



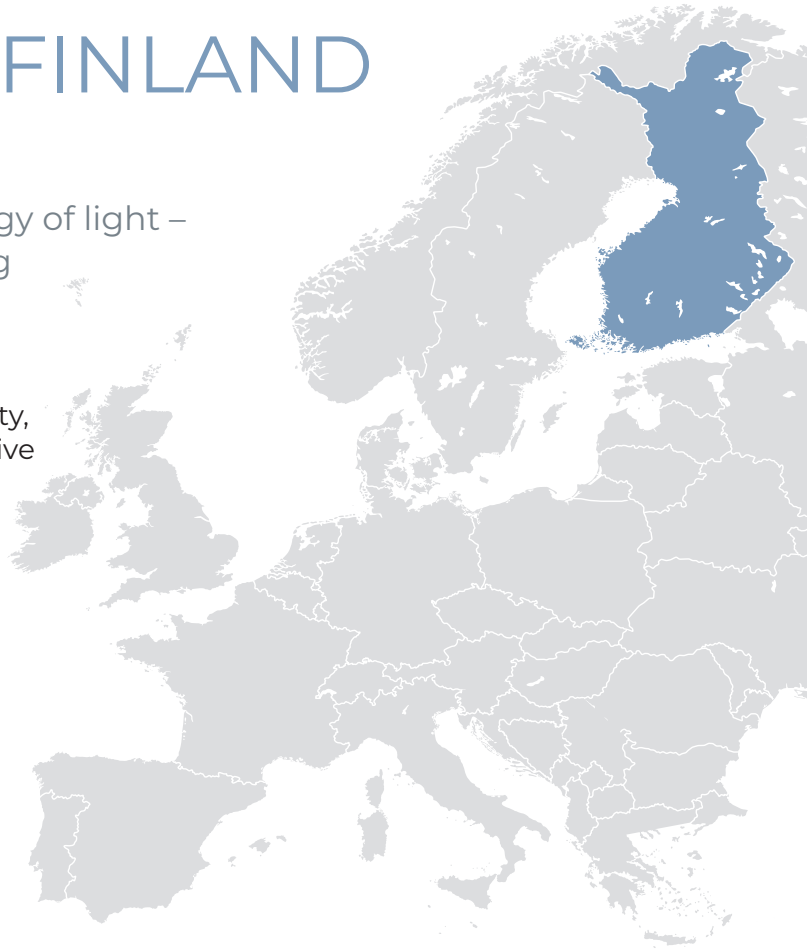
PHOTONICS IN FINLAND

PHOTONICS IN FINLAND

Photonics – the science and technology of light – is one of the most significant enabling technologies of our time.

Photonics plays a central role in today's society, and its ultra-fast, ultra-precise and non-invasive nature is essential to a sustainable future.

Finland has a long tradition of high-tech research and industry, and has a high level of expertise in photonics with many pioneer photonics-related technologies developed in the country. Educational excellence with a world-class research environment, wide range of competencies and know-how in sensing and imaging, micro- and nanophotonics, lasers and fiber-optics and Virtual and Augmented Reality makes Finland an ideal place for innovations in photonics, the commercialization of new products, the growth of companies in the field, and international success.



WELCOME TO THE DIVERSE POSSIBILITIES OF PHOTONICS IN FINLAND!

PHOTONICS INDUSTRY IN FINLAND (2020)

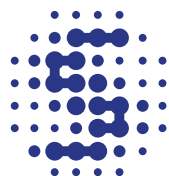
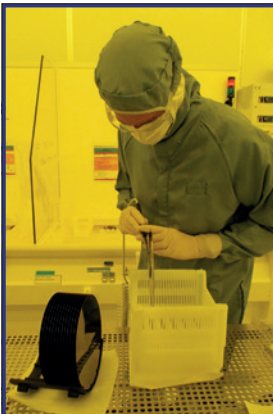
- 260 companies
- 4 200 employees
- 1,2 billion euro market
- 30% annual growth

KEY PHOTONICS COMPETENCES IN FINLAND

- Optical Sensing and Imaging
- Micro- and Nanophotonics
- Lasers and Fiber Optics
- VR, AR, MR

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FACTS AND FIGURES ABOUT PHOTONICS IN FINLAND

Finland has a great number of small photonics companies, and high growth expectations.

The photonics Industry employs today 4200 highly trained people, with an annual turnover exceeding 1,2 billion € with about 260 companies acting in the field. Sixty percent of the companies are relatively small, employing from 10 to 15 people. Indirect impact on workforce covers the jobs of about 30 000 employees.

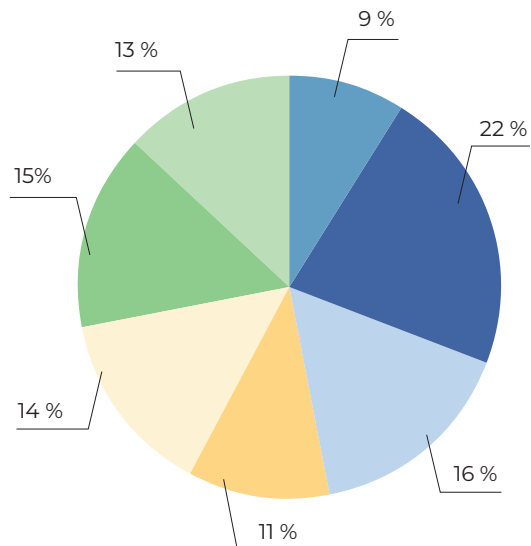
By far the largest output in photonics is in the manufacture of optical components, systems and instruments at 60%, followed by services, raw materials and distributors. Forty percent of the companies are totally dependent on exports, the main marketing areas being EU, US and Asia. Companies estimate an increase of nearly 40% in their turnovers in the coming three years.

Companies strive for finding new foreign and domestic partners, focusing on recruiting highly trained experts from Finland and from abroad. Improved efforts are needed to search talented human resources from both the educational sector (exposure to photonics) and among experts (recruitments). To guarantee growth, companies consider market and technology analyses as being of increasing importance for their future. They have to find their ways to places where they can get niche expertise that would support their product development.

