Important Dates

July 21, 2016
Deadline for paper submission

Sep 30, 2016
Deadline for early bird registration

October 14, 2016
Deadline for postdeadline paper submission

Contact us

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Welcome Message

Asia Communications and Photonics Conference (ACP) is currently the largest conference in Asia-Pacific region on optical communications, photonics, optical sensing and relevant optoelectronic technologies. ACP comes from APOC and AOE, and it has been held annually tracing back to 2001. ACP is jointly sponsored by The Optical Society (OSA), the International Society for Optics and Photonics (SPIE), IEEE Photonics Society (IPS), The Chinese Optical Society (COS) and China Institute of Communications (CIC).

ACP 2016 together with the 9th International Photonics and OptoElectronics Meetings (POEM 2016), the 13th International Conference on Photonics and Imaging in Biology and Medicine (PIBM 2016), will be held in Shangri-La Hotel, Wuhan, on November 2-5, 2016.

We look forward to welcoming you to this exciting event in Wuhan!

News & Information

ACP 2016 Program (Click Here to Download)

Conference Venue: Shangri-La Hotel, Wuhan
Address: 700 Jian She Avenue, Hankou, Wuhan, 430015, China
Shangri-La Hotel, Wuhan is conveniently located in the heart of the Hankou business and financial district and is only a short 30-minute drive from Wuhan Tianhe International Airport, a 15-minute drive from Hankou Railway Station, a 30-minute drive from Wuchang Railway Station, and a 35-minute drive from Wuhan Railway Station. It is easily accessible from Metro Xianggang Road Station (Line 3). From the Exit A of the Metro Station, it only takes 4 minutes to get to the hotel.

Transportation:
From Wuhan Tianhe International Airport
By Airport Line & Metro: take Airport Bus Line 3 from Terminal 2 to Jinjia Dun Bus Station, walk for 4 minutes and switch to Metro Line 2 (toward Optics Valley Square direction) from Hankou Railway Station to Fanhu Station, transfer to Metro Line 3 (toward Hongtu Boulevard direction) and get off at Xianggang Road Station (Exit A), then walk to Shangri-La Hotel, Wuhan. (19 RMB)
By Taxi: 30-min drive (~70 RMB) *From Hankou Railway Station*
By Metro: take Line 2 (toward Optics Valley Square direction) from Hankou Railway Station to Fanhu Station, transfer to the Line 3 (toward Hongtu Boulevard) to Xianggang Road Station (Exit A), then walk to Shangri-La Hotel, Wuhan for 4 minutes. (2 RMB)
By Taxi: 15-min drive (~15 RMB)
From Wuchang Railway Station
By Metro: take Line 4 (toward Huangjinkou direction) from Wuchang Railway Station to Wangjiawan Station, transfer to Line 3 (toward Hongtu Boulevard) to Xianggang Road Station (Exit A), then walk to Shangri-La Hotel, Wuhan for 4 minutes. (4 RMB)
By Taxi: 30-min drive (~35 RMB)
From Wuhan Railway Station
By Metro: take Line 4 (toward Huangjinkou direction) from Wuhan Railway station to Hongshan Square, transfer to Line 2 (toward Jinyintan direction) to Fanhu Station, then switch to Line 3 (toward Hongtu Boulevard) to Xianggang Road Station (Exit A), then walk to Shangri-La Hotel, Wuhan for 4 minutes. (5 RMB)
By Taxi: 35-min drive (~55 RMB)

Registration

08:30-18:00	Wednesday, 2 November
07:30-18:00	Thursday, 3 November
08:00-18:00	Friday, 4 November
08:00-16:00	Saturday, 5 November

Speaker Preparation
All oral presenters should check in at the corresponding session room at least thirty minutes prior to their scheduled talk to upload and check their presentation. **No shows of the oral presentation will be reported to Conference management and these papers will not be published.**

Poster Preparation
Authors should prepare their poster before the poster session starts. The poster must not exceed the boundaries of the display board and A0 size is recommended. Authors are required to be standing by their poster for the duration of their allocated session to answer questions and further discuss their work with attendees. **No shows will be reported to Conference management and these papers will not be published.**
Location: Public area, 2nd floor, Shangri-La Hotel, Wuhan
Poster Board Size: 1m (Length) *2.235m (Height)
Set-up Time: Thursday, November 3 from 09:00-18:00 **Tear-down Time:** Friday, November 4 from 12:30-18:00

Exhibition
The ACP Exhibition is open to all attendees.
Location: Public area, 2nd and 3rd Floor, Shangri-La Hotel, Wuhan
Hours:

Registration (Mainland China)

Registration (Outside Mainland China)

Postdeadline Paper Submission

Hosted by:

Organized by:

Co-organized by:

Technically Sponsored by:

Sponsors:

Conference Schedule

	Tuesday 1 November	Wednesday 2 November	Thursday 3 November	Friday 4 November	Saturday 5 November	Venue
Registration		08:30-18:00	07:30-18:00	08:00-18:00	08:00-16:00	Public area face to the escalator, F2, Shangri-La Hotel, Wuhan
Workshops	09:00-12:20 13:30-17:30	09:00-12:30 14:30-18:00 19:30–21:30				B1, F2 and F3, Shangri-La Hotel, Wuhan / Beijing-Hall Hilton Wuhan Optics Valley, No. 9 Chunhe Road Huashan Eco. City, Wuhan
Sino-French Forum		09:00-18:00				Xiao Gan, B1, Shangri-La Hotel, Wuhan
Industry Forums		09:00-18:00				(AM) Jing Men, B1; Xian Tao, F3; (PM) Jing Men, B1, Shangri-La Hotel, Wuhan
Opening Ceremony			08:00–08:30			Grand Ballroom (Han Kou, Wu Chang, and Han Yang), F2, Shangri-La Hotel, Wuhan
Plenary and Light the Future Session			08:30–12:45			Grand Ballroom (Han Kou, Wu Chang, and Han Yang), F2, Shangri-La Hotel, Wuhan
Technical Sessions			14:30–18:00	08:30-18:00	08:30-15:30	B1, F2 and F3, Shangri-La Hotel, Wuhan
Exhibition			09:00-18:00	08:00-18:00	08:00-16:00	Public area, F2 and F3 Shangri-La Hotel, Wuhan
Welcome Reception & OSA 100th Anniversary Celebration			18:30–21:30			Grand Ballroom (Han Kou, Wu Chang, and Han Yang), F2, Shangri-La Hotel, Wuhan
Poster Session				10:30–12:30		Public area, F2, Shangri-La Hotel, Wuhan
Best Student Paper Competition Sessions				14:00–16:00		Sui Zhou, F3; Huang Shi, F2; Shangri-La Hotel, Wuhan
Postdeadline Sessions					16:00–17:30	Han Yang, Wu Chang, F2, Shangri-La Hotel, Wuhan
Banquet and Awards Ceremony				18:45–21:30		Grand Ballroom (Han Kou, Wu Chang, and Han Yang), F2, Shangri-La Hotel, Wuhan

Thursday, 3 November

07:30–18:00	**Registration,** *Public area face to the escalator, 2nd Floor, Shangri-La Hotel, Wuhan*											**Exhibition Area**
08:00–08:30	**Opening Ceremony,** *Grand Ballroom (Han Kou, Wu Chang, and Han Yang), 2nd Floor, Shangri-La Hotel, Wuhan*											
08:30–12:45	**ATh1A • Plenary and Light the Future Session,** *Grand Ballroom (Han Kou, Wu Chang, and Han Yang), 2nd Floor, Shangri-La Hotel, Wuhan*											
11:00–11:15	**Coffee Break & Poster Preview & Exhibition,** *Public area, 2nd and 3rd Floor, Shangri-La Hotel, Wuhan*											
12:45–14:30	**Lunch Break,** *Café Wu, 1st Floor, or Shang Palace, 2nd Floor, Shangri-La Hotel, Wuhan*											
	Room: En Shi, F3	**Room: Sui Zhou, F3**	**Room: Huang Shi, F2**	**Room: Han Yang, F2**	**Room: Xian Tao, F3**	**Room: Wu Chang, F2**	**Room: Han Kou, F2**	**Room: Shi Yan, B1**	**Room: Jing Men, B1**	**Room: Xiao Gan, B1**	**Room: Xiang Yang, F3**	
14:30–16:00	**ATh2A • Photonics and Novel Devices**	**ATh2B • Novel Fibers and Applications I**	**ATh2C • SDM & OAM Transmission I**	**ATh2D • Digitial Signal Processing I**	**ATh2E • SDM Network and Node**	**ATh2F • Silicon-based Light Source**	**ATh2G • Silicon Photonics** *(ends at 16:15)*	**ATh2H • Si Waveguide Based Data Processing**	**ATh2I • Perovskite Solar Cells I**	**ATh2J • Optical Storage for Big Data**	**ATh2K • Spectroscopic Methods** (ends at 16:15)	**Conference Exhibition**
16:00–16:30	**Coffee Break & Poster Preview & Exhibition,** *Public area, Basement, 2nd and 3rd Floor, Shangri-La Hotel, Wuhan*											
	Room: En SHI, F3	**Room: Sui Zhou, F3**	**Room: Huang Shi, F2**	**Room: Han Yang, F2**	**Room: Xian Tao, F3**	**Room: Wu Chang, F2**	**Room: Han Kou, F2**	**Room: Shi Yan, B1**	**Room: Jing Men, B1**	**Room: Xiao Gan, B1**	**Room: Xiang Yang, F3**	
16:30–18:00	**ATh3A • Fiber Lasers I**	**ATh3B • Optical Fiber Technology**	**ATh3C • Advanced Modulation Formats & Multiplexing Schemes**	**ATh3D • Visible Light and Free-Space Com-munications**	**ATh3E • Data Center Networks**	**ATh3F • Active Devices**	**ATh3G • Nonlinear Optics and Applications**	**ATh3H • Microwave Photonic Devices and Links**	**ATh3I • Perovskite Solar Cells II**	**ATh3J • Ultrafast Photonics and Its Applications**	**ATh3K • Sensors**	
18:30–21:30	**Welcome Reception & OSA 100th Anniversary Celebration,** *Grand Ballroom (Han Kou, Wu Chang, and Han Yang), 2nd Floor, Shangri-La Hotel, Wuhan*											

