2025 13th International Conference on Intelligent Computing and Wireless Optical Communications

(ICWOC 2025)

➲➲➲ June 27-29, 2025 | Chengdu, China

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►Welcome Message

It is our great honor to welcome you to the **2025 13th International Conference on Intelligent Computing and Wireless Optical Communications (ICWOC 2025)**, held in Chegndu China during June 27-29. It's co-sponsored by Southwest Jiaotong University, China and Chongqing University, China; Technically co-sponsored by IEEE and IEEE Photonics Society; organized by School of Information Science and Technology, SWJTU.

As we gather in this vibrant forum, we celebrate the remarkable progress and interdisciplinary innovations in intelligent computing, wireless communications, and optical technologies—fields that are fundamentally transforming industries, societies, and the way we interact with the digital world.

The technical program features a diverse range of activities, including plenary speeches and keynote speeches by globally renowned experts, invited talks on emerging trends, peer-reviewed paper presentations which will be delved into pressing topics such as Wireless Communication and Networks, Optical Fiber Communication and Networks, Optical Wireless Communication and Networks, Integrated Sensing and Communication and Signal Processing, offering attendees deep insights into both theoretical advancements and real-world applications.

We are deeply grateful to our esteemed authors for their high-quality submissions, our dedicated reviewers for their rigorous evaluations, and our session chairs for guiding productive discussions. We also extend our sincere appreciation to our sponsors and partners, whose generous support has been instrumental in making this event possible.

Beyond the technical sessions, we encourage all participants to engage in networking opportunities, fostering new collaborations that transcend geographical and disciplinary boundaries. It is through such connections that transformative ideas take shape and impactful innovations emerge.

We hope that ICWOC 2025 will inspire lively debates, spark new research directions, and strengthen the global community of professionals dedicated to advancing intelligent computing and wireless optical communications.

Thank you for being part of this exciting journey. We wish you a stimulating and rewarding conference experience!

ICWOC 2025 Conference Committees

►Guideline

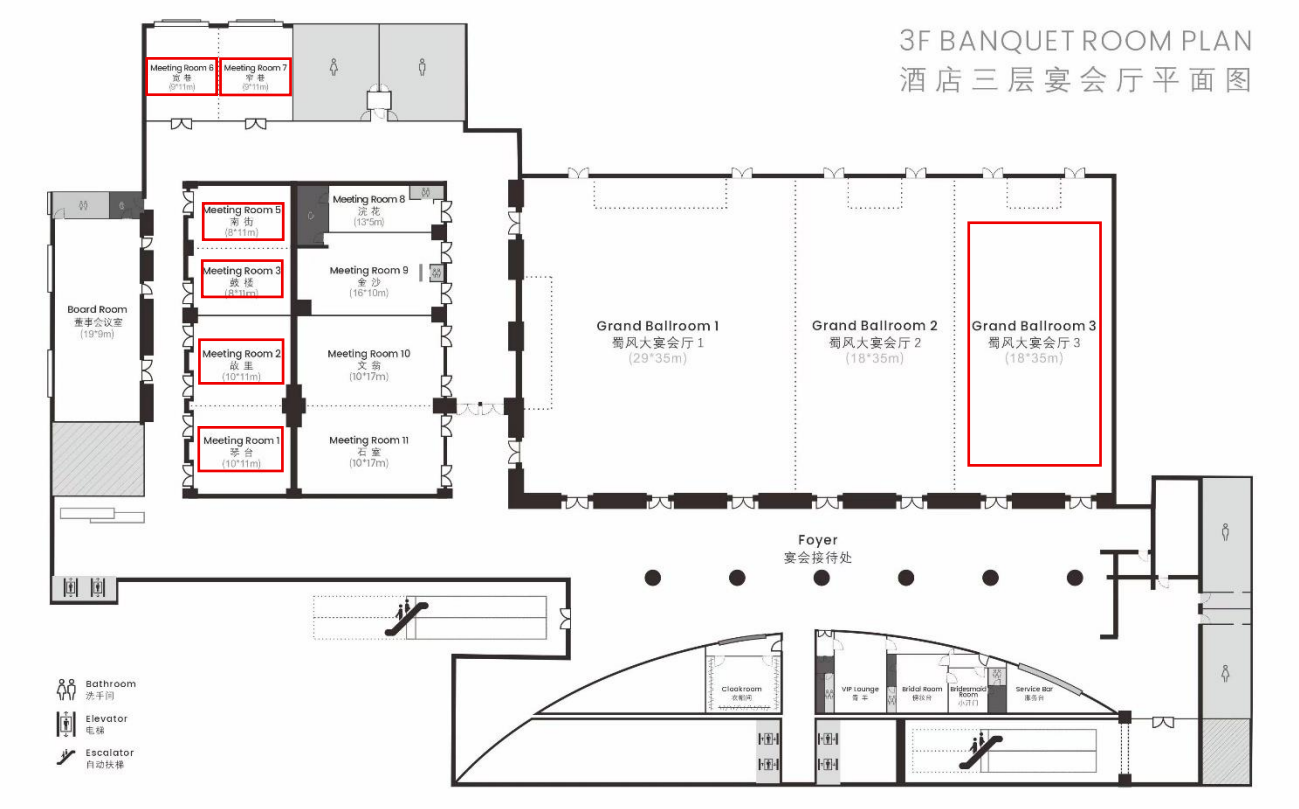
For Onsite Participants

Time Zone

- Chengdu standard time: UTC/GMT+8

Conference Venue

- 成都非遗博览园缇沃丽酒店
- Tivoli Chengdu at Cultural Heritage Park
- 地址：中国四川省成都市青羊区光华大道 2 段 60 号，邮编：610031 A
- Address: 601Guang Hua Avenue, Section 2, Qingyang District, Chengdu, Sichuan Province, CHINA 610031



Lodging Accommodation

- 成都非遗博览园盛橡： 豪华房 450 元（单早）， 500 元（双早）
  成都非遗博览园缇沃丽：豪华房 500 元（单早），550 元（双早）
- 订房电话：13348826945 （胡经理）：沟通时请告知参加 ICWOC 2025 会议
- Oaks Chengdu at Cultural Heritage Park:
  Deluxe room is 450 yuan (with single breakfast), 500 yuan (with double breakfast).
  Tivoli Chengdu at Cultural Heritage Park:
  Deluxe room is 500 yuan (with single breakfast), 550 yuan (with double breakfast).
- Reservation Call: +86-13348826945 (Ms. Hu). Please tell the hotel that you will attend ICWOC 2025.

►Guideline

For Onsite Participants

For Presentation

- The duration of oral presentation slot is 15 minutes (including 2-3 minutes Q&A).
- The duration of poster presentation slot is 5 minutes (including Q&A).
- Your punctual arrival and active involvement in each session will be highly appreciated.
- Get your presentation PPT or PDF files prepared and backed up.
- The regular oral presentation time arrangement is for reference only. In case any absence or some presentations are less than 15 minutes, please join your session earlier.
- A best presentation will be selected from each session which will be announced and awarded a best presentation certificate.

Attention

- For security purpose, all participants are required to wear name badge to all sessions and social function. Entrance into sessions is restricted to registered delegates only.
- For your personal and property safety, please take care of your belongings in public area. Conference does not assume any responsibility for loss of personal belongings of participants.

Emergency Numbers

Medical Emergency: 120	Police: 110	Fire: 119

►Guideline

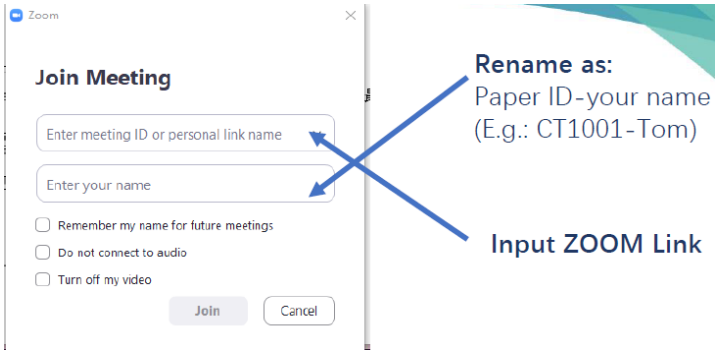
For Online Participants

Time Zone

- Chengdu standard time: UTC/GMT+8

Platform: ZOOM

- For general users, Zoom Download: https://zoom.us/
- For authors in China: Zoom Download: https://zoom.com.cn/download
- Please unmute audio and start video during your presentation.
- Use headset with microphone or earphone with microphone.



- Set up your Name.
  Authors: Paper ID-Name / T1001-Jimmy Smith
  Listener: Listener- Name / Listener- Jimmy Smith
  Keynote Speaker: Keynote-Name / Keynote- Jimmy Smith
  Invited Speaker: Invited-Name / Invited- Jimmy Smith
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Conference Recording

- The conference online part will be recorded. We appreciate your proper behavior and appearance.

ICWOC'25 会议通知

►Conference Schedule Overview

June 27, 2025 / UTC/GMT+8

Time	Schedule	
10:00-17:00	**Onsite** Registration Sign-in & Collecting Materials	**Lobby – 2nd Floor** Oaks Chengdu at Cultural Heritage Park Address: 601Guang Hua Avenue, Section 2, Qingyang District, Chengdu, Sichuan Province, China 610031
	Online Test for Online Participants	**ZOOM link:** https://us02web.zoom.us/j/81871643610 Password: 062729
14:00-15:00	Online Speakers & Online Session Chairs & Committee Members	
14:00-16:00	Online Paper Presentation Test C4070, C4059, C4077, C3031, C4044, C2005, C2008, C2011, C2004 C4073, C4062, C4047, C3026, C4082, T002, C3019, C3018, C3020, C2012	

►Conference Schedule Overview

June 28, 2025 / UTC/GMT+8

Opening Ceremony & Plenary Speeches

Time	Activity	
	Location: Ground Ballroom 蜀风大宴会厅 3- 3rd Floor	
8:00-9:00	Registration & Sign-in & Collecting Materials	Lobby 2nd Floor
Opening Ceremony **Host: Lianshan Yan, Southwest Jiaotong University, China**		
8:50-9:00	**Welcome Message** **Lianshan Yan, Southwest Jiaotong University, China**	
	Opening Remarks **Perry Shum, Southern University of Science and Technology, China**	
Plenary Speeches Session		
Plenary Speaker I (Online) **Host: Changyuan Yu, The Hong Kong Polytechnic University, China**		
9:00-9:40	**Alan Eli Willner, University of Southern California, USA** Speech Title: High-Accuracy Ranging in Turbid Water using Structured Light ZOOM link: https://us02web.zoom.us/j/81871643610 Password: 062729	
Plenary Speaker II **Host: Jian Song, Tsinghua University, China**		
9:40-10:20	**Jianping Yao, University of Ottawa, Canada** Speech Title: Microwave Photonics for AI: Challenges and Opportunities	
10:20-11:00	**Group Photo & Coffee Break**	
Plenary Speaker III **Host: Cheng-Xiang Wang, Southeast University, China**		
11:00-11:40	**Erdal Panayirci, Kadir Has University, Turkey** Speech Title: Visible Light Communications with Physical-Layer Security Issues	
11:40-14:00	**Lunch & Break | Location: Cafe 1933 - 3rd Floor**	

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Keynote Speeches

Time	Activity
	Location: Ground Ballroom 蜀风大宴会厅 3- 3rd Floor
Keynote Speeches Session **Host: Fei Xu, Nanjing University, China**	
14:00-14:40	**Keynote Speaker I** **Jian Song, Tsinghua University, China** Speech Title: High-speed Devices for Visible Light Communications and its Possible Applications for Intelligent Lighting Systems of E-Car
14:40-15:20	**Keynote Speaker II** **Cheng-Xiang Wang, Southeast University, China** Speech Title: Pervasive Channel Modeling for 6G/B6G Radio and Optical Wireless Communication Networks
15:20-15:50	**Coffee Break**
Keynote Speeches Session **Host: William Shieh, Westlake University, China**	
15:50-16:30	**Keynote Speaker III** **Nobuyuki Yoshikawa, Yokohama National University, Japan** Speech Title: Superconducting Adiabatic Logic for Beyond-CMOS Computing: Principles and Prospects
16:30-17:10	**Keynote Speaker IV** **Yun Chur Chung, Korea Advanced Institute of Science and Technology (KAIST), Korea** Speech Title: Multiplexing Technologies for Next-Generation Datacenter Networks
18:30-20:00	**Banquet | Location: Ground Ballroom 蜀风大宴会厅 3- 3rd Floor**

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Section Keynote & Invited Speeches & Onsite Oral Presentations

Location: Meeting Room 2 故里厅	
Time	**Activity**
Section Keynote & Invited Speeches	
Track 1. Wireless Communication and Networks	
9:00-10:00	**Chair: Longsheng Wang, Taiyuan University of Technology, China** **Section Keynote-** Ming Xiao (Online) Zoom Link: https://us02web.zoom.us/j/81871643610 Password: 062729 **Invited Speaker-** Jingjing Cui, Chang Liu
10:00-10:20	**Coffee Break**
10:20-11:20	**Chair: Jingjing Cui, Southwest Jiaotong University, China** **Invited Speaker-** Longsheng Wang, Xuedou Xiao, Xiaotong Shi
12:00-13:30	**Lunch & Break | Location: Cafe 1933 - 3rd Floor**
Paper Presentation	
13:30-15:00	**Chair: Xuedou Xiao, Wuhan University of Technology, China** Track 1. Wireless Communication and Networks Track 6. Fiber and Sensor Technologies Paper ID: C3016-A, C3029, C3027, C2009, C3038, C4072
15:00-15:30	**Coffee Break**
15:30-17:30	**Chair: Yuancheng Cai, Purple Mountain Laboratories, China** Track 7. Microwave Photonics and THz Technology Track 8. Intelligent Photonics and Optical Computing Paper ID: C4075, C4076, C4071, C4069, C4057, C4058, C4063, C4050

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Section Keynote & Invited Speeches & Onsite Oral Presentations

Location: Meeting Room 3 鼓楼厅	
Time	**Activity**
Section Keynote & Invited Speeches	
Track 2. Optical Fiber Communication and Networks	
9:00-10:40	**Chair: Chao Li, Peng Cheng Laboratories, China** **Section Keynote-** William Shieh, Jinlong Wei **Invited Speaker-** Xinwei Du, Yong Geng, Guijun Hu
10:40-11:00	**Coffee Break**
11:00-12:20	**Chair: Yong Geng, University of Electronic Science and Technology of China, China** **Invited Speaker-** Chao Li, Bitao Pan, Yu Wang, Ming Hao
12:20-13:30	**Lunch & Break | Location: Cafe 1933 - 3rd Floor**
Track 2. Optical Fiber Communication and Networks	
13:30-15:10	**Chair: Anbang Wang, Guangdong University of Technology, China** **Invited Speaker-** Zixian Wei, Xuwei Xue, Zhaopeng Xu, Fulong Yan, Chao Yang
15:10-15:40	**Coffee Break**
15:40-17:40	**Chair: Zhaopeng Xu, Peng Cheng Laboratories, China** **Invited Speaker-** Jing Zhang, Anbang Wang, Ming Chen, Ping Zhao **Section Keynote-** Christos Masouros (Online | 17:00-17:20) Zoom Link: https://us02web.zoom.us/j/81871643610 Password: 062729 **Invited Speaker-** Wei Xin

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Section Keynote & Invited Speeches & Onsite Oral Presentations

Location: Meeting Room 5 南街厅	
Time	**Activity**
Track 5. Space Communications, Navigation and Tracking	
9:00-10:20	**Chair: Xiping Wu, Southeast University, China** **Section Keynote-** Siyuan Yu **Invited Speaker-** Ning Jiang, Feng Wen, Zhenming Yu
10:20-10:40	**Coffee Break**
Track 3. Optical Wireless Communication and Networks	
10:40-12:00	**Chair: Renzhi Yuan, Beijing University of Posts and Telecommunications, China** **Section Keynote-** Xiping Wu **Invited Speaker-** Le Doan Hoang, Sicong Liu, Mingqing Liu
12:00-13:30	**Lunch & Break | Location: Cafe 1933 - 3rd Floor**
Track 3. Optical Wireless Communication and Networks	
13:30-14:50	**Chair: Guanjun Gao, Beijing University of Posts and Telecommunications, China** **Invited Speaker-** Chao Shen, Han Wu, Tingwei Wu, Renzhi Yuan
14:50-15:20	**Coffee Break**
15:20-16:00	**Chair: Chao Shen, Fudan University, China** **Invited Speaker-** Qiong Zhao, Guanjun Gao

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Section Keynote & Invited Speeches & Onsite Oral Presentations

Location: Meeting Room 6 宽巷厅	
Time	**Activity**
Track 4. Integrated Sensing and Communication and Signal Processing	
9:00-10:20	**Chair: Jia Ye, Chongqing University, China** **Section Keynote-** Zhaohui Li **Invited Speaker-** Lijun Deng, Donghyun Kim, Shuai Ma
10:20-10:40	**Coffee Break**
10:40-12:00	**Chair: Shuai Ma, Peng Cheng Laboratories, China** **Invited Speaker-** Yaxi Yan, Bingcheng Zhu, Jia Ye, Bingpeng Zhou
12:00-13:30	**Lunch & Break | Location: Cafe 1933 - 3rd Floor**
Track 3. Optical Wireless Communication and Networks	
13:30-15:00	**Chair: Mingqing Liu, Tongji University, China** **Paper ID**: C4083, C3014-A, C4049, C4078, C4051, C4045
15:00-15:30	**Coffee Break**
15:30-16:45	**Chair: Zhihong Zeng, Chongqing University, China** **Paper ID:** C4067, C4048, C4061, C3017, C1003

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Section Keynote & Invited Speeches & Onsite Oral Presentations

Location: Meeting Room 7 窄巷厅	
Time	**Activity**
Track 8. Intelligent Photonics and Optical Computing	
9:00-10:20	**Chair: Cheng Wang, ShanghaiTech University, China** **Section Keynote-** Lilin Yi **Invited Speaker-** Yaping Liu, Xiaozhou Li
10:20-10:40	**Coffee Break**
10:40-12:00	**Chair: Lilin Yi, Shanghai Jiao Tong University, China** **Invited Speaker-** Sheng Luo, Cheng Wang, Yongzhuang Zhou, Ying Zhu
12:20-13:30	**Lunch & Break | Location: Cafe 1933 - 3rd Floor**
Track 7. Microwave Photonics and THz Technology	
13:30-15:30	**Chair: Heng Zhou, University of Electronic Science and Technology of China, China** **Section Keynote-** Yue Zhang **Invited Speaker-** Yuancheng Cai, Xiuyou Han, Pu Li, Fu Wang, Cheng Guo
15:30-16:00	**Coffee Break**
16:00-18:20	**Chair: Fu Wang, Beijing University of Posts and Telecommunications, China** **Invited Speaker-** Liangping Xia, Heng Zhou, Xinhai Zou, Bing Lu, Xiaolong Pan, Zhiqiang Fan **Section Keynote-** Jian Wang (Online) Zoom Link: https://us02web.zoom.us/j/81058727383 Password: 062729

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June 29, 2025 / UTC/GMT+8

Section Keynote & Invited Speeches & Onsite Oral Presentations

Location: Meeting Room 1 琴台厅	
Time	**Activity**
Track 6. Fiber and Sensor Technologies	
9:00-10:40	**Chair: Qijun Sun, Guangdong University of Technology, China** **Section Keynote-** Yongkang Dong, Svetislav Savovic Fei Xu (Online) Zoom Link: https://us02web.zoom.us/j/82182568024 Password: 062729 **Section Keynote-** Jianhui Yu, Changyuan Yu
10:40-11:00	**Coffee Break**
11:00-11:40	**Chair: Svetislav Savovic, University of Kragujevac, Serbia** **Invited Speaker-** Qijun Sun, Weili Zhang
12:00-13:30	**Lunch & Break | Location: Cafe 1933 - 3rd Floor**
Track 2. Optical Fiber Communication and Networks **Track 4. Integrated Sensing and Communication and Signal Processing**	
13:30-15:00	**Chair: Ming Chen, Hunan Normal University, China** **Paper ID**: C3035, C3034, T001, C4074, C4056, C4060
15:00-15:20	**Coffee Break**
15:20-17:05	**Chair: Yu Wang, Eindhoven University of Technology, the Netherlands** **Paper ID:** C4068, C4040, C3032, C3036, C3028, C4043, C3025

►Conference Schedule Overview

June 29, 2025 / UTC/GMT+8

Time	Poster Session
14:00-14:40	**Chair: Yixian Dong, Southwest Jiaotong University** Paper ID: C4064, C4079, C4086, C3024

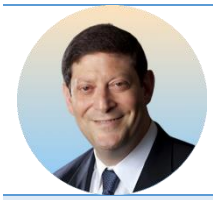
Time	Online Sessions
Zoom Link: https://us02web.zoom.us/j/89245014257 Password: 062729	
Online Track 1. Wireless Communication and Networks	
9:00-11:15	**Chair: Yi Zhou, Brunel University London, UK** Paper ID: C4070, C4059, C4077, C3031, C4044, C2005, C2008, C2011, C2004
12:00-13:30	**Lunch & Break**
Online **Track 3. Optical Wireless Communication and Networks** **Track 4. Integrated Sensing and Communication and Signal Processing** **Track 5. Space Communications, Navigation and Tracking** **Track 7. Microwave Photonics and THz Technology**	
13:30-16:00	**Chair: Tingwei Wu, Chongqing University of Posts and Telecommunications, China** Paper ID: C4073, C4062, C4047, C3026, C4082, T002, C3019, C3018, C3020, C2012

▶Plenary Speakers

June 28, Saturday | UTC/GMT+8

9:00-9:40 | Ground Ballroom 蜀风大宴会厅 3- 3rd Floor | Online Talk

Zoom link: https://us02web.zoom.us/j/81871643610 Password: 062729



Alan Eli Willner

University of Southern California, USA

Fellow of AAAS, APS, IEEE, IET, OSA, SPIE, and AAIA, Member of the U.S. National Academy of Engineering, International Fellow of the U.K. Royal Academy of Engineering, Presidential Faculty Fellows Award from the White House

Bio: Alan Willner received a Ph.D. (1988) in Electrical Engineering from Columbia University and a B.A. (1982) in Physics and an Honorary Doctorate (Honoris Causa, 2012) from Yeshiva University. Prof. Willner was a Postdoctoral Member of Technical Staff at AT&T Bell Labs and a Member of Technical Staff at Bellcore. He is currently Distinguished Professor of Electrical & Computer Engineering and the Andrew & Erna Viterbi Professorial Chair in the Ming Hsieh Dept. of Electrical & Computer Eng. of the Viterbi School of Eng. at the Univ. of Southern California; he also has a joint appointment with Dept. of Physics & Astronomy of the Dornsife College. Prof. Willner has been a Visiting Professor at Columbia Univ., Univ. College London, and Weizmann Institute of Science. He has been a Member of the U.S. Army Science Board, a Member of the Defense Sciences Research Council (16-member body that provided reports to DARPA Director & Office Directors), and a member of many advisory boards. He was also Founder & CTO of Phaethon Communications, a company whose technology was acquired by Teraxion, that created the ClearSpectrum® dispersion compensator product line which is presently deployed in many commercial 40-Gbit/s systems worldwide.

