



**Integrating actives
into low loss PICs**



Our Mission: Unleashing the potential of PICs!
or in short: Let's PIC it!

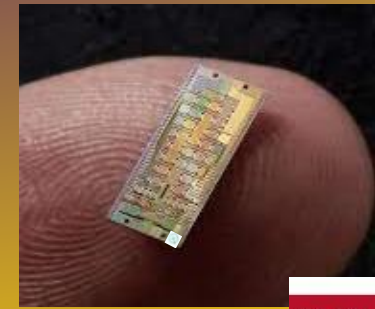
European PIC Company with a global reach

LIGENTEC key facts



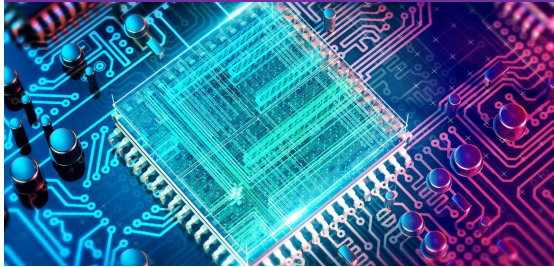
Best-in-class integrated passive SiN

- Low Loss SiN (0.2 dB/cm to < 1 dB/m)
- 3 Technologies (AN150, AN350, AN800)
- Extensive PDK



Advanced Computing

Quantum Computing
Neuromorphic Computing
Optical I/O (AI)
...



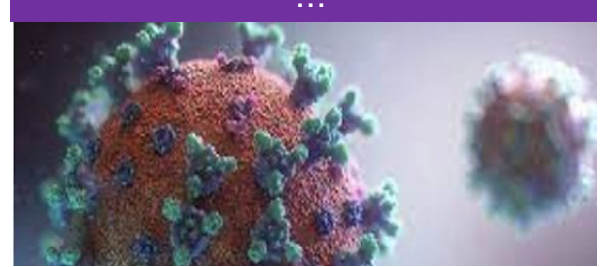
Communication

QKD
Telecom
Data Transmission
Satellite Communication
...



Sensing

OCT / LiDAR
Atomic Clocks / GPS-less navigation
Biosensing
Fiber sensing
Metrology
...



Low Loss Silicon Nitride Integrated Photonics

Seamless journey from Idea to Volumes

Entry: R&D & Prototyping

Open access, low barrier

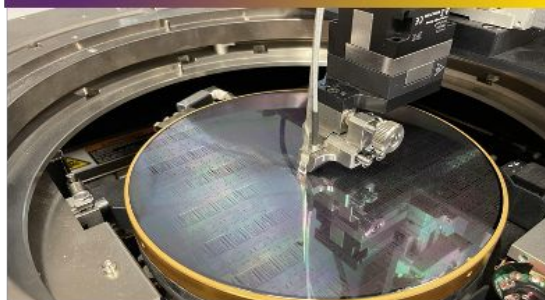


Fast prototyping

- Established technology
- Fixed layer stack
- Extensive PDK
- **Regular MPW runs**
- Custom runs
- Design / layout support
- Characterization
- Packaging support

Optimize: Development

High flexibility & competence



Custom PIC Developments

- Engineering studies
- Layer stack adaptation
- Custom integrations

Ligentec Labs

- Early technology access

Manufacturing: Supply

Quality and guarantee



Pilot Fabrication

- Pilot and niche quantities

Volume Fabrication

- Large volumes
- High-capacity wafer fab
- Fully automated testing
- Automotive quality system