08:00–18:00 Registration, *Public area face to the escalator, 2nd Floor, Shangri-La Hotel, Wuhan*

08:00–08:30 Opening Ceremony, *Grand Ballroom (Han Kou, Wu Chang, and Han Yang), 2nd Floor, Shangri-La Hotel, Wuhan*

08:30–12:45 ATh1A • Plenary and Light the Future Session, *Grand Ballroom (Han Kou, Wu Chang, and Han Yang), 2nd Floor, Shangri-La Hotel, Wuhan*

ATh1A.1 • 08:30 Plenary
Light in a Twist: Optical Angular Momentum, Miles J. Padgett; *University of Glasgow, Scotland, UK.* In 1992 Allen et al. recognized that light beams carrying an orbital angular momentum, in addition to the photon spin, could be created in the laboratory. This twist can be generated using lenses, or holograms encoded onto liquid crystal displays. Both whole beams and single photons can carry this twist, or transfer it to particles causing them to spin. In this talk I will introduce the underlying properties and discuss a number of manifestations of orbital angular momentum. These various demonstrations by our own group and others highlight how optics still contains surprises and opportunities for micro-manipulation, novel imaging modalities and high bandwidth communication in both the classical and quantum worlds. Our most recent work considers how a rotational form of the classical Doppler effect might by used to sense the rotation of distant bodies, even when the linear effect is zero.

ATh1A.2 • 09:15 Plenary
Innovations Abound in Functional Optical Communications, Alan E. Willner; *University of Southern California, USA.* Optical communication systems have achieved great success over the past several decades in terms of capacity growth and deployment. Looking into the future, optical communications continues to innovate, with advances in functionality, reconfigurability, integratability, and stability. This presentation will highlight recent innovations and future potential of high-capacity and highly functional systems that may make use of optical signal processing, being a broadly defined term.

ATh1A.3 • 10:00 OSA | 100
OSA's Light the Future Series: How Optics Will Revolutionize the World, Steven Chu; *Nobel Laureate, former U.S. Secretary of Energy, USA.* From energy to biomedicine, optics and photonics research will have a profound effect on the global economy and our everyday lives. Batteries will store renewable energy for on demand usage. Medical diagnostics tools will become more mobile, bringing improved healthcare opportunities to remote locations. Many innovations will stretch beyond our planet. With the discovery of gravitational waves by the global team of scientists working on LIGO, optics is expanding scientific frontiers. This talk will touch on the predictions for optics inventions that will revolutionize the world.

11:00–11:15 Coffee Break & Poster Preview & Exhibition, *Public area, 2nd and 3rd Floor, Shangri-La Hotel, Wuhan*

ATh1A.4 • 11:15 Plenary
Photoacoustic Tomography: Ultrasonically Beating Optical Diffusion and Diffraction, Lihong V. Wang; *Washington University in St. Louis, USA.* Photoacoustic tomography has been developed for in vivo functional, metabolic, molecular, and histologic imaging by physically combining optical and ultrasonic waves. Broad applications include early-cancer detection and brain imaging. High-resolution optical imaging is limited to superficial imaging within the optical diffusion limit of the surface of scattering tissue. By synergistically combining light and sound, photoacoustic tomography provides deep penetration at high ultrasonic resolution and high optical contrast.

ATh1A.5 • 12:00 Plenary
Perfect Optical Fibers, Jonathan Knight; *University of Bath, UK.* State-of-the-art single-mode optical fibers have exceptional performance, but they are far from perfect. As well as imposing distortions on the transmitted light through the effects of dispersion and nonlinearity, they have fundamental limitations such as their spectral transparency and material breakdown. This talk will explore how much better we can do by using the alternative waveguide physics of optical fibers with a hollow core.

12:45–14:30 Lunch Break, *Café Wu, 1st Floor, or Shang Palace, 2nd Floor, Shangri-La Hotel, Wuhan*

08:00–18:00 Registration, *Public area face to the escalator, 2nd Floor, Shangri-La Hotel, Wuhan*

08:00–08:30 Opening Ceremony, *Grand Ballroom (Han Kou, Wu Chang, and Han Yang), 2nd Floor, Shangri-La Hotel, Wuhan*

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12:45–14:30 Lunch Break, *Café Wu, 1st Floor, or Shang Palace, 2nd Floor, Shangri-La Hotel, Wuhan*

Room: En SHI, F3

14:30–16:00
ATh2A • Photonics and Novel Devices
Presider: Liang Dong; Clemson Univ., USA

ATh2A.1 • 14:30 Tutorial
Harnessing Stimulated Brillouin Scattering in Photonic Integrated Circuits for Signal Processing, Benjamin J. Eggleton[1]; [1]*Univ. of Sydney, Australia*. On-chip Stimulated Brillouin scattering (SBS) is the focus of current research because of its potential for integration of a variety of important photonic functionalities. Here, we demonstrate record high chip-based SBS of over 50dB net-gain which allows for advanced microwave photonic signal processing applications.

Room: Sui Zhou, F3

14:30–16:00
ATh2B • Novel Fibers and Applications I
Presider: Limin Tong, Zhejiang University, China

ATh2B.1 • 14:30 Invited
Ultrathin Optical Fibers for Particle Trapping and Manipulation, Aili Maimaiti[1,2], Viet Giang Truong[1], Sile Nic Chormaic[1]; [1]*Okinawa Inst of Science & Technology, Japan;* [2]*Univ. College Cork, Ireland*. We present experimental and theoretical results on chains of microparticles optically bound in the evanescent field of ultrathin optical fibers that can support the fundamental, LP_{01}, and first group, LP_{11}, of higher order fiber modes.

Room: Huang Shi, F2

14:30–16:00
ATh2C • SDM & OAM Transmission I
Presider: Lianshan Yan; Southwest Jiaotong Univ., China

ATh2C.1 • 14:30
Crosstalk-aware Routing, Spectrum, and Core Assignment in Elastic Optical Networks with Multi-core Fibers, Qiuyan Yao[1], Hui Yang[1], Yongli Zhao[1], Ruijie Zhu[1], Jie Zhang[1], jing wu[1]; [1]*BUPT, China*. We make a specific analysis about the transmission crosstalk in elastic optical networks with multi-core fibers. Based on the proposed concept of spare spectrum availability (SSA), a crosstalk-aware routing, spectrum, and core assignment (RSCA) algorithm is presented to improve the spectrum resource utilization and reduce blocking.

ATh2C.2 • 14:45
Free Space to Single Mode Fiber Coupling Efficiency Improvement using Wave-front Sensor-less Adaptive Optics, Beibei Li[1], Yan Li[1], Donghao Zheng[1], Deming Kong[1], Jian Wu[1]; [1]*Beijing Univ. of Posts and Telecommunications, China*. We demonstrate that a wave-front sensorless adaptive optics system based on SPGD algorithm improves fiber coupling efficiency by 2.0 dB, 5.6 dB and 12.1 dB under weak, moderate and strong turbulence, respectively.

Room: Han Yang, F2

14:30–16:00
ATh2D • Digitial Signal Processing I
Presider: Qi Yang, WRI, China

ATh2D.1 • 14:30
Generation and Detection of 170.49-Gb/s Single Polarization IM/DD Optical OFDM Signals Enabled by Volterra Nonlinear Equalization, Yicheng Zheng[1], Junwei Zhang[1], Xuezhi Hong[1], ChangJian Guo[1]; [1]*South China Normal Univ., China*. We demonstrate the generation and detection of 170.49-Gb/s single-wavelength and single-polarization IM/DD optical OFDM signals using Volterra-based two-step nonlinear equalization. A line rate of 164.35-Gb/s is achieved after 2-km of fiber transmission.

ATh2D.2 • 14:45
Self-Cancellation of Sampling Frequency Offset in Adaptively Modulated IMDD-OFDM Systems, Ming Chen[1], Qinghui Chen[2], Rui Deng[2], Hui Zhou[1], Zhiwei Zheng[1], Jing He[2], Lin Chen[2]; [1]*College of Physics and Information Science, Hunan Normal Univ., China;* [2]*College of Computer Science and Electronic Engineering, Hunan Univ., China*. We propose and experimentally demonstrate a phase rotation modulation-based SFO self-cancellation scheme in adaptively modulated IMDD-OFDM systems. Phase rotations induced by up to 200 ppm SFO can be corrected with negligible impact on transmission performance.

