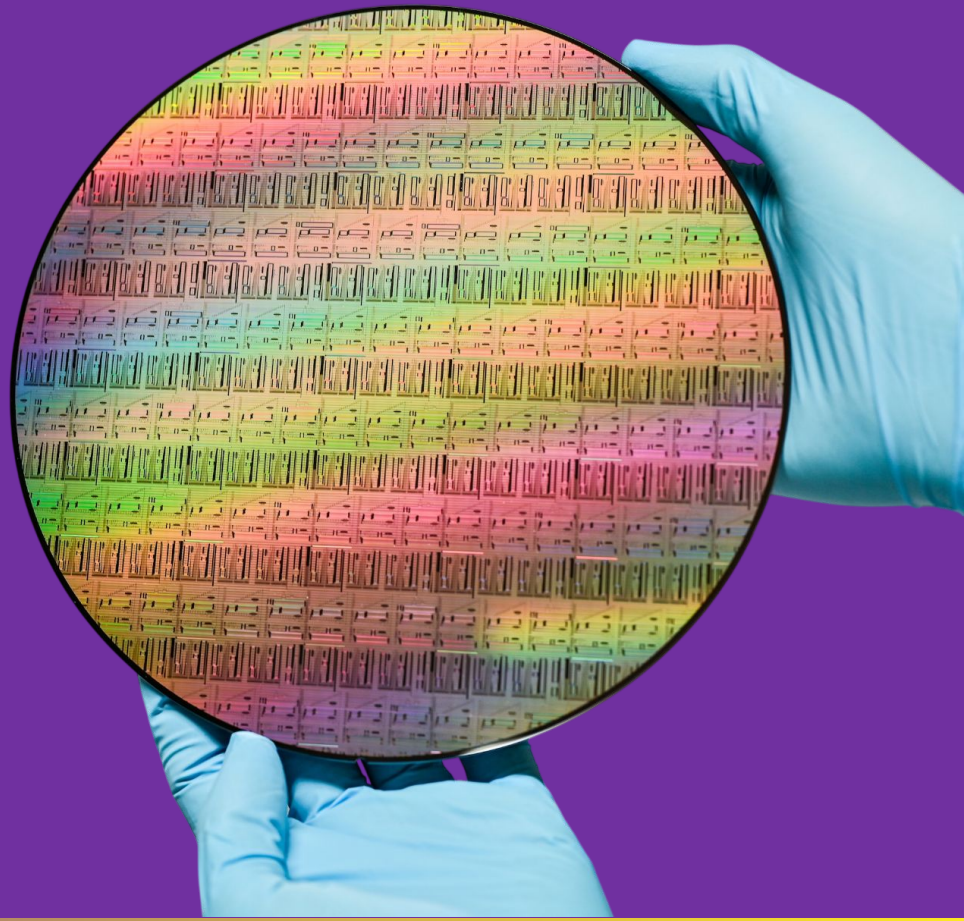
LIGENTEC: Low loss integrated photonics

Stuart May
Manal Mohamed



Introduction

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HR Business Partner
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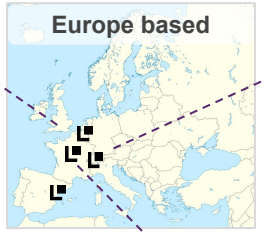
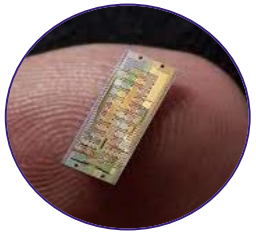
About LIGENTEC



Team of 80+ photonic enthusiasts

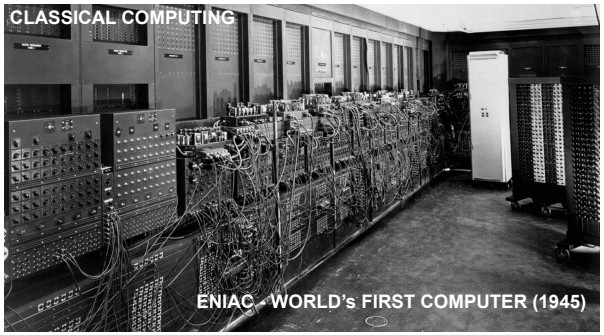
Best-in-class integrated photonic circuits

