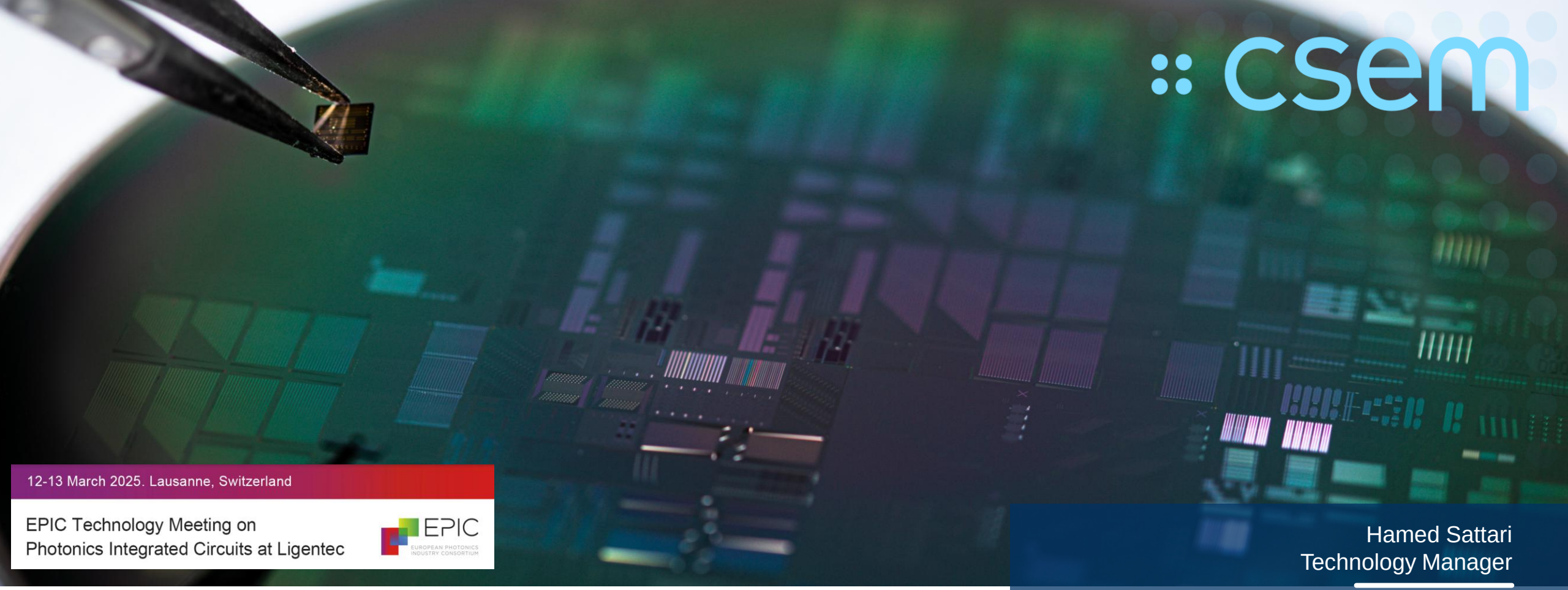

12-13 March 2025. Lausanne, Switzerland

EPIC Technology Meeting on
Photonics Integrated Circuits at Ligentec

Hamed Sattari
Technology Manager

12.03.2025

TFLN PICs:
Matching the Technology Push with the Market Pull

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CSEM AT A GLANCE

We are a public-private, Swiss technology innovation center

We enable competitiveness through innovation by developing and transferring world-class technologies to industry

