Photonics Finland

Annual Report 2023

10.06.2024

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ACTIVITY REPORT FOR THE PERIOD 01.01.–31.12.2023

1. Operating Principles of the Association

The Finnish Optical Society was founded on March 21, 1996. The purpose of the society was to act as a link between people interested in optics and related fields, and to promote research, teaching, hobby, and industrial application of optics in Finland. The society also aimed to maintain international relations and connections. The society was registered in an association on 16 December 1996 after minor rule revisions.

In June 2014, the association changed its name to the Suomen fotoniikan seura, more commonly called as Photonics Finland, and revised its rules. The goal of the association is to build a company-oriented technology network alongside with the academic community, which promotes the operating conditions of the Finnish photonics industry.

In 2016, Photonics Finland took over the functions of the National Committee for Optics. Photonics Finland's board of directors act as Finland's national committee for optics.

Photonics Finland and the photonics flagship PREIN cooperate closely in supporting the impact of photonics.

At Photonics Finland's autumn meeting, the targets which are aim to be achieved for 2023 were named. Those are:

- Activation of the Academic Advisory Board
- Photonics Finland events in Finland and abroad
- Visits related to project activities
- Applying for new projects

Finnish Pavilion was organized by Photonics Finland at two of the larges events in the photonics industry (Photonics West and Laser World of Photonics). A wide range of the association's individual members and member companies participated in these. The photonics industry and Photonics Finland received a lot of attention in both the national and regional media. Internationally, the association's social media attention grew strongly. A photonics industry survey was conducted reporting growth in all aspects of photonics.

Photonics Finland's services to its business members are part of the membership benefits: Discount on events organized by the club, such as the exhibitor price at the OPD event, a one-page ad in Fotoni magazine once a year, the option to send one A4-sized bulletin with Foton free of charge once a year, and the company's contact information or a link to the company's website from the club's website . Services offered by Photonics Finland to both member companies and individual members were, for example, Jobboard and various visits. In addition, the association's projects provided members with targeted services such as Cluster Exchange (matchmaking and networking), innovation support through Photon Hub Europe and Photonics4Industry, and specialized training in spectral color imaging.

2. Photonics Business in Finland

In 2023, Photonics Finland, the Flagship for Photonics Research (PREIN) and Business Finland ran the survey for the Finnish photonics industry and photonics research organizations. Survey results can be found at the following link: https://www.photonics.fi/wp-content/uploads/2023/06/Photonics-Industry-in-Finland-

2023.pdf. The industry survey received 128 responses and the response rate was approximately 18%. Whereas the research survey received 109 responses and the response rate was approximately 25%. The results of the survey show an increase of 40 % in photonics companies' revenues in the last three years, equating to an 18 % annual increase since 2020. In 2023, the turnover of companies will rise to over 2 billion euros, most of which will come from exports however, the national market is also growing. The increase of the industry's turnover is over 1 200 million euros and 67 % since 2020. The number of companies in the sector has increased significantly. Since 2016, the number of photonics companies has risen from 200 to 300 directly employing more than 6 000 people. Indirect employment exceeds 40 000 employees.

Most of the companies are small or medium-sized and are manufacturing photonic systems, instruments, and components. Photonics companies mainly provide for the target markets of industrial production and manufacturing; health; security, metrology, and sensors. The growth prospects of the Finnish photonics industry for the near future are also promising. The companies forecast that their photonics related turnover will grow 31 % annually for the next 3 years. Companies expect their number of employees to grow 18 % annually.

3. Photonics research in Finland

Photonics (Photonics Research and Innovation, PREIN) is one of six centers of excellence selected in 2018, funded by the Academy of Finland's Flagship Program until the end of 2026. The Flagship Program supports high-level research and its extensive impact, fostering future expertise and sustainable solutions to societal challenges while promoting economic growth through the development of new business opportunities. Photonics Finland is a significant collaboration partner, especially in strengthening the impact of photonics. https://prein.fi/

Photonics research is conducted in several universities and research institutes in Finland.

At Aalto University, top experts are trained with a strong theoretical foundation and competitive, high-level technical skills in various key areas of photonics. Aalto's research groups offer unique opportunities for optical and photonic research, ranging from understanding the basic principles of optics to photonics applications, which are significant in fields such as ICT, healthcare, and energy applications. Current fundamental research topics include quantum photonics, nanophotonics, ultrafast photonics, sensors, plasmonics, metamaterials, fiber optics, lighting technology (LEDs and lasers), thermophotonics, and photovoltaics. Aalto University is a partner in the PREIN Flagship.

