ACP 2023 Wuhan · China

POEM 2023 International Photonics and OptoElectronics Meetings

ACP / POEM 2023

Asia Communications and Photonics Conference
The International Photonics and OptoElectronics Meetings

Nov.4–7, 2023 | Wuhan, China

Host

華中科技大學 HUAZHONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

Co-Hosts

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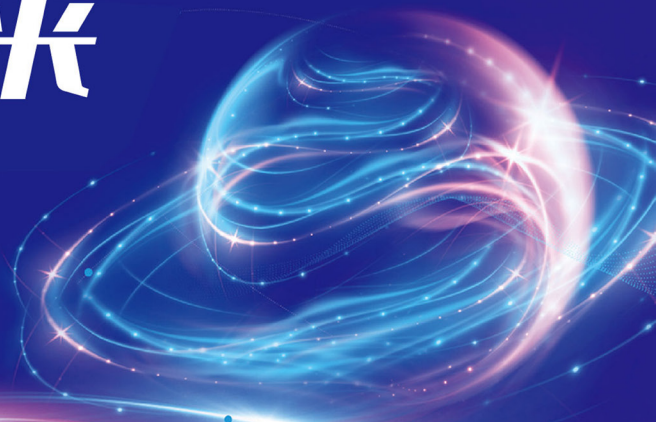

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Welcome to the Asia Communications and Photonics Conference and The International Photonics and OptoElectronics Meetings

It is a great pleasure to invite you to participate in the Asia Communications and Photonics Conference (ACP)/ The International Photonics and OptoElectronics Meetings (POEM) 2023 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 and CIC.

The ACP/POEM technical conference features a full suite of plenary, tutorial, invited, and contributed talks given by international academic and industrial researchers who are leaders in their respective fields. This year's conference will feature the following topics: Optical Fibers 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; Photonics for Energy; Micro-, Nano-, and Quantum Photonics: Science and Applications; Photonic Sensors & Bio-Photonics. The conference will also include a wide spectrum of workshops and industrial forums taking place on November 4th. With a conference program of broad scope and of the highest technical quality, ACP/POEM 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 700 papers scheduled, including over 100 invited and 10 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/POEM a truly unique, outstanding global event.

Our conference highlight is the Plenary Session scheduled on the morning of Sunday (November 5th). Four outstanding, distinguished speakers will give presentations: Tobias Kippenberg from EPFL will discuss hybrid low loss integrated photonics: from chipscale frequency combs, frequency agile lasers, erbium amplifiers to cryogenic quantum interconnects. Seb Savory from University of Cambridge will give a talk on Where next for digital coherent transceivers. Mona Jarrahi from Unversity of California Los Angeles will discuss Real-Time Hyperspectral Terahertz Imaging. Xiaojun Tang from Huawei Technologies Co., Ltd. will talk about Optical Communication System Architecture & Technology Evolution towards 2030.

In addition to the regular technical sessions, 10 workshops, 3 industrial forums and 1 special symposium will feature additional 134 speakers. The pre-conference workshops and industrial forums will be held on Saturday, 4th November. Special symposium will be held on Monday, 6th November. These workshops, industrial forums and special symposium will be held free of charge to conference registrants. We would like to thank the workshop, symposium 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, November 6th. The poster-only session will be held on 15:30–18:00, Monday, 6th 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 November 5th. On the evening of Monday, November 6th, 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 Huazhong University of Science and Technology. We also thank the professional societies such as IEEE Photonics Society, Optica, SPIE, COS and CIC for organizing and sponsoring this great event.

Sincerely,

ACP/POEM 2023 General Chair
Xinliang Zhang

Xidian University, China
Huazhong University of Science and Technology, China

COMMITTEE

Host

華中科技大學
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Co-Hosts

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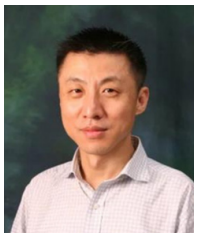

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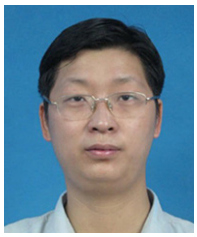

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Ning Deng, Huawei Technologies, China
Xuwei Xue, Beijing University of Posts and Telecommunications, China

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Xianshu Luo, Institute of Microelectronics, A*STAR, Singapore
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Yi Xu, Gaungdong University of Technology, China
Lijian Zhang, Nanjing University, China
Pei Zhang, Xi'an Jiaotong University, China
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Track 8: Photonic Sensors & Bio-Photonics

Chairs

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GENERAL INFORMATION

Conference Venue

Wanda Reign Wuhan
Address: 138 Donghu Road, Fruithu Street, Wuchang District, Wuhan City, Hubei Province, China

Accessibility

Wanda Reign Wuhan is located in the beautiful East Lake scenic area, surrounded by shopping and leisure places such as Chu River Han Street. It is about 1 hour drive from Wuhan Tianhe International Airport.

Registration

Location: Lobby of Wanda Reign Wuhan
07:30-20:00 Saturday, 4 November
07:30-19:00 Sunday, 5 November
08:00-18:00 Monday, 6 November
08:00-16:00 Tuesday, 7 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 but these papers will not be published.**

Onsite Poster Preparation

Authors should prepare their poster before the poster session starts. Authors are required to be standing by their poster for the duration of their allocated session to answer questions and further discuss their work with attendees. **No shows posters will be reported to conference management but 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, 6 November
Location:

Post Area I, 2F	Track 1 +2
Post Area II, 2F	Track 6
Post Area III, 2F	Track 8
Post Area IV, 2F	Track 7
Post Area V, 2F	Track 5
Post Area, 3F	Track 3 + Track 4

Note: For your safety, post area is divided into six zones.Please find the section of your track and post it. Each board has a Control ID, please note if it is your own ID when posting.
Set-up time: 08:00-18:00, Sunday, 5 November; 08:00-14:00, Monday, 6 November
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/POEM 2023 Committee. Certificates and Awards will be presented to the winners at the conference banquet and award ceremony. The nomination of this award are marked Industry Innovation Nomination in this program.

Best Paper Award

Best Paper Award Session: 13:30-18:00, Sunday, 5 November
Location: New York Hall, 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. 8 papers will be selected by the ACP/POEM 2023 Committee. Certificates and Awards will be presented to the winners at the conference banquet and award ceremony.

Best Student Paper Award

Best Student Paper Award Session: 13:30-18:00, Sunday, 5 November
Location: Chengdu Hall, 3F
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. 8 winners will be selected by the ACP/POEM 2023 Committee. Certificates and Awards will be presented to the winners at the conference banquet and award ceremony.

Best Poster Award

Poster Session: 15:30-18:00, Monday, 6 November
Location:

Post Area I, 2F	Track 1 + Track 2
Post Area II, 2F	Track 6
Post Area III, 2F	Track 8
Post Area IV, 2F	Track 7
Post Area V, 2F	Track 5
Post Area, 3F	Track 3 + Track 4

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/POEM 2023 Exhibition is open to all attendees.
Location: Grand Ballroom Foyer, 3F
09:00-18:00 Sunday, 5 November
09:00-18:00 Monday, 6 November
09:00-16:00 Tuesday, 7 November

Coffee Breaks

10:00-10:30	Saturday, 4 November
15:00-15:30	Saturday, 4 November
10:00-10:30	Sunday, 5 November
15:30-16:00	Sunday, 5 November
10:00-10:30	Monday, 6 November
15:30-16:00	Monday, 6 November
10:00-10:30	Tuesday, 7 November
15:30-16:00	Tuesday, 7 November

Lunches

Location: Cafe Reign 1F & RIVER DRUNK, 6F
11:30-13:30 Sunday, 5 November
11:30-13:30 Monday, 6 November
11:30-13:30 Tuesday, 7 November

Dinners

Location: Cafe Reign 1F & RIVER DRUNK, 6F
17:30-20:00 Saturday, 4 November
17:30-20:00 Monday, 6 November

Welcome Reception

Location: Cafe Reign 1F & RIVER DRUNK, 6F
17:30-20:00 Sunday, 5 November

Banquet and Award Ceremony

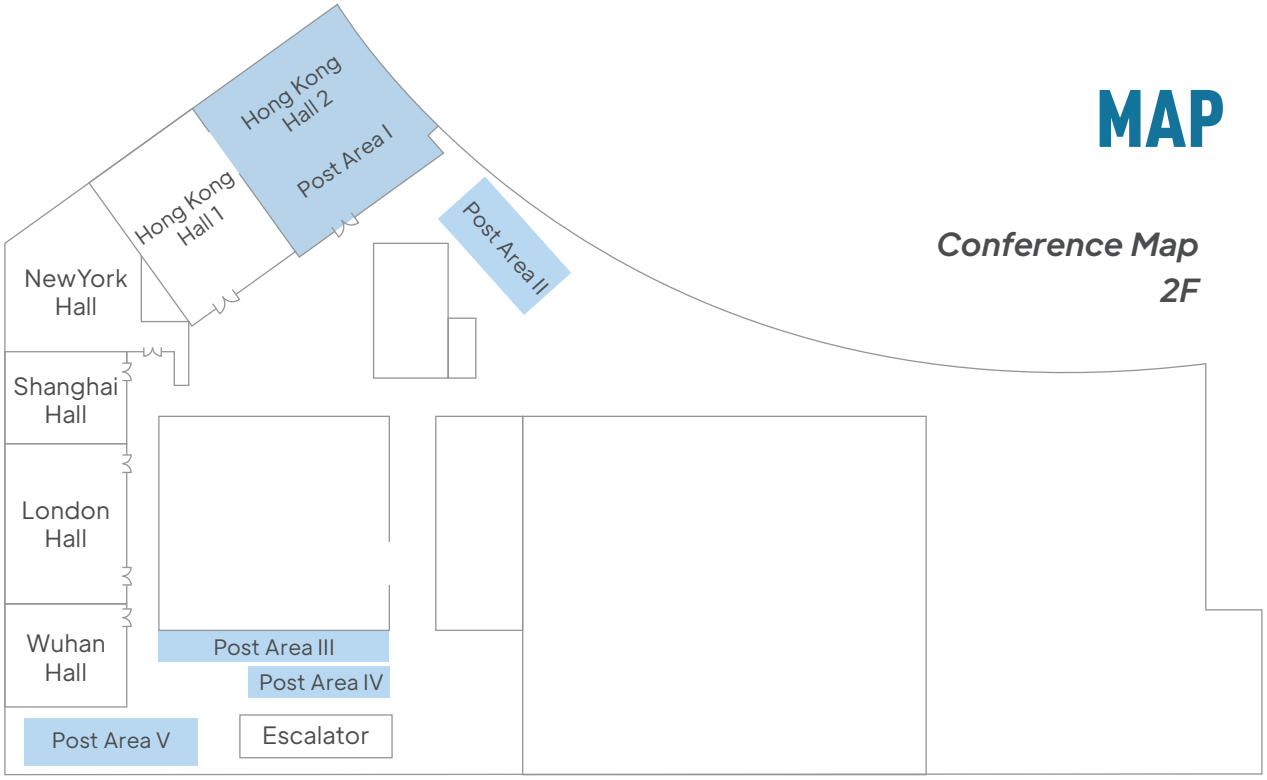
Best Paper Award in Industry Innovation, Best Paper Award, Best Student Paper Award, and Best Poster Award will be presented at the banquet. The Banquet is **NOT INCLUDED** in the registration fee for students, but is included for all other regular registration types. The ticket is provided within the badge.
Location: Grand Ballroom, 3F
Time: 18:30-21:00 Monday, 6 November

PROGRAM AT A GLANCE

	Saturday Nov.4	Sunday Nov.5	Monday Nov.6	Tuesday Nov.7
Registration Lobby, 1F	07:30-20:00	07:30-19:00	08:00-18:00	08:00-16:00
Workshop & Industry Forum 2F & 3F	08:30-18:00			
Special Symposium Gui Yuan Si, 33F			13:30-17:20	
Special Event: Meet the Editor VIP Room, 3F		19:30-21:30		
Opening Ceremony & Optica Fellows Presentation Grand Ballroom, 3F		08:30-08:45		
Plenary Session Grand Ballroom, 3F		08:45-12:00		
Technical Session 2F & 3F		13:30-18:00	08:30-15:30	08:30-18:00
Best Paper Award Competition Session New York Hall, 2F		13:30-18:00		
Best Student Paper Competition Session Chengdu Hall, 3F		13:30-18:30		
Postdeadline Session VIP Room 3F & Chicago Hall 3F			16:00-18:00	
Poster Session 2F & 3F			15:30-18:00	
Exhibition Grand Ballroom Foyer, 3F		09:00-18:00	09:00-18:00	09:00-16:00
Welcome Reception Cafe Reign 1F & River Drunk 6F		17:30-20:00		
Banquet and Awards Ceremony Grand Ballroom, 3F			18:30-21:00	

MAP

Conference Map
2F



4 November

Hong Kong Hall I
Workshop: Advanced Algorithms for Future Optical Communication Systems
Workshop: Optical Switching and Interconnecting for Data Center Networks and High-Performance Computing
Hong Kong Hall II
Workshop: Industrial Optical Network Technology and Application
Workshop: Optical Wireless Communication for 6G
London Hall
Workshop: The 10th Sino-French "Photonics and Optoelectronics" PHOTONET International Research Network

5 November

Shanghai Hall
Track 6: Photonics for Energy
London Hall
Track 7: Micro-, Nano-, and Quantum Photonics: Science and Applications
Hong Kong Hall I
Track 8: Photonic Sensors & Bio-Photonics
New York Hall
Best Paper Award Competition Session

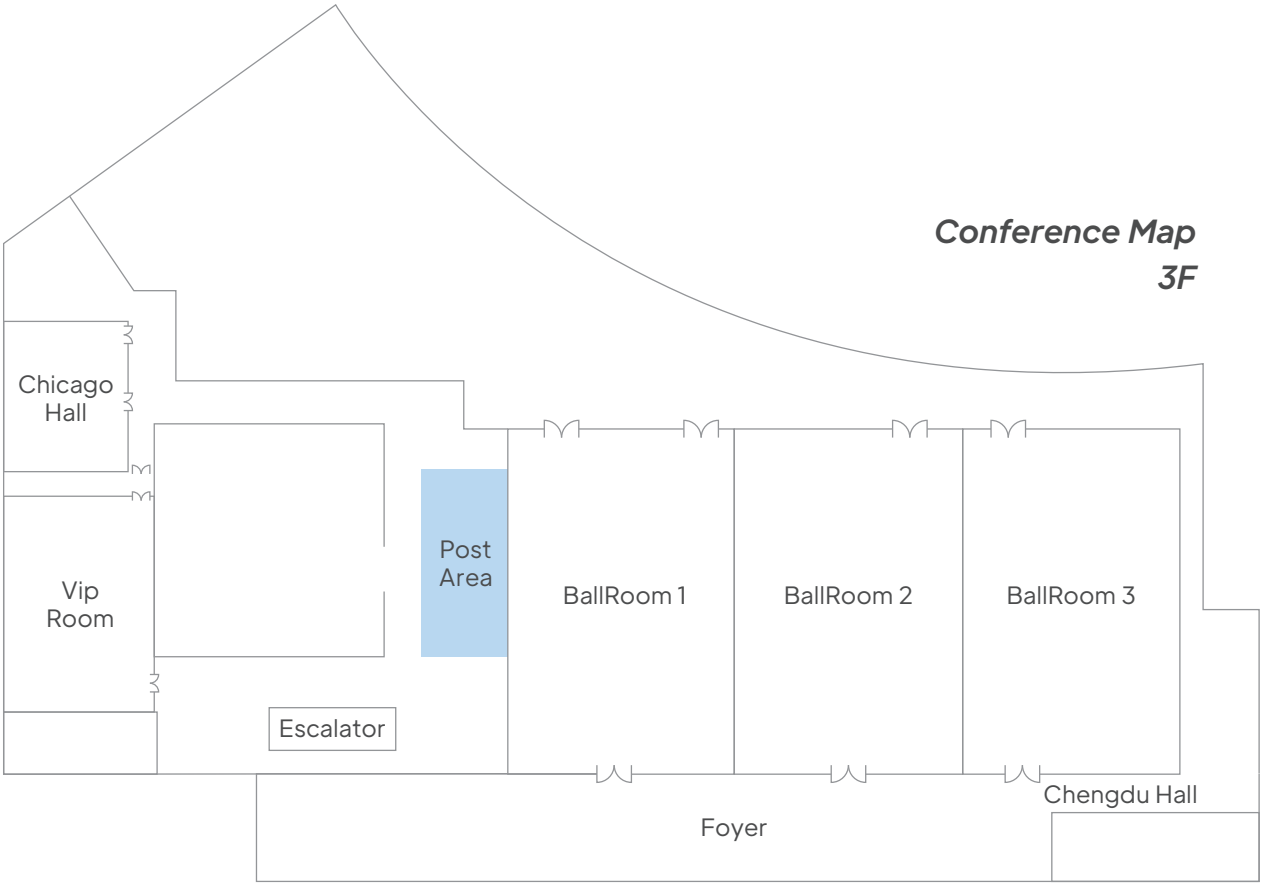
6 November

New York Hall
Track 2: Optical Transmission Systems, Subsystems and Technologies (Parallel Session)
Shanghai Hall
Track 6: Photonics for Energy
London Hall
Track 7: Micro-, Nano-, and Quantum Photonics: Science and Applications
Hong Kong Hall I
Track 8: Photonic Sensors & Bio-Photonics

Poster Session
Post Area I (Track 1 +2)
Post Area II (Track 6)
Post Area III (Track 8)
Post Area IV (Track 7)
Post Area V (Track 5)

7 November

New York Hall
Track 2: Optical Transmission Systems, Subsystems and Technologies (Parallel Session)
London Hall
Track 7: Micro-, Nano-, and Quantum Photonics: Science and Applications
Hong Kong Hall I
Track 8: Photonic Sensors & Bio-Photonics



4 November

VIP Room
Forum: Optical Network Applications: Opportunities and Challenges in the AIGC and 6G Era
Workshop: Novel Structured Light: Manipulation and Applications
Chicago Hall
Workshop: Reconfigurable photonics based on phase change materials
Workshop: Will AIGC Requires Disruptive Optical Interconnect Technologies
Grand Ballroom I
Forum: F5G-Advanced Symposium
Grand Ballroom II
Workshop: HUSTers in Photonics
Grand Ballroom III
Forum: Research on Ultrahigh-speed, Ultralarge-capacity , Ultralong-haul transmission for Next-generation network
Workshop: Broadband Gain Fibers and MultiBand Amplifiers for Optical Communication

5 November

Grand Ballroom I
Track 1: Optical Fibers and Fiber-based Devices
Grand Ballroom II
Track 2: Optical Transmission Systems, Subsystems and Technologies
Grand Ballroom III
Track 3: Network Architectures, Management and Applications
VIP Room
Track 4: Optoelectronic Devices and Integration
Chicago Hall
Track 5: Microwave Photonics and Optical Signal Processing
Chengdu Hall
Best Student Paper Award Competition Session

6 November

Grand Ballroom I
Track 1: Optical Fibers and Fiber-based Devices
Grand Ballroom II
Track 2: Optical Transmission Systems, Subsystems and Technologies
Grand Ballroom III
Track 3: Network Architectures, Management and Applications
VIP Room
Track 4: Optoelectronic Devices and Integration
Postdeadline Paper Session I
Chicago Hall
Track 5: Microwave Photonics and Optical Signal Processing
Postdeadline Paper Session II

Poster Session
Post Area (Track 3 + Track 4)

7 November

Grand Ballroom I
Track 1: Optical Fibers and Fiber-based Devices
Grand Ballroom II
Track 2: Optical Transmission Systems, Subsystems and Technologies
Grand Ballroom III
Track 3: Network Architectures, Management and Applications
VIP Room
Track 4: Optoelectronic Devices and Integration
Chicago Hall
Track 5: Microwave Photonics and Optical Signal Processing

Workshops & Industrial Forum

4 November · Saturday								
	VIP Room 3F	Chicago Hall 3F	Grand Ballroom I 3F	Grand Ballroom II 3F	Grand Ballroom III 3F	Hong Kong Hall I 2F	Hong Kong Hall II 2F	London Hall 2F
08:30-12:00	**Forum:** Optical Network Applications: Opportunities and Challenges in the AIGC and 6G Era *(8:50-12:30)*	**Workshop:** Reconfigurable photonics based on phase change materials *(ends at 12:15)*	/	/	**Forum:** Research on Ultrahigh-speed, Ultralarge-capacity , Ultralong-haul transmission for Next-generation network *(ends at 12:05)*	**Workshop:** Advanced Algorithms for Future Optical Communication Systems	**Workshop:** Industrial Optical Network Technology and Application *(starts at 09:00)*	**Workshop:** The 10th Sino-French "Photonics and Optoelectronics" PHOTONET International Research Network *(09:00-11:50)*
12:00-13:30	Lunch Break							
13:30-18:00	**Workshop:** Novel Structured Light: Manipulation and Applications *(14:00-17:40)*	**Workshop:** Will AIGC Requires Disruptive Optical Interconnect Technologies *(ends at 17:15)*	**Forum:** F5G-Advanced Symposium *(strats at 14:00)*	**Workshop:** HUSTers in Photonics *(ends at 17:45)*	**Workshop:** Broadband Gain Fibers and MultiBand Amplifiers for Optical Communication *(starts at 14:00)*	**Workshop:** Optical Switching and Interconnecting for Data Center Networks and High-Performance Computing *(ends at 17:00)*	**Workshop:** Optical Wireless Communication for 6G *(ends at 17:40)*	**Workshop:** The 10th Sino-French "Photonics and Optoelectronics" PHOTONET International Research Network *(14:30-17:20)*

Special Symposium

6 November · Monday	
13:30-17:20	**Optica Foundation Challenge for Groundbreaking Innovations - Use photonics, find a solution, and change the world** Gui Yuan Si, 33F

The 10th Sino-French "Photonics and Optoelectronics" PHOTONET International Research Network Workshop

The Sino-French PHOTONET Optoelectronics International Cooperation Research Network is committed to cooperation and collaborative innovation in the fields of optics and optoelectronics between China and France. This workshop will focus on the topics of integrated optics, optical fiber communication and sensing, nano optics, biomedical photonics and other topics for academic exchange and discussion, and discuss the future development plan of the Sino-French PHOTONET optoelectronics international cooperation research network.

Date: 4 November Time: 09:00-17:20 Venue: London Hall, 2F

Chairs:
Dingshan Gao, Huazhong University of Science and Technology
Benfeng Bai, Tsinghua University
Boris Gralak, Institut Fresnel, CNRS
Walter Blondel, University of Lorraine
Christophe Peucheret, University of Rennes

Speakers:

09:00-09:15 **Opening Speech and Group Photo**

09:15-09:35 **Boris Gralak,** Institut Fresnel, CNRS
Topic: Dispersive Perfectly Matched Layer for the Computation of Quasinormal Modes of Open Electromagnetic Structures

09:35-09:55 **Benfeng Bai,** Tsinghua University
Topic: Super-Resolved Imaging of Nanodefects and Excitonic Properties of Low-Dimensional Materials in the Optical near Field

09:55-10:15 **Walter Blondel,** University of Lorraine
Topic: Multimodal Optical Spectroscopy for Human Skin Cancer in Vivo Diagnosis

10:15-10:30 Coffee Break

10:30-10:50 **Jiaming Hao,** Fudan University
Topic: Infrared Photodetection Enhanced by Optical Engineering Nanostructures

10:50-11:10 **Gabriel Charlet,** Huawei Paris Lab
Topic: Ultra Wide Band WDM Optical Fiber Transmission

11:10-11:30 **Qiong He,** Fudan University
Topic: Tunable Metasurfaces for Terahertz Wave Manipulation

11:30-11:50 **Honghua Fang,** Tsinghua University
Topic: Visualization of Exciton Diffusion in Optoelectronics

11:50-14:30 Lunch Break

14:30-14:50 **Christophe Peucheret,** University of Rennes
Topic: Electro-Optic Frequency Combs Using Silicon Ring Resonator Modulators

14:50-15:10 **Jing Xu,** Huazhong University of Science and Technology
Topic: Parity Time Based Spectrum Manipulation of Microcavities

15:10-15:30 **Regis Barille**, University of Angers
Topic: Coupling Light at the Interface of Liquids

15:30-15:50 **Dingshan Gao,** Huazhong University of Science and Technology
Topic: High Efficiency Second-Harmonic Generation in Thin Film Lithium Niobate Optical Waveguides

15:50-16:10 **Lu Zhang,** Zhejiang University
Topic: Broadband Radio-over-Fiber Systems for Integrated Communication and Sensing

16:10-16:20 Coffee Break

16:20-17:20 **Round Table Discussion of Sino-French PHOTONET Network**

Will AIGC Requires Disruptive Optical Interconnect Technologies

As one of the key enabling technologies for industry 4.0, Artificial Intelligence (AI) has been a hot topic and attracted lots of attention in past decades in both academia and industries. With the recent emergence of ChatGPT, generative AI (AIGC) has made headlines everywhere. The generative AI, which allows for the creation of the original content by learning from existing data with machines, may revolutionize industries and transform the way companies operate in the near future.

With unprecedented amounts of computing power required, AIGC may reshape the IT infrastructure as well. It has been shown that the total amount of computing power for large model training has been doubling every three to four months, much faster than Moore's law. Massive parallelism has to be used to provide such high computing power due to the speed limit of a single GPU chip, generating huge demands for optical interconnects, which has been manifested by recent demand surge for optical transceivers in the market.

Will AIGC requires significantly different optical interconnect technologies than current ones on form factors, bandwidth density, power consumption, latency et al? Can current optical interconnect technologies accommodate the AIGC demands? Will disruptive optical interconnect technologies be needed? This workshop will bring together experts from hyperscalers, AIGC service providers, optical interconnects.

Date: 4 November Time: 13:30-17:15 Venue: Chicago Hall, 3F

Organizers:
Chongjin Xie, Alibaba
Ning Liu, Soochow University
Ming Tang, Huazhong University of Science and Technology

Speakers:

Presider: Ming Tang, Huazhong University of Science and Technology

13:30-13:45 **Jianbo Dong,** Alibaba
Topic: Experience in communication optimization in large-scale AI clusters

13:45-14:00 **Jiansheng Feng,** Tencent
Topic: Challenges and opportunities of Tencent Datacenters

14:00-14:15 **Stefanos Dris,** NVIDIA
Topic: Bridging Data Center Dreams with Optical Interconnect Realities

14:15-14:30 **Ying Huang,** Raintree Photonics
Topic: Evolution of silicon photonics technology commercialization in cloud data centers and AI

14:30-14:45 **Jiangwei Man,** HiSilicon Optoelectronics
Topic: Development Trend and Application Challenges of Optical Interconnection in Future Computing Networks

14:45-15:00 **Brad Booth,** Hyperphotonix
Topic: AIGC's Impact on Optical Connectivity

15:00-15:30 Coffee Break

Presider: Ning Liu, Soochow University

15:30-15:45 **Manish Mehta,** Broadcom
Topic: Progress and innovation in optics for AI networking

15:45-16:00 **Qinfen Hao,** Institute of Computing Technology, Chinese Academy of Sciences
Topic: Chip-level interconnect between GPU and AI chip for AIGC

16:00-16:15 **Gangxiang Shen,** Soochow University
Topic: Optical Switching for Data Center Networks: Rethinking

16:15-16:30 **Bingyi Ye, Weixin Gai,** Peking University
Topic: Analog techniques in low-power high-speed optical receiver

16:30-16:45 **Diogo Costa,** Ipronics
Topic: The next leap in optical communications: Programmable Photonic Processors

Presider: Chongjin Xie, Alibaba

16:45-17:15 **Panel Discussion**

HUSTers in Photonics

Photonics and optoelectronics are fields at the forefront of modern science and technology, playing a pivotal role in various industries, from telecommunications and healthcare to energy and materials science. Our global community of Huazhong University of Science and Technology (HUST) alumni have been at the forefront of innovation and rearch in these domains. This workshop provides an platform for the exchange of their expertise and the acquisition of insights into the most recent developments.

Date: 4 November Time: 13:45–17:45 Venue: Grand Ballroom II, 3F

Organizers:
Yu Yu, Huazhong University of Science and Technology
Junwen Zhang, Fudan University
Li Shen, Huazhong University of Science and Technology

Speakers:

Presider: Yu Yu, Huazhong University of Science and Technology

13:30-13:45 **Opening Speech–Xinliang Zhang,** Xidian University & Huazhong University of Science and Technology

13:45-14:00 **Liuyang Zhang,** Xian Jiaotong University
Topic: Recent advances of Terahertz Detection and Device Fabrication

14:00-14:15 **Ke Wang,** RMIT University
Topic: Terahertz and Optical Wireless Communications

14:15-14:30 **Yi Yu,** Technical University of Denmark
Topic: Semiconductor nanolasers

14:30-14:45 **Chao Xiang,** The University of Hong Kong
Topic: Heterogeneous integrated silicon photonics

14:45–15:15 Coffee Break

Presider: Junwen Zhang, Fudan University

15:15-15:30 **Wei Chen,** Shenzhen Institute of Advanced Technology, CAS
Topic: Mid-far infrared multispectral imaging technology and its application in gas leakage detection

15:30-15:45 **Yang Liu,** EPFL
Topic: Erbium-doped photonic integrated circuit-based amplifiers and lasers

15:45-16:00 **Chaoran Huang,** The Chinese University of Hong Kong
Topic: Photonic Neuromorphic Computing

16:00-16:15 **Xuhan Guo,** Shanghai Jiao Tong University
Topic: Silicon-based photonic integration and multiplexing

16:15-16:30 **Li Tao,** China Ship Development and Design Center
Topic: Microwave Photonic Millimeter-Wave Anti-Jamming Communication Technology

16:30-16:45 **Ending Speech-Ming Tang,** Huazhong University of Science and Technology

Presider: Ming Tang, Huazhong University of Science and Technology

16:45-17:45 **Plenary Discussion**--All HUSTers in ACP Conference

Reconfigurable Photonics Based on Phase Change Materials

Reconfigurable photonics provides a promising solution for manipulating the routing and phase delay within photonic systems, which is crucial for various applications including large-scale optical switching networks, neuromorphic computing, and active metasurfaces. However, traditional reconfigurable photonic components that rely on thermo-optic or electro-optic effects suffer from drawbacks such as high power consumption and large device footprint. These limitations prevent them from meeting the growing demand for scalability in photonic systems.

Phase change materials (PCM), such as chalcogenides and correlated oxides, exhibit a remarkable refractive index change during solid phase transitions. This unique property makes PCM an emerging and promising platform for reconfigurable photonics. By harnessing the extraordinary properties of PCM, it becomes possible to achieve efficient and compact reconfigurable photonic components. This advancement in reconfigurable photonics holds great potential for various applications and can pave the way for the future development of advanced optical technologies.

Date: 4 November Time: 08:30–12:15 Venue: Chicago Hall, 3F

Organizers:
Hongtao Lin, Zhejiang University
Juejun Hu, Massachusetts Institute of Technology

Speakers:

Presider: Hongtao Lin, Zhejiang University

08:30-08:55 **Arka Majumdar,** University of Washington
Topic: NEO-PGA: Nonvolatile Electro-Optically Programmable Gate Array

08:55-09:20 **Juejun Hu,** Massachusetts Institute of Technology
Topic: Triumphs and pitfalls of phase change reconfigurable photonics

09:20-09:45 **Linjie Zhou,** Shanghai Jiao Tong University
Topic: Low-loss phase change optical devices for photonic integrated circuits

09:45-10:10 **Junbo Yang,** National University of Defense Technology
Topic: Infrared radiation regulator based on phase change materials

10:10–10:30 Coffee Break

Presider: Juejun Hu, Massachusetts Institute of Technology

10:30-10:55 **Zhaohui Li,** Sun Yat-sen University
Topic: Phase-dominant spatial light modulation using low-loss chalcogenide phase change metasurfaces

10:55-11:20 **Zengguang Cheng,** Fudan University
Topic: Phase change photonics for memory and computing applications

11:20-11:45 **Hongtao Lin,** Zhejiang University
Topic: "Zero change" platform for monolithic back-end-of-line integration of phase change materials in silicon photonics

Presider: Hongtao Lin, Zhejiang University

11:45-12:15 **Panel Discussion**

Optical Wireless Communication for 6G

Optical wireless communication has been actively developed to derive the combined benefits from advanced optical and wireless technologies. With many inherent advantages, such as ultra-high bandwidth, long communication distance, and strong data privacy, optical wireless communication will play an important role in network operations for 6G and beyond. This workshop will offer the platform to discuss the latest research and technology development endeavors in the advanced fields of optical wireless communication. The eventual system implementation of OWC technologies will be an effective solution for successful deployment of 6G.

Date: 4 November Time: 13:30–17:40 Venue: Hong Kong Hall II, 2F

Organizers:
Nan Chi, Fudan University
Boon S. Ooi, King Abdullah University of Science and Technology
Gong-Ru Lin, National Taiwan University

Speakers:

Presider: Nan Chi, Fudan University

13:30-14:00 **Zhengyuan Xu,** USTC (keynote)
Topic: OWC Technology Evolution and Petahertz Communication

14:00-14:20 **Jiaheng Wang,** Southeast University
Topic: Fiber-Enabled Massive MIMO Optical Wireless Communications

14:20-14:40 **Juemin Yi,** SINANO, CAS
Topic: Coherent harmonic generations and photocurrents from nanostructures excited by a few cycle laser pulse

14:40-15:00 **Chao Shen,** Fudan University
Topic: Emerging Optoelectronic Devices for OWC systems

15:00–15:30 Coffee Break

Presider: Chao Shen, Fudan University

15:30-15:50 **Yongjin Wang,** Nanjing University of Posts and Telecommunications
Topic: All-light communication network for space-air-sea integrated interconnection

15:50-16:10 **Mitchell Cox,** University of the Witwatersrand
Topic: Roadmap to free space optics to bridge the digital divide

16:10-16:30 **Xun Guan,** Tsinghua University
Topic: Silicon Photonics for 6G Optical Access Networks

16:30-16:50 **Meiwei Kong,** Tongji University
Topic: Research on integrated system of underwater wireless optical communication and underwater acquisition, pointing, and tracking

16:50-17:10 **Chen Chen,** Chongqing University
Topic: Multi-dimensional transmission for underwater OWC systems

Presider: Boon S. Ooi, King Abdullah University of Science and Technology

17:10-17:40 **Panel Discussion**

Advanced Algorithms for Future Optical Communication Systems

Since its emergence in 1970's, optical fiber communication has deeply shaped the information society by providing the large-capacity infrastructure for data transportation. Especially in the last two decades, coherent communication and optical interconnect technologies based on digital signal processing has drastically increase the transmission data rate/capacity. The associated algorithms of the prevalent systems have become mature so far. However, to accommodate the continuous demand for low power consumption and large capacity for future optical communication systems, advanced algorithms are highly desired to tailor to different scenarios such as long-haul transmission, datacenter interconnect, 6G front haul, optical access networks, free-space optical communication, and so on.

This workshop will address the following questions on the emerging advance algorithms:
1) For optical interconnect, do we need direct detection with phase recovery or optical field reconstruction? How about the future development of low power consumption algorithm for coherent, IMDD and 6G front haul systems?
2) With artificial intelligence techniques entering optical communication field, how it enhances system ability of distortion monitoring and channel equalization? How about AI performance with constrained or limited resources? Could AI really speed up optical system modeling?
3) For future high-speed and high-capacity optical transmission, how much and what kind of benefit we can obtain from more sophisticated or intelligent algorithms? Shall we develop novel photonic simulation tools for emerging applications or building a new design paradigm?

Date: 4 November Time: 08:30–12:00 Venue: Hong Kong Hall I, 2F

Organizers:
Fan Zhang, Peking University
Ming Tang, Huazhong University of Science and Technology
William Shieh, Westlake University

Speakers:

Presider: Fan Zhang, Peking University

08:30-08:45 **Kangping Zhong,** The Hong Kong Polytechnic University
Topic: Power consumption considerations for short reach systems

08:45-09:00 **Oskars Ozolins,** KTH Royal Institute of Technology, Riga Technical University
Topic: Modulators for high symbol rate short-reach communication

09:00-09:15 **Miaofeng Li,** Alibaba Cloud
Topic: Wavelength locking, the key technology for industrialization of micro-ring modulators

09:15-09:30 **Yixiao Zhu,** Shanghai Jiaotong University
Topic: Delta-sigma modulation-enabled high-fidelity fronthaul

09:30-09:45 **Meng Xiang,** Guangdong University of Technology
Topic: Carrier-free Phase-retrieval Receiver with Adaptive Intensity Transformation

09:45-10:00 **Junwen Zhang,** Fudan University
Topic: Advanced Digital Signal Processing for Short-reach Optical Interconnections and Access Networks

10:00–10:30 Coffee Break

Presider: Ming Tang, Huazhong University of Science and Technology

10:30-10:45 **Danshi Wang,** Beijing University of Posts and Telecommunications
Topic: Deep Learning in Optical Fiber Communications: Data-driven or Physics-informed ?

10:45-11:00 **Lilin Yi,** Shanghai Jiaotong University
Topic: End-to-end design of optical transmission systems

11:00-11:15 **Qunbi Zhuge,** Shanghai Jiaotong University
Topic: The real challenges in building a digital twin for intelligent optical networks

11:15-11:30 **Liangchuan Li,** Huawei
Topic: Advanced Algorithms of LH and Access for F5G and beyond

Presider: William Shieh, Westlake University

11:30-12:00 **Panel Discussion**

Novel Structured Light: Manipulation and Applications

Tailoring the spatial structure of lightwaves produces structured light, also known as tailored light, shaped light, sculpted light or custom light. Structured light with spatially variant amplitude, phase, polarization, or even more general spatiotemporal structured light, has grown into a significant field, giving rise to many developments in optical manipulation, optical tweezers, microscopy, imaging, sensing, metrology, nonlinear optics, quantum science and optical communications. This workshop aims to provide a glimpse of some exciting developments in this field, including fundamentals, manipulation and applications of novel structured light.

Date: 4 November Time: 14:00-17:40 Venue: VIP Room, 3F

Organizers:
Jian Wang, Huazhong University of Science and Technology
Xiaocong Yuan, Shenzhen University

Speakers:

Presider: Jian Wang, Huazhong University of Science and Technology

14:00-14:25 **Junsuk Rho,** Pohang University of Science and Technology
Topic: Low-cost and scalable manufacturing of optical metasurfaces in the visible using engineered optical materials

14:25-14:50 **Angela Dudley,** University of the Witwatersrand
Topic: Manipulating exotic polarization structures

14:50-15:15 **Qiwen Zhan,** University of Shanghai for Science and Technology
Topic: Spatiotemporal sculpturing of light

15:15-15:40 **Siyuan Yu,** Sun Yat-sen University
Topic: Space/mode division multiplexed optical fiber communications based on OAM modes

Coffee Break: 15:40-16:00

Presider: Qiwen Zhan, University of Shanghai for Science and Technology

16:00-16:25 **Guixin Li,** Southern University of Science and Technology
Topic: Geometric phase controlled nonlinear photonic metasurfaces

16:25-16:50 **Jian Wang,** Huazhong University of Science and Technology
Topic: Structuring light on photonic integration platforms

16:50-17:15 **Xiaohao Xu,** Xi'an Institute of Optics and Precision Mechanics, CAS
Topic: Multipole optical forces

17:15-17:40 **Peng Shi,** Shenzhen University
Topic: Spin-momentum locking of structured light: properties, characterization and applications

Optical Switching and Interconnecting for Data Center Networks and High-Performance Computing

Current electrical switch technology in DCNs and HPC is expected to hit a wall in 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 latency 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 the 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? And with the emergence of large-scale machine learning models, are there any opportunities for optical switching technologies?
This workshop will discuss the following questions on the optical switching technologies (suggestion):
1) For kinds of switches like SOA, AWGR + tunable laser, MEMS, and MZI, which solution is the most promising solution considering the reconfiguration time, switch radix, power loss, stability and cost, .ect?
2) Do we need fast optical packet switching? Whether the slow optical circuit switching can satisfy the requirements of DCN and HPC? like Google deployed the MEMS in Jupiter. What are the practical challenges to deploying optical switches in large-scale networks? Time Sync? CDR? Switch control? New topology?
3) Could artificial intelligence really enhance optical switching technologies? Can optical switching technology overcome bandwidth bottlenecks in large-scale machine learning models with >10,000 nodes? Apart from the switching capacity, are the cost and power consumption still advantages compared to electrical switches?
4) Different communities address these problems from a different perspective, how to compatible with the solutions from the optical, networking and computer sciences communities?

Date: 4 Novemver Time: 13:30-17:00 Venue: Hong Kong Hall I, 2F

Organizers:
Shikui Shen, China Unicom Research Institute
Lei Gao, Huawei
Xuwei Xue, Beijing University of Posts and Telecommunications

Speakers:

Presider: Shikui Shen, China Unicom Research Institute

13:30-13:40 **Zuqing Zhu,** University of Science and Technology of China
Topic: P4INC-AOI: When In-Network Computing Meets AllOptical Interconnect for Adaptive and Low-Latency Optical DCN

13:40-13:50 **Yongcheng Li,** Soochow University
Topic: Large-Scale All-Optical Switching Networks in Data Centers

13:50-14:00 **Weigang Hou,** Chongqing University of Posts and Telecommunications
Topic: High Elastic Data Center Optical Interconnection Based on Passively-Programmable Metasurface

14:00-14:10 **Jianjun He,** Zhejiang University
Topic: Multi-wavelength multi-port transmitter-router for sub-nanosecond optical switching in HPC and datacenter networks

14:10-14:20 **Fulong Yan,** Beijing University of Posts and Telecommunications
Topic: Cloud computing data center optical switching disaggregation network

14:20-14:30 **Lei Gao,** Huawei
Topic: Optical switching enabled rack scale server

14:30-14:40 **Chongjin Xie,** Alibaba Group
Topic: Optical technologies for data center networks

14:40-14:50 **Xuwei Xue,** Beijing University of Posts and Telecommunications
Topic: AWGR-based optical switching networks

15:00-15:30 Coffee Break

Presider: Xuwei Xue, Beijing University of Posts and Telecommunications

15:30-15:40 **Peter Roorda,** Lumentum
Topic: Technologies for Optical Circuit Switching in Data Center and ML/AI Applications

15:40-15:50 **Xiaojie Yin,** Shijia Photon Technology Co., Ltd.
Topic: Research of PLC passive waveguide technology in optical networks

15:50-16:00 **Hua Zhang,** LUSTER/Polatis
Topic: Discussion on the application of all-optical switching in cloud computing and intelligent computing center

16:00-16:10 **Xu Zhou,** BAIDU
Topic: Optical interconnection technology in DCN in the AIGC era

16:10-16:20 **Shenglei Hu,** Tencent
Topic: Discussion on the application prospects of OCS technology in data centers

16:20-16:30 **Wei Buzheng,** China Unicom Research Institute
Topic: Discussion of datacenter inter/intra connection evolution

Presider: Lei Gao, Huawei

16:30-17:00 **Panel Discussion**

Broadband Gain Fibers and Multiband Amplifiers for Optical Communication

The invention of EDFA ignited the torch of optical fiber commucation development in the 1980's. To broaden the communication bandwidth for long-haul transmission must be the most economical and effective mode for increasing transmission capacity. Recently, the broadband gain fibers and multiband amplifiers for optical communication have been attacted much research interest from many world-famous groups. This workshop will invite the representives of them to present their latest research progress and systematic consideration of the broadband gain fibers and multiband amplifiers for optical communication.

Date: 4 Novemver Time: 14:00–18:00 Venue: Grand Ballroom III, 3F

Organizers:
Ansion LM Xiong, State Key Laboratory of Optical Fiber and Cable Manufacture Technology, YOFC
Junjie Li, China Telecom Research Institute
Tingyun Wang, Shanghai University

Speakers:

Presider: Junjie Li, China Telecom Research Institute

14:00-14:20 **David Payne,** Optoelectronics Research Centre, University of Southampton
Topic: Nothing Beats Silica

14:20-14:40 **Anxu Zhang,** State Key Laboratory of Optical Fiber and Cable Manufacture Technology Telecom Research Institute
Topic: Discussion on the Demand and Technology of Multi-band Amplification in the 400Gb/s Era and Beyond

14:40-15:00 **Dong Wang,** China Mobile Research Institute
Topic: Prospective of New Multi-Band All-Optical Network

15:00-15:20 **Yu Tang,** China Unicom Research Institute
Topic: Discussions on Applications of Raman Amplifiers in Next-Generation Optical Networks

15:20-15:40 **Jun Luo,** Huawei Technologies Co., Ltd.
Topic: Recent Progress of High Capacity Multi-Band Transmission System

15:40–15:50 Coffee Break

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

15:50-16:10 **Qinlian Bu,** Accelink Technologies Co.,Ltd
Topic: New Approaches of Broadband Amplification and Perspectives on Large Capacity Fiber Telecommunication System

16:10-16:30 **Guanshi Qin,** Jilin University
Topic: Thulium Doped Fluorotellurite Glass Fibers for S and U-band Optical Amplifiers

16:30-16:50 **Jianxiang Wen,** Shanghai University
Topic: Recent Progress on O-E Bands Fiber Amplifiers

16:50-17:10 **Li Zhong,** State Key Laboratory of Optical Fiber and Cable Manufacture Technology, Yangtze Optical Fibre and Cable Joint Stock Limited Company (YOFC)
Topic: Recent Progress of Erbium-doped Active Fibers and Their Applications

Presider: Tingyun Wang, Shanghai University

17:10-18:00 **Plenary Discussion**

Industrial Optical Network Technology and Application

This workshop will Invite industry partnerssuch as universities and manufacturers andfocus on the topics of Industrial Internet,Industrial Optical Network, and Applicationand Development, exploring the applicationand technological development of opticalnetwork technology deployed in industrialnternet scenarios.

Date: 4 Novemver Time: 09:00–12:00 Venue: Hong Kong Hall II, 2F

Organizers:
Xiongyan Tang, China Unicom.

Presider: Xiongyan Tang & Yue Sun, China Unicom

09:00-09:10 **Opening Speech**
Xiongyan Tang, China Unicom.

Speakers:

09:10-09:30 **Mengfan Cheng,** Huazhong University of Science and Technology
Topic: Exploration of Key Technologies for High Capacity and Wide Coverage Industrial Optical Network and Physical Layer Security

09:30-09:50 **Gang Zheng,** Huawei
Topic: Research on Key Technologies for Security Carrying in P2MP Networking for Industrial Scenarios

09:50-10:10 **Meilin Wang,** Guangdong University of Technology
Topic: Multi-protocol conversion and application cases in industrial gateway

10:10-10:30 **Shixuan Liao,** iService New Technology Holdings Limited
Topic: Industrial IoT Edge Cloud Collaboration

10:30–10:50 Coffee Break

10:50-11:10 **Qiang Zhang,** Hisense Broadband
Topic: 50G PON Optical Modules for Industrial Internet

11:10-11:30 **Haijun Wang,** China Unicom.
Topic: Development and Application of Industrial Optical Network Technology

11:30-12:00 **Plenary Discussion**

Industrial Forum

Optical Network Applications: Opportunities and Challenges in the AIGC and 6G Era

AI intelligent computing represented by ChatGPT has exploded in the world, and AI computing power has become one of the core driving forces of the optical communication market, driving the 400G/800G market demand to exceed the expected growth; At the same time, facing the space-air-ground integrated network in the future 6G era, 400G coherent solution will begin to be deployed on a large scale in the backbone network, and the optical transport network will still play a key role. This forum will focus on hot topics such as 800G/1.6T, CPO/LPO, all-optical switching, intelligent optical transport network, and deeply discuss the application of optical interconnection and all optical switching, as well as the opportunities and challenges it faces.

Date: 4 Novemver Time: 08:50–12:30 Venue: VIP Room, 3F

Organizers:
Zhiping Zhou, Peking University
Hua Zhang, LUSTER LightTech Co.,Ltd.

Speakers:
08:50-09:00 Welcome Speech

Presider: Zhiping Zhou, Peking University

09:00-09:20 **Wenyu Zhao,** CAICT
Topic: Some Hottest Topics and Development Prospects of Optical Networks in the Era of Intelligent and Computing

09:20-09:40 **Junjie Li,** China Telecom
Topic: Opportunities and Challenges for Optical Networking Technology in the AIGC Era

09:40-10:00 **Shikui Shen,** China Unicom
Topic: Technology and Application Discussion of Metro Network Modules

10:00-10:20 **Hua Zhang,** LUSTER LightTech Co.,Ltd.
Topic: Discussion on the Application of All-Optical Switching in Intelligent Computing Centers and Satellite Internet

10:20–10:30 Coffee Break

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

10:30-10:50 **Guojun Yuan,** Institute of Computing Technology, Chinese Academy of Sciences
Topic: Optical Networking in Post-Exascale Supercomputing

10:50-11:10 **Xue Wang,** H3C
Topic: Practice and Thinking of High-Speed Optical Connections

11:10-11:30 **Cheng Chen,** JD.com
Topic: Hot Technologies for Future Optical Interconnection in Datacenter

11:30-11:50 **Richard Zhang,** Intel
Topic: Intel Siph Development on Technology and Application

11:50-12:30 **Plenary Discussion**

Research on Ultrahigh-speed, Ultralarge-capacity , Ultralong-haul transmission for Next-generation network

This Industry Forum will invite industry partners, including Universities, Operators and Manufacturers, to discuss the developments and trends of Ultrahigh-speed, Ultralarge-capacity , Ultralong-haul transmission in Next-generation network.

Date: 4 Novemver Time: 08:30-12:05 Venue: Grand Ballroom III, 3F

Organizers:
Bin Zhang, FiberHome
Yi Cai, Soochow University

Speakers:

Presider: Bin Zhang, FiberHome

08:30-08:45 **Leader's oration**

08:45-09:05 **Wang Dong,** China Mobile Research Institute
Topic: Prospective of New All-Optical Network for Computing Force Network

09:05-09:25 **Wang YaQing,** FiberHome Telecommunication Technologies Co., Ltd.
Topic: Key Technologies and Trends of Pbit Optical Transmission System

09:25-09:45 **Cao Quan,** Wuhan Fisilink Microelectronics Technology Co.,LTD
Topic: Discussion on the Evolution Trends of Coherent Optical Technologies

09:45-10:05 **Xiao Xi,** State Key Laboratory of Optical Fiber Communication Technology and Network
Topic: Solutions of coherent optical transceiver for 800G beyond

10:05-10:30 Coffee Break

Presider: Yi Cai, Soochow University

10:30-10:50 **Cai Yi,** Soochow University
Topic: Overhead-free error detection and correction for self-coherent polarization-multiplexed optical fiber transmissions

10:50-11:10 **Yang Qi,** Huazhong University of Science and Technology
Topic: Multi-Carrier for future optical transmission

11:10-11:30 **Wu Jian,** Beijing University of Posts and Telecommunications
Topic: Key technologies for single channel 800Gbps long haul transmission

11:30-11:50 **Vincent Zhang,** Minnesota State University
Topic: Modeling Nonlinear Dynamics in High-Capacity Optical Fiber Communication Networks with Enhanced Numerical Accuracy and Simulation Efficiency

11:50-12:05 **Plenary Discussion**

F5G-Advanced Symposium

F5G was created in ETSI in 2020 and now it's time to migrate into F5G-Advanced (F5G-A). New technologies and applications are emerging for the transport, home and access network. Research and standard effort have been made on investigating the new generation of OTN, PON and Home network. The impact of artificial intelligence is also discussed.

Date: 4 Novemver Time: 14:00-18:00 Venue: Grand Ballroom I, 3F

Organizer:
Wang Xiang, Huawei

Speakers:

Presider: Wang Xiang, Huawei

14:00-14:30 **Zhiyong Feng,** Huawei Technologies
Topic: Industry Vision of F5.5G and F6G

14:30-15:00 **Sheng Liu,** China Mobile
Topic: Future OTN Technologies and Applications

15:00-15:30 **Lingjuan Zhao,** Institute of Semiconductors, CAS
Topic: Research Progress of 50G PON Optical Components

15:30-16:00 Coffee Break

16:00-16:30 **Yingzhuang Liu,** Huazhong University of Science and Technology
Topic: Fiber-to-the-room(FTTR): C-WAN Architecture and Network Coordination

16:30-17:00 **Ji Zhou,** Jinan University
Topic: Research on Key Technologies and Algorithms of Beyond 50G PON

17:00-17:30 **Xuming Fang,** Southwest Jiaotong University
Topic: Machine Learning for Multi-Ap Cooperative Access Control

17:30-18:00 **Panel Discussion**

Special Event

ACP 2023 Special Symposium on

Optica Foundation Challenge for Groundbreaking Innovations

- Use photonics, find a solution, and change the world.

In May 2022, the Optica Foundation Challenge was launched with the vision to "Use photonics, find a solution, and change the world." This program sought proposals aimed at tackling global issues in three areas—environment, health and information—via solutions driven by optics and photonics. In October 2022, after reviewing nearly 100 applications from across the globe, the Challenge Program Committee selected and announced ten winners, who had been awarded US$100,000 each (US$1,000,000 total) in seed money to explore their cutting-edge ideas for addressing important technical challenges. In this ACP 2023 Symposium, some of the 2022 Challenge Program Winners will share their groundbreaking innovations and the progresses made so far. In addition, some members of the Optica leadership team and the Challenge Program Committee will be presenting on the vision, scope and future plans for this exciting program. Moreover, the newly selected 2023 Challenge Program Winners and their research topics will be introduced. It is also the aim of this Symposium to bring together professors, graduate students, and industry experts at ACP 2023 to discuss and exchange ideas on important challenges and groundbreaking innovations in optics and photonics that will benefit our global society in a profound way.

Date: 6 November Time:13:30-17:20 Venue: Gui Yuan Si, 33F

Symposium Organizers:

Ning Liu, Soochow University, Suzhou, China
Xiang Liu, Huawei Hong Kong Research Center, Hong Kong, China

Speakers:

Presider: Xiang Liu, Huawei Hong Kong Research Center, Hong Kong, China

13:30-13:40 **Elizabeth Rogan,** CEO of Optica
Topic: Vision of the Optica Foundation Challenge Program

13:40-13:50 **John Taylor,** Deputy Senior Director, Optica Foundation
Topic: Introducing the 2022 and 2023 Optica Foundation Challenge Winners

15:50-14:10 **Chaoran Huang,** Chinese University of Hong Kong, Hong Kong, China
Topic: Increasing Information Processing Capacity and Energy Efficiency

14:10-14:30 **Mengjie Yu,** University of Southern California, United States
Topic: Photonic Integrated Circuits for Optical Communications

14:30-14:50 **Guangwei Hu,** Nanyang Technological University, Singapore
Topic: Transparent Moving Microparticle and Cancer Cell Imaging

14:50-15:30 Coffee Break

Presider: Ning Liu, Soochow University, Suzhou, China

15:30-15:50 **Xingchen Ji,** Shanghai Jiao Tong University, China
Topic: Developing Integrated OCT Platform using Low-loss Silicon Nitride

15:50-16:10 **Zaijun Chen,** University of Southern California, United States
Topic: Accelerating Optical Edge Sensing with Photonic Deep Learning

16:10-16:30 **Ying Xue,** Hong Kong University of Science and Technology, Hong Kong, China
Topic: Monolithic III-V Active Devices In-Plane Coupled with Si for Integrated Si-Photonics

16:30-16:50 **Xiang Liu,** Optica Challenge Program Selection Committee Member
Topic: Exciting Challenges and Opportunities in the Field of Optics and Photonics

Presiders: Ning Liu, Soochow University, Suzhou, China & **Xiang Liu,** Huawei Hong Kong Research Center, Hong Kong, China

16:50-17:20 **Panel Discussion**

ACP 2023 Special Event on

Meet the Editors

Event: Meet the Editors from Light Pulisher Group and HUST
Time: 19:30-21:00, Nov. 5, Sunday
Venue: VIP Room, 3F

How to prepare a manuscript and a cover letter?

What criteria do editors and reviewers use to select papers?

What kind of research is attractive to editors-in-chief?

How do journals promote published articles worldwide?

How does the academic journal serve the researchers?

How do editors select reviewers?

What makes a useful manuscript review?

This event is open to all ACP2023 participants.
Welcome to join us!

Light | Science & Applications
Light | Advanced Manufacturing
eLight
Frontiers of Optoelectronics
Journal of Innovative Optical Health Sciences 创新光学健康科学杂志

Opening Ceremony & Plenary Session

5 November · Sunday	
08:30-08:45	**Opening Ceremony · Grand Ballroom 3F** Presider: **Perry Shum,** Southern University of Science and Technology, China **Welcome Speech** Presenter:Xinliang Zhang, Xidian University & Huazhong University of Science and Technology Elizabeth A. Rogan, CEO, Optica **Optica Fellows Presentation** Presenter: **Min Qiu,** Optica Board Member, Westlake University
08:45-10:15 · Plenary Session I · Grand Ballroom 3F Presider: **Jianji Dong,** Huazhong University of Science and Technology, China	
08:45-9:30	**Hybrid low loss integrated photonics: from chipscale frequency combs, frequency agile lasers, erbium amplifiers to cryogenic quantum interconnects** **Tobias Kippenberg** EPFL, Switzerland
09:30-10:15	**Real-Time Hyperspectral Terahertz Imaging** **Mona Jarrahi** Unversity of California Los Angeles, United States
10:15-10:30	Coffee Break
10:30-12:00 · Plenary Session II · Grand Ballroom 3F Presider: **Lena Wosinska,** Chalmers University of Technology, Sweden	
10:30-11:15	**Where next for digital coherent transceivers?** **Seb Savory** University of Cambridge, United Kingdom
11:15-12:00	**Optical Communication System Architecture & Technology Evolution towards 2030** **Xiaojun Tang** Huawei Technologies Co., Ltd., China
12:00-13:30	Lunch Break

Hybrid low loss integrated photonics: from chipscale frequency combs, frequency agile lasers, erbium amplifiers to cryogenic quantum interconnects

Tobias Kippenberg
EPFL, Switzerland

Abstract: Recent advances in attaining ultra low loss highly confining silicon nitride waveguides with loss in the dB-meter range, and their heterogeneous integration with MEMS and Lithium Niobate have opened up novel applications that benefit not only from scalable manufacturing, compact form factor and low power, but crucially have now reached a point where the performance is on par and even exceeding that of legacy optical systems. I will describe a range of novel advances, including photonic integrated circuit based frequency agile lasers with fiber laser phase noise, parametric traveling wave amplifiers, Erbium amplifiers on chip, as well as soliton frequency combs, with applications from coherent communications, LiDAR to cryogenic quantum interconnects.

Biography: Tobias J. Kippenberg is Full Professor of Physics at EPFL and leads the Laboratory of Photonics and Quantum Measurement. He obtained his BA at the RWTH Aachen, and MA and PhD at the California Institute of Technology (Caltech in Pasadena, United States). From 2005-2009 he lead an Independent Research Group at the MPI of Quantum Optics, and is at EPFL since. His research interest are the Science and Applications of ultra high Q microcavities; in particular with his research group he discovered chip-scale Kerr frequency comb generation (Nature 2007, Science 2011) and observed radiation pressure backaction effects in microresonators that now developed into the field of cavity optomechanics (Science 2008). Tobias Kippenberg is alumni of the "Studienstiftung des Deutschen Volkes". For his invention of "chip-scale frequency combs" he received he Helmholtz Price for Metrology (2009) and the EFTF Young Investigator Award (2010). For his research on cavity optomechanics, he received the EPS Fresnel Prize (2009). In addition he is recipient of the ICO Prize in Optics (2014), the Swiss National Latsis award (2015), the German Wilhelm Klung Award (2015) and ZEISS Research Award (2018). He is fellow of the APS and OSA, and listed since 2014 in the Thomas Reuters highlycited.com in the domain of Physics.

Where next for digital coherent transceivers?

Seb Savory
University of Cambridge, United Kingdom

Abstract: From 80 km terrestrial links between data centres to transpacific submarine systems, digital coherent transceivers have become the dominant technology for modern optical fibre communication. We review the historic evolution of the digital coherent transceiver before discussing current trends in order to address the question of where next for digital coherent transceivers. We then discuss the future evolution of digital coherent transceivers before considering where else in the network digital coherent transceivers might be utilised. Passive optical networks (PON) for access is one specific area where conventional intensity modulation with direct detection is currently dominant. We examine the case for the deployment of digital coherent transceivers in the PON, including our recent research that enables symmetric bidirectional 200 Gbit/s transmission with more than 29 dB power budget. We close by reflecting on future challenges for digital coherent transceivers.

Biography: Seb J. Savory received M.Eng., M.A., and Ph.D. degrees in engineering from Cambridge, an M.Sc. (Maths) in mathematics from the Open University and a Postgraduate Certificate in Teaching and Learning in Higher Education from UCL.

His interest in optical fibre communication began in 1991, when he joined STL (subsequently Nortel) in Harlow, the birthplace of the field. Having been sponsored by Nortel through his undergraduate and postgraduate studies, he rejoined the Harlow Laboratories in 2000. In 2005, he moved to UCL where he held a Leverhulme Trust Early Career Fellowship from 2005 to 2007, before being appointed as a Lecturer (2007), Reader (2012) and Professor (2015). In October 2015, he was elected as a Fellow of Churchill College, Cambridge moving to Cambridge in January 2016 as a University Lecturer and subsequently promoted to Professor of Optical Fibre Communication in October 2019. For his contributions to digital coherent transceivers for optical fibre communication he was elected a Fellow of the IEEE and the OSA in 2017.

He has taught electronics, maths and optical fibre communication systems at both UCL and Cambridge and was heavily involved in the design of the Integrated Engineering Programme at UCL (when he was Undergraduate Tutor and Programme Director within the Department of Electronic and Electrical Engineering). From August 2018 to July 2021 he was the Director of Undergraduate Education within the Cambridge University Engineering Department.

Externally, he serves as Vice President for Publications within the IEEE Photonics Society (IPS), having previously served on the IPS Board of Governors (2018-2020) and Editor-in-Chief of IEEE Photonics Technology Letters (2012-2017). Until June 2021 he was the Chair of the Steering Committee for the Optical Fiber Communication (OFC) Conference having previously served as Program for OFC 2013 and General Chair for OFC 2015. He is a Chartered Engineer and Fellow of the IEEE, IET, OSA and HEA.

Real-Time Hyperspectral Terahertz Imaging

Mona Jarrahi
Unversity of California Los Angeles, United States

Abstract: With the rapidly developing terahertz science and technology, terahertz imaging has facilitated a plethora of applications, such as biomedical imaging, security screening, and conservation of cultural heritage. An ideal terahertz imaging system should provide ultrafast temporal, hyperspectral, spatial amplitude and phase information of the imaged object with a high throughput. However, state-of-the-art terahertz imaging systems cannot satisfy all these requirements. For example, the majority of terahertz time-domain imaging systems are still based on a single-pixel architecture, which requires two-dimensional raster scanning to capture an image, limiting the imaging speed. On the other hand, microbolometer and field-effect-transistor-based terahertz detector arrays cannot directly provide spectral and phase information. Here, we present a terahertz focal-plane array comprised of ~0.3 million plasmonic nano-antennas that can generate ultrafast temporal and hyperspectral terahertz images with more than 3 THz bandwidth. Utilizing the rich spatio-temporal and spectral information provided by this focal-plane array, a deep convolutional neural network is utilized to super-resolve images of objects while reconstructing their shape and depth profiles. We demonstrate the super-resolution of both shape and depth information of imaged objects with a lateral/depth resolution as small as 60/10 mm and an effective number of pixels exceeding 1-kilo-pixels and an imaging speed exceeding 16 fps. This terahertz imaging system would create new opportunities for real-world terahertz applications, e.g., in non-destructive quality control, medical diagnosis, and security screening.

Biography: Mona Jarrahi received her B.S. degree in Electrical Engineering from Sharif University of Technology in 2000 and her M.S. and Ph.D. degrees in Electrical Engineering from Stanford University in 2003 and 2007. She served as a Postdoctoral Scholar at University of California Berkeley from 2007 to 2008. After serving as an Assistant Professor at University of Michigan Ann Arbor, she joined University of California Los Angeles in 2013 where she is currently a Professor and Northrop Grumman Endowed Chair in Electrical and Computer Engineering and the Director of the Terahertz Electronics Laboratory.

Prof. Jarrahi has made significant contributions to the development of ultrafast electronic and optoelectronic devices and integrated systems for terahertz, infrared, and millimeter-wave sensing, imaging, computing, and communication systems by utilizing novel materials, nanostructures, and quantum structures as well as innovative plasmonic and optical concepts. The outcomes of her research have appeared in 250 publications and 200 invited talks and have received a significant amount of attention from scientific news outlets including Huffington Post, Popular Mechanics, EE Times, and IEEE Spectrum. Her scientific achievements have been recognized by several prestigious awards including the Presidential Early Career Award for Scientists and Engineers (PECASE); Friedrich Wilhelm Bessel Research Award from Alexander von Humboldt Foundation; Moore Inventor Fellowship from the Gordon and Betty Moore Foundation; A F Harvey Engineering Research Prize from the Institution of Engineering and Technology (IET); Kavli Fellowship by the United States National Academy of Sciences (NAS), Grainger Foundation Frontiers of Engineering Award from the United States National Academy of Engineering (NAE); Breakthrough Award from Popular Mechanics Magazine; Research Award from Okawa Foundation; Innovations in Regulatory Science Award from the Burroughs Wellcome Fund; Harold E. Edgerton Award in High-Speed Optics from the International Society for Optics and Photonics (SPIE); Early Career Award in Nanotechnology from the IEEE Nanotechnology Council; Outstanding Young Engineer Award from the IEEE Microwave Theory and Techniques Society; Booker Fellowship from the United States National Committee of the International Union of Radio Science; Lot Shafai Mid-Career Distinguished Achievement Award from the IEEE Antennas and Propagation Society; Early Career Award from the United States National Science Foundation (NSF); Young Investigator Awards from the United States Office of Naval Research (ONR), the Army Research Office (ARO), and the Defense Advanced Research Projects Agency (DARPA); Watanabe Excellence in Research Award from UCLA Henry Samueli School of Engineering and Applied Science; Elizabeth C. Crosby Research Award from the University of Michigan; and Distinguished Alumni Award from Sharif University of Technology. Prof. Jarrahi is a Fellow of the Institute of Electrical and Electronics Engineers (IEEE), Optical Society (OPTICA), International Society for Optics and Photonics (SPIE), American Physical Sosiety (APS), Institute of Physics (IoP), and has served as a distinguished lecturer of IEEE, traveling lecturer of OSA, and visiting lecturer of SPIE societies.

Optical Communication System Architecture & Technology Evolution towards 2030

Xiaojun Tang
Huawei Technologies Co., Ltd. , China

Abstract: It is anticipated that in the upcoming years, advancements in AI large model technology will lead to the establishment of extensive AI clusters and a massive increase in data volume. Near-eye/single-eye 3D display technology will become widely available in the market. Broadband networks in near-Earth space will undergo large-scale commercialization. Serving as the bedrock of digital infrastructure, optical communication networks will face unparalleled opportunities and challenges. The evolution of optical communication networks and architectures towards 2030 is crucial, particularly in terms of industrialization, future development directions, innovative ideas, and feasible technical routes. This evolution will result in the creation of a new, forward-looking optical communication network system that meets the diverse and high-quality requirements of an intelligent world.

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.

Technical Session

November 05 • Sunday										
	Track 1 Grand Ballroom I 3F	**Track 2** Grand Ballroom II 3F	**Track 3** Grand Ballroom III 3F	**Track 4** VIP Room 3F	**Track 5** Chicago Hall 3F	**Track 6** Shanghai Hall 2F	**Track 7** London Hall 2F	**Track 8** Hong Kong Hall I 2F	**Best Student Paper Award** Chengdu Hall 3F	**Best Paper Award** New York Hall 2F
13:30-15:30	**Fiber lasers** *Presider: Ryszard Buczynski, University of Warsaw,* Poland	**Optical Signal Processing** *Presider: Qunbi Zhuge, Shanghai Jiao Tong University, China*	**Quantum Key Distribution Secured Optical Networks** *Presider: Yanni Ou, Beijing University of Posts and Telecommunications, China*	**Photonics & Photonic Devices** *Presider: Siyuan Yu, Sun Yat-sen University, China*	**Free-Space Optics and Photonic Imaging** *Presider: Cheng Wang, City University of HongKong, Hongkong, China*	**Hybrid photovoltaics** *Presider: Haizheng Zhong, Beijing Institute of Technology, China*	**Micro- and Nano-Science and Applications I** *Presider: Fangwei Ye, Shanghai Jiao Tong University, China*	**Optical imaging techniques** *Presider: Dan Zhu, Huazhong University of Science and Technology, China*	**Best Student Paper Award Competition Session I** *Presider: Jianji Dong, Huazhong University of Science and Technology, China*	**Best Paper Award Competition Session I** *Presider: Gangxiang Shen, Soochow University, China*
15:30-16:00	Coffee Break									
16:00-18:00	**Structured fibers /devices** *Presider: Dingyuan Tang, Shenzhen Technology University, China*	**Modeling and Characterization** *Presider: Kangping Zhong, The Hong Kong Polytechnic University, Hong Kong, China*	**Optical Network Architectures** *Presider: Xuwei Xue, Beijing University of Posts and Telecommunications, China*	**Modulators and Functional Devices** *Presider: Xuhan Guo, Shanghai Jiao Tong University, China*	**Photonic chips for Optical networks** *Presider: Xiaodan Pang, KTH Royal Institute of Technology, Sweden*	**Organic photovoltaics I** *Presider: Hae Jung Son, Korea Institute of Science and Technology, South Korea*	**Nonlinear and Quantum Optics** *Presider: Jing Xu, Huazhong University Of Science And Technology, China*	**Optical fiber sensing** Presider: Fei Xu, Nanjing University, China	**Best Student Paper Award Competition Session II** *Presider: Jianji Dong, Huazhong University of Science and Technology, China*	**Best Paper Award Competition Session II** *Presider: Gangxiang Shen, Soochow University, China*
17:30-20:00	Welcome Reception · Cafe Reign 1F & River Drunk 6F									

November 06 • Monday

	Track 1 Grand Ballroom I 3F	**Track 2** Grand Ballroom II 3F	**Track 2** (Parallel) New York Hall 2F	**Track 3** Grand Ballroom III 3F	**Track 4** VIP Room 3F	**Track 5** Chicago Hall 3F	**Track 6** Shanghai Hall 2F	**Track 7** London Hall 2F	**Track 8** Hong Kong Hall I 2F
08:30-10:00	**Spectrum manipulation** *Presider: Yuan Gong, University of Electronic Science and Technology of China, China*	**Short Reach I** *Presider: Chen Chen, Chongqing University, China*	**Fiber Commucation and Sensing** *Yanni Ou, Beijing University of Posts and Telecommunications, China*	**Elastic Optical Networks** *Presider: Bin Chen, Hefei University of Technology, China*	**Compound Semiconductor Photonic Devices and Integration** *Presider: Jiangwei Man, Hisilicon Optoelectronics*	**Photonics Applications and Implementations** *Presider: Ke Wang,RMIT University, Australia*	**Organic photovoltaics II** *Presider: Changqi Ma, Suzhou Institute of Nano-Tech and Nano-Bionics, CAS, China*	**Scattering and Absorption of Light Nanophotonic Structures** *Presider: Yang Li, Tsinghua University, China*	**Optical imaging techniques** *Presider: Junle Qu, Shenzhen University,China*
10:00-10:30	Coffee Break								
10:30-12:00	**Sensors/micro-devices** *Presider: Guanshi Qin, Jilin University, China*	**Short Reach II** *Presider: Fan Li, Sun Yat-sen University, China*	**Component and Network** *Presider: Chen Zhu, Baidu, China*	**QoS Guaranteed Optical Networks** *Presider: Bitao Pan, Beijing University of Posts and Telecommunications, China*	**Photonic Devices & Application** *Presider: Baile Chen, ShanghaiTech University, China*	**Terahertz and Radio over fiber** *Presider:Xianbin Yu, Zhejiang University, China*	**Organic photovoltaics III** *Presider: Feng He, Southern University of Science and Technology, China*	**Micro- and Nano- Science and Applications II** *Presider: Wei Liu, National University of Defense Technology, China*	**Optical coherence tomography** Presider: Linbo Liu, Nanyang Technological University, Singapore
12:00-13:30	Lunch Break								
13:30-15:30	**Distributed effects** *Presider: Chengbo Mou, Shanghai University, China*	**DSP** *Presider:Meng Xiang, Guangdong University of Technology, China*	**Advanced Modulation Techniques** *Presider: Bin Chen, Hefei University of Technology, China*	**Optical Switching Networks** *Presider: Jiawei Zhang, Beijing University of Posts and Telecommunication, China*	**Advanced Diode/ Quantum Dot Lasers** *Presider: Siqi Yan, Huazhong University of Science and Technology, China*	**Optical Convolution Networks and Applications** *Presider: Periklis Petropoulos, University of Southampton, United Kingdom*	**Hybrid electronics** *Presider: Yuanping Yi, Institute of Chemistry, CAS, China*	**Quantum Networks and Communications** *Presider: Xuewen Chen, Huazhong University Of Science And Technology, China*	**Optical fiber sensing** *Presider: Qizhen Sun, Huazhong University of Science and Technology, China*
15:30-18:00	Coffee Break Poster Session, 2F & 3F Special Symposium, Gui Yuan Si, 33F Postdeadline Paper Session I & II (starts at 16:00) · VIP Room & Chicago Room, 3F								
18:30-21:00	Banquet & Awards Ceremony · Grand Ballroom, 3F								

November 07 • Tuseday								
	Track 1 Grand Ballroom I 3F	**Track 2** Grand Ballroom II 3F	**Track 2** (Parallel) New York Hall 2F	**Track 3** Grand Ballroom III 3F	**Track 4** VIP Room 3F	**Track 5** Chicago Hall 3F	**Track 7** London Hall 2F	**Track 8** Hong Kong Hall 2F
08:30-10:00	**Dynamics and micro-nano devices** *Presider: Minglie Hu, Tianjin University, China*	**SDM Transmission** *Presider: Jia Ye, Southwest Jiaotong University, China*	**Fiber Nonlinearity** *Presider: Wang Qian, Zhejiang University of Technology, China*	**Machine Learning Enhanced Optical Networks** *Presider: Ruijie Zhu, Zhengzhou University, China*	**Novel Integrated Photonics** *Presider: Ke Wang, RMIT University, Australia*	**Microwave Photonics** *Presider: Xinyi Zhu, Institut National de la Recherche Scientifique-EMT, Canada*	**Micro- and Nano- Science and Applications I** *Presider: Yi Xu, Guangdong University Of Technology, China*	**Super-resolution imaging** *Presider: Ke Si, Zhejiang University, China*
10:00-10:30	Coffee Break							
10:30-12:00	**Fiber-based devices** *Presider: Meng Pang, Shanghai Institute of Optics and Fine Mechanics, CAS, China*	**Transmission System** *Presider: Tianwai Bo,Beijing Institute of Technology, China*	**Novel Applications of Optical Network** *Presider: Yixiao Zhu, Shanghai Jiao Tong University, China*	**Optical Network-on-Chip** *Presider: Yi Lei, Hefei University of Technology, China*	**Integrated Photonic Signal Processing** *Presider: Ting Wang, Institute of Physics, CAS, China*	**Advanced Laser and Spectral Analysis** *Presider: Radan Slavik, University of Southampton, United Kingdom*	**Emerging Materials, Devices and Their Applications** *Presider: Feng Li, Xi'an Jiaotong University, China*	**Optical imaging and Phototherapy** *Presider: Qiuqiang Zhan,South China Normal University, China*
12:00-13:30	Lunch Break							
13:30-15:30	**Mode locking and mode manipulation** *Presider: Yingying Wang, Jinan University, China*	**Self-Homodyne and Fronthaul** *Presider: Yan Li, Beijing University of Posts and Telecommunications, China*	**Advanced PON Technology** *Presider: Jian Zhao, South China University of Technology, China*	**Optical Satellite Networks** *Presider: Fu Wang, Beijing University of Posts and Telecommunications*, China	**Heterogeneous Integration** *Presider: Lei Shi, Huazhong University of Science and Technology, China*	**Optoelectronic Oscillators and Microwave Photonics** *Presider: Heng Zhou, University of Electronic Science and Technology of China, China*	**Topological and Integrated Photonics** *Presider: Jihua Zhang, Australian National University, Australia*	**Photonic Sensors** *Presider: Liang Wang, Huazhong University of Science and Technology, China*
15:30-16:00	Coffee Break							
16:00-18:00	**Novel fibers** *Presider: Gang Xu, Huazhong University of Science and Technology, China*	**Free-Space Optical Communications** *Presider: Jinlong Wei, Peng Cheng Laboratory, China*	**Tranceiver Optimization** *Presider: Chao Li, Peng Cheng Laboratory, China*	**Optical Access Networks** *Presider: Yuxin Xu, Zhejiang University of Technology, China*	**Optoelectronic Devices** *Presider: Minhao Pu, Denmark Technical University*	**Microwave Photonics and Fronthaul Transmission** *Presider: Xihua Zou, Southwest Jiaotong University, China*		

Track 1: Optical Fibers and Fiber-based Devices
Grand Ballroom I, 3F

13:30-15:30 • November 05, 2023 • Sunday
Fiber lasers
Presider: Ryszard Buczynski, University of Warsaw, Poland

13:30-14:15 • ACPPOEM-0813-2 *Tutorial*
Dynamics of soliton fiber lasers
Dingyuan Tang
Shenzhen Technology University, China
It is well-known that solitons formed in a fiber laser are in nature dissipative solitons, and under certain appropriate conditions, the formed solitons could also mimic properties of the nonlinear Schrodinger equation (NLSE) solitons. Light circulating in a laser cavity is obviously also subjected to the action of the cavity boundary condition. How would the cavity effects influence the operation of a fiber laser? In this tutorial we will answer the question and show the various features of soliton fiber lasers, especially, we will explain in detail when fiber laser operation could be described by the extended Ginzburg-Landau equation (GLE), and under which conditions the GLE can be reduced to the NLSE.

14:15-14:30 • ACPPOEM-0731-126
Robust All-polarization-maintaining Linear-cavity Mode-Locked Tm-Doped Fiber Laser
Siwei Peng[1], Xuanyi Liu[2], H. Y. Fu[2], Qian Li[1]
1.School of Electronic and Computer Engineering, Peking University, China; 2.Tsinghua Shenzhen International Graduate School, Tsinghua University, China
A robust all-polarization-maintaining linea-cavity Tm-doped fiber laser mode-locked with the Kerr effect was demonstrated. Solitons centering at ~1890 nm and ~1905 nm were obtained with pulse durations of 448 fs and 567 fs, respectively.

14:30-14:45 • ACPPOEM-0710-2
"Invisible" Pulsation of Harmonic Mode-locking in a Bidirectional Fiber Laser
Qingbo Wang, Pan Wang, Zhi Wang, Yan-ge Liu
Nankai University, China
Using a bidirectional passively mode-locked fiber laser as research platform, we report the harmonic mode-locking "invisible" pulsation for the first time, and conduct research on this phenomenon by the dispersive Fourier transform technology.

