Po Dong, Nokia Bell Labs, USA

ATH2G.1 • 14:30 **Keynote**
Towards 2 - 14 μ m Silicon Photonics, Graham T. Reed¹; ¹*Univ. of Southampton, UK*. We are developing three integrated photonics platforms to cover the 2 - 14 μ m wavelength range. This paper offers a review of passive and active photonic devices in these three material platforms: germanium on silicon, suspended silicon and silicon on insulator (SOI).

Room: Shi Yan, B1

14:30–16:00
ATH2H • Si Waveguide Based Data Processing
Presider: Gong-Ru Lin; Taiwan Univ., Taipei

ATH2H.1 • 14:30 **Invited**
All – Optical Signal Processing on Silicon – Based Platforms, Dawn T. Tan¹; ¹*Singapore Univ of Technology and Design, Singapore*. In this paper, we present recent research progress in on – chip wavelength and mode division multiplexing strategies and silicon – based nonlinear optics with high nonlinear figures of merit.

Room: Jing Men, B1

14:30–16:00
ATH2I • Perovskite Solar Cells I
Yinhua Zhou; Huazhong Univ. of Science and Technology, China

ATH2I.1 • 14:30 **Tutorial**
Efficient and Stable of Perovskite Solar Cells, Jingbi You¹, Qi Jiang¹, Xingwang Zhang¹; ¹*Inst. of Semiconductors, China*. We have adopted all metal oxide layers as the charge transport layers, which has significantly improved the device stability. The improvement come from the avoid the interfacial degradation.

Room: Xiao Gan, B1

14:30–16:00
ATH2J • Optical Storage for Big Data
Presider: Changsheng Xie; Wuhan National Lab for Optoelectronics, China

ATH2J.1 • 14:30 **Tutorial**
Big Data Storage Solution: Collinear Holographic Data Storage System, Xiaodi Tan¹, Hideyoshi Horimai², Ryo Arai³, Junichi Ikeda³, Mitsuteru Inoue⁴, Xiao Lin¹, Ke Xu¹, Jinpeng Liu¹, Yong Huang¹; ¹*Beijing Inst. of Technology, China*; ²*HolyMine Corporation, Japan*; ³*Kyoeisha Chemical Co., LTD, Japan*; ⁴*Toyohashi Univ. of Technology, Japan*. We introduced the principle of the collinear holography and its media structure of disc, and discussed some methods to increase the recording density and data transfer rates of using phase modulated page data format.

Room: Xiang Yang, F3

14:30–16:15
ATH2K • Spectroscopic Methods
Presider: Juergen Popp; Leibniz Inst. of Photonic Technology, Germany

ATH2K.1 • 14:30 **Invited**
Laser Applications in Food Monitoring and Infectious Disease Diagnostics, Katarina Svanberg^{1,2}, Hao Zhang¹, Huiying Lin¹, Tianqi Li¹, Wansha Li¹, Sune R. Svanberg^{1,2}; ¹*Center for Optical and Electromagnetic Research, South China Normal Univ., China*; ²*Lund Laser Center, Lund Univ., Sweden*. Food safety and unnecessary prescription of antibiotics are real concerns worldwide. Laser-based spectroscopy research at both South China Normal Univ. as well as at Lund Univ., Sweden to meet these problems will be covered.

Room: En Shi, F3

Ath2B.2 • 15:00 **Invited**
High stability noise-like pulse generation from passively mode-locked thulium-doped fiber laser, Fengping Yan¹; ¹Beijing Jiaotong Univ.,

China. Abstract not available.

Ath2B.3 • 15:30
Large Pitch Nodeless Hollow-Core Fiber for Visible Guidance, Shoufei Gao¹, Yingying Wang¹, Xiaolu Liu¹, Shuai Gu¹, Pu Wang¹; ¹Beijing Univ. of Technology, China. We report a nodeless large pitch hollow-core fiber guiding in visible spectral range with low transmission loss of 80 dB/km @ 532 nm, broad transmission bandwidth from 450 nm to 1200 nm, low bending loss, and single

Ath2A.2 • 15:30
Graphene-Induced Losses for Cladding Modes of Optical Fibers, Ting Hao¹, Kin S. Chiang¹; ¹City Univ. of Hong Kong, Hong Kong. We demonstrate theoretically and experimentally that graphene-induced losses for the cladding modes propagating along a graphene-coated fiber increase with the surrounding refractive index, which could be explored for the realization of intensity-based refractive-index sensors.

Room: Sui Zhou, F3

Room: Huang Shi, F2

Ath2C.3 • 15:00 **Invited**
Optical MIMO Techniques for MDL Mitigation in Few-Mode Fiber Transmission Systems, Yves Jaouen¹, El-Mehdi Amhoud¹, Ghaya Rekaya-Ben Othman¹; ¹Telecom ParisTech, France. Accumulated MDL introduces penalties and reduces the capacity of SDM systems. We investigate different MIMO techniques to reduce impact of MDL such as optimized mode scrambling strategy and/or DSP solutions based on Space-Time coding techniques.

Ath2C.4 • 15:30
Mode Conversion Technology Based on Adaptive Simulated Annealing Algorithm, Jia Ye¹, Luyao Li¹, Lianshan Yan¹; ¹Southwest Jiaotong Univ., China. An improved adaptive simulated annealing algorithm is proposed to generate phase hologram for mode conversion between arbitrary optical modes. The simulation and experiment results have verified the effectiveness of the proposed method.

Room: Han Yang, F2

Ath2D.3 • 15:00
A Sign Bit Summation based Symbol Synchronization Method for Real-time IMDD-OOFDM Systems, Zhen Zhang¹, Qianwu Zhang¹, Weiliang Wu¹, Junjie Zhang¹, Yongxiong Song¹; ¹Shanghai Univ., China. A low-complexity symbol synchronization method based on sign bit summation is proposed and implemented in FPGA-based real-time IMDD-OOFDM receivers. The proposed synchronization method can achieve an acquisition probability of 0.9999 under ROP of -20.5dBm.

Ath2D.4 • 15:15 **Invited**
Nonlinear Fiber-Optic Communications Using Nonlinear Frequency Division Multiplexing, Tao Gui², Zhenhua Dong², Kang Ping Zhong¹, Chao Lu¹, P.K.A. Wai¹, Alan Pak Tao Lau²; ¹Department of Electronic and Information Engineering, Hong Kong Polytechnic Univ., Hong Kong; ²Department of Electrical Engineering, The Hong Kong Polytechnic Univ., Hong Kong. Nonlinear Frequency Division Multiplexing(NFDM) based on Nonlinear Fourier Transform(NFT) recently gains attraction as a new communication strategy for nonlinear optical communications. We review recent developments and discuss key challenges in NFDM research.

Room: Xian Tao, F3

Ath2E.2 • 15:00
A Scattered-Spectrum-Scan Routing and Spectrum Allocation Scheme for Spatial-Division-Multiplexing Optical Networks Based on Blocking OXCs, Yu Yang¹, Xin Chen¹, Han Yan², Bo Hua², Juhao Li¹, Yumeng Hao¹, Zhangyuan Chen¹, Yongqi He¹; ¹Peking Univ., China; ²Systems Engineering Research Inst., CSSC, China. We propose a novel scattered-spectrum-start-scan routing and spectrum allocation scheme for spatial-division-multiplexing optical networks based on OXCs with blocking switching architecture. The scheme can significantly reduce computational complexity with the same blocking performance.

Ath2E.3 • 15:15
Experimental Demonstration of Wavelength Reused MDM-PON with Rayleigh Backscattering Mitigation, Jinglong Zhu², Yuanxiang Chen², Bo Hua¹, Han Yan¹, Juhao Li², Zhongying Wu², Kaiwei Zhang², Dawei Ge², Zhangyuan Chen², Yongqi He²; ¹Systems Engineering Research Inst., CSSC, China; ²State Key Laboratory of Advanced Optical Communication Systems and Networks, Peking Univ., China. We propose and experimentally demonstrate a wavelength reused bidirectional MDM-PON for high-speed access network. A novel Rayleigh backscattering mitigation scheme by utilizing different sideband for US/DS transmission is proposed to improve US receiver sensitivity.

Ath2E.4 • 15:30
Contaminated Area-based RSCA Algorithm for SuperChannel in Flex-Grid Enabled SDM Networks, Zhun Shi¹, Yongli Zhao¹, Xiaosong Yu¹, Yajie Li¹, Jie Zhang¹, Chuan Liu², Gang Zhang², Zhu Liu³; ¹Beijing Univ of Posts & Telecom, China; ²Global Energy Interconnection Research Inst., China; ³State Grid Information & Telecommunication Group Co., LTD., China. A routing, spectrum and core assignment (RSCA) algorithm is proposed based on contaminated area to support super-channel in flex-grid enabled SDM networks. Simulation results show the proposed algorithm can achieve better performance than benchmark algorithms.

Room: Wu Chang, F2

ATH2G.2 • 15:00 **Invited**
Equivalent Circuit Models for Silicon Photonics Devices, Woo-Young Choi¹, Myungjin Shin¹, Jeong-Min Lee¹, Lars Zimmermann²; ¹Electrical & Electronic Engineering, Yonsei Univ., Korea; ²IHP, Germany. We present equivalent circuit models for Si micro-ring modulators and Ge-on-Si photodetectors. Model parameters are extracted from measurement and simulation. These circuit models are very useful for designing Si photonic and electronic ICs.

Room: Han Kou, F2

Ath2H.2 • 15:00
Diverse dynamics in silicon photonic crystal nano-cavities towards photonic microwave and secure communications, Jia-Gui Wu^{1,2}, Shu-Wei Huang², Hao Zhou², Ling Chen¹, Fei Wang³; ¹College of Electronic and Information Engineering, Southwest Univ., China; ²Mesoscopic Optics and Quantum Electronics, Univ. of California Los Angeles, USA; ³School of Electrical and Electronic Engineering, Chongqing Univ. of Technology, China. We experimentally demonstrate the low noise radio-frequency and complex chaos dynamics in photonic crystal (PhC) nano-cavity for applications of photon-microwave and cryptography, achieved through dual-coupled nonlinear radiation pressure and free-carrier Drude plasma.

Ath2H.3 • 15:15
4-Gbit/s All-optical Switching for SiC Micro-ring Resonator by Using FCA and Kerr Effects, Cai-Syuan Fu¹, Bo-Ji Huang¹, Chih-Hsien Cheng¹, Cheng-Ting Tsai¹, Huai-Hung Wang¹, Yu-Chieh Chi¹, Gong-Ru Lin¹; ¹Graduate Inst. of Photonics and Optoelectronics, National Taiwan Univ., Taiwan. 4-Gbit/s all-optical cross-wavelength data conversion with an extinction ratio of 14 dB for SiC micro-ring resonator is demonstrated by the hybrid free carrier absorption and Kerr effects.

Ath2H.4 • 15:30
Multi-wavelength regeneration experiments using clock-pump FWM in silicon waveguides, Yong Geng¹, Baojian Wu¹, Feng Wen¹, Xingyu Zhou¹, Heng Zhou¹, Kun Qiu¹; ¹Univ. of Electronic Science and Technology of China, China. All-optical three-wavelength regeneration based on the clock-pump FWM scheme was experimentally illustrated in the silicon wire waveguide and the extinction ratio was improved by 3dB. The impact of two-photon absorption and free-carrier absorption is also discussed.

Room: Jing Men, B1

Ath2I.2 • 15:30 **Invited**
Controlling the Formation of Perovskite Films by Low-temperature Solution Schemes for High Performance Solar Cells, Wallace C. Choy¹; ¹Univ. of Hong Kong, Hong Kong. Two novel low-temperature processing schemes for manipulating of perovskite films in the typical one-step and two-step approaches. A promising efficiency of about 17% is achieved in planar-heterojunction PSCs with enhanced stability and no hysteresis.

Room: Xiao Gan, B1

ATH2J.2 • 15:30 **Invited**
Holographic Data Storage by Use of Computer Generated Hologram, Takahiro Nomura¹, Teruyoshi Nobukawa¹; ¹Fac. Sys. Eng., Wakayama Univ., Japan. Angular multiplexing holographic data storage with a single amplitude spatial light modulator by use of a computer generated hologram (CGH) is presented. Page data and a reference beam are encoded in a CGH.

Room: Xiang Yang, F3

ATH2K.2 • 15:00
Cypate- mediated Thermosensitive Nanoliposomes for NIR Imaging and Photothermal Triggered Drug Release, Han Zhihao¹, Lv Liwei¹, Yueqing Gu¹; ¹China Pharmaceutical Univ., China. We synthesized a multifunctional photothermal sensitive liposomes drug-loading system. Its smart constitute was demonstrated through a series of characterization experiments and biological tests *in vitro* and *in vivo*.

ATH2K.3 • 15:15
A Raman-Compatible Isolation Strategy for Human Pathogenic Bacteria in Tap Water Samples Relying on Siderophores, Susanne Pahlow^{1,2}, Stephan Stöckel¹, Petra Rösch¹, Dana Cialla-May^{1,2}, Karina Weber^{1,2}, Jürgen Popp^{1,2}; ¹Friedrich-Schiller-Univ. Jena, Germany; ²Leibniz Inst. of Photonic Technology, Germany. An innovative siderophore-based sample preparation strategy enabling the isolation of several *Pseudomonas* species from tap water samples is introduced. The bacterial cells are captured on a chip surface and subsequently identified via their Raman fingerprint.

ATH2K.4 • 15:30
Evaluation of the quality of apple fruit using the its optical property spectra in the wavelength range from 500 to 1700 nm., Kuang-Ju Kao¹, Pin-Yuan Huang¹, Chien-Chih Chen¹, Sheng-Hao Tseng¹; ¹National Cheng Kung Univ., Taiwan. The absorption and scattering coefficients of apple fruit in the wavelength range from 500 to 1700 nm were characterized and these values would be employed in the quality evaluation of apple fruit.

ATH2F.2 • 15:30 **Invited**
Monolithic/Heterogeneous Integration of III-V Lasers on Si, Zhechao Wang^{1,2}, Clement Merckling², Marianna Pantouvak², Joris Van Campenhout², Geert Morthier¹, Gunther Roelkens¹, Dries Van Thourhout¹; ¹Photonics Research Group, Ghent Univ./IMEC, Belgium; ²IMEC, Belgium. In the paper, we elaborate our recent work on both monolithic (epitaxial growth) and heterogeneous (BCB bonding) integration techniques that enable integration of various III-V lasers on silicon.

ATH2G.3 • 15:30 **Invited**
Silicon Photonics as a Post-Moore Photonic Circuit Technology, K. Yamada, National Institute of Advanced Industrial Science and Technology, Japan. Capacity of data transmission systems is growing explosively while device/circuit technology development along Moore's law nears its end. Although silicon photonics offers immediate solutions, further evolution is needed for the continual growth in the future.

Room: En SHI, F3

ATH2A.3 • 15:45

Bistability in an Active Fiber-optical Parametric Oscillator, Feng Wen¹, Baojian Wu¹, Yong Geng¹, Yingyu Zhou¹, Kun Qiu¹; ¹*Univ. of Electronic Science and Technology of China, China*. Bistable behaviors are experimentally investigated in an active fiber-optical parametric oscillator by adjusting open-loop losses and pump powers. Optical bistability can be obtained at the switch-off state and the modulation depth of 16dB is achieved.

Room: Sui Zhou, F3

mode profile.

ATH2B.4 • 15:45

Side-leakage photonic crystal fiber loop mirror for simultaneous measurement of torsion, strain and temperature, Xin Wang¹, Shuqin Lou¹, Eric Numkam Fokoua²; ¹*School of Electronic and Information Engineering, Beijing Jiaotong Univ., China*; ²*Optoelectronics Research Centre, Univ. of Southampton, UK*. A fiber loop mirror based on a 70.4cm-long side-leakage photonic crystal fiber is proposed and experimentally demonstrated for simultaneous measurement of torsion, strain

Room: Huang Shi, F2

ATH2C.5 • 15:45

MIMO Equalization for Multi-Core Fiber-Based Systems Using the Affine Projection Algorithm, Mai Banawan¹, Nihal Anwar¹, Ziad El-Sahn¹, Hosam M. H. Shalaby^{1,2}; ¹*Photonics Group, Electrical Engineering Department, faculty of engineering, Egypt*; ²*Department of Electronics and Communications Engineering, Egypt-Japan Univ. of Science and Technology, Egypt*. An adaptive algorithm for MIMO equalization through multi-core fibers based on the affine projection is proposed. Our algorithm improves the convergence speed compared to LMS algorithm while having low computational complexity compared to RLS algorithm.

Room: Han Yang, F2

ATH2D.5 • 15:45

Construction of Large Girth QC-LDPC Codes Based on Finite Geometries and Fast Searching Method, Zhirong Wang¹, Liqian Wang¹, Dongdong Wang¹, Aimei Fei², Xue Chen¹, CHEN JU¹, Huitao Wang², Qi Zhang²; ¹*BUPT, China*; ²*ZTE Cooperation, China*. We proposed a method to construct quasi-cyclic low-density parity check (QC-LDPC) codes which have large girth for high speed optical communications. Compared with other method, our algorithm has lower complexity and faster speed.

Room: Xian Tao, F3

ATH2E.5 • 15:45

Contrasting Power Efficiency of Filter- vs. Ring-based Topologies for On-Chip Wavelength Routing with Layout Awareness, Mahdi Tala¹, Marta Ortin Obòn², Luca Ramini¹, Marco Balboni¹, Victor Vinals², Davide Bertozzi¹; ¹*Univ. of Ferrara, Italy*; ²*Univ. of Zaragoza, Spain*. This paper contrasts filter- vs. ring-based topologies for on-chip wavelength routing by performing their physical mapping under floorplanning, placement and routing constraints. Thus, the impact of their layout design flexibility over power efficiency is highlighted.

16:00–16:30 **Coffee Break & Poster Preview & Exhibition**, *Public area, Basement, 2nd and 3rd Floor, Shangri-La Hotel, Wuhan*

Room: Wu Chang, F2

Room: Han Kou, F2

Room: Shi Yan, B1

Room: Jing Men, B1

Room: Xiao Gan, B1

Room: Xiang Yang, F3

ATH2H.5 • 15:45
Wavelength Multicasting of 4/16QAM Channel in a Dual-pump Two-stage Silicon Mixer, Jin Zhang¹, Eduardo T. Giraldo¹, Ping Piu Kuo¹, Nicola Alic¹, Stojan Radic¹; ¹*Univ. of California, San Diego, USA*. We demonstrate nine-fold wavelength multicasting of 4- and 16-QAM signals in a two-stage, dual-pump silicon mixer. Characterized multicast performance varied for up to 10 dB for the generated copies over 15 nm.

ATH2K.5 • 15:45 **Invited**
Stimulated Raman Spectroscopic Imaging by Microsecond Delay-line Tuning, Ji-Xin Cheng¹; ¹*Purdue Univ., USA*. We report microsecond-scale acquisition of simulated Raman spectra by resonant delay-line tuning. Our scheme improved the spectral acquisition speed by 100 times compared to previous works by motorized translational-stage tuning. 4-D images (x-y-z- λ) from highly dynamic organelles in live *C. elegans* was demonstrated.

16:00–16:30 **Coffee Break & Poster Preview & Exhibition**, *Public area, Basement, 2nd and 3rd Floor, Shangri-La Hotel, Wuhan*

Room: En SHI, F3

16:30–18:00

ATH3A • Fiber Lasers I

Presider: Sile Nic Chormaic; Okinawa Inst. of Science & Technology, Japan

Room: Sui Zhou, F3

16:30–18:00

ATH3B • Optical Fiber Technology

Presider: Misha Sumetsky; Aston Univ., UK

Room: Huang Shi, F2

16:30–18:00

ATH3C • Advanced Modulation Formats & Multiplexing Schemes

Room: Han Yang, F2

16:30–18:00

ATH3D • Visible Light and Free-Space Communications

Presider: Changyuan Yu; Hong Kong Polytechnic Univ., China

Room: Xian Tao, F3

16:30–18:00

ATH3E • Data Center Networks

Presider: Gangxiang Shen; Soochow Univ., China

ATH3A.1 • 16:30 **Invited**

Mode-locked Fiber Lasers using 2D Nanomaterials as Saturable Absorbers, Yong Liu¹, He-Ping Li¹, Jianfeng Li¹, Hongyu Luo¹; ¹Univ of Electronic Sci & Tech of China, China. We demonstrate mode-locked fiber lasers using multilayer molybdenum disulfide (MoS₂) and black phosphorus (BP) as saturable absorbers respectively. Experimental proofs are provided.

ATH3B.1 • 16:30 **Invited**

UV light generation in Optical fibres, Gilberto Brambilla¹; ¹Univ. of Southampton, UK. UV light has been generated in optical fibers using non-linear optics (harmonic generation) and rare earth doping with Gd³⁺.

ATH3C.1 • 16:30

112-Gb/s IM-DD based transmission of PAM-4 signal over 12-km SMF with 50-GSa/s ADC, Ming Luo¹, Chao Yang¹; ¹WRI, China. A transmission of single channel 112-Gb/s 4-level pulse amplitude modulation (PAM-4) signal is experimentally demonstrated on 12km SMF link with only 50-GSa/s analog to digital converter (ADC), achieving an electrical spectrum efficiency (SE) of 2.24 b/s/Hz.

ATH3C.2 • 16:45

Demonstration of CD Pre-compensated Direct Detection PAM4 40km Transmission in C-band Using DDMZM, Qiang Zhang¹, Nebojsa Stojanovic¹, Cristian Prodanuic¹, Tianjian Zuo², Enbo Zhou², Liang zhang², Fotini Karinou¹, Changsong Xie¹; ¹Huawei Technologies Duesseldorf GmbH, Germany; ²Huawei Technologies Co. LTD, China. We experimentally demonstrate the generation and transmission of 56 Gb/s DSB and SSB PAM4 using a DDMZM. DSB outperforms SSB by 6 dB in B2B scenario as well as after 40 km when dispersion pre-compensation is employed in the latter case.

ATH3D.1 • 16:30

A 2x4 90° Optical Hybrid for Free-Space Coherent Optical Communication Based on a Birefringent Crystal, Zichen Liu¹, Quan You¹, Xiang Li¹, Dequan Xie¹, Ming Luo¹, Shufeng Chen², Qi Yang¹; ¹State Key Laboratory of Optical Communication Technologies and Networks, Wuhan Research Inst. of Post & Telecommunication, China; ²Wuhan Qingchuan Univ., China. We design and fabricate a 2x4 90° free-space optical hybrid based on a birefringent crystal, which can be used in the high-speed satellite communication and satellite-to-ground communication. Compared with current fiber-based commercial coherent optical receiver, our fabricated free-space optical hybrid can achieve comparable performance.

ATH3D.2 • 16:45

OFDM Modulation with Signal Space Diversity for Indoor Visible Light Communications, Chao Uang¹; ¹Huazhong Univ. of Science and Technology, China. We experimentally demonstrate that BER improvement of OFDM modulation with signal space diversity under multipath interference VLC environment. 200Mb/s OFDM-16QAM can be transmitted over 1.8m distance without increasing system complexity and bandwidth consumption.

ATH3E.1 • 16:30 **Invited**

Network Performance Analysis of An AWG-based Passive Optical Interconnect for Data-centers, Yi Yang², Jiajia Chen¹; ¹Kungliga Tekniska Hogskolan, Sweden; ²South China Normal Univ., China. AWG-based passive optical interconnects (POIs) are considered a high-capacity and energy-efficient solution for datacenter networks. We concentrate on a cascaded AWG-based POI and analyze network performance to gain an insight on efficiency of such architecture.

Room: Wu Chang, F2

16:30–18:00

ATh3F • Active Devices

Presider: James Lott; Technische Universität Berlin, Germany

Room: Han Kou, F2

16:30–18:00

ATh3G • Nonlinear Optics and Applications

Presider: Xinliang Zhang, Huazhong Univ. of Science and Technology, China

Room: Shi Yan, B1

16:30–18:00

ATh3H • Microwave Photonic Devices and Links

Presider: Xiaoke Yi; Univ. of Sydney, Australia

Room: Jing Men, B1

16:30–18:00

ATh3I • Perovskite Solar Cells II

Presider: Jiang Tang; Wuhan National Lab for Optoelectronics, China

Room: Xiao Gan, B1

16:30–18:00

ATh3J • Ultrafast Photonics and Its Applications

Presider: Xiaodi Tan; Beijing Inst. of Technology, China

Room: Xiang Yang, F3

16:30–18:00

ATh3K • Sensors

Presider: Ji-Xin Cheng; Purdue Univ., USA

ATh3F.1 • 16:30 Invited

Active fiber devices enabled by graphene's photothermal effect, Xuetao Gan¹, Liang Fang¹, Jianlin Zhao¹; ¹*School of Science, Northwestern Polytechnical Univ., China*. By integrating graphene with microfibers, we demonstrate all-optically controlled phase shifters and fiber Bragg gratings with the assistance of graphene's photothermal effect. Optical switching and bistability are achieved as well with response times of milliseconds.

ATh3G.1 • 14:30 Invited

Inducing and harnessing phonon-phonon interactions in nanoscale integrated circuits, Benjamin J. Eggleton¹; ¹*Univ. of Sydney, Australia*. My talk will review our progress and achievements in developing circuits that harness interactions between optical waves and hypersonic phonons towards a new class of silicon based optical phononic processor that is CMOS compatible.

ATh3H.1 • 16:30 Invited

Wideband Dynamic Microwave Photonic Systems: From Photonics to Neuromorphic, Mable P. Fok¹, Jia Ge¹, Ryan Toole¹, Ruizhe Lin¹, Qi Zhou¹, Aneek James¹, Alexander Mathews¹; ¹*Univ. of Georgia, USA*. Various microwave photonic systems – multiband RF filter, interference canceller, jamming avoidance system, and learning system, are developed based on photonic techniques and neuromorphic algorithms as the enabling technologies for wideband, dynamic and adaptive microwave systems.

ATh3I.1 • 16:30 Invited

Effects of post-synthesis thermal conditions on methylammonium lead halide perovskite: band bending at grain boundaries and its impacts on solar cell performance, Byungha Shin¹; ¹*Korea Advanced Inst. of Science and Technology (KAIST), Korea*. We studied how process conditions affect structural and electrical properties of the resulting methylammonium lead halide perovskite films prepared by two-step process and their device performance using KPFM and temperature-dependent IV measurements.

ATh3J.1 • 16:30 Invited

Second-harmonic Generation from nanostructures for the coherent light source at nanoscale, Peixiang Lu¹; ¹*Huazhong Univ of Science and Technology, China*. Here we present our recent works on a special origin of SHG (surface SHG) observed in ZnTe nanowires, the enhancement of SHG in Al/ZnS hybrid nanowire. Also, we discuss our recent works about the precise detection of the crystallographic orientations and the lattice distortion in a single nanowire by SHG microscopy.

ATh3K.1 • 16:30 Invited

Raman Microspectroscopy a powerful tool for spectral histopathology, Juergen Popp^{1,2}; ¹*Leibniz Inst. of Photonic Technology, Germany*; ²*Inst. of Physical Chemistry and Abbe Center of Photonics, Friedrich-Schiller Univ., Germany*. Modern trends in Raman based cytopathology and pathological tissue diagnostics providing sensitive and selective tools to potentially complement established clinical pathological diagnostic methods and therefore to solve challenges currently faced by clinical pathology are presented.

Room: En Shi, F3

ATH3A.2 • 17:00 **Invited**

Ultra-compact Q-switched single-frequency pulsed fiber lasers, Shanhui Xu¹, Yuanfei Zhang¹, Zhouming Feng¹, Changsheng Yang¹, Zhongmin Yang¹; ¹South China Univ. of Technology, China. We present an ultra-compact passively Q-switched single-frequency fiber laser based on a home-made phosphate fiber and a semiconductor saturable absorber mirror. A short cavity length ensures a stably single-frequency operation. By employing a SESAM, the narrowest pulse duration of <100 ns is realized with the repetition rate reaches 600 kHz.

Room: Sui Zhou, F3

ATH3B.2 • 17:00

Improvement of scale factor for resonant fiber optical gyroscope, Chengfeng Xie¹, Jun Tang¹, Danfeng Cui¹, Dajin Wu¹, Chengfei Zhang¹, Chunming Li¹, Yongqiu Zhen¹, Chenyang Xue¹, Jun Liu¹; ¹North Univ. of China, China. A novel method is proposed to improve the scale factor of the resonant fiber optical gyroscope. By using erbium-doped fiber splicing into the fiber ring resonator, forming active resonator to increase the depth of transmission.

ATH3B.3 • 17:15

A fibre-optic radiation dosimeter with metal tracking function based on scintillating material for radiotherapy applications, Yu Ma¹, Weimin Sun¹, Zhuang Qin¹, Yaosheng Hu¹, Wenhui Zhao¹, Daxin Zhang², Ziyin Chen², Elfed Lewis³; ¹Harbin Engineering Univ., China; ²Comprehensive Cancer Center, First Affiliated Hospital of Harbin Medical Univ., China; ³Optical Fibre Sensors Research Centre, Electronic and Computer Engineering, Univ. of Limerick, Ireland. A fiber-optic dosimeter for real-time radiation dose measurements with metal tracking function is proposed, which is based on an X-Ray sensitive scintillating material filled into the micro hole located at one end of the fibre.

ATH3B.4 • 17:30

Capillary based Fiber Fabry-Perot interferometer with controllable strain sensitivity, Haiyang Shao¹, Xiaobei Zhang¹, Haiyang Pan¹, Yong Yang¹, Huawen Bai¹, Fufei Pang¹, Tingyun Wang¹; ¹Shanghai Univ., China. We proposed a Fabry-Perot interferometer structure with controllable strain sensitivity based on the capillary by the manual welding technology. The maximum strain sensitivity of 4.2 pm/ $\mu\epsilon$ is achieved with the length of 53 μm .

Room: Huang Shi, F2

ATH3C.3 • 17:00 **Invited**

Transmission of 400+ Gbit/s POLMUX-OFDM with Coherent Detection Based on Single Band/ λ , Fan Li¹; ¹ZTE TX, USA. In this paper, we review and discuss our recent efforts on transmission of 400+ Gbit/s POLMUX-OFDM with coherent detection. Spectrum efficiency can be improved with the use of advanced DSP employed on high-order modulation formats.

ATH3C.4 • 17:30

Experimental Demonstration of 50 Gb/s PAM-4 Transmission Over 50-km SSMF Using 10-GHz DML, Taiping Ye¹, Jing Zhang¹, Juntao Dang¹, Yang Song¹, Xingwen Yi¹, Kun Qiu¹; ¹UESTC, China. We experimentally demonstrate a 50-Gb/s PAM-4 signal transmission over 50-km SSMF based on a cost-effective 10-GHz DML-based IM/DD system. With the changed Volterra Filter, the BER is below 3.8×10^{-3} .

Room: Han Yang, F2

ATH3D.3 • 17:00 **Invited**

Design of Coherent Receivers for Quantum Communication, Christian Schaeffer¹, Sebastian Kleis¹; ¹Helmut-Schmidt-Universität, Germany. We provide a review of currently investigated methods to apply coherent detection in the promising field of continuous variable quantum key distribution (CV-QKD). We motivate the use of machine learning techniques to improve the current state of the art.

ATH3D.4 • 17:30

Software-based Intradyne Detection for Optical High-speed Inter-satellite Links with M-PSK, Semjon Schaefer¹, Mark Gregory², Werner Rosenkranz¹; ¹Univ. of Kiel, Germany; ²TESAT Spacecom, Germany. We present experimental results for intradyne detection as an alternative for current homodyne systems in optical inter-satellite links. Our approach is based on digital frequency offset and phase noise compensation for more flexible coherent systems.

Room: Xian Tao, F3

ATH3E.2 • 17:00

Demonstration of Compact Flow-Switching Accelerator for Virtual Machines Communication in PON Enable Data Center Network, Yunxiang Fu^{1,2}, Rentao Gu^{1,2}, Shizong Zhang^{1,2}, Qi Tan^{1,2}, Yuefeng Ji^{1,2}; ¹Beijing Univ. of Posts and Telecommunications, China; ²Beijing Univ. of Technology, China. We demonstrate a flow-switching accelerator plugged into servers directly to accomplish low-latency data exchange between virtual machines for Passive-optical-network based data center network. The throughput reaches 32Gbps and latency varies from 389.0ns to 1230.6ns.

ATH3E.3 • 17:15

To Overcome the Scalability Limitation of Passive Optical Interconnects in Datacentres, Rui Lin^{3,1}, Krzysztof Szczerska⁴, Erik Agrell², Lena Wosinska¹, Ming Tang³, Jiajia Chen¹; ¹School of Information and Communication Technology, KTH Royal Inst. of Technology, Sweden; ²Department of Signals and System, Chalmers Univ. of Technology, Sweden; ³School of Optical and Electronic Information, Huazhong Univ. of Science and Technology, China; ⁴Department of Microtechnology and Nanoscience, Chalmers Univ. of Technology, Sweden. We propose to add optical amplifier(s) to passive optical interconnect (POI) at top-of-rack in datacentres and validate this approach by introducing impairment constraints into POIs design. It is shown that one amplifier can improve scalability by a factor of 16.

ATH3E.4 • 17:30

Virtual Optical Network Mapping in Flexible Bandwidth Optical Networks with Data Centers Interconnection, Bowen Chen¹, Xin Ye¹, Yinping Wu¹; ¹Soochow Univ., China. We develop a virtual optical network mapping algorithm with coordinated node and link mapping (CNLM) to reduce power consumption. Results show that CNLM greatly improves energy efficiency in flexible bandwidth optical networks with data centers interconnection.

ATH3A.3 • 17:30

Femtosecond mode-locked fiber laser with cylindrical vector beams using mode selective coupler, Teng Wang¹, Feng Wang¹, Fan Shi¹, Fufei Pang¹, Sujuan Huang¹, Tingyun Wang¹, Xianglong Zeng¹; ¹Shanghai Univ., China. We experimentally demonstrate a femtosecond passively mode-locked fiber laser with cylindrical vector beams using mode selective coupler, the generated 299-fs CVBs has a spectral width of 12.5 nm centered at 1566 nm.

Room: Wu Chang, F2

ATH3F.2 • 17:00

An optimization algorithm based characterization scheme for tunable semiconductor lasers, Quanan Chen¹, Gonghai Liu¹, Qiaoyin Lu¹, Weihua Guo¹; ¹Huazhong Univ. of S&T, China. An optimization algorithm based characterization scheme for tunable semiconductor lasers is proposed and demonstrated. Using modern optimization algorithms, we can get stable operating condition for tunable lasers at any frequency directly and efficiently.

ATH3F.3 • 17:15

High-brightness 95- μ m Broad-area 915nm Lasers with 29.4W COMD Power, Martin Hu¹; ¹RITS, China. COMD power upto 29.4W under long pulse duration of 1ms has been realized in a 915nm quantum-well laser with 95 μ m emitting width. We present the design, fabrication, characterization and failure analysis of such broad-area lasers.

ATH3F.4 • 17:30

Transparent wood as a novel material for non-cavity laser, Elena Vasileva¹, Sergei Popov¹, Ilya Sychugov¹, Lars Berglund², Yuanyuan Li²; ¹MF, ICT school, KTH, ICT school, Sweden; ²Fibre and Polymer Technology, CHE School, KTH, Sweden. In this work we have demonstrated conceptually new organic wood based laser. The laser action is supported by strong scattering due to structural properties of the host material (transparent wood) and can be characterized as quasi random lasing

Room: Han Kou, F2

ATH3G.2 • 17:00 **Invited**

Silicon Photonics for Entangled Photons, Shayan Mookherjee¹; ¹Univ. of California, San Diego, USA. Micro-chips using silicon photonics can generate entangled photons using low power at telecommunications wavelengths and at room temperature. With further development, such compact chips might replace traditional crystal-based or fiber-based bulky photon-generation sources.

Ath3G.3 • 17:30

Optical frequency comb generation based on the dual-mode square microlaser and nonlinear fibers, Hai-Zhong Weng¹, Yue-De Yang¹, Xiu-Wen Ma¹, Jin-Long Xiao¹, Fu-Li Wang¹, Yong-Zhen Huang¹; ¹Inst Semiconductor, CAS, China. We demonstrate the four-wave-mixing optical frequency comb generation by injecting the dual-wavelength square microlaser into nonlinear optical fiber. Using two-stage spectrum-spread technique, frequency comb with 50 nm range and 102 GHz repetition rate is achieved.

Room: Shi Yan, B1

ATH3H.2 • 17:00

Radio Frequency Transfer over 100 km Optical Fiber by a Passive Stabilization Scheme, Longqiang Yu¹, Rong Wang¹, Lin Lu¹, Yong Zhu¹, Baofu Zhang¹, Chuanxin Wu¹; ¹Coll Comm Engin, PLA Univ Sci & Tech, China. A radio frequency transfer system is developed to transfer 400 MHz frequency standard over 100 km optical fiber. The phase drift during the transmission is stabilized by a passive phase pre-compensation scheme.

ATH3H.3 • 17:15

Microwave Photonic Down-Conversion with Large Image Rejection Ratio Utilizing Digital Signal Processing, Peixuan Li¹, Xihua Zou¹, Wei Pan¹, Lianshan Yan¹; ¹Southwest Jiaotong Univ., China. A photonic microwave frequency down-conversion scheme with large image rejection ratio (IRR) is implemented. In experiments, the RF signal at 35.5 GHz is successfully down-converted to a 500-MHz one with an IRR beyond 60 dB.

ATH3H.4 • 17:30

Chirped Microwave Waveform Generation Using an Unbalanced Sagnac Loop, Qianyun Ling¹, Fangzheng Zhang¹, Ronghui Guo¹, Shilong Pan¹; ¹NUAA, China. A chirped microwave pulse generation scheme based on self-phase modulation effect in an unbalance Sagnac loop is proposed. The generation of chirped microwave pulses with a bandwidth as large as 23 GHz is experimentally demonstrated.

Room: Jing Men, B1

ATH3I.2 • 17:00 **Invited**

Point Defects and Chemical Stability of Novel Photovoltaic Semiconductors, Shiyong Chen¹; ¹East China Normal Univ., China. Using the first-principles calculations, we studied the point defects and secondary phases in a series of photovoltaic semiconductors including (Cu,Ag)₂ZnSn(S,Se)₄, CuSb(S,Se)₂, CsSnI₃ and CH₃NH₃PbI₃, and analyzed their influences on the photovoltaic performance and chemical stability.

ATH3I.3 • 17:30 **Invited**

Polymer-electrode-based Perovskite Solar Cells, Yinghua Zhou; ¹Huazhong University of Science and Technology, China. Abstract not available.

Room: Xiao Gan, B1

ATH3J.2 • 17:00 **Invited**

Deterministic laser nanomachining in glass, Yang Liao¹, Jielei Ni¹, Ya Cheng^{2,1}; ¹Shanghai Inst of Optics and Fine Mech, China; ²East China Normal Univ., China. We demonstrate fabrication of 3D nanostructures deeply buried inside glass in a controllable manner. In addition, we fabricate nanofluidic channels with a width of ~40 nm and use the fabricated nanochannels to perform single DNA molecule analysis.

ATH3J.3 • 17:30 **Invited**

Femtosecond Laser Filamentation for Combustion Diagnostics, Huailiang Xu¹; ¹Jilin Univ., China. We demonstrate that, when a femtosecond filament is formed in a combustion flame, clean fluorescence emissions from combustion intermediates can be obtained, showing the feasibility of femtosecond laser filamentation for combustion diagnostics.

Room: Xiang Yang, F3

ATH3K.2 • 17:00 **Invited**

Porphyrin Nanotechnology: Discovery, Clinical Translation and Beyond, Gang Zheng^{1,2}; ¹Department of Medical Biophysics, University of Toronto; ²Princess Margaret Cancer Centre, Canada. Porphyrin nanotechnology are simple yet intrinsically multifunctional nanoparticle platforms for cancer imaging and therapy. Here, the discovery and clinical translation, as well as the development of new porphyrin supramolecular assemblies beyond porphyrins will be discussed.

ATH3K.3 • 17:30

Local Field Enhancement Tuning of Horseshoe-Shaped Nanoparticles, Zhiyuan Du¹, Bin Hu¹; ¹Beijing Inst. of Technology, USA. A horseshoe-shaped nano-structure is studied by simulation, and enhanced local field is found. The structure is tunable by particle's geometry parameters. Such properties make the structure promising in biomedical and sensing applications.

Room: En SHI, F3

ATH3A.4 • 17:45

All-fiber laser generating orbital angular momentum beams based on a two-mode fiber long-period grating, Yunhe Zhao¹, Tianxing Wang¹, Chengbo Mou¹, Zhijun Yan², Yunqi Liu¹, Tingyun Wang¹; ¹Shanghai Univ., China; ²Huazhong Univ. of Science and Technology, China. We demonstrate an all-fiber laser generating orbital angular momentum (OAM) beams based on a two-mode fiber long-period grating. The experimental results confirm that the fiber laser can generate the L=±1 OAM beams successfully.

Room: Sui Zhou, F3

ATH3B.5 • 17:45

Gain Equalized Four Mode Groups Erbium Doped Fiber Amplifier with LP₀₁ Pump, Zhenzhen Zhang¹, Qi Mo², Cheng Guo¹, Ningbo Zhao¹, Cheng Du², Xiaoying Li¹; ¹Tianjin Univ., China; ²Fiberhome Telecommunication Technologies Co Ltd, China. Using an erbium doped fiber with the optimized doping profile, we experimentally demonstrate an EDFA, which supports four mode groups. The measured differential modal gain is about 1dB.

