

Integrated Photonics in Brainport Eindhoven

Turning science into disruptive
technology

Integrated photonics faster and more energy efficient

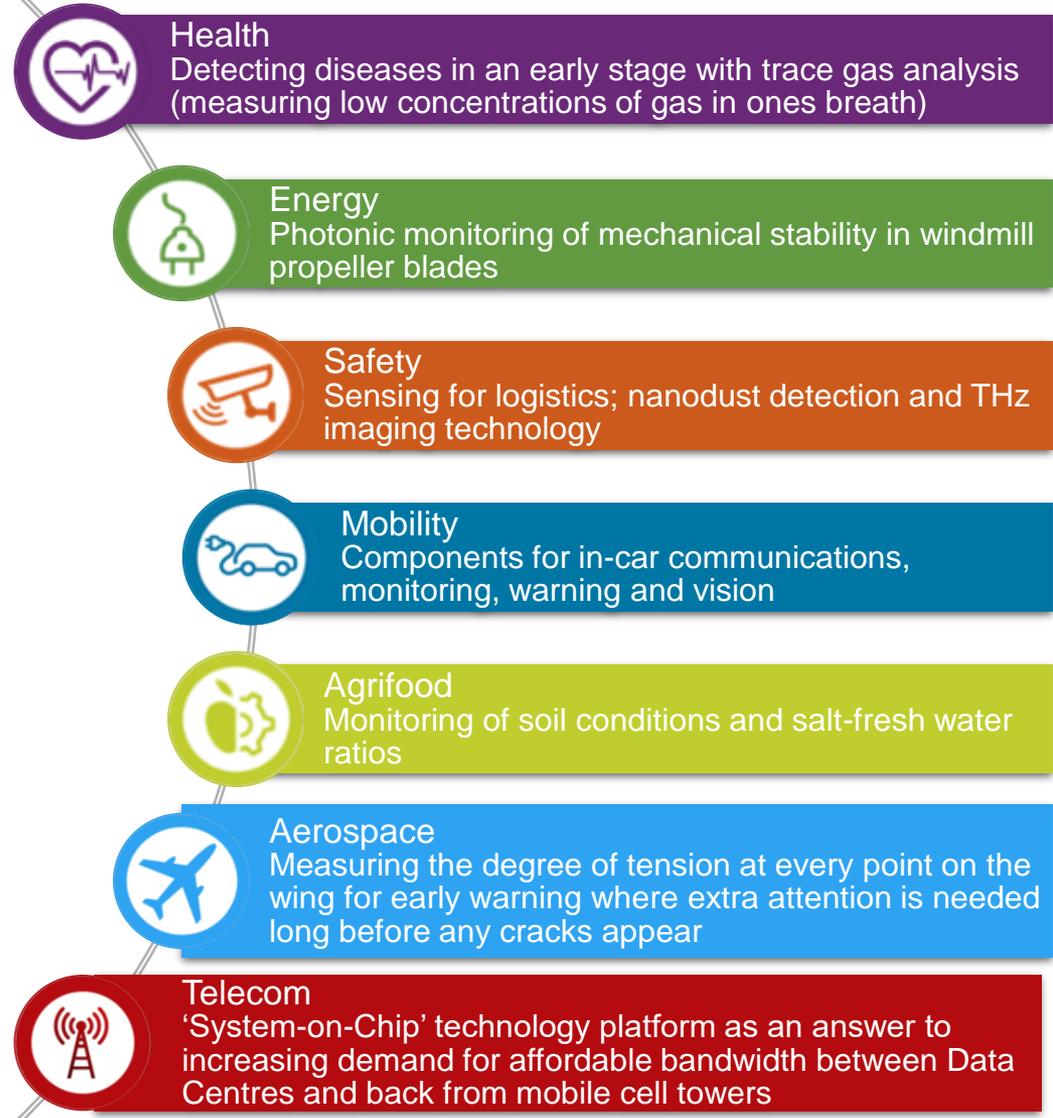
Photonics is the science of using and controlling photons—the smallest unit of light—to convey information and images. Integrated photonics is the shrinking of electronic components like lasers and optical sensors to a scale hundreds of times smaller than a single living cell and putting these components on a single platform. Photonics is a fast-evolving technology that uses miniscule laser beams or light parts (photons). Integrated photonics concerns micro-chips that are based on light signals and are built into devices. Until very recently, microchips were exclusively micro-electronic chips using electrical signals. Photonic microchips, however, have the advantage of being faster and more energy efficient. This leads to significant power savings. Exactly what is needed for the highly demanding data traffic and data usage. Moreover, integrated photonics offer opportunities for totally new functionalities, as for example sensing, in a lot of other fields such as the automotive, lifetech and food industry.

