

# Dutch industrial partners in integrated photonics collaborate on PICs in space

11 May 2020

*Eindhoven, the Netherlands,*

**At the end of April, the Dutch consortia of the PhotonDelta Flagship project jointly kicked off the project. The project addresses the realization of a robust and versatile hybrid integrated photonics platform that provides scalable solutions for a suite of applications. Moreover, with two proven technology platforms within the Netherlands, InP and TriPleX, the PhotonDelta Flagship project demonstrates scalability to high-volume manufacturing aiming for space quality modules; the highest quality grade in industry. Hence, this project indirectly also supports several industry and application driven roadmaps.**

The PhotonDelta Flagship project connects and involves the main Dutch industry players in integrated photonics, which are now jointly collaborating in the PhotonDelta ecosystem. The consortia is chaired by LioniX International, and involves six SME's - Bright Photonics, EFFECT Photonics, SMART Photonics, PHIX Photonics Assembly, Technobis Fiber Technologies, VTEC Lasers & Sensors - and the Space and Semiconductor departments from TNO. The companies cover the entire supply chain from chipdesign, chip manufacturing, assembly, packaging and testing. Co-initiator and co-funder of the project is PhotonDelta, (the Dutch public private partnership for photonic integration).

With their proven advantages of size, weight and power consumption Photonic Integrated Circuits (PICs) are on the verge of a breakthrough in the space applications, once proven its robustness and reliability for harsh environments. Still OEMs are reluctant, concerned and sometimes resistant to integrate unqualified components and novel platforms. Moreover, and apart from government funded initiatives, there is little, if any space-qualified industrial subcontractors in the Netherlands that have a track record of deliveries to European OEM's or have collaborated with integrated device manufacturer (IDM) in the space industry. *“By combining strengths within the supply chain in this PhotonDelta Flagship project, the entire supply chain is acting pro-active in order to fulfil the current needs of the space industry. We accelerate innovation and reduce time-to-market by closely working together in this project.”* says Arne Leinse, CEO of LioniX International, which is the lead partner of the project. *“The goal of the project is to prove the scalable supply of hybrid modules at a lower cost. By doing so, we lower the barrier for future customers.”*

Where electronic integrated circuitry is known for its compactness, high integration density of functions, robustness and excellent reproductivity in scalable volumes, photonic integrated circuits need to prove their mechanically robustness, temperature stability, radiation hardness and scalability to low-cost solutions for many applications in healthcare, automotive applications and implementation in complex and novel aeronautics and space systems. *“The joint initiative of the PhotonDelta Flagship project secures manufacturing and*

*design competences, assembly and qualification capabilities in the PhotonDelta ecosystem. The project will result in a scalable supply of hybrid modules at decreasing cost and compliant with Space standards. We are convinced that this is an efficient approach to address future opportunities and implementation of PICs in space systems for satcom and optical communications and we are excited to be partner in this activity”* says Kees Buijsrogge Director of Space & Scientific Instrumentation at TNO.

With the PhotonDelta Flagship project, the participants will show a reliable production process with reproducible performance of the PIC platform, proving space requirements can be met. The envisioned activities include implementation of process control, definition of standards derived from best known methods in the PIC industry that are compliant with the requirements of the SPACE and Aeronautics OEMs, serving a suite of applications including optical communication & sensing. *“The project results will provide proof of the performance capabilities of the integrated photonics platform for SPACE. Meanwhile we innovate by close cooperation, we will enable spin-off and further acceleration for manufacturing of a variety of novel components and serve a suite of applications beyond SPACE. Therefore, we are happy to support this project”* says Ewit Roos, CEO of PhotonDelta.

---

### Press Release ends here

For more information contact Dr. Arne Leinse ([a.leinse@lionix-int.com](mailto:a.leinse@lionix-int.com)) or Ewit Roos ([ewit@photondelta.eu](mailto:ewit@photondelta.eu)).

#### **Background**

With a track record and significant history in PIC manufacturing, since the 1980's when Philips Optoelectronics started with the production of integrated lasers for the compact disk player, and later blue-ray. Many of the companies, currently building the PIC ecosystem in the Netherlands, have their roots related to the activities in the 80's and 90's after which the activity was transferred to the USA and China after acquisition by JDS-Uniphase. Since then, the Dutch ECO System is built on the expertise of veterans in the industry, of which many are still under the umbrellas of the current players or affiliated to these players as senior management, coaches, consultants or members of the advisory board hereby securing expertise and know-how in the Dutch ECOSYSTEM.

#### *About Lionix International*

**LioniX International** is a leading global provider of customized microsystem solutions, in particular integrated photonics-based. LioniX International provides customized solutions for OEMs and system integrators, from design to fully assembled modules, by vertical integration and in scalable production volumes. LioniX International focuses on Photonic Integrated Circuits (PIC) enabled modules based on its proprietary silicon-nitride waveguide technology (TriPleX™) and has driven the technology development and commercialization of photonic

integrated circuits for a suite of applications since 2001. Technology leadership is secured by maintaining the strong IP position. The vertical integration allows a focus on volume microsystem applications for worldwide customers by enabling more rapid advancement from R&D concepts towards high-volume integrated solutions. The full, vertical integration allows a true one-stop-shop service to the customers.

