



World Class Supplier of Leading Edge Electro-Optical Circuit Boards

EU Projects boost vario-optics Integrated Planar Micro Optics

*Public Funding Opportunities
Swiss Photonics Workshop
Brugg-Windisch, 4.12.10*

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Dr. sc. techn. ETH*

Agenda

- vario-optics ag
- EOCB technology in a nutshell
- Past and actual EU-Projects
- Conclusions

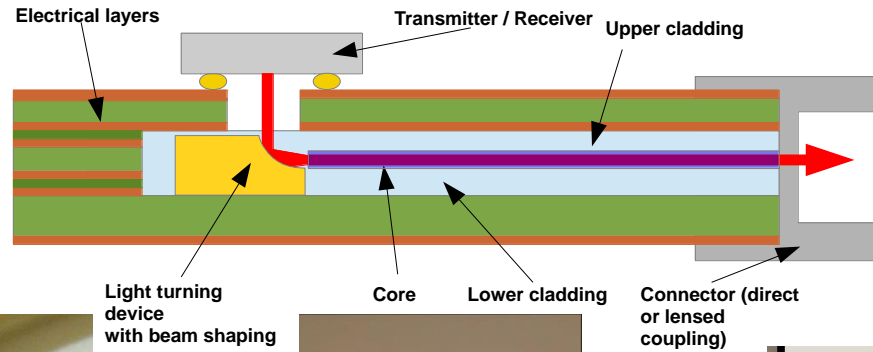
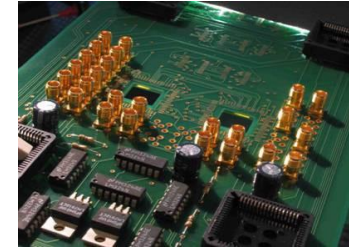
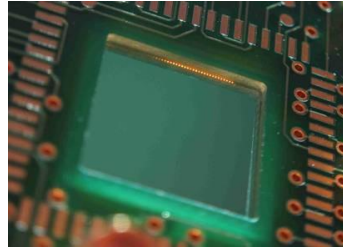
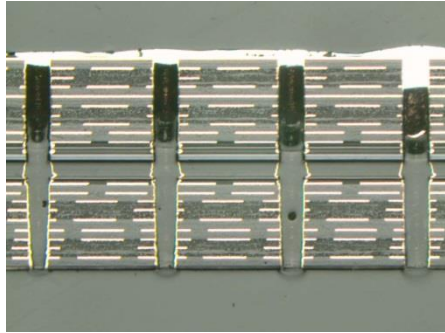
vario-optics ag

Heiden, Switzerland

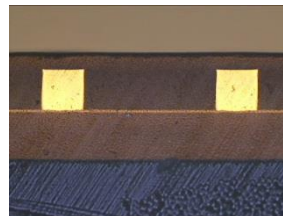
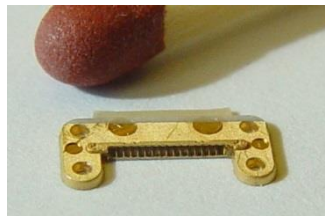
- Young SME based in Switzerland
- Unique technology solution for high-density integration of optics and electronics
- Fabrication and development
- EOCB: Electro-optical circuit board
 - Combining optical and electrical interconnects on a single board
 - Miniaturization and simplified (passive) assembly
 - Performance improvements



