

# MANUFACTURING MADE LIGHT

Solutions for integrated photonics. Built to scale.

## Enabling Double-sided Electro-Optical Wafer Testing for 3D-CPO

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# Increased investments in Data Center infrastructure

**Global Data Center CapEx:** In 2024, data center CapEx surged by **51%**, reaching approximately **\$455** billion. This substantial increase is largely attributed to heightened investments in AI infrastructure.

**Global Power Demand:** Data centers' global power demand is projected to reach around **130 gigawatts (GW)** by 2028, reflecting a **16%** compound annual growth rate from 2023 through 2028

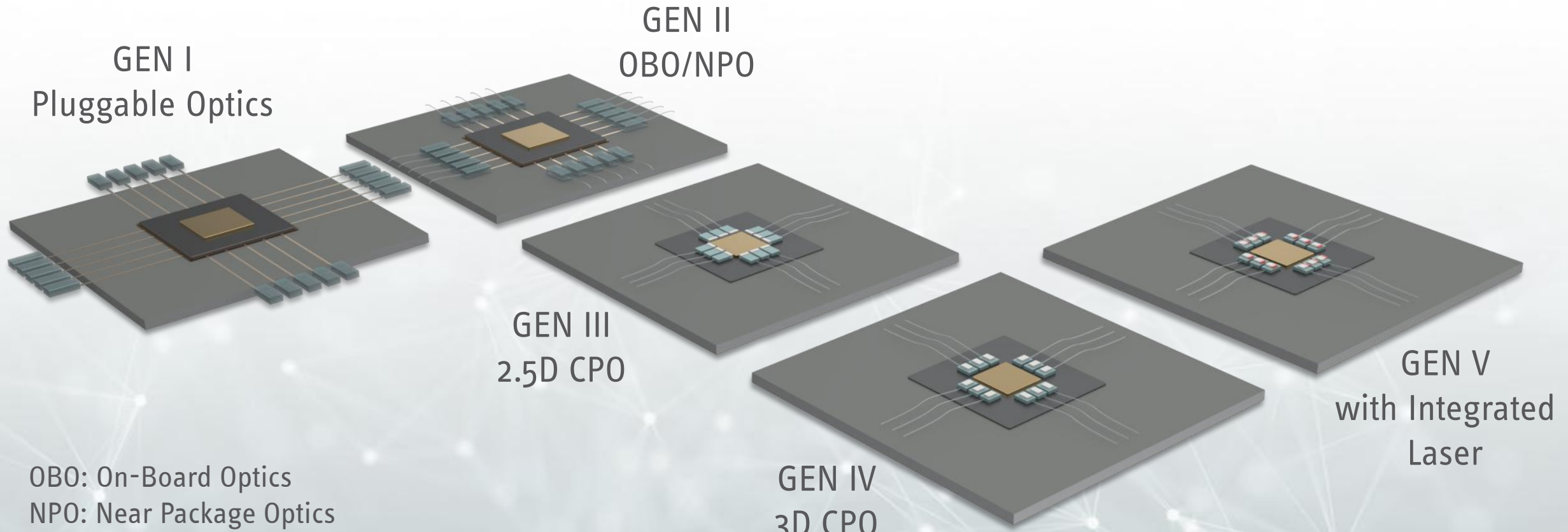
**CPO and SiPh** are the only available technology today to be able to provide bandwidth and lower power.

**(2023–2030):**

Segment	Estimated CAGR	Drivers
Global Data Center Market	~10-15%	Hyperscale demand, 5G, IoT
AI Infrastructure	~25-35%	Generative AI (e.g., ChatGPT), deep learning
GPU/Accelerator Market	~30%+	NVIDIA, AMD, custom AI chips
Edge Data Centers	~15-20%	Low-latency applications (e.g., autonomous vehicles)

