



ICOS Final Event – Results & Recommendations on International Cooperation on Semiconductors for European Economic Resilience



Photonics

Wim Bogaerts, Mattias Verstuyft
Ghent University – imec - ePIXfab



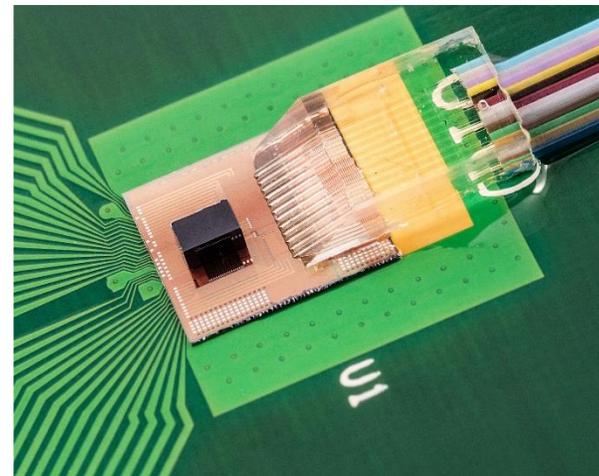
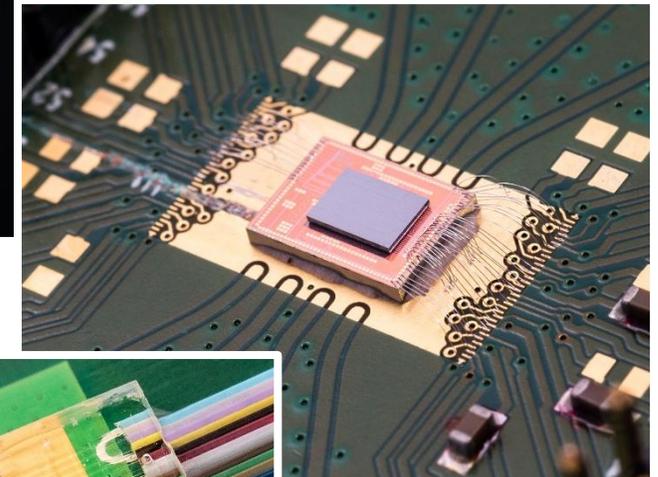
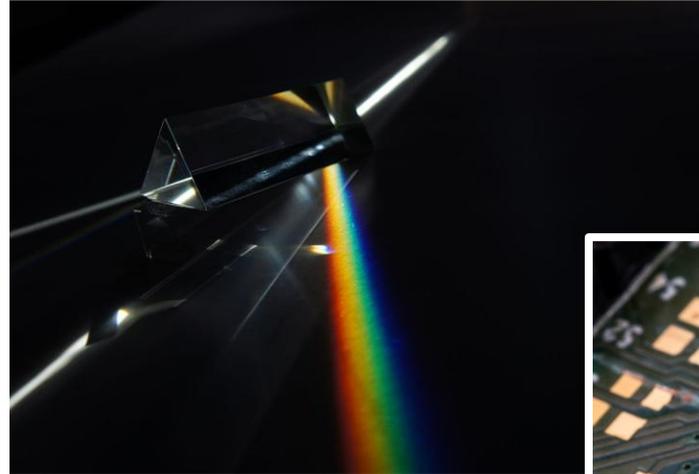
3rd February 2026,
The Faculty, Brussels

ICOS FINAL EVENT – Results & Recommendations on International
Cooperation on Semiconductors for European Economic Resilience

Name

Photonics: What's in a name?

- Manipulating light on a microscopic scale
- Fiber-optic communication
- Sensing
- Quantum-optics
- ...
- Often using semiconductor technology



