Asia Communications and Photonics Conference (ACP) 2020
International Conference on Information Photonics and Optical Communications (IPOC) 2020
24-27 October 2020
Kuntai Hotel, Beijing, China

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Welcome to Beijing and to the ACP/IPOC 2020 Conference

It is a great pleasure to invite you to participate in the Asia Communications and Photonics Conference (ACP) 2020 and International Conference on Information Photonics and Optical Communications (IPOC) 2020 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. ACP2020 will be held jointly with the International Conference on Information Photonics and Optical Communications (IPOC), i.e., a conference initiated and sustained by the State Key Laboratory of Information Photonics and Optical Communications (at Beijing University of Posts and Telecommunications) tracing back to 2013.

The conference format of ACP/IPOC 2020 will be on site for attendees residing within mainland China and online for attendees residing outside of mainland China because of the global impact of COVID-19. The organizing committee hopes that ACP/IPOC 2020 will give participants from all over the world a good opportunity to communicate with each other in this difficult situation.

The ACP/IPOC 2020 technical conference features a full suite of plenary, tutorial, 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: Optical Fibers, Fiber-based Devices and Sensors; Optical Transmission Sub-systems, Systems and Technologies; Network Architectures, Management and Applications; Photonic Components and Integration; Microwave Photonics and Fiber Wireless Convergence; Micro-, Nano-, and Quantum Photonics: Science and Applications. The conference will also include a wide spectrum of workshops and industrial forums taking place on October 24th. With a conference program of broad scope and of the highest technical quality, ACP/IPOC 2020 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 over 130 invited and 6 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/IPOC 2020 a truly unique, outstanding global event.

Our conference highlight is the Plenary Session scheduled in the morning of Sunday (October 25th) and in the morning of Monday (October 26th). Seven outstanding, distinguished speakers will give presentations: Connie J.Chang-Hasnain from UC Berkeley will give a talk on VCSELs for 3D Sensing and 5G Communications. Min Gu from University of Shanghai for Science and Technology will give a talk on Artificial intelligence enabled by nanophotonics. Dimitra Simeonidou from University of Bristol will discuss 5G and Beyond: Enabling the Future Networked Society. Ton (A.M.J.) Koonen from Eindhoven University of Technology will talk about Optical technologies to disclose the spatial diversity dimension in systems and networks. Han Li from China Mobile will discuss Vision and trend analysis for transport networks in 5G era. Bill Wang from Huawei and Chongjin Xie from Alibaba Group will also present a talk in this session.

In addition to the regular technical sessions, 12 workshops and 3 Industry Forums will feature an additional 120 speakers. Pre-conference workshops will be held on Saturday, October 24th starting at 08:30. 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.

This year, Huawei, will sponsor the Best Paper Award in Industry Innovation, OSA will sponsor the Best Student Paper Award, State Key Laboratory of Information Photonics and Optical Communications will sponsor the Best Poster Award. Awards will be presented during the Banquet on Monday, October 26th. The poster-only session will be held on Monday, October 26th from 15:30–18:00. This is a good chance for you to meet with the authors and discuss technical issues in-depth.

In addition to the technical program, we have also an impressive range of exhibitions from the relevant industries, publishers, and professional organizations.

We have also prepared a rich social program to facilitate meeting and networking with colleagues from all over the world. A conference welcome reception will be held in the evening on Sunday, October 25th. On the evening of Monday, October 26th, 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 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 Beijing University of Posts and Telecommunications, and the Chinese Laser Press. We also thank the professional societies such as OSA, IEEE Photonics Society, SPIE, COS and CIC for organizing and sponsoring this great event.

Sincerely,
Committee

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Connie J. Chang-Hasnain, UC Berkeley, USA
Naoya Wada, NICT, Japan

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Xiaomin Ren, Beijing University of Posts and Telecommunications, China

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Ping Perry Shum, NTU, Singapore
Yuefeng Ji, Beijing University of Posts and Telecommunications, China

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Chao Lu, The Hong Kong Polytechnic University, China
Lena Wosinska, Chalmers University of Technology, Sweden

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Shanguo Huang, Beijing University of Posts and Telecommunications, China

Workshop Technical Program Committee Co-Chairs
Gangxiang Shen, Soochow University, China
Xiang Liu, Futurewei Technologies, USA
Chongjin Xie, Alibaba Group, USA

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Jie Luo, YOFC, China

Industry Forum Co-Chair
Min Zhang, Beijing University of Posts and Telecommunications, China

Local Organization Chair
Yongli Zhao, Beijing University of Posts and Telecommunications, China

Local Organization Member
Xuejiao Li, Chinese Laser Press, China
Jiaqi Yan, Chinese Laser Press, China

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Xiaomin Ren, Beijing University of Posts and Telecommunications, China

Vice Chair:
Ping Perry Shum, Southern University of Science and Technology, China

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Andrew Brown, SPIE, USA
Connie J. Chang-Hasnain, University of California, Berkeley, USA, OSA
Naomi Chavez, OSA, USA
Arthur Chiou, Yang-Ming University, China

Yun C Chung, Korea Advanced Institute of Science and Technology, South Korea
Sailing He, Zhejiang University, China & KTH, Sweden
Chennupati Jagadish, Australian National University, Australia
Thomas L. Koch, University of Arizona, USA
Ming-Jun Li, Corning Inc., USA
Xingde Li, Johns Hopkins University, USA
Xiang Liu, Futurewei Technologies, USA
Chao Lu, The Hong Kong Polytechnic University, China
Qingming Luo, Hainan University, China, SPIE
Doug Razzano, IEEE Photonics Society, USA
Xiaomin Ren, Beijing University of Posts and Telecommunications, China, COS
Yikai Su, Shanghai Jiao Tong University, China
Shadhu Yu, Wuhan Institute of Posts and Telecommunications, China, CIC
Xinliang Zhang, Huazhong University of Science and Technology, China, COS

Track Committees

Track 1: Optical Fibers, Fiber-based Devices and Sensors
Gangding Peng, The University of New South Wales, Australia, Leading Chair
Xiaoyi Bao, University of Ottawa, Canada, Co-Chair
Kyungwhan Oh, Yonsei University, South Korea, Co-Chair
Yunjiang Rao, University of Electronic Science and Technology, China, Co-Chair
Xinzhu Sang, Beijing University of Posts and Telecommunications, China, Co-Chair
Somnath Bandyopadhyay, University of Calcutta, India
Yinxu Fan, Shanghai Jiao Tong University, China
Yuan Gong, University of Electronic Science and Technology, China
Tuan Guo, Jinan University, China
Tuan Guo, Jinan University, China
Yunhan Luo, Jinan University, China
Yusuke Mizuno, Yokohama National University, Japan
Jianxiang Wen, Shanghai University, China
Limin Xiao, Fudan University, China
Fei Xu, Nanjing University, China
Binbin Yan, Beijing University of Posts and Telecommunications, China

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Track 2: Optical Transmission Sub-systems, Systems and Technologies
Lianshan Yan, Southwest Jiaotong University, China, Leading Chair
Periklis Petropoulos, University of Southampton, UK, Co-Chair
Alan P. T. Lau, Hong Kong Polytechnic University, China, Co-Chair
Jinxing Cai, TECOM, USA
William Sheih, University of Melbourne, Australia
Koji Igarashi, Osaka University, Japan
Hoon Kim, KAIST, South Korea
Yves Jaouen, Telecom ParisTech, France
Zhaoxu Li, Sun Yat-sen University, China
Bo Liu, Nanjing University of Information Science & Technology, China
Shota Ishimura, KDDI, Japan
Fan Zhang, Peking University, China
Qunbi Zhuge, Shanghai Jiao Tong University, China

Track 3: Network Architectures, Management and Applications
Xiaoping Zheng, Tsinghua University, China, Leading Chair
Jason P. Jue, The University of Texas at Dallas, USA, Co-chair
Juajia Chen, Chalmers University of Technology, Sweden, Co-chair
Zuqing Zhu, University of Science and Technology of China, China, Co-chair
Yongli Zhao, Beijing University of Posts and Telecommunications, China, Co-chair
Nan Hua, Tsinghua University, China
Qiong Zhang, Fujitsu, USA
Filippo Cugini, CNIT, Italy
Lei Wang, Alibaba, China
Avishek Nag, University College Dublin, Ireland
Wenda Ni, Bytedance Networking, Bytedance Inc., USA
Jiawei Zhang, Beijing University of Posts and Telecommunications, China
Weigang Hou, Chongqing University of Posts and Telecommunications, China
Huaxi Gu, Xidian University, China
Jian Chen, Nanjing University of Posts and Telecommunications, China
Shuangyi Yan, Bristal University, UK
Zilong Ye, California State University, USA
Yi Zhu, Hawaii Pacific University, USA
Carmen Mas-Machuca, Technical University of Munich, Germany
Maria Yuan, National Chiao Tung University, South Korea
Daniel Kiper, University of Arizona, USA
Xiaoliang Chen, University of California, Davis, USA

Fen Zhou, Institut Supérieur d’Électronique de Paris (ISEP), France
Marco Ruffini, Trinity College, Ireland
Yabin Ye, Huawei Germany, Germany
Xiaodan Pang, KTH Royal Institute of Technology, Sweden
Xuezhai Hong, South China Normal University, China
Xinwen Yi, Sun Yat-sen University, China
Pakun Zhu, Graduate School for the Creation of New Photonics Industries (GPI), Japan

Track 4: Photonic Components and Integration
Daxin Dai, Zhejiang University, China, Leading Chair
Di Liang, HP Lab, USA, Co-chair
Huiyun Liu, UCL, USA, Co-chair
Lin Yang, Institute of Semiconductor, CAS, China, Co-chair
Xingjun Wang, Peking University, China
Minghua Chen, Tsinghua University, China
Liu Liu, Zhejiang University, China
Yu Yu, Huazhong University of Science and Technology, China
Jian Wu, Beijing University of Posts and Telecommunications, China
Zeje Yu, Chinese University of Hong Kong, China
Linjie Zhou, Shanghai Jiao Tong University, China
Roberto R. Panepucci, Centro de Tecnologia da Informação Renato Archer - CTI, Brazil
Sergei Popov, Royal Institute of Technology, Sweden
Joyce Poon, Max Planck Institute of Microstructure Physics, Germany
Robert Halir, Universidad de Málaga, Spain
Aditya Malik, University of California, Santa Barbara, USA
Yuqing Jiao, TU/e, Netherlands
Xianshu Luo, Advanced Micro Foundry Pte Ltd, Singapore
Lianxu Jia, Shanghai Institute of Microsystem and Information Technology, China
Guangwei Cong, National Institute of Advanced Industrial Science and Technology (AIST), Japan
Minhao Pu, Technical University of Denmark, Denmark

Track 5: Microwave Photonics and Fiber Wireless Convergence
Jose Capmany, Universidad Politècnica de Valencia (UPV), Spain, Leading Chair
Shilong Pan, Nanjing University of Aeronautics and Astronautics, China, Co-chair
Jose Azana, Institut National de la Recherche Scientifique-Energie, Canada, Co-chair
Stavros Iezekiel, University of Cyprus, Cyprus
Jianji Dong, Huazhong University of Science and Technology, China
Mable Fok, University of Georgia, USA
Zhenzhou Tang, Nanjing University of Aeronautics and Astronautics, China
Maurizio Burla, ETH Zurich, Switzerland
Xihua Zou, Southwest Jiaotong University, China
David Marpaung, University of Twente, Netherlands
Avi Zadok, Tel-Aviv University, Israel
Yifei Li, University of Massachusetts, USA
Weiwen Zou, Shanghai Jiao Tong University, China
Yitang Dai, Beijing University of Posts and Telecommunications, China
Jijn He, École polytechnique fédérale de Lausanne, Switzerland
Sheng-Kwang Hwang, National Cheng Kung University, China

Track 6: Micro-, Nano-, and Quantum Photonics: Science and Applications
Yun-Feng Xiao, Peking University, China, Leading Chair
Kartik Srinivasan, National Institute of Standards and Technology, USA, Co-chair
Tanabe Takasumi, Keio University, Japan, Co-chair
Chaoyang Lu, University of Science and Technology of China, China, Co-chair
Jin Liu, Sun Yat-sen University, China, Co-chair
Shumin Xiao, Harbin Institute of Technology, China
Xu Yi, University of Virginia, USA
Xiulai Xu, Institute of Physics (CAS), China
Thiago Alegre, University of Unicamp, Brazil
Yongchun Liu, Tsinghua University, China
Yu He, Southern University of Science and Technology, China
Yosshitomo Okawachi, Columbia University, USA
Yu-Ming He, University of Science and Technology of China, China
Igor Aharonovich, University of Technology Sydney, Australia
Ren-Min Ma, Peking University, China
Stephan Reizenstein, Technical University of Berlin, Germany
Simone Portalupi, University of Stuttgart, Germany
Xiankai Sun, The Chinese University of Hong Kong, China

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General Information

Conference Venue: Kuntai Hotel
Address: No. 2 Wangjing Qiyang Road, Chaoyang District, Beijing, China

Accessibility
Kuntai Hotel is a luxury hotel located in the Chaoyang District of Beijing, China. It is only 17 km from Beijing Capital International Airport, 66 km from Beijing Daxing International Airport, 17 km from Beijing Railway Station, 25 km from Beijingnan Railway Station, 26 km from Beijing West Railway Station and 15 km from Beijing East Railway Station. It is adjacent to a large comprehensive park of more than 300,000 square meters - Great Wangjing Park.

Transportation

From Beijing Railway Station (北京站)
By Public Transportation: 1hour, 5RMB
By Taxi: 17 km, 60 RMB

By Public Transportation: 1 hour 10 minutes, 6RMB
By Taxi: 15 km, 45 RMB

From Beijing West Railway Station (北京西站)
By Public Transportation: 1 hour 20 minutes, 6RMB
By Taxi: 26 km, 80 RMB

From Beijing Capital International Airport (北京首都国际机场)
By Public Transportation: 1 hour, 30RMB
By Taxi: 17 km, 60 RMB

From Beijing East Railway Station (北京东站)
By Public Transportation: 1 hour 10 minutes, 5RMB
By Taxi: 15 km, 45 RMB

Registration
Location: Lobby of Kuntai Hotel
Hours
07: 00-18: 00 Saturday, 24 October
07: 30-18: 00 Sunday, 25 October
08: 00-18: 00 Monday, 26 October
08: 00-16: 00 Tuesday, 27 October

Onsite Speaker Preparation
All presenters should check in at the corresponding session room at least 30 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.
Onsite Poster Preparation
Authors should prepare their poster before the poster session starts. The poster must not exceed the boundaries of the display board. 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 posters will be reported to conference management and these papers will not be published.
Poster Session: 15:30–18:00, Monday, 26 October
Poster Board Size: 1m (Length) * 2.235m (Height)
Recommended Poster Size: 0.8m (Length) * 1.2m (Height)
Set-up Time: 10:00–14:00, Monday, 26 October
Tear-down Time: 18:30–20:00, Monday, 26 October

Exhibition
The ACP/IPOC 2020 Exhibition is open to all attendees.
Location: Corridor & Public area, 2F, Kuntai Hotel, Beijing

Hours
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<td>09:00–16:00</td>
<td>Tuesday, 27 October</td>
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Coffee Breaks
| 10:00–10:30 | Sunday, 25 October |
| 15:30–16:00 | Sunday, 25 October |
| 10:00–10:30 | Monday, 26 October |
| 15:30–16:00 | Monday, 26 October |
| 10:00–10:30 | Tuesday, 27 October |
| 15:30–16:00 | Tuesday, 27 October |

Lunches
Four-day buffet lunches (Oct. 24-27) in Kuntai Hotel are included in the registration fee for all registered delegates. And lunch tickets are provided within the badge.
Location: 2 restaurants for distribution
Joy Café, 1F
Executive Lounge, 26F

Hours
| 12:00–14:00 | Saturday, 24 October |
| 12:00–14:00 | Sunday, 25 October |
| 12:00–14:00 | Monday, 26 October |
| 12:00–14:00 | Tuesday, 27 October |

Conference Materials
ACP/IPOC 2020 Technical Digest will be provided in a USB drive and not available in print form. The ACP/IPOC 2020 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/IPOC 2020 Welcome Reception is free to all the registered attendees. A ticket is provided within the badge. And extra ticket could be purchased at the Registration Desk for 300RMB per person.
Location: 2 restaurants for distribution
Joy Café, 1F
Executive Lounge, 26F
Time: Sunday, 25 October 18:00–21:30

Conference Banquet and Awards Ceremony
Best Paper Award in Industry Innovation, Best Student Paper Award, and Best Poster Award will be presented at the banquet. The Banquet is NOT INCLUDED in the registration fee for students, but is included for all other regular registration types. The ticket is provided within the badge. And extra banquet ticket could be purchased at the Registration Desk for 500RMB per person.
Location: Ballroom, 2F
Time: Monday, 26 October 18:00–21:30
Conference Highlights

Plenary Presentations

Time: 08:15-12:00, Sunday, 25 October; 09:00-11:45, Monday, 26 October

Venue: Ballroom, 2F, Kuntai Hotel

ACP/IPOC 2020 will feature 7 plenary presentations. The presentations will be preceded by an Opening Ceremony from 08:15 – 08:30. For more information about the individual presenters, talk titles and biographies appear below.

VCSELs for 3D Sensing and 5G Communications
8:30–9:15, Sunday, 25 October
Connie J. Chang-Hasnain
UC Berkeley, USA

Biography: Connie Chang-Hasnain is Whinnery Distinguished Chair Professor in Electrical Engineering and Computer Sciences, at the University of California, Berkeley. She was the Associate Dean for Strategic Alliances of College of Engineering since 2014-2019 and Chair of the Nanoscale Science and Engineering Graduate Group at UC Berkeley 2006-2017. Prior to joining the Berkeley faculty, Dr. Chang-Hasnain was a member of the technical staff at Bellcore (1987–1992) and Assistant Professor of Electrical Engineering at Stanford University (1992–1995). She is a fellow of IEEE, OSA and National Academy of Inventors. She is member of the US National Academy of Inventors and National Academy of Engineering.

Professor Chang-Hasnain’s research interests include semiconductor optoelectronic devices, materials and applications. She pioneered the first planar VCSEL structure using proton implantation for array fabrication with Gbps modulation, first MEMS-VCSEL for wavelength tuning, and the first 1000-elemeent VCSEL arrays for 3D imaging. Prof. Chang-Hasnain has been honored with many awards including the Okawa Prize (2018), UNESCO Medal For the Development of Nanoscience and Nanotechnologies (2015), IEEE David Sarnoff Award (2011), and the OSA Nick Holonyak Jr. Award (2007). Additionally, she has been awarded with a Vannevar Bush Faculty Fellowship, a Humboldt Research Award, and a Guggenheim Fellowship. She was a member of IEEE LEOS Board of Governors, OSA Board of Directors, and the Board on Assessment of NIST Programs. National Research Council. She was the Editor-in-Chief of Journal of Lightwave Technology 2007-2012. Professor Chang-Hasnain is the OSA President-Elect in 2020 and will be the President in 2021.

5G and Beyond: Enabling the Future Networked Society
10:30–11:15, Sunday, 25 October

Dimitra Simeonidou
University of Bristol, UK

Biography: Dimitra Simeonidou is a Full Professor at the University of Bristol, the Co-Director of the Bristol Digital Futures Institute and the Director of Smart Internet Lab.

Her research is focusing in the fields of high performance networks, programmable networks, wireless-optical convergence, 5G/BSG and smart city infrastructures. She is increasingly working with Social Sciences on topics of digital transformation for society and businesses. Dimitra has been the Technical Architect and the CTO of the smart city project Bristol Is Open. She is currently leading the Bristol City/Region 5G urban pilots. She is the author and co-author of over 600 publications, numerous patents and several major contributions to standards. She has been co-founder of two spin-out companies, the latest being the University of Bristol VC funded spin-out Zeetta Networks, http://www.zettag.com, delivering SDN solutions for enterprise and emergency networks.

Dimitra is a Fellow of the Royal Academy of Engineering, a Fellow of the IEEE and a Royal Society Wolfson Scholar.
Computing Optical Technologies for Hyperscale Cloud Computing

11:15–12:00, Sunday, 25 October

Chongjin Xie
Alibaba Group, USA

Biography: Chongjin Xie is a senior director and chief communication scientist in Alibaba Infrastructure Service, Alibaba Group, leading an optical network research, architecture, design and testing team to develop datacenter optical interconnects and networking technologies to support Alibaba online platform and cloud services. Prior to joining Alibaba Group in 2014, Dr. Xie was a distinguished member of technical staff at Bell Labs, Alcatel-Lucent (now Nokia), doing research on optical communication systems and networks. He did his postdoctoral research at Chalmers University of Technology in Sweden from 1999 to 2001, and received his M.Sc. and Ph.D. degrees from Beijing University of Posts & Telecommunications in 1996 and 1999, respectively. Dr. Xie has published one book, 3 book chapters and over 200 journal and conference papers. He is an associate editor of Journal of Lightwave Technology, a program chair of OFC’2019 and served as chairs, TPC chairs or TPC members in many conferences. Dr. Xie is a Fellow of OSA and a senior member of IEEE.

Optical Technologies to Disclose the Spatial Diversity Dimension in Systems and Networks

09:00–09:45, Monday, 26 October

Ton (A.M.J.) Koonen
Eindhoven University of Technology, Netherlands

Biography: Ton Koonen is a full professor of Electro-Optical Communications and Chair of Broadband Communication Networks in the department Telecommunication Technology and Electromagnetics. His areas of specialization include computer systems, architectures and networks, telecommunications, broadband and optical fiber-to/in-the-home. Ton has initiated and led several European and national R&D projects in this area on dynamically reconfigurable hybrid fiber access networks, fiber-wireless, packet-switched access, and short-range multimode (polymer) optical fiber networks, and label-controlled optical packet routed networks.

His current research interests are optical fiber-supported in-building networks (including optical wireless communication techniques, radio-over-fiber techniques, and high-capacity plastic optical fiber (POF) techniques), optical access networks, and spatial division multiplexed systems. His group has, for example, developed a Wi-Fi network that transmits signals via infrared light, achieving a speed of 42.8 Gb/s, 100 times faster than current networks generally achieve. At this speed, an entire film could be transferred in one second.

Ton Koonen received his MSc (with honors) in Electrical Engineering from TU/e in 1979. In that year, he joined Philips Telecommunicatie Industrie (Telecommunications Industry). From 1987 to 2000 he worked on high-speed transmission systems and optical fiber systems for hybrid access networks at Bell Laboratories within Lucent. He has also worked as a professor at the University of Twente, holding a chair on Photonic Networks.

Ton is chairman of the Electro-Optical Communication Systems (ECO) group, part of the COBRA institute and from September 2012 he was also vice-dean of the department Electrical Engineering. Ton is a Bell Labs Fellow, IEEE Fellow, OSA Fellow, ERC Advanced Investigator Grant Winner, Distinguished Guest Professor of Hunan University, Changsha, China, and has frequently acted as an auditor and reviewer on national and EC projects. Currently, he is involved in a number of access/in-home projects in the Freeband program, the IOP GenCom program, and the EC FP6 IST and FP7 ICT programs. He has authored and co-authored more than 250 conference and journal publications.

Vision and Trend Analysis for Transport Networks in 5G Era

09:45–10:30, Monday, 26 October

Han Li
China Mobile, China

Biography: Han Li graduated from Beijing University of Posts and Telecommunications and obtained his Ph.D in 2002. He is the chief expert of China Mobile and the deputy director of the China Mobile Research Institute. He has extensive knowledge of SPN, PTN, OTN, PON and synchronization technology, and has published more than 50 articles, 100 patents, and 200 ITU-T contributions. He is an editor of several ITU-T recommendations and IETF RFCs. He has rewarded the second prize of the National Science and Technology Progress for three times, the silver prize of the Nation Patent Award for one time and the second prize of the Nation Patent Award for two times.

Embracing F5G Era, Achieving Ubiquitous Optical Connections

11:00–11:45, Monday, 26 October

Bill Wang
Huawei, China

Biography: Bill Wang is the Chief Strategy Officer and Vice President of Huawei Transmission & Access Product Line. He is currently responsible for the strategy planning and collaborations with industry and academic partners of Huawei’s optical network technologies and products. Prior to current position, Bill had been the director of the Huawei Optical Network research center and the direct of Huawei OSN8800 product. As a veteran with 20 years of experience in the optical industry, Bill has a deep insight of the global ICT trends, and extensive knowledge in bridging the technology development and commercial practice.
Best Paper Award in Industry Innovation

ACP/IPOC 2020 is pleased to announce that this year’s Best Paper Award in Industry Innovation will be sponsored by Huawei.

5 recipients, Huawei Phone for each

Any non-invited speaker, who is the first author as well as the presenting author of a paper submitted will be eligible for this award. Five papers focusing on industry and technology will be selected by the ACP/IPOC 2020 Committee. Certificates and Awards will be presented to the winners at the conference banquet and award ceremony.

Best Student Paper Award

ACP/IPOC 2020 is pleased to announce that this year’s Best Student Paper Award will be sponsored by OSA.

8 recipients, $250 USD for each

Any full-time university student, who is the first author as well as presenter of a paper submitted with choosing presentation type of “Best Student Paper Award” will be eligible for this award. Eight winners will be selected by the ACP/IPOC 2020 Committee. Certificates and Awards will be presented to the winners at the conference banquet and award ceremony.

Best Poster Award

ACP/IPOC 2020 is pleased to announce that this year’s Best Poster Award on ACP will be sponsored by State Key Laboratory of Information Photonics and Optical Communications.

15 recipients, Huawei Watch for each

Any poster paper that is registered by at least one of the authors, presented during the assigned time slot will be eligible for this award. Certificates and Awards will be presented to the winners at the conference banquet and award ceremony.

Poster Session

Time: 15:30–18:00, Monday, 26 October
Location: 1F, Kuntai Hotel

Almost 360 posters will be displayed during ACP/IPOC 2020. 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.

Student Events

OSA Student Event

Sponsor: OSA
Time: 12:00 to 13:30 PM, Oct. 25 (Sunday)
Location: Conference 12, 2F, Kuntai Hotel

This event provides an opportunity for OSA student members to build connections with each other through fun activities. Students will also learn skills and experiences to achieve success in both graduate school and professional career. Lunch will be available.

IEEE Photonics Society Student Event

Sponsor: IEEE photonics society
Organizers:
Yikai Su, Shanghai Jiao Tong University, China
Haoshuo Chen, Nokia Bell Labs, USA
Time: 09:00 to 10:30 AM, Oct. 24(Saturday)
Location: Conference 03, 2F, Kuntai Hotel

Programs:
1) Memorial of Arthur Ashkin, Nobel Prize in Physics in 2018 and the father of optical tweezers.
2) How to write and review papers
Paper writing and paper reviewing are equally important skills any researcher needs.
This event will provide an informal environment where young researchers can discuss with experienced paper writers, and editors of journals their top techniques for writing and reviewing papers. Also, it’s a great way to build your network!
Workshop and Forums

Workshops

Workshop 1: AI-based Optics
Workshop Time: 14:00–17:30, Saturday, 24 October
Venue: Conference 12, 3F
Organizer
Alan P.K. Lau, The Hong Kong Polytechnic University, China
Co-organizers
Qunbi Zhuge, Shanghai Jiao Tong University, China

Description: Machine learning (ML) has been widely investigated for both optical transmissions (equalization, coding, telemetry, etc.) and optical networks (modeling, resource allocation, optimization, failure management, etc.). Many interesting research works are reported for various applications. Nevertheless, the adoption of ML techniques in commercial systems falls behind due to many practical issues. In this workshop, we invite speakers from universities, vendors and operators to discuss about the key question: what else is needed for full adoption of ML? The discussions will focus on three aspects: 1) the technological and commercial issues which limit the adoption of ML, 2) the path to address these issues to advance the adoption, and 3) the corresponding roadmap. We will also discuss about open data sources and projects for the community to achieve faster progress in developing and adopting ML-aided applications.

Speakers:
Part 1, Presider Qunbi Zhuge
14:00-14:15 Jianqiang Li, Alibaba, USA
14:15-14:30 Zuqing Zhu, University of Science and Technology of China, China
14:30-14:45 Miquel Garrich, Huawei, France
14:45-15:00 Danshi Wang, BUPT, China
15:00-15:30 Panel discussion
15:30-16:00 Coffee break

Workshop 2: Photonics for 6G: How and when?
Workshop Time: 09:00–11:50, Saturday, 24 October
Venue: Conference 12, 3F
Organizer
Chao Shen, KAUST, Saudi Arabia
Co-organizers
Zhenming Yu, Beijing University of Posts and Telecommunications, China

Description: With the commercialization of 5G, 6G has gradually entered planning. However, Moore’s Law is gradually coming to an end. Full-spectrum mobile communication technology will be applied in 6G. Traditional electronic methods are becoming difficult to meet the demands. In this era of photonic information, the entire signal processing chain of wireless communication is gradually migrating to the optical domain. The asynchronous wireless technology platform will be a photon-defined radio system integrating microwave photonic technology, optical computing and photon AI. According to current research, the continuous wireless technology platform defined by photon can well adapt to the future 6G vision, such as application scenarios, key technologies and system architectures. Coherent radio-over-fiber (CROF), Integrated microwave photonics (IMWP), Photonic digital signal processing (PDP), and Optical frequency comb (OFC) are expected to lead the design of future radio systems and sensing systems. This workshop aims to provide a forum for international experts to present and discuss the visions and perspectives of photonics for 6G including recent progresses and future prospects and challenges for applications. We welcome people of relevant interest to attend and join the discussions.

Speakers:
Presider: Chao Shen, KAUST, Saudi Arabia
09:00-09:20 Prof. Changyuan Yu, Hong Kong Polytechnic University, China
09:20-09:40 Prof. Hongyan Fu, Tsinghua-Berkeley Shenzhen Institute, China
09:40-10:00 Dr. Kozlov, Lightcounting Corp, China
10:00-10:20 Prof. Qinggui Tan, Xi’an Branch of China Academy of Space Technology, China
10:20-10:30 Coffee break
10:30-10:50 Prof. Wu Ben, Rowan University, USA
10:50-11:10 Prof. Boon S. Ooi, King Abdullah University of Science and Technology (KAUST), South Korea
11:10-11:30 Prof. Jing Zhang, University of Electronic Science and Technology of China, China
11:30-11:50 Prof. Weiwei, Beijing Institute of Technology, China

Workshop 3: Security Solutions Enabled by Physics in Fiber
Workshop Time: 08:30–12:00, Saturday, 24 October
Venue: Conference 10, 3F
Presider:
Lilin Yi, Shanghai Jiao Tong University, China
Wei Chen, University of Science and Technology of China, China

Chairs:
Reza Nejabati, University of Bristol, UK
Lilin Yi, Shanghai Jiao Tong University, China
Wei Chen, University of Science and Technology of China, China
Yongli Zhao, Beijing University of Posts and Telecommunications, China

Description: With the development of information technology and quantum computers, the network security issue is increasingly prominent, and a series of threats exist in the underlying optical networks. At present, there exists two research topics on security in optical networks: one is optical fiber physical layer security, and the other is quantum key distribution. For the former, different solutions such as noise-encrypted optical communication, chaotic based optical communication, spectrum-spread optical communication, hidden based optical communication, and frequency-hopping optical communication can be adopted, which have been experiencing a period of fast development. For the later, the research focus was on point-to-point quantum key distribution system, aiming to improve the generation rate of quantum key, reduce the quantum bit error rate, and increase the quantum key transmission distance. However, it is an urgent need for the deployment of multi-point interconnection for practical applications. This workshop mainly focuses on the above two research topics and their bottleneck issues. By discussing the latest progresses, research directions as well as possible solutions, we try to fundamentally enhance the network security in the future.

Session 1: Physical Layer Security

Presider:
Lilin Yi, Shanghai Jiao Tong University, China

Speakers:
08:30-08:35 Opening
08:35-08:50 Anbang Wang, Taiyuan University of Technology, China
Topic: Chaotic key distribution
08:50-09:05 Lei Deng, Huazhong University of Science and Technology, China
Topic: High speed physical layer security
09:05-09:20 Xuelin Yang, Shanghai Jiao Tong University, China
Topic: High speed and long distance random key distribution
09:20-09:35 Tao Pu, PLA Army Engineering University, China
Topic: The Security Analysis and Realization of Quantum stream Cipher physical-layer encryption System
09:35-09:50 Yajie Li, Beijing University of Posts and Telecommunications, China
Topic: Physical layer key generation: feature extraction and post-processing protocol
09:50-10:20 Coffee Break
Session 2: Quantum Communications and Networks

Presider:
Wei Chen, University of Science and Technology of China, China

Speakers:
10:20-10:35 Zhenqiang Yin, University of Science and Technology of China, China
Topic: Recent progresses on long-distance quantum key distribution
10:35-10:50 Yongmei Sun, Beijing University of Posts and Telecommunications, China
Topic: Low-noise Wavelength Assignment in Hybrid DV-QKD and DWDM Optical Networks
10:50-11:05 Zhangchao Ma, Beijing University of Science and Technology, China
Topic: Quantum key distribution networking technology and its standardization
11:05-11:20 Masahiro Takeoka, National Institute of Information and Communications Technology, Japan
Topic: Quantum key distribution network technologies towards quantum secure cloud
11:20-11:35 Yi Qian, Wuhan Research Institute of Posts and Telecommunications, China
Topic: Practical quantum key distribution powered by silicon photonics
11:35-11:50 Xiaosong Yu, Beijing University of Posts and Telecommunications, China
Topic: Optional Design and Optimization for Quantum Key Distribution Optical Networks (QKD-ON)

Workshop 4: Marriage between artificial intelligence and micro-/nano-photonics: happy or not?

Workshop Time: 08:30–18:00, Saturday, 24 October
Venue: Conference 16, 3F

Organizer
Hongbo Sun, Tsinghua University, China
Co-organizers
Mable P. Fok, University of Georgia, USA
Honghua Fang, Tsinghua University, China
Qiming Zhang, University of Shanghai for Science and Technology, China
Lili Gui, Beijing University of Posts and Telecommunications, China

Description: Emerging artificial intelligence algorithms have found wide-spread and successful applications in machine vision, speech and pattern recognition, etc. With the difficulties of fabricating more and more integrated electronic components, the performances of the algorithms have been meeting their limitations, determined by Moore’s law and Von Neumann architecture. Neuromorphic computing and optical neural networks enabled by integrated photonics, however, could offer advantages of high speed and low consumption. Presently, the optical computing hardware is highly unexplored yet and awaits more researches. Development of novel materials, design methods, integrated chips, and training procedures is the key for more powerful functionalities in smart applications.

The aim of this workshop is to bring together leading experts in both nanophotonics and artificial intelligence algorithms to discuss the latest advances and challenges in this field. On the one hand, exploring materials and integrated photonic chips helps the construction of optical neuromorphic computing hardware. On the other hand, machine learning enables more intelligent design of nanophotonic devices with better performances, which could further improve optical systems for diverse applications including optical computing, sensing, communications, etc.
The workshop will cover specifically the following main topics:

1. Integrated photonics for optical neuromorphic computing
2. Intelligent algorithms for designing smart nanophotonic devices and optical systems
3. Volatile and nonvolatile materials for optical computing
4. Challenges in upscaling and training of optical neuromorphic computing

**Morning Session**

**Presider:** Lili Gui, Mable P. Fok

**Speakers:**

- **8:30-8:35 Opening**
- **8:35-9:05 Bhavin J. Shastri,** Queen’s University, Canada
  Topic: Silicon photonics for AI and neuromorphic computing
- **9:05-9:35 Yuebing Zheng,** The University of Texas at Austin, USA
  Topic: Inverse design of photonic nanostructures with a deep convolutional mixture density network
- **9:35-10:05 Keisuke Kojima,** Mitsubishi Electric Research Laboratories, USA
  Topic: Inverse Design of Nanophotonic Devices using Deep Neural Networks
- **10:05-10:30 Coffee Break**
- **10:30-11:00 Richard Haglund,** Vanderbilt University, USA
  Topic: Enhancing device functionality using phase-changing quantum materials
- **11:00-11:30 Yichen Shen,** Lightelligence, USA
  Topic: Integrated Photonics for Machine Learning Applications
- **11:30-12:00 Alexandra Boltasseva,** Purdue University, USA
  Topic: Machine Learning Assisted Photonics

**Afternoon Session**

**Presider:** Honghua Fang, Qiming Zhang

**Speakers:**

- **14:00-14:30 Lin Yang,** Institute of Semiconductors, CAS, China
  Topic: Silicon-based optical matrix processor
- **14:30-15:00 Andrew Forbes,** University of the Witwatersrand, Wits, South Africa
  Topic: Structured light gets intelligent
- **15:00-15:30 Zengguang Cheng,** Fudan University, China
  Topic: Chalcogenide phase-change materials for future photonic memory and computing
- **15:30-16:00 Coffee Break**
- **16:00-16:30 Xing Lin,** Tsinghua University, China
  Topic: Artificial Intelligence Accelerator using Optoelectronic Computing
- **16:30-17:00 Chao Qian,** Zhejiang University, China
  Topic: Persistent optical storage without human intervention
- **17:00-17:30 Li Gao,** Zhejiang University, China
  Topic: Deep neural network for accurate, multifunctional nanophotonic design
- **17:30-18:00 Cuicui Lu,** Beijing Institute of Technology, China
  Topic: Intelligent algorithms: new avenues for designing nanophotonic devices

**Workshop 5: Information Functional Materials and Devices**

**Workshop Time:** 9:00-11:30, Saturday, 24 October

**Venue:** Conference 07, 2F

**Workshop Organizers:**

- **Sishen Xie,** Institute of Physics CAS, China
- **Weihua Tang,** Beijing University of Posts and Telecommunications, China
- **Jianhua Hao,** The Hong Kong Polytechnic University, Hong Kong, China

**Speakers:**

- **9:00-9:20 Zhou Shifeng,** South China University of Technology
  Topic: Multimaterials fiber and device
- **9:20-9:40 Guo Erjia,** Institute of Physics, China Academy of Science
  Topic: Spin-lattice entanglement in the oxide-based multiferroic devices
- **9:40-10:00 Huang Wen,** University of Electronic Science and Technology of China
  Topic: Surface plasmon polariton enhanced 2d-material photodetector for inferred application
- **10:00-10:30 Coffee break**
- **10:30-10:50 Zhang Yang,** Nankai University
  Topic: Field-induced smart phosphors and their applications
- **10:50-11:10 Bai Gongxun,** China Jiliang University
  Topic: Luminescence modulation of lanthanide ions doped photonic materials
- **11:10-11:30 Wu Zhenping,** Beijing University of Posts and Telecommunications
  Topic: Phase control of Ga2O3 film and its optoelectronic application

**Description:** Information functional materials are expected to lead to the major future breakthroughs in electronics, photonics and energetics. This workshop focuses on novel functional materials and nanostructures in combination with modern information devices, as well as on the physics of new devices and sensors, nanostructured materials and nano-scaled device characterization. It aims to bring together leading researchers to exchange and share their experiences and research results on all aspects of Information Functional Materials and Devices. It also provides a premier interdisciplinary platform for researchers to present and discuss the most recent innovations, trends, and concerns as well as practical challenges encountered and solutions adopted in the fields of Information Functional Materials and Devices.

**Speakers:**

- **14:00-14:30 Zhou Shifeng,** South China University of Technology
  Topic: Multimaterials fiber and device
- **9:20-9:40 Guo Erjia,** Institute of Physics, China Academy of Science
  Topic: Spin-lattice entanglement in the oxide-based multiferroic devices
- **9:40-10:00 Huang Wen,** University of Electronic Science and Technology of China
  Topic: Surface plasmon polariton enhanced 2d-material photodetector for inferred application
- **10:00-10:30 Coffee break**
- **10:30-10:50 Zhang Yang,** Nankai University
  Topic: Field-induced smart phosphors and their applications
- **10:50-11:10 Bai Gongxun,** China Jiliang University
  Topic: Luminescence modulation of lanthanide ions doped photonic materials
- **11:10-11:30 Wu Zhenping,** Beijing University of Posts and Telecommunications
  Topic: Phase control of Ga2O3 film and its optoelectronic application
Workshop 6: Multiple Band Optical Communications and Networking

Workshop Time: 9:00-12:00, Saturday, 24 October
Venue: Conference 09, 3F

Organizer
Gangxiang Shen, Soochow University, Suzhou, China

Co-organizers
Vittorio Curri, Politecnico di Torino, Italy
Liangjia Zong, Huawei Technology, China
Antonio Napoli, Infineon, Germany

Description:
In fiber-optic communication systems and networks, transmission technologies based on the conventional C-band standard single-mode fiber (SSMF) have approached the transmission capacity limit. However, the remaining bandwidth from the low-loss window of the SSMF is still abundant, up to 400 nm. To explore this potential capacity, fiber-optic communication systems based on multi-band wavelength division multiplexing (WDM) have been gathering increasing attentions. With the extension of spectra from the widely adopted C and L bands to additional bands including O, E, S, and U bands, a multi-band fiber-optic transmission system can be realized with an ultra-high spectrum efficiency, so as to cope with the rapid increase of data traffic. This workshop will focus on the key technical aspects that enable the full utilization of these multi-bands. The industrial status, system issues, and technical challenges in realizing such a multi-band optical transmission system will be presented and discussed. Also, new developed multi-band optical devices, such as photonic integrated wavelength selective switches (WSSs), fiber optical amplifiers supporting different or multiple bands in addition to the C band, etc., will be introduced. Other related technologies and open questions will also be discussed in this workshop.

