Photonics 4 Defence

Photonic technologies for defence and security applications

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PPTF Polish Technological Platform on Photonics

Photonics is a family of material and hardware technologies based on creation, manipulation and detection of light. This wide group includes classic optical elements, light sources, lasers, fiber optics, light detectors (visible, IR and UV), photovoltaics, LED lighting and displays. Photonics is one of Key Enabling Technologies that are transforming the global industrial base. Deeply embedded in modern digital industry, photonics is closely connected with other technology areas like microelectronics, quantum or biotechnology. Due to it high-precision nature, it is especially well applicable for measuring and sensing.

Photonics technologies enable numerous defence and security applications. From threat detection and observation to weapon guidance to secure optical communication to tactical situation imaging to direct energy weapons – and more, as new applications arise each year. Photonics technologies are indispensable for the very manufacturing in the defence industry as well – on the production line and in quality control.

New technology developments and new strategic situation call for new or updated applications of photonics in defence. Innovative applications of photonic technologies can be introduced easier in cooperation with PhotonHub Europe – a pan-European expertise network supporting photonics innovators (more on PhotonHub at the end of this brochure).

This brochure presents some of the technologies discussed during Photonics21's Photonics 4 Defence workshop held in Kielce, Poland on 8th September 2022, during 30th International Defence Industry Exhibition MSPO. The workshop was organised by Polish Technological Platform on Photonics – PPTF, in cooperation with Polish Chamber of National Defence Manufacturers.

Photonics 4 Defence

Kielce, Poland | 8 September 2022

Photonics Technologies for Defence

- Experts in Photonics and Defence
- Networking Opportunities
- Live event at the 30th International Defence Industry Exhibition MSPO

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Polish Technological Platform on Photonics – PPTF

Polish Technological Platform on Photonics (Polish: Polska Platforma Technologiczna Fotoniki - PPTF) is an employers association of the Polish photonics, microelectronics and quantum industry. Our role is to integrate, provide information and inspire to cooperation the community of businesses, research institutions and academia. Our members and partners are creating new technologies based on science of generation, manipulation and detection of light. Our member organisations are active in numerous areas to include lasers, IR detectors, fiber optics, optical elements, displays and LED lighting, optical sensors, photovoltaics, optical metrology, 3D printing, 3D scanning, quantum computing, quantum communication and cryptography, semiconductors, medical diagnostics, machining of metals and other materials, environmental monitoring, gas detection, weapon systems.

Based near Warsaw, PPTF is a country-wide organisation – with numerous links to Europe and world. PPTF members constitute a diversified community. There are global market leaders, established industrial players, universities, research institutes and dynamic startups.
PPTF is representing Polish photonics, microelectronics and quantum industry before national authorities as well as EU institutions. We are actively participating in cooperation projects at the regional, national and European levels. PPTF is a member of European technology platform Photnics21, associate member of Photonics21 association and a national hub of PhotonHub Europe.

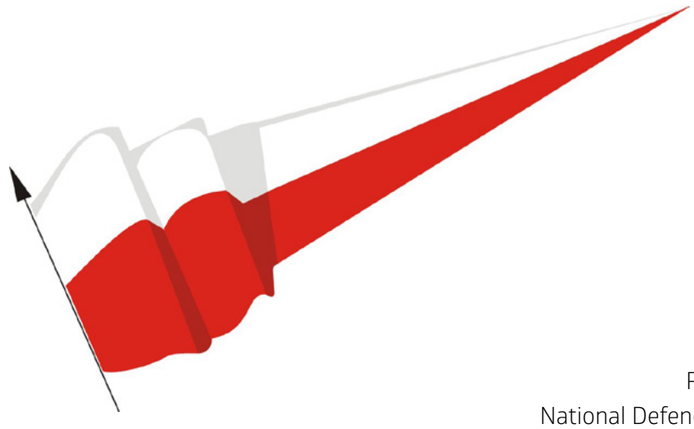
https://pptf.pl/

Polish Chamber of National Defence Manufacturers

Polish Chamber of National Defence Manufacturers (PCNDM) is a voluntary and self-governing organisation of over 140 companies conducting activities on the field of national defence and security. Among them are state-owned and private companies, research and development institutes, small, medium and large enterprises.

Polish Chamber of National Defence Manufacturers:

- helps foreign defence industry companies with finding partners in Poland;
- helps Polish companies with finding foreign partners;
- organises and leads Polish defence industry consortiums to present complex offer to foreign customers;
- has license of Ministry of Internal Affairs of Poland for arms trade;
- has ISO certificate
- represents Polish defence industry at the NATO Industrial Advisory Group (NIAG),
- is a point of contact between Polish defence industry and European Defence Agency (EDA).



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Companies presented

Elproma

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www.elpromatime.com/

ABOUT

Elproma is a Polish company, with its R&D and rapid prototyping facility, that actively creates the global technology market in:

- time & frequency synchronization (www.elpromatime.com)
- professional M2M telemetry (www.teleorigin.com)
- advanced photonic sensors (www.fosrem.eu)

Elproma has a new own laboratory facility near Warsaw equipped with 2 atomic cesium clocks

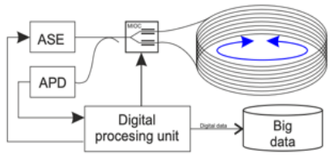
Our customers:

GALILEO NATO OTAN Deutsches Zentrum DLR für Luft- und Raumfahrt

It all started with telemetry and synchronisation

The company co-developed the CERN White Rabbit protocol (currently IEEE1588) – which is significant for the new Ethernet TSN Time Sensitive Networking. The company contributes to strengthening global cybersecurity by expanding the European terrestrial GALILEO satellite system. Solutions based on Elproma products are included in the autonomous Industry4.0 systems. They are a part of the new global NATO defence and cybersecurity solutions, incl. smart grid, 5G/6G, financial HFT and more.