Semiconductor Photonics

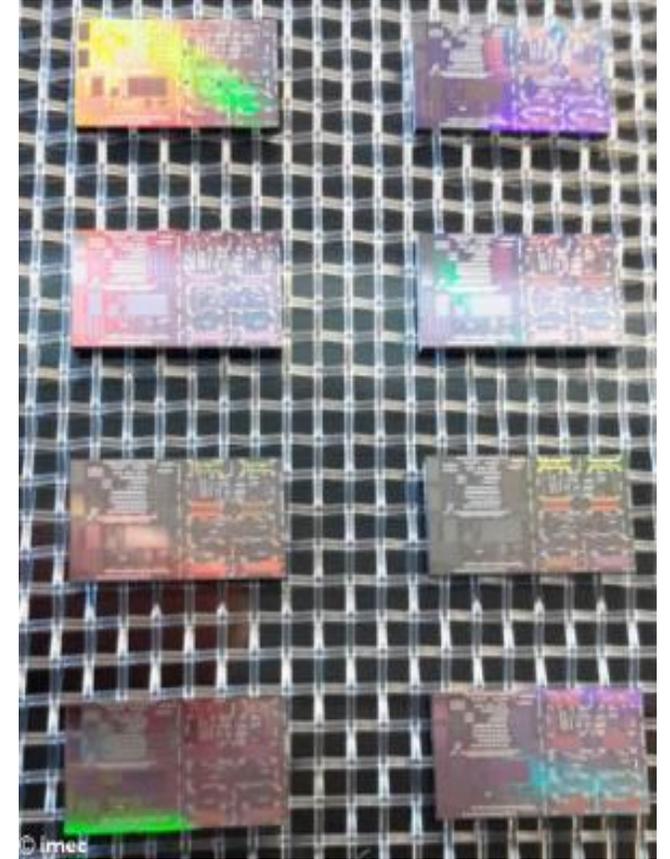
- Different classes of devices



CMOS Imagers

LEDs

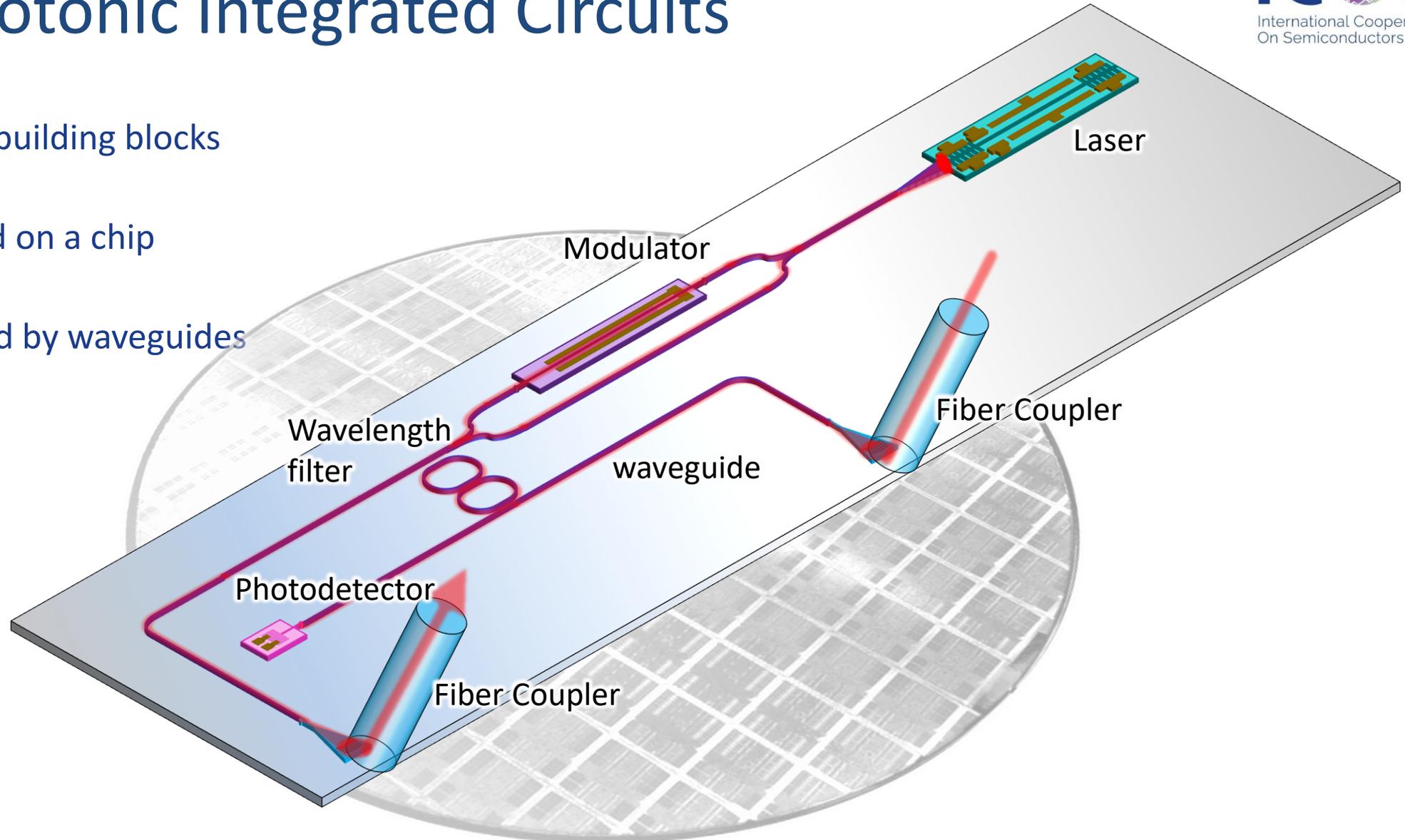
VCSELs



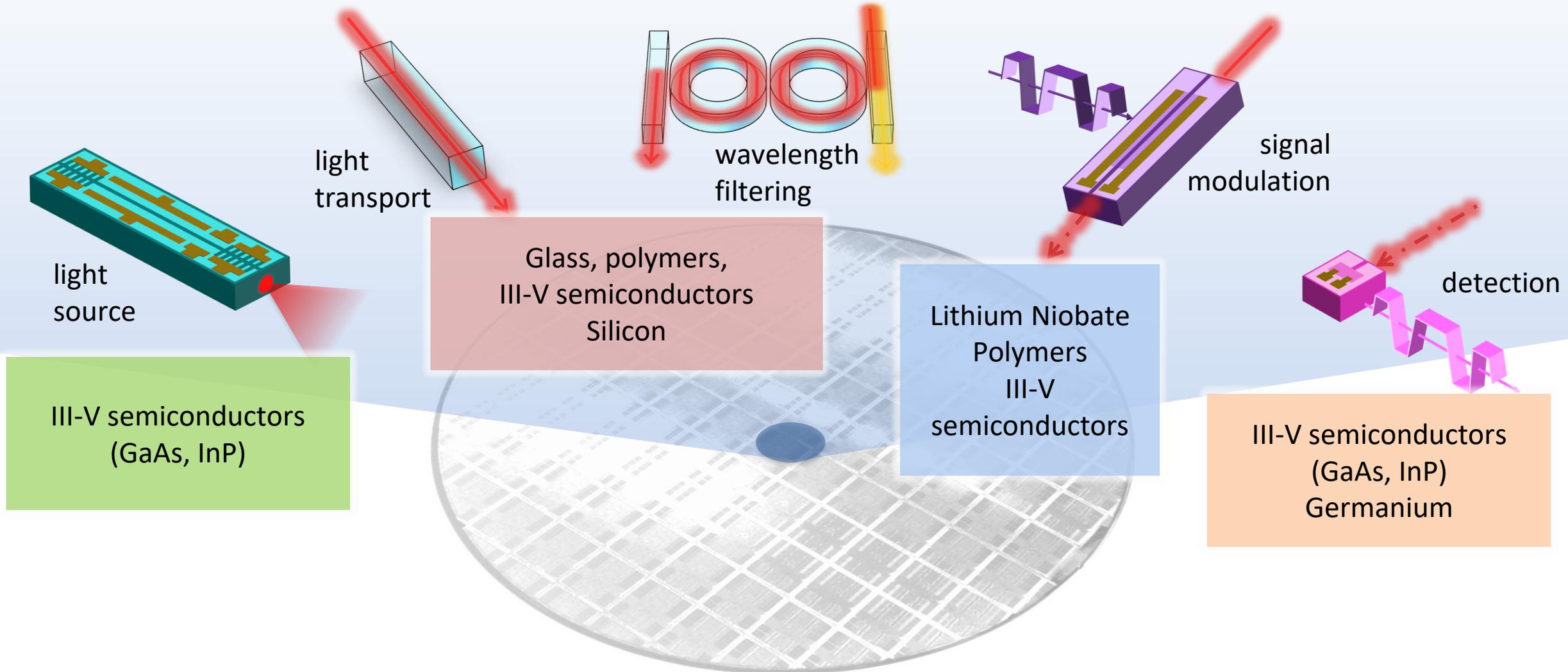
Photonic ICs

Photonic Integrated Circuits

- Photonic building blocks
- Integrated on a chip
- Connected by waveguides

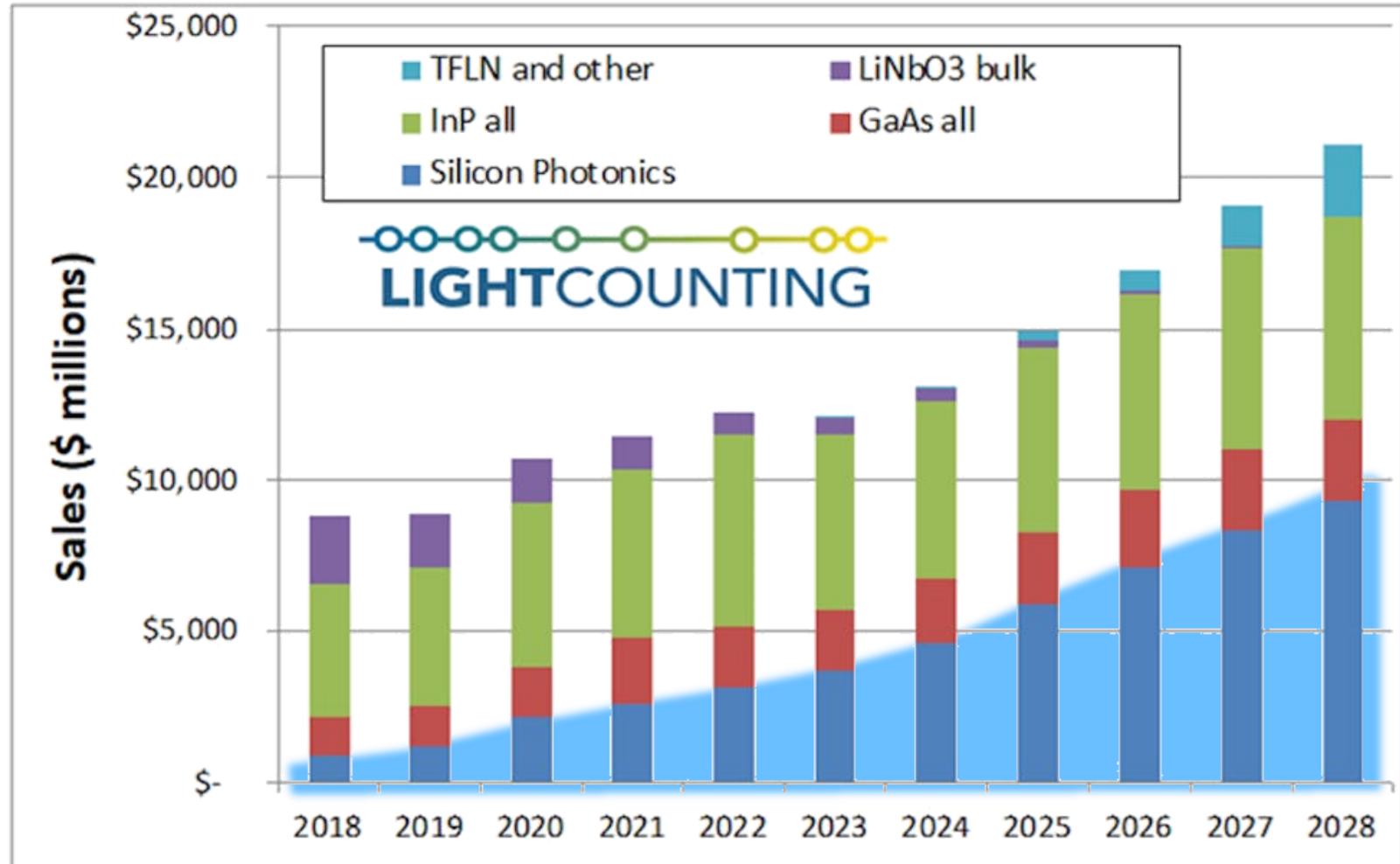


Photonic Integrated Circuits



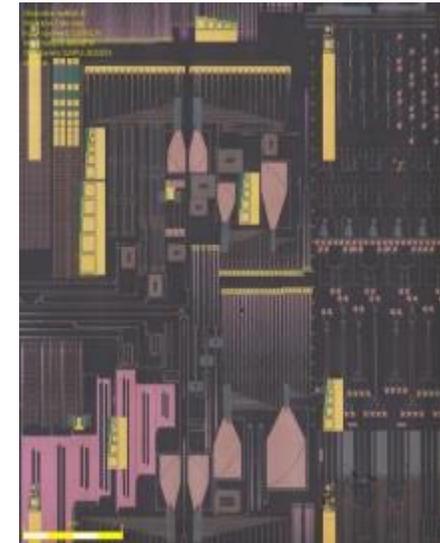
PICs build on semiconductor technology

- Diverse platforms
- III-V compound is still dominant
- Silicon is growing fast



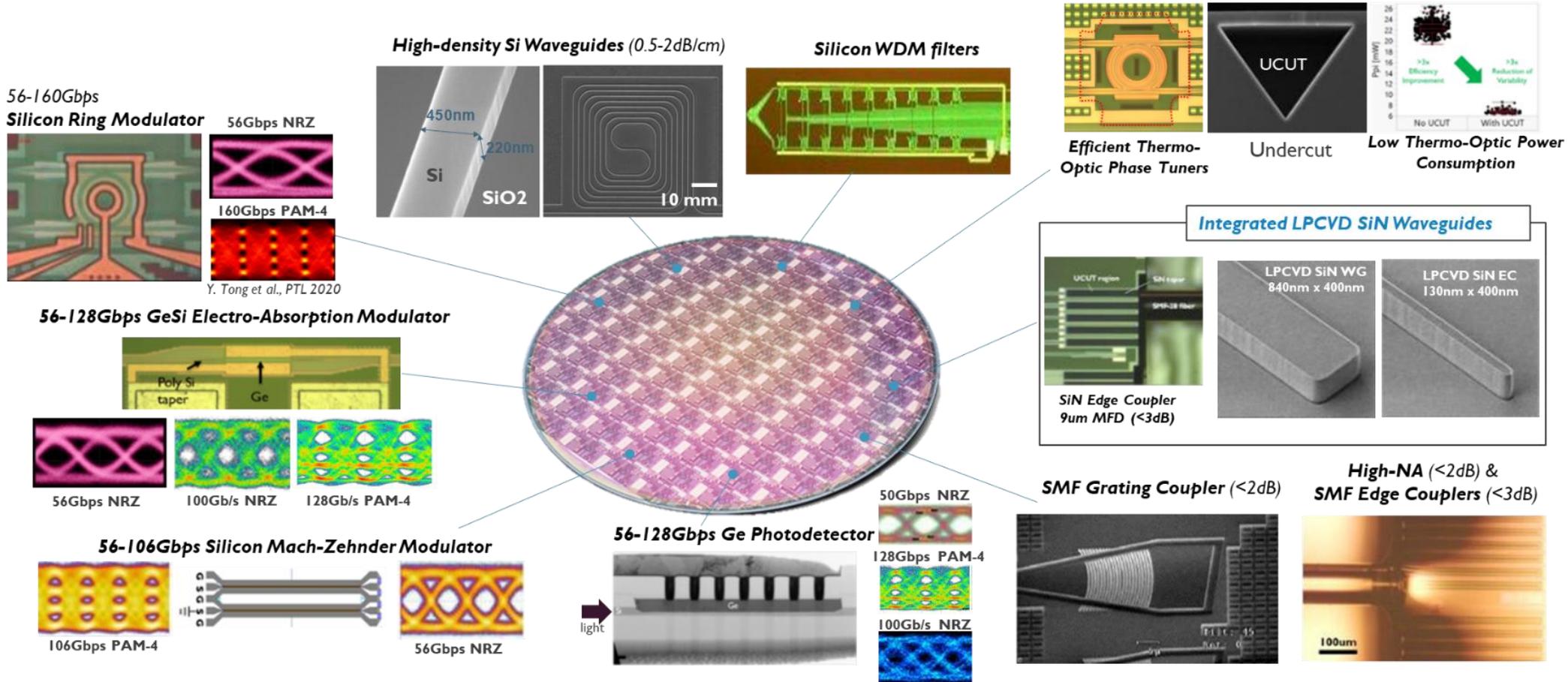
What is silicon photonics?

- The implementation of high density photonic integrated circuits by means of CMOS process technology in a CMOS fab



Enabling complex optical functionality on a compact chip at low cost

Silicon Photonics (example: imec)

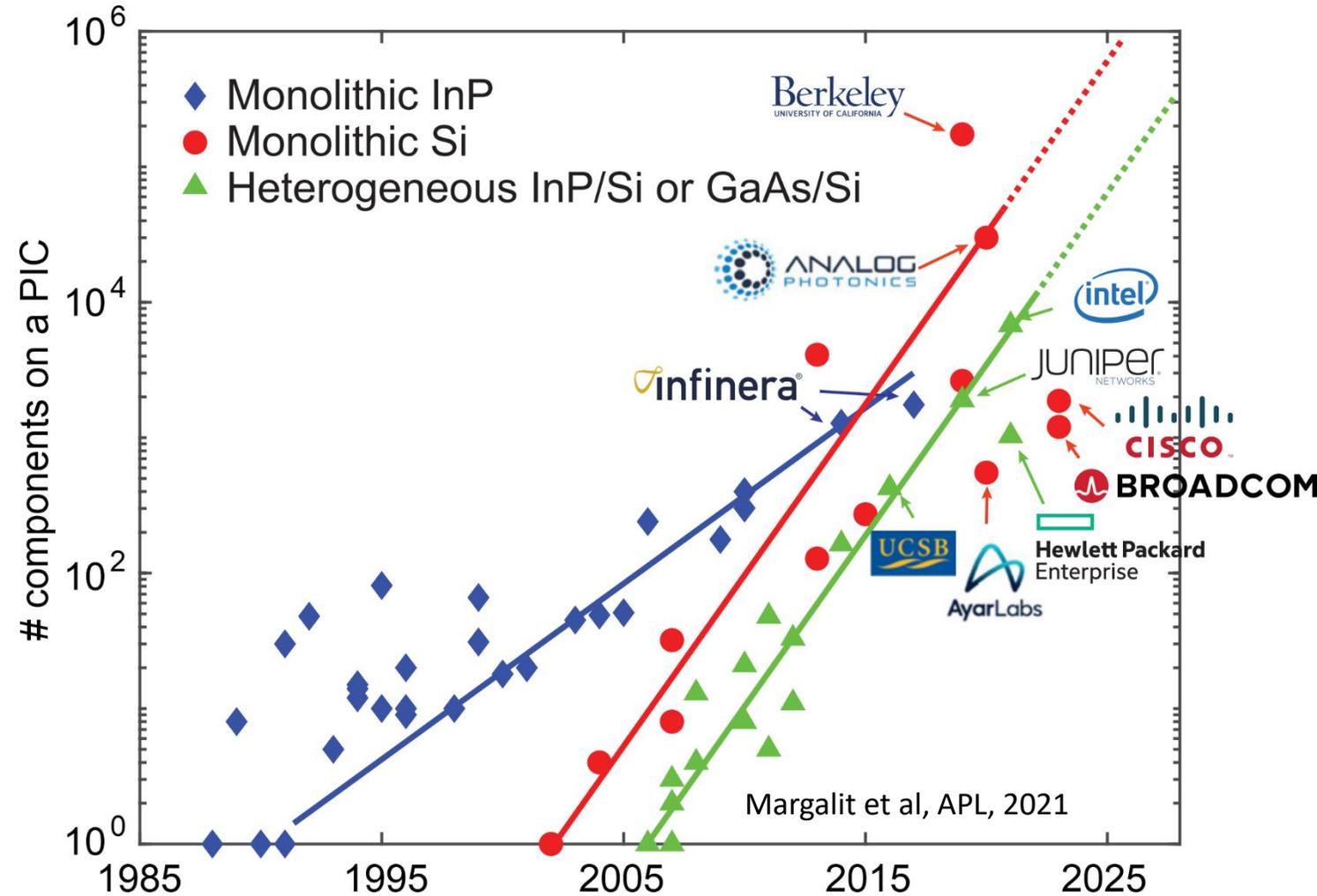


Fully Integrated Silicon Photonics Platform for 1310nm/1550nm Wavelengths

- Low-loss Passive Silicon Waveguide Devices and Fiber Coupling Structures
- 56Gb/s+ (Ge)Si Modulators and Ge(Si) Photodetectors

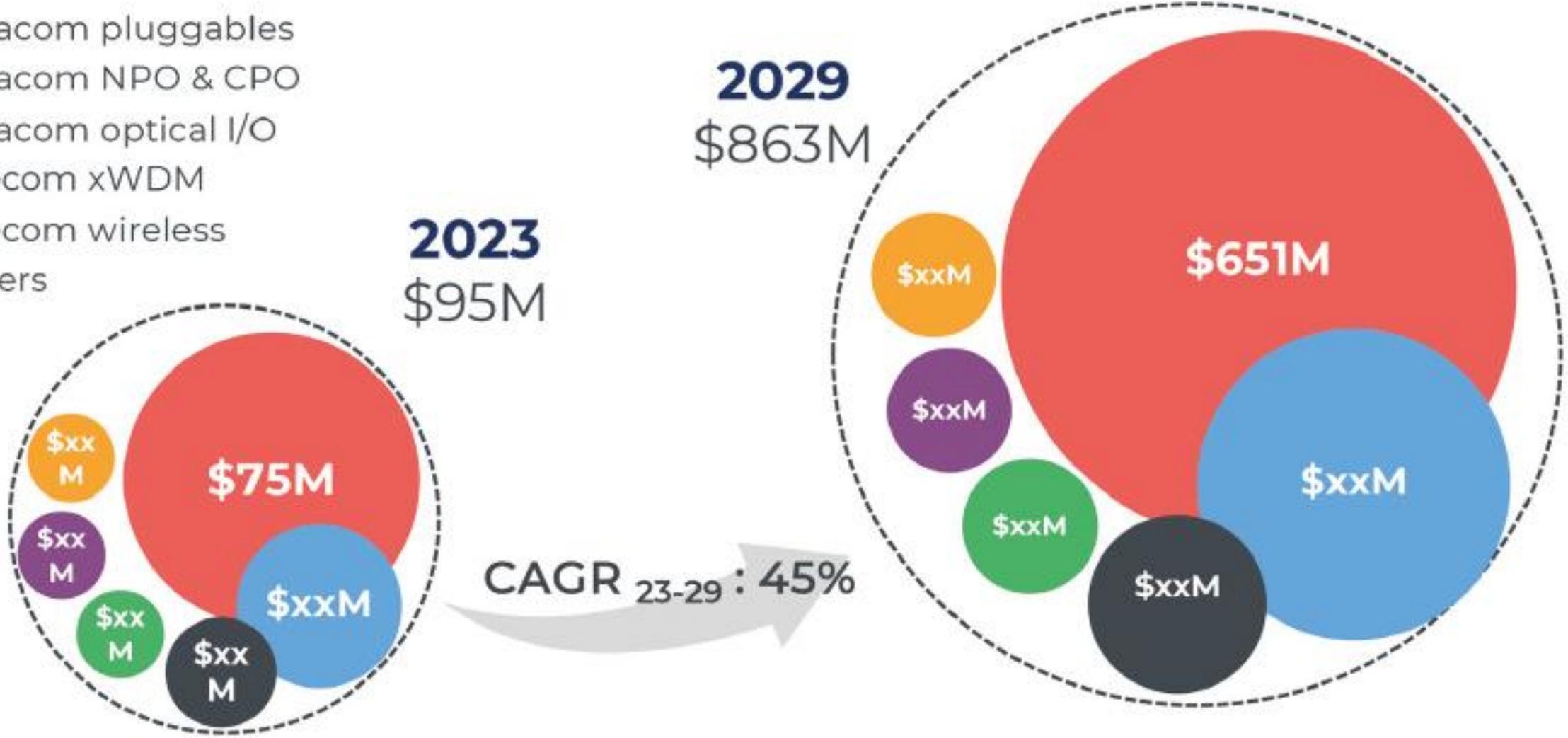
Photonic Chips are scaling...

