Interreg
EUROPEAN UNION
North-West Europe
OIP4NWE
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NEWS
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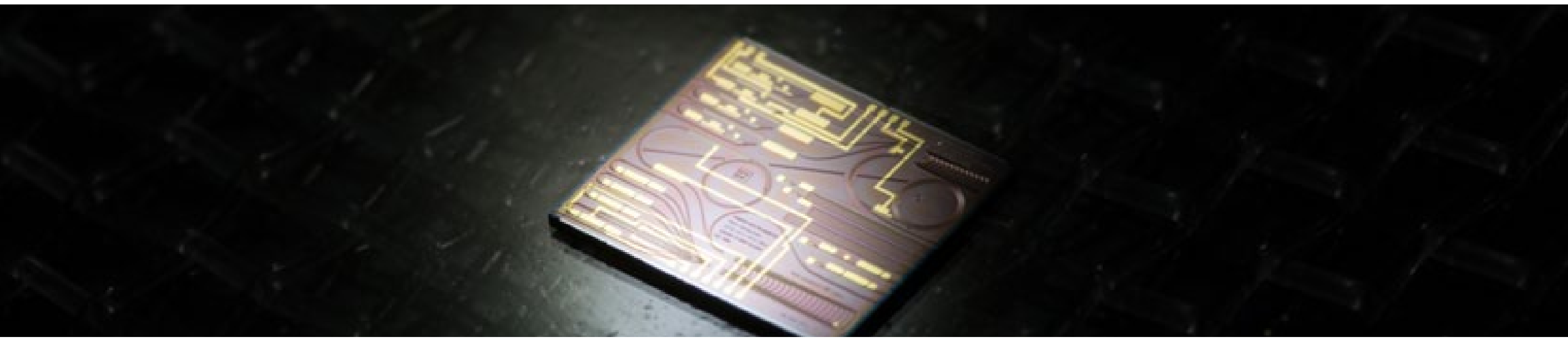
Enhanced and scalable photonic integration technology.

Open-Innovation Photonics pilot line for North West Europe

The The Interreg NWE project OIP4NWE aims at establishing an open innovation pilot line for the development of generic photonic integration technology. Integrated photonics is the emerging technology where the manipulation of light takes place on a chip, which could make some components an order of magnitude cheaper, smaller and more energy-efficient compared to today's solutions. By providing technology support to SMEs across Europe, the project contributes to strengthen the competitiveness and innovativeness of European SME sustainably on the global markets. The pilot line will be established in four phases:

Set-up

Create an open-access pilot line for generic PICs through open innovation. The pilot line will comprise 3 consecutive manufacturing stages for creating the raw PICs (part of the equipment will be installed at TUE, NL; manufacturing is done by SMART, NL), integration of optics (VUB, BE) and integral packaging (TNI, IE).



Validation

The pilot line will be evaluated and validated by the participating SMEs Technobis Fibre Technologies, mBryonics Limited and VTEC Lasers & Sensors.

Voucher

As first stimulation of uptake in SMEs, a voucher scheme for 7 external SMEs will be set up, to provide technology support which contributes to increasing the maturity of their product. We will share the activities of these SMEs in our dissemination activities as showcases during and after the project, showing what is possible within our open innovation model.

Long-term

A TransNational Network (TNN) will be set up including business clusters to reach out to SMEs in all relevant sectors. The current partners TNI (PIXAPP), TUE (JePPIX Pilot Line), VUB (ACTPHAST), Photonics Bretagne, Photon Delta and Cluster NMWP.NRW form a solid basis for this TNN.

Open innovation for more reliable PIC manufacturing Pilot Line part 1 – front-end.

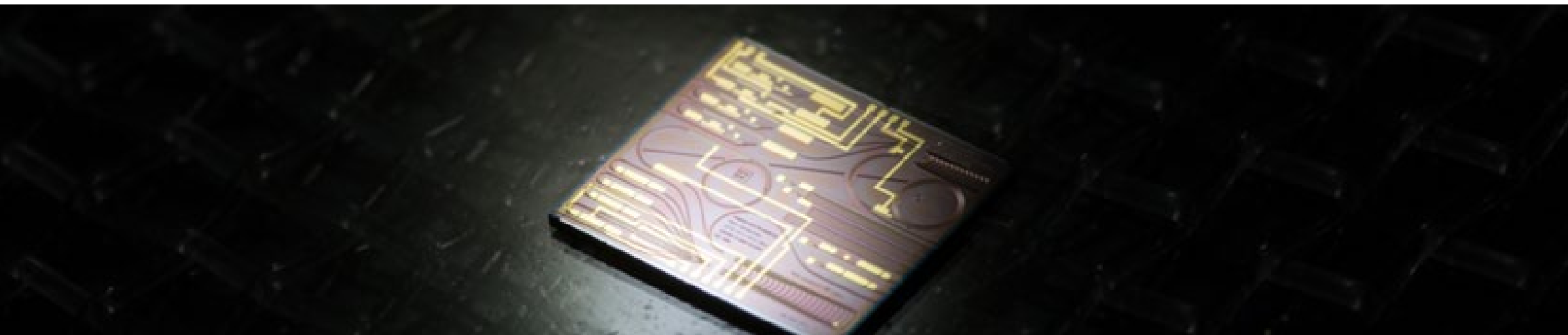
The front-end of the pilot line capabilities will be implemented at the premises of the Eindhoven University of Technology and will be complemented and operated by SMART Photonics during the project execution. The infrastructure investments will be instrumental for the transition to a manufacturing with higher yield and lower costs, enabled by more accurate processing of larger Indium Phosphide substrates (4 inch) with a high degree of automation in wafers handling.