Sources: Gartner, IDC, McKinsey

# Generations of Optical Datacom



OBO: On-Board Optics

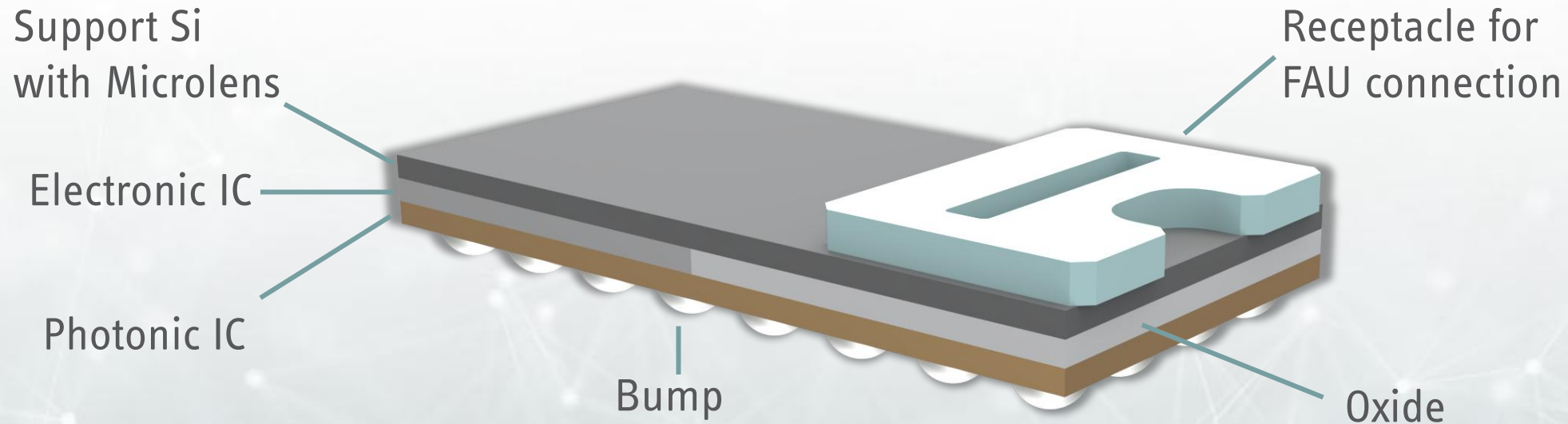
NPO: Near Package Optics

CPO: Co-Packaged Optics

2.5D: PIC/EIC side-by-side on the interposer

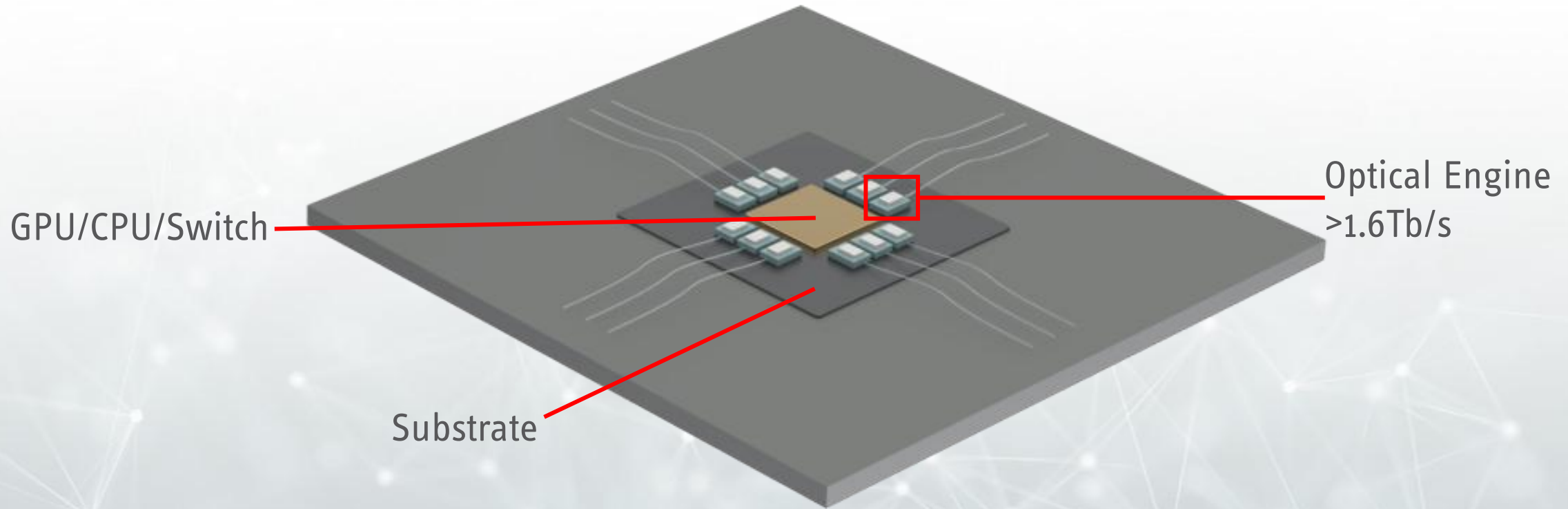
3D: PIC/EIC Chips stacked vertically

# Double Sided Optical Engine



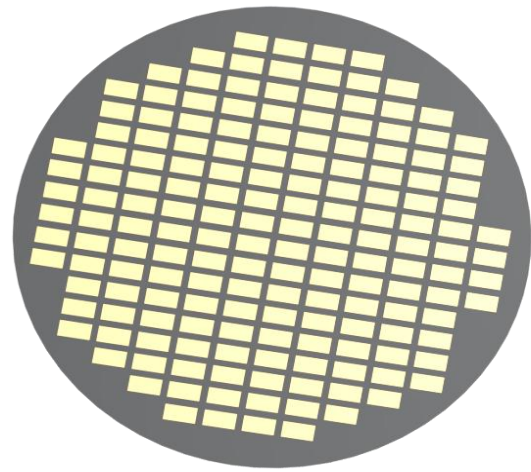
**An optical transceiver of 15mm x 10mm size!**

