Prototype Photonic Integrated Circuits (ProtoPICs): A Flexible Platform for Hybrid Integration

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Abstract

Silicon-based photonic integrated circuits (PICs) are seeing rapid adoption in datacom enabling data rates beyond 100 Gb/sec. These PICs leverage silicon (Si) waveguides operating at near-infrared wavelengths (1300-1600 nm) where Si is transparent. For photonic applications outside of telecom including lidar, bio-photonics, and atomic systems where wavelengths spanning near UV to IR are of interest, PICs based on silicon-nitride (SiN) waveguides can be utilized. Since neither Si nor SiN components emit light efficiently, light sources need to be integrated with these platforms using fiber coupling or heterogeneous integration techniques. There is a desire to combine the best-of-breed active devices (e.g., lasers, semiconductor optical amplifiers (SOAs), modulators, photodetectors) typically fabricated in III-V material systems with the Si and SiN platforms. We present a hybrid integration platform developed at Lincoln Laboratory that enables flip-chip die attach of a wide variety of III-V photonic components with our SiN PIC platform.

Short Bio: Dr. Dave Kharas is a member of the technical staff at MIT LL's Quantum Information and Integrated Nanosystems Group, where he is working in the Integrated Photonics Team in a process integration role. Dr. Kharas leads the Photonics Team's device fabrication activities across a number of technology platforms including silicon and nitride PICs, hybrid integration of III-V components, and MEMS and Microfluidic devices. Prior to joining Lincoln Labs, Dr. Kharas led the AlInGaP Technology Group at Philips Lumileds. Dr. Kharas holds PhD and MS degrees in Materials Science from SUNY Stony Brook, and a BS in Applied Physics from UMASS Lowell.