230
INDUSTRIAL CLIENTS / YEAR

203
PATENT FAMILIES

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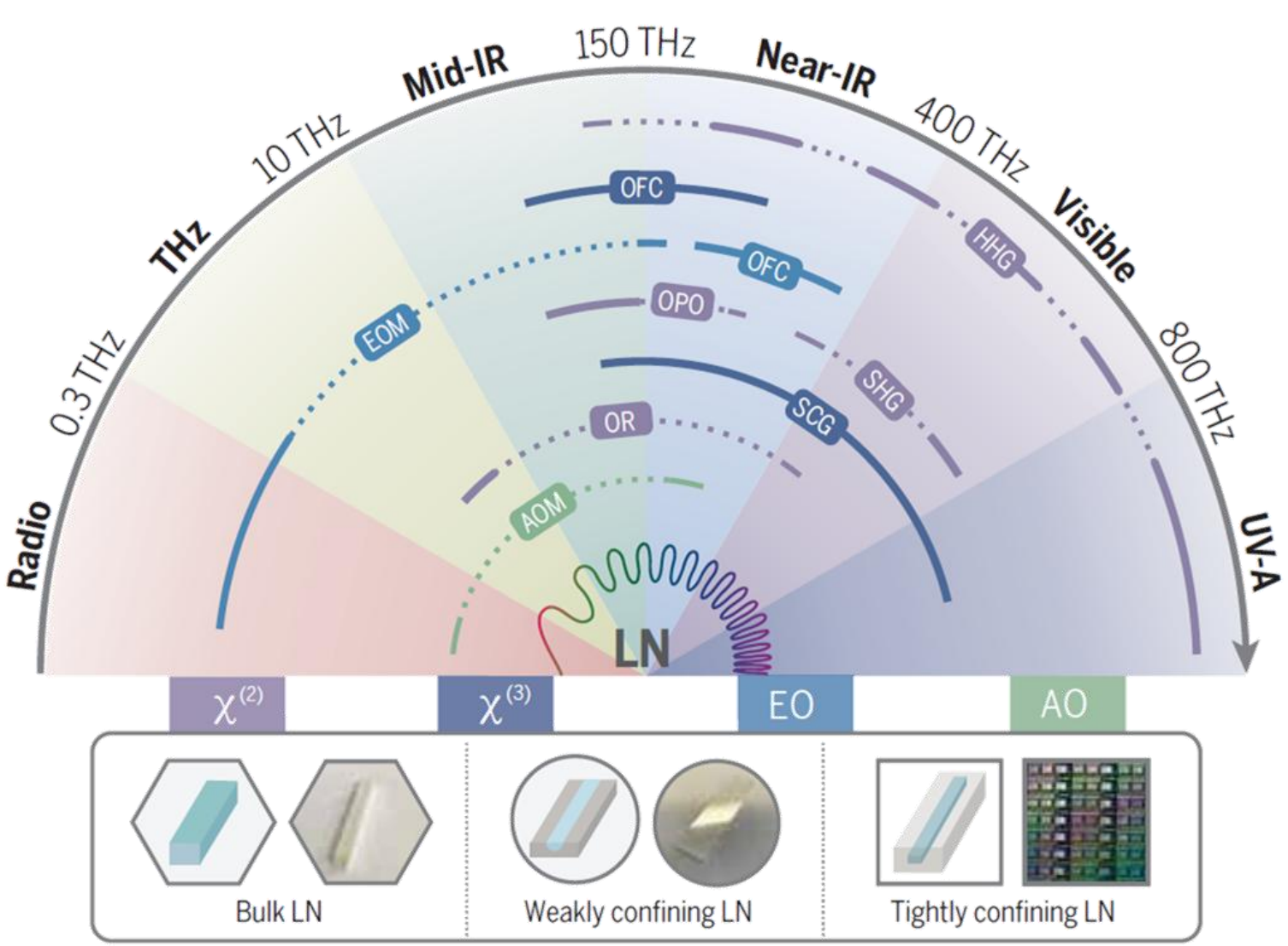
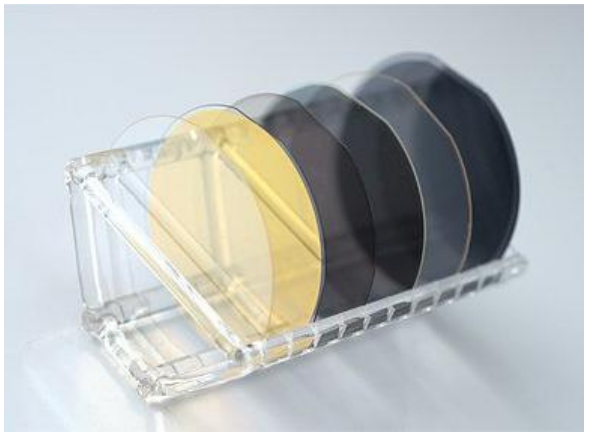
LN: UNIQUE MATERIAL PROPERTIES



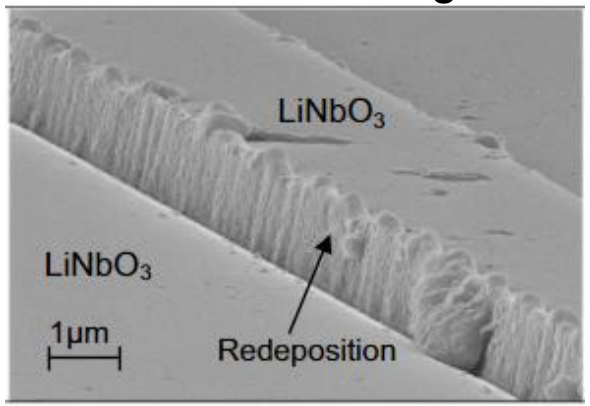
https://doi.org/10.1126/science.abj4396

TFLN Substrates



https://m.nanoln.com/

TFLN micromachining



G. Ulliac et al, Optical Materials, 2016

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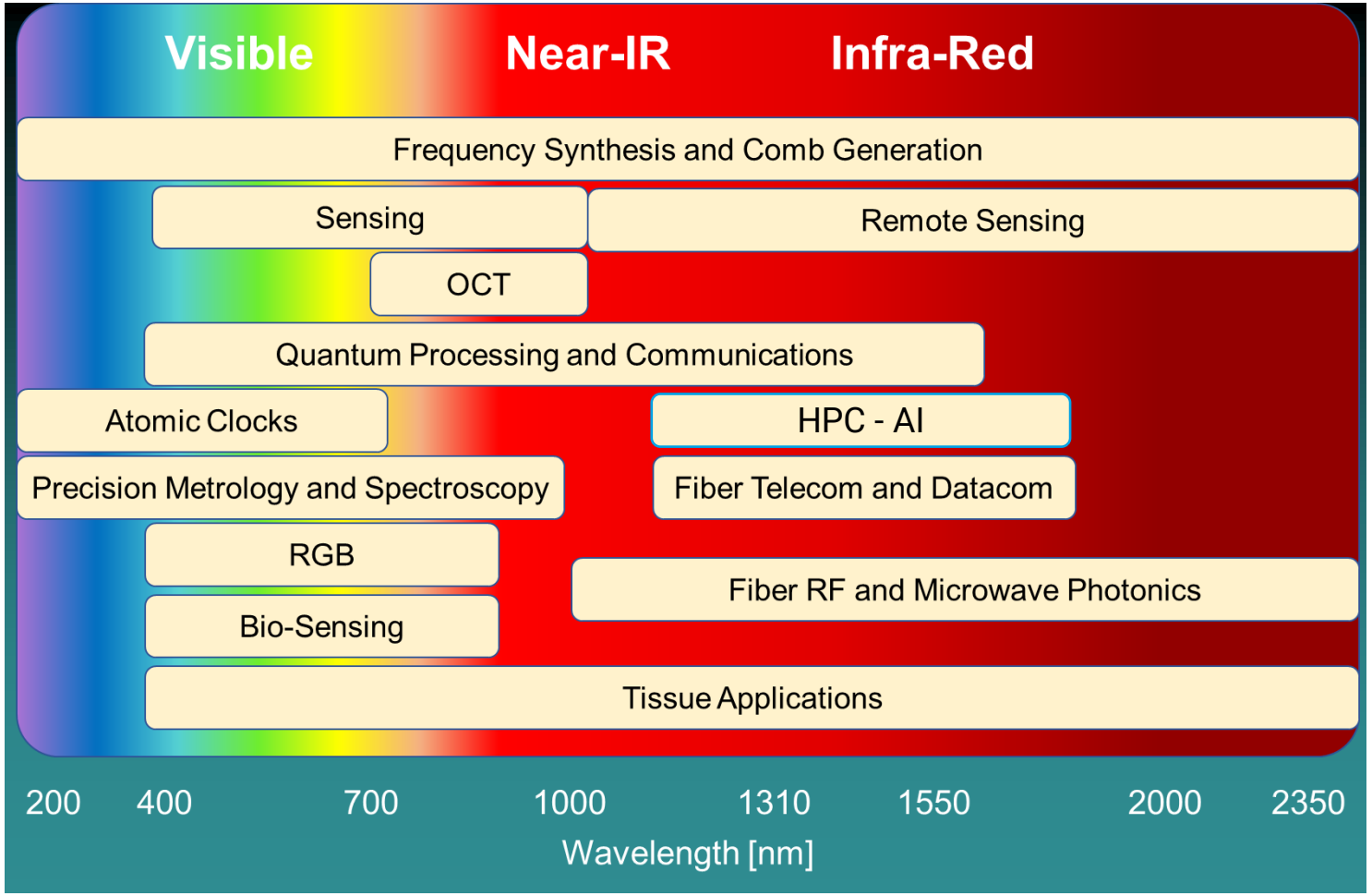
TFLN: AN ENABLING TECHNOLOGY