Speech Title: **High-Accuracy Ranging in Turbid Water using Structured Light**

Abstract: There is increased interest in using optical approaches for ranging applications in underwater environments. As compared to acoustic waves, optics can potentially provide higher ranging accuracy, albeit over <50 meters due to power loss. A typical optical ranging approach measures the time-of-flight (ToF) of a transmitted pulse that is reflected from a target object. However, underwater turbidity causes scattering that can result in temporal spreading of the optical pulse and degrade the ranging accuracy. One potential method to accurately retrieve the object's distance is to measure the transverse spatial power distribution of an optical beam reflected from an object.

▶Plenary Speakers

June 28, Saturday | UTC/GMT+8
9:40-10:20 | Ground Ballroom 蜀风大宴会厅 3- 3rd Floor

Jianping Yao

University of Ottawa, Canada

Fellow of IEEE, the Optica (formerly Optical Society of America), the Canadian Academy of Engineering, and the Royal Society of Canada

Bio: Jianping Yao is a Distinguished University Professor in the School of Electrical Engineering and Computer Science, University of Ottawa, Canada. He is known for his contributions to Microwave Photonics. Prof. Yao has authored over 400 refereed journal papers and 300 conference papers, with more than 30,000 citations and an H-index of 90. He was Editor-in-Chief of IEEE Photonics Technology Letters (2017-2021), an elected member of the Board of Governors of the IEEE Photonics Society (2018-2021), and currently a member of the IEEE Photonic Society Publication Council. He was an IEEE Distinguished Microwave Lecturer (2013-2015). Prof. Yao received the 2018 R.A. Fessenden Silver Medal from IEEE Canada and the 2025 IEEE Microwave Application Award from the IEEE Microwave Theory and Technology Society. Prof. Yao is a Fellow of IEEE, the Optica (formerly Optical Society of America), the Canadian Academy of Engineering, and the Royal Society of Canada.

Speech Title: **Microwave Photonics for AI: Challenges and Opportunities**

Abstract: Microwave photonics (MWP) is an interdisciplinary field that integrates microwave engineering with photonic technology to enable ultra-fast signal processing, leveraging the exceptional speed and broad bandwidth of photonics. In parallel, artificial intelligence (AI) has seen rapid advancements, particularly in machine learning, natural language processing, and computer vision. However, conventional electronic hardware struggles to keep up with the increasing computational demands of AI, especially in real-time processing and large-scale data analysis. This has motivated the exploration of alternative computing paradigms, including photonic computing. The integration of AI with MWP holds significant potential for next-generation intelligent systems. Photonic computing platforms can leverage the ultra-fast speed, parallel processing, and low power consumption of optical signals to accelerate AI-related tasks. Optical neural networks, photonic tensor processors, and MWP-based reservoir computing are emerging as promising solutions for AI acceleration.

This talk will explore MWP techniques for AI, highlighting key applications and examples of how MWP can be utilized to support AI-driven computing and signal processing. Additionally, the implementation of photonic-assisted AI using photonic integrated circuits (PICs) will be discussed, addressing the challenges and opportunities in developing compact, scalable, and efficient photonic AI hardware.

▶Plenary Speakers

June 28, Saturday | UTC/GMT+8
11:00-11:40 | Ground Ballroom 蜀风大宴会厅 3- 3rd Floor

Erdal Panayirci

Kadir Has University, Turkey

Istanbul Turkey & Visiting Research Collaborator at Princeton University, USA
Life Fellow IEEE, Member of the National Academy of Sciences of Turkey

Bio: Erdal Panayirci received a Diploma Engineering degree in electrical engineering from Istanbul Technical University, Istanbul, Turkey, and a Ph.D. degree in electrical engineering and system science from Michigan State University, East Lansing, MI, USA. He is currently a Professor at the Electrical and Electronics Engineering Department at Kadir Has University, Istanbul. He holds a visiting research collaborator position with the Department of Electrical Engineering, Princeton University, Princeton, NJ, USA. He has published extensively in leading scientific journals and international conferences and coauthored the book Principles of Integrated Maritime Surveillance Systems (Kluwer Academic, 2000). His research interests include communication theory, synchronization, advanced signal processing techniques, and their applications to wireless electrical, underwater, and optical communications. He has served as a member of the IEEE Fellow Committee from 2005 to 2008 and from 2018 to 2020 and the IEEE GLOBECOM/ICC Management and Strategy Standing Committee from 2017 to 2020. Currently, he is a member of the IEEE ComSoc Awards Standing Committee. He served as the Technical Program Co-Chair, the General Co-Chair, and the Technical Program Chair for several IEEE ICC, IEEE PIMRC, and IEEE WCNC conferences. He was an Editor of IEEE 1261 TRANSACTIONS ON COMMUNICATIONS in synchronization and equalization 1262 from 1995 to 2000.

Speech Title: **Visible Light Communications with Physical-Layer Security Issues**

Abstract: Optical Wireless Communications (OWC) and one of its potential applications, Visible Light Communications (VLC) offer significant technical and operational advantages. With attractive features such as high bandwidth capacity, robustness to electromagnetic interference, high degree of spatial confinement, inherent security, and unregulated spectrum, OWC, as well as VLC, stand out as powerful alternatives and complementary technologies to the existing radio frequency-based wireless systems for a wide range of applications. During the past few years, physical-layer security (PLS) in point-to-point and multiuser VLC networks has emerged as a promising approach to complement conventional encryption techniques and provide the first line of defence against eavesdropping attacks. It will undoubtedly have potential applications in 6G. In this presentation, after briefly introducing VLC, we introduce joint communications and positioning in the presence of dimming and physical layer security techniques in VLC.

►Keynote Speakers

June 28, Saturday | UTC/GMT+8
14:00-14:40 | Ground Ballroom 蜀风大宴会厅 3- 3rd Floor

Jian Song

Tsinghua University, China
Fellow of IEEE, IET, CIE, CIC

Bio: Prof. Song is now the Director of DTV Technology R&D Center of Tsinghua University, Director of National Engineering Laboratory of Digital TV, and the director of Key Laboratory of DTV System of Shenzhen. Tsinghua DTV technology R&D center is one of the major technical contributors for the Chinese digital television terrestrial broadcasting standard with the acronym of DTMB. This center also successfully developed the second generation of DTMB, i.e., DTMB Advanced or DTMB-A. Both standards are the ITU standards, and have been deployed.

The research areas of Prof. Song include wireless communications, digital TV broadcasting, visible light communications, light and health, powerline communications, and network convergence.

Prof. Song is very active in serving the IEEE community, was the founding Editor-in-Chief of ITU Journal of ICT Discoveries, and now the founding Editor-in-Chief of ITU Journal of Intelligent and Converged Networks, the Associate Editor of IEEE Transactions on Broadcasting, and Editor-in-Chief of IEEE Access for BTS section. Prof. Song is the TPC Co-chair of the ISPLC2012, ICC 2012 Co-chair of the Symposium of the selected areas, and the General Chair of IEEE Healthcom 2012, IEEE BMSB 2014, and IEEE SmartGridComm 2019, and has been the technical committee members for many IEEE conferences.

Speech Title: **High-speed Devices for Visible Light Communications and its Possible Applications for Intelligent Lighting Systems of E-Car**

Abstract: With the continuous advancements of semiconductor materials and processes, high-speed InGaN devices for visible light communication have made significant breakthroughs not only for transmission bandwidth but also for other key performance indicators, and are expected to be widely used for intelligent transportation and low altitude economy in the future. Taking the functional evolution example of electric vehicle onboard lighting from basic visual lighting, to current adaptive anti-dazzling safety lighting, and to future information and intelligent precision lighting, this report will explore the enabling technologies of informationization and intelligence of onboard lighting systems through the harmonization of "sensing, communication, and lighting" based on the integrated architecture of in vehicle information networks with the well-established power line communication technologies.

►Keynote Speakers

June 28, Saturday | UTC/GMT+8
14:40-15:20 | Ground Ballroom 蜀风大宴会厅 3- 3rd Floor

Cheng-Xiang Wang

Southeast University, China
MAE, MEASA, FRSE, FIEEE, FIET

Bio: Cheng-Xiang Wang received the B.Sc. and M.Eng. degrees in communication and information systems from Shandong University, China, in 1997 and 2000, respectively, and the Ph.D. degree in wireless communications from Aalborg University, Denmark, in 2004. Cheng-Xiang Wang is now a Chair Professor and the Dean of the School of Information Science and Engineering, Southeast University, Nanjing, China. He is also a professor with Purple Mountain Laboratories, Nanjing, China. He is a Member of the Academia Europaea (The Academy of Europe), a Member of the European Academy of Sciences and Arts (EASA), a Fellow of the Royal Society of Edinburgh (FRSE), IEEE, and IET, an IEEE Communications Society Distinguished Lecturer in 2019 and 2020, a Highly Cited Researcher recognized by Clarivate Analytics in 2017-2020. He is currently an Executive Editorial Committee Member of the IEEE TRANSACTIONS ON WIRELESS COMMUNICATIONS. Dr. Wang has authored 4 books and over 630 papers, including 28 highly cited papers. He has also delivered 32 invited keynote speeches and 21 tutorials at international conferences. His current research interests include wireless channel measurements and modeling, 6G wireless communication networks, and electromagnetic information theory. He received IEEE Neal Shepherd Memorial Best Propagation Paper Award in 2024 and 19 Best Paper Awards from international conferences.

Speech Title: Pervasive Channel Modeling for 6G/B6G Radio and Optical Wireless Communication Networks

Abstract: Channel characterization and modeling are the foundations of system design, performance evaluation, network planning/optimization, and standardization of wireless communication systems. Future sixth generation (6G) and beyond 6G (B6G) wireless communication systems are envisioned to provide global coverage, all spectra, full applications, and strong security. Therefore, 6G standard channel models should support global coverage, all spectra, and all application scenarios. This keynote will first discuss a novel 3D channel model for indoor visible light communication (VLC) systems, with a comparison of channel characteristics between optical wireless and radio channels. Then, a 6G pervasive channel model (6GPCM) is proposed to integrate channel statistical properties of all frequency bands and all scenarios. Finally, 6G channel simulation platforms and applications are briefly illustrated, such as digital-twin online channel modeling, indoor positioning, network planning, and network optimization.

►Keynote Speakers

June 28, Saturday | UTC/GMT+8
15:50-16:30 | Ground Ballroom 蜀风大宴会厅 3- 3rd Floor

Nobuyuki Yoshikawa

Yokohama National University, Japan
Fellow of IEEE

Bio: Nobuyuki Yoshikawa is a professor at the Institute of Advanced Sciences (IAS), Yokohama National University (YNU), Japan. He leads the Superconducting Electronics Laboratory, where his research focuses on ultra-energy-efficient computing technologies using superconducting integrated circuits. He earned his Ph.D. in Electrical and Computer Engineering (ECE) from YNU in 1989 and has been affiliated with the university's ECE Department ever since.

He is actively involved in Japan's national Moonshot and NEDO programs on quantum computing. He collaborates with leading institutions including MIT Lincoln Laboratory, University of Southern California, and UC Riverside. Prof. Yoshikawa has authored over 300 publications and has been invited as a plenary and keynote speaker at numerous international conferences. He has also chaired multiple committees related to superconducting electronics. In 2023, he was honored with the IEEE Council on Superconductivity (CSC) Award for Continuing and Significant Contributions in the Field of Applied Superconductivity. He is a Fellow of the IEEE.

Speech Title: **Superconducting Adiabatic Logic for Beyond-CMOS Computing: Principles and Prospects**

Abstract: The recent rapid growth of high-performance computing applications, such as artificial intelligence and cryptocurrency, has significantly increased the demand for more energy-efficient computing technologies. However, CMOS technology is approaching its physical and practical limits, as predicted by the end of Moore's Law, and is hard to keep up with this growing demand. Superconducting computing has emerged as a promising post-CMOS alternative, offering significant advantages in both speed and energy efficiency. Among the various superconducting logic families, superconducting adiabatic logic circuits are particularly notable for their extremely low energy consumption. They can operate with switching energies even below the thermal energy limit (kBT ln2), known as Landauer's limit. This cutting-edge technology holds great potential for a wide range of applications where energy efficiency is critical, including classical high-performance computing as well as control and readout circuitry for quantum bits. In this presentation, I will provide an overview of our recent research on superconducting adiabatic logic circuits and discuss the future prospects and challenges of this emerging technology.

►Keynote Speakers

June 28, Saturday | UTC/GMT+8
16:30-17:10 | Ground Ballroom 蜀风大宴会厅 3- 3rd Floor

Yun Chur Chung

Korea Advanced Institute of Science and Technology (KAIST), Korea

Bio: Yun C. Chung is a professor emeritus of electrical engineering at the Korea Advanced Institute of Science and Technology (KAIST), which he joined in 1994. From 1987 to 1994, he was with the Lightwave Systems Research Department at AT&T Bell Labs. From 1985 to 1987, he was with Los Alamos National Laboratory. His research activities include high-capacity WDM transmission systems, optical performance monitoring techniques, WDM passive optical networks, datacenter networks, and fiber-optic mobile fronthaul networks, etc. He has published over 500 journal and conference papers in these areas and holds over 90 patents issued. He has been the General Co-Chair of OFC, OECC, and APOC, and served as the President of the Optical Society of Korea. Prof. Chung is a Fellow of IEEE, OSA, Korean Academy of Science and Technology, and National Academy of Engineering of Korea.

Speech Title: **Multiplexing Technologies for Next-Generation Datacenter Networks**

Abstract: It is forecasted that the operating speed of the single-lane ethernet will be increased to 400 Gb/s by mid-2030s [1]. Thus, for the datacenter applications, in which cost-effectiveness is critical, it would be necessary to develop the intensity-modulation/direct-detection (IM/DD) systems operating at such a high speed in the near future. However, considering the current trends in the development of the high-speed optical modulators, it appears to be tremendously challenging to achieve this objective in time. To overcome this problem, we believe that it is inevitable to utilize some sort of the multiplexing technology. Accordingly, at KAIST, we evaluate the feasibility of drastically increasing the per-lane transmission speed of the short- reach IM/DD system by utilizing various multiplexing technologies such as the orthogonal-frequency-division-multiplexing (OFDM), optical-time-division-multiplexing (OTDM), mode- group-division-multiplexing (MGDM), and polarization-division-multiplexing (PDM) [2]-[6]. Some of these results will be presented at the conference together with their implications and outlooks for the future.

►Section Keynote & Invited Speakers

Track 1. Wireless Communication and Networks

■ Section Keynote Speakers

Ming Xiao
KTH Royal Institute of Technology, Sweden
(Online Talk)

■ Invited Speakers

Jingjing Cui
Southwest Jiaotong University, China

Longsheng Wang
Taiyuan University of Technology, China

Xiaotong Shi
Hubei University, China

Xuedou Xiao
Wuhan University of Technology, China

Chang Liu
The Second Research Institute of the Civil Aviation Administration of China, China

Track 2. Optical Fiber Communication and Networks

■ Section Keynote Speakers

William Shieh
Westlake University, China

Jinlong Wei
Peng Cheng Laboratories, China

■ Invited Speakers

Xinwei Du
Beijing Normal-Hong Kong Baptist University, China

Yong Geng
University of Electronic Science and Technology of China, China

Ming Hao
Sichuan University of Science and Engineering, China

Guijun Hu
Jilin University, China

Chao Li
Peng Cheng Laboratories, China

Ming Chen
Hunan Normal University, China

Bitao Pan
Beijing University of Posts and Telecommunications, China

Zhaopeng Xu
Peng Cheng Laboratories, China

Zixian Wei
The Hong Kong Polytechnic University, China

Xuwei Xue
Beijing University of Posts and Telecommunications, China

Yu Wang
Eindhoven University of Technology, the Netherlands

Ping Zhao
Sichuan University, China

Chao Yang
China Information Communication Technologies Group Corporation, China

Jing Zhang
University of Electronic Science and Technology of China, China

Anbang Wang
Guangdong University of Technology, China

Fulong Yan
Beijing University of Posts and Telecommunications, China

Yaping Liu
Tianjin University, China

Xin Wei
Institute of Semiconductors, Chinese Academy of Sciences, China

Track 3. Optical Wireless Communication and Networks

■ Section Keynote Speakers

Xiping Wu
Southeast University, China

■ Invited Speakers

Chao Shen
Fudan University, China

Le Doan Hoang
The University of Aizu, Japan

Sicong Liu
Xiamen University, China

Mingqing Liu
Tongji University, China

Guanjun Gao
Beijing University of Posts and Telecommunications, China

Han Wu
Sichuan University, China

Tingwei Wu
Chongqing University of Posts and Telecommunications, China

Renzhi Yuan
Beijing University of Posts and Telecommunications, China

Qiong Zhao
Xi'an University of Posts&Telecommunications, China

Track 4. Integrated Sensing and Communication and Signal Processing

■ Section Keynote Speakers

Christos Masouros
University College London, UK

Zhaohui Li
Sun Yat-sen University, China

■ Invited Speakers

Lijun Deng
Weinan Normal University, China

Donghyun Kim
Yonsei University, Korea

Shuai Ma
Peng Cheng Laboratories, China

Yaxi Yan
The Hong Kong Polytechnic University, China

Jia Ye
Chongqing University, China

Bingpeng Zhou
Sun Yat-sen University, China

Bingcheng Zhu
Southeast University, China

Track 5. Space Communications, Navigation and Tracking

■ Section Keynote Speakers

Siyuan Yu
Harbin Institute of Technology, China

■ Invited Speakers

Ning Jiang
University of Electronic Science and Technology of China, China

Feng Wen
University of Electronic Science and Technology of China, China

Zhenming Yu
Beijing University of Posts and Telecommunications, China

Track 6. Fiber and Sensor Technologies

■ Section Keynote Speakers

Svetislav Savovic
University of Kragujevac, Serbia

Fei Xu
Nanjing University, China

Changyuan Yu
The Hong Kong Polytechnic University, China

■ Invited Speakers

Qijun Sun
Guangdong University of Technology, China

Jianhui Yu
Jinan University, China

Weili Zhang
University of Electronic Science and Technology of China, China

Track 7. Microwave Photonics and THz Technology

■ Section Keynote Speakers

Yue Zhang
Jiujin Technology Co., Ltd., China

■ Invited Speakers

Yuancheng Cai
Purple Mountain Laboratories, China

Cheng Guo
Xi'an Jiaotong University, China

Xiuyou Han
Dalian University of Technology, China

Pu Li
Guangdong University of Technology, China

Bing Lu
Chongqing University of posts and Communications, China

Fu Wang
Beijing University of Posts and Telecommunications, China

Xiaolong Pan
Beijing Institute of Technology, China

Liangping Xia
Yangtze Normal University, China

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

Xinhai Zou
University of Electronic Science and Technology of China, China

Zhiqiang Fan
University of Electronic Science and Technology of China, China

Track 8. Intelligent Photonics and Optical Computing

■ Section Keynote Speakers

Jian Wang
Huazhong University of Science and Technology, China

Lilin Yi
Shanghai Jiao Tong University, China

■ Invited Speakers

Xiaozhou Li
Dalian University of Technology, China

Sheng Luo
Shenzhen University, China

Cheng Wang
ShanghaiTech University, China

Yongzhuang Zhou
National University of Defense Technology, China

Ying Zhu
National Information Optoelectronic Innovation Center, China

►Onsite Sessions

Location: Meeting Room 2 故里厅

► **Track 1. Wireless Communication and Networks**
► **Chair: Longsheng Wang, Taiyuan University of Technology, China**
► 9:00-10:00 | June 29, 2025 | Break Time: 10:00-10:20

Time	Speeches
Ming Xiao (Online) 9:00-9:20	Ming Xiao, KTH Royal Institute of Technology, Sweden Speech Title: Large AI Model in Wireless Networks: As Optimizer and Challenges in Deployment Zoom Link: https://us02web.zoom.us/j/81871643610 | Password: 062729 Abstract: Large artificial intelligence model (LAIM) has been tremendously developed in terms of capabilities and applications. Recent progress in the reasoning and mathematic capability has inspired many applications of LAIM as an optimizer. However, the application of LAIM in wireless optimization is still very limited. Meanwhile, the optimized deployment of LAIM in wireless networks have not been investigated yet, especially from a theoretical aspect.
Jingjing Cui 9:20-9:40	Jingjing Cui, Southwest Jiaotong University, China Speech Title: The Quantum Approximate Optimisation Algorithm (QAOA) for Maximum Likelihood (ML) Detection Abstract: Quantum computing originated from fundamental questions about the limitations of classical computation, with early contributions from Richard Feynman and David Deutsch. This led to the development of quantum information science, which exploits quantum phenomena, such as superposition, entanglement, and interference to process information in innovative ways. Recent advancements in quantum hardware have accelerated the shift from theoretical exploration to practical experimentation, opening up new possibilities for solving complex real-world problems, particularly in the area of optimisation. Quantum optimisation tackles classically intractable combinatorial problems using methods like the quantum approximate optimisation algorithm (QAOA), quantum annealing, and hybrid quantum-classical approaches. These techniques are actively explored in domains including operations research, logistics, finance, and machine learning. This talk will focus on how QAOA can be applied to the maximum likelihood (ML) detection problem in wireless communications--an optimisation task where finding the optimal solution is exponentially hard using classical computers. I conclude with a briefly overview of several other projects from my experience, illustrating the broader potential of quantum computing across diverse areas.
Chang Liu 9:40-10:00	Chang Liu, The Second Research Institute of the Civil Aviation Administration of China, China Speech Title: Digital Twin Foresees the Future of Smart Airports

	Abstract: Explain the current status and future development of digital twin technology in the civil aviation field, analyze the core key technologies, and identify technologies that need to be paid attention to in the future.