Success in search for investors and low-cost loans were considered fundamental to guarantee growth of start-up companies.

Finnish photonics companies want to continue and further improve co-operation with universities and research institutions. An excellent opportunity for this appeared recently as the Academy of Finland granted an eight-year flagship research program PREIN to Tampere University, Aalto University, University of Eastern Finland and VTT Technical Research Centre of Finland Ltd.

Companies want to join and support the events organized by the PREIN consortium and Photonics Finland. They want to create focused bilateral academia-company research projects within the program with the aim to develop existing and new products. Visibility of photonics could be enhanced both in the political circles and towards the public by more efficient use of media. Efforts to expose photonics, as an enabling technology that has a broad range of applications from health to communication, to school children and high school students, in particular girls and women, were considered important. In general, companies wish to make better use of domestic know-how both from the academic world and the industry.

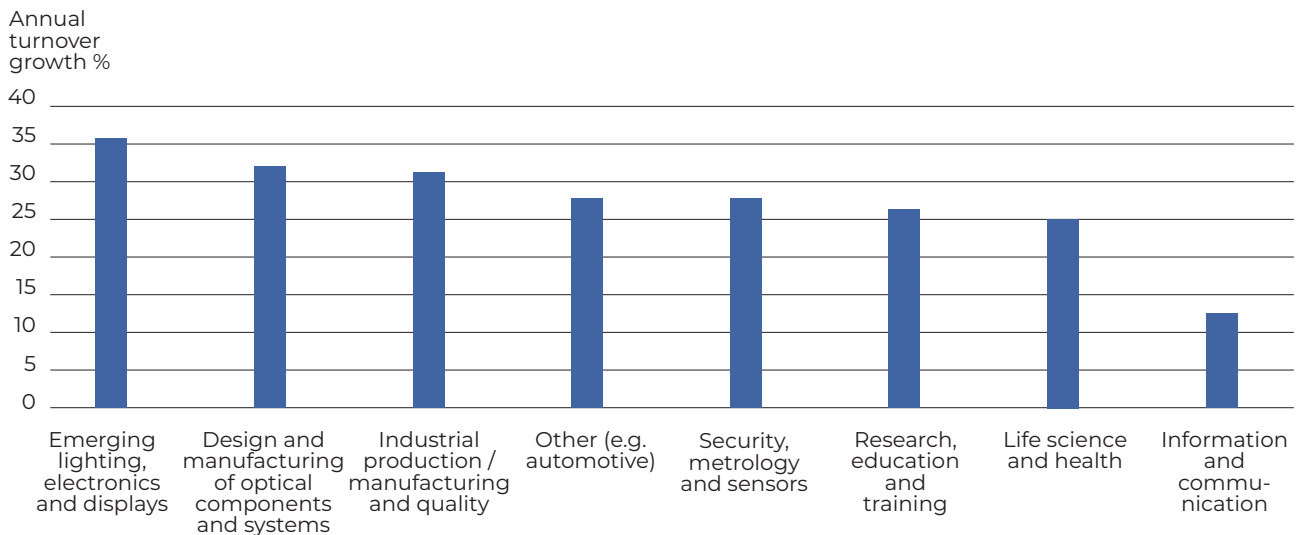


Markets for the photonics industry in Finland

- Industrial production / manufacturing and quality
- Life science and health
- Emerging lighting, electronics and displays
- Security, metrology and sensors
- Design and manufacturing of optical components and systems
- Research, education and training
- Information and communication

AT THE INDUSTRY LEVEL, THE ESTIMATED TOTAL ANNUAL REVENUE OF PHOTONICS BUSINESS IN FINLAND IS 1 200 – 2 300 M€. THE PHOTONICS SECTOR IS GROWING STRONGLY, GENERATING BENEFITS AND NEW KNOWLEDGE FOR OTHER INDUSTRIES.

Growth estimates for photonics markets for the years 2021-2023



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PHOTONICS FINLAND

Photonics Finland is the International
Photonics Network



Photonics Finland is a technology-oriented association that drives the photonics industry in Finland by connecting Finnish photonics companies, research centers and public authorities. Photonics Finland supports the development of the photonics field all the way from basic research to the deployment and market launch of products. In close collaboration with other European photonics clusters, it is the single point of contact for the photonics ecosystem in Finland.

Photonics Finland develops new business and research opportunities, and helps realize the full potential of the photonics industry in sectors like ICT, industrial manufacturing, energy efficiency, life science, health care, agriculture, forestry, safety and sustainability.

Photonics Finland organizes various Photonics events and webinars. Optics & Photonics Days (OPD) is an annually

organized main event that gathers the whole photonics ecosystem in Finland from business to academia. Photonics Finland also organizes the Finnish Pavilion in collaboration with Finnish companies for various Exhibitions such as Photonics West and Laser World of Photonics.

Optics and Photonics days – the main photonics event in Finland!

OPD delivers the latest findings and research results performed within Academy and Industry. The event is designed for matchmaking and networking of academy researchers and company representatives for finding common interests, partners for collaboration and investing opportunities. The program includes parallel running industrial and academic sessions, company exhibition, job fair and Photonics Finland members annual meeting.

Company exhibitors interested in the markets of the Finnish and Nordic country regions are encouraged to present their products, services and technologies, but also to participate in the pitch sessions, which are specially designed for raising interest among the event attendees and towards the services and products of the exhibiting companies.



READ MORE!
www.photonics.fi



THERE ARE 280 PERSONAL, OVER 100 COMPANIES, AND 8 UNIVERSITY MEMBERS IN PHOTONICS FINLAND!

Photonics



FLAGSHIP FOR PHOTONICS RESEARCH AND INNOVATION, PREIN

PREIN is a national initiative that brings together the main actors of the Finnish photonics research scene to develop the new generation of light-based technologies. The mission of PREIN is to generate future knowledge in photonics and promote the Finnish know-how by expanding frontier research into business opportunities, educating the professionals of tomorrow, and raising awareness of the critical role of light-based technologies for our society.



SEE OUR VIDEO!

