MicroAlign

EVERY FIBER MATTERS

EPIC - TechWatch ECOC 2023, Glasgow

About MicroAlign

WHO: spin-off from Eindhoven University of Technology

WHEN: founded in April 2021

WHAT: alignment stage for arrays of optical fibers

WHY: to relax tolerances in fiber-array to PIC connection + optimal coupling

WHERE: Eindhoven University Campus, Netherlands

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Trend: fiber arrays in optical modules

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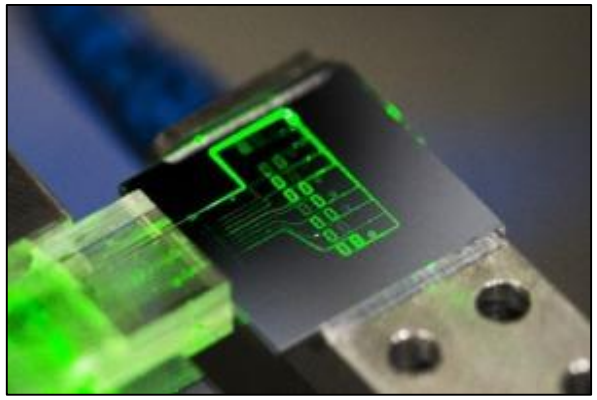
DATACOM transceivers

