Technical Program

30th October 2019, Wednesday

Time	Title	Name	
Opening			
09:00 -09:15	Welcome Remark from General Co-Chairs		
Keynote	**Presider: Xu Wang**		
09:15-10:00	Active-MMI laser diodes and optical mode switches -Toward high speed interconnection and flexible mode-division multiplexing network-	Kiichi Hamamoto	Japan
10:00-10:45	Optical switch based on silicon photonic integration	Tao Chu	China
10:45-11:00	**Coffee Break & Group Photo**		
Section 1	**Digital Signal Processing** **Presider: Naoya Wada**		
11:00-11:25	Signal Processing for Digital Coherent PON Technology Used in Optical Access Networks	Hiroshi Miura	Japan
11:25-11:50	Constant modulus algorithms for linear and nonlinear impairments compensation in high speed optical transmission links	Junhe Zhou	China
11:50-13:30	**Lunch**		
Section 2	**Optical Communication System** **Presider: Ming Tang**		
13:30-13:55	High-capacity SDM systems using homogeneous multi-core fibers	Ben Puttnam	Japan

13:55-14:20	Integrated perception network of marine information and Multi-source information fusion technologies	Mengxing Huang	China
14:20-14:45	A Novel Compact Architecture for Wavelength Selective Switches	Shiori Konisho	Japan
14:45-15:10	Predictive Link Switching for Energy-Efficient Hybrid FSO/RF Communication System	Yejun Liu	China
15:10-15:25	**Coffee Break**		
Section 3	**Integrated Photonic Devices**	**Presider: Satoshi Shinada**	
15:25-15:50	Hybrid Integration on Silicon Photonic Platform Enabled by Thin-layer Transfer Technology	Rai Kou	Japan
15:50-16:15	Ultra-compact mode division multiplexing components for arbitrary on-chip routing	Ke Xu	China
16:15-16:40	70 Gbaud Operation of All-Silicon PIN-Diode-Based Modulator Embedded with Passive Equalizer	Yohei Sobu	Japan
16:40-17:05	Tailorable forward Brillouin scattering in microstructred fiber	Sigang Yang	China
17:30-20:00	**Banquet**		

31h October 2019, Thursday

Time	Title	Name	
Section 4	**Functional Photonic Devices Presider: Ken-Ichi Kitayama**		
9:00-9:25	High Extinction-Ratio and High-Linearity Modulator for Analog and Digital Optical Modulation	Yuya Yamaguchi	Japan
9:25-9:50	Nonlinear nanoplasmonics for novel optical frequency converters	Lili Gui	China
9:50-10:15	The microwave photonic filter and its applications in optoelectronic oscillators	Yuan Yu	China
10:15-10:30	Coffee Break		
Section 5	**Optical Networks Presider: Jinsong Xia**		
10:30-10:55	Analog-to-digital compressed radio-over-fiber (ADX-RoF) for MIMO 5G/IoT fronthaul	Paikun Zhu	Japan
10:55-11:20	Blockchain Technology and Its Application in optical networks	Bin Chen	China
11:20-11:45	Performance Analysis for Approximate Optical Computing: Computer Architecture Perspective	Satoshi Kawakami	Japan
Closing			
11:45-12:00	Closing Remarks		
12:00-13:30	**Lunch**		

Active-MMI laser diodes and optical mode switches -Toward high speed interconnection and flexible mode-division multiplexing network-

Kiichi Hamamoto

Interdisciplinary Graduate School of Engineering Sciences (I-EggS), Kyushu University
6-1, Kasuga-Koen, Kasuga, Fukuoka 816-8580, Japan
hamamoto.kiichi.616@m.kyushu-u.ac.jp

Abstract

Active-MMI LDs have a potential of high direct modulation speed based on multiple photon-photon resonances. So far, we have proved the potential of more than 50 GHz resonance based on the internal interference of the device. In addition, we have demonstrated mode-selective light sources and optical mode switches so far. They offer mode exchange flexibility which, we think, are key-components for space-mode reconfigurable network. By utilizing these devices, we consider realizing high-speed interconnection in mobile/compact IT devices, and flexible mode-division multiplexing networks. In this talk, we present the principles, and the recent results of these devices.