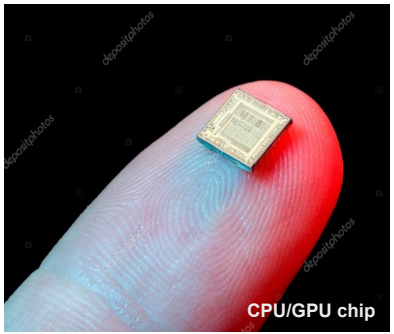
- Low Loss SiN (down to < 0.2 dB/m)
- 3+ technology platforms (AN800, AN350, AN150, custom)
- Integration with actives
- Extensive PDK

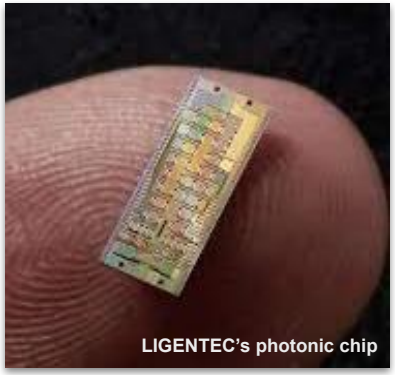


ISO 9001
BUREAU VERITAS
Certification

What is Photonic integration?



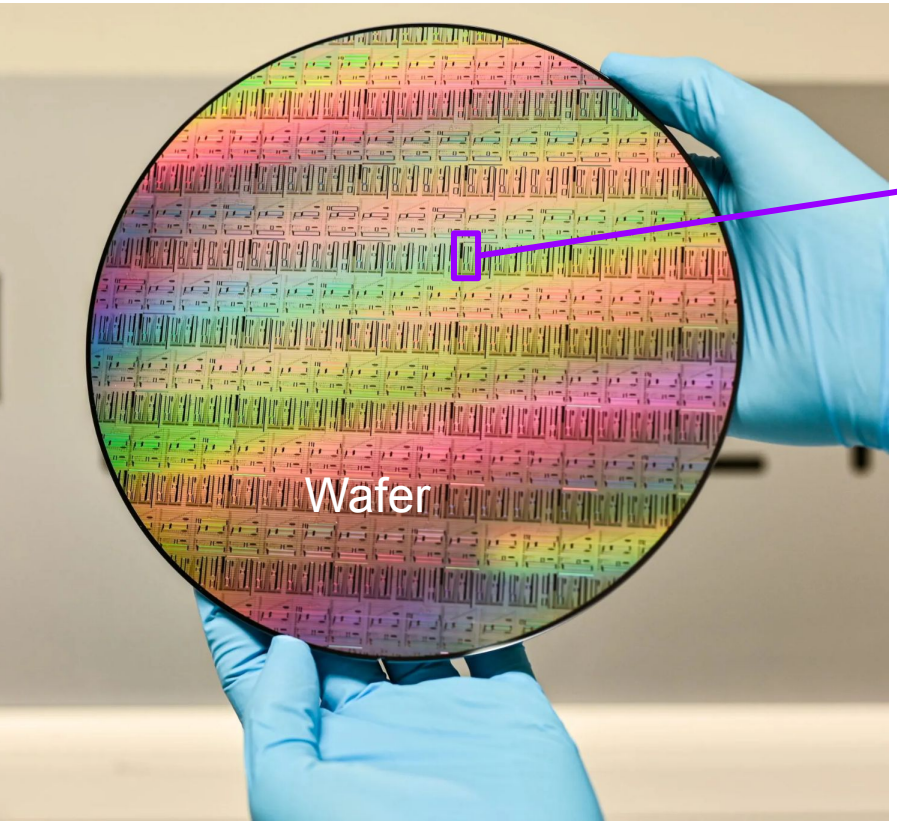


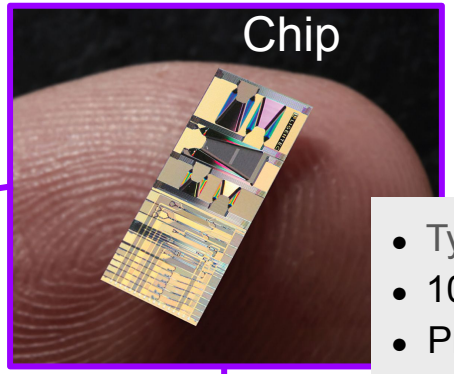


Arrazola et al., Nature 54 March 2021

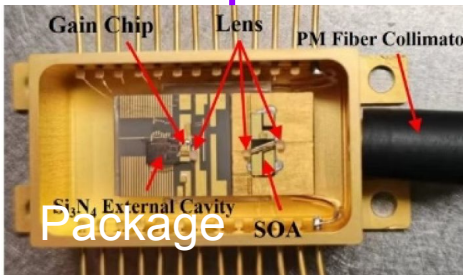
Smaller, lighter, power efficient, inexpensive..