# 3D CPO for AI Data Centres



**>20Tb/s of throughput per GPU/CPU/Switch**

# How an Optical Engine is Made



PIC wafer  
~800um thickness



Wafer Thinning

~100um thickness PIC wafer

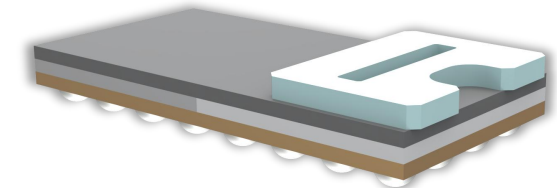


EIC attach Hybridization

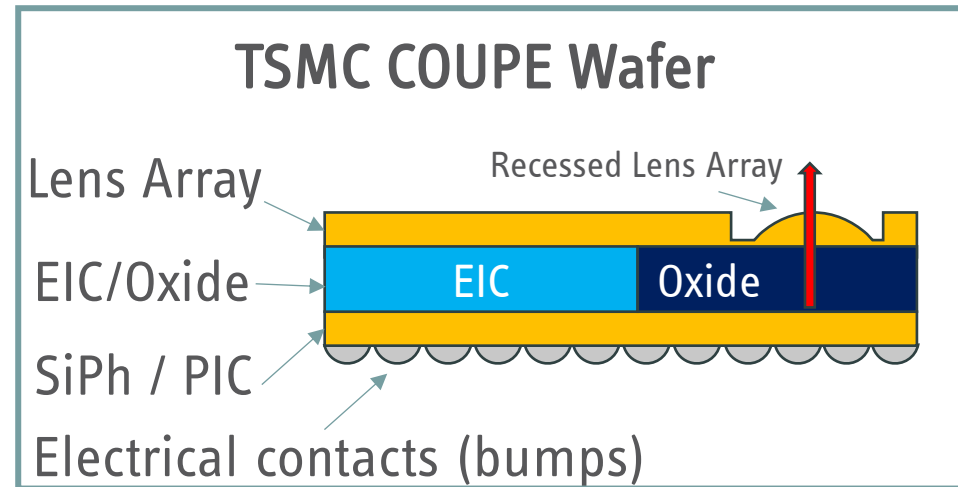
~800um COUPE wafer



Wafer cutting



Optical Engine - Singulated Die

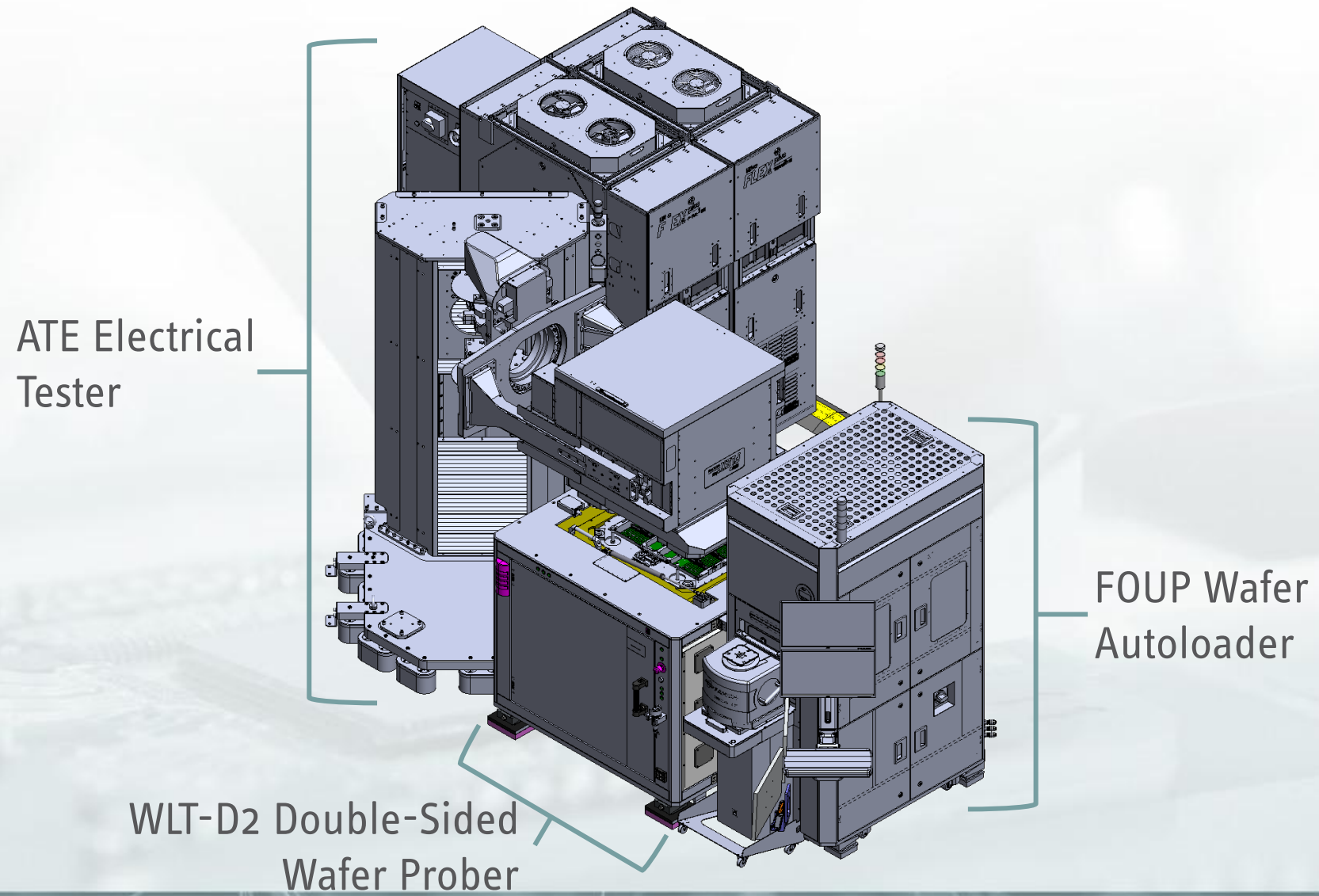


EIC - Electrical Integrated Circuit  
 SiPh - Silicon Photonics  
 PIC - Photonics IC  
 COUPE - Compact Universal Photonic Engine

