

SECURITY • IMAGING • EXTENDED REALITY

PHOTONICS IN FINLAND

MEDICAL TECHNOLOGIES • INDUSTRIAL MANUFACTURING • AUTOMATION



Photonics in Finland:

A HUB OF INNOVATION AND EXCELLENCE

Finland is shaping the future of photonics and strengthening Europe's leadership in this critical field.

Finland has established itself as a global leader in **photonics**, a key enabling technology that harnesses the power of light for applications in **healthcare**, **manufacturing**, **security**, **energy**, **sustainability**, and **communication**.

Since the **1960s**, Finland has played a pioneering role in photonics, developing breakthrough technologies in **optics**, **imaging**, **lasers**, **fiber optics**, and **nanophotonics**. Today with a strong foundation in **high-tech research and innovation**, Finland has a thriving ecosystem of universities, research institutions, and over **340 photonics companies**, generating an annual revenue of over **2,5 billion euros**.

The photonics industry in Finland is characterized by strong growth and international collaboration. The industry is highly export-driven, focusing on markets in Europe, the USA, and Asia, with a growing presence in emerging regions.

Photonics Finland, the country's leading technology cluster, plays a pivotal role in connecting businesses, researchers, and policymakers to accelerate development and commercialization. Finland also hosts key industry events, such as the **Optics and Photonics Days**, providing a platform for networking and showcasing groundbreaking research and industrial applications.

One of the key drivers for photonics R&D&I advancement in Finland is **PREIN (Flagship for Photonics Research and Innovation)**, a national research initiative that brings together leading universities and research centers to advance photonics technologies. PREIN fosters cutting-edge research – industry collaboration and development, ensuring Finland remains at the forefront of global photonics innovation.

With **strong expertise**, **industry and academic collaboration** and a **commitment to innovation**, Finland is shaping the future of photonics and strengthening Europe's leadership in this critical field.

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THE 2025 FINNISH PHOTONICS SURVEY HIGHLIGHTS
REMARKABLE GROWTH IN THE INDUSTRY SINCE 2023

COMPANIES

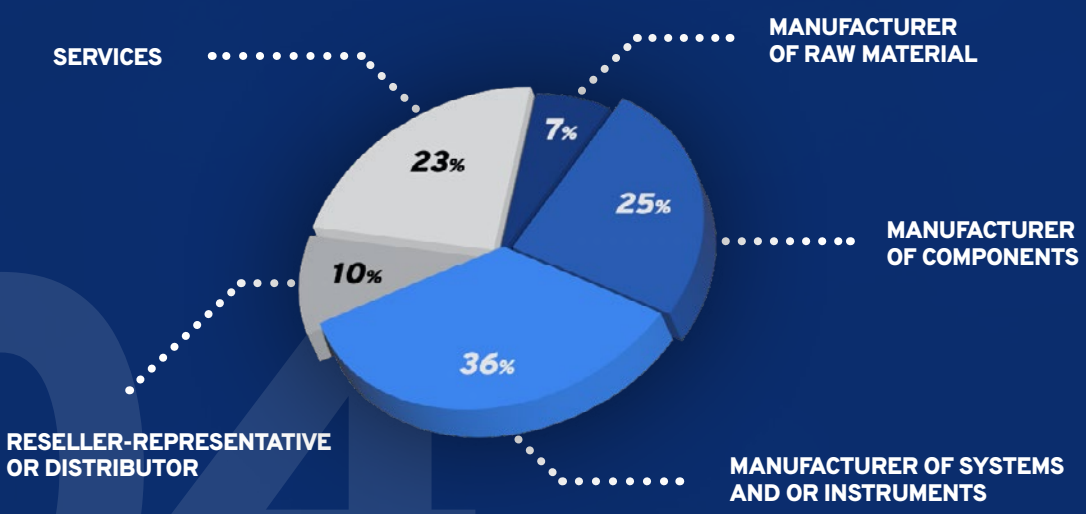
- Total 340 companies
- + 40 companies / + 13% since 2023
- New companies founded + 7% annually

TURNOVER

- Total 2 500 million euros
- + 500 million euros / + 25% since 2023
- Companies turnover grew + 25% annually

EMPLOYEES

- Total 7 500 employees
- + 1 000 employees / + 20% since 2020
- Amount of employees grew + 25% annually



STEADY GROWTH AND EXPANDING COMPANIES

In 2025, Finland's photonics industry boasts over €2.5 billion in annual revenue, directly employing more than 7,500 people across 340 companies. Including indirect employment, the workforce exceeds 50,000. Notably, the industry added 1,500 new jobs in two years and plans to increase recruitments in the coming three years. Despite economic uncertainties, the Finnish photonics industry has grown by 30% since 2023, adding over 40 new companies and maintaining an annual growth rate of 13%.

While 52 % of photonics companies are SMEs, the portion of larger companies with over €100M turnover has grown from 5% to 10%. The median number of employees per company has grown from 10 to 30, with 40% of photonics companies eager to hire photonics doctoral graduates. The Photonics doctoral pilot (I-DEEP) addresses the increasing demand for highly skilled staff.

EUROPEAN EXPORTS AND NATIONAL NETWORKING DRIVE EXPLOSIVE GROWTH

Photonics-related turnover is expected to grow by 48% driven by strategic investments and the success of the Photonics Finland ecosystem supporting industrial growth. The primary market remains photonics manufacturing, with security, metrology, and sensors steadily growing. Export activity has rebounded, with Europe, Asia, and the USA as key markets. Companies aim to further expand particularly their European exports.

PHOTONICS FLAGSHIP ESSENTIAL FOR RESEARCH-INDUSTRY COLLABORATION

Finnish research centers and universities excel in experimental and applied photonics research, with material science being the most prevalent field. Nearly 20% of research is conducted with industry partners. Enhanced collaboration between academia and industry is essential - a task that PREIN and Photonics Finland are committed to forward.

The Finnish photonics research community, including PREIN, is recognised as highly active and innovative. In addition to research collaboration, companies value joint events and media promotion with PREIN and Photonics Finland. The continuation of the PREIN in the flagship programme beyond 2026 is seen as vital, with strong support from both companies and researchers.

ACCESS TO RESEARCH AND STATE-OF-THE-ART INFRASTRUCTURE

Collaborative projects with research institutes are crucial also in leveraging Finland's photonics infrastructure for full utilisation of companies. Companies seek practical R&D support and flexible access to research infrastructure. An improved access to necessary infrastructure is also a key aspect in the importance of PREIN to researchers. The most preferred service for researchers is collaboration with other research institutes to access infrastructure reflecting strong interest in joint use and cooperation of infrastructures.

The Finnish photonics survey conducted since 2016, has expanded as research was added in the second round in 2020 whereas, the 2025 survey also explored the involvement of photonics companies in semiconductor and quantum technology-related activities. The survey in 2025 was a joint venture of Photonics Finland, PREIN and Business Finland, conducted by an independent external organisation.

Photonics Finland:

PHOTONICS FINLAND YOUR GATEWAY TO FINLAND'S PHOTONICS ECOSYSTEM

Photonics Finland is a **technology cluster** that promotes the photonics industry and research in Finland by connecting companies, universities, research institutions, experts, students, and public authorities. Its goal is to support the development of new business and research opportunities while maximizing the potential of photonics in various industries and society, including healthcare, energy efficiency, security, manufacturing, and sustainability. Photonics Finland serves as the single point of contact for the entire photonics ecosystem in Finland.