► Track 1. Wireless Communication and Networks
► Chair: Jingjing Cui, Southwest Jiaotong University, China
► 10:20-11:20 | June 29, 2025

Longsheng Wang 10:20-10:40	Longsheng Wang, Taiyuan University of Technology, China Speech Title: Frequency-Hopping Communication with Hardware Chaos Encryption Abstract: Wireless communication plays an increasingly important role in the data transmission, offering flexibility and mobility. The exposure of physical-layer transmission in wireless communication makes it susceptible to malicious attacks. It thus becomes highly desirable to ensure the security of wireless communication. Frequency hopping (FH) is a promising technique to secure the wireless communication. Unfortunately, the hopping pattern with computational security comprises the security. There is a growing need to develop encryption technique with hardware security to complement that with computational security in the FH communication. Chaos encryption based on the privacy of hardware parameters in semiconductor lasers or optoelectronic oscillators enables the hardware security and has been adopted by fiber-optic communication. In this talk, we propose enhancing the security of FH communication using chaos encryption with the hardware security. Results show that secure FH communication can be achieved due to the hardware-parameter superiority of legal users over attacker. Influences of the system parameters on the bit error rates of legal decryption and attack prove that the security can be consistently maintained. This work is expected to open a new avenue for enhancing the security of FH communication.
Xuedou Xiao 10:40-11:00	Xuedou Xiao, Wuhan University of Technology, China Speech Title: Intelligent Transmission for Real-Time Video: Delay Optimization and Semantic Compression Abstract: Real-time video streaming over heterogeneous, dynamic, and bandwidth-constrained wireless networks poses persistent challenges to achieving ultra-low latency and high perceptual accuracy. These two objectives conflict with each other, and existing algorithms often fail to consistently maintain a satisfactory balance under such volatile conditions, resulting in playback disruptions or quality degradation. In this talk, we introduce a set of adaptive video streaming techniques that address these challenges from two complementary perspectives: coping with dynamic network variations and reducing bandwidth consumption. To mitigate abrupt throughput fluctuations and suppress long-tail delay spikes, we propose a delay-aware streaming strategy that selectively activates a secondary stream, decoupling delay-sensitive playback from delay-tolerant reference delivery. This

	mechanism ensures responsive, low-latency, and uninterrupted viewing even under unstable network conditions. Concurrently, we introduce a semantic compression method guided by deep neural network (DNN) sensitivity, enabling fine-grained, content-aware bit allocation across space and time. By prioritizing semantically important regions, this method reduces bandwidth usage without compromising perceptual accuracy. These two techniques jointly contribute to resilient, efficient, and task-reliable video transmission, and provide new insights into building cross-layer adaptive systems for next-generation real-time video applications.
Xiaotong Shi 11:00-11:20	Xiaotong Shi, Hubei University, China Speech Title: Frequency-Hopping Communication with Hardware Chaos Encryption Abstract: Wireless communication plays an increasingly important role in the data transmission, offering flexibility and mobility. The exposure of physical-layer transmission in wireless communication makes it susceptible to malicious attacks. It thus becomes highly desirable to ensure the security of wireless communication. Frequency hopping (FH) is a promising technique to secure the wireless communication. Unfortunately, the hopping pattern with computational security comprises the security. There is a growing need to develop encryption technique with hardware security to complement that with computational security in the FH communication. Chaos encryption based on the privacy of hardware parameters in semiconductor lasers or optoelectronic oscillators enables the hardware security and has been adopted by fiber-optic communication. In this talk, we propose enhancing the security of FH communication using chaos encryption with the hardware security. Results show that secure FH communication can be achieved due to the hardware-parameter superiority of legal users over attacker. Influences of the system parameters on the bit error rates of legal decryption and attack prove that the security can be consistently maintained. This work is expected to open a new avenue for enhancing the security of FH communication.

► **Track 1. Wireless Communication and Networks**
Track 6. Fiber and Sensor Technologies
► **Chair: Xuedou Xiao, Wuhan University of Technology, China**
► 13:30-15:00 | June 29, 2025 | Break Time: 15:00-15:30

Time	Paper Presentation
C3016-A 13:30-13:45	Title: SCA-SCL Decoding Algorithm Optimized Based on Machine Learning All Authors: Xicheng Zhao, Yuchen Li, Ziqi Diao Presenter: Xicheng Zhao, Southeast University, China Abstract: This paper focuses on polar code decoding algorithms.Currently,the main polar code decoding algorithms include the successive cancellation decoding algorithm(SC), the CRC-aided successive cancellation list algorithm(CA-SCL),and the segmented CRC-aided successive cancellation list algorithm(SCA-SCL),among others.Notably,the SCA-SCL decoding algorithm represents an optimization of the CA-SCL decoding

	algorithm in terms of decoding performance and computational complexity. We first successfully reproduced and verified the CA-SCL algorithm's superiority over SC in terms of block error rate (BLER), with performance improving as list size increases. We then integrated segmented CRC into the CA-SCL platform, creating two-segment and four-segment SCA-SCL platforms. By comparing the performance,we further verified the superiority of the SCA-SCL decoding algorithm. Considering the varying complexities and BLERs of SCA- SCL with different segmentation points, CRC lengths, and generator polynomials, we propose an SCA-SCL algorithm optimized by machine learning (simulated annealing algorithm). This optimization includes selecting segmentation points based on polar code encoding properties, optimizing CRC generator polynomials for different lengths, and determining the best segmented CRC configurations under specific SNR and list size conditions.
C3029 13:45-14:00	Title: A Mininet-Based SD-WLAN Emulator for Hybrid LiFi and WiFi Networks with Performance Analysis All Authors: Rong Chen, Han Ji, Xiping Wu, Chengxiang Wang Presenter: Han Ji, Pulple Mountain Laboratories, China Abstract: Combining the high-speed transmission of light fidelity (LiFi) and the ubiquitous coverage of wireless fidelity (WiFi), hybrid LiFi and WiFi networks (HLWNets) have been recognized as a promising technology for next-generation wireless local area network (WLAN). For such a hybrid network, load balancing (LB) is essential and crucial for exploiting the full potential of network performance. So far, an extensive number of relevant studies have been carried out, exploring various approaches from game theory to machine learning. However, existing research is mainly based on simulations of network capacity, neglecting the impact of realistic network protocols and operations. In this paper, we develop the first ever network emulator for HLWNets, which is based on Mininet while incorporating software-defined networking (SDN) to realize the functionality of LB. The emulator consists of four key components: network deployment, LB decision making, LB implementation, and real-time performance measurement. With the constructed emulator, the performance of several representative LB methods is evaluated, including signal strength strategy (SSS), distributed optimization (DO), and game theory (GT). It is found that with respect to DO and GT, there exists a gap of about 10\% between the simulated network capacity and the emulator measurement results. In terms of SSS, this gap is less pronounced but still exceeds 4\%. These results prove the importance of the network emulator when studying LB for HLWNets and other similar heterogeneous networks.
C3027 14:00-14:15	Title: Enhanced Resource Pooling in MCDM for Data Collection and Energy Replenishment for WSN All Authors: Kondwani Makanda, Xingfu Wang, Ammar Hawbani Presenter: Kondwani Makanda, University of Science of Technology of China, China Abstract: Resupply of energy and data collection are crucial factors in allowing wireless sensor networks to operate perpetually. In wireless sensor networks, the longer the distance the data has to travel the more the energy will be used. Due to sensors having

	limited energy, it is important that the energy is replenished in good time to prevent the sensors from dying. The failure of a sensor results in an inability to sense and collect data, which is detrimental to the performance of the entire wireless sensor network. In this work, we proposed a data collection and data collection method based on multi-criteria decision making. To solve these problems, we first proposed a modified k-means clustering algorithm that combines sensor proximity to the base station and hop count to allocate a sensor to a particular cluster. Then, for the mobile vehicle to go charge and collect data in a particular cluster, we proposed a resource pooling method that allows a data collection and energy replenishment request to be sent to the base station so that the autonomous vehicle can travel to the requesting cluster. This results in a request being sent faster and as such having the autonomous vehicle deployed faster, resulting in a reduction in the number of dead nodes, reduced waiting time, reduced queue length, and shorter queues. Finally, a path for the vehicle to travel was created using multi-criteria greedy algorithm, more specifically, analytic hierarchy process to create priorities as to which sensor will be prioritized for data collection and energy replenishment. Our proposed method enhances performance by reducing average sensor visit density, minimizing queue length, decreasing the number of dead sensors, and shortening sensor queue waiting time.
C2009 14:15-14:30	Title: Two-Stage Sparse Bayesian Learning Algorithm for Multi-Target Localization in MIMO-FMCW Radar All Authors: Yingquan Zou, Haihan Ding, Jingfu Li Presenter: Haihan Ding, Southwest Jiaotong University, China Abstract: As an effective approach for parameter estimation in radar systems, Sparse Bayesian Learning (SBL) has attracted significant attention due to its superior reconstruction performance in the field of direction-of-arrival (DOA) estimation for multiple targets. However, when applied to multi-target scenarios for joint range-angle estimation, traditional SBL methods face challenges in computational complexity and estimation accuracy that have not been well addressed. In this paper, we propose a novel two-stage SBL algorithm for multi-target localization in MIMO-FMCW radar systems. The proposed algorithm first performs coarse searching on sparse grids to detect potential targets, and then employs an iterative refinement process to achieve precise parameter estimation. This two-stage strategy not only improves localization accuracy but also reduces computational time. Monte Carlo simulation results demonstrate that our algorithm outperforms existing methods in terms of both estimation accuracy and computational efficiency.
C3038 **14:30-14:45**	Title: New Multimode W-Type Graded-Index Silica Photonic Crystal Fiber for High Bandwidth Data Transmission All Authors: Ana Simovic, Branko Drljaca, Alexandar Djordjevich. Konstantinos Aidinis, Xiong Deng, Svetislav Savovic Presenter: Svetislav Savovic, University of Kragujevac, Serbia Abstract: We present a novel design for a multimode, doubly clad W-type silica photonic crystal fiber (SPCF) featuring a graded-index (GI) core profile, developed to enhance

	bandwidth performance. The bandwidth potential of this fiber was assessed through comprehensive modeling based on the power flow equation (PFE). Compared to conventional singly clad OM4 and OM5 silica optical fibers (SOFs) with 50-μm GI cores offering a bandwidth of 4.7 GHz km the proposed 50-μm core W-type GI SPCF achieves a higher bandwidth of 5.6 GHz·km at 850 nm. A fiber design with inner cladding results in leaky mode losses, supports fewer higher-order guided modes, and exhibits reduced modal dispersion. As a result, the proposed W-type GI SPCF is well-suited for high-data-rate fiber optic applications, including data centers, enterprise networks, and telecommunications systems. Moreover, one of the standout advantages of SPCF technology over traditional SOFs lies in its design flexibility: the ability to tailor air-hole diameters and spacing (pitches) offers precise control over optical properties, eliminating the need for the complex doping processes typical of standard SOFs.
C4072 **14:45-15:00**	Title: High-Precision Coherent Flash CCD 4D Imaging All Authors: Shukang Xu, Junze Tian, Bin Wang, Zhu Yang, Weifeng Zhang Presenter: Shukang Xu, Beijing Institute of Technology, China Abstract: We report a high-precision solid-state coherent flash 4D imaging system by directly leveraging mature charge-coupled device (CCD) sensors. In the proposed system, a high-speed MZM is employed to perform optical intensity modulation for range detection. When a step-frequency modulated optical signal flood-illuminates the scene, coherent detection is performed, from which spatial and velocity information of targets can be extracted. An experimental demonstration is performed. The experimental results exhibit that a depth precision as high as 8.0 mm and a velocity precision as high as 0.1 mm/s are demonstrated. The proposed flash CCD 4D imaging system holds unique advantages of high range and velocity, making it particularly well-suited for critical applications such as real-time monitoring of material deposition processes, high-accuracy industrial inspection, and robust perception for autonomous driving systems.

► **Track 7. Microwave Photonics and THz Technology**
Track 8. Intelligent Photonics and Optical Computing
► **Chair: Yuancheng Cai, Purple Mountain Laboratories, China**
► 15:30-17:30 | June 29, 2025

Time	Paper Presentation
C4075 15:30-15:45	Title: Highly Stable Microwave Dissemination over Fiber with Suppressed Incoherent Rayleigh Scattering Noise All Authors: Zhenxiang Yi, Zixuan Huang, Bin Wang, Weifeng Zhang Presenter: Zhenxiang Yi, Beijing Institute of Technology, China Abstract: We propose and experimentally demonstrate a highly stable microwave dissemination system with suppressed incoherent Rayleigh scattering noise (RSN) in long-haul fiber links. The proposed system employs an innovative reflective architecture that selectively removes the transmitted signal component from back-reflected light while

	preserving the probe signal, effectively suppressing Rayleigh backscattering-induced noise. Besides, active time jitter compensation is achieved via a precision-engineered variable optical delay line (VODL), effectively stabilizing fiber link temporal characteristics. An experimental demonstration was performed. Experimental results exhibit an 11.2 dB suppression of additive phase noise at 10 kHz offset frequency in the proposed microwave dissemination link, representing significant improvement over conventional Faraday rotating mirror (FRM)-based transmission link. System characterization further reveals outstanding temporal stability, demonstrating 0.23-ps root-mean-square (RMS) delay jitter over 2000 s observation time. The fractional frequency stability of the microwave dissemination link is calculated to be 1.2 × 10-13 @ 1 s and 1.6 × 10-15 @ 100 s.
C4076 15:45-16:00	Title: Electrically Tunable Microwave Photonic Filter Using a Phase-Shifted Waveguide Bragg Grating on Thin-Film Lithium Niobate All Authors: Xuan Wu, Bin Wang, Weifeng Zhang Presenter: Xuan Wu, Beijing Institute of Technology, China Abstract: We propose and experimentally demonstrate an electrically tunable microwave photonic filter (MPF) based on a phase-shifted waveguide Bragg grating (PS-WBG) on thin-film lithium niobate (TFLN). The proposed MPF is realized via phase modulation to intensity-modulation (PM-IM) conversion, in which a PS-WBG fabricated on TFLN serves as the optical notch filter. By mapping the optical spectral response of the PS-WBG to the microwave domain, a bandpass MPF can be realized. Leveraging the strong electro-optic effect of the lithium niobate, the center frequency of the MPF can be widely tuned by controlling the electrical power applied to the metal electrodes. Experimental results demonstrate that the implemented MPF has a 3-dB passband of 1.992 GHz and a wide tuning range from 3 GHz to 17 GHz. These performance metrics demonstrate strong potential of the proposed MPF for deployment in advanced radar imaging and next-generation wireless communications systems.
C4071 16:00-16:15	Title: High-Stability Wideband Microwave Dissemination Based on Optical Frequency Comb-Assisted Time Delay Measurement All Authors: Shijie Dong, Xingyu Liu, Bin Wang, Zhu Yang, Weifeng Zhang Presenter: Shijie Dong, Beijing Institute of Technology, China Abstract: We propose and experimentally demonstrate a highly stable wideband microwave transmission system based on optical frequency comb (OFC)-assisted time delay measurement. In the proposed system, a high-precision optical fiber transfer delay (OFTD) measurement scheme is performed by transmitting an OFC along the optical fiber link, where the fiber delay variation is mapped onto the phase shifts of the comb lines. By employing a dual-heterodyne phase error transfer scheme, the phase variations of comb lines caused by the OFTD change are converted into the phase shift of a low-frequency RF signal, which can be precisely measured using a high-accuracy phase detector. Afterwards, the OFTD variation is actively compensated via a variable optical delay line (VODL), enabling stable wideband microwave dissemination. In the experimental demonstration, microwave signals with frequencies ranging from 8 GHz to

	14 GHz are transmitted from the local end to the remote end via a 1-km-long single-mode optical fiber, in which the root-mean-square (RMS) value of the delay jitters is as low as 28 fs and the fractional frequency stability is measured to be 8×10-17 at 1000 s averaging time.
C4069 16:15-16:30	Title: Nonlinear Channel Equalization via Reservoir Computing with Delayed Optical Feedback Semiconductor Nanolasers All Authors: Rui Liu, Shoudi Feng, Haomiao He, Yipeng Zhu, Xingyu Huang, Zhuqiang Zhong Presenter: Rui Liu, Chongqing University of Technology, China Abstract: Nonlinear channel equalization is a key technology for reducing signal distortion and ensuring reliable data transmission. This work presents nonlinear channel equalization using a nanolaser-based delayed optical feedback reservoir computing system. The symbol error rate (SER) is adopted to evaluate the performance of equalization. The results show that maintaining low external perturbation strengths on the nanolaser in the reservoir layer results in a low SER and improved system stability. Higher spontaneous emission enhancement factor and spontaneous emission coupling factor improve perturbation tolerance. However, the minimal SER is achieved with optimally chosen moderate values of spontaneous emission enhancement factor and spontaneous emission coupling factor, which is different from the observations in previous nanolaser-based delayed optical feedback reservoir computing systems.
C4057 16:30-16:45	Title: Deep Time-Delay Reservoir Computing Using Cascading Optoelectronic-Feedback Lasers All Authors: Guiyue Wu, Song-Sui Li, Liyue Zhang, Xihua Zou, Wei Pan, Lianshan Yan Presenter: Guiyue Wu, Southwest Jiaotong University, China Abstract: Deep time-delay reservoir computing (TDRC) based on two electrical cascading optoelectronic-feedback semiconductor lasers (SLs) is proposed and numerically investigated. The reservoir of deep TDRC has two cascading layers. The coupling between two layers is electrical and unidirectional. Each layer consists of an SL under optoelectronic feedback. Chaotic time series prediction task is adopted to evaluate the performance of proposed deep TDRC. The results show that the prediction performance is more sensitive to the feedback strength and the coupling strength than the coupling delay time. By cascading of layers, the proposed deep TDRC effectively enhances the prediction performance.
C4058 16:45-17:00	Title: Processing-Speed Enhancement for a Long-Loop VCSEL-Based Time-Delay Reservoir Computing All Authors: He Nie, Song-Sui Li, Liyue Zhang, Xihua Zou, Wei Pan, Lianshan Yan Presenter: He Nie, Southwest Jiaotong University, China Abstract: Clock acceleration is proposed to enhance the processing speed for a long-loop VCSEL-based time-delay reservoir computing (TDRC). The polarization manipulation is further investigated to solve the speed degradation problem due to unwanted resonances at critical time ratios between the input clock cycle and the

	feedback delay. Then, complex time series prediction task is adopted to test the feasibility of proposed method. Numerical results indicate that the processing speed can be doubled by clock acceleration without significant performance degradation. Moreover, the use of orthogonal polarization optical feedback effectively mitigates the problems due to critical time ratios, increases the prediction performance by about 50%, and thereby improving the tunability of processing speed.
C4063 17:00-17:15	Title: Simulation of Temporally Matrix Vector Multiplication with Rayleigh Backscattering All Authors: Jiaying Chen, Jianping Li, Jianbo Zhang, Yuwen Qin Presenter: Jiaying Chen, Guangdong University of Technology, China Abstract: Photonic matrix vector multiplication (MVM) has renewed interest in optical computing, which has the potential to reduce the power consumption and maintain relatively high speed. Temporally MVM (T-MVM) using distributed feedback based on the Rayleigh backscattering is one of them. Here, we established the numerical model of the T-MVM using distributed feedback based on the Rayleigh backscattering in a single-mode fiber. The feasibility of this model is proven by performing the non-linear principal component analysis (PCA). The impact of the random Rayleigh backscattering coefficient on the capability of the non-linear PCA is also investigated. The simulation results show that the non-linear PCA can efficiently separate the points randomly distributed on 3 concentric spheres with different radii. The randomness of the Rayleigh backscattering coefficient plays an important role in improving the capability of this model.
C4050 17:15-17:30	Title: Prediction of Chaotic Dynamics for Semiconductor Lasers Based on Deep Photonic Reservoir Computing with Time Shifts All Authors: Ronghua Zhang, Liyue Zhang, Songsui Li, Wei Pan, Lianshan Yan, Bin Luo, Xihua Zou Presenter: Ronghua Zhang, Southwest Jiaotong University, China Abstract: The study of the chaotic dynamics of semiconductor lasers is of great theoretical significance and practical application value. However, it remains a challenging task to accurately predict the chaotic dynamic behavior of semiconductor lasers through numerical simulation. Meanwhile, reservoir computing demonstrates powerful and effective capabilities in capturing and predicting the chaotic dynamics of semiconductors. Nevertheless, reservoir computing architectures of different types have their own limitations. Given the challenges in achieving accurate dynamic prediction of semiconductor lasers as described above, we propose to apply the time shifts algorithm to deep reservoir computing to realize the dynamic prediction of lasers. Through numerical analysis, the effectiveness of the time shifts algorithm in predicting the chaotic time series of lasers is verified.

►Onsite Sessions

Location: Meeting Room 3 鼓楼厅

► **Track 2. Optical Fiber Communication and Networks**
► **Chair: Chao Li, Peng Cheng Laboratories, China**
► 9:00-10:40 | June 29, 2025 | Break Time: 10:40-11:00

Time	Speeches
William Shieh 9:00-9:20	William Shieh, Westlake University, China Speech Title: Carrier-Extracted Self-Coherent Detection (CESC) for Cost-Effective Short-Reach Systems Abstract: Coherent detection unlocks the full potential of light by leveraging all degrees of freedom, but its adoption in short-reach systems has been limited by the high cost of coherent lasers. In this work, we propose Carrier-Extracted Self-Coherent Detection (CESC), a novel approach that achieves performance comparable to coherent systems without requiring expensive coherent lasers. We demonstrate a silicon photonics implementation of CESC using micro-ring resonators, enabling efficient full-field information recovery. With its cost efficiency and high performance, CESC is poised to bridge the gap in short-reach applications where full-field data transmission may be advantageous.
Jinlong Wei 9:20-9:40	Jinlong Wei, Peng Cheng Laboratories, China Speech Title: Few-Mode Fiber Link Multiple Impairments Joint Monitoring Using CAZAC Sequences Abstract: In this invited talk, we propose a joint monitoring scheme of chromatic dispersion(CD), dependent loss (MDL), and differential mode group delay (DMGD) over multi-dimensional optical channels based on CAZAC sequences. Experimental results show that it can achieve excellent on-service estimation accuracy with error within 0.3 ps/nm, 0.3 dB, and 0.3 ps for CD, MDL, and DMGD, respectively.
Xinwei Du 9:40-10:00	Xinwei Du, Beijing Normal-Hong Kong Baptist University, China Speech Title: Pilot-Efficient DSP Algorithms for Signal Distortion Mitigation in High-Speed Coherent Optical Communications Abstract: This talk presents pilot-efficient DSP algorithms for signal distortion mitigation in high-speed coherent optical communications. The first part addresses fast rotation of state of polarization (RSOP), where a closed-form maximum likelihood (ML) estimator and a low-overhead expectation-maximization (EM) algorithm are developed for joint RSOP and phase tracking. The EM approach significantly reduces pilot consumption while maintaining high accuracy. The second part focuses on joint estimation of transmitter/receiver IQ imbalance, RSOP, frequency offset, and phase noise. A sequential number-theoretic optimization framework is proposed, enabling accurate signal recovery under severe distortions and fast channel dynamics. The algorithms are designed to operate with low pilot overhead, showing improved MSE and BER performance over conventional methods. These techniques offer scalable solutions for future high-capacity

	coherent optical systems operating under tight spectral efficiency constraints.
Yong Geng 10:00-10:20	Yong Geng, University of Electronic Science and Technology of China, China Speech Title: Frequency-Stabilized Chip-Scale Optical Frequency Comb for DSP-Free Coherent WDM Communications Abstract: Optical frequency combs hold the transformative potential to revolutionize coherent wavelength division multiplexing (WDM) communications. They consisting of a large quantity of evenly spaced and phase locked laser tones can provide spectral stability orders-of-magnitude better than individual lasers, and has long been considered as a promising laser source alternative for the next-generation WDM systems. Here, through a series of innovative strategies, we present a frequency-stabilized chip-scale optical frequency comb tailored for DSP-free coherent WDM communications with advanced modulation formats. First, we introduce a straightforward yet robust method to achieve an on-chip sub-Hz linewidth fully stabilized soliton Kerr comb. This is realized via sub-Hz linewidth laser pumping and optical injection locking, ensuring exceptional frequency stability. Second, we demonstrate the tight synchronization of two Kerr soliton combs over metropolitan distances using a novel comb cloning approach. In this method, the mutual coherence between the two combs is established through a single pilot tone derived from a common pump laser, resulting in unprecedented frequency and phase stability between the cloned combs.
Guijun Hu 10:20-10:40	Guijun Hu, Jilin University, China Speech Title: Measurement of Modal Impairments in Few-Mode Fibers Abstract: Few-mode fibers (FMFs) have emerged as a key technology for overcoming the capacity limitations of optical communication systems through mode-division multiplexing (MDM). However, modal impairments including differential mode delay (DMGD), mode-dependent loss (MDL), mode coupling(MC), and splice loss remain major challenges for FMF-based transmission and sensing applications. To address these issues, we classify modal impairments into intrinsic and splice categories and systematically analyze their underlying mechanisms. Beginning with theoretical modeling, we then propose corresponding measurement methodologies tailored to each type. Building on this foundation, we develop a dedicated FMF impairment measurement system capable of multi-channel, multi-parameter simultaneous characterization, supporting both fault localization and splice loss evaluation. In summary, this work establishes an integrated framework that combines theoretical modeling, measurement techniques, and system implementation, providing a comprehensive solution for FMF impairment characterization.