A base to build on
Versatile Platform



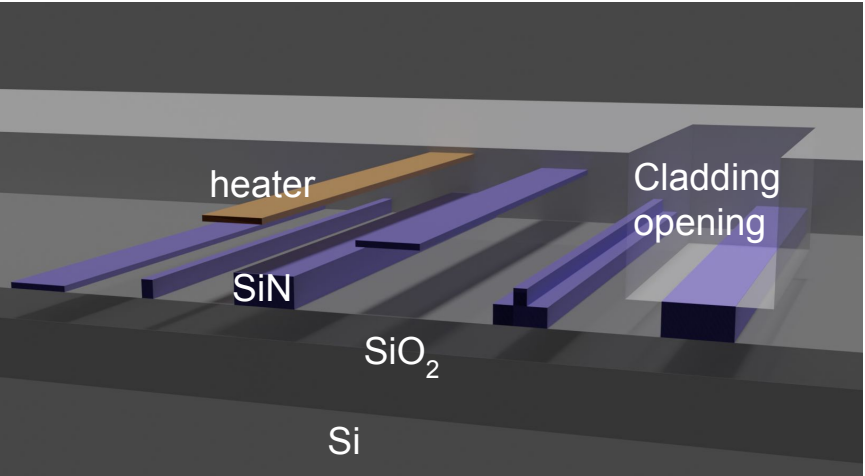
3+ thicknesses 10+ process modules Extensive PDK

800 nm

350 nm

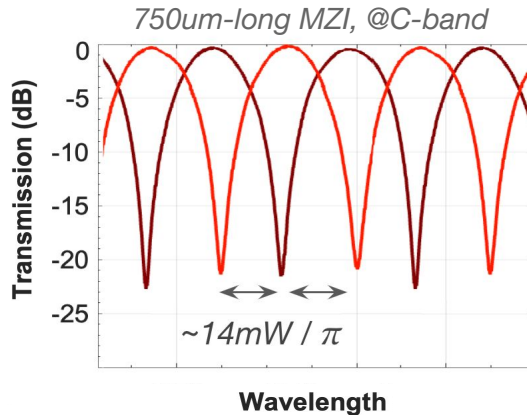
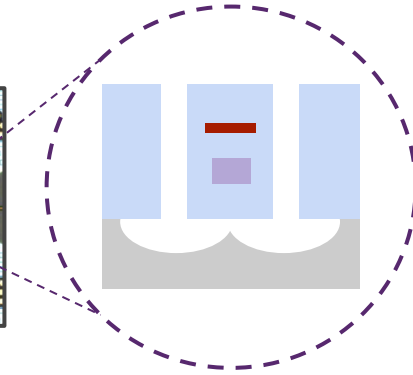
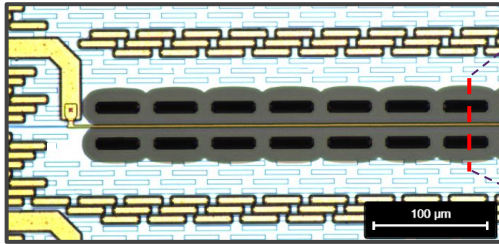
150 nm

custom



The next step – enhance the SiN PIC platform

Monolithic integration of modulators (kHz)



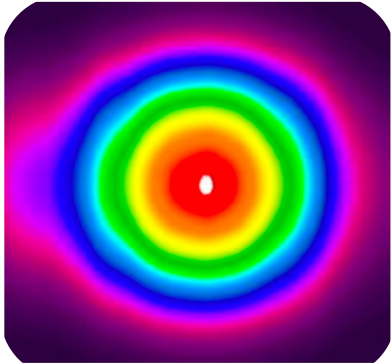
Monolithic undercut heater on top of SiN

