

2024.11.02-05 Beijing · China

ACP/IPOC 2024

Asia Communications and Photonics Conference
Information Photonics and Optical Communications

HOST

Beijing University of Posts and Telecommunications

ORGANIZERS

State Key Laboratory of Information Photonics and Optical Communications (BUPT) |
Huawei | State Key Laboratory of Optical fibre and Cable Manufacture Technology

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IEEE Photonics Society | OPTICA | SPIE | Chinese Optical Society |
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Welcome to the Asia Communications and Photonics Conference and The International Conference on Information Photonics and Optical Communications

It is a great pleasure to invite you to participate in the Asia Communications and Photonics Conference (ACP)/The International Conference on Information Photonics and Optical Communications (IPOC) 2024 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 IEEE Photonics Society, OPTICA, SPIE, COS, CIC and CIE.

The ACP technical conference features a full suite of plenary, tutorial, keynote, 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 and Fiber-based Devices; Optical Transmission Sub-systems, Systems and Technologies; Network Architectures, Management and Applications; Optoelectronic Devices and Integration; Microwave Photonics and Optical Signal Processing; LEDs, Photovoltaics, and Optoelectronics in Energy; Optical Sensors and Biophotonics; Micro-, Nano-, and Quantum Photonics: Science and Applications. The conference will also include a wide spectrum of workshops and industry forums. With a conference program of broad scope and of the highest technical quality, ACP provides an ideal venue to keep up with new research directions and an opportunity to meet and interact with the researchers who are leading these advances. We have over 800 papers scheduled, including over 100 invited, 15 Keynote and 4 tutorial presentations made by many of the world's most prominent researchers from academia and industry. We thank all the contributors and authors for making ACP a truly unique, outstanding global event.

Our conference highlight is the Plenary Session scheduled on the morning of November 3rd and 4th. Seven outstanding, distinguished speakers will give presentations: Juerg Leuthold from ETH Zurich will discuss Plasmonics—an Enabling Technology for 500 GHz and Beyond. David Moss from Swinburne University of Technology will give a talk on Advanced applications of optical microcombs. Xiongyan Tang from China Unicom Research Institute will explain Next generation optical networks for AI computing interconnects. R. J. Dwayne Miller from University of Toronto will elaborate What is Life? Towards Imaging the Molecular Machinery of the Cell. Xiaojun Tang from Huawei Technologies Co., Ltd. will talk about Architecture Evolution, Building Green All-Optical Networks in the Intelligent Era. Francesco Poletti will discuss Hollow core fibres: innovation at a faster speed. Peng Wang from Galaxy Space (Beijing) Technology Co., Ltd. will give a talk on Laser Communications: Empowering the Next-Generation High-Speed Satellite Internet.

In addition to the regular technical sessions, 10 workshops, 1 special student event and 5 industry forums will feature additional 131 speakers. The pre-conference workshops and industry forums will be held on Saturday, 2nd November. Special student event will be held on Monday, 4th November. These workshops, special student event and industry forums will be held free of charge to conference registrants. We would like to thank the workshop, special student event and forum organizers and speakers for the excellent program.

This year, Best Paper Award in Industry Innovation, Best Paper Award, Best Student Paper Award, and Best Poster Award will be presented during the Banquet on Monday, 4th November. The poster-only session will be held on 15:30–17:30, Monday, 4th November. 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, 3rd November. On the evening of Monday, 4th November, we will hold a Banquet and Awards Ceremony for conference registrants.

It is an enormous task to organize a conference and it is impossible to succeed without the dedicated efforts of many supporters and volunteers. We are indebted to the entire Technical Program Committee and the Subcommittee Chairs who have worked persistently throughout the whole year to invite speakers, solicit and review papers, organize technical sessions which results in the excellent technical program. We also thank the staff and volunteers of Beijing University of Posts and Telecommunications. We also thank organizers State Key Laboratory of Information Photonics and Optical Communications, Huawei and FCMT, co-organizer LUSTER and the professional societies such as IEEE Photonics Society, OPTICA, SPIE, COS, CIC and CIE for organizing and sponsoring this great event.

Sincerely,

ACP General Chair

Prof. Kun Xu

Beijing University of Posts and Telecommunications, China



Committee

HOST



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Xiang Liu, Huawei, China

Gangxiang Shen, Soochow University, China

Ming Tang, Huazhong University of Science and Technology, China

Massimo Tornatore, Politecnico di Milano, Italy

Jie Luo, YOFC, China

Workshop Chair:

Hui Yang, Beijing University of Posts and Telecommunications, China

Workshop Co-Chairs:

Min Zhang, Beijing University of Posts and Telecommunications, China

Anxu Zhang, China Telecom Research Institute, State key Laboratory of Optical Fiber and Cable Manufacture Technology, China

Industry Forum Chair:

Chongjin Xie, PhotonicX AI, Singapore

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Daquan Yang, Beijing University of Posts and Telecommunications, China

Ning Deng, Huawei, China

Local Organization Co-Chairs:

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Jianchun Xu, Beijing University of Posts and Telecommunications, China

Xuejiao Li, Beijing University of Posts and Telecommunications, China

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Naomi Chavez, Optica, USA

Arthur Chiou, National Yang Ming Chiao Tung University, Taipei, China

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

Sailing He, Zhejiang University, China & KTH, Sweden

Chennupati Jagadish, Australian National University, Australia

Ming-Jun Li, Corning Inc., USA

Xingde Li, Johns Hopkins University, USA

Xiang Liu, Huawei Technologies, Hongkong, China

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

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Yikai Su, Shanghai Jiao Tong University, China, CIC

Xunbin Wei, Peking University, China, SPIE

Lena Wosinska, Chalmers University, Sweden

Shaohua 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

Leading Chair:

Li Pei, Beijing Jiaotong University, China

Co-Chairs:

Jun Yang, Guangdong University of Technology, China

Lilin Yi, Shanghai Jiao Tong University, China

Xihua Zou, Southwest Jiaotong University, China

TPC

Tingyun Wang, Shanghai University, China

Libo Yuan, Guilin University Of Electronic Technology, China

Yunca Wang, Guangdong University of Technology, China

Jian Wang, Huazhong University of Science and Technology, China

Ran Gao, Beijing Institute of Technology, China, China

Zheng Zheng, Beihang University, China

Jie Zhang, Beijing University of Posts and Telecommunications, China

Zhangyuan Chen, Peking University, China

Liyang Shao, Southern University of Science and Technology, China

Tigang Ning, Beijing Jiaotong University, China

Xuetao Gan, Northwestern Polytechnical University, China

Cang Jin, OFS Laboratories, United States

Wenjun Liu, Beijing University of Posts and Telecommunications, China

Track 2: Optical Transmission Sub-systems, Systems and Technologies

Leading Chair:

Lianshan Yan, Southwest Jiaotong University, China

Co-Chairs:

Yi Cai, Soochow University, China

Yves Jaouen, Institut Polytechnique de Paris, France

Periklis Petropoulos, University of Southampton, United Kingdom

TPC

Anxu Zhang, China Telecom Research Institute, State key Laboratory of Optical Fiber and Cable Manufacture Technology, China

Yanni Ou, Beijing University of Posts and Telecommunications, China

Haining Yang, Southeast University, China

Yi Dong, Beijing Institute of Technology, China

Bin Chen, Hefei University of Technology, China

Qunbi Zhuge, Shanghai Jiao Tong University, China

Xiaodan Pang, Kungliga Tekniska högskolan (KTH), Sweden

Emilio Hugues-Salas, British Telecom (BT Group plc), United Kingdom

Gabriele Di Rosa, Adtran, Germany

Kari Clark, University College London (UCL), United Kingdom

Paul Anthony Haigh, Nubis Communications, United States

Track 3: Network Architectures, Management and Applications

Leading Chair:

Xiaoping Zheng, Tsinghua University, China

Co-Chairs:

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

Raul Muñoz, Technological Centre of Catalonia (CTTC), Spain

Alessio Giorgetti, University of Pisa, Italy

TPC

Bingli Guo, Beijing University of Posts and Telecommunications, China

Jialong Li, Max Planck Institute for Informatics (MPI-INF), Germany

Nan Hua, Tsinghua University, China

Paikun Zhu, National Institute of Information and Communications Technology, Japan

Salvatore Spadaro, Universitat Politècnica de Catalunya, Spain

Shikui Shen, China Unicom Research Institute, China

Wenda Ni, ByteDance Networking, United States

Yongcheng Li, Soochow University, China

Zhizhen Zhong, Massachusetts Institute of Technology (MIT), United States

Huaxi Gu, Xi'an University of Electronic Science and Technology, China

Rui Wang, University of Bristol, United Kingdom

Yishu Zhou, Microsoft, United States

Xuwei Xue, Beijing University of Posts and Telecommunications, China

Track 4: Optoelectronic Devices and Integration

Leading Chair:

Yikai Su, Shanghai Jiao Tong University, China

Co-Chairs:

Xingjun Wang, Peking University, China

Xi Xiao, National Optoelectronics Innovation Center, China

Yaocheng Shi, Zhejiang University, China

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Yong Zhang, Shanghai Jiao Tong University, China

Jiangwei Man, HiSilicon, China

Xinlun Cai, Sun Yat-sen University, China

Ke Xu, Harbin Institute of Technology, China

Junbo Feng, CUMEC, China

Yonghui Tian, Lanzhou University, China

Yu Yu, Huazhong University of Science and Technology, China

Ting Wang, Institute of Physics, Chinese Academy of Sciences, China

Daigao Chen, National Optoelectronics Innovation Center, China

Lei Wang, Peng Cheng Laboratory, China

Huashun Wen, Institute of Semiconductors, Chinese Academy of Sciences, China

Hongtao Lin, Zhejiang University, China

Yisu Yang, Beijing University of Posts and Telecommunications, China

Track 5: Microwave Photonics and Optical Signal Processing

Leading Chair:

Shilong Pan, Nanjing University of Aeronautics and Astronautics, China

Co-Chairs:

Xiaoke Yi, The University of Sydney, Australia

Antonella Bogoni, Scuola Superiore Sant'Anna & CNIT (Europe), Italy

Lawrence Chen, McGill University, Canada

Jose Azana, Institut National de la Recherche Scientifique, Canada

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Mable Fok, University of Georgia, United States

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Xingjun Wang, Peking University, China

Yitang Dai, Beijing University of Posts and Telecommunications, China

Xiaoshun Jiang, Nanjing University, China

Yang Liu, Huazhong University of Science and Technology, China

Xiaojun Xie, Southwest Jiaotong University, China

Xinlun Cai, Sun Yat-sen University, China

Xingyuan Xu, Beijing University of Posts and Telecommunications, China

Track 6: LEDs, Photovoltaics, and Optoelectronics in Energy

Leading Chair:

Andong Xia, Beijing University of Posts and Telecommunications, China

Co-Chairs:

Jianpu Wang, Changzhou University, China

Haizheng Zhong, Beijing Institute of Technology, China

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Dawei Di, Zhejiang University, China

Guohua Xie, Tan Kah Kee Innovation Laboratory, China

Guangjiu Zhao, Tianjin University, China

Huan Liu, Beihang University, China

Jianchun Xu, Beijing University of Posts and Telecommunications, China

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Kai Wang, Southern University of Science and Technology, China

Nana Wang, Nanjing Tech University, China

Wei Hua Tang, Nanjing University of Posts and Telecommunications, China

Yanqing Li, East China Normal University, China

Ying Wang, Technical Institute of Physics and Chemistry, CAS, China

Track 7: Optical Sensors and Biophotonics

Leading Chair:

Zhiguo Zhang, Beijing University of Posts and Telecommunications, China

Co-Chairs:

Tuan Guo, Jinan University, China

Yiping Wang, Shenzhen University, China

Xuping Zhang, Nanjing University, China

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Yongkang Dong, Harbin Institute of Technology, China

Xinyu Fan, Shanghai Jiao Tong University, China

Hui Huang, Dalian University of Technology, China

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Zhisheng Yang, Beijing University of Posts and Telecommunications, China

Haojie Zhang, Beijing University of Posts and Telecommunications, China

Liang Zhang, Shanghai University, China

Zhiyong Zhao, Huazhong University of Science and Technology, China

Track 8: Micro-, Nano-, and Quantum Photonics: Science and Applications

Leading Chair:

Yunfeng Xiao, Peking University, China

Co-Chairs:

Kartik Srinivasan, NIST/University of Maryland, College Park, MD, United States

Pascal Del'Haye, Max Planck Institute for the Science of Light, Erlangen, Germany

Tanabe Takasumi, Keio University, Japan

Jin Liu, Sun Yat-sen University, China

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Tao Li, Nanjing University, China

Shumin Xiao, Harbin Institute of Technology, China

Wei Zhang, Tsinghua University, China

Xuewen Chen, Huazhong University of Science and Technology, China

Yongnan Li, Nankai University, China

Shunping Zhang, Wuhan University, China

Xiaojun Jia, Shanxi University, China

Xifeng Ren, University of Science and Technology of China, China

Xiaoxiao Xue, Tsinghua University, China

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Tomohiro Tetsumoto, National Institute of Information and Communications Technology, Japan

Sponsors











General Information

Conference Venue

Conference Venue: Hyatt Regency Beijing Wangjing

Address: Lei Shing Hong Center, 8 Guangshun South Street, Chaoyang District, Beijing, China

Accessibility

Hyatt Regency Beijing Wangjing can be reached in 30 minutes by car from Beijing Capital International Airport. And it's just a short walk from Metro Line 14 Futong station and 798 ArtDist. Explore Beijing with its well-developed and convenient transportation routes.

Registration

Location: 1F Lobby of Hyatt Regency Beijing Wangjing

09:00–20:00 Saturday, 2 November

08:30–20:00 Sunday, 3 November

08:30–18:00 Monday, 4 November

08:00–15:00 Tuesday, 5 November

Onsite Speaker Preparation

Oral presenters are required to be in the 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 put up their poster before the poster session starts. Authors are required to be standing by their poster during poster 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 Board Size: 1m (Length) * 2.235m (Height)

Recommended Poster Size: 0.8m (Length) * 1.2m (Height)

Poster Session: 15:30–17:30, Monday, 4 November

Location: 2F

Note: For your safety, post area is divided into five zones. Please find the zone of your track and post it. Each board has a Control ID on it, please note if it is your own Control ID when posting.

Poster presenters are responsible to remove their poster, and the conference staff will not collect the posters left at the end of the poster session.

Best Paper Award in Industry Innovation

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. 5 papers focusing on industry and technology will be selected by the ACP/IPOC 2024 Committee. Certificates and Awards will be presented to the winners at the conference banquet and award ceremony. The nominates of this award are marked Industry Innovation Nomination in this program.

Best Student Paper Award

Best Student Paper Award Competition Session: 13:30–16:45, Sunday, 3 November

Location: The Residence 7, 2F

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. The winners will be selected by the ACP/IPOC 2024 Committee. Certificates and Awards will be presented to the winners at the conference banquet and award ceremony.

Best Paper Award

Best Paper Award Competition Session: 13:30–17:30, Monday, 4 November

Location: The Residence 7, 2F

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. Winners will be selected by the ACP/IPOC 2024 Committee. Certificates and Awards will be presented to the winners at the conference banquet and award ceremony.

Best Poster Award

Poster Session: 15:30–17:30, Monday, 4 November

Location: 2F

Any poster paper that is registered by at least one of the authors, presented during the assigned time slot (15:30–17:30) will be eligible for this award. Certificates and Awards will be presented to the winners at the conference banquet and award ceremony.

Exhibition

The ACP/IPOC 2024 Exhibition is open to all attendees.

Location: Regency Ballroom Foyer, 2F

Tea Breaks

10:00–10:30 Saturday, 2 November

15:00–15:30 Saturday, 2 November

10:00–10:30 Sunday, 3 November

15:30–16:00 Sunday, 3 November

10:00–10:30 Monday, 4 November

15:30–16:00 Monday, 4 November

10:00–10:30 Tuesday, 5 November

15:30–16:00 Tuesday, 5 November

Lunches

Location: Market Café & Shunpachi & Lobby Lounge & Cangyue, 1F

12:00–13:30 Sunday, 3 November

12:00–13:30 Monday, 4 November

Location: Market Café, 1F

12:00–13:30 Tuesday, 5 November

Dinner

Location: Market Café & Shunpachi, 1F

17:30–20:00 Saturday, 2 November

Welcome Reception

Location: Market Café & Cangyue, 1F

17:30–20:00 Sunday, 3 November

Banquet and Award Ceremony

Best Paper Award in Industry Innovation, Best Paper Award, 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.

Location: Regency Ballroom, 2F

Time: 18:30–20:30, Monday, 4 November

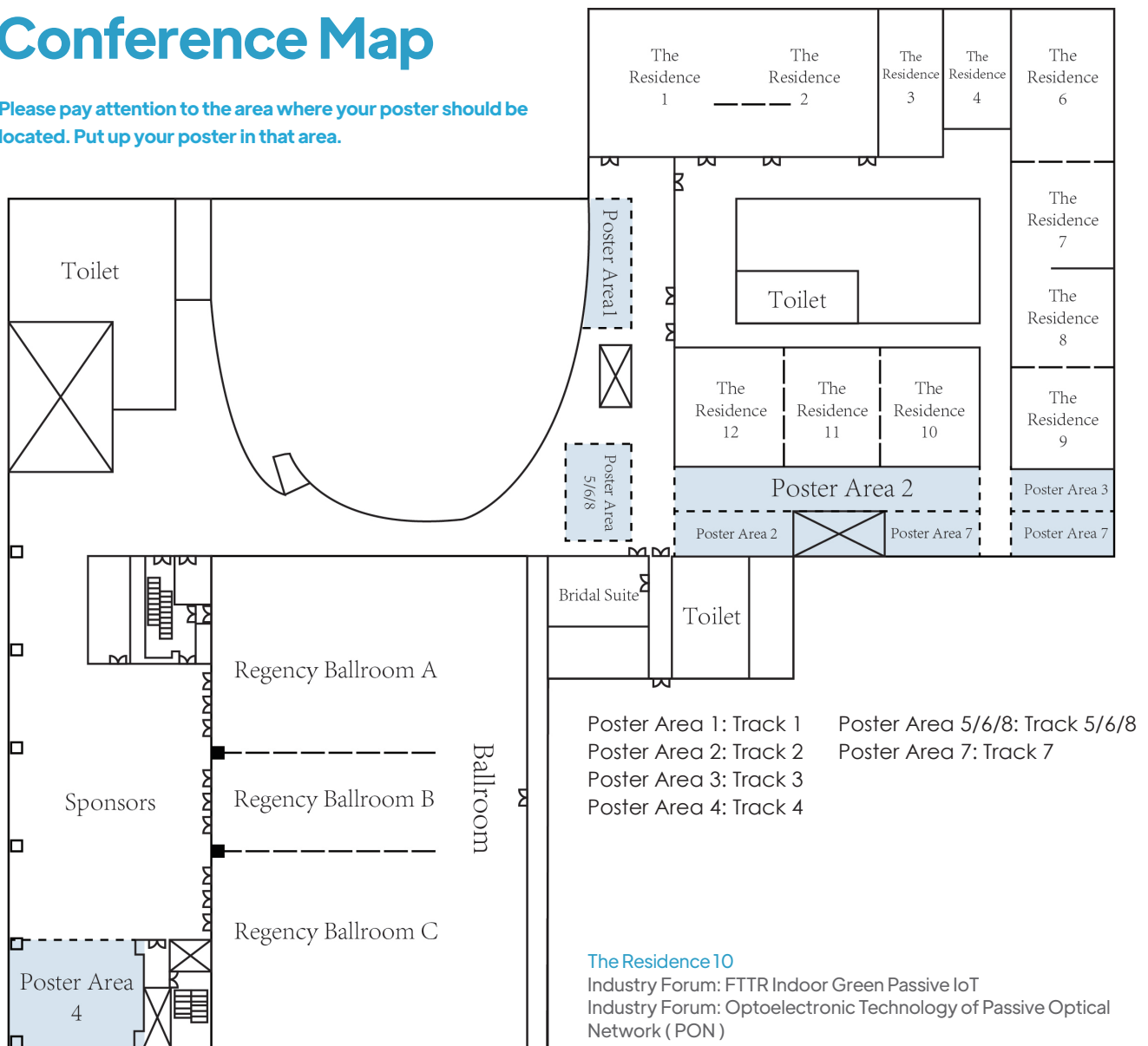
Tip: If you have any questions, you can ask staffs in white work clothes or go to the first floor registration desk for consultation.

Program at a Glance

	Saturday Nov. 2	Sunday Nov. 3	Monday Nov. 4	Tuesday Nov. 5
Registration Lobby, 1F	09:00-20:00	08:30-20:00	08:30-18:00	08:00-15:00
Workshop & Industry Forum 2F	09:00-18:00			
Steering Committee Conference The Residence 3, 2F	10:00-11:30			
Special Student Event The Residence 3, 2F		13:30-16:00		
Opening Ceremony Regency Ballroom, 2F		09:00-09:30		
Plenary Session Regency Ballroom, 2F		09:30-12:00	08:30-12:00	
Technical Session 2F		13:30-18:30	13:30-16:30	08:30-17:30
Best Student Paper Award Competition Session The Residence 7, 2F		13:30-16:45		
Best Paper Award Competition Session The Residence 7, 2F			13:30-17:30	
Postdeadline Session The Residence 1 & 2, 2F			15:45-18:15	
Poster Session 2F			15:30-17:30	
Exhibition Regency Ballroom Foyer, 2F		09:00-18:30	09:00-18:00	08:30-17:30
Welcome Reception MARKET CAFÉ, LG, 1F		17:30-20:00		
Banquet & Awards Ceremony Regency Ballroom, 2F			18:30-20:30	

Conference Map

Please pay attention to the area where your poster should be located. Put up your poster in that area.



2 November

The Residence 1

Workshop: Optical Satellite Communications and Networking

The Residence 2

Workshop: How will optical networks help for High performance AI&ML Data Center Interconnect?

The Residence 3

Steering Committee Conference

The Residence 6

Workshop: Digital Twin of Optical Communication Systems

The Residence 7

Workshop: Enabling Immersive Communications for Metaverse: Architectures, Technologies, and Challenges

The Residence 8

Workshop: Optical Switching and Interconnection for Artificial Intelligence Data Centers (AIDCs)

The Residence 9

Industry Forum: Can Optical Interconnects Keep up with AI Development?

3 November

Regency Ballroom

Plenary Session

Regency Ballroom A

Track 1: Optical Fibers, Fiber-based Devices

Regency Ballroom B

Track 5: Microwave Photonics and Optical Signal Processing

Regency Ballroom C

Track 4: Optoelectronic Devices and Integration

The Residence 1

Track 6: LEDs, Photovoltaics, and Optoelectronics in Energy

The Residence 2

Track 7: Optical Sensors and Biophotonics

The Residence 3

Special Student Event

The Residence 6

Track 8: Micro-, Nano-, and Quantum Photonics: Science and Applications

The Residence 7

Best Student Paper Award Competition Session

The Residence 8

Track 4: Optoelectronic Devices and Integration (Parallel Session)

The Residence 9

Track 2: Optical Transmission Sub-systems, Systems and Technologies

The Residence 10

Track 2: Optical Transmission Sub-systems, Systems and Technologies (Parallel Session I)

The Residence 11

Track 2: Optical Transmission Sub-systems, Systems and Technologies (Parallel Session II)

The Residence 12

Track 3: Network Architectures, Management and Applications

4 November

Regency Ballroom

Plenary Session

Regency Ballroom A

Track 1: Optical Fibers, Fiber-based Devices

Regency Ballroom B

Track 5: Microwave Photonics and Optical Signal Processing

Regency Ballroom C

Track 4: Optoelectronic Devices and Integration

The Residence 1

Track 6: LEDs, Photovoltaics, and Optoelectronics in Energy

The Residence 2

Track 7: Optical Sensors and Biophotonics

The Residence 6

Track 8: Micro-, Nano-, and Quantum Photonics: Science and Applications

The Residence 7

Best Paper Award Competition Session

The Residence 9

Track 2: Optical Transmission Sub-systems, Systems and Technologies

The Residence 10

Track 2: Optical Transmission Sub-systems, Systems and Technologies (Parallel Session I)

The Residence 11

Track 2: Optical Transmission Sub-systems, Systems and Technologies (Parallel Session II)

The Residence 12

Track 3: Network Architectures, Management and Applications

5 November

Regency Ballroom A

Track 1: Optical Fibers, Fiber-based Devices

Regency Ballroom B

Track 5: Microwave Photonics and Optical Signal Processing

Regency Ballroom C

Track 4: Optoelectronic Devices and Integration

The Residence 1

Track 6: LEDs, Photovoltaics, and Optoelectronics in Energy

The Residence 2

Track 7: Optical Sensors and Biophotonics

The Residence 6

Track 8: Micro-, Nano-, and Quantum Photonics: Science and Applications

The Residence 8

Track 4: Optoelectronic Devices and Integration (Parallel Session)

Track 7: Optical Sensors and Biophotonics (Parallel Session)

The Residence 9

Track 2: Optical Transmission Sub-systems, Systems and Technologies

The Residence 10

Track 2: Optical Transmission Sub-systems, Systems and Technologies (Parallel Session I)

The Residence 11

Track 3: Network Architectures, Management and Applications (Parallel Session)

The Residence 12

Track 3: Network Architectures, Management and Applications

Workshop

Integrated Photoelectric Information Processing Technology

The fusion/integration of photonics and electronics is the main technical path to solve the problems of “high speed, low power consumption, intelligence” faced by information technology, and has shown great technical advantages and potential. Integrated photoelectric information/signal processing technology, facilitated by photoelectric integrated circuits, offer distinct advantages including low interconnect latency, high bandwidth, immunity to electromagnetic interference, and low power consumption. After decades of development, information/signal processing devices have developed from fiber optic devices, passive integration, and active integration to photoelectric integration. At present, information/signal processing technologies face three major challenges: ultra-high speed, ultra-low power consumption, and intelligent integration.

The purpose of this workshop is to provide an overview of ongoing progress and trends in advancing the knowledge, understanding, and novel applications of integrated photoelectric information/signal processing technology. Areas of interest include (but are not limited to):

- Photoelectric materials and devices for signal processing
- Ultrafast nonlinear photonics science
- Programmable and integrated photonics for signal processing
- Integrated Photonics for AI and neuromorphic computing
- Integrated Photonic signal processing for sensing and communications
- Integrated photonics for 6G networks
- AI/machine learning for photonic device design and signal processing
- Integrated microwave photonic signal processing and sensing
- Optical frequency combs for photonic signal processing
- Quantum photonic signal processing

Organizers:

Prof. Ninghua Zhu, Nankai University

Prof. Huashun Wen, Nankai University

Prof. Heng Zhou, University of Electronic Science and Technology of China

Prof. Jing Xu, Huazhong University of Science and Technology

Prof. Sha Zhu, Nankai University

Date: 2 November Time: 13:30–17:30

Venue: The Residence 12, 2F (悦府 12,2 楼)

President: Prof. Sha Zhu, Nankai University

13:30–13:50 **Cheng Wang**, City University of Hong Kong

Integrated lithium niobate microwave and millimeter-wave photonics

13:50–14:10 **Guo-Wei Lu**, Kyushu University

High-Temperature Resistant Electro-Optic Modulators for Energy-Efficient Data Centers

14:10–14:30 **Xingyuan Xu**, Beijing University of Posts and Telecommunications

Robust phase retrieval of programmable photonic integrated circuits

14:30–14:50 **Xiaopeng Xie**, Peking University

Low phase noise microwave signal generation with optical frequency combs

14:50–15:10 **Honglei Yang**, China Aerospace Science and Industry Corporation

Free-space femtosecond-level absolute time transfer

15:10–15:30 **Coffee Break**

President: Prof. Jing Xu, Huazhong University of Science and Technology

15:40–16:00 **Pengyu Guan**, Beijing Institute of Technology

Point-to-Multipoint All Optical Networks Using Time Lens based Optical Fourier Transformation

16:00–16:20 **Xiang Li**, China University of Geosciences

Mitigation Techniques for Coherent Optical Transmitters in Both Optical and Electrical Domains

16:20–16:40 **Yuhang Wan**, Beihang University

Nonlinear Dynamics of Silicon Photonic Devices

16:40–17:00 **Guangcan Mi**, Huawei Technologies Co., Ltd.

Interoperable connectivity for AI infrastructure

President: Prof. Heng Zhou, University of Electronic Science and Technology of China

17:00–17:30 **Plenary Discussion**

Phase change materials reconfigurable photonics for next generation optical computing

Phase-change materials (PCMs) offer a transformative approach to reconfigurable photonics, enabling dynamic control over optical properties such as refractive index, absorption, and reflectivity. This workshop will explore the integration of PCMs into photonic devices for next-generation optical computing. With their ability to switch between amorphous and crystalline states, PCMs can realize non-volatile, compact, and energy-efficient photonic components, including switches, modulators, and memory elements. We will discuss recent advancements in materials engineering, device architectures, and fabrication techniques that optimize PCM-based photonics for computational applications. Emphasis will be placed on key challenges such as scalability, endurance, and integration with silicon photonics platforms. Participants will gain insights into how reconfigurable photonic systems can revolutionize data processing, offering faster, more efficient alternatives to traditional electronic computing. This workshop aims to foster interdisciplinary collaboration and innovation in the development of optical computing technologies using PCMs.

Organizers:

Prof. Hongtao Lin, Zhejiang University

Prof. Zhaohui Li, Sun Yat-sen University

Prof. Juejun Hu, Massachusetts Institute of Technology

Date: 2 November Time: 14:00–17:35

Venue: The Residence 11, 2F (悦府 11,2 楼)

President: Prof. Hongtao Lin, Zhejiang University

14:00–14:30 **Linjie Zhou**, Shanghai Jiao Tong University (keynote)

Low-loss phase change optical devices for photonic integrated circuits

14:30–14:55 **Junying Li**, Hangzhou Institute for Advanced Study, CAS (invited)

Electrically and optically driven scalable low-loss nonvolatile phase-change reconfigurable photonics

14:55–15:20 **Qiang He**, Huazhong University of Science and Technology (invited)

Ultrafast laser-driven phase change optical devices: from free-space to integrated photonics

15:20–15:45 **Peipeng Xu**, Shanghai Institute of Microsystem and Information Technology, CAS (invited)

Silicon Photonic Devices Based on Phase-change Materials for Intelligent Optical Computing

15:45–16:00 **Coffee Break**

President: Prof. Zhaohui Li, Sun Yat-sen University

16:00–16:25 **Xiang Shen**, Ningbo University (invited)

Reconfigurable multimode silicon photonics enabled by lowloss phase change materials

16:25–16:50 **Yan Li**, Sun Yat-sen University (invited)

Spatial light modulation using low-loss chalcogenide phase change metasurfaces

16:50–17:15 **Zengguang Cheng**, Fudan University (invited)

Photonic in-memory computing

President: Prof. Hongtao Lin, Zhejiang University

17:15–17:35 **Plenary Discussion**

Photonic Millimeter-wave/Terahertz Communication and Sensing

The millimeter-wave/terahertz frequency band, with its abundant spectrum resources, is widely regarded as the backbone frequency band for future B5G/6G communication networks. In addition, the coexistence needs of sensing and communication in MMW/THz band have urgently driven the seamless integration of sensing and communication. The MMW/THz photonics, with the natural advantages of inherent wide bandwidth and high frequency, has shown great potential to achieve large-capacity communication and high-precision sensing. Meanwhile, the photonic technology with greater degrees of freedom also facilitates the integration of sensing and communication. In this Workshop, we will discuss the theories, waveforms, architectures, algorithms, and core devices of photonic mmW/THz communication and sensing, as well as the burning issues and future trends.

Organizers:

Prof. Min Zhu, Southeast University

Dr. Mingzheng Lei, Purple Mountain Laboratories

Dr. Jiao Zhang, Purple Mountain Laboratories

Date: 2 November Time: 14:00–17:10

Venue: Regency Ballroom B, 2F (宴会B厅, 2楼)

President: Prof. Min Zhu, Southeast University

14:00–14:20 **Yuancheng Cai**, Purple Mountain Laboratories

Long-range THz wireless transmission at 300 GHz enabled by photonics

14:20–14:40 **Wen Zhou**, Fudan University

AI photonics broadband THz technology towards 6G

14:40–15:00 **Jing He**, Hunan University

Photonics-aided Millimeter-Wave Communication and Sensing Integration

15:00–15:20 **Lingxiang Li**, University of Electronic Science and Technology of China

A DBO-based Improved 2D-MUSIC Algorithm for Localization Using OFDM

15:20–15:40 **Coffee Break**

President: Dr. Mingzheng Lei, Purple Mountain Laboratories

15:40–16:00 **Junwen Zhang**, Fudan University

Photonics-assisted Adaptive and Flexible Terahertz Communication and Sensing

16:00–16:20 **Yong Zeng**, Southeast University

OFDM Integrated Sensing and Communication: From Theory to Practical Implementation

16:20–16:40 **Xiaojun Xie**, Southwest Jiaotong University

Heterogeneously Integrated Terahertz Photodetector Based on Thin Film Lithium Niobate Platform

President: Dr. Jiao Zhang, Purple Mountain Laboratories

16:40–17:10 **Plenary Discussion**

Digital Twin of Optical Communication Systems

In the field of optical communications, digital twin (DT) technology is being explored for its potential to enhance network management and optimization. By creating a virtual representation of the physical optical network, DT allows for real-time monitoring, simulation, and prediction of network performance. While the research on DT in optical networks is still in its early stages, it holds great promise for enhancing network automation. With continued advancements in key technologies and addressing existing challenges, DT has the potential to revolutionize the way we design, manage, and optimize optical networks.

This workshop aims to convene leading experts and researchers from industry and academia to delve into the transformative potential of DT technology in optical communication systems. Participants will engage in in-depth discussions, share cutting-edge research findings, and collaborate on developing practical strategies for leveraging DT to model, simulate, monitor, and predict the performance of optical networks with unprecedented accuracy and efficiency. Join us as we unlock new horizons in optical communications, fostering innovations that promise to reshape the future of digital connectivity.

Organizers:

Prof. Lilin Yi, Shanghai Jiao Tong University

Prof. Danshi Wang, Beijing University of Posts and Telecommunications

Date: 2 November Time: 14:00–16:55

Venue: The Residence 6, 2F (悦府 6,2 楼)

Presider: Prof. Danshi Wang, Beijing University of Posts and Telecommunications

14:00–14:15 **Alan Pak Tao Lau**, Hong Kong Polytechnic University

QoT Estimation in Practical Optical Networks

14:15–14:30 **Massimo Tornatore**, Politecnico di Milano

TBD

14:30–14:45 **Takeo Sasai**, NTT

Digital Longitudinal Monitoring as Digital Twin Operation of Optical Network

14:45–15:00 **Qian Li**, Peking University

Efficient Physics-informed Neural Network for Ultrashort Pulse Dynamics in Optical Fibers

15:00–15:15 **Bingli Guo**, Beijing University Of Posts and Telecommunications

Challenges of Digital Twins Orchestration in Optical Network

15:15–15:40 **Coffee Break**

Presider: Prof. Lilin Yi, Shanghai Jiao Tong University

15:40–15:55 **Liang Dou**, Alibaba

Unlocking the Potential of QoT-Based Digital Twin in Optical Networks

15:55–16:10 **Yuren You**, Huawei

Optical Network Digital Twin for Intelligent Automation

16:10–16:25 **Yu Tang**, China Unicom Research Institute

Opportunities and Challenges of Digital Twin in Optical Transport Networks

16:25–16:40 **Yubin Zang**, Nanjing University of Posts and Telecommunications

Explainability VS. Efficiency? The development of principle-driven intelligent fiber models and their potential role in future fiber digital twin systems

16:40–17:05 **Plenary Discussion**

Optical Satellite Communications and Networking

Laser communication systems offer significant advantages over microwave systems, including higher data rates, enhanced security, and greater resistance to interference. As global demand for high-speed and reliable communication grows, optical satellite communications have become crucial for expanding global internet access, supporting high-speed data transmission across remote regions, and enabling future space-based communication networks. This workshop will cover the core principles of optical communications, the design and operation of optical satellite links, and the challenges of integrating optical systems with existing satellite networks. Additionally, we will explore cutting-edge developments in free-space optical communications, laser communication technologies, and the role of optical networking in supporting deep-space exploration and Earth observation missions. Through expert presentations and interactive discussions, participants will gain insights into the fundamentals of optical communication, satellite system architectures, and future trends in space-to-space optical communications and inter-satellite networking.

Organizers:

Prof. Yongli Zhao, Beijing University of Posts and Telecommunications

Prof. Wei Wang, Beijing University of Posts and Telecommunications

Date: 2 November Time: 13:30–16:50

Venue: The Residence 1, 2F (悦府 1, 2 楼)

Presider: Prof. Yongli Zhao, Beijing University of Posts and Telecommunications

13:30–13:50 **Yunbo Li**, China Mobile Research Institute

Exploration of Key Technologies for Intelligent Networking of Space Optical Transport Network

13:50–14:10 **Buzheng Wei**, China Unicom Research Institute

Consideration of Satellite Optical Networks

14:10–14:30 **Wei Sun**, Chang Guang Satellite Technology Co., Ltd

Space Optical Communications for Satellite Remote Sensing

14:30–14:50 **Junwen Zhang**, Fudan University

TBD

14:50–15:20 **Coffee Break**

Presider: Prof. Wei Wang, Beijing University of Posts and Telecommunications

15:20–15:40 **Li Li**, Northwestern Polytechnical University

Hybrid Laser–Microwave Transmission for Ground to Satellite Communications

15:40–16:00 **Yejun Liu**, Chongqing University of Posts and Telecommunications

Intelligent Transmission of Free–Space Optical Communications

16:00–16:20 **Yan Li**, Beijing University of Posts and Telecommunications

Adaptive Ground to Satellite Optical Communication Technologies

16:20–16:50 **Yongli Zhao**, Beijing University of Posts and Telecommunications

F6G White Paper V2.0 Releasing Event

How will optical networks help for High performance AI & ML Data Center Interconnect?

The rapid growth of large language model (LLM) has accelerated the development of AI/ML-enabled data center (AIDC). AIDC is becoming one of the most important telecom-infrastructure for interconnecting a large number of GPUs (ranging from 10K to 1000K) to support distributed parallel training. Different traffic patterns and requirements between AI workloads and traditional cloud computing pose challenges to the current DCN and DCI network architecture. Optics-enabled switching network is becoming an essential part with its advantage in cost, energy and bandwidth consumption and so on. However, there are still some open questions on: how will optical networks help for AIDC interconnection and distributed parallel AI training? Do we need coordinate CCL and network controller for a globe optimization? if so, how? Which networking solution is better for DCI (OTN or IPoWDM)? Will electronic switching be replaced by all-optics switching in the near future?... With these questions, in this workshop, we have eight invited talks given by the experts from OTT, vendors and academia to share their insights in this field.

Organizers:

Prof. Jiawei Zhang, Beijing University of Posts and Telecommunications

Prof. Yongcheng Li, Soochow University

Dr. Zeshan Chang, Huawei

Date: 2 November Time: 14:00-17:50

Venue: The Residence 2, 2F (悦府 2, 2 楼)

President: Prof. Jiawei Zhang, Beijing University of Posts and Telecommunications

14:00-14:20 **Shizhen Zhao**, Shanghai Jiaotong University

Building Hybrid optoelectronic Networks for AI&ML Data Centers

14:20-14:40 **Jim Zou**, Adtran Networks SE

An AI effect-new speed hikes on optics

14:40-15:00 **Zhizhen Zhong**, MIT

Optics-enabled Distributed Computing for Emerging AI Workloads

15:00-15:20 **Xi Yu**, Kuai Shou

Optical Interconnection for AI Network in Short Video Platforms

15:20-15:40 **Coffee Break**

President: Prof. Yongcheng Li, Soochow University

15:40-16:00 **Dong Wang**, China Mobile Research Institute

Trend and Evolution of Optical Technologies for Data Center

16:00-16:20 **Shaoliang Yu**, Zhejiang Lab

Optical Circuit Switching for Next Generation Scalable AI Infrastructure

16:20-16:40 **Xin Liu**, Huawei

The Exploration of Optical Cross-Connects in Large Model Inference Clusters

16:40-17:00 **Lijing Zhu**, Xidian University

Optical Interconnects for Data Center Networks: Challenge and Opportunities

17:00-17:20 **Ping Zhao**, Sichuan University

On-chip High-speed Wide Range All-optical Wavelength Conversion

President: Prof. Jiawei Zhang, Beijing University of Posts and Telecommunications

Prof. Yongcheng Li, Soochow University

Dr. Zeshan Chang, Huawei

17:20-17:50 **Plenary Discussion**

Optical Switching Device and Network for Artificial Intelligence Data Centers (AIDCs)

Current electrical switch technology in Artificial Intelligence Data Centers (AIDCs) is expected to hit a wall two generations from now due to the inability to increase the pin density on the Ball Grid Array (BGA) package. As a counterpart, switching the traffic in the optical domain has been investigated considerably as a solution to overcome the bandwidth bottleneck and high power consumption issues. Benefiting from the optical transparency, the optical switching with high bandwidth is independent of the bit rate and data format of the traffic. WDM technology can be employed to boost the optical network capacity at a superior power-per-unit bandwidth performance. In addition, eliminating the power-consuming optical-electrical-optical conversions at the switch nodes significantly improves energy and cost efficiency. However, the optical switches especially for the fast optical switches are not practically deployed in large-scale networks. What are the main challenges? With the emergence of large-scale machine learning models, are there any opportunities for optical switching technologies? What are the technical directions for the optical switches? What kind of role can optical switching play? Will the optical switching update the current topology? and how to cooperate with load balancing and traffic optimization. This workshop will try to discuss these interesting questions and give researchers inspirational ideas.

Organizers:

Dr. Shikui Shen, China Unicom Research Institute

Prof. Jianjun He, Zhejiang University

Prof. Xuwei Xue, Beijing University of Posts and Telecommunications

Date: 2 November Time: 14:00–17:45

Venue: The Residence 8, 2F (悦府 8, 2 楼)

President: Dr. Shikui Shen, China Unicom Research Institute

14:00–14:15 **Lei Gao**, Huawei

The Application of Optical Switching in AI Data Centers

14:15–14:30 **Ning Deng**, Great Bay University

Optical Network Characteristics and Technologies for Intelligent Computing

14:30–14:45 **Xu Zhou**, Baidu

Trends in optical communication technology for AI data centers

14:45–15:00 **Zhiquan Wan**, Zhejiang Lab

Network behavior analysis and architecture exploration for LLM training

15:00–15:15 **Wenzhe Li**, Institute of Computing Technology, CAS

Reconfigurable Optical Networks for Accelerating AI Training

15:15–15:30 **Fulong Yan**, Beijing University of Posts and Telecommunications,

AOSphere: Next Generation Exabit/s Data Center Network Supporting All Optical Circuit and Packet Switching

15:30–15:45 **Coffee Break**

President: Prof. Jianjun He, Zhejiang University

15:45–16:00 **Jiasheng Zhao**, Lightip

Distributed optical switching for datacenter network and AI computing

16:00–16:15 **Yu Wang**, Eindhoven University of Technology

Photonic integrated circuits for artificial intelligence data center

16:15–16:30 **Zhiwei Zhou**, Preciseley

Mirror array solution for OCS in the datacenter

16:30–16:45 **Hualei Lu**, HUBER+SUHNER

DirectLight Piezo Based Beam Steering OCS & Applications

16:45–17:00 **Xuerui Sun**, EXFO

The Best Practices of the Large Capacity OCS Testing and Qualification

President: Prof. Xuwei Xue, Beijing University of Posts and Telecommunications

17:00–17:45 **Plenary Discussion**

Progress and Application Considerations for New-Type Optical Fibers and Corresponding Communication Systems

Space Division Multiplexing (SDM) fibers have been developed for over a decade. However, these fibers have not yet seen a large-scale commercial deployment. Meanwhile, Hollow-Core Fiber (HCF) has received significant attention due to its various advantages in optical communication systems, which is considered a disruptive innovation for fiber optic communications. Therefore, it is necessary to sort out and think about the development and application of the two fiber transmission systems based on the new-type fibers, in order to point out the next development direction. This workshop will provide a platform to discuss the progress and application considerations for the two new-type fibers and corresponding systems.

Organizers:

Chengliang Zhang, China Telecom

Jie Luo, Yangtze Optical Fiber and Cable Joint Stock Limited Company

Xiaoli Huo, China Telecom

Date: 2 November Time: 09:00–12:10

Venue: Regency Ballroom C, 2F (宴会 C 厅, 2 楼)

President: Chengliang Zhang, China Telecom

09:00–09:05 **Opening Speech**

09:05–09:25 **Lei Zhang**, Yangtze Optical Fiber and Cable Joint Stock Limited Company

The R&D progress of YOFC on next generation optical fibers and relative devices

09:25–09:45 **Li Xiao**, Accelink Technology Co. Ltd

Optical amplification solution for hollow core fiber transmission

09:45–10:05 **Zhiyong Zhao**, Huazhong University of Science and Technology

SDM fiber devices and fiber fusion splicing techniques

10:05–10:25 **Zhixue He**, Pengcheng Laboratory

Ultra-high capacity transmission in anti-resonant hollow-core fibre

10:25–10:50 **Coffee Break**

President: Jie Luo, Yangtze Optical Fiber and Cable Joint Stock Limited Company

10:50–11:10 **Jianping Li**, Guangdong University of Technology

Discussion on the technologies for capacity increase for optical fiber communications

11:10–11:30 **Lin Sun**, Soochow University

Multi-core fibers technology for submarine communications

11:30–11:50 **Yi Yu**, Huawei Technologies Co. Ltd.

Research status about capacity and intelligence improvement in next generation optical transmission network

11:50–12:10 **Xishuo Wang**, China Telecom

Development and Application Exploration of New-type Optical Fibers and Transmission Systems

Key Technologies and Application for Long-Distance, High-Capacity Submarine Optical Fiber Networks

Submarine fiber-optic cables now carry >95% of all transoceanic telecommunications traffic in an economic, fast and secure way. Fiber-optic cables also play a very important role in underwater sensing or monitoring. To develop advanced technologies for high-capacity fiber-optic transmission or smart sensing applications under water has been attracted extensive and intensive research interest. This workshop will give some representative technologies and integrated communication and sensing applications, involving in speciality fibers and cables, OAM-SDM solution, modulation and coding, integrated sensing and communication system, and operation and maintenance of submarine cable system.

Organizers:

Dr. Ansion LM Xiong, State Key Laboratory of Optical Fiber and Cable Manufacture Technology, YOFC
Dr. Junjie Li, China Telecom Research Institute
Prof. Zhaohui Li, Sun Yat-sen University

Date: 2 November Time: 14:00–17:30

Venue: Regency Ballroom C, 2F (宴会 C 厅, 2 楼)

President: Dr. Junjie Li, China Telecom Research Institute

14:00–14:10 **Jie Luo**, YOFC-SKL | **Welcome Address**

14:10–14:30 **Chao Lu**, The Hong Kong Polytechnic University

Photonics Integrated Sensing and Communication System Harnessing Submarine Fiber Optic Cables for Coast Event Monitoring

14:30–14:50 **Lianshan Yan**, Southwest Jiaotong University

AI-Assisted Mitigation of Fiber Nonlinearities in Ultra-Long-Haul Transmission Systems

14:50–15:10 **Zhaohui Li**, Sun Yat-sen University

OAM-SDM Solution Toward a Submarine Cable

15:10–15:30 **Yi Cai**, Soochow University

Advanced Modulation and Coding for High-Capacity Transoceanic-Distance Optical Fiber Transmissions

15:30–15:40 **Coffee Break**

President: Prof. Chao Lu, The Hong Kong Polytechnic University

15:40–16:00 **Junshi Gao**, China Mobile Group Design Institute Co., Ltd.

The Evolution of Trans-Ocean Submarine Cable Terminal and Fiber Technology

16:00–16:20 **Lipeng Feng**, China Telecom Research Institute, State Key Laboratory of Optical Fiber and Cable Manufacture Technology

Development of High-Capacity Submarine Transmission, Operation and Maintenance Technology

16:20–16:40 **Jiang Lin**, HMN Technologies Co., Ltd

Challenges of Commissioning and Acceptance in High Capacity Submarine Open Cable System

16:40–17:00 **Jun Luo**, State Key Laboratory of Optical Fiber and Cable Manufacture Technology (YOFC)

Speciality Fibers and Cables and Their Application in Integrated Fiber-Optic Communication and Sensing Networks Under Water

President: Dr. Ansion LM Xiong, State Key Laboratory of Optical Fiber and Cable Manufacture Technology, YOFC

17:00–17:30 **Plenary Discussion**

Enabling Immersive Communications for Metaverse: Architectures, Technologies, and Challenges

The metaverse is set to revolutionize the way individuals interact, creating immersive environments where users can communicate via digital avatars in real-time. This new dimension of digital existence is underpinned by a globally interconnected computing and communication architecture, encompassing both edge and cloud servers, as well as scalable networking technologies. Achieving hyper-interactivity requires symmetric, high-resolution content delivery alongside ultra-low and uniform network latency—demands that surpass the capabilities of existing communication networks. This workshop brings together experts from both the metaverse and networking technology fields to explore how immersive experiences can be realized through advancements in network infrastructure. We aim to address the technical challenges involved in creating seamless, real-time experiences within the metaverse.

Organizers:

Prof. Pan Hui, The Hong Kong University of Science and Technology (Guangzhou)

Dr. Ao Yu, The Hong Kong University of Science and Technology (Guangzhou)

Date: 2 November Time: 13:40–17:00

Venue: The Residence 7, 2F (悦府 7, 2 楼)

President: Dr. Ao Yu, The Hong Kong University of Science and Technology (Guangzhou)

13:40–14:00 **Bowen Bao**, Changsha University of Science and Technology

Node-Oriented Intelligent Reliable Resource Allocation for Metaverse Services in Optical Networks

14:00–14:20 **Yaojun Qi**, Universiti Putra Malaysia

A Natural Evolution of Urban Mobility: The Role of Metaverse Technologies in Advancing Smart City Transportation Infrastructure

14:20–14:40 **Yuyang Wang**, The Hong Kong University of Science and Technology (Guangzhou)

Virtual Reality: Towards Personalized Intelligence in Human–Machine Interaction

14:40–15:00 **Xin Wang**, Beijing Information Science and Technology University

A Deep Reinforcement Learning Approach for Resource-efficient 6G Holographic Type Communication over Flexible X-haul Networks

15:00–15:30 **Coffee Break**

15:30–15:50 **Qingxin Xia**, The Hong Kong University of Science and Technology (Guangzhou)

Enhancing Inertial Hand based HAR through Joint Representation of Language, Pose and Synthetic IMUs

15:50–16:10 **Jialong Li**, Max Planck Institute, Germany

Uniform-Cost Multi-Path Routing for Reconfigurable Data Center Networks

16:10–16:30 **Ming-cheng Tsai**, Hon Hai Precision Industry Ltd.

FSO Technologies: Enhancing Estimation, Data Fusion, and Tracking Capabilities

16:30–17:00 **Plenary Discussion**

Industry Forum

Lighting the Path to AI Revolution: Application of Optical Circuit Switching and Interconnection Technology in Intelligence Datacenter

As artificial intelligence (AI) ushers in a transformative era, the forum will concentrate on the critical role of optical switching and interconnect technologies within intelligent computing centers. The forum will discuss key entry points for these technologies, and also outlining the opportunities such as enhanced data throughput and the challenges including technological barriers and integration complexities. The discussion will further address the synchronization of optical switching and interconnects across multiple computing centers, exploring the prospects for improved connectivity and the impediments to be surmounted. With an emphasis on intelligent optical interconnection networks, the forum is set to illuminate the future trajectory of optical technologies in the AI revolution.

Organizers:

Dong Wang, CMRI

Hua Zhang, LUSTER LightTech Co.,Ltd.

Date: 2 November Time: 09:00–12:00

Venue: The Residence 11&12, 2F (悦府 11+12, 2 楼)

President: Hua Zhang, LUSTER LightTech Co.,Ltd.

09:00–09:25 **Fang Li**, CAICT

Enhancing the foundation of Photonics technology and industry, supports the development of new industrialization

09:25–09:50 **Ang Li**, Hisilicon Optoelectronics Co., Ltd.

Discussion on the Evolution of AI Optical Interconnect Solutions

09:50–10:15 **Dong Wang**, CMRI

Technical Progress and Prospect of New All-Optical Network

10:15–10:25 **Coffee Break**

President: Dong Wang, CMRI

10:25–10:50 **Songtao Chen**, Fiberhome Telecommunication Technologies Co.,Ltd.

Research on the development of optical interconnection technology for intelligent computing

10:50–11:15 **Fulong Yan**, Beijing University of Posts and Telecommunications

Experimental Investigation on Disaggregated Cloud Computing Data Centers Beyond Rack Scale with Optical Switching

11:15–11:40 **Hua Zhang**, LUSTER LightTech Co.,Ltd.

Discussion on the application of optical circuit switching for AI-Generated Content

President: Dong Wang, CMRI

Hua Zhang, LUSTER LightTech Co.,Ltd.

11:40–12:00 **Plenary Discussion**

Can Optical Interconnects Keep up with AI Development

Generative AI has attracted lots of attention since the advent of ChatGPT, not only from academia and industries, but from general public as well. As massive parallel computing is used for the training of large language models (LLMs), huge amount of interconnects at various levels are required for AI computing clusters. There have been unprecedented demands for optical interconnect products especially high-speed optical transceivers since last year. With computing power doubling every 3-4 months, AI computing advances much faster than before and may require our industry to evolve in a much faster pace. While AI brings excitement and opportunities to our industry, there are many challenges as well. Can optical interconnects keep up with AI development? Can existing technologies move fast enough to meet AI requirements? Are disruptive technologies required? Do we need to change the way to develop new technologies and products? This panel will bring together experts from various segments in our industry including end users, system vendors, optical transceiver and chip companies to discuss these questions.

Organizers:

Dr. Chongjin Xie, PhotonicX AI

Dr. Frank Chang, Source Photonics

Dr. Shikui Shen, China Unicom

Date: 2 November Time: 13:30-17:30

Venue: The Residence 9, 2F (悦府 9, 2 楼)

President: Dr. Chongjin Xie, PhotonicX AI

13:30-13:45 **Yuyang Liu**, China Telecom

Optical Communication Technology in the AI Era

13:45-14:00 **Anbin Wang**, Alibaba Cloud

Trends and Challenges of Optical interconnects in AI Datacenters

14:00-14:15 **Sidong Fu**, Tencent

Optical interconnect technology and photonic integrated chip architecture for intelligent computing centers

14:15-14:30 **Die Wan**, Baidu

Opportunity and Challenge for HPN Optical Interconnection

14:30-14:45 **Guangcan Mi**, Huawei

Optical Connectivity in the Age of AI

14:45-15:00 **Shiwei Cao**, Kuaishou

Applications of Optical Interconnect Technologies in the Era of AI

15:00-15:30 **Coffee Break**

President: Dr. Shikui Shen, China Unicom

15:30-15:45 **Xiang Liu**, Huawei

Advances in 800G and 1.6T Optical Transceiver Standards and Technologies

15:45-16:00 **Xue Wang**, H3C

Applications and Development of Optical Interconnection in AI Networks

16:00-16:15 **Cheng Ning**, Innolight

Optical I/O from Industrial Perspective: Current Products and Future Development

16:15-16:30 **James Zhang**, Eoptolink

AI Development Driving the Innovation of Optical Transceivers

16:30-16:45 **Richard Zhang**, Intel

Silicon Photonics as an Enabling Technology for AI Acceleration

16:45-17:00 **Jiaxing Wang**, Brexel

High speed VCSEL optical interconnection for AI application

President: Dr. Frank Chang, Source Photonics

17:00-17:30 **Plenary Discussion**

All-Optical Network Technology Evolution in the Intelligent Era

In the F5G era, all-optical networks will continue to evolve in the future. Looking ahead to 2030, the breakthroughs in the fields of AI big model and immersive 3D put forward the demand for large bandwidth, low latency and high reliability in future all-optical network architectures. Through this industrial forum, experts from industry and academia are invited to come together to reach a consensus on the core demands and key technologies of the future all-optical network that builds a network around the data centre, to build green all-optical network architectures.

This forum will focus on transport optical technologies in future all-optical networks, including:

- Intergenerational systems: next-generation optical system architecture and cutting-edge technologies
- Subsystems and subcomponents: three-dimensional DCI, one-hop DCA, efficient internal DCN, and subcomponent technologies
- High-reliability optical network: optical/electrical convergence and millisecond-level WSON technology
- AI for ON: digital optical layer and network automation technology

Organizers:

Jun Luo, Huawei Fellow, Huawei

Wei Jia, Huawei

Zhenqing Zhao, Huawei

Xiandan Tang, Huawei

Date: 2 November Time: 09:00–17:15

Venue: Regency Ballroom A, 2F (宴会 A 厅, 2 楼)

Presider: Wenyu Zhao, China Academy of Information and Communications Technology

09:00–09:15 **Opening**

09:15–09:45 **Dong Wang**, China Mobile Research Institute

Technical Deployment and Prospect of New All-optical Network for Artificial Intelligence

09:45–10:15 **Yadong Gong**, China Telecom Research Institute

Evolution and Exploration of Optical Network Technology in the Era of Intelligent Computing

10:15–10:45 **Yantao Zhou**, Research Institute of China United Network Communications Co., Ltd.

All-optical Target Network Innovation Progress of China Unicom

10:45–11:00 **Coffee Break**

11:00–11:30 **Mingwang Mao**, Meituan

Optical Interconnects in AI Data Centers: Technological Evolution and Future Prospects

11:30–12:00 **Dejiang Zhang**, Huawei Technologies Co., Ltd

All-Optical Target Network Architecture and Key Technologies

12:00–14:00 **Lunch**

Presider: Zeshan Chang, Huawei

14:00–14:30 **Gangxiang Shen**, Soochow University

Rethinking of High-speed Fault Recovery and Efficient Protection Resource Sharing in All-Optical Network

14:30–15:00 **Rentao Gu**, Beijing University of Posts and Telecommunications

Light+Computing: Exploration and Prospect of Intelligent Computing Optical Networks

15:00–15:30 **Fan Zhang**, Peking University

Advances in modulation chips, algorithm architectures, experiments, and simulation software for AI-driven ultrahigh-speed optical transmission

15:30–16:00 **Coffee Break**

16:00–16:30 **Qunbi Zhuge**, Shanghai Jiao Tong University

LLM-Powered AI Agent for Autonomous Driving Optical Networks

16:30–17:15 **Plenary Discussion**

Optoelectronic Technology of Passive Optical Network (PON)

With the advancement of technology, PON (Passive Optical Network) systems have evolved through multiple generations. Each phase of technological progress has been characterized by a significant increase in transmission rates, which in turn presents new challenges to the performance of optoelectronic devices. To meet the demands of future network development, continuous breakthroughs are necessary in terms of data rate, performance, and the coexistence of multiple generations of technology. This industry forum aims to bring together experts from both industry and academia to discuss and share insights on PON-related optoelectronic technology issues. We look forward to your valuable contributions.

Organizers:

Prof. Chao Lu, The Hong Kong Polytechnic University

Enyu Zhou, Huawei

Fan Yu, Huawei

Date: 2 November Time: 09:00–12:00

Venue: The Residence 10, 2F (悦府 10, 2 楼)

Presider: Prof. Chao Lu, The Hong Kong Polytechnic University

09:00–09:10 **Opening**

09:10–09:20 **Enyu Zhou**, Huawei Technologies Co., Ltd

Evolution and Challenges of Passive Optical Network (PON)

09:20–09:40 **Jianbing Zhang**, Huazhong University of Science and Technology

Computational Spectrometers and Their Applications

09:40–10:00 **Ning Liu**, Soochow University

Silicon photonics technologies for passive optical networks

10:00–10:20 **Zongyin Yang**, Zhejiang University

Application of Miniaturized Spectrometer in Identification of Communication Light Source Module

10:20–10:40 **Coffee Break**

10:40–11:00 **Ruijun Wang**, Sun Yat-sen University

DFB laser diode: temperature insensitive operation and heterogeneous integration

11:00–11:20 **Xingxing Jiang**, Technical Institute of Physics and Chemistry, CAS

Anomalous thermal expansion enables ultra-stable optical transmission in optical single crystals

11:20–11:40 **William Shieh**, Westlake University

Self-Coherent Detection for Cost-Effective 200G PON

11:40–12:00 **Plenary Discussion**

FTTR Indoor Green Passive IoT

In the F5G era, all-optical networks are developing. As a typical F5G solution, Fiber-To-The-Room (FTTR) is developing rapidly at a scale of 10 million sets in three years and 100 million sets in five years. FTTR extends optical fibers to more indoor spaces, and the "neural network" built by FTTR makes it possible to perceive and locate indoor IoT. Through this forum, industry and academic experts are invited to gather together to build a digital foundation for FTTR smart everything based on FTTR+ indoor passive IoT perception and positioning technologies, FTTR scenario perception application imagination, and positioning capability improvement. This forum will focus on FTTR indoor green passive IoT technologies, including:

- Research Progress of FTTR Synaesthesia Integration, Standard Industry Progress and Indoor IoT Application
- Research on Network RFID Convergence Architecture Technology
- Application and Progress of Next-Generation RFID Tag Awareness Technology and Awareness Tags to Meet IoT Requirements
- Research on Indoor IoT Positioning Technology

Organizers:

Prof. Min Hao, Fudan University
Junwei Li, China Mobile Research Institute
Xiang Wang, Huawei
Zihui Guo, Huawei

Date: 2 November Time: 14:00–17:50

Venue: The Residence 10, 2F (悦府 10, 2 楼)

President: Xiaolong Dong, Huawei

14:00–14:35 **Junwei Li**, China Mobile Research Institute

Considerations on Deployment and Technical Development of FTTR

14:35–15:10 **Xuming Wu**, Huawei Technologies Co., Ltd

FTTR Standards, Industry Progress, and Potential for Indoor IoT Application

15:10–15:45 **Tao Ye**, Southern University of Science and Technology

Next Generation RFID Tag Sensing Technology

15:45–16:05 **Coffee Break**

16:05–16:40 **Wei Wang**, Huazhong University of Science and Technology

GNSS Indoor Ubiquitous Location Sensing Assisted by Passive IoT

16:40–17:15 **Hao Min**, Fudan University

Application and Progress of RFID Technology to Meet the Requirements of IoT

17:15–17:50 **Jia Liu**, Nanjing University

Passive RFID Reshapes Next Generation Sensing Technology

Special Student Event

Talking with distinguished professors, industry leaders and early-stage professionals

Speakers will share interesting and meaningful insights about their research, work, and life with students and young professionals. We hope that these sharing sessions will give the audience some inspiration and encouragement in their early research career. Each speaker will deliver a 10-15 min presentation (see their titles below) followed by a 5-min Q&A. Students and young professionals can directly ask the leaders their interested questions.

Date: 3, November, 2024 Time: 13:30-16:00

Venue: The Residence 3, 2F (悦府 3, 2 楼)

Organizers:

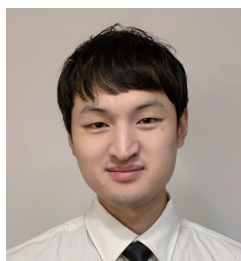
Xuwei Xue, Beijing University of Posts and Telecommunications, China

Bin Chen, Hefei University of Technology, China

Haoshuo Chen, Nokia Bell Labs, USA

Title: Don't be afraid to propose "stupid" ideas

Speaker: Dr. Di Che, Nokia Bell Labs, USA



Biography: Di Che received the B.E. degree from University of Science and Technology of China in 2012, and the Ph.D. degree from The University of Melbourne, Australia, in 2017. He joined Nokia Bell Labs (New Jersey, USA) as an optical fiber communication researcher in 2018. He has authored over 150 publications and has been an invited speaker in multiple international conferences including OFC and ECOC. He is the recipient of Tingye Li Innovation Prize (OPTICA) in 2020 and Marconi Society Paul Baran Young Scholar (The Marconi Society) in 2018. His research mainly focuses on the optical transmission system including novel digital optical subsystems, advanced modulation and multiplexing, digital signal processing and datacenter interconnects.

Title: Witnessing the inspiring journey of optical communications

Speaker: Dr. Xiang Liu, Huawei Technology, China



Biography: Xiang Liu is Chief Scientist of Optical Standards at Huawei Technologies. He has been actively contributing to international standards in ITU-T SG15, IEEE 802.3, ETSI ISG-F5G, BBF and OIF. He had been the Vice President for Optical Transport and Access at Futurewei Technologies. He received the Ph.D. degree in applied physics from Cornell University in 2000. He has authored/co-authored more than 350 journal and conference papers and holds over 100 patents. He is the author of a technical book entitled "Optical Communications in the 5G Era". He has served as a Technical Program Co-Chair of OFC 2016 and a General Co-Chair of OFC 2018. He is a Fellow of IEEE and OSA.

Title: Research in Academia and Industry: Differences and Similarities**Speaker: Dr. Chongjin Xie, PhotonicX AI, Singapore**

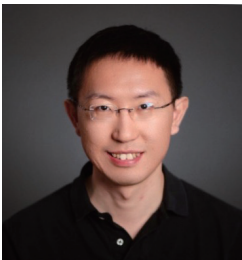
Biography: Chongjin Xie received his M.Sc. and Ph.D. degrees from Beijing University of Posts & Telecommunications, in 1996 and 1999, respectively. He did his postdoctoral research at Chalmers University of Technology in Sweden from 1999 to 2001. He joined Bell Labs, Lucent Technologies in New Jersey, USA in 2001, doing research on optical communication systems and networks. He worked at Alibaba Infrastructure Service, Alibaba Group from 2014 to 2024 as a senior director and chief communication scientist, leading an optical networking research, planning, design and testing team to develop and implement datacenter optical interconnects and networking technologies and products in support of Alibaba online platform and cloud services. He founded PhotonicX AI in September 2024, a startup focusing on AI optical interconnects and served as CEO of the company. Dr. Xie has published one book, 5 book chapters and over 250 journal and conference papers, and served as an associate editor of Journal of Lightwave Technologies from 2013 to 2019, OFC program chair and general chair in 2019 and 2021, respectively. He is a Fellow of IEEE and a Fellow of Optica.

Title: Academic contribution from an industrial perspective, and vice versa, too**Speaker: Dr. Jim Zou, Adtran Networks, Germany**

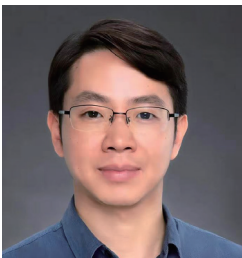
Biography: Jim Zou joined ADVA Optical Networking (now Adtran Networks), Germany, in 2016, currently leading emerging initiatives within Global Business Development. He is part of the Product Solution team for new technology introduction. He actively participates in the international SDOs like O-RAN Alliance, ITU-T SG15, CableLabs, OIF, Quantum Communication Networks Task Force at TSAC Singapore, Smart Tunable MSA, and other industrial MSAs. He received the PhD degree from Eindhoven University of Technology, The Netherlands, in 2015. He is currently serving on the OFC technical program as Subcommittee Chair, and also an Associate Editor for IEEE/Optica Journal of Optical Communications and Networking. He has co- and authored more than 65 scientific papers, and holds several international patents which lead to commercial products.

Title: Some Thoughts on Conducting Interdisciplinary Research**Speaker: Prof. Yanni Ou, Beijing University of Posts and Telecommunications, China**

Biography: Yanni Ou received the PhD degree from University of Bristol, UK, in 2016, and has become a senior research associate since then. Since 2018, she joined Nokia Bell Labs at Stuttgart, Germany, as a researcher with the Fixed Networks Group. In September 2021, she has become a professor at Beijing University of Posts and Telecommunications, China. Her research interests focus on the intelligent optical communication systems and networks, network convergence, as well as quantum information and networking. She has published in high quality journals and conferences, holding international patents that lead to commercialization, and has contributed in ITU-T/ETSI/CCSA standardizations. She has been involved in multiple UK/EU/Germany funded projects, and has also served as the grant reviewer for EPSRC UK, and TPC member of OFC/OECC/ACP/PEIRS.

Title: Bridging the gap: from optical networking to computer systems**Speaker: Dr. Zhizhen Zhong, Massachusetts Institute of Technology, USA**

Biography: Zhizhen Zhong is a postdoctoral associate at MIT. His research focuses on the interdisciplinary area between optical networking and distributed computer systems. He regularly served on the program committees of top-tier conferences like ACM SIGCOMM and NSDI. Before joining MIT, Zhizhen was a researcher at the Meta network infrastructure team. Zhizhen received his PhD and bachelor's degrees all from Tsinghua University, in 2019 and 2014, respectively. During his PhD, Zhizhen was a visiting PhD student at UC Davis.

Title: How to choose research topics**Speaker: Prof. Lilin Yi, Shanghai Jiao Tong University, China**

Biography: Lilin Yi, distinguished professor, vice director of the State Key Laboratory of Advanced Optical Communication Systems and Network of Shanghai Jiao Tong University. His main research topics include intelligent optical communication systems and intelligent fiber laser systems. Dr. Lilin Yi is the author or co-author of more than 200 papers in peer-reviewed journals and prestigious conferences. He has achieved the awards of "National Science Fund for Distinguished Young Scholars of China" and "Young scholars of the Yangtze River in China". He serves as the TPC member of OFC/OECC/CLEO-PR/ACP and TPC track/workshop/symposium co-chairs of OFC/ECOC/OECC/CLEO-PR/ACP.

Title: PhD Journey: Research, Learning, and Growth
Speaker: Ms. Mengfan Fu, Shanghai Jiao Tong University, China



Biography: Mengfan Fu received her B.E. degree in Information Engineering from Shanghai Jiao Tong University (SJTU), Shanghai, China, in 2019. She is currently pursuing a Ph.D. degree in Information and Communication Engineering at SJTU. Her research interests include digital coherent technologies in high-capacity long-haul systems and low-cost systems for data center interconnect. She received the Grand Prize for the Corning Outstanding Student Paper Competition at the 2020 OFC and the SPIE Optics and Photonics Education Scholarship in 2023.

Opening Ceremony & Plenary Session

November 3, 2024 · Sunday	
Grandball Room 2F (2 楼大宴会厅)	
Presider: Yongli Zhao , Beijing University of Posts and Telecommunications, China	
09:00-09:30	Opening Ceremony
	Welcome Speech
Presider: Gangxiang Shen , Soochow University, China	
09:30-10:15	Plasmonics – an Enabling Technology for 500 GHz and Beyond Juerg Leuthold ETH Zurich, Switzerland
10:15-10:30	Coffee Break
Presider: Ming Tang , Huazhong University of Science and Technology, China	
10:30-11:15	Advanced applications of optical microcombs David Moss Swinburne University of Technology, Australia
11:15-12:00	Next generation optical networks for AI computing interconnects Xiongyan Tang China Unicom Research Institute, China
12:00-13:30	Lunch Break



Juerg Leuthold
ETH Zurich, Switzerland

Title: Plasmonics – an Enabling Technology for 500 GHz and Beyond

Abstract:

The emerging field of plasmonics promises the generation, processing, transmission, sensing and detection of signals at highest frequencies on a most compact footprint. Plasmonics relies on electromagnetic waves that oscillate at optical frequencies along the surface of a metal. These waves form the so-called surface plasmon polaritons (SPPs). SPPs may be confined to structures with subwavelength dimensions. The small dimensions in turn provide large nonlinearities and permit fast operation. Meanwhile the community has developed a wide variety of plasmonic devices that take advantage of these characteristics and that are tailored for applications in sensing or communications.

In this plenary talk, we are going to review the field of plasmonics and are giving an outlook into the developments that might be relevant for communications or the field of neuronal networking. More precisely, we are going to discuss plasmonic modulators and photodetectors with bandwidths in excess of 500 GHz or plasmonic antenna for next-generation 6G applications that may cover the sub-THz and even the THz window. We are then also going to talk about opportunities to build novel volatile and non-volatile memristive-plasmonic devices. Devices that may become the building blocks of future neuronal networks. Finally, we are going to touch upon a new CMOS compatible plasmonic photon source.

Biography

Juerg Leuthold is the head of the department of Information Science and Electrical Engineering (D-ITET) and he is the head of the Institute of Electromagnetic Fields (IEF) of ETH Zurich, Switzerland. His interests are in the field of Photonics, Plasmonics and Microwave with an emphasis on applications in communications and sensing. Before his time at ETH he was affiliated with the Karlsruhe Institute of Technology (KIT) in Germany, where he was the Head of the Institute of Photonics and Quantum Electronics (IPQ) and the Helmholtz Institute of Microtechnology (IMT) in the time from 2004 until 2013. From 1999 to 2004, he was affiliated with Bell Labs, Lucent Technologies, Holmdel, NJ, USA, where he performed device and system research with III/V semiconductors and silicon photonics for applications in high-speed telecommunications. Juerg Leuthold received the Ph.D. degree in physics from ETH Zurich in Switzerland for work in the field of integrated optics and all-optical communications in 1998.

Juerg Leuthold is a fellow of the Optica, a fellow of the IEEE, a member of the Swiss Academy of Engineering Sciences (SATW), and a member of the Heidelberg Academy of Sciences. He served the community as member of the Helmholtz Association Think Tank, as a member of the board of directors of the OSA (now Optica), as a general chair, program chair and member of many committees.

**David Moss**

Swinburne University of Technology, Australia

Title: Advanced applications of optical microcombs**Abstract:**

Optical microcombs represent a new paradigm for generating laser frequency combs based on compact chip-scale devices, which have underpinned many modern technological advances for both fundamental science and industrial applications. Along with the surge in activity related to optical micro-combs in the past decade, their applications have also experienced rapid progress – not only in traditional fields such as frequency synthesis, signal processing, and optical communications, but also in new interdisciplinary fields spanning the frontiers of light detection and ranging (LiDAR), astronomical detection, neuromorphic computing, and quantum optics. This talk introduces the applications of optical microcombs. First, an overview of the devices and methods for generating optical microcombs is provided, which are categorized into material platforms, device architectures, soliton classes, and driving mechanisms. Second, the broad applications of optical microcombs are systematically reviewed, which are categorized into microwave photonics, optical communications, precision measurements, neuromorphic computing, and quantum optics. Finally, the current challenges and future perspectives are discussed.

Biography

David J. Moss received the B.Sc. degree in physics from the University of Waterloo, Waterloo, ON, Canada, and the M.Sc. and Ph.D. degrees in nonlinear optics from the University of Toronto, Toronto, ON, Canada, in 1983 and 1988, respectively. He is the Director of the Optical Sciences Centre, Swinburne University of Technology, Melbourne, VIC, Australia, leading research programs in integrated nonlinear nanophotonics, microwave photonics, telecommunications, quantum optics, biophotonics, renewable energy, and other areas. Prof. Moss has over 900 publications including numerous articles in Nature family journals and conference papers with over 50000 citations and an h-index of 134. He is leading extensive international research networks in nanophotonics and other areas. Prof. Moss was the recipient of the 2011 Australian Museum Eureka Science Prize and the Google Australia Award for innovation in computer science. He is a Fellow of the IEEE Photonics Society, Optica, SPIE, and the Australian Academy of Technological Sciences & Engineering (ATSE).

**Xiongyan Tang**

China Unicom Research Institute, China

Title: Next generation optical networks for AI computing interconnects**Abstract:**

Computing power network has become the key information infrastructure in the intelligent era. This presentation will focus on all optical network technologies for AI computing power network. Firstly, the background of the national "East Data, West Computing" project will be introduced, and the challenges and requirements of AI-driven computing infrastructure on optical networks will be discussed. Then this presentation will analyze the current status and future development trends of key optical network technologies, including C+L-band 400G/800Gbps transmission systems and lossless transmission for large capacity data center interconnects, G.654.E fibre for long-haul and metro transmission, digital twin for autonomous network, optical/electronic hybrid switching for data center networking, and hollow core fibers for lower latency transmission. Finally, this presentation will give China Unicom's practice of building all-optical network for AI computing interconnects.

Biography

Xiongyan Tang received the Ph.D. degree in telecom engineering from the Beijing University of Posts and Telecommunications, Beijing, China, in 1994. From 1994 to 1997, he conducted research of high-speed optical communications in Singapore and Germany. Since 1998, he has been working on technology management in telecom operators in China. He is currently an adjunct-professor with the Beijing University of Posts and Telecommunications. He has authored or co-authored more than 150 technical papers. His research interests include broadband communications, optical transmission, IP networks, SDN/NFV, telecom Big Data, new generation networks, and the Internet of Things. He is also the Chief Scientist with China Unicom Research Institute, the Vice Dean of China Unicom Research Institute, the state candidate of the Millions of Talents Project in the New Century, and a Member of the Telecom Technology Committee of the Ministry of Industry and Information Technology.