Room: Huang Shi, F2

ATH3C.5 • 17:45

10 Gb/s transmission of the 2-D incoherent OCDMA signals over 120 km with 32 users, Guorui Su¹, Tao Pu¹; ¹PLA Univ. of Science and Technology, China. In this paper, 32 users can be simultaneously transmitted over 120 km in a two-dimensional wavelength-hopping time-spreading OCDMA system as the bit rate is 10 Gb/s, which is proposed and experimental demonstrated.

Room: Han Yang, F2

ATH3D.5 • 17:45

Experimental Investigation of Inter-User Interference in Vehicular Visible Light Communication Systems, Xianqing Jin¹, Weijie Liu¹, Haifeng Luan¹, Yanfeng Mao¹, Runyao Yang¹, Zhengyuan Xu^{1,2}; ¹School of Information Science and Technology, Univ. of Science and Technology of China, China; ²Shenzhen Graduate School, Tsinghua Univ., China. Impact of interference lights on transmission performance of 25Mb/s OOK signals from an information light source is investigated over a vehicular visible light communication link using a commercial avalanche photodiode with a lens at the receiver.

Room: Xian Tao, F3

ATH3E.5 • 17:45

User Demands-Adaptive Dynamic Content Replacement in Elastic Optical Datacenter Networks, Tao Gao¹, Xin Li¹, Bingli Guo¹, Shan Yin¹, Haibin Huang¹, Yu Zhou¹, Yu Shang¹, Shanguo Huang¹; ¹Beijing Univ of Posts & Telecom, China. We study the problem of dynamic content replacement according to the distribution of the requests in elastic optical datacenter networks. An efficient dynamic content replacement scheme is proposed to minimize blocking probability and resource utilization.

18:30–21:30 **Welcome Reception & OSA 100th Anniversary Celebration**, Grand Ballroom (Han Kou, Wu Chang, and Han Yang), 2nd Floor, Shangri-La Hotel, Wuhan

Room: Wu Chang, F2

ATH3F.5 • 17:45

Optimization and Fabrication of High Power 1060 nm Single-mode DFB Lasers, Hao Wang¹, Zhai Teng¹, Shaoyang Tan¹, Ruikang Zhang¹, Lingjuan Zhao¹, Wei Wang¹, Dan Lu¹, chen ji¹; ¹*Inst. of Semiconductors, CAS, USA*. We report 1060-nm high power DFB lasers with single mode operation up to 300-mW in 2-mm cavity design, by systematically optimizing epitaxial design for low internal loss and a double-trench waveguide for lateral mode stability.

Room: Han Kou, F2

ATH3G.4 • 17:45

Linear and nonlinear characterization of silicon/silicon-rich nitride hybrid waveguides, Xiaoyan Wang^{1,2}, Xiaowei Guan², Shiming Gao¹, Leif K. Oxenløwe², Lars Frandsen²; ¹*Zhejiang Univ., China*; ²*Department of Photonics Engineering, Technical Univ. of Denmark, Denmark*. Silicon/silicon-rich nitride hybrid waveguides have been proposed and experimentally demonstrated. The waveguides were measured to have a linear loss of ~5.60 dB/cm and a nonlinear parameter of ~32.3 W⁻¹m⁻¹.

Room: Shi Yan, B1

Room: Jing Men, B1

Room: Xiao Gan, B1

Room: Xiang Yang, F3

ATH3K.4 • 17:45

Optical Beam Steering for Bio-sensing Application, Mahdad Mansouree¹, Leila Yousefi¹, Mohammadreza Kolahdouz Esfahani¹; ¹*Univ. of Tehran, Iran*. A new class of optical sensors is presented, and numerically analyzed. The proposed sensor is a phased array of nano-antennas whose beam direction rotates when reacting with biomaterials.

18:30–21:30 **Welcome Reception & OSA 100th Anniversary Celebration**, Grand Ballroom (Han Kou, Wu Chang, and Han Yang), 2nd Floor, Shangri-La Hotel, Wuhan

ACP 2016 — Friday, 4 November

Room: En SHI, F3

Room: Sui Zhou, F3

Room: Huang Shi, F2

Room: Han Yang, F2

Room: Xian Tao, F3

08:00–18:00 Registration, Public area face to the escalator, 2nd Floor, Shangri-La Hotel, Wuhan

08:30–10:30

AF1A • OTDR Technology and Optical Applications

Presider: Misha Sumetsky, Aston Univ., UK

08:30–10:30

AF1B • Sensors and Biosensing

Presider: Libo Yuan; Harbin Engineering Univ., China

08:30–10:30

AF1C • Short-Reach Transmission & Access Networking I

Presider: Kangping Zhong; The Hong Kong Polytechnic Univ., China

08:30–10:30

AF1D • SDM & OAM Transmission II

Presider: Yves Jaouen; Telecom ParisTech, France

08:30–10:30

AF1E • Fiber-wireless Convergence Networks I

Presider: Nan Hua, Tsinghua Univ., China

AF1A.1 • 08:30 **Invited**

Chirped-pulse Phase-sensitive Optical Time Domain Reflectometry, Miguel Gonzalez Herraes¹, Andres Garcia-Ruiz¹, Pedro Corredera², Juan Pastor-Graells¹, Maria R. Fernandez-Ruiz¹, Hugo F. Martins³, Sonia Martin-Lopez¹; ¹Universidad de Alcala, Spain; ²Consejo Superior de Investigaciones Cientificas (CSIC), Spain; ³Research, FOCUS S. L., Spain. We review our recent work on chirped-pulse phase-sensitive optical time-domain reflectometry along optical fibers and its application in the measurement of true nanostrain variations in the kHz frequency range over lengths up to 20 km.

AF1B.1 • 08:30 **Invited**

Optical microfiber mode interferometer chemical and biological sensors, Bai-Ou Guan¹, Li-Peng Sun¹, Yunyun Huang¹; ¹Inst. of Photonics Technology, Jinan Univ., China. In this paper, the basic principles and characteristics of optical microfiber mode interferometer are introduced, and the recent progress in their applications as chemical and biological sensors are reviewed.

AF1C.1 • 08:30

Multi-Dimensional Coded PAM4 Modulation for TDM-PON based on 10G Optical Devices, Yan Fu¹, Kuo Zhang¹, Hua M. Bi^{1,2}, Weisheng Hu¹; ¹State Key Laboratory of Advanced Optical Communication Systems and Networks, Shanghai Jiao Tong Univ., China; ²College of Communication Engineering, Hangzhou Dianzi Univ., China. We demonstrate an alternative approach of 12.5 GBaud 2D coded PAM4 for TDM-PON with 10 GHz DML and 10 GHz PIN-TIA. Compared with PAM4, 2D coded PAM4 shows superiority in power budget with low complexity.

AF1C.2 • 08:45

Robust Single Polarization Coherent Transceiver Using DGD Pre-distortion for Optical Access Networks, Md Saifuddin Faruk¹, Hadrien Louchet², Seb J. Savory¹; ¹Engineering Department, Univ. of Cambridge, UK; ²VPIphotonics GmbH, Germany. DGD pre-distortion implements a polarization time code enabling a single polarization coherent transceiver to recover the signal for all polarization states. Using a DFE the maximum polarization dependent sensitivity variation is 1.9/3.0dB for BPSK/QPSK respectively.

AF1D.1 • 08:30

Experimental Demonstration of Dense Fractional Orbital Angular Momentum (OAM) Multiplexing with a Channel Spacing of 0.2 Assisted by MIMO Equalization, Andong Wang¹, Jian Wang¹, Long Zhu¹, Jun Liu¹; ¹Wuhan National Lab for Optoelectronics, China. We report fractional orbital angular momentum (OAM) dense mode-division multiplexing (DMDM) assisted by 2X2 MIMO equalization in free-space optical communications. Fractional OAM multiplexing communications even with a small OAM channel spacing of 0.2 are demonstrated in the experiment.

AF1D.2 • 08:45

Time-Dependent Inter-Core Crosstalk Between Multiple Cores of a Homogeneous Multi-Core Fiber, Georg Rademacher¹, Benjamin J. Puttnam¹, Ruben S. Luis¹, Yoshinari Awaji¹, Naoya Wada¹; ¹National Inst of Information & Comm Tech, Japan. We present numerical simulations and experimental validation of the time-dependent crosstalk originating from multiple neighboring cores in a homogeneous multi-core fiber. We find that the time-fluctuation is strongly enhanced by increasing the number of interacting cores.

AF1E.1 • 08:30 **Invited**

Joint Planning of Small Cells and Optical Transport Deployment in Heterogeneous Mobile Networks, Diego Cardoso¹, Matteo Fiorani², Lena Wosinska², Paolo Monti²; ¹Universidade Federal do Par , Brazil; ²KTH Royal Inst. of Technology, Sweden. We investigate how to reduce the deployment cost of heterogeneous mobile networks by joint dimensioning small cells and optical transport resources. The proposed heuristic is able to save 24% of total network deployment cost.

ACP 2016 — Friday, 4 November

Room: Wu Chang, F2

Room: Han Kou, F2

Room: Shi Yan, B1

Room: Jing Men, B1

Room: Xiao Gan, B1

Room: Xiang Yang, F3

08:00–18:00 Registration, Public area face to the escalator, 2nd Floor, Shangri-La Hotel, Wuhan

08:30–10:30

AF1F • Laser Technology

Presider: Weihua Guo,
Huazhong Univ. of Science &
Tech, China.

08:30–10:30

**AF1G • Spatial Multiplexing
Devices**

Presider: Daoxin Dai; Zhejiang
Univ., China

08:30–10:30

**AF1H • Microwave Photonic
Signal Processing**

Presider: Jianji Dong;
Wuhan National Lab for
Optoelectronics, China

08:30–10:30

**AF1I • New Concepts for
Solar Energy Conversion**

Presider: Andriy Zakutayev;
Natal Renewable Energy
Laboratory, USA

08:30–10:30

**AF1J • Novel Optical
Approaches for Data Storage**

Presider: Hao Ruan; Shanghai
Institute of Optics and Fine
Mechanics, China

08:30–10:30

**AF1K • Therapeutical
Methods**

Presider: Katarina Svanberg;
Lund Laser Centre, Sweden

AF1F.1 • 08:30 Invited

Vertical Cavity Surface Emitting Lasers with Subwavelength High Index Contrast Surface Grating Reflectors, James Lott^{1,2}, M. GebSKI^{1,2}, P. Moser¹, T. Czynszanowski²; ¹Technische Universität Berlin, Institut für Festkörperphysik and Zentrum für Nanophotonik, Germany; ²Lodz Univ. of Technology, Inst. of Physics, Photonics Group, Poland. We present vertical cavity surface emitting lasers (VCSELs) with reduced physical dimensions for applications in chip-to-chip and on-chip optical interconnects. We compare and contrast computer optical simulations of various VCSEL designs that employ reflectors composed of combinations of monolithic subwavelength high refractive index contrast surface gratings (MHCGs) and semiconductor or dielectric distributed Bragg reflectors (DBRs). We experimentally demonstrate VCSELs with combination MHCG and DBR reflectors and analyze the potential of these low dimensional VCSELs for application in photonic integrated circuits.

AF1G.1 • 08:30 Invited

Silicon photonics for multicore fiber communication, Yunhong Ding¹, Valerija Kamchevska¹, Kjeld Dalgaard¹, Davide Bacco¹, Karsten Rottwitt¹, Hao Hu¹, Michael Galili¹, Toshio Morioka¹, Leif K. Oxenløwe¹; ¹DTU Fotonik, Technical Univ. of Denmark, Denmark. We review our recent work on silicon photonics for multicore fiber communication, including multicore fiber fan-in/fan-out, multicore fiber switches towards reconfigurable optical add/drop multiplexers. We also present multicore fiber based quantum communication using silicon devices.

AF1H.1 • 08:30 Invited

Waveguide Mesh Inspired Integrated Microwave Photonics, Jose Capmany¹, Daniel Perez¹, Ivana Gasulla¹; ¹Universidad Politecnica de Valencia, Spain. We introduce the concept of universal reconfigurable microwave photonic processor inspired on integrated waveguide meshes as opposed to the current application specific paradigm. We then explore the specific use of the hexagonal and square mesh topologies for the implementation of versatile and programmable optical cores for MWP processors.

AF1I.1 • 08:30 Invited

Photonics Applications of Zinc Oxide, David Rogers¹; ¹Nanovation, France. Recently there is a surge in the research into ZnO-based materials/devices. This talk will overview recent advances with regards to photonics applications of ZnO using illustrations from the work of Nanovation.

AF1J.1 • 08:30 Invited

Ultra-compact femtosecond laser for next generation optical storage, Xiangdong Cao^{1,2}; ¹Wuhan Hongtuo new Technology limited, China; ²Wuhan National Lab of Optoelectronics, China. Femtosecond lasers have become a very promising technology for optical storage. Most recent progress of femtosecond laser based optical storage will be summarized, practical challenges such as form factor, cost and reliability will be discussed.

AF1K.1 • 08:30 Invited

Emerging strategies for enhanced photodynamic therapy, Buhong Li¹; ¹Fujian Normal Univ., China. Photodynamic therapy (PDT) is a treatment modality that utilizes light to activate photosensitizer (PS) to destroy malignant and nonmalignant diseases. We present the emerging strategies, including synergistic therapeutics and the utilization of multifunctional nano-based PSs for enhanced PDT, and the future perspectives of PDT will be discussed.

Room: En SHI, F3

AF1A.2 • 09:00 **Invited**

Title to be Determined, Xue-Guang Qiao¹; ¹Northwest Univ., USA. Abstract not available.

Room: Sui Zhou, F3

AF1B.2 • 09:00 **Invited**

Recent Progress in Ultrahigh Resolution Fiber-optic Strain Sensors; Zuyuan He¹, Qingwen Liu¹, Jiageng Chen¹; ¹State Key Laboratory of Advanced Optical Communication Systems and Networks, Shanghai Jiao Tong University, China. Recent developments in ultrahigh resolution fiber-optic strain sensors for geophysical applications are reviewed, including a high-sampling-rate sensor, a time-division-multiplexed sensor array, and simultaneous measurements of strain and temperature by using a fiber Bragg grating.

Room: Huang Shi, F2

AF1C.3 • 09:00 **Invited**

Reinventing Optical Direct Modulation by Frequency Chirp, Di Che¹, Feng Yuan¹, Qi Yang², Hamid Khodakarami¹, Yifei Wang¹, Jian Fang¹, William Shieh¹; ¹Univ. of Melbourne, Australia; ²State Key Lab of Optical Communication Technologies and Networks, Wuhan Research Inst. of Post and Telecom, China. Frequency chirp used to be a transmission barrier for optical direct modulation (DM) systems. We reinvent DM by treating the chirp as complex modulation, which significantly increases the OSNR sensitivity of DM based coherent systems.

Room: Han Yang, F2

AF1D.3 • 09:00 **Invited**

Ultra-high Capacity Transmission Based on Ultra-dense SDM/WDM Techniques, Koji Igarashi^{1,2}, Takehiro Tsuritani¹, Itsuro Morita¹; ¹KDDI Research, Inc., Japan; ²Osaka University, Japan. We review 2.05 Pbit/s ultra-dense SDM transmission experiments over 9.8-km six-mode nineteen-core fibers with the help of ultra-dense Super-Nyquist WDM technique in the full C band. In this demonstration, the highest aggregate spectral efficiency of 456 bit/s/Hz was achieved.

Room: Xian Tao, F3

AF1E.2 • 09:00

Game-Theoretic Distributed Algorithm for Virtual TDM-PON Formulation to Realize Adaptive Data Transmission in C-RANs, Wei Lu¹, Lipei Liang¹, Zuqing Zhu¹; ¹Univ of Science and Technology of China, USA. We study the problem of building virtual base stations (vBS) adaptively in the TWDM-PON-based C-RAN, and developed a distributed algorithm based on the game-theoretic approach to formulate virtual TDM-PONs. We prove the existence of Nash Equilibrium (NE) points in the game and verify that the proposed algorithm can converge to an NE point quickly.

AF1E.3 • 09:15

Multi-FSR AWGR assisted uplink load aggregation in fronthaul with parallel signal detection, Haiyun Xin¹, Kuo Zhang¹, Hao He¹, Weisheng Hu¹; ¹Shanghai Jiao Tong Univ., China. We proposed an uplink load aggregation scheme for fronthaul based on Multi-FSR AWGR and parallel uplink signal detection, in which receiver can serve one or multiple cell sites according to different traffic demands to save energy.

AF1E.4 • 09:30

Minimum-Cut Graph based Wavelength Reconfiguration Scheme for CoMP in Cloud Radio and Optical Access Networks, Songhao Jia¹, Jiawei Zhang¹, Hui li¹, Rentao Gu¹, Yuefeng Ji¹; ¹Beijing Univ. of Posts and Telecomm, China. We propose a Minimum-Cut Graph based wavelength reconfiguration scheme in an Optical-enabled fronthaul to improve coordinated multipoint (CoMP) performance of cloud radio access networks. Simulation results show that efficient CoMP performance can be achieved.

AF1A.3 • 09:30

Mode Field Diameter Measurement of Two-mode Fiber Using Conventional OTDR, Masaharu Ohashi¹, Yasuhiro Tsutsumi¹, Yuji Miyoshi¹, Hirokazu Kubota¹; ¹Osaka Prefecture Univ., Japan. We demonstrate that the mode field diameter of a two-mode fiber can be measured within a relative error of less than 5% using a conventional OTDR when the mode coupling loss between modes is not considered.

AF1B.3 • 09:30

A Novel FBG-Based Sensor System for the Transmission Line Icing On-line Monitor, Zhiguo Li¹, Zhiguo Zhang¹, Luming Li²; ¹BUPT, China; ²Jiangxi Electric Power Company, China. A novel fiber-optic-based sensor device is presented for measurement of transmission line icing-thickness. The preliminary experiments confirm this device has resolved the temperature-cross sensitivity and achieved higher precision of icing monitor.

AF1C.4 • 09:30

Experiment Demonstration of Optical Fronthaul Transmission System based on Power Division Multiplexing for Future 5G Scenarios, Longsheng Li¹, Meihua Bi^{1,2}, Weikang Jia¹, Weisheng Hu¹; ¹State Key Laboratory of Advanced Optical Communication Systems and Networks, Shanghai Jiao Tong Univ., China; ²College of Communication Engineering, Hangzhou Dianzi Univ., China. In this letter, we propose an analog RoF fronthaul scheme based on power division multiplexing for the purpose of enlarging the massive terminal devices access and transmission capacity for future 5G mobile system. By experiment, transmission of 20MHz bandwidth PDM-OFDM signal is verified in BtB and 20-km SSMF cases.

AF1D.4 • 09:30

Experimental Realization of Multi-granularity Quantum Switch Node, Junjian lan¹; ¹School of Information and Telecommunication Engineering, Beijing Univ. of Posts and Telecommunications, China. We propose a novel multi-granularity quantum switch node architecture aiming at enhancing the flexibility and reducing the size of optical cross-connect in Quantum networks. With acceptable attenuation costs, we exhibit stable and efficient operation for 24 hours. The result shows that the proposed architecture has great practical value.

Room: Wu Chang, F2

AF1F.2 • 09:00

Single-transverse-mode unidirectional emission circular-side hexagonal resonator microlaser, Zhi-Xiong Xiao^{1,2}, ¹*Inst Semiconductor, CAS, USA*; ²*semiconductor, China*. A circular-side hexagonal microresonator with an output waveguide is proposed for realizing single-transverse-mode microlaser with unidirectional emission. Single-transverse-mode lasing with a threshold current of 2mA and side-mode-suppression ratios of more than 36dB is demonstrated.

AF1F.3 • 09:15

Hybrid square-rectangular laser for mode Q-factor control and single mode operation, Xiu-Wen Ma¹, Yue-De Yang¹, Hai-Zhong Weng¹, Zhi-Xiong Xiao¹, Jin-Long Xiao¹, Yong-Zhen Huang¹; ¹*Inst Semiconductor, CAS, China*. Hybrid square-rectangular lasers capable of mode control are proposed and fabricated. Single mode and unidirectional emission operation are obtained with a side-mode suppression-ratio up to 46 dB and single-mode-fiber coupling loss of 3.2 dB.

AF1F.4 • 09:30

Generation of Accelerating Light Beams Based on Integrated Photonic Approaches, Yuanhui Wen¹, Yujie Chen¹, Yanfeng Zhang¹, Zengkai Shao¹, Guoxuan Zhu¹, Pengfei Xu¹, Yi Wang¹, Lin Liu¹, Chunchuan Yang¹, Lidan Zhou¹, Hui Chen¹, Siyuan Yu¹; ¹*Sun Yat-sen Univ., China*. An experimental scheme is proposed and demonstrated for the generation of accelerating beams by fabricating a quartz plate capable of realizing both phase and amplitude modulation, exemplified by the generation of a sinusoidal beam with multiple bending.

Room: Han Kou, F2

AF1G.2 • 09:00

Wide-Passband PLC-Based Two Mode Demultiplexer, Hirokazu Kubota¹, Shota Yamamura¹, Yuji Miyoshi¹, Masaharu Ohashi¹; ¹*Osaka Prefecture Univ., Japan*. We propose wide-passband two-mode demultiplexer by cascading demultiplexers of different center wavelength and numerically investigate wavelength dependence of its mode separation property. This design permits passband design with large fabrication margin of PLC mode demultiplexers.

AF1G.3 • 09:15

Mode Conversion with Vertical Polymer-Waveguide Directional Coupler, Fukun Wei², Kaixin Chen², Kin S. Chiang^{2,1}; ¹*City Univ. of Hong Kong, Hong Kong*; ²*Univ. of Electronic Science and Technology of China, China*. We design vertical directional couplers for conversion between the fundamental mode and various high-order modes. An experimental LP₀₁-LP_{21a} mode converter fabricated with polymer waveguides shows a maximum coupling efficiency of 98.7% at 1550 nm.

AF1G.4 • 09:30

Efficient edge coupler for higher order mode fiber-to-chip coupling, Yaxiao Lai^{1,2}, Yu Yu¹, Songnian Fu¹, Perry Ping Shum², Xinliang Zhang¹; ¹*Wuhan National Laboratory for Optoelectronics & School of Optical and Electronic Information, Huazhong Univ. of Science and Technology, China*; ²*School of Electrical and Electronics Engineering, Nanyang Technological Univ., Singapore*. An edge coupler composed of two tapered waveguides and a Y-branch for LP₁₁-TE₁ mode coupling and mapping is proposed on silicon-on-insulator platform. An average 3 dB coupling loss can be acquired within 100 nm bandwidth.

Room: Shi Yan, B1

AF1H.2 • 09:00

Space-Division-Multiplexed Transmission of IEEE 802.11ac-Compliant 6×6 WLAN Signals over 2-km 7-core Fiber, Yi Lei¹, Jianqiang Li¹, Yuting Fan¹, Ming Tang², Feifei Yin¹, Yitang Dai¹, Kun Xu¹, Yuefeng Ji¹; ¹*Beijing Univ of Posts & Telecom, China*; ²*Huazhong Univ. of Science and Technology, China*. Transmission of IEEE 802.11ac-compliant 6-spatial-stream wireless signals over a single 2-km 7-core fiber is experimentally demonstrated. The impacts of inter-core crosstalk on channel matrix and link dynamic range were evaluated by comparing performances with SMFs.

AF1H.3 • 09:15

Instantaneous Frequency Measurement Using Optical Pump Frequency Based Resonance Shift, Ravi Pant¹, Siva Shakthi¹, Akhileshwar Mishra¹; ¹*IISER Trivandrum, India*. We exploit the pump frequency dependence of the Brillouin shift to demonstrate wide-bandwidth instantaneous frequency measurement (IFM). The proposed scheme has the potential to realize wide band (>50 GHz) IFM system.

AF1H.4 • 09:30

Photonic Generation of Linearly Chirped Microwave Waveform Using a Distributed Bragg Reflector Laser, Lu Guo¹, Ruikang Zhang¹, Dan Lu¹, Lingjuan Zhao¹, Wei Wang¹; ¹*The Inst. of Semiconductors, China*. A linearly chirped microwave waveform with a pulse duration of 1- μ s, bandwidth of 17.5-GHz and time-bandwidth product of 1.75×10^4 is optically realized using a distributed Bragg reflector laser and heterodyne-beating technology.

Room: Jing Men, B1

AF1I.2 • 09:00

Invited Plasmonic Hot Electrons Photovoltaics via Spontaneous Templating, Assaf Y. Anderson¹, Hannah-Noa Barad¹, Maayan Priel¹, David Keller¹, Elana Rothstein¹, Adam Ginsburg¹, Zhi Yan¹, Kevin Rietwyk¹, Koushik Majhi¹, Arie Zaban¹; ¹*Chemistry, Bar Ilan Univ., Israel*. Combinatorial quest for cost effective - environment friendly all oxide photovoltaics raised several outliers that didn't match the anticipated p-n junction mechanisms. Further investigation showed that spontaneous nanostructures forming at the back contacts are the source of Surface Plasmon Resonance, causing Hot Electron injection and PV activity.

AF1I.3 • 09:30

Induced Potential in Porous Carbon Films through Water Vapor Adsorption, Tianpeng Ding¹, Kang Liu¹, Peihua Yang¹, Jun Zhou¹; ¹*Huazhong Univ. of Science and Techn, China*. We report that sustainable electrical potential of tens of millivolts can be induced by water vapor adsorption on a piece of porous carbon film that has two sides with different functional group contents.

Room: Xiao Gan, B1

AF1J.2 • 09:00

Invited Multi-level data write/read by phase-locked collinear holography, Hideyoshi Horimai¹; ¹*Toyoashi Univ. of Technology, Japan*. Phase-locked collinear holography was proposed. Each pixel data contains phase-modulated multi-level information. Using the 32-levels phase data, i.e. 5 bits of phase information contained in one pixel was written and retrieved.

AF1J.3 • 09:30

Invited Nanophotonic techniques toward big data storage, Xiangping Li¹; ¹*Jinan Univ., China*. The emerging nanophotonics has enabled multi-dimensional multiplexed storage as well as super-resolution recording toward ultrahigh capacity and ultrahigh throughput. In this paper, we report on the recent progress of nanophotonic techniques toward big data storage.

Room: Xiang Yang, F3

AF1K.2 • 09:00

Tumour micro-environment activatable self-assembled DNA hybrids for pH and redox dual-responsive chemotherapy/PDT treatment of Hepatocellular carcinoma, Da Zhang¹, Ming Wu¹, Xiaolong Liu¹; ¹*Mengchao Hepatobiliary Hospital of Fujia, China*. We employ smart self-assembled "OFF-ON" DNA hybrids that respond to tumour micro-environment stimuli for cancer cell specific real-time fluorescence imaging, tumour-specific photodynamic therapy and chemotherapy in hepatocellular carcinoma.

AF1K.3 • 09:15

Targeting imaging of integrin α v β 3 positive tumor cells using Rhodamine B-labeled peptide in vitro, Yueqing Gu¹, Zhao Menglu¹, Han Zhihao¹; ¹*China Pharmaceutical Univ., China*. We designed a novel peptide which can bind with integrin α v β 3 receptors and then detected the binding capacity to integrin α v β 3-positive cells by flow cytometry and confocal microscopy imaging.

AF1K.4 • 09:30

Photo-controlled NO release from nitrosylruthenium complexes and their potential biomedical applications, Liqun Xu¹, Wenming Wang¹, Zhiou Ma¹, Hongfei Wang¹; ¹*Inst. of Molecular Science, Shanxi Univ., China*. Photo induced NO-release and cytotoxic activities of three [(CH₃)₂N][RuCl₃(QN)(NO)] complexes with different ligands (QN = qn, 2mqn and 2cqn) were investigated. Real-time NO release was proved through EPR spectroscopy. The qn and 2cqn complexes showed effective photocytotoxic activity.

Room: En Shi, F3

AF1A.4 • 09:45

Dynamic Strain Sensing by using Phase-Gain Ratio in Slope-Assisted Brillouin Optical Time Domain Analysis, Guangyao Yang¹, Xinyu Fan¹, Bing Wang¹, Qingwen Liu¹, Zuyuan He¹; ¹State Key Laboratory of Advanced Optical Communication Systems and Networks, Shanghai Jiao Tong Univ., China. We introduce the phase-gain ratio into slope-assisted BOTDA to enhance the performance of dynamic strain measurement. A linear slope is achieved with a doubled dynamic range of strain measurement, and the pump-power-dependency is also suppressed.

AF1A.5 • 10:00

Spatial Resolution Enhancement in Optical Coherence Domain Reflectometry Using High-order FWM Process, Bin Wang¹, Xinyu Fan¹, Qingwen Liu¹, Jiangbing Du¹, Zuyuan He¹; ¹Shanghai Jiao Tong Univ., China. We demonstrate a high spatial resolution optical coherence domain reflectometry with synthesis of coherence function by using high-order degenerated four-wave-mixing process. A 1.9-mm spatial resolution is realized with the second-order idler as a light source.

AF1A.6 • 10:15

A New Coherent OTDR by Timed Random Frequency Hopping and Logarithmic Mean of Signal Power, Lidong Lu¹, Xiaoyan Sun¹, Binglin Li¹; ¹Global Energy Interconnection Research Inst., China. A scheme using timed random frequency hopping and signal logarithmic mean is proposed in an OTDR system. The system is of high efficiency and the fading noise is just 1/5 of that without using it.

Room: Sui Zhou, F3

AF1B.4 • 09:45

Fiber Optic Current Sensor with High Sensitivity Based on Recirculating-loop Configuration Using Standard SMF, Yiping LIU¹, Lin Ma¹, Jiangbing Du¹, Yemeng Tao¹, Wenjia Zhang¹, Zuyuan He¹; ¹Shanghai Jiao Tong Univ., USA. We propose a novel fiber optic current sensor with high sensitivity and reconfigurable operation capability based on recirculating-loop configuration using standard SMF. We achieved a sensitivity as high as 42.6 degrees per ampere.

AF1B.5 • 10:00

Extraordinary sensitivity in optical microfiber based refractive index sensors near the turning point of turning point of effective group index difference, Kaiwei Li¹, Ting Zhang¹, Guigen Liu², Nan Zhang¹, Mengying Zhang¹, Wei Lei¹; ¹Nanyang Technological Univ., Singapore; ²Department of Electrical and Computer Engineering, Univ. of Nebraska-Lincoln, USA. We show that optical microfiber coupler sensors operating near the dispersion turning point can achieve ultrahigh refractive index (RI) sensitivity at RI around 1.33. It opens up new opportunities to ultra-sensitive biochemical sensing.

AF1B.6 • 10:15

Multiplexing Fiber Optic Interferometer Sensors based on Multiband Microwave Photonic Filter, Xu Zuowei¹, Xuewen Shu¹; ¹Wuhan National Laboratory for Optoelectronics & School of Optical and Electronic Information, Huazhong Univ. of Science and Technology, China. A multiplexed fiber optic interferometer sensor proposal based on non-periodic multiband microwave photonic filter is proposed and experimentally demonstrated. By tracing the centre frequency of each pass band, the temperature of each sensor can be intuitively deduced.

Room: Huang Shi, F2

AF1C.5 • 09:45

Experimental Demonstration of 100-Gbps Optical PAM-4 Transmission over 4-km SSMF Using Wiener Filter, Yue You¹, Jiangbing Du¹, Lin Sun¹, Chenyu Liang¹, Fan Yang¹, Wenjia Zhang¹, Zuyuan He¹; ¹Shanghai Jiao Tong Univ., China. We experimentally demonstrate a 100-Gbps optically-uncompensated PAM-4 transmission over 4-km SSMF at 1.55-um by using Wiener filter. The performance of the adaptive filters, including LMS and Wiener filter, are both analysed and compared.

AF1C.6 • 10:00

25Gbps and 40Gbps Symmetric PON Using Legacy 10G-Class Optics and Centralized ADC/DAC & DSP, Chenhui YE¹, Xiaofeng Hu¹, Kaibin Zhang¹; ¹Nokia Bell Labs, China. A DSP enabled NG-PON scheme has been demonstrated carrying symmetric downlink/uplink 25Gbps PAM4/DB-NRZ and 40Gbps PAM8/DB-PAM4 using 10GHz optics, costly devices like ADC/DAC/DSP have all been centralized in OLT with ONUs sustaining simple and compact.

AF1C.7 • 10:15

56-Gb/s PAM-4 Transmission Over 5-km SSMF Using Photonic Digital-to-analog Converter (PDAC) Based on Polarization Multiplexing, Chenyu Liang¹, Wenjia Zhang¹, Lin Sun¹, Ji-angbing Du¹, Lin Ma¹, Zuyuan He¹; ¹Shanghai Jiaotong Univ., China. We experimentally demonstrate a 56-Gb/s PAM-4 transmission over 5-km SSMF using photonic digital-to-analog converter based on polarization multiplexing. The performance of optical PAM-4 generator is analyzed and compared with electrical counterpart.

Room: Han Yang, F2

AF1D.5 • 09:45

Distribution of Entangled Photon Pairs over Few Mode Fibers, Liang Cui¹, Jie Su¹, Xiaoying Li¹; ¹Tianjin Univ., China. We demonstrate that after distributing in few mode fibers, the measured visibility of entanglement depends on the degree of freedom of entanglement and the spatial mode of photon pairs in transmission fibers.

AF1D.6 • 10:00 **Invited**

High-Capacity Transmission in Multi-core Fiber Systems Using Advanced Modulation Formats, Benjamin J. Puttnam¹; ¹National Inst. of Communication Technology, Denmark. We discuss key components for multi Petabit/second transmission using homogeneous, single-mode, multi-core fibers with a focus on the use advanced modulation formats and the potential for enhanced efficiency from spatial-super-channel transmission.

Room: Xian Tao, F3

AF1E.5 • 09:45

Hybrid Fiber and Microwave Restoration for Enhancing Availability of Fiber-Wireless Integrated Networks, Hao Chen¹, Longfei Li¹, Yongcheng Li¹, Yao Zhang¹, Sanjay Bose², Gangxiang Shen¹; ¹Soochow Univ., China; ²IIT Guwahati, India. Availability is key to the FiWi access network. To enhance this parameter, we present a flow-splitting restoration strategy, and based on this, develop an LP optimization model to maximize mobile user bandwidth availability. Simulations show that the proposed strategy is effective for the FiWi network under different failure scenarios.

AF1E.6 • 10:00

Dynamic User-Centric Resource Co-Allocation for Future Mobile Communication Networks, Yongtai Jin^{2,1}, Nan Hua^{2,1}, Xiaoping Zheng^{2,1}; ¹Department of Electronic Engineering, Tsinghua Univ., China; ²Tsinghua National Laboratory for Information Science and Technology (TNList), China. We consider the dynamic optimization problem of wireless and wired backhaul/fronthaul resource co-allocation. Based on smart antenna techniques in C-RAN architecture, we propose a novel scheme to enhance the overall access bandwidth of the system.

AF1E.7 • 10:15

Demonstration of Hardware-offloaded and Flexible Flow Grooming for Network Slicing in Future Mobile Network, Qi Tan^{1,2}, Rentao Gu^{1,2}, Yunxiang Fu^{1,2}, Yaohua Yan¹, Yuefeng Ji¹, Hongbo Wang¹; ¹Beijing Univ. of Posts and Telecommunications, China; ²Beijing Univ. of Technology, China. We propose an efficient technical scheme to realize flexible flow grooming at the node of cloud server for network slicing, and experimentally demonstrate its rationality, whose best performance can reach more than 32 Gbps.

10:30–12:30 AF2A • Poster Session & Coffee Break & Exhibition, Public area, Basement, 2nd and 3rd Floor, Shangri-La Hotel, Wuhan

Room: Wu Chang, F2

AF1F.5 • 09:45
Deformed Microsquare Resonators for Dual-Transverse-Mode Lasing with Specified Wavelength Intervals, Heng Long¹, Xiu-Wen Ma², Mo Li¹, Yong-Zhen Huang²; ¹Microsystem & Terahertz Research Center, China Academy of Engineering Physics, China; ²Inst Semiconductor, CAS, USA. A deformed microsquare resonator is proposed and numerically investigated for realizing dual-transverse-mode lasing. A wide wavelength interval range from 0.06 nm to 2.40 nm is obtained by varying the deformation amplitude.

AF1F.6 • 10:00
Single-Mode Multiwavelength Semiconductor Laser with Equivalent Distributed Fabry-Pérot Structure, Jilin Zheng¹; ¹PLA Univ. of Science and Technology, Nanjing, China. A novel distributed Fabry-Pérot semiconductor laser is proposed to achieve single-mode multiwavelength lasing from a single resonant cavity. As a proof of principle, a laser emitting simultaneously 4 lines spaced by 0.82nm was demonstrated.

AF1F.7 • 10:15
Thermal Tunable Compact External Cavity Laser with Thermal Sensitivity Enhanced FBG, Li Zhang^{1,2}, Fang Wei¹, Guangwei Sun¹, Dijun Chen¹, Haiwen Cai¹, Ronghui Qu¹; ¹SIOM, USA; ²Univ. of Chinese Academy of Sciences, China. We demonstrated a compact thermal tunable ECL design with semiconductor gain chip and thermal sensitivity enhanced FBG. High thermal tuning velocity as 100pm/°C(12.5GHz/°C) is achieved, which is about 7 times larger than previous ECL design.

Room: Han Kou, F2

AF1G.5 • 09:45
Mode (De)multiplexer/Sorter Based on Polymer-Waveguide Asymmetric Y-junction, Jing Feng¹, Kaixin Chen¹, Jie Yun Wu¹, Ke Yu Ren¹, Kin S. Chiang²; ¹UESTC, China; ²EE, City Univ. of Hong Kong, China. We proposed design a polymer-waveguide two-mode mode-sorting asymmetric Y-junction for (de) multiplexing LP₀₁ and LP_{11a} modes. Our fabricated device shows the optimal demultiplexed (de)multiplexer in polymer waveguide experimentally cross talk of -22.2 dB at 1560 nm and the 10-dB bandwidth of ~40 nm.

AF1G.6 • 10:00
J-Rib Waveguide as a Mode-Division Demultiplexer, Jidefor A. Odoeze^{1,2}, Hossam M. H. Shalaby¹, Nawwar, M. Omnia¹; ¹EJUST, Egypt; ²Electronics Engineering, Univ. of Nigeria, Nsukka, Nigeria. A rib waveguide with unequal slab thicknesses, called J-rib waveguide, is proposed as a mode-division demultiplexer. 3D FDTD simulation of the proposed device is performed. Low insertion loss, low crosstalk, and wide bandwidth are achieved.

AF1G.7 • 10:15
Compact Mode-Division De(multiplexer) with Anti-Reflection Grating for Optical Interconnects, Omnia M. Nawwar¹, Hossam M. H. Shalaby¹, Ramesh Pokharel²; ¹Egypt-Japan Univ. of Science and Te, Egypt; ²Kyushu Univ., Japan. A bidirectional mode-division de(multiplexer) with anti-reflection grating is proposed. The proposed device can de(multiplex) 3 modes in a simple and compact way. Good insertion losses and crosstalks are achieved for the device.

Room: Shi Yan, B1

AF1H.5 • 09:45
Radio Frequency Stability Transmission over Fiber Link Based on Photonic Phase Shifter, Zhai Wensheng¹; ¹Beijing Univ. of Posts and Telecomm, China. We demonstrate radio frequency stability distribution over remote fiber using control loop. The experimental results implement 360° phase shift over 10 to 20 GHz with Allan deviation approximate 5.35×10⁻¹⁷ at average time of 1000 s.

AF1H.6 • 10:00
Withdrawn

AF1H.7 • 10:15
Photonic Multi-Pulse Position Modulation UWB Pulse Generation by Pre-coding and Optical Differentiating, Anlin Yi¹; ¹Southwest Jiaotong Univ., China. A photonic multi-pulse position modulation (multi-PPM) ultra-wideband (UWB) pulse generation scheme is proposed and demonstrated. By pre-coding and optical differentiating, multi-PPM positive

Room: Jing Men, B1

AF1I.4 • 09:45
Characterization and Analysis of Nanowire-based Metamaterial Absorber as Infrared Selective Emitters, Peiheng Zhou¹, Qi Chen¹, Song Hao¹, Nan Zhang¹, Jianliang Xie¹, Longjiang Deng¹; ¹Univ of Electronic Science & Tech China, China. Gold nanowires decorated with sphere tops and Y-branch ends were deposited in anodic alumina templates to achieve ultra-wideband absorption in middle infrared. Thermal radiation characteristics is discussed for thermal signature camouflage and radiation cooling.

AF1I.5 • 10:00
Optoelectronic and Thermodynamic Study of Solar Cells, Aixue Shang¹, Xiaofeng Li¹; ¹Soochow Univ., China. This paper reports a comprehensive simulation of photovoltaic devices with simultaneous consideration of fundamental physical phenomena including electromagnetic, electrical and thermal effects. Photon behaviors, carrier transport and heat generation/dissipation are addressed in detail.

AF1I.6 • 10:15
Luminescent Silicon Nanocrystals as Downconverters for Photovoltaic and Lighting Applications, Ilya Sychugov¹; ¹Materials and NanoPhysics, KTH - Royal Inst. of Technology, Sweden. Nanocrystals offer new functionalities for optoelectronics. Ensemble and single-dot measurements of chemically-synthesized silicon nanocrystals revealed high quantum yield, narrow homogeneous linewidth, and large Stokes shift, confirming application feasibility for these non-toxic and abundant material nanoparticles.