Room: Xian Tao, F3

14:30–16:00
ATh2E • SDM Network and Node
Presider: Yabin Ye; Huawei Technologies Duesseldorf GmbH, Germany

ATh2E.1 • 14:30 Invited
Mode-division-multiplexing Passive Optical Network Based on Low-crosstalk Few-mode Fiber and Components, Juhao Li[1], Tao Hu[1], Fang Ren[1], Dawei Ge[1], Zhengbin Li[1], Zhangyuan Chen[1], Yongqi He[1]; [1]*Peking Univ., China*. In this paper, we discuss the concepts of multidimensional PONs and MDM optical switching networks. Thanks to low-modal crosstalk FMF, mode MUX/DeMUX and FMCs, no coherent detection or complex MIMO DSP is required.

Room: Wu Chang, F2

14:30–16:00
ATh2F • Silicon-based Light Source
Presider: Siyuan Yu; Univ. of Bristol, UK

ATh2F.1 • 14:30 Tutorial
Silicon-based III-V Quantum-dot Lasers for Silicon Photonics, Huiyun Liu[1]; [1]*Univ. College London, UK.* Monolithically integrating III-V lasers on Si is the most promising solution for light sources on silicon. We demonstrated the first long lifetime for telecommunications-wavelength InAs/GaAs quantum-dot laser monolithically grown on silicon substrates.

Room: Han Kou, F2

14:30–16:00
ATh2G • Silicon Photonics
Presider: Po Dong, Nokia Bell Labs, USA

ATh2G.1 • 14:30 Keynote
Towards 2 - 14μm Silicon Photonics, Graham T. Reed[1]; [1]*Univ. of Southampton, UK.* We are developing three integrated photonics platforms to cover the 2 - 14μm wavelength range. This paper offers a review of passive and active photonic devices in these three material platforms: germanium on silicon, suspended silicon and silicon on insulator (SOI).

Room: Shi Yan, B1

14:30–16:00
ATh2H • Si Waveguide Based Data Processing
Presider: Gong-Ru Lin; Taiwan Univ., Taipei

ATh2H.1 • 14:30 Invited
All – Optical Signal Processing on Silicon – Based Platforms, Dawn T. Tan[1]; [1]*Singapore Univ of Technology and Design, Singapore.* In this paper, we present recent research progress in on – chip wavelength and mode division multiplexing strategies and silicon – based nonlinear optics with high nonlinear figures of merit.

Room: Jing Men, B1

14:30–16:00
ATh2I • Perovskite Solar Cells I
Yinhua Zhou; Huazhong Univ. of Science and Technology, China

ATh2I.1 • 14:30 Tutorial
Efficient and Stable of Perovskite Solar Cells, Jingbi You[1], Qi Jiang[1], Xingwang Zhang[1]; [1]*Inst. of Semiconductors, China.* We have adopted all metal oxide layers as the charge transport layers, which has significantly improved the device stability. The improvement come from the avoid the interfacial degradation.

Room: Xiao Gan, B1

14:30–16:00
ATh2J • Optical Storage for Big Data
Presider: Changsheng Xie; Wuhan National Lab for Optoelectronics, China

ATH2J.1 • 14:30 Tutorial
Big Data Storage Solution: Collinear Holographic Data Storage System, Xiaodi Tan[1], Hideyoshi Horimai[2], Ryo Arai[3], Junichi Ikeda[3], Mitsuteru Inoue[4], Xiao Lin[1], Ke Xu[1], Jinpeng Liu[1], Yong Huang[1]; [1]*Beijing Inst. of Technology, China;* [2]*HolyMine Corporation, Japan;* [3]*Kyoeisha Chemical Co., LTD, Japan;* [4]*Toyohashi Univ. of Technology, Japan.* We introduced the principle of the collinear holography and its media structure of disc, and discussed some methods to increase the recording density and data transfer rates of using phase modulated page data format.

Room: Xiang Yang, F3

14:30–16:15
ATh2K • Spectroscopic Methods
Presider: Juergen Popp; Leibniz Inst. of Photonic Technology, Germany

ATh2K.1 • 14:30 Invited
Laser Applications in Food Monitoring and Infectious Disease Diagnostics, Katarina Svanberg[1,2], Hao Zhang[1], Huiying Lin[1], Tianqi Li[1], Wansha Li[1], Sune R. Svanberg[1,2]; [1]*Center for Optical and Electromagnetic Research, South China Normal Univ., China;* [2]*Lund Laser Center, Lund Univ., Sweden.* Food safety and unnecessary prescription of antibiotics are real concerns worldwide. Laser-based spectroscopy research at both South China Normal Univ. as well as at Lund Univ., Sweden to meet these problems will be covered.

Room: En SHI, F3

ATh2A.2 • 15:30
Graphene-Induced Losses for Cladding Modes of Optical Fibers, Ting Hao[1], Kin S. Chiang[1]; [1]*City Univ. of Hong Kong, Hong Kong.* We demonstrate theoretically and experimentally that graphene-induced losses for the cladding modes propagating along a graphene-coated fiber increase with the surrounding refractive index, which could be explored for the realization of intensity-based refractive-index sensors.

Room: Sui Zhou, F3

ATh2B.2 • 15:00 Invited
High stability noise-like pulse generation from passively mode-locked thulium-doped fiber laser, Fengping Yan[1]; [1]*Beijing Jiaotong Univ., China.* Abstract not available.

ATh2B.3 • 15:30
Large Pitch Nodeless Hollow-Core Fiber for Visible Guidance, Shoufei Gao[1], Yingying Wang[1], Xiaolu Liu[1], Shuai Gu[1], Pu Wang[1]; [1]*Beijing Univ. of Technology, China.* We report a nodeless large pitch hollow-core fiber guiding in visible spectral range with low transmission loss of 80 dB/km @ 532 nm, broad transmission bandwidth from 450 nm to 1200 nm, low bending loss, and single

Room: Huang Shi, F2

ATh2C.3 • 15:00 Invited
Optical MIMO Techniques for MDL Mitigation in Few-Mode Fiber Transmission Systems, Yves Jaouen[1], El-Mehdi Amhoud[1], Ghaya Rekaya-Ben Othman[1]; [1]*Telecom ParisTech, France.* Accumulated MDL introduces penalties and reduces the capacity of SDM systems. We investigate different MIMO techniques to reduce impact of MDL such as optimized mode scrambling strategy and/or DSP solutions based on Space-Time coding techniques.

ATh2C.4 • 15:30
Mode Conversion Technology Based on Adaptive Simulated Annealing Algorithm, Jia Ye[1], Luyao Li[1], Lianshan . Yan[1]; [1]*Southwest Jiaotong Uni., China.* An improved adaptive simulated annealing algorithm is proposed to generate phase hologram for mode conversion between arbitrary optical modes. The simulation and experiment results have verified the effectiveness of the proposed method.

Room: Han Yang, F2

ATh2D.3 • 15:00
A Sign Bit Summation based Symbol Synchronization Method for Real-time IMDD-OOFDM Systems, Zhen Zhang[1], Qianwu Zhang[1], Weiliang Wu[1], Junjie Zhang[1], Yongxiong Song[1]; [1]*Shanghai Univ., China.* A low-complexity symbol synchronization method based on sign bit summation is proposed and implemented in FPGA-based real-time IMDD-OOFDM receivers. The proposed synchronization method can achieve an acquisition probability of 0.9999 under ROP of −20.5dBm.

ATh2D.4 • 15:15 Invited
Nonlinear Fiber-Optic Communications Using Nonlinear Frequency Division Multiplexing, Tao Gui[2], ZhenHua Dong[2], Kang Ping Zhong[1], Chao Lu[1], P.K.A. Wai[1], Alan Pak Tao Lau[2]; [1]*Department of Electronic and Information Engineering, Hong Kong Polytechnic Univ., Hong Kong;* [2]*Department of Electrical Engineering, The Hong Kong Polytechnic Univ., Hong Kong.* Nonlinear Frequency Division Multiplexing(NFDM) based on Nonlinear Fourier Transform(NFT) recently gains attraction as a new communication strategy for nonlinear optical communications. We review recent developments and discuss key challenges in NFDM research.

Room: Xian Tao, F3

ATh2E.2 • 15:00
A Scattered-Spectrum-Scan Routing and Spectrum Allocation Scheme for Spatial-Division-Multiplexing Optical Networks Based on Blocking OXCs, Yu Yang[1], Xin Chen[1], Han Yan[2], Bo Hua[2], Juhao Li[1], Yumeng Hao[1], Zhangyuan Chen[1], Yongqi He[1]; [1]*Peking Univ., China;* [2]*Systems Engineering Research Inst.,CSSC, China.* We propose a novel scattered-spectrum-start-scan routing and spectrum allocation scheme for spatial-division-multiplexing optical networks based on OXCs with blocking switching architecture. The scheme can significantly reduce computational complexity with the same blocking performance.

ATh2E.3 • 15:15
Experimental Demonstration of Wavelength Reused MDM-PON with Rayleigh Backscattering Mitigation, Jinglong Zhu[2], Yuanxiang Chen[2], Bo Hua[1], Han Yan[1], Juhao Li[2], Zhongying Wu[2], Kaiwei Zhang[2], Dawei Ge[2], Zhangyuan Chen[2], Yongqi He[2]; [1]*Systems Engineering Research Inst.,CSSC, China;* [2]*State Key Laboratory of Advanced Optical Communication Systems and Networks, Peking Univ., China.* We propose and experimentally demonstrate a wavelength reused bidirectional MDM-PON for high-speed access network. A novel Rayleigh backscattering mitigation scheme by utilizing different sideband for US/DS transmission is proposed to improve US receiver sensitivity.