November 4, 2024 · Monday	
Grandball Room 2F (2 楼大宴会厅)	
Presider: Massimo Tornatore, Politecnico di Milano, Italy	
08:30-09:15	What is Life? Towards Imaging the Molecular Machinery of the Cell R.J.Dwayne Miller University of Toronto, Canada
09:15-10:00	Architecture Evolution, Building Green All-Optical Networks in the Intelligent Era Xiaojun Tang Huawei Technologies Co., Ltd., China
10:00-10:30	Coffee Break
Presider: Hui Yang, Beijing University of Posts and Telecommunications, China	
10:30-11:15	Hollow core fibres: innovation at a faster speed Francesco Poletti University of Southampton, United Kingdom
11:15-12:00	Laser Communications: Empowering the Next-Generation High-Speed Satellite Internet Peng Wang Galaxy Space (Beijing) Technology Co., Ltd., China
12:00-13:30	Lunch Break



R. J. Dwayne Miller
University of Toronto, Canada

Title: What is Life? Towards Imaging the Molecular Machinery of the Cell

Abstract:

The posed quintessential question is not cast as an origins of life issue here but rather directed towards understanding the underlying physics by which chemistry breathes life into otherwise inanimate matter. The real issue is how chemistry scales in complexity up to the level of biological systems. For even relatively small molecules (e.g., 10 to 100 atoms), there are an enormous number of possible nuclear configurations that could propagate the system from one molecular form to another during a chemical event. Chemistry is inherently a high dimensional problem of order $3N$ (N = number of atoms) and highly nonlinear in sampling rates for different reaction trajectories. To explain the observed time scales for chemistry and biological processes, there must be an enormous reduction in dimensionality at the barrier crossing region, controlling the kinetics, in which a few key modes direct the chemistry – irrespective of complexity. The challenge is to try to unearth these motions and to understand a priori which motions are directing the chemistry and thereby biological functions. With the recent advent of ultrabright electron sources using femtosecond laser photoinjection, it is now possible to directly observe the atomic motions involved to complete the picture. Based on model systems, a simple concept is introduced to understand the spatially correlated forces leading to generalized reaction mechanisms, which makes chemistry a transferrable concept. Several atomically resolved molecular movies will be presented to dramatically show this effect and the concept of key reaction modes. The problem is much more challenging within cells where the number of possible interactions becomes truly astronomical, as will be discussed. The lessons learned above give hope to find similar dynamically coupled spatial correlations, but these will be related to free energy gradients that arise within intracellular architecture. New technologies, based on the space charge limits mastered in ultrabright electron source development, will dramatically improve ion collection for laser based spatial imaging mass spectrometry that will enable us to look inside the cell to directly observe the driving forces for living systems, i.e., to quantify life. This prospect promises to fill in the gaps between genetic information and protein expression, from the blue print to the actual execution of the code. The light matter interactions being exploited and technological requirements under development to achieve this Moon Shot for Biology will be discussed as part of proposal for a strategic initiative to map the cell.

Biography

R. J. Dwayne Miller has published over 300 papers, notably contributions leading to the development of ultrabright electron sources to light up atomic motions. His group were the first to achieve the long-held goal to watch atomic motions during the defining moments of chemistry and have attained the fundamental space-time limit to imaging chemistry. His research accomplishments have been recognized with numerous awards including the National Science Foundation Presidential Young Investigator Award (USA), Sloan Fellowship, Guggenheim Fellow, Dreyfus Award, Polanyi Award, Royal Society of Canada (RSC) Ruther-

ford Medal, Chemical Institute of Canada (CIC) Medal, American Chemical Society (ACS) E. Bright Wilson Award, and most recently the European Physical Society (EPS) Award in Laser Science for "Achieving the Fundamental Limit to Min. Invasive Surgery with Complete Biodiagnostics". The enabling physics came from the first atomic movies on strongly driven phase transitions to determine the parameters for completely uniform forces for material removal without shock wave formation. These latter concepts are now going to clinical trials with the promise of enabling scar free surgery with broad medical applications. He is also a strong advocate for science promotion earning the RSC McNeil Medal (2011) and the Helen M. Free Award of the ACS for founding Science Rendezvous, now in its 18th year, aimed to make science accessible to the general public, including remote northern communities, with over 200,000 attendees (>6000 volunteers) annually. He is a Fellow of the CIC, OSA, RSC, RSC (Chemistry, UK) and was inducted as a Fellow of the Royal Society in 2023.

**Francesco Poletti**

University of Southampton, United Kingdom

Title: Hollow core fibres: innovation at a faster speed**Abstract:**

For decades, hollow core fibres have been a fascinating tool for scientists, enabling long distance light guidance in any gas and innovative experiments exploiting the long light:gas interaction length. For a long time, their optical performance failed to reach the requirements of optical communications. Recently though, thanks to nested antiresonant designs, the loss, modal purity and spectral bandwidth of these fibres has reached parity with, and in many instances improved the performance of, conventional glass-guiding telecoms fibres. Global interest in the technology is on the rise and, while there are still substantial challenges to be solved before it can achieve widespread commercialization, it is hard to believe that it will not find some application in optical communication networks of the future. In this talk we will review state-of-the-art, opportunities and challenges of the hollow core fibre technology.

Biography

Francesco Poletti received a Laurea degree in electronics engineering from the University of Parma, Italy in 2000. From 2000 to 2003 he worked as a design engineer in the WDM optical networks division of Marconi Communications. In 2004 he joined the Optoelectronics Research Centre for a postdoctoral study on the modelling of microstructured optical fibres for applications in nonlinear optics, optical sensing and telecommunications. He obtained a Ph.D. in Optoelectronics in 2007 from the ORC, where he is currently a Senior Research Fellow.

In 2009 he was awarded a Royal Society University Fellowship to support his research on the design of gas, liquid and semiconductor filled microstructured fibres and their use in biomedical, industrial, sensing and telecoms applications.

His research focuses on the study and application of multimaterial micro and nano-structured optical waveguides. His interests include the study of optical resonances, inverse electromagnetic problems, nonlinear optics and the numerical modelling of photonic bandgap structures.

**Xiaojun Tang**

Huawei Technologies Co., Ltd., China

Title: Architecture Evolution, Building Green All-Optical Networks in the Intelligent Era**Abstract:**

The unprecedentedly rapid development of AI large models in the past two years has created a huge demand for computing power and AI clusters. On the user side, AI is becoming widely used. Intelligent mobile terminals, like AI phones and AI PC, are becoming available. Intelligent home applications, such as entertainment, lighting, security, and cleaning also step into people's daily life. At the same time, AI applications in various industries are gradually commercialized, such as AI-based news and advertisement push. To meet the requirements of these intelligent applications, the architecture evolution trend, of all-optical networks is critical. DC-centric optical networks will evolve towards low power, high bandwidth, low latency, high reliability and flexibility. Home, office, and manufacturing are also calling for high-quality optical networks. People's requirements for networks will evolve from bandwidth-driven to experience-driven. These evolutions will create a new green all-optical network to meet the diverse and high-quality requirements of the intelligent era.

Biography

Dr. Tang, Ph.D. in Physical Electronics and Optoelectronics, is the Chief Technology Planner and Director of Huawei Optical Technology Planning Dept. Since joining Huawei in 1998, Dr. Tang served as an R&D director, the PDT manager, the PDU director, and a product line representative outside China. He has been responsible for optical communications R&D and technology research for many years. Now, he is leading the planning, development, and project implementation of cutting-edge technologies in the optical domain, and promoting the long-term technological evolution and development of the optical industry.

**Peng Wang**

Galaxy Space (Beijing) Technology Co., Ltd., China

Title: Laser Communications: Empowering the Next-Generation High-Speed Satellite Internet**Abstract:**

Driven by the global demand for connectivity and advancements in technology, the next generation of satellite internet is evolving towards low Earth orbit (LEO) deployments, massive scale, low latency, high bandwidth, and reduced cost. Inter-satellite laser communication (ISL), with its inherent advantages of high bandwidth, low power consumption, and enhanced security, has emerged as a key enabling technology for realizing this vision. This presentation delves into the application requirements and current development status of ISL within the satellite internet ecosystem. It focuses on key enabling technologies and analyzes the challenges facing ISL, such as inter-satellite link stability and system integration complexity. Finally, the presentation offers perspectives on the future evolution of ISL technology, contributing to the development of a globally connected, high-speed communication network.

Biography

Peng Wang is head of Communication Networks Department of GalaxySpace. He is engaged in satellite Internet related R&D in the company.

Peng Wang has over 20 years' experience of developing and deploying communication systems, including GSM, LTE, 5G and LEO satellite communication network. Prior to joining GalaxySpace, he led R&D teams in Nokia and Motorola for 4G/5G base station and OMC products development. At Huawei, he was responsible for GSM products technical support.

Technical Session

3 November P.M. Sunday												
	Track 1 Regency Ball- room A	Track 2 The Residence 9	Track 2 (Parallel I) The Residence 10	Track 2 (Parallel II) The Residence 11	Track 3 The Residence 12	Track 4 Regency Ball- room C	Track 4 (Parallel) The Residence 8	Track 5 Regency Ball- room B	Track 6 The Residence 1	Track 7 The Residence 2	Track 8 The Residence 6	Best Student Paper Award The Residence 7
13:30-15:30	Fiber mode modulation President: Xin Guo, Zhejiang University, China	Optical Transmission Sub-systems, Systems and Technologies I President: Jinlong Wei, Pengcheng Laboratory, China	Optical Transmission Sub-systems, Systems and Technologies VIII President: Xiaodan Pang, Kungliga Tekni- ska högskolan (KTH), Sweden	Optical Transmission Sub-systems, Systems and Technologies XV President: Xinwei Du, BNU-HKBU United Interna- tional College, China	Keynote talks(I) President: Hui Yang, Beijing University of Posts and Telecommuni- cations, China	Silicon photon- ics (I) President: Anjin Liu, Institute of Semiconduc- tors, Chinese Academy of Sciences, China	Micro/nano photonics and on-chip signal processing President: Zhao Wang, Institute of Physics, Chi- nese Academy of Sciences, China	Advanced Photonic Systems and Applications President: Xiaoxiao Xue, Tsinghua Uni- versity, China	Photodetector and Devices President: Guo- hua Xie, Xiamen Unviersty	Optical Sensors and Biopho- tonics I President: Li Shen, Huazhong University of Science and Technology, China	Integrated photonics and devices President: Cheng Wang, City University of Hong Kong, Hong Kong, China	Best Student Paper Award Competition Session I President: Lena Wosinska, Chalmers University of Technology, Sweden
15:30-16:00	Coffee Break											
16:00-18:30	Integrated transmission and sensing President: Wen- jun Liu, Beijing University of Posts and Telecommuni- cations, China	Optical Transmission Sub-systems, Systems and Technologies II President: Zekun Niu, Shanghai Jiao Tong Uni- versity, China	Optical Transmission Sub-systems, Systems and Technologies IX President: Qishuo Sun, British Telecom (BT Group plc), United King- dom	Optical Transmission Sub-systems, Systems and Technologies XVI President: Bin Zhang, Sun Yat-sen Uni- versity, China	Keynote talks(2) President: Xuwei Xue, Beijing University of Posts and Telecommuni- cations, China	Active photonic integration and Lasers (1) President: Yisu Yang, Beijing University of Posts and Telecommuni- cations, China	Optoelectronic Integration and Co-deisgn President: Nan Qi, Institute of Semiconduc- tors, Chinese Academy of Sciences, China	Microwave photonic signal processing President: Jianji Dong, Huazhong University of Science and Technology, China	Organic Photo- electronic President: Zhiting Ye, Chung Cheng University	Optical Sensors and Biopho- tonics II President: Fei Xu, Nanjing Uni- versity, China	Lithium Nio- bate- On-Insu- lator Devices President: Daquan Yang, Beijing Univer- sity of Posts and Telecom- munications, China	Best Student Paper Award Competition Session II President: Lena Wosinska, Chalmers University of Technology, Sweden
17:30-20:00	Welcome Reception · Market Café & Cangyue, 1F											

4 November P.M. Monday											
	Track 1 Regency Ball- room A	Track 2 The Residence 9	Track 2 (Parallel I) The Residence 10	Track 2 (Parallel II) The Residence 11	Track 3 The Residence 12	Track 4 Regency Ball- room C	Track 5 Regency Ball- room B	Track 6 The Residence 1	Track 7 The Residence 2	Track 8 The Residence 6	Best Paper Award The Residence 7
13:30-15:30	Fiber lasers President: Changrui Liao, Shenzhen Uni- versity, China	Optical Transmission Sub-systems, Systems and Technologies III President: Yanni Ou, Beijing Uni- versity of Posts and Telecom- munications, China	Optical Transmission Sub-systems, Systems and Technologies X President: Di Che, Nokia Bell Labs, United States	Optical Transmission Sub-systems, Systems and Technologies XVII President: Jim Zou, Adrant, Germany	Satellite Optical Network President: Nan Hua, Tsinghua University, China	Silicon photon- ics (2) President: Wen- jing Tian, Eindhoven University of Technology, Netherlands	Terahertz tech- nologies and applications President: Yuan Yu, Huazhong University of Science and Technology, China	Perovskite President: Huan Liu, Beihang University	Optical Sensors and Biopho- tonics III President: Zhiguo Zhang, Beijing Univer- sity of Posts and Telecom- munications, China	Quantum Pho- tonics I President: Yang Li, Tsinghua University, China	Best Paper Award Compe- tition Session I President: Hui Yang, Beijing University of Posts and Telecommuni- cations, China
	15:30-18:00	Coffee Break Poster Session 2F Postdead Paper Session I · The Residence 1, 2F 15:45-18:15 Postdead Paper Session II · The Residence 2, 2F 16:00-18:00									
18:30-20:00	Banquet & Awards Ceremony · Regency Ballroom, 2F										Best Paper Award Compe- tition Session II President: Hui Yang, Beijing University of Posts and Telecommuni- cations, China

5 November A.M. Tuesday												
	Track 1 Regency Ball- room A	Track 2 The Residence 9	Track 2 (Parallel) The Residence 10	Track 3 The Residence 12	Track 3 (Parallel) The Residence 11	Track 4 Regency Ball- room C	Track 4 (Parallel) The Residence 8	Track 5 Regency Ball- room B	Track 6 The Residence 1	Track 7 The Residence 2	Track 7 (Parallel) The Residence 8	Track 8 The Residence 6
08:30-10:00	Fiber sensors & band expansion I President: Tuan Guo, Jinan Uni- versity, China	Optical Transmission Sub-systems, Systems and Technologies VI President: Biwei Pan, Ghent University, Belgium	Optical Transmission Sub-systems, Systems and Technologies XI President: Chen Zhu, Baidu Online Network Technology (Beijing) Co., Ltd, China	Machine Learn- ing for Optical Networks President: Yan Shi, China Unicom, China	Intelligent Ac- cess Network President: Shan Yin, Beijing Uni- versity of Posts and Telecom- munications, China	Photodetec- tors and non- linear optical devices President: Xuetao Gan, Northwestern Polytechnical University, China	Nanophotonic devices and system inte- gration President: Weiwei Zhang, Songshan Lake Materials Labo- ratory, China	Photonic inte- grated circuits & devices (I) President: Jiejun Zhang, Jinan University, China	O(Q)LED President: Dawei Di, Zhejiang University	Optical Sensors and Biopho- tonics IV President: Yaxi Yan, The Hong Kong Poly- technic Uni- versity, Hong Kong, China	Optical Sensors / and Biopho- tonics V	Micro-nano optics I President: Zhen Shen, Univer- sity of Science and Technol- ogy of China, China
	Coffee Break											
10:00-10:30	Fiber sensors & band expansion II President: Fufei Pang, Shang- hai University, China	Optical Transmission Sub-systems, Systems and Technologies V President: Zhongwei Tan, Beijing Institute of Technology, China	Optical Transmission Sub-systems, Systems and Technologies XII President: Wei Wang, Beijing University of Posts and Telecommuni- cations, China	Digital Twin Optical Net- work President: Xiaoliang Chen, University of Science and Technology of China, China	Metro Optical Networks President: Jun Li, Soochow Uni- versity, China	Active photonic integration and Lasers (2) President: Changzheng Sun, Tsinghua University, China	Modulators and high-speed PIC applications President: Lei Zhang, Beijing University of Posts and Tele- communica- tions, China	Photonic inte- grated circuits & devices (II) President: Weifeng Zhang, Beijing Institute of Technology, China	Devices and OLED President: Chunfeng Zhang, Nanjing University	Optical Sensors and Biopho- tonics V President: Daquan Yang, Beijing Univer- sity of Posts and Telecom- munications, China	Optical Sensors / and Biopho- tonics V	Micro-nano optics II President: Zhen Shen, Univer- sity of Science and Technol- ogy of China, China
10:30-12:00												
12:00-13:30	Lunch Break											

5 November P.M. Tuesday												
	Track 1 Regency Ball-room A	Track 2 The Residence 9	Track 2 (Parallel) The Residence 10	Track 3 The Residence 12	Track 3 (Parallel) The Residence 11	Track 4 Regency Ball-room C	Track 4 (Parallel) The Residence 8	Track 5 Regency Ball-room B	Track 6 The Residence 1	Track 7 The Residence 2	Track 7 (Parallel) The Residence 8	Track 8 The Residence 6
13:30-15:30	Fiber fabrication & measurement President: Xiaobei Zhang, Shanghai University, China	Optical Transmission Sub-systems, Systems and Technologies VI President: Chen Zhu, Baidu Online Network Technology (Beijing) Co., Ltd, China	Optical Transmission Sub-systems, Systems and Technologies XIII President: Yanni Ou, Beijing University of Posts and Telecommunications, China	AI for Optical Networks President: Xin Qin, China Telecom, China	QKD optical networks President: Xiaosong Yu, Beijing University of Posts and Telecommunications, China	Advanced optoelectronic integration materials and technologies(I) President: Lei Wang, Peng Cheng Laboratory, China	/	Microwave Photonics and Radar Systems President: Jia Ye, Southwest Jiaotong University, China	Excited State Processes President: Haizheng Zhong, Beijing Institute of Technology	Optical Sensors and Biophotonics VI President: Zhaoyong Wang, Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, China	Optical Sensors and Biophotonics VIII President: Wentao Zhang, Institute of Semiconductors Chinese Academy of Sciences, China	Quantum Photonics II President: Lingling Huang, Beijing Institute of Technology, China
15:30-16:00	Coffee Break											
/	/	Optical Transmission Sub-systems, Systems and Technologies VII President: Tianwai Bo, Beijing Institute of Technology, China, China	Optical Transmission Sub-systems, Systems and Technologies XIV President: Dawei Ge, China Mobile Research Institute, China	Intelligent optical network's operation, maintenance and applications President: Zhizhen Zhong, Massachusetts Institute of Technology, United States	Technologies for optical networks President: Wenzhe Li, Institute of Computing Technology, Chinese Academy of Sciences, China	Advanced optoelectronic integration materials and technologies(2) President: Zonghai Hu, Beijing University of Posts and Telecommunications, China	/	Optical Communications and sensings President: Zhiyao Zhang, University of Electronic Science and Technology of China, China	/	Optical Sensors and Biophotonics VII President: Wenjuan Wang, Shanghai Institute of Technical Physics of the Chinese Academy of Sciences, China	Optical Sensors and Biophotonics IX President: Mingjiang Zhang, Taiyuan University of Technology, China	Nonlinear optics President: Zhihui Yan, Shanxi University, China
16:00-17:30												

Track 1: Optical Fibers, Fiber-based Devices

Regency Ballroom A, 2F (宴会 A 厅, 2 楼)

13:30-15:30 · November 3, 2024 · Sunday

Fiber mode modulation

Presider: Xin Guo, Zhejiang University, China

13:30-14:00 · ACPIPOC-1016-21 **Invited**

Low-loss all-fiber mode conversion and multiplexing devices based on mode selective couplers

Yange Liu

Nankai University, China

Trapped in the stringent adiabatic transmission condition of high-order modes, low-loss fused biconical taper mode selective coupler (FBT-MSC) has long been challenging to achieve. We identify the adiabatic predicament of high-order modes to stem from the rapid variation of the eigenmode field diameter, which is caused by the large core-cladding diameter difference of few-mode fiber (FMF). We proposed a optimized FMF to effectively solve the adiabatic dilemma. Moreover, an accurate and fast full-vector theoretical analysis model of MSCs based on mode component analysis is proposed, enabling precise design of high-order MSCs and cascaded MSC multiplexers. Through precise control of the fabrication process, high-performance mode-selective couplers targeting LP01, LP11, LP21, LP02, and LP12 mode groups are successfully fabricated in the 1550 nm band with insertion losses of all below 0.2 dB, ultra-low-loss mode-selective couplers targeting LP31 and LP41 modes are successfully fabricated in the 1310 nm band with insertion losses of 0.28 dB and 0.41 dB respectively. Based on cascaded MSCs, high performance all-fiber mode-division multiplexers for three, four, and five mode groups with a insertion loss of less than 0.72 dB and inter-mode crosstalk better than -17 dB are developed.

14:00-14:30 · ACPIPOC-0729-45 **Invited**

Optical fiber tip function integration with ultrafast laser manufacturing

Changrui Liao

Shenzhen University, China

An optical fiber sensor is a highly effective measurement method. With the advantages of long-distance transmission, optical fiber technology has made significant breakthroughs in sensing and imaging applications. The highly concentrated optical field of the fiber tip enables efficient interaction between light and matter, offering the potential for high-performance sensing and imaging functions. However, a key technical challenge lies in constructing micro/nano structures with sensing and imaging capabilities on the 100-micron diameter fiber tip. This report will introduce our research progress in ultrafast laser manufacturing of micro/nano functional structures on fiber tips. (1) The MEMS nanomechanical sensors have been manufactured on fiber tips and applied to single-cell mechanical analysis and antimicrobial susceptibility testing. (2) The endoscopy imaging lenses have been manufactured on fiber tips and applied to cardiovascular endoscopic tomography.

14:30-15:00 · ACPIPOC-0807-2 **Invited**

Investigation of mode excitation from SMF to MMF or FMF

Chongqing Wu

Beijing Jiaotong University, China

Higher-order modes can be excited in a few or multi-mode fiber from SMF by making axial offset, angular deflection and mode-spot mismatch. The analytic expressions and simulation results of amplitude and phase of the excitation factor are given.

15:00-15:30 · ACPIPOC-1016-27 **Invited**

TBD

Shanhui Xu

South China University of Technology, China

TBD

15:30-16:00 Coffee Break

16:00–18:00 · November 3, 2024 · Sunday

Integrated transmission and sensing

Presider: Wenjun Liu, Beijing University of Posts and Telecommunications, China

16:00–16:30 · ACPIPOC-0801-145 **Invited****Parallel fabrication of silicamicro/nanofiber****Xin Guo***Zhejiang University, China*

We demonstrate a parallel-fabrication technique for simultaneously drawing multiple (up to 20) micro/nanofibers. These micro/nano-fibers, with diameters down to ~500 nm, exhibit over 96.7% optical transmittance at 1550-nm wavelength and less than 5% diameter deviation.

16:30–17:00 · ACPIPOC-1016-29 **Invited****TBD****Yanyan Zhang***Northwestern Polytechnical University, China***TBD**17:00–17:30 · ACPIPOC-0723-20 **Invited****Physical-Layer Security Enhancement in Optical Networks Leveraging Digital Chaotic Encryption****Zhouyi Hu¹**, Li Pei¹, Peiji Song², Chun-Kit Chan³*1. Beijing Jiaotong University, China; 2. University of Cambridge, United Kingdom; 3. The Chinese University of Hong Kong, Hong Kong, China*

Some optical networks, e.g., passive optical networks, must broadcast signals to end users, making them vulnerable to eavesdropping. In this invited paper, we review our recent progress in physical-layer security enhancement leveraging digital chaotic encryption.

17:30–17:45 · ACPIPOC-0723-18

Characterization of Angular Misalignment induced Splicing Loss Variations for Antiresonant Hollow-Core Fiber**Cong Zhang¹**, Junjie Zeng¹, Yue Wang¹, Peng Li², Lei Zhang², Jie Luo², Meng Xiang¹, Di Lin¹, Songnian Fu^{1*}, Yuwen Qin¹*1. Guangdong University of Technology, China; 2. Yangtze Optical Fiber and Cable Joint Stock Limited Company, China*

We characterized that for antiresonant hollow-core fiber, splicing loss induced by angular misalignment varies from 0.05–0.20 dB, while the LP₁₁ mode suppression deteriorated from –31.6 dB to –19.1 dB under the maximum angular misalignment

17:45–18:00 · ACPIPOC-0814-53

Narrow-bandwidth mode-locking of an all-PM fiber laser with large tunability**Maolin Dai**, Bowen Liu, Yifan Ma, Naoki Yamaguchi, Sze Yun Set, Shinji Yamashita*The University of Tokyo, Japan*

We demonstrate an all-PM mode-locked fiber laser with giant tunability in both center wavelength and pulse duration. The narrowest bandwidth reaches 1.49 GHz, with characteristics of dissipative soliton under strong filtering.

13:30–16:30 · November 4, 2024 · Monday
Fiber lasers
 Presider: Changrui Liao, Shenzhen University, China

13:30–14:00 · ACPIPOC-0713-3 **Invited**

Optical fiber microresonators for high-repetition-rate laser

Fei Xu, Zixuan Ding

Nanjing University, China

As a fundamental opto-electronic component, optical resonators have got comprehensively researched and widely applied in the fields of optical communication, sensing, signal processing, and laser. Here we will talk about the high-Q microfiber resonators developed by our group, and the applications for high-repetition-rate laser

14:00–14:30 · ACPIPOC-0731-81 **Invited**

Fiber-based tunable excitation source and probe for coherent anti-Stokes Raman scattering microspectroscopy

Junfeng Jiang

Tianjin University, China

A polarization-maintaining photonic crystal fiber through polarization vector adjustment is used to realize two wavelengths simultaneously tuning. Fiber probe based on few-mode fiber taper and hollow-core anti-resonant fiber are adopted for coherent anti-Stokes Raman scattering signal generating.

14:30–15:00 · ACPIPOC-1015-5 **Invited**

1128W Continuous-Wave single-Mode Green laser output by frequency doubling of a linear-polarization, narrow-linewidth 1μm fiber laser

Guoxi Huang^{1,2}, Wenjia Li^{1,2}, Fan Zhang¹, Li Pei², Tigang Ning²

1. Shenzhen Gongda Laser Co., Ltd, China; 2. Beijing Jiaotong University, China

Based on phase-modulated single-frequency seed technology, we have achieved 1925W high-power near-infrared single-mode laser output from a polarization-maintaining narrow-linewidth Yb-doped fiber laser. Furthermore, by employing a single-pass frequency-doubling method, we have obtained 1128W of continuous single-mode green light output, with a frequency-doubling efficiency of 58.6% and an output beam quality factor M^2 of 1.05. This represents the highest frequency-doubling efficiency reported to date for high-power single-mode continuous-wave green light output achieved through a single-pass frequency-doubling scheme.

15:00–15:30 · ACPIPOC-0724-8 **Invited**

Three-dimensional microstructural characterization of optical fibers

Jianshuai Wang, Li Pei

Beijing Jiaotong University, China

In multidimensional fiber communications, slight fiber changes can seriously affect the transmission quality. We propose a 3D microstructure characterization technique to visualize mode activation and evolution during fiber splicing by reconstructing the 3D RI distribution.

15:30–15:45 · ACPIPOC-0727-12

Experiment study of the fiber laser operating near 980nm with large core-to-cladding ratio Yb-doped fiber

Maoni Chen, Shangde Zhou, Qi Zhang, Aimin Liu, Jianqiu Cao, Zhihe Huang, Zefeng Wang, Jinbao Chen

National University of Defense Technology, China

A 180-watt-level fiber laser operating near 980nm is reported with a large core-to-cladding ratio Yb-doped fiber. Based on 22.3 W seed light and 60/125μm Yb-doped fiber, 186-W output power is obtained with 60.16% slope efficiency.

15:45–16:00 · ACPIPOC-0730-35

Backward Rayleigh-Brillouin Scattering in an SF₆-Flowing Antiresonant Hollow-Core Fiber

Hao Liang, Yizhi Sun, Haitong Tan, Yifan Xiong, Helin Wu, Ran Wang, Shoufei Gao, Linghao Cheng, Yingying Wang, Bai-Ou Guan, Wei Ding

Jinan University, China

We report distributed measurement of backward Rayleigh-Brillouin scattering spectra in a 2.3-km SF₆-flowing antiresonant hollow-core fiber using BOTDR method. The gas species and pressure are clearly distinguished. The onset of stimulated Brillouin scattering is observed.

16:00–16:15 · ACPIPOC-0815-13

Low-Loss Interconnection Between SMF and NANF Using Coreless Fiber Ball-Lens**Tianqi Cheng**¹, Linbin Bai², Lin Ma¹, Zechen Li¹, Zuyuan He¹*1. Shanghai Jiao Tong University, China; 2. Shanghai Optoweave Technology Co., Ltd., China*

We propose a coreless fiber-melted ball-lens structure for low-loss interconnection between SMF and NANF. In experiment, we achieved an insertion loss of less than 0.24 dB per connection and a return loss about -43 dB.

16:15–16:30 · ACPIPOC-0801-42

High Peak-power Pulse Compression via an Anti-resonant Hollow-core Fiber**Shan Wang**^{1,2,3}, Xin Zhang⁴, Ziheng Zhuang^{1,2,3}, Weijia Luo^{1,2,3}, Di Lin^{1,2,3}, Jianping Li^{1,2,3}, Songnian Fu^{1,2,3}, Pu Wang⁴, Yuwen Qin^{1,2,3}*1. Institute of Advanced Photonics Technology, School of Information Engineering, Guangdong University of Technology, China;**2. Key Laboratory of Photonic Technology for Integrated Sensing and Communication, Ministry of Education of China, Guangdong**University of Technology, China; 3. Guangdong Provincial Key Laboratory of Information Photonics Technology, Guangdong University of Technology, China; 4. Institute of Laser Engineering, Beijing Engineering Research Center of Laser Applied Technology, Beijing**University of Technology, China*

We report the successful compression of high-energy, linearly chirped picosecond pulses through an optimally lengthened anti-resonant hollow-core fiber, achieving sub-40-fs de-chirped pulses with peak powers of 10 MW.

16:30–17:30 Coffee Break & Poster Session

08:30–09:30 · November 5, 2024 · Tuesday

Fiber sensors & band expansion I

Presider: Tuan Guo, Jinan University, China

08:30–09:00 · ACPIPOC-1016-22 **Invited****Metal-Silica Heterogeneous Integrated Optical Fibers for Sensing Applications****Fufei Pang***Shanghai University, China*

Heterogeneous integrated optical fiber is an emerging specialty optical fiber, achieving complex functionalities through the integration of different materials. This study has developed a metal nickel-silica integrated sensing optical fiber that leverages the magnetic and electrical properties of nickel to construct a novel fiber optic magnetic field sensor. Employing a rod-in-tube method, we successfully integrated a continuous and uniform micron-scale nickel core into a single-mode optical fiber, achieving good optical transmission performance with a relatively low loss of 2.28 dB/m. By the use of the magnetostriction effect and the Lorentz force respectively, this study demonstrates the potential of heterogeneous integrated optical fibers in high-performance magnetic field sensing and paves new ways for the multifunctionality and sensitivity enhancement of fiber-optic sensing technology.

09:00–09:30 · ACPIPOC-0731-169 **Invited****Hollow core fiber based sensors****Xiaobei Zhang***Shanghai University, China*

In this talk, we will present kinds of hollow core fiber sensors, based on cascaded structure and principles of FP, MZ, AR and MMI effects.

10:00–10:30 Coffee Break

10:30–12:00 · November 5, 2024 · Tuesday
Fiber sensors & band expansion II
 Presider: Fufei Pang, Shanghai University, China

10:30–11:00 · ACPIPOC-1016-24 **Invited**

Operando battery monitoring using lab-on-fiber optical sensing technologies

Tuan Guo

Jinan University, China

A crucial piece in renewable-energy power-management puzzle lies in the development of renewable energy storage devices such as lithium-ion batteries—poorly-understood degradation mechanisms that occur upon repeated cycling, and that increase the risk of catastrophic battery failure. To develop the next-generation of safe, high-capacity renewable-energy storage, it is therefore crucial to develop methods that monitor the battery's physical and chemical state-of-health and operation in real-time. Right now, battery assessing methods are typically offline and simulation based. This talk will review the recent developments of in situ fiber-optic analytical technique that will enable us to monitor the state of health of batteries continuously during operation and to minimize their degradation. This method fills a very important gap in current battery monitoring methods, will guide the design of new materials, and will optimize existing and new electro-chemistries.

11:00–11:30 · ACPIPOC-0816-7 **Invited**

Effect of bismuth active centers concentration on the characteristics of cladding-pumped fiber lasers near 1450 nm

Mikhail Melkumov¹, Alexander Vakhrushev¹, Alexander Khegal¹, Mikhail Yashkov², Konstantin Riumkin¹, Sergei Firstov¹

1. GPI RAS, Russia; 2. ICHPS RAS, Russia

We report results on cladding-pumped laser based on two low-Ge silica fibers with various bismuth concentration. The maximum efficiency and output power were 3.8% and ~0.38W, respectively. Lasing for 100 hours led to 10% of power degradation.

11:30–11:45 · ACPIPOC-0731-108

Design, fabrication and measurement of 19-core 10-LPmode fibers with low inter-core crosstalk and low DGD

Shuo Xu, Lei Shen, Li Zhang, Xianchao Gong, Jun Chu, Jia Wang, Weiguang Wang, Lei Zhang, Jie Luo

Yangtze Optical Fiber and Cable Joint Stock Limited Company, China

We report the design, fabrication and measurement of a low inter-core crosstalk and low DGD 19-core 10-LP-mode fibers adapted to weakly-coupled multi-core fiber and strongly-coupled mode-division-multiplexed systems that allows to multiply the capacity.

11:45–12:00 · ACPIPOC-0731-142

Weakly-Coupled 19-Core Ring-Core Fiber supporting 266 OAM Mode Channels: Structure and Performance Characterization

Yining Huang¹, Junyi Liu¹, Shuqi Mo¹, Yuming Huang¹, Haolin Zhou¹, Hualin Li¹, Lei Shen², Shuo Xu², Xianchao Gong², Jie Luo², Siyuan Yu¹, Jie Liu¹

1. Sun Yat-sen University, China; 2. Yangtze Optical Fibre and Cable Joint Stock Limited Company, China

A 23km 19-core ring-core fiber supporting 266 orbital angular momentum mode channels is designed, fabricated and experimentally characterized, demonstrating outstanding performance of attenuation and crosstalk among mode groups.

12:00–13:30 Lunch Break

13:30–16:00 · November 5, 2024 · Tuesday
Fiber fabrication & measurement
 Presider: Xiaobei Zhang, Shanghai University, China

13:30–14:00 · ACPIPOC-1016-26 **Invited**

TBD

Qi Li

Sichuan STR Laser Technology Co., Ltd, China

TBD

14:00-14:30 · ACPIPOC-1016-28 **Invited****TBD****Haitao Guo***Xi'an Institute of Optics and Precision Mechanics of CAS, China***TBD**14:30-14:45 · ACPIPOC-0814-27 **Industry Innovation Nomination****High Gain, Low Noise E+S Band Bi-doped Phosphosilicate Fiber with 90-nm Broad Bandwidth****Xin Huang**, Zhaolong Liao, Junjie Jie, Yuanpeng Ding, Chan Li, Haohua Wan, Lei Shen, Lei Zhang, Jie Luo*Yangtze Optical Fibre and Cable Joint Stock Limited Company, China*

An E+S band Bi-doped phosphosilicate fiber was prepared with high gain, low noise and wide broadband, demonstrating gain ≥ 20 dB and noise ≤ 6 dB in the range of 1390-1480 nm, and the S band(1460-1520nm) gain remains stable at ≥ 10 dB after shifting the center wavelength.

14:45-15:00 · ACPIPOC-0814-24

Improving the accuracy of 3D shape reconstruction with FBG spectral inversion method**Mingjing Zhou**, Na Chen, Yana Shang, Shupeng Liu, Yong Liu*Shanghai University, China*

We propose using spectral inversion method to reduce the error resulting from spectral distortion and insufficient sampling by obtaining multiple continuous non-uniform strain from the full spectrum in the fiber optic 3D shape reconstruction.

15:00-15:15 · ACPIPOC-0814-60

Ultra-dense high numerical aperture optical bundles**Rafal Kasztelan**^{1,2}, Dariusz Pysz¹, Ryszard Stepień¹, Ireneusz Kujawa¹, Rafal Czajkowski¹, Ryszard Buczyński^{1,2}*1.Institute of Microelectronics and Photonics, Poland; 2.University of Warsaw, Physics Department, Poland*

Imaging bundles with a high numerical aperture have been fabricated, tested, and used for two-photon imaging of the fluorescence signal of latex beads, ex vivo hippocampal neurons, and in vivo cortical neurons.

15:15-15:30 · ACPIPOC-0416-1

Fast and accurate extraction of ultra-high quality factor from cavity ring-down measurement**Heng Zhou¹, Yanping Yang¹, Shihan Liu², Huashun Wen³, Yong Geng⁴**

1.Key Laboratory of Optical Fiber Sensing and communication Networks, University of Electronic Science and Technology of China, China; 2.Sensing and communication Networks, University of Electronic Science and Technology of China, China; 3.State Key Laboratory on Integrated Optoelectronics, China; 4.Key Laboratory of Optical Fiber Sensing and communication Networks University of Electronic Science and Technology of China, China

In this letter, we clarify the basic property of cavity ring-down and present a specified algorithm that enables extraction of the overall quality factor, as well as the intrinsic loss and coupling state of UHQ cavities with superior fidelity and simplicity than prior schemes. First, we conduct detailed analysis on how to correctly extract the photon lifetime τ_p from the cavity ring-down. Then we revisit the ring down measurement and demonstrate a step-by-step recipe to derive the quality factor and actual coupling state of a fiber cavity. Finally, we set up an experiment to verify the validity and feasibility of the method. Our study provides useful technological tools to facilitate the design and implementation of UHQ fiber cavities for ultra-stable lasers, reference cavities, and ultranarrow optical filters.

15:30-15:45 · ACPIPOC-0716-1

Simplified Formula for Estimating Power Limitation of Transverse Modal Instability with Consideration of Radiation Effect**Jianqiu Cao**^{1,2,3}, Shangde Zhou^{1,2,3}, Pengfei Liu^{1,2,3}, Zhihe Huang^{1,2,3}, Zefeng Wang^{1,2,3}, Jinbao Chen^{1,2,3}

1.College of Advanced Interdisciplinary Studies, National University of Defense Technology, China; 2.Nanhu Laser Laboratory, National University of Defense Technology, China; 3.Hunan Provincial Key Laboratory of High Energy Laser Technology, National University of Defense Technology, China

Formula for estimating the limitation of transverse mode instability (TMI) on the power of Yb-doped fiber amplifiers is presented with the consideration of radiation effect. Then, the radiation effect on the TMI-limited power is discussed.

15:45-16:00 · ACPIPOC-0814-48

Tunable temporal separation of Loosely Bound Soliton Molecules in a 1.6 μm Mode-Locked Fiber Laser**Hong Jin¹, Chuangkai Li¹, Feng Ye¹, H.Y. Fu², Qian Li¹***1.Peking University, China; 2.Tsinghua University, China*

We have experimentally observed 1.6 μm soliton molecules in a mode-locked erbium-doped fiber laser based on nonlinear polarization evolution. By adjusting the pump power, stable loosely bound soliton molecules with different temporal separation are obtained.

Track 2: Optical Transmission Sub-systems, Systems and Technologies

The Residence 9, 2F (悦府 9, 2 楼)

13:30-15:30 · November 3, 2024 · Sunday

Optical Transmission Sub-systems, Systems and Technologies I

Presider: Jinlong Wei, Pengcheng Laboratory, China

13:30-14:15 · ACPIPOC-0722-22 **Tutorial**

Machine-Learning-Assisted Optical Network Failure Management

Francesco Musumeci

Politecnico di Milano, Italy

We overview ML applications for failure management in optical networks. Critical aspects, such as data scarcity and model explainability, are also discussed to highlight the potential and the risks of ML-based solutions in this domain.

14:15-14:45 · ACPIPOC-0729-48 **Invited**

Artificial Intelligence for Advanced Digital Signal Processing in Optical Fiber Transmission System.

Zekun Niu, Lilin Yi

Shanghai Jiao Tong University, China

We explore AI in optical fiber transmission system, introducing a learnable DSP method for high-performance linear compensation and a fiber nonlinear neural compensator to enhance nonlinear capacity, outlining AI application paradigms for fiber transmission systems.

14:45-15:00 · ACPIPOC-0731-110

Channel Power Control for Full C-band Generalized Signal-to-Noise Ratio Optimization Based on Deep Reinforcement Learning

Junzhe Xiao, Zekun Niu, Lyu Li, Minghui Shi, Weisheng Hu, Lilin Yi

Shanghai Jiao Tong university, China

A model-free method based on deep reinforcement learning is implemented to control channel power for GSNR optimization. Flat GSNR covering entire C-band is achieved across 1440 km transmission with uneven gain profile of EDFA.

15:00-15:15 · ACPIPOC-0731-111

Multi-Task Learning: Towards Low-Complexity Neural Network Nonlinearity Compensation in Coherent Optical Systems

Tonghui Ji¹, Qi Wu^{1,2}, Zhaopeng Xu¹, Honglin Ji¹, Yu Yang¹, Lulu Liu¹, Shangcheng Wang¹, Zhongliang Sun¹, Junpeng Liang¹, Linsheng Fan¹, Jianwei Tang¹, Jinlong Wei¹, Juhao Li^{1,3}, Weisheng Hu^{1,2}

1. Pengcheng Laboratory, China; 2. State Key Lab of Advanced Optical Communication System and Networks, Shanghai Jiao Tong University, China; 3. State Key Laboratory of Advanced Optical Communication Systems & Networks, Peking University, China

We propose multi-task learning based NN equalization for nonlinearity compensation in coherent optical system. Compared with conventional NN equalization, 30% complexity reduction is achieved in an 800-Gb/s PDM-16QAM system with 5 output symbols.

15:15-15:30 · ACPIPOC-0814-4

First verification of rogue ONU recognition in commercial GPON system based on machine learning

Xiatao Huang, Yifeng Xiong, Weiliang Zhang, Li He, Xingang Huang, Bo Liu

ZTE Corporation, China

We first demonstrate rogue ONU identification in commercial GPON system with waveform feature extraction. The experimental results show that the average identification accuracy can reach 90.69%/92.95%/96.57%/99.37% within 32 ONUs for Random Forest/KNN/CNN/ResNet, respectively.

15:30-16:00 Coffee Break

16:00–18:30 · November 3, 2024 · Sunday
Optical Transmission Sub-systems, Systems and Technologies II
 Presider: Zekun Niu, Shanghai Jiao Tong University, China

16:00–16:45 · ACPIPOC-1004-1 **Tutorial**

High Symbol Rate Optical–Amplification–Free Intensity Modulation Direct Detection Systems
Oskars Ozolins

Riga Technical University, Latvia

In this tutorial talk, recent advances in short-reach intensity modulation direct detection systems will be reviewed by focusing on indium phosphite silicon photonics and heterogeneous integration.

16:45–17:30 · ACPIPOC-1016-4 **Keynote**

Why we pursue higher symbol rates: Reflecting on the past decade
Di Che

Nokia Bell Labs, United States

We review the symbol rate improvement over the past years for optical transmissions, and discuss the evolving incentives of various high-symbol-rate generation techniques.

17:30–17:45 · ACPIPOC-0731-101

Low Complexity Joint Chromatic Dispersion and Time/Frequency Offset Estimation Based on Fractional Fourier Transform
Guozhi Xu, Zekun Niu, Lyu Li, Weisheng Hu, Lilin Yi

Shanghai Jiao Tong University, China

We propose and experimentally validate a joint estimation method for chromatic dispersion and time–frequency offset based on the fractional Fourier transform, which reduces computational complexity by more than 50% while keeping estimation accuracy.

17:45–18:00 · ACPIPOC-0731-25

An Optoelectronic Ising Machine with Low–Cost FPGA for 10,000–Spin High–Accuracy Calculations
Zhixian Zhou, Zhenhua Li, Zihao Chen, Jie Liu, Siyuan Yu

Sun Yat-sen University, China

An optoelectronic Ising machine is experimentally demonstrated using electro–optic modulators. Ten MAX–CUT tasks, mapped into Ising networks with up to 10,000 spins, are accomplished with high accuracy.

18:00–18:15 · ACPIPOC-0804-3

Performance Evaluation of Error Optimization Algorithms for Soft–Input LDPC Decoder with Adaptive Equalization
Liga Bai¹, Qun Zhang¹, Zhensheng Jia²

1.ZK Ascend Technologies, United States; 2.Cable Television Labs Inc., United States

This study evaluates adaptive equalization's impact on LDPC-based coherent-PONs, focusing on error-propagation mitigation strategies like state-tracking-and-demapping (StateTD) and error-decorrelation (ED) algorithms. Results show FFE-ED improves post-FEC BER by 0.5 dB at BER of 1E-5.

18:15–18:30 · ACPIPOC-0815-63

Experimental Verification of Non–Integer–Oversampling FD–MIMO Feedforward Equalization for Optical SDM Transmission System

Gao Ye^{1,2}, Shunfeng Wang¹, Christian Sanchez Costa³, Ting Lei⁴, Linsheng Fan¹, Zhongliang Sun¹, Junpeng Liang¹, Lingguo Cao¹, Hao Shi¹, Jianwei Tang¹, Jian Zhao^{2*}, Jinlong Wei¹, Weisheng Hu¹

1.Pengcheng Laboratory, China; 2.South China University of Technology, China; 3.Independent Researcher, United Kingdom; 4.Shenzhen University, China

The non-integer-oversampling frequency-domain MIMO feedforward equalization has been experimentally verified in a space-division-multiplexing transmission. A MIMO operation as low as 1.125 sample-per-symbol shows no performance degradation compared to 2-sps case, while reducing the complexity significantly.

17:30–20:00 Welcome Reception

13:30-16:15 · November 4, 2024 · Monday

Optical Transmission Sub-systems, Systems and Technologies III

Presider: Yanni Ou, Beijing University of Posts and Telecommunications, China

13:30-14:15 · ACPIPOC-0930-2 **Tutorial****Ultradense Communications with Optical Microcombs****Bill Corcoran***Monash University, Australia*

Optical microcombs have grown from supporting single terabit/s rates to over a petabit/s in a decade. We review this progress, focusing on the enabling experimental techniques required to achieve ultradense optical communications with microcombs.

14:15-14:45 · ACPIPOC-0801-89 **Invited****Towards the Quantum Internet: Challenges and Prospects of Efficient Entanglement Distribution over Telecom Fibers****Matheus Ribeiro Sena¹**, Ralf-Peter Braun², Ronny Döring¹, Michaela Ritter¹, Marc Geitz¹*1. Deutsche Telekom, Germany; 2. Orbit GmbH, Germany*

This paper discusses the current challenges for enabling efficient entanglement distribution over field-deployed optical fibers. Qubit transmission, storage, multiplexing and routing aspects are reviewed for realizing Quantum Internet capabilities over commercial fiber systems.

14:45-15:00 · ACPIPOC-0731-77

Highly Secure Self-homodyne Coherent System Empowered by Quantum Noise Stream Cipher**Haoze Du¹**, Chao Lei², Zong He², Rui Lin², Mingming Zhang¹, Chen Yang³, Zhiyong Zhao¹, MING TANG¹*1. Huazhong University of Science and Technology, China; 2. Chalmers University of Technology, Sweden; 3. Yangtze Optical Fibre and Cable Joint Stock Limited Company, China*

200Gb/s per spatial channel quantum noise stream cipher (QNSC) is experimentally demonstrated in 3km self-homodyne coherent (SHC) transmission system. A security level of $(32761)^{20}$ is obtained with 3dB penalty

15:00-15:15 · ACPIPOC-0726-15

Chaotic Digital Filter-based Physical Layer Security for Heterogeneous Access Networks**Jiaxiang He**, Wei Jin, Roger Giddings, Jianming Tang*Bangor University, United Kingdom*

A physical layer security technique employing chaotic digital filters is proposed and experimentally demonstrated for the first time, offering a low-complexity and cost-efficient security solution for heterogeneous access networks with ultra-high connection densities.

15:15-15:30 · ACPIPOC-0723-21

Low-Complexity Bimodal Optical Processor for High-Speed IM/DD Systems**George Brestas**, Giannis Kanakis, Maria Spyropoulou, Hercules Avramopoulos*ICCS, Greece*

We propose a PIC-compatible, Bimodal Optical Processor for future high-speed IM/DD systems. An advanced ML optimizer selects tasks between optical equalization and chromatic dispersion compensation and refines parameters achieving superior performance over classical DSP methods.

15:30-15:45 · ACPIPOC-0709-2

Parallel Micro-Ring Resonator based Reservoir Computing for Optical Equalization of 112 Gbaud PAM-4 Signals**Sebastian Kühn**, Mohammad Seifi Laleh, Stephan Pachnicke*Kiel University, Germany*

A real-time capable photonic reservoir based on parallel micro-ring resonators is presented for joint optical-electrical signal equalization in short-reach 112 Gbaud PAM-4 transmissions. This method reduces BER significantly compared to equally complex digital signal processing.

15:45-16:00 · ACPIPOC-0731-45

Multidimensional Voronoi Constellations vs. Short Blocklength Probabilistic Shaping: A Comparison for Multilevel Coding Approach**Yajie Sheng¹**, Bin Chen¹, Yi Lei¹, Jingxin Deng¹, Jiwei Xu¹, Mengfan Fu², Qunbi Zhuge², Shen Li³*1. Hefei University of Technology, China; 2. Shanghai Jiao Tong University, China; 3. Université Laval, Canada*

Performance of concatenated multilevel coding with probabilistic shaping (PS) and Voronoi constellations (VCs) is analysed over AWGN channel. Numerical results show that VCs provide up to 1.3dB SNR gains over PS-QAM with CCDD blocklength of 200.

16:00–16:15 · ACPIPOC–0801–50

Precoder Design for OFDM with Matrix Manifold Optimization**Yuan Liu***Chinese University of Hong Kong, Hong Kong, China*

We propose a matrix manifold optimization algorithm to optimize the precoder of an orthogonal frequency division multiplexing (OFDM) system. Our numerical results show that the system's achievable information rate is enhanced.

16:15–17:30 Coffee Break & Poster Session

08:30–10:00 · November 5, 2024 · Tuesday

Optical Transmission Sub-systems, Systems and Technologies VI

Presider: Biwei Pan, Ghent University, Belgium

08:30–09:00 · ACPIPOC–0815–28 **Invited****Measurement and Monitoring of Inter-core Crosstalk in Multi-core Fiber**Xuesong Zhao, **Zhongwei Tan**, Wen Zhuang, Tianwai Bo, Yi Dong*Beijing Institute of Technology, China*

Inter-core crosstalk (IC-XT) is a significant impairment characteristic in multi-core fibers (MCF). We review the existing IC-XT measurement solutions and introduce newly proposed multiple-loopback measurement solution and AMCC-aided online monitoring solution.

09:00–09:30 · ACPIPOC–0818–3 **Invited****Practical Utilization of Monolithically Integrable Dually Modulated EML as Optical SSB Transmitter****Tianwai Bo***Beijing Institute Of Technology, China*

We present the recent progress on the dual modulation of a monolithically integrable electro-absorption modulation laser for the generation of optical single sideband signal, focusing on its practical issue and the corresponding solutions.

09:30–09:45 · ACPIPOC–0731–130

130-GBaud Partial Response Encoded PAM4 IM/DD Transmission Using CNN-Based Decoder**Lulu Liu**¹, Tonghui Ji¹, Yu Yang¹, Shangcheng Wang¹, Gang Qiao², Qi Wu³, Zhaopeng Xu¹, Honglin Ji¹, Jinlong Wei¹, Jiali Li¹, Zhixue He¹, Weisheng Hu¹*1. PengCheng Laboratory, China; 2. Peking University, China; 3. Shanghai Jiao Tong University, China*

Convolutional neural network is investigated for equalization and decoding in partial response shaped intensity modulation direct detection systems for the first time. Without the channel state information as needed in the MLSE equalizer, 260-Gb/s PR PAM4 transmission can be successfully achieved.

09:45–10:00 · ACPIPOC–0731–14

Bit-level Soft-Switching Transmission for Heterogeneous VLC–RF OFDM Systems**Zhinan Sun**, Xiong Deng, Xi Cao, Xihua Zou, Wei Pan, Lianshan Yan*Southwest Jiaotong University, China*

This paper proposes a bit-level soft switching VLC–RF heterogeneous transmission algorithm, enhancing communication rate and robustness, with up to about 400% rate increase in damaged link scenarios.

10:00–10:30 Coffee Break

10:30-12:00 · November 5, 2024 · Tuesday
Optical Transmission Sub-systems, Systems and Technologies V
 Presider: Zhongwei Tan, Beijing Institute of Technology, China

10:30-11:00 · ACPIPOC-0730-31 **Invited**

Micro-transfer Printing of Pre-fabricated III-V Chiplets on Silicon and Silicon Nitride PICs

Biwei Pan, Gunther Roelkens

Ghent University, Belgium

We present an approach for integrating prefabricated III-V chiplets onto Si/Si₃N₄ PICs through micro-transfer printing. It allows completion of III-V and Si/Si₃N₄ processes on their native substrate, while enabling simple integration of multiple III-V functions.

11:00-11:30 · ACPIPOC-0925-1 **Invited**

Optoelectronic Integration Technology Trends of Next-Generation Network

Chen Zhu

Baidu, China

This talk will cover the important optoelectronic integration technology trends for future datacenter networking: 1. IP+OTN that enables coherent optics directly integrated to IP router; 2. Co-packaged optics; 3. Hybrid opto-electronic network architect

11:30-11:45 · ACPIPOC-0815-79

Automatic Wavelength Locking Stabilization of Silicon Microring Modulator With 240Gb/s PAM4 Modulation

Haopeng Zhou, Hongguang Zhang, Jia Liu, Ziyang Duan, Daigao Chen, Xi Xiao

National Information Optoelectronics Innovation Center, China We developed an automatic wavelength locking and stabilization method for silicon MRM, achieving 240 Gbits/s PAM4 and 140 Gbits/s NRZ modulation and long-term stability confirmed over 12 hours through a feedback control algorithm.

11:45-12:00 · ACPIPOC-0724-4

Hybrid Adaptive Biased Optical OTFS for RIS-assisted OWC Systems

Shuang Tang, Jianhua Pei, Yuxuan Liao, Xiao-Ping Zhang, Jian Song, Yuhang Dong

Tsinghua University, China

Adaptive biased optical orthogonal time frequency space (ABO-OTFS) faces challenges in achieving optimal spectral efficiency due to the presence of unused Doppler bins within the system. To address this, we propose two novel hybrid ABO-OTFS (HABO-OTFS) technologies for reconfigurable intelligent surface (RIS)-assisted optical wireless communication (OWC) systems. HABO-OTFS integrates ABO-OTFS with pulse amplitude modulated discrete multitone (PAM-DMT), offering a straightforward implementation that enables the receiver to directly extract data without the need for complex demodulators. On the other hand, HABO-OTFS combines ABO-OTFS with various hybrid schemes in a layered approach, providing enhanced flexibility and more efficient utilization of spectral resources. Numerical results demonstrate that both HABO-OTFS and HABO-OTFS significantly outperform the existing ABO-OTFS in terms of peak-to-average power ratio (PAPR), spectral efficiency, and power efficiency, underscoring their potential for superior performance in RIS-assisted OWC systems.

12:00-13:30 Lunch Break

13:30-15:30 · November 5, 2024 · Tuesday
Optical Transmission Sub-systems, Systems and Technologies VI
 Presider: Chen Zhu, Baidu Online Network Technology (Beijing) Co., Ltd, China

13:30-14:00 · ACPIPOC-0801-140 **Invited**

Energy Efficient and Compact Optical DAC Transmitter using CMOS Inverter Driver and Silicon Segmented Modulator

Yohei Sobu^{1,2}, Shinsuke Tanaka^{1,2}

1. PETRA, Japan; 2. Fujitsu Limited, Japan

We demonstrated 64 Gbaud NRZ and 50 Gbaud 16QAM operation using a silicon segmented modulator and a CMOS inverter driver. The highest transmitter density of 300 Gbps/mm² was achieved among a coherent optical transmitter.

14:00-14:15 · ACPIPOC-0801-10

Designing Polar Code and LDPC Code for Reduction of Decoder Complexity**Zhiyuan Song**, Koji Igarashi*Osaka University, Japan*

We show a method to design polar code and LDPC code to reduce the SD-FEC decoder complexity. The proposed method enables to determine the appropriate LDPC code and to estimate the BER performance.

14:15-14:30 · ACPIPOC-0814-28

Transmitter IQ Skew Estimation Using Single Subcarrier in the Digital Subcarrier Multiplexing System**Hong Lin**, Jing Zhang, Taowei Jin, Rui Wang, Bo Xu, Kun Qiu*University of Electronic Science and Technology of China, China*

We design a group of training sequences to estimate the transmitter (Tx) IQ skew in the optical DSCM system. The experimental results show the estimation accuracy is within ± 0.4 ps in 40 Gbaud PDM-DSCM system.

14:30-14:45 · ACPIPOC-0814-55

MMSE Equalization Incorporated OSNR Measurement for Signal Bandwidth Narrowing and Noise Coloring**Yang Lan**, Jiachuan Lin, Zhiping Jiang*Huawei Canada, Canada*

We propose to use MMSE criterion for optical spectrum based OSNR measurement. Experiments show the measured MMSE OSNR is close to DSP recovered SNR even with significant signal filtering and noise coloring in present.

14:45-15:00 · ACPIPOC-0814-61

289-Gb/s PAM-6 Transmissions with Joint PRE and Mapping-Rule-Based Simplified MLSE Decoder**Jiahao Zhou**¹, Jing Zhang¹, Xue Zhao¹, Zhaopeng Xu², Bo Xu¹, Kun Qiu¹*1. University of Electronic Science and Technology of China, China; 2. Peng Cheng Laboratory, China*

We propose a joint PRE with MRS-MLSE decoder according to the mapping rule, reducing the complexity by 46.8%. The MRS-MLSE is activated when detected errors, which processes only 8.57% of total symbols at KP4-FEC threshold.

15:00-15:15 · ACPIPOC-0728-8

Physical layer key distribution based on evolution of the single eigenmode polarization via transformation of representation in 50 km SSMF optical transmission**Le Liu**¹, Ziyun Yang¹, Xianfeng Tang^{1*}, Xiaoguang Zhang¹, Xia Zhang²*1. Beijing University of Posts and Telecommunications, China; 2. Liaocheng University, China*

We proposed and verified a minimalist-structured physical-layer key distribution scheme utilizing evolution of the single eigenmode polarization via representation transformation. A 50km SSMF transmission experiment achieved a key generation rate of 10.4Kbit/s and 0.01 eavesdropping-correlation.

15:15-15:30 · ACPIPOC-0814-35

FPGA Implementation of Low Complexity Timing Recovery with High SCO Tolerance for IM/DD Optical Data Links**Jianwei Tang**¹, Jianyu Wang¹, Bang Yang², Xiuquan Cui¹, Linsheng Fan¹, Chen Cheng², Yaguang Hao¹, Yuting Xu¹, Cancan Chen¹, Zhongliang Sun¹, Junpeng Liang¹, Zhaopeng Xu¹, Tonghui Ji¹, Yanfu Yang^{2*}, Weisheng Hu¹, Jinlong Wei¹*1. Pengcheng Laboratory, China; 2. Harbin Institute of Technology, China*

We implement a low-complexity timing recovery on FPGA platform, leveraging an advanced data buffer and timing error detector. Its stability and high SCO tolerance are verified through real-time experiments with 29.4912 Gbps PAM4 signals.

15:30-16:00 Coffee Break

16:00-17:00 · November 5, 2024 · Tuesday
Optical Transmission Sub-systems, Systems and Technologies VII
 Presider: Tianwai Bo, Beijing Institute of Technology, China

16:00-16:15 · ACPIPOC-0728-10

Compatible implementation of non-integer oversampling CDR for quantization-noise-shaped signals transmitted over MCFs

Haotian Mu, Lin Sun

Soochow University, China

We propose and experimentally demonstrate the feasibility of non-integer-oversampling clock data recovery (CDR) processing the quantization-noise-shaped signals transmitted over MCFs, which effectively alleviates the high-level hardware complexity and power consumption induced by multiple high-speed transceivers.

16:15-16:30 · ACPIPOC-0731-117

Fast and Accurate Estimation of MDL-Induced SNR Penalty in SDM Link with Non-uniform Noise Loading

Tonghui Ji¹, Qi Wu^{1,2}, Zhaopeng Xu^{1*}, Honglin Ji¹, Yu Yang¹, Lulu Liu¹, Shangcheng Wang¹, Zhongliang Sun¹, Junpeng Liang¹, Linsheng Fan¹, Jianwei Tang¹, Jinlong Wei¹, Juhao Li^{1,3}, Weisheng Hu^{1,2}

1. Pengcheng Laboratory, China; 2. State Key Lab of Advanced Optical Communication System and Networks, Shanghai Jiao Tong University, China; 3. State Key Laboratory of Advanced Optical Communication Systems & Networks, Peking University, China

We propose a fast and accurate estimation method of MDL-induced SNR penalty with non-uniform noise loading in SDM link. The proposed approach substantially saves the time cost while maintaining an estimation error within 0.2 dB.

16:30-16:45 · ACPIPOC-0730-75

Demonstration and Analysis of a 100-Mbps real-time Daytime OWC system

Shixuan Wang¹, Weibo Zheng², Shulei Wang¹, Yuanzhe Qu¹, Shidong Yuan², Yongchun Yuan², Wentao Li², Junjie Zhang^{1*}, Qianwu Zhang¹

1. Shanghai University, China; 2. Engineering No.1 Shanghai Institute of Technical Physics Chinese Academy of Sciences, China

We propose a daytime OWC system based on VCSEL and APD with misalignment tolerance of 18 degrees. FPGA-Based real-time experimental results show that 140m @100Mbps transmission distance can be achieved with 47300 lux background light.

16:45-17:00 · ACPIPOC-0730-63

Research on optimization of indoor visible light coverage uniformity based on EOBL-GA

Fengtao He¹, **Runan Liu**¹, Shaohui Guo¹, Ruina Wang¹, Yi Yang¹, Guanping He²

1. Xi'an University of Posts & Telecommunications, China; 2. Xi'an Precision Machinery Research Institute, China

This paper proposes a genetic algorithm introducing elite oppositional learning (EOBL) to optimize the parameters of LED array layout in indoor visible light communication (VLC) system to improve the coverage uniformity of communication.

Track 2: Optical Transmission Sub-systems, Systems and Technologies (Parallel Session I)

The Residence 10, 2F (悦府 10, 2 楼)

13:30–15:30 · November 3, 2024 · Sunday

Optical Transmission Sub-systems, Systems and Technologies VIII

Presider: Xiaodan Pang, Kungliga Tekniska högskolan (KTH), Sweden

13:30–14:15 · ACPIPOC-0930-4 **Keynote**

Optical Interconnects Based on Visible Light Laser Communication

Nan Chi

Fudan University, China

VLLC is gaining attention as a promising solution for optical interconnects due to its numerous benefits. Utilizing WDM based VLLC technology, transmission data rates surpassing 500Gbps can be realized, addressing the demands of optical interconnects.

14:15–14:45 · ACPIPOC-0730-37 **Invited**

Bismuth-Doped Fiber Amplifiers: Enabling Technology for Multi-Band Transmission Systems

Aleksandr Donodin

Aston University, United Kingdom

In this talk, history of and progress in bismuth-doped fiber amplifiers (BDFAs) will be outlined. BDFAs applicability for multi-band transmission networks will be highlighted along with the future prospects and realistic utilization of such systems.

14:45–15:00 · ACPIPOC-0812-5

Field Trial of Cylindrical Vector Beam Propagation in Free-Space Optical Communication

Jiazheng Ding¹, Shuangcheng Chen¹, Mengjie Zhou¹, Sichao Chen¹, Yong Yu², Mingfeng Xu³

1. Tianfu Xinglong Lake Laboratory, China; 2. National Key Laboratory of Optical Field Manipulation Science and Technology, Chinese Academy of Sciences, China; 3. National Key Laboratory of Optical Field Manipulation Science and Technology, Chinese Academy of Sciences, China

This study experimentally demonstrates the superior turbulence resilience of cylindrical vector beams (CVBs) over a 3.2 km free-space field trial transmission link, with approximately 1/3 greater stability under severe turbulence than scalar Gaussian beams.

15:00–15:15 · ACPIPOC-0731-185

Retroreflecting Modulation-based Underwater Wireless Optical Communication with Coherent Detection

Tiankuo Wei^{1,2}, Xinke Tang^{1*}, Zhen Chen¹, Rui Jiang¹, Chao Li¹, Zhixue He¹, Yuhan Dong^{1,2}

1. Pengcheng Laboratory, China; 2. Tsinghua University, China

A retroreflecting modulation-based coherent underwater wireless optical communication (UWOC) system with M-ary phase shift keying (MPSK) modulation formats is proposed. The feasibility of the system is studied by a series of experiments using the simplified coherent detection scheme. To guarantee the bit error rates (BERs) reach the target values lower than the forward error correction (FEC) limit, the maximum channel attenuation for the system with BPSK, QPSK, and 8PSK formats (with corresponding data rates of 150 Mbps, 300 Mbps, and 450 Mbps) are measured as about 18.4 dB, 16.15 dB, and 12.55 dB, respectively.

15:15–15:30 · ACPIPOC-0815-90

50-km Weakly-coupled Transmission with L-band 4-LP-mode FM-EDFA

Shuailuo Huang¹, Baolong Zhu², Gang Qiao², Yuyang Gao³, Mingqing Zuo⁴, Shikui Shen¹, Zelin Wang¹, Yongqi He², Zhangyuan Chen^{2,5}, Juhao Li^{2,5}

1. China Unicom Research Institute, China; 2. Peking University, China; 3. University of Science and Technology Beijing, China; 4. China Mobile Research Institute, China; 5. Pengcheng National Laboratory, China

50-km weakly-coupled transmission based on a L-band 4-LP-mode FM-EDFA is experimentally demonstrated only adopting 2×2 or 4×4 MIMO-DSP.

15:30–16:00 Coffee Break

16:00-18:30 · November 3, 2024 · Sunday
Optical Transmission Sub-systems, Systems and Technologies IX
 Presider: Qiushuo Sun, British Telecom (BT Group plc), United Kingdom

16:00-16:30 · ACPIPOC-0724-3 **Invited**

Novel Algebraic Soft Decoding of Reed-Solomon and BCH Codes
Li Chen

Sun Yat-sen University, China

Reed-Solomon (RS) codes and Bose-Chaudhuri-Hocquenghem (BCH) codes have been widely applied in communication system, including the optical one, for error-correction. Its efficiency can be enhanced by improving the decoding technique. This talk will introduce a novel algebraic soft decoding, namely low-complexity Chase (LCC) decoding, for RS and BCH codes. It is designed from the perspective of computing the Gröbner bases of interpolation modules. This new decoding technique not only yields a low complexity, but also a low latency that is superior to the state-of-the-art Chase decoding. Its progressive variant further optimizes the Chase decoding complexity by adjusting it to the quality of received information.

16:30-17:00 · ACPIPOC-0814-62 **Invited**

Real-time Transmission Investigations towards Practical Optical Networks for 400G and Beyond
Zhenhua Feng^{1,2}, Baoluo Yan^{1,3}, Hu Shi^{1,2}

1.State Key Laboratory of Mobile Network and Mobile Multimedia Technology, Shenzhen, China; 2.WDM System Department of ZTE Corp., Wuhan, China; 3.WDM System Department of ZTE Corp., Beijing, China

In this report, we will analyze the key technologies and challenges of 400G and beyond optical transmission systems, and share our progress on C+L integration system verification, investigations and thoughts on 800G and HCF technologies.

17:00-17:30 · ACPIPOC-0815-76 **Invited**

A Field Trial of Hybrid 400G and 800G Transmission System

Yakun Hu¹, Chuangye Wang¹, Shikui Shen¹, Yan Shi¹, Yu Tang¹, He Zhang¹, Zelin Wang¹, Xiaomei Ma², Guangquan Wang¹

1.China Unicom Research Institute, China; 2.China United Network Communications Group Corporation Limited, China

This paper introduces the key technologies of 800G optical transmission system and demonstrates a field trial of hybrid 400G and 800G transmission. It verifies the possibility and reliability of multi-rate and multi-channel spacing transmission system in the current network.

17:30-17:45 · ACPIPOC-0731-167 **Industry Innovation Nomination**

First Real-Time 224Tb/s Single-span 106-km Field Trial using Commercial 130-Gbaud DP-QPSK 400Gb/s backbone OTN Transceivers over Deployed 7-Core Multi-Core Fiber Cable

Jian Cui¹, Yu Deng¹, Zhuo Liu¹, Yuxiao Wang², Jiabin Wang³, Li Zhang⁴, Bin Hao¹, Chao Wu¹, Leimin Zhang¹, Yong Chen², Bin Wu², Baoluo Yan³, Xuechuan Chen³, Hu Shi³, Lei Shen⁴, Lei Zhang⁴, Jie Luo⁴, Yan Sun¹, Qi Wan¹, Bing Yan², Cheng Chang¹, Ninglun Gu¹

1.Department of Networks, China Mobile Communications Group Co., Ltd., China; 2.Network Management Center, China Mobile Communications Group Shandong Co., Ltd., China; 3.WDM System Department of Wireline Product R&D Institute, ZTE Corp., State Key Laboratory of Mobile Network and Mobile Multimedia Technology, China; 4.State Key Laboratory of Optical Fibre and Cable Manufacture Technology, YOFC., China

We demonstrate the first real-time single-span 106-km field trial over deployed 7-core fiber cable using commercial DP-QPSK 400Gb/s backbone OTN transceivers, which achieve a bit rate of 224Tb/s with a more than 3.5-dB OSNR margin.

17:45-18:00 · ACPIPOC-0731-195

Real-Time 142.65 Pb/s•km Transmission Capability Field Demonstration over Deployed 7-Core Fiber Cable with Multiple Fusion Splicing

Jian Cui¹, Yu Deng¹, Zhuo Liu¹, Yuxiao Wang², Shiyu Qin³, Weiguang Wang⁴, Bin Hao¹, Chao Wu¹, Leimin Zhang¹, Yong Chen², Bin Wu², Tongce Li³, Wenhua Cao³, Yaoxu Zhai³, Lei Shen⁵, Lei Zhang⁵, Jie Luo⁵, Yan Sun¹, Qi Wan¹, Bing Yan², Cheng Chang¹, Ninglun Gu¹

1.Department of Networks, China Mobile Communications Group Co., Ltd., China; 2.Network Management Center, China Mobile Communications Group Shandong Co., Ltd., China; 3.Huawei Technologies Co., Ltd., China; 4.Testing Laboratory of Yangtze Optical Fiber and Cable Joint Stock Limited Company, China; 5.State Key Laboratory of Optical Fibre and Cable Manufacture Technology, YOFC., China

Real-time 142.65 Pb/s•km transmission capability is field demonstration over deployed 7-core fiber cable with more than 4-dB OSNR margin, which is achieved by using commercial DP-QPSK 400Gb/s backbone OTN transceivers.

18:00-18:15 · ACPIPOC-0801-157

1780-km Reach Extension with Equalization-Enhanced Phase Noise Compensation Using 3-MHz LO for WDM Coherent Transmission**Yixiao Zhu¹**, Xiansong Fang², Xiang Cai², Yimin Hu¹, Weisheng Hu^{1,3}, Fan Zhang^{2,3}*1.Shanghai Jiao Tong University, China; 2.Peking University, China; 3.Pengcheng Laboratory, China*

We propose and experimentally demonstrate an efficient equalization-enhanced phase noise compensation scheme for long-haul coherent transmission. The distance is extended by 1780km and 470km for $8\lambda \times 788.4\text{-Gb/s}/\lambda$ and $968.4\text{-Gb/s}/\lambda$ line rate WDM transmission, respectively, using 3-MHz LO and receiver-side dispersion compensation.

18:15-18:30 · ACPIPOC-0813-16

100 km Discrete-Modulated Continuous-Variable Quantum Key Distribution Using Probabilistic Shaped 16QAM**Yan Pan¹**, Mingze Wu², Heng Wang¹, Yun Shao¹, Yang Li¹, Yichen Zhang², Wei Huang¹, Bingjie Xu¹*1.Institute of Southwestern Communication, China; 2.Beijing University of Posts and Telecommunications, China*

We first experimentally demonstrated discrete-modulated continuous-variable quantum key distribution over 100.93 km of standard single-mode fiber using probabilistic shaped 16QAM. The results show that a secret key rate of 50.68 kbits/s can be achieved.

17:30-20:00 Welcome Reception

13:30-16:15 · November 4, 2024 · Monday

Optical Transmission Sub-systems, Systems and Technologies X

Presider: Di Che, Nokia Bell Labs, United States

13:30-14:00 · ACPIPOC-0815-59 **Invited****Advanced Technologies for Next-Generation Passive Optical Networks****Md Saifuddin Faruk**, Wei Jin, Jianming Tang*Bangor University, United Kingdom*

This paper provides an overview and recent advancement of emerging technologies including transceivers, flexibility features, optical sensing and physical layer security for next-generation passive optical networks (PON).

14:00-14:30 · ACPIPOC-0726-20 **Invited****Dissemination and applications of ultra-stable frequencies in modern optical networks****Qiushuo Sun***British Telecom, United Kingdom*

We will present how we disseminate precise radio and optical frequencies over 100km distance using the optical transmission system. The delivered frequencies maintain the high precision and are used to support local wireless applications.

14:30-15:00 · ACPIPOC-0731-52 **Invited****Ultra-low-loss silica-core fiber technology****Shin Sato**, Yuki Kawaguchi, Hirotaka Sakuma, Yuto Kobayashi, Tetsuya Hayashi, Tetsuya Haruna, Takemi Hasegawa*Sumitomo Electronics industries, Ltd., Japan*

Ultra-low transmission loss in the silica-core fiber, having been improved by Rayleigh scattering reduction, leads to the power- and cost-efficient submarine transmission and will expand transmission capacity in combination with the space division multiplexing technology.

15:00-15:15 · ACPIPOC-0729-29

On the impact of inter-core skew on multiple-span coupled-core MCF transmission**Jiaqi Cai¹**, Daohui Hu¹, Weiye Wang¹, Lin Sun^{1*}, Junjie Xiong², Lin Ma²*1.Soochow University, China; 2.Shanghai Jiao Tong University, China*

Inter-core skew is a key issue for multiple-span coupled-core MCF transmissions. We experimentally investigate its impact on the signaling performance.

15:15–15:30 · ACPIPOC-0815-72

Delayed Self-heterodyne Interferometry Enabling 4.8 Tb/s Coherent Transmission and Simultaneous Vibration Sensing with 100 kHz Linewidth ECLs**Yaguang Hao**¹, Bing Yue¹, Yifan Xu¹, Qian Xiang², Linsheng Fan¹, Jiali Li¹, Yanfu Yang², Weisheng Hu¹, Xueyang Li¹*1. Pengcheng Laboratory, China; 2. Harbin Institute of Technology, China*

We relax the laser linewidth requirement for carrier phase-detection based vibration sensing via the delayed self-heterodyne interferometry scheme. In addition, we transmit net 4.8 Tb/s/λ signals over 55.9 km of weakly coupled seven-core fiber with joint vibration sensing utilizing 100 kHz linewidth external cavity lasers.

15:30–15:45 · ACPIPOC-0731-152

Digital Precoding Technique for Crosstalk Mitigation in an Intensity Modulation and Direct Detection (IM/DD) Space Division Multiplexing (SDM) Systems**Samina Rajbhandari**, Deming Kong, Liu Yaoxin, Metodi Plamenov Yankov, Søren Otto Forchhammer, Leif Katsuo Oxenløwe*Denmark Technical University, Denmark*

In an emulated IM/DD SDM system, at a fixed power budget, digital precoding increases crosstalk tolerance by 1.3 dB and 3.3 dB for PAM4 and PAM8 signaling, respectively, at the KP4 FEC BER threshold (2.2e-4).

15:45–16:00 · ACPIPOC-0730-70

PINN-Enabled Physical Parameter Identification for Accurate EDFA Gain Modeling **Jiawei Dong**, Xiaotian Jiang, Yuchen Song, Jin Li, Min Zhang, Danshi Wang*State Key Laboratory of Information Photonics and Optical Communications, Beijing University of Posts and Telecommunications, China*

We experimentally demonstrate a PINN-enabled physical parameter identification workflow for EDFA gain modeling. A maximum gain error of 0.303 dB and mean absolute error of 0.127 dB are achieved with only five sets of data per wavelength.

16:00–16:15 · ACPIPOC-0814-3

32 Tb/s Real-Time C6T+L6T Unrepeated 400G QPSK Transmission over a 50.3-dB Span Loss G.652.D Fiber using Bidirectional Raman Amplification**Nishan Wu**, Hongya Wang, Wenbo Yu, Hu Shi*WDM System Department, ZTE Corporation, China*

This paper first demonstrates a C6T+L6T 400G QPSK unrepeated transmission with the capacity of 32 Tb/s (80×400 Gb/s) over 50.3-dB span loss G.652.D fiber, utilizing standard commercial C6T+L6T optical system and bidirectional Raman amplification.

16:15–17:30 Coffee Break & Poster Session

08:30–10:00 · November 5, 2024 · Tuesday

Optical Transmission Sub-systems, Systems and Technologies XI

Presider: Chen Zhu, Baidu Online Network Technology (Beijing) Co., Ltd, China

08:30–09:00 · ACPIPOC-0927-3 **Invited****Flexible Grid Wavelength Selective Switch for Next Generation Data Centre Interconnect****Yiran Ma***Finisar Australia, Australia*

Data center interconnect (DCI) is the fastest growing market for DWDM. WSS becomes a popular choice as Mux/Demux for DCI due to features including flex-grid, ASE loading port, intra/inter channel reconfigurability and superior channel shape.

09:00–09:30 · ACPIPOC-0815-34 **Invited****Fast and Accurate Performance Analysis Enabled by Feedforward Neural Networks****Amirhossein Ghazisaeidi***NOKIA BELL LABS, France*

We report on our novel nonlinear neural-network-based QoT tool, enabling accurate computation of nonlinear inference noise in a few milliseconds per channel.