14:45-15:00 • ACPPOEM-0731-71
Q-switched Harmonic Mode-locked Noise-like Pulses with a Repetition Rate of 26.79 MHz in an Erbium-Doped Fiber Laser
Chuangkai Li[1], Xiaoqiang Ban[1], Minghe Zhao[1], Feng Ye[1], Hongyan Fu[2], Qian Li[1]
1.School of Electronic and Computer Engineering, Peking University, China; 2.Tsinghua Shenzhen International Graduate School, Tsinghua University, China
We have demonstrated a Q-switched harmonic noise-like pulses (QHMLNLPs) in an erbium-doped fiber laser using nonlinear polarization evolution with a repetition of 26.79 MHz, representing the highest repetition rate achieved in QHMLNLPs.

15:00-15:15 • ACPPOEM-0814-31 *Industry Innovation Nomination*
Triple-cladding Ytterbium doped fiber for 12 kW single module
Yue Meng[1], Zuying Xu[2], Xudong Shi[2], Yu Li[2], Tianying Liu[2], Can Li[2], Xiao Yan[2], Wei Zheng[2], Heng Wang[2], Jiangang Yu[2], Zhiyong Zhao[1], Ming Tang[1]
1.Huazhong University of Science and Technology, China; 2.Everfoton Technologies Corporation Limited, China
High-power fiber lasers had encountered numerous technology challenges in double-cladding fibers. In this paper, we designed and fabricated a fiber triple-cladding ytterbium doped fiber with large core diameter by using Modified Chemical Vapor Deposition (MCVD) combined with all-gas-phase doping method. An excellent laser performance could be obtained under 12kW .

15:15-15:30 • ACPPOEM-0814-42
Cavity Stabilization of a Brillouin Fiber Laser Based on Homodyne Phase Locking
Rui Wang, Wei Wei, Weilin Xie, Yi Dong
Beijing Institute of Technology, China
We stabilize the resonant cavity of a Brillouin fiber laser adopting a probe-based homodyne phase-locking technique. Laser Frequency and power variation are controlled to within 5 MHz and below 0.03 dB respectively in 600 seconds.

15:30-16:00 Coffee Break

16:00-18:15 • November 05, 2023 • Sunday
Structured fibers /devices
Presider: Dingyuan Tang, Shenzhen Technology University, China

16:00-16:30 • ACPPOEM-0731-149 *Invited*
Optical Properies of Active Fibers with Nanostructured Cores
Ryszard Buczynski[1,2], Jan Aubrecht[3], Dariusz Pysz[1], Ivo Barton[3], Marcin Franczyk[1], Michal Kamrádek[3], Adam Filipkowski[1], Ivan Kasik[3], Pavel Peterka[3]
1.Lukasiewicz Research Network - Institute of Microelectronics and Photonics, Poland; 2.University of Warsaw, Poland; 3.Institute of Photonics and Electronics of the Czech Academy of Sciences, Czech Republic
Nanostructured optical fibers are a new class of fibers with a core composed of various glass nanorods ordered in arbitrary structures. We study an influence of their internal structure on fiber active and passive properties. A proof-of-concept active fibers doped with ytterbium, erbium and thulium are presented and analyzed.

16:30-17:00 • ACPPOEM-1009-5 *Invited*
Coupled-Core Multicore Fibers and Devices for Long-haul Transmission Application
Lin Ma
Shanghai Jiao Tong University, China
We demonstrate the design, fabrication, and evaluation of coupled-core multicore fibers with low spatial mode dispersion and compatible fan-in/fan-out devices with low loss. Transmission experiments based on coupled-core multicore fibers are also experimentally demonstrated.

17:00-17:15 • ACPPOEM-0731-112
High Sensitivity Surrounding Refractive Index Sensor Based on Helical Long-Period Fiber Gratings Inscribed in Tapered Double-Cladding Fiber
Yanping He[1], Yuehui Ma[1], Chen Jiang[2], Peng Wei[1], Yunqi Liu[1]
1.Shanghai University, China; 2.Nanjing University of Posts and Telecommunications, China
We demonstrate a surrounding refractive index (SRI) sensor based on helical long-period fiber grating inscribed in the tapered double-cladding fiber. The maximum SRI sensitivity is 5483.33 nm/RIU

17:15-17:30 • ACPPOEM-0731-163
Ultralow-loss arc-discharge fusion splicing between antiresonant hollow-core fibers
Cong Zhang[1], Peng Li[2], Yue Wang[1], Di Lin[1], Lei Zhang[2], Jie Luo[2], Meng Xiang[1], Songnian Fu[1], Yuwen Qin[1]
1.Guangdong University of Technology, China; 2.Yangtze Optical Fiber and Cable Joint Stock Limited Company, China
We demonstrate a fusion splicing loss record of 0.03 dB between two anti-resonant hollow core fibers (AR-HCFs), using a traditional arc-discharge fusion splicer. After optimization of arc-discharge parameters, a deployment-friendly AR-HCF interconnection is reported.

17:30-17:45 • ACPPOEM-0731-43
Net 8×250 Gbit/s/λ PAM6/8 Optical Interconnect over High-Density Eight-Core Fiber and Low-Crosstalk Laser Direct Writing FI/FO Devices
Yu Yang[1], Zhaopeng Xu[1], Honglin Ji[1], Gang Qiao[1], Lulu Liu[1], Shangcheng Wang[1], Ruiting Cheng[2], Jinyi Yu[2], Chuanchuan Yang[2], Zhixue He[1], Yongqi He[2], Zhangyuan Chen[2], Weisheng Hu[1], Juhao Li[2]
1.Peng Cheng Laboratory, China; 2.Peking University, China
We experimentally demonstrate a net 8×250 Gbit/s/λ PAM6 and PAM8 transmission over 200-m standard-125μm-cladding high-density eight-core fiber and low-crosstalk femtosecond laser direct writing fan-in/fan-out devices. The proposed prototype system is promising for high-speed optical interconnection applications.

17:45-18:00 • ACPPOEM-0801-111
Wavelength and polarization state synchronization measurement based on MMF scattering pattern
Yuxuan Xiong, Ting Jiang, Zheng Gao, Hao Wu, Shaojun Zhou, Ming Tang
Huazhong University of Science and Technology, China
We presented a system for the measurement of wavelength and polarization state synchronization based on multimode fiber speckle. By employing convolutional neural network, we successfully established the mapping relationship between speckle patterns and wavelengths, as well as between speckle patterns and Stokes parameters. Consequently, the system accomplishes synchronized measurement of both wavelengths and polarization states. The system achieves a wavelength resolution of 0.5 nm and can distinguish two SOPs on the Poincaré sphere with a Euclidean distance of 0.365.

18:00-18:15 • ACPPOEM-0801-13
High Gain Bi-Doped Fiber Amplifier Operating in the O-band with a Broad Bandwidth
Yuanyuan Yang, Weiqi Wang, Jianxiang Wen, Yanhua Dong, Yana Shang, Yanhua Luo, Xiaobei Zhang, Fufei Pang, Tingyun Wang
Shanghai University, China
In a single 1240 nm pumped dual pass amplification system, when the signal power was -30 dBm, the Bi-doped fiber reached 41.1 dB at 1325 nm. The bandwidth range of gain above 20 dB was 1290-1365 nm.

17:30-20:00 Welcome Reception

08:30-10:00 • November 06, 2023 • Monday
Spectrum manipulation
Presider: Yuan Gong, University of Electronic Science and Technology of China, China

08:30-09:00 • ACPPOEM-0801-23 *Invited*
Mid-infrared supercontinuum laser source based on fluorotellurite fibers
Guanshi Qin
Jilin University, China
We demonstrated 50-W-level mid-infrared supercontinuum laser source, ultrabroadband supercontinuum generation from 600 to 5400 nm, and tunable Raman soliton generation from 2 to 4 μm in newly-developed all-solid fluorotellurite fibers.

09:00-09:15 • ACPPOEM-0815-60
Supercontinuum generation in silicon-germanium core silica cladding fiber pumped around the 1550 nm telecommunication wavelength
Congxiao Xu, Na Chen, Susu Zhang, Zhenyi Chen, Yana Shang, Yong Liu, Shupeng Liu, Fufei Pang, Tingyun Wang
Shanghai University, China
Femtosecond pulse evolution along $Si_{0.6}Ge_{0.4}$ core silica cladding fiber was simulated by solving the generalized nonlinear Schrödinger equation utilizing the fourth-order Runge-Kutta algorithm. Supercontinuum generation covers from 3.5μm to 11.1μm with 1550nm pump.

09:15-09:30 • ACPPOEM-0801-2
Splicing large-diameter hollow core fibers with SMF with low insertion loss
Bo Shi[1], Francesco Poletti[1], Ailing Zhong[2], Matěj Komanec[2], Radan Slavik[1]
1.Univeristy of Southampton, United Kingdom; 2.Czech Technical University in Prague, Czech Republic
We present a approach that allows to insert a short piece of coreless fiber in front of a large diameter HCF, which is experimentally shown to be low insertion loss (0.25 dB) and robust splices.

09:30-09:45 • ACPPOEM-0815-27
An Optical Arbitrary Spectral Synthesizer
Patrick Blown[1,2], Ian Clarke[2], Joseph Zagari[2], Andrei Valdez[2], Harald Rosenfeldt[2]
1.Institute of Photonics and Optical Science (IPOS), Australia; 2.Finisar Australia, Australia
We present a system for creating arbitrary frequency spectra with the ability to fold in other spectral sources. The device has output power 17dBm, contrast 60dB and accuracy 0.6dB over the C-band.

09:45-10:00 • ACPPOEM-0815-47
An extended L-band gain equliazation with a few mode erbium dopd fiber
Jianshuai Wang[1], Li Pei[1], Kaihua Hu[1], Jingjing Zheng[1], Wenxuan Xu[1], Jing Li[1], Tigang Ning[1], Li Zhong[2]
1.Beijing Jiaotong University, China; 2.Yangtze Optical Fibre and Cable joint stock limited company, China
An extend L-band FM-EDFA is demonstrated. At 1600 nm, a minimal differential modal gain of the first three order modes is obtained by 0.54 dB and the gains are higher than 20 dB.

10:00-10:30 Coffee Break

10:30-12:00 • November 06, 2023 • Monday
Sensors/micro-devices
Presider: Guanshi Qin, Jilin University, China

10:30-11:00 • ACPPOEM-0821-2 *Invited*
Fiber microlaser biosensor for sensitive optofluidic immunoassay
Yuan Gong
University of Electronic Science and Technology of China, China
High performance microlaser biosensors will be introduced. Optical fiber microlasers are developed for sensitive disposable biosensing, as well as the fast and high-throughput immunoassays.

11:00-11:15 • ACPPOEM-0731-136
Efficiency Tunnable All-Optical Controlled Coupled-Mode Induced Transparency in a Microsphere Resonator
Weichen Yuan, Hongyan Fu
Tsinghua University, China
In this work, based on a dual-laser pumping scheme, an all-optical controlled coupled-mode induced transparency in a silica microsphere resonatorhas been demonstrated, experimentally and theoretically. This proposed scheme is stable, simple and power efficient.

11:15-11:30 • ACPPOEM-0731-49
Ultra-sensitive Fiber Fabry-Perot Temperature Sensor Based on 3D Nano-Printed Air Cavity and Vernier Effect
Zhen Li[1], Wei Xu[2,3], Enqing Chen[4], Mian Wu[1], Ying Qiu[1], Jingjing Zheng[5], Chunmin Sheng[2], Jin Tao[1]
1.National Key Laboratory of Optical Communication Technology and Network China Information and Communication Technology Group Co., Ltd., China; 2.Zhejiang Dongtong Optical Network IoT Technology Co., Ltd, China; 3.School of Electronic and Information Engineering, Changshu Institute of Technology, China; 4.Xi'an High Technology Institute, China; 5.Wuhan Fiberhome Technical Services Co., Ltd, China;
In this paper, an ultra-high sensitive fiber Fabry-Perot temperature sensor based on direct 3D Nano-printed air cavity with two-photon polymerization and parallel Vernier effect is proposed and the sensitivity reaches up to -26nm/℃ .

11:30-11:45 • ACPPOEM-0731-77
3D printed microlens probe for optical coherence tomography
Yalong Tai[1], Zhuorong Li[1], Liu Dejun[1], Bozhe Li[1], Rui Zhu[2], Jianan Li[2], Qiang Li[2], Haiping Liu[2], Changrui Liao[1], Yiping Wang[1]
1.Shenzhen University, China; 2.Shenzhen Vivolight Medical Device & Technology Co., Ltd., China
In this paper, we propose a 3D printed side-viewing microlens on fiber tip by using the femtosecond laser two-photon polymerization (TPP) method for optical coherence tomography (OCT) imaging applications.

11:45-12:00 • ACPPOEM-0731-79
Magneto-refractive effect and sensing characteristics of erbium-doped silica fiber
Caihong Huang, Wanyue Wang, Qiufan Wu, Mei Chen, Yanhua Dong, Yi Huang, Tingyun Wang
Shanghai University, China
The magneto-refractive sensing characteristicsof EDF are investigated. The magnetic field sensing sensitivity is 4.914×10^{-5}rad/μT and the magnetic field resolution is 0.37 μT/√Hz under the AC magnetic field at 500 Hz.

12:00-13:30 Lunch Break

13:30-16:00 • November 06, 2023 • Monday
Distributed effects
Presider: Chengbo Mou, Shanghai University, China

13:30-14:00 • ACPPOEM-0831-3 *Invited*
Fiber based high power random Raman laser with flexible spectral manipulation property
Jiangming Xu
National University of Defense Technology, China
The history and status of high-power random Raman fiber laser (RRFL) will be reviewed. Especially, spectral manipulation of high-power RRFL, including purity scalability, wavelength number-interval-amplitude and linewidth tuning, and low-quantum-defect achieving, will be discussed.

14:00-14:15 • ACPPOEM-0731-107
Real-time FPGA Implementation of CNN-based Distributed Fiber Optic Vibration Event Recognition Method
LuoZhongyao[1,2,3], GeZhao[1,2,3], WuHao[1,2,3], TangMing[1,2,3]
1.Huazhong University of Science and Technology, China; 2.National Laboratory for Optoelectronics (WNLO), China; 3.National Engineering Laboratory for Next Generation Internet Access System, China
A scheme is proposed to create pipelined FPGA impelementation of CNN. It is used to demonstate the possibility of implementing a CNN-based DVS algorithm in embedded system for real-time edge computing.

14:15-14:30 • ACPPOEM-0731-85
Transfer Learning Based Programmable Raman Amplifier for Flexible Multi-band Optical Network
Liu Yuejiao, Gu Rentao, Gao Xiaoxuan, Bai Lin
Beijing University of Posts and Telecommunications, China
We deploy neural network and transfer learning, develop an integrated programmable Raman amplifier using commercial components to realize arbitrary target gain profiles, and achieve 0.126dB average RMSE in gain generation and ~67% prediction improvement when component parameters deviation.

14:30-14:45 • ACPPOEM-0801-130
Experimental study on the time-domain statistical properties of Er-doped random fiber laser
Xingyu Bao, Jiaojiao Zhang, Yifei Qi, Pan Wang, Longqun Ni, Zinan Wang
Key Laboratory of Optical Fiber Sensing and Communications University of Electronic Science and Technology of China, China
For understanding Er-doped random fiber laser (ERFL) intrinsic physical mechanisms, we investigate the ERFL time-domain statistical properties under full-bandwidth condition, and study the effects of the transmission and Raman amplification process on ERFL output characteristics.

14:45-15:00 • ACPPOEM-0815-112
Temperature-insensitivity PDMS coated silica microsphere
Guo Geng, Jin Xiaoling, Zhang Zuxing, **Bing Sun**
Nanjing University of Posts and Telecommunications, China
This study introduces a temperature-insensitive high-Q resonator employing the Whispering Gallery Mode (WGM) configuration. Leveraging the distinctive thermal-optic properties of PDMS characterized by a notably superior negative coefficient compared to silica microspheres, a controlled deposition of PDMS onto the silica microsphere surface is conducted. Experimental findings validate a highQ-factor within the resonant cavity, accompanied by a minimal temperature-induced crosstalk of merely 3 pm/°C.

15:00-15:15 • ACPPOEM-0815-39
High Spatial Density weakly coupled 7-core-6mode fiber and its (De)Multiplexer
Lei Shen[1,2,3], Jun Chu[1,2], Shuo Xu[1,2], Xianchao Gong[1,2], Liubo Yang[1,2], Ying Li[1,2], Lei Zhang[1,2,3], Jie Luo[1,2,3]
1.State Key Laboratory of Optical Fiber and Cable Manufacture Technology, China; 2.Yangtze Optical Fibre and Cable Joint Stock Limited Company, China; 3.Optical valley labs, China
We report the design, fabrication and measurement of a high spatial density weakly-coupled 7-core-6-mode fiber and its (de)Multiplexer. The attenuations of all channels are no more than 0.225dB/km. The IL of the FIFO part is less than 0.5dB, and the IL of the mode (de)MUX part is less than 2dB. This FM-MCF and its (de)Multiplexer can be used in weakly-coupled SDM systems that allows to multiply the capacity.

15:15-15:30 • ACPPOEM-0815-78
Characteristics optimization of tuning fork-fiber probes in shear force scanning near-field optical microscope
Hongjie Ma, Na Chen, Zhenmin Liu, Shaoying Li, Yong Liu, Yana Shang, Yangyi Zheng, Shupeng Liu, Tingyun Wang
Shanghai University, China
We demonstrate periodic variation of tuning fork fiber probe's resonant frequency and quality factor with its probe length and vibration modes through simulations and experiments, to optimize its character in shear force mode of SNOM.

15:30-16:00 • ACPPOEM-1008-3 *Invited*
Advanced fiber laser sources for 3D LIDAR imaging
Sze Set[1], Zheyuan Zhang[1], Takuma Shirahata[1], Chao Zhang[2], Naoki Yamaguchi[1], Shinji Yamashita[1]
1.The University of Tokyo, Japan; 2.Shimane University, Japan
We introduce advanced fiber laser sources for 3D LIDAR imaging, deployed in two fundamentally distinct and innovative laser-based distance ranging, the Chirped Amplitude-Modulated Phase-Shift (CAMPS) method and the Picosecond-Optical-Sampling Time-Of-Flight (POS-TOF) method.

15:30-18:00 Coffee Break & Poster Session

18:30-21:00 Banquet and Awards Ceremony

08:30-9:45 • November 07, 2023 • Tuesday
Dynamics and micro-nano devices
Presider: Minglie Hu, Tianjin University, China

08:30-09:00 • ACPPOEM-1009-1 *Invited*
High-repetition-rate, few-cycle pulse compression and wavelength-tunable UV dispersive-wave generation in hollow-capillary fiber
Meng Pang
Shanghai Institute of Optics and Fine Mechanics, CAS, China
Hollow-core fiber is a good platform to study nonlinear gas-light interactions, especially important for generating high-quality laser pulses with ultrashort pulse durations and broad wavelength-tuning range. In this talk, we demonstrate our recent work in this field, including a pulse-compression set-up that can deliver few-cycle, hundreds-of-uJ pulses at 10~100 kHz repetition rate and the a dispersive-wave-emission set-up that can generate ultraviolet ultrshort pulses with tunable central wavelengths from ~200 to ~400 nm.

9:00-9:15 • ACPPOEM-0801-125
High Sensitivity Nanoparticle Detection Enabled by Microresonators Operating at Exceptional Points
Zong Cao, Zijie Wang, Yong Yang, Qi Zhang, Xiaobei Zhang
Shanghai University, China
We demonstrate a theoretical investigation of a nanoparticle sensor using coupled whispering gallery mode resonators, and the sensitivity can be improved by more than 10 times when the sensor operates at exceptional points(EPs).

09:15-09:30• ACPPOEM-0801-127
Subnanometer Resolution Displacement Sensor Based on Vernier Effect
Dechun Dan, Yong Yang, Yang Wang, Qi Zhang, Xiaobei Zhang
Shanghai University, China
In this paper, the Vernier effect is realized for subnanometer resolution displacement sensing based on the structure of a hollow microsphere with a hole.

09:30-9:45 • ACPPOEM-0801-6
Distributed fiber vibration event recognition using Fractional Fourier Transform and Denoising Diffusion Probabilistic Models
Zhao Ge, Can Zhao, Hao Wu, Ming Tang
Huazhong University of Science and Technology, China
We propose a vibration event recognition method using fractional fourier transform (FrFT) and denoising diffusion probabilistic models (DDPM). The experimental results show that the model effectively identifies real vibration events by training on synthesized dataset, and it exhibits a high level of generalization ability.

10:00-10:30 Coffee Break

10:30-12:00 • November 07, 2023 • Tuesday
Fiber-based devices
Presider: Meng Pang, Shanghai Institute of Optics and Fine Mechanics, CAS, China

10:30-11:00 • ACPPOEM-1009-2 *Invited*
Attosecond soliton molecule dynamics and modulations in fiber laser
Minglie Hu
Tianjin University, China
The interactions of optical solitons in passively mode-locked fiber lasers result in abundant bound states that reflect intriguing nonlinear attractor behaviors in complex dissipative systems. By adopting a balanced optical cross-correlation method with a 5zs/√Hz temporal resolution, we derive an upper estimate of 60 as intramolecular timing jitter, which is integrated from 100 Hz to the Nyquist frequency (60 MHz). Furthermore, we experimentally demonstrate the synchronization of the internal vibrations of soliton molecules through the optical injection of a master oscillator signal. Direct observation of the synchronization process is enabled by balanced optical cross-correlation detection, a technique allowing real-time detection of intramolecular separation with sub-femtosecond temporal resolution. By retrieving these universal synchronization features, the role of the soliton molecule as a nonlinear dynamical system of chief importance is further highlighted.

11:00-11:15 • ACPPOEM-0731-188
Femtosecond laser plane-by-plane inscription of high-quality fiber Bragg gratings
Jiafeng Wu[1,2], Jun He[1,2], Xizhen Xu[1,2], Shen Liu[1,2], Changrui Liao[1,2], Yiping Wang[1,2]
1.Key Laboratory of Optoelectronic Devices and Systems of Ministry of Education/Guangdong Province, College of Physics and Optoelectronic Engineering, Shenzhen University, China; 2.Shenzhen Key Laboratory of Photonic Devices and Sensing Systems for Internet of Things, Guangdong and Hong Kong Joint Research Centre for Optical Fibre Sensors, Shenzhen University, China
We have demonstrated two novel plane-by-plane (Pl-b-Pl) methods for inscription of FBG in optical fiber using femtosecond laser.These Pl-b-Pl methods simplify the direct grating inscription process and improve the performance of the FBGs component.

11:15-11:30 • ACPPOEM-0731-80
High-temperature pressure sensor based on a highly birefringent fiber Bragg grating created in a dual side-hole fiber
Baijie Xu[1,2], Jun He[1,2], Xizhen Xu[1,2], Bin Du[1,2], Shen Liu[1,2], Changrui Liao[1,2], Yiping Wang[1,2]
1.Key Laboratory of Optoelectronic Devices and Systems of Ministry of Education/Guangdong Province, College of Physics and Optoelectronic Engineering, Shenzhen University, China; 2.Shenzhen Key Laboratory of Photonic Devices and Sensing Systems for Internet of Things, Guangdong and Hong Kong Joint Research Centre for Optical Fibre Sensors, Shenzhen University, China
We have demonstrated a novel high-temperature pressure sensor based on a highly birefringent FBG consisting of saw-tooth stressors inscribed in the cladding of dual side-hole fiber by using a femtosecond laser direct writing technology.

11:30-11:45 • ACPPOEM-0731-99
Mode Converters Based on the Long-Period Gratings Inscribed in Tapered Few Mode Fiber
Peng Wei, Yuehui Ma, Long Chen, Yunqi Liu
Shanghai University, China
We proposed the fabrication of mode converters based on long-period gratings after tapered few-mode fiber, and successfully realized fundamental mode coupled with high order core mode and cladding mode in a spectral range.

11:45-12:00 • ACPPOEM-0801-144
Sensing Demodulation from Degraded Spectra of Chiral Fiber Grating Based on Convolutional Neural Network
Hongliang Xie[1,2], Xiongfeng Rao[1,2], Zihan Li[1,2], Li Yang[1,2]
1.University of Science and Technology of China, China; 2.Key Laboratory of Electromagnetic Space Information, China
Taking C-LPFG-based torsion sensing as an example, we propose a detection method based on convolutional neural network, which maps the entire transmission spectrum to the corresponding environmental variables, enabling the torsion sensing in adverse cases.

12:00-13:30 Lunch Break

13:30-14:45 • November 07, 2023 • Tuesday
Mode locking and mode manipulation
Presider: Yingying Wang, Jinan University, China

13:30-13:45 • ACPPOEM-0801-1
Intelligent mode-locking enabled by real-time reinforcement learning
Jiajin Wang, Guoqing Pu, Zhiwei Fang, Chao Luo, Yong Wu, Lilin Yi
Shanghai Jiao Tong University, China
A real-time embedded approach to realize intelligent mode-locked fiber lasers based on reinforcement learning is proposed. The reinforcement learning is deployed in a Field programmable gate array (FPGA) to complete the inference process and real-time control. Benefited from the dedicated quantization and deployment strategy, the FPGA finishes a single forward inference in 6.4 us, which is about 32-times faster than an Nvidia RTX-3050 GPU, and the proposed solution manifests ultrahigh power efficiency.

13:45-14:00 ACPPOEM-0801-126
High All-Optical Tuning Efficiency in Magnetic Nanoparticles Coated Hollow Microbubble Resonator
Junlong Ma, Yiqi Chen, Yang Yu, Yong Yang, Qi Zhang, Xiaobei Zhang
Shanghai University, China
We conducted studies on the all-optical tuning characteristics of hollow microbubble resonators coated with magnetic nanoparticles and found that resonators with relatively larger wall thicknesses lead to a significant improvement in all-optical tuning efficiency.

14:00-14:15 • ACPPOEM-0801-40
High Sensitivity Refractive Index Sensor Based on the Cladding Mode of Long-Period Grating Inscribed in Few-Mode Fiber
Yuehui Ma, Yunqi Liu, Chengbo Mou
Shanghai University, China
The surrounding refractive index (SRI) sensing characteristics of cladding mode in a few-mode fiber are investigated. In the range of 1.33~1.43, the SRI sensitivity of LP_{05} mode is 5.30 times that of single-mode fiber.

14:15-14:30 • ACPPOEM-0801-43
Regulation of Radial Higher-order Orbital Angular Momentum Mode Based on Helically-Twisted Elliptic Fiber
Chuangrong Huang[1], Jiajing Tu[1], Shecheng Gao[1], Weiping Liu[1], Zhaohui Li[2]
1.Jinan University, China; 2.Sun Yat-sen University, China
Based on mode coupling theory and angular momentum matching principle, the generation process and mechanism of radial higher-order orbital angular momentum (OAM) based on helically-twisted elliptic fiber (HTEF) is analyzed. High-precision HTEFs are successfully fabricated using the arc discharge technology of a fusion splicer. By changing the twisted rate of the HTEF, $OAM_{\pm 2n}$ withradial order n of 2, 3, 4 and 5 are successfully generated at 1550 nm. Subsequently, we compare the differences in twisted rates between simulations and experiments.

14:30-14:45 • ACPPOEM-0814-53
Impact of Small Signal Gain and Saturation Engergy on the Mode-Locking States in an Yb-doped Fiber Laser
Xinxu Duan, Yuantong Liu, Qigui Huang, Zhengxin Gao, Lei Jin
Harbin Engineering University, China
Impact of small signal gain g_0 and saturation energy E_{sat} on the mode-locking states in an Yb-doped fiber was investigated. We discovered the transition states between the two stable mode-locking states by tuning them.

15:30-16:00 Coffee Break

16:00-18:00 • November 07, 2023 • Tuesday
Novel fibers
Presider: Gang Xu, Huazhong University of Science and Technology, China

16:00-16:30 • ACPPOEM-1009-3 *Invited*
Design, fabrication and characterization of high performance hollow-core anti-resonant fiber
Yingying Wang, Shoufei Gao, Yifeng Hong, Wei Ding
Institute of Photonics Technology, Jinan University, China
We review our recent works on design, fabrication and characterization of high performance anti-resonant hollow core fiber (AR-HCF). An in-house fabricated arc-shaped multi-layered AR-HCF structure shows a minimum loss of 0.2 dB/km @ 1550 nm. The polarization maintaining AR-HCF shows a birefringence of 1.8×10-5 and low loss of 4.8 dB/km @ 1522 nm. These two fibers could fulfill a range of applications in optical communication, precise metrologies, gyroscopes, and ultrafast/high-power laser deliveries.

16:30-16:45 • ACPPOEM-0726-16
Design of Heterogeneous 4LP-Mode Multicore Fiber with Two-Ring Layout
ZHEYU ZHAO, TAKANORI SATO, TAKESHI FUJISAWA, KUNIMASA SAITOH
Grad. Sch. of Info. Sci. and Tech., Hokkaido University Sapporo, Japan
Heterogeneous 4LP-mode 4- and 6-core fibers with two-ring layout and 125-um cladding diameter are investigated.Numerical results show that extending the modes number to 4LP-mode increases the spatial channel count keeping a feasible XT value.

16:45-17:00 • ACPPOEM-0728-10
Active Mode Multicasting without Parasitic Wavelength Conversion arising in Few-Mode Fiber
Xiaoshan Huang, Songnian Fu, Cong Zhang, Gai Zhou, Meng Xiang, Yuwen Qin
Institute of Advanced Photonics Technology, School of Information Engineering, Guangdong University of Technology, China
We theoretically propose the active mode multicasting without parasitic wavelength conversion, based on the inter-modal four-wave mixing arising in a dispersion engineered few-mode fiber. A proof-of concept experiment is demonstrated for LP_{01} and LP_{11} modes.

17:00-17:15 • ACPPOEM-0728-13 *Industry Innovation Nomination*
Fused Tapered Fan-in/Fan-out Device of 6-Mode 7-Core Fiber Based On OM3 Multimode Fiber
Chen Yang[1], **Haoze Du**[2], Yuanhui Shao[2], Fengming Zhang[2], Zhuyixiao Liu[2], Senyu Zhang[2], Zhiyong Zhao[2], Ming Tang[2]
1.Yangtze Optical Fiber and Cable Joint Stock Limited Company (YOFC) R&D Center, China; 2.National Engineering Laboratory for Next Generation Internet Access System, School of Optical and Electronic Information, Huazhong University of Science and Technology, China
Fused tapered Fan-in/Fan-out devices of few-mode multi-core fiber have received attentions in recent ten years. Most devices are based on special designed fibers which are called "bridge fiber". A low insertion loss and low-cost Fan-in/Fan-out device using OM3 fiber as the bridge fiber is fabricated and demonstrated in this paper. The insertion losses of LP01, LP11a, LP11b, and LP21a are less than 1dB, and the insertion loss of LP21b and LP02 are 2.02dB and 2.2dB.

17:15-17:30 • ACPPOEM-0728-18
A Data-efficient Erbium-doped Fiber Amplifier Model under Partial Channel Loadings
Yuqi Li[1], Mingming Zhang[1], Zihe Hu[1], Zhuoxuan Song[1], Siqi Yan[2], Ming Tang[1]
1.School of Optical and Electronic Information and Wuhan National Laboratory for Optoelectronics, Optics Valley Laboratory, Huazhong University of Science and Technology, China; 2.School of Optical and Electronic Information and National Engineering Laboratory for Next Generation Internet Access System, Huazhong University of Science and Technology, China
We proposed a modified spectral gain model for the Erbium-doped fiber amplifier based on singular value decomposition. More than 93% of predicted loading channel gain errors are less than 0.2 dB under partial channel loadings.

17:30-17:45 • ACPPOEM-0731-10
Coupling light into a hollow-core fiber with mitigated excitation of higher-order modes
Ailing Zhong[1], Eric Numkam Fokoua[2], Stanislav Zvanovec[1], Francesco Poletti[3], Radan Slavik[3], Matej Komanec[1]
1.Czech Technical University in Prague, Czech Republic; 2.Microsoft, UK, United Kingdom; 3.University of Southampton, United Kingdom
We show experimentally that unwanted cross-coupling into higher-order modes of a hollow-core fiber can be reduced to values close to -40dB when optimizing the input beam size for their suppression rather thanminimum insertion loss.

17:45-18:00 • ACPPOEM-0731-176

Optical Power Ring Model for Coupling Efficiency Estimation in VCSEL-MMF Links

Yuzhong Ma[1], Gordon Ning Liu[1], Xin Chen[2], Jason E. Hurley[2], Hao Dong[2], Hao Chen[2], Ming-Jun Li[2]
1.Soochow University, China; 2.Corning Incorporated, American Samoa

An optical power ring model for calculating fiber coupling efficiency is proposed. This model can reflect the complex mode field distribution at the end face of a launch fiber. Experimental results show that the model has higher accuracy than the model based on the uniform and Gaussian distribution. In addition, a further simulation analysis using the new model has proven that the large core multimode fiber has higher tolerance to the radial coupling offset and dust contamination.

Track 2: Optical Transmission Systems, Subsystems and Technologies
Grand Ballroom II, 3F

13:30-15:30 • November 05, 2023 • Sunday
Optical Signal Processing
Presider: Qunbi Zhuge, Shanghai Jiao Tong University, China

13:30-14:00 • ACPPOEM-1010-4 *Invited*
Enabling Low and Stable Latency Communication Using Clock and Frequency Referenced Access Networks
Zhixin Liu
Univeristy College London, United Kingdom
The rise of timing-critical applications such as virtual reality and connected car fleets, combined with the rapid growth of the number of user devices, creates new challenges for the latency and reliability of user-cloud data communications. Currently user-cloud communications rely on time-scheduled data frames through tree-topology fibre networks, incapable of assuring guaranteed connections with low or stable latency, which is necessary for, e.g. remote surgeries and safe operations of self-driven cars. Besides, their scalability to a larger user count is limited. Here we show that clock and optical frequency synchronisation, enabled by burgeoning frequency comb and signal processing techniques, can provide each user with dedicated optical bandwidth to enable scalable user-cloud communications that guarantee simultaneously high per-use data rate and low latency. Our approach provides accurate clock and optical frequency synchronisation over deployed optical fibre links, which will be beneficial for many applications, including accurate navigation, quantum communications, and astronomy.

14:00-14:15 • ACPPOEM-0721-1
Revival of In-line Partial Dispersion Compensation for Reducing Cross-Phase Modulation Penalty in WDM Systems
Qingyi Guo, Wing Chau Ng, Yang Lan, **Zhiping Jiang**
Huawei Technologies Canada, Canada
We analytically and experimentally verify for the first time how in-line partial dispersion compensation reduces XPM penalty by optimizing the relative amounts of dispersion-induced noises and correlated noises in coherent optical system.

14:15-14:30 • ACPPOEM-0731-178
A Method of Generating Second-Order Soliton with Specified Time Positions
Chuang Xu[1,2], Alan Pak-tao Lau[1,2]
1.The Hong Kong Polytechnic University, Hong Kong, China; 2.The Hong Kong Polytechnic University Shenzhen Research Institute, China
The relationship between the time position and the b-coefficient of a first-order soliton does not apply to a second-order soliton. We propose a method of generating second-order solitons with specified time positions based on nonlinear Fourier transform with modified b-coefficients.

14:30-14:45 • ACPPOEM-0731-184
DSP-free Demultiplexing for DP-QPSK Reception in Frequency Synchronous Optical Networks
Lei Liu[1], Puzhen Yuan[1], Weiqi Lu[2], Yuhao Fang[1], Zexu Liu[1], Qi Yang[2], William Shieh[1]
1.Westlake University, China; 2.Huazhong University of Science and Technology, China
We propose the concept of frequency-synchronous optical network (FSON) that enables the transmit and receive lasers to be quasi-synchronous. In doing this, we demonstrate the world-first polarization and phase demultiplexing of DP-QPSK signals without electronic DSP.

14:45-15:00 • ACPPOEM-0815-12
Optical Aggregation/De-aggregation between QPSK and OOK Channels enabled by Phase-sensitive Amplifier-based Bi-directional Vector Moving
Jiabin Cui[1], Huashun Wen[2], Yanxia Tan[3], Guo-Wei Lu[4], Zhaoyang Liu[1]
1.State Key Laboratory of Information Photonics and Optical Communications, School of Information and Communication Engineering, Beijing University of Posts and Telecommunications, China; 2.State Key Laboratory on Integrated Optoelectronics, Institute of Semiconductors, Chinese Academy of Sciences, Center of Materials Science and Optoelectronics Engineering, University of Chinese Academy of Sciences, School of Electronic, Electrical and Communication Engineering, University of Chinese Academy of Sciences, China; 3.Research Institute of China United Network Communications Co., Ltd., China; 4.Division of Computer Engineering, The University of Aizu, Japan
An optical aggregation/de-aggregation scheme between QPSK and OOK channels are proposed. The employed constellation manipulations is mainly based on nondegenerate phase-sensitive amplifier-based bi-directional vector moving. 10G Baud 2×OOK-to-QPSK-to-2×OOK aggregation and de-aggregation are achieved and analyzed.

15:00-15:30 • ACPPOEM-0904-1 *Invited*
Towards Ultra-wideband Optical Communications using Novel Optical Amplifiers
Yang Hong[1], Natsupa Taengnoi[2], Kyle R.H. Bottrill[2], Yu Wang[2, 3], Jayanta K. Sahu[2], Periklis Petropoulos[2], David J. Richardson[4], Cosimo Calo[5], Fabrice Blache[5], Amirhossein Ghazisaeidi[1], Jérémie Renaudier[1]
1.Nokia Bell Labs, France; 2.Optoelectronics Research Centre (ORC), University of Southampton, United Kingdom; 3.currently with Department of Physics, Imperial College London, United Kingdom; 4.Microsoft, United Kingdom; 5.III-V Lab, France
Ultra-wideband transmission over extended bandwidths through the existing fibre infrastructure represents a promising solution. In this paper, we review the recent progress of novel optical amplifiers-enabled ultra-wideband transmission over alternative optical bands.

15:30-16:00 Coffee Break

16:00-18:00 • November 05, 2023 • Sunday
Modeling and Characterization
Presider: Kangping Zhong, The Hong Kong Polytechnic University, Hong Kong, China

16:00-16:30 • ACPPOEM-0928-2 *Invited*
Fast Fault Recovery Implementation of a C+L Transmission System
Chen Zhu
Baidu Online Network Technology (Beijing) Co., Ltd., China
We discuss the practical consideration and the hierarchy implementation of the fast ffault recovery mechanism in a C+L transmission system that allows self-healing from major system faults such as fiber cust, loss degradation.

16:30-16:45 • ACPPOEM-0731-101
Accurate and Efficient Optical Fiber WDM Transmission Modeling Using the Encoder-only Transformer with Feature Decoupling Distributed Method
Minghui Shi, Hang Yang, Zekun Niu, Chuyan Zeng, Shilin Xiao, Weisheng Hu, Lilin Yi
Shanghai Jiao Tong University, China
We propose an innovative approach utilizing an encoder-only Transformer model with the feature decoupling distributed schemefor optical fiber channel modeling in the WDM scenarios.

16:45-17:00 • ACPPOEM-0731-95
Accurate DGD Estimation in All-Order PMD Model for High Baud Rate System
Ting Jiang, Zheng Gao, Ming Tang
Huazhong University of Science and Technology, China
We demonstrate the accurate estimation of differential group delay (DGD) of all-order polarization mode dispersion (PMD) in high baud-rate long-haul optical communication systems through comprehensive time-frequency data processing based on fractional Fourier transformation (FrFT). The mean absolute error (MAE) for DGD estimation is 0.53ps, with the estimation range of 0 to 100ps.

17:00-17:15 • ACPPOEM-0801-139
EDFA Noise Figure Analysis in Non-ideal Operating Conditions
Ambashri Purkayastha, **Juliana Tiburcio de Araujo**, Alexis Carbo Meseguer, Jean-Christophe Antona
Alcatel Submarine Networks (ASN), France
This paper gives an analysis of the impact on the noise figure of the erbium-doped fiber amplifier when operated in non-nominal conditions. We also discuss the impact of having a highly accurate noise figure model in the calculation of OSNR from a subsea system perspective.

17:15-17:30 • ACPPOEM-0814-13
PMD Impact on Transport System in Terms of Normalized DGD and ACF
Yan Zhang, Nan Cui, Jinyu Sun, Lixia Xi, Xianfeng Tang, Xiaoguang Zhang
Beijing University of Posts and Telecommunications, China
It is more appropriate to evaluate PMD impact on the transport system using the DGD normalized by symbol period other than just DGD in picosecond. Also, ACF is more suitable to be normalized.

17:30-17:45 • ACPPOEM-0814-7
Performance Improvement by Channel gOSNR Waterfilling
Zhiping JIANG
Huawei Technologies Canada, Canada
Link performance can be improved by gOSNR waterfilling. We developed and experimentally verified simple expressions to study gOSNR waterfilling capability. About 0.5dB improvement may be expected.

17:45-18:00 • ACPPOEM-0730-25
Analysis on the Anti-fading Dynamic Characteristics of Optical Injection Locking System Under Active Polarization Scrambling
Kun Li, Mingming Zhang, Weihao Li, Ziwen Zhou, Siqi Yan, Ming Tang
School of Optical and Electronic Information, *Huazhong University of Science and Technology*, China
Investigating effect of active polarization scrambling on OIL, and fitting functional relationship between APS frequency and unlocking threshold power. Selecting an appropriate APS frequency can maintain more stable locking, thereby resisting fading in communication system.

17:30-20:00 Welcome Reception

08:30-10:00 • November 06, 2023 • Monday
Short Reach I
Presider: Chen Chen, Chongqing University, China

08:30-08:45 • ACPPOEM-0816-3
Feedforward Neural Network Enabled Optical Multi-Path Interference Mitigation for High-speed IMDD Transmission Systems
Qiu Yongfeng, Xiang Meng, Yang Hailin, Cheng Wenzhuo, Li Jianping, Fu Songnian, Qin Yuwen
Guangdong University of Technology, China
The performance of high-speed intensity modulation direct detection (IM-DD) transmission can be severely degraded by the Optical multipath interference (MPI) arising from multiple reflections mainly from polluted fiber connectors. In this paper, we propose a data-driven MPI mitigation scheme utilizing a feedforward neural network (FNN), and its performance is experimentally evaluated in a 28Gbaud PAM4 IMDD system with a transmission distance of 10.81km. Compared to other newly reported MPI mitigation schemes, our proposed approach achieves a 3dB improvement in signal-to-interference (SIR) tolerance at the KP4 BER threshold.

08:45-09:00 • ACPPOEM-0801-35
Quantization of Recurrent Neural Network For Low-Complexity High-Speed IM/DD System Equalization Based on Neuron Clustering
Zhaopeng Xu[1], Honglin Ji[1], Yu Yang[1], Gang Qiao[1], Qi Wu[1], Weiqi Lu[2], Lulu Liu[1], Shangcheng Wang[1], Junpeng Liang[1], Jiali Li[1], Jinlong Wei[1], Zhixue He[1], Weisheng Hu[1], William Shieh[2]
1.Peng Cheng Laboratory, China; 2.Westlake University, China
Neural networks (NNs) are widely employed as effective equalizers in intensity-modulated direct-detection (IM/DD) links due to their excellent ability in dealing with nonlinear channel impairments. However, the complexity concern impedes the real-time application of NN-based receivers. To address this issue, we propose mixed-precision quantization of recurrent NN (RNN)-based equalizers in a 100-Gb/s 15-km C-band IM/DD system, which saves about 73.3% and 22.4% memory compared with traditional floating-point-based and fixed-precision quantized RNN. A simple and effective neuron clustering approach is proposed to realize mixed-precision quantization of RNN without degrading system performance.

09:00-09:15 • ACPPOEM-0731-48
PSO-Algorithm-Controlled Optimized Optical Equalizer for Bandwidth-Limited Transmitter and Receiver in Short-Reach PAM-4 Data Center Interconnects
Guofeng Yan[1,2], Yuanjian Wan[1,2], Min Yang[1,2], Lei Zhou[3], Rui Li[3], Minghui Tao[3], Jian Wang[1,2]
1.Wuhan National Laboratory for Optoelectronics and School of Optical and Electronic Information, China; 2.Huazhong University of Science and Technology Optics Valley Laboratory, China; 3.Research and planning Department, Central Research Institute, 2012Labs, Huawei Technologies, China
We present an adaptive integrated optical equalizer controlled by the particle swarm optimization (PSO) algorithm for bandwidth-limited transceivers. The optical equalizer with optimized structure can provide an efficient solution for short-reach data center optical interconnects.

09:15-09:30 • ACPPOEM-0725-2
Experimental Demonstration of Ultra-Wide O-Band WDM Unrepeated Transmission over 80 km G.652 with 25 Gbit/s IM/DD Transceivers
Hao Liu[1], **Xia Sheng**[1], Lei Wang[2], Ji Deng[2], Kai Lv[1], Anxu Zhang[1], Lipeng Feng[1], Yuyang Liu[1], Xiaoli Huo[1], Junjie Li[1]
1.China Telecom Research Institute, China; 2.Wuxi Taclink Optoelectronics Technology Co.,Ltd, China
We demonstrate a real-time 40-channel 25 Gbit/s WDM experiment over 80 km unrepeated system across about 100 nm bandwidth at O-band. The receiving sensitivity has reached-19 dBm and below with a threshold of 5E-05.

09:30-10:00 • ACPPOEM-0815-11 *Invited*
Electronic CD Compensation Techniques for C band DWDM IM/DD Systems
KANGPING ZHONG[1], Abdullah Karar[2], wu xiong[1], Haiqiang Wei[1], Alan Pak Tao Lau[1], Chao Lu[1], Changyuan Yu[1]
1.The Hong Kong Polytechnic University, Hong Kong, China; 2.American University of the Middle East, Kuwait
In this paper, we review different techniques for electronic chromatic dispersion (CD) compensation for C band DWDM intensity modulation/direct detection (IM/DD) systems for data center interconnections.

10:00-10:30 Coffee Break

10:30-12:00 • November 06, 2023 • Monday
Short Reach II
Presider: Fan Li, Sun Yat-sen University, China

10:30-11:00 • ACPPOEM-0831-2 *Invited*
New Opportunities for Silicon Photonics in Data Centers under The Wave of AI
Miaofeng Li
Alibaba Cloud, China
With the explosion of demand for AI technology, data centers will present a two-wheel drive pattern of traditional data centers and AI data centers. Silicon photonics technology has achieved initial success in the optical module market, but it is difficult to further reduce its cost due to the limitation of shipments. On the other hand, in the field of computing interconnection, its data throughput is 1-2 orders of magnitude higher than that of Ethernet. At the same time, compared with Ethernet, it has higher requirements for power efficiency, latency, bandwidth density and reliability. To meet these requirements of computing interconnection, silicon photonics is the only choice. Driven by the massive demand for computing interconnection, silicon photonics is expected to be shipped in large quantities and its cost will be greatly reduced.

11:00-11:15 • ACPPOEM-0731-144
Driverless 400-Gbps/λ PS-PAM16 Transmission Using Packaged 60-GHz Thin-Film LiNbO3 Modulator with 16-fJ/bit Energy Efficiency
Shangcheng Wang[1], Yu Yang[1], Zhaopeng Xu[1], Lulu Liu[1], Gang Qiao[1], Honglin Ji[1], Jinlong Wei[1], Zhixue He[1], Weisheng Hu[2]
1.Peng Cheng Laboratory, China; 2.Shanghai Jiao Tong University, China
We experimentally demonstrated line rate 300-Gb/s PAM4 and 400-Gb/s probabilistically shaped (PS)-PAM16 transmission using packaged thin-film $LiNbO_3$ modulators with only 550-mVpp CMOS-class driving voltage requiring no radio-frequency (RF) amplifiers. Net 296-Gbit/s PS-PAM16 transmission is achieved using 60-GHz transceivers with only 15.5-fJ/bit energy efficiency

11:15-11:30 • ACPPOEM-0731-161
Partial Response Signaling Enabled 320/150 GBd OOK/PAM4 Transmission Using a 65 GHz TFLN Modulator for Short-reach Optical Interconnects
Lulu Liu, Honglin Ji, Yu Yang, Zhaopeng Xu, Shangcheng Wang, Gang Qiao, Qi Wu, Junpeng Liang, Jinlong Wei, Jiali Li, Zhixue He, Weisheng Hu
Peng Cheng Laboratory, China
We experimentally demonstrated the transmission of 320 GBd OOK and 150 GBd PAM4 signals within a 62 GHz brick-wall system bandwidth (BW) limit, utilizing Partial Response (PR) encoding, digital anti-aliasing filter, and a packaged thin film lithium niobate (TFLN) modulator. An OOK faster than Nyquist ratio (FTN) of 158% is successfully achieved, with a bit error rate (BER) below the 20% hard-decision forward error correction (HD-FEC) threshold of 1.5e-2.

11:30-11:45 • ACPPOEM-0731-113
PAM4 Symbol Recognition based on Spiking Neural Network for 200Gb/s On-chip IM/DD Optical Interconnection
Ke Te[1], Zhu Ying[1,2], Yang Chao[1], Hu Xiao[2], Wu Dingyi[2], Luo Ming[1], Xiao Xi[1,2,3]
1.State key laboratory of optical communication technologies and networks, China Information Communication Technologies Group Corporation, China; 2.National Optoelectronics Innovation Center, China; 3.Peng Cheng Laboratory, China
A spiking neural network model is proposed for PAM4 symbol recognition in a 200-Gb/s on-chip IM/DD optical interconnection. The SNN model can achieve a minimum bit error rate of 5e-3, outperforming the traditional equalization algorithm implemented in digital signal processing.

11:45-12:00 • ACPPOEM-0726-2
MLSE-Assisted Overlapped DFE for Error-Propagation Suppression in 201-Gb/s PAM-8 IM-DD Systems
Jiahao Zhou, Jing Zhang, Xue Zhao, Zhengyu Ma, Bo Xu, Kun Qiu
University of Electronic Science and Technology of China, China
We propose and experimentally demonstrate a MLSE-assisted overlapped DFE that can be pipelined and suppress the burst errors in a 201-Gb/s PAM-8IM-DDsystem. We find the maximum length of burst errors resulted from DFE is reduced from 19 to 5.

12:00-13:30 Lunch Break

13:30-15:30 • November 06, 2023 • Monday
DSP
Presider: Meng Xiang, Guangdong University of Technology, China

13:30-14:00 • ACPPOEM-1010-1 *Invited*
DSP-enabled subsystem and system solutions for realising converged access networks with improved performances and new functionalities
Jianming Tang
Bangor University, United Kingdom
To satisfy various stringent requirements associated with 5G and beyond networks, significant advances in access networks

should be made at sub-system, system and network architecture levels. The talk reviews emerging DSP technologies with particular focus on key aspects, which include multifunctional optical transceivers and networking devices, IMDD transmission system linearization, physical-layer network security, novel flexible optical access networks with reduced latency, and convergence between fibre, RF and optical wireless transmission systems.

14:00-14:15 • ACPPOEM-0731-162
Low-Complexity Sequence Detection for Optical Fiber Transmissions with Correlated Multi-Symbol Modulation
Hansheng Xu, Zhongxing Tian, Kaisheng Zhang, Chao Zhang, Ji Huang, Chenxu Jiang, Huan Huang, Xiaoling Wang, Lin Sun, Gordon Ning Liu, Yi Cai
Soochow University, China
Emerging correlated multi-symbol modulation (CMSM) techniques require sequence detection to effectively increase spectral efficiency. A simplified sequence detection algorithm with low implementation complexity is proposed for CMSM-enhanced high-speed optical fiber transmissions.

14:15-14:30 • ACPPOEM-0731-17
Advanced Recursive Algorithm Based Electronic Polarization Tracking for PDM-DQPSK Differential Detection Optical Transmission Systems
Zhongxing Tian[1], Chenxu Jiang[1], Xudong Chai[2], Xiaozhou Wang[1], Huan Huang[2], Jun Zhou[1], Yi Cai[2]
1.Jiangsu Hengxin Semitech Co., Ltd, China; 2.Soochow University, China
We propose a differential-detection receiver architecture and a novel recursive algorithm for electronic polarization tracking in polarization-division-multiplexed differential quadrature-phase-shift-keying (PDM-DQPSK) systems. Simulation results demonstrate that the proposed system approaches the performance of coherent-detection-based PDM-DQPSK systems.

14:30-14:45 • ACPPOEM-0731-7
Analysis of the singularity avoidance capability of Constant Modulus Algorithms in coherent optical fibre communication systems
Peter Akachi Nwakamma[1,2], Gwillerm Froc[2], Yves Jaouën[1], Cédric Ware[1]
1. LTCI, Télécom Paris, Institut Polytechnique de Paris, France; 2.Mitsubishi-Electric R & D Centre Europe, France
Constant Modulus Algorithm (CMA) in dual-polarization optical coherent transmission is revisited for optical access. We introduce a refined CMA, exhibit singularity-free operation up to 5ps/√km polarization mode dispersion in 32GBaud-QPSK system and suggest new ideas.

14:45-15:00 • ACPPOEM-0801-121
Lumped Impairments Compensation based on A Finite-Impulse-Response Extended Kalman Filter for PDM-QPSK Systems
Guanju Peng[1], Yaping Liu[1], Zhiqun Yang[1], Zhanhua Huang[1], Lin Zhang[1, 2]
1.Tianjin University, China; 2.Peng Cheng Laboratory, China
A finite-impulse-response extended Kalman filter is proposed for the first time to simultaneously compensate forlinear impairments, including polarization crosstalk, rotation of state of polarization, frequency offset, and carrier phase noise in PDM-QPSK transmission systems.

15:00-15:15 • ACPPOEM-0801-75
A Low-Complexity Demodulation Scheme For Carrier Interleaved Modulation With Differential Coherent Detection Of Directly Modulated Lasers
Zhou Yanting, Guo Changjian
South China Normal University, China
Alow-complexity demodulation scheme is proposed for CIM/DCD of DML, which achieve over 11dB ROPimprovement compared with IM/DDand over 2dB ROP improvement compared with single pattern CIM/DCD schemes in 28Gb/s PAM-4 transmission system.

15:15-15:30 • ACPPOEM-0802-6
Carrier Phase Recovery Combined Optimal Decision Threshold with Principal Component Analysis for Probabilistically Shaped Square-QAM Systems
Mingjiao Wang[1], Xue Tang[1], Tingting Dong[1], Zukai Sun[1], Hengying Xu[1,2,3], Chenglin Bai[1,2,3], Yining Zhang[1], Lishan Yang[1,2,3], Wanxiang Bi[1]
1.Liaocheng University, China; 2.Shandong Provincial Key Laboratory of Optical Communication Science and Technology, China; 3.Liaocheng Key Laboratory of Industrial-Internet Research and Application, China;
We propose a carrier phase recovery (CPR) scheme combined optimal decision threshold with principal component analysis (ODT-PCA) for PS-QAM systems. The CPR performance of ODT-PCA scheme achieves significant improvements over the classical PCPE scheme.

15:30-18:00 Coffee Break & Poster Session

18:30-21:00 Banquet and Awards Ceremony

08:30-10:00 • November 07, 2023 • Tuesday
SDM Transmission
Presider: Jia Ye, Southwest Jiaotong University, China

08:30-08:45 • ACPPOEM-0726-7 *Industry Innovation Nomination*
0.62 Pb/s Real-Time Transmission over 360 km 7-Core MCFs Using 800 Gb/s Transceivers with Widened C+L band EDFAs
Lipeng Feng[1], Anxu Zhang[1], Zhenhua Feng[2], Haitao Ling[2], Yang Luo[2], Lei Zhang[3], Li Zhang[3], Lei Shen[3], Jie Luo[3], Yuyang Liu[1], Xia Sheng[1], Hao Liu[1], Guangnan Su[4], Xiaoli Huo[1], Junjie Li[1]
1.China Telecom Research Institute, China; 2.State Key Laboratory of Mobile Network and Mobile Multimedia Technology, ZTE Corporation, China; 3.Yangtze Optical Fibre and Cable Joint Stock Limited Company, China; 4.China Telecom Intelligent Network Technology Co., Ltd, China
For the first time, 110-channel real-time probabilistically shaped PDM-64QAM 800 Gb/s signals are successfully transmitted over 360 km 7-core fiber in an 11 THz system, achieving a record 0.62 Pb/s capacity with spectral efficiency of 56 bit/s/Hz in real-time SDM systems.

08:45-09:00 • ACPPOEM-0731-65 *Industry Innovation Nomination*
Single-λ 3-Tb/s (8 SDM×120 GBd) Probabilistically-Shaped-PAM16 Optical Interconnections over Standard 125μm-Cladding MCF Using Linear Equalizer Only
Yu Yang[1], Zhaopeng Xu[1], Honglin Ji[1], Gang Qiao[1], Qi Wu[1], Lulu Liu[1], Shangcheng Wang[1], Ruiting Cheng[2], Jinyi Yu[2], Chuanchuan Yang[2], Zhixue He[1], Yongqi He[2], Zhangyuan Chen[2], Weisheng Hu[1], Juhao Li[2]
1.Peng Cheng Laboratory, China; 2.Peking University, China
We first demonstrate a single-laser single-wavelength 3-Tb/s line rate (2.176-Tb/s net rate) SDM optical interconnect over 200-m standard 125μm-cladding 8-core fiber using entropy-loaded probabilistically-shaped-PAM16 signals with linear equalizer only.

09:00-09:15 • ACPPOEM-0801-132
Experimental Characterization of Crosstalk Impact at System Level in Weakly Coupled MCF-Based Subsea Links
Ambashri PURKAYASTHA, Jean-Christophe ANTONA, Alexis CARBO MESEGUER, Wesley TANG, **Juliana Tiburcio de Araujo**, Melanie JAOUEN
ASN, France
We experimentally characterize a 1024km-core length recirculating loop based on 2-core MCF in unidirectional and bidirectional configurations and compare crosstalk from standard power measurements and system measurements. We eventually investigate performance prediction models accuracy

09:15-09:45 • ACPPOEM-0831-1 *Invited*
Long-distance SDM transmission system based on parallel recirculating MCF loop
Xuesong Zhao, **Tianwai Bo**, Zhongwei Tan, Yi Dong
Beijing Institute of Technology, China
We introduce the recent progress of long-distance space division multiplexing transmission system based on parallel recirculating multi-core fiber. The performance difference caused by the variation in core parameters is experimentally investigated.

09:45-10:00 • ACPPOEM-0728-3
Algorithm for underwater weak light signal recovery based on time thresholding
Jianlei Zhang, **Pengtao Dang**, Bin Zhang, Yi Yang, Qian Liu, Liang Jiao
Xi'an university of posts & Telecommunications, China
A signal recovery algorithm based on time-threshold judgment is proposed for the received weak optical signals at the nano-watt level. Results show that the introduction of this algorithm reduces the communication BER by 17.6 dB.

10:00-10:30 Coffee Break

10:30-12:00 • November 07, 2023 • Tuesday
Transmission System
Presider: Tianwai Bo,Beijing Institute of Technology, China

10:30-10:45 • ACPPOEM-0721-4 *Industry Innovation Nomination*
Experimental Optimization of Entropy and Channel Spacing Combination in Unrepeatered Transmission using 128 GBd PCS-16QAM
Alexis Busson, Hans Bissessur, Juan Esparza
Alcatel Submarine Networks, France
Applying an Offline post-processing 128 GBd high baud rate transponder carrying PCS-16QAM modulation format, we experimentally optimize the Entropy / Channel Spacing combination as a function of the Spectral Efficiency to optimize the reach of an Unrepeatered-link of Enhanced Pure Silica Core Fiber.

10:45-11:00 • ACPPOEM-0727-14 *Industry Innovation Nomination*
Experimental Investigation of Power Loading Algorithm in Downlink Point-to-Multipoint Coherent Systems
Trung Hien Nguyen, Abel Lorences-Riesgo, Sami Mumtaz, Celestino Sanches Martins, Abir Hraghi, Clement Jauffret, Zhihang Wu, Yann Frignac, Gabriel Charlet, Yu Zhao
Huawei Technologies France, Paris Research Center, Optical Communication Technology Lab, France
We demonstrate the benefit of power loading for downlink point-to-multipoint coherent systems. We obtain 0.4/0.9dB required-OSNR gains at 0.01 bit-error-ratio with 10-/12-subcarrier (500G/600G-equivalent) systems, respectively. The gain reduces gradually in the nonlinear transmission regime.

11:00-11:15 • ACPPOEM-0728-29
Real-time implementation of Pilot-Assisted Decision-based Cycle Slip Elimination for Coherent Optical Receivers
Zixiong Jin, Yan Li, Jingwei Song, Xiaoshuo Jia, 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
A real-time low-complexity pilot-assisted decision-based cycle slip elimination (PAD-CSE) scheme is investigated over an FPGA-based coherent optical communication system, which exhibits an enhanced 1.4 dB improvement in ROP sensitivity under 15GBaud QPSK OBTB systems.

11:15-11:30 • ACPPOEM-0728-36
Experimental demonstration of real-time in-vehicle optical signal reception using FPGA and GPU
Jinyun Chen, Leyuan Zhang, Lin Sun, Gordon Ning Liu, Zhaohui Li, Changyuan Yu
Soochow University, China
We experimentally demonstrate the real-time optical signal reception at a rate of 2 Gbps using a 2.5-GSa/s ADC for the in-vehicle communication application. Adaptive decision thresholds are obtained through deploying real-time K-means clustering on GPU.

11:30-11:45 • ACPPOEM-0801-105
A Field Trial of 400G C+L Transmission System with Fast Automatic Power Management
Yu Tang[1,2,3], Yan Shi[1], Yakun Hu[1], Shikui Shen[1], Xiongyan Tang[1], Zhuangzhi Li[4], Wenlin Lv[4], Zhiguo Zhang[3]
1.China Unicom Research Institute, China; 2.China United Network Communications Group Corporation Limited, China; 3.Beijing University of Posts and Telecommunications, China; 4.China United Network Communications Corporation Limited Shandong Branch, China;
A field trial of EDFA-based 470-km 400G C+L band optical network is demonstrated. The transmission performance of the system and automatic power management function are evaluated and analysed.

11:45-12:00 • ACPPOEM-0814-23
Performance Analysis of Silicon-based Optical Coherent Transceiver Chip in S-Band Based on Standard 400 G Modulation Format
QINGYU HE[1], MING LUO[1], XU ZHANG[1], CHAO YANG[1], TAO ZENG[1], XI XIAO[1, 2]
1.China Information and Communication Technologies Group Corporation, China; 2.National Information Optoelectronics Innovation Centre, China
We present a standard 400Gbit/s transmission over 3×80km SSMF at S-band using silicon-based optical coherent transceiver, and compare its performance with C-band. The transceiver is capable of S-band transmission.

12:00-13:30 Lunch Break

13:30-15:30 • November 07, 2023 • Tuesday
Self-Homodyne and Fronthaul
Presider: Yan Li, Beijing University of Posts and Telecommunications, China

13:30-14:00 • ACPPOEM-0831-4 *Invited*
High-Capacity Digital-Analog Fronthaul via Self-Homodyne Detection
Yixiao Zhu
Shanghai Jiao Tong University, China
We overview the recent progress of high-capacity mobile fronthaul based on digital-analog radio-over-fiber and self-homodyne coherent detection. The principle, architecture, and perspectives are discussed.

14:00-14:15 • ACPPOEM-0707-2
Demonstration of A Novel Solution For Mobile Fronthaul Based on WDM Visible Light Transmission Over Multi-Mode Fiber Link
Xianhao Lin, Zengyi Xu, Zhiteng Luo, Junwen Zhang, Chao Shen, Nan Chi
Fudan University, China
We propose a novel solution for mobile fronthaul based on WDM visible light transmission over multi-mode fiber link for the first time. It has been experimentally demonstrated to achieve a total data rate of 24.35Gbps using three wavelengths over 100m MMF.

14:15-14:30 • ACPPOEM-0725-1
Impact Analysis of Multi-path Interference on Real-time 5G Front-haul Transmission System with 50Gbit/s IM-DD Transceivers
Xia Sheng[1], Hao Liu[1], Yangbo Wu[2], Qunbi Zhuge[3], Anxu Zhang[1], Kai Lv[1], Lipeng Feng[1], Yuyang Liu[1], Xiaoli Huo[1], Junjie Li[1], Jia Feng[2], Bowen Tan[2]
1.China Telecom Research Institute, China; 2.Huawei Technologies Co., Ltd, China; 3.Shanghai Jiao Tong University, China
We establish a real-time 5G front-haul system with 50Gbit/s transceivers to illustrate the impact of multi-path interference. The experimental results demonstrate that the performance significantly degrades when the MPI is between 37.09 to 42.12dB.

14:30-14:45 • ACPPOEM-0728-28
Optical Multipath Interference Noise Resistant Digital RoF Fronthaul Achieving 15-dB SNR Enhancement Based on Uneven Spacing and Bit Interleaving
Yimin Hu, Yixiao Zhu, Yikun Zhang, Zijun Yan, Gengming Lin, Ziyu Cheng, Weisheng Hu
Shanghai Jiao Tong University, China
We demonstrate uneven spacing and bit interleaving schemes to suppress MPI impairment in digital radio-over-fiber system without complicated DSP by protecting the significant quantization bits. Both simulation/experiment shows 15/16-dB SNR gain with 1024-QAM OFDM signal.

14:45-15:00 • ACPPOEM-0814-67
Baud-rate Clock Recovery and Adaptive equalization for Intra-Data Center Self-Homodyne Coherent Links
Jingpeng Liu, Sheng Cui, Chengbo Li, Tianhang Yao, Jinhao Zhou, Ming Tang
Huazhong University of Science and Technology, China
Power consumption and cost impose significant limitations on the widespread adoption of coherent optical communication in data centers. To address this issue, extensive research has been conducted on self-homodyne (SHD) coherent detection and baud-rate sampling digital signal processing (DSP), as they have the potential to significantly reduce device power consumption and costs. This paper introduces an enhanced baud-rate clock recovery (CR) and adaptive equalized (AEQ) algorithm designed specifically for SHD coherent links in data centers. Numerical simulations for 61-GBaud dual-polarization Nyquist shaping 16QAM signals with a roll-off factor (ROF) lower than 0.1 show that, for transmission over a 2-km single-mode fiber (SSMF) link, compared with a similar scheme with an oversampling factor (OSF) of two, the receiver sensitivity penalty of proposed baud-rate scheme is less than 0.13 dB. Additionally, compared with the conventional baud-rate algorithm, the proposed algorithm improves the receiver sensitivity by more than 0.42 dB for a receiver in-phase and quadrature (IQ) skew of 4 ps, effectively eliminating skew enhanced timing jitter.

15:00-15:15 • ACPPOEM-0814-34
FrFT Based Synchronization Method for Self-Homodyne Coherent FBMC/OQAM Systems.
Shangxu Yang, Junda Chen, Ming Tang
Huazhong University of Science and Technology, China
An accurate synchronization algorithm based on FrFT is proposed for self-homodyne coherent FBMC/OQAM systems with simulation verification of 40km SSMF transmission. It achieves accurate synchronization under the condition of short to medium-range, amplifier-free and low optical signal-to-noise ratio (~5dB).

15:15-15:30 • ACPPOEM-0730-2
Theoretical Analysis of Geometric Phase Noise in Self-Homodyne Coherent Systems
Zongkai Li, Meng Qiao, Xin Wang, Dawei Wang
School of Electronics and Information Technology, Sun Yat-sen University, China
We study a simple statistical property of the geometric phase noise in the self-homodyne coherent systems, which is investigated in a non-closed trajectory of randomly evolving polarization processes. Simulation based on a random walk polarization rotation model is used to verify the developed theory.

15:30-16:00 Coffee Break

16:00-18:00 • November 07, 2023 • Tuesday
Free-Space Optical Communications
Presider: Jinlong Wei, Peng Cheng Laboratory, China

16:00-16:15 • ACPPOEM-0723-5
Multilevel Polar-Coded PAM-8 with MSB Shaping over Turbulent FSO Communication Link
Weiying Yang, Xiaoyu Liu, Zhiyang Liu, Shilin Xiao
The State Key Laboratory of Advanced Optical Communication System and Networks, China
Proposed FSO communication scheme in Turbulent channel combines polar codes, PS, and PAM. Non-uniform PAM-8 generated by MLPC method with shaping precoder provides up to 1.09dB shaping gain on capacity and 0.82dB gain on BLER.

16:15-16:30 • ACPPOEM-0713-7
Research on the performance of the LDPC-OQPSK system used in underwater wireless optical communication
Yi Yang, **Qian Liu**, Jiayuan Lei, Zixuan Zhao, Leyan Li, Liang Jiao
Xi'an University of Posts & Telecommunications, China
Under novel turbulence model of exponential-generalized gamma distribution, the performance of underwater LDPC-OQPSK coded joint modulation system are simulated at different turbulence intensities and water qualities. A underwater communication setup is built for futher research.

16:30-16:45 • ACPPOEM-0728-21
Mode Correlation of Mode Diversity Free Space Optical Systems under Atmospheric Turbulence
Junjie Chen, Yan Li, Jifang Qiu, Xiaobin Hong, Hongxiang Guo, Jian Wu
State Key Laboratory of Information Photonics and Optical Communication, Beijing University of Posts and Telecommunications, China
We have explored the mode correlation by simulating the process of free-space optical communication with mode diversity. Our results show that the correlations are different between each pair of modes. LP11 and LP21 maintain a positive correlation, while the rest of the modes are negatively correlated with each other. For variations in transmission conditions, both turbulence intensity, aperture diameter, temporal correlation and inner-outer scale effect have influence on mode correlation.

16:45-17:00 • ACPPOEM-0729-15
Multi-User Allocation using Multi-band OFDM-NOMA in Visible Light Communications
Yan Xinda[1], Shi Jin[2], **Tangdiongga Eduward**[1]
1.Eindhoven University of Technology, Netherlands; 2.Wuhan University of Technology, China
The modulation bandwidth limitations and high frequency fading severely restrict the potential of multiple access technique in VLC systems. In this paper, the capacity of a multi-user VLC system is boosted by sub-band division of OFDM modulation and power allocation optimization of NOMA. Notably, the allocation of users in different sub-bands can be configured according to their SNRs. A capacity enhancement of over 21% is experimentally achieved compared to the traditional OFDM-NOMA scheme.

17:00-17:15 • ACPPOEM-0731-135
ACO-OTFS and ADO-OTFS For Indoor Relay-assisted Visible Light Communication
Jianhua Pei[1], Yuxuan Liao[1], Rui Wang[1], Jian Song[1,2,3], Yuhan Dong[1,3]
1.Shenzhen International Graduate School, Tsinghua University, China; 2.Department of Electronic Engineering, Tsinghua University, China; 3.Peng Cheng Laboratory, China
Orthogonal time frequency space (OTFS) is a promising two-dimensional modulation scheme outperforming orthogonal frequency division multiplexing (OFDM) on both dynamic and static multipath channels. However, there are still few efforts for optical OTFS and its performance evaluation in visible light communication (VLC). In this paper, we propose asymmetrically-clipped optical OTFS (ACO-OTFS) scheme for VLC. Based on ACO-OTFS and existing direct current biased optical OTFS (DCO-OTFS), we further propose asymmetrically clipped direct current biased optical OTFS (ADO-OTFS). We evaluate the bit error rate (BER) performance of both proposed schemes and the influencing factors of ADO-OTFS on relay-assisted multipath channels. Numerical results have shown that the BER performance of ACO-OTFS is much better than that of DCO-OTFS and the power efficiency of ADO-OTFS is higher than that of DCO-OTFS at high data transmission rates. Therefore, ADO-OTFS is more suitable for high data rate transmission scenarios by appropriate parameter setting.

17:15-17:30 • ACPPOEM-0731-3
12.5Gb/s Visible Light Communication Over 100m Free-Space Transmission Utilizing Geometric Constellation Shaping and Reservoir Computing
Yuning Zhou, Zhilan Lu, Fujie Li, Jifan Cai, Zengyi Xu, Chao Shen, Junwen Zhang, Nan Chi
Fudan University, China
We demonstrate 12.5Gb/s free-space visible light communication over 100m utilizing geometric constellation shaping and reservoir computing with GaN green laser diode. The resulting data rate is the highest reported in 100m free-space single-carried VLC system.

17:30-17:45 • ACPPOEM-0731-44
An Indoor P2MP Narrow Beam Optical Wireless Communication (NB-OWC) System for Cloud Office Application
Shan Zhang[1], Junwei Li[1], Jun Li[2], You Xiaodi[2], Gangxiang Shen[2], Qiang Cheng[3]
1.China Mobile Research Institute, China; 2.Soochow University, China; 3.China Academy of Information and Communications Technology, China
This paper demonstrates a P2MP NB-OWC system. Passive components plus integrated transmission and reception are implemented in optical antenna (OA). A cascaded relay architecture is designed for Cloud Office. The system can support up to 32-users parallel access with down-link aggregated throughput of 10 Gbps.

17:45-18:00 • ACPPOEM-0814-4
An Experimental Validation of Angular Diversity Aperture (ADA) Receiver in MIMO VLC Systems
Cuiwei He[1], Yuto Lim[1], Chen Chen[2]
1.Japan Advanced Institute of Science and Technology, Japan; 2.Chongqing University, China
We experimentally demonstrate the performance of an Angular Diversity Aperture (ADA) receiver in a VLC MIMO transmission system. These results show that the ADA receiver can provide a well-conditioned channel matrix and consequently, the signals transmitted from different transmitters can be separated with little noise enhancement.

Track 2: Optical Transmission Systems, Subsystems and Technologies (Parallel) New York Hall, 2F

08:30-10:00 • November 06, 2023 • Monday
Fiber Commucation and Sensing
Presider: Yanni Ou, Beijing University of Posts and Telecommunications, China

08:30-08:45 • ACPPOEM-0814-76
Simultaneous vibration sensing and transmission of a single-carrier 5.38 Tb/s signal over 41.4 km weakly coupled 7-core fiber
Xueyang Li[1], Qian Xiang[2], Yaguang Hao[1], Chen Cheng[2], Qi Wu[1], Yongchao Jin[2], Shangcheng Wang[1], Junpeng Liang[1], Yanfu Yang[2], Weisheng Hu[1]
1.Peng Cheng Laboratory, China; 2.Harbin Institute of Technology, China
We demonstrate simultaneous vibration sensing and high-speed communications leveraging a weakly coupled 7-core fiber. Based on DSP-assisted interference fading mitigation, we accurately measure a 100 Hz vibration signal at 41.4 km, while transmitting 6×120 Gbaud 16 QAM signals below the pre-FEC BER of 3.8E-3.

08:45-09:00 • ACPPOEM-0731-121
Awakening Intrinsic Distributed Acoustic Sensing in Digital Subcarrier Multiplexing Coherent Transmission Systems
Zihe Hu, Can Zhao, Mingming Zhang, Yuqi Li, Weihao Li, Junda Chen, Yuxuan Xiong, Luming Zhao, Ming Tang
Huazhong University of Science and Technology, China
By awakening the sensing capability of fractional Fourier transform (FrFT) synchronization pilot in digital subcarrier multiplexing (DSCM) coherent transmission systems, we realize 100-Gb/s 16QAM transmission with a distributed acoustic sensing (DAS) sensitivity of 70 at a spatial resolution of 5 m.

09:00-09:15 • ACPPOEM-0813-6
Integrated High Accuracy Laser Ranging and Communication Scheme Using Large Dynamic Range and Low-complexity DSP Algorithm
Jianwei Tang[1], Sheng Cui[2], Xueyang Li[1], Yaguang Hao[1], Yanfu Yang[3], Weisheng Hu[1]
1.Peng Cheng Laboratory (PCL), China; 2.Huazhong University of Science and Technology, China; 3.Harbin Institute of Technology, Shenzhen, China
A novel integrated laser ranging and communication (ILRC) scheme is proposed, offering high ranging accuracy, a large dynamic range and low complexity. By redesigning the receiver-side DSP scheme and utilizing the output parameters of a low-complexity clock recovery and frame synchronization algorithm in the Rx-DSP procedure, the proposed schemes achieves millimeter-level ranging in the conventional optical communication system without introducing any additional hardware components. Simulation and experimental results validate the effectiveness of the proposed ILRC scheme that exhibits a dynamic range exceeding 20 dB. We experimentally demonstrate an ILRC system of a communication rate of 20 Gbps and high ranging accuracy of 1.95 ~ 1.28 mm at the low received power of -48 ~ -35 dBm.

09:15-10:00 • ACPPOEM-1009-6 *Tutorial*
Distributed sensing over fiber optic cables
Ezra Ip
NEC Laboratories, United States
The optical fiber network is the backbone of modern telecommunications infrastructure. As of 2023, more than 4 billion km of optical fiber has been laid worldwide. In addition to facilitating telecommunications, optical fibers can also be used as sensors to monitor the ambient environment. Distributed fiber optic sensing (DFOS) exploit the scattering mechanisms in glass – Rayleigh, Brillouin and Raman scattering – to measure strain and/or temperature. Any environmental parameter that can be transduced to strain or temperature can also be measured using DFOS. DFOS methods have been studied since the 1970s. Recently, this field has leveraged technologies developed for telecommunications, such as coherent detection, digital signal processing, coding, and spatial/frequency diversity to achieve improved performance in terms of measurand resolution, reach, spatial resolution and bandwidth. Combining DFOS with machine learning methods, it is possible to realize sensor systems that are compact, low-cost, and can operate in harsh environments, and help facilitate improved public safety and smarter cities. In this talk, I will review some Rayleigh-based DFOS methods, their theoretical performance, and provide recent research results.

10:00-10:30 Coffee Break

10:30-12:15 • November 06, 2023 • Monday
Component and Network
Presider: Chen Zhu, Baidu, China

10:30-11:00 • ACPPOEM-0828-1 *Invited*
Frequency range extension of Wavelength Selective Switch enabling next generation multi-band ROADM network
Yiran Ma
Finisar Australia, Australia
Wavelength selective switch frequency range has been extended from C to super C+L band, to support 80 channels 400Gb/s per channel long haul transmission. S and O band can be supported as capacity keeps growing.

11:00-11:15 • ACPPOEM-0728-33
Experimental Demonstration of a Dual-Arm Drop Element-based Soft-ROADM for Future Optical-Wireless Converged Access Networks
Roger Giddings, **Omaro Gonem**, Jianming Tang
Bangor University, United Kingdom
A dual-arm soft-ROADM drop operation with drop RF-signal phase-offset insensitive performance is demonstrated, which eliminates the need to dynamically control the drop RF-signal phase-offset. Thus, making soft-ROADMs highly attractive for future optical-wireless converged access networks.