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BIOGRAPHY, Prof. Kiichi Hamamoto received Dr. Sc. Tech. degree in electrical engineering from Swiss Federal Institute of Technology (ETH-Zurich), Zurich, Switzerland, in 2000.

In 1988, he joined NEC Opto-electronics Laboratories, where he was engaged in research on opto-electronic devices including optical switches, semiconductor optical amplifiers, laser diodes, and photonic integrated circuits, in addition to their fabrication technologies including RIBE & ICP dry-etching, and MBE & MOVPE epitaxial growth technique.

From 1996 to 1997, he has been a guest researcher at ETH-Zurich, and at there, he has proved and invented active-multimode interferometer devices for the first time. Since 2005, he has been a professor of Kyushu University, Fukuoka, Japan.

Dr. Hamamoto is a life fellow of OSA, a senior member of IEEE Photonics Society, a senior member of IEICE, and a member of JSAP. He was the general co-chairs of MOC2018 and OECC/PSC 2019.

Optical switch based on silicon photonic integration

Tao CHU

College of Information Science & Electronic Engineering,
Zhejiang University, Zheda Road, Hangzhou, Zhejiang, 310027, China
Zhe jiang Lab, 1818 West Wenyi Road, Hangzhou, Zhejiang, China
Tel: +86 0571-87951011, Email: chutao@zju.edu.cn

Abstract

Accompanying the rapid developments of the big-data society, novel technologies for constructing high-speed and low-power-consumption data processing and communication systems are highly demanded. Silicon photonic integration is widely regarded as one of the most promising ways in various applications, due to the low-cost and high-density-integration of silicon photonic devices. In this presentation, our researches on large-scale 32x32 silicon electro-optic switch and 64x64 silicon thermo-optic switch will be introduced, with their designs, fabrications, measurements and future applications.

BIOGRAPHY, Prof. Tao CHU received his B.S. degree from Sichuan University, Chengdu, China, in 1991. He received his M. Eng. and D. Eng. degree from Kyoto Institute of Technology, Kyoto, Japan, in 1999 and 2002, respectively. From 1991 to 1995, he worked for CETC group, Hefei, China. From 2001 to 2003, he worked as a JSPS research fellow in Kyoto Institute of Technology. From 2003 to 2007, he worked as an OITDA researcher in NEC Fundamental Research Laboratories, Tsukuba, and Prof. Arakawa's lab in the University of Tokyo, Tokyo, Japan. From 2006 to 2011, he worked in NEC Central Research Laboratories and National Institute of Advanced Industry Science and Technology (AIST), as a NEC Principal Researcher and an AIST Senior Scientist, Tsukuba, Japan, respectively. From 2011 to 2016, he worked in Institute of Semiconductors, CAS, Beijing, China, as a National Distinguished Professor. In 2017, he joined College of Information Science and Electronic Engineering, Zhejiang University, Hangzhou, China, as a full professor and the director of ZJU Institute of Integrated Microelectronic Systems. In 2019, he joined the Intelligent IC Center of Zhejiang Lab, China, as a Senior Fellow. Prof. Tao CHU has been engaged in the research of integrated optoelectronics and has hosted many national and enterprise research projects.

Signal Processing for Digital Coherent PON Technology Used in Optical Access Networks

Hiroshi Miura, Keisuke Matsuda, and Naoki Suzuki

Information Technology R&D center, Mitsubishi Electric Corporation, 5-1-1 Ofuna, Kamakura, Kanagawa, Japan
Miura.Hiroshi@dw.MitsubishiElectric.co.jp

Abstract

Optical access networks are expected to serve as a platform supporting Fifth Generation mobile (5G) services as well as fixed broadband services. For 5G, the required data rate between a remote radio head and its baseband unit will reach 100 Gb/s. Passive Optical Network (PON) technology for use in access systems is the most feasible candidate for applying 5G and beyond 5G services. In the move towards future PON systems, demonstrations of PON systems supporting more than 50 Gb/s/λ are being reported, but achieving the same loss budgets as current systems is challenging. A 50 Gb/s Ethernet PON system with a 25 Gb/s multilane configuration will achieve a loss budget of 29 dB, which is the same as 10G-EPON. However, for intensity modulation and direct detection (IM-DD) technologies, it is challenging to achieve this with data rates higher than 50 Gb/s. Recently, it is proposed the use of neural networks (NN) in equalizers at the receiver side. While NN equalization exhibits excellent performance which measured back-to-back sensitivity of -28 dBm, it is uncertain that circuits of such a size are suitable for use in access networks. In contrast, digital coherent technology has been proposed as a promising candidate for 100 Gb/s or higher PON systems. We review the recent progress of 100 Gb/s to 1 Tb/s class coherent PON technology, highlighting recent work on using hardware-efficient DSP for coherent PON, especially simplified adaptive equalization (AEQ) and carrier phase recovery (CPR) in the receiver DSP.

