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bright connections

3D Lithography for Photonic Integration

Christian Koos

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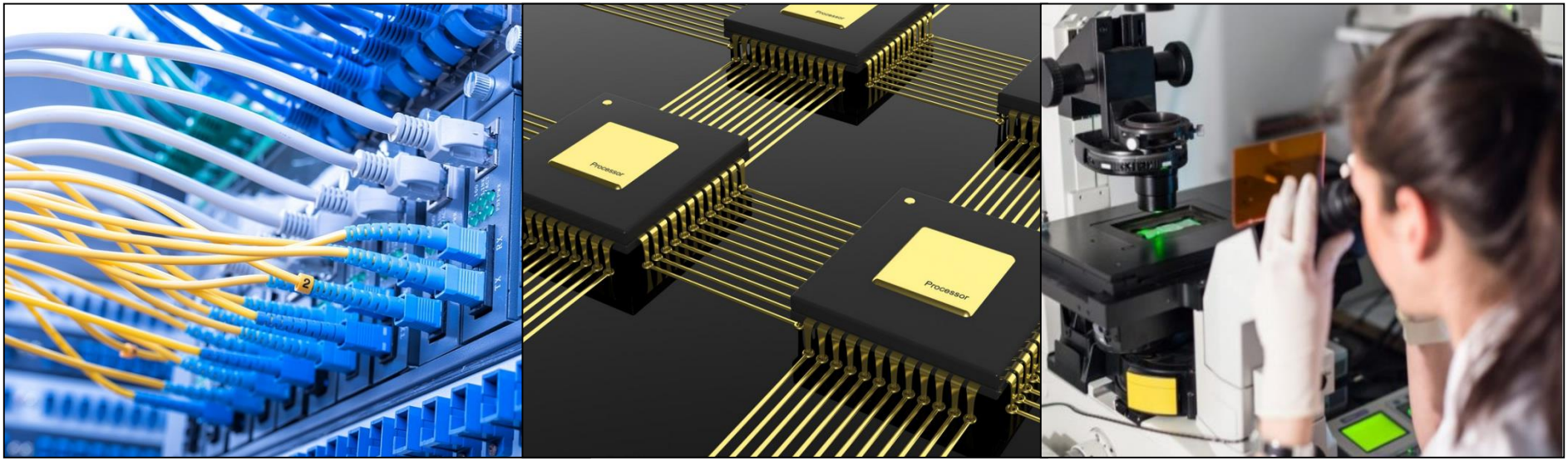