FOSREM **Multipurpose Earth & Space Photonic Sensor with Big Data output next generation FOG and seismograph for ROTATIONAL SEISMOLOGY** ELPROMA https://fosrem.eu

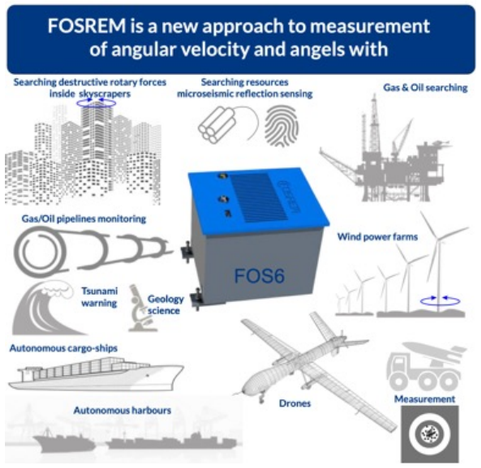


Sensor operates as a result of the measurement of a difference between two interfering light beams propagating around closed (very long) optical path, in opposite direction,

- Unique high-accuracy technology, so far available from 2 countries only;
- Sagnac effect, independent on Earth Gravity, for which the only frame of reference is Einstein's space-time;

Sensor produces high resolution Big Data output for a next step profile computing.

Main business profiles are: Microseismic sensing (gas & oil, thermal water, mining industry), military, autonomous vehicles (autonomous cargo-ships/drones/plains/robots),



A new era of dual-use photonic sensors

The new coming FOSREM is a multipurpose Earth & Space photonic sensor. It links the telemetry and synchronisation skills of Elproma. It is a dual-use product with two functionalities:

- Optical Seismograph for Rotational Seismology
- 3-axial Fibre Optic Gyroscope (FOG)

The FOSREM is optimised to measure the rotational rate (angular velocity) with sensitivity equal to 2.5*10E-8 rad/s/√Hz in the pass band from 0.01 to 100 Hz. The sensitivity mentioned above and rotation rate dynamic range up to 10 rad/s covers weak and strong rotational motions connected with irregular object movements occurring during solid winds, tectonics and earthquakes. In this way, the FOSREM is dedicated to monitoring the rotational vibration of any object. Thanks to connecting multiple FOSREM sensors in one synchronised network, new functionalities are available, including microseismic reflection scanning (searching for thermal water, gas & oil). The FOSREM is also a FOG class ultra-sensitive core device. Elproma offers a particular miniaturised version for autonomous vehicles, such as autonomous cargo ships, drones, aeroplanes and space vehicles. Compared to classical solutions, FOSREM can sense movement with the resolution of ½ size of a Helium atom, making it incredibly accurate for precision and long-distance (long-time) autonomous transportation

Applications:

3-axial FOG (gyroscopes):

- Autonomous vehicles (cargo ships, drones, space vehicles)
- Autonomous robots for monitoring gas & oil papes and tunnels
- Predictive Industry4.0 maintenance telemetry M2M systems
- Military ultra-accurate navigation (GNSS less operation)
- PNT ground systems (Positioning Navigation Time) Calibration of RF channels for fast-moving objects (air & space)
- Dangerous vibrations monitoring of critical industry
- Calibrating and monitoring QKD trusted nodes
- Nuclear power plants, water dams, strategic buildings
- Nuclear medicine

3-axial synchronised network of seismographs:

- Microseismic sensing (searching for carbon, gas/oil & water)
- Remote monitoring for military efficiency in shooting
- Nuclear activity remote monitoring

1-axial synchronised network of seismographs:

- Rotational seismology
- Monitoring rotation of towers of wind turbines and high buildings
- Measurement of Earth rotation deviations

ELPROMA

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Ensemble³
Centre of Excellence
for nanophotonics, advanced materials
and novel crystal growth-based technologies

Ensemble³

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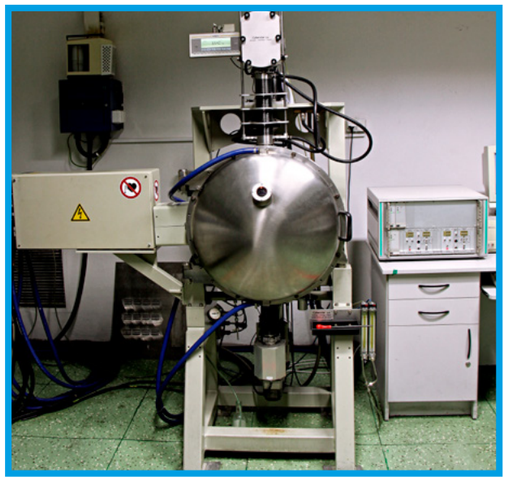
ABOUT

ENSEMBLE³ sp. z.o.o. is a newly established Center of Excellence in nanophotonics, advanced materials and advanced technologies based on crystal growth. The Center was established under the "Teaming for Excellence" program funded by the European Commission and the "International Research Agendas" program funded by the Foundation for Polish Science and works in collaboration with renowned national and international scientific institutions. The Center works on the development of new material technologies and advanced materials with exceptional electromagnetic properties that can be applied in areas such as photonics, optoelectronics, telecommunications, solar energy conversion, medicine, aeronautics and defense.