- Intrinsic nonlinearity
- Wide Transparency Window
- High Optical Power Handling

- Fast EO Modulation
- Frequency Conversion

Miniaturization



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FROM PLATFORM STANDARDIZATION TO THE APPLICATION

Standardization

- Monolithic TFLN - PDK
- Hybrid and Heterogeneous
- CMOS integration
- Packaging - ADK

Application oriented

- LIDAR
- Telecom
- Quantum
- Sensing

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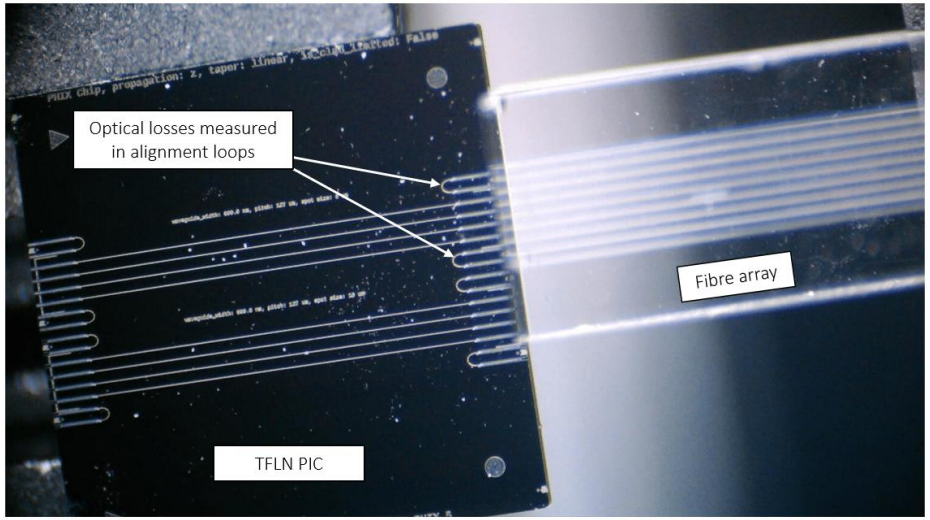
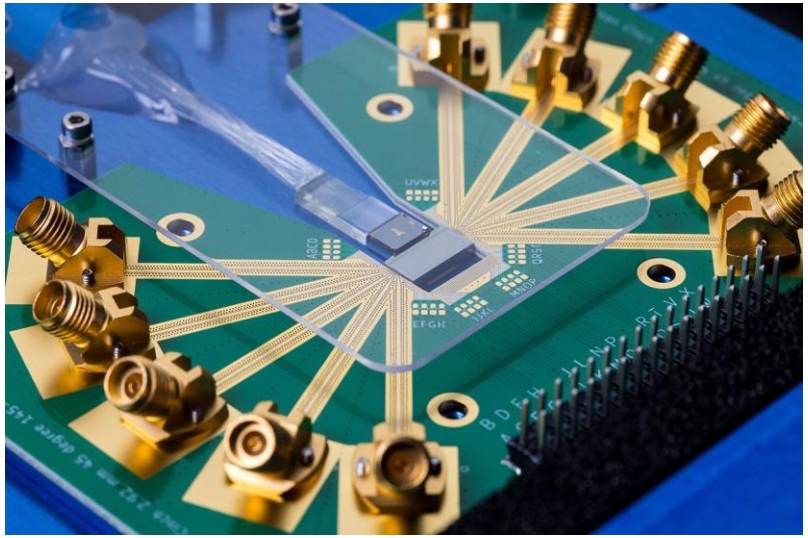
FROM PLATFORM STANDARDIZATION TO THE APPLICATION

Fiber-to-chip optical coupling losses of less than 2.0 dB per facet, demonstrated by PHIX