President: Prof. Gangxiang Shen

Speakers:
09:00-09:20 Chao Lu, The Hong Kong Polytechnic University, China
Topic: Challenges in Realizing Multi-band Transmission

09:20-09:40 Ning Deng, Huawei Technologies Co., Ltd., China

09:40-10:00 Nicola Calabretta, Eindhoven University of Technology, Netherlands
Topic: Multi Band Photonic Integrated Wavelength Selective Switches

10:00-10:30 Coffee Break

10:30-10:50 Andrea D’Amico, Polytechnic University of Turin, Italy

10:50-11:10 Wadek Forysiak, Aston University, UK
Topic: Recent advances in Raman amplifiers for ultra-wideband transmission systems

11:10-11:30 Mingyi Gao, Soochow University, China
Topic: Application and Challenges of Broadband Fiber Optical Parametric Amplifiers on Multiple Band Optical Communications

11:30-11:50 Guanshi Qin, Jilin University, China
Topic: Wideband Optical Amplification in Newly-developed Tellurite Fibers

11:50-12:00 Conclusion and Discussion

Workshop 7: Wireless Optical Communication in 6G: Challenges, and Prospects

Workshop Time: 14:00-17:20, Saturday, 24 October
Venue: Conference 10, 3F

Workshop Chairs
Gong-Ru Lin, National Taiwan University, China
Boon S Ooi, King Abdullah University of Science and Technology (KAUST), Saudi Arabia
Nan Chi, Fudan University, China

Description:
Following the commercial deployment of 5G at the end of 2019, research efforts on 6G are now expended in different countries and organizations. 6G networks are supposed to provide better performances than 5G and satisfy emerging services for Industry 4.0, personalized health, virtual presence, and other challenging applications. Accordingly, it would be necessary to explore different frequency sources to solve the problem of the scarce spectrum, such as wireless optical communication (WOC). WOC, exploiting the spectrum from terahertz to ultraviolet, employs unlicensed bands and high-transmission rates. Correspondingly, it is a promising candidate for short/medium range high-speed wireless communication. Several key research challenges have emerged within the WOC domain, including high data rates, physical layer security, resource allocation, machine-to-machine, underwater links, system network topologies, front-end design and novel photonic material. The proposed special issue will provide an opportunity for a thorough assessment of the current state of WOC across numerous applications, helping to develop the state-of-the-art.

Speakers:
President: Prof. Nan Chi

14:00-14:20 Prof. Zabih Ghassemlooy, Dept. EE of Northumbria University, UK
Topic: Laser Diode based FSO/OWC

14:20-14:40 Prof. Bin Liu, Nanjing University, China

14:40-15:00 Prof. Chi-Wai Chow, Dept. Photonics of National Chiao-Tung University, China
Topic: WDM LD VLC/OWC

15:00-15:20 Prof. Chao Zhao, CAS (China) & RWTH Aachen/Forschungszentrum (Germany)
Topic: High-speed visible optoelectronics on unconventional substrate

15:20-15:40 Dr. Rami Elafandy, Yale, USA
Topic: high-speed visible VCSEL

15:40-16:00: Coffee Break

16:00-16:20 Dr. Jorge Holguin Lerma, Yale USA
Topic: high-speed DFB laser for VLC

16:20-16:40 Prof. Chao-Hsin Wu, Grad. Photonics of National Taiwan University, China
Topic: ULED for OWC data transmission

16:40-17:00 Dr. Xiaobin Sun, Fraunhofer, Scotland
Topic: Deployment of water-air optical communication systems

17:00-17:20 Prof. Hsin-Mu Tsai, Dept. Computer Sci. of National Taiwan University, China
Topic: LED Vehicular Networking VLC
Workshop 8: Data Center Optic Interconnection

Workshop Time: 14:00–18:10, Saturday, 24 October
Venue: Conference 11, 3F

Organizer
Chao Lu, The Hong Kong Polytechnic University, China

Co-organizers
ZhaoHui Li, Sun Yat-sen University, China
Deming Liu, Huazhong University of Science and Technology, China
Bingli Guo, Beijing University of Posts and Telecommunications, China

Description: The projected increase in capacity, processing power and bandwidth density in data center environments must be addressed by the migration of high-density optical interconnect into the datacom and computing communication scenario. This workshop will therefore consider the optical technologies required to support the migration of short and long reach optical interconnect technology deployed in telecom system into datacom/computercom systems and the resulting architectural advancements that can be opened up in data center environments. In more detail, this workshop covers the following topics: requirements and challenge for T bit/s optical interconnect and its technology option, AI enabled FEC and equalization approach, application requirements and interconnect architectures at from system level.

Speakers:
14:00-14:30 Chongjin Xie, Alibaba Group
Topic: Tb optical interconnect technologies

14:30-15:00 Wen Zhou, Fudan University
Topic: 1Tb/s four-lane O-band IM/DD system for data center interconnection

15:00-15:30 Fan Li, Sun Yat-sen University
Topic: Beyond 100 Gbit/s Inter-Data Center Interconnect (Inter-DCI) with Direct Detection

15:30-15:40 Coffee break

15:40-16:10 Xiaogeng Xu, Hisilicon OE
Topic: The challenge of short reach optical transmission

16:10-16:40 Gangxiang Shen, Soochow University
Topic: Energy-efficient virtual data center embedding

16:40-17:10 Chuanchuan Yang, Peking University
Topic: Adaptive Neural Network-based Equalizer via Online Semi-supervised Learning

17:10-17:40 Qingshua Tian, Beijing University of Post and Telecommunications
Topic: Application of Machine Learning Techniques for Error Correction Codes

17:40-18:10 Zhongwei Tan, Hong Kong Polytechnic University
Topic: Simplified Coherent Optical Communication Systems for Data Center Interconnections

Workshop 9: Wireless Optical Communication and Networking

Workshop Time: 09:00–12:00, Saturday, 24 October
Venue: Conference 11, 3F

Presider: Yejun Liu, Chongqing University of Posts and Telecommunications, China

Chairs:
Lei Guo, Chongqing University of Posts and Telecommunications, China
Tianshu Wang, Changchun University of Science and Technology, China
Li Zeng, Huawei Technology, China
Hui Yang, Beijing University of Posts and Telecommunications, China

Description:
Wireless optical communication, ranging from Fiber-Wireless (FiWi), Free Space Optics (FSO), Radio over Fiber (RoF), et al., combines the advantages of both wireless and optical domains for flexible and high-speed data transmission. In this workshop, we focus on the recent progress in wireless optical communication and networking. The advent of 5G and B5G drives the convergence of optical network and wireless network into a new chapter. The new and efficient solutions to network architecture, deployment and resource allocation are expected for the network convergence towards 5G and beyond. As enabling techniques for wireless optical communication, RoF, FSO and Radio over FSO are also attracting ever-increasing attentions. However, many challenging issues such as mobility, reliability and networking remain unsolved and are worth of more research efforts. From the workshop, we aim to introduce more innovative ideas, insightful viewpoints and research opportunities to wireless optical communication and networking.

Speakers:
09:00-09:10 Opening

09:10-09:35 Chathurika Ranaweera, Deakin University, Melbourne, Australia
Topic: Application of Machine Learning Techniques for Error Correction Codes

09:35-10:00 Jiahao Huo, University of Science & Technology Beijing, China
Topic: Experimental Demonstration of 80 Gbaud PAM4 Signal Transmission Over 500 m SSMF in an 18 GHz IM/DD system

10:00-10:20 Coffee Break

10:20-10:45 Pham Tien Dat, National Institute of Information and Communications Technology, Tokyo, Japan
Topic: RoF/RoFSO Systems for Ultra-Dense Small Cells in B5G

10:45-11:10 Yejun Liu, Chongqing University of Posts and Telecommunications, China
Topic: Cooperative Free-Space Optical Communications

11:10-11:35 Mohamed-Slim Alouini, King Abdullah University of Science and Technology (KAUST), Saudi Arabia
Topic: On the Potential of Airborne Base Stations with Laser-Powered UAVs

11:35-12:00 Muhammad Bashir Salman, King Abdullah University of Science and Technology (KAUST), Saudi Arabia
Topic: Signal Acquisition and Tracking with Photon-Counting Detector Arrays in Free-Space Optical Communications
**Workshop 10: Workshop on Space Division Multiplexing Communication System**

**Workshop Time:** 8:30-17:10, Saturday, 24 October  
**Venue:** Conference 08, 3F  
**Organizer**  
Zhaozhi Li, Sun-Yat Sen University, China  

**Co-organizers**  
Xiaoming Yuan, Shenzhen University, China  
Siyuan Yu, Sun-Yat Sen University, China  
Guifang Li, University of Central Florida, USA  

**Description:** The capacity of existing standard single-mode fiber is approaching its fundamental limit, due to the fiber nonlinearity, fiber fuse and bandwidth limitation of available optical amplifiers. As a promising solution to enlarge the transmission capacity of optical communication, space division multiplexing (SDM) has attracted much attention in the last decade. In order to move SDM forward to the practical applications, there are still many issues should be considered. The following topics will be covered in this forum:

- Design methods of SDM fibers and SDM fiber-based transmission.  
- Advanced SDM optical amplifiers: recent progresses and the potential future impact.  
- SDM peripheral devices, such as mode converters, mode (de)multiplexers, mode filters, mode switch and so on.  
- Novel modes (OAM/CVB) supporting fiber-based transmission.  
- High-dimensional quantum communication: recent progresses and challenges.  

**Speakers:**  

**Section I: Space division multiplexing devices**  

**Presider:** Jiajing Tu, Jinan University  

09:00-09:20 Kunimasa Saitoh, Hokkaido University, Japan  
Topic: Reduction of Group Delay Spread in Coupled Multicore Fibers  

09:20-09:40 Kin Seng Chiang, City University of Hong Kong, China  
Topic: Polymer optical waveguide platform for the development of mode-controlling devices  

09:40-10:00 Jiajing Tu, Jinan University, China  
Topic: Dense space division multiplexing fiber design for orbital angular momentum modes transmission  

10:00-10:20 Jiangbing Du, Shanghai Jiao Tong University, China  
Topic: Improved MDM fiber link by inverse design  

10:20-10:40 Coffee Break  

10:40-11:00 Ting Lei, Shenzhen University, China  
Topic: Liquid crystal photonics enabled mode division multiplexing optical communication towards datacenter applications  

11:00-11:20 Yujie Chen, Sun Yat-sen University, China  
Topic: Integrated mode sorters for optical vortex communications  

11:20-11:40 Ke Xu, Harbin Institute of Technology, Shenzhen, China  
Topic: Photonic integrated components and circuits for on-chip mode division multiplexing  

11:40-12:10 Panel Discussion  

**Section II: Space division multiplexing system**  

**Presider:** Jianping Li, Guangdong University of Technology  

14:00-14:20 Yunfeng Huang, University of Science and Technology of China, China  
Topic: Distribution of high-dimensional orbital angular momentum entanglement over a 1 km few-mode fiber  

14:20-14:40 Jian Wang, Huazhong University of Science and Technology, China  
Topic: MIMO-Less Space-Division Multiplexing Fiber-Optic Communications using Diverse Spatial Modes  

14:40-15:00, Jie Liu, Sun Yat-sen University, China  
Topic: Study on mode division multiplexed optical fibre communications using orbital angular momentum modes  

15:00-15:20 Jianping Li, Guangdong University of Technology, China  
Topic: Vector-mode-multiplexing based transmission over few-mode fiber  

15:20-15:40 Coffee Break  

15:40-16:00 Davide Bacco, Technical University of Denmark, Denmark  
Topic: Multidimensional fibre based quantum communication  

16:00-16:20 Andrew Forbes, University of the Witwatersrand, South Africa  
Topic: Classical and quantum communication with structured light  

16:20-16:40 Yongmin Jung, University of Southampton, UK  
Topic: Optical amplifier and component technologies for successful SDM transmission  

16:40-17:00 Takayuki Mizuno, NTT Network Innovation Laboratories, Japan  
Topic: Recent progress in SDM transmission  

17:00-17:30 Panel Discussion  

**Workshop 11: Short-reach applications: Current status, Trend and Demand**

**Workshop Time:** 08:30-12:00, Saturday, 24 October  
**Venue:** Conference 15, 3F  
**Organizer**  
Fan Zhang, Peking University, China  

**Co-organizers**  
William Shieh, University of Melbourne, Australia  
Jiajia Chen, Chalmers University of Technology, Sweden  

**Description:** The rapid development of data centre interconnection and 5G applications drives short-reach optical transmission technology to high-speed and high capacity. This workshop will cover the most important technologies and the current status of short-reach applications, and also try to discuss the future trend in this field. The topics will cover advanced fibres for short distance communication, Short-reach applications in 5G X-haul, coherent VS. direct detection in data centre interconnect, advanced detection schemes such as Kramers-Kronig, self-homodyne, and carrier
assisted differential detection, machine-learning VS digital signal processing, advanced techniques for free-space optical communication, ultra-high baud rate operation, optical comb, and optical single-side band signalling.

Presider: Fan Zhang, Peking University, China

Speakers:
8:30-8.45 Xiang Liu, Futurewei Technologies, USA
Topic: Short-reach applications in 5G X-haul
8:45-9:00 Xiang Zhou, Google, USA
Topic: Coherent communication for data centre
9:00-9:15 Ming-jun Li, Corning, USA
Topic: Advanced fibers for short distance communication
9:15-9:30 Di Che, Bell Labs, USA
Topic: ultra-high baud rate transmission: approaching to data rate limit for short reach
9:30-9:45 Hoon Kim, KAIST, South Korea
Topic: Optical single side-band generation for short-reach applications
9:45-10:00 Yuki Yoshida, National Institute of information and communication technology, Japan
Topic: advanced FSO receiver for optical wireless communication
10:15-10:30 Tao Gui, Huawei, China
Topic: Self-Homodyne Coherent Detection for Short Reach
10:30-10:45 Lilin Yi, Shanghai Jiao Tong University, China
Topic: Machine Learning Vs DSP for short reach and access networks
10:45-11:00 Chester Shu, Chinese University of Hong Kong, China
Topic: Learning rate decay based LMS equalization for Kramers-Kronig detection system
11:00-11:15 Bill Corcoran, Monash University, Australia
Topic: Optical Micro-combs for Ultra-Dense Data Transmission in Installed Fibre Links
11:15-11:30 Chuan Bowen Sun, The University of Melbourne, Australia
Topic: Carrier-assisted differential detection for short-reach communications
11:30-12:00 Panel discussion

Workshop 12: Photonics Research Workshop: Next-generation silicon photonics
Workshop Time: 9:00-17:45, Saturday, 24 October
Venue: Conference 06, 2F

Organizers
Daoxin Dai, Zhejiang University, China
Po Dong, II-VI Incorporated, USA
Yikai Su, Shanghai Jiao Tong University, China
Dries Van Thourhout, Ghent University, Belgium

Description: Silicon photonics has been developing very well in the past decades. Various passive and active silicon photonic devices have been demonstrated successfully with excellent performances. Large-scale silicon photonic integrated circuits have also been realized with high density. It is expecting to explore more and more applications for silicon photonics. This workshop is to discuss the progresses and the challenges of silicon photonics. More importantly, we will discuss more on the prospective of next-generation silicon photonics, including new structures, new materials, new wavelength-bands, new applications, new fabrication technologies, etc.

Speakers:
Presider: Daoxin Dai and Po Dong
9:00-9:05 Opening
Lan Yang, Washington University, St. Louis, USA
Kelly Cohen, OSA, USA
9:05-9:30 Argisti Melikyan, Nokia Bell Labs, USA
Topic: Reinventing Coherent Optical Front-End with Silicon Photonics
9:30-9:55 Zhiping Zhou, Peking University, China
Topic: Recent Development on Silicon Photonics: A Perspective
9:55-10:20 Liu Liu, Zhejiang University, China
Topic: Heterogenous Integration Technology and Devices for Next Generation Silicon Photonics
10:20-10:35 Coffee break
10:35-11:00 Jian Wang, Huazhong University of Science and Technology, China
Topic: Multi-Dimensional Multiplexing and Processing Using Silicon Photonics
11:00-11:25 Di Liang, Hewlett Packard Labs, USA
Topic: Optical Communication and Computing Enabled by a Fully-Integrated Heterogenous Silicon Photonic Platform
11:25-11:50 Shinji Matsuo, NTT Device Technology Laboratories, Japan
Topic: Heterogeneous Integration of Membrane III-V Devices on Si Photonics Platform
11:50-14:00 Lunch break
Presider: Yikai Su and Dries Vanthourhout
14:00-14:25 Hon-Ki Tsang, The Chinese University of Hong Kong, China
Topic: Progress on 2D Materials for Integrated Optical Detectors and Modulators
14:25-14:50 Linjie Zhou, Shanghai Jiao Tong University, China
Topic: Optical Delay Line and Its Application in Microwave Phased Array
14:50-15:15 Joyce Poon, Max Planck Institute of Microstructure Physics, Germany
Topic: Integrated Photonics on Silicon for the Visible Spectrum
15:15-15:30 Coffee break
15:30-15:55 Robert Halir, University of Malaga, Spain
Topic: Building High Performance Devices with Silicon Metamaterials
15:55-16:20 Huiyun Liu, University College London, UK
Topic: III-V Quantum-Dot Lasers: The Key Technology for Silicon-Based Laser for Silicon Photonics
16:20-16:45 Lin Yang, Institute of Semiconductor, CAS, China
Topic: From Multimode Optical Switches to Multimode Systems-on-Chip
Industry Forums

Forum 1: High-speed Broadband Optical Fiber Communication System and the Key Technology Trend

Time: 13:30–18:20, Saturday, 24 October
Venue: Conference 07, 2F
Organizer: YOFC

Chairs:
Liangming (Ansion) Xiong, State Key Laboratory of Optical Fiber and Cable Manufacture Technology, YOFC, China
Junjie Li, China Telecom Research Institute, Beijing, China

Description: As the Cloud and 5G era comes, bigger and bigger data must be transported, more and more important it is for high-speed optical communication. This FORUM will give an overview of high-speed broadband optical communication technology and system, involving advanced optical fiber and nonlinearity mitigation, the latest broadband amplification, ultra-long haul and ultra-high capacity WDM systems, hybrid cross-connect network beyond 100G, and the SDM technology. A Panel Discussion will follow the invited talks and focus on the topic of Tb/s Ultra-long Haul Optical Transport Technology and Application. The experts from university, institute or academy, supplier and telecom operators will give their professional perspective on the high-speed broadband optical fiber communication.

For each invited talk, the time is 25 min including 5 min for Q&A.

Forum Program
13:30-13:40 Welcome Address by the ACP/IPOC 2020 Organizer: Dr. Jie Luo (State Key Laboratory of Optical Fiber and Cable Manufacture Technology, YOFC, China)
13:40-14:05 (Invited) Toward 100Tb/s per Fiber WDM Transmission
Junjie Li, China Telecom Research Institute, Beijing, China
14:05-14:30 (Invited) Hybrid Cross-connect Optical Communication Network beyond 100G
Dechao Zhang, China Mobile Research Institute, Beijing, China
14:30-14:55 (Invited) Recent Progress in SDM Technique to Increase Fiber Transmission Capacity
Guangquan Wang, China Unicom Research Institute, Beijing, China.
Wenyu Zhao, China Academy of Information and Communications Technology (CAICT), Beijing, China
15:20-15:30 Coffee Break
15:30-15:55 (Invited) Fiber Nonlinearity Mitigation in High-speed Optical Transmission Systems
Fan Zhang, Peking University, China.
15:55-16:20 (Invited) Ultra-long Haul and Unrepeated WDM System Design and Optimization
Yu Yu, Huawei Technologies Co., Ltd., China.
16:20-16:45 (Invited) Advanced Optical Fibers for 3U Transmission Networks
Lei Zhang, State Key Laboratory of Optical Fiber and Cable Manufacture Technology, YOFC, China.
16:45-17:10 (Invited) Latest Approach of Broadband Amplification and Its Impacts on Transmission
Qinian Bu, Accelink Technologies Co., Ltd., Wuhan, China.
17:10-17:40 Panel Discussion: Tb/s Ultra-long Haul Optical Transport Technology and Application
17:40-18:20 Closing Speech

Forum 2: F5G: Trends in Optical Switching Devices and Networks

Time: 13:30–17:45, Saturday, 24 October
Venue: Conference 05, 2F
Organizer: LUSTER

Chairman: Chengliang Zhang, China Telecom
Co-Chairman: Vincent Wang, LUSTER LightTech Co., LTD.

Description: The industry forum of ACP is an excellent place where the academics can learn the state of the art of the optical communications industry in terms of product, technology and market, and exchange ideas with experts from the industry. This is the sixth time for Luster LightTech Corp to organize the ACP Industry forum. This year’s industry forum will focus on ROADM and OXC Technologies. Distinguished speakers from the industry will discuss the latest advances and trends of the ROADM and OXC Technologies.
Speakers:

09:00-09:10 Chairman Speech
Chengliang Zhang, China Telecom
Vincent Wang, LUSTER LightTech

09:10-09:30 Rui Tang, CAICT
Topic: Development and Application Trend of ROADM Technologies

09:30-09:50 Dong Wang, China Mobile
Topic: Considerations on High-efficiency Hybrid OTN/OXC Network

09:50-10:10 Jianjun Tang, China Telecom
Topic: Problems and Challenges in ROADM Application

10:10-10:30 Liang Dou, Alibaba
Topic: Migration from FOADM to ROADM in Data Centers Interconnect Networks

10:30-10:40 Coffee Break

10:40-11:00 Zhiyong Feng, Huawei
Topic: Building a Petabit Optical Transmission Network

11:00-11:20 Zhenhua Feng, FiberHome
Topic: OXC Technology Evolution for all Optical Network in the Cloud Era

11:20-11:40 Yiran Ma, II-VI(Finisar)
Topic: Advanced WSS Technologies

11:40-12:00 Jet Zhang, LUSTER
Topic: Application Opportunities of Optical Matrix Switch in all Optical Network

12:00-12:30 Panel Discussion

Explanation of Session Codes

The first letter of the code designates the day of the week (S=Sunday, M=Monday, T=Tuesday). The second element indicates the session series in that day (for instance, 1 would denote the first parallel sessions in that day). The third element 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 M3C.4 indicates that this paper is being presented on Monday (M) 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
Conference & Exhibition Map

**2F**

**Exhibition**

2. Gallium Family Technology
3. YOFC
4. Amonics Limited
5. NANTJING TO-SUN TECHNOLOGY CO., LTD
6. Daheng New Epoch Technology, Inc.
7. Plugtech Precision Systems Limited
8. Beijing Keyang Photonics Technology Co., Ltd
9. LUSTER
10. Miracle Photonics Technology Co.
11. LBTEK
12. SHENZHEN HAOCHEN ELECTRONIC TECHNOLOGY CO., LTD.
13. Santec (Shanghai) Co., Ltd
14. Conquer Photonics
15. Newport/MKS Instruments
16. Beijing University of Posts and Telecommunications

**Track**

- Conference 05: Track 4  BALLROOM C: Track 1
- Conference 06: Track 3  BALLROOM A: Track 2
- Conference 07: Track 5
- Conference 03: IEEE Student Events (Oct. 24) / Track 2 (Oct. 25) / Postdeadline Session (Oct. 26)
- VIP 01: Track 6
- VIP 02: Track 1 (Oct. 25-26) / Track 4 (Oct. 27)
- Business Center: Best Student Session
Conference Map

3F

Workshop & Industry Forum Room

3F (Oct.24)
Conference 08  Workshop10
Conference 09  Workshop6
Conference 10  Workshop3 & Workshop7
Conference 11  Workshop8 & Workshop9
Conference 12  Workshop1 & Workshop2
Conference 15  Workshop11
Conference 16  Workshop4

2F (Oct.24)
Conference 05  Workshop5 & Industry Forum2
Conference 06  Workshop12
Conference 07  Industry Forum1 & Industry Forum3

3F (Oct.25)
Conference 12  OSA Student Events
## ACP/IPOC 2020 — Agenda of Sessions

### Saturday, 24 October

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<td>09:00–12:00</td>
<td>Workshop: Photonics for 6G: How and When? (ends 11:50)</td>
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<td>Workshop: Security Solutions enabled by Physics in Fiber (begins at 08:30)</td>
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<td>Workshop: Marriage Between Artificial Intelligence and Micro-/Nano-photonic: Happy or Not? Part 1</td>
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<td>Workshop: Multiple Band Optical Communications and Networking</td>
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<td>Workshop: Wireless Optical Communication and Networking</td>
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<td>Workshop: Space Division Multiplexing Communication System Part I (08:30–12:10)</td>
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<td>Workshop: Photonics Research Workshop: Next-generation Silicon Photonics Part 1 (ends at 14:00)</td>
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<td>Workshop: Short-reach Applications: Current Status, Trend and Demand (begins 08:30)</td>
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<td>Workshop: Information Functional Materials and Devices (ends 11:30)</td>
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<td>Workshop: Marketing Trend of Communication Industry based on Advanced ROADM and OXC Technologies (8:30-12:30)</td>
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<tr>
<td>12:00–14:00</td>
<td>Lunch Break</td>
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<td>14:00–18:00</td>
<td>Workshop: AI-based Optics (ends 17:30)</td>
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<td>Workshop: Marriage Between Artificial Intelligence and Micro-/Nano-photonic: Happy or Not? Part 2</td>
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<td>Workshop: Data Center Optic Interconnection</td>
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<td>Workshop: Space Division Multiplexing Communication System Part 2 (14:00–17:30)</td>
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<td>Forum 2: F5G: Trends in Optical Switching Devices and Networks (13:30–17:30)</td>
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## Agenda of Sessions

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<td>08:15–08:30</td>
<td>Opening Ceremony, Ballroom (2F)</td>
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<td>08:30–09:15</td>
<td>S1A • Joint Plenary Session I - Connie J. Chang-Hasnain and Min Gu, Ballroom (2F)</td>
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<td>10:30–12:00</td>
<td>S2A • Joint Plenary Session II - Dimitra Simeonidou and Chongjin Xie, Ballroom (2F)</td>
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<td>12:00–13:30</td>
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<td>13:30–15:30</td>
<td>S3A • Optical Fibres I</td>
<td>S3B • Advanced Modulation Formats</td>
<td>S3C • Data Center Optical Interconnection System and Control</td>
<td>S3D • Photonic Devices</td>
<td>S3E • Fiber Wireless Convergence I</td>
<td>S3F • Microcavity Devices and Micro-combs</td>
<td>S3G • Optical Fibre Sensors I</td>
<td>S3H • Short-Reach Transmission</td>
<td>S3I • Best Student Papers I</td>
<td>Conference Exhibition</td>
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<td>15:30–16:00</td>
<td>Coffee Break &amp; Exhibition, Corridor &amp; Public Area (2F)</td>
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<td>16:00–18:00</td>
<td>S4A • Optical Fibres II</td>
<td>S4B • Special Light Transmission (ends at 18:15)</td>
<td>S4C • Machine Learning and Its Applications</td>
<td>S4D • Lithium Niobate Integrated Photonics</td>
<td>S4E • Integrated MWP</td>
<td>S4F • Quantum and Nanoscale Devices</td>
<td>S4G • Optical Fibre Sensors II</td>
<td>S4H • Signal Processing &amp; Algorithms (ends at 18:15)</td>
<td>S4I • Best Student Papers II</td>
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<td>18:30–21:30</td>
<td>Welcome Reception, Joy Café (1F) and Executive Lounge (26F)</td>
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<td>09:00–10:30</td>
<td>M1A • Joint Plenary Session III - Ton (A.M.J.) Koonen and Han Li, Ballroom (2F)</td>
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<td>11:00–11:45</td>
<td>M2A • Joint Plenary Session IV - Bill Wang, Ballroom (2F)</td>
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<td>13:30–15:30</td>
<td>M3A • Fibre-based Devices I</td>
<td>M3B • Transmission Theory and Modeling</td>
<td>M3C • Next Generation Optical Networks</td>
<td>M3D • Classical and Quantum Communication</td>
<td>M3E • MWP Signal Processing</td>
<td>M3F • Nanoscale Light Matter Interaction</td>
<td>M3G • Optical Fibre Sensors III</td>
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<td>15:30–18:00</td>
<td>Coffee Break</td>
<td>M4A • Poster Session (1F)</td>
<td>M4D • Postdeadline Session (Conference 03)</td>
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<td>18:30–21:30</td>
<td>Banquet &amp; Awards Ceremony, Ballroom (2F)</td>
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<td>08:30–10:00</td>
<td>T1A • Optical Fibre Sensors IV</td>
<td>T1B • Machine-Learning Assisted Transmission</td>
<td>T1C • Design and Operation of Optical Networks</td>
<td>T1D • Photonic Integrated Devices</td>
<td>T1E • Waveguide Grating</td>
<td>T1F • Integrated Nanophotonic Device</td>
<td>T1G • Advanced Photonic Devices and Circuits</td>
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<td>10:30–12:00</td>
<td>T2A • Fibre-based Devices II</td>
<td>T2B • High Capacity and Long-Haul Transmission</td>
<td>T2C • Service-Oriented Optical Networks</td>
<td>T2D • Programmable Silicon Devices</td>
<td>T2E • Microcomb Applications</td>
<td>T2F • Bound State in the Continuum</td>
<td>T2G • Laser Science</td>
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<td>12:00–13:30</td>
<td>Lunch Break, Joy Café (1F) and Executive Lounge (26F)</td>
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<td>13:30–15:30</td>
<td>T3A • Optical Fibres and Devices III</td>
<td>T3B • DCI and Metro Transmission</td>
<td>T3C • Optical Network Control and Automation</td>
<td>T3D • Heterogeneous Integration I</td>
<td>T3E • Microwave Photonic Radar</td>
<td>T3F • Solid State Quantum Emitters</td>
<td>T3G • Advanced Photonic Devices</td>
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<td>16:00–18:00</td>
<td>T4A • Optical Fibre Sensors V</td>
<td>T4B • Signal Processing &amp; Performance Monitoring</td>
<td>T4C • Converged Optical and Wireless Networks</td>
<td>T4D • Nonlinear Photonics</td>
<td>T4E • Fiber Wireless Convergence II</td>
<td>T4F • Quantum Photonics</td>
<td>T4G • Heterogeneous Integration II</td>
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S1A.1 • 08:30  Plenary
**VCSELs for 3D Sensing and 5G Communications**, Connie J. Chang-Hasnain1; ‘University of California Berkeley, USA. Vertical cavity surface emitting lasers (VCSELs) have long been predicted as low-cost enabling laser sources for many applications including optical communications, sensing and imaging. Year 2017 marked the beginning of VCSEL arrays for 3D sensing in consumer electronics, with facial recognition applications for smart phones, ATM, and electronic payments. High power VCSELs also began to penetrate the LIDAR markets for automobiles, both for Advanced driver-assistance systems (ADAS) as well self-driving cars. In addition, 200Gbps VCSEL 1x4 arrays are enabling high bandwidth datacenter communications. In this talk, we will discuss some of the recent advances, applications and future prospects for VCSELs in 3D sensing, LIDAR and optical coherent tomography applications. I will also discuss future prospects for advanced applications.

S1A.2 • 09:15  Plenary
**Artificial Intelligence enabled by Nanophotonics**, Qiming Zhang and Min Gu1; ‘Univ of Shanghai Science & Technology, China. Nanophotonics, which studies optical science and technology at a nanoscale, has enabled the development of optical and photonic devices that provide a green information technology platform that has transformed massively our everyday life and global economy for a sustainable future. On the other hand, artificial intelligence based on ever-increasing computing power including neuromorphic computing has heralded a disruptive horizon in many ways of our life. In this talk, I will show the integration of artificial intelligence with nanophotonics enabling inverse design, on-chip optical angular momentum multiplexing and vectorial holography.

10:00–10:30  Coffee Break & Exhibition

S2A.2 • 10:30  Plenary
**5G and Beyond: Enabling the Future Networked Society**, Dimitra E. Simeonidou1; ‘University of Bristol, United Kingdom. This plenary will reflect on recent activities in developing and operating 5G testbeds for open experimentation in a number of urban environments and settings in the UK. I will present examples on how to drive 5G innovation through multi-sector co-creation. Specific examples will range from music to quantum where audiences and citizens experiences have been key for driving technology research. I will discuss the need to rethink the Future Networks innovation process, through new methodologies based on interdisciplinary co-creation and user participation through the full innovation cycle. Such transformation in our Research and Innovation culture will be necessary for transitioning from the 5G-era to a Post-G future.

S2A.3 • 11:15  Plenary
**Optical Technologies for Hyperscale Cloud Computing**, Chongjin Xie1; ‘Alibaba Group, USA. Hyperscale cloud infrastructure has brought significant changes to the field of optical communications, from short reach interconnects to submarine systems, and including ways to build and manage optical networks. Cloud computing has become one of the main drivers for optical communication technologies and will continue to shape our industry. In this talk, we will describe the development of optical communication technologies for hyperscale cloud infrastructure and discuss future challenges and opportunities.
**Sunday, 25 October**

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| 13:30–15:30| Ballroom C,   | Track 1   | S3A • Optical Fibres I  
Presider: Xinzhu Sang; Beijing Univ. of Posts and Telecomm, China    |
|            | ACP/2020      |           |                                                                          |
|            |               |           | S3B • Advanced Modulation Formats  
Presider: Songnian Fu; Guangdong University of Technology, China     |

**13:30–15:30**

**S3B.1 • 13:30**
Invited
Advanced Functional Semiconductor Fibers, Lei Wei; Nanyang Technological Univ., Singapore.
We present the recent progress on the precise control on crystal structures and device density of in-fiber semiconductor devices. These fibers are particularly suitable for wearable electronics for full-body sensing.

**S3B.2 • 13:45**
Threshold-Assisted Soft-Output Direct Detection FTN Algorithm for Bandwidth-Limited Systems, Shuangyue Liu; Zhou Ji; Mengqi Guo; Xiqi Tang; Zhangliang Sun; Han Gu; Yueming Lu; Yaqjin Qiao; School of Information and Communication Engineering, Beijing Univ. of Posts and Telecommunications, China; Department of Electronic Engineering, Jinan Univ., China; School of Cyberspace Security, Beijing Univ. of Posts and Telecommunications, China.
A threshold-assisted soft-output direct detection fast than Nyquist (SO-DD-FTN) is proposed to compensate bandwidth-limitation impairments in 56-Gb/s PAM-4 systems using 10G-class optics. Experimental results show the computational complexity reduces by 57% without performance degradation.

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<th>Time</th>
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| 13:30–15:30| Ballroom A,   | Track 2   | S3B • Advanced Modulation Formats  
Presider: Songnian Fu; Guangdong University of Technology, China     |

**13:30–15:30**

**S3A.1 • 13:30**
Invited
Large-scale High-density Optical Interconnects, Zhiyuan Chen; Chuanchuan Yang; Nan Hua; Bingli Guo; Junhao Lu; Junbin Huang; Xueping Zheng; Shanguo Huang; Peking Univ., China.
We report high-performance magneto-optical isolators and circulators on silicon nitride platforms for TM (TE) polarizations showing 32 dB(30 dB) isolation ratio, 2.3 dB(3 dB) insertion loss and -32 dB(-30 dB) minimum crosstalk.

**S3E.1 • 13:30**
Tutorial
Ultra-high capacity indoor wireless communication enabled by photonic technologies, Ton Koonen; Eindhoven Univ. of Technology, Netherlands.
Energy-efficient wireless communication at high speed and high user density is greatly supported by 2D steered beams, i.e., mm-wave radio beams and ultimately narrow IR optical beams. Optical techniques can simplify accurate 2D beam steering, in conjunction with user localization and wide FoV broadband receivers.

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| 13:30–15:30| Conference 06,| Track 3   | S3C • Data Center Optical Interconnection System and Control  
Presider: Nan Hua; Tsinghua Univ., China                               |

**13:30–15:30**

**S3C.1 • 13:30**
Invited
Waveguide Integrated Magneto-Optical Isolators on Silicon Nitride Platforms, Wei Yan; Yucong Yang; Jun Qin; Longjiang Deng; Lei Bi; Univ. of Electronic Sci & Tech of China, China.
We present the recent progress on the precise control on crystal structures and device density of in-fiber semiconductor devices. These fibers are particularly suitable for wearable electronics for full-body sensing.

**S3D.1 • 13:30**
Invited
Carrier-Suppressed Modified Duobinary PAM-4 Signal for Short Reach Transmission, Xi Chen; Longsheng Li; Weisheng Hu; Key Laboratory of Hunan Province for New Retail Virtual Reality Technology, Hunan Univ. of Technology and Business, China; State Key Laboratory of Advanced Optical Communication Systems and Networks, Shanghai Jiao Tong Univ., China.
We propose and experimentally demonstrate a carrier suppressed MDB PAM-4 signal for short-reach IM/DD system without dispersion compensation. The BER result of Volterra-DFE is better than FFE and both can reach the SD-FEC threshold.

**S3E.2 • 13:45**
Threshold-Assisted Soft-Output Direct Detection FTN Algorithm for Bandwidth-Limited Systems, Shuangyue Liu; Zhou Ji; Mengqi Guo; Xiqi Tang; Zhangliang Sun; Han Gu; Yueming Lu; Yaqjin Qiao; School of Information and Communication Engineering, Beijing Univ. of Posts and Telecommunications, China; Department of Electronic Engineering, Jinan Univ., China; School of Cyberspace Security, Beijing Univ. of Posts and Telecommunications, China.
A threshold-assisted soft-output direct detection faster than Nyquist (SO-DD-FTN) is proposed to compensate bandwidth-limitation impairments in 56-Gb/s PAM-4 systems using 10G-class optics. Experimental results show the computational complexity reduces by 57% without performance degradation.

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| 13:30–15:30| Conference 05,| Track 4   | S3D • Photonic Devices  
Presider: Daoxin Dai; Zhejiang Univ., China                             |

**13:30–15:30**

**S3D.1 • 13:30**
Invited
Large-scale High-density Optical Interconnects, Zhiyuan Chen; Chuanchuan Yang; Nan Hua; Bingli Guo; Junhao Lu; Junbin Huang; Xueping Zheng; Shanguo Huang; Peking Univ., China.
We report high-performance magneto-optical isolators and circulators on silicon nitride platforms for TM (TE) polarizations showing 32 dB(30 dB) isolation ratio, 2.3 dB(3 dB) insertion loss and -32 dB(-30 dB) minimum crosstalk.

