

MORE LIGHT

Wafer-Level PIC Testing

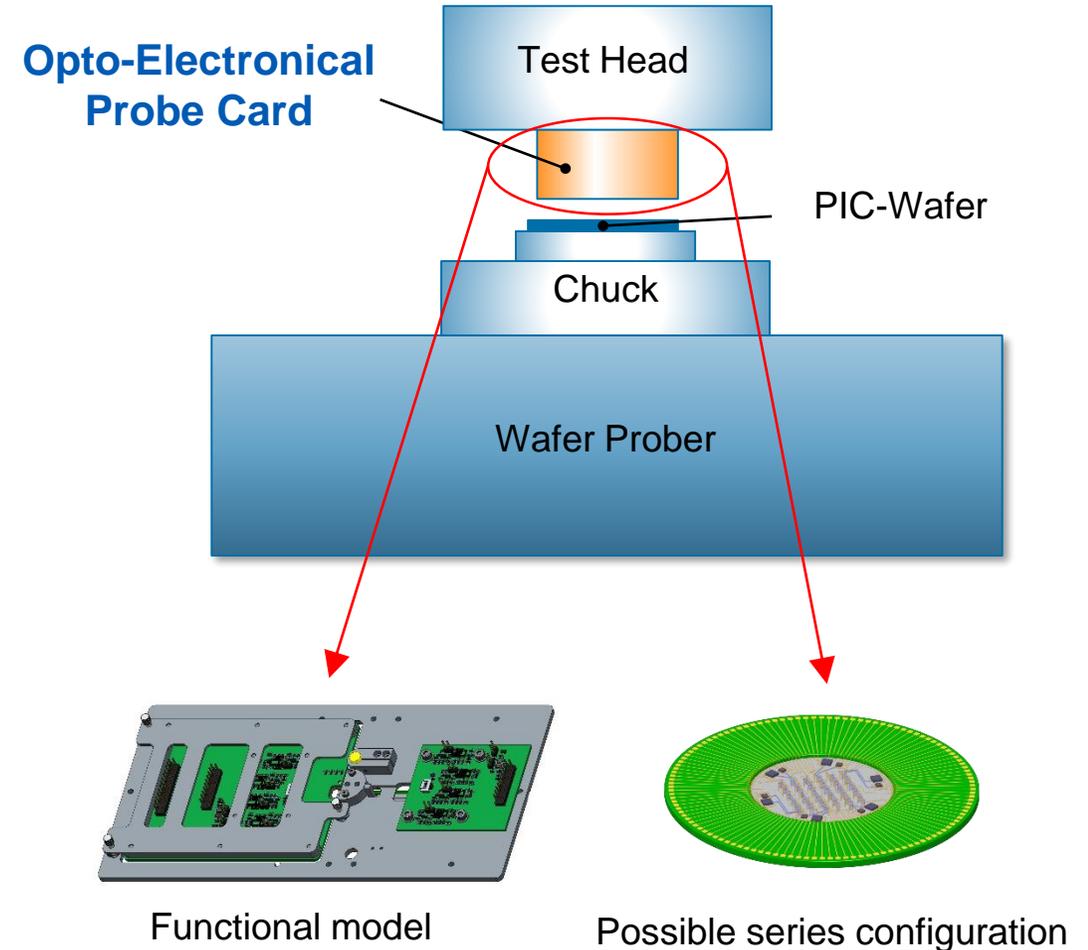
Optical solution for high volume testing of photonic integrated circuits on wafer level

Overview – 01/2020

Application and Market requirements

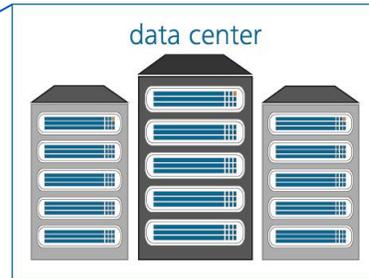
Application: **Opto-Electrical Probe Card**

- for **Wafer Level Test** of Photonic Integrated Circuits (PICs)
- **platform-based** product
- **Optical Module** as **core component** enables:
 - Electrical and optical interfaces in a single probe card
 - Fast and parallel qualification
 - ‘Plug & Play’ with existing IC probers
 - Easy and quick adaptation to different PIC designs

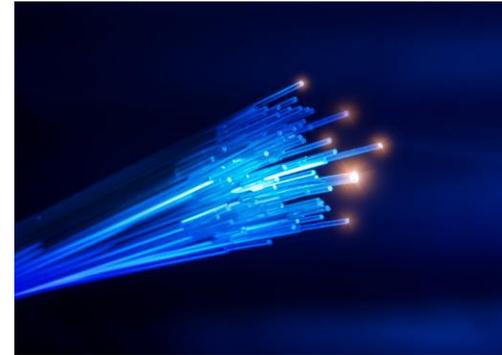


Application and Market requirements

What is the driver?