ATh2E.4 • 15:30
Contaminated Area-based RSCA Algorithm for SuperChannel in Flex-Grid Enabled SDM Networks, Zhun Shi[1], Yongli Zhao[1], Xiaosong Yu[1], Yajie Li[1], Jie Zhang[1], Chuan Liu[2], Gang Zhang[2], Zhu Liu[3]; [1]*Beijing Univ of Posts & Telecom, China;* [2]*Global Energy Interconnection Research Inst., China;* [3]*State Grid Information & Telecommunication Group Co., LTD., China.* A routing, spectrum and core assignment (RSCA) algorithm is proposed based on contaminated area to support super-channel in flex-grid enabled SDM networks. Simulation results show the proposed algorithm can achieve better performance than benchmark algorithms.

Room: Wu Chang, F2

ATh2F.2 • 15:30 Invited

Monolithic/Heterogeneous Integration of IIIV Lasers on Si, Zhechao Wang[1,2], Clement Merckling[2], Marianna Pantouvaki[2], Joris Van Campenhout[2], Geert Morthier[1], Gunther Roelkens[1], Dries Van Thourhout[1]; [1]*Photonics Research Group, Ghent Univ./IMEC, Belgium;* [2]*IMEC, Belgium.* In the paper, we elaborate our recent work on both monolithic (epitaxial growth) and heterogeneous (BCB bonding) integration techniques that enable integration of various IIIV lasers on silicon.

Room: Han Kou, F2

ATh2G.2 • 15:00 Invited

Equivalent Circuit Models for Silicon Photonics Devices, Woo-Young Choi[1], Myungjin Shin[1], Jeong-Min Lee[1], Lars Zimmermann[2]; [1]*Electrical & Electronic Engineering, Yonsei Univ., Korea;* [2]*IHP, Germany.* We present equivalent circuit models for Si micro-ring modulators and Ge-on-Si photodetectors. Model parameters are extracted from measurement and simulation. These circuit models are very useful for designing Si photonic and electronic ICs.

ATh2G.3 • 15:30 Invited

Silicon Photonics as a Post-Moore Photonic Circuit Technology, K. Yamada, *National Institute of Advanced Industrial Science and Technology, Japan.* Capacity of data transmission systems is growing explosively while device/circuit technology development along Moore's law nears its end. Although silicon photonics offers immediate solutions, further evolution is needed for the continual growth in the future.

Room: Shi Yan, B1

ATh2H.2 • 15:00

Diverse dynamics in silicon photonic crystal nano-cavities towards photonic microwave and secure communications, Jia-Gui Wu[1,2], Shu-Wei Huang[2], Hao Zhou[2], Ling Chen[1], Fei Wang[3]; [1]*College of Electronic and Information Engineering, Southwest Univ., China;* [2]*Mesoscopic Optics and Quantum Electronics, Univ. of California Los Angeles, USA;* [3]*School of Electrical and Electronic Engineering, Chongqing Univ. of Technology, China.* We experimentally demonstrate the low noise radio-frequency and complex chaos dynamics in photonic crystal (PhC) nano-cavity for applications of photon-microwave and cryptography, achieved through dual-coupled nonlinear radiation pressure and free-carrier Drude plasma.

ATh2H.3 • 15:15

4-Gbit/s All-optical Switching for SiC Micro-ring Resonator by Using FCA and Kerr Effects, Cai-Syuan Fu[1], Bo-Ji Huang[1], Chih-Hsien Cheng[1], Cheng-Ting Tsai[1], Huai-Hung Wang[1], Yu-Chieh Chi[1], Gong-Ru . Lin[1]; [1]*Graduate Inst. of Photonics and Optoelectronics, National Taiwan Univ., Taiwan.* 4-Gbit/s all-optical cross-wavelength data conversion with an extinction ratio of 14 dB for SiC micro-ring resonator is demonstrated by the hybrid free carrier absorption and Kerr effects.

ATh2H.4 • 15:30

Multi-wavelength regeneration experiments using clock-pump FWM in silicon waveguides, Yong Geng[1], Baojian Wu[1], Feng Wen[1], Xingyu Zhou[1], Heng Zhou[1], Kun Qiu[1]; [1]*Univ. of Electronic Science and Technology of China, China.* All-optical three-wavelength regeneration based on the clock-pump FWM scheme was experimentally illustrated in the silicon wire waveguide and the extinction ratio was improved by 3dB. The impact of two-photon absorption and free-carrier absorption is also discussed.

Room: Jing Men, B1

ATh2I.2 • 15:30 Invited

Controlling the Formation of Perovskite Films by Low-temperature Solution Schemes for High Performance Solar Cells, Wallace C. Choy[1]; [1]*Univ. of Hong Kong, Hong Kong.* Two novel low-temperature processing schemes for manipulating of perovskite films in the typical one-step and two-step approaches. A promising efficiency of about 17% is achieved in planar-heterojunction PSCs with enhanced stability and no hysteresis.

Room: Xiao Gan, B1

ATH2J.2 • 15:30 Invited

Holographic Data Storage by Use of Computer Generated Hologram, Takanori Nomura[1], Teruyoshi Nobukawa[1]; [1]*Fac. Sys. Eng., Wakayama Univ., Japan.* Angular multiplexing holographic data storage with a single amplitude spatial light modulator by use of a computer generated hologram (CGH) is presented. Page data and a reference beam are encoded in a CGH.

Room: Xiang Yang, F3

ATh2K.2 • 15:00

Cypate- m ediated Thermosensitive Nanoliposomes f or NIR Imaging a nd Photothermal Triggered Drug Release, Han Zhihao[1], Lv Liwei[1], Yueqing Gu[1]; [1]*China Pharmaceutical Univ., China.* We synthesized a multifunctional photothermal sensitive liposomes drug-loading system. Its smart constitute was demonstrated through a series of characterization experiments and biological tests *in vitro* and *in vivo*.

ATh2K.3 • 15:15

A Raman-Compatible Isolation Strategy for Human Pathogenic Bacteria in Tap Water Samples Relying on Siderophores, Susanne Pahlow[1,2], Stephan Stöckel[1], Petra Rösch[1], Dana Cialla-May[1,2], Karina Weber[1,2], Jürgen Popp[1,2]; [1]*Friedrich-Schiller-Univ. Jena, Germany;* [2]*Leibniz Inst. of Photonic Technology, Germany.* An innovative siderophore-based sample preparation strategy enabling the isolation of several *Pseudomonas* species from tap water samples is introduced. The bacterial cells are captured on a chip surface and subsequently identified via their Raman fingerprint.

ATh2K.4 • 15:30

Evaluation of the quality of apple fruit using the its optical property spectra in the wavelength range from 500 to 1700 nm., Kuang-Ju Kao[1], Pin-Yuan Huang[1], Chien-Chih Chen[1], Sheng-Hao Tseng[1]; [1]*National Cheng Kung Univ., Taiwan.* The absorption and scattering coefficients of apple fruit in the wavelength range from 500 to 1700 nm were characterized and these values would be employed in the quality evaluation of apple fruit.

Room: En SHI, F3

ATh2A.3 • 15:45
Bistability in an Active Fiber-optical Parametric Oscillator, Feng Wen[1], Baojian Wu[1], Yong Geng[1], Yingyu Zhou[1], Kun Qiu[1]; *[1]Univ. of Electronic Science and Technology of China, China.* Bistable behaviors are experimentally investigated in an active fiber-optical parametric oscillator by adjusting open-loop losses and pump powers. Optical bistability can be obtained at the switch-off state and the modulation depth of 16dB is achieved.

Room: Sui Zhou, F3

mode profile.

ATh2B.4 • 15:45
Side-leakage photonic crystal fiber loop mirror for simultaneous measurement of torsion, strain and temperature, Xin Wang[1], Shuqin Lou[1], Eric Numkam Fokoua[2]; *[1]School of Electronic and Information Engineering, Beijing Jiaotong Univ., China; [2]Optoelectronics Research Centre, Univ. of Southampton, UK.* A fiber loop mirror based on a 70.4cm-long side-leakage photonic crystal fiber is proposed and experimentally demonstrated for simultaneous measurement of torsion, strain

Room: Huang Shi, F2

ATh2C.5 • 15:45
MIMO Equalization for Multi-Core Fiber-Based Systems Using the Affine Projection Algorithm, Mai Banawan[1], Nihal Anwar[1], Ziad El-Sahn[1], Hossam M. H. Shalaby[1,2]; *[1]Photonics Group, Electrical Engineering Department, faculty of engineering, Egypt; [2]Department of Electronics and Communications Engineering, Egypt-Japan Univ. of Science and Technology, Egypt.* An adaptive algorithm for MIMO equalization through multi-core fibers based on the affine projection is proposed. Our algorithm improves the convergence speed compared to LMS algorithm while having low computational complexity compared to RLS algorithm.

Room: Han Yang, F2

ATh2D.5 • 15:45
Construction of Large Girth QC-LDPC Codes Based on Finite Geometries and Fast Searching Method, Zhirong Wang[1], Liqian Wang[1], Dongdong Wang[1], Aimei Fei[2], Xue Chen[1], CHEN JU[1], Huitao Wang[2], Qi Zhang[2]; *[1]BUPT, China; [2]ZTE Cooperation, China.* We proposed a method to construct quasi-cyclic low-density parity check (QC-LDPC) codes which have large girth for high speed optical communications. Compared with other method, our algorithm has lower complexity and faster speed.