Photonic Integrated Circuit (PIC)



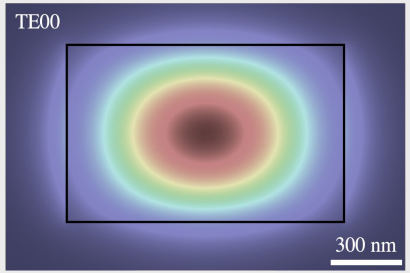


- Typical Chip Size: 1 - 10mm
- 100s to 1’000s chips per wafer
- Produced in CMOS foundries



Ligentec Offering

Thick SiN – the game changer



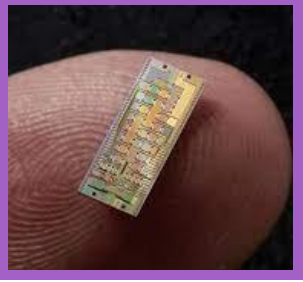
90% of the light is confined

- Low propagation loss
- Small chip size
- Non-linear optics
- High Power, VIS to IR

All Nitride Core Technology: combining the benefits of

- **Silicon Nitride** (VIS-IR, low loss, high power) with
- **Silicon Photonics** (small chip size, scalability)

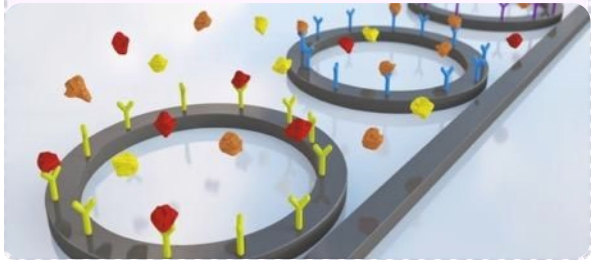
We deliver PICs



Our PIC technology is an enabler for:

Sense

Biosensing
OCT / LiDAR
Metrology & Instrumentation
Atomic Clocks / GPS-less navigation
…

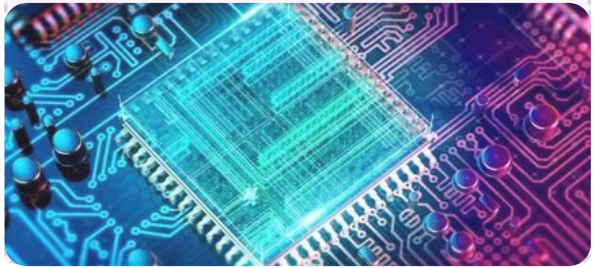


Connect

Telecom / Datacom
Satellite Communication
Optical Circuit Switching
Quantum Key Distribution (QKD)
…

Compute

Quantum Computing
Neuromorphic Computing
Optical I/O and interposers (AI)
…

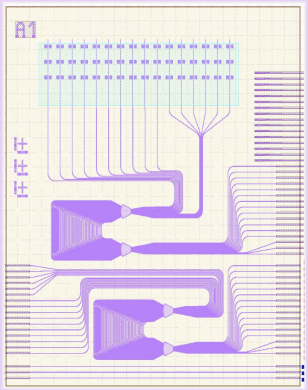


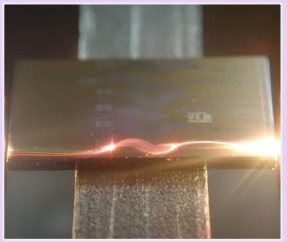
LIGENTEC's High-performance PIC Platforms