ENSEMBLE's ³ Centre of Excellence offers a wide range of materials for photonic and electronic applications. These materials are monocrystalline and can be divided into two main groups of crystals. The first group consists of oxide crystals (YAG, YAP, GdCOB, NGO, SBN), which are widely used in photonics, especially in laser technology. The second group is semiconductor crystals from the group of AIIIBV compounds, e.g. GaP, GaAs, InP, InSb. Oxide crystals are used in the construction of lasers and other photonic devices, while semiconductor crystals are used in the manufacture of electronic devices such as diodes, transistors, etc. GaP substrates, of which Ensemble3 is a leading manufacturer, are particularly sought after today. It should also be emphasised at this point that GaP crystals are not manufactured to any significant extent by other competitors, which represents a real opportunity for Ensemble3 to be recognised as the world's leading manufacturer of GaP crystals.



To meet the expectations of the defense industry, we offer two groups of oxide and III–V semiconductor single crystals currently produced by ENSEMBLE³ sp. z o.o.:

Optics of infrared detection systems based on gallium phosphide (GaP)

Characteristics:

- Diameter 2" or 3"
- Orientation <100> or <111> or <110>
- Available types and their parameters
  - undoped SI [r > 107 W cm]
  - undoped n-type [n < 2 x 10^{16} cm^{-3}; μ > 150 cm^2 / Vs]
  - doped with Sulfur (S)
  n-type [n = 2 x 1017 to 5 x 1018 cm^{-3}; μ > 90 cm^2 / Vs]
  - doped with Zinc (Zn)
  p-type [p = 5 x 1017 to 5 x 1018 cm^{-3}]
  - doped with Cadmium (Cd)
  p-type [p = 2 x 1016 to 3 x 1017 cm^{-3}]
  - doped with Chromium (Cr) SI [r > 107 W cm]

Application:

- elements of infrared systems,
- THz applications,
- emitters and detectors,
- optical switches.

Elements of laser systems based on yttrium aluminum grenade (YAG) and aluminum-magnesium spinel (MALO) doped with: neodymium, cobalt, erbium

Characteristics:

- Weight of Nd in YAG: 0.725%

- Atoms of Nd per unit volume: 1.38×10^{20} /cm^3
- Charge state of Nd: 3^+
- Emission wavelength: 1064 nm
- Transition: $^4F_{3/2} \rightarrow {}^4I_{11/2}$
- Duration of fluorescence: 230 μs
- Thermal conductivity: 0.14 W·cm^{-1}·K^{-1}
- Specific heat capacity: 0.59 J·g^{-1}·K^{-1}
- Thermal expansion: 6.9×10^{-6} K^{-1}
  dn/dT: 7.3×10^{-6} K^{-1}
- Young's modulus: 3.17×104 K·g/mm^{-2}
- Poisson's ratio: 0.25
- Resistance to thermal shock: 790 W·m^{-1}

Application:

Laser range finding, laser designators, scintillators, active materials for lasers, optical isolators, passive Q-modulators of laser resonators, nonlinear optical materials.

Ensemble³
Centre of Excellence
for nanophotonics, advanced materials
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GL Optic

Light quality control

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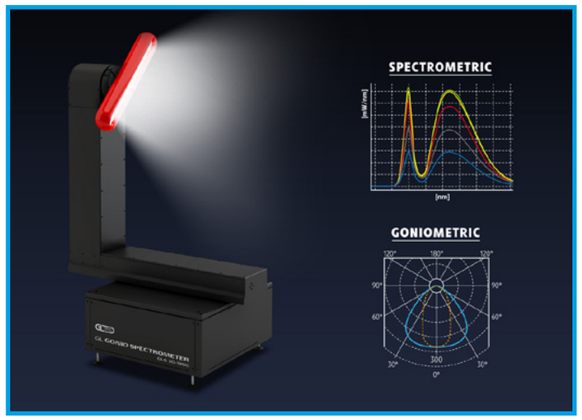

ABOUT

GL Optic is a Polish manufacturer of professional systems for measuring optical radiation in a wide spectral range. Our equipment is used by companies and institutions around the world to measure single radiation sources, LEDs and conduct comprehensive tests of radiant heaters, displays and luminaires. We offer complete systems, with a user-friendly interface, prepared according to the "plug and measure" concept, to handle spectro-radiometric, photometric, colorimetric measurements and to control electrical parameters and temperature, for various applications. In addition to measuring instruments and systems, we also offer measurement services and instrument calibration in our Calibration and Research Laboratory of Optical Radiation (CARLO), which is the only one in Central and Eastern Europe equipped with a blackbody spectral irradiance standard - the Black Body Radiator. Our team consists of experienced programmers, electronic and mechanical engineers, production technicians, sales and support engineers - all focused on delivering intelligent yet affordable solutions. Our customers are leading international lighting system manufacturers, test labs and suppliers, as well as start-ups and consultants from around the world, operating in every industry related to light measurement. We are continuously developing solutions for the measurement of UV optical radiation and infrared illuminators in the automotive, electronics, defense and medical industries. Our instruments and measurement software are subject to continuous development to ensure compliance with the requirements of international norms and standards and to calculate new applicable measures of light quality.

Night vision system performance
Night time visibility can be enhanced by precisely designed and efficient Infrared active emitting sources. We offer comprehensive selection of photometric and radiometric equipment for tests and measurements that go beyond the visual range. GL SYSTEMS are the best choice for VIS and IR lighting products quality control. This easy-to-operate system combine the functionality of a goniophotometer with the features of a spectroradiometer for total radiant flux and angle dependent radiant intensity distribution. Full optical characterization of NIR LEDs, including angular intensity distribution diagrams, is available thanks to a dedicated GL GONIO-SPECTROMETER system setup.

Vehicle & Aircraft lights approval
Excellent nighttime visibility and maintaining a low profile for covert operations are critical performance parameters for military vehicle lighting systems. LED sources and lamps must be measured to ensure the color consistency, intensity values or spatial distribution patterns. Blackout Light, Tail and Head lamps must be tested according to industry specific standards. Our systems allows for immediate tests and approval of any light emitting sources. The GL PHOTOMETER 3.0 LS + Flicker has been designed for On Fly (non stop) measurements of lamps on goniophotometer. Our new Spectrally Corrected GL RADIOMETER SC improves speed and accuracy of inferred sources testing up to 2500nm.