Room: Xian Tao, F3

ATh2E.5 • 15:45
Contrasting Power Efficiency of Filter- vs. Ring-based Topologies for On-Chip Wavelength Routing with Layout Awareness, Mahdi Tala[1], Marta Ortìn Obòn[2], Luca Ramini[1], Marco Balboni[1], Victor Vinals[2], Davide Bertozzi[1]; *[1]Univ. of Ferrara, Italy; [2]Univ. of Zaragoza, Spain.* This paper contrasts filter- vs. ring-based topologies for on-chip wavelength routing by performing their physical mapping under floorplanning, placement and routing constraints. Thus, the impact of their layout design flexibility over power efficiency is highlighted.

16:00–16:30 Coffee Break & Poster Preview & Exhibition, *Public area, Basement, 2nd and 3rd Floor, Shangri-La Hotel, Wuhan*

Room: Wu Chang, F2	Room: Han Kou, F2	Room: Shi Yan, B1	Room: Jing Men, B1	Room: Xiao Gan, B1	Room: Xiang Yang, F3
		ATh2H.5 • 15:45 **Wavelength Multicasting of 4/16QAM Channel in a Dual-pump Two-stage Silicon Mixer,** Jin Zhang[1], Eduardo T. Giraldo[1], Ping Piu Kuo[1], Nicola Alic[1], Stojan Radic[1]; [1]*Univ. of California, San Diego, USA*. We demonstrate nine-fold wavelength multicasting of 4- and 16-QAM signals in a two-stage, dual-pump silicon mixer. Characterized multicast performance varied for up to 10 dB for the generated copies over 15 nm.			**ATh2K.5 • 15:45** Invited **Stimulated Raman Spectroscopic Imaging by Microsecond Delay-line Tuning,** Ji-Xin Cheng[1]; [1]*Purdue Univ., USA*. We report microsecond-scale acquisition of simulated Raman spectra by resonant delay-line tuning. Our scheme improved the spectral acquisition speed by 100 times compared to previous works by motorized translational-stage tuning. 4-D images (x-y-z-λ) from highly dynamic organelles in live *C. elegans* was demonstrated.

16:00–16:30 Coffee Break & Poster Preview & Exhibition, *Public area, Basement, 2nd and 3rd Floor, Shangri-La Hotel, Wuhan*

Room: En SHI, F3

16:30–18:00
ATh3A • Fiber Lasers I
Presider: Sile Nic Chormaic; Okinawa Inst. of Science & Technology, Japan

ATh3A.1 • 16:30 Invited
Mode-locked Fiber Lasers using 2D Nanomaterials as Saturable Absorbers, Yong Liu[1], He-Ping Li[1], Jianfeng Li[1], Hongyu Luo[1]; [1]*Univ of Electronic Sci & Tech of China, China*. We demonstrate mode-locked fiber lasers using multilayer molybdenum disulfide (MoS_2) and black phosphorus (BP) as saturable absorbers respectively. Experimental proofs are provided.

Room: Sui Zhou, F3

16:30–18:00
ATh3B • Optical Fiber Technology
Presider: Misha Sumetsky; Aston Univ., UK

ATh3B.1 • 16:30 Invited
UV light generation in Optical fibres, Gilberto Brambilla[1]; [1]*Univ. of Southampton, UK*. UV light has been generated in optical fibers using nonlinear optics (harmonic generation) and rare earth doping with Gd^{3+}.

Room: Huang Shi, F2

16:30–18:00
ATh3C • Advanced Modulation Formats & Multiplexing Schemes

ATh3C.1 • 16:30
112-Gb/s IM-DD based transmission of PAM-4 signal over 12-km SMF with 50-GSa/s ADC, Ming Luo[1], Chao Yang[1]; [1]*WRI, China*. A transmission of single channel 112-Gb/s 4-level pulse amplitude modulation (PAM-4) signal is experimentally demonstrated on 12km SMF link with only 50-GSa/s analog to digital convertor (ADC), achieving an electrical spectrum efficiency (SE) of 2.24 b/s/Hz.

ATh3C.2 • 16:45
Demonstration of CD Pre-compensated Direct Detection PAM4 40km Transmission in C-band Using DDMZM, Qiang Zhang[1], Nebojsa Stojanovic[1], Cristian Prodaniuc[1], Tianjian Zuo[2], Enbo Zhou[2], Liang zhang[2], Fotini Karinou[1], Changsong Xie[1]; [1]*Huawei Technologies Duesseldorf GmbH, Germany;* [2]*Huawei Technologies Co. LTD, China*. We experimentally demonstrate the generation and transmission of 56 Gb/s DSB and SSB PAM4 using a DDMZM. DSB outperforms SSB by 6 dB in B2B scenario as well as after 40 km when dispersion pre-compensation is employed in the latter case.

Room: Han Yang, F2

16:30–18:00
ATh3D • Visible Light and Free-Space Communications
Presider: Changyuan Yu; Hong Kong Polytechnic Univ., China

ATh3D.1 • 16:30
A 2×4 90° Optical Hybrid for Free-Space Coherent Optical Communication Based on a Birefringent Crystal, Zichen Liu[1], Quan You[1], Xiang Li[1], Dequan Xie[1], Ming Luo[1], Shufeng Chen[2], Qi Yang[1]; [1]*State Key Laboratory of Optical Communication Technologies and Networks, Wuhan Research Inst. of Post & Telecommunication, China;* [2]*Wuhan Qingchuan Univ., China*. We design and fabricate a 2×4 90° free-space optical hybrid based on a birefringent crystal, which can be used in the high-speed satellite communication and satellite-to-ground communication. Compared with current fiber-based commercial coherent optical receiver, our fabricated free-space optical hybrid can achieve comparable performance.

ATh3D.2 • 16:45
OFDM Modulation with Signal Space Diversity for Indoor Visible Light Communications, Chao Uang[1]; [1]*Huazhong Univ. of Science and Technology, China*. We experimentally demonstrate that BER improvement of OFDM modulation with signal space diversity under multipath interference VLC environment. 200Mb/s OFDM-16QAM can be transmitted over 1.8m distance without increasing system complexity and bandwidth consumption.

Room: Xian Tao, F3

16:30–18:00
ATh3E • Data Center Networks
Presider: Gangxiang Shen; Soochow Univ., China

ATh3E.1 • 16:30 Invited
Network Performance Analysis of An AWG-based Passive Optical Interconnect for Datacenters, Yi Yang[2], Jiajia Chen[1]; [1]*Kungliga Tekniska Hogskolan, Sweden;* [2]*South China Normal Univ., China*. AWG-based passive optical interconnects (POIs) are considered a high-capacity and energy-efficient solution for datacenter networks. We concentrate on a cascaded AWG-based POI and analyze network performance to gain an insight on efficiency of such architecture.

Room: Wu Chang, F2

16:30–18:00
ATh3F • Active Devices
Presider: James Lott; Technische Universität Berlin, Germany

ATh3F.1 • 16:30 Invited
Active fiber devices enabled by graphene's photothermal effect, Xuetao Gan[1], Liang Fang[1], Jianlin Zhao[1]; [1]*School of Science, Northwestern Polytechnical Univ., China.* By integrating graphene with microfibers, we demonstrate all-optically controlled phase shifters and fiber Bragg gratings with the assistance of graphene's photothermal effect. Optical switching and bistability are achieved as well with response times of milliseconds.

Room: Han Kou, F2

16:30–18:00
ATh3G • Nonlinear Optics and Applications
Presider: Xinliang Zhang, Huazhong Univ. of Science and Technology, China

ATh3G.1 • 14:30 Invited
Inducing and harnessing photon-phonon interactions in nanoscale integrated circuits, Benjamin J. Eggleton[1]; [1]*Univ. of Sydney, Australia.* My talk will review our progress and achievements in developing circuits that harness interactions between optical waves and hypersonic phonons towards a new class of silicon based optical phononic processor that is CMOS compatible.

Room: Shi Yan, B1

16:30–18:00
ATh3H • Microwave Photonic Devices and Links
Presider: Xiaoke Yi; Univ. of Sydney, Australia

ATh3H.1 • 16:30 Invited
Wideband Dynamic Microwave Photonic Systems: From Photonics to Neuromorphic, Mable P. Fok[1], Jia Ge[1], Ryan Toole[1], Ruizhe Lin[1], Qi Zhou[1], Aneek James[1], Alexander Mathews[1]; [1]*Univ. of Georgia, USA.* Various microwave photonic systems – multiband RF filter, interference canceller, jamming avoidance system, and learning system, are developed based on photonic techniques and neuromorphic algorithms as the enabling technologies for wideband, dynamic and adaptive microwave systems.

Room: Jing Men, B1

16:30–18:00
ATh3I • Perovskite Solar Cells II
Presider: Jiang Tang; Wuhan National Lab for Optoelectronics, China

ATh3I.1 • 16:30 Invited
Effects of post-synthesis thermal conditions on methylammonium lead halide perovskite: band bending at grain boundaries and its impacts on solar cell performance, Byungha Shin[1]; [1]*Korea Advanced Inst. of Science and Technology (KAIST), Korea.* We studied how process conditions affect structural and electrical properties of the resulting methylammonium lead halide perovskite films prepared by two-step process and their device performance using KPFM and temperature-dependent IV measurements.