THE ROLE OF PHOTONICS FINLAND

Founded as the Finnish Optics Society in 1996 and relaunched in 2014 as a technology cluster, Photonics Finland has grown significantly. Today, it represents over 250 individual members and 130 organizations, including startups, SMEs, research institutions, and large enterprises. In a close collaboration with PREIN – Photonics Research and Innovation Flagship the cluster plays a key role in fostering industry-academia cooperation and ensuring that Finland remains a global leader in photonics innovation and development.

COLLABORATION AND RESEARCH EXCELLENCE

Photonics Finland works closely with national and international research initiatives to drive advancements in optics, lasers, imaging, fiber optics, and quantum technologies. One of the key partnerships is PREIN (Flagship for Photonics Research and Innovation), which brings together Finland's top research institutions to develop new photonics-based solutions for industries worldwide.

By bridging the gap between research and industry, Photonics Finland and its partners ensures that cutting-edge photonics technologies translate into real-world applications, strengthening Finland's position as a leader in light-based innovations.

For more information, visit www.photonics.fi

PHOTONICS FINLAND SUPPORTS ITS MEMBERS BY:

- Facilitating collaboration between academia and industry.
- Organizing networking events, conferences, and trade fairs to connect Finnish companies with international markets.
- Providing business development support by assisting companies in accessing funding opportunities and forming strategic partnerships.
- Enhancing global visibility by hosting Finnish pavilions at major international events such as Photonics West (San Francisco) and Laser World of Photonics (Munich).
- Promoting photonics education and workforce development, helping to attract new talent to the field.

OPTICS AND PHOTONICS DAYS (OPD)

A key event organized by Photonics Finland is the annual Optics and Photonics Days (OPD), the largest photonics conference in Finland. OPD gathers over 350 industry experts, researchers, and businesses from Finland and abroad to discuss the latest advancements in photonics technology.

THE EVENT INCLUDES:

- Scientific and industry presentations
- Poster sessions and Networking opportunities
- Photonics exhibition showcasing the latest products and services
- Special sessions such as PREIN Annual Event and Student event
- Best PhD Thesis and Photonics Company of the Year Awards

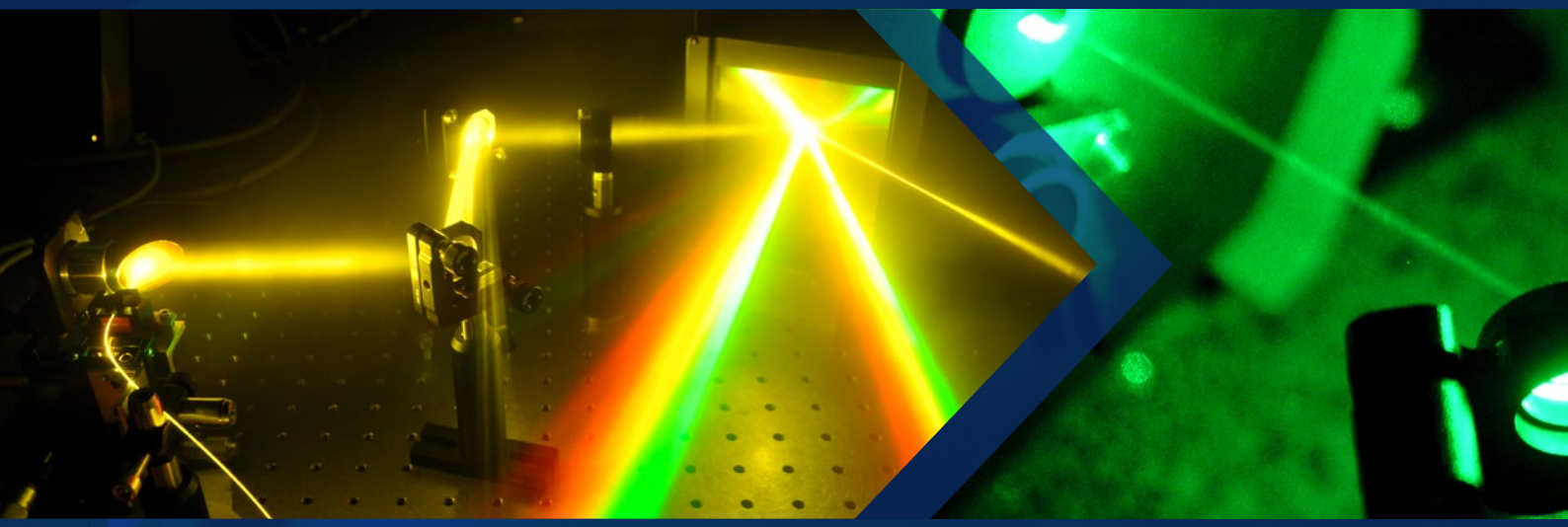
PHOTONICS FINLAND'S EUROPEAN PROJECTS

Photonics Finland actively participates in European photonics initiatives to support industry growth, research, and international collaboration. The organization is a partner in major EU-funded projects, including:

- PhotonQBoost – Dedicated to helping European SMEs enhance sustainability, resilience, and global competitiveness by leveraging Photonics and Quantum technologies.
- PhotonHub Europe – Helping European companies adopt photonics technologies to boost competitiveness.
- 360 CARLA – Developing a European innovation ecosystem to attract and train new talent in photonics and deep tech.
- FiCCC (Finnish Chips Competence Centre) – Strengthening Finland's expertise in microelectronics and photonics, funded by the European Union's Chips Joint Undertaking.

Through these initiatives, Photonics Finland helps Finnish companies expand internationally, access funding, and participate in collaborative R&D.

Finnish National P



STARTING POINT

- Increased Demand for Data Communication
- Green Energy and Sustainability
- Healthcare and Biotechnology
- Industry 4.0
- Dual-use products