Photonic integration and assembly challenges

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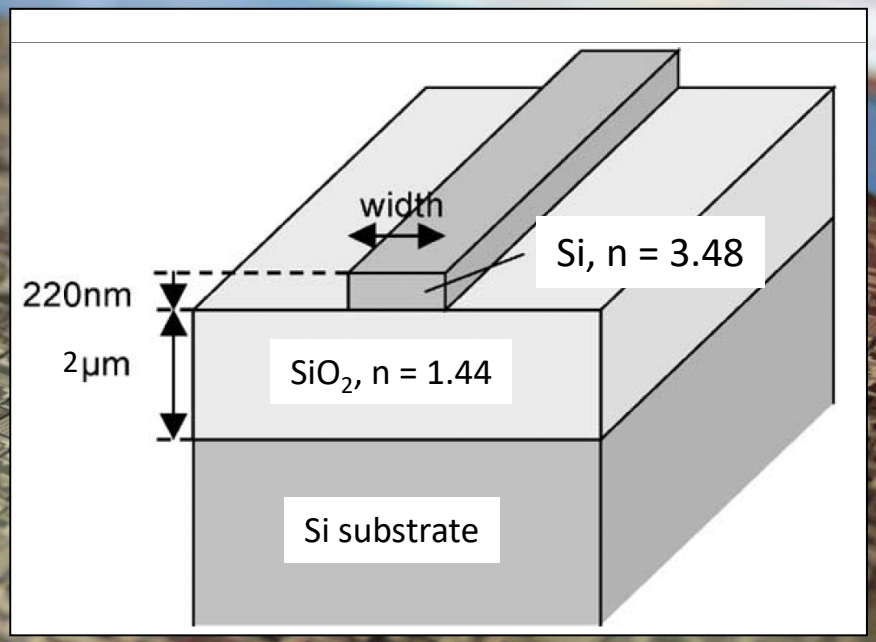
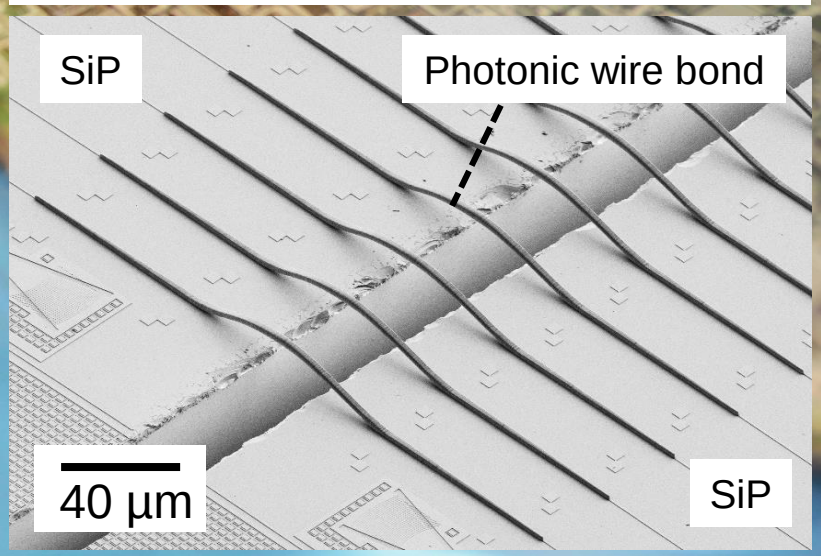
Silicon photonics (SiP):