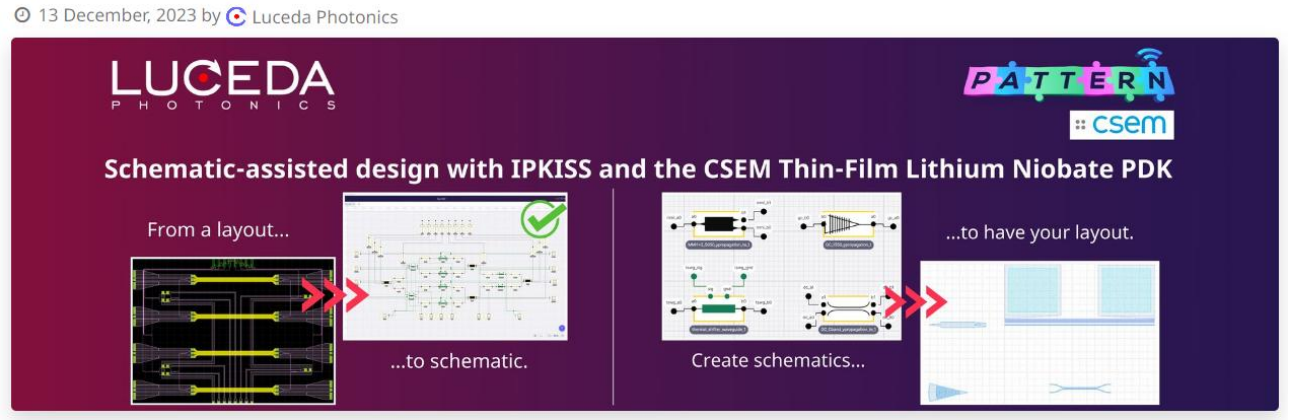


https://pattern-project.eu/key-milestone-achieved-for-facet-fiber-chip-coupling/

High speed EO modulators- hybrid integration with SiN chip on an advanced PCB and assembly



https://horizon-de-lolipop.eu/lolipop-module-assembled-by-phix/



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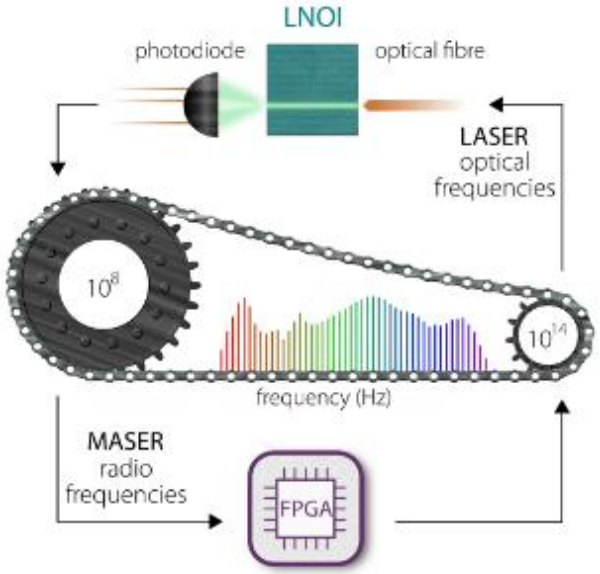
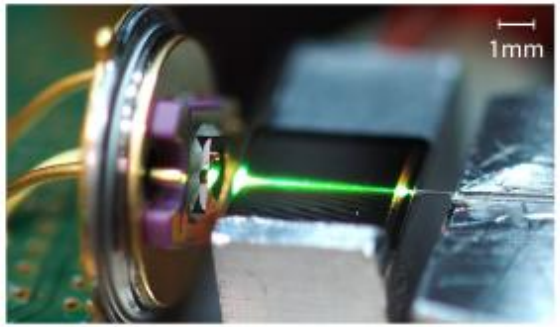
FROM PLATFORM STANDARDIZATION TO THE APPLICATION

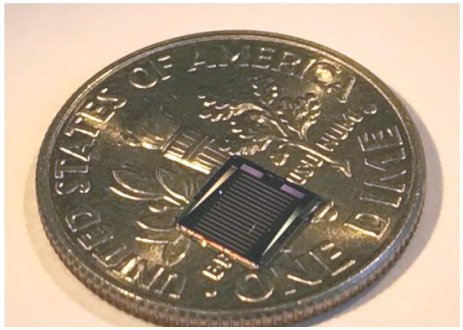
Metrology

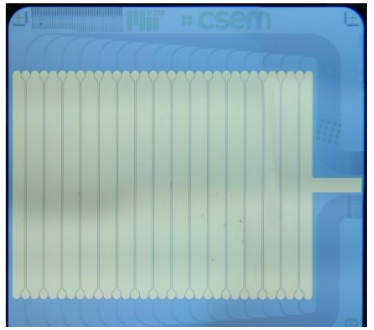




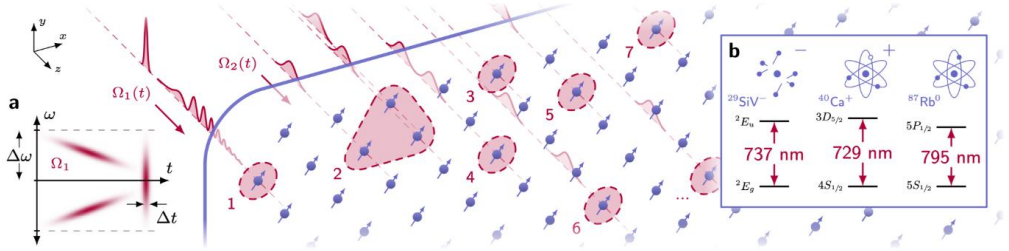
Obrzud, E. *et al. APL Photonics* **6**, 121303 (2021)

