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Framework Programme of the European Union

3PEAT

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

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Research and Innovation Action (RIA)
Information & Communication Technologies (ICT)

Deliverable D7.1
Announcement of 3PEAT (Preparation of fact-sheet, presentation and press-release)

Lead beneficiary for this deliverable:	ICCS/NTUA
Contact Person:	Prof. Hercules Avramopoulos
Address:	9 Iroon Polytehneiou Str., 15780 Athens, GREECE,
Phone:	+30 210 772 2076
e-mail:	hav@mail.ntua.gr

Date due of deliverable:	31 January 2018
Authors:	C. Christogiannis, V. Katopodis
Participants:	ICCS/NTUA
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Nature:	Report
Version:	1.0

List of abbreviations

CA	Consortium Agreement
DEUC	Distribution of EU Contribution
DoA	Description of Action
EC	European Commission

Table of Contents

Executive Summary

The following document reports on the preparation of basic material for the announcement of 3PEAT project through the official tools of the European Commission (EC) and through the dissemination channels of the consortium partners. More specifically, the document reports on the preparation of the project factsheet and the preparation of a short presentation of the project for the official website of the EC, the preparation of one common press-release for all partners (document prepared by ICCS/NTUA and Fraunhofer-Heinrich Hertz Institute).

1. Introduction

3PEAT aims to develop 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. Using this technology, it will develop the necessary photonic integration technology that could exploit the aforementioned functionalities and could enable the commercial uptake of optical switching and remoting sensing, which is still missing. 3PEAT is a 3-year collaborative project on 3D photonic integration that brings together nine leading European research centers, companies and universities. The project was launched in January 2018, is expected to finish in the December of 2020 and is funded by the European Commission through the Horizon 2020 programme. The announcement of the project launch to the general public and the scientific and technical community was pursued through the publication of the project factsheet and the project presentation through the cordis website of the EC and through two press-releases from a university and an industrial partner of the consortium. This dissemination material is presented below.

2. Project Factsheet

The 2-page long project factsheet follows a typical format and provides standard information about the project (call identifier, consortium, time-line, budget, contact persons and project website), a short description about the motivation behind the project, a short description about the main technical concepts and the main objectives, and an overview about the exploitation plans and the expected impact. The factsheet will be made available through the project website (www.ict-3peat.eu) and will be also available through the cordis website (http://cordis.europa.eu/projects/home_en.html). The project factsheet is appended to the present report as Appendix 1.

3. Project short presentation

The short presentation of the project includes 9 slides that provide the same information as the project factsheet with stronger emphasis, however, on the technical scope and the technical concepts of the project. The short presentation of the project will be made available through the project website (www.ict-3peat.eu) and will be also available through the cordis website (http://cordis.europa.eu/projects/home_en.html). This presentation is appended to the present report as Appendix 2.

4. Press releases

One press release was prepared in order to announce the project to the general public and the scientific and technical community. This document was prepared by the ICCS/NTUA in collaboration with HHI and was wired through the News section of the photonics communications research laboratory's website

(http://photonics.ntua.gr/press-release-3peat-project/)

addressing the Greek and international general public and technical community. Further, Mellanox uploaded this press-release in its news room (http://www.mellanox.com/page/mellanox_in_the_news). The content of the specific press release is appended to the present report as Appendix 3.

5. Further dissemination channels

Further announcements of 3PEAT have already been made through the websites of the participating organizations.

Appendix 1: 3PEAT Factsheet

Information and Communication Technologies

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

Call identifier: H2020- ICT-2017-1

Project website: www.ict-3peat.eu

Contract No: 780502

Partners:

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

Timeline: January 2018 – December 2020

Budget:

Overall cost: 3.993.285,00 €
EC contribution: 3.993.285,00 €

Contact:

Dr. Vasilis Katopodis
Prof. Hercules Avramopoulos
Photonic Communications Research Laboratory
National Technical University of Athens
Tel. +30 210 7722057
vkat@mail.ntua.gr, hav@mail.ntua.gr

Motivation

Over the last two decades photonic integration has unleashed the potential of optical technology in many application fields leading to technical breakthroughs with a strong commercial impact. 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 combination of these requirements is very challenging, and the conclusion is very clear: 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. 3PEAT will develop a powerful photonic integration technology with all size, functionality and quality credentials in order to help a broad range of optical applications like optical

Figure 1: 3PEAT aims to provide single-die hybrid 3D PICs with PolyBoard and TriPleX sections and efficient coupling schemes combining the toolboxes of both platforms for switching and sensing applications.