Increase Speed
of traffic inside data
centers by...

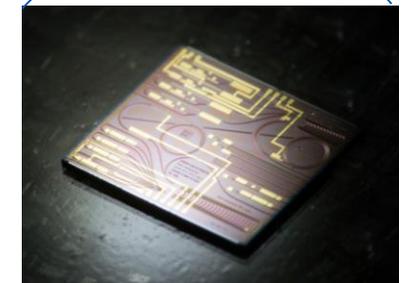
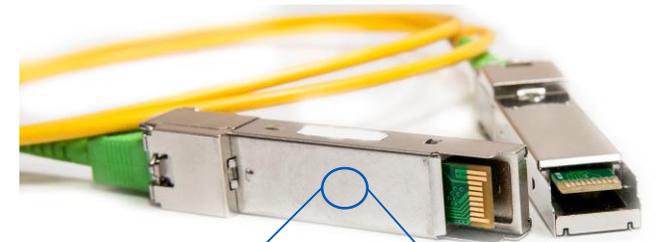


Optical data transmission.
Switch from copper cables to
optical fibers.



Signal conversion

from electrical → optical → electrical
inside the **Optical Transceivers** needed.



PIC - Photonic integrated circuit
as core component.

Connected World

generates continuously growing

data traffic

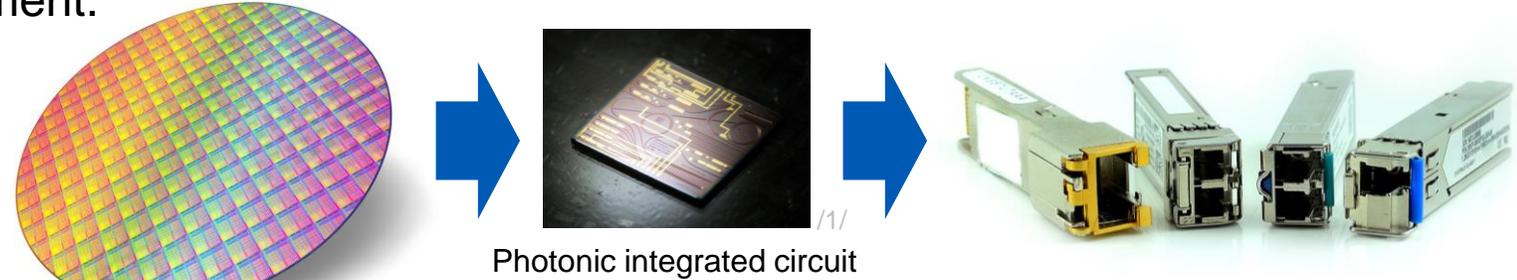
with need for low latency.

Application and Market requirements

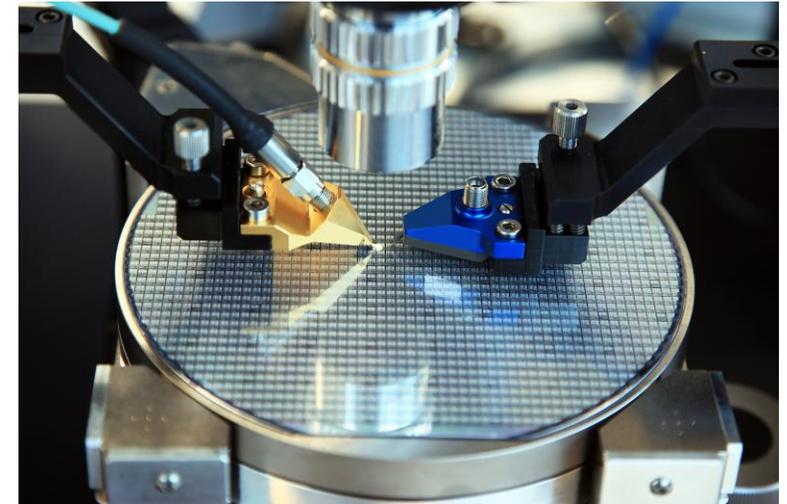
The **PIC ecosystem** is still under development.