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| 13:30–15:30| Conference 07,| Track 5   | S3E • Fiber Wireless Convergence I  
Presider: Yitang Dai; Beijing Univ of Posts & Telecom, China            |

**13:30–15:30**

**S3E.1 • 13:30**
Tutorial
Ultra-high capacity indoor wireless communication enabled by photonic technologies, Ton Koonen; Eindhoven Univ. of Technology, Netherlands.
Energy-efficient wireless communication at high speed and high user density is greatly supported by 2D steered beams, i.e., mm-wave radio beams and ultimately narrow IR optical beams. Optical techniques can simplify accurate 2D beam steering, in conjunction with user localization and wide FoV broadband receivers.
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<tr>
<td>S3F.1</td>
<td>13:30</td>
<td>Chip-scale Frequency Combs Based on AlN-on-Sapphire Platform</td>
<td>Invited, Changzheng Sun, Bing Xiong, Lai Wang, Zhiabiao Hao, Jian Wang, Yanjun Han, Hongtao Li, Yi Luo, Department of Electronic Engineering, Peking University, China. Aluminum nitride (AlN) epitaxially grown on sapphire is a newly-developed platform for integrated nonlinear optics. Optical frequency comb generation in both near infrared and near-visible regime in high-Q AlN microring resonators will be presented.</td>
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<tr>
<td>S3G.1</td>
<td>13:30</td>
<td>Atomic Spin Precession Detection with Fiber Optic Sagnac Interferometer</td>
<td>Invited, Yuanhong Yang, Beihang University, China. The detection of atomic spin precession was introduced and a novel scheme with reflective fiber-optic Sagnac interferometer was proposed and experimentally demonstrated. The proposed technique shows great potential in SERF atomic magnetometer and spin gyroscope.</td>
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<tr>
<td>S3H.1</td>
<td>13:30</td>
<td>Stokes vector direct detection using a spin-dependent grating</td>
<td>Youpeng Xie, Ting Lei, Huangbin Fei, Yanjun Chen, Dawei Wang, Yanmeng Dai, Luping Du, Zhaohui Li, Xiaocong Yuan, Shenzhen University, China; Sun Yat-sen University, China. We demonstrate a spin-dependent liquid crystal grating to detect the polarization states of light. We achieved Stokes vector direct detection of QPSK, 8PSK and 16QAM signals with 16G, 8G and 4G baud data rates.</td>
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<tr>
<td>S3H.2</td>
<td>13:45</td>
<td>Single-lane 200-Gbps PAM-4 transmission for Datacenter Intra-Connections employing 850-nm VCSEL</td>
<td>Tianjian Zuo, Tingting Zhang, Sen Zhang, Lei Liu, Huawei Technologies Co Ltd, China. We experimentally demonstrated an 850nm VCSEL based 200G 4-PAM transmission over 100m MMF. The DSP with ISI and non-linearity tolerances for next generation lane-rate is presented.</td>
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<td>S3I.1</td>
<td>13:30</td>
<td>Fiber-tip polymer microcantilever for hydrogen sensing</td>
<td>Xi Yang, Zewen Han, Yuan Gong, Gang-Ding Peng, Yun-Jiang Rao, University of Electronic Science and Technology of China, China; School of Electrical Engineering and Telecommunications, University of New South Wales, Australia. We propose a sequentially bio-conjugated fiber optofluidic laser to solve the washing problem in the heterogeneous assay in the microstructures. Its laser emission can be tuned through the control of biomolecule concentration in a sequential manner.</td>
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<td><strong>S3D.2 • 14:00</strong></td>
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<td>On-Chip Polarimeter for Stokes Parameters Detection, Ting Lei, Changyu Zhou, Xiaocong Yuan; &quot;Shenzhen Univ., China. We design an on-chip polarimeter using the silicon nanodisk based elements enabled by spin-orbit interactions. We also demonstrate the polarimetry for Stokes parameters detection by separating and measuring the polarization components of the incident light.</td>
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<td><strong>S3E.2 • 14:15</strong></td>
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<tr>
<td>Photonic in 5G and beyond, Tetsuya Kawanishi; &quot;Waseda Univ., Japan. This presentation focuses on broadband waveform transfer over fiber which offers future mobile forefront links connecting many base stations and antenna. Radio-over-fiber based millimeter-wave radars are also described as examples of high-performance waveform transfer over fiber.</td>
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<td><strong>S3C.2 • 14:00</strong></td>
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<td>Neural Network-assisted Routing Strategy Selection for Optical Datacenter Networks, Yuanjuan Hong, Xuezhong Hong, Jiajia Chen; &quot;Chalmers Univ. of Technology, Sweden; &quot;Taizhou Univ., China; &quot;South China Normal Univ., China. This paper proposes the neural network-assisted routing strategy selection for the optical datacenter networks. Results reveal the high accuracy of strategy selection within the range of interesting traffic load, validating feasibility of the proposed scheme.</td>
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<td><strong>S3D.3 • 14:15</strong></td>
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<td>100 Gb/s PSM-4 Silicon Photonics Transceiver for Intra-Datacenter on a 200-mm Wafer, Zhipeng Hu, Zhiqian Xian, Xinggui Zhu, Yue Wu, Junbo Feng, Jin Guo; &quot;CUMEC, China. We report integrated four-channel 100 Gbps silicon photonics transceiver chip based on CUMECC 200-mm monolithic CSP180Al technology platform, which can be utilized in intra-datacenter applications.</td>
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<td>Passive Optical Networks for 5G Transformation, Jun Shan Weiy; &quot;ZTE TX, Inc., USA. Passive optical network (PON) is a cost-effective solution for residential and business access services, and a strong candidate for 5G transport network. This presentation discusses recent technological developments in PON standardization supporting the 5G transformation.</td>
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<td><strong>S3A.2 • 14:00</strong></td>
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<td>Specialty Optical Fibre for Radiation Sensing, Harul A. Abdul-Rashid; &quot;Multimedia Univ., Malaysia. Specialty Optical Fibre is tailored specifically for purposes of radiation sensing, measurement and dosimetry. We report some results using Germanium, Phosphorus and Cerium doped fibers for the purpose of radiation sensing. The approach for such measurement is based on Radioluminescence, allowing a real-time, remote dosimetry system to be realized. We report the use of such systems for dosimetry in radiotherapy, diagnostic imaging, NORM/ TENDORM measurement and time-resolved dosimetry.</td>
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<td><strong>S3B.3 • 14:00</strong></td>
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<td>Multi-dimensional modulation formats and space-division multiplexed transmission, Rene-Jean Essiambre; &quot;Nokia Corporation, USA. Abstract not available.</td>
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<td>Disaggregated Optical Network for Datacenter Interconnection: Current Practice and Future Outlook, Wei Wang; &quot;Alibaba Group, China. We present our practice and view on open and disaggregated optical transport networks, with an focus on metro data center interconnection.</td>
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<td>Discrete-Circulant-Transform Spread OFDM Based on the Sparse ZC Sequence for Short-Reach IM/DD System, Zhaocuan Fan, Jian Zhao; &quot;South China Univ. of Technology, China. We demonstrate DCT-S-OFDM based on the sparse Zadoff-Chu sequence in a 68.8-Gbit/s bandwidth-limited IMDD system over 10-km SMF. Results show that this scheme outperforms conventional OFDM, DFT-S-OFDM and OCT precoded OFDM by optimizing the sparsity.</td>
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<td>Multielements Doped Silica Glass Based Specialty Optical Fibers for High Power Optical Amplifiers, Mukul C. Paul, Shyamal Das, Anirban Dhar, Minmyan Pall, Shyamal Bhadra, Ramadas Pillai; &quot;Puxiu Varughese; &quot;Alexander Kiri; &quot;Narayani; &quot;Central Glass &amp; Ceramics Research Inst, India; &quot;Raman Center for Atomic, Molecular and Optical Sciences, IACS, India; &quot;Vinish Technologies Pvt. Ltd., Technopark, Trivandrum, Kerala, India; &quot;National Univ. of Science and Technology (NUST) ‘MISIS’, Russian Federation. We have developed multielements (Al, Ge, P, Ce, B, F) doped silica glass based Er/Yb specialty optical fibers for high power optical amplifiers showing efficiency above 41.0% with stable output power and radiation hardness behavior.</td>
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<td>A Frequency-Modulated Ladar System Based on an Optical Frequency Shifting Loop, Lu Li, Ce Lu, Yamei Zhang, Shilong Pan; &quot;Nanjing Univ Aeronautics &amp; Astronautics, China. A frequency-modulated ladar is demonstrated based on an optical frequency shifting loop (OFSL), and a multi-chirped optical LFM signal is generated with the OFSL which is employed for simultaneous distance and velocimetry measurement.</td>
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Chao-assisted two-octave-spanning microcombs, Hao-Jing Chen1, Xun Yi1, Yun-Feng Xiao1; 1Peking Univ., China; 2Univ. of Virginia, USA. We demonstrate on-record spectral span microcombs (450-2000 nm) in an asymmetric optical microcavity. The two-octave-span intracavity emission is harnessed to a nanowaveguide through the chaos-assisted broadband coupling.

Ultra-Compact Silicon Multimode Waveguide Bends with Shallow-Etched Grooves, Sai Gao1, Hongwei Wang1, Xin Peng1, 2Naval Medical Center of the PLA, China; 3College of Advanced Interdisciplinary Studies, National Univ. of Defense Technology, China; 4Engineering, Zhejiang Univ., China; 5Wuhan National Laboratory for Optoelectronics and School of Optical and Electronic Engineering, Huazhong Univ. of Science and Technology, China. Accessing thermally stable solitons in microresonators generally requires complex laser tuning with a carefully selected speed. Here, we demonstrate a simplified method by manual microheater tuning with the aid of an auxiliary laser.

 comptechnique generated by microstructure optical fiber, due to its special internal structure. In the presentation, we demonstrate several kinds of the microstructure optical fiber sensor for Multi-parameter measurement.

Multi-mode toolbox, Nicolas K. Fontaine1; 1Nokia Bell Labs, USA. Abstract not available.

S3H.4 • 14:30 Multimode Toolbox, Nicolas K. Fontaine1; 1Nokia Bell Labs, USA. Abstract not available.
S3A.4 • 15:00 Invited All-solid Fluorotellurite Fibers and Their Applications, Guanshi Qin; Jilin Univ., China. We demonstrated 20-W-level mid-infrared supercontinuum laser source, ultrabroadband supercontinuum generation from 600 to 5400 nm, and tunable Raman soliton generation from 2 to 4 μm in newly-developed all-solid fluorotellurite fibers.

S3B.6 • 15:00 Invited Phase Recovery in Probabilistically-Shaped Optical Communication Systems, Jian Zhao; South China Univ. of Technology, China. We propose a novel phase recovery method based on Kullback-Leibler divergence. Simulations and experiments show that it exhibits better performance than Kalman filtering, PCA and PCA+BPS, and lower complexity than 2-stage BPS for PS formats.

S3C.4 • 15:00 Invited Mininet-Optical: an SDN optical network emulator for disaggregated optical systems, Marco Ruffini; Univ. of Dublin Trinity College, Ireland. Optical network disaggregation provides great benefits to vendors and presents interesting challenges to the research community. This paper introduces Mininet-Optical, a research framework supporting optical control plane development and testing on large scale emulated networks.

S3D.5 • 15:00 Invited On-chip mode division multiplexing devices for high-capacity transmission, Yikai Su; Shanghai Jiao Tong Univ., China. We review a 4-channel mode division multiplexing (MDM) device based on directional couplers and a 11-channel MDM device by employing subwavelength grating couplers. Transmission capacities of 160Gb/s and 1.23Tb/s are demonstrated, respectively.

S3E.4 • 15:15 Invited SNR Enhanced Microwave Photonic Radar based on LFM Pulse with High Extinction Ratio, Sijie Liu, Jiangtao Zhang, Dan Zhu, Xiangchuan Wang, Shilong Pan; Nanjing Univ Aeronautics & Astronautics, China. A signal to noise ratio (SNR) enhanced radar based on linear frequency modulation pulse is proposed. The SNR of de-chirped signal is increased by 5 dB when the extinction ratio is improved by 20 dB.

15:30–16:00 Coffee Break & Exhibition
Microresonator-based Frequency Combs and Applications, Pascal Del’Haye\textsuperscript{1,2}; \textsuperscript{1}Max Planck Inst. for Science of Light, Germany; \textsuperscript{2}Department of Physics, Friedrich Alexander Univ., Germany. This talk will show recent progress on optical frequency combs in microresonators. I will present work on microcombs at low threshold powers, generation of stabilized THz-waves, and spectral extension of combs using an auxiliary laser.

Sensing Vector Magnetic Field by Breaking the Centrosymmetry of Fibers, Yaofei Chen\textsuperscript{1}; Jinan Univ., China. The ferrofluids-functionalized optical fiber sensors for magnetic field, evolving from a scalar to a vector sensor by breaking the centrosymmetry of fibers, will be comprehensively discussed and presented.

High-speed short reach optical communications: technological options and challenges, Xiaodan Pang\textsuperscript{1,2}, Aleksejs Udalcovs\textsuperscript{2}, Richard Schatz\textsuperscript{1}, Sergei Popov\textsuperscript{1}, Oskars Ozolins\textsuperscript{1,2}; \textsuperscript{1}Applied Physics Department, KTH Royal Inst. of Technology, Sweden; \textsuperscript{2}Networks Unit, RISE Research Inst.s of Sweden, Sweden. We review the current trend in the research and development of short reach optical communications. Typical application scenarios with corresponding technological options are discussed, and an outlook on the challenges from different aspects are presented.

Opto-plasmonic nanolaser with a record-low threshold at near-infrared, Yifei Mao\textsuperscript{1}, Renmin Ma\textsuperscript{1}; Peking Univ., China. Plasmonic nanolasers are a new class of laser devices which amplify surface plasmons instead of photons by stimulated emission. Here we demonstrate a room temperature sodium-based plasmonic nanolaser with a record low threshold of 140 kW/cm\textsuperscript{2} at near-infrared.
S4A.1 • 16:00
Hollow-core PCF for molecular optics and quantum information, Fetah Benabd1; 1GPPMM Group, XLIM Research Inst., CNRS-Univ. of Limoges, France. We review the recent development on hollow-core photonic crystal fiber and their application in molecular trapping and in the generation of photon pair and single-photon.

S4A.2 • 16:30
Materials for Advanced Fiber-based Photonic Devices and Sensors, Davide Janner1; Politecnico di Torino, Italy. The seminar will present an overview of the activities on two main research topics: specialty fiber optics and functional materials for fiber optics sensors. In the field of specialty optical fibers recent contributions about active fibers and bioresorbable optical fibers will be presented. In the field of fiber optics sensors, applications to composites and environmental sensing will be discussed.

S4B.1 • 16:00
Frequency Slicing Pre-equalization Scheme for Laser Diode based Underwater Visible Light Communication, Guoqiang Li1, Peng Zou1, Fangchen Hu1, Chaofan Wang1, Gong-Ru Lin1, Nan Chi1; Fudan Univ., China. We presented a proposed frequency slicing pre-equalization scheme for laser diode based underwater visible light communication. An AIR increment of beyond 1 Gbps was achieved when signal suffers from great attenuation at the high frequency region.

S4B.2 • 16:15
Probabilistic Shaping based Superposed Coded Modulation in Single Receiver Multiple-Input-Multiple-Output Visible Light Communication System, Peng Zou1, Guoqiang Li1, Fangchen Hu1, Nan Chi1; Fudan Univ., China. We proposed two novel probabilistic shaped superposed coded modulation schemes, which are superior to the conventional space-time-block-code. The PAM4 based scheme outperforms that of QPSK based scheme and 1.70 Gbps achievable information rate is achieved.

S4B.3 • 16:30
8.23 Gbps High-speed Near-Infrared VCSEL Based Facile Optical Wireless Communication System via QAM-OFDM, Zhaoming Shi1; Zhejiang Univ., China. In this talk, wide-scan-angle optical phased arrays includes the conversion from RF-to-optical-to-RF.

S4C.1 • 16:00
Active learning and Transfer learning for QoT estimation and failure management in optical networks, Massimo Tornatore1; 1Politecnico di Milano, Italy. Active learning and Transfer learning allow to successfully apply machine learning also in presence of limited and/or unbalanced datasets. We discuss recent results regarding their application for QoT estimation and failure management in optical networks.

S4C.2 • 16:30
Toward Deployment of ML in Optical Networks, Transfer Learning, Monitoring and Modeling, Shuangyi Yan1, Paurakh Paudyal1, Sen Shen1, Dimitra E. Simeonidou1; 1HPN group, Smart Internet Lab, Univ. of Bristol, UK. This talk reviewed challenges of ML deployments in optical networks. A transfer-learning based ML lifecycle-management framework is presented with reduced requirements of practical data over a cloud-based monitoring platform and paves the way to further deployments.

S4C.3 • 16:30
8.23 Gbps High-speed Near-Infrared VCSEL Based Facile Optical Wireless Communication System via QAM-OFDM, Zhaoming Shi1; Zhejiang Univ., China. We presented an overview of the activities on two main research topics: specialty fiber optics and functional materials for fiber optics sensors. In the field of specialty optical fibers recent contributions about active fibers and bioresorbable optical fibers will be presented. In the field of fiber optics sensors, applications to composites and environmental sensing will be discussed.

S4D.1 • 16:00
Optical Phased Array Based on Silicon Waveguides for Solid-State Optical Beam-Steering, Yaocheng Shi1; Zhejiang Univ., China. We introduced the development of an integrated microwave photonic chip platform where Si, AlN-based TriPleX and InP integrated circuits are hybridly combined. This platform enables efficient processing of high frequency broadband microwave signals and includes the conversion from RF-to-optical-to-RF.

S4D.2 • 16:30
Photonic integrated circuits with bound states in the continuum: principle and applications, Xiaikun Sun1; 1Chinese Univ. of Hong Kong, China. We demonstrated bound states in the continuum in photonic integrated circuits, with which we further realized acousto-optic modulation, frequency shifting, high-dimensional communication, and hybrid 2D-material photonics on an etchless lithium niobate integrated platform.

S4D.3 • 16:30
Automated configuration of general-purpose programmable photonic ICs: from RF equalizers to dispersion management, Daniel Perez1,2; 1Universitat Politècnica de València, Spain; 2iPronics programmable photonics S. L., Spain. Programmable integrated photonics deals with the configuration of software-defined functions employing general-purpose photonic hardware. In this paper we discuss different reconfiguration methodologies applied to optical and RF equalization, and dispersion management applications.
On-chip nanophotonic devices based on intelligent algorithm, Cuicui Lu1, Beijng Inst. of Technology, China. On-chip integrated wavelength routers, polarization routers and cascaded filter and routers are successfully designed and experimentally demonstrated based on the intelligent algorithm by combining genetic algorithm, simulated annealing algorithm, topology optimization, and finite element method.

On-the-Fly Particle Metrology in Hollow-Core Photonic Crystal Fiber, Shangran Xie1,2,5, Abhinav Sharma1,2,5, Richard Zeilner1,2,5, Philip Russell1,2,5, Max-Planck-Institut für das Licht, Germany. I will introduce a novel technique for airborne particle metrol- ogy based on hollow-core photonic crystal fiber. It offers in situ particle counting, sizing and refractive index measurement with effectively unlimited device lifetime.

Convergence of Photonics and Electronics, Physical Design for Transmission, Ke Li1,2, Shenghao Liu1,2, David J. Thomson1,2, Weiwei Zhang1,2, Fanfan Meng1,2, Xingzhao Yan1,2, Abdul Shakaar1,2, Callum Littlejohns1,2, Wei Cao, Mehdi Banakar1,2, Martin Ebert1,2, Dehn Tran1,2, Bigeng Chen1,2, Wei Zhang1,2, Peng Zou1,2, Yingjun Zhou1,2, Liangming Xiong1,2, Jie Luo1,2, Nan Chi1,2, Fudan Univ., China; 3Dept. of Electrical and Electronic Engineering, National Tsing Hua Univ., Taiwan; 4State Key Laboratory of Advanced Optical Communication System and Networks, Frontiers Science Center for Nano-optoelectronics, Peking Univ., China. We present one transmitter and one receiver design, where both silicon photonics devices are synergistically designed with electronic devices by consider- ing the device packaging, power efficiency, operation speed, footprint, modulation format, and signal detection scheme.

Investigation on the Impact of Additional Connections to Feedforward Neural Networks for Equalization in PAM4 Short-Reach Direct Detection Links, Ruopeng Xu1, Shuangyu Dong1, Xin Zhou1,2, William Sheih1,1, Univ. of Melbourne, Australia; 2Univ. of Science and Technology Beijing, China. Different additional connections onto feedforward neural networks are investigated for equaliza- tion in a 50-Gb/s PAM short-reach direct detection link. The auto-regressive and cascade structures demonstrate the most significant performance improvement with limited additional computational complexity.
**ACP/IPOC 2020 — Sunday, 25 October**

**Ballroom C, Track 1**

- **S4A.3 • 17:00**
  - **Invited**
  - Research and Applications of Special Optical Fiber for Sensing at FiberHome, Cheng Du; Fiberhome Telecommunication Technologies, China. We focus on fabrication of various types of special fiber with sensing. Research on design, process and application of polarization-maintaining fiber, hollow-core photonic bandgap fiber, high temperature fiber, super bending resistant fiber and multi-core fiber.

**Ballroom A, Track 2**

- **S4B.4 • 16:45**
  - **Invited**
  - Location-Aware Time Domain Hybrid Modulation for Mobile Visible Light Communication, Xiaodi You, Zhongxu Liu, Jian Chen, Mingyi Gao, Changyuan Yu, Gangxiang Shen; School of Electronic and Information Engineering, Soochow Univ., China; Department of Electronic and Information Engineering, The Hong Kong Polytechnic Univ., China; School of Telecommunications and Information Engineering, Nanjing Univ. of Posts and Telecommunications, China. A location-aware time domain hybrid modulation (TDHM) scheme is proposed for mobile visible light communication. TDHM frames are constructed according to location information, which can increase capacity more than 20% for around 20% indoor areas.

**Conference 06, Track 3**

- **S4B.5 • 17:00**
  - **Invited**
  - Dual-band Airy beams enabled full duplex free-space photonic interconnection, Songnian Fu, Xuesong Zhao, Zhu Lei, Yuncai Wang, Yuwen Qin; Guangdong Univ. of Technology, China; Huazhong Univ. of Science and Technology, China. We experimentally demonstrate a proof-of-concept dual-band 2D Airy beams enabled 100 Gbps full duplex free-space photonic interconnection over 40 cm free-space link with a receiver sensitivity of -17.3 dBm at bit error ratio of 1e-9.

**Conference 05, Track 4**

- **S4C.3 • 17:00**
  - **Invited**
  - Transmission Performance Evaluation Throughout the Life Cycle of Lightpath in Intelligent Optical Networks, Qunbi Zhuge, Yichen Liu, Xiaomin Liu, Huazhi Lu, Meng Cai, Lilin Yi; Shanghai Jiao Tong Univ., China. To ensure reliable control and management throughout the life cycle of lightpath, evaluating the quality of transmission (QoT) including various physical layer impairments is essential. We review our progress on the modeling and monitoring of optical link impairments.

**Conference 07, Track 5**

- **S4D.3 • 17:00**
  - **Invited**
  - High speed modulators based on thin film lithium niobate, Xinlun Cai; Sun Yat-Sen Univ., China. Electro-optic modulators are critical components in modern optical fiber telecommunication networks and microwave-photonic systems. Ideally, the optical modulators should feature high electro-optic bandwidths, low drive voltages and low optical losses. The current modulator platforms based on materials such as silicon, indium phosphide or polymers have not yet been able to meet these requirements simultaneously because of the intrinsic limitations of the material systems. Here, we show that high performance optical modulators can be achieved in lithium niobate on insulator platform.

- **S4E.3 • 17:00**
  - **Invited**
  - Integrated Microwave Photonics on Generic Integration Platforms, Martijn J. Heck; Aarhus Universitet, Denmark. I will give an overview of the specific opportunities and challenges when using generic photonic integration platforms for high-end integrated microwave photonics. Widely-tunable and narrow-band filters and low-noise oscillators will be discussed.
Essential Formulations of the Low-dimensional Electron-transportation in Semiconductors and the Energetic Electron-transition in Atoms, Xiaomin Ren1; 1Beijing Univ of Posts & Telecom, China. As a fundamental advance, the theoretical models of the low-dimensional electron-transportation in semiconductors and the energetic electron-transition in atoms based on the principle of energy level divergence have been essentially established.

Plasmonic optical fiber grating aptasensing, Christophe Cau-cheteur1; 1Universite de Mons, Belgium. We report bioassays with gold-coated tilted fiber Bragg gratings functionalized with aptamers for both proteins and cells sensing. Our work is focused towards the measurement of relevant cancer biomarkers.

Fading-free Block-wise PAM Signal Transmission with Direct Detection Based on Alamouti Coding and DDMZM, Yixiao Zhu1, Longsheng Li1, Xin Miao1, Longjie Yin1, Xi Chen1, Weisheng Hu1; 1Shanghai Jiao Tong Univ, China. We propose and experimentally demonstrate fading-free direct detection transmission of PAM signal enabled by Alamouti coding and dual-drive MZM. After 80km SSMF transmission, 32Gbaud PAM-4/6/8 signal can achieve KP4, 7% and 20% FEC thresholds, respectively.

Noise Mitigation Using Adaptive Filtering Algorithm for Long-Range VLC System Based on FPGA, Xiaofeng Wang1, Mingjun Zhang1, Xiaomin Ren1; 1Beijing Univ. of Posts and Telecommunications, China. We design and implement an adaptive filter using FPGA for real-measured ambient noise mitigation in a 100m outdoor visible light communication system. Experimental results indicate that 7.84 dB SNR improvement is achieved.

Blind Shaping Rate Identification for Probabilistic Shaping Quadrature Amplitude Modulation Formats, Zexin Chen1, Jianing Lu3, Songnian Fu3, Ming Tang3, Deming Liu1, Chao Lu1; 1Huazhong Univ. of Science & Technol, China; 2school of Information Engineering, Guangdong Univ. of Technology, China; 3Department of Electronic and Information Engineering, The Hong Kong Polytechnic Univ., China. We experimentally demonstrate a blind scheme enabled by a frequency offset loading technique to identify the shaping factor and modulation format of probabilistically shaped 16/64/256QAM signals with various entropies.

Adaptive Clock Frequency Based Energy Efficient Provisioning for Virtual Data Centers, Zhiyuan Wang1, Chao Guo2, Sanjay K Bose2; 1Suzhou Key Laboratory of Advanced Optical Communication Network Technology, Soochow Univ., China; 2Department of Electrical Engineering, City Univ. of Hong Kong, Hong Kong. An energy-efficient virtual data center (VDC) embedding scheme is proposed through applying dynamic frequency scaling (DFS) to datacenters. An integer linear programming (ILP) model and a heuristic algorithm are developed to demonstrate the effectiveness of the proposed scheme in energy saving.
Hollow-core antiresonant fibers for communications, Francesco Poletti; Univ. of Southampton, UK. We review our recent progress in developing nested antiresonant nodeless hollow core fibres (NANFs) for data transmission, laser delivery and sensing applications, with a particular focus on their loss, polarization properties and data transmission capability.

Single-pixel imaging using optical phased array chip, Takuwa Tanemura, Taihiro Fukui, Kento Komatsu, Yusuке Kohno, Yoshiaki Nakano; The Univ. of Tokyo, Japan. We review our recent approaches of using compact silicon optical phased array (OPA) chips for speckle-based single-pixel imaging. Unlike conventional OPA-based beam steering, precise calibration of optical phases is not necessary, enabling robust and low-complexity operation.

A Distributed Federated Transfer Learning Framework for Edge Optical Network, Hui Yang, Quyan Yao, Jie Zhang; Beijing Univ of Posts & Telecom, China. This paper proposes a cross-scene, cross-spectrum, and cross-service edge optical network architecture, and designs a distributed federated transfer learning (FTL) framework to provide solutions for the intelligent edge optical network.

Low Vπ silicon-based x-cut thin-film lithium niobate MZ modulators fabricated by photolithography, Heng Li, Ye Liu, Jia Liu, Su Tan, Mingzhi Lu, Qiaoyin Lu, Weihua Guo; Huazhong Univ. of Science and Techn, China; Ningbo Ori-chip Optoelectronics Technology LTD, China. We calculated Vπ, and light loss for different electrode gap and waveguide depth for x-cut TFLN modulators. Then we fabricated modulators which have shown the lowest Vπ among similar modulators as far as we know.

A novel thin film lithium niobate electro-optic modulator with metal-filled photonic Crystal Waveguide, Xuecheng Liu, Bing Xiong, Changgheng Sun, Zhibiao Hao, Lai Wang, Jian Wang, Yanjun Han, Hongtao Li, Jiadong Yu, Yi Luo; Tsinghua Univ., China. A novel thin film lithium niobate modulator with metal-filled photonic crystal is proposed to greatly enhance the electro-optical interaction. Half-wave-voltage of 2 V and bandwidth over 200 GHz can be realized with a 500-μm-long device.

Ultra-compact Thin Film Lithium Niobate Electro-optic Modulator with Metal-filled Photonic Crystal Waveguide, Xuecheng Liu, Bing Xiong, Changgheng Sun, Zhibiao Hao, Lai Wang, Jian Wang, Yanjun Han, Hongtao Li, Jiadong Yu, Yi Luo; Tsinghua Univ., China. A novel thin film lithium niobate modulator with metal-filled photonic crystal is proposed to greatly enhance the electro-optical interaction. Half-wave-voltage of 2 V and bandwidth over 200 GHz can be realized with a 500-μm-long device.
VIP 01, Track 6

S4F.4 • 17:30
Quantum Photonics with Flying Atoms, Heng Shen1,2; 1Oxford Univ, UK; 2Shanxi Univ., China. Quantum interface between light and atoms serves as powerful tools for quantum technologies. Here I shall talk its application on non-Hermitian Quantum photonics, generation of non-classical light and quantum metrology.

S4G.4 • 17:30
Enlarging strain dynamic range of quasi-distributed acoustic sensing with interleaved identical chirped pulses, Zitan Wang1,2; Jialin Jiang1, Zinan Wang2, Yun-Jiang Rao1; Univ. Electronic Sci. & Tech. of China, China. A novel interleaved identical chirped pulses (IICP) method to enlarge the strain dynamic range of quasi-distributed acoustic sensing system is proposed, on the basis of pulse compression Phi-OTDR with coherent detection.

S4G.5 • 17:45
DUI Algorithm for improving the dynamic range of Fiber optic Distributed Acoustic Sensor, Cunzheng Fan1, Hao Li1, Tao Liu1, Zhijun Yan1, Deming Liu1, Qiahe Sun1; Huazhong Univ of Science and Technology, China. We proposed a differential-unwrapping-integral (DUI) algorithm for distortionless recovery of large amplitude acoustic signal in optical fiber DAS. The dynamic measurement range of phase demodulation could be increased by 82 times without sacrificing other performance.

VIP 02, Track 1

S4H.5 • 17:30
Demonstration of Real-time Optical Labelling System for Coherent Optical Wavelength Division Multiplexing Networks, Chao Yang1, Ming Luo1, xu Zhang1, Lingheng Meng1, Yancai Luan1, Liang Mei1, Zhiwei He1; Wuhan Research Inst. of Post & Tele, China; 2Fiberhome Telecommunication Technologies Co., Ltd., China. We experimentally demonstrate a real-time optical labelling system in coherent optical WDM network. The scheme is based on subcarrier index modulation technology with 100-Gb/s DP-QPSK signal in practical network scenarios.

Conference 03, Track 2

S4I.7 • 17:30
Microwave Photonic Frequency Divider with Switchable Ratios enabled by an Opto-electronic Oscillator, Shifeng Liu1, Kailin Lv1, Xiaocheng Kang1, Honglei Lu1, Shilong Pan2; 1Nanjing Univ. Aeronautics & Astronautics, China. A microwave frequency divider with switchable division ratios is proposed using an opto-electronic oscillating loop based on a dual-parallel Mach-Zehnder modulator. Different frequency division ratios can be achieved by merely adjusting the loop phase.

Business Center, Best Student Papers

S4I.7 • 17:30
DUI Algorithm for improving the dynamic range of Fiber optic Distributed Acoustic Sensor, Cunzheng Fan1, Hao Li1, Tao Liu1, Zhijun Yan1, Deming Liu1, Qiahe Sun1; Huazhong Univ of Science and Technology, China. We proposed a differential-unwrapping-integral (DUI) algorithm for distortionless recovery of large amplitude acoustic signal in optical fiber DAS. The dynamic measurement range of phase demodulation could be increased by 82 times without sacrificing other performance.

18:30–21:30 Welcome Reception
**08:30–16:00 Registration**

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**Ballroom**

### 09:00–10:30

**M1A • Joint Plenary Session I**

**Presider: Min Qiu, Westlake University, China**

**M1A.1 • 09:00**

**Plenary**

*Optical Technologies to Disclose the Spatial Diversity Dimension in Systems and Networks*, Ton Koonen; Technische Universität Eindhoven, Netherlands. The spatial dimension is the key dimension in which exponential growth of data capacity in networks can be enabled. Optical technologies offer a wealth of opportunities to disclose this dimension; in particular the opportunities in optical fiber networks, in mm-wave radio networks and in optical wireless networks will be addressed.

**M1A.2 • 09:45**

**Plenary**

*Vision and Trend Analysis for Transport Networks in 5G Era*, Han Li; China Mobile Research Institute, China. This talk will analyze the technical characteristics of 5G era, analyze and prospect the technology and development trend of backbone networks, 5G backhaul and fronthaul networks and access networks.

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### 10:30–11:00

**Coffee Break & Poster Preview & Exhibition**

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### 11:00–11:45

**M2A • Joint Plenary Session II**

**Shanguo Huang, Beijing University of Posts and Telecommunications, China**

**M2A.2 • 11:00**

**Plenary**

*Embracing F5G Era, Achieving Ubiquitous Optical Connections*, Libiao Wang; Huawei Technologies Co Ltd, China. In early 2020, ETSI announced the F5G working group which is focused on next-generation fixed networking, encompassing new technologies in fiber networks and ensuring coordination across the optical industry. As the fundamental infrastructure of all kinds of communications, F5G will play a critical role for new network applications in different scenarios including homes, enterprise and wireless 5G etc. In this talk, we will discuss on the key driving forces of F5G, how it will impact the digital transformation for various verticals, and an outlook of F6G in the next decade.

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### 11:45–13:30 Lunch Break
M3A • Fibre-based Devices I
13:30–15:30
Presider: Yuan Gong; Univ of Electronic Science & Tech China, China

M3A.1 • 13:30
All-fiber micro-resonators, Fei Xu1, Ye Chen1, Zi-Xuan Ding1; 1Nanjing Univ., China. In this talk, hybrid All-fiber micro-resonators with single polarization will be demonstrated and the colourful applications on wearable sensors and high-repetition rate lasers will be also introduced.

M3A.2 • 14:00
Quantum cascade laser-based wavelength modulation spectroscopy, Arup L. Chakraborty1, 2Indian Inst of Technology, Gandhinagar, India. A new calibration-free 1f and 2f wavelength modulation spectroscopy technique is demonstrated on a quantum cascade laser to measure ambient CO and CO2. The method is robust, highly sensitive and usable in congested spectral regions.

M3A.3 • 14:30
Study on photostability of BACs in Bi/Er co-doped fibre at various laser wavelengths, Jiaying Wang1, Bowen Zhang1, Shuen Wei1, Binbin Yan1, Yanhua Luo1, Gang-Ding Peng1; 1Univ. of New South Wales, Australia; 2Beijing University of Posts and Telecommunications, China. The photostability of bismuth active centre associated with aluminium (BAC-Al) and bismuth active centre associated with silicon (BAC-Si) in bismuth/erbium co-doped optical fibre (BEDF) is investigated at a wide range of laser wavelengths.

M3B • Transmission Theory and Modeling
13:30–15:30
Presider: Lianshan Yan; Southwest Jiaotong Univ., China

M3B.1 • 13:30
Analysis and Measurement of Intra-mode Dispersion for Non-degenerate and Degenerate Modes in Weakly-coupled FMFs, Juhao Li1, 2Peking Univ., China. We analyze the generation mechanism of intra-mode dispersion in weakly-coupled FMFs. We propose the measurement method and experimentally show that it’s one of the major impairment for IM/DD mode-division-multiplexing (MDM) transmission systems.

M3B.2 • 14:00
Information-theoretic Performance Prediction in Optical Communications, Erik Agrell1, 2Chalmers Univ. of Technology, Sweden; 2TeleCIP Inst., Scuola Superiore Sant’Anna, Italy. It is often desirable to predict the performance of optical communication links without implementing full system simulations. We survey methods and metrics for this purpose, including FEC thresholds, achievable information rates, and mismatched decoding.

M3B.3 • 14:30
Challenges and Problems in ROADM Network Application, Xiaoping Zheng1,2; 1Tsinghua Univ., China; 2Beijing National Research Center for Information Science and Technology (BNRist), China. The presentation mainly introduces some problems and challenges of ROADM network in the large-scale commercial application since 2018 in China.

M3C • Next Generation Optical Networks
13:30–15:30
Presider: Hui Yang; Beijing Univ of Posts & Telecom, China

M3C.1 • 13:30
Optical Networking for Cloud, Junjie Li1, Xiaoli Huo1; China Unicom, China. On-chip generating, controlling and detecting quantum states of light with large-scale silicon-photonic circuits opens the way to realizing advanced quantum technologies. In this talk we present recent progress in silicon-photonic circuit for quantum information processing.

M3C.2 • 14:00
Towards Large-Scale High-Precision Time Synchronization Networks: Challenges and Solutions, Nan Hua1, 2Luyan Han1, 2Xiaoping Zheng1, 2Tsinghua Univ, China; 2Beijing National Research Center for Information Science and Technology (BNRist), China. We focus on the major challenges of building large-scale high-precision time synchronization networks for 5G, PNT services and high-dynamic network cooperation. The latest solutions and results will be given and discussed.

M3C.3 • 14:30
Silicon Quantum Photonics, Jianwei Wang1; 1Peking Univ., China; 2Tech China, China. In this talk, hybrid All-fiber micro-resonators with single polarization will be demonstrated and the colourful applications on wearable sensors and high-repetition rate lasers will be also introduced.

M3D • Classical and Quantum Communication
13:30–15:30
Presider: Yaocheng Shi; Zhejiang Univ., China

M3D.1 • 13:30
Silicon Quantum Photonics, Jianwei Wang1; 1Peking Univ., China; 2Tech China, China. In this talk, hybrid All-fiber micro-resonators with single polarization will be demonstrated and the colourful applications on wearable sensors and high-repetition rate lasers will be also introduced.

M3D.2 • 14:00
Quantum optics on Si chips, Xifeng Ren1, 2Uni. of Sci. and Tech. of China, China. Here, we demonstrate a super-compact integrated quantum CNOT gate on a silicon chip by using the idea of symmetry breaking of a 6-channel waveguide super-lattice. It is implemented with a footprint of 4.8 × 4.45 μm2.

M3D.3 • 14:30
Optical single-sideband modulation based on a silicon dual-parallel Mach-Zehnder modulator, Panpan Shi1, Liangjun Lu1, Gangqiang Zhou1, Shuhuang Chen1, Jianping Chen1, Linjie Zhou1, 1Shanghai Jiao Tong Univ., China. We experimentally demonstrate optical single-sideband modulation with a variable RF frequency. The sideband suppression ratio for the carrier remained and carrier-suppressed modulation is more than 38 dB and 13 dB from 1 to 24 GHz, respectively.
13:30–15:30
M3E • MWP Signal Processing
Presider: Weiwen Zou; Shanghai Jiao Tong Univ., China

M3E.1 • 13:30
Tutorial
Space-division-multiplexing Microwave Photonic Signal Processing, Ivana Gasulla Mestre, Sergi Garcia, Ruben Guillem, Maria Urena; ITEAM Research Inst., Universitat Politècnica de València, Spain. We present an overview of different space-division multiplexing fiber technologies engineered to provide distributed signal processing for microwave signals. The incorporation of the space dimension brings advantages in terms of compactness, flexibility and versatility.

M3F • Nanoscale Light Matter Interaction
Presider: Yu He; South Univ Of Science & Tech of China, China
13:30–15:30
M3F.1 • 13:30
Low relative intensity noise InAs/GaAs quantum dot laser emitted at 1.3 μm, Xinzhong Zhang, Zhuohui Yang, Hancheng Zhang, Sheng Cao, Ying Yu, Siyuan Yu; Sun Yat-sen Univ., China; Univ of Bristol, UK. An ultra-low relative intensity noise of less than -155 dB/Hz in the frequency range of 5-20 GHz is demonstrated in single transverse mode 1.3 μm InAs/GaAs quantum dot Fabry-Perot lasers. Their different performance in the excited-state and the ground-state are also theoretically exposed.

M3F.2 • 13:45
High performance topological bulk lasers, Zengkai Shao, Huazhou Chen, Renmin Ma; Peking Univ., China. We report on a topological bulk laser based on band-inversion-induced reflection constructed by trivial and topological photonic crystal arrays. It provides a novel lasing mode selection mechanism and renders high-performance laser devices.

M3G • Optical Fibre Sensors III
Presider: Limin Xiao; Fudan Univ., China
13:30–15:30
M3G.1 • 13:30
Opto-mechanical time domain analysis, Yong Kang Dong; Harbin Inst. of Technology, China. We demonstrated a 2-meter spatial resolution opto-mechanical measurement over a 225-meter-long fiber in which we were able to distinguish air from alcohol. These advances greatly facilitate the practicability of forward stimulated Brillouin scattering.

M3G.2 • 14:00
Optical phase-locking based long-distance optical frequency domain reflectometry, Weilin Xie; Beijing Institute of Technology China. We present long-distance optical frequency domain reflectometry with high spatial resolution and precision enabled by optical phase-locked loop (OPLL). It allows for efficient enhancement for the dynamic coherence and chirp linearization, achieving Fourier transform-limited spatial resolution over multiples of the intrinsic coherence length of the laser source.

M3G.3 • 14:30
Accurate BFS Estimation in Simultaneous Multi-Point Sensing Based on Externally Modulated BOCDA, Bhargav Somepalli, Yashwanth Kalepu, Uday Kharkhode, Deepa Venkitesh, Balaji Srinivasan; Indian Inst. of Technology Madras, India. We review the recent demonstration of multi-point simultaneous sensing based on External Modulation Brillouin Correlation Domain Analysis (EM-BOCDA), and the use of gradient descent algorithm for accurate estimation of the Brillouin Frequency Shift (BFS).
<table>
<thead>
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<td>M3A.4 • 14:45</td>
<td>FBG with wide-range cladding mode comb inscribed by femtosecond laser and phase mask</td>
<td>Weijia Bao1, Shen Liu1, Yiping Wang1; 1Shenzhen Univ., China. FBG with continuous and wide-range cladding mode comb is inscribed by femtosecond laser and phase mask. Such grating induces significant birefringence. The cutoff cladding mode of air can be observed in the spectrum.</td>
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<td>M3B.3 • 14:45</td>
<td>Data-driven modeling technique for optical communications based on deep learning</td>
<td>Danshi Wang1, 1Beijing Univ.of Posts &amp; Telecom, China. A data-driven modeling technique based on deep learning is proposed and introduced in optical communications. The compatibility with the existing model system demonstrates that the proposed method is a supplementary technique for the conventional modules and is also a potential option for future modeling methods.</td>
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<td>M3C.4 • 15:00</td>
<td>Challenges and Problems in OXC Evolution</td>
<td>Yabin Ye1; 1Huawei Technologies, Germany. In this presentation, we will discuss the values of optical cross connect (OXC) solutions, key technologies used in OXC, what challenges and problems to be solved in order to achieve good performance.</td>
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<td>M3D.4 • 14:45</td>
<td>80 Gbit/s NRZ Lateral PIN Germanium Photodetector with 4-Directional Light Input Silicon Waveguides</td>
<td>Xiao Hu1,2, Dingyi Wu2, Xi Xiao1,2; 1National Information Optoelectronics Innovation Center, China Information and Communication Technologies Group Corporation, China; 2State Key Laboratory of Optical Communication Technologies and Networks, China Information and Communication Technologies Group Corporation (CICT), 430074 Wuhan, China, China. A 4-directional light input lateral germanium photodetector is reported with responsivity 1.23 A/W at 1550 nm and dark current 4 nA at -1V bias voltage. The 80 Gbit/s NRZ clear eye diagram is achieved</td>
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<td>M3A.5 • 15:00</td>
<td>Optimization of optical fiber long period gratings for biosensing applications</td>
<td>Cosimo Trono1, Tanoy K. Dey3, Sara Tombelli1, Francesco Chiavaoli1, Palas Biswas1, Ambra Giannetti1, Nandini Basumallick1, Sunirmal Jana1, Francesco Baldini1, Somnath Bandyopadhyay2; 1Inst. of Applied Physics “Nello Carrara”, CNR-IFAC, Italy; 2Central Glass and Ceramic Research Inst., CSIR-CGCR, India. Different optimization techniques of long period fiber grating (LPFG) for Bio-chemical sensing applications are described.</td>
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<td>M3B.4 • 15:15</td>
<td>Power Loading for Carrier Assisted Differential Detection</td>
<td>Chuanbowen Sun1, Honglin Ji1, Tonghui Ji1,2, Zhaopeng Xu1, William Shieh1; 1The Univ. of Melbourne, Australia; 2Univ. of Science and Technology Beijing, China. We propose a power loading scheme to deal with colored-SNR effects for CADD receiver. It is shown by simulation that the proposed scheme can effectively mitigate SSBI and give an OSNR improvement of 2.7 dB.</td>
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<td>M3C.4 • 15:00</td>
<td>Frequency comb generation using Silicon Modulators</td>
<td>Delphine Marris-Morini1,2; 1Univ. of Paris Sud, France. Abstract not available.</td>
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15:30–17:30 Coffee Break

M4A • Poster Session (1F)

M4D • Postdeadline Session (Conference 03)
M3E.3 • 14:45  Invited  
Attosecond timing in photonic and electronic domains, Jungwon Kim1; Korea Advanced Inst of Science & Tech, Korea. By combining optical frequency combs and microwave photonic methods, attosecond timing is possible in both photonic and electronic domains. New applications based on attosecond-precision timing, such as ultrafast and ultrasensitive time-of-flight detection, are presented.