09:30–09:45 · ACPIPOC–0813–13

Ultra Flexible S-band 1x5 Wavelength Selective Switch Based On Off-the-shelf C-band Optics**Zhenhua Feng**^{1,2}, Quan You^{1,3}, Minghuan Liu^{1,4}, Hu Shi^{1,2}, Weizhang Chen^{1,4}

1. State Key Laboratory of Mobile Network and Mobile Multimedia Technology, Shenzhen, China; 2. WDM System Department of ZTE Corp., Wuhan, China; 3. WDM System Department of ZTE Corp., Wuhan, China; 4. WDM System Department of ZTE Corp., Beijing, China

An S-band 1x5 WSS prototype covering 1470 to 1520 nm is experimentally demonstrated using off-the-shelf C band optical elements. The main optical performances are measured, showing comparable or even superior performance than commercial S-band Waveshapers.

10:00–10:30 Coffee Break

10:30–12:00 · November 5, 2024 · Tuesday

Optical Transmission Sub-systems, Systems and Technologies XII

Presider: Wei Wang, Beijing University of Posts and Telecommunications, China

10:30–11:00 · ACPIPOC–0927–1 **Invited****Digital Coherent Optics (DCO) Module for Data Center****Joe Zhao***Coherent Germany GmbH, Germany*

In this work we present Steelerton™ – a low-power, low-cost coherent 100G ASIC. Targeting 100ZR applications, we drive the power of a 100G coherent DSP down to record low. Combined with a low-power PIC and laser, Steelerton™ unlocks the QSFP28 form-factor for coherent 100ZR. Furthermore, integrating our high performance IC–TROSA 140Baud with DSP in the QSFP–DD form-factor, we present coherent 800G ZR/ZR+ at industry leading performance with lowest power.

11:00–11:30 · ACPIPOC–1013–3 **Invited****Coherent pluggable evolution enabling IPoDWDM from DCI to Metro****Jim Zou***Adtran Networks SE, Germany*

Coherent pluggable has been revolutionizing today's 400G DWDM interface, especially for the DCI. This talk will reveal its development and applications, and also discuss the opportunity and challenges of adopting coherent pluggable in metro networks.

11:30–11:45 · ACPIPOC–0731–168

Optics-Informed Fully Convolutional Networks for Enhanced Channel Equalization in High-Speed VCSEL-Based Optical Interconnects**Yuting Xu**², Chuanchuan Yang², Zhaopeng Xu¹, Hao Qin², Jianwei Tang¹, Yuping Zhao²

1. Pengcheng Laboratory, China; 2. Peking University, China

This paper proposes an optics-informed fully convolutional network equalizer for high-speed VCSEL-based optical interconnects. The proposed method demonstrates significant performance improvements across different transmission rates and received optical powers.

11:45–12:00 · ACPIPOC–0724–7

C Band Single Wavelength 1.12Tb/s Optical Interconnect over 43-km 7-core Fiber based on Neural Networks Nonlinear Digital Equalization**Tingyi Zhou**, Yuhang Gong, Yuan Li, Ming Luo, Jin Tao, Chao Yang

China Information and Communication Technologies Group Corporation, State Key Laboratory of Optical Communication Technologies and Networks, China

1.12 Tb/s (160Gb/s×7) PAM-4 signal has been successfully transmitted over 43-km 7-core fiber with Single Side-band at C band. The experiment demonstrates that Neural Networks are capable of mitigating the nonlinear effects significantly.

12:00–13:30 Lunch Break

13:30–15:30 · November 5, 2024 · Tuesday
Optical Transmission Sub-systems, Systems and Technologies XIII
 Presider: Yanni Ou, Beijing University of Posts and Telecommunications, China

13:30–14:00 · ACPIPOC-0802-4 **Invited**

125µm Hollow Core DNANF with SMF-Matched MFD

Ghafour Amouzad Mahdiraji¹, Jaroslaw Rzegocki¹, Ian A. Davidson¹, Gianluca Guerra¹, Gregory T. Jasion¹, Seyed Mohammad Abokhamis Mousavi², Konstantin Vidiajev¹, Chiang Ping Saw¹, Austin Taranta¹, Francesco Poletti^{1,2}

1. University of Southampton, United Kingdom; 2. Microsoft Azure Fiber, United Kingdom

We will present our recent work producing hollow core fibres with mode-field diameter and outer diameter matched with SMF, 2 dB/km loss in O- and C-bands and outstanding bending loss performance.

14:00–14:30 · ACPIPOC-1011-1 **Invited**

An Operator's Perspective on Future Wideband Transmission Combined with Fiber Choice for Ultra-high-speed Long-haul Optical Communications

Dawei Ge, Mingqing Zuo, Dong Wang, Dechao Zhang, Han Li

China Mobile Research Institute, China

This paper provides an operator's perspective on what is the most promising fiber choice for practical ultra-high-speed long-haul multi-band transmission. Anti-resonant hollow-core fiber will truly enable multi-band transmission with better transmission performance and stability.

14:30–14:45 · ACPIPOC-0808-5

Leveraging the SNR statistics to pinpoint an anomalous PDL element in optical links

Lina Shi

Nokia Bell Labs, France

We propose to locate an anomalous PDL utilizing SNR statistics collected by a single receiver with a machine-learning classifier, achieving 96.33% test accuracy and validating experimentally with only 1 misclassification when PDL exceeding 1.5 dB.

14:45–15:00 · ACPIPOC-0731-116

Colored-Noise Suppressed Decision Feed-Forward Equalizer for Passive Optical Networks

Sai Chen¹, Ji Zhou¹, Haide Wang², Mark Liu³, Qingxin Lu¹, Weiping Liu¹, Changyuan Yu⁴

1. Jinan University, China; 2. Guangdong Polytechnic Normal University, China; 3. Huawei Technologies Company Ltd., China; 4. The Hong Kong Polytechnic University, Hong Kong, China

Driven by bandwidth-hungry applications, 50G passive optical network (PON) has been standardized towards the upstream line rates of 25Gb/s (asymmetric mode) or 50Gbps (symmetric mode). For the asymmetric mode of 50G PON, the legacy 10G-class components with limited bandwidth can be reused with digital signal processing to achieve the upstream line rate of 25Gb/s and maintain cost efficiency. To deal with the limited bandwidth-induced inter-symbol interference (ISI), the feed-forward equalizer (FFE) is the most commonly used. However, the in-band noise will be colored and amplified after using FFE, which will degrade the performance. This paper proposes the decision FFE (DFFE) to deal with the limited bandwidth-induced ISI and suppress the colored noise. The experimental results of the 25Gb/s on-off keying using 10G-class components show approximately 0.5dB improvement in receiver sensitivity at 20% soft-decision forward error correction limit after using DFFE compared to FFE.

15:00–15:15 · ACPIPOC-0731-96

PDL Mitigation Based on SOP Optimization Using Genetic Algorithm for Digital Subcarrier Multiplexing System

Chenhao Dai, Zekun Niu, Weisheng Hu, Lilin Yi

Shanghai Jiao Tong University, China

We propose a genetic algorithm-based state-of-polarization optimization approach to mitigate polarization-dependent loss in digital subcarrier multiplexing system. This approach reduces imbalance between polarizations by 1.75 dB and 0.81 dB Q-factor in simulation and experiment scenario.

15:15–15:30 · ACPIPOC-0724-1

Penalty-Free 400Gb/s 4λ WDM Transmission in NANF with Linear FFE Only Reaching 42dB Optical Budget for Mobile X-Haul**Chao Li¹**, Xumeng Liu¹, Peng Sun¹, Qibing Wang¹, Juan Chen¹, Lei Wang¹, Shoufei Gao², Yingying Wang², Wei Ding², Zichen Liu¹, Zhixue He¹, Shaohua Yu¹*1.Pengcheng Laboratory, China;2.Jinan University, China*

Supported by self-developed high-performance 1.4km NANF and linear equalizer, we achieved the penalty-free 400Gb/s 4λWDM transmission for mobile X-Haul, reaching optical budget of 42.4dB and dynamic range and net data rate product of 14,965dB•Gbps.

15:30–16:00 Coffee Break

16:00–16:45 · November 5, 2024 · Tuesday

Optical Transmission Sub-systems, Systems and Technologies XIV

Presider: Dawei Ge, China Mobile Research Institute, China

16:00–16:15 · ACPIPOC-0731-192

Comparison of MLSD and M-BCJR for 1.6T Data-Center Interconnects with Brick-wall Bandwidth Limitation**Dangui Huang¹**, Yixiao Zhu¹, Xiansong Fang², Yimin Hu¹, Yikun Zhang¹, Chenbo Zhang², Xiaopeng Xie², Fan Zhang², Weisheng Hu¹*1.Shanghai Jiao Tong University, China; 2.Peking University, China*

We experimentally demonstrate single-wavelength 1.6-Tb/s(=8×200Gb/s) data-center interconnects over a 1-km 8-core MCF link. The MLSD algorithm achieves 10.19% BER decrease compared with M-BCJR for FTN transmission under 40-GHz brick-wall bandwidth limitation.

16:15–16:30 · ACPIPOC-0725-1

Performance Analysis of Parallel Structures for Links Between Data Centers**Safarnejadian Arman**, Wei Shi, Leslie Rusch, Ming Zeng*Laval University, Canada*

We use a nonlinear frequency-dependent digital-to-analog converter model to study performance versus parallelization. We contrast shared and multiple sources, we quantify trade-offs in signal-to-noise ratio, phase noise, and distortion for 1.6 Tb/s at 28.7–115.3 Gbaud.

16:30–16:45 · ACPIPOC-0730-24

Simplified Coherent DSP Scheme for Short-Reach Optical Interconnect with Frequency Domain Pilot Tone**Linsheng Fan¹**, Jianwei Tang¹, Junpeng Liang¹, Zhongliang Sun¹, Yaguang Hao¹, Yanfu Yang², **Jinlong Wei¹***1.Pengcheng Laboratory, Shenzhen, China;2.Department of Electronic and Information Engineering, Harbin Institute of Technology, Shenzhen, China*

A simplified coherent DSP is experimentally validated for short-reach optical interconnects. Frequency-domain pilot tones and baud-rate PAM equalization are used for impairments compensation. The complexity is reduced more than 67% compared to typical coherent DSP.

Track 2: Optical Transmission Sub-systems, Systems and Technologies (Parallel Session II)

The Residence 11, 2F (悦府 11, 2 楼)

13:30–15:30 · November 3, 2024 · Sunday

Optical Transmission Sub-systems, Systems and Technologies XV Presider: Xinwei Du, BNU–HKBU United International College, China

13:30–14:00 · ACPIPOC–0731–226 **Invited**

Impact of Two-Mode Propagation on 1060 nm VCSEL-based Transmission over Standard Single-Mode Fiber (SSMF)

Stefanos Dris, Peter Zhou, Filip Hjort, Anders Larsson, Isabelle Cestier, Paraskevas Bakopoulos, Elad Mentovich
NVIDIA, Greece

We analyze the impact of differential modedelay on PAM4 transmission over SSMF at 1060 nm, where two modes are supported. The potential of DSP-based mitigation to enable 200G/lane single-mode VCSEL-based optical interconnects is explored.

14:00–14:45 · ACPIPOC–0730–66 **Tutorial**

Intelligent Optical Fiber Communication System

Lilin Yi

Shanghai Jiao Tong University, China

Global optimization with AI algorithms for optical fiber communication system are introduced, including channel modeling, DSP, and link optimization. We also discuss GPT applications in optical communication to facilitate research.

14:45–15:00 · ACPIPOC–0721–5

Record Real-time 2Pbit/s·km Transmission over 20km Hollow Core Fiber Using Widened C+L 12THz Bandwidth and 1.2Tbit/s Transponder with Symbol Rate of 135GBaud

Lipeng Feng¹, Hong Liu², Kun Chang², Jie Luo³, Anxu Zhang¹, Baoluo Yan², Nan Lu², Xiaoli Huo¹, Hu Shi², Xishuo Wang¹, Xia Gao¹, Yuyang Liu¹, Tao Ma⁴, Junjie Li¹, Chengliang Zhang¹

1.China Telecom Research Institute, China; 2.ZTE Corporation, China; 3.Yangtze Optical Fibre and Cable Joint Stock Limited Company, China; 4.China Telecom Co., Ltd, China

We successfully demonstrate a real-time transmission over 20km hollow core fiber (HCF). With widened C+L 12THz bandwidth and highest bit rate per wavelength of 1.2Tbit/s, record real-time capacity of 100.4Tbit/s and capacity distance product of 2008Tbit/s·km is achieved in HCF transmission.

15:00–15:15 · ACPIPOC–0729–14

Field trial of real-time 80×800Gbit/s DP-PCS-16-QAM transmission over 907.8km G.652.D fiber with 12THz bandwidth EDFA and integrated WSS

Yuyang Liu¹, Anxu Zhang¹, Jitao Gao², Yaqin Wang², Songtao Chen², Tao Ma³, Kai Lv¹, Lipeng Feng¹, Hao Liu¹, Xia Sheng¹, Xishuo Wang¹, Xiaoli Huo¹

1.China Telecom Research Institute, China; 2.Fiberhome Telecommunication Technologies Co., Ltd., China; 3.China Telecom Corp. Ltd., China

We demonstrate a real-time field trial of 80×800Gbit/s DP-PCS-16-QAM transmission over 907.8km G.652.D fiber based on widened C+L-band erbium-doped fiber amplifiers and integrated wavelength selective switches with 12THz bandwidth.

15:15–15:30 · ACPIPOC–0731–151

Fiber Channel Skew Study for Multi-fiber SDM

Jiachuan Lin¹, Zujun Xu¹, Hossein Najafi¹, Ali Bakhshali¹, Xingyu Zhou¹, Zhuhong Zhang², Zhiping Jiang²

1.Huawei Technologies Canada, Canada; 2.Huawei Canada, Canada

The fiber skew within a 2 km 12-fiber cable is experimentally measured, providing reference values for multi-fiber system design. A model for the fiber skew across extended link distances is developed, and the resource requirement of DSP buffer for multi-fiber-super-channel is discussed.

15:30–16:00 **Coffee Break**

16:00–18:00 · November 3, 2024 · Sunday
Optical Transmission Sub-systems, Systems and Technologies XVI
Presider: Bin Zhang, Sun Yat-sen University, China

Track 2

Parallel Session II

16:00–16:30 · ACPIPOC-0724-11 **Invited****IQ-Code for CDL and PDL Mitigation in Coupled Multi-core Fibers**Akram Abouseif¹, **Ghaya Rekaya**^{1,2}, Yves Jaouen², Jamal Darweesh¹, Rami Klaimi¹*1. MIMOPT Technology, France; 2. Telecom Paris, France*

We propose the IQ code to mitigate both PDL and CDL in coupled MCF. When combined with core permutation and applying simple MIMO ZF decoding, a gain of 0.9 dB is obtained at FEC limit.

16:30–17:00 · ACPIPOC-0730-25 **Invited****Research and Application of Optic Transmission Systems Based on New-type Fibers****Lipeng Feng***China Telecom Research Institute, China*

We will share the progress of key technologies for transmission systems based on new-type fibers, challenges and solutions during deployment in the field network, as well as considerations about application scenarios.

17:00–17:15 · ACPIPOC-0814-18

Learning Multimode Fiber for Ring Speckle-Based Encryption**Han Gao**, Li Pei, Jianshuai Wang, Zhouyi Hu, Kaihua Hu*Beijing Jiaotong University, China*

An optical cryptographic system based on multimode fiber with ring speckles is proposed. This system leverages the speed of light for encryption and deep learning for decryption. It is expected to enhance the security performance of the encryption system while maintaining low encryption processing latency.

17:15–17:30 · ACPIPOC-0731-201

Fiber Channel Modeling Using Kolmogorov–Arnold Network based Conditional Generative Adversarial Network**Hengda Gao**, Yongjun Wang, Haifeng Yang, Lu Han, Shaonan Hong, Qi Zhang*Beijing University of Posts and Telecommunications, China*

A Kolmogorov–Arnold Network (KAN) based Conditional Generative Adversarial Network (CGAN) is proposed for single mode fiber channel modeling. Simulation results demonstrate that the KAN based CGAN aided channel modeling technique is accurate and efficient.

17:30–17:45 · ACPIPOC-0725-2

High Security and High Spectrum Efficiency Radio-over-Fiber System with Compressive Sensing-based Chaotic Encryption Algorithm**Zhanhong Wang**, Lu Zhang, Xianbin Yu*Zhejiang University, China*

This paper presents a novel radio-over-fiber system with a compressive sensing-based chaotic encryption algorithm, achieving secure 8 Gbps data transmission at 20 GHz, improved security, and enhanced spectrum efficiency with reduced quantization bit requirements.

17:45–18:00 · ACPIPOC-0731-170

S-band fiber amplifier with exceed 28 dB gain across 1460~1530 nm**Haohua Wan**¹, Junjie Qi¹, Zhaolong Liao¹, Lei Shen^{1,2,3}, Xin Huang¹, Shiqi Zhou¹, Jun Chu¹, Chan Li¹, Jie Luo^{1,2,3}*1. Yangtze Optical Fibre and Cable Joint Stock Limited Company, China; 2. State Key Laboratory of Optical Fiber and Cable Manufacturing Technology, China; 3. Optics Valley Laboratory, China*

We report an S-band amplifier that can provide at least 28 dB gain across 1460~1530 nm. This demonstration shows the potential of S-band amplifiers to extend communication windows.

17:30–20:00 Welcome Reception

13:30–16:15 · November 4, 2024 · Monday
Optical Transmission Sub-systems, Systems and Technologies XVII
 Presider: Jim Zou, Adrant, Germany

13:30–14:00 · ACPIPOC-0929-3 **Invited**

Reconfigurable chalcogenide integrated nonlinear photonics

Bin Zhang

Sun Yat-sen University, China

Integrated nonlinear photonics combines state-of-the-art photonic integration with nonlinear optics to create high-performance laser sources. However, the dispersion characteristics of these nonlinear photonic devices, which determine the phase-matching conditions of various nonlinear optical processes, remain challenging to modify post-fabrication. Recently, we present integrated GeSbS microresonators with dispersion profiles that can be arbitrarily reconfigured. The tunable dispersion enables the adjustment of parametric oscillator sidebands, the spectral flattening of Kerr microcombs, and the deterministic generation of Brillouin lasers. Our approach allows for arbitrary and dynamic dispersion engineering in integrated photonics, paving the way for scalable and reconfigurable nonlinear devices that can be reprogrammed for a multitude of applications.

14:00–14:45 · ACPIPOC-0801-18 **Keynote**

Sequence Selection for Nonlinear Interference Mitigation: Current Approaches & Open Challenges

Élie Awwad¹, Jingtian Liu², Hartmut Hafermann³, Yves Jaouën¹

1. Télécom Paris, Institut Polytechnique de Paris, France; 2. Xi'an University of Posts & Telecommunications, China; 3. Huawei Technologies France – Paris Research Center, France

In optical fiber transmission systems, nonlinear interference (NLI) significantly limits the achievable data rates for a reliable communication. In this talk, we review recent approaches to sequence selection as a method for minimizing NLI. By carefully selecting at the transmitter side symbol sequences that generate minimal NLI, it is possible to enhance system performance. We underline the various metrics used to assess the NLI generated by a symbol sequence in a transmission link, highlighting their theoretical bases and practical applications. Despite these recent advancements, numerous challenges remain unsolved, such as the complexity of predicting NLI accurately and on-the-fly at the transmitter, the computational burden of sequence selection, and the quest for novel schemes drawing upon the lessons learned from sequence selection. This talk discusses these open challenges and suggests potential directions for future research to address them.

14:45–15:00 · ACPIPOC-0723-14

Neural Channel Model-Aided Distributed Dispersion Manage Optimization for Mitigation of Nonlinearities and Dispersion in Fibre Transmission

Chuyan Zeng, Zekun Niu, Hang Yang, Minghui Shi, Weisheng Hu, Lilin Yi

Shanghai Jiaotong University, China

A distributed dispersion manage system is proposed for mitigating fibre nonlinearities and dispersion in fibre transmission through optimizing accumulated chromatic dispersion (aCD) distribution. 0.7 dB OSNR improvement and 40% overall aCD reduction are simultaneously achieved.

15:00–15:15 · ACPIPOC-0726-11

Experimental Demonstration of Improved Adaptive Digital Back-propagation for Kerr-nonlinearity Compensation

Huitong Yang¹, Mingqing Zuo², Yi Liu¹, Zhengyang Xie^{1*}, Yong Chen³, Dong Wang^{2*}

1. Beihang University, China; 2. China Mobile Research Institute, China; 3. WDM system department of wireline product R&D institute, ZTE Corp, China

We propose fast and high-robustness A-DBP based on root mean square propagation (RMSProp) algorithm, which is experimentally verified by 26-λ 63 GbD DP-16QAM transmission over 1200 km with OSNR penalty improvement of 0.33 dB.

15:15–15:30 · ACPIPOC-0730-68 **Industry Innovation Nomination**

Universal Virtual Lab for Fast and Accurate Performance Assessments in Nonlinear DWDM Systems with Digital Subcarrier Multiplexing

David Dahan^{1,2}, Itzhak Moshe¹, Michael Zarubinsky¹, Xianhe Yangzhang¹, Ori Golani¹

1. Toga Networks – a Huawei company, Israel; 2. Holon Institute of Technology, Israel

The Universal Virtual Lab method is extended for performance assessments of nonlinear DWDM links using 800 Gb/s DSCM channels with accuracy errors below 0.08 dBQ and a speed-up factor of 5150 for a 6.2 THz DWDM system.

15:30-15:45 · ACPIPOC-0730-57

High-Precision and Flexible Optical Fiber Channel Modelling for 140 GBaud WDM System Using a Nonlinear Feature Decoupled Distributed Scheme**Minghui Shi**, Zekun Niu, Chuyan Zeng, Yang Hang, Weisheng Hu, Lilin Yi*Shanghai Jiaotong University, China*

We propose a nonlinear feature decoupling distributed waveform modelling scheme. This method decouples SPM and XPM nonlinearities, achieving 34% reduction in NMSE and under 0.15 dB SNR error for 140 GBaud and 1200 km transmission.

15:45-16:00 · ACPIPOC-0725-19

Lossless Path-averaged Enhanced Gaussian Noise Model Orienting Nonlinear Interference Estimation in Multi-arbitrary Fiber Spans**Peiyun Ge**¹, Lixia Xi¹, Yichao Wang¹, Zili Fang², Jiale Duan¹, Kehan He¹, Wenbo Zhang², Xiaoguang Zhang¹*1.State Key Laboratory of Information Photonics and Optical Communications, Beijing University of Posts and Telecommunications, China; 2.Beijing University of Posts and Telecommunications, China*

The lossless path-averaged (LPA) approximation method is combined with the enhanced Gaussian noise (EGN) model, consequently inducing simple general closed-form expression for swift precise nonlinear interference estimation in optical transmission system with multi-arbitrary spans.

16:00-16:15 · ACPIPOC-0801-102

Transmission of 10 Gbps NRZ stream over 200 m GI-POF at wavelength of 1310 nm**Hossam Selmy**, Gil Fernandes, Rogerio Nogueira, Ricardo Oliveira*It telecommunications, Portugal*

The paper demonstrates the transmission of 10 Gbps NRZ streams over 200 m perfluorinated graded-index plastic optical fiber GI-POF at wavelength 1310 nm. Also, the performance is evaluated for 50 m and 100 m transmission.

Track 3: Network Architectures, Management and Applications

The Residence 12, 2F (悦府 12, 2 楼)

13:30-15:30 · November 3, 2024 · Sunday

Keynote talks(1)

Presider: Hui Yang, Beijing University of Posts and Telecommunications, China

13:30-14:15 · ACPIPOC-0802-5 **Keynote**

Multiband photonic integrated WDM switches for optical networks

Nicola Calabretta, Yu Wang, Aref Rasoulzali, Mohammed Muki, Shiyi Xia, Henrique Freire Santana, Marijn Rombouts

Eindhoven University of Technology, Netherlands

Multiband photonic wavelength selective switches (MBT_WSS) and cross-connect switches allows reconfigurable wideband network nodes that dynamically route the network traffic. We report the assessment of photonic integrated MBT_WSS for metro access and 6G distribution networks.

14:15-15:00 · ACPIPOC-0801-62 **Keynote**

Improved QoT Estimations in disaggregated and partially-loaded live disaggregated production network

Alan Pak Tao Lau¹, Yan He¹, Liang Dou², Zhiqun Zhai², Chao Lu¹, Chongjin Xie²

1. The Hong Kong Polytechnic University, Kong Kong, China; 2. Alibaba Cloud, China

Physical parameter measurement uncertainties and other intractable signal propagation effects degrade the accuracy of QoT estimation, especially in live production networks. We discuss refined parameter measurement and data-driven optimization techniques to improve the QoT estimation accuracy.

15:00-15:30 · ACPIPOC-0730-47 **Invited**

Fine Grain Metro Transport Network Technology for 5G-A/6G Communication Evolution

Liuyan Han, Jiachen Li, Xinyu Chen, Dechao Zhang, Han Li

China Mobile Research Institute, China

To address technical challenges of new services towards 5G-A/6G evolution, this paper proposes a fine-grain metro transport network (fgMTN) architecture and fine-grain technologies, focusing on hitless bandwidth adjustment and cross-domain protection mechanisms.

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

16:00-17:30 · November 3, 2024 · Sunday

Keynote talks(2)

Presider: Xuwei Xue, Beijing University of Posts and Telecommunications, China

16:00-16:45 · ACPIPOC-0724-2 **Keynote**

Capabilities and Future Prospects of High-Capacity Optical Wireless Transmission

Ton Koonen

Eindhoven University of Technology, Netherlands

Optical wireless communication alleviates the burden on radio-based wireless networks. Using accurately steered narrow beams, OWC enables dense high-capacity individual connections. Recent progress in key OWC techniques and an outlook on further enhancements are presented.

16:45-17:30 · ACPIPOC-1009-1 **Keynote**

TBD

Hui Yang

Beijing University of Posts and Telecommunications, China

TBD

17:30-20:00 **Welcome Reception**

13:30–15:45 · November 4, 2024 · Monday
Satellite Optical Network
Presider: Nan Hua, Tsinghua University, China

13:30–14:00 · ACPIPOC–1009–6 **Invited**

Optical Wireless Data Center Networks Using Nanosecond Optical Switching Technologies

Shaojuan Zhang

Eindhoven University of Technology, Netherlands

Optical wireless data center networks (DCNs), which incorporate optical wireless communication technology and optical switching technology, present a viable solution for the next generation of DCNs for providing massive network capacity and ultra-high bandwidth while meeting flexible and scalable architecture requirements.

14:00–14:30 · ACPIPOC–0731–39 **Invited**

Physical-layer impairments estimate of arbitrary spectral-shaped signals in C+L-band transmission

Xinwei Du¹, Chenhao Fang², Xi Gao², Maite Brandt-Pearce³, **Yuxin Xu**²

1.BNU-HKBU United International College, China; 2.Zhejiang University of Technology, China;

3.University of Virginia, United States

The C+L-band component-wise-Gaussian-noise (C+L-CWGN) model estimates physical-layer impairments (PLIs) of arbitrary spectral-shaped signals in C+L-band transmission. The model significantly reduces the PLI overestimation of the GN model and is compatible with cross-layer resource provisioning algorithms.

14:30–15:00 · ACPIPOC–0731–1 **Invited**

The role of digital twins in operator networks

Yvan Pointurier

Huawei, France

I will describe the digital twin developed in Huawei's Paris Research Center, and show how it was used to optimize the SNR of several services in a real operator network.

15:00–15:15 · ACPIPOC–0815–82

K-minimally Risk Routing for Avoiding Interruption by Space Debris in Optical Satellite Networks

Shiyu Yang, Yongli Zhao, Yansong Fu, Xin Li, Wei Wang, Zhang Jie

Beijing University of Posts and Telecommunications, China

How to avoid obstruction from space debris is an important topic for optical satellite networking. In this paper, we develop the space debris risk model and propose k-minimally risk routing algorithms.

15:15–15:30 · ACPIPOC–0815–93

Link State Aware Dynamic Service Function Chains Deployment in Satellite Optical Networks

Xiaojie Hou¹, Peizhang Liu², Zhichun Sun¹, Chao Xi², Bo Yang², Ruijie Zhu^{1,3}

1.Zhengzhou University, China; 2.Space Star Technology CO., LTD., China; 3.Songshan Laboratory, China

A link state aware dynamic service function chain deployment algorithm is proposed to ensure the reliability of service deployment in satellite optical networks. Simulations show that our algorithm improves service acceptance rate and average delay.

15:30–15:45 · ACPIPOC–0815–84

Dynamic Routing Based on Satellite Reliability Evaluation in Satellite Optical Networks

Zhichun Sun¹, Chao Xi², Xiaojie Hou¹, Haicheng Li¹, Bo Yang², Ruijie Zhu^{1,3}

1.Zhengzhou University, China; 2.Space Star Technology CO., LTD., China; 3.Songshan Laboratory, China

A dynamic routing algorithm based on satellite reliability evaluation model is proposed to reduce the impact of satellite failure in satellite optical networks. Simulations show that our algorithm can achieve lower transmission failure rate.

15:45–17:30 Coffee Break & Poster Session

08:30-10:00 · November 5, 2024 · Tuesday

Machine Learning for Optical Networks

Presider: Yan Shi, China Unicom, China

08:30-09:00 · ACPIPOC-0727-7 **Invited****Toward Intrinsically Interpretable Machine Learning Applications for Optical Networks****Zhenlin Ouyang**¹, Xiaokang Chen¹, Hanyu Gao¹, Zhengyong Liu¹, Xiaoliang Chen²*1.Sun Yat-sen University, China; 2.University of Science and Technology of China, China*

In this paper, we review the recent advances in explainable machine learning (ML) techniques and shed light on how to design intrinsically interpretable ML solutions for optical networks by two preliminary

09:00-09:30 · ACPIPOC-0801-40 **Invited****Machine Learning based Physical Layer Resilience for Optical Networks against Jamming Attack****Xiaoxue Gong**, Junhao Fei, Xu Zhang, Weigang Hou, Jiahao Pang, Lei Guo*Chongqing University of Posts and Telecommunications, China*

We propose a machine learning-based recovery scheme for optical networks against physical layer jamming attacks. The results show that the proposed models can achieve high recovery rates without consuming additional optical path resources.

09:30-10:00 · ACPIPOC-0815-40 **Invited****Reliable Lightpath Provisioning with ML-Based QoT Estimation: Challenges and Opportunities****Carlos Natalino***Chalmers University of Technology, China*

Lightpath provisioning in elastic optical networks (EONs) require the quality-of-transmission (QoT) estimation for the decision of modulation format. This paper discusses the challenges in providing reliable lightpath provisioning, and opportunities to improve this process.

10:00-10:30 Coffee Break

10:30-12:00 · November 5, 2024 · Tuesday

Digital Twin Optical Network

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

10:30-11:00 · ACPIPOC-0719-2 **Invited****Research on Security and Transmission Performance Enhancement Technologies for Free Space Optical Communication****Tingwei Wu***Chongqing University of Posts and Telecommunications, China*

With the development of technologies such as low earth orbit (LEO) satellites in recent years, wireless laser communication has become a hotspot for many scholars. Free space optical (FSO) communication is one of the key technologies in wireless optical communication. However, due to the exposed surface of the optical medium during wireless laser transmission, there is a high possibility of information being eavesdropped. This report will improve the security and transmission performance of FSO communication systems from three aspects: Constellation probability shaping coding, filtering algorithms, and OFDM-FSO synchronization head-assisted transmission technology.

11:00-11:30 · ACPIPOC-0801-54 **Invited****Practice and Prospective of Digital Twin Optical Network****Yan Shi***China Unicom Research Institute, China*

This report focuses on the application and practice of digital twinning in China Unicom's optical network, exploring its architecture, key technologies, application scenarios, and practical cases. It also aims to provide constructive suggestions for the automation and intelligent development of optical networks.

11:30–12:00 · ACPIPOC-1009-5 **Invited****Trends in optical communication technology for AI data centers****Xu Zhou***Baidu, China*

This talk discusses the requirements and challenges of long-distance RDMA for AI datacenter interconnect. On the other hand, the LLM-based OTN agents play an important role in future optical transmission networks operation and maintenance.

12:00–13:30 Lunch Break**13:30–15:30 · November 5, 2024 · Tuesday****AI for Optical Networks****Presider: Xin Qin, China Telecom, China**13:30–14:00 · ACPIPOC-1009-8 **Invited****Rearchitecting Data Movement with Optical Networking for Distributed AI Computing****Zhizhen Zhong***Massachusetts Institute of Technology, United States*

Distributed AI workloads rely on large-scale interconnection networks to aggregate vast computing resources. This paper discussed several emerging features unlocked by optical networking to rearchitect the data movement for the next-generation AI computing systems.

14:00–14:30 · ACPIPOC-1009-4 **Invited****A Three-Stage ROADM Node Architecture based on NxN Partial Wavelength Selective Switch****Zeshan Chang***Huawei, China*

1*N WSS in ROADM system has encountered a bottleneck in the face of the continued growth of degree. We propose a three-stage ROADM node architecture to support scaling to 64 degrees and beyond, and demonstrate an enabling 64x64 wavelength selective switch that supports partial wavelengths in C band.

14:30–15:00 · ACPIPOC-0722-8 **Invited****Development of standards on free space optics****Buzheng Wei***China Unicom, China*

The invited talk introduces the development of free space optics standards worldwide. Mainly the recommendations from ITU-T are introduced.

15:00–15:15 · ACPIPOC-0814-15

Field Trial of Partial Co-cable Detection with a Self-attention Deep Learning Model**Yucong Liu¹**, Yunbo Li¹, Yang Zhao¹, Zhiwei Wang², Hui Yang², Dong Wang¹, Dechao Zhang¹*1.China Mobile Research Institute, China; 2.Beijing University of Posts and Telecommunication, China*

A deep learning architecture incorporating a self-attention mechanism for detecting identical and partial co-cable scenarios is presented. Field trial shows that precise co-cable segment localization with a detection accuracy of 96.1% can be achieved.

15:15–15:30 · ACPIPOC-0730-5

Parallel Optical Binary Convolution Processor Based on Arrayed Waveguide Grating and Multi-dimensional Multiplexing**Yanfeng Bi**, Xingyu Wu, Chuan Wang*Beijing Normal University, China*

Combining the multi-dimensional multiplexing of digital and optical domain, we propose a binary convolution processor based on arrayed waveguide grating. Simulations show that the root mean square error after image convolution is lower than 0.2.

15:30–16:00 Coffee Break

16:00-17:30 · November 5, 2024 · Tuesday

Intelligent optical network's operation, maintenance and applications

Presider: Zhizhen Zhong, Massachusetts Institute of Technology, United States

16:00-16:30 · ACPIPOC-0728-11 **Invited****Research and Practice on Intelligent Operation and Maintenance of Optical Networks****Xin Qin***China Telecom, China*

AS OPTICAL NETWORKS CONTINUE TO EVOLVE TOWARDS ULTRA LARGE NETWORKING, ULTRA LONG DISTANCE, ULTRA LARGE CAPACITY, AND ALL OPTICAL NETWORK, THE INTELLIGENT OPERATION OF OPTICAL NETWORKS HAS ALSO BECOME AN IMPORTANT DEVELOPMENT DIRECTION. CHINA TELECOM ALL-OPTICAL NETWORK 2.0 INTRODUCES THE SDN CONCEPT INTO CONTROLLERS TO ACHIEVE DIRECT CONTROL OF EDGE LAYER OPTICAL NETWORK EQUIPMENT, WHICH CAN FORM AN END-TO-END INTELLIGENT OPERATION CAPABILITY OF /BACKBONE+URBAN AREA/. AT THE SAME TIME, CHINA TELECOM EXPLORES INTELLIGENT APPLICATION SCENARIOS AND INTRODUCES NEW TECHNOLOGIES SUCH AS PRECISE PERCEPTION, DIGITAL TWINS, AND AI, TO ANALYZE SCENARIOS SUCH AS TRAFFIC PREDICTION, FAULT LOCATION, SITUATIONAL AWARENESS, INTELLIGENT CUTOVER, AND OSNR PREDICTION WHICH CAN PROMOTING THE TRANSFORMATION FROM MANUAL TO INTELLIGENT OPERATION AND MAINTENANCE.

16:30-17:00 · ACPIPOC-1009-7 **Invited****TBD****Xiaosong Yu***Beijing University of Posts and Telecommunications, China***TBD**

17:00-17:15 · ACPIPOC-0731-56

Field Trial of Long-distance Flexible Large Data Transfer Service Based on IP and Optical Networks**Mengyao Han**^{1,2,3,4}, Ying Liu^{3,4}, Ran Pang^{3,4}, Naihan Zhang^{1,2,2,3}, Zheng Ruan^{3,4}, Chang Cao^{3,4}, Tao Huang², Xiongyan Tang^{3,4}

1.China United Network Communications Group Corporation Limited, China;2.Beijing University of Posts and Telecommunications, China;3.China Unicom Research Institute, China;4.National Engineering Research Center of Next Generation Internet Broadband Service Application, China

We present the first field trial of a long-distancelarge data transfer service utilizing IP and optical networks. Theresultsdemonstratethattransferring 9 TB of data over a distance of 3000-kmtakes 4.6 hours.

17:15-17:30 · ACPIPOC-0812-1 **Industry Innovation Nomination****A Use Case Study of Implementing 50G-PON for Fiber-to-the-Room-Business (FTTR-B)**Yuanqiu Luo¹, **Dezhi Zhang**², Frank Effenberger¹, Tao Zeng², Yuying Gan², Ming Jiang²

1.Futurewei Technologies, United States;2.China Telecom, China

We investigate a use case and its test results from China Telecom's network. It demonstrates how 50G-PON and FTTR are improving connectivity and operational efficiency in the scenarios of enterprise and campus networks.

Track 3: Network Architectures, Management and Applications (Parallel Session)

The Residence 11, 2F (悦府 11, 2 楼)

08:00–10:00 · November 5, 2024 · Tuesday

Intelligent Access Network

Presider: Shan Yin, Beijing University of Posts and Telecommunications, China

Track 3

Parallel Session

08:30–09:00 · ACPIPOC-1002-2 **Invited**

FAN Intelligent Engine – The way to intelligent Access Network

Jian Zhu

Huawei, China

Promising Quality of Experiences (QoE), Network as a Services (NaaS), and Artificial Intelligence (AI) pose great challenges for network management and operation. Solutions with intelligence receive benefits from the statistics in the Fixed Access Network (FAN) and provide guidance in various of network stages such as network planning, operation, optimization and maintenance. Standardization efforts in various SDOs (ITU-T, IETF, BBF and ETSI) are provided in this presentation. There is also a proof of concept (POC) experiments available in the event

09:00–09:30 · ACPIPOC-0731-47 **Invited**

Centralized Fixed Access Network (C-FAN): Architecture and Bandwidth Scheduling

Jun Li

Soochow University, China

In the context of Fiber-to-the-Room (FTTR), we propose a centralized fixed access network (C-FAN) architecture and a unified bandwidth scheduling mechanism to improve end-to-end performance.

09:30–09:45 · ACPIPOC-0815-19

Deterministic Optical Time Slot Allocation Scheme Based on Time Aware Shaping in Metro/Access All-Optical Switching Networks

Huitao Zhou¹, Jiawei Zhang¹, Zhiqun Gu¹, Bitao Pan¹, Yongcheng Li², Yuefeng Ji¹

1. Beijing University of Posts and Telecommunications, China; 2. Soochow University, China

The advancement of intelligent edge computing has enhanced network edge service capabilities, requiring deterministic service delivery and efficient resource utilization. For metro/access networks, we propose a time aware shaping based optical time slot allocation scheme that assigns transmission windows and reserves time slots based on traffic characteristics and requirements. Simulation results show that compared with the RS scheme, this scheme achieves deterministic transmission and improves the average bandwidth utilization efficiency by 9.57%.

09:45–10:00 · ACPIPOC-0729-7

Wavelength Allocation in Hollow-core-fiber-based Future Quantum-secured Fronthaul Optical Networks

Weiwen Kong¹, Yongmei Sun², Tianqi Dou¹, Zhenhua Li¹, Yang Liu¹, Jianjun Tang¹

1. China Telecom Research Institute, China; 2. Beijing University of Posts and Telecommunications, China

In this paper, we present a quantum-secured optical fronthaul architecture utilizing hollow-core fiber and propose optimized wavelength allocation for classical and quantum channels, enhancing QKD performance with secure key rate improvement of 14 dB.

10:00–10:30 Coffee Break

10:30–12:00 · November 5, 2024 · Tuesday
Metro Optical Networks
 Presider: Jun Li, Soochow University, China

10:30–11:00 · ACPIPOC-0726–12 **Invited**

Intelligent optimization of resource allocation in metro optical networks

Shan Yin

Beijing University of Posts and Telecommunications, China

We will introduce resource allocation problems in metro optical networks, and introduce related intelligent resource optimization strategies.

11:00–11:30 · ACPIPOC-0725–20 **Invited**

Flexible and Efficient Network Slicing for Next-Generation Optical Metro Networks

Bitao Pan

Beijing University of Posts and Telecommunications, China

Next generation optical metro networks need to serve heterogeneous access traffic with guaranteed quality of service (QoS) and lower CAPEX and OPEX. In this context, an integrated network infrastructure enabling multiple services access and network slicing is necessary. In this paper, we investigate recent research efforts on network slicing in optical metro networks, the fgMTN and fgOTN. These technologies have limitations in flexible network resource slicing and efficient bandwidth utilization. Therefore, we propose a new all optical metro network SiMON for achieving flexibility in network slicing and efficiency in bandwidth utilization. In addition, we theoretically investigate the SiMON in achieving end-to-end deterministic latency. A jitter reduction method for SiMON network slices is proposed by formulating the latency components of its communication paths. Theoretical analysis and numerical studies support that the SiMON outperforms the fgMTN and fgOTN in flexible network resource slicing, and achieves higher bandwidth efficiency. Moreover, an experimental setup of the SiMON system has been implemented by FPGA. Experimental results show that the SiMON achieves 96.5% of bandwidth utilization with dynamically adjustable network slicing. Below 2us jitter is achieved in the SiMON network slices under burst traffic, and below 0.2us jitter has been achieved for constant frame rate traffic with short frame lengths.

11:30–11:45 · ACPIPOC-0815–24

Field Trial of a New Metropolitan WDM Architecture and Flexible Scheduling based on Optical Layer OAM

Yang Zhao¹, **Yucong Liu**¹, Xiang Li², Dong Wang¹, Changbin Hu², Dechao Zhang¹

1.China Mobile, China; 2.Huawei, China

A novel wavelength pooling technology and a flexible scheduling method based on optical layer OAM (O-OAM) are proposed. Costs of network construction and maintenance are reduced significantly, and service latency is reduced by 17%.

11:45–12:00 · ACPIPOC-0818–1

More Capacity from Less Spectrum: Tapping into Optical-layer Intelligence in Optical-computing-enabled Network

Dao Hai¹, Li Shuo², Woungang Isaac³

1.RMIT University Vietnam, Vietnam; 2.RMIT University, Australia; 3.Toronto Metropolitan University, Canada

This paper presents a forward-looking architecture for future optical transport networks exploiting the optical computing capabilities between lightpath entities crossing the same intermediate nodes. A case study focusing on the optical aggregation is examined and simulation results indicate a promising spectral saving enabled by optical-computing-enabled mode compared with the currently adopted optical-bypass one.

12:00–13:30 Lunch Break

13:30–15:00 · November 5, 2024 · Tuesday

QKD optical networks

Presider: Xiaosong Yu, Beijing University of Posts and Telecommunications, China

13:30–14:00 · ACPIPOC-0731-83 **Invited****Accelerate Data Loading in Distributed Training with Fast Reconfigurable Optical Network****Wenzhe Li**¹, Xinhang Zhang¹, Wenxuan Jia¹, Zhuohan Chen², Guojun Yuan¹, Zhan Wang¹, Peiheng Zhang³*1. Institute of Computing Technology, Chinese Academy of Sciences, China; 2. Hangzhou Institute of Advanced Study, China; 3. Institute of Intelligent Computing Technology, CAS, China*

We enhance our prior all-optical reconfigurable network to accelerate the data loading with minimized communication distance between compute and storage nodes. A novel corresponding data loading scheme is proposed to further reduce the distance. Simulation results show up to 3.3x improvement compared to fat-tree.

14:00–14:30 · ACPIPOC-1009-2 **Invited****Optical Cross-Connect Solution For Data Centre Networks****Guanghui Sun***Optical Business Product Line, ICT Products & Solutions, Huawei Technologies Co., Ltd, China*

1. What is Optical Cross-Connect (OXC)? 2. Application Scenarios of the OXC. 3. OXC Solution For Data Centre Networks and Benefits.

14:30–14:45 · ACPIPOC-0730-62

Trusted relay based routing strategy with load balancing in large-scale metropolitan QKD Networks (QKDN)**Yutang Sun**, Xiaosong Yu, Yongli Zhao*Beijing University of Posts and Telecommunications, China*

This paper proposes a trusted relay based routing strategy with load balancing in large-scale metropolitan QKD Networks (QKDN). Simulation results show that the proposed routing strategy can achieve good performance in terms of secure key rates (SKR).

14:45–15:00 · ACPIPOC-0731-100

Gaussian Feature Analysis for Fault Management in CV-QKD Coexisting with Classical Channels**Masab Iqbal**, Michela Svaluto Moreolo, Laia Nadal, Raul Muñoz*Centre Tecnològic de Telecomunicacions de Catalunya, Spain*

Faults in CV-QKD systems coexisting with classical channels can impact CV-QKD performance. We characterize several failure causes and propose effective algorithms to perform fault detection, severity estimation for preventive maintenance, and identification of probable failures.

15:00–16:00 Coffee Break

16:00–17:30 · November 5, 2024 · Tuesday

Technologies for optical networks

Presider: Wenzhe Li, Institute of Computing Technology, Chinese Academy of Sciences, China

16:00–16:15 · ACPIPOC-0815-55

Digital Twin-Assisted QoT Estimation for a Field-trial Hybrid 800G Optical Transmission System**Yu Tang**¹, Yan Shi¹, Shikui Shen¹, Lin Bai², Yakun Hu¹, He Zhang¹, Zelin Wang¹, Guangquan Wang¹, Xiongyan Tang¹, Yuchen Song³, Danshi Wang³*1. China Unicom, China; 2. China United Network Communications Group Corporation Limited, China; 3. Beijing University of Posts and Telecommunications, China*

In this work, we built a digital twin-assisted quality of transmission (QoT) estimator for a field-trial C-band hybrid 800G optical transmission system where OSNR, GSNR and optical power are estimated.

16:15-16:30 · ACPIPOC-0815-80

Graph Attention Network Enhanced Deep Reinforcement Learning Framework for Routing, Modulation, and Spectrum Allocation in EONs**Zheng Xiong**, Yue-Cai Huang, Xiaohui Hu*South China Normal University, China*

We propose a graph attention network (GAT) enhanced deep reinforcement learning framework for routing, modulation and spectrum allocation (RMSA) in elastic optical networks. GAT is able to learn the relationships between links, which is important for RMSA due to the spectrum continuity constraints. Simulation results show that our proposed method outperforms state-of-the-art methods.

16:30-16:45 · ACPIPOC-0731-203

SIF: Flexible Identifier based Forwarding for Heterogeneous Non-Terrestrial Network**Xue Zhang**¹, Yirong Zhuang², Yuming Zhang¹, Mingyuan Liu¹, Jie Liang², Wei Quan¹, Hongke Zhang¹*1. Beijing Jiaotong University, China; 2. China Telecom Research Institute, China*

Non-Terrestrial Network (NTN) provide reliable and extensive coverage, which is crucial for communication in remote and underserved areas. However, the use of traditional IP addresses in NTN can lead to communication interruptions during frequent network switches, requiring additional protocols, and the management and allocation of IP addresses in large networks is particularly complex. Research on NTN short identifier communication proposes a potential solution, offering benefits such as reduced bandwidth overhead, simplified routing, and lower latency, which can enhance efficiency in low-bandwidth environments. In this paper, we propose a novel datagram header and a scalable integrated forwarding (SIF) solution for heterogeneous NTN interconnection with flexible identifiers. Based on the novel datagram header, SIF can support packet forwarding using multiple flexible identifiers simultaneously in NTN nodes. Additionally, an identifier mapping method is proposed to support interaction between identifiers of different lengths. Simulation results show that the proposed SIF solution can effectively identify NTN with various scales, improving transmission efficiency compared to existing solutions.

16:45-17:00 · ACPIPOC-0801-97

Time Error Bound of Deterministic Transmission in Cross-Domain Time-Sensitive Networking**Hao Ma**¹, Hongxing Li¹, Li Chen², Dong Zhao², Xiaoyu Zhao², Kai Xia², Guochu Shou¹*1. Beijing University of Posts and Telecommunications, China; 2. China Academy of Railway Sciences Corporation Limited, China*

Based on coupled network theory, a bounded time error model for network determinism is proposed. The limit of traffic scheduling performance affected by time synchronization error in cross-domain time-sensitive networks is verified experimentally.

Track 4: Optoelectronic Devices and Integration

Regency Ballroom C, 2F (宴会 C 厅, 2 楼)

13:30–15:30 · November 3, 2024 · Sunday

Silicon photonics (1)

Presider: Anjin Liu, Institute of Semiconductors, Chinese Academy of Sciences, China

13:30–14:00 · ACPIPOC-1001-1 **Invited**

Bandwidth scaling of silicon photonic interconnects

Wei Shi

Université Laval, Canada

We review our recent advances in high-bandwidth silicon transceivers, achieving multi-Tb/s/mm bandwidth density and over 1 Tb/s transmission rates, scalable via wavelength and spatial multiplexing, for next-generation AI-driven optical interconnects.

14:00–14:30 · ACPIPOC-0731-160 **Invited**

The pathway for silicon photonics modulator to operate at 200G baud and beyond

Ke Li, Junbo Zhu, Lingjun Zhou, YunChen Li, Zhen Chen, Lei Wang

PengCheng Laboratory, China

The integration of electronics and photonics means various signal processing functions could be realized within E-O modulation procedures. We believe this concept could be used to achieve 200G Baud transmission with a silicon photonic modulator.

14:30–14:45 · ACPIPOC-0731-153

Observation of Fundamental Charge Noise in Electro-Optic Photonics Integrated Circuits

Junyin Zhang, Zihan Li, Johann Riemensberger, Grigory Lihachev, Guan hao Huang, Tobias J. Kippenberg

École Polytechnique Fédérale de Lausanne, Switzerland We observed a novel 1/f-type frequency noise in Lithium Niobate and Lithium Tantalate microresonators, distinct from thermorefractive noise and originating from thermodynamical charge fluctuations, setting the linewidth limits for integrated lasers. A charge-noise-limited laser with sub-hundred-hertz linewidth is demonstrated.

14:45–15:00 · ACPIPOC-0731-95

Polarization-Insensitive Optical Switch Fabrics and the Key Components on the 220-nm SOI Platform

Wei Gao¹, Liangjun Lu^{1,2}, Jinwei Su¹, Xin Li¹, Jianping Chen^{1,2}, Linjie Zhou^{1,2}

1.State Key Laboratory of Advanced Optical Communication Systems and Networks, Shanghai Jiao Tong University, China;

2.SJTU-Pinghu Institute of Intelligent Optoelectronics, China

We propose innovative polarization-insensitive optical switch fabrics on the 220-nm SOI platform, featuring polarization-insensitive switch elements, polarization-insensitive waveguide crossings, and TE₀-TM₀ mode exchangers. All the key components have been simulated and partially measured.

15:00–15:15 · ACPIPOC-0801-58

C+L 800G integrated coherent receiver based on silicon photonics

Xun Lei, Quan Cao, Chan Liu, Shichao Zhu, Bolan Liu, luluzi Lu, Xi Guo, Jiaxin Peng, Guidong Deng, Yinxue Lv

Wuhan Fisilink Microelectronics Technology Co., Lt, China

This paper shows an 128Gbaud+integrated coherent receiver (ICR) based on silicon photonics, achieving a responsivity of over 0.05 A/W and a 3dB bandwidth of over 75GHz across the entire C+L band.

15:15–15:30 · ACPIPOC-0824-2

Ultra-low-LO-power optical coherent receiver on silicon

Weichao Sun, Hengzhen Cao, Yuluan Xiang, Jin Xie, Jingshu Guo, Daoxin Dai

Zhejiang University, China

A silicon photonic coherent receiver is proposed by introducing balanced Ge/Si avalanche photodiodes. The present APD-based coherent receiver enables high-sensitivity data-receiving of the QPSK signals with low LO power of -11dBm without any equalization.

15:30–16:00 **Coffee Break**

16:00–18:00 · November 3, 2024 · Sunday

Active photonic integration and Lasers (I)

Presider: Yisu Yang, Beijing University of Posts and Telecommunications, China

16:00–16:30 · ACPIPOC-0801–70 **Invited****Output characteristics of III–V quantum dot injection microdisk lasers****Natalia Kryzhanovskaya**¹, Eduard Moiseev¹, Alexey Nadtochiy¹, Ivan Melnichenko¹, Nikita Fominykh¹, Rustam Khabibullin², Rinat Galiev², Alexander Pavlov², Ivan Makhov¹, Alexey Zhukov¹*1.HSE University, Russia; 2.Institute of Ultra High Frequency Semiconductor Electronics RAS, Russia*

In this work, we provide a comprehensive overview on the main parameters influencing output power and efficiency progress of III–V quantum dot injection microdisk lasers.

16:30–17:00 · ACPIPOC-0721–2 **Invited****Photodetector–integrated tunable MEMS vertical–cavity surface–emitting laser****Anjin Liu***Institute of Semiconductors, Chinese Academy of Sciences, China*

Tunable micro–electro–mechanical system (MEMS) VCSELs are important laser sources in optical coherence tomography (OCT), light detection and ranging (LiDAR), and so on. In this talk, I will present a photodetector–integrated tunable MEMS vertical–cavity surface–emitting laser. The device can monitor the output power when the wavelength is tuned.

17:00–17:15 · ACPIPOC-0730–43

SSC Integrated High Power Low Divergence Angle 1.3 μm InGaAlAs/InP DFB Lasers**Xinkai Xiong**^{1,2,3}, Huan Li^{1,2,3}, Daibing Zhou^{1,2,3}, Song Liang^{1,2,3}*1.Key Laboratory of Optoelectronic Materials and Devices, China; 2.Center of Materials Science and Optoelectronics Engineering, University of Chinese Academy of Sciences, China; 3.Beijing Key Laboratory of Low Dimensional Semiconductor Materials and Devices, China*

We report 1.3 μm InGaAlAs/InP high power DFB lasers integrated with a laterally tapered SSC, which have less than 10 degrees field divergence angle. The SMSR of the laser spectra is larger than 50 dB.

17:15–17:30 · ACPIPOC-0731–92

High Efficiency Tuning Method for MG–Y Lasers Based on Arc Strategy Scanning**Haosen Zhang**, Yi Huang, Chuanlu Deng, Chengyong Hu, Xiaobei Zhang, Tingyun Wang*Shanghai University, China*

We report an arc scanning strategy containing 1631 combinations of reflector currents, which can speed up the process of LUT construction. The wavelength accuracy is 0.266 pm, and the SMSRs are greater than 40 dB.

17:30–17:45 · ACPIPOC-0731–68 **Industry Innovation Nomination****Enhancing SOA Linear Performance in Coherent Systems with Tunable Gain Clamping****Iosif Demirtzioglou**, Nayla El Dahdah, Loig Godard, Abel Lorences–Riesgo, Antonin Gallet, Sheherazade Azouigui, Shuqi Yu, Ro–main Brenot, Gabriel Charlet*Huawei Technologies France SASU, France*

We demonstrate a gain–clamped SOA based on an external cavity laser that offers gain tunability and an increase in the 3–dB–gain–saturation output power with limited noise figure degradation, suitable for linear operation in coherent systems.

17:45–18:00 · ACPIPOC-0725–9

Design of a real–time Afterpulsing monitoring circuit for Single Photon Avalanche Diode**Rongjie Zhu**, Xuanke Tong, Xin Pang, Yi Zou, Shijie Deng*Guilin University of Electronic Technology, China*

In this work, a real–time afterpulsing monitoring circuit for single photon avalanche diode (SPAD) is proposed and implemented which can be used in real–time to detect the afterpulsing probability in SPAD. The circuit is based on passive quenching circuit, monostable multivibrator and FPGA and can be used for SPAD with different bias voltages (V_b). To evaluate the designed circuit, a Si SPAD, previously developed was used with an operating bias voltage of approximately 25.6V. Experimental results show that the afterpulsing effect measured using the circuit developed is very close to that measured using a TDC (Time–to–Digital Converter) instrument. The measurement differences are below 11% as the increasing of the bias voltage. The circuit developed is simple, compact and can be used to monitor the real time afterpulsing for any SPAD that enables the real–time intelligent control for maintaining a reasonable after–pulsing propobility in SPAD based photon counting system.

17:30–20:00 Welcome Reception

13:30–15:30 · November 4, 2024 · Monday

Silicon photonics (2)

Presider: Wenjing Tian, Eindhoven University of Technology, Netherlands

13:30–14:00 · ACPIPOC-0731-150 **Invited****Photonic integrated wideband polarization insensitive filters and switches****Yu Wang**, Nicola Calabretta*Eindhoven University of Technology, Netherlands*

We demonstrate polarization insensitive wideband integrated filters and switches: arrayed waveguide grating, fold-back planar Echelle grating and nanosecond wavelength selective switch using 3- μm silicon, 4×4 polymer matrix switch and hybrid integrated silicon-InP wavelength switch.

14:00–14:30 · ACPIPOC-0726-17 **Invited****Hybrid photonic integration with high-port-count optical and electrical connectivity****Wenjing Tian***Eindhoven University of Technology, Netherlands*

This invited paper explores how hybrid photonic integration empowers high-performance circuits with efficient, dense, and scalable input/output interfaces for diverse applications. Emphasis is on addressing complexity and enhancing connectivity through a self-aligned opto-electrical assembly.

14:30–15:00 · ACPIPOC-0927-2 **Invited****Progress of the vehicular FMCW LiDAR based on silicon photonics technology****Jing Wang***Southern University of Science and Technology, China*

This report reviews the technological advancements and evolution trends of long-range vehicle-mounted FMCW LiDAR, with a particular focus on the role of silicon photonics in enhancing system integration and mitigating light source nonlinearity.

15:00–15:15 · ACPIPOC-0801-24

High-efficiency 2 μm band interleaved-etch grating coupler optimized using edge optimization algorithm**Yifan Wu**^{1,2}, Yutong Wu^{1,2}, Rongxing Mao^{1,2}, Yihang Li^{1,2}, Rui Zhong¹, Ke Xu^{1,2}

1. Guangdong Provincial Key Laboratory of Semiconductor Optoelectronic Materials and Intelligent Photonic Systems, China; 2. Department of Integrated Circuits Harbin Institute of Technology, China

Optimized grating coupler for 220 nm silicon SOI platform achieves 71.7% efficiency at 2 μm . Inverse design algorithm controls grating groove edges, optimizes diffraction mode field. Interlaced-etching structure enhances performance.

15:15–15:30 · ACPIPOC-0731-230

Inverse Design of a Broadband and Compact Silicon Three-mode Multiplexer for On-chip Optical Interconnect with a 705 nm Bandwidth**Aolong Sun**¹, Xuyu Deng¹, Sizhe Xing¹, Yuqin Yuan¹, Hua Tan¹, Fangchen Hu², Ouhan Huang¹, Nan Chi¹, Junwen Zhang¹

1. Fudan University, China; 2. Zhangjiang Lab, China

We inversely design a pixelated ultra-broadband three-mode multiplexer on SOI with a record bandwidth of 705 nm. Numerical results show that loss is less than 2.03 dB over the entire wavelength range from 1458–2163 nm.

15:30–17:30 Coffee Break & Poster Session

08:30-10:00 · November 5, 2024 · Tuesday
Photodetectors and nonlinear optical devices
 Presider: Xuetao Gan, Northwestern Polytechnical University, China

08:30-09:00 · ACPIPOC-1028-1 **Invited**

Advancements in Micro-Transfer Printing for Heterogeneous Silicon Photonic Integrated Circuits

Bart kuyken

Ghent University - imec, Belgium

We will present the latest advancements in micro-transfer printing (μ TP) for heterogeneous integration in silicon photonic integrated circuits (PICs). Micro-transfer printing offers a scalable, precise, and highly versatile approach for integrating diverse prefabricated components onto silicon and/or silicon nitride platforms, establishing it as a key enabler for next-generation photonic systems-on-chip. We highlight the technology's ability to address different wavelength ranges particularly in visible, and its compatibility with various materials. We will showcase an array of high-performance devices developed through μ TP, such as lasers, uni-traveling-carrier photodiodes, lithium niobate-based modulators, electronic chiplets, etc. In addition, we are propelling μ TP towards industrial-scale production and expanding its potential for scalable photonic manufacturing.

09:00-09:15 · ACPIPOC-0730-22

Ultrafast Waveguide MUTC Photodiode with a 3dB Bandwidth of 240 GHz

Zhouze Zhang, Linze Li, Baile Chen

ShanghaiTech University, China

An evanescently-coupled waveguide modified uni-traveling carrier (MUTC) photodiode with a 3-dB bandwidth of 240 GHz is presented. It exhibits an external responsivity of 0.167 A/W and a saturation power of -6.85 dBm at 240 GHz.

09:15-09:30 · ACPIPOC-0729-2

Wide Bandwidth and High Responsivity Photodiodes Utilizing Aperiodic Distributed Bragg Reflectors

Mengjing Xu, Bing Xiong, Changzheng Sun, Jian Wang, Zhibiao Hao, Lai Wang, Yanjun Han, Hongtao Li, Lin Gan, Yi Luo

Tsinghua University, China

Modified uni-traveling-carrier photodiodes with aperiodic distributed Bragg reflectors are proposed for high responsivity and wide bandwidth. The fabricated 6- μ m diameter PD demonstrates a 3-dB bandwidth of 122 GHz with 0.29 A/W peak responsivity.

09:30-10:00 · ACPIPOC-0729-18 **Invited**

Nonlinear Optics in Suspended AlGaAs Waveguides/Resonators

Changzheng Sun

Tsinghua University, China

In this talk, we present our recent work on suspended AlGaAs-integrated nonlinear photonics, including near and mid-infrared Kerr comb generation in suspended AlGaAs microrings, and octave-spanning supercontinuum generation in straight suspended AlGaAs waveguides.

10:00-10:30 Coffee Break

10:30-12:00 · November 5, 2024 · Tuesday
Active photonic integration and Lasers (2)
 Presider: Changzheng Sun, Tsinghua University, China

10:30-11:00 · ACPIPOC-1016-6 **Invited**

Mode controlled Nanowire Laser and Its Chip-Integration

Xuetao Gan

Northwestern Polytechnical University, China

Nanowire lasers have compact structures that are easy to integrate and have extremely low power consumption. They have wide-ranging applications in on-chip communication, sensing, and detection. In the field of optical communication, the output mode of lasers is very important. For example, designing narrow linewidth and single longitudinal mode output lasers can avoid pulse broadening and signal crosstalk caused by multi-frequency output, increasing communication bandwidth. Designing lasers with different transverse modes output can increase communication capacity by mode reuse. However, existing nanowire lasers often have larger geometric dimensions to improve their optical gain, limiting their mode control. This report introduces research progress on mode control of nanowire lasers in our research group. We combined numerical simulation software to design nanowire geometric structure parameters and selectively grew InGaAs/InP quantum disk nanowires by metal organic compound chemical vapor deposition, achieving near-infrared emission and stable single longitudinal mode output nanowire lasers. In addition, by controlling the pattern of the selective growth of the graphically patterned substrate, we achieved transverse mode controllable and vector emission nanowire

vertical cavity surface emitting lasers. Lastly, the developed strategies of integrating nanowire lasers in photonic integrated circuits would be discussed.

11:00–11:30 · ACPIPOC-1016-13 **Invited**

Key Technologies for integrated microwave photonics aimed at reconfigurable broadband processing

Haowen Shu

Peking University, China

Nanowire lasers have compact structures that are easy to integrate and have extremely low power consumption. They have wide-ranging applications in on-chip communication, sensing, and detection. In the field of optical communication, the output mode of lasers is very important. For example, designing narrow linewidth and single longitudinal mode output lasers can avoid pulse broadening and signal crosstalk caused by multi-frequency output, increasing communication bandwidth. Designing lasers with different transverse modes output can increase communication capacity by mode reuse. However, existing nanowire lasers often have larger geometric dimensions to improve their optical gain, limiting their mode control. This report introduces research progress on mode control of nanowire lasers in our research group. We combined numerical simulation software to design nanowire geometric structure parameters and selectively grew InGaAs/InP quantum disk nanowires by metal organic compound chemical vapor deposition, achieving near-infrared emission and stable single longitudinal mode output nanowire lasers. In addition, by controlling the pattern of the selective growth of the graphically patterned substrate, we achieved transverse mode controllable and vector emission nanowire vertical cavity surface emitting lasers. Lastly, the developed strategies of integrating nanowire lasers in photonic integrated circuits would be discussed.

11:30–12:00 · ACPIPOC-1016-12 **Invited**

新型光子晶体面发射激光器进展与展望

Chao Peng

Peking University, China

高性能芯片的快速发展对片上互连的带宽和功耗提出了更高的要求。由于传统电互连技术正逐渐逼近物理极限，光子集成日趋成为突破片上互连瓶颈的一项颠覆性技术。面发射激光器具有结构紧凑、光束质量好，便于与芯片或光纤耦合特点，因此是一类极具优势的片上光源解决方案。近年来，利用光子晶体光场调控特性构造面发射激光器成为领域研究热点。在传统电磁优化方法的基础上，若干光子学新机理与方法，包括拓扑光子学、非厄米光子学、奇点光学等，也被用于发展新型光子晶体面发射激光器，为光通信、光计算、光传感等关键应用开辟了新途径。

报告简要介绍了光子晶体面发射激光器的最新进展，包括利用对称性破缺实现大功率、高光束质量激光，利用连续区束缚态降低激励阈值，利用拓扑机制提升激光器鲁棒性以及实现手性发射等。相关进展表明光子晶体面发射激光器具有广阔应用前景。

12:00–13:30 Lunch Break

13:30–15:30 · November 5, 2024 · Tuesday

Advanced optoelectronic integration materials and technologies(1)

Presider: Lei Wang, Peng Cheng Laboratory, China

13:30–14:00 · ACPIPOC-0801-125 **Invited**

Flexible integrated photonics for on-chip quasi-distributed sensing

Lan Li

Westlake University, China

We introduce a universal fabrication technique that allows for a wider selection of optical materials to be integrated with flexible platforms, along with a novel photonic integrated sensor design utilizing cascaded one-dimensional photonic crystal micro-cavities for on-chip quasi-distributed sensing.

14:00–14:30 · ACPIPOC-1016-10 **Invited**

CMOS Compatible Visible Band Grating and Ultraviolet Avalanche Photodiode on Silicon Photonics Platform

Yan Yang

Institute of Microelectronics of the Chinese Academy of Sciences, China

Integrated optical devices offer a scalable interface to manipulate trapped ions for quantum information processing. In this work, Si₃N₄ aperiodic addressing subwavelength grating (SWG) in visible (VIS) and ultraviolet (UV) silicon avalanche photodiode (APD) on silicon photonics platform are initially investigated and demonstrated for on-chip trapped-ion manipulation numerically and experimentally. Apodized focusing addressing SWG is designed to realize integrated optical manipulation of trapped ⁴⁰Ca⁺, which obtains a focused beam in free space at 729nm-λ experimentally. A novel structure of APD with a ridge-type Si layer based on SOI film is presented for 397nm-λ fluorescence detection.

14:30–14:45 · ACPIPOC-0805–1

Lithium tantalate photonic integrated circuits for high volume manufacturing**Zihan Li¹**, Chengli Wang¹, Johann Riemensberger², Grigory Lihachev¹, Mikhail Churaev¹, Wil Kao¹, Xinru Ji¹, Terence Blesin¹, Junyin Zhang¹, Alisa Davydova¹, Yang Chen³, Kai Huang³, Xi Wang³, Xin Ou³, Tobias Kippenberg¹*1.EPFL, Switzerland; 2.NTNU, Norway; 3.Chinese Academy of Sciences, China*

We demonstrate the first photonic integrated circuit platform using Lithium Tantalate, achieving low loss waveguides with low losses, Mach-Zehnder modulators with a voltage-length product of 4.2 V · cm, and microresonators supporting dissipative Kerr soliton generation.

14:45–15:00 · ACPIPOC-0814–37

Narrowband Fast-tunable Microring Filter Based on Micro-Transfer Printed Thin-Film Lithium Niobate on Silicon Nitride**Jinwei Su¹**, Wei Gao¹, Zekun Cui¹, Liangjun Lu^{1,2*}, Kan Wu¹, Jianping Chen^{1,2}, Linjie Zhou^{1,2}*1.State Key Laboratory of Advanced Optical Communication Systems and Networks, Shanghai Jiao Tong University, China;**2.SJTU-Pinghu Institute of Intelligent-Optoelectronics, China*

We demonstrate a fast-tunable microring filter using micro-transfer printing of a racetrack-shaped thin-film lithium niobate on the silicon nitride platform, achieving a loaded Q-factor exceeding 105 and a response time of approximately 3 ns.

15:00–15:15 · ACPIPOC-0824–1

Dense Wavelength-Division Multiplexing Transmitter Chip Based on Lithium-Niobate-on-Insulator Platform**Hongxuan Liu**, Bingcheng Pan, Daoxin Dai*State Key Laboratory for Extreme Photonics and Instrumentation Photonics, Zhejiang University, China*

We demonstrate a compact photonic chip (0.78×0.58 mm²) for DWDM transmitters on lithium-niobate-on-insulator with a channel spacing of 1.6 nm, exhibiting an excess loss of 1.3 dB and enabling 4×100-Gbps PAM4 signals generation.

15:15–15:30 · ACPIPOC-0815–94

Broadband Adiabatic Polarization Rotator-Combiner Based on Thin-Film Lithium Niobate Platform**Yuheng Pan¹**, Panpan Yu¹, Yongqian Tang¹, Xiangyang Dai², Guojiong Li¹, Juan Xia¹, Qiaoyin Lu¹, Weihua Guo¹*1.Huazhong University of Science and Technology, China; 2.Ori-chip Optoelectronics Technology LTD, China*

We propose a fabrication tolerant polarization rotator-combiner (PRC) based on thin-film lithium niobate with excellent bandwidth characteristics. The fabricated device provides a polarization extinction ratio (PER) higher than 17 dB over the whole C+L band.

15:30–16:00 Coffee Break

16:00–17:00 · November 5, 2024 · Tuesday

Advanced optoelectronic integration materials and technologies(2)

President: Zonghai Hu, Beijing University of Posts and Telecommunications, China

16:00–16:30 · ACPIPOC-1016–11 **Invited****Photolithography in wafer-scale photonic integration for compute first networking****Zizheng Cao***Peng Cheng Laboratory, China*

The need of optical interconnects driven by artificial intelligence (AI) applications is fast developing nowadays. To accelerate the development of compute first networking, wafer-scale photonic integrated circuit (PIC) is of demand. In this talk we introduce our latest research on the new lithograph tools fitting wafer-scale PIC exposure with the enhanced resolution.

16:30–16:45 · ACPIPOC-0730–58

Ultralow-Loss Micro-Transfer Printed Thin-Film Lithium Niobate on Silicon Nitride Coupler**Jinwei Su¹**, Minglu Cai¹, Zekun Cui¹, Liangjun Lu^{1,2}, Kan Wu¹, Jianping Chen^{1,2}, Linjie Zhou^{1,2}*1.State Key Laboratory of Advanced Optical Communication Systems and Networks, Shanghai Jiao Tong University, China;**2.SJTU-Pinghu Institute of Intelligent-Optoelectronics, China*

An efficient and large-tolerance ($\pm 1.5 \mu\text{m}$) coupler based on the micro-transfer printed thin-film lithium niobate on silicon nitride platform is demonstrated with insertion loss of ~ 0.1 dB/facet within a 100 nm wavelength range.

16:45–17:00 · ACPIPOC-0722–4

Broadband and Fabrication-Tolerant Mode (De)Multiplexer Using the STIRAP Technique**Yingdi Pan**, Lu Sun, Yikai Su*Shanghai Jiao Tong University, China*

We use the stimulated Raman adiabatic passage (STIRAP) technique to realize a broadband and fabrication-tolerant four-mode (de) multiplexer. The proposed device shows a broad bandwidth of 100 nm and remarkable fabrication tolerance.

Track 4: Optoelectronic Devices and Integration (Parallel Session)

The Residence 8, 2F (悦府 8, 2 楼)

13:30–15:30 · November 3, 2024 · Sunday

Micro/nano photonics and on-chip signal processing

Presider: Zihao Wang, Institute of Physics, Chinese Academy of Sciences, China

13:30–14:00 · ACPIPOC–0722–11 **Invited**

Frequency Stabilization for Microresonator-Based Optical Frequency Combs

Shihan Liu, Yanping Yang, **Zhou Heng**

University of Electronic Science and Technology of China, China

This talk reports stabilization of microresonator-based OFCs, achieving sub-Hz linewidth and $< 8 \times 10^{-16}$ Allan variance, via narrow linewidth pumping and injection locking techniques. Progress in unprecedented low-noise laser is also discussed.

14:00–14:30 · ACPIPOC–0920–1 **Invited**

Quantum Dots Comb Lasers for on-chip Optical I/O Applications and Beyond

Zihao Wang

Institute of Physics, CAS, China

The talk will focus on a high-order harmonic mode-locked laser design featuring 100/200 GHz comb line spacing, specifically optimized for integrated DWDM on-chip transmitters, achieving 1.65 pJ/bit power consumption for on-chip optical I/O applications.

14:30–15:00 · ACPIPOC–0723–9 **Invited**

Miniaturized on-chip computational spectrometer

Xuhan Guo

Shanghai JiaoTong University, China

As an advancing field, computational spectrometers offer pathways to highly compact on-chip systems for in-situ or portable measurements. These systems integrate pre-calibrated spectral encoders to process incoming spectral data. However, the interdependence of physical size, resolution, and bandwidth in spectral encoders limits miniaturization. This study explores miniaturized computational spectrometers using on-chip resonators. It includes an on-chip spectrometer with two-photon absorption in a micro-ring resonator, removing the need for a photodetector and reducing the footprint. Additionally, a spectrometer with a disordered photonic molecule and chaotic spectra can greatly improve resolution-bandwidth-footprint metrics. These spectrometers use a CMOS-compatible integrated photonics platform, representing a new paradigm in miniaturized spectroscopy.

15:00–15:15 · ACPIPOC–0729–39

Carbon Nanotube Emission Enhancement in Silicon Photonic Crystal Nanobeam Cavity

Zijun Xiao³, Jianhao Zhang¹, Weiwei Zhang², Carlos Ramos³, Daniele Melati³, Delphine Marris-Morini³, Eric Cassan³, Arianna Filoramo⁴, Nicolas Dubreuil⁵, Laurent Vivien³

1. National Research Council Canada, Canada; 2. Songshan Lake materials Laboratory, China; 3. Université Paris Saclay, France; 4. French Alternative Energies and Atomic Energy Commission, France; 5. Institut d'Optique Graduate School, France

We demonstrate a significant enhancement in photoluminescence from carbon nanotubes when integrated with a side-coupling silicon photonic crystal air mode nanobeam cavity. The cavity with ultralow mode volume exhibits high coupling efficiency and Purcell factor.

15:15–15:30 · ACPIPOC–0730–67

A Multicore and Multimode Optical Demultiplexer for Orbital Angular Momentum-based Spatial and Mode Division Multiplexing

Zituo Wu, Lixun Wu, Weihang Zhong, Zhouxin Liang, Yujie Chen

Sun Yat-sen University, China

We design a multicore and multimode optical demultiplexer based on multi-plane light conversion, and verify the feasibility of this scheme for orbital angular momentum-based (OAM) space division multiplexing. We fabricate a diffractive optical element with double-sided patterns on two quartz plates.

15:30–16:00 Coffee Break

16:00-18:00 · November 3, 2024 · Sunday
Optoelectronic Integration and Co-design

Presider: Nan Qi, Institute of Semiconductors, Chinese Academy of Sciences, China

16:00-16:30 · ACPIPOC-1016-9 **Invited**

Chiplet Optical I/O for High-Performance Computing

Nan Qi

Institute of Semiconductors, Chinese Academy of Sciences, China

The emerging AI computing asks for high bandwidth, high-density and low-power interconnects. The CMOS-compatible photon-electronic converged optical-I/O enables large-scale multi-channel chip integration. This talk focuses on the co-design techniques of silicon photonics and CMOS integrated electronics, exploring the promising techniques to achieve Tb/s per-chip bandwidth, pJ/bit power efficiency. The recent advances in this area will be reported, technological trends will also be discussed.

16:30-16:45 · ACPIPOC-0730-30

A Low Temperature Drift Bandgap Reference Structure Undervoltage Lockout Circuit

Gaoju Zhang, Xihu Wang, Xin Wang, Hongqian Dong

Xi'an University of Posts and Telecommunications, China

Improved UVLO circuit eliminates external references, uses bandgap structure, and achieves low temperature drift, enhancing reliability and reducing power consumption.

16:45-17:00 · ACPIPOC-0813-11

A high-stability and fast-transient response LDO design

Long Ma¹, Xihu Wang¹, Yibo Wang², Hongqian Dong¹

1. Xi'an University of Posts and Telecommunications, China; 2. Northeastern University, China

In this paper, a low-dropout linear regulator with a transient enhancement circuit is designed to improve the load transient response, and the simulation results are given.