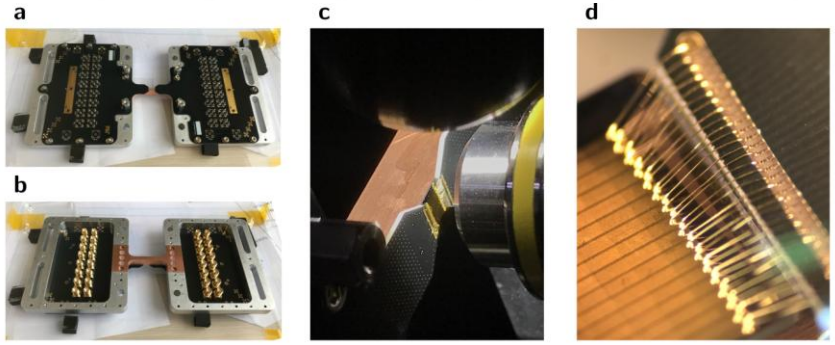
Quantum





An integrated photonic engine for programmable atomic control





https://www.nature.com/articles/s41467-024-55423-3

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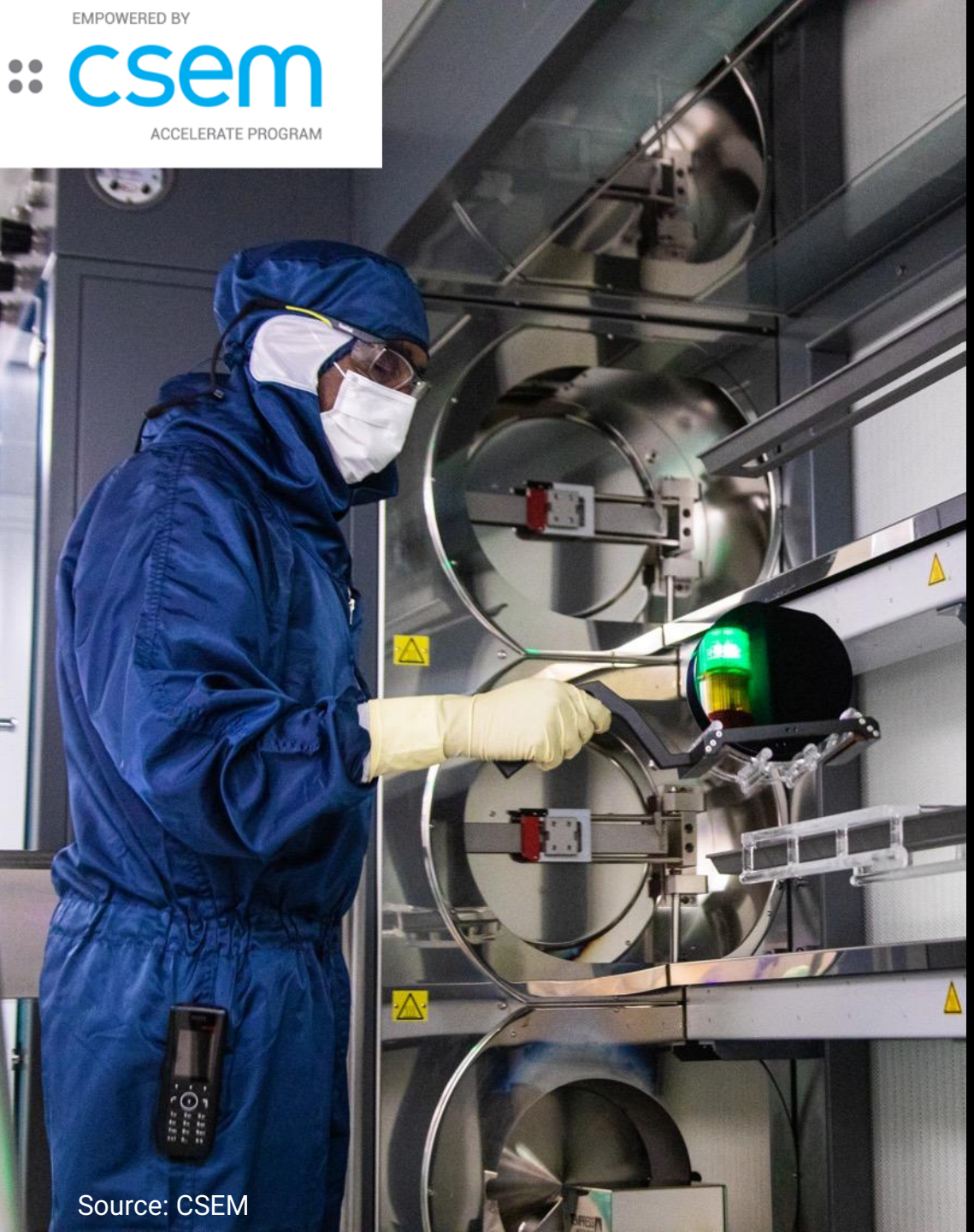
EMPOWERED BY csem ACCELERATE PROGRAM



