

*EPIC Online Technology Meeting on Co-Packaged Optics
8.6.2020*

- vario-optics ag
- Technology in a nutshell
- Benefits of photonic Boards
 - co-packaged optics
 - optical chip-chip communication
- Conclusions

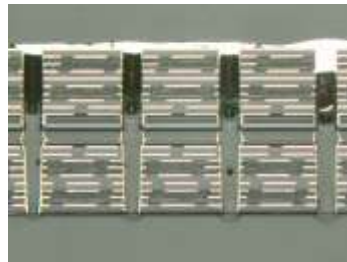
vario-optics ag

Heiden, Switzerland

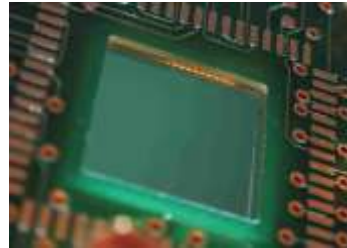
- Young SME based in Switzerland
- Manufacturer of photonic substrates
- Services for design and development
- Markets
 - Sensor applications
 - Photonic packaging
 - High-speed on board communication



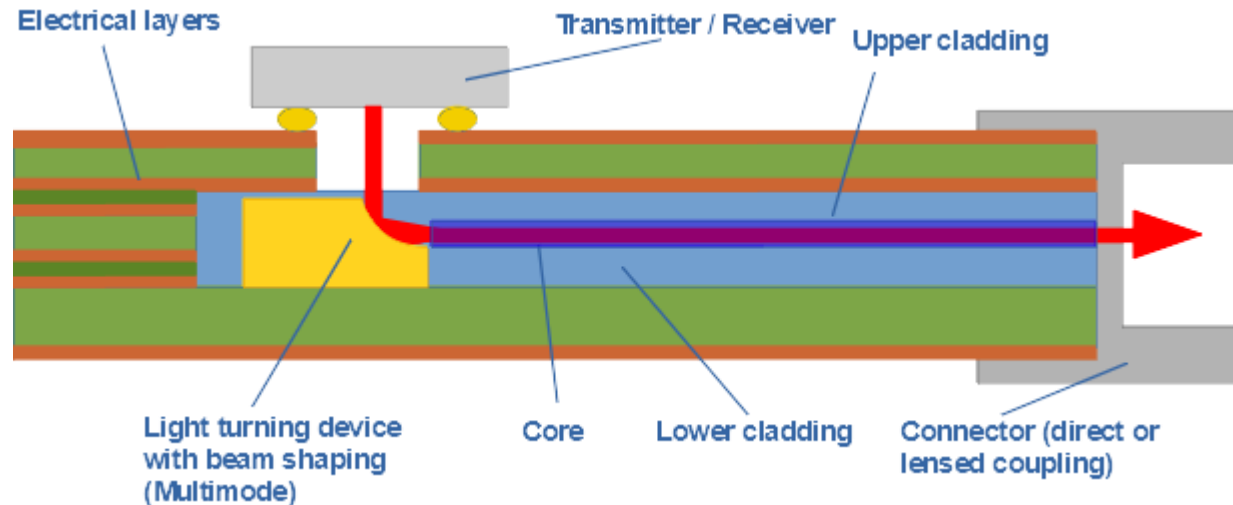
Photonic Board: Integrated Planar Waveguides



Electrical layers



Transmitter / Receiver

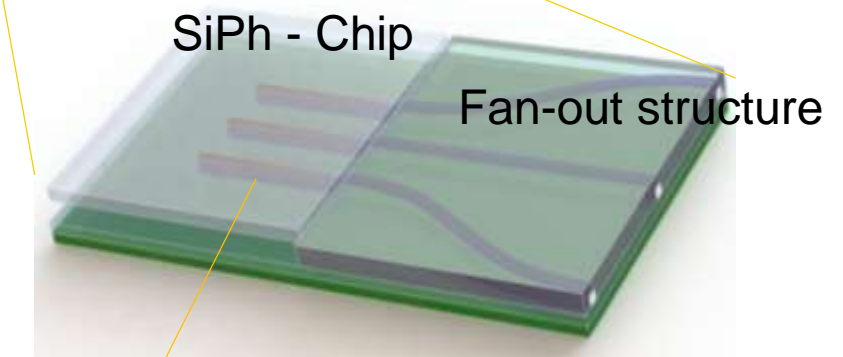
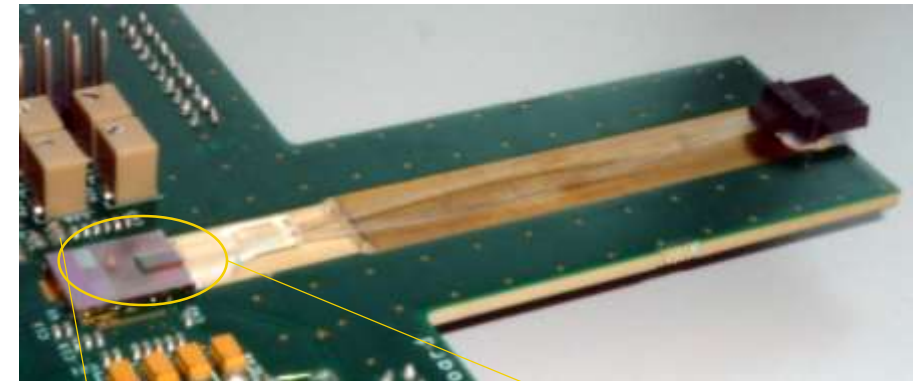