Room: Xiao Gan, B1

AF1J.4 • 10:00 **Invited**
Current Trends in Multi-Dimensional Optical Data Storage Technology, Jingyu Zhang¹, Austra Čerkauskaitė², Rokas Drevinskas², Aabid Patel², Martynas Beresna², Peter Kazansky²; ¹Qichang Optics Co., Ltd., China; ²Optoelectronics Research Centre, Univ. of Southampton, UK. Optical data storage, renowned for its low energy consumption features, is an ideal candidate for data archiving. The major challenge is the lack of appropriate combination of storage technology and medium possessing the advantages of both high capacity and long lifetime.

Room: Xiang Yang, F3

AF1K.5 • 09:45
Photoacoustic Therapy using Perfluorohexane-containing Nanoparticles, Junping Zhong¹, Sihua Yang¹, Da Xing¹; ¹MOE Key Laboratory of Laser Life Science & Inst. of Laser Life Science, College of Biophotonics, South China Normal Univ., China. Perfluorohexane (PFH) and gold nanorods (AuNRs) loaded nanoparticles (PAnP) were synthesized for photoacoustic therapy. Under pulsed laser irradiation, the PFH vaporization can facilitate bubble implosion and shockwave generation that induced apoptosis of cancer cells efficiently.

AF1K.6 • 10:00 **Invited**
Hyperspectral Imaging for Intraoperative Margin Assessment during Breast Cancer Surgery, Henricus J. Sterenborg^{2,1}, Esther Kho^{2,3}, Lisanne de Boer², K.K. Van de Vijver², Theo Ruers^{2,3}; ¹Biomedical Engineering and Physics, Academic Medical Centre, Netherlands; ²Surgery, Netherlands Cancer Inst., Netherlands; ³Twente Univ., Netherlands. An innovative approach to processing of hyperspectral images based on first derivative spectroscopy is proposed. The approach is evaluated on freshly excised resection specimen obtained from breast cancer surgeries. First results indicate an accuracy of 0.93.

10:30–12:30

AF2A • Poster Session

AF2A.1

Calibrating backplane aberration of a spatial light modulators using phase retrieval algorithm, Xiao Chen¹, Zhiguang Shi¹, Jicheng Li¹, Wei Liu¹; ¹ATR key laboratory, National Univ. of Defense Technology, China. We studied the aberration calibration of Spatial Light Modulators (SLMs) based on random-illumination-phase-retrieval. The setup of our method is simple, while with a better convergence. Simulation experiments showed its superiority to the state-of-art methods.

AF2A.2

A Blind Equalizer for PolMux 16/64QAM Optical Coherent Systems, Zhili Zhou², Yiju Zhan², Xiukai Ruan¹, Qibo Cai¹, Guihua Cui¹, Yanhua Tan¹, Guijun Zhu¹; ¹Wenzhou Univ., China; ²Sun Yat-Sen Univ., China. Propose a double decision-directed(double-DD) blind algorithm which combines the soft decision-directed(SDD) algorithm with the equalizer in variable step size decision-directed(VSS-DD) mode. By simulation in a PolMux-16QAM/64QAM coherent system, the double-DD algorithm outperforms existing blind equalizer.

AF2A.3

Microwave Photonic Phase Shifter Using Linear Chirped Fiber Bragg Grating and Optical Phase Modulator, Zhai Wensheng¹; ¹State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. A photonic phase shifter using linear chirped fiber Bragg grating and phase modulator is presented. The experimental results implement 360° phase shift with power variation less than 1.16 dB and phase deviation less than 1.3°.

AF2A.4

Investigation of pump noise transfer characteristics in degenerated four-wave mixing, Zhuo Wang¹, Baojian Wu¹, Feng Wen¹, Xingyu Zhou¹, Yong Geng¹, Kun Qiu¹; ¹Univ. of Electronic Science and Technology of China, China. The transfer characteristics of pump in-band and out-of-band noises to the signal in degenerated four-wave mixing are analyzed. The noise figure of a clock-pump fiber optical parametric amplifier is measured to be 4.3 dB.

AF2A.5

Design of all-optical fiber phase regenerators for MPSK signals, XinYue Zhang¹, Baojian Wu¹, Xingyu Zhou¹, Shanglong Jiang¹, Feng Wen¹, Kun Qiu¹; ¹UESTC, China. For the case of short fiber, the optimized initial pump power is inversely proportional to the fiber length corresponding to the best performance of phase fluctuation suppression. We design a 510m-long fiber 8PSK regenerator with the phase fluctuation suppression ratio of 4.5, and the symbol error rate can be reduced by two orders of magnitude.

AF2A.6

Analysis of photon flux distribution of type-2 SPDC for highly efficient entangled source adjustment, Wenbo Sun¹, Ziyi Wang¹, Heying Wang¹; ¹Tsinghua Univ., China. The photon flux distribution of signal light ring and intersecting points of light cones via type-2 SPDC is analyzed, finding that the emergent direction of frequency-degenerate photons deviates from the direction with maximum flux.

AF2A.7

Generation of Nth-order Orthogonal Hermite-Gaussian Waveforms Based on Frequency-to-time Mapping, Qidi Liu¹, Juanjuan Yan¹, Fengdan Xin¹, Ming Bai¹, Zheng Zheng¹; ¹Beihang Univ., China. Taking advantage of frequency-to-time mapping, a novel programmable technique for nth-order temporal differentiation of optical waveforms is proposed. Based on the scheme, the first-order to the fourth-order Hermite-Gaussian pulses are experimentally generated.

AF2A.8

Phase modulated self-mixing micron vibration measurement using Hilbert Transform, Yufeng Tao¹, Ming Wang¹, Wei Xia¹; ¹Nanjing Normal Univ., China. Self-mixing interferometer employs resonant phase modulator operating at 12MHz to non-contact measure micron ultrasonic vibration with accuracy better than $N/40$. Hilbert transform extracts phase-shift with automatic direction distinguishing. Experimental results are compared to LDV.

AF2A.9

A Novel Tunable Microwave Generation Based on Single-longitudinal-mode Dual-wavelength Fiber Laser Using a Sagnac Interferometer and FBG, Qiong Yu¹, Fei Wang¹, Jiagui Wu¹, Xin Zhang¹, Jun Gu¹, Youxi Lu¹, Huihui Xiao¹; ¹Chongqing Univ. of Technology, China. A novel tunable microwave generation based on single-longitudinal-mode (SLM) dual-wavelength fiber laser is experimentally demonstrated by using a Sagnac interferometer and FBG. The tunable microwave signal from 16.4 G to 26.2 G is successfully generated.

AF2A.10

Graphene-on-silicon nitride microring resonators with high modulation depth, Zeru Wu¹, Yujie Chen¹, Pengfei Xu¹, Zengkai Shao¹, Tianyou Zhang¹, Yanfeng Zhang¹, Lin Liu¹, Chunchuan Yang¹, Lidan Zhou¹, Hui Chen¹, Siyuan Yu¹; ¹Sun Yat-sen Univ., China. A graphene-on-SiNx microring resonator is studied. Propagation loss of 0.06 dB/ μ m and loss tunability of 0.04 dB/ μ m in a graphene-SiNx waveguide is enhanced through a 40- μ m-radius microring resonator, offering a high modulation depth of \sim 30 dB.

AF2A.11

Intermodulation distortion suppression for microwave photonic links incorporating bi-directional phase modulation, Tianwei Jiang¹, Dong S. Wang¹; ¹Beijing Univ of Posts & Telecom, China. Using bi-directional phase modulation, an efficient intermodulation distortion (IMD) suppression approach is applied on phase-modulation microwave photonic link (PM-MPL). IMD3 is reduced by 28.6 dB experimentally, compared with traditional single sideband PM-MPL.

AF2A.12

All Optical QPSK Regeneration based on a Modified Mach-Zehnder Interferometer Phase Sensitive Amplifier, Hongxiang Wang¹, Fengshuo Li², Yuefeng Ji¹; ¹Beijing Advanced Innovation Center for Future Internet Technology, Beijing Univ. of Technology, China; ²Beijing Univ Posts & Telecommunications, USA. A modified Mach-Zehnder interferometer phase sensitive amplifier (MZI-PSA) configuration is proposed and demonstrated. Simulation results show MZI-PSA can obtain higher gain, reduce BER to 8.58×10^{-6} , and reduce EVM to 18.63%, compared with the traditional FWM-PSA.

AF2A.13

Regeneration of Monochromatic Subwavelength Optical Focus by Phase Conjugation of Multiply Scattered Light, Jongchan Park¹, YongKeun Park¹; ¹KAIST, USA. We demonstrate the regeneration of subwavelength optical focus by far-field time-reversal of multiply scattered light. Monochromatic light from a subwavelength focus is scattered by random nanoparticles. The scattered field is phase-conjugated at the far-field region.

AF2A.14

Grouped Selected Mapping for PAPR Reduction in Optical OFDM Systems, Shaolin Yang¹, Yating Wu¹, Tao Wang¹, Yanzan Sun¹, Renrong Liu¹; ¹Shanghai Univ., China. In this paper we propose a grouped selected mapping (G-SLM) scheme for PAPR reduction in optical OFDM (O-OFDM) systems, which improves the PAPR reduction performance and decreases the overhead of side information.

AF2A.15

Ultrafast and large bandwidth spectrum analyzer based on microwave photonics and temporal magnification, Yuhua Duan¹, Haidong Zhou¹, Liao Chen¹, Chi Zhang¹, Xinliang Zhang¹; ¹Wuhan National Laboratory for Optoelectronics, Huazhong Univ. of Science and Technology, China. A parametric temporal magnification system is introduced to a microwave photonics based electrical spectrum analyzer with large bandwidth (over 20 GHz). This scheme helps to achieve finer spectral resolution, as well as \sim 100-MHz frame rate.

AF2A.16

Dynamic-Range Enhancement in Microwave Photonic Link Based on Single-Sideband Phase Modulation, Enming Xu¹, Mingchen Zhang¹, Peili Li¹, Zuxing Zhang¹; ¹NJUP, USA. Dynamic-range enhancement in microwave photonic link based on single sideband phase modulation is proposed. The simulated results show that the spurious-free dynamic range is improved by 22.9 dB.

AF2A.17

Theoretical and Experimental Demonstration of Orbital Angular Momentum (OAM) States Measurements of Vortex Beams with Annular Gratings, Shuang Zheng¹, Shuhui Li¹, Jian Wang¹; ¹Wuhan National Laboratory for Optoelectr, China. We present a simple and efficient scheme to measure OAM states (i.e. topological charge values) of vortex beams with annular gratings. By observing the diffraction patterns, we can detect high-order vortex beams with topological charge value as high as ± 10 .

AF2A.18

High Efficiency Wavelength Conversion Based on an SOA and Detuning Fano Filter, Zhuyang Huang¹, Tong Cao¹, Liao Chen¹, Xinliang Zhang¹; ¹Wuhan National Laboratory for Optoelectronics, China. An all-optical wavelength conversion using a semiconductor optical amplifier and a Fano filter is experimentally demonstrated. Due to the sharp falling characteristics of Fano filter, high efficiency non-inverted wavelength conversion is obtained with small detuning.

Poster Session, Public area, 2nd Floor, Shangri-La Hotel, Wuhan

AF2A.19

High Sensitivity and Accuracy Coherent Lidar Using Chirped Pulse Compression, Bin Zhao^{1,2}, Yuanjue Zhang¹, Hongwei Chen¹, Minghua Chen¹; ¹Tsinghua Univ., China; ²Southwest Inst. of Technical Physics, China. A coherent chirped lidar using pulse compression is demonstrated. The electrical field of transmitted laser pulse is chirp modulated and the received RF signal is compressed by matching filter. The sensitivity and accuracy are measured.

AF2A.20

Microwave Photonic Phase Shifter Using a Dual-Parallel Mach-Zehnder Modulator, Jinwang Qian¹, Xinlu Gao¹, Zhai Wensheng¹, Wenjing Xu¹, Mingyang Zhao¹, Mutong Xie¹, Mingzheng Lei¹, Shanguo Huang¹; ¹Beijing Univ. of Posts and Telecomm, China. A microwave photonic phase shifter using a dual-parallel Mach-Zehnder modulator is proposed. The experimental results implement continuous phase tuning range from -40 to 30 degree over 7 to 17 GHz microwave signal.

AF2A.21

Silicon based polarization sensitive filters for WDM-PDM demultiplexing, Jing Xu¹, Ji Zhang¹, Yanli Zhao¹; ¹Wuhan National Lab for Optoelectronics, China. An efficient polarization sensitive filter based on a slot-waveguide-based ring resonator (SRR) in silicon-on-insulator (SOI) has been designed. Combined with the ordinary microring resonator (MRR), they can be employed in the wavelength division and polarization division multiplexing (WDM-PDM) hybrid multiplexing systems for signal demultiplexing.

AF2A.22

Multiscale-photoacoustic microscopy for imaging cancer cells and solid tumors, Huan Qin¹; ¹South China Normal Univ., China. A multiscale-photoacoustic microscopy system is developed for imaging living biological structures ranging from cancer cells to solid tumors.

AF2A.23

Ultra-short microwave pulse induced thermoacoustic therapy for deep-seated tumor with mitochondria-targeting single wall carbon nanotubes, Liewei Wen¹; ¹MOE Key Laboratory of Laser Life Science & Inst. of Laser Life Science, College of Biophotonics, South China Normal Univ., China. This study developed a deep-seated tumor therapy modality with mitochondria-targeting single-walled carbon nanotubes (SWNTs) as microwave absorbing agents, which high-efficiently convert ultra-shot microwave pulse energy into thermoacoustic (TA) shock wave and selectively destroy the targeted mitochondria, thereby inducing cancer cell apoptosis.

AF2A.24

Image plane adjustment in photoacoustic tomography based on a full ring transducer array, Zhong Ji¹, Wenzheng Ding¹; ¹South China Normal Univ., China. We developed a photoacoustic (PA) tomography system based on a full-ring transducer array and a parallel data acquisition system. In addition to rapid imaging, the position of the imaging plane can also be recognized.

AF2A.25

Simultaneous P hotoacoustic Elasticity and Viscosity Imaging, Fen Yang¹; ¹South China Normal Univ., China. Based on the thermoelastic and viscoelasticity damping effect, we propose a photoacoustic method for the elastic modulus and viscosity coefficient measurement. Elasticity and viscosity imaging of phantom sample indicates feasibility of method and imaging performance.

AF2A.26

Combined photoacoustic tomography and diffuse optical tomography for small-animal model:A methodological study, Yihan Wang², Tong Lu², Jiao Li^{2,1}, Huijuan Zhao^{2,1}, Feng Gao^{2,1}; ¹Tianjin Key Laboratory of Biomedical Detecting Techniques and Instruments, China; ²School of Precision Instrument and Optoelectronics Engineering, Tianjin Univ., China. A photoacoustic tomography (PAT) guided diffuse optical tomography (DOT) reconstruction scheme is introduced. The results demonstrate the proposed PAT-guided DOT approach is capable of effectively improving the quantitative accuracy and spatial resolution of DOT reconstruction.

AF2A.27

Lookup-Table-Based Inverse Model for Calculating Blood Oxygen Saturation of Cutaneous Microvessels, Feng Wei¹, Shi Rui¹, Zhang Chao¹, Dan Zhu¹; ¹Department of Biomedical Engineering, Wuhan National Lab for Optoelectronics, China. Hyperspectral imaging combined with skin optical clearing technique can monitor blood oxygen dynamics of cutaneous microvessels. A lookup-table-based inverse model was developed for hyperspectral analysis to extract the microvascular physiological and optical properties.

AF2A.28

Smart SparseTracer: An intelligent reconstruction method on axonal fibers, Shiwei Li^{1,2}, Hang Zhou^{1,2}, Jing Li^{1,2}, Tingwei Quan^{1,2}, Shaoqun Zeng^{1,2}; ¹Britton Chance Center for Biomedical Photonics, Huazhong Univ. of Science and Technology-Wuhan National Laboratory for Optoelectronics, China; ²MoE Key Laboratory for Biomedical Photonics, Department of Biomedical Engineering, Huazhong Univ. of Science and Technology, China. Reconstruction of complex axonal fibers is the main challenge in acquiring brain-wide single neuronal morphology. Here, a self-learning method based on SVM, named Smart SparseTracer is proposed. The accuracy of reconstructing various of axonal morphologies is over 95%.

AF2A.29

Photoacoustic Imaging of Cervical Cancer on Nude Mice Model with Two Wavelengths, Tianshuang Wang¹, Bo Wang², Kuan Peng¹, Xiaofei Luo¹, Jiaying Xiao¹; ¹Central South Univ., China; ²Hunan Univ., China. We propose photoacoustic imaging for the cervical cancer detection. A dual-wavelength photoacoustic imaging system of 532nm and 1064nm was designed and built, and experiments of cervical cancer scans on nude mice model were carried out.

AF2A.30

Monitoring blood flow during vascular-targeted photodynamic therapy using laser speckle imaging, Zou Tan¹, Jinde Zhang¹, Xiangyu Niu¹, Lisheng Lin¹, Buhong Li¹; ¹Fujian Normal Univ., China. Laser speckle imaging was used to monitor blood flow dynamics during and after vascular-targeted photodynamic therapy (V-PDT). The results show that blood flow and blood perfusion rate was decreased after V-PDT, while the blood flow in veins could be partially increased after treatment.

AF2A.31

Accelerating sectioning-based whole-brain imaging by real-time contour recognition of cytoarchitecture, Xiaoyu Zhang¹, Qiuyuan Zhong¹, Jing Yuan¹, Hui Gong¹, Qingming Luo¹; ¹Huazhong Univ. of Science & Technol, China. To reduce the data acquisition time of sectioning-based whole-brain imaging, we develop a real-time contour recognition method of cytoarchitecture landmarks to define minimized imaging area of whole-brain sample.

AF2A.32

Label-free optical-resolution multispectral photoacoustic microscopy of microvasculature using supercontinuum laser, Zhongjiang Chen¹, Wei Qiao¹; ¹South China Normal Univ., USA. We have developed supercontinuum-laser-based optical-resolution multispectral photoacoustic microscopy which has the desirable properties of being compact, low-cost. The phantom and *in vivo* experiment results have demonstrated the photoacoustic microscopy system can accomplish label-free microvasculature imaging.

AF2A.33

A phantom experimental research on pharmacokinetic diffuse fluorescence tomography with CT-analogous scanning mode, Yanqi Zhang¹, Xin Wang¹, Huijuan Zhao^{1,2}, Feng Gao^{1,2}, Limin Zhang^{1,2}; ¹School of Precision Instrument and Optoelectronics Engineering, Tianjin Univ., China; ²Tianjin Key Laboratory of Biomedical Detecting Techniques and Instruments, China. In this paper, we investigate the principle validity of the experiment system and reconstruction algorithms by designing a dynamic phantom that can simulate the ICG agent metabolism in living tissues.

AF2A.34

Intravital imaging of hepatic sinusoids using optical-resolution photoacoustic microscopy, Deqiang Deng¹, Qiaoya Lin¹, Xianlin Song¹, Xiaoquan Yang¹, Qingming Luo¹, Zhihong Zhang¹; ¹Britton Chance Center for Biomedical Photonics, Wuhan National Laboratory for Optoelectronics-Huazhong Univ. of Science & Technology, China. We acquired complex structure information of hepatic sinusoids in high-resolution using optical-resolution photoacoustic microscopy *in vivo*. This provides important foundation for the analysis of liver disease.

AF2A.35

Improving the Estimation of Flow Speed for Laser Speckle Contrast Imaging, Yang Wang¹, Xiao Chen¹, Jinling Lu¹, Pengcheng Li¹; ¹Wuhan National Lab for Optoelectronics, China. Developing a simple approach to correct the effect of static scattering from stationary tissue and improve the estimation of flow speed with single exposure time by using a standard LSCI system.

AF2A.36

High-sensitivity and high-tolerance Label-free detection of proteins based on parabolic tapered coupled two photonic crystal nanobeam slot cavities, Chen Yang¹; ¹BUPT, China. In this work, parabolic tapered CPCNCs have been designed for label-free detection of proteins featuring ideal biosensing performance. Numerical calculations with high surface sensitivity up to 345pm/nm and outstanding fabrication tolerance have been obtained.

AF2A.37

Brain-wide and Fast Reconstruction of Sparsely Distributed Neuronal Trees, Hang Zhou¹, Shiwei Li¹, Tingwei Quan¹, Jing Li¹, Lei Su¹, Hui Gong¹, Shaoqun Zeng¹; ¹Wuhan National Laboratory for Optoelectronics, China. High-throughput whole mouse imaging datasets poses challenge to reconstruct brain-wide single neural tree. We build a new platform combining existed automatic reconstruction method and human intervention. It is 10 times faster than manual reconstruction.

AF2A.38

Comparative analysis of diagnostic efficiency of confocal micro-Raman spectroscopy and surface-enhanced Raman spectroscopy for nasopharyngeal carcinoma detection based on tissue smears method, Zhihong Xu¹, Xiaosong Ge¹, Xueliang Lin¹, Wei Huang¹, Duo Lin¹, Liqing Sun²; ¹Fujian Normal Univ., China; ²Affiliated Fuzhou First Hospital of Fujian Medical Univ., China. Raman spectroscopy is a practice tool for tissue detection. This work demonstrated that confocal micro-Raman spectroscopy (CMRS) and surface-enhanced Raman spectroscopy (SERS) have promising exploratory potential for the detection of nasopharyngeal carcinoma (NPC) based on nasopharyngeal swab smear.

AF2A.39

Iterative reweighting via homotopy for reconstruction of bioluminescence tomography, Jingjing Yu¹, Qiyue Li¹, Haiyu Wang¹; ¹Shaanxi Normal Univ., China. The reconstruction of BLT (bioluminescence tomography) is an ill-posedness problem. This paper solves it by converting a $L_{1/2}$ -norm problem to a series of weighted L_1 -homotopy minimization problems. It performs well in location accuracy and double-source resolving.

AF2A.40

Low-Power Laser Irradiation Promotes Reactive Oxygen Species Production in L6 Myotubes, Gong L. Long¹; ¹South China Normal Univ., China. The mechanisms of low-power laser therapy remains unknown. Laser scanning microscope assay showed low-level laser irradiation promoted reactive oxygen species (ROS) production in L6 myotubes, which might become a potential approach to regulate muscle-related diseases.

AF2A.41

Optical measurements of stored human red blood cells with and without CPDA-1, SangYun Lee¹, HyunJoo Park¹, YongKeun Park¹; ¹KAIST, USA. 3-D tomograms of refractive index and 2-D dynamic membrane fluctuations of individual red blood cells were measured during 6 weeks of storage with and without preservation material, called citrate phosphate dextrose adenine-1.

AF2A.42

A Monolithic Tunable Laser based on Cascading of Distributed Feedback Laser Array, Shiyu Li^{1,2}, Jianyi Zhao², Ning Zhou², Mingyang Zhang², Qi Yang³, Shaohua Yu³, Xun Li⁴; ¹Huazhong Univ. of Science and Technology, China; ²ACCELINK, China; ³Wuhan Research Inst. of Posts Telecommunications, China; ⁴McMaster Univ., Canada. We demonstrate a monolithic tunable laser based on cascading of distributed feedback laser array with 45 dB SMSR and more than 20 nm tuning range. The laser is placed in a 14-pin butterfly module with TEC control.

AF2A.43

Silicon photonic device for Quantum Key Distribution, Yannong Luo¹; ¹Sun-Yatsen Univ., China. We demonstrate a novel silicon integrated photonic device for BB84 Quantum key distribution protocol, which can efficiently emit polarization states in two mutually-unbiased bases. We observe up to 96% fidelity of emission light around 1550nm.

AF2A.44

Terahertz modulator based on graphene-embedded waveguide, Ran Hao¹, Xiliang Peng¹, erping Li¹; ¹Zhejiang Univ., China. We reported a novel terahertz modulator based on graphene-embedded waveguide. In theory, the modulation depth can be nearly 100% as the simulation results show. The best experimental modulation depth is 29.53%, which is much larger than state-of-art results.

AF2A.45

Silica PLC-based Polarization Beam Splitter for 780 nm Free-Space Quantum Key Distribution Applications, Joong-Seon Choe¹, Byung-Seok Choi¹, Heasin Ko¹, Chun Ju Youn¹; ¹Electronics & Telecomm Res. Inst, Korea. Polarization beam splitter for 780 nm wavelength was developed to be applied to free-space quantum key distribution applications. Short wavelength compared to telecommunication wavelength requires several differences in fabricating silica PLC devices. In this study, we fabricated silica PBS having polarization extinction ratio of 16.0dB at 780 nm.

AF2A.46

Design of compact orbital angular momentum (OAM) beams generator on an integrated silicon platform, Shuang Zheng¹, Li Shen¹, Shuhui Li¹, Jian Wang¹; ¹Wuhan National Laboratory for Optoelectr, China. We present a compact integrated structure to generate optical orbital angular momentum (OAM) beams, where a simple waveguide structure with a trench is formed on a silicon platform. Numerical simulations show that OAM beams with topological charges of ± 1 could be achieved over a wide wavelength range from 1.45 μm to 1.65 μm .

AF2A.47

Multi-wavelength $\lambda/4$ -shifted Bragg grating array on silicon-on-insulator, qi yang¹, Jinsong Xia¹; ¹Wuhan National Laboratory for Optoelectronics, Huazhong Univ. of Science and Technology, China. We report a multi-wavelength $\lambda/4$ -shifted Bragg grating array on silicon-on-insulator(SOI). A four-channel $\lambda/4$ -shifted Bragg grating array with highly uniform channel spacing was demonstrated with a measured channel spacing variation nearly 0.8nm(100GHZ).

AF2A.48

GaAs-based monolithic electrically injected optical parametric oscillator, Sihang Wei¹; ¹Inst. of semiconductors, China. GaAs based edge emitting Bragg reflection waveguide laser device capable of emitting pump wavelength around 1.064 μm , signal wavelength around 1.77 μm and idler wavelength around 2.71 μm through intracavity phase matching process is fabricated and characterized.

AF2A.49

Bandwidth Improvement of Avalanche Photodiode Using Non-uniformly Doped Multiplication Layer, Zhiwei Wu¹, Yuan Li¹, Jingshu Guo¹, Yanli Zhao¹; ¹Wuhan National Lab for Optoelectronics, Huazhong Univ. of Science and Technology, China. A novel high speed (>35 GHz) avalanche photodetector (APD) with 3D-shaped multiplication region is proposed. Results show that the avalanche build-up time can be effectively reduced with proper non-uniform deep/shallow doping.

AF2A.50

Asymmetric Bragg gratings based on a multimode SOI strip waveguide, Huiye Qiu¹, Yuxia Su¹, Liangjie Chen¹, Ping Yu²; ¹Longyan Univ., China; ²Ningbo Inst. of Technology, Zhejiang Univ., China. A silicon photonic filter based on asymmetric sidewall Bragg gratings in a multimode SOI strip waveguide is demonstrated. Experimental results show that the presented Bragg gratings have a bandwidth of 2.8 nm and an extinction ratio of -23 dB.

AF2A.51

InP/InGaAsP-Si/SiO₂ Hybrid Micropillar Cavity for 1.55- μm Quantum Communication, bizhou shen¹, Yanzhen Zheng², Jie Deng¹, Qiang Xu¹, Xiu M. Xie¹, Jian Chen¹, Qian Dai¹, Lei Zhang², Ruo Y. Gao², Zhi L. Ren², Zhi M. Wang², Li B. Yu¹, Hai Z. Song^{1,2}; ¹Southwest Inst. of Technical Physics, China; ²Inst. of Fundamental and Frontier Sciences, and School of Optoelectronic information, Univ. of Electronic Science and Technology of China, China. Fiber-based quantum communication requires effective single photon sources. We designed a micropillar cavity with high quality factor ($\sim 10^3$), small mode volume and sufficiently thick quantum-dot containing active layer.

AF2A.52

Unidirectional transmission in finite-size high-contrast gratings, Anjin Liu^{1,3}, Wanhua Zheng¹, Dieter Bimberg^{3,2}; ¹Inst. of Semiconductors, CAS, China; ²King Abdulaziz Univ., Saudi Arabia; ³Technische Universität Berlin, Germany. The finite-size high-contrast grating is unidirectional in its transmission caused by the eigenmodes of the high-contrast grating section. This unidirectional transmission in the finite-size high-contrast grating is very useful for photonic integration.

AF2A.53

A novel dual-wavelength InGaAsP/InP DFB laser integrated with a SOA, Qiufang Deng¹, Junjie Xu¹, Song Liang¹, Hongliang Zhu¹; ¹Inst. of semiconductor, China. A novel dual-wavelength DFB laser integrated with a SOA is demonstrated. The two-mode emission can be obtained over a wide range of currents. Our device has advantages of simple structure, compact size and fabrication cost.

AF2A.54

Optimized Design of Chirp Managed Lasers with Dispersion Pre-compensation by Integral Layer-Peeling Algorithm, Zengyuan Zhu¹, Yanping Xi¹; ¹Wuhan National Laboratory for Optoelectr, Huazhong Univ. of Science and Technology, China. In this paper, we design the optical spectrum reshaper (OSR) filter with the desired amplitude and phase property, and greatly facilitate the optimization design of the OSR for a better transmission performance of a CML. The dispersion pre-compensation is also included in the optimized OSR design, which further extends the transmission distance.

AF2A.55

Low Phase Noise Quantum Dot Lasers for Coherent Communication Networks, Cheng Wang^{1,2}, Frédéric Grillot^{2,3}; ¹ShanghaiTech Univ., China; ²Télécom ParisTech, France; ³Univ. of New Mexico, USA. Quantum dot lasers are demonstrated to exhibit low phase noises. A low gain compression factor and a large state energy separation are favorable to reduce the phase noise, while carrier scattering rates has little impact.

AF2A.56

Simulation and Experimental Results of Single Drive Silicon Mach-Zehnder Modulator, Haowen Shu¹, Junlong Zhang¹, Xingjun Wang¹, Tiantian Li¹, Zhiping Zhou¹; ¹Peking Univ., China. After optimizing the electrode structure, 15 Gb/s BPSK modulation was presented employing a 3mm single drive silicon Mach-Zehnder modulator under 3.5v driving voltage.

AF2A.57

Inverse Design of a Compact Silicon-on-Insulator T-junction, Chong Meng¹, Jifang Qiu¹, Ye Tian¹, Zi Ye¹, Jian Wu¹; ¹Beijing Univ of Posts & Telecom, China. A SOI T-junction with an ultra-compact footprint of $2.8 \times 2.8 \mu\text{m}^2$ is proposed. Simulation results show that the insertion loss is less than 1dB with nearly identical power ratio in wavelength range from 1534nm to 1576nm.

AF2A.58

Novel Beam Splitter Based on 2D Sub-wavelength High-Contrast Gratings, Ying Y. Wang¹, Yongqing Huang¹; ¹Beijing Univ. of Posts and Telecommunications, China. A polarization-insensitive beam splitter using 2D non-periodic sub-wavelength high-contrast gratings is proposed. The properties are numerically studied with Finite Element Method. Total transmittance is exceeding 85% within the range 1500-1600 nm of wavelength.

AF2A.59

Design of random nanostructure s for optical power splitter with arbitrary splitting ratio, Lu Liu¹, Xiang Wen¹, Ke Xu¹, Qinghai Song¹; ¹Harbin Inst. of Technology, Shenzhen, China. We design a random 2D nanophotonic structure for optical power splitting using a nonlinear searching algorithm. The designed devices could achieve arbitrary split ratio with 80% transmission efficiency over 30 nm wavelengths.

AF2A.60

Effect of Annealing Process for Copper Ion-Exchanged Planar Waveguides in BK7 Glass, Yue Ding¹, Xiaowei Zhao¹, Chuanxin Teng¹, Jie Zheng¹; ¹Jilin Univ., China. Planar BK7 glass waveguides were prepared by thermal ion-exchanged technique for 15-30 minutes at temperature of 585°C. Then the prepared waveguides were annealed in the air for 60 minutes at 400-600°C. It shows that the annealing process strongly influences the refractive index profiles and photoluminescence properties of the waveguides.

AF2A.61

Single Event Effects on Commercial Optical Transceivers, Yang Wang¹, Wei Dang¹, Zeming Zhang¹, Yueying Zhan¹, Suzhi Cao¹; ¹Technology and engineering center for space utilization, CAS, China. An irradiation testing has been implemented to analyze single event effects on commercial high speed optical transceivers. The result proved that PIN diode and micro controller unit are sensitive devices to single event effects.

AF2A.62

Design Optimization for 25Gbps DML InAlGaAs/InP SL-MQW Laser Diode, Cheng Ke¹, Xun Li², Yanping Xi¹; ¹Wuhan National Laboratory for Optoelectronics, Huazhong Univ. of Science and Technology, China; ²Department of Electrical and Computer Engineering, McMaster Univ., Canada. A full physics based model has been exploited to systematically study the modulation bandwidth of the directly modulated strained-layer multiple quantum well (SL-MQW) laser. The major parameters of the active region are optimized to achieve the maximum modulation bandwidth under an ambient temperature ranging from 25°C to 85°C.

AF2A.63

Design of Multi-wavelength Loss-Coupled DFB Laser Array, Yangjun Chen¹, Yu H. Lee¹, Yanping Xi¹, Junqiang Sun¹; ¹Wuhan National Laboratory for Optoelectronics, Huazhong Univ. of Science and Tech, China. In this paper, we report a 1.55mm four wavelengths loss-coupled distributed feedback (DFB) laser arrays with different ridge waveguide widths and tilt angles with respect to the gratings. A stable single-mode operation for all channels and an accurate channel spacing of 3.1nm have been achieved.

AF2A.64

Photorefractive effect in Pb(Zr_{0.52}Ti_{0.48})O₃ thin film at terahertz range, Jingcheng Zhang¹, Furi Ling¹, Yin Quantao¹, Shi Songjie², Li Renkui¹, Peng Gao¹; ¹Huazhong Univ. of Science and Techn, China; ²School of Optical and Electronic Information, Huazhong Univ. of Science and Technology, China. The refractive index of Pb(Zr_{0.52}Ti_{0.48})O₃ films under external optical fields are investigated at room temperature through terahertz time-domain spectroscopy. The change of refractive index with the applied light power are also discussed.

AF2A.65

Monolithically integrated chirp-managed laser (CML) based on a resonant tunneling optical spectrum reshaper filter, Yue Pan¹, Yanping Xi¹; ¹Wuhan National Lab for Optoelectronics, China. We have presented a monolithically integrated chirp-managed laser (CML) consists of a conventional directly modulated laser and a resonant tunneling based optical filter. Simulation results show that the proposed 25G 1.55 μm CML can send signal over 20 and 26 km standard single mode fiber for bit error rate of 10⁻¹³ and 10⁻⁵, respectively.

AF2A.66

A Novel Surface-Emitting Laser based on Microcylinder Cavity Etched with Second-Order Gratings, Xiang Ma¹, Quanan Chen¹, Qiaoyin Lu¹, Weihua Guo¹; ¹Huazhong Univ. of Science & Tech, China. A novel surface-emitting laser structure based on a microcylinder cavity etched with second-order gratings, is presented. Extensive numerical simulations show that ~1mA threshold current and >40GHz direct modulation bandwidth can be realized with it.

AF2A.67

A Balanced Optical System for Excess Noise Factor Measurement of Avalanche Photodiode, Ke Wen¹, Junjie Tu¹, Yanli Zhao¹; ¹Wuhan National Lab for Optoelectronics, China. A balanced optical system is proposed for measuring accurately the excess noise factor (F) of avalanche photodiode. The relative intensity noise (RIN) from the laser can be effectively suppressed.

AF2A.68

Novel 1.55μm Mushroom-type Vertical-illumination Photodiode, Junchu Wang¹, Xiaofeng Duan¹, Yongqing Huang¹, Kai Liu¹, Jiarui Fei¹, Qingtao Chen¹, Xiaomin Ren¹; ¹Beijing Univ. of Posts and Telecom., China. We propose a novel InP-based mushroom-type vertical-illumination PIN photodiode. By using mushroom-type structure, numerical calculation results show that the optimized photodiode has a 3-dB bandwidth of 29.81 GHz, which increased by 35.62% comparing with conventional PIN photodiode.

AF2A.69

The Effect of Overvoltage and Gate Signal Voltage on Dark Count Rate of Single Photon Detection, Junjie Tu¹, Yuchong Tian¹, Chao Xie¹, Ke Wen¹, Yanli Zhao¹; ¹Wuhan National Lab for Optoelectronics, China. We found that the change of overvoltage has more influence than that of the gate signal voltage on DCR. The lower DCR and higher detection efficiency can be achieved by choosing the voltage appropriately

AF2A.70

Integrated Microdisk Resonator for Simultaneous Refractive Index and Temperature Measurement Using Two Whispering-gallery Modes, Ma Tao^{1,2}, Jinhui Yuan^{1,3}, Lei Sun¹, Xinzhu Sang¹, Binbin Yan¹, Kuiru Wang¹, Heng Liu², Jinhui Gao², Chongxiu Yu¹; ¹Beijing Univ. of Posts and Telecommunications, China; ²Henan Normal Univ., China; ³The Hong Kong Polytechnic Univ., China. We propose and investigate an integrated microdisk resonator with two whispering-gallery modes. The simulation results show that refractive index and temperature can be measured simultaneously by monitoring the wavelength shifts of the two whispering-gallery modes.

AF2A.71

Low-Cost, Compact Optical Time-Domain Reflectometer Based on Silicon Oxynitride Waveguides, Yunfei Fu¹, Kun Li², Weike Wu¹, Weijie Tang¹, Tao Chu¹, YIng Wang², Zhiming Fu²; ¹Chinese Acad Sci Inst of Semiconductor, China; ²ZTE Corporation, China. An optical time-domain reflectometer (OTDR) based on silicon oxynitride (SiON) waveguides was demonstrated to have a dynamic range of 10 dB. The compact OTDR optical device was fabricated with III-V/Si hybrid integration technology.

AF2A.72

A polarization splitter and rotator utilizing the partiallyetched coupling-enhanced Bragg grating-assisted coupler, Ting Hu¹, Haodong Qiu¹, Zecen Zhang¹, Xin Guo¹, Chongyang Liu¹, Hong Wang¹; ¹Nanyang Technological Univ., USA. A polarization splitter and rotator based on the partially-etched Bragg grating assisted coupler with enhanced coupling coefficient is proposed. A low polarization crosstalk < -20.78 dB and a high polarization conversion efficiency of 96.12% are numerically demonstrated.

AF2A.73

Improving Efficiency of THz Photoconductive Antennas Using Nano Plasmonic Structure, saman Ghorbani¹, Mohammad Bashirpour¹, Mohammadreza Kollahdouz¹, Mohammad Neshat¹, Mahdad Mansouree¹, Matin Forouzmehr¹; ¹Univ. of Tehran, Iran. A silicon-on sapphire photoconductive antenna (PCA) as a terahertz source has been simulated by COMSOL Multiphysics[®] using wave optics and semiconductor modules. A periodic nanoplasmonic structure has been incorporated to improve terahertz radiation.

AF2A.74

High-efficiency and Broad-bandwidth All Optical Wavelength Converters Based on Parallel-Cascaded Micro-ring Resonators, Dongyu Li¹, Minming Zhang¹, Chen Liu¹, Songnian Fu¹, Demin Liu¹; ¹Univ., China. The parallel-cascaded micro-ring resonators(PC-MMR) have been proposed to enhance the conversion efficiency without sacrificing the bandwidth. There is an 11.46-dB improvement in the conversion efficiency and the bandwidth of the signal is nearly triple of that of single ring resonator.

AF2A.75

Facile synthesis of Ni₃Se₂ nanomaterials for dye-sensitized solar cells, Qingsong Jiang¹, Guang Hu¹; ¹Huaiyin Inst. of Technology, China. The Ni₃Se₂ counter electrode (CE) has been fabricated by a solvothermal and spray method, and exhibits high electrocatalytic activity. High power conversion efficiency of the DSSC based on Ni₃Se₂ CE is up to 5.72%.

AF2A.76

Microwave Combustion for Modification of Transition Metal Oxides, Jun Wan¹, Jun Zhou¹; ¹Wuhan National Laboratory for Optoelectr, China. In this work, we use microwave combustion system to quickly synthesize reduced metal oxides and graphene hybrid composite in several minutes.

Poster Session, Public area, 2nd Floor, Shangri-La Hotel, Wuhan

AF2A.77

Broadband Antireflection Enhancement in Thin Crystalline Silicon Solar Cell with Parametric Nanotexturing, Jinqiannan Zhang¹, Jing Hao¹, Zhongyuan Yu¹; ¹Beijing Univ Posts & Telecommunications, USA. Parametric-designed nanotexture arrays on ultrathin c-Si solar cells for broadband light antireflection enhancement is investigated. The simulation show that the proposed structure gives 40.7% ultimate efficiency enhancement compared to flat solar cell.

AF2A.78

All-Solution-Processed All-plastic Multijunction Solar Cells, Jinhui Tong¹, Sixing Xiong¹, Yinhua Zhou¹; ¹Huazhong Univ. of Science and Tech, China. All-solution-processed all-plastic multijunction solar cells have been demonstrated based on the fine tuning the conductivity of the charge-recombination layer. The multijunction cells with a high V_{oc} up to 5.37 V are applied to power electronics.

