

Session 33 - Optoelectronics, Displays, and Imagers - Silicon Photonics

Wednesday, December 11, 9:00 a.m.

Continental Ballroom 7-9

Co-Chairs: A. Giesecke, AMO

S. Matsuo, NTT

9:05 AM 33.1 A Silicon Photonics Technology for 400 Gbit/s Applications

Frederic Boeuf, Antonio Fincato, Luca Maggi, Jean Francois Carpentier, Patrick Lemaitre, Mark Shaw, Sebastien Cremer, Nathalie Vulliet, Charles Baudot, Stephane Monfray, Sebastien Jan, Claire Deglise, Jean-Robert Manouvrier, Cedric Durand, Angelica Simbula, Dimitri Goguet, Pierre Bar, Delia Ristoiu, Francois Leverd, Laurene Babaud, Alessio Daverio, Marco Binda, Adamo Bazzoti, Antonio Canciamilla, L. Ramini, M. Traldi, P. Gambini, STMicroelectronics, Universita di Pavia

A Si-Photonics platform operating at 100 Gbit/s per lane is demonstrated. Integration of 60 GHz photodiode and efficient phase modulator into a 400G-DR4 test chip is shown. Extension towards 400G-FR4 is addressed by the introduction of a SiN layer allowing wideband fiber to the chip optical coupling and polarization management.

9:30 AM 33.2 Silicon Nitride Waveguide Coupled 67+ GHz Ge Photodiode for non-SOI PIC and ePIC Platforms

S. Lischke, D. Knoll, C. Mai, A. Hesse, G. Georgieva, A. Peczek, A. Kroh, M. Lisker, D. Schmidt, M. Fraschke, H. Richter, A. Krüger, U. Saarow, P. Heinrich, G. Winzer, K. Schulz, P. Kulse, A. Trusch, and L. Zimmermann, IHP – Leibniz-Institut für innovative Mikroelektronik, Technical University Berlin, Institut für HF- und HL-Systemtechnologien, IHP Solutions GmbH

A silicon nitride waveguide coupled Ge photodiode, showing more than 67 GHz bandwidth is demonstrated for the first time, which paves the way for utterly new SiN waveguide platform based applications. The new photodiode can also be a key enabler for a bulk-Si based, monolithically integrated electronic-photonic integrated circuit platform.

9:55 AM 33.3 High-performance Hybrid Silicon and Lithium Niobate Mach-Zehnder Modulators for over 100 Gbit/s (Invited)

Xinlun Cai, Sun Yat-sen University

Based on a Silicon and Lithium Niobate hybrid integration platform, we demonstrate Mach-Zehnder modulators that feature low insertion loss, low drive voltage, large modulation bandwidth, high linearity, compact footprint and low manufacturing cost. The hybrid platform demonstrated here opens up new avenues for future high-speed and energy efficient networks.

10:20 AM 33.4 Integrated DFB Laser Diode and High-efficiency Mach-Zehnder Modulator using Membrane III-V Semiconductors on Si Photonics Platform

Tatsuro Hiraki, Takuma Aihara, Takuro Fujii, Koji Takeda, Takaaki Kakitsuka, Tai Tsuchizawa, Shinji Matsuo, NTT Corporation

A distributed feedback laser diode and InGaAsP Mach-Zehnder modulator are heterogeneously integrated on Si waveguide circuits. The integrated device shows a fiber output power of 2.9 mW with a laser current of 70 mA, $V_{\pi L}$ of 0.4 Vcm, and an eye opening at 28 Gbit/s with 4.2 Vpp.

10:45 AM 33.5 2D-3D Integration of High- κ Dielectric with 2D Heterostructures for Opto-electronic Applications

B. Terrés, H. Agarwal, L. Orsini, A. Montanaro, V. Soriano, D. van Thourhout, K. Watanabe, T. Taniguchi, M. Romagnoli and F. H. L. Koppens, The Barcelona Institute of Science and Technology, Photonic Networks and Technologies National Laboratory, University–IMEC, National Institute for Material Science, ICREA

11:10 AM 33.6 First Demonstration of Waveguide-Integrated Black Phosphorus Electro-Optic Modulator for Mid-Infrared Beyond 4 μm

Li Huang, Bowei Dong, Yiming Ma, Chengkuo Lee, Kah-Wee Ang, National University of Singapore

We demonstrate the first black phosphorus electro-optic modulator integrated with Si waveguide for the mid-infrared spectrum from 3.85 to 4.1 μm . With a gate bias of -4 V, a modulation depth of ~5 dB was achieved with a small active footprint of 225 μm^2 at room temperature.