π phase shift power : 15mW
Speed: ~kHz

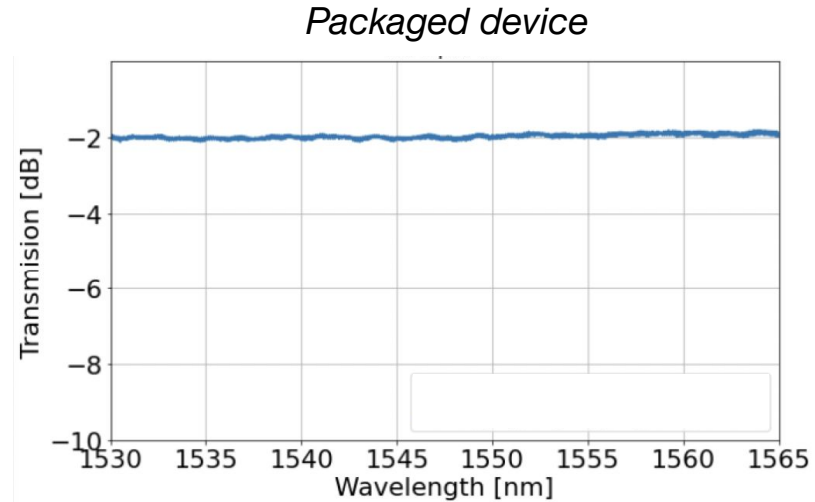
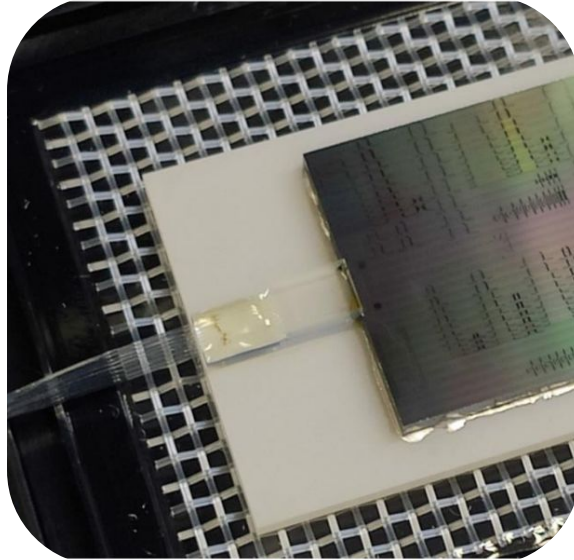
Hybrid Integration example
High performance optical I/O (ExSpot)

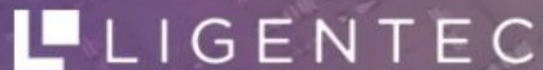


Proven track-record in development of efficient optical I/O interfaces



MFD [μm] 9.7
 M^2 1.06





Standardized low loss
fiber array to PIC
interface demonstrated
with Photonic Wire
Bonds

vanguard
AUTOMATION
MYCRONIC



One basis, large diversity in the add-ons

Materials and Functionalities

Use SiN as base platform for general circuitry

- Comprehensive PDK
- Standard I/Os
- Scalable to volume

Add-on Functionalities for Light

- Generation
- Modulation
- Amplification
- Detection

Many great materials, each comes with their own merits (and challenges):

InP

GaAlAs

BTO

Plasmonics

Polymer

LNO

AlN

...

SiN

SiO₂

SiN

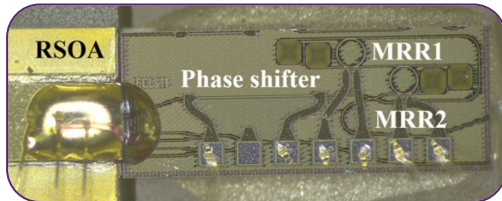
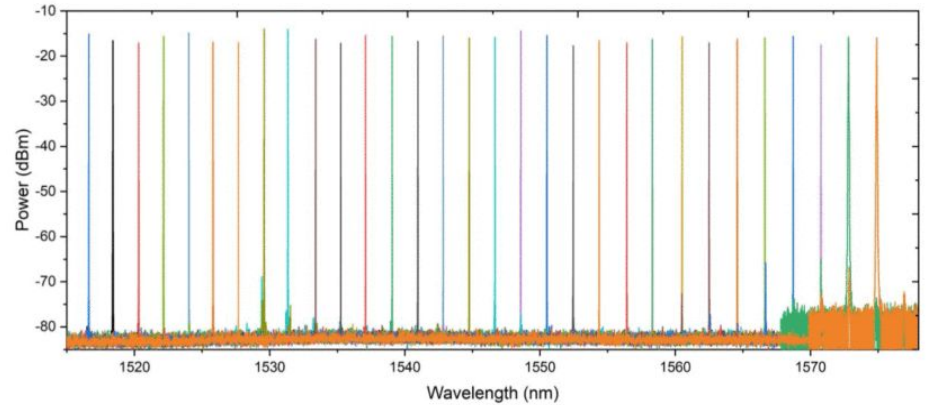
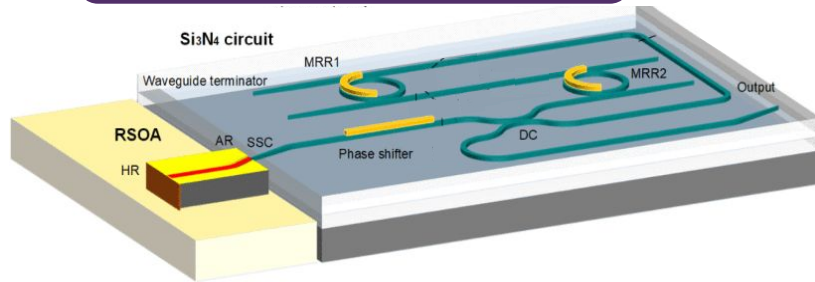
SiN