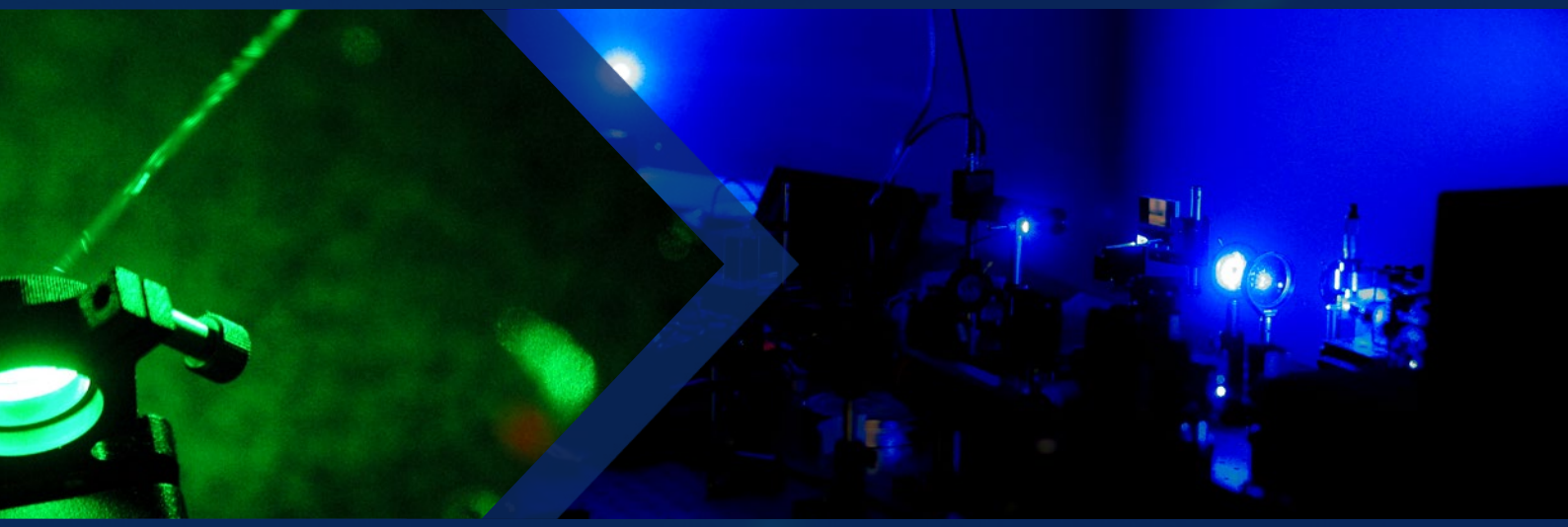
AIM

Doubling the i
Period: 2025 –

What are we d

- Revenue 2
  4 Billion
- Employees

hotonics Roadmap



M

ndustry
2030

oubling?

Billion to

7k to 14k

ACTION RECOMMENDATIONS

1. National Photonics Pilot Line
2. Continuing and Expanding the PREIN Flagship Program
3. National Photonics Growth Engine
4. Workforce Growth and Development
5. Enhancing Finland's International Influence and Export in Photonics
6. Strengthening the Photonics Ecosystem

VAISALA

PHOTONICS COMPANY OF THE YEAR 2023

Photonics Finland awarded Photonics Company of the Year prize to Vaisala Oy for their pioneering work of merging photonics in their weather and industrial instrumentation. Vaisala is renowned for its innovative Photonics-based products that make up a substantial proportion of their portfolio and is a global leader in measurement instruments and intelligence. With over 2400 staff and almost a century of experience, Vaisala has a strong global presence and the ability to meet diverse customer needs in various markets.

"I want to thank Photonics Finland for this great and unexpected honor. We have been developing world leading optical and photonics instruments since the 1980 s, utilizing, e.g. diode laser LIDAR technologies, infrared absorption spectroscopy, and proprietary optical MEMS components to achieve the best performing products. I want to thank our great technology and R&D teams and well as research partners for making all that happen. We continue to push growth with new innovations in the Photonics sector", said **Hannu Talvitie**, Technology Strategy Director from Vaisala after receiving the prize.

Vaisala, a Finnish company founded in 1936 by Professor Vilho Väisälä, has a rich history of innovation in environmental and industrial measurement. The company's journey began with the invention of the radiosonde, a device used to measure atmospheric parameters and transmit them to a ground receiver. This invention laid the foundation for Vaisala's future success and established its reputation as a leader in meteorological instruments.

From its humble beginnings in the basement of a residential building in Helsinki, Vaisala has grown into a global company with over 2400 employees and operates in more than 150 countries with technology on two planets.

PHOTONICS AT VAISALA

The company's commitment to innovation and quality has driven its expansion into various fields, including photonics and optical technologies. Vaisala's first products using photonics technologies were cloud height lidar (i.e. ceilometer) and visibility instruments aimed at airports and aviation safety, developed in the mid-1980s.

Nowadays photonics technologies play a critical role in Vaisala's products. Vaisala has more than 20 different product families that use photonics and optics technologies. These technologies account for over 25% of Vaisala's total sales.

Vaisala has developed a range of advanced optical measurement technologies. Many of them utilize light scattering from aerosols or particles, like various atmospheric lidars, visibility and present weather sensors as well as particle monitors. These products are used for several weather applications supporting weather forecasting, safe transportation and air quality monitoring. On the other hand, Vaisala has also developed a range of spectroscopy-based technologies for infrared gas sensing in industrial processes and environmental applications.

Photonics remains central to Vaisala's innovation and product development. What is really special for Vaisala is how to develop photonics products that provide continuous, reliable and accurate measurement data even in the harshest ambient or process environments with minimal or no maintenance. That requires special skills and experience in product development as well as comprehensive product testing.

The National Network for Photonics Research

PREIN

The **Flagship for Photonics Research and Innovation (PREIN)** selected in 2019 by the Research Council of Finland as one of the first flagship initiatives, combines top-tier research, industry collaboration, and societal contributions. It enhances both national and international research collaboration of its partners Tampere University, University of Eastern Finland, Aalto University, and VTT Technical Research Centre of Finland.

With over 500 researchers from photonics and diverse related fields PREIN fosters a multidisciplinary environment that boosts innovation through photonics applications and industry collaboration. Leveraging the vast resources and infrastructures of its partners, PREIN offers a wide range of services, including research cooperation, product development, commercialization, and spinoffs.

PREIN also educates future photonics experts and emphasizes the importance of light-related technologies through outreach and communication activities. Its comprehensive approach to research, innovation, and impact makes PREIN a valuable partner for advancing photonics and related technologies, benefiting both academic and industrial partners globally.