AF2A.79

Aqueous spray pyrolyzed ZnO as orientation induced buffer layer for Sb_2Se_3 photovoltaics of improved stability, Liang Wang¹; ¹Wuhan National Laboratory for Optoelectr, China. through systematic optimization of spray pyrolysis, [221] oriented Sb_2Se_3 could grow on ZnO film and form a high quality ZnO/ Sb_2Se_3 heterojunction, resulted in a ZnO/ Sb_2Se_3 solar cell with 5.08% device efficiency and exceptional stability.

AF2A.80

Continuous-wave and Time-resolved Photoluminescence of GaN LED grown on amorphous SiC buffer, Chih-Hsien Cheng², Shuai Chen¹, Lingyu Wan¹, Zhe Chuan Feng¹, Gong-Ru. Lin²; ¹Guangxi Univ., China; ²Graduate Inst. of Photonics and Optoelectronics, and Department of Electrical Engineering, National Taiwan Univ., Taiwan. GaN LED grown upon amorphous SiC buffer is demonstrated. Its PL peak is red-shifted to 442 nm because of the decreased compressive strain induced by lattice mismatch when changing the SiC buffer to C-rich condition.

AF2A.81

Charge Carrier Balance for Highly Efficient Inverted Planar Heterojunction Perovskite Solar Cells Based on Interface Engineering, Ke Chen¹, Qin Hu^{1,2}, Tanghao Liu¹, Lichen Zhao¹, Deying Luo¹, Jiang Wu¹, Yifei Zhang¹, Wei Zhang³, Feng Liu^{2,6}, Thomas P. Russell^{2,4}, Rui Zhu^{1,5}, Qihuang Gong^{1,5}; ¹State Key Laboratory for Artificial Microstructure and Mesoscopic Physics, School of Physics, Peking Univ., China; ²Materials Sciences Division, Lawrence Berkeley National Laboratory, USA; ³School of Chemistry, Joseph Banks Laboratories, Univ. of Lincoln, UK; ⁴Department of Polymer Science and Engineering, Univ. of Massachusetts, USA; ⁵Collaborative Innovation Center of Quantum Matter, China; ⁶Department of Physics, Shanghai Jiao Tong Univ., China. The charge carrier balance strategy by interface engineering was employed to optimize carrier transport in the planar heterojunction perovskite solar cells, leading to high power conversion efficiency of 18.72% and stabilized output efficiency of 17.70%.

AF2A.82

Efficient planar antimony sulfide thin film photovoltaics with large grain and preferential growth, Shengjie Yuan¹; ¹Wuhan National Laboratory for Optoelectr, China. Antimony sulfide was obtained by rapid thermal evaporation. The large grain and preferential growth of Sb_2S_3 thin film were implemented by crystallization and cooling techniques, and the corresponding device obtained solar efficiency of ~3.5%.

AF2A.83

Non-reduction-active hole-transporting layer for efficient perovskite solar cells, Tiefeng Liu¹, Fangyuan Jiang¹, Yinhua Zhou¹; ¹Huazhong Univ. of Science and Tech, China. PEDOT:PSS layer is found chemically reduced by methylamine and perovskite precursor solution, and therefore results in the decrease of open-circuit voltage. Non-reduction-active polymer is used as hole-transporting layer and 18% perovskite solar cells are achieved

AF2A.84

Graphitic Carbon Nitride Films Prepared by Thermal Vapor Condensation for Optoelectronic Application, Xiaowei Lv¹, Shen Yan¹; ¹Wuhan National Laboratory for Optoelectronics, HUST, China. As a promising photoelectric material, the first problem facing graphite carbon nitride is the preparation of uniform film. Here, a vapor condensation method is presented. By this way, the films can be synthesized by tailored monomer.

AF2A.85

Extreme light concentration in strong coupled plasmonic system for surface-enhanced CARS, junqiao Wang¹, Jia Zhang¹, Kaijun Mu¹, Chunzhen Fan¹, Erjun Liang¹; ¹Zhengzhou Univ., China. We report a plasmonic film-crisscross dimers array coupled system to be designed to enhance the CARS signal. The maximum surface-enhanced CARS factor can be reached as high as 10^{17} , which provides a new insight to enable the detection of single molecules.

AF2A.86

Study and Comparison of Low Cost Intensity Modulation Direct Detection Radio Over Fiber Systems, Mao Zhang¹, Bo Xu¹, Qun Guo¹, Kun Qiu¹; ¹School of Communication and Information Engineering, Key Laboratory of Optical Fiber Sensing and Communications (Education Ministry of China), Univ. of Electronic Science and Technology of China, China. Performances of low cost IM-DD ROF systems with MZM or EAM are compared. For OFDMA transmission in downlink, EAM is preferred for better linearity. For SC-FDMA in uplink, MZM is chosen for increasing signal power.

AF2A.87

Bi-directional Transmission in mode using MIMO-less space-division-multiplexing in Few Mode Fibers, Jian Zhao¹, Wei Wang¹; ¹Tianjin Univ., China. Bi-directional transmission in spatial mode is a forward-looking system architecture benefiting from reduced linear and nonlinear penalty. Especially, it is suitable for metro and data-center networks using MIMO-less space-division-multiplexing in weakly guiding few mode fibers.

AF2A.88

A NOVEL APPM SCHEME BASED ON TWO DIMENSIONAL CYCLIC ITERATIVE CODING, Yingfu Sun¹, Bo Liu¹, Lijia Zhang¹, Xiangjun Xin¹, Xiaoli Yin¹, Qi Zhang¹, Qinghua Tian¹, Feng Tian¹, Yongjun Wang¹, Lan Rao¹; ¹School of Electronic Engineering, BUPT, China. An amplitude and pulse position modulation (APPM) scheme based on a novel multilevel modulation format named two dimensional cyclic iterative coding (TDCIC) is proposed and experimentally demonstrated in BER performance and chromatic dispersion tolerance.

AF2A.89

Frequency Offset Compensation Using Non-linear Preprocessing for Coherent Optical Systems with Nyquist and FTN Signaling, hanchao zhang¹, Lingchen Huang³, Changjian Guo²; ¹South China Normal Univ., China; ²South China Normal Univ., China; ³Zhejiang Univ., China. We propose a low-complexity frequency offset compensation method based on nonlinear preprocessing in Nyquist and faster-than-Nyquist (FTN) coherent optical systems. Simulation results show that the proposed scheme outperforms the conventional algorithms in asymmetrical spectrum cases.

AF2A.90

Modified Radius-directed Linear Kalman Filter for Polarization Demultiplexing of 16QAM and 64QAM Signals, Qun Zhang¹, YanFu Yang¹, Yunxu Sun¹, Yong Yao¹; ¹Harbin Inst. of Technology Shenzhen, China. A modified radius-directed linear Kalman filter are proposed with the introduced optimal radius decision and the probabilistic error function. The improvement on convergence and tracking speed performance are confirmed for 16QAM and 64QAM signals.

AF2A.91

Real-time 25-Gb/s EPON OLT MAC/PHY with a Single FPGA for 100-Gb/s Access Networks, Kwang Ok Kim¹, KyeongHwan Doo¹, HwanSeok Chung¹; ¹Electronics & Telecomm Res. Inst., Korea. We implement an efficient, asymmetric 25-Gb/s Ethernet PON (EPON) OLT MAC/PHY that can support a rate of 25.78125-Gb/s in the downstream direction and 10.3125-Gb/s in the upstream direction, based on a single FPGA.

AF2A.92

Multi-mode Mask Optimized by Super Pixel for Mode Multiplexing, Chenghui Tian¹, Song Yu¹, Shanyong Cai¹, Baojing Gu¹, Mingyong Lan², Na An¹, Mi Yang², Wanyi Gu¹; ¹State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China; ²School of Digital Media and Design Arts, Beijing Univ. of Posts and Telecommunications, China. The multi-mode phase mask optimized by super pixel displayed on phase-only spatial light modulator for mode multiplexing is proposed and demonstrated. LP_s_0\$\$_1\$ mode and LP_s_1\$\$_1\$ mode multiplexing is achieved in experiment successfully.

AF2A.93

Land-to-Underwater Optical Communication System Based on Underwater Visible Light Communication Network Units and Fiber Links, Wei Li^{1,2}, Zhitong Huang^{1,2}, Miaolan Gong^{1,2}, Yuefeng Ji^{1,2}; ¹Beijing Advanced Innovation Center for Future Internet Technology, Beijing Univ. of Technology, China; ²School of Information and Communication Engineering, Beijing Univ. of Posts and Telecommunications, China. We proposed a land-to-underwater communication system integrating visible light communication and passive optical network to realize communications between underwater users and on-land users. The simulations and experiment of link performance are conducted in this paper.

AF2A.94

A Cost-effective 100 (4x25)-Gbps Coherent PON based on directly modulation laser, Li Haibo^{2,1}, Rong Hong¹, Cai Li¹, Qi Yang¹, Ming Luo¹, Shaohua Yu¹; ¹Lab Optical Comm. Tech & Networks, China; ²Wuhan National Laboratory for Optoelectronics & School of Optical and Electronic Informtion, Huazhong Univ. of Science and Technology, China. A cost-effective coherent PON based on DML is proposed using intensity-modulation of PAM-4 signal. Optics filter is employed to control the chirp effect, to realize the 25-Gb/s/λ transmission of PAM-4, which could be extended to 100Gbps Coherent PON.

Poster Session, Public area, 2nd Floor, Shangri-La Hotel, Wuhan

AF2A.95

Efficient Crosstalk Mitigation of a Free-Space Orbital Angular Momentum Multiplexed Communication Link by using Maximum Likelihood Detection, Le Wang¹; ¹Nanjing Univ. of P & T, USA. We propose an efficient method to overcome the modal crosstalk induced by atmospheric turbulence of a free-space orbital angular momentum multiplexed communication link by using maximum likelihood detection.

AF2A.96

PDM-DD-SSB-OFDM system based on a single-end PD for short reach communications, Kaili Yan¹, Xian Zhou¹, Wei Liu¹, Jiahao Huo¹; ¹Univ. of Science&Tech. Beijing, China. We propose a PDM-DD-SSB-OFDM system with a single-end PD at the receiver and a reduced guard band for short reach communications. The receiver sensitivity is -11.8dBm for the 100-Gbit/s-PDM-DD-SSB-OFDM system.

AF2A.97

Time delay signature concealment in chaotic systems for enhanced security, Hou Tong Tong¹, Lilin Yi¹, Junxiang Ke¹, Ye Hu¹, Weisheng Hu¹; ¹Shanghai Jiao Tong Univ., China. Time delay signature, the most critical security key in delayed-feedback chaotic systems, is completely concealed by introducing a dispersion module into the feedback loop, which is verified by both theoretical analysis and experiment.

AF2A.98

A FPGA Design Verification of Radition-Induced Single Event Effects Impact on Optical Transceiver for Space Payload System, Peng Li¹, Liqian Wang¹, Yueying Zhan², Chi Chen¹, Suzhi Cao², Xue Chen¹; ¹BUPT, China; ²Chinese Academy of Science, China. A FPGA system is designed and implemented to test the sensitivity of different optical transceivers to "heavy ion" SEE for space payload system. The testing results show FPGA system could complete verification correctly and stably.

AF2A.99

Mode-Interleaving Method with Improved Transmission Reach for MDL-Impaired MDM Systems, Yingchao Xin¹, Yu Tian¹, Bo Hua², Han Yan², Juhao Li¹, Paikun Zhu¹, Yongqi He¹, Zhangyuan Chen¹; ¹Peking Univ., China; ²Systems Engineering Research Inst., CSSC, China. Mode-interleaving method is proposed to mitigate the MDL impact on MDM transmission by averaging performances of all spatial channels. Simulation shows that the proposed method can significantly improve transmission reach and introduces negligible DSP complexity.

AF2A.100

An In-band OSNR Monitoring Technique based on Normalized Autocorrelation Function, Zhuili Huang¹, Jifang Qiu¹, Deming Kong¹, Miao Yu¹, Ye Tian¹, Jian Wu¹; ¹Beijing Univ. of Posts and Telecom., China. We experimentally demonstrate a novel in-band OSNR monitor based on normalized autocorrelation function, which is insensitive to both CD and input optical power. OSNR up to 26 dB is successfully monitored for 112 Gbit/s PDM-QPSK.

AF2A.101
Withdrawn.

AF2A.102

Research on performances of coherent Nyquist-WDM-PON and WDM-OFDM-PON using effective phase noise suppression methods, Zhao-peng Xu¹, Zhongwei Tan¹, Chuanchuan Yang¹; ¹Peking Univ., China. In this paper, we research on performances of coherent Nyquist-WDM-PON and WDM-OFDM-PON using effective phase noise suppression methods. We find that WDM-OFDM-PON achieves better performance with the help of effective phase noise compensation.

AF2A.103

Layer-by-layer bit allocation algorithm for discrete multitone modulation in VLC systems, Wei Liu¹, Xian Zhou¹, Kaili Yan¹, Jiahao Huo¹; ¹Univ. of Science and Technology Beijing, USTB, China. In this paper, a novel layer-by-layer bit allocation algorithm is proposed, which can effectively reduce the system complexity. Meanwhile, this algorithm complexity is lower than Chow algorithm and Greedy algorithm under the same resources allocation performance.

AF2A.104

On the Performance of Few Mode EDFAs with Bidirectional Pumping, Nihal Anwar^{1,2}, Hesham Atef³, Ziad El-Sahn¹, Moustafa Hussein⁴, El-Sayed El-Badawy¹; ¹Electrical Engineering Department, Photonics Group, Egypt; ²International Transmission Sector, Telecom Egypt, Egypt; ³Electrical Engineering Department, Arab Academy for Science, Technology and Maritime Transport, Egypt. A few mode erbium doped fiber amplifier (FM-EDFA) is designed using 980 nm forward pump and 1480 nm backward pump with unequal pump power, we achieve a high gain with low NF and low BER.

AF2A.105

Comparison of Orbital Angular Momentum (OAM) Based OFDM and Conventional Optical Fiber-OFDM Systems, Tengfen Sun¹, Weibin Zhang¹, Yingchun Li¹, Wei Shao¹, Fuquan Zhu¹, Youxiang Qin¹; ¹Shanghai Univ., China. We use Laguerre-Gauss (LG) beams to transport OAM modes in free-space and compare OAM based OFDM (OAM-OFDM) with optical fiber OFDM (OF-OFDM) systems. The results show that FSO-LG-OAM-OFDM has similar performance with OF-OFDM.

AF2A.106

A Rate-Adaptive Multi-level Coded Modulation Algorithm Based on Quasi-Cyclic Linear Block Code, Fei Xiao¹, Bo Liu¹, Lijia Zhang¹, Xiangjun Xin¹, Qi Zhang¹, Qinghua Tian¹, Feng Tian¹, Yongjun Wang¹, Lan Rao¹, Deng'ao Li², Jumin Zhao², Renfan Wang³; ¹BUPT, China; ²College of Information Engineering, Taiyuan Univ. of Technology, China; ³Wuhan Telecommunication Devices Co., Ltd., China. A rate adaptive multi-level coded modulation (RA-MLM) structure based on fixed length binary quasi-cyclic linear block code is presented with a detailed description of the process of codec algorithms, and BER performance is also analyzed.

AF2A.107

A Study on the Asymmetry Between Uplink and Downlink in Slant-Path Free Space Optical Communication Systems, Minghao Wang¹, Xiuhua Yuan¹, Jun Li¹, YaLin Zhang¹; ¹School of Optical and Electronic Information, Huazhong Univ. of Science and Technology, China. The asymmetry of optical uplink and downlink is researched in this work, with various system configurations considered. Numerical results reveal the difference in terms of scintillation index, signal-to-noise ratio (SNR) and bit error rate (BER).

AF2A.108

Investigation of Multiple Impairments Monitor based on RF Spectrum Analysis, Yuan Zhang¹, LanLan Li¹, Shi Yang¹, Lantian Jiang¹; ¹College of Physics and information Engineer, Fuzhou Univ., China. We propose a multiple impairments monitoring technology based on RF spectrum analysis. It can realize 5-35dB OSNR, 45 ps/nm CD and 12.5 ps PMD monitoring simultaneously and independently.

AF2A.109

Dynamic Judgment in Optical Transmission Links by Applying and Comparing Machine Learning Algorithms, Jie Guo^{1,2}, Yiming Wang^{1,2}, Min Zhang³; ¹Telecommunications Engineering with Management, BUPT, China; ²Electrical Engineering and Computer Science, QMUL, UK; ³State Key Laboratory of Information Photonics and Optical Communications, BUPT, China. The effectiveness of machine learning to mitigate adverse impact of nonlinear phase noise in optical transmission links is illustrated. Besides, related DSP modules are implemented to compare performance of Adaboost, Naive Bayes and Naive Bayes-EM.

AF2A.110

A Novel In-Service OTN Fiber Link Monitoring Scheme using Correlation-Based OTDR, Jinsong Hu¹, Xue Chen¹, Zhiliang Ren², Sheping Shi², Ke Yan¹, Yan Zhang¹; ¹State Key Lab of Information Photonics and Optical Communications (Beijing Univ. of Posts and Telecommunications), China; ²ZTE corporation, China. We have proposed an in-service OTN fiber link monitoring scheme using correlation-based OTDR in optical supervising channel. Simulation results show that dynamic range of 26 dB and spatial resolution of 2 m could be achieved.

AF2A.111

Correlation detection utilizing receiver bandwidth limitations for Nyquist OTDM scheme, Yuji Miyoshi¹, Hideyuki Okamoto¹, Hirokazu Kubota¹, Masaharu Ohashi¹; ¹Osaka Prefecture Univ., Japan. We investigate the effect of the receiver bandwidth and quantization error of the analog-to-digital converters on the signal quality of a Nyquist optical time division multiplexing scheme utilizing the receiver bandwidth limitations.

AF2A.112

Modulation Format Identification Using Support Vector Machine in Heterogeneous Optical Networks, Zhongle Cai¹, Min Zhang¹, Danshi Wang¹; ¹Beijing Univ. of Posts and Telecommunications, China. A simple and effective method for modulation format identification (MFI) using a support vector machine (SVM) trained with the features extracted from the asynchronous amplitude histogram(AAH) in next-generation heterogeneous optical networks is proposed.

AF2A.113

Performance comparison of FFT-OFDM and Discrete Wavelet Transform-based OFDM in Power Line Communications, Zhen Wang¹, Ying Wang¹, Shihang Bian¹, Junjie Ding¹, Hao Wu¹, Haozhe Chen¹, Shanhong You¹; ¹Soochow Univ., China. In this paper, we compared the performances of FFT-OFDM and DWT-OFDM in power line channel by simulation. It is shown that DWT-OFDM is better than FFT-OFDM, which is more appropriate to power line communications.

AF2A.114

Performance Analysis of MIMO Vehicle-to-Vehicle Visible Light Communication, Wei Liu¹, Zhitong Huang¹, Yuefeng Ji¹; ¹Beijing Univ of Posts & Telecom, China. We present a mathematical model of MIMO VLC-based V2V system. The LED lamps of the car are considered as multiple transmitters and two PDs installed considered as multiple receivers. The simulation results show that BER performance and the communication distance have been improved than the single input single output system.

AF2A.115

Experimental demonstration of an FPGA-based optical communication system using space-shift modulation, Yan Luo¹, Long Zhu¹, Jian Wang¹; ¹Huazhong Univ. of Scien & Technol, China. We experimentally demonstrate a 100-m-long real-time Field-Programmable Gate Array (FPGA)-based optical communication system using space-shift modulation. We use this system successfully transmit three pictures and measure the bit error rate (BER) performance by introducing a 100 GHz noise.

AF2A.116

Performance Comparison of OFDM and Nyquist-shaped Single-carrier in Visible Light Communication System, Ying Wang¹, Zhen Wang¹, Junjie Ding¹, Hao Wu¹, Shihang Bian¹, Haozhe Chen¹, Shanhong You¹; ¹Soochow Univ., China. We simulate and compare the performance of OFDM and N-shaped SC in VLC system. The BER and SE are analyzed and compared. It is shown that N-shaped SC is more robust and suitable in VLC.

AF2A.117

High-Dimensional modulation for optical orthogonal frequency division multiplexing communication system, Zhaoxi Li¹, Dan Hou¹, Guijun Hu¹; ¹Jilin Univ., USA. A high-dimensional modulation based Optical Orthogonal Frequency Division Multiplexing (OOFDM) communication system is proposed. Simulation results show that the proposed high-dimensional based system offers a higher average optical power gain over traditional 2D modulation system under the same BER.

AF2A.118

Transmission Analysis of M-ary QAM Based Wireless Services over Exponentiated Weibull Turbulent RoFSO Channels, Haitham Khalilaf¹, Hossam M. H. Shalaby¹, Seiichi Sampei²; ¹EJUST, Egypt; ²Osaka Univ., Japan. Exact and approximate expressions for average BER of M-ary QAM-based wireless services, transmitted over radio-on-FSO systems, are derived. The effects of FSO turbulence exponentiated Weibull channels, fog, beam divergence, and pointing errors are considered.

AF2A.119

Dual-wavelength mode-locked Yb-doped fiber laser with SESAM, Xu Z.W¹, Xing Luo¹, Kuan Fu¹, Haiqing Li¹, Jinyan Li¹; ¹HUST, China. We report a mode-locked Yb-doped fiber laser with a semiconductor saturable absorber mirror. Without the bandpass filter or the fiber grating in laser cavity, the tunable single wavelength and dual-wavelength pulses could still be obtained.

AF2A.120

Simultaneously Flatten and Clamp Gain Spectrum of L-Band EDFA by Accurate FBG-based Gain-Control, Jiuru Yang¹; ¹Heilongjiang Univ., China. We present and compare three fiber-Bragg-grating-based schemes in terms of stability and flatness. And under suitable adjustment, the gain of erbium-doped fiber amplifier is simultaneously flattened and clamped with over 21 dB average gain.

AF2A.121

Graphene-enhanced Fiber Modulator with Small Footprint and Good Integrated Compatibility, Feng Zhou¹, Xiaofeng Jin²; ¹Zhejiang Univ. of Media and Communications, China; ²Zhejiang Univ., China. We proposed a graphene-based fiber phase modulator. The results confirmed the graphene layer has greatly enhanced the light-matter interaction. A p phase modulator with arm length of 127 μm is numerically demonstrated.

AF2A.122

Sampled Fiber Bragg Grating induced by Femtosecond Laser Point-by-Point Inscription, Changrui Liao¹, Congzhe Zhang¹, Ying Wang¹, Yiping Wang¹; ¹Shenzhen Univ., China. We have successfully fabricated a series of sampled fiber Bragg gratings with easily adjustable sampling periods and duty cycles using an 800 nm femtosecond laser point-by-point inscription.

AF2A.123

Novel Bend-Insensitive Wideband Multimode Fiber for SWDM Systems, Rong Huang^{1,2}, Runhan Wang^{1,2}, Xiao Hu^{1,2}, Jihong Zhu^{1,2}, Honghai Wang^{1,2}, Ruichun Wang^{1,2}, Xinben Zhang^{1,2}; ¹State Key Laboratory of Optical Fiber and Cable Manufacture Technology, China; ²YOFC, China. A new type of multimode fiber with OM4 performance over 850~950nm operational windows is presented. This bend-insensitive wideband multimode fiber is designed to support at least 4 SWDM channels for 100Gbps or even 400Gbps transmission system.

AF2A.124

Study of Side-polished Plastic Optical Fibers for Refractive Index Sensing, Teng Chuanxin¹, Ning Jing², Zhenpeng Si¹, Zijian Min¹, Jie Zheng¹; ¹Jilin Univ., USA; ²School of Information and Communication Engineering, North Univ. of China, China. A plastic optical fiber (POF) with a side-polished structure was proposed for refractive index (RI) sensing. The macro-bending POFs with side-polished structure have better sensing performance than the straight ones. The highest sensitivity reaches 8.64/RIU.

AF2A.125

Study on coupling between two strongly-coupled highly multi-mode fibers, Zhihe Huang¹, Yu Yu¹, Jianqiu Cao¹, Shaofeng Guo¹, Xiaojun Xu¹, Jinbao Chen¹; ¹National Univ of Defense Technology, China. The optical coupling between two strongly-coupled highly multi-mode fibers is studied. The coupling process is measured in experiment. The effects of the differences between two fiber cores on the coupling process are revealed.

AF2A.126

Sensing of m-Cresol with a Long-Period Fiber Grating Coated with Enzyme-Entrapped Gel, Satyendra K. Mishra¹, Tianyi Zhong¹, Kin S. Ching¹; ¹City Univ. of Hong Kong, Hong Kong. We present a long-period fiber grating coated with a specially synthesized enzyme-entrapped gel for the sensing of m-cresol. The sensor operates for an m-cresol concentration varying from 0 to 800 μM .

AF2A.127

Extra-Large-Mode-Area Few-Mode Laser Fiber, Zhaonian Jia¹, Huan Zhan¹, Yuying Wang¹, Cong Gao¹, Li Ni¹, Xiaolong Wang¹, Aoxiang Lin¹; ¹China Academy of Engineering Physics, China. An Yb-doped extra-large-mode-area few-mode laser fiber was fabricated successfully by chelate precursor doping technique. With refractive index difference of 0.0004 and numerical aperture of 0.036, the 25- μm -core fiber possesses extra-large-mode-area and few-mode properties.

AF2A.128

Absorption and Microstructure Properties Calculated of Er-doped Silica Fiber Based on DFT Theory, Xinxin Sun¹, Jianxiang Wen¹; ¹Shanghai Univ., China. A local microstructure model of Er-doped silica fiber is constructed and its absorption spectrum properties are calculated based on DFT and TD-DFT theory. An absorption spectrum of commercial Er-doped silica fiber is also measured.

AF2A.129

Femtosecond Er-doped fiber laser using a graphene/MoS₂ heterostructure saturable absorber, Cong Liu¹, He-Ping Li¹, Guanglei Deng¹, Changyong Lan¹, Chun Li¹, Yong Liu¹; ¹Univ of Electronic Science & Tech China, China. We experimentally demonstrate an Er-doped fiber ring laser passively mode-locked by a graphene/MoS₂ van der Waals heterostructure, producing 830-fs soliton pulses at 1571.8 nm. Numerical simulations reproduce the generation of pulses in the experiment.

AF2A.130

Optical Tuning of Er/Yb Co-doped Fiber Bragg Gratings by Side Pumping, Zhaoming Liu¹, Xuwen Shu¹; ¹Wuhan National Laboratory for Optoelect, China. We propose and demonstrate a new optical tuning method for Er/Yb co-doped fiber gratings based on side pumping. Wavelength-tunable notch filters are demonstrated with this technique.

AF2A.131

A Twist Sensor With Sensitivity-enhanced Based Sagnac Interferometer, Jian J. Wu¹, Xiang Shen¹, Xing Luo¹, Xiong W. Hu¹, Jing G. Peng¹, Hai Q. Li¹, Jing Y. Li¹, Nengli Dai¹; ¹Wuhan National Laboratory for Optoelectronics, Huazhong Univ. of Science and Technology, China. We propose a twist sensor by employing a Sagnac interferometer based on polarization-maintaining photonic crystal fiber (PM-PCF). In order to improve the torsion sensitivity, a short length of PM-PCF is processed by CO₂ laser. The maximum sensitivity can reach up to 0.55nm/ $^\circ$ after post-processing, which is 3 times higher than unprocessed.

AF2A.132

High-speed 3D Shape Measurement Based on Fiber Interference, Yifei Duan¹, Pan Ou², Yitang Dai¹, Kun Xu¹; ¹State Key Laboratory of Information Photonics & Optical Communications (Beijing Univ. of Posts and Telecommunications), China; ²School of Instrument Science and Optoelectronic Engineering, Beihang Univ., China. This paper presents a method of 3D shape measurement based on structure light generated by fiber interference. Only two fibers are used to generate structure light, therefore we can easily miniaturize this system for some applications.

AF2A.133

Temperature- and strain-insensitive fiber twist sensor based on a Lyot filter, Bo Huang¹, Xuwen Shu¹; ¹WNLO, China. A novel temperature- and strain-independent fiber twist sensor based on a Lyot filter is demonstrated. The sensitivities of the sensor with respect to twist, temperature and strain are -15.586 dBm/rad, 0.00268 dBm/ $^\circ\text{C}$ and -0.00099 dBm/ μe , respectively.

AF2A.134

The optimal photonic crystal fiber for M-Z interferometer and temperature sensing application, Xiongwei Hu¹, Jian J. Wu¹, Xiang Shen¹, Jinggang Peng¹, Jinyan Li¹, Haiqing Li¹, Luyun Yang¹, Nengli Dai¹; ¹Wuhan National Lab for Optoelectronics, China. We experimentally demonstrate an all fiber M-Z interferometer for temperature sensing based on an all-solid photonic bandgap fiber which supports vibrant core and cladding mode transmission. The sensitivity of this fiber sensor is 20 pm/ $^\circ\text{C}$.

Poster Session, Public area, 2nd Floor, Shangri-La Hotel, Wuhan

AF2A.135

Enhanced Gamma Radiation Effect in Bi/Er Co-Doped Optical Fibre by Co-Doping Yb, Binbin Yan^{1,2}, Yanhua Luo^{3,2}, Dan Sporea⁴, Laura Mihai⁴, Daniel Negut⁵, Mingjie Ding³, Chang Wang³, Jianxiang Wen⁶, Xinzhu Sang¹, Gang-Ding Peng³; ¹Beijing Univ. of Posts and Telecomm, China; ²Donghua Univ., China; ³Univ. of New South Wales, Australia; ⁴National Inst. for Laser, Plasma and Radiation Physics, Romania; ⁵Horia Hulubei National Inst. of Physics and Nuclear Engineering, Romania; ⁶Shanghai Univ., China. Gamma radiation effects on bismuth/erbium co-doped fibre and bismuth/erbium/ytterbium co-doped fibre have been investigated and compared. We found co-doping Yb enhanced the pump absorption and accelerated the formation of new BAC-Si by γ radiation.

AF2A.136

Seven-core fiber based interferometer for high temperature sensing, Song Zhou¹, Xuewen Shu¹; ¹Wuhan National Laboratory for Optoelectronics & School of Optical and Electronic Information, Huazhong Univ. of Science and Technology, China. We demonstrate a seven-core fiber based Mach-Zehnder interferometer for high temperature sensing. The sensor shows a high temperature sensitivity up to 170.2pm/°C and can work up to 800°C.

AF2A.137

Chiral long period grating with etched multi-core fiber, Xiang Shen¹, Fangfang Zhang¹, Luyun Yang¹, Jinggang Peng¹, Jinyan Li¹; ¹Wuhan National Laboratory for Optoelectronics, Huazhong Univ. of Science and Technology, China. We have demonstrated a long period grating manufacture with multi-core fiber which being heated with CO₂ laser while being rotated by stepping motor and the grating is sensitive to refractive index of environment.

AF2A.138

Photocatalytic Degradation of Gaseous Benzene over CdS/TiO₂ Nanotube Arrays, Junwei Zhao¹, Jingjing Du², Youbin Yu¹, Huaijun Wang¹, Fengmin Ji¹; ¹Inst. of Materials, Ningbo Univ. of Technology, China; ²School of Mechanical Engineering, Ningbo Univ. of Technology, China. CdS/TiO₂ nanotube arrays with different CdS contents were successfully synthesized to degrade gaseous benzene pollution in the air. The photocatalytic results confirmed the benzene-degradation effectiveness of the TiO₂ nanotube arrays modified with CdS nanoparticles.

AF2A.139

Key Programmable Optical Networks (KPN) with OpenFlow-based Key Distribution, Yongli Zhao¹, Huibin Zhang¹, Jie Zhang¹; ¹Beijing Univ. of Posts & Telecom, China. Key programmable optical networks (KPN) is first proposed and designed with hierarchical software defined networks (SDN) controllers. The flowchart of key distribution based on extended OpenFlow protocol is given and verified on KPN testbed.

AF2A.140

Availability Analysis of Permanent Dedicated Path Protection in Multilayer WDM Mesh Networks, Yanwei Li^{2,1}, Nan Hua², Yanhe Li², Xiaoping Zheng²; ¹National Computer Network Emergency Resp, China; ²Department of Electronic Engineering, Tsinghua Univ., China. This paper compares and analyses the connection availability of permanent dedicated path protection (P-DPP) and dedicated path protection (DPP) in a multilayer WDM network setting. Numerical results show that P-DPP reduces average connection unavailability remarkably.

AF2A.141

Analysis of History-Based Inter-Domain Routing Algorithm in Multi-Domain Optical Networks, Yanwei Li^{2,1}, Jiawang Zhang¹, Yanhe Li², Xiaoping Zheng²; ¹National Computer Network Emergency Resp, China; ²Department of Electronic Engineering, Tsinghua Univ., China. This paper analyzes the inter-domain routing algorithm based on statistics of inter-domain routing history with different parameters. Simulation results show that it achieves better performance on blocking probability than topology abstraction based algorithms.

AF2A.142

Fair Optimal Transceivers Placement in Foggy Cooperative Dynamic FSO Networks, abdallah shawky ghazy¹, Hossam A. I. Selmy², Hossam M. H. Shalaby¹; ¹EJUST, Egypt; ²Laser Inst., Egypt. New optimal transceivers' placement scheme is proposed to improve the performance of fair resource allocation in foggy dynamic FSO networks. The scheme is formulated as bilevel-multi-objective-optimization problem. Results indicate the superior performance over random placements.

AF2A.143

Survivable Software Defined Optical Network Virtualization with Multipath Provisioning Protection, Shan Yin¹, Shanguo Huang¹, Bingli Guo¹, Haibin Huang¹, Xin Li¹, Yu Zhou¹, Jie Zhang¹; ¹State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. We propose a survivable multipath mapping scheme with MPP for software defined optical network virtualization. It trades off bandwidth resources consumption and node resources consumption, and 15% reduction in resource consumption can be achieved.

AF2A.144

Sharing Ratio Based Manycast Resource Allocation in Elastic Optical Networks, Xiao Luo¹, Yang Zhao¹, Xue Chen¹, Lei Wang¹; ¹Beijing Univ. of Posts & Telecom, China. A novel node sharing ratio based algorithm for optimization of the manycast routing, modulation level and spectrum assignment (RMLSA) in elastic optical networks (EONs) is proposed. Simulation results show the remarkable performance of the algorithm.

AF2A.145

2D Fragmentation-aware Virtual Optical Network Embedding (VONE) in Elastic Optical Networks, Ruijie Zhu^{1,2}, Yongli Zhao¹, Hui Yang¹, Yuanglong Tan¹, Jie Zhang¹, Nannan Wang²; ¹BUPT, USA; ²Univ. of Texas at Dallas, USA. We proposed two virtual optical network embedding (VONE) algorithms in elastic optical networks, considering time and spectrum fragmentations. Simulation results show that they perform better than the baseline algorithm in blocking probability and spectrum utilization.

AF2A.146

Survivable Fragmentation-Aware Spectrum Allocation Approaches in Software-Defined Elastic Optical Networks, Bowen Chen¹, Xiaoling Wang¹, Xiaosong Yu², Yongli Zhao², Jie Zhang²; ¹School of Electronic and Information Engineering, Soochow Univ., China; ²State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. We develop two survivable fragmentation-aware spectrum allocation approaches to improve spectrum utilization in software-defined elastic optical networks. Simulation results show that the proposed spectrum allocation approaches reduce blocking probability compared to the first-fit spectrum allocation approach.

AF2A.147

A Novel K-path based Resource Allocation Scheme for Optical Network on Chip, Wenzhe Li¹, Bingli Guo¹, Xin Li¹, Shan Yin¹, Yu Zhou¹, Jie Zhang¹, Shanguo Huang¹; ¹BUPT, China. We employ a k-path based resource allocation scheme on optical network-on-chip to avoid contentions. Simulation results show that the performances on ETE delay and throughput are improved with the proposal.

AF2A.148

A Novel Multi-Controller Placement Scheme against Single Controller Failure in Software Defined Optical Networks, Yang Fu¹, Fan Ning², Xin Li¹, Bingli Guo¹, Yu Zhou¹, Jie Zhang¹, Shanguo Huang¹; ¹State Key Laboratory of Information Photonics and Optical Communications, China; ²Key Laboratory of Universal Wireless Communications, Ministry of Education, China. We propose a multi-controller placement scheme which assigns two controllers for each switch in software defined optical networks. This scheme improves the survivability of control plane and achieves load balance during normal and failure scenarios.

AF2A.149

Selective Receiving Modes for Energy Saving in the OFDMA-PON Downlink, Renrong Liu^{1,2}, Shaolin Yang^{1,2}, Yating Wu^{1,2}, Tao Wang¹, Guoxin Zheng¹; ¹Shanghai Univ., China; ²Key Laboratory of Specialty Fiber Optics and Optical Access Networks, Shanghai University, China. We propose three selective receiving modes for energy saving in the downlink of OFDMA-PON systems. The experimental results indicate that more than 55% energy can be saved compared to traditional systems.

AF2A.150

End-to-end Link-Disjoint Path Computation and Resource Pre-locking Scheme for Multi-domain Packet Transport Networks, Junfen Li¹, Lei Wang¹, Xue Chen¹, Mingjun Guo¹, Shihua Zhang¹, Yang Cao¹; ¹BUPT, China. We propose a link-disjoint path computation and resource pre-locking scheme for hierarchical controlled multi-domain PTN, in order to decrease the path setup delay and improve resource utilization, as well as eliminate concurrent reservation conflicts. Simulations show its better performance in terms of disjoint path setup delay and blocking rate.

AF2A.151

A Novel Scheme of Integrating QKD in WDM-PON, Jianing Niu¹, Yishan Lu¹, Yongmei Sun¹, Yuefeng Ji¹; ¹Beijing Univ. of Posts and Telecom, China. Focusing on how to reduce the nonlinear noise, especially the FWM, a novel integrating scheme of QKD in WDM-PON is proposed. Both experiments and simulations have been done to confirm the scheme.

AF2A.152

A Flexible and Cost-effective Optical Access Scheme based upon DSP-assisted Block-IFDMA, Jin Chen¹, Hui Yang¹, Bin Luo¹, Lianshan Yan¹, Huanlai Xing¹; ¹Southwest Jiaotong Univ., Chengdu, China. A novel flexible and cost-effective transmission scheme based on B-IFDMA is proposed for next-generation PONs. DSP-assisted method is employed to enable low-complexity channel compensation and flexible bandwidth allocation.

Poster Session, Public area, 2nd Floor, Shangri-La Hotel, Wuhan

AF2A.153

Virtual Optical Network Embedding with K-Node (Edge) Content Connectivity Requirement over Elastic Optical Datacenter Networks, Xin Li¹, Shan Yin¹, Bingli Guo¹, Yu Zhou¹, Haibin Huang¹, Yongli Zhao¹, Shanguo Huang¹; ¹Beijing Univ of Posts & Telecom, USA. A novel VON embedding scheme which ensures that virtual independent end-to-content paths are also independent in substrate EODN is proposed. Heuristic VON embedding algorithms are developed with lower blocking probability and higher spectrum efficiency

AF2A.154

An Efficient Routing for Bulk Data Transfer in Circuit-Switched Networks with Assistive Storage, Jiarong Li¹, Tao Zhang¹, Wei Guo¹; ¹Shanghai Jiao Tong Univ., China. We introduce a routing algorithm for static traffic of bulk data transfer in circuit-switched networks with assistive storage. Simulation results demonstrate it reduces average transfer time and improves link utilization compared to traditional circuit switching.

AF2A.155

An energy-efficient optical access network scheme based on ONU interconnection, Yunxin Lv¹, Ning Jiang¹, Ding Liu², Chao Wang¹, Chenpeng Xue¹, Hongliang Ma¹, Kun Qiu¹; ¹School of Communication and Information Engineering, Univ of Electronic Science & Tech China, China; ²School of Electronic Engineering, Sichuan Technology and Business Univ., China. An energy-efficient ONU interconnection scheme is proposed for electronic switch based optical access networks. By separately performing traffic aggregation in downstream and upstream, substantial energy is saved and elastic capacity can be provided.

AF2A.156

Performance Evaluation of Multi-Request to Multi-Resource Strategy Based on Network Function Virtualization in Classified Optical Network, Ao Yu¹, Hui Yang¹, Yongli Zhao¹, Jie Zhang¹, Wei Bai¹, Yuanlong Tan¹, Linkuan He¹, Zhu Liu², Qinghai Ou², Ziguang Zhou²; ¹Beijing Univ. of Posts and Telecommunications, China; ²State Grid Information & Telecommunication Group Co., LTD., China. We present a novel fragmentary resources optimization architecture (FROA) model in classified optical networks(CON). A multi-request to multi-resources(MRMR) algorithm is proposed based on the model. Simulation results show MRMR can get better performance.

AF2A.157

A Multi-service QoS Supported DBA algorithm based on Concurrency for FC-AE-1553 PON Network, Jing J. Li¹, Liqian Wang¹, Shaojun Wu², Yueying Zhan², Suzhi Cao², Jin Wang¹, Xue Chen¹; ¹BUPT, China; ²Chinese Academy of Science, China. A multi-service QoS supported dynamic bandwidth allocation mechanism based on concurrency for FC-AE-1553 PON network has been proposed. The simulation results show that this mechanism meets multi-service delay requirement and the maximum throughput is 3.76Gbps.