Quality of displays and backlit controls
Electronic devices used in military technologies with luminous elements of various shapes and sizes require more advanced analysis than just measuring spot luminance meters. Imaging Luminance Measuring Device GL Opticam 2.0 4K TEC is used to verify luminous components in terms of their compliance with standards and to assess their quality. The purpose designed GL Spectrosoft software for image analysis is a great tool for R&D and production quality control.

Light quality control

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Łukasiewicz
Institute of Microelectronics and Photonics

Łukasiewicz – Institute of Microelectronics and Photonics

Łukasiewicz – Institute of Microelectronics and Photonics
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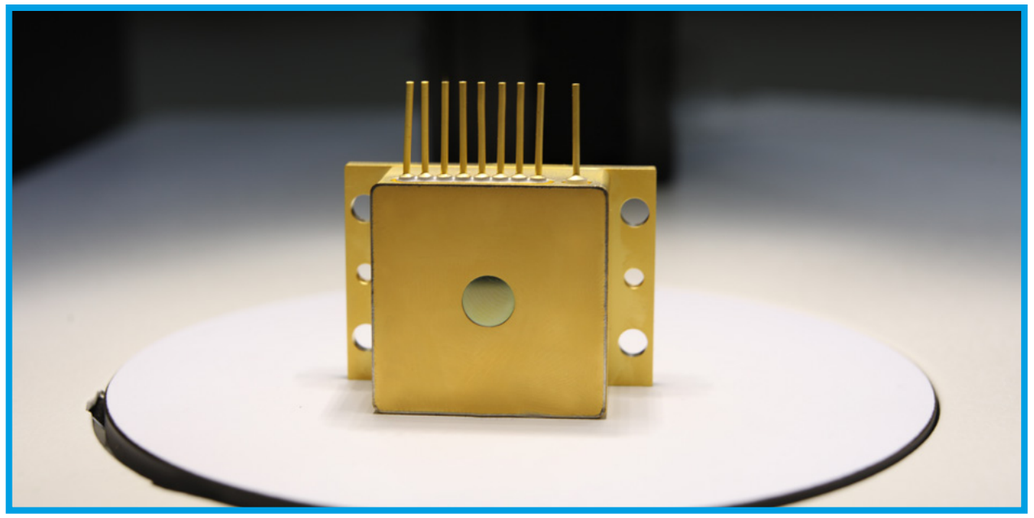
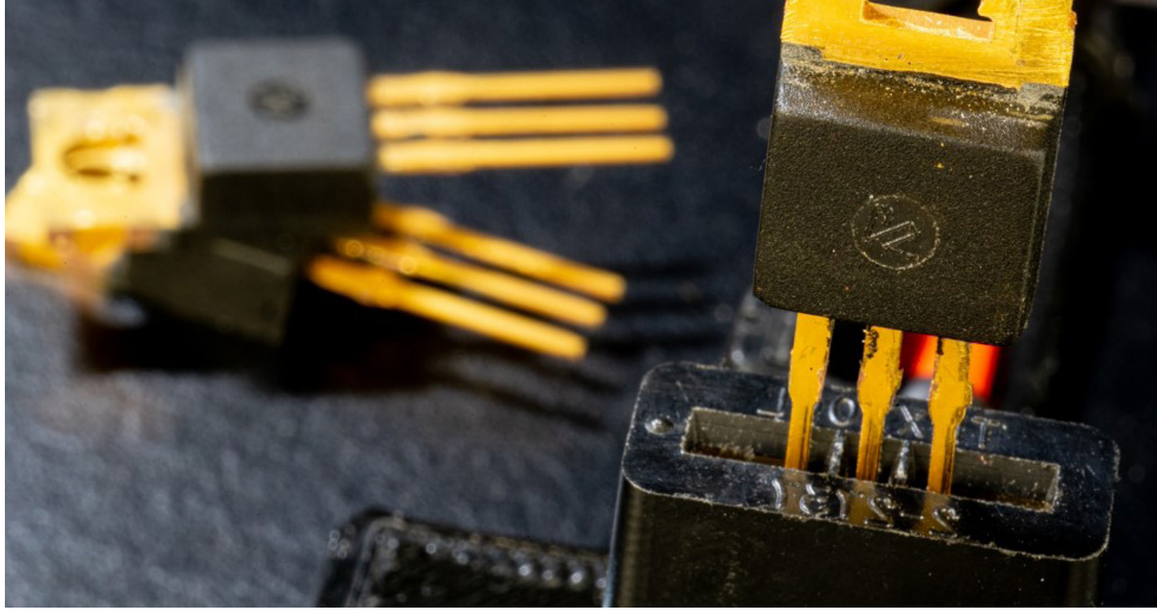
ABOUT

Microelectronics and photonics are two key technologies enabling the delivery of innovative solutions to society. Łukasiewicz – Institute of Microelectronics and Photonics with over 50 years of history is experienced enough to conduct highly advanced research in the field of photonics, considered to be the technology of the 21st century. Its scientists are working intensively on the development of optical miniature integrated circuits in the infrared range, the so-called Photonic Integrated Circuits (PICs), which are the photonic equivalent of microprocessors and open up completely new possibilities for many industries and everyday life.