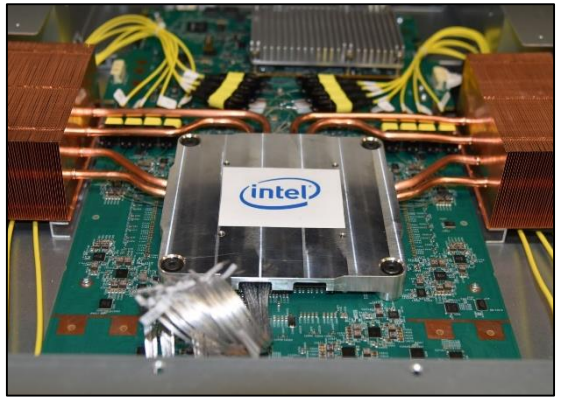
PSM4 transceiver

Photonic biosensing



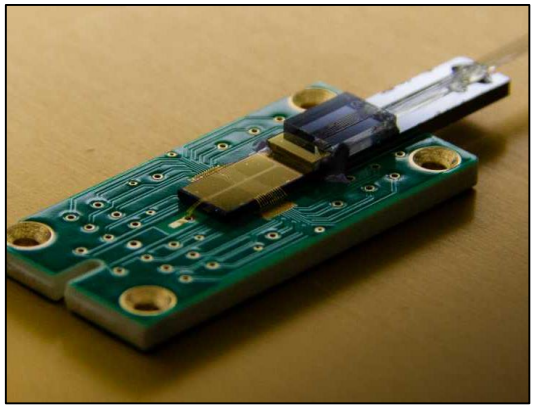
Chip from Surfix diagnostics

Co-packaged optics



INTEL co-packaged optics

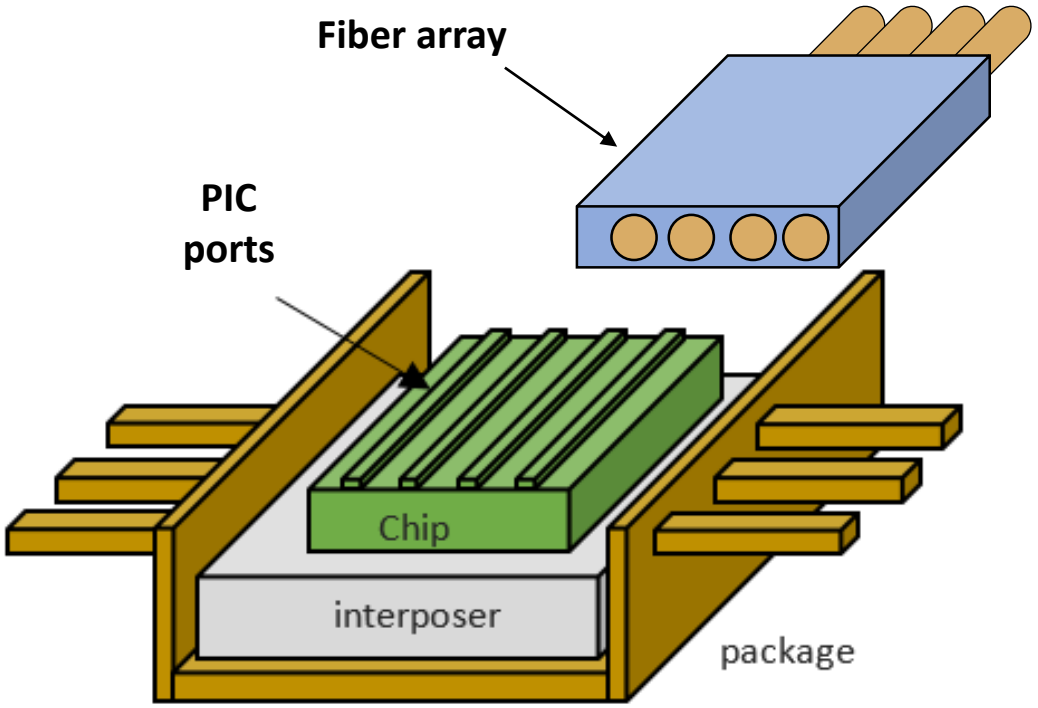
Quantum computing



Chip from ETH

Multiple optical fibers in optical modules for established and emerging photonics applications

Main problem in fiber array alignment



Causes

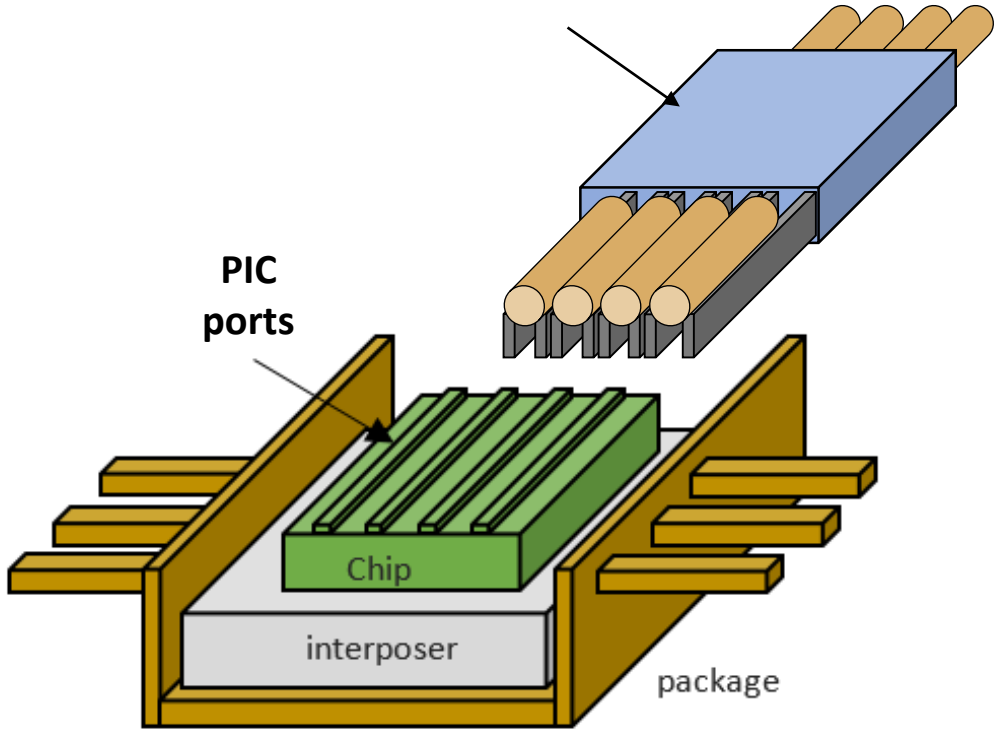
- Core eccentricity
- Fabrication imperfections

Effect

- ~0.5 - 1 dB extra loss per channel
- Unbalanced power between channels
- Require overdesign
- Lower energy efficiency