PREIN, a consortium between Tampere University, University of Eastern Finland, Aalto University and VTT Technical Research Centre of Finland, was selected as an Academy of Finland flagship project in 2019. All the partners are highly recognized internationally for their photonics research, but the joint activities increase their global visibility and importance. The almost 400 researchers involved in PREIN have complementary backgrounds in physics, chemistry, materials science, nanotechnology, and electrical engineering, creating together a truly multidisciplinary environment and providing significant added value to the Finnish innovation ecosystem enabled by photonics.



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**INTEGRATION
INSTRUMENTATION**



**NANOMATERIALS
DEVICES**



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www.prein.fi**

Flagship for Photonics Research and Innovation, PREIN



Push your company's technology readiness level with help from the best photonics researchers

The Flagship for Photonics Research and Innovation PREIN focuses on light-based technologies and photonic applications. We offer research and development services covering the whole value chain from fundamental to applied research, product development and commercialization.

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- Ray tracing and optical design software

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- Semiconductors
- Wafer processing
- Packaging

CHARACTERISATION

- Optical response
(refractive index, losses, dispersion etc.)
- Conventional microscopy, scanning electron microscopy, atomic force microscopy
- Spectral measurements
- Surface quality

OTHER SERVICES

- Training and education
- Consulting
- Prototype development
- Facilities and infrastructure



Photo: Tampere University/Hannu Vanhanen



Photo: Aalto University/Mikko Raskinen

Contact form for companies:

prein.fi/industry/join-prein-ecosystem

Industry and impact contact persons

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prein.fi

PHOTONICS RESEARCH IN FINLAND

Dozens of photonics research groups operate in Finland, employing more than 700 researchers. Most research groups operate with a less than 1M€ annual research budget. Total annual research budget in Finland is more than 80 M€.

Aalto University's photonics research focuses on light-matter interaction, optical coherence and polarization, quantum phenomena, development of methods to manipulate light with nano- and microstructures, design and construction of novel light sources and detectors, optical metamaterials and optical imaging.

At the University of Helsinki, photonics research is carried out at the Department of Chemistry. The research focuses on laser spectroscopy and microscopy.

The Finnish Meteorological Institute develops methods and systems of atmospheric and weather observation that utilize photonics.

The photonics research of **the University of Eastern Finland (UEF)** is compiled under the Institute of Photonics. Research is carried out e.g. at the Department of Physics and Mathematics, the Department of Computer Science, the Department of Biology, the Department of Chemistry and the Department of Applied Physics.

At the University of Jyväskylä, photonics research focuses on the utilization and development of time-resolved laser methods and the utilization of optical confocal and near-field microscopy.

The study of photonics at the Department of Physics of **LUT University** focuses on optical measurement technology.

The Laboratory of Optoelectronics and Measurement Technology at **the University of Oulu** carries out research and development of measurement methods for highly scattering materials. The Measurement Technology Research Unit (MITY) carries out research and development of optical measurement methods.

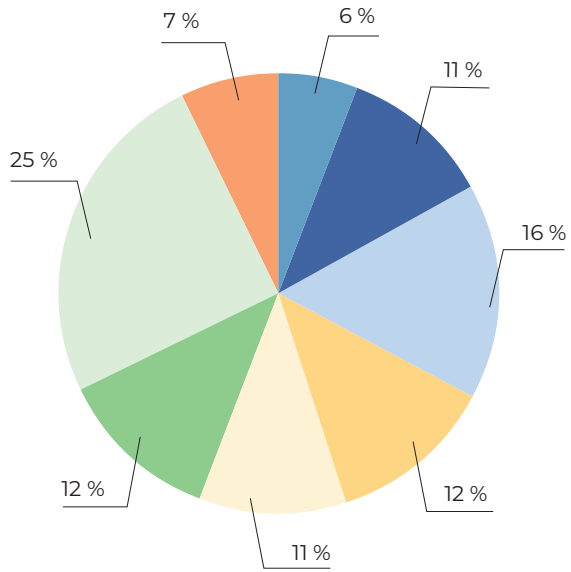
Tampere University (TAU) is developing new light sources and methods for utilizing and precisely controlling the properties of light. Together with new light-sensitive materials this will lead to the development of new types of solutions in many application areas, aiming at scientific and technological breakthroughs.

At the University of Turku, photonics research is being carried out in the laboratory of quantum optics at the Department of Physics and Astronomy. The research group of atomic quantum optics theoretically examines the manipulation of cold atoms by external laser and magnetic fields.

At VTT, photonics research is carried out by more than 100 people in Espoo, Oulu, Kuopio and Tampere.

Photonics research infrastructure is largely available also for external users. Read more at prein.fi/industry.





The key photonics related research fields in Finland

- Information and communication
- Industrial production / manufacturing and quality
- Life science and health
- Emerging lighting, electronics and displays
- Security, metrology and sensors
- Design and manufacturing of optical components and systems
- Education and training
- Other

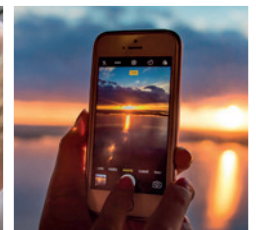
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PHOTONICS EXPLORER KIT

The Photonics Explorer Kit inspires children and young people to pursue scientific careers particularly in photonics.

The Photonics Explorer Kit (PEK), an experimental light education teaching package developed by the Brussels-based non-profit organization EYESTvzw, is designed for upper secondary and high school levels, being also suitable for vocational training. Each package includes high-quality and durable components for the entire class, such as lasers, polarizers, optical fiber and LEDs. The Teacher's Guide and Lesson Plans as well as the students' work instructions cover eight different topics: optical communication, colors, lenses, eye and vision, polarization, diffraction, and light sources. Topics are addressed with the Photonics Explorer Kit through a variety of group experiments, tasks, and discussion. The experiments and tasks in the package are linked to real-life applications. The content of the high-quality package is designed in a Europe-wide collaboration and is easy to incorporate into the teaching curriculum.



Hundreds of thousands of students have taken advantage of the material across Europe. One package costs € 150 + VAT and benefits up to 250 students. The instructions for the kit are available in several languages, including Finnish.