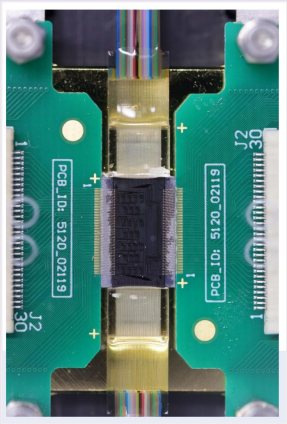
LIGENTEC - A PIC solutions partner

Feasibility study	Design and layout	Fabrication	Measurement	Packaging

Number of channels	1X12
Admissible optical input power (per channel):	>0 dBm
Channel spacing	100 GHz
Channel filter mask:	-
Central wavelength accuracy	+/- 5 GHz
3-dB bandwidth	60 GHz
Pass-band ripple	< 0.25 dB peak to peak
Transition band	< 10 GHz
Stop band attenuation	> 30 dB
Central wavelength thermal drift	< 0.12 GHz/°C
Adjacent Cross talk	< -30dB
Non-Adjacent Cross talk	< -35dB
Cumulative Cross talk	< -25dB
Optical return loss	> 35 dB
Polarization Extinction Ratio	> 25 dB
Insertion loss	< 1.5 dB
Insertion loss stability (across the operating temperature range)	+/- 0.5 dB





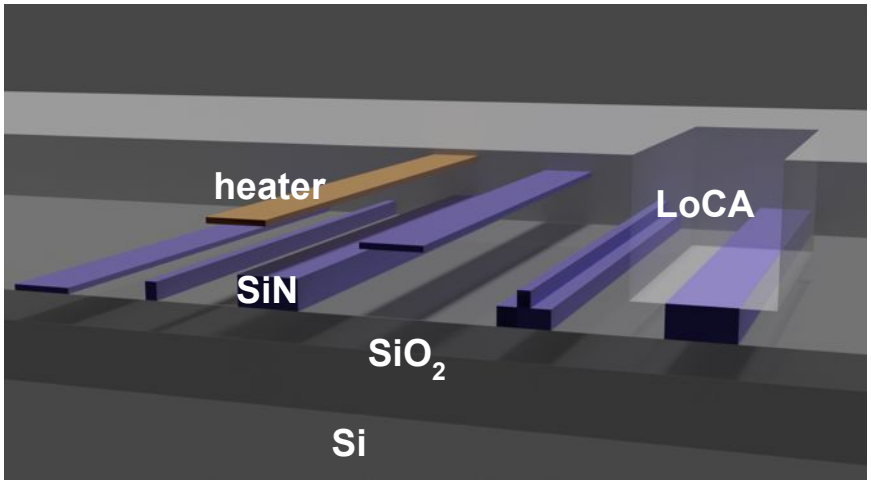


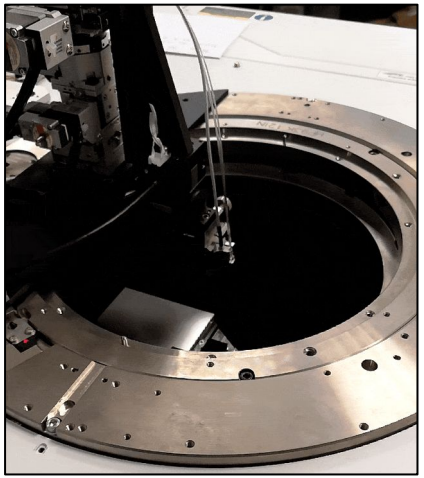
Engagement with Engineering team	Standardised PDK usage	LIGENTEC X-FAB	LIGENTEC facility	LIGENTEC ecosystem

A versatile platform to start from

3+ thicknesses	10+ process modules	Extensive PDK

- AN800
- AN350
- AN150
- custom





Fully automated wafer testing

Enhance the SiN platform with monolithic & heterogeneous integration

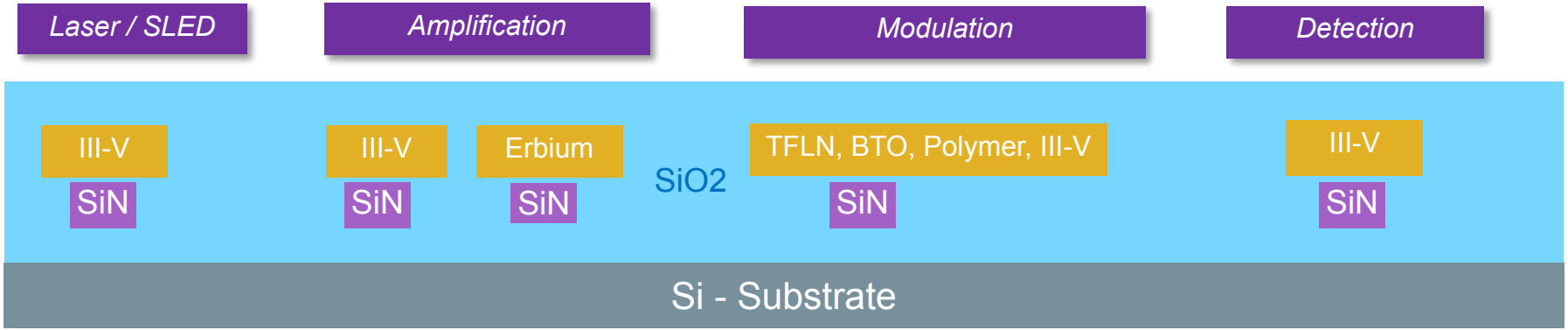
Use SiN as base platform for general circuitry