MicroAlign concept solution

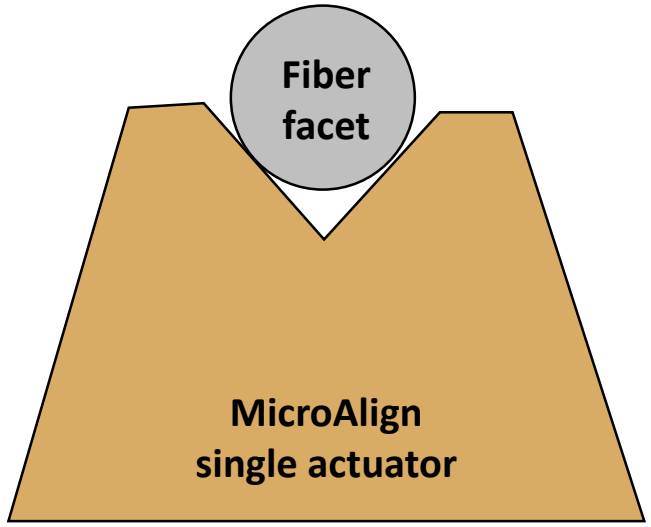
Fiber array with protruding fibers



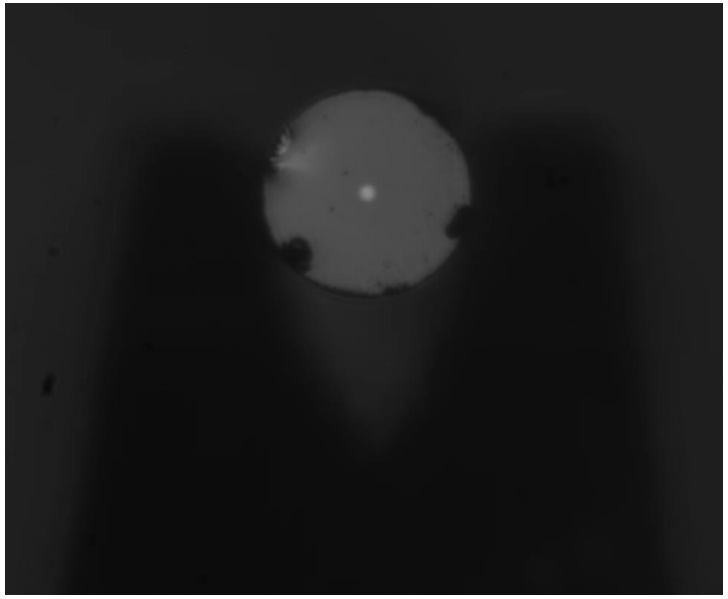
Value

- Every fiber is optimally aligned
- All the fibers are aligned simultaneously
- Relax assembly tolerances