- Scaling depends on
- Material parameters
- Fabrication quality
- Design capabilities
- Electronic control



Growth in silicon photonic chips

- Datacom pluggables
- Datacom NPO & CPO
- Datacom optical I/O
- Telecom xWDM
- Telecom wireless
- Others

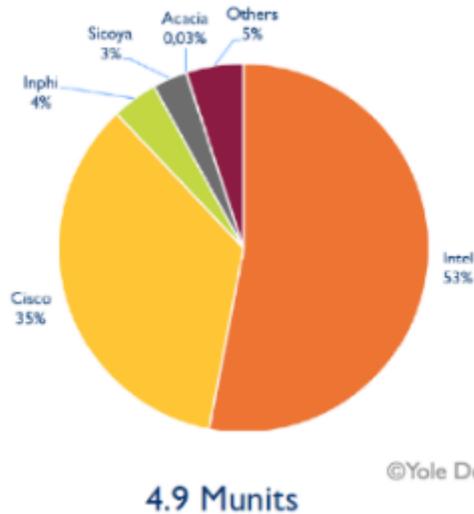


Application driver today: Transceivers



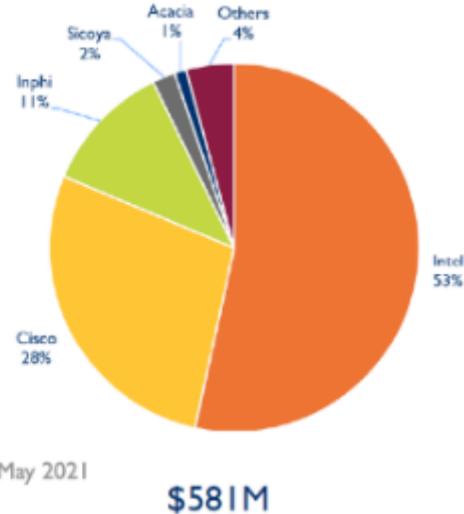
- Typical data rate: 400-1600 Gb/s
- Typical symbol rate: 25-50 GBaud
- PSM4-8 (4-8 parallel fibers)
- WDM4-8 (4-8 wavelengths)
- PAM4
- Polarisation multiplexing
- Coherent (QPSK, 16-QAM)

Datacenter silicon photonic transceiver market share in units



©Yole Développement – May 2021

Datacenter silicon photonic transceiver market share in dollars



Under development + early deployment:
Data rate: >1600 Gb/s
Symbol rate: 100-200 GBaud
Evolution towards Co-packaged Optics

EE Times

Silicon Photonics and Co-Packaged Optics Shine a Light at OFC 2025

By Nitin Dahad 04.04.2025 0

The 2025 Optical Fiber Communications Conference, or OFC 2025, took place this week in San Francisco, Calif., amid the excitement of optical networking being one part of the solution to solving the many facets of AI compute bottlenecks.

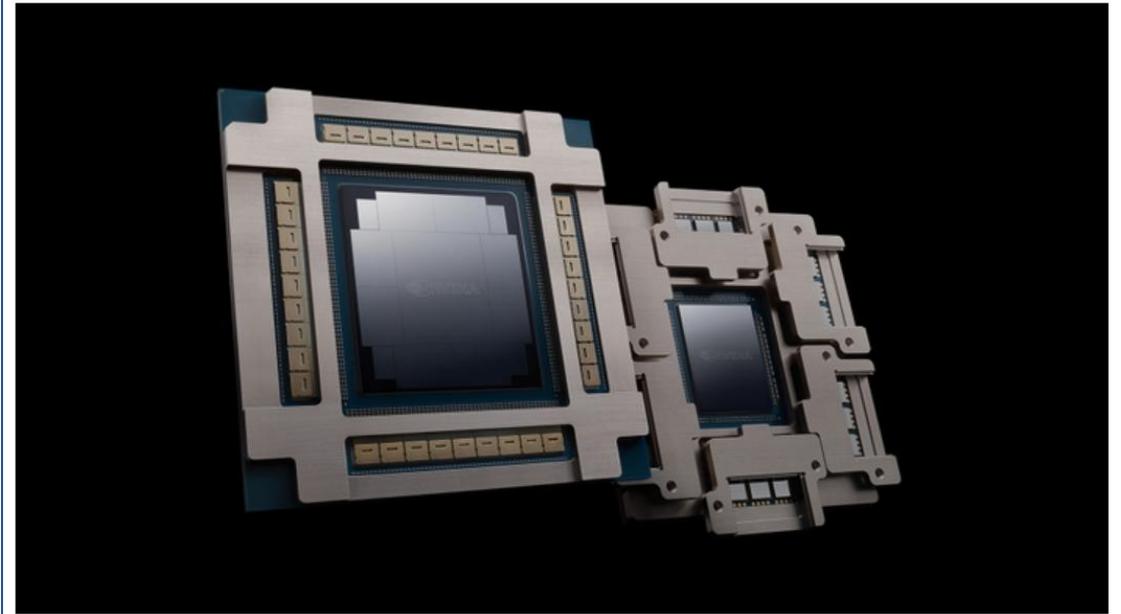
One thing is clear: silicon photonics and co-packaged optics have reached an inflection point, especially more so following Jensen Huang's enthusiasm for silicon photonics during his keynote at Nvidia's GTC 2025 a few weeks earlier about 50 miles down south from the OFC 2025 venue at Moscone.

As if to provide further evidence of the rise of market and investor interest in silicon photonics and optical networking, you could probably add up at least a billion dollars worth of venture capital funding being poured into this sector. For example, just a few weeks ago, I caught up with Preet Virk in Santa Clara, Calif. As co-founder and COO of [Celestial AI](#), he displayed a confident enthusiasm for how his company will be able to address the interconnect challenge in cloud service providers' infrastructure with its photonic fabric. The company has just raised another \$250 million as part of a series C1 round, taking its total to \$515 million.

NVIDIA Announces Spectrum-X Photonics, Co-Packaged Optics Networking Switches to Scale AI Factories to Millions of GPUs

- > 1.6 Terabits Per Second Per Port Switches to Deliver 3.5x Energy Savings and 10x Resilience in AI Factories
- > Joint Inventions and Collaborations With TSMC, Coherent, Corning Incorporated, Foxconn, Lumentum and SENKO to Create Integrated Silicon, Optics Process and Supply Chain

March 18, 2025



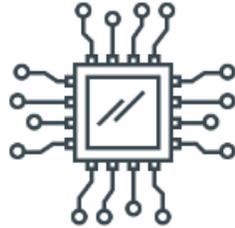
Value chain to build a chip...



EDA / PDA

*Software to design
EIC / PIC chips*

Cadence, Synopsys
Siemens EDA, Keysight,



Fabless

*Design chips
+ sell chips*

NVidia, AMD,
Broadcom, Mediatek



IP Provider

Design IP blocks

ARM, Qualcomm



Foundry

Manufacture chips

TSMC, UMC,
GlobalFoundries



OSAT

*Outsourced semicon
assembly and test*

ASE, Amkor, JCET,
Tongfu

electronics

photonics

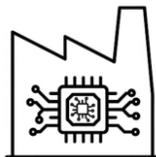
Luceda, Synopsys,
(Lumerical), VPI Photonics,
photondesign, GDSfactory

Sentea, Caliopa,
Indigo Diabetes
Lightmatter, Quix,
Ayar Labs, SiPhox

Epiphany, Alcyon,
OpenLight

Tower, SMART, Ligentec,
Globalfoundries, Silterra

LioniX, PhiX, VLC
Photonics, Ficontec



Integrated
Device
Manufacturers

INTEL, ST, Samsung, Hynix,
Texas Instruments



Value chain for SiPho optical links



PIC design

INNO LIGHT, XPHOR, intel, BROADCOM, OpenLight, POET, SiFotonics, COHERENT, sicoya, HYPER PHOTONIX, SKORPIOS, SCINTIL, dustphotonics, Newphotonics, AyarLabs, CENCERA, BROADEX, MARVELL, Inphi, LUXTERA, NVIDIA, HUAWEI, Calopa, cloudlight, ALPINE, RANOVUS, IBM, LUMENTUM, NeoPhotonics, CISCO, ACACIA, TeraXion, NOKIA, HUAWEI, FUJITSU, NTT, VLE PHOTONICS, SPARC PHOTONICS, AIO CORE, epiphany, ZTE, Yole Semiconductor Technology Co., Ltd., DETRA, Super Photonics Integrated Circuit Xiamen Co., Ltd.

SOI substrate

soitec, ShinEtsu, IQE, VPEC, SUMITOMO ELECTRIC, IntelliEPI, axt, JX

Epi-wafer suppliers

LandMark, IQE, VPEC, SUMITOMO ELECTRIC, IntelliEPI, axt, JX

Foundry and fabs

Tower Semiconductor, intel, amf, GlobalFoundries, SILTERRA, AIM Photonics, CISCO, tsmc, ULTRA-LOW LOSS TECHNOLOGIES, SKORPIOS, COHERENT, LUMENTUM, SAMSUNG, NTT, skywater, BROADCOM, PETRA, leti, UMC, imec, a*, IMECAS, UMEC, VTT, Compoundtek, ST, silex, SiPhotonIC TECHNOLOGIES, CORNERSTONE MICROSYSTEMS, LIGENTEC, Lionix INTERNATIONAL, onit, INPHOTEC, FAB, ENM, NEWPORT, LXT

Packaging

ASE HOLDINGS, JABIL, fabrinet, COHERENT, LUMENTUM, BROADCOM, phix, icon PHOTONICS, bay photonics, AIM Photonics

Transceiver integrator

INNO LIGHT, JABIL, LUMENTUM, Accelink, FAST PHOTONICS, Hisense Broadband, sicoya, eoptolink, source, COHERENT, HYPER PHOTONIX, fabrinet, HG Genuine, CIG, LUXSHARE, HUAWEI, GigaLight, BROADEX TECHNOLOGIES CO., LTD, CENCERA, ZTE, ANALOG PHOTONICS, LEONI, HENG TONG GROUP, RANOVUS, FIT, Alibaba Cloud, CREALIGHTS, MARVELL, ciena, CISCO, LUMENTUM, FUJITSU, NOKIA, NTT

Equipment

Datacom equipment
Router, switch, server
aws, Microsoft Azure, HUAWEI, ARISTA, DELL EMC, NVIDIA, intel, Hewlett Packard Enterprise, JUNIPER

Telecom equipment
HUAWEI, NOKIA, ciena, Infinera, ZTE, FUJITSU, NEC, ERICSSON

Operators (customers)

Datacom
aws, Microsoft Azure, Meta, Tencent 腾讯, ByteDance, Alibaba Group, Baidu 百度

Telecom
at&t, NTT, verizon, China unicom 中国联通, 中国移动通信 CHINA MOBILE, SoftBank, 中国电信 CHINA TELECOM

And more...

Value chain to build a chip...

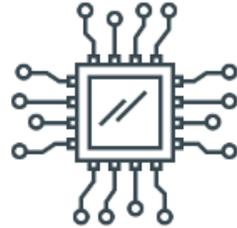


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*Software to design
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Cadence, Synopsys
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Design IP blocks

ARM, Qualcomm

Epiphany, Alcyon,
OpenLight



Foundry

Manufacture chips

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OSAT

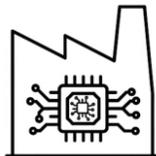
*Outsourced semicon
assembly and test*

ASE, Amkor, JCET,
Tongfu

electronics

photonics

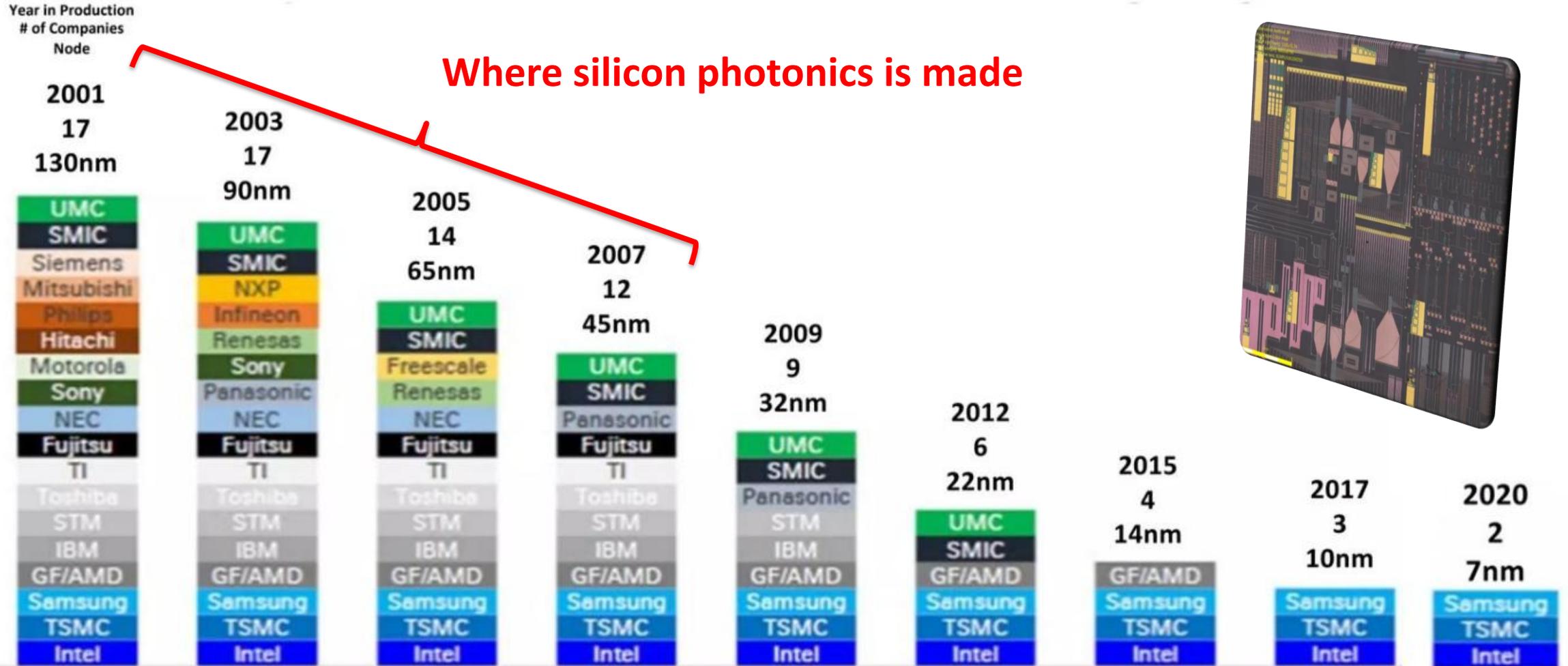
LioniX, PhiX, VLC
Photonics, Ficontec



Integrated
Device
Manufacturers

INTEL, ST, Samsung, Hynix,
Texas Instruments

Who can make silicon photonics?