BIOGRAPHY, Hiroshi Miura received the B.E. and the M.E. degrees in engineering from Kyoto Institute of Technology, Kyoto, Japan, in 2011 and 2013, respectively. In 2013, he joined Mitsubishi Electric Corporation, Japan, where he had involved in the design of optical submarine networks. Since 2015, he has been a researcher of Information Technology R&D center of Mitsubishi Electric Corporation. His research interests include optical transceivers and optical signal processing.

Constant modulus algorithms for linear and nonlinear impairments compensation in high speed optical transmission links

Junhe Zhou

Dept. of electronics science and engineering, Tongji University, Shanghai 200092, P.R. China
Tel: +86 021-69587684, Email: jhzhou@tongji.edu.cn

Abstract

Constant modulus algorithm can be used for both linear and nonlinear impairments compensations. A variety of novel CMAs have been proposed and demonstrated recently with high performance.

BIOGRAPHY, Prof. Junhe Zhou received B.S. and Ph. D Degree in Electronics Engineering from Shanghai Jiaotong University in 2002 and 2008 respectively.
From 2006 to 2007, he worked as a joint-educated Ph. D student in Ecole Nationale Supérieure des Télécommunications (ENST). Since 2009, he has been with the department of electronics science and engineering, Tongji University, where he is currently an associate professor. His main research interests are optical communication systems analysis and optical signal processing.

High-capacity SDM systems using homogeneous multi-core fibers

Ben Puttnam

Photonic Network System Laboratory, National Institute of Information and Communications Technology (NICT), 4-2-1 Nukui-Kitamachi, Koganei, Tokyo 184-8759, Japan.
Email address: ben@nict.go.jp

Abstract

We discuss the prospect of high capacity multi-core fiber (MCF) transmission systems based on homogeneous, single mode MCFs. We describe the key features of such fibers including inter-core crosstalk and discuss inter-core propagation delays and how these properties might affect such systems. We then describe a number of transmission and networking experiments utilizing such fibers and related components such as cladding pumped optical amplifiers that can provide both peta-bit per second level transmission and the greater efficiency required to make SDM technologies attractive. We demonstrate that despite a relatively modest number of spatial channels, such fibers can be suitable for ultra-high capacity transmission without the need for multiple-input-multiple-output (MIMO) digital signal processing and using current transceiver technology.

BIOGRAPHY, Ben Puttnam is a senior researcher in the Photonic Network System Laboratory at the National Institute of Information and Communications Technology (NICT) in Tokyo, Japan. He received the MPhys degree in Physics from the University of Manchester (UK) in 2000 and the PhD degree from University College London in 2008. In between he worked as a Switch Design Engineer for T-mobile (UK) and before joining NICT in 2010 was a visiting researcher in the Photonics group at Chalmers University, Göteborg, Sweden. His research interests are space-division multiplexing transmission systems and optical signal processing.

Integrated perception network of marine information and Multi-source information fusion technologies

Mengxing Huang

State Key Laboratory of Marine Resource Utilization in South China Sea,
School of Information and Communication Engineering, Hainan University, Haikou, 570228, China
Tel: +86 0898-66187056, Email: huangmx09@163.com

Abstract

To meet the needs of the utilization of marine resources and the security of the marine environment, an integrated perception network of marine information is constructed, and the technologies for Multi source and heterogeneous information fusion are proposed.

BIOGRAPHY, Prof. Mengxing Huang is the dean of School of Information and Communication Engineering of Hainan University, and obtained the degree of PhD from Northwestern Polytechnical University in 2007. He then joined staff at the Research Institute of Information Technology in Tsinghua University as a postdoctoral researcher.

