Photonics, Micro and Nano Technologies in the Baltic Sea Region

Berlin Copenhagen Helsinki Oslo Riga Stockholm Tallinn Vilnius Warsaw

Photonics, Micro and Nano Technologies in the Baltic Sea Region

LIST OF CONTENT

Introduction to BaSIC **3**

Photonics, Micro and Nano Technologies in the Baltic Sea Region **4**

Regional overviews **5**

Berlin 6

Copenhagen 9

Helsinki 12

Oslo 15

Riga 17

Stockholm 19

Tallinn 22

Vilnius 24

Warsaw 27

Market Access Points (Information on how to access the markets) **30**

Imprint and BaSIC partner contact information **32**

Introduction to BaSIC

PREFACE

Optical technologies, Microsystems and Nanotechnologies count among leading key technologies of the future.

The presented BaSIC cluster report gives a first overview information about this dynamic field, informs on the most important player in research and industry. It also lists relevant network organisations and service tools to start cooperation and to access the market. It will serve as a door opener towards the BSR markets in this key area.

The Baltic Sea InnoNet Centres (BASIC), presenting the information is a European pilot project, aiming to build a “Baltic Sea Archipelago of Innovation” - creating a seamless working environment for fast growth innovative SME all over the Baltic Sea Region, embedded in a reliable network of leading science parks and clusters. Emphasis is given to provide them harmonized access to markets and to connect them for access to finance for internationalization and growth, finally to improve competitiveness, dynamics and economic growth of the Baltic Sea area.

The project consortium of the 10 Baltic Metropolises, leading science parks, incubators and innova-tion facilitators has decided to start the project with focus on innovative and sustainable technolo-gies, having a strong market potential, well skilled human resources and strong technical compe-tences in the BSR.

Optical technologies, photonics, microsystems and nanotechnologies had been identified as one of the possible pilot areas fulfilling these conditions.

BaSIC activities, efficient networking between the regional clusters and strong company related services will be tested out for business relevance and will be expanded to new partners and to other regions. Agreed joint marketing calendars and activities for innovation sites and events of the partner regions will provide a schedule for the SME to find the most important events, expositions and conferences for their business activities.

At the moment, for fast growth SME, the BSR markets are full of hurdles for growth. BSR markets are still disconnected, innovative SME suffer from insufficient information about market situation in the different regions, varying regional regulations, different rules for investing, opening branch offices, creating ventures, etc.

Reliable initial market information in key areas and harmonized instruments are needed to enable SME to better access international markets. Science parks/incubators offer tools for accessing markets and finance to their clients on a local level but regional limited, not harmonized, not transferable. Finally, the cities have not yet discovered the dynamic growth competences of science parks/incubators for networked economic growth and innovative international SME.

Transferable, easy understandable solutions have to be found to become competitive as BSR: to overcome disparities not only between old and new EU-member regions, but also between Scandinavian and “continental” regions. Time to market, easy access to cooperation partners, ventures and finance is becoming a limiting factor and a bottle neck.

BaSIC is understood as a pilot for proposing solutions and bridging the gaps, to develop tools and instruments for a quick, harmonized and also for certified and transferable market access. The approach will contribute to establishing a “Baltic Sea Archipelago of Innovation” with seamless working conditions for innovative SME and based on reliable initial market information provided by competent regional partners – as e.g. science parks and cities can provide.

It will provide a better visibility of the regions and their strengths to enhance better cross border cooperation. The proposed overview on the situation and the market strengths in the field of optical technologies, photonics, Microsystems and nanotechnologies is the first approach of BaSIC project to provide initial market information within the BSR region.

I wish the information to become a first important guide towards the Baltic Sea area in the field of optical, MST and nanotechnology. I hope it will contribute to encourage companies from the BSR and from other regions to identify the BSR as an interesting and promising dynamic growth market and business region.

Sincerely

Helge Neuman

Photonics, Micro and Nano Technologies in the Baltic Sea Region

In many countries of the Baltic Sea Region (BSR) photonics have a long tradition and have been important drivers for the growth of local industries during the last decades. Micro and nano technologies, however, are a relatively young industry that is emblematic of the demands innovative products have to meet in the context of global competition: smaller, more efficient, and more cost-effective.

In September 2009 the European Commission designated photonics, micro and nano technologies as three of five key enabling technologies (KETs) for our future prosperity , due to its importance in providing a basis for the sustainable development of businesses and the creation of new jobs in the various areas of application of cross-section technology.