11:15-11:30 • ACPPOEM-0731-132
Non-Volatile Tunable Optical Power Splitter based on the Hybrid Integration of the Planar Lightwave Circuits and the Phase Change Material
Wenyi Peng[1], Siqi Yan[1], Hao Tong[2], Qingshan Tan[2], Ming Tang[1]
1.School of Optical and Electronic Information and Wuhan National Laboratory for Optoelectronics, China; 2.School of Integrated Circuits and Wuhan National Laboratory for Optoelectronics, China
In optical communication systems, tunable optical power splitters play a crucial role in photonic integrated circuits. Optical power splitters using planar lightwave circuits (PLC) technology offer several advantages over silicon-based platforms, such as wider optical bandwidth, low insertion loss, cost-effectiveness, and high compatibility with optical fibers. However, conventional tunable optical power splitters often rely on the thermos-optical effect induced by the metallic heater, which consumes power and exhibits volatility. In this paper, we propose a novel non-volatile optical power splitter that leverages a phase change material within the planar lightwave circuits platform's multimode interference device. By heating the material to modify its refractive index, the self-imaging effect of multimode interference is altered, allowing for continuous tuning of the spectral ratio between 50%:50% and 70%:30%. The phase change material's constant refractive index in the passive state creates a waveguide-type tunable optical splitter. It maintains the splitting ratio after initialization, offering benefits such as low power consumption, flexible deployment scenarios, and cost-effectiveness in the industry market.

11:30-12:00 • ACPPOEM-0801-10 *Invited*
High-Baudrate Silicon Photonics Ring Resonator Modulators for Short-Reach Applications
Oskars Ozoliņš[1,2,3], Armands Ostrovskis[1], Aleksandrs Marinins[1], Toms Salgals[4], Michael Koenigsmann[5], Benjamin Krüger[5], Fabio Pittalà[5], Ints Murans[1], Arvids Sedulis[1], Kristaps Rubuls[1], Dilan Enrique Ortiz Blanco[1], Ryan P. Scott[5], Hansjoerg Haisch[5], Mahdieh Joharifar[3], Richard Schatz[3], Lu Zhang[6,7], Jurgis Porins[1], Sandis Spolitis[1], Xianbin Yu[6,7], Markus Gruen[5], Hadrien Louchet[5], Vjaceslavs Bobrovs[1], Xiaodan Pang[1,2,3]
1.Riga Technical University, Latvia; 2.RISE Research Institutes of Sweden AB, Sweden; 3.KTH Royal Institute of Technology, Sweden; 4.Riga Tecnical University, Latvia; 5.Keysight Technologies, Germany; 6.Zhejiang University, China; 7.Zhejiang Lab, China
We demonstrate up to 160 Gbaud on-off keying with first ring resonator modulator and up to 128 Gbaud on-off keying with second ring resonator modulator. Both modulators achieve performance below 6.25% OH HD-FEC threshold.

12:00-12:15 •ACPPOEM-0801-28
Transmitter IQ mismatch Estimation by Number-Theoretic Net-Based Gaussian Particle Filter for Coherent Optical Communications
Shuai Liu[1], Yangfan Xu[1], Xinwei Du[1], Qian Wang[2], Changyuan Yu[3]
1.BNU-HKBU United International College, China; 2.Zhejiang University of Technology, China; 3.The Hong Kong Polytechnic University, Hong Kong, China
In this paper, we propose a novel approach for estimating in-phase/quadrature-phase mismatch at the transmitter using a number-theoretic net (NT-net)-based Gaussian particle filter (NT-GPF). Simulation results demonstrate that the NT-GPF-based approach offers higher estimation accuracy.

12:00-13:30 Lunch Break

13:30-15:30 • November 06, 2023 • Monday
Advanced Modulation Techniques
Presider: Bin Chen, Hefei University of Technology, China

13:30-14:00 • ACPPOEM-0801-24 *Invited*
PDM Probabilistically Shaped High-order QAM Coherent Optical Communication
Mingyi Gao
Soochow University, China
The PDM probabilistically shaped high-order QAM signal is attractive due to its higher spectral efficiency, but it is susceptible to various noise. The paper introduces the DSP algorithms and challenges in the PDM PS-1024/4096-QAM experiments.

14:00-14:15 • ACPPOEM-0711-1
Multi-dimensional Energy Limitation in Sphere Shaping for Nonlinear Interference Noise Mitigation
Jingtian Liu, Élie Awwad, Yves Jaouën
Télécom Paris, Institut Polytechnique de Paris, France
We propose Four-Dimensional (4D) energy limit enumerative sphere shaping (ESS) of M-QAM signaling to minimize rate loss and improve the transmission performance over non-linear WDM optical-fiber systems. Simulation results show that the proposed scheme outperforms the conventional ESS by 0.19 bit/4D-symbol in achievable information rate over a 205 km single-span link and a WDM transmission of five polarization-division-multiplexed channels with 400 Gbit/s net rate per channel. We also study the achieved performance over several shaping block lengths and show that the achieved gains do not scale well over multi-span systems.

14:15-14:30 • ACPPOEM-0726-23
Experimental Comparisons Between TPS-64QAM and UD-16QAM over a Bandwidth-limited 25-Tb/s 6300-km Transmission System
Xiaoshuo Jia[1], Yan Li[1], Jingwei Song[1], Zixiong Jin[1], Chao Yang[2], Ming Luo[2], Runzhe Fan[2], Jifang Qiu[1], Xiaobin Hong[1], Hongxiang Guo[1], Zhisheng Yang[1], Jian Wu[1]
1.State Key Laboratory of Information Photonics and Optical Communications, Beijing University of Posts and Telecommunications, China; 2.State Key Laboratory of Optical Communication Technologies and Network, China Information and Communication Technologies Group Corporation, China
Comparisons between TPS-64QAM and UD-16QAM are executed employing bandwidth-limited transmission systems. Results show that 0.7-dB OSNR sensitivity improvements, 1.0-dB optimal launch power improvements and 350-km maximum-reach improvements could be introduced by TPS-64QAM compared to UD-16QAM.

14:30-14:45 • ACPPOEM-0727-17
Novel Distribution Matcher Design for Short Length Frames Based on Non-Binary Convolutional Codes
Rami Klaimi[1], **Akram Abouseif**[1], Ghaya Rekaya-Ben Othman[2], Yves Jaouen[2]
1.MIMOPT Technology, France; 2.Telecom Paris - Institut Polytechnique de Paris, France
We propose a distribution matcher that enables probabilistic constellation shaping while ensuring low-complexity dematching techniques. The proposal is based on non-binary convolutional codes, designed to respect a given optimal symbol distribution. In addition to lowering the dematching complexity, the proposed structure is shown to reduce the latency, to respect the target distribution with a low overhead and to outperform existing solutions with more than 0.3dB. It is also shown that, while being able to respect the target distribution for short frame lengths, the proposed technique helps enhancing the resilience of the optical system in question to the non-linearity effects.

14:45-15:00 • ACPPOEM-0730-29
Optical Modulation Format Identification Under Hybrid OSNRs Using LIN Model
Meng Liang, **Weiwen Chen**
Xi'an University of Posts and Telecommunications, China
A novel lightweight convolutional neural network with improved Inception model is proposed and combined with neighborhood grayscale enhanced constellation diagrams to achieve accurate recognition of six optical communication signal modulation formats in different communication scenes.

15:00-15:15 • ACPPOEM-0731-92
End-to-end Geometric Shaping for Long-haul Coherent Transmission Based on the Artificial Shaping Parameter Setting Approach
Jiayu Zheng[1], Fan Zhang[1,2]
1.Peking University, China; 2.Peng Cheng Laboratory, China
We propose an artificial shaping parameter setting approach for end-to-end geometric constellation shaping, achieving Q^2-factor and GMI gains respectively up to 0.15dB and 0.13bits/4D over square QAM on a 960km 32GBaud 64QAM WDM SSMF system.

15:15-15:30 • ACPPOEM-0814-26
Optical Fiber Communication System with Intelligent Joint Source-Channel Coded Modulation
Liming Cheng, Zhenming Yu, Hongyu Huang, Wei Zhang, Yueqiu Mu, Kun Xu
State Key Laboratory of Information Photonics and Optical Communications, Beijing University of Posts and Telecommunications, China
We propose a new point-to-point optical fiber communication system based on intelligent joint source-channel coded modulation. The experimental results show that the proposed system achieves higher information compression and greater tolerance to optical link impairments.

15:30-18:00 Coffee Break & Poster Session

18:30-21:00 Banquet and Awards Ceremony

08:30-10:00 • November 07, 2023 • Tuesday
Fiber Nonlinearity
Presider: Wang Qian, Zhejiang University of Technology, China

08:30-08:45 • ACPPOEM-0724-1
Accurate Nonlinearity Characterization of Dual-Polarization 16QAM Transmitter Using Four-Level Probability-Maintained Notch Signal
Tong Ye[1], Xiaofei Su[1], Ke Zhang[1], Jingnan Li[1], Hisao Nakashima[2], Takeshi Hoshida[2], **Zhenning Tao**[1]
1.Fujitsu R&D Center, China; 2.Fujitsu Limited, Japan
Probability-maintained notch method based on four-level signal instead of two-bit signal is proposed to evaluate the nonlinearity of PAM4/16QAM formats. By introducing appropriate diffusion in the four-level signal, the large two-bit quantization error is avoided, and a 28 dB notch depth is achieved.

08:45-09:00 • ACPPOEM-0729-19
Digital Back Propagation Algorithm for Nonlinear Compensation in 54.5GBaud 4000km 16QAM Raman Amplification Transmission System
Xiaona Zhang[1], Yan Li[1], Xiaoshuo Jia[1], Ming Luo[2], Chao Yang[2], Jifang Qiu[1], Xiaobin Hong[1], Hongxiang Guo[1], Zhisheng Yang[1], Jian Wu[1]
1.State Key Laboratory of Information Photonics and Optical Communications, Beijing University of Posts and Telecommunications, China; 2.State Key Laboratory of Optical Communication Technologies and Network, China Information and Communication Technologies Group Corporation, China
The paper introduces the digital backpropagation (DBP) algorithm for Raman amplification, achieving 0.83 dB Q-factor enhancement and 3 dBm optimal launch power improvement in a 4000 km 54.5-GBaud 16QAM coherent optical communication system.

09:00-09:15 • ACPPOEM-0730-27
An Innovative Temporal Convolutional Network(TCN) Combined with Self-Attention Mechanism for Fiber Nonlinear Compensation
Jingyan Yin[1,2], Zili Fang[1,2], Xiaoqian Feng[1,2], Jiyuan Cai[1,2], Lixia Xi[1], Wenbo Zhang[1,2]
1.State Key Laboratory of Information Photonics and Optical Communications (Beijing University of Posts and Telecommunications), China; 2.Key Laboratory of Mathematics and Information Networks (Beijing University of Posts and Telecommunications), Ministry of Education, China
A Time Convolutional Network equalizer combined with self-attention mechanism is proposed for nonlinear compensation. Results show that the scheme achieves significant Q-factor improvements in single and multi-channel systems compared to DBP.

09:15-09:30 • ACPPOEM-0814-51
Low-Resolution Coherent Optical Fiber Communication System with digital backpropagation and error feedback noise shaping
Qiuyang Yin, Zhenming Yu, Xiangyong Dong, Hongyu Huang, Kaixuan Sun, Kun Xu
State Key Laboratory of Information Photonics and Optical Communications, China
The joint compensation of quantization noise and nonlinear distortion with EFNS and DBP is investigated in a low-resolution 100-Gb/s optical transmission system. The performance on joint and separate use of EFNS and DBP is analyzed.

09:30-09:45 • ACPPOEM-0815-1
Effective Impact of Modulation on Interchannel Nonlinear Effects in Realistic Submarine Links with Commercial Transceivers
Joana Girard-Jollet[1], Jean-Christophe Antona[1], Alexis Carbo Meseguer[1], Sebastien Dupont[1], Richard Garuz[1], Andrea Quintana Zambrano[1], Ghaya Rekaya-Ben Othman[2]
1.Alcatel Submarine Networks, Nokia, France; 2.Telecom Paris, France
We measure the GSNR of a subsea link with three different real-time transceivers for various link reaches and input powers. We experimentally show that, contrary to what the eGN model predicts, noise loading does not cause an additional penalty in the channel under test performance.

09:45-10:00 • ACPPOEM-0815-104
Learned Volterra Equalization for WDM Systems
Nelson Castro, Stylianos Sygletos
Aston University, United Kingdom
We propose a learned MIMO Volterra scheme for mitigating Kerr-based intra- and inter-channel nonlinearity in WDM systems. We demonstrate a 1.2 dB improvement of the SNR over single-channel nonlinear equalization at two steps per span.

10:00-10:30 Coffee Break

10:30-12:00 • November 07, 2023 • Tuesday
Novel Applications of Optical Network
Presider: Yixiao Zhu, Shanghai Jiao Tong University, China

10:30-11:00 • ACPPOEM-1009-7 *Invited*
Reinventing passive optical network with coherent pluggable technology
Jim Zou, Gabriele Di Rosa
Adtran Networks SE, Germany
Passive Optical Network (PON) has been one of the most successful innovations enabling broadband access for today's residential Internet connectivity. PON systems always adopt intensity modulation and direct detection primarily due to cost and complexity constraints. Now, with the PON capacity being expanded to 50G and even beyond, coherent transmission technologies are being considered for the future high-speed PON. This paper elaborates some of the latest coherent PON developments.

11:00-11:15 • ACPPOEM-0801-109
A Chaotic Encryption Algorithm with Dynamic Key Enabled by Power-Division Multiplexed Transmission
Yinchen Ding[1], Yi Lei[1,2,3], Qi Lu[1], Zhongyi Guo[1], Bin Chen[1,4]
1.Hefei University of Technology, China; 2.Intelligent Interconnected Systems Laboratory of Anhui Province (Hefei University of Technology, China; 3.State Key Laboratory of Advanced Optical Communication Systems and Networks (Shanghai Jiao Tong University), China; 4.Intelligent Interconnected Systems Laboratory of Anhui Province (Hefei University of Technology), China
Using power-division multiplexing, a chaotic encryption method is proposed based on dynamic key generation from the instantaneously transmitted information. The influence of power allocation is analyzed and the security with different key mismatches is demonstrated.

11:15-11:30 • ACPPOEM-0814-17
Semantic Optical Fiber Communication System Based on Deep Learning
Hongyu Huang, Zhenming Yu, Liming Cheng, Wei Zhang, Yueqiu Mu, Kun Xu
State Key Laboratory of Information Photonics and Optical Communications Beijing University of Posts and Telecommunications, China
We proposed and experimentally demonstrated a semantic optical fiber communication system aimedat maximizing the semantic information transmission. Compared with the bit-based structure, the proposed system achieved better transmission performance, especially in terrible channel environments.

11:30-12:00 • ACPPOEM-0907-1 *Invited*
Progress on Integrating Quantum Communications in Optical Systems Testbeds
Dan Kilper[1], Jerry Horgan[2], Briantcev Dmitrii[3], Aleksandra Kaszubowska-Anandarajah[1], Marco Ruffini[1]
1.Trinity College Dublin, Ireland; 2.SETU, United States; 3.CONNECT Centre, Ireland
Experimental methods are being developed to enable quantum communication systems research in testbeds. We describe testbed architectures for emerging quantum technologies and how they can integrate with existing fibre optical testbeds, specifically OpenIreland.

12:00-13:30 Lunch Break

13:30-15:30 • November 07, 2023 • Tuesday
Advanced PON Technology
Presider: Jian Zhao, South China University of Technology, China

13:30-14:00 • ACPPOEM-0815-36 *Invited*
Paradigm shift for optical access network: from TDM to FDM
Jinlong Wei[1], Zhixin Liu[2], Yuan Luo[3]
1.Peng Cheng Laboratory, China; 2.University College London, United Kingdom; 3.The Chinese University of Hong Kong, Shenzhen, China
We reviewed the paradigm shift from TDM to FDM for optical access network and proposed a frequency-referenced coherent-PON system with >200Gb/s bit rate, >30dB power budget, and low latency using a single optical coherent receiver.

14:00-14:15 • ACPPOEM-0730-16
Receiver Sensitivity Improvement with Joint Geometric and Probabilistic Shaping for 200G Flexible Coherent Passive Optical Network
Gengming Lin, Yixiao Zhu, Zijun Yan, Yimin Hu, Xi Chen, Qunbi Zhuge, Weisheng Hu
Shanghai Jiao Tong University, China
We optimize and experimentally demonstrate joint GPS scheme under level-dependent PD noise for 200G flexible coherent

PON. GPS-16-QAM scheme achieves 1-dB and 0.6-dB receiver sensitivity improvement compared with PS-16-QAM at B2B and after 10-km transmission.

14:15-14:30 • ACPPOEM-0801-60
Impact of Differential Group Delay on 100 Gb/s/λ IM/DD Passive Optical Networks
Haide Wang[1], Ji Zhou[1], Jinyang Yang[1], Weiping Liu[1], Changyuan Yu[2], Zhaohui Li[3]
1.Jinan University, China; 2.The Hong Kong Polytechnic University, Hong Kong, China; 3.Sun Yat-sen University, China
The 100 Gb/s/λ passive optical networks (PONs) based on the intensity-modulation and direct-detection (IM/DD) optical systems are still potential candidates for the next-generation PON. However, in addition to the limited bandwidth and chromatic dispersion, differential group delay (DGD) is a potentially great challenge for the 100 Gb/s/λ IM/DD PONs. DGD not only causes inter-symbol interference but also seriously affects timing recovery. In this paper, we evaluate the impact of DGD on the 100 Gb/s/λ IM/DD PON. The results show that the bit-error ratio is seriously degraded. Although more powerful digital signal processing is used, the penalty on the receiver sensitivity still exists. Moreover, the variance of the timing error is larger with the increase of DGD, which would be a great challenge to implement timing recovery for the 100 Gb/s/λ IM/DD PONs.

14:30-14:45 • ACPPOEM-0815-41
Real-Time UDWDM-PON Demonstration of Ten Wavelength Locked 10G Coherent Transponder Using Frequency-Interval Feedback Control Method
Muxin Shi[1], Tian Qiu[1], Yang Zou[1], Xiaoxiao Dai[1,2], Qi Yang[1,2], Yonghua Feng[3], Jing Dai[3], Yudi Fu[3], Yaqin Wang[3]
1.School of Optical and Electronic Information, Huazhong University of Science and Technology, China; 2.Optics Valley Laboratory, China; 3.basic research department of optical networks, Fiberhome Telecommunication Technologies Co., LTD, China
We propose a real-time UDWDM-PON demonstration of ten wavelength locked 10Gb/s coherent transponder using feedback control method scheme. The results show that it can realize the transmission with channel spacing of 6.25GHz on 85.4km fiber.

14:45-15:00 • ACPPOEM-0729-22
Balancing the reception performance of ONUs in CDM Coherent PON downstream signaling by Hadamard Transform Pre-coding
Luxiao Zhang[1], Meng Mao[1], Lin Sun[1], Gordon Ning Liu[1], Zhaohui Li[2]
1.Soochow University, China; 2.Sun Yat-sen University, China
We observed and investigated the inconsistency of the reception performance deviation of ONUs in CDM coherent PONs by experiments. We employed the Hadamard transform pre-coding for balancing the performance of CDM-assigned ONUs.

15:00-15:15 • ACPPOEM-0731-128
PON Monitoring Based on Dual-FBG Periodic Encoders and Sequence Correlation
Zhiyi Zhong, Wu Liu, Hong Li, Han Li, Ming Luo
State Key Laboratory of Optical Communication Technologies and Networks, China
Dual-FBG periodic encoders are allocated to branches for PON monitoring, and correlated sequences instead of pulses are employed for encoder probing. The experiment successfully identified encoders on a 16-customer PON with 23 km of fiber.

15:15-15:30 • ACPPOEM-0801-148
250G Hybrid FiWi access based on coherent PON and MMW Fiber-Wireless Integrated Network
Guoqiang Li[1], Junlian Jia[1], Boyu Dong[1], Zhongya Li[1], Sizhe Xing[1], Jianyang Shi[1], Nan Chi[1,2], Junwen Zhang[1,2]
1.Shanghai ERC of LEO Satellite Communication and Applications, Shanghai CIC of LEO Satellite Communication Technology, Fudan University, China; 2.Peng Cheng Lab, China
We propose and experimentally demonstrate an FDM-based multi-format hybrid fiber-wireless communication system integrated with coherent PON and millimeter-wave wireless network. We realize a 6.25GBaud/SC×4SCs 250G data rate after 20-km fiber and 1-m MMW wireless transmission.

15:30-16:00 Coffee Break

16:00-17:45 • November 07, 2023 • Tuesday
Tranceiver Optimization
Presider: Chao Li, Peng Cheng Laboratory, China

16:00-16:30 • ACPPOEM-0824-1 *Invited*
Low power consumption digital signal processing for bandwidth limited coherent optical system with Tomlinson-Harashima pre-coding
Guoxiu Huang, Hisao Nakashima
FUJITSU LIMITED, Japan
The Tomlinson-Harashima pre-coding could realize low power consumption digital signal processing for the coherent optical system. A good performance will be shown by the comparison to the Nyquist shaping 64QAM signal with probabilistic constellation shaping.

16:30-16:45 • ACPPOEM-0713-1
Estimation and Compensation of Electronic-Opto Frequency Response on Carrier-less Phase Retrieval Receivers
Qi Gao[1,2], Hanzi Huang[1,2], Haoshuo Chen[3], Ziyue Liu[1,2], Yuanzhe Qu[1,2], Zhengxuan Li[1,2], Yingxiong Song[1,2]
1.Shanghai University, China; 2.Key Laboratory of Specialty Fiber Optics and Optical Access Networks, China; 3.Nokia Bell Labs, United States
We propose two methods to estimate the complex electronic-opto frequency response with intensity-only measurements and compensate its effect for phase retrieval receivers. Simulation results validate the improved OSNR and bandwidth sensitivity using proposed methods.

16:45-17:00 • ACPPOEM-0719-8
Automatic Bias Point Control for Optical IQ Modulators Based on LFM Dithers and Fractional Fourier Transform
Zheli Liu[1], Mingming Zhang[1], Weihao Li[1], Zihe Hu[1], Can Zhao[1], Ming Tang[1,2,3]
1.Huazhong University of Science and Technology, China; 2.School of Optical and Electronic Information and Wuhan National Laboratory for Optoelectronics, China; 3.Optics Valley Laboratory, China
We propose and demonstrate a method for controlling bias point of optical IQ modulator using LFM pilot and FrFT. This approach enables highly precise bias point control even in the presence of RF noise, while also maintaining stable signal transmission performance under laboratory test.

17:00-17:15 • ACPPOEM-0730-24
Complete and Low-complexity Frequency-dependent IQ Crosstalk Compensation for High-baud-rate Coherent Optical Transceiver
Ziheng Zhang, Longquan Dai, Zicai Cao, Mengfan Cheng, Qi Yang, Deming Liu, Lei Deng
Huazhong University of Science and Technology, China
We propose a complete and low-complexity compensation scheme for frequency-dependent crosstalk in high-baud-rate coherent optical transceivers. The BER of a 64GBaud PDM-16QAM experiment is improved from 4.09e-3 to 7.70e-4 by only a low-complexity 2×2 algorithm.

17:15-17:30 • ACPPOEM-0801-90
Clipping PAM4 for 56G ER Optical Interconnects using Cost-Effective 10G-Class TOSA and ROSA
Qingxin Lu[1], Ji Zhou[1], Haide Wang[1], Weiping Liu[1], Changyuan Yu[2], Zhaohui Li[3]
1.Jinan University, China; 2.The Hong Kong Polytechnic University, Hong Kong, China; 3.Sun Yat-sen Univeristy, China
Amplifier-free O-band intensity modulation direct detection (IM/DD) optical system has been applied in the extended-reach (ER) optical interconnects. The amplifier-free IM/DD optical systems are peak-power constrained, in which a high-peak-to-average power ratio (PAPR) signal leads to a low optical power budget. In this paper, we propose the symmetric clipping operation to reduce the high PAPR of the Nyquist-shaping four-level pulse amplitude modulation (PAM4) signal, and the clipping noise cancellation (CNC) to remove the clipping noise. 56G PAM4-based ER optical interconnects are experimentally demonstrated by using 10G-class transmitter optical sub-assembly (TOSA) and receiver optical sub-assembly (ROSA). The experimental results show that the clipping operation and CNC algorithm can bring down the bit error ratio under the KP4 forward-error-correction limit of 2.2×10^{-4} at the received optical power of -16dBm. Based on the proposed algorithm, the optical power budget of 56G PAM4-based ER optical interconnects is ~24dB, which is ~3dB higher than that using only clipping operation. The sufficient optical power budget makes the cost-effective 10G-class optical components feasible for ER optical interconnects.

17:30-17:45 • ACPPOEM-0814-65
A Simple and Precise IQ Skew Calibration Method by Spectrum Analysis for Coherent Transmitters
Jingchuan Wang, Li Wang, Yaxi Yan, Alan Pak Tao Lau, Chao Lu
The Hong Kong Polytechnic University, Hong Kong, China
We propose a simple one-shot transmitter IQ skew calibration method by just using optical spectrum analyzer without introducing extra complexity. A skew error less than 0.5ps is demonstrated for DP 80 GBaud 16QAM system.

Track 3: Network Architectures, Management and Applications
Grand Ballroom III, 3F

13:30-15:30 • November 05, 2023 • Sunday
Quantum Key Distribution Secured Optical Networks
Presider: Yanni Ou, Beijing University of Posts and Telecommunications, China

13:30-14:15 • ACPPOEM-1009-11 *Tutorial*
Evolution of Quntum Key Distribution Networks
Yongli Zhao
Beijing University of Posts and Telecommunications, China
In response to security threats posed by emerging technologies like quantum computing, Quantum Key Distribution (QKD) has gained prominence in the fields of photonics and network security research. This report offers a comprehensive review of optical fiber-based QKD networking research, applications, and the standardization efforts, alongside a forward-looking perspective on satellite-based QKD networks for securing laser communications. Within this context, the report involves the new challenges and solutions in network control management, interworking, and network resilience arising from the introduction of QKD to classical networks. These key perspectives address the evolving landscape of secure data transmission in our interconnected world.

14:15-14:30 • ACPPOEM-0731-116
Joint Multi-Layer Routing and Resource Allocation in QKD-Embedded IP over Optical Networks
Kaili Zhang, Xiaosong Yu, Yongli Zhao
State Key Laboratory of Information Photonics and Optical Communications, IPOC, Beijing University of Posts and Telecommunications, China
We proposed a joint multi-layer routing and resource allocation algorithm in QKD-Embedded IP over optical networks to satisfy the security requirements of IP over optical networks. The performance of the proposed algorithm is evaluated by simulation.

14:30-14:45 • ACPPOEM-0731-137
A Crosstalk-Minimized Wavelength Conflict Avoiding Algorithm for Optical Switching in Quantum-Key-Distribution Optical Networks
Yufei Guo, Xiaosong Yu, Yongli Zhao
State Key Laboratory of Information Photonics and Optical Communications, IPOC, Beijing University of Posts and Telecommunications, China
We proposed a wavelength conflict avoiding algorithm in quantum key distribution optical networks (QKD-ON) with multi-core fibers. The proposed algorithm minimizes the crosstalk in the switching process and improves the successful switching probability of requests by constructing the crosstalk auxiliary graph. Simulation results show that blocking probability is greatly reduced.

14:45-15:00 • ACPPOEM-0801-67
Security Provisioning in Quantum Key Distribution-Secured Optical Networks
Shifeng Ding, Chun-Kit Chan
The Chinese University of Hong Kong, Hong Kong, China
We consider the security of quantum keys and encrypted data in QKD-secured optical networks. A security framework integrating a multi-path multi-protocol (2MP) service provisioning scheme is proposed to enhance network security and reduce network costs.

15:00-15:15 • ACPPOEM-0812-1
Time-scheduled End-to-end Entanglement Establishment in Memory-cells-limited Quantum Networks
Yazi Wang[1], Xiaosong Yu[1], yongli zhao[1], Avishek Nag[2], jie zhang[1]
1.Beijing University of Posts and Telecomm, China; 2.School of Electrical and Electronic Engineering University College Dublin, Ireland
A routing and entangled pairs allocationalgorithm was proposed to support remote entangled pairs sharing with finite storage capacity and limited storage time, upon satisfying the timeconstraint, and the proposed algorithm is further verified via simulation.

15:15-15:30 • ACPPOEM-0801-143
Survivable Service Planning with Security-degraded Protection in Physical-layer Secured Optical Transport Networks
Tianhe Liu[1], Xiaoyu Yu[1], Wei Wang[1], Qiaojun Hu[1], Liyazhou Hu[2], Yajie Li[1], Yongli Zhao[1], Yongyuan Liu[3], Jie Zhang[1]
1.Beijing University of Posts and Telecommunications, China; 2.Macau University of Science and Technology, Macau, China; 3.Beitsing Communications Technology Co., Ltd, China
We propose a security-degradation-based protection provisioning scheme (SDPP) . Simulation results show that the proposed SDPP scheme performs better than the non-security-degradation-based protection provisioning(N-SDPP) scheme in terms of the blocking rate and the security deviation.

15:30-16:00 Coffee Break

16:00-17:30 • November 05, 2023 • Sunday
Optical Network Architectures
Presider: Xuwei Xue, Beijing University of Posts and Telecommunications, China

16:00-16:30 • ACPPOEM-0827-2 *Invited*
Advanced ROADM Architectures based on High Capacity WSSs
Haining Yang
Southeast University, China
This talk will review how CDC ROADMs can be enhanced and simplified by high-capacity wavlength selective switch(WSS) modules.

16:30-17:00 • ACPPOEM-1009-8 *Invited*
A Stopgap Solution for EON Resource Assignment Postponing the Need for Disruptive Technologies
Yuxin Xu[1], Hang Xing[1], Bin Chen[2]
1. Zhejiang University of Technology, China; 2. Hefei University of Technology, China
This talk discusses optical reconfiguration strategies for datacom networks. The objective is to improve applications performance while avoiding traffic disruptions and reduce packet loss due to the reconfiguration of optical links.

17:00-17:15 • ACPPOEM-0717-3 *Industry Innovation Nomination*
Digital Twin-Enabled Service Optimization Sequence of Actions for Power Equalization
Chenyu Sun[1,2], Xin Yang[1,3], Gabriel Charlet[1], Photios Stavrou[2], Yvan Pointurier[1]
1.Huawei Technologies France, France; 2.EURECOM, France; 3.Politecnico di Milano, Italy
We experimentally demonstrate that service SNR can be degraded by several dB if links are not equalized in the correct sequence; this is prevented with our digital twin-enabled heuristic to optimize the sequence for equalization.

17:15-17:30 • ACPPOEM-0815-53
Non-Line-of-Sight 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 (UOWC)can provide high-speed underwater data transmission. Here we establish and verified a non-line-of-sight (NLOS) UOWC system model incorporating the previously overlooked wavy water surfaces. The SNR performance is also investigated.

17:30-20:00 Welcome Reception

08:30-10:00 • November 06, 2023 • Monday
Elastic Optical Networks
Presider: Bin Chen, Hefei University of Technology, China

08:30-09:00 • ACPPOEM-0814-75 *Invited*
Non-disruptive optical reconfiguration strategies for datacom networks
Roberto Proietti
Politecnico di Torino, Italy
This talk discusses optical reconfiguration strategies for datacom networks. The objective is to improve applications performance while avoiding traffic disruptions and reduce packet loss due to the reconfiguration of optical links.

09:00-09:15 • ACPPOEM-0729-17
Cost-Efficient Computing Offloading in Computing First Networks Supported by EONs
Jingjie Xin, Xin Li, Lu Zhang, Chenyu Zhao, Yongjun Zhang, Shanguo Huang
Beijing University of Posts and Telecommunications, China
This paper proposes a cost-efficient computing offloading (CECO) scheme to determine offloading decisions for requests arriving at EON-supported computing first networks. Results show CECO can improve acceptance ratio and reduce completion delay and electricity charge.

09:15-09:30 • ACPPOEM-0814-38
A Deep-Reinforcement-Learning-based Dynamic Scheduling of Delay-Tolerant Requests in Elastic Optical Networks
Xiaoying Lin[1], Yue-Cai Huang[1], Han Zhang[1], Jie Zhang[2]
1.South China Normal University, China; 2.Shunde Polytechnic, China
We propose a deep reinforcement learning (DRL) framework for dynamic scheduling of delay-tolerant requests in the elastic optical networks, where the DRL agent automatically adjusts its scheduling strategy by interacting with the dynamic network environment. To the best of our knowledge, this is the first attempt to introduce DRL to schedule the delay-tolerant requests. The simulation results demonstrate that our proposed method outperforms the conventional heuristic methods.

09:30-09:45 • ACPPOEM-0814-50
Immediate and Advance Reservations with Dynamic Resources Provisioning in Edge-Cloud Elastic Optical Networks
Jinrui Wu[1], Bin He[1], Hong Chen[1], Weidong Shao[1], Min Jiang[1], Liulei Zhou[1], Bowen Chen[1], Weiguo Ju[2]
1.School of Electronic and Information Engineering Soochow University, China; 2.Institute of ICT Technology, China Information Consulting & Designing Institute CO., LTD,, China
This paper investigates resources provisioning for immediate and advance reservations in edge-cloud elastic optical networks (EC-EON). The simulation results demonstrate that the proposed dynamic resource provisioning method achieves higher spectrum efficiency and lower blocking probability.

09:45-10:00 • ACPPOEM-0731-105
Open Set Hardware Fingerprint Authentication of Optical Transmitters in Fiber Networks
Yilin Qiu[1], Jiawei Ren[2], Zhi Chai[1], Huang Xinran[1], Huang Renhui[1], Yang Xuelin[1]
1.Shanghai Jiao Tong University, China; 2.Henan Key Laboratory of Visible Light Communications, China
A physical-layer authentication is proposed for fingerprint recognition and classification of optical transmitters in fiber networks, based on the received optical spectra, where the recognition accuracy of 98% is achieved.

10:00-10:30 Coffee Break

10:30-12:00 • November 06, 2023 • Monday
QoS Guaranteed Optical Networks
Presider: Bitao Pan, Beijing University of Posts and Telecommunications, China

10:30-11:00 • ACPPOEM-1009-10 *Invited*
Building Digital Twin for Large-scale and Dynamic C+L-Band Optical Networks
Min Zhang
Beijing University of Posts and Telecommunications, China'
Optical networks are evolving towards wideband capabilities, highly dynamic states and ever-increasing scales. Digital twin models may perform efficient QoT estimation in large-scale C+L-band optical networks, and thus facilitate effective managements and failure positioning.

11:00-11:15 • ACPPOEM-0713-3
Innovation and Field Trial of Optical Service Unit (OSU) Based Metro-Optimized OTN Technologies
Ruiquan Jing[1], Chengliang Zhang[1], Junjie Li[1], Heng Zhou[1], Yadong Gong[1], Yuanbin Zhang[2], Xiaoli Huo[1], Chengxin Duan[2]
1.China Telecom Research Institute, China; 2.ZTE Corporation, China
The latency performance of the M-OTN/OSU technologies was verified in a network operator's lab. Moreover, the features of low latency and hitless bandwidth adjustment were verified in multi-vendor field trial based on commercial M-OTN equipment.

11:15-11:30 • ACPPOEM-0731-41
Demostration of Resource-Efficient and Load-Balanced Network Slicing in Computing Power Optical Networks
Yongjian Wu, Bojun Zhang, Shaoxiong Feng, Chaoqun Li, Yuqing Song, Zhiqun Gu, Jiawei Zhang, Yuefeng Ji
State Key Lab of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China
We propose a resource-efficient and load-balanced routing algorithmin computing power optical networks. Additionally, we design and implement a software-defined Intelligent Computing Power Optical Network Convergence Platformto demonstrate the performance of the proposed routing algorithm.

11:30-11:45 • ACPPOEM-0731-75
A Protection Scheme Based on Multi-Granularity Connection Resource Sharing in Optical Networks
Wenhong Liu[1], Hongzhen Yang[2], Jiangsheng Li[3], Yufei Shi[3], Zhuotong Li[1], Yongli Zhao[1]
1.Beijing University of Posts and Telecommunications, China; 2.Information and communication branch State Grid Zhejiang Electric Power Co., Ltd, China; 3.State Grid Economic and Technological Research Institute Co., Ltd, China
This paper proposes a multi-granularity connection resource-sharing protection scheme in optical networks. Results demonstrate the improved performance in blocking rate, resource utilization rate, recovery failure rate, and bandwidth adjustment rate compared with the benchmark schemes.

11:45-12:00 • ACPPOEM-0815-93
Deterministic Overlay Networking for Edge Computing Distributed Cloud in Optical Networks
Mingyang Liu, Guochu Shou
Beijing University of Posts and Telecommunications, China
We propose a SD-TSN-based overlay network scheme to realize deterministic transmission for edge computing distributed cloud in optical network. A gateway is implemented to establish data transmission tunnels among clouds with low latency and jitter.

12:00-13:30 Lunch Break

13:30-15:30 • November 06, 2023 • Monday
Optical Switching Networks
Presider: Jiawei Zhang, Beijing University of Posts and Telecommunication, China

13:30-14:00 • ACPPOEM-0728-8 *Invited*
Service Provisioning in Wavelength-Switched Optical Networks based on P2MP Transceivers
Ruoxing Li, Sijia Li, **Zuqing Zhu**
University of Science and Technology of China, China
We address the challenge of provisioning dynamic requests in a wavelength-switched optical network (WSON) built with coherent point-to-multipoint transceivers (P2MP-TRXs) in this work. An efficient heuristic for transceiver, routing, and spectrum assignment (TRSA) is proposed, along with a subcarrier (SC) level proactive defragmentation method that can further enhance the provisioning performance through reconfiguring the spectrum allocations of leaf P2MP-TRXs. Extensive simulations confirm the effectiveness of our proposals.

14:00-14:30 • ACPPOEM-1009-12 *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.

14:30-15:00 • ACPPOEM-1009-14 *Invited*
Cloud computing data center optical switching disaggregation network
Fulong Yan
Beijing University of Posts and Telecommunications, China
We carry out investigations for data center disaggregation exploiting optical switching. The results show that PCIe over optical (PO) guarantees 3μs latency with 62m fiber. Moreover, the PO scheme saves 48.3% application completion time and 51.3% power consumption, respectively, compared with the ethernet solution.

15:00-15:15 • ACPPOEM-0731-28
DEER: Deadline-driven and Contention-free Central Arbitration in AWGR-based Optical Datacenter Networks
Shi Feng, Jiawei Zhang, Yuefeng Ji
Beijing University of Posts and Telecommunication, China
We propose an algorithm that enables flexible optical timeslot assignment for deadline-driven bursting traffic in an AWGR-based datacenter network. Assessments indicate that DEER decreases deadline missing rate by 41.48% versus RRB, 26.29% versus LQF.

15:15-15:30 • ACPPOEM-0731-32
When Electronic Spine-Leaf Meets Optical Torus: A Hybrid Optical-Electronic Data Center Network
Dawei Yu, Weidong Shao, Gangxiang Shen
Soochow University, China
We propose a hybrid DCN, merging electronic Spine-Leaf with optical Torus, supporting unicast, multicast, and Ring services. Our algorithm efficiently deploys Ring services considering node computing resources. Simulations confirm its effectiveness.

15:30-18:00 Coffee Break & Poster Session

18:30-21:00 Banquet and Awards Ceremony

08:30-10:00 • November 07, 2023 • Tuesday
Machine Learning Enhanced Optical Networks
Presider: Ruijie Zhu, Zhengzhou University, China

08:30-09:00 • ACPPOEM-0801-81 *Invited*
Error Analysis of Distributed Network Time Synchronization in Time-Varying Topology
Kangqi Zhu, Nan Hua, Xiaoping Zheng
Tsinghua University, China
In this paper, we analyze the physical and network layer error sources for distributed time synchronization of large-scale optical networks with time-varying topology, and compare the performance difference with that of fixed topology networks.

09:00-09:15 • ACPPOEM-0726-11
Long-Short-Term QoT Prediction for Already Established Light-Path While Considering Light-Path Correlation
Chenyu Zhao, Xin Li, Lu Zhang, Jingjie Xin, Daixuan Li, Shanguo Huang
Beijing University of Posts and Telecommunications, China
We proposed a deep LSTM-based neural network model training with field data and light-path correlation to accurately predict the QoT of already established light-path for 200 hours, enabling proactive measures to prevent service disruptions.

09:15-09:30 • ACPPOEM-0801-18
A Stacking Ensemble ML-Based Failure Prediction Model for Optical Networks with Imbalanced Data
Zhiming Sun[1], Chunyu Zhang[1], Min Zhang[1], Futao Yang[2], Danshi Wang[1]
1.State Key Laboratory of Information Photonics and Optical Communications, Beijing University of Posts and Telecommunications, China; 2.School of Public Security Information Technology and Intelligence, Criminal Investigation Police University of China, China
A stacking ensemble ML-based failure prediction model for optical networks with imbalanced data is proposed. Under the condition that the failure sample ratio is 5.3%, our model obtains 98.97% F1 score.

09:30-09:45 • ACPPOEM-0801-31
Neuron-level Transfer Learning for ANN-based QoT Estimation in Optical Networks
Yuhang Zhou, Zhiqun Gu, Jiawei Zhang, Yuefeng Ji
Beijing University of Posts and Telecommunications, China
We propose a neuron importance-based transfer model search algorithm to optimize the transfer model for QoT estimation. Simulation results show that the proposed scheme improves accuracy compared with conventional layer-level transfer learning-based QoT estimation schemes.

09:45-10:00 • ACPPOEM-0814-3
Tidal Traffic Prediction for Reliable Optical Network Orchestration in Industry 5.0
Igor Kardush, Sejeong Kim, Elaine Wong
The University of Melbourne, Australia
We propose a tidal traffic prediction and network orchestration scheme that proactively enable protection paths for optical networks in Industry 5.0. Results show a fast machine learning convergence and improved network connection availability.

10:00-10:30 Coffee Break

10:30-12:00 • November 07, 2023 • Tuesday
Optical Network-on-Chip
Presider: Yi Lei, Hefei University of Technology, China

10:30-11:00 • ACPPOEM-0801-89 *Invited*
Technology and Management Evolution of Optical Networks Oriented at Computing Force Network
Liuyan Han, Yang Zhao, Minxue Wang, Dechao Zhang, Han Li
China Mobile Research Institute, China
We analyze how to better integrate computing services and transport networks and propose the new technologies on it. Experimental and field trial results validate the computing service transport and flexible scheduling system.

11:00-11:15 • ACPPOEM-0717-1
MSONoC: A Metasurfaces-assisted Optical Networks-on-Chip Architecture
Zimo Wang, **Pengxing Guo,** Jiahao Zhou, Kun Liu, Zhengrong You, Weigang Hou, Lei Guo
Chongqing University of Posts and Telecommunications, China
This paper proposes a metasurface-assisted wired-wireless hybrid optical networks-on-chip (ONoC) structure. It can achieve 6.5%-28.6%, 7.5%-14.7% and 16.4%-103.4% performance improvements in insertion loss, crosstalk noise and SNR, respectively, compared with the traditional wired-based ONoCs.

11:15-11:30 • ACPPOEM-0723-4
A user-centric cell-free network architecture for bidirectional VLC based on tri-color LEDs
Xiuqi Huang[1], Chih-Yung Yang[2], QiGuan Chen[1], Min Zhang[1]
1.Beijing Univ of Posts & Telecom, China; 2.ITON technology Corp., China
Visible light communication (VLC) technology is a potential candidate for access networking in 6G, which offers a higher spectral efficiency than radio-frequency (RF)-based femtocell networks by three orders of magnitude. This paper proposes an all-wireless optical bidirectional VLC access network architecture to solve the problem that users need to switch access frequently when VLC is deployed to the application. The networking architecture is based on tri-color LEDs, which improve the quality of user communication by partitioning the AP coverage area and determining the number of service wavelengths based on the user's location. The feasibility of the proposed access network architecture scheme was verified by theoretical analysis, simulation and experimentation. We showed that the proposed access network architecture is suitable for large-scale bidirectional VLC access networks and can be used as a potential technology for 6G.

11:30-11:45 • ACPPOEM-0728-14
Energy-Efficient and Low-Latency Optical Network-on-Chip Architecture and Mapping Solution for Artificial Neural Networks
Kun Liu, **Pengxing Guo,** Jiahao Zhou, Zimo Wang, Zhengrong You, Weigang Hou, Lei Guo
Chongqing University of Posts and Telecommunications, China
This paper proposes a ANN accelerator interconnection architecture and mapping mechanism based on ONoC. Compared with traditional ANN accelerators, energy consumption and latency are reduced by 46.8% and 79.7%, throughput is increased by 4.8 times.

11:45-12:00 • ACPPOEM-0729-12
Probabilistic Path Selection Based on Arbiter-enabled Router in WDM Optical Network-on-chip
Daqing Meng[1], Qiuyan Yao[1], Hui Yang[1], Jie Zhang[1], Nan Feng[2], Mingqing Zuo[3], Yucong Liu[3]
1.Beijing University of Posts and Telecommunications, China; 2.The 54th research Institute of CETC, China; 3.China Mobile Communication Corporation Research Institute, China
This paper proposes a multipath arbitration routing algorithm for optical network-on-chip based on grid topology. The simulation results demonstrate the reliability of the algorithm by analyzing latency, power consumption, memory United Statesge and loss.

12:00-13:30 Lunch Break

13:30-15:45 • November 07, 2023 • Tuesday
Optical Satellite Networks
Presider: Fu Wang, Beijing University of Posts and Telecommunications, China

13:30-14:00 • ACPPOEM-1009-13 *Invited*
Space-terrestrial Integrated Optical Networking for 6G Core Networks
Ruijie Zhu
Zhengzhou University, China
6G core networks will be space-terrestrial integrated optical networks. This talk will discuss the key challenges and future research directions for 6G core networks.

14:00-14:15 • ACPPOEM-0714-2 *Industry Innovation Nomination*
Applications of free space optics in terrestrial backhaul
Buzheng Wei, Shikui Shen, Guangquan Wang, He Zhang, Xiongyan Tang, Liang Zhao
China Unicom, China
This paper gives an overview of free space optics applications in terrestrial backhaul. Free space optics has flexible and fast deployment advantages which serve 5G-A or 6G in space-sky-ground-ocean communication scenarios well. In this paper, some demonstrations of FSO backhaul implementations are presented while different realization schemes are provide as well.

14:15-14:30 • ACPPOEM-0716-1
Chaotic Constellation Shaping Synchronization Header Assistance Cognate Coherence OFDM-FSO Communication
Wenhui Zhu, **Tingwei Wu**, Yejun Liu, Song Song, Lun Zhao, Lei Guo
Institute of Intelligent Communication and Network Security, School of Communication and Information Engineering, Chongqing University of Posts and Telecommunications, China
We propose an orthogonal frequency division multiplexing - free space optical - chaotic constellation shaping (OFDM-FSO-CCS) scheme based on synchronization header assistance.

14:30-14:45 • ACPPOEM-0730-13
Parallel Subnetwork Routing Algorithm for Inter-Satellite Optical Communication
Yiming Hong, Junjie Zhang, Jingjing Zang, Xiwen Fan, Qianqian Zhao
Shanghai University, China
We propose an algorithm to reduce latency by dividing subnetworks and establishing long-distance links between subnets. It reduces the delay by 10.23ms on average compared to classic Dijkstra algorithm by simulating the Starlink constellation.

14:45-15:00 • ACPPOEM-0731-100
Adaptive Dynamic Virtual Network Function Placement in Mega LEO Satellite Optical Networks
Wenchao Zhang[1], **Ruijie Zhu**[1], Yudong Zhang[1], Zhichao Yang[1], Huiying Sang[1], Chao Xi[2], Bo Yang[2]
1.Zhengzhou University, China; 2.Space Star Technology CO., LTD, China
We propose an adaptive-based VNF placement (A-VNFP) algorithm. Simulation results demonstrate that the A-VNFP algorithm can efficiently allocate resources and place the VNFs for user requests in mega LEO satellite optical networks.

15:00-15:15 • ACPPOEM-0731-180
Spatio-temporal Routing Based on Sun Outage Prediction in Deterministic Satellite Optical Networks
Yating Wei[1], **Ruijie Zhu**[1], Yudong Zhang[1], Wenchao Zhang[1], Qiancheng Zhao[1], Zhichun Sun[1], Xiaojie Hou[1], Zhichao Yang[1], Huiying Sang[1], Mengzhen Liu[1], Kai Li[1], Aman Wang[1], Chao Xi[2], Bo Yang[2]
1.Zhengzhou University, China; 2.Space Star Technology CO., LTD, China
A spatio-temporal routing algorithm based on sun outage prediction is proposed to reduce the impact of optical inter-satellite link interruption in deterministic satellite optical networks. Simulations prove that our approach can significantly improve transmission quality.

15:15-15:30 • ACPPOEM-0814-37
Optimizing Multi-Source Multi-Sink Maximum Flow with Coverage Constraints in Large-Scale Optical Satellite Networks
Yunxiao Ning, Yongli Zhao, Jie Zhang
Beijing University of Posts and Telecommunications, China
A novel algorithm is proposed to optimize throughput with global internet coverage in large-scale optical satellite networks. Simulations prove that our proposed algorithm can achieve 99.66% of the optimal throughput while ensuring global internet coverage.

15:30-15:45 • ACPPOEM-0814-70
Assessment of the Doppler effect on transmission characteristics in LEO satellite networks
Lipeng Guo[1], Fu Wang[1], Weiying Feng[2], Haipeng Yao[3], Dandan Sun[1], Qi Zhang[1]
1.School of Electronic Engineering Beijing University of Posts and Telecommunications, China; 2.School of Space and Environment Beihang University, China; 3.School of Information and Communication Engineering Beijing University of Posts and Telecommunications, China
In this paper, we derive and simulate in detail the Doppler shifts at different locations under the LEO satellite network, and analyze their effects on the network characteristics.

15:45-16:00 Coffee Break

16:00-18:00 • November 07, 2023 • Tuesday
Optical Access Networks
Presider: Yuxin Xu, Hefei University of Technology, China

16:00-16:30 • ACPPOEM-0902-1 *Invited*
Cluster-based Method for Eavesdropping Identification and Localization in Optical Links
Haokun Song[1,2], Rui Lin[1], Andrea Sgambelluri[3], Filippo Cugini[4], Yajie Li[2], Jie Zhang[2], Paolo Monti[1]
1.Chalmers University of Technology, Sweden; 2.Beijing University of Posts and Telecommunications, China; 3.Scuola Superiore Sant'Anna, Italy; 4.National, Inter-University Consortium for Telecommunications (CNIT), Italy
We propose a cluster-based method to detect and locate eavesdropping events in optical line systems characterized by small power losses. Our findings indicate that detecting such subtle losses from eavesdropping can be accomplished solely through optical performance monitoring (OPM) data collected at the receiver. On the other hand, the localization of such events can be effectively achieved by leveraging in-line OPM data.

16:30-17:00 • ACPPOEM-1009-9 *Invited*
Optics-informed Neural Networks for photonic AI accelerators
Nikos Pleros
Aristotle University of Thessaloniki, Greece
In this talk we address the main challenges faced today in the field of neuromorphic photonics. We present our recent work on linear silicon photonic architectures and optics-informed Deep Learning training models, demonstrating experimental results that confirm the potential of photonic AI accelerators to reach the high-scalability and high-performance metrics required by the AI industry within an impressive energy efficiency envelope.

17:00-17:15 • ACPPOEM-0713-4
Fault Prediction for Optical Access Network Equipment using Decision Tree Methods
Killian Murphy, Antoine Lavignotte, Catherine Lepers
Télécom SudParis, France
We introduce a new QoS metric, measuring the reduction of Quality of Service loss due to failures. This metric is used to provide network context to the Machine Learning task of Network Fault Prediction. A set of 20 optical equipment monitored over the course of three weeks in real networks is studied. Decision Tree based methods are used to create a benchmark of DT methods for alarm prediction.

17:15-17:30 • ACPPOEM-0730-4
A Point-to-Multipoint Architecture Using Fiber Unidirectional Ring Protected by Optical Switches Array for Business Access Network
Jianhua Liu
Huawei Technologies, China
A novelty point-to-multipoint architecture using fiber unidirectional ring protected by optical switches array for business access network is proposed. This fiber unidirectional ring can protect multiple faults, provide good resiliency, and use half number of optical modules and fibers compared with Ethernet ring. This fiber unidirectional ring also can support point to multi-points with star or tree topology. At the same time this fiber unidirectional ring has low cost, robust, resiliency features so that it is suitable for access network in business scenario, as an alternative solution to passive optical network. Compared with PON, this fiber unidirectional ring has following extra advantages: low insertion loss (0.5dB), reusing existent Ethernet optical modules, about 100% physical layer bandwidth utilization, very significantly reduce the impact of rogue ONT.

17:30-17:45 • ACPPOEM-0801-110
Cooperative Scheduling of PON domain and TSN domain for Global Optimization of E2E Time-Sensitive Industrial Flows
Chen Su, JiaWei Zhang, YueFeng Ji
Beijing University of Posts and Telecommunications, China
We propose a TSN equivalent model for TDM-PON to co-schedule time-sensitive flows across TSN and TDM-PON domains. Simulation results show that the schedulability of this strategy is 25% higher than that of non-cooperative one.

17:45-18:00 • ACPPOEM-0801-150
Comparative Study of Multiplication-Based and Addition-Based Auxiliary Management and Control Channel for FDM PON
Wangwei Shen, Jiaye Wang, Guoqiang Li, Sizhe Xing, An Yan, Zhongya Li, Jianyang Shi, Nan Chi, Junwen Zhang
Key Laboratory of EMW Information of Fudan University, China
We presented a comparison study of multiplication-based and addition-based auxiliary management and control channels (AMCC) on the performance of both the AMCC and the main signal in frequency division multiplexing coherent passive optical networks (FDM-CPON).

Track 4: Optoelectronic Devices and Integration
VIP Room, 3F

13:30-15:30 • November 05, 2023 • Sunday
Photonics & Photonic Devices
Presider: Siyuan Yu, Sun Yat-sen University, China

13:30-14:00 • ACPPOEM-1009-20 *Invited*
Light-Matter Interaction in Exciton-Photon Hybrid Systems of TMDC Nanostructures
Fuhuan Shen[1], Zefeng Chen[2], **Jian-Bin Xu[1]**
1.Department of Electronic Engineering, and Materials Science and Technology Research Center, The Chinese University of Hong Kong, Hong Kong, China ;2.School of Electronic and Information Engineering, South China Normal University, China
Comprehensive understandings of optoelectronic properties and phenomena at hetero-interfaces and in atomically thin films play an important role for high-performance device realization. Manipulation of the interplay between matter and photonic structure yields numerous opportunities in fundamental understandings and practical applications.
In this presentation, we will first present our new understanding of the Fano-type asymmetry deviated from the Rabi-type asymmetry in the exciton-plasmon hybrid system, which is experimentally confirmed with two-dimensional (2D) layered WSe2 coupled to plasmonic lattice. We demonstrate the Fano-type asymmetry in the open plasmon-exciton system both theoretically and experimentally. The Fano-type interference process is found to enhance the lower energy branch (LEB) and reduce the higher energy branch (HEB), rendering the Fano-type asymmetry in the output spectra, even at zero detuning.
Secondly, to overcome the large Ohmic loss of plasmonic material, we apply the chemical vapor deposition (CVD) bottom-up method to fabricate the metaphotonic structure based on the bulk transition metal dichalcogenides (TMDCs). More specifically, we realize the magnetic-type surface lattice resonance (M-SLR) in the one-dimensional (1D) MoS2 metaphotonic structure with extremely low material loss. Bright Mie modes and self-coupled anapole-exciton polaritons with unambiguous anti-crossing behavior are also realized in 2D MoS2 metaphotonic structures. However, the aforementioned TMDCs structure does not demonstrate photoluminescence properties. By combining the multilayer (ML) TMDCs to the designed TMDCs metaphotonic structures, we are able to manipulate the polarization and direction of the photoluminescence from the ML TMDCs.
Thirdly we leverage the concept of Kerker's effects to demonstrate the dynamic control of scattering directionality in dielectric nanostructures by tuning the exciton-photon coupling. We first provide theoretical evidence for a significant modification of the scattering directionality of a dielectric metastructure engineered by excitonic polaritons. As a proof of concept, we construct self-coupled metasurfaces using bulk MoS2, which exhibit a forward/backward scattering ratio up to 20. Importantly, we achieve tunable directionality by thermally controlling the excitonic coupling to the Mie modes.
Fourthly we propose a synergistic effect of chiral near-field and hot carrier injection for actively controlling the valley polarization of WSe2 at room temperature (RT). The degree of valley polarization emission is enhanced from near zero (for pure WSe2) to 20% under non-resonant optical excitation (532 nm) when monolayer WSe2 is integrated with the chiral near field by the plasmonic metasurface.

14:00-14:30 • ACPPOEM-1010-2 *Invited*
Optoelectronics using one and two dimensional nanomaterials
Tawfique Hasan
Cambridge University, United Kingdom
An increasingly popular strategy to improve the performance of nanomaterial-enabled optoelectronics is to exploit computational algorithms. I will give specific examples of how such devices could benefit from computational approaches as the key enabler. The first example will be through the development of an ultraminiaturised computational spectrometer from a single nanostructure without complex optics or filters. I will next discuss how the philosophy of mathematically combining the output of seemingly unconnected devices could be applied to more sophisticated designs, where active modulation of optoelectronic properties can enable even more compact systems, representing a future application-agnostic platform with unmatched simplicity and compactness.

14:30-14:45 • ACPPOEM-0801-50
On-chip four mode-division (de)multiplexer for conventional telecom bands and the TDFA window
Qiyuan Yi, Guanglian Cheng, Zhiwei Yan, Zengfan Shen, Qiyuan Yi, Li Shen
Huazhong University of Science and Technology, China
We propose and demonstrate a four-mode division (de)multiplexer with two operation wavebands centered at 1550, and 1970 nm, respectively. The fabricated device shows low insertion losses and crosstalk 3.1 dB and −10.6 dB

14:45-15:00 • ACPPOEM-0731-59
On-chip Pulse Self-compression to Single-cycle Level in Silicon-rich Nitride Waveguides
Yuke Zhai[1], Lijuan Xu[2], Kexin Ren[1], Lin Zhang[1]
1.Key Laboratory of Integrated Opto-electronic Technologies and Devices, School of Precision Instruments and Opto-electronics Engineering, Tianjin University, China; 2.School of Electronic Engineering, Tianjin University of Technology and Education, China
We propose a silicon-rich nitride waveguide with slot-assisted dispersion flattening, which is suitable for on-chip pulse self-compression to a single-cycle level with a compression factor as high as 37, accompanied by octave-spanning supercontinuum generation.

15:00-15:15 • ACPPOEM-0731-183
Inverse-Designed Two-Dimensional Grating Coupler with Low Polarization-Dependent Loss
Ge Renyou[1], Gao Shengqiao[2], Wu Meiyan[3], Chen Ping[3], Chen Bigeng[1], **Luo Yannong**[3]
1.Zhejiang Lab, China; 2.Sun Yat-sen University, China; 3.Guangxi Medical University, China
We propose low polarization-dependent-loss (PDL) two-dimensional grating couplers (2D GC) on SOI platform, with perfectly vertical fiber-chip coupling, using inverse design method. Simulation results show that -3.17 dB (-1.90 dB) and -2.10 dB (-1.00 dB) of coupling efficiency can be achieved for 2-port and 4-port structures, without (with) metal mirror beneath the buried oxide. Low PDL of 0.2 dB and 0.025 dB can be obtained over a broad bandwidth of 52 nm and 100 nm, respectively. We fabricate and measure the proposed devices of 2-port and 4-port 2D GC. Coupling efficiency of the two are -5.3 dB and -5.0 dB, respectively. The PDL is 0.7 dB ranging from 1.49 μm to 1.57 μm.

15:15-15:30 • ACPPOEM-0730-9
A Broadband Metalens Exhibiting Superior Focusing Efficiency and Polarization Insensitivity
Junjing Huang, Xiaofeng Duan, Kai Liu, Yongqing Huang, Xiaomin Ren
Beijing University of Posts and Telecommunications, China
We proposed a broadband metalens that demonstrates efficient operation across the wavelength range of 1270 to 2070nm and exhibits polarization insensitivity. The average focusing efficiency is 56%, with a maximum focusing efficiency of 70.7%.

15:30-16:00 Coffee Break

16:00-18:00 • November 05, 2023 • Sunday
Modulators and Functional Devices
Presider: Xuhan Guo, Shanghai Jiao Tong University, China

16:00-16:30 • ACPPOEM-1009-16 *Invited*
3D laser heterogeneous integration in silicon photonics
Chao Xiang
The University of Hong Kong, Hong Kong, China
In this talk, I'll introduce recent progress in enabling wafer-scale three-dimensional (3D) integrated lasers with ultra-low-loss silicon nitride platform. The demonstrated lasers exhibit excellent performance including ultralow laser noise and high resistance to downstream reflections.

16:30-16:45 • ACPPOEM-0730-14
A Performance Comparison of Coplanar Strip-Line and Capacitive Loading Traveling Wave Electrode InP Mach-Zehnder Modulators
Ruoyun Yao[1], Weiwei Pan[1], Yili Liu[2], Zhangwan Peng[1], Yiti Xiong[2], Chen Ji[1]
1.Zhejiang University, China; 2.Zhejiang Lab, China
We present an InP Mach-Zehnder modulator with coplanar strip-line electrode enabling velocity and impedance matching anticipating to attain 93 GHz bandwidth, higher than a capacitive loading electrode design with similar length and waveguide parameters.

16:45-17:00 • ACPPOEM-0731-11
A Fast Silicon Polarization Scrambling Device Utilizing Novel Thermal Tuning Scheme
Weiqin Wang, Ziwen Zhou, Yifan Zeng, Yining Sun, Hao Wu, Siqi Yan, Ming Tang
Huazhong University of Science and Technology, China
Through an innovative design of a new heater placement scheme, we present the development of a silicon-based rapid polarization scrambling device with a scrambling rate of 150 krads^{-1}

17:00-17:15 • ACPPOEM-0801-76
Numerical demonstration of silicon micro-ring modulator with X-interleaved PN junction for high modulation efficiency
Wenkai YANG[1], Deji LI[1], Takaaki KAKITSUKA[1], Kiyoto TAKAHATA[1]
1.Graduate School of Information, Production and Systems, Waseda University, Japan
A silicon-based carrier depletion micro-ring modulator with X-interleaved PN junction is investigated. The enhanced modulation efficiency, low power consumption and satisfactory modulation performance (clearer eye diagram at 40 Gbit/s NRZ operation) is demonstrated.

17:15-17:30 • ACPPOEM-0815-116
Broadband Arbitrary Coupler Based on Asymmetric Mach-Zehnder Interferometers with Bezier Curves
Jiaqi Chen, Yuanbin Liu, Ziheng Ni, Liangjun Lu, Jianping Chen, Linjie Zhou
Shanghai Jiao Tong University, China
We propose a broadband coupler based on cascaded Mach-Zehnder interferometers with Bezier curves on the silicon nitride platform, which has a wide operation wavelength range of 110 nm and good width/thickness fabrication tolerance.

17:30-17:45 • ACPPOEM-0801-129
Accelerated FDFD Inverse Design of 1 × 2 Beam Splitter Based on Schur Complement Domain Decomposition-Adaptive Mesh Method
Jin Li[1,2], Houyu Chen[1], Simei Mao[1], Zhenmin Chen[2], Zhengtong Liu[2], Connie Chang-Hasnain[1], H. Y. Fu[1]
1.Tsinghua University, China; 2.Peng Cheng Laboratory, China
We realized the inverse design of 1×2 beam splitter through Schur complement domain decomposition- adaptive mesh method, improving the FDFD computational efficiency, which achieves 17.9 times the acceleration ratio and maintains good accuracy.

17:45-18:00 • ACPPOEM-0801-32
A comprehensive equivalent circuit model of silicon-based segmented microring modulators for electronic and photonic integrated circuit codesign
Shenlei Bao[1,2], Jintao Xue[1,2], Jinyi Wu[1,2], Binhao Wang[1,2]
1.State Key Laboratory of Transient Optics and Photonics, China; 2.University of Chinese Academy of Sciences, China
We present an equivalent circuit model for two-segment Si microring modulators(MRMs). The model consists of three blocks: electrical parasitics, electro-optic dynamics, and self-heating effects. Model parameters are derived through curve fitting based on Si MRM characterization. An excellent agreement between simulated and measured eye diagrams at a data rate of 106Gb/s was achieved. This equivalent circuit model can be effectively employed for driver design optimization and MRM wavelength stabilization circuitry improvement.

17:30-20:00 Welcome Reception

08:30-10:00 • November 06, 2023 • Monday
Compound Semiconductor Photonic Devices and Integration
Presider: Jiangwei Man, Hisilicon Optoelectronics, China

08:30-09:00 • ACPPOEM-1009-19 *Invited*
High-speed III-V photodetectors: from near-infrared to mid-infrared optoelectronicsdevices
Baile Chen
Shanghai Tech University, China
High-speed III-V photodiodes (PDs) have various applications from communications to sensing. Here we report back illuminated modified uni-traveling carrier (MUTC) PDs flip-chip bonded to AlN substrates. Due to the high thermal conductivity of AlN, the devices with diameters of 40 μm and 28 μm exhibites 23 dBm output power at 15 GHz and 20dBm output power at 25 GHz, respectively, with responsivity of 0.65 A/W. On the other hand, the development of terahertz (THz) technology has driven the demand for ultra-high-speed PDs. I will also discuss the evanescently-coupled waveguide MUTC PD with optimized high impedance coplanar waveguide (CPW) designs. The device shows a 3dB bandwidth above 220 GHz and external responsivity of 0.18 A/W. In the MWIR band, I will talk about the recent process of high-speed InAs/InAsSb photodiodes with bandwidth above 12 GHz.

09:00-09:30 • ACPPOEM-1009-23 *Invited*
Frequency-agile, low-noise Integrated lasers for FMCW Lidars
Grigorii Likhachev
EPFL, Switzerland
We show recent advances in the development of ultra-low loss silicon nitride integrated photonic circuits that have heralded a new generation of integrated lasers capable of reaching fiber laser coherence and fast tuning using monolithically integrated piezoelectrical actuators. Such lasers been achieved by self-injection locking of DFB or E-DBR lasers to SiN microresonators. We also show a photonic-electronic integrated circuit-based coherent LiDAR source comprised of a high voltage arbitrary waveform generator, a hybrid integrated tunable Vernier laser and an erbium-doped waveguide optical amplifier - all realized in wafer scale manufacturing compatible processes.

09:30-09:45 • ACPPOEM-0729-8 *Industry Innovation Nomination*
Transfer-Printing of III-V Photodetector for High Bandwidth Si-Photonic Integrated Coherent Receiver
Zhiheng Quan, Qichao Ding
JFS Laboratory, China
Wafer-scale integration of III-V photodetectors on silicon photonic coherent receiver through transfer-printing is demonstrated, showing responsivities up to 1 A/W, dark current 90 pA and 3dB bandwidth of 42 GHz at -2 V bias.

09:45-10:00 • ACPPOEM-0713-6
Narrow Linewidth, Tunable External Cavity Diode Laser using AlGaAs-Si_3N_4 Hybrid Integration
Chen Chen[1,2], Wei Fang[1,3], Han Xiuyou[2], Su Qingshuai[1], Pi Haoyang[1], Stroganov Anton[4], Ye Qing[1], Cai Haiwen[1,5]
1.Shanghai Institute of Optics and Fine Mechanics, CAS, China; 2.Dalian University of Technology, China; 3. Zhangjiang Laboratory, China; 4.Ligentec SA, Switzerland; 5.Zhangjiang Laboratory, China
We introduce a high-performance external cavity diode laser constructed with AlGaAs-Si_3N_4 hybrid integration, exhibiting a narrow linewidth of 18 kHz, a tuning range of 62.9 nm, and side mode suppression ratio better than 45 dB.

10:00-10:30 Coffee Break

10:30-11:45 • November 06, 2023 • Monday
Photonic Devices & Application
Presider: Baile Chen, ShanghaiTech University, China

10:30-11:00 • ACPPOEM-1009-15 *Invited*
Progress on MR-based photonic devices
Haisheng Rong
Intel, United States

11:00-11:30 • ACPPOEM-1009-18 *Invited*
Integrated Photonics For AL/ML Applications
Di Liang
Alibaba Group, United States
The recent emergence of regenerative artificial intelligence (AI) tools like ChatGPT marks the advent of a new AI era. It is also imposing an even heavier toll on the computing hardware. From the networking perspective, bandwidth, latency, energy efficiency, formfactor and cost all contribute to increasing challenges in next-generation optical interconnect. In this talk, I will attempt to discuss several scalable solutions based on integrated photonics to enable massive data transmission for exponentially grown AI and machine learning applications. Perspectives to use integrated photonics for future optical computing will be shared as well.

11:30-11:45 • ACPPOEM-0726-18
Bound state in the continuum enabled ultralong silicon waveguide grating antennas for integrated LiDAR applications
Zhipeng Ma[1,2], Yao Fu[1,2], Yuanjian Wan[1,2], Han Cao[1,2], Jian Wang[1,2], Yu Zhang[1,2]
1.Wuhan National Laboratory for Optoelectronics, Huazhong University of Science and Technology, China; 2.Optics Valley Laboratory, China
We report two kinds of silicon ridge-waveguide-based waveguide grating antennas with ultra-sharp instantaneous field-of-view for light detection and ranging (LiDAR) applications. Measured beam divergence of WGAs with 6mm length are 0.0251° and 0.0237°.

12:00-13:30 Lunch Break

13:30-15:30 • November 06, 2023 • Monday
Advanced Diode/ Quantum Dot Lasers
Presider: Siqi Yan, Huazhong University of Science and Technology, China

13:30-14:00 • ACPPOEM-0823-1 *Invited*
Monolithically integrated QD comb lasers on SOI substrates for optical I/O
Ting Wang
Institute of Physics, CAS, China
We have recently achieved multi-wavelength comb lasers on silicon substrates with Tbps transmission bandwidth, which can be a desirable on-chip laser source for silicon photonic optical I/O applications.

14:00-14:15 • ACPPOEM-0721-7
50 Gb/s Directly Modulated 1.3 μm InGaAlAs/InP DFB Laser Having MQW Based Passive DBR Section
Huan Li[1,2,3], Xuyuan Zhu[1,2,3], Jing Guo[1,2,3], Daibing Zhou[1,2,3], Lingjuan Zhao[1,2,3], Song Liang[1,2,3]
1.Institute of Semiconductors, CAS, 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
A directly modulated 1.3 μm InGaAlAs/InP DFB laser having MQW based passive DBR section has been fabricated. The modulation bandwidth of the device is 29 GHz. 50 Gb/s NRZ and PAM4 data transmission in up to 40 km standard single mode fiber have been demonstrated.

14:15-14:30 • ACPPOEM-0721-9
Comb Span Extension of a Mode-locked Laser Diode by Pumping a Highly Nonlinear Fiber Loop
Defan Sun[1,2,3], Dan Lu[1,2,3], Ruikang Zhang[1,2,3], Tingwu Ge[4], Jinlong Xiao[5], Lingjuan Zhao[1,2,3]
1.Key Laboratory of Semiconductor Materials Science, Institute of Semiconductors, CAS, 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; 4.Institute of Laser Engineering Beijing University of Technology, China; 5.Institute of Semiconductors, CAS, China
Optical comb span extension of a mode-locked laser diode by pumping a highly nonlinear fiber loop is demonstrated, with a 10-GHz repetition rate and an enhanced comb span of 50 nm.

14:30-14:45 • ACPPOEM-0729-23 *Industry Innovation Nomination*
Dual optical feedback dynamics of quantum dot lasers in silicon-based photonic integrated circuits
Yuanxiang Wang, Zhiyong Jin, Yong Yao, Xiaochuan Xu, Jianan Duan
Harbin Institute of Technology (Shenzhen), China;
This work investigated the dynamic characteristics of quantum dot lasers under dual optical feedback by solving the three-level rate equations in time-domain. Within long cavity feedback, the route to chaos of the quantum dot lasers and its dependence on the short cavity feedback dynamics are studied. The combination of the reduction of short cavity length and the increase of short cavity feedback strength can reinforce the coupling efficiency between the laser and the waveguide, thereby enhancing the insensitivity of the laser to external long cavity feedback. These results offer valuable insights for optimizing feedback insensitivity of quantum dot lasers for isolator-free photonic integrated circuits on silicon.

14:45-15:00 • ACPPOEM-0731-182
High linearity InAs/GaAs quantum dot distributed feedback lasers
Minghao Cai, Zhengqing Ding, Kun Zhan, Ying Yu, Siyuan Yu
Sun Yat-sen University, China
We demonstrate the modulation linearity performances of GaAs-based quantum dot (QD) distributed feedback (DFB) diode lasers, which are decisive for the QD lasers applied in analog optical communication.

15:00-15:15 • ACPPOEM-0814-59
Reliability of 100GHz Colliding Pulse Mode-Locked Quantum Dots Laser
Jiale Qin, Jingzhi Huang, Bo Yang, Zihao Wang, Jian-Jun Zhang, Ting Wang
Institute of Physics, CAS, China
We have investigated the performance of an InAs quantum dots colliding pulse mode-locked laser with 100GHz comb spacing. This laser shows temperature reliability up to 80 ˚C, with an extrapolated lifetime of over 20 years under the stress condition.

15:15-15:30 • ACPPOEM-0808-2
Gain-Coupled Wide-Ridge-Waveguide High-Power 1.55 μm Single-Mode DFB Laser
Mukun He, Hongtao Li, Jian Wang, Yanjun Han, Changzheng Sun, Bing Xiong, Zhibiao Hao, Lai Wang, Yi Luo
Tsinghua University, China
Gain-coupled 1.55 μm single-mode DFB laser with 6-μm-wide ridge-waveguide is demonstrated based on a double trench ridge waveguide structure. The fabricated laser exhibits over 100 mW kink-free output power and FWHM divergence angles of 11°×21°.

15:30-18:00 Coffee Break & Poster Session

18:30-21:00 Banquet and Awards Ceremony

08:30-10:00 • November 07, 2023 • Tuesday
Novel Integrated Photonics
Presider: Ke Wang, RMIT University, Australia

08:30-09:00 • ACPPOEM-1010-3 *Invited*
100Gb/s quantum-confined Stark effect optical modulator integrated with SiN waveguides
Ilias Skandalos
University of Southampton, United Kingdom
We present an O-band multiple quantum well Ge/SiGe quantum-confined Stark effect electro-absorption modulator with 100Gb/s data rate, integrated with a N-rich SiN photonic platform on 8-inch Si and SOI substrates.

09:00-09:15 • ACPPOEM-0801-124
Integrated Spectrometer by Using Counter-propagating Arrayed Waveguide Grating and Interleaved Micro-ring Resonators
Zunyue Zhang[1], Yi Wang[2], Zhenzhou Cheng[1], Hon Tsang[2]
1.Tianjin University, China; 2.The Chinese University of Hong Kong, Hong Kong, China
We reported an integrated spectrometer by using a counter-propagating arrayed waveguide grating and cascaded micro-ring resonators with interleaved resonance for spectral resolution enhancement and channel number expansion

09:15-09:30 • ACPPOEM-0731-15
Photonic crystals nanohole array-based silicon TM-pass polarizer for 1550/2000 nm wavebands
Guanglian Cheng, Qiyuan Yi, Zengfan Shen, Zhiwei Yan, **Qiyuan Li**, Li Shen
Huazhong University of Science and Technology, China
We propose an on-chip transverse magnetic (TM)-pass polarizer for multi-band operation. The measured BWs for PER 25dB are 100nm for both 1550/2000nm wavebands, while the measured ILs are 1/0.8 dB at wavelengths of 1550/2000nm.

09:30-09:45 • ACPPOEM-0731-42
Waveguide Ge/Si avalanche photodetector with ultra-high gain-bandwidth product of 1440GHz
Hengzhen Cao, Yuluan Xiang, Weichao Sun, Jin Xie, Jinshu Guo, Daoxin Dai
Zhejiang University, China
A lateral Reach-Through type waveguide Ge/Si avalanche photodetector is presented. The device exhibits a GBP of 918GHz under -18dBm and a GBP of 1440GHz under - 21dBm.The 50Gbps eye-diagrams under different optical power are also measured.

09:45-10:00 • ACPPOEM-0801-55
Integrated Scandium-doped Aluminum Nitride Microring Resonators on 8-inch Silicon Wafers
Kewei Bian, Zhenyu Li, Xingyan Zhao, Yang Qiu, Shaonan Zheng, Yuan Dong, Qize Zhong, Hu Ting
Shanghai University, China
Scandium-doped aluminum nitride (AlScN) on insulator is a potential platform for realizing a diverse range of applications in photonic devices, due to its large piezoelectric effects, large optical nonlinear effects, unique pyroelectric effects, and broad transparency window. In this work, we report the characterization of thin-film AlScN microring resonators with Sc doping of 9% and 18% fabricated on 8-inch silicon (Si) wafers. Through complementary metal-oxide semiconductor (CMOS) compatible fabrication processes, microring resonators with high-quality (Q) factors are successfully demonstrated, and their optical propagation losses are thoroughly assessed. Experimental results show promissing application of integrated AlScN-based photonics devices with Sc doping up to 18%.

10:00-10:30 Coffee Break

10:30-12:00 • November 07, 2023 • Tuesday
Integrated Photonic Signal Processing
Presider: Ting Wang, Institute of Physics, CAS, China

10:30-11:00 • ACPPOEM-1009-17 *Invited*
Low loss meta-silicon photonics for large-scale integration
Tingyi Gu
University of Delaware, United States
Integrating subwavelength components in silicon photonics enables advanced dispersion tailoring, wavefront control, and back reflection suppression functions. However, the primary concern is the foundry compatibility of the subwavelength device designs and the potential incremental loss. In this talk, I will share our progress toward developing low-loss on-chip mode conversion, back reflection suppression, photonic crystal switches, and spatial-spectral information classification.

11:00-11:15 • ACPPOEM-0731-129
7.12-Gbps Visible Light Communication Link Utilizing InGaN/GaN Micro-LED-based Photodetector
Yue Liao, Xinyi Shan, **Pengfei Tian**
Fudan University, China
We proposed a micro-LED acting as a photodetectorfor high-speed visible light communication. A data rate of 7.1291 Gbps at a distance of 0.3 m was demonstrated by using OFDM modulation and a bit-loading algorithm.

11:15-11:30 • ACPPOEM-0730-31
Compensation of Multi-channel Mismatches in OADC Based on MMI-Based Phase-Shift Quantization
Yiding Zhao, Jifang Qiu, Bowen Zhang, Yan Li, Jian Wu
State Key Laboratory of Information Photonics and Optical Communications, Beijing University of Posts and Telecommunications, China
We apply a blind compensation method to OADC. Simulation results show that timing mismatches are suppressed from -50.58dB to below -66.31dB. Compensation method improves system ENOB and SFDR at 1~49 GHz input frequency.

11:30-11:45 • ACPPOEM-0801-101
Neuromorphic computing with the plasmonic microcavity for all types of logic tasks
Lai Yihang[1], Zhiwei Yang[1], Jian Dai[1], Tian Zhang[1], Kun Xu[1]
Beijing University of Posts and Telecommunications, China
We propose a new passive-integrated photonic reservoir computer. It has a tiny footprint and a high information processing speed and can handle all types of sequential logic tasks after simple training.