At the University of Helsinki, photonics research is conducted extensively as part of the research in physics, chemistry, as well as pharmacy and medicine. The Department of Physics focuses particularly on the development of microscopy and X-ray spectroscopy/tomography. Additionally, the department has world-class expertise in scattering research, especially related to aerosol optics and astrophysics applications. The Department of Chemistry conducts fundamental research in photonics (nonlinear optics, photoacoustics) and develops new spectroscopy and microscopy methods. These are applied in air quality measurements, as well as in pharmaceutical and medical research in collaboration with experts in those fields. Other key research areas include photosynthesis, light-controlled drug delivery, and the use of plasmonic nanoparticles for chemical analysis and catalysis (renewable energy sources).

The Finnish Meteorological Institute develops atmospheric and weather observation methods and systems utilizing photonics.

The University of Eastern Finland's (UEF) photonics research (https://sites.uef.fi/photonics/) is organized under the Institute of Photonics and the Photonics Research Community (RC), one of UEF's strategic top research areas. Multidisciplinary photonics research is conducted in the Departments of Physics and Mathematics, Computer Science, Environmental and Biological Sciences, Chemistry, and Applied Physics. The research focuses on areas such as ultrafast coherence and polarization theory, nanophotonics, integrated optics, biophotonics, spectral color research, optical material research, modern optical manufacturing methods, and optical imaging. UEF has excellent nanophotonics manufacturing and characterization equipment and a unique 3D printer for optics worldwide. In addition to Finnish-language education, UEF offers international master's and doctoral programs in photonics and three Erasmus Mundus programs. Training in diffractive optics and wave optics theory, applications, and manufacturing is world-class, providing a foundation for significant applied industry in Finland. UEF offers companies and startups robust expertise in photonics applications and commercialization. UEF is a partner in the national PREIN Flagship, with primary responsibility for economic and societal impact. UEF is also part of the national research infrastructure roadmap FinnLight for photonics.

At the University of Jyväskylä, photonics-related research includes quantum optics (optomechanical structures and spin-photon emitters), the study of polaritonic phenomena (strong light-matter interactions), and the development and utilization of time-resolved laser methods (from nanoseconds to femtoseconds). Femtosecond lasers are also used to modify two-dimensional materials. Additionally, optical confocal and near-field microscopy are widely used, with a near-field microscope acquired in 2022 enabling nanoscale imaging and spectroscopy. Research subjects include carbon nanostructures, such as graphene, gold nanoparticles, light-sensitive proteins, ultrafast proton transfer reactions of photoacids, surface plasmons in customized nanostructures, polaritonic chemistry, spin-photon interfaces, and their quantum information applications, imaging of cell transport phenomena, and studying surface material distributions (metal coatings and ores). https://www.jyu.fi/science/en/nanoscience-center/research/infrastructures/laser-laboratory

The photonics research at Lappeenranta University of Technology's Department of Physics focuses on optical measurement techniques, particularly nonlinear laser spectroscopy (mainly CARS and SFG spectroscopy). Photonics-related research is also conducted in the Department of Mechanical Engineering, where various laser welding and laser processing methods are studied.

At the University of Oulu's Optoelectronics and Measurement Techniques Laboratory, research and development focus on measurement methods for highly scattering materials such as paper, pulp, and biological samples, with key technologies including optical coherence tomography, photon migration, photoacoustics, and directly optically readable biometrics methods. Other methods include spectrophotometric sample characterization and the use of optical tweezers to study light-matter interactions. The laboratory also models photon-material interactions. Additionally, organic light-emitting components such as LEDs and transistors (OLED) and solar cells are researched and developed.

The University of Oulu's Measurement Technology Research Unit in Kajaani focuses on developing optical measurement methods, particularly for the needs of the bioeconomy, mining industry, process industry, environmental monitoring, and sports technology. Key technologies include reflectance measurement methods, surface plasmon resonance (SPR) methods, multivariate methods-based UV-VIS-NIR spectroscopy, and imaging measurement methods. The research unit has increasingly focused on developing non-optical measurement methods (electrochemical sensors and biosensors), but optical measurement methods will continue to be part of its research activities.