17:00-17:15A · CPIPOC-0807-3

8-inch wafer level through glass via (TGV) interposer with 110-GHz bandwidth facing 128-GBaud 2.5D co-packaged optics (CPO)

Chang Ge¹, Xinyi Wang¹, Jiangbing Du¹, Xiaozhong Lin², Ting Lei³, Luping Du², Zuyuan He¹

1. Shanghai Jiao Tong University, China; 2. Shenzhen Photonics Valley Technology Co., LTD, China; 3. Shenzhen University, China

TGV interposer fabricated by 8-inch glass wafer with 110-GHz bandwidth and 128-GBaud OOK signal interconnection is presented. Flip-chip packaging of EML and EIC chips were realized, proving great potential in 2.5D CPO applications.

17:15-17:30 · ACPIPOC-0802-3

Silicon-based Quantum Dot Comb Laser and Micro Ring Modulator Array Empowered Compact Optical Interconnect

Jiajian Chen¹, Bo Yang², Xiangru Cui², Jiale Qin², Zihao Wang², Ting Wang², Changyuan Yu³, Jianjun Zhang²

1. Songshan Lake Materials Laboratory, China; 2. Institute of Physics, Chinese Academy of Science, China; 3. The Hong Kong Polytechnic University, Hong Kong, China

We demonstrate silicon-based quantum dot comb laser and micro ring modulator array-based transmitter with 6 × 32 Gbps transmission capacity with bit error rate of 3e-5, exhibiting reliable performance up to 80 °C.

17:30-18:00 · ACPIPOC-1016-7 **Invited**

Integrated waveguide Bragg grating devices and applications

Zejie Yu

Zhejiang University, China

Waveguide Bragg grating devices have many applications such as dispersion control, filters, wavelength division and multiplexing, etc. Here, we discuss a high-order mode assisted waveguide Bragg grating devices which avoid the circulator to separate input and reflected light. Different kinds of applications including large-scale dispersion control, coarse/dense wavelength division and multiplexing, and large-capacity optical transmitters were demonstrated.

17:30-20:00 Welcome Reception

08:30–10:00 · November 5, 2024 · Tuesday
Nanophotonic devices and system integration
Presider: Weiwei Zhang, Songshan Lake Materials Laboratory, China

08:30–09:00 · ACPIPOC-0731–60 **Invited**

Realtime characterization of indistinguishability between two photons with a multiport metasurface

Jihua Zhang

Songshan Lake Materials Laboratory, China

We inversely design and experimentally demonstrate a multiport metasurface that realizes an ultra-stable multiport interferometer and enables realtime characterization of the indistinguishability between two photons in a single shot with a fidelity over 98.4%.

09:00–09:30 · ACPIPOC-1016–5 **Invited**

Gassing up the potential for mid-infrared on-chip gas sensing

Zhenzhou Cheng

Tianjin University

Mid-infrared (mid-IR) silicon photonics has been widely explored for developing on-chip gas sensors. However, conventional mid-IR silicon photonic integrated circuits usually suffer from moderate performance and trade-off between low optical losses and significant evanescent fields. In this talk, I present our efforts to develop novel suspended nanomembrane silicon (SNS) waveguide devices to overcome the limitation. As for the light coupling between optical fibers and SNS waveguides, we studied that a subwavelength grating (SWG) coupler has an experimental coupling efficiency of -5.5 dB at a wavelength of $2.27\ \mu\text{m}$ with a 1-dB bandwidth of ~ 160 nm and a back reflection of -21.2 dB. Moreover, we achieved an SWG-cladding SNS waveguide microring resonator with a high intrinsic quality factor of 6×10^5 and an extraordinarily large confinement factor of $\sim 80\%$ in air. Based on the proposed SNS waveguide devices, we demonstrated on-chip gas refractive index sensing with a large dynamic sensing range spanning from 0% to 100% with a high resolution of better than 4%. Our results open new possibilities for the development of unprecedented nanophotonic integrated circuits with a broad range of sensing applications.

09:30–09:45 · ACPIPOC-0801–119

Monolithic Integration of a Tunable laser and a Grating Antenna with Large Steering Angle on InP Substrate

Limeng Zhang¹, Marco Gagino¹, Millan-Mejia Alonso², Erwin Bente¹, Kevin A. Williams¹, Victor Dolores Calzadilla¹

1.Eindhoven University of Technology, Netherlands; 2.SMART Photonics, Netherlands

We present a monolithically integrated widely tunable laser with a surface emission grating antenna on InP substrate. It exhibits a large steering angle exceeding 9.6° and an angular resolution better than 0.05° .

09:45–10:00 · ACPIPOC-0730–6

Wavelength-Locked, Widely Tunable Laser through Self-Injection-Locking a DBR Laser to High-Q Integrated Resonator

Qingshuai Su¹, Fang Wei², chen chen¹, Haoyang Pi¹, Xiangyue Li¹, Haiwen Cai²

1.Shanghai Institute of Optics and fine Mechanics, Chinese Academy of Sciences, China; 2.Zhangjiang Laboratory, China

We propose a wavelength-locked laser through self-injection-locking a DBR laser to high-Q Si_3N_4 resonator, exhibiting full C-band tuning with narrow linewidth, and frequency deviation of 107 channels from the ITU-grid less than ± 1.5 GHz.

10:00–10:30 Coffee Break

10:30-12:00 · November 5, 2024 · Tuesday
Modulators and high-speed PIC applications

Presider: Lei Zhang, Beijing University of Posts and Telecommunications, China

10:30-11:00 · ACPIPOC-0801-43 **Invited**

Advances in silicon modulators for high speed optical interconnects

Weiwei Zhang

Songshan Lake Materials Laboratory, China

This talk will focus on recent advancement of silicon-based optical modulators for mass-producible Tb/s-scale inter-rack, intra-rack interconnects, free space and quantum communication applications.

11:00-11:15 · ACPIPOC-0728-17

High-performance Calibration-free 4×4 Mach-Zehnder Switches

Xiaomin Jiao, Lijia Song, Huan Li, Daoxin Dai

Zhejiang University, China

We have demonstrated calibration-free 4×4 Mach-Zehnder switches (MZSs), featuring a low excess loss of <1 dB across 25-nm bandwidth and a low crosstalk of <-18 dB across C-band even without any calibration.

11:15-11:30 · ACPIPOC-0706-1

Fully-analog Automatic Bias Controller for Electro-optic Modulator

Junlie Hu¹, Yifei Wang¹, Yanmei Lin¹, Wei Liang¹, Wei Ke², Siyuan Yu¹, Zhongjin Lin¹, Xinlun Cai^{1,3}

1.State Key Laboratory of Optoelectronic Materials and Technologies, School of Electronics and Information Technology, Sun Yat-sen University, China; 2.Liobate Technology Co., LTD, China; 3.Hefei National Laboratory, China

We present an automatic bias controller by completely using analog circuit which maintains the bias point of the thin-film lithium niobate modulator within $\pi/2 \pm 0.016$ rad under a bias disturbance of 3140 rad/s.

11:30-11:45 · ACPIPOC-0731-109

Gradient-Based Control Strategy for Microring Modulator Wavelength Stabilization Under Thermal Perturbation

Juan Chen¹, Zhen Chen¹, Junbo Zhu¹, Linqi Cheng¹, Chao Li¹, Zhixue He¹, Jia Liu¹, Lei Wang¹, Xi Xiao^{1,2}

1.Pengcheng Laboratory, China; 2.National Information Optoelectronics Innovation Center, China

We propose and demonstrate a gradient-based thermal control strategy to resolve the auto-alignment and tracking challenges of microring modulator wavelength against temperature fluctuations. Wavelength stabilization have been achieved at different desired operating points of the received mean optical power while applied 42-Gb/s electrical signal. Experimental results show that the optimal performance of the microring modulator in high-speed transmission is observed at the operating point where the measured mean optical power gradient by monitoring the through port is at its maximum.

11:45-12:00 · ACPIPOC-0814-63

Modulation Voltage Swing Adaptive Microring Resonant Wavelength Locking Technique

Han Wang, Wenjia Zhang

Shanghai Jiao Tong University, China

This paper proposes a modulation voltage swing adaptive microring wavelength locking method. The effect of swing on average optical power versus wavelength curve is analyzed through simulation and the method is experimentally validated with STM32.

Track 5: Microwave Photonics and Optical Signal Processing

Regency Ballroom B, 2F (宴会厅 B 厅, 2 楼)

13:30-15:30 · November 3, 2024 · Sunday
Advanced Photonic Systems and Applications
Presider: Xiaoxiao Xue, Tsinghua University, China

13:30-14:15 · ACPIPOC-1010-2 **Keynote**

Integrated Microwave Photonics for Phased Array Antenna Beamforming

Maurizio Burla

Technical University Berlin, Germany

Optical techniques for radio frequency antenna beamforming have been first proposed in the early 1990s, to provide large amounts of tunable delays over a broad instantaneous bandwidth for phased array radars. With the recent, enormous progress of radio frequency integrated circuits and printed circuit boards, optical beamforming techniques went out of the spotlight. However, today we see a re-surgence of interest toward this approach, mainly driven by the need of flexible antenna beam control at sub-THz frequencies for next generation wireless communications, and by the progress in photonic integration. Starting from a brief history of the topic, this talk will provide an insight of the current trends and a perspective for the future of optical beamforming.

14:15-14:45 · ACPIPOC-0624-2 **Invited**

Large Scale Photonic Computing on Silicon Photonic Platform

Jianji Dong

Huazhong University of Science and Technology, China

In this talk, I will show some advances on Large Scale Photonic Computing on Silicon Photonic Platform, such as ising machine, recurrent network, and diffractive network.

14:45-15:00 · ACPIPOC-0713-1

Optimized Design of a 32-Core Heterogeneous Fiber for Nonuniform Delay Line Applications

Mario Annier González Pérez

ITEAM/UPV, Spain

This study presents a 32-core heterogeneous fiber design using optimization algorithms for nonuniform delay line microwave applications. Simulations analyze its performance in a bandpass filter, Hilbert transformer, and phase encoder, including group delay error impacts.

15:00-15:15 · ACPIPOC-0801-60

Hybrid Dual wavelength digital holography method combining beat frequency and constrained underdetermined equations

Tianwei Zuo¹, Tuo Li^{1,2}, Duo Zhang^{1,2}, Junhao Zhang^{1,2}, Qian Zhang^{1,2}

1. Xi'an University of Posts and Telecommunications, China; 2. School of Electronic Engineering, China

This paper proposes a hybrid dual-wavelength digital holography (DWDH) method. By combining the beat frequency with the constrained underdetermined equations, the proposed hybrid DWDH use the constrained underdetermined equations method to reconstruct the thickness beyond a synthetic wavelength, and use the beat frequency method to retrieve the thickness within the synthetic wavelength. This design of the proposed method can improve the execution efficiency of constrained underdetermined equation. Simulation results verify that this method can extend the measurement range beyond the synthetic wavelength and reduce the computational time when reconstructing high-thickness samples. Experimental results also demonstrate the validity of the proposed method. This method is suitable for scenarios that high methodic computation speed is required. It is also applicable in situations where the maximum sample thickness exceeds one synthetic wavelength but occupies a relatively small area, and high imaging speed is necessary.

15:15-15:30 · ACPIPOC-0816-4

Stable Transmission of Optically Carried Microwave Signals Using Temperature-controlled Fiber Delay Line

Guoying Zheng, Wei Wei, Zhuoran Li, Jinping Xiao, Weilin Xie, Yi Dong

Beijing Institute of Technology, China

We present a stable optically carried microwave transmission system utilizing a temperature-controlled fiber delay line, achieving a delay jitter of 27.8 fs and eliminating non-uniform delay variations in 1 THz-spaced dual-channel signals.

15:30-16:00 Coffee Break

16:00–18:00 · November 3, 2024 · Sunday

Microwave photonic signal processing

Presider: Jianji Dong, Huazhong University of Science and Technology, China

16:00–16:30 · ACPIPOC-0930-3 **Invited****Compact Signal Processing exploiting Dispersion Diversity in Space-Division Multiplexing Fibers****Ivana Gasulla***Universitat Politècnica Valencia, Spain*

This invited paper explores novel space-division multiplexing optical fibers for signal processing applications, leveraging spatial parallelism and dispersion diversity for tunable true-time delay line operation with increased compactness and versatility.

16:30–17:00 · ACPIPOC-0814-52 **Invited****Time-frequency self-injection locked ultra-linear frequency-swept laser****Xiaoxiao Xue**, Jichen Zhang, Shangyuan Li, Xiaoping Zheng*Tsinghua University, China*

Frequency-swept laser is a key component for wideband microwave photonic signal generation and LiDAR ranging. Here we demonstrated a novel time-frequency self-injection locked DFB laser with a record-low relative frequency nonlinearity.

17:00–17:15 · ACPIPOC-0722-6

Deep Photonic Time-delay Reservoir Computing for Information Processing Acceleration**Jiahao Zhang**¹, Lu Zhang¹, Xiaodan Pang^{2,3,4}, Oskars Ozolins^{2,3,4}, Xianbin Yu¹

1.Zhejiang University, China; 2.KTH Royal Institute of Technology, Sweden; 3.RISE Research Institutes of Sweden, Sweden; 4.Riga Technical University, Latvia

We propose deep photonic time-delay-reservoir-computing for accelerated information processing. Experimental evaluation using image classification demonstrated a sixfold increase in processing speed with only a 0.6% performance degradation, while conventional TDRC experiences a 5.5% performance degradation.

17:15–17:30 · ACPIPOC-0731-71

Microwave Photonic Segment Reception for Broadband Millimeter-Wave Signal**Jingxin Zhang**, Hanxiao Xue, Lingxiao Li, Zhennan Zheng, Xinlu Gao, Shanguo Huang*Beijing University of Posts and Telecommunications, China*

We propose a novel microwave photonics segment reception scheme for broadband mm-wave signal. The scheme divides the mm-wave signal into four parts for detection and recovery through narrowband receivers, successfully simulating a 40 GBaud signal.

17:30–17:45 · ACPIPOC-0804-4

Optimized Frequency Offset Estimation Scheme Using Short Symbol Block Based on Training Sequence for Coherent Free-Space Optical Communication**Siqi Zhang**, Liqian Wang, Kunfeng Liu, Shuang Ding*Beijing University of Posts and Telecommunications, China*

For training sequence, a frequency offset estimation (FOE) optimization scheme using a single short symbol block is proposed to accomplish FOE. The results show that the residual FOE complexity is about 17% of FSTS.

17:45–18:00 · ACPIPOC-0814-5

An optical phased array system with a controllable main lobe and null**Shangzhe Xu**¹, Xiangchuan Wang¹, Xi Liu¹, Lihan Wang¹, Zhijian Zhang², Shilong Pan²

1.Nanjing University of Aeronautics and Astronautics, China; 2.National Key Laboratory of Microwave Photonics, China

A wideband optical phased array system with the main lobe and null controlled independently is proposed. The main lobe and null can be steered at least $\pm 40^\circ$ while null depth is larger than 60 dB.

17:30–20:00 Welcome Reception

13:30–15:45 · November 4, 2024 · Monday

Terahertz technologies and applications

Presider: Yuan Yu, Huazhong University of Science and Technology, China

13:30–14:15 · ACPIPOC-0723-1 **Keynote****Terahertz semiconductor laser frequency combs****Hua Li***Shanghai Institute of Microsystem and Information Technology, Chinese Academy of Sciences, China*

The terahertz quantum cascade laser (QCL) has been proved to be suitable for frequency comb and dual-comb operations. In this work, I will review our recent progress on the chip-scale terahertz frequency combs.

14:15–14:45 · ACPIPOC-0731-10 **Invited****Recent research activities for a sub-terahertz band indoor network based on photonics technology****Seung-Hyun Cho**, Minkyu Sung, Sang-Rok Moon, Sooyeon Kim, Wonkyoung Lee, Joon Ki Lee*ETRI, Korea*

We introduce our recent research activities to configure a sub-terahertz band indoor network based on photonics technology.

14:45–15:15 · ACPIPOC-0813-1 **Invited****Research on integrated high-Q terahertz resonator and sensing applications****Liao Chen**¹, Zhibo Hou¹, Xiaojun Wu², Xinliang Zhang¹*1. Huazhong University of Science and Technology, China; 3. Beihang University, China*

The terahertz spectrum is a powerful method to identify substances. We demonstrate the recent progress in the integrated high-Q terahertz resonator and enhancement in the terahertz vibrational absorption spectroscopy.

15:15–15:30 · ACPIPOC-0723-19

Laser Linewidth Tolerance for Multiple Modulation Formats in Photonics-assisted THz Wireless System at 320 GHz**Zhigang Xin**^{1,2}, Jiao Zhang^{1,2}, Min Zhu^{1,2}, Xiang Liu^{1,2}, Weidong Tong^{1,2}, Qing Zhong¹, Mingzheng Lei², Junjie Ding², Yuancheng Cai^{1,2}, Xingyu Chen², Yucong Zou², Jianjun Yu^{2,3}*1. Southeast University, China; 2. Purple Mountain Laboratories, China; 3. Fudan University, China*

We experimentally evaluate the robustness of laser linewidth on 46/28/23 GBaud QPSK/16QAM/32QAM signals in photonics-assisted THz communication system, respectively. The maximum tolerance of linewidth is 5 MHz for a net bit rate of 230 Gbit/s.

15:30–15:45 · ACPIPOC-0708-3

The Impact of Laser Linewidth on Fiber-THz Multi-Users Broadband Wireless Access Network Employing Digital Subcarrier Multiplexing**Weidong Tong**¹, Jiao Zhang², Min Zhu^{1*}, Zhigang Xin¹, Xiang Liu¹, Yunwu Wang¹, Junjie Ding², Mingzheng Lei², Yuancheng Cai², Xingyu Chen², Yucong Zou², Jianjun Yu²*1. Southeast University, China; 2. Purple Mountain Laboratories, China*

We experimentally investigate the laser linewidth impacts on the digital subcarrier multiplexing system supporting photonics-assisted Terahertz broadband wireless access for multi-user scenarios. Results show that different subcarriers of SCM are similarly affected by laser linewidth.

15:45–17:30 Coffee Break & Poster Session

08:30–10:00 · November 5, 2024 · Tuesday
Photonic integrated circuits & devices (I)
 Presider: Jiejun Zhang, Jinan University, China

08:30–09:15 · ACPIPOC–0926–4 **Keynote**

Photonic Integrated Circuits for Microwave Sensing and Communications

Xihua Zou

Southwest Jiaotong University, China

This talk will introduce a few cutting-edge photonic integrated circuits (PICs) developed for versatile microwave sensing, radar and communications in our group, including dense wavelength multiplexers (AWGs), broadband modulators, high-speed photodetectors, and on-chip subsystems.

09:15–09:45 · ACPIPOC–1010–4 **Invited**

Microwave photonics in Large-Scale Distributed Coherent Radar

Weifeng Zhang

Beijing Institute of Technology, China

The rapid advancement of radar systems has led to the development of large-scale distributed coherent radar (DCR) systems, which offer enhanced spatial resolution, extended detection range, and superior target detection capabilities. However, the challenges posed by the need for precise synchronization and signal coherence across widely distributed radar nodes require innovative technological solutions. Microwave photonics, with its inherent advantages in wideband signal processing, low-loss transmission, and immunity to electromagnetic interference, provides a promising approach to addressing these challenges.

In this talk, I will discuss the microwave photonic techniques employed in large-scale DCR systems. Key areas of focus include photonic-assisted generation, distribution of coherent microwave signals, and optical 3D imaging, which enable accurate time synchronization and phase coherence among distributed radar elements.

09:45–10:00 · ACPIPOC–0731–59

Silicon microwave photonic multi-beamforming network based on wavelength-selective tunable delay lines

Yixuan Wang, Liangjun Lu, Ziheng Ni, Wei Gao, Linjie Zhou, Jianping Chen

Shanghai Jiao Tong University, China

We present a microwave photonic multi-beamforming network based on wavelength-selective tunable delay lines. A 6-bit wavelength-selective tunable delay line based on microring-assisted Mach-Zehnder interferometers is designed and fabricated, which can support 4 beams.

10:00–10:30 Coffee Break

10:30–12:00 · November 5, 2024 · Tuesday
Photonic integrated circuits & devices (II)
 Presider: Weifeng Zhang, Beijing Institute of Technology, China

10:30–11:00 · ACPIPOC–0813–10 **Invited**

Two-Dimensionally Coupled Optical Switch Networks for Compact and Reconfigurable Matrix Operations

Jiejun Zhang, Sheng Dong, Junyi Zhang, Jianghai Wo

Jinan University, China

A novel two-dimensional optical switch network enables compact, reconfigurable matrix operations with linear scaling. We demonstrate a silicon photonic 8×8 matrix operator with applications in microwave communication signal processing and AI-assisted biomedical segmentation.

11:00–11:30 · ACPIPOC–0815–65 **Invited**

Ultra-High-Q Microring Resonators and Their Applications in Microwave Photonics

Yuan Yu, Xinliang Zhang

Huazhong University of Science and Technology, China

The design of ultra-high-Q microring resonators and their applications in microwave photonics, including microwave photonic filters and optoelectronic oscillators, are introduced.

11:30–11:45 · ACPIPOC–0731–222

Multiband Linearly Frequency-Modulated Signal Generation Based on an Optical Integrated Cascade Microring Filter**Zheng Wang**, Zikai Yin, Haoyan Xu, Feifei Yin, Yitang Dai, Kun Xu*Beijing University of Posts and Telecommunications, China*

A multiband linear frequency-modulated generation scheme based on an integrated cascade microring filter is proposed. LFM signals cover S, C, Ku bands with a bandwidth of 1 GHz, which can switch between each other.

11:45–12:00 · ACPIPOC–0731–199

Hybrid Integrated Multi-lane Erbium-doped Si₃N₄ Waveguide Amplifiers**Zheru Qiu¹**, Xinru Ji¹, Yang Liu¹, Xuan Yang¹, Martin Hafermann¹, Taegon Kim², Joseph C. Olson², Rui Ning Wang¹, Carsten Ronning³, Tobias Kippenberg¹*1. EPFL, Switzerland; 2. Applied Materials, United States; 3. Friedrich Schiller University Jena, Germany*

We present the integration of four individual erbium-doped waveguide optical amplifiers on a Si₃N₄ photonic integrated circuit hybrid integrated with a four-lane semiconductor pump laser diode chip. Each amplifier achieves 15 dB on-chip gain and 15 mW on-chip output power.

12:00–13:30 Lunch Break

13:30–15:30 · November 5, 2024 · Tuesday
Microwave Photonics and Radar Systems
 Presider: Jia Ye, Southwest Jiaotong University, China

13:30–14:00 · ACPIPOC–0723–13 **Invited****Temporal Dissipative Solitons in Optoelectronic Oscillator****Zhiyao Zhang***University of Electronic Science and Technology of China, China*

In this talk, the research on externally-triggered temporal dissipative soliton with controllable morphology from Microwave Photonic Research Center of University of Electronic Science and Technology of China will be introduced.

14:00–14:30 · ACPIPOC–0814–29 **Invited****Integrated on-chip millimeter wave photonics multifunctional radar transceiver based on Thin Film Lithium Niobate****Sha Zhu¹**, Jiaxue Feng², Ninghua Zhu¹*1. Nankai University, China; 2. Beijing University of Technology, China*

We proposed an integrated on-chip thin film lithium niobate millimeter wave photonic radar based on two electro-optic modulators with large bandwidth and low half-wave voltage, which achieves centimeter-resolution for measurement of range, velocity, and imaging.

14:30–14:45 · ACPIPOC–0731–164

Photonic generation of Nyquist pulse based on time-domain jointing**Xiaohong Lan**, Yang Jiang, Jing Xu, Jinjian Feng, Qianyou Long, Yunkun Luo*Guizhou University, China*

A novel method for optically generating Nyquist pulses is proposed and experimentally demonstrated. Nyquist pulse, characterized by a distinct single main lobe and multiple sidelobes, can be synthesized by jointing together these independently generated lobe and sidelobes in time domain. Starting with a Gaussian pulse, it is split into multiple paths. One path undergoes appropriate dispersion to broaden the pulse to act as the main lobe, while the remaining paths are subject to simple power attenuation and time delay to serve as the corresponding sidelobes. The lobe and sidelobes are eventually jointed in time domain to generate the desired Nyquist pulse. Compared to the prevalent generation methods based on optical frequency combs (OFCs), this approach is more intuitionistic and effectively avoids the complicated spectral line manipulation, which offers a new idea for Nyquist pulse generation.

14:45–15:00 · ACPIPOC–0801–142

Dual-Band Microwave Photonic Imaging Radar Based on Optical Frequency Combs and Polarization Multiplexing**Yu Sun**, Dan Zhu, Jiewen Ding, Zhao Zhang, Xianqin Ke, Shilong Pan*Nanjing University of Aeronautics and Astronautics, China*

A dual-band microwave photonic radar based on optical frequency combs and polarization multiplexing is proposed and demonstrated. The radar can generate and process linear frequency modulated signals in dual bands simultaneously. ISAR imaging is also experimentally implemented.

15:00–15:15 · ACPIPOC-0814-65

An Enhanced Velocity Measurement of Coherent Lidar Based on Time-Domain Compensation and Phase Compensation**Xianzhuo Li¹**, Nan Ye¹, Junjie Zhang¹, Zhiyong Lu², Haoming Yuan², honghui Jia², Wenzhong Liu¹, Kun Chen¹, Yingchun Li¹*1. Shanghai University, China; 2. Key Laboratory of Space Laser Transmission and Detection Technology, Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, China;*

We propose an enhanced speed detection method that reduces computational resource. Measurements of targets at 18.5 km show that the average speed detection probability increases by 49.17%, and the average speed mean square error decreases by 35.32%.

15:15–15:30 · ACPIPOC-0430-1

High spectral purity millimeter-wave generated from millihertz-linewidth lasers**Zhengyuxiao Yang¹**, Haocheng Ke¹, Yanlan Xiao¹, Houchen Li², Huashun Wen³, Heng Zhou¹*1. University of Electronic Science and Technology of China, China; 2. Institute of Advanced Millimeter-Wave Technology, University of Electronic Science and Technology of China, China; 3. State Key Laboratory on Integrated Optoelectronics, Institute of Semiconductors, Chinese Academy of Sciences, China*

We demonstrate photonic-assisted tunable millimeter-wave generation via heterodyne beating of two common-cavity Brillouin lasers with sub-millihertz (0.1 mHz) fundamental linewidth, the measured phase noise of multi-frequency millimeter-wave carriers are down to -110 dBc/Hz@1 kHz offset; -130 dBc/Hz@10 kHz offset, the lowest reported to date.

15:30–16:00 Coffee Break**16:00–17:30 · November 5, 2024 · Tuesday****Optical Communications and sensings****Presider: Zhiyao Zhang, University of Electronic Science and Technology of China, China**16:00–16:30 · ACPIPOC-0731-118 **Invited****Radio over fiber: Convergence between radio and optical systems****Atsushi Kanno***Nagoya Institute of Technology, Japan*

Radio over fiber for seamless conversion between radio and optical systems are evolved with advanced device technologies. The paper reviews the RoF systems for mobile xHauls, clock distribution, and other use cases.

16:30–17:00 · ACPIPOC-1010-3 **Invited****Machine Learning-Driven Modeling and Optimization for Microwave Photonic Systems****Jia Ye***Southwest Jiaotong University, China*

This presentation discusses the latest advancements in machine learning (ML)-driven modeling techniques for microwave photonic (MWP) systems. Using models like Transformer, FTnet, and self-supervised learning frameworks, these methods enable high-fidelity system modeling, efficient demodulation, and end-to-end (E2E) optimization. ML-driven modeling decreases the need for complex expertise, significantly accelerating model execution while efficiently integrating with actual experimental data. These techniques exhibit exceptional performance in compensating for nonlinear impairments and dispersion. Moreover, the E2E optimization improves system performance and security.

17:00–17:15 · ACPIPOC-0723-10

Photonics-enabled full-duplex millimeter-wave integrated sensing and communication**Can Wang**, Zhidong Lyu, Lu Zhang, Xianbin Yu*Zhejiang University, China*

This paper proposes a co-frequency and co-time full-duplex integrated-sensing-and-communication system that utilizes optical-domain millimeter-wave self-interference cancellation (SIC), numerically achieving over 40 dB SIC and realizing communication with accurate radar sensing, effectively doubling spectrum utilization.

17:15–17:30 · ACPIPOC-0801-47

Multi-Access Optical Wireless Communications Employing Time-Slot Coding Enabled by High-Precision Clock Data Recovery**Jianghao Li¹**, Zhaopeng Xu², Junyu Wu¹, Dayu Shi¹, William Shieh¹*1. Westlake University, China; 2. Peng Cheng Laboratory, China*

A high-precision clock data recovery scheme is proposed and demonstrated for multi-access optical wireless communications using time-slot coding. With the help of the scheme, the BER of different users reaches below the 7% HD-FEC limit.

Track 6: LEDs, Photovoltaics, and Optoelectronics in Energy

The Residence 1, 2F (悦府 1, 2 楼)

13:30–15:30 · November 3, 2024 · Sunday

Photodetector and Devices

Presider: Guohua Xie, Xiamen University

13:30–14:00 · ACPIPOC-0925-7 **Invited**

A metasurface Ge PIN photodetector with high Gain and ultra-high responsivity at 1550nm

Zingway Pei

Chung Hsing University

We presented an ultra-high responsivity (8A/W) Ge PIN photodetector for 1550 nm mid-infrared photodetection at room temperature. A photon harvest efficient metasurface and an internal gain structure accomplish the high responsivity.

14:00–14:30 · ACPIPOC-0925-5 **Invited**

Bioinspired Polymeric Quantum Bits

Mingfeng Wang

The Chinese University of Hong Kong, Shenzhen

In this talk, I will present our recent research progress on molecular design, synthesis and processing of polymers inspired by certain biological quantum systems such as fluorescent proteins and light-harvesting complexes.

14:30–15:00 · ACPIPOC-0719-5 **Invited**

Self-Powered Gallium Oxide-Based Solar-Blind Deep Ultraviolet Detectors for Energy-Efficient Optoelectronics

Zhenping Wu

Beijing University of Posts and Telecommunications

Ga₂O₃ thin films enable self-powered solar-blind DUV detectors with high sensitivity and selectivity (200–280 nm). Leveraging Ga₂O₃'s unique properties, these detectors advance energy-efficient optoelectronic applications, offering significant performance improvements.

15:00–15:30 · ACPIPOC-0925-11 **Invited**

Use of Recycling-Refection CPEF to Improve color saturation of Full-Color Micro-LEDs

ChingLin Li

Chung Cheng University

During the color conversion between micro-LEDs and QDs, the QDs are unable to fully absorb the incident wavelengths. This paper proposes use of a RCPEF to reflect the incident wavelength, thereby preventing wavelength mixing after QD conversion.

15:30–16:00 Coffee Break

16:00–17:30 · November 3, 2024 · Sunday

Organic Photoelectronic

Presider: Zhiting Ye, Chung Cheng University

16:00–16:30 · ACPIPOC-0925-4 **Invited**

Solution-processed organic LEDs

Guohua Xie

Xiamen University

Organic LEDs (OLEDs) have many promising applications in active matrix displays, solid-state lighting, visible light communication, and medical treatment. We managed to demonstrating highly efficient solution-processed OLEDs via spin-coating, inkjet printing, and transfer printing, respectively.

16:30-17:00 · ACPIPOC-0925-6 **Invited****Synergetic Interface Engineering on Blue Perovskite Light-Emitting Diodes****Yanqing Li***East China Normal University*

Here, we demonstrate an efficient device architecture to synergistically reduce the energetic losses during electron-photon conversion and boost the extraction of trapped light in the device.

17:00-17:30 · ACPIPOC-1003-2 **Invited****LED Lighting and Microdisplay with Advanced Packaging and MEMS Technology****Shih-Hung Lin¹, Chun-Wei Tsai²***1. Yunlin University of Science and Technology (YunTech); 2. NNU*

In this study, LED packaging solutions are designed and manufactured by micro-electro-mechanical systems (MEMS) technology, redistribution layer (RDL) technology, silicon interposer technology, flip chip bonding technology, through silicon via (TSV) technology, and LED technology, etc.

17:30-20:00 Welcome Reception

13:30-15:30 · November 4, 2024 · Monday
Perovskite
 Presider: Huan Liu, Beihang University

13:30-14:00 · ACPIPOC-0731-54 **Invited****Efficient and ultra-stable perovskite light-emitting diodes****Dawei Di***Zhejiang University*

We present our recent progress in the development and understanding of efficient, bright and stable light-emitting diodes based on perovskite semiconductors.

14:00-14:30 · ACPIPOC-0720-1 **Invited****Colloidal technology of semiconductor halide perovskites for efficient devices****Jianjun Tian***University of Science and Technology Beijing*

We recently focused on the research of colloidal technology fabrication of novel perovskite semiconductor films and strong quantum confined nanocrystals for the LEDs, detectors and solar cells. We control the crystal orientation growth by multi-molecular coordination system to achieve low dimensional semiconductor epitaxial and monocrystalline films, thus obtaining efficient solar cells, detectors and LEDs. Furthermore, we develop synthesis of colloidal perovskite nanocrystals using ligand engineering, thus achieving strongly confined nanocrystals with 9% size dispersion and near-unity photoluminescence yield, demonstrating high color purity and promising for display application. The perovskite LEDs based on such nanocrystals displayed high external quantum efficiency more than 25%.

14:30-15:00 · ACPIPOC-0722-24 **Invited****Efficient tin-based perovskite light-emitting diodes****Nana Wang***Nanjing Tech University*

Environmentally friendly tin (Sn) perovskites have received considerable attention due to their great potential for replacing their toxic lead counterparts in applications of photovoltaics and light-emitting diodes (LEDs). Here, I will talk about our recent progress in Sn-based perovskite LEDs, focusing on spin-coating epitaxial heterodimensional tin perovskites for efficient perovskite LEDs.

15:00-15:30 · ACPIPOC-0914-9 **Invited****Coherent energy transfer in a photosynthetic protein complex studied by two-dimensional electronic spectroscopy****Hongguang Duan***Ningbo University*

The very process of funneling the absorbed photon energy within the chlorophyll antennae system of photosynthetic systems was a critical evolutionary turning point in living systems. It is one of the primal events leading to living systems and occurs on ultrafast timescales approaching the known decoherence time for optically induced coherences/excitation. If there was a biological function where

pure quantum effects could be manifest, one would expect it to be observable in the energy transport process in photosynthetic systems – the primal step involved in capturing solar energy for powering living systems. If nature could achieve this exotic quantum state for a design purpose, surely quantum computers, quantum information could be radically transformed if we only understood how nature optimized the system–bath coupling to evade quantum decoherence. We have studied the ultrafast energy and charge transfers in FMO and PSII reaction center complexes. With the combination of theory and experiment, we uncovered the timescales of population transfer and the decay of electronic quantum coherences at different temperature. We disentangled the long-lived vibrational coherence from the electronic coherence based on advanced data analysis. This work provides a guideline for the study of coherent energy transfer in photosynthetic systems and suggests that nature does not use electronic coherence since it is too fragile against the dissipation. In contrast, nature employs dissipation to form effective channels for the ultrafast energy transfer in antenna protein complexes.

15:30–17:30 Coffee Break & Poster Session

08:30–10:00 · November 5, 2024 · Tuesday
O(Q)LED
Presider: Dawei Di, Zhejiang University

08:30–09:00 · ACPIPOC-0925-12 **Invited**

Controllable Liquid Transfer for Micro-patterning QDs: Towards high-performance QLEDs

Huan Liu

Beihang University

Here, we clarified the physicochemical fundamental of the liquid manipulation and developed a facile direct-writing strategy for micro-patterning various functional liquid materials with a centimeter-scale large-area uniformity and a high width-resolution

09:00–09:30 · ACPIPOC-0708-1 **Invited**

Efficient, stable organic light-emitting diodes with over one micron thickness

Wang Ying

Technical Institute of Physics and Chemistry, CAS

Thick organic light-emitting diodes (OLEDs) are desirable for the high production yield of OLED-based displays and lightings, but the low carrier mobility of organic semiconductors will inevitably introduce high operating voltage and thus unsatisfied device performance of thick OLEDs. Here, we demonstrated high performance OLEDs over one micron thickness incorporating thick TAPC hole transporting layer and MoO₃/SimCP2 hole injection layer. Because of the high mobility of TAPC, Ohmic hole injection from ITO to TAPC with MoO₃/SimCP2 injection layer can only be formed for TAPC over 900 nm in the hole-only devices. These thick devices with 950 nm TAPC present inappreciable dependence of EQE on the device area, TAPC thickness and deposition rate, and EQE of 26.0%, 25.0% and 7.8% and low operating voltage of 4.5, 3.4, and 6.7 V at 1000 cd/cm² can be achieved for red green and blue OLEDs, respectively. Thin HAT-CN layer were incorporated between TAPC and electron blocking layer to suppress electron leakage to TAPC layer, these devices remained their high efficiencies with operational lifetime LT₉₅ of 55000 h, 18000 h and 1600 h for red, green, and blue OLEDs at initial luminance of 1000 cd/m². Our work paves the way towards a higher production yield of high performance OLED-based displays and lightings.

09:30–10:00 · ACPIPOC-0731-32 **Invited**

Light Field Manipulation of Colloidal Quantum Dot Light-Emitting Diodes and Lasers

Kai Wang

Southern University of Science and Technology

Invited Colloidal Quantum dots (CQDs), with their excellent optoelectronic properties and process compatibility, are regarded as one of the most competitive candidates for the light sources of displays and information science. And the manipulation of light field of CQD devices (e.g. amplitude, phase, polarization, etc.) is very important for their future applications. In this presentation, we will report our recent research findings on the light field manipulation of QLEDs and CQD lasers, including horizontal dipoles dominated microcavity-QLED, full-color meta-QLED, circularly polarized electroluminescent spin-QLED, low-threshold surface-emitting CQD circular Bragg laser array, and high-performance CQD VCSEL with quality factor above 2000.

10:00–10:30 Coffee Break

10:30–12:00 · November 5, 2024 · Tuesday
Devices and OLED
 Presider: Chunfeng Zhang, Nanjing University

10:30–11:00 · ACPIPOC-0925-3 **Invited**

Gallium Oxide Ultrawide Band Gap Semiconductor: Materials, Devices and Applications

Weihua Tang

Nanjing University of Posts and Telecommunications

This talk review the progress of materials devices and applications gallium based on oxide ultrawide band gap semiconductor.

11:00–11:30 · ACPIPOC-1020-1 **Invited**

Electronic polarization effects in molecular semiconductors

Yuanping Yi

Institute of Chemistry Chinese Academy of Sciences

In this talk, I will introduce accurate computational methods to evaluate the electronic polarization energies for molecular semiconductors and the polarization effects in organic thermally activated fluorescence, organic photovoltaics, and organic thermoelectrics.

11:30–12:00 · ACPIPOC-0914-10 **Invited**

Ultrafast Photophysics of Emerging Organic Emitters for High-Performance OLEDs: Reconsideration on Emitting Efficiency

Xiaonan Ma

Tianjin University

The UHl displaying with OLED devices is becoming increasingly attractive in recent years. As key performance of OLED devices, the external quantum efficiency (η_{EQE}) is determined not only by device fabrication, but also relaxation dynamics of current-generated singlet and triplet excitons. For singlet excitons, emitting (radiative decay) is competed by non-radiative processes, leading to fluorescence quantum yield (Φ_F). Meanwhile, efficient harvesting of triplet excitons also plays key role, describing as exciton utilization efficiency (η_{EUE}), which is associated with thermally activated delayed fluorescence (TADF) emitting. In last several years, our research group concentrated on resolving excited-state dynamics of emerging organic emitters by both experimental (time-resolved spectroscopy) and theoretical (thermal vibrational correlated function) approaches, and attempted to find photophysics behind the measured η_{EQE} of OLED devices. In this talk, I will briefly introduce two aspects of our works, associating with Φ_F and η_{EUE} of organic emitters, respectively. (1) we investigated relationship between excited-state structural relaxation (ES-SR) and promoting vibrational modes of vibronic coupling of many organic emitters, which can greatly affect non-radiative decay rate of singlet excitons (kNRS) and subsequently Φ_F . The corresponding works revealed the important role of external structural restrain for achieving high emitting efficiency in OLED applications. (2) we demonstrated a new strategy for enabling TADF emitting of conjugated emitters without intrinsic TADF behaviour. By facilitating formation of an excimer-like state in co-facial dimer of TADF-inactive molecules, considerable TADF contribution was achieved. This strategy can be potentially employed for more conjugated TADF-inactive emitters, thus inspirable for application of high-performance OLED.

12:00–13:30 Coffee Break

13:30–15:30 · November 5, 2024 · Tuesday
Excited State Processes
 Presider: Haizheng Zhong, Beijing Institute of Technology

13:30–14:00 · ACPIPOC-0925-10 **Invited**

Excited-state dynamics in OPV materials under sunlight equivalent excitation

Chunfeng Zhang

Nanjing University

Ultrafast transient absorption and terahertz spectroscopy with enhanced sensitivity were employed to investigate the excited state dynamics in OPV materials. This revealed a charge generation pathway facilitated by intra-moiety delocalized excitations.

14:00–14:30 · ACPIPOC-0925-9 **Invited**

Soft lattice self trapped state luminescence kinetics

Guangjiu Zhao

Tianjin University

This report introduces the work on the /Soft lattice self trapped state luminescence kinetics/ of a metal halide perovskite nanocrystal, which is divided into three aspects: (1) A model for ultrafast capture of charge carriers by lattice defects and distortions in lead

containing perovskite is proposed, and its excited state dynamics are discussed. (2) The modulation mechanism of doping on lattice distortion of excited states was further revealed in lead-free perovskite nanocrystals, thereby achieving the conversion of /dark/ and /bright/ self trapped states and affecting the migration and relaxation of carrier dynamics. Based on this law, a new perovskite system with high luminescence efficiency was designed. (3) A new approach has been proposed to achieve anisotropic polarized luminescence using dual perovskite nanocrystals with isotropic morphology, exploring new applications of self trapped state luminescence.

14:30–15:00 · ACPIPOC-1016-3 **Invited**

Non-Condon Effect during Singlet Fission Revealed by Two-Dimensional Electronic Spectroscopy

Yuanyuan Guo

Nanyang Technological University & Beijing University of Posts and Telecommunications

Singlet fission (SF) generates two triplet excitons from one photon. Using two-dimensional electronic spectroscopy on a Terrylene trimer, we found ultrafast singlet (S1) to charge transfer (CT) state coupling, influenced by solvent polarity. A high-frequency vibrational mode (1210 cm⁻¹) enhances S1-CT coupling, emphasizing the role of vibrational-electronic interplay in SF.

15:00–15:30 · ACPIPOC-0914-7 **Invited**

Exploring Coherent Dynamics and Exciton-Carrier Correlations in Orthorhombic Lead Halide Perovskites

Ajay Jha

University of Oxford

Using two-dimensional electronic spectroscopy, exciton-carrier interactions in orthorhombic lead halide perovskite are studied at cryogenic temperatures. Our results highlight phonon-mediated carrier-to-exciton transfer and provide insights into exciton-carrier interaction in complex materials.

Track 7: Optical Sensors and Biophotonics

The Residence 2, 2F (悦府 2, 2 楼)

13:30-15:30 · November 3, 2024 · Sunday

Optical Sensors and Biophotonics I

Presider: Li Shen, Huazhong University of Science and Technology, China

13:30-14:15 · ACPIPOC-0713-2 **Keynote**

All-fiber multifunction-integrated devices for sensing

Fei Xu, Yifeng Xiong

Nanjing University, China

With the development of materials science and manufacture technology, the conventional homogeneous doped core and pure cladding structures in a silica fiber have evolved with a new paradigm shift by merging the multi-structures and multi-materials. This emerging trends in optical fibers aim to break the fundamental limit by a single structure and material, and extend their photonic and optoelectronic applications. Here we will show some all-fiber multifunction-integrated devices developed in our labs and their applications in imaging and sensing will also be discussed.

14:15-14:45 · ACPIPOC-0722-16 **Invited**

FBG array demodulation using mode-locked fiber laser

Chengbo Mou

Shanghai University, China

We show nonlinear amplification of a mode-locked fiber laser for FBG sensor array with MHz demodulation speed. The demonstrated spectral broadening support up to 30 FBGs in high-speed temporal analysis mode.

14:45-15:15 · ACPIPOC-1016-15 **Invited**

Sensitivity enhanced fiber-optical acoustic sensors

Heming Wei

Shanghai University, China

Ultrasonic wave has strong penetration characteristics in liquid, metal, ceramic and other media, and the detection technologies based on ultrasonic signal has a wide range of applications in aerospace, Marine and electric power. Compared with the traditional piezoelectric ultrasonic sensor, the fiber-optic ultrasonic sensor has the advantages of strong anti-interference, reusability and wide detection frequency band. However, in weak signal detection applications, the sensor sensitivity and signal-to-noise ratio need to be further improved. In view of the characteristics and detection methods of acoustic emission signals in safety detection, coupling enhanced fiber-optic ultrasonic sensor are proposed, and its design method, micro-nano preparation method and existing problems are analyzed. The designed sensor has simple structure and high frequency response, which has potential applications in underwater detection, photoacoustic imaging and Acoustic emission detection, etc.

15:15-15:30 · ACPIPOC-0724-10

Milli-Tesla Level Magnetic Field Vector Detection Based on YIG Microcavity Optical Sensor

Yanran Wu, Songyi Liu, Yongpan Gao, Daquan Yang

Beijing University of Posts and Telecommunications, China

A millitesla-level magnetic field vector detection using a yttrium iron garnet (YIG) microcavity is proposed. Under the magnetic field strength of 95.49 mT, the YIG microsphere cavity-based sensor realizes the direction sensitivity of 0.0717 pm/°.

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

16:00–18:00 · November 3, 2024 · Sunday
Optical Sensors and Biophotonics II
Presider: Fei Xu, Nanjing University, China

16:00–16:30 · ACPIPOC-0723-5 **Invited**

Application and Challenges of Optical Fiber Axle Counter in Rail Transit

Sheng Wang, Chunxiao Wu

Beijing National Railway Research & Design Institute of Signal & Communication Group Co., Ltd., China

A novel axle counting system based on fiber Bragg grating sensor is proposed and demonstrated in railway, subway, and suspended rail line.

16:30–17:00 · ACPIPOC-1010-6 **Invited**

Silicon integrated subwavelength grating devices for telecom and sensing applications

Li Shen

Huzhong University Of Science And Technology, China

We experimentally demonstrate a high-sensitivity and wide-range refractive index (RI) sensing relied on tracking the envelope spectrum of a subwavelength grating slot waveguide microring resonator (SWGS-MRR).

17:00–17:15 · ACPIPOC-0726-19

Real-time Φ -OTDR system based on FPGA digital signal processing scheme

Wenzhao Yang, Jun He, Guanfeng Chen, Bin Du, Baijie Xu, Yiping Wang

Shenzhen University, China

The FPGA-based Φ -OTDR real-time demodulation framework achieves real-time sensing about 9 km at a demodulation rate of 10 kHz.

17:15–17:30 · ACPIPOC-0726-8

Wide Range Optical Fiber Fabry-Perot Interferometric Accelerometer Based on Spectral Analysis

Hongbo Duan, Yi Shi, Junhui Wu, Zhilin Xu, Qizhen Sun, Yurong Liang

Huazhong University of Science and Technology, China

In this paper, we present an accelerometer with wide measuring range based on extrinsic Fabry-Perot interferometer and spectral phase demodulation. The response frequency range is as large as 10–300 Hz, and the measuring range is 13.364 g. The proposed accelerometer offers advantages such as compact structure, wide frequency band, and wide measuring range holding great significance in the micro vibration monitoring of spacecraft and jitter monitoring of satellite imaging.

17:30–17:45 · ACPIPOC-0729-19

Optomechanical accelerometers based on periodic exceptional points

Xingyu Wu, Yanfeng Bi, Chuan Wang

Beijing Normal University, China

We introduce an optomechanical accelerometer based on the WGM resonator, generating periodic EPs by adjusting the angles of two nanotips. We found the accelerometer exhibits an exponential response near EPs, significantly enhancing sensitivity.

17:45–18:00 · ACPIPOC-0731-194

High Sensitive Refractive Index Sensor Based on Helical Long-Period Fiber Gratings inscribed in Y-shaped Triangular Core Fiber

Xiaolong Fan, Siyu Chen, Yuehui Ma, Peng Wei, Yang Cao, Yanhua Luo, Yunqi Liu

Shanghai University, China

We demonstrate a surrounding refractive index (SRI) sensor based on helical long-period fiber grating inscribed in Y-shaped triangular core fiber. The maximum SRI sensitivity is -9026 nm/RIU .

17:30–20:00 Welcome Reception

13:30–15:45 · November 4, 2024 · Monday

Optical Sensors and Biophotonics III

Presider: Zhiguo Zhang, Beijing University of Posts and Telecommunications, China

13:30–14:15 · ACPIPOC-1016-14 **Keynote****AI-assisted Stimulated Raman Scattering Microscopy for Cancer Diagnosis****Minbiao Ji***Fudan University, China*

Rapid diagnosis of human biopsy tissue is critically important for treatment strategy and timely decision-making. However, current standard histopathology is time-consuming and incompatible with fresh biopsies, including gastroscopic biopsy and core-needle biopsy. We have integrated label-free stimulated Raman scattering (SRS) microscopy with various deep-learning algorithms to achieve instant and automated diagnosis of these biopsy tissues. With the technical advances, we have demonstrated applications in multiple tumor types, including gastric, prostate and breast cancers.

14:15–14:45 · ACPIPOC-0730-54 **Invited****High Spatial Resolution Distributed Multi-parameter Sensing Using All-Grating Fiber****Mengshi Zhu***Shanghai University, China*

The use of all-grating fiber, where long-length fiber Bragg gratings are continuously inscribed without gap, enables high spatial resolution multi-parameter measurements in aircraft structure monitoring including strain, temperature, vibration and shape.

14:45–15:15 · ACPIPOC-0731-9 **Invited****Distributed Brillouin fiber sensors powered by machine learning****Liang Wang***Huazhong University of Science and Technology, China*

In this talk, we will report our recent works on machine learning assisted distributed Brillouin fiber sensors. With machine learning, high-performance Brillouin fiber sensors have been achieved regarding measurement speed, accuracy and signal-to-noise ratio.

15:15–15:30 · ACPIPOC-0729-20

Shape calibration of the distributed acoustic sensing cable by using the ambient harmonic noise**Qiuyan Miao**, Weikang Liu, Ruqian Guo, Guofeng Yan, Lang Jiang, Chun Xiao*Zhejiang Lab, China*

A method is proposed for calibrating the shape of distributed acoustic sensing cables by using the ambient harmonic noise, without the need of auxiliary acoustic sources. Both simulation and sea-trial experimental results verify the feasibility.

15:30–15:45 · ACPIPOC-0816-2

Simultaneous Distributed Acoustic and Temperature Sensing System Using a Single Mode Fiber**Anand V P**^{1,2}, Sasikumar Neethu¹, Ranjith V R¹, Srinivasan Balaji¹*1. Indian Institute of Technology Madras, India; 2. CSIR Central Scientific Instruments Organisation, India*

We have simulated and experimentally validated a multi-parameter fiber optic sensing system using Distributed Acoustic Sensing (DAS) and Distributed Temperature Sensing (DTS) with a single-mode fiber (SMF). The hybrid sensing system was achieved by measuring the phase of the Rayleigh backscattered signal for DAS, as well as the intensity of the Raman Stokes and anti-Stokes for DTS. In the simulation and proof-of-concept experiment, signal to noise ratios (SNRs) of 26.355 dB and 21.560 dB were achieved for acoustic event at 19.1 km with a frequency response of 10 Hz. Concurrently, temperature measurements from 30 °C to 100 °C were obtained in both simulation and experiment, with uncertainty of 2.1 °C and 3 °C at 6.1 km. The spatial resolution of the multi-parameter sensing system is 10 m.

15:45–17:30 Coffee Break & Poster Session

08:30–10:00 · November 5, 2024 · Tuesday

Optical Sensors and Biophotonics IV

Presider: Yaxi Yan, The Hong Kong Polytechnic University, Hong Kong, China

08:30–09:00 · ACPIPOC-0801-48 **Invited****High-precision sensing applications based on ultrahigh-Q microcavities****Daquan Yang***Beijing University of Posts and Telecommunications, China*

In contrast to most studies that rely on labeled methods, the WGM microbubble resonator offers the advantages of being label-free, possessing ultrahigh sensitivity, and providing a rapid response.

09:00–09:15A · CPIPOC-0730-56

Ghost Imaging LiDAR Based on FMCW Technology for Long Distance Detection**Annan Xia**, Yaqi Han, Qingyang Zhu, Lihang Liu, Yi Hao, Hongyan Fu*Tsinghua University, China*

We propose a ghost imaging (GI) LiDAR with a frequency modulated continuous wave (FMCW) laser as light source. The simulation results show distance resolution of 2.93 m at a detection distance of 700 m.

09:15–09:30 · ACPIPOC-0730-69

High-Performance and Low-Cost Distributed Acoustic Sensor with Phase Noise Compensation**Zhengyuan Xiao**, Yichen Pan, Jiageng Chen, Jiazhen Ji, Zhengwen Li, Zuyuan He*Shanghai Jiao Tong University, China*

Without any specialized receivers for extracting phase noise, we demonstrate a distributed acoustic sensor with phase noise compensation. 50 km sensing range is achieved using 100 kHz linewidth laser in EDFA free experimental scheme.

09:30–09:45 · ACPIPOC-0729-21

Fiber optic biosensors: from single molecule detection to the ranostics**Yunyun Huang***Jinan University, China*

We developed an interface sensitization mechanism to improve the sensitivity of optical fiber sensor to single molecule level, and integrated photothermal therapy function through the interface.

09:45–10:00 · ACPIPOC-0730-4

Tilted Fiber Bragg Grating for Rapid Clinical Detection of Platinum Ion**Yifan Duan**¹, Jiahui Jin¹, Haining Xu¹, Yunting Du², Ji Shi², Xiaojing Tong², Qiao Wang¹, Yang Zhang¹, Wei Peng¹

1. Dalian University of Technology, China; 2. Cancer Hospital of Dalian University of Technology (Liaoning Cancer Hospital & Institute), China

In this paper, we utilized tilted fiber Bragg grating surface plasmon resonance (TFBG-SPR) sensing in conjunction with DNA-targeted biomolecular probes to detect platinum ions in actual water samples.

10:00–10:30 Coffee Break

10:30–12:00 · November 5, 2024 · Tuesday

Optical Sensors and Biophotonics V

Presider: Daquan Yang, Beijing University of Posts and Telecommunications, China

10:30–11:00 · ACPIPOC-0918-1 **Invited****Recent advances in integrated optical sensing and communication (IOSAC)****Yaxi Yan**, Liwang Lu, Jingchuan Wang, Jingming Zhang, Alan Pak Tau Lau, Chao Lu*The HK Polytechnic University, Hong Kong, China*

We will discuss the parameters that influence the performance of IOSAC, demonstrate different designs of integrated optical communication and distributed vibration sensing including forward sensing and Rayleigh backscattering based sensing and introduce the prospective applications.

11:00–11:30 · ACPIPOC-0925-2 **Invited****Mitigation of Doppler-shift induced demodulation errors in phase-sensitive optical frequency domain reflectometry using frequency-tracking****Weilin Xie**, Qiang Yang, Congfan Wang, Xiang Zheng, Sijing Yang, Yi Dong*Beijing Institute of Technology, China*

Disturbances during one single sweep period in optical frequency domain reflectometry (OFDR) introduce Doppler frequency shifts that impair the demodulation. Here, we report on frequency-tracking based Doppler-shift-immune distributed dynamic strain sensing using phase-sensitive OFDR.

11:30–12:00 · ACPIPOC-1016-18 **Invited****Optical trapping and metrology in hollow-core optical fibers****Shangran Xie***Beijing Institute of Technology, China*

Hollow-core fiber (HCF) is a special optical waveguide type that can guide light in the air core surrounded by properly designed cladding structures. The guiding modes of the fiber can form a stable optical trap in the hollow core. The levitated objects can be propelled over the fiber length along the beam axis through an imbalance of the optical scattering forces. The ability to overcome the diffraction of the laser beam in HCF opens up vast ranges of sensing applications. In this talk, I will introduce the principle and applications of HCF-based optical traps, including long-distance object delivery, flying particle sensors, and particle metrologies.

12:00–13:30 Lunch Break

13:30–15:15 · November 5, 2024 · Tuesday

Optical Sensors and Biophotonics VI

Presider: Zhaoyong Wang, Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, China

13:30–14:00 · ACPIPOC-0929-1 **Invited****InP-based Single Photon Avalanche Diodes and Their Applications****Wenjuan Wang***Shanghai Institute of Technical Physics of the Chinese Academy of Sciences, China*

InP-Based Single Photon Avalanche Diodes (SPADs) have received extensive attention in the field of quantum technology due to the characteristics of compact size, low power consumption, stable operation, and no need for ultra-low temperature working environments. For example, they're used in quantum communication, laser ranging, LiDAR, quantum imaging, etc. For different application scenarios, the working modes of SPADs will also be different, currently including gated mode, passive quenching mode, and active quenching mode. Devices operating in different working modes will also exhibit different performances. We demonstrate several typical applications of InP-Based SPADs and describe the precautions for the devices. At the same time, we further discuss how to improve the performance of devices from the perspectives of crosstalk suppression and large-area arrays by combining micro-nano structure photoelectric joint regulation technology with the development of array devices.

14:00-14:30 · ACPIPOC-1016-16 **Invited****High accuracy point and distributed fiber optic sensors for simultaneous humidity and temperature measurement****Yanping Xu***Shandong University, China*

Simultaneous measurement of relative humidity (RH) and temperature is crucial for many applications in industry, food quality, health management or human comfort as RH depends mainly on the temperature of the environment. RH measurement is especially required given the fact that moisture in the surrounding environment is able to affect the physical or chemical properties of many especial natural and synthetic functional materials. In addition, moisture monitoring is also helpful for biochemical sensing, medical identification, environmental detection, and other fields. However, in practical applications when many different technical configurations are employed for the RH measurements, crosstalk effect inevitably induced by other environmental parameters, mainly temperature in most cases, deteriorates the measurement accuracy of the RH. Therefore, by maintaining a relative high response for the RH, the surrounding temperature of the sensor should be effectively monitored by the sensor itself as well, which raises the requirement of simultaneous measurement capability for the sensors under development. In this talk, high accuracy point and distributed fiber optic sensors will be introduced and demonstrated for simultaneous humidity and temperature measurement.

14:30-14:45 · ACPIPOC-0731-106

Ultra-fine image fibers with high image transmission quality and bending resistance**Nian Yang**, Liubo Yang, Liyan Zhang, Yaping Liu, Peng Li, Lei Zhang, Jie Luo*Yangtze Optical Fibre and Cable Joint Stock Limited Company, China*

Based on plasma chemical vapor deposition (PCVD) and one-step fiber preparation technology, we have successfully prepared ultra-fine image fibers with high image transmission quality and bending resistance, which are suitable for endoscopy in complex environments.

14:45-15:00 · ACPIPOC-0731-50

Dual Carriageway Traffic Monitoring Utilizing Superlets-Based Signal Processing for Distributed Acoustic Sensing**Jingming Zhang**^{1,2}, Yaxi Yan¹, Alan Pak Tao Lau¹, Liyang Shao², Changyuan Yu¹*1. Hong Kong Polytechnic University, Hong Kong, China; 2. Southern University of Science and Technology, China*

Recently, using distributed acoustic sensing (DAS) for traffic monitoring has attracted great research attention. In urban environments, the prevalent noise interference and the presence of multi-lane roads limits the signal to noise ratio (SNR) of traffic signals. Moreover, since optical fiber cable is deployed on one side of the road, DAS data is dominantly composed of vehicle signals from the near side of the cable. It is difficult to effectively detect the vehicles moving in the opposite direction. This paper presents a signal processing method based on superlets to largely improve the SNR of traffic signals. Field trial test in the Cross Harbour Tunnel of Hong Kong shows that with the significantly improved SNR, the detection of vehicles travelling along the opposite direction becomes possible, validating the potential of applying DAS for monitoring dual carriageway multi-lane roads.

15:00-15:15 · ACPIPOC-0731-85

Laser ranging and reflectance discrimination based on stretched noise-like pulseYao Yao¹, Yixiang Sun², **Haoguang Liu**², Long Lu¹, Yu An¹, Yiyang Luo¹, Qizhen Sun², Ping Perry Shum³*1. Chongqing university, Key Laboratory of Optoelectronic Technology and Systems (Ministry of Education), China; 2. Huazhong University of Science and Technology, School of Optics and Electronic Information, China; 3. Southern University of Science and Technology, China*

We proposed a laser ranging method using the noise-like pulse stretched by the dispersive Fourier transform technique, which has a resolution of 6 mm and can identify the relative reflectance information of the target.

15:30-16:00 Coffee Break

16:00–17:30 · November 5, 2024 · Tuesday

Optical Sensors and Biophotonics VII

Presider: Wenjuan Wang, Shanghai Institute of Technical Physics of the Chinese Academy of Sciences, China

16:00–16:30 · ACPIPOC-0723-2 **Invited****From 1D to 4D: Distributed fiber acoustic sensing for spatial multi-dimensional detection and application****Zhaoyong Wang**, Boqi Chen, Jinyi Wu, Yifan Liu, Yici Chen, Haiwen Cai, Qing Ye*Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, China*

DAS are endowed with two-dimensional (2D) and 3D localization and 4D attitude perception capability. Our related technologies and applications are demonstrated, including underwater target detection, seismic monitoring and non-destructive inspection.

16:30–17:00 · ACPIPOC-1016-17 **Invited****TBD****Long Jin***Jinan University, China***TBD**

17:00–17:15 · ACPIPOC-0801-128

Waveguide-enhanced raman spectroscopy on lithium niobate-on-insulator**Yannong Luo**¹, Meiyang Wu¹, Ping Chen¹, Renyou Ge^{2*}*1. Guangxi Medical University, China; 2. Zhejiang Lab, China*

We experimentally demonstrate the waveguide-enhanced Raman spectroscopy, on the LNOI platform. We analyze the background signal and length dependence of the fiber-coupled sensor, and characterize the Raman spectra of Rhodamine 6G utilizing the proposed architecture.

17:15–17:30 · ACPIPOC-0801-63

Low-Complexity Event Detection and Identification in Coherent Correlation OTDR Measurements**Jasper Müller**¹, Ognjen Jovanovic¹, Florian Azendorf¹, André Sandmann¹, Roman Ermakov², Jim Zou¹, Sai Kireet Patri¹, Jörg-Peter Elbers¹, Darko Zibar², Carmen Mas-Machuca³*1. Adtran Networks SE, Germany; 2. DTU Electro, Department of Electrical and Photonics Engineering, Technical University of Denmark, Denmark; 3. UniBw München, Germany*

Pairing coherent correlation OTDR with low-complexity analysis methods, we investigate the detection of fast temperature changes and vibrations in optical fibers. A localization accuracy of ~2m and an extraction of vibration amplitudes and frequencies is demonstrated.

Track 7: Optical Sensors and Biophotonics (Parallel Session)

The Residence 8, 2F (悦府 8, 2 楼)

13:30–15:30 · November 5, 2024 · Tuesday

Optical Sensors and Biophotonics VIII

Presider: Wentao Zhang, Institute of Semiconductors Chinese Academy of Sciences, China

13:30–14:00 · ACPIPOC-0726-16 **Invited**

Chaotic Raman Distributed Fiber Optic Sensing Technology

Mingjiang Zhang

Taiyuan University of Technology, China

In view of the bottleneck that the spatial resolution of the traditional Raman distributed optical fiber sensing system is limited by the principle of optical time-domain reflection positioning and the pulse width of the light source, a chaotic Raman distributed optical fiber sensing technology is proposed. In this scheme, the chaotic laser replaces the traditional pulsed laser as the detection signal, and the Raman anti-Stokes signal with chaotic timing features at each position is stripped out by performing time-domain differential reconstruction of the back-Raman anti-Stokes scattering signal excited by the sensing fiber, and then the time-domain compression and demodulation based on the chaotic correlation function are carried out to reveal the correlation characteristics between the spatial position of the chaotic Raman scattering temperature-modulated light field and the chaotic reference signal. The asymmetric pulse pairing method improves the intensity of chaotic correlation peaks, and the scheme can improve the spatial resolution performance of the traditional meter level to the centimeter level at the kilometer-level sensing distance.

14:00–14:30 · ACPIPOC-1016-19 **Invited**

Adaptive detection of pulsed twin beams in fiber with asymmetric loss for quantum metrology

Xueshi Guo

Tianjin University, China

We demonstrate a dynamic detection scheme for pulsed twin beams, which adaptively adjusts the ratio between the electronic gain of the detector for twin beams measurement. 1.5 dB advantage is shown compared to traditional detection method.

14:30–14:45 · ACPIPOC-0807-1

Optimized vectorial summing for fading noise suppression in ϕ -OFDR using multi-core fiber

Yi Yin¹, Weilin Xie^{1,2}, Qiang Yang¹, Xiang Zheng¹, Jiang Yang^{1,3}, Wei Wei^{1,2}, Yi Dong^{1,2}

1. Key Laboratory of Photonic Information Technology, Ministry of Industry and Information Technology, School of Optics and Photonics Beijing Institute of Technology, China; 2. Yangtze Delta Region Academy Beijing Institute of Technology, China; 3. Beijing Zhenxing Institute of Metrology and Measurement, China

We present the analysis for the time-domain noise accumulation in the multi-core fiber based coherent fading noise suppression for phase-sensitive optical frequency domain reflectometry. A method based on the optimized selection of the cores used for the combination is proposed and demonstrated and an effective suppression for accumulated noise which could be able to improve the sensitivity and the stability in long-term measurement.

14:45–15:00 · ACPIPOC-0807-4

Detection and Localization of Simulated Lightning Strikes induced Ultra Rapid Polarization Rotation Using the Coherent Receivers

Lin Zheng¹, Tao Zeng², YingMe Pan¹, BaiChuan Shao¹, Te Ke², Ming Luo², ZiQing Liu²

1. Wuhan Research Institute of Posts and Telecommunications, China; 2. China information and communication technology Group Corporation, China

This paper presents a method for detecting and localizing ultra rapid polarization rotation induced by lightning strikes using coherent receivers. The method's reliability was verified, with errors kept under 100 meters at distances.

15:00–15:15 · ACPIPOC-0813-9

High Sensitivity Tapered LPFG fiber Refractive Index Sensor Based on Dispersion Turning Point

Yingying He, Yi Huang, Chuanlu Deng, Chengyong Hu, Xiaobei Zhang, Tingyun Wang

Key Laboratory of Specialty Fiber Optics and Optical Access Networks Shanghai University, China

The tapered LPFG sensor is designed based on the dispersion turning point to achieve highly sensitive sensing of the surrounding refractive index (SRI). The simulation and experimental results agree with the sensitivity of 539.7 nm/RIU in the SRI range of 1.3–1.34.

15:15–15:30 · ACPIPOC-0814-39

Oscillation amplitude measurement of tuning fork-based fiber probes with Fabry-Perot cavity

Yi Gong, Na Chen, Yana Shang, Heming Wei, Yong Liu, Shupeng Liu

Shanghai University, China

A Fabry-Perot cavity formed by the tuning fork-based fiber probe and an Au reflecting mirror is utilized to measure the tip amplitude under different excitation voltages in normal force mode of scanning near-field optical microscope.

15:30–16:00 **Coffee Break**

16:00-17:15 · November 5, 2024 · Tuesday
Optical Sensors and Biophotonics IX
 Presider: Mingjiang Zhang, Taiyuan University of Technology, China

16:00-16:30 · ACPIPOC-0905-1 **Invited**

High performance fiber optic seismic sensors for borehole applications

Guoheng Qi, Wentao Zhang, Wenzhu Huang

Institute of Semiconductors Chinese Academy of Sciences, China

This paper reports the recent borehole applications of high performance fiber optic sensors, including borehole co-seismic response observation, and strain solid earth tide observation.

16:30-17:00 · ACPIPOC-1016-20 **Invited**

Monitoring submarine optical fibre cables with distributed acoustic sensors

Marcelo A. Soto

Universidad Técnica Federico Santa María, Chile

This paper reviews the use of distributed acoustic sensing (DAS) for monitoring earthquakes, marine waves, and ocean currents in submarine optical cables, and describes some deep learning approaches to enhance earthquake detection from DAS measurements.

17:00-17:15 · ACPIPOC-0815-85

Point Cloud Registration with Preprocessing Enhanced Robustness for Structured Light Sensors

Jiachen Dong¹, Chuanchuan Yang¹, Xiujiao Zhang², Chiennan Yu², Connie J. Chang-Hasnain², Hongbin Li¹

1. Peking University, China; 2. Berxel Photonics Company Ltd., China

We propose a point cloud registration method with preprocessing to improve the robustness to unfavorable factors introduced by structured light sensors. Decreases in registration errors above 21.1% are achieved without losing efficiency.

Track 8: Micro-, Nano-, and Quantum Photonics: Science and Applications

The Residence 6, 2F (悦府 6, 2 楼)

13:30–15:30 · November 3, 2024 · Sunday

Integrated photonics and devices

Presider: Cheng Wang, City University of Hong Kong, Hong Kong, China

13:30–14:15 · ACPIPOC-1012-2 **Keynote**

Nonlinear 2D–Material Metaphotonics

Chengwei Qiu

National University of Singapore, Singapore

In this talk, we will report recent progress on nonlinear metasurface photonics using 2D materials, from monolayer TMDCs, van der Waals crystals, stacked 2D materials, patterned perovskite spin–valley locked laser, and metasurface-enabled active emitters.

14:15–14:45 · ACPIPOC-0730-48 **Invited**

Nanoplasmonic Speckle Illumination for Super-resolved Imaging with Temperature-Induced Nonlinearity

Yoo Hajun¹, Seongmin Im¹, Kwanhwi Ko¹, Inseop Byeon¹, Sukhyeon Ka¹, **Donghyun Kim^{1,2}**

1. Yonsei University, Korea; 2. The Chinese University of Hong Kong, Hong Kong, China

We describe use of disordered nanoplasmonic speckles for super-resolved imaging. Temperature-induced nonlinearity that accompanies the excitation of plasmonic near-fields is analyzed by opto-thermal theoretical modeling. Tip-based experimental measurements show excellent agreement with the theoretical data.

14:45–15:00 · ACPIPOC-0815-98

Broadband Thin-film Lithium Niobate (TFLN) TE-pass Waveguide Polarizer

Yudan Zhang

Wuhan National Laboratory for Optoelectronics, China

By utilizing the polarization-dependent mode leakage loss of shallow etched waveguides, we experimentally demonstrated a TFLN polarizer with a high ER of 20 dB and a broad bandwidth of 100 nm (1.26–1.36 μm).

15:30–16:00 Coffee Break

16:00–17:30 · November 3, 2024 · Sunday

Lithium Niobate– On–Insulator Devices

Presider: Daquan Yang, Beijing University of Posts and Telecommunications, China

16:00–16:30 · ACPIPOC-0723-12 **Invited**

Integrated lithium niobate photonics for future optical and microwave links

Cheng Wang

City University of Hong Kong, Hong Kong, China

I will discuss our recent efforts on integrated lithium niobate photonics towards microwave and millimeter-wave applications. We demonstrate chip-scale systems including high-speed microwave photonic signal processors, integrated photonic millimeter-wave radars, and on-chip optical vector analyzers.

16:30–17:00 · ACPIPOC-1012-6 **Invited**

Integrated lithium niobate photonics: from communications to metrology

Yang Li

Tsinghua University, China

Lithium niobate features low absorption, high refractive index, large electro-optic coefficient, and high chemical and thermal stability from 0.4 μm to 5 μm , leading to broad applications in the electro-optic modulators of fiber-optic communications. Recently, the fabrication technique of thin film lithium niobate on insulator (TFLNOI) wafer and its nanofabrication techniques achieved significant development. This development enables integrated electro-optic modulators with voltage-length product of as low as $\sim 1\text{V}\cdot\text{cm}$ as well as 3dB bandwidth of over 100GHz, electro-optic frequency combs with tunable repetition rate. By fully leveraging the tunable repetition rate of electro-optic frequency combs, we achieved an ambiguity-free absolute distance measurement system with a

precision of ~100mm and an acquisition rate of ~10 kHz. Based on the integrated lithium niobate phase modulators, we achieved a 16-channel optical phased array, featuring beam steering of 24° and 8°, respectively, in two dimensions. To achieve the mass production of integrated TFLN devices with high fidelity and low cost, we developed a wet etching-based fabrication process for TFLNOI, resulting in microring with an intrinsic quality factor of over 10 million.

17:30–20:00 Welcome Reception

13:30–16:15 · November 4, 2024 · Monday Quantum Photonics I Presider: Yang Li, Tsinghua University, China

13:30–14:15 · ACPIPOC-0731-99 **Keynote**

Single-quantum-dot devices for photonic quantum technologies: Design, deterministic nanofabrication, and application perspectives

Stephan Reitzenstein

TU Berlin, Germany

We introduce in situ electron-beam lithography as advanced deterministic nanofabrication platform for photonic quantum devices. Examples include quantum dot single-photon sources based on circular Bragg gratings, fiber-coupled single-photon sources, and scalable integrated quantum circuits.

14:15–14:45 · ACPIPOC-1012-5 **Invited**

Quantum sensing at nanoscale with solid state spins

Fangwen Sun

University of Science and Technology of China, China

With long coherence time, stable fluorescence and small size, spin defects in solids are extensively studied in quantum sensing in recent years. Realizing high spatial resolution, high fidelity and integrated spin manipulation is important for the practical application. Here, we will present our recent efforts on high resolution, high sensitivity quantum sensing. Manipulation of spin qubit in 2D material and quantum differential sensing protocol are developed to improve the accuracy of detection. Techniques for integrated quantum sensing are explored.

14:45–15:15 · ACPIPOC-0722-5 **Invited**

Quantum photonic integrated circuits with nano-mechanical control

Leonardo Midolo

University of Copenhagen, Denmark

I will present recent advances in generating and routing single photons on-chip using quantum dots and reconfigurable photonic devices based on nano-mechanical motion and discuss the challenges in scaling up the technology further.

15:15–15:45 · ACPIPOC-0725-5 **Invited**

GaN-based microcavity optoelectronic devices

Baoping Zhang^{1,2}

1.Xiamen University, China; 2.Southern University of Science and Technology, China

Based on high-Q InGaN/GaN microcavities, green RCLEDs with orthogonally polarized emissions were obtained. Blue and green VCSELs under current injection were demonstrated. Under optical pumping, VCSEL in the DUV region and polariton lasing were demonstrated.

15:45–16:15 · ACPIPOC-0801-99 **Invited**

Chalcogenide integrated nanophotonics and its potential for quantum photonics

Kunhao Lei, Kai Xu, Hongtao Lin

Zhejiang University, China

Due to the high optical nonlinearity and nonvolatile phase-changing properties, chalcogenide integrated nanophotonics are emerging for entangling photon generation and nonvolatile quantum states operation. We will review the progress and our recent progress.

16:15–17:30 Coffee Break & Poster Session

08:30–09:30 · November 5, 2024 · Tuesday

Micro–nano optics I

Presider: Zhen Shen, University of Science and Technology of China, China

08:30–09:00 · ACPIPOC–1001–2 **Invited****Silicon–based Integrated Optical Microring Resonators with Reconfigurable Mode Chirality****Jiawei Wang***Harbin Institute of Technology Shenzhen, China*

Silicon–based integrated optical microring resonators in a spiral ring geometry are introduced. The structural asymmetry enables adjustable non–Hermiticity around the exceptional points, so that the mode chirality and emission directionality become reconfigurable.

09:00–09:30 · ACPIPOC–0811–1 **Invited****On–chip integrated MEMS tunable photonics****Guangya Zhou***National University of Singapore, Singapore*

Photonics integrated with MEMS/NEMS can achieve ultra–low–power tunable photonic devices, which are attractive as they can provide greater flexibility in a dynamic photonic system and offer post–process compensation capability for fabrication imperfections. In this talk, I will introduce some of our work on MEMS tunable photonic devices.

10:00–10:30 Coffee Break

10:30–12:00 · November 5, 2024 · Tuesday

Micro–nano optics II

Presider: Zhen Shen, University of Science and Technology of China, China

10:30–11:00 · ACPIPOC–1012–7 **Invited****Multifunctional wavefront engineering based on metasurface****Lingling Huang***Beijing Institute of Technology, China*

Metasurface as a novel and extraordinary platform has demonstrated intriguing electromagnetic properties by tailoring the artificial structures. Since its emergence, multidimensional modulation of light is proposed to improve information capacity and realize dynamic optical response at different incident conditions. In this report, various functional metasurfaces are proposed and demonstrated. For example, our team demonstrate an all–optical parallel operation method based on the Dammann vortex metasurface, which realized the intuitive graphical expression of differential addition and subtraction operations. Meanwhile, we demonstrate a dielectric quasicrystal metasurface which enables dual functionality of diffraction pattern generation and hologram reconstruction. In addition, we propose and experimentally demonstrate a snapshot NIR spectral imaging system that combines diverse metasurface filters and a deep–learning–based algorithm to achieve image reconstruction with precise textures, minimal artifacts, and little crosstalk.

11:00–11:15 · ACPIPOC–0814–34

Differential Spectral Phase Reconstruction of Microcombs by Stepped Dual Comb Interferometry**Bofan Yang**, Shangyuan Li, Xiaoping Zheng, Xiaoxiao Xue*Tsinghua University, China*

We demonstrate spectral phase measurement of microcombs through stepped interference with an electro–optic comb generated by a phase modulator. The temporal waveform of a normal–dispersion microcomb is characterized using the proposed method.