► **Track 2. Optical Fiber Communication and Networks**
► **Chair: Yong Geng, University of Electronic Science and Technology of China, China**
► **11:00-12:20 | June 29, 2025**

Chao Li 11:00-11:20	Chao Li, Peng Cheng Laboratories, China Speech Title: Beyond Terabit-Scale Short-Reach Optical Interconnects in Anti-Resonate Hollow-Core-Fiber Abstract: Driven by the booming data traffic, caused by high-performance computing (HPC), artificial intelligence (AI), Internet of Things (IoT), augmented reality and virtual reality (AR/VR), and 5G/F5G applications, high-capacity interconnects for both data center and computing center are facing high challenge. To cope with this demand in an economically and practically way, scaling the capacity to beyond 1.6T per optical link is the key solution. Intensity modulation direct detection (IM/DD) technique combined with wavelength-division multiplexing (WDM) is the preferred choice for such applications. However, the frequency power fading raises a question mark over the possible viability of 200-Gb/s per lane line rate over single mode fiber not only in C-band, but also in O-band for WDM system. Anti-resonant hollow-core fibre (AR-HCF) is regarded as a powerful meaning to solve this issue and used to build a high-capacity low-latency optical communication link due to its properties of wide band, low dispersion, low nonlinearity, low latency, and high power tolerance. In this talk, we propose and experimentally demonstrate breakthrough optical interconnects with beyond Terabit-scale in AR-HCF.
Bitao Pan 11:20-11:40	Bitao Pan, Beijing University of Posts and Telecommunications, China Speech Title: Flexible and Efficient Network Slicing for Integrated Optical Metro Networks with Diverse Access Applications Abstract: Next generation optical metro networks need to serve heterogeneous access traffic with guaranteed quality of service (QoS) and lower CAPEX and OPEX. In this context, an integrated network infrastructure enabling multiple services access and network slicing is necessary. In this paper, we investigate recent research efforts on network slicing in optical metro networks, the fgMTN and fgOTN. These technologies have limitations in flexible network resource slicing and efficient bandwidth utilization. Therefore, we propose a new all optical metro network SiMON for achieving flexibility in network slicing and efficiency in bandwidth utilization. In addition, we theoretically investigate the SiMON in achieving end-to-end deterministic latency. A jitter reduction method for SiMON network slices is proposed by formulating the latency components of its communication paths. Theoretical analysis and numerical studies support that the SiMON outperforms the fgMTN and fgOTN in flexible network resource slicing.
Yu Wang 11:40-12:00	Yu Wang, Eindhoven University of Technology, the Netherlands Speech Title: Wideband Polarization Insensitive Photonic Integrated Filters and Switches Abstract: Multi-band transmission (MBT) can enhance optical network capacity by up to tenfold in the C-band by utilizing the low-loss window spanning from the O- to L-band in standard single-mode fiber (ITU-T G.652.D). To efficiently manage the

	resulting heterogeneous high-volume data traffic, ultra-wideband (UWB) photonic integrated filters and switches offer a promising solution. These devices enable fully programmable, all-optical routing from any input to any output without the need for optical-electrical-optical conversion. Here, we demonstrate polarization-insensitive (PI), UWB photonic filters and switches, including: a 1×12 100 GHz-spaced arrayed waveguide grating (AWG), a cascaded 1×40 planar echelle grating (PEG) on a 3-μm silicon platform, a 4×4 polymer matrix switch based on total internal reflection (TIR), and a 1×2 electro-optic wavelength selective switch (WSS) with nanosecond switching time.
Ming Hao **12:00-12:20**	Ming Hao, Sichuan University of Science and Engineering, China Speech Title: Joint Modulation Format Identification and Osnr Monitoring Utilizing Polar-Coordinate-System-Based Features for Digital Coherent Receivers Abstract: For elastic optical networks, a joint modulation format identification and OSNR monitoring scheme is proposed. The amplitude and phase information of received signal in Cartesian coordinates are transformed into polar coordinates, and then the amplitude and phase information in polar coordinates are further divided. The number of symbols in each grid is mapped into color information to generate the color image. The color image not only includes the amplitude and phase information, but also contains the density information of the received symbols. Utilizing polar-coordinate-system-based features, the modified multi task learning neural network is able to realize joint modulation format identification and OSNR monitoring. The performance of the proposed scheme is numerically verified in 28GBaud coherent optical communication systems. The numerical simulation results show that, to achieve 100% correct identification rates for all of the six modulation formats, the required minimum OSNR are less than their relevant thresholds corresponding to the 20% forward error correction. The average MAE values for the OSNR monitoring of the six modulation formats are 0.196dB, 0.236dB, 0.197dB, 0.224dB, 0.335dB and 0.474dB, respectively. In addition, the simulated results also show that the proposed scheme is robust against the residual chromatic dispersion and fiber nonlinearities.

► **Track 2. Optical Fiber Communication and Networks**
► **Chair: Anbang Wang, Guangdong University of Technology, China**
► 13:30-15:10 | June 29, 2025 | Break Time: 15:10-15:40

Time	Speeches
Zixian Wei 13:30-13:50	Zixian Wei, The Hong Kong Polytechnic University, China Speech Title: NOMA in Rate-Flexible Coherent Passive Optical Network Abstract: Coherent access offers a potential 4-times capacity increase compared to current 50-G PON standards. However, 100/200-G passive optical networks (PON) will face the challenge of accommodating a diverse range of end-user types with different rates and fluctuating traffic patterns and maintaining compatibility with both

	fixed and flexible rate access systems. In this presentation, we will demonstrate how we have responded in recent years to more flexible deployments in high-rate CPON using power division non-orthogonal multiple access in the digital domain as well as in the physical domain.
Xuwei Xue 13:50-14:10	Xuwei Xue, Beijing University of Posts and Telecommunications, China Speech Title: Optical Switching Enhanced Distributed Machine Learning Abstract: This slide will discuss the deployment effort of fast optical packet switches and slow optical circuit switches in distributed AI training networks, respectively. This presentation will inspire the researchers to reconsider the design of the new-generation AI training networks.
Zhaopeng Xu 14:10-14:30	Zhaopeng Xu, Peng Cheng Laboratories, China Speech Title: High-Speed Low-Cost IM/DD Optical Interconnects Enabled by Advanced DSP Abstract: The ever-growing demand for high-capacity low-cost data transmission in data centers requires innovative solutions to overcome the bandwidth and digital-to-analog converter (DAC) limitations of traditional intensity-modulated direct detection (IM/DD) optical interconnects. This talk presents recent advancements in IM/DD optics, focusing on high-speed signaling techniques and advanced noise mitigation strategies that effectively address the bandwidth and DAC limitations. Leveraging advanced digital signal processing technologies, high-speed IM/DD systems utilizing low-cost devices are demonstrated with record achievable data rates, which offer valuable insights into the future of cost-effective high-speed optical interconnects for next-generation communication systems.
Fulong Yan 14:30-14:50	Fulong Yan, Beijing University of Posts and Telecommunications, China Speech Title: Next Generation Exabit/s Data Center Network Supporting All Optical Circuit and Packet Switching Abstract: Nowadays, we have witnessed an exponential increase of intra-data center (DC) traffic and various emerging applications. Consequently, to support the scaling up of the needed link bandwidth in the DC, optical fibers and transceivers have been extensively deployed to realize highspeed data transmission. However, current electrical data center networks (DCNs) still face severe issues of high latency, low scalability, as well as high cost and energy inefficiency. With the progress of optical switching technologies, the above issues could be potentially solved in the optical domain together with a reconfigurable network topology and control mechanism to adapt to the heterogenous DCN traffic patterns. In this article, we discuss various optical switching technologies and the related DCN topologies. We also propose and investigate the performance of a novel, all optical, switching architecture with sphere topology (AOSphere) supporting capacity of exabit/s.
Chao Yang 14:50-15:10	Chao Yang, China Information Communication Technologies Group Corporation, China

	Speech Title: “3U” Optical Interconnection Technology Towards Data Center Application Abstract: This report will introduce the recent new technological developments in the field of ultra-large capacity, ultra-low latency and ultra-low power consumption optical interconnections and the contributions our team has made in these areas.

► **Track 2. Optical Fiber Communication and Networks**
► **Chair: Zhaopeng Xu, Peng Cheng Laboratories, China**
► **15:40-17:40 | June 29, 2025**

Jing Zhang 15:40-16:00	Jing Zhang, University of Electronic Science and Technology of China, China Speech Title: Lite Equalizations for High-Speed intra Datacenter Interconnects Abstract: For cost-sensitive intra-data center interconnects (DCIs), intensity modulation and direct detection (IM/DD) systems are the simplest and most efficient solutions. Up to now, the 200-Gb/s per lane IM/DD optics are being commercialized to support 800G and 1.6T applications inside DCIs. Meanwhile, it is necessary to employ advanced equalizations like maximum likelihood sequence estimation (MLSE) and decision-feedback equalizer (DFE) to suppress the noise enhancement caused by feed-forward equalizer (FFE). However, a plenty of hardware consumptions are required to implement the advanced equalizers, which hinder the evolution of high-speed optics. We have investigated lite equalizers such as trellis-compressed MLSE, error-pattern dependent noise cancellation and so on to assist the next-generation 1.6T optics.
Anbang Wang 16:00-16:20	Anbang Wang, Guangdong University of Technology, China Speech Title: Field Trial of High-speed Optical Secure Communication Using Wideband Chaotic Semiconductor Lasers Abstract: With the rapidly expanding network traffic and increasingly diversified network services, protecting data security against eavesdropping has emerged as a critical challenge. Optical chaos communication provides an alternative and promising solution, offering distinct advantages of physical-layer security, high-speed potential and compatibility with the existing fiber-optic systems. Semiconductor lasers have gained particular attention as chaotic transceivers with fully hardware-based security because of easy-to-integrated structure and capacity for emitting complex chaotic dynamic. However, the laser-based chaos communication has a bottleneck that its transmission rate is constrained below 20 Gb/s due to the restricted chaos carrier bandwidth. This technical barrier becomes particularly evident in practical implementations that current field demonstration achieves only 1-Gb/s data rate -- significantly below modern communication requirements. In this work, the short-resonant-cavity DFB lasers are used to generate synchronized chaos carrier with record-breaking 30-GHz bandwidth under

	a common optical injection. With the installed multi-core fiber cable, the field trial of optical chaos communication achieved 100-Gb/s/core 16-QAM message secure parallel transmission over 25-km distances. These technological breakthroughs establish a new framework for implementing high-speed physical-layer security solutions in practical fiber-optic networks.
Ming Chen 16:20-16:40	Ming Chen, Hunan Normal University, China Speech Title: Hardware Modeling of Chromatic Dispersion in Optical Fiber for Real-Time on-Chip Simulation Systems Abstract: Real-time on-chip simulation is much faster than traditional software simulation and can also provide a better platform for comprehensive verification of digital signal processing algorithms compared to offline experiments. Optical fiber, as the core component of optical fiber communication systems, exhibits various physical phenomena such as chromatic dispersion (CD), which seriously limits transmission distance, especially in low-cost intensity modulation and direct detection systems. Accurate CD modeling is thus critical for real-time optical fiber communication simulation systems. We propose a field programmable gate array (FPGA)-based online configurable hardware CD model implementation scheme enabled by piecewise convolution approaches. A 40-GSa/s CD model is implemented in a single FPGA chip and its performance is investigated in a co-simulation platform. The results show that the proposed hardware CD models with overlap-add/save algorithms can achieve a normalized root-mean-square error of the order of 1e-3 over more than 500 km of standard single-mode fiber transmission.
Ping Zhao 16:40-17:00	Ping Zhao, Sichuan University, China Speech Title: Broadband Optical Signal Processing Using Nonlinear Integrated Waveguides Abstract: Four-wave mixing (FWM) is a nonlinear optical phenomenon that can be utilized for wideband, low-noise optical amplification and wavelength conversion, which is promising in optical communications as well as signal processing. With the advantages of small footprints, large nonlinearity and dispersion engineering capability, integrated photonic waveguides are excellent candidates to realize high-gain and large-bandwidth FWM. In this talk, I will present our recent progress in continuous wave optical parametric amplification based on third-order nonlinear integrated waveguides, particularly in ultra-braodband efficient FWM. Moreover, applications such as all-optical wavelength conversion will also be included.
Christos Masouros **(Online)** 17:00-17:20	Christos Masouros, University College London, UK Speech Title: From Link-level to Network-level Distributed ISAC Zoom Link: https://us02web.zoom.us/j/81871643610 Password: 062729 Abstract: The future global cellular infrastructure will underpin a variety of applications, such as smart city solutions, urban security, infrastructure monitoring, and smart mobility, among others. These emerging applications require new

	network functionalities that go beyond traditional communication. The ultimate goal for a cellular deployment would be, alongside next generation communications, to deliver coordinated sensing of an unprecedented scale. In this talk, I focus on enabling multifunctionality in signals and wireless transmissions as a means of reducing hardware redundancy through integrated sensing and communications (ISAC). In this talk I briefly present the opportunities of ISAC as a natural evolution of the two technologies, with obvious gains in energy-, hardware- and cost-efficiency through the use of dual-functional hardware. I further explain that their co-design also offers opportunities in flexible trade-offs and new synergies between sensing and communication. Moving on from link-level ISAC systems, I explore network level deployments and in particular cell coordination approaches tailored for the dual-functionality of ISAC, alongside distributed approaches.
Wei Xin **17:20-17:40**	Wei Xin, Institute of Semiconductors, Chinese Academy of Sciences, China Speech Title: Short Wavelength High-Speed Detector for Multi-Mode Optical Module Abstract: The exponential growth of internet data transmission and the escalating computational demands driven by AI advancements have led to significantly increased demand for short-reach optical interconnects within data centers and high-performance computing (HPC) systems. A key component of these optical interconnect modules is the light source for signal transmission and the photodetector for signal reception. In this domain, the 850nm Vertical-Cavity Surface-Emitting Laser (VCSEL) has become the dominant light source due to its compelling advantages: low power consumption, high modulation speed, cost-effectiveness, and ease of integration. Significant progress has been achieved in developing high-speed VCSELs for data transmission. Consequently, photodetectors operating at the 850nm wavelength must evolve to match these increasing speeds and bandwidth requirements. Research focused on high-speed 850nm photodetectors is therefore critically necessary to prevent a system bottleneck. This report comprehensively reviews and summarizes the current state-of-the-art research progress in 850nm high-speed photodetectors. It delves into the key physical and technological factors that constrain their performance and limit further development at higher speeds. Building on this analysis, the report proposes concrete recommendations and suggests promising directions for subsequent research efforts. The ultimate goals are to foster a deeper fundamental understanding of these devices and to guide the development of enhanced high-speed 850nm photodetectors, enabling future optical interconnect solutions.

►Onsite Sessions

Location: Meeting Room 5 南街厅

► **Track 5. Space Communications, Navigation and Tracking**
► **Chair: Xiping Wu, Southeast University, China**
► 9:00-10:20 | June 29, 2025 | Break Time: 10:20-10:40

Time	Speeches
Siyuan Yu 9:00- 9:20	Siyuan Yu, Harbin Institute of Technology, China Speech Title: Non-Mechanical Beam Steering Technology in Laser Communication Payloads Abstract: Traditional laser communication systems face challenges like bulkiness, high power consumption, and cost due to their reliance on mechanical components (e.g., rotators, steering mirrors). This report highlights two non-mechanical alternatives: (1) Liquid Crystal on Silicon (LCOS) for wide-angle beam steering and wavefront control, and (2) piezoelectric MEMS for ultrafast, low-power fine pointing. Recent tests, including satellite and airborne links, demonstrate their potential for next-generation compact, mass-producible laser communication payloads, with in-orbit trials upcoming.
Ning Jiang 9:20- 9:40	Ning Jiang, University of Electronic Science and Technology of China, China Speech Title: Security-enhanced Free Space Communication Based Optical Chaos Abstract: Laser-based chaotic communication is an important physical-layer secure optical communication technology, and space laser communication is an important supporting technology of space-earth integrated information network. The application of chaotic optical communication technology in space optical communication can significantly enhance the physical layer information security protection capability of space-space-space-integrated network. This report mainly introduces the research progress of joint team of the University of Electronic Science and Technology of China and the Institute of Optoelectronics Technology of Chinese Academy of Sciences in the field of space chaotic optical communication: The joint team proposed to convert the Gaussian optical field chaotic signal into vector optical field for spatial transmission, and realized the anti-turbulence spatial chaotic optical transmission based on vector optical field regulation, effectively enhanced the reliability and information security of spatial optical communication, and provided a new technical idea for constructing a secure and reliable space-earth integrated information network.
Feng Wen 9:40-10:00	Feng Wen, University of Electronic Science and Technology of China, China Speech Title: High-Efficiency Optical Performance Monitoring for Mode-Division Multiplexing Systems Abstract: Mode-division multiplexing (MDM) technology holds promise for breaking through the nonlinear Shannon limit of conventional single-mode fiber communication systems. However, due to the more rapid variation of channel characteristics in few-mode fibers, dynamic monitoring of various system impairments in MDM systems poses significant challenges. To address this, we propose two efficient and high-precision monitoring schemes: the TF-DD-DNN scheme and the MPT

	(mode-pilot-tone)-XT scheme based for XT and OSNR monitoring. Furthermore, we introduce the DeepRS scheme to enable accurate and efficient monitoring of RS noise in bidirectional MDM systems.
Zhenming Yu 10:00-10:20	Zhenming Yu, Beijing University of Posts and Telecommunications, China Speech Title: Satellite Laser Communication with Integrated Acquisition and Transmission Abstract: At present, the average daily growth of multimodal high-resolution remote sensing data generated by satellite Internet for earth perception reaches 10 PB, and the inter-satellite and satellite-ground transmission traffic is climbing exponentially. Against this backdrop, it is urgently necessary to build an integrated service system covering the entire domain of space, air, sea and land, and support the future construction of a diversified and multi-level information service system through the collaborative empowerment of the two major technologies of data collection and transmission. This report proposes satellite laser communication with integrated acquisition and transmission to address Tb level bandwidth demands, device performance bottleneck, and satellite-ground link constraints. Computational optical imaging is adopted as the remote sensing acquisition method and deeply integrated with satellite laser communication to construct an integrated optical information perception architecture, breaking the inherent barriers between the source and the channel and achieving full-chain optimization from acquisition to transmission. Compared with the traditional separated system, this scheme can achieve optimal adaptation, simplify transmission, thereby enhancing transmission capacity and noise resistance. To meet the requirements of aerospace carrying, through encoding compression, multimodal perception and component integration, we have achieved a significant reduction in the volume and weight of the system, reducing the need for data pressure and transmission damage resistance.

► **Track 3. Optical Wireless Communication and Networks**
► **Chair: Renzhi Yuan, Beijing University of Posts and Telecommunications, China**
► 10:40-12:00 | June 29, 2025

Time	Speeches
Xiping Wu 10:40-11:00	Xiping Wu, Southeast University, China Speech Title: AI-Enabled 6G Intelligent Heterogeneous Networks Abstract: The vision of 6G is “full spectrum, full coverage, full application, and strong security.” Heterogeneous wireless networks are an important technology trend for realizing this vision. It is not merely a combination of wireless technologies operating in different frequency bands, but also faces numerous significant challenges that are quite different from those of conventional wireless networks, such as network architecture, resource allocation, load balancing, and mobility management. This report focuses on 6G heterogeneous networks, delving into their application scenarios, constituent elements, encountered problems, and current

	research status. It also emphasizes the analysis of the network intelligence process and the roles and potential that AI technologies, including lightweight models and large - scale models, can play.
Le Doan Hoang 11:00-11:20	Le Doan Hoang, The University of Aizu, Japan Speech Title: AI-Empowered FSO-based Non-Terrestrial Networks Abstract: Non-Terrestrial Network (NTN) using free-space optical (FSO) communications is emerging as a transformative solution for the future 6G era. In this talk, I will present the applications of using AI/Machine Learning for the end-to-end FSO-based NTN optimization.
Sicong Liu 11:20-11:40	Sicong Liu, Xiamen University, China Speech Title: Cooperative Multi-Target Indoor Visible Light Positioning: A Compressed Sensing Perspective Abstract: In this talk, we introduce a cooperative multiple targets positioning method using multi-measurement vector compressed sensing (MCS) for indoor industrial environments. The proposed method capitalizes on the inherent sparsity of spatially distributed targets, enabling accurate simultaneous localization. In our scheme, positioning signals emitted from LED anchors are processed through autocorrelation techniques, while leveraging cooperative information among multiple targets to obtain time difference of arrival (TDOA) measurements. By aggregating TDOA measurements collected from multiple spatially diverse LED reference anchors (RAs), an effective MCS-based model for cooperative multiple targets VLP is developed. Simulation results confirm that the proposed scheme provides robust and accurate localization performance, even in complex indoor conditions.
Mingqing Liu 11:40-12：00	Mingqing Liu, Tongji University, China Speech Title: Self-Alignment Intracavity Laser System for Integrated Wireless Power Transfer and Positioning Abstract: The emergence of 6G demands, including full coverage, ultra-high-speed data transmission, ultra-dense connectivity, high-precision positioning, and low power consumption, has driven exploration into higher frequency bands, such as millimeter waves, terahertz, and optical frequencies. Optical fiber networks, known for their high speed, low latency, strong reliability, enhanced security, and immunity to electromagnetic interference, are regarded as a foundational infrastructure for 6G. However, indoor optical wireless transmission (OWT) still faces challenges in mobile application scenarios, particularly in achieving efficient narrow-beam transmission without relying on complex receiver-side tracking mechanisms. Intracavity laser systems (also known as resonant beam systems), as a potential enabling technology for 6G, offer efficient transmission and inherent physical self-alignment capabilities, showing promise in overcoming these bottlenecks. Their main advantages include: (1) Supporting highly efficient self-aligned transmission that enables stable power delivery for high-power applications and millimeter-level

	positioning accuracy; (2) Integrating high-quality communication, wireless power transfer, and precise positioning to significantly reduce the cost and complexity of system design, optimization, and deployment. This report focuses on unveiling the mobile self-alignment mechanism of intracavity laser systems and explores how these systems can deliver stable energy to nodes located in hard-to-reach or inaccessible areas, while achieving high-precision positioning without increasing system complexity or compromising data/energy transmission performance.

