PHOTONICS PUBLIC PRIVATE PARTNERSHIP

*Press Release*

# InP on SiN Photonic integrated circuits realized through wafer-scale micro-transfer printing

**Eindhoven, March 9, 2021: New H2020 project INSPIRE will revolutionize photonic integrated circuit technology by combining highest optoelectronic efficiencies in InP photonics and lowest optical loss in SiN photonics, in a single platform through wafer-scale micro-transfer printing technology.**

Major photonic integration platforms, i.e., silicon, silicon nitride (SiN) or indium phosphide (InP) based, are now mature and make their impact in the real world, for example by enabling our internet. The potential for wider impact in other fields, such as sensors, is clear. However, the performance trade-offs within a single platform are sometimes limiting the uptake. Most notably, applications in high-performance fiber sensors, for example for infrastructure monitoring, and microwave signal processing, for example for Radar systems, would require low-noise operation, which requires the combination of best-in-class actives, such as lasers, modulators, and photodetectors, with ultra-low loss waveguide propagation. This requires the combination of such platforms, taking a “best of both worlds” approach. By ensuring scalability and manufacturability, major impact on these demanding application fields is expected.

Our platform, through wafer-scale micro-transfer printing technology, will allow us to combine high-performance III-V opto-electronic components, such as InP-based semiconductor optical amplifiers, high-speed modulators and photodetectors, operating in the C-band, with the low-loss passive functionalities of the SiN platform, like filters and delay lines. The micro-transfer printing integration, on 200-mm silicon wafers, enables high-throughput integration of III-V devices on SiN photonic integrated circuits, which is key for low cost and scalability. To show the potential to impact a wide range of high-volume-markets, the INSPIRE technology will be validated by three use cases: a distributed fiber-sensing readout unit, a microwave photonic radio-frequency pulse generator, and a datacentre switch fabric. Compact models of the III-V opto-electronic components will be developed, enabling designers to exploit this platform for a wide range of applications.

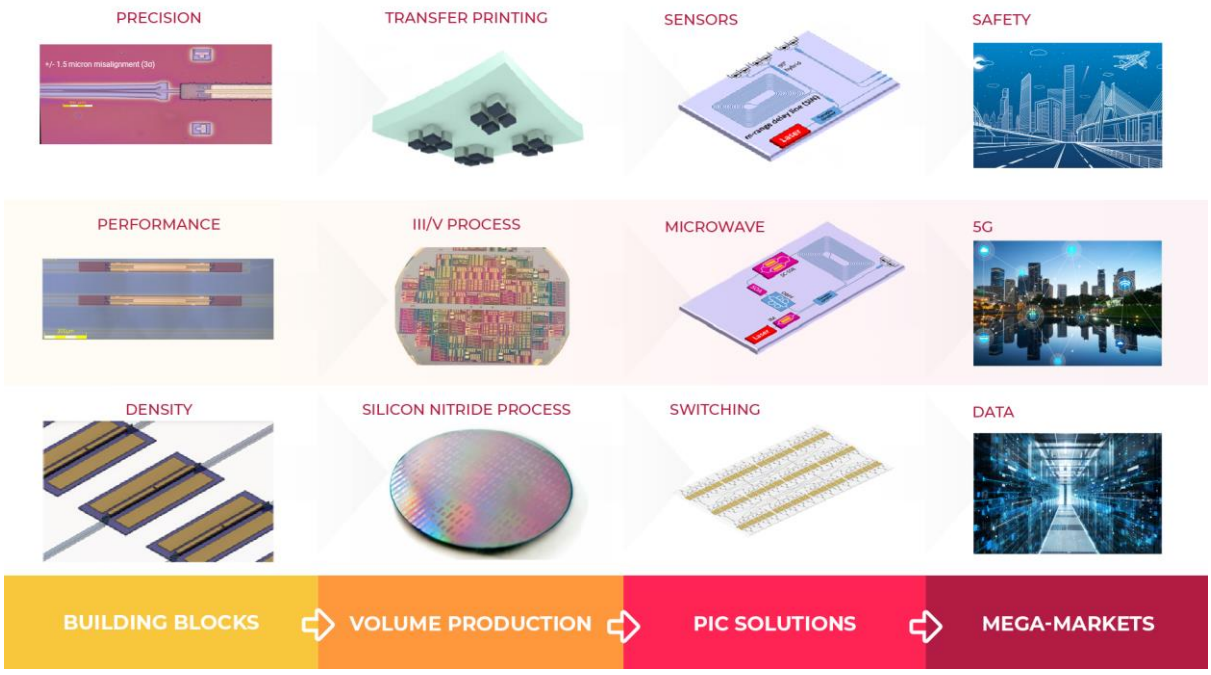
The potential of the technology is highlighted by the participation of industrial partners. Dr. Jerome Bourderionnet from THALES notes: “*The INSPIRE platform enables high performance building blocks,*

*such as low-linewidth lasers, which are at the heart of THALES' applications for optical signal processing at large integrated systems.*"

INSPIRE will sustain Europe's industrial leadership in photonics by combining the generic integrated foundry technology at the pioneering pure-play foundry SMART Photonics and the silicon photonics pioneer imec, with the micro-transfer printing technology at X-Celeprint, making this a world-first platform that combines the strengths of two of the most well-known PIC manufacturing platforms. It will also strengthen the European manufacturing base, by developing and implementing processing steps that are key to removing expensive assembly steps in photonic-IC-based product realization. The methods will be developed for SiN-InP integration but can be transferred to silicon photonics too.

"*By combining the mature SMART and imec technologies, with only minor changes to the fabrication processes, we can leverage the major investments in the development of these platforms, done over the last decade. We thus significantly reduce the time needed to transfer our technology out of the lab and serve these new and demanding markets*," says the INSPIRE coordinator, prof. Martijn Heck from Eindhoven University of Technology.

INSPIRE creates a full-function PIC platform, compatible with open-access pilot manufacturing and with an order of magnitude lower cost for volume production. The generic approach makes the technology widely applicable and ensures that European innovators can focus their research and development directly on manufacturing platforms, for shorter time to market.




*INSPIRE in overview connecting building block innovation to high-growth markets*

*Project consortium INSPIRE:*

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| **Contact persons:** | **Coordinator:** | **Project Manager:** |
|---|---|---|
| **Name** | prof. Martijn Heck | Marika Kurova |
| **Organisation** | TU/e | AMI |
| **Email** | m.heck@tue.nl | kurova@amires.eu |
| **inspire-h2020.eu** | | |

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