AF2A.158

Virtualizing and Scheduling Elastic Optical Network Scheme for Emerging Inter Datacenter Services, Xing Bin Yin¹, Jie Zhang¹, Yongli Zhao¹, Hui Yang¹, Zhu Liu², Qinghai Ou², Ziguang Zhou²; ¹Beijing Univ of Posts & Telecom, China; ²State Grid Information & Telecommunication Group Co., LTD., China. A framework of virtualizing inter datacenter elastic optical network is proposed, based on which a resource scheduling scheme is designed to optimize the inter datacenter network performance.

AF2A.159

Distance Adaptive Routing, Core and Spectrum Allocation in Space Division Multiplexing Optical Networks with Multi-core Fibers, Yuanlong Tan¹, Hui Yang¹, Ruijie Zhu¹, Yongli Zhao¹, Jie Zhang¹, Zhu Liu², Qinghai Ou², Ziguang Zhou²; ¹Beijing Univ. of Posts and Telecoms, China; ²State Grid Information & Telecommunication Group Co., LTD, China. This paper considers distance adaptive routing, core and spectrum allocation (RCSA) for space division multiplexing (SDM) optical networks with inter-core crosstalk, and proposes an efficient distance and modulation format adaptive algorithm to improve resource utilization.

AF2A.160

Study of nonlinear carrier dynamics of InAs in high THz field, Jiaoli Gong^{1,2}, Jinsong Liu¹, Zheng Chu¹, Man Zhang¹, Zhengang Yang¹, Kejia Wang¹, Jianquan Yao¹; ¹Wuhan National Laboratory for Optoelectronics, School of Optical and Electronic Information, Huazhong Univ. of Science and Technology, China; ²Hubei Collaborative Innovation Center for High-efficient Utilization of Solar Energy, School of Science, Hubei Univ. of Technology, China. The nonlinear carrier dynamics of n-doped InAs in high THz field is studied by Ensemble Monte Carlo method. The discussion is focused on the intervalley scattering and impact ionization mechanisms, which have important effects on the physical quantities: average kinetic energy, transient velocity and conductivity.

AF2A.161

Effects of spectral filter bandwidth on properties of an all normal dispersion mode-locked fiber laser, Du Yueqing¹, Xuewen Shu¹; ¹Wuhan National Laboratory for Optoelectr, China. When the bandwidth of the bandpass filter in the simulation is narrower than 5nm, bound state pulse will be generated under strong pump while noise-like pulse will be generated when bandwidth is larger than 5nm

AF2A.162

Thermal stability consideration on HAMR with L10-FePt nanoparticles, Tao Huang¹, Yuhao Zou¹, Weiming Cheng², Qiang Chen¹, Changsheng Xie¹; ¹WNLO, China; ²School of Optical and Electronic Information, Huazhong Univ. of Science & Technology, China. Considering the advance of HAMR technology, the storage potential of L10-FePt nanoparticles with practical investigation are of great significance due to its extremely high uniaxial anisotropy energy. Thermal stability and size limitation focusing on L10-FePt nanoparticle are fully investigated by utilizing an atomistic magnetic simulation model.

AF2A.163

Monte Carlo Simulation with Flexible Three-dimensional Model Reconstructed by OpenGL, Qijiang Chen¹, Fuhong Cai², Sailing He²; ¹South China Normal Univ., China; ²Zhejiang Univ., China. Three-dimensional model is reconstructed by medical images obtained by MRI or CT. Point of incidence can be flexibly selected in the model and Monte Carlo simulation will be launched at the point of incidence.

12:30–14:00 Lunch Break, Café Wu, 1st Floor, or Shang Palace, 2nd Floor, Shangri-La Hotel, Wuhan

Room: Sui Zhou, F3

14:00–16:00
AF3A • Best Student Paper Competition (Tracks 1, 2, 3, 8)

AF3A.1 • 14:00
Experimental study of capacity approaching general LDPC coded non-uniform shaping modulation format, Changyu Lin¹, Zhen Qu¹, Tao Liu¹, Ding Zou¹, Ivan B. Djordjevic¹; ¹Univ. of Arizona, USA. We experimentally demonstrate the efficiency of nonbinary GF(3)/GF(3²) LPDC-coded non-uniform 9-QAM. We propose the non-uniform design method and low-complexity decoder. The proposed 9-QAM has >3dB gain in symbol OSNR compared to traditional binary LDPC-coded star-8-QAM.

AF3A.2 • 14:15
700G/280G SDM-TWDM-PON over 20km Seven-Core Fibre based on 10G-Class Optical Components, Honglin Ji¹, Lilin Yi¹, Lei Xue¹, Ming Tang², Yan Fu¹, Zhenhua Feng², Lin Gan², Weisheng Hu¹; ¹Shanghai Jiaotong Univ., China; ²Huazhong Univ. of Science and Technology, China. We demonstrate a SDM-TWDM-PON system with 700-Gb/s and 280-Gb/s aggregated capacity for the downstream and upstream directions respectively. 20-km seven-core fibre is employed to support 100G/40G TWDM-PON per core based on 10G-class optical components with optical equalization.

AF3A.3 • 14:30
Multi-material Optical Fibers with Integrated Optoelectronic Devices, Wei Yan¹, Yunpeng Qu¹, Dang Tung Nguyen¹, Marco Volpi¹, Alexis Gérald Page¹, Fabien Sorin¹; ¹Ecole Polytechnique Fédérale de Lausanne, Switzerland. We demonstrate innovative simple and scalable fabrication approaches to realize high-performance polycrystalline semiconductor at the tips of a multi-material fiber. The photoresponsivity is two to three orders of magnitude higher than that of the as-drawn fiber. Such novel devices will enable flexible photodetecting probes.

Room: Huang Shi, F2

14:00–16:00
AF3B • Best Student Paper Competition (Track 4-7)

AF3B.1 • 14:00
100-Gb/s All-Optical Logic Gates Based on Semiconductor Optical Amplifier with Optical Filtering, Xin Chen¹, Li Huo¹, Liang Zhuang¹, Zhixi Zhao¹, Caiyun Lou¹; ¹Tsinghua Univ., China. We experimentally demonstrated all-optical OR/NOR/AND logic gates at 100 Gb/s with one semiconductor optical amplifier (SOA) assisted by optical filtering. Logics can be reconfigured by adjusting the optical band pass filter (OBPF) at SOA output.

AF3B.2 • 14:15
WDM Wavelength Quantizer, Zihan Geng¹, Chen Zhu¹, Bill Corcoran¹, Andreas Boes², Arnan Mitchell², Joshua Hart¹, Arthur Lowery²; ¹Monash Univ., Australia; ²School of Engineering, RMIT Univ., Australia. We demonstrate a novel all-optical frequency shifter that remaps signals with significant unknown frequency drifts onto precise static frequencies, as defined by channel multiplexing filters. We show <1 dB sensitivity penalty for frequency remapping with channel detuning of ±5 GHz.

AF3B.3 • 14:30
Passively mode-locked erbium-doped fiber laser with Ge-rich Si_{1-x}Ge_x saturable absorber, Yi-Hsiang Lin¹, Chi-Cheng Yang¹, Chih-Hsien Cheng¹, Chih-I Wu¹, Gong-Ru Lin¹; ¹Graduate Inst. of Photonics and Optoelectronics, Department of Electrical Engineering, National Taiwan Univ., Taiwan. The Ge-rich Si_{0.052}Ge_{0.948} is employed as a saturable absorber to demonstrate an L-band passively mode-locked erbium-doped fiber laser with a pulsewidth of 330 fs and a spectral linewidth of 7.91 nm.

Room: En SHI, F3

14:00–16:15
AF3C • Fiber Sensors and Gratings
President: Xuewen Shu, Huazhong Univ. of Science and Technology, China

AF3C.1 • 14:00 **Invited**
Photonic crystal fiber-based sensors, Dora Juan Juan Hu¹; ¹Inst. for Infocomm Research, Singapore. In this talk, we will discuss the mechanisms and designs of photonic crystal fiber (PCF)-based sensors, and present our experimental achievements in the field of physical and biochemical sensing applications.

AF3C.2 • 14:30 **Invited**
Fiber Bragg Gratings Induced by Femtosecond Laser and Sensing Applications, Yiping Wang¹, Changrui Liao¹, Jun He¹, Qiao Wang¹, Ying Wang¹, Congzhe Zhang¹, and Shen Liu¹; ¹Key Laboratory of Optoelectronic Devices and Systems of Ministry of Education and Guangdong Province, College of Optoelectronic Engineering, Shenzhen University, China. We reported recent developments of fiber Bragg gratings (FBGs) induced by use of a femtosecond laser in Shenzhen University. Novel FBGs induced in different types of optical fibers were demonstrated to develop their unique sensing applications.

Room: Han Yang, F2

14:00–16:00
AF3D • Long-Haul & High Capacity Transmssion
President: Hussam Batshon; TE SubCom, USA

AF3D.1 • 14:00
A Novel Asymmetric Optical System for Ultra Dense WDM Networks, YaNan Ma¹, Ning Deng¹; ¹Huawei Technologies Co., Ltd., China. A novel scheme for ultra-dense WDM network is proposed using one coherent transceiver at core-node end and multiple non-coherent transceivers at access-node ends. We successfully demonstrated 2×20-Gb/s PAM4 transmitted over 300-km SMF.

AF3D.2 • 14:15
Evaluation of Long-haul Coherent Transmission Performance Using Low RIN Forward Raman Pump, Mingming Tan¹, Vladislav Dvoyrin¹, Md A. Iqbal¹, Sergei K. Turitsyn¹, Paul Harper¹; ¹Aston Inst. of Photonics Technologies, Aston Univ., UK. Long-haul Raman amplified transmission performance evaluation using different first-order forward pumps including low RIN bismuth-doped fibre laser is presented. 2.8dB Q penalty was observed with forward pump RIN of -140dB/Hz, compared with backward pumping only.

AF3D.3 • 14:30
1.2Tbit/s Dual-Polarization Nyquist 16-QAM Half-Cycle Subcarrier Modulation Transmission with High Spectral Efficiency Direct Detection, Kaiheng Zou¹, Fan Zhang¹, Yixiao Zhu¹, Zhangyuan Chen¹; ¹Peking Univ., China. We demonstrated dual-polarization direct detection WDM transmission over 80km SSMF using Nyquist 16-QAM half-cycle single side band modulation with the total capacity of 1.2Tb/s (25GBaud×4×2×6). The net spectral efficiency is 4.65 bits/s/Hz.

Room: Xian Tao, F3

14:00–16:00
AF3E • Fiber-wireless Convergence Networks II
President: Changcheng Huang, Carleton University, Canada

AF3E.1 • 14:00 **Tutorial**
Survivable Multi-layer Elastic optical Networks, Gangxiang Shen¹; ¹Soochow Univ., China. Abstract not available.

Room: Wu Chang, F2

14:00–16:00

AF3F • Modulator & Photodetector

President: Xi Xiao; Wuhan Research Inst. of Post & Telecom., China

Room: Han Kou, F2

14:00–16:00

AF3G • Devices for optical interconnection

President: Linjie Zhou; Shanghai Jiao Tong Univ., China

Room: Shi Yan, B1

14:00–16:00

AF3H • Communication Data Format Processing

Room: Jing Men, B1

14:00–15:45

AF3I • Thin Film Solar Cells

Room: Xiao Gan, B1

14:00–16:00

AF3J • Holographic Data Storage and Micro-Photonics

President: Haiwei Wang; Huazhong Univ. of Science and Technology, China

Room: Xiang Yang, F3

14:00–16:00

AF3K • Imaging I

President: Laura Marcu; Univ. of California Davis, USA

AF3F.1 • 14:00 **Invited**

Photonic Integration for Terabit Scale Single-wavelength On-chip Optical Interconnects, Xinru Wu¹, Hon K. Tsang¹; ¹Dept. of Electronic Engineering, The Chinese Univ. of Hong Kong, China. We describe some of our recent results on using silicon photonics for high capacity on-chip interconnects, including integrated optical switches for mode division multiplexing and integrated ring modulators with advanced modulation formats for direct detection short reach interconnects.

AF3G.1 • 14:00 **Invited**

Strictly Non-Blocking Silicon Photonics Switches, Keijiro Suzuki¹, Ken Tanizawa¹, Satoshi Suda¹, Guangwei Cong¹, Hiroyuki Matsuura¹, Kazuhiro Ikeda¹, Shu Namiki¹, Hitoshi Kawashima¹; ¹AIST, Japan. We review recent achievements in multi-port optical switches based on silicon photonics, in which our 8 × 8 and 32 × 32 switches are focused. Additionally, future prospects including polarization-independent and broadband operation are discussed.

AF3H.1 • 14:00 **Invited**

Next Generation Advanced Optical Access Networks Towards 100G-PON, Lei Zhou¹; ¹Optical Access Networks, Huawei Technologies CO. LTD, China. The key challenges and Requirements of 100G-PON will be analyzed. The latest 100G-PON research hot points, mainstream technical solutions and standard status will be reviewed in this presentation.

AF3I.1 • 14:00 **Invited**

Nanoscope studies of Cu(InGa)Se₂ grain boundaries, Xudong Xiao¹; ¹SRI International, USA. Abstract not available.

AF3J.1 • 14:00 **Invited**

Ultra-high density optical storage technologies for big data center, Hao Ruan¹; ¹High Density Optical Storage Laboratory, Shanghai Inst. of Optics and Fine Mechanics, Chinese Academy of Sciences, China. In big data center, optical storage technologies have many advantages. However, how to improve the storage density of optical storage is still a huge challenge. In this presentation, multilayer optical storage, holographic data storage and SPIN technology are reviewed and the largest capacities of each technology are given.

AF3K.1 • 14:00 **Invited**

Laser Spectroscopy Applications for Ecology and Environmental Monitoring, Guangyu Zhao¹, Zheng Duan¹, MIng Lian¹, Shiming Zhu¹, Wansha Li¹, Wei Fu¹, Hao Zhang¹, Katarina Svanberg^{1,3}, Sune R. Svanberg^{1,2}; ¹Center of Optical and Electromagnetic Research, South China Normal Univ., China; ²Department of Physics, Lund Univ., Sweden; ³Lund Laser Center, Lund Univ., Sweden. Optical spectroscopy, and in particular laser spectroscopy, has numerous applications in the assessment and probing in ecology, such as agricultural field and flying pest insect monitoring, as well as in the measurement of atmospheric pollutants. An overview of recent work by our group is given.

AF3F.2 • 14:30

Hollow Hybrid Plasmonic Waveguide Used for Electro-optic Phase Modulation, Xu Sun¹, Lars Thylén¹, Lech Wosinski¹; ¹KTH, Sweden. An electro-optic polymer-based hollow hybrid plasmonic phase modulator has been proposed. Estimating from our preliminary experimental results, related to a hollow HP liquid sensor, the proposed device shows unique advantages in high speed modulation applications.

AF3G.2 • 14:30

Dynamic Compensation Technique for Improving Extinction Ratio of Silicon-based Optical Switch Driven by Carrier-Injection Diode, Liao Mingle¹, Baojian Wu¹, Wei Huang¹, Heng Zhou¹, Feng Wen¹, Kun Qiu¹; ¹Key lab of optical fiber sensing and communication networks, Ministry of Education, Univ. of Electronic Science and Technology of China, China. A dynamic compensation technique for improving ER of silicon-based optical switch driven by carrier injection diode is proposed and experimental results show that ER is improved by 1 dB, along with a better switching waveform.

AF3H.2 • 14:30

Novel Implementation of SOA-Based All-Optical Wavelength Conversion of DQPSK Signals Using Fast Switching Tunable Lasers, Yi Lin¹, Sepideh T. Naimi¹, Sean O'Duill¹, Aravind P. Anthur¹, Yonglin Yu², Liam P. Barry¹; ¹Dublin City Univ., Ireland; ²Wuhan National Laboratory for Optoelectronics, China. We investigate the feasibility of SOA-based wavelength conversion of DQPSK signals using wavelength tunable SGDBR pump lasers. Our results indicate that it is possible to build fast reconfigurable wavelength converters with <5 ns switching time.

AF3I.2 • 14:30

Nitride semiconductors for energy conversion in photonic applications, Andriy Zakutayev¹; ¹National Renewable Energy Laboratory, USA. Nitride semiconductors are interesting materials for solar energy energy conversion and other photonic applications [JMCA 4 6742 2016]. This presentation describes several recent examples of novel nitrides such as ZnSnN₂, Sn₃N₄ and Cu₃N.

AF3J.2 • 14:30 **Invited**

Applications of Volume Holographic Storage in Raman Biosensors, Claire Gu¹, Liangcai Cao²; ¹Univ. of California Santa Cruz, USA; ²Tsinghua Univ., China. We review the idea of incorporating a volume holographic storage unit in a Raman biosensor to achieve preliminary molecular identification, and present our work on the theoretical analysis and experimental demonstration of the concept.

AF3K.2 • 14:30

Withdrawn.

Room: Sui Zhou, F3

AF3A.4 • 14:45
Simultaneous Measurement of Torsion and Temperature Based on Helical Structure in Multi-core Fiber, Hailiang Zhang^{1,4}, Zhifang Wu^{4,1}, Perry Ping Shum^{4,1}, Chun Wah Low^{4,1}, Xuguang Shao⁴, Ruoxu Wang², Xuan Quyen Dinh^{1,3}, Songnian Fu², Weijun Tong⁵, Ming Tang²; ¹CINTRA CNRS/NTU/Thales, UMI 3288, Singapore; ²National Engineering Laboratory for Next Generation Internet Access System, Huazhong Univ. of Science and Technology, China; ³Thales Solutions Asia Pte Ltd, R&T, Singapore; ⁴COFT, School of EEE, Nanyang Technological Univ., Singapore; ⁵Yangtze Optical Fibre and Cable Company Ltd (YOFC), Singapore. An all-fiber torsion sensor based on a helical structure in a multicore fiber is demonstrated. The sensor exhibits the ability of discriminating torsion direction, torsion angle and temperature.

AF3A.5 • 15:00
Real-time bi-directional 800Mbs visible light communication system utilizing commercial LEDs, Fumin Wang¹, Jiaqi Yin², Jianyang Shi¹, Nan Chi¹, Liuming Lu², Aijun Xu², Jie Xiong², Zhuang Ma²; ¹Fudan Univ., China; ²ZTE, China. For the first time we experimentally demonstrate the highest data rate for real-time full-duplex VCL system at 800Mbit/s over 1-meter free space transmission based on commercial red/white LEDs employing adaptive OFDM modulation format.

AF3A.6 • 15:15
Design and Implementation of Multi-layer and Multi-domain SDTN Orchestration Architecture, Longfei Zhao¹, Guoying Zhang¹, Haiyi Zhang¹, Hui Ding¹; ¹CAICT, China. We propose a Software Defined Transport Network (SDTN) multi-layer and multi-domain Orchestration Architecture based on Common Information Model and Northbound API. We implement the orchestration system and validate the interoperability among different vendor's packet OTN equipment.

Room: Huang Shi, F2

AF3B.4 • 14:45
Novel high-performance polarization beam splitter on silicon, Hao Wu¹, Daoxin Dai¹; ¹College of Optical Science and Engineering, Centre for Optical and Electromagnetic Research, China. A high-performance silicon-based PBS is realized with a footprint of $\sim 4 \times 15 \mu\text{m}^2$ by utilizing structure of cascaded bent direction couplers. The PBS has very high ER (>25dB) and low excess loss (<0.9dB) over a broad band.

AF3B.5 • 15:00
First demonstration of a reconfigurable optical add-drop multiplexer on silicon for mode-division-multiplexed systems, Wang Shipeng¹, Hao Wu¹, Daoxin Dai¹; ¹Zhejiang Univ., China. A reconfigurable optical add-drop multiplexer (ROADM) with four mode-channels is proposed and demonstrated by integrating a mode DEMUXer, four thermo-optic MZSes, and a mode MUXer for the first time.

AF3B.6 • 15:15
A Monolithically Integrated InP-based Few-mode Laser, Zhaosong Li¹, Dan Lu¹, Song Liang¹, Zhen Liu¹, Jiaoqing Pan¹; ¹Inst. of Semiconductors, CAS, China. A monolithically integrated InP-based few-mode laser comprising of a distributed feedback laser (DFB) and a multimode interference coupler (MMI) based mode converter is designed and manufactured. TE₀ and TE₁ laser modes generation are demonstrated.

Room: En SHI, F3

AF3C.3 • 15:00
Optical Fiber Spectrometer based on Smartphone Platform for Refractive Index Sensing Application, Yaohui Zhang¹, Guofeng Yan¹, Sailing He¹; ¹Zhejiang Univ., China. We proposed an optical fiber spectrometer based on smartphone platform with a resolution of ~ 0.5 nm. A practical application of such a spectrometer for refractive index sensing, was experimentally demonstrated by using an optic-fiber interferometer.

AF3C.4 • 15:15
Polarization-dependent phase-shifted fiber Bragg gratings inscribed by femtosecond laser overexposure, Jun He^{1,2}, Yiping Wang¹, Changrui Liao¹, Ying Wang¹, Kaiming Yang¹, Shen Liu¹, Gang-Ding Peng²; ¹Shenzhen Univ., China; ²Univ. of New South Wales, Australia. Polarization dependent phase-shifted fiber Bragg gratings (PS-FBGs) were fabricated with 800 nm femtosecond laser overexposure and a uniform phase mask. Negative index change created in the center was responsible for the PS-FBG formation.

Room: Han Yang, F2

AF3D.4 • 14:45
100G Transmission over Ultra-long, G.655 (NZDSF) Unrepeated Span, Do-Il Chang¹, Philippe Perrier¹, Herve Fevrier¹; ¹Xtera Communications Inc USA, USA. This paper reports ultra-long 100G unrepeated transmission on NZDSF. 4×120 Gb/s transmission over 402.7 km (82.8dB) of NZDSF is achieved using a commercial Raman-based system and enhanced ROPAs with a dedicated pumping fiber

AF3D.5 • 15:00 **Invited**
Nonuniform Signaling based LDPC-Coded Modulation for High-Speed Optical Transport Networks, Tao Liu¹, Zhen Qu¹, Changyu Lin¹, Ivan B. Djordjevic¹; ¹Univ. of Arizona, USA. Different non-uniform (probability shaping) signaling schemes are introduced. By transmitting symbols with different probabilities, energy efficiency (shaping gain) of traditional schemes can be improved. With constellation points selected according to Maxwell-Boltzmann distribution, ultimate shaping gain of 1.53dB can be achieved.

Room: Xian Tao, F3

AF3E.2 • 15:00
Survivable Virtual Network Embedding Based on Connection Availability in Fiber-Wireless Access Network, Jian Hou¹, Yejun Liu¹, Lei Guo¹, Pengchao Han¹, Xu Han¹; ¹Northeastern Univ., China. We focus on the survivability issue in virtualized Fiber-Wireless access network and propose a virtual network embedding scheme based on connection availability. Results demonstrate the advantage of proposed scheme in resource utilization and acceptance ratio.

AF3E.3 • 15:15
Green Virtual Network Embedding with Periodical Sleep Mechanism for Fiber-Wireless Access Network, Xu Han¹, Pengchao Han¹, Yejun Liu¹, Lei Guo¹, Jian Hou¹; ¹Northeastern Univ., USA. This paper addresses the Virtual Network Embedding (VNE) problem in fiber-wireless access network and proposes a VNE algorithm for energy conservation. Simulation results verify the proposed algorithm is effective in saving energy with acceptable delay.

Room: Wu Chang, F2**AF3F.3 • 14:45**

Design of an ultra-compact optical modulator based on a silicon-vanadium dioxide hybrid waveguide, Linjie Zhou¹; ¹Shanghai Jiao Tong Univ., China. We present the design of an electrically driven hybrid Si-VO₂ electro-optic modulator with a length of 1.4 mm. Simulation shows the modulator on-off extinction ratio is 8.7 dB and insertion loss is only 1.9 dB.

AF3F.4 • 15:00

Hybrid Integrated Velocity Matched Travelling-wave InP/InGaAs Photodetectors with Silicon Nitride Waveguides, Pengfei Xu¹, Yujie Chen¹, Zengkai Shao¹, Yanfeng Zhang¹, Tianyou Zhang¹, Zeru Wu¹, Chunchuan Yang¹, Lin Liu¹, Lidan Zhou¹, Hui Chen¹, Jie Liu¹, Siyuan Yu¹; ¹Sun Yat-sen Univ., China. Hybrid integrated InP/InGaAs travelling-wave photodetector based on slotline transmission line with velocity-matched bent silicon nitride (SiN_x) optical waveguide is designed and fabricated.

AF3F.5 • 15:15

High responsivity photodetector based on monolayer molybdenum disulfide (MoS₂), Tianyou Zhang¹, Yujie Chen¹, Pengfei Xu¹, Zeru Wu¹, Yanfeng Zhang¹, Lin Liu¹, Chunchuan Yang¹, Hui Chen¹, Siyuan Yu¹; ¹Sun Yat-sen Univ., China. A photodetector based on a monolayer molybdenum disulfide (MoS₂) is demonstrated with a promising photoresponsivity (230 mA/W @532 nm) for potential applications.

Room: Han Kou, F2**AF3G.3 • 14:45**

Ultrafast chip-integrated all-optical switch in photonic circuits, Zhen Chai¹, Yu Zhu¹, Xiaoyong Hu¹, Hong Yang¹, Qihuang Gong¹; ¹Peking Univ., China. We report a picosecond and low-power all-optical switch with multiple operating wavelengths in integrated photonic circuits, on-chip-triggered by a control light. The sample configuration combines the advantages of plasmonics and photonics, i.e. plasmonic nanostructures used as core units interconnected by ultralow-loss dielectric slot waveguides.

AF3G.4 • 15:00

Three Dimensional Beam Splitter in Silica Substrate based on Orthogonal Cascaded Y-branch couplers, Haiyang Zhang¹, Yawen Huang², Sheng Huang², Zhixin Wang¹, Kevin Chen², Weiwei Hu¹; ¹Peking Univ., China; ²Univ. of Pittsburgh, USA *Minor Outlying Islands*. A technique for constructing an innovative structure of the three dimensional beam splitter with a designable feature is demonstrated. Orthogonal cascaded Y-branch couplers are utilized. Perfect 3D beam splitting results are achieved.

AF3G.5 • 15:15

Low Crosstalk and Low Power Consumption 24-Channel Thermo-Optic Dark VOA Array Based on Silica-on-Silicon, Xiaoping Wu^{1,2}; ¹Huazhong Univ. of Science and Technology, USA; ²Accelink Technologies, Wuhan Research Inst. of Posts and Telecommunications, China. The paper introduces a low crosstalk and low power consumption dark 24ch-VOA Array based on Silica-on-Silicon, with thermally-insulating trenches and etched-free waveguides technologies in different channels, the IL and PDL are lower at 15dB attenuation.

Room: Shi Yan, B1**AF3H.3 • 14:45**

100-Gb/s All Optical 3R Regeneration Based on Cross Gain Compression in Semiconductor Optical Amplifiers, Xin Chen¹, Li huo¹, Zhixi Zhao¹, Caiyun Lou¹; ¹Tsinghua Univ., China. All optical 3R regeneration of 100-Gb/s return-to-zero on-off-keying (RZ-OOK) signal based on cross gain compression (XGC) effect using semiconductor optical amplifiers (SOAs) is experimentally demonstrated for the first time. Receiving sensitivity is improved by 2~3 dB.

AF3H.4 • 15:00

40 Gb/s Regenerative and Wavelength-Converting Format Conversion from NRZ-QPSK to RZ-OOK using Ultrafast Gain Recovery in a Single SOA, Tong Cao¹, Xinliang Zhang¹, Liao Chen¹, Zhuyang Huang¹; ¹Wuhan National Lab for Optoelectronics, China. We demonstrate the regenerative and wavelength-converting format conversion from NRZ-QPSK to RZ-OOK using the ultrafast gain recovery in a single SOA. The scheme shows good regenerative performance for different amplitude noises

AF3H.5 • 15:15

80 km optical steganography transmission over 200 GHz-grid WDM network, Huatao Zhu¹, Rong Wang¹, Peng Xiang¹, Tao Pu¹, Tao Fang¹, Yeteng Tang¹, Haiping Chen²; ¹PLA Univ. of Science and Technology, China; ²Chongqing Communication Inst., China. Optical steganography based on super-continuum generation over multiple channels WDM network is investigated. By adjusting the bandwidth of notch filter, the stealth channel can be transmitted with error-free transmission.

Room: Jing Men, B1**AF3I.3 • 14:45** **Invited**

Rational Surface Textures with Nanophotonic Patterns for Efficient Crystalline-Silicon/Organic Heterojunction Solar Cells, Pingqi Gao¹; ¹Ningbo Inst. of Industrial Technology, Chinese Academy of Sciences, Chile. Si/PEDOT:PSS heterojunction solar cells with rational surface texturing are widely researched in recent years. Here we present various surface design to achieve excellent power conversion efficiency for this photoelectric device.

Room: Xiao Gan, B1**AF3J.3 • 15:00** **Invited**

Applications of Digital Holography with a Single Low-Coherence Light Source, No-Cheol Park¹, Sungbin Jeon¹, Janghyun Cho¹, Jinan Jin¹; ¹Yonsei Univ., Korea. The short coherence length of light source in digital holography limits the performance and the applications of the digital holographic measurement system in practical. In this paper, we propose the experimental methods to control coherence in both spatial and temporal way, which is essential to apply the digital holography in measurement system.

AF3I.4 • 15:15

CuSbSe₂ as a Potential Photovoltaic Absorber Material: Studies from Theory to Experiment, Yang Bo¹; ¹WNLO, China. CuSbSe₂ appears to be a promising absorber material for thin-film solar cells due to its attractive optical and electrical properties, as well as earth-abundant, low-cost and low-toxic constituent elements.

Room: Xiang Yang, F3**AF3K.3 • 14:45**

DNA-templated silver nanoclusters locate microRNAs in nucleus in gastric cancer cells, Jingpu Zhang^{1,2}, Yanlei Liu¹, Chunlei Zhang¹, Tiefu Liu², Daxiang Cui¹; ¹Inst. of Nano Biomedicine and Engineering, Shanghai Jiaotong Univ., China; ²Department of Scientific Research, Shanghai Public Health Clinical Center, China. Based on G-rich fluorescence enhancement effect, DNA-templated silver nanoclusters were used as signal probe for miRNA detection in fluorescence in-situ hybridization, and located miRNAs in the nucleus of cells, providing their subcellular distribution information.

AF3K.4 • 15:00

Efficient image reconstruction for fluorescence molecular tomography via linear regression approximation scheme with dual augmented lagrangian method, Xu Zhang¹, Huangjian Yi¹, Xuelei He¹, Yuqing Hou¹, Xiaowei He¹; ¹School of Information Sciences and Technology, Northwest Univ., China. Fluorescence molecular tomography remains issue to obtain fast and accurate reconstruction. Here, we present an innovative method associating dual augmented lagrangian method with linear regression approximation strategy, which guarantees better location and computational efficiency for reconstruction.

AF3K.5 • 15:15

Wide-field fluorescence diffuse optical tomography based on sinusoidal illumination, Tongxin Li¹, Weiting Chen¹, Caixia Qi¹, Panpan Yan¹, Huijuan Zhao^{1,2}, Feng Gao^{1,2}; ¹School of Precision Instrument and Optoelectronics Engineering, Tianjin Univ., China; ²Tianjin Key Laboratory of Biomedical Detecting Techniques and Instruments, China. We present a wide-field method for obtaining fluorescence tomography of turbid media based on sinusoidal illumination pattern. Experimental validation performed on a phantom embedding the fluorescence targets is presented.

Room: Sui Zhou, F3

AF3A.7 • 15:30

Measuring Viscoelasticity by Tracking Vibration Based on Laser Speckle Contrast Imaging, Chen Xiao^{1,2}, Jinhua Wang^{1,2}, Yang Wang^{1,2}, Jinling Lu^{1,2}, Pengcheng Li^{1,2}; ¹Wuhan National Laboratory for Optoelectronics, China; ²Key Laboratory of Biomedical Photonics of Ministry of Education, Department of Biomedical Engineering, Huazhong Univ. of Science and Technology, China. Developing a laser speckle contrast imaging method to obtain the viscoelastic properties of biological sample by tracking the vibration induced by acoustic stimulation. This method can also be used for non-invasive imaging of tissue viscoelastic *in vivo*.

AF3A.8 • 15:45

Rotary Scanning Optical Resolution Photoacoustic Microscopy, Wei Z. Qi¹, Tian Jin¹, Lei Xi¹; ¹Univ Elec Sci & Tech China, USA. In this paper, we reported a rotary scanning optical resolution photoacoustic microscopy that is free of raster scanning. Both carbon fibers and mice ears were imaged to evaluate the performance of the system.

Room: Huang Shi, F2

AF3B.7 • 15:30

An AWG-based synchronized multichannel mode-locked laser, Songtao Liu¹, Xilin Zhang¹, Ruikang Zhang¹, Qiang Kan¹, Dan Lu¹, Lingjuan Zhao¹, Chen Ji¹; ¹Inst. of Semiconductors, CAS, China. A low-cost synchronized multichannel AWG based mode-locked semiconductor laser is reported. The fundamentally mode-locked laser demonstrates multichannel synchronous mode-locking operation at a repetition frequency of 4 GHz under both passive mode-locking and hybrid mode-locking condition.

Room: En SHI, F3

AF3C.5 • 15:30

Optical Gas Pressure Sensor with Long Period Fiber Grating Fabricated with Heat-shrinkable Tube, Yasuhiro Tsutsumi¹, Masaharu Ohashi¹, Yuji Miyoshi¹, Hirokazu Kubota¹; ¹Osaka Prefecture Univ., Japan. A simple optical gas pressure sensor with long period fiber grating (LPFG) fabricated with heat-shrinkable tube is proposed and demonstrated. Experimental results show good property of the gas pressure sensor with the LPFG.

AF3C.6 • 15:45

Design of High Channel-Count Dispersion Compensators Based on Digital Concatenated Chirped-sampled Fiber Grating With Multiple Phase Shifts, Man Li¹, Jialin Zhao¹, Yonglin Yu¹; ¹Huazhong Univ. of Science and Tech, China. Chirping the grating pitches is introduced into digital concatenated grating with multiple phase shifts to design dispersion compensators. Simulation results indicate this technique is a promising method for designing high channel-count dispersion compensators.

AF3C.7 • 16:00

High-resolution Distributed Strain Sensing System for Landslide Monitoring, Zhihua Yu¹, Qi Zhang¹; ¹School of Automation, China Univ. of Geosciences(Wuhan), China. A novel fiber-optics landslide monitoring system is proposed to achieve distributed, high-sensitivity and high-resolution strain measurement. The whole system adopts coherent OTDR technique to realize accurate monitoring with a resolution of 0.1µε.

Room: Han Yang, F2

AF3D.6 • 15:30

Unrepeated Raman-amplified transmission of 28 Gbaud PM-16QAM over 300 km enabled by digital nonlinear pre-compensation, Syed Muhammad Bilal¹, Kseniia Goroshko¹, Hadrien Louchet¹, Igor Koltchanov¹, André Richter¹; ¹VPIphotonics, Germany. We demonstrate the effectiveness of digital nonlinear pre-compensation for Raman-amplified transmission of single-carrier 28 Gbaud PM-16QAM. Our simulation results show that by applying transmitter side digital backpropagation and carefully selecting forward and backward Raman pump powers, unrepeated transmission over 300 km can be achieved.

AF3D.7 • 15:45

Studies on Spectral Shaping for Fiber Nonlinear Channels, Qun Guo¹, Bo Xu¹, Mao Zhang¹, Kun Qiu¹; ¹Univ. of Electronic Science and Tec, China. The performances of four pulse shaping schemes over long-haul fiber nonlinear channel are analyzed based on numerical simulations. Constraints from practical high-speed DAC, ADC resolution and bandwidth are also compared among different pulse shaping.

Room: Xian Tao, F3

AF3E.4 • 15:30

Impact of Radio over Ethernet Time-based Encapsulation on Fronthaul Performance, Luca Valcarengi¹, Koteswararao Kondepu¹, Piero Castoldi¹; ¹Scuola Superiore Sant'Anna, Italy. This paper proposes a time-driven encapsulation for structure-agnostic Radio over Ethernet. Analytical and experimental evaluations show that the proposed encapsulation limits the delay to few microsecond without jitter but an optimal time must be found to limit the overhead.

AF3E.5 • 15:45

Reducing Virtual Network Reconfiguration and Traffic Losses under Multiple Traffic Anomalies, Alba P. Vela¹, Marc Ruiz¹, Luis Velasco¹; ¹Universitat Politècnica de Catalunya, Spain. Multiple OD traffic anomalies can arise exceeding pre-planned capacity and causing congestion. We propose to detect anomalous and suspicious ODs to reduce virtual network reconfiguration and total traffic losses. Results show savings higher than 25%.

16:00–16:30 Coffee Break & Exhibition, Public area, Basement, 2nd and 3rd Floor, Shangri-La Hotel, Wuhan

Room: Wu Chang, F2

AF3F.6 • 15:30

Design and Fabrication of an Array of 8 Evanescently Coupled Uni-Traveling-Carrier Photodiodes, Han Ye¹, Qin Han¹, Qianqian Lv¹, Xiaohong Yang¹; ¹*Inst. of Semiconductors, CAS, China*. Optical transmission from a diluted waveguide to an evanescently coupled uni-traveling carrier photodiode is optimized. The fabricated array of 8 photodiodes each shows a -3dB bandwidth of 17GHz and linear photocurrent to 20mA.

AF3F.7 • 15:45

Study of the Effect of Gaussian Doping in Absorber on High Speed Performance of Uni-Traveling-Carrier Photodetector, Lirong Liu¹, Yongqing Huang¹; ¹*BUPT, China*. The effect of Gaussian Doping in absorber on high speed characteristic of uni-traveling-carrier is studied. Results show that the location of peak doping and characteristic length of Gaussian doping have a significant impact on bandwidth.

Room: Han Kou, F2

AF3G.6 • 15:30

Spiral Optical Delay Lines in Silicon-on-Insulator, Yan Li¹, Xun Song¹, Yue Xu¹, Yanping Li¹; ¹*Peking Univ., China*. Four spiral optical delay lines (ODLs) in silicon-on-insulator (SOI) with the length of 1.2055cm, 4.9915cm, 19.79cm and 44.18cm were fabricated and the average insertion loss was measured as 3.153dB/cm, 3.134dB/cm, 1.908dB/cm and 1.001dB/cm respectively.

AF3G.7 • 15:45

Scalability and tunability of the silicon circuit supporting on-chip ordered-route light transmission, Huaqing Qiu^{1,2}; ¹*Huazhong Univ. of Science and Technology, China*; ²*Wuhan National Laboratory for Optoelectronics, China*. We demonstrate a six-port circuit to obtain ordered-route light transmission by exploiting thermo-optic effect in microrings. We theoretically analyzed the scalability and experimentally proved the working region tunability of the device.

Room: Shi Yan, B1

AF3H.6 • 15:30

Experimental Demonstration of Wireless In-Band Full-Duplex with DML-Based Self-Interference Cancellation, Yinghong Yu¹, Shilin Xiao¹, Yunhao Zhang¹, Shaojie Zhang¹, Lu Zhang¹, Ling Liu¹, Cao Chen¹; ¹*Department of Electronic Engineering, Shanghai Jiao Tong Univ., China*. Wireless in-band full-duplex transmission of OFDM signals is experimentally demonstrated with DML-based self-interference cancellation. As antennas employed, 22-dB cancellation at 900MHz and 30-dB cancellation at 2.4GHz are obtained both over 100MHz bandwidth.

AF3H.7 • 15:45

Linearized Phase-Modulated Analog Photonic Link with Large Spurious-Free Dynamic Range, Zhipeng Xie¹, Song Yu¹, Shanyong Cai¹, Wanyi Gu¹; ¹*State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts & Telecommunications, China*. A novel phase-modulated link with large SFDR beyond 120 dB is demonstrated. By properly manipulating the ratios of RF and optical powers, improvements of 25.35 dB in CIR and 12.85 dB in SFDR are experimentally demonstrated.

Room: Jing Men, B1

AF3I.5 • 15:30

A study of degradation of organic solar cells with TiO_x protection layer by laser beam induced current mapping, Jiguang Li^{1,2}, Yang Shen¹; ¹*Univ. of Virginia, USA*; ²*Goforward Tech Inc., China*. Laser beam induced current mapping were used to explore local photocurrent distribution in organic solar cells with TiO_x protection layer. The results show that the TiO_x layer could effectively absorb water/oxygen from ambient air.

Room: Xiao Gan, B1

AF3J.4 • 15:30

Design and analysis of periodically patterned metallic nanostructures, Sha Peng¹, Ying Yuan¹, Dong Wei¹, Xinyu Zhang¹, Haiwei Wang¹, Changsheng Xie¹; ¹*Huazhong Univ. of Science and Tech, China*. A kind of periodically patterned metallic nanostructures has been developed in this paper. Through changing the structural parameters, the most effective nanostructures can be selected. The experimental results demonstrate that it can stimulate surface plasmons.

AF3J.5 • 15:45

Observation of strong and weak couplings in a single hybrid plasmon-waveguide system, Yisheng Gao¹, Haitao Zhang¹, Shang Sun¹, Chen Zhang¹, Qinghai Song², Shumin Xiao¹; ¹*School of Material Science and Engineering, Harbin Inst. of Technology, China*; ²*School of Electrical and Information Engineering, Harbin Inst. of Technology, China*. EIT-like and Fano-like resonances can be obtained in a single hybrid plasmonic system under the excitation by different polarization light. The LSPs and the Bragg resonance from the plasmonic grating under different polarizations interference couple with the waveguide mode and contribute to the strong and weak couplings, respectively.