A Novel Compact Architecture for Wavelength Selective Switches

Shiori Konisho, Mitsumasa Nakajima, Masashi Miyata, Satomi Katayose, Kazunori Seno, and Toshikazu Hashimoto

NTT Device Technology Laboratories, NTT Corporation,
3-1 Morinosato-Wakamiya, Atsugi, Kanagawa, Japan
shiori.konisho.tw@hco.ntt.co.jp

Abstract

A key operation in a reconfigurable optical add/drop multiplexers (ROADMs) network is wavelength routing by wavelength selective switches (WSSs), which add/drop arbitrary wavelength signals to/from the network. For a WSS module, a lot of free-space optics (FSO) is used and that makes it difficult to miniaturize the module size. To downsize and integrate WSSs, we have reported a spatial and planar optical circuit (SPOC) technique that combines waveguides and FSO. Although the SPOC technique reduces the size of WSS modules, there are still two limiting factors in the FSO. The first factor is the distance given by two lenses. In the conventional model, the two lenses are aligned with a Fourier 4-f optical system (where f is lens focal length), so the optical path length is about $4 \times f$. The other factor is the distance from a bulk grating to a spectral lens. When the distance is short, a spatial wavelength dispersion or wavelength resolution becomes low unless using a higher dispersion grating. In this talk, we will present a novel compact WSS architecture using a 1-f optical system. In this optics, the optical path length is reduced because there is no lens in the switching plane. In addition, we incorporate a metasurface grating and interleaver to broaden the beam for wavelength division. Using these approaches, we demonstrate a 1 x 5 WSS supporting the C+L band.

BIOGRAPHY, Shiori Konisho received the B.S. and M.S. degrees in physics from Ochanomizu University and Tokyo University in 2013 and 2015, respectively. She joined NTT Device Technology Laboratories, Kanagawa, Japan, where she has been conducting research on photonic computing technologies and spatial and planar optical circuit (SPOC) technologies. She is a member of the Japan Society of Applied Physics (JSAP).

Predictive Link Switching for Energy-Efficient Hybrid FSO/RF Communication System

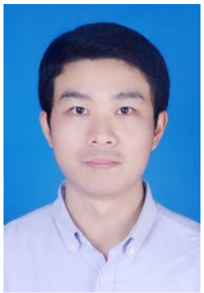
Yejun Liu

School of Communication and Information Engineering, Chongqing University of Posts and Telecommunications, P. R. China

TEL: +86-15040295264, Email: yjliu@cqupt.edu.cn

Abstract

Free-Space Optics (FSO) communication has been recognized as a promising technique merging the technological merits of optical communication and wireless communication. Although the richness in bandwidth capacity and ease of infrastructure deployment, FSO communication system is susceptible to atmospheric condition and line-of-sight transmission. For practical application, FSO link often coexists with Radio Frequency (RF) link to form the hybrid FSO/RF communication system. Link switching is one of the critical issues in hybrid FSO/RF communication system. According to the conventional hard switching, the FSO link needs to keep persistently active to monitor the signal change even if the data is being transmitted on RF link, leading to the unnecessary energy consumption. In our works, we aim to address the issue of energy waste in hybrid FSO/RF system from the perspective of link switching. A machine learning algorithm is proposed to predict the time-varying trend of FSO signal, which can fundamentally transform the link switching from a reactive behavior to a proactive one. The FSO link does not have to be persistently active, and thus the system energy is saved significantly.



Yejun Liu is currently serving as an associate professor in School of Communication and Information Engineering, Chongqing University of Posts and Telecommunications. His research interests include optical access network and wireless optical communication.

Hybrid Integration on Silicon Photonic Platform Enabled by Thin-layer Transfer Technology

Rai Kou

Electronics and Photonics Research Institute, National Institute of Advanced Industrial Science and Technology (AIST), Onogawa 1-16, Tsukuba, Ibaraki 305-8568, Japan
rai.kou-takahashi@aist.go.jp

Abstract

Silicon photonics provides numerous unexpected opportunities in scientific discoveries and industrial product developments because of its excellent optical properties such as high refractive index and broadband transparency at near-infrared wavelengths. However, efficient light sources and high-speed modulation have been a long-standing bottleneck which has limited the total performance so far.