Tampere University

VTT

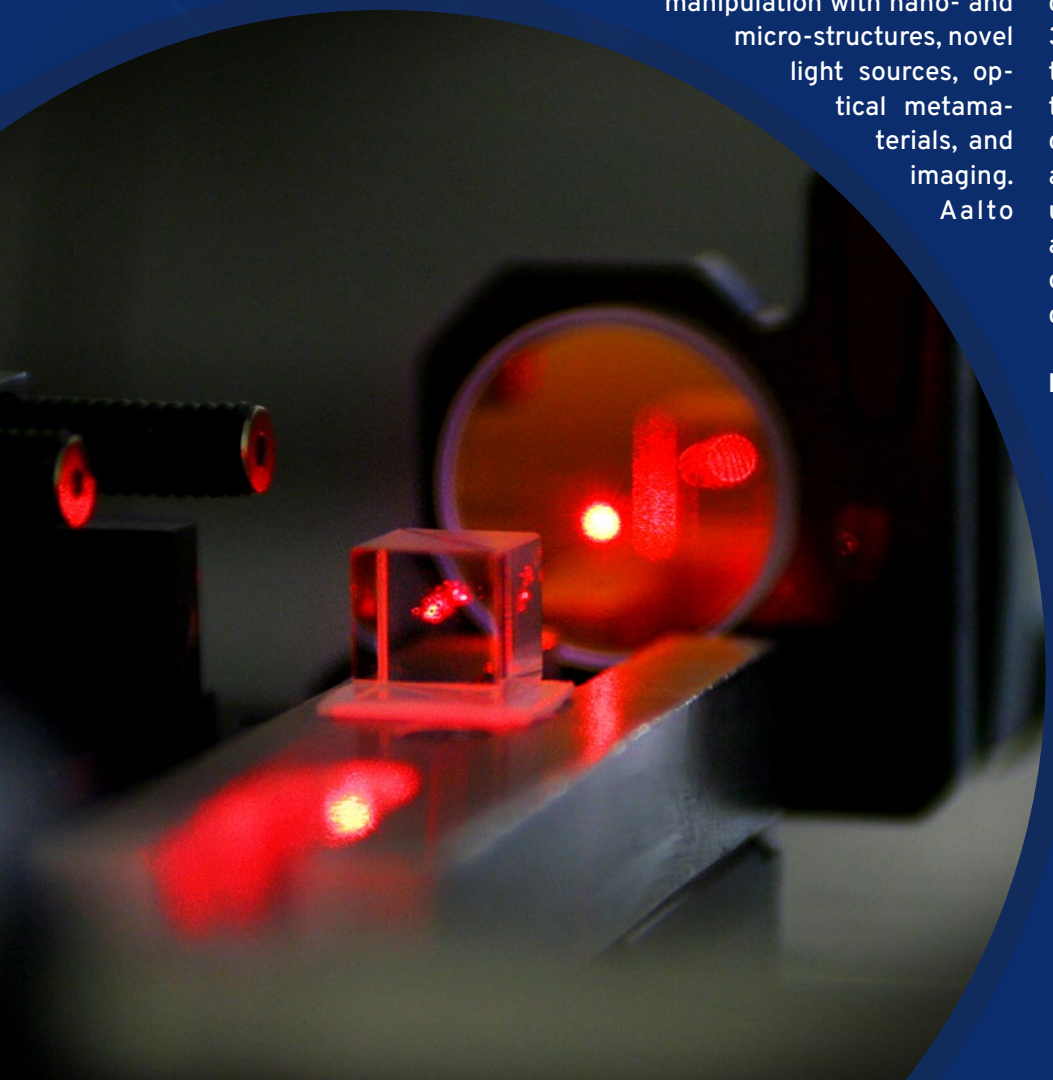
Aalto University

UNIVERSITY OF EASTERN FINLAND

For more information, visit www.prein.fi

Photonics Research in Finland

Finnish universities and research institutes conduct top-notch fundamental photonics research and produce cutting-edge applications. There are nearly one thousand full-time photonics researchers and several hundred more in related fields. Strong collaboration networks are key to the success of the Finnish photonics research ecosystem. Funding comes from institutions' basic funding and public funders like the Research Council of Finland, Business Finland, the EU, and increasingly from industry. The estimated total research funding in 2025 is 88M–97M€, with most research groups operating on an annual budget of around 1M€.



Aalto

AALTO UNIVERSITY

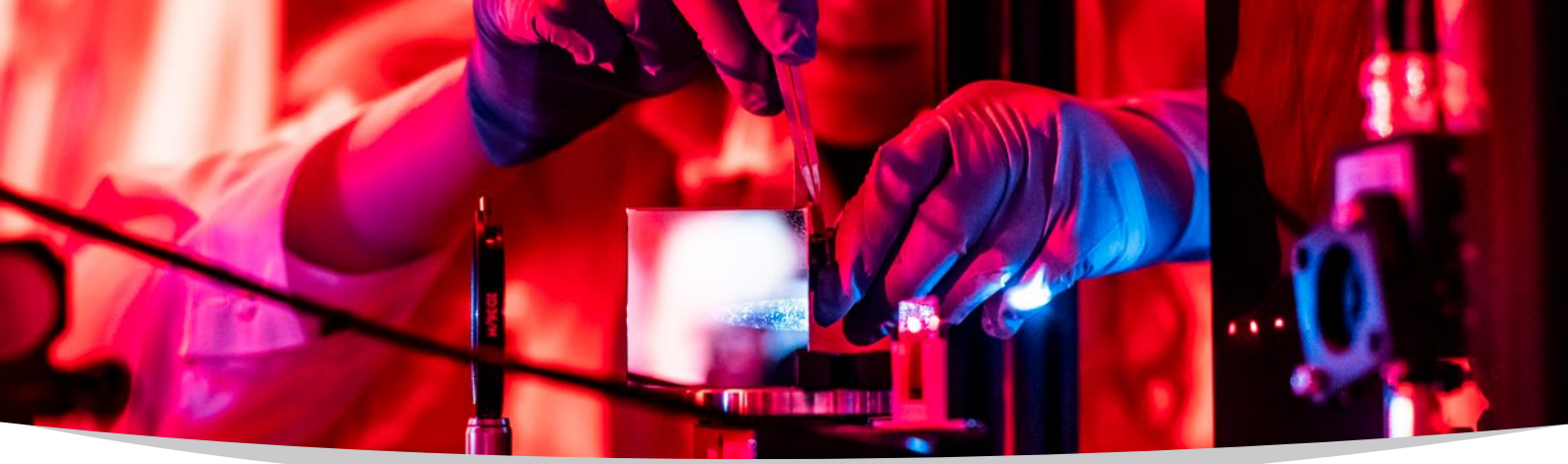
The Department of Electronics and Nanoengineering focuses on nanomaterials for photonic and optoelectronic applications, silicon-based photovoltaics, photodetectors, photoelectrocatalysis, integrated photonics, semiconductor lasers, quantum optics, and optical fibers. The Department of Applied Physics studies light-matter interaction, optical coherence, polarization, light manipulation with nano- and micro-structures, novel light sources, optical metamaterials, and imaging. Aalto University hosts the national infrastructure OtaNano, providing facilities for micro-, nano-, and quantum technologies. Aalto is a partner in the PREIN Flagship.

UNIVERSITY OF HELSINKI

The Department of Physics researches light scattering and absorption by particles across the UV-Vis-NIR spectrum, with applications in astrophysics and planetary sciences. Research also includes laser-generated ultrasound and optical imaging. The Department of Chemistry focuses on photosynthesis, light-controlled drug delivery, photopolymerization 3D printing, and plasmonic nanoparticles for chemical analysis and catalysis and develop laser spectroscopy and microscopy methods for air quality measurements. The Faculties of Pharmacy and Medicine apply photonics to enhance drug development, medical imaging, and diagnostics.

FINNISH METEOROLOGICAL INSTITUTE

The Finnish Meteorological Institute observes the atmosphere, sea and space at over 400 stations around Finland. In addition to weather observations, they monitor air quality, radioactivity and properties of the upper atmosphere. They also develop atmospheric and weather observation methods and systems utilizing photonics applications of remote sensing instruments such as radars and satellites.



UNIVERSITY OF EASTERN FINLAND

The University of Eastern Finland's photonics research is organized under the Institute of Photonics, which spans biology, chemistry, IT, and physics. Research areas include ultrafast coherence and polarization, nanophotonics, integrated optics, biophotonics, spectral color research, optical materials, optical manufacturing, and optical imaging. UEF is a partner in the PREIN Flagship, focusing on economic and societal impact. UEF offers advanced nanophotonics manufacturing and characterization equipment, a unique 3D printer for optics, and is part of the national FinnLight infrastructure.

UNIVERSITY OF JYVÄSKYLÄ

The Nanoscience Center combines biological and environmental sciences, chemistry, and physics for experimental and theoretical research on molecules, materials, and structures. The Laser Laboratory integrates laser spectroscopy with nanoscience. Photonics research includes quantum optics, polaritonic phenomena, time-resolved laser methods, optical confocal and near-field microscopy, carbon nanostructures, gold nanoparticles, light-sensitive proteins, ultrafast proton transfer reactions, surface plasmons, polaritonic chemistry, spin-photon interfaces, quantum information applications, cell transport imaging, and surface material distributions.

