

Silicon Photonics: Opportunities and Challenges

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Abstract: The tutorial will provide a broad introduction to the field of silicon photonics, with emphasis on the major opportunities and challenges encountered when applying silicon technology for photonic integrated circuits.

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Room 2

11.00-12.30

SaF • High Capacity Systems and Technologies IIGuifang Li: Univ. of Central Florida, USA, *Presider***SaF1 • 11.00** **Invited**

Coherent Optical Communication, Guifang Li: Univ. of Central Florida, USA. Recent progress in coherent optical communication technology will be discussed. Experimental results focusing on high spectral efficiency transmission as well as linear and nonlinear impairment compensation in WDM systems will be presented.

Room 4AB

11.00-12.30

SaG • Fiber Lasers and Sources IIDavid Payne: Univ. of Southampton, UK, *Presider***SaG1 • 11.00**

Single-Longitudinal-Mode Erbium-Doped Fiber Laser Based on a Fiber-Bragg-Grating Pair, Daru Chen, Weisheng Liu, Hongyan Fu, Yizhen Wei, Sailing He: Ctr. for Optical and Electromagnetic Res., Zhejiang Univ., China. A single-longitudinal-mode erbium-doped fiber laser based on a fiber-Bragg-grating pair formed by two standard fiber Bragg gratings is proposed. Both single-wavelength and dual-wavelength single-longitudinal-mode lasing for the proposed fiber laser have been demonstrated.

SaG2 • 11.15

Photonic Crystal Fiber Based Multi-Wavelength Brillouin-Erbium Laser, Mohd Narize Mohd Nasir, Zulfadzli Yusoff, Mohammed Haydar Al-Mansoori, Hairul Akhar Abdul Rashid, Pankaj Kumar Choudhury: Multimedia Univ., Malaysia. An efficient multi-wavelength Brillouin-erbium photonic crystal fiber (PCF) laser with Fabry-Perot cavity design is presented. Up to 14 output channels with good signal to noise ratio could be generated with only 100 m of PCF.

SaG3 • 11.30

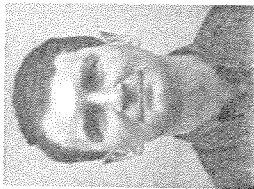
Tunable Nonlinear-Polarization-Rotation Based Multiwavelength Fiber Laser with In-Line Fiber Filter, Zuxing Zhang^{1,2}, Xingye Ye¹, Kun Xu², Jian Wu¹, Yiyue Nie¹, Jintong Lin¹: ¹Key Lab of Photoelectron and Communications of Jiangxi Province, Jiangxi Normal Univ., China; ²Key Lab of Optical Communication and Lightwave Technologies (Ministry of Education), Beijing Univ. of Posts and Telecommunications, China. Multiwavelength fiber laser based on nonlinear-polarization-rotation (NPR) has been demonstrated. The intensity-dependent loss induced by NPR can effectively alleviate mode competition. Using the in-line birefringence fiber filter, the laser wavelength can be finely tuned.

Room 4C

11.00-12.30

SaH • Silicon Photonics IAlexei Sotob: Swiss Federal Inst. of Technology, Switzerland, *Presider***SaH1 • 11.00** **Tutorial**

Silicon Photonics: Opportunities and Challenges, Roel Baets: Dries Van Thourhout, Peter Bienstman, Gunther Roelkens, Pieter Dumon, Wim Bogaerts: Ghent Univ., IMEC, Belgium. The tutorial will provide a broad introduction to the field of silicon photonics, with emphasis on the major opportunities and challenges encountered when applying silicon technology for photonic integrated circuits.



Roel Baets is full professor at Ghent University and leads the Photonics Research Group, which is associated with IMEC. With about 250 journal publications, as well as about 15 patents, he has made contributions to research on semiconductor laser diodes, passive guided wave and grating devices and to the design and fabrication of photonic ICs, both in III-V semiconductors and in silicon. He has been granted several scientific prizes and is a fellow of the IEEE.

Roel Baets is coordinator of the European Network of Excellence ePIXNet and of the European "Erasmus Mundus" Master of Science in Photonics program.