To further develop the current silicon photonics technology, we demonstrated a hybrid integration of low-dimensional materials realized by thin-layer transfer technology. Taking graphene, two-dimensional carbon atoms with honeycomb structure, as an example, the unique linear energy dispersion of graphene offers remarkable optical functionalities, such as wavelength-independent light absorption (2.3 %/layer), ultra-high carrier mobility (10^6 cm^2/Vs), strong-nonlinear effect, and tunable Fermi level and bandgap (with bilayer graphene). In this presentation, we describe how we apply existing silicon photonics technologies as an integration platform to maximize graphene's potential for achieving future opto-electro integrated circuits. Especially, we review our recent advances using the material transfer technology for an optical intensity modulator [1], a supercontinuum light source [2], a high-Q dopamine sensor [3], a photon-pair generation light source [4], as well as an on-chip THz transceiver [5].

References:

[1] R. Kou et al. *Appl. Phys. Lett.* **109**, 251101 (2016)
[2] A. Ishizawa et al. *Sci. Rep.* **7**, 45520 (2017)
[3] R. Kou et al. *Opt. Exp.* (to be published)
[4] Y. Yonezu et al. *Opt. Exp.* **27**, 21, 30262-30271 (2019)
[5] P. Gallagher et al. *Science* **354**, 6436, 158-162 (2019)

Dr. Rai Kou received the B.E. M.E. and Ph.D. degrees in applied physics from Waseda University, Tokyo, Japan, in 2007, 2009 and 2014, respectively. He was a researcher at NTT Device Technology Labs. Atsugi, Japan from 2009 to 2015, and a post-doctoral fellow at University of California, Berkeley (UCB) from 2015 to 2017. He is currently a senior researcher at AIST, Tsukuba, Japan. His research interests include integrated photonic circuits with silicon and new functional materials, and nonlinear optics.

Ultra-compact mode division multiplexing components for arbitrary on-chip routing

Ke Xu

Ministry of Industry and Information Technology Key Lab of Micro-Nano Optoelectronic Information System
School of Electronic and Information Engineering, Harbin Institute of Technology, Shenzhen, 518055, China
Email: kxu@hit.edu.cn

Abstract

The orthogonal guiding modes in waveguide provide an important degree of freedom to exploit the on-chip applications. Mode division multiplexing has shown great potential for parallel signal processing in optical interconnect and computing system. However, the radiation leakage and inter-mode crosstalk become a primary challenge for large scale photonic circuits. In this work, a novel inversely designed meta-structure is demonstrated to overcome this issue.

BIOGRAPHY, Assoc. Prof. Ke Xu obtained his PhD degree in The Chinese University of Hong Kong in 2014 and joined Harbin Institute of Technology, Shenzhen in 2015. During 2013-2014, he was a visiting scholar in Yale University. He is the recipient of IEEE Photonics Society Graduate Student Fellowship (2013) and Hong Kong Young Scientist Award (2014). He his research interests includes integrated optics and nanophotonics.

70 Gbaud Operation of All-Silicon PIN-Diode-Based Modulator Embedded with Passive Equalizer

Yohei Sobu, Shinsuke Tanaka, and Yu Tanaka

Fujitsu Limited, 1-1 Shin-ogura, Saiwai-ku, Kawasaki-Shi, Kanagawa, 212-8510, Japan
Tel: +81-44-280-9937, sobu.yohei@fujitsu.com

Abstract

Silicon photonics is a promising platform for optical communication link of large-scale data centers as they enable small footprint, low fabrication cost, and complementary metal–oxide–semiconductor (CMOS) process compatibility. In the future, the modulation speeds higher than 50 Gbaud and low power consumption should be required for optical transceivers targeting 400 Gbps and beyond with a compact module form factor, such as Quad Small Form-Factor Pluggable (QSFP). Therefore, the development of all-Si-based optical modulators with high speed modulation and low power consumption is important from these perspective.

Although traveling-wave type all-Si modulators equipped with reverse-biased PN diodes have exhibited high-speed operation of > 50 Gbaud, they have an issue in terms of low power consumption for higher baud rate. So, we have been proposed a lumped electrode all-Si modulator with PIN diode integrated with a passive RC equalizer (PIN-RC). The limited analog bandwidth of the PIN phase shifter is expanded by the passive equalization technique that inserts a simple RC filter between a driver output and a PIN phase shifter. To realize the low power consumption, by combining a CMOS inverter driver with a multi-segmented architecture, a very low power operation of 1.59 mW/Gbps of 56Gbps PAM4 transmitter was demonstrated in 2018. In this study, we showed the feasibility of higher-speed operation of PIN-RC modulator by introducing a metal–insulator–metal (MIM) structure into a capacitor for a passive equalizer. We achieved the 3 dB bandwidth of 37.5 GHz and confirmed the > 70 Gbaud NRZ operation with a clear optical eye opening of > 1.38 dB.

