**MODetector (MOD): a dual-function optical modulator-detector for on-chip communication**

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Electronic device scaling in modern microsystems has lead to system limitations mainly driven by challenges in signal communication, but also fundamental challenges such as quantum tunneling. Although new emerging options including photonics and plasmonics have recently been investigated to overcome the interconnect and communication bottleneck, the fundamental energy efficiency of optical logic devices is still been limited to fJ level due to weak non-linearity. Rather than focusing at the logic level, reducing the energy cost in data communication via both optoelectronic component- and architecture improvements is a viable optiona. While augmenting network on chips (NoC) with photonic links enables high-bandwidth communication, the overhead for photonics is rather large, mainly driven by bulky footprints and the multi-functionality of transceivers. The latter requires, in addition to a photon source, signal modulation and detection. If a NoC were photonically augmented at every network point to enable all-to-all connectivity, the resulting photonic overhead would be excessive. Besides, the high bandwidth of a single optical bus may be sufficient to supply the networks data-sharing demand. Spatial signal routing is a necessary function of data communication in NoCs. However, if photonic links are used to augment electronics, an energy-costly optical-electrical-optical (OEO) conversion is required since routing is currently executed in the electronic domain. Here we show a novel integrated broadband hybrid photonic-plasmonic device termed MODetector featuring dual light modulation and detection. With 10 dB extinction ratio and 0.8 dB insertion loss at the modulation state and 0.7 W/A responsivity at the detection state, this transceiver-like device (i) eliminates the OEO conversion, (ii) reduces optical losses from photodetectors via bypassing the photodetector when not needed, and (iii) enables cognitive routing strategies for network-on-chips. As such MODetector acts as a micrometer-compact transceiver for next-generation NoCs.