The Finnish Defence Research Agency's research area of optronics and acoustics involves studying and developing optronic sensors for the needs of the Finnish Defence Forces and their suitability for the Finnish operational environment.

Tampere University (TAU) is one of the world's leading photonics research hub, with light-based technologies chosen as one of the university's strategic focus areas. TAU develops new light sources as well as materials and methods for controlling light properties enabling innovative solutions in various application areas in e.g. sensing, imaging, communications, environmental monitoring, security etc. Specific research topics include light-activated functionalities in materials, photonic glass, solar cells, molecular beam epitaxy-based semiconductor technology, nanostructures, nonlinear optics, semiconductor and fiber lasers, ultrafats photonics, surface science and optical spectroscopy applications, experimental quantum optics as well as computational optics. Tampere University coordinates the PREIN Flagship https://www.tuni.fi/photonic s and the national roadmap infrastructure for light based technologies FinnLight https://finnlight.fi

At the University of Turku, photonics research is conducted in the Quantum Optics Laboratory of the Department of Physics and Astronomy and the Research Group of Digital Manufacturing Techniques in the Department of Mechanical Engineering. The Atomic Quantum Optics Research Group theoretically examines the manipulation of cold atoms with external laser and magnetic fields, focusing on atomic Bose-Einstein condensates and atomic optics. The laboratory also uses a source of polarization-entangled photon pairs for quantum mechanics teaching and testing various quantum tomography methods. The Mechanical Engineering Research Group studies and develops laser-based manufacturing techniques such as laser welding and laser-based metal printing. Academic research focuses on understanding the interaction between laser beams and materials using sensors and imaging techniques. Research also includes product design, new materials, and industrial applications. Additionally, photonics research is conducted in the Department of Biomedical Sciences in the Faculty of Medicine, developing fluorescence-based molecular research methods.

VTT conducts photonics research at several locations with over 100 personnel. In Espoo's Micronova, dense photonic integration at the chip and wafer level is developed using silicon and silicon nitride waveguides, graphene, and plasmonics. In connection with quantum technology, low-temperature optoelectronics and its packaging and single-photon detectors integrated with silicon photonics are developed. Micronova also develops microspectrometers, micromirrors, and other optical MEMS technology. In Oulu, photonics integration and packaging at the module level, optical measurement methods, and prototype measurement devices for demanding conditions, machine vision, optical instrumentation, bio-photonics, and optoelectronics for wearable sensors are developed. In Tampere, the focus is on plasmonics and laser radar applications, and in Kuopio, on optical instrumentation. VTT MIKES in Espoo researches and develops optical realization methods for SI units, traceability and reliability of optical measurements, and optical measurement methods. One focus area is developing and validating optical quality assurance methods for industrial production. VTT is a partner in the PREIN Flagship.
https://www.vttresearch.com/en/ourservices/photonics

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.
https://www.bioimaging.fi/

4. Photonics education in Finland

Photonics degree education in Finnish universities is based on top-level research and is closely integrated with the photonics industry and its their needs.

Academic research and education are closely intertwined, with research-informed degree programmes providing workforce with theoretical competences and application skills. There is a constantly growing demand on master's and doctoral graduates in Finnish photonics companies due to the rapid growth of the sector. It is possible to study photonics in several Finnish universities from the bachelor level to the doctoral degree. Finnish photonics education is very international with programs attracting students from around the world, and there are joint and double degrees with renowned international universities.

Aalto University Photonics is offered as a specialization in the master's programme in Nano and Radio Sciences. 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 nanoscience 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. The Doctoral Programme in Electrical Engineering is a broad multidisciplinary programme providing graduates with possibility to specialize in photonics and to work in a variety of application fields ranging from energy production to biomedical applications, robotics, nanotechnology and communications

University of Eastern Finland offers several photonics programmes on all degree levels. The international Master's Degree in Photonics provides expert skills needed globally in careers in optics, photonics and related fields covering aspects from theory to practical work and has a strong connection with working life. In addition, there are three Erasmus Mundus joint master's degree programs, which have a more multidisciplinary approach towards photonics applications offered in collaboration with international partners. In 2023, University of Eastern Finland opened the intake for the Bachelor and Master of Science (Technology) degree in Photonics in Finnish to answer to the growing need for photonics experts nationally. The doctoral education in Photonics is included in the Doctoral Programme in Science, Forestry and Technology (LUMETO) and there is also a Double Doctoral Degree with Beijing Institute of Technology.