In 2020 PREIN and Photonics Finland implemented a campaign in Finland to seek companies and individuals to donate packages to, for example, local schools. PREIN and Photonics Finland both donated one package for each donated package. The aim of the campaign is to significantly increase the amount of Photonics Explorer Kits in Finland. The donor will have their brochure and logo included in the package, and visibility on the Photonics Finland and PREIN websites.

SEE OUR VIDEO!





CHILDREN ARE INTERESTED IN PHOTONICS

Nepenmäki Comprehensive School in Joensuu received the Photonics Explorer Kit in the autumn of 2020.

Modern technology is utilized in the new comprehensive school of Nepenmäki in Joensuu. The classes use, for example, mobile presentation technology and a high-quality wireless network. Resources have also been allocated to the teaching of physics, chemistry and mathematics. The classes are equipped with new and modern teaching aids, with special emphasis on computer-aided measuring devices.

In the autumn of 2020, the Nepenmäki school also received the Photonics Explorer Kit. The material is utilized especially with seventh-graders whose physics curriculum includes optics.

With the help of compact and easy-to-use material, quite spectacular demonstrations can be created in the classroom - in addition to the refractions and reflections of light, it is possible to observe, for example, the formation of colors.

“Children are interested in science, and hands-on teaching makes them excited about photonics and light as a phenomenon. Also from the teacher’s point of view, the Photonics Explorer Kit is convenient and easy to use - the material doesn’t take up much room and is easy to take and return.”

*Juha Kettunen
Lecturer in Mathematics,
Physics and Chemistry*

Donate a Photonics Explorer Kit

- Become a sponsor and donate a kit to a school of your choosing
- Have your company leaflet and logo put in the kit!
- Only 150€ (0% VAT) per kit!

Fill a form to donate



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NATIONAL PHOTONICS CLUSTER

PhotonicsNL, Netherland
Photonics Sweden
Photonics Austria
Photonics France
Fotonika 21, Slovenia
PCO, Photonics Platform Poland
Swissphotonics, Photonics Platform Switzerland
AIET, Photonics Platform Greece

OTHER CLUSTERS

Triple Steelix, Sweden
AFIL – Assosiation Intelligent Industry Lombardia, Italy
Aero Cluster – Chech Republic
IFAC/CNR – Italian National Research Council
Center for Process Innovation (CPI), UK

REGIONAL PHOTONICS CLUSTERS

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New York Photonics, US
Photonics HUB, Wetzlar, Germany
Optonet, Marseille, France
Route des Lasers, Bordeaux, France
SecPho, Barcelona, Spain
Photonics Bretagne
OpTecBB, Berlin Germany
Quebec Photonics, Canada

INTERNATIONAL CO-OPERATION

Finnish photonics companies are export intensive.

The focus of Finnish photonics companies is on international operations and growth. Companies are mainly SME sized and need both domestic and international partners. Better access to finance and foreign partners would also facilitate Photonics research in Finland.

Photonics Finland develops practices to coordinate and develop Finnish photonics internationally by working closely with other European photonics clusters which are sustained by European Union Photonics Technology Platform (Photonics21). Together with the Finnish photonics community Photonics Finland participates the major photonics events and exhibitions globally.

Photonics Finland is a member of ICO – International Commission for Optics, Photonics21 – The European Technology Platform, PIMAP Partnership – Photonics for International Markets and Applications, GPA –Global Photonics Alliance, SPIE – The international society for optics and photonics, EPIC – European Photonics Industry Consortium, PREIN – Photonics Research and Innovation platform and EOS – The European Optical Society, which is also headquartered in Finland.



INTERNATIONAL RESEARCH CO-OPERATION

Finnish Universities have an extensive international network of collaborators on all continents.

Researchers collaborate on a regular basis with many key Universities in Russia, China, Germany, France, USA, and UK. Universities host regularly international research visitors within the framework of many joint international projects. Finnish universities are also involved in multiple international education networks and highly competitive MSc programs.



Test Automation **Capabilities**



Production Test Solutions



Smart Devices Testing Systems and Solutions



Automotive Infotainments



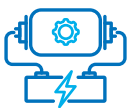
Electrical Test Systems



Virtual and Augmented Reality



Display Inspection



Industrial Electronics and Machinery



R&D Testers



Automation and Test Robotics



Touch Display Testing



Refurbished Phones



Smart Phones Testing Systems and Solutions



PHOTONICS EDUCATION IN FINLAND

Academic research provides a crucial platform for educating skilled workforce. Degree education in photonics in Finnish universities is based on top-level research.

Universities offer mainly master programs and doctoral education specialising in photonics which attract the brightest foreign students and future employees and entrepreneurs to Finland. Together in the Flagship for Photonics Research and Innovation, the universities can offer shared courses in the fundamentals, but also specialise and profile their programs and educational offering in a complementary way.

Education is international with all the programs offered in English and attracting students from around the world. Double degrees with renowned international universities, and Erasmus Mundus funded joint master programs are a clear indication of the high quality of our education in photonics.