The global need for disruptive next-generation chips

Current chip technology cannot keep up with the explosive growth of data traffic in the near future. The solution? Integrated photonics.

These optical chips provide more speed, energy-efficiency and functionalities and can be applied in a wide variety of industries.

The European Commission has recognized photonics as one of six Key Enabling Technologies that provide the basis for solutions for the grand societal challenges of our time.



The perfect conditions for turning science into business and a leading industry

With an industry of about 160 companies and organisations active in photonics the Netherlands is an absolute frontrunner in this field. Brainport Eindhoven is an important worldwide hub for integrated photonics.

Photon Delta

This hub is embodied by The Photon Delta ecosystem, which is the sum of high-tech companies, knowledge institutions and authorities that have joined forces to gain a leading position in the development and commercialisation of photonic integrated circuits. This is the result of a research legacy of over 2 decades. We are now building an end-to-end supply chain from design, production, packaging and assembly to integration.

Technology is becoming market ready and turned into business

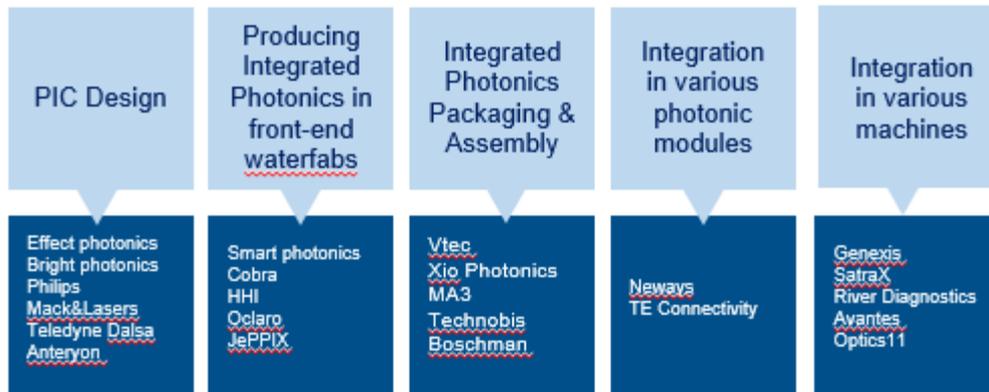
Because of an enormous cut in chip development costs
Because of several TU/e spinoffs among which a 'pure-play foundry' for the production of optical chips.