Bharat Jha, The Evolution of Semiconductor Nodes: A Journey of Innovation and Progress, LinkedIn

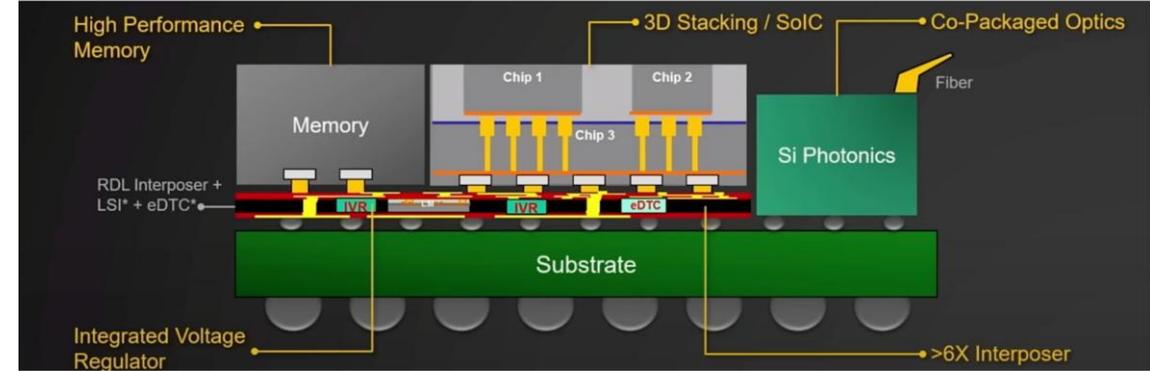
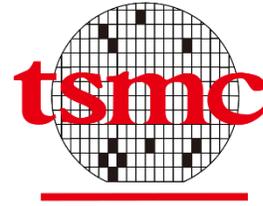


Commercial Pure-play SiPho Foundries



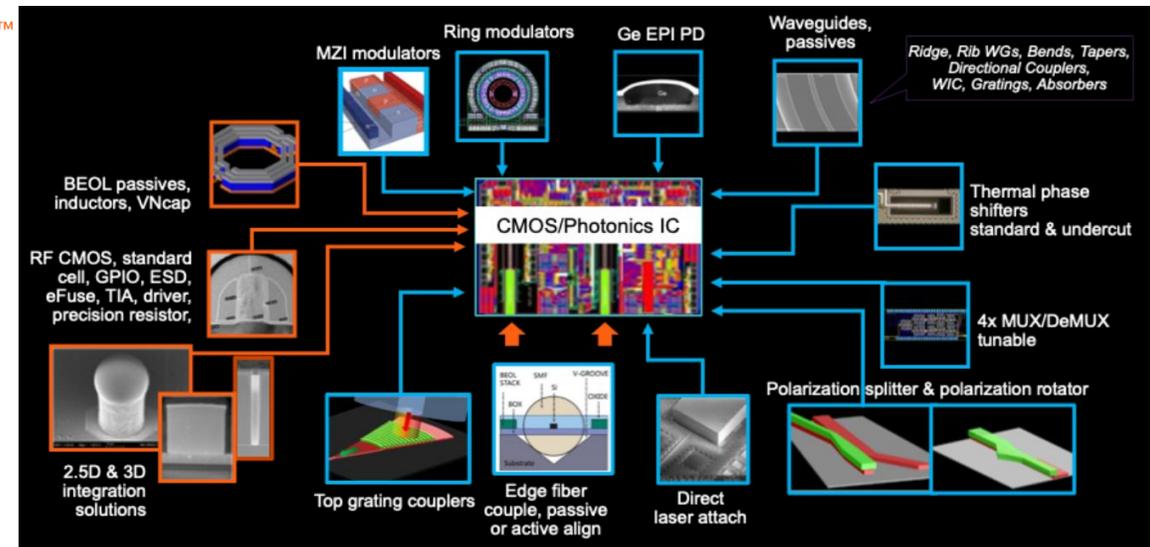
High-volume, ultimate performance... (300mm)

- TSMC
- GlobalFoundries



Medium Volume, mid-range performance (200/300mm)

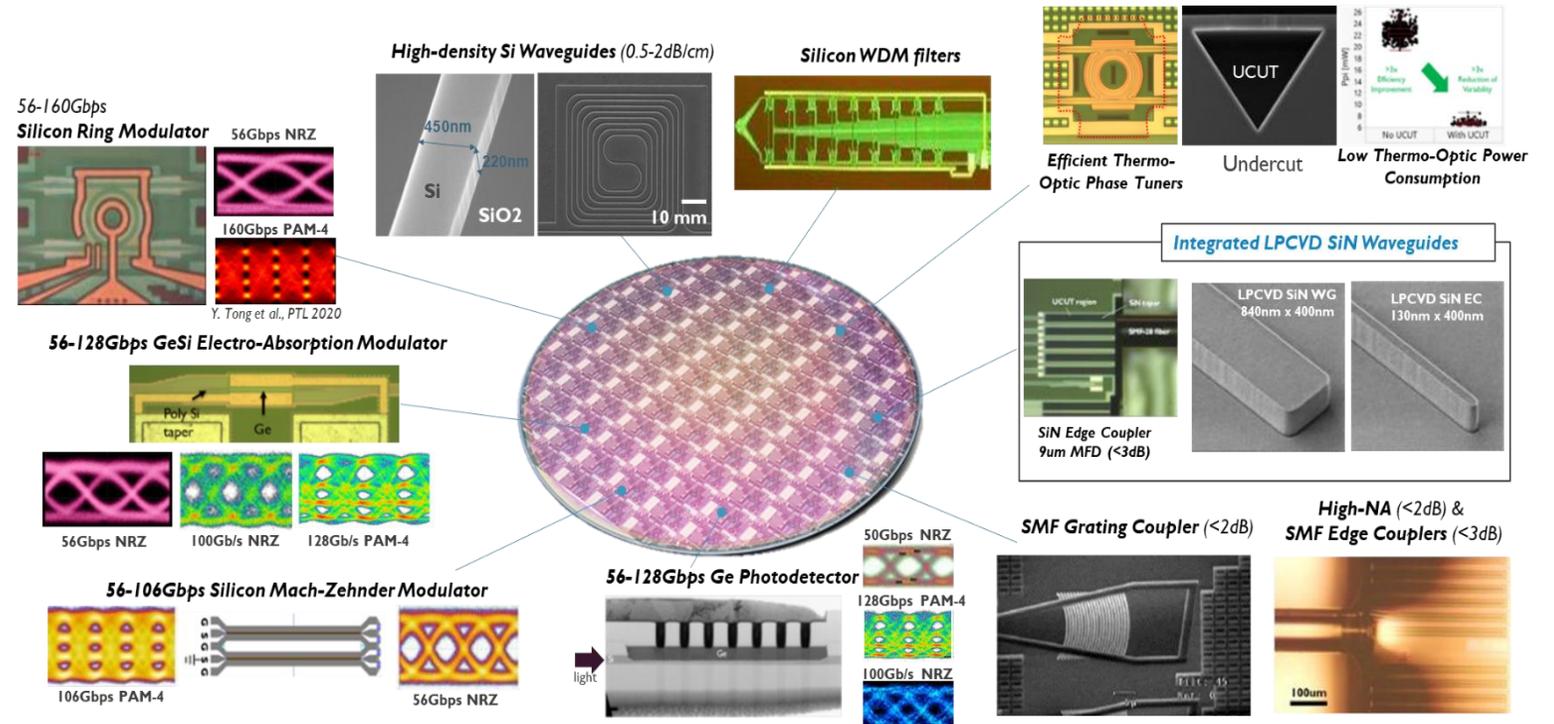
- Tower
- Silterra



Silicon Photonics R&D Fabs

- Act as R&D centers for large commercial foundries and fabless firms
- Act as fabs for prototyping and small volume manufacturing with routes to larger volume through collaboration with speciality commercial fabs
- Best effort service

Example: **imec**



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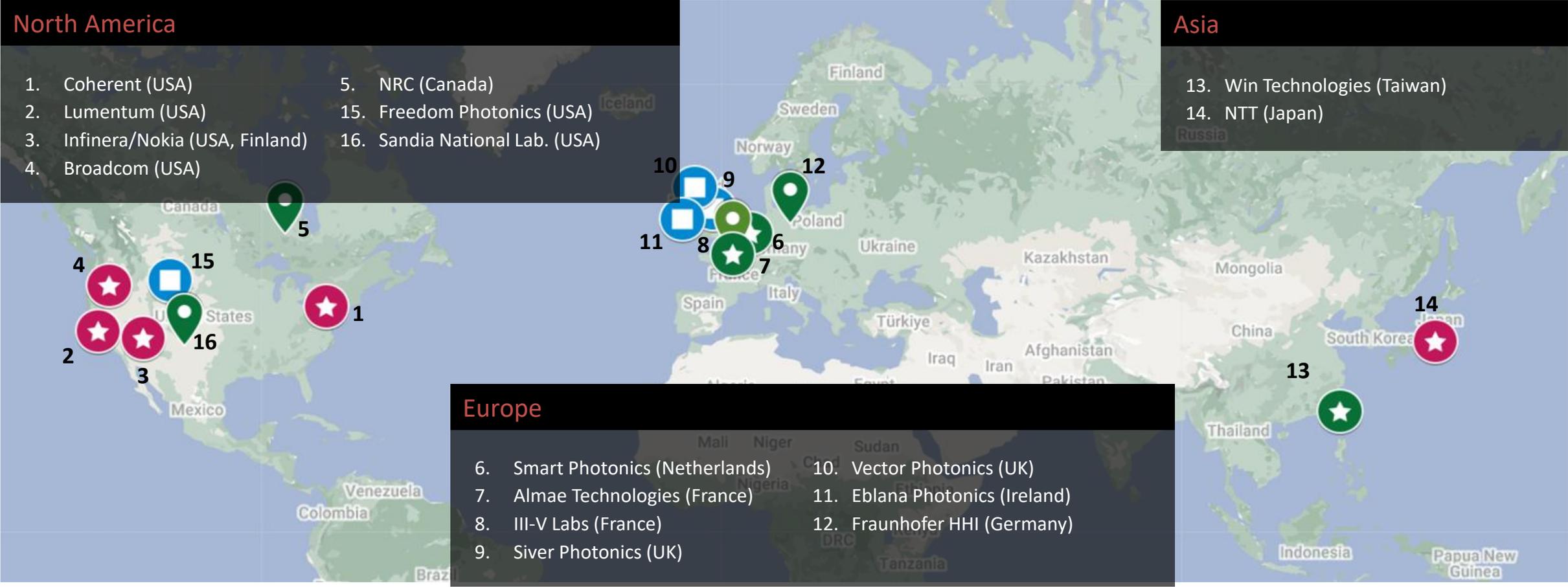
- Strong presence of IDMs and limited number of pure-play fabs

North America

- | | |
|----------------------------------|--------------------------------|
| 1. Coherent (USA) | 5. NRC (Canada) |
| 2. Lumentum (USA) | 15. Freedom Photonics (USA) |
| 3. Infinera/Nokia (USA, Finland) | 16. Sandia National Lab. (USA) |
| 4. Broadcom (USA) | |

Asia

- | |
|-------------------------------|
| 13. Win Technologies (Taiwan) |
| 14. NTT (Japan) |



Europe

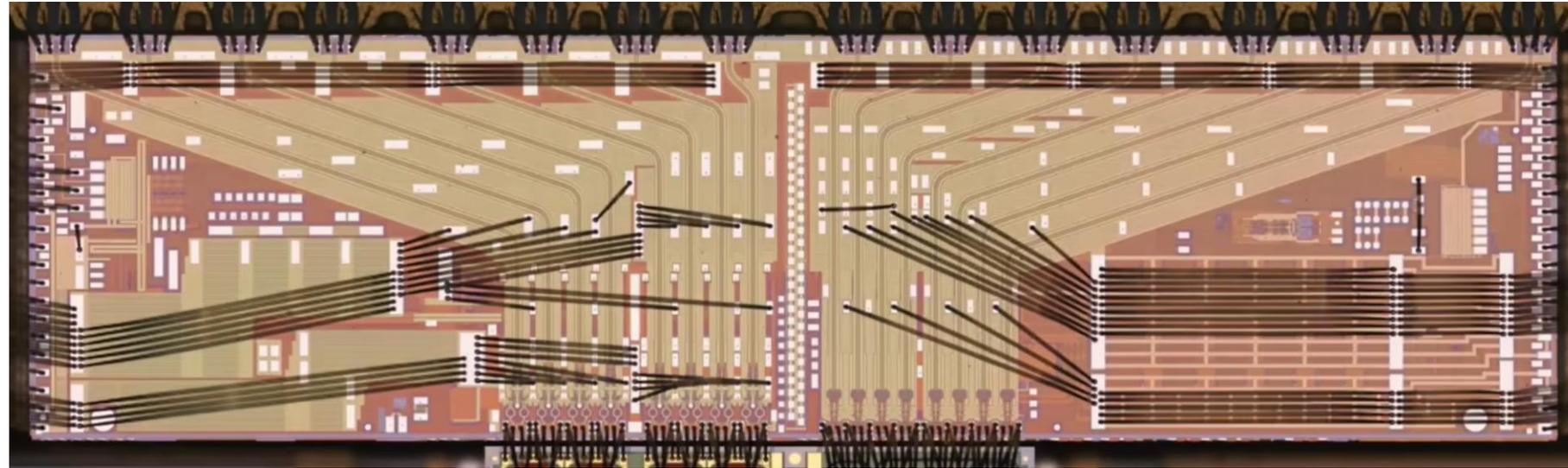
- | | |
|----------------------------------|--------------------------------|
| 6. Smart Photonics (Netherlands) | 10. Vector Photonics (UK) |
| 7. Almae Technologies (France) | 11. Eblana Photonics (Ireland) |
| 8. III-V Labs (France) | 12. Fraunhofer HHI (Germany) |
| 9. Siver Photonics (UK) | |

IDM	R&D + Small volume
Pure-play Foundry	Laser Modules Only

III-V Integrated Device Manufacturers

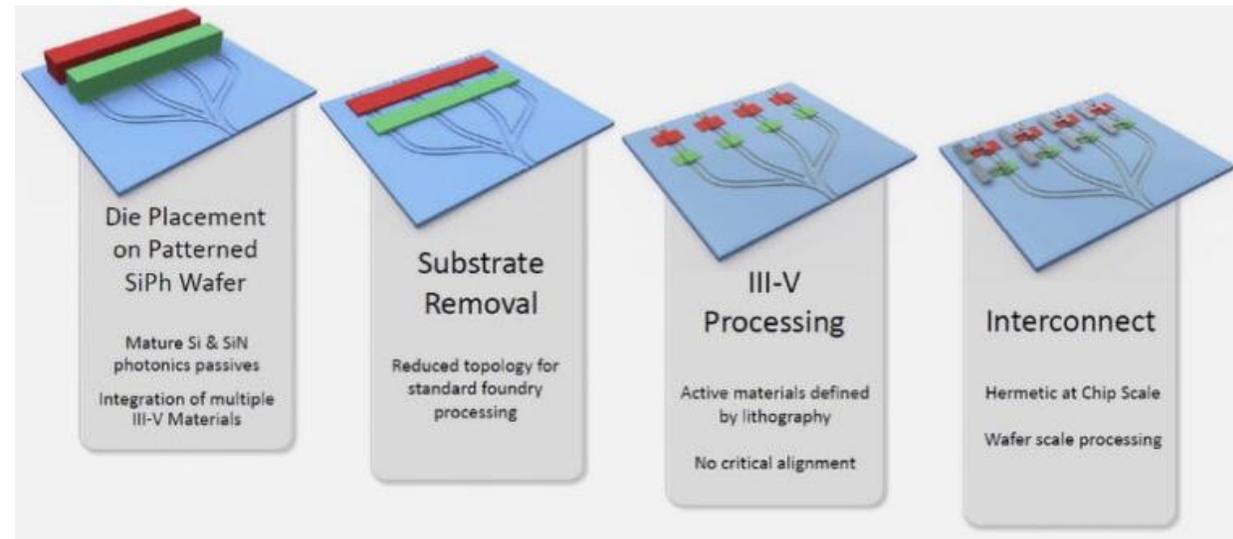
- Focused on III-V components and subsystems
- (mostly for transceivers)

- Infinera (Nokia)
- Coherent
- Innolight
- Lumentum
- InPhi (Marvell)
- Fujitsu
- ... and others

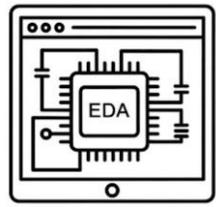


Adding value: New material integration

- **Adding new materials to the processes of established foundries**
 - Openlight: light-source integration
 - SCINTIL: backside light-source integration
 - LumiPhase: BTO integration
 - Transverse: Transfer printed sources and modulators
 - ... and others



Value chain to build a chip...