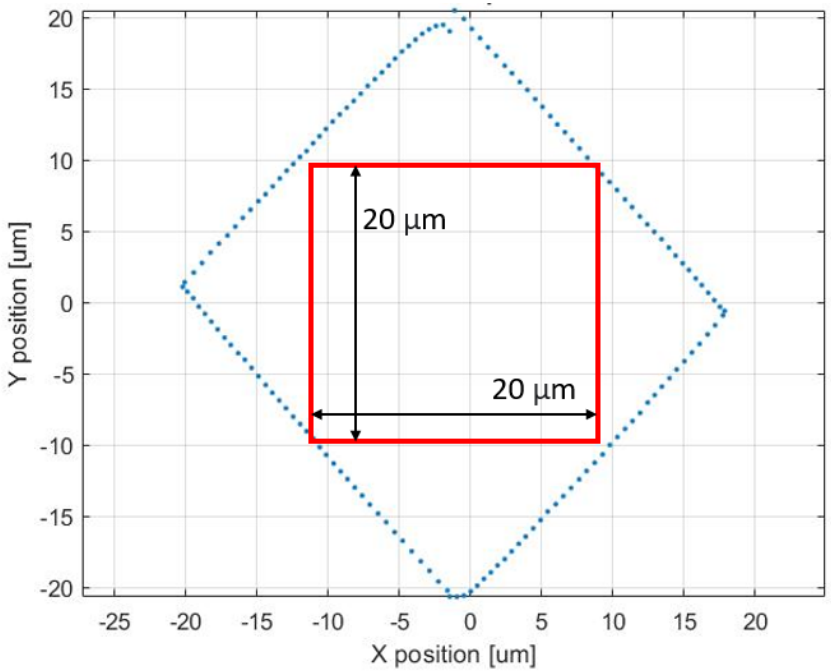
Single actuator operation



Front view
single actuator



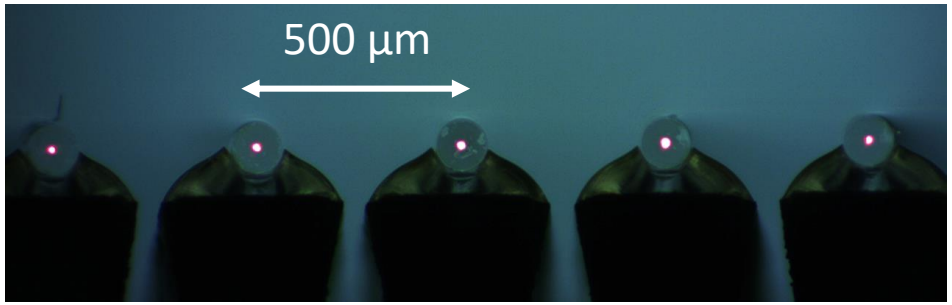
Measured typical tuning range per fiber

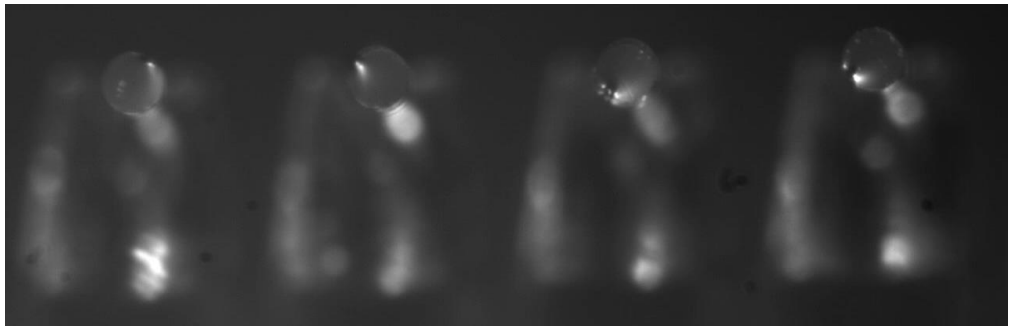


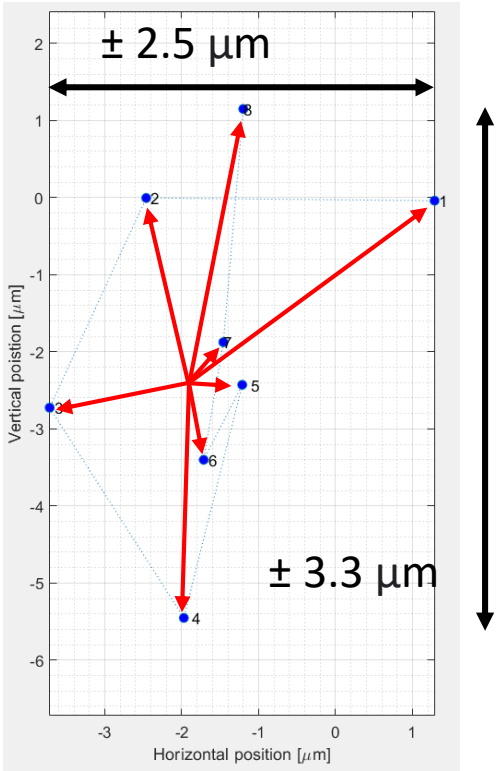
Performance indicators

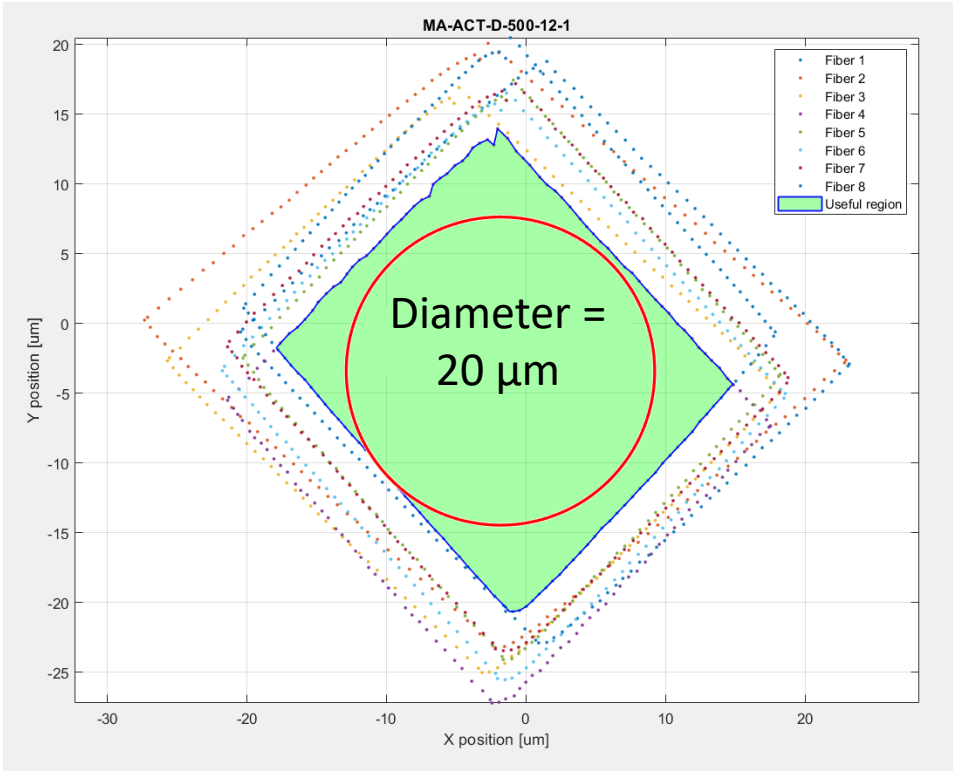
- Vertical displacement 20 µm
- Horizontal displacement 20 µm
- Minimum step < 20 nm

