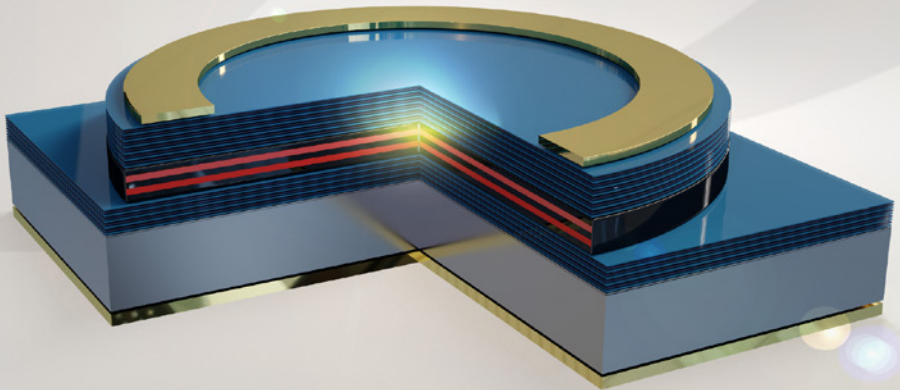




PHOTOGENIC

# A GAME CHANGER FOR THE PHOTONICS INDUSTRY

NOVEL LASER TECHNOLOGY



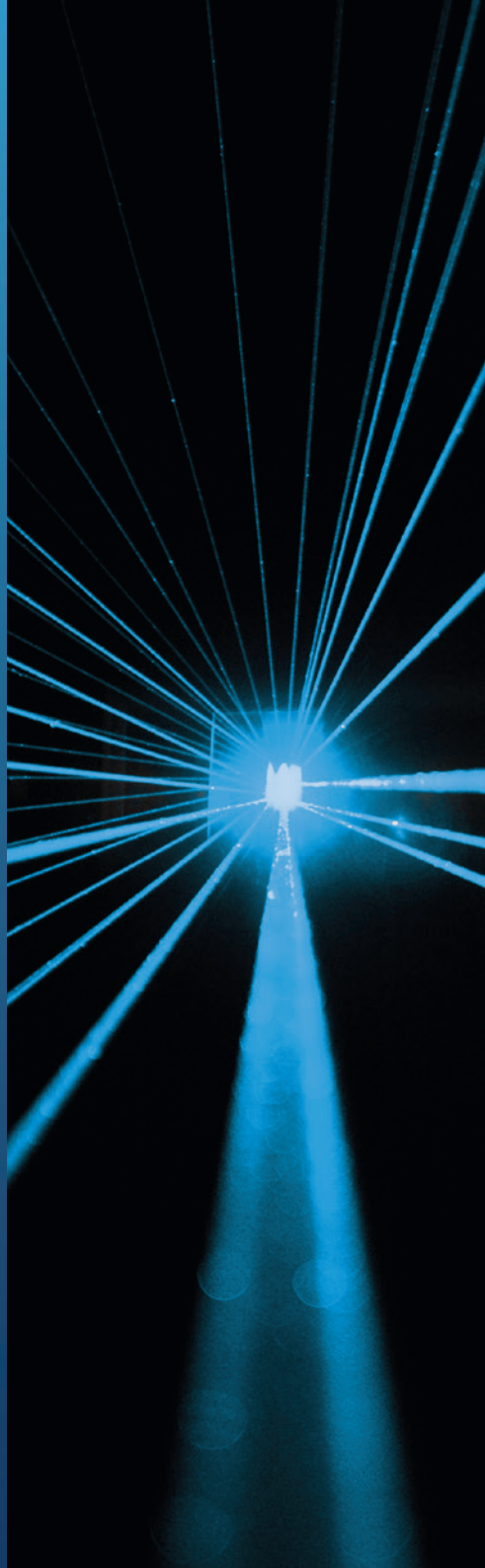
The PhotoGeNIC project is funded by the European Union under grant agreement No. 101069490. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.



PHOTOGENIC

## About

As the VCSEL sector is developing dynamically with lasers' production expected to triple in the next five years, the project, with its innovative Ge-VCSEL solution, has the potential to be a game changer for the photonics industry. Demonstration of high performing devices of Ge-on-Si can unlock potentially large markets from optical data communications to imaging, lighting and displays, to the manufacturing sector, to life sciences, health care, security and safety. The new technology developed within the PhotoGeNIC project is expected to provide higher yields and severely reduced carbon footprint with recycling possibilities along every step. The projected results also include the production of larger Ge wafers with improved quality, uniformity and lower defects densities, which will enhance epitaxial technology on Ge substrates and increase the reliability of the device fabrication process.





## Vision

The PhotoGeNIC consortium was born of the idea to introduce Ge substrates to the VCSELs manufacturing process. The goal is to meet the demand of constantly growing photonics market by providing a novel solution that will increase the production yield, reduce the defectivity,

and introduce reduced impact on the environment. On top of that we believe that the project findings can be developed into usable tools and leave an innovative change across various end-user industries (e.g. automotive, smart phone, 3D sensing technologies)



## Motivation

The PhotoGeNIC team is driven by the desire to provide high performance and reliable laser technology to be integrated with leading edge CMOS technology as well as LiDARs. The consortium's ambition is to compare and demonstrate the advantages of the implementation of a novel VCSELs epi-structure grown on

germanium (Ge) substrates instead of traditional gallium arsenide (GaAs). As Ge-based VCSEL is a new technology, we aim to focus on its non-toxic and infinitely recyclable feature to produce remarkable technology that will yield higher profit and decrease production losses.



## Mission & Objectives

The proposal involves advanced photonics, and concerns semiconductor vertical-cavity surface-emitting lasers (VCSEL), widely used in the photonics industry, including short-distance communication systems, LIDARs, time-of-flight sensors, autonomous vehicles, robots and drones.

Developing new VCSEL industrial technology with applied large diameter Ge substrates would bring novelty that has not yet been presented to the market. The main objectives of PhotoGeNIC project include:

- ▶ Mastering epitaxial growth technology of Ge-VCSEL structures and device fabrication
- ▶ Improving VCSEL's spectral quality, optical power and reliability
- ▶ Lowering VCSELs' environmental impact to meet the market growing requirements
- ▶ Integration with CMOS and miniaturization of technologies

# Partners

The PhotoGeNIC consortium consists of eight partners from five countries (AT, BE, DE, FR, PL) including highly specialised SMEs, qualified university, advance research organisation and leading industrial companies. Their extensive know-how and long-lasting experience will allow the development of the new VCSEL industrial technology applying Ge large diameter substrates.



1

**TECHNIKON**

Technikon Forschungs- und  
Planungsgesellschaft mbH  
Austria [Villach]

2



VIGO Photonics  
Poland [Ozarow Mazowiecki]

3



Politechnikę Łódzką,  
Poland [Lodz]

5



Centre National De La Recherche  
Scientifique CNRS  
France [Toulouse]

7



XenomatiX  
Belgium [Leuven]

4



pmdindustrial GmbH,  
Germany [Ulm]

6



Umicore  
Belgium [Bruxelles]

8



Łukasiewicz – Institute  
of Microelectronics and  
Photonics [Warsaw]

# Facts



## Budget

**€ 4.8 Million**

100% EU-funded



## Consortium

**8 Partners**

5 countries



## Duration

**36 Months**

10/2022 - 09/2025

# Contact

## Technical Lead

**Włodzimierz Strupiński**

Vigo Photonics

Poland

## Project Coordinator

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Find out more about this Project:  
<https://horizon-photogenic.eu/>