It needs to

- align with **CMOS fabrication chain**,
- meet **current industry standards**,
- **reduce costs!**



→ **Opto-electronical testing plays a vital role!**



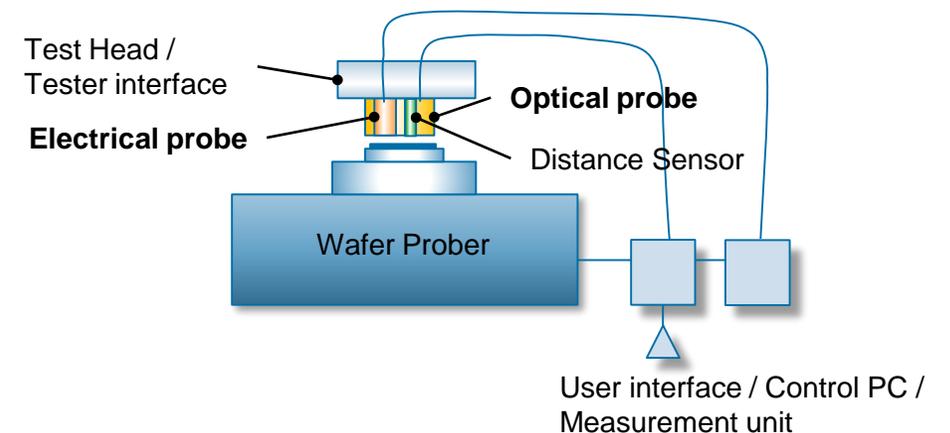
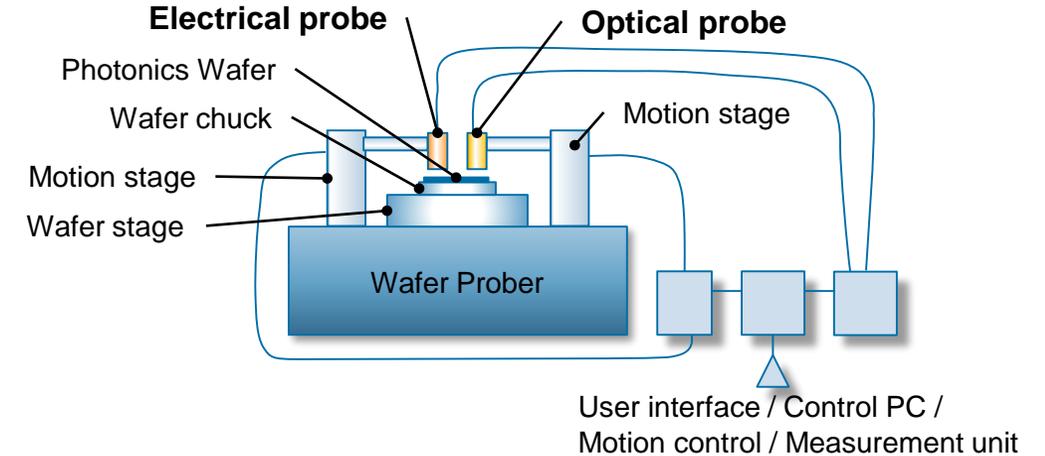
Current and Ideal Wafer Level Test Solutions

Current solutions

- are **fiber based**,
- Need **active alignment** in **sub-micrometer** range,
- **separated probes** (electrical and optical) and
- **dedicated** or customized probing **equipment**.
- Have **no** or only limited possibility for **parallelization**.

Ideal solution

- would be **Plug & Play** ready for existing **standard IC wafer probers** and automated test equipment,
- needs **no active alignment** time per chip,
- **Parallel qualification** → multi-DUT regime
- Can be operated by same personnel as standard IC equipment.