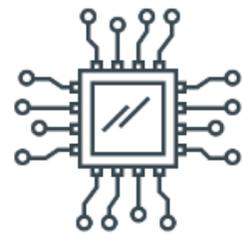


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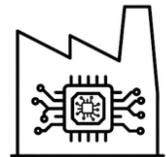
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electronics

photonics



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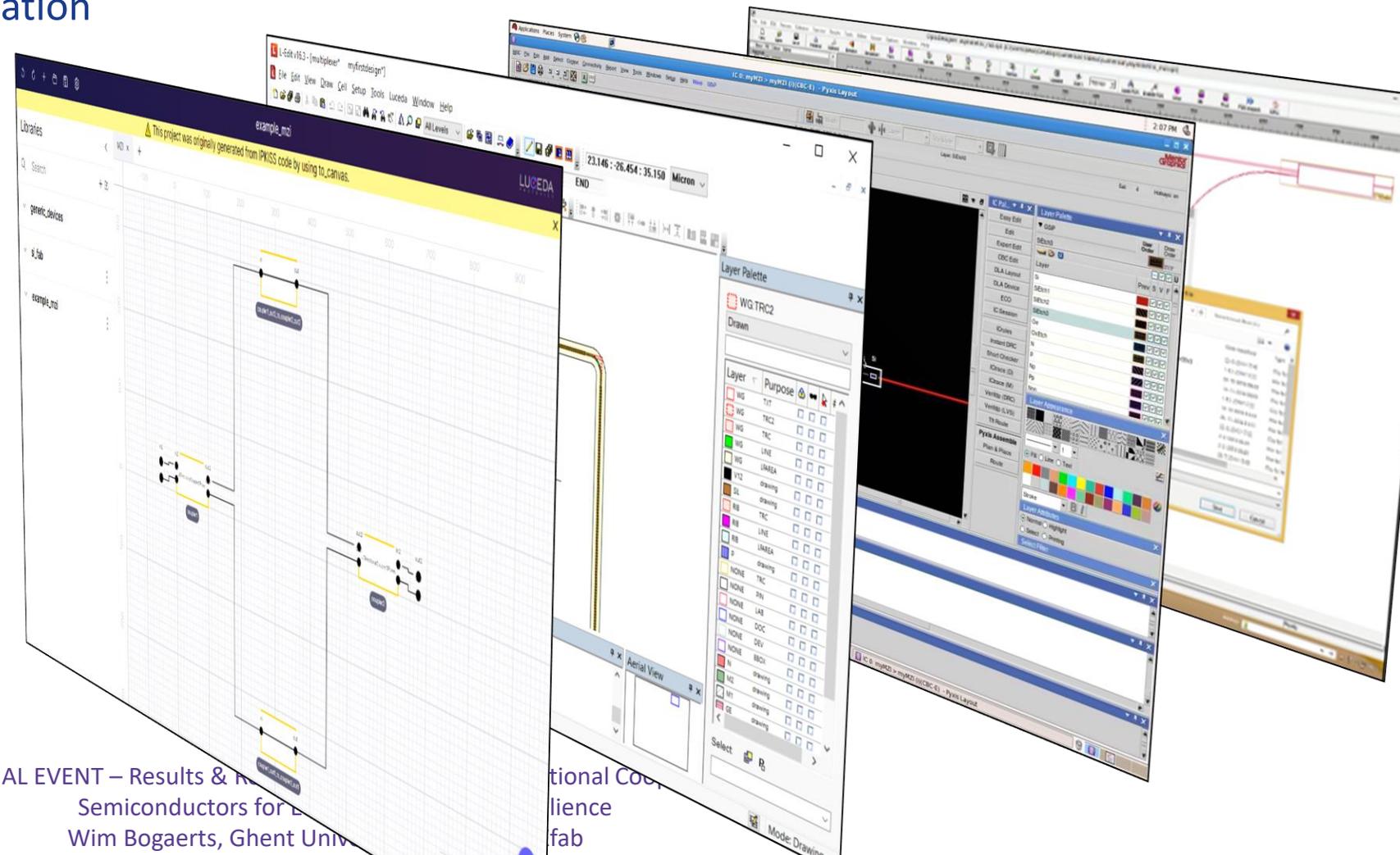
INTEL, ST, Samsung, Hynix,
Texas Instruments



Design Environments are Emerging

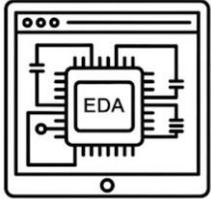


- Combinations of Photonics Design and EDA
- Physical simulation combined with circuit design
- Physical and functional verification
- PDKs with basic models



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 Semiconductors for ...
 Wim Bogaerts, Ghent Univ ...
 tional Coo ...
 lience ...
 fab

Value chain to build a chip...

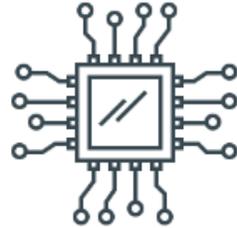


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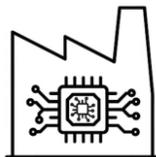
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electronics

photonics

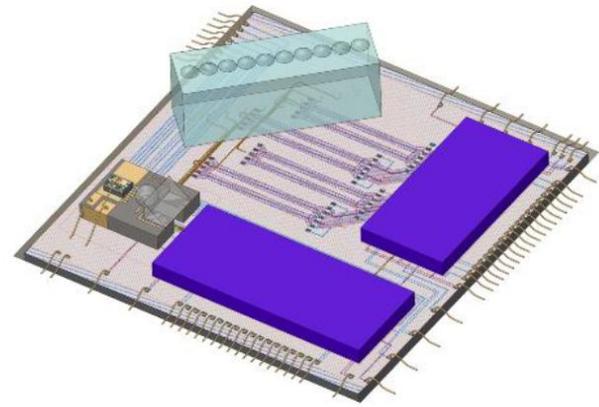
LioniX, PhiX, VLC
Photonics, Ficontec



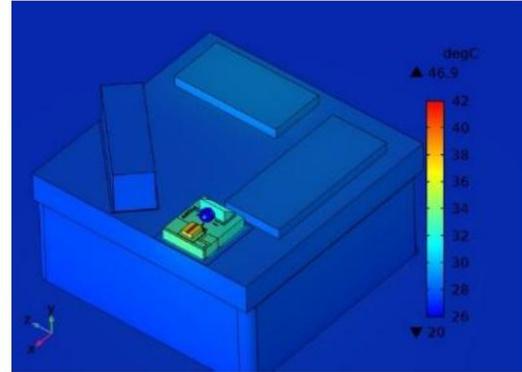
Integrated
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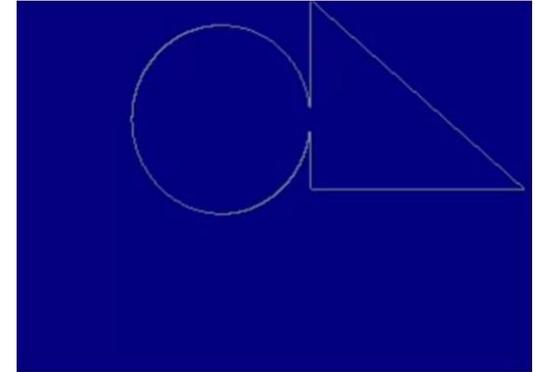
Photonic Packaging: not an afterthought



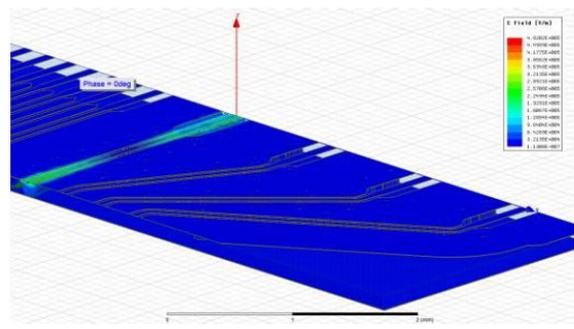
**PIC and Packaging
Co-Design**



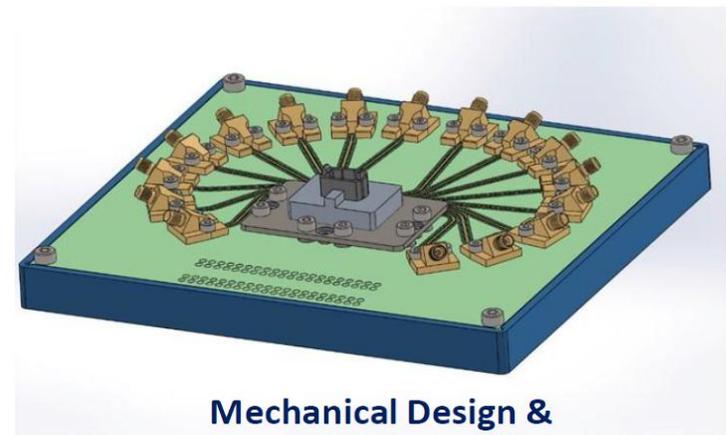
**Thermal Analysis &
Optimisation**



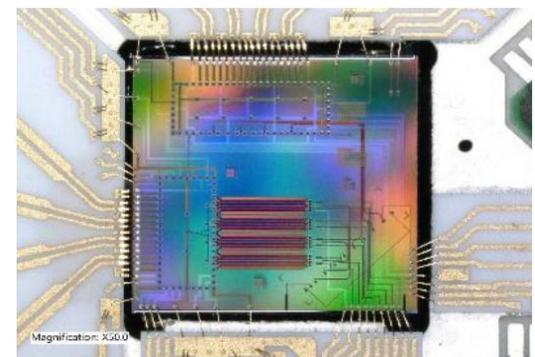
**Optical Simulation &
Design**



**Electrical Simulation &
Design**

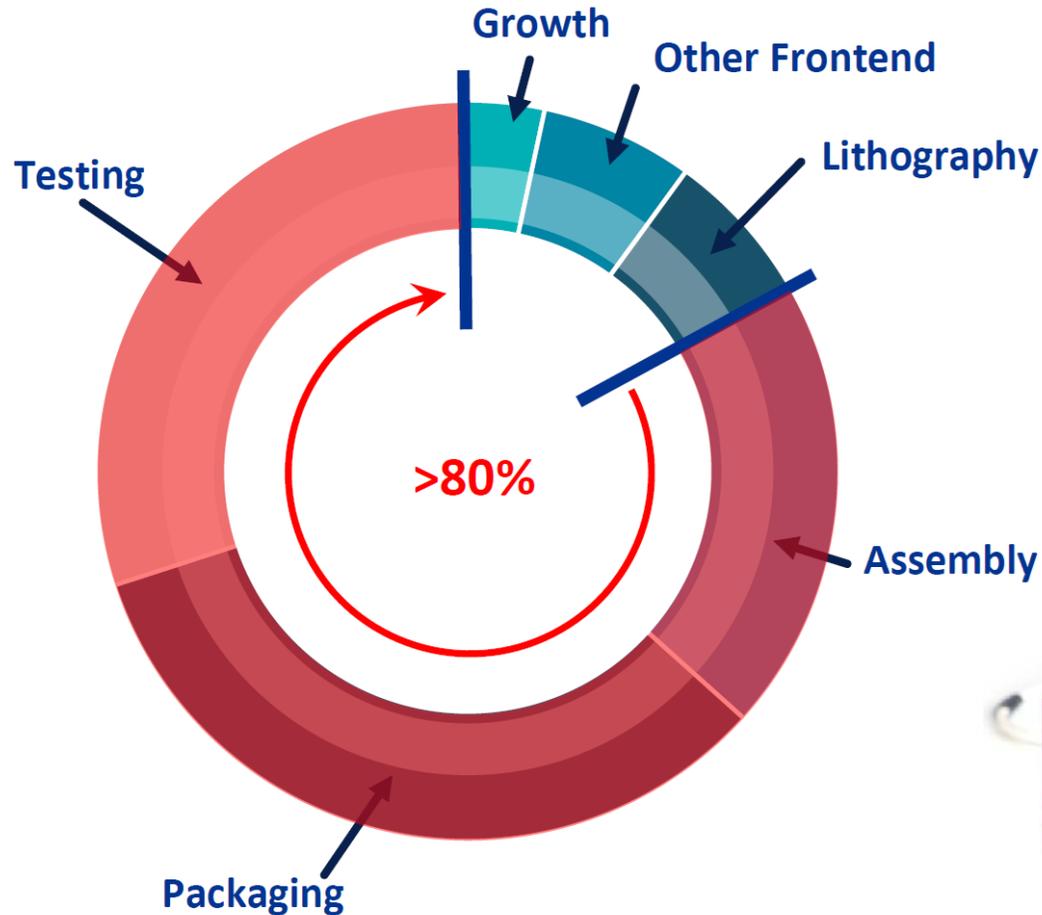


**Mechanical Design &
Optimisation**



**Assembly &
Process Development**

The cost of Photonic Packaging



- 2006: Packaging and testing are 80% of the cost of a photonic chip product

- Today: not much better

- Push towards more cost-effective methods

- Wafer-level packaging

- Passive alignment

- Using techniques from electronics



“Process-Based Cost Modeling of Photonics Manufacture: The Cost Competitiveness of Monolithic Integration of a 1550-nm DFB Laser and an Electroabsorptive Modulator on an InP Platform” IEEE Journal of Lightwave Technology, Vol. 24, No. 8, 2006.