11:45-12:00 • ACPPOEM-0801-117
A 100Gbps Monolithic Integrated Analog Coherent QPSK Optical Receiver Based on a COSTAS Optical Phase-Locked Loop
Yihao Yang[1,2], Yongliang Xiong[3], Yangming Ren[1], Qianli Ma[3,4], Jintao Xue[1,2], Zhiyuan Yu[1], Nan Qi[3,4], Binhao Wang[1,2]
1.State Key Laboratory of Transient Optics and Photonics, Xi'an Institute of Optics and Precision Mechanics, CAS, China; 2.School of Future Technology, University of Chinese Academy of Sciences, China; 3.State Key Laboratory of Superlattices and Microstructures, Institute of Semiconductors, CAS, China; 4.Center of Materials Science and Optoelectronics Engineering, University of Chinese Academy of Sciences, China
This paper presents a 100Gbps Quadrature Phase Shift Keying (QPSK) analog coherent optical receiver. The study emphasizes the utilization of optoelectronic monolithic integration technology to realize the proposed optical receiver, which is based on the COSTAS optical phase-locked loop (OPLL) technique. The analysis thoroughly examines the impact of loop filter bandwidth and loop delay on the system's phase locking accuracy. Moreover, it demonstrates an effective solution to address phase locking challenges arising from increased loop delay. When using a laser with a linewidth of 10MHz for the local oscillator, the optical receiver successfully achieves phase locking with a phase error of less than 0.8°.

12:00-13:30 Lunch Break

13:30-15:30 • November 07, 2023 • Tuesday
Heterogeneous Integration
Presider: Lei Shi, Huazhong University of Science and Technology, China

13:30-14:00 • ACPPOEM-0930-1 *Invited*
Towards chip-scale octave-spanning frequency combs in emerging platforms
Minhao Pu
Technical University of Denmark, Denmark
Octave-spanning optical frequency combs are essential for metrology and spectroscopy applications that require self-referencing. This talk will present the recent works on low-power octave-spanning frequency comb generation in the AlGaAs- and SiC-on-insulator platforms.

14:00-14:15 • ACPPOEM-0814-77
A new high-precision micro-accelerometer based on optomechanical system
Zhang Senyu, Li Zhe, Li Xinwei, Huang Wenyi, Chen Dingwei, Huang Yongjun
University of Electronic Science and Technology of China, China;
In this paper, a new linear accelerometer based on the optomechanical system of silicon photonic crystal cavity is designed.

14:15-14:30 • ACPPOEM-0815-106
Tunable MEMS-VCSEL with High-Contrast Grating
Minglu Wang[1,2], Wanhua Zheng[1,3,4], Anjin Liu[1,4]
1.State Key Laboratory on Integrated Optoelectronics, Institute of Semiconductors, CAS, China; 2.School of Electronic, Electrical and Communication Engineering, University of Chinese Academy of Sciences, China; 3.Key Laboratory of Solid-State Optoelectronics Information Technology, Institute of Semiconductors, CAS, China; 4.Center of Materials Science and Optoelectronics Engineering, University of Chinese Academy of Sciences, China
We designed and fabricated a MEMS-VCSEL with a tunable HCG mirrorat 940-nm range. At present, we have realized a tuning range of 3.7 nm at room temperature.

14:30-14:45 • ACPPOEM-0815-29 *Industry Innovation Nomination*
Heterogeneous integration of GaSb on Ge-SOI photonic integrated circuits for SWIR applications
Xin Guo[1], Andreas De Groote[2], Roger Loo[3], Gunther Roelkens[1]
1.Ghent University - IMEC, Belgium; 2.Brolis Sensor Technology, Belgium; 3.imec, Belgium
We report on the development of a germanium-on-SOI platform for short-wave-infrared applications. Heterogeneous integration of GaSb opto-electronic devices via micro-transfer-printing is reported.

14:45-15:00 • ACPPOEM-0727-18
Comparison of InAs waveguide Photodetectors on Silicon Platform via different heteroepitaxial structures
Hao Luo[1], Wang Shengyi[1], Hua Ge[1], Xiang Li[2], Bowen Jia[1]
1.Wuhan University of Technology, China; 2.China University of Geosciences (Wuhan), China
A mid-infrared InAs waveguide detector on silicon is proposed based on the heteroepitaxial growth. The influences of GeSi and SOI platforms on the optical properties of detectors are numerically investigated and discussed.

15:00-15:15 • ACPPOEM-0801-57
Fast Characterization System of Multi-Channel Interference Widely Tunable Lasers
Ying Li, Jiajun Lou, Kuankuan Wang, Zifeng Chen, Qiaoyin Lu, Weihua Guo
Wuhan National Laboratory for Optoelectronics, Huazhong University of Science and Technology, China
We demonstrate a fast characterization system integrated on a compact printed circuit board for multi-channel interference widely tunable lasers with frequency deviations of less than 1.5 GHz and characterization time of 3 hours.

15:15-15:30 • ACPPOEM-0801-49
Feedback Insensitivity of Self-Chaotic Microcavity Laser
Yun-Xiao Dong[1,2], Jian-Cheng Li[1,2], Ya-Li Li[1,2], Yue-De Yang[1,2], Jin-Long Xiao[1,2], Yong-Zhen Huang[1,2]
1.Institute of Semiconductors, CAS, China; 2.Center of Materials Science and Optoelectronics Engineering, University of Chinese Academy of Sciences, China
A deformed square microcavity laser has achieved chaos operation with a standard bandwidth of 12.3 GHz without external optical feedback or injection. We investigate the influence of feedback strength on its chaotic properties. The results show that the self-chaotic microlaser is insensitive to strong feedback, and can provide stable chaotic signals.

15:30-16:00 Coffee Break

16:00-18:00 • November 07, 2023 • Tuesday
Optoelectronic Devices
Presider: Minhao Pu, Denmark Technical University, Denmark

16:00-16:30 • ACPPOEM-1009-21 *Invited*
Integrated lithium niobate electro-optic modulation and amplification
Zejie Yu
Zhejiang University, China
Thin film lithium niobate on insulator (LNOI) attracts extensive attention for electro-optic (EO) modulation because of sub-wavelength scale confinement of light. Recent progress on different kinds of EO modulators with different passive structures will be introduced first. Next, some new EO modulation structures will be discussed, including a compact and high-speed electro-optic modulator based on a new 2×2 Fabry–Perot cavity and a high linear electro-optic modulator. Further, multiplexing technology with freedoms of mode and wavelength will be presented to increase the link capacity. At last, perspectives of EO modulators based on LNOI will be discussed.

16:30-17:00 • ACPPOEM-1009-22 *Invited*
High-performance Heterogeneous Integrated Photodiedes
Xiaojun Xie
Southwest Jiaotong University, China
Integrated photonics involves the integration of waveguides, lasers, modulators, and photodiodes on a single chip. This discipline has the potential to significantly impact communication, computing, and sensing due to its ability to transmit and process information rapidly and efficiently. Photodiodes are crucial components in integrated photonics and play a key role in various applications, including analog photonics links, microwave signal generation, and antenna remoting. In this talk, we will discuss the advancements made in the field of high-performance heterogeneous integrated photodiodes for microwave photonics.

17:00-17:15 • ACPPOEM-0719-9
Highly efficient and differentially driven thin-film Lithium Niobate modulators based on reversely-poled arms
Sheng Yu, Quan Cao
Wuhan Fisilink Microelectronics Technology Co.,LTD, China
A novel structure with reversely-poled arms is proposed on the X-cut thin-film Lithium Niobate platform. A differentially driven modulator is demonstrated with 75GHz EO bandwidth, V_π of 2 V, and $V_\pi L$ of 1.37 V•cm.

17:15-17:30 • ACPPOEM-0801-146
Thin-Film Lithium Niobate Mach-Zehnder Modulator Operating at 800nm
Xutong Lu, Xiyao Song, Yanping Li
Peking University, China
We present a modulator chip based on thin film lithium niobate and Mach-Zehnder interferometer that operates around 800nm with a modulation bandwidth to half-wave voltage ratio of over 6GHz/V and good adaptivity for packaging.

17:30-17:45 • ACPPOEM-0730-23
Calibration of $LiNbO_3$-Based Polarization Controller With Simplified Principle and RMSProp Algorithm
Linan Shan, Qingmin Lu, Peng Sun, Xiaoguang Zhang, Lixia Xi, Xiaosheng Xiao
Beijing University of Posts and Telecommunications, China
A concise method using only S_1vector in Stokes space and an adaptive gradient algorithm for calibrating $LiNbO_3$-basedpolarization controller are proposed, which complexity reduces by75% and accuracy up to 93%.

17:45-18:00 • ACPPOEM-0814-69
Tunable Optoelectronic Oscillator based on Thin Film Lithium Niobate
Zijun Huang, Rui Ma, Xinlun Cai
Sun Yat-sen University, China
A tunable optoelectronic oscillator based on the thin film lithium niobate is experimentally demonstrated. The phase noise at the frequency from 20 to 35 GHz is -90dBc/Hz @1 MHz.

Track 5: Microwave Photonics and Optical Signal Processing
Chicago Hall, 3F

13:30-15:30 • November 05, 2023 • Sunday
Free-Space Optics and Photonic Imaging
Presider: Cheng Wang, City University of HongKong, Hongkong, China

13:30-14:15 • ACPPOEM-0927-1 *Tutorial*
Microwave Photonic Radars
Shilong Pan
Nanjing University of Aeronautics and Astronautics, China
This tutorial introduces system architectures and key technologies of microwave photonic radars. Emerging technologies in this area and possible future research directions are discussed.

14:15-14:30 • ACPPOEM-0816-6
Photonic Time Compressing Assisted Real-time Fourier Transform System
Tao Lu, Dan Zhu, Jiewen Ding, Boyang Ni, Xin Liu, Shilong Pan
Nanjing University of Aeronautics and Astronautics, China
A novel photonic real-time Fourier transform (PRTFT) system assisted by the photonictimecompressing is proposed and demonstrated experimentally. By introducing the photonic time compressing, the frequency of the input RF signalis stretched, and thus the frequency-to-time mapping output is also stretched. In this way, the frequency resolution will be improved. A frequency magnification factor of 7 is achieved experimentally and the frequency resolution is improved from 140 to 30 MHz.

14:30-14:45 • ACPPOEM-0712-2
Microwave Photonic Imaging Radar Based on Polarization Multiplexing Coherent Receiving
Qingshui Guo[1,2], Qiang Zhang[1], Tongkai Xu[1], Shuo Liu[1], Wanshu Xiong[1], Kun Yin[1]
1.Zhejiang Laboratory, China; 2.Zhejiang University, China
A microwave photonic radar with ISAR imaging resolution better than 2.0 cm is proposed and experimentally demonstrated, in addition, the phase variation of 0.36 rad within 10 seconds in receiver is achieved.

14:45-15:00 • ACPPOEM-0714-3
Entanglement Assisted Quantum Radar Demonstration over Turbulent Free-Space Optical Channels
Ivan B Djordjevic, **Vijay Nafria**
University of Arizona, ECE Dept., United States
In entanglement assisted communications and sensing the optical phase-conjugation (OPC), required before homodyne detection takes place, is typically performed on signal photons on receive side. Unfortunately, in turbulent free-space optical channels, the signal photons can be scattered or absorbed by the channel, and if they reach the receiver they are very weak. Here we propose an entanglement assisted radar technique in which the OPC is performed on bright idler photons instead. By performing the OPC on idler photons on transmit side, while employing adaptive optics and classical homodyne detection on receive side, we experimentally demonstrate that the target detection probability of the proposed entanglement assisted radar over turbulent free-space optical channel is significantly better than that of corresponding classical detection scheme.

15:00-15:15 • ACPPOEM-0801-36
Reservoir Computing System based on VCSEL with the self-polarization-stabilization structure
Jinze Fan[1,2], Taihang Qiu[1,2], Yuqing Wu[1,2], Lei Deng[1,2], Qi Yang[1,2], Xiaoxiao Dai[1,2], Xiaojing Gao[3], Deming Liu[1,2], Mengfan Cheng[1,2]
1.Huazhong University of Science and Technology, China; 2.Shenzhen Huazhong University of Science and Technology Research Institute, China; 3.China University of Geosciences, China
We propose a reservoir computing system with a self-polarization-stabilization structure and demonstrate the performance improvement through the simulation task. Furthermore, we analyze the performance of the VCSEL-based reservoir in two other simulation tasks.

15:15-15:30 • ACPPOEM-0722-1
Stepped Frequency Radar with Broadband Signal Generation by Period One Laser Dynamics
Boyang Wu, Fangzheng Zhang, Xiaoyue Yu, Xing Wang, Shilong Pan, Xinyi Li
Nanjing University of Aeronautics and Astronautics, China
A stepped frequency radar is proposed using period one laser dynamics to generate signals with a bandwidth of 4 GHz and a frequency step of 100 MHz. High-resolution detection of multiple targets is demonstrated.

15:30-16:00 Coffee Break

16:00-18:00 • November 05, 2023 • Sunday
Photonic chips for Optical networks
Presider: Xiaodan Pang, KTH Royal Institute of Technology, Sweden

16:00-16:30 • ACPPOEM-0811-9 *Invited*
Integrated lithium niobate microwave photonics
Cheng Wang
City University of Hong Kong, Hong Kong, China
In this talk, I will discuss our recent efforts on thin-film lithium niobate microwave photonics, including devices like ultra-broad-band and high-linearity modulators, power-efficient electro-optic combs, and system-level demonstrations of high-speed microwave photonic signal processers and in-situ optical vector analyzers.

16:30-16:45 • ACPPOEM-0815-21
On-Chip Fully Reconfigurable Microwave Photonic Flat-Top Filter
Zhenjie Yu[1,2,3,4], Xu Hong[1,2,3,4], Bin Wang[1,2,3,4], Weifeng Zhang[1,2,3,4]
1.Beijing Institute of Technology, China; 2.Key Laboratory of Electronic and Information Technology in Satellite Navigation, China; 3.Beijing Institute of Technology Chongqing Innovation Center, China; 4.Chongqing Key Laboratory of Novel Civilian Radar, China
We propose and experimentally demonstrate an on-chip fully reconfigurable microwave photonic flat-top filter based on cascaded ultrahigh-Q silicon racetrack micro-ring resonators (MRRs). The microwave photonic filter (MPF) is realized based on phase modulation to intensity modulation conversion, which maps the spectral response of the cascaded MRRs in the optical domain to the one of the resulted microwave filter in the electrical domain. To enable filter frequency tunability, two independent micro-heaters are placed on top of the two MRRs. By controlling the direct current (DC) voltage applied to the micro-heaters, a flat-top MPF is produced, whose center frequency and bandwidth can be flexibly tuned. A silicon-based ultrahigh-Q cascaded MRRs chip is designed, fabricated and evaluated. With the use of the chip, a flat-top MPF is experimentally demonstrated. The experimental results show that the MPF has a tunable center frequency from 4 to 24 GHz and a tunable bandwidth from 225 to 405 MHz. Thanks to its strong reconfigurability, the proposed integrated microwave photonic flat-top filter is promising to be widely used in multi-function microwave photonic signal processing systems.

16:45-17:00 • ACPPOEM-0814-35
Frequency-Tunable Active Mode-Locked Optoelectronic Oscillator Incorporating an Electrically-Switchable Silicon Photonic Micro-Ring Resonator
Yaming Liu[1,2,3,4], Yushu Jiang[1,2,3,4], Bin Wang[1,2,3,4], Weifeng Zhang[1,2,3,4]
1.Beijing Institute of Technology, China; 2.Key Laboratory of Electronic and Information Technology in Satellite Navigation, China; 3.Beijing Institute of Technology Chongqing Innovation Center, China; 4.Chongqing Key Laboratory of Novel Civilian Radar, China
We propose and experimentally demonstrate a frequency-tunable active mode-locked optoelectronic oscillator (AML-OEO) for microwave pulse generation. The proposed AML-OEO has a dual-loop configuration based on phase modulation to intensity modulation conversion. In the loops, an electrically-switchable silicon photonic micro-ring resonator (MRR) with a top-placed metallic micro-heater and a lateral PN junction incorporated in the waveguide is used to play two-fold key functions. First, the MRR is employed as a narrow optical notch filter for frequency selection in the OEO implementation, and with the use of the top-placed micro-heater, the generated microwave frequency is highly tunable in a large range based on the thermal optics; secondly, the MRR is leveraged to realize the mode locking by performing the periodically high-speed gain modulation based on the lateral PN junction. An experiment is performed, and microwave pulses with a period of 1.08 μs and tunable center frequencies from 6 GHz to 18 GHz are experimentally generated. The proposed AML-OEO provides a flexible tunability and a compact structure, which is promising to be widely used in high-speed pulsed doppler radar and multi-carrier communication systems.

17:00-17:15 • ACPPOEM-0726-5
Optical forward error correction based on recirculating frequency shifter
Tianyan Guo, Jiangbing Du, Zuyuan He
Shanghai Jiao Tong University, China
In this paper, optical forward error correction using recirculating frequency shifter is proposed and investigated. The optical and in-the-fly process leads to great potential for low latency and high-speed optical communications.

17:15-17:30 • ACPPOEM-0814-39
On-chip Reconfigurable Silicon Photonic Fabry-Perot Resonator
Lang Zhou[1,2,3,4], Yihao Cheng[1,2,3,4], Bin Wang[1,2,3,4], Weifeng Zhang[1,2,3,4]
1.Beijing Institute of Technology, China; 2.Key Laboratory of Electronic and Information Technology in Satellite Navigation, China; 3.Beijing Institute of Technology Chongqing Innovation Center, China; 4.Chongqing Key Laboratory of Novel Civilian Radar, China;
We propose and design an on-chip reconfigurable silicon photonic Fabry-Poret (FP) resonator. The proposed FP resonator mainly consists of a pair of Sagnac loop mirrors (SLMs) with tunable reflectivity and a low-loss multimode ridge waveguide, which is of great help to reducing the optical propagation loss and to improving the Q-factor of the FP resonator. To achieve flexible tunability, metal micro-heaters are placed on top of the multimode ridge waveguide and the directional couplers (DCs) of the SLMs. By tuning the direct current voltage applied to the micro-heaters, the resonance wavelength and the bandwidth of the proposed FP resonator can be flexibly tuned. As a demonstration, the chip is fabricated and characterized. Experimental results show that the resonance wavelength of the proposed FP resonator can be tuned within a range of 0.25 nm, and the bandwidth of the FP resonator can be tuned from 2.0 pm to 25.1 pm, corresponding to a tunable Q-factor

from 7.8×10^5 to 0.6×10^5. The proposed FP resonator holds unique advantages including high Q-factor, flexible tunability, and compact footprint, which is potential to be widely used in microwave photonic signal processing and non-linear optical systems.

17:30-17:45 • ACPPOEM-0727-22
Backward-Emitting Antenna Based on Ridge Subwavelength Grating Array Enabled High Wavelength Sensitivity
Weijie Xu, Junjia Wang
Southeast University, China
Optical antennas are the key components for optical phased array. In this work, we demonstrate a backward-emitting antenna based on ridge structure with a beam divergence of 0.13°and a wavelength sensitivity up to 0.237°/nm.

17:45-18:00 • ACPPOEM-0728-7 *Industry Innovation Nomination*
An On-chip Optical Quantizer with an ENOB of 5.83 bits using a Thermo-optic Phase Shifter Array
Donghe Tu[1,2], Xingrui Huang[1,2], Hang Yu[1,2], Yuxiang Yin[1,2], Zhiguo Yu[1], Huan Guan[1], Lei Jiang[1], Zhiyong Li[1]
1.State Key Laboratory on Integrated Optoelectronics, Institute of Semiconductors, Chinese Academy of Science, China; 2.College of Materials Science and Opto-Electronic Technology, University of Chinese Academy of Sciences, China
We demonstrate an optical quantizer on thin film lithium niobate (TFLN) with a 64-channel thermo-optic phase shifter (TOPS) array. An effective number of bits (ENOB) of 5.83 bits is accomplished by the proposed quantizer.

08:30-09:45 • November 06, 2023 • Monday
Photonics Applications and Implementations
Presider: Ke Wang,RMIT University, Australia

08:30-09:00 • ACPPOEM-0912-2 *Invited*
High coupling efficiency grating couplers for silicon photonics
Periklis Petropoulos, V. Vitali, R. Marchetti, T. Dominguez Bucio, F.Y. Gardes, C. Lacava
University of Southampton, United Kingdom
We present techniques for optimizing the coupling efficiency between silicon photonic and optical fiber systems based on the adoption of back-end-of-line CMOS-compatible waveguide grating couplers.

09:00-09:15 • ACPPOEM-0801-153
Phase sensitive amplification assisted by high-order harmonics based on six wave model
Zeyu Wu[1,2] Weilin Xie[1,2], Xuefeng Wang[3,4], Mingfei Li[3,4], Wenshuai Feng[3], Wei Wei[1], Yi Dong[1]
1. Beijing Institute of Technology, China; 2. Yangtze Delta Region Academy, Beijing Institute of Technology, China; 3. Research Center, Beijing Institute of Aerospace Control Devices, China; 4. Quantum Engineering Research Center, China Aerospace Science and Technology, China
Aiming at obtaining a flat and wide gain spectrum in the fiber-optic parametric process based phase-sensitive amplifier (PSA), In this work, we have established a theoretical study for the potential gain property of two pump PSA with the six-wave model. It allows for a more precise description and optimization for the signal gain spectrum from a practical point of view by exploiting the high-order harmonics.

09:15-09:30 • ACPPOEM-0801-25
Differential Doppler Velocity Measurement using a Distributed Bragg Reflector Mode-locked Laser
Hao Song, Dan Lu, Zhihao Zhang, Fei Guo, Daibing Zhou, Lingjuan Zhao
Institute of Semiconductors, CAS, China
A differential Doppler velocity measurement scheme using the synchronized multiple modes of a distributed Bragg reflector semiconductor mode-locked laser is proposed and experimentally demonstrated with a cross-referenced velocity measurement capability

09:30-09:45 • ACPPOEM-0801-33
Photonic generation of triangular-shaped waveform with tunable symmetry based on a single-drive Mach-Zehnder modulator and differentiator
Xiaohong Lan, Yang Jiang, Jing Xu, Qiong Zhang, Jinjian Feng, Qianyou Long, Yunkun Luo
College of Physics, Guizhou University, China
A novel and simple approach for photonic generation of triangular-shaped waveform with tunable symmetry is proposed and demonstrated experimentally. Firstly, triangular-shaped waveform with tunable symmetry is considered as a combination of sawtooth waveform, triangular waveform and reversed-sawtooth waveform. The generation of each of them is then accordingly implemented by a differentiator. Starting from a sinusoidal modulated signal, an integral waveform of triangular waveform and a dark parabola can be easily obtained, respectively, under different bias index and modulation index. From the perspective of envelope function operation, applying time-domain first-order differentiation to the former, triangular waveform (δ=50%) can be achieved. By differentiating to the latter, triangular-shaped waveform with tunable symmetry (δ=44%~45% and δ=56%~57%) can be obtained, respectively, under different time delay. Thus, triangular-shaped waveform with tunable symmetry (δ=44%~45%, 50%, δ=56%~57%) are generated. In experiment, all of the expected results are successfully demonstrated and agree with the theoretical predictions well.

09:45-10:30 Coffee Break

10:30-11:45 • November 06, 2023 • Monday
Terahertz and Radio over fiber
Presider: Xianbin Yu, Zhejiang University, China

10:30-10:45 • ACPPOEM-0815-96
End-to-end Learning Based Symbol-to-Symbol Autoencoder for G-band Fiber-Terahertz integrated Communication System
Changle Huang[1,2], Zhongya Li[1,2], Junlian Jia[1,2], Size Xing[1,3], Chenxi Wang[1,2], Boyu Dong[1,2], Jianyang Shi[1,2], Nan Chi[1,2], Junwen Zhang[1,3]
1.Key Laboratory of EMW Information (MoE), Fudan University, China; 2.Shanghai ERC of LEO Satellite Communication and Applications, China; 3.Shanghai CIC of LEO Satellite Communication Technology, China
An end-to-end learning-basedsymbol-to-symbol autoencoder frame work is proposed and demonstrated. Asensitivity gain of 1.3 dB is achieved at a data rate of 40 Gbps after 10-km fiber and 1-m wireless transmission.

10:45-11:00 • ACPPOEM-0729-21
Photonics-assisted Broadband Frequency-hopping System for W-band MMW Secure Communications
Hanfeng Wang, Fan Yang, Jian Zhang
University of Electronic Science and Technology of China, China
We propose a photonics-assisted broadband frequency hopping system for secure millimeter-wave (MMW) communications. Wireless transmission of 2 Gbps OOK signals is experimentally demonstrated, operating at 83-98 GHz with a hopping bandwidth of 16 GHz.

11:00-11:15 • ACPPOEM-0730-22
Inverse Designed Optical Phased Array Antenna Based on the Direct Binary Search Algorithm for Angle-Customized Beam Emission
Weijie Xu, Junjia Wang
Southeast University, China
The ability to steer light beams is the key technology of optical phased array (OPA). In this paper, we demonstrate a general framework for the inverse design of optical antennas, which enables angle-customized beam emission.

11:15-11:30 • ACPPOEM-0725-5
Coherent Joint Transmission with 1024-QAM for 6G Distributed-MIMO Networks with Analog Radio-over-LWIR FSO Fronthaul Links
Rafael Puerta[1,2], Mahdieh Joharifar[2], Richard Schatz[2], Anders Djupsjöbacka[3], Armands Ostrovskis[4], Yan-Ting Sun[2], Grégory Maisons[5], Johan Abautret[5], Roland Teissier[5], Lu Zhang[6,7], Sandis Spolitis[4], Vjaceslavs Bobrovs[4], Sergei Popov[2], Xianbin Yu[6,7], Oskars Ozolins[2,3,4], **Xiaodan Pang**[2,3,4]
1.Ericsson AB, Sweden; 2.KTH Royal Institute of Technology, Sweden; 3.RISE Research Institutes of Sweden, Sweden; 4.Riga Technical University, Latvia; 5.mirSense, France; 6.Zhejiang University, China; 7.Zhejiang Lab, China
Distributed-MIMO (D-MIMO) is a prospective solution for next-generation mobile networks to increase capacity and coverage. We experimentally validate 1024-QAM coherent joint transmissions in a two transmitter D-MIMO network including radio-over-LWIR FSO fronthaul links facilitating deployment and achieving diversity and power gains close to theoretical values.

11:30-11:45 • ACPPOEM-0801-145
Wideband-tunable (2-22 GHz) Low-phase-noise (− 120 dBc/Hz) Optoelectronic Oscillator Based on EML with RF-injection
Zhihao Zhang[1,2,3], Dan Lu[1,2,3], Daibing Zhou[1,2,3], Chen Ji[4], Lingjuan Zhao[1,2,3]
1.Key Laboratory of Semiconductor Materials Science, 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; 4.College of Information Science and Electronic Engineering, Zhejiang University, China
An EML-based wideband-tunable OEO is demonstrated with phase noise of less than − 120 dBc/Hz in a tuning range of 2-22 GHz. RF injection is introduced to achieve frequency stabilization throughout the entire tuning range.

12:00-13:30 Lunch Break

13:30-15:15 • November 06, 2023 • Monday
Optical Convolution Networks and Applications
Presider: Periklis Petropoulos, University of Southampton, United Kingdom

13:30-14:00 • ACPPOEM-0905-1 *Invited*
Optical Camera Communication: Principles and Applications
Yitong Wang[1], Mohamed Shehata[1], Kandeepan Sithamparanathan[1], Yiwei Xie[2], **Ke Wang**[1]
1.RMIT University, Australia; 2.Zhejiang University, China
With the development of modern lighting technology and wide availability of cameras, optical camera communication (OCC) has developed rapidly. In this paper, we review recent progress and challenges in both indoor and outdoor OCC systems.

14:00-14:15 • ACPPOEM-0801-131
Linear Frequency Swept Laser With High-Repetition-Rate Based on an Iterative Predistortion Method in the Fourier Domain
Guomeng Zuo[1], Xie Qijie[2], Na Quanxin[2], Zhu Xiaoqi[3], Liu Huabei[1], Fang Zhao[1], Zhuang Dongwei[2], Hao Zhang[1], Song Junfeng[4], Shao Liyang[5]
1.Southern university of sci & tech, China; 2.Peng Cheng Laboratory, China; 3.Shenzhen Photonx Technology Co.Ltd., China; 4.State Key Laboratory on Integrated opto-electronics, College of Electronic Science and Engineering, China; 5.School of Electronic and Electrical Engineering, Southern University of Science and Technology, China
We present a novel iterative pre-distortion method in the Fourier domain, specifically designed for frequency modulated continuous wave (FMCW) laser source boasting high modulation frequency and exceptional linearity.

14:15-14:30 • ACPPOEM-0801-133
Stable Dual-Polarized Mode Oscillation in a Birefringent Buried Heterostructure (BH) Laser
Soumi Pal, Arpit Khandelwal, Nitin Bhatia
1.Indian Institute of Technology Jodhpur, India
We investigate the numerical model for achieving stable gain conditions of a two-mode BH laser. The model is optimized for achieving two frequencies with a difference in the microwave region.

14:30-14:45 • ACPPOEM-0731-160
Complete photonic tensor convolution driven by single dataflow
Tang Kaifei[1,2], Wang Jiantao[1,2], Xiang Ji[1,2], Jiahui Liu[1,2], Yu Xin[1,2], Haijiang Cao[1,2], Zaobang Zeng[3], Rulei Xiao[1,2], Wei Jiang[1,2]
1.College of Engineering and Applied Sciences, Nanjing University, China; 2.National Laboratory of Solid-State Microstructures, Nanjing University, China;3.School of Physics and Optoelectronic Engineering, Nanjing University of Information Science & Technology, China
Current photonic convolutional processors transform tensor convolutions into multi-channel general matrix multiplication (GeMM), leading to data replication and hardware complexity. In this study, we propose and experimentally demonstrate a photonic tensor processing unit (PTPU) with single dataflow, which offers a more concise approach to multi-channel standard tensor convolution processing. In experiment, we extracted features from a 3-channel (RGB) image in horizontal and vertical directions using an integrated multi-wavelength source. We then built a 3D-convolutional neural network to predict the presence of COVID-19 based on computer tomography (CT) scan data consisting of 64-channel tensors.

14:45-15:00 • ACPPOEM-0801-14
All-optical complex-valued convolution based on time-delay interference structure
Wentao Gu, Xiaoyan Gao, Wenchan Dong, Xinliang Zhang
Huazhong University of Science and Technology, China
We propose an optical computing scheme based on time-delay interference structure that enables parallel complex-valued convolution in the wavelength dimension, and experimentally demonstrate versatile image processing at a pixel loading speed of 50 GHz.

15:00-15:15 • ACPPOEM-0801-149
An Optical Binary Neural Network Processor enabled by Homodyne Detection Technology
Weiwei Pan[1], Ruoyun Yao[1], Zhangwan Peng[1], Jinhua Chen[1], Wanshu Xiong[2], Chen Ji[1]
1.Zhejiang University, China; 2.Zhejiang Lab, China
We present a compact approach to implementing an optical binary neural network processor utilizing homodyne detection technology. Convolutional operations are performed using our proposal and simulation results have validated its efficacy in neural network calculations.

15:30-18:00 Coffee Break & Poster Session

18:30-21:00 Banquet and Awards Ceremony

08:30-09:45 November 07, 2023 • Tuesday
Microwave Photonics
Presider: Xinyi Zhu, Institut National de la Recherche Scientifique-EMT, Canada

08:30-09:00 • ACPPOEM-0815-46 *Invited*
Microwave/Millimeter-wave Integrated Sensing and Communication (ISAC) Techniques enabled by Photonics
Xihua Zou, Peixuan Li
Southwest Jiaotong University, China
Microwave/millimeter-wave integrated sensing and communication (ISAC) techniques now are extensively focused in 6G and defense scenarios, due to the high utilization efficiencies in hardware, space, power and spectrum. In this talk, advances in photonics-enabled microwave/millimeter-wave ISAC techniques are introduced, providing high data rate beyond tens Gbit/s and outstanding resolution as fine as mm-level.

09:00-09:30 • ACPPOEM-0821-3 *Invited*
Terahertz photonics in radar and ISAC applications
Xianbin Yu[1], Zhidong Lyu[1], Zuomin Yang[1], Hongqi Zhang[1], Hang Yang[1], Nan Li[1], Changming Zhang[2], Xiaodan Pang[3,4,5], Oskars Ozolins[3,4,5], Lu Zhang[1], Xianmin Zhang[1]
1.Zhejiang University, China; 2.Zhejiang Lab, China; 3.KTH Royal Institute of Technology, Sweden; 4.RISE Research Institutes of Sweden, Sweden; 5.Institute of Telecommunications, Riga Technical University, Latvia
This paper reviews our recent progress on photonic terahertz radar and integrated sensing and communication (ISAC) systems in the 300GHz band with distinguished sensing performance.

09:30-09:45 • ACPPOEM-0731-110
Photonic-assisted compressive sensing with dispersion fiber
Chunyu Che, Jiasi Yang, Jiazhen Cai, Yufei Fu, Xinlu Gao, Shanguo Huang
State Key Laboratory of Information Photonics and Optical Communications Beijing University of Posts and Telecommunications, China
The technique of microwave photonic filtering and the structure of dual-drive Mach-Zehnder modulator (DDMZM) are applied to photonic-assisted compressed sensing (CS) for better system performance.

10:00-10:30 Coffee Break

10:30-12:00 • November 07, 2023 • Tuesday
Advanced Laser and Spectral Analysis
Presider: Radan Slavik, University of Southampton, United Kingdom

10:30-11:00 • ACPPOEM-0922-1 *Invited*
Photonic-enabled real-time dynamic spectral analysis and processing of high-speed waveforms
Xinyi Zhu, José Azaña
Institut National de la Recherche Scientifique-EMT, Canada
We review a novel scheme based on electro-optic phase modulation following the Talbot effect that enables real-time spectrogram analysis of high-speed signals. The method is further showcased for application to programmable time-varying frequency filtering.

11:00-11:30 • ACPPOEM-0730-1 *Invited*
Linewidth narrowing and intense optical pulse generation in microscopic Fano lasers
Yu Yi
Technical University of Denmark, Denmark
We present the results of significantly reduced quantum-limited linewidth and the generation of intense optical pulses using microscopic semiconductor Fano lasers. These results pave the laser for numerous low-power, ultrafast on-chip applications.

11:30-11:45 • ACPPOEM-0721-8
Frequency-tunable Narrow Linewidth THz Signal Generation by Semiconductor Lasers Subject to Mutual Optical Injection
Xiaoyue Yu[1], Fangzheng Zhang[1], Guanqun Sun[1], Zhidong Lv[2], Shilong Pan[1], Changming Zhang[3], Xianbin Yu[2]
1.Nanjing University of Aeronautics and Astronautics, China; 2.Zhejiang University, China; 3.Zhejiang Lab, China
A frequency-tunable narrow linewidth THz signal generation method is demonstrated using optically mutual-injected semiconductor lasers based on period-one dynamics. THz signals from 100 GHz to 300 GHz are generated with the linewidth bellow 10 kHz.

11:45-12:00 • ACPPOEM-0801-136
Microwave pulse generation based on active mode-locking coupled optoelectronic oscillator
Juncheng Li, Zhengtao Wang, Yali Zhang, Tingchuan Gao, Shouhai Li, Zhiyao Zhang, Shangjian Zhang, Yong Liu
University of Electronic Science and Technology of China, China
In this paper, we propose an active mode-locking coupled optoelectronic oscillator (AML-COEO) to generate microwave pulses. Fundamental frequency and harmonic AML-COEOs have been demonstrated by controlling the external low-frequency sinusoidal signal, which replaces the direct-current bias voltage and is directly applied to the bias port of the sharing modulator in the proposed AML-COEO. It is believed that this generation method will enrich the application of the COEO in the pulse Doppler radar.

12:00-13:30 Lunch Break

13:30-15:30 • November 07, 2023 • Tuesday
Optoelectronic Oscillators and Microwave Photonics
Presider: Heng Zhou, University of Electronic Science and Technology of China, China

13:30-14:00 • ACPPOEM-0927-2 *Invited*
Hollow core fibers for RF photonics
Radan Slavik
University of Southampton, United Kingdom
Thanks to the strong suppression of the light-glass interaction in the hollow core optical fibers, they can have simultaneously low chromatic dispersion and nonlinearity, opening new opportunities in multitude of applications, including RF photonics links.

14:00-14:30 • ACPPOEM-0927-4 *Invited*
Microresonator Frequency Comb for Optical Signal Processing and Microwave Photonics
Heng Zhou
University of Electronic Science and Technology of China, China
This talk presents our recent works on, first, all-optical multichannel QPSK phase regeneration using microresonator Kerr combs; second, ultra-low noise microcomb generation with 1mHz fundamental linewidth; third, tunable mmWave and THz frequency synthesis using microcombs.

14:30-14:45 • ACPPOEM-0801-87
Microwave Photonic Channelizer Based on Cascaded Microring Resonators
Ziyang Lu, Hongwei Chen, Sigang Yang, Minghua Chen
Tsinghua University, China
We demonstrate an 8-channel microwave photonic channelizer with an instantaneous bandwidth of over 10 GHz based on cascaded microring resonators. A two-tone RF input is experimentally received and successfully reconstructed.

14:45-15:00 • ACPPOEM-0815-9
Broadband Signal Synthesis Based on Microwave Photonics Channelization
Guchang Chen, Xue Lan, Xiangzhi Xie, Feifei Yin, Yitang Dai, Kun Xu
Beijing University of Posts and Telecommunications, China
In experiment, the generation of LFM signals were achieved with transient bandwidth of 4 GHz and working frequency range from 400 MHz to 20 GHz.The pulse width ranged from 1usto 1ms.

15:00-15:15 • ACPPOEM-0729-1
High-precision Micro-displacement Measurement Based on Self-calibration and Optoelectronic Oscillators
Hao Luo
TianJin university, China
A novel high-precision micro-displacement measurement method is proposed and experimentally demonstrated. The measurement resolution of the system can reach 356 pm. The standard deviations are less than 130 nm over a measurement range of 19 mm.

15:15-15:30 • ACPPOEM-0814-74
Dynamic noise analysis and linewidth measurement for frequency-swept laser
Qichao CHEN, Yubo ZHANG, Feifei YIN, Haoyan XU, Yitang DAI, Kun XU
Beijing University of Posts and Telecommunications, China
A dynamic noise analysis and linewidth measurement technology based on 3×3 coupler Michelson interferometer with frequency trend extraction algorithm is proposed.

15:30-16:00 Coffee Break

16:00-18:00 • November 07, 2023 • Tuesday
Microwave Photonics and Fronthaul Transmission
Presider: Xihua Zou, Southwest Jiaotong University, China

16:00-16:30 • ACPPOEM-0731-164 *Invited*
NR Conformance Testing and Coherent Joint Transmission Validation in Distributed-MIMO with Analog Fronthaul for 6G
Xiaodan Pang[1,2,3], Rafael Puerta[1,4], Mahdieh Joharifar[1], Richard Schatz[1], Lu Zhang[5,6], Sandis Spolitis[3], Vjaceslavs Bobrovs[3], Xianbin Yu[5,6], Oskars Ozolins[1,2,3]
1.KTH Royal Institute of Technology, Sweden; 2.RISE Research Institutes of Sweden, Sweden; 3.Riga Technical University, Latvia; 4.Ericsson AB, Sweden; 5.Zhejiang University, China; 6.Zhejiang Lab, China
We present NR conformance testing of analog radio-over-fiber (ARoF) and analog radio-over-free-space-optics (ARoFSO) fronthaul links for Distributed MIMO (D-MIMO) systems in 6G mobile networks. Experimental validations of coherent joint transmissions are also performed to meet the stringent synchronization demands.

16:30-16:45 • ACPPOEM-0815-107
Stable Wideband Signal Dissemination Based on High-accuracy Optical Transfer Delay Measurement
Zelin Lyu[1,2,3,4], Qianlong Zhang[1,2,3,4], Bin Wang[1,2,3,4], Weifeng Zhang[1,2,3,4]
1.Beijing Institute of Technology, China; 2.Key Laboratory of Electronic and Information Technology in Satellite Navigation, China; 3.Beijing Institute of Technology Chongqing Innovation Center, China; 4.Chongqing Key Laboratory of Novel Civilian Radar, China
We propose and experimentally demonstrate a stable wideband signal dissemination system based on high-accuracy optical transfer delay measurement. In the proposed system, the absolute time delay of the fiber link is accurately measured based on phase-derived ranging, and then the fiber link is actively stabilized for stable wideband signal dissemination. As a demonstration, a wideband signal with a bandwidth of 4 GHz and a center frequency of 16 GHz is transmitted over a 1-km-long single-mode fiber, and the peak-to-peak time jitter is as small as 31.2 fs. The proposed system provides a high stability and a unique capability of absolute time delay measurement, which is promising to be widely used in distributed coherent detection systems.

16:45-17:00 • ACPPOEM-0815-20
Photonics-Assisted Complex-Valued Discrete Fourier Transform Processor Based on Temporal Computing
Weizhen Yu[1,2,3,4], Bin Wang[1,2,3,4], Weifeng Zhang[1,2,3,4]
1.Beijing Institute of Technology, China; 2.Key Laboratory of Electronic and Information Technology in Satellite Navigation, China; 3.Beijing Institute of Technology Chongqing Innovation Center, China; 4.Chongqing Key Laboratory of Novel Civilian Radar, China
In this paper, we propose and experimentally demonstrate a photonics-assisted complex-valued discrete Fourier transform (DFT) processor based on temporal computing. In the proposed DFT processor, the complex-valued input data and the orthogonal basis are encoded in sequence on an optical carrier via two high-speed dual-drive Mach-Zehnder modulators (DD-MZMs). By precisely controlling the synchronization time of the input data and orthogonal basis loading, the complex-valued multiplication operation is performed in the time domain. An optical hybrid is used to implement coherent detection, and two low-speed photodetectors are used to perform the complex-valued accumulation operation. As a demonstration, 32-points complex-valued DFT is performed, and the normalized root mean square error (NRMSE) is as small as 0.0133. In addition, a 16×32 pixels image is employed to implement 2D DFT, which achieves an NRMSE as small as 0.0065. The proposed DFT processor holds unique advantages including high throughput and low latency, which is potential to be widely used in artificial intelligence computing and radar signal processing systems.

17:00-17:15 • ACPPOEM-0730-26
Optical True Time Delay Compensation Network-Based Beam Tracking for THz Massive MIMO Systems
Shilong Jia[1], Chongfu Zhang[1], Zixin Zhao[1], Lipeng Dai[1], Huan Huang[1], Songnian Fu[2], Kun Qiu[1]
1.University of Electronic Science and Technology of China, China; 2.Guangdong University of Technology, China
Terahertz (THz) communication is one of the most important technologies of future 6G due to its ultra-bandwidth. In THz massive multiple-input multiple-output (MIMO) systems, the performance of beam tracking is significantly degraded due to the beam split effect. In this paper, we propose an optical true time delay compensation network (OTTDCN)-based beam tracking scheme. In the proposed OTTDCN-based beam tracking scheme, the OTTDCN is introduced between the radio-frequency (RF) chains and the phase shifter network. The OTTDCN pregenerates the beam compensation modes and controls the degree of the beam split effect through frequency-dependent phase compensation to create multiple beams to track the physical directions of multiple users. Meanwhile, we develop a beam compensation mode-based beam tracking (BCM-BT) algorithm, which considers the selection of the optimal beam compensation modes. The results show that the OTTDCN-based beam tracking scheme can effectively reduce beam tracking overhead and achieve near-optimal sum rate performance.

17:15-17:30 • ACPPOEM-0815-32
Stable Wideband WDM Receiving System Based on Relative Phase-locking
Baixuanyao Ye, Wei Wei, Xi Wang, Weilin Xie, Yi Dong
Beijing Institute of Technology, China
We present a wideband wavelength division multiplexed receiving system. The relative transmission delay variation between 2 channels is controlled within 40fs using a probe-based homodyne phase-locked loop.

17:30-17:45 • ACPPOEM-0731-139
High-Fidelity Positive Real Matrix Transformation with Coherent Integrated Photonics Chip
Guangsong Yuan, Hongxiang Guo, Yuepeng Wu, Yi Guo, Shunxin Song, Jian Wu
Beijing University of Posts and Telecommunications, China
We implement random 3x3 positive real matrix transformation with a 4x4 coherent integrated photonics chip. Experiments show the similarity results for random single or two parallel matrices are 95.2% and 93.5%, respectively.

17:45-18:00 • ACPPOEM-0801-65 *Industry Innovation Nomination*
A Photonic Transceiver for the Aggregation and Disaggregation of Microwave Signals Based on an Optical Frequency Comb Source
Haikun Huang[1], Shengkang Zeng[1], Lingzhi Li[1], Jiejun Zhang[1], Jianping Yao[2]
1.Jinan University, China; 2.University of Ottawa, Canada
A photonic transceiver for the aggregation and disaggregation of microwave signals based on an optical frequency comb source is proposed and experimentally demonstrated. The key device is a dual-polarization dual-drive Mach-Zehnder modulator (DP-DDMZM) which is employed to perform signal aggregation and disaggregation. In the aggregation mode, four binary phase shift keying (BPSK) microwave signals with each having a bit rate of 2 Gbps at different frequencies received by four antennas are aggregated into two quadrature phase shift keying (QPSK) single-sideband (SSB) modulation optical signals with orthogonal polarizations. The spectral efficiency is quadrupled with a combined bit rate of 8 Gbps. After coherent detection, the aggregated signals are decoded. The error vector amplitude (EVM) is 19.93% and the bit error rate (BER) is 2.61×10^{-7}. In the disaggregation mode, a QPSK microwave signal with a bit rate of 4 Gbps received by an antenna is disaggregated into two BPSK optical signals, with each disaggregated signal having a bit rate of 2 Gbps and an EVM of 13.75%.

Track 6: Photonics for Energy
Shanghai Hall, 2F

13:30-15:30 • November 05, 2023 • Sunday
Hybrid photovoltaics
Presider: Haizheng Zhong, Beijing Institute of Technology, China

13:30-14:15 • ACPPOEM-0810-4 *Tutorial*
Printable Organic and Perovskite Solar Cells for Clean Energy
ALEX JEN
City University of Hong Kong, Hong Kong, China
Several novel interface/additive engineering approaches will be discussed to demonstrate high PCE (~26%) could be achieved in inverted perovskite solar cells and very efficient lead-capturing from decomposed perovskite devices. Their applications in various clean energy generation fields will also be discussed.

14:15-14:45 • ACPPOEM-0811-1 *Invited*
Minimizing voltage losses in organic solar cells
Feng Gao
Linköping University, Sweden
Recent advances in organic solar cells (OSCs) based on non-fullerene acceptors (NFAs) come along with reduced non-radiative voltage losses. We show that the non-radiative voltage losses in these state-of-the-art donor:NFA OSCs show no correlation with the energies of charge-transfer electronic states at donor:acceptor interfaces, different from conventional fullerene-based OSCs. Based on a combined temperature-dependent electroluminescence experiments and dynamic vibronic simulations, we have been able to rationalize the low voltage losses in these devices, where we highlight the critical role of the thermal population of local exciton states in decreasing the non-radiative losses. An important finding is that the molecular photoluminescence properties of the pristine materials define the limit of non-radiative voltage losses in OSCs, indicating that it is critical to design high-luminescence-efficiency donor and acceptor materials with complementary optical absorption bands extending into the near-infrared region. We further extend our understanding to ternary OSCs and paint a comprehensive picture of how the guest component affects the radiative and non-radiative related parts of the open-circuit voltage in ternary OSCs. We highlight that the thermal population of charge-transfer and local exciton states provided by the guest component based binary system has a significant influence on the non-radiative voltage losses. Ultimately, we provide two design rules for enhancing the open-circuit voltage in ternary OSCs.

14:45-15:15 • ACPPOEM-0801-74 *Invited*
Multi-Component Strategies for Enhancing Organic Photovoltaic Performance
Doo-Hyun Ko
Sungkyunkwan University, Korea
Extensive research on bulk-heterojunction (BHJ) optimization has significantly advanced organic photovoltaics (OPVs). However, addressing the issue of morphological instability and ensuring long-term durability remains a top priority for further investigation. To achieve stability while maximizing performance, researchers have strategically explored multi-component BHJ-based OPVs. In this study, we present the use of multi-component (ternary, quaternary, and beyond) BHJ active layers as a highly effective approach to enhance OPV performance. Experimentally optimized multi-component OPVs demonstrate a broadened spectral response and improved charge transport process, leading to suppressed recombination and overall improved OPV performance. Furthermore, these multi-component OPVs benefit from enhanced morphological stability, achieved by reducing the driving force for grain growth through increased entropy in the multi-component blend system.

15:15-15:30 • ACPPOEM-0814-33 *Industry Innovation Nomination*
Industrial silicon cell compatible efficient perovskite/silicon tandem solar cells
Lin Mao[1], Yang Tian[2], Zhang Hao[1], Liu Mingzhen[1]
1.University of electronic science and technology of China, China; 2.Sichuan Research Center of New Materials Institute of Chemical Materials China Academy of Engineering Physics, China
Perovskite/silicon tandem solar cells have made extraodiary progress in efficiency that exceeds all other two-junction tandem technologies including gallium arsenide. However, most highly efficient monolithic perovskite/silicon tandems are based on thick (≈250–300 μm) float-zone (FZ) silicon bottom cell with front-side flat-polished or sub-micro textured surface in order to be compatible with solution-processed perovskite films. For every change made over SHJ production process in coordination with fabrication of tandem cells, will certainly come along with notable rise in cost. Thus, despite their promises, these high-efficiency perovskite/silicon tandems based on the thick front-side polished or sub-micro textured silicon bottom cell are not favored in the current industrial production line. Here, a molecular-level nanotechnology is developed by designing NiOx/2PACz ([2-(9H-carbazol-9-yl) ethyl]phosphonic acid) as an ultrathin hybrid hole transport layer (HTL) above indium tin oxide (ITO) recombination junction, to serve as a vital pivot for achieving a conformal deposition of high-quality perovskite layer on top. The NiOx interlayer facilitates a uniform selfassembly of 2PACz molecules onto the fully textured surface, thus avoiding direct contact between ITO and perovskite top-cell for a minimal shunt loss. As a result of such interfacial engineering, the fully textured perovskite/silicon tandem cells obtain a certified efficiency of 28.84% on a 1.2-cm2 masked area, which is the highest performance to date based on the fully textured, production-line compatible SHJ. This work advances commercially promising photovoltaics with high performance and low costs by adopting a meticulously designed HTL/perovskite interface.

15:30-16:00 Coffee Break

16:00-18:00 • November 05, 2023 • Sunday
Organic photovoltaics I
Presider: Hae Jung Son, Korea Institute of Science and Technology, South Korea

16:00-16:30 • ACPPOEM-0725-11 *Invited*
Conjugated polyelectrolytes as a multifunctional interlayer for perovskite solar cells
Han Young Woo
Korea University, South Korea
The exceptional magnetic, electrical, and optical properties exhibited by metal halide perovskites (MHPs) have garnered significant interest from the optoelectronic research community in recent decades. These materials have found wide-ranging applications in photovoltaics, light emitting diodes (LEDs), lasers, photodetectors, field effect transistors, and solar concentrators. Perovskite solar cells (PeSCs) have attracted extensive attention because of their inherent advantages such as solution processability, band-gap tunability, high absorption coefficient, and long carrier diffusion length. It has been successfully demonstrated that their power conversion efficiencies exceed 25%, which becomes similar with the highest PCE for crystalline Si solar cells. For PeSCs applications, appropriate charge transport layers (CTLs) are crucial for device performance and stability. The CTLs should have suitable energy levels for effective charge injection/transport while blocking opposite charges. Moreover, the CTL below the perovskite layer is critical because it significantly affects the crystal growth of the perovskite layer and its interfacial defects. In this presentation, a new series of conjugated polyelectrolytes is reported as an ideal interfacial layer and CTLs in PeSCs.

16:30-17:00 • ACPPOEM-0804-3 *Invited*
Printed Flexible Organic Solar Cells with High Specific Power Ratio
Chang-Qi Ma
Printed Electronics Research Center, Suzhou Institute of Nano-Tech and Nano-Bionics, CAS, China
In this presentation, we will report our latest results on preparing high-performance printed flexible organic solar cells, which showed a high PCE of over 17% for 1 cm^2. We will also present a solution-processed ultra-thin encapsulation layer for polymer solar cells. With these, we are able to fabricate flexible polymer solar cells for near space applications, that was concept-proved by a high-attitude balloon testing system.

17:00-17:30 • ACPPOEM-0813-3 *Invited*
Aggregate Control of Organic Semiconductors toward High Performance Photovoltaics
Tao Wang
Wuhan University of Technology, China
The emergence of new organic semiconductors has driven the continuous development of organic solar cells, with the power conversion efficiency of single-junction devices having passed 19%. The strong intermolecular interactions between organic semiconductors lead to the self-assembly of them into hierarchical aggregates, which exhibits vastly different optoelectronic properties compared to those of the single molecules. Revealing and controlling the complex aggregation structure of organic semiconductors, and establishing the key relationship between structure and the power conversion process, is vitally important toward high performance organic solar cells, but remains as a grand challenge. Dedicating to this field, we have developed a number of physical and chemical approaches to tune the hierarchical aggregates of organic photovoltaic molecules: We developed the heating-induced aggregation strategy to suppress the large-size aggregation of crystalline semiconductors, realizing the conversion from large-size aggregation to small aggregation, which broadens the light absorption range and enhances exciton splitting; we developed the solution-induced aggregation strategy, realizing the conversion from random aggregation to ordered aggregation, which increases the light absorption intensity and improves charge transport; we also developed the small-molecular fibrillization strategy, realizing the conversion from short-range aggregation to long-range aggregation, which resolves the serious charge recombination issue during charge hoping and achieves a device efficiency of over 19%. The correlation between aggregates and light absorption, exciton dissociation and charge transport processes is eventually established to direct the future development of organic solar cells.

17:30-17:45 • ACPPOEM-0810-2
In situ Spectroscopy Study of Morphology Formation Process of Organic Photovoltaic Blends
Yanfeng Liu
Jiaxing University, China
The efficiency of bulk heterojunction (BHJ) based organic solar cells is highly dependent on the morphology of the blend film, which is a result of a fine interplay between donor, acceptor, and solvent during the film drying. In this work, a versatile set-up of in situ spectroscopies is used to follow the morphology evolution during blade coating of three iconic BHJ systems, including polymer:fullerene, polymer:nonfullerene small molecule, and polymer:polymers. the drying and photoluminescence quenching dynamics are systematically studied during the film formation of both pristine and BHJ films, which indicates that the component with higher molecular weight dominates the blend film formation and the final morphology. Furthermore, Time-resolved photoluminescence, which is employed for the first time as an in situ method for such drying studies, allows to quantitatively determine the extent of dynamic and static quenching, as well as the relative change of quantum yield during film formation. This work contributes to a fundamental understanding of microstructure formation during the processing of different blend films. The presented setup is considered to be an important tool for the future development of blend inks for solution-cast organic or hybrid electronics.

17:45-18:00 • ACPPOEM-0815-31
Recent progress in solution-processed flexible organic photovoltaics
Lulu Sun
RIkagaku KENkyusho/Institute of Physical and Chemical Research, Japan
The rapid development of narrow-bandgap small-molecule acceptors and wide-bandgap polymer donor materials has propelled laboratory-fabricated organic photovoltaics (OPV) to achieve certified power conversion efficiencies (PCE) exceeding 19%. The crucial next phase involves translating these gains into practical large-scale applications. This necessitates the OPV devices to be solution-processed and flexible, aligning with high-throughput production methods like roll-to-roll printing. We provide a concise yet comprehensive overview of recent advancements in solution-processed flexible OPV. By scrutinizing the behavior of narrow-bandgap acceptors and wide-bandgap polymer donors within solution-processed flexible devices, we delve into challenges and future directions. The focus lies in bridging the gap between laboratory achievements and industrial implementation, addressing issues of materials compatibility, stability, and scalable production. Through this analysis, we offer insights into the potential of solution-processed flexible OPV, paving the way for its integration into mainstream renewable energy technologies.

17:30-20:00 Welcome Reception

08:30-10:00 • November 06, 2023 • Monday
Organic photovoltaics II
Presider: Changqi Ma, Suzhou Institute of Nano-Tech and Nano-Bionics, CAS, China

08:30-09:00 • ACPPOEM-0810-6 *Invited*
3D Network Acceptors for Efficient Solar Conversions
Feng He
Southern University of Science and Technology, China
The morphology and organic photovoltaic materials are mainly decided by the secondary intramolecular/intermolecular interactions from their constructing components, which includes the types of backbones and substitution units. Over past five years, we have focused on the precise regulation of non-covalent intermolecular interactions, such as Cl-S and Cl-π, to achieve series of three-dimensional (3D) structures for elevated solar conversions. We have successfully realized the transformation of the molecular structures from the linear stacking to 3D network arrangement by precise positioning of chlorine atoms, which provided a promising pathway to design highly efficient non-fullerene acceptors with more isotropic electron transmission identity. The single-crystal X-ray diffraction shows that the 3D interpenetrating isomer has a better molecular planarity and a closer π-π interaction distance than the linear one. Recently, the trifluoromethylation has been proved to be an effective strategy to achieve an ultra-narrow bandgap acceptors (named BTIC-CF3-γ) with a 3D structure, a PCE of 15.59% has been achieved which is the highest value in reported ultra-narrow bandgap acceptors. The single crystal structure of BTIC-CF3-γ has also been successfully presented, which helps us to understand the charge transportation in blend films and provide a facile method for efficient solar conversion. The 3D network packing in those acceptors can promote the electron transport in acceptors, which is similar to the isotropic transport in fullerene acceptors for favorable charge transfer. An understanding of 3D networks could provide an insight into the electron transport behaviors for design of high-performance materials for next generation organic solar cells. Single crystals explored in this presentation could help the researchers in the organic optoelectronics to understand the charge carrier transportation processes in active layers. It also offers a guideline for development of new generation materials with improved and balanced device performance.

09:00-09:30 • ACPPOEM-1009-24 *Invited*
Charge generation mechanisms for efficient organic photovoltaics
Yuanping Yi
Institute of Chemistry, Chinese Academy of Sciences, China
For organic solar cells, the photoelectric conversion consists of a series of electronic processes, including light absorption, exciton diffusion, exciton dissociation, charge migration, and charge collection. At the same time, there also exist competitive energy loss processes including exciton decay and charge recombination. To achieve high yield of charge generation, the charge separation and charge migration processes should be maximized, while the charge recombination processes should be minimized. In this talk, we will discuss the effect of electronic polarization on charge separation, the super-exchange mechanism for charge transport, and the role of triplet states in modulating charge recombination, and then propose some effective strategies to improve organic photovoltaic efficiency.

09:30-10:00 • ACPPOEM-1009-28 *Invited*
Tethered Small-Molecule Acceptors for Stable Polymer Solar Cells
Zhiguo Zhang
Beijing University of Chemical Technology, China
In our pursuit to address the trade-off between device efficiency and durability in polymer device, we have introduced a novel ternary device design. This design combines two acceptor components: DY-P2EH, a tethered small molecule acceptor (SMA) with conjugated side-chains as the primary host acceptor, and BTP-ec9, a monomeric SMA serving as the secondary acceptor. Unlike previously reported tethered SMAs with flexible side-chains, DY-P2EH exhibits distinct thermodynamic properties, including a high Tg value of 136 , a surface energy of 31.71 mN/m, and hypo-miscibility with the polymer donor PM6. As expected, the PM6: DY-P2EH binary system demonstrated remarkable device stability under thermal stress. However, challenges such as severe phase separation and over-purification of mixed domains limited the JSC to 24.03 mAcm-2 and PCE to 17.09%. To overcome the limitations posed by the hypo-miscible host blend, we introduced BTP-ec9 as a secondary acceptor component. BTP-ec9 is optimally hyper-miscible with PM6 and possesses a narrow band gap, which allows for efficient harvesting of NIR solar energy, thereby significantly increasing exciton splitting and light harvesting ability. Consequently, the ternary device exhibited a hierarchical morphology, optimizing charge generation, transport, and suppressing recombination. With an impressive FF of 80.61%, the ternary device achieved an excellent PCE of 19.09%, ranking among the highest PCEs for PSCs. Remarkably, the ternary device demonstrated substantially reduced burn-in efficiency loss, retaining over 85% of the initial efficiency even after 1100 hours under 85 thermal stress. Our results demonstrate that a ternary device design with tethered SMAs and a suitable SMA as the dual acceptor component, each being hypo-miscible and hyper-miscible with the polymer donor, respectively, can yield ternary devices with a hierarchical morphology, resulting in simultaneous enhancements in photovoltaic performance and device stability. In recent times, significant progresses have been made in achieving long-term stability with acceptor clusters, including PSMA and GMAs. Just like TSMAs, they also demonstrate hypo-miscibility with polymer donors due to reduced entropic contributions compared to individual SMAs. As a result, the ternary design proposed in this study suggest to be a universal approach for enhancing both photovoltaic performance and stability in such systems.

10:00-10:30 Coffee Break

10:30-12:00 • November 06, 2023 • Monday
Organic photovoltaics III
Presider: Feng He, Southern University of Science and Technology, China

10:30-11:00 • ACPPOEM-1009-27 *Invited*
Modification of Metastable phase in Organic Solar Cells
Jie Min
Wuhan University, China
The performance optimization of organic solar cells is influenced not only by the design of the molecular structures but also by the regulation of the blend morphologies. Currently, there is a well-established understanding of how material design can regulate energy levels, film absorption, carrier mobility, and molecular crystallinity, leading to efficient device performance through the aggregation regulation of active layers. However, there is a lack of effective methods and investigations on the regulation of the metastable state of the active layer, the analysis of degradation mechanisms, and the improvement of operational stability. At present, organic solar cells are not only facing the basic problem of unclear metastable decay mechanism, but also facing the important challenge of synergistic development of "efficiency and stability". The development of physical and chemical methods of metastable regulation is an important breakthrough point for future work. On the basis of levelized cost of electricity analysis, this report will briefly indicate the performance requirements of organic photovoltaic materials and a brief analysis of performance improvement strategies and introduce the metastable morphology characteristics of active layer. By analyzing and revealing the attenuation mechanism of metastable morphology, combined with the intrinsic characteristics of small molecule materials, this report is used to understand the morphologic changes of the active layer under light/thermal stress, and explore the physical attenuation dynamics. Finally, the recent progress made by our research group in regulating the metastable state through physical and chemical methods, as well as the coupling strategies employed. This report aims to provide theoretical support for a deeper understanding of the mechanisms behind metastable morphology attenuation, and to offer valuable references for fellow researchers in the field.

11:00-11:30 • ACPPOEM-1009-25 *Invited*
Development of organic photovoltaics with excellent device efficiency and stability
Ning Li
South China University of Technology, China
As an important representative of the emerging photovoltaic technology, organic photovoltaics (OPV) can achieve excellent device performance and low-cost, continuous production and processing through solution printing technology, and are expected to make outstanding contributions to solar-driven multifunctional applications. In order to realize the industrialization and commercial application of OPV technology, research teams around world have made a lot of efforts. In the past few years, through the synthesis of new materials, optimization of thin film micro-morphology, and development of advanced processing technologies, the power conversion efficiency of OPV devices has been continuously improved. However, the stability of OPV devices is a key issue that still restricts the industrialization of OPV technology. In this contribution, I will discuss our recent progress on the stability of OPV devices, and propose some effective solutions to solving the instability problems, including the development of oligomer acceptors, the use of single-component OPV devices, and the use of multiple component strategy, etc., so as to further promote the new generation of OPV devices to achieve excellent performance and stability.

11:30-12:00 • ACPPOEM-0815-19 *Invited*
Organic photovoltaics based on functional third components
Pei Cheng
Sichuan University, China
Organic photovoltaics is a very potential technique for solar energy conversion. In recent years, we designed a variety of third components to construct high-performance organic photovoltaics through improving charge carrier generation efficiency, lifting carrier extraction efficiency, enhancing device stability, etc. Semitransparent organic photovoltaics is an important embranchment in organic photovoltaics. Lately, we introduced the strategies of constructing layer-by-layer active layer of wide-bandgap inorganic semiconductor/narrow-bandgap acceptor, adjusting the absorption peak of donor layer to redshift and narrow by small molecule additives, building the ternary blend active layer of wide-bandgap third component, mid-bandgap donor and narrow-bandgap acceptor to construct high-performance semitransparent organic photovoltaics, etc. while the mechanism of the differences between the performance of opaque and semitransparent devices are studied in detail.

12:00-13:30 Lunch Break

13:30-15:30 • November 06, 2023 • Monday
Hybrid electronics
Presider: Yuanping Yi, Institute of Chemistry, CAS, China

13:30-14:00 • ACPPOEM-0815-37 *Invited*
Optically Tunable Field-Effect Transistors with Conjugated Polymer Entailing Azo-group in the Side Chains
Zitong Liu
Lanzhou University, China
Semiconducting conjugated polymers with photos witching behavior are highly demanded for field-effect transistors (FETs)

with tunable electronic properties. Herein we present a new design strategy for photoresponsive conjugated polymers by incorporating photochromic azo-groups (azobenzene, arylazopyrazole, and tetra-ortho-methoxy-substituted azobenzene) into the flexible side alkyl chains. It is shown that azo-groups in the side chains of conjugated polymers can undergo trans/cis photoisomerization in fully reversible and fast manner. Therefore, optically tunable FETs with bistable states are successfully fabricated.

14:00-14:30 • ACPPOEM-0731-125 *Invited*
Fullerene-Based Heterojunctions For Transparent Photovoltaics
Ruiqian Meng, Qianqing Jiang, **Dianyi Liu**
Westlake University, China
Generally, absorption-selective semiconductor materials are the best choice for highly transparent photovoltaics. However, non-absorption-selective semiconductor materials may still be options for transparent devices. Here, we report a set of non-absorption-selective fullerene-based heterojunctions for transparent photovoltaics. The TPV devices with fullerene-based light-harvesting layers exhibit an AVT exceeding 80%.

14:30-15:00 • ACPPOEM-1009-26 *Invited*
Defects modulation and optoelectronic devices of perovskite single crystals
Qingfeng Dong
Jilin University, China
The single crystal perovskite materials exhibit excellent charge carrier transport properties and efficient photovoltaic conversion abilities. This report will introduce research on the stability of single crystal perovskite materials and devices, discussing ion defects and electron defects within perovskite materials, as well as their impact on the performance of radiation detector and photovoltaic devices.

15:00-15:15 • ACPPOEM-0731-157
Constructive pyridine molecular configurations for defect passivation of Printable Perovskite Solar Cells
Yue Ming[1], Weiqiang Wu[1], Jiale Liu[2], Jian Yang[2]
1.Shenzhen Polytechnic University, China; 2.HuaZhong University of Science and Technology, China
Continued endeavors are focused on advancing emerging printable mesoscopic perovskite solar cells (p-MPSCs), and many of these efforts are focused on composition engineering, intermediate phase engineering, and passivation engineering. In particular,the application of passivators to reduce defects in perovskite materials has been demonstrated as an effective approach to enhance the photovoltaicperformance and long-term stability of MPSCs. However, a lack of in-depth understanding of how the molecular configuration influences the passivation effectiveness is a challenge to rational molecule design. In this study, the chemical environment of a functional group activated for defect passivation was systematically investigated using Pyridine methanol molecules(ortho, para, and meta positions).Our research demonstrates that the different relative positions of the methanol group and the N atom on the pyridine ring result in distinct electron cloud distributions. The power conversion efficiency (PCE) of the prepared MPSCsdevices increased from 16.37% to 17.70% with the 4-pyridine methanol (4PM) molecule treatment.

15:15-15:30 • ACPPOEM-0813-11
Highly conductive PEDOT and its application on energy devices
Zaifang Li
Jiaxing University, China
Conducting polymer poly(3,4-ethylenedioxythiophene (PEDOT)-based materials have been extensively studied due to its excellent air, thermal stability, and high transparency in the visible spectral region and tunable conductivity from 10^{-4} to 10^{3} S/cm. This report will focus on the preparation, characterization and applicationof highly conductive PEDOT:PSS electrode- and itsapplications in organic solar cells, supercapacitors, thermoelectrics and photocapacitor devices.

15:30-18:00 Coffee Break & Poster Session

18:30-21:00 Banquet and Awards Ceremony

Track 7: Micro-, Nano-, and Quantum Photonics: Science and Applications London Hall, 2F

13:30-15:30 • November 05, 2023 • Sunday
Micro- and Nano- Science and Applications I
Presider: Fangwei Ye, Shanghai Jiao Tong University, China

13:30-14:15 • ACPPOEM-1009-29 *Tutorial*
Dreams about Dreams: Topology with Spatiotemporally Sculptured Light
Qiwen Zhan
University of Shanghai for Science and Technology, China
With the rapid advances in laser technology, optical fields with various topological features have attracted increasing attentions. In this talk I will review recently developed techniques that allows us to directly sculpt optical fields in the spatial and spatiotemporal domains. These spatiotemporal sculpturing techniques are employed to produce optical fields with various topological features. Wavepackets with these complicated topological structures exhibit many unique properties and may find important applications when interact with matters, opening tremendous potential opportunities for sculptured complex spatiotemporal wavepackets.

14:15-14:45 • ACPPOEM-0727-23 *Invited*
Single molecule detection and imaging via nanoscale optical-field and light-matter interaction control
Zhiyuan Li, Yang Haiyao
South China University of Technology, China
In this talk we report our route toward single-molecule detection and imaging, one of the ultimate goals of molecular sciences and optical sciences, via nanoscale optical-field and light-matter interaction control. Raman scattering carries many key characteristic information in molecular structure, but its weak signal intensity hinders Raman scattering for practical spectroscopic applications. Based on a simple additive concept, we built an optical nanocavity composed of gold nanoparticles sitting on silicon wafers coated with gold film and covered with a 2 nm layer of SO2, screened rhodamine B and the two-dimensional material WS2 as matched molecule and adsorbed surfaces. Due to the synergistic electromagnetic and chemical enhancement mechanisms, Raman spectroscopy can be observed at a minimum concentration of 10-18 M rhodamine B (12 molecules, 5 mm×5 mm) and with a maximum Raman signal enhancement factor reaching 16 orders of magnitude, thus enabling to detect and localize unambiguously the Raman signal of single molecule. Microscopy is a kind of technology to observe molecules more visually. Scanning near-field optical microscopy (SNOM) offers a way to break down the diffraction limit of conventional optical microscopy and reach a fine spatial resolution down to ~10 nm, but suffers from low transmission efficiency of optical signal power. We designed and 3D printed a polymer-core/gold-shell spiral-grating conical nanostructured tip on the end facet of single-mode optical fiber. Numerical simulations and optical measurements for this deliberately designed and fabricated high-resolution, high throughput, and high contrast SNOM tip show it has 10% transmission efficiency, ~5 nm spatial resolution of optical imaging, 20 dB signal-to-noise ratio, 7000 pixels per second fast scanning speed, and 50 nm bandwidth around 785 nm. This tip thus enables to transport Ti:Sapphire femtosecond signal and offers the prospect to build a high temporal-spatial resolution optical microscopy and spectroscopy instrument.

14:45-15:00 • ACPPOEM-0727-16
InSb All-Dielectric Metasurface for Enhancing photodetection in Mid-Infrared Silicon Photonics
Shengyi Wang, Hao Luo, Qiu Wang, Hua Ge, Bowen Jia
Wuhan University of Technology, China
A InSb all-dielectric metasurface is proposed based on Kerker effect. Simulation results shows that metasurface exhibit a near perfect absorption in the 5.0-5.5 μm range, which is important for mid-infrared detection.

15:00-15:15 • ACPPOEM-0731-153
Ultrafast Pulse Management with Hyperbolic Metamaterials
Jingyi Wu, Jack Kingsley-Smith, Anton Yu. Bykov, Alexey V. Krasavin, Francisco J. Rodríguez-Fortuño, Anatoly V. Zayats
King's College London, United Kingdom
Understanding interaction of ultrafast optical pulses with materials is important for the development of new approaches for pulse management and, vice versa, for tailoring optical processes enabled by laser pulses. Here, we investigate the interaction and modification of ultrashort optical pulses with anisotropic metamaterials in hyperbolic and epsilon-near-zero dispersion regimes. Considering a broad range of pulse lengths from 8 fs to 180 fs, we demonstrate how the changes of the spectral and wavevector content of the pulse due to the interaction with metamaterial influence its spatial and temporal shape. The developed model provides opportunities to investigate the details of interaction of ultrashort pulses with complex media in a wide range of pulse durations and shapes.

15:15-15:30 • ACPPOEM-0719-1
Mode Multiplexer Based on Multiplane Light Conversion Using a Monolayer Metasurface
Mian Wu, Lin Wu, Jin Tao
State Key Laboratory of Optical Communication Technologies and Networks, China Information Communication Technologies Group Corporation (CICT), Wuhan, China
We propose a mode-division multiplexer based on multiplane light conversion (MPLC) using a monolayer-structured metasurface and a reflective half-wave plate (HWP). Our design releases the need for strict phase plate alignment in the MPLC

experiments.

15:30-16:00 Coffee Break

16:00-18:00 • November 05, 2023 • Sunday
Nonlinear and Quantum Optics
Presider: Jing Xu, Huazhong University Of Science And Technology, China

16:00-16:30 • ACPPOEM-1009-31 *Invited*
Thouless pumping in linear and nonlinear moire potentials
Fangwei Ye
Shanghai Jiao Tong University, China
In certain periodic systems, the propagation direction and distance of a wave packet across the lattice are determined solely by a global property of the system called "topology," irrespective of the local details of the system at the specific location. This phenomenon, initially discovered by physicist David Thouless in 1983, is known as "Thouless pumping" or "topological transport". Thouless pumping has been verified in various physical systems. Due to the presence of nonlinearity in many physical systems, a natural question arises: how does nonlinearity affect topological transport?
In our study, we have investigated the Thouless pumping in dynamic moiré lattices, in both linear and nonlinear conditions. In linear condition, we have created (2+1)D photonic moiré lattices, and achieved the directed propagation of localized bulk states, whose propagation direction and speed being determined by the twisting angle of the underlying moiré lattices. in nonlinear condition, we found that under the influence of nonlinearity, solitons become the carriers of topological transport. A soliton, which is a localized wave packet, can undergo directed spatial motion under the protection of topology. Moreover, through the nonlinear degrees of freedom, the distance of spatial transport can undergo discrete changes, and the direction of transport can also be reoriented. This is because nonlinearity not only creates solitons but also couples different energy bands in the system, leading to Rabi oscillations of solitons between different bands (different bands correspond to different Chern numbers).

16:30-17:00 • ACPPOEM-1009-35 *Invited*
Brillouin-Kerr soliton and optomechanical optical microcombs in chip-based microresonators
Xiaoshun Jiang
Nanjing University, China
We demonstrate a Brillouin-Kerr soliton microcomb through exciting the Kerr frequency comb using the generated Brillouin laser in the same cavity. This enables us to access the soliton states with a blue-detuned pump. Due to the ultra-narrow linewidth and the low-noise properties of the generated Brillouin laser, the observed soliton microcomb exhibits narrow-linewidth comb lines and stable repetition rate. Also, we achieve a new kind of microcomb using a cavity optomechanical system with giant oscillation amplitude. We observe both optical and microwave frequency combs in a microresonator, which feature a flat OFC with 938 comb lines and a repetition rate as low as 50.22 MHz, as well as a flat microwave frequency comb with 867 comb lines.

17:00-17:15 • ACPPOEM-0801-103
Characterizing Kerr Optical Frequency Combs Using Quantum Interference
Jin Guo[1], Yunru Fan[1], Yong Geng[1], Guang-Wei Deng[1], Hai-Zhi Song[1,2], You Wang[1,2], Li-Xing You[3], Zhen Wang[3], Heng Zhou[1], Kun Qiu[1], Guang-Can Guo[1,4], Qiang Zhou[1,4]
1.University of Electronic Science and Technology of China, China; 2.Southwest Institute of Technical Physics, China; 3.Shanghai Institute of Microsystem and Information Technology, Chinese Academy of Science, China; 4.University of Science and Technology of China, China
For the first time, we characterize the properties of Kerr optical frequency combs using quantum optics. The temporal FWHM of single soliton state is obtained as 109.8±6.5 fs within the Fourier transform limit.

17:15-17:30 • ACPPOEM-0728-5
Relieving the Limit of Photon-pairs Generation Rate in Microresonators
Nuo Chen[1], Zijie Wang[1], Hanghang Li[1], Zhuang Fan[1], Yunru Fan[2], Qiang Zhou[2], Xinliang Zhang[1], Jing Xu[1]
1.Huazhong University of Science and Technology, China; 2.University of Electronic Science and Technology of China, China
Photon-pairs generation rate (PGR) based on spontaneous nonlinear processes in microresonators is found to be limited set by the quality (Q) factors of the cavity resonances.

17:30-17:45 • ACPPOEM-0801-123
Gallium Nitride Microring based Quantum Light Source
Hong Zeng[1], Zhao-Qin He[2], Yun-Ru Fan[1], Jin-Peng Wu[1], Guang-Wei Deng[1], You Wang[1,3], Hai-Zhi Song[1,3], Zhen Wang[4], Li-Xing You[4], Chang-Zheng Sun[2], Yi Luo[2], Guang-Can Guo[1,5], Qiang Zhou[1,5]
1.University of Electronic Science and Technology of China, China; 2.Tsinghua University, China; 3.Southwest Institute of Technical Physics, China; 4.Chinese Academy of Sciences, China; 5.University of Science and Technology of China, China
We demonstrate the generation of multi-wavelength nonclassical photon pairs at telecom-band on a gallium nitride microring chip via spontaneous four-wave mixing process. Nonclassical properties of our source are characterized by HBT measurement and two-photon interference.

17:45-18:00 • ACPPOEM-0801-128
Multi-wavelength Quantum Light Source with Dual Pumps
Jin-Peng Wu[1], Yun-Ru Fan[1], Hong Zeng[1], Hao Li[2], You Wang[1,3], Guang-Wei Deng[1], Li-Xing You[2], Zhen Wang[2], Hai-Zhi Song[1,3], Guang-Can Guo[1,4], Qiang Zhou[1,4]
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
We demonstrate a multi-wavelength quantum light source utilizing dual pumps and realize the generation of 25-pair correlated photons in a silicon nitride micro-ring resonator. The properties of correlation and energy-time entanglement are investigated in experiments.

17:30-20:00 Welcome Reception

08:30-09:45 • November 06, 2023 • Monday
Scattering and Absorption of Light Nanophotonic Structures
Presider: Yang Li, *Tsinghua University, China*

08:30-09:00 • ACPPOEM-0812-3 *Invited*
Some Wave Illuminations from Geometric Shadows
Wei Liu
National University of Defense Technology, China
How to orientate an arbitrary opaque object toward the sun to cast the largest or smallest geometric shadow? We have managed to partially solve an analogous problem in wave optics.