Actuator array: passive alignment and effective actuation range

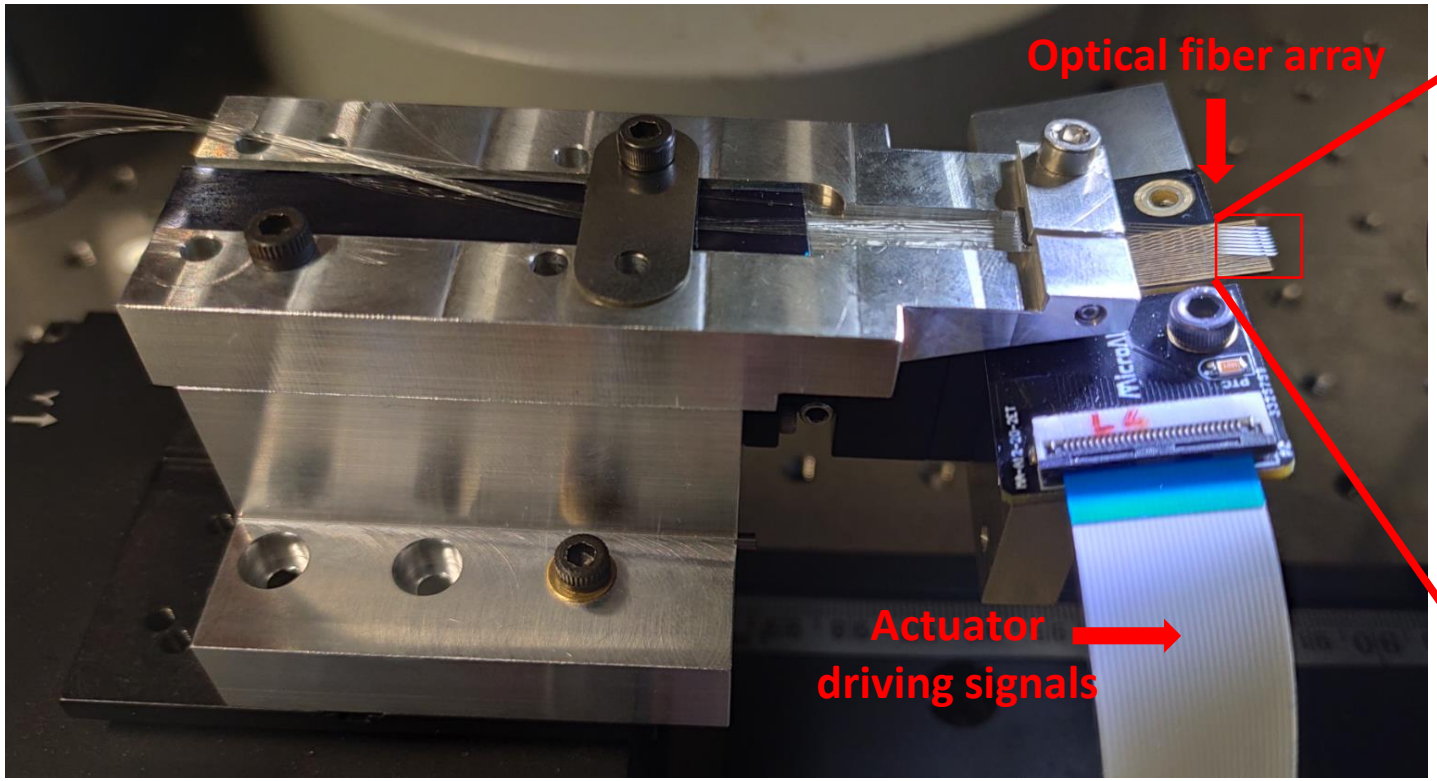




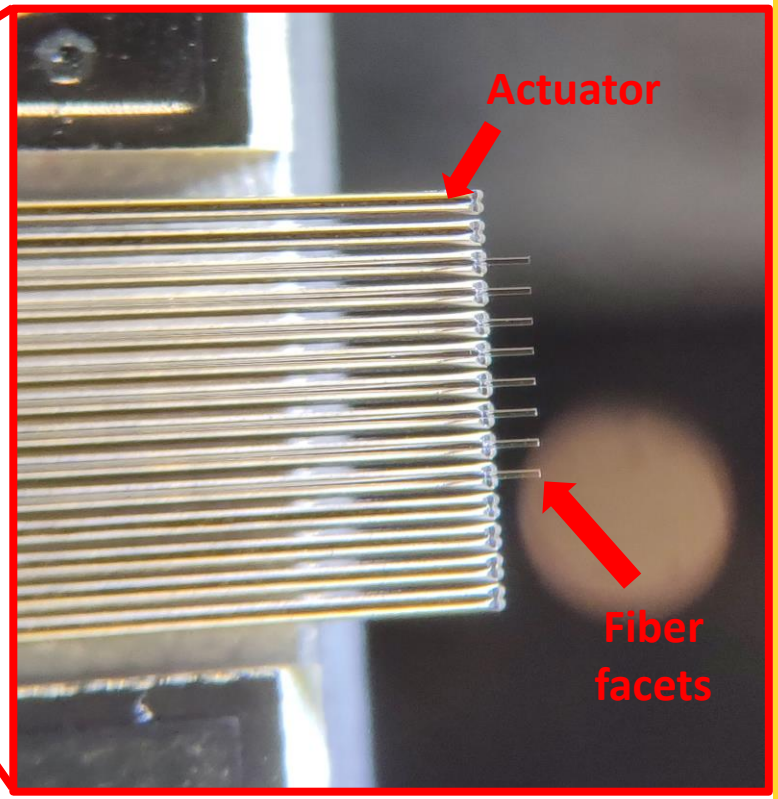




The alignment stage

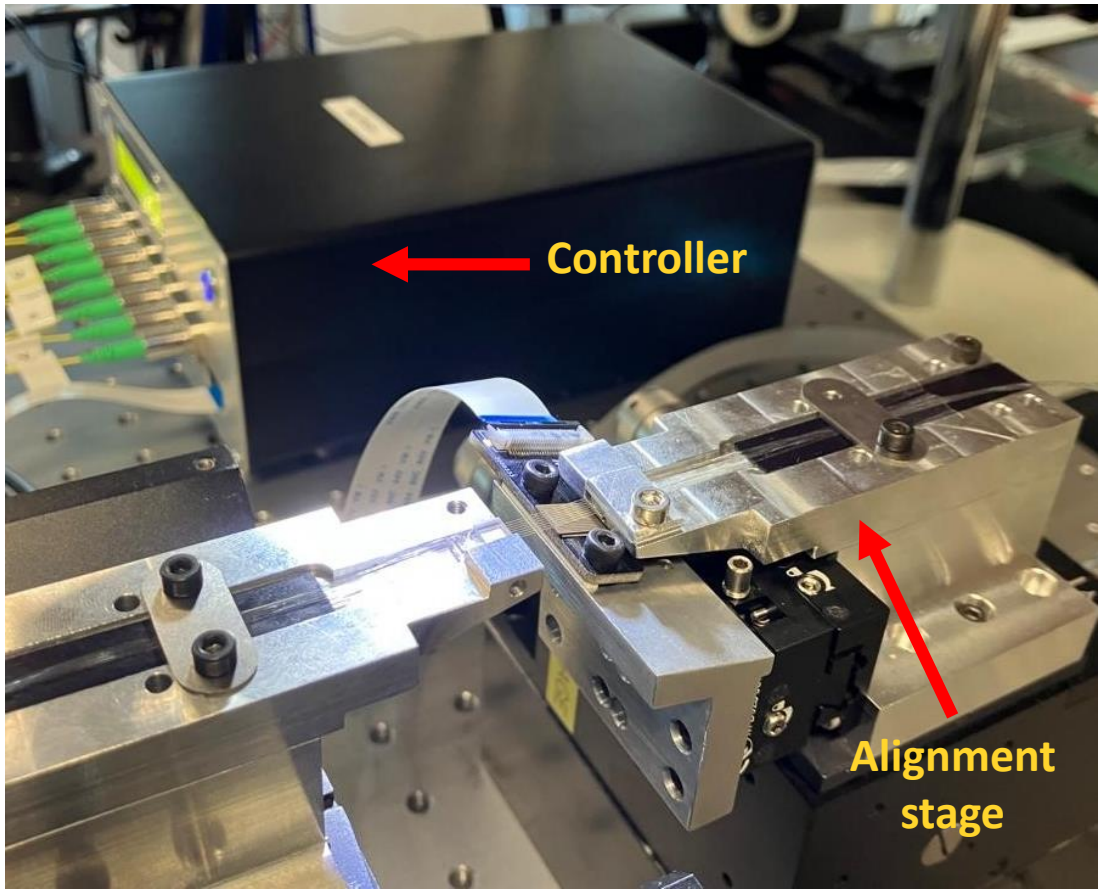