- Optical layer integrated into PCB (20+1)
- Large format manufacturing 305x460mm²
- Polymer or glass optical waveguide layers (in cooperation with FhG IZM)



Efficient Optical SiPh – Polymer Waveguide – Fiber Interface for Chip Packaging

- EU project COSMICC, objective: optical fan-out board for 2.4TBit/s on-board optical transceiver
 - 50GBit/s/wavelength
 - 4 CWDM per fiber
 - 2 x 12 fibers
- Low loss adiabatic coupling between Si-taper to polymer waveguide < 1dB
- Relaxed assembly tolerances $\pm 2\mu\text{m}$
- Broad wavelength range, supports WDM
- Fan-out to passively assembled glass-fibers

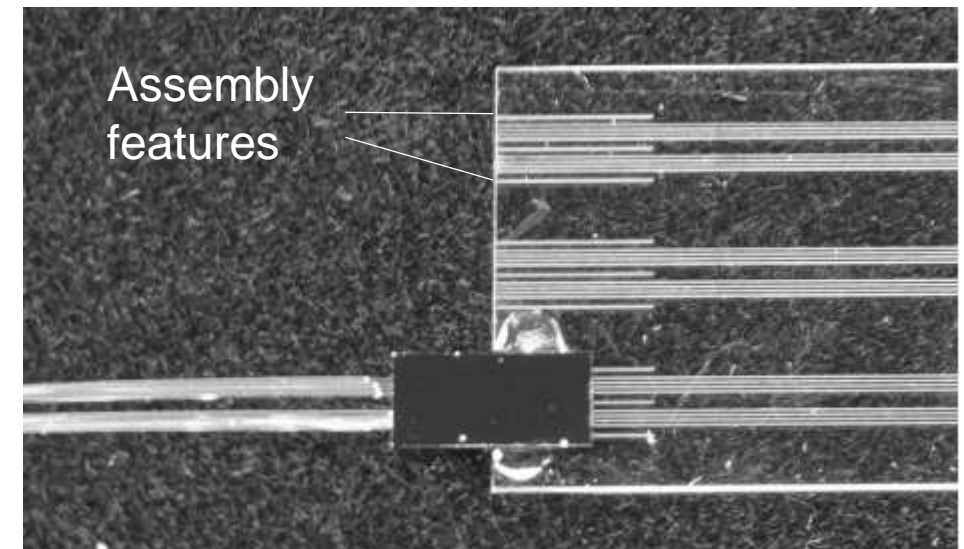
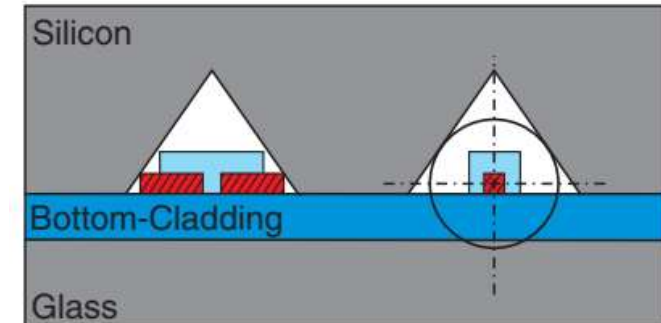


