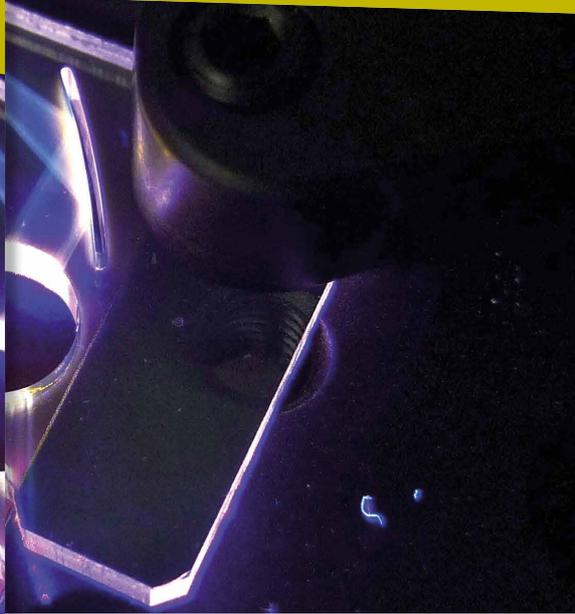


IOF Knowledge Center

Photonics Engineering



Photonics Engineering

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Vrije
Universiteit
Brussel

European leader in photonics innovation support

The Brussels Photonics Team (B-PHOT) of the Vrije Universiteit Brussel has more than 30 years of experience in the exciting field of optics and photonics research and innovation. Under the leadership of Professor Hugo Thienpont it has progressed into a world-class research team that excels in fundamental, applied, and industrial photonics.

Today B-PHOT is internationally recognized for its distinct scientific and technological contributions to the photonics field, for the successful transfer of its research results and know-how to Flemish and European companies, for leadership in the photonics European research and innovation area through its coordinating role in large-scale EC-supported projects and for its international networking activities with world-class research teams.

Photonics Innovation Center from lab to fab

To support its fundamental, applied and industrial research B-PHOT heavily invested in a **photonics technology supply chain** that is fully compatible with the high demands of industrial standards and mass-production. This technology supply chain for fundamental, applied, and industrial optics and photonics research integrates **4 major technology platforms** in B-PHOT's 2000m² Photonics Innovation Center.

Expertise & Techniques

Photonics is one of the 6 key-enabling technologies of the 21st century. The Brussels Photonics research and innovation team B-PHOT, headed by Prof. Dr. Ir. Hugo Thienpont, operates at TRL levels 1 to 8 and masters optical modelling and design, advanced optical prototyping and manufacturing, optical characterization and precision metrology, and proof-of-concept demonstration.

B-PHOT's technology supply chain includes:

- Modelling and design of optical components and systems: from refractive and diffractive optics to hybrid and free-form optics and optical systems
- Advanced prototyping and manufacturing: macro-, micro- and nano- optical components with extreme optical surface finish. Dimensions range from 300 mm diameter down to the micron level, from individual component fabrication to wafer-scale replication through hot-embossing and optical mold fabrication
- Optical characterization and metrology: optical measurement of surface qualities, optical profilometry from nano-sized to macro-sized objects and components, inspection and characterization of optical component quality, and optical spectroscopy and scatterometry from deep UV to MIR
- Proof-of-concept demonstration: from demonstration of first principles to the construction and validation of advanced industrial prototypes

Specialty domains: micro-optics and free-form optical design and fabrication, micro-structured fibers, lab-on-chips, micro- and macro- lasers, optical spectroscopy, nonlinear photonic integrated circuits

Application domains: optical datacom and connectivity, automotive, lighting, displays, food and health, medical technologies, aerospace, advanced manufacturing, clean-tech, energy



Photonics key-enabler for industrial innovation

At the beginning of the 21st century we are at the dawn of a new era where photonics – the science-and-technology that innovates with the unique properties of light – is revolutionizing our world in a similar way as electronics did in the last 5 decades. Photonics takes advantage of the unique properties of light to accomplish a multitude of original functionalities, which cannot be achieved in other ways.

The best-known examples of successful innovation with light are found in the ICT sector, where single-mode optical fibers, photonic integrated circuits and optical amplifiers form the backbone of our broadband world-wide internet. Photonic technologies also support DVD and Blu-Ray optical data storage, while highly advanced optical light engines are at the heart of 3D high-definition cinema projectors and ultra-high definition O-LED TVs and displays. In addition, photonics triggers a "clean-tech" innovation wave in energy production, interior lighting and advanced manufacturing empowered respectively by high-efficiency photovoltaic solar cells, high-brightness light emitting diodes and compact ultra-high-power lasers. Photonics also enables breakthroughs in the medical world and in biotechnology with bio-photonic labs-on-a-chip for point-of-care medical diagnosis, photonic integrated chips for optical coherence tomography of human tissue and free-form micro-lens ocular implants to improve the vision of macular degeneration patients.