11:15–11:30 · ACPIPOC–0727–8

A Mid–Infrared On–Chip Computational Spectrometer Based on Plasmonic Metasurface**Yatong Hou**, Haoxiang Cui, Chao Hu, Xingyan Zhao, Yang Qiu, Yuan Dong, Qize Zhong, Ting Hu, Shaonan Zheng*Shanghai University, China*

An on–chip computational spectrometer consisting of a planar array of broadband optical filters is proposed, which are formed by plasmonic metasurfaces. By adjusting the structural parameters of plasmonic metasurface, the optical characteristics of a stop–band filter in the mid–infrared band are realized. By applying compressive sensing (CS) and genetic algorithm (GA), the incident spectrum can be reconstructed. Simulation results show the proposed design can successfully reconstruct the spectra over the 1.5 to 4 μm spectral range with a full width at half maximum (FWHM) resolution of 30 nm and the bandwidth–resolution ratio (BRR) of 83.33. These results support future applications in mid–infrared on–chip spectrometers.

11:30–11:45 · ACPIPOC–0731–70

Leaky-wave focusing metasurfaces based on bound states in continuum for 532 nm**Xuanyu Zhou**, Yanfeng Zhang*Sun Yat-sen University, China*

Bound states in the continuum (BICs) are unique states of light that facilitate a sharp resonant response in subwavelength optical structures, associated with extremely high values of the resonance quality (Q) factor approaching infinity. Here, we propose a leaky-wave metasurface (LWM) combining with BICs based on Si_3N_4 platform working for 532 nm which is able to focus at random height with full width at half maximum (FWHM) of $0.9\ \mu\text{m} \times 1.1\ \mu\text{m}$ and nearly 99% theoretical efficiency as well as experimentally focusing spot image at focal plane.

11:45–12:00 · ACPIPOC–0731–115

Robust fabrication of SNAP bat microresonators via laser annealing saturation effectZijie Wang¹, Manuel Crespo-Ballesteros¹, Xiaobei Zhang², **Michael Sumetsky**¹*1.Aston University, United Kingdom; 2.Shanghai University, China*

Bat microresonators are unique resonators possessing spatially uniform rather than oscillating eigenmodes. We develop an exceptionally accurate and robust method to fabricate SNAP bat microresonators based on the laser annealing saturation effect.

12:00–13:30 Lunch Break

13:30–15:30 · November 5, 2024 · Tuesday

Quantum Photonics II

Presider: Lingling Huang, Beijing Institute of Technology, China

13:30–14:00 · ACPIPOC–0527–1 **Invited****Continuous-variable quantum communication network****Zhihui Yan**, Shaocong Liang, Jialin Cheng, Xiaojun Jia, Changde Xie, Kunchi Peng*Shanxi University, China*

Continuous-variable (CV) quantum optics has advantages of deterministic generation, manipulation and detection, which is the building block of metropolitan quantum communication network. Based on broadband CV quantum entangled optical modes, we have realized high-rate quantum radio frequency over light communication, where a real picture is transferred with rate of 20 Mbps. It is highly demanded to construct quantum network with multiple users. We have realized eight-user quantum secret sharing with the CV bound entangled state for high key rate and flexibility. Moreover, we have demonstrated four-user quantum teleportation for CV polarization state, that is suitable for remote distribution with local oscillation free measurement and direct interaction with atomic node. The works can be potentially applied in metropolitan quantum communication network.

14:00–14:30 · ACPIPOC–0731–66 **Invited****Frequency conversion and coherent storage in optomechanical microresonators****Zhen Shen***University of Science and Technology of China, China*

We have demonstrated the coherent storage of photons by taking advantage of the long coherent lifetime of mechanical oscillators. By harnessing the excellent tunability of magnons, we have achieved tunable microwave-optical conversion and phonon interference.

14:30–15:00 · ACPIPOC–0722–13 **Invited****Coherent precision acoustic mapping based on on-chip dual microcombs****Baicheng Yao***University of Electronic Science and Technology of China, China*

We introduce the scheme that microcomb can be utilized in high performance acoustic sensing. The natural coherence and convenient operation of soliton dual microcomb devices offer a way for distributed and multi-point acoustic field mapping.

15:00–15:15 · ACPIPOC–0731–215

Quantum Hacking against 256QAM Modulated Continuous-Variable Quantum Key Distribution Using Amplitude-Boosting Attack**Mingze Wu**, Yiming Bian, Junhui Li, Song Yu, Yichen Zhang*Beijing University of Posts and Telecommunications, China*

We report the amplitude-boosting attack against 256QAM continuous-variable quantum key distribution system, which could lead to an inflated estimation of secret key rate by communication parties, thereby compromising the security of practical system.

15:15–15:30 · ACPIPOC–0730–55

Synergistic Resource Allocation with Key Generation and Consumption Matching in Quantum Secured Multicore Fiber Optical Networks**Chuan Xie**, Yongmei Sun, Yaoxian Gao, Fengkai Sun*The State Key Laboratory of Information Photonics and Optical Communications, Beijing University of Posts and Telecommunication, China*

QKD transceiver planning algorithms are proposed to solve the problem of mismatch between key generation and consumption. The classical and quantum signal layered interleaved algorithm is proposed to achieve synergistic transmission.

15:30–16:00 Coffee Break

16:00–17:30 · November 5, 2024 · Tuesday

Nonlinearity optics

Presider: Zhihui Yan, Shanxi University, China

16:00–16:30 · ACPIPOC–0730–33 **Invited****Mode coupling and nonlinear dynamics for surface-grating twin-waveguide semiconductor laser****Yuede Yang***Institute of Semiconductors, CAS, China*

We propose and experimentally demonstrate a coupled twin-waveguide surface-grating semiconductor laser. By adjusting the injection currents, injection locking, period oscillation and chaotic states are achieved due to the mode coupling.

16:30–17:00 · ACPIPOC–0725–10 **Invited****Deformable nanofabrication and manipulation of micro-/nano-structures****Jiafang Li***Beijing Institute of Physics, China*

Here we report a deformable micro-/nano-fabrication technique named nano-kirigami. Studies on reconfigurable metasurfaces at optical wavelengths, as well as precise nanofabrication and free navigation of nano-kirigami microrotors with advanced optoelectronic tweezers, will be introduced.

17:00–17:15 · ACPIPOC–0730–7

Engineered photonic supercontinuum generation with long period grating dispersion**Hongyang Shi**, Zhiming Shi, qiankun Li, Lu Yang, Yongyuan Chu, Hairun Guo*Shanghai University, China*

We introduce an on-chip integrated silicon nitride waveguide structure designed to achieve local supercontinuum power enhancement. This meticulously engineered structure allows for precise tuning, resulting in a remarkable amplification across a specified spectral range.

17:15–17:30 · ACPIPOC–0731–123

Core and Wavelength Allocation for Synergistic Transmission in Quantum Key Distribution Coexistence with Classical Optical Communications**Weiwen Kong**¹, Yongmei Sun², Yuheng Xie¹, Qi Zhao¹, Yaoxian Gao², Jianjun Tang¹*1. China Telecom Research Institute, China; 2. Beijing University of Posts and Telecommunications, China*

In this paper, we propose a power coupling model for fiber switching and a core and wavelength allocation scheme that enhances the performance of classical communication and QKD, increasing synergistic degree by 0.47.

13:30–15:00 · November 3, 2024 · Sunday

Best Student Paper Award I

Presider: Lena Wosinska, Chalmers University, Sweden

The Residence 7, 2F (悦府 7, 2 楼)

13:30–13:45 · ACPIPOC–0720–2

Frequency–flow convolution empowered by high–speed thin–film lithium niobate modulators

Haojun Zhou¹, Bo Wu, Shiji Zhang, Mengyue Xu, Xinlun Cai, Jianji Dong

Huazhong University of Science and Technology, China

We demonstrate an optical frequency–flow convolution (OFFC) core utilizing high–speed thin–film lithium niobate (LN) modulators. Our implementation achieves convolution at an 8 GHz frequency spacing with a power consumption of just 52.9 mW.

13:45–14:00 · ACPIPOC–0725–4

Tandem neural network based rapid voltage configuring method for programmable photonic integrated circuit

Zeyang Fan¹, Yihang Dan², Tian Zhang¹, Jian Dai¹, Kun Xu¹

1. Beijing University of Posts and Telecommunications, China; 2. China Mobile Communications Group Shaanxi Co., LTD., China

We experimentally demonstrate voltage configuration method for programmable photonic integrated circuits, which enables the imperfect circuits to achieve excellent performance. We further successfully experimentally verify the method on several permutation matrices with high fidelities.

14:00–14:15 · ACPIPOC–0726–13

Seamless Fiber–Wireless Access Network Convergence with Dynamic O–E–O Conversion–less Sub–Wavelength Switching and Tunable Photonic mmWave Generation

Omaro Fawzi Abdelhamid Gonen, Luis Vallejo, Jiaxiang He, Roger Giddings, Wei Jin, Xingwen Yi, Md Saifuddin Faruk, Jianming Tang

Bangor university, United Kingdom

We experimentally demonstrate 3×1.333Gbps flexible BBU–UE connections over 10kmSSMF and 50m adaptable wireless reach @38GHz mmWave wireless transmissions, using free–running laser/envelope detection–based tunable mmWave generation/detection, and DSP–free O–E–O conversion–less soft–ROADM–enabled dynamic sub–wavelength–level channel switching.

14:15–14:30 · ACPIPOC–0730–53

Photonic Continuous–Wave Single–Pixel Terahertz Imaging Based on Compressive Sensing

Tianyu Li, Xing Fang, Lu Zhang, Xianbin Yu

Zhejiang University, China

We present a photonic continuous–wave single–pixel terahertz imaging system using compressive sensing via spatial light modulation with a DMD and photosensitive high–resistive silicon wafer. It enhances imaging speed previously constrained by pulse repetition and integration time through rapid mask switching, fast light modulation, and downsampling, achieving 0.1 frames per second for a 4096–pixel and 1 cm×1 cm image.

14:30–14:45 · ACPIPOC–0731–113

A Real–time Sleep Monitoring System Based on Fiber Optic Sensor

Tianyu Chen, Weimin Lyu, Shuyang Chen, Changyuan Yu

The Hong Kong Polytechnic University, Hong Kong, China

This study introduces a real–time sleep monitoring system using optical fiber sensors and threshold–based turnover detection, enabling non–invasive extraction of heart and respiratory rates with high accuracy for clinical and home environments.

14:45–15:00 · ACPIPOC–0731–135

Analyzing and Mitigating the Impact of Network Cutover in C+L–Band Optical Networks

Yuqi Yuan, Danshi Wang, Yao Zhang, Yuchen Song, Jin Li, Min Zhang

Beijing University of Posts and Telecommunications, China

This study analyzed the impact of cutover operations on established lightpaths, and proposed a routing and wavelength assignment algorithm to ensure the GSNR fluctuation caused by cutover was under 2.1% in C+L–band mesh optical network.

15:00–15:30 Coffee Break

15:30–16:45 · November 3, 2024 · Sunday

Best Student Paper Award II

Presider: Lena Wosinska, Chalmers University, Sweden

The Residence 7, 2F (悦府 7, 2 楼)

15:30–15:45 · ACPIPOC-0731-128

Ultrabroadband Integrated Triply Resonant Electro-Optic Frequency Comb in Lithium Tantalate

Junyin Zhang¹, Chengli Wang¹, Connor Denney², Johann Riemensberger¹, Grigory Lihachev¹, Jianqi Hu¹, Wil Kao¹, Terence Blésin¹, Nikolai Kuznetsov¹, Zihan Li¹, Mikhail Churaev¹, Xin Ou³, Gabriel Santamaria-Botello², Tobias J Kippenberg¹

1.École Polytechnique Fédérale de Lausanne, Switzerland; 2.Colorado School of Mines, United States; 3.State Key Laboratory of Materials for Integrated Circuits, Chinese Academy of Sciences, China

We demonstrated an integrated electro-optic frequency comb generator with 450nm span and 29.6GHz spacing, entirely covering optical telecom E-, S-, C-, L-, and U-bands, via monolithic co-integration of microwave and photonics resonators on thin-film lithium tantalate.

15:45–16:00 · ACPIPOC-0801-30

Polarization-Insensitive Orbital Angular Momentum Converter Based on Helically Twisted Anti-Resonant Fiber

Jie Zhang¹, Jiajing Tu¹, Shecheng Gao¹, Zhaohui Li², Weiping Liu¹, Dongmei Huang³, Yingying Wang¹, Shoufei Gao¹

1.Jinan University, China; 2.Sun Yat-sen University, China; 3.The Hong Kong Polytechnic University, Hong Kong, China

Based on the topological charge matching principle and mode coupling theory, the higher-order orbital angular momentum (OAM) generating mechanism in a helically-twisted anti-resonant fiber (HARF) is illustrated. We successfully fabricate a left-handed HARF by arc discharge method and excite the OAM-1 mode. The experimental result shows that the excitation of the OAM-1 mode is polarization-independent of input light and the polarization of the generated OAM-1 mode can be controlled by changing the polarization of the input light.

16:00–16:15 · ACPIPOC-0801-126

Scalable and Energy-Efficient Photonic Neural Networks Through Convolution Compression

Yixuan Li, Benshan Wang, Tengji Xu, Shaojie Liu, Qiarong Xiao, Chaoran Huang

The Chinese University of Hong Kong, Hong Kong, China

We experimentally demonstrate a convolution compression method for scalable and energy-efficient photonic neural networks. Our method achieves a 52-fold and 71.5-fold reduction in component counts and power consumption compared to conventional approaches, maintaining high accuracy.

16:15–16:30 · ACPIPOC-0815-33

Demonstration of Flexible FDM 400G Bidirectional Coherent Point-to-Multipoint PON

An Yan, Junhao Zhao, Yongzhu Hu, Sizhe Xing, Penghao Luo, Yingjun Zhou, Jianyang Shi, Nan Chi, Junwen Zhang

Fudan University, China

We propose and demonstrate a bidirectional FDM point-to-multipoint coherent PON that supports flexible data rates of 100G, 200G, and 400G, achieving a power budget exceeding the N1 class loss budget (29-dB) of ITU-T standards.

16:30–16:45 · ACPIPOC-0818-9

Simultaneous Communication and Low-Frequency Vibration Sensing Over Deployed Seven-Core Fiber

Yingyu Chen¹, Dawei Wang¹, Xiaokai Cai¹, Chao Lu², Zhaohui Li¹

1.Sun Yet-sen university, China; 2.Hong Kong Polytechnic University, Hong Kong, China

We successfully recovered the low-frequency vibration signals from 1 to 500 Hz based on fiber interferometry constructed by seven-core fiber while during communication. We report field trial results over installed fiber cable to detect real-world vibrations.

13:30–15:30 · November 4, 2024 · Monday

Best Paper Award I

Presider: Hui Yang, Beijing University of Posts and Telecommunications, China

The Residence 7, 2F (悦府 7, 2 楼)

13:30–13:45 · ACPIPOC-0705-1

Real Time 41 x 1 Tb/s C-Band Unrepeated Transmission over 300 km using PCS-64QAM

Alexis Busson, Hans Bissessur, Farana Hedary, Philippe Plantady

Alcatel Submarine Networks, France

We present a 120 GBd high baud rate record C-band unrepeated experiment with 41 channels at 1 Tb/s net rate carrying PCS-64-QAM with a real-time transponder over 300.2 km of PSCF, applying co-Raman and ROPA.

13:45–14:00 · ACPIPOC-0722-10

Record Real-time 128.7Tbit/s DWDM Transmission over 75km G.654.D Fiber Using S+C+L 17THz Bandwidth Lumped Doped Fiber Amplifiers

Anxu Zhang¹, Yuyang Liu¹, Baoluo Yan², Yan Zhao², Lipeng Feng¹, Yu Zheng², Hu Shi², Chuanze Zhang³, Zhixu Jia³, Guanshi Qin³, Jun Wu⁴, Xin Qin¹, Xiaoli Huo¹, Junjie Li¹, Chengliang Zhang¹

1.China Telecom Research Institute, State Key Laboratory of Optical Fiber and Cable Manufacture Technology, China;2.ZTE Corp, State Key Laboratory of Mobile Network and Mobile Multimedia Technology, China;3.College of Electronic Science and Engineering, Jilin University, China;4.YOFC, State Key Laboratory of Optical Fiber and Cable Manufacture Technology, China

We experimentally demonstrate a record real-time 128.7Tbit/s transmission over 75km ultra-low loss and large effective area G.654.D fiber together with S+C+L-band 17THz bandwidth using only lumped doped fiber amplifiers.

14:00–14:15 · ACPIPOC-0728-4

CMA-based Multi-Thread Adaptive Frequency Domain Equalization for Fully Virtualized Coherent Access Networks

Akio Yamasaki¹, Daisuke Hisano¹, Takahiro Suzuki², Sang-Yuep Kim², Jun-ichi Kani², Tomoaki Yoshida²

1.Osaka University, Japan;2.NTT Corporation, Japan

We propose a multi-thread adaptive frequency-domain equalizer. The proposed scheme reduces the calculation cost by 87.5% with 128 taps and 1024 GPU threads while operating with the same performance as the multi-thread time domain equalizer.

14:15–14:30 · ACPIPOC-0731-20

A Three-Component Distributed Acoustic Sensing Prototype Based on Elliptically Wound Cable

Yuran Tao, Zhengxuan Shi, Cunzhen Fan, Hao Li, Zhijun Yan, Qizhen Sun

Huazhong University of Science and Technology, China

A three-component distributed acoustic sensing method based on multi-angle elliptically wound cable is proposed. Using the different directional response of specific winding angles, 20cm spatial resolution can be realized, showing great potential for long-range applications.

14:30–14:45 · ACPIPOC-0731-112

Broadband Flat-top Electro-optic Frequency Comb Generation Based on Integrated Thin-film Lithium Niobate Modulators

Hao Wen¹, Jun Wang¹, Lei Shi^{1,2}, Xinliang Zhang^{1,2,3}

1.Huazhong University of Science and Technology, China; 2.Optics Valley Laboratory, China; 3.Xidian University, China

We demonstrate a flat-top electro-optic frequency comb with over 100 comb lines and widely tunable repetition rates, by integrating an intensity modulator and two phase modulators on the same thin-film lithium niobate chip.

14:45–15:00 · ACPIPOC-0731-114

Efficient mass manufacturing of high-density, ultralow-loss Si₃N₄ photonic integrated circuits

Xinru Ji, Rui Ning Wang, Yang Liu, Johann Riemensberger, Zheru Qiu, Tobias Kippenberg

Swiss Federal Institute of Technology Lausanne (EPFL), Switzerland

We demonstrate ultra-low propagation loss, lithographic precision, and wafer-scale manufacturing for high-density Si₃N₄ photonic integrated circuits using an efficient DUV-based subtractive approach. We show a propagation loss as low as 1.4 dB/m at 1.55 μm.

15:00–15:15 · ACPIPOC-0801-16

Programmable Photonic Nonlinearity for Quantum Simulation

Ying Wang¹, Kasper Nielsen¹, Edward Deacon², Patrik Sund¹, Zhe Liu¹, Sven Scholz³, Arne Ludwig³, Leonardo Midolo¹, Anders Sørensen¹, Stefano Paesani¹, Peter Lodahl¹

1.University of Copenhagen, Denmark; 2.University of Bristol, United Kingdom; 3.Ruhr-Universität Bochum, Germany

We demonstrate multi-mode photonic circuits enabling programmable linear and nonlinear phase configurations at the single-photon level. A quantum dot integrated into a nanophotonic device provides nonlinearity for quantum simulation of anharmonic molecular dynamics.

15:15–15:30 · ACPIPOC-0801-76

Time-Multiplexed Dual Comb Spectroscopy with Electro-Optically Modulated Combs

Debanuj Chatterjee¹, Eve-Line Bancel¹, Matteo Conforti¹, Siddharth Sivankutty¹, Hervé Rigneault², Pascal Szriftgiser¹, Steven Cundiff³, Arnaud Mussot^{1,4}

1.University of Lille, France; 2.Aix Marseille University, France; 3.University of Michigan, United States; 4.Institut universitaire de France, France

We demonstrate a novel technique for signal-to-noise ratio (SNR) improvement of dual comb spectroscopy (DCS) through time multiplexing of interferogram. We provide an experimental proof-of-concept of the technique in an all-fiber frequency-agile DCS setup.

15:30–16:00 · Coffee Break

16:00–17:30 · November 4, 2024 · Monday**Best Paper Award II**

Presider: Hui Yang, Beijing University of Posts and Telecommunications, China

The Residence 7, 2F (悦府 7, 2 楼)

16:00–16:15 · ACPIPOC–0815–44

Two-step 3D printed few-mode fiber mode power equalizerJing Liu¹, Senyu Zhang¹, Zhiyong Zhao¹, Jie Yan², Xi Xiao², Ming Tang¹*1. Huazhong University of Science and Technology, China; 2. National Information Optoelectronics Innovation Center, China Information and Communication Technologies Group Corporation, China*

We proposed and demonstrated an all-fiber type few-mode fiber mode power equalizer fabricated using two-photon polymerization (TPP) 3D printing technology, aimed at addressing the key challenge of mode-dependent loss between different modes in mode-division multiplexing (MDM) systems. Differential attenuation between the LP₀₁ and LP₁₁ modes was generated by precisely 3D printing three-layer waveguide structures on the end face of the few-mode fiber, thereby achieving mode power equalization between the modes. The innovative TPP 3D printing technique enables the flexible fabrication of waveguides with multi-layer refractive index profiles, effectively manipulating the attenuation of different modes, which will be particularly useful in few-mode fiber transmission systems.

16:15–16:30 · ACPIPOC–0815–66

Fault Tracing of Optical Networks based on CPSO–SNNYuxuan Gao^{1,2}, Bingli Guo^{1,2}, Liu Yuan^{1,2}, Jingxiang Wang^{1,2}, Shanguo Huang^{1,2}*1. State Key Laboratory of Information Photonics and Optical Communications, China; 2. Beijing University of Posts and Telecommunications, China*

The optical network fault traceability scheme based on CPSO–SNN is proposed and experimentally verify its feasibility and superiority. The aim is to cope with scenarios where untrained fault types occur and to address the time-consuming and laborious problem of manually fine-tuning hyperparameters.

16:30–16:45 · ACPIPOC–0815–67

Experimental Demonstration of Real-time Fully-loaded 80×800Gb/s Transmission over 1253-km G.652.D Fiber with Commercial 12-THz C+L-band EDFA and Integrated WSSMingqing Zuo¹, Dechao Zhang¹, Dawei Ge¹, Hongqiang Zou², Dong Wang¹, Yi He³, Jin Wang⁴, Han Li¹, Xiaodong Duan¹*1. China Mobile Research Institute, China; 2. China Mobile Communications Corporation Group Co., China; 3. ZTE Corp., China; 4. Huawei Technologies Co., China*

Using commercial EDFA and integrated WSS covering 6-THz C and 6-THz L bands, real-time 80-λ×800-Gb/s single-carrier 138-GBd DP-16QAM-PCS transmission is experimentally demonstrated over 1253-km G.652.D fiber with a mean OSNR margin of 1.6 dB.

16:45–17:00 · ACPIPOC–0815–96

Time-to-Failure Risk-based Handover Algorithm for Optical Satellite Networks

Yi An, Wei Wang, Kexin Gao, Yanran Xiao, Yongli Zhao, Jie Zhang

Beijing University of Posts and Telecommunications, China

This paper addresses the issue of frequent link handovers by proposing a Risk-based Handover Algorithm in optical networks. Results show that the proposed can reduce the handover rate by 27.8% compared with Breadth First Search(BFS).

17:00–17:15 · ACPIPOC–0816–5

Minimizing Power Consumption in IPoWDM Networks with ZR/ZR+ using Network ReconfigurationNisanur Camuzcu¹, Qiaolun Zhang¹, Mëmëdhe Ibrahim¹, Ruikun Wang², Lu Zhang², Massimo Tornatore¹*1. Politecnico di Milano, Italy; 2. Beijing University of Posts and Telecommunications, China*

We evaluate power consumption savings in IPoWDM networks with ZR/ZR+ using network reconfiguration with daily varying traffic profile. Although network reconfiguration with ZR+ is less effective than with long-haul muxponder, ZR+ is still more power-efficient.

17:15–17:30 · ACPIPOC–0731–214

Full C-band tunable integrated Erbium lasers via wafer-scale fabricationXinru Ji¹, Yang Liu¹, Xuan Yang¹, Zheru Qiu¹, Anat Siddharth¹, Rui Ning Wang¹, Taegon Kim², Joseph Olson², Tobias Kippenberg¹*1. Swiss Federal Institute of Technology Lausanne (EPFL), Switzerland; 2. Applied Materials, United States*

We demonstrate an integrated Erbium-based tunable laser using wafer-scale fabrication and ion implantation of Si₃N₄ photonic integrated circuits, and achieve single-frequency lasing tunable from 1530 nm to 1575 nm covering the entire optical C-band.

Postdeadline Paper Session I

Presider: Daquan Yang, Beijing University of Posts and Telecommunications, China

The Residence 1, 2F (悦府 1, 2 楼)

15:45-18:15 · November 4, 2024 · Monday

15:45-16:00 · ACPIPOC-1006-1

Co-wavelength-channel Integration of Ultra-low-frequency Distributed Acoustic Sensing and High-Capacity Communication

Xiang Meng¹, Long Gu¹, Zebing Zhang¹, Chaocheng Liu¹, Pengbai Xu¹, Wei Sun², Jun Yang¹, Songnian Fu¹, Yuncai Wang¹, Yuwen Qin¹

1. Guangdong University of Technology, China; 2. Jiangsu Alpha Optic-electric Technology Co., Ltd, China

We experimentally demonstrate, for the first time, the co-wavelength-channel integration of ultra-low-frequency distributed-acoustic-sensing and high-capacity communication over a 38-km weakly-coupled-seven-core fiber, achieving a sensitivity of $3.89\text{-n}\epsilon/\sqrt{\text{Hz}}@0.1\text{-Hz}$ with 20-m spatial-resolution and a transmission capacity of 241.85-Tb/s.

16:00-16:15 · ACPIPOC-1012-8

506-Pb/s-km C+L-Band 7-Core 2-Mode Transmission over Weakly-Coupled FM-MCF with Only 2×2 MIMO

Yu Yang¹, **Gang Qiao**², Honglin Ji¹, Zhaopeng Xu¹, Tonghui Ji¹, Shangcheng Wang¹, Lulu Liu¹, Baolong Zhu², Chengbin Long², Jiarui Zhang², Lei Shen³, Jie Luo³, Mingqing Zuo², Weisheng Hu¹, Juhao Li²

1. Pengcheng Laboratory, China; 2. Peking University, China; 3. YOFC, China

We demonstrate a broadband long-haul weakly-coupled SDM-WDM transmission adopting non-degenerate modes of the FM-MCFs. 14×379×24.5-GBd PDM-QPSK signals, over 1170-km FM-MCF, is achieved only utilizing 2×2 MIMO-DSP, resulting in total 433.32-Tb/s throughput and 506-Pb/s-km distance-capacity product.

16:15-16:30 · ACPIPOC-1014-11

1.2-Tb/s/λ IM/DD Optical Interconnects with Stokes Vector Receiver

Xiansong Fang¹, Yixiao Zhu², Lingjun Zhou^{1,3}, Yunchen Li^{1,3}, Chuanchuan Yang¹, Xian Zhou⁴, Weisheng Hu^{2,3}, Zhixue He³, Lei Wang³, Ke Li³, Fan Zhang^{1,3}

1. Peking University, China; 2. Shanghai Jiao Tong University, China; 3. Pengcheng Laboratory, China; 4. University of Science and Technology Beijing, China

We demonstrate the first 1.2Tb/s/λ line rate IM/DD optical interconnects using ultra-high-order modulation and Stokes vector receiver. This achievement utilizes polarization division multiplexing and 154-GBd PS-PAM20 signaling, resulting in a net 932Gb/s/λ transmission record.

16:30-16:45 · ACPIPOC-1014-14

502.6 Tbit/s S+C+L-band Transmission in Anti-Resonant Hollow-Core Fiber

Xumeng Liu¹, Chao Li¹, Zichen Liu¹, Hui Chen¹, Qibing Wang¹, Siyue Jin¹, Peng Sun¹, Mingshi Zhang¹, Songyuan Hu¹, Lei Zhang², Jie Luo², Peng Li², Lei Wang¹, Zhixue He¹, Zhangyuan Chen³, Shaohua Yu¹

1. Pengcheng Laboratory, China; 2. State Key Laboratory of Optical Fiber and Cable Manufacture Technology, YOFC, China; 3. Peking University, China

A record-breaking high-capacity transmission of 502.6Tbit/s in self-developed wideband 11.04-km anti-resonant hollow-core fiber (AR-HCF) is demonstrated for the first time, enabled by same-wavelength bidirectional technique, dense wavelength division multiplexing (DWDM), and S+C+L-band 156-nm bandwidth.

16:45-17:00 · ACPIPOC-1014-5

5.29-Pb/s Capacity in S+C+L Band Bi-directional Transmission with 24-core Single-mode Fiber

Qingyu He¹, Ming Luo¹, Xi Xiao², Chao Yang³, Xu Zhang³, Chuyu Peng⁴, Hao Guo⁴, Huang Yu⁴, Zhixue He⁵, Chao Li⁵, Hanbin Li¹, Shaohua Yu⁵

1. China Information and Communication Technologies Group Corporation, China; 2. National Information Optoelectronics Innovation Center, China; 3. China Information and Communication Technologies, China; 4. Fiberhome Fujikura Optic Technology, China; 5. Peng Cheng Laboratory, China

We demonstrate a 5.29-Pb/s GMI-estimated throughput applying WDM/SDM combined bi-directional transmission over 24-core SMF, with the average net capacity/core exceeding 220-Tb/s. Applying 75-GHz WDM spacing, the system consists 264-WDM channels, covering 19.8-THz spectrum bandwidth.

17:00–17:15 · ACPIPOC-1015-15

Field Trial of 90.81Tbit/s C+L-Band Quantum Noise Stream Cipher Coherent Transmission over 112km of Deployed Commercial FiberJihui Sun¹, Lin Jiang¹, Xingchen He¹, Anlin Yi¹, Wei Pan¹, Bin Luo¹, Lianshan Yan¹*1. SouthWest Jiaotong University, China*

We report on 90.81Tbit/s probabilistic-shaping 64QAM quantum noise stream cipher (QNSC) coherent transmission over a 112km deployed commercial fiber. To our knowledge, it is the highest capacity record of QNSC secure communication system to date.

17:15–17:30 · ACPIPOC-0929-2

First Demonstration of S+C+L-band 3.29Pbit/s SDM Network Node Enabled by Integrated S+C+L-band WSSZichen Liu¹, Linbojie Huang¹, Xumeng Liu¹, Zhongyi Li¹, Lingjun Zhou¹, Jin Tao², Ming Luo², Xu Zhang², Chao Yang², Qibing Wang¹, Zhixue He¹, Chao Li¹, Shaohua Yu¹*1. Pengcheng Laboratory, China; 2. China Information Communication Technologies Group Corporation, China*

We experimentally demonstrate a 3.29Pbit/s hierarchical switching SDM network node by using a self-developed S+C+L-band integrated WSS. The operating wavelength covers 170nm (1460nm – 1630nm) and the switching granularity of 5.4 Tbit/s is achieved.

17:30–17:45 · ACPIPOC-1014-8

First Demonstration of Software-Defined Cloud-Optical Network for Long-Haul Geographically Distributed Training (>1000 km) over CENI

Meng Lian, Yike Jiang, Yongli Zhao, Jie Zhang

Beijing University of Posts and Telecommunications, China

Long-haul geographically distributed training is a trend for LLM, while limited-cooperation among cloud-network domains becomes challenging. For the first time, we demonstrate software-defined cloud-optical network in China Environment for Network Innovations, significantly improving training efficiency.

17:45–18:00 · ACPIPOC-1015-11

The Demonstration of 100 Gb/s per Lane Optical Switching Network Enhanced with an Adaptive Time-Slot Allocation MechanismChangsheng Yang¹, Zihan Qiu¹, Yuanzhi Guo¹, Bingli Guo¹, Hui Yang¹, Wenzhe Li², Shikui Shen³, Buzheng Wei³, Xianchen Wu¹, Yisong Zhao¹, Shanguo Huang¹, Xuwei Xue¹*1. State Key Laboratory of Information Photonics and Optical Communications, Beijing University of Posts and Telecommunications, China; 2. Institute of Computing Technology, Chinese Academy of Sciences, China; 3. China Unicom Research Institute, China*

We conducted the inaugural demonstration for 100 Gb/s per lane optical switching network, introducing a novel adaptive time-slot allocation mechanism, achieving an optical switch with a packet loss rate below 6.35×10^{-9} .

18:00–18:15 · ACPIPOC-1015-16

Field Trials of a Novel Digital Twin Optical Network Utilizing Incremental Learning Modeling TechniquesYunbo Li¹, Dechao Zhang¹, Bingli Guo², Liwei Kuang³, Yucong Liu¹, Dong Wang¹, Han Li¹, Shanguo Huang²*1. China Mobile Communication Corporation Research Institute, China; 2. Beijing University of Posts and Telecommunications, China; 3. FiberHome Telecommunication Technologies Co., China*

A pioneering incremental learning modeling approach for optical network health assessment has been showcased. This method incorporates iteration technology, combining the strengths of multi-modeling techniques and achieves an impressive accuracy of over 97% in trials.

Postdeadline Paper Session II

Presider: Ke Bi, Beijing University of Posts and Telecommunications, China

The Residence 2, 2F (悦府 2, 2 楼)

16:00–18:00 · November 4, 2024 · Monday

16:00–16:15 · ACPIPOC-1015-13

Nonlinear–Penalty Free Single–carrier >600 Gbit/s Entropy–loaded DP–PCS–256QAM Transmission over 2 km NANF with Launch Power of 39 dBm

Hailin Yang¹, Meng Xiang¹, Lipeng Feng², Peng Li³, Lei Zhang³, Jie Luo³, Cong Zhang¹, Jianping Li¹, Songnian Fu¹, Yuwen Qin¹

1. Guangdong University of Technology, China; 2. China Telecom Research Institute, State Key Laboratory of Optical Fiber and Cable Manufacture Technology, China; 3. State Key Laboratory of Optical Fiber and Cable Manufacture Technology, Yangtze Optical Fibre and Cable Joint Stock Limited Company, China

We experimentally demonstrate a single–carrier DSM transmission over 2 km NANF with a net bit–rate of 613 Gbit/s, enabled by the entropy–loaded DP–PCS–256QAM. Even under 39 dBm launch optical power, nonlinear–penalty free transmission is achieved.

16:15–16:30 · ACPIPOC-1014-12

Single–Wavelength 1.9–Tb/s Direct Detection Using TFLN DDMZM and Optical Hilbert Receiver

Yixiao Zhu^{1,2}, Xiansong Fang³, Lingjun Zhou^{1,3}, Junbo Zhu¹, Yunchen Li¹, Xian Zhou⁴, Kangping Zhong⁵, Alan Pak Tao Lau⁵, Zhixue He¹, Lei Wang¹, Weisheng Hu^{1,2}, Ke Li¹, Fan Zhang^{1,3}

1. Pengcheng Laboratory, China; 2. Shanghai Jiao Tong University, China; 3. Peking University, China; 4. University of Science and Technology Beijing, China; 5. The Hong Kong Polytechnic University, Hong Kong, China

We propose an optical Hilbert direct detection receiver with an all–pass transfer function for carrier–assisted complex–valued double–sideband signal reception. We experimentally demonstrate single–wavelength line rates at 1.94 Tb/s at 300–m SSMF and 1.84 Tb/s at 10–km SSMF using a 100–GHz thin–film LiNbO₃ dual–drive Mach–Zehnder modulator.

16:30–16:45 · ACPIPOC-1014-13

Comb–driven Micrometer–scale I/Q Modulator for Tb/s O–band Coherent DWDM Interconnects

Alireza Geravand¹, Erwan Weckenmann¹, Jean–Michel Vallee¹, Zibo Zheng¹, Simon Levasseur¹, Bo Yang², Jiajian Chen², Ting Wang², Zihao Wang², Leslie Rusch¹, Wei Shi¹

1. Laval University, Canada; 2. Chinese Academy of Sciences, China

We present the first O–band ultra–compact all–silicon coherent modulator for DWDM data–center interconnects, achieving 2 Tb/s/mm bandwidth density in 120–GBaud QPSK. Transmission exceeding 1 Tb/s over 5 km is demonstrated with a quantum–dot comb source, without dispersion compensation, enabling energy–efficient, scalable interconnects.

16:45–17:00 · ACPIPOC-1015-14

Up to 320–GBaud Coherent Optical System Based on Broadband Segmented TFLN I/Q Modulator

Lingjun Zhou¹, Xiansong Fang¹, Yixiao Zhu², Junbo Zhu³, Yunchen Li¹, Xiaomin Nie³, Xian Zhou⁴, Chuanchuan Yang¹, Lei Wang³, Weisheng Hu², Ke Li³, Zhixue He³, Fan Zhang¹

1. Peking University, China; 2. Shanghai Jiao Tong University, China; 3. Pengcheng Laboratory, China; 4. University of Science and Technology Beijing, China

We demonstrate the record 320–GBd single–polarization QPSK and 300–GBd dual–polarization QPSK signal generation and intra–dyne coherent detection. This result is achieved with a novel broadband segmented TFLN I/Q modulator we fabricated and partial response signaling.

17:00–17:15 · ACPIPOC-1007-1

Chiral Metasurfaces for Heat Engine

Tianle Chen, Yungui Ma, Chen Ni, Xinran Li, Yongdi Dang, Rui Chen

Zhejiang University, China

We propose a radiative heat engine that has chirality–selective thermal emission with circular dichroism (CD) value of 0.9. We calculate the transferred total angular momentum to estimate its rotation speed, which is approximately 1 rad/s.

17:15-17:30 · ACPIPOC-1015-20

Co-route Fiber Identification with Cable and Trench Classification based-on GAN and Few-shot Meta Learning**Zhiwei Wang¹**, Hui Yang¹, Yucong Liu², Qiuyan Yao¹, Yunbo Li², Jie Zhang¹*1.Beijing University of Posts and Telecommunications, China; 2.China Mobile Research Institute, China*

We achieved 99% accuracy in identifying co-route fibers using GAN and few-shot meta-learning, with 99% classification accuracy in trenches and 98% in cables few-shot classification, significantly improving optical network survivability and reliability.

17:30-17:45 · ACPIPOC-1001-3

Dispersive Perfectly Matched Layer for the computation of Quasinormal modes of open electromagnetic structures**Boris Gralak¹**, Guillaume Demésy²*1.CNRS - Institut Fresnel, France; 2.Aix Marseille Université - Institut Fresnel, France*

Perfectly matched layers (PML) are numerical and theoretical tools allowing to handle the oscillating outgoing nature of waves in unbounded problems. In direct frequency domain, the wavelength in the infinite space to truncate is fixed which facilitates the optimization of the PML parameters (damping profile, truncation, mesh discretization...). In spectral problems, PML are a widely used theoretical tool allowing to retrieve the Quasinormal modes of open electromagnetic structures. However, in the modal context, the wavelength becomes eigenvalue dependent and the use of non-dispersive PML, well optimized for direct harmonic problems where the wavelength is fixed, leads to a radically different treatment of low and high frequency QNMs. Thus, we propose to investigate the use of frequency-dependent PML damping profiles, as it was originally the case in the seminal paper by Bérenger which was targeting time-domain methods. In this paper, 1D and 2D Cartesian dispersive PMLs are investigated and the advantages of using them in the computation of Quasinormal modes are presented.

17:45-18:00 · ACPIPOC-1016-1

An Electrochromic Device with Dynamic Tamm Resonance via Reversible Metal Electrodeposition**Jiahao Hou^{1,2}**, Shenghao Jin^{1,2}, Tao Xie^{1,2}, Tiger H. Tao¹, **Boxiang Wang¹***1.Shanghai Institute of Microsystem and Information Technology, Chinese Academy of Sciences, China; 2.Shanghai Jiaotong University, China*

We have designed and fabricated an electrochromic device based on reversible metal electrodeposition to achieve color switching by the excitation and annihilation of Tamm resonance.

Poster Session

Track 1: Optical Fibers, Fiber-based Devices

ACPIPOC-0419-1

Bar-supported negative curvature hollow-core fiber for low-loss guidance in the near-infrared region

Arooj Fatima¹, Ahmet Emin Akosman², Mustafa Ordu¹

1.Bilkent University, Turkey; 2.Roger Williams University, United States

A novel negative curvature hollow-core optical fiber with bar-supported tubular structures is proposed. The five sets of cladding elements improved the transmission in the near-infrared region as low as 0.0014 dB/km with strong single-mode guidance.

ACPIPOC-0725-7

Wideband low confinement loss anti-resonant hollow core fiber with nested waterdrop-shaped tube

Jingmin He¹, Hu Zhang¹, Jiaqi Wang¹, Xia Zhang², Lixia Xi¹, Xiaoguang Zhang¹

1.Beijing University of Posts and Telecommunications, China; 2.Liaocheng University, China

We propose a nested waterdrop-shaped anti resonant hollow core fiber supporting single mode with low confinement loss and bending loss over a wide wavelength range while maintaining a larger gap between adjacent tubes.

ACPIPOC-0729-28

Encoding of the soliton molecules in a passively mode-locked fiber laser

Haoguang Liu¹, Yixiang Sun¹, Yao Yao², Yusong Liu¹, Yiyang Luo², Qizhen Sun¹

1.Huazhong University of Science and Technology, China; 2.Chongqing University, China

Via selecting two different states of the soliton pair as encoding elements, a binary encoding scheme is experimentally realized. It verifies the feasibility of solitonic encoding by gain control, releasing its potential in all-optical storage.

ACPIPOC-0730-32

Broadband supercontinuum generation in a Mamyshev fiber oscillator with highly nonlinear fiber

Zhuang Wang, Heping Li, Ding Niu, Zhiyao Zhang, Yong Liu

University of Electronic Science and Technology of China, China

We demonstrate supercontinuum generation in an all-silica fiber Mamyshev oscillator using highly nonlinear fiber with a zero-dispersion wavelength at 1550 nm. A supercontinuum spectrum spanning from 1124 to 2177 nm is obtained.

ACPIPOC-0730-38

All-Fiber Non-Hermitian Devices Enabling Chiral Mode Switching of LP Modes

Yuchen Zhang^{1,2}, Kang Li^{1,2}, Siwei Wang^{1,2}, Jian Wang^{1,2}

1.Wuhan National Laboratory for Optoelectronics and School of Optical and Electronic Information, Huazhong University of Science and Technology, China; 2.Optics Valley Laboratory, China

We propose and demonstrate an all-fiber non-Hermitian device enabling high-purity (92%) chiral mode switching within a broad band (1500-1630 nm) for both LP₀₁ (LP₁₁) mode.

ACPIPOC-0730-42

Modelling of single-frequency gain-switched ultrashort 2-μm thulium doped fiber laser oscillator with kW peak power output

Yifei Li, Jindan Shi, Xian Feng

Jiangsu Normal University, China

We have numerically studied single-frequency gain-switched 2-μm thulium doped fiber laser oscillator with cm-level long cavity length. The peak output power of such a high-performance laser is predicted to be beyond 1 kW.

ACPIPOC-0730-46

Measurement of the Coefficient of Thermal Expansion of Carbon Fiber Composites Based on Fabry-Pérot Cavities

Liang Xin¹, Xiaojun Tang¹, Lixia Liu¹, Tianli Hui¹, Zijie Sun¹, Xin Tian¹, Yuanbo Zhai², Tigang Ning²

1.Beijing Satellite Manufacturing Co., Ltd, China; 2.Key Laboratory of All Optical Network & Advanced Telecommunication Network of EMC Beijing Jiaotong University, China

A method for measuring the thermal expansion coefficient (CTE) of carbon fiber composites based on Fabry-Pérot (FP) cavity is proposed. The CTE of a carbon fiber composite is measured to be $5.18 \times 10^{-6} / ^\circ\text{C}$.

ACPIPOC-0731-103

Design of a weakly coupled 19-core 5-mode-group fiber for dense space-division multiplexingChen Kaihui^{1,2}, Tu Jiajing^{3,4}, Gao Shecheng^{3,4}, Li Zhaohui^{1,2}*1. Guangdong Provincial Key Laboratory of Optoelectronic Information Processing Chips and Systems and School of Electronics and Information Technology, China; 2. Sun Yat-sen University, China; 3. Department of Electronic Engineering, College of Information Science and Technology, China; 4. Jinan University, China*

We propose a weakly-coupled 19-core 5-mode-group trench-assisted ring-core fiber, supporting 380 spatial channels. Each inter-mode-group separation exceeds 1×10^{-3} and the intra-mode-group crosstalk can be demodulated using 4×4 MIMO. The inter-core crosstalk is below -60 dB/km.

ACPIPOC-0731-107

Mode Converter Based on the Long-Period Fiber Grating Inscribed in Graded Index Few Mode Fiber

Hang Su, Yunqi Liu, Yuehui Ma, Chengbo Mou

Shanghai University, China

A mode converter based on the long-period fiber grating is investigated, which is inscribed in graded-index few-mode fiber. The coupling from the fundamental mode to higher-order core mode (LP₂₁) has been achieved.

ACPIPOC-0731-125

Efficient Al-Ge-Er Co-Doped FM-EDF for Low-DMG C-Band AmplificationYuanpeng Ding¹, Lu Dai¹, Junjie Qi¹, Baolong Zhu², Lei Shen¹, Shiqi Zhou¹, Jun Chu¹, Haohua Wan¹, Zhaolong Liao¹, Xin Huang¹, Lei Zhang¹, Jie Luo¹*1. Yangtze Optical Fibre and Cable Joint Stock Limited Company, China; 2. Peking University, China*

A double-cladding weakly-coupled FM-EDF was fabricated, and the cladding-pumped FM-EDFA was constructed. In C-band, the average gain after simultaneous amplification of the 4-LP mode is 21.62 dB, and the DMG is less than 2.37 dB.

ACPIPOC-0731-159

Compact ring core fiber collimator and isolator supporting three OAM modes with low insertion loss and high isolation

Mutian Xu, Xi Zhang, Yuchen zhang, Jun Liu, Jian Wang

Wuhan National Laboratory for Optoelectronics and School of Optical and Electronic Information, Huazhong University of Science and Technology Optics Valley Laboratory, China

We present ring core fiber (RCF) collimators and realize micro-optical fiber isolators which support three OAM modes (OAM₀, OAM₁, OAM₂) with low insertion loss (1.8dB) and high isolation (40dB)

ACPIPOC-0731-171

Generation of 9 MW Peak Power from a Pre-chirped Mamyshev Oscillator Utilizing a Hollow-core FiberShan Wang^{1,2,3}, Ziheng Zhuang^{1,2,3}, Weijia Luo^{1,2,3}, Xin Zhang⁴, Cong Zhang^{1,2,3}, Di Lin^{1,2,3}, Songnian Fu^{1,2,3}, Pu Wang⁴, Yuwen Qin^{1,2,3}*1. Institute of Advanced Photonics Technology, School of Information Engineering, Guangdong University of Technology, China;**2. Key Laboratory of Photonic Technology for Integrated Sensing and Communication, Ministry of Education of China, Guangdong**University of Technology, China; 3. Guangdong Provincial Key Laboratory of Information Photonics Technology, Guangdong**University of Technology, China; 4. Institute of Laser Engineering, Beijing Engineering Research Center of Laser Applied Technology, Beijing University of Technology, China*

We report an Yb-doped fiber Mamyshev oscillator employing pre-chirp management through a hollow-core fiber, capable of generating externally de-chirped pulses with a duration of sub-40 fs and a peak power of ~9.7 MW.

ACPIPOC-0731-184

Mode Converters of LP₅₁ Core Mode Coupling Based on Long-Period Fiber Gratings

Siyu Chen, Xiaolong Fan, Chengbo Mou, Yunqi Liu

Shanghai University, China

We demonstrate the inscription of multi-cascaded long-period fiber grating in a few-mode fiber using a CO₂ laser. The mode conversion from LP₀₁-LP₁₁ mode, LP₁₁-LP₂₁ mode, LP₂₁-LP₃₁ mode, LP₃₁-LP₄₁ mode, and LP₄₁-LP₅₁ mode can be achieved.

ACPIPOC-0731-217

Design and characterization of the heterogeneous integrated optical fiber with triple side nickel cores

Luo Chen, Yunzhe Gu, Junjie Zhu, Xian Wang, Mengshi Zhu, Liang Zhang, Heming Wei, Fufei Pang

Shanghai University, China

A heterogeneous integrated optical fiber with triple side nickel cores (TSNCF) was designed, fabricated, and characterized. The results demonstrate that the TSNCF has promising potential for applications in distributed magnetic field sensing.

ACPIPOC-0731-36

Inverse Parameters Estimation for Electro-Optic Frequency Combs Generation via Modified Physics-Informed Neural Network

Yaoping Wu, Xihua Zou, Jincong Hu, Hui Yang

Southwest Jiaotong University, China

To solve the prediction deterioration in the scenario of the all-fiber electro-optical frequency combs generation, we propose a modified physics-informed neural network for improved accuracy and efficiency. Simulations illustrate that it maximally reduces mean squared error by 82.4% in the inverse estimation and 42.0% in the forward propagation.

ACPIPOC-0801-103

Research on 800Gbit/s transmission fiberHongyan Zhou¹, Jun Wu², Zhibin Ma², Yifeng Zhu³, Lin Tian³, Hongyang Zhao², Lixin Gu¹, Liwei Huang¹, Xinwei Qian¹

1.State Key Laboratory of Optical Fiber and Cable Manufacture Technology, Yangtze Optical Fibre and Cable Joint Stock Limited Company (YOFC), China; 2.Hubei Key Laboratory of Plasma Chemistry and Advanced Materials, Wuhan Institute of Technology, China; 3.China Southern Power Grid Co., Ltd. EHV Transmission Company, China

This paper introduces the performance of G.654.E single-mode optical fiber based on the requirements of 800 Gbit/s single-carrier optical fiber transmission system. The performance of G.654.E single-mode optical fiber is introduced through the long-haul/ultra-long haul backbone network transmission experiment and medium-long distance transmission experiment in single-carrier 800G laboratory, and the single-carrier 800G practical network transmission experiment. It is verified that G.654.E is the best fiber choice in the single carrier 800G high speed era.

ACPIPOC-0801-105

Research of Attenuation Test for NANF

XiaoKai Wang, LiYan Zhang, Jun Chu, Peng Li, Lei Zhang, YaPing Liu, Zheng Feng, Xu Lei, Luo Jie

Yangtze Optical Fiber and Cable Joint Stock Limited Company, China

We investigate the effect of launching fiber type, cut-back length, and coupling condition on the NANF attenuation testing when using cut-back technique, and analyze the reasons behind them.

ACPIPOC-0801-127

Transmission of orbital angular momentum modes in Angular Symmetry Fibers

Suwan Qin, Xiongfeng Rao, Li Yang

University of Science and Technology of China, China

We propose an angular symmetry fiber and demonstrate its capability for the transmission of optical orbital angular momentum modes by using numerical analysis based on finite element method.

ACPIPOC-0801-85

Research on 400G ultra-high speed ultra-long distance unrepeated transmission fiberJun Wu¹, Hongyan Zhou², Zhibin Ma¹, Guangzhe Wu³, Fang Chen⁴, Hongyang Zhao¹, Lixin Gu², Bozhong Li⁵, Xinwei Qian², Han Long⁶, Chao Huang⁶, Ming Hu⁷

1.Hubei Key Laboratory of Plasma Chemistry and Advanced Materials, Wuhan Institute of Technology, China; 2.State Key Laboratory of Optical Fiber and Cable Manufacture Technology, Yangtze Optical Fibre and Cable Joint Stock Limited Company (YOFC), China; 3.State Grid Information & Telecommunication Co.,Ltd., China; 4.State Grid Information & Telecommunication Co.,Ltd, China; 5.State Grid Information and Telecommunication Co.,Ltd., China; 6.Accelink Technologies Co. Ltd, China; 7.Wuhan University, China

According to the application requirements of 400Gbit/s ultra-long span unrepeated transmission, based on two typical amplification schemes, it is verified that adopting 400G 16QAM, the single span unrepeated transmission distance of G.654.E fiber exceeds 300km, which can meet most of the ultra-long distance unrepeated transmission scenarios.

ACPIPOC-0801-91

Cut-off Wavelength Research of G.654.E Optical Fibre and CableQiqiang Yang¹, Liyan Zhang¹, Lu Liu¹, Chen Feng², Weiguang Wang¹, Zhechi Liu¹, Hongyan Zhou¹, Xinwei Qian¹, Zhuang Xiong¹

1.State Key Laboratory of Optical Fibre and Cable Manufacture Technology Yangtze Optical Fibre and Cable Joint Stock Limited Company, China; 2.Supply Chain Management Center China Mobile Communications Group Co,Ltd, China

Influence of fibre length and stress to G.654.E cutoff wavelength are studied. As the fibre length increases, the cutoff wavelength decreases. Cut-off wavelength of 2km cabled fibre is about 73nm lower than that of 22m.

ACPIPOC-0812-8

Polarization-Dependent Gain in E-Band Bismuth-doped Fiber AmplifierKit On Chung¹, Kwong Shing Tsang¹, Wai Sing Man², Dongmei Huang¹, Chao Lu¹

1.The Hong Kong Polytechnic University, Hong Kong, China; 2.Amonics Limited, China

This paper investigates the polarization-dependent gain (PDG) characteristics of an E-Band bismuth-doped fiber amplifier (BDFA). It was found that E-Band BDFA exhibits 2.7dB PDG. Different methods are studied to reduce the PDG, and less than 0.35dB PDG is successfully achieved.

ACPIPOC-0813-7

A Novel Ultra-Low Loss Anti-Resonant Fiber Suitable for the Near-Infrared BandZhaoyang Zhang¹, Yuemei Li², Yao Guo², Zheng Liu², Haobo Guo², Zhiguo Zhang²

1.State Key Lab of Information Photonics and Optical Communications Beijing University of Posts and Telecommunications, China; 2.Beijing University of Posts and Telecommunications, China

This paper presents an anti-resonant fiber that exhibits an ultra-low loss of 3.556×10^{-5} dB/km near the 808 nm wavelength, underscoring its significant potential for power transmission applications within this specific wavelength range.

ACPIPOC-0814-21

A high temperature sensor based on silicon core optical fiber Fabry-Perot cavity

Lijun Zhu, Na Chen, Yana Shang, Zhenyi Chen, Fufei Pang, Tingyun Wang

Shanghai University, China

A high temperature sensor based on silicon core optical fiber Fabry-Perot cavity is proposed and experimentally demonstrated. The sensor can operate stably from 100°C to 900°C with a high sensitivity of 113.9 pm/°C.

ACPIPOC-0814-43

Imperfection and Attenuation Coefficient Spectral Distributions Measurements for Scintillating Fiber Based on Bidirectional Measurements and Side-Induced Fluorescence Method

Takuya Hamasaki, Yasuki Morimoto, Yasuhiro Tsutsumi

Kindai University, Japan

We have proposed a method for measuring the imperfection and attenuation coefficient spectral distributions of scintillating fibers based on the bidirectional measurement method and the side-induced fluorescence method.

ACPIPOC-0815-21

Compact Brillouin-Erbium Random Fiber Laser via Distributed Feedback from a Random Fiber GratingWeiyu Pan¹, Liang Zhang¹, Haiyang Wang², Mengshi Zhu¹, Heming Wei¹, Fufei Pang¹, Tingyun Wang¹*1. Shanghai University, China; 2. North University of China, China*

A compact random fiber laser utilizing a hybrid Brillouin and Erbium gain along 10-m Erbium doped fibers and distributed feedback from a random fiber grating was proposed and experimentally demonstrated.

ACPIPOC-0815-23

Chaotic time delay signature elimination based on self-feedback antisymmetric resonatorGuomeng Zuo¹, Quanxin Na², Liyang Shao¹, Qijie Xie², Huabei Liu¹, Lanxuan Zhang², Dongwei Zhuang², Lei Wang²*1. Southern University of Science and Technology, China; 2. Pengcheng laboratory, China*

A chaotic delay elimination scheme based on a self-feedback anti-symmetric coupling fiber ring resonator (SACFRR) is proposed. This scheme utilizes the multipath effect of the SACFRR to completely eliminate the time delay signature (TDS). The ability to completely eliminate TDS is verified by experiments. The coupling coefficient of SACFRR is also optimized to achieve better TDS suppression performance. The proposed structure is remarkably simple and easy to be implemented and integrated. The chaotic laser can offer an effective optical source for encrypted communications, chaotic Lidar, and random bit generation.

ACPIPOC-0815-31

Study on the phenomenon of double dominant modes in vortex fiber with ring-core structure

Yuzhen Zhao, Yuchao Jiang, Yongfu Su, Mengjuan Qin, Shiyong Xiao

Beijing Jiaotong University, China

The vortex fiber is a fiber that can generate and transmit orbital angular momentum (OAM) modes. The vector modes in the same mode group in the vortex fiber with ring core structure are no longer degenerate. We find that when the inner refractive index of the ring-core structure introduces a gully to increase the refractive index difference between the core center point and the external high refractive index ring, the dominant mode will appear in both the outer high refractive index layer and the inner high refractive index layer. After making this kind of fiber into a Bragg grating, it is found that the dominant modes of the outer and inner sides will both produce strong reflection peaks. In addition, in the process of grating measurement, the reflection peak intensity of the inner main mode can be reduced by means of dislocation until it disappears. The phenomenon found in this paper has important application value in the field of mode filter and mode separation.

ACPIPOC-0815-68

Periodicity and bifurcation of single pulse and soliton moleculesXiaoqiang Ban¹, Xiaohui Li², Qian Li¹, Ming Zhong³*1. Peking University, China; 2. Shaanxi Normal University, China; 3. Shenzhen University, China*

Period bifurcation of single pulse and soliton molecule are studied in fiber lasers, where period-timing bifurcation reveals the abundant nonlinear pulse dynamics and may be applied to optical switch.

ACPIPOC-0815-69

Continuous switching dynamics of breathing dissipative solitons in mode-locked fiber lasers

Rui Zhou, Hanyang Shen, Zuxing Zhang

Nanjing University of Posts and Telecommunication, China

A fiber laser capable of continuous switching between different soliton states through pump intensity modulation was investigated, which provides new perspectives for direct manipulation and programmable encoding of breathing dissipative solitons.

ACPIPOC-0818-10

High-order mode laser based on a low-order mode filter in few-mode fiber ring resonatorRunzhou Qiu¹, Wei Li², Bofan Guo¹, Jiajing Tu¹, Cheng Du², Shecheng Gao¹*1.Jinan University, China; 2.Fiberhome Telecommunication Technologies Co. Ltd., China*

We proposed and demonstrated a few-mode fiber (FMF) ring laser with controllable second-order transverse mode output by constructed a low-order mode filter in a few-mode fiber ring resonator. The mode filter consists of two cascaded long-period fiber gratings, which can couple the light in the fundamental mode and LP_{1,1} mode into the cladding mode, and then dissipate it. The filtering efficiency of the fundamental mode is ~90%. With a homemade symmetric mode coupler, the second-order mode light is successfully coupled out from the ring resonator. Furthermore, LP_{2,1} mode have been obtained at 1553.5nm by adjusting the polarization controllers. And the 3dB bandwidth is 0.4nm.

ACPIPOC-0818-11

Design of High-Capacity Multimode Erbium-Doped Optical Fibers Based on Neural NetworkYanghua Xie¹, Jinkai Zhou¹, Bofan Guo¹, Jiajing Tu¹, Cheng Du², Shecheng Gao¹*1.Jinan University, China; 2.Fiberhome Telecommunication Technologies Co. Ltd., China*

In this work, we present a multimode erbium-doped fiber (MM-EDF) design scheme optimized by neural network, which effectively reduces inter-mode-group crosstalk and achieves high gain and low differential mode gain (DMG). The designed fiber supports the transmission of up to 100 modes across 10 mode groups, and by optimizing the Δn_{eff} within and between groups, we significantly lower inter-mode-group crosstalk. The demonstrated erbium ion distribution structure we designed shows a high degree of overlap with the mode distribution, achieving mode gains greater than 29 dB and DMG less than 1.38 dB. This design holds promise for low-crosstalk, high-gain, large-capacity online transmission systems.

ACPIPOC-0818-4

Five Orbital-angular-momentum mode-groups multiplexed amplification based on a ring-core erbium-doped fiberBofan Guo¹, Wei Li², Jiajing Tu¹, Cheng Du², Shecheng Gao¹, Zhaohui Li³*1.Jinan University, China; 2.Fiberhome Telecommunication Technologies Co. Ltd., China; 3.Sun Yat-sen University, China*

In this work, we experimentally investigated the gain characteristics of a ring-core erbium-doped fiber (RC-EDF) that supports five orbital angular momentum (OAM) mode groups. Through the design and successful fabrication of the erbium-doped fiber, we ensured its capability to support up to five OAM modes. Experimental results indicate that the RC-EDF can simultaneously amplify five OAM mode groups with an average gain exceeding 25 dB, and the mode gain difference across all 20 modes is less than 1 dB.

ACPIPOC-0818-5

Design of high-capacity, low-loss, multi-layer few mode fiber with negatively-doped cladding over C-bandHaiqin Ye¹, Jiajing Tu², Mingjuan Zhuang¹, Shecheng Gao², Zhaohui Li¹*1.Sun Yat-sen University Guangzhou, China; 2.Jinan University Guangzhou, China*

In this paper, to achieve ultra-low loss, we adopt fluorine-doped cladding to reduce the doping content of core and design weakly-coupled few-mode fibers with ultra-low loss and 10 mode groups through numerical simulation and algorithm.

Track 2: Optical Transmission Sub-systems, Systems and Technologies

ACPIPOC-0624-1

A method for reducing optical multipath interference based on probabilistic shaping

Pengcheng Zhang, Hui Yang, Rong Wang, Li Chen, Shuteng Cui

Southwest Jiaotong University, China

We demonstrate a method for reducing optical multipath interference (MPI) based on probabilistic shaping (PS). The result shows 2.8dB enhancement in MPI tolerance for 25 GBaud PAM4 transmission over 10 km SSMF.

ACPIPOC-0701-1

Flexible and differentiable optical fiber channel modeling based on a neural network moduleRui Jiang¹, Xin Ding¹, Zican Xie¹, Kaihong Wang¹, Tao Jia¹, Ningxin Jiao¹, Li Yang¹, Zunliang Zou¹, Huiying Wang², Chao Shang¹, Zhi Wang¹*1.Beijing Jiaotong University, China; 2.Beijing Institute of Technology, China*

Optical fiber channel is emulated flexibly and accurately by a neural network module which is differentiable naturally and has good generalization over GCS and PCS modulation format with little normalized MSE (=0.025).

ACPIPOC-0705-2

Entropy-Power Loading for OFDM-FSO Communication System under Atmospheric TurbulenceQianwu Zhang^{1,2}, Zhiyu Li¹, Bingyao Cao¹, Yating Wu¹, Kun Chen¹*1.Shanghai University, China; 2.Teralink Optical Corporation, China*

We applied entropy-power loading to atmospheric turbulence scenarios for the first time. It can achieve 0.35 bits/symbol and 0.47 bits/symbol generalized mutual information (GMI) gains compared to bit-power loading and 0.45 bits/symbol and 0.55 bits/symbol GMI gains compared to fixed-order 64QAM under strong and weak turbulence, respectively.

ACPIPOC-0709-1

Amplitude-Constrained Gerchberg-Saxton (AC-GS) Optimization for Laguerre-Gaussian Beams in Atmospheric-turbulence Channels

Bianxia Feng, Tianfeng Zhao, Feng Wen, Baojian Wu, Kun Qiu

University of Electronic Science and Technology of China, China

We propose an amplitude-constrained Gerchberg-Saxton method to effectively compensate for the distorted Laguerre-Gaussian beams. The proposed scheme exhibits the greater adaptability and achieves 5.33% improvement on the mode purity compared to conventional GS scheme.

ACPIPOC-0720-3

Noninteger Fractionally Spaced Equalizers Tolerant to Carrier-Phase Fluctuations for Coherent Optical ReceiversMengyu Qin¹, Qinghua Tian¹, Fangxu Yang¹, Zhipei Li², Fu Wang¹, Feng Tian¹, Qi Zhang¹, Sitong Zhou¹, Xiangjun Xin²*1.Beijing University of Posts and Telecommunications, China; 2.Beijing Institute of Technology, China*

We propose an approach for non-integer oversampling equalization with high tolerance to carrier-phase fluctuations, simulation on 400Gbit coherent system shows that its performance is better than other existing schemes

ACPIPOC-0720-4

A Novel Training Sequence for Long Distance Coherent Optical Filter Bank Multi-CarrierJian Ge¹, Yongtao Huang², Jianguo Yu²*1.Institute of Technology and Standards, China Academy of Information and Communications Technology Internet Center, China;**2.Beijing University of Posts and Telecommunications, China*

A novel training sequence is applied to the CO FBMC channel estimation and equalization. Compared with the E-IAM-C, the BER performance is optimized by a quarter of an order of magnitude at a distance of 1600km.

ACPIPOC-0722-15

A Novel Pilot-aided Polarisation Joint Carrier Phase Estimation Method for Set-Partitioning QAM SystemsYuan Gao^{1,2,3}, Zhipei Li⁴, Qi Zhang^{1,2,3}, Sitong Zhou^{1,2,3}, Feng Tian^{1,2,3}, Qinghua Tian^{1,2,3}*1.Beijing University of Posts and Telecommunications, China; 2.Beijing Key Laboratory of Space-Ground Interconnection and Convergence, China; 3.State Key Laboratory of Information Photonics and Optical Communications, China; 4.Beijing Institute of Technology, China*

In this paper, we propose a novel 4-D CPR method for SP-QAM signals. The simulation results demonstrate that the proposed CPR method is more applicable to SP-QAM signals than the traditional methods.

ACPIPOC-0722-18

Simulation of Self-Coherent Methods to Mitigate Turbulence-introduced Higher-order Modes Loss for Optical Wireless Communications

Yunjie Hu, Xiong Deng, Bin Lu, Xihua Zou, Wei Pan, Lianshan Yan

Center for Information Photonics and Communications, Southwest Jiaotong University, China

This study employs self-coherent methods to mitigate higher-order modes caused by atmospheric turbulence. We simulate Laguerre-Gaussian beam propagation and analyze intensity and phase distributions to validate the method's effectiveness.

ACPIPOC-0722-7

A BiGRU-Based Method for Indoor Visible Light DCO-OFDM Channel ModelingBo Song¹, Yanwen Zhu², Haiteng Zong³, Yi Huang²*1.Beijing Smartchip Semiconductor Technology Co.Ltd, China; 2.Beijing University of Posts and Telecommunications, China;**3.Beijing Guoyuan Liannuo Technology Co.Ltd, China*

This paper introduces a BiGRU-based indoor VLC model with lower computational needs than BiLSTM, achieving a maximum MSE of 6.54×10^{-5} .

ACPIPOC-0722-9

Experimental Demonstration of Channel Modeling in End-to-End Visible Light Communication SystemBo Song¹, Yanwen Zhu², Haiteng Zong³, Yi Huang²*1.Beijing Smartchip Semiconductor Technology Co.Ltd, China; 2.Beijing University of Posts and Telecommunications, China;**3.Beijing Guoyuan Liannuo Technology Co.Ltd, China*

A BiLSTM and Transformer channel modeling approach are proposed for end-to-end VLC systems. Through model fitting and data distribution analysis, it shows Transformer has an R-Square 0.99, indicating better suitability.

ACPIPOC-0723-15

Learning and Perturbation based Multi-stage Nonlinear Pre-compensation Algorithm in Coherent Optical Systems

Yuheng Wang, Tengyuan Liu, Junhe Zhou

Tongji University, China

A learning and perturbation based multi-stage pre-compensation method is proposed. The nonlinear compensation performance is enhanced by introducing amplitude and phase factors in each stage of pre-compensation, which are obtained by the gradient descent algorithm.

ACPIPOC-0725-13

C-band High CPRI-Equivalent Rate Direct Detection Transmission over 10 km Standard Single-Mode Fiber for Digital-Analog Radio-over-Fiber Mobile Fronthaul

Maomao Wu, Jianping Li, Xinkuo Yu, Jianbo Zhang, Yuwen Qin, Ou Xu, Di Peng, Meng Xiang, Songnian Fu

Institute of Advanced Photonics Technology, School of Information Engineering, Guangdong University of Technology, China

We experimentally demonstrate the C-band 40-GBaud 1024-QAM DMT signal transmission over 10-km direct-detection-based digital-analog radio-over-fiber mobile-fronthaul link with a record of 3-Tb/s*km CPRI-equivalent rate-distance product, achieved by optimizing the magnification and scaling factors.

ACPIPOC-0726-1

Increasing Maximum Reach in Coupled Core Multi-Core Fiber using Subcarrier MultiplexingAndrea Carena¹, Hossam Selmy²*1.Politecnico di Torino, Italy; 2.IT - Instituto de Telecomunicações, Portugal*

Subcarrier multiplexed transmission is used to reduce nonlinear interference NLI and increase the maximum reach of coupled core multi-core fiber. An increase of 19% in the maximum reach is achieved by deploying 8 subcarriers.

ACPIPOC-0727-1

256 GBaud C-band RRM-based OOK Transmission Using CNN-GRU and Bi-LSTM EqualizationDan Li^{1,2}, Yevhenii Osadchuk³, Armands Ostrovskis^{4,5}, Toms Salgals⁴, Francesco Da Ros³, Darko Zibar³, Lu Zhang⁶, Xianbin Yu⁶, Vjaceslavs Bobrovs⁴, Xiaodan Pang^{1,2,4}, Oskars Ozolins^{1,2,4}*1.Department of Applied Physics, KTH Royal Institute of Technology, Sweden; 2.RISE Research Institutes of Sweden, Sweden;**3.DTU Electro, Technical University of Denmark, Denmark; 4.Institute of Photonics, Riga Technical University, Latvia; 5.Keysight Technologies Deutschland GmbH, Germany; 6.Zhejiang University, China*

We experimentally demonstrate CNN-GRU and bi-LSTM equalization for 256 GBaud C-band RRM-based OOK transmission, significantly outperforming conventional FFE and DFE with BER below the 6.25% HD-FEC threshold in both B2B and 100 m SMF transmissions.

ACPIPOC-0727-11

A Nonlinear Equalization Method Based on Kolmogorov-Arnold Networks in WDM SystemsXinyu Yuan¹, Qi Zhang¹, Xiangjun Xin², Ran Gao², Qihan Zhao¹, Yi Cui¹, Fu Wang¹, Feng Tian¹, Sitong Zhou¹, Qinghua Tian¹, Yi Zhao¹, Yun Wang¹*1.Beijing University Of Posts and Telecommunications, China; 2.Beijing Institute of Technology, China*

A nonlinear equalization method based on Kolmogorov-Arnold Networks is proposed to mitigate nonlinear effects in WDM systems. Experimental results demonstrate that this approach significantly enhances system performance.

ACPIPOC-0727-4

Generation and Self-Healing Characteristics of Symmetric Power-Exponent-Phase Quasi-Bessel Beams

Yangzong Ao, Jinghong Wang, Yaoyao Liu, Gengliang Zhao, Andong Wang, Long Zhu

Chongqing University of Posts and Telecommunications, China

Symmetric power-exponent phase vortex beams (SPEPVBs) are a new type of noncanonical vortex beams that have been widely followed and studied due to their flexible control freedom. To further meet the practical application requirements, this paper generates symmetric power-exponent-phase quasi-Bessel beams (SPEQBBs) by reasonably adding the radial phase, which successfully improves the self-healing capability of SPEPVBs. The effects of different obstacle types, topological charge m and power index n , radial tuning parameter a , and diffraction distance on the self-healing performance of the two obstructed beams are also discussed. This study has potential applications in the field of free-space optical communication and optical trapping.

ACPIPOC-0727-5

Generation and free-space transmission characterization of tunable focusing vortex beams

Jinghong Wang, Yangzong Ao, Gengliang Zhao, Yaoyao Liu, Andong Wang, Long Zhu

Chongqing University of Posts and Telecommunications, China

In this paper, we introduce a new type of optical beams capable that can auto-focusing multiple times in free space, namely, a tunable focusing vortex beams (TFVBs). The TFVBs are generated by controlling the radial phase distribution to generate multiple vortex beams with pre-determined convex trajectories. After tailoring and overlapping of multiple vortex beams with different predetermined convex trajectories, thus enabling an on-axis multi-focus property. At the same time, we investigate the effect of different OAM states ($l=\pm 1, \pm 2$ and ± 3) on the focusing. Realize the controllable position of the focusing point and the controllable number of focusing points in the process of dissemination. we expect that this work may bring auto-focusing optical beams further potential applications.

ACPIPOC-0727-6

Multi-dimensional Soft Decoding to Mitigate the Residual IC-XT in Coupled-core MCF LinksJunze Fu¹, Lin Sun¹, Junjie Xiong², Lin Ma²*1. Soochow University, China; 2. State Key Laboratory of Advanced Optical Communication Systems and Networks, Shanghai Jiao Tong University, Minhang, China*

A multi-dimensional soft decoding method is proposed and experimentally demonstrated on coupled-core MCF transmission links. Residual intercore crosstalk (IC-XT) can be effectively mitigated with using the MIMO equalizer with short taps.

ACPIPOC-0728-14

Message Passing Neural Network-Enhanced Optical OTFS Iterative Symbol DetectionYuxuan Liao¹, Rui Wang¹, Jianhua Pei¹, Jian Song^{1,2}, Yuhang Dong^{1,2}*1. Tsinghua University, China; 2. Peng Cheng Laboratory, China*

Optical orthogonal time frequency space (O-OTFS) has been proven to exhibit spectral and power efficiency superiority than previous optical orthogonal frequency-division multiplexing (O-OFDM) in visible light communication (VLC) systems. However, in prior related works, the efficient symbol detection method has not been fully investigated yet. In this paper, we devise an effective delay-Doppler (DD) domain detection scheme based on message passing neural network (MPNN) iterations, which utilizes the zero-forcing (ZF) equalized symbols as additional prior information. Numerical results have demonstrated that the proposed ZF-aided MPNN-iterated symbol detection scheme (MPNN-ZF) provides notable enhancement in terms of the bit-error-rate (BER) and convergence performance compared with other conventional methods.

ACPIPOC-0728-15

Informer-based Long-term Prediction Method for Radio Frequency Transfer System

Yiyi Yao, Zhengkang Wang, Jiahui Cheng, Buyun Ma, Xinyu Miao, Yaojun Qiao

Beijing University of Posts and Telecommunications, China

An Informer-based long-term prediction method for radio frequency (RF) transfer system is proposed, with an RMSE of 0.0028 and R^2 of 0.86, outperforming LSTM and RNN by 15% and 46%, respectively.

ACPIPOC-0729-11

Automatic Wavelength Locking of Microring Resonators Based on Coherent Detection

Hui Liu, Tingge Dai, Yifei Wang, Chengyuan Wang, Baojie Hou, Yuehai Wang, Jianyi Yang

Zhejiang University, China

We propose and demonstrate a wavelength locking method of double-ring resonator based on the coherent detection. This method can successfully lock to a preset wavelength and is robust to input optical power.

ACPIPOC-0729-13

Experimental Demonstration of a NLOS VLP System Based on LoRa ModulationJingxian Yang¹, Hongtao Yu¹, Yixiang Huang², Shujie Yan², Jiabin Luo², Bohui Xu¹, Zhaoqiang Zeng¹, Bangjiang Lin², Zabih Ghassemloooy³*1. Fuzhou University, China; 2. Quanzhou Institute of Equipment Manufacturing, Chinese Academy of Sciences, China; 3. Faculty of Engineering and Environment, Northumbria University, United Kingdom*

We proposed a NLOS VLP system based on LoRa modulation. The lowest average error and the RMSE shown in the experimental results were 16.27 and 18.29 cm, respectively.

ACPIPOC-0729-15

LPAM-OTFS and LHPAM-OTFS For IM/DD Optical Wireless Communication Systems

Rui Wang, Jianhua Pei, Yuxuan Liao, Jian Song, Yuhang Dong

Tsinghua University, China

Orthogonal time frequency space (OTFS) is an excellent two-dimensional modulation scheme suitable for optical wireless communication (OWC) systems. However, the conventional pulse amplitude modulated optical OTFS (PAM-OTFS) only modulates the imaginary parts of the Doppler bins, resulting in a loss of spectral efficiency. To address this issue, we first propose a novel efficient layered PAM-OTFS (LPAM-OTFS) scheme, enhancing the spectral efficiency by layering and utilizing the real parts of the Doppler bins. Based on LPAM-OTFS, we further propose a general efficient layered hybrid PAM-OTFS (LHPAM-OTFS) scheme. It can improve the overall performance by providing a more flexible layered method of spectral resource allocation. Theoretical derivation demonstrates that LHPAM-OTFS achieves the same spectral efficiency as LPAM-OTFS and layered asymmetrically clipped optical OTFS (LACO-OTFS) with lower computational complexity. Numerical results indicate that LHPAM-OTFS offers superior peak-to-average power ratio (PAPR) performance and higher power efficiency than its counterparts, which implies better ability to resist nonlinear distortion.