Close in of fibers on actuators

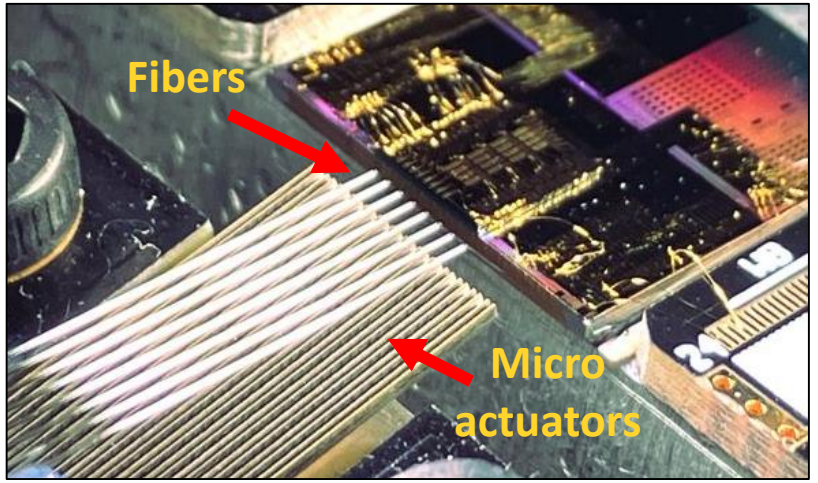


Prototype fiber array alignment system

Alignment system



System aligning fibers to a chip



Die testing prototype