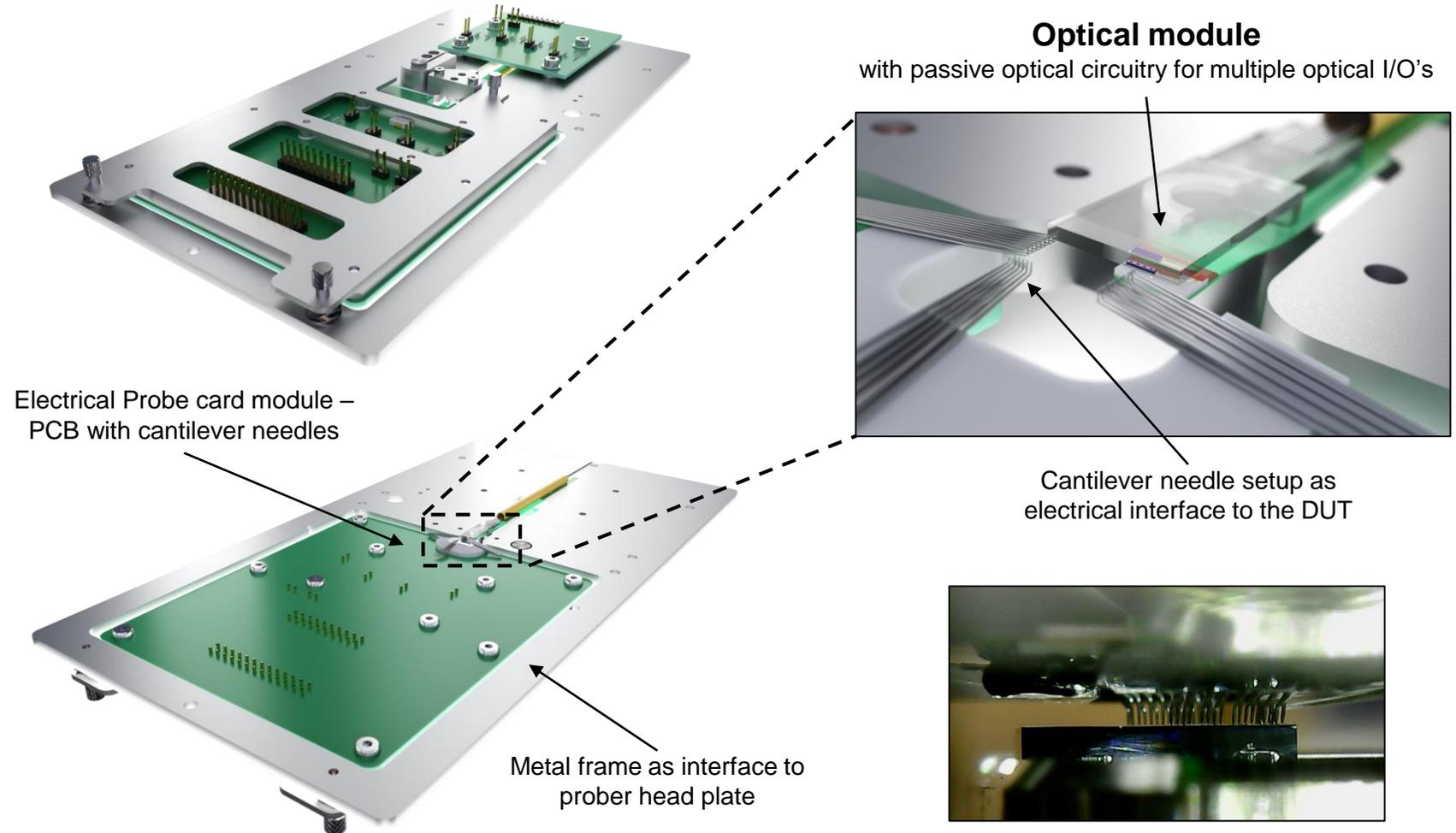


Technical Realization of a Demonstrator

Functional demonstrator

with

- Standard prober interface
- **Monolithic optical module:**
 - 16 optical I/O's
 - Works for PICs with **grating couplers**
 - Alignment insensitive optical coupling
- Simultaneous optical and electrical probing