► Track 3. Optical Wireless Communication and Networks
► Chair: Guanjun Gao, Beijing University of Posts and Telecommunications, China
► 13:30-14:50 | June 29, 2025 | Break Time: 14:50-15:20

Chao Shen **(C4066)** 13:30-13:50	Chao Shen, Fudan University, China Speech Title: Irradiation Hardness of GaN Laser Diodes for Visible Light Communications in Harsh Environments Abstract: Visible Light Communication (VLC) offers significant advantages and represents a promising solution for inter-satellite communication. However, the space environment is characterized by a high flux of energetic radiation particles, with protons being the most prevalent. Therefore, it is crucial to evaluate the radiation hardness of devices intended for VLC applications. In this study, the performance of GaN-based laser diodes was systematically characterized under proton irradiation. The results confirm the excellent radiation tolerance of these devices, highlighting their strong potential for deployment in harsh environments such as inter-satellite visible light communication systems.
Han Wu 13:50-14:10	Han Wu, Sichuan University, China Speech Title: Mid-Infrared Temporal Ghost Imaging and Data Encryption Abstract: Ghost imaging in the time domain allows for reconstructing fast temporal objects using a slow photodetector. The technique involves correlating random or pre-programmed probing temporal intensity patterns with the integrated signal measured after modulation by the temporal object. However, the implementation of temporal ghost imaging necessitates ultrafast detectors or modulators for measuring or pre-programming the probing intensity patterns, which are not available in all spectral regions especially in the mid-infrared region. Here, we report a frequency downconversion temporal ghost imaging scheme that enables us to realize computational temporal ghost imaging in the mid-infrared. The approach modulates a signal with temporal intensity patterns in the near-infrared fiber laser and transfers the patterns to an idler via difference-frequency generation in a nonlinear crystal at a wavelength where the temporal object can be retrieved. As a proof-of-concept, we demonstrate computational temporal ghost imaging in the mid-infrared with operating wavelength that can be tuned from 3.2 to 4.3 μm. We further demonstrate mid-infrared data encryption and transmission over a 3 m free space link at a speed more than 60 times higher than MIR detector bandwidth

	based on the frequency downconversion computational temporal ghost imaging.
Tingwei Wu **(C2010)** 14:10-14:30	Tingwei Wu, Chongqing University of Posts and Telecommunications, China Speech Title: Dynamic Deep Coding for Secure Image Transmission Over Communication Networks Abstract: Deep learning-based joint source-channel coding is an efficient method for wireless image transmission over additive white Gaussian noise (AWGN) channels. It enjoys high data compressibility and insensitivity to noise, especially at low signal-to-noise ratios. Current approaches are unable to adjust code rates based on diverse channel conditions and image contents and hence become inflexible and bandwidth-inefficient. To solve this issue, variable-length deep learning modeling offers variable code length adaptability, and an oracle network predicts the peak signal-to-noise ratio (PSNR) from image content, channel SNR, and compression ratio. A compression optimizer then compresses data transfer while keeping images at a set quality. These methodologies promote bandwidth efficiency by sending images with the smallest possible data size but keeping quality high. Simulation results show that the proposed approach generates image quality on par with state-of-the-art attention models, and the Oracle network predicts PSNR values within less than 0.5 dB average deviation. The approach is capable of efficiently reducing bandwidth usage but can also cope with different channel conditions and classes of images, and it is a reliable option for secure and efficient image transmission in AWGN networks.
Renzhi Yuan 14:30-14:50	Renzhi Yuan, Beijing University of Posts and Telecommunications, China Speech Title: Key Techniques and Challenges of NLoS Integrated Ultraviolet Communication and Positioning Abstract: Ultraviolet (UV) communication has attracted increasing attention in recent 10 years due to its inherent advantages such as low background noise, high local security, and non-line-of-sight (NLOS) ability. NLOS UV communication can be used in both military secure communications and civil communications. Though the UV communication can achieve NLOS links thanks to the strong scattering effect of UV signals passing through the atmosphere, the NLOS communication link still suffers from interruption issue when there is no single-scattering link between the transmitter and the receiver. To tackle this interruption issue, the NLOS UV positioning method can be employed to help the UV transceivers maintain the single-scattering link during the communication period, especially in mobile scenarios. Currently, the UV communication and UV positioning are separately studied. In this presentation, we introduce the idea of integrated ultraviolet communication and positioning (IUCaP). We summarize the key techniques and challenges of IUCaP, including the UV positioning, channel modeling, compacity analysis, full-duplex technique, weak signal detection, and experimental studies.

► **Track 3. Optical Wireless Communication and Networks**
► **Chair: Chao Shen, Fudan University, China**
► 15:20-16:00 | June 29, 2025

Qiong Zhao 15:20-15:40	Qiong Zhao, Xi'an University of Posts&Telecommunications, China Speech Title: A Quantized CSI Acquisition Strategy Based on Position Information Feedback for Indoor VLC Systems Abstract: Channel State Information (CSI), characterizing real-time optical channel conditions, is critical for system optimization in visible light communication (VLC) systems. In VLC networks, CSI acquisition typically relies on uplink feedback mechanisms that require frequent updates due to rapid channel variations. As access point (AP) density increases, this feedback process incurs substantial overhead that scales with network size, becoming a major bottleneck for system scalability. By decoupling static channel characteristics from dynamic user positions, this paper proposes a dual-step strategy decoupling offline channel quantization from online uplink positioning. This enables efficient downlink CSI reconstruction via pre-trained lookup tables, bypassing real-time computations. The feedback overhead scales as 1/M of conventional methods in M-AP systems, with experiments showing less than 3% spectrum efficiency loss for precoding-sensitive applications in high speed mobile scenarios. The framework's adaptability to varying LED densities further supports practical deployment in large-scale networks. This work resolves the CSI acquisition bottleneck, enabling scalable VLC systems with minimal performance degradation.
Guanjun Gao 15:40-16:00	Guanjun Gao, Beijing University of Posts and Telecommunications, China Speech Title: Research and Practice of Underwater Wireless Optical Communication Technology Abstract: Underwater wireless optical communication utilizes the low-attenuation window of seawater blue-green light band to achieve short-range communication, featuring advantages such as high speed and low power consumption, and demonstrating great application potential in the field of high-speed underwater wireless communication. Aiming at the demand for reliable and stable transmission of underwater wireless optical communication, the report introduces key technologies including performance modeling of underwater wireless optical communication, integrated performance improvement of spectrum expansion encryption, and adaptive regulation of transceiver collaboration, as well as the sea trials of Sealink series underwater wireless optical communication machines and their applications in multiple fields such as marine observation, underwater vehicles, and cross-media communication

►Onsite Sessions

Location: Meeting Room 6 宽巷厅

► **Track 4. Integrated Sensing and Communication and Signal Processing**
► **Chair: Jia Ye, Chongqing University, China**
► 9:00-10:20 | June 29, 2025 | Break Time: 10:20-10:40

Time	Speeches
Zhaohui Li 9:00-9:20	Zhaohui Li, Sun Yat-sen University, China Speech Title: Spatial Division Multiplexing (SDM) Enabled Integrated Sensing and Communications (ISAC) System Abstract: Long-term research in the fields of optical communication systems, photonic integrated chips, and intelligent optical signal processing. Selected as a leading scientific and technological innovation talent under the National "Ten Thousand Talents Plan." Has undertaken projects including the National Natural Science Foundation of China (NSFC) Distinguished Young Scholars Program, NSFC Key Projects and Integrated Projects, and the National Key R&D Program of China "Key Scientific Issues of Transformative Technologies." Serves as the Director of the Guangdong Provincial Key Laboratory of Optoelectronic Information Processing Chips and Systems.
Lijun Deng 9:20-9:40	Lijun Deng, Weinan Normal University, China Speech Title: Indoor Visible Light Tilt-Resilient Positioning Based on RSS Fingerprint Self-Transferability Abstract: In order to solve function failure or a reduction in the accuracy of the indoor visible light positioning (VLP) system under tilt receiving, we propose a tilt-resilient positioning method based on received signal strength (RSS) fingerprint self-transfer learning. Based on the modified path loss (PL) exponent model, the vertical RSS fingerprints can self-transfer to the tilted RSS fingerprints of arbitrary receiving direction (RD) in the online stage. The constructed tilted RSS fingerprint databsae have the same granularity and dimension as the vertical RSS fingerprint database, making the proposed method have the capability of rapid learning and positioning while completing RSS fingerprint self-transfer. The simulation results show that the proposed method achieves a higher positioning accuracy compared to the other three methods without adding the labor and time costs of RSS measurement caused by the multidimensionality of the RD at each fingerprint point. In the case of dense and sparse light-emitting diode (LED) distributions, the proposed method can guarantee the stable centimeter-level positioning accuracy, which further improves the practicability and reliability of the VLP system in the actual environment.
Donghyun Kim 9:40-10:00	Donghyun Kim, Yonsei University, Korea Speech Title: Superlocalized Metaplasmonic Detection of Biomedical Intracellular Dynamics Abstract: Superlocalized Metaplasmonic Detection of Biomedical Intracellular

	Dynamics.
Shuai Ma 10:00-10:20	Shuai Ma, Peng Cheng Laboratories, China Speech Title: Integrated Visible Light Positioning and Communication Design with Single LED-Lamp Abstract: We propose a design method for a single station visible light communication positioning integrated system for practical applications. A high-efficiency visible light communication positioning integrated waveform method was designed by using the DC component of the signal for positioning and the AC component for transmitting information. The inherent coupling relationship between communication and positioning was explored, and the positioning result was used as channel estimation for communication, which can significantly reduce the pilot cost of channel estimation. Meanwhile, by minimizing CRLB, the integrated waveform design for communication positioning is optimized to meet the constraints of communication interruption probability and total transmission power. Finally, the simulation results validated the effectiveness and robustness of the proposed waveform design. The visible light 3D localization problem (VLP) was modeled as a nonlinear programming problem, and the VLP algorithm based on stochastic gradient descent (SGD) was used to solve the least squares localization optimization problem. The measured average localization error was significantly better than the existing RSS VLP localization methods. Finally, a 3D real-time VLP system prototype system was designed, using a portable Raspberry Pi as the intelligent processor, and centimeter level positioning accuracy was achieved through actual testing.

► **Track 4. Integrated Sensing and Communication and Signal Processing**
► **Chair: Shuai Ma, Peng Cheng Laboratories, China**
► **10:40-12:00 | June 29, 2025**

Yaxi Yan 10:40-11:00	Yaxi Yan, The Hong Kong Polytechnic University, China Speech Title: Integrated Optical Sensing and Communication and Related Applications in Urban Areas Abstract: With the extensive reach of telecom fiber networks, turning optical fiber networks into sensors by seamlessly combining optical fiber sensing and communication into a single system has attracted great research interest in recent years. In this talk, we will review our latest research in integrated optical communication and distributed optical fiber vibration sensing, and introduce our updated results of sensing over deployed optical fiber networks in urban areas.
Bingcheng Zhu 11:00-11:20	Bingcheng Zhu, Southeast University, China Speech Title: Design and Implementation of Low-Cost High-Performance Wireless Optical Positioning Systems Abstract: Wireless optical positioning based on photodiodes offers advantages of

	low latency, small size, and low power consumption. However, this positioning system also has drawbacks such as difficult beacon deployment, insufficient accuracy, and cumbersome hardware and software design. This report will discuss the above issues. For the problem of difficult deployment, a scheme capable of simultaneously building a beacon database and positioning users is introduced, and its positioning error analysis method is briefly described. For the issue of insufficient accuracy, it is demonstrated that the main source of error lies in the distortion of the Lambert model rather than additive noise, and a more flexible light radiation model is proposed. For the challenge of hardware and software design, an ultra-simple hardware and software architecture is introduced to avoid high-speed digital-to-analog/analog-to-digital converters. Based on this architecture, an optical positioning system based on ESP32 or FPGA is presented, which can achieve centimeter-level accuracy and a positioning rate exceeding 8ksps. The high-speed and high-precision optical positioning system is expected to boost industries such as autonomous driving, low-altitude economy, and industrial Internet of Things, and will lay the foundation for laser mobile communications.
Jia Ye 11:20-11:40	Jia Ye, Chongqing University, China Speech Title: Demonstration of a Flexible Optical Integrated Communication, Sensing and Power Transfer System Abstract: This study introduces and experimentally demonstrates a novel optical integrated communication, sensing, and power transfer (O-ICSPT) system. The proposed system integrates optical wireless communication, sensing, and wireless power transfer into a multifunctional framework, addressing the limitations of existing systems in terms of flexibility and resource utilization. The experimental setup investigates the effects of bias current, peak-to-peak voltage, and light source wavelength on the performance of each functional module. Experimental results indicate that the O-ICSPT system achieves a maximum data rate of approximately 632.58 Mbps, a best ranging root mean square error approaching 0 m, and a peak energy harvesting capability of about 10.02 mW. These findings underscore the potential of the O-ICSPT system in future 6G integrated communication networks, marking the first experimental validation of such a system.
Bingpeng Zhou **11:40-12:00**	Bingpeng Zhou, Sun Yat-sen University, China Speech Title: Optical Wireless Positioning towards 6G Integrated Communication and Sensing: Algorithm, Performance & Resource Deployment Abstract: With the rapid evolution of wireless communications, a multitude of location-based intelligent applications such as internet-of-vehicles and autonomous driving will gain flourish development, which do not only require high data-rate transmission, but also need high-accuracy wireless positioning. Optical wireless communication is featured with wide available spectrum resource, which can be exploited to not only enhance data-transmission, but also improve spatial resolution of wireless positioning, thus paving the way for optical wireless-based integrated communication and sensing (OW-ICAS). In this talk, we shall summarize the recent

	research work of our group on optical wireless communication-enabled positioning, especially on the key ideas on how "wireless positioning" gains from "optical wireless communication" for addressing random fading, multipath interference and Doppler effect. This will build a solid technical foundation for breaking performance constraints of wireless localization in complex environments

► **Track 3. Optical Wireless Communication and Networks**
► **Chair: Mingqing Liu, Tongji University, China**
► 13:30-15:00 | June 29, 2025 | Break Time: 15:00-15:30
► C4083, C3014-A, C4049, C4078, C4051, C4045

Time	Paper Presentation
C4083 13:30-13:45	Title: Closed-Form Approximation for the BEP of BDPSK Signals over EW FSO Channel in Dual-Hop DF Relaying Systems All Authors: Yuxuan Feng, Wenqiang Ma, Xinwei Du, Changyuan Yu, Pooi-Yuen Kam Presenter: Yuxuan Feng, Beijing Normal-Hong Kong Baptist University, China Abstract: In this paper, we derive the closed-form expression of the bit error probability (BEP) for binary differential phase-shift keying (BDPSK) modulated signals over a single exponentiated Weibull (EW) free-space optical (FSO) fading channel. We simplify the calculations of an infinite integral by utilizing the second-order Taylor expansion as well as the second-order Binomial series approximation, and the expression is reduced to involve the gamma function only, with a high approximation accuracy. We further derive the explicit expression of the BEP for dual-hop decode-and-forward (DF) relaying systems. The comparisons between the approximate BEP and theoretical BEP for a single EW channel and a dual-hop EW channel are conducted via simulations with the appearance of weak, moderate and strong turbulences. The simulation results verify the accuracy and effectiveness of the proposed closedform approximate BEP expressions under various turbulence scenarios.
C3014-A 13:45-14:00	Title: Experimental Demonstration of Integrated Free-Space Optical and Millimeter-Wave Transmission Systems with Simplified Structure All Authors: Zhiwei Jiao, Yejun Liu, Lei Guo, Qiming Sun Presenter: Kexiong Liu, Chongqing University of Posts and Telecommunications, China Abstract: Integrated free space optical (FSO) and millimeter-wave (MMW) communications have gained significant academic interest due to their complementary advantages. Existing systems typically integrate FSO and MMW links with separate link configurations, resulting in low fusion of transmitter and receiver structures. In this paper, we analyze the system structures of traditional FSO and MMW links in terms of the required components. We then propose an integrated system structure that can freely switch between FSO and MMW links. The integrated FSO and MMW system structure is significantly simplified by making both links reuse the optoelectronic

	components. Based on whether or not the bidirectional transmission links are of the same type, we further categorize the system into homogeneous and heterogeneous integrated systems, both of which are implemented by fusing FSO and MMW links in different structures. The experimental results show that the proposed integrated systems exhibit bit error rate (BER) performance similar to traditional systems while significantly reducing the amount of optoelectronic components.
C4049 14:00-14:15	Title: Frequency-domain Received Signal Strength for Indoor Visible Light Positioning All Authors: Ping Fu, Hao Chen, Xiong Deng, Zhinan Sun, Wenyuan Ma, Xihua Zou, Wei Pan, Lianshan Yan Presenter: Ping Fu, Southwest Jiaotong University, China Abstract: Visible Light Positioning (VLP) has emerged as a research hotspot in indoor positioning due to its high precision and strong anti-interference capability. However, the robustness of existing methods in complex noise environments remains to be improved. We proposed a Frequency-domain Received Signal Strength (F-RSS) based on composite frequency-domain noise modeling. The system robustness is significantly improved by enhancing signal power through Fast Fourier Transform (FFT) based frequency-domain separation technology. Simultaneously, a composite noise model integrating phase offset and Additive White Gaussian Noise (AWGN) is established, systematically revealing the impact mechanisms of key parameters, sampling frequency, frequency resolution, and FFT points, on positioning errors for the first time. Furthermore, this study conducts comparative accuracy verification of F-RSS and Frequency-domain Time Difference of Arrival (F-TDOA) technologies under identical scenarios. Simulation results demonstrate that the optimized F-RSS system achieves an average positioning error of 0.55 cm at SNR = 30 dB, outperforming the F-TDOA method by approximately 5.5 times.
C4078 14:15-14:30	Title: Joint Optimization of Trajectory Planing and User Association for Secure VLC-UAV Communications with Friendly Jamming All Authors: Xiufeng Xu, Pu Miao, Kong Song, Peng Chen, Gaojie Chen Presenter: Pu Miao, Qingdao University, China Abstract: Visible light communication (VLC) assisted unmanned aerial vehicles (UAVs) can offer a promising solution of high data rate transmission and mobile illumination in specific field of night monitoring safety and diaster rescue applications. However, it is highly susceptible to malicious interference and eavesdropping attacks due to the openness and broadcast characteristics of VLC. In this paper, a friendly jamming scheme is proposed to combat these problems and further improve the secrecy performance of VLC-UAV system, which is mathematically formulated as joint optimization of user association and trajectory planning as come up against the No-fly zone. We decompose the original problem into two sub-problems, and then transform them to be binary programming and convex optimization problems with the well-designed successive convex approximation method. Moreover, we proposed an efficient algorithm to obtain the optimal solution by using the block coordinate descent method in an alternating iterative way. Numerical results show that the proposed

	method can achieve the significant secrecy performance gain as compared with the conventional schemes.
C4051 14:30-14:45	Title: Fusion-Aware Beam Tracking for Robust High-Mobility RF-FSO Communication All Authors: Zhinan Sun, Xiong Deng, Wenyuan Ma, Xiping Wu, Li Zhang, Xihua Zou, Wei Pan, Lianshan Yan Presenter: Zhinan Sun, Southwest Jiaotong University, China Abstract: This paper proposes a radio frequency-free space optics (RF-FSO) fusion beam tracking algorithm for high-mobility hybrid RF-FSO communication. By combining the wide-beam dynamic control of millimeter-wave (mmWave) phased array RF system and the precise laser tracking of acquisition, tracking, and pointing (ATP) FSO system, a Kalman filter-based fusion algorithm is developed. Simulation results show that the algorithm enables 86.98% faster initial acquisition via mmWave adaptive beam narrowing compared to a single FSO system and improves angular tracking accuracy by about 75% with laser activation. The RF-FSO fusion system achieves mutual gains in its respective single systems, providing robust support for high-mobility scenarios and improving communication capacity through signal-to-noise ratio (SNR) enhancements enabled by improved alignment accuracy. The proposed algorithmic mechanism effectively demonstrates the effectiveness of RF-FSO fusion beam tracking in high-mobility scenarios.
C4045 14:45-15:00	Title: Experimental Demonstration of a Dual-mode Index Modulation 3D-OFDM VLC System All Authors: Ke Yao, Tiantian Chu, Tuo Li, Changhong Wang, Jia Ye Presenter: Tiantian Chu, Chongqing University, China Abstract: We propose and experimentally demonstrate a dual-mode index-modulated three-dimensional orthogonal frequency division multiplexing (DMIM-3D-OFDM) visible light communication (VLC) system. DMIM-3D-OFDM improves the spectral efficiency of conventional 3D-OFDM by 25% by implicitly transmitting the index bits. Experimental results show that the transmission distance of DMIM-3D-OFDM is 1.44 times that of 3D-OFDM at the same data transmission rate. In addition, DMIM-3D-OFDM improves the maximum data transmission rate by 13.1% compared to conventional 3D-OFDM.

► **Track 3. Optical Wireless Communication and Networks**
► **Chair: Zhihong Zeng, Chongqing University**, China
► 15:30-16:45 **| June 29, 2025**
► C4067, C4048, C4061, C3017, C1003

C4067 15:30-15:45	Title: Experimental Validation of ACO-OTFS Signal Transmission Over Turbulent FSO Channels All Authors: Yue Zhang, Zexuan Wang, Minghua Cao, Yangyang Zhou, Yuchi Wang Presenter: Yue Zhang, Lanzhou University of Technology, China

	Abstract: This paper investigates the performance of asymmetrically clipped optical orthogonal time frequency space (ACO-OTFS) modulation combined with a residual dense network (RDN) signal detection scheme in free-space optical (FSO) communication systems under atmospheric turbulence conditions. We propose an experimental framework featuring an atmospheric turbulence chamber capable of simulating weak-to-moderate turbulence conditions, while simultaneously enabling performance evaluation of the ACO-OTFS system under realistic turbulence scenarios. Comparative analysis demonstrates that the proposed RDN detector achieves superior bit error rate (BER) performance compared to conventional maximum likelihood detection, particularly without channel state information scenarios, with the performance advantage becoming more pronounced as the modulation order increases. Notably, the RDN model through offline training maintains robust detection capability when deployed in realistic turbulence conditions, demonstrating effective simulation-to-reality transfer. These findings validating the atmospheric turbulence chamber as an effective testbed for turbulent FSO communication system development.
C4048 15:45-16:00	Title: Optical Orthogonal Time Frequency Space with Enhanced Joint Delay-Doppler Index Modulation All Authors: Zhen Wang, Huiqin Wang, Qihan Tang, Qinbin Peng, Yue Zhang, Minghua Cao Presenter: Zhen Wang, Lanzhou University of Technology, China Abstract: To address the non-ideal spectral efficiency (SE) and high implementation complexity of the optical orthogonal time-frequency space with joint Delay-Doppler index modula- tion (OOTFS-JDDIM) system, this paper proposes an enhanced OOTFS-JDDIM (OOTFS-EJDDIM) scheme based on the discrete Zak transform. The main idea of the proposed scheme is to enhance SE by introducing a sparse structure in the delay- Doppler resource blocks. After detailing the signal mapping rules and implementation principles of the proposed scheme, the SE and computational complexity are derived and analyzed. Furthermore, based on the exponential Weibull atmospheric turbulence channel model, the bit error rate (BER) performance of the proposed scheme is simulated and compared with OOTFS- JDDIM. The results show that the proposed scheme achieves consistent improvements in spectral efficiency over the OOTFS- JDDIM scheme under various parameter configurations, with SNR losses limited to within 1.5 dB and 2 dB under weak and strong turbulence conditions, respectively.
C4061 16:00-16:15	Title: Intelligent Modulation Recognition for Generalized Optical MIMO in OWC Systems All Authors: Xinyue Zhang, Zhihong Zeng, Dengke Wang, Chen Chen Presenter: Xinyue Zhang, Chongqing University, China Abstract: A modulation recognition method for generalized optical multiple-input multiple-output (GO-MIMO) schemes in optical wireless communication (OWC) systems is proposed, which employs the frequency domain difference amplitude

	histogram as a feature to complete the identification of the two schemes. The proposed method has a low-complexity advantage and achieves highly accurate recognition at low signal-to-noise ratios (SNRs).
C3017 16:15-16:30	Title: Investigation of NLOS Ultraviolet Communication Systems Exposed to Periodic Pulse Jamming All Authors: Tian Cao, Ping Wang, Tianfeng Wu, Kaile Wang Presenter: Tian Cao, Xidian University, China Abstract: This paper presents a theoretical analysis of the impact of periodic pulse jamming on non-line-of-sight (NLOS) ultraviolet communication (UVC) systems. A new probability mass function (PMF) is proposed to describe the proportion of jamming time within a signal slot relative to the entire slot, assuming the jamming pulse period is a multiple of the slot or vice versa. Using this PMF, a closed-form expression for the average bit-error rate (ABER) is derived using the Gauss-Legendre quadrature technique and validated through simulations. The results demonstrate that aerial jammers leveraging line-of-sight links can achieve substantially greater jamming ranges than ground-based jammers relying on NLOS propagation. Furthermore, even jammers operating at low average power levels can significantly impair the ABER performance of NLOS UVC systems.
C1003 16:30-16:45	Title: Visible Light Positioning Based on Received Signal Strength With Receiver Tilting All Authors: Qianxia Huang, Shuojin Huang, Bingcheng Zhu, Zaichen Zhang Presenter: Qianxia Huang, Southeast University, China Abstract: Prior received signal strength positioning systems require the receiver to be placed vertically with the help of inertial measurement units. However, this assumption could become impractical when the receiver is vibrating or tilting. In this work, we propose two different received signal strength positioning systems that are immune to the random tilting angle of the receiver where the first has higher accuracy for the three-dimensional cases and the second has lower complexity for the two-dimensional cases. We also derive an error expression for the mean square value of the average positioning error, revealing insights into the system design. Simulation results show that the received signal strength positioning scheme can achieve accuracy of centimeters and the derived error expression is reliable.

