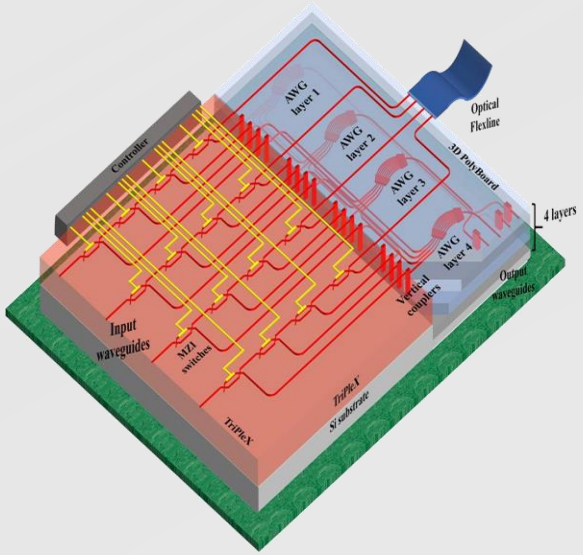
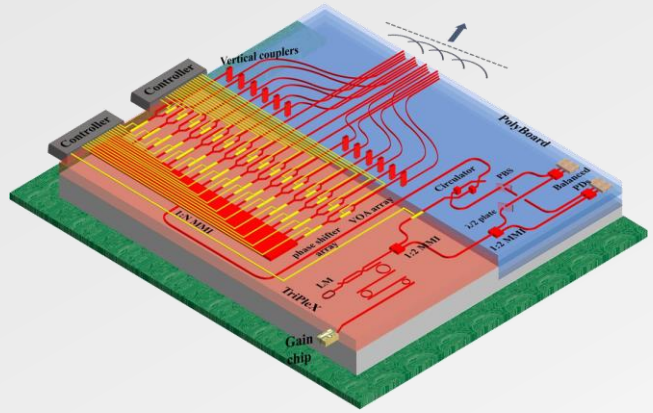
3PeaT: Photonic integration platform based on multilayer PolyBoard and TriPleX technology for optical switching and remote sensing and ranging applications

3PeaT Action
Short Presentation





Call identifier: H2020- ICT-2017-1
Contract No: 780502
Project Start: Dec 1, 2018
Duration: 3 years
Budget: 3.993.285,00 €
www.ict-3peat.eu

Consortium

- Institute of Communications and Computer Systems/ National Technical University of Athens – ICCS/NTUA (GR)
- LioniX International - LioniX (NL)
- Fraunhofer Gesellschaft Heinrich-Hertz Institute – FhG-HHI (DE)
- SolMateS B.V. – SolMateS (NL)
- University of Twente – Utwente (NL)
- Cordon Electronics – Cordon (IT)
- Optagon Photonics – Optagon (GR)
- Mellanox – MLNX (IL)
- Polytec GmBH – Polytec (DE)

Motivation

Although telecom and datacom sectors has been benefited from photonic integration technology reaching its maturity level, the case is not the same for a broad range of optical applications like optical switching and remote sensing applications. Therefore, a powerful integration platform that can offer low optical loss and high integration density in order to facilitate a very large number of processing components on-chip, a very broad range of optical functionalities, and very high purity and quality in the generation, processing and detection of light is obligatory.

The necessary photonic integration technology that could exploit the aforementioned functionalities and could enable the commercial uptake of optical switching and remoting sensing is still missing.