At the **University of Helsinki**, the fundamentals of photonics and optics are taught in the Faculty of Science, primarily in the Department of Physics. Additionally, we offer several courses related to photonics applications to master's and doctoral students, not only in the Faculty of Science but also in the Faculties of Pharmacy and Medicine. These courses cover the latest methods for generating light (lasers, synchrotron radiation, X-rays), as well as its use in imaging (microscopy, bioimaging, X-ray tomography), spectroscopy (molecular spectroscopy, optical analytics, laser spectroscopy), aerosol optics, and nanoplasmonics. The courses are practical and include laboratory and project work.

University of Jyväskylä The master's degree in Nanoscience combines physics, chemistry and biology in multidisciplinary way allowing students to select either chemistry, physics or cell and molecular biology as their major. University of Jyväskylä is also involved in the Erasmus University of Helsinki The master's programme in Materials Research is based on physics, chemistry, biology and medical sciences, mathematics and computer science, all taught in a cohesive, and selfcontained way and one study trac in optics and photonics. Mundus join master's programme in Radiation and its Effects on Micro Electronics and Photonics Technologies.

University of Oulu Photonics education at the University of Oulu is related to the Electrical Engineering master's degree programme where students may select the specialization module on Photonics and

measurement technology to get acquainted with advanced optical and electrical measurement techniques in the application fields of biomedical measurements, photonics, and printed electronics.

Tampere University offers the opportunity study photonics in the master's and doctoral levels. Photonics is one of the focus areas in the Finnish Master's in Technology degree programme. The International master's programme in Photonics Technologies provides students with in-depth knowledge 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. Tampere University is also involved in the EuroPhotonics Erasmus Mundus joint master's programme and has a double degree programme in photonics with Bordeaux University in France. In addition, students can enroll in the international bachelor's programme in Science and Engineering offering direct access to masters' studies in the Photonics Technologies programme.

The doctoral programme in Engineering and Natural Sciences offers the profiling area of light-based technologies to doctoral researchers. Tampere University coordinates the doctoral pilot in Innovative Doctoral Education Ecosystem for Photonics – I-DEEP launched in 2024. The I-DEEP consortium was established based on the activities of the Flagship for Photonics Research and Innovation PREIN, the photonics national research infrastructure FinnLight and Photonics Finland and extends its reach to all Finnish universities with research activities in light-based technologies. Besides Tampere University, University of Eastern Finland, Aalto University, Åbo Akademi, University of Oulu, University of Jyväskylä, and University of Turku are part of the I-DEEP consortium. Photonics Finland and VTT are I-DEEP associate members that offer possibilities for collaboration with the industry. prein.fi/home/studies

University of Turku In the master´s programme in Physical and Chemical Sciences, photonics is a theme of one of the specialization tracks. The programme aims at training graduates for research and development of new materials in biomedical or electronic applications.

5. Members

Members end of December 2023 (under end of year 2022)

Individual	Student	Societal	Societal side	Corporate	Corporate side	Honorary
174	**49**	**12**	**12**	**109**	**18**	**0**
202	76	12	16	99	16	1

At the end of 2022, Photonics Finland had 121 corporate and community members:

5.1. Member register keeper

Tuukka Pakarinen has been responsible for maintaining the member register.

6. Publications and communication activities

6.1. Fotoni-magazine

Photonics Finland's member magazine is Fotoni-magazine. It was published twice in 2023. Jouko Korppi-Tommola, from the University of Jyväskylä, is the editor-in-chief of Fotoni magazine. The Editorial Board consists of Lasse Orsila and Jouko Korppi-Tommola. Eero Sundvall was responsible for the magazine's high-quality visuals.

The themes of the 20223 FOTONI magazines were: e.g. OPD2023 in Joensuu, Professor Zhiphei Sun's research group and the microspectrometer, Obituary: Emeritus Professor Markus Pessa, Obituary: Emeritus Professor Jari Turunen, Senop helps to see the unseen, Shifting the paradigm of optical coating manufacturing.