M3F.5 • 15:00  Invited  
Towards Photonic Neuromorphic Computing, Wolfram H. Pernice1; Universität Münster, Germany. Photonic technologies hold promise for accelerating key computational tasks in artificial intelligence with arithmetic co-processors. I will present recent progress in implementing such devices on the basis of waveguide-integrated phase-change materials.

M3G.4 • 15:00  Withdrawn

M3G.5 • 15:00  1.7 µm all-fiber gas Raman laser source, Hao Li1,3, Wei Huang1,2, Wenxi Pei1,2, Meng Wang1,2, Zefeng Wang1,2; National Univ of Defense Technology, China; State Key Laboratory of Pulsed Power Laser Technology, China; Hunan Provincial Key Laboratory of High Energy Laser Technology, China. We report here the first tunable pulsed all-fiber 1.7 µm gas Raman laser source. It is based on hydrogen-filled hollow-core photonic crystal fibers by rotational stimulated Raman scattering. The maximum average Stokes power of 1.61 W is obtained with optic-to-optic conversion efficiency of about 23%.

M3E.4 • 15:15  
Surface Acoustic Wave Integrated-Photonic Radio-Frequency Filters with Arbitrary Complex Tap Coefficients, Dvir Munk1, Moshe Katzman1, Maayan Priel1, Mirit Hen1, Avi Zadok1; Bar-Ilan Univ., Israel. Discrete time, integrated microwave photonic filters with narrow bandwidths are realized in standard silicon on insulator. Long delays are achieved using slow moving surface acoustic waves. The complex magnitude of each tap is chosen arbitrarily.

15:30–17:30  Coffee Break

M4A • Poster Session (1F)
M4D • Postdeadline Session (Conference 03)
M4D.1 • 15:30
80x200 Gbit/s Real-Time Un-Repeated Transmission Over 440 km With 2.9 b/s/Hz Spectral Efficiency, Junjie Li1, Arxu Zhang1, Kai Li1, Yutao Yang1, Haiqiang Wang2, Fei Yan3, Yue Tian1, Peng Lu1, Zhenhui Zhang1, Lvhui Jiang1, Deng Pan1, Jie Chen1, Yi Tu1, Liangchuan Li1, Huawei Technologies Co Ltd, China; 1China Telecom Beijing Research Inst., China. In this paper, we demonstrated a real-time 80x200 DWDM system in 440-km un-repeated transmission link, which is a new distance (440 km) and spectral efficiency (2.9 b/s/Hz) record of single span un-repeated DWDM system.

M4D.2 • 15:45
Large Dynamic Strain Measurement in Ultra-Weak FBG Array, Rui Hong1, Feng Wang1, Yu Liu1, Guoqie Tu1, Zhiqun Shen1, Xiaoke Ruan1, Fan Yang1; 1Peking Univ., China; 2China Telecom Beijing Research Inst., China. We propose a new method which can measure large dynamic strain in Ultra-Weak FBG array, where the wrongly phase wrapping is corrected by a digital anti-aliasing filter.

M4D.3 • 16:00
Beyond 200G Single Sideband Transmission Over 80km With a Silicon IQ Modulator, Lei Zhang1, Xiaoke Ruan1, Fan Yang1, Xinyu Chen1, Yanping Li1, Fan Zhang1; 1Peking Univ., China. We experimentally demonstrate ultra-high speed metro-scale optical transmission of 552 PAM-4 signal with a record single lane bit rate of 204Gb/s over 80km SSMF based on a silicon IQ modulator with two-parallel Mach-Zehnder structure.

M4D.4 • 16:15
Sub-Sampling Generation and Transmission of 205Gbaud OOK Signal With 120GSa/s DAC Based on High-Order Partial Response Narrowing, Xiuqin Zhu1, Le Zhang1, Xian-song Fang1, Fan Zhang1, Weisheng Hu1; 1Shanghai Jiao Tong Univ., China; 2Peking Univ., China. With 120GSa/s DAC, up to 205Gbaud OOK signal is generated and transmitted over 500m SSF below 20% HD-FEC threshold of 1.5×10-2. Sub-sampling rate of 0.585 is achieved by partial response narrowing and digital anti-aliasing filter.

M4D.5 • 16:30
Digital Coherent Quantum Noise Stream Cipher Over 300km Span Fiber Without Intermediate Amplifier, chao lei1, Jie Zhang1, Yajie Li1, Bo Wang1, Yongli Zhao1, Junjia Li1, Kai Wang1, Hang Gao1; 1Beijing Univ. of Posts and Telecom. China. This paper first reports a digital coherent quantum noise stream cipher experiment over 300km fiber without intermediate amplifiers. Results show the system can carry 10.2Tbit/s km data, which is historical high in the digital coherent context.

M4D.6 • 16:45
Centralized Control and Core Function Prepositioning for Point-to-Point Service Slicing in Multidimensional Large-Scale Optical Networks, Xin Li1, Jinglin Guo2, Daqiang Wang1, Jiayu Wang2, Wuhan Cheng3, Xiangyang Zhang1, Qian Li3, Shangguo Huang3; 1State Key Laboratory of Information Photonics and Optical Communication, Beijing Univ. of Posts and Telecommunications, China; 2ZTE Corporation, China. A framework of centralized control and core function prepositioning is proposed. The functions of fast connection establishment, disaster-resilient survivability, etc., are deployed in advance. This framework supports the point-to-point service slicing in 5G era.

M4D.7 • 17:00
The First Demonstration of High-Speed LiNbO3 Thin-Film Optical Modulators Operating at the Wavelength of 2 μm, Bingcheng Pan1, Jinrui Hui1, Yashu Huang1, Liia Song1, Jingyi Wang1, Pengxin Chen1, Liu Liu2, Daomin Dai1, Qihejiang Univ., China; 2Zhejiang Univ., Ningbo Research Inst., China; 3South China Normal Univ., China. We demonstrate the first high-speed LiNbO3 thin-film optical modulators operating at 2 μm wavelength. The measured Vπ is 3.67 V, and the electro-optic bandwidth is > 22 GHz (beyond the measurement limit of photodetector).

M4D.8 • 17:15
High Efficiency and Low Voltage Actively Q-Switched Yb-Doped Waveguide Lasers Using a Liquid Crystal Modulator, Xinyue Lei1, Lu Hao1, Jiosha Forth1, Francois Ladouceur1, Leonardo Silvestri1, Alex Fuerbach2; 1Electrical Engineering and Telecommunications, The Univ. of New South Wales, Australia; 2Department of Physics and Astronomy, Macquarie Univ., Australia. We present a high efficiency actively Q-Switched laser using a liquid crystal modulator. The Q-switched lasers with a pulse width of 15.6 ns and a peak power of 110 W are achieved at 1030 nm.

M4D.9 • 17:30
Observation of Nonlinear Topological Corner States, Sergey S. Kruk1,2, Wenlong Gao1,2, Duk-Yong Choi1, Thomas Zentgraf1, Shuang Zhang1, Yuri Kivshar1; 1 Australian National Univ., Australia; 2Department of Physics, Univ. of Paderborn, Germany; 3School of Physics and Astronomy, Univ. of Birmingham, UK. We bring the physics of topological corner states to the nanoscale. We study experimentally topology-driven nonlinear effects generated by subwavelength edge and corner topological states in optical valley-Hall dielectric metasurfaces.
M4A.1  Technical requirement and test method specifications for decoy-state BB84 protocol QKD system, Junsen Lai1, Liu Lu1, Xin Zhao1, Xiao-hua Tang1, Rui Tang1, Wenyu Zhao1, Haiyi Zhang1; 1CAICT, China. Recently released CCASs specifications about technical requirements and test methods for multi-vendor commercialized decoy-state BB84 protocol QKD system are reviewed. The future standardization outlook for QKD system and network are also discussed.

M4A.2  High-resolution holographic 3D display method by direct coding of light field images, Zimo Liu1, Jinyun Yao2, Fuyang Xu1, Xin Yang1, Qiang Song1, Yong Li1; 1School of Physics and Electronic Information Engineering, Zhejiang Normal Univ., Inst. of Information Optics, Zhejiang Normal Univ., Jinhua, China; 2School of Instrumentation and Optoelectronic Engineering, Beihang Univ., China; 3Hunan Univ.-Lochn Optics Micro/Nano Photonics Research Center, China. Direct coding of light field images for high-resolution holographic 3D display is proposed. Two high-resolution holograms for static 3D display and multi-view dynamic 3D display are calculated and optically reconstructed to approve the validate of proposed method.

M4A.3  Photoluminescence quantum yield from gold nanorods, Weidong Zhang1,2, Zixian Wei1, Shi Zhang2, Zhiyuan Cao2, Lei Wang3, Chien-Yu Huang3,4, Ming Li1,5, Qian Li1,6, Xin Yan1, Xiaomin Ren1, Shuai Luo3, Haiqing Wang3, Xiaoming Huang2, Kai Liu2, Xiaomin Ren2; 1Beijing Univ. of Posts & Telecom, China. We studied on the focal shift effect of Posts & Telecom, China. of plasmonic nanoparticles inside plasmonic nanowires, are advantages brought about by the newly emergent materials, and obtained an axial intensity formula which describes the focal performance, and a fitting formula to predict the actual focal length.

M4A.4  Towards perfect image-contrast in lensless ghost imaging with sunlight, Sanjit Karmakar1; 1NUS, Singapore. Sunlight-based lensless ghost imaging could be used to take a picture of a distant-object with 130 μm image resolution. But the image-contrast is very low. This article reports a study of this lensless ghost imaging to achieve perfect image-contrast.

M4A.5  Synthesis of Silver Nanoparticles using Rumex Crispus Extract and Evaluation of their Antibacterial Activities, Aruna Gandhi M S1, Qian Li1; 1Shenzhen Graduate School, Peking Univ., China. Luminescence quantum yield from gold nanorods: Synthesis of Silver Nanoparticles using Rumex Crispus Extract and Evaluation of their Antibacterial Activities, Aruna Gandhi M S1, Qian Li1; 1Shenzhen Graduate School, Peking Univ., China. Nanoparticles are characterized by UV-Vis absorption spectroscopy, FTIR, XRD and SEM. The UV-Vis spectrum revealed the formation of silver-nanoparticles by exhibiting the typical surface-plasmon absorption maxima at 435 nm for the Rumex Crispus green extract.

M4A.6  High resolution phase imaging with transport of intensity equation and sinusoidal illumination, Sibi Chakravarty Shangumagavil1, Virginia Tech, USA. A super resolved Transport of Intensity phase imaging is demonstrated using sinusoidal illumination. The intensity pattern modulates the phase gradient and shifts the high frequencies of the phase down into the passband which are stitched together with the low frequencies obtained using multi-plane TIE to obtain a super resolved phase image.

M4A.7  Optimization Design for 1.55 μm InAs/InGaAs quantum dot Square Microcavity Lasers on Silicon with Edge Midpoint Output Waveguide Structures, Yuanqing Yang1, Jun Wang1,2, Lina Zhu1, Weiwei Chen1, Guofeng Wu1, Yanxing Jia1, Haiying Wang1, Yongqing Huang1, Xiaomin Ren1, Shuai Luo1, Haiming Ji1; 1State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecom, China; 2Beijing Optoelectronics Institute, China. We fabricated and packaged a blue micro-LED with a diameter of 50-µm based on a single layer of InGaAs quantum dot (QD) micro-LED for VLC, and then revealed its impedance characteristics by fitting with a modified equivalent circuit model.

M4A.8  Impedance Characteristics Study of Packaged InGaAs QD-based Micro-LED for Visible Light Communication, Keming Qi1, Qian Li1; 1Peking Univ., China; 2Peking Univ., China. We demonstrated an optimized structure design and analyze the optical mode characteristics of 1.55 μm S-basel III-V square microcavity laser with InAs/InGaAs quantum-dot active region and directional midpoint output waveguide.

M4A.9  On performance of continuous-variable quantum key distribution over realistic air real quantum channel, Ming Li1; 1State Key Laboratory of Wireless Mobile Communications and Power Transmission, Tianjin Normal Univ., China. We evaluate the performance of continuous-variable quantum key distribution propagating through the air quantum channel. The realistic Gaussian model associated with transmission fluctuation is established. We find that the secret key rate has been overestimated.

M4A.10  Study on the Focal Shift Effect of Planar Dielectric Subwavelength Grating Focusing Reflector, Gongqing Li1,2, Xiaofeng Liao1,2, Yongqiang Huang1, Kai Liu2, Xiaomin Ren2; 1Beijing Univ. of Posts & Telecom, China. We studied on the focal shift effect in planar dielectric subwavelength grating focusing reflector, and obtained an axial intensity formula which describes the focal performance, and a fitting formula to predict the actual focal length.

M4A.11  Design and Development of Plasmonic Sensor Chips based on Self Assembly of Nanoparticles inside Nanowires, Yashna Sharmas1, Varun Prashe2; 1Delhi Technological Univ., India. Plasmonic sensor-chips, based on gap-controlled self assembly of plasmonic nanoparticles inside plasmonic nanowires, are modelled and fabricated. These chips with high electromagnetic-enhancement can be developed on a wafer-scale with sub-20 nm gaps.

M4A.12  Undecorated Quantum Dot Based Micro-LED for Microwave Generation, Yashna Sharma1, Varun Prasher1; 1Taiyuan Univ. of Technology, China; 2Tianjin Key Laboratory of Wireless Mobile Communications and Power Transmission, Tianjin Normal Univ., China. We demonstrated an optimized structure design and analyze the optical mode characteristics of 1.55 μm S-basel III-V square microcavity laser with InAs/InGaAs quantum-dot active region and directional midpoint output waveguide.

M4A.13  Giant Enhancement of Third- and Fifth-Harmonic Generations in Epsilon-Near-Zero Nanolayer, Zetao Xie1,2, Jiaye Wu1, H.Y. Fu1, Qian Li1; 1Peking Univ., China; 2Tsinghua Univ., China. We numerically demonstrate the third- and fifth-harmonic generations in epsilon-near-zero indium tin oxide metasurface. The conversion efficiency of 2.64×10⁻⁶ and 1.55×10⁻⁶ have achieved for the third- and fifth-harmonic generations.

M4A.14  Micro/Nano Photonic Structures for light absorption/emit- sion applications, Zhihui Chen1,2, Tianshan Univ. of Technology, China. Enhanced light absorption/emission has been mani- fested to be vitally important via its versatile applications. This work will show the possibility and potential of designing novel light absorbers and scatterers with extreme performance and advantages brought about by the newly emergent materials, structures and physics.

M4A.15  Multi-vendor commercialized decoy-state BB84 protocol QKD system are reviewed. The future standardization outlook for QKD system and network are also discussed.

M4A.16  On performance of continuous-variable quantum key distribution over realistic air real quantum channel, Ming Li1; 1State Key Laboratory of Wireless Mobile Communications and Power Transmission, Tianjin Normal Univ., China. We evaluate the performance of continuous-variable quantum key distribution propagating through the air quantum channel. The realistic Gaussian model associated with transmission fluctuation is established. We find that the secret key rate has been overestimated.

M4A.9  Study on the Focal Shift Effect of Planar Dielectric Subwavelength Grating Focusing Reflector, Gongqing Li1,2, Xiaofeng Liao1,2, Yongqiang Huang1, Kai Liu2, Xiaomin Ren2; 1Beijing Univ. of Posts & Telecom, China. We studied on the focal shift effect in planar dielectric subwavelength grating focusing reflector, and obtained an axial intensity formula which describes the focal performance, and a fitting formula to predict the actual focal length.
Monday, 26 October

M4A.17 Curvature Model and Transmission Characteristics of a Micro-Bottle Resonator, Shuaiqiang Zhao1, Fengyu Hou1, Zijie Wang1, Yong Yang1, Xiaobei Zhang1, Tingyun Wang1; 2Shanghai Univ., China. We demonstrate the curvature model of the micro-bottle resonator and study the influence of curvature on its transmission characteristics, which reveals that the quality factor can be further enhanced by increasing the curvature.

M4A.18 Modeling of turn-key soliton microcomb generation with transient loss fluctuations, Yuanyuan Chen1, Tuo Liu1, Hainun Gao1, 2Shanghai Univ., China. We present a numerical model that masters the dynamics of cavity dissipative solitons in associated with the saturable absorption (SA) effect, and demonstrates turn-key soliton microcomb generation with SA-induced transient loss fluctuations.

M4A.19 The influence of fabrication imperfections in an optomechanical crystal nanobeam cavity, Xiaomin Lv1, Boyu Pan2, Jindiao Tang1, Nan Xu1, Hui Chen1, Yanmin Zhang1, You Wang1, Hai-Zhi Song1, 2Guangwei Deng1, Qiang Zhou1; 3Univ. of Electronic Science and Technology of China, China; 4Southwest Inst. of Physics, China; 5Univ. of Science and Technology of China, China. We present the analysis of the influence of fabrication imperfections on the optical, mechanical and optomechanical coupling characteristics in an optomechanical crystal nanobeam cavity.

M4A.20 Design and Analysis of Si-Based Vertical-Emitting Nanowire Lasers with Enhanced Bottom Reflectivity, Xingao Zhang1, Chao Wu1, Jiahui Zheng1, Xin Yan1, Xia Zhang1, Xiaomin Ren1; 2Beijing Univ. of Posts and Telecommunications Beijing 100876, China, State Key Laboratory of Information Photonics and Optical Communications, China. Low-threshold Si-based vertical-emitting nanowire lasers are designed and analyzed. By introducing air and SOI between the nanowire and substrate, the bottom reflectivity is significantly enhanced, resulting in a low-threshold and smaller cutoff diameter.

M4A.21 Studies on dynamics of hot electrons in metal and the influence on photodetection, Xiaobing Tang1, Zhibiao Hao1, Zijie Wang1, Yong Yang1, Xiaobei Zhang1, Tingyun Wang1; 3Shanghai Univ., China. We demonstrate the curvature model of the micro-bottle resonator and study the influence of curvature on its transmission characteristics, which reveals that the quality factor can be further enhanced by increasing the curvature.

M4A.22 Ultra-compact Sensor Based on a single-cavity dual-mode Photonic Crystal Nanobeam for Simultaneous Detection of Relative Humidity and Temperature, Ying Yang1, Fujun Sun1, Zhexi Gao1; 2Beijing Univ. of Posts & Telecom, China. We propose a sensor based on a single photonic crystal nanobeam cavity that supports both air mode and dielectric mode to simultaneously detect relative humidity and temperature. High sensitivity, strong anti-interference ability, and compact footprint are achieved.

M4A.23 Single-cell nanostructured metasurface for simultaneous holography and gray-image display, Zhi Wang1, Zile Li1, Qi Di1, Ruo Fu1, Guoxing Zhuang1; 2Wuhan Univ., China. Combining intensity modulation governed by Malus law with phase manipulation based on both geometric and propagation phases, a tri-channel metasurface for simultaneous holography and gray-image display can be obtained, merely with a single-cell nanostructure design approach.

M4A.24 Near-infrared Photodetection in Graphene-Based-InSe Heterostructure, Wen Shao1, Xiaoping Xie1, Yunqiang Zheng1, Wei Wang1, Tianxian Li1, Feifei Wang1, Yong Wang1, Stephanie Law1, Tingyi Gui1; 2State Key Laboratory of Optical and Photonic Technologies, Xian Inst. of Optics and Precision Mechanics (XIOPM), Chinese Academy of Sciences, China; 3Univ. of Chinese Academy of Sciences, China. A compact photodetector was fabricated at 1550 nm light excitation and 0.35 V bias, with smaller than 2 ms response time.

M4A.25 Polarization-sensitive Imbert-Fedorov shift for Gaussian beam at a telecommunication wavelength through graphene, Zhe Chen1, Yu Zhang1, Xiaoguang Zhang1, Jinguan Yang1, Wenbo Zhang1, Lixia Xi1, Xiaofeng Tang1; 2Beijing Univ. of Posts and Telecom, China. We report how the Imbert-Fedorov shift of beam reflected at air-graphene interface is affected by the state of polarization and incident angle. The results obtained are of significance for spin optics.

M4A.26 InGaAs Visible Light Heterojunction Phototransistor, Zhong-Kun Luo1, Ze-Sheng Lv1, Hao Jiang1; 2Sun-Yat-Sen Univ., China. InGaAs based heterojunction phototransistors with multiple-quantum-well collector and polarization-doped p-base were fabricated. The devices exhibit a 405/490-nm rejection ratio of more than 103 under 1 V bias. A peak responsivity of 0.9 A/W was obtained, indicating a gain of ~2.7.

M4A.27 Numerical model of spontaneous mode locking and frequency comb generation in a Fabry-Perot laser based on split-step time domain, Sheng Cao1, Zhuhui Yang1, Hancheng Zhong1, Xinzhong Zhang1, Ying Yu1, Siyuan Yu1; 2Sun-Yat-sen Univ., China; 3Univ. of Bristol, UK. We propose an algorithm based on split-step time domain dynamic modeling (SS-TDDM) to solve the time-dependent coupled wave equations of the traveling domain wave model (TDWM). Using this effective and high-speed model, we analyze the spontaneous mode locking and frequency comb generation in a Fabry-Perot laser.

M4A.28 Microfiber mechanical resonator for optomechanics, Qi Zhang1, Rui Li1, Shuai Wang1, Shuyi Wang1, Mingmin Li1; 2Shanxi Univ., China. A microfiber mechanical resonator for optomechanics is proposed. Experiment results showed that the Q0 of the resonators exceed 1010 to yield the highest f×Q products (>1015 Hz) for fiber-optic mechanical resonators.

M4A.29 Antisymmetric-Nonlinear LNOI Waveguide for Highly Efficient Second-Harmonic Generation, Xiangxiu Zhang1, 2Institute of Physics, Chinese Academy of Sciences, China. An antisymmetric nonlinearity is proposed to enhance the efficiency of mode-β phase-matched second-harmonic generation. The theoretical conversion efficiency is as high as 1300%/W/cm2.

M4A.30 Monolithic Silicon-based Active Photonic Integration with Specially Designed III/V Laser and SiNp Interlayer Optical Coupler, Yu Yang1, Hao Zhao1, Xiaomin Ren1; 2Beijing Univ. of Posts and Telecom, China. Monolithic integration of III/V laser on silicon photonics platform using a SiNp interlayer optical coupler is proposed. The simulation indicates that the lasing mode is coupled to the SiNp waveguide underneath efficiently with small footprint.

M4A.31 High Loss, High Extinction Ratio Plasmonic Spot Size Converter, Kejian Zhu1, Pengfei Xu1, Pengfei Sun1, Xingliang Liu1, Hauou Li1, Zhiguo Zhou1; 2Peking Univ., China; 3Guilin Univ. of Electronic Technology, China. Spot size conversion from the nanowaveguide core (400×220 nm²) to a plasmonic waveguide core (20×40 nm²) is studied with insert loss (IL) 1.29 dB and extinction ratio (ER) 29.3 dB.

M4A.32 A metasurface-assisted fiber laser enables generation of high-power and high-purity structured beams, Chuanhui Wang1, Mi Gu1, Kejun Qu1, Yuexia Cai1, Yuhai Gan1, Fang He1, Kun Xu1; 2State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China; 3School of Information and Communication Engineering, Beijing Univ. of Posts and Telecommunications, China; 4School of Science, Beijing Univ. of Posts and Telecommunications, China. We propose a compact method of vortex beam generation directly inside a fiber cavity with a plasmonic metasurface, which holds potential for producing high-power and high-purity structured beams.

M4A.33 Optimal two-mode collective attacks against unidimensional two-way continuous-variable quantum key distribution, Yiming Jian1, Luyu Huang1, Yichen Zhang1, Song Yu1; 2BUPT, China. We report the security analysis of unidimensional two-way continuous-variable quantum key distribution protocol against two-mode collective attacks, where the optimal eavesdropping strategy is given by a two-mode attack with appropriate separable correlations.

M4A.34 A 1766 nm Micro-Ring Laser with InGaAs/InGaAsP Quantum Wells for Potential Gas Sensing, Fangyuan Meng1, Mengqi Wang1, Hongyan Yu1, Kuiyang Zhu1, Wenyu Yang1, Weixi Chen1, Yejin Zhang1, Jiaqiao Pan1; 2Inst. of Semiconductors, CAS; 3School of Physics, Peking Univ., China. A multi-quantum-wells micro-ring laser based on whispering-gallery modes (WGMs) was fabricated and a single-mode lasing was obtained for the first time at 1766 nm under condition of 288 K, which showed potential for HCI and NO gas sensing.

M4A.35 High Efficiency Error Correction for Continuous-Variable Quantum Key Distribution using Raptor-Like LDPC Codes, Chao Zhou1, Xiaoguang Wang1, Yichen Zhang1, Zheguo Zhang1, Song Yu1; 2Beijing Univ. of Posts and Telecommunications, China. We introduce a simple but effective raptor-like LDPC code for the long distance continuous-variable quantum key distribution system, which achieves stable reconciliation efficiency of more than 90% under low SNR regions.
M4A.36 Ultracompact on-chip spectrometer based on high-index-contrast grating, Zekun Zeng1, Kaiyu Cui2, Xusheng Cai1, Hongbo Zhu1, Jian Xiong1, Yidong Huang1, Wei Zhang1, Yue Feng1, Fang Liu1; 1State Key Lab for Mesoscopic Physics, Peking Univ., China. We present a practical tunable all-optical logic gate based on the FWM effect in the graphene-on-silicon (GoS) microresonator. The GoS microresonator could produce broadband flat dispersion with multiple zero-dispersion wavelengths (ZDWs) by electrically tuning the graphene. The size of the device footprint is only 60 μm× 48 μm.

M4A.37 Chip-based tunable all-optical logic gates via four-wave mixing in graphene-on-silicon microresonators, Wei Wu1, Xinrui Mao1,2, Renmin Ma1,2; 1Army Engineering Univ. of China; 2School of Physics, Peking Univ., China. We propose an ultracompact on-chip spectrometer based on high-index-contrast grating. Simulation results show that, optical spectra are reconstructed with resolution as high as 2 nm and a compact footprint of only 60 μm× 48 μm.

M4A.38 Steering valley-polarized emission of monolayer MoS2 sandwiched in plasmonic antennas, Te Wer1, Weidong Zhang1, Cheng-wei Qiu1, Guowei Lu1; 1Army Engineering Univ. of China; 2National Univ. of Singapore, Singapore. We demonstrate that a chiral plasmonic antenna consisting of two stacked gold nanorods can modulate strongly valley-polarized photoluminescence (PL) of monolayer MoS2 in a broad spectral range at room temperature.

M4A.39 100-km Secure Fiber Transmission of ASE-source-based Quantum-Noise Randomized Stream Cipher, Hasong Jiao1, Tao Pu1, Yukai Chen1, Jilin Zheng1; 1Army Engineering Univ. of China; 2School of Physics, Peking Univ., China. Quantum-noise stream cipher based on amplified spontaneous emission (ASE) source is experimentally investigated. With key-modulated local light as decryption signal, secure transmission of 128-level encryption is realized at 2.5Gb/s over 100-km fiber.

M4A.40 Spin-Momentum-Locked Edge Mode for Topological Vortex Lasing, ZHENZANG YANG1, Zengkai Shao2, Huashou Chen1, Xirui Mao1,2; 1State Key Lab for Mesoscopic Physics and School of Physics, Shandong Univ., China; 2Frontiers Science Center for Nano-optoelectronics & Collaborative Innovation Center of Quantum Matter, Peking Univ., China. A topological vortex laser that relies on a novel feature in non-Hermitian topological photonic systems is demonstrated. The out-of-plane radiation feature of spin-momentum locking is reported.

M4A.41 Excitation-collection dual resonance of quantum dot in microporous cavity, Shufna Liu1, Yuming Wei1, Ying Yu1, Jin Liu1; 1Sun Yat-Sen Univ., China. We have investigated the cavity-resonant excitation of quantum dot which is spectrally and spatially coupled with the fundamental mode of microporous, achieving a single photon source that is highly efficient both in excitation and emission.

M4A.42 Diabolical Points in Coupled Cavities with Quantum Emitters, Jingnan Yang1, Chenjian Qian1, Xin Xie1, Kai Peng1, Shiyao Wu1, Feilong Song1, Sibai Sun1, Jianchen Dang1, Ying Yu1, Shuush Shi2, Jiong He3, Matthew J. Steer1, Iain G. Thygre1, Bei-Wei Li1, Fang Bo1, Yun-Feng Xiao1, Zhanhun Zuo1, Kuizjue Jin1, Changfeng Gu1, Xiaoli Xu1; 1Inst Phys, Chinese Academy of Sciences, China; 2School of Engineering, Glasgow Univ., UK; 3The MOE Key Laboratory of Weak Light Nonlinear Photonics, China; 4TEDA Applied Physics Inst. and School of Physics, Nankai Univ., China. We here propose a macroscopic control of the backscattering direction by optimizing the cavity size. The backscattering directions are confirmed with two strongly-coupled microdisks and diabolical points are achieved at the resonance of two microdisks.

M4A.43 Enhanced emission and second harmonic generation from WS2 by using dielectric circular Bragg resonators, Bo Chen1, Zhe He1, Zhao-Jun Liu1, Yun-Kun Wang1, Ya-Nan Gao1, Igor Aharonovich1, Zai-Quan Xu2, Jin Liu1; 1Sun Yat-sen Univ., China; 2Peking Univ., China. We demonstrate a two-dimensional monolayer WS2, efficiently coupled to a dielectric circular Bragg resonator (CBR). The coupling of the WS2 and CBR leads to the pronounced enhancements in both photoluminescence and second-harmonic generation.

M4A.44 Entropy estimation of optical chaos in integrated silicon optomechanical cavities for physical random number, Jia-Gui Wu1, Shi Binglei1, Xiong Xueyai1, Yan Yanlig1, Gu Li1; 1Southwest Univ., China. We evaluated the entropy of mesoscopic chaos from photonic-crystal optomechanical (PhC-OM) microring for physical random bit (PRB) generation. The NIST Special Publication 800-90B is used and the entropy generation rate is estimated to be 2.0 Gbps.

M4A.45 A Model for the Enhancement of the Gain Saturation Power of the Forward Pumped Fiber Raman Amplifier with the Phase Modulation, Yich Zhang1,2, Yan Liang1, Zong Meng1, Jianwei Wang1, Shiyang Tian3; 1College of Meteorology and Oceanology, National Univ. of Defense Technology, China; 2Academy of Artillery and Air Defense, China. A model of enhancing the gain saturation power of the forward pumped fiber Raman Amplifier (FFRA) with the phase modulation is presented, which shows agreements with the experimental results, providing an effective reference in practice.

M4A.46 High power tapered fiber bundle 19×1 pump combiner, Hui Zhang1, Chengmin Lei1, Zhihong Li1, Zilun Chen1; 1National Univ. of Defense Technology, China. We investigate a 19×1 tapered fiber bundle (TFB) pump combiner based on twist method. To our best knowledge, this is the first time 220/242 μm multimode fibers act as pump fibers for a 19×1 pump combiner.

M4A.47 Distributed Temperature and Strain Sensing Utilizing Brillouin Frequency Shifts Contributed by Multiple Acoustic Modes in Dispersion-Shifted Fiber, Liwen Sheng1,2, Liqiong Li1, Jimpeng Lang1, Jiangwu Wang1, Leijun Hu1, Jiong Yan1, Ziming Liu1; 1China Electronics Technology Instruments Co., Ltd, China; 2Science and Technology on Electronic Test & Measurement Laboratory. A multi-parameter sensor for distributed measurement of temperature and strain based on Brillouin scattering in dispersion-shifted fiber is proposed, which is an excellent candidate for the cross effects in traditional Brillouin sensing system. In experiment, a temperature accuracy of 0.2 °C, a strain accuracy of 60 με are achieved simultaneously.

M4A.48 Random Perturbations on Crosstalk in Quasi-homogeneous Multi-core Fiber with Bidirectional Transmission, Ke Tong; Wenjie Wang1, Lin Xiang1; 1School of Electronic and Information Engineering, Soochow Univ., China. A rede fined discrete changes model is proposed to estimate the crosstalk of bidirectional transmission with random perturbations. Results show a large effective index difference increase the crosstalk obviously because of perturbations in quasi-homogeneous multi-core fiber.

M4A.49 Design and optimization of heterogeneous Few-mode Multi-core Fiber with graded-index profile and trench/rod assisted, Yong Dai1, Yongjun Wang1, Feng Tian1, Qi Zhang1, Xingjun Xin1; 1Beijing Univ. of Posts & Telecomm, China. We have proposed a design scheme of heterogeneous multi-core and few-mode fiber, which can improve the performance of the RCMF, etc performance by combining rod-assisted and trench-assisted, as well as using a graded refractive index profile.

M4A.50 Graphitic Carbon Nitride Nanosheets Deposited on Microfibers for Relative Humidity Sensing, Zengyou Yan1, Caojun Wang1, Ruowei Yu1, Xizhu Han1, Linniu Xiao1, Fudan Univ., China. Graphitic carbon nitride nanosheets deposited on microfibers for relative humidity sensing is first demonstrated with high sensitivity. Fast response time of 0.43 s and recovery time of 0.87 s are characterized.

M4A.51 Simultaneous Achievement of Large Negative Dispersion and High Birefringence in the Single-mode Photonic Crystal Fibers with Hexagonal Double Cladding, Huai Bai1, Shuo Chen1, Han Wang1, Huiping Tian1; 1Beijing Univ. of Posts & Telecomm, China. The article describes a novel hexagonal double cladding photonic crystal fiber with the inner-cladding elliptical hole. A large negative dispersion of -1068.78 ps/nm/km and high birefringence of 1.01×10^-2 are achieved at 1.55 μm.

M4A.52 Immunosensor based on graphene oxide-coated 81° tilted Fiber Grating LSPR sensing probe, Qingming Lu1, Bin-bin Zhuang1, Tianming Liu1, Yang Zhang1, Decao Wu1, Shenghui Shi1, Qi Yang1, Mingfu Zhao1; 1Chongqing Key Laboratory of Optical Fiber Sensor and Photodetector Engineering, Soochow Univ., China. A silver-plated film was deposited on the end of the 81° tilted fiber grating to form a fiber probe. The probe surface was modified by gold nanoshells, graphene oxide and programmed cell death ligand 1 (PD-L1) monoclonal antibodies. The result showed that the limit of detection for PD-L1 antigens was ~0.071 pM.

M4A.53 All-optical M-PSK Signal Regeneration using a Nonlinear Optical Loop Mirror (NOLM), Yaqi Cai1, Feng Wen1, Biao Guo1, Baqian Wu1, Kun Qiu1; 1UESTC, China. We optimized key operational parameters of an attenuator-based nonlinear-optical loop mirror (Att-NOLM), achieving total 2.6 dB Q-factor improvement for the 16-PSK signals, which has only 0.4dB performance gap between the optimized Att-NOLM and the ideal regenerator.
Temperature-insensitive 2D tilt sensor based on a multi-fiber bundle, cm Luo1, Di Zheng2, Zhiming Liu1, Xihua Zou1, 2Southwest Jiaotong Univ., China; 2College of Advanced Interdisciplinary Studies, National Univ of Defense Technology, China; 2State Key Laboratory of Optical Electronics and Technologies, Sun Yat-sen Univ., China. A novel two-dimensional (2D) temperature-insensitive tilt sensor is proposed, utilizing four fibers containing two FBGs to form a multi-fiber bundle. 2D tilt angle can be determined by monitoring the wavelength separations of the split peak in two FBGs.

Temperature-insensitive 2D tilt sensor based on a multi-fiber bundle, cm Luo1, Di Zheng2, Zhiming Liu1, Xihua Zou1, 2Southwest Jiaotong Univ., China; 2College of Advanced Interdisciplinary Studies, National Univ of Defense Technology, China; 2State Key Laboratory of Optical Electronics and Technologies, Sun Yat-sen Univ., China. A novel two-dimensional (2D) temperature-insensitive tilt sensor is proposed, utilizing four fibers containing two FBGs to form a multi-fiber bundle. 2D tilt angle can be determined by monitoring the wavelength separations of the split peak in two FBGs.

Vehicle Classification based on Multi-Grained Cascade Forest in Phase Sensitive Optical Time-domain Reflectometer, Song Chen1, Yinghun Li1, Liang I. Huang1, 2Shanghai Univ., China. We propose a method which uses Kalman filter to pre-process the vibration signal. Furthermore, the Multi-Grained Cascade Forest algorithm is used to classify different vehicle vibration signal. The real-time recognition accuracy is 84.38%.

Thermal annealing effects on the anti-irradiation performance of fluorine doped multimode fiber, Daoyun Lyu1, 2Wei Zheng3, Fei Guo1, Liangming Xiong1, Song Wang1, Minghong Yang1, National Engineering Laboratory for Fiber Optic Sensing Technologies, Wuhan Univ. of Technology, China; 2State Key Laboratory of Optical Fiber and Cable Manufacture Technology, Yangtze Optical Fibre and Cable Joint Stock Limited Company. This work reports the thermal annealing influence on the radiation resistance of a graded-index multimode optical fiber, which was doped with fluorine and investigated by radiation-induced attenuation (RIA).

A compact and distributed near infrared detecting system based on 45° TFGs, Qingguo Song1, Zhijian Yan1, Qiheen Sun1, Kaiming Zhou2, Lin Zhang2, Huazhong Univ. of Science and Technology, China; 2Aston Univ., UK. We have proposed a compact and distributed near infrared detecting system based on 45° tilted fiber gratings. The system has been applied to measure the moisture level of flour sample, which have shown linear response between moisture level and testing signal

Stable multi-wavelength photonic crystal fiber laser based on figure-eight cavity, Zheng Wanjuan1, Ma Zhijian1, Zhang Min1, Guangdong Polytechnic of Science and Tech, China; 2Shenzhen Univ., China. We propose a stable multi-wavelength erbium-doped photonic crystal fiber laser at room temperature using figure-eight cavity. The physical model and theoretical mechanism are analyzed theoretically. The power changes are less than 1dB during 100 min scan.

A new fiber Mach-Zehnder interferometer based on three micro-silica spheres and photonic crystal fiber is proposed in this paper. Experimental results indicate the proposed sensor has advantages of high mechanical strength and miniaturization.

A temperature-insensitive refractive index sensor based on side-polished no-core fiber, Kandi Xu1, Minghui Bai1, Xinjiang Wang1, Bing Sun1, Nanjing Univ. of Posts and Telecom, China. A temperature-insensitive fiber structure, for refractive index (RI) measurement is demonstrated. The temperature sensitivity is only -4.8 μm/°C while the refractive index sensitivity of the structure is 1147 nm/RIU.

Temperature Compensation of Ultra-high Resolution FBG Static Strain Sensor for Crustal Deformation Observation, Wenzhu Huang1, Wentao Zhang2, Fang Li3, 1Chinese Academy of Sciences, China. This paper proposed a high-resolution temperature compensation technique by measuring the effective cavity length of two FBG resonators, which can improve the static strain measurement resolution and reduce the long-term drift of the system.

A new algorithm for estimating refractive index in the low-temperature range fiber Bragg grating temperature sensor, Shelu Liu1, 2Shanghai Univ., China; 2State Key Laboratory of Optical Electronics and Technologies, Sun Yat-sen Univ., China. We proposed and experimentally demonstrated the new method, which overcomes the shortcomings of traditional calibration methods, such as instability, low accuracy and so on. The feasibility of the method is verified by phase setting experiment.
Performance in BOTDR Using Twice Cross Correlation, M4A.75
tally further improved the microbending sensitivity.

new design of anti-resonant hollow-core fiber has experimen-
tally further improved the microbending sensitivity.

Improvement of Brillouin Frequency Shift Estimation Per-
formance in BOTDR Using Twice Cross Correlation, Zhenyu
Xiao, Xueguang Yuan, Yang'an Zhang, Yaqiong Huang, Lixia Xi, Shengyao Xu, Linan Shan, Xuan Li, BINFPT, China.

Brillouin Frequency Shift as a Function of Laser Wavelength for Delivery of High Power, Xiaobin Xu, Xinyue Cao, Fuyu Gao, Yanjin Zhao, Jia Fu, Yuanxiang Chen, Shengyao Xu, Yang'an Zhang, Meng Wang, Xueguang Yuan, National Univ of Defense Technology, China.

Impact of stimulated Raman scattering in high-power fiber laser delivery distance, Qihao Hu, Xin Tian, Meng Wang, Zhongyi Chen, Xin Tian, Beijing Univ of Posts and Telecom, China.

Improvement of Brillouin Frequency Shift Estimation Performance in BOTDR Using Twice Cross Correlation, Zhenyu Xiao, Xueguang Yuan, Yang'an Zhang, Yaqiong Huang, Lixia Xi, Shengyao Xu, Linan Shan, Xuan Li,

Influence of rejection bandwidth of CTFBGs on Raman suppression in high-power MOPA fiber lasers, Meng Wang, Xueguang Yuan, Yang'an Zhang, Meng Wang, Jinan Univ, China.

Shengyao Xu, Yang'an Zhang, Meng Wang, National Univ of Defense Technology, China.