Si

Hybrid Integration example

Tunable Narrow Linewidth Lasers

LIGEN TEC's capability to design, layout and fabrication



Narrow Linewidth External Cavity Lasers

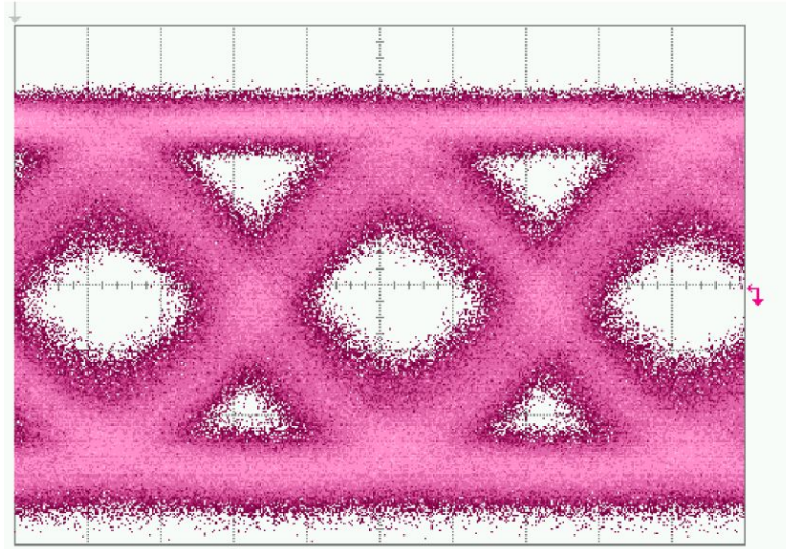
Linewidth: <3kHz

SMSR: -70dB

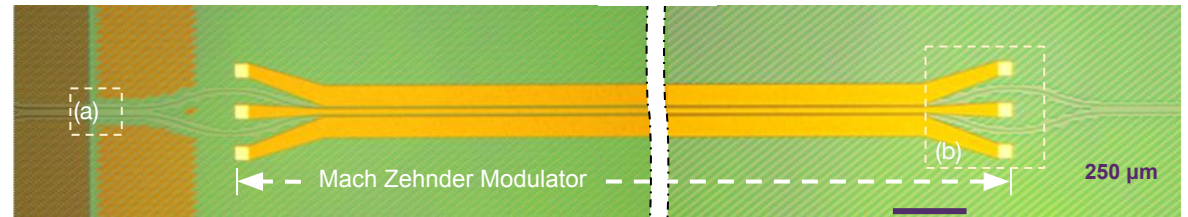
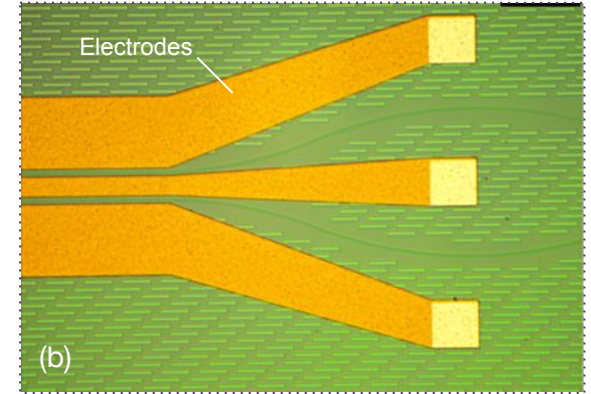
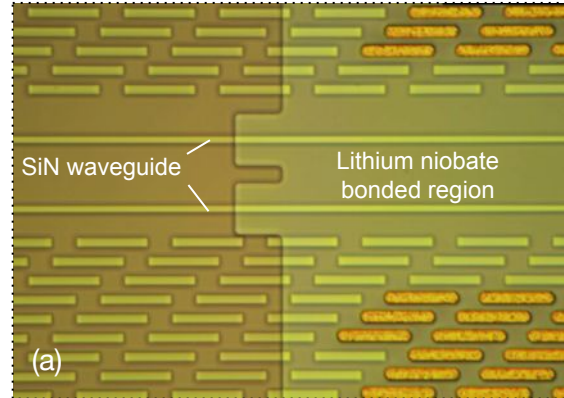
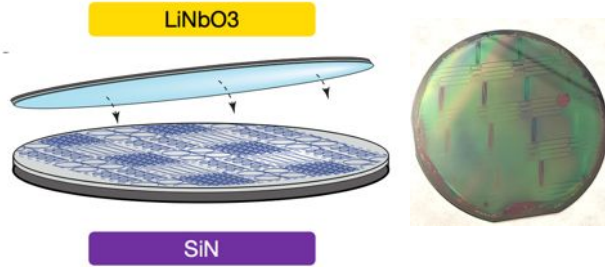
Max power: 34mW