Room: Xiang Yang, F3AF3K.6 • 15:30 **Invited**

Creation of new diagnostic/therapeutic windows in tissues: from UV to terahertz, Valery V. Tuchin^{1,2}; ¹*Optics and Biophotonics, Saratov National Research State Univ., Russia*; ²*Laboratory of Laser Diagnostics of Technical and Living Systems, Inst. of Precision Mechanics and Control RAS, Russia*. Fundamentals and advances of tissue immersion clearing for enhanced spectroscopy, imaging and treatment of living tissues and cells in a broad range of wavelengths from UV to terahertz within created windows for electromagnetic radiation transport will be discussed.

16:00–16:30 **Coffee Break & Exhibition**, Public area, Basement, 2nd and 3rd Floor, Shangri-La Hotel, Wuhan

Room: En SHI, F3

16:30–18:00

AF4A • Fiber Lasers II

Presider: Yong Liu; Univ of Electronic Sci & Tech of China, China

Room: Han Yang, F2

16:30–18:00

AF4B • Coding & Optimization

Presider: André Richter, VPIphotonics, Germany

Room: Huang Shi, F2

16:30–18:00

AF4C • Device Enabled Functionalities

Room: Xian Tao, F3

16:30–18:00

AF4D • Optical Switching

Room: Han Kou, F2

16:30–18:00

AF4E • Optical Vortex

Presider: Jian Wang; Huazhong Univ. of Science and Technology, China

AF4A.1 • 16:30 **Invited**

Progress and challenges in further power scaling of single-mode fiber lasers, Liang Dong¹, Fanting Kong¹, Guancheng Gu¹, Thomas Hawkins¹, Maxwell Jones², Joshua Parsons¹, Monica Kalichevsky-Dong¹, Christopher Dunn¹; ¹Clemson Univ., USA; ²Nufern, USA. There has been tremendous progress in fiber lasers over the past decade both academically and commercially. There are still some significant challenges in power scaling. We will review some of our recent works.

AF4B.1 • 16:30

Transmitter IQ Mismatch Compensation Based on Second Order Moment Estimation for Coherent Optical M-QAM System, Chao Li¹, Zhengyuan Xu^{1,2}, Qi Yang³, Shaohua Yu³; ¹USTC, China; ²Shenzhen Graduate School, Tsinghua Univ., China; ³Wuhan Research Inst. of Posts and Telecommunications, China. This paper presents a pilot-aided method to compensate the transmitter IQ mismatch in coherent optical 4/16-QAM system. The IQ unbalanced amplitude and phase parameters are extracted by employing a second order moment estimation algorithm.

AF4B.2 • 16:45 **Invited**

Mutual Information Based Metrics for Post-FEC Performance Estimation, Hussam G. Batshon¹; ¹TE SubCom, USA. Alternative metrics to pre-FEC BER based on mutual information have been recently suggested to provide a more accurate estimation of the post FEC performance. We discuss these metrics and their suitability for different modulation formats.

AF4C.1 • 16:30 **Invited**

Ultra-Broadband High-Linear Integrated Transmitter for Low Complexity Optical Interconnect Applications, Sergei Popov¹, Xiaodan Pang², Oskars Ozolins², Miguel I. Olmedo³, Aditya Kakkar³, Simone Gaiarin⁴, Aleksejs Udalcovs^{1,2}, Rui Lin^{1,5}, Richard Schatz¹, Jaime R. Navarro^{1,2}, Anders Djupsjöbacka², Darko Zibar⁴, Jiajia Chen¹, Urban Westergren¹, Gunnar Jacobsen²; ¹Royal Inst. of Technology (KTH), Sweden; ²Swedish ICT Acreo AB, Sweden; ³Royal Inst. of Technology, Sweden; ⁴Denmark Technical Univ., Denmark; ⁵Huazhong Univ. of Science and Technology, China. We report on a high-speed optical transmitter using InP-based integrated externally modulated laser for optical interconnect applications with up to 30 dB static extinction ratio and over 100 GHz 3 dB bandwidth with 2 dB ripple. It is evaluated with up to 116 Gbit/s on-off keying, 4-pulse amplitude modulation (PAM) and up to 105 Gbit/s 8-PAM optical signals with different digital equalization implementations. Low number of taps is required for a high and stable performance. Results reveal that digital equalization significantly boosts the passive optical interconnect scalability.

AF4D.1 • 16:30 **Invited**

Technology Evolution of All Optical Switching, Ning Deng¹, Wei Jia¹; ¹Huawei Technologies Co Ltd, China. This paper summarizes recent technology evolution of all optical switching, especially from the perspective of industry applications. Promising technologies for near future, such as ultra dense wavelength switching network (UD-WSN), are also discussed.

AF4E.1 • 16:30 **Invited**

Optical angular momentum structures chiral materials and devices, Takashige Omatsu¹; ¹Chiba Univ., Japan. Structured lights enable us to chiral nanostructures formed of metal, silicon, and polymers. Such chiral nanostructures will provide us advanced chiral photonics devices, such as plasmonic metasurfaces for chiral chemical detection and reaction.

Room: Wu Chang, F2

16:30–18:00

AF4F • Transceivers

President: Woo-Young Choi;
Yonsei University, Korea

Room: Jing Men, B1

16:30–18:00

AF4G • Optical Measurement Techniques

President: Ming Li; CAS, China

Room: Shi Yan, B1

16:30–18:00

AF4H • Optical Data Processing

President: Zhaohui Li; Jinan Univ., China

Room: Xiao Gan, B1

16:30–18:00

AF4I • Laser Fibers and Waveguides

President: Ya Cheng; Shanghai Inst of Optics and Fine Mech, China

Room: Sui Zhou, F3

16:30–18:00

AF4J • Imaging II

President: Sune Svanberg;
Center for Optical and Electromagnetic Research, South China Normal Univ., China; Lund Laser Center, Lund Univ., Sweden

Room: Xiang Yang, F3

16:30–18:00

AF4K • Imaging III

President: Valery V Tuchin;
Saratov State Univ., Russia

AF4F.1 • 16:30 **Invited**

Polarization-independent, low-loss and micro-scale silicon photonics for high-dense GPON OLT application, Shengmeng Fu¹, Jiangwei Man¹, Qiang Zhang¹, Zhiwei Li¹, Matteo Cherchi², Fei Sun², Mikko Karppinen², Li Zeng¹; ¹Hua-wei Technologies Co.,Ltd, China; ²VTT Technical Research Center, Finland. We propose a 4-channel high-dense GPON optical line terminal module based on the polarization-independent, low-loss and micro-scale silicon photonics platform. The performance with output power of 3dBm and sensitivity of -32dBm can be achieved for class C+ standard.

AF4G.1 • 16:30 **Invited**

High-Extinction-Ratio Multi-Wavelength Optical Source Based on an On-Chip Nonlinear Micro-Ring Resonator, Kun Zhu¹, Sonia Shuk Chu Wong¹, Tsz Fung Tam¹, Kwong Shing Tsang^{2,3}, Victor Ho^{1,2}, Kwok Sum Chan¹, Ray Man², Chao Lu³, Sai Tak Chu¹; ¹Department of Physics and Materials Sciences, City Univ. of Hong Kong, Hong Kong; ²Amonics Limited, Hong Kong; ³Department of Electronic and Information Engineering, The Hong Kong Polytechnic Univ., Hong Kong. We present and experimentally demonstrate a stable high-extinction-ratio multi-wavelength optical source with Erbium-doped fiber, which is mainly based on a CMOS-compatible nonlinear micro-ring resonator. Optical spectrum from different output positions are compared and analyzed.

AF4H.1 • 16:30 **Invited**

Channel effects and mitigation approaches in free-space and underwater optical communications using orbital angular momentum multiplexing, Yongxiong Ren¹, Long Li¹, Guodong Xie¹, Alan Willner¹; ¹Univ. of Southern California, USA. We discuss atmospheric turbulence effects and turbulence mitigation approaches in free-space optical links employing multiplexing of orbital-angular-momentum (OAM) beams. We also describe the use of OAM multiplexing for high-capacity underwater optical transmission.

AF4I.1 • 16:30

High-energy Q-switched Yb-doped Fiber Laser Based on WS₂ Film Saturable Absorber, Junli Wang¹, Sha Li¹, Yong-gang Wang¹, Jiangfeng Zhu¹, Zhiyi Wei²; ¹Xidian Univ., China; ²Inst. of Physics, Chinese Academy of Sciences, China. An all-fiber high-energy Q-switched Yb-doped fiber laser using WS₂ film as the saturable absorber (SA) is demonstrated. The highest single pulse energy of 56.50 nJ and the shortest pulse width of 1.0 μs were achieved.

AF4I.2 • 16:45

High order harmonic generation in gas-filled slab waveguide, Peng Gu¹, Yao Li¹, Haiying Song¹, Shibing Liu¹; ¹Beijing Univ. of Technology, China. A Ti:sapphire femtosecond laser is focused into a helium filled slab waveguide to generate high order harmonics. Our results indicate that this new geometry can restrain the effect of laser defocusing and phase matching of 63rd harmonic is obtained.

AF4J.1 • 16:30 **Invited**

Biophotonics tools for characterising tissues using optical coherence tomography: Detecting mechanics, motion and birefringence, David D. Sampson¹, Peijun Gong¹, Karol Karnowski¹; ¹Univ. of Western Australia, Australia. The capacity of optical coherence tomography to characterize biological tissues can be augmented by extensions to detect motion (blood and lymph flow), response to load (stiffness) and birefringence (stress and sub-structure). This talk will review these extensions and describe example applications in cancer, the eye and skin.

AF4K.1 • 16:30 **Invited**

Fluorescence lifetime techniques in biomedical applications, Laura Marcu¹; ¹Univ. of California Davis, USA. This presentation overviews fluorescence lifetime spectroscopy and imaging techniques for label-free in vivo characterization of biological tissues. Emphasis is placed on devices and methods enabling real-time characterization and diagnosis of diseased tissues during intraoperative procedures.

Room: En SHI, F3

AF4A.2 • 17:00

Tunable dual-wavelength Erbium-doped fiber lasers using a hollow core Bragg fiber, Xin Wang¹, Shuqin Lou¹, Tanglin Zhao¹, Zhenggang Lian²; ¹Beijing Jiaotong Univ., China; ²Yangtze Optical Electronic Co., China. A tunable dual-wavelength Erbium-doped fiber laser with a side mode suppression ratio of 50 dB is proposed. With the introduction of a hollow core Bragg fiber, the side modes can be effectively suppressed.

Room: Han Yang, F2

AF4B.3 • 17:15

Error Analysis and Compensation Method of Non-diffraction Grating Structured Light System with Adjustable Parameters in 3D Profile Measurement, Fangyuan Zhou¹, Liping Zhou²; ¹Huazhong Inst. of Electro-Optics-Wuhan National Laboratory for Optoelectronics, China; ²Huazhong Univ. of Science and Technology, China. Error analysis and compensation experiments for non-diffraction grating structured light system with adjustable parameters have been carried out. Results show increasing the angle θ_0 or decreasing the distance L_0 will both reduce profile's restoring errors.

Room: Huang Shi, F2

AF4C.2 • 17:00 **Invited**

Photonic crystal Fano structures and their application to ultrafast switching and lasers, Yi Yu¹, Dagmawi A. Bekele¹, Hao Hu¹, Weiqi Xue¹, Leif K. Oxenløwe¹, Kresten Yvind¹, Jesper Mørk¹; ¹Danmarks Tekniske Universitet, Denmark. We present investigations on photonic-crystal Fano structures based on a cavity-waveguide configuration. We show that the use of Fano resonance can enable great improvements in high-speed low-energy all-optical switching and realizing ultra-fast nanolasers.

AF4C.3 • 17:15

A 0-100GHz Channel Integrated RoF System Based on Optical Frequency Comb and Wavelength Selective Switch, ChengBo Wu^{1,2}, Shangyuan Li^{1,2}, Xiaoping Zheng^{1,2}, Hanyi Zhang^{1,2}, Bingkun Zhou^{1,2}; ¹ Tsinghua National Laboratory for Information Science and Technology (TNList), China; ²Department of Electronic Engineering, Tsinghua Univ., China. We propose a channel integrated RoF system with multi-channel and multi-band transmission covering 0-100GHz based on optical frequency comb (OFC) and wavelength selective switch (WSS). Realizing frequency conversion with OFC and switching function with WSS.

Room: Xian Tao, F3

AF4D.2 • 17:00 **Invited**

Energy and Spectral Efficiencies Analysis in OTN Switching WDM MLR Networks, Yabin Ye¹, Jorge Lopez Vizcaino¹; ¹Huawei Technologies Duesseldorf GmbH, Germany. Energy and spectral efficiencies are analyzed by introducing OTN switching in WDM MLR networks for both unprotected and dedicated protected 1+1 scenarios. Substantial improvements can be achieved compared with conventional WDM architectures.

Room: Han Kou, F2

AF4E.2 • 17:00 **Invited**

Manipulating Optical Vortices Using Integrated Photonics, Xinlun Cai¹; ¹Sun Yat-Sen Univ., China. Abstract not available.

AF4A.3 • 17:15

3kW Yb-doped Aluminophosphosilicate Laser Fiber, Ani You¹, Cong Gao¹, Huan Zhan¹, Yuying Wang¹, Li Ni¹, Xiaolong Wang¹, Aoxiang Lin¹; ¹China Academy of Engineering Physics, China. We fabricated and reported on Yb-doped aluminophosphosilicate laser fiber with chelate precursor doping technique. 3.1 kW laser output with an optical-to-optical efficiency of 78.4% at ~1064 nm was achieved without any evidence of roll-over.

Room: Wu Chang, F2

AF4F.2 • 17:00
Single Event Effect Testing and Radiation-hardened Designing for Optical Transceivers, Yueying Zhan¹, Suzhi Cao¹, Yang Wang¹; ¹Chinese Academy of Sciences, China. SEE susceptibility of the MCU and the key chips of transceivers were studied. The MCU was sensitive to SEE and the performances of received chip was better than transmitted. The measure of radiation-hardened designing was discussed.

AF4F.3 • 17:15
FPGA Implementation of Carrier Recovery Algorithm for QPSK Coherent Optical Communication Systems, Jian Yan¹, zhixiang luo¹, Sheng Cui¹, changjian ke¹, deming liu¹; ¹Huazhong Univ. of Science and Technology, China. Real-time carrier recovery of QPSK signals with symbol rate above 10GBaud is realized using a single FPGA chip. Experiments show that the hardware performance is close to that of the off-line algorithm.

Room: Jing Men, B1

AF4G.2 • 17:00
Noise Performance Improvement of Broadband Distributed Raman Amplifier Using Dual Order Bidirectional Pumping, Md A. Iqbal¹, Mingming Tan¹, Lukasz Krzaczanowicz¹, Giuseppe Rizzelli Martella², Francesca Gallazzi², Atalla El-Taher¹, Wlodek Forsysiak¹, Paul Harper¹, Juan Diego Ania-Castanon²; ¹AIPT, Aston Univ., UK; ²Instituto de Óptica "Daza de Valdés", CSIC, Spain. A low-noise broadband bidirectional Raman pumping scheme combining dual order co-pumps is proposed. The improved noise figure without RIN increase is compared experimentally and numerically with conventional pumping schemes for distributed amplification over 70 nm.

AF4G.3 • 17:15
Bi-directional emission control with multilayered metal-dielectric nanoantenna, Xiao Ming Zhang¹, Jun Jun Xiao¹, Qiang Zhang¹; ¹College of Electronic and Information Engineering, Shenzhen Graduate School, Harbin Inst. of Technology, China. We propose an ultra-compact plasmonic nanoantenna with tunable high directionality. The operating frequency of maximum forward and backward emission can be approximately predicted based on a Farby-Perot model of the gap surface plasmon polaritons.

Room: Shi Yan, B1

AF4H.2 • 17:00 **Invited**
Access Network Amplification beyond TWDM-PON, Lida Sadeghioon¹; ¹Ash-ton Univ., UK. We discuss the amplification needs and constraints in the next generation access network, and discuss current solutions that satisfy these requirements. Finally we present fiber optical parametric amplifier performance in a bidirectional experimental setup.

Room: Xiao Gan, B1

AF4I.3 • 17:00
Slow light performance enhancement using Graphene-based photonic crystal coupled cavity waveguide, Xidong Wu¹, Haina Cui¹; ¹Zhejiang Univ., China. We demonstrate a graphene-based slow light waveguide. A group index of 177.5 is obtained from 29.62 THz to 30.02 THz. The corresponding normalized delay-bandwidth product is 2.38, about 60% improvement compared to the literature results.

AF4I.4 • 17:15
80-GHz Colliding-Pulse Mode-Locked Laser with High Pulse Power, Pengchao Zhao^{1,2}, Anjin Liu², Wan-hua Zheng^{1,2}; ¹State key Laboratory on Integrated Optoelectronics, Inst. of Semiconductors, CAS, China; ²Laboratory of Solid State Optoelectronics Information Technology, Inst. of Semiconductors, CAS, China. We demonstrate an 80 GHz colliding-pulse mode-locked laser with pulse width of 1.75 ps, pulse energy of 0.33 pJ. With a long saturable absorber, we achieve two-fold improvement in pulse energy and peak power.

Room: Sui Zhou, F3

AF4J.2 • 17:00
Cellular-level structure imaging in rat colon ex vivo and in vivo using micro-optical coherence tomography (μ OCT), Xiaojun Yu¹, Yuemei Luo¹, xinyu liu¹, Si Chen¹, Xianghong wang¹, Shi Chen¹, linbo liu¹; ¹School of Electrical & Electronic Engin, Nanyang Technological Univ., Singapore. The feasibility of a constructed high-resolution μ OCT for cellular-level structures imaging in rat colon was evaluated for the first time. Imaging results demonstrated that μ OCT could be a viable tool for intestinal mucosa structures imaging.

AF4J.3 • 17:15
Motion Contrast Optical Coherence Tomography Angiography, Pei Li¹, Liping Zhou¹, Yang Ni¹, Yuxuan Cheng¹, Zhihua Ding¹, Peng Li¹; ¹Zhejiang Univ., China. Statistical model of optical coherence tomography angiography (OCTA) signals is mathematically derived and validated through the live animal experiments. Longitudinal OCTA imaging of cortical perfusion in the rat photothro-bosis model is presented.

Room: Xiang Yang, F3

AF4K.2 • 17:00
A high-throughput imaging facility for evaluation of oilseed rape biomass related traits, Xiong Xiong³, Wanneng Yang^{2,1}, Di Wu¹, Qian Liu³; ¹College of Engineering, Huazhong Agricultural Univ., China; ²National Key Laboratory of Crop Genetic Improvement and National Center of Plant Gene Research, Huazhong Agricultural Univ., China; ³Britton Chance Center for Biomedical Photonics, Wuhan National Laboratory for Optoelectronics, Huazhong Univ. of Science and Technology, China. In this study, we established a high-throughput imaging facility to extract 56 phenotypic traits during the rape growth period. The modeling result reveals that this non-destructive measurement method has great potential for predicting biomass.

AF4K.3 • 17:15
A Wireless-and-Lensless Microscope for In-Situ, High-resolution Imaging of Ultra-large-scale Cell Culture, Tingting Zhu^{1,2}, Hao Zhang¹, Yiran Guo³, Bifeng Liu³, Peng Fei^{1,2}; ¹School of Optical and Electronic Information College, Huazhong Univ. of Sci and Tech, China; ²Innovation Inst., Huazhong Univ. of Sci and Tech, China; ³College of Life Science and Technology, Huazhong Univ. of Sci and Tech, China. We develop a portable wireless-and-lensless cell culture imaging device that is highlighted by ultra-large field-of-view and on-air data transmission. With super-resolution processing, the final images achieve a FOV of 3.5 cm² at single cell resolution.

Room: En SHI, F3

AF4A.4 • 17:30

Bright and dark pulse pair generation in dual wavelength fiber ring laser incorporating highly nonlinear fiber, Yinglong Gu¹, YanFu Yang¹, Yong Yao¹, XiaoRui Wang¹; ¹Harbin Inst. of Technology Shenzhen Graduate School, China. A dual-wavelength fiber ring laser scheme employing highly nonlinear fiber are proposed and the bright and dark pulse pair generation on two respective wavelength are achieved experimentally after optical filtering.

Room: Han Yang, F2

AF4B.4 • 17:30

An Equal Equivalent-channel Capacity Partition Design Method for Multi-Level Coded Modulation Scheme, Chen Ju¹, Liqian Wang¹, Dongdong Wang¹, Aimei Fei², Xue Chen¹, Zhirong Wang¹, Huitao Wang², Qi Zhang²; ¹BUPT, China; ²ZTE Cooperation, China. We propose a partition design method for Multi-Level Coded Modulation based on Information Theory, by which we can obtain a labeling strategy enabling all equivalent channels to adopt one component code to approach Shannon limit.

Room: Huang Shi, F2

AF4C.4 • 17:30

High-speed Independent Random Phase-Modulated Dual-loop Feedback performing Security-Enhanced Chaos Communication, Chenpeng Xue¹, Ning Jiang¹, Ding Liu², Fan Zhang¹, Hongliang Ma¹, Guilan Li¹, Kun Qiu¹; ¹School of Communication and Information Engineering, Univ of Electronic Science & Tech China, China; ²School of Electronic Engineering, Sichuan Technology and Business Univ., China. A physical-enhanced secure communication scheme is proposed, in which time delay signature concealment of chaotic carrier and phase encryption for the feedback light is achieved using dual optical feedback and independent high-rate random phase modulation.

Room: Xian Tao, F3

AF4D.3 • 17:30

Ultra Dense-Wavelength Switched Network (UD-WSN): A Cost, Energy, and Spectrum Efficient Metro Network Architecture, Ya Zhang¹, Xu Zhou², Ning Deng², Gangxiang Shen¹; ¹Soochow Univ., China; ²Huawei Technologies Co., Ltd., China. We propose a novel metro network architecture based on ultra dense spectrum granularity. Simulations show that the proposed architecture is more cost, energy, and spectrum efficient and has a lower end-to-end connection latency compared to OTN over DWDM networks.

Room: Han Kou, F2

AF4E.3 • 17:30

On-chip Tunable Cylindrical Vector Beams Emitter, Shimao Li¹, Zhichao Nong¹, Shengqian Gao¹, Wen Yu¹, Marc Sorel², Siyuan Yu^{1,3}, Xinlun Cai¹; ¹Sun Yat-sen Univ., China; ²Univ. of Glasgow, UK; ³Univ. of Bristol, UK. We experimentally demonstrated a silicon photonic cylindrical vector beams emitter, consisting of a micro-ring resonator with angular grating and a resistive heater. The device is capable of generating and tuning azimuthal and radial polarization beams.

AF4A.5 • 17:45

Simple Open Cavity Pulsed Fiber Laser With Broadband Supercontinuum Generation Based On SBS Effect, Luo Xing¹, Xu Z.W¹, Jinggang Peng¹, Lan Cheng¹, Luyun Yang¹, Nengli Dai¹, Haiqing Li¹, Jinyan Li¹; ¹HUST, China. Over 1000 nm supercontinuum was obtained in a simple open cavity pulsed laser. Nanosecond pulses generation can be realized without any reflectors or modulators based on the stimulated Brillouin scattering effect.

AF4B.5 • 17:45

Improved Amplitude and Phase Noise Mitigation for 16QAM Transmission Using Viterbi-Viterbi Phase Estimator Combined with Extended Kalman Filter, Tong Shu¹, Yan Li¹, Sujie Fan¹, Miao Yu¹, Jiangchuan Pang¹, Deming Kong¹, Jian Wu¹; ¹Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. Viterbi-Viterbi phase estimator combined with extended Kalman filter (VVPE-EKF) is proposed to mitigate both amplitude and phase noise. 24% and 20% maximum transmission reach are gained compared with VVPE and VVPE maximum-likelihood (VVPE-ML) algorithms.

AF4D.4 • 17:45

Demonstration of Optical Label Swapping using Optical Comb for DWDM Optical Label Switching Networks, Zhongying Wu¹, Juhao Li¹, Dawei Ge¹, Jinglong Zhu¹, Yu Tian¹, Paikun Zhu¹, Yuanxiang Chen¹, Zhangyuan Chen¹, Yongqi He¹; ¹Peking Univ., China. In this paper, a novel cost-effective all-optical label swapping scheme based on optical comb is proposed and experimentally demonstrated for dense wavelength-division-multiplexing (DWDM) optical label switching networks. The cost and power consumption are also investigated.

AF4E.4 • 17:45

Integrated Orbital Angular Momentum Emitters Based on Silicon Nitride Photonic Platform, Zengkai Shao¹, Yanfeng Zhang¹, Shimao Li¹, Lin Liu¹, Chunchuan Yang¹, Lidan Zhou¹, Hui Chen¹, Yujie Chen¹, Siyuan Yu¹; ¹Sun Yat-sen Univ., China. We demonstrated integrated orbital angular momentum emitters based on silicon nitride micro-ring resonators with angular gratings. The emitted OAM modes have excellent angular intensity distributions, and relative high average emission efficiency has been achieved.

18:45–21:30 Banquet & Awards Ceremony, Grand Ballroom (Han Kou, Wu Chang, and Han Yang), 2nd Floor, Shangri-La Hotel, Wuhan

Room: Wu Chang, F2

AF4F.4 • 17:30
Ultra-dense Silicon Photonics Coupling Solution for Optical Chip Scale Package Transceiver, Qing Zhao¹; ¹Huawei, China. We propose a high-density, low-power optical chip scale package transceiver scheme facing future high capacity network. With novel ultra-dense SiPh coupling solution, OCSP with 336 channels is achievable in scenarios of edge and surface coupling.

AF4F.5 • 17:45
High Density Silicon Photonic Integrated Transceiver Chip with 1.2 Tbps Capacity, Zhen Dong¹; ¹Huawei Technologies Co., Ltd, China. To achieve high capacity, high density, low power consumption and low-cost non-hermetic package, a silicon photonic transceiver chip with 42-channel I/O was demonstrated. With each I/O supports 28 Gbps rate, the transceiver chip reached 1.2 Tbps capacity.

Room: Jing Men, B1

AF4G.4 • 17:30
All-Optical Wavelength Multicasting of DMT Signals Using Multi-Mode Injection Locking in a Fabry-Pérot Laser, Juntao Dang¹, Xingwen Yi¹, Jing Zhang¹, Yang Song¹, Kun Qiu¹; ¹Univ. of Electronics Science & Tech, China. We report the first 5×20.41-Gb/s all-optical wavelength multicasting of DMT signals by using multi-mode injection locking in the FP laser. The averaged power penalty is 2.8 dB at the FEC BER limit of 2.3×10^{-3} .

Room: Shi Yan, B1

AF4H.3 • 17:30
MIMO Equalization to Mitigate Crosstalk Degradation in a Dual-Channel OAM Multiplexed System, Weibin Zhang¹, Yingchun Li¹, Tengfen Sun¹, Wei Shao¹, Fuquan Zhu¹; ¹Shanghai Univ., China. In this paper, we demonstrate crosstalk degradation mitigation using minimum mean-square error (MMSE) algorithm combined constant modulus algorithm (CMA) in a dual-channel OAM multiplexed system. For OFDM-16QAM signals with up to -3dB crosstalk is recovered.

AF4H.4 • 17:45
Wavelength Conversion of PAM signals by XGM in SOAs, Giampiero Contestabile¹; ¹Scuola Superiore Sant Anna di Pisa, Italy. All-optical wavelength conversion of PAM-4 signals by cross-gain-modulation (XGM) in semiconductor optical amplifiers is experimentally investigated. It results that, because of the XGM non-linear transfer-function, double-stage schemes must be used for obtaining reliable distortion-free conversions.

Room: Xiao Gan, B1

AF4I.5 • 17:30
Impact of Absorber Length on Pulse Power of Mode-Locked Semiconductor Laser, Pengchao Zhao^{1,2}, Anjin Liu², Wanhua Zheng^{1,2}; ¹State key Laboratory on Integrated Optoelectronics, Inst. of Semiconductors, CAS, China; ²Laboratory of Solid State Optoelectronics Information Technology, Inst. of Semiconductors, CAS, China. We theoretically analyze the impact of absorber length on pulse power of mode-locked laser. We found lasers with longer absorbers emit higher power. This gives us a new freedom in the design of mode-locked laser.

Room: Sui Zhou, F3

AF4J.4 • 17:30 **Invited**
Monitoring circulating tumor cells by in-vivo flow cytometry, Xunbin Wei¹; ¹Med-X Res. Inst, Shanghai Jiao Tong Univ, China. An in vivo flow cytometer is used to monitor circulating tumor cells. The counting of circulating tumor cells provides insights in cancer metastasis. It is useful to understand molecular mechanisms of tumor metastasis.

Room: Xiang Yang, F3

AF4K.4 • 17:30
Automatic Light-sheet Imaging Plugin for Rapid Three-dimensional Visualization of Embryo Angiogenesis on Common Wide-field Microscope, Hao Jiang², Tingting Yu³, Jun Nie¹, Chunyu Fang¹, Dan Zhu³, Peng Fei^{1,4}; ¹School of Optical and Electronic Information College, Huazhong Univ. of Sci and Tech, China; ²School of Mechanical Science & Engineering, Huazhong Univ. of Sci and Tech, China; ³Britton Chance Center for Biomedical Photonics, Wuhan National Laboratory for Optoelectronics, Huazhong Univ. of Sci and Tech, China; ⁴Innovation Inst., Huazhong Univ. of Sci and Tech, China. We upgraded an inverted microscope into cutting edge light-sheet fluorescent microscope simply via attaching a plugin device. This plugin enabled rapid 3-D visualization of zebrafish embryo angiogenesis network otherwise optically challenging to the original microscope.

AF4K.5 • 17:45
Quantitative phase imaging of fluid mixing in microfluid chips, GwangSik Park¹, Park YongKeun¹; ¹Department of Physics, Korea Advanced In, Korea. Microfluidic mixing is one of the important topics with a various application for example biomedicine, chemical engineering, etc. We present a method for imaging and quantifying microfluidic mixing using quantitative phase imaging method.

18:45–21:30 Banquet & Awards Ceremony, Grand Ballroom (Han Kou, Wu Chang, and Han Yang), 2nd Floor, Shangri-La Hotel, Wuhan

Room: En SHI, F3

Room: Han Yang, F2

Room: Huang Shi, F2

Room: Sui Zhou, F3

Room: Xian Tao, F3

08:00–16:00 Registration, Public area face to the escalator, 2nd Floor, Shangri-La Hotel, Wuhan

08:30–10:30

AS1A • Fiber Lasers III

Presider: A. Ping Zhang, Hong Kong Polytechnic Univ. China

08:30–10:30

AS1B • Data Center & Indoor Networking

Presider: Fan Zhang; Peking Univ., China

08:30–10:30

AS1C • Digital Signal Processing II

Presider: Di Che, Univ. of Melbourne, Australia

08:30–10:30

AS1D • Optical Access Networks

08:30–10:30

AS1E • Network Technology and Application

AS1A.1 • 08:30 **Invited**

Stable GHz-rate mode-locking of fiber lasers by optoacoustic effects in photonic crystal fibers, Meng Pang¹, Wenbin He¹, Philip Russell¹, ¹Max-Planck Inst for Science of Light, Germany. Tightly-trapped optoacoustic interactions in solid-core photonic crystal fibers have been successfully used for harmonically mode-locking fiber lasers at GHz repetition rate and storing encoded GHz-rate soliton sequence in the laser cavity over many hours.

AS1B.1 • 08:30

Machine learning for nonlinearity mitigation in CAP modulated optical interconnect system by using K-nearest neighbour algorithm, Lin Sun¹, Jiangbing Du¹, Zuyuan He¹; ¹Center of Intelligent Photonics, China. In this study, for the first time, we experimentally demonstrated the machine learning method of K-nearest neighbour (K-NN) algorithm to mitigate nonlinear constellation distortion in optical carrier-less amplitude phase modulation (CAP) system.

AS1B.2 • 08:45

Single sideband FBMC system for 2-km SMF transmission, Tingting Zhang¹, Mary Mccarthy¹, Stylianos Sygletos¹, Filipe Ferreira¹, Andrew D. Ellis¹; ¹Aston Univ., UK. We report a 144-Gb/s single sideband filter bank multicarrier system supporting transmission of studio quality ultra-high definition TV over 2-km single mode fiber (SMF) and the importance of optimizing the modulation index is highlighted.

AS1C.1 • 08:30

High Speed PAM-8 Optical Interconnects with Digital Equalization based on Neural Network, Simone Gaiarin¹, Xiaodan Pang², Oskars Ozolins², Rasmus T. Jones¹, Edson Porto da Silva¹, Richard Schatz³, Urban Westergren³, Sergei Popov³, Gunnar Jacobsen², Darko Zibar¹; ¹DTU Fotonik, Denmark; ²Acreo Swedish ICT AB, Sweden; ³School of ICT, KTH Royal Inst. of Technology, Sweden. We experimentally demonstrate receiver sensitivity improvements by using post-equalization schemes employing neural networks. Enhanced equalization performances are shown comparing to standard linear FFE for an EML-based 32 GBd PAM-8 signal after 4-km SMF transmission.

AS1C.2 • 08:45

Study of FFT/IFFT precision in optical OQAM-OFDM system with limited resolution DAC/ADC, Meihua Bi^{1,2}, Tiancheng Huang¹, Guowei Yang¹, Ran Zeng¹, Hao He², Lu Zhang², Shilin Xiao²; ¹Hangzhou Dianzi Univ., China; ²Shanghai Jiao Tong Univ., State Key Laboratory of Advanced Optical Communication Systems and Networks, China. We investigated the effects of clipping noise due to limited DAC/DAC resolution, FFT/IFFT bit precision on performance of real time optical OQAM-OFDM system. By numerical simulation, we can figure out the influence of arithmetic precision of DAC/ADC and IFFT/FFT on system performance.

AS1D.1 • 08:30 **Invited**

Towards Broadband Long-reach Underwater Wireless Optical Communication, Jing Xu¹; ¹Zhejiang Univ., China. Recent development of underwater wireless optical communication is reviewed. Underwater optical channels are calculated using Monte Carlo simulation. Gaussian laser pulse is proposed to extend the transmission reach and is analyzed with different parameters.

AS1E.1 • 08:30 **Invited**

The Hi-Ring DCN Architecture, Michael Galili¹; ¹DTU Fotonik, Technical Univ. of Denmark, Denmark. We will review recent work on the proposed hierarchical ring-based architecture (Hi-Ring) proposed for data center networks. We will discuss the architecture and initial demonstrations of optical switching performance and time-domain synchronization.

Room: Wu Chang, F2

Room: Han Kou, F2

Room: Shi Yan, B1

Room: Jing Men, B1

Room: Xiao Gan, B1

Room: Xiang Yang, F3

08:00–16:00 Registration, Public area face to the escalator, 2nd Floor, Shangri-La Hotel, Wuhan

08:30–10:30

AS1F • Optical Sources and Applications

Presider: Huiyun Liu; Univ. College London, UK

08:30–10:30

AS1G • Novel Devices and Applications

Presider: Regis Barille; Moltech university of Angers; France

08:30–10:30

AS1H • Frequency-Time Domain Signal Processing

Presider: Pengyu Guan; DTU Fotonik, Denmark

08:30–10:30

AS1I • Hybrid Perovskite: Single Crystals and Nanocrystals

08:30–10:15

AS1J • Novel Optical Recording and Application of Ultrafast Optics

Presider: Xiangping Li; Jinan Univ., China

08:30–10:30

AS1K • Imaging IV

Presider: Buhong Li, Fujian Normal Univ., China

AS1F.1 • 08:30 **Invited**

Printed Photonic Crystal Membrane Lasers on Silicon, Weidong Zhou¹, Shih-Chia Liu¹, Deyin Zhao¹, Hongjun Yang¹, Zhenqiang Ma², Mattias Hammar³; ¹Univ. of Texas at Arlington, USA; ²Univ. of Wisconsin-Madison, USA; ³KTH-Royal Inst. of Technology, Sweden. We report two types of photonic crystal membrane lasers on silicon based on photonic crystal membrane reflectors and photonic crystal bandedge effect. Multi-layer stacking and integration for beam routing and modulation will also be discussed for integrated photonics.

AS1G.1 • 08:30 **Invited**

Novel Optoelectronic Devices based on Planar Graphene-Nanotube Hybrid Film, Frank (Fengqiu) Wang¹; ¹Nanjing Univ., China. Recent device applications employing planar carbon nanotube-graphene hybrid films is discussed, including a high performance photodetector with 10⁵ photoconductive gain, a flexible hybrid film photodetector on PET substrates, and a multifunctional optical memory device.

AS1H.1 • 08:30 **Invited**

Advanced Optical Signal Processing using Time Lens based Optical Fourier Transformation, Pengyu Guan¹, Kasper M. Røge¹, Mads Lillieholm¹, Hao Hu¹, Michael Galili¹, Toshio Morioka¹, Leif K. Oxenløwe¹; ¹DTU Fotonik, Denmark. An overview of recent progress on time lens based advanced optical signal processing is presented, with a special focus on all-optical ultrafast 640 Gbit/s all-channel serial-to-parallel conversion, and scalable WDM regeneration.

AS1I.1 • 08:30 **Invited**

Perovskite – a Wonder for Photovoltaic & Optoelectronic Applications, Shengzhong Liu¹; ¹Shaanxi Normal Univ., China. With its superior solar cell efficiency and optoelectronic performance, the organic and inorganic hybrid perovskite has appeared to be a wonder for its excellent optical absorption, long range charge-carrier diffusion and apparent tolerance to defects.

AS1J.1 • 08:30

Far-field super-resolution recording and reading towards petabyte optical discs, Zongsong Gan¹, Richard A. Evans³, Min Gu^{1,2}; ¹Centre for Microphotonics, Swinburne Uni, Australia; ²Intelligence Nanophotonics Laboratory, School of Science, RMIT Univ., Australia; ³Manufacturing, CISRO, Australia. To significantly increase the capacity of optical discs for petabyte data storage, we report a dual-beam far-field super-resolution approach to break the diffraction limit barrier for both data recording and reading.

AS1K.1 • 08:30 **Tutorial**

Case Studies in Bringing Biophotonics from Concept to Product, Dennis L. Matthews¹; ¹Univ. of California Davis, USA. Abstract not available.

AS1J.2 • 08:45

Liquid-crystal microlens arrays with graphene electrodes for optical storage, Yong Wu², Wei Hu², Qing Tong², Zhaowei Xin², Yu Lei², Dong Wei², Xinyu Zhang², Jing Liao¹, Haiwei Wang², Changsheng Xie²; ¹Wuhan Product Quality Supervision & Test Inst., China; ²Huazhong Univ. of Science and Technology, China. A new kind of liquid-crystal microlens arrays with graphene electrodes controlled electrically, are designed and fabricated successfully and exhibit excellent beam focusing performances in both the visible and near-infrared wavelength regions, holding a great potential for fast optical-information storage.

Room: En SHI, F3

AS1A.2 • 09:00 **Invited**

High-energy pulse fiber lasers, Xueming Liu¹;
¹*Xi'an Inst of Optics and Precision Mech, China*.
 Abstract not available.

Room: Han Yang, F2

AS1B.3 • 09:00 **Invited**

Practical Solutions for 400Gbit/s Data Center Transmission, Annika Dochhan¹, Nicklas Eiselt^{1,2}, Jinlong Wei¹, Helmut Griesser³, Michael Eiselt¹, Juan J. Vegas Olmos², Idelfonso Tafur Monroy², Jörg-Peter Elbers³; ¹*Advanced Technology, ADVA Optical Networking SE, Germany*; ²*Department of Photonics Engineering, Technical Univ. of Denmark, Denmark*; ³*Advanced Technology, ADVA Optical Networking SE, Germany*. We review three solutions for low-cost data center interconnects with reaches of up to 80 km. Directly detected DMT, PAM4 and multi-band CAP are promising modulation schemes, enabling 400 Gbit/s by combining eight channels of 56 Gbit/s.

Room: Huang Shi, F2

AS1C.3 • 09:00 **Tutorial**

Enabling Technologies in Modern WDM Networks, Xiang Liu¹; ¹*Futurewei Technologies, Inc., HUAWAI R&D USA*. We review recent advances in the field of WDM networks for core, metro, and data center applications. Enabling technologies such as coherent 400+G, direct-detection 100G, photonic integration, low-loss OXC/ROADM, and transport SDN will be discussed.

Room: Sui Zhou, F3

AS1D.2 • 09:00

A Novel Codeword Assignment Strategy based on MLMW-OOCs for Fiber Fault Monitoring in Large Capacity PON, Jiao Zhang¹, Min Zhu¹, Yang Lin¹, Pan Gao¹, Xiaohan sun¹; ¹*Southeast Univ. (China), China*. A novel codeword assignment strategy based on MLMW-OOCs is proposed for large capacity PON monitoring. The results show that it realizes the shorter code length and smaller correlation distance, and better SIR performance than 2D-OOCs.