Tapered Si-waveguide

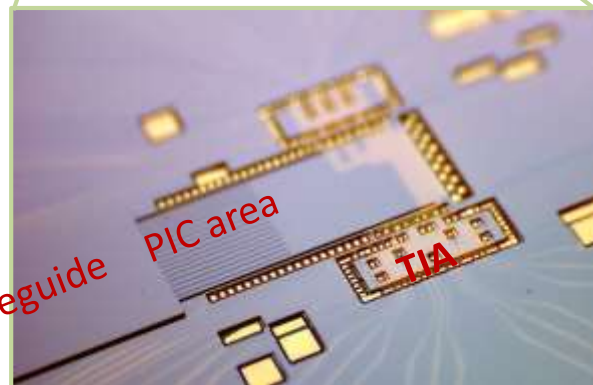
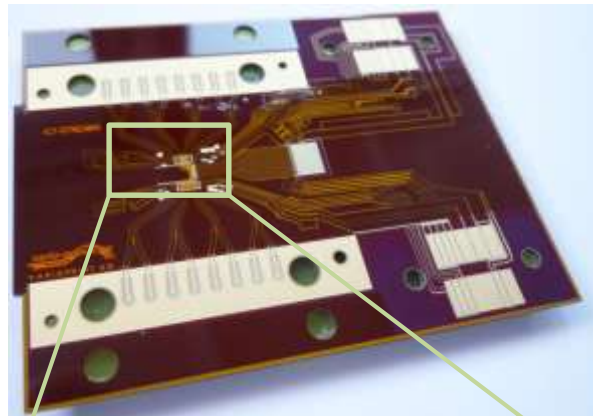


Cost Effective Assembly Of Glass Fiber Ribbons

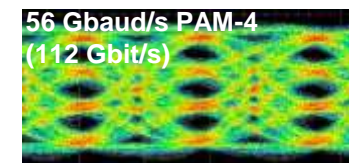
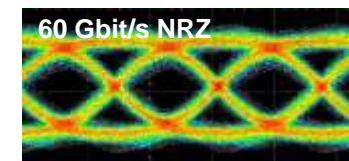
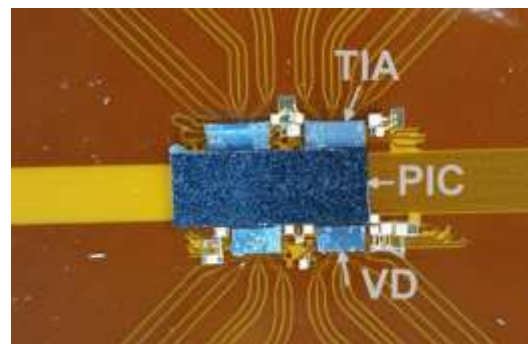
- Precise assembly features, simultaneously defined with waveguide cores
- Repeatable passive assembly process
- Coupling losses SM – Waveguides – SM glass fibers < 0.3 dB
- Can also be used to mount other components



STREAMS: Substrate for High-Speed optical Chip-Chip Communication (25TBit/s)



- Substrate with very high planarity to support adiabatic and electric coupling
 - electrical pads flush with substrate surface)
 - Very planar PIC-area < 0.5 μm
- Optical loss < 0.5 dB/cm @ 1310 nm
- Very good RF electrical properties (IL ~0.4dB/cm @ 50GHz)
- 70% power reduction compared to electrical communication
 - 5pJ/bit (50Gbit/s) vs. 16pJ/bit (QPI)*



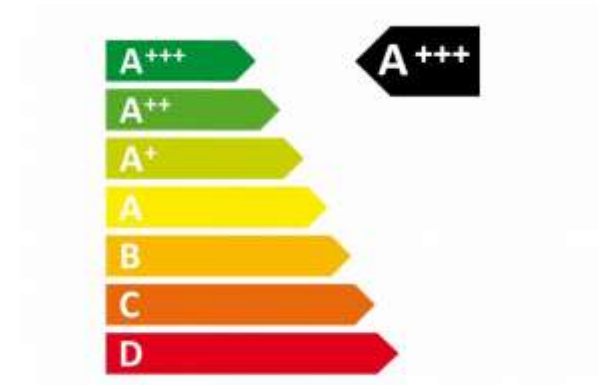
* Stelios Pitris *u. a.*, „400 Gb/s Silicon Photonic Transmitter and Routing WDM technologies for glueless 8-socket Chip-to-Chip interconnects“, *Journal of Lightwave Technology*, S. 1–1, 2020, doi: 10.1109/JLT.2020.2977369.

www.ict-streams.eu - This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 688172, ICT-STREAMS



Conclusions

- What we can offer:
 - A completely new approach for optical co-packages and chip-chip communication
 - highly integrated electrical and optical interconnects
 - providing very high data-throughput on-board
 - supporting low cost packaging
 - significant power reduction
- What we are looking for
 - Innovative partners which are willing to benefit from our novel and disruptive technology





The Future is
Bright !

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Meeting on Co-Packaged Optics