ACPIPOC-0729-22

A lightning location method based on POTDR in Optical fiber transmissionXiaofang Feng¹, Xingrui Su², Guilong Wu³, Bin Wu³, Yitong Chen³, Lin Liu³, Li Wei², Kaijing Hu², Yujia Hu²

1.China Southern Power Grid, China; 2.Wuhan National Laboratory for Optoelectronics, Huazhong University of Science and Technology, China; 3.China Southern Power Grid Company, China

In this paper, a lightning location method based on polarization optical time-domain reflectometer is proposed. Through simulated lightning strike experiment, the positioning accuracy can reach 5m within the fiber length of 8.2km.

ACPIPOC-0729-30

Self-learned Entropy Loading for Channel-adaptive Optical CommunicationsRuqing Xi¹, Lu Zhang¹, Qun Zhang², Xianbin Yu¹

1.Zhejiang University, China; 2.ZK Ascend Technologies, United States

This paper proposes a self-learned entropy recognition scheme for optimizing entropy loading in optical communication systems, leveraging transfer learning to adapt entropy allocation across modulation formats and varying channel conditions for enhanced performance.

ACPIPOC-0729-38

Performance Analysis of Space-Time Trellis Coding in MIMO NLOS Ultraviolet Communication SystemTian Luo¹, Yong Zuo¹, Feiyu Li², Yuhao Wang¹, Xiaobin Hong¹, Jian Wu¹

1.Beijing University of Posts and Telecommunications, China; 2.National University of Defense Technology, China

Space-Time Trellis Coding is applied to a MIMO ultraviolet communication system. Simulation and experimental results show the coding scheme efficiently reduces system BER caused by channel correlation and mitigates the effects of atmospheric turbulence.

ACPIPOC-0729-4

Simultaneous Coherent Optical Transmission of OFDM-256QAM and OFDM-512QAM Signals Based on 1-bit Bandpass Delta-sigma Modulation

Qiuying Lin, Hengxin Yan, Liye Fang, Jiahao Bi, Yuxiao Xu, Tangyao Xie, Xiaolong Pan, Xinying Li, Xiangjun Xin

Beijing Institute of Technology, China

We propose and experimentally demonstrate the simultaneous coherent optical transmission of OFDM-256QAM and OFDM-512QAM signals based on 1-bit BP-DSM, with BERs of both signals below the HD-FEC threshold of 3.8×10^{-3} after 20 km SMF-28 transmission.

ACPIPOC-0729-40

Chaotic Optical Transmitter Fingerprint Identification System Based on Random Phase and Temporal Spread Encryption

Xueying Yang, Hongxiang Wang, Pengjin Zhu, Yuefeng Ji

Beijing University of Posts and Telecommunications, China

We propose to use the complexity feature of chaos as an optical transmitter fingerprint, and combine the chaos with 16-QAM using an optical time encryption module. The reliability and security of optical transmitter fingerprinting are guaranteed.

ACPIPOC-0729-44

Metric Learning Assisted Aging Optical Transmitter Identification Based on the Constellation Diagram

Qian Lu, Hongxiang Wang, Pengjin Zhu, Yuefeng Ji

Beijing University of Posts and Telecommunications, China

An aging optical transmitter identification method based on metric learning is proposed for identifying aging optical transmitters in coherent optical communication system, which are used to extract fingerprint feature vectors with high cohesion and low coupling.

ACPIPOC-0730-2

Sum Rate Maximization for Sub-Connected MIMO UWOC Systems: A Rate-Splitting SchemeLiyan Zhang^{1,2}, Xinke Tang², Sihui Zheng¹, Weijie Dai¹, Xiaoping Zhang¹, Yuhang Dong^{1,2}*1. Tsinghua University, China; 2. Pengcheng Laboratory, China*

We propose a novel precoding scheme integrating rate-splitting multiple access (RSMA) and sub-connected (SC) structure for multiple-input multiple-output (MIMO) underwater optical communication (UWOC) systems. Numerical results demonstrate that the proposed scheme achieves a sum rate increase of more than 5 bps/Hz and an energy efficiency enhancement of up to 25% over the existing space-division and non-orthogonal multiple access approaches.

ACPIPOC-0730-20

Square-shaped Irregular QAM Formats Outperforming Cross-shaped Odd-bit QAM and Probabilistically Shaped Even-bit QAM in the Presence of Laser Phase NoiseXishuo Wang¹, Kai Lv¹, Xiaolong Pan², Xia Sheng¹, Qi Zhang³, Xiangjun Xin²*1. Research Institute of China Telecom Co., Ltd., China; 2. Beijing Institute of Technology, China; 3. Beijing University of Posts and Telecommunications, China*

In this study, the performance of irregular QAM formats under laser phase noise was evaluated. Simulation results demonstrate notable performance improvement of up to 0.89-bit/symbol over conventional cross-shaped odd-bit and probabilistically-shaped even-bit QAM formats.

ACPIPOC-0730-3

End-to-End Learning of Joint Noise Shaping and Probabilistic Shaping for OAM Mode Division Multiplexing TransmissionRan Gao¹, Qi Xu¹, Zhaohui Cheng¹, Fei Wang¹, Yi Cui², Xiangjun Xin¹*1. Beijing Institute of Technology, China; 2. Beijing University of Posts and Telecommunications, China*

We propose and experimentally demonstrate an end-to-end learning of joint noise shaping and probabilistic shaping in OAM-MDM system. The proposed joint shaping technology outperformed conventional technology with improvements in receiver sensitivity of 1.5 and 1.7 dB.

ACPIPOC-0730-41

Enhanced ROPA design for ultra-long unrepeated communication lines with an additional pump fiberMarina Zhulidova^{1,2}, Tatiana Kozlova³*1. Moscow Institute of Physics and Technology, Russia; 2. T8 LLC, Russia; 3. Moscow State University Sarov, Russia*

An enhanced design of the ROPA passive device for ultra-long unrepeated lines has been demonstrated, allowing to increase the budget of the line (total losses) by 2.5 dB without the use of special optical components.

ACPIPOC-0730-51

Comparison of Neural Network Equalizers for IMDD Optical Transmission

Yixian Dong, Yiqian Shi, Xihua Zou, Wei Pan, Lianshan Yan

Southwest Jiaotong University, China

Equalization performance of FNN, RNN, LSTM, BiRNN, BiLSTM and reservoir computing is thoroughly compared in IMDD short-reach optical transmission. Experiments show BiRNN/BiLSTM outperform other four, while reservoir computing require minimum parameters for training.

ACPIPOC-0730-52

Layered Adaptively Biased Optical OTFS Scheme For Visible Light CommunicationJianhua Pei¹, Rui Wang¹, Yuxuan Liao¹, Jian Song^{1,2}, Yuhang Dong^{1,2}*1. Tsinghua University, China; 2. Pengcheng Laboratory, China*

Layered adaptively biased optical orthogonal time frequency space (LABO-OTFS) is proposed by layering the delay-Doppler domain signal. Numerical results suggest that LABO-OTFS has better bit error rate performance and higher power efficiency than its counterpart.

ACPIPOC-0730-60

Field Demonstration of High Spectral Efficiency PS-PDM-4096-QAM Coherent Optical Transmission

Jiamin Fan, Mingyi Gao, Xuejing Huang, Yifan Ge, Xubiao Zhang, Guoliang Shen, Yadong Wang, Xiaodi You, Gangxiang Shen

Soochow University, China

We experimentally demonstrated the transmission of PS-PDM-4096-QAM signals over installed field fiber. The raw spectral efficiency of 20.381 b/s/Hz is achieved based on the probabilistic shaping data of 21.4-b/symbol information entropy.

ACPIPOC-0731-102

Two-stage low-loss waveguide taper for O-band wavelength multiplexer

Jiayu Liu, Chongfu Zhang, Jiahong Chen, Wenjun Zeng, Pengju Hu, Qingran Liu

University of Electronic Science and Technology of China, China

We propose a two-stage in-plane coupler with rib-cone and inverted-tapered structures for wavelength division multiplexer, providing low insertion loss and compact size.

ACPIPOC-0731-121

Multipath Interference Mitigation for PAM4 Transmission Based on Spectrum Inversion and RRC Filtering

Hao Chen, Wenxiang Cui, Lin Sun, Yi Cai, Gordon Ning Liu

Soochow University, China

We have developed an efficient multipath interference (MPI) mitigation method based on spectrum inversion and root-raised cosine filtering. Simulations have verified that this scheme has advantages over the traditional high-pass filtering scheme in suppressing MPI and improving system BER performance for large linewidth lasers.

ACPIPOC-0731-132

Hybrid Pulse Amplitude Modulated Optical OTFS Scheme For Visible Light Communication

Rui Wang, Jianhua Pei, Yuxuan Liao, Jian Song, Yuhang Dong

Tsinghua University, China

In visible light communication (VLC), the spectrum-efficient layered asymmetrically clipped optical OTFS (LACO-OTFS) scheme suffers from high receiver complexity. To address this issue, we propose a novel hybrid pulse amplitude modulated optical orthogonal time frequency space (HPAM-OTFS) scheme, which achieves the same spectrum efficiency as LACO-OTFS with significantly lower receiver complexity. Simulation results indicate that the proposed scheme exhibits superior peak-to-average power ratio (PAPR) performance compared to LACO-OTFS, thereby enhancing its ability to resist nonlinear distortion. Additionally, HPAM-OTFS demonstrates higher power efficiency than conventional optical OTFS schemes, making it more suitable for power-constrained scenarios.

ACPIPOC-0731-133

Frequency offset estimation for full-spectrum modulated nonlinear frequency division multiplexing system

Jiayun Deng, Lixia Xi, Peiyun Ge, Jiale Duan, Xiaoguang Zhang

Beijing University of Posts and Telecommunications, China

This paper introduces frequency offset estimation and compensation schemes for full-spectrum modulated nonlinear frequency division multiplexing systems. In simulations, these schemes achieve errors below 10^{-2} , providing reliable solutions for effectively managing frequency offsets.

ACPIPOC-0731-136

Demonstration of Real-time Orbital Angular Momentum Mode-Division Multiplexing Transmission over 2km MMF using FPGAZhiming Zhou^{1,2,3}, Yuchen Zhang^{1,2}, Zhongyang Wang^{1,2}, Bing Han^{1,2}, Jian Wang^{1,2}

1. Wuhan National Laboratory for Optoelectronics and School of Optical and Electronic Information, Huazhong University of Science and Technology, China; 2. Optics Valley Laboratory, China; 3. Wuhan Research Institute of Posts and Telecommunications, China

We propose a real-time orbital angular momentum (OAM) mode-division multiplexing (MDM) communication system. Based on the system, data can be transmitted at 10-Gbps over 2km multi-mode fiber (MMF) in real time.

ACPIPOC-0731-139

Robust and Wide-Range Transmitter Frequency-Dependent IQ Impairments Monitoring for Coherent Digital Subcarrier Multiplexing SystemsYuchen Jia¹, Qian Xiang², Chuan Wang³, Yongchao Jin¹, Yinghui Wang², Tianjian Zuo², Qi Ding¹, Yanfu Yang¹

1. Harbin Institute of Technology (Shenzhen), China; 2. Network Technology Laboratory Huawei Technology Co.Ltd. Shenzhen, China; 3. China Mobile Equity Investment Management, China

We propose a transmitter frequency-dependent IQ impairments monitoring scheme for coherent digital subcarrier multiplexing systems based on multi-taps 4×4 real-valued MIMO, which achieves wide-range monitoring and robustness to carrier phase noise and polarization variation.

ACPIPOC-0731-141

Robust Blind Frequency Offset Estimation for Digital Subcarrier Multiplexing SystemYongchao Jin¹, Yanfu Yang¹, Qian Xiang², Yuchen Jia¹, Siyu Gong¹, Yinghui Wang², Tianjian Zuo²

1. Harbin Institute of Technology, China; 2. Huawei Technology Co.Ltd., China

A robust frequency offset estimation scheme (FOE) using power minimization is proposed and demonstrated experimentally for DSCM system. Experimental results indicate that our scheme can achieve high FOE accuracy in the presence of strong filtering.

ACPIPOC-0731-144

Performance analysis of free-space optical link and beam displacement tracking using combined Bessel-Gaussian beamsMingze Cai^{1,2}, Min Liu^{1,2}, Binhang Xu^{1,2}, Jing Du^{1,2}

1. Wuhan National Laboratory for Optoelectronics and School of Optical and Electronic Information, Huazhong University of Science and Technology, China; 2. Optics Valley Laboratory, China

We proposed a free-space optical link with beam displacement tracking using combined Bessel-Gaussian (BG) beams. The simulated results indicate that BG beams are more turbulence-resistant compared to Gaussian beams.

ACPIPOC-0731-146

A Generative Model Based Channel Estimation Method for Optical Communications with Few-Mode FibersJunhong Lu, Yiwen Zhang, Xuezhi Hong
South China Normal University, China

A novel channel estimation method based on the generative model is proposed for MIMO processing in optical mode-division multiplexing systems with few-mode fibers. Results show that the proposed method significantly outperforms the conventional one.

ACPIPOC-0731-148

Joint SNR and Mode Coupling Estimation for Integrated Sensing and Communication in Weakly-Coupled MDM SystemsYue Wang, Yuxi Xu, Jinpeng Liao, Zhaohui Li, Jie Liu, Dawei Wang
Sun Yat-sen University, China

We propose a novel joint SNR and mode coupling estimation method for weakly coupled mode-division multiplexing systems, offering potential vibration detection in integrated sensing and communication scenarios. The method is based on an extended cyclic matrix and is robust against random polarization effects.

ACPIPOC-0731-155

Improve the Fitting Accuracy of Deep Learning for the Nonlinear Schrödinger Equation Using Linear Feature Decoupling MethodYunfan Zhang, Zekun Niu, Minghui Shi, Weisheng Hu, Lilin Yi
Shanghai Jiao Tong University, China

We utilize the Feature Decoupling Distributed (FDD) method to enhance the capability of deep learning to fit the Nonlinear Schrödinger Equation (NLSE), significantly reducing the NLSE loss compared to non decoupling model.

ACPIPOC-0731-161

Noise Mitigation Based on Geometric Shaping of 32QAM for Discrete Spectrum Nonlinear Frequency Division Multiplexing SystemsXue Tang¹, Bo Liu^{1,2}, Jianxin Ren^{1,2}, Yaya Mao¹, Xiangyu Wu¹, Xiumin Song¹, Shuaidong Chen³, Rahat Ullah¹*1.Nanjing University of Information Science and Technology, China; 2.Beijing University of Posts and Telecommunications, China; 3.Nanjing University of Posts and Telecommunications, China*

A noise mitigation scheme is proposed for nonlinear frequency division multiplexing systems. This scheme utilizes channel characteristics to design an olive shape geometry with greater ASE noise and phase noise tolerance than 32APSK and 32QAM.

ACPIPOC-0731-178

Performance evaluation of OAM-based MIMO FSO system integrated with hybrid channel coding and space-time codingShidong Xu, Shanyong Cai, Zhiguo Zhang
Beijing University of Posts and Telecommunications, China

This paper presents an orbital angular momentum multiplexing MIMO FSO system based on the combination of hybrid channel coding and space-time coding. Simulation results show that compared with only vertical Bell Layered Space-Time (V-BLAST) coding, the coding gain is improved by 1.33dB under strong turbulence.

ACPIPOC-0731-18

Beyond 200Gbit/s/IDuo-Binary PAM-4 Transmission Assisted by Two-dimensional Attention-based CNN EqualizerWeijiao Liu, Lin Jiang
Southwest Jiaotong University, China

A two-dimensional (2D) attention-based CNN equalizer has been experimentally demonstrated. The BER performance of 220Gbit/s duo-binary PAM-4 over 200mSSMF and 256-Gbit/s back-to-back transmission can be achieved below 20%FEC threshold using a single-ended 50-GHz PD.

ACPIPOC-0731-182

Analog Mobile Fronthaul Transmissions Based on FBG-Enabled Phase Modulation and Direct DetectionLi Ao, Yangzong Ao, Jinghong Wang
Chongqing University of Posts and Telecommunications, China

Owing to its high cost-effectiveness and operational simplicity, IMDD is favored in MFH transmissions. However, a DC bias is still needed at the transmitter to ensure optimal transmission performance, and high received optical power is required to achieve high link gain. To address these challenges, we have proposed the use of MZI to break the phase balance of phase-modulated signals, which, although excellent in enhancing the link RF gain, also leads to the amplification of nonlinear distortions and also suffers from power cyclic fading due to dispersion and square-law detection. In this paper, we utilize FBG to break the amplitude balance of phase-modulated signals, which not only eliminates the need for bias point control but also improves the link gain for MFH transmissions while overcoming power cyclic fading. The FBG-enabled PMDD-based MFH transmission links are first introduced through theoretical analysis, and then extensive numerical exploration of their performance are conducted. The simulation results show that CSPR and FBG SLSR play important roles in determining the transmission performance. More importantly, the simulation results also show that FBG-enabled PMDD improves the receiver sensitivity by about 3.1 dB due to its inherently high link gain compared to IMDD.

ACPIPOC-0731-191

Prototype of Multiple Modulation Formats Receiver with Low Complexity and High Sensitivity

Pu Zhang, Yan Li, Jingwei Song, Li Ao, Jifang Qiu, Hongxiang Guo, Xiaobin Hong, Zhisheng Yang, Jian Wu

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

We propose a phase-domain carrier recovery suitable for QPSK and PPM-QPSK. An offline back-to-back experiment under different received optical power (ROP) is carried out to demonstrate the bit error rate (BER) performance of the receiver.

ACPIPOC-0731-205

Real-time Satellite Optical Terminal Prototype with Integrated Multi-Rate Transmission and Ranging FunctionWenzhong Liu¹, Junjie Zhang¹, Yuanzhe Qu¹, Qianwu Zhang^{1,2}, Lewei Gong¹, Yingxiong Song^{1,2}*1. Shanghai University, China; 2. Teralink Optical Corporation, China*

We present a real-time satellite optical terminal prototype with multi-rate communication and high-precise ranging. Real-time bidirectional results achieved optical power sensitivities of $-41.1/-43.7/-48.2$ dBm and ranging RMS of 0.019/0.023/0.028 cm for 10 Gbps/5 Gbps/1.25 Gbps respectively.

ACPIPOC-0731-208

Intelligent Optimization for Laser Frequency Locking through Deep LSTM Formed by Dual-Loop Structure

Jieyi Yu, Jianming Shang, Mingwen Zhu, Bin Luo, Shangsuo Ding, Song Yu

Beijing University of Posts and Telecommunications, China

This paper proposes a laser frequency locking system assisted by neural network. Utilizing dual-loop structure to construct deep LSTM has refined the frequency locking performance, enabling it to maintain long-term stability at the kHz level.

ACPIPOC-0731-210

Real-Time Demonstration of TFDMA CPON with Subcarrier Interleaving and Bidirectional Shared LasersChenghao Chay¹, Yang Zou¹, Yizhou Wang¹, Zipeng Liang¹, Jing Li¹, Shenmao Zhang^{1,2,3}, Xiaoxiao Dai^{1,2,3}, Qi Yang^{1,2,3}, Deming Liu^{1,3}*1. Huazhong University of Science and Technology, China; 2. Hubei Optical Fundamental Research Center, China; 3. Jinyinhu Laboratory, China*

This paper demonstrates a point-to-multipoint bidirectional single-fiber real-time transmission system based on DSCM with shared laser. The real-time electrical back-to-back experiment at a rate of 25.6 Gbit/s shows the SNR of 19.12 dB and EVM within 11%.

ACPIPOC-0731-211

Reception of -80 dBm BPSK Signal in FSO Systems using an Ultra-High-Gain Segmented EDFAJiale Liu¹, Tian Qiu¹, Yizhou Wang¹, Shijie Li¹, Chengxuan Ye¹, Shenmao Zhang^{1,2,3}, Xiaoxiao Dai^{1,2,3}, Qi Yang^{1,2,3}, Deming Liu^{1,2,3}*1. National Engineering Laboratory for Next Generation Internet Access System, School of Optical and Electronic Information, Huazhong University of Science and Technology, China; 2. Hubei Optical Fundamental Research Center, China; 3. Jinyinhu Laboratory, China*

With an architecture-optimized high-gain segmented EDFA, the reception of -80 dBm spread BPSK signal is achieved in a FSO coherent transmission system.

ACPIPOC-0731-218

High-Speed and High-Precision Optical Fourier Convolutional Neural Network Based on Multidimensional Control

Huixin Jia, Hongxiang Guo, Shunxin Song, Peishuo Wang, Peilin Li, Jian Wu

Beijing University of Posts and Telecommunications, China

We introduce a high-speed, high-precision optical Fourier convolutional neural network with up to 10 kHz processing speed. Evaluations on MNIST, CIFAR-10, and a remote sensing dataset show superior performance with simultaneous amplitude and phase control.

ACPIPOC-0731-220

Reservoir Computing Based on LED model for Signal Equalization in VLC-OFDM System

Yeping Huang, Xiong Deng, Zhihan Sun, Yixian Dong, Xihua Zou, Wei Pan, Lianshan Yan

Center for Information Photonics and Communications, Southwest Jiaotong University, China

In this paper, we innovatively introduce the nonlinear LED model into reservoir computing for signal equalization to enhance VLC-OFDM system performance, achieving an approximate 5 dB improvement in communication SNR compared to traditional equalization techniques.

ACPIPOC-0731-225

Computationally-Efficient Quantized Volterra Nonlinear Equalizer for IM/DD SystemsCancan Chen¹, Zhaopeng Xu², Qi Wu³, Tonghui Ji², Honglin Ji², Jianghao Li⁴, Yu Yang², Jianwei Tang², Lulu Liu², Shangcheng Wang², Junpeng Liang², Jinlong Wei², Lei Zhao¹, Yuan Jiang¹, Weisheng Hu³*1. Sun Yat-sen University, China; 2. Pengcheng Laboratory, China; 3. Shanghai Jiao Tong University, China; 4. Shandong Normal University, China*

We propose uniform/non-uniform quantized Volterra and V-DFE receivers for hardware-efficient nonlinear equalization in IM/DD systems. Compared with conventional floating-point-based approaches, experimental results show that the required receiver memory can be reduced by more than half while maintaining acceptable system performance.

ACPIPOC-0731-29

Improving Hard-Decision FEC Decoding via Four-Level Bit Marking: A Case Study of KR4/KP4 Codes

Yanzhe Yue, Yi Lei, Jinlong Tian, Bin Chen

Hefei University of Technology, China

An improved decoding algorithm for Reed-Solomon codes is proposed using bit flipping in combination with miscorrection detection with the help of four-level bit-marking, achieving 0.28 dB and 0.19 dB additional gains for KR4 and KP4 codes, respectively.

ACPIPOC-0731-31

Predicting the System Outage Probability Caused by All-order PMD

Yan Zhang, Nan Cui, Xiaoguang zhang

Beijing University of Posts and Telecommunications, China

This paper proposes a method for predicting system outage probability caused by PMD based on theoretical joint PDF of PMD. Compared to long-term channel simulation results, the error is less than 1%.

ACPIPOC-0731-55

Demonstration of High-sensitivity Auxiliary Management and Control Channel Detection Based on Native 50G PON ModulesZhenfeng Xue¹, Qi Yang^{1,2,3}, Yang Zou¹, Xiaoxiao Dai^{1,2,3}, Zipeng Liang¹, Pengzhuo Sun¹, Zhen Luo¹, Chenghao Chay¹, Tian Qiu¹, Jiale Liu¹, Shenmao Zhang^{1,2,3}, Liang Wang^{1,2,3}, Deming Liu^{1,2,3}

1.National Engineering Laboratory for Next Generation Internet Access System, School of Optical and Electronic Information, Huazhong University of Science and Technology, China; 2.Hubei Optical Fundamental Research Center, China; 3.Jinyinhu Laboratory, China

A high-sensitivity AMCC detection scheme based on native 50G PON modules has been experimentally demonstrated. Results show that the sensitivity of AMCC signals can reach -46.5dBm with a power penalty of 0.5dB for DS traffic.

ACPIPOC-0731-84

Auxiliary Neural Network Assisted Machine Learning for Extended Band Power Optimization

Yiwen Yang, Han Li, Wu Liu, Zhiyi Zhong, Tianqian Zhang, Ming Luo

National Key Laboratory of Optical Communication Technologies and Networks, China

An Aux-CNN model-based input power estimation method for optical transmission systems was proposed, which is experimentally validated by an L-band WDM system, achieving an MAE of 0.21dB with 20% of the training data.

ACPIPOC-0731-89

Fiber-optic time transfer over a ring network with data transmission

Yansong Yang, Kunfeng Xie, Yuzhe Ma, Liang Hu, Jianping Chen, Guiling Wu

Shanghai Jiao Tong University, China

We reported a point-to-multipoint fiber-optic time transfer scheme over ring network with the communication data transmission in the adjacent channel. The time stability is better than 15.17ps@1s and the BER is better than 1.37E-14.

ACPIPOC-0801-100

Frequency Offset Estimation based on Improved Concavity Positioning for Digital Subcarrier Multiplexing Systems

Jingshuai Qiao, Lei Du, Hengying Xu, Chenglin Bai, Yining Zhang, Lishan Yang

Liaocheng University, China

We propose a FOE scheme throughimproving the concavity positionfor DSCM system. Simulation results demonstrate that the applicable range of roll-off factor is wider and FOE error is less than 50MHzat equal complexity.

ACPIPOC-0801-104

Amplitude-Scaled Clustering Method for Probabilistic Shaping Distribution RecognitionQihan Zhao¹, Qi Zhang¹, Ran Gao², Feng Tian¹, Xinyu Yuan¹, Gang Xin³, Yuan Gao¹, Lan Rao¹, Yongjun Wang¹, Qinghua Tian¹, Yi Zhao¹, Yun Wang¹

1.Beijing University of Posts and Telecommunications, China; 2.Beijing Institute of Technology, China; 3.Changzhou Jingxin New-Generation Information Technology Research Institute Co., Ltd, China

An amplitude-scaled clustering method for the identification of PS-QAM signals shaping distributions is proposed. Simulations show that this method achieves 100% recognition of high-order PS-QAM signal distributions with a 0.1 bit/symbol interval.

ACPIPOC-0801-106

A Nonlinear Compensation Scheme for High Baud Rate Assisted by Neural Network Based on First-order and Second-order Perturbation Theory

Tianchi Chen, Chenglin Bai, Yuting Wu, Zhihang Sun, Wanxiang Bi, Guizhen Wang, Hengying Xu, Lishan Yang, Yuanhao Cui

Liaocheng University, China

A CNN-BiLSTM neural network-aided nonlinear compensation scheme based on first-order and second-order perturbation theory is proposed, which increases the Q-factor gain by 0.34dB and reduces the complexity by 29% compared with DBP40Stps in 128GBaud scenario.

ACPIPOC-0801-111

Kurtosis-constrained Optimum Enumeration Sphere Shaping for Probabilistic Shaping Optical Transmission System

Danping Pan, Lishan Yang, Chenglin Bai, Hengying Xu, Xuezhen Wang, Yuanhao Cui

Liaocheng University, China

We propose a kurtosis-constrained optimum enumeration sphere shaping (KO-ESS) scheme that recover the effective SNR-penalty caused by the input signal with high kurtosis while achieve the ultimate energy efficiency.

ACPIPOC-0801-12

Wavelength Allocation and Dispersion Penalty Analysis of 50G PON Coexisting with EPONYang Zou¹, Chenghao Chay¹, Zhenfeng Xue¹, Suyi Wang², Qiongxia Shen², Rui Li², Ming Jiang³, Dezhi Zhang³, Xiaoxiao Dai¹, Zhijun Yan¹, Qi Yang¹, Deming Liu¹

1. Huazhong University of Science and Technology, China; 2. Fiberhome Telecommunication Technologies Co., Ltd., China; 3. China Telecom Research Institute, State Key Laboratory of Optical Fiber and Cable Manufacture Technology, China

To address the wavelength collision between 50G PON and EPON, this paper discusses the power budget penalty when changing the downstream wavelength of 50G PON with varying EML chirp factors and DSP combinations.

ACPIPOC-0801-14

Robust Longitudinal Power Profile Estimation using Enhanced Correlation Template Method

Junhao Chang, Choloong Hahn, Qingyi Guo, Zhiping Jiang

Huawei Technologies Canada, Canada

We introduce effective correlation lengths to compensate for convolution effects arising from nonlinear distortion correlations across different locations. This approach enhances absolute power profile estimation, reducing RMSE by 1.5 dB compared to the LS method.

ACPIPOC-0801-143

Theoretical Analyses of the Compensation Method of PDL at the Transmitter

Jiarun Zhao, Chenxi Ji, Bin Zhang, Nan Cui, Lixia Xi, Xiaoguang Zhang

Beijing University of Posts and Telecommunications, China

We proposed a theoretical PDL compensation scheme which can achieve perfect compensation based on the real-time channel information. It is suggested that PDL must compensated at the transmitter.

ACPIPOC-0801-144

High-Throughput LDPC Encoder/Decoder For Real-Time Coherent Optical CommunicationsKun Chen^{1,2}, Yanhao Chen^{1,2}, Qianwu Zhang^{1,2}, Yuanzhe Qu^{1,2}, Junjie Zhang^{1,2,3}, Yingxiong Song^{1,2,3}

1. Key Laboratory of Specialty Optics fiber and Optical Access Networks, Shanghai Institute for Advanced Communication and Data Science, China; 2. Shanghai University, China; 3. Teralink Optical Corporation (Shanghai), China

We demonstrate an LDPC encoder/decoder architecture with a maximum throughput of 2229 Mbps. Implemented on an FPGA, the receiver sensitivity achieves -56 dBm@2G BPSK (decoded BER 1E-7), with a decoding gain exceeding 8 dB.

ACPIPOC-0801-147

Modal-Dispersion Statistics in Multiple-Mode Fibers from Weak to Strong Coupling Regimes

Fengtao Sun, Xinran Zhu, Xiaoxiao Liu, Zhenshan Yang, Xia Zhang

3 Liaocheng University, China

We numerically simulate the joint probability distributions of the modal dispersion in a 6-mode fiber and show that the modal-dispersion statistics has qualitatively distinct features in the weak and strong mode-coupling regimes.

ACPIPOC-0801-148

FPGA Implementation of a Concatenated KP4 and Hamming Code for Forward Error CorrectionChuanji Yan¹, Yucai Tian², Feng Tian¹, Yutian Li¹, Ze Dong², Qi Zhang¹

1. Beijing University of Posts and Telecommunications, China; 2. Beijing Institute Of Technology, China

We implemented concatenated KP4-Hamming codes on an FPGA. Using different convolutional interleaving structures, at a signal-to-noise ratio of 8.9, one achieved a bit error rate of 2.82e-12 while the other achieved a BER of 3.27e-16.

ACPIPOC-0801-154

Artificial Noise Design for SISO ACO-OFDM against Randomly Located EavesdroppersWeishen Wang¹, Fan Yang², Yuxuan Liao¹, Yuhang Dong^{1,3}

1. Tsinghua University, China; 2. Department of Electronic and Computer Engineering, University of Toronto, Toronto, Canada;

3. Pengcheng Laboratory, China

This paper investigates the secrecy performance of single-input single-output (SISO) asymmetrically clipped optical orthogonal frequency division multiplexing (ACO-OFDM) visible light communication (VLC) wiretap systems. We propose a precoding scheme using time-domain artificial noise (AN) to maximize secrecy capacity. Furthermore, we also consider the scenario where the eavesdropper's location is random and calculate the average secrecy rate using stochastic geometry methods. Numerical results suggest that the proposed scheme enhances the system's secrecy capacity and mitigates the increase in peak-to-average power ratio (PAPR) caused by the introduction of AN.

ACPIPOC-0801-156

The Technology and Application of multi-rate receiving in 50G PONLuyao Huang^{1,2}, Dezhi Zhang^{1,2}, Qizheng Li^{1,2}, Fu Wang³, Ming Jiang^{1,2}

1.China Telecom Research Institute, China; 2.State Key Laboratory of Optical Fiber and Cable Manufacture Technology, China;
3.Beijing University of Posts and Telecommunications, China

This paper gives the technology and applications on multi-rate receiving ability of 50G-PON upstream. The progress of ITU-T standardization is presented. The technical feasibility is analyzed. Receivers for multi-rate are compared. Requirement and use cases are given.

ACPIPOC-0801-17

Location-Resolved gOSNR Estimation of Multi-Span Optical Transmission Systems

Choloong Hahn, Junho Chang, Zhiping Jiang

Huawei Technologies Canada, Canada

We present a location-resolved gOSNR estimation that utilizes longitudinal digital monitoring techniques at receiver-side DSP. The proposed method is experimentally validated in a 12-span link using a commercial transceiver.

ACPIPOC-0801-2

Optimal Transceiver Design for RIS-assisted FSO Communication Systems

Shuang Tang, Xiaoping Zhang, Jian Song, Yuhan Dong

Tsinghua University, China

We propose an optimal power allocation strategy at the transmitter and maximal ratio combining (MRC) at the receiver for reconfigurable intelligent surface (RIS)-assisted free-space optical (FSO) communication systems. Numerical results demonstrate that the proposed design improves signal-to-noise ratio (SNR) and performs better than the conventional design.

ACPIPOC-0801-20

Transfer Learning for BiLSTM-DNN-Based Optical Performance Monitoring in WDM SystemsJunyao Shi¹, Di Zhang¹, Yameng Cao¹, Yanling Xue^{1,2,3,4}

1.Shanghai Key Laboratory of Multidimensional Information Processing, School of Communication and Electronics Engineering, East China Normal University, China; 2.Shanghai Branch, Hefei National Laboratory, China; 3.Shanghai Research Center for Quantum Sciences Collaborative, China; 4.Innovation Center of Extreme Optics, Shanxi University, China

We designed a more accurate and generalizable TL-based BiLSTM-DNN model for optical performance monitoring, using three-channel data reflecting inter-channel inference as the source domain, transferred to multi-channel WDM systems with flexible parameters.

ACPIPOC-0801-28

Novel Low complexity Decision Feedback Volterra-Inspired Neural Network Equalizer for Net-355-Gbs/λ transmission in short-reach IMDD optical systemLuyao Huang^{1,2}, Dezhi Zhang^{1,2}, An Yan³, Junwen Zhang³, Lilin Yi⁴, Ming Jiang^{1,2}

1.China Telecom Research Institute, China; 2.State Key Laboratory of Optical Fiber and Cable Manufacture Technology, China;
3.Fudan University, China; 4.Shanghai Jiao Tong University, China

A novel decision feedback VINN equalizer is utilized to realize low-complexity nonlinear equalization. It is a white-box machine learning (ML) algorithm guided by a conventional physical model. Based on this equalizer, we experimentally demonstrate a net-355-Gbs/λ PAM-8 transmission in an IMDD short-reach system.

ACPIPOC-0801-31

Impact of Super-Gaussian Distribution on Shaping Gain of Probabilistic Shaping 64QAM in Turbulence-induced Coherent Free-Space Optical Communication SystemsXishuo Wang¹, Kai Lu¹, Xiaolong Pan², Sheng Xia¹, Qi Zhang³, Xiangjun Xin²

1.Research Institute of China Telecom Co., Ltd., China; 2.Beijing Institute of Technology, China; 3.Beijing University of Posts and Telecommunications, China

The impact of introducing super-Gaussian distribution based probabilistic shaping in FSO systems under turbulence is investigated for the first time. Results indicate a 4% maximum transmission distance improvement can be achieved compared with Maxwell-Boltzmann distribution.

ACPIPOC-0801-34

Joint compensation of Doppler shift and phase noise with ultra-fast RSOP for satellite communication systems based on Kalman filterZhipeng Zheng^{1,2}, Nan Cui^{1,2}, Xianfeng Tang^{1,2}, Yongli Zhao^{1,2}, Kun Xu^{1,2}, Xiaoguang Zhang^{1,2}

1.Beijing University of Posts and Telecommunications, China; 2.State Key Lab of Information Photonics and Optical Photonics Communications, China

In this paper, an IEKF algorithm is proposed in a satellite communication system that jointly compensates for the Doppler shift at 12 GHz and RSOP at 80 MHz/s and tolerates a laser linewidth of 30 MHz.

ACPIPOC-0801-37

Single-wavelength 400-Gbit/s Carrier Assisted Direct Detection Without Receiver Transfer Function Equalization for Optical InterconnectionsShangcheng Wang¹, Honglin Ji¹, Zhaopeng Xu¹, Tonghui Ji¹, Lulu Liu¹, Gang Qiao², Yu Yang¹, Hui Chen¹, Qi Wu³, Jiali Li¹, Zhixue He¹, Weisheng Hu³*1. Peng Cheng Laboratory, China; 2. Peking University, China; 3. Shanghai Jiao Tong University, China*

We propose a simplified symmetric carrier assisted direct detection without receiver transfer function equalization enabled by a delay interferometer for carrier suppression only. The performance of the symmetric receiver is evaluated by 112-Gbaud 16-QAM OFDM signals with 418-Gbit/s net rate.

ACPIPOC-0801-38

Automatic Amplifier Configuration System in Tencent Open Optical Platform

Jinquan Liu, Jianing Lu, Yinxin Wang, Minggang Chen, Yu Wang, Zekun He

Tencent holdings Ltd, China

This paper presents the work of Tencent in the field of automatic amplifier configuration that achieves complete compensation for fiber span loss, addresses fiber degradation, maintains system margin, and improves signal quality without human intervention.

ACPIPOC-0801-39

Fast and accurate estimation of performance degradation due to PMD based on neural network method

Boyang Hou, Nan Cui, Zhipeng Zheng, Tianrun Sun, Yan Zhang, Xiaoguang Zhang

Beijing University of Posts and Telecommunications, China

We propose a fast and accurate method based on neural networks to estimate the performance degradation due to PMD. This method provides precise results and is 1000 times faster in computation than traditional method.

ACPIPOC-0801-46

Retroreflective Optical ISAC Supporting 3D Positioning in Indoor Environments

Haichuan Wang, Chen Chen, Zhihong Zeng

School of Microelectronics and Communication Engineering Chongqing University, China

A retroreflective optical ISAC (RO-ISAC) system supporting 3D positioning is proposed. This system used the transmitted signal and the reflected signal to measure the distance, which can further locate position of the target.

ACPIPOC-0801-49

The Impact of the Equalization Delay on Latency Performance in SR-DBA Scheme for TDM-PONYi weng¹, Dezhi Zhang¹, Jialiang Jin¹, Dan Shu², Mingzheng Wu¹*1. China telecom, China; 2. Fiberhome, China*

When discussing reducing the latency of TDM-PON, a minor factor is often overlooked: the equalization Delay (EqD). We give both theoretical analysis and test results on how the EQD value affects the latency performance.

ACPIPOC-0801-51

Demonstration of an ECL Wavelength Stabilization System for Coherent Free-Space Optical Communication

Zongbi Yu, Hao Li, Yuanzhe Qu, Weiwei Mo, Yingxiong Song

Shanghai University, China

We propose an ECL wavelength stabilization system for coherent free-space optical communication. Experimental results demonstrate that the system achieves wavelength stability of 0.0010 nm, and a Doppler frequency shift range of [-7.32, 10.43] GHz.

ACPIPOC-0801-53

Research on high stability time-frequency transmission over a 22.5 km 7-core fiber

Jing Zhang, Feng Tian, Tianze Wu, Qi Zhang, Xuanchi Gan, Xiangjun Xin

Beijing University of Posts and Telecommunications, China

we experimentally demonstrated time-frequency transmission over a 7-core optical fiber and achieved a long-term frequency stability of 9.48×10^{-17} @1000s, time stability of 1.17ps@1000s, and time synchronization accuracy of 33.8 ps.

ACPIPOC-0801-55

A Novel Three-layer GRU Equalizer for High-speed PAM-4 Transmission beyond 300Gbps

Yu Sun, Junde Lu, Jun Qin, Junxiong Tan, Qian Wang, Jie Shi, Lanling Chen, Yueqin Li, Jian Sun

Beijing Information Science and Technology University, China

A novel three-layer gated recurrent unit neural network (TL-GRU) equalizer for high-speed intensity modulation direct-detection (IM/DD) PAM-4 systems is proposed. Based on this novel equalization scheme, the BER performance of the 200 Gbaud (400 Gbps) PAM-4 can be decreased into hard-decision forward error correction (HD-FEC) threshold 3.8×10^{-3} , which is much better than least mean squares (LMS), polynomial nonlinear equalization (PNE) and gated recurrent unit (GRU) equalizers. The TL-GRU highlights its potential as a promising signal equalization solution for 1.6T and 3.2T short-reach optical interconnect systems.

ACPIPOC-0801-56

Low-complexity Memory Polynomial Equalizer for Digital Pre-Distortion based on Look-up TablesHexun Jiang¹, Xiangjun Lu², Shuai Wei¹, Da Hu³, Lei Shi³, Yongben Wang¹*1.ZTE Corporation, China; 2.China Mobile Communications Group Shandong Co., Ltd, China; 3.Sanechips Technology Co., Ltd, China*

A low-complexity memory polynomial equalizer is proposed for digital pre-distortion using look-up tables (LUTs) or linear interpolation LUTs (LERP-LUTs). The numbers of multiplications are decreased from 30 to 0 or 10 for LUTs or LERP-LUTs.

ACPIPOC-0801-57

Receiver-side Lookup-Table-Assisted Equalization for PAM4 IM/DD Transmission Systems

Junde Lu, Yu Sun, Jun Qin, Junxiong Tan, Qian Wang, Jie Shi, Lanling Chen, Yueqin Li, Jian Sun

Beijing Information Science and Technology University, China

We experimentally demonstrate the performance of the receiver (Rx)-side lookup-table (LUT)-assisted equalization, which has not been previously explored in the receiver for 4-ary pulse amplitude modulation (PAM4) intensity modulation and direct detection (IM/DD) system.

ACPIPOC-0801-66

Impact of Modem's Link-Dependent Digital Impairments on Generalized Signal to Noise Ratio Measurement

Yanpu Wang, Jiang Lin, Quanying Wen, Jianping Li, Jingying Yu, Bangtian Xu

HMN Technologies Co., Ltd., China

This paper discusses the importance of Modem's Link-Dependent Digital Impairments (SNRi) in measuring the Generalized Signal-to-Noise Ratio (GNSR) in Open Cables, based on the ITU-T standard. It analyzes the key factors that affect SNRi and discusses the necessity of conducting actual measuring SNRi. This paper analyzes several factors that influence SNRi using the channel pre-emphasis SNRi test method. These factors include the accuracy of channel power measurement, Optical Signal-to-Noise Ratio (OSNR) measurement, Guided Acousto-optic Wave Brillouin Scattering (GAWBS) coefficient, and Back-to-Back (BTB) curve measurements. This paper discusses the feasibility of using multiple modems to test SNRi and GNSR based on a single BTB curve in order to improve efficiency and accuracy of testing. The point is proven through a test experiment conducted on a 6000km system.

ACPIPOC-0801-68

Cascaded MIMO Equalizer for IQ Imbalance Compensation in Ultra-High-Order QAM Coherent Optical Transmission

Xuejing Huang, Mingyi Gao, Jiamin Fan, Yifan Ge, Xubiao Zhang, Guoliang Shen, Yadong Wang, Xiaodi You, Gangxiang Shen

Soochow University, China

We experimentally demonstrated a cascaded MIMO equalizer in the PS polarization division multiplexing 64/256/1024/4096/16384-QAM coherent optical transmission. The 4096/16384-QAM raw spectral efficiency can reach 20.381 and 21.333bit/s/Hz, respectively.

ACPIPOC-0801-7

A MADRL-based Trajectory Planning Scheme for Multi-UAV Assisted VLC Systems with Mobile UsersDaohong Ying^{1,2}, Gao Zang^{1,2}, Jiawei Hu¹, Liang Li¹, Xinke Tang³, Yuhao Dong^{1,3}, Zongyao Zhao^{1,3}*1.Tsinghua University, China; 2.University of Electronic Science and Technology of China, China; 3.Pengcheng Laboratory, China*

In this paper, we propose a multi-agent reinforcement learning (MADRL) based trajectory planning scheme to improve energy efficiency in unmanned aerial vehicle (UAV) assisted visible light communication (VLC) systems with mobile users, outperforming other benchmarks.

ACPIPOC-0801-72

Performance-Enhanced FBMC/OFDM-VLC Systems Enabled by Analog Pre-equalization and WHT PrecodingMing Chen¹, Ruizhi Li¹, Jing Yang¹, Yuxin Cai¹, Qinghui Chen²*1.Hunan Normal University, China; 2.Hunan University of Technology, China*

Analog Pre-equalization in combination with the low-complexity Walsh-Hadamard transform (WHT) precoding technique can enhance modulation bandwidth and bit error rate (BER) performance of visible light communication (VLC) systems. In this work, we proposed and experimentally demonstrated blue Light-emitting diode-based 525-MHz filter bank multicarrier/orthogonal frequency division multiplexing (FBMC/OFDM)-VLC systems enabled by a single-stage bridge-T pre-equalizer and low-complexity WHT precoding technique. The results exhibit that the BER performance of precoded FBMC/OFDM signals with net rates 2.08/2.02 Gbit/s can be improved by up to about two orders of magnitude over a 2.3-m free-space link.

ACPIPOC-0801-73

Inter-core Crosstalk Monitoring in Multi-core Fibers Based on Precoded CO-OFDM Systems

Zhijin Zhao, Chen Cheng, Yuqi Li, Shangxu Yang, Zhiyong Zhao, Ming Tang

Huazhong University of Science and Technology, China

We propose a novel dynamic instantaneous average crosstalk (IAXT) monitoring method for a 20 Gbaud coherent optical orthogonal frequency division multiplexing (CO-OFDM) system, accurately revealing the strong correlation between IAXT and bit error ratio (BER).

ACPIPOC-0801-78

Adaptive Trigonometric-based Nonlinear Equalizer for SiPM-Based PAM-8 VLC System

Yinan Niu, Chengju Hu, Yun Liu, Jian Zhao

South China University of Technology, China

We propose an adaptive trigonometric-based nonlinear equalizer to compensate the nonlinearity of SiPM-VLC system. Experiments of 100–300 MBaud PAM-8 signal show that the proposed method outperforms conventional FFE, DP-VNLE and MPE while exhibiting low complexity.

ACPIPOC-0801-93

Noise Equalization Scheme based on Probabilistic Shaping and 1D Convolutional Bidirectional Long Short-Term Memory Neural Network for Dual-Polarization NFDM System with Hermite-Gaussian Subcarriers

Zhihang Sun, Chenglin Bai, Tianchi Chen, Yuting Wu, Xusheng Li, Yu Zhang, Donghu Yao, Hengying Xu, Lishan Yang

Liaocheng University, China

A noise equalization scheme for DP-NFDM system using HG-subcarriers based on PS and 1D CNN-BiLSTM is proposed, which can achieve a Q-factor gain of 2.98 dB and an SE increase of 0.39 bit/s/Hz over 960 km.

ACPIPOC-0801-96

Low-Complexity QPSK Partitioning Assisted Carrier Phase Recovery for CS-NFDM PS-64QAM System

Xusheng Li, Jingshuai Qiao, Zhihang Sun, Lei Du, Hengying Xu, Yining Zhang, Chenglin Bai, Lishan Yang, Donghu Yao

Liaocheng University, China

We propose a QPSK partitioning assisted carrier phase recovery scheme for CS-NFDM PS-64QAM system. Simulation results demonstrate that with lower complexity, the maximum transmission distance and linewidth tolerance achieve 880 km and 1.6 MHz, respectively.

ACPIPOC-0801-98

Performance Improvement of DFT-s OFDM Systems Leveraging Non-orthogonal Matrix PrecodingPeiji Song¹, Zhouyi Hu², Li Pei², Chun-kit Chan¹

1. The Chinese University of Hong Kong, Hong Kong, China; 2. Key Laboratory of All-Optical Networks and Modern Communication Networks of Ministry of Education, Institute of Lightwave Technology, Beijing Jiaotong University, China

The non-orthogonal matrix precoding (NOM-p) is proposed to avoid signal-to-noise ratio dips in discrete-Fourier-transform spread (DFT-s) orthogonal frequency division multiplexing (OFDM) signals. Simulation results verify its performance superiority over the conventional DFT-s OFDM and the recently reported chirp-like polyphase sequence (CLPS) precoded scheme.

ACPIPOC-0804-2

Experimental demonstration of modified low-CSPR Kramer-Kronig receivers based on signal-signal beat interference estimation

Yihuan Li, Chao Yu, Deqian Wang, Fu Wang

China Telecom Satellite Communication Co., Ltd, China

We propose a modified Kramer-Kronig (KK) receiver that allow for signal detection when the CSPR is 0 dB. Compared with a conventional KK receiver, the RoP of modified KK receiver can be reduced by 3.9 dBm.

ACPIPOC-0811-2

Dispersion-Diverse Receiver for Power Fading Mitigation in IM-DD Systems at C Band

Jian Yao Zhang

Shanghai Jiao Tong University, China

We experimentally demonstrate a dispersion-diverse receiver to mitigate the CD-induced power fading for IM-DD systems at C-band. The receiver can support 256.5 Gb/s line-rate PS-64-QAM signal transmission over 10-km SSMF.

ACPIPOC-0812-3

Power Loading for Improving Spectral Efficiency of Simplified Carrier Assisted Differential Detection without Iterative CancellationMuyang Wang¹, Jianghao Li¹, Junyu Wu¹, Zhaopeng Xu², William Shieh¹

1. Westlake University, China; 2. Peng Cheng Laboratory, China

We propose a power loading scheme to improve the spectral efficiency (SE) for simplified carrier-assisted differential detection. Results show the SE can be improved by more than 20% at low carrier to signal power ratio.

ACPIPOC-0813-6

An ultra-dense optical vortex mode sorter for 19-ring-core-based fiber-optic communications

Lixun Wu, Zituo Wu, Weihang Zhong, Zhouxin Liang, Yujie Chen

Sun Yat-sen University, China

We propose and demonstrate a transmissive ultra-dense optical vortex mode sorter via inversely-designed reconstruction improved by spiral coordinate transformation, of which structure pattern is compatible to 19-ring-core-based fiber-optic communications.

ACPIPOC-0813-8

MLP-Mixer for Optical Fiber Channel Modeling in WDM Transmission System based on Feature Decoupling Distributed Method

Yu Fu, Tianwai Bo, Mengsheng Zhai, Yihao Zhou, Wen Zhuang, Zhongwei Tan, Yi Dong

Beijing Institute of Technology, China

We propose to integrate MLP-Mixer with feature decoupling distributed technique for modeling the signal propagation in optical fiber channel. It exhibits high accuracy and low complexity, especially in the long-haul wavelength division multiplexing transmission scenarios.

ACPIPOC-0814-11

High Achievable Information Rate Super-Nyquist WDM System with Joint Signal Processing and Probabilistic Shaping

Yingcao Zhuo, Jianping Li, Xinkuo Yu, Jianbo Zhang, Yuwen Qin, Ou Xu, Di Peng, Meng Xiang, Songnian Fu

Institute of Advanced Photonics Technology, School of Information Engineering, Guangdong University of Technology, China

To cope with the severe crosstalk in super-Nyquist-WDM systems with higher-order modulation formats, the joint digital signal processing and probabilistic constellation shaping method has been proposed to improve the system performance and achievable information rate.

ACPIPOC-0814-20

Weighted Filter-enabled BPS Algorithm for PCS-64QAM Transmission System

Sun Zhongliang, Wei Jinlong, Tang Jianwei, Fan Linsheng, Liang Junpeng, Shi Hao, Hao Yaguang, Ji Tonghui, Xu Zhaopeng, Hu Weisheng

Peng Cheng Laboratory, China

Weighted filter-enabled blind phase search (BPS) algorithm variants are experimentally investigated for the PCS-64QAM transmission system. Results validate that the mutual information (MI) performance can be significantly improved through the filtering approach.

ACPIPOC-0814-22

Newton-Schultz Iterative Enabled MIMO Equalizer for 16QAM Transmission

Zhongliang Sun, Jinlong Wei, Shunfeng Wang, Lingguo Cao, Gao Ye, Linsheng Fan, Junpeng Liang, Tonghui Ji, Zhaopeng Xu, Honglin Ji, Lulu Liu, Shangcheng Wang, Weisheng Hu

Peng Cheng Laboratory, China

We experimentally investigate an efficient multiple-input multiple-output (MIMO) equalizer leveraging Newton-Schultz iterative (NSI) algorithm. Results show that NSI algorithm could achieve the great precision and performance with only one iteration.

ACPIPOC-0814-31

Laplace Neural Operator for Accurate Modeling of Long-distance Optical Fiber Channels

Shaonan Hong, Yongjun Wang, Haifeng Yang, Lu Han, Hengda Gao, Qi Zhang

Beijing University of Posts and Telecommunications, China

In this paper, the Laplace neural operator (LNO) is introduced to realize the modeling of long-distance optical fiber channels. We verify the scheme by numerical simulation in 16-QAM system on 800-km standard single-mode fiber (SSFM).

ACPIPOC-0814-41

Low-Complexity Three-stage Power Profile Estimation Method for Long-Haul Optical Link Anomaly LocalizationXulong Yan¹, Zhudong Shi¹, Peng Xu², Quanlin Chen², Qingling Zhou², Yuyang Gao¹, Xian Zhou¹*1. University of Science and Technology, China; 2. China Information Technology Design & Consulting Institute Co., Ltd., China*

A Three-stage Power Profile Estimation Method is proposed to localize power anomaly with low complexity, achieving a 94.92% reduction in complexity within 80 km by 15 span fiber link scenarios without sacrificing original accuracy.

ACPIPOC-0815-1

An Adaptive Clock Recovery Algorithm for Differentiated Roll-Off Characteristics in Gridless Optical NetworkChaoyu Deng¹, Fu Wang¹, Qi Zhang¹, Qinghua Tian¹, Ran Gao², Ze Dong², Feng Tian¹, Xiangjun Xin²*1. Beijing University of Posts and Telecommunications, China; 2. Beijing Institute of Technology, China*

We proposed an adaptive clock recovery algorithm applicable to variable data rate with different roll off factors, which can decrease the timing error jitter and improve convergence speed.

ACPIPOC-0815-12

On the Performance of Advanced Modulation Formats for Extended Single-Span Links

Jiwei Xu, Bin Chen, Can Zhao, Yajie Sheng, Yi Lei

Hefei University of Technology, China

Six modulation formats referring the 400ZR standard are compared, revealing that PCS-16QAM and 4D-64PRS may offer optimal performance at different transmission distances, enhancing high-capacity optical fiber communication efficiency.

ACPIPOC-0815-22

Investigating The Use Of Machine Learning in Conventional Heterodyned-based ReceiversGuohao Thng¹, Said Mikki^{2,3}*1.ZJU-UIUC Institute, China; 2.Zhejiang University - University of Illinois Urbana-Champaign Institute, China; 3.Department of Electrical and Computer Engineering, University of Illinois Urbana-Champaign, United States*

This paper explores the incorporation of machine learning algorithm in conventional heterodyned-based detection approach, with a goal of improving detection performance of conventional heterodyned-based receivers in the presence of signal-to-signal beating interference.

ACPIPOC-0815-27

Online Learning Raman Scattering Coefficient for S+C+L Band Transmission with Raman Amplification Based on WaOA

ZanShan Zhao

Hainan Acoustics Laboratory Institute of Acoustics, Chinese Academy of Sciences, China

We propose an approach of online learning Raman scattering coefficient for S+C+L band transmission. The results show that the maximum discrepancy between the predicting output power and its real value is less than 0.37 dB.

ACPIPOC-0815-32

Phase-sensitive Amplifier-based OOK to 8QAM Optical Aggregation enabling Optical Networks Interconnection

Xuanming Cao, Yuxuan Dong, Jiabin Cui, Yuefeng Ji

Beijing University of Posts and Telecommunications, China

A scheme for optical aggregation from OOK to 8QAM has been proposed. 10G Baud 3×OOK-to-8QAM channel aggregation is achieved and analyzed. The constellation operations mainly contain non-degenerate phase-sensitive amplifier-based vector moving and cross phase modulation-based information superposition. The constellation, eye diagram, and bit error rate (BER) performance of OOK, PAM4 and 8QAM signals were measured. When the BER is 10⁻³, under the input OSNRs of 20 dB and 30 dB, the aggregated 8QAM shows the receiver OSNRs of 21.0 dB and 19.1 dB. Optical aggregation is an important support for the evolution of optical networks.

ACPIPOC-0815-43

A Monitoring System Based on Power-over-Fiber for Electromagnetically Confined Spaces

haobo guo, Yuemei Li, Yao Guo, zheng Liu, Zhaoyang Zhang, Zhiguo Zhang

Beijing University of Posts and Telecommunications, China

Utilizing Power-over-Fiber technology, a monitoring system capable of 24-hour stable operation in electromagnetically confined spaces has been produced, meeting the requirements for real-time information retrieval in underground mines and mountain tunnels.

ACPIPOC-0815-47

Intelligent Reflecting Surface-Aided Underwater Optical Wireless Communications with Wavy Surface

Chengwei Fang, Shuo Li, Yinong Wang, Ke Wang

Royal Melbourne Institute of Technology (RMIT) University, Australia

Underwater optical wireless communication offers high-speed underwater data transmissions. In this paper, we study an intelligent reflecting surface-aided NLOS UOWC system with wavy surfaces, showing that IRS enhances approximately average of 12.56% link reliability.

ACPIPOC-0815-52

All-order PMD Estimation Based on Fractional Fourier Transform and Vision Transformer for High Baud Rate System

Ting Jiang, Zheng Gao, Hao Wu, Ming Tang

Wuhan National Laboratory for Optoelectronics (WNLO) and Next Generation Internet Access National Engineering Laboratory (NGIA), School of Optical and Electronic Information, Huazhong University of Science and Technology Wuhan, China, China

By applying fractional Fourier transformation for time-frequency representation followed by Vision Transformer for impairment analysis, we achieve precise estimation of all-order polarization mode dispersion in high baud rate long-haul optical communication systems.

ACPIPOC-0815-57

Multi-impairments equalization enabled by a pruning neural network in single sideband-direct detection 200Gbps PON downlinkGuan Wang¹, Zheyao Wu¹, Tao Yang¹, Xingang Huang², Yiming Zhong², Bo Liu², Xiaotao Huang², Xue Chen¹*1.Beijing University of Posts and Telecommunications, China; 2.ZTE Corporation, Shanghai, China*

The SSB-DD scheme is expected to be a potential solution for the next generation PON over 50Gbps, because it can overcome the power fading. However, due to various impairments such as chromatic dispersion, SSBI, fiber nonlinearity and bandwidth limitation existed in the system at the same time, it is difficult for the traditional equalization scheme to effectively mitigate them. This paper proposed a multi-impairment equalization scheme based on a pruning neural network. It can simultaneously equalize multiple impairments and has excellent equalization performance. The 200Gbps simulation results under 20km fiber transmission show that the system can achieve a power budget of 42.5dB with EDFA power-amplifier and SOA pre-amplifier.

ACPIPOC-0815-58

Low Complexity Multilevel Coding with Multiplication-Free Probabilistic Shaping for Rate-Adaptive Optical CommunicationsHao Shi^{1,2}, Yifan Chen³, Jianwei Tang¹, Lingguo Cao¹, Gao Ye¹, Junpeng Liang¹, Weishen Hu¹, Jinlong Wei¹, Jian Zhao²*1. Pengcheng Laboratory, China; 2. South China University of Technology, China; 3. Sun Yat-sen University, China*

A low-complexity MLC with bit-class multiplication-free PCS PAM4 system has been proposed, which reduces FEC complexity by 59.7% compared to the classic BICM-CCDM scheme, achieving negligible SNR penalty at high IRs case.

ACPIPOC-0815-60

A Björck Sequence-based Frequency-Domain MIMO for Strongly-Coupled FMF Transmission with Enhanced Tolerance to Link ImpairmentsLingguo Cao^{1,2}, Linsheng Fan², Jinlong Wei², Zhongling Sun², Junpeng Liang², Gao Ye², Hao Shi², Jianwei Tang², Yaojun Qiao¹, Weisheng Hu²*1. Beijing University of Posts and Telecommunications, China; 2. Pengcheng Laboratory, China*

A Björck sequence-based frequency-domain MIMO scheme has been proposed for strongly-coupled FMF transmission with significant tolerance of 605ps DMGD and 200ps IQ skew, representing 1.37 and 89 times improvement compared to a ZC counterpart, respectively.

ACPIPOC-0815-70

Phase-noise Tolerable Microwave Photonics Link with Large SFDRShen Wang¹, Shaohua Hu¹, Jing Zhang¹, Hong Lin¹, Pingjian Xiong², Guangxiang Wu², Bo Xu¹, Kun Qiu¹*1. University of Electronic Science and Technology of China, China; 2. The 34th Research Institute of China Electronics Technology Group Corporation, China*

We experimentally validate a microwave photonic link utilizing dual-drive Mach-Zehnder modulator (DD-MZM) and homodyne detection, achieving an exceptional spurious-free dynamic range (SFDR) exceeding 100 dB·Hz^{2/3}, without optical phase-locked loop and ultra-narrow linewidth lasers.

ACPIPOC-0815-71

High-Order Harmonic Ambiguity Exclusion for Optical Performance Monitoring Based on Subsampling Technique

Yupeng Liu, Aiyang Yang, Peng Guo, Zhe Zhao

Beijing Institute of Technology, China

This paper proposes a high-order harmonic ambiguity exclusion method and software synchronization algorithm for subsampling based optical performance monitoring, achieving up to a 29.7% improvement in synchronization success rates and more robustness.

ACPIPOC-0818-6

Optical Modulation Format Identification under Hybrid Increasing Spacing OSNRs Based on Signal Constellation Diagrams and LIN Model

Meng Liang, Weiwen Chen, Yuqi Wu

Xi'an University of Posts and Telecommunications, China

Modulation Format Identification (MFI) is of great research significance to ensure the normal operation of dynamic and flexible optical communication networks. In this paper, based on a lightweight convolutional neural network with improved Inception (LIN) model, a scheme of increasing spacing optical signal-to-noise ratio (OSNR) of training data set is proposed to train the network model. Meanwhile, data set of different OSNRs are tested to evaluate the generalization performance of the model. Firstly, 10Gbaud BPSK, QPSK, 8PSK, 16QAM, 32QAM and 64QAM coherent optical fiber communication systems are constructed, and the constellation diagrams of series of OSNRs are processed by the neighborhood grayscale enhanced algorithm. Next, the constellation diagrams of the OSNRs of increasing spacing are used as input features to create training data set to train the four deep convolutional neural network models (LIN, AlexNet, ResNet, and GoogLeNet). Finally, the constellation diagrams of the OSNRs different to the OSNRs in training data set are used as the test set of the deep learning network. The simulation experiment shows that the identification accuracy of LIN for modulation formats under three different OSNRs are 89.41%, 95.37% and 97.64% respectively, and LIN has the highest accuracy, and better generalization ability and can meet the requirements of dynamic optical networks.

Track 3: Network Architectures, Management and Applications

ACPIPOC-0708-2

All-Optical Metro Network with Hybrid OCS and Optical Time-slot Switching Capability for Converged Access Services

Yuan Wang, Zhaoyang Liu, Bitao Pan

Beijing University of Posts and Telecommunications, China

We propose an all-optical metro network with hybrid optical switching (HOS) for serving converged fixed, mobile, and edge computing services. Numerical results show that the network achieves up to 28% and 77% wavelength saving compared to wavelength switched networks under different network dimensions.

ACPIPOC-0722-1

Dynamic Hybrid Slice Migration Strategy Based on Proactive Decision-Making in Optical Networks

Mengru Cai, Chenyu You, Shan Yin, Shuyao Wang, Shanguo Huang

Beijing University of Posts and Telecommunications, China

We propose a proactive decision-based dynamic hybrid slice migration strategy for the problem of dynamic slice resource imbalance in optical networks. The strategy performs well in terms of blocking probability and resource utilization.

ACPIPOC-0722-23

Latency-Aware Mean Field Game-Based Task Offloading Strategy in Metro Optical Networks

chenyu You¹, Mengru Cai¹, Shan Yin¹, Honglei Wang², Shanguo Huang¹*1.Beijing University of Posts and Telecommunications, China; 2.Beijing University of Chemical Technology, China*

We propose a task offloading strategy based on mean-field game in metro optical networks. The finite difference method is used to solve the problem, and the task latency is 30% lower than multi-agent reinforcement learning.

ACPIPOC-0723-11

The Demonstration of Traffic Prediction based on SDN Controller for Government and Enterprise OTN Dedicated Line

Xin Qin, Guangnan Su, Xia Gao, Jie Liu, Qian Hu, Hongwei Lv, Jiuyu Xie, Junjie Li

China Telecom, China

We propose a customized traffic prediction method based on software defined network controller. The field trial demonstrates that our proposed method can realize the intelligent and dynamic resource allocation with normalization deviation less than 0.01.

ACPIPOC-0725-3

Distributed Task Aggregation and Resource Optimisation Scheme Based on Task Characteristics in Optical Networks

Yurong Jiao, Shuyao Wang, Shan Yin, Shanguo Huang

Beijing University of Posts and Telecommunications, China

We propose A distributed task aggregation and resource optimization scheme based on deep Q-networks (DQN-DTA) for optical networks, reducing latency difference, lowering task blocking rate, and improving resource utilization.

ACPIPOC-0726-18

Resource Allocation Algorithm based on Physical Layer Impairment for Space Division Multiplexing Elastic Optical Networks

Haoyu Yang^{1,2}, Danping Ren^{1,2}, Qiuyan Yao³, Jinhua Hu^{1,2}, Jijun Zhao^{1,2}*1.Hebei University of Engineering, China; 2.Hebei Key Laboratory of Security and Protection Information Sensing and Processing, Hebei University of Engineering, Handan, China; 3.Beijing University of Posts and Telecommunications, China*

This paper proposed a resource allocation algorithm (DQ-PI) considering both linear and nonlinear impairment in SDM-EONs. Simulation results show that the proposed algorithm has effectively improved the quality of transmission(QoT) and resource utilization.

ACPIPOC-0726-2

Novel Power Allocation Zero-Padded Dual-Mode Optical OFDM Index Modulation

Weiyu Zhou¹, Tingwei Wu¹, Huiqin Wang², Lei Guo¹*1.Chongqing University of Posts and Telecommunications, China; 2.Lanzhou University of Technology, China*

We propose a particle swarm optimization algorithm power allocation model for deep neural networks on zero-padded dual-mode optical OFDM index modulation, which improves the performance gain by 2.11 dB at BER=3.8×10⁻³.

ACPIPOC-0728-18

Fault Localization Method Based on Spatio-temporal Correlation in Optical Transport Networks

Ni An^{1,2}, Hui Li^{1,2}, Xin Qin^{3,4}, Rentao Gu^{1,2}*1.Beijing Laboratory of Advanced Information Networks, China; 2.Beijing University of Posts and Telecommunications, China; 3.State Key Laboratory of Optical Fiber and Cable Manufacture Technology, China; 4.China Telecom Research Institute, China*

We propose a fault localization method based on ML model, which achieves an accuracy of 0.995 and an F1 score of 0.943. The spatio-temporal correlation slicing method can significantly improve the performance of ML models.

ACPIPOC-0729-12

Enhanced Fault Management in Fiber Optic Networks Using Long- and Short-Term Time Series NetworksKamlesh Kumar¹, Yuanxiang Chen¹, Muhammad Asif², Cong Hu¹, Shahbaz Khan¹*1. Beijing University of Posts and Telecommunication, China; 2. Electrical Engineering, University of Houston Houston, United States*

The persistent internet users' requirements and heavy payload have significantly increased network complexity. Although fiber optics is a well-known backbone communication network for its reliability, security, and high data rate capabilities, it is intrinsically sensitive to faults. Traditionally, faults are detected manually using Optical Time Domain Reflectometry (OTDR) and other techniques. Manual fault detection has become impractical with the rapid enhancement of fiber optic deployments. Alternatively, Machine Learning (ML)-driven approaches provide enhanced fault detection capabilities, efficiently handling complex calculations and predicting faults. Despite these advancements, existing ML techniques still face challenges in efficiently detecting faults and have higher processing and prediction delays. On the other hand, our ML-based proposed technique leverages long- and short-term time series networks to detect failures in fiber optic networks. By forecasting the model, faults are efficiently detected, reducing both training and prediction delays. Additionally, our model predicts the severity of faults, ranging from normal to severe, thereby enhancing fault management in fiber optic communication networks. Finally, the performance is compared with long short-term memory (LSTM) and convolutional neural network (CNN) models, our proposed approach shows the highest prediction accuracy of 99.01% with the lowest delay of 14 sec.

ACPIPOC-0729-26

Distributed Network Node Access Strategy Based on Game Theory

Qinyan Gao, Zhidong Xie

Military Intelligence Research Institute, China

To address the competition for network resources in the Space-Air-Ground Integrated Emergency Communication Network (SAGIECN), a distributed user access strategy grounded in multi-agent stochastic game theory has been proposed. The strategy takes into account both user priority and data priority, aiming to maximize user transmission rates by constructing a game model. The Regret Matching (RM) algorithm is used, with a specially designed iterative process to optimize the user access strategy, ultimately reaching a Nash equilibrium. Simulation analysis shows that the proposed strategy, while ensuring optimal network node access for users, allows high-priority users to achieve higher transmission rates, effectively improving the utilization of network resources and system throughput. This, to some extent, solves the problem of network congestion and ensures the smooth progress of emergency operations.

ACPIPOC-0730-1

A Band and Spectrum Allocation Scheme Considering Propagation Loss in Optical Networks with Hollow Core Fibers

Xueyu Fan, Chenyu You, Zhizhi Li, Ling Chen, Shan Yin, Shanguo Huang

Beijing University of Posts and Telecommunications, China

Focusing on the propagation loss of hollow-core fibers, a band selection and spectrum allocation scheme based on genetic algorithm is proposed. Results show that, the resource efficiency in the optical network can be effectively improved.

ACPIPOC-0730-12

Location-Aided Watermarking-Based Physical Layer Authentication for Optical Wireless CommunicationsLilian Jiang¹, Xiaodi You¹, Hanshu Hong², Jian Chen², Changyuan Yu³, Mingyi Gao¹, Gangxiang Shen¹*1. Soochow University, China; 2. Nanjing University of Posts and Telecommunications, China; 3. The Hong Kong Polytechnic University, Hong Kong, China*

We propose location-aided watermarking-based physical layer authentication for uplink optical wireless communications, achieving 100% detection accuracy for spoofing attacks and 0% misdetection for replay attacks when attacker is 0.3 m or more from legitimate transmitter.

ACPIPOC-0731-183

A Multi-chromosome Genetic Algorithm for Core Direction Allocation in Optical Networks with Bidirectional Multicore Fiber

Jinbiao Nie, Xiaodong Liu, Shan Yin, Xueyu Fan, Mengru Cai, Shanguo Huang

Beijing University of Posts and Telecommunications, China

We propose a multi-chromosome genetic algorithm for fiber core direction allocation in optical network with bidirectional multicore fiber (BMCF) for asymmetric traffic. To the best of our knowledge, this is the first study in fiber core direction allocation, aiming to reduce direction reversal-introduced cost. Simulation results show that it reduces the number of core direction changes.

ACPIPOC-0731-187

Multi-Constraint Contraction Hierarchies with Dynamic Label Restrictions for Routing in Optical Networks

Yan Pan, Yingbo Fan, Jiaxing Guo, Bingrong Zhou, Yajie Li, Yongli Zhao, Jie Zhang

Beijing University of Posts and Telecommunications, China

This paper presents a routing algorithm based on the Contraction Hierarchies (CH) and Dijkstra's algorithms, addressing wavelength, OSNR, and relay-induced latency constraints. In simulation, the algorithm deploys service in milliseconds with minimal memory usage.

ACPIPOC-0731-204

Adaptive-INT: Fast Network Anomaly Perception Based on Multidimensional Attribute MeasurementXuetong Hu¹, Yuming Zhang¹, Mingyuan Liu¹, Xiaoting Ma², Wei Quan¹, Deyun Gao¹, Xue Zhang¹*1. Beijing Jiaotong University, China; 2. China Telecom Corporation Limited Research Institute, China*

With the development of the information age, modern networks have become complex ecosystems that demand high performance, high utilization, and high reliability. Network measurement technologies have emerged to monitor and manage network states to detect and mitigate network failures. Traditional network measurement techniques suffer from significant measurement errors and lack flexible scalability. In-band Network Telemetry (INT) technology, implemented via programmable data planes, offers a new approach for fine-grained real-time data plane monitoring. However, existing INT technologies have limited performance under diverse monitoring requirements, leading to delayed and missing sensed information. This study proposes a novel network telemetry scheme, Adaptive-INT, aimed at achieving comprehensive network monitoring, real-time network state assessment, and accurate anomaly detection. By designing lightweight INT data packets, combined with an optimized probing path planning algorithm and dynamically flexible in-network node telemetry action control, the scheme significantly enhances the flexibility and responsiveness of network telemetry.

ACPIPOC-0731-206

Multi-Modal Knowledge Graph with Large Language Model for Intelligent Fault Management in Optical NetworksWeijie Yang¹, Chunyu Zhang¹, Min Zhang¹, Xunjie Jiang², Yanlin Fan², Zhongbo Bi², Jiansheng Xiong², Danshi Wang¹*1. The State Key Laboratory of Information Photonics and Optical Communications, Beijing University of Posts and Telecommunications, China; 2. China Unicom Intelligent Network Innovation Centre, China*

We propose a multi-modal knowledge graph with large language model for intelligent fault management in optical networks. Demonstrations of two real-world cases validate its capability to utilize multi-modal data and facilitate intelligent reasoning.

ACPIPOC-0731-207

Large-scale Satellite Optical Network Simulation Architecture and Performance EvaluationXinjun Wang¹, Zhenrong Zhang¹, Kangqi Zhu², Nan Hua²*1. Guangxi University, China; 2. Tsinghua University, China*

We proposed the MegaStarSim architecture utilizing discrete-event simulation technology to integrate various modules for end-to-end simulation of large-scale satellite optical networks. Results show improved efficiency in offline mode and high accuracy in autonomous position calculating.

ACPIPOC-0731-21

Endogenous Security Architecture and Application for Industrial PONZhenming Liang^{1,2}, Kaiyue Wang^{1,2}, Dezhi Zhang^{1,2}, Fu Wang³, Ziyao Yang^{1,2}, Ming Jiang^{1,2}*1. State Key Laboratory of Optical Fiber and Cable Manufacture Technology, China; 2. China Telecom Research Institute, China; 3. Beijing University of Posts and Telecommunications, China*

This paper proposes an endogenous security architecture based on proactive defense. Key technologies, such as proactive interception, proactive isolation, and situational awareness, have formed an in-depth security defense system for industrial PON.

ACPIPOC-0731-22

Physical Layer-Aware Route and Spectrum Allocation in Optical Networks by Multi-Objective Deep Reinforcement Learning

Jiajia Xie, Yuchen Song, Yao Zhang, Shengnan Li, Min Zhang, Danshi Wang

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

We propose a multi-objective Reinforcement Learning approach for RSA in optical networks, integrating awareness of signal quality, delay, and load-balancing. It outperforms traditional algorithms with 0.7dB SNR improvements, 15.2% latency and 68.3% blocking rate reduction.

ACPIPOC-0731-221

TSN Disciplined Oscillators for Time Synchronization in Distributed NetworksZhifu Li¹, Guochu Shou¹, Xiaodong Zhang¹, Li Chen², Dong Zhao², Xiaoyu Zhao², Kia Xia²*1. Beijing University of Posts and Telecommunications, China; 2. Center of National Railway Intelligent Transportation System Engineering and Technology, China*

This paper proposes a TSNDOS scheme utilizing time-sensitive networking to discipline clocks, providing precise time for distributed networks. The experimental results demonstrate that TSNDOS achieves the time accuracy of 10ns to tens of ns.

ACPIPOC-0731-48

Research on SPN Optical Networks Convergence with AIQin Li¹, TianKuo Yu², Liuyan Han¹, Dechao Zhang¹, Han Li¹, Hui Yang²*1. China Mobile Research Institute, China; 2. State Key Laboratory of Information Photonics and Optical Communications Beijing University of Posts and Telecommunications, China*

Using technologies such as physical layer slicing, built-in arithmetic, cloud-edge synergy, arithmetic-network synergy and machine vision, SPN optical network effectively integrates network capability and arithmetic capability.

ACPIPOC-0731-6

CNN-LSTM Based Routing Optimization Strategy in Quantum Key Distribution Networks

Xiayu Hu, Xiaosong Yu, Yongli Zhao

Beijing University of Posts and Telecommunications, China

This paper proposes a CNN-LSTM-based routing optimization strategy in quantum key distribution networks. Simulation results show that the proposed routing strategy can achieve better performance in terms of service success rate compared with non-predictive strategy.

ACPIPOC-0731-86

Elastic optical network virtual embedding for C+L band spectrum allocation

Xingyu Hu, Danping Ren, Yujing Deng, Jinhua Hu, Jijun Zhao

Hebei University of Engineering, China

This paper proposes a fragmentation-aware algorithm for C+L band spectrum allocation and virtual network embedding, optimizing resource allocation with energy constraints. Results show improved virtual network acceptance rates and spectrum utilization compared to other algorithms.

ACPIPOC-0801-11

UAV Trajectory Planning and Resource Optimization for NOMA-VLC Systems via MAS-MARLLiang Li¹, Jiawei Hu¹, Xinke Tang², Yuhan Dong^{1,2}*1. Tsinghua University, China; 2. Pengcheng Laboratory, China*

The advent of 6G communication technologies drives the development of innovative solutions, such as unmanned aerial vehicle (UAV)-assisted visible light communication (VLC) systems. However, these systems face challenges, including limited bandwidth and scalability issues. To address these, we introduce non-orthogonal multiple access (NOMA) into the VLC framework and propose a mixed action space multi-agent reinforcement learning (MAS-MARL) algorithm. This algorithm optimizes both continuous and discrete variables, facilitating cooperative communication among multiple UAVs. Extensive simulations demonstrate its effectiveness in improving the overall performance of multi-UAV NOMA-VLC systems.