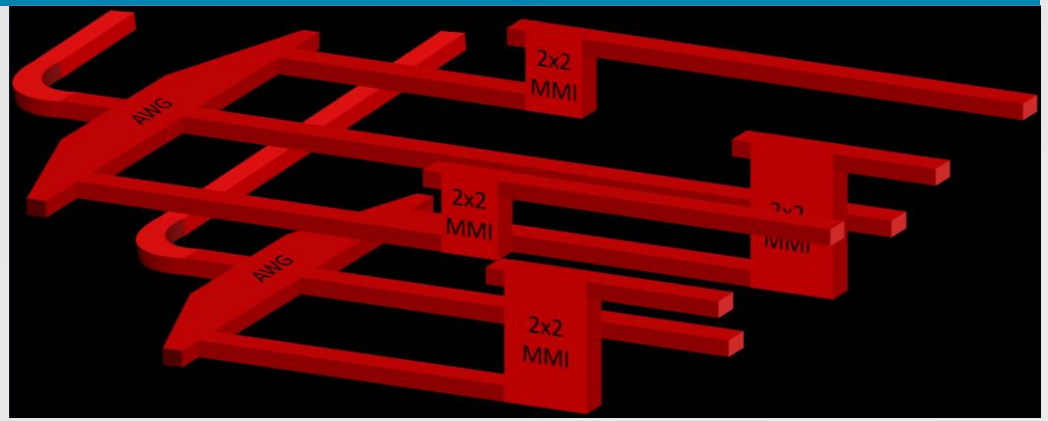
Approach

- Develop a disruptive 3D photonic integration technology based on multilayer PolyBoard platform
- Advance the PZT-based phase shifter technology on TriPleX platform
- Combine the two integration platforms and develop single-die hybrid PICs of high performance and functionality
- Explore this disruptive photonic integration platform for switching applications inside data centers
- Explore this disruptive photonic integration platform for optical phased array systems in sensing and ranging applications taking the example of Laser Doppler Vibrometers (LDVs)

Objectives (I)

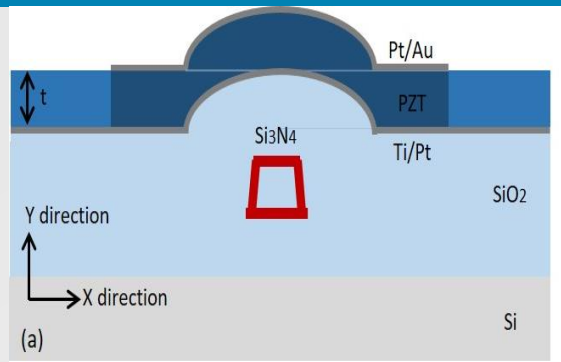
1) Develop a disruptive 3D photonic integration technology based on a multilayer PolyBoard platform

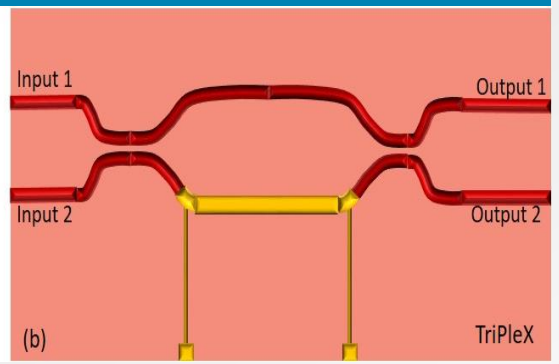
The use of vertical MMI couplers with low insertion loss 0.5 dB on PolyBoard will enable the transition of light from a waveguiding layer to a different one within a multilayer structure leading to general purpose 3D integration platform



2) Advance the PZT-based phase shifter technology on TriPleX platform to the direction of smaller size, higher speeds and smaller polarization sensitivity

The upgrade of the PZT-based phase shifter technology will enable integration of large-scale circuits with large number of polarization insensitive phase shifters, while the reduction of the power consumption of each PZT-based phase shifter will support high frequency operation at 50 MHz.

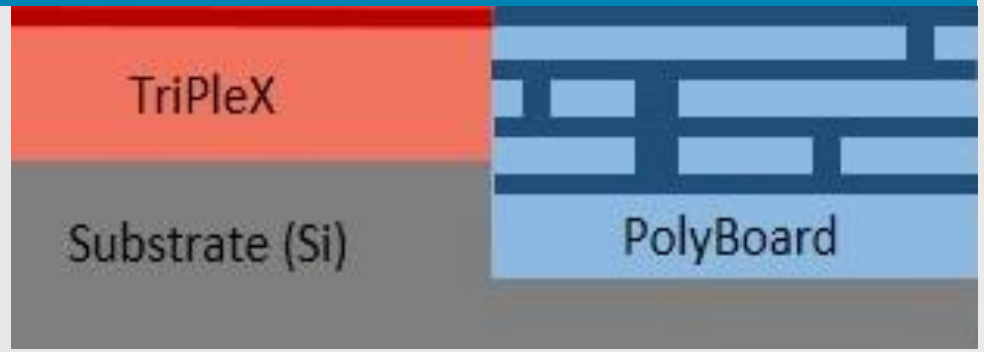




Objectives (II)