Source: CSEM

Technology Transfer

to

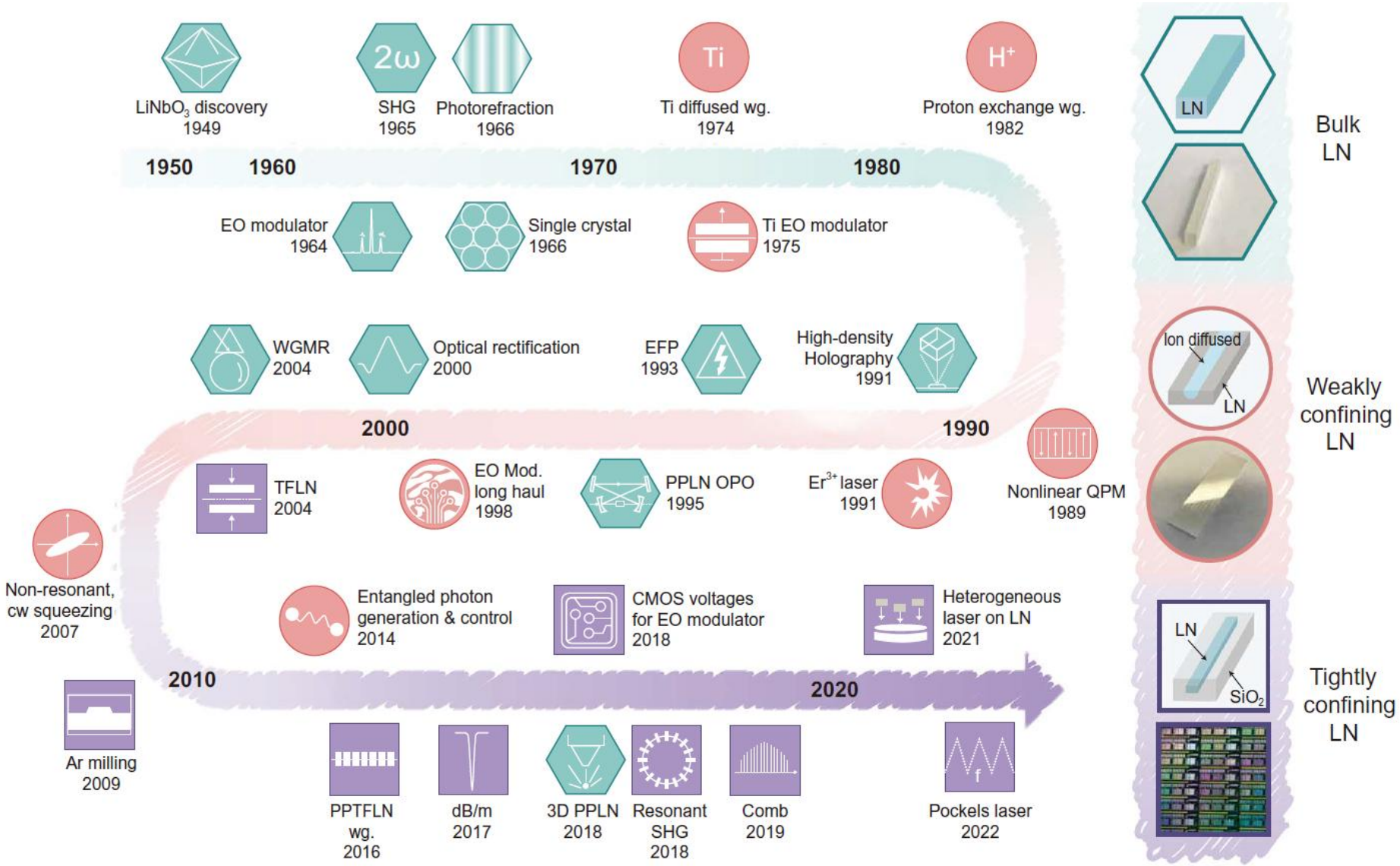
CCRAFT

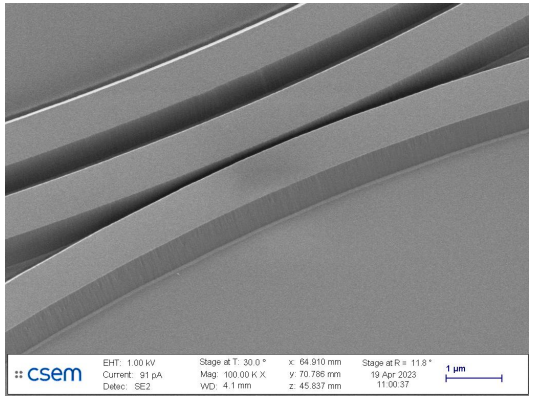
NEXT GENERATION PHOTONIC CHIPS

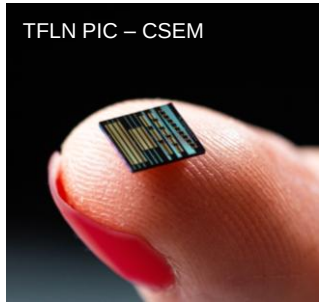
enabling tomorrow's AI, datacom and quantum

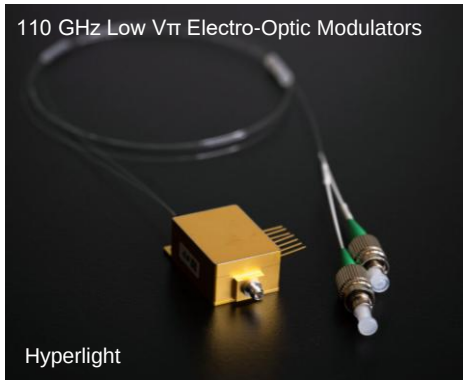
www.ccraft.com

WHAT IS NEXT?