LUT UNIVERSITY

Photonics research in the Department of Physics focuses on optical measurement technology, nonlinear laser spectroscopy, semiconductor and supraconductor physics and nanophysics. In the Department of Mechanical Engineering, various laser welding and laser processing methods are applied to automotive, aerospace and additive manufacturing.

UNIVERSITY OF OULU

The Laboratory of Optoelectronics and Measurement Technology develops measurement methods for highly scattering materials like paper, pulp, and biological samples using optical coherence tomography, photon migration photoacoustics, and optically readable biometrics. Specializing in biophotonics, biomedical, and industrial measurements, the lab also models photon-material interactions and researches organic light-emitting components (OLEDs) and solar cells.

The Measurement Technology Research Unit focuses on optical measurement methods for cleantech and health and wellness, including reflectance measurement, surface plasmon resonance (SPR), UV-VIS-NIR spectroscopy, and imaging methods.

THE FINNISH DEFENCE RESEARCH AGENCY

The Finnish Defence Research Agency focuses on the performance of various electro-optic sensors in Nordic operational environment and their countermeasures. The aim is to provide reliable information to the decision makers in the planning, building and use of military capabilities. The research covers all military applications of electro-optic sensors including intelligence and targeting

sensors, seekers, and different laser applications.

TAMPERE UNIVERSITY

Light-based technologies are a strategic focus at Tampere University, which coordinates the PREIN Flagship, the I-DEEP doctoral pilot, and the FinnLight infrastructure. Photonics related research is carried out in several faculties. In the Faculty of Natural Sciences and Engineering the focus is on materials, including photonic glasses, solar cells and semiconductor nanostructures. Other topics include advanced light sources, nonlinear optics, lasers, and optical spectroscopy. The Faculty of Information Technology and Communication Sciences uses photonics in signal processing, image and video analysis, depth and thermal imaging, robotics, signal analysis, and VR/AR/XR systems. The Faculty of Medicine and Health Technologies applies light-based technologies to enhance medical diagnostics and healthcare technologies, biomedical imaging, tomography, fluorescence imaging, laser and photodynamic therapies, and optogenetics.

UNIVERSITY OF TURKU

Photonics research at the University of Turku spans multiple departments. The Quantum Optics Laboratory focuses on manipulating cold atoms with laser and magnetic fields, exploring atomic Bose-Einstein condensates, and developing quantum tomography methods using polarization-entangled photon pairs. The Department of Mechanical and Materials Engineering advances laser-based manufacturing techniques, including laser welding and metal printing, emphasizing laser-material interactions, sensors, and imaging. The Faculty of Medicine specializes in fluorescence-based molecular methods.

VTT

VTT Technical Research Centre of Finland, owned by the Finnish state, is one of Europe's leading research institutions with 400 researchers. Espoo and Oulu sites focus on silicon photonics, hyperspectral imaging, packaging, industrial optical devices, and machine vision, optical communication, quantum computing, medical imaging, gas sensing, and autonomous vehicles. In Espoo, Micronova develops dense photonic integration, low-temperature optoelectronics, and single-photon detectors, advancing microspectrometers, micromirrors, and optical MEMS technology and MIKES focuses on optical realization methods for SI units, traceability, reliability of optical measurements, and quality assurance for industrial production. In Oulu, research includes photonics integration and packaging, optical measurement methods, machine vision, optical instrumentation, bio-photonics, and wearable sensors. Tampere specializes in plasmonics and laser radar applications, while Kuopio focuses on optical instrumentation. VTT is a partner in the PREIN Flagship, FinnLight, and the I-DEEP doctoral pilot.

ÅBO AKADEMI

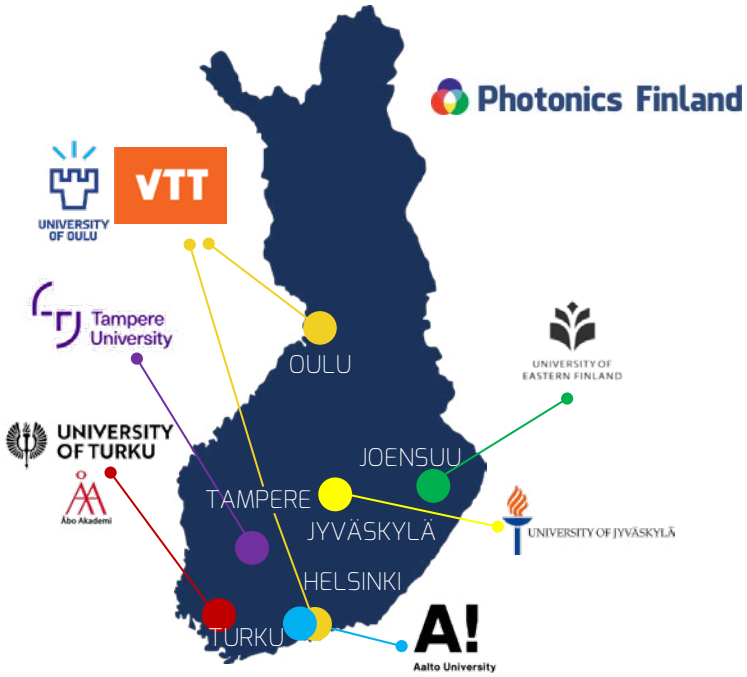
Photonics research at Åbo Akademi University focuses on nanophotonics modeling, next-generation solar cells, materials for passive cooling, and especially imaging and microscopy within Turku BioImaging center.

I-DEEP Doctoral Pilot

– INNOVATING THE FUTURE OF PHOTONICS TALENT

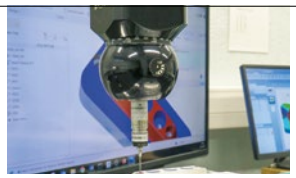
I-DEEP in a nutshell

- Collaborative initiative by seven leading Finnish universities in photonics research, with VTT and Photonics Finland as associate partners
- Shaping the future of doctoral education
- Industry-aligned curriculum with real-world applications
- Collaboration between university research groups and industry
- Training highly skilled doctoral researchers aiming for industry



For more information, visit www.prein.fi/i-deep/





Karelia University of Applied Sciences

Precision Engineering

Precision engineering is deeper understanding of manufacturing processes, metrology and material science to generate added value to product performance through functionality.

- Applied research with companies
- Development of new manufacturing processes
- Manufacturing and design of prototypes
- In-house manufacturing services:
  mold prototypes, injection moulding,
  diamond turning (freeforms, micro-milling,
  diffractives), high speed machining,
  metal injection moulding process and metrology
  services

Co-funded by the European Union

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Photonics Joensuu

Finland's leading photonics research and education center with a strong focus on modern photonics.

Joensuu is the leading photonics education hub in the Nordic countries and a pioneer in modern optics with a growing focus on dual-use photonics applications.