Tuning: 58.5nm

Modulation

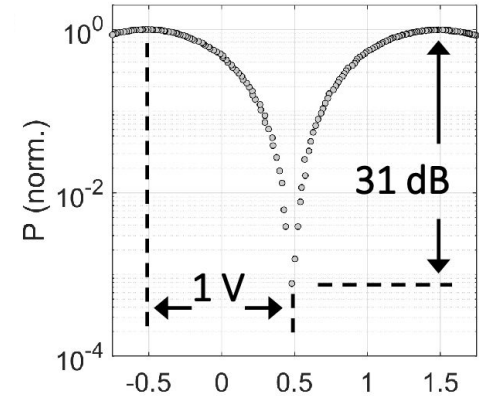
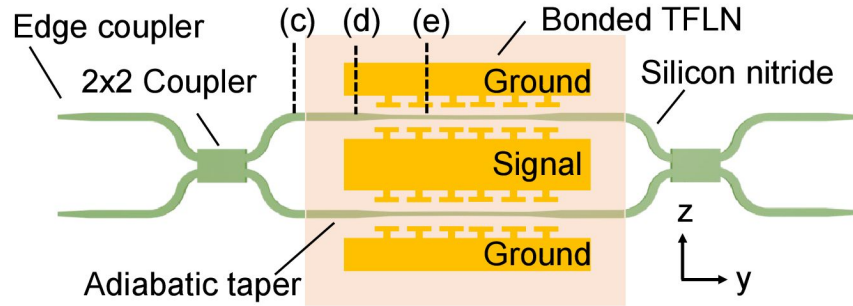


Wafer bonding of thin-film lithium niobate (GHz)



The next step – enhance the SiN PIC platform

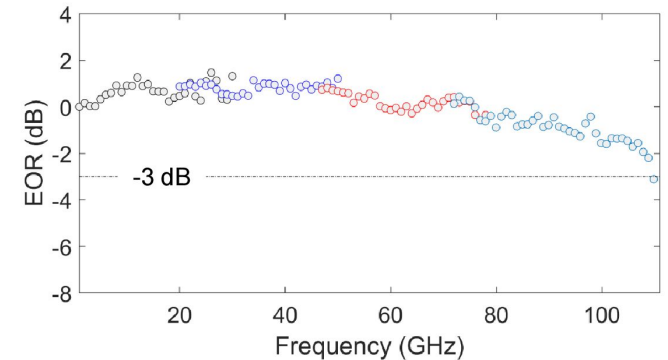
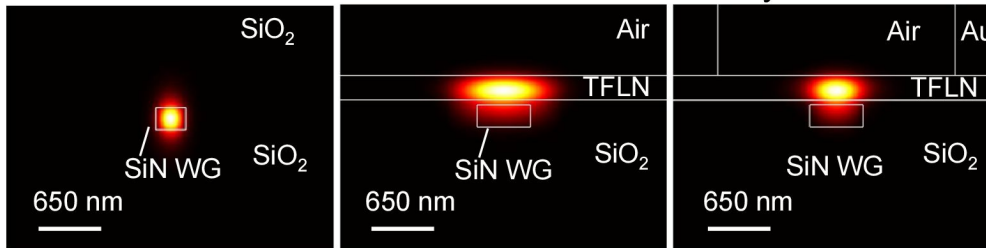
Heterogeneous integration of modulators (GHz)