Our solution: in practice

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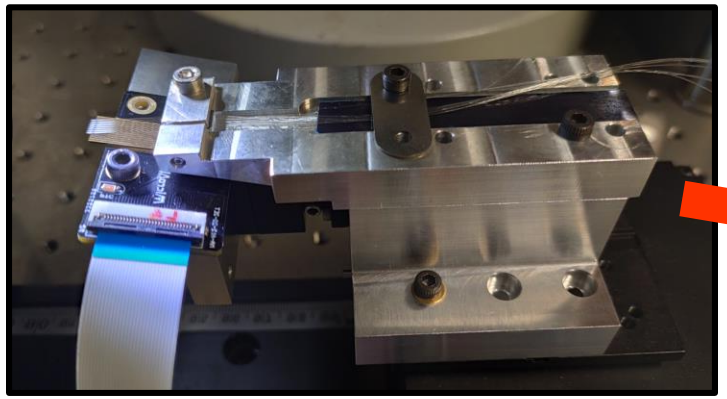
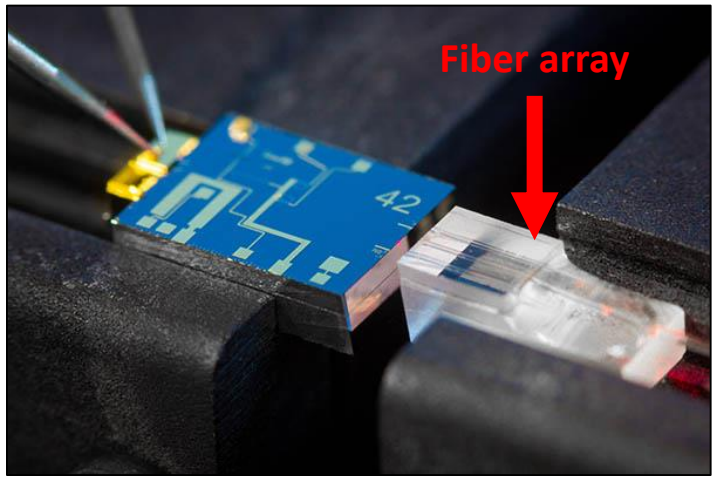
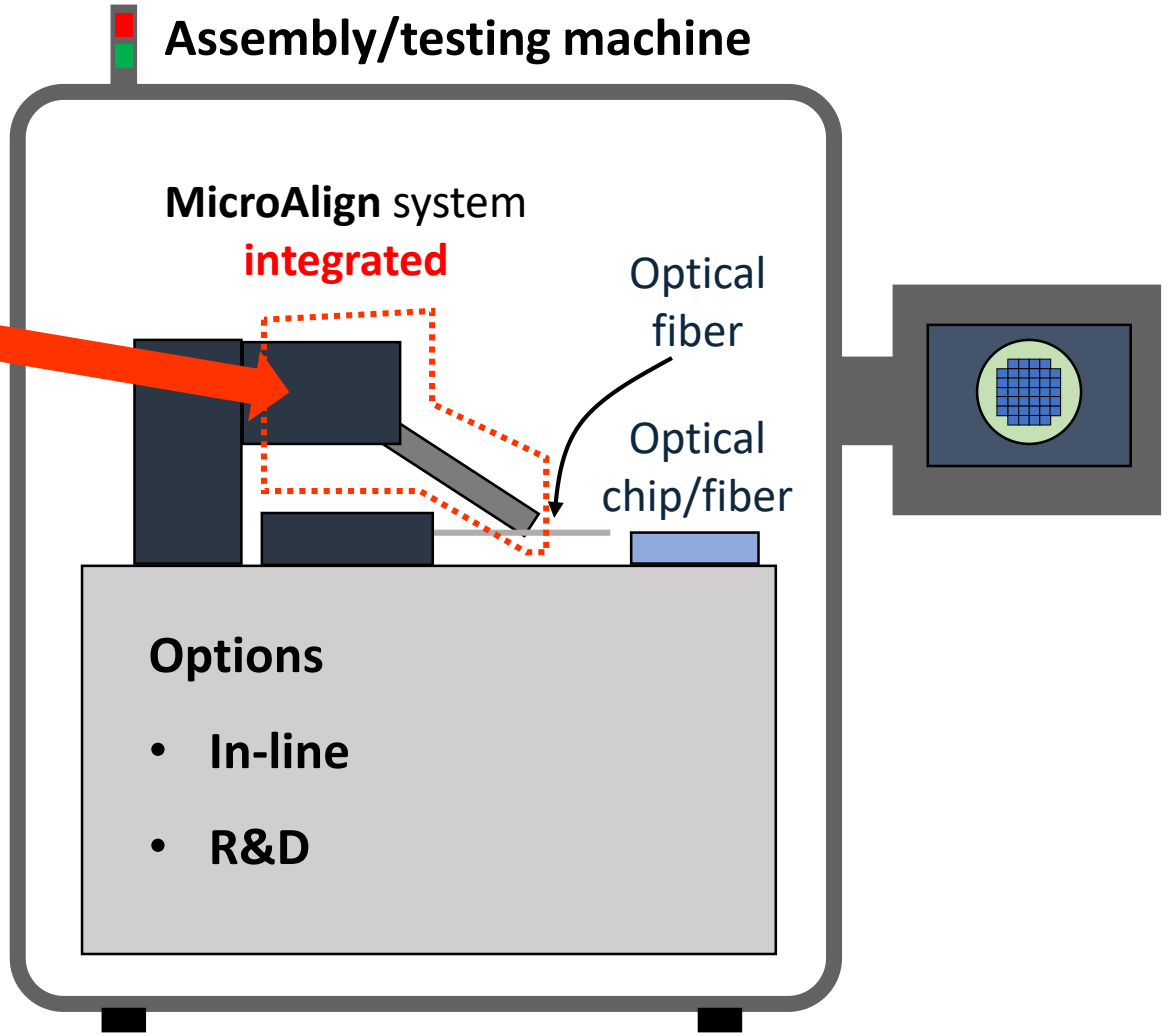
MicroAlign solution



