

FLEXIT

The high volume production line for Integrated Photonics

Photonic integrated circuits (PICs) play an essential role in finding and developing solutions to many of the world's critical problems, such as reducing energy consumption, improving healthcare, fighting food waste and meeting our continuous hunger for information. However, a generic solution for the assembly and packaging of photonic chips does not currently exist. The FLEXIT project, which runs from January 2022 to December 2023, therefore sees an opportunity to unite high-tech companies in the Netherlands and push forward this highly promising domain.

The FLEXIT project will enable this through the further development of the FLEXIT method to process photonic chips at an industrial level. Through a design tool for product development and the mapping of the entire digital chain, the project will also optimise all production processes in the supply chain. Ultimately, two demo products will be selected to test the supply chain according to a new FLEXIT product standard for mass production, through which manufacturing yield will rise, costs will be reduced and delivery reliability can be maintained for the foreseeable future.



EUROPEAN UNION

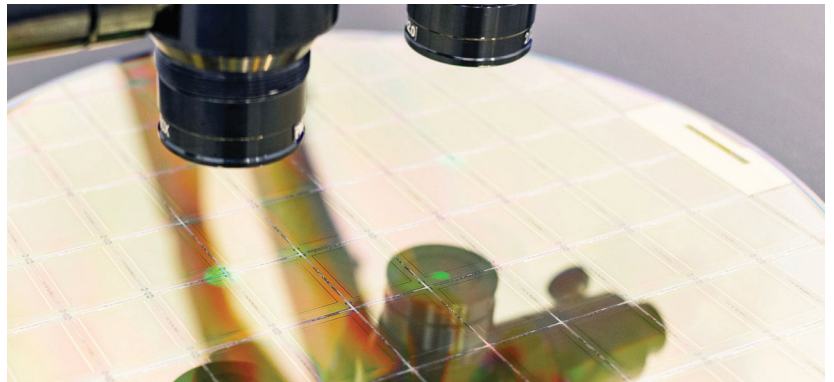
European Regional Development Fund.
Funded as part of the Union's response to the COVID-19 pandemic



European Regional Development Fund

IMS delivers critical equipment in the FLEXIT supply chain

Over the past decades, Integrated Mechanization Solutions, better known as IMS, has become an expert in handling production systems and processing delicate components with high accuracy. This expertise and experience have brought them to a leading role in the development of new photonics metrology equipment that is much needed in this industry – as well as in the FLEXIT project.



Cross-project connections

Production systems for precision optics and photonics rely on advanced metrology solutions to secure consistent performance at high accuracy and provide essential production data for quality control and continuous improvement to its users. No high-accuracy product is achieved without proper quality assurance and control; IMS' metrology equipment is therefore a must to guarantee that FLEXIT's technology is produced properly at a wafer level and is ready for implementation in back-end assembly and packaging.

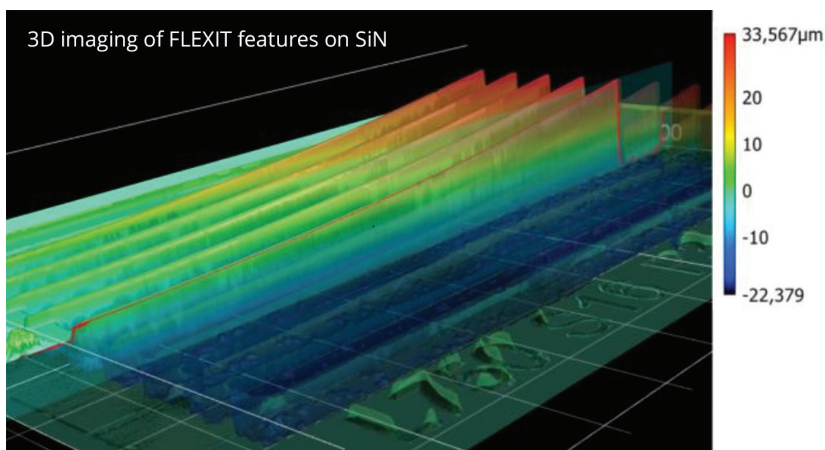
IMS is also contributing extensive experience in the field of high-volume production and test processes: the scaling up of (photonics) production requires not only a thorough understanding of the combination of fast and accurate part handling in specific environmental conditions but also sound, reproducible metrology procedures, a lot of data processing and excellent user interfacing for operators controlling the equipment.