09:00-09:30 • ACPPOEM-1009-33 *Invited*
Manipulate light wavefront by photonic crystal slabs in momentum space
Lei Shi
Fudan University, China
In this talk, I will show that, based on the principles of fourier optics, photonic crystal slabs could be used to manipulate wavefront spatially and temporally. I will give four examples. The first one is using photonic crystal slabs to generate optical vortices with phase singularities. The second one is realization large polarization depended beam shift. The third one is design photonic crystal slabs as a ultrathin reciprocal lens to realize upright real image. The last one is using photonic crystal slabs to realize spatial temporal vortices with transverse angular momentum.

09:30-09:45 • ACPPOEM-0728-1
Quantum Imaging with a Nonlinear Metasurface Photon-pair Source
Jihua Zhang, Jinliang Ren, Jinyong Ma, Andrey Sukhorukov
ARC Centre of Excellence for Transformative Meta-Optical Systems (TMOS), Department of Electronic Materials Engineering, Research School of Physics, Australian National University, Australia
We propose a novel quantum imaging technique that combines ghost and scanning imaging protocol to capture two-dimensional images using only a one-dimensional detector array, enabled by strong spatial correlations and tunable emission angle of entangled photon pairs emitted from an ultrathin nonlinear metasurface.

09:45-10:30 Coffee Break

10:30-12:15 • November 06, 2023 • Monday
Micro- and Nano- Science and Applications II
Presider: Wei Liu, National University of Defense Technology, China

10:30-11:00 • ACPPOEM-0731-62 *Invited*
Optics at the Deep Nanoscale: Fundamentals and Opportunities
Xuewen Chen
Huazhong University of Science and Technology, China
Recent progress in nanotechnology has allowed structuring materials at the deep nanoscale. We will discuss the fundmentals, concerning the correct characterization of the nonlocal and quantum effects, and outline the unique opportunities.

11:00-11:30 • ACPPOEM-0811-4 *Invited*
Low-loss zero-index metawaveguide
Yang Li
Tsinghua University, China
We demonstrated a one-dimensional metawaveguide with zero refractive index along the propagation direction, featuring zero index with propagation loss around 10 dB/mm at 1550 nm.

11:30-11:45 • ACPPOEM-0815-114
On-chip Spatial Hilbert Transformer based on Fourier optics and metasurface
Yuhan Ma, Shaonan Zheng, Qize Zhong, Yuan Dong, Yang Qiu, Xingyan Zhao, Ting Hu
Shanghai University, China
Here we propose a metasystem for implementing the spatial Hilbert transform based on Fourier optics and metasurface with a ultracompact footprint and a high accuracy of 98.9%.

11:45-12:15 • ACPPOEM-1009-32 *Invited*
Topological lasers with a non-Hermitian bulk and gain-assisted hyperbolic metamaterials
Zhitong Li[1], Qing Gu[2,3]
1.State Key Laboratory of Information Photonics and Optical Communications, School of Science, Beijing University of Posts and Telecommunications, China;2.Department of Electrical and Computer Engineering, North Carolina State University, United States;3.Department of Physics, North Carolina State University, United States
In this talk, we will discuss edge-mode lasing from a non-Hermitian topological bulk. Our 1D coupled microlaser array is equivalent to a 2D non-Hermitian Chern insulator with precise mapping. Besides, a perovskite hyperbolic metasurface is discussed.

12:00-13:30 Lunch Break

13:30-15:30 • November 06, 2023 • Monday
Quantum Networks and Communications
Presider: Xuewen Chen, Huazhong University Of Science And Technology, China

13:30-14:15 • ACPPOEM-1009-30 *Tutorial*
Quantum network based on solid state quantum memory
Chuangfeng Li
University of Science and Technology of China, China
Quantum networks are the extension and improvement of classical networks, and the use of quantum networks can achieve secure information storage and transmission, efficient information processing and high-precision remote sensing. Quantum memory is the core device for building quantum networks and realizing long-range quantum communication. Due to the advantages of stable performance and easy micro and nano processing of rare-earth ion doped crystals, solid-state quantum memories based on rare-earth ion-doped crystals have received wide attention in recent years. This report will introduce the recent progress of our research group in building quantum networks based on solid-state quantum memory, including the enhancement of quantum storage capacity, the realization of integrated solid-state quantum memory using direct laser writing technology, the realization of 1-hour coherent optical storage and the realization of multi-mode quantum repeater.

14:15-14:30 • ACPPOEM-0729-13
Core and Wavelength Allocation for Joint Optimization in Quantum Access Networks
Weiwen Kong[1], Yongmei Sun[2], Jianjun Tang[1], Tianqi Dou[1], Yaoxian Gao[2], Zhenhua Li[1], Qi Zhao[1], Yuheng Xie[1], Na Chen[1]
1.China Telecom Research Institute, China; 2.Beijing University of Posts and Telecommunications, China
In this paper, we investigate measures to simultaneously improve the performance of classical and quantum key distribution systems in quantum access networks. First, we construct a multicore-fiber-based quantum access network architecture that supports simultaneous access to classical and quantum signals, and establish theoretical models of noise on classical and quantum channels. Secondly, a jointly optimized core wavelength allocation (JOCWA) scheme is proposed, which is applicable to multi-core fibers with any number of cores. Finally, simulation results show that the JOCWA scheme can improve the optical signal-to-noise ratio of the classical system by at least 20 dB, and can extend the secure transmission distance by about 35% compared with the benchmark scheme.

14:30-14:45 • ACPPOEM-0730-8
Continuous-Variable Quantum Key Distribution with Practical Unbalanced Heterodyne Detection
Jiale Mi, Yiming Bian, Lu Fan, Yichen Zhang, Song Yu
Beijing University of Posts and Telecommunications, China
We report a continuous-variable quantum key distribution protocol with unbalanced heterodyne detection considering practical imperfection factors, where a higher secret key rate is achieved compared with the balanced protocols.

14:45-15:00 • ACPPOEM-0731-22
Synergistic Resource Allocation in Space Division Multiplexed Data Center Optical Networks Secured with Quantum Key Distribution
Xueqin Ren, Yongmei Sun, Chuan Xie, Dengqi Liu
The State Key Laboratory of Information Photonics and Optical Communications, Beijing University of Posts and Telecommunications, China
In this article, we propose two novel core prioritization and crosstalk aware (CP-XT-Aware) algorithms, including CP-XT-Aware with wavelength grouping (CPWG-XT-Aware) and CP-XT-Aware with wavelength reservation (CPWR-XT-Aware), aiming to realize the synergistic transmission of classical and quantum signals in quantum key distribution (QKD)-enabled optical data center networks based on wavelength-division-multiplexing and space-division-multiplexing. For comparison, we introduce the core and wavelength random allocation without XT-Aware, called the CWRA. Analytical simulations show that the both proposed algorithms can simultaneously improve the average secure key rate and reduce blocking probabil-

ities under dynamic traffic scenarios in different network topologies, compared to the CWRA. Particularly, the CPWG-XT-Aware performs exceptionally well in QKD under the low traffic load, while the CPWR-XT-Aware excels under the high traffic load.

15:00-15:15 • ACPPOEM-0801-135
Quantum teleportation from photon to matter at telecom band
Jinyu Liao[1], Si Shen[1], Hao Li[2], Zhen Wang[2], You Wang[1, 3], Guangwei Deng[1,4], Haizhi Song[1,3], Lixing You[2], Yunru Fan[1], Guangcan Guo[1,4], Zhou Qiang[1,4]
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
We experimentally demonstrate quantum teleportation from a telecom photonic time-bin qubit to a solid-state quantum memory at telecom band. The demonstration is compatible with fiber communication infrastructure, which is important for future quantum networks.

15:15-15:30 • ACPPOEM-0801-116
Experimental Demonstration Advantage of Photonic Finite Automata
Yuan-Yuan Zhao, Keren Li, Chao Li, Shenggen Zheng, Zhixue He
Peng Cheng Laboratory, China
Finite automata have abundant applications such as finding reachability and so on. This work presents the first experimental implementation of the two-way quantum finite automaton with the optical platform and demonstrates its potential quantum advantages.

15:30-18:00 Coffee Break & Poster Session

18:30-21:00 Banquet and Awards Ceremony

08:30-10:00 • November 07, 2023 • Tuesday
Excitons and Optical microresonators
Presider: Yi Xu, Guangdong University Of Technology, China

08:30-09:00 • ACPPOEM-0811-7 *Invited*
Spinoptronics in optical microcavities
Feng Li
Xi'an Jiaotong University, China
Fabry-Perrot (FP) microcavities with metal or DBR (distributed Bragg reflector)-coated mirrors provide an excellent platform for investigating the collective behavior of confined 2-dimensional photons and polaritons. The TE-TM mode splitting in such cavities acts as an effective magnetic field, leading to photonic spin-orbit (SO) coupling effect that the pseudospin of cavity photons changes anisotropically with their momenta. Such mechanism has led to interesting observations including optical spin-Hall effect, magnetic-monopole-like half solitons, spinor condensate with half-quantum circulation, and polaritonic topological insulators. We report the direct measurement of the Berry curvature and quantum metric of the photonic modes of a FP cavity containing an anisotropic organic microcrystal (Perylene). Photonic spin-orbit-coupling induced by the cavity together with the anisotropy of the material results in the action of an effective gauge field on photons, which includes an effect of emergent optical activity (OA). The photonic gauge field makes emerge geometrically non-trivial bands containing two gapped Dirac cones with opposite topological charges. The same cavity structure with a DPAVBi microcrystal allows the observation of Voigt exceptional point at which the quantum metric is demonstrated to be divergent. We also predict that in fully confined systems the eigenstates of the second excited manifold under TE-TM splitting are degenerate skyrmions which can be manipulated by the non-Hermitian properties, and meanwhile, derive the general rules for the eigenstates of all excited manifolds under TE-TM splitting.

09:00-09:30 • ACPPOEM-0806-1 *Invited*
Interaction between plasmonic nanocavity and two-dimensional excitons
Xiulai Xu
Peking University, China
We demonstrate a strong coupling of MoS_2 excitons and bowtie nanocavity with low exciton number and a coupling of single localized defect excitons in 2D layer with chiral plasmonic nanocavity.

09:30-09:45 • ACPPOEM-0815-80
Self-hybridized Exciton-Polaritons in Perovskite Nanostructured Arrays
Yuan Zhang[1], Feng Ye[1], Jiayao Huang[1], Hongyan Fu[2], Qian Li[1]
1.School of Electronic and Computer Engineering Peking University Shenzhen, China; 2.Tsinghua Shenzhen International Graduate School Tsinghua University Shenzhen, China
We explore enhanced exciton-polaritons through symmetry-protected quasi-bound states in the continuum within self-hybridized perovskite metasurfaces, achieving a significant Rabi splitting of 249.6 meV via tailoring the geometric size of nano-rods.

09:45-10:00 • ACPPOEM-0812-6
Taming Brillouin optomechanics using supermode microresonators
Min Wang[1], Zhi-Gang Hu[1], Chenghao Lao[2], Wenjing Liu[2], Qi-Fan Yang[2], Bei-Bei Li[1]
1.Institute of Physics CAS, China; 2.Peking University, China
We have designed and fabricated a supermode microresonstor to enhance Brillouin optomechanical coupling, and realized both phonon lasing and optomechanical strong coupling. This system exhibits a single-photon optomechanical coupling rate as high as 12.5 kHz.

10:00-10:30 Coffee Break

10:30-11:15 • November 07, 2023 • Tuesday
Emerging Materials, Devices and Their Applications
Presider: Feng Li, Xi'an Jiaotong University, China

10:30-10:45 • ACPPOEM-0721-11
The Advantages of Dual-layer Broadband Filter Spectrometers in Improving Ill-conditioned Spectrum Reconstruction Processes
Ding Zhao, Jie Bao
Tsinghua University, China
We propose a design scheme of a dual-layer broadband filter spectrometer based on quantum dot and silicon films, and verify the advantages of this dual-layer filter structure in improving the ill-conditioned spectrum reconstruction processes.

10:45-11:00 • ACPPOEM-0729-9
Silicon-based Mode (de)multiplexer beyond Single Communication Band Limit
Siwei Liu[1,2], Xin Fu[1,2], Hongliang Chen[1,2], Guangchen Su[1,2], Yujie Huo[1,2], Chuang Cheng[1,2], Jiaqi Niu[1,2], Lin Yang[1,2]
1.State Key Laboratory of Integrated Optoelectronics, Institute of Semiconductors, University of Chinese Academy of Sciences, China; 2.College of Materials Science and Opto-Electronic Technology, University of Chinese Academy of Sciences, China
We propose a dual-band mode (de)multiplexer supporting four TM modes. For all the mode channels, the insertion losses are within 0.74 dB and the crosstalk is below -18.8 dB across the entire O-band and C-band.

11:00-11:15 • ACPPOEM-0731-46
Microwave sensing and localization with solid-state spins
XiangDong Chen
University of Science and Technology of China, China
The nitrogen vacancy (NV) color center in diamond is studied as a nanoscale magnetic sensor in high frequency microwave regime. A high spatial resolution radio ranging and localizaton with the diamond quantum sensor is demontrated.

12:00-13:30 Lunch Break

13:30-15:00 • November 07, 2023 • Tuesday
Topological and Integrated Photonics
Presider: Jihua Zhang, Australian National University, Australia

13:30-14:00 • ACPPOEM-1009-34 *Invited*
Mid-Infrared Photodetection Based on Topological Semimetals
Dong Sun
Peking University, China

14:00-14:15 • ACPPOEM-0726-4
Single-mode Topological Valley-Hall Laser via Spatially Distributed Injection
Xiao-Tian Cheng, Ling-Fang Wang, Dai-Bao Hou, Jia-Wang Yu, Chen-Hui Li, Xing Lin, Feng Liu, Chao-Yuan Jin
Zhejiang University, China
We report a single-mode topological valley-Hall laser with larger than 31 dB side-mode suppression ratio (SMSR) through active intensity modulation of the pump beam. Single whisper gallery mode lasing is achieved despite multiple modes resonance in the topological bandgap using spatial optical injection.

14:15-14:30 • ACPPOEM-0728-23
Scattering losses minimization in silicon nitride photonic integrated circuits for near-IR and telecom bandwidth
Kirill Buzaverov[1,2], Aleksandr Baburin[1,2], Evgeny Sergeev[1], Sergey Avdeev[1], Evgeniy Lotkov[1], Sergey Bukatin[1], Ilya Stepanov[1], Arseniy Belyaev[1], Aleksey Kramarenko[1], Danil Kushnev[1], Alina Melekhina[1], Ilya Ryzhikov[1,3], Ilya Rodionov[1,2]
1.FMN Laboratory, Bauman Moscow State Technical University, Russia; 2.Dukhov Research Institute of Automatics (VNIIA), Russia; 3.Institute for Theoretical and Applied Electromagnetics RAS, Russia
In this work, we show possible ways and give guidelines for silicon nitride photonic integrated circuits fabrication process

Track 7

optimization, suitable for near-IR and telecom bandwidth. Most attention is focused on minimization of scattering losses originating from e-beam lithography and dry etching of silicon nitride.

14:30-14:45 • ACPPOEM-0728-31
Silicon Nitride High Confinement Thermally- and E/O Tuned Photonic Integrated Platfrom
Aleksandr Baburin[1,2], Kirill Buzaverov[1], Evgeniy Lotkov[1], Sergey Avdeev[1], Evgeny Sergeev[1], Sergey Bukatin[1], Ali Amiraslanov[1], Arseniy Belyaev[1], Ilya Ryzhikov[1], Ilya Rodionov[1]
1.FMN Laboratory, Bauman Moscow State Technical University, Russia;2.Dukhov Research Institute of Automatics (VNIIA), Russia;
In this work we present developed silicon nitride high confinement thermally-, E/O tuned platform, that shows propagation losses lower than 0.05 dB/cm for 1550 nm wavelength and lower than 0.30 dB/cm for 935 nm wavelength.

14:45-15:00 • ACPPOEM-0813-7
End-to-End Design of Diffractive Optical Elements Fabricated by Direct Laser Writing Lithography
Yunpeng Xu
Tsinghua University, China
Based on differentiable models of fabrication and optics, we introduce an /end-to-end/ strategy for the optimization of diffractive optical elements (DOEs) fabricated via direct laser writing lithography, achieving enhanced performance and increased fabrication tolerance.

Track 8: Photonic Sensors & Bio-Photonics
Hong Kong Hall I, 2F

13:30-15:30 • November 05, 2023 • Sunday
Optical imaging techniques
Presider: Dan Zhu, Huazhong University of Science and Technology, China

13:30-14:15 • ACPPOEM-0727-1 *Tutorial*
Tissue optics and optical clearing in a wide spectral range: from deep UV to THz
Valery Tuchin[1,2,3,4]
1.Inst. of Physics and Science Medical Center Saratov State University, Russia; 2.Inst. of Precision Mechanics and Control FRC "Saratov Scientific Center of the Russian Academy of Science", Russia; 3.Laboratory of Laser Molecular Imaging and Machine Learning, Tomsk State University, Russia; 4..N. Bach Institute of Biochemistry, FRC "Biotechnology of the Russian Academy of Sciences", Russia
The tutorial presents the principles and achievements of tissue optics and photonics in a wide spectral range, covering wavelengths from deep UV to the terahertz range.

14:15-14:45 • ACPPOEM-1009-38 *Invited*
Deep-tissue optics: recent advances via photoacoustics and wavefront shaping
Puxiang Lai
Hongkong Polytechnic University, Hong Kong, China
Light has been playing a more and more important role in biomedicine due to its extremely sensitive reaction to biological and pathological changes to tissues. Its applications, however, are limited to superficial layers beneath sample surface or compromised resolution at depths due to the inherent strong scattering nature of light in tissue. In this presentation, we would like to share with you our recent journey in the field to achieve high-resolution or high-fidelity imaging through thick scattering media or biological tissue based on energy conversion (photoacoustic effect), optical modulation (wavefront shaping), and computing (deep learning). We will first briefly talk about the general principles, and then discuss several representative works that have strengthened the understanding of the mechanisms and the confidence of moving forward. Towards the end, a couple of new applications will be discussed along with the future roadmaps.

14:45-15:15 • ACPPOEM-1009-43 *Invited*
High throughput imaging based on ultrafast optical clearing
Ke Si
Zhejiang University, China
The development of high-precision optogenetics in deep tissue is limited due to the strong optical scattering induced by biological tissue. Although various wavefront shaping techniques have been developed to compensate the scattering, it is still a challenge to non-invasively characterize the dynamic scattered optical wavefront inside the living tissue. Here, we present a non-invasive scattering compensation system with fast multidither coherent optical adaptive technique (fCOAT), which allows the rapid wavefront correction and stable focusing in dynamic scattering medium. We achieve subcellular-resolution focusing through 500-μm-thickness brain slices, or even three pieces overlapped mouse skulls after just one iteration with a 589 nm CW laser. Further, focusing through dynamic scattering medium such as live rat ear is also successfully achieved. The formed focus can maintain longer than 60 s, which satisfies the requirements of stable optogenetics manipulation. Moreover, the focus size is adjustable from subcellular level to tens of microns to freely match the various manipulation targets. With the specially designed fCOAT system, we successfully achieve single-cellular optogenetic manipulation through the brain tissue, with a stimulation efficiency enhancement up to 300% compared with that of the speckle.

15:15-15:30 • ACPPOEM-0731-78
Application of optoacoustic imaging and diffuse optical spectroscopy in experimental oncology
Anna Orlova[1], Ksenia Akhmedzhanova[1,2], Alexey Kurnikov[1], Anna Glyavina[1,2], Dmitry Khochenkov[3], Yulia Khochenkova[3], Anna Maslennikova[1,2], Dmitry Skamnitsky[4], Ilya Turchin[1], Pavel Subochev[1]
1.Institute of Applied Physics of Russian Academy of Sciences, Russia; 2.N.I. Lobachevsky State University of Nizhny Novgorod, Russia; 3.N.N. Blokhin National Medical Research Center of Oncology, Russia; 4.Nizhny Novgorod Regional Oncology Hospital, Russia
Using optoacoustic (OA) microscopy and diffuse optical spectroscopy (DOS) differences in the vessel fraction and oxygenation level of tumor xenografts are revealed. Radiation-induced changes were demonstrated for vessels of different diameters.

15:30-16:00 Coffee Break

16:00-18:15 • November 05, 2023 • Sunday
Optical fiber sensing
Presider: Fei Xu, Nanjing University, China

16:00-16:30 • ACPPOEM-0830-1 *Invited*
Optical fiber sensors for monitoring current and power cables
Gilberto Brambilla
University of Southampton / The Future Photonics Hub, United Kingdom
This talk will review approaches implemented at the ORC in Southampton for optical fiber sensing of current and power distribution, with focus on monitoring offshore power cable infrastructures and sensing of pulsed currents.

16:30-17:00 • ACPPOEM-0814-25 *Invited*
Forward Brillouin Scattering Fiber Sensors
Avi Zadok
Bar-Ilan University, Israel
Sensors based on forward Brillouin scattering processes allow for quantitative analysis of liquid media and coating layers outside the cladding of standard, unmodified fibers. Point measurements and spatially distributed analysis have been demonstrated.

17:00-17:30 • ACPPOEM-0810-5 *Invited*
Microcavity-enhanced optical sensing, imaging and spectroscopy
Tang Shui-Jing
Peking university, China
Sensors play an important part in many aspects of daily life such as motion sensors in mobile phones, particle sensors for environmental monitoring, and infrared sensors in home security systems. High-quality optical microcavities are prime candidates for sensing applications because of their ability to enhance light-matter interactions in a very confined volume. In particular, microcavity-based sensors have attracted considerable interest in life science due to their distinguished advantages such as high sensitivity, fast response, and miniature device sizes. Here I will introduce microcavity-enhanced optical detection in sensing, imaging, and spectroscopy applications, and mainly cover the following three parts: 1. Single-nanoparticle and single-molecule sensing; 2. Microcavity-based versatile imaging, including photoacoustic microscopy and single-cell tracking. 3. Single-particle optoacoustic vibrational spectroscopy.

17:30-17:45 • ACPPOEM-0815-63
Fast Brillouin optical time domain analysis utilizing double-sideband digital optical frequency comb
Huan He[1], Yingxuan Li[1], Xuan Zou[1], Zhiyong Zhao[1], Dongmei Huang[2], Ming Tang[1]
1.Huazhong University of Science and Technology, China; 2.The Hong Kong Polytechnic University, Hong Kong, China
Utilizing double-sideband digital optical frequency comb, a fast BOTDA based on simultaneous measurement of Brillouin gain and loss spectrum is demonstrated. Measurements with less than 1-MHz uncertainty over 10-km fiber are achieved in 5.5 ms.

17:45-18:00 • ACPPOEM-0811-10
Photonic Skin based on Microfiber Bragg Grating for Pulse Wave Detection
Hengtian Zhu, Junxian Luo, Shugeng Zhu, Huan Yang, Fei Xu
Nanjing University, China
An intelligent photonic skin, utilizing femtosecond laser direct-writing microfiber Bragg gratings, has been proposed for the detection of pulse waves. Through structure engineering, the sensitivity of the photonic skin is significantly enhanced by 12 times.

18:00-18:15 • ACPPOEM-0813-12
Load Measurement Based on Forward Stimulated Brillouin Scattering in Photonic Crystal Fiber
Xuan Zou[1], Yunshan Zhou[1], Zhiyong Zhao[1], Weilun Wei[1], Chen Yang[2], Ming Tang[1]
1.Huazhong University of Science and Technology, China; 2.Yangtze Optical Fibre and Cable Joint Stock Limited Company, and Optics Valley Laboratory, China
We demonstrate a novel optical fiber transverse loadsensor based on forward stimulated Brillouin scattering (FSBS) in photonic crystal fiber. Highly linear dependence between linewidth of FSBS spectrum and transverse load has been experimentally verified.

17:30-20:00 Welcome Reception

08:30-10:00 • November 06, 2023 • Monday
Optical imaging techniques
Presider: Junle Qu, Shenzhen University,China

08:30-09:15 • ACPPOEM-0814-2 *Tutorial*
Deep Imaging in Scattering Biological Tissues
CHRIS XU
CORNELL UNIVERSITY, United States
This tutorial aims to elucidate the challenges for high spatial resolution, deep tissue, three-dimensionally resolved fluorescence microscopy. The state-of-the-art approaches and their performance and limitations for deep tissue imaging will be discussed.

09:15-09:45 • ACPPOEM-0812-4 *Invited*
Intelligent Image-Activated Cell Sorting 2.0
Keisuke Goda[1,2,3]
1.University of Tokyo, Japan; 2.Wuhan University, Japan; 3.University of California, Los Angeles, United States
I introduce an upgraded version of Intelligent Image-Activated Cell Sorting, a groundbreaking technology that enables real-time, intelligent, molecular image-based sorting of cells at an unprecedented rate of 1000 cells per second.

09:45-10:00 • ACPPOEM-0819-2
Synthetic aperture based PA-US dual-modality all optical fiber imaging optical fiber imaging
Dongchen Xu, Anqi Wang, Geng Chen, Chenhao Dai, Hao Li, Qizhen Sun
Huazhong University of Science and Technology, China
A synthetic aperture based PA-US dual-modality all optical fiber imaging system with a denoising algorithm is demonstrated. The algorithm increases SNR of the reconstructed image by 11.1 dB, and a dual-modality image of a vascular model is clearly reconstructed.

10:00-10:30 Coffee Break

10:30-12:00 • November 06, 2023 • Monday
Optical coherence tomography
Presider: Linbo Liu, Nanyang Technological University, Singapore

10:30-11:00 • ACPPOEM-0720-1 *Invited*
Experimental evaluation of human skin optical clearing in vivo efficiency using biocompatible agents and optical coherence tomography
Walter Blondel[1], Sergey Zaytsev[2], Valery Tuchin[2], Elina Genina[2], Dan Zhu[3], Marine Amouroux[1]
1.Université de Lorraine, France; 2.Saratov State University, Russia; 3.Britton Chance Center for Biomedical Photonics - Huazhong University of Science and Technology, China
In the present study, the clearing-effectiveness of nine biocompatible OCAs mixtures combined with dermabrasion and sonophoresis was investigated on three volunteers hand skin using line-field confocal OCT and image contrast modelling with depth and time.

11:00-11:30 • ACPPOEM-1009-41 *Invited*
Micro-optical coherence tomography: image interpretation and safety management
Linbo Liu
Nanyang Technological University, Singapore
Micro-optical coherence tomography (Micro-OCT) provides one order of magnitude higher spatial resolution than the standard OCT technology. There has been little study on the new information brought about by this resolution improvement. We investigated the back-scattered intensities from clustered or packed nanometer scale intracellular scatterers using Micro-OCT, and uncovered that there existed correlations between the reflectance contrasts and the ultrastructural clustering or packing states of these scatterers, which allows us to interpret the physiological state of the cells. Further preliminary study demonstrated that these new understandings of OCT image contrast enables the characterization of precancerous lesions, which could complement the current morphology-based criteria in realizing "virtual histology".

11:30-11:45 • ACPPOEM-0731-120
OPTOACOUSTIC ANGIOGRAPHY WITH ULTRAWIDEBAND ULTRASONIC DETECTORS: volumetric, multispectral, and realtime
Pavel Subochev
IAP, Russia
The talk overviews optoacoustic angiography, a hybrid imaging technique for in vivo diagnostics of blood vessels. The basics of optoacoustic imaging will be covered, and different approaches for system optimization will be discussed. The advantages and limitations of using PVDF detectors in optoacoustic angiography applications will be presented. The talk highlighted the technical features of two optoacoustic systems, and their potential diagnostic and research applications. Scanning optoacoustic angiography can be used to identify blood vessel abnormalities associated with various pathologies and has great promise for tumor diagnosis and anti-tumor treatment. Volumetric real-time optoacoustic tomography offers addi-

tional advantages over traditional methods, such as multimodal contrast and real-time feedback providing important 5D imaging capabilities for neuroimaging.

11:45-12:00 • ACPPOEM-0814-16
High-sensitivity ultrasound sensors based on optical microcavities
Hao Yang, Xuening Cao, Zhi-Gang Hu, **Bei-Bei Li**
Institute of Physics, Chinese Academy of Sciences, China
We have realized high-sensitivity air-coupled ultrasound sensing in the kHz-to-MHz renage using whispering gallery mode microcavities. A peak sensitivity of 1.18 μPa Hz−1/2 is achieved, which represents the record sensitivity among cavity optomechanical ultrasound sensors.

12:00-13:30 Lunch Break

13:30-16:00 • November 06, 2023 • Monday
Optical fiber sensing
Presider: Qizhen Sun, Huazhong University of Science and Technology, China

13:30-14:00 • ACPPOEM-1009-40 *Invited*
Distributed Optic Fiber Sensing Technology in Optical Frequency Domain and Its Applications
Guolu Yin
Chongqing University, China
Optical frequency domain reflectometry has broad application prospects in precision measurement of photonic devices, flexible three-dimensional shape sensing, distributed biochemical sensing, and other fields due to its high spatial resolution. In this report, we will demonstrate two kinds of signal processing methods based on machine learning and differential phase. On the basis of the traditional cross-correlation algorithm, we first used the multilayer perceptron and convolutional neural network to realize the classification learning and regression analysis of the sensing signal of the optical frequency domain reflectometry. In the method of differential phase, we used the two-step unwrapping algorithm to solve the problem of the phase jumping, and used the wavelet analysis to remove the Gaussian white noise. Finally, we will demonstrate the applications of optical frequency domain reflectometry, including the shape sensing, pH senging and liquid level sensing.

14:00-14:30 • ACPPOEM-0829-1 *Invited*
Highly deformable magnetic elastomer (ME) based miniature fibre-optic magnetic field sensor
Zhi Li, Sacha Noimark
University College London, United Kingdom
A miniature design for a fibre-optic magnetic sensor based on highly responsive ME composites, which enables real-time measurement of small changes in magnetic fields using an interferometric interrogation scheme. This highly sensitive and miniaturesensoris cost-effective, simple in design, immune to EM interference and well-suited to MRI-relevant applications.

14:30-15:00 • ACPPOEM-1009-42 *Invited*
Optical Fibre sensing for Battery Testing and Characterisation
Yifei Yu
Huazhong University of Science and Technology, China
The precise in-situ testing, characterization, and failure analysis of battery materials is a global scientific challenge. Therefore, the development of non-invasive monitoring tools for tracking and managing power and energy storage batteries throughout their entire lifecycle is of great importance. The development of optical fiber communication technology has facilitated the advancement of optical fiber sensors, and the complementary information provided by optical fiber sensing and conventional electrochemical techniques will offer more support for battery exploration. This report discusses optical fiber sensing and in-situ monitoring of batteries, the advantages of using optical fiber sensing in battery monitoring, the principles of optical fiber sensing, and its application in the field of battery detection. Given the characteristics of rapid changes in failure features, long United Statesge cycles, and short fault occurrence times in power and energy storage battery systems, there is a need to develop optical fiber sensing detection technology, equipment, and solutions. Based on the analysis of temperature and stress data along the optical fiber, preliminary insights have been gained into the correspondence between battery charging status and health status and the characterization of material-electrode-battery structure and thermal performance, allowing for real-time, in-situ quantitative assessment.

15:00-15:15 • ACPPOEM-0731-170
Femtosecond Laser Inscribed POF Bragg Grating for Flexible and Wearable Sensing Applications
Liuyu Jia, Hao Jiang, Lin Ma, Zuyuan He
State Key Laboratory of Advanced Optical Communication Systems and Networks, Shanghai Jiao Tong University, China
We demonstrate polymer optical fiber Bragg grating directly inscribed using a femtosecond laser for flexible and wearable sensing applications. An elastic strain exceeding 4% has been achieved with an axial strain sensitivity of 0.99 pm/με.

15:15-15:30 • ACPPOEM-0801-157
Microcomb driven graphene oxide deposited FBG array for multispecies parallel gas sensing
Zihan Liu, Yiwei Li, Yuchen Wang, Bing Chang, Ning An, Teng Tan, Baicheng Yao
University of Electronic Science and Technology of China, China
By utilizing soliton microcomb to drive graphene oxide functionalized fiber Bragg grating arrays, we achieve a multispecies parallel gas sensor, realizing the detection of SO_2 and H_2S in the SF_6, with sensitivity down to ppb-level.

15:30-15:45 • ACPPOEM-0814-20
Frequency Response Range Expanded Slope-assisted BOTDA Sensor Using Randomized Sampling Technique
Weilun Wei, Zhonghong Lin, Zhiyong Zhao, Can Zhao, Xuan Zou, Ming Tang
School of Optical and Electronic Information and Wuhan National Laboratory for Optoelectronics Huazhong University of Science and Technology, Wuhan, China
A novel frequency response range expanded slope-assisted BOTDA sensor is proposed and demonstrated using randomized sampling technique, which paves the way to enable ultra-high frequency vibration signal measurements in long range sensing.

15:45-16:00 • ACPPOEM-0815-51
High-Resolution Liquid Level Sensor Based on Microwave Photonics Technique interrogated Multicore Fiber Interferometer
Yucheng Yao[1], Jianqiang Yuan[1], Zhiyong Zhao[1], Lei Shen[2,3], Weijun Tong[1], Ming Tang[1]
1.School of Optical and Electronic Information and Wuhan National Laboratory for Optoelectronics, Huazhong University of Science and Technology, China; 2.The State Key Laboratory of Optical Fiber and Cable Manufacture Technology, China; 3.Yangtze Optical Fiber and Cable Joint Stock Limited Company (YOFC) R&D Center, China
A high-resolution liquid level sensor based on microwave photonics filter technology interrogated seven-core fiber Michelson interferometer is reported. The measured sensitivity is 10.97 MHz/cm and a liquid level resolution of 0.04558 cm is achieved.

15:30-18:00 Coffee Break & Poster Session

18:30-21:00 Banquet and Awards Ceremony

08:30-10:00 • November 07, 2023 • Tuesday
Super-resolution imaging
Presider: Ke Si, Zhejiang University, China

08:30-09:00 • ACPPOEM-0814-12 *Invited*
High-throughput and four-dimensional live-cell super-resolution imaging
Haoyu Li
Harbin Institute of Technology, China
Super-resolution (SR) imaging with high-throughput is invaluable to fast and high-precision profiling in a wide range of biomedical applications. However, prevalent SR methods require sophisticated acquisition devices and specific imaging control, and may cost a fairly long time on a single field-of-view. These essentially increase the construction difficulty, including challenges in imaging throughput, system establishment, and automation. Using the natural photophysics of fluorescence, fluctuation-based microscopy techniques can routinely break the diffraction limit with no need for additional optical components, but its long acquisition time still poses a challenge for high-throughput imaging or visualizing transient organelle dynamics. Here, we propose an SR method based on the Auto-Correlation with two-step Deconvolution (SACD) that reduces the number of frames required by maximizing the detectable fluorescence fluctuation behavior in each measurement, with further removal of tunable parameters by a Fourier ring correlation analysis. It only needs 20 frames for twofold lateral and axial resolution improvements, while the SR optical fluctuation imaging (SOFI) needs more than 1000 frames. As an open-sourced module, we anticipate SACD can offer direct access to SR, which may facilitate the biology studies of cells and organisms with high-throughput and low-cost.

09:00-09:30 • ACPPOEM-0815-15 *Invited*
Upconversion super-resolution microscopy
Qiuqiang Zhan
South China Normal University, China
Photon upconversion offers an exciting opportunity for various photonics technologies. By harnessing excitation and emission processes of upconversion, we discovered powerful nonlinear depletion/emission strategies, enabling high-performance super-resolution microscopy by breaking the unbroken traditional STED limitations.

09:30-10:00 • ACPPOEM-0827-3 *Invited*
The development of highly photostable organic fluorescent probes for STED super-resolution imaging
Chenguang Wang
Jilin University, China
Stimulated Emission Depletion (STED) super-resolution fluorescence imaging is a powerful tool to visualize the organelle structures and dynamic processes on the nanoscale in living cells, thus wining the Nobel Prize in Chemistry (2014). However, the practical utility of STED imaging is largely limited by the availability of advanced fluorescent probes that can be efficiently depleted by the STED laser as well as exhibits significantly high photostability. In this context, the development of superior fluorescent probes has attracted much attention in recent years and emerged as a cutting-edge topic in the field of fluorescence bio-imaging. Herein, we report a new small-molecular fluorescent probe Lipi-DSB which exhibits high photostability and brightness, large Stokes shift, low saturation intensity for STED laser, and good staining specificity toward cellular lipid droplets (LDs). These features enable the probe to be ideally applied in STED super-resolution imaging of LDs, e.g. time-lapse STED imaging, two-color STED imaging, as well as 3D STED imaging. Consequently, the dynamics and the spatial distribution of LDs have been precisely visualized at the unprecedented nanoscale resolution. Moreover, employing the probe for time-lapse STED imaging has uncovered the fusion process of nascent LDs for the first time.

10:00-10:30 Coffee Break

10:30-12:00 • November 07, 2023 • Tuesday
Optical imaging and Phototherapy
Presider: Qiuqiang Zhan,South China Normal University, China

10:30-11:00 • ACPPOEM-1009-39 *Invited*
Applications of near infrared luminescence imaging and sensing using rare earth doped nanoparticles
Tymish Ohulchanskyy
Shenzhen University, China
Rare-earth doped nanoparticles (RENPs) are known to reveal a unique ladder-like system of energy levels in rare-earth ions that manifest multiple luminescence emission bands distinguishable by spectrally narrow shape and large Stokes and anti-Stokes shifts. RENPs luminescence involves excitation energy downconversion (DC) and upconversion (UC) and RENPs are broadly utilized as promising UC and DC luminescent nanomaterials in diverse applications, ranging from bioimaging and therapy to lasing, sensing and anti-counterfeiting. Special spectral and temporal features of UC and DC luminescence from RENPs allowed us to employ them as imaging agents in advanced optical imaging modalities, such as hyperspectral, time-gated and luminescence lifetime imaging. Use of near and short wave (NIR-SWIR) spectral region opens new perspectives in the field of biological imaging and sensing due to a reduced light scattering in NIR-SWIR range. This talk will present our results on the applications of the developed RENPs in advanced NIR-SWIR imaging and sensing, concluding with a discussion on the perspectives of RENPs use in various optical imaging and sensing applications.

11:00-11:30 • ACPPOEM-0724-2 *Invited*
Phototherapy of Alzheimer's disease during sleep
Oxana Semyachkina-Glushkovskaya[1,2], Ivan Fedosov[1], Alexander Shirokov[1], Andrey Terskov[1], Inna Blokhina[1]
1.Saratov State University, Russia; 2.Humboldt University, Germany
Photobiomodulation during sleep vs. wakefulness better improves removal of amyloid beta from brain that is associated with effective recovery of metabolic activity and recognition memory in mice with Alzheimer's disease.

11:30-12:00 • ACPPOEM-0730-6 *Invited*
Modulation of Organic Semiconductors for Optical Imaging and Biosensing
Changfeng Wu
Southern University of Science and Technology, China
We describe the development of semiconductor polymer dots (Pdots) for biomedical imaging and biosensing applications, including photophysical modulation for Super-resolution imaging, spectral tuning for in vivo Imaging, and dye doping for continuous glucose monitoring.

12:00-13:30 Lunch Break

13:30-15:15 • November 07, 2023 • Tuesday
Photonic Sensors
Presider: Liang Wang, Huazhong University of Science and Technology, China

13:30-14:00 • ACPPOEM-1009-44 *Invited*
Photonic techniques for sensing microcirculatory and microrheologic disorders in patients
Alexander Priezzhev
Moscow State University, Russia
The feasibility of biophotonic technologies (laser tweezers, diffuse light scattering, laser diffractometry and digital capillaroscopy) for sensing microrheological effects of various molecular mechanisms affecting erythrocyte aggregation and deformability will be discussed. We will show that laser tweezers and diffuse light scattering allow for assessing the changes in erythrocyte aggregation in whole blood samples and cell suspensions both on the level of single cells and on the level of large ensembles of cells. Application of these methods in vitro enable one to study the mechanisms of erythrocyte aggregation because they are sensitive to changes in the medium surrounding the cells (i.e., blood plasma, serum or model solutions of blood plasma proteins) and to changes in the cellular properties of the erythrocytes. Using the laser diffractometry technique we can assess the distribution of the erythrocytes in sizes and deformabilities. Using digital capillaroscopy we can monitor in vivo the alterations of blood flow parameters on the microcirculatory level where the major exchange of gases between blood and tissues takes place. We have been applying all these techniques to monitor and analyze the alterations of blood microrheology and microcirculation in patients suffering from such socially important diseases as arterial hypertention, diabetes mellitus, etc.

14:00-14:30 • ACPPOEM-0730-37 *Invited*
High-resolution fiber sensing for marine multi-element environment based on microwave photonics
Muguang Wang
Beijing Jiaotong University, China
For the application of marine environment survey, multi-parameter fiber sensing with high resolution based on microwave photonics is presented from aspects of optic fiber probe and microwave photonic demodulation.

14:30-14:45 • ACPPOEM-0815-24
Fast-scanning ultraviolet histological photoacoustic microscopy based on fiber-optic ultrasound detection
Zehua Yu, Yizhi Liang, Long Jin
Jinan University, China
We developed a fast-scanning ultraviolet photoacoustic microscope for intraoperative histopathology. This was achieved by detecting the UV-induced ultrasound waves by using a high-sensitivity, wide-field fiber optic ultrasound sensor.

14:45-15:00 • ACPPOEM-0726-12 *Industry Innovation Nomination*
LiDAR Point Cloud Image Modeling and Quality Testing Method
Chuanchuan Yang[1], Yao Duan[1], Yongxin Cao[2], Jiajie Yang[2], Wenhua Chen[2], Hongbin Li[1]
1.Peking University, China; 2.TÜV Rheinland (Shenzhen) Co., China
This paper develops a modeling method for LiDAR point cloud imagewhich can accurately simulate the interferences encountered by LiDAR in the real world, and a method to test the quality of LiDAR point cloud.

15:00-15:15 • ACPPOEM-0731-156
Phase Noise Induced Interference for Coherently-detected OTDR Systems
Zexu LIU[1,2], Weiqi Lu[2], Lei LIU[2], William Shieh[2]
1.Zhejiang University, China; 2.Westlake University, China
In COTDR system, the phase noise induced interference (PNII) are investigated. For the first time, an analytical expression for the PNII is obtained for COTDR. Numerical simulation is also carried out to verify the theoretical results.

Best Paper Award

13:30-15:30 • 5 • November • Sunday
Best Paper Award I
Presider: Gangxiang Shen, Soochow University, China

13:30-13:45 • ACPPOEM-0726-22
Photoacoustic fiberscope for cerebral oxygenation imaging based on optical ultrasound detection
Xiaoxuan Zhong;Yizhi Liang;Long Jin
Jinan University, China
We developed a photoacoustic fiberscope based on optical ultrasound sensor. This new imaging modality was used for cerebral oxygenation imaging on freely moving mice for neuroscience study and intensive care of sepsis for medicine study.

13:45-14:00 • ACPPOEM-0727-2
400 Gb/s DWDM Field Trial over a Record Distance of 3820 km G.654.E Fiber Link with 107 GBaud Transceivers and C-band EDFAs
Chengliang Zhang[1];Anxu Zhang[1];Zhiwen Fan[2];Kai Lv[1];Lipeng Feng[1];Yuyang Liu[1];Xiaoli Huo[1];Junjie Li[1];Jitao Gao[2];Yudi Fu[2];Chen Duan[2];Songtao Chen[2];Bin Zhang[2];Qi Yang[3];Deming Liu[3]
1.China Telecom Research Institute, State Key Laboratory of Optical Fiber and Cable Manufacture Technology, China; 2.Fiberhome Telecommunication Technologies Co., LTD, China; 3.School of Optical and Electronic Information, Huazhong University of Science and Technology, China
A real-time 40×400 Gb/s dense wavelength division multiplexing (DWDM) ultra-long-distance transmission is demonstrated over a field-deployed G.654.E fiber link using 107 GBaud transponders. The transmission distance reaches 3820 km, refreshing the industry record of 400 Gb/s DWDM optical transmission systems.

14:00-14:15 • ACPPOEM-0731-104
Exceptionally Efficient Second-Harmonic Generation in a Double-Layer Thin-Film Lithium Niobate Waveguide
Yuan Li;Lutong Cai;Lin Zhang
Tianjin Key Laboratory of Integrated Opto-electronics Technologies and Devices, School of Precision Instruments and Opto-electronics Engineering, Tianjin University, China
We demonstrate highly efficient second-harmonic generation in thin-film lithium niobate waveguides. Due to the significantly enhanced modal overlap integral in polarization-reversed double layers, an unprecedentedly high conversion efficiency of up to 9700% $W^{-1}cm^{-2}$ is achieved.

14:15-14:30 • ACPPOEM-0731-109
Measurement of chromatic dispersion in hollow core fibers using optical frequency comb
Meng Ding[1];Daniel Dousek[2];Ailing Zhong[2];Matej Komanec[2];Ian Davidson[1];Gregory Jasion[1];Francesco Poletti[1];Radan Slavik[1]
1.University of Southampton, United Kingdom; 2.Czech Technical University in Prague, Czech Republic
We present a novel method for accurate and fast measurement of signal time delay over a broad wavelength range. This enables accurate measurement of chromatic dispersion. We demonstrate this method on characterizing hollow core fibers.

14:30-14:45 • ACPPOEM-0731-146
Impact of WDM-Band Drop on S+C+L Multi-Band Optical Transmission Systems
Xiaohui ZHAO[1];Salma Escobar-Landero[2];Abel Lorences-Riesgo[2];Dylan Le Gac[2];Loig Godard[2];Iosif Demirtzioglou[2];Hartmut Hafermann[2];Qiang Guo[3];Romain Brenot[2];Massimo Tornatore[1];Yann Frignac[2];Gabriel Charlet[2]
1.Politecnico di Milano, Italy; 2.Huawei Technologies France - Paris Research Center, France; 3.Huawei Technologies CO., Ltd., China
We experimentally and numerically assess the impact of different WDM band drops on S+C+L multi-band systems. Our results highlight how ISRS induces a higher impact on the L-band transmission performance due to the S-band drop.

14:45-15:00 • ACPPOEM-0731-152
Side-amorphous-silicon-grating InGaAs/GaAs nano-ridge distributed feedback laser monolithically grown on 300 mm silicon substrate
Zhongtao Ouyang[1], Eslam Fahmy[1], Davide Colucci[1,2], Andualem Ali Yimam[1], Bernardette Kunert[3], Dries Van Thourhout[1]
1.Ghent University, Belgium; 2.Imec, Belgium; 3.imec, Belgium
A compact III-V semiconductor laser is regarded as a promising light source for the silicon photonic platform due to its unique advantages of low energy consumption and small footprint. However, the significant lattice mismatch between the III-V material and silicon is a fundamental challenge for the monolithic integration of III-V lasers on silicon substrates and requires specific integration solutions to confined relaxation defects outside the active device region. Here, a distributed feedback GaAs/InGaAs nano-ridge laser directly grown on silicon substrate by nano-ridge engineering is demonstrated. Under pulse pumping, the lasing was achieved with a cavity length as small as 50 μm. This laser establishes a novel route to realize a compact light source for the future high-density and massively scalable silicon photonic integrated circuits.

15:00-15:15 • ACPPOEM-0731-52
A Beam-scannable photonic THz-ISAC system based on Risley prisms
Zhidong Lyu[1];Lu Zhang[1];Hongqi Zhang[1];Zuomin Yang[1];Hang Yang[1];Changming Zhang[2];Vjačeslavs Bobrovs[3];Xiaodan Pang[3,4,5];Oskars Ozolins[3,4,5];Xianbin Yu[2]
1.Zhejiang University, China; 2.Zhejiang Lab, China; 3.Riga Technical University, Latvia; 4.KTH Royal Institute of Technology, Sweden; 5.RISE Research Institutes of Sweden, Sweden
We demonstrate a beam-scannable photonic terahertz-integrated sensing and communication (THz-ISAC) system using Risley prisms. 20 Gbps data rate and 1.5 cm resolution are simultaneously achieved at 300 GHz with 40 deg field of view (FoV).

15:15-15:30 • ACPPOEM-0731-6
Low Hardware-Complexity 100G Transceiver Using A Single DAC and Two ADCs
Abel Lorences-Riesgo;Yu Zhao;Yann Frignac;Gabriel Charlet
Huawei Technologies France, France
We demonstrate that dual-sideband modulation and intradyne detection, 100G transmission over 400 km with SNR margin of 3 dB. While mininmizing the required number of components, this transceiver is still tolerant to PMD and SOP

15:30-15:45 Coffee Break

15:45-18:00 • 5 • November • Sunday
Best Paper Award II
Presider: Gangxiang Shen, Soochow University, China

15:45-16:00 • ACPPOEM-0731-60
Cascadable Integrated Optical Tweezers by Crossing MMI Waveguides
Xuedi Wang;Xin Tong;Weichao Cheng;Lin Zhang
Key Laboratory of Opto-electronics Information Technology of Ministry of Education, School of Precision Instruments and Opto-electronics Engineering, Tianjin University, China
We propose and experimentally demonstrate a crossing multimode-interference (MMI) device, which produces a strong optical force to trap microparticles. The trapping dynamics of microparticles are analyzed. Low-loss characteristic allows for cascading to improve capture efficiency.

16:00-16:15 • ACPPOEM-0801-100
Entanglement Networks with Fiber-Pigtailed Silicon Nitride Microring
Yun-Ru Fan[1];Jin-Peng Wu[1];Ri-Yao Song[1];Hao Yu[1];Hong Zeng[1];Guang-Wei Deng[1];Hai-Zhi Song[1,2];You wang[1,2];Li-Xing You[3];Zhen Wang[3];Guang-Can Guo[1,4];Qiang Zhou[1,4]
1.University of Electronic Science and Technology of China, China; 2.Southwest Institute of Technical Physics, China; 3.Shanghai Institute of Microsystem and Information Technology, Chinese Academy of Science, China; 4.University of Science and Technology of China, China
A fully connected entanglement network with four users is experimentally demonstrated by using multi-wavelength energy-time entanglement source with a fiber-pigtailed silicon nitride microring. The entanglement-based quantum key distributions among users are realized with improved performance.

16:15-16:30 • ACPPOEM-0801-134
10λ×3.26Tb/s CPRI-Equivalent Rate 1024-QAM DA-RoF Fronthaul in Single-Mode Fiber Using Coherent-Compliant DSP
Yixiao Zhu[1];Xiansong Fang[2];Chenbo Zhang[2];Lingjun Zhou[2];Jiayu Zheng[2];Yicheng Xu[1];Xiaopeng Xie[2];Fan Zhang[2];Qunbi Zhuge[1];Weisheng Hu[1]
1.Shanghai Jiao Tong University, China;2.Peking University, China
We experimentally demonstrate high-capacity coherent DA-RoF fronthaul leveraging pilot symbol- and BPS-based carrier phase recovery. Up to 4.42-Tb/s and 32.6-Tb/s CPRI-equivalent rates are achieved with single-carrier (256-QAM) and WDM (1024-QAM) transmission over 10-km SSMF, respectively.

16:30-16:45 • ACPPOEM-0801-61
Timing Recovery for 400G P2MP Optical Networks using Coherent Digital Subcarrier Multiplexing
Haide Wang[1], Jinyang Yang[1], Ji Zhou[1], Zhenping Xing[2], Keshuang Zheng[2], Liangchuan Li[2], Weiping Liu[1], Changyuan Yu[3], Zhaohui Li[4]
1.Jinan University, China; 2.Huawei Technologies Co Ltd, China; 3.The Hong Kong Polytechnic University, China; 4.Sun Yat-sen University, China
Point-to-multi-point (P2MP) optical networks using coherent digital subcarrier multiplexing (DSCM) can offer a better match to the hub-and-spoke traffic pattern. To reduce the computational complexity of the digital signal processing at the leaf nodes, the hub-site chromatic dispersion (CD) pre-compensation can be adopted but the residual CD will affect the timing recovery (TR). In this paper, we present a CD-tolerant TR algorithm for 400Gb/s P2MP optical networks using coherent DSCM over 320 km transmission. The experimental results of the 400Gb/s P2MP optical networks show that the proposed leaf-node TR can tolerate a residual CD up to ~5600 ps/nm after hub-site CD pre-compensation. The timing phase can be maintained accurately by the proposed CD-tolerant TR algorithm under the timing errors of phase offset, frequency offset, and jitter. Moreover, TR for P2MP optical networks using coherent DSCM with lower baud rate subcarrier has more robustness against CD.

16:45-17:00 • ACPPOEM-0801-64
Experimental Demonstration of Traffic-driven Control Framework and Autonomous Connection Management for Flexible Transport Networks
Qiaojun Hu[1];Wei Wang[1];Xiangkun Man[2];Renji Zhang[1];Liyazhou Hu[3];Yongli Zhao[1];Yajie Li[1];Guangquan Wang[2];Yanxia Tan[2];Jie Zhang[1]
1.School of Electronics Engineering, Beijing University of Posts and Telecommunications, China; 2.Broadband Network Research Lab, China Unicom Research Institute, Beijing 100048, China, China; 3.Macau University of Science and Technology, China
We design a traffic-driven control framework for managing massive optical connections and implement a prototype based on commercial equipment. Experiments demonstrate the framework's ability for enabling autonomous dynamic service provisioning.

17:00-17:15 • ACPPOEM-0812-7
Narrow Bandwidth Hundreds Picosecond Pulse Fiber Laser Based on Carbon Nanotubes Mode-locker
Weixi Li[1];Lilong Dai[1];Kaiquan Yan[1];Yuze Dai[2];Chengbo Mou[1];Zhijun Yan[2]
1.Shanghai University, China;2.Huazhong University of Science and Technology, China
0.01 nm, 323 ps passively mode-locked erbium-doped fiber laser(EDFL) based on carbon nanotubes (CNTs) is established with a homemade fiber Bragg Grating(FBG) as the intra-cavity filter.

17:15-17:30 • ACPPOEM-0815-26
Ultraflexible organic solar cellsforwearable power sources
Sixing Xiong
RIKEN, Japan
In recent years, wearable electronics have garnered significant attention due to their vast potential for application across diverse domains. The efficacy of these devices hinges on an efficient and reliable energy supply system for sustained operation. With the ongoing trend towards slimmer, lighter, and more pliable designs, wearable electronics require power sources that not only offer enhanced effectiveness but also possess comparable mechanical attributes. Among the solutions, ultra-flexible organic solar cells, boasting a thickness of less than 10 μm, emerge as a compelling option, capable of seamlessly integrating into irregular and stretchable substrates, such as human skin and textiles. This renders them among the most promising off-grid power supply candidates for wearable electronics. Notably, research has demonstrated the compatibility of organic solar cells with the human body. This presentation will delve into our advancements concerning the development of ultra-flexible solar cells and their role in energizing wearable electronics and sensors. We have successfully engineered organic solar cells with a mere 3 μm thickness, yielding a remarkable power conversion efficiency exceeding 15%, coupled with improved environmental stability. Leveraging a hot-melt adhesion process, these ultra-flexible solar cells can be affixed to human skin or textiles with precision. Moreover, we have seamlessly integrated these ultra-flexible solar cells with sensors, culminating in a self-powered system adept at monitoring biological signals.

17:30-17:45 • ACPPOEM-0815-83
Wavelength-selective 2 × 2 optical switch based on a Ge2Sb2Te5-assisted microring for the 2-μm wavelength band
Weixun Zhu[1];Xing Yang[2];Huan Li[1];Liangjun Lu[2];Linjie Zhou[2];Daoxin Dai[1,3]
1.State Key Laboratory for Modern Optical Instrumentation, Center for Optical & Electromagnetic Research, College of Optical Science and Engineering, International Research Center for Zhejiang University, Zijingang Campus, China; 2.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; 3.Ningbo Research Institute, Zhejiang University, China
We propose and demonstrate a wavelength-selective 2 × 2 silicon photonic switch using a $Ge_2Sb_2Te_5$-assisted microring-resonator for the 2-μm wavelength-band, showing an extinction ratio of ~20 dB and a low excess loss of ~1 dB.

17:45-18:00 • ACPPOEM-0815-86
A Terahertz time-domain spectroscopy based on a high performance mode-locked fiber laser
Liao Chen[1];Jingmeng Li[1];Rongwu Liu[1];Yufan Du[1];Chi Zhang[1];Xiaojun Wu[2];Xinliang Zhang[1]
1.Wuhan National Laboratory for Optoelectronics & School of Optical and Electronic Information, China;2.School of Electronic and Information Engineering, China
A terahertz time-domain spectroscopy based on a mode-locked fiber laser with 76 fs pulsewidth and 42 mw power, has demonstrated with 40 dB dynamic and 2.5 THz bandwidth， used to characterize terahertz filter and lactose.

17:30-20:00 Welcome Reception

Best Paper Award

Best Student Paper Award

13:30-15:30 • November 05, 2023 • Sunday
Best Student Paper Award I
Presider: Jianji Dong, Huazhong University of Science and Technology, China

13:30-13:45 • ACPPOEM-0728-11
Integration of III-V Quantum Dot Lasers and Silicon Waveguides on SOI
Bo Yang
Institute of Physics, CAS, China
We embedded InAs QD lasers on trenched SOI, enabling monolithic integration with butt-coupled waveguides. High-performance lasers with max output power of 6.8 mW and -6.7 dB coupling efficiency achieved.

13:45-14:00 • ACPPOEM-0728-15
Joint Self-Homodyne Coherent Transmission and Distributed Vibration Detection Using a (1+8) Multicore Fiber
Haoze Du[1], Mingming Zhang[1], Zhiyong Zhao[1], Siqi Yan[1], Chen Yang[2], Ming Tang[1]
1.National Engineering Laboratory for Next Generation Internet Access System, School of Optical and Electronic Information,Huazhong University of Science and Technology, China; 2.State Key Laboratory of Optical Fiber and Cable Manufacture Technology, Yangtze Optical Fiber and Cable Joint Stock Limited Company (YOFC) R&D Center & Optics Valley Laboratory, China
The self-homodyne coherent transmission and distributed vibration detection are realized simultaneously on a (1+8) MCF, which is characterized by 1 polarization-maintaining central core and 8 side cores. The effect of the continuous wave light power used for polarization detection on the signal is also discussed.

14:00-14:15 • ACPPOEM-0729-10
Design and Fabrication of a Seven-mode Mode-mismatching Photonic Lantern for Mode Purification from Multi-mode Pump Sources
Tiecheng Jin, Yan Li, Jifang Qiu, Xiaobin Hong, Hongxiang Guo, Jian Wu
State Key Laboratory of Information Photonics and Optical Communications, Beijing University of Posts and Telecommunications, China
Pump light is the energy source for Er-doped Fiber Amplifiers (EDFAs) and an essential component for long-distance fiber optic communication systems. We have designed a Mode-Mismatching Photonic Lantern (MMPL) in the 980nm band, to achieve low-loss coupling from a single-channel, multi-mode pump source to a multi-channel, single-mode pump source, providing a multi- channel source for EDFAs. Through experiments, we have demonstrated the feasibility of the design.

14:15-14:30 • ACPPOEM-0729-3
O-band TOSA enabled 100 Gbaud PAM-8 Transmission over 2 km SSMF with FFE
Hailin Yang[1], Meng Xiang[1], Ruitao Wu[1], Wenzhuo Cheng[1], Qin Li[1], Gai Zhou[1], Li Zhang[2], Songnian Fu[1], Yuwen Qin[1]
1.Guangdong University of Technology, China; 2.High Speed and High Frequency Lab, Huawei Technologies Co. Ltd, China
We experimentally demonstrate 100 Gbaud PAM-8 signals intensity modulation and direct detection (IM-DD) transmission over 2 km standard single-mode fiber (SSMF), based on self-developed O-band transmitter optical sub-assembly (TOSA) with a 3dB bandwidth of 60 GHz. Considering the threshold of 20% soft-decision forward error correction (SD-FEC), a photonic data-center interconnection with net bit-rate of 250 Gbit/s is achieved by only feed-forward equalizer (FFE).

14:30-14:45 • ACPPOEM-0731-151
Field Trial of Privacy-preserving Resource Allocation in Multi-domain Optical Networks Based on Federated Reinforcement Learning
Xiaoya Zhang, Rentao Gu, Jiangshan Dong, Jiyan Chen, Weijing Sang, Chuang She
Beijing University of Posts and Telecommunications, China
We propose and demonstrate federated reinforcement learning enabled multi-domain optical networks resource allocation in China's national network across over 2420 km, saving 30% decision time and obtaining even better optimal configuration without sensitive information disclosure.

14:45-15:00 • ACPPOEM-0731-171
Intelligent Intra- and Inter-Channel Nonlinearity Compensation for Terabit-per-lambda 16QAM Long-Haul Transmission
Xiansong Fang[1], Lingjun Zhou[1], Yixiao Zhu[2], Jiayu Zheng[1], Xiang Cai[1], Fan Zhang[1,3]
1.Peking University, China; 2.Shanghai Jiao Tong University,China; 3.Peng Cheng Laboratory, China
We experimentally demonstrate the combination of learned modified DBP and adaptive equalizer to compensate for intra- and inter-channel nonlinearity, in an 8×125Gbaud 16QAM system over 1600km SSMF, showing a 97.3% complexity reduction compared to DBP-64.

15:00-15:15 • ACPPOEM-0731-66
Exploring the Neural Organoid in High Definition: Physics-Inspired High-Throughout Super-Resolution 3D Image Reconstruction
Davit Khutsishvili, Yuanzheng Ma, Zitian Wang, Xun Guan, Shaohua Ma
Tsinghua University, China
Organoids serve as a versatile platform for biomedical research, including drug screening, disease progression, cancer,

developmental, and mechanobiology studies. However, precise 3D modeling of organoids remains a formidable challenge due to the complexity of tissue architecture, resolution limitations of confocal microscopy, and the time and labor-intensive process of acquiring data to achieve peak results. In this paper, we propose a novel strategy named LayerLink to enhance 3D structure of Neural Organoids' TUJ1 fluorescently labeled nerve fibers using neighboring layers of stacked 3D image. By leveraging the Beer-Lambert law, we link each vertical layer to its neighboring layers through a blending process, forming the input for a super-resolution diffusion model to reconstruct the entire volume. The reconstructed layers achieve 11.02% improvement over conventional deep learning method with a peak signal-to-noise ratio of 22.46. Notably, the reconstructed nerve fibers and fascicles in the vertical sections exhibit remarkable continuity. This precise modeling algorithm shows great promise for high-resolution monitoring of organoids and tissues exhibiting continuous fine structures. Furthermore, it holds potential for advancing our understanding of cell-to-tissue-to-organ interactions and advancing 3D tissue bioprinting techniques in the future.

15:15-15:30 • ACPPOEM-0731-70
Flexible and High-fidelity Concurrent Dual-band Delta-sigma Modulator for Diverse Applications Convergence
Zijun Yan, Yixiao Zhu, Yikun Zhang, Yimin Hu, Gengming Lin, Qi Wu, Ziyu Cheng, Weisheng Hu
Shanghai Jiao Tong University, China
We propose and experimentally demonstrate a concurrent dual-band delta-sigma modulation for fronthaul. The proposed modulator can flexibly adjust the center frequency of each passband with ~3.0-dB SNR improvement, supporting 2.67GHz 1024-QAM transmission over 10-km SSMF.

15:30-15:45 Coffee Break

15:45-18:30 • November 05, 2023 • Sunday
Best Student Paper Award II
Presider: Jianji Dong, Huazhong University of Science and Technology, China

15:45-16:00 • ACPPOEM-0731-90
High Resolution Millihertz Fibre-optic Strain Sensor Based on Time Delay Interferometry
Ke Ai, Cunzheng Fan, Junfeng Chen, Hao Li, Zhijun Yan, Qizhen Sun
Huazhong University of Science and Technology, China
The frequency drift of lasers is one of the most significant source of phase noise in fiber-optic sensing systems. Time delay interferometry (TDI) in gravitational wave detection mission can effectively suppress the frequency noise of laser. We applied TDI to fiber-optic sensing systems and achieved 80 dB noise floor suppression at 10 mHz and the strain resolution reached 2.39 pε/Hz^1/2@10mHzon a 100 km ultra-long SMF link. The signal to noise ratio was improved by 10 dB and 25 dB at 500 mHz and 2 Hz respectively. The proposed method has the potential to significantly improve the low-frequency response of fiber optic sensing systems such as DAS and OFDR.

16:00-16:15 • ACPPOEM-0801-38
Experimental Demonstration of SDN-Controlled OFDM VLC System based on Adaptive Multi-user Bit and Power Loading Algorithm
Yongxin Wang, Chengju Hu, Jian Zhao
South China University of Technology, China
In this paper, we experimentally demonstrate a multi-user OFDM visible light communication system supporting software-defined-network (SDN) configuration to realize flexible resource allocation and bit/power loading for multiple users. An access point is designed based on FPGA to realize real-time generation of the OFDM signal and to interact with the SDN. Multi-user OFDM bit and power loading algorithm is implemented and configured by SDN to the real-time transmitter to flexibly allocate resources according to the demand of users and channel information. Two-user experiments with 30Mbit/s throughput show that the SDN-controlled system works properly and the bit error rate is kept below 10^{-3} as the receiving angle and the data rate ratio between users change.

16:15-16:30 • ACPPOEM-0801-53
Photonics-based Arbitrary Waveform Generator based on Time Interleaved 1-bit Delta-Sigma DAC
Jinghan Yu, Zhaoyi Wang, Shangyuan Li, Xue Xiaoxiao, Xiaoping Zheng, Bingkun Zhou
Tsinghua University, China
A 1-bit photonic digital-to-analog convertor (PDAC) based on Delta-Sigma coding and optical time interleaving is proposed. In experiment, an X-band, 2GHz bandwidth radar signal with an in-band spurious free dynamic range (SFDR) of 30.59dB is generated.

16:30-16:45 • ACPPOEM-0801-73
A Phase Recovery-Aware Algorithm for Kernel Estimation of the Manakov Equation
Astrid Barreiro, Gabriele Liga, Alex Alvarado
Eindhoven University of Technology, Netherlands
The performance of the normalized batch gradient descent (NBGD) algorithm to model nonlinear interference in the presence of phase recovery is analyzed. A modification of the underlying model's parameterisation is proposed, which reduces NBGD's penalties.

Best Student Paper Award

16:45-17:00 • ACPPOEM-0801-8
A photonic integrated high-power soliton microcomb generator
Xinru Ji, Yang Liu, Zheru Qiu, Rui Ning Wang, Johann Riemensberger, Tobias Kippenberg
Swiss Federal Institute of Technology in Lausanne, Switzerland
We demonstrate a compact soliton microcomb light source. The soliton is generated from a Kerr microresonator and amplified by an erbium-implanted gain section integrated on the same photonic chip. We achieved an output power of 7.9 mW at a compact device footprint of 12.5 mm^2

17:00-17:15 • ACPPOEM-0802-2
Monolithic Single mode QD Discrete Mode Laser Epitaxially Grown on SOI
Jingzhi Huang
Chinese Academy of Science, China
We have successfully demonstrated a novel single-mode InAs/GaAs quantum dot discrete mode laser, grown directly on a silicon-on-insulator substrate with embedded silicon gratings. This regrowth-free design allows for integration with silicon-based photonic circuits, offering promising advancements in the field of integrated photonics.

17:15-17:30 • ACPPOEM-0815-111
High-accuracy Solid-state LiDAR Based on Optical Intensity Modulation and Coherent Detection
Junze Tian[1,2,3,4], Jianhao Duan[1,2,3,4], Bin Wang[1,2,3,4], Weifeng Zhang[1,2,3,4]
1.Beijing Institute of Technology, China; 2.Key Laboratory of Electronic and Information Technology in Satellite Navigation, China; 3.Beijing Institute of Technology Chongqing Innovation Center, China; 4.Chongqing Key Laboratory of Novel Civilian Radar, China
We propose and experimentally demonstrate a high-accuracy solid-state LiDAR based on optical intensity modulation and coherent detection. In the proposed system, a high-speed Mach-Zehnder modulator (MZM) is employed to perform optical intensity modulation for range detection, and a free-space optical coherent receiver constructed by an optical hybrid and four charge-coupled devices (CCDs) is used to perform coherent detection and to improve the signal-to-noise ratio. In this way, the depth information of the target objects is mapped to the grayscale images captured by the CCDs, and non-scanning 3D imaging with a high accuracy can be realized. In the experimental demonstration, the 3D image of a home-made target object is acquired by the proposed solid-state LiDAR, and the range detection accuracy is as high as 2.75 mm.

17:30-17:45 • ACPPOEM-0815-69
Crosslink Polymer Strategy to Minimize Voltage Loss in Wide-Bandgap Perovskites for All-Perovskite Tandem Solar Cells
Xin Zheng, Xiong Li
Huazhong University of Science and Technology, China
In recent years, the photoelectric conversion efficiency (PCE) of perovskite solar cells (PSCs) has exceeded 25%. However, according to Shockley-Queisser's limitations, the maximum theoretical efficiency of a single-junction solar cell is about 33%. The room for efficiency improvement of single-junction perovskite solar cells is very limited. Therefore, the development of tandem solar cells is an important way to break the limit and further improve the efficiency of PSCs. The theoretical limit efficiency of double-junction tandem solar cells (TSCs) can reach 46%, which is much higher than that of single-junction solar cells. In practice, The efficiency of all-perovskite tandem solar cells (28%) has surpassed that of single-junction perovskite solar cells (26%). Wide-bandgap (WBG) mixed-halide perovskites show promise of realizing efficient tandem solar cells but at present suffer from large open-circuit voltage loss because of excess lead iodide and light-induced halide phase segregation. Here, a crosslink polymer strategy with high crosslinking degree and high density of functional groups is reported for finely regulating the crystal growth of $FA_{0.8}Cs_{0.2}Pb(I_{0.6}Br_{0.4})_3$, thereby obtaining high-performance PSCs. The pentaerythritol tetraacrylate (PTA) is introduced to form hydrogen bonds and strong Pb–O bonds with perovskite precursors, realizing the complete elimination of excess lead iodide. Besides, this uniformly distributed PTA crosslink polymer system passivates the defects and inhibits the photo-induced halide segregation effectively. The prepared PSCs with a band gap of 1.77 eV yield an impressive open-circuit voltage (V_{OC}) of 1.36 V, corresponding to a record lowV_{OC}-deficit of 0.41 V and an efficiency of 19.58%. With these WBG perovskite subcells, we report 27.3% monolithic all-perovskite TSCs shows an outstanding combination of a high$V_{OC}$of 2.15 V and a FF of 81.4% with improved operational stability.

17:45-18:00 • ACPPOEM-0815-91
Integrated broadband lithium niobate optical parametric amplifier
He Gao, Jizhi Zhang, Siyuan Wang, Zejie Yu, Liu Liu, Daoxin Dai
Zhejiang University, China
Here we propose and demonstrate an integrated broadband optical parametric amplifier by second-order nonlinear wavelength conversion on a TFLN platform. An optical gain of ~18.11 dB for the signal light at 1550 nm is experimentally observed.

18:00-18:15 • ACPPOEM-0815-99
Ultra-compact fiber refractive index probe based on 3D printed fiber-tip dual-ring interferometer
Jing Liu[1], Yucheng Yao[1], Zhiyong Zhao[1], Jie Yan[2], Xi Xiao[2], Ming Tang[1]
1.Huazhong University of Science and Technology, China; 2.National Information Optoelectronics Innovation Center, China
We proposed a ultra-compact refractive index probe based on a dual-ring interferometer . The sensor was 3D printed on the fiber tip. Within the refractive index range of 1.33-1.357, it has a sensitivity of 868.1nm/RIU.

18:15-18:30 • ACPPOEM-0816-7
Frequency-Hopping Signal Measurement Based on Real-time Photonic Fourier Transform
Xin Liu, Dan Zhu, Jiewen Ding, Zhouyang Pan, Tao Lu, Shilong Pan
Nanjing University of Aeronautics and Astronautics, China
A frequency-hopping signal measurement scheme based on real-time photonic Fourier transform is proposed and demon-

Best Student Paper Award

strated. In the experiment, the wideband and multiple frequency-hopping signals with 100-ns frequency-hopping period and 4-40 GHz frequency range are verified.

17:30-20:00 Welcome Reception

Postdeadline Paper Session I

16:00-17:45 • November 06, 2023 • Monday
Presider: William Shieh, Westlake University, China

16:00-16:15 • ACPPOEM-1007-3
High-precision static strain field measurement based on Dense Fiber Bragg Grating Array
Zhijun Yan[1,2], **Weiliang Zhao[1],** Xiangpeng Xiao[1], Yibo Liu[1], Peng Wang[2], Qizhen Sun[1,2]
1.Huazhong University of Science and Technology, China; 2.Wuxi Research Institute, Huazhong University of Science and Technology, China
We have achieved precise static strain field measurement and applied for 2D shape sensing by using DFBG array with 20 different wavelengths. The accuracy was high with 0.83 με strain sensing and 0.2% reconstruction error.

16:15-16:30 • ACPPOEM-1005-2
Record Experimental Demonstration of 800G/lane based 36-Tb/s 3150-km Transmission enabled by Silicon-based IC-TROSA
Xiaoshuo Jia[1], Yan Li[1], Jingwei Song[1], Ming Luo[2], Chao Yang[2], Xu Zhang[2], Qingyu He[2], Xi Xiao[2,3], Daigao Chen[3], Hongguang Zhang[3], Jifang Qiu[1], Xiaobin Hong[1], Hongxiang Guo[1], Zhisheng Yang[1], Jian Wu[1]
1.State Key Laboratory of Information Photonics and Optical Communications, Beijing University of Posts and Telecommunications, China; 2.State Key Laboratory of Optical Communication Technologies and Network, China Information and Communication Technologies Group Corporation, China; 3.National Information Optoelectronics Innovation Centre, China Information and Communication Technologies Group Corporation, China
800-Gb/s/lane based 36-Tb/s 3150-km transmission in a 100-GHz spaced WDM configuration employing silicon-based IC-TROSA in C-Band at the spectral of 8-bit/s/Hz is successfully demonstrated by utilizing 90-GBaud PS-64QAM signal, contributing to a capacity-distance product of 113.4-Pb/s×km, which is a new record for the 800-Gb/s/lane based transmissions employing single core fibers.

16:30-16:45 • ACPPOEM-1008-10
Record Long-haul Transmission with FIFO-less Multicore EDFA over 125-μm Cladding MCF
Hui Yan[1], Hao Liu[1], Wenxiong Du[1], Yizhou Wang[1], Shuai Yuan[1], Yongfu Wang[1], Ming Chen[1], Wei Sun[2], Xuegang Lao[2], Gonghui Zhang[2], Lin Wang[2], Wendou Zhang[1,3], Wenwei Xu[1,3]
1.Huawei Technology Co., Ltd., China; 2.Jiangsu Alpha Optic-electric Technology Co., Ltd., China; 3.Peng Cheng Laboratory, China
The record 203 Tb/s and 102 Tb/s SDM transmission enabled by C+L band FIFO-less MC-EDFA over 3105 km and 7245 km weakly-coupled 4-core MCF with 125-μm cladding diameter was first experimentally demonstrated using PCS-16QAM and PDM-QPSK, respectively. Effective cost was achieved by G.652-compatible MCF and fully-integrated-components multi-core EDFA.

16:45-17:00 • ACPPOEM-1008-14
0.9-dB/m Single-mode Silicon Nitride Nonlinear Integrated Waveguides for Continuous-wave Wavelength Conversion
Ping Zhao, Marcello Girardi, Vijay Shekhawat, Zonglong He, Magnus Karlsson, Victor Torres-Company, Peter Andrekson
Chalmers University of Technology, Sweden
We present efficient wavelength conversion with an over-180-nm bandwidth, using single-mode Si_3N_4 Kerr integrated waveguides with record-low losses of 0.9±0.2 dB/m. This enables a first-time 100-Gbps-single-channel all-optical L-to-S-band translation without amplifying signal/idler-waves for $\chi^{(3)}$ waveguides.

17:00-17:15 • ACPPOEM-1008-20
100 Gb/s All-Optical Programmable Logic Array Chip Based on Full Set of Canonical Logic Units
Xiaoyan Gao[1], Wentao Gu[1], Wenchan Dong[2], Jing Xu[2], Jianji Dong[1], Xinliang Zhang[1]
1.Wuhan National Laboratory for Optoelectronics, Huazhong University of Science and Technology, China; 2.School of Optical and Electronic Information, Huazhong University of Science and Technology, China
We experimentally demonstrate an all-optical programmable logic array scheme through linear pre-coding and nonlinear four-wave mixing in silicon-based integrated chip. The full set of canonical logic units are generated simultaneously at 100Gb/s.

17:15-17:30 • ACPPOEM-1006-1
Wideband Tuning Range Microwave Photonic Filter on ThinFilm Lithium-Niobate-on-Insulator for Next-Generation Wireless Communication
Hao Yan[1], Yiwei Xie[1], Shihan Hong[1], Lu Zhang[2], hongqi zhang[3], Qianyu He[2], Hang Yang[2], zhidong Lv[2], ke Wang[4], Mingming Tan[5], Andrew Ellis[5], Daoxin Dai[1]
1.Centre for Optical and Electromagnetic Research State Key Laboratory for Modern Optical Instrumentation, Zhejiang University, China; 2.College of Information Science and Electronic Engineering, Zhejiang University, China; 3.College of Information and Electronic Engineering, Zhejiang university, China; 4.School of Engineering RMIT University, Australia; 5.Aston Institute of Photonic Technologies, Aston University, United Kingdom
We propose the first reconfigurable integrated MPF on TFLN platform. The MPF exhibits an operation band extending to millimeter-wave (40 GHz), and tunable spectral resolution of 0.5-3 GHz. Gb/s-level RF wireless communications are demonstrated towards real-world scenarios.

17:30-17:45 • ACPPOEM-1008-5
1 Milliwatt Pumped Error-free 38 Gbaud Wavelength Conversion with AlGaAs Microresonators of 1 GHz Intrinsic Linewidth
Xinda Lu[1], Chanju Kim[2], Deming Kong[2], Nuo Chen[1], Yuntian Chen[1], Leif Katsuo Oxenløwe[2], Kresten Yvind[2], Xinliang Zhang[1], Lan Yang[3], Minhao Pu[2], **Jing Xu**[1]
1.Huazhong University of Science and Technology, China; 2.Technical University of Denmark, Denmark; 3.Washington University, St. Louis, United States
We demonstrate error-free 38 Gbaud wavelength conversion with only 1 mW pump power by taking the advantage of AlGaAs-on-Insulator microresonators with high-quality factors, breaking the bandwidth-efficiency limit imposed on single resonator systems by two orders of magnitude.

Postdeadline Paper Session II

16:00-18:00 • November 06, 2023 • Monday
Presider: Chao Lu, The Hong Kong Polytechnic University, Hong Kong, China

16:00-16:15 • ACPPOEM-1007-5
405-GBd OOK and 201-GBd PAM-4 IM/DD Optics at Record Faster-Than-Nyquist Ratios of 226.6% and 62.1% Enabled by Advanced Noise Whitening
Qi Wu[1,2], Zhaopeng Xu[1], Yixiao Zhu[2], Honglin Ji[1], Yu Yang[1], Junpeng Liang[1], Gang Qiao[1], Shangcheng Wang[1], Lulu Liu[1], Jinlong Wei[1], Qunbi Zhuge[2], Weisheng Hu[1,2]
1.Peng Cheng Laboratory, China; 2.Shanghai Jiao Tong University, China
We demonstrate 405-GBd OOK and 201-GBd PAM-4 signaling in an intensity modulation and direct detection system with a 62-GHz brick-wall bandwidth. Record faster-than-Nyquist ratios of 226.6% and 62.1% are achieved for OOK and PAM-4 modulations.