Room 5A

11.00-12.30

SaI • Probes, Sensors and Assays IIChinlon Lin: Nanyang Technological Univ., Singapore, *Presider***SaI1 • 11.00** **Invited**

Drug Discovery Biology Leading Biophotonics, Ye Fang, Ann Ferric, Gary Li, Joydeep Lahiri: Corning Inc., USA. Discussed are enabling biophotonic technologies that provide *in vivo* like information earlier in drug discovery. The development of resonant waveguide sensor based high-throughput screening platform and utilization for studying signaling in cells will be described.

Room 5B

11.00-12.45

SaJ • Radio over Fiber and Radio Frequency OpticsMable Fok: Princeton Univ., USA, *Presider***SaJ1 • 11.00**

Generation of 60-GHz Optical Millimeter-Wave and 20-GHz Channel-Spaced Optical Multicarrier Using Two Cascaded 10-GHz Modulators, Qingliang Chang, Tong Ye, Junming Gao, Yikai Si: State Key Lab of Advanced Optical Communication Systems and Networks, Dept. of Electronic Engineering, Shanghai Jiao Tong Univ., China. We propose and experimentally demonstrate the generation of 60-GHz optical millimeter-wave and 20-GHz channel-spaced optical multicarrier using two cascaded 10-GHz single-drive Mach-Zehnder modulators.

SaJ2 • 11.15

Simultaneous Dual RF Beam Reception of an X-Band Phased Array Antenna Utilizing Highly Dispersive Photonic Crystal Fiber Based True-Time-Delay, Harish Subramanian¹, Maggie Yihong Chen², Ray T. Chen³: ¹Univ. of Texas at Austin, USA; ²Omega Optics, Inc., USA. We report dual RF beam reception of an X-band phased array antenna using photonic crystal fiber based delay network. We accurately detect RF signals at 8.4GHz and 12GHz coming from -7.4 and -21.2 degrees respectively.

SaJ3 • 11.30

Tunable Single-Bandpass Microwave Photonic Filters with High Q Factor or Flat-Top Shape Based on Cascaded Optical Structures, Kun Zhu, Haiyan Ou, Ying Hu, Hongyan Fu: Ctr. for Optical and Electromagnetic Res., Zhejiang Univ., China. A tunable single-bandpass microwave photonic filter with high Q factor or flat-top shape is proposed and experimentally demonstrated. The filtering response with variable shape is achieved by carefully matching the transfer functions of two cascaded structures.

Workshop on the Commercialization of Photonics Technologies from Universities

Saturday, 1 November, 16.30–19.00, Room 2

Organizers:

Dr. Wei-Ping Huang, Professor, McMaster Univ., Canada
Mark Cranshaw, Project Manager, Innovation China-UK (ICUK),
Univ. of Southampton, UK

University research groups and laboratories play important roles in discovery, invention and development of enabling photonics technologies for a wide range of applications in our everyday life. Companies, entrepreneurs, investors, and governments around the world are making efforts to promote and realize commercialization of ideas and technologies from universities. This workshop will bring together the best minds from industry, government, university and capital communities to share their visions, business models, experiences and real life joys and pains in pushing from ideas of ivory towers to products and services of down-to-earth business.

Speakers will cover a range of topics with direct relevance to commercialization. These will include building links between industry and the University sector, the incubation of newly formed companies and exploring funding sources. Prof. David Payne will draw on his experience of establishing and running a successful photonic cluster of spin out companies around the Optoelectronics Research Centre at the University of Southampton. Richard Lin from Fangda Partners in Shanghai will provide a briefing on issues related to the protection of Intellectual Property while local Chinese government officials will speak on the funding of commercialisation activities on the Chinese side. Dr. Tongyu Liu will share his personal experience to take a leading-edge technology into a new commercial venture for commercialization of fiber-sensor in mine applications.

Additional information may be found on pages 22–24.