Concept and objectives

3PEAT introduces a fully functional 3D photonic integration platform based on the use of multiple waveguiding layers and vertical couplers in a polymer technology (PolyBoard), as a means to disrupt the integration scale and functionality. Moreover, 3PEAT combines this powerful 3D photonic technology with a silicon-nitride platform (TriPleX), via the development of a methodology for the deposition and processing of multilayer polymers inside etched windows on TriPleX chips. In parallel with the development of this hybrid 3D technology, 3PeaT brings a number of key innovations at the integration and component level relating to: a) the heterogeneous integration of PZT films on TriPleX platform for development of phase shifters and switches for operation up to 50 MHz, b) the development of a disruptive external cavity laser on the same platform with linewidth less than 1 kHz, c) the development for the first time of an integrated circulator on PolyBoard with isolation more than 25 dB, and d) the development of flexible types of PolyBoards for the purpose of physical interconnection of other PICs.

This enormous breadth of innovations will remove the current limitations and unleash the full potential of optical switching and remote sensing and ranging applications. The main switching module that will be fabricated will be a 36×36 optical switch with 20 ns switching time and possibility for power and cost savings of almost 95% compared to standard electronic solutions. The main sensing module on the other hand will be a disruptive Laser Doppler Vibrometer (LDV) with all of its optical units, including its optical beam scanning unit, integrated on a very large, hybrid 3D PIC.

Exploitation and expected impact

3PEAT aims to industrialize the foreground knowledge that will be generated within the project and establish viable exploitation paths in order to reinforce the European industrial competitiveness. The envisioned industrialization lines are associated with:

- Photonic components and devices
- Photonic integrated circuits technology
- Optical switching modules without waveguide crossings and with low latency, high throughput for the switching of optical packets inside large switching fabrics
- Optical sensing modules with optical beam scanning abilities for compact and self-standing remote sensing and ranging systems.

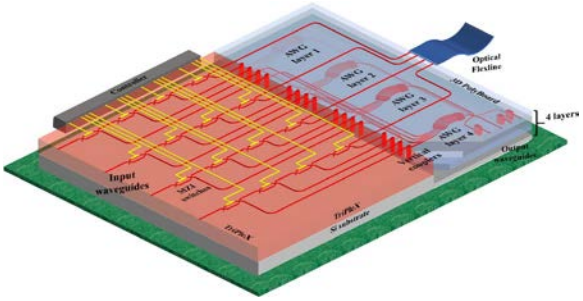


Figure 2: The 3PEAT optical switching module will serve as the active optical switch of optical packets inside large switching fabrics with 20 ns switching time for direct replacement of electrical switches at the higher layers of the reference network.

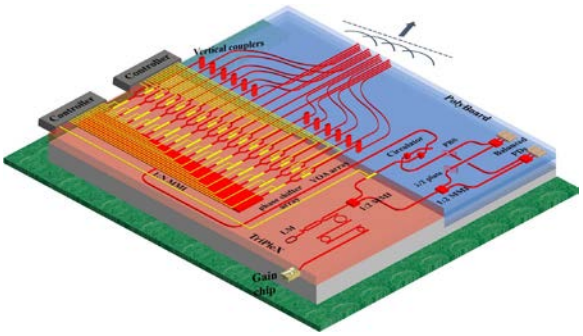
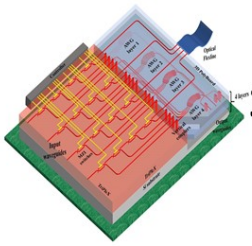


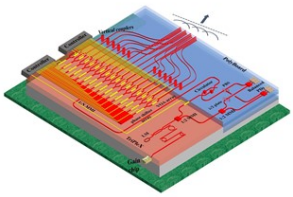
Figure 3: The 3PEAT optical sensing module will serve as the compact and integrated Laser Doppler Vibrometer system, providing advanced optical beam scanning functionalities with field of view close to 10°×10°.

Appendix 2: 3PEAT short presentation

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: ICT-30-2017-RIA
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)

2

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.