Fotoni 2023 / 1: https://www.photonics.fi/fotoni/fotoni-1-2023/

Fotoni 2023 / 2: https://www.photonics.fi/fotoni/fotoni-2-2023/

6.2. Web pages

The association's web pages (https://www.photonics.fi) have been constantly developing to improve the structure and accessibility of content. New material is being continuously added and old content updated.

6.3. Postal Service

The association has an electronic mailing service. Messages, announcements, inquiries, etc. were sent via the e-mail address list photonics-list@fos.fi to all members who have entered their e-mail address in the member register and have not prohibited sending e-mail via the mailing list. The reply to a message that has

entered the list is directed only to the original sender of the message. Email reaches more than 95% of members.

7. National actions and activities

7.1. Annual meeting (Spring)

The 2023 spring meeting of the association was held on May 31, 2023 at 18:40 as a hybrid meeting. Juha Toivonen was the chairman of the meeting and Juha Purmonen was the secretary. Jyrki Saarinen and Seppo Honkanen were chosen as auditors of the minutes, who act as vote counters if necessary. The meeting dealt with the statutory matters of the spring meeting.

7.2. Optics & Photonics Days 2023 (OPD 2023)

OPD2023 was held at University of Eastern Finland (UEF), Carelia building, 30. May – 1. June 2023, Joensuu, Finland. Total 317 participants, 182 from industry and 135 from research organisations. 88 abstract submissions and 35 exhibiting companies. Main participating countries: Finland, Sweden, France, Germany, Lithuania, Japan, Austria, and Switzerland

Plenary speakers were:

- DSc Sanna Yliniemi, Dispelix, Joensuu: Waveguide technology for XR glasses that look an feel like ordinary glasses
- Prof Emiliano Descrovi, Politecnico di Torino, Italy: Light-responsive architectures from nano to macro
- Dr. Martin Gerken, Hensoldt Optronics, Germany: Multispectral Imaging in Defense Applications

Industrial program themes were:

- Nano & Microphotonics
- Photonics in Security & Defence
- Spectral & Hyperspectral Imaging

Academic program themes were:

- Integrated Photonics
- Sensing and Imaging
- Emerging active material and devices
- Quantum technology

Also, there where a lot of other activities such as Networking Dinner, Job Fair, Student meeting, Nordic Photonics meeting, PREIN flagship event, Photonics Finland annual meeting, Women in Optics and Photonics event and also Poster- and Exhibitor Pitch sessions.

OPD2023 web pages are accessible through the following link: https://www.photonics.fi/opd2023/

7.3. Annual meeting (Autumn)

The 2023 autumn meeting of the association was held on Monday 28 November 2023 at 15:00 as a video meeting. The chairman of the meeting was Kim Grundström and the secretary was Juha Purmonen. Jyrki Saarinen and Timo Vuorenpää were elected as minutes inspectors, who also act as vote counters if necessary. The meeting dealt with the statutory matters of the autumn meeting.

7.4. Photonics Finland – Events in Finland

Photonics Finland organized or participated in 2023 in the following events:

- Deep Tech Atelier + Nordic Optics and Photonics Days (NOP), 19th of April 2023
- Spectral Imaging and its Applications demo course, 11th of May 2023 *Online event*,, 12th of May and 30th of May *in Joensuu*
- Photonics meets KELLOSEPPÄKOULU, 16th of May 2023
- OPD2023, 30th of May 2023 – 1st of June 2023
- Suomi Areena 2023 – Fotoniikan paneelikeskustelu, 30th of June 2023
- The Fourteenth Japan-Finland Joint Symposium on Optics in Engineering, 28th of August 2023
- Photonics Meets Quantum Tech, 4th of October 2023
- What's up Photonics Finland Online session, 10 of October 2023,
- Fotoniikan kaupunkiekosysteemiprojektin (FKE) Kick off -tilaisuus, 28th of November 2023
- Photonics Finland Annual Autumn Meeting 2023, 28th of November 2023
- Webinar – information about the training/services call from PIMAP4Sustainability, 12th of December 2023

Photonics Finland events are listed and promoted at the association's website. They can be found at the following link: https://www.photonics.fi/events/

6.5. Scholarship activity in the field of photonics

The Best Doctoral Thesis award was given to PhD Yadong Wang from Aalto yliopisto for the thesis "Transient Nonlinear Optics of Two-Dimensional Layered Materials". The thesis can be accessed at the following link: https://aaltodoc.aalto.fi/items/ce35a37c-a42f-4a16-a2de-e0aee1f28e78

7.5. Photonics Company of the year award

The Photonics company of the year award was given now for the seventh year in a row. Photonics Finland board rewarded Senop Oy the photonics company of the year award for 2022. More about the company at the following link: https://senop.fi/

Previous winners: in 2016 Gasera Oy, in 2017 OptoFidelity Oy, in 2018 Oplatek Group Oy, in 2019 Modulight Oyj, in 2020 Varjo Technologies Oy and Dispelix Oy in 2021.