[www.lionix-international.com](http://www.lionix-international.com)

#### *About PhotonDelta*

**PhotonDelta** consists of a cohesive cluster of companies, including Lionix International, and knowledge institutes who have partnered and work intensively together to collectively offer state-of-the-art design, development and (volume) manufacturing of integrated photonics technologies and components. Such a collective and long-standing effort has led us to acquire unique competences and assets in the domain of customized PICs and PICs-based modules/subsystems. By working together within a mission-driven ecosystem, we innovate, reduce time-to-market and create economy of scale that benefits us all. PhotonDelta Foundation provides access, knowledge, business development and funding to our partners. Our goal is to facilitate companies and further establish growth of the integrated photonics cluster by 2026. Funding is made possible by substantial financial contributions from our partners as a result of our 'partnerconvenant PhotonDelta' and the "RegioDeal Brainport Eindhoven".

[www.photondelta.eu](http://www.photondelta.eu)

#### *About Bright photonics*

**BRIGHT Photonics** is an independent design house for photonic integrated circuits (PICs), founded in 2010, and the first commercial PIC design house to provide access to generic PIC foundry technology. Our office is located in the photonics heart of the Netherlands, Eindhoven. Bright makes PIC technology accessible to businesses, research institutes and universities. We perform, concept studies, product development support through photonic engineering, prototyping, design support on component- and full mask level. We provide our own state-of-the-art open source design platform "Nazca" to the photonics community as a service. We work in technologies SOI, InP, SiN, glass and polymers for custom, commercial and research foundries.

Design projects range from technology development with foundries to full commercial wafer layout for production. In addition to mask design BRIGHT Photonics develops process design kits (PDK), either as a part of the foundries own PDK or as extensions to the foundry's PDK. These greatly speed up the design process and quality.

#### *About EFFECT Photonics*

**Effect Photonics** is a research-performing SME based in Eindhoven, with a 100% owned subsidiary company in the UK (EFFECT Photonics Ltd). It was founded by Dr. Boudewijn Docter (President) and Tim Koene (CTO) in 2010 and was spun out of the prestigious Eindhoven University of Technology (TU/e) in 2013. The company is now a team of >100 people. EFFECT Photonics develops and delivers optical communication products based on InP (Indium Phosphide) photonics integration using a fabless business model. The PIC design expertise is combined with a unique low-cost packaging technology, developed in-house specially for

highly integrated system-on-chip products. The Eindhoven facility is the main design center and sales center, while the facility based in Brixham, UK performs the micromechanical packaging, module assembly and reliability engineering. A well-balanced management team of innovative engineers and industry business professionals lead the company. In late 2014 the company won Best Company award at the Invest in Photonics Event in Bordeaux, and in March 2017 it won the prestigious PIC award for “Advances in Integration” in Brussels.

#### *About SMART Photonics*

**SMART Photonics**, located in Eindhoven, The Netherlands, is a foundry offering production services for mainly Indium Phosphide based photonic components. We are an independent pure-play foundry, using our knowledge, experience and equipment to produce photonic components for our customers, based on their designs. We offer the complete production process from epitaxial growth and re-growth, processing, polishing and dicing of wafers into chips. As an independent Pure-Play foundry we support our customers from the proof of concept phase up to and including full production. As a foundry, we also offer single or combined process steps to complete or being a back-up for the production processes of customers.

#### *About PHIX Photonics Assembly*

**PHIX Photonics Assembly** ambition is to become the world’s first automated photonics assembly and packaging line for medium and large volume photonic integrated circuits (PICs), photonic components, assemblies and modules. PHIX will sell photonic components and assemblies, act as component or module manufacturer and subcontractor for OEM and Tier 1 customers and provide education and training on photonics assembly and packaging in collaboration with its academic partners.

#### *About Technobis Fiber Technologies*

**Technobis Fiber Technologies** offers leading edge PIC-enabled products in aerospace and healthcare, leveraging the size, weight and precision advantages for InP PICs to implement the readout function for discrete distributed fibres optic sensors. Technobis is an early adopter of PIC technology in fibre optic sensor readout technology. Through sustained innovation both in terms of PIC design and also in terms of assembly and module assembly, the module size has been reduced by orders of magnitude to enable prototypes to be applied in aerospace markets. PIC technology will play a significant role in Industry 4.0 with its ability to provide reliable, miniature, low cost but high-performance components and systems for instance for Fibre Optic Sensing and Datacom (i.e. DataSense™) solutions in all markets.

Technobis will be able to address growing needs in maintained / improved performance, reduction in Total Cost of Ownership (TCO), Condition based Maintenance (CBM), Health Monitoring, throughout multiple demanding market sectors in stringent environments, including Aerospace (civil and military), High-Tech (performance), Medical (commodities, disposables), Energy (nuclear, green energy).