16:15-16:30 • ACPPOEM-0930-2
Fully-loaded 80×400Gb/s DP-QPSK Transmission with Commercial 12-THz C6T+L6T EDFAs over Record Distance of 7000km
Dawei Ge[1], Mingqing Zuo[1], Haibin Liu[2], Lin Gan[2], Dong Wang[1], Yongchao Chen[2], Dechao Zhang[1], Qiang Guo[2], Han Li[1]
1.China Mobile Research Institute, China; 2.Huawei Technologies Co., Ltd., China
By using commercial C6T+ L6T EDFAs with 12-THz spectrum, a record 7000 km of 80×400Gb/s QPSK over G.654.E is demonstrated for the first time. Performance comparison is also carried out for both G.652.D and G.654.E.

16:30-16:45 • ACPPOEM-1007-7
Field Trial of 7 × 89λ × 256 Gb/s C-Band Classical / CVQKD Co-Existence Transmission over 7-Core Fiber
Xin Wang, Jintao Wang, Yingyu Chen, Yongguang Xiao, Zongkai Li, Zhirong Chen, Zhaohui Li, Dawei Wang
School of Electronics and Information Technology, Sun Yat-sen University, China
We successfully demonstrated the coexistence of CV-QKD and 89 classical channels in C-band transmitted over a 16.7 km field deployed 7-core fiber, achieving 35 Mb/s secure key rate with 22.8 Tb/s classical data per core.

16:45-17:00 • ACPPOEM-1008-18
First Demonstration of Quasi-Continuous S+C+L 154.5 Tbit/s Coherent Transmission in Hollow-Core Anti-resonant Fiber
Chen Hui[1], Zhang Xu[1,2], Liu Zichen[1], Li Chao[1], Ji Honglin[1], Jin Siyue[1], Wang Qibing[1], Gao Shoufei[3], Wang Yingying[3], Ding Wei[3], Wang Lei[1], Luo Ming[4], Xiao Xi[5], He Zhixue[1], Yu Shaohua[1]
1.Peng Cheng Laboratory, China; 2.China Information and Communication Technologies Group Corporation, China; 3.Jinan University, China; 4.China Information and Communication Technologies Group Corporation, China; 5.National Information Optoelectronics Innovation Centre, China
We experimentally demonstrated a record-breaking high-capacity wavelength division multiplexing coherent transmission through a 1.4km hollow-corefiber, covering the quasi-continuous(14.8THz bandwidth) of S, C and L-band, and achieving 154.5 Tbit/s capacity for the first time.

17:00-17:15 • ACPPOEM-1005-1
Cost-Effective and High Capacity-Distance Product (~800Pbit/s×km) Single Mode Transoceanic Transmission Assisted by Silicon-Based Integrated Transponder and Long Span Length
Lin Jiang[1,3], Xi Xiao[2,3], Xingchen He[1], Youren Yu[1], Anlin Yi[1], Hong Li[2], Ming Luo[2,3], Jie Luo[4], Liangming Xiong[4], Chengpeng Fu[5], Qianggao Hu[5], Wei Pan[1], Lianshan Yan[1,3]
1.Center for Information Photonics and Communications, Southwest Jiaotong University, China;2.The State Key Laboratory of Optical Communication Technologies and Networks, China Information and Communication Technologies Group Corporation, China;3.The Peng Cheng Laboratory, China;4.State Key Lab. of Opt. Fiber & Cable Manuf. Tech., Yangtze Optical Fiber & Cable Company Ltd.,China;5.Accelink Technologies Co., Ltd.,, China
We report a cost-effective and high-capacity single mode transoceanic transmission system. It is the first time that the silicon-based integrated transponder and the long span length (~75km) are experimentally verified in such capacity-distance product (~800Pbit/s×km) system.

17:15-17:30 • ACPPOEM-1003-1
First Baud-Rate Sampled DSP-Free Self-Homodyne Coherent Receiver
Mingming Zhang[1], Xuefeng Wang[1], Can Zhao[1], Chengbo Li[1], Zihe Hu[1], Weihao Li[1], Haoze Du[1], Junda Chen[1], Jiajun Zhou[2], Shuai Zhang[2], Siyang Liu[2], Sheng Cui[1], Ming Tang[1,3,4]
1.Huazhong University of Science and Technology, China; 2.Hubei Jiufengshan Laboratory, China; 3.Wuhan National Laboratory of Optoelectronics, China; 4.Optics Valley Laboratory, China
A DSP-free baud-rate sampled self-homodyne coherent receiver is achieved by utilizing all-optical signal processing. The error-free dual-polarization 64-GBaud QPSK signal reception has been verified in back-to-back (BER1e-6) and 1 km (BER5e-6) scenarios.

17:30-17:45 • ACPPOEM-1008-22
1-Pb/s CPRI-equivalent Rate Coherent DA-RoF Fronthaul with 1024-QAM Scalable in Capacity, Reach, and Linewidth Using Residual Carrier-based Phase Tracking
Yixiao Zhu[1], Xiansong Fang[2], Chenbo Zhang[2], Jingjing Lin[2], Yicheng Xu[1], Weiwei Hu[2], Zhangyuan Chen[2], Qunbi Zhuge[1], Fan Zhang[2], Xiaopeng Xie[2], Weisheng Hu[1]
1.Shanghai Jiao Tong University, China; 2.Peking University, China
We demonstrate 1.0-Pb/s CPRI-equivalent rate fronthaul with 1024-QAM using modulator bias-induced residual carrier-based phase tracking. The reach is extended to 20-km SSMF with 4096-QAM and 80-km with 256-QAM, and laser linewidth is relaxed to 3MHz.

17:45-18:00 • ACPPOEM-1007-8
Real-Time 1.6T (2×800G) Optical Interconnection with Coherent BiDi and SiP-based Polarization Tracker for Dual LOs with 1THz Spacing
Juntao Cao[1], Tao Gui[2], Keshuang Zheng[2], Shuai Yuan[2], Chen Liu[2], Xuefeng Wang[2], **Liangchuan Li[2]**
1.The Hong Kong Polytechnic University, Hong Kong, China; 2.Huawei Technologies, China
For the first time, we demonstrate a real-time 1.6T (2×800G) optical interconnection for 10 km data center application with coherent bi-directional (BiDi) systems. In the systems, coherent BiDi uses single silicon photonics (SiP) based polarization tracker for remote homodyne coherent and achieved a record of 8 krad/s endless SOP tracking speed and wavelength demultiplexing for dual local oscillators (LOs) with 1THz spacing simultaneously. The proposed solution proves that it is promised for low cost and low power consumption 1.6T LR optical interconnection in data center networks.

Poster Session

Track 1: Optical Fibers and Fiber-based Devices

ACPPOEM-0531-1
Hollow-core Fiber with Eight U-shaped Tubes
Yu Pan, Yu cheng, Houquan Liu, Xiao Yiming, libo yuan
Guilin University of Electronic Technology, China
In this paper, we propose a hollow-core fiber with eight U-shaped tubes and discuss a method for reducing loss in hollow-core fibers. A three-order of magnitude reduction in confinement loss can be achieved using this method, which improves hollow-core fiber beam capacity significantly. Furthermore, the eight U-shaped tubes in our proposed hollow-core fiber provide greater flexibility in the design, making it suitable for a variety of applications, such as electronic communication, biosensing and lasers.

ACPPOEM-0707-3
Prediction of Optical Fiber Cable Lifespan Based on Bi-LSTM and Attention Mechanism
Weihua Lian[1], Yuan Li[2], Mengchao Niu[2], Jiaye Zhu[2], Wei Li[1]
1.Huazhong University of Science and Technology, China; 2.Central China Normal University, China
In this paper, multiple factors, including weather conditions such as lightning, wind vibration, as well as the length, stress, and loading ratio of optical cables under all-weather conditions, are comprehensively evaluated in the prediction model. This model can provide more reliable guarantees for ensuring the development and application of optical cable technology, benefiting the industry and its related applications through more effective management and maintenance methods. Simulation results on the experimental dataset presented in this paper demonstrated that the proposed model outperformed other models in predicting the lifespan of optical cables.

ACPPOEM-0719-3
Crosstalk Estimation in Multicore Fiber with Random Bending, Twisting and Structure Fluctuations Perturbations
Hou Shiwen, Xiang Lian
Suzhou Key Laboratory of Advanced Optical Communication Network Technology, China
A novel model for inter-core crosstalk (ICXT) estimation in weakly coupled multi-core fiber based on coupled power theory has been derived with various random perturbations. The simulation shows that in addition to bending and structure fluctuations, twisting has a significant impact on ICXT.

ACPPOEM-0728-24
PLSR Enhanced Ultra-wide Measuring Range Fiber-optic Curvature Sensor Based on Mode Switching Effect in Four Mode Fiber
Xu Wei[1,2], Tang Mutian[3,4], Zhen Li[5], Chen Enqing[6], Tao Jin[5,7], Yu Changyuan[8], Sheng Chunmin[9], Xu Feng[10]
1.School of Electronic and Information Engineering Changshu Institute of Technology, China; 2.Zhejiang Dongtong Optical Network IoT Technology Co., Ltd,, China; 3.Suzhou Source-Digit Communication Technology Co., Ltd,, China; 4.School of Economics and Management Tsinghua University, China; 5.National Key Laboratory of optical communication technology and network China information and Communication Technology Group Co., Ltd., China; 6.Xi'an High Technology Institute, China; 7.Peng Cheng Laboratory, China; 8.Department of Electronic and Information Engineering, The Hong Kong Polytechnic University, Hong Kong, China; 9.Zhejiang Dongtong Optical Network IoT Technology Co., Ltd,, China; 10.SEU-FEI Nano-Pico Center, Key Laboratory of MEMS of Ministry of Education Southeast University, China
A partial least squares regression (PLSR) enhanced ultra-wide measuring range fiber-optic curvature sensor based on mode switching effect in four-mode fiber is proposed and investigated. The curvature measuring range covers from 0 to 8 m^{-1}.

ACPPOEM-0729-5
Temporal-spectral transient dynamics of pulsating solitonsin an ultrafast fiber laser
Junwen Li, Heping Li, Zhuang Wang, Zhiyao Zhang, Yong Liu
University of Electronic Science and Technology of China, China
We demonstrate a time-lens-based temporal magnifier. By utilizing the temporal magnifier and dispersive Fourier transform technique, the temporal-spectral transient dynamics of pulsating solitons are simultaneously measured in an ultrafast fiber laser.

ACPPOEM-0730-38
Longitudinal Mode Broadening in Multi-wavelength Raman Fiber Laser
Yanxin Li, Jiancheng Deng, Ming Shen, Zuowei Xu, Xuewen Shu
Huazhong University of Science and Technology, China
We demonstrate longitudinal mode broadening behavior in multi-wavelength Raman fiber lasers utilizing Sagnac filters. With the increase of pump power, the discrete longitudinal modes gradually broaden and adjacent longitudinal modes overlap.

ACPPOEM-0731-25
All-Fiber LP Mode Converter Based on Cascaded Long-Period Fiber Gratings in the Elliptical Ring Core Fiber
Ziwen Bai, Hu Zhang, Jiaqi Wang, Xiaoguang Zhang, Lixia Xi
Beijing University of Posts and Telecommunications, China
A linearly polarized mode converter based on cascaded long-period fiber gratings in the elliptical ring core fiber is proposed, which exhibits the maximum 10 and 15 dB bandwidths are 188.7 and 165.5 nm, respectively.

ACPPOEM-0731-51
Weakly-Guiding and Weakly-Coupling Ring-Core Fiber with 8 Fully Lifted Mode Groups for Orbital Angular Momentum Mode Space-Division Multiplexing
Xi Zhang[1,2], Jun Liu[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 a ring-core fiber supporting 8 fully lifted OAM mode groups including 3 radially higher-order mode groups with minimum effective index difference between adjacent mode groups larger than 1.21×10^{-3} at 1550 nm.

ACPPOEM-0731-56
High-Flat-Gain and C+L Band Distributed Raman Amplifier Applied in 3 Mode-Group-Division Multiplexing and WDM Long-Haul MIMO-Free Transmission over 104-km Ring-Core Fiber
Yuchen Zhang[1,2], Xi Zhang[1,2], Guofeng Yan[1,2], Min Yang[1,2], Mutian Xu[1,2], Jun Liu[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 demonstrate 3 orbital angular momentum mode-group-division multiplexing assisted with wavelength-division multiplexing for MIMO-free transmission over 104-km ring-core fiber. The distributed Raman amplifier in system shows high flat gain (10dB) over the C+L band.

ACPPOEM-0731-72
Low Differential Modal Gain Trench-assisted Ring-core Erbium-doped Fiber Amplifier Supporting 14 Orbital Angular Momentum Modes
Jiaqi Wang[1], Hu Zhang[1], Haixia Feng[1], Cheng Du[2], Wei Li[2], Jing Yang[1], He Wen[1], Xiaoguang Zhang[1], Lixia Xi[1]
1.State Key Laboratory of Information Photonics and Optical Communications, Beijing University of Posts and Telecommunications, China; 2.Fiberhome Telecommunication Technologies Co. Ltd., China
A ring-core erbium-doped fiber amplifier for mode division multiplexing is proposed to amplify 14 orbital angular momentum modes with gains more than 23dB and differential modal gain less than 1dB.

ACPPOEM-0731-88
Wide measurement range vector curvature sensor based on single stress applying fiber
Jiaqi Cao, Shuqin Lou, Xin Wang
Beijing Jiaotong university, China
To solve the limited measurement range of existing optical fiber curvature sensors, a vector curvature sensor, constructed using the single stress applying fiber (SSAF)-based Sagnac interferometer is presented and experimentally validated. The experiment results demonstrate that the sensor enables curvature measurement over a wide measuring range from $11m^{-1}$ to $26.8m^{-1}$ with the sensitivity of -2.6nm/m^{-1} in upward direction and 1.6nm/m^{-1} in downward direction. Compared with existing sensors, the measurement range has been greatly improved.

ACPPOEM-0731-119
A gas pressure sensor based on optical fiber Fabry-Perot interference
Yuexin Li, Weiming Lyu, Yujian Li, Qing Wang, Xiuyuan Wang, Weihao Yuan, Changyuan Yu
The Hong Kong Polytechnic University, Hong Kong, China
An FPI-basedgas pressure sensor made of single-mode fiber-hollow-core fiber-twin-core fiber is proposed and experimentally observed. The gas pressure sensitivity is ~4.4 nm/MPa and the temperature cross-sensitivity is low to ~0.325 kPa/℃ .

ACPPOEM-0801-20
Sensitivity enhanced optics fiber acoustic sensor for gas leakage detection in booster station
Gang Li[1], Xiaohui Lin[1], Kehong Zeng[1], Bin Zhou[2], Wenming Yang[1], Fei Wang[1]
1.China Petroleum Pipeline Telecom & Electricity Engineering Co.,Ltd, China; 2.South China Normal University, China
An optics fiber acoustic sensor with sensitivity enhanced tube was proposed. The acoustic sensor was used for gas leakage detection in the booster stations of the China West-East Gas Pipeline Project. Many environment noises like hay mower, cicada chirp could seriously interfere the leakage detection. By optimizing the features in the frequency domain, the identification rate was promoted up to 99. 6%.

ACPPOEM-0801-29
Low-loss Fan-in/Fan-out Devices Based On Multi-Cladding Bridge Fibers
Yi Huang, Hai Yang, Chuanlu Deng, Yingying He, Xiaobei Zhang, Tingyun Wang
Key laboratory of Specialty Fiber Optics and Optical Access Networks, Shanghai University, China
We utilized bridge fibers and fused taper method to achieve 7-core fiber fan-in/fan-out devices with low crosstalk of below -51.0 dB. The insertion losses for the devices are 0.56 dB and 0.58 dB, respectively.

ACPPOEM-0801-47
A Giant Fiber-optic Gyroscope with Ultra-low Bias Instability
Yanjun Chen, Huimin Huang, Wenbo Wang, Lanxin Zhu, Xinyu Cao, Xiangdong Ma, Zhengbin Li
Peking University, China
A giant fiber-optic gyroscope is implemented. Temperature compensation based on multiple temperature sensors is used to suppress the effects of the time-varying temperature field. A static observation shows that the bias instability reaches 1.7×10^{-6} °/h.

ACPPOEM-0801-66
All-polarization-maintaining L-band fiber ring laser mode-locked by nonlinear polarization rotation
Guanyu Ye[1], Kin Kee Chow[2], Maolin Dai[1], Takuma Shirahata[1], Shinji Yamashita[1], Sze Yun Set[1]
1.The University of Tokyo, Japan; 2.Manchester Metropolitan University, United Kingdom
We report the first all-polarization maintaining (all-PM) nonlinear polarization rotation (NPR) mode-locked fiber ring laser in the all-anomalous dispersion regime. The laser generates pulses at 1575 nm with a 5 nm spectral width.

ACPPOEM-0801-69
HighConversion EfficiencyLinearly Polarized Single-frequency Fiber Laser Based on Yb: YAG Crystal-derived Silica Fiber
Yongtao Chen, Jianxiang Wen
Shanghai University, China
We demonstrated a linearly polarized single-frequency fiber laser (SFFL) using a 0.7-cm-long Yb:YAG crystal-derived silica fiber (YCDSF). Its optical-to-optical efficiency is 73.8% and polarization extinction ratio (PER) is 31.3 dB.

ACPPOEM-0801-83
Helical-structure phase-shifted Bragg grating fabricated by femtosecond laser
Wang Hupo, Lin Jing, Wu Zhifang
Huaqiao University, China
We demonstrate the fabrication of a novel helical-structure phase-shifted fiber Bragg grating(PS-FBG) by using a femtosecond laser direct writing technique in the single-mode fiber. This approach provides a single-step method for creating PS-FBG. The unique helical structure could introduce phase in the fiber Bragg grating. And a PS-FBG with a narrow 3-dB bandwidth of 35 pm and a peak wavelength of 1552.7 nm was achieved. In addition, the proposed helical-structure PS-FBG exhibited a low strain sensitivity(9.175 pm/με).

ACPPOEM-0801-99
Frequency domain separation of DAS multi-source aliased signals
Huaxin Gu[1], Shuaiqi Liu[1], Feihong Yu[1], Deyu Xu[1], Xingwei Chen[1], Liyang Shao[1], Yu Wu[2], Haifeng Zhang[3]
1.Southern University of Science and Technology, China; 2.University of Electronic Science and Technology, China; 3.Research Institute of Tsinghua University, Pearl River Delta, China
In this paper, fast independent vector analysis (FastIVA) based on convolutionalaliasing model is proposed to separate the aliased signals collected by distributed acoustic sensing (DAS) system, and the time-frequency entropy is used to judge the separation performance. The results show that the time-frequency entropy interval of the separated signals and the source signals correspond to each other, which means that the aliased signals are separated. This method is used to improve the accuracy of DAS system signal detection and recognition in complex real environment, and reduce the number of false alarm events.

ACPPOEM-0801-120
Design and application of pressure sensor based on double plate waveguide core microstructure fiber
Liuyi Xu
Huaqiao University, China
Devices made of flat waveguides are easy to be highly integrated, and flat-core optical fibers reduce the losses incurred in packaging compared to conventional flat waveguides. The coupling effect between the optical waveguides creates resonance peaks at different wavelengths. The design of a bent dual flat plate waveguide core fiber is proposed, and the entry of the bending modulation brings a special loss window as well as special mode transitions with reduced transmission loss. The bending position is in the middle of the three equal parts of the flat plate part, taking the flat plate spacing of 600 nm, the flat plate thickness of 350 nm, and the radius of curvature of 25,000 nm, and the full vector finite element method is used, and we detect the samples under different pressures, which will be gradually increased from 0.2 to 1 MPa every 0.2 MPa, and the sensitivity of the pressures is 14.000 nm/MPa , and the R-Square is 99.9%, with the plate spacing between 550nm-650nm changes, the sensitivity is basically unchanged, the plate spacing has less impact, the radius of curvature between 25000-35000 changes, the sensitivity changes are larger radius of curvature has a greater impact. The designed sensor selects different radius of curvature parameters to get the required corresponding characteristic wavelength and sensitivity. The sensitivity is higher compared to other barometric pressure sensors and hence has a great potential in the application of detecting barometric pressure.

ACPPOEM-0801-140
High Repetition Rate Harmonic Mode-locked Erbium-doped Fiber Laser Based on Graphene Saturable Absorber
Jianwei Zhou[1], Feng Tian[1], Xiaodong Liu[2], Yutian Li[1], Tianze Wu[1], Qi Zhang[1], Qinghua Tian[1], Fu Wang[1]
1.Beijing University of Posts and Telecommunications, China; 2.Beijing Ancoren Science& Technology Co.,ltd, China
A passively harmonic mode-locked Er-doped fiber laser based on graphene saturable absorber(GSA) is demonstrated. The repetition rate of 6.253GHz corresponding to 348th harmonic is obtained for the first time among the same structure of lasers.

ACPPOEM-0808-1
Optimal Few-mode Self-similar Pulse Compression In Photonic Crystal Fibers
Liu Baojun[1], Yuan Jinhui[1], Mei Chao[2]
1.Beijing University of Posts and Telecommunications, China; 2.University of Science and Technology Beijing, China
Few-mode self-similar pulse compression in tapered photonic crystal fibers (TPCF) is proposed. Simulation results show that for 1.55-ps input pulse, self-similar pulse compression with 10 factor can be realized for three modes in 1.9-m.

ACPPOEM-0809-4
100 GHz high-repetition-rate vortex fiber laser
Zhi-Yin Feng, Wen-Yao He, Hu Cui, Zhi-Chao Luo, Wen-Cheng Xu, Ai-Ping Luo
South China Normal University, China
We propose a 100 GHz high-repetition-rate vortex pulse fiber laser based on the dissipative four-wave-mixingmode-locked technique, for the first time to the best of our knowledge,delivering ±1 order vortex pulses.

ACPPOEM-0814-57
Mode Dependent Loss EqualizedFew-mode Fiber Photonic Lantern
Yingxuan Li, Senyu Zhang, Jing Liu, Zhuyixiao Liu, Zhiyong Zhao, Ming Tang
Huazhong University of Science and Technology, China
We propose and fabricate anabnormal photonic lantern, which can equalize mode dependent loss for two LP mode transmission, therefore it can not only accomplish mode multiplexing and demultiplexing, but also mode equalization.

ACPPOEM-0815-14
Low Latency Fiber CommunicationSystem Equalizer Based onPhotonicReservoir Computing
Xiaoyan Zuo[1], Li Pei[1], Bing Bai[1,2], Bowen Bai[3], Jianshuai Wang[1], Juan Sui[2]
1.Beijing Jiaotong University, China; 2.Photoncounts (Beijing) Technology Co. Ltd, China; 3.Peking University, China
We demonstrate a low latency fiber channel distortion equalizer basing on photonic reservoir computing chip for C-band IMDD link.The equalizer can adapt to different optical fiber transmission distances and signal rates without modifying photonic chipstructure.

ACPPOEM-0815-28
O-Band Optical Burst Mode Amplifier for Optical Switching Data Center Networks
Kit On CHUNG[1,2], Kwong Shing Tsang[1], Wai Sing Man[2], Dongmei Huang[1], Pak Tao Lau[1], Chao Lu[1]
1.The Hong Kong Polytechnic University, Hong Kong, China; 2.Amonics Limited, China
An O-band optical burst mode amplifier is demonstrated for optical switched data center interconnects. Linear gain and gain variation among different input peak levels of less than 1.3dB have been realized.

ACPPOEM-0815-35
Photonic Crystal Fiber Refractive Index Sensor Based on Surface Plasmon Resonance Effect
Danlin Feng, Jinhui Yuan, Jingao Zhang, Kuiru Wang, Binbin Yan, Xinzhu Sang
Beijing University of Posts and Telecommunications, China
A photonic crystal fiber (PCF) refractive index (RI) sensor based on surface plasmon resonance effect is proposed. The maximum sensitivity of the PCF RI sensor can reach 28,300 nm/RIU in the RI range of 1.30 to 1.40.

ACPPOEM-0815-42
Research on the Splicing performance of G.654.E optical Fiber
Hongyan Zhou[1], Guangzhe Wu[2], Jun Wu[1]
1.Key Laboratory of Optical Fibre and Cable Manufacture Technology, Yangtze Optical Fibre and Cable Joint Stock Limited Company, Optics Valley Laboratory, China; 2.State Grid Information & Telecommunication Branch, China
Novel G.654.E has been large-scale deployed in optical communication network, so it has become urgent problems to reduce the splicing loss, improve the success probability of in one splicing and unsatisfactory splicing loss from different manufacturers in practical engineering applications. Based on the theory of single-mode fiber splicing loss testing, we obtained a large number of laboratory experiment data and practical network engineering data to verify the splicing performance form the same and different manufacturers of G.654.E fiber in various aspects based on different splicing machines. And also we propose a targeted splicing optimization scheme for practical engineering applications. All of the research provides a guidance for engineering application of G.654.E optical fiber in practical network engineering.

ACPPOEM-0815-57
Simultaneous measurement of magnetic field and temperature by using 3D printed multicore fiber-tip probes
Cong Xiong, Caoyuan Wang, Wei Ji, Limin Xiao
Fudan University, China
An ultracompact multicore fiber-tip sensor is proposed, designed, and experimentally demonstrated. The 3D printed multicore fiber-tip probes provide a highly sensitive and reliable scheme for discriminative measurement of magnetic field and temperature.

ACPPOEM-0815-76
Broadband Helical Long-Period Grating Inscribed in a Double-Cladding Fiber
Chen Jiang[1], Ying Wan[2], Zuxing Zhang[1], Yuehui Ma[3], Chengbo Mou[3], Yunqi Liu[3]
1.Nanjing University of Posts and Telecommunications, China; 2.Nanjing University of Information Science & Technology, China; 3.Shanghai University, China
We demonstrate the fabrication of a broadband helical long-period grating using a CO_2-laser automated inscription technique. A 10-dB bandwidth of 160 nm was achieved for the grating, which featured a compact length of 5.98 mm.

ACPPOEM-0815-85
All-fiber mode-locked femtosecond laser based on Er: YAG crystal-derived silica fiber
Ying Wan[1], Chen Jiang[2], Yuxia Zheng[3], Yongtao Chen[3], Taximaiti Yusufu[4], Jianxiang Wen[3]
1.Nanjing University of Information Science & Technology, China; 2.Nanjing University of Posts and Telecommunications, China; 3.Shanghai University, China; 4.Xinjiang Normal University, China
We demonstrated an all-fiber mode-locked femtosecond laser employing a 7.6 cm long Er: YAG crystal-derived silica fiber.

The mode-locked pulses operate with a duration of 686 fs and achieve a signal-to-noise ratio of 83.6 dB.

ACPPOEM-0815-92
Study on the optical radiation distribution of Gaussian and vortex beams based on AFM
Hengfei Guo[1], Yana Shang[1], Zhenmin Liu[1], Shaoying Li[1], Yong Liu[1], Na Chen[1], Shupeng Liu[1], Heming Wei[1], Fufei Pang[1]
Shanghai University, China
Information regarding the optical radiation distribution of Gaussian and vortex beams is characterized, by recording the optical force applied to the apex of atomic force microscopy (AFM) probe.

Track 2: Optical Transmission Systems, Subsystems and Technologies

ACPPOEM-0505-1
Influence of analogue-to-digital converters on multichannel digital nonlinearity compensation in 200-Gb/s-per-wavelength DP-QAM transmission systems
Zhang Yunfan[1], Xu Tianhua[1,2,3], Wang Yulin[2], Jin Cenqin[2], Xu Tongyang[3,4], Tan Mingming[5], Zhao Jian[1], Liu Tiegen[1]
1.School of Precision Instruments and Opto-Electronics Engineering, Tianjin University, China; 2.School of Engineering, University of Warwick, United Kingdom; 3.Department of Electronic and Electrical Engineering, University College London, United Kingdom; 4.School of Engineering, Newcastle University, United Kingdom; 5.Aston Institute of Photonic Technologies, Aston University, United Kingdom
In this paper, the comprehensive research on the influence of analog-to-digital converters (ADCs) resolution bits on the performance of the multichannel DBP (MC-DBP) has been carried out in high-capacity optical fiber communication systems.

ACPPOEM-0629-1
Mode crosstalk mitigation based on convolutional neural network in direct detection mode division multiplexing passive optical network
Li Chen, Hui Yang, Lianshan Yan, Xiaoyu Lu
Southwest Jiaotong University, China
A crosstalk mitigation scheme based on convolutional neural networks is proposed for MDM-PON. The simulation results show the proposed scheme can effectively compensate for channel impairment without requiring information from other modes.

ACPPOEM-0712-1
Investigations of wavefront shaping for improving the transmission distance of VCSEL-MMF based optical communication links
Daohui Hu[1], Lin Sun[1], Bin Chen[2], Ning Liu[1], Gangxiang Shen[1]
1.Soochow University, China; 2.Hefei University of Technology, China
We investigate the wavefront shaping technique to improve the transmission distance of VCSEL-MMF optical links. Impacts of the number of sub-blocks and phase accuracy of wavefront shaping on the improving performance is analyzed by simulations.

ACPPOEM-0713-2
Experimental Demonstrations of Point-to-multipoint Flexible Optical Transceiver-enabled Concurrent Direct Inter-ONU and Upstream Communications in IMDD PONs
Wei Jin[1], Lin CHEN[2], Jiaxiang He[1], Roger Philip Giddings[1], Hao Ming[3], Jianming Tang[1]
1.Bangor University, United Kingdom; 2.Shanghai University of Electric Power, China; 3.Sichuan University of Science and Engineering, China
Point-to-multipoint flexible optical transceiver-enabled concurrent direct inter-ONU and upstream communications are experimentally demonstrated in 62.47Gbit/s@27km IMDD PONs. The PONs flexibly and adaptively establish simultaneous ONU-to-ONU and ONU-to-OLT communication connections according to end-user's dynamic requirements.

ACPPOEM-0719-2
Linear Fitting-Based Residual Frequency Offset Compensation in Simultaneous Transmitting and Sensing System Using Coherent Transponders
Hao Zhou[1], Wen Zuo[1], Yaojun Qiao[1], Yan Zhao[2], Bing Ye[2]
1.Beijing University of Posts and Telecommunications, China; 2.ZTE Corporation, China
A linear fitting-based residual frequency offset compensation (LF-RFOC) algorithm is proposed for simultaneous transmitting and sensing using transponders. The power spectrum density of phase noise induced by residual frequency offset is mitigated by 34.5 dB.

ACPPOEM-0719-4
Integrated Radar Jamming and Secure Wireless Communication Based-on Photonics at Ka-band
Wang Yanyi[1], DuDongju[1], Songying Xiong[1], Lizheng Xuan[1], Ye Nan[1], Zhangqian Wu[1], Zhang Junjie[1], Chen Jian[1], Cao Bingyao[1], Yu Jianjun[2]
1.Shanghai University, China; 2.Fudan University, China
We propose and experimentally demonstrate a novel scheme that integrates radar jamming signal generation and chaotic encryption wireless communication based on photonics.

ACPPOEM-0719-6
Decision Feedback Channel Estimation for Integrated Mobile VLCP Based on STBC-MIMO
Yuzhe Sun[1], Xiaodi You[1], Jian Chen[2], Changyuan Yu[3], Mingyi Gao[1], Gangxiang Shen[1]
1.Soochow University, China; 2.Nanjing University of Posts and Telecommunications, China; 3.The Hong Kong Polytechnic University, Hong Kong, China
Decision feedback channel estimation is employed to enhance the performance of an integrated mobile VLCP system based on STBC-MIMO, where reliable communication and positioning can simultaneously be achieved when receiver moves at 1 m/s.

ACPPOEM-0721-2
Convolutional Neural Network based Equalization for 112-Gbit/s High Speed Optical Link
Na Li[1], Wei Li[1], qanggao Hu[2], Yi Jiang[2], liyan Huang[2], Peili He[1], Zhongshuai Feng[1]
1.Huazhong University of Science and Technology, China; 2.Accelink Technologies Co., Ltd, China
We proposed a CNN-based equalizer with 2 convolutional layers, 2 full-connected layers and 1 output layers. We experimentally demonstrate 112-Gbit/s PAM transmission based on a 30-GHz MZM over 2/10-km SSMF at 1550nm using the equalizer.

ACPPOEM-0724-3
Optimization of NB-QC-LDPC codes with column weight not exceeding three
Jingke Zou, liqian Wang
Beijing University of Posts and Telecommunications, China
The non-binary quasi cyclic low-density parity-check (NB-QC-LDPC) code is a strong candidate code in optical communication. However, the presence of elementary absorbing sets in NB-QC-LDPC codes can degrade the frame error rate (FER) performance of the codes in the error floor region. Additionally, better minimum Hamming distance distribution can improve the FER performance of codes in the waterfall region. In this paper, a joint optimization of absorbing sets and minimum Hamming distance distribution is proposed for NB-QC-LDPC codes with a maximum column weight not exceeding 3. Simulation results show that the constructed codes could achieve comparable or better FER compared to the recently proposed NB-QC-LDPC codes with the same codes parameters.

ACPPOEM-0725-3
High-Speed C-Band Transmission Using the Advanced Low-complexity Threshold-assisted Memory Polynomial Equalizer
Fei Xie[1], Xiaoqian Huang[1], Hengying Xu2, Yaojun Qiao[1]
1.Beijing University of Posts and Telecommunications, China; 2.Liaocheng University, China
In this paper, we firstly propose a threshold-assisted memory polynomial equalizer (TA-MPE), in which different thresholds are deployed in the memory polynomial equalizer (MPE) to combat inter-symbol interference (ISI) while significantly reducing computational complexity

ACPPOEM-0725-13
A CGAN-aided Autoencoder Supporting Joint Geometric Probabilistic Shaping for Optical Fiber Communication System
Yuzhe Li[1], Huan Chang[2], Qi Zhang[1], Xiangjun Xin[2], Gao Ran[2], Tian Feng[1], Qinghua Tian[1], Wang Fu[1], Li Zhipei[2]
1.Beijing University of Posts and Telecommunications, China; 2.Beijing Institute of Technology, China
An autoencoder supporting joint geometric and probabilistic shaping is proposed with aid of conditional generative adversarial network. Result shows that BER is reduced by 12% compared to a probabilistic shaping-only signal with the same entropy.

ACPPOEM-0726-20
Fiber Nonlinearity Compensation Using Deep Photonic Reservoir Computing
Yiwei Shen, Ruiqian Li, Guanting Liu, Jingyi Yu, Xuming He, Cheng Wang
ShanghaiTech University, China
We experimentally demonstrate a deep photonic reservoir computing architecture based on cascading injection-locked lasers. It is proved that the deep reservoir computing network with three layers well compensates the nonlinearity of optical fiber communication systems.

ACPPOEM-0726-24
A high-accuracy modulation format recognition scheme based on NFDM system
Jinwang Bai, Yongjun Wang, Xingyuan Huang, Lu Han, Haifeng Yang, Gang Feng
Beijing University of Posts and Telecommunications, China
This paper proposes a CNN aided MFR scheme for NFDM optical communication system, with a recognition accuracy of 99.5% under low OSNR and 100% under high OSNR.

ACPPOEM-0726-26
Deep Learning Based Free Space Optical Communication Diversity System
Hui Peng, Liqian Wang
Beijing University of Posts and Telecommunications, China
In this paper, a DL-based spatial diversity system for free-space optical (FSO) communication is proposed. Compared to traditional FSO spatial diversity systems that employ Maximum Ratio Combining (MRC), Equal Gain Combining (EGC), and Selection Combining (SC) techniques, the proposed system reduces system complexity while maintaining an acceptable performance. When simulating atmospheric turbulence with 16 turbulence states, the DL-based FSO diversity system achieves an operating time of 5.56s, whereas the traditional FSO diversity system requires 8.24s under the same conditions. In fact, turbulence states in the range of 200-300 are commonly employed to better emulate atmospheric channels. As the

number of turbulence states increases, the DL-based FSO diversity system demonstrates a more significant performance advantage in terms of operating time compared to traditional systems.

ACPPOEM-0727-10
Cable Capacity Optimization for Power-Limitted Submarine Transmission Systems
Yanpu Wang, Changwu Xu, Shao Yue, Lin Jiang, Li Jianping
HMN Technologies Co., Ltd., China
The capacity of the ultra-long-haul submarine cable system is limited by the power supply and electro-optical conversion efficiency. The system design needs to optimize cable current and the electro-optical efficiency of the repeater while considering the constraints of the power feed. This paper calculates and analyzes the optimized current of a typical transatlantic cable. It also analyzes the impact of bandwidth on pump conversion efficiency using Erbium-Doped Fiber Amplifier (EDFA) simulator. In contrast to conventional submarine cable systems, spatial division multiplexing (SDM) systems support a larger number of fiber pairs and operate at a lower optical power level, which is limited by the power supply. This paper compares the relationship between capacity and the number of fiber pairs with different bandwidths in transatlantic cables to determine the optimal number of fiber pairs.

ACPPOEM-0727-11
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 (GSNR) 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.

ACPPOEM-0727-12
Unsupervised denoising assisted channel impairment compensation for next-generation optical access networks
Hong Guo, Hui Yang, pengcheng Deng, Li Chen, xiaoyu Lu
Southwest Jiaotong University, China
We propose a novel channel impairment compensation scheme that combines unsupervised denoising and Least Square equalizer for next-generation PONs. The results demonstrate the proposed scheme enhances the BER performance by improving OSNR of received signals.

ACPPOEM-0727-13
A Wide-Broadband Spectrum (110nm) Fabry-Perot Photodetector Enabling Cost-Efficient 10 Gb/s Optical Communications
Hao Zhong[1], Zhigang Cao[1], Zhijia Hu[1], Zichen Liu[2], Zhixue He[2], Chao Li[2]
1.Anhui University, China; 2.Peng Cheng Laboratory, China
We proposed a 110nm (1520nm~1630nm) broadband photodetector based on Fabry-Perot cavity and implemented it in a 10 Gb/s experimental wavelength-controllable optical wireless communication system over 3m link.

ACPPOEM-0727-19
Carrier-Assisted Ultra-Fast Phase Retrieval in Direct Detection DSCM System
Xiuquan Cui, Linsheng Fan, Jianyu Wang, Yuchen Jia, Jiexing Lin, Yong Yao, Yanfu Yang
Harbin Institute of Technology, Shenzhen, China
We report a strongly constrained phase retrieval (SC-PR) scheme for digital subcarrier multiplexing (DSCM) signals based on the Gerchberg-Saxton algorithm, which features fast convergence with less than 5 iterations and lowCSPR within 1dB.

ACPPOEM-0727-20
Roll-Off Insensitive and Robust Receiver IQ Skew Monitoring Based on Nonlinear Godard Algorithm for DSCM Systems
Yuchen Jia, Linsheng Fan, Qun Zhang, Xiuquan Cui, Siyu Gong, Jianyu Wang, Muqi Liu, Yong Yao, Yanfu Yang
Harbin Institute of Technology, Shenzhen, China
We report a receiver IQ skew monitoring scheme for coherent digital subcarrier multiplexing (DSCM) systems based on nonlinear Godard algorithm, which is insensitive to roll-off factors and robust to transceiver impairments and ASE noise.

ACPPOEM-0728-6
Experiment and field test of Raman amplifier based on 400G communication system
Zhang Chuanbiao, Tang Xiongyan, Shen Shikui, Zhang He, Shi Yan, Zhang Yejing, Hu Yakun, Tang Yu
China Unicom Research Institute, China
The performance optimization of Raman amplifier in 400G system is analyzed. Compared with the test in real fiber link, the quality of actual fiber link has a greater influence on Raman amplifier.

ACPPOEM-0728-22
Real-time Satellite Optical Terminal Prototype with 10Gbit/s Bidirectional Digital Video Transmission and Ranging Function
GongLewei[1], QuYuanzhe[1], SongYingxiong[1], WangShulei[1], ZhangQianwu[1,2], ZhangJunjie[1,2]
1.Shanghai University, China; 2.Teralink Optical Corporation (Shanghai), China
We demonstrate a real-time satellite optical terminal prototype with large-capacity communication and ranging function. A sensitivity of -41 dBm and ranging RMS of 0.039 cm is achieved at 10 Gbit/s bidirectional transmission.

ACPPOEM-0728-27
A Low Complexity Nonlinear Equalizer Based on Wavelet Clustering Algorithm
Xiying Ding, Yongjun Wang, Xingyuan Huang, Lu Han, Dewen Chen, Chao Li
Beijing University of Posts and Telecommunications, China
A nonlinear equalization technique based on grid retrieval wavelet clustering algorithm is proposed and verified in the 16-QAM coherent optical communication system. Compared with other iterative clustering algorithms, wavelet clustering has lower linear time complexity.

ACPPOEM-0728-30
Long-haul optical chaos synchronization employing optical phase conjugation
Liang Li, Anlin Yi
Center for Information Photonics & Communications, School of Information Science and Technology Southwest Jiaotong University, China
Optimization of launching power, fiber transmission-distance, linewidth of the pump laser in the OPC module are well studied. Finally, an up to 2240-km chaos synchronization with a synchronization coefficient beyond 0.9 is obtained.

ACPPOEM-0728-34
An Improved Hybrid Switching Scheme for UAV-to-Ground ACM FSO System
Qianwu Zhang[1], Boyang Liu[1], Guanwen Chen[1], Shucheng Zhan[1], Zhiyu Li[1], Jing Zhang[2], Ning Jiang[2], Bingyao Cao[1], Zhengxuan Li[1]
1.Shanghai University, China; 2.University of Electronic Science and Technology of China, China
An improved hybrid switching scheme is proposed for UAV-to-Ground ACM FSO system. Simulation results show SNR switching threshold deviation is reduced by 3.65 dB in strong turbulence.

ACPPOEM-0729-16
Semi-Supervised Feature-Crosses Neural Network Equalizer In Fiber Optics
Rui Yang[1,2,3], Qi Zhang[2,3,4], Xiangjun Xin[5,6], Fu Wang[2,3,4], Jinkun Jiang[1,2,3], Feng Tian[2,3,4], Qinghua Tian[2,3,4], Yongjun Wang[2,3,4], Leijing Yang[2,3,4]
1.School of Electronic Engineering, China; 2.Beijing Key Laboratory of Spaceground Interconnection and Convergencet, China; 3.Beijing University of Posts and Telecommunications, China; 4.State Key Laboratory of Information Photonics and Optical Communications, China; 5.School of Information and Electronics, China; 6.Beijing Institute of Technology, China
In this paper, a semi-supervised feature-crosses nonlinear equalization(FC-NLE) scheme with adaptive threshold regulation and consistency regularization is proposed to compensate for the linear and nonlinear impairment in the high-speed optical communication systems.

ACPPOEM-0730-10
Real-time 3.4-Gbit/s DMT-VLC transmission with block precoding techniques
Jie Zhou[1], Ming Chen[1], Xu Gao[1], Rui Deng[2]
1.Hunan Normal University, China; 2.Huachang Chip-lighting Co., Ltd, China
We experimentally demonstrated two block precoding techniques for real-time DMT and red LED-based VLC systems, and the real-time 3.4-Gbit/s DMT signal can transmit over a 2.3-m free-space link with the BER below 1e-3.

ACPPOEM-0730-11
A stepped low density parity check codes punching algorithm based on multiple check matrices
Xie Rongzhen[1,2], Zhang Qi[2,3], Xin Xiangjun[4,5], Wang Fu[2,3], Tian Feng[2,3], Tian Qinghua[2,3], Wang Yongjun[2,3], Yang Leijing[2,3], Jiang Jinkun[1,2]
1.School of Electronic Engineering, China; 2.Beijing University of Posts and Telecommunications, China; 3.Beijing Key Laboratory of Space-Ground Interconnection and Convergence, China; 4.The Advanced Research Institute of Multidisciplinary Science, China; 5.Beijing Institute of Technology, China
A stepped low density parity check (LDPC) codes punching algorithm based on multiple check matrices is proposed. The proposed scheme is more flexible to realize the adaptive rate under Gaussian white channel. In a 100Gbit/s optical communication simulation system, the proposed algorithm has about 0.49dB gain after 1000km of transmission, compared to the general punching algorithm.

ACPPOEM-0730-12
Non-Recursive Algorithm for Bounded-energy Trellis Computation in Enumerative Sphere Shaping
Jinkun Jiang[1], Qi Zhang[1], Xiangjun Xin[2], Ran Gao[2], Fu Wang[1], Zhipei Li[2], Feng Tian[1], Qinghua Tian[1], Yongjun Wang[1]
1.Beijing University of Posts and Telecommunications, China; 2.Beijing Institute of Technology, China
A non-recursive energy-free bounded-energy trellis calculation algorithm is proposed in this paper. Based on the derivation of the recursive relationship of the trellis nodes, a non-recursive calculation method is applied, and energy-related calculations are removed, thereby reducing the computational complexity. The results of complexity analysis and numerical simulation show that under different block lengths, maximum energy, and amplitude alphabet size, lower complexity always be

achieved by the proposed algorithm.

ACPPOEM-0730-15
Sparse Bayesian Learning-based Channel Estimation for Indoor OTFS Visible Light Communication
Yuxuan Liao[1], Jianhua Pei[1], Weijie Dai[1], Jian Song[1,2,3], Yuhan Dong[1,3]
1.Shenzhen International Graduate School, Tsinghua University, China; 2.Department of Electronic Engineering, Tsinghua University, China; 3.Peng Cheng Laboratory, China
Benefiting from the sparse representation of channels in the delay-Doppler (DD)-domain, orthogonal time-frequency space (OTFS)-based visible light communication (VLC) systems can compensate different channel impairments to detect transmitted symbols with the knowledge of channel state information (CSI). However, in prior OTFS-based VLC works, the effective channel estimation method has not been fully explored yet. In this paper, we derive the relation equation between the channel impulse response (CIR) and the received DD-domain pilot signal subblock to provide an efficient channel estimation method based on sparse Bayesian learning (SBL) algorithm. Numerical results have shown that the proposed embedded pilot-aided DD-SBL channel estimation scheme significantly outperforms other conventional methods in terms of estimation accuracy and bit error rate (BER) performance for practical scenarios.

ACPPOEM-0730-21
Underwater Real-time Mobile Duplex Video Transmission Using Visible Light
Jiehui Liu, Lin Ma, Zuyuan He
Shanghai Jiao Tong University, China
We demonstrate an underwater visible light mobile communication system at 5.0 Mb/s data rate while moving at 0.21 m/s. Real-time duplex video transmissionwas achieved at a distance ranging from 1.3 m to 5.6 m.

ACPPOEM-0730-28
20Gbps Free-Space Optical Chaotic Communication Based on Orbital Angular Momentum Multiplexing
Yiqun Zhang[1], Ning Jiang[1], Anran Li[1], Mengjie Zhou[2], Shuangcheng Chen[2], Jiazheng Ding[2], Gang Hu[1], Yongsheng Cao[1], Kun Qiu[1]
1.University of Electronic Science and Technology of China, China; 2.Tianfu Xinglong Lake Laboratory, China
We experimentally demonstrate a free-space all-optical chaotic communication system that enhances transmission capacity and security by orbital angular momentum (OAM) multiplexing. Optical chaotic signals with two different OAM modes carrying 20 Gbps on-off keying signals are secretly transmitted over a 2 m free-space link. Our work may inspire structured light application in optical chaos and pave a new way for developing future high-capacity free-space chaotic secure communication systems.

ACPPOEM-0730-30
Wasserstein Autoencoder based End-to-End learning strategy of geometric shaping for an OAM mode division multiplexing IM/DD transmission
Zhaohui Cheng[1], Ran Gao[1], Qi Xu[1], Fei Wang[1], Yi Cui[2], Xiangjun Xin[1]
1.Beijing Institute of Technology, China; 2.Beijing University of Posts and Telecommunications, China
We propose a Wasserstein Autoencoder based end-to-end geometric shaping scheme for IM/DD OAM-MDM optical fiber communication system. Compared with traditional autoencoder, the BER decreased by up to 28% and 33% with two OAM modes.

ACPPOEM-0730-32
Baud-rate and IQ skew tolerant timing recovery for short-reach coherent optical interconnection
Siyu Gong[1], Yanfu Yang[1], Qian Xiang[2], Jianhua Liu[2], Qun Zhang[2], Tianjian Zuo[2]
1.Harbin Institute of Technology, Shenzhen, China; 2.Huawei Technologies Co., Ltd, China
A baud-rate timing recovery scheme with PN sequence synronization is proposed. Compared to traditional scheme, the compensation capability of sampling phase error and IQ skew in our scheme is confirmed by both simulation and experiment.

ACPPOEM-0730-33
Hybrid Probabilistic and Geometric Constellation Shaping for Phase Noise Channels with an Improved Differentiable Blind Phase Search
Liu Zhiyang, Liu Xiaoyu, Xiao Shilin, Yang Weiying, Hu Weisheng
Shanghai Jiao Tong University, China
We perform hybrid probabilistic and geometric constellation shaping in a phase noise channel using bitwise end-to-end learning with an improved two-stage differential blind phase search. The proposed approach reduces computational complexity with favorable performance.

ACPPOEM-0730-36
On Propagation of OAM Modes carried by Partially Coherent Laguerre-Gaussian Beams in Weak Oceanic Turbulence with Wide Range Parameters
Weijie Dai[1], Yuxuan Liao[1], Yize Zhang[1], Yuhan Dong[1,2]
1.Shenzhen International Graduate School, Tsinghua University, China; 2.Peng Cheng Laboratory, China
In this work we consider the propagation properties of orbital angular momentum (OAM) modes carried by partially coherent Laguerre-Gaussian beams (PCLGB) in weak oceanic turbulences of wide range where the average temperature varies from 0 to 30 degrees of Celsius and the average salinity varies from 0 to 40 part per thoUnited Statesnd, which stand available for describing most scenarios in realistic oceanic environments. By utilizing the oceanic turbulence optical power spectrum capable of describing wide range oceanic optical turbulence into the propagation of PCLGB, we evaluate the cor-

responding turbulent coherent length, the detection and crosstalk probabilities of OAM modes, constituting the direct and vital metrics in OAM-based underwater wireless optical communication systems, for which our results offer assessments of metrics and provide instructions under wide range parameters

ACPPOEM-0730-45
Dual-Mode Spatial Division Multiplexing with Geometric Constellation Shaping for UVLC
Wang Jiwei[1], Chen Chen[1], Deng Bohua[2], Liu Min[1], He Cuiwei[3], Fu H. Y.[2]
1.Chongqing University, China; 2.Tsinghua University, China; 3.Japan Advanced Institute of Science and Technology, Japan
A dual-mode spatial division multiplexing (DM-SDM) scheme with geometric constellation shaping (GCS) is proposed for underwater visible light communication (UVLC) systems. Simulation and experimental results successfuly verify the superiority of DM-SDM with GCS for UVLC.

ACPPOEM-0730-46
Performance Analysis of Adaptive Optics in Turbulence Compensation with WFS for Synthetic Aperture Lidar Imaging
Chao Chen, Yan Li, Hongxu Song, Xiaobin Hong, Hongxiang Guo, Jian Wu
State Key Laboratory of Information Photonics and Optical Communication, Beijing University of Posts and Telecommunications, China
Synthetic aperture lidar (SAL) is a widely used radar system, and the quality of its imaging is greatly affected by atmospheric turbulence during transmission. The use of adaptive optics (AO) systems can effectively improve the imaging quality. In this paper, we constructed a SAL simulation system based on wavefront sensing (WFS) and studied its imaging quality. The simulation results show that the adaptive optics system with WFS can effectively improve the imaging signal-to-noise ratio (SNR) of the system, and has almost no negative impact on its imaging resolution.

ACPPOEM-0731-1
A Low-Complexity Adaptive Equalizer for Field PDM-PAM4 with Coherent Detection
Yuyuan Gao, Zhou Xian, Wang Shiyao, Fang Qianwen
Univesity of Science and Technology Beijing, China
A low-complexity equalization based on SP-LMS iteration is proposed to compensate the IQ imbalance of field modulated PAM4 signals. This algorithm reduces the complexity compared to conventional algorithms. Further, the IQ amplitude phase imbalance can be estimated based on the tap coefficients of the first stage.

ACPPOEM-0731-5
22.5 Gbps UOWC Using WDM/PolM and OFDM with Interleaved Subcarrier Number Modulation
Chen Jiamin[1], Deng Bohua[2], Chen Chen[1], Fu H. Y.[2]
1.Chongqing University, China; 2.Tsinghua University, China
A 22.5-Gbps UOWC system using WDM/PolM is demonstrated, where OFDM with interleaved subcarrier number modulation (OFDM-ISNM) is proposed to extend the United Statesble bandwidth. Experimental results show a 78.6% bandwidth extension by OFDM-ISNM compared with OFDM.

ACPPOEM-0731-12
Multi-level Decomposition Enumerative Sphere Shaping Scheme for Short Blocklengths
Xuezhen Wang, Lishan Yang, Chenglin Bai, Hengying Xu, Danping Pan, Weibin Sun, Yining Zhang, Zukai Sun, Pengfei Li
Liaocheng University, China
The Multi-level Decomposition Enumerative Sphere Shaping Scheme proposed in this paper reduces the average amplitude energy and rate loss of traditional ESS, while also improving the OSNR gain without increasing complexity.

ACPPOEM-0731-14
DP-16QAM and DP-QPSK Coherent Links for 1.6Tb/s in O-band
Yao Chaonan[1], Zhu Yanjun[2], Zhang Hua[1]
1.Hisense Broadband Multimedia Technologies Co., Ltd., China; 2.Hisence Broadband Inc., United States
We report results of 800 Gb/s (1.6 Tb/s with 2 lanes, for DP-16QAM) and 400 Gb/s (1.6 Tb/s with 4 lanes, for DP-16QAM and DP-QPSK) with transmission link from 2 km to 20 km at O-band. For 1.6 Tb/s interface bandwidth, 400 Gb/s per lane with DP-QPSK technology has potential advantages for LR reach applications, while 800 Gb/s per lane (for DP-16QAM) extends these advantages for scaling the interconnect (interface) bandwidth efficiently beyond 1.6Tb/s.

ACPPOEM-0731-21
CNN Based Input Power Optimization for S , C and L Wide-band Transmission Systems
Han Li, Wu Liu, Hong Li, ZhiYi Zhong, Ming Luo
State Key Laboratory of Optical Communication Technologies and Networks, China
Based on CNN, we estimate the optimal input power with given output power for 186 S+C+L channels in a 160 km 2-span amplification link and the estimation MAE is 0.19dB.

ACPPOEM-0731-27
A Deep Neural Network-Based Split-Step Decoding Algorithm in Optical Spatial Modulation System
Minghua Cao, Xiangwen Ye, Yue Zhang, Ruifang Yao, Zhihao Li, Huiqing Wang
Lanzhou University of Technology, China
In order to address the issues of low transmission rate and low spectral efficiency in existing optical spatial modulation, we propose a Deep Neural Network (DNN)-based split-step decoding algorithm for optical spatial pulse position modulation Faster-Than-Nyquist (OSPPM-FTN) scheme to achieve near optimum performance with low-complexity. Additionally, we derive the theoretical upper bound of bit error rate (BER) for the OSPPM-FTN system under the Gamma-Gamma turbu-

lence channel and validate its reliability using Monte Carlo method. Simulation results demonstrate that compared to existing OSPPM at acceleration factor τ=0.9, the OSPPM-FTN scheme achieves higher spectral efficiency and transmission rate by 0.17 bit/s/Hz and 0.22 bpcu respectively, albeit with a loss of approximately 1 dB in signal-to-noise ratio (SNR). Moreover, our proposed decoding algorithm exhibits 42% lower computation complexity than the maximum likelihood (ML) algorithm.

ACPPOEM-0731-31
250m Daytime Real-time LED-OWC System
Wang Shulei[1], Qu Yuanzhe[1], Chen Jian[1], Yu Zongbi[1], Chen Yanhao[1], Yuan Yongchun[2], Yuan Shidong[2], Zhang Qianwu[1,3], ZhangJunjie[1,3]
1.Shanghai University, China; 2.Shanghai Institute of Technical Physics Chinese Academy of Sciences, China; 3.Teralink Optical Corporation (Shanghai), China
We have demonstrated a simple LED-OWC system based on FPGA. From the indoor and field tests, the real-time extreme communication sensitivity and transmission distance at 1Mbps OOK are of -41.93dBm and 250m respectively.

ACPPOEM-0731-53
On the PMD Impact of Dual-Polarization Direct Detection with Jones-Space Optical Field Recovery
Qi Wu[1,2], Yixiao Zhu[1,2], Hexun Jiang[1], Zhaopeng Xu[2], Honglin Ji[2], Yu Yang[2], Gang Qiao[2], Shangcheng Wang[2], Lulu Liu[2], Junpeng Liang[2], Jinlong Wei[2], Jiali Li[2], Zhixue He[2], Qunbi Zhuge[1], Weisheng Hu[1,2]
1.Shanghai Jiao Tong University, China; 2.Peng Cheng Laboratory, China
We theoretically extend the concept of proposed Jones-space optical field recovery to the all-order polarization mode dispersion model for short-reach direct detection optical fiber communications. We numerically verify the impact of polarization mode dispersion can be mitigated using linear equalization as coherent detection systems with a 56-GBd dual-polarization QPSK, 16-QAM, and 64-QAM simulation.

ACPPOEM-0731-55
Low Latency and Resource Consumption Phase Recovery for Real-time Inter-satellite QPSK Optical Communications
Yanhao Chen[1], Yuanzhe Qu[1], Junjie Zhang[1], Lewei Gong[1,2], Qianwu Zhang[1,2], Yingxiong Song[1,2]
1.Shanghai University, China; 2.Teralink Optical Corporation(Shanghai), China
We propose a real-time QPSK phase recovery method. Compared with conventional CORDIC system, the latency and resource consumption are reduced by 83.87% and over 64%, while the sensitivity is improved by 0.3 dB.

ACPPOEM-0731-57
Enhanced Transmission Rate and Reach for POF-based VLC system with Probabilistic Shaping PAM-8
Yibin Li, Zixian Wei, Bohua Deng, H. Y. Fu
Tsinghua University, China
PS-PAM-8 is experimentally demonstrated to improve transmission performance of the POF-based VLC system, i.e., enhancing the transmission rate by 28% and transmission reach up to beyond 50 m.

ACPPOEM-0731-84
Neural hierarchical network based channel emulator for IM/DD OAM mode division multiplexing optical fiber communication system
Fulin Yang[1], Ran Gao[2], Qi Xu[2], Fei Wang[2], Qi Zhang[3], Xiangjun Xin[4]
1.School of Electronic Engineering Beijing University of Posts and Telecommunications, China; 2.School of Information and Electronics Beijing Institute of Technology, China; 3.Beijing Key Laboratory of Space-Ground Interconnection and Convergence, China; 4.School of Information and Electronics Beijing Institute of Technology, China
We propose and experimentally demonstrate a novel channel emulator based on neural hierarchical network for OAM-MDM system. Compared withCGAN emulator, it improves the modeling accuracy by 34.5% and 35.3% for two OAM modes, respectively.

ACPPOEM-0731-89
Pilot-Aided Deep Learning based Phase Estimation forOFDM Systems with Wiener Phase Noise
Qian Wang[1], Xingke Chen[1], Liping Qian[1], Xinwei Du[2], Changyuan Yu[3], Pooi-Yuen Kam[4]
1.Zhejiang University of Technology, China; 2.BNU-HKBU United International College, China; 3.The Hong Kong Polytechnic University, Hong Kong, China; 4.The Chinese University of Hong Kong (Shenzhen), China
Orthogonal frequency-division multiplexing (OFDM) and high-order modulations have a wide range of applications in coherent optical communications. However, the existence of phase noise will greatly affect the system performance. To overcome this issue, this paper proposes a pilot-aided deep learning (PADL)-based phase estimation scheme, since deep learning has been a hot trend to be applied on digital signal processing in communications. To be specific, preliminary phase noise is first estimated by the pilot-aided (PA) method, and then the estimates are fed into the neural network to train for more accurate estimation. Simulation results show that the mean square error performance of the proposed method is much better than the conventional PA method. Especially for high-order modulations (M≥64), the bit error rate of the PADL-based receiver is smaller than that with even double pilots used for phase estimation, which verifies a stronger robustness in our design using limited spectrum resources.

ACPPOEM-0731-94
The Effect of Coupling Offset to VCSEL-MMF Links for Short-reach Optical Communications
Zijing Huang, Ning Liu, Lin Sun
School of Electronic and Information Engineering Soochow University, China
We investigated the transmission of 100-Gb/s PAM4 signals using 850-nm VCSELs over 150-m MMFs with lateral offsets. The oxide aperture size of VCSEL, coupling loss and modal dispersion induced by misalignments are evaluated by simulations.

ACPPOEM-0731-102
Modified Long Short-term Memory For OpticalFiber Channel Modeling
Xingwang You[1], Huan Chang[2], Ran Gao[2], Qi Zhang[1], Sitong Zhou[2], Dong Guo[2]
1.Beijing University of Posts and Telecommunications, China; 2.Beijing Institute of Technology, China
For fiber channel modeling, compared with traditional LSTM, the proposed modified LSTM-aided technique can alleviate the gradient explosion problem with a higher modeling accuracy, making it more suitable for assisting in fiber channel modeling.

ACPPOEM-0731-114
A Noise performance optimization method for SBS-based optical spectrum analyzer
Zi Liang[1,2], Changjian Ke[1,2], Yuming Zhang[1,2], Yanjun Lv[1,2], Deming Liu[1,2]
1.School of Optical and Electronic Information, Huazhong University of Science and Technology, China; 2.National Engineering Research Center of Next Generation Internet Access-system, Huazhong University of Science and Technology, China
A noise performance optimization method for SBS-based OSA is proposed and experimentally proved. By adjusting the working state of the spectrometer system, the optimized sensitivity can be reduced by ~5dB.

ACPPOEM-0731-122
Suppression for laser phase noise in phase-stabilized transmission systembased on phase conjugation
Tao Wang[1], Chen Tian[1], Shangyuan Li[2], Jinyang Liu[1], Zhengyang Xie[1], Xin Zhao[1], Zheng Zheng[1]
1.Beihang University, China; 2.Tsinghua University, China
In this paper, a phase conjugation-based method for suppressing the phase noise of the laser in the phase-stabilized transmission system is proposed. As a result, the phase noise of the far-end radio-frequency (RF) signal is optimized.

ACPPOEM-0731-127
Transmission link OSNR monitoring based on data-aided carriers
ZhangHao, ZouXinhang, ZhaoWanqi, ZhengZhennan, GaoXinlu, HuangShanguo
Beijing University of Posts and Telecommunications, China
Monitoring the optical signal-to-noise ratio (OSNR) of optical communication transmission links is very important for optical networks dynamic operation. We propose a low-cost OSNR monitoring scheme based on data- aided carriers. In the scheme, narrowband low-power data- aided carriers are introduced at the boundary of WDM grids, achieving high precision OSNR monitoring without interfering with network transmission service. The simulation results show that the data-aided carrier with 0.1% service signal power has high estimation accuracy under different OSNR, and the estimated standard deviation is very stable, reaching 0.1.

ACPPOEM-0731-133
Modeling of Multi-Core Fiber Channel Based on M-CGAN for High Capacity Fiber Optical Communication
Maming, Changhuan, Gaoran, Guodong, Liuxinyu, Yuanmengzhu
Beijing Institute of Technology, China
This paper proposes a modified conditional generative adversarial network (M-CGAN) aided channel modeling technique for multi-core fiber (MCF) communication systems. The results show that the proposed M-CGAN can achieve better modeling performance for MCF communication.

ACPPOEM-0731-134
Experiment demonstration of OFDM-based VLC systems with low-resolution DAC
Siyu Bai[1], Yibin Li[1], Zixian Wei[1], Chen Cheng[2], Yanfu Yang[2], H.Y. Fu[1]
1.Tsinghua University, China; 2.Harbin Institute of Technology, China
We demonstrate a 1-m free-space VLC system with low-resolution DAC based OFDM, prove ACO-OFDM outperforms than DCO-OFDM in low-resolution modes. Results reveal that DRE can significantly improve the BER performance of low-resolution based OFDM system.

ACPPOEM-0731-138
Adaptively Biased Optical OTFS For Power-constrained Visible Light Communication
Jianhua Pei[1], Yuxuan Liao[1], Rui Wang[1], Jian Song[1,2,3], Yuhan Dong[1,3]
1.Shenzhen International Graduate School, Tsinghua University, China; 2.Department of Electronic Engineering, Tsinghua University, China; 3.Peng Cheng Laboratory, China
Direct current biased optical orthogonal time frequency space (DCO-OTFS) scheme suffers relatively low power efficiency for the large DC bias due to the high peak to average power ratio (PAPR) of OTFS. Thus, it is not suitable for power-constrained scenarios. In this paper, we propose a power efficient adaptively biased optical OTFS (ABO-OTFS) scheme whose DC bias can be dynamically adjusted according to the signal samples at some specific positions. Numerical results have shown that the proposed ABO-OTFS has better bit error rate (BER) performance, lower PAPR, and higher power efficiency than existing DCO-OTFS.

ACPPOEM-0731-141
Robust Polar coordinate system-based KNN algorithm suitable for FSO communication systems with turbulence distortions
Xishuo Wang[1], Kai Lv[1], Xiaolong Pan[2], Qi Zhang[3], Xiangjun Xin[2], Xiaoli Huo[1], Ruiquan Jing[1]
1.China Telecom Research Institute, China; 2.Beijing Institute of Technology, China; 3.Beijing University of Posts and Telecommunications, China
A Polar KNN classification algorithm suitable for turbulence-distorted QAM signals is proposed, which can robustly achieve optimized decision at low training lengths. Simulation results show that, the proposed algorithm can achieve 23% transmission distance improvement.

ACPPOEM-0731-154
Automatic Bias Control for PPM-based Free Space Optical Communication Systems
Chenchen Ding, Ziyuan Shi, Yang Sun, Xiaowei Wu, Lei Yang
Technology and Engineering Center for Space Utilization, Chinese Academy of Sciences, China
Pulse position modulation (PPM) is widely adopted by free space laser communication system due to high energy efficiency. The performance of PPM-based system is greatly affected by the extinction ratio (ER) of optical transmitter due to the fact that ER contributes to a non?negligible proportion of background noise. In this paper, we present a practical automatic bias control (ABC) algorithm to maximize ER of optical PPM signal and build a experimental demonstration system. The experiments show that the proposed ABC algorithm can retain ER at 24 dB during a long continuing operation.

ACPPOEM-0731-165
Shaping Distribution Identification of Probabilistic Shaping QAM Signals Based on Higher-order Cumulants
Hongye Li[1], Zhou Gan[1], Yuxuan Liao[1], Xinke Tang[2], Yuhan Dong[1,2]
1.Shenzhen International Graduate School, Tsinghua University, China; 2.Peng Cheng Laboratory, China
We propose a shaping distribution identification method for classifying shaping rate of PS-MQAM signals, which combines higher-order cumulants with threshold classifiers. Results showthat when SNR is higher than 9dB, classification accuracy can reach 100%.

ACPPOEM-0731-167
Low-complexity channel prediction based on retroreflection of auxiliary beam and deep learning for free-space optical communication systems
Hengrui Liu, Shanyong Cai
State Key Laboratory of Information Photonics and Optical Communications, Beijing University of Posts and Telecommunications, China
In this paper, a low-complexity channel prediction scheme for adaptive FSO systems based on auxiliary beam retroreflection and deep learning is proposed. Additionally, we explore the use of prediction model based on the Conv-GRU network.

ACPPOEM-0731-175
A Low-Complexity Neural Network Equalizer Based on Symbol Classification for VLC System
Shupeng Li, Yi Zou
South China University of Technology, China
In this paper, we propose a symbol classification multilayer perceptron (SC-MLP) equalization scheme for the VLC system based on the degree of signal impairment. Particularly, we propose a low complexity neural network equalizer without sacrificing the optimal performance. Experimental results show that the performance of the SC-MLP scheme is comparable to that of MLP equalizer at the optimal working point with a complexity reduction of 67.7%.

ACPPOEM-0801-4
Phase Recovery of Probabilistically Shaped 1024-QAM Signals
Xinbang Han, Mingyi Gao, Xin Shi, Xuejing Huang, Xiaodi You, Gangxiang Sheng
School of Electronic and Information Engineering, Soochow University, China
The phase recovery algorithms are investigated in PDM PS-1024QAM coherent optical transmission system. The NGMI is experimentally measured to verify the feasibility of the V-V QPSK phase recovery algorithm.

ACPPOEM-0801-11
A DSP-Based Monitor Algorithm For Time-Varying Trajectory and Rotation Speed of Principal States of Polarization
Zhang Bin, Ji Chenxi, Zhao Jiarun, Cui Nan, Tang Xianfeng, Zhang Xiaoguang
Beijing University of Posts & Telecommunications, China
We propose a DSP-based algorithm for monitoring PSP trajectories and rotation speeds. By using sliding-window median-filtering and modulus judgment method, the algorithm can precisely recover the PSP trajectories and determine the rotation speeds more accurately.

ACPPOEM-0801-16
Numerical study of 1.6T IM/DD Transmission Based on LWDM Grid using 200G/lane over 2-5 km of Standard Single Mode Fibers
Adrian A. Juarez[1], Yanjun Zhu[2], Xin Chen[1], Ming-Jun Li[1]
1.Corning Inc., United States; 2.Hisense Broadband Inc., United States
1.6T IM/DD transmission based on LWDM grid using 200G/lane over 2-5 km of SSMFis studied. The impact of FWM is assessed for different fiber distances showing marginal impact if statistical laser variations are considered.

ACPPOEM-0801-19
Impact of FWM on O-Band CW-WDM Links for High-Capacity, Low-Latency Data Center Applications
Adrian A. Juarez[1], Andreas Matiss[2], Sergey Ten[1], Pushkar Tandon[1]
1.Corning Inc., United States; 2.Corning Optical Communications, Germany
The impact of Four-Wave-Mixingis analyzed for CW-WDM data-center architecture interconnects that rely on low latency and low Bit-Error-Rates. This analysis shows that novel dispersion-shifted-fibers are advantageous and extend the reachup to 15 km.

ACPPOEM-0801-22
A Time-Domain Carrier Frequency Offset Estimation Algorithm Based on the Power of Zero-Subcarriers for CO-OFDM Systems
Jiaxin Yan[1], Taowei Jin[1], Xinwei Du[2], Jing Zhang[1], Shaohua Hu[1], Kun Qiu[1], Qi Yang[3]
1.University of Electronic Science and Technology of China, China; 2.Guangdong Provincial Key Laboratory of Interdisciplinary Research and Application for Data Science BNU-HKBU United International College, China; 3.Huazhong University of Science and Technology, China
We propose a simple, full-range, and low-latency frequency offset estimation method based on the moving average filter bank in the time domain for CO-OFDM transmission systems. Simulation results validate its feasibility.

ACPPOEM-0801-26
Simplified Coherent Reception Enabled by Alamouti Coding and Digital Subcarrier Multiplexing Technology
Wei Wang[1], Dongdong Zou[1], Zhenpeng Wu[1], Fan Li[1], Xingwen Yi[1], Chao Lu[1], Zhaohui Li[1], Qi Sui[2]
1.Sun Yat-sen University, China; 2.Southern Marine Science and Engineering Guangdong Laboratory, China
In this paper, a simplified self-coherent system achieved by Alamouti coding and digital subcarrier multiplexing technology is proposed. The transmission of 50Gbaud 4-subcarrier 16QAM signal over 40km single mode fiber is experimentally demonstrated.

ACPPOEM-0801-30
Joint Timing and Frequency Synchronization for Coherent Optical SEFDM Systems
Jinze Shi[1], Xinwei Du[1], Shuai Liu[1], Qian Wang[2], Changyuan Yu[3]
1.BNU-HKBU United International College, China; 2.Zhejiang University of Technology, China; 3.The Hong Kong Polytechnic University, Hong Kong, China
In this paper, we propose a joint timing and frequency synchronization algorithm for spectrally efficient frequency-division multiplexing (SEFDM) systems by utilizing a training symbol composed of a conjugate symmetric sequence.

ACPPOEM-0801-62
Experimental demonstration of time-frequency transmission in a 22.5 km 7-core fiber link
Jing Zhang[1,2], Feng Tian[1,2,3], Xiaodong Liu[4], Tianze Wu[1,2], Qi Zhang[1,2,3], Xuanzhi Gan[1,2]
1.State Key Laboratory of Information Photonics and Optical Communications, China; 2.School of Electronic Engineering, Beijing University of Posts and Telecommunications, China; 3.Beijing Key Laboratory of Space-ground Interconnection and Convergence, BUPT, China; 4.Beijing Arcoren Science & Technology Co.,LTD, China
We experimentally demonstrated a 22.5 km stable optical time-frequency transmission system using 7-core fiber, achieving a time-synchronization accuracy of ±625 ps, time stability of 5 ps, and frequency stability of 6.23E-14/1000s, verifying the potential of multicore fibers for application in optical stable time-frequency transmission."

ACPPOEM-0801-68
19.02Gbps/25m Underwater Wireless Optical Communication Adopting Probabilistic Constellation Shaping QAM-DMT Transmission
Tianyi Zhang[1], Jiahan Tian[1], Yuan Wang[1], Chao Fei[1], Junwei Zhang[2], Fei Zhang[1], Yitong Xie[1], Guowu Zhang[1], Gaoxuan Wang[1], Ji Du[1], Xiaojian Hong[1], Sailing He[1,3]
1.Zhejiang University, China; 2.The Hong Kong Polytechnic University, Hong Kong, China; 3.Royal Institute of Technology, Sweden
We experimentally demonstrated probabilistic constellation shaping quadrature amplitude modulation discrete multitone (PCS QAM-DMT) for 25-m underwater wireless optical communication (UWOC) system with a net data rate of 19.02Gbps. 28.1% capacity improvement is achieved in comparison with conventional bit-power loading DMT scheme. To the best of our knowledge, this is the highest net data rate ever reported for a single LD in current UWOC.

ACPPOEM-0801-92
3.078 Tb/s (162-Gb/s×19) PAM-8 Transmission Based on 1-km 19-core Fiber Using Liquid Time-Constant Networks
Runzhe Fan, Chao Yang, Ming Luo
State Key Laboratory of Optical Communication Technologies and Networks, China
This paper uses liquid time-constant neural networks to perform nonlinear equalization on the 3.078-Tb/s PAM-8 transmission system on a 1-km 19-core single-mode fiber.

ACPPOEM-0801-102
Neural Network Equalizer with Gate Control Mechanism in High-Speed PAM4 Short-reach Optical System
Chen Hui, Jin Siyue, Li Chao, Wang Qibing, Liu Zichen, Wang Lei, He Zhixue
Peng Cheng Laboratory, China
We proposed an untraditional neural network equalizer with gate control mechanism to compensate the severe impairments in over 100Gbit/s PAM4 bandwidth-limited short-reach optical system, with enhanced equalization performance and around 45% complexity reduction.

ACPPOEM-0801-107
A Two-Step Pilot-based Phase Noise Suppression Method for Optical Universal Filtered Multi-carrier Systems
Liu Shi
Beijing Electronic Science and Technology Institute, China
In this paper,we propose a novel two-step pilot-based phase noise suppression method for optical UFMC. The proposed method enhances the suppression and robustness of phase noise caused by the laser. The effectiveness of the method is demonstrated through a large number of Monte Carlo experiments.

ACPPOEM-0801-122
Fast and High-Robustness Adaptive Digital Back-Propagation for Fiber Nonlinearity Compensation
Yi Liu[1], Mingqing Zuo[2], Dong Wang[2], Zhengyang Xie[1], Xin Zhao[1], Zheng Zheng[1], Shan Cao[2], Yunbo Li[2], Dechao Zhang[2], Han Li[2]
1.Beihang University, China; 2.China Mobile Research Institute, China
RMSProp-based digital back-propagation is proposed for blind nonlinearity compensation. Compared with conventional method, 69.8% reduction in complexity and at least 46.1% improvement in robustness are demonstrated in a simulation of 2000-km 69-GBd DP-16QAM transmission.

ACPPOEM-0801-137
Autonomous Obstacle Avoidance and Communication Capacity Optimization for UAV-Assisted VLC Systems
Liang Li[1], Jiawei Hu[1], Xinke Tang[2], Yuhan Dong[1,2]
1.Shenzhen International Graduate School, Tsinghua University, China; 2.Peng Cheng Laboratory, China
Unmanned aerial vehicles (UAVs) have broad application potential in communication systems, especially those equipped with visible light communication (VLC) systems, which can provide high-rate information transmission and illumination services simultaneously. This paper proposes UAV-assisted VLC systems based on deep Q-network (DQN), which use deep reinforcement learning (DRL) algorithm to achieve autonomous obstacle avoidance and communication capacity maximization of UAVs. This paper focuses on the dynamic trajectory planning problem of UAVs in complex obstacle scenarios, considering factors such as obstacle collision risk and line of sight (LoS) communication quality, and designs a reasonable DRL reward function. Through simulation experiments, the effectiveness and feasibility of the system and algorithm proposed in this paper are verified.

ACPPOEM-0801-138
A Novel MIMO method for Few-mode Multi-core Optical Transmission System based on Modify Frequency Domain
Ren Zhihao, Wang Yongjun, Huang Xingyuan, Han Lu, Li Chao, Zhang Qi
Beijing University of Posts and Telecommunications, China
A Multiple-Input Multiple-Output equalization based on the Frequency Domain Modify Cascaded Multimode Algorithmis proposed in this paper, and experimentally demonstrated in the few-mode multi-core transmission with capacity of 210 Gb/s.

ACPPOEM-0802-4
Central Carrier-Assisted Phase Retrieval Scheme Based on Parallel Alternative Projections GS Algorithm
Pengfei Li, Chenglin Bai, Yu Zhang, Wanxiang Bi, Fan Yang, Hengying Xu, Lishan Yang, Xuezhen Wang, Peng Qin
Liaocheng University, China
The PR receiver with multiple parallel dispersive elements is constructed for the first time, and a novel scheme combining parallel alternative projections GS algorithm and central carrier-assisted technology is realized to effectively improve system performance.

ACPPOEM-0802-5
Experimental Demonstration of Weak Signal Detection Using Photo-Counting Receiver with Inter-Symbol-Interference
Chao Li, Zichen Liu, Zhixue He
Peng Cheng Laboratory, China
We experimentally demonstrate an 10Mb/s OOK weak light signal detection scheme using photo-counting receiver in the presence of inter-symbol interference. BER performance is significantly enhanced from $2e^{-2}$ to $5e^{-5}$ compared with direct detection scheme.