Tampere University

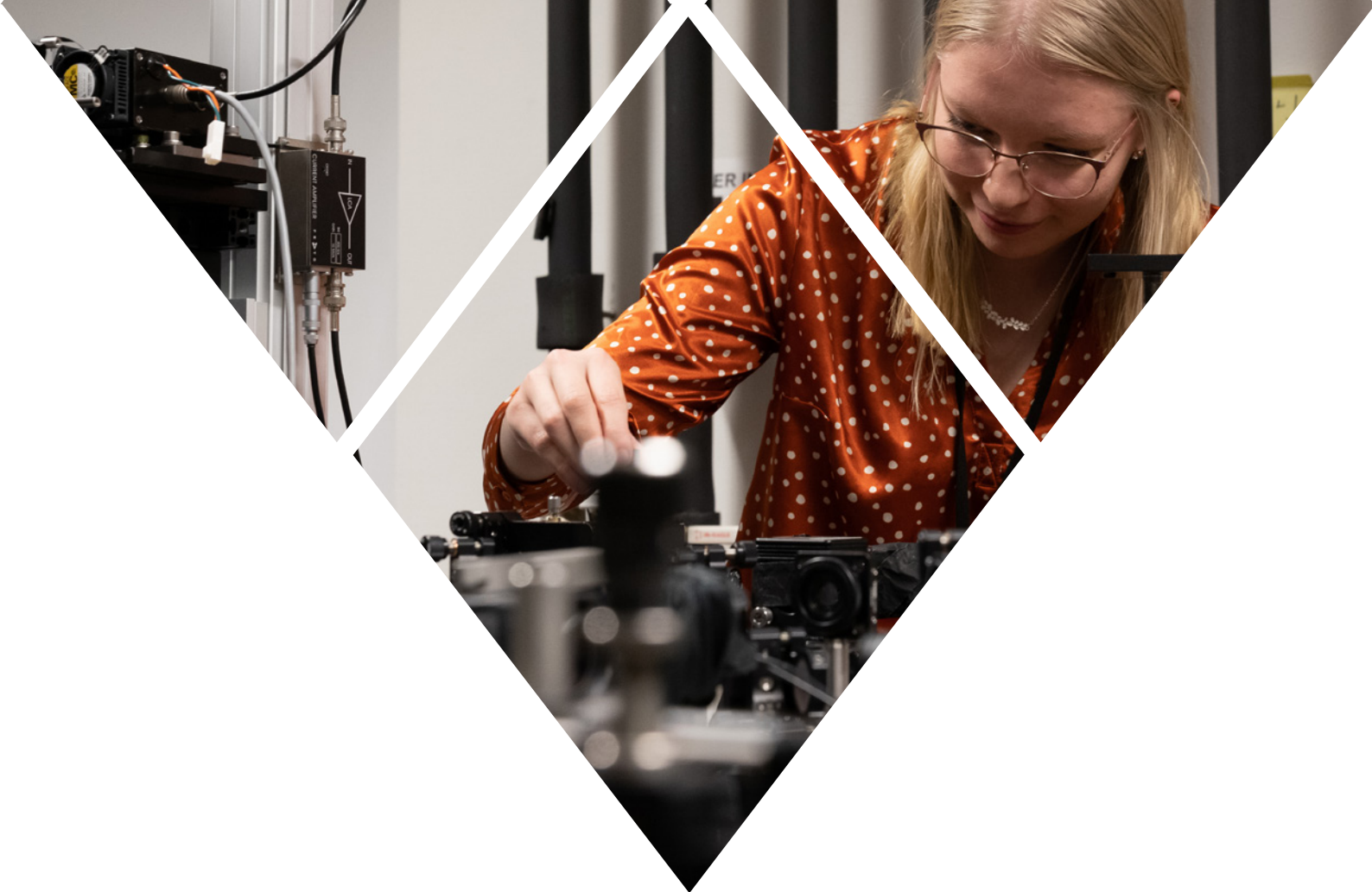
The Master's Degree Program in Photonics Technologies provides students with in-depth knowledge of photonics ranging from fundamental light-matter interactions, laser physics and nonlinear dynamics to the design of optical systems, semiconductor technologies, advanced nanofabrication methods and measurement techniques.

www.tuni.fi

The University of Eastern Finland

Photonics education at the University of Eastern Finland is offered by the Institute of Photonics. The Master's Degree in Photonics offers expert skills needed in international careers in optics, photonics and related fields. The program covers all important aspects from theory to practical work in laboratories with world-class facilities.

www.uef.fi



Aalto University

Photonics is offered as a specialization in the Master's Program in Nano and Radio Sciences where the major in Photonics and Nanotechnology gives the student theoretical and practical skills in electromagnetic radiation, modeling, optics, and in materials-related topics that can be applied from nanosciences up to space physics. The programme focuses strongly on researching and building hardware for these technologies, paving the way for a fluent shift towards a career in the industry or an academic postgraduate path.

www.aalto.fi

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PHOTONICS EDUCATION AND TRAINING FOR COMPANIES

Education is adapted to meet the company needs.

The demand for educated workforce in the photonics sector is high in both Finland and Europe as businesses in the field grow rapidly. There is need for a wide variety of photonics experts from all levels of education from vocational training to doctoral level in the universities. Collaboration between the different level educational providers has been developed in a pilot between the University of Eastern Finland (UEF), Karelia University of Applied Sciences and Riveria vocational school.

Companies also need specific skills and training for their own personnel on topics from manufacturing to component design and different types of basic and continuing trainings from cleanroom work and laser-safety to advanced optical manufacturing. Previously many of these trainings have been carried out by companies themselves. As part of the photonics flagship the University of Eastern Finland coordinates activities on continuing education and training where courses are adapted to meet the company needs and organized jointly with the other education providers and external experts.

SEE OUR VIDEO!



The University of Eastern Finland (UEF)

Training modules available for companies are cleanroom training, laser safety training, photonics and optics fundamentals training, Fundamental Optical Design and Introduction to Optomechanical Design.