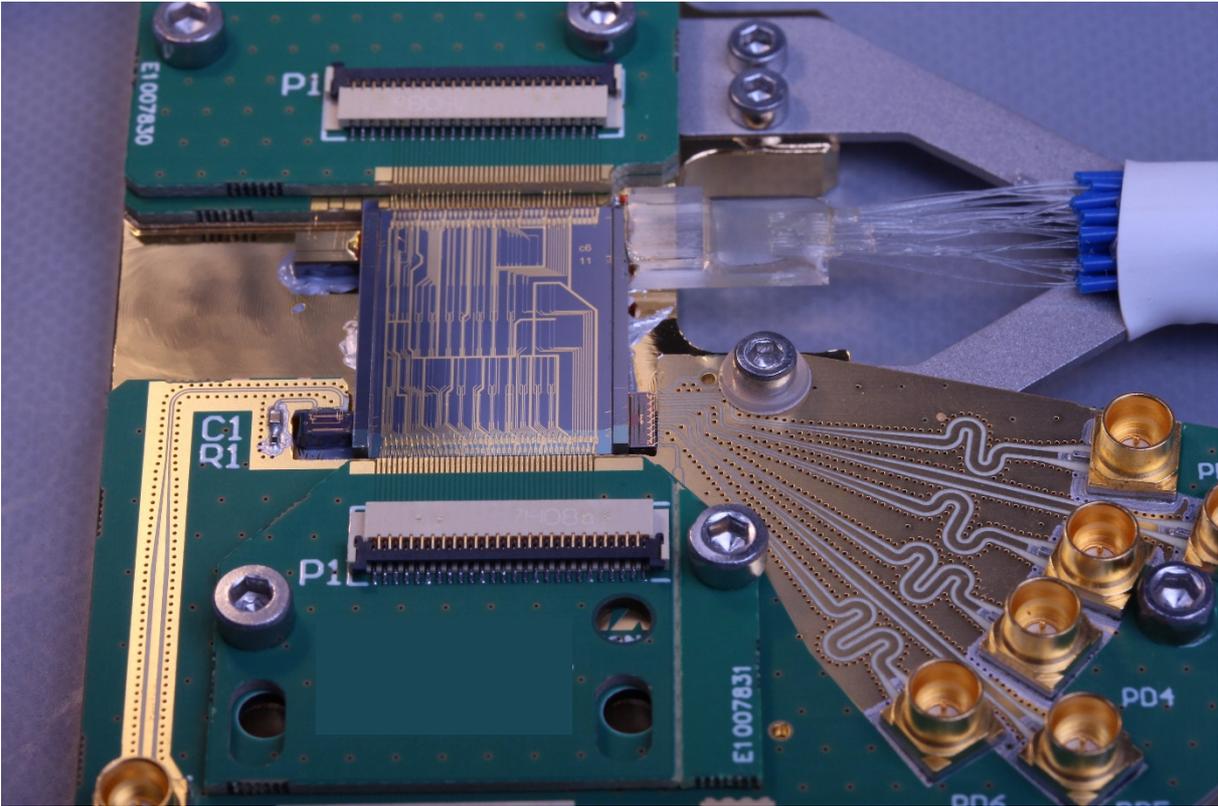
#### *About TNO*

**TNO** ambition is to become a world leader in the development optical satellite communication systems. In doing so, TNO intends of harboring the ambitions of the Dutch industry to provide recurring products to the commercial market. TNO recognizes the importance of photonic

modules in this field, especially to achieve functionalities that are impractical or even impossible to realize otherwise while meeting requirements on performance, robustness, stability, operating temperature range, size and weight. We have applied photonic devices mainly for sensing applications, and are experienced in the main material platforms TriPleX, InP, SOI and polymers. We rely on foundries to fabricate and package photonic chips for us and our customers. Our focus is on photonic system architecture, in which we can design the chips ourselves, and where we have a thorough understanding of the potential and the pitfalls of photonic chips.

*About VTEC Lasers & Sensors*

**VTEC Lasers & Sensors** located in Eindhoven, The Netherlands, was founded in 2011 and its experience dates back to the 1980s at the time of the invention and first production of the 780 nm Compact Disk lasers. We are an independent organic growing company developing, manufacturing and selling high tech products.



*Description of the picture:*

The big chip (Photonic Integrated Circuit; PIC) in the center is the photonic processor, manufactured in silicon photonics technology, in particular using proprietary ultra-low-loss silicon nitride (TriPleX™) waveguides. The smaller “satellite” chips are InP modulator (left), gain chip, and detectors (Photodiodes: PD) respectively. The Hybrid InP-TriPleX platform has RF (gold connectors), DC (white 25-pins connectors) and optical fiber interfaces (16), along with the bias and power that feed the gain chip in the upper left corner of the picture. The compact module measures 10 cm x 10 cm x 3 cm, weighs 200 grams, and is attached to a Thermo-Electric Cooler (TEC) and a copper base plate for accurate temperature stabilization.

The module is a 30 GHz, RF-to RF 1-to-4 integrated Optical Beamforming Network, using true-time delays and can be used in beamforming applications for terrestrial (5G) and satellite communications.