All ingredients needed for creating a leading industry

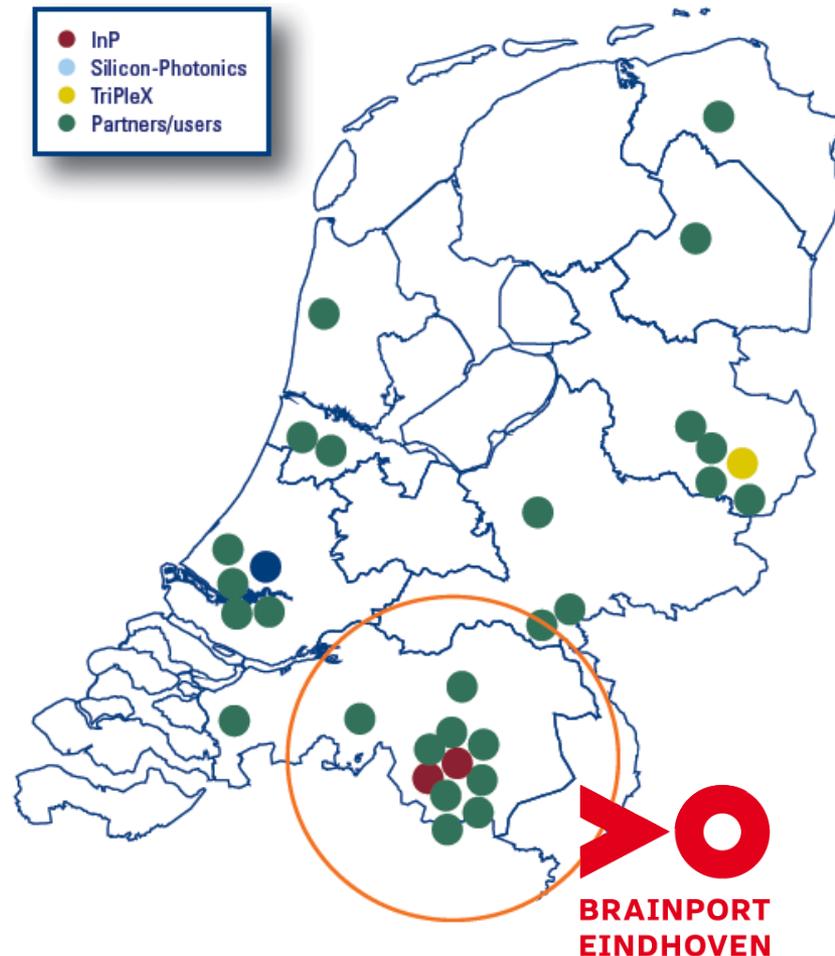
In the field of microelectronics Brainport Eindhoven has proven its ability to convert a complete ecosystem - with companies like ASML, ASMI, BEI and NXP- into a longstanding leading global market position and a multi-billion dollar business. We believe optical chips will have a similar future.

Building a complete end-to-end supply chain

- Elaborating on:
 - A research legacy of over 2 decades
 - a Dutch Photonics cluster of 160 companies with its centre of gravity in Brainport Eindhoven
 - Cross-border collaboration with Belgium, Germany and United Kingdom.
- Working towards an end-to-end of supply chain from design, production, packaging, assembly to integration.



Brainport Eindhoven



Turning technology into business

- Our knowledge base turns technology into business, in collaboration with industry.
- The semiconductor market is well represented in the Netherlands, with its focus point in Brainport. With companies like NXP, ASML, ASM International and BSI, a complete semiconductor industry is present that shows strong growth numbers over the past years (see graph on next slide).
- We believe in a similar future for optical chips as the one for microelectronics, in which the region has already built a leading position. Taking a similar development path as the semiconductor industry.
- SMART Photonics already provides integrated photonics using the generic technology as its basis; it brought the industry on the verge of making breakthrough developments.

Optical chips expected to have similar future as microelectronics



Brainport Eindhoven is famous for its ability to develop, design and manufacture machinery with the highest precision, reliability and speed. This competences resulted in a complete world-leading semiconductor industry.

- ASML, the world's leading chip equipment manufacturer, and its extensive supplier network;
- BE Semiconductor Industries N.V. (Besi; semiconductor assembly equipment)
- ASM (Advanced Semiconductor Materials) International;
- NXP (the semiconductor manufacturer with HQ and manufacturing in the Netherlands)

We expect the same development for integrated photonics. Taking a similar development path as the semiconductor industry did in the past. SMART Photonics already provides integrated photonics using the generic technology as its basis. This brought the industry on the verge of making breakthrough developments.