Electro-Optical Circuit Board Based on Photolitho

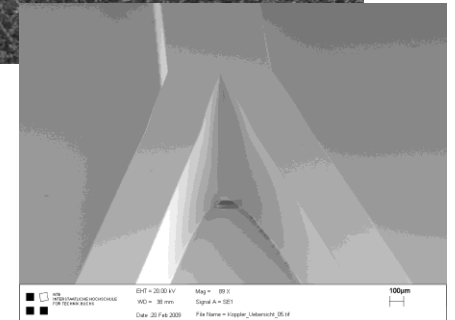
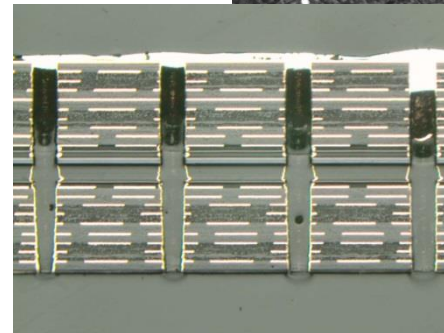
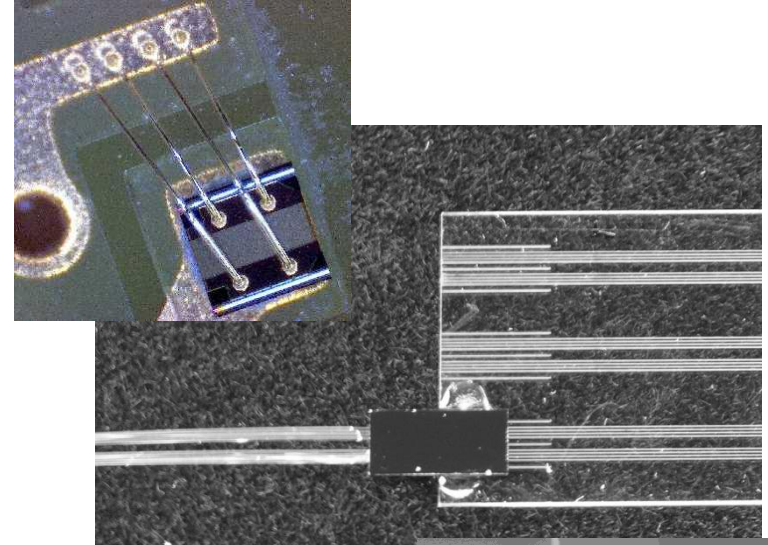


Light turning device with beam shaping



Key Features

- Optical layer integrated into PCB (20+1)
- Large format manufacturing 305x460mm²
- Polymer or glass optical waveguide layers
 - UV-curing of polymers by lithography or laser imaging
 - Ion-diffused glass singlemode waveguides for long-wavelengths
- Insertion loss down to 0.05 dB/cm (λ -dependence)
- Polymers and Glass to withstand 85°C/85%r.H. >2000h
- Robust against harsh environment (incl. radiation)



EOCB's for High Speed on Board Communication (Multimode)

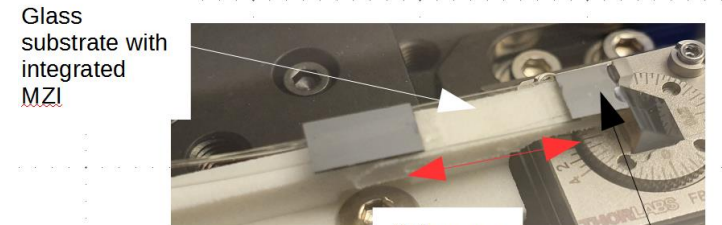
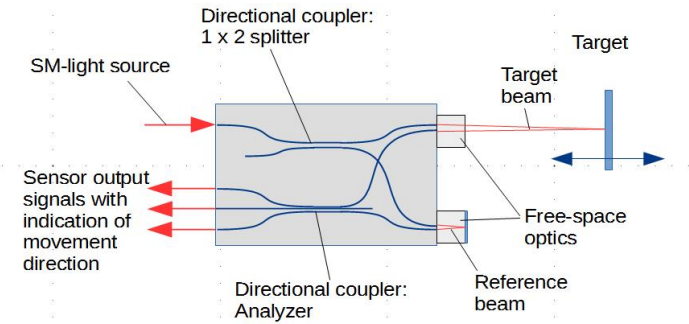
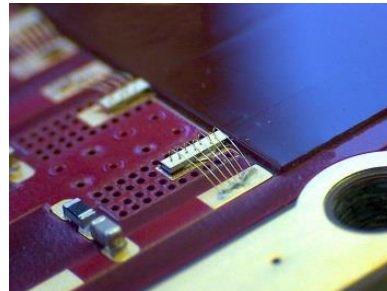
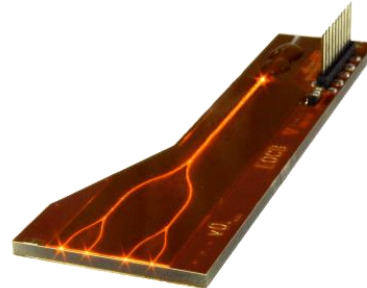
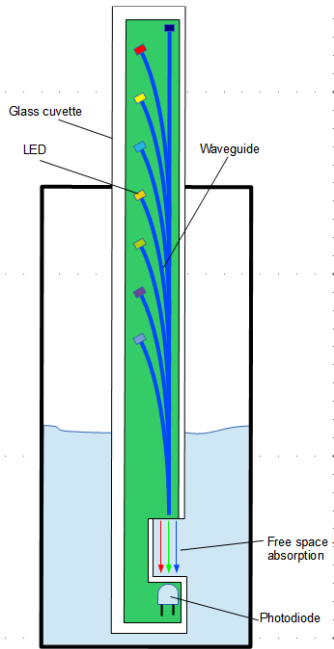
- 1.4 Tb/s on board communication
- 20 electrical layers – 1 multimode optical layer
- 4 mid-board optical engines (Finisar)
- Xilinx Virtex FPGA for simultaneous coding, switching, BER & eye diagram measurements on all 48 optical channels
- Automated assembly (Benchmark)
 - Double sided reflow soldering