3

Approach

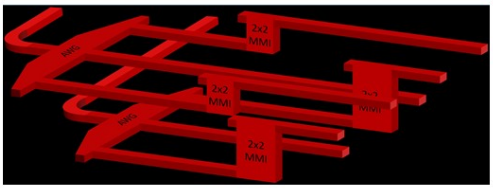
- Develop a disruptive 3D photonic integration technology based on multilayer PolyBoard platform
- Advance the PZT-based phase shifter technology on TriPleX platform
- Combine the two integration platforms and develop single-die hybrid PICs of high performance and functionality
- Explore this disruptive 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)

4

Objectives (I)

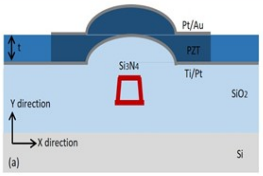
1) Develop a disruptive 3D photonic integration technology based on a multilayer PolyBoard platform

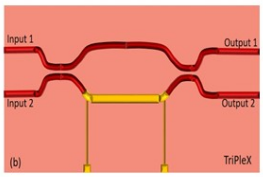
The use of vertical MMI couplers with low insertion loss 0.5 dB on PolyBoard will enable the transition of light from a waveguiding layer to a different one within a multilayer structure leading to general purpose 3D integration platform



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.





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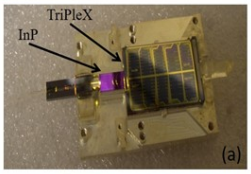
Objectives (II)

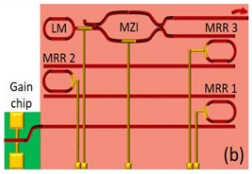
3) Combine the two integration platforms and develop single-die hybrid PICs of high performance and functionality

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



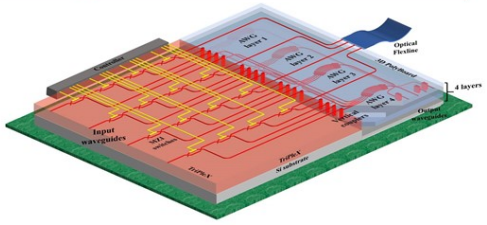


6

Objectives (IV)

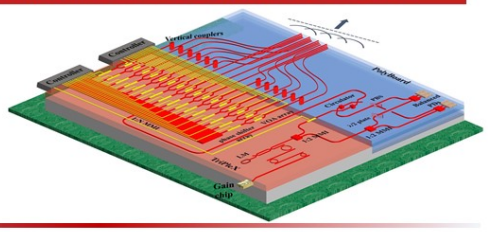
5) Develop 3D PICs for large-scale optical switches with 20 ns switching time inside data center networks