# WLT-D2: HVM Double Sided Testing

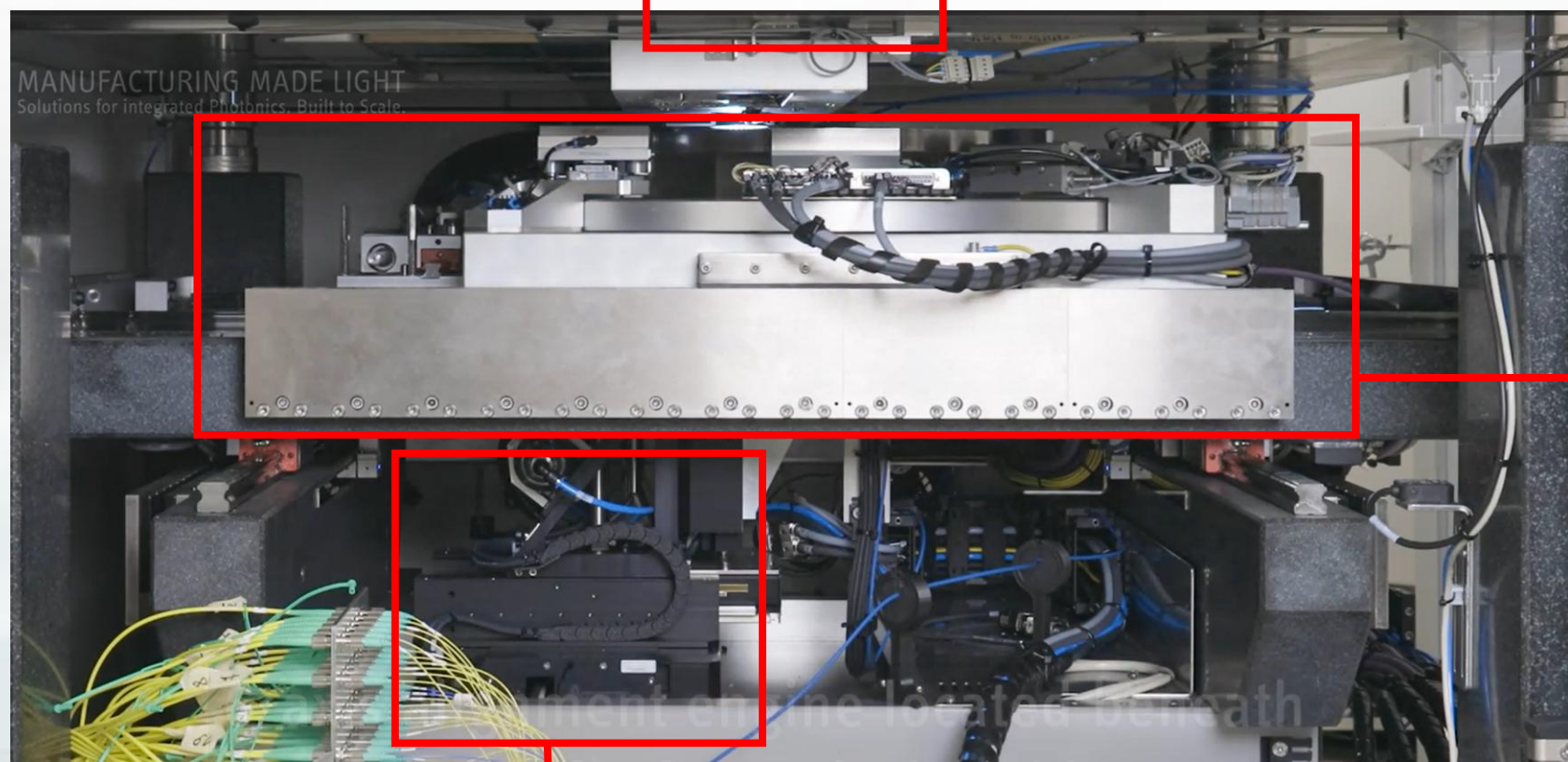


# WLT-D2 with Wafer Autoloader



# Inside the Prober

Probecard, Stationary



Wafer table with  
4-axis motion

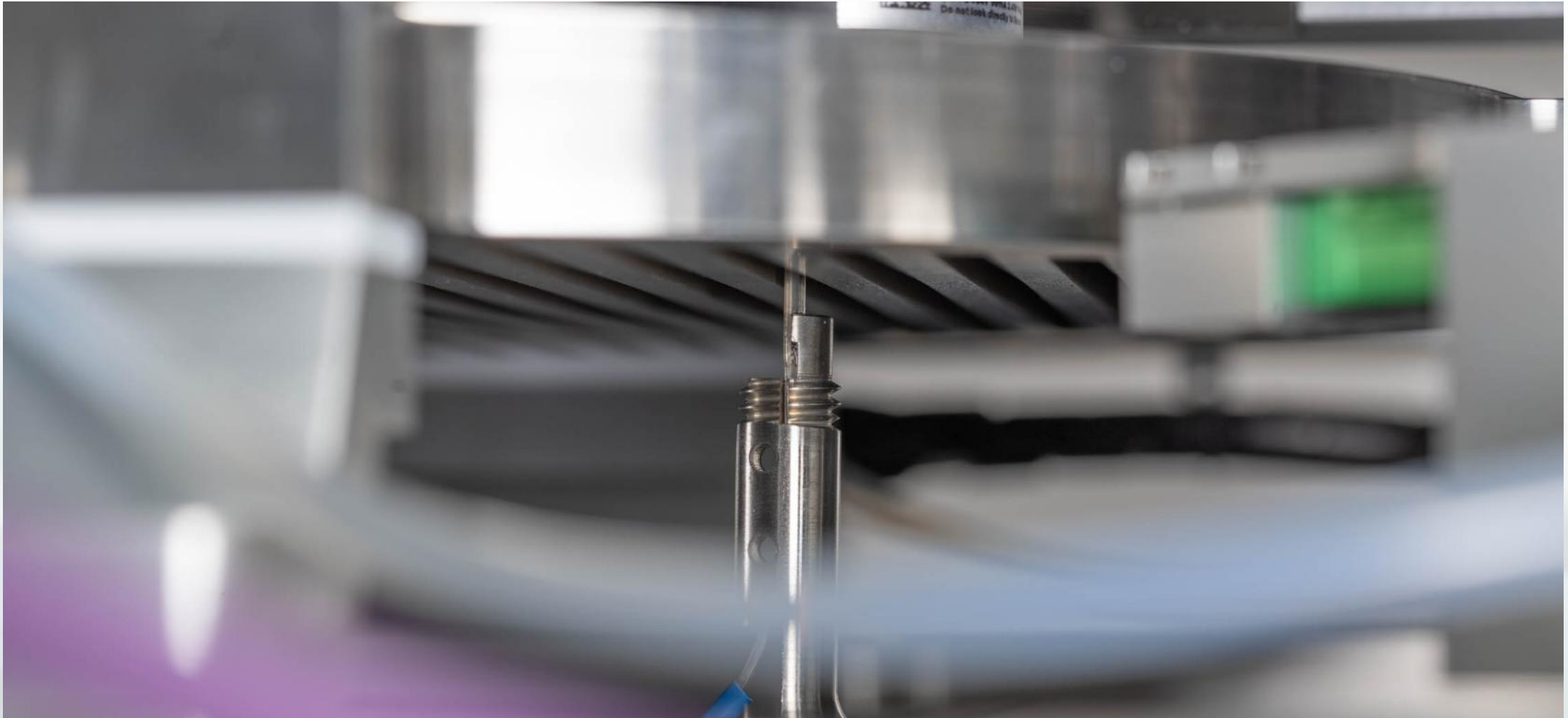
6-axis Optical Probe  
Alignment Engine



**NEW  
DEVELOPMENT**

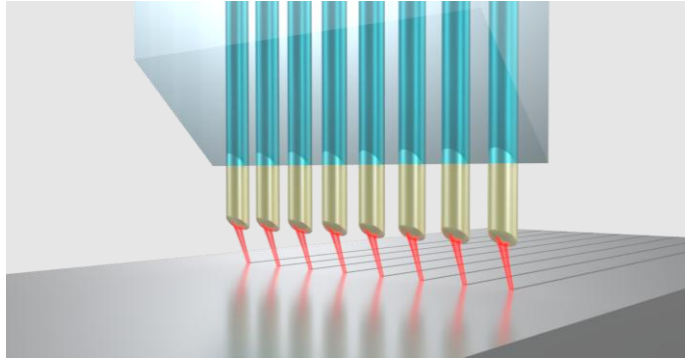
# DOUBLE SIDED E/O WAFER TESTER

# Key Technology: Wafer Chuck and FAU

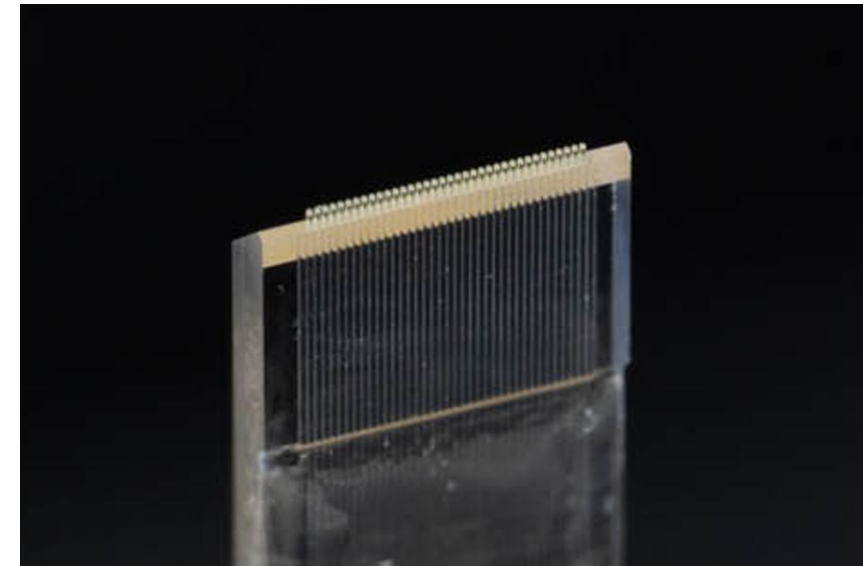