BIOGRAPHY, Yohei Sobu received the B. E. and M.E. degrees in electrical and electronic engineering from Tokyo Institute of Technology, Tokyo, Japan, in 2011 and 2013, respectively. He joined Fujitsu Laboratories, Ltd., Atsugi, Japan and Photonics Electronics Technology Research Association (PETRA), Tsukuba, Japan in 2013. He is currently a researcher with the Fujitsu Limited, Shinkawasaki, Japan. His current research focuses on the development and integration of Si-based optical devices.

Tailorable forward Brillouin scattering in microstructred fiber

Sigang Yang

Beijing National Research Center for Information Science and Technology (BNRist)
Department of Electronic Engineering, Tsinghua University, Beijing, 100084, China
Tel: +86 10-62784784, Email: ysg@tsinghua.edu.cn

Abstract

The research of Brillouin scattering has obtained renaissance recently driven by the increasing maturity of micro-nanostructured fibers, photonic integration platforms and nanophotonics. Among these nonlinear acoustic-photon interaction, guided acoustic wave Brillouin scattering (GAWBS), also named as forward Brillouin scattering provides extra freedoms to tailor the optical and acoustic guidance separately. A variety of mechanisms have been proposed to enhance the photon-phonon either in microstructured fibers or integrated waveguides. Benefiting from the remarkable tailorable ability, the Brillouin interactions have shown potentials in sensors, microscopy, optical storage, integrated Brillouin lasers and non-reciprocal optical signal processing. In this talk we will demonstrate our progress in forward Brillouin scattering in our customized microstructured fiber. We have obtained record-long lifetime of acoustic phonon and record-small Brillouin linewidth. Such enhanced opto-acoustic interaction paves the way towards ultra-narrow linewidth Brillouin lasers, large Brillouin amplification and optical signal processing.

Dr. Sigang Yang received his B. E. degree from Northeastern University, Shenyang, China in 2000 and the M. E degree in physical electronics from Huazhong University of Science and Technology, Wuhan, China in 2003. He received his Ph.D. degree in the Department of Electronic Engineering, at Tsinghua University, Beijing, China in 2008. From 2008 to 2010, he worked as a postdoctoral fellow in the Department of Electrical and Electronic Engineering, at The University of Hong Kong. He is currently an Associate Professor in the Department of Electronic Engineering, at Tsinghua University. His current interests focus mainly on Brillouin integrated photonics, novel mechanism to ultra-fast pulse generation.

High Extinction-Ratio and High-Linearity Modulator for Analog and Digital Optical Modulation

Yuya Yamaguchi

National Institute of Information and Communications Technology (NICT),
4-2-1 Nukuikitamachi, Kogakei, Tokyo, Japan
yamaguchi@nict.go.jp

Abstract

Lithium niobate (LN) modulator is one of the key components that make up the modern optical fiber communications. I review the recent research on the LN modulator with high extinction ratio and high linearity for the digital coherent optical links with advanced modulation format and analog applications.

LN is a dielectric crystal with electro-optic effect (Pockels effect), therefore the phase of a lightwave propagating in LN can be controlled by applying voltage. By a use of Mach-Zehnder (MZ) interferometer configuration, the optical phase modulation is converted to the optical amplitude or intensity modulation. In the modern long-haul optical links, integrated LN modulator consisting of four MZ interferometers is used as polarization-multiplexed quadrature amplitude modulator. MZ interferometer is simple structure to be integrated, however it has intrinsic nonlinear response. Therefore, when the electrical signal waveform is converted to optical one, the waveform is distorted due to the nonlinear response. In the case of analog applications and higher-order modulation format in digital coherent link, the modulation distortion limits the link performance calculated from the signal-to-noise and distortion ratio (SNDR).

To solve these problems, we developed the high-extinction-ratio modulator and high-linearity modulator. They work as high-accuracy optical synthesizer and waveform transfer from electrical to optical signals, respectively.