www.uef.fi/photonics

Karelia University of Applied Sciences

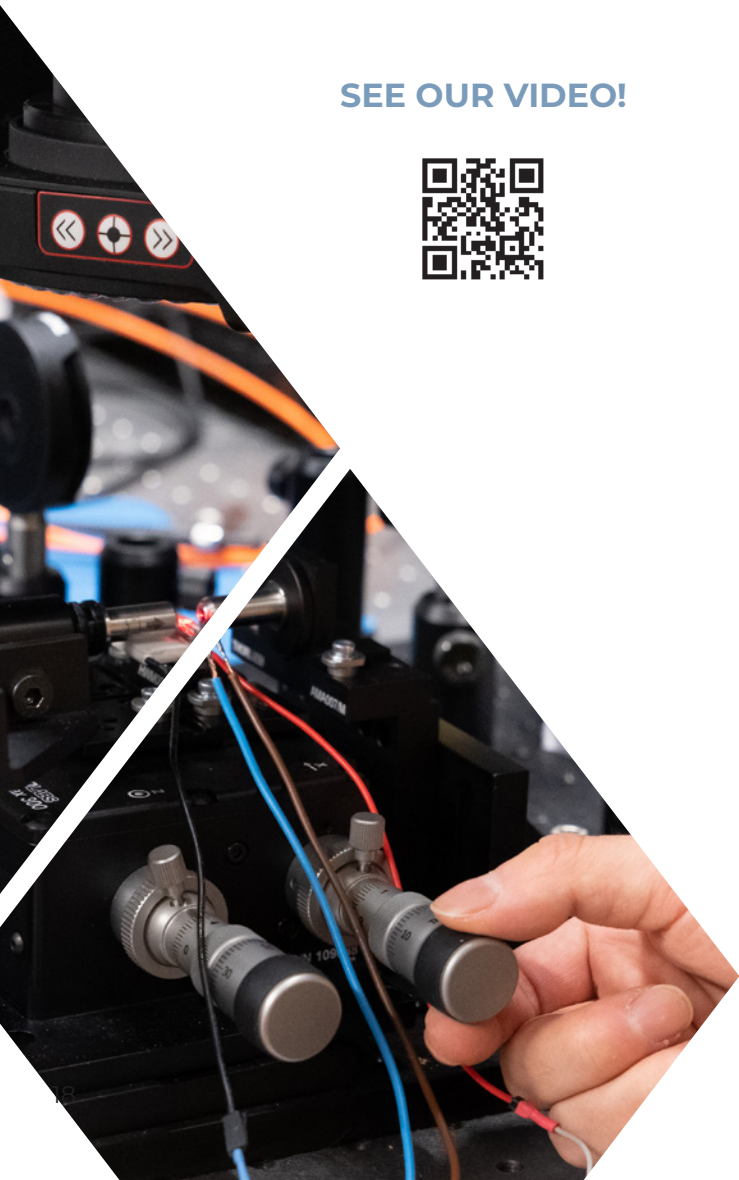
Karelia University of Applied Sciences provides bachelor's degree education, continuing education, expert services as well as product development and testing in the field of photonics. Karelia's education and development environment has been specifically designed to meet industrial needs.

www.karelia.fi/photonics

Riveria

Riveria provides versatile continuing education to meet the constantly growing labour needs in the field of photonics. The training content can be adapted to the company's requirements. At the end of the course, the participants' skills are assessed in accordance with the relevant competence requirements.

www.riveria.fi/fotoniikka



FURTHER TRAINING IS REQUIRED

Oplatek is a photonics solution provider offering design and manufacturing services for both domestic customers and export. Finding experts in optics manufacturing for the sector is not easy, and in most cases a new employee learns to utilize the technologies used in the company working in pairs with an experienced professional.

To support the practical work, theoretical knowledge of photonics is needed, which is acquired at Oplatek through various lecture entities. Oplatek has also been involved in a pilot project at the University of Eastern Finland, where physics professors trained the company's staff on site.



"The pilot experiment was a success and the feedback from the employees was positive. The training was, for example, able to take into account the employees' basic competence. The personality of the trainer is also of great importance. Substance knowledge alone is not enough, the trainer must get people excited about the topic - learning will then get better."

Jyrki Huttunen
CEO
Oplatek Group

The bottom section of the page features a dark background with a green vertical bar on the left. The Oplatek logo, consisting of a green circle with white dots and the word "oplatek" in white, is positioned on the left. To its right, the text "Inspired by Optics" is written in a light, sans-serif font. In the center, there is a photograph of a photonics manufacturing process, showing a bright orange and yellow flame or laser beam interacting with a metal component. On the right side, the text "MANUFACTURING INNOVATIVE PHOTONICS SOLUTIONS" is written in a bold, white, sans-serif font. At the bottom center, the website address "www.oplatek.com" is displayed in white. At the bottom right, there is a short paragraph in white text: "For lasers, lighting, and analyzers in medical industry, process control and energy & environmental monitoring".

Inspired by Optics

**MANUFACTURING
INNOVATIVE
PHOTONICS
SOLUTIONS**

For lasers, lighting, and analyzers
in medical industry, process control and
energy & environmental monitoring

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ALUMNI STORY

Pakistani Dura Shahwar did her MSc. in photonics at the University of Eastern Finland (UEF). Now she's working at VTT.

"MSc. Photonics program at the University of Eastern Finland attracted me the most because of the diverse combination of courses and lab works offered." The degree program gave Dura an opportunity to work with VTT Technical Research Centre of Finland, where Dura did her master's thesis research work in silicon photonics. Research work helped her to explore the polarization state of light and its applications in telecommunication for broadband operations.

After the master's thesis, Dura got the opportunity to work at VTT as a research scientist.

