Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

A MoTe2 based light emitting diode and photodetector for silicon photonic integrated circuits. YA-QING BIE, M. HEUCK, G. GROSSO, M. FURCHI, Y. CAO, MIT, J. ZHENG, Columbia U., E. NAVARRO-MORATALLA, L. ZHOU, MIT, T. TANIGUCHI, K. WATANABE, NIMs, J. KONG, D. ENGLUND, P. JARILLO-HERRERO, MIT — A key challenge in photonics today is to address the interconnects bottleneck in high-speed computing systems. Silicon photonics has emerged as a leading architecture, partly because many components such as waveguides, interferometers and modulators, could be integrated on silicon-based processors. However, light sources and photodetectors present continued challenges. Common approaches for light source include off-chip or wafer-bonded lasers based on III-V materials, but studies show advantages for directly modulated light sources. The most advanced photodetectors in silicon photonics are based on germanium growth which increases system cost. The emerging two dimensional transition metal dichalcogenides (TMDs) offer a path for optical interconnects components that can be integrated with the CMOS processing by back-end-of-the-line processing steps. Here we demonstrate a silicon waveguide-integrated light source and photodetector based on a p-n junction of bilayer $MoTe_2$, a TMD semiconductor with infrared band gap. The state-of-the-art fabrication technology provides new opportunities for integrated optoelectronic systems.

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Date submitted: 09 Nov 2016 Electronic form version 1.4