Probe Card Principle

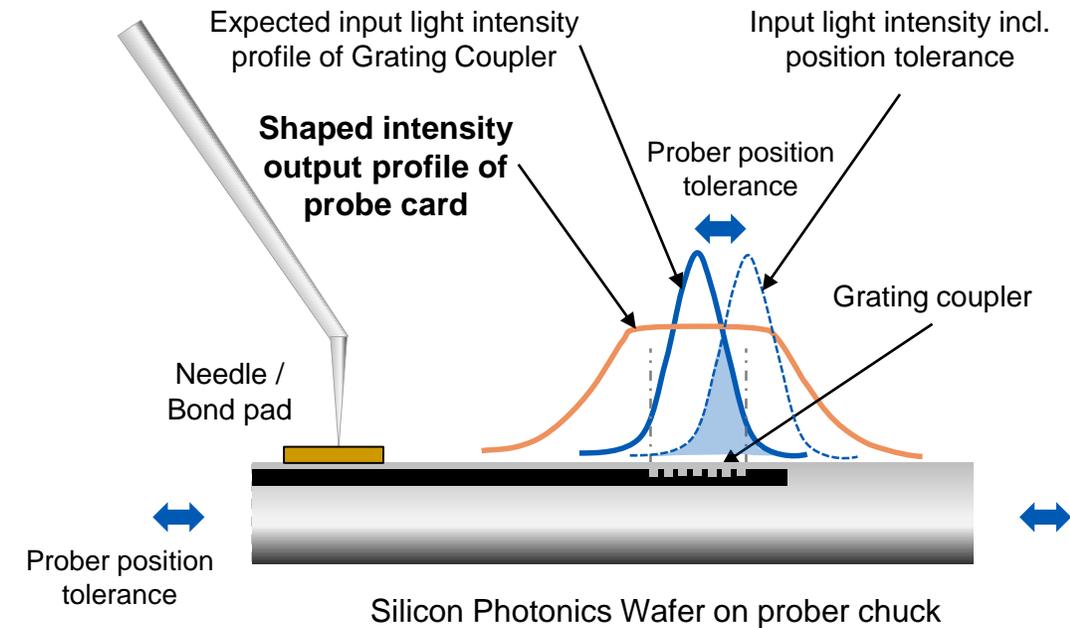
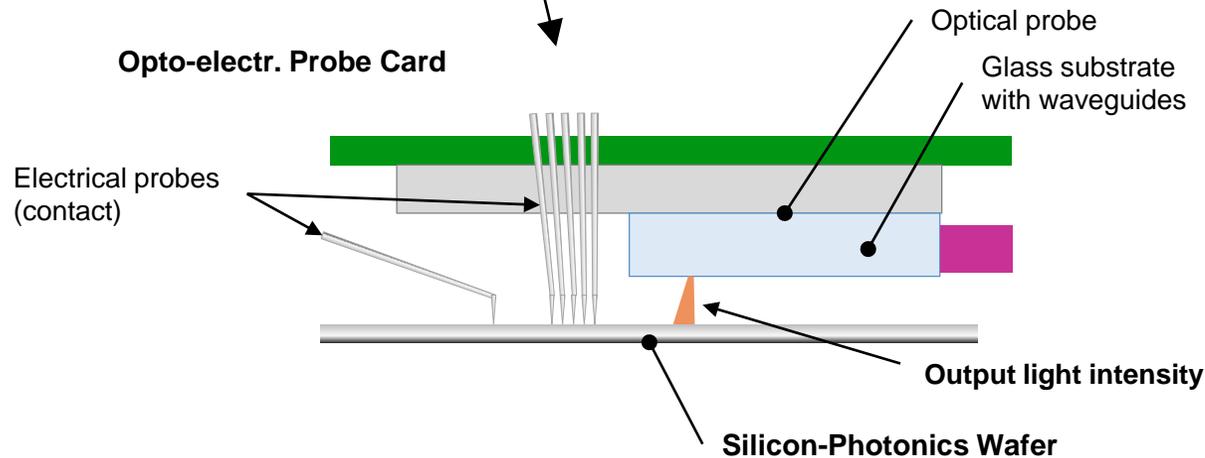
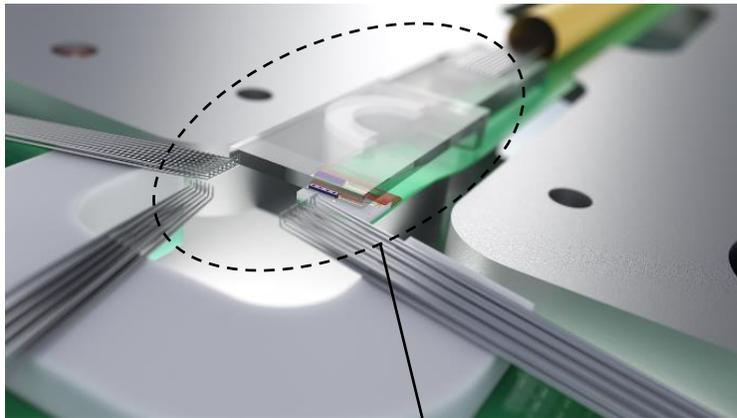
How does it work?



Basic idea:

Optical concept compensates prober alignment tolerances.

The shaped intensity output profile allows relative constant coupling conditions at the grating coupler.





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Supporting the digital world.