# Optical Probe Technologies

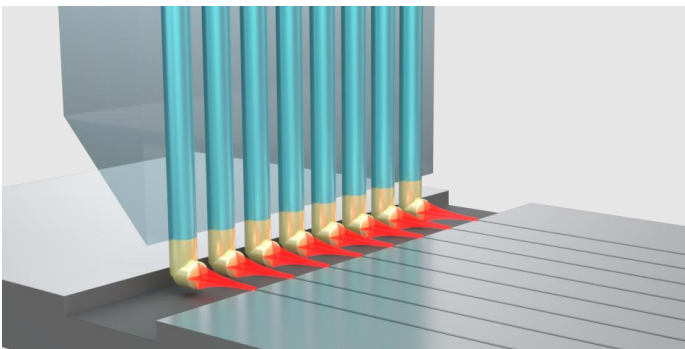
## Grating / Surface coupling



3D printed lenses on the FAU collimate and bend the beam angle



## Edge / Trench coupling



3D printed periscopes on the FAU reflect the light for horizontal coupling

# The Solutions

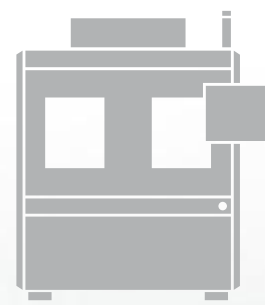
Currently in development



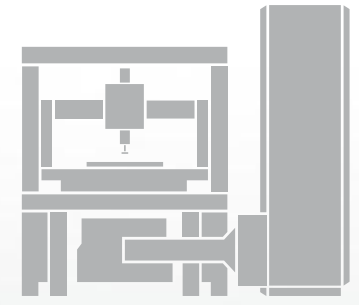
WLT Top Side  
PIC



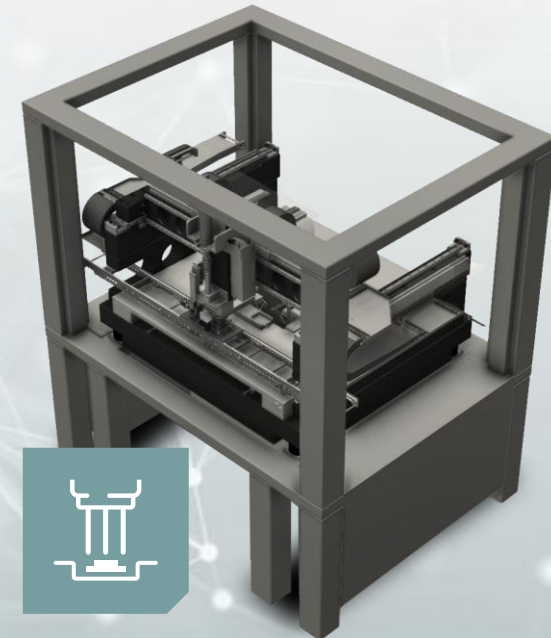
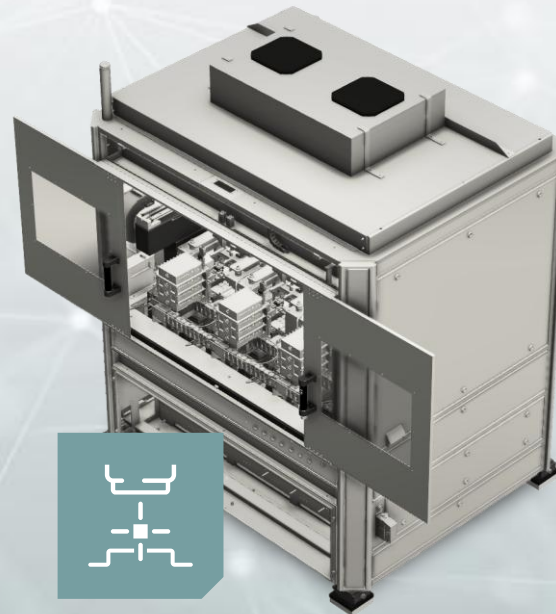