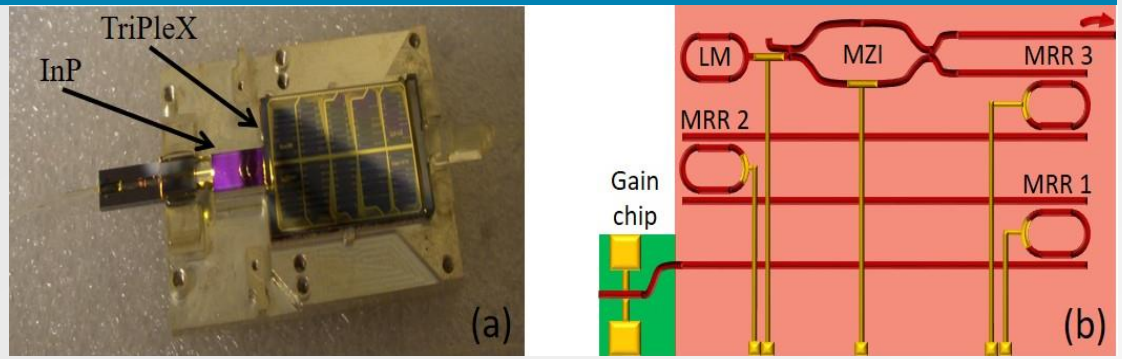
3) Combine the two integration platforms and develop single-die hybrid PICs of high performance and functionality

Single-die hybrid PICs with PolyBoard and TriPleX sections and efficient coupling schemes will enable multi-functional 3D PICs combining the toolboxes of both platforms for switching and sensing applications



4) Develop an integrated laser source with ultra-narrow linewidth (< 1 kHz)

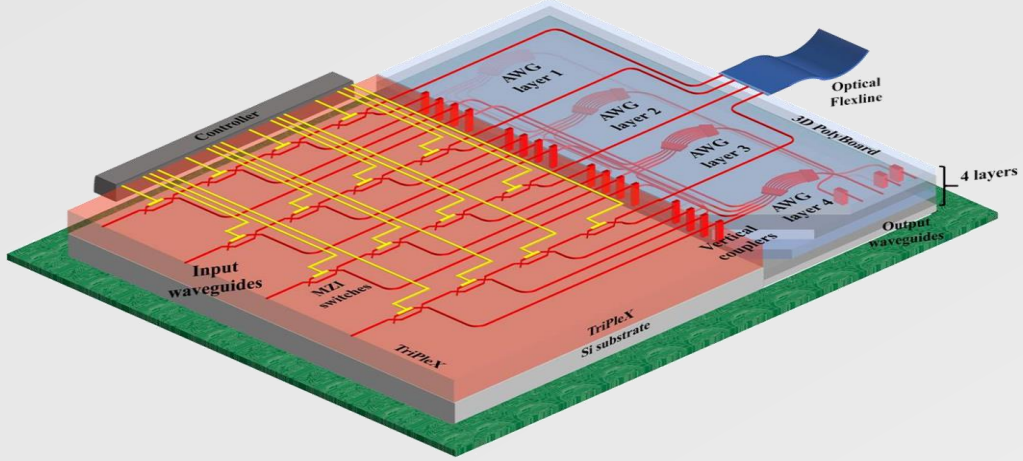
Tunable MRRs with high Q-factor on the TriPleX platform will be used as the basic elements of a disruptive laser source in the form of an integrated external cavity laser with linewidth in the sub-kHz regime (<1 kHz) and high output power >10 mW



Objectives (IV)