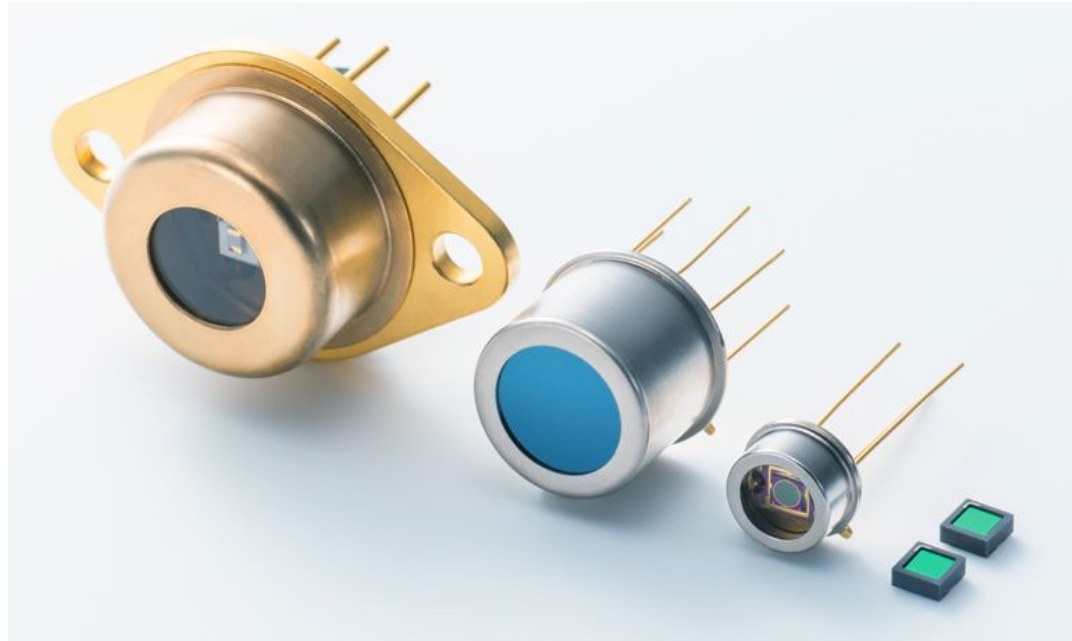
Feeder Mode

Transition Mode

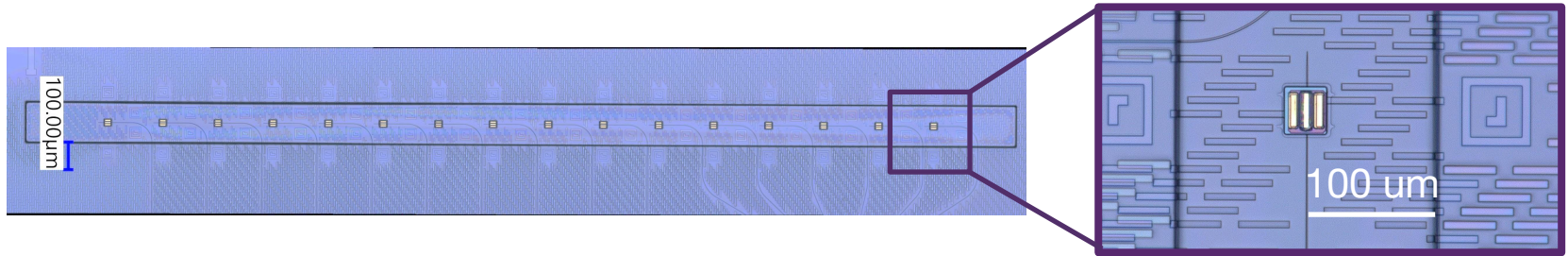
Hybrid Mode



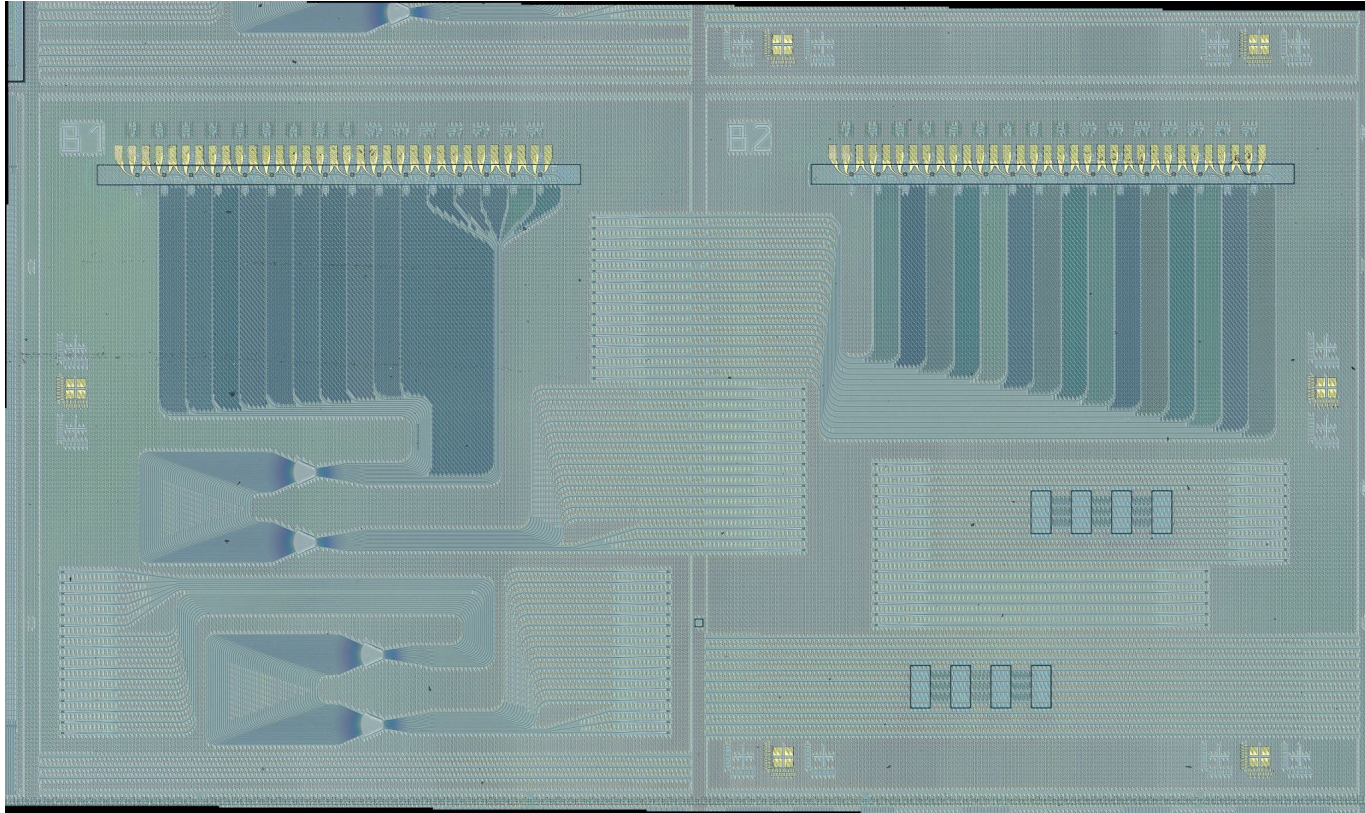
Detection