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Technology platforms – Photonics innovation Center

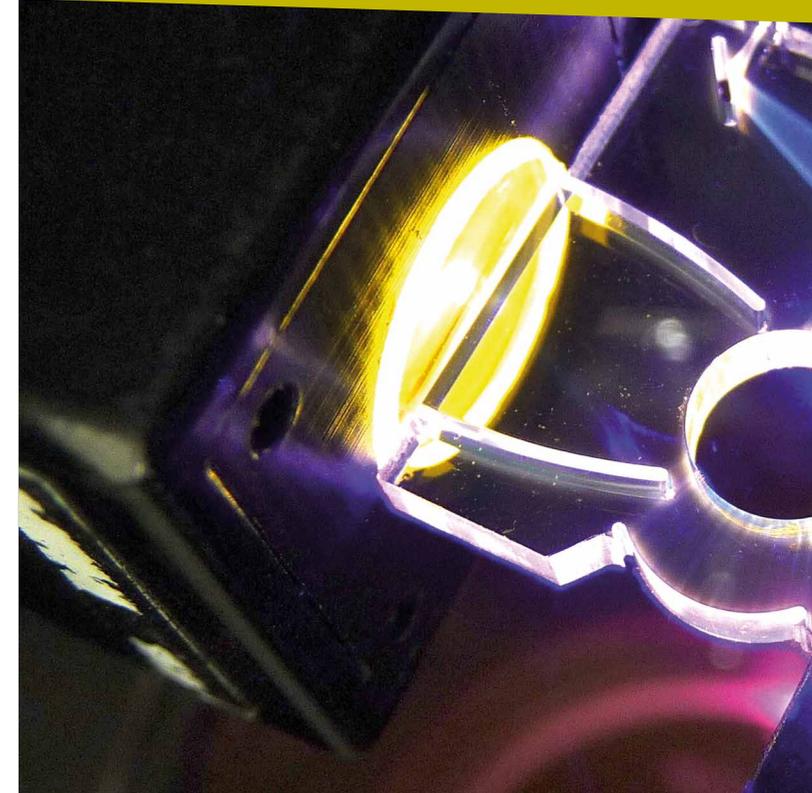
- The **"optics and photonics modelling and design platform"** consists of powerful computer clusters equipped with a variety of commercial and in-house-developed simulation software to support optical modelling and photonic design efforts. This platform is essential in a strategic research environment where concepts and components are first explored via modelling, before they are prototyped and tested.
- The **"optics prototyping and fabrication line"** consists of a 5-axis ultra-precision diamond tooling machine, a high-precision clear-to-clear laser welder, an ultrafast two-photon polymerization based nano-scribe and a 300mm wafer-scale hot- and UV-embossing equipment. This platform enables the rapid prototyping and mass-replication of nano-, micro- and macro-sized free-form optical components and of high-aspect ratio opto-mechanical and opto-fluidic micro-structures on up to 300 mm-sized polymer wafers in a variety of optical standard and specialty polymers. This **world-unique prototyping and mass-fabrication line** is vital to research, develop and quickly transfer original concepts, components and applications "from lab to fab".
- The **"instrumentation and metrology clean room facility"** hosts a unique collection of high-end metrology instruments for the quantitative characterization of micro- and nano-photonic components and structures, and is crucial to check the quality of the prototyped components and the reproducibility of scientific results and technological achievements.
- The **"demonstrator lab facility"** consists of photonics research labs which feature state-of-the-art scientific-grade tunable lasers spanning the broad optical spectrum from deep-UV to Mid-IR, optical and opto-mechanical precision components, opto-electronic and photonic measurement equipment, wafer probe stations and a variety of high-end electronic and optical diagnostic tools.

Spearheading industrial photonics innovation

So far B-PHOT's experts successfully delivered more than 30 industry-related photonics projects with large-scale companies such as Barco, AGFA, TE Connectivity, Umicore, Tomra, Philips, Melexis, ETAP, and Xeikon. As such B-PHOT contributed to a variety of industrial products in the world of projection and displays, food sorting and safety, industrial printing, lighting, and automotive.

For this valorization track-record B-PHOT received in 2005 the quality label 'Spearhead for Industrial Validation' from VUB's Industrial Research Fund (IOF). Besides a strong collaboration with large-scale companies, B-PHOT heavily invests in supporting Small and Medium-sized Enterprises (SMEs).

B-PHOT's photonics innovation center, with its world-unique infrastructure, functions as **an access center for a variety of national and international research groups and companies, who team up with B-PHOT to jointly use the enabling power of optics and photonics for product innovation.**



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