Assembly/testing of photonic chips

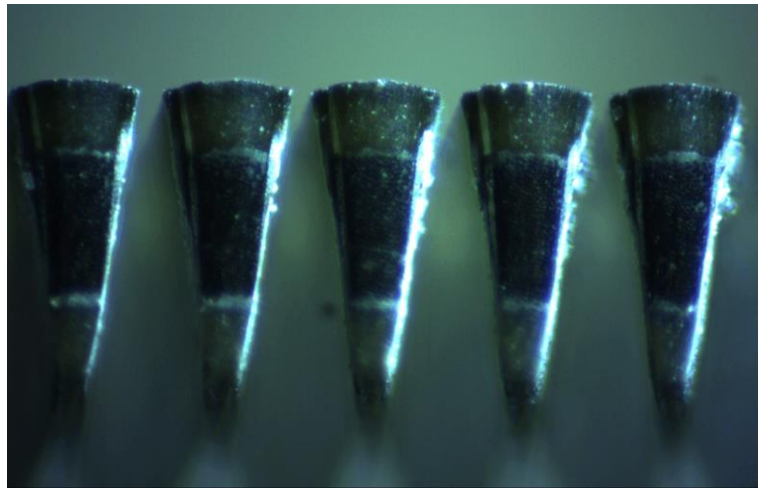




Next development steps

- Scale actuation pitch down to 250 µm
- Increase the number of channels up to 16 fibers
- Investigate the integration of different fiber fixation methods
- Implement independent fiber rotation for PM fiber array rotation alignment

Recently developed 250 µm actuator



Takeaway from ECOC 2023

- Saving 0.5 dB of optical power with better fiber alignment is becoming more important: laser arrays, transceivers, amplifiers, quantum applications…
- Fixing independent fibers to a photonic chip with our technology is an interesting and viable option

Visit our booth #563 and check out our demo

Thank you for the attention!

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