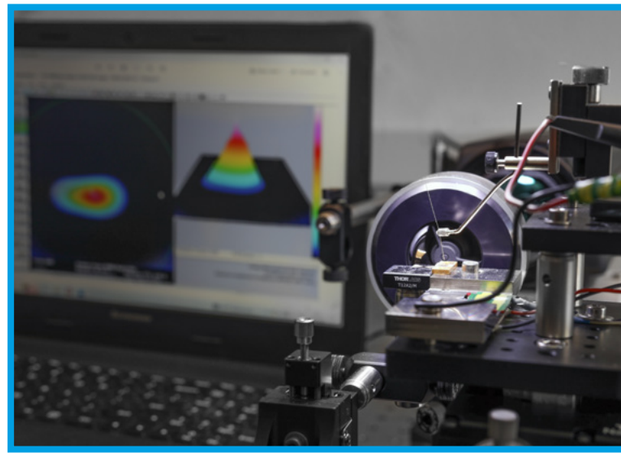
The portfolio of key photonic technologies with enormous application potential also includes fiber optic and micro-optical technologies, as well as lasers and radiation detectors. The offer of Łukasiewicz – IMiF consists of technologies for the production of new materials, such as: silicon carbide, epitaxial and flake graphene, advanced ceramics, and tests of their properties for industrial use.





Some of these inventions have to wait for their moment in history, but the Institute creates this history and plays an important role in their implementation. Thanks to the competence of scientists and a unique research infrastructure, projects that are realized in the Institute can be used in the defense industry and to ensure state security, including:

- quantum cascade lasers (QCL) emitting in the bands: 4.5-5.5 μm and 8-10 + μm, compact and easily controllable. Perfect light sources for mid and far infrared applications,
- microelectronic and photonic systems for applications in targeting systems,
- photodiodes for missile and missile guidance systems,
- AlGaN / GaN microwave transistor for S-band radiolocation in GaN-HEMT technology,
- specialized integrated circuits for optoelectronic heads,
- cold plasma generator for protection against biological hazards.



Łukasiewicz
Institute of Microelectronics and Photonics

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NARODOWE LABORATORIUM FOTONIKI I TECHNOLOGII KWANTOWYCH

National Laboratory for Photonics & Quantum Technologies

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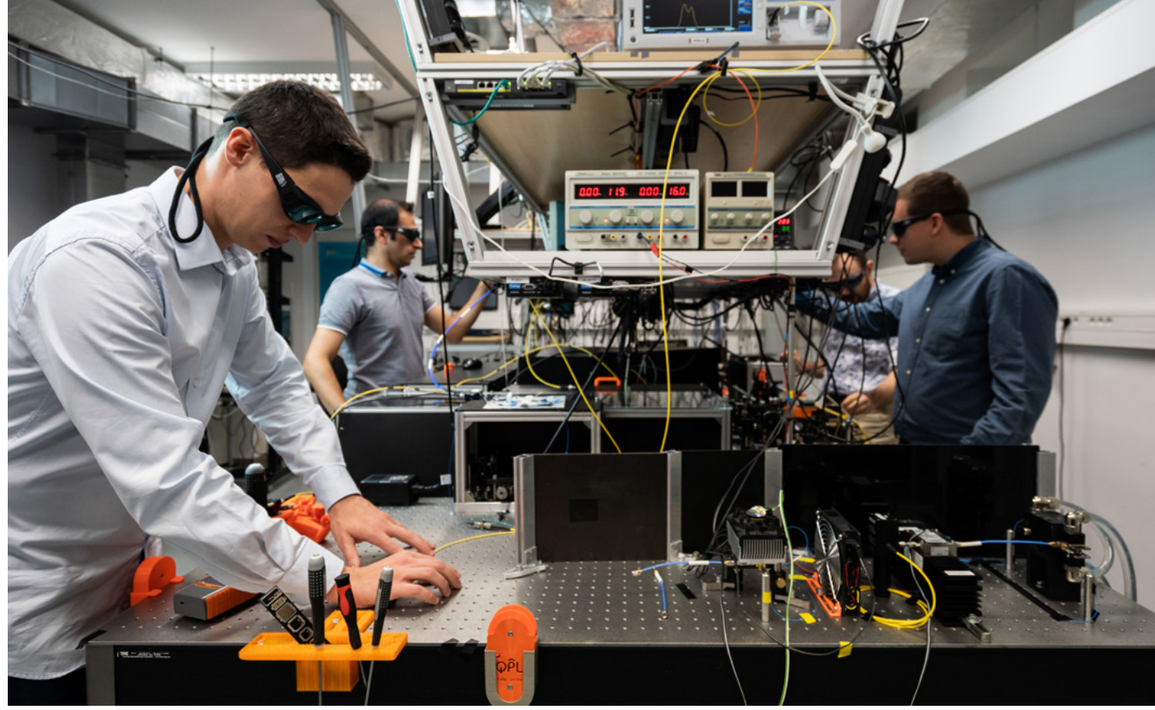
www.nlpqt.fuw.edu.pl

ABOUT

The National Laboratory for Photonics and Quantum Technologies - NLPQT - is an investment project under which a modern infrastructure in the field of photonics and optical quantum technologies is being built in Poland. The infrastructure consists of over 80 research stations located in 7 research centers. It will be available to scientists and entrepreneurs interested in using it for research and development. The range of its applications includes:

- Development of secure data transmission methods using cryptographic key distribution based on quantum effects;
- Development of new lasers and laser devices, including very robust high-power pulsed lasers and near-infrared and mid-infrared radiation sources;
- Laser micromachining of materials using high-power femtosecond lasers, enabling the cutting and modification of any materials;
- Detection of toxic gases and air pollutants based on the absorption of near-infrared radiation, allowing the detection of trace gas concentrations;
- Production of specialized glass and polymer optical fibers, including fibers for sensor applications and the construction of optical fiber devices;
- Ultra-precise metrology based on optical reference frequency delivered to several laboratories in Poland by dedicated fiber links.