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Semiconductors for European Economic Resilience
Wim Bogaerts, Ghent University – imec - ePIXfab

Outsourced Assembly and Test

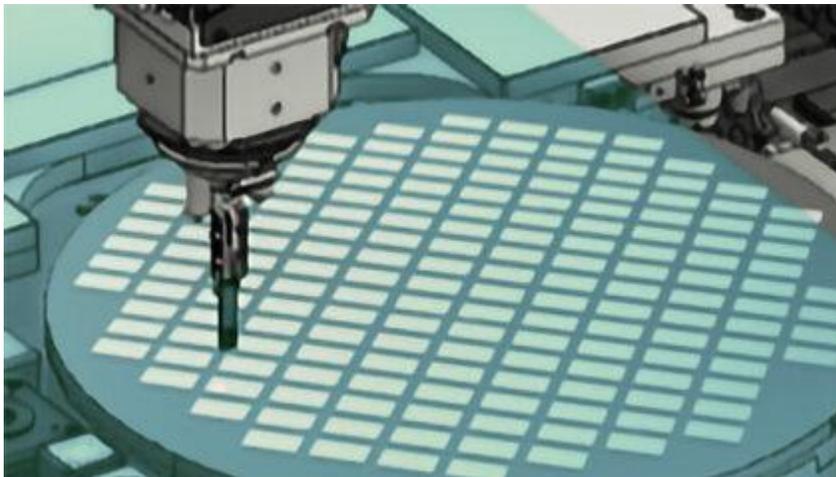
- Large-scale facilities
- Building on electronics capabilities
- Mostly in Asia



... and others

Assembly and Test Tools

- Automation and positioning
- Optical fiber (arrays)
- Electrical probing
- Wafer-level, die-level
- Optical and electrical (RF) tests
- Optical transmission tests
- Link transmission tests



- **Scaling up:** PIC Manufacturing is ramping up volume (>100k wafers/year)
- Performance improvements of **key photonic IC building blocks** (especially high-speed modulators)
- **Wafer-scale heterogeneous integration** of different PIC materials to offset the missing functionality (lasers, modulators, ...)
- Combining **electronic ICs and photonic IC**, (monolithic or advanced packaging)

Europe's position in Photonic Chips



Pilot lines

Prototyping of validated designs
Testing of equipment
Validation of process flows



Competence centres

Access to technical expertise, helping
companies to approach and improve design
capabilities and developing skills



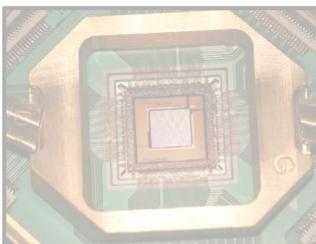
Design Platform

Help designing semiconductor devices, via
access to Electronic Design Automation
tools and IP libraries



Quantum chips

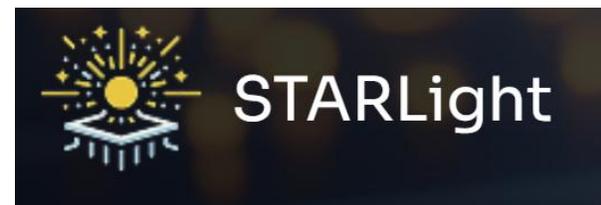
Technology and engineering capacities for
accelerating innovative development of
quantum chips



PIX Europe



EuroCDP | EU Chips
Design
Platform



- XPH90: Silicon and Silicon Nitride platform
- High-speed Si modulators
- Heterogeneous III-V integration

- Sources
- modulators
- detectors

Heterogeneous Integration

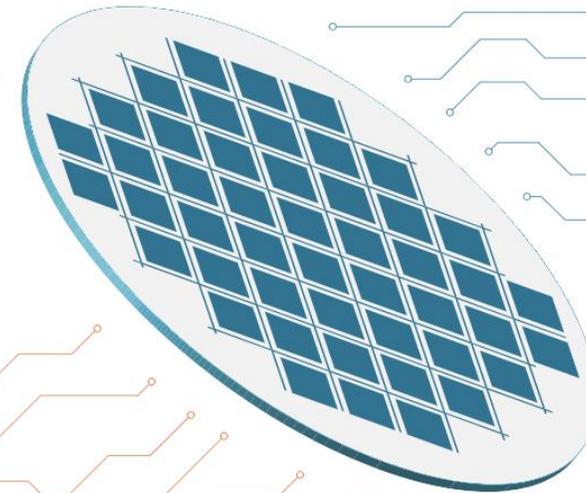
Micro-Transfer Printing
Cu RDL

Active HI Components

Laser
Modulators
Semiconductor
Optical Amplifiers
Photo Diodes
Silicon Chipelets

SOI Technology

Si and SiN Waveguides
Phase Shifters
Si Modulators
Polarizer
Cu BEOL (2-4) with Al
High-Efficiency Couplers
Heater Module



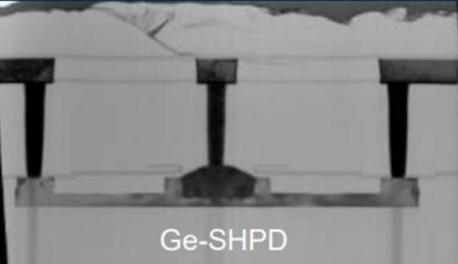
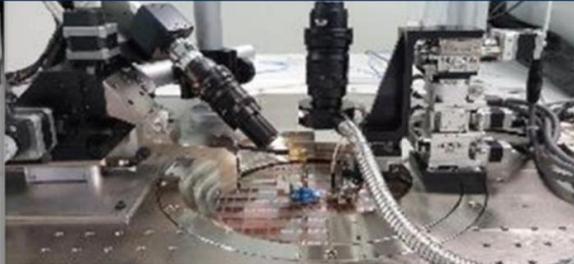


ST re-enters the SiPho game



- Foundry or IDM?

SiPho PIC100
The only silicon-only 300 mm technology able to support 200 Gbps per lane (100 GBaud PAM4)

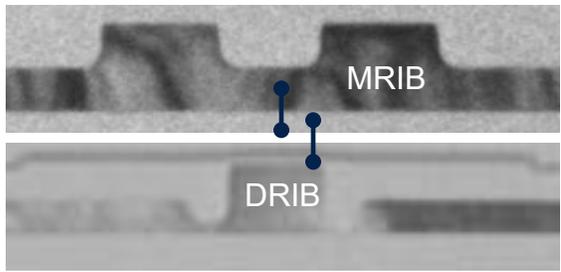
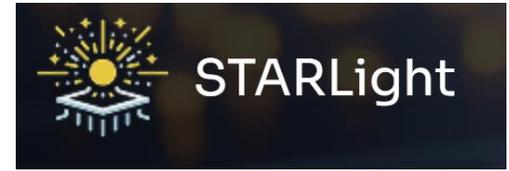
Ge-SHPD

- **Yield 300 mm** 90%, best-in-class vs 200 mm foundries
- **System on Chip** High-performing compact integration
- **Distance range** cm to 100 km+ best-in-class vs EML/VCSEL

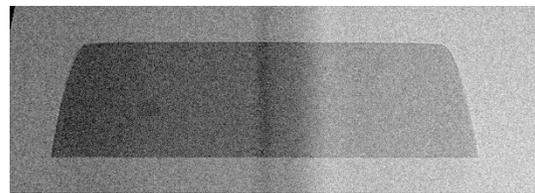
Enable **Edge coupling** thanks to a patented technology stack

200 Gbps silicon-only based, ideal for AI, ramp H2'25

300mm - Based on a 32nm CMOS node



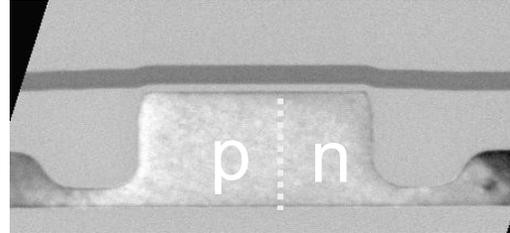
Si Low-loss (<0.3 dB/cm)



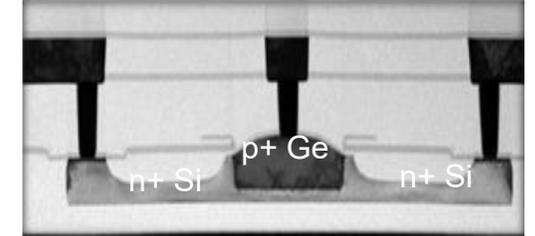
SiN Low-loss

(<0.4-0.5 dB/cm)

Edge Coupler <1dB



E/O Modulator (Bandwidth >50+GHz)



Photodetector (Bandwidth >80+GHz)



New Silicon Nitride Foundry (Netherlands)



- A semi-automated 200mm SiN pure-play foundry
- Medium volume (>20KWPY) with a high-mix wafer production for current and future applications of PICs
- Brand new fully equipped cleanroom
- PDK for linear and non-linear applications using SiN PICs
- Integration of active materials with SiN

**NEW
ORIGIN**
CHIPTECH FOUNDRY

Founding Partners



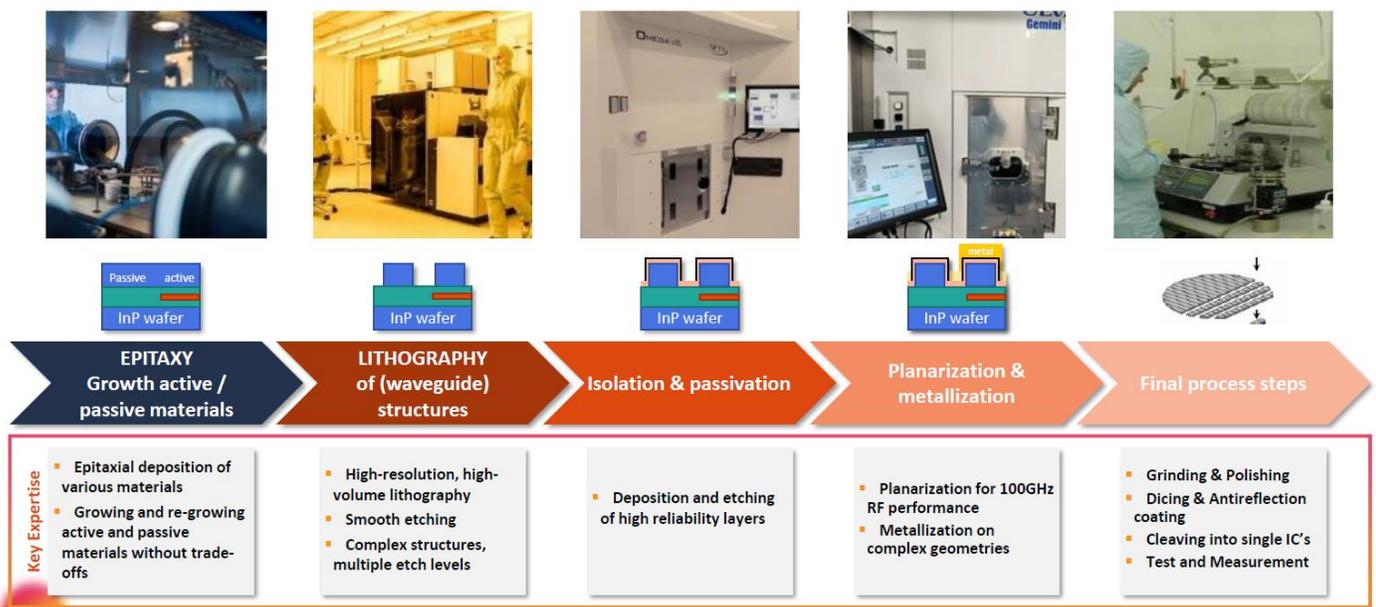
Twente's photonics foundry New Origin secures seed funding

20 January 2025

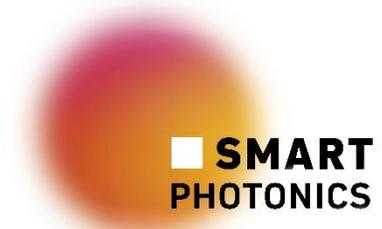
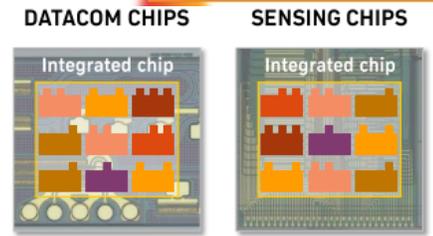
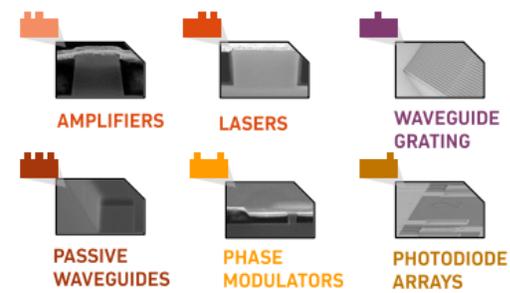
Thanks to an investment from development agency Oost NL and a grant from the province of Overijssel, New Origin has laid the financial foundation for the construction of an integrated-photonics foundry in Twente. Focused on the silicon nitride (SiN) platform, the firm aims to ship the first wafers by the end of 2026.

InP foundry: Smart Photonics

- 4" InP foundry with standardized processes
- Validated PDK for O & C-band
- EPI for for high temperature applications



PROCESS DESIGN KIT (PDK) TOOLBOX



- 50+** Proprietary building blocks
- 10+** Years of refining PDK
- 20+** Issued and pending patent families

PDKS HELP OUR CUSTOMERS:

- Customize designs
- Leverage experience
- Reduce time to market
- Leverage infrastructure

- Europe has world-class processes
 - IMEC, LETI, IHP leading-edge Silicon Photonics platforms
 - Very strong III-V processing capabilities
 - High-quality Silicon Nitride
 - New Materials (Thin-Film Lithium Niobate)
- Emerging initiatives for volume foundries
 - Silicon Photonics: XFAB and ST
 - Silicon Nitride: XFAB, New Origin, ...
 - ...