►Onsite Sessions

Location: Meeting Room 7 窄巷厅

► **Track 8. Intelligent Photonics and Optical Computing**
► **Chair: Cheng Wang, ShanghaiTech University, China**
► 9:00-10:20 | June 29, 2025 | Break Time: 10:20-10:40

Time	Speeches
Lilin Yi 9:20- 9:40	Lilin Yi, Shanghai Jiao Tong University, China Speech Title: Intelligent Optical Fiber Communication System Abstract: This talk will introduce how AI can improve the performance of optical fiber communication system and the intelligent fiber transmission system (IFTS) platform we have built.
Yaping Liu 9:40- 10:00	Yaping Liu, Tianjin University, China Speech Title: Technology and Applications of Space-division Multiplexing Optical Fiber Amplifiers Abstract: Space-division multiplexing (SDM) technology based on multi-core fibers and few-mode fibers holds the promise of increasing the capacity of traditional single-mode fiber-based optical transmission systems by tens of times. As crucial devices, SDM amplifiers can simultaneously compensate for the loss of all spatial modes in long-haul SDM transmission systems. In addition to fundamental performance metrics such as gain, bandwidth, and noise figure, SDM amplifiers possess a unique metric, i.e., core/mode-dependent gain, when compared with single-mode amplifiers. Since excessive core/mode-dependent gain would constrain the system capacity and reach of SDM systems, minimizing this gain difference becomes a critical issue in the design of SDM amplifiers. This report summarizes recent advances in SDM amplifiers and their other applications, such as inter-satellite interconnects, LiDAR, and so on.
Xiaozhou Li 10:00-10:20	Xiaozhou Li, Dalian University of Technology, China Speech Title: Studying the Chaotic Dynamics of Semiconductor Lasers by Machine Learning Abstract: Chaotic dynamics of semiconductor lasers have enabled a variety of novel applications including secure communications, random bit generations, and ranging. The performances for most of the above-mentioned applications have been found to be directly related to the statistical properties and underlying dynamics of chaotic lasers. In this presentation, we demonstrate the use of machine learning techniques for studying the dynamical behaviors of chaotic semiconductor lasers. By using reservoir computing, we demonstrate successful prediction of the continuous intensity time series and reproduction of the underlying dynamics for a chaotic optically injected laser. The calculation of largest Lyapunov exponent is also investigated by using a convolutional neural network, where the computation time

	and the required input data length are found efficiently reduced as compared to traditional methods. In addition, we propose to use a feed-forward neural network to study the statistical properties of chaotic lasers by measuring merely the optical spectrum of a chaotic emission output. These machine learning-based approaches for studying the dynamical behaviors are readily extended for different simulations and experiments based on chaotic semiconductor lasers.

► Track 8. Intelligent Photonics and Optical Computing
► Chair: Lilin Yi, Shanghai Jiao Tong University, China
► 10:40-12:00 | June 29, 2025

Sheng Luo 10:40-11:00	Sheng Luo, Shenzhen University, China Speech Title: Recent Advancements in Modulation Schemes for MIMO Communications Abstract: MIMO configurations employing reduced RF chains represent a pivotal advancement in multi-antenna technology, strategically optimizing the critical trade-off between performance, hardware complexity, and energy consumption. By activating only a subset of the available transmit antennas through a limited number of RF front-ends, this architecture drastically lowers implementation costs and power requirements compared to conventional full-chain MIMO, while retaining significant spatial diversity. In this presentation, we introduce innovative spatial modulation (SM) schemes specifically designed for modern MIMO platforms operating under this RF chain constraint. We show that SM approaches exploit antenna indices or phase-shifting vectors as additional information carriers, creating higher-dimensional hybrid modulation techniques. We introduce how these SM strategies significantly enhance the system's reliability, reducing error rates than traditional modulation under the same RF limitations. Furthermore, the talk provides a summary of the inherent challenges confronting spatial modulation in constrained MIMO deployments. Key issues addressed include channel feedback overhead, the fast response time of the antenna switcher and the phase array, and the accuracy of the phase shifters.
Cheng Wang 11:00-11:20	Cheng Wang, ShanghaiTech University, China Speech Title: Deep Photonic Reservoir Computer and Its Applications in Optical Communication Abstract: Photonic reservoir computer (PRC) is a real-time, adaptive recurrent neural network, and it is featured with high energy efficiency and low latency. PRCs have applications in the area of edge computing, which requires real-time processing with both low power consumption and low latency. Here we show a deep PRC with cascading hidden layers. Each layer consists of a semiconductor laser with an optical feedback loop, which produces a large number of neurons. The consecutive layers are interconnected through the optical injection technique. This is an all-optical interconnection, which does not require any optical-electrical-optical conversion or

	analog-digital-analog conversion. Therefore, the power cost of the deep PRC is low and the latency is low. In addition, the architecture is highly scalable, because the laser in each hidden layer supplies optical power. We demonstrate that the deep PRC have strong ability in the nonlinear equalization of optical communication signals, including both intensity-modulation signals and coherence signals.
Yongzhuang Zhou 11:20-11:40	Yongzhuang Zhou, National University of Defense Technology, China Speech Title: Computational Imaging Enables High-Precision Detection of 3D Dynamics in Ultracold Atomic Systems Abstract: Precise, real-time detection of individual atoms/ions in three dimensions is essential for advancing quantum information science and atomic physics; However, conventional single-atom-resolved detection methods are limited to static circumstances or a shallow detection range. We demonstrate that by employing computational imaging, it is possible to achieve high-precision 3D localization of single ions across an extended axial range using compact, non-scanning optics. By modulating the collected fluorescence light with a custom phase mask, we generate a helical point-spread function (PSF) that encodes the emitter's axial position as image rotation, which can subsequently be decoded via post-processing algorithm. This configuration facilitates single-frame volumetric tracking over a depth range of 20 μm with nanometer-scale sensitivity. It eliminates the need for focus scanning, thereby reducing complexity while enhancing temporal resolution. The technique is applied in trapped Ca+ ion systems to observe rapid 3D dynamics, including forced oscillations and structural phase transitions in multi-ion Coulomb crystals, which indicates its potential for investigating high-throughput volumetric dynamics in ultracold atomic systems.
Ying Zhu 11:40-12:00	Ying Zhu, National Information Optoelectronic Innovation Center, China Speech Title: Silicon Photonic AI Accelerator and Processor Using Integrated Coherent Technologies Abstract: As Moore's Law reaches its physical limits, AI models continue to drive innovations in computing hardware architecture. Silicon photonic technology, with its inherent advantages of high speed, low power consumption, large bandwidth, and CMOS compatibility, represents a promising solution for next-generation AI computing systems. In this presentation, we showcase our integrated approach to developing photonic AI accelerators and processors, encompassing both hardware architecture design and software algorithm optimization. Our implemented systems successfully demonstrate various computational functions, including convolutions, matrix-vector multiplications, neural network operations, filtering, and switching capabilities. The performance results are particularly noteworthy, achieving computational speeds beyond tera-operations per second while maintaining exceptional energy efficiency at the pico-joule per operation level.

► Track 7. Microwave Photonics and THz Technology

► **Chair: Heng Zhou, University of Electronic Science and Technology of China, China**
► 13:30-15:30 | June 29, 2025 | Break Time: 15:30-16:00

Time	Speeches
Yue Zhang 13:30-13:50	Yue Zhang, Jiujin Technology Co., Ltd., China Speech Title: Key Technology for Wideband Oscilloscopes: Applications in Microwave Photonics and Terahertz Verification Platforms Abstract: This report presents key technologies of oscilloscope, which is critical for microwave photonics and terahertz verification platforms, emphasizing technologies such as ultra-high-speed data stream acquisition with 80 GSa/s real-time sampling rate, inter-channel frequency response mismatches and femtosecond-precision trigger localization for capturing transient events in 640 Gbps data streams. These capabilities enable groundbreaking applications in THz systems, such as real-time demodulation for 64-QAM modulated signals through photonic down-conversion and photonics communication, validates 1.6 Tb/s optical links.
Yuancheng Cai 13:50-14:10	Yuancheng Cai, Purple Mountain Laboratories, China Speech Title: Research on Polarization Problem in Hybrid Optical Fiber and Thz Wireless Transmission System Abstract: In recent years, the photonics-assisted THz communication system has attracted a wide range of research interests due to its advantages of ultra bandwidth and large capacity, which are quite conducive to the future 6G ultra-high-speed wireless transmission scenarios. However, this system usually suffers from the problem of polarization sensitivity, which significantly reduces its robustness and practicality. In this report, we propose a polarization-insensitive photonics-assisted THz communication system based on the block-wise Alamouti coding scheme, which can achieve stable performance over extended periods. A 50-Gbps polarization-insensitive photonics-assisted THz wireless transmission over the hybrid 20-km optical fiber and outdoor 200-m long-range THz wireless links at 300 GHz has been successfully demonstrated for the first time. Furthermore, we build 200-m long-range 2×2 multiple-input multiple-output (MIMO) THz wireless links, which employ both optical polarization division multiplexing (PDM) and electromagnetic polarization multiplexing. The experimental results show that, as compared with the electromagnetic polarization multiplexing scheme, the same polarization scheme can provide additional diversity gain up to 6 dB. Benefiting from the improved receiving sensitivity, we successfully demonstrate a record-breaking 58-GBd PDM-QPSK signal transmission over 200-m 2×2 MIMO THz wireless links.
Xiuyou Han 14:10-14:30	Xiuyou Han, Dalian University of Technology, China Speech Title: In-band Full-duplex Communication by Using Silicon Photonic Integrated RF Self-Interference Canceller Abstract: Nowadays, the rare spectrum resource has become one of the major factors limiting the development of wireless communication, not only for B5G and 6G networks, but also for the new generation satellite communications. In-band

	full-duplex (IBFD) technology can double the spectrum utilization efficiency and information transmission rate. However, the radio frequency (RF) self-interference is a key issue to be resolved for the application of IBFD. The photonic RF self-interference cancellation (SIC) scheme has the advantages of wide bandwidth, high amplitude and time delay tuning precision, and immunity to electromagnetic interference. In this talk, we will present our group recent work about silicon photonic integrated RF self-interference canceller for IBFD communications. The new photonic SIC scheme transfers the RF signal from electrical domain to optical domain where the amplitude, phase, and time delay is adjusted for matching the conditions for RF SIC. The photonic integrated SIC chip is designed and fabricated on silicon photonic platform. The RF SIC performance of the silicon photonic integrated SIC canceller over the wide frequency band is measured and investigated in detail. The IBFD communication by using the packaged silicon photonic integrated SIC canceller is demonstrated experimentally.
Pu Li 14:30-14:50	Pu Li, Guangdong University of Technology, China Speech Title: Broadband Terahertz Noise Generation based on Photomixing Incoherent Lights Abstract: We present a terahertz photonic noise source by with photo-mixing three Gaussian-shaped noise slices from a super luminescent diode slicing the broadband noise light into three Gaussian-shaped lights and mixing the lights through a photomixer. Experimental results demonstrate that Terahertz noise with a frequency range of 200 GHz to 390 GHz is obtained in the experiment with an excess noise ratio (ENR) reaches up to 48±4.3 dB, corresponding to an equivalent noise temperature exceeding 107 K. Furthermore, we use the proposed noise source is used to measure the noise figure of some mature mixer products. The proposed photonic noise source holds the promise of generating terahertz noise at a higher frequency and with a larger bandwidth. The proposed photonic noise source possesses a high integration, and raises the frequency range and the excess noise ratio of the noise spectrum to a new level.
Fu Wang 14:50-15:10	Fu Wang, Beijing University of Posts and Telecommunications, China Speech Title: Research on Large scale Low Earth Orbit Satellite Optical Network Routing Technology Based on Multidimensional Spatiotemporal Information Abstract: Low Earth Orbit (LEO) satellite networks are currently developing towards large-scale, multi-level, and flexible networking. In order to adapt to the characteristics of large temporal and spatial scales, LEO satellite networks need to adopt new networking architectures and methods to improve routing efficiency. The talk will take optoelectronic hybrid transmission as the starting point, discussing several key technologies of LEO optoelectronic hybrid networking, and reporting on the recent achievements of the project team around large-scale low orbit satellite optical network routing technology based on multidimensional spatiotemporal information.
Cheng Guo	Cheng Guo, Xi'an Jiaotong University, China

15:10-15:30	Speech Title: Current Research on Micro Additive Manufacturing of Millimeter-Wave GSG/GSGSG Probes Abstract: With the advancement of wireless communication technology, the operating frequency of electronic devices has extended into the millimeter-wave/terahertz spectrum. This increase in frequency and decrease in device size make testing more challenging. Direct on-wafer testing has become essential, allowing for precise characterization of chip-level S-parameters without packaging. RF on-wafer probes are crucial for connecting large testing instruments like vector network analyzers to miniaturized chips, enhancing accuracy and efficiency while reducing development costs. Traditionally, RF GSG probes have been dominated by American and European companies, leading to high prices, long lead times, and costly maintenance. This paper introduces a novel RF GSG probe that operates up to 400 GHz, manufactured using multi-material additive techniques. The probe integrates the tip, transmission lines, and coaxial-to-waveguide transition on a single chip, eliminating assembly errors. The multi-material additive manufacturing approach allows for faster production, reduced costs, and shorter maintenance cycles compared to traditional probes. With comparable RF performance—return loss over 15 dB and insertion loss under 3 dB—the probe offers long service life, excellent mechanical properties, and efficient chip testing.

► **Track 7. Microwave Photonics and THz Technology**
► **Chair: Fu Wang, Beijing University of Posts and Telecommunications, China**
► 16:00-18:00 | June 29, 2025

Liangping Xia 16:00-16:20	Liangping Xia, Yangtze Normal University, China Speech Title: Researches and Applications of Micro-/Nano- Optical Devices with Large Size Abstract: With the development of optical information technology, micro nano optical chips, as the underlying hardware, have an urgent market demand. In optical systems, micro nano optical chips need to reach a certain size to meet the requirements of engineering applications. Based on this demand, our team mainly developed optical devices such as large-area gratings, large angle diffraction beam splitters, and metasurfaces using electron beam lithography combined with nanoimprint technology, providing key device support for their applications in 3D structured light detection, light field shaping, spectral diffraction spectroscopy, and other fields.

Heng Zhou 16:20-16:40	Heng Zhou, University of Electronic Science and Technology of China, China Speech Title: Research on Optoelectronic-Integrated Precision Measurement Technology Abstract: As a cornerstone tool in modern electronics, the phase noise analyzer (PNA) measures signals' phase instability and time jitter—the most critical metrics for communication devices, radar systems, and positioning-navigation-timing modules. Today, electronic PNA (e-PNA) systems demonstrate exceptional performance and enable the most precise noise investigation in the RF and microwave regime. We introduce a novelphase noise analyzer for mmWave signal beyond 100 GHz, enabled by thin-film lithum niabate modulator and ultra-narrow linewidth Brillouin lasers, achieving excellent noise floor down to 150 dBc/Hz at 100 kHz offset.
Xinhai Zou 16:40-17:00	Xinhai Zou, University of Electronic Science and Technology of China, China Speech Title: High-speed Optoelectronic Devices Measurement based on Frequency Up/Down-Conversion by Using an Optical Frequency Comb Abstract: Optoelectronic devices characterization runs through the design, fabrication, and packaging processes. In the past decades, there are lots of methods proposed for measuring frequency response of optoelectronic integrated chips, which can be categorized into optical spectrum and electrical spectrum methods. The measurement is direct and effective for high-frequency and ultra-wideband operation. However, the resolution is restricted to be 1.25 GHz (0.01 nm@1550 nm) by the commercially available grating-based OSA. Moreover, the OSA-based method applies only to the measurement of electro-optic modulators (EOMs). Currently, the electro-optic frequency sweep (EOFS) scheme, which is a typical electrical spectrum analysis method, is widely used to measure both EOMs and photodetectors (PDs) with the assistance of an optical-electrical (O-E) or E-O transducer standard. In this paper, we propose calibration-free and wideband measurement methods for optoelectronic devices based on frequency up/down-conversion by using an optical frequency comb (OFC). It is free of extra E-O or O-E calibration and insensitive to impedance match. Moreover, it enables high-frequency measurement of electro-optic modulator through low-frequency photodetection, and wideband measurement of photodetector through narrowband electro-optic modulation, which is promising for in-line testing of wafer-level optoelectronic chips.
Bing Lu **17:00-17:20**	Bing Lu, Chongqing University of Posts and Communications, China Speech Title: Linearization Technology and Performance Optimization in Broadband Microwave Photonic Down-Conversion Abstract: In microwave photonic frequency conversion systems, the nonlinear characteristics of optoelectronic devices (such as modulators, and detectors) would introduce self-mixing interference, harmonic distortion, intermodulation distortion, etc. These distortions interfere with useful signals, reducing the signal-to-noise ratio

	and dynamic range of the system. Digital signal processing (DSP) linearization technology realizes nonlinear compensation through software algorithms, reducing reliance on high-precision analog devices. Therefore, we respectively adopt the KK algorithm and the iterative algorithm to eliminate SSBI, intermodulation and cross-modulation distortion in the down-conversion system, so as to improve the performance of the broadband communication system.
Xiaolong Pan **17:20-17:40**	Xiaolong Pan, Beijing Institute of Technology, China Speech Title: Research on Implementation Techniques and Neural Network Optimization for Photonic-assisted MmWave Sensing-Communication Integration Systems Abstract: Integrated sensing and communication (ISAC) systems are pivotal for next-generation 6G networks, addressing spectrum scarcity and hardware costs by co-optimizing communication and sensing functionalities. High-frequency bands (e.g., W-band) enable high-capacity communication and high-resolution sensing, while shared OFDM waveforms leverage 5G infrastructure for cost efficiency. This work proposes a photonic-assisted W-band (94.5 GHz) ISAC system with a two-stage carrier frequency recovery (CFR) algorithm, comprising fractional and integer frequency offset estimations. Experiments validate that the CFR algorithm enhances system robustness against frequency offsets, achieving a 47.54 Gbit/s transmission rate over 5.2 m and 0.98 cm ranging resolution for a 2 m corner reflector using 16 GHz bandwidth. Furthermore, a neural network (NN) approach is introduced to process Range-Doppler maps for target parameter estimation. Simulations show that the NN method outperforms traditional 2D-FFT in distance and velocity sensing under high SNR conditions, demonstrating its potential to improve sensing accuracy in photonic-assisted MmWave ISAC systems. This framework integrates signal processing and machine learning for versatile 6G applications.
Zhiqiang Fan 17:40-18:00	Zhiqiang Fan, University of Electronic Science and Technology of China Speech Title: Broadband Microwave Photonics Signal Generation
Jian Wang (Online) 18:00- 18:20	Jian Wang, Huazhong University of Science and Technology, China Speech Title: Structured Light Communications and Beyond Zoom Link: https://us02web.zoom.us/j/81058727383 Password: 062729 Abstract: In this talk, we show recent advances in structured light communications and beyond. We first introduce the concept and principle of structured light field manipulation. After that, we present structured light communications in diverse scenarios (free space, underwater, fiber, chip). We also talk about structured light communications in complex media. Additionally, we introduce recent works on structured light metrology applications and structured light diverse applications (optical trapping, optical tweezer, imaging, microscopy, quantum information processing). Finally, it is a brief summary and perspective.