> 10 000 optical devices on a single wafers



Photonic wire bonds: 3D-printed chip-chip connections



Photonic multi-chip modules

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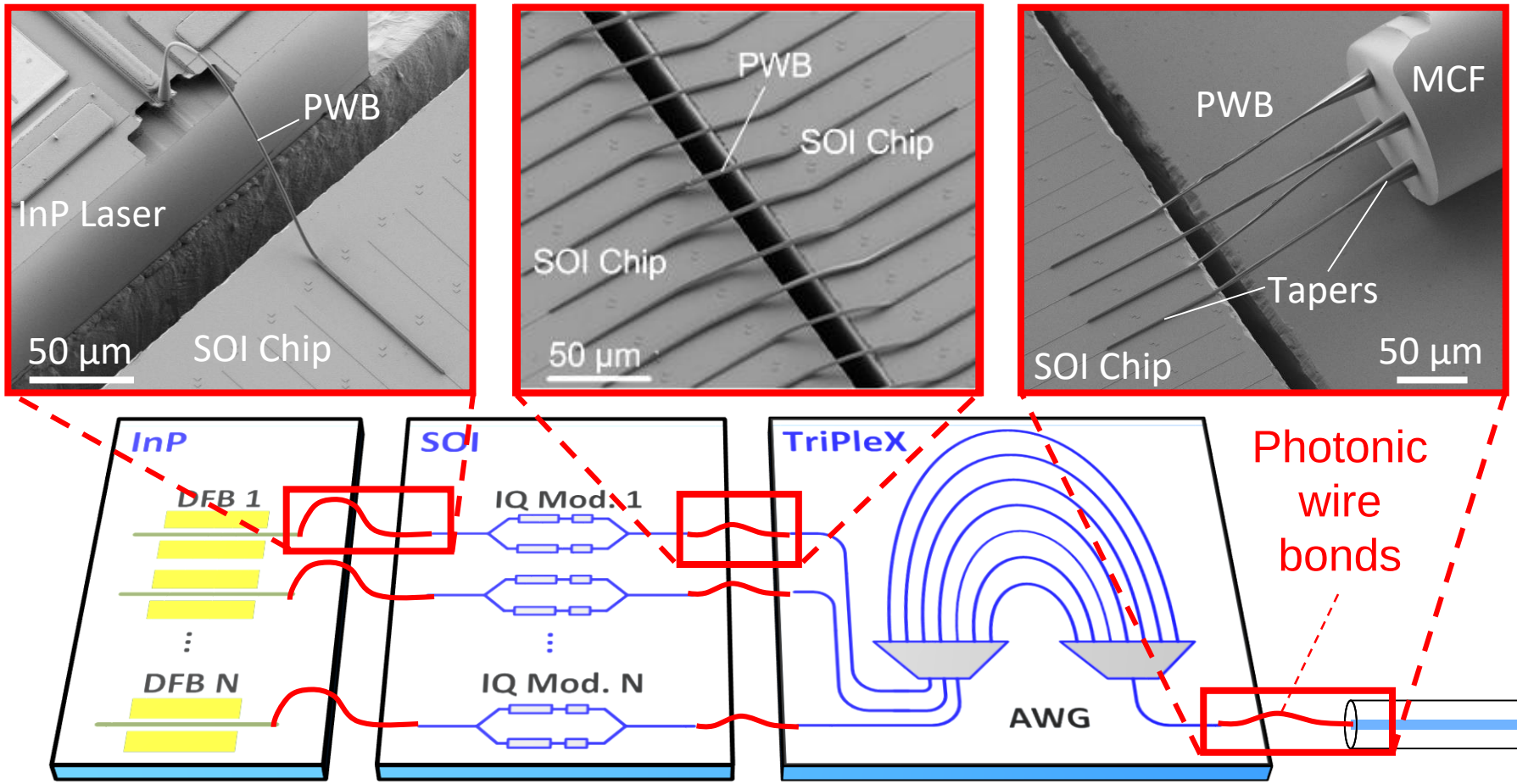