Antiresonant Hollow-core Fiber for Ho:YAG Laser Litho-
trips, Xiaobin Xu, Xinyue Cao, Fuyu Gao, Yanjin Zhao, Cheng He, Beijing Univ, China.

For delivery of high power Ho:YAG laser, a fiber with 7 tubes and a core of 40μm was designed. Also we designed a coupling structure and a waveguide structure at each end of fiber.

Fast temperature extraction via Echo State Network for BOTDA sensors, Yufeng Zhang, Yingjie Li, Le Cheng, Lei Yu, Hongna Zhu, Bin Luo, Xin Tian, Huazhong Univ of Science and Technology, China.

We present a novel hemoglobin sensor based on parabolic tapered waveguides. The parabolic tapered waveguides can effectively reduce the average insertion loss from 5 dB to 1.2 dB and improve the 3 dB bandwidth from 15 nm to 16.3 nm.

Hemoglobin Detection Based on Excessively Tilted Fiber Grating by Non-covalent bonding, Yuezheng Sun, Yan Li, Hushan Wang, Qizhen Sun, Zhijun Yan, Deming Liu.

We have demonstrated a novel hemoglobin sensor based on hydroxide bond functionalized excessively tilted fiber grating. Due to non-covalent bonding between hydroxide bond and hemoglobin, such sensor could achieve hemoglobin detection with sensitivity around 1.93nm/(mg/ml).

Field Test of Broadband Fiber Optic Interferometric Seis-
mometer, Wentao Zhang, Wenzhu Huang, Yibo Wang, National Univ of Defense Technology, China.

We report here on the mitigation of the stimulated Raman scattering in a 5 kHz fiber amplifier using a long-period fiber gratings fabricated by CO2 laser. Experimental results show that the SRS suppression ratio is 13 dB at 5 kHz.

Topological Design and Fabrication of Bi, Er and Yb Co-
Doped Optical Fibre with Flat Ultrabroad Emission, Yanhua Luo, Shimen Wei, Bowen Zhang, Binbin Yan, Jiazheng Zhang, Jianxiang Wei, Gang-Qing Peng, Univ. of New South Wales, Australia; Beijing Univ. of Posts and Telecommunica-
Cations, China; Harbin Engineering Univ., China; Shanghai Univ., China. Through the topological engineering, Bi/Er/
Yb co-doped optical fibre with the emission spectrum of an ultrabroad bandwidth of 692 nm and a high flatness of 0.611 has been predicted and designed.

Detection of Hemoglobin Based on Graded Index Multimode Optical Fibre, Linan Shan, Xuan Li, Shengyao Xu, Yang'an Zhang, Meng Wang, Xin Tian, National Univ of Defense Technology, China.

Influence of rejection bandwidth of CTFBGs on Raman suppression in high-power MOPA fiber lasers, Meng Wang, Xueguang Yuan, Yang'an Zhang, Meng Wang, Jinan Univ, China.

We present a novel hemoglobin sensor based on parabolic tapered waveguides. The parabolic tapered waveguides can effectively reduce the average insertion loss from 5 dB to 1.2 dB and improve the 3 dB bandwidth from 15 nm to 16.3 nm.

Mitigating SRS in high-power fiber laser systems using CTFBGs for longer delivery distance, Xin Tian, Meng Wang, Zefeng Wang, Xueguang Yuan, National Univ of Defense Technology, China. We report here on the mitigation of the stimulated Raman scattering in high-power fiber laser systems by chirped and tilted fiber Bragg gratings for longer laser delivery distance.

Improved fluorescent doped graded index multimode optical fibre with enhanced ultraviolet transmission, Dajuan Lyu, Wei Zheng, Fei Guo, Liangming Xiong, Song Wang, Xinben Zhang, Minghong Yang, National Engineering Laboratory for Fiber Optic Sensing Technologies, Wuhan Univ. of Technol-
ogy, China; State Key Laboratory of Optical Fiber and Cable Manufacture Technology, Yangtze Optical Fibre and Cable Joint Stock Limited Company, China.

We research here on the mitigation of the stimulated Raman scattering in high-power fiber laser systems by chirped and tilted fiber Bragg gratings for longer laser delivery distance. ACP/IPOC 2020 — Monday, 26 October Poster Room ACP/IPOC 2020 — Monday, 26 October
A tunable random polymer fiber laser based on magneto-optical effect, Fengling Yu1, Zhijia Hu2, Laboratory of Optical Fibers and Micro-nano Photonics, School of Instrument Science and Opto-electronics Engineering, Hefei Univ. of Technology, China; Information Materials and Intelligent Sensing Laboratory of Anhui Province, Key Laboratory of Opto-Electronic Information Acquisition and Manipulation of Ministry of Education, School of Physics and Materials Science, Anhui Univ., China.

A chirally-Coupled-Ring Fiber for Generation and Transmission of Orbital Angular Momentum, Xiongfang Rao1, Li Yang2, School of Microelectronics, Univ. of Science and Technology of China, China; Key Laboratory of Electro-magnetic Space Information, Chinese Academy of Sciences, China; Department of Electronic Engineering and Information Science, Univ. of Science and Technology of China, China. A chirally-coupled-ring fiber with a center, a side and a ring core is proposed for phase-dependent generation and stable transmission of orbital angular momentum, which is analyzed by coupled-mode analysis and verified by numerical simulations.

Isolating backward Raman signal in high-power narrow-band MOPA fiber laser using CTFBGs, Zefeng Wang1, Meng Wang1, Penglei Ma1, Hu Xiao1, Hanwei Zhang1, Xiaoling Wang1, Jianbo Chen1, National Univ of Defense Technology, China. Here, we firstly report the SRS suppression in high-power narrow-band MOPA fiber lasers using chirped and tilted fiber Bragg gratings (CTFBGs). Experimental results show that traditional bulky isolators can be replaced by compact CTFBGs.

Influence of buffer gas on the absorption characteristics of CO2 in hollow-core fibers, Ziyun Li1, Yulong Cui1, Zhijue Zhou2, Wei Huang1, Hao Li1, Zefeng Wang1, National Univ of Defense Technology, China. Here, we firstly study the influence of buffer gas on the absorption characteristics of CO2 in hollow-core fibers, paving the way toward high-power mid-IR fiber gas lasers.

Partially spatially coherent light source for imaging through opacity, Zhaowang, Rui Ma1, Wen Yu Wang1, Xiaoyu Wu1, Ze Wen Cui1, Hong Yang Zhu1, Jun Liu1, Wei Li Zhang1, Univ of Electronic Science & Tech China, China; Shen Zhen Univ., China. Imaging through opacity using a partially spatially coherent light source is enabled by using the proposed wavelength dependent speckle multiplexing, which broadens the space of effective candidate light sources for the speckle-correlated imaging.

Ultrafast laser inscription of fiber Bragg gratings with low polarization dependent loss, Xihen Xu1, Jun He1, Changrui Liao1, Yiping Wang1, Shenzhen Univ, China. We proposed FBGs with a low polarization dependent loss inserted using three methods based on femtosecond laser, i.e., a phase mask, a point-by-point (PbP) technology, and a PbP technology with a slit beam shaping method.

A novel COTS based Sagnac interferometer for a single beam anti-counterfeiting system, Jiechen He1,2, Naiqiu Sun1,3, Jianan Li3, Kenneth K. Wong4, Calvin Chun-Kit Chan1, Litong Li5, Ming Tang1, Deming Liu1, Huazhang Univ. of Sci. & Tech, China; The Hong Kong Polytechnic Univ, Hong Kong, China; Tianjin Univ, China; The Chinese Univ. of Hong Kong, Hong Kong, China. State Key Laboratory of Optical Fiber and Cable Manufacture Technology, Yangtze Optical Fiber and Cable joint stock limited company, China. Impact of 2D-BMD parameters on the denoising performance has been fully analyzed for denoising optimization in 100.8km BOTDA 12.2dB SNR improvement has been achieved without much loss of accuracy and spatial resolution.

The influence of incident-Light Field Distribution on High-Speed Response Characteristic of UTC Photodetector, Chaozheng Xiao1, Yongqiang Huang1, Huayun Zhi1, Huijuan Niu1, Xiaofeng Du1, Kai Li1, Yu Yang1, Xiaomin Ren1, State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. The effect of the incident-light field distribution on the electric-field and carrier distribution in the InGaAs P-I-N photodiode is analyzed, and a 10-μm UTC-PD achieved 3dB bandwidth 69.86GHz under 1V bias, increased about 12%.

Multi-band Frequency Conversion Scheme Employing Single Optical Frequency Comb, Xiang Li1, Yongfeng Wei1, Xiaoli Liu1, Inner Mongolia Univ., China. Abstract: A novel multi-band frequency conversion scheme employing single optical frequency comb is proposed. Results show that the scheme can cover 5 to 20 bands and realize cross-band frequency conversion.

Compact Five-mode De-multiplexer based on Grating Assisted Asymmetric Directional Couplers, Simei Mao1, Lirong Tu1, 1State Key Laboratory of Optical Fiber and Cable Manufacture Technology, Yangtze Optical Fiber and Cable Manufacture Technology, China; 2ZTE Corporation, China. A novel five-mode de-multiplexer based on FBGs is presented. The insertion loss is less than 0.31 dB at 1550 nm and its 3-dB bandwidth is over 100 nm.
Monday, 26 October

**Poster Room**

M4A.129  Ultra-broadband Power Splitter using subwavelength grat- ing, Ting Yu, Yingjie Liu, Ke Xu; 1Harbin Inst. of Technology, China. A silicon-based ultra-broadband power splitter is pro- posed using a subwavelength grating (SWG) structure. The bandwidth of loss is less than 0.2dB over the 1.55-μm wave- band and 2-μm waveband, the total bandwidth is over 500nm.

M4A.130  Supercontinuum Generation in Silicon-Organic Hybrid Slot Waveguide Assisted by a Weak CW Trigger, Kangzhu Zhou,1 Harbin Inst. of Technology, China. We numerically demonstrate supercontinuum generation in the silicon-organic hybrid wave- guide can be improved significantly by a weak CW trigger. The CW-triggered supercontinuum exhibits a broader spectrum with a higher degree of temporal coherence.

M4A.131  Inverse design of integrated four-channel mode multiplexer with dual polarizations, Yingjie Liu, Yong Yao, Jinbing Du, Ke Xu; 1Harbin Inst. of Technology (Shenzhen, China; 2Shanghai Jiaotong Univ., China. A four-channel and dual polarization mode (de)multiplexer is designed with a compact footprint of 6.8 x 6 μm. The insertion loss and crosstalk are less than 1.2 dB and ~17 dB for all channels.

M4A.132  Efficient and Compact InGaAsP/Si Nanobeam Electro-optical Modulator Based on Hybrid MOS Structure, Jin Xu, An He; 1Lanzhou Univ., China. We have designed a CMOS-compatible mode TE, and TE, mode exchange device based on adjacent and level set inverse design method. The mode conversion efficiencies are both above 93% for TE, and TE, TE, process.

M4A.133  Ultra-compact and Scalable Optical Mode Multiplexer by Adjoint-based Inverse Design Method, Hengquan Guo,1,2, Ninghua Zhu,1,2; 1Peking Univ., China. We numerically demonstrate that the property of picosecond pulse pumped mid-IR supercontinuum in a silicon waveguide can be improved by a weak CW trigger.

M4A.134  Design of an Optical Phased Array with Low Side-lobe Level and Wide-angle Steering Range Based on Particle Swarm Optimization, Xinhu Zou,1,2, Ruohan Liu,1,2, Zhouchen Chen,1,2, Xinlin Su,1,2, Shuhui Bo,1,2, Zhihua Li,1,2, Qingguang Tani,1,2, Yang Gu,1,2, Jiayuan Zhao,1,2, Xiuyou Han; 1Peking Univ., China. We propose a SiN-Si Dual-layer Directional Coupler, the coupler ratio achieved from 0% to 97%. It can demonstrate that the property of picosecond pulse pumped mid-IR supercontinuum in a silicon waveguide can be effectively improved by a weak CW trigger.

M4A.135  Broadband Nonvolatile Tunable Mode-order Converter based on Silicon and Optical Phase Change Materials Hybrid Meta-structure, Haowang Chen,1,2, Tao Wang,1,2, Jianhong Yang,1,2, Hao Ji; 1Lanzhou Univ., China. We numerically demonstrate that the property of picosecond pulse pumped mid-IR supercontinuum in a silicon waveguide can be effectively improved by a weak CW trigger.

M4A.136  Research on beam shaping based on grating bars, Canghong Xie; 1,2, Yongqing Huang,1,2, Yuqing Yang,1,2, Huijuan Niu,1,2, Xiaofeng Duan,1,2, Kai Li,1,2, Xiaomin Ren; 1,2, BUPT, China. We realize the change materials hybrid meta-structure to achieve nonvolatile arbitrary-ratio power splitting ratios based on a directional coupler with subwavelength grating bars. The simulation results show that arbitrary power splitting can be achieved over a broad bandwidth ~120 nm.

M4A.137  Research on beam shaping based on grating bars, Canghong Xie; 1,2, Yongqing Huang,1,2, Yuqing Yang,1,2, Huijuan Niu,1,2, Xiaofeng Duan,1,2, Kai Li,1,2, Xiaomin Ren; 1,2, BUPT, China. We realize the change materials hybrid meta-structure to achieve nonvolatile arbitrary-ratio power splitting ratios based on a directional coupler with subwavelength grating bars. The simulation results show that arbitrary power splitting can be achieved over a broad bandwidth ~120 nm.

M4A.138  Broadband Silicon Arbitrary Ratio Power Splitters based on Directional Couplers with Subwavelength Structure, Shuangchen Luo,1,2, Yejun Zhang,1,2, Jiaoqing Pan,1,2; 1Inst. of Semiconductors, Chinese Academy of Sciences, China; 2Center for Optical and Electromagnetic Research, University of Chinese Academy of Sciences, China. We propose a 1×2 power splitter enabling arbitrary splitting ratios based on a directional coupler with subwavelength grating bars. The simulation results show that arbitrary power splitting can be achieved over a broad bandwidth ~120 nm.

M4A.139  A SiN-Si Dual-layer Directional Coupler, Jianbin Ma1,2, Xuecheng Guo1,2, Pingfei Wang1,2, Ruiting Wang1,2, Zhengkai Yang1,2, Xuliang Zhou1,2, Yisu Yang1,2, Xuliang Zhou1,2, Yejin Zhang1,2, Jiaoqing Pan1,2; 1State Key Lab of Modern Optical Instrumentation, University of Chinese Academy of Sciences, China; 2State Key Lab of Advanced Optical Communication Systems and Networks, University of Electronic Science and Technology of China. We propose a 1×2 power splitter enabling arbitrary splitting ratios based on a directional coupler with subwavelength grating bars. The simulation results show that arbitrary power splitting can be achieved over a broad bandwidth ~120 nm.

M4A.140  Dual-mode arbitrary-ratio power splitter based on a Tbranch embedded with nanoholes, Zhangqiu Zhong1,2, Yingjie Liu,1,2, Ke Xu; 1Harbin Inst. of Technology (Shenzhen, China. A dual-mode power splitter with arbitrary-ratio is designed via a T-branch embedded with nanoholes. The device can operate from 1500 to 1600 nm with excess losses < 0.42 dB and inter- mode crosstalks < 15.64 dB.

M4A.141  Broadband Silicon Arbitrary Ratio Power Splitters based on Directional Couplers with Subwavelength Structure, Shuangchen Luo,1,2, Yejun Zhang,1,2, Jiaoqing Pan,1,2; 1Inst. of Semiconductors, Chinese Academy of Sciences, China; 2Center for Optical and Electromagnetic Research, University of Chinese Academy of Sciences, China. We propose a 1×2 power splitter enabling arbitrary splitting ratios based on a directional coupler with subwavelength grating bars. The simulation results show that arbitrary power splitting can be achieved over a broad bandwidth ~120 nm.

M4A.142  A SiN-Si Dual-layer Directional Coupler, Jianbin Ma1,2, Xuecheng Guo1,2, Pingfei Wang1,2, Ruiting Wang1,2, Zhengkai Yang1,2, Xuliang Zhou1,2, Yisu Yang1,2, Xuliang Zhou1,2, Yejin Zhang1,2, Jiaoqing Pan1,2; 1State Key Lab of Modern Optical Instrumentation, University of Chinese Academy of Sciences, China; 2State Key Lab of Advanced Optical Communication Systems and Networks, University of Electronic Science and Technology of China. We propose a 1×2 power splitter enabling arbitrary splitting ratios based on a directional coupler with subwavelength grating bars. The simulation results show that arbitrary power splitting can be achieved over a broad bandwidth ~120 nm.

M4A.143  Low Half-wave-voltage Thin Film LiNbO3 Electro-optic Mod-ulator Based on a Compact Electrode Structure, Xuecheng Liu,1,2, Bing Xiong,1,2, Changhe Sun,1,2, Zhihao Hao,1,2, Lai Wang,1,2, Jin Wang,1,2, Yanjun Han,1,2, Hongtao Li,1,2, Jiadong Yu,1,2, Yi Luo,1,2, Tinghua Univ., China. We numerically demonstrate that the property of picosecond pulse pumped mid-IR supercontinuum in a silicon waveguide can be effectively improved by a weak CW trigger.

M4A.144  Ultra-compact and Scalable Optical Mode Multiplexer by Adjoint-based Inverse Design Method, Hengquan Guo,1,2, Ninghua Zhu,1,2; 1Peking Univ., China. We numerically demonstrate that the property of picosecond pulse pumped mid-IR supercontinuum in a silicon waveguide can be effectively improved by a weak CW trigger.

M4A.145  Inverse design of integrated four-channel mode multiplexer with dual polarizations, Yingjie Liu, Yong Yao, Jinbing Du, Ke Xu; 1Harbin Inst. of Technology (Shenzhen, China; 2Shanghai Jiaotong Univ., China. A four-channel and dual polarization mode (de)multiplexer is designed with a compact footprint of 6.8 x 6 μm. The insertion loss and crosstalk are less than 1.2 dB and ~17 dB for all channels.

M4A.146  Broadband Silicon Arbitrary Ratio Power Splitters based on Directional Couplers with Subwavelength Structure, Shuangchen Luo,1,2, Yejun Zhang,1,2, Jiaoqing Pan,1,2; 1Inst. of Semiconductors, Chinese Academy of Sciences, China; 2Center for Optical and Electromagnetic Research, University of Chinese Academy of Sciences, China. We propose a 1×2 power splitter enabling arbitrary splitting ratios based on a directional coupler with subwavelength grating bars. The simulation results show that arbitrary power splitting can be achieved over a broad bandwidth ~120 nm.

M4A.147  A SiN-Si Dual-layer Directional Coupler, Jianbin Ma1,2, Xuecheng Guo1,2, Pingfei Wang1,2, Ruiting Wang1,2, Zhengkai Yang1,2, Xuliang Zhou1,2, Yisu Yang1,2, Xuliang Zhou1,2, Yejin Zhang1,2, Jiaoqing Pan1,2; 1State Key Lab of Modern Optical Instrumentation, University of Chinese Academy of Sciences, China; 2State Key Lab of Advanced Optical Communication Systems and Networks, University of Electronic Science and Technology of China. We propose a 1×2 power splitter enabling arbitrary splitting ratios based on a directional coupler with subwavelength grating bars. The simulation results show that arbitrary power splitting can be achieved over a broad bandwidth ~120 nm.
M4A.147

Optical Neural Networks of Handwriting Recognition Using Optical Scattering Unit System, Xinlin Long1, Ji Guo1, Ran Hao1, Xiaowen Dong1, Chong Li1, Jianjun He1; Zhejiang Univ., China; 2HuaWei Technologies Co., Ltd., China. We simplify the classic convolutional neural network (CNN) of handwriting recognition — LetNet-5, and achieve classification based on the dataset MNIST by using an interconnected system of inverse-designed optical scattering units.

M4A.148

Neuromorphic Reservoir Computing System Using a Semiconductor Nanolaser with Double Phase Conjugate Feedbacks, Xiongge Guo1, Shuying Xiang1, Yan Qu1, Yanan Han1, Aiyun Wen1, Yue Hao1, Aijian Univ., China. A neuromorphic reservoir computing (RC) system using a semiconductor nanolaser (SNL) with double phase conjugate feedbacks (PCF) is proposed for the first time and demonstrated numerically, and enhanced performance can be obtained.

M4A.149

Analysis of Carrier Transportation in High Power Uni-Traveling-Carrier Photodiodes based on Self-Consistent Monte Carlo Model, Jinchao Zhang1, Bing Xiong1, Yi Luo1, Changsheng Sun1, Zhizhao Hao1, Jian Wang1, Lai Wang1, Yanjun Han1, Hongtao Li1; Beijing National Research Centre for Information Science and Technology, Tsinhua Univ., China. A self-consistent Monte Carlo model is proposed for the analysis of carrier transportation in high power uni-traveling-carrier photodiodes. Simulation results are in good agreement with experimental measurements.

M4A.150

Comprehensive Design Method of MUTC-PD for Terahertz Applications, Enfei Cao1, Bing Xiong1, Changsheng Sun1, Zhizhao Hao1, Jian Wang1, Lai Wang1, Yanjun Han1, Hongtao Li1; Beijing National Research Centre for Information Science and Technology, Tsinhua Univ., China. A novel modified uni-traveling-carrier photodiode has been carefully designed by a comprehensive design method which includes a physically-based energy-balance model and an accurate circuit model. The simulated 3-dB bandwidth reaches 180 GHz for 3-μm-diameter device.

M4A.151

An Ultra-compact Broadband TE-pass Nanofocusing Structure, Kejian Zhu1, Pengfei Xu1, Pengfei Sun1, Xingpeng Liu1, Haiou Li1, Zhiping Zhou1, Peking Univ., China; 2Guilin Univ. Of Electronic Technology, China. We propose a broadband struc- ture which integrates polarization and nanofocusing functions into a single device with 3.8×4 μm^2 footprint. The bandwidth is over 200 nm with insert loss (IL) smaller than 1.68 dB.

M4A.152

Realization of a Heterogeneous Laser Beam Array Based on Grating Module, Yaqi Liu2, Zhizhao Hao2, Lai Wang3, Bing Xiong4, Changsheng Sun2, Jian Wang2, Hongtao Li2, Yanjun Han1, Li Yue2; Department of Electronic Engineering, Tsinghua Univ., China; 2Beijing National Research Centre for Information Science and Technology, China. A binary phase grating with partially opaque region is proposed based on Boolean operation and Gerchberg-Saxton (GS) algorithm, providing an inner-dense and outer-sparse laser beam array for fovea vision detection in LIDAR system.

M4A.153

High-Speed InGaAs/InAlAs Avalanche Photodiode with Low Dark Current, Rui wang1, Xiaohong Yang 1,2, Hui Wang1,2, Tingting He1,2; 1Inst. of Semiconductors, Chinese Academy of Sciences, China; 2College of Materials Science and Opto-Electronic Technology, Univ. of Chinese Academy of Sciences, China. We report an InGaAs/InAlAs avalanche photodiode with a bandwidth of 18GHz at M=10 and a low dark current of 0.3nA at 0.9 breakdown voltage which can be applied in 25Gb/s optical fiber communication systems.

M4A.154

Silicon Photonic Vertical Few-mode Fiber Interface Designed by Adjoint Optimization, Lirong Cheng1,vinei Mao1, Xin Mu1, Qian Li1, Haiyu Fu1, Tsinghua Univ., China; 2Peking Univ., China. We propose a vertical few-mode fiber interface on silicon photonics. Compact mode converter and non-uniform grading laser coupling supporting both LP_{01} and LP_{11} modes are demonstrated using adjoint optimization.

M4A.155

Fabrication of high-Q Ge$_2$Sb$_2$Se$_5$ chalcogenide microring resonators in telecomband band, Zhen Yang1, Mingyue Zhao1, Rihenzhang1, Peipeng Wang1, Rongxing Wang1, Ningbo Univ., China. We fabricated a Ge$_2$Sb$_2$Se$_5$ chalcogenide microring resonators with an intrinsic quality factor of 3.9×10^7, which corresponds to a propagation loss of 3.4 dB/cm. The nonlinear coefficient was determined to be=122 W$^{-1}$m$^{-1}$.

M4A.156

Two-photon Absorption in C-band Commercial FP Laser Diode for the Detection at 2 μm Wavelengths, Yuanhe Qu1, Di Ji1, Yan Xu1, Xuewen Li1, Nan Ye1, Fufei Pang1, Yingxiong Song1; Shanghai Univ., China. We have realized the 2-μm wavelength detection based on the two-photon absorption from a commercial C-band FP laser at the -1 V bias. The 0.2 μA photocur- rent can be observed benefiting from the cavity resonance.

M4A.157

A Low-Loss High-Directionality Grating Coupler for Integra- tion of An Injection-Locked VCSL on Silicon Photonics, Yisu Yang1, Hao Lei1, Yongqing Huang1; 2Beijing Univ. of Posts and Telecommunications, China. We propose an injection-locked VCSL on silicon photonics through a grating coupler to enhance the injection directionality. The measured coupling efficiency of the coupler is -2.5 dB at 1546.8 nm under 10$^{-1}$ incidence.

M4A.158

Wafer-level automatic testing of DBS lasers with active distributed reflector, Lei Xu1, Jialin Yan1, Gonghui Lu1, Xiang Ma1, Fan Yang1, Qiaoyin Lu1, Mingzhi Lu1, Weihua Guo1,2; 1Wuhan National Lab for Optoelectronics, China; 2Ningbo On-chip Optoelectronics Technology LTD, China. We achieved the wafer-level automatic testing of DBS lasers with active distributed reflector. We can test the entire two-inch wafer with nearly 18000 lasers in about 3 hours, i.e. 0.6 seconds for single laser test.

M4A.159

Ultra-Compact Bandwidth Tunable Filter via Subwavelength Grating-Assisted Contra-Directional Coupler Employing Changing Double Grating Arrays Perturbations, Yuan Wang1, Zixian Zhao1, Kangnian Wang1, Xuan Guo1, Yikai Su1; Shanghai Jiao Tong Univ., China. An ultra-compact tunable filter based on subwavelength grating and taper waveguides with double grating arrays perturbations has been proposed. The bandwidth tunability of ~7.6 nm is achieved with a coupling length of only 60 μm.

M4A.160

High-Q chalcogenide Ge$_2$Sb$_2$Se$_5$ photonic crystal nano-beam cavities, Mingyue Zhao1, Zhen Yang1, Rihenzhang1, Peipeng Wang1, Ningbo Univ., China. We design and fabricate a photonic crystal (PC) nanobeam cavity on the chalcogenide glass Ge$_2$Sb$_2$Se$_5$ platform. A high quality (Q) factor of 1.2×10$^6$ in the fabricated devices is achieved.

M4A.161

Research on High-speed and Saturation Characteristics of Low-bias Cascade Uni-traveling Carrier Photodiode Ar- ray, Jiaowu Du1, Yongqing Huang1, Dan Yang1, Doudou Wu1, Xiaofeng Duan1, Kai Liu1, Yisu Yang1, Xiaomai Ren1; 1State Key Laboratory of Information Photonics and Optical Com- munications, Beijing Univ. of Posts and Telecommunications, China. The performance of a low-bias cascade uni-traveling carrier photodiode (UTC-PD) array was studied. Compared with the single UTC-PD, the cascade UTC-PD array can increase the 3-dB bandwidth by 47.5% and has better DC saturation performance.

M4A.162

Optimization of Tunable Semiconductor V-cavity Laser for Analog Application, DANDI ZHU1, Jianjun He1; Zhejiang Univ., China. We report a tunable semiconductor v-cavity laser with optimized modulation section length for analog applica- tion. The input third order intermodulation intercept of the optimized laser has been improved by 3.2 dB.

M4A.163

Lorentzian linewidth of electro-optically tuned multi-channel interference widely tunable laser, Wang K. kuan1, Miao Zhang1, Quanan Chen1, Chong Jiang1, Qiaoyin Lu1, Weihua Guo1; 1Zhejiang Univ. of Science and Technology, Wuhan National Laboratory for Optoelectronics &School of Optical and Electronic Information, China. Lorentzian linewidth of electro-optically tuned multi-channel interference widely tunable laser has been demonstrated to be less than 350 kHz in the entire tuning range.

M4A.164

HR-AR-coated DBF Laser Array with High Wavelength Uni- formity, Gen Lu1,2, Ruile Xiao1, Yadong Zhou1, Zhenxing Sun1, Tao Fang1, Xiangfei Chen1; 1Changzhou Inst. of Technology, China; 2Key Laboratory of Intelligent Optical Sensing and Manipulation of the Ministry of Education & National Laboratory of Solid State Microstructures & College of Engineering and Applied Sciences & Inst. of Optical Communication Engineering, Nan- jing Univ., China. We proposed an 8-wavelength HR-AR-coated DBF laser array with uniform wavelength spacing of 0.8 nm. By injecting different currents into the two-section structure, random facet phase is compensated and lasing wavelength can be finely tuned.

M4A.165

Optical 90° Hybrid Based on a 2×4 MML coupler Integrated with a Parallel 2×2 MML Coupler, Xiaoyang Dai1, Gongsun Yan1, Quan Yuan1, Lai Wang1, Weihua Guo1,2; Wuhan National Laboratory, China; 1Semiconductor Photonics Group, School of Physics and CRAANN, Trinity College, Ireland. We propose an optical 90° hybrid with deformed MML coupler. The fabricated hybrid exhibited the excess loss ~1dB, CMRR >20dB and phase deviation <7° with the wavelength range from 1525nm to 1570nm.

M4A.166

Efficient Silicon Nitride Grating Coupler with Silicon Reflec- tor at Near-Infrared Wavelengths, Min Li1, Daigao Chen1, Xia Hu1, Peng Feng1, Xi Xiao1; NOEDC, China. A high efficiency double layer grating coupler at near-infrared wavelengths is proposed for the first time. The experimental peak coupling efficiency and 1-dB bandwidth of the grating coupler are 2.78 dB and 32 nm, respectively.
M4A.176
Four-channel Optical Add-drop Multiplexer Based on Traveling Wave-like Fabry-Perot Nanocavities, Qiang Liu1,2, Chencheng Mei1, Ying Zhang1, Desheng Zeng1, Weni Li1, Linghong Huang1,2, Huazhong Univ. of Sci. and Tech., China.

M4A.177
Flat-top CWDM Using Narrow Straight Directional Couplers on LN Thin Film, Hao Li1,2, Sun Yat-sen Univ., China. A flat-top 4-channel wavelength-division multiplexer on Lithium Niobate thin film is designed and manufactured. By utilizing cascaded MZI filters and narrow straight directional couplers, the -3 dB bandwidths are ~12 nm for all channels.

M4A.178
Novel silicon polarization beam splitter at 2 μm, Xinyu Liu1,2, Daxiong Dai1, Zhejiang Univ., China. A silicon polarization-beam splitter at 2 μm is realized by using a bent coupler assisted with a nano-slot waveguide, which has a high extinction ratio of >15dB and a low loss of <5.5dB over a broad band.

M4A.179
A densely integrated micro-ring optical switch network for beam steering, Guangming Luo1,2, Pengfei Wang2, Hongyan Yu1, Xuliang Zhou1,3, Jieqi Yang4, Inst. of Semiconductors, CAS, China; 4Center of Materials Science and Optoelectronics Engineering, Univ. of Chinese Academy of Sciences, China. We proposed an 1×100 micro-ring switch network for beam steering, which has a more compact structure and excellent performance than it based on a Mach-Zehnder switch array.

M4A.180
Arrayed Vortex Mode Demultiplexer Based on Spiral Transformation for Dense Space Division Multiplexing, Xuanke Feng1, Zhongsheng Lin1, Jie Zhang1,2, Jin Guo1,2, Inst. of Semiconductors, CAS, China; 2Center of Materials Science and Optoelectronics Engineering, Univ. of Chinese Academy of Sciences, China. We designed a hexagonal arrayed OAM demultiplexer based on spiral transformation to match the output of a seven-core ring-core fiber, and fabricated the phase plates as diffractive optical elements on quartz plates.

M4A.181
Broadband 2×2 Polarization Splitter-Rotator Based on an Adiabatic Asymmetric Directional Coupler on the Lithium-Niobate-on-Insulator, Le Zhang1,2, Shanglin Yang2, Gaolu Zhang2, Xin Fu1, Le Zhang3, Lin Yang2,3, Inst. of Semiconductors, CAS, China; 2Center of Materials Science and Optoelectronics Engineering, Univ. of Chinese Academy of Sciences, China. A 2×2 polarization splitter-rotator utilizing adiabatic asymmetric directional couplers are proposed on the lithium-niobate-on-insulator. The device exhibits broadband performance and is suitable for both TE and TM polarization diversity systems.

M4A.182
Photonic Generation of Linearly Chirped Microwave Waveform Based on an Integrated Multiwavelength Distributed Feedback Lasers, Yubin Li1,2, Wu Zhao1, Huan Wang2, Yu-anteng Mao2, Dan Lu1,2, Jiang Kani1,2, Inst. of Semiconductors, CAS, China; 2Center of Materials Science and Optoelectronics Engineering, Univ. of Chinese Academy of Sciences, China. A simple method for photonic generation of linearly chirped microwave waveforms using an integrated multiwavelength laser has been demonstrated with the bandwidth of 4.8 GHz and time-bandwidth product of 4.8 × 10⁴.

M4A.183
Multimode WDM (De)Multiplexer Based on Multimode Contra-Directional Coupling Using Dielectric Etches, Yaotian Zhao1, Xuhan Guo1, Yikai Su2, Shanghai Jiao Tong Univ., China. We present a four-channel flat-top coarse wavelength-division multiplexing (CWDM) (de)multiplexer employing contra-directional coupling between multiple modes simultaneously with shallow etched dielectric etches in a single multimode waveguide. -

Poster Room
M4A.185 Deep-reinforcement-learning-assisted network orchestration for VNF-SC provisioning in inter-DC elastic optical networks, Qi Chen1, Min Zhu2, Tianyu Shen1, Jiahua Gu1, Chunping Yan1, Pingping Gu1; School of Electronic Science and Engineering, Southeast Univ., China; National Mobile Communications Research Laboratory, Southeast Univ., China; TAIWAN T&W Electronics Co. Ltd., China; Purple Mountain Laboratories, China. We propose a deep-reinforcement-learning (DRL)-based virtual network function (VNF) provisioning algorithm which guarantees efficient VNF reusing while consuming lower spectrum resource. The simulation results show the proposed algorithm can achieve better performance than heuristics.

M4A.186 Subchannel and Power Allocation for NOMA-Based Satellite Networks, Qingyuan Liu1, Qi Zhang2, Yufen Shen1, Ying Tao1, Dong Chen1, Wei Zhang1, Feng Tian2, Qinghua Tian1, Yongjun Wang1, Qingcheng Yang1, Jinhong Liu2, Beijing Univ. of Posts and Telecommunications, China; China Academy of Space Technology, China; China Satellite Communications Co., Ltd., China. A resource allocation method based on matching theory and a difference-of-two-convex-functions programming approach is proposed for satellite networks. Numerical results show that this method can balance system capacity and user fairness.

M4A.187 Routing, Wavelength and Time-Slot Assignment Approaches with Security Level in QKD-Enabled Optical Networks, Weike Ma1, Ling Liu1, Bowen Chen1,3, Mingyi Gao1, Hong Chen1, Jinhong Wu1, Soochow Univ., China; Suzhou LZY Technology Co., Ltd., China. We develop two routing, wavelength, time-slot assignment (RWTA) approaches to improve overall network security performance and quantum key utilization by considering different security levels. Simulation results show the effectiveness of our proposed approaches.

M4A.188 Crosstalk-Aware Routing, Core, and Wavelength Assignment in MCF-based SDM-QKD Optical Networks, Haibin Huang1, Yushu Zhang1, De Zhang1, Guanghong Liu1, Information Science Academy, China Electronics Technology Group Corporation, China; A crosstalk-aware routing, core, and wavelength assignment mechanism is proposed for MCF-based SDM-QKD optical networks. The simulation results show that the accept ratio of requests is efficiently improved.

M4A.189 Profit-Aware Virtual Optical Network Mapping in Space-Division-Multiplexing Elastic Optical Networks, Qi Chen1, Yufen Jian1, Bowen Chen1,3, Qiang Wang2, Mingyi Gao1, Hong Chen1, Jinhong Wu1, Soochow Univ., China; Applied Technology College of Soochow Univ., China; Suzhou LZY Technology Co., Ltd., China. This paper proposes two profit-aware virtual optical networks (VONs) mapping approaches in space-division-multiplexing elastic optical networks (SDM-EONs). Simulation results show that the proposed VONs mapping approach based on link resource set can achieve better performance.

M4A.190 A Wavelength Assignment Scheme for QKD-Based Dynamic IDC Networks over Multicore Fiber without Affecting the Coexisting Conventional Service, xianglong jia1, Yongmei Sun1,3, Jianing Niu1, Beijing Univ. of Posts & Telecomm., China. To guarantee security of IDC networks, we propose a heuristic wavelength assignment algorithm to transmit quantum signals by recycling wavelength fragments, through which QKD is integrated into IDC networks over MCF without affecting data services.

M4A.191 Modulation Format Identification and Transmission Quality Monitoring for Link Establishment in Optical Networks Using Machine Learning Techniques, Jie Hong1, Long Chen1, Jiao Zhu1, Shenzhen Zhou1, Bo Li1, Long Wang1, Hainan Power Grid Co., Ltd., China; Digital Grid Research Inst., China Southern Power Grid, China. We propose and experimentally demonstrate a novel cost-effective and distributed optical performance monitor by employing Gaussian process regression for OSNR monitoring and support vector machine for modulation format identification simultaneously in optical network link establishment.

M4A.192 Optimization of time error in large scale synchronization network via algorithm of quantum annealing method, Bo Li1, Technology and Standard Institution, China Academy of Information and Communication Technology, China; optimal combination problem for time error in synchronization network is proposed, formulated to quadratic binary models and solved via quantum annealing which shows better experimental results of optimal performance and time comparing with simulated annealing.

M4A.193 Routing and Key Assignment for Secure Multicast Services in Quantum Satellite Networks, Xinyi He1, Lin Li1, Yongli Zhao1, Yajie Li1, Xiaosong Yu1, Jie Zhang1, Beijing Univ. of Posts and Telecomm., China. A routing and key assignment algorithm is first proposed for secure multicast services in Low-Earth-orbit (LEO) quantum satellite networks, which is evaluated in terms of secure probability compared with the benchmark algorithm.

M4A.194 A Dynamic Planning Algorithm based on Q-Learning Routing in SDON, Jinkun Shang1, Hui Li1, Xiangkun Man1, Fang Wu1, JiaWei Zhao4,1, Xiaomei Ma3, Beijing Univ. of Posts and Telecommunications, China; Beijing Laboratory of Advanced Information Networks, China; Network Technology Research Inst., China Unicom, China; Beijing Key Laboratory of Network System Architecture and Convergence, China; China United Network Communications Corporation Limited, China. This paper introduces an adaptive routing algorithm based on Q-learning in the SDON controller, which effectively realizes dynamic load balancing and reduces the risk of congestion in the optical transmission network.

M4A.195 Intensity Modulation and Heterodyne Coherent Detection based 100 Gbit/s A DMT-PON System, Wei Wang1,2, Li Zibin1, Zou Dongdong1, Xingwen Yi1, Zhaohui Li1, Fan Li1,2, Sun Yat-Sen Univ., China. The 100 Gbit/s A DMT PON is demonstrated based on intensity modulation and heterodyne coherent detection. And both CPE and RFP based schemes are discussed and compared for phase noise compensation. The power budgets after 10-km and 20-km SMF transmission without dispersion management with RFP method are 35-dB and 32.9-dB, respectively.

M4A.196 Reconfigurable Network Topology Based on Deep Reinforcement Learning in Software-Defined Data-Center Networks, Wen Yang1, Bingli Guo1, Yu Shang1, Shangguo Huang2, Beijing Univ. of Posts and Telecomm., China; CyberSpace Security Key Laboratory of Sichuan Province, China. In this paper, a Deep-Reinforcement-Learning (DRL) agent is implemented and evaluated to enable dynamic topology reconfiguration according to traffic fluctuations and proposes to minimize the network delay.

M4A.197 Transfer learning aided concurrent multi-alarm prediction in optical transport networks, Bing Zhang1, Yongli Zhao1, Yajie Li1, Jie Zhang1, Beijing Univ. of Posts and Telecomm., China. Using transfer learning for concurrent multi-alarm prediction in optical transport networks, we assess prediction precision, data volume, and model training time. The method can effectively improve the efficiency of prediction while maintaining accuracy.

M4A.198 Layered Graph based Routing and Spectrum Assignment for Multicast in Fixed/Flex-grid Optical Networks, Qinfeng Zhu1, Xiaosong Yu1, Yongli Zhao1, Jie Zhang1, Beijing Univ. of Posts & Telecom, China. We propose a layered graph based routing and spectrum assignment algorithm for multicast by considering distance-adaptive modulation in fixed/flex-grid optical networks. Simulation results show the good performance of the proposed algorithm.

M4A.199 All-optical Pattern Recognition of QPSK Signals for High Speed Optoelectronic Firewalls, Qian Zhang1, Xiaoue Gong1, Lei Guo1, Changesing Univ. of Posts and Telecommunications, China; Northeastern Univ., China. We propose and simulate a pattern recognition system of QPSK signals for all-optical high speed optoelectronic firewalls. Arbitrary target pattern can be recognized and a baud rate of 200 Gbaud can be achieved.

M4A.200 Dynamic Time-Aware Path Optimization Scheme in TDM based Quantum Key Distribution Optical Networks, Xinyang Li1, Xiaosong Yu1, Yongli Zhao1, Ya-Jie Li1, Jie Zhang1, Beijing Univ. of Posts & Telecom, China. A dynamic time-aware path optimization algorithm is proposed to re-configure established services in TDM based quantum key distribution optical networks. Simulation shows it has good performance in terms of success rate of QKD services.