Room: Xiao Gan, B1

16:30–18:00
ATh3J • Ultrafast Photonics and Its Applications
Presider: Xiaodi Tan; Beijing Inst. of Technology, China

ATh3J.1 • 16:30 Invited
Second-harmonic Generation from nanostructures for the coherent light source at nanoscale, Peixiang Lu[1]; [1]*Huazhong Univ of Science and Technology, China.* Here we present our recent works on a special origin of SHG (surface SHG) observed in ZnTe nanowires, the enhancement of SHG in Al/ZnS hybrid nanowire. Also, we discuss our recent works about the precise detection of the crystallographic orientations and the lattice distortion in a single nanowire by SHG microscopy.

Room: Xiang Yang, F3

16:30–18:00
ATh3K • Sensors
Presider: Ji-Xin Cheng; Purdue Univ., USA

ATh3K.1 • 16:30 Invited
Raman Microspectroscopy a powerful tool for spectral histopathology, Juergen Popp[1,2]; [1]*Leibniz Inst. of Photonic Technology, Germany;* [2]*Inst. of Physical Chemistry and Abbe Center of Photonics, Friedrich-Schiller Univ., Germany.* Modern trends in Raman based cytopathology and pathological tissue diagnostics providing sensitive and selective tools to potentially complement established clinical pathological diagnostic methods and therefore to solve challenges currently faced by clinical pathology are presented.

Room: En SHI, F3

ATh3A.2 • 17:00 Invited

Ultra-compact Q-switched single-frequency pulsed fiber lasers, Shanhui Xu[1], Yuanfei Zhang[1], Zhouming Feng[1], Changsheng Yang[1], Zhongmin Yang[1]; [1]*South China Univ. of Technology, China*. We present an ultra-compact passively Q-switched single-frequency fiber laser based on a home-made phosphate fiber and a semiconductor saturable absorber mirror. A short cavity length ensures a stably single-frequency operation . By employing a SESAM, the narrowest pulse duration of <100 ns is realized with the repetition rate reaches 600 kHz.

ATh3A.3 • 17:30

Femtosecond mode-locked fiber laser with cylindrical vector beams using mode selective coupler, Teng Wang[1], Feng Wang [1], Fan Shi[1], Fufei Pang[1], Sujuan Huang[1], Tingyun Wang[1], Xianglong Zeng[1]; [1]*Shanghai Univ., China*. We experimentally demonstrate a femtosecond passively mode-locked fiber laser with cylindrical vector beams using mode selective coupler, the generated 299-fs CVBs has a spectral width of 12.5 nm centered at 1566 nm.

Room: Sui Zhou, F3

ATh3B.2 • 17:00

Improvement of scale factor for resonant fiber optical gyroscope, Chengfeng Xie[1], Jun Tang[1], Danfeng Cui[1], Dajin Wu[1], Chengfei Zhang[1], Chunming Li[1], Yongqiu Zhen[1], Chenyang Xue[1], Jun Liu[1]; [1]*North Univ. of China, China*. A novel method is proposed to improve the scale factor of the resonant fiber optical gyroscope. By using erbium-doped fiber splicing into the fiber ring resonator, forming active resonator to increase the depth of transmission.

ATh3B.3 • 17:15

A fibre-optic radiation dosimeter with metal tracking function based on scintillating material for radiotherapy applications, Yu Ma[1], Weimin Sun[1], Zhuang Qin[1], Yaosheng Hu[1], Wenhui Zhao[1], Daxin Zhang[2], Ziyin Chen[2], Elfed Lewis[3]; [1]*Harbin Engineering Univ., China;* [2]*Comprehensive Cancer Center, First Affiliated Hospital of Harbin Medical Univ., China;* [3]*Optical Fibre Sensors Research Centre, Electronic and Computer Engineering, Univ. of Limerick, Ireland*. A fiber-optic dosimeter for real-time radiation dose measurements with metal tracking function is proposed, which is based on an X-Ray sensitive scintillating material filled into the micro hole located at one end of the fibre.

ATh3B.4 • 17:30

Capillary based Fiber Fabry-Perot interferometer with controllable strain sensitivity, Haiyang Shao[1], Xiaobei Zhang[1], Haiyang Pan[1], Yong Yang[1], Huawen Bai[1], Fufei Pang[1], Tingyun Wang[1]; [1]*Shanghai Univ., China*. We proposed a Fabry-Perot interferometer structure with controllable strain sensitivity based on the capillary by the manual welding technology. The maximum strain sensitivity of 4.2 pm/με is achieved with the length of 53 μm.

Room: Huang Shi, F2

ATh3C.3 • 17:00 Invited

Transmission of 400+ Gbit/s POLMUX-OFDM with Coherent Detection Based on Single Band/λ, Fan Li[1]; [1]*ZTE TX, USA*. In this paper, we review and discuss our recent efforts on transmission of 400+ Gbit/s POLMUX-OFDM with coherent detection. Spectrum efficiency can be improved with the use of advanced DSP employed on high-order modulation formats.

ATh3C.4 • 17:30

Experimental Demonstration of 50 Gb/s PAM-4 Transmission Over 50-km SSMF Using 10-GHz DML, Taiping Ye[1], Jing Zhang[1], Juntao Dang[1], Yang Song[1], Xingwen Yi[1], Kun Qiu[1]; [1]*UESTC, China*. We experimentally demonstrate a 50-Gb/s PAM-4 signal transmission over 50-km SSMF based on a cost-effective 10-GHz DML-based IM/DD system. With the changed Volterra Filter, the BER is below 3.8×10^{-3}.

Room: Han Yang, F2

ATh3D.3 • 17:00 Invited

Design of Coherent Receivers for Quantum Communication, Christian Schaeffer[1], Sebastian Kleis[1]; [1]*Helmut-Schmidt-Univ., Germany*. We provide a review of currently investigated methods to apply coherent detection in the promising field of continuous variable quantum key distribution (CV-QKD). We motivate the use of machine learning techniques to improve the current state of the art.

ATh3D.4 • 17:30

Software-based Intradyne Detection for Optical High-speed Inter-satellite Links with M-PSK, Semjon Schaefer[1], Mark Gregory[2], Werner Rosenkranz[1]; [1]*Univ. of Kiel, Germany;* [2]*TESAT Spacecom, Germany*. We present experimental results for intradyne detection as an alternative for current homodyne systems in optical inter-satellite links. Our approach is based on digital frequency offset and phase noise compensation for more flexible coherent systems.

Room: Xian Tao, F3

ATh3E.2 • 17:00

Demonstration of Compact Flow-Switching Accelerator for Virtual Machines Communication in PON Enable Data Center Network, Yunxiang Fu[1,2], Rentao Gu[1,2], Shizong Zhang[1,2], Qi Tan[1,2], Yuefeng Ji[1,2]; [1]*Beijing Univ. of Posts and Telecommunications, China;* [2]*Beijing Univ. of Technology, China*. We demonstrate a flow-switching accelerator plugged into servers directly to accomplish low-latency data exchange between virtual machines for Passive-optical-network based data center network. The throughput reaches 32Gbps and latency varies from 389.0ns to 1230.6ns.

ATh3E.3 • 17:15

To Overcome the Scalability Limitation of Passive Optical Interconnects in Datacentres, Rui Lin[3,1], Krzysztof Szczerba[4], Erik Agrell[2], Lena . Wosinska[1], Ming Tang[3], Jiajia Chen[1]; [1]*School of Information and Communication Technology,, KTH Royal Inst. of Technology, Sweden;* [2]*Department of Signals and System, Chalmers Univ. of Technology, Sweden;* [3]*School of Optical and Electronic Information, Huazhong Univ. of Science and Technology, China;* [4]*Department of Microtechnology and Nanoscience, Chalmers Univ. of Technology, Sweden*. We propose to add optical amplifier(s) to passive optical interconnect (POI) at top-of-rack in datacentres and validate this approach by introducing impairment constraints into POIs design. It is shown that one amplifier can improve scalability by a factor of 16.

ATh3E.4 • 17:30

Virtual Optical Network Mapping in Flexible Bandwidth Optical Networks with Data Centers Interconnection, Bowen Chen[1], Xin Ye[1], Yinping Wu[1]; [1]*Soochow Univ., China*. We develop a virtual optical network mapping algorithm with coordinated node and link mapping (CNLM) to reduce power consumption. Results show that CNLM greatly improves energy efficiency in flexible bandwidth optical networks with data centers interconnection.

Room: Wu Chang, F2

ATh3F.2 • 17:00
An optimization algorithm based characterization scheme for tunable semiconductor lasers, Quanan Chen[1], Gonghai Liu[1], Qiaoyin Lu[1], Weihua Guo[1]; [1]*Huazhong Univ. of S&T, China.* An optimization algorithm based characterization scheme for tunable semiconductor lasers is proposed and demonstrated. Using modern optimization algorithms, we can get stable operating condition for tunable lasers at any frequency directly and efficiently.

ATh3F.3 • 17:15
High-brightness 95-μm Broad-area 915nm Lasers with 29.4W COMD Power , Martin Hu[1]; [1]*RITS, China.* COMD power upto 29.4W under long pulse duration of 1ms has been realized in a 915nm quantum-well laser with 95μm emitting width. We present the design, fabrication, characterization and failure analysis of such broad-area lasers.