ACPIPOC-0801-133

Low-Complexity and Multi-Dimensional Resource Allocation for Industrial Network Slicing

Wendi Zhao, Jin Li, Yonghan Wu, Danshi Wang, Min Zhang

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

To solve the time-consuming multi-dimensional slice resource allocation problem, a low-complexity algorithm based on alternating direction multiplier (ADMM) is proposed. This algorithm reduce the slice delay violation rate substantially with less data in shorter time.

ACPIPOC-0801-135

Low-Delay Modified OLSR Scheme for Flying AdHoc NetworksXiran Xiong¹, WeiBo Zheng², Shulei Wang¹, Yuanzhe Qu¹, Shiqi Chen², Yongchun Yuan², Wentao Li², Yiming Hong¹, Bingyao Cao¹*1. Shanghai University, China; 2. Engineering No.1 Shanghai Institute of Technical Physics Chinese Academy of Sciences, China*

We propose a low-delay modified OLSR scheme for FANET. Through hardware testing, compared with the OLSR protocol, EED and RO have decreased by 100 times and 8% respectively, and PDR has increased by 3%.

ACPIPOC-0801-25

Experimental Demonstration of SDN-Based Elastic Optical Switching for LEO Satellite Constellations

Zihang Xu, Hongxiang Guo, Jian Wu

Beijing University of Posts and Telecommunications, China

We demonstrate a LEO satellite elastic optical switching network with self-designed switching nodes. The experimental results confirm that the satellite node supports link reconstruction and flexible bandwidth adjustment.

ACPIPOC-0801-6

Cascaded-Neural-Networks-enabled Failure Localization in High-Degree Clos-ROADM Optical NetworksYuqing Song¹, Jiawei Zhang¹, Ruikun Wang¹, Zhiqun Gu¹, Qiaolun Zhang², Yuefeng Ji¹*1. Beijing University of Posts and Telecommunications, China; 2. Politecnico di Milano, Italy*

Targeting failure localization in high-degree Clos-ROADM optical networks, we propose a cascaded-neural-networks-based algorithm (Ca-NN). Results show that it achieves satisfactory accuracy under different numbers of service requests, percentages of OPMs and types of failure components.

ACPIPOC-0801-94

The Impact of Temporal Resolution on Routing Accuracy in Digital Twins of Multi-Domain Optical NetworksChengyu Wu^{1,2}, Nan Hua^{1,2}, Kangqi Zhu^{1,2}, Xiaoping Zheng^{1,2}*1. Tsinghua University, China; 2. Beijing National Research Center for Information Science and Technology, China*

We studied the impact of the temporal resolution of digital twins on AI routing paradigms. Numerical results demonstrate that AI routing with low data temporal resolution has a relatively higher tolerance in light load condition.

ACPIPOC-0813-14

Fault Localization Schemes Based on Adaptive Probing in Optical NetworksJian Dang¹, Huijie Yang¹, Liulei Zhou¹, Bowen Chen^{1,2}, Zhijun Li¹, Qiang Wang¹*1. Soochow University, China; 2. Suzhou LZY Technology Co., Ltd., China*

The adaptive probing enhances fault localization efficiency in optical networks. Simulation results indicate that the proposed fault localization schemes significantly improve fault localization time, efficiency, and cost, demonstrating their effectiveness across these critical metrics.

ACPIPOC-0813-15

Inter-band Wavelength Conversion in Multi-band Optical Networks with a Partial Set of Band-Upgraded LinksNingning Guo¹, Vittorio Curri², Gangxiang Shen¹*1. Soochow University, China; 2. Politecnico di Torino, Italy*

We propose a novel inter-band wavelength conversion strategy for multi-band optical networks with a partial set of band-upgraded links. Simulation results demonstrate that the proposed strategy performs nearly as well as a fully upgraded network with full wavelength conversion capability, while requiring much fewer wavelength converters.

ACPIPOC-0813-2

A Service Awareness Network Topology Planning Strategy Based on "Ring to Tree" in Metro Optical Network

Tao Liu, Xin Li, Yongli Zhao

Beijing University of Posts and Telecommunications, China

With the release of Apple Vision Pro, the resolution of Extended Reality (XR) terminal has been increased to 8K, and the ultra-high resolution Cloud XR service has brought great challenges to the bandwidth capacity of metro optical network. At present, the access layer of metro optical network mostly adopts ring topology, which carries less traffic and has poor scalability. This paper proposes a service awareness network topology planning strategy based on "ring to tree" in metro optical network. Compared with ring topology, the proposed network planning strategy of "physical ring logical tree" has lower cost per unit bandwidth, and the average price per unit bandwidth is reduced by 37.1%. The proposed network planning strategy of tree topology has stronger service carrying capacity and better scalability, and the service scalability is increased by 122%.

ACPIPOC-0813-5

Key Rate and Security Degree-Aware Schemes Based on Hybrid Relay in Quantum Key Distribution Optical NetworksYuxuan Lu¹, Huijie Yang¹, Hong Chen¹, Bowen Chen^{1,2}, Nianyang Zheng³*1. Soochow University, China; 2. Suzhou LZY Technology Co., Ltd., China; 3. Guilin University of Electronic Technology, China*

Two key rate and security degree-aware schemes based on hybrid relay for key services are proposed to improve the success ratio in quantum key distribution optical network. Simulation results show that the schemes perform well in terms of success ratio, key rate, and security degree.

ACPIPOC-0814-10

Low-Latency Routing Scheme for Burst Traffic in Power Communication within F5GYuan Chao¹, Kunpeng Zheng², Zhenxiao Fu³, Hao Zhang³, Huixuan Wang³, Yongli Zhao²*1. State Grid Laiwu Power Supply Company, China; 2. Beijing University of Posts and Telecommunications, China; 3. State Grid Shandong Electric Power Company, China*

With the development of network technology, the types and quantities of communication services carried by the Fifth Generation Fixed Networks (F5G) have been continuously increasing, placing higher demands on the capacity and transmission rates of F5G. When routing large volumes of services in F5G, it is often challenging to ensure various communication requirements, such as service latency, importance, and protection levels. Furthermore, during periods of high concurrent communication traffic, the insufficient bandwidth resources can lead to an increase in service blocking rates. This not only degrades the quality of communication but also causes a sharp rise in service blocking rates when burst traffic occurs in power communication networks, making it difficult to meet the latency requirements of services. Therefore, in the context of F5G carrying power communication services, we have designed a Joint Optimization based on Latency and Maximum Bandwidth Utilization (JO-LMBU) algorithm. Compared to benchmark algorithms, JO-LMBU effectively reduces the service blocking rate and decreases service latency during burst traffic.

ACPIPOC-0814-13

Minimum-Use Shared Backup Segment Protection (SBSP) in WDM Optical NetworksJunyue He¹, Xuanchen Dai¹, Gangxiang Shen¹, Luo Han², Kerong Yan², Ruishan Chen², Zeshan Chang²*1. Soochow University, China; 2. Huawei Technology, China*

We propose a shared backup segment protection scheme for WDM optical networks with non-tunable transponders. Simulations show improved spare capacity redundancy, wavelength usage, and restoration times compared to other protection schemes.

ACPIPOC-0814-14

HMWC: A Pay-as-You-Grow High-Dimension Optical Cross-Connect (OXC) Based on MEMSs and WSSs

Xuanchen Dai, Junyue He, Yongcheng Li, Gangxiang Shen

Soochow University, China

We propose the HMWC architecture, a high-dimension Clos-OXC using MEMS and WSS, to upgrade Spanke-OXCs. It offers "pay-as-you-grow" scalability and cost efficiency without compromising switching performance compared to a traditional Spanke-OXC of the same size.

ACPIPOC-0814-16

Cross-Domain Cooperative Resource Scheduling in Integrated XGS-PON and Wi-Fi 6 Network

Shen Yu, Jinhan Cai, Mingyuan Zan, Jun Li, Gangxiang Shen

Soochow University, China

We propose a cooperative resource scheduling scheme for XGS-PON and Wi-Fi 6 networks, introducing a centralized Wi-Fi resource scheduling method. This method relays scheduling information to the OLT, enabling it to pre-allocate additional bandwidth resources.

ACPIPOC-0814-17

Traffic-Aware Energy-Saving Mechanism in the FTTR Network

Mingyuan Zan, Jinhan Cai, Shen Yu, Jun Li, Gangxiang Shen

Soochow University, China

With the widespread deployment of FTTR networks, a significant issue of energy consumption arises. Current systems lack energy-saving measures. We propose a traffic-aware mechanism, reducing power consumption by 20% with latency fluctuations within 3 ms.

ACPIPOC-0814-19

Counter-Propagating Core Assignment for Asymmetric Traffic in Multi-Core Fiber Inter-Data Center Networks

Fengxian Tang, Weiqiang Wu, Yongxue Wang

Shenzhen Polytechnic University, China

To address the rapid expansion of long-distance data transmission between geographically dispersed data centers and cloud service providers, multi-core fiber (MCF)-based inter-data center networks (IDCNs) have emerged as one of the most promising solutions. However, two critical challenges must be addressed: the bidirectional traffic asymmetry inherent in these networks and the inter-core crosstalk in MCFs. In this paper, we propose employing a counter-propagation mode during the Data Center, Routing, Core, and Spectrum Assignment (DRCSA) process within an MCF-IDCN. Our results demonstrate a significant improvement in network resource utilization and a reduction in inter-core crosstalk compared to traditional co-propagation methods, thereby validating the effectiveness of the proposed approach.

ACPIPOC-0814-40

Model Distribution for Edge-Cloud Collaboration Inference in Optical Networks

Tingting Bao, Meng Lian, Yongli Zhao, Jie Zhang

Beijing University of Posts and Telecommunications, China

Tasks with high latency requirements require cloud-edge collaborative inference. We propose an algorithm for model distribution and task inference that can significantly reduce 9.47% task completion time.

ACPIPOC-0814-46

Dynamic Subcarrier and Bandwidth Allocation for Time-Sensitive Services in TFDm-CPON

Qianqian Pei, Xiang Lu, Yongcheng Li, Jun Li

Soochow University, China

In order to support time-sensitive (TS) services with low latency requirements, this paper proposes a dynamic subcarrier and bandwidth allocation scheme based on transmission containers (T-CONTs) granularity in Time-Frequency Division Multiplexing (TFDM) coherent passive optical network. Simulation results show that the proposed scheme can meet low latency requirements of TS services without sacrificing that of other services and resource utilization.

ACPIPOC-0814-58

A computing and network resource aware mapping algorithm for MEC systems interconnected by metro optical networksJing Zhao¹, Yuanmou Chen¹, Yi Huang²*1. China Telecom Research Institute, China; 2. Beijing University of Posts and Telecommunications, China*

Aiming at the resource allocation in MEC system, a computing and network resource aware mapping algorithm (CN-ACO) is proposed, which can reduce the network blocking probability, improve the spectrum resource utilization and balance the load.

ACPIPOC-0815-103

QoS-Guaranteed Routing in Satellite Optical NetworksLongchao Wei¹, Xiaoke Sun^{2,3}, Shaobo Qin^{2,3}, Haicheng Li^{2,3}, Pengyu Wang¹, Xueqiang Zhao¹, Yajun Li², Ruijie Zhu^{2,3}*1. The 27th Research Institute of China Electronics Technology Group Corporation, China; 2. Zhengzhou University, China;**3. Songshan Laboratory, China*

This paper proposes a QoS-guaranteed routing algorithm. Simulation results show that it meets the diverse QoS requirements of different services while ensuring data transmission efficiency and reliability.

ACPIPOC-0815-104

Traffic Shaping for Diverse Cycles Reduction in Industrial TDM-PON GatewayChaoqun Li¹, Jiawei Zhang¹, Lizhu Liu¹, Chen Su², Zhiquan Gu¹, Yuefeng Ji¹*1. Beijing University of Posts and Telecommunications, China; 2. Purple Mountain Laboratories, China*

Time-Aware Deterministic Bandwidth Allocation (TA-DetBA) scheme was proposed in an industrial Time Division Multiplexing Passive Optical Network (TDM-PON) bandwidth according to the characteristics of flow arrivals. However, diverse flow cycles will increase the scheduling time of TA-DetBA sharply. In this paper, we propose a Traffic Shaping scheme for Diverse flow Cycles (DC-TS) in an industrial TDM-PON. Through the DC-TS enabled industrial gateway on the Optical Network Unit (ONU) side, the diversity of flow cycles can be reduced, thereby improving the scheduling speed of TA-DetBA. The simulation results show that, on the basis of ensuring schedulability, the scheduling time of TA-DetBA after DC-TS is reduced to 14.8% compared to conventional TA-DetBA.

ACPIPOC-0815-108

A Traffic Pattern Identification and Switching Granularity Selection Scheme in Metro/Access All-Optical Switching Networks

Xu Chen, Jiawei Zhang, Huitao Zhou, Bojun Zhang, Zhiquan Gu, Yuefeng Ji

Beijing University of Posts and Telecommunications, China

Diverse traffic requirements pose challenges to the switching capacity of the metro/access networks. All-optical switching network has been promising for improving network flexibility and reducing resource waste. However, selecting optical circuit switching technology for diverse traffic may result in resource waste, whereas selecting optical timeslot switching may increase the network controlling costs. To solve this problem, we propose a traffic pattern identification and switching granularity selection scheme in network access interface using multiple switching granularities to fit the dynamic traffic pattern. Experiments show that the proposed scheme could decrease the number of wavelengths used by 10% and packet loss by 35%.

ACPIPOC-0815-17

Three-Layer Matrix Ring Data Center Interconnect Based on FSO TechnologyJianning Su^{1,2}, Qian Kong¹, Xiaowei Lu^{3,4,5}, Liming Liu⁶, Zichuan Yi⁶, Xinjian Pan⁶

1. School of Electronic and Information Engineering, University of Electronic Science and Technology of China, Zhongshan Institute, China; 2. College of Physics and Optoelectronic Engineering Shenzhen University, SZU, China; 3. Optoelectronic Devices and Systems of Ministry of Education and Guangdong Province, Shenzhen Key Lab of Micro Nano Photonic Information, China; 4. Technology, State Key Laboratory of Radio Frequency Heterogeneous Integration, China; 5. College of Physics and Optoelectronic Engineering, Shenzhen University, China; 6. School of Electronic and Information Engineering, University of Electronic Science and Technology of China, Zhongshan Institute, China

This paper proposes a three-layer grid matrix ring data center interconnect using Free Space Optical Communication as the inter-layer connection technology, which simplified the wiring complexity and offers more diverse and flexible routing options.

ACPIPOC-0815-25

Dynamic Spectrum Allocation with Adaptive Maximum SNR in C+L-Band Elastic Optical NetworksHuijie Yang¹, Jian Dang¹, Hong Chen¹, Bowen Chen¹, Fan Li²*1. Soochow University, China; 2. China Comservice Wangying Technology Co., Ltd., China*

A dynamic spectrum allocation algorithm with adaptive maximum Signal-to-Noise Ratio (AMSNR) is proposed to improve the spectrum efficiency in C+L-band elastic optical networks. Simulation results demonstrate the effectiveness of the proposed AMSNR algorithm.

ACPIPOC-0815-29

Direction-Aware Multi-Agent Hybrid Routing in Low-Earth-Orbit Optical Satellite NetworksHai Yi¹, Fu Wang², Qi Zhang¹, HaiPeng Yao¹, Weiying Feng³, Qinghua Tian¹, Xiangjun Xin²*1. Beijing University of Posts and Telecommunications, China; 2. Beijing Institute of Technology, China; 3. Beihang University, China;*

In satellite optical network routing optimization, we propose a direction-aware multi-agent hybrid routing scheme that reduces the average delay by 16.95% and improves the resource utilization by 17.98% compared to three traditional algorithms.

ACPIPOC-0815-35

Bandwidth reservation algorithm for time-varying services in optical networksYaping Li¹, Bing Yu¹, Xuwei Duan¹, Jing Ni¹, Jingjing Liu², Yuhang Liu², Xiaosong Yu², Yongli Zhao²*1. State Grid Xinjiang Electric Power Company Limited Urumqi, China; 2. Beijing University of Posts and Telecommunications, China*

This paper proposes a bandwidth reservation algorithm for time-varying services in optical networks. Simulation results show the feasibility of the proposed algorithm in reducing service blocking rate and failure recovery failure rate.

ACPIPOC-0815-36

Service route fairness assignment strategy toward holographic optical communication in F6G

Yike Jiang, Yongli Zhao, Wenhong Liu, Meng Lin, Li Xin, Jie Zhang

Beijing University of Posts and Telecommunications, China

Ensure user experience has become an important topic in F6G. Unreasonable routing can lead to a poor user experience. We propose a SRFA algorithm, in which user experience is increased by 13.5%.

ACPIPOC-0815-39

Field Trial of Long-distance RDMA lossless transmission for Wide-area data center Interconnection

Yanxia Tan, Xiangkun Man, Guangquan Wang, Zelin Wang, He Zhang, Bohua Xu

Research Institute of China Unicom, China

We report a field trial of 3000-kilometer long-distance RDMA traffic transmission based on OTN lossless flow control and end-network collaborative congestion control, and the port bandwidth utilization rate has increased from 20% to over 90%.

ACPIPOC-0815-49

Game Theory-Based Trusted Virtual Network Function Deployment in LEO Satellite Optical NetworksRuijie Zhu^{1,2}, Haicheng Li^{1,2}, Shaobo Qin^{1,2}, Yudong Zhang¹, Chao Xi³, Bo Yang³*1. Zhengzhou University, China; 2. Songshan Laboratory, China; 3. Space Star Technology CO., LTD., China*

Low Earth Orbit (LEO) satellite optical networks, characterized by low delay, high capacity, and global seamless coverage, are a pivotal component of the 6G communication system. Efficient service delivery, divided into distinct components, necessitates collaboration among multiple satellites, given the constraints of onboard satellite resources. Network Function Virtualization (NFV) is recognized as an efficient approach for flexibly allocating satellite network resources on demand. However, existing research on satellite network function virtualization predominantly focuses on VNF deployment in secure environments, overlooking vulnerabilities such as Distributed Denial-of-Service (DDoS) attacks, channel interference, and satellite hijacking, which result in computation and transmission delays during VNF deployment. This paper introduces a Fuzzy Theory-based Trust Evaluation (FTE) model to assess node reputation and proposes a Game Theory-Based Delay-Aware Trusted Virtual Network Function Deployment (GT-DATD) algorithm to maximize the deployment success rate of VNFs and reduce average delay. Numerical results validate the effectiveness of the proposed method in enhancing average delay, network revenue, and deployment success rate.

ACPIPOC-0815-62

Particle Swarm Optimization on Deep Q-Learning Algorithm for Disaster Backup Transmission in Data Center Networks

Lin He, Jiayuan Hu, Hao Liu, Min Gao, Weihua Cao

China Telecom Research Institute, China

A novel hybrid DQN-PSO algorithm is proposed for disaster backup in data center networks, enhancing exploration performance and avoiding premature convergence for high-dimensional scenarios.

ACPIPOC-0815-95

Traffic Prediction in Satellite Optical Networks Based on Asynchronous Federated LearningXueqiang Zhao¹, Zihao Qin^{2,3}, Shaobo Qin^{2,3}, Haicheng Li^{2,3}, Xiaoke Sun^{2,3}, Pengyu Wang¹, Longchao Wei¹, Yajun Li², Ruijie Zhu^{2,3}*1. The 27th Research Institute of China Electronics Technology Group Corporation, China; 2. Zhengzhou University, China;**3. Songshan Laboratory, China*

This paper presents a traffic prediction method for satellite optical networks using asynchronous federated learning, enhancing model convergence, reducing communication burden, and addressing traffic distribution and overload challenges while ensuring privacy.

ACPIPOC-0831-1

Nanosecond Precision Time Synchronization Over Large Scale High Speed Ethernet Network

Daohang Dang

Beijing University of Posts and Telecommunications, China

A nanosecond time synchronization network based on 25G Ethernet is shown in this paper. The network is of high scalability through the Time Distribution Switch (TDS), allowing to form a synchronization network of thousands of devices.

Track 4: Optoelectronic Devices and Integration

ACPIPOC-0405-1

Soliton assistant optical fiber mode coupling and conversion in liquid crystal chip

Hongyang Zhu, Zhi Liu

Tianjin Navigation and Instrument Institute, China

Through soliton excitation in fibers integrated nematic liquid crystals chip, we demonstrated an all-optical response and electrical tunable on-chip structure for light coupling and mode conversion in fibers within nearly all optical communication band.

ACPIPOC-0618-1

Multi-channel and multi-mode waveguide crossing enabled by GRIN meta-lens

Xin Qiao, Xingqi Wang, Minghan Yang, Yabing Chen, Zonghao Hu, Yingjie Liu

YanShan University, China

A compact five-channel dual-mode waveguide crossing is designed via gradient-index meta-lens. The insertion losses are 0.2–0.6 dB, and the crosstalks are less than -18 dB from 1500 to 1600 nm for all cases.

ACPIPOC-0710-1

Monolithic integration of 1.3 μm quantum dot microdisk lasers and photodetectors grown on planar on-axis Si (001) substrates

Shuaicheng Liu, Hao Liu, Jiacheng Lin, Jihong Ye, Yanan Chen, Binbin Tong, Yisu Yang, Jun Wang, Qi Wang, Xiaomin Ren

Beijing University of Posts and Telecommunications, China

A monolithic silicon-based optoelectronic integrated system consisting of quantum dot microdisk lasers, coupled waveguides, and photodetectors, is demonstrated. The feasibility of this integration approach has been substantiated by our preliminary test results.

ACPIPOC-0721-1

UTC-PD optical mixing array

Jihong Ye, Yongqing Huang, Mingxi Yang, Shuhu Tan, Xuejie Wang, Xiaomin Ren

Beijing University of Posts and Telecommunications, China

An optical mixing array based on UTC-PD is demonstrated in this paper. Under zero bias voltage, it was able to perform up-conversion at the LO signal frequency of 20 GHz with a conversion loss of 21.9 dB.

ACPIPOC-0722-17

The Design of an Integrated Amplitude Equalizer in Silicon Photonics

Wenqi Fan, Chukun Huang, Tianheng Zhang, Junqiang Sun

Huazhong University of Science and Technology, China

We propose an integrated amplitude equalizer and prove its theoretical feasibility. The device consists of a Mach-Zehnder Interferometer structure with a thermal phase shifter on one arm and a nonlinear optical loop mirror.

ACPIPOC-0722-21

Research on InGaAsP/InGaAs high-performance MUTC photodiodes with monolithic integrated microlens

Xiaowei Yang

Beijing University of Posts and Telecommunications, China

A modified uni-traveling-carrier photodiode of InGaAsP/InGaAs material is proposed to have high-bandwidth and high output power performance. Considering the incident light problem, an InP microlens is monolithically integrated on the backside of the device.

ACPIPOC-0723-6

Design of compact microdisk resonator for on-chip high-resolution spectrometers

Yijie Chen, Yuxiao Ma, Rui Wu, Xin Qiao, Xingqi Wang, Yingjie Liu

YanShan University, China

A multi-channel compact silicon microdisk resonator for high-resolution computational spectrometers is designed and simulated, which has a footprint of only $100 \times 100 \mu\text{m}^2$ and a spectral resolution of 44 pm.

ACPIPOC-0725-12

Comparison of the performance between conventional and flat-top SOI-AWG based on dual-etched waveguide apertures

Xudong Du, Weiwei Pan, Yu Cheng, Chen Ji

Zhejiang University, China

We design and fabricate conventional and flat-top SOI-AWGs based on dual-etched waveguide apertures. The flat-top AWG has 180% more 3 dB bandwidth than the conventional AWG, with less than 3.5 dB additional loss.

ACPIPOC-0725-15

Multi-plane light conversion based simplified coherent receiver for mode division multiplexing optical transmission

Jie Xiang, Jianping Li, Yuwen Qin

Institute of Advanced Photonics Technology, School of Information Engineering Guangdong University of Technology, China

We propose a multi-plane light conversion based simplified coherent receiver to realize the mode demultiplexing and 90-deg optical mixing simultaneously with 3-photo-detector. The 3-linearly-polarized-mode multiplexed demonstration has been simulated with low crosstalk and high fidelity.

ACPIPOC-0725-16

Experimental Observation of the PPR effect with a multi-section DBR laser

Runze Dai, Zhenze Wang, Da Chen, Yonglin Yu

Huazhong University of Science and Technology, China

A multi-section DBR laser was studied experimentally, with a focus on comparing characteristics of the laser in absence and presence of the photon-photon resonance (PPR) effect.

ACPIPOC-0725-17

25 GHz 3-dB Bandwidth Directly Modulated DBR Laser at 55 °C

Zhenze Wang, Runze Dai, Jiashi Feng, Haixuan Xu, Da Chen, Yonglin Yu

Huazhong University of Science and Technology, China

Temperature effects on a novel directly modulated DBR laser are investigated experimentally. It is possible to achieve 25 GHz 3-dB bandwidth at 55 °C.

ACPIPOC-0725-8

Design of a low noise avalanche photodiode with integrated dark pixel

Xin Pang, Xuanke Tong, Rongjie Zhu, Yi Zou, Shijie Deng

Guilin University of Electronic Technology, China

This paper proposes a novel structure for the silicon avalanche photodiode. The structure uses an integrated dark pixel to offset the dark current of the avalanche photodiode, effectively reducing the output noise. The device structure is simulated by software to extract the relevant electrical and optical properties. The results show that the breakdown voltage of the avalanche photodiode is 33.6 V at 300 K, the breakdown current is less than 1×10^{-10} A, and the output current values under light and dark conditions at different temperatures differ by at least 5 orders of magnitude. Under 0 V bias voltage, the device exhibits the highest quantum efficiency of 35%, and it has a high response in the wavelength range of 400 ~ 800 nm, with a peak responsivity of 0.14 A/W at 540 nm. In addition, under 6.4V overbias, the avalanche probability in the light-receiving region is the same as that within the integrated dark pixel, the maximum avalanche breakdown probability reaches 83%, and the peak electric field is about 4.6×10^5 V/cm.

ACPIPOC-0726-4

Research on the resonance of photodiode with a collector for terahertz communication

Shuhu Tan, Yongqing Huang, Xuejie Wang, Mingxi Yang, Jihong Ye, Kai Liu, Xiaofeng Duan, Xiaomin Ren

Beijing University of Posts and Telecomm, China

A terahertz band photodiode (TB-PD) is proposed that utilizes resonance to achieve a flat frequency response. For -4V, the 30- μ m-diameter device exhibits 3dB flatness in the range of 267-451GHz and -3.8dBm@333GHz of output power.

ACPIPOC-0727-2

Tailorable Stimulated Brillouin Scattering in Gallium Nitride Waveguides

Zhaoqin He, Changzheng Sun, Bing Xiong, Jian Wang, Zhibiao Hao, Lai Wang, Yanjun Han, Hongtao Li, Lin Gan, Yi Luo

Tsinghua University, China

GaN-on-sapphire waveguide is proposed for efficient backward stimulated Brillouin scattering. The maximum normalized Brillouin gain G_B/Q_m for GaN waveguide is estimated to be $0.082 \text{ W}^{-1}\text{m}^{-1}$ and $0.047 \text{ W}^{-1}\text{m}^{-1}$ for TM- and TE-polarized pumps, respectively.

ACPIPOC-0728-2

A High-power and Low-timing Jitter Mode-locked Semiconductor Laser Based on a Distributed Bragg ReflectorYueying Niu^{1,2,3}, Defan Sun^{1,2,3}, Fei Guo^{1,2,3}, Ruikang Zhang^{1,2,3}, Dan Lu^{1,2,3}*1. Key Laboratory of Optoelectronic Materials and Devices, Institute of Semiconductors, Chinese Academy of Sciences, China;**2. Center of Materials Science and Optoelectronics Engineering, University of Chinese Academy of Sciences, China; 3. Beijing Key**Laboratory of Low Dimensional Semiconductor Materials and Devices, China*

We demonstrated a high-power and low-timing jitter monolithically integrated DBR AlGaInAs/InP mode-locked semiconductor laser with a repetition frequency of 25GHz. The optical output is 74mW and timing jitter is 42fs (integrated from 1kHz to 10MHz).

ACPIPOC-0728-7

Integrated Si₃N₄ External Cavity Semiconductor Laser with Full C-Band Wavelength CalibrationXiangyue Li¹, Qingshuai Su², Fang Wei³, Chen Chen², Haoyang Pi², Kangwen Yang¹, Qing Ye², Haiwen Cai³*1. University of Shanghai for Science and Technology, China; 2. Shanghai Institute of Optics and Fine Mechanics Chinese Academy of Science, China; 3. Zhangjiang Laboratory, China*We proposed a wavelength-calibrated narrow-linewidth high-power external cavity semiconductor laser, which can achieve 43 nm full C-band wavelength tuning, with a frequency deviation within ± 0.3 GHz and a maximum output power of 273.1 mW.

ACPIPOC-0729-34

High performance dual-band chirped grating coupler with high and balanced coupling efficiency

Rui Cen, Minming Geng, Qiang Liu, Zhenrong Zhang

School of Computer and Electronic Information of Guangxi University, China

A dual-band grating coupler based on one-dimension chirped structure is proposed based on silicon-on-insulator platform, which can simultaneously improve and balance the peak coupling efficiency in and between O- and C-band.

ACPIPOC-0730-14

Enhanced Modulation Bandwidth in Tunneling-Injection Quantum Dot Laser

Chaoyuan Yang, Ying Yu, Siyuan Yu, Yingxin Chen, Changkun Song, Kun Zhan

Sun Yat-sen University, China

We reported an enhanced modulation bandwidth in an optimized tunneling-injection quantum dot laser, with a K-factor as low as 0.2 ns, and a corresponding 3-dB modulation bandwidth of 44 GHz.

ACPIPOC-0730-19

External Cavity Lasers Based on Photonic Crystal Nanobeam For Refractive Index Sensing

Qingbo Hu, Yisu Yang, Daquan Yang, Lulu Wang, Yongqing Huang, Xiaomin Ren

Beijing University of Posts and Telecommunications, China

We propose an external cavity laser based on a nanobeam cavity and RSOA for sensing. The detection limit of the refractive index change is improved by a factor of 175 compared to its passive counterpart.

ACPIPOC-0730-21

On-chip Dispersion Compensation in the 2- μ m Waveband based on Circulator-free Silicon Nitride Chirped Bragg Grating

Kan Huang, Yanwei Huang, Jincheng Wei, Ruijun Wang, Siyuan Yu

*State Key Laboratory of Optoelectronic Materials and Technologies, School of Electronics and Information Technology, Sun Yat-sen University, China*We demonstrate a circulator-free dispersion compensator for the 2 μ m-waveband based on a silicon nitride chirped Bragg gratings (CBGs). The group velocity dispersion ranges from 50 to 120 ps/nm/m in the 1998-2032 nm wavelength range.

ACPIPOC-0730-26

A trimming circuit design with pre-trim and fuse protection

Hongqian Dong, Xihu Wang

*Xian University of Posts and Telecommunications, China*This paper introduces a digital trimming circuit using dongbu 0.18 μ m process, reducing pins and enhancing accuracy while integrating fuses for reliability and lowering power consumption.

ACPIPOC-0730-27

High Precision Reverse Blocking Type Current Limit Circuits

Mengfan Sun

Xi'an University of Posts and Telecommunications, China

Two power tubes are connected to block the reverse current; increase the number of sampling tubes in series, reduce the sampling tube channel length modulation effect to reduce the sampling error, while the op-amp clamps the power tubes and the sampling tube source voltage, and the current limiting accuracy is as high as 6.5%; the current limiting threshold is adjustable by adjusting the external adjustable resistor.

ACPIPOC-0730-28

Waveguide-integrated Graphene- Colloidal-Quantum-Dots Photodetector with High Responsivity and Fast ResponseHengtai Xiang¹, Jingshu Guo¹, Jing Liu², Laiwen Yu¹, Liang Gao², Daoxin Dai¹*1. Zhejiang University, China; 2. Huazhong University of Science and Technology, China*We propose and demonstrate a graphene-CQD waveguide photodetector. It exhibited a measured responsivity of 2 A/W at 1550 nm, a fast response time of 3 μ s, and a low dark current of 7 nA.

ACPIPOC-0730-45

Research on Integrated Optical Interferometric Imaging System Based on an Innovative Baseline Pairing Method

Ziteng Gao, Yong Zuo, Xiaohan Song, Bohan Si, Xiaobin Hong, Jian Wu

Beijing University of Posts and Telecommunications, China

A novel microlens array and pairing method is proposed. This structure triples the number of baseline collections, enables continuous and zero-frequency sampling. Image reconstruction uses compressive sensing, simplifying photonic circuit structure and improving imaging performance.

ACPIPOC-0730-50

High-Speed InAlAs Digital Alloy Avalanche Photodiode with Partially Depleted AbsorberWenyang Wang^{1,2,3}, Jinshan Yao⁴, Hong Lu⁴, Baile Chen^{1,5}*1. ShanghaiTech University, China; 2. Shanghai Institute of Microsystem and Information Technology, Chinese Academy of Sciences, China; 3. University of Chinese Academy of Sciences, China; 4. Nanjing University, China; 5. Shanghai Engineering Research Center of Energy Efficient and Custom AIIC, China*

We demonstrate a high-speed avalanche photodiode (APD) with InAlAs digital alloy multiplication layer and partially depleted absorption layer. The 3-dB bandwidth is up to 13.8 GHz and gain-bandwidth product is about 100 GHz.

ACPIPOC-0730-61

Low-loss Silicon Nitride Double-tip Fiber-to-chip Edge Couplers at the 850 nm Band Based on a MMI Beam Combiner

Yanwei Huang, Yueyang Shi, Jincheng Wei, Ruijun Wang, Siyuan Yu

State Key Laboratory of Optoelectronic Materials and Technologies, School of Electronics and Information Technology, Sun Yat-sen University, China

We demonstrate a low-loss silicon nitride fiber-to-chip edge coupler utilizing a multimode interference beam combiner. An average coupling loss of 1.6 dB/facet is achieved for four devices at the 850 nm wavelength band.

ACPIPOC-0730-64

The Study of Temperature Characteristics of High-Speed High-Power Uni-Traveling-Carrier Photodetectors

Yijie Di, Yongqing Huang, Jihong Ye, Fuyao Liu, Shuhu Tan, Xiaofeng Duan, Kai Liu, XiaoMin Ren

Beijing University Of Posts and Telecommunications, China

In this paper, the temperature characteristics of UTC photodiode are analyzed, and a temperature control system is established to test the performance of UTC-PD at varying temperatures. The results align closely with the theoretical analysis.

ACPIPOC-0731-12

Ring-assisted Mach-Zehnder flat-top, box-shaped filter on thin film lithium niobate platformQi Wang¹, Yifei Wang¹, Junlie Hu¹, Wei Ke², Bing Wang¹, Siyuan Yu¹, Zhongjin Lin¹, Xinlun Cai¹*1. Sun Yat-sen University, China; 2. Liobate Technology Co., LTD, China*

Based on thin film lithium niobate platform, we experimentally demonstrate a high-performance ring-assisted Mach-Zehnder interferometer flat-top filter. It features a crosstalk lower than -25 dB, a channel spacing of 37.5 GHz with 677-dB/nm roll-off slope.

ACPIPOC-0731-120

Research on Optimization Methods for Optical Interference Imaging Based on Novel Apertures

Bohan Si, Yong Zuo, Xiaohan Song, Ziteng Gao, Xiaobin Hong, Jian Wu

School of Electronic Engineering, Beijing University of Posts and Telecommunications., China

This paper proposes an optimization method for optical interference imaging based on a novel aperture. By introducing an innovative aperture design, the sampling rate is improved, enhancing the quality of image reconstruction.

ACPIPOC-0731-122

Ultra-Large FSR Silicon Adiabatic Microring Resonators Based on Euler Curve and Modified Bezier CurveYu Chen¹, Meilin Zhong¹, Leyuan Zhang¹, Wei Cao², Shenghao Liu², Xu Sun², Gordon Ning Liu¹*1. Soochow University, China; 2. Silicon Photonics R&D Center, CreaLights Technology Co., Ltd., China*

A design method for ultra-compact adiabatic microrings is proposed and demonstrated. The microring design features two identical 180-degree bends, with the outer contour traced by double Euler curves. Moreover, we optimized the inner contour of the ultra-compact bends based on inverse-designed high-order Bezier curve. This optimization significantly reduces propagation loss due to sidewall roughness and multimode loss resulting from the excitation of higher-order modes. Additionally, simulation results indicate that the ultra-compact adiabatic microrings have ultra-low mode crosstalk, particularly when the free spectral range (FSR) is approximately 42 nm.

ACPIPOC-0731-127

Design and Simulation of Low-Loss Multimode B-spline Shaped Waveguide Crossing Based on Lithium Niobate on InsulatorBinhang Xu^{1,2}, Min Liu^{1,2}, Mingze Cai^{1,2}, Jing Du^{1,2}*1. Wuhan National Laboratory for Optoelectronics and School of Optical and Electronic Information, Huazhong University of Science and Technology, China; 2. Optics Valley Laboratory, China*

We designed a B-spline modified multimode waveguide crossing based on LNOI assisted by Equilibrium optimizer. The results show that the insertion losses are about 0.05, 0.25, 0.32dB for TE0, TE1, TE2, respectively.

ACPIPOC-0731-129

High TM mode transmission by subwavelength-gratings-modified-slab ridge waveguide

Zhipeng Ma, Ruiqi Zhou

Huazhong University of Science and Technology, China

We proposed an effective strategy for general high TM-mode transmission ridge waveguide. By introducing the subwavelength gratings into slab region, we reduced the equivalent medium index and suppressed the TE-TM polarization conversion strength.

ACPIPOC-0731-134

Integrated Self-Interference Micro-Disk Resonator Reconstructive SpectrometerLuya Li¹, Yi Xu¹, Qiang Li¹, Ruifeng Zhong¹, Jingshun Pan², Dawei Wang¹, Zhaohui Li¹*1. Sun Yat-sen University, China; 2. South China Normal University, China*

We propose a chip-size integrated self-interference micro-disk resonator reconstructive spectrometer which realizes a high resolution of 0.02 nm across a working bandwidth of 1500–1600 nm using 401 sampling channels by regularization optimization.

ACPIPOC-0731-138

Design and Simulation of High Efficient Bident Edge Coupler Based on Thin-Film Lithium NiobateMin Liu^{1,2}, Binhang Xu^{1,2}, Mingze Cai^{1,2}, Jing Du^{1,2}*1. Wuhan National Laboratory for Optoelectronics and School of Optical and Electronic Information, Huazhong University of Science and Technology, China; 2. Optics Valley Laboratory, China*

We design a kind of high-performance bident edge coupler based on TFLN. The results show that the coupler has a coupling efficiency of 0.61 dB and a favorable tolerance to fiber alignment errors.

ACPIPOC-0731-147

Reconfigurable Mode Demultiplexing-Routing Integrated Diffractive Photonic Chip with In-Situ TrainingJianwei Cui^{1,2}, Bo Wu^{1,2}, Shiji Zhang^{1,2}, Jialong Zhang^{1,2}, Hailong Zhou^{1,2}, Jianji Dong^{1,2}*1. Huazhong University of Science and Technology, China; 2. Wuhan National Laboratory for Optoelectronics, China*

We demonstrate a diffractive optics-based photonic chip capable of demultiplexing and routing four TE modes. The chip, with tunable pixels for real-time training, suggests significant potential for advanced photonic systems when combined with AI algorithms.

ACPIPOC-0731-154

L-band Directly-Modulated Distributed Feedback Lasers with Low Chirp and High Extinction Ratio

Zhipeng Dou, Jian Wang, Changzheng Sun, Bing Xiong, Lai Wang, Zhibiao Hao, Yanjun Han, Hongtao Li, Lin Gan, Yi Luo

Tsinghua University, China

An L-band gain-coupled directly modulated laser is demonstrated, which features 9 dB extinction ratio at 10 Gbit/s data rate, and only 1.74 dB power penalty after 20 km transmission through standard single-mode fiber.

ACPIPOC-0731-158

A Dual-segment Distributed Feedback Laser with 70 GHz Bandwidth

Zhipeng Dou, Jian Wang, Changzheng Sun, Bing Xiong, Lai Wang, Zhibiao Hao, Yanjun Han, Hongtao Li, Lin Gan, Yi Luo

Tsinghua University, China

A high-speed 1577 nm dual-segment distributed feedback (DFB) laser is presented. A small-signal bandwidth up to 70 GHz is recorded, and 100 Gbps data rate is demonstrated via PAM-4 modulation format.

ACPIPOC-0731-162

High-Responsivity and High-Power Reconfigurable Uni-Traveling-Carrier Photodiodes: From Vertical to Waveguide DesignsShuaiyang Zhang¹, Huijuan Niu¹, Qingtao Chen², Kai Liu³, Xiaofeng Duan³, Yongqing Huang³*1. Liaocheng University, China; 2. Department of Electrical Engineering, Poly-Grames Research Center Polytechnique Montreal,**Canada; 3. State Key Laboratory of Information Photonics and Optical Communications Beijing University of Posts and Telecommunications, China*

A configurable uni-traveling-carrier photodiode with hybrid-graded-doping mechanism is proposed both for vertical to waveguide designs. This yields 150 GHz bandwidth, 12.41 dBm output power at 100 GHz under -1 V, and ~0.8 A/W responsivity.

ACPIPOC-0731-163

Investigating Novel Low-Loss Electrodes for PIN PhotodetectorsJian Wei¹, Huijuan Niu¹, Qingtao Chen², Kai Liu³, Xiaofeng Duan³, Yongqing Huang³*1. Liaocheng University, China; 2. Department of Electrical Engineering, Poly-Grames Research Center Polytechnique Montréal,**Canada; 3. State Key Laboratory of Information Photonics and Optical Communications Beijing University of Posts and Telecommunications, China*

We present a novel low-loss electrode model, demonstrating a transmission loss of -1.15 dB. When applied to photodetectors and incorporating equivalent circuit calculations, this electrode model results in a nearly 32% increase for 3-dB bandwidth.

ACPIPOC-0731-175

Heterogeneously integrated III-V-on-lithium niobate light emitting diodes and high-responsivity photodetectorsZhiwen Zheng^{1,2}, Xian Zhang^{1,3}, Xuejie Mu¹, Xiaomin Nie², Ruijun Wang¹, Xinlun Cai¹*1.Sun Yat-sen University, China; 2.Peng Cheng Laboratory, China; 3.Guangzhou Innovation Centre of Optoelectronics and Microelectronics, China*

This paper presents C-band III-V light-emitting diodes and photodetectors heterogeneously integrated on thin-film lithium niobate photonic integrated circuit. The photodetector exhibits a high responsivity of 0.92 A/W at the 1560 nm wavelength at -2 V

ACPIPOC-0731-176

Design of Modified Mushroom-Type Near-Ballistic Uni-Traveling-Carrier PhotodetectorsYuansen Shen¹, Huijuan Niu¹, Qingtao Chen², Kai Liu³, Xiaofeng Duan³, Yongqing Huang⁴*1.School of Physics Science and Information Technology Liaocheng University, China; 2.Department of Electrical Engineering, Poly-Grames Research Center Polytechnique Montréal, Canada; 3.State Key Laboratory of Information Photonics and Optical Communications Beijing University of Posts and Telecommunications, China*

We report a mushroom-type near-ballistic Uni-traveling-carrier photodetector, achieved by scaling down both the active and depleted region areas. This well-designed device achieves a bandwidth of 109 GHz and a responsivity of 0.47 A/W.

ACPIPOC-0731-179

High-Speed and High-Power Modified Uni-Traveling-Carrier PhotodetectorLiwen Wang¹, Huijuan Niu¹, Qingtao Chen², Kai Liu³, Xiaofeng Duan³, Yongqing Huang³*1.Liaocheng University, China; 2.Department of Electrical Engineering, Poly-Grames Research Center Polytechnique Montréal, Canada; 3.State Key Laboratory of Information Photonics and Optical Communications Beijing University of Posts and Telecommunications, China*

A modified uni-traveling-carrier photodetector is proposed, incorporating Gaussian-graded doping and reduced thickness for both the absorber and collector, along with a well-designed cliff layer, demonstrating a 126 GHz bandwidth and a 10 dBm output power.

ACPIPOC-0731-186

Dual-Optical-Modes-Based Polarization-insensitive Thin-film Lithium Niobate Electro-optic Modulator

Hongcheng Hu, Heyun Tan, Jingyi Wang, Yifei Wang, Junlie Hu, Zhongjin Lin, Yanfeng Zhang, Siyuan Yu, Xinlun Cai

State Key Laboratory of Optoelectronic Materials and Technologies and School of Electronics and Information Technology, Sun Yat-sen University, China

A compact and high-speed polarization-insensitive thin-film lithium niobate electro-optic modulator is experimentally demonstrated. The proposed device has a polarization-dependent loss of approximately 0.244 dB and a bandwidth of significantly over 50 GHz.

ACPIPOC-0731-188

A broadband and polarization-insensitive 2 × 2 power splitter with CMOS compatibility

Jin Xie, HengZhen Cao, Dai Daoxin

Zhejiang University, China

A compact 2×2 power splitters with 30um x 1.3m footprint on SOI is broadband, polarization-insensitive, and CMOS-compatible. The deviations of splitting ratio within 1460 nm~1560 nm for TE and TM polarization are ±3.8% and ±8.5%.

ACPIPOC-0731-196

All-optical 4×4 network model with self-feedback regulation function

Leheng Zhang, Qi Chen, Tian Zhang, Jian Dai, Kun Xu

Beijing University of Posts and Telecommunications, China

We primarily utilize the micro-ring resonators with phase change materials to construct a photonic neural network with self-feedback adjustment, and demonstrate image recognition in a 4×4 network using a simplified STDP algorithm.

ACPIPOC-0731-23

An ultra-fast demodulation method of identical weak FBG arrays based on multiwavelength RECDFB laser array integrated with SOAsJiacheng Wang, Pan Dai, Kaichuan Xu, Yuan Liu, Yu Wang, Yaqiang Fan, Junwei Dong, Yuan Lv, Feng Wang, Xiangfei Chen
Nanjing University, China

An ultra-fast identical weak Fiber Bragg gratings (wFBGs) demodulation method based on multiwavelength reconstruction-equivalent-chirp distributed feedback (REC-DFB) laser array and integrated switching semiconductor optical amplifiers (SOAs) is proposed.

ACPIPOC-0731-24

A time- and wavelength-division multiplexed weak FBG array interrogation system based on tunable REC-DFB laser arrayYu Wang, Pan Dai, Kaichuan Xu, Jiacheng Wang, Yuan Liu, Yuan Lv, Yaqiang Fan, Junwei Dong, Feng Wang, Xiangfei Chen
Nanjing University, Afghanistan

A time- and wavelength-division multiplexed interrogation system for weak fiber Bragg grating (WFBG) array based on the tunable reconstruction-equivalent-chirp distributed feedback (REC-DFB) laser array is introduced.

ACPIPOC-0731-26

Optimized Design of a Non-uniform Optical Phased Array with Large Steering Angle and Low Side-lobe LevelYuetong Han^{1,2}, Yulong Huang^{1,2}, Jianping Chang¹, Chaoyu Liu¹, Zihan Geng¹*1. Tsinghua University, China; 2. Pengcheng Laboratory, China*

We propose a multi-objective evolutionary algorithm to optimize a 64-element nonuniform antenna array, achieving 0.27° beamwidth and -13.7 dB side-lobe level. The antenna amplitude is optimized for a wide steering range of 160°.

ACPIPOC-0731-27

A Reconfigurable Optical-Electronic non-linear Activation with Easy-Integrated Analog CircuitChaoyu Liu¹, Yulong Huang², Yuetong Han¹, Jianping Chang¹, Zihan Geng¹*1. Tsinghua University, China; 2. Pengcheng Laboratory, China*

We introduce a reconfigurable, all-analogue optoelectronic circuit for non-linear activation in optical neural networks by using the physical-properties of diodes and photodiodes. The proposed nonlinear can be easily integrated with optical convolution modules.

ACPIPOC-0731-30

The Impact Mechanism of Interfacial Intermixing on the Dark Current of Interband Cascade Infrared PhotodetectorsYupeng Wang¹, Xuliang Chai^{1,2}, Jindi Pei¹, Lingfang Wang¹, Yi Zhou^{1,2}, Jianxin Chen^{1,2}*1. Hangzhou Institute for Advanced Study, University of Chinese Academy of Sciences, China; 2. Key Laboratory of Infrared Imaging Materials and Detectors, Shanghai Institute of Technical Physics, Chinese Academy of Sciences, China*

Antimonide superlattice interband cascade infrared photodetectors (ICIPs) are novel semiconductor devices that enable the directional transport of photogenerated carriers within multi-stage absorbers formed through phonon-assisted tunneling, allowing for higher operating temperatures. The dark current of infrared detectors has been the main factor limiting their performance. ICIPs have complex interfaces characterized by multi-layer heterostructures. Interfacial intermixing leads to band misalignment in the actual device structure, affecting both photocurrent transport and the dark current mechanism. Based on previous research on interfacial intermixing and the computational results from the *k*·*p* model, this paper explores the impact of interfacial intermixing on dark current and establishes a dark current model for ICIP at high operating temperatures. The calculation results are compared and analyzed against experimental results, partially validating its accuracy and providing a theoretical foundation for subsequent research.

ACPIPOC-0731-35

Waveguide integrated graphene bolometer based on Johnson noise read-outYuanrong Li¹, Tiannan Han², Jingshu Guo¹, Laipeng Ma², Laiwen Yu¹, Hengtai Xiang¹, Wencai Ren², Daoxin Dai¹*1. State Key Laboratory of Extreme Photonics and Instrumentation, College of optical Science and Engineering, Zhejiang University, China; 2. Shenyang National Laboratory for Material Science, Institute of Metal Research, Chinese Academy of Sciences, China*

A waveguide integrated graphene bolometer based on Johnson noise read-out is demonstrated, realizing nW-scale on-chip photodetection. It enables wide-wavelength-band and high sensitivity on-chip photodetection with low integration cost.

ACPIPOC-0731-38

240 GHz Terahertz-Wave Emitter Based on MUTC-PD Integrated with a Planar AntennaHeng Chen¹, Zhangwan Peng¹, Jinhua Chen¹, Ruoyun Yao¹, Chaodan Chi², Xiaojun Ying¹, Chen Ji¹*1. Zhejiang University, China; 2. Zhejiang Lab, China*

In this paper, a photonic terahertz-wave emitter based on a modified uni-traveling-carrier photodiode (MUTC-PD) is designed and fabricated. The 5- μ m-diameter MUTC-PD is integrated with a planar antenna, demonstrating an ultrahigh 3dB bandwidth exceeding 240 GHz.

ACPIPOC-0731-42

Optimal absorber thickness in interband cascade photodetectors for high speed application

Zefeng Chen, Yong Li, Yunjiang Jing

Sun Yat-sen University, China

We propose a strategy to balance quantum efficiency and bandwidth by optimizing absorber thickness in different ICIP architectures. Optimal thicknesses are provided under various conditions for high-performance ICIP design.

ACPIPOC-0731-43

Latest Understanding of The Effect of Energy Level Divergence on The Performance of Superluminescent Diode

Doudou Wu, Xiaomin Ren, Pan Li, Hao Liu

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

In this paper, the latest theoretical model of superluminescent diode is established based on the effect of energy level divergence. The theoretical simulation results agree well with the experimental results.

ACPIPOC-0731-61

Optical neural network based on slimmed Mach-Zehnder interferometer mesh

Qi Chen, Zhiwei Yang, Zili Cai, Tian Zhang, Jian Dai, Kun Xu

Beijing University of Posts and Telecommunications, China

We propose three simplified MZI designs and experimentally verify that the accuracy is comparable to the original complete structure on the three classification tasks, while the number of optical devices used is significantly reduced.

ACPIPOC-0731-7

2.05 μm laser diodes and broadband superluminescent diodes based on InP-based antimony-free quantum well

Zehang Xu, Xiang Wang, Yanfang Wang, Yang Ke, Ruijun Wang, Siyuan Yu

State Key Laboratory of Optoelectronic Materials and Technologies, School of Electronics and Information Technology, Sun Yat-sen University, China

We present high-performance 2.05 μm laser diodes operating at room temperature based on an antimony-free InP-based quantum well structure. Superluminescent diodes with a record 3-dB bandwidth of 106 nm and low ripples are also reported.

ACPIPOC-0731-82

Object detection utilizing photonic spiking neuron based on passive add-drop micro-ring resonator

Jianping Chang, Yulong Huang, Yuetong Han, Chaoyu Liu, Zihan Geng

Tsinghua University, China

This work proposes optical-assisted neuromorphic computing with passive add-drop micro-ring resonator. Our optical device mimics the leaky integrate-and-fire (LIF) model of bionic spiking neuron, enabling intelligent and rapid object detection.

ACPIPOC-0731-88

Time delay signature suppression of chaos in semiconductor laser using the step-index multimode fiber feedback loopHaoyu Zhang¹, Xu Wang¹, Likai Zheng¹, Yanhua Hong², Zuxing Zhang¹, Chenpeng Xue¹*1.Nanjing University of Posts and Telecommunications, China; 2.Bangor University, United Kingdom*

Time-delay-signature suppression of chaos in semiconductor laser based on modal dispersion feedback is experimentally demonstrated. The results shows that with properly feedback power, the time-delay-signature can be well suppressed.

ACPIPOC-0731-90

Highly integrated polarization beam splitter with MMI structure based on LNOI-SiN rib waveguide

Wei Ji, Xinyu Yin, Yuqian Wang, Zhaoheng Wang, Qian Wu, Xianghao Tan

Shandong University, China

We propose a lithium niobate polarization beam splitter (PBS) on X-cut insulators based on multimode interference (MMI). The device uses lithium niobate (LiNbO₃, LN) and the heterogenous integration of silicon nitride (SiN) to form a PBS ridge waveguide structure.

ACPIPOC-0801-107

igh-density MDM-WDM silicon photonic transmitter chiplet based on MRMs and dual-mode GC for single-fiber 4×56-Gbps signalingXinyi Wang¹, Jiangbing Du¹, Weihong Shen¹, Ke Xu², Zuyuan He¹*1.Shanghai Jiao Tong University, China; 2.Harbin Institute of Technology, Shenzhen, China*

A four-channel silicon photonic MDM-WDM transmitter chiplet is demonstrated with 4×56-Gbps signaling, based on high-speed MRMs and an equalized dual-mode grating coupler over 1.65 mm² footprint, indicating significant potential for high-density optical interconnects.

ACPIPOC-0801-115

Design of uni-traveling-carrier photodetector (UTC-PD) with low-energy consumption

Borui Huang, Bing Wang, Yunjiang Jin

Sun Yat-sen University, China

In order to realize high-speed and high-power performance with a thin absorber layer thickness and low incident optical power, this paper provides the design simulation of a GaAsSb/InP back-incident high-speed and high-power Uni-Traveling-Carrier photodetector based on Silvaco TCAD. By replacing In_{0.57}Ga_{0.43}As in the absorber layer with GaAs_{0.51}Sb_{0.49}, which matches the InP lattice, the responsivity of the GaAsSb absorber layer with a thickness of 300 nm reaches 0.593 A/W, which is 80% higher than that of the same-thickness InGaAs, and the optical power required to output an 80mA photocurrent is 134.9 mW, which is half of the optical power of the InGaAs material. This work provides valuable insights and guidance for designing low energy consumption photodetector with high speed and high power performances.

ACPIPOC-0801-117

Dispersion Engineered C-band Parametric Oscillator Based on Silicon Concentric MicroresonatorsHuajin Chang¹, Bitao Shen², Haoyu Wang³, Yimeng Wang², Ruixuan Chen², Yandong He³, Haowen Shu², Xingjun Wang²*1.State Key Laboratory of Advanced Optical Communication Systems and Networks, School of Electronics, Peking University, China, China; 2.State Key Laboratory of Advanced Optical Communication Systems and Networks, School of Electronics, Peking University, China; 3.School of Integrated Circuits, Peking University, China*

Here we simulate and design a silicon-based concentric microresonator with the PIN junction across waveguides, simultaneously realizing the dispersion engineering and depletion of free carriers. 10 OPO sidebands are experimentally generated with a single pump.

ACPIPOC-0801-131

ASimplifiedOptical Vector Analysis Technique

Xuecheng Zeng, Jiajia Wang, Haoran Zhang, Shuying Li, Yunping Bai, Xingyuan Xu

Beijing University of Posts and Telecommunications, China

We present a simplified optical vector analysis technique, which can precisely recover phase information solely from insertion loss via adding an optical reference path with tunable delay. Simulation results verify the effectiveness of our approach.

ACPIPOC-0801-151

Hybrid Integrated Arbitrary-Polarized Pulsed Laser with Ultra-High Intensity- and Polarization-Extinction-RatioRenyou Ge¹, Bigeng Chen¹, Yuan Shen², Yannong Luo³, Shaoliang Yu¹*1. Zhejiang Lab, China; 2. Westlake Institute for Optoelectronics, China; 3. Guangxi Medical University, China*

This paper presents a hybrid integrated arbitrary-polarized pulsed laser with ultra-high intensity- and polarization-extinction-ratio. Linewidth of the laser is 610 Hz, extinction ratio of pulse modulation and polarization manipulation is 54 dB and 42 dB, respectively.

ACPIPOC-0801-27

2 × 2 silicon thermo-optic switch with $P_{\pi} < 2$ mW and Extinction Ratio > 25 dB

Tongxin Yang, Shiqi Zhang, Lei Zhang

Beijing University of Posts and Telecommunications, China

We propose a 2×2 SOI thermo-optic switch with folded configuration for heaters and waveguides. The power required for π phase shift is 1.5 mW, and the extinction ratio is less than -25 dB.

ACPIPOC-0801-32

Highly efficient silicon Michelson interferometer modulator at 2 μ m waveband

Xi Wang, Jianing Wang, Yihang Li, Yong Yao, Yanfu Yang, Ke Xu

Harbin Institute of Technology (Shenzhen), China

We have experimentally demonstrated highly efficient silicon Michelson interferometer modulator with a modulation efficiency of 0.32 V·cm at 2 μ m waveband. A modulation speed of 30 Gbit/s is achieved.

ACPIPOC-0801-4

Direct Electric-field Measurements of High-order Harmonic Mode-locked Quantum-dot LasersXiangru Cui¹, Jingzhi Huang¹, Bo Yang¹, Jiajian Chen², Jiale Qin¹, Zihao Wang¹, Ting Wang¹, Jianjun Zhang¹*1. Institute of Physics, Chinese Academy of Sciences, China; 2. Songshan Lake Materials Laboratory, China*

We carried out frequency-resolved optical gating measurements of Si-based InAs/GaAs quantum dot 4th-order colliding pulse mode-locked lasers. The impact of electrical driven condition on laser cavity dispersion and modulation modes were figured out.

ACPIPOC-0801-44

Inverse design of ultra-compact passive phase shifters using multi-objective particle swarm optimization

Mengfan Chu, Tianyang Fu, Yao Li, Xin Yan, Xia Zhang, Xiaomin Ren

Beijing University of Posts and Telecommunications, China

We have designed an ultra-compact passive phase shifters with a footprint of 4 μ m × 3.2 μ m. The device designed by a MOPSO method and simulated by FDTD. The shifters exhibit higher transmission and lower excess loss.

ACPIPOC-0801-5

Integrated spatial photonic Ising sampler based on high-uniformity 1×8 multi-mode interferometer

Xin Ye, Wenjia Zhang, Zuyuan He

Shanghai Jiao Tong University, China

We propose an integrated spatial photonic Ising sampler using a high-uniformity multi-mode interferometer. It minimizes discrete and continuous spin Hamiltonians, achieves programmable spin couplings and external magnetic fields, with a linear dependence of 0.82.

ACPIPOC-0801-59

High-Performance Balanced Photodiode on Thin-Film Lithium Niobate Platform

Chao Wei, Chenghao Wang, Jihui Sun, Lin Jiang, Jia Ye, Xihua Zou, Wei Pan, Xiaojun Xie, Lianshan Yan

Southwest Jiaotong University, China

A high-performance balanced photodiode heterogeneously integrated on thin-film lithium niobate is proposed, featuring a 3-dB bandwidth of 55 GHz and enabling high-quality reception of 100 Gbaud 16 QAM signals.

ACPIPOC-0801-64

Design and optimization of high-speed and high-power uni-traveling carrier photodetector

Jinsen Huang, Yunjiang Jin, Borui Huang

Sun Yat-sen University, China

We have realized a uni-traveling carrier photodetector (UTC-PD) epitaxial structure with a 3dB bandwidth of 20.1 GHz, a saturated output current of 320 mA, and a high saturation current-bandwidth product of 6432 GHz·mA.

ACPIPOC-0801-65

Broadband Ultra-low thermal sensitivity Silicon Nitride Mach-Zehnder Interferometer Filters

Tang Zihao, Wang Kaiyuan, Zhang Ruigang, Zhang Minming, Zheng Shuang, Ziyuan Zhou

Huazhong University of Science and Technology, China

We demonstrate broadband ultra-low thermal sensitivity filters showing less than 1 pm/°C wavelength shift from 25°C to 85°C, over a wavelength range of 100 nm both in O and C band. Optical properties of the fabricated device are accurately extracted from the optical measurement method.

ACPIPOC-0801-74

Thin-Film Lithium Niobate Modulator Module with over 90 GHz Electro-optic ResponseYutong He, Hao Liu, Changzheng Sun, Bing Xiong, Jian Wang, Zhibiao Hao¹, Lai Wang, Yanjun Han, Hongtao Li, Lin Gan, Yi Luo*Tsinghua University, China*

We present a compact thin-film lithium niobate (TFLN) modulator module, which exhibits over 90 GHz electro-optic bandwidth, as well as low half-wave voltage length product in both C and O bands.

ACPIPOC-0801-87

High-Speed 2 μ m Silicon Photonic Mach-Zehnder Modulator with 30 GHz BandwidthJianing Wang^{1,2}, Xuelin Zhang³, Xi Wang^{1,2}, Yanfu Yang², Jiangbing Du³, Ke Xu^{1,2}

1. Guangdong Provincial Key Laboratory of Semiconductor Optoelectronic Materials and Intelligent Photonic Systems, Harbin Institute of Technology, Shenzhen, China; 2. Department of Integrated Circuits, Harbin Institute of Technology, Shenzhen, China; 3. State Key Laboratory of Advanced Optical Communication Systems and Networks, Shanghai Jiao Tong University, China

We proposed a high-speed 2- μ m Mach-Zehnder modulator with a record high bandwidth up to 30 GHz, which is able to modulate high-speed signals with up to 34 Gb/s.

ACPIPOC-0808-1

Responsivity Enhancement Using Fabry-Pérot Cavity for Zero-Bias Waveguide PhotodiodesShuaiyang Zhang¹, Huijuan Niu¹, Chuanxing Jiang¹, Tao Liu², Qingtao Chen³, Chenglin Bai¹

1. Liaocheng University, China; 2. Qujing Normal University, China; 3. Department of Electrical Engineering, Pol-Grames Research Center Polytechnique Montreal, Canada

A novel Fabry-Pérot cavity waveguide photodiode is designed with a short absorber to enhance responsivity. It achieves 0.733 A/W responsivity, 75 GHz 3-dB bandwidth and 7.36 dBm output-power at 100 GHz, at 0 V bias.

ACPIPOC-0809-2

MMI-based Pseudo-real-value Silicon Photonic Neural Networks

Shang Gao, Qiang Li, Yang Zhao, Wei Wang, Guoguang Yao, Wenjie Yuan, Shengping Liu, Dapeng Liu, Naidi Cui, Junbo Feng

United Microelectronics Center (CUMEC), China

We present a pseudo-real-value silicon photonic chip based on cascaded 4×4 multimode interference couplers and phase shifter arrays for convolutional neural networks, which experimentally demonstrated a classification accuracy of 98.4% on the MNIST dataset.

ACPIPOC-0812-10

Measuring Third-order Nonlinear Susceptibility in Silicon Nitride Resonator based on DC Kerr Effect

Abdou Shetewy, Menglong He, kambizjamshidi

TU Dresden, Germany

We use an efficient measurement technique for measuring polarization-dependent third-order nonlinearity in silicon nitride integrated waveguides with CW excitations. We recorded a third-order nonlinear susceptibility of $(0.40 \pm 0.07) \times 10^{-21} \text{m}^2/\text{V}^2$ for TM mode

ACPIPOC-0812-2

An O-band III/Si Heterogeneous integrated laser with high alignment tolerance adiabatic couplerChufan Wang¹, Xiuyan Ren², Bingzhou Hong¹, Wei Chu¹, Haiwen Cai¹

1. Zhangjiang Laboratory, China; 2. Fudan University, China

Design and Simulation of O-band III/Si Heterogeneous integrated laser with high alignment tolerance adiabatic coupler is presented. To achieve high performance heterogeneous integrated III-V lasers, an adiabatic coupler structure that ensures lossless coupling between the III-V taper and the silicon waveguide underneath is required. However, such adiabatic tapers typically have very narrow alignment tolerances, usually within tens of nanometers, making any deviation in lithography significantly reduce the coupling efficiency and deteriorate device performance. Consequently, high-precision lithography, such as electron beam lithography (EBL), is necessary for realizing III-V on silicon heterogeneous integrated lasers, potentially increasing the fabrication costs. To address this issue, we have designed an adiabatic coupler structure with high alignment tolerance. By optimizing the length and width of the adiabatic coupler, the coupling efficiency remains ~97% with misalignment up to 200 nm. This design significantly reduces reliance on high-precision lithography, enables seamless integration of high-performance lasers in various photonic platforms with high device success rates.

ACPIPOC-0812-9

Voltage-Controlled Resonance Tuning in Silicon-on-Insulator Microring Resonators by Lateral Diodes

Menglong He, Vithalani Hrishikesh, Mircea Catuneanu, Abdou Shetewy, Kambiz Jamshidi

TU Dresden, Germany

We investigate the voltage-controlled index modulation in a silicon microring with a p-i-n junction. We demonstrate two notable regimes including reverse (linear) and forward bias (exponential-like), with a tuning range of 280 pm (blue side).

ACPIPOC-0814-1

Design and Optimization of a Photodetector Electrode Incorporating a High-Impedance Transmission Line Structure

Likang Gong, Yongqing Huang, Kai Liu, Xiaofeng Duan, Xiaomin Ren

Beijing University of Posts and Telecommunications, China

This paper presents a low-loss photodetector electrode that incorporates a high-impedance transmission line structure. This design achieves a bandwidth of 258 GHz, representing a 42.3% increase, with a loss of -1.69 dB at 200 GHz.

ACPIPOC-0814-25

Wide-Tunability and Narrow-Linewidth III - V /Si₃N₄ O-band External Cavity LaserYihao Fan¹, Yuyao Guo^{1,2}, Xinhang Li¹, Siyu E¹, Minhui Jin¹, Liangjun Lu^{1,2}, Yu Li^{1,2}, Jianping Chen^{1,2}, Linjie Zhou^{1,2}

1. Shanghai Jiao Tong University, China; 2. SJTU-Pinghu Institute of Intelligent Optoelectronics, China

We present an O-band external cavity laser with a wide tuning range of 115 nm and a narrow intrinsic linewidth of 157 Hz by butt-coupling a III -V gain chip with a low-loss Si₃N₄ extension chip.

ACPIPOC-0814-30

Record-Breaking 150-Channel DFB Laser Array with Asymmetric Multiple-Quantum Well and Equivalent Reconstruction Chirp Technologies

Yue Zhang, Zhenxing Sun, Jie Zhao, Wentao Sun, Zijiang Yang, Xiangfei Chen

Nanjing University, China

We propose and demonstrate a 150-channel multi-wavelength distributed feedback (DFB) laser array for dense wavelength division multiplexing (DWDM) systems. The proposed multi-wavelength laser array with wavelength spacing at 0.8 nm (100 GHz) meets the ITU-T specifications. To the best of our knowledge, the 150-channel multi-wavelength DFB laser array reported in this paper represents the highest number of channels for a DFB laser array reported to date. The superior properties of the proposed laser array such as stable single-mode operation, precise wavelength control, and high channel count are advantageous for its application in the DWDM systems to enhance the transmission capacity.

ACPIPOC-0814-36

8-channel CWDM filter on the lithium-niobate-on-insulator platform using cascaded multimode waveguide gratings

Jianghao He, Dajian Liu, Ming Zhang, Daoxin Dai

Zhejiang university, China

An 8-channel coarse-wavelength-division multiplexing device is realized on lithium-niobate-on-insulator platform. The experiment result exhibits box-like spectral responses with ~20 nm channel spacing, 1-dB bandwidth ~13-16 nm, and low inter-channel-crosstalk ~22 dB for all channels

ACPIPOC-0814-44

Low-loss Calibration-free 8×8 Mach-Zehnder Switches with Bent Directional Couplers on Silicon Nitride

Zian Cao, Lijia Song, Huan Li, Daoxin Dai

Zhejiang University, China

We demonstrate calibration-free 8×8 Mach-Zehnder switches with bent directional couplers on silicon nitride, featuring a low excess loss of <1.2 dB and a low crosstalk of <-17.5 dB across a 25-nm bandwidth without any calibration.

ACPIPOC-0814-47

Microwave Signal Generation by Heterodyning Dual Lasers Injection-locked to a Single Microring Resonator

Siyu E, Yuyao Guo, Xinhang Li, Yihao Fan, Minhui Jin, Yu Li, Liangjun Lu, Jianping Chen, Linjie Zhou

State Key Laboratory of Advanced Optical Communication Systems and Networks, Shanghai Key Lab of Navigation and Location Services, Department of Electronic Engineering, Shanghai Jiao Tong University, China

We demonstrate the co-injection locking of two lasers to a high-Q MRR, achieving a linewidth of ~10 Hz. Through heterodyne synthesis, the resulting microwave signal exhibits a drift of only 898 kHz over 10 hours.

ACPIPOC-0814-49

Meter-length and crossingless Si₃N₄ waveguide with multimode Euler bend towards integrated optical gyroscope applications

Yuming Zhang, Jiangbing Du, Wenlong Zuo, Zuyuan He

Shanghai Jiao Tong University, China

A silicon nitride waveguide chip with multimode Euler bends is proposed and fabricated for integrated optical gyroscope applications. The 1.01-m waveguide achieves 4.8-dB/m attenuation over 4300×1730 μm² footprint, supporting 0.58 deg/s minimum detectable angular rate.

ACPIPOC-0814-54

Space-charge effect assisted GeSi avalanche photodetector with record 67 GHz bandwidth

Hengzhen Cao, Daoxin Dai, Yuluan Xiang, Weichao Sun, Jin Xie, Jingshu Guo

Zhejiang University, China

A high-bandwidth Ge/Si waveguide avalanche photodetector is experimentally demonstrated. The presented device has a moderate gain of 12.3 and a record-high bandwidth of 67 GHz assisted by the prominent space-charge effect under high reverse voltage.

This high-bandwidth avalanche photodetector shows great potential for high-sensitivity detection in the single lane 100G/200G receiving.

ACPIPOC-0814-57

Swept-Wavelength Interferometry for Phase Error Measurement of Arrayed-Waveguide Grating on X-cut TFLN

Xiaofu Pan, Liu Liu

Zhejiang University, China

A 100GHz channel spacing AWG based on TFLN is reported. The dimension of the AWG is $1.43 \times 1.44 \text{ mm}^2$. The device shows a crosstalk level -8dB and an insertion loss of 5dB. A swept-wavelength interferometry was built to measure the phase error of each

arrayed waveguide of the AWG.

ACPIPOC-0814-7

A 260–300 GHz Three-stage Power Amplifier Using Pre-embedding Network in 130-nm SiGe

Xiaorui Liu, Jianguo Yu, Yun Wang, Yibo Huang

Beijing University of Posts and Telecommunications, China

A three-stage power amplifier operating between 260–300 GHz in 130-nm SiGe is designed. The gain is boosted by a linear lossless reciprocal pre-embedding network, and the admittance matrix expression of the network is derived.

ACPIPOC-0815-10

A Swing Rate Controllable Low Electromagnetic Emission USB-PD Transmitter Design

Hangkun Xu

Xi'an University of Posts and Telecommunications, China

In this paper, a three-stage high level adjustable, swing rate controllable high-precision PD driver is designed to effectively suppress electromagnetic interference.

ACPIPOC-0815-107

Level set Reinitialization in Device Boundary Evolution based on Inverse Design

Junyu Gao

Beijing University of Posts and Telecommunications, China

We proposed a level set reinitialization algorithm in the inverse design framework to avoid numerical errors in boundary evolution caused by kinks, which lead to stagnation in structural optimization.

ACPIPOC-0815-111

Semiconductor laser chip far-field divergence angle measurement

Cunyu Shi, Yuanhao Zhang, Weihua Guo, Qiaoyin Lu

Huazhong University of Science and Technology, China

A method for measuring the far-field divergence-angle of a semiconductor laser-chip is proposed. Experiments show that the proposed method yields high precision through measurements of a SMF and a lensed-fiber, followed by semiconductor laser chips.

ACPIPOC-0815-48

A 160Gb/s PAM-4 Optical Receiver using optoelectronic co-design method with peaking PD

Ang Yang

National Optoelectronics Innovation Center, China

In this paper, we propose a low noise gain-adjustable optical receiver for a 160-Gb/s PAM-4 optical link. We use a peaking photodiode and a linear transimpedance amplifier (TIA) joint design to efficiently optimize the receiver. The TIA is designed for best noise performance at the cost of TIA's bandwidth. While the peaking PD is achieved with a on-chip spiral inductor to properly compensate TIA's bandwidth. By such a optoelectronic co-design, we achieved a receiver with 61 GHz 3-dB bandwidth and an input current referred noise of 4.9 uArms. The Total Harmonic Distortion (THD) is smaller than 0.7% with 450mVpp output voltage amplitude. A clear 160 Gb/s PAM4 eye diagram is achieved in co-simulation.

ACPIPOC-0815-50

Segmented thin-film lithium niobate modulator for photonic digital-to-analog conversion and high-level PAM signal generation

Shengqi Gong

Zhejiang University, China

A photonic digital-to-analog converter based on a thin film lithium niobate platform using a segmented Mach-Zehnder modulator is proposed. 8-level pulse-amplitude modulated signals are generated with on-off keying drive up to 60Gbaud.

ACPIPOC-0815-54

Distributed feedback laser based on of two-dimensional sampled tilted grating

Zhuoying Wang, Wentao Sun, Jiaqiang Nie, Zizhuo Li, Zhenxing Sun, Xiangfei Chen

Nanjing University, China

Two-dimensional (2D) sampling structures based on tilted Bragg grating for distributed feedback lasers are proposed and demonstrated. This proposed method offers a novel approach for designing wavelength-selective devices in photonic integrated circuits and fiber systems.

ACPIPOC-0815-86

Effect of Hydrogen Doping on the Photoelectronic Properties of Indium Oxide Thin FilmsJialiang Li¹, Chenxingyu Huang², Hong Jin¹, Haosheng Xiao¹, H. Y. Fu², Lei Lu¹, Qian Li¹*1. Peking University, China; 2. Tsinghua University, China*

Hydrogen doping and annealing in indium oxide can improve the conductivity, mobility and lower the extinction coefficient, enhancing suitability for high-speed photoelectronic devices. The effects on photoelectronic properties of indium oxide are investigated.

ACPIPOC-0815-88

High-Resolution Vibration Measurement Using Soliton Microcomb-Based Doppler Vibrometer

Zhiming Shi, Hairun Guo

Shanghai University, China

We demonstrate a laser Doppler vibrometry system using a soliton microcomb as the light source, enhancing resolving accuracy by increasing comb teeth without increasing individual laser power, ideal for detecting high-power-sensitive materials.

ACPIPOC-0815-97

Ultrahigh Purcell factor in a hybrid plasmonic crystal nanobeam cavity with an atomically smooth single-crystalline gold microflake

Hongyuan Cao, Bingjie Liu, Yuanbiao Tong, Hongzhi Xiong, Yinpeng Hu, WeiKe Zhao, Pan Wang, Huan Li, Daoxin Dai

Zhejiang University, China

We experimentally demonstrate a hybrid plasmonic crystal nanobeam cavity, achieving an ultrahigh Purcell factor of 3217 by integrating atomically smooth single-crystalline gold microflake with silicon photonic waveguide at telecommunication wavelengths, significantly enhancing light-matter interaction.

ACPIPOC-0816-3

Integrated computational spectrometer based on a thermally reconfigurable self-coupled waveguide system

YanFeng Zheng, Rui Cheng

Hefei University of Technology, China

We developed a silicon integrated computational spectrometer with a single output channel based on a novel thermally reconfigurable self-coupled waveguide system. With a footprint of smaller than 0.02 mm², it achieves a high resolution of better than 0.1 nm over a 75 nm wavelength bandwidth.

ACPIPOC-0817-1

Etchless and Rewritable Mode Converters Based on Sb₂Se₃-Silicon Nitride Waveguide

YueXiang Guo, Yin Xu, ShengXiong Lai, Xin Hu, Hualong Bao

Soochow University, China

We propose etchless and rewritable TE₀-TE₁ and TE₀-TE₂ mode converters based on Sb₂Se₃-silicon nitride waveguide. Their conversion lengths are less than 8 μm and such device can be fabricated without any etching process.

Track 5: Microwave Photonics and Optical Signal Processing

ACPIPOC-0612-1

Reconfigurable Minimum-phase Filter Based on Integrated Microcombs

Weiwei Han¹, Zhihui Liu¹, Yifu Xu¹, David J. Moss², Xingyuan Xu¹, Kun Xu¹*1. Beijing University of Posts and Telecommunications, China; 2. Swinburne University of Technology, Australia*

In this paper, we propose reconfigurable minimum-phase filters based on integrated microcombs. We have simulated and implemented minimum-phase filters with Gaussian-apodized, tunable center frequencies (2.5~6.25 GHz) and tunable 3dB bandwidths (2~5 GHz), respectively.

