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.

OCIS codes: 130.3120 Integrated optics devices; 160.6000 Semiconductor materials


AOE 2008
TECHNICAL DIGEST ON CD-ROM
ISBN 978-1-55752-863-6
Asia Optical Fiber Communication & Optoelectronic Exposition & Conference
亚洲光纤通讯与光电博览会及国际会议
CONFERENCE: 30 October–2 November 2008
EXPOSITION: 31 October–2 November 2008
Shanghai Expo Convention Center
99 Xin Yi Road, Shanghai, China
www.aoe-expo.com
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Room 2

11.00–12.30
SaF • High Capacity Systems and Technologies II
Guifang 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.

SaF2 • 11.30 Invited
High-Speed Vectorial Lightwave Modulation Techniques, *Tetsuya Kawanishi; Natl. Inst. of Information and Communications Technology, Japan.* We describe high-speed vectorial modulation techniques for high-capacity transmission systems. Integrated parallel Mach-Zehnder modulators can achieve various types of lightwave modulation, such as differential quadrature phase shift keying, quadrature amplitude modulation.

Room 4AB

11.00–12.30
SaG • Fiber Lasers and Sources II
David 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.

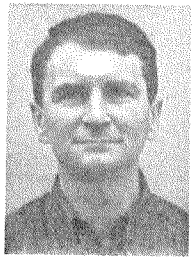
SaG2 • 11.15
Photonic Crystal Fiber Based Multi-Wavelength Brillouin-Erbium Laser, *Mohd Narizee Mohd Nasir, Zulfadzli Yusoff, Mohammed Haydar Al-Mansoori, Hairul Azhar Abdul Rashid, Pankaj Kumar Choudhury; Multimedia Univ., Malaysia.* An efficient multi-wavelength Brillouin-erbium photonic crystal fiber (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], Zhiqing Ye[1], Kun Xu[2], Jian Wu[2], Yiyou Nie[1], Jintong Lin[2]; [1]Key Lab of Photoelectron and Communications of Jiangxi Province, Jiangxi Normal Univ., China, [2]Key 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-depended 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 I
Alexei Sirbu; 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 II
Chinlon Lin; Nanyang Technological Univ., Singapore, Presider

SaI1 • 11.00 Invited
Drug Discovery Biology Leading Biophotonics, *Ye Fang, Ann Ferrie, 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.

SaI2 • 11.30 Invited
Correlating Cellular Metabolic Status with the Lifetime of Autofluorescence from NADH, *Vladimir Gukassyan, Po-Yen Lin, Fu-Jen Kao; Inst. of Biophotonics, Natl. Yang Ming Univ., Taiwan.* FLIM/FRET, one of the most effective tools in addressing cellular molecular dynamics in living cells and organisms, is applied to autofluorescence from cellular NADH to reveal the metabolic status of cells.

Room 5B

11.00–12.45
SaJ • Radio over Fiber and Radio Frequency Optics
Mable 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, *Qingjiang Chang, Tong Ye, Junming Gao, Yikai Su; 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 Subbaraman[1], Maggie Yihong Chen[2], Ray T. Chen[1]; [1]Univ. of Texas at Austin, USA, [2]Omega 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

Invited Speakers

Scope 2: Optoelectronic Devices and Materials

Tutorial Speaker

Invited Speakers