Photo : Hiroya Nakauchi

Opportunities for companies applying photonics

- Photonics Joensuu brings together the right partners for your company's R&D projects.
- Photonics experts from clean room staff to engineers and PhD researchers.
- Photonics Joensuu invests in its unique equipment portfolio and growing facilities.
- Strong national and international networks.
- Business Joensuu's extensive service portfolio from smooth relocation to growth, investments, and internationalization

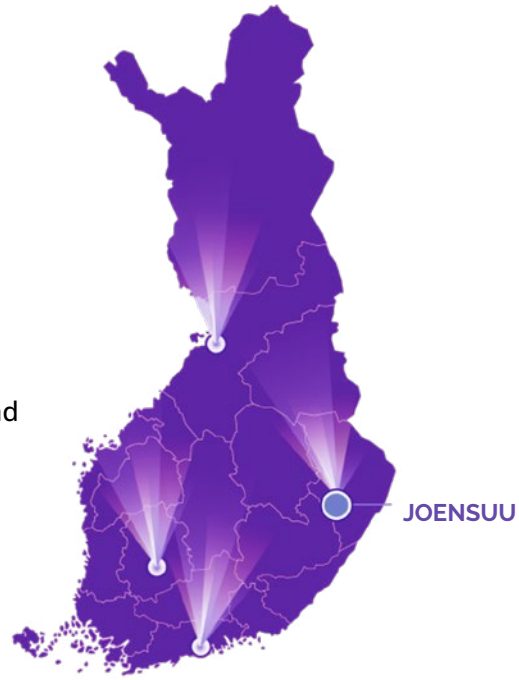
BUSINESS JOENSUU | JOE WITH | J•ENSUU | CENTER FOR PHOTONICS SCIENCES | Karelia

Unique Photonics Triple Helix ecosystem:

- University of Eastern Finland and Karelia University of Applied Sciences with a strong R&D focus.
- Vibrant startup scene and a growing company cluster.
- Photonics Center - Collaboration for Business and Research.
- City of Joensuu, Business Joensuu, Photonics Finland, European Optical Society, Innocities programme.

JOENSUU - One of Europe's leading regional photonics ecosystems and one of the four photonics innovation hubs in Finland

- Research spearheads micro- and nanophotonics and hyperspectral imaging.
- Long history in 3D printed optics.
- Facilitating R&D projects with top-notch shared facilities and equipment for prototyping and product development.
- 55 years of cutting-edge research by the Center for Photonics Sciences at the University of Eastern Finland: 25+ professors and the only MSc in Finland specializing in photonics.



MAJOR STRENGTH	An established research and business community generating industry applications.

UNIVERSITY OF EASTERN FINLAND
Regional Council of NORTH KARELIA
Co-funded by the European Union

Photonics Education

Finnish universities offer research-informed degree programmes from bachelor to doctoral levels, focusing on photonics or linking it to other disciplines. These programmes attract international students and include collaborations with renowned universities worldwide.

Photonics doctoral studies in Finland can be pursued through fully-funded researcher positions or while employed in industry. The rapid growth of the photonics sector has increased demand for master's and doctoral graduates.

AALTO UNIVERSITY

Offers advanced studies in electronics with specialisation in photonics and nanotechnology, covering electromagnetic radiation, optics, and materials science. Students gain practical skills in developing state-of-the-art devices using nanocarbon compounds and 2D materials.

TAMPERE UNIVERSITY

Provides comprehensive education in photonics at both master's and doctoral levels, including international bachelor's programmes that offer the possibility to continue in photonics studies. The curriculum covers light-matter interactions, laser physics, optical systems design, and advanced nanofabrication methods. Tampere University is also involved in double degree programmes and Erasmus Mundus joint master's programmes in photonics with international partners.

UNIVERSITY OF EASTERN FINLAND

Offers extensive photonics programmes at all degree levels, blending theory with practical work. The university maintains strong industry connections and participates in several international joint Erasmus Mundus Master's programmes. In 2023, UEF launched a Bachelor's and Master's programme in Photonics in Finnish to meet the national demand for photonics experts.

UNIVERSITY OF JYVÄSKYLÄ

Features a programme in nanoscience with interdisciplinary studies in nanophotonics, combining physics, chemistry, and biology. The university also partners in international programme focusing on radiation physics and photonics applications for medical physics, industrial systems, and scientific research, along with international research opportunities.

UNIVERSITY OF OULU

Offers an electronics degree programme with advanced optical and electrical measurement techniques, and applications in biomedical measurements, photonics, and printed electronics. The university also offers courses related to medical imaging and optics.

UNIVERSITY OF HELSINKI

The programme in Materials Research is based on physics, chemistry, biology and medical sciences, mathematics and computer science, with a study track in optics and photonics. The programme in Physics provides studies on scattering and absorption of light by particulates, encompassing theoretical and computational electromagnetics, and astronomical observations, focusing especially on planetary sciences. Additionally, in the Faculty of Pharmacy

and Medicine, there is a selection of courses on the fundamentals and applications of photonics. The University of Helsinki is a partner in one Erasmus Mundus programme, and an associated partner in another. These programmes cover state-of-the-art optical spectroscopy, imaging, and characterisation methods.

UNIVERSITY OF TURKU

Focuses on Physical Chemistry with light-based technologies such as optics, laser technology, and material science. The programme combines theoretical and practical training, preparing students for careers in telecommunications, biomedical engineering, and materials science.

ÅBO AKADEMI

Integrates photonics into its curriculum through studies in chemistry, materials science, and biomedical imaging. In the Biomedical imaging studies, students gain a comprehensive understanding of imaging technologies and their applications.

PHOTONICS STUDENT ASSOCIATIONS

There are photonics student associations in the Finnish universities affiliated with different international photonics associations. The student associations are aimed at students in all study levels from bachelor to doctoral studies.

- National student association, EOS Finland Student Club
- Finnish SPIE Student Chapters
- Finnish Optica Student Chapters

Outreach

PHOTONICS FOR EVERYONE! CELEBRATE LIGHT AROUND THE YEAR

PREIN and Photonics Finland organize events aimed at the general public and children and youth to promote technical fields as study and career options for future students, raise awareness about photonics as a key enabling technology, and encourage diversity and inclusiveness in science, technology, engineering and mathematics (STEM) fields and photonics in particular. We collaborate with university outreach experts and photonics companies to make these events successful. We participate in national and local science outreach events, such as the European Researchers' Night, Shaking up Tech and the Science Forum. The International Day of Light on May 16 is a significant occasion for our outreach efforts when we organize workshops, training sessions, and events throughout the month. Some activities have become regular fixtures, while new initiatives are introduced annually. Spark Curiosity: Partner with us in Photonics Outreach!

Inspire Future Innovators

– DONATE A PHOTONICS EXPLORER KIT

Help bring hands-on science to schools across Finland! The Photonics Explorer Kit is a fun, interactive learning package that introduces students to the science of light through real experiments – from lasers and LEDs to fiber optics and polarization.

Developed by the non-profit EYEST, this durable classroom kit is ideal for high school and upper secondary education. It comes with a teacher's guide, student materials, and experiments covering topics like optical communication, lenses, colors, and careers in science.

Over 200 Finnish schools already use the kit – let's reach even more. Support science education, boost your company's visibility, and help shape the next generation of STEM professionals.

PREIN and Photonics Finland have been carrying out a donation campaign for the Photonics Explorer Kit in Finland since 2020. In the campaign we seek companies and individuals to donate packages to local schools around Finland. PREIN and Photonics Finland both donate one package for each donated package to ensure wider geographical coverage and the equal opportunities for all schools to receive a donation.