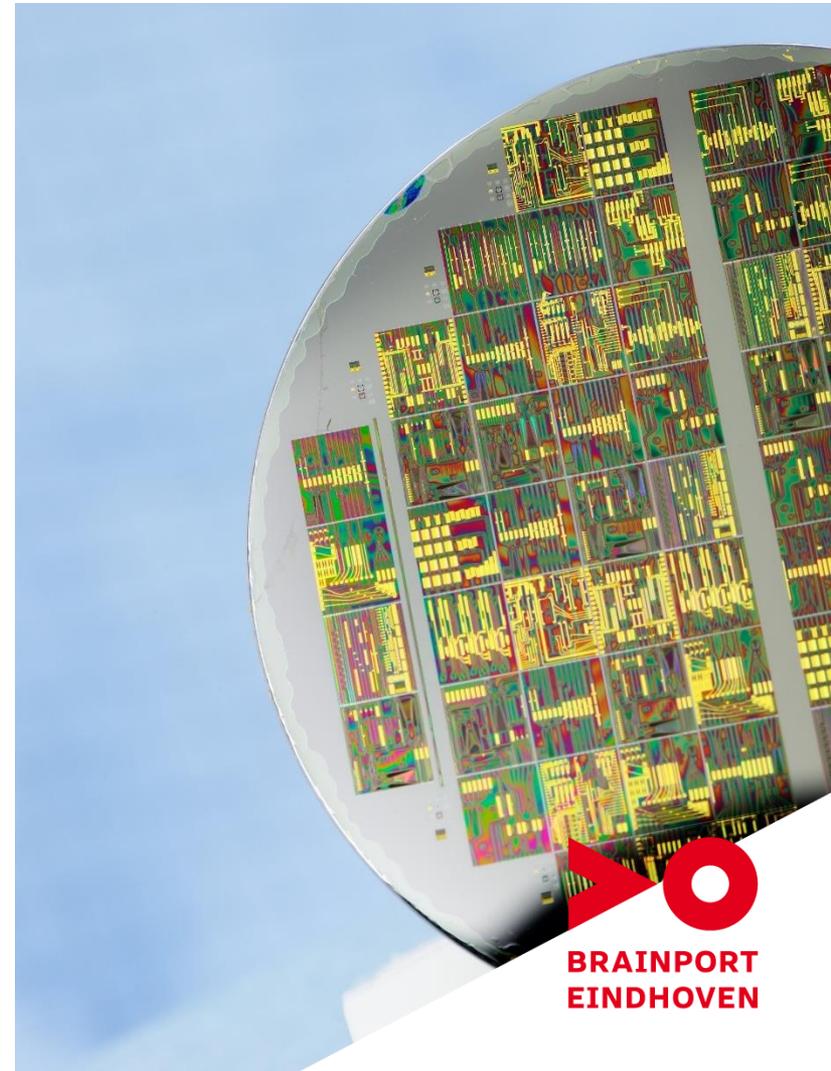
Photon Delta: essential for scaling-up

PhotonDelta is amplifying existing initiatives and kick-starting new ones. Their believe is that a fragmented approach to building the multi-billion Photonics business in Europe is never going to scale. Disruptive innovation comes when these young companies get access to the knowledge already gained by high-tech enterprises and applied research institutes

Photon Delta is building on photonic partnerships already in place. It's already a European-wide “end-to-end ecosystem” of researchers, chip designers, foundries and software developers rising up to meet grand societal challenges.

Three main activities:

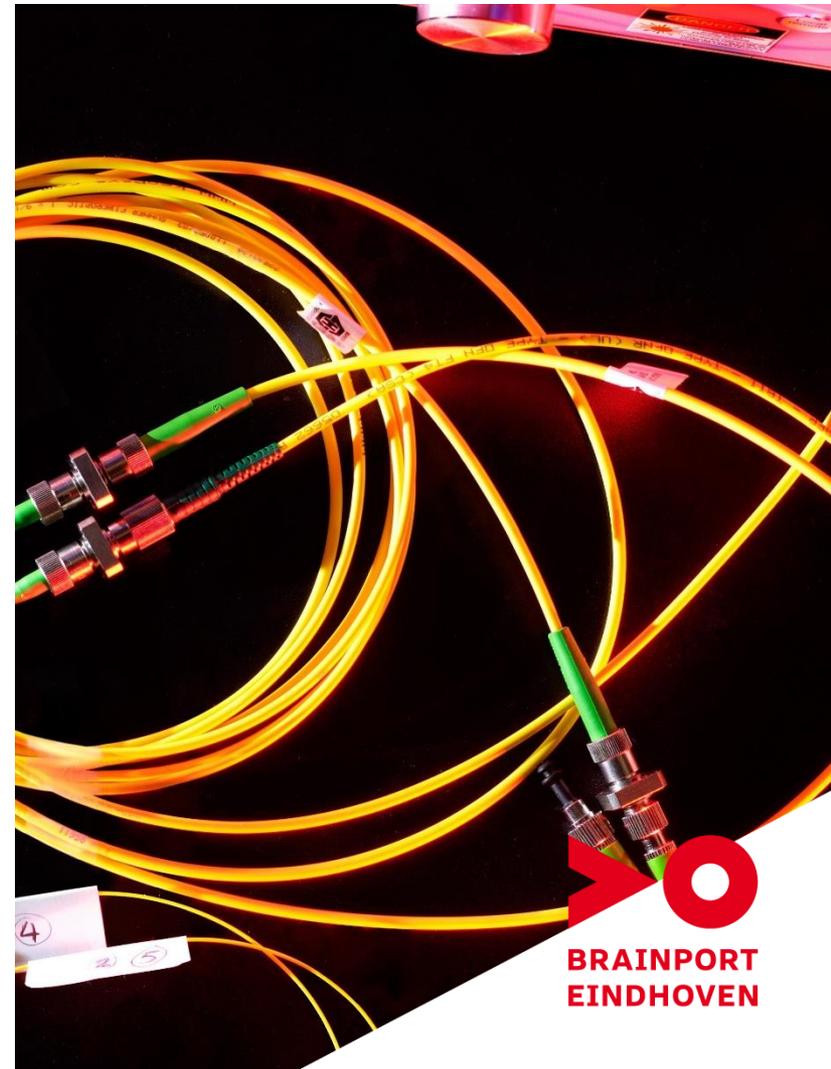
- Top level collaboration
- Packaging and reliability engineering
- Long-term road mapping



Turning technology into business

Research is quickly becoming market-ready

- Close collaboration between fundamental research and industry. For instance SMART Photonics developed its production process together with the COBRA institute.
- A lot of credit goes to visionaries at Eindhoven University of Technology for their pioneering research and business vision on how to scale this. The researchers at TU/e have dramatically cut chip development costs thus accelerating time to market. The next step is manufacturing. The scale-up phase has already begun.
- Many TU/e spinoffs, like SMART and EFFECT Photonics, putting research directly into practice and significantly reducing time to market



Manufacturing at an independent pure-play foundry: Smart Photonics



Smart Photonics, founded in 2012, is a 'pure-play foundry' for the production of optical chips. A pure-play foundry exclusively produces chips for customers on the basis of their designs. In the micro-electronics world this is a common model but in photonics this Eindhoven company is the first of its kind. The role of Smart Photonics is unique, since it is the only independent pure-play foundry in Indium Phosphide. The company does not produce its own products, but purely facilitates its customers in co-developing the best PICs possible and is always improving its production process.

- 21 employees
- 2 production lines
- 2 million sales in 2016

Partner up with Smart Photonics and join in the multi project wafer runs with your own design. Anything is possible, it only needs to be invented...