- o Comprehensive PDK
- o Best for passive components
- o Standard optical I/Os
- o Scalable to volume

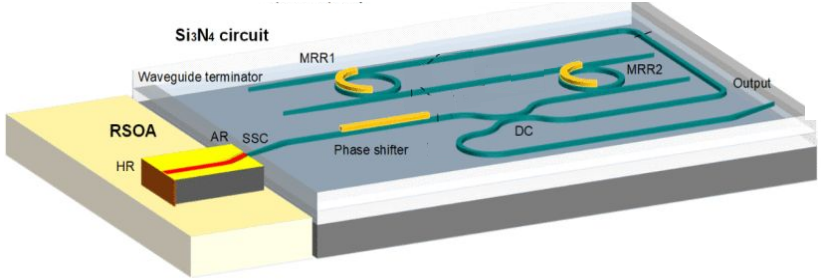
+

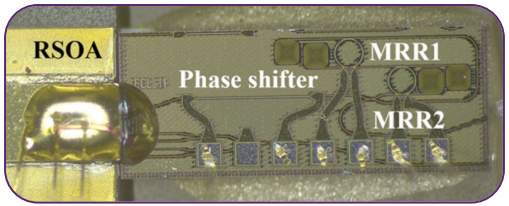
Heterogeneous Integration for active functionalities

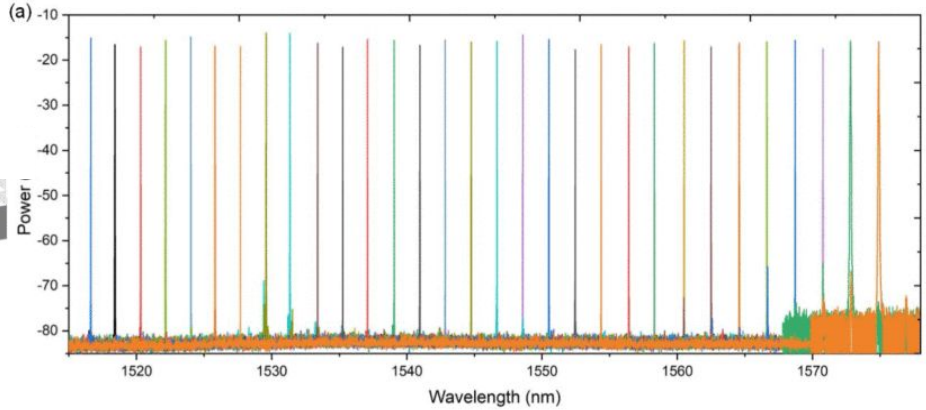
Combine the best passive PIC platform with the best active materials



Hybrid: Tunable Narrow Linewidth Lasers







Narrow Linewidth External Cavity Lasers

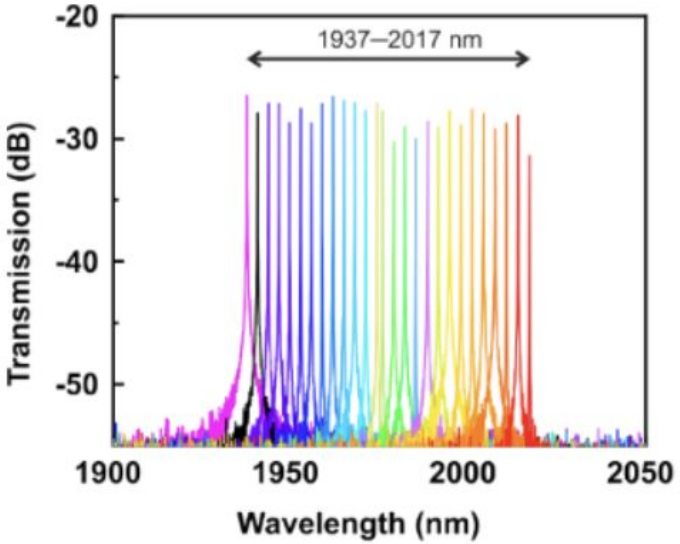
Linewidth: <3kHz	***Max power: 34mW***
SMSR: -70dB	***Tuning: 58.5nm***