M4A.201 Dynamic Secret-Key Assignment in QKD Access Networks (QAN), Hua Wang1, Yongli Zhao1, Xiaosong Yu1, Liquan Chen1, Jie Zhang1, Beijing Univ. of Posts and Telecom, China; Southeast Univ., China. We propose an architecture of QKD access networks (QAN) and a dynamical secret-key assignment (DSA) scheme for multiple edge users. Simulation results show that the DSA can effectively provide secret keys with less queuing time.
Poster Room

M4A.202 Satellite Backbone Ring Network with D-topology based on Sparse Configuration Arrayed Waveguide Grating, Li Yang1, Yixiao Zhu1, Longsheng Li1, Zhong Gou1, Weisheng Hu1, Shanghai Jiao Tong Univ., China. A novel architecture for satellite backbone network with D-topology is presented, where the ROADM nodes are based on arrayed waveguide grating with loop-back optical paths. © 2020 The Author(s)

M4A.203 Low-Cost Free-Space-Optical Communication System with Federated Learning-based Channel Prediction, Donglin Xue1, Pengzhao Han1, Yajing Liu1, Zijie Sha1, Hejun Lu1, Lei Guo1, 1School of Computer Science and Engineering, Northeastern Univ., China; 2School of Communication and Information Engineering, Changjiang Univ. of Posts and Telecommunications, China. A channel prediction scheme based on federated learning is proposed to achieve channel pre-compensation for a low-cost design of FSO communication system. The proposed scheme is demonstrated effective in simplifying system structural and operational cost.

M4A.204 High-Availability and Resource-Efficiency Slicing for Converged Optical-Wireless Access Networks, Lanyu Wu1, Jabin Cui1, Lin Bai1, Yuefeng Ji1, 1Beijing Univ. of Posts & Telecomm, China. A high-availability slicing scheme is proposed to establish NG-RAN slicing with ILM model and heuristics. Simulation results show that heuristics can effectively improve the slice availability and produce solutions that approximate well the optimal ILM.

M4A.205 Multi-Objective Routing and Resource Allocation Based on Reinforcement Learning in Optical Transport Networks, Xin Li1, Yongli Zhao1, Taise Li1, Sabidtah Ramhan1, Feng Wang1, Xinghua Li1, Jie Zhang1, 1Beijing Univ. of Posts & Telecom, China; 2Sonoma State Univ, USA; 3 Ningxia Electric Power Research Inst., China. We propose a multi-objective routing and resource allocation algorithm based on reinforcement learning in optical transport networks. Results show promising results by achieving the shortest route and by using the least number of wavelength converters.

M4A.206 Deep Reinforcement Learning Enabled Network Routing Optimization Approach with an Enhanced DDPG Algorithm, Lingyu Meng1, Wen Yang1, Bingli Guo1, Shangguo Huang1, 1BUP, China. This paper proposes an enhanced DDPG algorithm solving network routing problem to minimize the average network delay. Simulation results show that the algorithm has good convergence speed improvement in routing optimization.

M4A.207 Cross-domain Interconnection with Time Synchronization in Software-defined Time-Sensitive Networks, Mengjie Guo1, Guochu Shui1, Junjie Xue1, Yihang Hu1, Yaqiong Liu1, Zhigang Guo1, 1Beijing Univ. of Posts and Telecommunications, China. We propose a software-defined Time-Sensitive Networking cross-domain interconnection scheme based on a coordinate controller and conduct a time synchronization experiment. The results show that the scheme is valid in time synchronization.

M4A.208 Performance Evaluation of Distributed Computing over Optical Disaggregated Data Centers, Yinghui Xing1, Cen Wang1, Ting Xu1, Xiang Gao1, Hongxiang Guo1, Jian Wu1, 1Beijing Univ. of Posts & Telecom, China; 2KDDI Research Inc., Japan. We evaluate the performance of two types of distributed computing jobs in optically interconnected disaggregated data centers and show the requirements of minimum bandwidth and local memory on CPU blades to achieve acceptable job-level performance.

M4A.209 Distributed Caching and Lightpath Provisioning in Multi-access Edge Computing based Elastic Optical Networks, Zhichen Guo1, Lin Bai1, Zhen Liu1, Jiaow Zhang1, Yuefeng Ji1, 1Beijing Univ. of Posts & Telecom, China. We propose a distributed caching and lightpath provisioning algorithm to reduce bandwidth consumption and improve storage space utilization in MECEON. Simulation results show that the algorithm can reduce blocking probability and bandwidth consumption.

M4A.210 Towards Low-Latency Distributed Tasks Collaboration by Joint Optimization of Transmission, Computation and Storage Resources Allocation in Edge Computing, Jialong Li1, Nan Hua1, Chen Zhao1, Yanhe Li1, Xiaopeng Zheng1, Bingkun Zhou1, 1Beijing Univ. of Posts & Telecom, China. We propose a collaboration strategy by jointly considering the transmission, computation, and storage resources to reduce the completion time of distributed tasks in edge computing. Results show that over 50% completion time reduction is achieved.

M4A.211 Resource Allocation Algorithm for Multicarrier Non-orthogonal Multi-Access Visible Light Systems, Geyang Wang1, Yingjie Shao1, Lian-Kuan Chen1, Jian Zhao1, 1South China Univ. of Technology, China; 2the Chinese Univ. of Hong Kong, Hong Kong. A novel subcarrier and power allocation algorithm for multicarrier NOMA VLC systems is proposed. Simulation results show that the proposed algorithm exhibits better throughput and user fairness than conventional fixed power allocation and the GPRA algorithm.

M4A.212 Leveraging Brain-like Resource Algorithm to Achieve Efficient Resource Allocation in Datacenter Optical Networks, Guangliang Zha1, Hu Yang1, Yichen Wu1, Yong Jiang1, Huifeng Guo1, Jie Zhang1, 1Beijing Univ. of Posts and Telecom, China; 2Zhejiang Telecommunication Equipment Cooperation, China. This paper proposes a brain-like resource allocation strategy for data center optical networks with high bandwidth demand differences. Experiments show that this strategy can improve bandwidth utilization, reduce network latency and reduce blocking rate.

M4A.213 Provisioning Uninterrupted Satellite Communication Services by Preset-Satellite-Chain (PSC)-Based Seamless Handover, Chen Zhao1, Nan Hua1, Jialong Li1, Xiaopeng Zheng1, 1Department of Electronic Engineering Tsinghua Univ., China; 2Beijing National Research Center for Information Science and Technology (Abbreviation: BNRIst), China. A novel preset-satellite-chain (PSC)-based seamless handover scheme is proposed based on satellite ephemeris. Results show that the proposed scheme can eliminate service outages caused by periodic disconnection of inter-satellite links.

M4A.214 Quantum Noise Diffusion Mapping Based on Chaotic Recurrent Neural Network in Quantum Noise Cipher, Bo Wang1, Ya Je Li1, Chao Lei1, Yongli Zhao1, Jie Zhang1, Xiangqing Wang1, 1State Key Laboratory of Information Photonics and Optoelectronics, China. We introduce a quantum noise diffusion mapping method based on chaotic recurrent neural network in quantum noise cipher system. Simulation results demonstrate the improved security performance in terms of increasing quantum noise masking number. This paper will also present the proposed system obtains better BER performance than conventional QAM scheme.

M4A.215 Quantum-Pilot Carrier Phase Recovery Algorithm with Improved ML for PS-64QAM Systems, Zhiyong Sun1, Jin Hu1, Xueku Xu1, Yueming Li1, Yaqiong Qiao1, 1State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China. The proposed quantum-pilot scheme is investigated to compensate the penalty in a PS-64QAM system, achieving approximately 1 bit/s/Hz gain in lower SNRs.

M4A.216 Quantum-Pilot-Aided Carrier Phase Recovery Algorithm for 800-Gb/s DP-256QAM Transmission, Han Cui1, Xuekai Xu1, Shuangyue Liu1, Yueming Li1, Yaqiong Qiao1, 1State Key Laboratory of Information Photonics and Optical Communications, School of Information and Communication Engineering, Beijing Univ. of Posts and Telecommunications, China; 2Beijing National Research Center for Information Science and Technology (Abbreviation: BNRIst), China. A QPSK pilot-aided carrier phase recovery algorithm is investigated for 800-Gb/s DP-256QAM transmission systems. Simulation results show that, compared with BPS, this proposed algorithm reduces by 99% computational complexity with about 1 dB OSNR penalty.

M4A.217 Channel Estimation Method for Nonlinear frequency division multiplexing Systems Based on B-modulation, Xi Fang1, Xin Su1, Yuxin Fu1, Ding Ding1, Ronglei Hu1, 1BEST Institute, China. In this paper, we use a training sequence to realize channel estimation for NFDM systems based on the b-coefficient modulation. We discuss the process theoretically and verified the feasibility of the method with simulations.

M4A.218 The Model of the TFL property of filter banks for nonlinear Optical OFDM/OQAM Systems Based on Volterra Series, Xi Fang1, Junying Mao1, Lei Zhang1, Guiguang Jiang1, Ding Ding1, 1State Key Laboratory of Electronic Science and Technology Inst., China. In this paper, we propose the model of the filter banks’ TFL property for nonlinear optical OFDM/OQAM systems based on Volterra series. We analyze the energy concentration characteristics of different typical filters in nonlinear systems.
M4A.220 Phase Offset Train-Sequence Method for Nonlinear Fre-
quency Division Multiplexing with b-Modulation, Xi Fang1, Yixin Fu1, Ding Ding1, Lei Zhang1, Xianwei Gao1; 1Beijing Elec-
tronics and Technology Inst., China. In this paper we inter-
roduce the NFDM system using multiple eigenvalues and
design a train-sequence method to realize the frequency-
domain channel estimation. Compared to pre-compensation
method, the proposed method shows a better performance.

M4A.221 A Novel MIMO method based on Square Contour Algo-
rithm for Joint Few-mode/Multi-core Optical Transmission System,
Hou Heping1, Hou Feng1, Rui Chen Wang1, Qi Zhang1, Qinghua Tian1, Yongjun Wang1; 1Beijing Univ. of Posts and Telecom-
media, China. This paper proposes and demonstrates a
novel MIMO equalization algorithm to suppress the crosstalk
between different modes in the space division multiplexing
(SDM) transmission system. Compared with traditional MIMO
equalization, the proposed method improves the optical
signal-to-noise ratio (OSNR) about 3dB at the FEC threshold
value of 1e-3.

M4A.222 Indoo Three-Dimensional Optical Wireless Positioning
and Orienting Using Steerable Line Lasers, Xiaoai You1, Zha-
ongyu Liu1, Mingyi Gao1, Jian Chen1, Chanyan Yu1, Gangx-
ian Shen1; 1School of Electronic and Information Engineering,
Soochow Univ., China; 2Department of Electronic and Infor-
mation Engineering, The Hong Kong Polytechnic Univ., China;
3School of Telecommunications and Information Engineering,
Nanjing Univ. of Posts and Telecommunications, China. A 3D
optical wireless positioning (OWP) scheme is proposed by
observing steering angles emitted from two line lasers with
a pair of photo-detectors. OWP accuracy < 10 cm is achieved
while offering terminal orientation information.

M4A.223 A Physical Layer Authentication Method Based on Chaotic Dynamic Feature SNR, Xiangfang Wang1, Jie Zhang1;
1Beijing Univ. of Posts and Telecom, China. This paper pro-
poses a physical layer authentication method based on the
dynamic characteristics of electrical signal. The signal-to-noise
ratio (SNR) can accurately reflect the dynamic characteristics
of the channel and authenticate users.

M4A.224 Sequence Detector based Autoencoder for ACO-OFDM Op-
tical Wireless Communication, Xin Liu1, Zixian Wei1, Zhaoming
Wang1, Albert Pepe1, H. Y. Fu1, Tszhung-Berkeley Shenzen
Inst., China. We propose a novel autoencoder with sequence
detector for asymmetrically clipped optical OFDM optical
wireless communication. The BER of our proposed system
outperforms conventional QAM and pure dense autoencoder
based counterpart in high modulation order.

M4A.225 Analysis of the Channel Estimation for Nonlinear Frequency
Division Multiplexing Systems via Continuous Spectrum, Xi Fang1,
Xin Su1, Junying Mao1, Ding Ding1, Rongli Hu1; 1BESTI, China.
In this paper, the performance of NFDM systems is eval-
uated by channel image rejection method and compared with
the OFDM systems. We deduce the process theoretically and verify
the potential and prospect of the method through simulations.

M4A.226 Low Power-Consumption 50-Gb/s PON Utilizing BAPM-4
Modulation, Minhuu Yin1, Zou Dongdong1, Xiangwei Yi1,
Zhaohui Li1, Fan Li1; 2Sun Yat-Sen Univ., China. In this paper,
we demonstrate a low power-consumption 50-Gb/s Bipolar
PAM-4 (BAPM-4) PON with 32.1-dB power budget under the
7% FEC threshold after 20-km SMF transmission in C-band
for the first time.

M4A.227 BioE 115MHz to 54kHz. 

M4A.228 Sequence Detector based Autoencoder for ACO-OFDM Op-
tical Wireless Communication, Xin Liu1, Zixian Wei1, Zhaoming
Wang1, Albert Pepe1, H. Y. Fu1, Tszhung-Berkeley Shenzen
Inst., China. We propose a novel autoencoder with sequence
detector for asymmetrically clipped optical OFDM optical
wireless communication. The BER of our proposed system
outperforms conventional QAM and pure dense autoencoder
based counterpart in high modulation order.

M4A.229 RF Investigation of Injection Locking Enhancements on the Characteristics of L-band Quantum Dash Laser, Emad
Alkhazraji1; 1King Fahd Univ of Petroleum and Mi, Saudi Arabia.
An improvement of ~9.6- ~6.5 dB/Hz in relative-intensity-
noise and ~4- ~32 dB/Hz in phase-noise from self- and
external-injection locked ~1614nm InAs/InP quantum-dash-
laser, respectively, is reported, with linewidth narrowing from
115MHz to 54kHz.

M4A.230 Research on signal recovery method of IM/DD optical fiber
transmission system based on multi-bit and multi-class clas-
sification convolutional neural network, Meng Liang1, Jiayu
Pei1,2, Hengying Xu1,2, Lishan Yang1,2, Chenglin Bai1,2, Weibin
Sun1,2, Xinkuo Yu1,2; 1School of Physics and Information
Engineering, Liaocheng Univ., China; 2Shandong Provincial
Key Laboratory of Optical Communication Science and Technology, China. Based on modified particle
swarm optimization clustering, we have proposed and verified
a modulation format identification (MFI) scheme. It searches
multiple local extrema in s-r plane and counts the number of
clusters to perform MFI.

M4A.231 A Simple and Effective K-means OSNR Monitoring
Scheme, Peiyun Ge1,2, Hengying Xu1,2, Lishan Yang1,2, Chenglin
Bai1,2, Weibin Sun1,2, Xinkuo Yu1,2; 1School of Physics and Infor-
mation Engineering, Liaocheng Univ., China; 2Shandong
Provincial Key Laboratory of Optical Communication Science and Technology, China. We propose a simple and effective
OSNR monitoring scheme assisted by K-means algorithm.
The simulation results show that it has high OSNR monitoring
accuracy for PDM-QPSK/8QAM/16QAM/32QAM/64QAM
signals, combining good tolerance for CD and PMD.

M4A.232 Phase Offset Train-Sequence Method for Nonlinear Frequen-
cy Division Multiplexing, Xi Fang1, Yixin Fu1, Ding Ding1, Lei
Zhang1, Xianwei Gao1; 1Beijing Electronics and Technology Inst., China. In this paper, we propose and verify the train-
sequence based frequency-domain equalization method for
nonlinear frequency division multiplexing. Theoretical analysis
indicate that proposed method exhibits a better estimation
accuracy compared with the pre-compensation method.

M4A.233 A Modulation Format Identification Scheme Based on
Modified PSO Clustering in Stokes Space, Ruqing Zhao2, Hengying Xu2,1, Chenglin Bai2,1, Weibin Sun2,1, Lishan Yang2,1,
Xinkuo Yu1,2, Tanglei Zhou1,2, Baokun Li1,3; 1School of Physics
Science and Information Engineering, Liaocheng Univ., China;
2Shandong Provincial Key Laboratory of Optical Communica-
tion Science and Technology, China. Based on modified particle
swarm optimization clustering, we have proposed and verified
a modulation format identification (MFI) scheme. It searches
multiple local extrema in s-r plane and counts the number of
clusters to perform MFI.

M4A.234 Date Augmentation for Constellation and Eye Diagrams
Using Conditional Generative Adversarial Nets, Wenjing Yu1,
Danashi Wang1, Yilian Xu1, Min Zhang1; 1State Key Labora-
tory of Information Photonics and Optical Communications,
Beijing Univ. of Posts and Telecommunications, China. For
the constellation diagrams and eye diagrams in the field of opti-
cal research, a data augmentation method using the CGAN
algorithm is proposed, to solve the problem of insufficient
training data.

M4A.235 A hybrid optical frequency-hopping scheme based on OAM
multiplexing for secure optical communications, Ya Jin1; 1Inst.
of Semiconductors, CAS, China. In this paper, a hybrid optical
frequency hopping system based on OAM multiplex-
ing is proposed, which is mainly applied to the security of free
space optical communication. In the proposed scheme, the
segmented users’ data goes through two stages of hopping
successively to realize data hiding. And the security perfor-
mance is also analyzed.

M4A.236 A Physical Layer Encryption System for Satellite Multiservice
Distribution Middleware, Peng Peng1,2, Hengying Xu1,2, Lishan
Yang1,2, Chenglin Bai1,2, Weibin Sun1,2, Xinkuo Yu1,2; 1School
of Physics and Information Engineering, Liaocheng Univ., China;
2Shandong Provincial Key Laboratory of Optical Communication Science and Technology, China. Based on modified
particle swarm optimization clustering, we have proposed and verified
a modulation format identification (MFI) scheme. It searches
multiple local extrema in s-r plane and counts the number of
clusters to perform MFI.

M4A.237 Weighted Dual-Polling Burst Assembly Scheduling Strat-
egy Based on Service Priority Assurance and Nodes Load,
Xuzhou Liu1, Qi Zhang1, Yuefeng Shen1, Yujuan Hou1, Qinghua
Tian1,2, Feng Tian1,2, Yongjun Wang2,1, Leijing Yang1,2, Dong
Chen1,2, Wei Zhang1, Cong Li1,2; 1School of Electronic Engineer-
ing, Beijing Univ. of Posts and Telecommunications, China;
2Beijing Key Laboratory of Space-round Interconnection and Convergence, BUPT, China; 3China Satellite Communications
Co., Ltd, China; 4Academy of Broadcasting Planning, NRTA,
China; 5China Academy of Space Technology, China. Weighted
Dual-Polling Burst Assembly Scheduling Strategy are proposed
in the paper to balance service data with different priorities and
balance destination site data traffic. It shows that the strategy
can increase the stability of network performance while meeting
the requirements of service data.
Monday, 26 October

M4A.239 Physical-layer Security Improvement Based on 2D-SCL Map and Brownian motion in CO-OFDM System, Changqing Yang1, *Jiang Xin1, *Le Liu1, *Xiaofeng Tang1, *Lisa Xi1, *Xiaoqiang Zhang1; 1Beijing Univ of Posts & Telecom, China. A physical-layer encryption scheme is proposed in coherent OFDM system using a two-dimensional chaotic mapping and Brownian motion. Simulations show that no OSNR penalty is introduced and the PAPR can be decreased by 1dB.

M4A.240 A Novel Scheme for Stable Frequency Dissemination Over Fiber in Mesh Networks, Jing Liang1,2, Jian Zhu1,3, Bingli Guo1,2, Shangrui Huang1,2; 1State Key Laboratory of Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China; 2School of Electronic Engineering, Beijing Univ. of Posts and Telecommunications, China. We propose a stable frequency transmission scheme based on mesh network. What's new is that the scheme satisfies both ring and point-to-point models. In the simulation, phase drifting we obtained is less than 0.074/grad×5×10⁻⁵.

M4A.241 Fast Adaptive Digital Back-propagation Algorithm For Fiber Nonlinear Compensation, Xi Chen1, Qil Zhang1,2, Ran Gao1,2, Xiangjun Xin1,4, Xinhuo Wang1, Qinghua Tian1,2, Feng Tian1,2, Yongjun Wang1,3, Yujuan Hou1, Leijing Yang1,4; 1School of Electronic Engineering, Beijing Univ. of Posts and Telecommunications, China; 2the Advanced Research Inst. of Multidisciplinary Science, Beijing Inst. of Technology, China; 3National Radio and Television Administration, Beijing, China; 4Beijing Institute of Tracking and Telecommunication Technology, Beijing, China. We develop an adaptive digital back-propagation algorithm for estimating the product of nonlinear coefficients and compensation factors is proposed. Fast convergence is achieved in the simulation transmission of 60Gb/s-64QAM over a 5×80km single channel.

M4A.242 Experimental study on 100km free space coherent optical communication, Xuehui Ke1; 1X’tan Univ. of Technology, China. The experimental research and experimental results of free space optical communication based on heterodyne detection in the 100km link from Erlang to Quanjia Township in Qinghai Lake is reported.

M4A.243 Improved the Performance of MS-CPE in Long-distance Transmission of Optical Comb Communication, Minhui Zhu1, Yujie Zhao1, Bo Xu1; 1UESTC, China. A scheme using optical delay module is proposed to recover the phase coherence for MS-CPE in optical comb-based WDM systems over long fiber transmission. Its good performance is validated with simulations over 2000km fiber transmission.

M4A.244 Simplified Blind Carrier Frequency Offset Estimation Algorithm Based on the Power of Zero-Subcarriers for CO-OFDM Systems, Xinwei Du1,2, Changyuan Yu1,2, Poo-Yuen Kam1; 1the Hong Kong Polytechnic Univ., Hong Kong; 2Division of Science and Technology, Beijing Normal Univ. - Hong Kong Baptist Univ. United International College, China; 3Chinese Univ. of Hong Kong, Shenzhen, China. A simplified blind CFO estimation algorithm is proposed for CO-OFDM systems based on the power of zero-subcarriers, which models the cost function as a cosine function, then easily estimating CFO by calculating three test functions.

M4A.245 Research and Implementation of Frequency Offset Adjustment in Real-Time IMDD OOFDM System, Xinyu Song1, Huibin Zhang1, Chenguang Yang1, Jie Zhang1; 1Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, Beijing, China. We propose a novel carrier frequency correction method capable of compensating for SCD in IMDD OOFDM system. The system is experimentally demonstrated that the frequency offset is stable within ±0.64ppm and no EVM degradation.

M4A.246 Optical Signal-to-Noise Ratio Monitoring Based On Statistical Moments Using Artificial Neural Network, Feng Wang1,2, Shanhong You1,2; 1Soochow Univ., China; 2we experimentally demonstrate an optical signal-to-noise ratio (OSNR) monitoring method based on statistical moments in combination with artificial neural network (ANN). The simulation and experiment results show that this method can monitor OSNR accurately.

M4A.247 Performance Analysis of Polar Code with SCL Algorithm in Ultraviolet Communication System, Yong Zuo1,2, Mengjia Ran1,2; 1Beijing Univ. of Posts & Telecom, China; 2the Advanced Research Inst. of Multidisciplinary Science, Beijing Inst. of Technology, China. We experimentally demonstrate a novel optical signal-to-noise ratio (OSNR) monitoring method based on statistical moments in combination with artificial neural network (ANN). The simulation and experiment results show that this method can monitor OSNR accurately.

M4A.248 Adaptive Optics Compensation of Hybrid Input-Output Algorithm for Gaussian-beam in Satellite-to-Ground laser communication links, Shanshan Li1, Huan Chang1, Qi Zhang1, Guoxing Cao1, Yufei Shen1, Ying Tao1, Dong Chen1, Cong Li1, Zhe Gao1, Inxi Qian1, Yuqing Li1, 1Beijing Univ of Posts and Telecomm, China; 2Beijing Inst. of Technology, China; 3China Academy of Space Technology, China; 4China Satellite Communication Co., Ltd. A hybrid input-output algorithm HOA-based AO is proposed to compensate Gaussian beam propagating through turbulence. Simulation results show it can effectively ameliorate beam distortion by 50% or more iterations are sufficient for HOA convergence.

M4A.249 A QC-LDPC Design Considering the Limited Number of Decoding Iterations for Optical Communications, Wei Zhang1,2, Sheng Zhong1,3, Jinzhao1,4, South China Univ. of Technology, China. We propose a QC-LDPC design by optimizing the degree distribution under a limited number of decoding iterations. Simulation results show that it achieves better performance than conventional QC-LDPC for different code rates and iteration numbers.

M4A.250 High-power S-Band EDFA using standard Erbium doped fiber and double pass configuration, Dicky Chung1, Kwong Shing Tsang1, Ming Luo1, Sonia Shuk Chu Wong1, Abby Yeung1, Victor Ho1, Ray Man1; 1Amonics Ltd, Hong Kong. This study describes a novel EDFA capable of compensating for SCD in IMDD OOFDM system. Stage one is a double pass EDFA with narrowband filter. Stage two is a single pass EDFA with a mid-stage narrowband filter.

M4A.251 Performance of Concatenated Polar Codes in VLC System, Wenkai Liu1, Xingkun Jin1, Xiaodong Nie1, Mengjia Wu1, Dahai Han1, 1Beijing Univ. of Posts and Telecommunications, China; 2Beijing Inst. of Technology, China; 3North China Univ. of Technology, China. The concatenated polar codes exhibit a lower error floor in visible light communication (VLC) system under burst error than the individual polar codes. Compared with BCH-polar schemes, Convolutional-polar schemes have better robustness.

M4A.252 Models Multiplexing Conversion Based on Multi-plane Light Conversion, Yiming Bian1, Yang Li1, Wei Li1, Xiaobin Hong1, Jifang Qiu1, Eruo Chen1, Jian Wu1; 1Beijing Univ of Posts & Telecom, China; 2Beijing Inst. of Tracking and Telecommunication Technologies, China. We achieve low-loss, low-crosstalk models multiplexing conversion based on multi-plane light conversion. For the 6 modes conversion with 10 phase plates, the crosstalk loss and the mode-dependent loss are 0.020dB and 0.020dB, respectively.

M4A.253 Machine Learning Assisted Clock Recovery for Pulse Position Modulation in Free Space Optical Communication, Shennao Zhang1, Xiaoxiao Dai1, Xueyuan Ao1, Zhonghong Wang1, Linsheng Zhong1, Jinzuo Zuo1, Tianlu Guo1, Jun Zhang1, Qi Yang1, Deming Liu1; 1School of Optical and Electronic Information and Wuhan National Laboratory for Optoelectronics, Huazhong Univ. of Science and Technology, China; 2School of Electrical and Automation, Wuhan Univ., China. We apply a multi-layer perception as the timing error detector for PPM signal clock recovery. Simulation results show that the proposed MLP-based CDR method can improve the accuracy of phase detection with large sampling frequency offset over 1200 ppm.

M4A.254 Nonlinear Compensation for OAM Optical Fiber Communication System Based on Naive Gaussian Bayes Algorithm, Xiong Zhou1, Ran Gao1, Qi Zhang1,2, Huan Chang1, Xiangjun Xin1,4; 1School of Electronic Engineering, Beijing Univ. of Posts and Telecommunications (BUPT), China; 2the Advanced Research Inst. of Multidisciplinary Science, Beijing Inst. of Technology, China; 3State Key Laboratory of Information Photonics and Optical Communications, BUPT, China; 4School of Information and Electronics, Beijing Inst. of Technology, China. A nonlinear compensation scheme for the OAM optical fiber communication system has been presented based on NGB algorithm. The simulation results demonstrate that the accuracy and calculation complexity of the NGB algorithm is improved significantly.

M4A.255 Channel independent precoding for layered ACO-OFDM in optical wireless communications, Wu Li1,2, Chao Yang1,2, Ming Luo1,2; 1State Key Laboratory of Optical Communication Technologies and Networks, China; 2National Optoelectronics Innovation Center, China. We use orthogonal circumulant matrix transform (OCT) for each layer of LACO-OFDM in the OWC fading channel. Simulation results show the performance gain is 1.6dB at BER of 10⁻⁶ compared with conventional scheme.

M4A.256 FPGA-based PPM modulation and demodulation algorithm, Chengyue Ji1, Qin Mei1, Qing Li1, Shangyong Cai1, Di Jiang1, Fen Wu1, Zhiquo Zhang1; 1Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China; 2State Grid Wu Power Supply Company, China. A 4-PPM modulation and demodulation algorithm based on FPGA is demonstrated. Experimental results show that when the BER is 1E-6, the receiver sensitivity of 4-PPM modulation is 5.11 dB higher than that of OOK.
Shaping Distribution Identification of Probabilistically Shaped MQAM Signals based on Generalized Circular Harmonic Expansion, Qifeng Yan1, Peishan Zhang1, Liu Liu1, Changjian Guo1, Xuehai Hong1, South China Normal Univ., China. A shaping distribution identification method based on generalized circular harmonic expansion is proposed for probabilistically shaped MQAM systems. The results show that high success rate can be achieved using only a small number of symbols.

Spectrum Efficiency and Cost Evaluation for G.654.E Fiber Based Optical Transmission Systems, Ningning Guo1, Yongcheng Li1, Mingyi Gao1, Yichun Shen1, Zhihong Liu1, Xinli Jiang1, Shanshan Cao1, Yigang Qian1, Gangxiang Shen1, Soochow Univ., China; Zhongtian Technology Fiber Optics Co., Ltd, China. We evaluate the spectrum efficiency and the cost of a G.654.E fiber based optical transmission system. Simulation results show that, for a 40G optical transmission system, using G.654.E fiber with 0.17-dB/km attenuation coefficient and 130-μm2 large effective area (Aeff) can achieve the best tradeoff between spectrum efficiency and system cost.

Nonlinear Equalizer by Feature Engineering Based-Deep Neural Network for Coherent Optical Communication System, Xinli Jiang2, Shanshan Cao1, Yigang Qian1, Gangxiang Shen1, Soochow Univ., China; Zhongtian Technology Fiber Optics Co., Ltd, China. We experimentally demonstrate the maximum 1.07 dB Q-factor improvement in terms of nonlinearity compensation of 120 Gb/s 64-QAM coherent optical communication system, and also experimentally demonstrate the maximum 20MHz mobile signals, a link loss budget improvement of 0.17-dB/km attenuation coefficient and 130-μm2 large effective area (Aeff) can achieve the best tradeoff between spectrum efficiency and system cost.

Routing, Spectrum and Core Assignment based on Auxiliary Matrix in the Intra Data Center Networks using Multi-Core Fibers with Super Channel, Zhuhuan Luo1, Shan Yin1, Luyou Jiang1, Liang Zhao1, Shangguo Huang1; State Key Laboratory of Information Photon, China. This paper proposes a RSC algorithm through auxiliary matrix and super channel in intra Data Center with 5DM-EON to suppress crosstalk and fragmentation. Simulation results show the proposed algorithm performs better than benchmark method.

Brownian motion-based Constellation Scrambling Encryption Method to enhance the Security of CO-OFDM/QAM systems, Ding Ding1, Yang Zhou1, Ming Li1, Zhihuan Wu1, Yuefeng Liu1, Ji Bai1, BRIST, China. In this paper, we propose a Brownian motion-based Constellation Scrambling Encryption (BCSE) method to enhance the security of CO-OFDM/QAM systems. Simulation results indicate the safety of CO-OFDM/QAM system is significantly improved when employing BCSE method.

Phase Modulation-Enabled Improvement of Link Loss Budget for Bandwidth-Efficient and Low-Complexity Mobile Fronthaul, Mingliang Deng1, Yan Liu1, Qianwu Zhang1, Xiaojin Guo1, Andong Wang1, Bing Lu1, Long Zhu1, CQIPT, China; Shanghai Univ, China. PM is proposed to enhance loss budget for SNR-hungry mobile fronthaul involving analog optical links. Simulation results demonstrate that, for phase-modulated 24 20MHz mobile signals, a link loss budget improvement of -2.3dB is achievable.

Decision making for multi-armed bandit problem utilizing two parallel uncorrelated wideband complex chaotic signals. It is experimentally demonstrated that any-numbered arm bandit problem can be successfully solved.

A Low Complexity Frequency Domain Adaptive Equalizer for Coherent Optical Receivers, Qi Zhang1, Xue Li1, Nannan Zhao1, Xianjiao Hu1, Nan Cui1, Xiaoguang Zhang1, Long Zhu1; Beijing Univ. of Posts and Telecommunications, China. A novel scheme for FSOC system under random angular jitter with high efficiency. The coupling efficiency improved 30.77% and 50.23%, when the radial offset is 7 μm.

A Probabilistic Shaped Adaptive Hierarchical QAM Scheme for Elastic Optical Network, Hui Xu1, Yongjun Wang1, Xinyu Liu1, Xiangun Xin1, Qiiaqiao Gao2, Beijing Univ. of Posts and Telecommunications, China; Ch Chinese Power Research Inst., China. A probabilistic shaped adaptive hierarchical 12QAM (PS-AH-12QAM) scheme is proposed. Simulation results show that the proposed scheme obtains better BER performance than traditional adaptive hierarchical 16QAM (AH-16QAM).

Transmission of 50-Gb/s x4 PM-4 over 100-km SMF for LR-PON utilizing Low Complexity Polarization-insensitive Quasi-coherent Receiver, Daoshing Li1, Li Zbin1, Zong Dongdong1, Xingwen Yi1, Zhaohui Li1, Fan Li1, Sun Yet-Sen Univ, China. A low complexity quasi-coherent 50-Gb/s x4 PM-4 LR-PON under the 7% hard decision forward FEC threshold is demonstrated. Electrical dispersion compensation (EDC) is applied to compensate the fiber chromatic dispersion. The power budgets after 80-km and 100-km E2MP transmission without pre-amplifier are 36 dB and 34 dB, respectively.

A Low Complexity 16QAM Based on Geometric Shaping for Fiber Optics Transmission System, Wenmao Zhou1, Qi Zhang1, Xishuo Wang1, Ran Gao1, Xiangjun Xin1, Fing Tian1, Qinhua Tian1, Yuxiao Zhu1, Leijeng Yang1, Yongjun Wang1, Fu Wang1, Huan Chang1, Dong Guo1; Beijing Univ. of Posts and Telecommunications, China; Beijing Inst. of Technology, China. A low complexity geometrically-shaped (GS) 16QAM is proposed in order to obtain the shaping gain effectively. The simulation results show that the proposed GS-16QAM outperforms the regular 16QAM in the aspect of mutual information (MI).

Nonlinearity Compensation Technique by Spectral Clustering for Coherent Optical Communication System, Xinyu Liu1, Yongjun Wang1, Hui Xu1; School of Electronic Engineering, Beijing Univ. of Posts and Telecommunications (BUP), China. The nonlinear compensation algorithm using spectral clustering is experimentally demonstrated for 16-QAM coherent optical communication system. The spectral clustering outperforms the data-driven-based spatial clustering of applications with noise (DBSCAN) and K-means clustering.

A Probabilistic Shaped Adaptive Hierarchical QAM Scheme for Elastic Optical Network, Hui Xu1, Yongjun Wang1, Xinyu Liu1, Xiangun Xin1, Qiiaqiao Gao2, Beijing Univ. of Posts and Telecommunications, China; China Electric Power Research Inst., China. A probabilistic shaped adaptive hierarchical 12QAM (PS-AH-12QAM) scheme is proposed. Simulation results show that the proposed scheme obtains better BER performance than traditional adaptive hierarchical 16QAM (AH-16QAM).
M4A.292 Precoded DMT System Enhanced with Geometric Shaping, Tianhao Tong1, Xi Chen1, Ziqun Sun1, Deming Liu1, Ming Tang1, ‘Huazhong Univ of Science and Technology, China. We propose to optimize the performance of precoded discrete-multitone (DMT) transmission system by using geometric shaping (GS). The simulation results show that up to 0.9 dB receiver sensitivity improvement has been achieved.

M4A.293 A Frequency Offset Estimation and Compensation Method Compliant with the CCSDS 131.2-B-1 Standard by using Kalman Filter, Hao Li1, Yingchun Li1, ‘Shanghai Univ, China. We propose a method which uses frame header, pilot and Kalman filter to estimate and compensate frequency offset. Within frequency offset range -800kHz~800kHz, the estimated absolute error is less than 1KHz.

M4A.294 Performance comparison of different OAM-based mode diversity schemes with coherent receipt under atmosphere turbulence, Andong Wang1, Long Zhu1, Mingliang Deng1, Bing Lu1, ‘Changjiang Univ. of Posts and Telecommunications, China. We numerically compare the performance of different OAM-based mode diversity schemes under different atmosphere turbulence. The numerical results show that SIMO modes diversity scheme is more preferable under moderate-to-strong turbulence, while MISO is more appropriate under weak turbulence.

M4A.295 Joint Time Synchronization and PMD Estimation Based on Superimposed FRFT Training Sequences, Wang Li1, Hexun Jiang1, Xi Chen1, Yating Xiang1, Fengguang Lu1, Ming Tang1, ‘Huazhong Univ of Science and Tech, China. Fractional Fourier transform training sequences have been proposed to superimpose with signals to experimentally achieve large range PMD monitoring (0-108ps, 5.7ps RMSE) and accurate timing offset estimation (0.8 sample RMSE) before equalization.

M4A.296 Optical Label-enabled Low-cost DWDM Optical Network Performance Monitoring Using Novel DSP Processing, Jinhao Du1, Tao Yang1, Sheping Shi2, Xue Chen1, Zhengyu Liu1, Jiao Wang1, ‘Beijing Univ of Posts & Telecom, China; ‘2TÉ Corporation, China. A low-cost DWDM optical network performance monitoring scheme based on Optical Label with SRS mitigation DSP is proposed. Accurate power monitoring of each wavelength channel could be achieved simultaneously even under severe SRS crosstalk.

M4A.297 Non-data-aided less-iterations scheme for fiber nonlinearity compensation with low computational complexity, Boqun Li1, Chenglun Bai1,2, Xingping Xu1,2, Lishan Yang1,2, Weibin Sun1,2, Xinkuo Yu1, Ruqing Zhao1, Tanglei Zhou1, ‘School of Physics Science and Information Engineering, Liaocheng Univ., China; ‘Shandong Provincial Key Laboratory of Optical Communication Science and Technology, China. We proposed a non-data-aided less-iterations clustering scheme to compensate the fiber nonlinearity for PDM-16QAM/32QAM/64QAM signals. It can compensate the impairments caused by ASE and Kerr nonlinearity, and improve the BER performance with low computational complexity.

M4A.298 All-optical Amplitude Noise Suppression in a Nonlinear Semiconductor Optical Amplifier (SOA), Long Shao1, Feng Wen1, Biao Guo1, Lukasz Krzaczanowicz2, Feng Yang1, Baolian Wu1, Kun Qiu1, ‘Univ. of Electronic Science and Technology of China, China; ‘Aston Univ, UK; ‘Maralob Co., Ltd., China. All-optical amplitude regeneration was experimentally investigated in a nonlinear semiconductor optical amplifier (SOA), achieving a 3.9dB signal-to-noise ratio improvement, over 5nm operational range and up to 28Gb/s data-rate in this wavelength-shift free, single-SOA regenerator.

M4A.299 Optical De-aggregation from 9QAM to PAM3 using Phase-sensitive Amplifier-based Optical Quadrature De-multiplexing and Two-level Vector Moving, Jiabin Cui1, Yuefeng Ji1, Chongqing Univ. of Posts and Telecommunications, China.

M4A.300 The Effectively Corrected Scheme for Polarization De-multiplexing in Tight Time-Packing PDM-FTN Optical Communication System with Extreme Polarization Impairments, Peng Sun1, Xiaoguang Zhang1, Luxi Xu1, Wenbo Zhang1, Xiangfen Tang1, ‘Beijing Univ of Posts & Telecom, China. We propose an effectively corrected scheme for polarization de-multiplexing algorithms in tight time-packing factor which is equal to 0.5 PDM-FTN-QPSK system with extreme polarization impairments which contain ultra-fast ROOS and large PMD.

M4A.301 Laser Spot Centroid Locating and Tracking Based on Tobit Kalman Filter in SOF Communications, Jiao Xiong1,2, Yueying Zhan1, Ning Yang1, Lei Yang1, ‘Key Laboratory of Space Utilization, Technology and Engineering Center for Space Utilization, Chinese Academy of Science, China; ‘Univ. of Chinese Academy of Sciences, China. An improved laser spot centroid extraction algorithm based on Tobit Kalman filter is proposed for SOF communication systems. The performance of the algorithm in terms of the mean and variance of spot position offset are evaluated and discussed.

M4A.302 Kramers-Kronig Carrierless Amplitude/Phase Modulation System without Extra Digital Upsampling, Chao Yu1, Genxiang Chen1, Xishuo Wang1, Xia Sheng1, Xing Xu1, Yongjun Wang1, School of Science, Minzu Univ of China, China; ‘Beijing Univ. of Posts and Telecommunications, China. We propose a new transceiver solution named KK-CAP-NQAM that combines Kramers-Kronig (KK) reception with carrierless amplitude/phase modulation (CAP) technology. This system’s KK receiver operates without extra digital upsampling.

M4A.303 Secure Optical Communication based on Synchronous Chaotic Phase Scrambling-Induced Wave-length-aliasing, Ning Jiang1, Anke Zhao1, Jiafa Peng1, Yiqun Zhang1, Qin Li1, ‘Univ of Electronic Science & Tech, China. We propose a physical-layer encryption scheme that is compatible with conventional WDM transmission system in virtue of private chaos synchronization and phase-modulation-induced wave-length-aliasing, and experimentally demonstrate a 4×12.5Gbps secure WDM transmission to confirm the feasibility.

