What is AIM Photonics ?

A full service provider and consortium for Integrated Photonics as part of the Manufacturing USA network

The Foundry behind AIM: Wafer Fab

24/7 Pilot Line for Development and EUH production

- 1.3M ft^2 facility
- 135k ft^2 of class 1 capable cleanroom
- Cutting edge 300mm toolset
- Total investment > $10B
- Proven processing capability spans 65nm - 5nm CMOS

SUNY Polytechnic Institute

AIM Technology Access

❑Quantum Dot Lasers

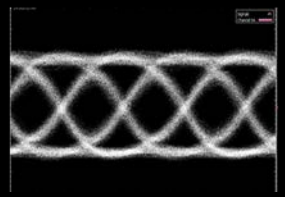
- ✓ Less sensitivity to defects
- ✓ Enables amplification
- ✓ Reduces need for isolators
- ✓ Thermal stability
- ✓ Integration cost advantage
- ✓ Significant reliability progress

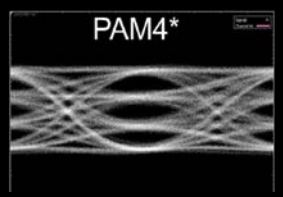
❑Low-loss Waveguides

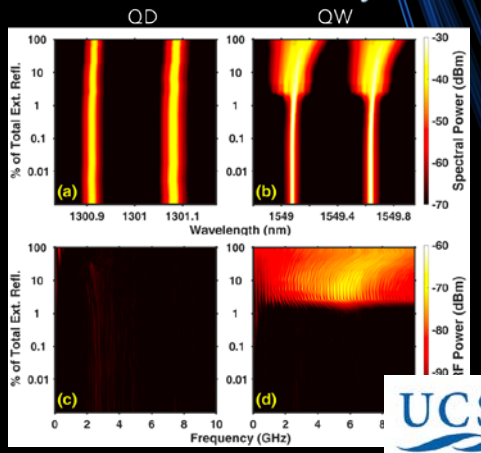
- ✓ <0.25 db/cm for 220nm silicon
- ✓ <0.10 db/cm for 220nm SiN
- ✓ ~1db/facet edge coupler for both TE and TM

❑Design Elements (component library)

PDKv3.0a MZM







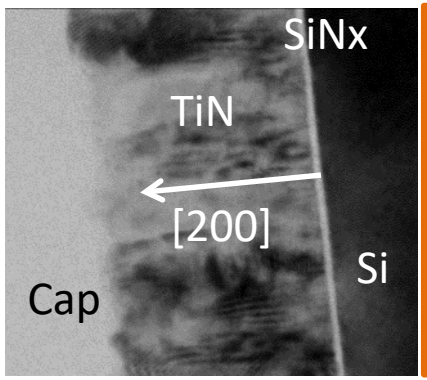
UCSB

Passive Components	Qty	Selected Performance
Waveguides	6	<1dB/cm
Edge Couplers	5	<1.5dB/facet
Vertical Couplers	2	<3dB/coupler
3dB 4-Port Splitters	2	<0.5dB loss
3dB Y-junctions	3	<0.2dB loss
Power Taps (1% & 10%)	3	<0.1dB loss
Layer Transitions	5	<0.1dB loss
Crossing	1	<0.15dB loss, <-50dB Xtalk
Polarization Rotator	1	<0.8dB loss
Polarization Splitter & Rotator	1	<0.8dB PDL, >20dB PER
Waveguide Termination	1	<-50dB reflection
Active Devices	**Qty**	**Selected Performance**
C Band Photodetector	1	BW>45GHz, R~1A/W
C+L Band Photodetector	1	BW>35GHz, R~1.1A/W
O Band Photodetector	1	BW>40GHz, R~0.9A/W
C+L Band MZM 25G	1	50Gbps PAM4, 0.9Vcm
C+L Band MZM 50G	1	100Gbps PAM4, 1.2Vcm
O Band MZM	1	50Gbps PAM4, 1.3Vcm
Microring Bandpass Filters	4	0.5nm FWHM, ~26nm FSR
Microdisk Bandpass Switches	4	<3ns switch, >30dB isolation
Microdisk Modulators	5	50Gbps, 1Vpp >4dB ER
Analog Photodetector	1	SFDR>113dB/Hz$^{2/3}$
Analog MZM	1	SFDR>100dB/Hz$^{2/3}$
Thermo-Optic Phase Shifter	2	<25mW/π
Thermo-Optic Switch	2	<25mW/switch
Variable Optical Attenuator	1	up to 10dB

ANALOG PHOTONICS

Quantum Tech. Dev. at 300mm scale

- **300mm CMOS fab-friendly superconducting materials, devices and circuits**
  - Superconducting qubits
  - Single flux quantum logic
  - Superconducting single photon detectors
  - High kinetic inductance superinductors



Al/AlOx transmons with 193 nm litho

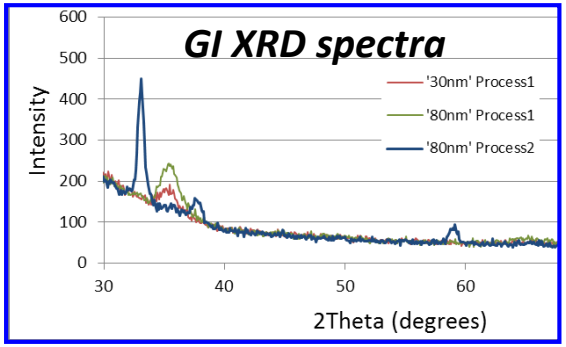
$\frac{\omega_q}{2\pi} = \mathbf{4.76612}$ GHz, $\mathbf{4.70267}$ GHz

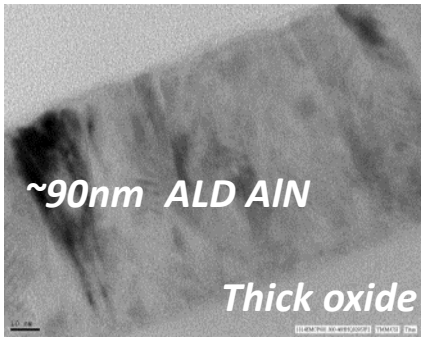
$T_1 = \mathbf{26.79}$ µs, $\mathbf{25.93}$ µs

ECS Transactions 85(6) 151 (2018)

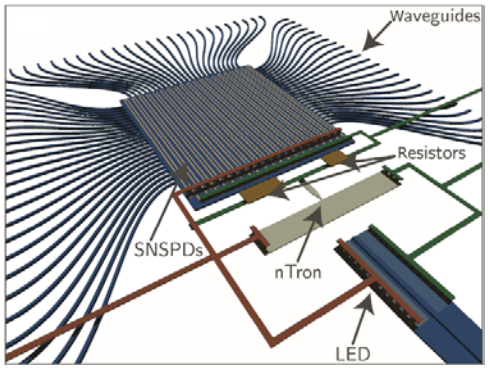
Foroozani et al, Quantum Sci. & Tech. (2019)

- **Development of AlN-based photonic integrated circuits**
  - UV-transparent waveguides
  - electro-optic modulators
  - Quantum signal transduction





- **Development of superconducting optoelectronics components**
  - Fast, energy-efficient neuromorphic computing
  - 3 year project (AFRL funded)



Shainline et al, Phys. Rev. Appl. 7, 034013 (2017)