DONATE TODAY:

prein.fi/tiedekasvatus/photonics-explorer-kit-english

- **Cost-effective: only €250 per kit**
- **Your logo and brochure included in every donated kit**
- **Visibility on Photonics Finland & PREIN websites**
- **Match campaign: PREIN & Photonics Finland will double every donation!**

Photonics Explorer Kit

- A VERSATILE TOOL FOR STUDYING LIGHT PHENOMENA

Have you used illustrative methods in physics teaching? If so, what kind?

I believe that experimentation and illustrative tools are the cornerstones of teaching physics and chemistry, as these sciences have developed through experimentation. According to the curriculum objectives, experimentation is both a goal of learning and a content that I believe cannot be replaced by anything else. Personal experiences, described experiments, as well as simulations and animations support experimentation. These methods allow phenomena to be studied one at a time, eliminating disturbances.

How is photonics taught in elementary school?

The importance of light for vision and the properties of light are explored in various ways. The dispersion of light into different colors, reflection, refraction, and total internal reflection are generally part of the basic curriculum. Teaching how the path of light can be altered using mirrors and lenses introduces everyday applications, such as curved mirrors and optical devices.

How do you think the Photonics Explorer Kit supports teaching?

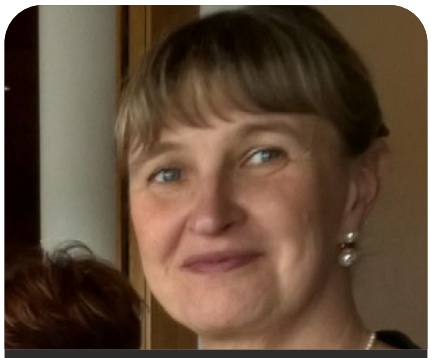
The Photonics Explorer Kit is a versatile set of tools for studying light phenomena.

How do students respond to the contents of the teaching kit and their learning experience?

Students always get excited about experiments, as long as the experiments are carefully planned so they understand why the research is conducted and how the results can be applied. Especially in photonics, simulations provide deeper insights into the nature of phenomena, as the properties of colored lights, in particular, depend heavily on the tools used—for example, combining lights of different colors.

How important do you consider photonics in physics education?

Photonics is traditionally taught as part of the physics curriculum in seventh grade. I think it's a sufficiently simple way to begin exploring physical phenomena. Many phenomena can be observed in everyday life, and many applications are already familiar to students. However, there is also a lot of new information to learn in photonics. I also believe it's essential to include health and safety aspects in photonics education. Eyes should be protected from intense light sources, such as the sun and laser lights.



TUULA HAVONEN
- 2ND VICE CHAIR
- ASSOCIATION OF TEACHERS OF MATHEMATICAL SUBJECTS (MAOL)

Beneq brings Photonics into hands-on STEM education

THE FINNISH ALD TECHNOLOGY PIONEER HAS DONATED PHOTONICS EXPLORER KITS TO SCHOOLS.

Beneq is a Finnish company specializing in Atomic Layer Deposition (ALD) technology. Established in 2005, the company has since expanded its expertise by acquiring the Finnish operations of Planar Systems. These acquisitions also included the electroluminescent (EL) display production originally launched by Lohja Oy, based on ALD technology.

Today, Beneq is a recognized leader in the field, offering ALD solutions for both research and industrial applications. The company's equipment is widely used in photonics applications such as optical coatings, LED technology, augmented reality (AR), and µOLED displays. ALD makes it possible to produce extremely thin, uniform, and pinhole-free films that enhance the performance and durability of optical components. Beneq's technology is particularly well-suited for coating curved lenses, waveguides, and other complex optical structures—applications where conventional methods are less effective.

In addition to its role as a technological front-runner, Beneq is also committed to advancing STEM (Science, Technology, Engineering, Mathematics) education, especially in optics and photonics.

"Beneq has supported STEM education by donating Photonics Explorer Kits to schools," says Sami Sneck, Vice President, Advanced ALD at Beneq.

The Photonics Explorer Kit (PEK) is a curriculum-linked teaching package designed to encourage students to learn through experimentation. The kit includes lenses, LED lights, lasers, diffraction gratings, and polarizers—allowing the entire class to participate in hands-on experiments simultaneously. It is suitable for middle and high school physics education and can also be used in vocational secondary education.

Investing in the Future of Photonics

Beneq's motivation for donating the kits lies in its commitment to developing future talent in a field that is becoming increasingly important in modern society.

"We have several photonics experts working at Beneq, and we understand how crucial it is to inspire and support young talents to explore this field," says Sneck. "Photonics plays a significant role in our everyday lives and offers fascinating career opportunities. When Photonics Finland proposed donating Photonics Explorer Kits to support education, we immediately saw it as a fantastic idea."

LEARNING THROUGH DOING

The real strength of the kits lies in their practical, hands-on approach to learning.

"Seeing physical phenomena in action is the most effective way for students to learn about optics and photonics," Sneck explains. "These experiments naturally spark curiosity and encourage students to dive deeper into the underlying theories."

With initiatives like this, Beneq demonstrates how industry can play an active role in shaping the future—not only through technological innovation but also by investing in the next generation of scientists and engineers.

Photonics Finland:

DRIVING INNOVATION THROUGH GLOBAL COLLABORATION

Finland stands at the forefront of photonics innovation, where cutting-edge research meets high-impact industry, and education fuels long-term development. At the core of this dynamic ecosystem is the seamless and long-term of collaboration between academia and industry – a synergy that drives global competitiveness and sustainable growth in Finnish photonics.

NATIONAL STRENGTH BUILT ON COLLABORATION

Finland's photonics success story is one of unified national ambition. Photonics Finland serves as a central organization uniting stakeholders from across the value chain – companies, research and education institutions, and public organizations – to create a thriving community that shares knowledge, fosters talent, and accelerates innovation.

Photonics Finland works together with national research initiatives, such as the Flagship for Photonics Research and Innovation (PREIN) which ensures that world-class research is efficiently translated into real-world applications. From quantum technologies and imaging systems to optical communications and life sciences, this collaborative approach has made Finnish photonics well known on the international stage.

WHY CHOOSE FINLAND?

- Open, Transparent Collaboration: Finland's research and business culture emphasizes trust and shared progress. Multidisciplinary cooperation is not just encouraged –it is embedded into how institutions and companies operate.
- Strong Talent Pipeline: Education and skills development are prioritized, ensuring a steady flow of new professionals and researchers into the field.
- Global Mindset, Local Strength: Finnish companies are export-driven and globally active but deeply rooted in a supportive domestic ecosystem that enhances their resilience and adaptability.
- Finland stands at the forefront of global innovation, particularly in areas where photonics intersects with digitalisation, automation, sustainability, and energy efficiency. The Finnish government has positioned photonics as a key enabler in its national policy frameworks.

