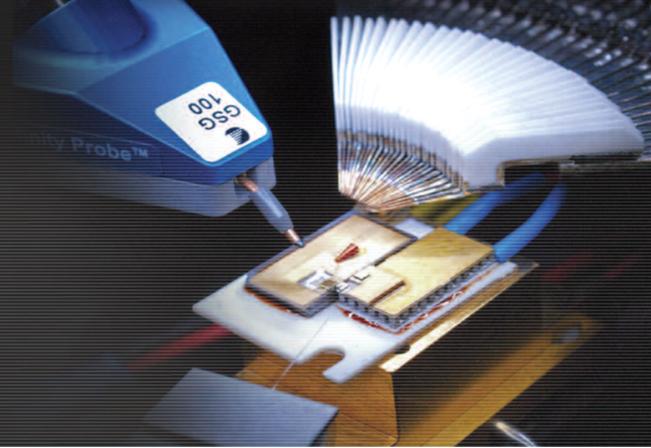




## Photonic Integrated Circuits Manufacturing Pilot Lines



The manufacturing pilot lines enable businesses to transition from first prototypes to pilot production. There are four manufacturing pilot lines specific to PIC technology addressing silicon nitride, indium phosphide, packaging and equipment technologies as well as a number of related initiatives for photonics in the wider sense. Pilot lines enable SMEs in Europe to take their photonic integrated circuit ideas, scale-them up, and validate them with customers for commercial production. The pilot-lines provide a reduced-barrier-to-entry via cost-effective pricing. A key remit of all existing and future pilot lines is to become sustainable after the initial 4-year duration and offer their state-of-the-art technologies and services on a fully commercial basis. The pilot lines will give SMEs easy access to advanced manufacturing services and cost-intensive infrastructures together with the expertise needed to manufacture new and innovative products. There are now four pilot lines with a specific focus on PIC technology.



**InPULSE** InPulse (coordinated by TU/e) is the latest addition to the European photonic pilot-line projects and it specifically targets indium phosphide photonic integrated circuit technology. The pilot line will be offering design, testing and pilot production services in indium phosphide devices and circuits with extensive capabilities for pre-production runs and support for the transition to volume production. InPulse is expecting to have new manufacturing process design kits from the start of 2021 for customer trials. Access to prototyping services is already up and running, using the technology and ecosystem from JePPIX.eu.



**PIX4life** PIX4Life (coordinated by IMEC) is focussed on a state-of-the-art silicon nitride photonic integrated circuit technology for health applications. The project provides the customers with the production technology to make compact, low-cost, detection and imaging systems in the visible range. PIX4Life will scale up existing platforms in order to bring silicon nitride systems towards commercial production and industrial take up. Potential use cases are expected to include biosensors, cytometers, DNA sequencers, gas sensors, microscopes and

medical imagers. The PIX4Life pilot line drives leadership in health applications by making this technology accessible to industrial and academic customers together with the necessary design, packaging and test services.



**PIXAPP** PIXAPP (coordinated by Tyndall Research Institute) is the world's first open-access photonic integrated circuit (PIC) assembly and packaging pilot-line, and helps users exploit the breakthrough advantages of PIC technologies. The PIXAPP gateway provides a unified entry point to a comprehensive range of assembly methods, packaging technologies and provides a route to pilot production of packaged parts. The consortium includes Europe's leading industrial and research organisations and provides users with single-point access to PIC assembly and packaging. PIXAPP bridges missing gaps in the value chain, from assembly & packaging, through to equipment optimization, test and application demonstration.



**Interreg North-West Europe OIP4NWE** OIP4NWE (coordinated by TU/e) will create an efficient open-innovation pilot-production line for shared use by European SMEs, through innovations in manufacturing equipment. The focus is on reducing the defect rate, variability in production and shortening throughput time. The new infrastructure ensure that future technology nodes provide major performance advantages at reduced cost, significantly lowering the threshold for developing new photonic products.

In addition to the PIC pilot lines, there are photonics initiatives across the broader range of photonics technologies within Europe including ACTPHAST, the pilot lines LYTEUS and MIRPHAB, and there are plans to support further pilot lines addressing free-form optics and optical medical devices:

ACTPHAST (coordinated by Vrije Universiteit Brussel) is a key part of the European photonics-ecosystem and is complementary to the work of the pilot-lines. ACTPHAST reaches out to SMEs and provides photonics and non-



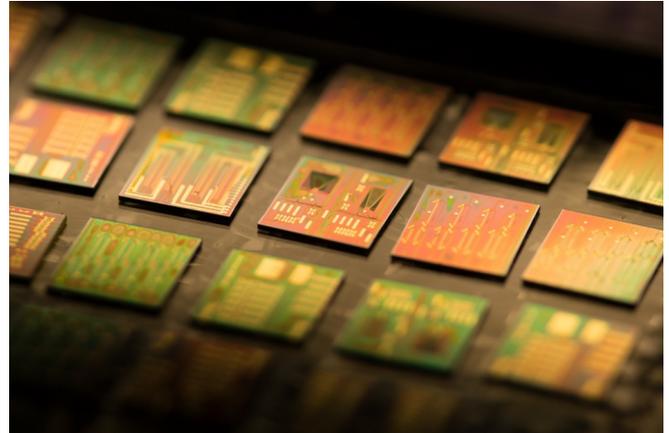
photonics companies and researchers with one-stop-shop access to a wide range of cutting-edge photonics technology platforms from Europe's top research centres. The ACTPHAST network offers a single streamlined way to access 200 of Europe's experts and technologies from 24 of Europe's leading photonics research institutes. This provides structured, user-driven projects to develop PIC prototypes with expert advice and assistance. The initiative has recently been extended to include proof-of-concept prototyping for researchers.

LYTEUS (coordinated by the Holst Centre, originally known as PI-SCALE) offers world class capability in pilot production services for customised flexible OLEDs (Organic Light-Emitting Diodes). The technology provides large area, energy-efficient light sources that are ultra-thin, flexible and lightweight. These can be made or cut to any shape or size allowing new opportunities to create high value-added products in numerous application areas, ranging from architectural lighting and automotive to aerospace and consumer electronics. LYTEUS enables companies to quickly and cost effectively test and scale up their flexible OLED lighting concepts and turn them into market ready products.

MIRPHAB (coordinated by CEA-LETI) offers prototyping and production of innovative sources and sensors in the mid-IR range, for the detection of chemicals in gas, liquid, and solid media. The MIRPHAB platform is based on miniaturized laser systems and will allow the manufacturing of compact, low cost and low power consumption sensing devices, which can be used for safety, security and environmental applications. The industry partners involved in MIRPHAB are committed to deploy new products swiftly in the market and achieve prompt take-up in the environmental and chemical sensing areas.

The manufacturing pilot-lines are actively reaching out to businesses which wish to incorporate PIC technologies in their own products for cost and performance advantage.

They are specifically addressing the industrialisation aspects to ensure a robust route to manufacture.



*Example photonic integrated circuits produced on the indium phosphide platform for sensing and communications applications*

### Discuss your application with us

If you want to learn more on moving beyond prototyping, please contact the PICs4All consortium. Our consortium can orientate you in the technology eco-systems and identify opportunities for support and open access technologies. The PICs4All consortium is funded under the EU Horizon 2020 programme and brings together expertise of nine European Application Support Centers (ASCs). The ASCs can guide you through the existing eco-system of design houses, foundries, packaging and test services.

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