ATh3F.4 • 17:30
Transparent wood as a novel material for non-cavity laser, Elena Vasileva[1], Sergei Popov[1], Ilya Sychugov[1], Lars Berglund[2], Yuanyuan Li[2]; [1]*MF, ICT school, KTH, ICT school, Sweden;* [2]*Fibre and Polymer Technology, CHE School, KTH, Sweden.* In this work we have demonstrated conceptually new organic wood based laser. The laser action is supported by strong scattering due to structural properties of the host material (transparent wood) and can be characterized as quasi random lasing

Room: Han Kou, F2

ATh3G.2 • 17:00 Invited
Silicon Photonics for Entangled Photons, Shayan Mookherjea[1]; [1]*Univ. of California, San Diego, USA.* Micro-chips using silicon photonics can generate entangled photons using low power at telecommunications wavelengths and at room temperature. With further development, such compact chips might replace traditional crystal-based or fiber-based bulky photon-generation sources.

ATh3G.3 • 17:30
Optical frequency comb generation based on the dual-mode square microlaser and nonlinear fibers, Hai-Zhong Weng[1], Yue-De Yang[1], Xiu-Wen Ma[1], Jin-Long Xiao[1], Fu-Li Wang[1], Yong-Zhen Huang[1]; [1]*Inst Semiconductor, CAS, China.* We demonstrate the four-wave-mixing optical frequency comb generation by injecting the dual-wavelength square microlaser into nonlinear optical fiber. Using two-stage spectrum-spread technique, frequency comb with 50 nm range and 102 GHz repetition rate is achieved.

Room: Shi Yan, B1

ATh3H.2 • 17:00
Radio Frequency Transfer over 100 km Optical Fiber by a Passive Stabilization Scheme, Longqiang Yu[1], Rong Wang[1], Lin Lu[1], Yong Zhu[1], Baofu Zhang[1], Chuanxin Wu[1]; [1]*Coll Comm Engin, PLA Univ Sci & Tech, China.* A radio frequency transfer system is developed to transfer 400 MHz frequency standard over 100 km optical fiber. The phase drift during the transmission is stabilized by a passive phase pre-compensation scheme.

ATh3H.3 • 17:15
Microwave Photonic Down-Conversion with Large Image Rejection Ratio Utilizing Digital Signal Processing, Peixuan Li[1], Xihua Zou[1], Wei Pan[1], Lianshan . Yan[1]; [1]*Southwest Jiaotong Univ., China.* A photonic microwave frequency down-conversion scheme with large image rejection ratio (IRR) is implemented. In experiments, the RF signal at 35.5 GHz is successfully down-converted to a 500-MHz one with an IRR beyond 60 dB.

ATh3H.4 • 17:30
Chirped Microwave Waveform Generation Using an Unbalanced Sagnac Loop, Qianyun Ling[1], Fangzheng Zhang[1], Ronghui Guo[1], Shilong Pan[1]; [1]*NUAA, China.* A chirped microwave pulse generation scheme based on self-phase modulation effect in an unbalance Sagnac loop is proposed. The generation of chirped microwave pulses with a bandwidth as large as 23 GHz is experimentally demonstrated.

Room: Jing Men, B1

ATh3I.2 • 17:00 Invited
Point Defects and Chemical Stability of Novel Photovoltaic Semiconductors, Shiyou Chen[1]; [1]*East China Normal Univ., China.* Using the first-principles calculations, we studied the point defects and secondary phases in a series of photovoltaic semiconductors including (Cu,Ag)2ZnSn(S,Se)4, CuSb(S,Se)2, CsSnI3 and CH3NH3PbI3, and analyzed their influences on the photovoltaic performance and chemical stability.

ATh3I.3 • 17:30 Invited
Polymer-electrode-based Perovskite Solar Cells, Yinghua Zhou; *Huazhong University of Science and Technology, China.* Abstract not available.

Room: Xiao Gan, B1

ATh3J.2 • 17:00 Invited
Deterministic laser nanomachining in glass, Yang Liao[1], Jielei Ni[1], Ya Cheng[2,1]; [1]*Shanghai Inst of Optics and Fine Mech, China;* [2]*East China Normal Univ., China.* We demonstrate fabrication of 3D nanostructures deeply buried inside glass in a controllable manner. In addition, we fabricate nanofluidic channels with a width of ~40 nm and use the fabricated nanochannels to perform single DNA molecule analysis.

ATh3J.3 • 17:30 Invited
Femtosecond Laser Filamentation for Combustion Diagnostics, Huailiang Xu[1]; [1]*Jilin Univ., China.* We demonstrate that, when a femtosecond filament is formed in a combustion flame, clean fluorescence emissions from combustion intermediates can be obtained, showing the feasibility of femtosecond laser filamentation for combustion diganostics.

Room: Xiang Yang, F3

ATh3K.2 • 17:00 Invited
Porphysome Nanotechnology: Discovery, Clinical Translation and Beyond, Gang Zheng[1,2]; [1]*Department of Medical Biophysics, University of Toronto;* [2]*Princess Margaret Cancer Centre, Canada.* Porphysome nanotechnology are simple yet intrinsically multifunctional nanoparticle platforms for cancer imaging and therapy. Here, the discovery and clinical translation, as well as the development of new porphyrin supramolecular assemblies beyond porphysomes will be discussed.

ATh3K.3 • 17:30
Local Field Enhancement Tuning of Horseshoe-Shaped Nanoparticles, Zhiyuan Du[1], Bin Hu[1]; [1]*Beijing Inst. of Technology, USA.* A horseshoe-shaped nano-structure is studied by simulation, and enhanced local field is found. The structure is tunable by particle's geometry parameters. Such properties make the structure promising in biomedical and sensing applications.

Room: En SHI, F3

ATh3A.4 • 17:45
All-fiber laser generating orbital angular momentum beams based on a two-mode fiber long-period grating, Yunhe Zhao[1], Tianxing Wang[1], Chengbo Mou[1], Zhijun Yan[2], Yunqi . Liu[1], Tingyun Wang[1]; [1]*Shanghai Univ., China;* [2]*Huazhong Univ. of Science and Technology, China*. We demonstrate an all-fiber laser generating orbital angular momentum (OAM) beams based on a two-mode fiber long-period grating. The experimental results confirm that the fiber laser can generate the L=+/-1 OAM beams successfully.

Room: Sui Zhou, F3

ATh3B.5 • 17:45
Gain Equalized Four Mode Groups Erbium Doped Fiber Amplifier with LP $_{01}$ Pump, Zhenzhen Zhang[1], Qi Mo[2], Cheng Guo[1], Ningbo Zhao[1], Cheng Du[2], Xiaoying Li[1]; [1]*Tianjin Univ., China;* [2]*Fiberhome Telecommunication Technologies Co Ltd, China*. Using an erbium doped fiber with the optimized doping profile, we experimentally demonstrate an EDFA, which supports four mode groups. The measured differential modal gain is about 1dB.

Room: Huang Shi, F2

ATh3C.5 • 17:45
10 Gb/s transmission of the 2-D incoherent OCDMA signals over 120 km with 32 users, Guorui Su[1], Tao Pu[1]; [1]*PLA Univ. of Science and Technology, China*. In this paper, 32 users can be simultaneously transmitted over 120 km in a two-dimensional wavelength-hopping time-spreading OCDMA system as the bit rate is 10 Gb/s, which is proposed and experimental demonstrated.

Room: Han Yang, F2

ATh3D.5 • 17:45
Experimental Investigation of Inter-User Interference in Vehicular Visible Light Communication Systems, Xianqing Jin[1], Weijie Liu[1], Haifeng Luan[1], Yanfeng Mao[1], Runyao Yang[1], Zhengyuan Xu[1,2]; [1]*School of Information Science and Technology, Univ. of Science and Technology of China, China;* [2]*Shenzhen Graduate School, Tsinghua Univ., China*. Impact of interference lights on transmission performance of 25Mb/s OOK signals from an information light source is investigated over a vehicular visible light communication link using a commercial avalanche photodiode with a lens at the receiver.

Room: Xian Tao, F3

ATh3E.5 • 17:45
User Demands-Adaptive Dynamic Content Replacement in Elastic Optical Datacenter Networks, Tao Gao[1], Xin Li[1], Bingli Guo[1], Shan Yin[1], Haibin Huang[1], Yu Zhou[1], Yu Shang[1], Shanguo Huang[1]; [1]*Beijing Univ of Posts & Telecom, China*. We study the problem of dynamic content replacement according to the distribution of the requests in elastic optical datacenter networks. An efficient dynamic content replacement scheme is proposed to minimize blocking probability and resource utilization.

18:30–21:30 Welcome Reception & OSA 100th Anniversary Celebration, *Grand Ballroom (Han Kou, Wu Chang, and Han Yang), 2nd Floor, Shangri-La Hotel, Wuhan*

Room: Wu Chang, F2

ATh3F.5 • 17:45
Optimization and Fabrication of High Power 1060 nm Single-mode DFB Lasers, Hao Wang[1], Zhai Teng[1], Shaoyang Tan[1], Ruikang Zhang[1], Lingjuan Zhao[1], Wei Wang[1], Dan Lu[1], chen ji[1]; *[1]Inst. of Semiconductors ,CAS, USA.* We report 1060-nm high power DFB lasers with single mode operation up to 300-mW in 2-mm cavity design, by systematically optimizing epitaxial design for low internal loss and a double-trench waveguide for lateral mode stability.