Yuya Yamaguchi received the B.E., M.E., and D.Eng. degrees in applied physics from Waseda University, Tokyo, Japan, in 2012, 2014, and 2017, respectively.

From 2015 to 2016, he was a research associate in Waseda University. Since 2016, he has been with the National Institute of Information and Communications Technology (NICT), Tokyo, Japan. His research interests include optical modulators and functional optoelectronic devices.

Nonlinear nanoplasmonics for novel optical frequency converters

Lili Gui

State Key Laboratory of Information Photonics and Optical Communications, Beijing University of Posts and Telecommunications, Beijing 100876, China
Email: liligui@bupt.edu.cn

Abstract

The traditional nonlinear optical frequency converters are based on nonlinear crystals such as BBO and PPLN which are bulky and usually exhibit narrow operation bandwidth limited by phase matching condition. In this regard, nonlinear optical devices with high nonlinear conversion efficiency, as well as wide and even tailorable bandwidth at the nanoscale are highly desired. Resonant metallic nanostructures are promising candidates due to their significant near-field enhancement benefiting from collective oscillation of free electrons at the surface (surface plasmons). In my presentation I will show our recent work on novel nonlinear plasmonic nanodevices. The goal is to improve the performances of nonlinear nanophotonic converters including the robustness, the nonlinear conversion efficiency, as well as the functionality of the nanodevices, by means of exploring novel materials, optimizing structural design, and developing analytical methods.

BIOGRAPHY, Dr. Lili Gui obtained her Bachelor's degree and Doctor's degree at Tsinghua University in China in July 2008 and July 2013, respectively. From August 2013 to December 2018 she was a postdoctoral researcher at University of Stuttgart, Germany. Since January 2019 she has been a senior researcher at Beijing University of Posts and Telecommunications (BUPT), China.

The microwave photonic filter and its applications in optoelectronic oscillators

Yuan Yu

Wuhan National Lab for Optoelectronics (WNLO) & School of Optics and Electronic Information,
Huazhong University of Science and Technology, Wuhan, 430074, China
Tel: +86 027-87792367, Email: yuan_yu@hust.edu.cn

Abstract

The microwave photonic technique can generate, transmit, and process microwave signals with low loss, large bandwidth and high flexibility. As an important branch, the microwave photonic filter (MPF) exhibits advantages of excellent tunability and reconfigurability. To enhance the performance of the MPF, approaches of improving the Q factor and rejection ratio are investigated. Meanwhile, applications of MPFs to optoelectronic oscillators (OEOs) are also investigated. Thanks to the wideband tunability of MPF, the oscillating frequency of MPF-based OEO can be widely tuned consequently. To enhance the mode selection in OEO, cascaded MPFs and selective parity-time symmetry are proposed. The frequency stabilization of OEO based on micro ring resonator (MRR) is also investigated by using a home-made feedback control loop. It is demonstrated that the frequency jitter of the oscillating frequency is three orders of magnitude lower than that without the feedback control.

BIOGRAPHY, Dr. Yuan Yu obtained the degree of Bachelor of Science and Doctor of Philosophy in Huazhong University of Science and Technology (HUST), Wuhan, China, 2008 and 2013, respectively. His study interest includes microwave photonics and integrated photonics, including microwave photonic filter, optoelectronic oscillator, microwave photonic measurement.

Analog-to-digital compressed radio-over-fiber (ADX-RoF) for MIMO 5G/IoT fronthaul

Paikun Zhu[1], Yuki Yoshida[2], Ken-ichi Kitayama[1,2]

1. The Graduate School for the Creation of New Photonics Industries (GPI), Hamamatsu, Shizuoka, 431-1202, Japan

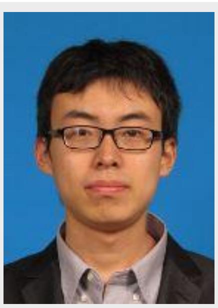
2. National Institute of Information and Communications Technology (NICT), Koganei, Tokyo, 184-8795, Japan