AS1D.3 • 09:15

A Low Latency and Reliable Peer-to-Peer Communication Scheme with Protection Capability for TWDM Access Networks, Huanhuan Han¹, Min Zhang¹, Dongyu Wang², Ze Li¹, Danshi Wang¹; ¹*BUPT, China*; ²*School of Electronic and Information Engineering, North China Univ. of technology, China*. We propose a dual-function scheme which supports both failure protection of the fiber links and P2P communication between RSOA-based colorless ONUs. Equivalent experiments are performed to evaluate the feasibility of the proposed scheme.

Room: Xian Tao, F3

AS1E.2 • 09:00 **Invited**

A Low Insertion Loss and Non-Blocking Optical Router for 3D Optical Network-on-Chip (Invited Paper), Pengxing Guo¹, Weigang Hou¹, Lei Guo¹; ¹*Northeastern Univ. (China), China*. In this paper, we proposed a novel 6×6 non-blocking optical router structure for 3D ONOCs. Simulation results demonstrate our structure performs well in terms of reducing insertion loss, floorplan area and improving the network scalability.

Room: Wu Chang, F2**AS1F.2 • 09:00**

Enhanced carbon nanotubes light emission integrated with photonic SOI ring resonators, Weiwei ZHANG¹, Elena Durán-Valdeiglesias¹, Matteo Balestrieri², Samuel Serna¹, Carlos Ramos¹, Xavier Le Roux¹, Arianna Filoramo², Laurent Vivien¹, Eric Cassan¹; ¹Universite de Paris-Sud XI, France; ²LICSEN, CEA Saclay, IRAMIS, NIMBE (UMR 3685), France. We present our recent results towards the integration of carbon nanotubes onto the SOI platform for the implementation of light sources. We experimentally demonstrate two-orders of magnitude enhancement of semiconductor single walled carbon nanotubes emission in fully integrated silicon microresonators.

AS1F.3 • 09:15

Transferrable GaN LED on SiC/SiO₂/Si substrate, Tzu-Wei Huang¹, Chih-Hsien Cheng¹, Hao-Chung Kuo², Gong-Ru Lin¹; ¹Graduate Inst. of Photonics and Optoelectronics, National Taiwan Univ., Taiwan; ²Inst. of EO Engineering, National Chiao Tung Univ., Taiwan. Epitaxy of transferrable GaN LED on PECVD synthesized amorphous C-rich SiC film is demonstrated. The GaN LED on C-rich SiC/SiO₂/Si reveals turn-on voltage of 2.5 V, output power of 91 mW and EQE of 36%.

Room: Han Kou, F2**AS1G.2 • 09:00**

Optical holographic anti-counterfeiting using a plasmonic metasurface, Mian Liu¹, Hailong Zhou¹, Xiaolin Chen¹, Jianji Dong¹, Xinliang Zhang¹; ¹Wuhan National Laboratory for Optoelectronics, China. We present an optical holographic anti-counterfeiting method using a V-shaped metasurface antenna. When the beam illuminates meta-hologram, the encrypted pattern appears on the image plane, and the original image can be retrieved after decryption.

AS1G.3 • 09:15

Large saturable absorption of in-plane single-layer graphene on a silicon waveguide, Heng Cai¹, Yahui Cheng¹, Jie Shao¹, Yi Wang¹; ¹Wuhan National Laboratory for Optoelectronics, Huazhong Univ. of Sci.&Tech., China. Silicon waveguide with a patterned single-layer graphene (SLG) is fabricated and characterized. Saturable absorption with a large 25% modulation depth introduced by the in-plane graphene is experimentally observed, which is potentially applicable for future chip-sized mode-locking lasers.

Room: Shi Yan, B1**AS1H.2 • 09:00**

Uniformity Improvement in Serial-to-Parallel Data Conversion via Time Lens Processing with Raman Amplification, Junying Ru¹, Chaoran Huang¹, Qijie Xie¹, Chester C.T. Shu¹; ¹Chinese Univ. of Hong Kong, Hong Kong. We apply Raman amplification in a nonlinear fiber to compensate the roll-off in conversion efficiency due to phase mismatch between the signal and chirped pump in time-lens processing. A 3.5-dB improved uniformity is observed.

AS1H.3 • 09:15

A Tunable Photonic Differentiator Based on Temporal Pulse Shaping System, Jiang Tang^{1,2}, Minming Zhang^{1,2}, Weijie Chang^{1,2}, Lei Deng^{1,2}, Mengfan Cheng^{1,2}, Demin Liu^{1,2}; ¹School of Optical and Electronic Information, Huazhong Univ. of Science and Technology, China; ²National Engineering Laboratory for Next Generation Internet Access System, Huazhong Univ. of Science and Technology, China. We propose a tunable photonic differentiator based on a temporal pulse shaping (TPS) system. A first-order differentiator with a bandwidth of 143.75 GHz is experimentally demonstrated.

Room: Jing Men, B1**AS1I.2 • 09:00** **Invited**

Non-Centrosymmetric Structure-Based Optoelectronic Crystalline Materials, Junhua Luo¹; ¹Fujian Inst. of Research on the Structure of Matter, Chinese Academy of Sciences, China. Abstract not available.

Room: Xiao Gan, B1**AS1J.3 • 09:00**

The Formation of Concentric Rings Induced by Defocusing Femtosecond Laser on Si Surface, Hanyuan Cao¹, Xuewen Shu¹; ¹Wuhan National Laboratory for Optoelectronics & School of Optical and Electronic Information, Huazhong Univ. of Science and Technology, China. We have observed the formation of the concentric rings on silicon surface induced by defocusing femtosecond laser. We develop a method to illustrate that the formation of such rings is attributed to the Fresnel diffraction.

AS1J.4 • 09:15

Nonlinear optical conversion of the orbital angular momentum of light in a PPLT crystal, XinYuan fang¹; ¹College of Engineering and Applied Science, Nanjing Univ., China. We experimentally demonstrate the efficient nonlinear optical conversion of an optical orbital angular momentum (OAM) state through quasi-phase-matching (QPM) technique in a periodically poled LiTaO₃ (PPLT) crystal.

Room: Xiang Yang, F3

Room: En SHI, F3

AS1A.3 • 09:30

Observation of bound soliton sequences from a compact mode-locked fiber laser, Handing Xia^{2,1}, HE-PING LI¹, Xiaoyan Zhou², Zhiqing Wu², Zhaohua Shi², Fengrui Wang², Qinghua Deng², Jin Huang², Xiaodong Jiang²; ¹*School of Opto-electronic Information, Univ of Electronic Sci & Tech of China, China*; ²*Research Center of Laser Fusion, China Academy of Engineering Physics, China*. Various long bound soliton sequences consisting of up to five solitons were generated from a compact fiber laser. The soliton separations between adjacent solitons in BSSs were quantized by a discrete fixed value.

AS1A.4 • 09:45

Intensity noise reduction technique of fiber laser via intracavity SOA structure, Kang Ying¹, Dijun Chen¹, Zhengqing Pan¹, Xi Zhang¹, Haiwen Cai¹, Ronghui Qu¹; ¹*Shanghai Inst Optics & Fine Mech, CAS, China*. By exploiting the gain saturation effect of the semiconductor optical amplifier (SOA), the whole resonance relaxation oscillation peak of fiber laser completely disappears. Via a specially designed intracavity SOA structure, the optical intensity inside the SOA will be in a balance state and the frequency noise of the laser will not be degraded.

Room: Han Yang, F2AS1B.4 • 09:30 **Invited**

Recent Advances for High Speed Data Center Inter-connects, Kang Ping Zhong¹, Xian Zhou¹, YIGUANG WANG¹, Changyuan Yu¹, Alan Pak Tao Lau¹, Chao Lu¹; ¹*The Hong Kong Polytechnic Univ., Hong Kong*. In this paper, we review recent advances on optical short reach transmission systems for data center inter-connects. Recent progress from our group on high-speed short reach transmission systems is summarized.

Room: Huang Shi, F2

AS1D.4 • 09:30

Impact of Sleep Period Variation Pattern on Energy-Delay Performances of Watchful Sleep Mode in PON, Min Zhu¹, Xiaobo Zeng¹, Yang Lin¹, Xiaohan sun¹; ¹*Southeast Univ., China*. We have modeled the watchful sleep mode based on the Markov chain and proposed four different variation patterns of the sleep period to get the optimal tradeoff between the energy-saving efficiency and the transition delay.

AS1D.5 • 09:45

Experimental Demonstration of Flexible Multicasting and Aggregation Functionality for TWDM PON, Yuanxiang Chen¹, Juhao Li¹, Jinglong Zhu¹, Paikun Zhu¹, Yu Tian¹, Zhongying Wu¹, Huanfa Peng¹, Yongchi Xu¹, Jingbiao Chen¹, Yongqi He¹, Zhangyuan Chen¹; ¹*Peking Univ., China*. Flexible multicasting and aggregation functionality are proposed for TWDM PON utilizing multiple-pump FWM and cyclic AWG. A proof-of-concept 10-Gb/s OOK and QPSK-OFDM signal multicasting and aggregation to seven PON links are experimentally demonstrated.

Room: Sui Zhou, F3

AS1E.3 • 09:30

A hybrid bandwidth allocation algorithm based on parallel scheduling for FC-AE-1553 switching network, Jin Wang¹, Liqian Wang¹, Shaohun Wu², Yueying Zhan², Suzhi Cao², JingJing Li¹, Xue Chen¹; ¹*BUPT, China*; ²*Technology and Engineering Center for Space Utilization, China*. A hybrid bandwidth allocation algorithm based on parallel scheduling was proposed to solve scheduling problem and fit the multi-traffic demand in FC-AE-1553 switching network. Simulation indicates that network performance is better than non-parallel scheduling algorithm.

AS1E.4 • 09:45

A Dual-Condition Handover Solution in High-Speed Railway Communication Networks, Zelin Zheng^{1,2}, Nan Hua^{1,2}, Haijiao Liu^{1,2}, Yanhe Li^{1,2}, Xiaoping Zheng^{1,2}; ¹*Tsinghua National Laboratory for Information Science and Technology (TNList), China*; ²*Department of Electronic Engineering, Tsinghua Univ., China*. We introduce a dual condition handover scheme to determine the handover point of dual antenna high-speed trains, and propose a handover postponement scheme for the back antenna to reduce the impact of handover delay.

Room: Wu Chang, F2**AS1F.4 • 09:30**

Luminescence enhancement of near ultraviolet light-emitting diodes, Li Lin¹, Flemming Jensen¹, Berit Herstrøm¹, haiyan Ou¹; ¹*Technical Univ. of Denmark, Denmark*. Nanopillars were applied on the p-GaN layer of the InGaN-based near ultraviolet epiwafer to improve the light extraction efficiency. A photoluminescence enhancement of 74 % is reported with a nanopillar height of around 105 nm.

AS1F.5 • 09:45

Range-resolved atmospheric aerosol monitoring by a Scheimpflug lidar system based on a continuous-wave laser diode, Peng Guan¹, Liang Mei¹; ¹*Dalian Univ. of Technology, China*. A continuous-wave Scheimpflug Lidar (SLidar) system has been developed for atmospheric aerosol monitoring in Dalian Univ. of Technology, China. A nearly 2.5-hour measurement of atmospheric aerosol has been performed over 5 km range.

Room: Han Kou, F2**AS1G.4 • 09:30**

A Single Mode Hybrid Laser Based on Graphene Bragg Gratings, Zhengliang Ren¹, Qiang Kan¹, Lijun Yuan¹, Ke He², Weixi Chen³, Guangzhao Ran³; ¹*Inst. of Semiconductor, Chinese Academy of Science, China*; ²*Tsinghua Univ., China*; ³*Peking Univ., China*. We developed a single mode hybrid laser based on graphene Bragg gratings (GBGs). This hybrid laser achieves single-mode, continuous-wave operation at 1540nm with a remarkable side-mode suppression ratio (SMSR) of 48dB.

AS1G.5 • 09:45

Integrated magnetoplasmonic nanostructures for non-reciprocal optical devices, Vy Yam¹, Giovanni Magno¹, Beatrice Dagens¹; ¹*C2N, France*. We have numerically shown that when a magneto-optical bismuth iron garnet waveguide is coupled to a gold grating on its top, surface plasmon polaritons can strongly enhance transverse magneto-optical Kerr effect, and thus non-reciprocal transmission.

Room: Shi Yan, B1**AS1H.4 • 09:30**

Binary Pattern Controlled Optical Pulse-Rate Multiplication Based on Fractional Temporal Self-Imaging Effect, Qijie Xie¹, Bofang Zheng¹, Chester C.T. Shu¹; ¹*Chinese Univ. of Hong Kong, China*. We demonstrate electrically adjustable multiplication of 9.72 GHz pedestal-free picosecond pulses using fractional temporal self-imaging effect. Various multiplication factors of 2, 4 and 8 are achieved and up to ~80 GHz pulse train is generated.

AS1H.5 • 09:45

InP-based Monolithic Tunable Narrow Linewidth Optical Radio Frequency Signal Generator with Direct Modulation, Yi Wang¹, Ning Zhang², Yujie Chen¹, Yanfeng Zhang¹, Lin Liu¹, Lidan Zhou¹, Chunchuan Yang¹, Hui Chen¹, Xinlun Cai¹, Siyuan Yu²; ¹*Sun Yat-sen Univ., China*; ²*Univ. of Bristol, UK*. A monolithic optical RF carrier generator with direct modulation of high bandwidth combining CPW, SRL and DFB lasers is presented. Key fabrication difficulties are tackled. Initial results show great application potentials in RF photonics.

Room: Jing Men, B1**AS1I.3 • 09:30** **Invited**

Halide Perovskite Quantum Dots: New Generation Materials for Display Applications, Haizheng Zhong¹; ¹*Beijing Inst. of Technology, China*. Halide perovskite quantum dots exhibit high photoluminescence quantum yields, wide wavelength tunability, and ultra-narrow band emission. The combination of these superior optical properties and low cost fabrication makes them to be potential candidates for display technology.

Room: Xiao Gan, B1**AS1J.5 • 09:30**

Comprehensive Optical Characterization of MoS₂ Layered Structures via Ultrafast Laser Spectroscopy, Wei Xiong¹, Dawei Li², Xi Huang², Lijia Jiang², Zhiyong Xiao³, Yongfeng Lu²; ¹*Wuhan National Laboratory for Optoelectronics, Huazhong Univ. of Science and Technology, China*; ²*Department of Electrical and Computer Engineering, Univ. of Nebraska-Lincoln, USA*; ³*Department of Physics and Astronomy, Univ. of Nebraska-Lincoln, USA*. High-fidelity, fast and comprehensive optical characterization of 2D materials is challenging. We developed a multimodal ultrafast laser spectroscopy method which enables the simultaneous characterization of critical properties of MoS₂-based 2D layered structures including layer number, crystal orientation, and interlayer coupling.

AS1J.6 • 09:45

Characterization of Ultrafast Pulse by Temporal Superoscillatory Pulse, Hao Chenglong^{1,2}, Hao Li³, Xia Yu³, Changyuan Yu⁴, Cheng-Wei Qiu¹; ¹*National Univ. of Singapore, Singapore*; ²*National Univ. of Singapore (Suzhou) Research Inst., China*; ³*Singapore Inst. of Manufacturing Technology, Singapore*; ⁴*The Hong Kong Polytechnic Univ., Hong Kong*. We propose a temporal superoscillatory pulse generation method by amplitude modulation. The cross correlation using temporal superoscillatory pulse as reference pulse is proposed and validated for ultrafast pulse characterization.

Room: Xiang Yang, F3**AS1K.2 • 09:30**

3-D quantitative measurements of individual human red blood cells from diabetic patients employing 3-D quantitative phase imaging, SangYun Lee¹, YongKeun Park¹; ¹*KAIST, Korea*. We present quantitative optical measurements of individual human red blood cells from both diabetes patients and healthy blood donors using 3-D quantitative phase imaging technique in a noninvasive manner.

AS1K.3 • 09:45

Stress Plays Provoking Role in Hypertension-Related Stroke: Injuries of Blood-Brain Barrier Function, Oxana Semyachkina-Glushkovskaya¹, Alexander Shirokov², Artemiy Gekalyuk¹, Maxim Abakumov³, Nikita Navolokin⁴, Arkady Abdurashitov¹, Maria Ulanova¹, Viktoria Fedorova¹, Viktoria Razubaeva¹, Elena Saranceva¹, Pengcheng Li⁵, Qin Huang⁵, Valery V. Tuchin^{1,6}; ¹*Saratov State Univ., Russia*; ²*Inst. of Bioorganic Chemistry, Russian Academy of Sciences, Entusiastov Str.13, Saratov 410049, Russia*; ³*Russian National Research Medical Univ., Ostrovit, Russia*; ⁴*Russian National Research Medical Univ., Saratov Medical State Univ., Russia*; ⁵*Huazhong Univ. of Science and Technology, Wuhan, China*; ⁶*Laboratory of Biophotonics, Tomsk State Univ., Tomsk, Russia*. Chronic hypertension itself does not cause stroke but significantly decreases the resistant to stroke induced by stress due to exhausting of adaptive capacity of cerebral endothelium and decrease resistance of blood-brain barrier to stress.

Room: En SHI, F3

AS1A.5 • 10:00

High-resolution dual-polarization fiber laser hydrophone by using a corrugated diaphragm, Wenzhao Yang¹, Yizhi Liang¹, Long Jin¹, Bai-Ou Guan¹; ¹*Inst. of photonics technology, China*. We present a fiber laser hydrophone by using a corrugated diaphragm to translate acoustic pressure into concentrated lateral stress on the laser cavity. Experimental result exhibits an average sensitivity of 190kHz/Pa and a working bandwidth over 1kHz. The detection limit reaches 74μPa/Hz^{1/2} at 1kHz, which is comparable to the 0-th order sea noise.

AS1A.6 • 10:15

Investigation of Passive Mode Locking Characteristics of Thulium Doped Fiber Ring Laser, Anjali P S¹, Suresh Kumar¹, Balaji Srinivasan¹, Deepa Venkitesh¹; ¹*Indian Inst. of Technology, Madras, India*. We experimentally demonstrate a thulium doped fiber ring laser at 2020 nm with a slope efficiency of 31.8 %. We also demonstrate passive mode locking characteristics with the gain medium acting as saturable absorber.

Room: Han Yang, F2

AS1B.5 • 10:00

An Indoor VLC Positioning System Based on OFDMA, Bangjiang Lin^{1,3}, Xuan Tang¹, Zabih Ghassemloooy², Yiwei Li¹, Shihao Zhang¹; ¹*Quanzhou Inst. of Equipment Manufacturing, Haixi Inst.s, Chinese Academy of Sciences, China*; ²*Optical Communications Research Group, NCRLab, Faculty of Engineering and Environment, Northumbria Univ., UK*; ³*Key Laboratory of Optoelectronic Science and Technology for Medicine of Ministry of Education, Fujian Normal Univ., China*. We propose an indoor visible light communications and positioning system using the orthogonal frequency division multiplexing access (OFDMA) scheme, which can provide both indoor positioning and communications.

AS1B.6 • 10:15

Indoor high-accuracy positioning system using image sensor and visible LED lights, Wu Liu¹, Chao Yang¹, Qi Yang¹; ¹*Wuhan Research Inst. of Post & Tele, USA*. We adopt geometry method and modified LED reflectors in indoor optical positioning system. Using LED as beacon and smartphone as image sensor, accuracy of 6.6 cm average horizontal positioning error and 9.4 cm average 3-D positioning error is experimentally achieved at 1.9 m distance.

Room: Huang Shi, F2

AS1C.4 • 10:00 **Invited**
All-electronic Generation of Ultra-high Symbol Rate Signals, X. Chen¹, S. Chandrasekhar¹, S. Randel¹, G. Raybon¹, A. Adamiecki¹, P. Pupalaikis², and P. Winzer¹; ¹*Nokia Bell Labs, USA*; ²*Teledyne LeCroy, USA*. We demonstrate an all-electronic digital-to-analog converter (DAC) with 100-GHz electrical bandwidth based on digital band interleaving (DBI). We test the DAC by generating 190-GBaud pulse amplitude modulation (PAM) and 140-GBaud binary phase shift keying (BPSK).

Room: Sui Zhou, F3

AS1D.6 • 10:00

Smile OAN: A Long Reach Hybrid WDM/TDM Passive Optical Network for Next Generation Optical Access, Bo Yang¹, Xue Chen², Chengbin Shen³, Xingang Huang¹, Zhuang Ma¹, Jinsong Bei¹, Mingsheng Li¹, Qingfeng Zhu¹, Ting Na¹; ¹*ZTE Corporation, China*; ²*BUPT, China*; ³*China Telecom Corporation Ltd., China*. We present a hybrid WDM/TDM PON for next generation optical access, which supports 100 km reach, 640 Gbit/s capacity and 8000 ONUs. Commercially TDM-PONs can be smoothly migrated to the proposed network. The protection performance of the Smile OAN is also characterized.

AS1D.7 • 10:15

Novel Multi-service Bandwidth Allocation Algorithm in Unipolar Optical OFDM-based systems, Jidong Wang¹, Lei Guo¹, Yufang Zhou¹, Yejun Liu¹, Jinkun Ma¹; ¹*Northeastern Univ., USA*. A novel multi-service bandwidth allocation algorithm is proposed in unipolar OFDM-PON, which takes full advantages of the new bandwidth dimension in an innovative framework. The proposed algorithm is verified effective in improving throughput and delay.

Room: Xian Tao, F3

AS1E.5 • 10:00

Time Error Analysis of Time Synchronization Networks under Failure, Ruijie Luo¹, Nan Hua¹, Xiaoping Zheng¹, Bingkun Zhou¹; ¹*Tsinghua Univ., China*. We analyze the time errors generated during the restoration process of the IEEE 1588v2- and Distributed Time Synchronization (DTS)-based time synchronization networks. Results show that DTS exhibits better failure toleration than IEEE 1588v2.

AS1E.6 • 10:15

Risk-Aware Rapid Data Evacuation for Large-Scale Disasters in Optical Cloud Networks, Yongcheng Li^{1,2}, Sifat Ferdousi², Carlos Colman-Meixner², Yongli Zhao^{3,2}, Massimo Tornatore^{2,4}, Gangxiang Shen¹, Biswanath Mukherjee²; ¹*Soochow Univ., China*; ²*Univ. of California, Davis, USA*; ³*Beijing Univ. of Posts & Telecommunications, China*; ⁴*Politecnico di Milano, Italy*. We develop a risk-aware rapid data evacuation scheme for large-scale disasters in optical cloud networks. Simulations show that our algorithm significantly reduces the risk of data loss caused by disasters with minimum additional time consumption.

10:30–11:00 **Coffee Break & Exhibition**, Public area, Basement, 2nd and 3rd Floor, Shangri-La Hotel, Wuhan

Room: Wu Chang, F2**AS1F.6 • 10:00**

High-performance InGaN/GaN Quantum-Disks-in-Nanowires Light-emitters for Monolithic Metal-Optoelectronics, Chao Zhao¹, TienKhee Ng¹, Nini Wei¹, Bilal Janjua¹, Rami T. ElAfandy¹, Aditya Prabaswara¹, Chao Shen¹, Giuseppe B. Consiglio¹, Abdulrahman Albadri², Ahmed Y. Alyamani², Munir M. El-Desouki², Boon S. Ooi¹; ¹KAUST, Saudi Arabia; ²National Center for Nanotechnology, King Abdulaziz City for Science and Technology (KACST), Saudi Arabia. The first droop-free, reliable, and high-power InGaN/GaN quantum-disks-in-nanowires light-emitting diode on molybdenum substrates was demonstrated. The high performance was achieved through the epitaxial growth of high-quality nanowires on the all-metal stack of TiN/Ti/Mo.

AS1F.7 • 10:15

A vertical cavity semiconductor optical amplifier monolithically integrated with the photodetector, Yuyu Xia¹, Yang Yu¹, Kai Wang¹, Xun Li², Yanping Xi¹, Liping Wang³; ¹Wuhan National Laboratory for Optoelectronics, Huazhong Univ. of Science & Technology, China; ²Department of Electrical and Computer Engineering, McMaster Univ., Canada; ³Hua-wei Technology Co., Ltd, China. A novel vertical cavity semiconductor optical amplifier monolithically integrated with the photodetector has been developed. The experimental result shows that an optical gain of 2.7dB can be achieved with a responsivity of 1A/W.

Room: Han Kou, F2**AS1G.6 • 10:00**

Tailoring the GVD of hollow core slotted silicon photonic crystal waveguides for hybrid integration of soft materials, Eric Cassan¹, Samuel Serna¹, Pierre Colman¹, Weiwei Zhang¹, Xavier Le Roux¹, Laurent Vivien¹; ¹Universite de Paris-Sud XI, France. We experimentally demonstrate that soft materials can be incorporated in silicon slot photonic crystal waveguides and hence can benefit from both slow-light field enhancement effect and slot-induced ultra-small effective areas.

AS1G.7 • 10:15

Scattering Optical Elements: Exploiting Multiple Light Scattering, Jongchan Park¹, YongKeun Park¹; ¹KAIST, USA. We propose a method to generate optical elements utilizing multiple light scattering. A holographic photopolymer film was used to record permanently and reconstruct an optimized wavefront impinging on a disordered medium for desired optical function.

Room: Shi Yan, B1**AS1H.6 • 10:00**

Experimental demonstration of re-configurable pulses generation based on integrated optical differentiators, Jie Hou¹, Jianji Dong¹, Xinliang Zhang¹; ¹Wuhan Natl Lab Opto, China. We experimentally demonstrate the generation of flat-top, parabolic and triangular pulses with tunable pulse widths from a 20-ps Gaussian pulse using three cascaded optical differentiators, which are implemented with delay interferometers on a SOI platform.

AS1H.7 • 10:15

Improved full-field information characterization of ultrashort pulses by introducing an extra time-lens, Liao Chen², Chi Zhang², Kenneth Kin-Yip Wong¹, Xinliang Zhang²; ¹Photonic Systems Research Laboratory, Department of Electrical and Electronic Engineering, The Univ. of Hong Kong, China; ²Wuhan National Laboratory for Optoelectronics, Huazhong Univ. of Science and Technology, China. For the full-field information characterization, a time-lens was introduced to enhance the pure dispersion-induced diversity, and accelerate the convergence of the retrieval algorithm. The pulsewidth observation range is enlarged from 18 ps to 41 ps.

Room: Jing Men, B1**AS1I.4 • 10:00**

Light loss mechanism in planar p-i-n perovskite solar cell, Shaohang Wu¹; ¹Huazhong Univ. of Science and Technology, China. The result suggest that we should enhance the absorption of MAPbI₃ by increasing thickness and reduce the reflection of Glass by using the antireflection coating.

AS1I.5 • 10:15

Synthesis and Optical Properties of Lead-Free Methylamine Bismuth Halide Perovskite Quantum dots, Meiyang Leng¹; ¹HUST, China. Through the co-LARP method, lead-free MA 3 Bi 2 Br 9 perovskite quantum dots is successfully fabricated, reaching a PLQY up to 12%. The emission peak of bismuth-based quantum dots is characterized to be at 430 nm, FWHM of the PL spectra was ~ 62 nm, large stokes shift (~54 nm).

Room: Xiao Gan, B1**AS1J.7 • 10:00**

Mode-locked femtosecond dispersion-managed all-PM Er-doped fiber laser with a nonlinear amplifying loop mirror, Ji Sun¹, Dun Wang², Jie Yin², Yue Zhou¹, Wenjue Wu¹, Yitang Dai¹, Feifei Yin¹, Jian Dai¹, Kun Xu¹; ¹Beijing Univ. of Posts and Telecoms, USA; ²State Key Laboratory of Space-Ground Integrated Information Technology, China. We demonstrate an all polarization-maintaining erbium-doped fiber laser at 1550 nm. Mode-locking is induced by a nonlinear amplifying loop mirror. The laser produces a 12 MHz train of linearly polarized, 1 nJ pulses.

Room: Xiang Yang, F3**AS1K.4 • 10:00**

Scattering of vector vortex beams: polarization speckles, Gangireddy Salla¹, Vijay Kumar², Ravindra P. Singh², Yoko Miyamoto¹; ¹Univ. of Electro-Communications, Japan; ²Lasers and Quantum Optics, Physical research Laboratory, India. We generate the vector vortex or polarization singular beams using a polarization sensitive spatial light modulator and scattered. Scattered light has random spatial polarization distribution, namely polarization speckles, although locally every point is completely polarized.

AS1K.5 • 10:15

A New Model of Cerebral hemorrhages in newborns rats, Olga Sindeeva¹, Arkady Abdurashitov¹, Sergey Sindeev¹, Nikita Navolokin², Valery V. Tuchin¹, Oxana Semyachkina-Glushkovskaya¹; ¹Saratov State Univ., USA; ²Pathophysiology, Saratov Medical Univ., Russia. Here we describes a new model of stress-induced cerebral hemorrhage in newborn rats. Using histological and laser speckle imaging, we characterized changes in the brain tissues and circulation associated with the pre- and post-hemorrhage periods.

10:30–11:00 Coffee Break & Exhibition, Public area, Basement, 2nd and 3rd Floor, Shangri-La Hotel, Wuhan

Room: En SHI, F3

11:00–12:30
AS2A • Novel Fiber and Micro-fabrication
Presider: Noel Healy; Newcastle Univ., UK

Room: Han Yang, F2

11:00–12:30
AS2B • Performance Monitoring & Optimization
Presider: Lilin Yi; Shanghai Jiao Tong Univ., China

Room: Huang Shi, F2

11:00–12:30
AS2C • Transmitter & Receiver Technology
Kangping Zhong, The Hong Kong Polytechnic University, Hong Kong

Room: Xian Tao, F3

10:45–12:45
AS2D • Elastic Optical Networks

Room: Xiao Gan, B1

11:00–12:30
AS2E • Optical Signal Processing
Presider: Akimasa Kaneko; NTT Photonics Laboratories, Japan

AS2D.1 • 10:45 **Invited**
Spectrally-Spatially Flexible Optical Networking, Ioannis Tomkos¹, Behnam Shariati¹, Nikolaos Panteleimon Diamantopoulos¹, Jose Manuel Rivas-MoscOSO¹, Dimitrios Klionidis¹, Antonia Mastropaolo¹, Federico Pederzoli², Domenico Siracusa²; ¹*Athens Information Technology Center, Greece*; ²*CreateNet, Italy*. In this paper we review the recent advancements of spectrally spatially flexible optical network design and planning. We discuss benefits/drawbacks of different approaches. Finally, opening areas of further research are presented.

AS2A.1 • 11:00 **Invited**
Recent Progress in Surface Nanoscale Axial Photonics (SNAP), Misha Sumetsky¹; ¹*Aston Univ., UK*. Surface Nanoscale Axial Photonics (SNAP) is a novel photonics technology enabling fabrication of microphotonic resonant structures and devices at the surface of an optical fiber with unprecedentedly high sub-angstrom precision and exceptionally small losses. We review recent progress in the theoretical and experimental development of SNAP.

AS2B.1 • 11:00 **Invited**
Machine Learning in Photonics: From Components to System Optimization, Darko Zibar¹; ¹*Danmarks Tekniske Universitet, Denmark*. In this paper, we will review our activities within the application of machine learning to optical communication systems. The focus will be on how techniques from machine learning, such as Bayesian filtering, Gaussian process regression, support vector machines and neural networks can be applied to optical communication for time-varying impairment tracking, WDM system prediction and signal-to-noise estimation.

AS2C.1 • 11:00 **Invited**
InP-based Comb-locked Optical Super Channel Transmitter, Zhixin Liu¹, Selina G. Farwell², Michael J. Wale², David Richardson¹, Radan Slavik¹; ¹*Univ. of Southampton, UK*; ²*Oclaro Inc., UK*. We demonstrate a comb-based transmitter with a potential to be integrated on a single InP photonic chip. Nyquist-shaped polarization-multiplexed 16QAM/64QAM signals are generated and transmitted over 300-km of SMF-28.

AS2E.1 • 11:00 **Invited**
All-Optical Signal Processing for Optical Communications Using Four-Wave Mixing in Silicon Waveguides, Shiming Gao¹, Xiaoyan Wang¹, Xianglian Feng¹, Zhihang Wu¹; ¹*Zhejiang Univ., China*. We systematically reviewed our works on all-optical signal processing for optical communication networks, such as wavelength conversion, wavelength multicasting, and logic gates, based on four-wave mixing in silicon waveguides.

Room: Wu Chang, F2

11:00–12:30
AS2F • Polarization Handling and Applications
Presider: Yu Yu; Huazhong Univ. of Science and Technology, China

Room: Han Kou, F2

11:00–12:30
AS2G • Manipulation and Plasmonics
Presider: Jinsong Xia, Huazhong Univ. of Science and Technology, China

Room: Shi Yan, B1

11:00–12:30
AS2H • Waveform Processing

Room: Jing Men, B1

11:00–12:30
AS2I • Electro-Optics and Optical Sampling
Presider: Ci-Ling Pan; Tsing Hua Univ., Hsinchu

Room: Sui Zhou, F3

11:00–12:30
AS2J • Imaging V
Presider: Dennis Matthews; Univ. of California Davis, USA

Room: Xiang Yang, F3

11:00–12:45
AS2K • Imaging VI
Presider: Ewa Goldys; Macquarie Univ., Australia

AS2F.1 • 11:00 **Invited**
Stokes Vector Communications Using Silicon Photonic Integrated Circuits, Po Dong¹, Xi Chen¹; ¹*Nokia Bell Labs, USA*. We review a highly compact and monolithically integrated silicon photonics Stokes vector receiver, which was used for the direct detection of a 128-Gb/s 16-ary quadrature amplitude modulated signal.

AS2G.1 • 11:00 **Invited**
Dielectric optical antennas for light beam steering, Min Qiu¹; ¹*Zhejiang Univ., China*. In this talk, we will review our recent works on utilizing dielectric nanoantenna arrays with the help of the electric and magnetic resonances to steer the light beam.

AS2H.1 • 11:00 **Invited**
Title to be Determined, Ci-Ling . Pan¹; ¹*National Tsing Hua Univ., Taiwan*. Abstract not available.

AS2I.1 • 11:00 **Tutorial**
Electro-Photonics, Arthur J. Lowery¹; ¹*Monash Univ, Australia*. I introduce a new field: electro-photonics, where the best of the electronic and photonic technologies are combined to increase the capacity, flexibility and energy efficiency of communications systems.

AS2J.1 • 10:45 **Invited**
Super-Resolution: New Contrast, 3D Imaging, Multiparticle Parallel Localization & Tracking, Junle Qu¹; ¹*Key Laboratory of Optoelectronic Devices and Systems of Ministry of Education and Guangdong Province, College of Optoelectronic Engineering, Shenzhen University, China*. This talk presents our recent work in super-resolution, including fluorescence lifetime imaging, methods for 3-dimensional DNA characterization, multiparticle parallel localization and tracking in transparent sample thicker than 10 μ m using distorted imaging and double-helix PSF device.

AS2K.1 • 11:00 **Invited**
Laser speckle imaging techniques for investigating biological tissues, Pengcheng Li¹; ¹*Wuhan National Lab for Optoelectronics, China*. Abstract not available.

Room: En SHI, F3

AS2A.2 • 11:30

Heterogeneous 32-core fiber with square-lattice layout for high-density transmissions, Xueqin Xie¹, Jiajing Tu¹, Keping Long¹, Kunimasa Saitoh²; ¹Univ. of Sci & Tech Beijing, China; ²Hokkaido Univ., Japan. We propose a 32-core fiber with rod/trench structures and achieve average A_{eff} of about $75 \mu\text{m}^2$, low XT of less than -27 dB/100km, and cable cutoff wavelength of less than $1.53 \mu\text{m}$.

Room: Han Yang, F2

AS2B.2 • 11:30

Research on optical performance monitoring (OPM) in coherent transmission system, Junsen Lai¹, Rui Tang¹, Bingbing Wu¹, Shaohui Li¹, Xin Zhao¹, Xiaohua Tang¹, Wenyu Zhao¹, Haiyi Zhang¹; ¹China Academy of Information and Communication Technology (CAICT), China. Requirement and limitation of optical performance monitoring in coherent transmission system are considered. Error vector magnitude measurement and optical signal noise ratio monitoring are analyzed. Recent test results are summarized and discussed.

Room: Huang Shi, F2

AS2C.2 • 11:30

40-Gb/s 10-km SSMF Transmission Using Directly PAM4 Modulation of 1.5- μm 10 GHz VCSEL, Jun Luo¹, Bo Wu¹, YaNan Ma¹, Aidan Daly², Christian Neumeyr², Zhiyong Feng¹, Hiroshi Segawa², Markus Ortsiefer²; ¹Huawei Technologies Co., Ltd., China; ²VERTILAS GmbH, Germany. We reported 40-Gb/s PAM4 transmission over 10-km SSMF with 2-dB penalty and 6-dBm sensitivity at BER of $2E-4$, using directly modulated 1.5- μm VCSEL, with the bandwidth enhancement from 6.4-GHz to 9.35-GHz by offset optical filtering.

Room: Xian Tao, F3

AS2D.2 • 11:15 **Invited**

Optimal Replica Servers Placement for Content Delivery Networks, Xiang Li¹, Xuejiao Zhao¹, Sanjay Bose², Bowen Chen¹, Mingyi Gao¹, Gangxiang Shen¹; ¹Soochow Univ., China; ²IIT Guwahati, India. A MILP model is formulated for replica server placements in Content Delivery Networks which use anycast routing and an efficient *server-list-growth (SLG) algorithm* for this is also proposed. Simulations indicate that the proposed approaches can balance the content delivery load and provide low transmission latency.

Room: Xiao Gan, B1

AS2E.2 • 11:30 **Invited**

Microwave Signal Processing using High Speed Silicon Optical Modulators, Linjie Zhou¹, Yanyang Zhou¹, Minjuan Wang¹, Yiming Zhong¹, Yujie Xia¹, Jianping Chen¹; ¹Shanghai Jiao Tong Univ., China. We review our recent progress on the high-speed silicon optical modulators for microwave signal processing applications. Various functions including microwave phase shift, frequency multiplication and linear modulation have been realized.

Room: Wu Chang, F2

AS2F.2 • 11:30 **Invited**
Control of Light Polarization using Photonic and Phononic Crystals, Satoshi Iwamoto^{1,2}, Shun Takahashi², Ingi Kim¹, Takeyoshi Tajiri¹, Yasutomo Ota², Yasuhiko Arakawa^{1,2}; ¹*Inst. of Industrial Science, The Univ. of Tokyo, Japan*; ²*Inst. for Nano Quantum Information Electronics, The Univ. of Tokyo, Japan*. Photonic and phononic crystals offer the possibilities of controlling light polarization efficiently. Here, we discuss giant optical rotation in a chiral photonic crystal and enhanced photoelastic modulation in a phononic crystal cavity.

Room: Han Kou, F2

AS2G.2 • 11:30
Integrated plasmonic tweezer for linear repositioning of nanometric objects, Giovanni Magno¹, Aurore Ecarnot¹, Vy Yam¹, Beatrice Dagens¹; ¹*Centre for Nanosciences and Nanotechnology - C2N, France*. Plasmonic nanoparticles chains coupled to traditional SOI waveguides allow for nanoobjects trapping and jumpless linear repositioning. This innovative feature is here numerically detailed. This may be extremely captivating for the conception of integrated optomechanical nanoactuators.

Room: Shi Yan, B1

AS2H.2 • 11:30 **Invited**
Parametric Mixer Based Passive Phase Correction for Stable Transfer of High-frequency Reference, Zhaohui Li¹; ¹*Jinan Univ., China*. We propose to use a parametric mixer for stable distribution of 36-GHz millimeter wave over 20km optical fiber. The remote frequency stability achieves 4.0210^{-16} at 2000 s.

Room: Jing Men, B1**Room: Sui Zhou, F3**

AS2J.2 • 11:15
A Compact Fluorescent Light Field Microscope for Rapid Plenoptic Imaging of Multilayer Droplet Emulsions, Huilli Chen¹, Hao Jiang², Yanyi Huang⁴, Peng Fei^{1,3}; ¹*School of Optical and Electronic Information College, Huazhong Univ. of Sci and Tech, China*; ²*School of Mechanical Science & Engineering, Huazhong Univ. of Sci and Tech, China*; ³*Innovation Inst., Huazhong Univ. of Sci and Tech, China*; ⁴*Biodynamic Optical Imaging Center (BIOPIC), Peking Univ., China*. We develop a compact light field microscope that enables the refocusing of multi-layer fluorescent micro-droplets dispersed in oil. This device shows great potential to analyze high-throughput Droplet-Digital PCR in a simple and robust way.

AS2J.3 • 11:30
Photoacoustic Imaging using Microstructured Plastic Fiber-Optic Illumination, Ming-Hui Chen^{2,1}, Hsiu-An Tsai³, Yi-Hsun Lin¹, Wei-Chen Lin¹, Shao-Pu Hu¹, Wei-Te Chen³, Shyh-Hau Wang¹, Hsiang-Chen Chui¹; ¹*National Cheng Kung Univ., Taiwan*; ²*Medical Devices and Opto-Electronics Equipment Department, Metal Industries Research & Development Centre, Taiwan*; ³*Department of Industrial Upgrading Service, Metal Industries Research & Development Centre, Taiwan*. We observed that photoacoustic imaging of a gelatin phantom, which consisted a graphite-filled inclusion with a 4-mm-diameter, illuminated by a microstructured plastic fiber guiding green laser light inside. This approach can effectively extend light propagation depth in tissue.