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



7

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

8

Contact

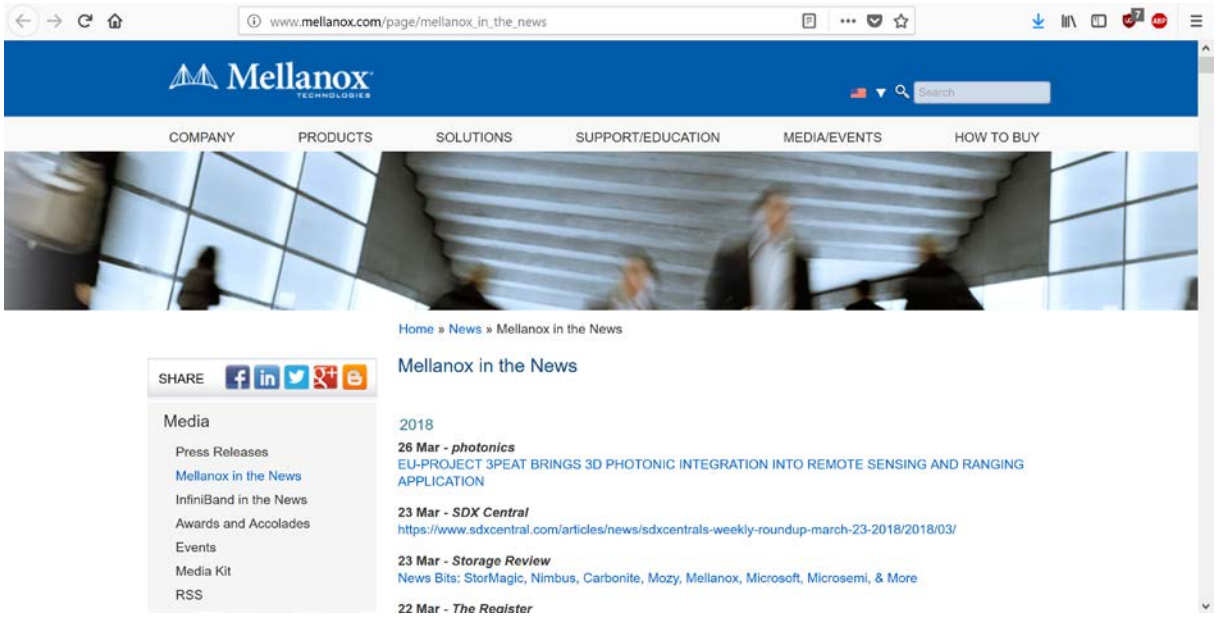
Project coordination

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

Appendix 3: 3PEAT press-release



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Press release – 3PEAT project

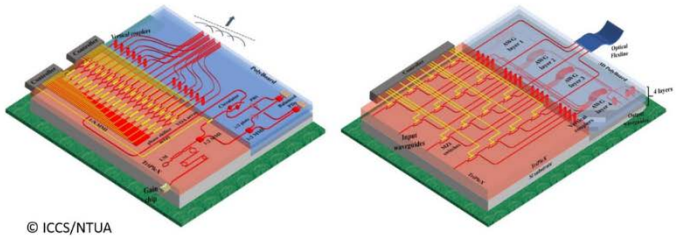
EU-PROJECT 3PEAT BRINGS 3D PHOTONIC INTEGRATION INTO REMOTE SENSING AND RANGING APPLICATION

The innovative EU-Horizon-2020 research project 3PEAT started in the beginning of January 2018 in Athens. The goal of the project is the joint development of a new kind of integration platform with low optical loss and high integration density for optical switching and remoting sensing applications. Under the coordination of the Institute of Communications and Computer Systems (ICCS), an international consortium comprising six companies (Optagon Photonics, LioniX, SolMateS, Cordon Electronics Italia, Mellanox and Polytec) and three research institutes (ICCS, Fraunhofer-HHI and Univ. Twente) aims to cover the whole fabrication of optical switching and remote sensing modules based on a 3D platform.

One of the major objectives of the project is the development of a fully functional 3D photonic integration platform based on the use of multiple waveguiding layers and vertical couplers in Fraunhofer HHI's PolyBoard technology, as a means to disrupt the integration scale and functionality. LioniX will offer its silicon-nitride platform (TriPleX) for the combination with this powerful 3D photonic technology via the development of a methodology for the deposition and processing of multilayer polymers inside etched windows on TriPleX chips.

Leveraging this 3D integration platform, the 3PEAT consortium will model and design optical switching and sensing modules (ICCS/NTUA, Optagon). This requires several key developments: a) the heterogeneous integration of PZT films on TriPleX platform for development of phase shifters and switches for operation up to 50 MHz (LioniX, SolMateS), b) a disruptive external cavity laser on the same platform with linewidth less than 1 kHz (UTwente, LioniX), c) for the first time, an integrated circulator on PolyBoard with isolation more than 25 dB (FhG-HHI), and d) the development of flexible types of PolyBoards for the purpose of physical interconnection of other PICs (FhG-HHI).

Integrated LDV | Active optical switch



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This enormous breadth of innovations will unleash the full potential of TriPleX and PolyBoard for optical switching and remote sensing and ranging applications. Target is an 36×36 optical switch with 20 ns switching time and possibility for power and cost savings of almost 95% compared to standard electronic solutions, and an integrated disruptive Laser Doppler Vibrometer (LDV), including its optical beam scanning unit, integrated on a very large, hybrid 3D PIC.

The PolyBoard and TriPlex platforms being individually extended as part of 3PEAT, are planned to be made available as a single integration platform in the future as well. The combination of the advantages of both platforms is expected to bring new capabilities in the design and manufacturing of integrated photonic components and to open new market opportunities, addressing industry's special needs by providing tailor-made solutions.