The next step – enhance the SiN PIC platform
Transfer printing of photodiodes

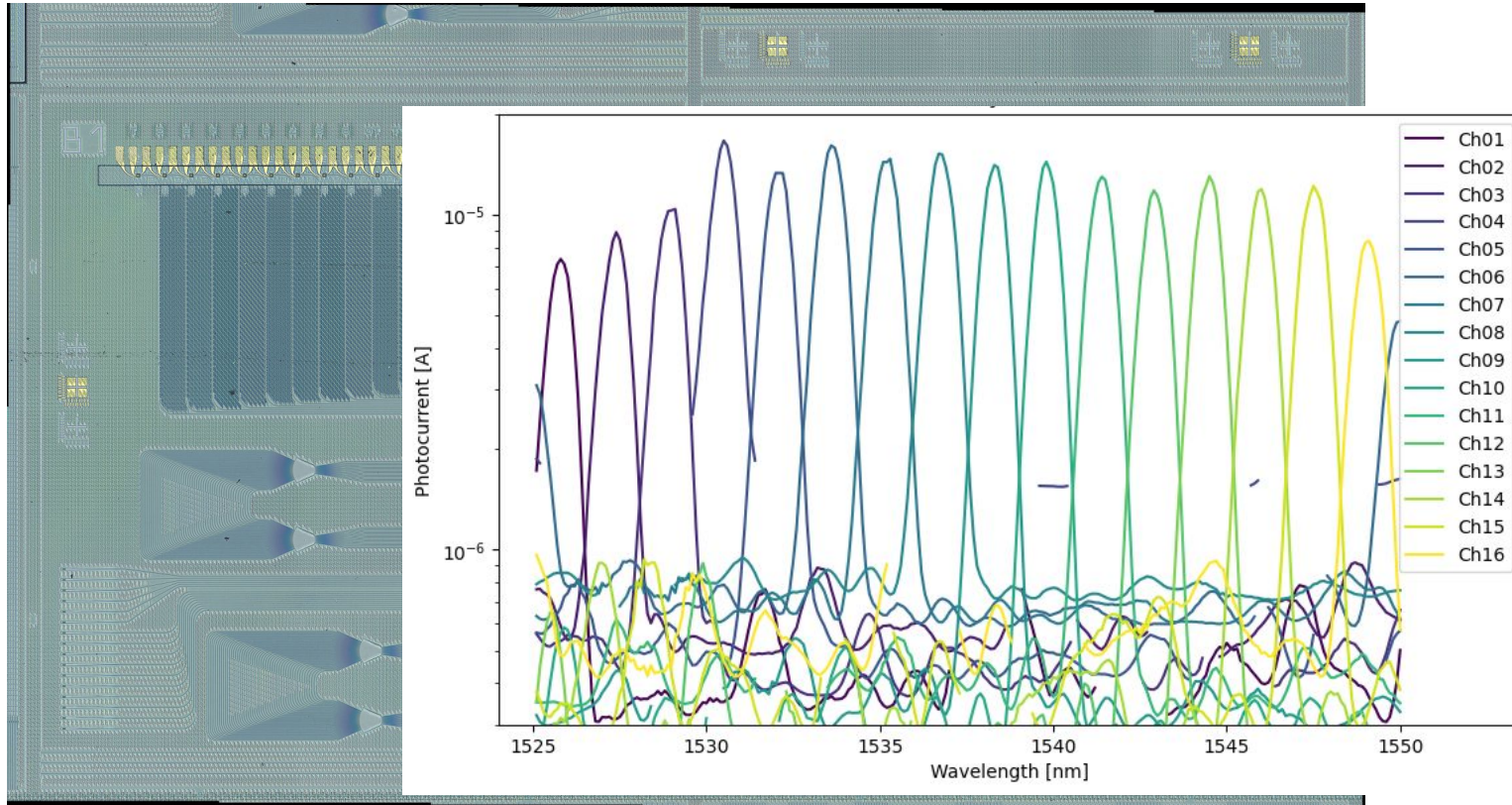


The next step – enhance the SiN PIC platform
Heterogeneous integration of photodiodes



The next step – enhance the SiN PIC platform

Heterogeneous integration of photodiodes





World's first integrated value chain platform initiative for heterogeneous integration in photonics



We are hiring!