zpk@gpi.ac.jp

Abstract

The emerging wireless traffic demands from both human and machines are driving the development of evolved radio access network (RAN) architectures. Centralization & fronthauling is regarded as a key for RAN to efficiently support small cells with cost and energy savings. In 5G and beyond, the fronthaul (FH) network will become more complex and overloaded, and traditional FH interface (CPRI) might be no longer practical. Alternative FH technologies, such as analog radio-over-fiber (A-RoF) and functional split, have been studied. Besides, the candidate technologies should also meet other important FH requirements such as low latency, high signal quality, good MIMO scalability, etc. In this talk, we present an evolved RoF concept, analog-to-digital compressed RoF (ADX-RoF), towards 5G/IoT and beyond FH. In ADX-RoF, MIMO waveforms are converted to digital stream as high-fidelity “radio bearer” for transporting and switching through FH networks, meanwhile data is compressed with limited signal distortion to save wired bandwidth and cost. The novel low-complexity spatial compression in ADX-RoF offers good scalability to single/multi-user MIMO and even massive MIMO. The joint spatial-temporal optimization of compression leads to significantly improved bandwidth-efficiency for optical FH links. We discuss the basic architecture, technical principles, and hardware design considerations of the technique. The FH bandwidth-efficiency improvement, wireless signal quality and processing latency of the ADX-RoF concept are evaluated on field programmable gate array (FPGA) platform.

Acknowledgement: this work was partially supported by the R&D contract (FY2017~2020) “Wired-and-Wireless Converged Radio Access Network for Massive IoT Traffic” for radio resource enhancement by the Ministry of Internal Affairs and Communications (MIC), Japan.



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BIOGRAPHY, Dr. Paikun Zhu received PhD in 2017 in Peking University, China. Since 2017 he has been a Prj. Assistant Professor of GPI, Japan, currently visiting NICT. He has co-authored over 60 IEEE/OSA publications, including an invited paper in JOCN OFC2016 Special Issue. He is a conference invited speaker of SPIE ICOCN2018 and CIOP2019. He is a reviewer of Opt. Express, IEEE PTL, etc. He received 2016 SPIE Optics & Photonics Education Scholarship, and 2018 MWP Symposium “Young Scientist Poster Award” (Matsue, Japan). His current research interests include fiber-wireless converged system, signal processing and its hardware design using FPGA.

Blockchain Technology and Its Application in optical networks

Bin Chen

College of Electronics and Information Engineering,
Shenzhen University, Shenzhen, 518040, China
Tel: +86-755-22673422, Email: Bchen@szu.edu.cn

Abstract

The blockchain represents emerging technologies and future trends. In this work, the technologis that make the blockchain an immutable digital ledger are reviewed. Then, the applicatioin of the blockchain technology in optical networks is discussed.

BIOGRAPHY, Associate Prof. Bin Chen received the B.E. and M.S. degrees in electronic engineering in 1997 and 2002 from Lanzhou University. He got his Ph.D. degree in Communication Engineering from Nanyang Technological University in 2007. He is now an associate professor in Shenzhen University. His research interests include the application of artificial intelegent and blockchain technology in optical networks.

Performance Analysis for Approximate Optical Computing
- Computer Architecture Perspective -

Satoshi Kawakami

Faculty of Information Science and Electrical Engineering, Department of I&E Visionaries, Kyushu University, 744 Motooka Nishi-ku Fukuoka, Japan.
satoshi.kawakami@cpc.ait.kyushu-u.ac.jp

Abstract

Nanophotonic computers using optical devices are one of the promising methods to realize high-performance low-power computing system. Advanced nanophotonic technology offers an opportunity to invent the optical computer by integrating at high density and reducing the power and area for the optical device. Although nanophotonic devices themselves have great primitive potential, it is not clear whether an efficient computer system can actually be realized and how. To realize a truly efficient optical computer system, careful co-design across the system stack of devices/circuits/architectures/applications is quite important. Grand challenges and opportunities in such post CMOS computing platforms are discussed with some introductions of our recent research activities which is based on performance analysis through the system stack from a viewpoint of computer architect.

Here is for your

BIOGRAPHY, Satoshi Kawakami received the B.E., M.E. and Ph.D. degrees in Information Science and Electrical Engineering from Kyushu University in 2012, 2014 and 2019 respectively. During 2014-2016, he worked on an electrical control unit for automobiles in Bosch Corporation. He is currently an assistant professor in Kyushu University. His research interests are computer architecture includes emerging technologies such as nanophotonic and superconducting devices for both classical and quantum computing.