Scope 1: Optical Fibers, Fiber Components and Subsystems

Tutorial Speakers

SaA1, Technologies and Subsystems for High Speed Transmission, Benny Mikkelsen; Mintera Corp., USA page 14
SuP2, Bend Insensitive Fiber Design Strategies, David Peckham; OFS Labs, USA page 33

Invited Speakers

FD5, Fiber-Based Approaches for All-Optical Clock Recovery, Lawrence R. Chen; McGill Univ., Canada page 12
FD6, Optical Electrostatic MEMS for Wavelength Switching, Yuan Ma; Dalhousie Univ., Canada page 12
SaA2, 640-Gb/s OTDM RZ-DQPSK Signal Enabling 2.4-Bit/s/Hz Spectral Efficiency and its Detection with an EAM-Based Receiver, Lothar Moeller¹, Yikai Su², Chongjin Xie¹, Jürgen Gripp¹, Xiang Liu¹, Roland Ryf¹; ¹Bell Labs, Lucent Technologies, USA, ²State Key Lab of Advanced Optical Communication Systems and Networks, Shanghai Jiao Tong Univ., China page 15
SaB1, High Power CW Pumped Supercontinuum Sources, B. A. Cumberland, A. B. Rulkov, J. C. Travers, S. V. Popov, J. R. Taylor; Imperial College London, UK page 14
SaB2, Fiber MOPAs with High Control and High Power, Johan Nilsson, S. Yoo, P. Dupriez, C. Farrell, M. S. Z. Abidin, J. Ji, J.-N. Maran, C. A. Codemard, Y. Jeong, J. K. Sahu, D. J. Richardson, D. N. Payne; Optoelectronics Res. Ctr., Univ. of Southampton, UK page 14
SaE1, Development of Long-Period Fiber Grating Coupling Devices, Kin Seng Chiang; City Univ. of Hong Kong, Hong Kong page 14
SaF1, Coherent Optical Communication, Guifang Li; Univ. of Central Florida, USA page 16
SaF2, High-Speed Vectorial Lightwave Modulation Techniques, Tetsuya Kawanishi; Natl. Inst. of Information and Communications Technology, Japan page 16
SaG5, Carbon Nanotube Based Mode-Locked Fiber Lasers, Shinji Yamashita; Univ. of Tokyo, Japan page 17

Sa6, Fiber-Radio Antenna Feeding for MIMO Systems, Michael Sauer, Andrey Kobaykov; Corning Inc., USA page 17
SaM1, Diffraction-Resistant Light (Bessel Beams) from Optical Fibers, Siddharth Ramachandran; OFS Labs, USA page 22
SuA1, DPSK, DQPSK and Coherent Receivers for 40G and 100G Systems, Yannick K. Lize; Stratelight Communications, USA page 25
SuA2, High Spectral-Efficiency Mixed 10G/40G/100G Transmission, Xiang Liu, S. Chandrasekhar; Bell Labs, Alcatel-Lucent, USA page 25
SuB1, Recent Advances in Highly Nonlinear Microstructured Optical Fibers and Their Applications, David Richardson, F. Poletti, M. L. V. Tse, P. Horak, J. Y. Y. Leong, F. He, J. H. V. Price, X. Feng, H. N. Rutt, K. E. Frampton, W. H. Loh, S. Asimakis, P. Petropoulos; Optoelectronics Res. Ctr., Univ. of Southampton, UK page 25
SuK1, Recent Advances in Parametric Amplification and Processing, Stojan Radic, C. Bries; Univ. of California at San Diego, USA page 30
SuP1, Recent Developments in Optical Fiber Technology and Their Impact Opening New Application Spaces, Claudio Mazzali; Corning Inc, USA page 33
Scope 2: Optoelectronic Devices and Materials
Tutorial Speaker
SaH1, Silicon Photonics: Opportunities and Challenges, Roel Baets; Univ. of Ghent, IMEC, Belgium page 16
Invited Speakers
FG1, High Speed Modulation of Optical Injection-Locked Semiconductor Lasers, Ming Wu; Univ. of California at Berkeley, USA page 12
FG4, High-Speed and High-Power InP Based Photodiode for the Applications of Microwave Photonics, Jin-Wei Shi, Y.-S. Wu, W.-Y. Chiu; Natl. Central Univ., Taiwan page 13