Apart from those mentioned above, potential applications of the emerging infrastructure cover practically all areas of photonics applications in modern technologies. More information is available on the Project website: http://nlpqt.fuw.edu.pl. The project is financed by the European Funds under the Smart Growth Operational Program.



Of multiple R&D services offered by the NLPQT consortium, the services in the following areas can be particularly interesting for defense-related applications.

Quantum Key Distribution (QKD) - a technique of establishing a secret cryptographic key between two communicating parties using quantum properties of photons. Thanks to the use of quantum effects, it is impossible to intercept the key without alerting the parties establishing it, which means that the data encrypted with the key can only be decrypted by the authorized recipient. Secure keys could be further used for symmetric one-time-pad encryption providing absolute confidentiality even against the attacks of quantum computers.

Fiber lasers - the unique properties of fiber lasers, such as compact size and weight, high efficiency, temperature insensitivity, robustness, and operational mode flexibility open new areas of applications, for example, in LIDAR systems for accurate and precise construction of high-resolution maps, laser guidance, airborne laser swath mapping, or laser altimetry.

Laser micromachining - the micromachining stations equipped with femtosecond lasers with selectable wavelengths (1030 nm, 515 nm and 343 nm) and tunable pulse durations (from 300 fs to 20 ps) offer a wide range of laser micromachining modes, from cutting and modifying glass, polymers, metals and hard materials with the resolution as good as 1 micrometer to structuring and functionalization of surfaces, marking and welding.

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Semicon

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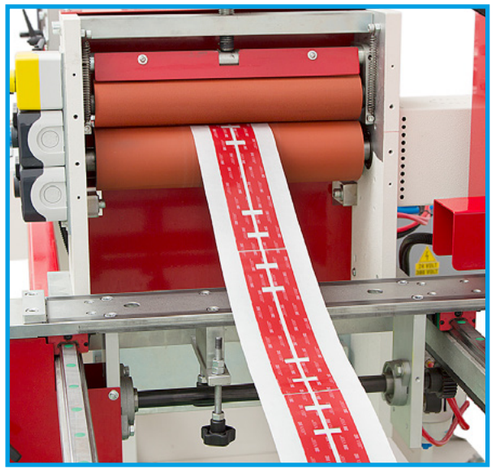
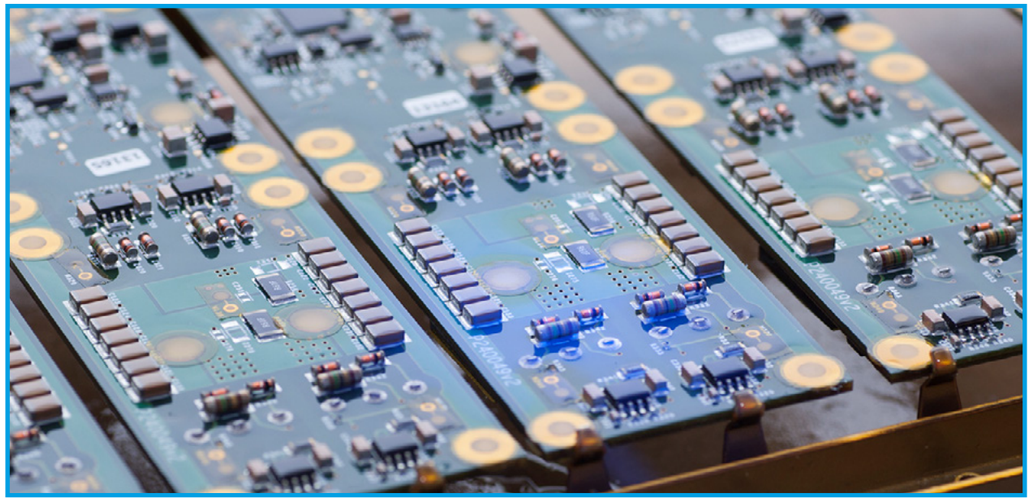


SEMICON - INNOVATIVE PRODUCTS & TECHNOLOGIES

Semicon sp. z o.o. is a family-owned, innovative company operating in electronics, photonics, aerospace, military and other high-tech industries.

We are an importer and authorized distributor of electronic components, materials, tools for electronics, measuring apparatus and measuring accessories of renowned brands. We are a supplier of materials for aerospace industry and service.

We offer SMT and THT assembly of electronic boards. Modern equipment allows us to assemble components from 01005, BGAs, PoPs.



We carry out quality control on AOI optical inspection equipment, in accordance with MIL-STD, IPC standards, and BGAs are checked using an X-Ray device.

We have equipment for nitrogen shielded wave soldering, as well as for selective PCB varnishing and for automatic PCB washing with ionic purity control. We also have equipment for selective soldering, laser depaneling (green laser).

Semicon carried out complex PCB assembly projects for military and space applications, nuclear experiments, photonics and medical sector.

We offer complex component completion - PCBs, as well as electronics assembly in MIL-STD, IPC Class 3 assembly for critical applications. We specialize in PCB flex assembly technology.

We have our own Research and Development Department providing electronics design services including pre-market conformity assessment (CE) services.

We design and manufacture SMT laser-cut steel stencils on LPKF equipment also equipped with a micro-welding module to produce stepped stencils. We are a licensee of ASM-DEK - stencils in the VectorGuard™ standard.

Converting industrial single- and double-sided adhesive tapes. We make cut-to-size tapes and die-cut and kiss-cut blanks. We have a laser plotter, an oscillating knife and offer a lamination option. We are a licensed converter of companies: 3M, Saint Gobain, IPG, Tesa.

We produce laser modules for military and industrial applications: point, line, cross - different wavelengths and output power.