7.6. National Photonics Survey

During 2023 Photonics Finland conducted a national photonics industry and research survey together with the Flagship for Photonics Research (PREIN) and Business Finland. The results of the survey can be found at the following link: https://www.photonics.fi/media-2/surveys-brochures/

The industry and research surveys were conducted in parallel by Boost Brothers and directed respectively to photonics companies and researchers in research institutions and universities. The industry survey received 128 responses and the response rate was approximately 18%. Whereas the research survey received 109 responses and the response rate was approximately 25%.

The survey show an increase of 40 % in photonics companies' revenues in the last three years, equaling to a 18 % annual increase since 2020. This year, the companies expect their turnover to rise to over 2 billion euros, most of which will come from exports. National market is also showing a growing trend. The increase of the industry's turnover is over 1 200 million euros and 67 % since 2020.

The number of companies in the sector has increased significantly. Since 2016, the number of photonics companies has risen from 200 to 300 directly employing more than 6 000 people. Indirect employment exceeds 40 000 employees.

Most of the companies are small or medium-sized. The number of new companies increases over 8% annually. Companies are mostly manufacturing photonic systems, instruments and components. Photonics companies mainly provide for the target markets of industrial production and manufacturing; health; security, metrology, and sensors.

The growth prospects of the Finnish photonics industry for the near future are also promising. The companies forecast that their photonics related turnover will grow 31 % annually for the next 3 years. Companies also expect their number of employees to grow 18 % annually.

In the next few years, efforts need to be focused on acquiring foreign and domestic partners as well as a skilled workforce. In addition, companies have a need to increase investments in market and technology research to accumulate new knowledge. As a result of the expansive growth, the industry needs hundreds of new experts. There is a great need for diverse education and training in the field. University education has been increased in the recent years. In addition, there is demand for expanding education to the secondary level as well as in universities of applied sciences.

The results of the survey targeted at higher education institutions and research centers maps out the different research areas and future needs of the research ecosystem. Key research thematic areas include material science, metrology and sensing and imaging. Photonics was also highlighted to play an important role in the education programs of the respondents' institutions.

The Flagship for Photonics Research and Innovation (PREIN) has gained visibility among companies, and more than half of the industry respondents have a positive view on its activities. A quarter of the companies are not yet aware of PREIN. Finnish photonics companies see joint event organization, joint research, and media promotion as the most important functions of PREIN. Photonics companies are hoping for more collaborative projects with research institutes. The promotion of photonics in national media and an outreach to the general public are seen as the most important tasks for the PREIN flagship.

7.7. Photonics Finland and photonics flagship PREIN cooperation

Photonics Finland continues as an official partner of the PREIN flagship in supporting the effectiveness of photonics. Cooperation with the PREIN organization is carried out on many fronts, such as communication, innovation activities, business cooperation, recruitment activities, numerous events, encouraging young people to enter the field. The cooperation has grown over the years and brought significant benefits to both parties.

7.8. Photonics Finland jobboard

In the field of photonics, the demand for skilled workers is high, from secondary school to university graduates. Photonics Finland responded to that need by creating a unified platform, the Photonics jobs in Finland job site, where experts, companies and open jobs meet. The jobboard website collects the entire photonics job offer in one place, through which it is easy for companies to announce and edit their previous announcements. The jobboard has been running smoothly in 2023 as well. It can be accessed through the following link: https://www.photonics.fi/jobboard/

8. International cooperations

Photonics Finland is a member of the following organizations: EPIC (European Photonics Industry Consortium) - https://epic-assoc.com/ , SPIE (the international society for optics and photonics) - https://spie.org/ , and EOS (European Optics Society) - https://www.europeanoptics.org/ .

