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

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

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

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

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

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

10:00-10:30 Coffee Break

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

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

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

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

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

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

12:00-13:30 Lunch Break

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

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

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

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

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

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

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

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

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

18:30-21:00 Banquet and Awards Ceremony

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

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

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

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

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

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

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

10:00-10:30 Coffee Break

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

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

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

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

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

12:00-13:30 Lunch Break

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

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

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

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

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

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

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

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

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

15:30-16:00 Coffee Break

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

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

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

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

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

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

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