The industrial research phase consists of equipment and process development for epitaxy, deposition of dielectrics and semiconductor etching, which are key processes in the manufacturing of PICs. The epitaxy and PECVD equipment will allow for highly uniform growth of semiconductors and deposition of dielectric layers, respectively, also, etching processes with high throughout and etch depth accuracy of waveguide structures will become available. Such state-of-the-art equipment and processes will be used to improve the maturity of PICs manufacturing.

Optical interfacing of PICs with the outside world Pilot Line part 2 – back-end: optics.

The first part of the back-end of the pilot line capabilities, involving the optical interfacing of PICs, will be implemented at the premises of the Photonics Campus Gooik of the Vrije Universiteit Brussel. The infrastructure and equipment investments will be instrumental for the manufacturing of high-quality micro-optical and micromechanical components with sub-micrometer precision and short machining times.

The industrial research phase consists of equipment and process development for the fabrication and integration of optical lenses and coupling struc-



tures that are key in the interfacing of PICs with the outside world. Indeed, light sensing and light generating PICs (e.g. for medical, automotive, agrifood) need optical in- and outputs. Laser-based micro-machining allows the fabrication of refractive or diffractive optical components and of mechanical alignment features to achieve high-precision alignment and high-efficiency coupling to the PIC for various applications. In addition, it allows the creation of optofluidics devices where an interface between the PIC and microfluidic channels is foreseen to achieve high-performance labs-on-chips. Such state-of-the-art equipment and processes will be used to improve the robustness and the maturity of PIC interfacing.

Integrated Photonics Packaging Pilot Line part 3 – back-end: packaging.

The second part of the back-end of the pilot line capabilities will be implemented at the premises of the Tyndall National Institute in Cork, Ireland and will be operated by Photonics Packaging Group during the project execution. The infrastructure investments will be instrumental for the optimisation of the ultra-precision connectors required for PIC packaging. The industrial research phase consists of the equipment and process development for a fully PIC packaged solution, therefore interfacing the PIC to the environment via an assembly of optimized connections with glass-fibres and electronics. The assembly of multilevel electrical interposers in glass/ceramic will be designed for high-frequency applications and high density PIC connections. The aim is to increase the electrical alignment control thus reducing the rejection rate in conjunction with an improvement of the fiber alignment procedure to guarantee a high standard connection characterized by low loss optical coupling together with a fundamental advance in the thermal management of the packages. This is crucial as high-frequency devices generate large amounts of heat that could negatively affect the PIC performance and ultimately irremediably damage parts of the circuit.

The Interreg NWE-Project "OIP4NWE" aims at establishing an open innovation pilot line for the development of a generic photonic integration technology for the production of Indium Phosphide Photonic Integrated Circuits (PICs). Integrated photonics is the emerging technology where the manipulation of light takes place on a chip, making the components an order of magnitude cheaper, smaller and more energyefficient compared to today's solutions. By providing these services to SMEs across Europe, the project reduces PIC access barriers and strengthens the competitiveness and innovativeness of European SME sustainably on the global markets.

Current generic PIC facilities are of a laboratory nature and inadequate for manufacturing and packaging PICs with cost-efficiency, speed and reliable quality. There is a strong need to increase the technology readiness level (TRL) from the current 4 to 7. The equipment for PIC manufacturing and packaging is of an innovative, specialised nature that cannot be obtained from a single country. As application of PICs grows, North-West Europe needs to stay ahead. Therefore, intense collaboration between innovation stakeholders at transnational level is an important goal of the project.

The project is funded by the Interreg North-West Europe programme, which fosters transnational cooperation to make North-West Europe a key economic player and an attractive place to work and live, with high levels of innovation, sustainability and cohesion.

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