LIGENTEC AN technology provides a basis for your LIDAR system

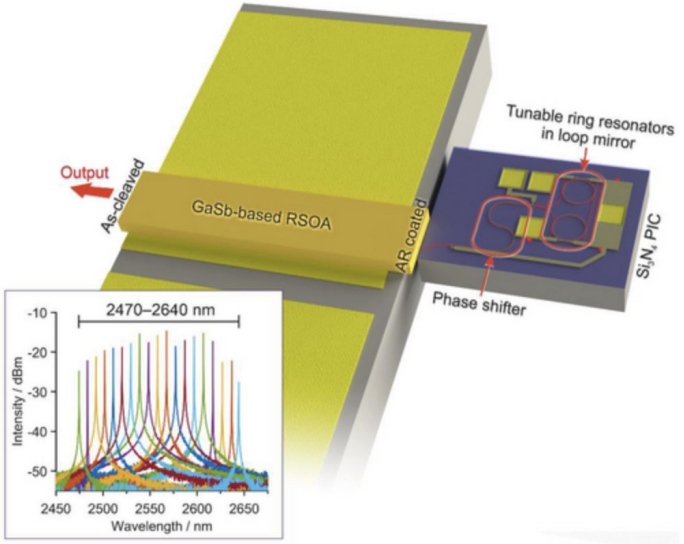
- Transparent to all LIDAR sources (0.8-1.7um)
- High power handling (~10W)
- Long reach ~200m

Y.Guo et al., IEEE Photonics Journal (2021)
C.Liu et al., JLT (2022)
Zia et al., arXiv 2211.02135 (2022)

Hybrid: Tunable Narrow Linewidth Lasers

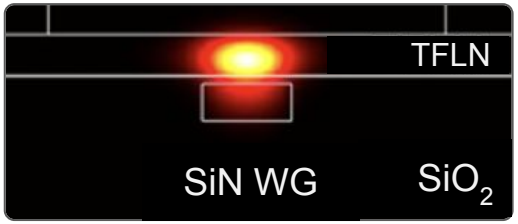


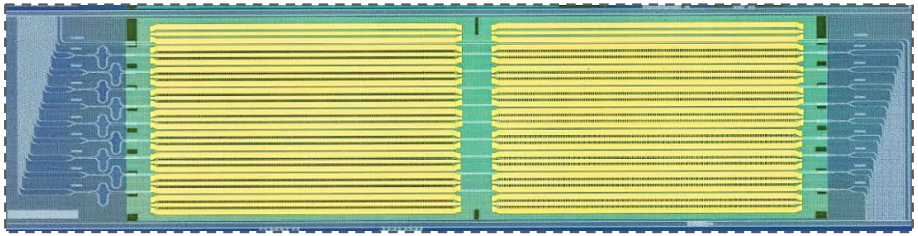
Zia et al., arXiv 2211.02135 (2022)

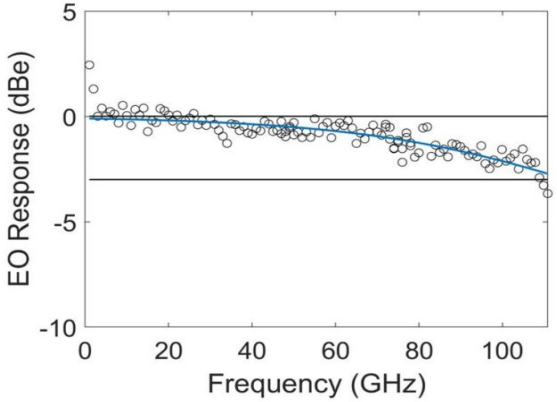


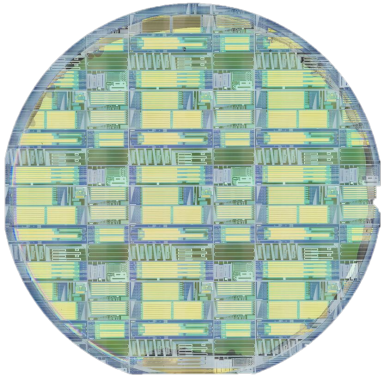
Ojanen et al., Laser&Photonics Review (2023)