EOCB's for Highly Integrated Sensors (Multimode)

- Electro-optical PH-Optrode
- Laser source for medical application

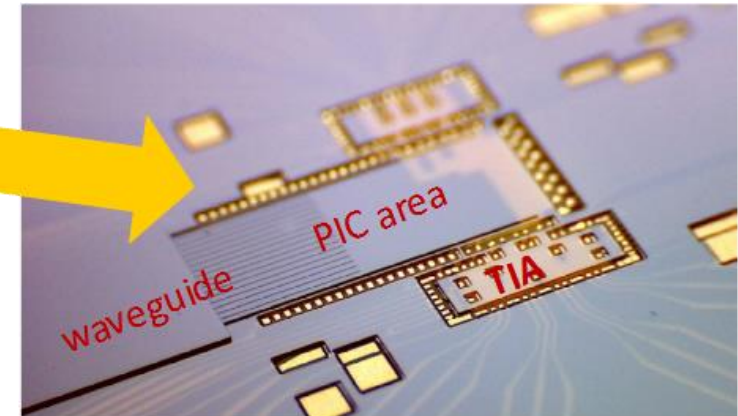
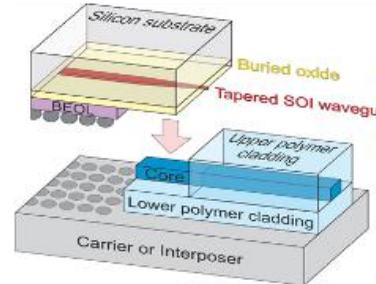
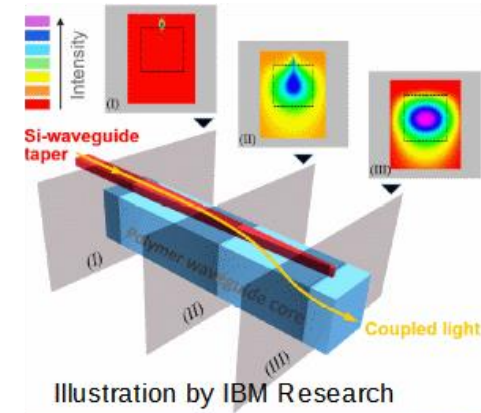
- Mach-Zehnder Interferometer for Displacement Sensing