M4A.304 Double-Light-Path Multiplexing Enabled Light Shaping Efficiency Enhancement for Digital Micromirror Device, Zhi Lei1, Zhiheng Cao1, Songnian Fu1, Yuncang Wang1, Yuwen Qin1, ‘Wuhan National Laboratory for Optoelectronics, and School of Optical and Electronic Information, Huazhong Univ of Science and Technology, China; ‘Inst. for Photonic Integration, Department of Electrical Engineering, Eindhoven Univ. of Technology, Netherlands; ‘School of Information Engineering, Guangdong Univ. of Technology, and Guangdong Provincial Key Laboratory of Photonics Information Technology, China. In order to solve the low conversion efficiency (theoretically less than 10%) of digital micromirror device (DMD) based light shaping, we demonstrate a double-light-path multiplexing technique to double corresponding light shaping efficiency.

M4A.305 High-Speed Fiber Optic Communication System Based on WDM Transmission, Jiacheng Sun1,2, Biao Guo1, Lukasz Krzczanowicz2, Feng Yang1, ‘Beijing Univ of Posts & Telecom, China; ‘Aston Univ., UK; ‘Maralob Co., Ltd., China. A novel probabilistically shaped star-10QAM-OFDM modulation based on bit-level mapping with new geometric constellation structure is proposed, which outperforms the uniformly-distributed star-10QAM-OOFDM by 3.68 dB in OSNR.

M4A.306 In-line nonlinearity compensation utilizing data-driven phase modulation for long haul optical fiber communication, Yan Pan1, Lianshan Yan1, Anlin Yi1, Lin Jiang1, Wei Pan1, Bin Luo1, ‘Southwest Jiaotong Univ., China. A data-driven in-line scheme is proposed to suppress fiber nonlinearity, and transmission performance of 32-GBaud QPSK/16QAM is investigated. Results show that more than 50% transmission distance improvement can be achieved.

M4A.307 Walk-off Effect on Inter-channel Nonlinearity Compensation for Multi-channel Unrepeated Optical System, Qinghong Wei1, Jiakang Ma1, Jianxin Ma1, ‘Beijing Univ of Posts & Telecom, China. The walk-off effect on multi-channel DBP-based inter-channel nonlinear-ity compensation for unrepeated system is investigated. 5×112Gb/s PDM-QPSK transmission results confirm that XPM can be efficiently compensated by utilizing multi-channel DBP including the walk-off effect among channels.
A new scheme using convolutional neural network to realize orbital angular momentum beams disturbed by atmospheric turbulence, Jin Wang1,2, Bing Zhu1,2, Jie Zheng1,2, and Yichen Li1,2. Department of Electronic Engineering and Information Science, Univ. of Science and Technology of China, China; Key Laboratory of Electromagnetic Space Information, Chinese Academy of Science, China. We propose a new neural network-assisted scheme for identifying OAM beams disturbed by atmospheric turbulence from the one-dimensional signals detected by the ring photodetector, which improves the recognition efficiency while the accuracy does not decrease.

High-speed Long-distance Optical Wireless Communication Based on a 940-nm VCSEL with 4.46-Gbps QAM-OFDM, Zhiyuan Cao1,2, Shi Zhang1,2, Zixian Wei3, Li Zhang1,2, Zhaomin Li2, Jiaotong Univ., China; 1Tsinghua University, China; 2Shanghai Jiao Tong University, China. We propose a 940-nm VCSEL-based QAM-OFDM optical wireless communication (OWC) system using adaptive bit-power loading strategy over 12 meters which achieved 4.46-Gbps data rate below forward error correction (FEC) criterion of 3.8 x 10⁻³.

Join Modulation Format Identification and OSNR Monitoring Assisted by Intensity and Differential-Phase Features, Jiachen Feng1, Lianshan Yan1, Lin Jiang1, Anlin Yi1, Yan Pan1, Wei Pan1, Bin Luo1; Southwest Jiaotong Univ., China. A joint modulation format identification and OSNR monitoring scheme is proposed. 100% identification accuracies are achieved and maximum mean monitoring errors are respectively 0.19dB, 0.17dB, 0.26dB, 0.40dB, 0.85dB, and 0.64dB for all mainstream formats (PDM-QPSK/BPSK/8QAM/16QAM/32QAM/64QAM).

Reservoir Computing Based on Semiconductor Lasers Using Parallel Double Optical Feedback Structure, Shuai Wang1, Fei Hu1, Nan Fang1,lutang wang1, Shanghai Univ., China. A structure of parallel double optical feedback for semiconductor lasers-based reservoir computing is proposed to reduce the masked input data, speed up the data processing and lowering the memory length requirement for the arbitrary waveform generator. The simulation results of three benchmark tasks and memory capacity verify the improvement effects.

Joint Power Optimization of PTMP Coherent Architecture for Improving Link Budget in Downlink Transmission, Huijun Ren1, Mengfan Gu1, Xiaobo Zeng1, Zhiquan Zhai1, Yuyun Fan1, Qiaoyu Liu1, Lin Yi1, Weisheng Hu1, Qunbi Zhuge1; Shanghai Jiao Tong University, China. A joint power optimization method is proposed for the digital subcarrier-multiplexing system based on digital subcarriers. 2.3 dB power budget gain was achieved experimentally with eight 4GBaud 16QAM subcarriers with a distance difference of 24 km.

Rubik’s cube rotation encryption based on chaos in 3D-CAP-PON, Shuangdong Chen1, Bo Liu1, Yaya Mao1, Jianren Ren1, Xiuli Song1, Lei Jiang1, Rahatullah1, Shun Han1, Jiang Zhao1, Jingyi Zhang1, Delin Zhao1, Minye Li1, Yueyang Liu1, Inst. of Optics and Electronics, Nanjing Univ. of Information Science & Technology, China; School of Electronic Engineering, Beijing Univ. of Posts and Telecommunications, China; School of Electrical, Computer and Telecommunication Engineering, Univ. of Wollongong, Australia. A Rubik’s cube rotation encryption based on chaos in three-dimensional carrier-free amplitude and phase modulation passive optical network (3D-CAP-PON) is proposed. Experiment verifies that the proposed scheme has good transmission performance and extremely high security.
M4A.327 Photonic Compressive Sampling of Sparse Broadband RF Signals using a Multimode Fiber, Kaiqiang Ding1, Ziqi Meng1, Zhenming Yu1, Zhenyang Zhao1, Kun Xu1; 1State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. Of Posts and Telecommunications, China. We propose a photonic compressive sampling scheme based on multimode fiber for radio spectrum sensing, which shows high accuracy and stability, and low complexity and cost. Pulse overlapping is utilized for a fast detection.

M4A.332 Experimental study of Multi-Standard Wireless Signal Transmission over 7-Core Multiframe Fiber in Radio-over- Fiber System, Congyi Sun1, zhenming Yu1, Zhiquan Wan1, Kaixuan Sun1, Kun Xu1; 1State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. Of Posts and Telecommunications, China. We experimentally study the multiframe fiber transmission of multi-standard wireless signals in radio-over-fiber (RoF) system with fiber-wireless hybrid links. The EVM performance of both WLAN and LTE-TDD signals can achieve below 3% during the experiment.

M4A.333 Multi-core fiber transmission of multi-standard wireless signals in radio-over-fiber (RoF) system with fiber-wireless hybrid links. The EVM performance of both WLAN and LTE-TDD signals can achieve below 3% during the experiment.

M4A.334 Mitigation of Multi-Source Modulation Distortions in A-RoF Link by Using Transfer Learning aided ANN, Enji Liu1, Ziyi Meng1, Kaiqiang Ding1, Shangyuan Li1, Xiaoxiao Xue1, Xiaoping Zheng1; 1State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. Of Posts and Telecommunications, China. We adopt transfer learning aided artificial neural network (TL-ANN) as the approach of post digital signal process in A-RoF link. The proposed method could mitigate multi-source distortions and decrease training cost of ANN simultaneously.

M4A.335 Weak microwave signal detection based on microwave photonics-enabled single-photon technology, Xiaoxue Chen1, Shangyuan Li1, Xiaoping Zheng1, Beiyou Wei1; 1Center for Information Photonics & Communications, School of Information Science and Technology, Southwest Jiaotong Univ., China; 2Wuhan National Laboratory for Optoelectronics, Huazhong Univ. of Science and Technology, China; 3the Science and Technology on Electronic Information Control Laboratory. A photonic approach to cancel the multi-path leakage by employing an optical true time delay (OTTD) line array is proposed and experimentally demonstrated. A multi-path leakage cancellation depth larger than 40-dB is realized.

M4A.336 Photonic-Assisted Multi-Path Leakage Cancellation Employing OTTD Line Array, Jianwei Luo1, jia yu1, Zhaohao Gao2, Fan Jiang3, Lianshan Yan1, Wei Pan1; 1Center for Information Photonics & Communications, School of Information Science and Technology, Southwest Jiaotong Univ., China; 2Wuhan National Laboratory for Optoelectronics, Huazhong Univ. of Science and Technology, China; 3the Science and Technology on Electronic Information Control Laboratory. We propose a photonic approach to cancel the multi-path leakage by employing an optical true time delay (OTTD) line array is proposed and experimentally demonstrated. A multi-path leakage cancellation depth larger than 40-dB is realized.

M4A.337 Arbitrary Waveform Generation with a Doubled Bandwidth based on an IQ Photonic Digital-to-analog Converter, Jiading Li1, Xiaoshuo Xue1, Shangyuan Li, Xianbin Yu1, Jian Wang1, Xiaoping Zheng1; 1Jianghua Univ., China; 2College of Information Science and Electronic Engineering, Zhejiang Univ., China; 3Huazhong Univ. of Science and Technology, China. A novel method of photonic arbitrary waveform generation is presented, which combines photonic digital-to-analog conversion technology and IQ upconversion. A 2-bit prototype is built experimentally and a linear frequency-modulated waveform with a bandwidth of 4 GHz is synthesized with a 2-GHz baseband width.

M4A.338 Chromatic Dispersion Immune Photonic Microwave Frequency Shift Keying Pulse Generator, Mingzheng Len1, Min Zhu2, Xiu Li3, Yonggang Gao4, Xingming Bai5, Zhiqiang Zheng6, Aijie Li7, Shanguo Huang8; 1Beijing Univ. Of Posts & Telecom, China; 2Southeast Univ., China; 3Purple Mountain Laboratories: Networking, Communications and Security, China. A photonic microwave FSK pulse generator based on carrier-suppressed double sideband modulation is proposed. The simulation results show that the pulse generator is free from the chromatic dispersion-induced power fading and has high receiving sensitivity.

M4A.339 Reconfigurable Microwave Photonic Filter Based on Multicore Fibers Incorporating a TOAD Switch, Liang Huo1, Can Zhao1, Hao Wu1, Ming Tang1; 1Wuhan National Lab for Optoelectronics (WNLO) & National Engineering Laboratory for Next Generation Internet-Access System, School of Optical and Electronic Information, Huazhong Univ. of Science and Technology, China. We propose a new scheme of reconfigurable microwave photonic filter based on multicore fibers and a terahertz optical asymmetric demultiplexer switch, with a switching rise/fall time of 3.4/3 ns.

M4A.340 Optical Codebook-Based Hybrid Precoding for Intelligent Reflecting Surface-Assisted mmWave C-RAN Systems, Mushuan Yang1, Huang Huang1, Congfeng Zhang1, Xiaowen Wang1, Kun Qiu1; 1Univ. Electron. Sci. & Technol. China, China. An optical codebook-based hybrid precoding is proposed for intelligent reflecting surface-assisted millimeter-wave cloud radio access networks, where an optical codebook-based alternating optimization algorithm is developed. Based on numerical simulation, the obtained results are discussed.

M4A.341 Photonic-Assisted Multi-Path Leakage Cancellation Employing OTTD Line Array, Jianwei Luo1, jia yu1, Zhaohao Gao2, Fan Jiang3, Lianshan Yan1, Wei Pan1; 1Center for Information Photonics & Communications, School of Information Science and Technology, Southwest Jiaotong Univ., China; 2Wuhan National Laboratory for Optoelectronics, Huazhong Univ. of Science and Technology, China; 3the Science and Technology on Electronic Information Control Laboratory. A photonic approach to cancel the multi-path leakage by employing an optical true time delay (OTTD) line array is proposed and experimentally demonstrated. A multi-path leakage cancellation depth larger than 40-dB is realized.

M4A.342 Arbitrary Waveform Generation with a Doubled Bandwidth based on an IQ Photonic Digital-to-analog Converter, Jiading Li1, Xiaoshuo Xue1, Shangyuan Li, Xianbin Yu1, Jian Wang1, Xiaoping Zheng1; 1Jianghua Univ., China; 2College of Information Science and Electronic Engineering, Zhejiang Univ., China; 3Huazhong Univ. of Science and Technology, China. A novel method of photonic arbitrary waveform generation is presented, which combines photonic digital-to-analog conversion technology and IQ upconversion. A 2-bit prototype is built experimentally and a linear frequency-modulated waveform with a bandwidth of 4 GHz is synthesized with a 2-GHz baseband width.

M4A.343 Chromatic Dispersion Immune Photonic Microwave Frequency Shift Keying Pulse Generator, Mingzheng Len1, Min Zhu2, Xiu Li3, Yonggang Gao4, Xingming Bai5, Zhiqiang Zheng6, Aijie Li7, Shanguo Huang8; 1Beijing Univ. Of Posts & Telecom, China; 2Southeast Univ., China; 3Purple Mountain Laboratories: Networking, Communications and Security, China. A photonic microwave FSK pulse generator based on carrier-suppressed double sideband modulation is proposed. The simulation results show that the pulse generator is free from the chromatic dispersion-induced power fading and has high receiving sensitivity.

M4A.344 Reconfigurable Microwave Photonic Filter Based on Multicore Fibers Incorporating a TOAD Switch, Liang Huo1, Can Zhao1, Hao Wu1, Ming Tang1; 1Wuhan National Lab for Optoelectronics (WNLO) & National Engineering Laboratory for Next Generation Internet-Access System, School of Optical and Electronic Information, Huazhong Univ. of Science and Technology, China. We propose a new scheme of reconfigurable microwave photonic filter based on multicore fibers and a terahertz optical asymmetric demultiplexer switch, with a switching rise/fall time of 3.4/3 ns.
M4A.345 Photonic-based Reconfigurable Multi-band Dual-chip Microwave Waveform Generation, Hongshi Zhao1, Jianxin Ma1,2; 1Beijing Univ. of Posts & Telecom, China; 2State Key Laboratory of Information Photonics and Optical Communications, China. A novel photonic scheme for multi-band dual-chip waveforms generation is proposed. The bandwidth-quadrupling dual-chip waveforms at five consecutive bands without high frequency components are simultaneously generated after balanced detection between the modulated and unmodulated lightwaves.

M4A.346 Improving the Performance of an Optoelectronic Oscillator by Employing a Whisperry Gallery Microwave Cavity, Haibo Chen1, He Yang1, Ya Ban1, Chao Wang1, Yushan Lu1, Kai Huang1, Fan Yang1, Dan Liu1, Yuan Yuan1, Dongliang Yan1, Xing Chen1; 1Beijing Inst. Radio Metro & Measurement, China; 2China Aerospace Science and Technology Corporation, China; School of Microelectronics, Tianjin Univ., China; 3Information and Navigation College, China. An orthogonally polarized optical signal is generated and used to perform data modulation and local carrier generation. As a result, a phase modulated linearly chirped waveform can be obtained and coherent detected.

M4A.347 Suppression of Even-Order Distortions in Directly Modulated APL for the Mobile Fronthaul System, Ying Cao1, Jianxin Ma1; 1Beijing Univ. of Posts and Telecommunications, China. A method based on the push-pull manner is proposed in the directly-modulated analog photonic link (APL) to eliminate IMD2. Nine 200 MHz IF signals are experimentally achieved the reduction (>1%) of EVM over 1.5km SSMF.

M4A.348 A Novel Microwave Photonic Filter for Frequency-tripled Signals, Nan Zhu1, Shifeng Liu1, Hongfei Liu1, Limin Zhang1, Mingheng Liu1, Bowen Zhang1, Shiliang Pan1; 1Nanjing Univ. of Aero. and Astro., China. A novel microwave photonic filter (MPF) for frequency-tripled signals is proposed. The simulation results show that the proposed MPF successfully selects out frequency-tripled signals with reconfigurable center frequency and bandwidth.

M4A.349 Generation and detection of a phase modulated linearly chirped waveform using an orthogonally polarized optical signal, Xuan Li1, Shanghong Zhao1, Guodong Wang1, He Li1; 1Information and Navigation College, China. An orthogonally polarized optical signal is generated and used to perform data modulation and local carrier generation. As a result, a phase modulated linearly chirped waveform can be obtained and coherent detected.

M4A.350 Photonic Generation of Multi-Band Dual-chip Microwave Waveform with Increased Time-Bandwidth Product, Jialing Yang1, Jianxin Ma1; 1Beijing Univ. of Posts and Telecommunications, China. A simple scheme to generate multi-frequency dual-chip microwave waveform with increased time-bandwidth product based on microwave photonics is proposed. The waveforms including center frequency-bandwidths of 10GHZ-3.2GHZ, 20GHZ-3.2GHZ, and 30GHZ-3.2GHZ are simultaneously generated with two cascaded polarization modulators.

M4A.351 All-Optical Aggregation Scheme Based On Joint Modulation, Qi Yang1, Xiaohu Wang1, Qi Zhang1, Xiangjun Xin1, Ran Gao1, Ying Tao1; 1China Academy of Space Technology, China; 2College of Physics and Electronic Engineering, Qujing Normal Univ., China; 3China Academy of Space Technology, China. A novel all-optical aggregation scheme based on joint modulation is proposed. The simulation results show that the proposed scheme can solve the high time-delay and complexity problem of optical-electrical-optical aggregation in traditional schemes.

M4A.352 A photonics waveform generator with RF Frequency Multiplication Circuit and Dual-parallel Mach-Zehnder Modulator, Xiao Li1,2, Jianbin Yao1; 1Beijing Univ. of Posts and Telecommunications, China; 2State Key Laboratory of Information Photonics and Optical Communications, Beijing University of Posts and Telecommunications, China. A novel optical frequency comb (OFC) generator with two parallel dual-Mach-Zehnder modulators (PMZMs) and intensity modulator (IM) is proposed. Results show that 80-line OFC with flatness of 0.32dB and frequency interval of 8GHz can be obtained.

M4A.353 Flat Optical Frequency Comb Generation Based on Intensity Modulator with RF Frequency Multiplication Circuit and Dual-parallel Mach-Zehnder Modulator, Xiaoliu Liu1,2, Qiang Li1; 1Beijing Univ. of Posts and Telecommunications, China; 2State Key Laboratory of Information Photonics and Optical Communications, Beijing University of Posts and Telecommunications, China. A novel optical frequency comb (OFC) generator using two parallel Mach-Zehnder modulators (PMZMs) and intensity modulator (IM) is proposed. Results show that 80-line OFC with flatness of 0.3dB and frequency interval of 8GHz is obtained.

M4A.354 A Bonding Structure with Low Return Loss and High Transmission Bandwidth for Microwave Circuit, Shangbin Sun1, Yuanxiang Chen1, Jia Fu1, Ying Han1, Yongtao Huang1, Shangjing Lin1, Leijing Yang1, Jianguo Yu1; 1Beijing Univ. of Posts and Telecomm, China. In this paper, we present a bonding interconnect structure based on multi-stub impedance matching. The proposed structure has excellent high-frequency performance with 3dB bandwidth of 65.9GHz and return loss is -15.533dB at 40GHz.

M4A.355 Monolithically Reflector Integrated Waveguide Photodetector with RF Frequency Multiplication Circuit and Dual-parallel Mach-Zehnder Modulator, Shangbin Sun1, Yuanxiang Chen1, Jia Fu1, Ying Han1, Yongtao Huang1, Shangjing Lin1, Leijing Yang1, Jianguo Yu1; 1Beijing Univ. of Posts and Telecommunications, China. In this paper, a waveguide photodetector with optically-isolated mesa, a RF frequency multiplication circuit and a dual-parallel Mach-Zehnder modulator is proposed. Results show that the proposed scheme works well for managing the resources of the hybrid networks.

M4A.356 Photonic generation of phase-coded microwave signal with tunabilities, Wensheng Zhai1, Jianbin Yao1, Yuxia Xin1, Rujiao Zhang1, Hai Yang1; 1School of Physics and Electronics, North China Agricultural University of Water Resources and Electric Power, China; 2State Key Laboratory of Information Photonics and Optical Communications, Beijing University of Posts and Telecommunications, China. We propose a photonic scheme to generate a tunable frequency phase-coded microwave signal based on a phase modulator and balanced detection. The experimental results implement 30GHz signal with a coding rate of 5Gbps.

M4A.357 Dynamic Resource Management for Indoor Hybrid Visible Light Communications and WiFi Networks, Liwei Yang1, Yuqi Luo1, Zelin Li1, Zhang Qi1, Wenjie Zhang2; 1China Agricultural University, China; 2Minnan Normal University, China. Dynamic resource management is proposed to realize the coexistence of visible light communications and WiFi systems. Simulation results show that the proposed scheme works well for managing the resources of the hybrid networks.

M4A.358 Photonic generation of phase-coded microwave signal with tunabilities, Wensheng Zhai1, Jianbin Yao1, Yuxia Xin1, Rujiao Zhang1, Hai Yang1; 1School of Physics and Electronics, North China Agricultural University of Water Resources and Electric Power, China; 2State Key Laboratory of Information Photonics and Optical Communications, Beijing University of Posts and Telecommunications, China. We propose a photonic scheme to generate a tunable frequency phase-coded microwave signal based on a phase modulator and balanced detection. The experimental results implement 30GHz signal with a coding rate of 5Gbps.
**Ballroom C, Track 1**

**08:30–10:00**

**T1A • Optical Fibre Sensors IV**

*Presider: Fei Xu; Nanjing Univ., China*

**T1A.1 • 08:30**

**Invited**

*Optical fiber sensing technology for wearable devices, Arnaldo Leal Junior1,2; ‘Federal Univ. of Espirito Santo, Brazil.*

In this presentation, we discuss the developments on optical fiber sensors for wearable devices, using both standard silica optical fibers and specialty fibers including the polymer optical fibers for both intensity and wavelength-based sensors systems.

**T1A.2 • 09:00**

**Invited**

*Silicon-tipped fiber-optic thermometers, anemometers, and bolometers, Ming Han1;3; ‘Michigan State Univ., USA.*

Taking advantage of the peculiar optical and thermal properties of silicon, we introduce the fabrication of silicon Fabry-Perot sensors at the tip of an optical fiber and their applications as high-speed temperature sensors, anemometers for flow measurement, and bolometers for plasma diagnosis in fusion devices.

**Ballroom A, Track 2**

**08:30–10:00**

**T1B • Machine Learning Assisted Transmission**

*Presider: Liangchuan Li; Huawei Technologies Co Ltd, China*

**T1B.1 • 08:30**

**Four-Dimensional Direct Detection Receiver Based on Stokes Vector and Differential Polarization Inner Product, Honglin Ji1, Tonghui Ji2, Chuanbowen Sun1, Zhaopeng Xu1, Ranjith Rajasekharan Unnithan1, William Shieh3; ‘The Univ. of Melbourne, Australia; ‘Univ. of Science & Technology Beijing, China.**

We propose a four-dimensional direct detection receiver based on differential polarization inner product and Stokes vector direct detection, which is experimentally verified by a reception of 30-Gbaud dual-polarization QPSK signal.

**T1B.2 • 08:45**

**Novel Preamble Scheme for Upstream Burst-mode Coherent Detection in TDM PON, Jie Li1, Shaohua Yu1, Ming Luo1, Tao Zeng1; ‘Lab Optical Comm. Tech & Network, China.**

We propose a novel preamble scheme combined with memory-aided equalization strategy for upstream burst-mode coherent detection in TDM PON. The power budgets are 39.4-dB for 112-Gb/s PDM-QPSK system after 40-km SMF by 59.43-ns preamble.

**Conference 06, Track 3**

**08:30–10:00**

**T1C • Design and Operation of Optical Networks**

*Presider: Qunbi Zhuge; Shanghai Jiao Tong Univ., China*

**T1C.1 • 08:30**

**Invited**

*Cognitive optical networks, Vincent W. Chan1; ‘Massachusetts Inst. of Technology, USA.*

The optical network of the future will have huge increase in rates, due to large transactions. Cognitive techniques will be used for fast scheduling of resources and agile adaptations for congestion control and network resilience.

**T1C.2 • 09:00**

**Invited**

*SDN Enabled Reconfigurable Optical Data Center Network, Xuewei Xue1,2; ‘Beijing University of Posts and Telecommunications, China; ‘Eindhoven University of Technology, Netherlands.*

SDN enabled control plane facilitate the flexible optical network slicing provisioning with reconfigurable network interconnections. Programmable functionalities can be supported by updating look-up table and monitoring statistic from top of racks and optical switch controllers.

**Conference 05, Track 4**

**08:30–10:00**

**T1D • Photonic Integrated Devices**

*Presider: Yu Yu; Wuhan National Lab for Optoelectronics, China*

**T1D.1 • 08:30**

**Invited**

*Lithium niobate integrated photonics, Qiang Lin1; ‘Univ. of Rochester, USA.*

This talk will present our recent progress in developing various photonic functionalities on the lithium niobate integrated photonic platform, such as broadband frequency combs, high-quality entangled photon pairs, and wavelength-scale electro-optic modulators.

**T1D.2 • 09:00**

**Invited**

*An open Silicon Photonics ecosystem for computercom applications, Marco Fiorentino1;2; ‘Hewlett Packard Lab, USA.*

I will discuss progress towards an open Silicon Photonics ecosystem targeted at computercom applications. The ecosystem comprises a number of tools including a development kit with verified devices designed using industry-standard tools and fabricated in a commercial foundry, a test environment, fiber attach, and packaging.
T1E.1 • 08:30 Invited
Silicon photonic integrated Bragg gratings and the applications for microwave photonic signal processing, Jianping Yao1; 1Univ. of Ottawa, Canada. Silicon photonic integrated Bragg gratings are key components in photonic integrated circuits (PICs). In this talk, two silicon photonic integrated Bragg gratings that can be reconfigured for electronically programmable microwave photonic signal processing are presented.

T1E.2 • 09:00 Invited
Subwavelength Grating Waveguide Devices in Silicon Photonics for Microwave Photonic Signal Processing, Lawrence R. Chen1; 1McGill Univ., Canada. We review recent work on developing integrated optical delay lines based on subwavelength grating waveguide devices in silicon photonics for microwave photonic signal processing.

T1F.1 • 08:30 Invited
Si-compatible CW Perovskite Laser at Room Temperature and Perovskite Gain-assisted Hyperbolic Metamaterials, Qing Gu1, Zhitong Li1, Jiyoung Moon1, Masoud Alahbakhsh1, Abouzar Gharajeh1, Anvar Zakhidov1; 1The Univ. of Texas at Dallas, USA. We show stable green lasing in MAPbBr3 perovskite under continuous wave optical pumping at room temperature. We also show loss-compensated, luminescent hyperbolic metamaterials wherein the dielectric constituent is fully composed of MAPbI3 perovskite.

T1F.2 • 09:00 Invited
Integrated lithium niobate nonlinear photonics, Mengjie Yu1; 1Harvard Univ., USA. Lithium niobate (LN) is an excellent photonic material for nonlinear interactions. We will discuss the recent advancement of thin-film LN technology, including electro-optic frequency shifters and beamsplitters, supercontinuum generation, Kerr microcombs, and electro-optic frequency combs.

T1G.1 • 08:30 Tutorial
Silicon Photonics Integrated Circuits, John Bowers1; 1Univ. of California, Santa Barbara, USA. Silicon photonics has become a mainstream technology for high volume, low cost manufacturing of photonic devices and integrated circuits for a wide variety of applications. These include optical transceivers for datacom and telecommunications, navigation including LiDARs and gyroscopes, biomedical sensors including lab on a chip, analog transmission for military and space applications and precision timing and optical clocks. Silicon photonic foundries exist on three continents with volumes in the millions of units per year. Laser integration on silicon has been commercialized using heterogeneous integration and prospects look good for epitaxial lasers on silicon. Here we give an overview of recent research in the area and prospects for future results.

T1G.2 • 09:15 Tutorial
Silicon subwavelength meta-structures based multifunctional problem solver, Hao Jia1, Shanglin Yang1, Ting Zhou1, Lei Zhang1, Tao Wang1, Haxiong Chen1, Jianhong Yang1, Lin Yang1; 1Lanzhou Univ., China; 1ISCAS, China. In this paper, we utilize silicon subwavelength meta-structures as hardware solvers for multiple problem. By manipulating the evolution of optical parameters through device, we solve the permutation cipher and signal switching problem in optical field.
T1A.3 • 09:30
Distributed acoustic sensor based sand content detection in solid-liquid two-phase flow, Tongda Li1, Wei Qiao1, Hao Li1, Zijun Sun1, Zhijun Yan1, Deming Liu1; ‘Huazhong Univ of Science and Technology, China. We demonstrated a real time sand content measurement in solid-liquid flow by employing an optical fiber distribution acoustic sensor (DAS) system.

T1A.4 • 09:45
Single-shot detection of thermal response of thin films based on photonic time stretch, Luhe Zhang1, Zhi Wang1, Caiyun Li1, Longfei Zhu1, Mengjie Zhou1; ‘Nankai Univ., China. Single-shot detection method based on photonic time-stretch of femtosecond laser pulses is introduced to obtain thermal response of materials. This process improves the traditional detection technology and has potential applications in high-throughput measurement of materials.

T1B.4 • 09:30
Applications of information theoretic approaches in optical Communications, Tobias Fehenerberger1; ‘ADVA Optical Networking, Germany. Performance metric such as signal-to-noise ratio (SNR) and achievable information rate (AIR) are reviewed in the context of fiber-optic communications. We highlight that for probabilistic constellation shaping, AIR are the most relevant quantities while SNR might give misleading results.

T1C.3 • 09:30
Defragmentation in optical networks, Brigitte Jaumard1; ‘Concordia Univ., Canada. Abstract not available.

T1D.3 • 09:45
Sinusoidal Silicon Waveguide Array for Optical Phased Array with Low Crosstalk, Xiaogen Yi1, Huiying Zeng1, Sai Gao1, Ciyuan Qiu1; ‘Shanghai Jiao Tong Univ., China. We propose an ultra-compact low-crosstalk sinusoidal silicon waveguide array with a pitch of 695 nm, where the sinusoidal bends are keys to reduce the crosstalk between waveguides.

T1D.4 • 09:45
New concept of silicon photonic MEMS switch based on total internal reflection, Yi Sun1, Daoxin Dai1; ‘Zhejiang Univ., China. A novel silicon photonic MEMS switch based on total internal reflection is proposed for the first time. It works well with a low excess loss of ~0.2dB, a high extinction ratio in an ultra-broad wavelength range of 1250-1650nm, and can be easily extended to large-scale switch matrix in the future because of its low power consumption.

10:00–10:30 Coffee Break & Exhibition
Coverage Analysis for Centralized Optical Beamforming Based mmWave Cloud-RAN Systems, Huan Huang1, Xiaowen Wang1, Chongfu Zhang1, Wei Zheng1, Kun Qiu1; 'Univ. Electron. Sci. & Technol. China, China. A centralized optical beamforming scheme, only requiring less than half of the beamforming resources, is proposed for 5G millimeter-wave cloud radio access networks. Stochastic geometry-based coverage analysis shows that the proposed scheme achieves near-optimal performance.

Mesa-Top Single Quantum Dot Arrays as Single Photon Sources: A new paradigm for On-chip Quantum Photonics, Jiefei Zhang1, Swarnabha Chattaraj1, Qi Huang1, Lucas Jordao1, Siyuan Lu2, Anupam Madhukar1; 'Univ. of Southern California, USA; 'IBM Thomas J. Watson Research Center, USA. We demonstrate a new paradigm for realizing scalable quantum optical circuits based on a new class of buried ordered spectrally uniform (\(\sigma_{\lambda}<2\text{nm}\)) quantum dot single photon source array with highly pure single photon emission (purity>99%).

Toward fully integrated nonlinear photonics, Lin Chang1, Weiqiang Xie1, John Bowers1; 'Univ. of California Santa Barbara, USA. Two key advances recently made toward integrated nonlinear photonic circuits are presented, including an ultra-efficient (Aluminium) Gallium Arsenide on insulator nonlinear platform, and integrated turnkey soliton microcombs.

Multi-Microwave Frequency Comb Generation by Injecting Modulated Beams with Negative Wavelength Detuning in a Single Mode FP-LD, Snehi Bassi1, Hao Chen1, Limin Zhang1, Bikash Nakarmi1, Shilong Pan1; 'Nanjing Univ. Aeronautics & Astronautics, China. We demonstrate multi-microwave frequency comb generation using negative injection locking of the modulated beams in a single mode FP-LD. The additional modulator is used to improve the power flatness of the comb generation.
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<th>Time</th>
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<tr>
<td>10:30–12:00</td>
<td><strong>Ballroom C, Track 1</strong></td>
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<tr>
<td>T2A.1 • 10:30</td>
<td><strong>Invited</strong> Recent Progress on fusion splicing of hollow-core photonic crystal fibers, Limin Xiao; Fudan Univ., China. We demonstrate a reverse tapering approach for the low-loss fusion splice between the antiresonant hollow core fiber (AR-HCF) and the standard single-mode fiber (SMF-28). A record low loss of the SMF-28/AR-HCF/SMF-28 chain less than 1.4 dB is demonstrated without using any intermediate bridging elements.</td>
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<tr>
<td>T2A.2 • 11:00</td>
<td><strong>Invited</strong> Polymer-Filled In-Fiber Mach-Zehnder Interferometer with Pt-loaded WO3, Coating for Trace Hydrogen Detection, Bin Du; Jun He; Kukui Guo; Xihen Xu; Ying Wang; Yiping Wang; Shenzhen Univ., China. A highly sensitive hydrogen optical fiber sensor based upon Mach-Zehnder interference is demonstrated. The fiber sensor exhibits a high sensitivity of (-1948.68 \text{ nm/% (vol)}) when the hydrogen concentration increases from 0% to 0.8% (vol%).</td>
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<td>T2A.3 • 11:15</td>
<td><strong>Invited</strong> 4 μm HBr fiber gas laser, Zefeng Wang; Zhiyue Zhou; Hao Li; Yalong Cui; Wei Huang; National Univ of Defense Technology, China; State Key Laboratory of Pulsed Power Laser Technology, China. We report here a 4 μm fiber laser in HBr-filled silica hollow-core fibers (HCFs). Pumped by a 2 μm thulium–doped fiber amplifier (TDFA), a maximum 4 μm power of (-350 \text{ mW}) is achieved with a conversion efficiency of about 10%.</td>
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<td>10:30–12:00</td>
<td><strong>Ballroom A, Track 2</strong></td>
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<tr>
<td>T2B.1 • 10:30</td>
<td><strong>Invited</strong> Modern Undersea Cable Systems Evolution, Ruomei Mu; TE SubCom, USA. We will overview the evolution of modern submarine cable systems from harvesting capacity within bandwidth of single fiber to power efficient space division multiplexing (SDM) designs. Capacity optimization employing &quot;open cable&quot; concept will be introduced.</td>
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<td>T2B.2 • 11:00</td>
<td><strong>Invited</strong> Extended wavelength-band transmission by wavelength conversion, Tomoyuki Kato; Fujitsu Ltd., Japan. We review a large-capacity WDM transmission system that utilizes the wider transparent wavelength band of the developed fiber while using commonly available C-band transceivers, and wavelength conversion technologies that realizes the system.</td>
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<tr>
<td>T2B.3 • 11:15</td>
<td><strong>Invited</strong> 4 μm HBr fiber gas laser, Zefeng Wang; Zhiyue Zhou; Hao Li; Yalong Cui; Wei Huang; National Univ of Defense Technology, China; State Key Laboratory of Pulsed Power Laser Technology, China. We report here a 4 μm fiber laser in HBr-filled silica hollow-core fibers (HCFs). Pumped by a 2 μm thulium–doped fiber amplifier (TDFA), a maximum 4 μm power of (-350 \text{ mW}) is achieved with a conversion efficiency of about 10%.</td>
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<td>10:30–12:00</td>
<td><strong>Conference 06, Track 3</strong></td>
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<tr>
<td>T2C.1 • 10:30</td>
<td><strong>Invited</strong> Service Function Chaining &amp; Embedding, Xiaojun Cao; Georgia State Univ., USA. The optimization of Service Function Chaining (SFC) and embedding involves three interrelated subprocesses: SFC composition, node mapping and link mapping. The asymmetric traffic patterns and operation dependences add further constraints onto the challenging SFC processes.</td>
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<td>T2C.2 • 11:00</td>
<td><strong>Invited</strong> Multi-granular Optical Networks, Suresh Subramaniam; George Washington Univ., USA. Disasters can damage or destroy large parts of our communications infrastructure. This talk will explore the impact of disasters on optical transport networks, and present some disaster management strategies.</td>
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<td>T2C.3 • 11:15</td>
<td><strong>Invited</strong> 4-bar Quasi-phase-matching in AlGaAs-on-insulator square microcavities, Andrew W. Poon; Hong Kong Univ of Science &amp; Technology, China. The AlGaAs-on-insulator material platform offers compact, integrated nonlinear devices. The point-group symmetry of AlGaAs enables a natural quasi-phase-matching. In this talk, we will present our work on 4-bar quasi-phase-matching in square microcavities.</td>
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<td>10:30–12:00</td>
<td><strong>Conference 05, Track 4</strong></td>
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<tr>
<td>T2D.1 • 10:30</td>
<td><strong>Invited</strong> Optical phase-change materials (O-PCMs) for reconfigurable photonics, Juejun Hu; Massachusetts Inst. of Technology, USA. O-PCMs uniquely offer exceptionally large refractive index modulation with minimal loss penalty, made possible through a dielectric-dielectric structural transition. Here we discuss our recent work on reconfigurable integrated photonics and metasurface based on O-PCMs.</td>
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<tr>
<td>T2D.2 • 11:00</td>
<td><strong>Invited</strong> 4-bar Quasi-phase-matching in AlGaAs-on-insulator square microcavities, Andrew W. Poon; Hong Kong Univ of Science &amp; Technology, China. The AlGaAs-on-insulator material platform offers compact, integrated nonlinear devices. The point-group symmetry of AlGaAs enables a natural quasi-phase-matching. In this talk, we will present our work on 4-bar quasi-phase-matching in square microcavities.</td>
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T2E • Microcomb Applications
Presider: Yihan Li; Beihang Univ.

T2E.1 • 10:30
Invited
Microcomb Generation for Microwave Photonic Applications, Xiaoxiao Xue; Tsinghua Univ., China. Microresonator frequency combs are very promising as a novel generation of optical sources. Here we review recent advances of microcomb generation for microwave photonic applications, including signal processing, antenna steering, radio-over-fiber transmission, and waveform generation.

T2F • Bound State in the Continuum
Presider: Renmin Ma; Peking Univ., China

T2F.1 • 10:30
Massively-encoded optical data storage mediated by cylindrical vector beams and disordered nanoparticles, Mingcong Xian, Yi Xu, Xu Ouyang, Yaoyu Cao, Sheng Lan, Xiangping Li; Jinan Univ., China. We demonstrate that vectorial properties of cylindrical vector beams within the focal spot can boost the capacity of optical data storage in disordered nano-aggregates which shed new light on interaction between structured light and nanostructures.

T2F.2 • 10:45
Tutorial
Recent advances in Mie-resonant metaphotonics, Yuri S. Kivshar; Australian National Univ., Australia; ITMO Univ., Russian Federation. This talk aims to review recent advances in Mie-resonant metaphotonics, including the physics of bound states in the continuum with isolated dielectric resonators and metasurfaces, generalized Kerker effect, nonlinear, active, and topological effects.

T2G • Laser Science
Presider: Yue Zhou, Beijing University of Posts and Telecommunications, China

T2G.1 • 10:30
Invited
Integrated optical switches based on 2D materials and beyond, Jianji Dong; Wuhan National Lab for Optoelectronics, China. Abstract not available.