►Onsite Sessions

Location: Meeting Room1 琴台厅

► **Track 6. Fiber and Sensor Technologies**
► **Chair: Qijun Sun, Guangdong University of Technology, China**
► 9:00-10:40 | June 29, 2025 | Break Time: 10:40-11:00

Time	Speeches
Yongkang Dong 9:00-9:20	Yongkang Dong, Harbin Institute of Technology, China Speech Title: Athermal forward Stimulated Brillouin Scattering Abstract: Forward stimulated Brillouin scattering (FSBS) in optical waveguides enables acousto-optic interactions between co-propagating light and guided acoustic waves, offering promising applications in integrated photonics and sensing. However, in conventional optical fibers, FSBS encounters challenges such as temperature-induced sensitivity of the acoustic resonance frequency, significant acoustic wave transmission loss in coated layer. In this work, we propose the use of aluminum-coated optical fibers to address these challenges simultaneously via two innovative mechanisms. First, we propose a novel mechanism to achieve "athermal FSBS". By optimizing the ratio of the radius and thickness of silica to aluminum to approximately 2.21, the temperature dependence of the acoustic velocity in the aluminum coating compensates for that in silica cladding, thereby achieving temperature insensitivity of the FSBS resonance spectrum, as verified through both simulation and experimental validation. Second, we propose the concept of quasi-acoustic impedance matching for enhanced sensing performance. The acoustic impedance between the silica cladding and the aluminum coating is nearly matched, minimizing acoustic field reflection at the interface and enabling high signal-to-noise ratio discrimination of air and water with a spatial resolution of 2 meters. The aluminum-coated optical fiber simultaneously exhibits a temperature-insensitive FSBS and superior optical force sensing capability, offering a significant impetus for the transition of FSBS technology from laboratory research to engineering applications.
Svetislav Savovic 9:20-9:40	Svetislav Savovic, University of Kragujevac, Serbia Speech Title: New Multimode W-Type Graded-Index Silica Photonic Crystal Fiber for High Bandwidth Data Transmission Abstract: We present a novel design for a multimode, doubly clad W-type silica photonic crystal fiber (SPCF) featuring a graded-index (GI) core profile, developed to enhance bandwidth performance. The bandwidth potential of this fiber was assessed through comprehensive modeling based on the power flow equation (PFE). Compared to conventional singly clad OM4 and OM5 silica optical fibers (SOFs) with 50-μm GI cores—offering a bandwidth of 4.7 GHz·km—the proposed 50-μm core W-type GI SPCF with thinner inner cladding achieves a significantly higher bandwidth of 9.8 GHz·km at 850 nm, effectively doubling performance. A fiber design featuring a thinner inner cladding results in greater leaky mode losses, supports fewer higher-order

	guided modes, and exhibits reduced modal dispersion. As a result, the proposed W-type GI SPCF is well-suited for high-data-rate fiber optic applications, including data centers, enterprise networks, and telecommunications systems. Moreover, one of the standout advantages of SPCF technology over traditional SOFs lies in its design flexibility: the ability to tailor air-hole diameters and spacing (pitches) offers precise control over optical properties, eliminating the need for the complex doping processes typical of standard SOFs.
Fei Xu (Online) 9:40-10:00	Fei Xu, Nanjing University, China Speech Title: All-fiber Multifunction-integrated Devices Zoom Link: https://us02web.zoom.us/j/82182568024 Password: 062729 Abstract: With the development of materials science and manufacture technology, the conventional homogeneous doped core and pure cladding structures in a silica fiber have evolved with a new paradigm shift by merging the multi-structures and multi-materials. This emerging trends in optical fibers aim to break the fundamental limit by a single structure and material, and extend their photonic and optoelectronic applications. Here we will show some all-fiber multifunction-integrated devices developed in our labs and their applications in imaging, laser and sensing will also be discussed.
Jianhui Yu 10:00-10:20	Jianhui Yu, Jinan University, China Speech Title: Anti-resonant Guiding Effect in Side-polished Holllow Core Fiber and High Performance Fiber Sensors Abstract: In the talk, we present the anti-resonant (AR) guiding effect in side-polished hollow core fiber and found that the anti-resonant guiding mechanism exhibits a high sensitivity to the refractive index of the material in the hollow core. The AR effect could break the bottleneck between the sensitivity and the size of the sensors, which open a path to high performance fiber sensor for biological molecule and physical parameters. Based on the AR-effect, high sensitive and ultrafast fiber sensors were demonstrated to detect temperature and endotoxin. Temperature fiber sensor could have a rapid response of 16 ms and a high sensitivity of 4.23nm/ C, allowing the sensors to detect the rapid temperature variation during the human breath. While, the endotoxin fiber bio-sensor exhibits a ultrafast response of 5 min and low sample consumption of only 5 μL, which is 9 times faster and 20 times less consumption than the traditional detection.
Changyuan Yu 10:20-10:40	Changyuan Yu, The Hong Kong Polytechnic University, China Speech Title: AI-assisted Non-invasive Smart Health Monitoring System based on Optical Fiber Interferometer Abstract: We review our recent work on AI-assisted non-invasive smart health monitoring system based on optical fiber interferometer.

► **Track 6. Fiber and Sensor Technologies**
► **Chair: Svetislav Savovic, University of Kragujevac, Serbia**
► **11:00-11:40 | June 29, 2025**

Qijun Sun 11:00-11:20	Qijun Sun, Guangdong University of Technology, China Speech Title: Flexible Tactile Sensing with Functional Composite Films Abstract: Flexible tactile sensors have good flexibility, stretchability, and high sensitivity, and have broad application prospects in fields such as health monitoring, human-computer interaction, and intelligent robots. The pressure-sensitive response layer is the core component of flexible tactile sensing devices and has a decisive impact on the sensing performance of the device. Among them, functional composite materials composed of conductive filling materials and polymers combine the good conductivity of filling materials with the flexibility and tensile properties of polymer materials, and have been widely used in flexible tactile sensors. Based on the composite material of graphite and PDMS, we have prepared a resistive flexible pressure sensor with a structure similar to human skin, demonstrating the application of the sensor in fields such as tactile perception, object roughness recognition, temperature perception, and intelligent robots. In addition, based on this composite material, self powered resistive tactile sensors and frictional tactile sensors have also been successfully prepared, demonstrating their potential applications in fields such as self-propelled wearable electronics and intelligent robot electronic skin.
Weili Zhang 11:20-11:40	Weili Zhang, University of Electronic Science and Technology of China, China Speech Title: Multimode Fiber Assistant Random Laser and Application Abstract: Multimode optical fibers can be regarded as a waveguide-limited scattering medium. Compared with conventional scattering media, they have low optical transmission loss, good directionality, and can provide a sufficient number of scattering channels, providing an excellent platform for optical control and other applications. By utilizing the sensitive characteristics of multimode fiber output speckles to wavelength and wavefront, the research group proposed a multimode fiber programmable optical filter based on wavefront control, and combined with Raman cascaded gain to achieve an intelligent controllable fiber laser with wavelength. This breakthrough overcame the problem of mutual constraints between output wavelength bandwidth and controllable accuracy. Based on a similar idea, we developed an optical random laser with self-mixing of output spectrum and spatial distribution, and applied it to sparse sampling for multi-dimensional information acquisition, achieving super-resolution imaging and spectral measurement.

► **Track 2. Optical Fiber Communication and Networks**
► **Track 4. Integrated Sensing and Communication and Signal Processing**
► **Chair: Ming Chen, Hunan Normal University, China**
► 13:30-15:00 | June 29, 2025 | Break Time: 15:00-15:20
► C3035, C3034, T001, C4074, C4056, C4060

Time	Paper Presentation
C3035 13:30-13:45	Title: Segmented Power Optimization for Achieving 800 Gbps Per-Channel Transmission in C+L+S Band Fiber Systems All Authors: Miao Gong, Min Ran, Xiao Xiao, Xuemeng Hu, Yuan Li, Ming Luo, Tianye Huang, Xiang Li, Zelin Gan Presenter: Miao Gong, China University of Geoscience (Wuhan), China Abstract: Ultra-wideband optical transmission systems operating, over the C+L+S bands are critical for meeting the growing demand for high-capacity networks. However, existing power optimization strategies typically based on coarse control using one slope and one offset per band struggle to achieve sufficiently flat SNR profiles, especially in the L-band. To address this limitation, we propose a segmented power allocation approach that models the L-band power distribution as multiple linear segments, each controlled by offset and slope parameters. Using particle swarm optimization (PSO) under the ISRS GN model, we evaluate various segmentation strategies in a 181-channel, 20 THz WDM system targeting 800 Gbps per-channel transmission. Experimental results demonstrate that segmenting the L-band into three or four regions significantly reduces SNR ripple to below 0.2 dB, improves minimum achievable data rate to over 797 Gbps, and maintains acceptable optimization time, offering a superior trade-off between performance and complexity.
C3034 13:45-14:00	Title: Improved Frequency Domain Equalizer with Carrier Phase and Frequency Offset Estimation and Transmitter IQ Skew Mitigation All Authors: Xuemeng Hu, Pengpeng Wei, Yuan Li, Ming Luo, Tianye Huang, Xiang Li Presenter: Xuemeng Hu, China University of Geoscience (Wuhan), China Abstract: We propose an improved frequency domain equalizer (FDE) which can effectively estimate and compensate carrier phase and frequency offset and mitigate the transtimtter IQ skew in coherent optical communications, and significantly reduce the computational complexity of time domain equalizer (TDE).
T001 14:00-14:15	Title: Self-Coherent Detection with Hermite-Gaussian Beams for Turbulence-Resilient Free-Space Optical Communication All Authors: Yunjie Hu, Xiong Deng, Bin Lv, Ziqiang Gao, Zhinan Sun, Hao Chen, Wenyuan Ma Presenter: Yunjie Hu, Southwest Jiaotong University, China Abstract: Atmospheric turbulence severely degrades free-space optical (FSO) communication by inducing modal power coupling and wavefront distortion. This paper investigates a pilot-assisted self-coherent detection scheme to mitigate such

	impairments. A simulation framework is developed incorporating Hermite-Gaussian beams, multi-phase-screen turbulence modeling, and full-link quadrature amplitude modulation (QAM) modulation and digital signal processing (DSP) processing. By exploiting spatial coherence between co-propagating data and pilot beams, the scheme suppresses turbulence-induced distortion without explicit channel estimation. Simulation results demonstrate enhanced mode confinement and improved error vector magnitude (EVM) under varying turbulence levels, confirming the feasibility of self-coherent detection for robust FSO communication.
C4074 14:15-14:30	Title: Innovative GPON Communication Framework for Reliable Differential Protection in Distribution Networks All Authors: Ying Zeng, Xingnan Li, Jiajia Fu, Rong Yang, Jia Ye Presenter: Ying Zeng, Electric Power Dispatching Control Center of Guangdong Power Grid Co., Ltd, China Abstract: This paper explores the deployment of a slicingenabled gigabit passive optical network (GPON) architecture to address the stringent communication requirements of differential protection in power distribution networks. Differential protection, a critical fault detection method, relies on synchronized current measurements exchanged between remote terminals within sub-millisecond intervals. Conventional GPON systems, designed for best-effort data services, lack mechanisms to ensure deterministic delay, secure transmission, and service isolation, which are essential for time-critical protection applications. To overcome these limitations, the proposed architecture integrates fixed-bandwidth transmission containers (T-CONTs, Type 1), dedicated GEM ports, IEEE 1588v2 time synchronization, and hard slicing mechanisms to guarantee bounded latency, minimal jitter, and robust service isolation. Additionally, a dual-bus protection design enhances fault tolerance and network resilience by providing redundant optical paths. The system's performance was validated through field tests on a live optical ring interconnecting substations and distribution nodes. Experimental results demonstrated that the end-to-end communication delay remained within 201 μs, well below the 300 μs threshold required for differential protection, even under traffic congestion. These findings confirm the feasibility of applying slicing-enabled GPON networks as secure, scalable, and low-latency communication solutions for digital power grid protection applications.
C4056 14:30-14:45	Title: High-speed DMT Signal and Power-over-fiber Simultaneous Transmission over Weakly-coupled Multicore Fiber All Authors: Wei Chen, Jianping Li, Xinkuo Yu, Jianbo Zhang, Songnian Fu, Yuwen Qin Presenter: Jianbo Zhang, Guangdong University of Technology, China Abstract: We experimentally demonstrate the 50 and 60 G-Baud 64-level quadrature amplitude modulation (QAM) high-speed optical discrete multi-tone (DMT) signal corresponding to the data rate of 117 Gbit/s and 140 Gbit/s, and 60-W power over fiber (PoF) energy light co-transmission over 1-km 7-core single-mode weakly coupled multi-core fiber (WC-MCF) for the first time. In this demonstration, the optical power

	transmission efficiency (OPTE) of energy light is up to 53.9%, and the collected optical power at the remote unit (RU) can be up tp 32.4 W. The bit error rate (BER) of 50-GBaud and 60-GBaud 64 QAM DMT signal in the intensity modulation direct detection (IM-DD) system at RU are all lower than the soft decision forward error correction (SD-FEC) threshold of 2E-2. The signal-to-noise ratio (SNR) of 50 G-Baud is more than 22 dB within the limits established in the 3rd Generation Partnership Project (3GPP) defined requirements.
C4060 14:45-15:00	Title: 225.26 Gb/s Net Rate Achieved in NANF-HCF with Bit Loading Probabilistic Shaping DMT Modulation All Authors: Zukai Sun, Jianping Li, Xinkuo Yu, Jianbo Zhang, Peng Li, Lu Dai, Songnian Fu, Yuwen Qin Presenter: Zukai Sun, Guangdong University of Technology, China Abstract: We experimentally demonstrate a short-reach optical transmission, integrating bit loading PS-DMT and NANF-HCF methodologies with a third-order VFFE equalizer, achieves a net data rate of 225.26 Gb/s over a 3 km link, which shows an improvement of 32.8 Gb/s compared to conventional systems.

► **Track 2. Optical Fiber Communication and Networks**
► **Track 4. Integrated Sensing and Communication and Signal Processing**
► **Chair: Yu Wang, Eindhoven University of Technology, the Netherlands**
► **15:20-17:05 | June 29, 2025**
► C4068, C4040, C3032, C3036, C3028, C4043, C3025

C4068 15:20-15:35	Title: Joint Digital Signal Processing Scheme for Super-Nyquist WDM System with Kramers-Kronig Receiver All Authors: Yingcao Zhuo, Jianping Li, Xinkuo Yu, Jianbo Zhang, Meng Xiang, Di Peng, Songnian Fu, Yuwen Qin Presenter: Jianping Li, Guangdong University of Technology, China Abstract: To reduce the hardware cost of the super-Nyquist wavelength division multiplexing optical communication systems, the joint digital signal processing scheme has been adopted with the Kramers-Kronig receiver, which can effectively reduce the required photodetectors with a comparison of the conventional coherent receiver. The simulation results show that the maximum net spectral efficiency can be realized to 8.0352 bit/s/Hz.
C4040 15:35-15:50	Title: Low-loss and Laser Damage Resistant O-band AWG Multiplexer All Authors: Jiahong Chen, Zhiyuan Zheng, Jiayu Liu, Qingran Liu, Pengju Hu, Chongfu Zhang Presenter: Jiahong Chen, University of Electronic Science and Technology of China, China Abstract: The next generation high-efficiency and high-power optical network requires high performance wavelength division multiplexer, which can withstand high power

	input with good optical performance such as insertion loss and channel crosstalk. In this paper, an improved design and packaging silica-based 1×4 O-band arrayed waveguide grating multiplexer is presented and demonstrated. The laser damage mechanism is studied and experimentally verified. The optical performance of the proposed design is tested and compared with the conventional multiplexer. These results show the proposed device can operate at a high 5W input power, and have insertion loss of 1.595dB, which is 1.5dB lower than the conventional packaged device under high power operation.
C3032 15:50-16:05	Title: 1.2Tbs (150Gbs×2×4) PM-PAM4 WDM Transmission over 10-km Hollow-core Fiber at C band based on TFLN Automatic Polarization Controller All Authors: Yuhan Gong, Chao Yang, Jin Tao, Ming Luo, Xiang Li, Ye Qiu, Chao Li, Zhixue He Presenter: Yuhan Gong, China Information and Communication Technologies Group Corporation (CICT) Wuhan, China Abstract: This paper presents a high-capacity optical interconnection solution for data centers, leveraging the synergistic integration of hollow-core fiber (HCF) and polarization multiplexing (PDM). Under the automatic polarization control algorithm, this paper innovatively proposes a multi-cycle FFT accumulation method for pilot tone extraction. By leveraging a frequency-domain signal enhancement mechanism, it overcomes the traditional limitation of pilot power ratio, achieving high-precision polarization tracking with as low as 1% resource occupation. Combined with a TELN polarization controller for dynamic polarization drift compensation, the system achieves a total capacity of 1.2 Tb/s (150 Gb/s ×4×2) PM-PAM4 signal transmission over 10 km HCF, utilizing 4- channel WDM-IM/DD transmission with a bit error rate (BER) below the 20% SD-FEC threshold of 2.4 × 10 -2 . Experimental validation on an FPGA platform demonstrates polarization tracking speeds exceeding 800 rad/s while maintaining negligible signal degradation. By exploiting HCF's ultra-low nonlinearity and broad bandwidth within an intensity modulation direct detection (IMDD) framework, this work establishes a cost- effective, high-compatibility Tb/s-level optical interconnection paradigm, paving the way for HCF's scalable deployment in next-generation ultra-high-speed computing networks.
C3036 16:05-16:20	Title: A CSQF-Based Deterministic Scheduling Scheme for Industrial Passive Optical Networks All Authors: Yichen Zong Presenter: Yichen Zong, Beijing University of Posts and Telecommunications, China Abstract: Industrial Passive Optical Networks (IPONs) are rising recently in industrial Internet scenarios due to their high reliability and low cost. However, traditional dynamic bandwidth allocation (DBA) schemes for IPON introduce latency and jitter uncertainty, challenging guaranteeing the delay requirement for industry networks. This paper proposes a CSQF-based scheduling scheme that integrates a multi-queue cyclic mechanism to reduce polling frequency and ensure bounded delay. Simulation results show a 47% reduction in ONU packet delay, over 50%

	fewer polling cycles, and a 42% decrease in end-to-end latency.
C3028 16:20-16:35	Title: Hybrid Sensing Strategy Using Pilot and Frame for OTFS-Based ISAC Systems All Authors: Xiaolin He Presenter: Xiaolin He, Southwest Jiaotong University, China Abstract: Orthogonal Time Frequency Space (OTFS) modulation has emerged as a promising candidate for Integrated Sensing and Communication (ISAC) in high-mobility environments. This paper presents a hybrid sensing strategy that jointly leverages both embedded pilot signals and the full OTFS frame to enhance sensing accuracy and resource efficiency. Specifically, the proposed algorithm is mainly divided into two stages. In the first stage, a matched filter is applied to the pilot-only response to yield a coarse estimate of the delay and Doppler shifts. In the second stage, this initial estimate is refined via quasi-Newton iterative search using the full-frame signal in delay-Doppler (DD) domain. The pilot facilitates fast localization of the target region, while the data frame enables fine-grained Doppler refinement. Compared to conventional full-grid matched filtering, the proposed hybrid method significantly can reduce complexity and achieve better sensing performance compared to two dimensional (2D) correlation algorithm. Simulation results confirm the effectiveness of this hybrid sensing approach for practical OTFS-ISAC implementations.
C4043 16:35-16:50	Title: Multi-scale Interactive Fusion Global-Local Network for Smoke Semantic All Authors: Yan Li, Xiang Li, Zexi Hua, Xuan Liu Presenter: Yan Li, Southwest Jiaotong University, Chengdu, China Abstract: Smoke semantic segmentation in early fire detection faces multiple challenges, with the translucency of smoke leading to boundary blurring, turbulent motion inducing dynamic morphological aberrations, and multi-scale diffusion characteristics in monitoring scenarios. In this paper, we propose a multi-scale global-local interaction fusion network (MIFGLNet) to achieve high-precision real-time smoke segmentation by synergistically optimizing the local texture perception of CNN and the global diffusion modeling capability of Transformer. Firstly, a multi-level feature complementary module (MFCM) is proposed to establish cross-branch interaction channels between the layers of the two-branch encoder, and adaptively fuse the local detail information and global long-range dependency information through a multi-level self-attention mechanism. A lightweight MLP multiscale decoder (MLPMFD) is constructed to replace the traditional inverse convolution with bilinear interpolative convolution to fuse multiscale information and reduce the number of parameters. Finally, an edge-sensitive loss function is designed to optimize the pixel-level classification stability in translucent regions. We conducted extensive experiments on the USS dataset, and the mIoU reaches 91.6%, which significantly outperforms existing methods.
C3025 16:50-17:05	Title: Research on Hierarchical Recognition Method for Long Channel Coding Types Based on Deep Learning All Authors: Weiran Zhang, Lin Liu, Ping Wang, Pu Zhang, Xuan Liu, Lingxin Yang

Presenter: Weiran Zhang, Southwest Jiaotong University, China

Abstract: In the process of signal transmission, the receiver obtains the data without channel decoding after a series of processing such as synchronization and demodulation of the received signal. In the case of non-cooperation, the encoded data cannot be directly decoded because the coding type of the data is unknown, and the coding type needs to be recognized first. In this paper, a hierarchical channel coding recognition scheme based on deep learning is proposed, which employs CNN-BiLSTM and CNN-LSTM models for multi-stage recognition. The system sequentially recognizes different coding types using raw encoded data, extracted code features, and IP matrices. Experimental results show that the proposed method achieves a recognition accuracy of 99.76% at bit error rate of 10-3, delivering robust recognition performance.

►Poster Session

Location: Meeting Room 2 故里厅

► **Chair: Yixian Dong, Southwest Jiaotong University**
► 14:00-14:40 | June 29, 2025

Time	Paper Presentation
C4064 14:00-14:10	Title: Reservoir Computing-Based Equalization for WDM-DP-16QAM Coherent Optical Communication All Authors: Lv Wentao, Dong Yixian, Zou Xihua, Pan Wei, Yan Lianshan Presenter: Wentao Lv, Southwest Jiaotong University, China Abstract: In long-haul optical communication systems, the complex interplay between Kerr nonlinearity, chromatic dispersion (CD), and amplified spontaneous emission (ASE) noise from in-line amplifiers makes digital signal processing (DSP)-based nonlinearity compensation computationally intensive and challenging. We propose an enhanced reservoir computing (RC) equalization architecture for a 7-channel WDM 16QAM coherent optical communication system. The performance of our proposed model is evaluated and compared with digital backpropagation (DBP) linear algorithms, original RC, and third-order Volterra architectures. The results demonstrate superior performance improvements than other equalizers.
C4079 14:10-14:20	Title: Study on High Frequency Characteristics of Terahertz Ridged Sine Waveguide All Authors: Yi Wang, Yao Li, Wei Wang, Haoying Wang Presenter: Yi Wang, Ocean University of China, China Abstract: In this paper, a ridged sine waveguide structure is proposed, which combines the smooth and continuous characteristics of the sine waveguide with the electric field concentration advantage of the ridged waveguide, intending to achieve a broader operating bandwidth and higher operating frequency in the terahertz frequency band. To verify the design scheme, the waveguide structure is simulated and analyzed using the high frequency simulation software CST, focusing on the effects of each structural parameter of the waveguide on the dispersion characteristics and coupling impedance. The simulation results show that the fundamental mode operating bandwidth of the designed waveguide reaches 87 GHz. The period length has the most significant effect on the dispersion characteristics, while the narrow-side has almost no impact on the dispersion characteristics; moreover, in the backward wave region, the variation of h has a more significant effect on the coupling impedance in the high frequency band. This study provides a novel design scheme for vacuum electronics-based terahertz wave sources, which has specific theoretical and engineering application value.
C4086 14:20-14:30	Title: High-Efficiency Thin-Film Lithium Niobate Modulator Enabled by Slow-Wave Electrode All Authors: Jiapeng Su, Xiaojun Xie, Yake Chen, Hua Liu, Wei Pan, Lianshan Yan Presenter: Jiapeng Su, Southwest Jiaotong University, China

Abstract: Thin-film lithium niobate (TFLN) modulators have emerged as a critical technology in modern photonic systems due to their exceptional performance metrics, including low driving voltage, ultrahigh bandwidth, and compact footprint. These attributes make them indispensable for applications in high-speed optical communications, coherent transmission systems, and microwave photonics. However, conventional electro-optic modulators are fundamentally constrained by a well-known trade off between operational bandwidth and half-wave voltage. To circumvent this limitation, we implemented a novel electrode design incorporating periodically capacitance-loaded traveling wave structures combined with substrate etching for precise velocity matching. In this work, we demonstrate a compact TFLN modulator with a device length of 5.8 mm, achieving a remarkable half-wave voltage length product of 2.2 V·cm while maintaining an electro-optic bandwidth of 67 GHz at 2 dB roll-off.