8.1. European Optical Society (EOS)

The structure of EOS, the umbrella organization of European photonics societies, is two-layered: local chapters (branches), whose individual members are directly full members of EOS, and sub-chapters (affiliated), whose individual members are directly (associate) members of EOS but with lesser benefits (discounts etc.). The associate members have the opportunity to become full members with voting rights by upgrading their membership. FOS/Photonics Finland has been a full member of EOS since the beginning of 2013. Information about EOS's activities can be found at https://www.europeanoptics.org/

Association's EOS-representative

Elina Koistinen, EOS Executive Director, EOS

EOS Board Member

Matthieu Roussey, University of Eastern Finland

Ana Gebejes, University of Eastern Finland

Member of EOS Scientific Advisory Committee

Tero Setälä, University of Eastern Finland

Member of EOS Industrial Advisory Committee

Jyrki Kimmel

Jyrki Huttunen, Benevic Oplatek

The Journal of the European Optical Society – Rapid Publications (JEOS:RP)

Associate Editors

Paolo Vivo, Tampere University

Yuri Svirko, University of Eastern Finland

Matthieu Roussey, University of Eastern Finland

Editorial Advisory Board

Ari T. Friberg, University of Eastern Finland

8.2. International Commission for Optics (ICO)

Photonics Finland represents Finland in the international photonics umbrella organization ICO (International Commission for Optics (ICO). Current information about ICO can be found on its website: http://www.ico-optics.org/ . Photonics Finland's ICO representative is Professor Jyrki Saarinen, UEF.

8.3. Other international organizations

The members of Photonics Finland are active in the following international networks:

- Photonics21 - The Technology Platform for Photonics in Europe. The Board of Stakeholders includes Tauno Vähä-Heikkilä, from VTT; Jyrki Saarinen, from UEF; and Juha Purmonen from Photonics Finland. Mircea Guina from Tampere University was elected in 2023. They also participated in the Photonics21 annual meeting. https://www.photonics21.org/

- EPIC (European Photonics Industry Consortium). Photonics Finland is also a cooperative member of the consortium. https://epic-assoc.com/

- GPA (Global Photonics Alliance). https://www.linkedin.com/showcase/11689935/admin/

8.4. International Projects

Photonics Finland participated in 2023 in the following European projects:

- **BestPhorm21 (**Ended) - Boosting Europe's Sovereignty in Technology by driving Photonics from Research to Market – Photonics21. Other partners: VDI Technologies coordinator and national photonics clusters from Italy, Germany, Spain, Greece, Sweden, Netherlands, France, Slovenia, Poland, Belgium, Ireland, Switzerland and Lithuania, https://www.photonics21.org/ This project ended in and a follow-up project was applied and granted called Phoward21.

- **PhotonHub Europe (**On-going) - One-Stop-Shop Open Access to Photonics Innovation Support for a Digital Europe. 52 partners across Europe. From Finland, VTT and Photonics Finland participate. The goal is the rapid and need-oriented utilization of photonics applications in Europe and the realization of more than 1,000 new high-tech jobs and one billion euros in turnover and capital investments by 2025. https://www.photonhub.eu/

- **Photonics4industry** - connects international photonics organizations through financially supported study visits and provides access to project funding along with research and business development opportunities. Countries involved: France, Germany, Austria, Lithuania, Finland https://www.photonics4industry.eu . Role of PF: Leader of the Communication WP & Support on all other WPs

- **PIMAP4Sustainability** - Photonics for international markets and applications for sustainability - brings together 6 leading European clusters to leverage from KETs technologies, photonics, advanced manufacturing and advanced materials, to boost the innovation potential of European SMEs and companies in two key industrial European industries, metalworking and aerospace. Countries involved: France, Portugal, Italy, Czech Republic, Sweden, Finland. https://www.linkedin.com/company/pimap4s/ . Role of PF: Leader of the Communication WP & Support on all other WPs

Submitted in 2023:

360 CARLA (FUNDED) - Followup of CARLA project (PF was NOT Partner) (starts 01/2024 - Duration 30months). 360 CARLA's goal is to connect academia and industry by targeting mostly the students through symposiums, experiences in companies and trainings. PF will organise a symposium on Health in spring 2025, 2 experiences (company visit + shadowing of employe during 1-2 days) and 1 training (can be connected to the demo centre of PhotonHub) 11 countries involved