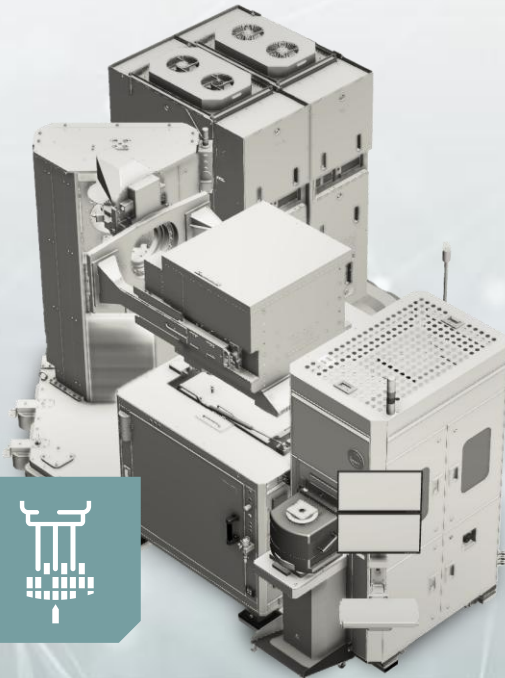
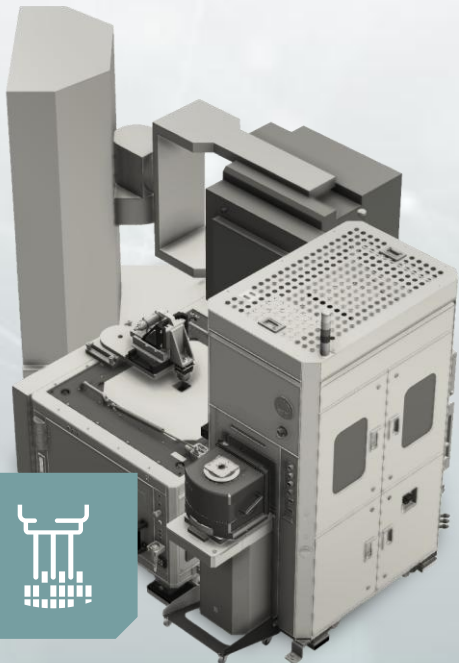
WLT Dual Side  
EIC-PIC



DLT Singulated  
OE



MLT Integrated  
ASIC/CPO



# Singulated Chip Level Testing



- Optical equipment can be integrated into machine to reduce footprint or external rack
- Can handle from tray, blue tape or gel pack
- Multiple test heads
- Full thermal chuck (20 to 125C)
- Use case for high-speed digital: Integrate chipsets/SerDes on probe card for High Speed and customer-specific GPIO