ACPIPOC-0708-4

Photonic Generation of Phase-Coded Frequency Multiplied LFM Signals for ISAC systems

Yixiao Zhou¹, Di Zhang², Xuan Li¹, Guodong Wang¹, Shanghong Zhao¹*1. Air Force Engineering University, China; 2. PLA unit 93160, China*

An orthogonally polarized optical signal is generated and utilized to perform data modulation and local signal generation. Therefore, optical generation, de-chirp operation and coherent detection to the phase-coded LFM waveform can be achieved.

ACPIPOC-0712-1

Deep Tree Photonic Reservoir Computing with Parallel Architecture

Ronghua Zhang, Liyue Zhang, Songsui Li, Wei Pan, Lianshan Yan, Bin Luo, Xihua Zou, Ling Peng

Southwest Jiaotong University, China

In this paper, we investigate the parallel deep tree reservoir computing structure based on semiconductor lasers. The reservoir computing is reconstructed with the combination of deep reservoir computing and tree structure. The aim of this architecture is to enhance the information processing speed while maintaining robust computational performance by leveraging the strengths of both deep reservoirs and parallel reservoirs. We subjected our model to rigorous testing with the Santa Fe task and achieved a commendable performance, attaining an error rate as low as 0.001. Concurrently, we conducted comparative studies with the traditional deep reservoir and observed that the parallel architecture can effectively transcend the limitations imposed by the number of layers typically associated with deep reservoirs. We elucidate that the parallel deep tree reservoir structure can significantly enhance the computing performance both in terms of efficiency and effectiveness.

ACPIPOC-0719-1

Dual-Wavelength Phase-Modulated Continuous-Wave Ranging Method

Wang Zi, Dan Lu, Hao Song, Fei Guo, Daibing Zhou

Key Laboratory of Optoelectronic Materials and Devices, Institute of Semiconductors, Chinese Academy of Sciences, China

We propose a dual-wavelength phase-modulated continuous wave (PhMCW) ranging method with the capability to perform long-range ranging without using narrow linewidth lasers. Ranging distance of 300m is demonstrated.

ACPIPOC-0724-9

Self-sustained generation of dual-chirp microwave waveforms

Jiaqi Luo, Hanlei Zeng, Juanjuan Yan

Beihang University, China

A dual-chirp microwave signal centered at 8GHz with a 1-GHz bandwidth and a 1-μs period is experimentally generated by using a dual-loop OEO. Fiber dispersion-induced power fading is eliminated by adjusting the modulator in OEO.

ACPIPOC-0725-14

A simplified-spectral-sliced optical arbitrary waveform measurement method for high baud-rate optical signal reception

Xingxing Hu, Jianping Li, Xinkuo Yu, Jianbo Zhang, Yuwen Qin, Songnian Fu

Institute of Advanced Photonics Technology, School of Information Engineering, Guangdong University of Technology, China

To implement the optical signal reception with baud-rate beyond 200GBaud and higher-order modulation formats with limited coherent receiver bandwidth, we demonstrate a simplified-spectral-sliced optical arbitrary waveform measurement method based on the 2 × 3 optical coupler.

ACPIPOC-0726-14

Photonics-assisted frequency modulated continuous wave harmonic radar system

Jie Yang¹, Zhenzhou Tang¹, Yanming Zhang², Shilong Pan¹*1. Nanjing University of Aeronautics and Astronautics, China; 2. Future Research Lab China Mobile Research Institute, China*

A 26-GHz band photonic harmonic radar is proposed based on polarization division multiplexing for the first time, demonstrating a distance measurement error of less than 2 cm when the detection range is 45 cm.

ACPIPOC-0726-5

Dynamic Compensation for Chromatic Dispersion in Rapidly-Tuned Optical True Delay Lines

Weichen Hou, Shangyuan Li, Xiaoxiao Xue, Xiaoping Zheng

Beijing National Research Center for Information Science and Technology, Tsinghua University, China

We propose a dynamic compensation method for optical true delay lines characterized by significant dispersion and tunable wavelengths. By employing a dual-polarization dual-parallel MachZehnder modulator, we enhance signal quality through effective mitigation of dispersion-induced degradation.

ACPIPOC-0728-12

Trellis Shaping for Nonlinearity Mitigation in 64QAM Photonic THz Communication System

Feixiang Zhang, Kaile Li, Yuting Huang, Hongwei Zhang, Yunyang Zhang, Jianguo Yu

Beijing University of Posts and Telecommunications, China

The Trellis Shaping method reduced nonlinearity in a 450GHz photonic THz system, improving BER by 15.4dB and Q by 2.9dB compared to a uniform constellation.

ACPIPOC-0728-5

PS-16QAM-OFDM with Nonlinear Equalization Based on RBF Neural Network by 350GHz photonic THz system

Yuting Huang, Kaile Li, Feixiang Zhang, Yunyang Zhang, Hongwei Zhang, Jianguo Yu

Beijing University of Posts and Telecommunications, China

We propose and simulate a 16QAM-OFDM 350GHz photonic THz system based on probabilistic shaping and RBF neural network nonlinear equalization, which BER and EVM are improved by 61.9% and 90% respectively.

ACPIPOC-0728-9

Photonic ADC Bandwidth Extension based on Homologous LOs Segment Receiver

Hanxiao Xue, Hao Zhang, Wanqi Zhao, Zhennan Zheng, Xinlu Gao, Shanguo Huang

Beijing University of Posts and Telecommunications, China

We propose a flexible and scalable segment reception architecture, which can extend the limited bandwidth of receiver. In the validation experiment, the 20 GHz bandwidth QPSK signal is successfully received by 5 GHz bandwidth ADC.

ACPIPOC-0729-32

All-optical computing for super-resolution direction of arrival estimation

Sheng Gao, Hang Chen, Haiou Zhang, Zhi Sun, Yuan Shen, Xing Lin

Tsinghua University, China

We propose a super-resolution diffractive neural network (S-DNN) to perform all-optical DOA estimation over a broadband frequency range with angular resolution beyond the diffraction limit. S-DNN combined with RIS achieves low-latency integrated sensing and communication.

ACPIPOC-0729-8

Photonic THz Communication System based on Geometric Shaping via End-to-end Autoencoder Learning and Pruning Algorithm

Hongwei Zhang, Kaile Li, Yuting Huang, Feixiang Zhang, Yunyang Zhang, Jianguo Yu

Beijing University of Posts and Telecommunications, China

The structured pruning-optimized geometric shaping scheme effectively reduced nonlinearity in a 400GHz photonic THz communication system. The results demonstrate that this approach significantly improves Q-factors and extends transmission distance compared to unshaped constellation schemes.

ACPIPOC-0730-15

3D Holographic Imaging Using Diffractive Deep Neural Networks with Wavelength Division Multiplexing

He Zhou, Haoqian Pu, Hao Xie, Junhe Zhou

Tongji University, China

A 3D holographic imaging method is proposed using diffractive deep neural networks based on wavelength division multiplexing. The method can adapt to phase modulation differences at different wavelengths to achieve wavelength multiplexed 3D imaging.

ACPIPOC-0730-16

A Multi-Wavelength Multiplexed Tunable Optical Secret Sharing System based on D2NN

Hao Xie, Haoqian Pu, He Zhou, Junhe Zhou

Tongji University, China

In this paper, we propose a multi-wavelength multiplexed tunable secret sharing system based on diffractive neural networks (D2NN). Compared to existing technologies, the proposed system significantly enhances the information security and capacity.

ACPIPOC-0730-40

Dual-channel Terahertz-band DMT 512QAM signal transmission scheme based on 1-bit delta-sigma modulation and photonic heterodyne beatingQiuying Lin, Jiawei Wang, Gang Li, Liye Fang, Hengxin Yan, Jiahao Bi, Yuxiao Xu, Tangyao Xie, Xiaolong Pan, Xinying Li, Xiangjun Xin
Beijing Institute of Technology, China

We propose and demonstrate by numerical simulation a dual-channel Terahertz-band DMT heterodyne optical transmission scheme based on baseband DSM, with BERs of dual Terahertz-band DMT 512QAM signals below 3.8×10^{-5} after 3 km SMF transmission.

ACPIPOC-0730-49

Enhanced Dual-Task Reservoir Computing in Semiconductor Ring Laser with FBG FeedbackLiwen Peng, SongSui Li, Liyue Zhang, Xihua Zou, Wei Pan, Lianshan Yan
Southwest Jiaotong University, China

A TDRC based on an SRL with FBG feedback is demonstrated to expand the effective parameter range by more than two times and to suppress the accuracy degradation by about 50% in dual-task simultaneous processing.

ACPIPOC-0730-8

A Photonics-Assisted D-Band ISAC System Based on A Time-Frequency Efficient WaveformJunhao Zhang¹, Mingzheng Lei², Hao Li¹, Qingzhi Zhou¹, Qing Zhong¹, Jiao Zhang¹, Zhennan Zheng³, Bingchang Hua², Yuancheng Cai², Xingyu Chen², Jianjun Yu², Min Zhu¹*1. National Mobile Communications Research Laboratory, Southeast University, China; 2. Purple Mountain Laboratories, China; 3. State Key Laboratory of Information Photonics and Optical Communications, China*

We design a time-frequency efficient ISAC waveform for photonics-assisted D-band ISAC system. By embedding subcarrier communication waveforms on the idle time-frequency dimension of an LFM CW, simultaneous 88-Gbps data rate and 1-cm radial resolution are realized.

ACPIPOC-0731-143

A microwave photonic ranging radar based on an acousto-optic frequency shifting loopQuanyang Zhang, Juanjuan Yan
Beihang University, China

A microwave photonic ranging radar using an AO-FSL is demonstrated. LFMWs with a 492-MHz/ns chirp rate in 6-16GHz are generated. Distance measurements are achieved with a maximum error 1.1 cm and a 1.13-cm resolution.

ACPIPOC-0731-173

Photonic-assisted radar for simultaneous detection of velocity, distance and angle of arrival of multiple targets

Mengmeng Wu, Jianxin Ma

Beijing University of Posts and Telecommunications, China

A photonic-assisted radar that can be used to track multiple targets simultaneously is proposed. The proposed scheme utilizes a V-shaped Linear Frequency Modulated (LFM) signal as the transmitted signal, and the de-chirping process is performed by a dual-polarized Mach-Zehnder modulator (Dpol-MZM). The velocity, distance and angle of arrival (AOA) of multiple targets are determined by analyzing the beat frequencies obtained from the de-chirped signals of the up-chirp and down-chirp segments. Simulations have verified the proposed method's capability for multi-target detection, with average measurement errors of velocity, distance and AOA are 0.58 m/s, 0.02 cm and 0.04°, respectively.

ACPIPOC-0731-193

Full-duplex Integrated Sensing and Communication System Based on Microwave PhotonicsWeiqiong Wang, Guanxing Zhang, He Wen, Jie Zhang
Beijing University of Posts and Telecommunications, China

A full-duplex ISAC system based on microwave photonics technology is proposed, simultaneous sensing and full-duplex communication in E band is realized by using FDM. Both simulation and experimental verification were conducted to validate the approach.

ACPIPOC-0731-202

Implementation of large-scale arbitrary linear unitary transformation using wavefront matching algorithm

Shunxin Song, Hongxiang Guo, Guangsong Yuan, Huixin Jia, Peishuo Wang, Peilin Li, Jian Wu

State Key Laboratory of Information Photonics and Optical Communication, Beijing University of Posts and Telecommunications, China

We propose a matrix characterization and optimization method using the wavefront matching algorithm. Simulation results indicate that this method can achieve a matrix size of 121×121 with a fidelity of over 99%.

ACPIPOC-0731-216

Distributed Network Time – Frequency Synchronization Based on Optically Carried Satellite Navigation SignalsHao Chen¹, Yufei Wang¹, Yang Li¹, Wenlin Bai², Jia Ye¹, Xihua Zou¹, Wei Pan¹, Lianshan Yan¹*1. Southwest Jiaotong University, China; 2. The 29th Research Institute of China Electronics Technology Group Corporation, China*

In this paper, a distributed network time–frequency synchronization system based on optically carried satellite navigation signals is proposed. This system generates satellite navigation waveform signals at both nodes and transmits them to the opposing receiver through an optical fiber link. The system leverages the integrated capability of satellite navigation signal measurement and communication to calculate and compensate for the clock difference between the two nodes, ultimately achieving picosecond-level synchronization accuracy.

ACPIPOC-0731-223

Large-scale photonic chip based pulse interleaver for low-noise microwave generationZheru Qiu¹, Neetesh Singh², Yang Liu¹, Xinru Ji¹, Ruining Wang¹, Franz X. Kartner², Tobias Kippenberg¹*1. École Polytechnique Fédérale de Lausanne, Switzerland; 2. Deutsches Elektronen-Synchrotron, Germany*

We demonstrate a 64-times multiplication of a mode-locked laser's 217 MHz pulse repetition rate using an integrated Si₃N₄ interleaver with a compact 8.5 mm×1.7 mm footprint, for the generation of a low-noise 14 GHz microwave signal.

ACPIPOC-0731-231

Spectral Self-Imaging Based on All-Optical Cross-Phase Modulation with Multilevel Pump

Ziying Zhao, Hongqian Mu, Muguang Wang

Beijing Jiaotong University, China

Spectral self-imaging is achieved based on all-optical cross-phase modulation with multilevel pump, which is generated using a cost-effective frequency-to-time mapping module. This method can realize energy-preserving comb FSR division.

ACPIPOC-0731-34

Bandpass delta-sigma modulation-based fiber-wireless integration transmission of dual OFDM-modulated high-order QAM signals

Yuxiao Xu, Qiuying Lin, Jiahao Bi, Liye Fang, Hengxin Yan, Xiaolong Pan, Tangyao Xie, Xinying Li, Xiangjun Xin

Beijing Institute of Technology, China

We propose and experimentally demonstrate fiber-wireless integration transmission of dual OFDM-modulated signals with high-order QAM modulation at 30-GHz mm-wave band, with the BERs of both signals below 3.8×10^{-3} after 10-km fiber and 1.2-m wireless transmission.

ACPIPOC-0731-64

High Frequency, Large Time-Bandwidth Product Chirp Signal Generated Based on cascading DPMZM and parallel RPML

Qingji Meng, Yongfeng Wei, Jialu Zhao, Caili Gong, Ying Zhan

Inner Mongolia University, China

A double chirped linear frequency modulation signal with large time bandwidth product (TBWP) scheme based on the cascade of a double parallel Mach Zehnder modulator (DPMZM) and a parallel cyclic phase modulator is proposed. In this scheme, the six times frequency suppressed carrier double-sideband signal is generated by DPMZM, and then the sideband separation is injected into the cyclic phase modulator by FBG. The cyclic phase modulator is injected into the 16-bit phase coded parabolic signal, and the twelve times linear frequency modulation signal is generated by beating the photodetector (PD). The proposed technique is theoretically studied and demonstrated. Using a 10GHz RF signal with the amplitude is 1, the duration is 10ns, and the phase code is 16 bit parabolic signal, after 20, 40, 60, 80 and 100 cycles, the TBWP can reach, 5.12×10^3 , 1.024×10^4 , 1.536×10^4 , 2.048×10^4 , 2.56×10^4 , respectively.

ACPIPOC-0731-69

Microwave photonic jamming suppressor for interrupted-sampling repeater jamming

Luhang Xing, Shangyuan Li, Xiaoxiao Xue, Xiaoping Zheng, Bingkun Zhou

Tsinghua University, China

A microwave photonic jamming suppressor (MPJS) based on stimulated Brillouin scattering is proposed and experimentally demonstrated to suppress interrupted-sampling repeater jamming in real-time, showing a maximum suppression ratio of 30.5 dB on the false targets.

ACPIPOC-0731-75

Microwave Photonic Multi-channel Repeater in Satellite Communication

Lingxiao Li, Hanxiao Xue, Hao Zhang, Xinlu Gao, Zhennan Zheng, Shanguo Huang

Beijing University of Posts and Telecommunications, China

We propose a microwave photonic repeater for satellite communication, which can realize channel switching by only configuring waveshaper. Experiment shows the undesired signal rejection ratio (USRR) and spurious free dynamic range (SFDR) are 29.70 dBm and 92.90 dBm/Hz^{2/3}.

ACPIPOC-0731-80

High frequency sparse millimeter wave photon assisted compression receiver

Wanqi Zhao, Hao Zhang, Hanxiao Xue, Zhennan Zheng, Xinlu Gao, Shanguo Huang

Beijing University of Posts and Telecommunications, China

In millimeter wave communication with ultra-high frequency, high bandwidth, and sparse signal characteristics, we propose a photon assisted compression receiver that can effectively reduce the bandwidth of the receiving end PD and ADC.

ACPIPOC-0731-98

An Optical Radio-Frequency Memory for Radar False Target GenerationGuangying Wang¹, Jiejun Zhang¹, Jianping Yao²*1.Jinan University, China; 2.University of Ottawa, Canada*

An optical radio-frequency memory (ORFM) based on a distributed-amplification-assisted frequency shifting loop is proposed and experimentally demonstrated. The pulse duration of the stored RF signal is 10 μs and more than 300 circulations is achieved.

ACPIPOC-0801-122

Study of the stimulated-Brillouin-scattering- and four-wave-mixing-induced communication signal transmission quality deterioration in high-power radio-over-fiber linkQixia Ou^{1,2,3}, Shengkun Chen^{1,2,3}, Zhiyao Zhang^{1,2,3}, Yong Liu^{1,2,3}*1.University of Electronic Science and Technology of China, China; 2.State Key Laboratory of Electronic Thin Films and Integrated Devices, China; 3.Research Center for Microwave Photonics, China*

We investigated the impact of stimulated Brillouin scattering and four-wave mixing in high-power radio-over-fiber (RoF) links on communication signals. Thereinto, Phase modulation was used to suppress stimulated Brillouin scattering.

ACPIPOC-0801-129

Dispersion Measurement and Compensation in Optical Convolutional System based on Time-Wavelength Interleaving

Sirui Huang, Yifu Xu, Shifan Chen, Xiaoyan Xu, Yunping Bai, Xingyuan Xu

Beijing University of Posts and Telecommunications, China

We theoretically analyzed and experimentally measured calculation errors caused by higher-order dispersion of fiber in optical convolutional system. Furthermore, a problem-solving method to compensate non-ideal performance of fiber dispersion was also proposed and demonstrated.

ACPIPOC-0801-130

Intelligent Phase Synchronization in the Repetition Frequency Adjustment of Electro-Optic Frequency Combs

Xiaoyan Xu, Shifan Chen, Yuhang Song, Sirui Huang, Yunping Bai, Xingyuan Xu

Beijing University of Posts and Telecommunications, China

This paper proposes applying deep reinforcement learning to realize intelligent phase synchronization in quickly tuning electro-optical frequency combs across varied frequencies. Besides, the proposed method is effectively verified through simulations and experiments.

ACPIPOC-0801-146

Photonics-based Scheme to Generate Broadband Signal with Controllable Negative Signal-to-Noise Ratio

Xianqin Ke, Dan Zhu, Jiewen Ding, Zhouyang Pan, Zhao Zhang, Shilong Pan

Nanjing University of Aeronautics and Astronautics, China

A photonics-based scheme for generating broadband signals with controllable negative signal-to-noise ratio (SNR) is proposed. The radio frequency (RF) signals with SNR tuning from -3 to -7 dB over a 1-GHz bandwidth are experimentally generated.

ACPIPOC-0801-158

XRF Overlapping Spectra Analysis Method Based on a Cascade Equilibrium Optimizer and Trust Region AlgorithmMohai Yue¹, Qi Zhang¹, Xiangjun Xin¹, Ran Gao², Jiajie Li¹, Lan Rao¹, Feng Tian¹, Yun Teng³, Fu Wang¹, Yongjun Wang¹, Qinghua Tian¹*1.Beijing University of Posts and Telecommunications, China; 2.Beijing Institute of Technology, China; 3.Beijing Ancoren Technology Co, China*

XRF overlapping spectra analysis method based on a cascade equilibrium optimizer and trust region algorithm is proposed to fit overlapping spectra peaks. Experiment results show that performance is better than that of particle swarm optimization.

ACPIPOC-0801-33

Simulation of Constant-envelope THz Integrated Sensing and Communication System based on Photonics with 2D Positioning

Yuxin Liu, Xiong Deng, Ningyuan Zhong, Xihua Zou, Wei Pan, Lianshan Yan

Southwest Jiaotong University, China

A 135GHz-145GHz THz MWP ISAC system demonstrates two error-free 2-GHz LFM-OFDM and a $\sim 10^{-4}$ BER 4-GHz 64-QAM CE-OFDM, achieves >20-Gbit/s data rate, 3.75-cm high-range resolution through coherent fusion processing and <1.5-cm 2D positioning error.

ACPIPOC-0801-36

High-dimension Photonic Multi-Channel Convolution Parallel Acceleration Unit

Dengqi Liu, Yongmei Sun, Ruijia Guo

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

We design a novel photonic multi-channel convolution acceleration unit by multiplexing across three dimensions: RF, wavelength and space. This results in an increase in parallelism proportional to the number of convolutional kernels.

ACPIPOC-0801-86

Microwave Photonic Beamforming System based on an On-Chip Multi-Wavelength Laser and Integrated Waveguide Bragg GratingRongan Wu^{1,2}, Haibo Zeng^{1,2}, Zhenmin Du³, Zhenzhou Tang^{1,2}, Hongwei Chen³, Yanming Zhang^{4,5}, Shilong Pan^{1,2}*1.Nanjing University of Aeronautics and Astronautics, China; 2.National Key Laboratory of Microwave Photonics, China; 3.Tsinghua University, China; 4.China Mobile Research Institute, China; 5.Future Research Lab, China*

We propose an ultra-compact RF beamforming system based on an on-chip multi-wavelength laser and integrated waveguide Bragg grating. The experiment demonstrated that no beam squint is observed within 6-10 GHz.

ACPIPOC-0801-90

Microwave Photonic Filter Based on an Integrated Microcomb and Waveguide Bragg GratingHaibo Zeng^{1,2}, Zhenzhou Tang^{1,2}, Yifei Zhang^{1,2}, Rongan Wu^{1,2}, Zhenmin Du³, Jijun He^{1,2}, Hongwei Chen³, Shilong Pan^{1,2}*1.Nanjing University of Aeronautics and Astronautics, China; 2.National Key Laboratory of Microwave Photonics, China; 3.Tsinghua University, China*

We proposed an ultra-compact microwave photonic filter based on an integrated Kerr microcomb and a waveguide Bragg grating. In the experiment, a seven-tap MPF with a free spectral range of 8.6 GHz is realized.

ACPIPOC-0801-95

Tunable Active Mode-locked Optoelectronic Oscillator Based on Injection LockingJunfeng Ren¹, Ping Li¹, Chenyang Ma², Zhengyang Xie², Xin Zhao², Zheng Zheng²*1.Beijing Institute of Technology, China; 2.Beihang University, China*

A novel AML-OEO structure is proposed, in which the mode selection of OEO is carried out by injection locking, and the generation of OEO microwave comb signal is completed by using the AML signal.

ACPIPOC-0809-1

Covert wireless communication with enhanced denoising capability through a dense optical frequency combJiaxin Zhang^{1,2}, Xueling Liu^{1,2}, Yifan Bai^{1,2}, Bing Lu^{1,2}, Pengxing Guo^{1,2}, Weigang Hou^{1,2}*1.Chongqing University of Posts and Telecommunications, China; 2.Institute of Intelligent Communication and Network Security, Chongqing University of Posts and Telecommunications, China*

We proposed a covert wireless communication system enhanced with dense optical frequency comb (OFC) for denoising is proposed. Original data is spread with random phases, hidden below noise for high concealment and low interception probability in the microwave domain, then transmitted wirelessly. At the receiver, the signal is upconverted optically via carrier-suppressed single sideband modulation. An external modulation-based OFC with double sidebands is generated and used for denoising via analog spectrum convolution and in-phase coherent addition. This approach achieves a signal-to-noise ratio improvement of $10\log(2 \times N)$ using N electric comb lines with special phases. Simulation results show 600 comb channels for in-phase summation and a 27 dB SNR increase with 300 electrical comb lines, demonstrating double detection gain without altering the OFC generation module.

ACPIPOC-0812-4

Pattern matching based algorithm for improving signal-to-noise ratio at radar receivers

Yatong Xiao, Shangyuan Li, Xiaoxiao Xue, Xiaoping Zheng

Tsinghua University, China

We propose a pattern matching-based algorithm to suppress the nonlinearity from the mismatch of multi-bit photonic digital-to-analog conversion channels at the microwave photonics radar receiver. It improves the signal-to-noise ratio by about 30 dB.

ACPIPOC-0813-18

Design and Optimization of Broadband High Gain Terahertz Antenna Based on Artificial Magnetic Conductor

Wenjie Zhang, Kai Liu, Yongqing Huang, Xiaofeng Duan, Xiaomin Ren

Beijing University of Posts and Telecommunications, China

This paper proposes a Yagi antenna with artificial magnetic conductor. At a frequency of 145 GHz, the bandwidth can reach 62.86 GHz, which is 280% higher, and the gain is 9.2 dB, significantly enhancing the performance of the antenna.

ACPIPOC-0815-11

Optimization of Linear Frequency-modulated Signal Generation with Period One Laser DynamicsXing Wang¹, Fangzheng Zhang¹, Xiaoyue Yu¹, Gengze Wu¹, Xinyi Li¹, Yuan Yu²*1. Nanjing University of Aeronautics and Astronautics, China; 2. Huazhong University of Science and Technology, China*

The optimization of linear frequency-modulated (LFM) signal generation by period-one laser dynamics is demonstrated, through which broadband LFM signal sweeping from 12 GHz to 18 GHz with high comb contrast and good linearity is generated.

ACPIPOC-0815-5

Design and Analysis of a 1-bit Reflective Metasurface for Reconfigurable Intelligent Surface Applications in the Ka-Band

Asad Khan, Jinling Zhang, Muhammad Ishfaq, Hafiz Muhammad Bilal, Shahbaz Khan, Kamlesh Kumar Sothar

Beijing University of Posts and Telecommunications, China

In this work, a 1-bit reflective metasurface for reconfigurable intelligent surfaces (RISs) in Ka-band is proposed. The design uses linear polarization and a PIN diode for phase properties to achieve two distinct phase states, providing a wide bandwidth and precise phase control. The PIN diode switches between these two states. The reflecting element is uniquely configured with the bias circuit and a PIN diode in the center of two triangle patches to improve antenna efficiency. This element is used to enhance the performance of a $5\lambda \times 5\lambda$ reconfigurable reflectarray antenna. The simulation results show that the proposed design has a strong signal focus, good surface area utilization, and adaptable performance with a peak gain of 19.5 dBi, an aperture efficiency of 18%, and effective beam-scanning capabilities.

ACPIPOC-0815-51

Ultrafast All-fiber Spectrometer in C-band Based on Multimode Fiber

Zheng Gao, Ting Jiang, Hao Wu, Ming Tang

Huazhong University of Science and Technology, China

We propose an ultrafast C-band spectrometer based on MMF and MCF with 5 MHz detection speed. We further enhance precision to 0.3 pm within a 10 pm range, demonstrating broad bandwidth and high precision.

ACPIPOC-0815-53

Time-lens based Optical Phased Array Lidar for Resolution-Enhanced RangingLanxuan Zhang¹, Qijie Xie¹, Quanxin Na¹, Lei Wang¹, Junfeng Song², Lijun Wang³*1. Peng Cheng Laboratory, China; 2. Jilin University, China; 3. State Key Laboratory of Luminescence Science and Technology, Changchun Institute of Optics, Fine Mechanics and Physics, Chinese Academy of Sciences, China*

We innovatively design a time-lens based optical phased arrayed Lidar to improve resolution up to 5.6 mm for a 6-m ranging. The ranging resolution is enhanced by 268 times compared to the traditional ToF Lidar.

ACPIPOC-0815-61

Synchronization-Enhanced All-Optical Pattern Matching System Based on Semiconductor Optical AmplifierMingming Sun¹, Xin Li¹, Wensheng Zhai², Haijing Hou³, Feiyang Ruan¹, Shanguo Huang¹*1. Beijing University of Posts and Telecommunications, China; 2. North China University of Water Resources and Electric Power, China; 3. China Network Communications Corporation Shandong Branch, China*

This paper proposes a Synchronization-Enhanced All-Optical Pattern-Matching System that combines all-optical bit-error-rate eliminator with all-optical pattern-matching system, which can mitigate the impact of non-strict symbol synchronization on the system's output at 10 Gbit/s.

ACPIPOC-0815-64

Microwave photonics down-conversion system based on laser injection locking

Cheng Gu, Wen Xie, He Jiang, Zhengyang Xie, Xin Zhao, Zheng Zheng

1. Beihang University, China; 2. Beijing Institute of Radio Metrology and Measurement, China

Frequency conversion in communication systems can achieve frequency adjustment and adaptation, enhance anti-interference capabilities, improve spectrum utilization, and facilitate signal processing and transmission. In this paper, we propose and demonstrate a microwave photonic down-conversion system based on laser injection locking. A vector modulated signal with is successfully down-converted by dual-wavelength injection locking to the optical frequency comb (OFC).

ACPIPOC-0815-78

Salinity sensing by the radio-frequency power based on the Michelson interferometer

Lin Gui, Xuhui Chen

Shanghai polytech University, China

The salinity sensing technology based on the microwave photonic interferometry of the Michelson interferometer is proposed. Experimental results show that the salinity sensitivity of 0.284 dB/% is achieved with the brine concentration in the range of 31% - 40% and the value of R-square can reach 0.88 by linearity fitting for salinity sensing, and the value can be improved to 0.979 by Cubic fitting.

ACPIPOC-0816-6

Probe Signal Generation Using Laser Frequency Offset Locking For Stable Microwave Transfer

Zelin Liu, Wei Wei, Zhuoran Li, Xiyi Weng, Weilin Xie, Yi Dong

Beijing Institute of Technology, China

Laser offset-frequency locking is used to generate a probe for delay variation detection in optical links. The probe frequency jitter is less than 2Hz, and the link delay jitter is 15.5fs.

ACPIPOC-0818-7

Photonic Synchronization in Wideband Spread Spectrum Transceiver

Qijun Liang, Ziyu Liu, Naijin Liu, Guangyu Gao, Qiang Zhao, Xiang Yan

China Academy of Space Technology, China

We propose and demonstrate a novel photonic synchronization using a tunable optical delay line. This technique enables the synchronization of 10 GHz bandwidth spread spectrum with high performance, which is essential in wideband spread spectrum transceiver.

Track 6: LEDs, Photovoltaics, and Optoelectronics in Energy

ACPIPOC-0914-1

Intersystem Crossing in Gold Nanoclusters

Linlin Zeng

University of Science and Technology of China, China

Intersystem crossing is crucial for the luminescence of clusters. Transient absorption spectroscopy reveals that intersystem crossing is significantly faster in films, enhancing phosphorescence quantum yield compared to in solution.

ACPIPOC-0914-2

Polarization-Sensitive Artificial Optoelectronic Synapse Based on Anisotropic β -Ga₂O₃ Single Crystal for Neuromorphic Vision Systems and Information encryption

Guang Zhang

Zhejiang Sci-Tech University, China

We propose a polarization-sensitive artificial photoelectric synapse based on β -Ga₂O₃ single crystal with reconfigurable anisotropic vision. Using this device, a series of polarization-sensitive synaptic activities and polarization-sensitive image recognition functions were successfully simulated.

ACPIPOC-0914-3

Investigation into the Exciton and Carrier Dynamics in 2D Halide Perovskite Crystals (C₆H₁₅N)₂MX₄

Yangyang Jing

Beijing Normal University, China

Two-dimensional (2D) halide lead perovskite has structural diversity, good charge transport performance and excellent stability, which is suitable for various photoelectric applications. In this work, we select a representative organic cations, which is hexylammonium CH₃(CH₂)₅NH₃⁺ (HA⁺). We prepared the 2D halide perovskite single crystal (HA)₂MX₄ (M = Pb, Sn; X = Br, I), and combine micro-area femtosecond transient absorption spectroscopy and transient photoluminescence spectroscopy to explore the influence of lead-based, tin-based and different halogen anions on the dynamic characteristics of excitons and carriers in 2D perovskite. We observed that (HA)₂MI₄ (M = Pb, Sn) have good luminous performance, and hybrid lead bromide perovskites have broad-band emission at room temperature. It is revealed that there are defect-assisted recombination and multi-body interactions after photoexcitation.

ACPIPOC-0914-4

Photophysical Process of Perylene Diimide Derivatives with N site substituted

Minghang Li

Beijing Normal University, China

Perylene diimide (PDI) and its derivatives are attractive π -conjugated molecules with high fluorescence quantum yields, high photochemical stability, strong electron acceptance properties, and excellent thermal and oxidation stability, which are ideal components of various optoelectronic devices. In this work, we selected two PDI derivatives with different substituents at the N site, 2,9-Bis[3-(dimethylamino)propyl]anthra[2,1,9-def:6,5,10-d'e'f']diisoquinoline-1,3,8,10(2H,9H)-tetrone (PDI-N) and 2,9-Dihexylanthra[2,1,9-def:6,5,10-d'e'f']diisoquinoline-1,3,8,10(2H,9H)-tetrone (PDI-C). We investigated the excited state relaxation dynamics of the two PDIs in solution (toluene and methylene chloride) and single crystal by using transient absorption (TA) spectroscopy. The results show that PDI-N has more rapid energy relaxation process in methylene chloride solution than that in toluene solution, while PDI-C has similar process in the two solvents. The results of global fitting show that the decay time constant of τ_1 represents the relaxation from the singlet excited state S₁ to a charge transfer state, while τ_2 represents the radiative transition from charge transfer state to the ground state. The PDI crystals have one more intermediate state than the solution.

ACPIPOC-0914-5

Ultrafast Singlet Fission and Symmetry-Breaking Charge Separation of PDI in Tetramers with Saddle-Shaped Linker

Guo Yu

Institute of Molecular Plus, Tianjin University, China

Linking by spatially twisted cyclooctatetrathiophene core, singlet fission (100–150 ps) and symmetry-breaking charge separation (1 ps) of perylenediimides were observed, in which deactivation path was largely determined by structural flexibility of tetramers.

ACPIPOC-0914-6

Facilitating Intrinsic Delayed Fluorescence of Conjugated Emitters by Inter-Chromophore Interaction

Yixuan Gao

Institute of Molecular Plus, Tianjin University, China

By facilitating excimer-like state in covalent dimer, intrinsic delayed fluorescence of conjugated emitter was enabled with kRISC = 6.5105 s⁻¹, which can be regarded as general strategy for rational designing of high-performance OLED devices.

ACPIPOC-0924-1

Tuning exciton dynamics by the dielectric confinement effect in quasi-two-dimensional perovskites

Minghuan Cui, Yonggang Yang

Henan Key Laboratory of Infrared Spectrum Measures and Applications, School of Physics, Henan Normal University, China

This work investigated the effect of the dielectric constant on the coherent phonon dynamics, Auger recombination and energy transfer processes in two-dimensional perovskites.

ACPIPOC-0924-2

Discerning the internal spatial heavy-atom effect on the organic phosphorescence of 9-phenylcarbazole by transient absorption spectroscopy

Yonggang Yang, Yang Liu

Henan Key Laboratory of Infrared Spectrum Measures and Applications, School of Physics, Henan Normal University

This work investigates the internal space heavy-atom effect on the organic phosphorescence of 9-phenylcarbazole and demonstrates that heavy-atom effect is enhanced by bromine substituent in the carbazole core or by decreasing the distance between them.

ACPIPOC-0926-1

Two-Photon Current Generation and Autocorrelation Measurement with Ga₂O₃ Photodetector using Femtosecond Laser

Biaobing Zhang, Ganghua Deng, Andong Xia

Beijing University of Posts and Telecommunications, China

This work studies the photovoltaic properties of Ga₂O₃ photodetectors. Two-photon current generation in Ga₂O₃ photodetectors was examined using femtosecond laser pulses. A two-photon absorption based autocorrelator was constructed to measure femtosecond laser pulses within the 350–450 nm range. This research suggests a potential for developing a cost-effective, single-detector autocorrelator for the visible to ultraviolet based on Ga₂O₃ photodetectors.

ACPIPOC-1015-4

High-performance Underwater Encrypted Communications Based on Bipolar Photoresponse in Cu₂O-Modified α-Ga₂O₃ Nanorod Arrays Self-powered Ultraviolet Photodetector

Hangjie Xu

Zhejiang Sci-Tech University, China

We propose Cu₂O modified Ga₂O₃ nanorods array to realize self-powered, anti-interference and safe underwater ultraviolet communication system, which can realize ternary communication and encrypted communication, with automatic error correction and low BER of 0.26%.

ACPIPOC-1025-1

The influence of host-guest interaction on the triplet states of Pt doped gold nanoclusters

Fangming Zhao

University of Science and Technology of China (USTC), China

In this work, we reported the influence of host-guest interaction on triplet states of gold nanocluster by transient absorption (TA) spectra and energy transfer experiments. The lifetime of Phosphorescent and the luminescence quantum yield in doped film are much higher than in solution

ACPIPOC-1015-2

Symmetry Breaking Charge Transfer Mechanism in Sulfone-Functionalized Diradical Near-Infrared Emitters

Zixi Liu, Zhuoran Kuang, Andong Xia

Beijing University of Posts and Telecommunications, China

Diradicaloids, characterized by two weakly coupled interacting single electrons, exhibit unique physicochemical properties and hold significant potential for applications in bipolar field-effect transistors (OFETs), organic spintronics, and near-infrared (NIR) dyes. Previously reported sulfone-functionalized diradicaloids demonstrate a large Stokes shift and achieve the longest emission wavelengths among known organic fluorescence radicals. However, many diradical emitters suffer from low photoluminescence quantum yields. Thus, understanding the excited-state relaxation mechanisms of sulfone-functionalized diradicaloids is crucial for designing NIR open-shell molecular materials. In this study, we characterized sulfone-functionalized ChiChibabin's hydrocarbon derivatives, SD-1 and SD-2 with different substituents (H/CF₃) on the molecular skeleton. Experimental and theoretical calculations reveal that SD-1 and SD-2 contain high diradical character and small ΔE_{S-T}, indicating that both are open-shell singlet diradical molecule. The steady-state fluorescence spectroscopy reveals that two diradicaloids exhibit emission properties sensitive to solvent polarity. This observation suggests the presence of significant intramolecular charge transfer characteristics, which may arise from symmetry breaking within their electronic structures. Femtosecond time-resolved transient absorption spectroscopy reveals the formation of symmetry-breaking charge transfer (SBCT) state in polar solution, and the corresponding kinetics are correlated to the solvent reorientation dynamics and dihedral torsional motion. Quantitative calculations indicate that the charge transfer feature in these diradicaloids may come from the overlap with the single electron SOMO orbitals and is significantly regulated by substituents (H/CF₃) on the molecular skeleton. The quenching of SBCT emission in the NIR region primarily results from the fast charge recombination, which is anticipated to enhance its potential as an efficient NIR emitter by suppressing charge recombination processes. Overall, this study demonstrates that the sulfone-functionalized diradical compounds SD-1 and SD-2 possess unique SBCT properties, making them promising candidates for efficient near-infrared emitters. Their ability to inhibit charge recombination addresses the challenge of low photoluminescent quantum yields, paving the way for advancements in organic optoelectronic applications.

Track 7: Optical Sensors and Biophotonics

ACPIPOC-0718-2

Adaptation to temporal intensity variability of interference fringes based on short-time Fourier transform for envelope peak position determination in vertical-scanning wideband interferometry

Wei Dong

Nagaoka University of Technology, Japan

This paper describes our measurement procedure and its development using a short-time Fourier transform-based time-variable spectrum selection scheme based on the fact that the STFT-based time-frequency decomposition matches the time variability of the fringe signal.

ACPIPOC-0724-6

PON Monitoring Method based on Novel Optical Visual Splitter

Songlin Zhu¹, Yidai Zhu², Xinyu Fan³, Zuyuan He³*1. Wireline Product Planning Department, ZTE Corporation, China; 2. Shanghai Jiao Tong University, China; 3. State Key Laboratory of Advanced Optical Communication System and Networks, Shanghai Jiao Tong University, China*

We propose a novel visual optical splitter used in passive optical network (PON) architecture to realize PON monitoring with the help of a multi-wavelength optical time domain reflectometry (OTDR), which reduce 10 dB attenuations for sensing lightwave and obtained individual reflective curve for each branch.

ACPIPOC-0726-6

High-Precision Dual-Channel TEC Temperature Controller for LiDAR Doppler Vibrometry System

Zixuan Ming¹, Yanyi Wang¹, Yingxiong Song¹, Jian Chen¹, Qianwu Zhang^{1,2}, Junjie Zhang^{1,2}*1. Shanghai University, China; 2. Teralink Optical Corporation, China*

In this paper, a high-precision dual-channel TEC temperature controller for LiDAR Doppler vibrometry systems is discussed. The control stability 0.006°C and accuracy $\pm 0.65\%$ with setting stabilization time 15s is achieved through experimental verification.

ACPIPOC-0728-6

A Human Footsteps Localization Method Based on Fiber-Optic Distributed Acoustic Sensing

Shuolong Zhu¹, Junfeng Chen¹, Shixiong Zhang¹, Cunzheng Fan¹, Hao Li¹, Zhijun Yan^{1,2}, Qizhen Sun^{1,2}*1. Huazhong University of Science and Technology, China; 2. JinYinHu Laboratory, China*

A human footsteps localization method based on fiber-optic distributed acoustic sensing is proposed. With the time differences of arrival compensated by Gaussian time offsets, the footsteps localization error is reduced to 15.63 centimeters.

ACPIPOC-0729-36

Phase-Coded FMCW for Optical Integrated Sensing and Communication

Tianzhu Zhang, Zhongji Yan, Anning Pang, Anhong Dang

Peking University, China

We propose an optical integrated sensing and communication scheme using phase-coded frequency-modulated continuous waves (PC-FMCW) and verify that the scheme enables mutual interference-free sensing and communication capabilities.

ACPIPOC-0729-37

Low-Frequency Drift Compensation Method for Interferometry Fiber-Optic Vibration Sensing Using Sampling Matched Integral Fitting Difference

Ke Ai, Cunzheng Fan, Junfeng Chen, Hao Li, Zhijun Yan, Qizhen Sun

Huazhong University of Science and Technology, China

We demonstrate a low-frequency drift compensation method in interferometry fiber-optic vibration sensing system without any additional components and achieve 65.13 dB @ 10mHz phase noise floor suppression and 50.22 dB @ 1Hz SNR improvement.

ACPIPOC-0729-41

High Birefringence Hollow-Core Negative Curvature Fiber Based on Surface Plasmon Resonance with Nested Tubes

Xingyu Zhang, Jinhui Yuan, Jingao Zhang, Kuiru Wang, Binbin Yan, Xinzhu Sang

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

A high birefringence hollow-core negative curvature fiber with a nested tube structure is designed for refractive index sensing using surface plasmon resonance effect. It achieves the maximum sensitivities of $-10,620$ nm/RIU and $-10,620$ nm/RIU, respectively.

ACPIPOC-0729-5

A dual-channels photonic crystal fiber sensor based on surface plasmon resonance for refractive index sensing

Yetong Gu, Jinhui Yuan, Jingao Zhang, Kuiru Wang, Binbin Yan, Xinzhu Sang

State Key Laboratory of Information Photonics and Optical Communication, Beijing University of Posts and Telecommunications, China

A dual-channels photonic crystal fiber (PCF) refractive index (RI) sensor based on surface plasmon resonance (SPR) effect is proposed. The average and maximum wavelength sensitivity can be up to 8080 nm/RIU and 49500 nm/RIU, respectively.

ACPIPOC-0730-10

Hollow-Core Negative Curvature Fiber Refractive Index Sensor Based on Surface Plasmon Resonance Effect

Xinyu Sun, Jinhui Yuan, Jingao Zhang, Kuiru Wang, Binbin Yan, Xinzhu Sang

State Key Laboratory of Information Photonics and Optical Communications, Beijing University of Posts and Telecommunications, United States

A hollow-core negative curvature fiber refractive index sensor based on surface plasmon resonance (SPR) effect is proposed. The proposed sensor achieves a maximum sensitivity of -10900 nm/RIU within the RI range of 1.31 to 1.40.

ACPIPOC-0730-23

A System for Simultaneous Optogenetics Stimulation, Calcium Imaging, Electrical Signal Detection, and Electrical Stimulation of In Vitro Neuronal NetworksYin Deng¹, Yarong Lin², Shiyang Cao¹, Tao Li¹, Jie Li¹, Zeying Lu¹, Yueheng Lan¹, Xiaojuan Sun¹, Longze Sha², Lili Gui¹, Qi Xu², Kun Xu¹

1. Beijing University of Posts and Telecommunications, China; 2. Chinese Academy of Medical Sciences and Peking Union Medical College, China

We developed the OptoCaMEA system, which provides high-resolution recording (50 μ s) and single-neuron control (10 μ m) of in vitro neuronal networks, enhancing future neural computing.

ACPIPOC-0730-9

Information Extraction of FMCW Laser Ranging Based on ResNet-BiGRUPansong Zhang^{1,2,3}, Haohao Zhao^{2,3}, Guohui Yuan^{2,3}, Shichang Xu², Zhuoran Wang^{1,2,3}

1. Quzhou University, China; 2. Yangtze Delta Region Institute (Quzhou), University of Electronic Science and Technology of China, China; 3. University of Electronic Science and Technology, China

The study enhances FMCW LiDAR accuracy using ResNet-BiGRU, improving distance measurement robustness against noise, validating through significant ranging accuracy improvements.

ACPIPOC-0731-104

Quasi-bound states in the continuum regulation and sensor design based on embedded square column all-dielectric metasurface

Ziang Gao, Yang He, Zhengshan Xu, Tonggang Zhao

Beijing University of Posts and Telecommunications, China

Generating polarization-independent quasi-bound states in the continuum (QBIC) using asymmetric metasurfaces with embedded square columns can achieve Q-factors up to 7144 and sensitivity of 280 nm/RIU, offering significant potential for advanced sensing applications.

ACPIPOC-0731-145

A Caenorhabditis elegans Locomotion Detection and Tracking System with Optoelectronic Stimulations in Microfluidic Chips

Shuhao Yang, Junliang Liu, Yin Deng, Lili Gui, Ke Wang, Kun Xu

Beijing University of Posts and Telecommunications, China

This paper introduced a low-cost, scalable system for real-time tracking and optoelectronic stimulation of C. elegans, which can help to understand C. elegans' responses to optogenetic and electric stimuli.

ACPIPOC-0731-149

An acoustic emission-based power cable partial discharge monitoring system by Power-Over-Fiber with SignalJiemin Wang¹, Zhiguo Zhang¹, Rui Zhou¹, Xueliang Gu¹, Guangxin Li¹, Xinyan Feng²

1. Beijing University of Posts and Telecommunications, China; 2. Shandong electric extra high voltage company, China

A solution has been proposed to address sensor communication and energy supply issues using a single fiber optic cable, which can be used for partial discharge monitoring in cable trenches under harsh conditions.

ACPIPOC-0731-15

Correlation-Based OTDR for Fault Identification in Passive Optical Networks using Machine Learning

Zhiyi Zhong, Wu Liu, Han Li, Tianqian Zhang, Yiwen Yang, Ming Luo

National Key Laboratory of Optical Communication Technologies and Networks, China

A COTDR-based ML method is proposed to identify faulty branches in PONs from low-SNR correlation results. Experimental results show that using only 10% of datasets achieves 91.89% accuracy and a spatial resolution under 30 cm.

ACPIPOC-0731-224

Classified-Cascaded Convolutional Neural Networks enabled imaging recovery of random length GRIN imaging systems

Ruiqi Zhou, Yang Yang, Jinwei Zeng, Jian Wang

Huazhong University of Science and Technology, China

We demonstrate a novel network architecture termed the Classified-Cascade CNN (CC-CNN), which aims to identify virtual-real deteriorated images and facilitate image recovery. This approach employs distinct networks tailored to specific issues.

ACPIPOC-0731-37

Closed-Loop Physical Reservoir Computing with Optogenetic Control in Biological Neural NetworksJie Li¹, Lili Gui¹, Kun Xu¹, Yin Deng¹, YaRong Lin², ZeYing Lu¹, XiaoJuan Sun¹, YueHeng Lan¹, LongZe Sha²*1. Beijing University of Posts and Telecommunications, China; 2. Department of Biochemistry and Molecular Biology, Chinese Academy of Medical Sciences and Peking Union Medical College, China*

This paper explores optogenetic control and FORCE learning in biological neural networks for efficient signal processing and virtual car obstacle avoidance.

ACPIPOC-0731-65

Adjustable sensitivity dual-wavelength differential detection of tilted fiber Bragg gratings using a broadly tunable MG-Y laserYang Cheung^{1,2}, Wei Dang¹, Yang Zhang², Wei Peng², Xiaoqun zheng¹, Zhenguo Jing^{1,2}*1. Central Hospital of Dalian University of Technology, China; 2. Dalian University of Technology, China*

A dual-wavelength differential detection technique based on a broadly tunable MG-Y laser is proposed to achieve demodulation of TFBGs with adjustable sensitivity. This technique provides a real-time and novel approach for on-site applications of TFBGs.

ACPIPOC-0731-91

Refractive index sensor based on cascaded multimode fiber – no-core fiber structure with high sensitivity

Jianing Guo, Hu Zhang, Jiaqi Wang, Lixia Xi, Xiaoguang Zhang

Beijing University of Posts and Telecommunications, China

Refractive index sensor based on cascaded multimode fiber – no-core fiber structure was proposed. The experimental result shows the sensitivity is 137.5 nm/RIU from 1.360–1.376.

ACPIPOC-0731-93

An AWG-Based FBG Interrogation Approach Using Convolutional Neural Networks

Juanli Li, Haoen Cai, Ziqi Liu, Chang Liu, Xiaoliang Cao, Zhengyong Liu

Sun Yat-sen University, China

We propose a low-cost and high-accuracy FBG interrogation approach based on an AWG by employing CNN. The achieved accuracy of network trained on experimental data could reach 99.9967% with a RMSE of 0.1575°C.

ACPIPOC-0731-97

A multi-perspective detection head aided YOLOv8 algorithm based on adaptive label assignment for semiconductor laser chip defect detectionJue Wang¹, Feng Tian¹, Jianwei Zhou¹, Yutian Li¹, Biao Luo², Fu Wang¹, Tian Qinghua¹, Zhang Qi¹*1. Beijing University of Posts and Telecommunications, China; 2. Accelink Technologies Company Ltd., China*

We proposed an improved YOLOv8 algorithm. The results show that our algorithm has 2.1ms, 0.2% improvement on the detection time and mAP50. Comparing with YOLOv10 and YOLOv9, the prediction time has improved 11.8ms and 12.7ms.

ACPIPOC-0801-113

Precision Analysis of TOF and FMCW Lidar in Gamma-Gamma Channel

Tianzhu Zhang, Zhongji Yan, Anning Pang, Anhong Dang

Peking University, China

This article experimentally verifies that the irradiance probability density function of a laser beam propagating through turbulent media satisfies the Gamma-Gamma distribution, and analyses the precision of TOF and FMCW LiDAR in atmospheric turbulent channels.

ACPIPOC-0801-116

Hyperspectral Image Reconstruction Using Spatial Enhancement Neural Networks with Hybrid Prior Strategy

Yantao Jin, Zhenming Yu, Jiayu Di, Liming Cheng, Jingyue Ma, Yue Zhou, Haiying Zhao, Kun Xu

Beijing University of Posts and Telecommunications, China

We propose a spatial enhancement neural network with hybrid prior strategy for dual-camera compressed hyperspectral imaging system. The results show our method can more effectively utilize grayscale information and improve the reconstruction quality.

ACPIPOC-0801-120

Optical Frequency Domain Reflectometry using Dual Kerr Soliton MicrocombsTeng Tan^{1,2}, Zhaoyu Li^{1,2}, Xuyan Chen^{1,2}, Yunhe Song^{1,2}, Baicheng Yao^{1,2}, Yunjiang Rao^{1,2}*1. University of Electronic Science and Technology of China, China; 2. Key Laboratory of Optical Fiber Sensing and Communications (Education Ministry of China), China*

We propose an optical frequency domain reflectometry (OFDR) with dual Kerr soliton microcombs, enabling the OFDR system to achieve a sub-pc/√Hz detection sensitivity limit.

ACPIPOC-0801-150

Real time monitoring of partial discharge in Gas-insulated Switchgear based on ultraviolet radiationYufeng Xu¹, Shanyong Cai¹, Zhiguo Zhang¹, Xinyan Feng²*1. Beijing University Of Posts and Telecommunications, China; 2. Ultra-high Voltage Company of State Grid Shandong Electric Power Company, China*

A UV based sensing system was constructed using a photomultiplier tube (PMT) to achieve real-time monitoring of partial discharge conditions in Gas-insulated Switchgear (GIS), achieving a 100% sampling rate for discharge signals.

ACPIPOC-0801-153

Mode Selection in Optimization Based on Analytical Analysis of Complex Coupled-mode Equations for High Refractive-index SensingDongdong Wang¹, Wei Wang¹, Li Yang¹, Zhijia Hu², Benli Yu²*1. University of Science and Technology of China, China; 2. Anhui University, China*

In the optimization of high refractive index sensor based on chiral fiber grating, an enhanced simulated sensitivity of 701.04 dB/RIU is obtained by selecting a unique quasi-leaky mode working at the most sensitive coupling state.

ACPIPOC-0801-26

High-Speed Deformation Sensor Based on Multiple Sampling of Multimode Fiber SpecklegramLele He^{1,2}, Hongjian Xu^{1,2}, Lili Gui^{1,2}, Yan Zhang^{1,2}, Xiaosheng Xiao^{1,2}*1. Beijing University of Posts and Telecommunications, China; 2. State Key Laboratory of Information Photonics and Optical Communications, China*

A high-speed multimode fiber specklegram based deformation sensor is proposed, by multiple sampling of the specklegram. The feasibility of this sensor is verified by preliminary experiments, and a fast sensing algorithm is proposed.

ACPIPOC-0801-29

Research on acoustic sensitivity performance of different optical cables underwaterYucheng Fan¹, Rendong Xu², Guoxiang Xu¹, Wei Yin³, Siyuan Wang³, Huiling Kang³, Yunpeng Sun¹, Guibin Sun³*1. Jiangsu ShenYuan Ocean Information Technology and Equipment Innovation Center Co., Ltd., China; 2. Zhejiang University, China; 3. Future Information and Artificial Intelligence Institute, China*

We selected six types of optical cables to detect underwater acoustic waves, and the experimental results provide data support for the application of DAS system in ocean exploration.

ACPIPOC-0801-45

A fading noise suppression method based on frequency-shift loop in TGD-OFDR system

Yimin Luo, Qingwen Liu, Chaozhu Liu, Xinyu Fan, Zuyuan He

Shanghai Jiao Tong University, China

A frequency-shift loop is introduced in the TGD-OFDR-based DAS system, by which fading noise suppression and high-frequency response are achieved without sacrificing spatial resolution. Semiconductor optical amplifier is employed in the loop to avoid transient response.

ACPIPOC-0801-82

Sidewall Scallop Removal Method for End-face Smoothing and Its Application in the Fabrication of High-temperature Optical Sensors

Guandong Liu, Ruiqi Luo, Hongli Zhu

Zhejiang Lab, China

We present a practical method to reduce the sidewall scallops of deeply etched cavities, employing a post-etching process with a KOH-based solution. Moreover, an optical pressure sensor was fabricated using the convenient method.

ACPIPOC-0813-4

High-resolution Frequency-modulated Dual-pulse Phase-sensitive Optical Time-domain Reflectometry with Direct DetectionYafeng Cheng¹, Zhiyang Xie², Changpeng Ming³, Hanyong Wang⁴, Lei Qian⁵, Lei Dong⁵, Hongguang Zhang⁶, Dong Wang⁶, Ming Luo¹, Wu Liu¹, Tianye Huang⁴, Xiang Li⁴

1. National Key Laboratory of Optical Communication Technologies and Networks, China Information and Communication Technologies Group Corporation, China; 2. Department of Ship Electrical and Electronic Technology, Wuhan Institute of Shipbuilding Technology, China; 3. Wuhan WUTOS Co., Ltd, China; 4. School of Mechanical Engineering and Electronic Information, China University of Geosciences, China; 5. Wuhan WUTOS Co., Ltd., China; 6. National Information Optoelectronics Innovation Center, China Information and Communication Technologies Group Corporation, China

High signal-to-noise detection is achieved by using frequency-modulated dual-pulse phase-sensitive optical time-domain reflectometry with direct detection. Experimental results show that multi-point vibration localization and waveform recovery can be achieved at a space resolution of 5 m.

ACPIPOC-0814-26

Phase Sensing Technique Using Conventional Linewidth Lasers Widely Employed in Commercial Coherent TranspondersBaichuan Shao¹, Tao Zeng², Yingmei Pan³, Lin Zheng³, Te Ke⁴, Ming Luo⁵, Ziqing Liu⁵

1. Wuhan Research Institute of Posts and Telecommunications, Telecommunications, China; 2. State Key Laboratory of Optical Communication Technologies and Networks, China information and communication technology Group Corporation, China; 3. Wuhan Research Institute of Posts and Telecommunications, China; 4. China information and communication technology Group, China; 5. China information and communication technology Group Corporation, China

In this paper, we present a technique that can utilize low-cost hardware to measure and compensate for phase noise, enabling the use of conventional linewidth lasers in commercial coherent transponders for phase noise sensing and integration into joint communication-sensing systems. We validate this technique through simulations and investigate potential technical challenges and issues in practical implementations.

ACPIPOC-0814-38

Highly sensitive fiber-optic temperature sensor based on CdSe quantum dots and Fabry-Perot interferometer

Ying Zeng, Yana Shang, Na Chen, Shupeng Liu, Yong Liu, Fufei Pang

Shanghai University, China

Highly sensitive temperature sensing is realized by combining temperature-sensitive CdSe quantum dots with a Fabry-Perot interferometer. Experiments show the temperature sensitivity of the sensor is 811.9pm/°C in the temperature range of 30°C~42°C.

ACPIPOC-0814-42

High-Resolution Distributed Temperature Measurement Based on Φ -OFDR using Hampel FilterYiheng Cheng¹, Fei Liu¹, Fei Cui¹, Benzhang Wang², Xian Zhou¹

1. University of Science and Technology Beijing, China; 2. Innovation & Research Institute, Hiwing Technology Academy of CASIC, China

We propose a distributed temperature measurement method based on phase-sensitive optical frequency (Φ -OFDR) with all grating fiber (AGF), employing Hampel filter to eliminate anomalous values between grating interval, achieving 1.13°C precision within a 220°C range.

ACPIPOC-0815-14

Massively Parallel FMCW LiDAR with Centimeter Range Resolution and Megapixel-Line Rates Based on Dual Chirped Electro-Optical Combs

Duan Jianhao, Tian Junze, Wang Bin, Zhang Weifeng

Beijing Institute of Technology, China

We propose a massively parallel FMCW LiDAR with centimeter range resolution and megapixel-line rates based on dual chirped electro-optical combs. 3D imaging with a 1.07-cm range resolution and a 1.13-megapixels/second rate has been performed.

ACPIPOC-0816-1

Shape Sensing of Carbon Fiber Reinforced Polymer Wing Structure with pre-weaved Fiber Bragg Grating Sensors

Danting Li, Dian Chen, Wenjing Mo, Wei Luo, Xingquan Zeng, Bo Zhang, Yuan Gao, Yujiao Zhang

AVIC Chengdu Aircraft Industrial (Group) Co. Ltd. Chengdu, China

A shape sensing method of wing structure is demonstrated. The wing structure is made of carbon fiber reinforced polymer, where FBG sensors have been pre-weaved. And a deformation display interface has been developed.

Track 8: Micro-, Nano-, and Quantum Photonics: Science and Applications

ACPIPOC-0728-16

Vortex fiber laser based on a gold-film assisted full-space metasurface

Jianying Pan^{1,2}, Lili Gui^{1,2}, Yiyuan Xu^{1,2}, Hao Chen^{1,2}, Kun Xu^{1,2}1. *Beijing University of Posts and Telecommunications, China*; 2. *State Key Laboratory of Information Photonics and Optical Communications, China*

We propose and experimentally demonstrate a vortex fiber laser based on a gold-film assisted full-space metasurface, which enables the generation of orbital-angular-momentum beams with topological charge of $l = 1$ directly.

ACPIPOC-0729-35

Broadband and Efficient Inter-modal Wavelength Conversion in Microresonators

Hanghang Li¹, Xiaolong Fan¹, Nuo Chen¹, Zhuang Fan¹, Xinliang Zhang², Jing Xu¹1. *Huazhong University of Science and Technology, China*; 2. *Wuhan National Laboratory for Optoelectronics, China*

We propose and theoretically investigate a wavelength converter utilizing resonantly enhanced intermodal Bragg scattering four-wave mixing (BS-FWM).

ACPIPOC-0730-59

Quantum Random Number Generator Based on Coherent Optical Receiver

Yifan Ge¹, Xubiao Zhang¹, Jiajia Shen¹, Jiamin Fan¹, Fengge Wang², Mingyi Gao¹1. *Soochow University, China*; 2. *Zhongyuan University, China*

We proposed a quantum random number generation scheme based on a coherent optical receiver to measure vacuum fluctuation. We achieved the quantum random number aggregation generation rate of 23.6 Gb/s by 1 GSa/s oscilloscope.

ACPIPOC-0731-11

Densely Integrated Focal Plane Array with High Directional Antennas for LiDAR

Yifan Xin^{1,2}, Lei Yu^{1,2}, Pengfei Wang^{1,2}, Liang Kong³, Yejin Zhang^{1,2}, Jiaoqing Pan^{1,2}1. *Key Laboratory of Optoelectronic Materials and Devices, Institute of Semiconductors, Chinese Academy of Sciences, Beijing, China*; 2. *Center of Materials Science and Optoelectronics Engineering, University of Chinese Academy of Sciences, Beijing, China*; 3. *Xinchen Semiconductor Co., Ltd., Jiangsu, China*

We propose a densely integrated two-dimensional scalable Focal Plane Array (FPA) consisting of 128 (16×8) highly directional grating antennas, with a field of view (FOV) of $2.47^\circ \times 1.79^\circ$ and a divergence of $0.05^\circ \times 0.05^\circ$.

ACPIPOC-0731-131

Eliminating correlation on a continuous variable source independent quantum random number generator with finite bandwidth

Han Zhou¹, Xiangyu Wang¹, Ziyang Chen², Yu Song¹1. *Beijing University of Posts and Telecommunications, China*; 2. *Peking University, China*

This paper proposes a security protocol based on continuous-variable source-independent quantum random number generator, which analyzes the data correlations caused by the finite bandwidth of the detector and proposes a correlation eliminating method.

ACPIPOC-0731-166

10 Gbps Quantum Random Number Generator Based on Direct Detection and Vacuum Fluctuations

Haoyuan Jiang¹, Jie Yang¹, Yiming Bian¹, Song Yu¹, Bingjie Xu², Yichen Zhang¹1. *Beijing University of Posts and Telecommunications, China*; 2. *National Key Laboratory of Security Communication Institute of Southwestern Communication, China*

We report a quantum random number generator scheme that significantly reduces the number of optical components, by detecting vacuum fluctuations with a photodiode, where 10.1 Gbps generation rate is achieved with standard telecommunication devices.

ACPIPOC-0731-197

A Compact, 4-Channel CWDM Demultiplexer Optimized Using Energy Constrained Inverse Design

Guowu Zhang¹, Xiaojian Hong¹, Chao Fei¹, Jingshu Guo¹, Liu Liu¹, Daoxin Dai¹1. *Zhejiang University, China*

A four-channel coarse wavelength division multiplexing (CWDM) (de)multiplexer with 50 nm channel spacing and $10 \mu\text{m} \times 10 \mu\text{m}$ footprint is designed with an energy constrained inverse design method, providing low loss, crosstalk. Specifically, the optimized design has a $<0.8 \text{ IL}$, $<-14 \text{ dB}$ crosstalk. The optimization takes approximately 40 hours with a multi-GPU Maxwell equation solver. The optimized design validates the benefits of the proposed topological inverse design with energy constraint for more complex devices.

ACPIPOC-0731-212

Generation of 13.5-nm Bessel Beams Using Metasurfaces

Weixuan Wang, Gaoyu Dai, Jianhua Zhang

Shanghai university, China

In this paper, a metalens generating 13.5-nm Bessel beam for extreme ultraviolet (EUV) application is proposed. The beam intensity profile at different NA are demonstrated, and the simulation results are in agreement with the theoretical values. Such a metalens with NA of 0.045 can generate Bessel beam with depth of focus, beam FWHM of 120 μm and 106.5 nm, respectively. These properties make it promising for applications in important fields such as lithography and microscopy.

ACPIPOC-0731-4

A Negotiated Physical Layer Security Key Generation and Distribution Based on Amplified Spontaneous Emission

Xubiao Zhang, Yifan Ge, Jiajia Shen, Jiamin Fan, Jing Deng, Mingyi Gao

Soochow University, China

We proposed and experimentally demonstrated a 2.5Gb/s negotiated security key generation and distribution (SKGD) system based on amplified spontaneous emission (ASE). The cross-correlation of 0.85 has been achieved over 30-km SSME.

ACPIPOC-0801-118

Probing laser-cavity detuning and soliton switching in mode-locked fiber lasers

Suwan Sun

Shanghai University, China

We demonstrate off-resonance behavior of optical dissipative solitons in decoherently driven laser cavities. An external probing laser is introduced to the cavity, which enables both the laser-cavity detuning measurement, and a soliton on-off switching dynamic.

ACPIPOC-0801-121

Deterministic single soliton generation using program-controlled technologyYiyang Gu^{1,2}, Xinyue He^{1,2}, Bing Chang^{1,2}, Zeping Wang^{1,2}, Teng Tan^{1,2}, Baicheng Yao^{1,2}*1. University of Electronic Science and Technology of China, China; 2. Key Laboratory of Optical Fiber Sensing and Communications (Education Ministry of China), China*

We propose a program-controlled scheme for the deterministic generation of single soliton microcomb. By employing soliton step recognition technology and thermal-assisted optical tuning method with feedback techniques, we demonstrate a 100% single soliton appearance.

ACPIPOC-0801-8

Remote switchable particle trapping based on all-dielectric composite phase metalens

Yichen Yang, Haochen Geng, Huiping Tian

Beijing University of Posts and Telecommunications, China

We present an all-dielectric composite phase metalens, which enables remote and switchable particle trapping. The two trapping modes can be freely switched without altering the structure, providing high flexibility for applications in compact on-chip optical trapping.

ACPIPOC-0801-88

State-multiplexing source based fully connected quantum networksYunru Fan^{1,2}, Hong Zeng¹, Jinpeng Wu¹, Yue Luo¹, Kai Guo³, Guangwei Deng¹, You Wang^{1,4}, Haizhi Song^{1,4}, Zhen Wang⁵, Lixing You⁵, Boyu Fan^{1,2}, Guangcan Guo^{1,2,6}, Qiang Zhou^{1,2,6}*1. University of Electronic Science and Technology of China, China; 2. Tianfu Jiangxi Laboratory, China; 3. Institute of Systems Engineering, AMS, China; 4. Southwest Institute of Technical Physics, China; 5. Chinese Academy of Sciences, China; 6. University of Science and Technology of China, China*

We propose a fully connected quantum network with a state-multiplexing source for the first time. A fully connected graph between four users with six wavelengths – saving half of the wavelength channels, is established with a total SKR of 1.94 kbps.

ACPIPOC-0801-92

Bidirectional generation of correlated photon pair in PPLN waveguideJinyu Liao¹, Bojie Chen¹, Hao Li², Zhen Wang², You Wang^{1,3}, Guangwei Deng^{1,4}, Haizhi Song^{1,3}, Lixing You², Boyu Fan^{1,5}, Yunru Fan¹, Guangcan Guo^{1,4,5}, Qiang Zhou^{1,4,5}*1. University of Electronic Science and Technology of China, China; 2. Chinese Academy of Sciences, China; 3. Southwest Institute of Technical Physics, China; 4. University of Science and Technology of China, China; 5. Tianfu Jiangxi Laboratory, China*

We experimentally demonstrate bidirectional generation of correlated photon pair from a single piece of periodically poled lithium niobate waveguide. Our results pave the way for developing a cost-effective quantum light source.

ACPIPOC-0808-2

Flexible Anti-Counterfeiting Labels Based on Lens-Free Plasmonic Physical Unclonable FunctionsYizhe Xiong¹, Juntao Duan¹, Wenkai Shan¹, Guoqun Li¹, Qi Hao², Jiawei Wang¹*1. Harbin Institute of Technology (Shenzhen), China; 2. Southeast University, China*

We report a scheme of realizing flexible anti-counterfeiting labels leveraging plasmonic physical unclonable functions. The devices were made by template-assisted deposition of heterogenous plasmonic gold nanoparticles and transferring onto polydimethylsiloxane substrates. Taking advantage of lensless imaging, the generated cryptographic keys exhibit nice uniqueness and repeatability upon repeated stretching up to 30% tensile strain

ACPIPOC-0814-56

Silicon-Photonics-Empowered Physical Unclonable Functions Using Chaotic Resonances

Yu Miao, Wenkai Shan, Juntao Duan, Yihao Chen, Jiawei Wang

Harbin Institute of Technology (Shenzhen), China

We report optical physical unclonable functions based on a deformed microcavity leveraging silicon photonics technology. The adopted quadrupolar microdisk design with an adjustable deformation parameter enables the generation of chaotic resonances. Via introducing embedded scatterers, the spectral response exhibits nice randomness and uniqueness. Key generation was processed utilizing wavelet transform and pool based key generation and expansion. In practice, the correlation analysis between the original and six copied devices examines the superior reproducibility.

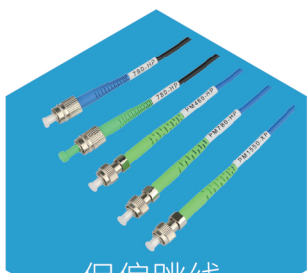
ACPIPOC-0815-102

Pigment Classification Based on Snapshot Hyperspectral Imaging System and AlexNet

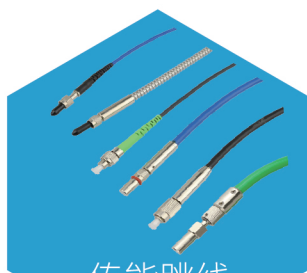
Lefei Xu, Zhenming Yu, Jingyue Ma, Yue Zhou, Haiying Zhao, Kun Xu

Beijing University of Posts and Telecommunications, China

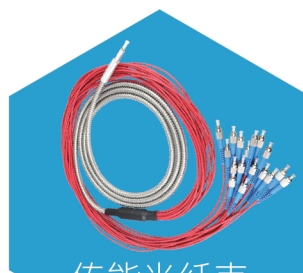
In this paper, we implement pigment classification by using snapshot hyperspectral imaging system and AlexNet. We identify the corresponding pigments in three paintings, which provides reference for the application of snapshot hyperspectral imaging system.



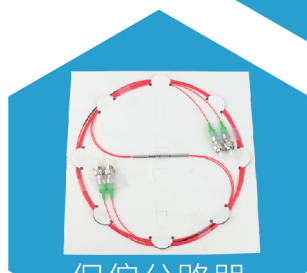
保偏跳线



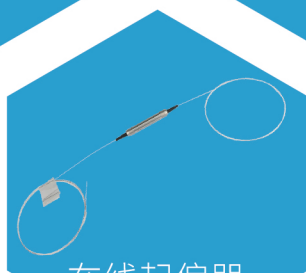
传能跳线



传能光纤束



保偏分路器



在线起偏器



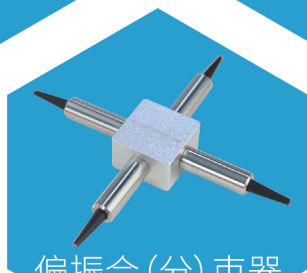
真空馈通法兰



七芯扇入扇出



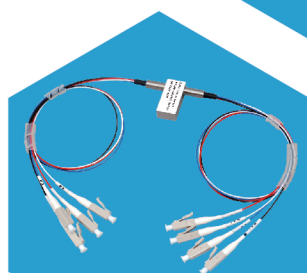
Filter 光分路器



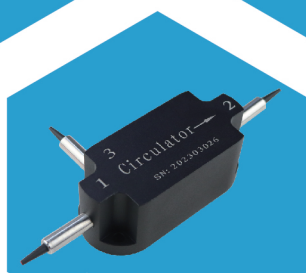
偏振合(分)束器



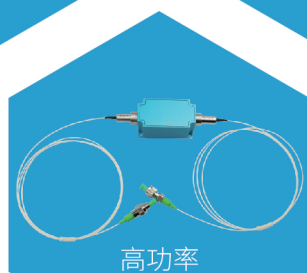
高功率分路器



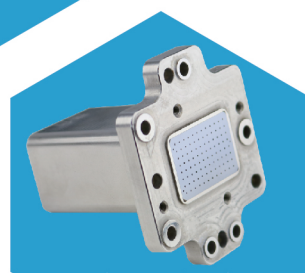
机械式光开关



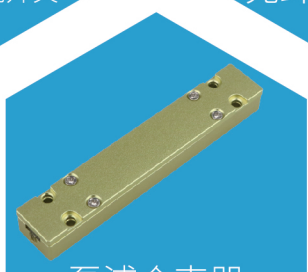
光纤环形器



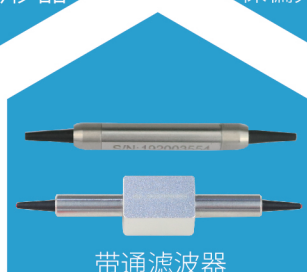
高功率
保偏光纤隔离器



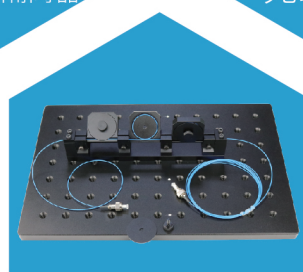
光纤阵列



泵浦合束器



带通滤波器
泵浦保护器



手动偏振控制器



性能特点

- 波长范围：C / L 波段
- 带宽：23GHz/40GHz/60GHz
- 波特率：32GBaud/64GBaud/96GBaud

相干发射机



性能特点

- 波长范围：C / L 波段
- 小信号带宽：22GHz/40GHz/60GHz
- 符号率：32GBaud/64GBaud/96GBaud

相干接收机



OMTP-08/12 是一款专为高端实验室和高严格制造生成环境设计的一套多应用、可编程、可扩展的通用光学测试平台。最多可支持 12 个模块，可支持宽带光源、稳定光源、可调谐光源、光开关、光功率计、可调光衰减器、光谱仪等功能模块，支持热插拔，上电控制等功能，支持屏幕或上位机软件控制。



光功率计模块



可调谐光源模块



宽带光源模块



稳定光源模块



光谱仪模块

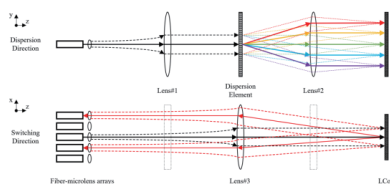


可调光衰减模块



光开关模块

多功能集成测试平台



Super C band waveshaper 是一款先进的可编程光处理器，专为光学研发和生产测试应用设计。该产品基于硅基液晶 LCoS，能够精确控制光学参数，如中心波长、带宽、形状、色散和衰减，广泛应用于光通信领域。

主要应用

- 复用 / 解复用：支持灵活栅格网络架构，包括非等间隔信道
- 光系统加载：生成可控光梳，用于放大器和光系统测试
- 波形整形：提供对通信信号波形和激光脉冲等的精细控制

性能特点

- 高分辨率光处理：支持灵活栅格，实现精确的滤波控制。
- 灵活的滤波选项：支持多种可编程光学滤波和切换模式。

产品参数	描述
端口数	1 Com + 4 or 8 add/drop ports
工作频段	190.6-196.6THz
可调谐带宽精度	3.125 GHz
支持的滤波带宽	10GHz ~ 6THz
滤波类型	任意波形
端口插损	< 8 dB
端口插损平坦度	< 0.7 dB
PDL	≤ 1.5 dB
衰减调整范围	0 ~ 30 dB
衰减调整精度	1 dB
衰减设置分辨率	0.1 dB
端口 / 通道隔离度	相邻端口、通道 ≥ 25 dB, 非相邻 ≥ 35 dB

C/C++ 波段可编程光处理器

性能特点

- 线宽 <100kHz (25kHz typ.)
- 输出功率范围：7-15dBm
- 工作波长范围：C / C++ / L/L++ 波段
- 24 小时光功率稳定性：±0.03dB(typ.)
- 频率微调分辨率：1MHz



手持式单通道可调谐光源

性能特点

- 8 个电通道接口可并行工作
- 支持 NRZ、PAM4 码型多种速率
- 发射端支持 5 TAP 预加重设置
- 接收端支持 GAIN 和 CTLE 设置
- 支持 KP4-RS (544, 514) FEC 功能



800G 误码测试仪

性能特点

- 最大探测距离：50km
- 定位精度：4m (最小)
- 空间分辨率：5~50m 可调
- 灵敏度：0.1ne/√Hz@>10Hz
- 响应频段：0.1Hz-50kHz



DAS 解调仪模块

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数据通信

科学通信

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光纤传感

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