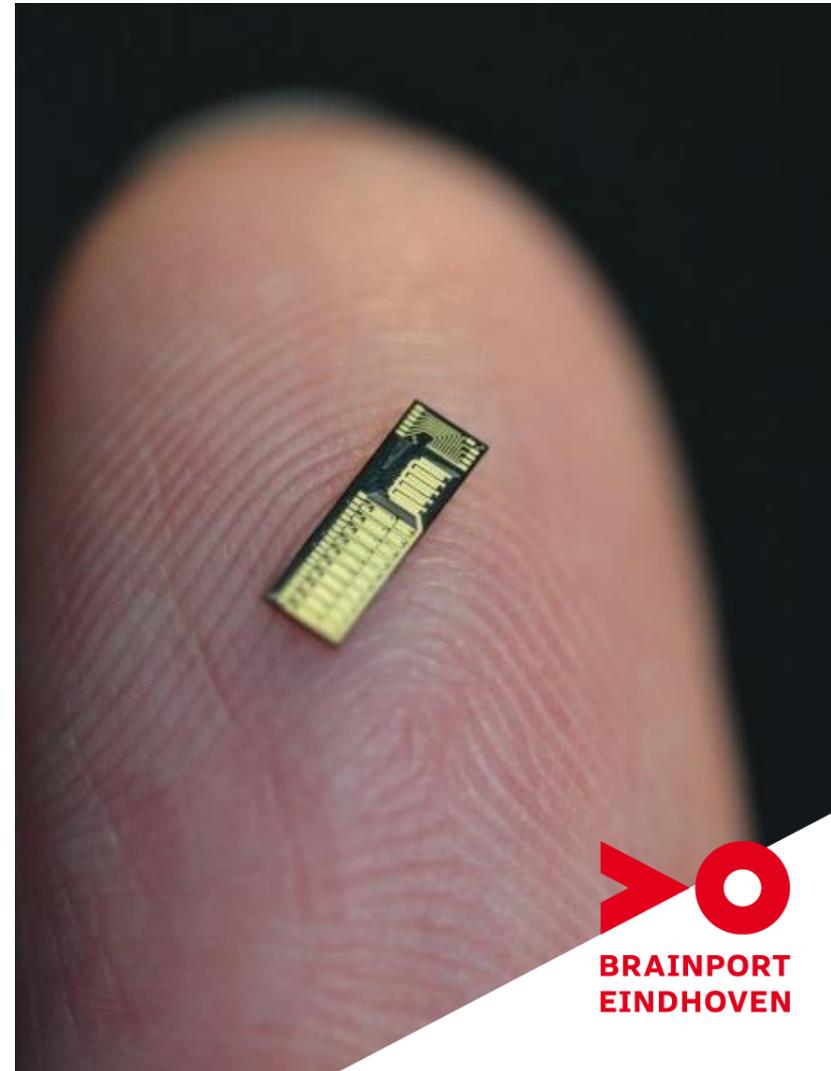


Effect Photonics



In 2010 Effect Photonics started as a developer of optical chips. Its first chip, for transporting very large data streams at a very low level of energy consumption, has since been introduced in the market.

- ± 25 employees
- Founded in 2010. After 5 years of hard work, they made the technology market-ready and launched their system-on-a-chip in March 2016
- Delivers highly integrated optical communications products based on its Dense Wavelength Division Multiplexing (DWDM) optical System-on-Chip technology
- Platform approach to integration using high-yielding building blocks within the wafer
- Driven by the soaring demand for high bandwidth connections between datacentres and back from mobile cell towers
- Effect Photonics (design) and Smart Photonics (production) reinforce each other and the Integrated Photonics industry by working together.



What can Brainport Development do for you?

Brainport Development

Brainport Development is a new-style economic development agency, that works with representatives from industry, knowledge institutes and government to strengthen the Brainport top technology region. In cooperation with the Brabant Development Agency (BOM) and the Netherlands Foreign Investment Agency (NFIA) we provide Foreign Direct Investors with information and practical assistance free of charge.

Setting up your business without burdens

Brainport Development helps you set up your business in a fast, flexible and transparent manner.

By:

- Providing you with all the information you need about the regional business climate
- Connecting and introducing you to a transparent network of reliable service providers
- Introducing you to our large and valuable network for the development of your core-business

How we help international companies set up their business

Our services, all provided on a confidential basis, include:

- Real estate search, providing insight and data on site selection and logistics strategies
- Personal guidance on matters such as available incentives, permit procedures, tax structures;
- Identifying the right talent and other human resource issues;
- Introduction to a variety of Dutch networks and service suppliers in business, to government authorities at national and regional levels, to academic and private sector consultants, and to others central to the investment process.
- Connecting you to customer segments that are relevant to your business
- All other aspects concerned in setting up your business.



Join Brainport Eindhoven

This disruptive technology integrated photonics can be applied in a wide variety of industries, used in various applications, and is now at a turning point. It is becoming market-ready at a quick pace, and Brainport Eindhoven is the place where this is being realised.

Become a part of the future and use integrated photonics as an answer to your business challenges!

Join our network, to co-create the roadmap of the future of integrated photonics, spot new technologies, keep up with innovations and explore new business opportunities.

Contact Brainport Development via invest@brainportdevelopment.nl

Or follow Brainport Eindhoven on [LinkedIn](#)