ACPPOEM-0802-8
Noise Equalization of Nonlinear Frequency Division Multiplexing Wavelength Division Multiplexing System Based on Probabilistic Shaping
Yu Zhang[1], Chenglin Bai[2,3,4], Pengfei Li[2], Wanxiang Bi[1], Qi Qi[1], Hengying Xu[1,3,4], Lishan Yang[1,3,4], Yining Zhang[5], Fan Yang[1]
1.School of Physics Science and Information Engineering Liaocheng University, China; 2.School of Physics Science and Information Engineering Liaocheng University, China; 3.Shandong Provincial Key Laboratory of Optical Communication Science and Technology, China; 4.Liaocheng Key Laboratory of Industrial-Internet Research and Application, China; 5.School of Mathematical Sciences Liaocheng University, China
A noise equalization scheme with probabilistic shaping is proposed for ASE noise, processing noise and phase noise in NFDM-WDM systems, highlighting its potential for both superior performance and large transmission capacity in future optical communication.

ACPPOEM-0805-1
2-D Digital Frequency Offset Loading Technique for Discrete Spectrum Modulated Nonlinear Frequency Division Multiplexing System
Donghu Yao[1], Yanfeng Bi[1], Mingjiao Wang[1], Hongbing Gao[1], Hengying Xu[2,3,4], Yining Zhang[5], Chenglin Bai[3,4,6], Lishan Yang[3,4,7], Wanxiang Bi[1]
1.Liaocheng University, China; 2.School of Physics Science and information Engineering Liaocheng University, China; 3.Shandong Provincial Key Laboratory of Optical Communication Science and Technology, China; 4.Liaocheng Key Laboratory of Industrial-Internet Research and Application, China; 5.School of Mathematical Sciences Liaocheng University, China; 6.School of Physics Science and Information Engineering Liaocheng University, China; 7.School of Physics Science and Information Engineering Liaocheng University, China
We propose a two-dimensional digital frequency offset loading (2D-DFOL) technique for discrete spectrum nonlinear frequency division multiplexing (DS-NFDM) system to improve transmission capacity and mitigate amplified spontaneous emission (ASE) noise.

ACPPOEM-0810-7
Ultra-fast Azimuth Rotation Tracking of SOP Evolution Based on Superimposed FrFT Training Sequence
Li Wang[1], Zhi Cheng[1], Jingchuan Wang[1], Changyuan Yu[1], Ming Tang[2], Jing Zhou[1]
1.The Hong Kong Polytechnic University, Hong Kong, China; 2.Huazhong University of Science and Technology, China
Fractional Fourier transform (FrFT) training sequences (TSs) have been proposed to achieve ultra-fast azimuth rotation tracking of state of polarization (SOP) without sacrificing spectrum efficiency.

ACPPOEM-0811-2
Global Power Analyses in Super C band WDM Transmissions System based on Parameter Estimation
Honga Wang
ZTE Corp., China
Broadband optical transmission with super C band is achieved with precise OSNR analyses based on parameter estimation. An OSNR estimation error ≤ 2.2 dB in an end-to-end WDM system consisting of 16 spans is demonstrated.

ACPPOEM-0813-4
Reservoir Computing for Dispersion Compensation in IMDD Transmission
Yixian Dong, Yiqian Shi, Liang Liu, Xihua Zou, Wei Pan, Lianshan Yan
Southwest Jiaotong University, China
The digital reservoir computing for chromatic dispersion compensation is compared with traditional FFE and DFE equalizers in the IMDD transmission system for the first time, showing its more than 1-dB penalty of receiver sensitivity.

ACPPOEM-0814-1
Experimental Demonstration of 520-Mbps LED-Based UWOC Utilizing Nonlinear Weighted DFE
King Shing Lo, Junwei Zhang, Chao Lu
The Hong Kong Polytechnic University, Hong Kong, China
A nonlinear weighted DFE (NWDFE) is introduced and demonstrated in a 520-Mbps PAM-4 blue-LED-based UWOC system for the first time, which improves the data rate by approximately 9% while maintaining similar complexity compared to VFFE-DFE.

ACPPOEM-0814-6
Clustered Cascaded Optical-Electrical Feedforward Equalization for C-band Single-lane 100G ER PAM4 IM/DD Systems
Xiaoqian Huang, Fei Xie, Wen Zuo, Yaojun Qiao
Beijing University of Posts and Telecommunications School of Information and Communication Engineering, China
A low-complexity clustered cascaded optical-electrical feedforward equalization (OE-FFE) scheme is proposed and verified for C-band dispersion-limited high-speed IM/DD PAM4 systems. 7%FEC threshold is achieved for 122Gb/s 40-km PAM4 system with only 35 real-valued multiplications.

ACPPOEM-0814-36
SOA Pre-Amplified 100Gb/s PON Based On Convolutional Neural Networks Nonlinear Digital Pre-Equalization at O-band with 33dB Power Budget
Yuhan Gong, Runzhe Fan, Ming Luo, Chao Yang
State Key Laboratory of Optical Communication Technologies and Networks, China
The experiment achieved 100Gb/s PON using SOA pre-amplified at O-band with 33 dB power budget. The results indicate that the nonlinear pre-equalization based on CNN outperforms than traditional method in optical assess case.

ACPPOEM-0814-43
Single Source Full-duplex Underwater Wireless Optical Communication System based on MEMS Grating Modulator
Lihang Liu[1], Xinke Tang[2], Zhiyan Chen[1], Yibin Li[1], Hongyan Fu[1]
1.Tsinghua University, China; 2.Peng Cheng Laboratory, China
A single source laser-based full-duplex underwater wireless optical communication system using MEMS grating modulator is demonstrated, enabling 200 kbps uplink data rate and 0.5 Gbps downlink data rate simultaneously.

ACPPOEM-0814-47
Coherent Optical Transmitter Impairments Estimation Using Adaptive 2×2 Real-Valued Channel Equalizer
Zepeng Gong[1], Fan Shi[2], Hanyong Wang[2], Yafeng Cheng[2], Desheng Li[2], Ming Luo[1], Xu Zhang[1], Xi Xiao[3], Xiang Li[2]
1.China Information and Communication Technologies Group Corporation, China; 2.China University of Geosciences, China; 3.National Information Optoelectronics Innovation Centre, China
We present a precise estimation method for 60GBaud coherent optical single-carrier systems. The method achieves an absolute estimate error of less than 0.3ps for transmitter skew and 0.1dB for gain imbalance.

ACPPOEM-0815-102
Unequally-Spaced PAM-4 Enabled Power Budget Enhancement of UDWDM-PON Utilizing Simplified Coherent Receiver
Zhou Jiajun[1], Chen Junda[2], Wang Hongli[1], Fu Songnian[3], Tang Ming[2]
1.Hubei Jiufengshan Laboratory, China; 2.Huazhong University of Science and Technology, China; 3.Guangdong University of Technology, China
We numerically investigate a 4×10 Gb/s cost-effective coherent ultra-dense wavelength division multiplexing passive optical network (UDWDM-PON) by the use of unequally-spaced 4-level pulse-amplitude modulation (UES-PAM-4) signal based on gradient descent algorithm. According to the simulation results, a receiver sensitivity of -35.2 dBm for a single wavelength at the bit-error ratio (BER) of 3.8×10^{-3} is obtained. Compared with the conventional equally-spaced PAM-4 (ES-PAM-4) signal, a 2.5 dB receiver sensitivity enhancement can be secured after 20-km standard single-mode fiber (SSMF)

transmission. Meanwhile, the UES-PAM-4 signal is numerically verified for 4×10 Gb/s UDWDM-PON. An average receiver sensitivity of -37.5 dBm and a power budget of 38.5 dB are obtained after the 20-km SSMF transmission. The proposed UES-PAM-4 scheme with the receiver sensitivity enhancement is a promising candidate for the UDWDM-PON in the existing optical distribution network (ODN).

ACPPOEM-0815-38
A Novel Probabilistic Shaping Based Chaotic Encryption for VLC Systems
Jiaqi Chen[1], Yi Sun[1], Yize Zhang[1], Xiaoping Zhang[1,2], Yuhan Dong[1,2]
1.Shenzhen International Graduate School, Tsinghua University, China; 2.Peng Cheng Laboratory, China
Visible light communication (VLC) suffers from eavesdropping due to its broadcast nature and channel openness in public areas. In this paper, we propose a low-rate loss distribution matching to generate shaped symbols, further employing chaotic sequences to encrypt symbols. Numerical results show that the proposed scheme outperforms constant component distribution matching (CCDM)-based probabilistic shaping and conventional direct current-biased optical orthogonal frequency division multiplexing (DCO-OFDM) scheme in terms of both bit error rate (BER) and general mutual information (GMI). The proposed scheme enjoys the benefit of the large key space of 10^{65}, which can prevent almost any violent attacks.

ACPPOEM-0815-40
A study on AM-PM suppression in an optical-RF phase-locked loop
Kunlin Shao, Penghui Gao, Ping Li, Feng Yang, Yamei Zhang, Shilong Pan
Nanjing University of Aeronautics and Astronautics, China
This paper studies the amplitude-to-phase noise (AM-PM) suppression in an optical-RF phase-locked loop. The phase noise induced by AM noise can be suppressed effectively under appropriate condition. More than 80 dB suppression ratio is achieved.

ACPPOEM-0815-48
Fourier Neural Operator Based Modeling of Long-Haul Optical Fiber Channel in Dual-Polarization Systems
Fangfang Huang, Xiatao Huang, Hong Lin, Jing Zhang, Bo Xu, Kun Qiu
University of Electronic Science and Technology of China, China
We present the modeling of fiber channel using Fourier neural operator (FNO). For a 30-GBaud 16-QAM dual-polarization system, the simulation results show that the SNR difference is within 0.15 dB between the FNO and SSFM.

ACPPOEM-0815-59
Underwater Wireless Optical Communication Using Diversity Reception and Pruned-Term-Based Nonlinear DFE
Chao Fei[1], Shu Mao[2], Lusheng Li[2], Feiping Tang[2], Zhenxing Ling[2], Zhaojie Zhang[2], Tianyi Zhang[3], Xiaojian Hong[3], Yuan Wang[3], Jiahan Tian[3], Guowu Zhang[3], Shiyin Li[1]
1.China University of Mining and Technology, China; 2.Ningbo ZSNOW Electronics Co. LTD, China; 3.Zhejiang University, China
Volterra series-based nonlinear equalization is widely used to ease the nonlinearity in underwater wireless optical communication (UWOC) systems. However, the conventional Volterra series-based model is of high complexity, especially for nonlinearity of higher-order terms or longer memory lengths. In this paper, to reduce the complexity of the conventional Volterra series-based nonlinear equalization, a pruned-term based nonlinear decision-feedback equalization (PT-NDFE) is proposed and experimentally demonstrated. Meanwhile, a pruned-term based absolute operation nonlinear decision-feedback equalization (PT-ANDFE) is also introduced to further balance the performance and complexity. The experimental results show that PT-NDFE exhibits comparable performance as compared to conventional NDFE with a lower complexity. While PT-ANDFE yields suboptimal performance with a slight performance degradation but brings further reduced complexity when considering performance and complexity tradeoff. Moreover, diversity reception is employed to further improve performance. The robustness of the proposed schemes in different turbidity waters is experimentally verified. The proposed scheme is promising for cost-effective UWOC systems.

ACPPOEM-0815-61
Real-Time Demonstration of All-Digital Clock Recovery for satellite communication
Yizhou Wang[1], Linsheng Zhong[1], Shenmao Zhang[1], Yuanxiang Wang[1], Jinyang Wu[1], Zhen Luo[1], Xiaoxiao Dai[1,2], Qi Yang[1,2,3], Liu-Deming[1]
1.Huazhong University of Science and Technology, China; 2.Optics Valley Laboratory, China; 3.Wuhan National Laboratory for Optoelectronics and School of Optical and Electronic Information, China
This paper experimentally demonstrates a real-time digital clock recovery algorithm in a 1.024Gb/s BPSK free space optical transmission. Only 110 real-time DSP resources are needed to correct up to ±150PPM clock errors.

ACPPOEM-0815-65
Turbulent OAM Compensation using CNN for OAM-based FSO Communications
Wuli Hu, Jiaxiong Yang, Long Zhu, Andong Wang
School of Communication and Information Engineering, Chongqing University of Posts and Telecommunications, China
We propose a turbulent orbital angular momentum (OAM) compensation scheme based on convolutional neural network (CNN) for OAM-based free-space optical (FSO) communications. The CNN is trained to extract the atmospheric turbulence's inherent OAM based on the intensity distribution. Under various turbulence strengths (D/r_0 = 1, 2, 4), the received power of the multiplexed OAM channels significantly improves, with an average reduction of 12 dB in mode crosstalk. Our work provides an effective solution for improving the communication performance of OAM-based FSO links.

ACPPOEM-0815-66
Free-space Multi-dimentional Mode Coding with Rotating Gear Beams carrying Orbital Angular Momentum
Yangzong Ao, Wuli Hu, Andong Wang, long Zhu
School of Communication and Information Engineering Chongqing University of Posts and Telecommunications, China
The demand for high-dimensional coding techniques for communication systems is increasing. In this study, Laguerre-Gaussian (LG) beams is used as the basic mode of superposition, and specific parametersp, m0, n0, ϕ are added in each superposition to generate a class of four-dimensional structured beams, which is called Rotating Gear Beams (RGBs). High-dimensional RGBs has a large number of available coding modes, which can effectively improve the resource utilization of existing dimensions, and expand the optical communication capacity, theoretically achieving a maximum coding of up to 1024 bits. We demonstrated the exceptional coding capability of RGBs by transmitting a 64-bit grayscale image. Our work will accelerate the development of future optical communications for higher capacity.

ACPPOEM-0815-67
A Quantitative Investigation on the Impact of Microring Modulator Coupling States to 112 Gbps PAM4 Signal Transmission
Junxiong Tan[1,2], Kejia Zhu[1,2], Weiyi Meng[1,2], Qian Wang[1,2], Yu Sun[1,2], Junde Lu[1,2], yueqin Li[1,2], Jian Sun[1,2], min Miao[1,2], Jun Qin[1,2]
1.Key Laboratory of Information and Communication Systems, Ministry of Information Industry, China; 2.Key Laboratory of the Ministry of Education for Optoelectronic Measurement Technology and Instrument, China
In this paper, a comprehensive quantitative analysis on the impact of silicon microring modulators (Si-MRM) coupling states to 112 Gbps PAM4 transmission system based on a system-level model of Si-MRM is demonstrated.

ACPPOEM-0815-70
Free-space optical communication with bottle vortex beam under atmospheric turbulence and finite receiving aperture
Jiaxiong Yang, Wuli Hu, Andong Wang, Long Zhu
Chongqing University of Posts and Telecommunications, China
To enhance the performance of orbital angular momentum (OAM) beams in Free-Space Optical (FSO) communications under conditions of atmospheric turbulence and finite receiving aperture, we propose a design for parabolic trajectory Bottle vortex beams (BVBs) using the caustic line method. Compared to conventional OAM beams, BVBs exhibit a smaller beam diameter at the receiver while displaying enhanced resistance to turbulence. Under conditions of strong turbulence D/r_0 = 4 and a receiver aperture of 20 mm, the average received optical power of BVBs is increased by 12 dBm and 40 dBm compared to OAM beams, respectively.

ACPPOEM-0815-71
FPGA Implementation of 5-bit Non-Uniform Quantization LDPC Code for High-speed PON
Zipeng Liang[1], Tian Qiu[1], Yang Zou[1], Yizhou Wang[1], Ningchang Zhangsun[1], DaiXiaoxiao[1,2], YangQi[1,2,3], Deming Liu[1]
1.Huazhong University of Science and Technology, China; 2.Optics Valley Laboratory, China; 3.Wuhan National Laboratory for Optoelectronics and School of Optical and Electronic Information Huazhong University of Science and Technology, China
This paper proposes and verifies a resource-efficient 5-bit non-uniform quantization LDPC code for LLR processing. This low power consumption and low latency LDPC decoding method is promising for future high-speed PON.

ACPPOEM-0815-109
SDM solution for datacenters based on weakly-coupled multi-core fiber
Jun Chu[1,2], Lei Shen[1,2,3], Shuo Xu[1,2], Xianchao Gong[1,2], Liubo Yang[1,2], Ying Li[1,2], Xinhua Fu[1,2], Li Zhang[1,2], Lei Zhang[1,2,3], Jie Luo[1,2,3]
1.State Key Laboratory of Optical Fiber and Cable Manufacture Technology, China; 2.Yangtze Optical Fibre and Cable Joint Stock Limited Company, China; 3.Optical valley labs, China
We report a SDM solution for datacenters based on weakly-coupled multi-core fiber. The solution is consisted of design, fabrication and measurement of 4-core single mode fiber, fan in/out device, and LC/MPO connectors. This MCF solution can be used in the optical interconnects for short reach applications that allows to multiply the capacity.

ACPPOEM-0816-1
Fast Computational Algorithm for the Weakly Coupled FMF Model
Zhengyang Li[1], Yangan Zhang[1], Xueguang Yuan[1], Peiren Wang[2], Yongqing Huang[1]
1.Beijing University of Posts and Telecommunicatios, China; 2.Tianjin Research Institute for Water Transport Engineering, M.O.T., China
The transmission of optical waves within Few-Mode Fiber (FMF) is challenged by the influences of dispersion, attenuation, various nonlinear effects, and inter-modal crosstalk arising from suboptimal transmission conditions. Therefore, this paper introduces a fast computation algorithm for the weakly coupled FMF model. Building upon the split-step Fourier algorithm, this method subdivides the computation step size into smaller intervals, each computed independently using parallel algorithms. Additionally, the inter-modal crosstalk terms are represented as matrix-vector multiplications and accelerated using matrix libraries. Experimental verification demonstrates a 37% efficiency improvement compared to the split-step Fourier algorithm.

ACPPOEM-0816-4
Application of Full-Nyquist Pulse on Hybrid SSB OFDM-Digital Filter Multiple Access PONs
Liang Liu, Yixian Dong, Yiqian Shi, Xihua Zou, Wei Pan, Lianshan Yan
Southwest Jiaotong University, China
Full-Nyquist-pulses are utilized in Hybrid SSB OFDM-digital filter multiple access PON for the first time. Compared to square-root-raised-cosine filter, they have higher receiver sensitivity and more robustness to system ISI/noise.

Track 3: Network Architectures, Management and Applications

ACPPOEM-0702-1
Dynamic Hybrid Single-Multi-Path RSA Algorithm in Semi-Filterless Optical Networks
Yanyan Xie[1], Junling Yuan[1], Xuhong Li[2], Qikun Zhang[1], Suhua Wang[1]
1.Zhengzhou University of Light Industry, China; 2.Zhongyuan University of Technology, China
This paper proposes a dynamic hybrid single-multi-path (DH-SM) RSA algorithm. Simulation results show that the proposed algorithm has a lower blocking rate than those using fixed bandwidth assignment granularity and traditional single-path algorithms.

ACPPOEM-0721-3
Industrial PON Application Innovation Pilot based on 50G-PON and XG-PON Hybrid Architecture
Jialiang Jin[1], Dezhi Zhang[1], Ming Jiang[1], Dekun Liu[2], Hui Sun[1], Ziyao Yang[1], Tao Zeng[1], Heng Yue[1], Xiao Yu[1], Feng Zhu[1]
1.China Telecom Research Institute, China; 2.Huawei Technologies Co., China
Requirements of industrial applications, and the architecture and key capabilities of 50G-PON are introduced. In this pilot project, the mixed application of 50G-PON and 10G-PON provides ultra-high bandwidth, stable and reliable, and flexible access capabilities.

ACPPOEM-0721-6
Dynamic routing, spatial channel and spectrum assignment (RSCSA) in spatial channel networks (SCNs)
Yu Zheng[1], Weichang Zheng[2], Mingcong Yang[3], Yongbing Zhang[1]
1.University of Tsukuba, Japan; 2.University of Electronic Science and Technology of China, China; 3.Huawei Technologies, China
In this paper, we propose a dynamic RSCSA algorithm that employs a granularity switching threshold to efficiently switch between spatially bypassed and spectrally groomed space lanes depending on the request demand in spatial channel networks (SCNs).

ACPPOEM-0728-20
GPU-efficient Deployment of Ring All-Reduce-based Distributed Model Training in Tidal Computing Power Network
Yingbo Fan, Yajie Li, Ling Chen, Boxin Zhang, Yahui Wang, Jiaxing Guo, Wei Wang, Yongli Zhao, Jie Zhang
Beijing University of Posts and Telecommunications, China
This paper proposes a tidal-aware deployment algorithm for RAR-based DMT services in tidal CPN. The algorithm performance is evaluated in resource sufficient and constrained cases, respectively. Simulation results verify the benefit of reducing 20.6% GPU United Statesge by dynamically partitioning training data and allocating GPU resources.

ACPPOEM-0730-7
A Load Balancing and Time-Frequency Fragmentation-aware Algorithm for Elastic Optical Network
Mingxuan Yu[1], Jing Jiang[1], Tao Shang[1], Junfeng Zhai[1], Haotian Liang[1], Makoto Tsubokawa[2]
1.School of Telecommunications Engineering, Xidian University, China; 2.Graduate School of Information, Production and System, Waseda University, Japan
In order to improve the performance of EONs, spectrum management is necessary. In this paper, a Load Balancing and Time-Frequency (LB-TF) fragmentation awareness algorithm is proposed.

ACPPOEM-0730-42
Routing and Spectrum Assignment in Spatial Channel Network-based Inter-Datacenter Networks
Zheng Weichang[1], Zheng Yu[2], Yang Mingcong[3], Yang Kun[4]
1.School of Information and Communication Engineering,Yangtze Delta Region Institute, University of Electronic Science and Technology of China, China; 2.Graduate School of Systems and Information Engineering, University of Tsukuba, Japan; 3.Department of R&D, Huawei Technologies, China; 4.School of Information and Communication Engineering, University of Electronic Science and Technology of China, China
We introduce spatial channel networks (SCNs) to the interconnection of data center networks (DCNs). We propose an integer linear programming (ILP) model to solve the routing and spectrum assignment problem for SCN-based inter-DCNs.

ACPPOEM-0731-20
Delay-Energy-Aware Dependent Task Offloading Based on Orchard Algorithm in Collaborative Cloud-Edge Optical Networks
Shuyao Wang, Shan Yin, Shanguo Huang
Beijing University of Posts and Telecommunications, China
We study the problem of dependent task offloading in cloud-edge scenario interconnected by optical networks. An effective orchard algorithm-based dependent task offloading method is proposed to jointly optimize the delay and energy consumption.

ACPPOEM-0731-68
Computing Power Slicing Strategy Based on Deep Reinforcement Learning Under the Constraint of Services Intention
Zhengjie Sun[1], Hui Yang[1], Qiuyan Yao[1], Jie Zhang[1], Sheng Liu[2], Dong Wang[2]
1.Beijing University of Posts and Telecommunications, China; 2.China Mobile Research Institute Department of Fundamental Network Technology, China
In order to fully exploit the advantages of computing power optical networks, we propose a computing power slicing strategy based on Deep Reinforcement Learning under the constraint of services intention. The simulation results show that this scheme performs best in terms of average delay and overall network blocking probability.

ACPPOEM-0731-87
Joint Resources Allocation for Asynchronous Distributed Training in Cloud-edge Collaborative Optical Networks
Xiaodong Liu, Yutong Chai, Zheng Duan, Zhidong Zhang, Shan Yin, Shanguo Huang
State Key Laboratory of Information Photonics and Optical Communications, China
We analyze the asynchronous model parallel training process in the cloud-edge collaborative scenario and propose pipeline optimization scheme considering communication delay. Based on scheme, we propose a multi-task optimization algorithm named Resourc Aware Balance Allocation.

ACPPOEM-0731-98
Adaptive Cross-Layer Bandwidth Defragmentation for Multi-band Optical Network
Liu Jiaxin, Xi Ziyi, Gu Rentao
Beijing University of Post and Telecommunications, China
We propose an adaptive IP/optical cross-layer bandwidth defragmentation algorithm to reduce bandwidth fragmentation caused by the mismatch between services and channels in multi-band optical networks. Experimental results demonstrate that the bandwidth utilization improves significantly.

ACPPOEM-0731-145
Mixed Channel Traffic Grooming in an SBPP-Based IP over MCF-EON with Minimized Inter-core Crosstalk
Fengxian Tang[1], Gangxiang Shen[2]
1.Shenzhen Polytechnic Univeristy, China; 2.Soochow University, China
Traffic grooming and shared backup path protection (SBPP) can significantly improve network resource utilization and ensure the survivability in multi-core fiber-elastic optical networks (MCF-EON). However, addressing routing, core, modulation, and spectrum assignment (RCMSA) with the consideration of inter-core crosstalk in such networks is challenging. In this paper, we propose an efficient auxiliary graph (AG) based algorithm to tackle this challenge in the context of an IP over MCF-EON. Our results demonstrate significant improvement in networkresource utilizationand reduction in inter-core crosstalk, thereby confirming the effectiveness of the proposed approach.

ACPPOEM-0731-155
Reconfigurable Topology Design with Deep Reinforcement Learning in Satellite Optical Network
Yun Xiao[1,2], Bingli Guo[1,2], Hai Yang[1,2], Kuan Yan[1,2], Shanguo Huang[1,2]
1.State Key Lab of Information Photonics and Optical Communication, China; 2.Beijing University of Posts and Telecommunications, China
To minimize delay of satellite optical network, this paper proposes an enhanced deep deterministic policy gradient scheme for reconfigurable topology design with distinct traffic intensity. Simulation results show that average delay is reduced about 28%.

ACPPOEM-0731-177
Research on Routing and Spectrum Allocation Algorithm in C+L Band Elastic Optical Networks
Lingfei Shen[1], Nan Feng[2], Yunxuan Liu[1], Dan Yan[1], Shihao Fan[1], Danping Ren[1], Jijun Zhao[1]
1.Hebei University of Engineering, China; 2.54 Institute of China Electronic Technology Corporation, China
In C+L band EONs, we propose a routing and spectrum allocation algorithm that consider both spectrum resource and link transmission distance. Simulation results demonstrate the proposed algorithm effectively decreases blocking probability and improves resource utilization.

ACPPOEM-0801-9
Cost-effective computing power provisioning for video stream in Computing Power Network with mixed CPU&GPU
Yahui Wang, Yajie Li, Jiaxing Guo, Yingbo Fan, Ling Chen, Boxin Zhang, Wei Wang, Yongli Zhao, Jie Zhang
Beijing University of Posts and Telecommunications, China
We propose the concept of RVC to quantify the United Statesge efficiency of CPU and GPU in CPN. A RVC-based computing provisioning algorithm is then designed for processing video stream services. The algorithm can accommodate more services by reducing 4.2% blocking probability through cost-effective computing provisioning.

ACPPOEM-0801-41
Availability-Aware Dedicated Path Protection Schemes for Key Service in Quantum-Key-Distribution Optical Networks
He Bin[1], Lu Yuxuan[1], Chen Hong[1], Shao Weidong[1], Jiang Min[1], Zhou Liulei[1], Chen Bowen[1], Ju Weiguo[2]
1.School of Electronic and Information Engineering, Soochow University, China; 2.Institute of ICT Technology, China Information Consulting&Designing Institute CO., LTD, China
Two availability-aware dedicated path protection schemes for key service are proposed in quantum-key-distribution optical network. Simulation results show that the proposed schemes performs well in terms of success ratio, timeslot occupancy, and average unavailability of key services.

ACPPOEM-0801-45
Inter-core Crosstalk Aware Deep Reinforcement Learning Based Resource Allocation in Multicore Elastic Optical Networks
ChengHao Li, Yue-Cai Huang, Liwei Mu
South China Normal University, China
We present a deep reinforcement learning (DRL) framework for the routing, modulation, core selection, and spectrum allocation (RMCSA) of the multicore elastic optical networks. Specifically, the DRL agent senses the impact of the inter-core crosstalk and makes the RMCSA decisions accordingly.

ACPPOEM-0801-52
Data-Aware Hierarchical Task Offloading in Collaborative Cloud-Edge Elastic Optical Networks
Yuexuan Fan, Weiguo Ju, Jian Dang, Huijie Yang, Liulei Zhou, Hong Chen, Weidong Shao, Bowen Chen
Soochow University, China
We proposed data-aware hierarchical task offloading method to optimize network resource allocation. Compared to existing methods, simulation results show the proposed methods can reduce end-to-end latency andblocking probability in collaborative cloud-edge elastic optical networks.

ACPPOEM-0801-58
Cross-domain Resource Scheduling of Computing Service Based on Particle Swarm Optimization
Yang Zhao[1], Yunyu Zhang[2], Hui Yang[2], Tiankuo Yu[2], Yucong Liu[1], Yunbo Li[1]
1.China Mobile Communication Corporation Research Institute, China; 2.StateKey Laboratory of Information Photonics and Optical Communications, Beijing University of Posts and Telecommunications, China
In this paper, we propose a cross-domain delay optimization scheme to optimize the delay in the metro, regional, and backbone domains respectively. The simulation results show that, compared with the benchmark, this scheme can effectively reduce the blocking rate, basically meet the delay upper limit of each domain, and finally construct threedelay circles.

ACPPOEM-0801-63
Three Gossiping Protocols in Three-Dimensional Underwater Optical Cellular Network
Yuan Wang[1], Tianyi Zhang[1], Jiahan Tian[1], Junwei Zhang[2], Yitong Xie[1], Fei Zhang[1], Guowu Zhang[1], Gaoxuan Wang[1], Xiaojian Hong[1], Chao Fei[1], Sailing He[1]
1.Zhejiang University, China; 2.The Hong Kong Polytechnic University, Hong Kong, China
In this paper, three different low-complexity sector-based Gossiping routing protocols, namely Gossiping with probabilistic selection (Gossiping-PS), Gossiping with visibility priority (Gossiping-VP), and Gossiping with energy priority (Gossiping-EP), are evaluated through the three-dimensional underwater optical cellular network (UOCN). Comprehensive performance comparisons are made among the above three routing protocols in terms of the average hop, end-to-end delay, network lifetime, packet-loss rate, and energy utilization. Numerical analysis shows that Gossiping-PS significantly outperforms the other two schemes, while Gossiping-VP and Gossiping-EP behave even worse than the standard Gossiping routing protocol under some circumstances, which is owing to the fact that the Greedy algorithm makes the best choice for the current moment instead of taking the global optimality into consideration.

ACPPOEM-0801-86
An Layered Topological Scheduling Method for Cutover in Optical Networks
Xin Qin, Tongquan An, Qian Hu, Fan Yang, Xia Gao, Guangnan Su
China Telecom, China
The intelligent scheduling method is proposed for cutover by converting tasks and rules into a layered topological graph. The experiment in real optical networks demonstrates that our method can achieve a conflict-free and effective schedule.

ACPPOEM-0801-119
Multi-dimensional Data Collection for High-performance Optical Transport Network Maintenance and Optimization
Yu Tang[1,2,3], Xiongyan Tang[1], Yakun Hu[1], Shikui Shen[1], Yan Shi[1], Chuanbiao Zhang[1], He Zhang[1], Zhiguo Zhang[3]
1.China Unicom Research Institute, China; 2.China United Network Communications Group Corporation Limited, China; 3.Beijing University of Posts and Telecommunications, China
In this work, weinvestigated optical power, OSNR and fiber length collected by the MCSof a 400G C+L system and compared with the results measured by separate measurement equipment.

ACPPOEM-0811-11
Toward Increasing User Capacity through Application of Loopback-enabled Architecture and an Adaptive Caching Strategy in Mobile Cellular Networks
Cheng Jin, Yongbing Zhang
University of Tsukuba, Japan
In this paper, we adopt a loopback-based passive optical network architecture in the mobile cellular network and formulate a data caching problem adapting the loopback-enabled network structure for optimal number of served users in the network. We also propose a heuristic caching algorithm adapting the proposed network structure to increase the number of served users and address the issue of time-inefficiency with obtaining optimal values. The simulation results show that there was less than 5% of difference between numbers of served users obtained using proposed algorithm and optimal values, whilst the calculation time for proposed algorithm was significantly reduced compared to optimizations. Furthermore, the number of served users by using our proposed method can be 15% higher than previous studies.

ACPPOEM-0814-41
Strategies of Switching Granularity Selection for Lightpath Services in a Multi-Granularity Optical Network
Zhilin Yuan[1], Huitao Zhou[2], Yongcheng Li[1], Jiawei Zhang[2], Gangxiang Shen[1]
1.Soochow University, China; 2.Beijing University of Posts and Telecommunications, China
We address the issue of selecting switching granularity in a multi-granularity optical network (MGON), focusing on sub-wavelength, wavelength, and waveband granularities. We propose three strategies for granularity selection: network performance prioritization (NPP), service quality prioritization (SQP), and a balanced approach considering both network performance and service quality (BNPSQ). Through simulations, we find that the BNPSQ strategy effectively improves overall network performance and average task completion time (TCT), while fulfilling all the service requirements.

ACPPOEM-0814-45
Assessment of Machine-Learning-based Traffic Prediction Algorithms for Real Access/Metro Network Traffic
Zhewei Lei[1], Fu Wang[1], Leijing Yang[1], Qinghua Tian[1], Li Li[2], Xiongyan Tang[2], Qi Zhang[1], Dandan Sun[1]
1.Beijing University of Posts and Telecommunications, China; 2.China Unicom, China
In this paper, a Graph-Convolutional-Network-Transformer traffic prediction method is proposed and assessed in real network traffic scenarios. An accuracy of 99.47% is achieved, which is better than existing algorithms.

ACPPOEM-0814-68
A Protection Method Based On Shared Slice With Multidimensional Resource In Optical Networks
Shuang Ma, Meng Lian, Xin Li, Yunxiao Ning, Yongli Zhao
Beijing University of Posts and Telecommunications, China
This study proposes a protection method based on shared slice with multidimensional resource to solve the resource waste problem caused by ensuring optical network survivability. Simulation results demonstrate that the proposed algorithm can decrease the service blocking rate and enhance the utilization rate of network resources compared to benchmark algorithms.

ACPPOEM-0815-5
Efficient Redundant Transmission Assurance Mechanisms in the Control Plane for Low-Earth-Orbit Satellite Optical Networks
Wenkui Guo[1], Fu Wang[1], Weiying Feng[2], Qi Zhang[1], Tao Dong[3], Jie Yin[3], Zhewei Lei[1]
1.Beijing University of Posts and Telecommunications, China; 2.Beihang University, China; 3.Space Star Technology Co., Ltd, China
We propose a parallel forwarding redundancy protection algorithm for the control plane of LEO satellite networks based on regional centralized management to reduce flooding operations, and improve system efficiency.

ACPPOEM-0815-16
Multi Hierarchy Mapping Based Computing Power Scheduling for Data Center Optical Network
Wenxin Liu, Hui Yang, Tiankuo Yu, Qiuyan Yao, Ao Yu, Jie Zhang
Beijing University of Posts and Telecommunications, China
This paper introduces a scheduling method of computing power of data center optical network based on multi-hierarchymapping, which aims to solve the challenge of computing power of heterogeneous devices that can not be measured uniformly and realize the balanced allocation of residual computing power resources between different hardware devices. Experimental results show that this method can significantly reduce the total delay of data center optical network, and improve the service processing efficiency by about 50%.

ACPPOEM-0815-58
Timeslot-Aware Protection Scheme with Dynamic Request Adjustment in QKD Optical Networks
Yuxuan Lu[1], Bin He[1], Hong Chen[1], Weidong Shao[1], Ming Jiang[1], Liulei Zhou[1], Bowen Chen[1], Weiguo Ju[2]
1.Soochow University, China; 2.Consulting & Designing Institute CO., LTD, China
In this paper, we proposed a timeslot-aware protection scheme with dynamic request adjustment (TAPS-DRA) to enhance timeslot utilization and success probability within quantum key distribution (QKD) optical networks. Simulation results show that the proposed TAPS-DRA can achieve higher success probability of requests and greater security requirement adaptability.

ACPPOEM-0815-75
QoT Assured RBMSA Design for Shared Path Protection based C+L Bands EONs
Yunxuan Liu[1], Nan Feng[2], Lingfei Shen[1], Jingjing Lv[1], Jinhua Hu[1], Jijun Zhao[1]
1.Hebei University of Engineering, China; 2.54 Institute of China Electronic Technology Corporation, China
This paper proposes a robust RBMSA algorithm for survivable C+L bands EONs to guarantee the OSNR of working paths and backup paths.

ACPPOEM-0815-89
A Hybrid Heuristic Algorithm for Disaster Backup in Data Center Networks
Lin He, Jiayuan Hu, Fengchao Fu, Min Gao, Hao Liu, Weihua Cao
China Telecom Research Institute, China
We propose a hybrid heuristic algorithm that combines particle swarm optimization and ant colony optimizationalgorithm, which enables efficiently selecting transimission paths for rapid disaster backup in data center networks.

ACPPOEM-0815-94
Fast configuration planning algorithm for cost optimization in undersea fiber cable system
Haoyu Wang
School of Electronic Engineering, Beijing University of Posts and Telecommunications, China
We propose and numerically study a fast configuration planning algorithm for cost optimization in undersea fiber cable system Compared with full traversal algorithm, it has been accelerated by 30 times.

ACPPOEM-0815-105
Meta Learning based QoT Estimation of lightpaths with few samples for Optical Networks
Shangbo Lin, Zhiqun Gu, Yuefeng Ji, Jiawei Zhang
State Key Lab of Information Photonics and Optical Communications, BUPT, China
We propose a meta learning based QoT estimation method to estimate the quality of transmission of lightpaths with few samples. The simulation results demonstrate that the proposed method outperforms the traditional models and save train-

ing samples significantly.

Track 4: Optoelectronic Devices and Integration

ACPPOEM-0701-1
Temperature dependence characteristics and noise characteristics of InGaAs/InAlAs X-ray APDs
Yanli Zhao, Wenqiang Ding
Wuhan National Laboratory for Optoelectronics, Huazhong University of Science and Technology, China
The temperature dependence characteristics and noise characteristics of InGaAs/InAlAs X-ray avalanche photodiodes (APDs) with different structures have been investigated. Homemade devices have a lower temperature coefficient(16.20 mV/K) and noise than commercial InGaAs/InPAPDs.

ACPPOEM-0706-1
Research on novel coplanar waveguide electrodes for enhancing the bandwidth of photodiodes
Tonghui Li, Yu Li, Xiaole Gong, Xiaofeng Duan, Kai Liu, Yongqing Huang
Beijing University of Posts and Telecommunications, China
This paper presents a novel photodiode electrode structure to enhance the bandwidth of photodiodes. Simulation results demonstrate that the bandwidth of the photodiode using the proposed electrode can increase by over 40%.

ACPPOEM-0714-1
Design and Performance of High-speed InGaAs/InGa$_{0.351}$As$_{0.755}$P Modified-pin Photodiodes
Yu Li, Tonghui Li, Xiaole Gong, Kai Liu, Yongqing Huang, Xiaofeng Duan
Beijing University of Posts and Telecommunications, China
A high-speed InGaAs/InGa$_{0.351}$As$_{0.755}$P modified-pin photodiode (M-PIN-PD) is presented and investigated. The 3-dB bandwidth of the M-PIN-PD with an absorber layer thickness of 800 nm is 48 GHz and a responsivity of 0.78 A/W.

ACPPOEM-0719-7
High-efficient Silicon Microring Modulator of 3D Omni-junction Profile
Zijian Zhu[1,2], Yingxuan Zhao[1], Fuwan Gan[1,2]
1.Shanghai Institute of Microsystem and Information Technology, Chinese Academy of Sciences, China; 2.University of Chinese Academy of Sciences, China
A silicon microring modulator composed of U-shaped and L-shaped junctions is demonstrated with the VπL of 0.78 V·cm and bandwidth over 28.1 GHz. Results demonstrate the feasibility of complex 3D doping profiles for high-speed applications.

ACPPOEM-0721-10
High-power 1.5 μm InGaAsP/InP BH laser having dilute waveguide structure
Guo Jing[1,2,3], Li Huan[1,2,3], Zhao Lingjuan[1,2,3], Zhou Daibing[1,2,3], Liang Song[1,2,3]
1.Key Laboratory of Semiconductor Materials Science, 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
A 1.5μm high power buried heterojunction (BH) semiconductor laser having dilute waveguide structure has been fabricated. At room temperature, the peak output power is 132 mW. The vertical and lateral divergence angles are 16.8×32.4 degree.

ACPPOEM-0725-8
Optical Phase-Locked Loop Based on a Hybrid Integrated Self-Injection Locked Laser
Minghua Chen[1,2], Shuai Shao[1,2], Liwei Tang[1,2]
1.Beijing National Research Center for Information Science and Technology, China; 2.Department of Electronic Engineering, Tsinghua University, China
We propose an optical phase-looked loop (OPLL) based on an integrated self-injection locked laser. By tuning the high-Q microring resonator (MRR) external cavity, the hybrid slave laser can achieve high-precision phase-locking with the master laser.

ACPPOEM-0726-3
Polarization-insensitive four-channel wavelength-division (de)multiplexer based on cascaded Mach-Zehnder interferometers with adiabatic couplers
Huan Guan
Institute of Semiconductors , Chinese Academy of Sciences, China
A polarization-insensitive 4-channel wavelength (de)multiplexer based on MZIs and adiabatic couplers is proposed. Simulation show that it has a 3-dB bandwidth of 3.21 nm, and the polarization dependent losses are 0.0057 dB for four channels.

ACPPOEM-0726-10
50 Gb/s Wavelength Tunable DBR Laser Integrated with an Electro-absorption Modulator
MengYang Zhong[1], Huan Li[2], Dan Lu[2], LingJuan Zhao[2], Song Liang[2], Kun Yang[1], DaiBing Zhou[2]
1.Zhengzhou University of Light Industry, China; 2.Institute of Semiconductors, Chinese Academy of Sciences, China
A wavelength tunable DBR laser integrated with an electro-absorption modulator TEML operating in the 1.5 μm band was prepared using an InGaAlAs/InP quantum well structure. At 40 °C, the small signal bandwidth of TEML laser was greater than 28 GHz, and the wavelength tuning range was 12.4 nm. 50 Gb/s data transmission is implemented over the entire wavelength tuning range.

ACPPOEM-0726-13
Hybrid-core planar waveguide mode multiplexer fabricated by multi-step photolithography for high-order-mode-passed guide mode manipulating
Quandong Huang, Jiali Zhang, Zhaoqiang Zheng, Jianping Li, Ou Xu, Yuwen Qin
Guangdong University of Technology, China
We propose a methodology to realize the fabrication of hybrid-core planar waveguide mode multiplexer by using multi-step photolithography and demonstrate in the experiment for manipulating the fundamental mode without affecting the high-order modes.

ACPPOEM-0726-14
Power-efficient, ultra-broadband and reconfigurable four-mode converter
Shijie Sun, Yuanhua Che, Tianhang Lian, Daming Zhang, Xibin Wang
Jilin University, China
A power-efficient, ultra-broadband and reconfigurable four-mode converter is designed based on two 1×4 Y-junctions assisted by four thermo-optic phase shifters. The device can realize arbitrarily conversion between four modes with power-consumption of ~ 6.2 mW.

ACPPOEM-0726-21
Image encoding and recovery based on inhibited spiking dynamics of VCSEL neuron
Zhifei Duan, Xiaodong Lin, Yingke Xie, Xiaorui Du, Xue Wu, Lin Ma, Zhengmao Wu, Tao Deng
Southwest University, China
We propose and numerically investigate an image encoding and recovery system based on the inhibited spiking dynamics of a 1550-nm vertical-cavity surface-emitting laser (VCSEL) neuron. The results demonstrate that VCSELs subject to orthogonal optical injection can mimic the behaviors of biological neurons under external perturbations (stimuli) with different intensities and durations. Furthermore, VCSEL neuron can possess the encoding capability of binary-to-spike with GHz rate. Based on the post-processing techniques of spiking dynamics, the image recovery with bit error rate (BER) of 6.6×10^{-3} is achieved.

ACPPOEM-0727-7
A Low-Loss Polarization-Splitting Grating Coupler based on Inverse-Design
Lan Wu, Jifang Qiu, Lihang Wang, Yuchen Chen, Hongxiang Guo, Jian Wu
Beijing University of Posts and Telecommunications, China
We present a vertical polarization-splitting grating coupler (PSGC) designed using inverse design method. The insertion loss of this PSGC is minimized to -1.52 dB and -1.62 dB at 1555 nm for two polarizations.

ACPPOEM-0727-8
Optimization design of arrayed waveguide grating using dual-etched multimode interference aperture
Xudong Du, Yu Cheng, Tao Shi, Jinhua Chen, Chen Ji
Zhejiang University, China
We propose a low-loss and wide-bandwidth 4-channel SOI horseshoe-shaped MMI-AWG based on dual-etched waveguide apertures. The 3dB bandwidth of the device has been improved from 0.9nm to 3.1nm, with an insertion loss below 5.5dB.

ACPPOEM-0728-2
Silicon Photonic Filter using an Elliptical Micro-Ring with Small Bent Radius and Ultra-Large FSR
Xu Hua Cao[1,2,3], Yu Hao Zhang[1,2,3], Ming Li[1,2,3], Ning Hua Zhu[1,2,3], Wei Li[1,2,3]
1.State Key Laboratory on Integrated Optoelectronics, Institute of Semiconductors, Chinese Academy of Sciences, China; 2.School of Electronic, Electrical and Communication Engineering, University of Chinese Academy of Sciences, China; 3.Center of Materials Science and Optoelectronics Engineering, University of Chinese Academy of Sciences, China
We propose a silicon photonic filter using an elliptical micro-ring, and describe in detail of the simulation studies conducted on minimizing the bent radius and maximizing the free spectral range (FSR). The ultra-large FSR of 56 nm is realized without multimode involved in the filter.

ACPPOEM-0728-9
A 56 Gb/s 9.6 mW PAM-4 Receiver Analog Front end based on gm-boosted
Shunyu Li[1], Guang Yong Chu[1,2], Pengfei Niu[3], Velásquez Micolta Juan Camilo[4], Shixun Zhang[5], Guofeng Yang[1]
1.Jiangnan University, China; 2.Jiangsu Provincial Research Center of Light Industrial Opto. Engi.&Tech, China; 3.Tianjin University, China; 4.Universidad Autónoma de Manizales, Colombia; 5.Peng Cheng Laboratory, China
The analog front-end receiver provides a data rate of 56 Gb/s while using only 9.2 mW power. It adjusts for 27.1 dB loss to maintain a bit error rate under 10^{-9} , and its FoM of 0.006 pJ/bit/dB greatly improves energy efficiency.

ACPPOEM-0728-16
Ultralow-Loss Power Splitters Based on Shape Optimization Method
Yijun He, Jifang Qiu, Bowen Zhang, Suping Jiao, Hongxiang Guo, Jian Wu
State Key Laboratory of Information Photonics and Optical Communications, Beijing University of Posts and Telecommunications, China
We demonstrate two 1 × 4 MMI power splitters by using a shape optimization method. Simulation results show that uniform power splitting and a splitting ratio of 1:2:4:8 are both realized with ultra-low insertion loss.

ACPPOEM-0728-19
800 Gbps Integrated Silicon Photonics Receiver Chip Based on Cascaded Mach-Zehnder Interferometer (MZI) Lattice Filters
Ruiqi Luo[1], Maojing Hou[1], Wei Ma[1,2]
1.Zhejiang Laboratory, China; 2.Zhejiang University, China
We have successfully demonstrated an integrated polarization-diversified 8×100 Gbps Silicon Photonics Receiver chip, which is composed of an edge coupler, a polarization splitter-rotator, two cascaded Mach-Zehnder Interferometer (MZI) lattice filters, and high-speed germanium photodetector (GeSi PD) array. We tested the bandwidth of the GeSi detector (> 40GHz) and measured the eye diagram of the receiver chip with 53.125Gbaud PAM4 signal for each channel.

ACPPOEM-0728-35
Programmable high-precision weight bank based on integrated semiconductor optical amplifier array
Jiahui Liu[1,2], Kaifei Tang[1,2], Xiang Ji[1,2], Xin Zhou[1,2], Chuanbo Zhang[1,2], Ling Wang[1,2], Wentao Sun[1,2], Pan Dai[1,2], Shaobo Li[3], Xiang Ma[3], Rulei Xiao[1,2], Xiangfei Chen[1,2]
1.College of Engineering and Applied Sciences, Nanjing University, China; 2.National Laboratory of Solid-State Microstructures, Nanjing University, China; 3.Optical Communication Research and Development Center, the 54th Research Institute of China Electronics Technology Group Corporation, China
As the main challenge for in-memory photonic computing, high-precision weight controlling will enable us to perform parallel multiply accumulate (MAC) with enhanced computing accuracy. Considering environmental factors such as fluctuation of temperature, it's difficult to accurately control the weight for photonic computing. To solve the problem above, we proposed an integrated array of semiconductor optical amplifiers (SOAs) as photonic synapses for programmable weight bank. A monolithically integrated 8-channel DFB-SOA chip is designed and fabricated, demonstrated record-high precision of 9.2 bits for weighting control.

ACPPOEM-0729-14
Optical Nonlinearity Enhancement in Silicon Nitride Organic Hybrid Strip Waveguide
Wentao Ye, Lei Lei
Shenzhen University, China
We demonstrate a dispersion-engineered nonlinear Si_3N_4 waveguide. The conversion efficiency of the four-wave mixing exhibits great enhancements of more than 13 dB and 17 dB compared to Si_3N_4 waveguide and silicon-organic hybrid slot waveguide, respectively.

ACPPOEM-0730-3
2×2 SOI optical switch with robust high extinction ratio on all paths enabled by parabolic MMI coupler
Guihan Wu, Haijiang Cao, Minfeng Jin, Xin Zhou, Qiuyang Jiang, Wei Jiang
Nanjing University, China
We propose and experimentally demonstrate a Mach-Zehnder silicon thermo-optic switch based on a parabolic multimode interference coupler. By judiciously designing the parabolic structure, the 2×2 MMI can exhibit an extremely small imbalance of output power around 0.1 dB over the C band and have good manufacturing tolerances according to simulation. As such, for all four possible switching paths, high average extinction ratios over 35 dB can be achieved from 1520 nm to 1580 nm in the experiment, with maximum values concurrently over 40 dB. The proposed parabolic MMI occupies a small area of merely 2.4 μm × 9.5 μm.

ACPPOEM-0730-5
Ultra-wide and ultra-compact spot size converter based on dielectric metasurfaces
Desheng Zeng, Qingzhong Huang
Wuhan National Laboratory for Optoelectronics, China
We present a compact and efficient spot size converter (SSC) design method based on metasurfaces, which is suitable for beam transformation between single mode waveguide and any wide multi-mode waveguide in theory. Two kinds of SSCs connecting 100 μm or 12 μm wide waveguide with 0.5 μm wide waveguide have been fabricated. Experiments show that the insertion losses are 0.81 dB and 1.00 dB at 1550nm, respectively. For SSCs connecting 100 μm or 12 μm wide waveguide with 0.5 μm wide waveguide, the insertion losses are both lower than 1.50 dB in 1530-1580 nm and 1500-1590 nm, respectively.

ACPPOEM-0730-20
A high-power modified uni-traveling-carrier photodiode (MUTC-PD) operating at 1310nm band for Radio-over-Fiber (RoF) communication system
Shuhu Tan, Xuejie Wang, Yongqing Huang, Kai Liu, Xiaofeng Duan, Xiaomin Ren
Beijing University of Posts and Telecommunications, China
We propose a high-power MUTC photodiode operating at 1310nm band. The 20μm photodiode with a dual Gaussian doping structure exhibits over 30GHz of 3dB bandwidth, 37.2dBm@15GHz of peak RF output power, and 0.82A/W of responsivity.

ACPPOEM-0730-39
Design and Simulation of Highly Efficient Chirped Blazed Grating Coupler Based on Thin-Film Lithium Niobate
Min Liu[1], Guangshuai Meng[1], Binhang Xu[1], Jing Du[1,2], Jian Wang[1,2], Junqiang Sun[1]
1.Huazhong University of Science and Technology, China; 2.Optics Valley Laboratory, China
We design a chirped blazed grating coupler based on TFLN using particle swarm optimization. The results show that the coupler has a coupling efficiency of -1.56 dB and a 3 dB bandwidth of 67.28 nm.

ACPPOEM-0731-4
Impact of Gamma-Ray Radiation on High Speed Silicon Optical modulators
Nengyang Zhao[1], Longsheng Wu[1], Chao Qiu[1], Dawei Bi[1], Yanyue Ding[1], Enxia Zhang[2], Aimin Wu[1]
1.Shanghai Institute of Microsystem and Information Technology, Chinese Academy of Sciences, China; 2.Department of Electrical and computer engineering, University of Central Florida, United States
The performance of MZMs was studied under gamma-ray radiation. The experiments showed when the total dose of radiation reached 10Mrad(Si), the influence on modulation efficiency of MZMs was negligible. However, the EO-bandwidth decreased by 13%.

ACPPOEM-0731-13
Ertical Impedance-Matched Photodetectors for High-Power Applications
Tianlang Yang, Xiangyang Dai, Qiaoyin Lu, Weihua Guo
Huazhong University of Science and Technology Wuhan photoelectric National Research Center, China
A small area waveguide photodiode is designed, which can achieve stable and uniform photocurrent, photocurrent fluctuation 0.05dB/μm, response 0.5A/W, and meet the requirements of high speed and high power operation.

ACPPOEM-0731-18
Deep reinforcement learning based on optical neural networks in path planning
Zhiwei Yang, Yihang Lai, Jian Dai, Tian Zhang, Kun Xu
Beijing University of Posts and Telecommunications, China
We propose the optical deep Q network (ODQN) algorithm based on optical neural networks (ONNs) to accelerate calculation and prove the relatively good robustness of the ODQN algorithm in 2D grid path planning task.

ACPPOEM-0731-23
Investigation of collimation and polarization characteristics of multimode VCSEL based on metasurface optoelectronic integration
Pan Fu, Xiaorui Zhao, Bo Wu, Yiyang Xie
Beijing University of Technology, China
We propose a method based on metasurface optoelectronic integration to realize the collimation of multimode VCSEL and explore their polarization characteristics. This study provides valuable guidance for VCSEL in mode and polarization multiplexing.

ACPPOEM-0731-26
Design of 1550 nm High-power Single-mode DBR Laser Diodes
Qianru Lu[1], Yuanhao Zhang[1], Minwen Xiang[1], Can Liu[2], Qiaoyin Lu[1], GuoWeihua[1]
1.Huazhong University of Science and Technology, China; 2.Ori-chip optoelectronics technology LTD, China
We present an 8-μm-wide 1.5-mm-long high-power and single-mode DBR laser. The designed laser has been predicted with a threshold current of about 88 mA and a slope efficiency of about 0.28 mW/mA.

ACPPOEM-0731-34
Continuous THz-wave generation using antenna-integrated MUTC-PD and DFB laser array
Chaodan Chi[1], Yingfei Wan[1], Yiti Xiong[1], Yili Liu[1], Zhangwan Peng[2], Hao Wang[3], Dan Lu[3], Kun Yin[1], Chen Ji[2]
1.Zhejiang Lab, China; 2.Zhejiang University, China; 3.Key Laboratory of Semiconductor Materials Science Institute of Semiconductors, CAS, China
In this paper, photonic generation of continuous terahertz waves is demonstrated using our internal designed antenna-integrated MUTC-PD and DFB laser array chip, and signal from 0.027 to 0.641 THz is demonstrated.

ACPPOEM-0731-35
Continuous-wave Terahertz Mode-beating Signal Generation Based on High-power Multi-wavelength DFB Semiconductor Laser Array
Yingfei Wan[1], Chaodan Chi[1], Yiti Xiong[1], Yili Liu[1], Wanshu Xiong[1], Kun Yin[1], Hao Wang[2], Dan Lu[2], Chen Ji[3]
1.Zhejiang Lab, China; 2.Key Laboratory of Semiconductor Materials Science Institute of Semiconductors, Chinese Academy of Sciences, China; 3.College of Information Science and Electronic Engineering Zhejiang University, China
We report a high-power multi-wavelength DFB diode laser array that can generate continuously tunable THz signals in the frequency range of 0.075 to 2.23 THz through optical heterodyne method.

ACPPOEM-0731-45
Photonic Chip Set for Terahertz Frequency 45 Gb/s Data Transmission
Yiti Xiong, Yingfei Wan, Chaodan Chi, Yili Liu, Yanhui Shi, Kun Yin, Hao Wang, Dan Lu, Chen Ji
Zhejiang Lab, China
We experimentally demonstratea 45 Gb/s terahertz data transmitter with continuously tunable terahertz signals in 110-219 GHz, based on an internally developed 1550 nm photonic chip set, including DFB lasers, a MZM and a UTC-PD.

ACPPOEM-0731-58
Efficient On-Chip Training of Optical Processor Using Stochastic Parallel-Gradient-Descent Algorithm
Yuanjian Wan[1,2], Xudong Liu[1,2], Guangze Wu[1,2], Yu Zhang[1,2], Jian Wang[1,2]
1.Wuhan National Laboratory for Optoelectronics, Huazhong University of Science and Technology, China; 2.Optics Valley Laboratory, China
We use stochastic parallel-gradient-descent algorithm to configure optical processor, which has less computation than traditional gradient descent algorithms. We apply it in optical communication system for compensating the crosstalk in space division multiplexing systems.

ACPPOEM-0731-63
Mid-infrared supercontinuum generation in a cascaded silicon ridge waveguide by a low-energy picosecond pulse
You Wu, Jiajia Zhao, Qian Li
School of Electronic and Computer Engineering, Peking University, Shenzhen, China
We propose an approach to generate a mid-infrared supercontinuum with a wide bandwidth of 1490 nm and high coherence in a two-segment cascaded silicon ridge waveguide, which is pumped by a 4.5-pJ picosecond pulse.

ACPPOEM-0731-81
A laser-to-chip edge coupling scheme based on novel dual lens
Yili Liu, Tian Chai, Chaodan Chi, Yingfei Wan, Yiti Xiong, Shuo Liu, Wanshu Xiong, Kun Yin, Chen Ji
Zhejiang Lab, China
A novel high-tolerance coupling configuration of DFB lasers to silicon photonic chips based on the dual-lens is discussed. The high-tolerance and high-coupling-efficiency dual-lens solution iseasy to assemble for the silicon photonics integration.

ACPPOEM-0731-82
An Image-free Location Method Using Photonic Integrated Interferometric System
Xiaohan Song, Yong Zuo, Wang Yuhao, Xiaobin Hong, Jian Wu
Beijing University of Posts and Telecommunications, China
Object location technology has wide application prospects in the military, sports, security, transportation and other fields. This paper proposes an image-free target location method by combining photonic integrated circuits and the Fourier projection slicing theorem.

ACPPOEM-0731-91
Design and optimization of high-impedance transmission line electrode for high-power and high-bandwidth photodetector
Xiaodong Xie, Yongqing Huang, Shaoyu Wang, Xuejie Wang, Xiaofeng Duan, Kai Liu
Beijing University of Posts andTelecommunications, China
This paper proposes and adopts a co-simulation method to design an electrode with a high-impedance transmission line to enhance the output power and bandwidth of the photodetector.

ACPPOEM-0731-111
Angular response improvement of a Fabry-Perot tunable filter for infrared multispectral imaging
Can Chen[1,2], Yang Chenlong[1,2], Zhou Jiajun[2,3], Lai Jianjun[1,2]
1.Wuhan National Laboratory for Optoelectronics, China; 2.Huazhong University of Science and Technology, China; 3.School of Opitcal and Electronic Information, China
A Fabry Perot tunable filter with stable bandwidth has been designed for infrared multispectral imaging. Sub-wavelength metasurfaces are introduced on the inner sides of high reflection cavity mirrors to lessen the angular influence.

ACPPOEM-0731-117
Wide Bandwidth Wavelength combination for 50G-PON through adiabatic 3-dB coupler based on asymmetric MZI
Panpan Yu, Guojiong Li, Yuheng Pan, Liyuan Song, Juan Xia, Jieru Zhao, Yongqian Tang, Qiaoyin Lu, Weihua Guo
Huazhong University of Science and Technology, China
Photonic integrated wavelength combination through an asymmetric Mach-Zehnder interferometer was proposed. It contains an adiabatic 2´2 coupler and a multi-mode interference splitter, which enables the input of 1342 and 1490 nm to couple into one output port. The transmission efficiency of the wavelength combining is more than 90% at the wavelength of 1342-1577 nm. The wavelength beam combination scheme proposed above is an attractive candidate for 50G-PON wavelength division multiplexing based on the TFLN photonic integration platform.

ACPPOEM-0731-124
High Performance Adiabatic Polarization Rotator-Combiner Based on Thin-Film Lithium Niobate Platform
Panpan Yu, Yuheng Pan, Yongqian Tang, Xiangyang Dai, Juan Xia, Jieru Zhao, Guojiong Li, Qiaoyin Lu, Weihua Guo
Huazhong University of Science and Technology, China
We experimentally demonstrate a polarization rotator-combiner based on thin-film lithium niobite with wide bandwidth and high polarization extinction ratio. The device fabricated by standard photolithography has a large fabrication tolerance and provides a PER 20 dB in the wavelength range of 80 nm.

ACPPOEM-0731-143
Modified dual depletion region photodiode with optimized collection layer
Xinyue Li, Xiaofeng Duan, Jihong Ye, Yongqing Huang, Kai Liu, Xiaomin Ren
Beijing university of posts and telecommunications, China
Using two layers of InGaAsP with different components as the non-absorption depletion region of the Dual Depletion Region Photodiode (DDR-PD), a Modified Dual Depletion Region Photodiode (MDDR-PD) is proposed. Eventually, the device achieved 67GHz bandwidth.

ACPPOEM-0731-169
PLC Splitter Encoded with Waveguide Bragg Grating by Femtosecond Laser Inscribing Technique for PON Monitoring
Jin Hu[1], Xu Liu[1], Lin Ma[1], Heyuan Li[2], Zuyuan He[1]
1.State Key Laboratory of Advanced Optical Communication Systems and Networks,Shanghai Jiao Tong University, China; 2.Zhejiang Lab, China
We demonstrate PLC splitter encoded by Bragg waveguide gratings with a wavelength interval of 4 nm and an adjustable reflectanceup to 40% using a femtosecond laser inscribing technique for passive optical network monitoring applications.

ACPPOEM-0731-172
Non-volatile photonic synapse with ultra-low insertion loss for deep neural network
Zhiqiang Quan, Ma Xiaoxiao, Yuanjian Wan, Jian Wang
Huazhong University of Science and Technology, China
Neuromorphic computing underlies many computational tasks, from signal processing to classification, artificial intelligence, and deep learning applications. Compared with the traditional Von Neumann architecture, the non-volatile photonic neural network adopts the in-memory computing architecture to improve the computing speed and reduce the computing energy consumption. The non-volatile photonic neural network consists of photonic synapses with linear responses and nonlinear activation functions. However, existing non-volatile photonic neural synapses with large insertion loss (IL) and small output intensity modulation range hamper the construction of the deep neural network (DNN) with multiple hidden layers for high-accuracy complex signal recognition. Here, we show a non-volatile synapse with excellent performance to construct the non-volatile deep neural network (NVDNN). The obtained results show that the IL and output intensity modulation range of our photonic synapse is 0.01 dB and 30.03 dB with a 54 nm 3 dB bandwidth. For the complex picture classification task, the NVDNN based on our photonic synapse has a higher accuracy compared with the single-layer non-volatile photonic neural network. Our results demonstrate how to design non-volatile synapses and construct complex optical neural networks, and reveal their advantages in information processing capabilities.

ACPPOEM-0731-179
A computational algorithm for design of dual-etched grating couplers on 220-nm SOI platform
Lihang Wang, Jifang Qiu, Lan Wu, Yuchen Chen, Hongxiang Guo, Jian Wu
State Key Laboratory of Information Photonics and Optical Communications, Beijing University of Posts and Telecommunications, China
A three-step computational algorithm for designs of dual-etched grating couplers is proposed. By modulating different unit grating structures, a high-performance grating coupler, compatible with deep ultraviolet lithography, reaches a coupling efficiency of 64.5% and a 3-dB bandwidth of 70nm, validating the efficacy of this algorithm.

ACPPOEM-0731-187
A compact AR-HUD system based on 1-D pupil expansion diffractive waveguide
Han Yang, Gaoyu Dai, Ren Kailin, Yin Luqiao, Zhang Jianhua
Shanghai University, China
A one-dimensional pupil expansiondiffractive optical waveguide system for AR-HUD is presented, with an expanded pupil size of 80 mm × 15 mm and a field of view of 10° × 5° at the wavelength of 532 nm.

ACPPOEM-0801-5
Narrow spectral linewidth O-band quantum dot distributed feedback lasers
Lin Shizhe, Ding Zhengqing, Zhan Kun, Cai Minghao, Yu Ying, Yu Siyuan
Sun Yat-Sen University, China
A 1.3 μm GaAs-based QD-DFB laser with integrated FP cavity has been fabricated. The laser have a tuning range of 5.21 nm, with alinewidth of 140 kHz and a highest SMSR of 48 dB.

ACPPOEM-0801-12
Design and Simulation of Low-Loss Multimode B-spline Waveguide Bends Based on Lithium Niobate on Insulator
Binhang Xu[1], Min Liu[1], Guangshuai Meng[1], Jing Du[1,2], Jian Wang[1,2], Junqiang Sun[1]
1.Huazhong University of Science and Technology, China; 2.Optics Valley Laboratory, China
We design and simulate low-loss multimode B-spline waveguide bends based on lithium niobate on insulator assisted by Equilibrium optimizer. The results also show favorable crosstalk properties.

ACPPOEM-0801-27
Low-loss and broadband edge coupler for cleaved single mode fiber and lithium niobate waveguide
Zhenmin Chen[1], Xin Tu[2], Chen Zhang[1], Zhengtong Liu[1]
1.Peng Cheng Laboratory, China; 2.China University of Geosciences, China
A double-forked shape edge coupler has been presented base on LNOI. The coupling loss of TE mode is 0.92 dB with the cleaved single mode fiber. The 3-dB alignment tolerance can reach more than ±4 mm.

ACPPOEM-0801-46
Deformed Square Microcavity Semiconductor Lasers With Dual Transverse Modes
Yang Shi[1,2], Hang-Dong Wei[1,2], You-Zeng Hao[1,2], Yue-De Yang[1,2], Jin-Long Xiao[1,2], Yong-Zhen Huang[1,2]
1.Institute of Semiconductors, Chinese Academy of Sciences, China; 2.Center of Materials Science and Optoelectronics Engineering, University of Chinese Academy of Sciences, China
Deformed square microcavity semiconductor lasers with pure dual-transverse-mode lasing spectra are designed and demonstrated. Two opposite circular vertices deformation are used to enlarge the dual mode interval that can be adjusted by changing the deformation.

ACPPOEM-0801-48
Mode Control for Octagonal Microcavity Lasers
Zhenning Zhang[1,2], Jiancheng Li[1,2], Youzeng Hao[1], Mengwei Sheng[1,2], Yuede Yang[1,2], Jinlong Xiao[1,2], Yongzhen Huang[1,2]
1.Institute of Semiconductors, Chinese Academy of Sciences, China; 2.Center of Materials Science and Optoelectronics Engineering, University of Chinese Academy of Sciences, China
A bistable deformed octagonal microcavity laser is demonstrated. A counterclockwise hysteresis loop is observed with the current range of 17 mA.The direct modulation bandwidth is increased to 16 GHz through the photon-photon resonance effect.

ACPPOEM-0801-96
Packaged ultra-high-quality optical whispering gallery mode microresonators with air tightness and 3-axis adjustment
Haiyun Yuan[1,2,3,4], Hairun Guo[1,2,3,4], Suwan Sun[1,2,3,4], Jiamin Bai[1,2,3,4], Siyu Wang[1,2,3,4]
1.Key Laboratory of Specialty Fiber Optics and Optical Access Networks, China; 2.Joint International Research Laboratory of Specialty Fiber Optics and Advanced Communication, China; 3.Shanghai University, China; 4.Shanghai Institutefor Advanced Communication and Data Science, China
Whispering gallery mode (WGM) microcavity has become an important platform for optical research and application due to its ultra-high quality factor (Q-factor) and low mode volume. However, the surface of crystalline microcavities and fiber-microcavity system is extremely sensitive toenvironment. The optimal coupling between WGM microcavity and tapered fiber depends heavily on observation of optical microscope and adjustment of precision mechanical instruments. In this paper, we present a novel packaged device for high-quality WGM MgF_2 and SiO_2 microcavities with 3D adjustment, good portability and high air tightness, which not only ensures the long-term stability of the microcavities' Q factor, but also realizes the real-time control of fiber-microcavity coupling system. The proposed device has shown potential for onsite applications outside the laboratory frame.

ACPPOEM-0801-115
Effect of Phase Noise on Electro-optic Frequency Combs Using Integrated Lithium Niobate Modulators
Pengfei Liu[1], Hao Wen[1], Zuhang Li[1], Yu Yu[1,2], Lei Shi[1,2], Xinliang Zhang[1,2]
1.Huazhong University of Science and Technology, China; 2.Optics Valley Laboratory, China
Electro-optic (EO) frequency combs have played a critical role in high-capacity optical communications, microwave photonics, and spectroscopy. These applications require EO frequency combs featuring good flatness and strong coherence, however, high phase noise severely degrades the performance of EO frequency combs. Here, we demonstrated an on-chip EO frequency comb generator based on thin-film lithium niobate modulators, and we analyzed the effect of phase noise on integrated EO frequency combs.

ACPPOEM-0801-118
Automated Design of FSR-Free Silicon Photonics Microring Filters Based on Sparse Spectral Response
Yu Chen[1], Meilin Zhong[1], Gangxiang Shen[1], Gordon Ning Liu[1], Wei Cao[2], Xu Sun[2], Xiaogang Chen[2], Shenghao Liu[2]
1.School of Electronic and Information Engineering, Soochow University, China; 2.Silicon Photonics R&D Center, CreaLights Technology Co., Ltd., China
We present an automated design method for FSR-Free silicon photonics microring filter. The sparsity of the filter spectral response is utilized as an evaluation metric. Simulation results demonstrate the effectiveness and superiority of the proposed method.

ACPPOEM-0801-151
Mode-switching based Reconfigurable Optical Power Splitter for Channel Scalable and MSA-compatible Optical Interconnects
Xinyi Wang, Jiangbing Du, Zuyuan He
Shanghai Jiao Tong University, China
We proposed a mode-switching based reconfigurable optical power splitter with channel number scalability covering 1, 2, 4, and 8 channels, which can be used for versatile MSA-compatible optical interconnects with minimal switching control and large bandwidth.

ACPPOEM-0801-156
A 4-channel ultrafast wavelength-swept REC-DFB laser array for fiber Bragg grating interrogation
Lingxin Meng[1], Pan Dai[1], Qilu Ban[1], Kaichuan Xu[1], Jiacheng Wang[1], Zhen Li[1], Feng Wang[1], Jie Zeng[2], Shaobo Li[3], Xiang Ma[3], Xiangfei Chen[1]
1.Nanjing University, China; 2.Nanjing University of Aeronautics and Astronautics, China; 3.Optical Communication Research and Development Center, the 54th Research Institute of China Electronics Technology Group Corporation, China
We present a four-channel ultrafast wavelength-swept REC-DFB laser array based on instantaneous injection current modulation. A fast tuning of over 16nm at 100kHz sweeping was achieved and four FBG temperature sensor arrays were successfully demodulated.

ACPPOEM-0809-2
Design of UTC-PD With Nanoscale Optical Microstructures
Junjie Wang[1,2], Kai Liu[1,2], Xiaowen Dong[1,2], Xiaofeng Duan[1,2], Yongqing Huang[1,2], Honggang Zhai[3]
1.School of Electronic Engineering, Beijing University of Posts and Telecommunications, China; 2.State Key Laboratory of Information Photonics and Optical Communications Beijing University of Posts and Telecommunications, China; 3.Ccloud Electro Optics Technology Co. Ltd, China
We design a UTC-PD incorporating nanoscale optical microstructures. It includes a waveguide structure and scattering structure to convert incident light from vertical incidence to lateral propagation and constrain it within the absorption layer, thereby the responsivity of UTC-PD is improved.

ACPPOEM-0809-5
Ultra-Compact Silicon-on-Chip Photonic Devices Based on Inverse Design
Maojing Hou, Ruiqi Luo, Nan Liu, Qiao Wang, Guandong Liu, Wei Ma
Zhejiang Laboratory, China
Our work designed two kinds of silicon optical devices based on inverse design, one is an ultra-compact taper with a length of only 5μm, which has a wide operating frequency band from 1500nm to 1600nm, and the average insertion loss is about -2 dB. Anotheris an O-band polarization-independent wavelength division Multiplexing (WDM) device with an insertion loss of -3 db.

ACPPOEM-0813-8
Ultra-compact Silicon Waveguide Mode Converting Reflector Based on Inverse Design
Shanglin Yang[1], Yue Yu[1], Han Zheng[1], Tong Zhang[2]
1.School of Optoelectronic Engineering, Xidian University, China; 2.School of Automation Science and Engineering, Xi'an Jiaotong University, China
We design an ultra-compact silicon waveguide mode-converting reflector based on photonics inverse design, which converts TE_0 mode to TE_1 mode and reflects light within $2 \times 2\ \mu m^2$.

ACPPOEM-0813-10
Fast Wavelength Locking of Thermally Tunable Silicon Vernier Microring Filter over the O-band
Guangze Wu[1,2], Yuanjian Wan[1,2], Yu Zhang[1,2], Jian Wang[2,3]
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.Optoelectronics and School of Optical and Electronic Information, Huazhong University of Science and Technology, China
We experimentally demonstrate fast wavelength locking of thermallly tuned silicon Vernier microring filter over the O-band by using the improved stochastic parallel-gradient-descent algorithm.

ACPPOEM-0814-5
800G Receiver Integrated Chip based on Tunable Etched Diffraction Grating
Nan Liu, Ruiqi Luo, Maojing Hou, Qiao Wang, Guandong Liu, Wei Ma
Zhejiang Lab, China
An 800G receiver integrated chip based on tunable EDG is reported. A single thermo-optic tuning process allows for the correction of the integrated chip's operating wavelength, achieving a single-wavelength transmission rate of 100Gbps.

ACPPOEM-0814-32
Design and Characterization of Line-Defected Silicon Waveguide and High-Q Optical Cavity
Sohail Muhammad
University of Electronic Science and Technology of China, China
The development of optical devices has become increasingly important in the miniaturization of integrated circuits, and photonic crystals (PhCs) have emerged as a promising platform for such devices. In this paper, we propose a broadband Silicon waveguide operating at telecommunications wavelengths ($\lambda 0 \sim 1550$ nm), which utilizes a silicon-based 2D photonic crystal to achieve a high transmission rate. Our simulation results show that by optimizing the width of the waveguide and radius, we can improve the transmission rate and adjust the passband region wavelength range. Specifically, for a waveguide width of 0.25um, the transmission rate varies from 83% to 92%, with a passband region wavelength range of 1480nm to 1670nm. For a wider waveguide width of 0.5um, the transmission rate varies from 75% to 95%, with a wider passband region wavelength range of 1550nm to 1720nm. Furthermore, we designed a high Q hexagonal lattice photonic crystal optical cavity based on Silicon with a thickness of 0.5um. Our simulation results demonstrate a high-quality factor of 52548 at 188.375THz. Our proposed broadband Silicon waveguide and photonic crystal cavity have potential applications in various areas, including telecommunications, sensing, and quantum information processing.

ACPPOEM-0814-56
Flat-Top, Narrow-Band, Thermally Tunable Optical Filters Based on Multi-Phase-Shifted Bragg Gratings and Suspended Waveguide
Lian Zhu, Long Chen, Yonglin Yu, Kaixiang Cao, Yuan Yu
Huazhong University of Science and Technoloy, China
Tunable optical filters are key components in optical communication systems. In this paper, a multi-phase-shifted Bragg gratings (MPSBGs) filter based on a laterally supported suspended waveguide is designed and fabricated. Optimized design of phase-shift segments location and length in MPSBGs combined with thermal tuning of the suspended waveguide to achieve a flat-top, narrow-band filter response. By tuning the heater in the phase shift section, a transmission window with a -3 dB bandwidth of 270 pm is obtained, while out-of-band rejection of is about 30 dB, shape factor (the ratio of -20 dB to -3 dB bandwidth) is 2.3, and thermal tuning efficiency is about 40 pm/mW.

ACPPOEM-0814-64
Experimental Investigation on Chirp Characteristics of 3s-DBR Lasers
Jiashi Feng, Haixuan Xu, Yonglin Yu
Huazhong University of Science and Technology, China
The chirp parameters of a 3s-DBR laser are characterized. Experimental results show that the LEF can decrease with tuning the grating section, confirming the detuned loading effect on the chirp property from a new perspective.

ACPPOEM-0815-33
A novel thermo-optic phase shifter based on anti-symmetric Bragg grating
Shengping Liu[1], Qiang Li[1], Yang Zhao[1], Wei Wang[1], Guoguang Yao[1], Shang Gao[1], Junbo Feng[1], Qipeng Zhan[2], Yong Tang[3], Yao Xiao[3]
1.Chongqing United Microelectronics Center, China; 2.Anhui University, China; 3.University of Electronic Science and Technology of China, China
Thermo-optic phase shifter (TOPS) plays an important role in the silicon photonics integrated circuits. In this article, we proposed and experimentally demonstrated a novel TOPS based on the anti-symmetric Bragg grating (ASBG). By using the ASBG and anti-directional coupler, the overlap integral of light field and thermal field is increased by three times. The TOPS has been fabricated on CUMEC's standard CSiP180Al and CSiP130Cu silicon photonics platform. The experimental results show that the efficiency of the TOPS is about 6.75mW/π, which is only about a third of the conventional TOPS. At the same

time, the rise time and drop time are only 7.1 μs and 9.7 μs. The proposed TOPS based on the ASBG paves the way for a high efficiency TOPS for the silicon photonics integrated circuits without sacrificing the switching time.

ACPPOEM-0815-43
Low Power Consumption Supercontinuum Source in the Dispersion Engineered Silicon Nitride Waveguides
Ruifeng Chen, Feng Ye, Jiayao Huang, Qian Li
Peking University Shenzhen Graduate School, China
We introduce a scheme for supercontinuum generation with relatively low power consumption and better coherence through the incorporation of additional frequency components in the dispersion-engineered silicon nitride waveguides.

ACPPOEM-0815-52
Ultra-compact Silicon-based Three Mode Splitter via Inverse Design Method
Jinhua Chen, Weiwei Pan, Yu Cheng, Xudong Du, Tao Shi, Chen Ji
Zhejiang University, China
We proposed an ultra-compact and broadband three mode splitter with a footprint of only 5*5.2 um^2 based on silicon photonics platform. The device is optimized by the topology optimization-based inverse design method.

ACPPOEM-0815-54
Non-Hermitian Silicon Nitride Microring Resonators with Large Tunable Bandwidth
Yuchen Yin, Xuhan Guo, Yikai Su
Shanghai Jiao Tong University, China
We propose a non-Hermitian silicon nitride (Si_3N_4) microring resonators (MRRs) with a large tunable bandwidth from 5.4 GHz to 97.3 GHz and a large free space range (FSR) using an efficient titanium (Ti) heater.