Room: Xiang Yang, F3

AS2K.2 • 11:30
Depleting upconverting luminescence of NaGdF₄:Yb³⁺/Er³⁺ for potential multi-photon STED-like microscopy, Ruitao Wu¹, Baoju Wang¹, Bingru Huang¹, Rui Pu¹, Sailing He¹, Qiuqiang Zhan¹; ¹*South China Normal Univ., China*. We experimentally demonstrated that 56% of the two-photon green luminescence induced by 795-nm laser in NaGdF₄:Yb³⁺/Er³⁺ upconverting nanoparticles (UCNPs) could be depleted by an 1140-nm laser. This finding has great potential in multi-photon STED-like microscopy.

Room: En SHI, F3**AS2A.3 • 11:45**

Proposal of Center Core Pumped Multi-core Erbium-doped Fibers for SDM, Hirokazu Kubota¹, Kosuke Ukai¹, Yuji Miyoshi¹, Masaharu Ohashi¹; ¹*Osaka Prefecture Univ., Japan*. We propose multi-core erbium-doped fibers for simultaneous pumping where the pump power is provided by the mode coupling between the center core and the outer cores. We have numerically investigated the small signal gain and the noise figure.

AS2A.4 • 12:00

Yb-doped photodarkening-free aluminophosphosilicate laser fiber, Kun Peng¹, Huan Zhan¹, Yuying Wang¹, Li Ni¹, Xiaolong Wang¹, Cong Gao¹, Jianjun Wang¹, Feng Jing¹, Aoxiang Lin¹; ¹*Research Center of Laser Fusion, USA*. KW-level Yb-doped aluminophosphosilicate (Yb-APS) large-mode-area fiber was fabricated by chelate precursor doping technique. The fiber shown excellent laser stability for over 10 hours at 900 W with power fluctuation of 2.2%.

Room: Han Yang, F2**AS2B.3 • 11:45**

Optical Modulation Format Identification Based on Gaussian Mixture Model of Signal Amplitude Distribution, Tianyan Zhou¹, Jie Liu¹, Changjian Guo², Xiong Wu¹, Kangping Zhong³, Siyuan Yu¹; ¹*Sun Yat-Sen Univ., China*; ²*South China Normal Univ., China*; ³*The Hong Kong Polytechnic Univ., Hong Kong*. A modulation format identification technique is proposed for coherent optical communications, based on Gaussian mixture model of signal amplitude distribution. The simulation and experimental results show successful recognition can be realized among five modulation formats.

AS2B.4 • 12:00

Multi-impairment Monitoring of 80 Gb/s RZ-DQPSK Signal Using Optical Spectrum Power Ratio Based on Cross-Phase Modulation in a HNLF, Shi Yang¹, LanLan Li¹, Yuan Zhang¹; ¹*Fzu, China*. We present and demonstrate a novel technique for multi-impairment monitoring based on XPM in a HNLF for 80 Gb/s RZ-DQPSK signal. The influences of PMD and input signal power are also considered in the letter.

Room: Huang Shi, F2**AS2C.3 • 11:45**

Real-Time 25Mb/s Data Transmission for Underwater Optical Wireless Communication Using a Commercial Blue LED and APD Detection, Peilin Wang¹, Chao Li¹, Boke Wang¹, Zhengyuan Xu^{1,2}; ¹*USTC, China*; ²*Shenzhen Graduate School, Tsinghua Univ., China*. We demonstrate a 25Mb/s real-time data transmission system based on FPGA transceivers for underwater optical wireless communications. The experimental results indicate that for 448nm, the achievable link distance in clear water is up to 50-meter.

AS2C.4 • 12:00

Optimum Angle Diversity Receivers for Indoor Single User MIMO Visible Light Communication Systems, Abdelkader A. Matrawy¹, Nihal Anwar^{1,2}, Mohamed El-Shimy¹, Mohamed Rizk¹, Ziad El-Sahn¹; ¹*Electrical Engineering Department, Alexandria Univ., Egypt*; ²*International Transmission Sector, Telecom Egypt, Egypt*. We propose a novel technique for single user MIMO-OFDM indoor visible light communication systems that optimizes the orientation angle of each photodetector in the receiver. Numerical results show that our technique outperforms conventional orientation method.

Room: Xian Tao, F3**AS2D.3 • 11:45**

Demonstration of Software-reconfigurable Elastic Spectrum Manipulation Node Enabled by Optical Comb, Paikun Zhu¹, Yuanxiang Chen¹, Han Yan², Bo Hua², Juhao Li¹, Yu Tian¹, Zhongying Wu¹, Dawei Ge¹, Jinglong Zhu¹, Zhangyuan Chen¹, Yongqi He¹; ¹*State Key Laboratory of Advanced Optical Communication Systems and Networks, Peking Univ., China*; ²*Systems Engineering Research Inst., CSSC, China*. We experimentally demonstrate optical comb-enabled elastic spectrum manipulation node for EON. Simultaneous comb-based Add-Drop of over 260 OFDM subbands, multi-band defragmentation and power equalization are verified. OpenFlow extensions are also discussed.

AS2D.4 • 12:00

Migration-Aware Dynamic Connection Provisioning in Optical Networks Evolving from Fixed Grid to Flexible Grid, Xiaosong Yu¹, Yongli Zhao¹, Bowen Chen², Jiawei Zhang¹, Yajie Li¹, Guoying Zhang³, Xue Chen¹, Jie Zhang¹; ¹*Beijing Univ of Posts & Telecom, China*; ²*Soochow Univ., China*; ³*China Academy of Telecom Research, China*. In this paper, we investigate the brownfield migration problem from fixed grid to flexible grid in optical networks, propose a migration-aware dynamic connection provisioning algorithm, and evaluate its performance under different traffic models.

Room: Xiao Gan, B1**AS2E.3 • 12:00**

Research on THz wave reflection based on volume phase grating, Yi Xu¹; ¹*Department of applied physics, China*. This paper demonstrated terahertz wave reflection frequency-selecting through volume phase grating driving by ultrasonic wave. Under the action of volume phase grating, the reflectivity and scattering of terahertz wave was altered based on GaP crystal.

Room: Wu Chang, F2

AS2G.3 • 11:45

Plasmonic nanotweezers composed by a gold dimer for ultra-effective nanoparticles trapping, Aurore Ecarnot¹, Giovanni Magno¹, Vy Yam¹, Philippe Gogol¹, Robert Mégy¹, Beatrice Dagens¹; ¹C2N, France. A plasmonic nanotweezers based on the coupling between a gold dimer and a SOI waveguide is here numerically investigated. By optimizing the dimer gap size, an ultra-high value of the stiffness is achieved.

Room: Shi Yan, B1

AS2H.3 • 12:00

Electromagnetic Waves of Even Rotational Indices with Electric Field Parallel to Magnetic Field, Hyoung-In Lee¹; ¹Research Inst. of Math., Seoul Nat. Uni., Korea. We consider rotational electromagnetic waves by azimuthally averaging planar oscillatory waves, arising from two waves oppositely propagating in the transverse direction. The resulting even-numbered azimuthal modes are discussed in terms of interferences.

Room: Jing Men, B1

AS2I.2 • 12:00 **Invited**

Frequency-Time Coherence for All-Optical Sampling, Thomas Schneider¹; ¹Institut für Hochfrequenztechnik, Technische Universität Braunschweig, Germany. Sampling is the first step to convert analogue to digital signals. A method for all-optical sampling without a laser source is presented. It might enable integrated all-optical sampling with very high sampling rates.

Room: Sui Zhou, F3

AS2J.4 • 11:45 **Invited**

Real-time In Vivo Tissue Raman Spectroscopy for Early Cancer Detection, Haishan Zeng^{1,2}, Jianhua Zhao^{2,1}, Michael Short¹, David McLean², Stephen Lam¹, Hanna McGregor², Sunil Kalia², Annette McWilliams¹, Wenbo Wang¹, Harvey Lui^{2,1}; ¹BC Cancer Agency Research Centre, Canada; ²Univ. of British Columbia, Canada. A platform technology for real-time *in vivo* tissue Raman spectroscopy was developed that takes 1-2 seconds to obtain a spectrum. The system was tested over 900 skin patients and 80 lung patients, achieved high diagnostic sensitivity (90%) and good specificities (73%, 65%) for skin cancer and lung cancer detection.

Room: Xiang Yang, F3

AS2K.3 • 11:45

Two-photon excited fluorescence imaging of blood flow in live mouse dorsal skin window chamber model, Shaozhuang Yang¹; ¹Shenzhen Univ., China. In this study, a fast two-photon laser scanning microscopy system, has been developed to obtain a series of real-time images of blood flow within dorsal skin window chamber in live mouse tumor model.

AS2F.3 • 12:00

Design of a random nanostructure for efficient chip-fiber polarization independent coupling, Xiang Wen¹, Ke Xu¹, Qinghai Song¹; ¹Harbin Inst. of Technology, USA. We design a waveguide nanostructure for polarization independent coupling to a single mode fiber by an algorithm. The optimized coupling efficiency is -2.83 dB for TE and -3.49 dB for TM polarization near 1550nm wavelength.

AS2G.4 • 12:00

Manipulating Plasmonic Vortices with Metallic Grooved-Slit, Yu Wang¹, Peng Zhao¹, Xue Feng¹, Wei Zhang¹, Fang Liu¹, Yidong Huang¹; ¹Tsinghua Univ., China. Two metallic devices with grooved-slit are proposed to manipulate plasmonic vortices. The first generates optical lattice with helicity or not, while the second generates optical vortex with tunable orbital angular momentum from integer to fraction.

AS2K.4 • 12:00 **Invited**

Multicolor TPEF microscopy using phase shaped fiber continuum, Ling Fu¹; ¹Wuhan National Lab for Optoelectronics, China. By pumping pulses from the Ti:Sapphire oscillator through the high nonlinear photonic crystal fiber, broadband continuum is generated. Phase shaping method is used to achieve multicolor two-photon microscopy.

Room: En SHI, F3

AS2A.5 • 12:15

Microhole-based long period fiber grating fabricated by femtosecond laser-induced breakdown in distilled water, Fangcheng Shen¹, Kaiming Zhou², Lin Zhang², Xuewen Shu¹; ¹Huazhong Univ. of Science and Tech, China; ²Aston Univ., UK. Long period fiber grating constructed with periodic microholes, which can enhance the interaction of surrounding environment with the core-propagating light, is fabricated in single mode fiber with femtosecond laser-induced breakdown in distilled water.

Room: Han Yang, F2

AS2B.5 • 12:15

Mid-Link Optical Phase Conjugation in Lumped Optical Transmission Systems, Mohammad Al-Khateeb¹, Mary Mccarthy¹, Christian S. Costa¹, Andrew D. Ellis¹; ¹Aston Univ., UK. We report an analytical description of four wave mixing in lumped optical transmission systems deploying mid-link optical phase conjugator, and provide corroborating simulation results matching theoretical predictions for four wave mixing and for modulated signals.

Room: Huang Shi, F2

AS2C.5 • 12:15

On Practical Considerations for Designing Indoor Visible Light Communication Systems, Jian Chen¹, Xiaodi You¹, Yang Hong², Huanhuan Zheng³, Changyuan Yu⁴; ¹Nanjing Univ. of Posts & Telecomm., China; ²The Chinese Univ. of Hong Kong, China; ³National Univ. of Singapore, Singapore; ⁴The Hong Kong Polytechnic Univ., China. In this paper, we review on our recent proposed schemes so as to raise concerns about the practicability and applicability of futuristic indoor visible light communication (VLC) systems.

Room: Xian Tao, F3

AS2D.5 • 12:15

OSNR-aware Control of Optical White Boxes on Elastic Optical Networks, Camila d. Diniz¹, Miquel Garrich^{2,3}, Georgios Zervas⁴, Darli Mello¹; ¹UNICAMP - Universidade Estadual de Campinas, Brazil; ²POLITO - Politecnico di Torino, Italy; ³CPqD, Brazil; ⁴Univ. of Bristol, UK. Results of optical white boxes on Elastic Optical Networks with adaptive modulation format and symbol rate simulations demonstrate that synthesized nodes improve capacity under low loads while preserving performance of existing ROADMs for higher loads.

AS2D.6 • 12:30

On the Impact of Modulation Format Transmission Reach on Spectrum Usage in Elastic Optical Networks, Krzysztof Walkowiak¹, Mirosław Klinkowski¹; ¹Wroclaw Univ. of Science and Technology, Poland. The impact of modulation formats transmission reach on the spectrum usage in Elastic Optical Networks is studied. Results of extensive simulations run on representative network topologies are presented and discussed.

Room: Xiao Gan, B1

AS2E.4 • 12:15

Simulation and Fabrication of Photoconductive Antenna on LTG-GaAs for Terahertz Radiation, Mohammad Bashirpour¹, Saman Ghorbani¹, Mohammadreza Kolahdouz¹, Mohammad Neshat¹, Hamidreza Hajhosseini¹, Mahdad Mansouree¹, Morteza Fathipour¹; ¹Univ. of Tehran, Iran (the Islamic Republic of). Photoconductive antenna on LTG-GaAs has been simulated and fabricated. Reducing gap size, increasing bias voltage and increasing laser pulse power will increase terahertz field. Narrower laser pulse width results in wider terahertz bandwidth.

12:30–14:00 Lunch Break, Café Wu, 1st Floor, or Shang Palace, 2nd Floor, Shangri-La Hotel, Wuhan

Room: Wu Chang, F2

AS2F.4 • 12:15
CMOS-Compatible High Efficiency Polarization Splitting Grating Coupler near 1310nm, Weike Wu¹, Tianhua Lin¹, Tao Chu¹, Hua Zhang²; ¹State Key Laboratory on Integrated Optoelectronics, Inst. of Semiconductors, Chinese Academy of Sciences, Beijing 100083, China, Inst. of Semiconductors, Chinese Academy of Sciences, China; ²Hisense Broadband Multimedia Technologies, Ltd., China. Polarization-splitting grating couplers (PSGCs) were fabricated by the complementary metal-oxide semiconductor process at 1310 nm on silicon-on-insulator. The PSGC achieved a maximum coupling efficiency of -3.3 dB using compensation design.

Room: Han Kou, F2

AS2G.5 • 12:15
INTEGRATED PLASMONIC NANOANTENNA FOR OUT-OF-PLANE BEAM STEERING., Benjamin Leroy¹, Giovanni Magno¹, David Barat², Laetitia Pradere², Beatrice Dagens¹; ¹C2N, France; ²Groupe PSA, France. We numerically study the giant coupling between a Si₃N₄ waveguide and a silver nanoparticle chain at visible wavelengths and the resulting integrated nanoantenna showing tunable out-of-plane beaming in both angle and intensity.

Room: Shi Yan, B1

AS2H.4 • 12:15
Fusion of 2D line-scan camera with 3D structured light vision measurement system, Zhenjie Wang¹, Yong Zhang¹, Zijie Zhao¹, Guangchao Hu¹; ¹School of Instrument Science and Optoelectronic Engineering, BeiHang University, , China. We present a high resolution 3D visual information acquiring method by fusing 3D information of structured light vision measurement system with the high resolution grayscale image captured by the 2D line-scan camera.

Room: Jing Men, B1

Room: Sui Zhou, F3

Room: Xiang Yang, F3

12:30–14:00 Lunch Break, Café Wu, 1st Floor, or Shang Palace, 2nd Floor, Shangri-La Hotel, Wuhan

Room: En SHI, F3

14:00–15:30
AS3A • Novel Fibers and Applications II
Prsident: Meng Pang; Max Planck Inst. for Science of Light, Germany

AS3A.1 • 14:00 **Invited**
Functionalized optical fibers for non-linear optics, Noel Healy¹, Haojie Zhang², Li Shen², Anna Peacock²; ¹Newcastle Univ., UK; ²Univ. of Southampton, UK. The state of the art of functionalized optical fibers will be reviewed. The discussion will include, but not be limited to, semiconductor optical fibers and fibers that have been integrated with low-dimensional materials.

Room: Han Yang, F2

14:00–15:30
AS3B • Coverage of Wireless and Optics
Prsident: Juhao Li; Peking Univ., China

AS3B.1 • 14:00
Experimental Demonstration of Analog Fronthaul Transmission System based on F-OFDM for Future 5G Scenarios, Weikang Jia¹, Meihua Bi^{1,2}, Weisheng Hu¹; ¹Shanghai JiaoTong Univ., China; ²College of Communication Engineering, Hangzhou Dianzi Univ., China. We demonstrate analog-fronthaul architecture based on F-OFDM signals with the transmission of eight 20-MHz-bandwidth LTE-A-like signals. Results show that our proposed system, even with no guard tone, could have same performance as including one.

AS3B.2 • 14:15
An FTF 2-D Adaptive Nonlinearity Resistance Approach for TDM-based Analog Mobile Fronthaul, Chenhui YE¹, Xiaofeng Hu¹, Xiaohan Huang¹, Kaibin Zhang¹; ¹Nokia Bell Labs, China. A cross frequency-time-frequency domain adaptive nonlinearity resistance approach is proposed, and up to 256QAM formatted wireless services are demonstrated in the TDM-based analog mobile fronthaul using commercially available ADC.

AS3B.3 • 14:30 **Invited**
Generation and Transmission of Electronically Time-Division Multiplexing High Baud Single Carrier Signals, Zhang Junwen¹; ¹ZTE(Tx) Inc., USA. We experimentally demonstrated the generation and transmission of high symbol rate single-carrier (SC) signals based on electronically time-division multiplexing (ETDM) method. We reported 128.8- and 138.4-GBaud QPSK and 120-GBaud 16QAM over long-haul fiber transmission.

Room: Huang Shi, F2

14:00–15:30
AS3C • Short-Reach Transmission & Access Networking II
Prsident: Jian Wang; Huazhong Univ. of Science and Technology, China

AS3C.1 • 14:00
A Novel Toggle-rate based Energy-Efficient Scheme for Real-time IMDD OFDM-PON, Youxiang Qin¹, Junjie Zhang¹, Junjie Ma¹, Weilong Wang¹, Tengfen Sun¹, Xizhen Peng¹, Jian Chen¹, Qianwu Zhang¹; ¹Shanghai Univ., China. An energy-efficient scheme for real-time OFDM-PON is realized through controlling the toggle-rate of ONU by using time-domain identification. Experimental results show that 25.1% dynamic power in ONU can be saved compared to the conventional configurations.

AS3C.2 • 14:15
A Novel Pilot-aided and BPS Combined Phase Estimation Algorithm for CO-OFDM Systems, Rongrong Chen¹, Caixia Kuang¹, Zhen Zhang¹, Peng Wang¹, Min Wang¹, Rujian Lin¹, Qianwu Zhang¹; ¹Shanghai Univ., China. An effective pilot-aided and BPS combined algorithm for phase estimation in coherent OFDM systems is proposed. Complexity reduction with a factor of 3 and band-width utilization incensement with a factor of 2 is experiment verified.

AS3C.3 • 14:30
Four-Wave Mixing Impairments in O-band Multi-Wavelength NG-EPON System, Xin Miao¹, Meihua Bi^{1,2}, Weisheng Hu¹; ¹Shanghai Jiao Tong Univ., China; ²College of Communication Engineering, Hangzhou Dianzi Univ., China. We investigate four-wave mixing impairments in O-band multi-wavelength NG-EPON system in zero dispersion case by simulation. BER plateaus are observed with 8dBm or more launched power in 5nm spacing system deteriorated by FWM induced crosstalk.

Room: Xian Tao, F3

14:00–15:45
AS3D • Software Defined Systems and Networks
Prsident: Fen Zhou; Univ. of Avignon, France

AS3D.1 • 14:00 **Invited**
Managing the Use-phase and Embodied Energy Consumption to Achieve Sustainable Network Growth, Chien A. Chan¹, André F. Gygax², Christopher Leckie³, Elaine Wong¹, Ampalavanapillai Nirmalathas¹; ¹Department of Electrical and Electronic Engineering, The Univ. of Melbourne, Australia; ²Department of Finance, The Univ. of Melbourne, Australia; ³Department of Computing and Information Systems, The Univ. of Melbourne, Australia. We present a model to understand the interdependencies of the contributing factors in the sustainable growth of communication networks: (i) network operational energy, (ii) network embodied energy, (iii) network traffic growth, and (iv) energy-efficiency improvements.

AS3D.2 • 14:30
Optical-bypass Access-aggregation Network for High-delay-sensitivity Traffics based on SDN Orchestration, Wei Bai¹, Hui Yang¹, Yongli Zhao¹, Jie Zhang¹, Yuanlong Tan¹, Zhu Liu², Qinghai Ou², Ziguan Zhou²; ¹Beijing Univ. of Posts & Telecom, China; ²State Grid Information and Telecommunication Group CO., LTD., China. This paper proposes an optical-bypass access-aggregation network for serving high-delay-sensitivity traffics, by using optical-bypass OLT and SDN. Numerical results demonstrate the proposed architecture promotes network service efficiency and traffic congestion mitigation.

Room: Han Kou, F2

14:00–15:30
AS3E • Sensing & Monitoring
Prsident: Zhechao Wang; Gent Univ., Belgium

AS3E.1 • 14:00 **Invited**
Germanium Photodetectors on Amorphous Substrates for Back-End-Of-Line Process Integration, Jurgen Michel¹, Brian S. Pearson¹, Lionel C. Kimerling¹; ¹Microphotonics Center, MIT, USA. Germanium photodetector are fabricated on silicon dioxide at 350C in order to demonstrate monolithic compatibility with back-end-of-line CMOS manufacturing. Final MSM photodetectors demonstrate a net gain with an internal quantum efficiency greater than 100%.

AS3E.2 • 14:30
A Remote LIBS applied on leaves in-situ elemental analysis, Ming Zhu¹, Menghan Wang¹, Chuangsheng Lian¹, Xiao Peng¹, Junle Qu¹; ¹Shenzhen Univ., China. A remote Laser Induced Breakdown Spectroscopy (LIBS) detection system is developed which enables scanning of a 2-dimensional area with a maximum distance of 30 meters. We applied it on leaves in-situ elemental analysis.

Room: Wu Chang, F2

14:00–15:30

AS3F • Passive Devices

Presider: Yunhong Ding, DTU Fotonik, Technical Univ. of Denmark, Denmark

Room: Jing Men, B1

14:00–15:30

AS3G • Photonic Microwave Filtering Technology

Presider: Xiaoke Yi, Univ. of Sydney, Australia

Room: Sui Zhou, F3

14:00–15:30

AS3H • Imaging VII

Presider: Ling Fu; Huazhong Univ. of Science and Technology, China

Room: Xiang Yang, F3

14:00–15:30

AS3I • Imaging VIII

Presider: Pengcheng Li; Wuhan National Lab for Optoelectronics, China

AS3F.1 • 14:00 **Invited**

Photonic Integration Technologies Beyond 100G, Akimasa Kaneko¹; ¹NTT Photonics Laboratories, Japan. I will review and summarize the latest status of photonic integration technologies beyond 100G especially for digital coherent optical transmission.

AS3G.1 • 14:00 **Invited**

Fully programmable spectrum sliced chirped microwave photonic filter, Xiaoke Yi¹; ¹Univ. of Sydney, Australia. Recent new methods in optical filtering for wideband microwave photonic signal processing are presented in this paper including optical waveguide filters for sideband suppression, optical-to-electrical filtering techniques, and cascaded microwave photonic signal processors.

AS3H.1 • 14:00 **Invited**

Title to be Determined, Yueqing Gu¹; ¹China Pharmaceutical Univ., China. Abstract not available.

AS3I.1 • 14:00 **Invited**

Non-invasive detection and monitoring of biochemistry in cells and tissues by decomposing autofluorescence, Ewa M. Goldys¹; ¹Macquarie Univ., Australia. Hyperspectral imaging based on endogenous contrast provides a new non-invasive method to characterise cells and tissues. Cellular content and maps of native fluorophores help monitor biological processes, with proper account of intrinsic cellular heterogeneity.

AS3F.2 • 14:30

Three-Dimensional Silicon Nitride Platform for Resonant Filters, Jijun Feng¹, Ryoichi Akimoto², Heping Zeng¹; ¹Univ. of Shanghai for Science and Technology, China; ²National Institute of Advanced Industrial Science and Technology, Japan. Three-dimensional vertically coupled Si₃N₄ resonant filters are investigated. Strong polarization dependent property is observed, with only TE wave coupling existing for SiO₂ cladded resonance while enhanced TM light coupling can happen for a suspended structure.

AS3G.2 • 14:30

Integrated Chromatic and Modal Dispersion Measurement Using Microwave Photonic Techniques, Ruilong Mi¹, Ningbo Zhao¹, Zhiqun Yang¹, Lin Zhang¹, Guifang Li²; ¹Tianjin Univ., China; ²Univ. of Central Florida, USA. A flexible and compact electrical interferometric technique for measuring dispersion characteristics of few-mode fibers is proposed and experimentally demonstrated. This setup enables simultaneous high-precision measurement of chromatic dispersion and differential-mode-group-delay.

AS3H.2 • 14:30

Guiding Photons through the Scattering Maze: Progress and Challenges in Optical Wavefront Shaping, Cheng Ma^{1,2}, Lihong V. Wang¹; ¹Washington Univ. in St Louis, USA; ²Electronic Engineering, Tsinghua Univ., China. This paper summarizes some of our recent achievements in suppressing the effect of light scattering. These technologies may have profound impacts on biomedical optics because scattering makes most biological tissues opaque.

AS3I.2 • 14:30

A pH-sensitive red fluorescent protein enables chemical reactivation in hydrophobic resin, Wenyan N. Guo^{1,2}, Yadong Gang^{1,2}, Xiuli Liu^{1,2}, Hongfu Zhou^{1,2}, Shaoqun Zeng^{1,2}; ¹Britton Chance Center for Biomedical Photonics, Wuhan National Laboratory for Optoelectronics, Huazhong Univ. of Science and Technology, China; ²Department of Biomedical Engineering, Key Laboratory for Biomedical Photonics of Ministry of Education, Huazhong Univ. of Science and Technology, China. A pH sensitive red fluorescent protein, pHuji, is selected and verified to be compatible with resin embedding and thus may be promising for dual-colour chemical reactivation imaging by fMOST in conjunction with EGFP or EYFP.

Room: En SHI, F3

AS3A.3 • 15:00
5kW GT-Wave Fiber, Huan Zhan¹, Yuying Wang¹, Kun Peng¹, Jianjun Wang¹, Feng Jing¹, Aoxiang Lin¹; ¹China Academy of Engineering Physics, China. We fabricated and reported on a GT-wave fiber suitable for bidirectional pump method. 5.07 kW laser output with optical-to-optical efficiency of 74.5% was generated in bidirectional pump GT-wave fiber amplifier.

AS3A.4 • 15:15
High-efficiency high-power all-fiber oscillator with counter-pumping configuration, Yu Yu¹, Jianqiu Cao¹, Zhihe Huang¹, Shaofeng Guo¹, Xiaojun Xu¹, Jinbao Chen¹; ¹National Univ. of Defense Technol, China. A 525 W all-fiber counter-pumping oscillator is demonstrated with a distributed side-coupled cladding-pumped Yb-doped fiber, which outputs at 1080 nm with a slope efficiency as high as 78.7%. The beam quality is also measured.

Room: Han Yang, F2

AS3B.4 • 15:00
Generation and Transmission of 745Mb/s OFDM Signal Using a Single Commercial Blue LED and an Analog Post-Equalizer for Underwater Optical Wireless Communications, Chao Li¹, Boke Wang¹, Peilin Wang¹, Zhengyuan Xu^{1,2}, Qi Yang³, Shaohua Yu³; ¹USTC, China; ²Shenzhen Graduate School, Tsinghua Univ., China; ³Wuhan Research Inst. of Posts and Telecommunications, China. A 745Mb/s 64-QAM OFDM optical signal is experimentally generated and transmitted over 2-meter underwater channel using a single commercial blue LED with a 3dB bandwidth of 4MHz and a simple efficient analog post-equalizer.

AS3B.5 • 15:15
An Asymmetric Analog Mobile Fronthaul Solution for UDN of Small Cells with Low-Bandwidth ADCs in ONUs, Chenhui YE¹, Xiaofeng Hu¹, Xiaohan Huang¹; ¹Nokia Bell Labs, China. An analog mobile fronthaul for UDN is proposed using off-the-shelf real-time ADCs in ONUs. Transmission of 96x 20MHz LTE signals over 20km fiber with 1:32 power-split is achieved using intelligent management on fiber-optics nonlinear response.

Room: Huang Shi, F2

AS3C.4 • 14:45
Timing Phase Synchronization for Short-Reach Optical Direct Detected Systems Using Nyquist & FTN Signaling, Langyu Yi¹, Lingchen Huang², Jie Liu³, Changjian Guo¹; ¹South China Academy of Advanced Optoelectronics, South China Normal Univ., China; ²Center for Optical and Electromagnetic Research (COER), Zhejiang Univ., China; ³School of Electronics and Information Technology, Sun Yat-Sen Univ., China. We propose a feed-forward timing phase synchronization algorithm operating at twotimes oversampling for Nyquist/FTN pulse shaped optical IM/DD systems. Simulation results show that the proposed scheme has similar performance to existing algorithms using four-times oversampling.

AS3C.5 • 15:00
Wireless Laser Uplink Scheme with 1550-nm Wavelength for Indoor Visible Light Communications, Lu Liu¹, Zhong Zheng¹, Te Chen¹, Ran Wang¹, Feng Liu¹, Weiwei Hu¹; ¹EECS, Peking Univ., China. A wireless laser uplink scheme with 1550-nm wavelength and large divergence angle for indoor visible light communication (VLC) systems is presented. It can achieve high data rate (> 1 Gbit/s) without the need for precise alignment.

AS3C.6 • 15:15
Efficient Frequency Domain Channel Equalization Methods for OFDM Visible Light Communications, Bangjiang Lin^{1,2}, Xuan Tang¹, Zabih Ghassemlooy³, Yiwei Li¹, Shihao Zhang¹, Yi Wu²; ¹Quanzhou Inst. of Equipment Manufacturing, Haixi Inst.s, Chinese Academy of Sciences, China; ²Key Laboratory of Optoelectronic Science and Technology for Medicine of Ministry of Education, Fujian Normal Univ., China; ³Optical Communications Research Group, NCRLab, Faculty of Engineering and Environment, Northumbria Univ., UK. We present efficient frequency domain channel estimation methods based on the ISFA, MMSE and WIFA schemes for the orthogonal frequency division multiplexing (OFDM) visible light communications (VLC) system.

Room: Xian Tao, F3

AS3D.3 • 14:45
Novel Dynamic Bandwidth Management Approach for Software Defined Optical Access and Aggregation Networks, Mingjun Guo¹, Lei Wang¹, Yan Wang¹, Xue Chen¹; ¹BUPT, China. We propose a dynamic bandwidth management approach for software defined optical access and aggregation networks. Simulation shows it enables automatic bandwidth adjustment and traffic engineering among multiple paths based on monitored aggregation traffic so as to make efficient use of network bandwidth and improve service experience.

AS3D.4 • 15:00
An Innovative Routing in SDN Controller over Optically-routed network Model, Jianglong Wang¹, Guochu Shou¹, Wenzhuo Jia¹, Yihong Hu¹, Zhigang Guo¹; ¹BUPT, China. An innovative routing mechanism combining with scale-free network topology construction and flow table pre-configuration is proposed for SDN controller. We experimentally and numerically show the decline of the average number of hops and network delay.

AS3D.5 • 15:15
Experimental Demonstration of VM Designation in Hybrid Cloud-Fog Computing with Software-Defined Optical Networking, Yongli Zhao¹, Yajie Li¹, Weizhong Wang¹, Xiaosong Yu¹, Jie Zhang¹, Haomian Zheng², Yi Lin², Massimo Tornatore³, Biswanath Mukherjee⁴; ¹Beijing Univ of Posts & Telecom, China; ²Huawei Technologies Co., Ltd, China; ³Politecnico di Milano, Italy; ⁴Univ. of California, USA. A location-aware virtual machine (VM) designation scheme is first proposed in hybrid cloud-fog computing using hierarchical control architecture of software-defined optical networks, in which virtual machines are designated for different requests with different latency requirements.

Room: Han Kou, F2

AS3E.3 • 14:45
Force sensors based on intrinsic fiber Fabry-Perot interferometer fabricated by the femtosecond laser, Yong Yang¹, Xiaobei Zhang¹, Huawen Bai¹, Haiyang Shao¹, Haiyang Pan¹, Fufei Pang¹, Tingyun Wang¹; ¹Shanghai Univ., China. The intrinsic Fabry-Perot interferometer is fabricated by the femtosecond laser in a single mode fiber to form a sensitive force sensor. Its force sensing property was investigated, showing a sensitivity of 1.382 nm/N.

AS3E.4 • 15:00
Experimental characterization of the Bloch-surface-wave device with large loss, Weijing Kong¹, Yuhang Wan², Kun Du², Wenhui Zhao¹, Zheng Zheng²; ¹School of Electronic Engineering, Tianjin Univ. of Technology and Education, China; ²School of Electronic and Information Engineering, Beihang Univ., China. The sensing capability and enhanced GH effect of Bloch-surface-wave device with a large loss are experimentally studied. The results demonstrate that the device can show a good performance even with an extinction coefficient of 9×10^{-4} .

AS3E.5 • 15:15
Infrared Perfect Ultra-narrow Band Absorber as Plasmonic Sensor, Dong Wu¹, Yumin Liu¹, Ruifang Li¹; ¹Beijing Univ. Of Post and Telecommu, China. We propose and numerically investigate an ultra-high resolution refractive index sensor based on plasmonic metamaterial structure in near-infrared region, which has a high sensitivity of 2400nm/RIU and an ultra-high figure of merit (FOM) of 4800.

Room: Wu Chang, F2**AS3F.3 • 14:45**

High-Q Resonance Implementation with Mini-scale High-index-contrast Grating on Silicon-on-insulator, Zhixin Wang¹, Haiyang Zhang¹, Jicheng Jin¹, Xuefan Yin¹, Jiaxin Lv¹, Chao Peng¹, Weiwei Hu¹; ¹EECS, Peking Univ., China. We demonstrate a high-Q resonance achieved on a mini-scale HCG (110 $\mu\text{m} \times 300 \mu\text{m}$) with the measured Q of ~ 2420 , revealing that in-plane energy leakage and finite-size effect will not destroy high-Q resonance.

AS3F.4 • 15:00

Integrated tunable all-optical filters based on push-pull fractional order photonics Hilbert transformers, Binchen Cai¹, Chaotan Sima^{1,2}, Bolan Liu¹, Demin Liu¹, Yu Yu², James Gates³, Peter Smith³; ¹Next Generation Internet Access National Engineering Laboratory, Huazhong Univ. of Science and Technology, China; ²Wuhan National Laboratory for Optoelectronics, Huazhong Univ. of Science and Technology, China; ³Optoelectronics Research Centre, Univ. of Southampton, UK. We proposed and demonstrated a tunable all-optical filter based on the integration of X coupler, grating based fractional Hilbert transformers and optical phase push-pull elements, realizing controllable flat-top notch filters and microwave photonic SSB filters.

AS3F.5 • 15:15

Novel Slanted Grating Coupler for Vertical Coupling, Yanan Y. Guo¹, Yongqing Huang¹; ¹Beijing Univ. of Posts and Telecomm, China. A novel slanted grating coupler is proposed and demonstrated for perfectly-vertical coupling between optical fibers and waveguides. It offers a coupling efficiency as high as 88.6% for TE polarization at the wavelength of 1.55 μm .

Room: Jing Men, B1**AS3G.3 • 14:45**

A reconfigurable microwave photonic filter, Xin Zhang³, Fei Wang^{3,1}, Jia-Gui Wu², Qiong Yu³, Jun Gu³, Youxi Lu³; ¹Chongqing Key Laboratory of Time Grating Sensing & Advanced Testing Technology, China; ²College of Electronic and Information Engineering, Southwest Univ., China; ³School of Electrical and Electronic Engineering, Chongqing Univ. of Technology, China. A reconfigurable microwave photonic filter based on phase modulation to intensity modulation conversion is experimentally demonstrated. A bandpass filter and a notch filter can be respectively achieved only by manipulating optical sources.

AS3G.4 • 15:00

Microwave Photonic Notch Filter Based on Phase Modulation, Enming Xu¹, Xiaoxiao Han¹, Peili Li¹, Zuxing Zhang¹; ¹Nanjing Univ. of Posts and Telecommunications, China. A microwave photonic notch filter with tunable frequency is proposed and experimentally demonstrated. Experimental results with a 3-dB bandwidth of about 180 MHz, a tunable frequency from 1.5 to 6.6 GHz are obtained.

AS3G.5 • 15:15

Optical Filtering Techniques for Microwave Photonics, Xiaoke Yi¹, Shijie Song¹, Sune X. Chew¹, Liwei Li¹, Linh Nguyen¹, Robert Minasian¹; ¹Univ. of Sydney, Australia. Recent new methods in optical filtering for wideband microwave photonic signal processing are presented in this paper including optical waveguide filters for sideband suppression, optical-to-electrical filtering techniques, and cascaded microwave photonic signal processors.

Room: Sui Zhou, F3**AS3H.3 • 14:45**

Adaptive optical confocal fluorescence microscope with stochastic parallel gradient descent algorithm, Yi He¹, Zhibin Wang¹, Ling Wei¹, Xiqi Li¹, Jinsheng Yang¹, Uudong Zhang¹; ¹Inst. of optics and electronics, CAS, China. We have demonstrated adaptive optics confocal microscopy with stochastic parallel gradient descent (SPGD) algorithm for *in vivo* vessel imaging of mice auricle. After aberration correction, better image quality and more clearly vascular structure were realized.

AS3H.4 • 15:00

Ultra-sensing with slit-enhanced infrared spectroscopy, Thomas G. Mayerhofer^{1,2}, Richard Knipper^{1,2}, Uwe Hübner¹, Dana Cialla-May^{1,2}, Karina Weber^{1,2}, Juergen Popp^{1,2}; ¹Leibniz Inst für Photonische Technol eV Jena, Germany; ²Inst. of Physical Chemistry, Friedrich-Schiller Univ., Germany. We present slit-based metamaterial substrates for surface-enhanced infrared transmission and reflectance spectroscopy. These substrates allow detecting extremely small concentrations of analytes by concentrating both, the analyte and the incident light within the slits.

AS3H.5 • 15:15

Optical Sensor Based on a Mesoscopic Photonic Crystal Microcavity, Benedetta Ferrara¹, Marco Grande¹, Giovanna Calò¹, Antonella D'Orazio¹, Beatrice Dagens^{2,3}, Antoine Monmayrant^{4,5}, Olivier Gauthier-Lafaye^{4,5}, Vincenzo Petruzzelli¹, Giovanni Magno^{2,3}; ¹Dipartimento di Ingegneria Elettrica e dell'Informazione, Politecnico di Bari, Italy; ²Université Paris-Saclay, France; ³Centre de Nanosciences et de Nanotechnologies, CNRS, France; ⁴LAAS-CNRS, France; ⁵Université de Toulouse, France. We propose a mesoscopic photonic crystal microcavity-based refractive index sensor, that exhibits high quality-factor and good sensitivity. The translational invariance it offers, allowing for linear repositioning, is captivating for integrated optical sensors and tweezers.

Room: Xiang Yang, F3**AS3I.3 • 14:45**

Confocal Imaging Guided Photochemical Thrombosis Toward the Development of a Novel Zebrafish Model of Stroke, I-Ju Lee¹, Jia-Wen Hsu¹, Ian Liau¹; ¹Department of Applied Chemistry, National Chiao Tung Univ., Taiwan. Confocal imaging guided photochemical thrombosis was demonstrated on living zebrafish. Occlusion at selected cerebral blood vessels caused varied mortality rate and neurological outcome. This novel zebrafish stroke model may facilitate translational research and thrombolytic screening.

AS3I.4 • 15:00 Invited

Photoactivation of cell signaling molecules by lasers, Hao He¹; ¹Shanghai Jiao Tong Univ., China. Abstract not available.

Room: En SHI, F3

Room: Han Yang, F2

Room: Huang Shi, F2

Room: Xian Tao, F3

Room: Han Kou, F2

AS3D.6 • 15:30

A Software-Defined Network (SDN) based Service Provisioning Scheme for Packet Optical Networks, Yu Zhou¹, Yu Shang¹, Bingli Guo¹, Shan Yin¹, xin li¹, Jie Zhang¹, Shanguo Huang¹; ¹*BUPT, China*. We propose a SDN based Resource Garbage Collection scheme applied to service provider network, which brings the more efficient and intelligent service-providing performance. The proposals are also implemented and evaluated via an extended ONOS testbed.

15:30–16:00 **Coffee Break & Exhibition**, *Public area, 2nd Floor, Shangri-La Hotel, Wuhan*

Room: Han Yang, F2

16:00–17:30
Postdeadline Session

Room: Wu Chang, F2

Room: Jing Men, B1

Room: Sui Zhou, F3

Room: Xiang Yang, F3

ATH3F.6 • 15:30

A Technological Process of Coupling, Alignment and Packaging of Optical Fiber based on Nano-SOI Waveguide, Rui Xiao¹, Liangqiu Zhu¹, Jinsong Xia¹, Qingzhong Huang¹; ¹F201, Wuhan national lab of photonics, China. In this paper, we come up with a technological process solving problems including optical fibers' coupling ,alignment and packaging to nano-SOI waveguide.

15:30–16:00 **Coffee Break & Exhibition**, Public area, 2nd Floor, Shangri-La Hotel, Wuhan

Room: Wu Chang, F2

16:00–17:30

Postdeadline Session

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