Photonics

Shape the future with Photonic Integrated Circuits

Challenge Introduction

This challenge proposes you to embark in an adventure to find where a brand new technology can be an added value in our daily lives.

Photonic Integrated Circuits is a technology that harnesses the power of light to create energy-efficient, faster, and more accurate microchips. It enables new functionalities to achieve a more sustainable world.

Do you want to be part of this revolution?

Who is behind this initiative?

Bernat Molero Agudo, in collaboration with the Eindhoven Hendrik Casimir Institute (**EHCI**), believes that entrepreneurship is the most effective and impactful way to improve our surroundings. And this vision needs people like you taking action**.**

Bernat is able to provide you with a network with high expertise in the university, as well as a network in industry that will help you in prototyping your idea, such as PhotonDelta, MantiSpectra and SMART Photonics.

What is the *Photonics* challenge?

Shedding light on sustainability with photonic integrated circuits: leave no waste in the dark!

We live in the era of information technology - data is everywhere and everything is data. We want to be connected and we want things to work faster. Meanwhile, we are in the middle of a global energy crisis. As we grapple with climate change, we need to drastically change how we use energy and we need to do this before the world we know simply stops.

As a response to these needs, we are developing *Photonic Integrated Circuits (PICs)*. A photonic integrated circuit is a chip that contains photonic components, which work with light (photons). PICs offer advantages such as miniaturization, higher speed, low thermal effects, large integration capacity, and compatibility with existing processing flows that allow for high yield, volume manufacturing, and lower prices. Applications for integrated photonics are broad – from data communications and sensing to the automotive industry and the field of astronomy.

Now, this technology is taking off and is available in an easy way for companies in the form of different building blocks which have different functions. One key capability for PICs is to update old, bulky optical applications.

- Your role here is to understand what are the needs of the market that can be fulfilled with this technology.
- Then focus on one of them and deepen your insights of how feasible the creation of a product would be.

Some hot topics that have already been spotted are the following:

- One of the key application fields for PICs is **data communications**. For instance in the subfield of data encryption is another example with companies such as *Quside* who use PICs to achieve quantum random number generators.
- One potential technology that is being studied is *LiDAR* (Light detection and ranging), a detection system which works on the principle of radar, but uses light for detection. LIDAR can enable new products like autonomous cars. However, its use with Photonic Integrated Circuits has not been explored fully yet. What are the promising future applications that can emerge from the **integration of LiDAR** with Photonic Integrated Circuits?
- Another hot topic is related to **sensing**, which can be applied to a variety of markets from imaging to even *agriculture*. For instance, there are projects on-going which uses these devices in drones to detect substances in the crops that can be harmful for consumption.
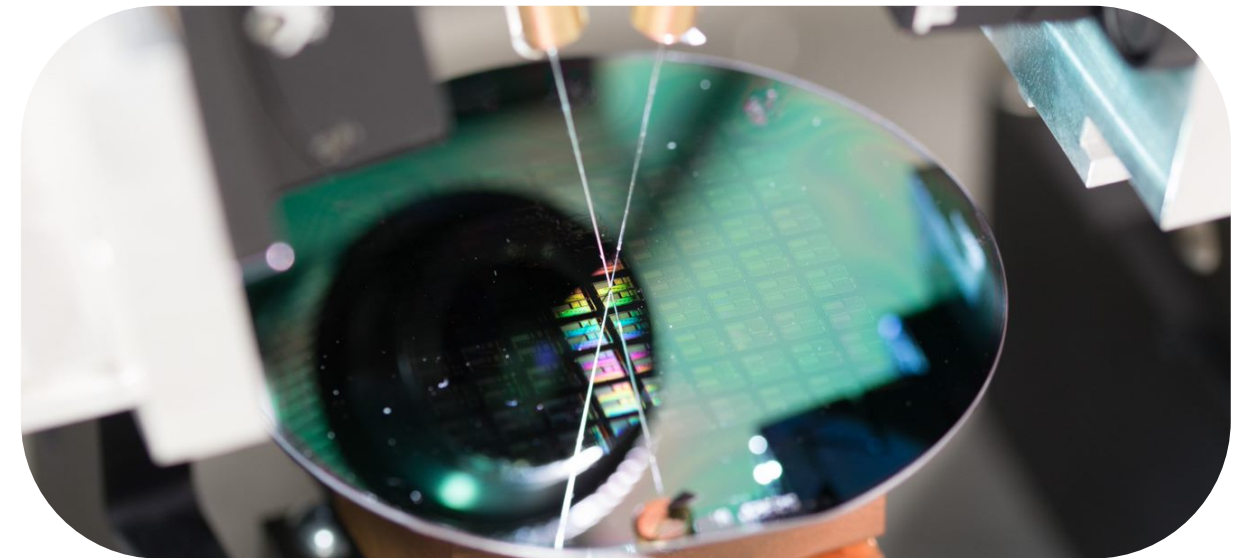
Relevant considerations for the challenge / theme:

This technology has already tested building blocks. It means that in order to create a photonic chip we don't have to start from scratch, but we have different blocks with a given functionality, and combining them we can achieve higher order functionalities. So, in order to create the business model, we shouldn't go deep into "how the technology works", but more to "what this technology can offer"

Relevant links
Challenge Introduction Video

Bernat already added some valuable links in the text above. You can contact him here for more information: b.molero.agudo@tue.nl

Depending on the direction you want to go in your challenge, he can provide specific contacts.

EuroTeQ Engineering University