- No high-precision/active alignment required
- Can connect to arbitrary mode fields
- Highly scalable automated fabrication

Lindenmann *et al.*, Opt. Express **20**, 17667-17677 (2012)
Lindenmann *et al.*, J. Light. Technol. **33**, 755-760 (2015)
Billah *et al.*, Optica **5**, 876-883 (2018)
Blaicher *et al.*, Light: Science and Applications **9**, 72 (2020)

Facet-attached micro-optical elements

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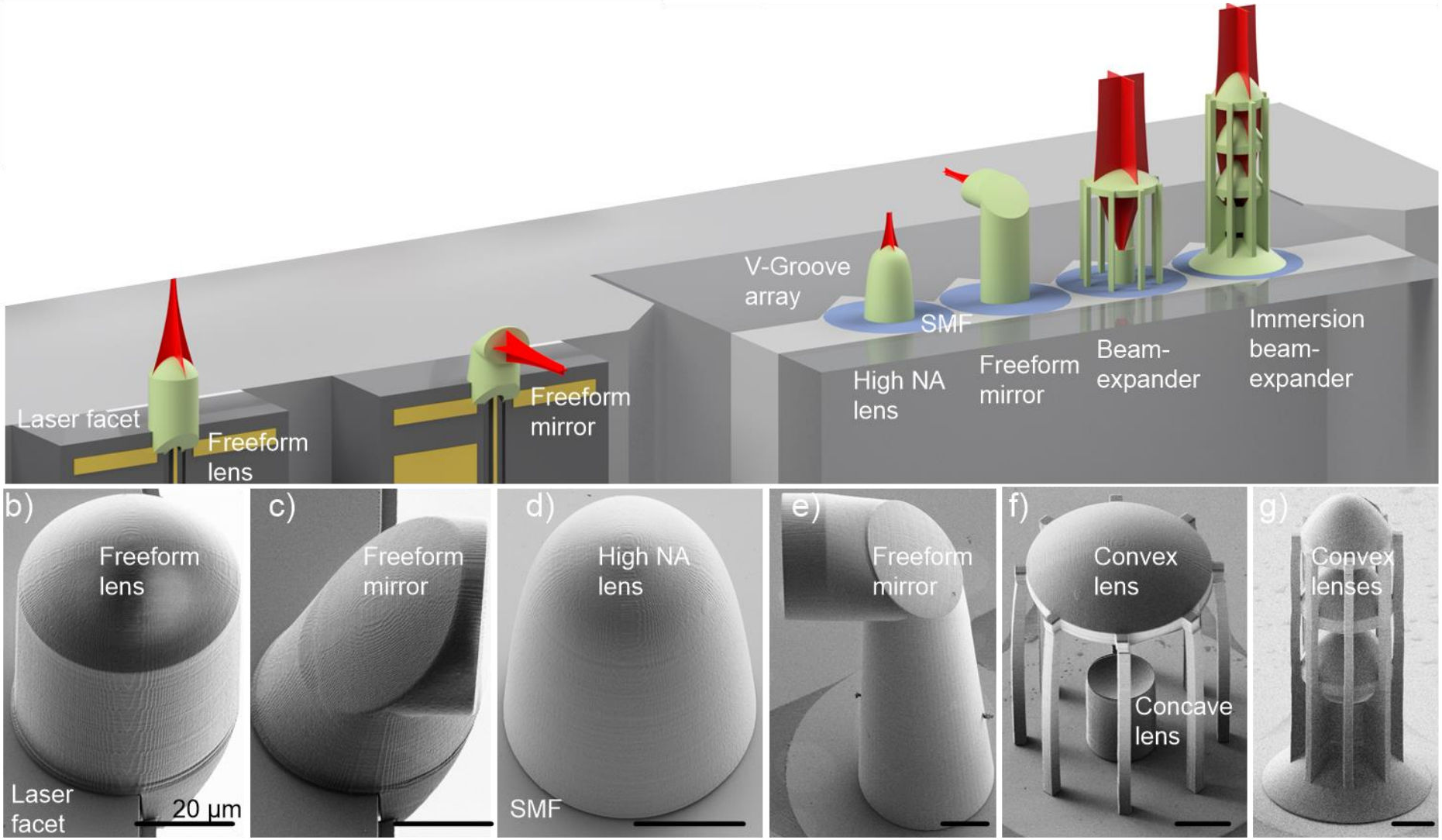

Dietrich *et al.*, Nat. Photon. **12**, 241–247 (2018)

VANGUARD SYMPHONY
Industry-grade 3D lithography

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in cooperation with ficonTEC photonics assembly & testing

VANGUARD SONATA1000 Series
Industrial multi-photon lithography system

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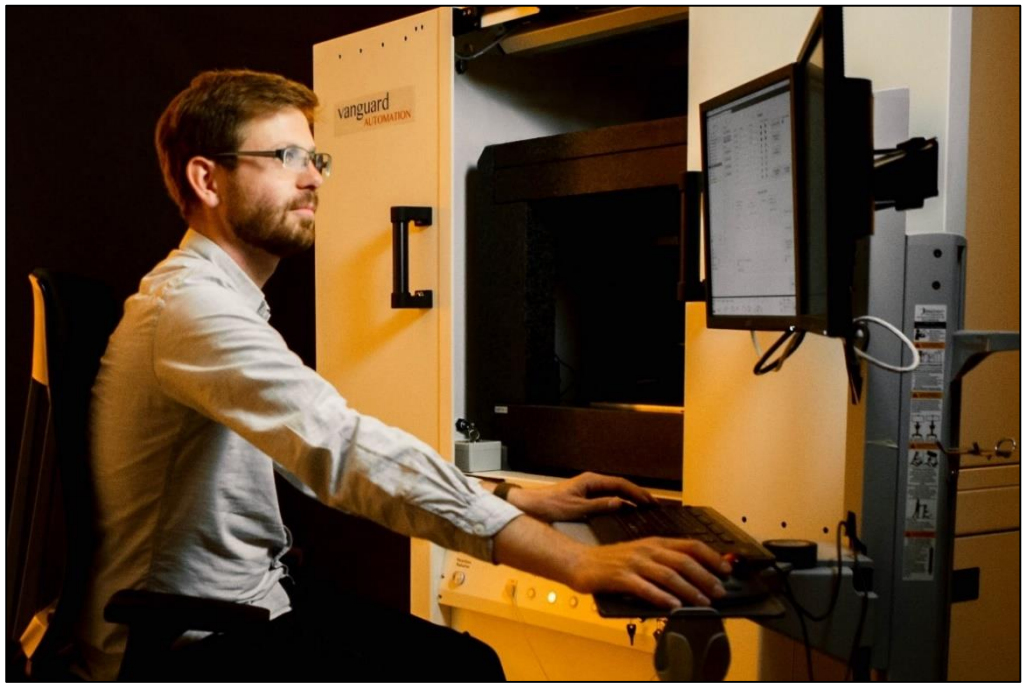