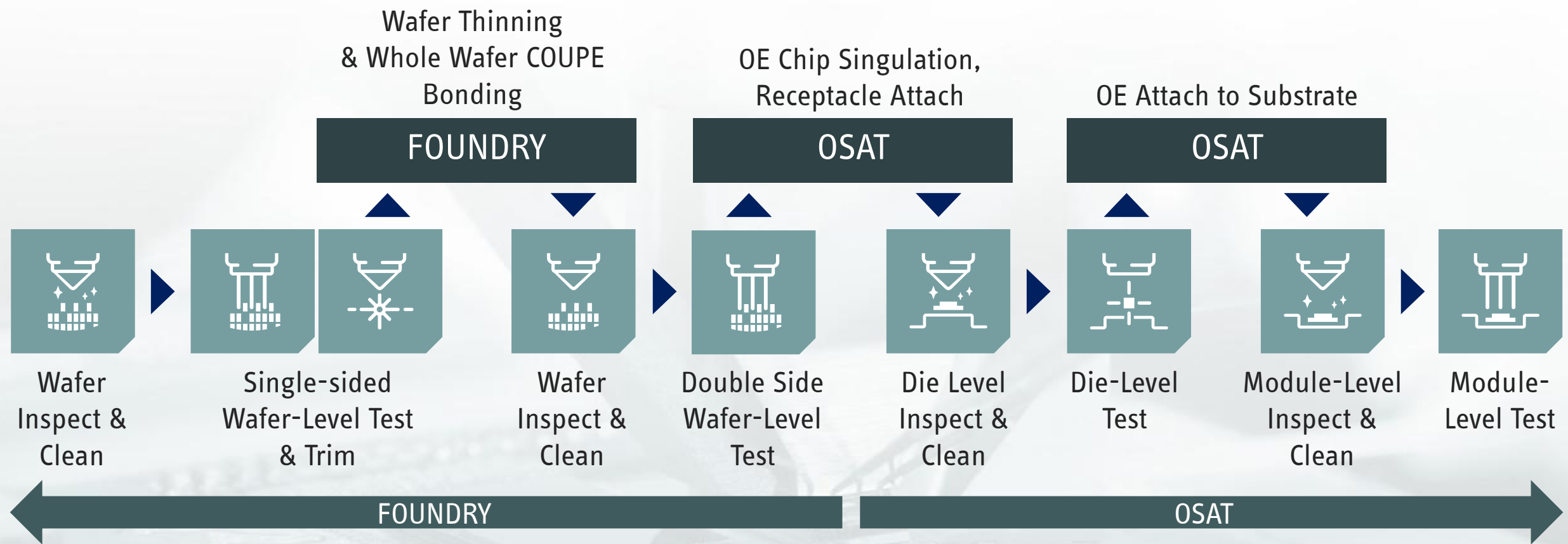


SEMI S2 Certification



SECS/GEM

# ficonteC Ecosystem Test Flow



OE - Optical Engine  
 OSAT - Outsourced Semiconductor Assembly and Test

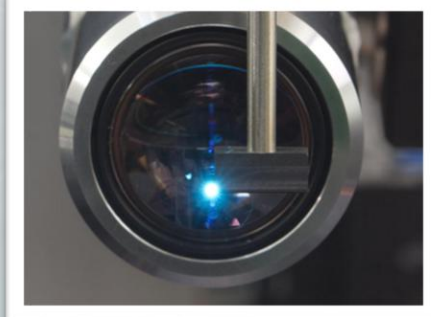
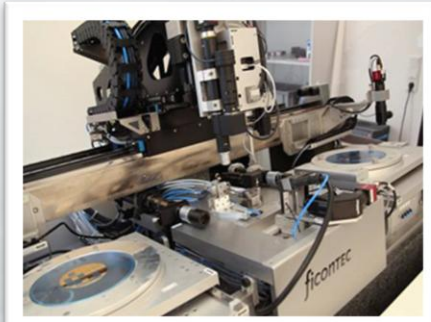


Inspect, Clean and Profile Technology Partners  
**FEMTECH** & **zygo**

# From assembly to testing

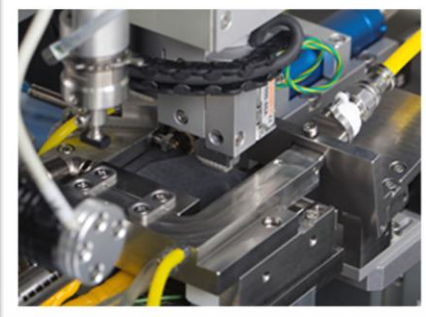
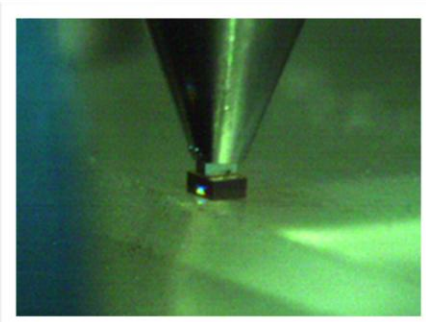
## Laser Diode Stacking / Inspection

- Stacking unstacking
- LD/LD bar handling
- Facet coating
- Visual inspection



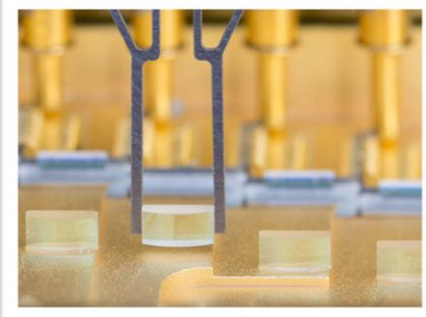
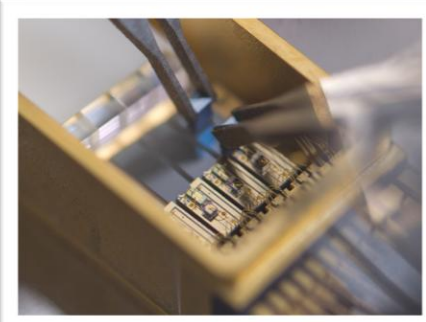
## Assembly Laser / PD Die Bonding

- Laser diodes/photo diodes
- Passive/active
- Integrated optics
- Laser soldering
- Conventional heating



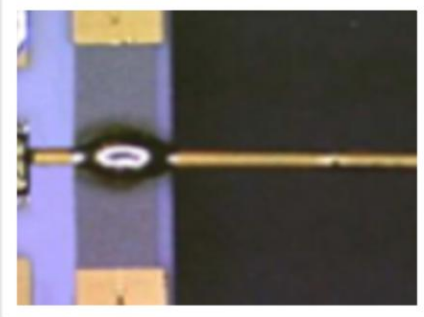
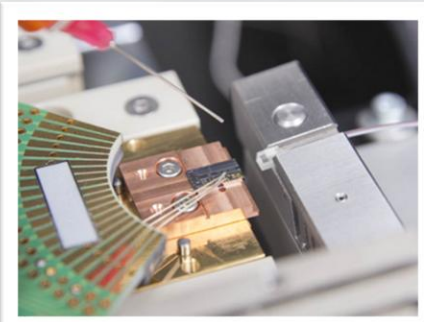
## Assembly Photonic Devices

