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Center for Advanced Research in Photonics
and
Department of Electronic Engineering
The Chinese University of Hong Kong

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Time: 4:30pm – 5:30 pm
Location: Rm 214 Ho Sin Hang Engineering Bldg, The Chinese University of Hong Kong

Silicon based Optoelectronics

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Abstract

Silicon has been the mainstay material for the electronics industry over the last 40 years. However, it has had a very limited impact in the area of optoelectronics because it is extremely inefficient as a light emitter, it is incapable of detecting photons for 1.3-1.55 μm wavelengths of interest in telecommunications, and it is lacking of electro-optic effects for high-frequency light modulation. Nevertheless, several recent breakthroughs, including fast silicon optical modulator [1, 2] and Raman silicon laser [3] based on Silicon-on-Insulator (SOI), have sparked an intense interest in the field of silicon photonics, the technology of implementing conventional photonic functionalities in a silicon host. Such an advance in the development of individual silicon photonic devices boosts the promise that silicon could in the near future be considered as an optical material for optoelectronic applications. In this talk, we present an overview of silicon photonics in the industry perspective. We start with discussion of technical challenges of interconnects for high performance computing as higher data rate transmission (bandwidth) is required with a trend of multi-core and many-core CPUs. We then discuss the role of silicon photonics in the possible electrical interconnect to optical interconnect transition. We review the fundamental photonic building blocks for silicon-based optoelectronics applications and the recent advances. Both high speed silicon modulators and silicon Raman amplifiers and lasers are covered. We also address technical challenges associated with photonics and electronics integration.

References

- [1] A. Liu *et al.* "A high-speed silicon optical modulator based on a metal-oxide-semiconductor capacitor," *Nature* **427**, 615 (2004).
- [2] L. Liao *et al.* "High-speed silicon Mach-Zehnder modulator," *Opt. Express* **13**, 3129 (2005).
- [3] H. Rong *et al.* "A continuous-wave Raman silicon laser," *Nature* **433**, 725 (2005).

About the Speaker: Dr. Ansheng Liu is currently a Principal Engineer with the Corporate Technology Group, Intel Corporation, Santa Clara, CA, where he is developing silicon photonic devices and circuits for high speed optical interconnect and communications. He is one of the key contributors to Intel's recent technology breakthroughs in fast silicon optical modulator and continuous-wave Raman silicon amplifier and laser. Before joining Intel in 2000, he worked at NASA Ames Research Center, the National Institute of Standards and Technology, and at the University of Aalborg as an assistant professor. His interests include nonlinear optics of nanostructures, near-field optics, opto-electronics, and photonics. He has authored or co-authored more than 80 publications in these fields and contributed to more than 40 patents. He has been a reviewer for various prestigious journals. He is the member of OFC/NFOEC 2007 program committee. He has also been an invited speaker for various international conferences.

***** All are welcome to attend *****

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