Room: Han Kou, F2

ATh3G.4 • 17:45
Linear and nonlinear characterization of silicon/silicon-rich nitride hybrid waveguides, Xiaoyan Wang[1,2], Xiaowei Guan[2], Shiming Gao[1], Leif K. Oxenløwe[2], Lars Frandsen[2]; *[1]Zhejiang Univ., China; [2]Department of Photonics Engineering, Technical Univ. of Denmark, Denmark.* Silicon/silicon-rich nitride hybrid waveguides have been proposed and experimentally demonstrated. The waveguides were measured to have a linear loss of ~5.60 dB/cm and a nonlinear parameter of ~32.3 $W^{-1}m^{-1}$.

Room: Shi Yan, B1

Room: Jing Men, B1

Room: Xiao Gan, B1

Room: Xiang Yang, F3

ATh3K.4 • 17:45
Optical Beam Steering for Bio-sensing Application, Mahdad Mansouree[1], Leila Yousefi[1], Mohammadreza Kolahdouz Esfahani[1]; *[1]Univ. of Tehran, Iran.* A new class of optical sensors is presented, and numerically analyzed. The proposed sensor is a phased array of nano-antennas whose beam direction rotates when reacting with biomaterials.

18:30–21:30 Welcome Reception & OSA 100th Anniversary Celebration, *Grand Ballroom (Han Kou, Wu Chang, and Han Yang), 2nd Floor, Shangri-La Hotel, Wuhan*

Equivalent Circuit Models for Silicon Photonics Devices

Woo-Young Choi[1], Myungjin Shin[1], Jeong-Min Lee[1], Lars Zimmermann[2]
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Abstract: We present equivalent circuit models for Si micro-ring modulators and Ge-on-Si photodetectors. Model parameters are extracted from measurement and simulation. These circuit models are very useful for designing Si photonic and electronic ICs.

1. Introduction

Si photonic integrated circuits (PIC) are attracting a great amount of research and development interests since they can provide cost-effective, high-performance photonic circuits and systems using the mature processing, design, packaging, and testing infrastructure developed for Si ICs. When designing Si PICs, designers must have the accurate and easy-to-use model for each component with which the performance of the entire PIC can be predicted. In addition, in order to simulate the behavior of PICs along with electronic ICs, which are often needed for driving and monitoring photonic devices, it is strongly desired that photonic device models are compatible with the well-established electronic design automation (EDA) tools for Si ICs. In this paper, we present equivalent circuit models for Si micro-ring modulators (MRM) and waveguide-type Ge-on-Si photodetectors (Ge-PD). Since these photonic devices have to be directly connected to electronic circuits for their applications, the capability to simulate performances of the entire transmitter composed of Si MRM and driver electronics, and the entire receiver composed of Ge-PD and the transimpedance amplifier can provide much improved simulation accuracy and transmitter/receiver performances.

2. Equivalent Circuit Model for Si MRM

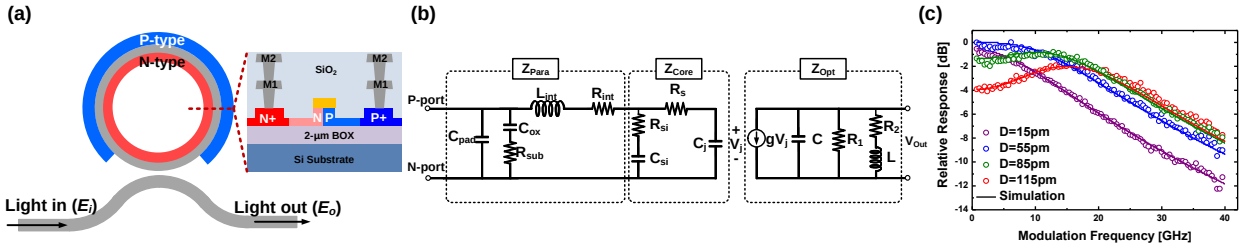

Fig. 1 (a) Structure and cross-section, (b) equivalent circuit of Si MRM, and (c) Si MRM modulation frequency responses

Fig.1 (a) shows the structure and the cross-section of a depletion-type Si MRM having 8-μm radius. The device was fabricated through Si PIC MPW provided by IHP. For its operation, the PN junction reverse bias voltage is modulated by voltage signals, which causes the effective index modulation for the ring waveguide. With this, the Si MRM resonance wavelength shifts and the amount of light coupled into the optical output port is modulated. Within the linear approximation, this process can be modeled with the equivalent circuit shown in Fig.1 (b) [1], which has three functional blocks: Z_{Para} for parasitic components due to pads and interconnects, Z_{Core} for electrical components of Si MRM core, and Z_{Opt} modeling the Si MRM optical modulation characteristics with a lossy LC tank. In Z_{Para}, C_{pad} is the capacitance between pads and interconnect lines, C_{ox} is the capacitance between pads and silicon substrate, R_{sub} is the resistance through the silicon substrate below two pads, L_{int} and R_{int} are the inductance and resistance of interconnect lines. The numerical value for each of Z_{Para} component can be determined from the s-parameter measurement of open and short test patterns that are fabricated together with the Si MRM. Accurate modeling of Z_{Para} becomes more important as the Si MRM operating speed becomes larger. In Z_{Core}, C_{si} represents the capacitance between doped silicon layer and silicon substrate, R_{si} represents the resistance of the silicon substrate below Si MRM, R_s and C_j are the resistance and the capacitance of the PN-junction. With the knowledge of Z_{Para}, the value of each Z_{Core} component can be determined from the s-parameter measurement of the Si MRM device.

Z_{Opt} is derived from the small-signal approximation for the Si MRM frequency modulation characteristics based on the coupled-mode theory, which analytically describes the Si MRM dynamics with resonator loss time constants

and the amount of detuning between the resonance wavelength and the input light wavelength. The resulting frequency response has two poles and one zero, having lossy-tank characteristics as shown in Fig. 1(c). Numerical values for model parameters can be determined from Si MRM transmission characteristics and converted into circuit parameters. Fig. 1(c) shows the measured Si MRM frequency responses for different input wavelengths for the different amount of detuning. The figure also shows the simulated results with the equivalent circuit model in Cadendece Spectre, a standard EDA tool. Measurement and simulation results agree very well, confirming accuracy of our model. As can be seen in the figure, Si MRM modulation frequency responses have very sensitive dependence on detuning, indicating a very careful control of the Si MRM resonance wavelength and/or the input wavelength is needed for the optimal modulation performance.

3. Equivalent Circuit Model of Ge-PD

Fig. 2(a) shows the structure of a waveguide Ge-PD on Si fabricated by IHP's photonic BICMOS process. The device is 20μm long. Fig 2(b) shows its equivalent circuit model [2]. Z_{Para} here has essentially the same circuit elements as Z_{Para} for the Si MRM discussed earlier. Z_{Core} includes the electrical components for the PN junction as well as two current sources representing photo-generated carriers experiencing two different types of transport: one for those carriers generated within the depletion region and transport by drift, and the other generated in the region where the electric field is not very large and transport by diffusion. A separate current source for the diffusion component is needed since, due to the waveguide nature of the Ge-PD, there are a considerable amount of photo-generated carriers in the charge-neutral region. Z_{Para} are determined from s-parameter measurement for open and short test patterns, and R_s, C_j, R_j, and $C_{c\text{-}c}$ are determined with the electrical s-parameter measurement of the Ge-PD. The relative ratio of I_1 and I_2 and their frequency responses are determined TCAD Sentaurus and 3-D FDTD simulations. Fig. 2(c) shows the measured photodetection frequency response and the simulated result with our equivalent circuit. They agree well.

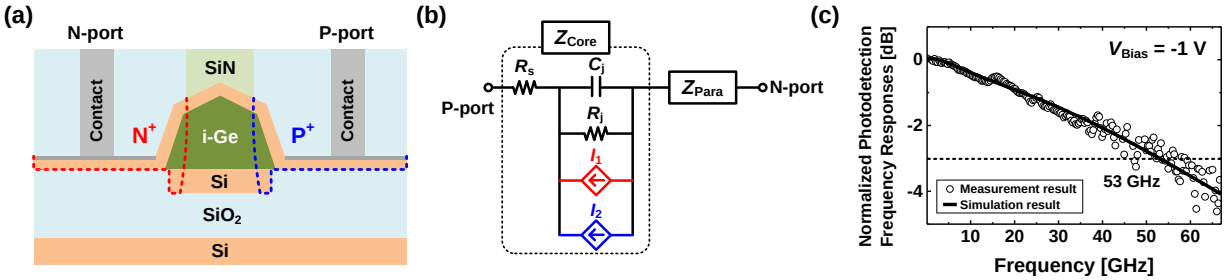

Fig. 2 (a) Cross-section of Ge-PD. (b) Equivalent circuit model of Ge-PD. (c) Measured and simulated photodetection frequency response.

4. Conclusion and Acknowledgement

We developed accurate equivalent circuit models for Si MRM and waveguide-type Ge-PD on Si. Their model parameter values are extracted from measurement and simulation. These models should be very helpful for designing electronic photonic integrated circuits using the standard EDA tools for IC design. This work was supported by National Research Foundation of Korea (NRF) grant funded by the Korean government (MSIP) (2015R1A2A2A01007772) and Materials and Parts Technology R&D Program funded by the Ministry of Trade, Industry & Energy (MOTIE), Korea (Project No. 10065666).

5. References

[1] Myungjin Shin *et al.*, "A Linear Equivalent Circuit Model for Depletion-Type Silicon Micro-Ring Modulators," *in preparation.*
[2] Jeong-Min Lee *et al.*, "Photodetection Frequency Response Characterization for High-Speed Ge-PD on Si with an Equivalent circuit," O*ECC/PS2016*, WA2-78.