PHASTFlex

TU/e Technische Universiteit Eindhoven University of Technology

Fundamental breakthrough in packaging of photonic integrated circuits

TU Eindhoven is pleased to announce the start of the international R&D project PHASTFlex. This project, which is co-ordinated by TU/e, aims at a fundamental breakthrough in the way photonic integrated circuits are packaged, making the technology much cheaper to access and bringing all kinds of new, sophisticated products within arm's reach.

Optical chips, chips that work with light signals instead of electronic signals, are in increasing demand, for example to help process ever-growing Internet traffic flows. They are often referred to as Photonic Integrated Circuits (PICs). What is less well known is that they also have great potential in many other application areas. It is now widely recognized that the ever larger data flows in computers, in data centres and in processors with dozens of arithmetic cores require optical components as well. Low cost PIC based readout units for fibre based structural sensors could revolutionize engineering approaches in wind turbines, aeronautics and in structural engineering.

A long standing problem for the deployment of optical circuits based on Indium Phosphide has been the small size of the optical waveguides compared to the standard transmission medium – glass optical fibre. High-precision alignments are needed (certainly better than ±0.25µm), which makes packaging, which achieves the coupling of the light from the PIC to the optical fibre, expensive. The PHASTFLex project focuses specifically on finding a solution to this technical problem.

PHASTFLEX proposes the development of a fully automated, high precision, cost-effective assembly technology for next generation hybrid photonic packages. In hybrid packages, multiple Photonic ICs are assembled, combining the best of different material platforms for a wide range of applications and performance. In PHASTFlex, InP PICs with active functions will be combined with passive TriPleX^{TM} PICs on a ceramic carrier. PIC fabrication can now be done in a generic foundry-based process, bringing PIC cost within the scope of many applications (~10-100€). However, current assembly and packaging technology leads to custom-engineered solutions; packaging is an order of magnitude more. Photonics21 refers to *new approaches to packaging* as a key challenge.

The most demanding assembly task for multi-port PICs is the high-precision (±0.1µm) alignment and fixing of waveguides. The PHASTFlex consortium proposes an innovative concept, in which the waveguides in the TriPleX PIC are released during fabrication to make them movable. Actuators and fixing functions, integrated in the same PIC, place and fix the flexible waveguides in the optimal position (peak out-coupled power). The project aims to develop a complete assembly process and the necessary tooling to implement this concept, including pre-assembly using solder reflow and automated handling, and on-chip micro-

fabricated fine-alignment and fixing functions. Fully automated cost-effective and high-performance solutions will also encourage providers of photonic packaging services to locate in EU economies rather than in the Far East.

The consortium, which is led by TUE in collaboration with LioniX BV in the Netherlands consists of nine partners in total; seven industrial (LioniX, Oclaro Technology, IMST, TELNET, Willow Photonics, AifoTec and FiconTec) of which two provide applications (Oclaro, TELNET), and two are universities (TU Delft, TU Eindhoven). All are recognized to be leading industrial and research entities in the photonics components and systems industry.

The project duration will be three years, the total cost will be ~3.9M€, and the requested EU contribution is ~2.8M€: a modest amount indeed for a project with the potential to open the door to a new market, potentially worth tens of billions of euros.

PHASTFlex: ***P****hotonic* ***H****ybrid* ***AS****sembly* ***T****hrough* ***Flex****ible Waveguides* is funded through EU FP7 (Project Number: 619267)

Website: www.phastflex.eu

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