- Active alignment
- Lens and array assembly
- Epoxy bonding
- Thermal cure
- Different dispensing methods



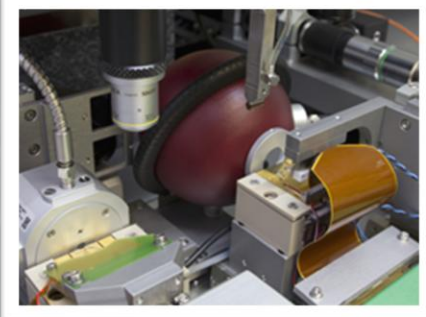
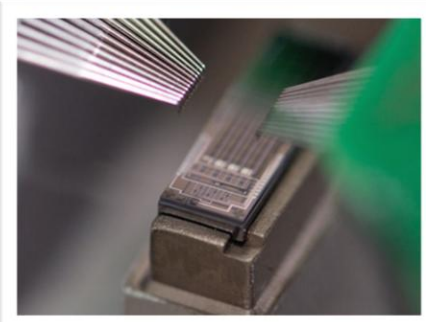
## Assembly Fiber, Fiber Array

- Fiber to pump assembly
- Fiber array attachment
- Automatic fiber handling
- Laser welding
- Laser soldering

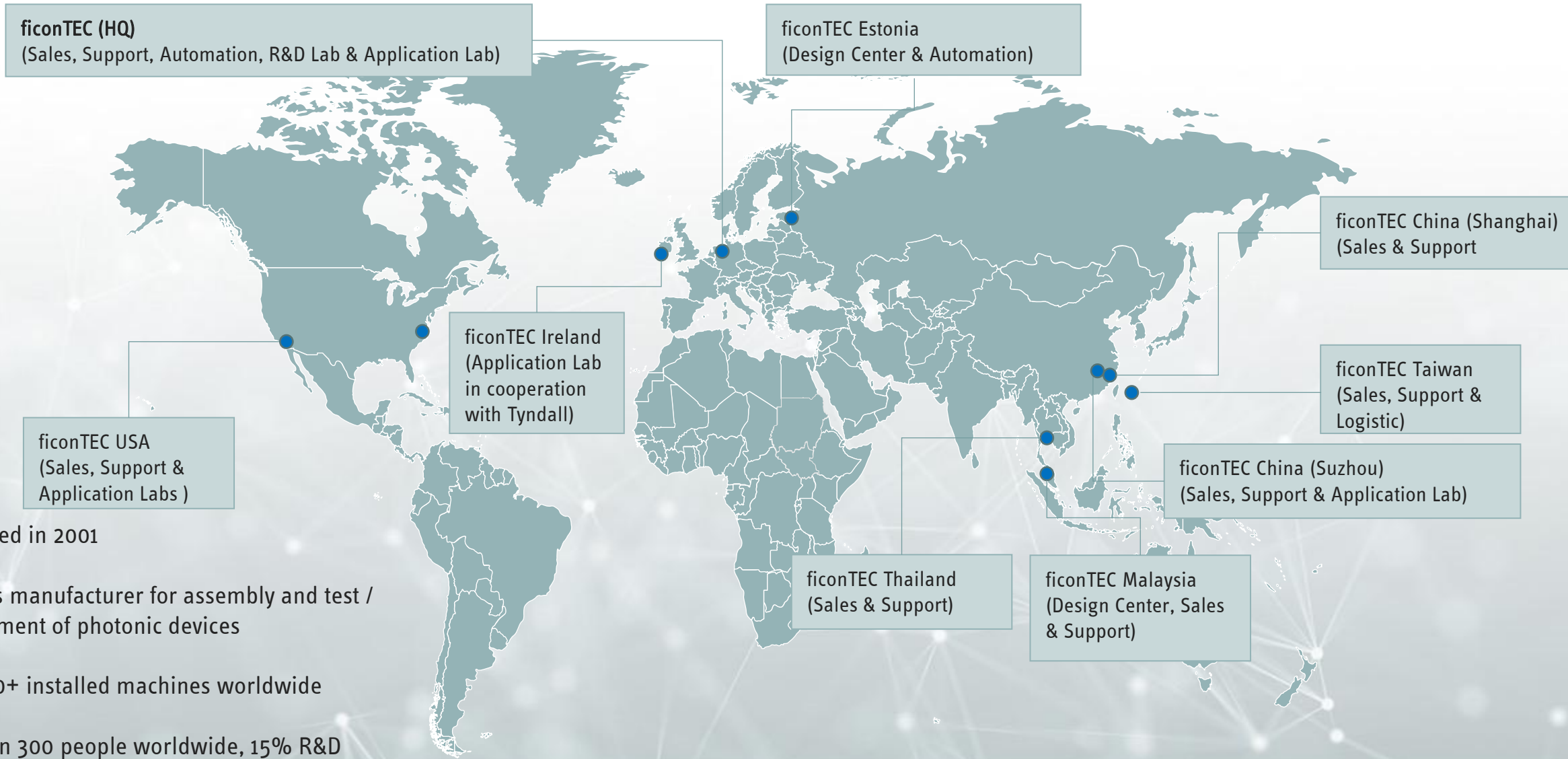


## Final Test/ Characterisation

- Final module test
- Handling to/from burn in carrier
- Supply of customised test equipment based on PXI



# ficonTEC's Global Presence



Established in 2001

Machines manufacturer for assembly and test / measurement of photonic devices

Over 1400+ installed machines worldwide

More than 300 people worldwide, 15% R&D



Double-sided 3D CPO Testing is now possible with ficonTEC