Adiabatic Coupling for Efficient Interconnection to Silicon Photonics Components

Adiabatic coupling (mode converter), superior to conventional coupling schemes

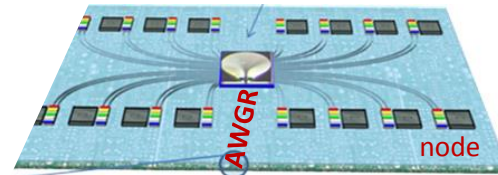
- Successful prove of feasibility within 2 EU-Projects
(www.h2020-cosmicc.eu, www.ict-streams.eu)
- Superior to conventional coupling schemes:
- Low loss coupling from SiPh – glass fiber
< 1dB
- Broad wavelength window
Wavelength Division Multiplexing
- Relaxed assembly tolerances
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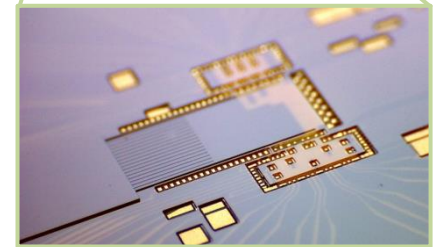
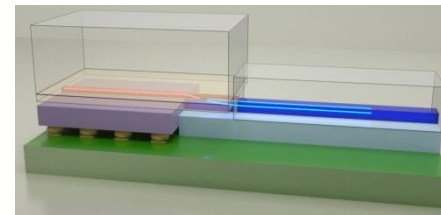
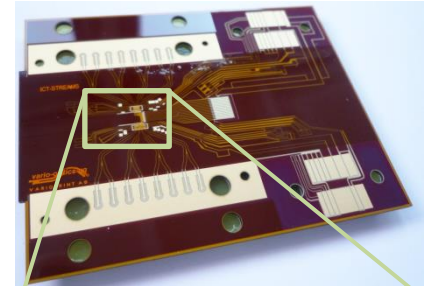
H2020 ICT-STREAMS:

EOCB Technology Platform for Miniaturized High Performance Computing

- Consortium with 9 partners (a.o. IBM, STMicroelectronics, FCI Amphenol)
- Efficient optical any-to-any communication for multi-socket boards for a total of 25TBit/s
 - AWGR: low-latency & low energy (no switch)
 - Elastic (25G or 50G)
 - Flexible (any-to-any or multicast)
- Simultaneous electrical and optical bonding
 - Very planar substrate
 - Optical interface for adiabatic coupling
- High speed electrical and optical signalling
 - Combination of RF-dielectric materials supporting 60 Gbit/s electrical signalling
 - Singlemode optical waveguides supporting



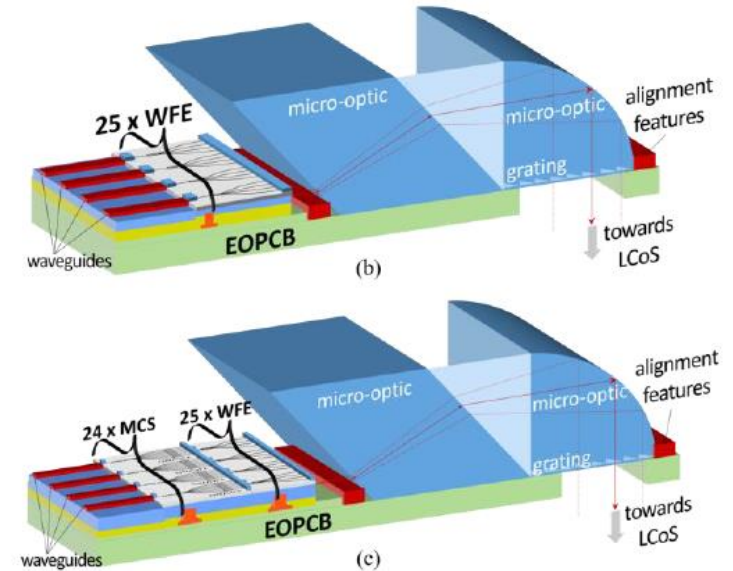
AWGR based server board



www.ict-streams.eu

EU Projekt QAMeleon

- Consortium: 16 Partner, a. o. Finisar, Alcatel Lucent, Telecom Italia
- Objective: Development of a micro-optical platform for „SDN“, Software Defined Networks
 - 3 Tbit/s optical Router (Transponder), Software-configurable
- SM – Waveguides for high power densities (1550nm)
 - New materials
 - New manufacturing processes
- www.ict-QAMeleon.eu



Conclusions and Learnings

- vario-optics is profiting significantly from 3 EU projects COSMICC, ICT-STREAMS, QAMeleon
 - Technology portfolio successfully extended
 - First customer driven projects for miniaturized optical sensors and optical co-packages started
 - Very good network not only to universities but also and more important to potential customers
- Most important success factor was the careful selection of the projects:
 - Inline with company's technology portfolio
 - High potential for commercialization
 - Strong industrial partners (network)
 - Strong project leader



World Class Supplier of Leading Edge Electro-Optical Circuit Boards

The future is bright!

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