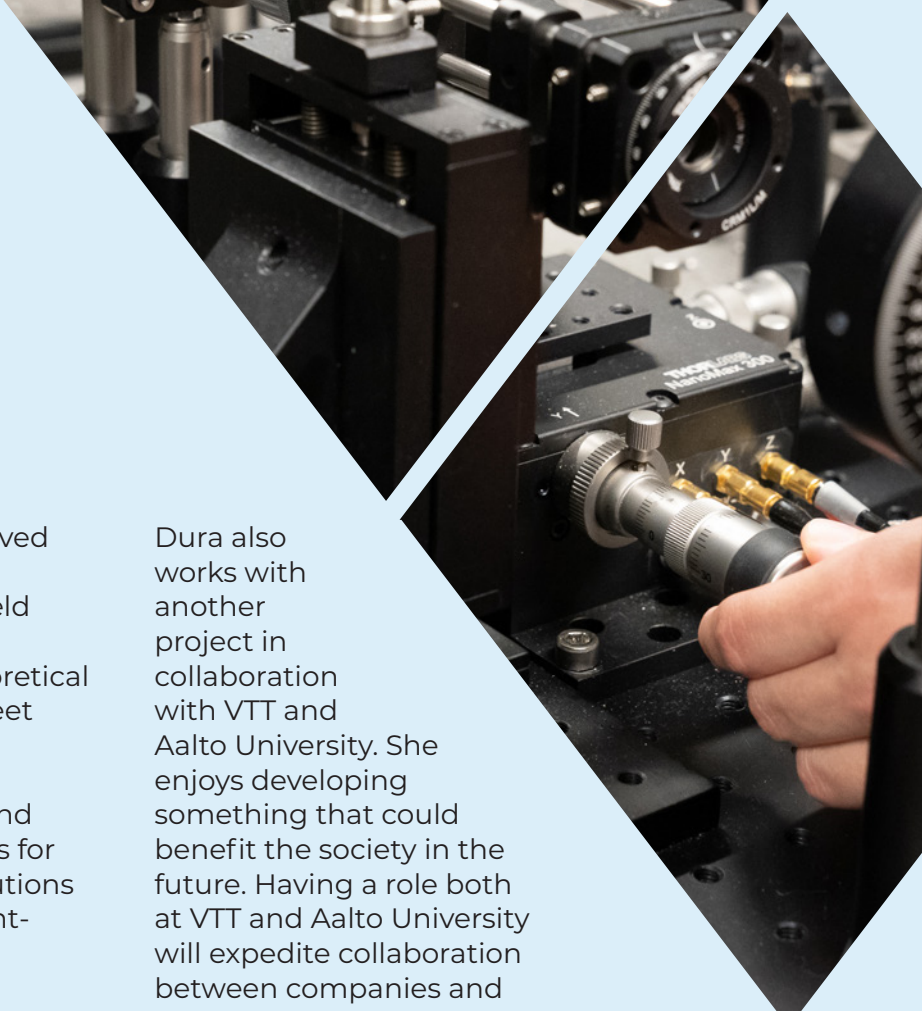
"I'm mostly involved in research and development (R&D) and customer project work, which includes design, simulation and testing of silicon photonics based indicated circuit. I'm also doing my doctoral studies at Aalto University."



Thoughts about Photonics

I would say light is integral part of our lives as it is revolutionizing the sustainable energy solutions, communication, industrial sector, defense, medical sciences and life sciences. Photonics was already there, but now people have started seeing it as a source that can reshape many applications. Overlapping with other sciences make it so interdisciplinary. Nowadays you would see many spin-offs coming out of this interdisciplinary field. Many theoretical ideas and concepts that emerged/ came out of the field of photonics in the past seemed very difficult to achieve/ realize in the real world. However, today with the incredible advancements in the field, it seems doable. Though, still a lot needs to be done, I believe that photonics has a lot of potential to bring up solutions for most of the challenges we face today.

Dura Shahwar



In her daily work Dura is mostly involved with polarization related design and testing. It is closely related to light field control work package under PREIN. "It is an opportunity to combine theoretical research with applied research to meet industrial needs."

Collaboration between universities and companies under PREIN opens doors for the development of many viable solutions and innovative business ideas for light-based technologies.

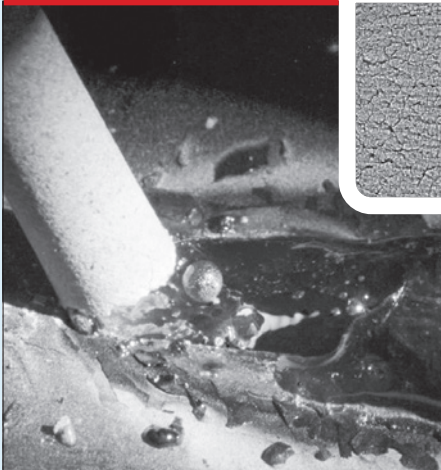
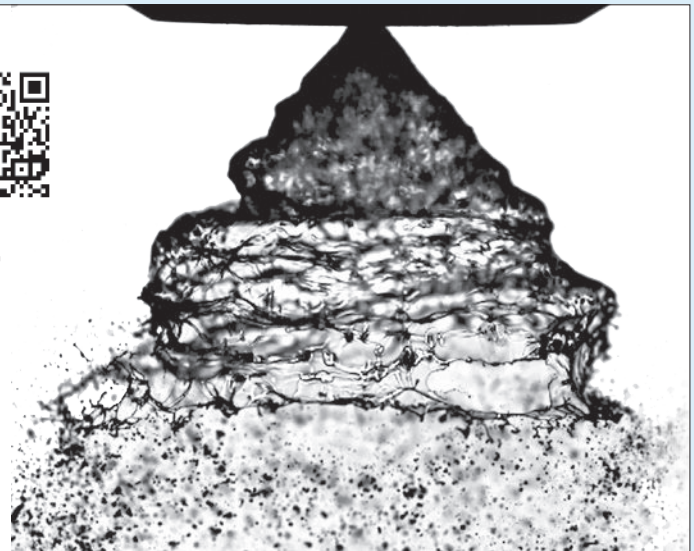
Dura also works with another project in collaboration with VTT and Aalto University. She enjoys developing something that could benefit the society in the future. Having a role both at VTT and Aalto University will expedite collaboration between companies and universities.



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THE PHOTONICS SECTOR IS STRONGLY INVOLVED IN SOLVING GLOBAL CHALLENGES SUCH AS CLIMATE CHANGE AND ENERGY DEMAND.

PHOTONICS IS APPLIED IN CONSUMER ELECTRONICS. NANO AND MICRO LEVEL STRUCTURES ARE APPLIED TO GUIDE LIGHT FOR HIGH PERFORMANCE DISPLAYS AND INTERFACES.

LIGHT-BASED TECHNOLOGIES ARE FAST, EFFICIENT, SAFE AND USER-FRIENDLY.

PHOTONICS IS APPLIED IN HEALTH CARE TO EYE ILLUMINATION AND IMAGING BUT ALSO TO THERAPEUTIC LASER DEVICES AND CANCER TREATMENTS.

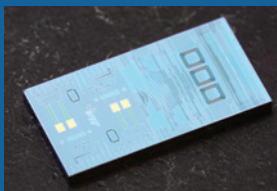
PHOTONICS IS INVOLVED IN EVERYTHING FROM LASERS, LEDS AND SOLAR PANELS TO AR/VR/MR, AUTOMATION AND AGRICULTURE.

PHOTONICS IS APPLIED IN CLEAN TECH. HYPERSPECTRAL IMAGING IMPROVES MACHINE VISION AND GENERATES MORE ACCURATE INFORMATION FOR PROCESS CONTROL.