JOIN THE FINNISH PHOTONICS NETWORK

For companies and individuals abroad, Finland offers more than just business opportunities – it offers access to a collaborative and forward-looking environment. Whether a startup seeking partners, a researcher aiming to collaborate, or an investor exploring opportunities in photonics technologies, there are multiple ways to join the ecosystem:

- Become a member of Photonics Finland: This opens the door to a vibrant network of professionals and organizations, as well as access to marketing platforms, job board, expert forums, and joint projects. The Finnish photonics ecosystem welcomes new members, collaborators, and partners from all over the world.
- Participate in Top Events: The annual Optics and Photonics Days (OPD) is a must-attend for anyone looking to connect with the Finnish photonics community. It's a unique mix of academic insight and industrial relevance, bringing together scientists, business leaders, and students under one roof for knowledge-sharing, networking, and exhibition.
- Join R&D&I ventures with academic leaders and find research collaboration partners from Finnish universities and research centres.

Take the next step and explore opportunities and get involved by visiting www.photonics.fi and www.prein.fi.

Photonic Services and Equipment

FinnLight is a National Infrastructure for Photonics Research and a consortium between Tampere University, VTT and University of Eastern Finland. The consortium offers unique expertise and infrastructure services for research, development, and innovation in photonics.

The infrastructure and services cover the whole innovation value chain from the development of materials and structures with specific optics properties, to the fabrication of fully functional photonic devices and components, and up to systems integration and instruments. Examples of application fields include industrial process control, pharmaceutical analysis, health care, environmental monitoring, safety, and security.

FinnLight partners have a long history of photonics research with complementary skills ranging from the design of and fabrication of nanomaterials and optical components to the development of advanced light sources with tailored properties, up to system integration, instrumentation, and transfer of scientific results towards commercialization.

The FinnLight platform is accessible to external users from academic institutions and industrial actors.

Visit the website, choose the service you need and connect by using the contact form!

READ MORE AT **FINNLIGHT.FI**

Photonics Finland:

CURRENTLY ONGOING PHOTONICS FINLAND PROJECTS

Photonics Finland actively connects to leading European and global networks, creating new opportunities to its members for innovation, funding, and international growth. As a key partner in EU projects like PhotonQBoost, CARLA 360, PhotonHub, FiCCC, and Phorwards21, Photonics Finland helps companies access cutting-edge expertise, strategic partnerships, and millions in innovation support—strengthening their position in the global photonics landscape.

Photonics Finland is also a partner of the PREIN Flagship, a national center of excellence for photonics research and innovation, funded by the Research Council of Finland. PREIN unites top Finnish universities and research institutions to accelerate breakthroughs in photonics and turn them into impactful technologies and business opportunities.

Participating in European projects also supports Photonics Finland's own operations, providing a vital funding stream that complements membership fees and income from events. These combined resources enable Photonics Finland to offer high-value services, expand the photonics ecosystem, and ensure its members remain at the forefront of Europe's technological future.

PHOTONQBOOST

PhotonQBoost is a major EU initiative aimed at empowering European SMEs in the Photonics and Quantum sectors. With €3.6 million in funding available, it helps businesses drive innovation, improve sustainability, and expand globally. Through Photonics Finland, members gain access to innovation, technology, and sustainability transition support, funding opportunities, and high-impact matchmaking events across Europe. Itis a fast track to growth, visibility, and new partnerships—positioning SMEs at the forefront of Europe's tech leadership.

CARLA 360

CARLA 360 brings photonics to life for students and researchers—especially for those from non-photonics STEM fields—by showcasing the impact of photonics on health, energy and sustainability, manufacturing and industry 4.0, and quantum technologies. Each event connects participants with innovation, entrepreneurship, and mentorship opportunities, while highlighting photonics as an exitinginterdisciplinary career path. It offers a fresh, accessible gateway into the industry and a stepping stone in accessing future photonics workforce in Europe.

PHORWARDS21

Phorwards21 is shaping Europe's industrial future with photonics at its core. By aligning national strategies and involving over 1,000 experts, it is crafting roadmaps that integrate photonics into vital application sectors—from AI to healthcare. The initiative drives investment, boosts the access of SME to funding, and promotes photonics as a key enabler of the digital and green transitions. Phorwards21 also strengthens community engagement, ensuring Europe leads in photonics innovation and industrial resilience.

FICCC

The Finnish Chips Competence Center (FiCCC) offers companies hands-on support in chip design, prototyping, testing, and access to chips infrastructure.

Businesses can benefit from tailored services, expert guidance, and connections to European pilot lines and innovation ecosystems - accelerating development, scaling, and funding access. FiCCC helps companies bridge the gap between research and market-ready chip solutions.

Photonics Finland Members

COHERENT

INNOVATIONS THAT RESONATE

Coherent Corp. is a global leader in lasers, materials and networking solutions for the industrial, communications, electronics, and instrumentation markets. The company is headquartered in Saxonburg, Pennsylvania, and operates in more than 20 countries around the world.

Tampere business unit brings together the company's high-power fiber laser R&D, manufacturing and testing expertise into more than 53,000 sq ft of production floor space, including a more than 10,000-sq-ft clean room devoted to the fabrication of critical optical components.

Kari Kola – Impact Through Light

KARI KOLA IS AN INTERNATIONALLY RENOWNED FINNISH LIGHT ARTIST WHOSE WORK CENTERS AROUND LIGHT – ITS SYMBOLIC, TECHNICAL, AND EMOTIONAL POWER.

Over the past 24 years, Kari Kola has completed thousands of projects, ranging from UNESCO headquarters in Paris to the ancient stones of Stonehenge, from remote wilderness installations to arctic conditions. His art combines a unique creative vision, exceptional scale, and a deep understanding of the technology and potential of light – in other words, photonics.

A TOOL TO CHANGE THE WORLD

"Everything on this planet is based on light. Everything connects to it," says Kola.

What drives him in light art is the fact that light is both physically intangible and symbolically powerful – and photonics provides the tools to shape and control it. He has developed new optical solutions and colour technologies in collaboration with equipment manufacturers to broaden the expressive potential of his art.

"RGB is no longer enough – I want more precise colours and greater impact."

HISTORIC SITES, MONUMENTAL SCALE

For Kola, impact isn't just about audience numbers – it's about evoking thought and emotion in the right context. He has created light installations at iconic and sensitive locations, including Stonehenge – a site no other light artist has had access to – and UNESCO's headquarters as part of the UN's International Year of Light and first International Day of Light.

"Light can highlight the significance of historical places without physically touching them. Even if a piece is only visible for a brief moment, its influence can reach millions through global media."

BIGGER, SLOWER, AND MORE INTENTIONAL

Kola believes light art is at a crossroads. As technology becomes more accessible, more works are being produced, but often at the cost of depth and meaning. "Too many projects rely on AI to generate something flashy in seconds – but where's the thought, the symbolism, the feeling?"

He is shifting his focus toward ever larger, but shorter and more carefully curated works where quality outweighs quantity. Upcoming projects include massive installations in Australia and the Middle East – as well as in Botania, the botanical garden he owns in Joensuu, where he is developing a light-based piece that brings together biodiversity, photonics, and cutting-edge technology.

LIGHT AS A SOLUTION FOR THE FUTURE

Kola sees enormous potential in photonics – not just in the arts, but across society. He's concerned about light pollution and energy overconsumption:

"We need to learn to light better – not just more. Photonics can solve major global problems, but it requires a new mindset."

He hopes to see closer collaboration between artists, scientists, and policymakers.

“Light can move people – but it can also move the world.”

Photonics Finland

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COMMUNICATION • CLEANTECH • AGRICULTURE