

## Photonics

We are on the verge of a new photonics era, and the European Commission is working to ensure citizens and businesses enjoy the full benefits of this technology.



Photonics is the science and technology of light. It encompasses generating, guiding, manipulating, amplifying and detecting light. And, it is behind many of the innovations which have transformed the way we live over the last few years.

Lasers, optical fibres, the cameras and screens in our phones, optical tweezers, and lighting in our cars, homes, computer screens and TVs are just a few examples of photonics. Given the current landscape and the potential that photonics has to enhance innovation in several industries, it has been recognized as one of Europe's key enabling technologies (KETs) of the 21st Century.

The European Technology Platform, Photonics21, represents photonics research priorities at European level. It aims to develop a common approach between European industry, science and policy. The European Commission signed for a public-private partnership with Photonics21, for the support and development of this fundamental part of European science and business.

## Photonics and daily life

Photonics plays an important role in driving innovation across an increasing number of fields. The application of photonics spreads across several sectors, from optical data communications to imaging, lighting and displays, to the manufacturing sector, to life sciences, health care, security and safety.

Photonics offers new and unique solutions where today's conventional technologies are approaching their limits in terms of speed, capacity and accuracy. The impact of photonics in our daily lives is remarkable.

### Health

Photonics has the potential to revolutionise healthcare because of the ability of light to detect and measure diseases in a fast, sensitive and accurate way.

Biophotonics is the use of light-based technologies in the bio & medical sciences. It can be used effectively for very early detection of diseases, with non-invasive imaging techniques or point-of-care applications.

Biophotonics is also instrumental to the analysis of processes at the molecular level, giving a greater understanding of the origin of diseases, hence allowing prevention and new treatments. Photonic technologies also play a major role in addressing the needs of our ageing society from pacemakers to synthetic bones to endoscopes to the micro-cameras used in in-vivo processes.

## **Lighting and energy savings**

Photonics are used also in advanced lighting technology, such as Solid State Lighting (SSL) for general lighting applications. SSL is based on light emitting diodes (LEDs) and organic light emitting diodes (OLEDs) technologies.

SSL provides higher quality lighting and contributes to substantial energy savings. Intensive manufacturing and research activities aim to further improve SSL performance, particularly energy efficiency and quality, and therefore reduce costs.

As part of the European Green Deal, the EU committed to zero net emissions of greenhouse gases emissions by 2050. Lighting adds up to around 19% of electricity consumption worldwide, so more efficient lighting will provide huge energy savings.

For example, the replacement of incandescent bulbs with SSL technologies could save up to 70% of the energy used today in lighting. And, SSL possesses outstanding unique properties including robustness, longer lifetime, dimming and colour tunability. These properties offer unprecedented opportunities to shape and adjust the lighting environment to accommodate individual needs.

## **Broadband Internet**

The need for faster, more transparent, dynamic and greener broadband networks drives EU research policy in the field of optical data communications. Research in this area addresses the dramatic increase of power consumption on the web, in data centres and servers. The aim is to allow traffic growth, fast network changes and varying traffic demands while making data communications faster, cheaper and more energy efficient.

## **Safety and security**

Photonics is a key enabler for enhancing the safety and security of people, goods and the environment. It brings the possibility of building contactless sensors and visual applications operating in various ranges of the light spectrum from x-ray to terahertz. Such sensors would be sufficiently sensitive and accurate to reliably detect potential hazards or dangerous situations.

Photonics technologies have several practical applications in safety and security. Fibre sensors are used to detect structural defects in the building sector, prevent environmental pollution and develop driver assistance systems.

Security applications also rely on photonics technologies, for example in biometrics and border security systems, video surveillance systems and equipment to detect dangerous or illegal goods.

## High Quality Manufacturing

Lasers have become a versatile tool. Laser processing has become essential for high-volume, low-cost and precision manufacturing. New laser-based technologies stimulate new manufacturing processes with an extraordinary high-quality. This allows mass customisation and highly flexible production on demand, rapid, clean and resource-efficient manufacturing and zero-fault production.

Europe is a leader in industrial laser technologies. It develops, supplies and applies lasers and laser systems. Industrial laser technologies are used in the automotive industry, for the treatment of plastics, for the manufacture of photovoltaic cells, semiconductors and miniaturised components used in medical technology, and more.

To find out more about Photonics, you can visit Photonics21, the European Technology Platform, or contact us for further information.

Follow the latest progress and learn more about getting involved.

Follow the Commission's work on photonics @PhotonicsEU

## **Latest**

DIGIBYTE | 23 June 2021

New European Partnerships launched to deliver on the EU's ambitions for the Digital Decade

To boost research and innovation investments in digital, the Commission has launched new European Partnerships together with industry and academia, under the Horizon Europe programme.

The Partnerships will pursue innovative solutions on a large scale, pooling in efforts, resources and investments which will generate long-term positive impact, boost European competitiveness and technological sovereignty, as well as create jobs and growth.

PRESS RELEASE | 14 June 2021

Commission and industry invest €22 billion in new European Partnerships to deliver solutions to major societal challenges

The Commission has launched 11 new European Partnerships together with industry, to boost investments in research and innovation and to overcome major climate and sustainability challenges, towards making Europe the first climate neutral economy and delivering on the European Green Deal. In line with the goals of the 'twin' green and digital transition, the Partnerships will also deliver on the EU's digital ambitions for the next decade, Europe's Digital Decade.

DIGIBYTE | 19 May 2020

Coronavirus response: €56 million for solutions using medical technologies, digital tools and artificial intelligence

A new Call on Medical technologies, Digital tools and Artificial Intelligence analytics, with a budget of €56 million, is launched on May 19 to quickly deploy new solutions using medical technologies, digital tools and artificial intelligence to increase our response capabilities to this coronavirus crisis, improve the recovery, and better prepare for future such crises or waves.

DIGIBYTE | 17 February 2016

Boost for EU industrial leadership: Launch of three advanced pilot lines in photonics.

Three major Pilot Lines, which help SMEs take photonics technologies from lab into market, have just been launched by the Photonics Public Private

Partnership (PPP).

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## **Related Content**

### **Big Picture**

Advanced computing

EU investment in high performance computing and computing technologies will enable Europe to lead the way in supercomputing in the Digital Decade.

## **Dig deeper**

Photonics: Industrial innovation and cooperation

The Commission established a public-private partnership (PPP) under Horizon 2020 to enhance the photonics sector.

## **See Also**

Destination Earth

Destination Earth aims to develop a high precision digital model of the Earth to model, monitor and simulate natural phenomena and related human activities.

Electronics

Micro and nano-electronics take us to the world in miniature, where big things are facilitated by the smallest and smartest electronic components and systems.

Quantum

To unlock the transformative power of quantum, the EU should develop a solid industrial base that builds on its tradition of excellence in quantum research.

High Performance Computing

High performance computing refers to computing systems with extremely high computational power that are able to solve hugely complex and demanding problems.

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