C3024
14:30-14:40

Title: Hybrid Grouped Transmission and Probabilistic Shaping for Mitigating High-SNR Nonlinearities in UV DCO-OFDM Communication System

All Authors: Junwei Li, Renzhi Yuan, Siming Wang, Chuang Yang, Mugen Peng
Presenter: Junwei Li, Beijing University of Posts and Telecommunications, China

Abstract: This paper focuses on the critical challenge of peak-to-average power ratio (PAPR)-induced nonlinear distortions in LED-based ultraviolet (UV) communication systems employing direct current-biased optical orthogonal frequency division multiplexing (DCO-OFDM). While DCO-OFDM enhances spectral efficiency, its high PAPR deteriorates LED nonlinear clipping effects, severely degrading bit-error rate (BER) performance at high signal-to-noise ratios (SNR). We propose a hybrid grouped transmission and probabilistic shaping (H-GTAPS) to mitigate these distortions in UV communications. By partitioning subcarriers into multiple LED-driven groups and optimizing symbol probability distributions via Maxwell-Boltzmann shaping, our proposed H-GTAPS method suppresses PAPR while maintaining spectral utilization. Simulation results demonstrate a significant PAPR reduction and improved BER performance under UV-LED nonlinearity compared to conventional schemes in UV communications. This work offers a feasible pathway to reconcile high-order modulation demands with LED hardware constraints.

►Online Sessions

► **Online Session 1**
► **Track 1. Wireless Communication and Networks**
► **Chair: Yi Zhou, Brunel University London, UK**
► 9:00-11:15 | June 29, 2025
► Zoom Link: https://us02web.zoom.us/j/89245014257 Password: 062729

Time	Paper Presentation
C4070 9:00- 9:15	Title: Lightweight Encryption for Data Security in Wireless Sensor Networks All Authors: Saiyidai Wufuer, Yasen Aizezi, Ayinuer Nuertai, Zhu Weiwei Presenter: Saiyidai Wufuer, Nanjing University of Posts and Telecommunications, China & Xinjiang Police College Urumqi, China Abstract: Wireless Sensor Networks (WSNs) require secure data transmission under strict resource constraints. This paper proposes LWC-WSN, a lightweight symmetric encryption scheme tailored for low-power sensor nodes. It features a 64-bit Feistel cipher and a truncated SHA-256 MAC, relying only on XOR, rotation, and small S-box operations. A dynamic key management protocol enables efficient session key updates and resynchronization. The scheme is implemented in a Python-based simulated WSN with 50 Docker-emulated nodes. Compared with AES-128 and LEA, LWC-WSN achieves lower encryption time, energy consumption, and communication overhead. Security simulations demonstrate strong resistance to differential, linear, and replay attacks. Implementation analysis confirms compatibility with embedded platforms such as TelosB and STM32. LWC-WSN provides a practical balance of performance, scalability, and security, making it suitable for real-world WSN deployments in energy-constrained environments.
C4059 9:15- 9:30	Title: Hybrid Precoding for Optoelectronic Base Station All Authors: Xiaofeng Su, Jian Song Presenter: Xiaofeng Su, Tsinghua University, China Abstract: An optoelectronic base station (OE-BS) architecture is proposed to mitigate the performance loss and computational overhead caused by the unimodular constraint in conventional analog precoding, wherein the phase-shifter network is replaced with an optical network. Optical components provide joint amplitude-phase control in the analog domain, eliminating the unimodular constraint and enhancing precoding flexibility. Based on the proposed OE-BS architecture, a user-selective hybrid precoding scheme is devised for wideband multi-user systems, wherein the analog precoder and power allocation are jointly optimized. Simulation results demonstrate the superior performance of the proposed OE-BS schemes.
C4077 9:30- 9:45	Title: Behavioral Analysis of Non-Steady-State Passive Intermodulation All Authors: Hong Zheng, Tian Qi, Yan Mao Presenter: Yilin Tan, University of Electronic Science and Technology of China, China Abstract: This study investigates the behavioral char-acteristics of non-steady-state PIM

	signals generated by small-area multi-point contact PIM sources in radiated RF environ-ments. Observations were conducted over millisecond-to-second intervals under both constant temperature and variable temperature scenarios to analyze PIM fluctuation dynamics. This study not only investigates the power variation in passive intermodulation but also conducts a comprehensive analysis of the power difference in PIM and its variation. Observations reveal that instability in PIM persists under constant temperature scenarios, alongside fluctuation patterns induced by temperature variations.
C3031 9:45-10:00	Title: Lightweight Complex-Valued Delay RBFNN For Predistortion of Wideband Power Amplifiers All Authors: Wanle Wang, Tingyong Wu, Jianhua Duan, Yilin Tan, Peixi Yu Presenter: Wanle Wang, University of Electronic Science and Technology of China, China Abstract: Convolutional Neural Networks (CNNs) have become the mainstream models for linearizing Power Amplifiers (PAs) in Digital Predistortion (DPD) technology due to their strong nonlinear fitting capabilities. However, existing neural network models often suffer from a large number of parameters and high computational complexity, leading to significant hardware resource consumption and challenges in practical deployment. This paper proposes a Lightweight Complex-Valued Delayed Radial Basis Function Neural Network (LW-CVDRBFNN), which reconstructs the Radial Basis Function (RBF) network to build a nonlinear layer supporting complex-valued inputs. This design directly processes the PA's In-phase and Quadrature (IQ) signals, avoiding the phase information distortion inherent in traditional real-valued networks. The model introduces Delay Cross-Terms, which nonlinearly couple the current input with delayed cross-terms to capture the PA's memory effects. Additionally, Gaussian kernels with learnable center points and bandwidth parameters are employed to dynamically adjust the activation function's form, adapting to the PA's nonlinear characteristics across different operating regions. We apply LW-CVDRBFNN to the linearization of two real-world PAs with operating bandwidths of 100MHz and 160MHz, respectively, and compare them with the latest neural networks, and the results show that LW-CVDRBFNN has better linearization capabilities. The model significantly reduces computational resource consumption while maintaining linearization performance, providing an efficient solution for the real-time deployment of DPD.
C4044 10:00-10:15	Title: PPO-based Joint Task Offloading and Resource Allocation for Vehicular Edge Computing via V2I and V2V Communications All Authors: Zhuo Hu, Min Guo, Chaoqun Liu Presenter: Xinyang Liu, Wuhan University of Technology, China Abstract: Advances in Intelligent Transportation Systems (ITS) and Vehicular Edge Computing (VEC) demand task-offloading and resource-allocation schemes that can guaran tee millisecond-level latency and high reliability. Yet most existing work overlooks the idle spectrum and computing resources avail able through Vehicle-to-Vehicle (V2V) links, leaving substantial efficiency untapped. This paper

	introduces a joint task offloading and resource allocation framework driven by Proximal Policy Optimization (PPO). We frame the problem as a Markov Decision Process (MDP) and train a PPO agent to select, for every task, among local execution, Vehicle-to-Infrastructure (V2I) offload, and V2V offload while allocating radio and CPU resources in real time. Extensive simulations show that the proposed method surpasses state-of-the-art baselines random, greedy, and Deep Q-Network (DQN) policies on both average latency and task completion ratio. Harnessing V2V links trims latency by 21.8% and raises the completion ratio by 10.5 percentage points. The PPO agent also converges faster and maintains robust perfor mance under highly dynamic traffic conditions, highlighting its practicality for real-world vehicular networks.
C2005 10:15-10:30	Title: Doppler Estimation for Aeronautical Satellite OFDM System Based on AoD and AoA All Authors: Houssein Boud, R. Rao Presenter: Houssein Boud, Western University, Canada Abstract: This Study investigates the potential approach of using Angle of Departure (AoD) and Angle of Arrival (AoA) to mitigate Doppler frequency for OFDM (Orthogonal Frequency Division Multiplexing) system in Aeronautical satellite mobile system. The Proposed approach is based on subspace estimation. The Doppler effect is one of the significant issues in implementing OFDM modulation in the mobile multipath channel since the received carrier frequency shifts, and Doppler spread results in inter-carrier interference (ICI). Utilizing both AoD and AoA will increase estimation accuracy. The satellite aeronautical channel is considered for evaluation in the proposed approach. Simulation results show improved error resolution estimation accuracy and the system performance for multiple Doppler shifts.
C2008 10:30-10:45	Title: Two Weighted lp-norm Based Multiuser Detection Algorithms for Uplink Grant-Free NOMA All Authors: Yi He, Xiaoxu Zhang, Zheng Ma, Quyuan Luo Presenter: Yi He, Southwest Jiaotong University, China Abstract: Grant-free non-orthogonal multiple access (GFNOMA) has become increasingly sophisticated in supporting massive machine-type communications (mMTC) in recent years. One of the current challenges in mMTC is multiuser detection (MUD). In this work, we propose two focal underdetermined system solver (FOCUSS) algorithms to address MUD in mMTC. Specifically, FOCUSS effectively addresses the issue of transmitting user information within a single time slot by introducing norm factor and regularization parameter. In practical MUD scenarios, the user's activity status remains unchanged within a certain timeframe. To enhance the efficiency of MUD, we devise the M-FOCUSS algorithm for data transmission in multiple time slots. Simulation results indicate that both the FOCUSS and MFOCUSS algorithms outperform conventional detectors.
C2011 10:45-11:00	Title: Queuing Theory-Based Task Offloading for Ground Satellite Edge-Cloud Computing All Authors: Yunmeng Wang, Tao Zhang

	Presenter: Yunmeng Wang, Beihang University, China Abstract: With the growing demand for computation, traditional computing methods are increasingly unable to meet the requirements of IoT applications. Satellite edge computing, leveraging the coverage advantages of low Earth orbit (LEO) satellites and the low-latency characteristics of edge computing, offers efficient support for remote and emergency scenarios. This paper constructs a " ground-satellite edge-cloud computing " architecture based on queuing theory and proposes a queuing optimization offloading strategy (QAFO) based on the Artificial Fish Swarm Algorithm (AFSA) to reduce task processing delays. Experimental results demonstrate that the QAFO algorithm effectively reduces average delay and enhances system performance while lowering algorithmic complexity.
C2004 11:00-11:15	Title: VANET Privacy Protection Protocol based on Claimable Ring Signature All Authors: Dan Yao, Siyuan Chen Presenter: Dan Yao, Shanghai University of Electric Power, China Abstract: The Vehicular Ad-hoc Network (VANET), as a core component of intelligent transportation systems, connects participants such as vehicles and roadside units (RSUs) through information and communication technologies to enhance traffic safety and optimize road usage efficiency. However, as VANET applications expand, the security of information exchange and the protection of user privacy have emerged as critical challenges. If private data such as vehicle locations and driving routes are leaked, users may face significant risks. Ring signature schemes have been applied in VANETs to provide information authentication while preserving user privacy. However, in scenarios requiring accountability, the anonymity of traditional ring signature schemes hinders the ability to trace vehicle responsibility. To address this issue, this study introduces a claimable ring signature scheme, which allows the signer to reveal their identity to meet legal accountability requirements. By designing a DualRing structure, the scheme reduces signature size using inner-product parameters and constructs a dynamic anonymous ring, enhancing the flexibility and efficiency of privacy protection. Experimental results show that, while maintaining computational costs comparable to those of DualRing, the communication overhead of the claimable ring signature scheme is significantly lower than that of existing ring signature schemes.

►Online Sessions

► Online Session 2
Track 3. Optical Wireless Communication and Networks
Track 4. Integrated Sensing and Communication and Signal Processing
Track 5. Space Communications, Navigation and Tracking
Track 7. Microwave Photonics and THz Technology
► Chair: Tingwei Wu, Chongqing University of Posts and Telecommunications, China
► 13:30-16:00 | June 29, 2025
► Zoom Link: https://us02web.zoom.us/j/89245014257 Password: 062729

Time	Paper Presentation
C4073 13:30-13:45	Title: Research on UAV Spoofed Signal Detection Based on Multipath Effect Modeling All Authors: Ayinuer Nuertai, Yasen Aizezi, Saiyidai Wufuer Presenter: Saiyidai Wufuer, Nanjing University of Posts and Telecommunications, China & Xinjiang Police College Urumqi, China Abstract: This paper proposes a UAV spoofed signal detection method that integrates multipath effect modeling with machine learning. First, the signal generation stage fully considers the multipath propagation characteristics present in real communication environments, while introducing Gaussian white noise to simulate more realistic normal and spoofed signal samples. Subsequently, various feature images are extracted from these signals, including power spectral density (PSD), spectrogram, and histogram, in order to comprehensively reflect different dimensional characteristics of the signals in the frequency domain, time-frequency domain, and amplitude distribution. For feature classification, a Support Vector Machine (SVM) is employed as the classifier to effectively distinguish between normal and spoofed signals. This method not only takes into account both the physical and statistical properties of the signals but also enhances the generalization and detection accuracy of the model, providing strong technical support for UAV communication security and abnormal signal identification.
C4062 13:45-14:00	Title: Lightweight Offloading with Task Dependency Awareness in ISCC-Enabled Vehicular Networks All Authors: Yao Yu, Meiwen Yang, Wenjian Hu, Qiuping Li, Xin Hao Presenter: Yao Yu, Northeastern University, China Abstract: This paper proposes a latency-minimization-oriented lightweight task offloading scheme (DM-LTOS) for Integrated Sensing, Communication, and Computing (ISCC)-enabled vehicular networks, aiming to minimize the total application completion latency of the system while ensuring sensing accuracy. Specifically, a spatially coupled task deduplication and merging model is designed to eliminate redundant tasks with spatiotemporal overlap under the constraint of task dependencies, thereby reducing computational load and improving task processing efficiency. Furthermore, a wireless resource pre-allocation method based on the Cramér-Rao Bound (CRB) is proposed to guarantee sensing accuracy and enhance task transmission rates. On this basis, a hybrid offloading algorithm combining Graph Convolutional Network (GCN) and Deep Reinforcement Learning (DRL) is constructed for dependent applications, enabling

	accurate capture of task dependencies and network dynamics to determine the optimal offloading strategy. Simulation results show that the proposed scheme reduces the total application completion latency of the system by 60.71% to 71.79% across various network scenarios by minimizing redundant task processing and improving resource utilization, effectively enhancing the system's real-time responsiveness and operational efficiency.
C4047 14:00-14:15	Title: ScaChain: A Hierarchical Blockchain Architecture for Scalable Data Management in IoV All Authors: Yao Yu, Wenjian Hu, Meiwen Yang, Qiuping Li, Xin Hao Presenter: Yao Yu, Northeastern University, China Abstract: In this paper, we propose a hierarchical blockchain architecture, namely ScaChain, for scalable data management in the Internet of Vehicles (IoV). ScaChain aims to enhance scalability in both storage and throughput of IoV data management. To improve storage scalability, ScaChain hierarchically stores IoV data in multiple blockchains partitioned by geographical regions. Specifically, ScaChain's hierarchical architecture consists of a cross-region chain that stores globally shared data and multiple DAG-structured intra-region chains that store locally shared data. To improve throughput scalability, we develop an adaptive throughput optimization algorithm for ScaChain based on Deep Reinforcement Learning (DRL). The algorithm maximizes throughput by adaptively adjusting blockchain configurations based on varying IoV resource conditions, while satisfying decentralization, security, and low-latency constraints. Simulation results demonstrate that our ScaChain achieves superior scalability in data storage and throughput compared to state-of-the-art blockchain architectures in the IoV.
C3026 14:15-14:30	Title: Terahertz Broadband RCS Reduction based on Polarization Conversion Metasurfaces All Authors: Tao Ma, Liping Liu, Xuehong Sun, Xin Jiang Presenter: Tao Ma, Ningxia University, China Abstract: Polarization conversion metasurfaces enhance stealth capabilities by changing the polarization state of electromagnetic waves and reducing the radar echo signal of the target. Firstly, this paper designs a polarization-conversion metasurface basic unit suitable for the terahertz band; Secondly, the cross-sectional area of broadband radar is reduced through different array layouts. The results show that the polarization conversion efficiency of the metasurface element exceeds 0.9 when electromagnetic waves are vertically incident within the frequency range of 0.817-1.703THz. Under the incident Angle of 0° to 40°, the polarization conversion efficiency exceeds 0.8 in multiple frequency bands. The radar cross section of different metasurface arrays are significantly reduced when electromagnetic waves are vertically incident.
C4082 14:30-14:45	Title: Real-Time Object Detection Algorithm for Railway Crack Inspection System Comparison of yolo v6, v7, v8 and NAS All Authors: Fadhlil Hamdi, Koredianto Usman, Gelar Budiman Presenter: Fadhlil Hamdi, Telkom University, Indonesia

	Abstract: The increasing intensity of train usage in big cities has resulted in some damage to the railroad tracks, one of the defects that appear is on the surface of the railroad, and this maintenance will require effort from workers every time to check and maintain the surface of the railroad periodically. This will have an impact on the need for labor if done manually for periodic inspections, and of course, will increase the need for operational costs and others. To streamline time efficiency in field inspections, we analyze and compare surface defect detection systems based on deep learning using several variations of the You Only Look Once Algorithm (YOLO): YOLOv6, YOLOv7, YOLOv8, and YOLO NAS. In addition, our experiments focus on the training results using the RSSD dataset consisting of high-speed rail (type1) and heavy rail (type2), We aim to assess the effectiveness of each model variation in detecting defects on the surface of the railroad tracks and performance matrices such as recall, precision, F1-Score and Mean Average Precision are used. In this research, the recall matrix is needed to minimize the false negative value to detect defects, so that the error is small when determining the point that must be repaired immediately. In accordance with the existing challenges from the Yolo v7, v8, and NAS data sets, they are good at remembering damaged objects during training and validation. While for Yolov6 it is low for the recall matrix but good for the precision matrix.
T002 14:45-15:00	Title: Package-Substrate Distributed Antenna with Shaped Beam for 5G Millimeter Wave Application All Authors: SongLing Peng, DongYao Wang, Yi Sun, YiXue Gu, ShaoWei Liao Presenter: SongLing Peng, Jiangsu Automation Research Institute, China Abstract: Integrated antenna technology is difficult to apply to 5G millimeter wave terminal due to the size restrictions of chip and package. In this paper, based on the idea of distributed antenna, a new design is proposed where Yagi antenna structure is adopted and distributed in the package and PCB substrate. Based on the working principle of Yagi antenna, the feeder is placed on package fabricated using LTCC processing technology, and the directors is placed on the PCB substrate. Thus, the PCB substrate structure is used to obtain a larger antenna aperture to effectively control the aperture field to shape the beam while reducing interconnection loss between package and PCB substrate to ensure radiation efficiency. According to different application scenarios, the same feeder on the package with different directors on the PCB substrates can obtain different performance such as gain and pattern, so as to achieve the effect of reusing the package. The simulation results show that the impedance bandwidth of the proposed distributed antenna is 26.5-29.5GHz (10.7%), and a shaped beam with isoflux pattern. The proposed design has good feasibility and is a good candidate as 5G millimeter wave terminal antenna.
C3019 15:00-15:15	Title: Compressed Sensing Based Indoor Visible Light Positioning for Multiple Targets with Cooperation All Authors: Bin Chen, Sicong Liu Presenter: Bin Chen, Xiamen University, China Abstract: In this paper, we propose a cooperative multiple targets positioning method

	using multi-measurement vector compressed sensing (MCS) for indoor industrial environments. The proposed method capitalizes on the inherent sparsity of spatially distributed targets, enabling accurate simultaneous localization. In our scheme, positioning signals emitted from LED anchors are processed through autocorrelation techniques, while leveraging cooperative information among multiple targets to obtain time difference of arrival (TDOA) measurements. By aggregating TDOA measurements collected from multiple spatially diverse LED reference anchors (RAs), an effective MCS-based model for cooperative multiple targets VLP is developed. Simulation results confirm that the proposed scheme provides robust and accurate localization performance, even in complex indoor conditions.
C3018 15:15-15:30	Title: Learning-Based VLC with Optical Reflecting Intelligent Surface against Eavesdropping All Authors: Hong Zhang, Sicong Liu Presenter: Hong Zhang, Xiamen University, China Abstract: The broadcast nature of visible light communication (VLC) inherently compromises data confidentiality in wireless transmissions. To address this vulnerability, we propose a learning-driven framework that leverages optical reflecting intelligent surface (ORIS) for multi-user secure VLC systems. Our approach optimizes both LED transmitter beamforming pattern and ORIS unit orientations, thereby enhancing secrecy capacity, signal quality, and energy efficiency. A novel reinforcement learning (RL)-based ORIS orientation scheme is introduced, employing rank correlation to reduce complexity in high-dimensional action spaces. Simulation results demonstrate that the RL-based framework significantly outperforms conventional methods in anti-eavesdropping performance, proving its efficacy in dynamic VLC environments.
C3020 15:30-15:45	Title: Research on TDOA localization strategy based on OSSA-Chan collaborative algorithm All Authors: Xuan'ang Peng, Sijie Li, Suiyuan Yang, Jiaqi Ren, Minghui Zhu Presenter: Xuan'ang Peng, National University of Defense Technology, China Abstract: In this paper, we propose a fusion OSSA-Chan cooperative localization method for the TDOA passive localization problem of remote islands and reefs. The position vector is constructed by WGS84-ECEF coordinate conversion, and the positioning model is constructed by TDOA algorithm. In order to improve the accuracy and stability of the traditional algorithm, the optimized sparrow search algorithm and Chan cooperative strategy are introduced. After the initial solving of Chan, the optimized sparrow search algorithm is used to disperse the search and iteratively find the optimal. The algorithm accelerates the optimization with the help of inverse learning strategy, avoids local optimization, and improves the search accuracy by the adaptive speed updating factor. Experiments show that the optimization ability and positioning accuracy of this algorithm are better than traditional methods. At the same time, this paper further analyzes the estimation of the target position of 4 base stations to provide theoretical and practical support for the solution of TDOA positioning model.

C2012 15:45-16:00	Title: OTFS-ISAC SDR Implementation and Experiment Testing fo UAV Micro-Doppler Analysis All Authors: Zikun Yang, Qianli Wang, Gang Liu, Zheng Ma Presenter: Zikun Yang, Southwest Jiaotong University, China Abstract: This paper proposes a software-defined radio (SDR) experimental system based on Orthogonal Time Frequency Space Integrated Sensing and Communication (OTFS-ISAC) to analyze micro-Doppler (MD) features of unmanned aerial vehicles (UAVs) in urban environments. OTFS modulation maps information symbols onto a two-dimensional delay-Doppler (DD) grid, effectively mitigating intercarrier interference (ICI) and Doppler shifts in high-mobility scenarios. This inherent coupling between the delay-Doppler domain and radar parameters enables the ISAC paradigm. However, traditional OTFS-ISAC systems struggle to identify UAVs in urban low-altitude settings due to their subtle micro-movements and complex electromagnetic environments, limiting the reliability of low-altitude security systems. We developed an SDR-based OTFS-ISAC UAV sensing system tailored for urban scenarios to address these challenges. The MD effect induced by UAV rotor rotation is analyzed through range filtering and joint time-frequency (TF) domain analysis to achieve UAV feature extraction. Real-world experiments demonstrate the effectiveness of the proposed OTFS-ISAC system in UAV MD analysis.