Europe's Photonic Design Tools

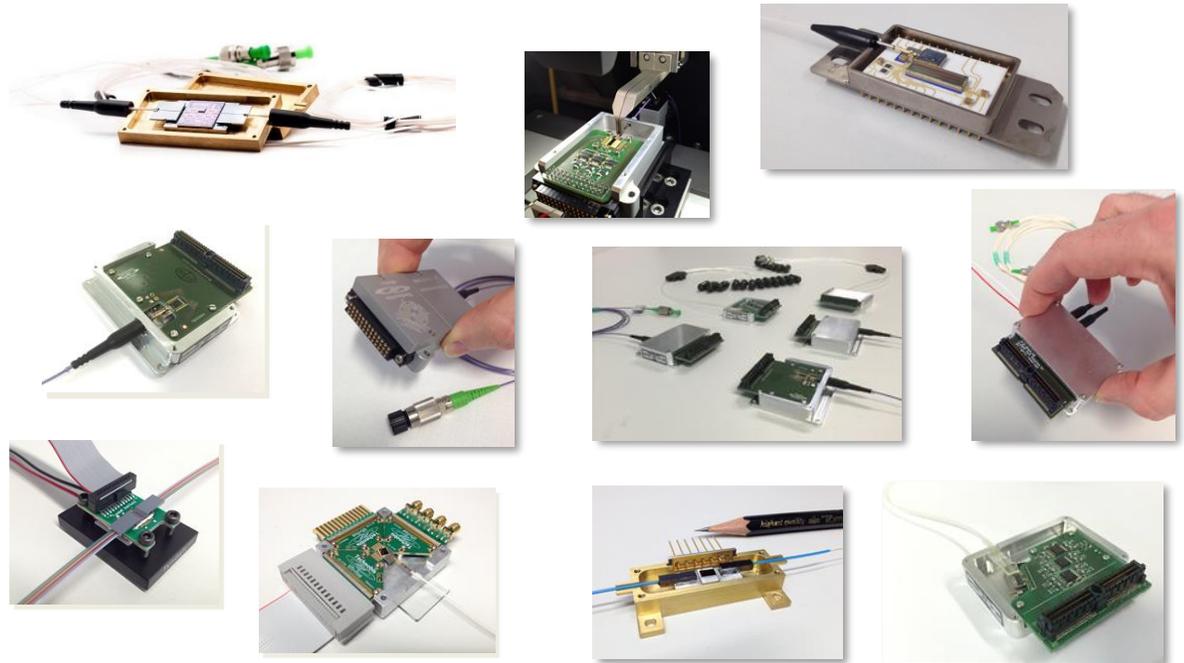
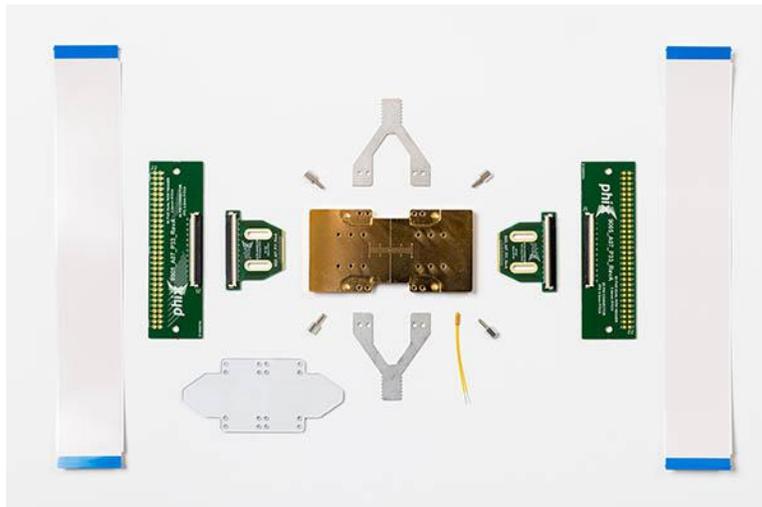
- The tier-1 EDA tools are mostly not European
- Several tier-2 European players
- Strong expertise in Europe

- Need for standardization
 - Models and circuit simulation (“Spice for photonics”)
 - Design for manufacturability
 - Design kit format
- Opportunities for international collaboration

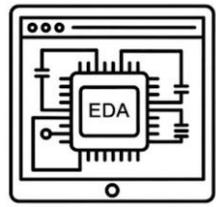
Photonics Packaging in Europe

- Bespoke packaging houses
- Custom solutions or packaging templates
- Small volumes

- Packaging in Labs
- Demonstrators

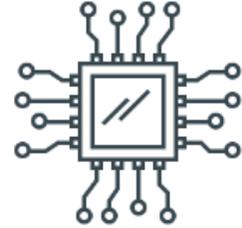


Value chain to build a PIC ... in Europe?



EDA / PDA

Software to design PICs



Fabless

Design chips + sell chips



IP Provider

Design IP blocks



Foundry

Manufacture chips



OSAT

Outsourced assembly and test



Luceda, Synopsys, (Lumerical), VPI Photonics, photondesign, GDSfactory

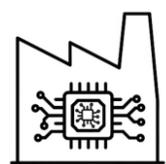
Sentea, Caliopa, Indigo Diabetes, Lightmatter, Quix, Ayar Labs, SiPhox iPronics, many SMEs...

Epiphany, Alcyon, OpenLight, Wave

Tower, SMART, Ligentec, Globalfoundries, Silterra, ST, Xfab, New Origin

LioniX, PhiX, VLC Photonics, Ficontec, **But no large OSATs**

photonics



Integrated Device Manufacturers

INTEL, Samsung, Hynix, Texas Instruments, ST

And no hyperscalers

PICs in Europe: (current) strengths

- **Europe's Strengths:**

- Very strong photonics R&D
- World class research fabs with low-volume capability
- Building out medium/large volume production in different segments (XFAB, ST)
- Innovative Design tool companies

- **Challenges for Europe:**

- Heavyweight EDA companies not in Europe
- No scaling OSATs for advanced packaging and large-scale testing
- No big European customers (e.g. transceiver vendors, hyperscalers, ...)

- EDA tools
 - Tier-1: Currently very dependent on US owned providers
 - Tier-2: Very strong EU presence
- Advanced packaging and heterogeneous integration
 - Strong R&D and low-volume
 - No high-volume OSATs in EU, subject to export restrictions
- Fabs & Foundries
 - Mainly research fabs (low-volume)
 - Currently no high-volume options within EU
 - X-FAB and STMicroelectronics can make a big difference

The elephant in the room

- Photonics market is driven by datacenter interconnect
- But there are **no European** hyperscalers (ST's re-entry is driven by Amazon...)
- Only one pure EU transceiver builder



Europe is not an island..

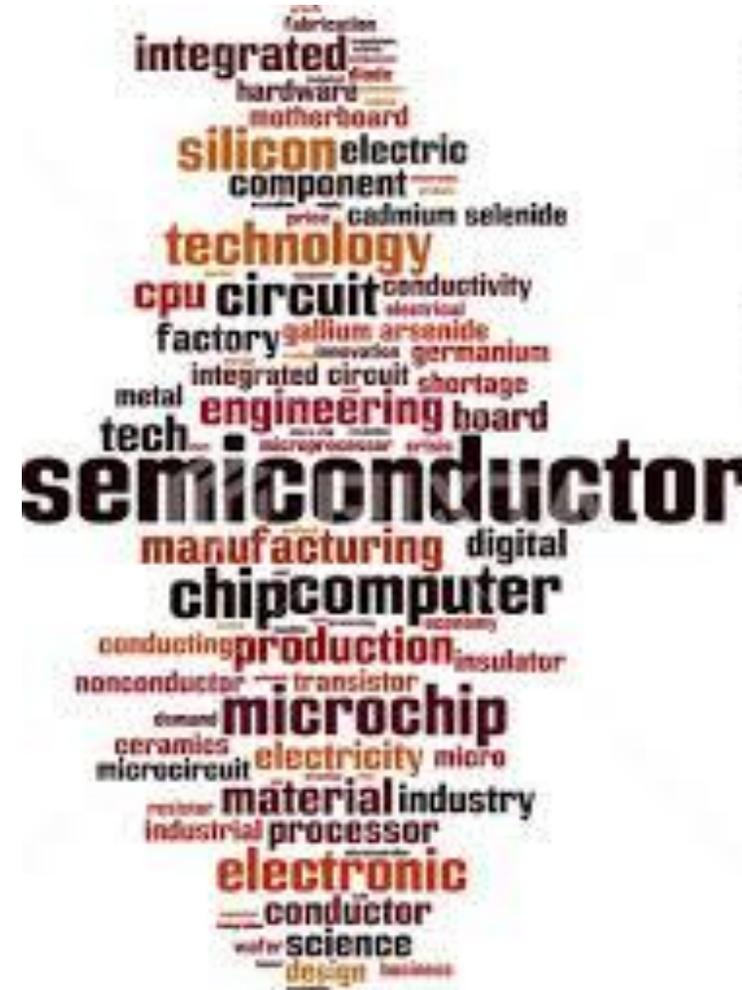


Here Be Dragons



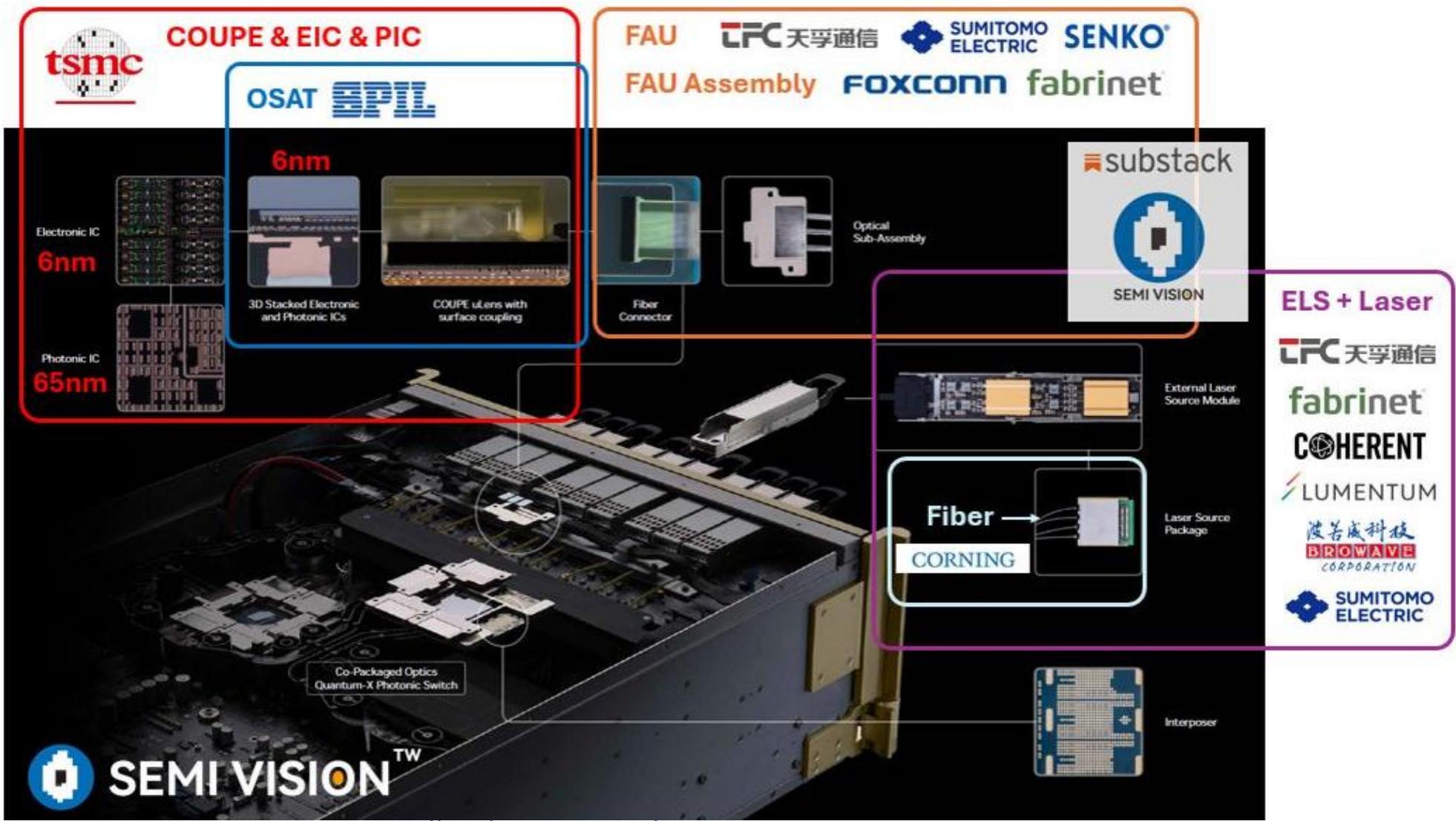
Semicon is about ecosystems

- Corporate Ecosystems
- Innovation Ecosystems
- Regional Ecosystems
- Knowledge ecosystems



NVIDIA: Corporate Ecosystem

- Example: Quantum X800 Supply chain (CPO switch)





TSMC/ASE Global SiPho Ecosystem



- Components
- Modules
- III-V
- Design House
- Testing
- Equipment
- Foundry
- Epitaxy
- Packaging
- PCB Foundry
- PCB Manufacturer



ICOS FINAL EVENT – Results & Recommendations on International Cooperation on Semiconductors for European Economic Resilience
 Wim Bogaerts, Ghent University – imec - ePIXfab