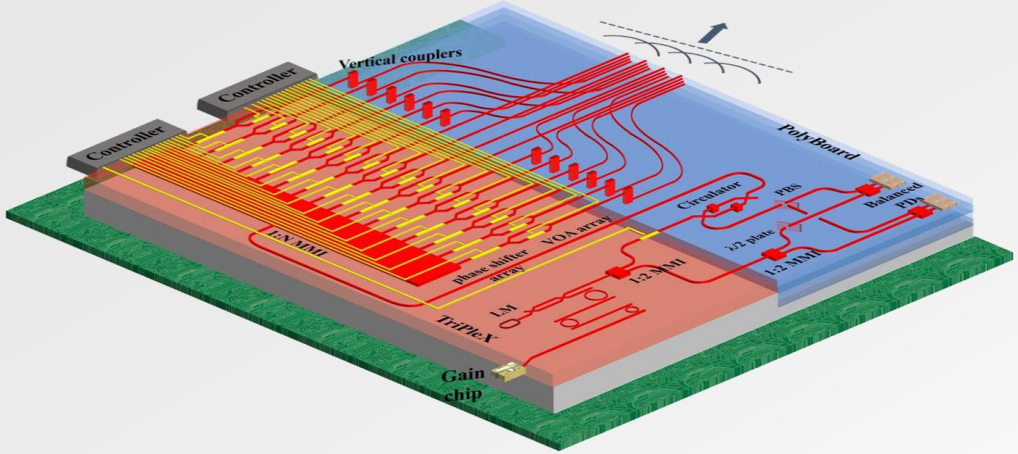
5) Develop 3D PICs for large-scale optical switches with 20 ns switching time inside data center networks

3PEAT photonic integration scheme will enable fast PZT-based phase shifters on the TriPleX section with 3D PolyBoard structure for large-scale active optical switches without waveguide crossings.



6) Develop 3D PICs for the interrogation and optical beam scanning unit of Laser Doppler Vibrometers

3D hybrid PIC for an integrated Laser Doppler Vibrometer with a low-linewidth laser, an optical circulator, polarization handling elements, a PZT-based phase modulator and a 16×16 optical phased-array



Roles

- System design and methodologies for integration and packaging processes
- Monolithic and heterogeneous integration on TriPleX platform
- Monolithic and heterogeneous integration on PolyBoard and hybrid integration with TriPleX platform
- Development of integration engine and packaging of 3PEAT prototypes
- System integration, testing and performance evaluation
- Dissemination and exploitation activities, manufacturability studies and roadmapping

LioniX International

University of Twente.

Cordon Electronics

Mellanox Technologies

Fraunhofer Heinrich Hertz Institute

ICCS

SolMateS Solutions in Material Science

Polytec

Optagon Photonics

Contact

Project coordination

Dr. Vasilis Katopodis
Photonic Communications Research Laboratory
ICCS/NTUA
e-mail: vkat@mail.ntua.gr
tel: +30 210 772 2057

Prof. Hercules Avramopoulos
Photonic Communications Research Laboratory
ICCS/NTUA
e-mail: hav@mail.ntua.gr
tel: +30 210 772 2076

3PEAT web-site: www.ict-3peat.eu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PHOTONICS COMMUNICATIONS RESEARCH LABORATORY (PCRL)
The Photonics Communications Research Laboratory (PCRL) was founded in September 1995 by Prof. Hercules Avramopoulos, as a research facility of the School of Electrical and Computer Engineering of National Technical University of Athens (NTUA), and member of the Institute of Communications & Computer Systems (ICCS). It currently numbers 25 doctoral, post-doctoral researchers and support perosonnel. Their research interests include optical interconnects and telecommunications, digital signal processing, photonic integrated circuit (PIC) design, and biophotonics/sensing.
RECENT NEWS
Press release – 3PEAT project
Press Release – QAMeleon project
Photonic Integrated Circuits Accessible to everyone
"Συστήματα Μετάδοσης Οπτικών Ινών" – 20/2/18, αίθουσα 2.1.19
Best student paper award to Vasilis Katopodis at SPIE West 2018
Από τη συμμετοχή του ΕΦΕ στην εκδήλωση για τα 100 χρόνια της Σχολής ΗΜΜΥ
Μάθημα Φωτονικής την Παρασκευή 19.01, Αίθουσα 1.1.29, Ώρα: 12:45-15:30