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SMARTTECH3D

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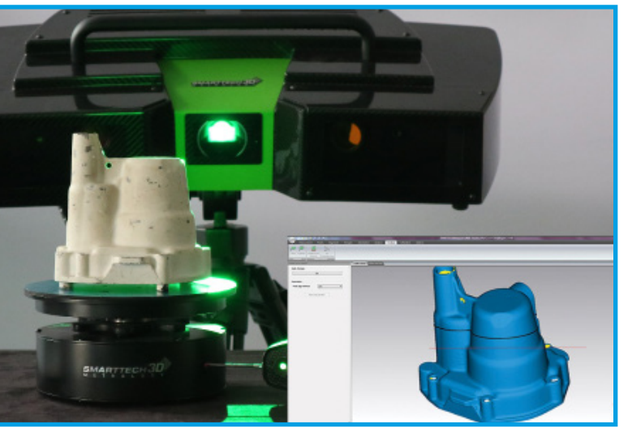

ABOUT

SMARTTECH3D is a world-renowned Polish manufacturer of optical 3D scanners, founded in 2000. The company's offer includes a full range of professional contactless measuring devices for various applications, as well as quality control and reverse engineering software. SMARTTECH3D provides design and implementation services for advanced optical measuring systems and 3D measurement services around the world. The satisfied customers include NASA, Boeing, Lufthansa, Orlen, Military Police, KRONES, Central Office of Measures as well as many educational units.

Our Clients

Our distributors:

Applications of SMARTTECH 3D scanners in military and defence:

- Virtual Database
- Digitalization
- Reverse Enginiering
- Detailed Documentation
- Criminology

Industry and technical applications

What is a 3D scan?

Non-contact reproduction of the real object in digital form, allowing to obtain a virtual model of the measured object.

The result of the measurement is a cloud of points describing the surface of a cloud of points describing the surface of the object, optionally also with color components at each measuring point

Non-technical applications – 3D scanning with colour

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SYGNIS
SPÓŁKA AKCYJNA

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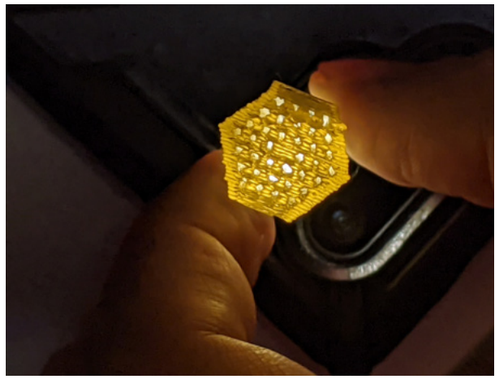
ABOUT

Sygnis SA is a Polish deeptech company specializing in hardware R&D projects in four main areas of activities: new additive technologies, power engineering, biotechnology and nanotechnology. The company supplies and implements high-tech systems at universities, research institutes, companies and production lines in Poland and Europe. Sygnis SA conducts several EU funded R&D projects, including construction of a multifunctional hybrid 3D printer with a real-time quality control system, and creation of a biomaterial printing technology

Sygnis



and constructing a 3D bioprinter for automated creation of bionic organs. The company has entered NewConnect market, a Polish stock exchange, in December 2021.

We solve problems and come up with new solutions in the areas of new additive technologies, biotechnologies, power engineering and nanotechnologies. Thanks to our projects, breakthrough ideas in the field of energy storage, expanding access to nanotechnological solutions, as well as pioneering methods of saving life are created.

We are a research and development company that can earn for itself. Thanks to the skilful combination of an extensive sales department and a qualified research team, we are able to provide the latest technological solutions from around the world and produce completely new, breakthrough manufacturing methods. We grow in strength from year to year.

We want our inventions to effectively change the world.

Revolutionary technologies for photonics and optics

As a research team at Sygnis SA, we are proud to present the world's first 3D printer for low-temperature glass. It is the result of more than five years of research and development.

Syglass technology makes it possible to create previously impossible, complicated projects in the field of optics and photonics.

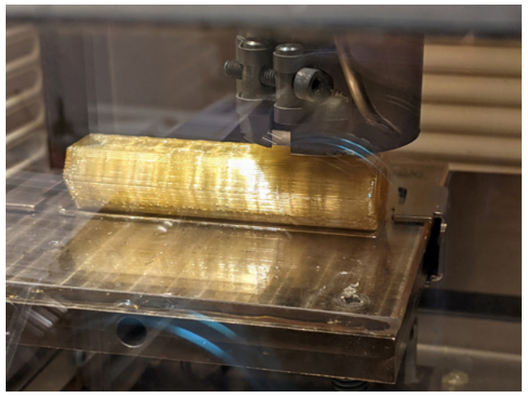
The Syglass 3D printer allows the creation of a new type of multi-mode fiber optic cables for faster and more secure data transmission. The application of this technology in the defense sector will become most apparent in two segments: communications and sensing.

Communications
Improved transmission quality: parabolic fiber optic cables (GRIN). Mid-infrared: supercontinuum generation of bright, ultra-broadband light sources. Security: hardware-protected fiber optic cables with converter vortex beam.

Detection
Use of nanostructured mid-infrared lenses that will allow to detect objects and signals at previously inaccessible frequencies

Syglass technology unlocks the potential of the optics market nanostructured. It automates the production of preforms fiber optics by using 3D printing to directly deploy molten glass in the desired pattern. This innovative technology reduces production time 14x and cuts costs by more than 40%.

Syglass makes affordable production of preforms on demand becomes possible and stimulates the global growth in photonics.