Vertical integration trends

- GF acquires AMF
- GF acquires infinilink
- GF establishes packaging line in NY

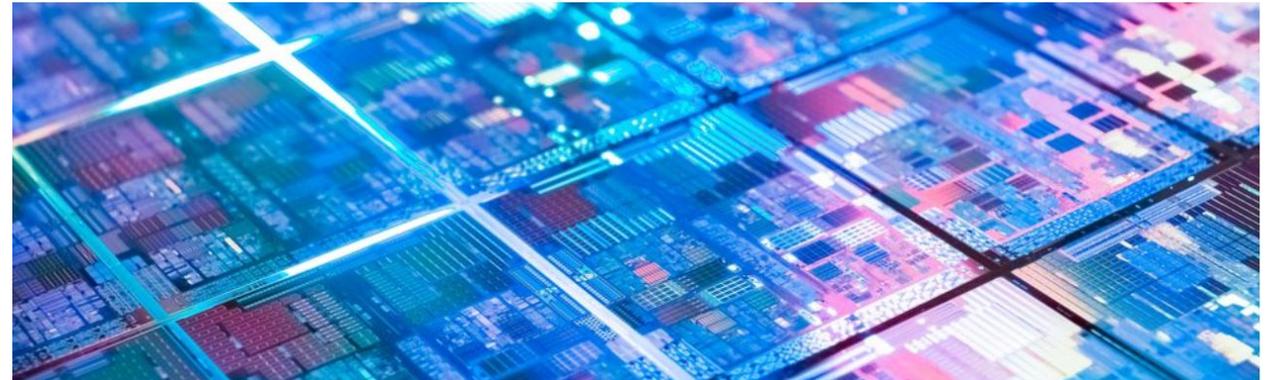
THE STRAITS TIMES

GlobalFoundries acquires Singapore semiconductor firm amid AI data centre boom

Sign up now: Get ST's newsletters delivered to your inbox



GlobalFoundries buys optical chipmaker InfiniLink
Latest acquisition bulks out GF's AI data center proposition

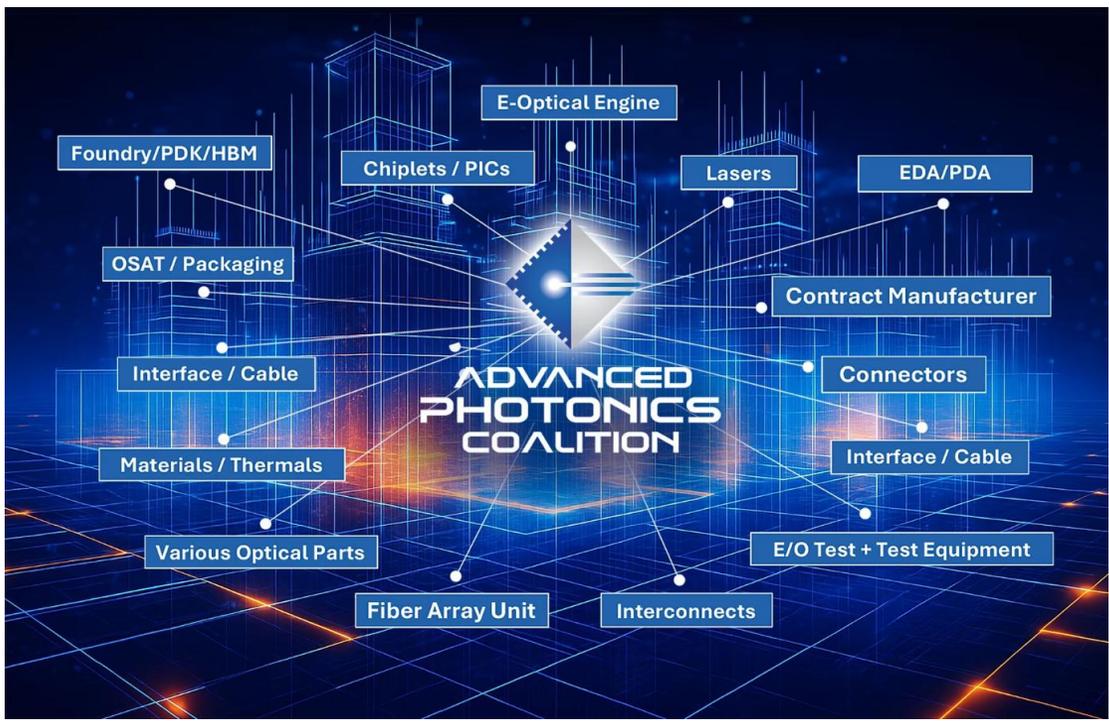




APC: (Open) Innovation Ecosystem



- Creating a value chain
- Coordinating between segments (e.g. standards)



CURRENT MEMBERS



Semicon is about ecosystems

- Corporate Ecosystems
- Innovation Ecosystems
- Regional Ecosystems
- Knowledge ecosystems





United states

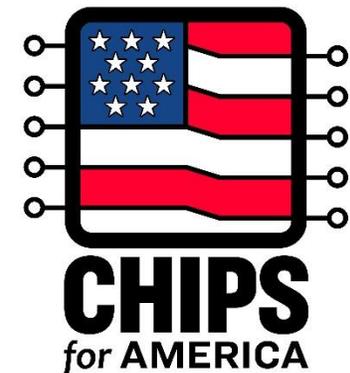


- 50+ B\$ on Semiconductor ecosystem

ABOUT CHIPS FOR AMERICA

Semiconductors, or chips, are tiny electronic devices that are integral to America's economic and national security. These devices power tools as simple as a light switch and as complex as a fighter jet or a smartphone. Semiconductors power our consumer electronics, automobiles, data centers, critical infrastructure, and virtually all military systems. They are also essential building blocks of the technologies that will shape our future, including artificial intelligence, biotechnology, and clean energy.

When the CHIPS and Science Act of 2022 was signed into law, it provided the Department of Commerce with \$50 billion for a suite of programs to strengthen and revitalize the U.S. position in semiconductor research, development, and manufacturing — while also investing in American workers. CHIPS for America encompasses two offices responsible for implementing the law: The CHIPS Research and Development Office is investing \$11 billion into developing a robust domestic R&D ecosystem, while the CHIPS Program Office is dedicating \$39 billion to provide incentives for investment in facilities and equipment in the United States.





AIM Photonics



The American Institute for
Manufacturing Integrated Photonics

AIM PHOTONICS

Albany NanoTech Complex
Albany, NY
**Test, Assembly and
Packaging Facility**
Rochester, NY



AIM Photonics: Organizations



Development



Enablement



Education



Application



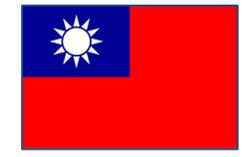
Government





Taiwan

- Strong Industry – academia – government synergies




HiSPA
國際矽光子異質整合聯盟
 Heterogeneously Integrated Silicon Photonics Alliance

- Samsung (foundry)

SAMSUNG

Research institutes

- KAIST
- ETRI
- ...



And quite a few startups

[News] Samsung Reportedly Joins Broadcom on Silicon Photonics, with Commercialization Expected in 2 Years

📅 2025-03-07 | 📁 Semiconductors | 👤 editor |



Samsung AI Solutions: Technologies

Advanced heterogeneous integration on a single packaged substrate

- Compact form factor for higher bandwidth density
- Reduced power consumption & latency
- Improved signal integrity



Singapore

- Rich Ecosystem



- Fabs (e.g. AMF)
- Design, Test, Measurement
- Packaging
- Equipment
- End-users

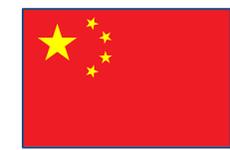


- ...and ecosystem with multiple (non-photonic) semiconductor foundries

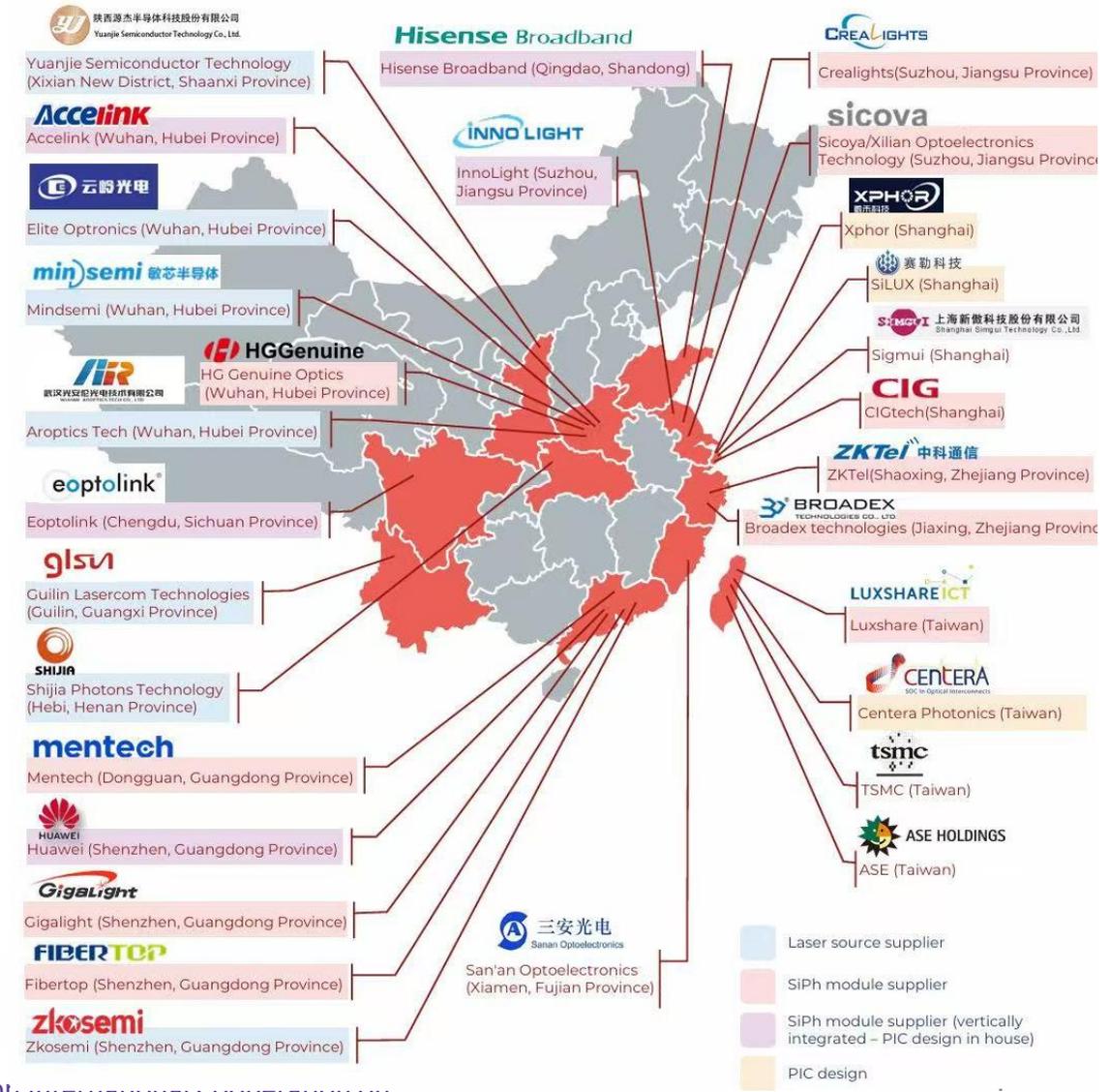


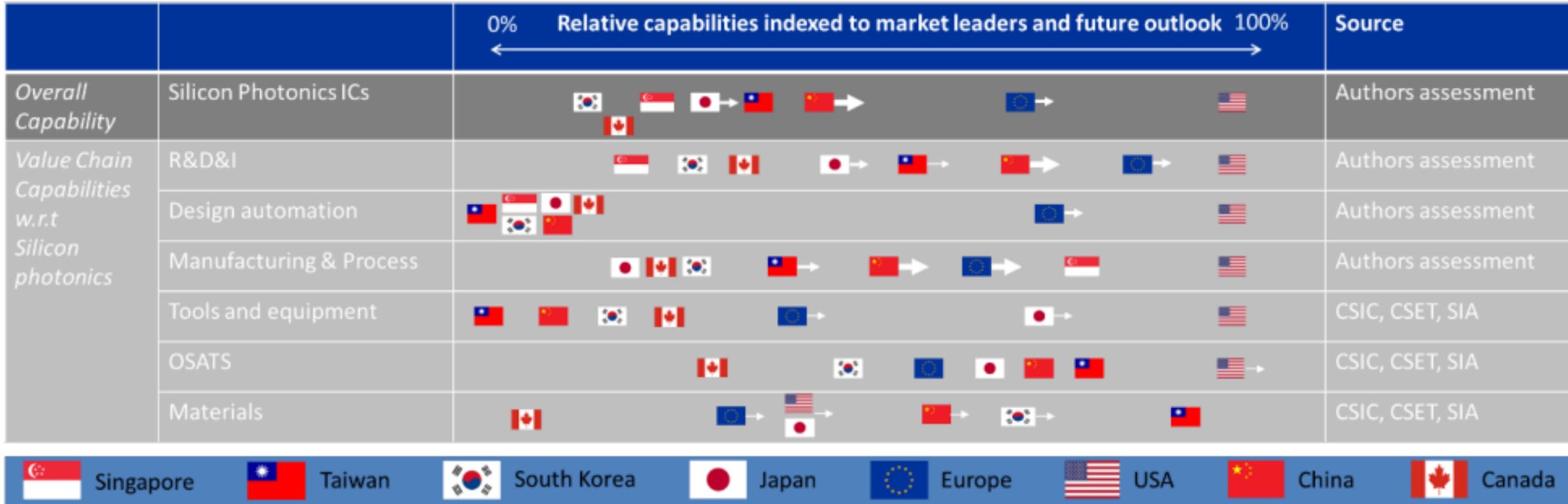


And China?



- Rapidly developing semiconductor ecosystem, including PICs/SiPho
- Materials
- Tools
- Fabs
- Design
- Packaging
- Modules
- Systems





ICOS deliverable 2.1

Semicon is about ecosystems

- Corporate Ecosystems
- Innovation Ecosystems
- Regional Ecosystems
- Knowledge ecosystems

Opportunities for collaboration



- Academia are still the most 'open' to international collaboration
- Education, workforce development, and talent rotation programs
 - E.g. India: IC design
 - E.g. Taiwan, Korea, USA: process engineers
- Standardization and road mapping
 - Canada
 - Japan

Build a resilient supply chain

- Design tools and expertise
 - E.g. US: Cadence, Synopsys, Keysight
- Advanced packaging and heterogeneous integration
 - Japan: AIST, NTT, PETRA
 - South-Korea: Samsung
 - Singapore: A*STAR
 - Taiwan: Taiwan Tech, ASE Technology, Hon Hai (Foxconn)
 - China: Foxconn
 - US: Marvel
- High-volume pure-play foundries

Europe is not in a bad shape for photonics

- Chip Fabrication and foundries are here (or coming) for low, medium and high volume.
- Considerable design expertise, and design tool companies
- Packaging and testing know-how, but no scaling capacity
- World-class education and training initiatives
- But: No End Users (transceiver vendors, hyperscalers)

Opportunities for collaborations

- Reinforce our strengths
- Complete the supply chain

THANK YOU



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This Event is associated with



And is a side event of the

**ECS BROKERAGE
EVENT 2026**

www.icos-semiconductors.eu

ICOS Final Event – Results & Recommendations on
International Cooperation on Semiconductors for
European Economic Resilience