Next milestone?

https://doi.org/10.1126/science.abj4396

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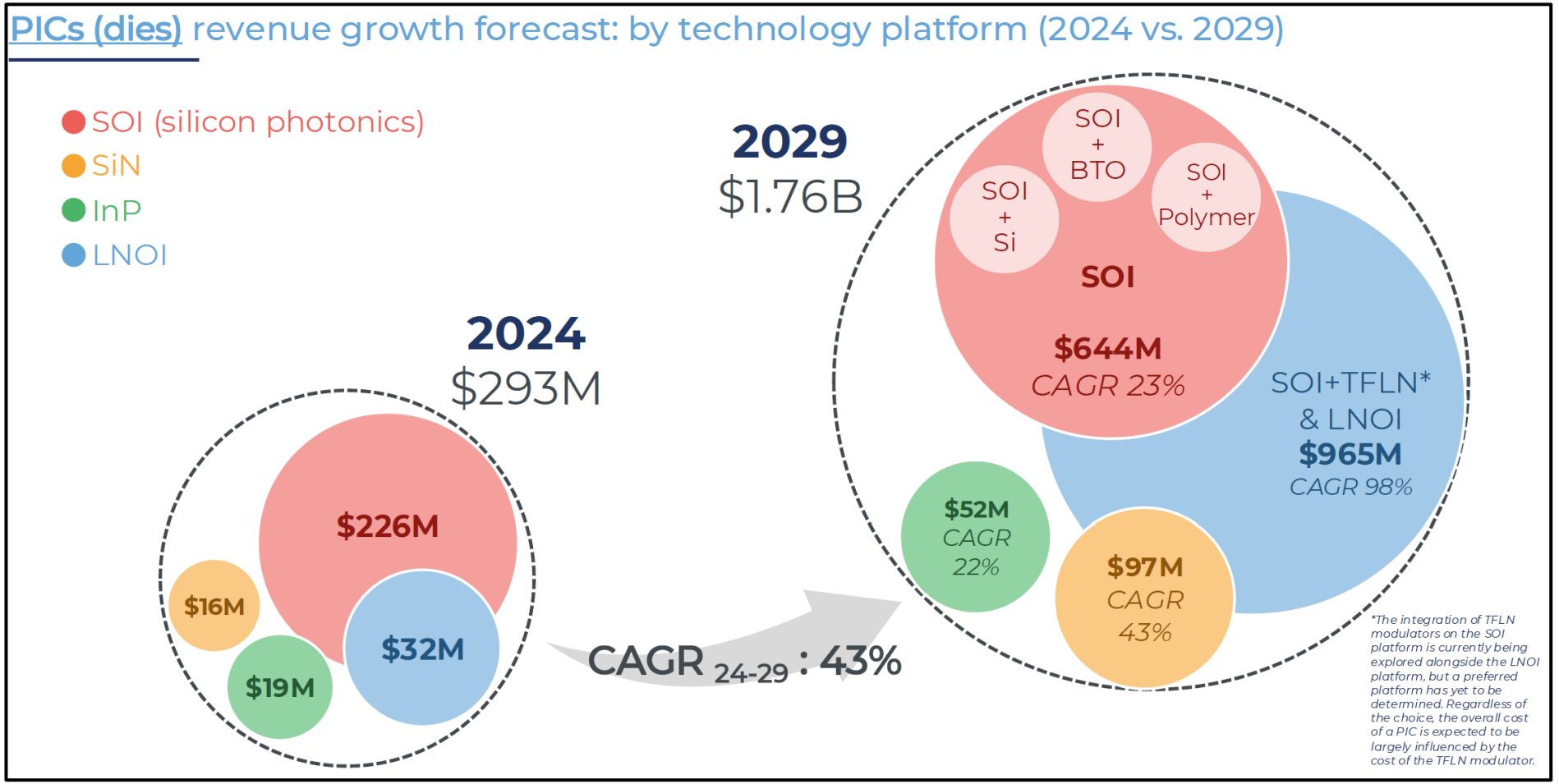
MARKET SIZE FOR BARE DIES

TFLN/LNOI FASTEST GROWING PIC PLATFORM



Source: YOLE Intelligence 2024

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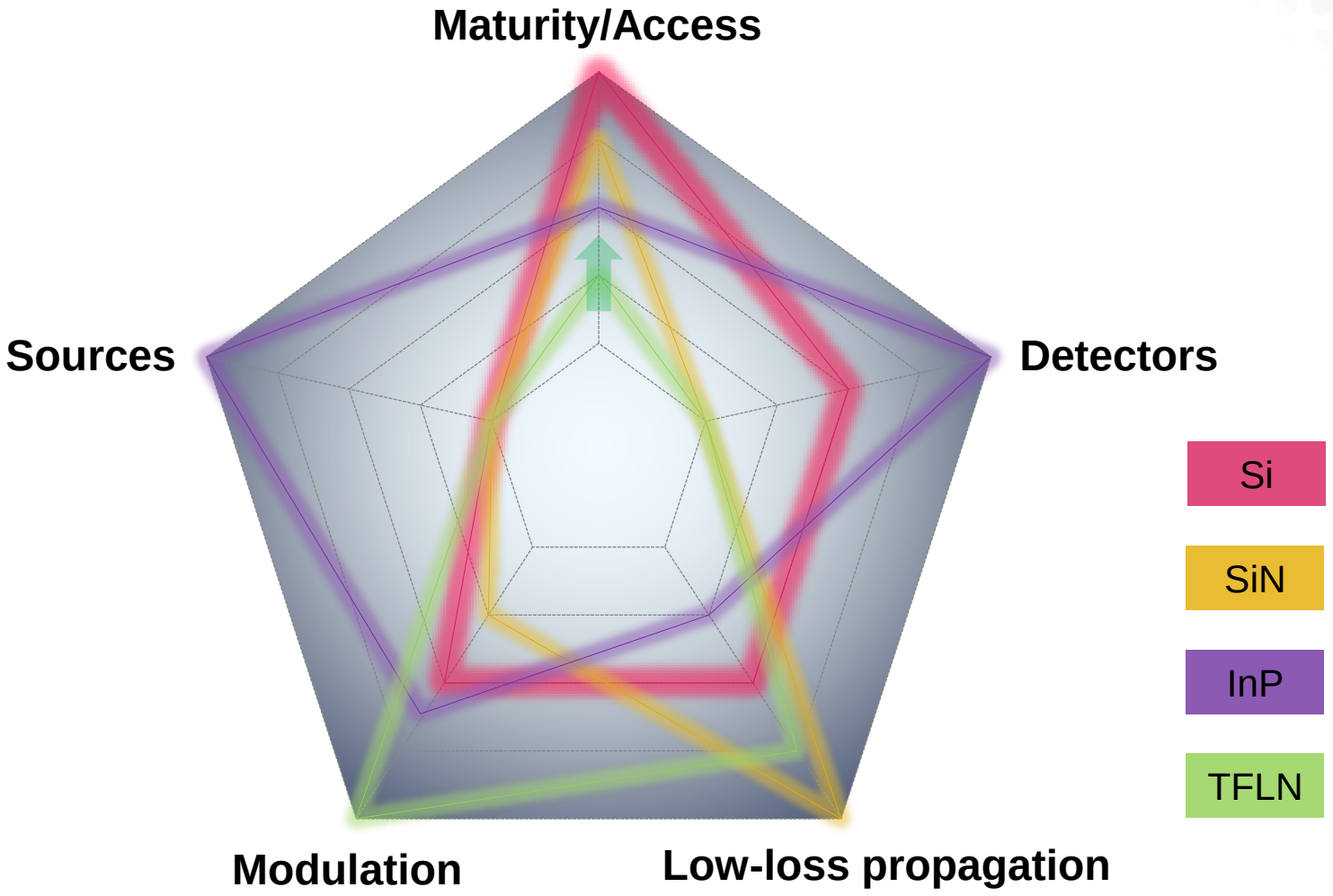
ARE PICS READY TO ADDRESS THE NEEDS?!