Phorwards21 (FUNDED) - Followup project of BestPhorm21 (PF Already partner) - (starts 01/2024 - Duration 36months). Similar actions planned, lobbying of Photonics to decision makers in order to secure future fundings. This time PF is leading a task in one of the WPs, this allow us to increase our funding, while the whole project funding is decreasing by 25% - 13 countries + UK involved

DEEPSUPPORT (FUNDED) - (starts 01/2024 - duration 12 months) Preparatory project for a regional innovation Valley project proposal in 2025. The general idea is to map the needs and challenges of the different regions involved to find possible synergies for an innovation valley (RIV) proposal. 5 countries involved (Austria, Slovenia, Italy, Hungary and Finland)

PF Role: WPLeader of Communication tasks

9. Board and officials

9.1. Board

Board 1.1.2023 – 31.5.2023

- Chairman Juha Toivonen, University of Tampere
- Vice-president Kim Grundström, Kimmy Photonics Oy
- Petri Stenberg, Dispelix - (Deputy) Ulla Haapanen, Modulight
- Timo Vuorenpää, Senop - (Deputy) Kimmo Solehmainen, KuopioHealth
- Niklas Saxen, Edmund Optics - (Deputy) Jouko Korppi-Tommola, JYU
- Antti Isomäki, University of Helsinki - (Deputy) Mikko Huttunen, University of Tampere
- Heidi Piili, University of Turku - (Deputy) Pekka Hänninen, University of Turku
- Sanna Uusitalo, VTT, Oulu - (Deputy) Harri Lipsanen, Aalto

Board 31.5.2023 – 31.12.2023

- Chairman of the Board Kim Grundström, Kimmy Photonics Ltd.
- Vice Chairman Heidi Piili, University of Turku
- Birgit Päivänranta, Microsoft Ltd. (Deputy Jussi Rahomäki, Dispelix Ltd.)
- Niklas Saxen, Edmund Optics Ltd., (Deputy Jouko Korppi-Tommola, University of Jyväskylä.)
- Polina Kuzhir, (University of Eastern Finland, (Deputy Antti Isomäki, University of Helsinki)
- Timo Vuorenpää, Peak PC. (Deputy Samuli Siitonen, Nanocomp Ltd.)
- Sanna Aikio, VTT, (Deputy Harri Lipsanen, Aalto University)
- Juha Toivonen, Tampere University, (Deputy Göery Genty, Tampere University)

The board has drawn up the 2023 activity report and financial statements and prepared the 2024 action plan. The board met 9 times during 2023.

9.2. Executive Director

Since spring 2014, the club has had an executive director. Juha Purmonen from Business Joensuu and University of Eastern Finland have been appointed to the position.

9.3. Scientific Advisory Board

The Scientific Advisory Board operating under Photonics Finland started its activities at the beginning of the year. Representatives from all major photonics research sites and locations in Finland have been invited to it. The composition of the negotiating committee on 31 December 2023 was

- Chairman Professor Juha Toivonen, TAU, Tampere

- PhD Timo Aalto, VTT Otaniemi, Espoo

- Professor Tapio Fabritius, OY

- Professor Janne Ihalainen, JY

- Professor Zhipei Sun, Aalto, Espoo

- Professor Ari Friberg, UEF, Joensuu

- Professor Markku Vainio, HY

- Professor Jussi Hiltunen, VTT Oulu

- Professor Vesa Virtanen, Kajaani, OY

9.4. Auditor and accounting firm

In 2023, Photonics Finland chose Tilipalvelu Rantalainen Oy (parent company) as its accounting firm.

Sahakuja 4, 05810 Hyvinkää

Social security number: 0362167-0

The accountant is Terhi Kiurunen, 044 722 5495, terhi.kiurunen@rantalainen.fi

The auditor is Ernst & Young Oy

Ernst & Young Oy Photonics Finland as contact person

Jonna Sallinen | KHT / Authorized Public Accountant | Assurance Services

+358 50 5911 952 | jonna.sallinen@fi.ey.com

Ernst & Young Oy

10. The association's finances

The association receives its primary funding from membership fees and events it organizes. In 2023, the membership fee for corporate and organizational members ranged from €165 to €700, depending on the size of the company. The fee for individual members was €45, and for student members, it was €20. Photonics Finland has continued to organize its events inclusive of value-added tax (VAT). The result for 2023 was +€6,451.24.