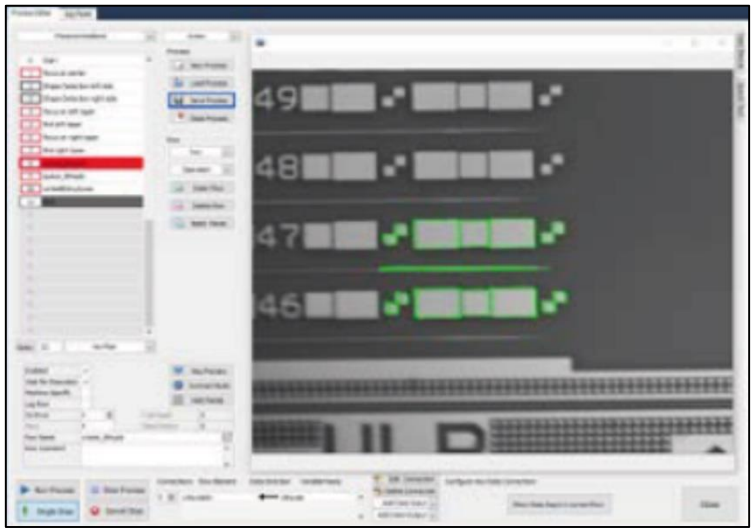

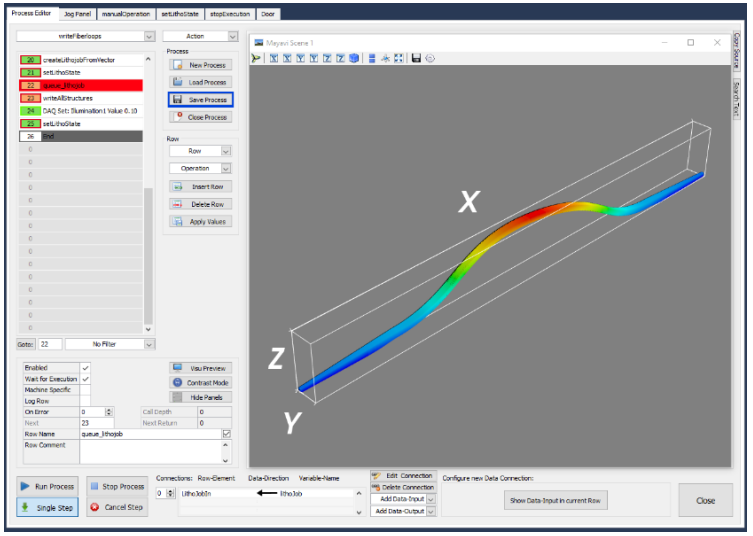

VANGUARD SONATA1000 Series

- Industrial 3D lithography tool for in-situ printing of Photonic Wire Bonds and micro-optical elements
- Wide variety interfaces to surface-emitting and edge-emitting devices, e.g., silicon photonics, InP light sources, SMF/MCF, TriPleX…

BRIGHTWIRE3D:

Process-oriented application software for automated interface detection and 3D waveguide routing

ficonTEC photonics assembly & testing