- Need for Components to Generate, Manipulate, Transport, and Detect light
- No single material can do everything!

PIC Systems

- Optical interfacing
- CMOS integration
- Power consumption
- Form factor



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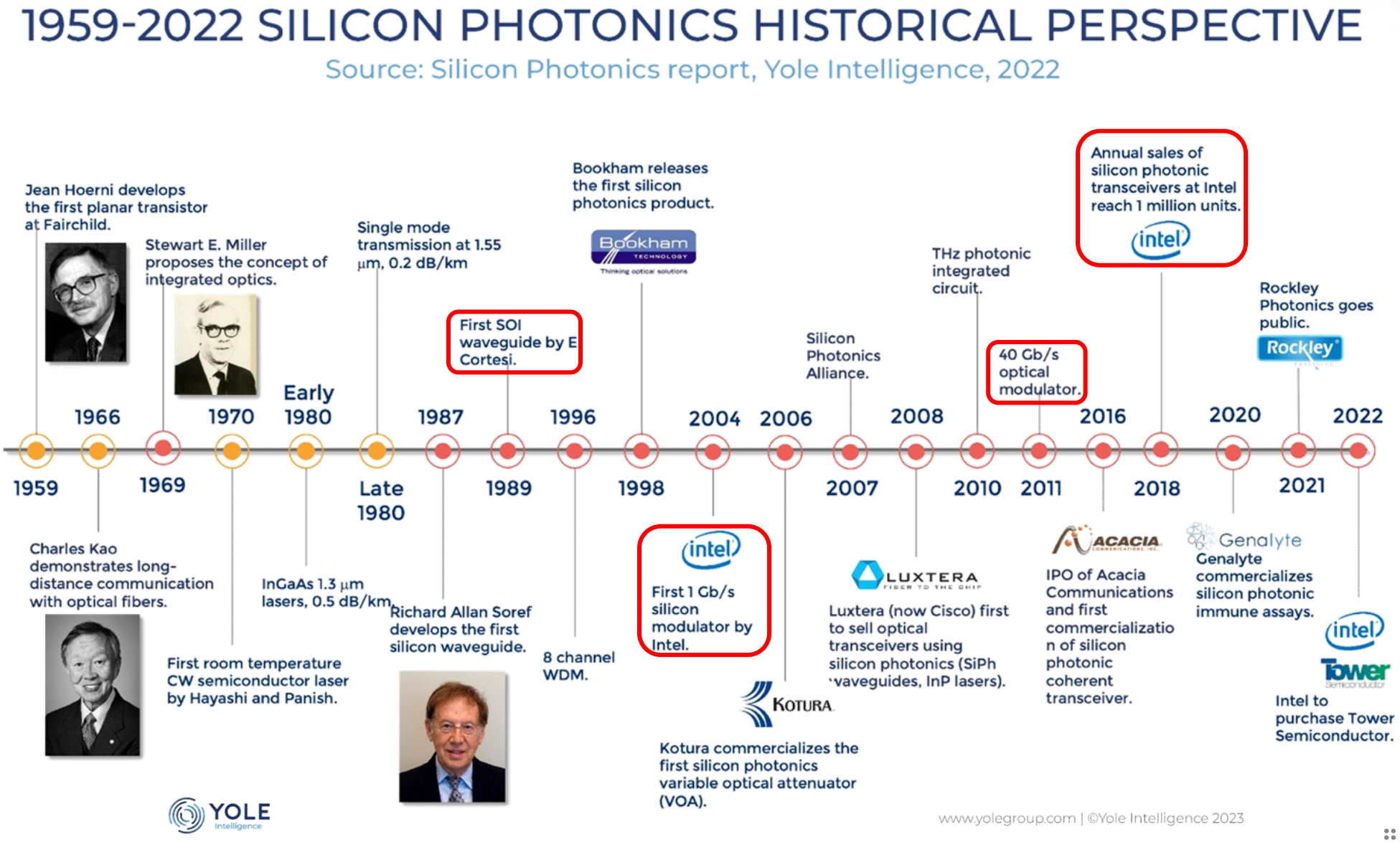
A LOT TO LEARN! A LOT TO DO!



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FACING THE CHALLENGES OF OUR TIME

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Fonds national suisse
Schweizerischer Nationalfonds
Fondo nazionale svizzero
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