Alongside FLEXIT, IMS is leading a consortium developing photonic wafer visual inspection equipment and photonic wafer level functional probing systems in the MEKOPP project (the Dutch abbreviation for 'Metrology Equipment for Critical Upscaling of PIC Production'). In 2023, the first launches of this metrology equipment will be announced. As part of this launch, the photonics wafer visual inspection system Helios will be tailored to the FLEXIT project as this presents a new application area. With the Helios system, the FLEXIT features on silicon nitride (SiN) created by LioniX and on indium phosphide (InP) created by SMART Photonics can be inspected. This is a necessary and critical step to ensure proper front-end photonic integrated circuit (PIC) production, as well as the correct starting point for back-end integration of the components.

Downstream and upstream

FLEXIT offers IMS several new dimensions for its photonics visual inspection systems. Firstly, this project is an excellent setting in which a complete supply chain/production chain demonstrates that close cooperation between partners involved in PIC production and integration will bring about more than just the sum of the individual companies. Every step in the process has consequences both downstream and upstream, which makes it necessary for each partner to understand how its contribution affects that of the other partners. The IMS team therefore includes hardware and software system architects, optics/photonics specialists and a variety of engineers and technicians to design, build and test the system, as well as a project manager to coordinate IMS' overall part of the project.

Secondly, the FLEXIT project is a new and specific application of the IMS photonics visual inspection system Helios. Exchanges of product and process information between the 11 partners in FLEXIT are necessary to make optimal use of Helios. The design of the first version of this system is now ready and IMS will build the system in the third quarter of 2023. Photonic wafers are being produced by LioniX and SMART Photonics with dies that are provided using FLEXIT technology and, in the final quarter of 2024, the Helios system will be put into action to inspect the FLEXIT features.



A global ambition

Both within FLEXIT and outside of it, IMS develops its metrology equipment to meet the specific needs of the photonics industry. With an installed base of over 750 high-precision production systems worldwide, the company truly understands the intricacies involved in scaling up from low to high volume production and testing. The vast majority of these systems include optical and other types of metrology modules that are able to assess production process quality in an in-line and/or end-of-line manner. IMS has a proven track record in designing, supplying and supporting robust and reliable equipment architectures with high value-added subsystems or modules, providing its customers with an excellent competitive advantage. These are the skills that IMS is bringing to FLEXIT and further developing within the project, feeding its ambition to become a leading provider of photonics production and test equipment.

FLEXIT project partners

Chilas

Development and production of semiconductor lasers based on several materials with high power in combination with integrated technology.

IMS

Development of production and assembly lines for hybrid microsystems with added value like lenses for smart phones, medical implants and microsystems.

LioniX International

Develops and commercialises silicon nitride (SiN)-based waveguide technology (TriPlex) for a variety of applications and is leading the photonic sector.

PHIX

World-leading packaging and assembly foundry for Photonic Integrated Circuits (PICs), building optoelectronic modules based on all major PIC technology platforms in scalable manufacturing volumes.

Salland Engineering

World-leading in test technology and engineering, specialised in solutions and services to improve efficiency and quality testing at semiconductor manufacturers.

SMART Photonics

The first "pure-play foundry" in the area of InP PIC production and on the verge of scale up.

Synopsys

Supports the project with design software and tools for the development of photonic ICs.

VTEC

Development and realisation of lasers and sensors for various photonic platforms. Assembly and packaging is taken care of including fibre connections.

Workfloor

Supplier of factory data collection systems.

High Tech NL

The national branch association for the Dutch high-tech industry. Its Semiconductors cluster is fully focused on the vast and strong semicon industry, operating as a 'single point of contact' in all steps of the value chain, driving and stimulating (international) cooperation, and initiating and facilitating (international) innovation and crossover projects.

Berenschot

A consultancy company that supports High Tech NL with grant proposal writing and project management and facilitates cooperation between companies and the growth of ecosystems.