ACPPOEM-0815-56
On-chip microdisk resonator wave-meter
Jianfei Sun
Shanghai Jiao Tong University, China
We demonstrate an on-chip wave-meterimplemented using microdisk resonators. The device exhibits robust resistance to environmental interference. The utilization of machine learning classification algorithms enables achieving high resolution and accuracy in spectral analysis.

ACPPOEM-0815-81
Mitigating Fast Thermal Instability by Engineered Laser Sweep in AlN Soliton Microcomb Generation
Zihao Wang[1], Kewei Liu[1], Shunyu Yao[1], Yanan Guo[2,3], Jianchang Yan[2,3], Junxi Wang[2,3], Changxi Yang[1], Chengying Bao[1]
1.State Key Laboratory of Precision Measurement Technology and Instruments, Department of Precision Instruments, Tsinghua University, China; 2.Center for Materials Science and Optoelectronics Engineering, University of the Chinese Academy of Sciences, China; 3.Research and Development Center for Solid State Lighting, Institute of Semiconductors, Chinese Academy of Sciences, China
Transient thermal instability represents a significant challenge in generating soliton microcombs.Here, we engineer the laser sweep waveform to generate AlN-on-sapphire soliton microcombs with an intermediate sweep speed (30 GHz/μs).

ACPPOEM-0815-82
High Speed Single-Mode Surface-Emitting DFB Laser
Nanguo Li[1], Can Liu[2], Guojiong Li[1], Juan Xia[1], Qiaoyin Lu[1], Weihua Guo[1]
1.Wuhan National Laboratory for Optoelectronics, China; 2.Ori-chip Optoelectronics Technology LTD, China
High speed single mode surface emitting distributed feedback laser has been presented. The equivalent circuit model is established. The effect of parasitic parameters on the high speed modulation characteristics of the device is analyzed and calculated.

Track 5: Microwave Photonics and Optical Signal Processing

ACPPOEM-0718-3
On-Chip Constant-Coefficient Second-Order Differential Equation Solver Based on Microdisk with Dual-Mode Alignment
Jiahao Zhou, Pengxing Guo, Zhengrong You, Zimo Wang, Kun Liu, Weigang Hou, Lei Guo
Chongqing University of Posts and Telecommunications, China
This paper proposed an all-optical constant coefficient second-order ordinary differential equation solver based on a single microdisk resonator with dual-mode alignment. The device footprint is approximately 20×30 $μm^2$, and the Q-factor reaches $9.8×10^4$.

ACPPOEM-0725-12
Denoising convolutional neural network for wideband frequency modulation signals based on microwave photonic down-conversion
Shilin Chen[1,2], Tao Pu[1], Li Wang[3], Zheng Jilin[1], Gengze Wu[1], Jin Li[1], Xin Zhang[4], Jiaqi Zhao[1]
1.Army Engineering University of PLA, China; 2.Nanjing Vocational College of Information Technology, China; 3.Nanjing University of Science and Technology ZiJin College, China; 4.College of Information and Communication, National University of Defense Technology, China
The denoising convolutional neural network (DnCNN) algorithm is introduced into the microwave photonics down-conversion system to alleviate the system noise and reduce the number of radar false alarms, which is proposed and demonstrated.

The noise characteristics of the broadband signal after fast Fourier transform are learned by training the network, and the noise reduction and enhancement of the signal are realized. The simulation results show that the peak-to-floor ratio (PFR) of the triangular frequency modulation down-conversion signal is increased by about 23.2 dB, which greatly improves the detection ability of the radar, especially the weak target detection ability.

ACPPOEM-0726-6
Super-resolution of near-field SAR imaging based on deep convolutional neural network
Peng Chen, Qin Junjie, Ming Ziwei, Yang Zhengang, Wang Kejia, Liu Jinsong
Huazhong University of Science and Technology, China
We built a deep convolutional neural network to realize the imaging super-resolution of 24-30GHz near-field SAR imaging system. The results show that this method can effectively remove background noise and improve the clarity of imaging.

ACPPOEM-0727-3
Nonlinear Distortion Mitigation via Coherent All-Optical Reservoir Computing for Long-Haul IM-DD transmission Systems
Guanju Peng[1], Yaping Liu[1], Zheng Li[1], Kunpeng Zhu[1], Zhiqun Yang[1], Jianping Li[2], Shigui Zhang[2], Zhanhua Huang[1], Lin Zhang[1,3]
1.Tianjin University, China; 2.HMN Technologies Co., Ltd, China; 3.Peng Cheng Laboratory, China
We propose a coherent all-optical reservoir computing for nonlinear equalization in 3960-km transmission scenarios. It can improve the Q^2 factor by 2.6 dB for a single-wavelength system and 1.9 dB for a7-channel WDM system.

ACPPOEM-0727-15
A Wideband Spread Spectrum Microwave Photonic Transceiver Architecture With Coherent Dual Carriers And Superheterodyne Down Conversion
Weifeng Su, Naijin Liu, Guangyu Gao, Qijun Liang, Qiang Zhao, Ziyu Liu, Xiang Yan
Qian Xue Sen Laboratory of Space Technology/China Academy of Space Technology, China
In this paper, we propose and demonstrate a novel microwave photonics architecture consisting of a transmitter and a receiver, designed for spread spectrum communication. The transmitter is capable of spreading and up-converting a baseband signal to a wideband spread spectrum signal at a frequency of 10 GHz. On the other hand, the receiver can despread and down-convert the wideband spread spectrum signal back to the baseband signal. The architecture exhibits remarkable capabilities in handling large instantaneous bandwidth signals across a wide operating band, making it suitable for various application scenarios. Additionally, our experimental results highlight the architecture's excellent performance in image suppression (up to 56 dB) and dynamic range (SFDR3: 127.2 dB $\cdot Hz^{2/3}$).

ACPPOEM-0729-6
A High-Throughput QC-LDPC Encoder
Yifan Ding[1,2], Qiang Cao[1,2], Jie Yao[1,2]
1.Wuhan National Laboratory for Optoelectronics, China; 2.Huazhong University of Science and Technology, China
Low Density Parity Check (LDPC) codes have been widely used in communication and storage fields to support high reliability of data channel. Quasi-cyclic (QC)-LDPC as a regular code can sufficiently exploit hardware parallelism of Field-Programmable Gate Array (FPGA) to accelerate the encoding/decoding performance. However, existing FPGA encoders are generally dedicated to a specialized LDPC code and hardware platform with limited flexibility. In this paper, to achieve high throughput and flexibility simultaneously, we propose a High-level synthesis (HLS) based QC-LDPC encoder microarchitecture. The encoder designs a fine-grained partially-parallel iterative process execution to exploit intra-codeword parallelism by fully leveraging capability of HLS . The proposed encoder further optimizes data-layout and HLS-function implementation. The encoding throughput of the proposed encoder achieves 98.4Gbps higher than the state-of-the-art QC-LDPC encoder.by up to 14.75X.

ACPPOEM-0729-7
A High-accuracy Progressive Training Scheme to Combat the Recognition Error of MZI-ONN
Zhengrong You, Pengxing Guo, Jiahao Zhou, Kun Liu, Zimo Wang, Weigang Hou, Lei Guo
Chongqing University of Posts and Telecommunications, China
This paper proposes a progressive training scheme to configure the phase shift in MZI-based feedforward ONN. The simulation results show that the proposed scheme can improve the recognition accuracy of the ONN average by 39%.

ACPPOEM-0730-17
Photonics-based microwave signal replication with low noise figure using a hybrid amplifier
Yifan Pu, Zhongyang Xu, Shilong Pan
Nanjing University of Aeronautics and Astronautics, National Key Laboratory of Microwave Photonics, China
We propose an optical fiber replication loop with a low noise figure, in which a hybrid optical amplifier consisting of an erbium-doped fiber amplifier and a Raman fiber amplifier is used. Numeric simulations are implemented. It is shown that the microwave signal can be replicated with a noise figure (NF) around 2 dB. It is of significance for applications such as recirculating memory loop and microwave frequency measurement.

ACPPOEM-0730-18
Impact of Unbalanced Interferometers on Laser Frequency Sweep Linearization
Gang Hu, Zhongyang Xu, Hangtian Lu, Xiuyuan Sun, Shilong Pan
National Key Laboratory of Microwave Photonics, Nanjing University of Aeronautics and Astronautics,China
Laser frequency sweep linearization is achieved using an auxiliary unbalanced interferometer, in which the impact of the fiber delay line is analyzed. The short fiber delay line reduces the linearization accuracy and ranging resolution. In the experiment, ranging resolution can be enhanced by eight times if the fiber delay line length is lengthened from 10 cm and 5 m. For the fiber shorter than 1 m, it is infeasible to obtain a residual nonlinearity smaller than 10^{-7}. This work gives the limitation of fiber length in the auxiliary interferometer for laser frequency sweep linearization.

ACPPOEM-0730-19
Microwave Radar System Based on Chaotic Photonic Compressed Sensing
Anran Li, Ning Jiang, Qiang Zhang, Huanhuan Xiong, Yiqun Zhang, Gang Hu, Yongsheng Cao, Kun Qiu
University of Electronic Science and Technology of China, China
A radar system utilizing chaotic photonic compressed sensing is proposed for distance and velocity measurements of a target. All the de-chirped frequencies are reconstructed with a compression ratio of 8 under an acceptable error range.

ACPPOEM-0730-34
Side-peak suppression in the microwave frequency comb using an optical injected semiconductor laser with optoelectronic feedback
Wei Chen, Chenpeng Xue Xue, Zuxing Zhang
Nanjing University of Posts and Telecommunications, China
Side peaks in microwave-frequency-comb corresponding to the optoelectronic feedback would increase with increasing of the delay time. The study presents it can be optimized by setting appropriate delay-time offset and introducing the third feedback loop

ACPPOEM-0730-35
Narrow Linewidth Measurement based on Adaptive Extended Kalman Filter Algorithm
Xiaoyu Zhang, Yangan Zhang, Xueguang Yuan
Beijing University of Posts and Telecommunications, China
A pioneering approach is introduced in this paper, which utilizes the adaptive extended Kalman filter algorithm to measure spectral linewidths of narrow-linewidth lasers. The effectiveness and dependability have been confirmed by field experiment.

ACPPOEM-0731-33
A -70 dBm High-Sensitivity AGC Algorithm for PPM-APD Low-Power FSOC Systems
Yi'nan Li[1,2], Jiaji Chen[1], Xiaowei Wu[1], Lei Yang[1]
1.Technology and Engineering Center for Space Utilization,Chinese Academy of Sciences, China; 2.University of Chinese Academy of Sciences, China
Automatic gain control (AGC) is essential for improving the sensitivity and dynamic range of receiver in free space optical communication (FSOC) systems. In this paper, we investigate an AGC algorithm for a typical low-power FSOC system with pulse position modulation (PPM) and avalanche photodiode (APD). Conventional average/peak detection methods are inadequate for measuring signal strength in the PPM-APD FSOC systems due to the low received power and pulse sparsity. To overcome this issue, we propose a high-sensitivity signal strength estimation (SSE) method based on correlation detection. Then, we design an AGC algorithm that maximizes the output signal-to-noise ratio (SNR) of the APD. The proposed SSE algorithm can retain a sensitivity of -70 dBm. The designed AGC algorithm achieves a dynamic range of at least 20 dBm and reduces the bit error rate (BER) of demodulation by 1 to 4 orders of magnitude under a 20 Mbps rate and 16-PPM format near the decoding threshold.

ACPPOEM-0731-73
Millimeter wave generation based on photodetector nonlinearity
Mingxi Yang, Yongqing Huang, Jihong Ye, Xiaofeng Duan, Kai Liu, Xiaomin Ren
Beijing University of Posts and Telecommunications, China
In this paper, we investigated the nonlinear mechanism of photodetectors. A method for generating millimeter wave signals using nonlinear frequency-doubling effect was proposed and experimentally verified.

ACPPOEM-0731-96
Design of Multi-functional reconfigurable microwave photonic chip
Xiaohang Zhang[1], Chaotan Sima[1], Tailin Li[1], Qazi Salman Ahmed[2], James C. Gates[2], Peter G. R. Smith[2]
1.Next Generation Internet Access National Engineering Research Centre, School of Optical and Electronic Information, Huazhong University of Science and Technology, China; 2.Optoelectronics Research Centre, University of Southampton, Highfield Campus, United Kingdom
A multi-functional reconfigurable microwave photonic chip is proposed and theoretically demonstrated. The optical functions obtain continuous adjustability and high operating bandwidth, andcould be realized on the silica-on-silicon platform.

ACPPOEM-0731-106
Passband-Controlled Cascaded Microwave Photonic Filter Based on Refletive Fiber Mach-Zehnder Interferometer
Tao Wu, Qiqi Hu, Enming Xu, Zuxing Zhang
Nanjing University of Posts and Telecommunication, China
An approach to implement passband-controlled cascaded microwave photonic filter (MPF) based on broadband optical source (BOS) and reflective fiber Mach-Zehnder interferometer is proposed and experimentally demonstrated.The sliced

BOS is used as multiple light sources, and a singlemode fiber is used as the dispersion medium. By changing the polarization controllers, the left-passband, right-passband and dual-passband states of the MPF can be separately achieved.The center frequency of the passband can be tuned by changing the optical variable delay line. By cascading a fiber ring, the 3 dB bandwidth of the cascaded MPF can be narrowed, compared to that without cascading the fiber ring.

ACPPOEM-0731-115
Photonic-assisted multifunctional radar for simultaneous measurement of distance, direction and velocity
Yan Li[1], Muguang Wang[1], Yuxiao Guo[1], Jian Wang[1], Bin Yin[2], Beilei Wu[1]
1.Institute of Lightwave Technology, Key Lab of All Optical Network & Advanced Telecommunication Network, Ministry of Education, Beijing Jiaotong University, China; 2.Institute of Marine Technology, Faculty of Information Science and Engineering, Ocean University of China, China
A novel photonic-assisted multifunctional radar is proposed for simultaneous measurement of the distance, velocity, and direction of the target. In this scheme, a dual-polarization binary phase shift keying (DP-BPSK) modulator is used to implement parallel de-chirping process of the echo signals received by two distributed receiving antennas. By applying a composite signal that combines a linear frequency modulated (LFM) signal and a single-frequency microwave signal as the transmitted signal, the distance, velocity, and direction of the target under test can be derived by analyzing the spectra of the de-chirped and beat signals. Simulation experiments are performed to verify the measurement capability and performance of the proposed scheme. The simulation results show that the error of the distance, velocity and direction measurement are less than ± 6×10^{-5} m, ± 0.1 m/s and ± 0.2°, respectively.

ACPPOEM-0731-118
Error vector magnitude optimization in phase-stabilized transmission system for vector signals without precoding
Tao Wang[1], Cheng Gu[1], Shangyuan Li[2], Jinyang Liu[1], Zhengyang Xie[1], Xin Zhao[1], Zheng Zheng[1]
1.Beihang University, China; 2.Tsinghua University, China
This paper investigates the effect of optical signal-to-noise ratio (OSNR) and microwave source amplitude ratio (MSAR) on the error vector magnitude (EVM) of millimeter wave (mm-wave) signals in a dual single-sideband (SSB) signal generation and phase-stabilized transmission system.

ACPPOEM-0731-158
Optoelectronic Oscillator Based on Directly Motulated Microcavity Laser Under Optical Injection
Hang Dong Wei[1,2], Yang Shi[1,2], Yue De Yang[2], Jin Long Xiao[2], Yong Zhen Huang[2]
1.University of Chinese Academy of Sciences, China; 2.Institute of Semiconductors, Chinese Academy of Sciences, China
A tunable optoelectronic oscillator based on a directly modulated diamond-FP coupled cavity microlaser is proposed. Tunable 4.3 to 16.7 GHz signals are experimentally obtained, with a maximum side-mode suppression ratio of 50 dB.

ACPPOEM-0731-166
Multi-point Optical Vector Analyzer Based on Optical LinearFrequency-Modulated Waveform and Kramers-Kronig Receiver
Yaowen Zhang, Lingjie Zhang, Zhen Zeng, Zhiyao Zhang, Yong Liu
UESTC, China
A multi-point OVA is proposed based on optical linear frequency-modulated waveform and Kramers-Kronig receiver is proposed.The Kramers-Kronig receiver is used to suppress spurious signals in the measurement photocurrent, which enhances the measurement accuracy

ACPPOEM-0801-34
Photonic multi-threshold comparator based on Mach-Zehnder modulator
Jinjian Feng, Yang Jiang, Jing Xu, Qiong Zhang, Xiaohong Lan, Qianyou Long, Yunkun Luo
College of Physics, Guizhou University, China
A new photonic approach of multi-threshold comparator based on Mach-Zehnder modulator is proposed and experimentally demonstrated. Unlike previous methods, we avoid the use of electronic comparators. The comparator consists of two modulators, one of which provides a sinusoidal transmission curve and the other modulator based at quadrature point shapes the sinusoidal transmission curve to a square transmission curve. The theoretical analysis and simulation are developed. The comparator stands out for its simple structure, cost-effectiveness, and the flexibility to adjust the threshold. The transmission curve of the comparator exhibits flat tops and bottoms with a relatively steep slope between them, closely resembling the ideal comparator with a fitting degree of 0.82; thus may be used to construct multi-bit analog-to-digital convertors.

ACPPOEM-0801-113
Simplified two-dimensional optical beamforming network based on cascade microring resonators in all-pass filter configuration
Fei Duan[1], Fang Zou[1], Tao Tang[1], Yinghui Guo[2], Xiong Li[2]
1.Tianfu Xinglong lake laboratory, China; 2.The institute of Optics and Electronics, Chinese Academy of Sciences, China
We propose a two-dimensional (2-D) optical beamforming network (OBFN) using cascade microring resonators (MRRs) in all-pass filter configuration. The cascade MRRs can obtain a maximum time delay of greater than 100ps within a radio frequency (RF) range of more than 1.0GHz in 28GHz band. For 4×4 2-D antenna array, the OBFN architecture utilizes only 8 cascade MRRs, and can scan the beam with wide coverage of -60° to 60° in the transverse and longitudinal directions simultaneously.This simplified OBFN architecture is promising to be applied in millimeter-wave communications.

ACPPOEM-0801-142
Automatic Optimization of Electro-Optic Frequency Comb Based on Deep Reinforcement Learning
Zixuan Li[1,2], Shifan Chen[1,2], Yunping Bai[1,2], Yue Zhou[1,2], Xingyuan Xu[1,2], Kun Xu[1,2]
1.The State Key Laboratory of Information Photonics and Optical Communications, China; 2.Beijing University of Posts and Telecommunications Beijing, China
We propose a novel automatically optimized electro-optic frequency comb (AO-EOFC) based on deep reinforcement learning, which utilizes a deep Q-learning network algorithm to replace blind and inefficient manually optimization in traditional ways.

ACPPOEM-0814-15
Optically Transparent EMI Shielding Film with Excellent Stability Based on Colorless Polyimide and Silver Nanowire
Huang Zhen
Huazhong University of Science and Technology, China
Optically transparent electromagnetic interference (OTEMI) shielding materials have gained significant attention due to their ability to offer both electromagnetic shielding and optical visibility properties. However, existing optically transparent EMI shielding films still exhibit many issues. To meet the practical requirements of both civilian and military applications, OTEMI materials must possess not only high optical transparency and shielding efficiency (SE), but also additional features such as low density, ultra-thin thickness, stability, and reliability in extreme environments. In this study, OTEMI films were embedded with AgNWs using a combination of colorless polyimide and in situ packaging technology with excellent stability. The films exhibit an impressive SE exceeding 4000dB mm^{-1} at a thickness of only 8 um, and their superior shielding properties remain unaffected even after exposure to extreme temperatures of 378K and 161K. The OTEMI films also displayed high transmittance (80%) in the wavelength range of 400-2500nm, with EMI SE exceeding 45 dB in the 12-18 GHz band. Even when folded 1,000 times at a radius of 1.5 mm, the appearance, optical transmittance, and EMI SE of the OTEMI films remained uncompromised. As a result, these films have the potential to be widely used in a wide range of high-temperature and high-pressure work environments that cannot be accessed by humans, offering new opportunities for OTEMI to operate effectively in harsh conditions.

ACPPOEM-0814-73
Measurement of 3.331GHz Pulse Light Signal Using Optical Sampling
Jiemin Li[1,2], Feng Tian[1,2,3], Xiaodong Liu[4], Fu Wang[2], Qi Zhang[1,2,3]
1.State Key Laboratory of Information Photonics and Optical Communications, China; 2.School of Electronic Engineering, Beijing University of Posts and Telecommunications (BUPT), China; 3.Beijing Key Laboratory of Space-ground Interconnection and Convergence, BUPT, China; 4.Beijing Arcoren Science & Technology Co.,LTD, China
With the advancement of fiber optic communication technology, the measurement of high-speed signals is the guarantee for the future development of fiber optic communication. All optical sampling technology provides a new direction for the measurement of high-speed signals. Linear light sampling with optical hybrid has broad prospects .This article uses a pulse laser with a repetition rate of 30M to mix a 3.331G pulse signal, and the restored pulse signal can reach a similarity of 0.9019 to the initial signal.

ACPPOEM-0815-98
Frequency comb distillation enabling broadband microwave photonic channelized receiver
XiaoLing Zhang[1], Chen Chen[2]
1.Southwest China Institute of Electronic Technology, China; 2.Chongqing University, China
Microwave photonics channelization has become a promising technology for ultra-wideband RF spectral analysis. In this paper, a wideband microwave photonics channelization scheme based on dual optical frequency combs with comb distillation technique is proposed. A 10 GHz bandwidth RF signal with frequencies from 2 to 12 GHz is down-converted to the same IF band with 1-GHz instantaneous bandwidth, where the in-band crosstalk suppression is larger than 33 dB for all channels, and the spurious-free dynamic range of the system can reach 101.3 dB $\cdot Hz^{2/3}$. Moreover, BERs for all channels without and with distillation are compared.

ACPPOEM-0816-2
Frequency-Hopping Signal Measurement Based on Real-time Photonic Fourier Transform
Xin Liu, Dan Zhu, Jiewen Ding, Zhouyang Pan, Tao Lu, Shilong Pan
Nanjing University of Aeronautics and Astronautics, China
A frequency-hopping signal measurement scheme based on real-time photonic Fourier transform is proposed and demonstrated. In the experiment, the wideband and multiple frequency-hopping signals with 100-ns frequency-hopping period and 4-40 GHz frequency range are verified.

Track 6: Photonics for Energy

ACPPOEM-0801-88
Performance of CsPbI3 Photovoltaics for Indoor Light Harvesting
Seon Joong Kim, Jae Won Shim
Korea University, South Korea
With the increasing demand for low-power microelectronic devices in the emerging Internet of Things (IoT) applications, indoor photovoltaics (PVs) have gained significant attention as promising sustainable power generation solutions, especially in dim indoor light conditions. Notably, indoor perovskite photovoltaics (PePV) have been proven to outperform other technologies under indoor lighting conditions. In this study, the potential of $CsPbI_3$-based indoor PePV is explored, evaluating their characteristics under three different indoor light sources: LED, fluorescent lamp (FL), and halogen lamp (HL). The PePVs showcase remarkable power conversion efficiencies (PCE) of 34.0% under LED, 35.5% under FL, and 3.7% under

HL at 1000 lux illumination, accompanied by corresponding output power densities (P_{max}) of 86.5, 107.5, and 174.8 μW/cm^2, respectively. These findings demonstrate the potential suitability of indoor PePV for meeting the power requirements of advanced IoT devices.

ACPPOEM-0807-1
Green-solvent Processable Dopant-free Hole Transporting Materials for Inverted Perovskite Solar Cells
Xinyu Yu, Zhong'an Li
Huazhong University of Science and Technology, China
A star-shaped D-A-D strategy is used to solve the trade-off between green-solvent processing and high hole mobility in dopant-free HTMs. The resulting BTP1 processed by 2-methylanisole achieved an impressive efficiency of 24.34% in inverted PVSCs.

ACPPOEM-0808-5
Efficient Inverted Dopant-free Perovskite Solar Cells with Low Voltage Loss Achieved by a Pyridine-based Polymer Semiconductor
Xianglang Sun
1.Huazhong University of Science and Technology, China; 2.City University of Hong Kong, Hong Kong, China
We report a simple but efficient way to simultaneously reduce the NRR processes inside perovskite and at its interface by rationally designing a new pyridine-based polymer semiconductor.

ACPPOEM-0809-7
Surface termination passivationof imidazole-based diiodide enabling efficient inverted perovskite solar cells
Wang Yu[1], Song Jiaxing[2], Yan Wensheng[1], Li Zaifang[2]
1.Hangzhou Dianzi University, China; 2.Jiaxing University, China
Ligand engineering is an effectivemeans to regulate the chemical environment of the uppersurface of perovskite films. Compared to the ligand engineering realized by moleculeswith electron-donating groups, the ammonium salt-based modificationhas the advantage of a convenient and efficientprocess for the passivation step.We introduced the N-(3-Aminopropyl)-imidazole diiodide (APDI) on the upper surface of FACs perovskite film to modulate the terminal chemical environment. The bifunctionalgroups (C=NH^+-and -NH_3^+-) in APDI make it more effective inreducing the Pb^{2+}defect on the perovskite surface throughbonding to Pb^{2+}. Density functional theory (DFT) demonstratedthat the N on the imidazole ring in APDI was slightly moreinclined to bind to Pb^{2+}traps thantheN on the branched chain.Moreover, the hydrophobicity of the perovskite films wasenhanced by the introduction of APDI with an alkyl chain onthe surface. Consequently, the optimum device with-APDI has an increased PCE, from 20.01% to21.41%. Additionally, the target devices exhibited excellentstability, maintaining 78% and 90% of the initial PCE after800 h and 1000 h of aging in air and nitrogen atmospheres,respectively.

ACPPOEM-0809-9
Lead Sulfide (PbS) Quantum Dots (QDs) Tandem Solar Cells
Salman Ali
WNLO, HUST, China
Lead Sulfide (PbS) Quantum Dots (QDs) possess size-tunable bandgaps (ranging from visible to infrared), solution-processable, stable, and cost-effective. As a result, they hold promise as a material for QDs tandem solar cells. The tandem structure of solar cells presents itself as a promising candidate for surpassing the 31% Shockley–Queisser limit of single-junction solar cells. The first exploration of a tandem structure for PbS QDs solar cells dates back to 2011. However, progress has been gradual, and the most notable achievement for the tandem structure in 2017 was an efficiency of 9%. This lags behind the 11% efficiency attained by single-junction QDs solar cells. In this study, we introduce a tandem solar cell utilizing solution-processible PbS Quantum Dots (QDs) with distinct bandgaps: PbS 1.33 eV in the top cell and PbS 0.92 eV in the bottom cell. To facilitate charge generation, we replaced the PbS QDs's ligands with iodine (I) and bromine (Br), which serve as the charge generation layers in the respective subcells. For interconnection, we employed an ultra-thin gold film. Due to the bottom cell's heat and solvent exposure, we implemented a protective layer of SnO_2 to shield the top cell. Our tandem solar cell architecture, denoted as ITO/ZnO (100 nm)/PbS (1.33 eV 200 mg/ml)/PbS-Edt/Au (1 nm)-SnO_2 (15 nm)/ZnO (50 nm)/PbS (0.96 eV 350 mg/ml)/PbS-Edt/Au, achieved a noteworthy efficiency of 5.8%. However, further investigation is needed to identify a recombination layer with minimal resistance. The deposition techniques employed include sputtering for the Electron Transport Layer (ETL), spin coating for the absorber and Hole Transport Layer (HTL), electron beam evaporation (e-beam) for the interconnection layer, and Atomic Layer Deposition (ALD) for the SnO_2 protective layer. The stability, excellent performance, and low-temperature processing could offer the potential future commercialization of flexible and large-area tandem solar cells utilizing quantum dots (QDs).

ACPPOEM-0810-1
Interface Interactions and Inhibition Strategies in Non-Fullerene Organic Solar Cells
Lin Hu
Jiaxing University, China
The development of novel non-fullerene acceptors and their matched donors have driven the rapid advancement of organic solar cells. Currently, the power conversion efficiency (PCE) of organic solar cells has exceeded 20%, demonstrating promising application prospects. Long-term stability has become a key factor for the application of this photovoltaic technology. Interface engineering is one of the most important issues contributing the state-of-the-art OSCs to obtain superior PCE and stability. In this work, the chemical reaction between the fused-ring electron acceptors and commonly used cathode interface modification layer polyethyleneimine (PEI) is systematically investigated. The interaction sites and reaction mechanisms are confirmed through mass spectrometry, nuclear magnetic resonance spectroscopy, absorption spectroscopy, and infrared spectroscopy analysis. The strategies of protonation of PEI and the formation of a phenol self-assembled layer ontop of PEI surface are employed to inhibit this adverse chemical reaction. Furthermore, a novel PEIE-Pac is designed to

passivate the surface defects of ZnO electron transfer layer. The interface photocatalytic reaction is suppressed and the device stability under air and light conditions are enhanced. The aforementioned investigations contribute to a deeper understanding of the interface degradation processes and mechanisms in non-fullerene organic solar cells.

ACPPOEM-0810-3
High performance PEDOT/PPy composites for electrochemical supercapacitor
Yingzhi Jin
Jiaxing University, China
The conductive polymer is a promising candidate for energy storage devices due of its flexibility, light weight, and low cost. Poly (3,4-ethyldioxythiophene) (PEDOT) electrode with good conductivity and stability is successfully fabricated by in-situ chemical polymerization. Using the PEDOT electrode as the substrate, a binder-free PEDOT/ (polypyrrole) PPy composite electrode is further produced by electrochemically polymerizing PPy on the top surface of PEDOT. Compared to the PPy electrode, the electrochemical performance and stability of PEDOT/PPy have been greatly improved. At a current density of 2 A/cm^3, a high capacitance of 764 F/cm^3 is obtained, and the capacitance retention rate of 74.6% can be obtained after 3,000 cycles at a current density of 48 A/cm^3. This study provides a new route for the preparation of high electrochemical performance conductive polymer composite electrodes.

ACPPOEM-0810-9
Tuning the Length of Carbosilane Side Chains in the Non-fullerene Acceptors for Highly Efficient and Mechanically-Robust Organic Solar Cells
Di Zhang
Huazhong University of Science and Technology, China
Emerging wearable electronics and sensor devices for internet-of-thing (IoT) systems would benefit from integration of low-cost light-harvesting power sourcessuch as organic solar cells (OSCs). Although the state-of-art OSCs have achieved power conversion efficiencies (PCEs) surpassing 19%, they fail operation under large mechanical deformation (ultimate tensional strain, e_u, 10%). Here, we have synthesized three small molecule acceptors (SMAs) based Y-series and attached the different length of the carbosilanes group to the pyrrole unit named BTP-SiX (X = 4, 6, 8) for OSCs designed for large mechanical compliance. The farther the branching points of SMAs are from the fused core, the higher the e_u of PM6:BTP-SiX blend films are. The PM6:BTP-Si6 blend film achieves a record eu of 30.5%, nearly six-fold higher than the widely used PM6:Y6 reference blend (e_u ~ 4.5%). Especially, the mechanical properties of blend films also remarkably displayed a higher than the e_u of pristine films (e_u ~ 23.7%). Morphological and structural analysis demonstrate that BTP-SiX crystallizes to a less extent and is highly miscibile with PM6, leading to the significantly improved mechanical stretchability. Most importantly, the enhanced blend stretchability does not sacrifice the device efficiency with PM6:BTP-Si6 blend based OSCs exhibiting a PCE of 16.4%. To the best of our knowledge, it is the highest e_u achieved in high efficiency OSCs. Indeed, we demonstrate that our OSCs operate normally under stretching deformations restraining > 81% of the initial PCE under a e_u of 30%. The structure-property relationship study proves that side chain engineering based on carbosilanes side-chains is a promising design strategy to develop highly efficient and mechanically robust OSCs appropriate for stretchable electronics.

ACPPOEM-0811-6
Efficient and Stable2D Perovskite Solar Cells
Tong Bie
Huazhong University of Science and Technology, China
The2D PSCs achieve a record PCE of 21.07% , which is the highest efficiency reported to date. Importantly, thePSCs retain 97% of their initial efficiency at 85°C persistent heating after 1500h.

ACPPOEM-0812-8
Amine-Free ZnO Precursor to Suppress Dedoping of PEDOT Electrodes for All-Solution-Processed Flexible Organic Solar Cells
Jianping Chen, Yinhua Zhou
Huazhong University of science and technology, China
Poly(3,4-ethylenedioxythiophene):poly(styrenesulfonate) (PEDOT:PSS) is a widely used solution-processed electrode in organic solar cells with the advantages of high electrical conductivity and high optical transparency. Highly oxidized (doped) states are the origin of its high electrical conductivity. However, PEDOT can be readily dedoped by reductive reagents, such as amines. Traditional sol-gel ZnO precursors (including ethanolamine and zinc acetate in 2-methoxyethanol denoted as ZnO_{EA}) cause dedoping when deposited on top of PEDOT to produce low work function for electron collection. In this work, we report that an amine-free precursor of ZnO (zinc acetate dehydrate in methanol denoted as $(ZnO)_{EA\text{-}free}$) is introduced to replace traditional ZnO precursors, which can suppress the chemical dedoping of PEDOT:PSS films. PEDOT:PSS remains higher optical transmittance and electrical conductivity after coating $(ZnO)_{EA\text{-}free}$than ZnO_{EA}films. All-solution-processed flexible devices with the device structure of PET/PEDOT:PSS/$(ZnO)_{EA\text{-}free}$/PEI/PM6:L8-BO/PEDOT:F/PEDOT:PSS show a power conversion efficiency of 11.9% with an open-circuit voltage of 0.87 V, a short-circuit current of 20.8 mA cm^{-2}, and a fill factor of 0.66.

ACPPOEM-0812-9
Understanding the composition of layer-by-layer deposited active layer at buried bottom surface
Kai Feng, Zhou Yinhua
Huazhong University of Science and Technology, China
Layer-by-layer (LbL) coating is becoming a widely used method to fabricate nonfullerene active layer films for organic solar cells. However, the vertical compositional distribution of the LbL-coated active layer, particularly at the buried bottom surface, is not clear yet. In common sense, it is believed that the LbL-coating yields a donor-mixture-acceptor (D-m-A) vertical distribution in the active layer, i.e., a thin polymer donor layer at the bottom surface, a thin acceptor layer at the top surface and a donor-acceptor mixture in the middle. In this work, we show that the LbL active layer vertically is an entire donor:ac-

ceptor mixture. A pure layer of polymer donor didn't exist at the bottom surface. The LbL active layer delivered high performance in both conventional and inverted device structures. A thin polymer layer with different thicknesses (2, 6, 12 nm) was inserted at the bottom surface to study their effects on the device performance. Those inserted layers substantially deteriorated the device's performance. Furthermore, the assumption was further confirmed by X-ray photoelectron spectroscopy measurement on the exposed "originally buried" surface. This study sheds light on understanding the vertical compositional distribution of active layer via layer-by-layer solution processing.

ACPPOEM-0814-9
Realistic losses of indoor organic and perovskite photovoltaics
Xinlu Liu, Yinhua Zhou
Huazhong University of Science and Technology, China
The application in indoor light is one of the significant development directions of organic and perovskite photovoltaics. In 1961, Shockley and Queisser reported that the detailed balance limit of efficiency in standard sunlight was about 33%. However, realistic losses of the organic and perovskite PVs under indoor illumination are to be understood for further efficiency improvement. Based on the detailed balance limit of efficiency, we calculated the limit efficiency of the photovoltaics to be 55.33% whose band gap (E_g) of active layer is 1.8 eV in LED with an illumination of 1000 lux and a spectral color temperature of 2700 K. In practice, the loss of external quantum efficiency (EQE_{PV}), non-radiative recombination, and resistance within the devices would all cause further losses. For organic or perovskite solar cells in the LED with a color temperature of 2700 K and an illumination of 1000 lux, when EQE_{PV} = 0.9, EQE_{EL} = 0.1, R_s = 0.5 Ω cm^2 and R_{sh} = 104 kΩ·cm^2, the highest efficiency of 47.39% can be obtained at the band gap of the active layer of 1.77 eV.

ACPPOEM-0814-11
Two-in-one alcohol-processed PEDOT electrodes produced by solvent exchange for organic solar cells
Xianmin Zhou, Xinyun Dong, Yinhua Zhou
Huazhong University of Science and Technology, China
Poly(3,4-ethylenedioxythiophere):poly(styrenesulfonate) (PEDOT:PSS) is a common solution-processed electrode for printable organic solar cells. However, the water-dispersed PEDOT:PSS displays de-wetting issues when deposited on active layer, which limits its application on printable top electrode. In this work, we report a solvent exchange method to prepare alcohol-processed PEDOT:PSS. Spontaneous exchange of water and alcohol occurs when aqueous PEDOT:PSS in membrane is immersed into alcohol. This is probably due to the polarity difference that induces different speed to pass through the dialysis membrane. The PEDOT:PSS residual was further dispersed in ethanol and ethanol-based PEDOT:PSS (e-PEDOT:PSS) was obtained. The e-PEDOT:PSS has good wetting ability and high electronic conductivity. Work function of e-PEDOT:PSS was tuned from 4.9 to 5.3 eV by adding alcohol-based fluorinated formulation (PEDOT:F). The obtained formulation e-PEDOT:PSS was blade coated as the top electrode without additional hole-transporting layers (called 2-in-1 electrode), and the fabricated devices based on e-PEDOT:PSS showed an efficiency of 14.02%.Poly(3,4-ethylenedioxythiophere):poly(styrenesulfonate) (PEDOT:PSS) is a common solution-processed electrode for printable organic solar cells. However, the water-dispersed PEDOT:PSS displays de-wetting issues when deposited on active layer, which limits its application on printable top electrode. In this work, we report a solvent exchange method to prepare alcohol-processed PEDOT:PSS. Spontaneous exchange of water and alcohol occurs when aqueous PEDOT:PSS in membrane is immersed into alcohol. This is probably due to the polarity difference that induces different speed to pass through the dialysis membrane. The PEDOT:PSS residual was further dispersed in ethanol and ethanol-based PEDOT:PSS (e-PEDOT:PSS) was obtained. The e-PEDOT:PSS has good wetting ability and high electronic conductivity. Work function of e-PEDOT:PSS was tuned from 4.9 to 5.3 eV by adding alcohol-based fluorinated formulation (PEDOT:F). The obtained formulation e-PEDOT:PSS was blade coated as the top electrode without additional hole-transporting layers (called 2-in-1 electrode), and the fabricated devices based on e-PEDOT:PSS showed an efficiency of 14.02%.

ACPPOEM-0814-30
Antioxidant strategy based on Lewis acid-base theory in tin-leadperovskitesolar cells
Tianjun Ma
Huazhong university of science and technology, China
Tin-leadperovskites are particularly attractive for photovoltaic applications because their bandgap is tunable in the range of 1.2–1.6 eV, whicharereally appropriate for optimum single-cell efficiencies and bottom cells in all-perovskite tandem devices.Though mixed Sn-PbPSCs have made huge progress recently, it still has low power conversion efficiency (PCEs) compared to Pb-based PSCs.Besides relative low efficiency, poor long-term stability is also a serious problem for Sn-Pb PSCs in practical applications, which the oxidation of $Sn^{2+}$to $Sn^{4+}$is still the main cause. There are many ways to inhibit Sn^{2+}, including deoxygenating the material, adding reducing agents to the precursor solution, or complexing antioxidants with Sn^{2+} to inhibit its oxidation.

ACPPOEM-0814-44
Encapsulation of flexible organic solar cells
Hui Zheng, Yinhua Zhou
Huazhong University of Science and Technology, China
Flexible organic solar cells (OSCs) have a susceptibility to water vapor and oxygen which limit thier commercial application. In order to improve the stability of OSCs, encapsulation is indispensable. In this study, it is reported that a strategy of alternating barrier films with parylene and alumina dyads, in which organic parylene layers are deposited by chemical vapor deposition (CVD) and dense alumina films are grown by atomic layer deposition (ALD). Using a method of the resistance change of patterned calcium films to calculate water vapor transmission rates (WVTR). Three dyads film shows an extremly low WVTR of 8.7×10^{-4} g m^{-2} day^{-1} (25 °C/99% RH). These encapsulated OSCs show excellent stability under constant illumination and in water.

ACPPOEM-0814-49
An ionic liquid additive for High-Quality Narrow Bandgap Sn-Pb Perovskites and Efficient All-Perovskite Tandem Solar Cells
Ranran Liu
Wuhan National Laboratory for Optoelectronics, China
The narrow bandgap of tin-lead halide perovskite is appropriate for the bottom cell of all-perovskite tandem solar cells. However, due to the oxidation propensity and high Lewis acidity of Sn^{2+}, Sn-based perovskite films have rapid crystallization process and high defect density, leading to poor film quality and notorious device instability. In this work, we synthesize an ionic liquid additive, which contains sulfonate anion and ammonium cation. The sulfonate anion in the ionic liquid additive can passivate uncoordinated Sn^{2+}/ Pb^{2+}defects and retard the oxidation of Sn^{2+} by chelate coordination, enabling the growth of high-quality Sn-Pb perovskite. As a result, the ionic liquid-processed tin-lead halide perovskite devices exhibit a remarkable efficiency of 22.25% with remarkable enhancement in both open-circuit voltage and fill factor. Benefitting from high quality film, the sub-cell of 1.75eV is integrated into a tandem device, yielding a 25.5%-efficient all-perovskite monolithic tandem device.

ACPPOEM-0815-13
Mechanical Properties Optimizations of Ultra-flexible organic solar cells
Fei Qin
Northwestern University, China
Ultra-flexible organic solar cells (OSCs) exhibit great potential as a promising power source for electronic skin and wearable electronic systems. To increase the mechanical properties of ultra-flexible OSCs, every layer in the device should be improved. Here, electron transport layer (ETL) and the active layer are investigatedto enhance the flexibility of the whole device, respectively. Ametal ion-chelated polymer interfacial layer (PEI-Zn), which can bechemically compatible with different non-fullerene active layers and possess excellent flexibility,was developed. The ultra-flexible OSCs with a thickness of less than 5 um demonstrate a PCE of 15% and stable performance undercontinuous compression-flat deformation. As for the active layer, two polymer acceptors (PAs) with fully and non-fully conjugated structures were synthesized. The nonconjugatedPA revealssuperiormechanical ductility compared to the conjugated one. The nonconjugated PA-based ultra-flexible OSCs also demonstrate the best mechanical stability. Upon the optimization of ETLs and the active layers, we realized the high-efficient ultra-flexible OSCs with excellent stability under large strain, demonstrating promising application in wearable electronics.

Track 7: Micro-, Nano-, and Quantum Photonics: Science and Applications

ACPPOEM-0723-2
A broadband double-lined metasurface for Simultaneous Generation of inverse functions
Zongkun Zhang, Mingzhe Chong, Jin Zhao, Yueyi Zhang, Pu-kun Liu
Peking University, China
This paper explores one new plasmonic function that displays inverse functions on the two sides using columns of nonoslits, which is applicable in broadband wavelength range. The design strategy is well verified in two terahertz structures.

ACPPOEM-0725-6
Graphene-Quantum-Dots-Graphene Heterojunction Waveguide Photodetector with Low dark current and High Speed
Laiwen Yu[1], Jingshu Guo[1], Xuezhi Zhao[2], Hengtai Xiang[1], Liang Gao[2], Daoxin Dai[1]
1.Zhejiang University, China; 2.Huazhong University of Science and Technology, China
We demonstrate a graphene-QDs-graphene heterojunction photodetector. The measured bandwidth is ~2 MHz at 1550 nm, and the high NPDRof ~8×10^5 W^{-1} are obtained with the low dark current of 1.1 pA at a bias of 1 V.

ACPPOEM-0731-2
Low Loss Asymmetric Bragg Grating Mode Couplers on Thin Film Lithium Niobate for Efficient Extraction of Reflected Light
Lars Emil Gutt[1], Thach Nguyen[2], Peter Girouard[1], Guanghui Ren[2], Leif Katsuo Oxenløwe[1], Bill Corcoran[3], Arnan Mitchell[2], Pengyu Guan[4]
1.DTU, Denmark; 2.RMIT, Australia; 3.Monash University, Australia; 4.Beijing Institute of Technology, China
Bragg gratings are important components in integrated photonics, however, efficiently accessing the reflected waves remains challenging. Here, we demonstrate an asymmetric Bragg grating mode coupler in thin-film lithium niobate with -0.95 dB insertion loss.

ACPPOEM-0731-181
Impact of Non-Vertical Sidewalls on Bandgap Characteristics of LiNbO3 Photonic Crystals
Peyman Bagheri, Xiaoyan Zhou, Lin Zhang
Tianjin University, China
We investigated the impact of non-vertical sidewall angles on TFLN PhCs. A typical slanted sidewall in PhCs reduce the gap-midgap ratio by 50%. We propose compensative solutions and provide design guidelines for TFLN photonic circuits.

ACPPOEM-0801-17
High-Performance Thermo-Optic Switch Based on Graphene Microheater and Fano Slab Photonic Crystal Cavity
Xiaoyan Gao, Yilun Wang, Wentao Gu, Wenchan Dong, Xinliang Zhang
Wuhan National Laboratory for Optoelectronics, China
A high-performance thermo-optic switch based on fano slab photonic crystal cavity and graphene microheater is pro-

posed, with a thermal tuning efficiency of 0.548nm/mW and a rise/decay time of 11ns/9ns validated in simulation.

ACPPOEM-0801-44
Ultra-low-loss Silicon Waveguides covering a very large band
Gangmin Li, Shihan Hong, Long Zhang, Zixu Xu, Daoxin Dai
Zhejiang University, China
We present an ultra-low-loss silicon waveguide covering a very large band. Additionally, we investigate the waveguide wavelength-dependent scattering losses. Remarkably, we achieve loss reductions of (0.1663, 0.1226, 0.0742) dB/cm around (1310, 1550, 1910) nm, respectively.

ACPPOEM-0801-85
SNR improvement in differential reflection method for weak absorption measurement
Zhen Wang[1], Shipeng Yao[2], Jinghao Wang[1], Chen Hu[1], Huan Zhang[1], Hao Sun[2], Kun Yin[1], Cun-Zheng Ning[3]
1.Zhejiang Lab, China; 2.Tsinghua University, China; 3.Shenzhen Technology University, China
The impact of the dielectric environment on SNR within the differential reflection method for weak absorption measurement was investigated.Signal of sampleencapsulated in metal and high-refractive-index material exhibited one-order enhancement compared to transparency substrate.

ACPPOEM-0801-106
Characterization of Two-Dimensional Microwave field Beyond the Diffraction Limit
Longkun Shan, Tongtian Weng, Wang Zehao, Mengqi Ma, Shaochun Zhang, Xiangdong Chen, Fangwen Sun
University of Science and Technology of China, China
In nanoelectronics research, microwaves have attracted considerable attention due to it's widespread application in the semiconductor industry.Quantum sensing imaging such as the NV Center provides an efficient way to directly measure microwaves at the nanoscale. However, the diffraction limit, a fundamental limitation in microscopy imaging, prevents us from exploiting the potential advantage of quantum sensing in this field. Here, we use structured illumination microscopy (SIM), a popular superresolution technique, to overcome this challenge. To the best of our knowledge, this is the first time that a wide-field superresolution scheme has been implemented in optically based nanoscale microwave measurements. To demonstrate our method in a real-world quantum sensing experiment, we perform SIM-based microwave imaging of nanowire networks using NV centers. We observe a twofold improvement in resolution compared to wide-field imaging. Such a valid result illustrates the potential of our approach, especially for further applicationsin the field of microwave phtonics.

ACPPOEM-0801-152
Hybrid Coupler for Examining Indistinguishability between Surface Plasmon Polariton and Photon
Ruoyun Luo[1], Boyu Fan[1], Yaoqing Zhang[1], Yuanxia Qi[1], Yunru Fan[1], Guangwei Deng[1], Haizhi Song[1,2], You Wang[1,2], Guangcan Guo[1,3], Qiang Zhou[1,3]
1.University of Electronic Science and Technology of China, China; 2.Southwest Institute of Technical Physics Institute of Fundamental and Frontier Sciences, China; 3.University of Science and Technology of China, China
We present a hybrid coupler for examining indistinguishability between surface plasmon polariton (SPP) and photon. Our results show that the obtained hybrid coupler chip satisfies the requirement for investigating the property of SPP.

ACPPOEM-0803-4
Super Quasibound State in the Continuum
Zhanyuan Zhang[1,2], Yi Xu[1,2], Yuwen Qin[1,2,3]
1.Key Laboratory of Photonic technology for Integrated Sensing and Communication, Ministry of Education, China; 2.Guangdong Provincial Key Laboratory of Information Photonics Technology, Institute of Advanced Photonics Technology, School of Information Engineering, Guangdong University of Technology, China; 3.Southern Marine Science and Engineering Guangdong Laboratory, China
Avoided crossing of resonances and merging multiple bound states in the continuum (BICs) are parallel means for tailoring the physical properties of BICs. Herein, we introduce a new concept of super quasi-BIC for photonic crystal PhC systems where its quality (Q) factor is boosted in both parametric and momentum spaces. A super quasi-BIC with substantial enhancement of Q factor can be achieved in a finite PhC by combining avoiding crossing of two symmetry protected (SP) quasi-BICs in parametric space and merging BICs in momentum space simultaneously. More importantly, analytical theory shows that the proposed mechanism results in the transition of asymptotic behavior of the Q factor over the numbers of resonators from N^2 to exclusive N^3 for SP-BICs, which is of vital importance for realizing quasi-BICs in a compact PhC. Microwave experiments are performed to validate the theoretical results. Our results provide a paradigm shift for manipulating the physicalproperties of quasi-BICs in finite PhC structures, which would facilitate various applications, including but not limited to low threshold lasing, wireless power transfer and high figure of merit sensing etc.

ACPPOEM-0815-115
Digital-Based Inverse Design for Ultra-Compact Power Splitter on LNOI
Lingjun Zhou[1,2], Hansi Ma[3], Xiaomin Nie[1], Yunchen Li[1,2], Zhixue He[1], Lei Wang[1], Ke Li[1], Fan Zhang[1,2]
1.Peng Cheng Laboratory, China; 2.Peking University, China; 3.National University of Defense Technology, China
We propose and experimentally demonstrate an ultra-compact and efficient power splitter on LNOI. The device is realized through the inverse design of a digital meta-structure and occupies a small footprint of only 4.8×4.8μm^2. The measured results show that the insertion losses are below 2.5dB across the wavelength band of 1500-1560 nm, and the power imbalance between the two output ports is within 0.3 dB.

Track 8: Photonic Sensors & Bio-Photonics

ACPPOEM-0707-1
Photo-responsive chemistry in the diagnosis and treatment ofmitochondrial diseases
Bo Peng[1],Lin Li[2], Hua Bai[1]
1.Northwestern Polytechnical University, China; 2.Xiamen University, China
Stimulus-responsive chemistry is a kind of chemical reactions that only occur in the presence of target molecule or chemical environment. Due to its specificity, stimulus-responsive chemistry has been used in various biological applications, such as controlled drug release, hydrogel, disease diagnosisetc.By using stimulus responsive chemical groups, we synthesized a series of molecules, which are sensitive to different stimuli, such as light, pH and enzymes. Based on these molecules, several mitochondria-related biomedical applications have been designed and studied, such as organ-on-a-chip, mitochondrial protein detection, mitochondria extraction, drug delivery and mitochondria imaging.

ACPPOEM-0710-1
Temperature-independent integrated optical sensor based on a Fabry-Perot cavity using the slot hybrid-core waveguide
Zhaoyang Chen[1], Yanqing Qiu[1], Tingting Lang[2], Xiaowei Guan[3]
1.China jiliang University, China; 2.Zhejiang University of Science & Technology, China; 3.Jiaxing Research Institute Zhejiang University, China
We propose a novel temperature-independent integrated optical sensor, which consists of Bragg gratings andslot hybrid-core waveguide.The proposed sensor can achieve low temperature dependence within 1pm/K while sustain a high sensitivity of 278 nm/RIU.

ACPPOEM-0725-4
Tilted Fibre Bragg Grating for Rapid Clinical Detection of Platinum Ion
Yifan Duan[1], Dongyang Du[1], You Lv[1], Yunting Du[2], Ji Shi[2], Xiaojing Tong[2], Qiao Wang[1], Yang Zhang[1], Wei Peng[1]
1.Dalian University of Technology, China; 2.Cancer Hospital of Dalian University of Technology (Liaoning Cancer Hospital & Institute), China
In this paper, we have developed a highly sensitive and practical sensor for platinum ions, which holds significant promise for clinical cancer diagnosis and pharmaceutical development. The sensor utilizes tilted fiber Bragg grating surface plasmon resonance as its core sensing technology, integrating it with DNA-targeted biomolecule probes to enable precise target-specific capture. By detecting various concentrations of platinum ions, we have successfully demonstrated that the sensor's detection range and minimum detection concentration adequately meet the requirements for clinical platinum ion detection, offering an effective technical solution for implementing long-term point-of-care testing of platinum drugs.

ACPPOEM-0725-7
Optical magnetic field enhancement by strong coupling for high sensitivity sensing
Huimin Wang, Tao Wang
Huazhong University of Science and Technology, China
We investigate the strong couplingbetween propagating surface plasmon polariton and magnetic plasmon resonance.The enhanced magnetic field intensity and sensitivity of the proposed structure are up to 550 times and 585 nm/RIU, respectively.

ACPPOEM-0727-4
Raman Gas Sensor Based on Platinum Coated Capillary
Zhixiong Liu, Qilu Nie, Mengen Cheng, Dexun Yang, Minghong Yang, Donglai Guo
Wuhan University of Technology, China
A multi-component gas Raman spectroscopy sensor based on platinum-plated capillary with probe structure for easy arrangement and practicaldetection capability for low concentration gases with potential for industrial applications.

ACPPOEM-0727-6
Investigation on the Coexistence of Real-time DAS System and High-speed Coherent Optical Signal
Yiqi Li, Hu Shi, Yan Zhao, Zhongshu Zhang, Mo Zhu, Zhanshan Wang
ZTE Corporation, China
The phase optical time-domain reflectometry based onchirped pulses is demonstrated. The real-time systemhas realized a sensing distance of over 60km. The coexistence experiment with high-speed coherent optical signals reveals the performance of co/counter-propagation.

ACPPOEM-0728-12
High numerical aperture piezopolymer detectors for optoacoustic imaging of experimental neoplasms
Alexey Kurnikov[1], Grigory Volkov[1], Anna Orlova[1], Andrey Kovalchuk[1], Yulia Khochenkova[1], Daniel Razansky[2,3], Pavel Subochev[4]
1.Institute of Applied Physics, Russian Academy of Sciences, Russia; 2.Institute of Pharmacology and Toxicology, Faculty of Medicine, University Zurich, Switzerland; 3.Institute for Biomedical Engineering, Department of Information Technology and Electrical Engineering, ETH Zurich, Switzerland; 4.Institute of Applied Physics, Russian Academy of Sciences, Russia
A number of optoacoustic (or photoacoustic) microscopy and mesoscopy techniques have successfully been employed for non-invasive tumor angiography. However, accurate rendering of tortuous and multidirectional neoplastic vessels is commonly hindered by the limited angular coverage of commercially available ultrasound transducers. In this work, it is theoretically and experimentally shown that a wide viewing angle allows obtaining more detailed and continuous images of the of the intricate arbitrarily-oriented neovasculature in experimental tumors. To reduce the effect of a limited field of view, a detector based on a PVDF piezopolymer film was developed, which has an ultra-high numerical aperture of 0.9, an aperture

diameter of 27 mm, suitable for imaging tumors of various sizes.

ACPPOEM-0728-25
Deep-Learning-based Simultaneous Demodulation and Denoising for Φ-OTDR
Yongxin Liang, Jialei Zhang, Shibo Zhang, Zhenyu Ye, Anchi Wan, Chunye Liu, Jianhui Sun, Zinan Wang
University of Electronic Science and Technology of China, China
A deep learning model was proposed to simultaneously integrate the functions of demodulation and denoising for the phase-sensitive optical time domain reflectometry (Φ-OTDR), resulting in low-noise reconstruction of the phase curves.

ACPPOEM-0728-32
Experimental research of angiographic capabilities of photoacoustic probe based on gradient lens and PVDF-TrFe ultrasonic detector
Daria Voytovich, Alexey Kurnikov, Anna Orlova, Pavel Subochev
Institute of Applied Physics, Russian Academy of Sciences, Russia
Optical resolution photoacoustic microscopy (OR-PAM) is an in vivo imaging technique with micrometer spatial resolution. The paper presents the OR-PAM setup that uses copolymer PVDF-TrFe film as a piezo element in ultrasonic detector. PVDF-TrFe film allows to increase a sensitivity of piezoelectric detector. Experimental capabilities of OR-PAM probe based on GRIN-lens and the copolymer ultrasonic antenna is described in the paper.

ACPPOEM-0729-18
Utilizing Two-Dimensional Perovskite in a TFBG Humidity Sensor for Improved Soil Moisture Detection
Wang Xiaoniu[1], gao Feng[1], Yang Yi[2], Shen Changyu[1]
1.China Jiliang University, China; 2.Fujian Normal University, China
This study proposes a reflective, TFBG based soil content sensor enabled by a two-dimensional halide perovskite material $(PMA)_2PbBr_4$). The sensor exhibits a linear response when the soil moisture content ranging from 0% to 16.67%, and the sensitivity of the soil water content is observed to be 0.43 dB/%.

ACPPOEM-0731-24
High Accuracy Curve Reconstruction based on Twisted Multicore Fiber and Twist bias Calibration
Yang Keyuan[1,2], Gui Zhiyuan[1,2], Ke Changjian[1,2], Xu Zikang[1,2], Liu Deming[1,2]
1.School of Optical and Electronic Information, Huazhong University of Science and Technology, China; 2.National Engineering Research Center of Next Generation Internet Access-system, Huazhong University of Science and Technology, China
A high accuracy curve reconstruction method based on twisted multicore fiber and twisted bias calibration is proposed. The reconstruction error is optimized from 7.43 mm to 1.41 mm after twist bias calibration.

ACPPOEM-0731-29
Quasi-Distributed Relative Humidity Sensing Based on Optical FMCW Multiplexed Fabry-Perot Interferometer
Zhiyu Feng[1], Chaotan Sima[1], Yu Cheng[2], Yi Tang[2], Zhipeng Wang[2], Yu Pan[2], Libo Yuan[2]
1.Huazhong University of Science and Technology, China; 2.Guilin University of Electronic Technology, China
A quasi-distributed fiber optic relative humidity sensing system based on optical frequency modulated conti-nuous wave (FMCW) multiplexing Fabry-Perot interferometer (FPI) is proposed. In this paper, the fundamental structure and the locating principle are introduced, and the system layout and signal demodulation process are described in detail. Next, the sensing performance of the system is evaluated through humidity experiments. Finally, the stability of the system is tested by repeatability experiments. The system can be used for online monitoring of environmental humidity status and has significant application prospects for quasi-distributed sensing based on FPI.

ACPPOEM-0731-168
Novel Dual-Axis Accelerometer Designs Using Cavity Optomechanics: Analysis and Simulation
Chuanwang Fang, Jiahui Liang, Zijiang Liao, Jing He, Ruoyu Li, Yongjun Huang
University of Electronic Science and Technology of China, China
This paper presents novel dual-axis accelerometers using cavity optomechanics, optimized through theoretical analysis and COMSOL simulations. Highlighted improvements include reduced thermal noise, paving the way for high-precision, cost-effective applications.

ACPPOEM-0731-173
Innovative Fusion of Multimode Fiber and Multicore Fiber for High-precision Non-contact Displacement Measurement
Zheng Gao, Ting Jiang, Jing Liu, Huan He, Fengming Zhang, Ming Tang
Huazhong University of Science and Technology, China
We demonstrated a non-contact displacement measurement system based on multimode fiber (MMF) and multicore fiber (MCF). The proposed MMF-MCF structure converts the displacement into variations in pulse intensity and break the speed limitations of conventional camera-based methods. The mean absolute error (MAE) for displacement estimation is 2.3 μm, with the estimation range of 300 μm.

ACPPOEM-0731-185
Investigation of a Subwavelength Grating Bimodal Interferometric Sensor Built on Silicon Nitride Platform
Wenyu Liao, Yiqiang Chen, Linghua Wang
Fuzhou University, China
A bimodal interference sensor on a 400nm-thick silicon nitride (SiN) platform is proposed, using a subwavelength grating (SWG) waveguide structure. The device has good sensitivity and is easy to be fabricated with accessed commercial foundry.

ACPPOEM-0801-42
A wearable strain sensor based on mechanoluminescent polydimethylsiloxane fiber
Tang Mengjing, Jiang Qinchuan, Luo Ling, Xu Jing, Chen Qingming
School of Microelectronics Science and Technology, Sun Yat-Sen University, China
This paper presents a ZnS:Cu-added polydimethylsiloxane fiber as a mechanoluminescent wearable sensor. Both the strength and frequency of the finger bending have been detected by this sensor. It will find applications in low-cost wearable sensor.

ACPPOEM-0801-141
Statistics for Intensity of Rayleigh Backscattering based Coherent Distributed Measurement System
RenYan, XieWeilin, TanZhongwei, WeiWei, DongYi
Beijing Institute of Technology, China
A modified analytical method for calculation of the statistics of intensity of Rayleigh backscattering of non-ideal light source is presented. The probability density function is deduced and its evolution in different system states are exhibited.

ACPPOEM-0804-1
Asensitive relative humiditysensor based on a tapered fiber Mach-Zehnder interferometer coated with hydrogel
Lingchao Bai, Yuanji Fan, Guiyu Wang, WuYao, Xuefeng Chen, Xiujuan Yu
Heilongjiang University, China
This paper presents a novel and compact relative humidity sensorbased on a taperedfiber Mach-Zehnder interferometer coated with hydrogel.The proposedsensor has a humidity sensitivity of 0.466nm/%RH within humidityrange of 80-98 %RH.

ACPPOEM-0809-3
A Robust Vessel Labeling Pipeline with High Tissue Clearing Compatibility for 3D Mapping of Vascular Networks
Yating Deng, Jingtan Zhu, Xiaomei Liu, Tingting Yu, Dan Zhu
Huazhong University of Science and Technology, China
The combination of vessel-labeling, tissue-clearing, and light-sheet imaging techniques provides a potent tool for accurately mapping vascular networks across different tissue types, enabling the assessment of vascular remodeling in vascular-related disorders. However, most vascular labeling methods face challenges due to fluorescence quenching after extended periods of tissue-clearing, which significantly undermines the image quality. To address this limitation, we introduce a vessel-labeling pipeline, termed Ultralabel. Ultralabel employs dextran dye covalently bound to lysine residues, mixed with a gelatin solution to fill blood vessels and subsequently strengthened by aldehyde fixation. Consequently, Ultralabel demonstrates high compatibility with all the tissue clearing methods tested and outperforms other vessel labeling methods, enabling successful 3D reconstructions of the vascular networks in the mouse brain, liver, and spinal cord. In conclusion, Ultralabel tackles the issue of reduced fluorescent signals and enhances tissue clearing compatibility, making it a robust and user-friendly method for obtaining precise structures of 3D vascular networks. This promising technique is expected to be a valuable tool for the precise analysis of vascular dysfunction and diseases.

ACPPOEM-0809-8
Photobiomodulation of brain waste removal system.
Elmira Kaibeleva, Oxana Semyachkina-Glushkovskaya
Saratov State University Saratov, Russia
The meningeal lymphatic vessels (MLVs) are an important part of the brain waste removal system (BWRS). A decrease in MLV function is associated with various brain diseases, including Alzheimer's and Parkinson's diseases, brain tumors and trauma. Augmentation of the BWRS might be an innovative and promising strategy for neurorehabilitation medicine. Here we discuss that photobiomodulation of the BWRS/MLVs during deep sleep is a breakthrough technology for the effective removal of metabolites and wastes from the brain in order to increase the neuroprotection of the brain as well as to prevent or delay neurodegenerative diseases.

ACPPOEM-0813-5
A Novel Fiber Optic Ring Cavity Oscillating DC Magnetic Field Sensing Technology Based on Phase Demodulation
Dongchao Liu
NR Electric Co., Ltd, China
This paper proposes a sensing technology based on fiber optic ring cavity oscillation structure for DC magnetic field detection requirements, which can be obtained by detecting the strength of the phase-locked output signal.
ACPPOEM-0813-9
Optical pulling of synthetic Janus particles mediated by photonic nanojet
Yuxuan Ren[1], Johannes Frueh[2], Sven Rutkowski[2], Cihang Kong[3], Bo Li[3], Kenneth Wong[4]
1.Fudan University, China; 2.National Research Tomsk Polytechnic University, Russia; 3.Fudan University, China; 4.Hong Kong University, Hong Kong, China
The Janus microparticle with an opaque metal layer on one side can be used to create a nanomotor. However, due to inhomogeneous coating, the Janus particle cannot concentrate light into a perfect nanojet. We report on the tunable asymmetric nanojet with a plasmonic Janus particle and anticipate that the asymmetric nanojet offers great possibilities to pull synthetic particles. Such scheme may be applied for parallel particle manipulation and classification.

ACPPOEM-0814-10
A deep learning-based model for human non-invasive vital sign signal monitoring with optical fiber sensor
Qichang Zhang, Qing Wang, Weimin Lyu, Changyuan Yu
The Hong Kong Polytechnic University, Hong Kong, China
This paper presents a non-contact monitoring system using micro-bend fiber sensors and deep learning. The system improves vital sign measurements, outperforming traditional methods, and holds the potential for medical diagnostics.

ACPPOEM-0814-14
Two-photon STED microscopy based on dual-Bessel beam
Renlong Zhang, Junle Qu
Campus of Physics and Optoelectronic Engineering, Shenzhen University, China
Stimulated emission depletion (STED) microscopy has gained widespread applications in cellular super-resolution imaging and lithography, owing to its remarkable ability to surpass the diffraction limit. However, the presence of sample-induced aberrations disrupts the stability of the donut-shaped depletion light field, significantly compromising the performance of STED. As a result, imaging thick tissue samples poses significant challenges for STED. In this study, we propose a novel approach for Two-photon excited STED microscopy (TP-STED) that leverages Bessel beams and 1040 nm fs pulse excited laser. Specifically, we employ first-order Bessel beams for the depletion light and zero-order Bessel beams for the excitation light. Exploiting the self-healing properties of Bessel beams, this technique not only enhances the imaging depth but also preserves the resolution performance of STED. Results demonstrate that the utilization of Bessel beams enables a fourfold increase in axial information acquisition compared to Gaussian beams, while maintaining resolution. Our proposed technique holds tremendous potential for imaging thick tissue samples and enabling fast super-resolution imaging.

ACPPOEM-0814-19
Privacy-encrypted Lensless Camera for Face Recognition
Zheng Huang[1,2], Wanxin Shi[1,2], Shukai Wu[1,2], Xin Liu[3], Chen Qian[3], Wentao Liu[3,4], Sigang Yang[1,2], Hongwei Chen[1,2]
1.Tsinghua University, China; 2.Beijing National Research Center for Information Science and Technology, China; 3.SenseTime Research, China; 4.Shanghai AI Laboratory, China
We propose a privacy-encrypted lensless camera. By an end-to-end joint optimization algorithm, we design an optical mask for multiple tasks within the face recognition process, achieving an impressive recognition result and a robust encryption effect.

ACPPOEM-0814-46
A Lensless Camera Simulator via Deep Learning
Zheng Huang[1,2], Wanxin Shi[1,2], Yuyang Han[1,2], Xin Liu[3], Chen Qian[3], Wentao Liu[3,4], Sigang Yang[1,2], Hongwei Chen[1,2]
1.Tsinghua University, China; 2.Beijing National Research Center for Information Science and Technology, China; 3.SenseTime Research, China; 4.Shanghai AI Laboratory, China
We present a generative adversarial network that can simulate a lensless camera. This can efficiently generate datasets to fine-tune the electrical neural network against the gap between actual optical encoders and forward models in simulations.

ACPPOEM-0814-63
Diagnosis of dental caries in OCT images based on deep learning
Shuhao Fan[1], Huanhuan Yu[1], Zehua Guan[1], Fukang Lv[1], Zhuojun Zhou[2], Cuixia Dai[1]
1.Shanghai Institute of Technology, China; 2.Shanghai Ninth People's Hospital, China
Optical Coherence Tomography (OCT), characterized by its non-invasive nature and high resolution, enables non-destructive, cross-sectional imaging of oral tissues.Deep learning (DL) has prominently contributed to dental medicine, specifically in tasks such as image recognition (IR), classification (CL), segmentation (SG), and quantification (QT), owing to its robust feature learning abilities and outstanding portability. Presently, prevalent clinical techniques employed in the identification of dental caries encompass visual examination and X-ray radiography. Nevertheless, these methodologies fall short in achieving precise identification of incipient enamel caries or visualization of minuscule structural alterations within dental structures. OCT has the capability to detect minute demineralized regions both on the surface and within the internal structure of teeth, thus overcoming the limitations associated with alternative optical detection methods.Initially, we employed a swept-source Optical Coherence Tomography (SS-OCT) system to conduct imaging and preliminary analysis on demineralized dental caries samples. Manual annotation of regions and relevant information associated with dental caries within OCT images to generate a United Statesble dataset.Subsequently, we trained and tested the dataset using three distinct object detection models: YOLOv5, Faster R-CNN, and RetinaNet. After training, the mean average precision achieved was 86%, 86%, and 75% respectively. The experimental results offer potential to expedite diagnosis time for clinicians, thereby serving as a foundation for supplementary diagnostic support by aiding medical professionals in making informed decisions.

ACPPOEM-0814-66
Machine learning-based fiber optic salinity sensor for temperature immunity
Lirong Ren, Yifan Zhou, Ya-nan Zhang
Northeastern University, China
In this work, a simple optical fiber sensor is designed and fabricated to accurately predict the seawater salinity by the machine learning method. The test set R^2 is higher than 0.99 even when instrument requirements are not stringent or temperature perturbations are present.

ACPPOEM-0815-6
Pd-WO_3 co-doped PVB film coated fiber grating for high-sensitive hydrogen sensing
Hongrong Zheng, Biqiang Jiang, Dingyi Feng, Jianlin Zhao
Northwestern Polytechnical University, China
We propose and experimentally demonstrate a highly sensitive hydrogen (H_2) sensor by coating palladium (Pd)-tungsten trioxide (WO_3) co-doped polyvinyl butyral (PVB) nanofibers onto tilted fiber Bragg grating (TFBG). The tilted grating planes of the employed TFBG excite a set of cladding modes and strong evanescent field that can fully interact with the H_2-sensitive film. The Pd-WO_3 co-doped PVB nanofibers wrapped TFBG presents a sensitivity of 0.304 dB/% in the concentration range of 0%~1% by tracking the intensity of a specific cladding mode resonance. The high sensitivity, good repeatability, and reliability of the proposed H_2 sensor enable it to detect leak of low-concentration H_2.

ACPPOEM-0815-30
Smart Health Monitoring System Based on a Fiber Optic Sensor
Yiheng Chen, Weimin Lyu, Weihao Yuan, Changyuan Yu
The Hong Kong Polytechnic University, Hong Kong, China
An optical fiber Mach-Zehnder interferometer (MZI) based smart health monitoring system using a vertical-cavity surface-emitting laser (VCSEL) is proposed. The feasibility of using FOS-based Ballistocardiography (BCG) to replace ECG in monitoring human signs is verified.

ACPPOEM-0815-34
SPR Refractive Index Sensor Based on Anti-resonant Fiber
Ziqing Zhao, 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 refractive index (RI) sensor based on surface plasmon resonance (SPR) effect is proposed by using anti-resonant fiber structure. The sensor has an average sensitivity of 12,302 nm/RIU in the refractive index range of 1.26 to 1.41.

ACPPOEM-0815-79
Enhanced Velocity Measurement of Lidar by Optical Parametric Assisted Frequency Modulation
Zhang Hao[1,2], Xie Qijie[2], Na Quanxin[2], Zhang Nan[2], Song Junfeng[2,3], Wang Lijun[1,2]
1.State Key Laboratory of Luminescence and Application, Changchun Institute of Optics, Fine Mechanics and Physics, Chinese Academy of Sciences, China; 2. Peng Cheng Laboratory (PCL), China; 3.Jilin University, China
A novel approach is proposed to enhance the velocity measurement range of frequency-modulated continuous-wave (FMCW) Lidar. By virtue of optical parametric assisted frequency modulation (OPAFM) method, the available range of velocity measurement can be double. In our experimental demonstration, the chirp rate of a frequency sweeping light is increased from 6.40 GHz/μs to 12.80 GHz/μs.Hence, the maximum measurable velocity for a target at 5.2 m can be improved from 2.13 m/s to 4.41 m/s.

ACPPOEM-0815-97
Delay-beat Differential Phase Demodulation for Laser Phase Noise Immunity in Phase-sensitive OTDR
Heng Qian[1], Chuan Li[1], Chengli Li[2]
1.Kunming University of Science and Technology, China; 2.Yunnan Normal University, China
A phase demodulation method immune to laser phase noise based on time-delay beat-frequency coherent Φ-OTDR is proposed. In this method, the two Rayleigh backscattered light beams with time delay are beat with local light beams respectively, and the phase difference of the two beat signals is used instead of the traditional distance-difference phase to obtain the local disturbance information. In this way, the impact of laser phase noise introduce by the distance-difference phase is avoid, and the constraint of laser linewidth on phase demodulation performance is weakened. In the experiment, a demodulation accuracy of -63.5dB rad^2/Hz is achieved under the condition of a laser with a linewidth of 100kHz, which is improve by 11dB compared to traditional phase demodulation method.

ACPPOEM-0815-103
Ultrahigh resolution isotropic 3D nanoscopy by employing mirror-basedsingle-beaminterference
Binxiong Pan, Chang Liu, Baoju Wang, Qiuqiang Zhan
South China Normal University, China
A novel 3D isotropic super-resolution method based on single-beam interference is proposed. Combining with photon avalanching nanoparticles co-doped with Yb^{3+} / Pr^{3+}, isotropic imaging resolution below 70 nm (λ/12) was achieved under low-power, single-beam excitation.

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光纤激光 | 光纤传感 | 科学通信 | 数据通信 | 电信通信

光纤激光

光纤熔接处理

光纤传感

微波光子

800G

硅光集成

量子信息

微纳光学

集成光子

全光交换

凌云光技术股份有限公司

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Amonics
Specialist in Optical Amplifiers

20th 辉煌二十载 奋进光电年代
Light to a Brighter World

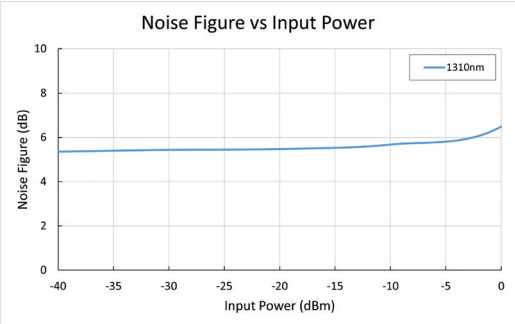
ISO 9001 : 2015
Certificate No.: CC 5346

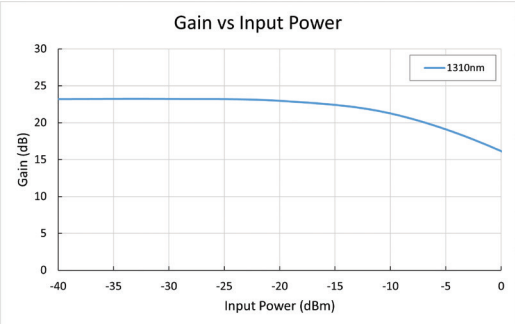
O波段掺铋光纤放大器 (BDFA)

O波段掺铋光纤放大器(BDFA)采用掺铋光纤作为增益介质。BDFA具有高小信号增益和低噪声系数。硅基掺铋光纤具有与用于C和L波段放大的掺铒光纤类似的基本优势。

主要特点

- 高小信号增益 >23 dB @ 1310 nm
- 与传统EDFA类似的增益和噪声系数
- 比传统拉曼放大器的功耗更低
- 无失真放大





Semight 联讯仪器

采样示波器

选型指南

10G

DCA4201-光通道＋电通道

- 10G 光口+20G BW 电口（单端）
- 液晶屏实时更新重要参数
- GUI 界面简单易用
- 测试速度快
- 通过大客户严格的验证，已大批量应用
- 适合10G及以下速率光模块/PON/光猫等测试

40G

DCA6201-电通道

- 快速采样>100KHz
- 1/2/4差分电口可选
- 支持NRZ/PAM4测试(最大支持28.9波特率)

30G

DCA6201-光通道

- 快速采样>100 KHz
- 1/2/4光口可选
- 支持NRZ/PAM4测试(最大支持28.9波特率)

50G

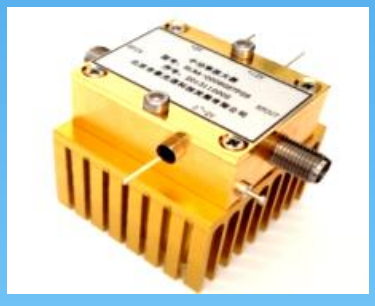
DCA6201-光通道

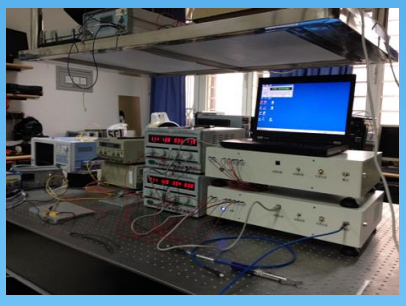
- 50G光采样示波器(Filter49.76664 Gbps、53.1250 GBd)
- 支持单波100G 光口测试
- 800G PSM8 /400G DR4/FR4/LR4
- 50G PON

北京吉泰光通科技发展有限公司

企业简介:

北京吉泰光通科技发展有限公司是一家专业从事射频微波器件组件、光通信器件、射频微波接头、射频同轴线缆组件等研发生产及相关系统设计的高新技术企业。公司非常重视技术人才队伍的建设，研发生产骨干人员多来自于清华大学及国内各研究院所，团队紧密跟踪调研本领域国际最新发展动向，与国内外先进的企业进行广泛的合作和技术引进。相关产品的技术指标均处于国内领先水平。





企业文化：我们将以客户需求为向导，不懈努力研究，创造及生产出更多，更好的射频微波器件、光模块产品。

- 发展理念-创新务实、追求卓越
- 技术理念-领先一步、高精质量
- 创新理念-追求创新、推陈出新
- 合作理念-开诚布公、互相信任

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Tracks

Track 1: Optical Fibers and Fiber-based Devices

Track 2: Optical Transmission Systems, Subsystems and Technologies

Track 3: Network Architectures, Management and Applications

Track 4: Optoelectronic Devices and Integration

Track 5: Microwave Photonics and Optical Signal Processing

Track 6: Photonics for Energy

Track 7: Micro-, Nano-, and Quantum Photonics: Science and Applications

Track 8: Photonic Sensors & Bio-Photonics

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