SYGNIS
SPÓŁKA AKCYJNA

PHOTONICS 21
PHOTONICS PUBLIC PRIVATE PARTNERSHIP

VIGO Photonics

Vigo Photonics
Poznańska 129/133, 05-850 Ożarów Mazowiecki
e-mail: info@vigo.com.pl
www.vigo.com.pl

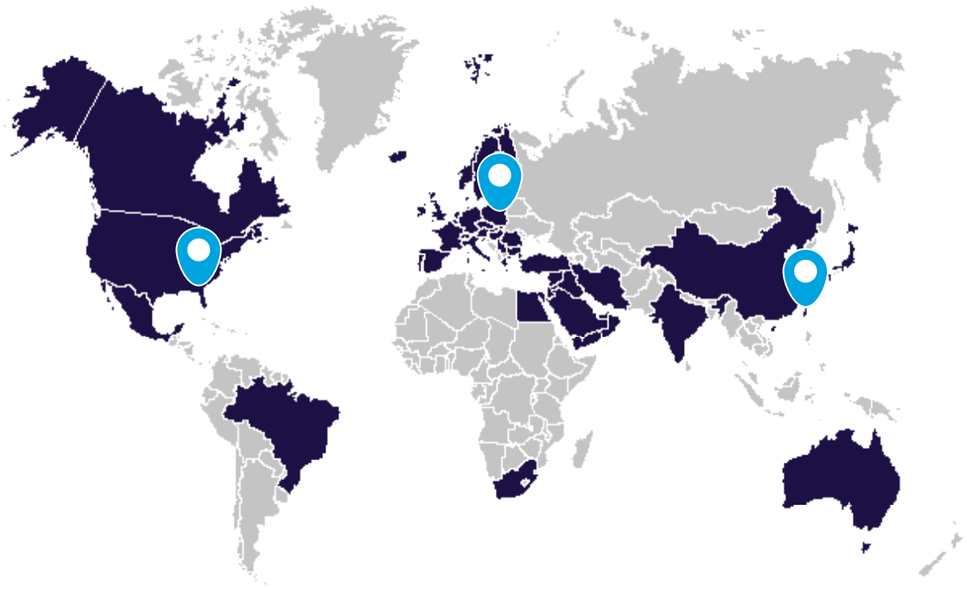
ABOUT

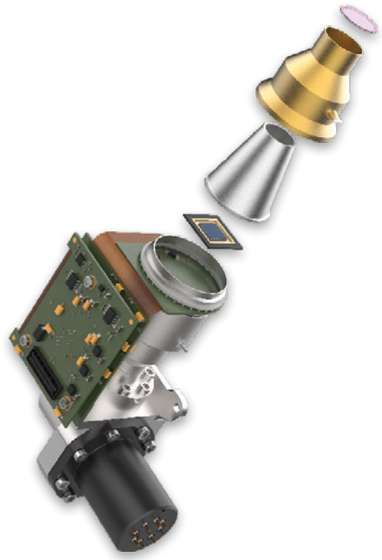
VIGO Photonics is a European manufacturer of semiconductor materials and instruments for photonic and microelectronic covering SWIR, MWIR and LWIR infrared detection range of single and multielement (FPA) detectors using internally developed technology and various materials.

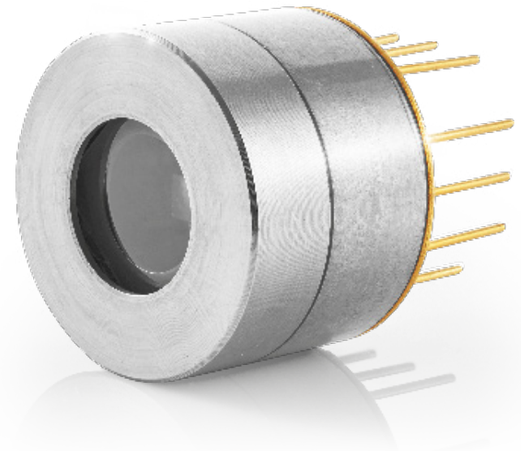
Headquarters
Poland, Ożarów Maz.

Vigo Photonics US
St Petersburg, Florida

Vigo Photonics Taiwan
Taipei, Taiwan







VIGO Photonics ability to create custom infrared technologies allow to develope dedicated security and defense applications:

Integrated Optoelectronic Head
Thermal observation and tracking systems based on infrared multielement FPA

DIRCM & CIRCM
Infrared detectors enable deceiving hosile missiles

Muzzle Flash
System indicates visible and infrared blast caused by single shot

Early Warning System
Detect and indicate hostile laser pointing

Thermal Panoramic System
Semi-spherical thermal drone detection system

Round Observation System
Autonomy AI based visible and thermal vehicle observation system

Stop-Fire
Fire risk prevention system

NRBC Threat Monitoring System

IED Recognition System

Smart Munition
Infrared guided inteligent munitions

Missile Warhead
Infrared missile homing warhead

Soldier Equipment
Indyvidual laser warning system, thermal camera

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PhotonHub Europe®

PHOTONICS INNOVATION HUB FOR EUROPE

Innovation requires a lot of research, organisational and financial efforts. PhotonHub Europe was established to make innovation with photonics easier for any European company.

PhotonHub Europe (PHE) is a pan-European support network working to accelerate the uptake of photonics technologies by European industry. It is open for all entrepreneurs interested in developing and upgrading their businesses with photonics technologies.

PhotonHub Europe is a full-service one-stop-shop Photonics Innovation Hub, offering for free:

- knowledge, training and experimenting
- development and testing of technologies,
- including test-before-invest
- business support
- funding support
- wide network of contacts

Companies (with focus on SMEs and startups) are provided technology, business and funding support services by leading European expertise centres participating in PhotonHub consortium. Over 50 PhotonHub members from all over Europe are available to support photonics innovation in the industry: from basic information and training to technology development and scaling-up to market strategies, IP protection and investors meetings.

Contact PhotonHub Europe to learn how we can assist your business with photonics.

https://www.photonhub.eu/