Low loss & high speed modulator









TFLN on SiN
- Only essential components in TFLN, all others remain in SiN
- All standard building blocks available

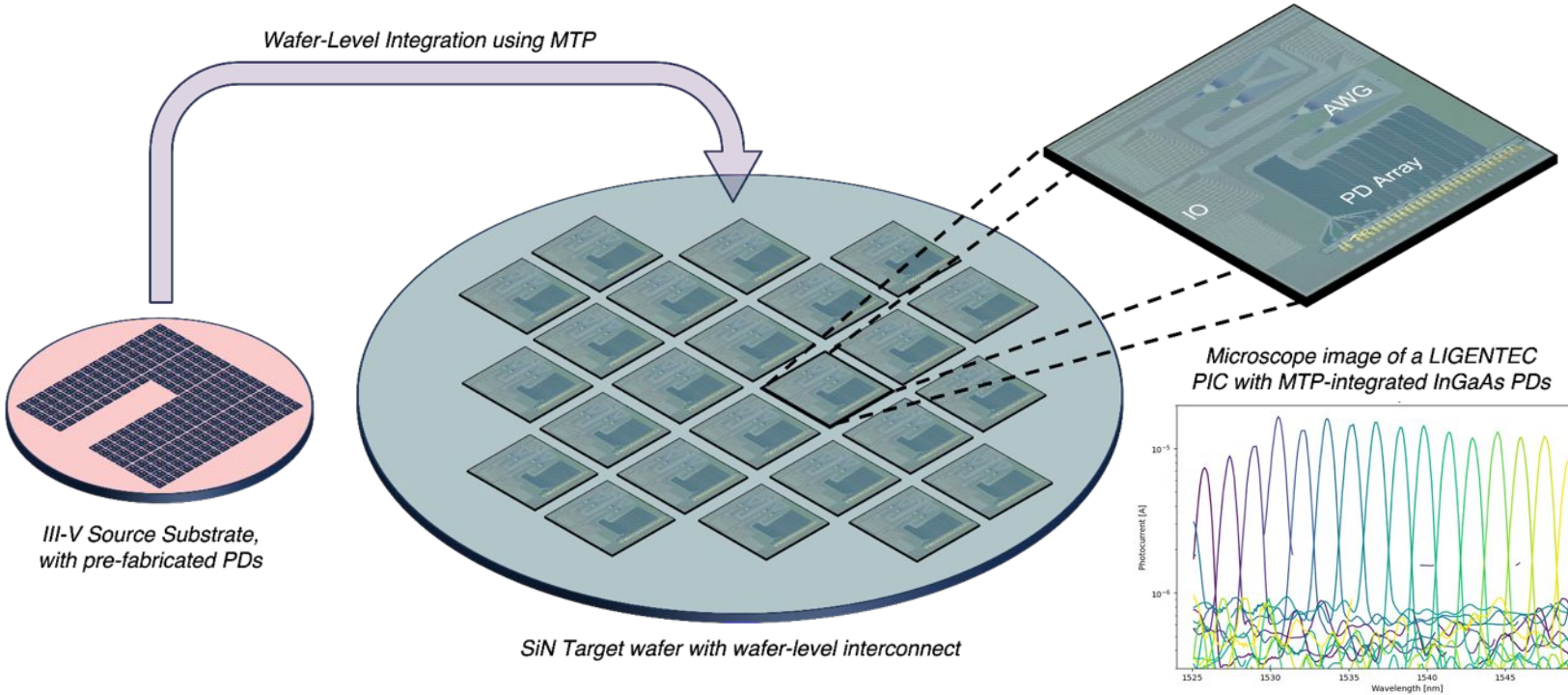
Modulator specifications
- Bandwidth: 110 GHz
- Vπ: 2V

Hybrid mode approach
- Low propagation loss: 4 dB/m
- Simplified fabrication
- Escalator loss: < 20 mdB
- Fibre to fibre loss: < 2.5 dB

J. Lightwave Technol. 44, 1822-1831 (2026)

Low-loss, high-responsivity detection

LIGENTEC



Let's PIC it !
Come talk to us