Photonics services from R&D to production

VTT is a visionary research, development and innovation partner. We are at the sweet spot where innovation and business come together.

In the field of photonics and optics, VTT offers services related to



Silicon-based photonics technologies

- Silicon photonics
- MEMS-mirrors for LIDAR
- MEMS FPI for hyperspectral solutions



Roll-to-roll pilot line for photonic devices

- Printed electronics for large area lighting
- Printed solar cells
- Biosensors and photonics integration



Optical instruments and systems

- Photonic micromodules
- Optics and optical instruments
- Optical metrology instrumentation
- Active hyperspectral imaging
- Laser spectroscopy for trace gas monitoring

INVESTING IN PHOTONICS MAKES SENSE

Voima Ventures is a EUR 40 million deep tech fund that invests in science-based growth companies in Finland and the Nordic and Baltic countries. The mission of Voima Ventures is to solve significant global problems by combining science, entrepreneurship and capital.

Why invest in the photonics industry and photonics companies?

“In growth business investment, it pays to invest in teams and companies that are world leaders in their area. Photonics offers a wide range of opportunities for major breakthroughs in a number of global industries, be it the automotive industry, health technology solutions, the AR/VR industry or space technology.

The latest investment in photonics in our portfolio is Elfys, which is developing the world’s most accurate black silicon-based light sensor. Our other companies applying optics and photonics are e.g. Dispelix, which designs and manufactures light guides for augmented reality AR lenses, and Helmee Imaging, which develops

imaging solutions for industrial quality control. All of these companies have the opportunity to solve major global problems. For example, the Elfys light sensor improves the accuracy of the human body’s health sensing and makes e.g. medical imaging more safe. Voima Ventures does not limit their investments in the sector, but includes in the portfolio a wide range of deep technology areas in addition to optics and photonics.”

Inka Mero
Managing Partner
Voima Ventures



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PIC edge & grating
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BRIGHT FUTURE OF PHOTONICS

Photonics is involved in nearly every facet of a sustainable future.

Photonics technology is at the heart of solar energy. Photonic devices are used in biodiesel production, water purification, wind energy, energy-efficient lighting, sustainable farming and forestry, and many more. Besides its impact on the society, Photonics technologies have also an enormous economic potential and today nearly 10% of the jobs depend on Photonics in one way or another.



THE WORLD WILL BE SAVED BY PHOTONICS

In the future, photonics will affect people in the same way as electronics today - it is needed everywhere. Photonics plays a key role in everyday life - be it learning, entertainment, food production, energy management or the manufacture of goods.

Photonics is also needed to solve the world's problems of global warming, food security, health care, transport and information flow. For instance, the widespread teleworking opportunities during the Corona era are largely enabled by photonics.

Whatever aspect of life you want to develop, photonics is at the heart of the solution.

*Risto Linturi
Futurist*

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PHOTONICS CENTER

– Collaboration for Business and Research

Photonics Center provides photonics companies with space to grow and develop as a part of a unique operating environment.

Photonics Center supports photonics companies in business development, capital acquisition and networking. We help companies promote innovations nationally and internationally and find new partners and experts to boost growth. Start-up companies can utilize comprehensive expert and accelerator services.

Photonics Center promotes collaboration between companies and educational organisations and enables the use of modern shared equipment as well as measurement and processing services. Available services include a unique optics research and manufacturing environment at the UEF/Institute of Photonics which includes the manufacture of micro- and nanostructures, such as e-beam and characterisation, and the top precision technology equipment at the Karelia University of Applied Sciences. The operating environment also supports the training of future top experts from all levels of education for the needs of your company.

More information: photonicscenter.fi |  [@photonicscenter](https://www.facebook.com/photonicscenter) |  [@photonicscenter](https://twitter.com/photonicscenter) |  [Photonics Center](https://www.linkedin.com/company/photonics-center)

PHOTONICS CENTER

- Versatile facilities for the needs of a growing company's research, development and innovation activities
- Modern shared equipment, measurement and processing services
- International educational cooperation and future talents
- A strong photonics community, wide-reaching networks and co-marketing
- Business Joensuu services for accelerating growth and development

Contact

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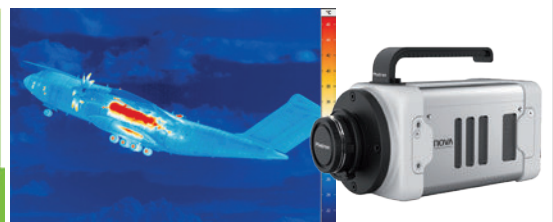
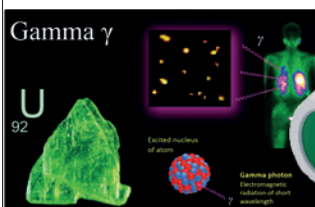
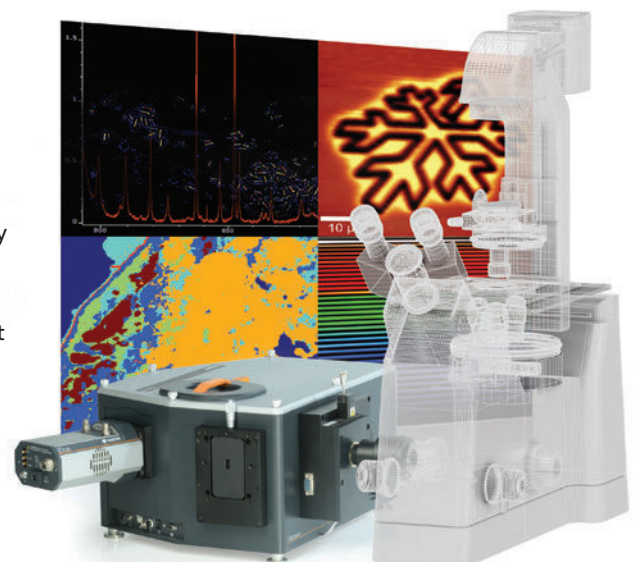
Laser beam analysis, power and energy meters, LED measurement

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