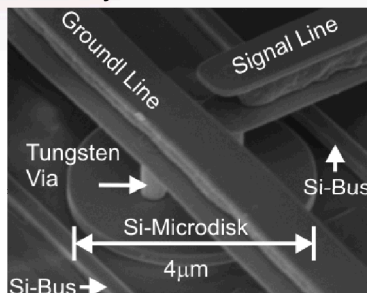


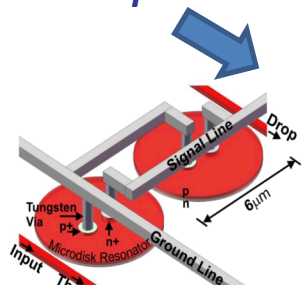
Sandia Silicon Photonics for Reconfigurable Systems

SAND2012-4763P

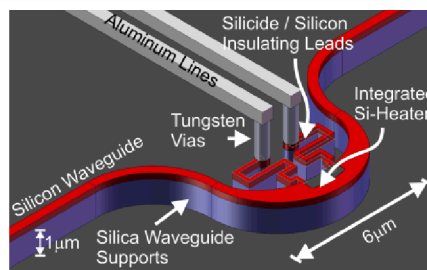
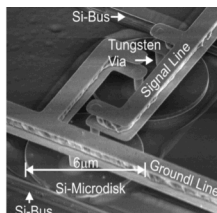
3.2fJ/bit at 12Gb/s



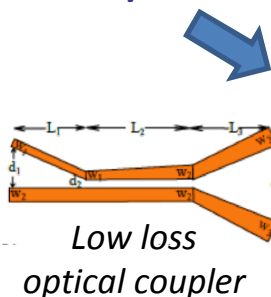
Resonant Optical Modulator/Filter



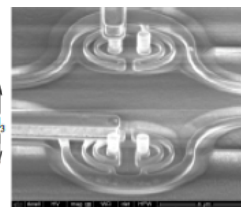
Fast Reconfigurable Interconnects



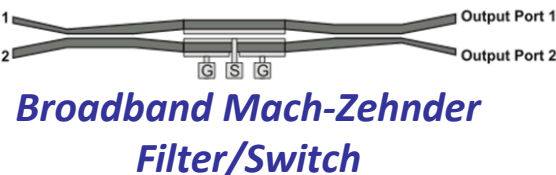
Thermo-optic Phase Shifter



Low loss optical coupler

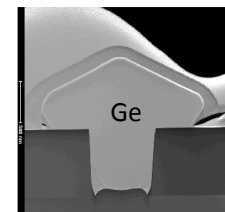


Switch Arrays



Broadband Mach-Zehnder Filter/Switch

45GHz BW



High-speed Ge Detector on Si

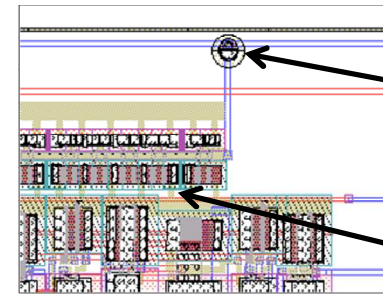
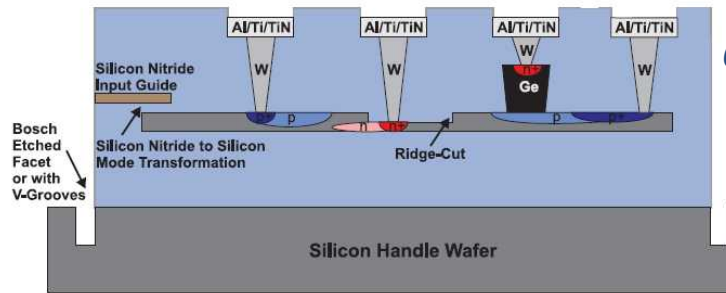
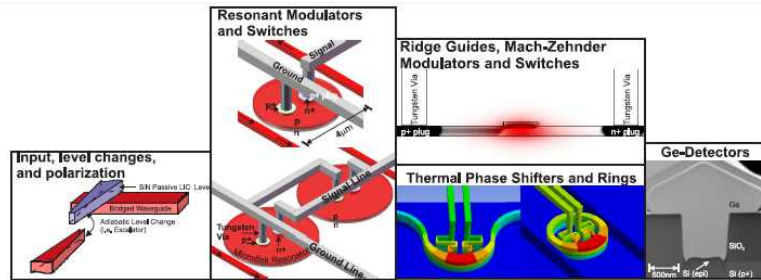
Demonstrated capabilities:

- Low energy tunable WDM modulation: <1V, 3fJ/bit at 12.5Gbps, BER<10⁻¹³
- High speed detection: 45GHz BW with 1V bias, 3nA dark current and 0.8 responsivity
- Fast reconfigurable filters and switches: 1GHz switching across 100GHz spectral BW
- Low-loss Silicon and Nitride multilevel nano-waveguides for optical routing
- Building blocks for low-power transceivers and redundant reconfigurable networks

Sandia Silicon Photonics Integration

Multi-functional photonic integration platform

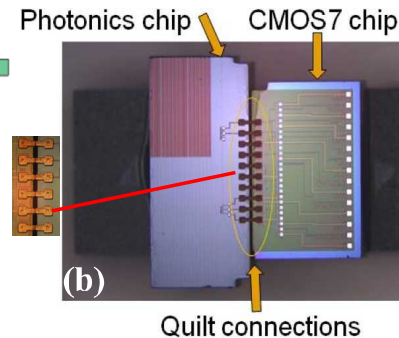
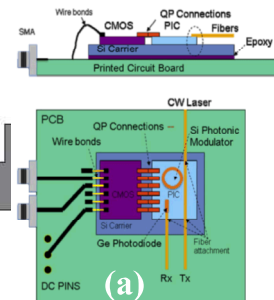
*Monolithic opto-electronic fabrication
with RADHARD electronics*



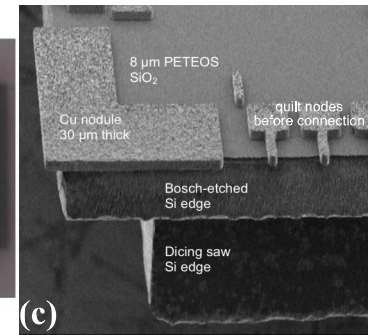
Optical modulator

CMOS electronics

Opto-electronic Quilt packaging with RADHARD electronics



Quilt connections



Features of monolithic and hybrid demonstrations:

- Integration : High-yield silicon photonics integration with state of the art CMOS
- Packaging : Fiber attachment, rework-able 2D integration, emerging 3D capability
- Interface Electronics: Efficient clock and data recovery and differential drivers
- System Applications: Satellites, Aircraft, Computing, Focal plane arrays