T2G.2 • 11:00
Invited
GaSb-based Lasers and PICs for Short- and Mid-wave Applications, Shamsul Arafin; ECE, Ohio State Univ., USA. I will mainly discuss about the recent progress on antimonide material system for the development and demonstration of a photonic integrated circuits (PICs) technology platform in the extended short- and mid-wave infrared (S-MWIR) spectral band.
**Ballroom C, Track 1**

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<th>Time</th>
<th>Session Title</th>
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<tr>
<td>T2A.4</td>
<td>11:30 Soliton molecules in a robust all polarization-maintaining mode-locked fiber laser, renlai zhou, H.Y. Fu, Qian Li; Peking Univ., China; Tsinghua Univ., China. We experimentally demonstrate the generation of soliton molecules in a robust all polarization-maintaining mode-locked fiber laser with a non-reciprocal phase bias.</td>
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<td>T2A.5</td>
<td>11:45 Soliton-molecule mode-locking via spectral filtering effect, Zilong Li, Hairun Guo, Huanhuan Liu; Shanghai Univ., China; Southern Univ. of Science and Technology, China. We demonstrate the generation of soliton molecules by means of the spectral filtering effect in mode-locked fiber lasers, and we implement the control on number of the bounded solitons by frequency tuning the filter component.</td>
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**Ballroom A, Track 2**

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<th>Time</th>
<th>Session Title</th>
<th>Authors</th>
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<tr>
<td>T2B.3</td>
<td>11:30 Field Trial Demonstration of Real-Time 1.2Tb/s (2x600Gb/s) Optical Channel over a Live G.652 Fiber Link Achieving Net Spectral Efficiency of 8bit/s/Hz, Yu Rong Zhou, Kevin Smith, Steve Duff, Hongbing Wang, Weimei Pan, Paul Hackett, Daniel Tanasou, Hui Zhang, Ming Chen, Huang Gu, Jianwu Wang, Chao Zhang, Zhuhong Zhang, BT, UK; Opticconnections Ltd, UK. We report a successful field trial of real-time 1.2Tb/s (2x600Gb/s) optical channel within 150GHz spectral width over a live 16km G.652 fiber link using only EDFAs, achieving long-term error-free performance with net spectral efficiency of 8bit/s/Hz.</td>
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<td>T2B.4</td>
<td>11:45 28 Channel PAM4 WDM Transmitter based on a Single Time Lens Source, Xiaoyu Xu, Deming Kong, Peter D. Girouard, Mads Lillieholm, Leif K. Oxenløwe, Pengyu Guan; Technical Univ. of Denmark, Denmark. We demonstrate a PAM4 WDM transmitter using a single Time Lens source. 28x250 Mb/s WDM PAM4 channels are generated simultaneously.</td>
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**Conference 06, Track 3**

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<th>Time</th>
<th>Session Title</th>
<th>Authors</th>
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<tbody>
<tr>
<td>T2C.3</td>
<td>11:30 Invited Asymmetric Cluster Network with Distributed Broadcast Switch and Asymmetric Network Adapter, Yunqiu Liu, zhilong li, Jiang Tao, Peng Gao, Vissore Technologies Inc., Canada; Huazhong Univ. of Science and Technologies, China; China Mobile Group Design Institutes, China. This paper proposes an asymmetric cluster network, and how an asymmetric network is constructed with novel Distributed Broadcast Select Switch. It discusses the combination of multi-stage networks and direct interconnection networks with Distributed Broadcast-Select Switch.</td>
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<td>T2D.3</td>
<td>11:30 Silicon Optical Phased Array Side Lobe Suppression Based on an Improved Genetic Algorithm, Qixin Liu, Youxi Lu, Beibei Wu, Ping Jiang, Rui Cao, Junbo Feng, Jin Guo, Li Jin; Changjiing United Microelectronics Center, China. We experimentally demonstrate a 1x128 optical phased array, and an improved genetic algorithm is proposed to efficiently increase the side lobe suppression ratio (SLSR). The measured SLSR can achieve 20 dB with a divergence angle of 0.16°.</td>
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**Conference 05, Track 4**

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<th>Time</th>
<th>Session Title</th>
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<td>T2D.4</td>
<td>11:45 Silicon-based Optical Neural Network Chip Based on Coherent Detection, Ruiting Wang, Pengfei Wang, Guangheng Luo, Hongyan Yu, Xuliang Zhou, Yeyin Zhang, Jiaqing Pan; Inst. of Semiconductors, CAS, China; Unv. of Chinese Academy of Sciences, China. We design a silicon-based optical neural network (ONN) chip based on coherent detection. Nonnegative neural networks are trained and tested on three different datasets and test accuracies are 96.67%, 97.22% and 96.16% respectively.</td>
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**12:00–13:30 Lunch Break**
### T2E.3 • 11:30
**Frequency Stabilization of a Mode-locked Semiconductor Laser Using Simultaneous Optical and Optoelectronic Oscillation Feedback**, Huan Wang, Hefei Qi, Rui Kang Zhang, Junyi Zhang, Jinhui Qie, Dan Lu, Lingjuan Zhao; 'Inst. of Semiconductors, Chinese Academy of Sciences, China; 2Hebei Key Laboratory of Electromagnetic Spectrum Cognition and Control, The 54th Research Inst. of CETC, China. A simultaneous optical and optoelectronic oscillation feedback scheme has been demonstrated to reduce the phase noise of a mode-locked laser diode to -102 dBc/Hz at 10 kHz offset from the carrier frequency of 41GHz.

### T2E.4 • 11:45
**Frequency Measurement Utilizing the Frequency shift of Optical Frequency Combs**, Yuan Ling; 'Univ. of Electronic Science and Tec, China. A novel method of microwave frequency measurement is proposed and demonstrated utilizing the frequency shift of optical frequency combs with simplified system, enabling ultra-wide frequency measurement with its error less than 10kHz.

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### VIP 01, Track 6

**T2G.4 • 11:45**  
**Invited**  
**Polarization vortices in momentum space and bound states in the continuum,** Lei Shi; 'Fudan Univ., China. Bound states in the continuum in periodic photonic systems like photonic crystal slabs are proved to be accompanied by vortex polarization singularities on the photonic bands in the momentum space. In this talk, I will show that the winding structures of polarization states not only widen the field of topological physics but also show great potential that such systems could be applied in polarization and phase manipulating.

### VIP 02, Track 4

**T2G.3 • 11:30**  
**Reduced Relative Intensity Noise of Integrated DFB Laser Array under Injection Locking**, Xiaoyang She, Bing Xiong, Changzheng Sun, Zhibiao Hao, Jian Wang, Lai Wang, Yanjun Han, Hongtao Li, Yi Luo; 'Tsinghua Univ., China. A four-element DFB laser array with double Y-branch couplers is monolithically integrated for stable injection locking. Experiment results show that relative intensity noise of the laser array is obviously reduced under injection locking.

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### 12:00–13:30 Lunch Break
Tuesday, 27 October
ACP/IPOC 2020 — Tuesday, 27 October

Ballroom C, Track 1
13:30–15:30
T3A • Optical Fibres and Devices III
President: Binbin Yan; Beijing Univ. of Posts and Telecom, China

T3A.1 • 13:30
Kilometers long graphene coated optical fibers for fast temperature sensing, Yi Yong Guo1, Bing Han2, Shanshan Cao1, Teng Tan3, Ning An4, Chenye Qin1, Yiew Li2, Yun-Jiang Rao2, Baicheng Yao2; 1Key Laboratory of Optical Fiber Sensing and Communications (Education Ministry of China), Univ of Electronic Science & Tech China, China; 2Research Center for Optical Fiber Sensing, Zhejiang Laboratory, China; 3Optical Fiber Co., Ltd., ZTT Group, China. Kilometers long graphene coated fiber based on industrial production is proposed. The in-fiber graphene illustrates unusually high thermal diffusivity, enabling rapid thermo-optical response in both fiber Bragg grating sensors and distributed fiber temperature sensing systems.

T3A.2 • 13:45
Controlled Wave Structure of the Microfiber for Stretchable Optical Sensors, Hengtian Zhu1, Fei Xu1; 1Shenzhen Research Inst. of Nanjing Univ., China. We demonstrate a stretchable optical sensor based on the wavy microfiber. With great sensitivity and stretchability, the proposed sensor is employed for human respiration monitoring and the finger bend, preforming an application potential for human health monitoring and robotics.

T3A.3 • 14:00
Modal Delay Measurement for Few-Mode Fibers Using Frequency-Domain Complex Transfer Function, Kangmei Li1, Xin Chen1, Jason Hurley1, Jeffrey Stone1, Ming-Jun Li1; 1University of California, Davis, USA. We present a simple and robust method for measuring modal delays of few-mode fibers by using complex transfer function. The results for bi-modal and four-mode fibers agree well with direct time domain measurements.

Ballroom A, Track 2
13:30–15:30
T3B • DCI and Metro Transmission
President: Jian Wu; Beijing Univ of Posts & Telecom, China

T3B.1 • 13:30
Direct Detection of 100-Gb/s PAM-8 Signals Over 80-km Fiber Transmission for DCI and Metro Networks, Ming Luo1, Zhixue He1, Chao Yang1, Hailbo Li1, Shaohua Yu1; 1China Information Communication Technologies Group Corporation, China. We experimentally demonstrate a direct detection scheme in DCI and metro networks to generate 43-Gbaud PAM-8 signals in a single-driver MZM and transmit over 85-km SSMF at C band without optical inline dispersion compensation.

T3B.2 • 13:45
56 Gbit/s/dA PAM-4 IM/DD Transmission over 120 km SSMF at O-band Using Cascaded Semiconductor Optical Amplifiers for Data Center Interconnects, Jiao Zhang1,2, Wen Zhou1, Jiangnan Xiao1, Jianjun Yu1, Min Zhu1, Mingzheng Lei1,2, Yuanchao Cai1,2, Yunchou Zou1,2, Gangyi Zhou1, Weiliang Xu1, Ji-Kuan Wang1; 1Purple Mountain Laboratories, China; 2Southeast Univ., China. We experimentally demonstrated the first 56 Gbit/s/dA PAM-4 IM/DD system transmission over 120 km SSMF at O-band assisted by cascaded SOAs with the bandwidth-limited optics and simple DSP for high-speed DCI in metro-access networks.

T3B.3 • 14:00
Invited
Field Recovery of Double Side Banded Signals with Self-coherent Detection, William Sheih1; 1Univ. of Melbourne, Australia. Abstract not available.

Conference 06, Track 3
13:30–15:30
T3C • Optical Network Control and Automation
President: Weigang Hou; Chongqing Univ. of Posts and Telecommunications, China

T3C.1 • 13:30
Invited
Machine Learning and Data-Driven Solutions for Cost-efficient Network Automation, Sabidur Rahman1; 1Sonoma State Univ., USA. Many time-consuming and complex tasks of network management are being automated thanks to advances in machine learning, and other data-driven solutions. This study highlights recent contributions towards network automation and gives directions for future research opportunities.

T3C.2 • 14:00
Collaborative Learning in Multi-Domain Optical Networks, Xiaoliang Chen1, Roberto Proietti1, Che-Yu Liu1, S. J. Ben Yoo1; 1Univ. of California, Davis, USA, 2Inst. of Nanjing Univ., China. Abstract not available.

Conference 05, Track 4
13:30–15:30
T3D • Heterogeneous Integration I
President: Zejie Yu; Zhejiang Univ., China

T3D.1 • 13:30
SOI based InAs QD lasers for silicon photonic integration, Ting Wang1; 1Institute of Physics, CAS, China. Direct epitaxial growth of III-V nanostructures on Si is one of the most promising candidates for realizing photonic devices on Si platform. Here, we have demonstrated series of InAs/GaAs quantum-dot lasers on SOI substrates via (111)-faceted-sawtooth Si hollow structure via IV/I/II-V hybrid epitaxy for on-chip silicon photonic integration.

T3D.2 • 14:00
High performance germanium photodetectors for O-band silicon photonics, Junrong Cing1, Thomas Ang2, Xin Guo1, Soon T. LIM1, Hong Wang1, Jason Ching Eng Png1; 1Inst. of High Performance Computing, Singapore, 2Nanyang Technological Univ., Singapore. We demonstrate a germanium-on-silicon vertical photodetectors for O-band wavelengths. The device shows $<$4mA of dark current and responsivity of 0.87 A/W at -2V. The device bandwidth of 35 GHz is suitable for high speed applications.
**ACP/IPOC 2020 — Tuesday, 27 October**

**Conference 07, Track 5**

**13:30–15:30**
**T3E • Microwave Photonic Radar**
*Presider: Fangzheng Zhang; Nanjing Univ. of Aeronautics and Astronautics*

**13:30–15:30**
**T3F • Solid State Quantum Emitters**
*Presider: Yu-Nan Gao, Peking University, China*

**13:30–15:30**
**T3G • Advanced Photonic Devices**
*Presider: Jian Wu; Beijing Univ of Posts & Telecom, China*

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**T3E.1 • 13:30**
Invited
Broadly tunable RF receiver and Radar architectures enabled by silicon photonics, Daniel Onori¹, Jose Azana¹; ¹INRS - EMT, Canada. This talk reviews recent work on broadly-tunable transceivers on silicon-photonic-chip for radar and surveillance. By exploiting an innovative lasers' noise-referencing scheme, the fabricated devices show reconfigurable operation in the range 0.5-35GHz, an unprecedented image-rejection ratio >80dB, and robust antenna-remoting capability.

**T3F.1 • 13:30**
Invited
High-performance single-photon sources from solid-state quantum emitters, Hui Wang; ¹Univ. of Science and Technology of China, China. A series of work focused on the single- and entangled-photon sources from quantum dots will be introduced.

**T3G.1 • 13:30**
Invited
Silicon Optical Interposer for EPIC 2.5D Integration, Soon T. Lim¹, Hong Y. Li², Hong M. Li³, Eva W. Li³, Thomas Ang¹, JunRong Ong¹, Wee Kee Phua¹, Alagappan Gandhi¹, Jason Ching Eng Png¹, Teck Guan Lim³; ¹Inst. of High Performance Computing, Singapore; ²Heterogeneous Integration (HI), Inst. of Microelectronics, Singapore; ³System In Package (SIP), Inst. of Microelectronics, Singapore. A Silicon Optical Interposer for 2.5D integration functions as a bases for optical alignment of the Photonic IC. It utilizes a set of U-grooves with submicron accuracy and Dummy Fiber’s cylindrical face for self-alignment.

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**T3E.2 • 14:00**
Invited
Scalable Integrated Photonics Beamforming Circuits, Jonathan Klamkin¹; ¹Univ. of California Santa Barbara, USA. Abstract not available.

**T3F.2 • 14:00**
Invited
Quantum Emitters in Two-dimensional Hexagonal Boron Nitride, Zai-Quan Xu¹, Chi Li¹, Noah Mendelson¹, Igor Aharonyovitch¹, Milos Toth¹; ¹Univ. of Technology Sydney, Australia. Quantum emitters (QEs) in hexagonal boron nitride (hBN) are critical components with potential applications in quantum technologies. This talk will review our recent study on fabrication, modulation of QEs in 2D hBN and integration to photonics resonators.

**T3G.2 • 14:00**
Invited
High-speed partial-depleted-absorber photodiode based on GaAs/AlGaAs at 850nm wavelength, Zhiyang Xie¹, Zhiqi Zhou¹, Linze Li¹, Haiming Ji², Baile Chen¹; ¹ShanghaiTech Univ., USA; ²Center of Materials Science and Optoelectronics Engineering, Univ. of Chinese Academy of Sciences, China. We report a high-speed partial-depleted-absorber photodiode based on GaAs/AlGaAs with 3-dB bandwidth of 17.9 GHz at 850nm wavelength. Device exhibits responsivity of 0.466 A/W and dark current of 1.09 pA under −3 V bias.
Ballroom C, Track 1

T3A.4 • 14:15 Invited
Orbital Angular Momentum States Switching Scheme in Coherent Fiber Laser Array Based Optical Fields Tailoring System, Tianyue Hou1, Qi Chang1, Hongxiang Chang1, Jinhui Long5, Pengfei Ma1, Pu Zhou1; National Univ of Defense Technology, China. We propose a novel efficient scheme for in-service correlation OTDR signal processing, which reduces the probe time to one third of the original correlation OTDR and decreases processing complexity by using single-period signal extension.

T3A.5 • 14:30 Simulation and Experimental Demonstration of Novel In-service Correlation OTDR using Single-period Signal Extension, Xintao Fan1, Jinhao Du1, Tao Yang1, Sheping Shi1, Yangguang Shangquan1; Beijing Univ of Posts & Telecom, China; ZTE Corporation, China. We propose a novel efficient scheme for in-service correlation OTDR signal processing, which reduces the probe time to one third of the original correlation OTDR and decreases processing complexity by using single-period signal extension.

T3A.6 • 14:45 Analysis of real-time spectral interference using a deep neural network to reconstruct multi-soliton dynamics in mode-locked lasers, Caiyun Li1, Jiangyong He1, Ruijing He1, Yange1; National Univ of Defense Technology, China. We propose a homodyne coherent BiDi systems for data center, Jiangzhuan Li1; HuaWei Technologies Co Ltd, China. We proposed a homodyne coherent BiDi systems for data center. A successful real-time 400G DP-16QAM/600G DP-64QAM demonstration with un-cooled DFB laser and silicon photonics integrated polarization tracking coherent receiver.

T3A.7 • 15:00 Invited
Liquid crystal-assisted coherent combination of fiber lasers for mode-tunable orbital angular momentum beam array generation, Kaiyan Zhu1, Zhi Wang1; 1Nankai Univ., China. A residual convolutional neural network (RCNN) is introduced to retrieve the separation and relative phase of solitons in soliton molecules in passively mode locked lasers (PMLs). It proved to be an effective method to explore complex soliton molecule dynamics.

Ballroom A, Track 2

T3B.4 • 14:30 Invited
Real-time homodyne coherent BiDi optical transmission for data center, Liangzhuan Li1, HuaWei Technologies Co Ltd, China. We proposed a homodyne coherent BiDi systems for data center. A successful real-time 400G DP-16QAM/600G DP-64QAM demonstration with un-cooled DFB laser and silicon photonics integrated polarization tracking coherent receiver.

T3B.5 • 15:00 Invited
Low-complexity nonlinear equalizer for IM/DD systems, Yukui Yu1, Hoon Kim1; KAIST, Korea, Korea. We review our recently proposed nonlinear equalizer based on absolute operation for intensity-modulation/direct-detection systems. The proposed equalizer performs similar to the Volterra equalizer, but reduces the implementation complexity considerably.

Conference 06, Track 3

T3C.3 • 14:30 Invited
P4-Enabled Smart NIC for Intra-Server Network Virtualization Acceleration, Yan Yan2,1, Jianlin Zhuang2, Reza Nejabati1, Dimitra E. Simeonidou1; 1Univ of Bristol, UK; 2Raymax Technology Ltd., China. We implemented OVS data plane offload on P4-enabled Smart NIC, which enabled accelerating the server virtualization flexibly. The results showed, with Smart NIC enabled OVS offload, the bandwidth increased 4x and CPU utilization decreased 70%.

T3C.4 • 14:45 Multiband Pilot Tone Based Optical Performance Monitor- ing and Its Application in Mitigating Chromatic Dispersion Fading, Zhiping Jiang1, Yuefeng Tang1; ‘Huawei Technologies Canada, Canada. Multiband pilot tone based optical performance monitoring is introduced and its generation mechanism in digital domain is described. Its tolerance to dispersion fading is analyzed theoretically and confirmed with experimental measurements.

T3C.5 • 15:00 Experimental Demonstration of Hierarchical Control over Multi-Vendor SDOTN Networks Based on Extended ACTN, Yanxia Tan1,2, Yong Zhang3, Yanlei Zheng3, Zhi Hong Liu1, Yan Shi1, Yantao Zhou1, Guangquan Wang1, Yuefeng Ji1; ‘Beijing Univ of Posts & Telecom, China; ‘China United Network Communications Group Company Limited, China; ‘China Informa- tion Technology Consulting and Designing Inst., China; ‘China Unicorn Research Inst., China. We demonstrate the provisioning of constrained connectivity services and protection functions using extended ACTN for multi-domain and multi-vendor software defined optical transport networks, which are validated in a multi-vendor testbed with commercial OTN equipment.

Conference 05, Track 4

T3D.3 • 14:15 Magneto-optical devices for silicon photonics, Tetsuya Maizumo1, Yaya Shoji1, Daiki Kario1; Tokyo Inst. of Technology, Japan. Magneto-optical isolators exhibit performance characteristics of a 30 dB isolation, a 20-dB isolation bandwidth of 8 nm, and a temperature-insensitive isolation. The magneto-optical switch is successfully demonstrated with a latching function.

T3D.4 • 14:30 Invited
Magnetooptical devices for silicon photonics, Tetsuya Maizumo1, Yaya Shoji1, Daiki Kario1; Tokyo Inst. of Technology, Japan. Magneto-optical devices for silicon photonics, Tetsuya Maizumo1, Yaya Shoji1, Daiki Kario1; Tokyo Inst. of Technology, Japan. Magneto-optical isolators exhibit performance characteristics of a 30 dB isolation, a 20-dB isolation bandwidth of 8 nm, and a temperature-insensitive isolation. The magneto-optical switch is successfully demonstrated with a latching function.

T3D.5 • 15:00 Invited
Broadly tunable laser sources integrated using generic foundry process: from concept to production ready prototype, Sylwester Latkowski1, TU/e, Netherlands. Monolithic photonic integration technologies on indium-phosphide native- ly enable developments of laser systems that can be optimized to meet performance demands for specific applications. Recent advancements enabled by European pilot-line activities further mature the processes across full PIC product creation chain and assure seamless scalability to volume production.
**Conference 07, Track 5**

**T3E.3 • 14:30**  
**Invited**  
Comb-assisted RF Receiver with Reduced Complexity, Huan Hu’, Stojan Radic’;  
’Univ. of California San Diego, USA. Comb-assisted DFT processor circumvents the quantization and throughput challenges for traditional all-electronic DFT operation on radiofrequency signals. This report describes novel design strategies for comb-assisted RF receivers with reduced implementation complexity.

**T3E.4 • 15:00**  
**Invited**  
Dual-frequency tunable optoelectronic oscillator, ZhiQiang Fan’, Jun Su’, Qi Qiu’;  
‘School of Optoelectronic Science and Engineering, Univ. of Electronic Science and Technology of China, China. A dual-frequency tunable optoelectronic oscillator based on the nonlinear effect of an amplifier is proposed and experimentally demonstrated. In the experiment, a dual-frequency signal with tuning ranges of 6.68-10.6 GHz and 20.04-31.9 GHz is generated.

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**VIP 01, Track 6**

**T3F.3 • 14:30**  
**Invited**  
‘Technische Universität Kaiserslautern, Germany. We summarize novel fabrication techniques and novel materials for single crystal diamond nanostructures containing shallow nitrogen vacancy color centers and their scalability. We demonstrate near-field energy transfer between NV centers and 2D materials and multi-functional sensing capabilities of NV centers.

**T3F.4 • 15:00**  
**Invited**  
Moiré Heterostructure Quantum Emitters and Fermi-Polarons, Brian Gerardot’;  
‘Univ. of California, Santa Barbara, USA. Stacking two atomic layers with a twist leads to a moiré superlattice. In a MoSe2 / WSe2 heterostructure, we observe the moiré superlattice leads to quantum dot arrays and emergent physics in Fermi-polarons.

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**VIP 02, Track 4**

**T3G.3 • 14:15**  
A compact optics embedded optical receiver engine mounted on silicon interposer for 400G CWDM4 10km data center application, Jyung Chan Lee’;  
‘Electronics and Telecom Research Inst, Korea. We proposed a new conceptual tiny optical engine. With optimization of direct optical coupling between PDs and PLC-AWG, the compact optics embedded optical receiver engine mounted on silicon interposer was applicable for 400G CWDM4 10km.

**T3G.4 • 14:30**  
**Invited**  
Multi-Mode Lasing due to Self-Enforced Mode Beating, Richard Schatz’;  
‘KTH, Sweden. Self-enforced mode beating gives rise to phenomena like asymmetric gain compression, photon-photon resonance and mode locking. This may drastically reduce the side mode suppression of DFB and DBR lasers at high bias above threshold.

**T3G.5 • 15:00**  
**Invited**  
III-V Quantum Dot Laser in Silicon Photonics: Direct Epitaxy, Siming Chen’;  
‘Univ. College London, UK. This talk has a special focus on 1310 nm InAs/GaAs quantum dot lasers in silicon photonics. The challenges and Strategies for developing high-quality III-V materials on silicon using direct epitaxy methods are discussed.
T3A.8 • 15:15
Kilometer-long fast light and superluminal propagation via polarization-matched Brillouin lasing oscillation in optical fibers, Zhelan Xiao¹, Zenghuan Qiu¹, Jilin Zhang¹, Liang Zhang¹, Fupei Pang¹, Tingyun Wang¹; 'Shanghai Univ., China.
We experimentally demonstrated the longest fast light and superluminal propagation along kilometer optical fibers by utilizing the polarization maintaining fiber-based Brillouin lasing oscillator incorporating a population inversion dynamic grating.

T3C.6 • 15:15
Reinforcement Learning-based Resource Allocation in Quantum Key Distribution Networks, YingMin Zuo¹, Yongli Zhao¹, Xiaosong Yu¹, Avishek Nag², Jie Zhang¹; 'Beijing Univ of Posts & Telecom, China; ²School of Electrical and Electronic Engineering Univ College Dublin, Ireland. Efficient utilization of key resources is one of the key problems in quantum key distribution (QKD) networks. This paper verifies the effectiveness of using reinforcement learning to realize resource allocation in QKD networks.

15:30–16:00 Coffee Break & Exhibition
VIP 01, Track 6

NLFM Microwave Waveform Generation by Optically Injected Semiconductor Laser for Radar Applications, Renheng Zhang, Pei Zhou, Kunxi Li, Zhidong Jiang, Hualong Bao, Nianqiang Li; Soochow Univ., China. Photonic generation of non-linear frequency-modulated (NLFM) microwave signals based on optically injected semiconductor laser has been demonstrated. Compared with LFM signals with the same bandwidth, a 13 dB improvement of peak-to-sidelobe ratio (PLSR) is found.

15:30–16:00 Coffee Break & Exhibition
Francesco Baldini1; and intracellular application: past, present and future, Chemical and biochemical optical fibre sensing for invasive applications. The way for their use in intracellular applications. Fibre tip miniaturization has also paved the way for their use in medicine since the 1980s, mainly due to their invasive capabilities. Chemical/biochemical sensing with optical fibres has played an important role in medicine since the 1980s, mainly due to their invasive capabilities. Fibre tip miniaturization has also paved the way for their use in medicine since the 1980s.

New applications and future trends are shown, including new opportunities for wireless applications.

Invited Plasmonic fiber-optic biochemical sensing, Tuan Guo1; Jinan Univ., China. Surface Plasmon resonance optical fiber biosensors can be used as a high sensitivity tool for in-situ biochemical measurements. Health monitor and energy storage detection will be discussed in this talk.

High-Speed ADC/DAC and ASIC Technology Trends, Tomislav Drenski1; Socionext Europe, UK. The rapid advances of High-Speed ADC/DAC and ASICs for optical (coherent) applications, starting from 10G to Terabit are shown. We will numerically compare achievable information rate performances of frequency-pilot-aided method and blind phase search method. The frequency-pilot method has higher tolerance for phase noise even for 256QAM.

Experimental Investigation on the Nonlinearity of Coherent Receiver with Various Modulation Formats, Tong Ye1, Xiaofei Su1, Chengwu Yang1, Hisao Nakashima2, Takeshi Hashida2; Fujitsu R&D Center, China; Fujitsu Ltd., Japan. A simple method to quantitatively evaluate the nonlinearity of coherent receiver with various transmission conditions is proposed. Experiments demonstrate that nonlinear SNR is inversely proportional to kurtosis, with different modulation formats and transmission distances.

Achievable Information Rate Performance Comparison of Frequency-pilot-aided and Blind Carrier Phase Estimation Methods, Zhiyuan Song1, Koji Igarashi1; Osaka Univ., Japan. For carrier phase estimation in optical coherent receivers, we numerically compare achievable information rate performances of frequency-pilot-aided method and blind phase search method. The frequency-pilot method has higher tolerance for phase noise even for 256QAM.

We propose and experimentally demonstrate a hybrid FSO/RF system with adaptive link selection and switching: FSO and RF links can be switched adaptively to different channel conditions for a robust transmission in changeable weather factor.

Wafer-scale fabrication of ultralow-loss silicon nitride nonlinear photonic circuits, Junquiu Liu1; Swiss Federal Inst. of Technology Lausanne (EPFL), Switzerland. Recent advances in silicon nitride integrated photonics have achieved ultralow optical loss. Transferring this technology to standard commercial foundries, and merging it with silicon photonics via heterogeneous integration, will seed novel laser and quantum applications.
Conference 07, Track 5

16:00–18:00
T4E • Fiber Wireless Convergence II
Presider: Xihua Zou; Southwest Jiaotong Univ., China

VIP 01, Track 6

16:00–18:00
T4F • Quantum Photonics
Presider: Heng Shen; Shanxi Univ., China

VIP 02, Track 4

16:00–17:45
T4G • Heterogeneous Integration II
Presider: Jianwei Wang; Peking Univ., China

16:00–18:00
T4E.1 • 16:00
Invited Photonic Platforms for Fiber-Wireless Network Convergence: Challenges and Opportunities, Colm Browning1; 'Dublin City Univ., Ireland. Flexible photonic systems can be a disruptive technology enabling high-speed wireless transmission. This talk will highlight some key challenges, and potential solutions, associated with the convergence of photonic systems/networks with emerging microwave and millimetre-wave technologies.

T4E.2 • 16:30
Invited In-fibre Diffraction for Beam Steering Optical Wireless Communication, Chao Wang1; 'Univ. of Kent at Canterbury, UK. In-fibre diffraction provides a highly-efficient solution for wavelength-controlled laser beam steering for optical wireless communications. Characteristics of in-fibre diffraction gratings is presented and its utility in beam steering and ultrafast user localization is introduced.

16:00–18:00
T4F.1 • 16:00
Tutorial A bright and fast source of coherent single photons, Richard J. Warburton1; 'Univ. of Basel, Switzerland. A quantum dot inside a microcavity is used as single photon source. On excitation, the probability of a single photon exiting the final optical fibre is above 50%; the coherence of the photons is high.

T4F.2 • 16:45
Invited Highly efficient entangled photon sources based on semiconductor quantum dots, Fei Ding1; 'Universitat Hannover, Germany. Self-assembled semiconductor quantum dots (QDs) are a promising candidate for the deterministic generation of entangled photons. In this talk, I will introduce our recent efforts in developing QD-based entangled photon sources with high performances. The high yield, high fidelity, wavelength tunability, together with the demonstrations of electrical injection and on-chip integration, make these sources an ideal workhorse for the quantum photonic applications. As an example, the first experiment on QD-based entanglement swapping will be shown.

16:00–17:45
T4G.1 • 16:00
Recent Advances in Waveguide Germanium Receivers, Daniel Benedkovic1, Leopold Viró2, Yuriy Gapontsev3, Leopold Virot2, Jean-Michel Hartmann4, Farah Amar5, Xavier Le Roux1, Carlos Alonso-Ramos6, Eric Cassan7, Delphine Marris-Morini8, Paul Crozat1, Frederic Boeuf9, Jean-Marc Fedeli2, Christophe Kopp10, Bertrand Szeg11, Laurent Vivien12, 'Universite de Paris-Sud XI, France; 'LETI, University Grenoble Alpes and CEA, France; 'Silicon Technology Development, STMicroelectronics, France. Light detection is a key functionality for a myriad of applications. A review of recent advances in waveguide germanium receivers is given including Ge pin diode and avalanche photodiode (APD) operating in telecom wavelength range.

T4G.2 • 16:30
Invited Programmable Silicon Photonic Integrated Circuits Enabled by MEMS integration, Kristinn B. Gylfason1; 'Kungliga Tekniska Hogskolan, Sweden. We review our work on compact and low power silicon photonic MEMS components implemented in imec’s SiPSSG foundry platform. Such large scale reconfigurability is attractive for emerging applications such as photonic accelerators for AI workloads.
Ballroom A, Track 2

T4A.4 • 17:00
Receiver IQ Imbalance and Skew Compensation By Frequency Domain Widely Linear Equalizer, Liang Junpeng1, Weiming Wang1, Yi Cai1, Meng Xiang1; 2ZTE Corporation, China. We propose a frequency domain widely linear 2x2 multi-input and multi-output (MIMO) equalizer, which can compensate receiver IQ imbalance and skew with lower complexity than time domain widely linear equalizer.

T4A.5 • 17:30
Optical Filtering Impairment Monitoring Based on Artificial Neural Network in Coherent Receiver, Meng Cai1, Huazhi Li1, Mengfan Fu1, Xiaomin Liu1, Linlin Hu1, Weisheng Hu1, Qunbi Zhuge1; Shanghai Jiao Tong Univ., China. A digital signal processing (DSP)-aided scheme to monitor optical filtering impairments based on artificial neural network (ANN) is proposed. A root-mean-square error (RMSE) of 0.1-dB is achieved in highly diverse link configurations.

Ballroom C, Track 1

T4A.3 • 17:00
A Mixed-Signal Framework for Modelling Fourier-Domain Optical Coherence Tomography, Yueyue Li1, Mengyuan Wang1, Yu Gan1, Xinwen Yao1, Leopold Schmiedinger2, Rongting Xu2, Hairun Guo3, Jiajun Deng3, Meng Xiong3; 1Shanghai Jiao Tong Univ., China; 2University of Sannio, Italy; 3University of Science and Technology of China, China. Taking account of latency sensitivity in collaborative cloud-edge computing networks, we propose two load balancing schemes for improving user quality of service in hybrid VLC/WiFi networks. The impacts of load status and movement speed are discussed.

T4A.4 • 17:15
Soliton-molecule mode-locking via spectral filtering effect, Zilong Li1, Haijun Guo1, Huanhuan Liu1, Meng Cai1, Huazhi Li1; Shanghai Jiao Tong Univ., China. We demonstrate the generation of soliton molecules by means of the spectral filtering effect in mode-locked fiber lasers, and we implement the control on number of the bounded solitons by frequency tuning the filter component.

T4A.5 • 17:30
Optical Nonlinear Activation Functions Based on MZI-Structure for Optical Neural Networks, Meng Cai1, Huazhi Li1, Mengfan Fu1, Xiaomin Liu1, Linlin Hu1, Weisheng Hu1, Qunbi Zhuge1; Shanghai Jiao Tong Univ., China. A digital signal processing (DSP)-aided scheme to monitor optical filtering impairments based on artificial neural network (ANN) is proposed. A root-mean-square error (RMSE) of 0.1-dB is achieved in highly diverse link configurations.

Conference 06, Track 3

T4C.3 • 17:00
Network Resource Optimization with Latency Sensitivity in Collaborative Cloud-Edge Computing Networks, Ling Liu1, Weike Ma1, Bowen Chen1, Mingzi Gao1, Hong Chen1, Jinfeng Wu1; Soochow Univ., China; 2Suzhou LZY Technology Co., Ltd., China. This paper investigated the network resource optimization with latency sensitivity in collaborative cloud-edge computing networks. Simulation results show that the proposed approach optimize network resource allocation and reduce end-to-end (E2E) latency.

Conference 05, Track 4

T4D.3 • 17:00
TiO2 Integrated Nonlinear Photonics, Meicheng Fu1, Guayuan Li1, Yi Zheng1, Xiaowei Guan1; 1Technical Univ. of Denmark, Denmark; 2National Univ. of Defense Technology, China. Our recent achievements on titanium dioxide (TiO2) integrated nonlinear photonics are summarized, including the enhanced four-wave mixing in TiO2 microring resonators and octave-spanning supercontinuum generation in TiO2 waveguides with delicate dispersion engineering.

T4D.4 • 17:30
Optical Nonlinear Activation Functions Based on MZI-Structure for Optical Neural Networks, Meng Cai1, Huazhi Li1, Mengfan Fu1, Xiaomin Liu1, Linlin Hu1, Weisheng Hu1, Qunbi Zhuge1; Shanghai Jiao Tong Univ., China. We experimentally demonstrated an on-chip optical nonlinear activation function circuit for optical neural networks based on a conventional linear transformer, MZI-mesh. The proposed circuit is reconfigurable to perform multiple types of activation functions.
T4E.3 • 17:00 Invited
Photonic Random Bit Generation Based on Chaotic Laser Diodes for Wireless Distribution, Jia-Xin Dong1, Jingya Ruan1, Luan Zhang1, Sze-Chun Chan1; City Univ. of Hong Kong, China. Random bits generated from physical entropy in the timing of microwave bursts are investigated using a laser diode. The bursts are generated by chaotic dynamics for yielding bits at gigabits per second for wireless distribution.

T4F.3 • 17:15 Invited
Quantum optics with semiconductor quantum dots, Klaus Jons1; Paderborn University, Germany. I will present our results on the quantum light emission from a two-level quantum system and from a 3-level quantum ladder system. I will compare the two systems and discuss their different advantages and disadvantages.

T4G.3 • 17:00 Invited
Micro-Transfer-Printing for III-V/Si PICs, Jing Zhang2,1, Camiel Op de Beeck2, Bahawal Haq2, Jeroen Gooyaerts2, Stijn Guyens2, Sulakshna Kumari2, Grigorij Muliuk2, Artur Hermans2, Agnieszka Gocalsinska1, Antonio J. Trindade2, Chris Bower1, Joris Van Campenhout1, Gyu Lapege1, Peter Verheyen1, Bart Kuyken2, Dries Van Thourhout1, Geert Morthis1, Roel Baets1, Gunther Roelkens2,1; imec, Belgium; 2Ghent Univ.-imec, Belgium; 1imec, Belgium; 2Ghent Univ.-imec, Belgium; 3Tyndall national Inst., Ireland; 4celeprint, Ireland. Micro-transfer-printing (μTP) enables the intimate integration of a variety of III-V opto-electronic components on silicon photonic integrated circuits (Si PICs). It allows for the scalable manufacturing of complex III-V/Si PICs at low cost.

T4E.4 • 17:30
Microwave frequency, phase, and amplitude control system based on a polarization-multiplexed dual-parallel Mach-Zehnder modulator, Wenhao Du1, Dan Zhu1, Jiang Liu1, Shilong Pan1; Nanjing Univ Aeronautics & Astronautics, China. A microwave frequency, phase, and amplitude control system based on a polarization-multiplexed dual-parallel Mach-Zehnder modulator is proposed. The frequency, phase, and amplitude control with microwave signals are experimentally demonstrated, and no coupling effect exists.

T4G.5 • 17:30
Monolithically Integrated Linear-Cascade Modified Uni-traveling-carrier Photodiodes, Enfei Chao1, Bing Xiong1, Yanu Han1, Changzheng Sun1, Zhibiao Hao1, Jian Wang1, Lai Wang1, Yanjun Han1, Hongtiao Li1, Jiadong Yu1, Yi Luo1; Tsinghua Univ., China. Linear-cascade modified uni-traveling-carrier photodiodes are monolithically integrated and exhibit a bandwidth improvement from 32 GHz to 54 GHz, which has been verified to result from the reduction of device capacitance due to the series structure.
**Ballroom C, Track 1**

**T4A.6 • 17:45**

All-Fiberized 2.7–4.2 μm Mid-Infrared Supercontinuum Source Based on Er-doped ZBLAN Fiber Amplifier, Kaixin Deng1, Linyong Yang1, Bin Zhang1, Jinmei Yao1, Jing Hou1; 1College of Advanced Interdisciplinary Studies, National Univ. of Defense Technology, China. An all-fiberized supercontinuum (SC) source based on Er-doped ZBLAN fiber amplifier is demonstrated for the first time, and a SC spanning from 2.7 to 4.2 μm is obtained with a record power of 2.32 W.

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**Ballroom A, Track 2**

**T4B.7 • 17:45**

LGBM-improved-MLSE equalizer for 50Gb/s PAM4 IM-DD PON with 10G class optical transceivers, Qianwu Zhang1, Yuntong Jiang1, Shuangfeng Duan1, Zicong Wang1, Pu Li1, Jiawei Zhang1, yuefeng1; 1Shanghai Univ., Key Laboratory of Specialty Optics and Optical Access Networks, Shanghai Inst. for Advanced Communication and Data Science, China. A light gradient boosting machine improved-MLSE equalizer for 50Gb/s PAM4 IM-DD PON with 10G class optical transceivers is proposed and experimental results show that 21 dB power budget is achieved over 15km SSMF.

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**Conference 06, Track 3**

**T4C.5 • 17:45**

Isolation-Aware 5G-RAN Slice Embedding Over OTN/WDM Metro-Aggregation Networks, Boyan Liu1, Hao Yu1, Lin Bai1, Jiawei Zhang1, yuefeng1; Beijing Univ. of Posts and Telecommunications, China. We design an isolation mechanism for 5G-RAN slices over OTN/WDM metro-aggregation networks, and an isolation-aware heuristic algorithm is proposed to implement slice embedding. Simulation shows that our approach can map RAN slices efficiently.

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**Conference 05, Track 4**

**T4D.5 • 17:45**

Increasing the power of dissipative Kerr soliton microcomb by bus-resonator coupling control, Qin Wen1, Jinhui Qin1, Weiren Cui1, Yong Geng1, Heng Zhou1, Kun Qiu1; 1Univ of Electronic Science & Tech China, China. We demonstrate output power enhancement of dissipative Kerr soliton microcomb by reducing the bus-resonator gap and equivalently increasing the coupling efficiency of the microcavity, providing a straightforward way to realize high efficiency Kerr comb generation.
**Optical Multipath RF Self-Interference Cancellation for Full-Duplex Communication**

Xinxin Su1, Shuanglin Fu1, Chao Wang2, Zhenlin Wu1, Yiying Gu1, Mingshan Zhao1, Xiyou Han1; 1Dalian Univ. of Technology, China; 2Univ. of Kent, UK. Optical multipath RF self-interference cancellation for full-duplex communication is proposed. The measured results show that the cancellation depth is 30dB over bandwidth 40 MHz at 6 GHz and the signal of interest is well recovered.

**Interaction between topological photonic crystal nanocavity and quantum dots**

Xin Xie1,2, Wexuan Zhang3,4, Xiaowu He1, Huiming Hao1, Jiaochen Dang1,2, Shiyao Wu1,2, Kai Peng1,2, Feilong Song1,2, Shan Xiao3,4, Longlong Yang1,2, Haqiao Ni, Zhichuan Niu2, Can Wang1,2, Kuijuan Jin1,2, Xudong Zhang1,2, Xiulai Xu1,2; 1Beijing National Laboratory for Condensed Matter Physics, Inst. of Physics, Chinese Academy of Sciences, China; 2CAS Center for Excellence in Topological Quantum Computation and School of Physical Sciences, Univ. of Chinese Academy of Sciences, China; 3Key Laboratory of advanced optoelectronic quantum architecture and measurements of Ministry of Education, School of Physics, Beijing Inst. of Technology, China; 4Beijing Key Laboratory of Nanophotonics & Ultrafine Optoelectronic Systems, Micro-nano Center, School of Physics, Beijing Inst. of Technology, China; 5State Key Laboratory of Superlattices and Microstructures, Inst. of Semiconductors Chinese Academy of Sciences, China. We demonstrate a low-threshold topological nanolaser and the weak coupling to single quantum dot in the topological nanocavity, promoting the development of topological nanophotonic circuitry for the manipulation of photons in classical and quantum regimes.