The key to success is a well-developed research landscape, with close connection to the industry – on local as well as on transnational level. Over the past years, the Baltic Sea Regions have witnessed the development of a large number of local network structures, which aim at ensuring access for companies and research institutions to resources such as knowledge and capital. The aim of the Baltic Sea Innovation Network Centres (BaSIC) is to extend those structures on the international level in the BSR.

With more than 600 companies and many research institutions providing a complementary set of expertises the BaSIC partner regions offer excellent initial conditions to foster the development of inter-regional value chains among the actors, thus strengthening the competitiveness of the BSR.

The report “Photonics, Micro and Nano Technologies in the Baltic Sea Region” is part of this development process, and for the first time provides a quantitative and qualitative overview of the sector in the BSR, while also intending to make a contribution to creating greater internal and external transparency.

Gerrit Rössler and **Jaanus-Martti Kangur**

Regional Overviews

Berlin Copenhagen Helsinki Oslo Riga Stockholm Tallinn Vilnius Warsaw

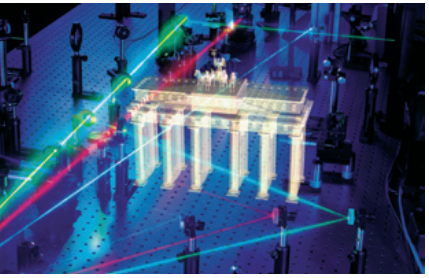
Berlin-Brandenburg

INTRODUCTION

The German Capital Region Berlin-Brandenburg hosts about 400 companies from photonics and microsystems technology, generating an annual turnover of 2.1 billion Euro while employing 13.000 people.

The strong science sector is a major asset of Berlin-Brandenburg. 5 universities and 26 research institutions work in the field of photonics and microsystems technology providing input for the local companies. Several spin-offs have been generated during the last decade.

Almost half of the companies and research institutions are organized in networks. The biggest one with about 100 institutional members is **OpTecBB (www.optecbb.de), which also holds the cluster management of photonics in Berlin-Brandenburg.** Others are Laserverbund Berlin-Brandenburg, PhotonikBB and optic alliance brandenburg berlin (oabb).



wwww.optecbb.de

In order to support the strategic development of the technology field the following focal points have been identified in science and industry:

- Bio-medical optics
- Innovative ophthalmology
- Laser technology
- Lighting
- Microsystems technology (packaging and system integration)
- Multi sensors, visualization and signal processing
- Optical process measurement technology
- Photonics for communication and sensors
- UV- and x-ray technologies
- Terahertz technology

Every two years the Messe Berlin hosts a congress and trade show

for photonics – the Laser Optics Berlin. The event has taken place nine times so far and has made a remarkable development towards an internationally renowned marketplace for photonics. In 2010 135 exhibitors and 2.900 visitors came to Laser Optics Berlin. BaSIC organised a joint presentation for 30 photonics, micro and nano technology companies and research institutions from the Baltic Sea Region. The presentation was supported by a cluster colloquium, a brokerage event and an internationalisation seminar.

PHOTONICS AND MICROSYSTEMS SCIENCE

Germany's capital region is the home to research institutes that are in the top of their respective leagues, globally speaking. The Ferdinand Braun - Institute for Highest Frequency Technology (FBH), for instance, with about 240 staff members it is one of the leading institutes for application- and industry- oriented research in microwave and optro-electronics in Europe.

One of the region's lighthouse projects is "FreshScan", which is a joint project of the Ferdinand-Braun-Institute, the Technical University Berlin, the Fraunhofer-Institute for Reliability and Microintegration (IZM) and other partners. This project is based on lasers, which can scan meat through the packaging and determine how fresh it is. A handheld prototype has already been developed and preparations for mass production have started. This and other examples such as LEDs that emit ultraviolet light and therefore neutralise germs in drinking water, underlines FBH´s work in market-applicable fields. Another renowned institute is the Max-Born-Institute for Nonlinear Optics and Short Pulse Spectroscopy (MBI), which defines its core research themes in lasers with ultra short impulses and lasers impulses that absorbed non aqueous tissue in the brain. A task force at the German Aerospace Center (DLR) marks the research in application of radiation in quality control, medicine, security and surveillance.

These are just three of more than 30 research institutes working in the field of photonics and microsystems technology. The density of research institutes makes the Berlin-Brandenburg region a provider of expertise that is unique throughout Germany. The close cooperation between scientists on the one hand and business on the other is one of the major advantages, generating several joint projects. For example the "100 x 100 Optics" project that aims to achieve a transmission rate of 100 gigabits for 100 million users was enabled not only by optical components and fibre cables from companies , but also by contributions from science institutions, such as the Technical University Berlin and the Fraunhofer-Institute for Telecommunications – Heinrich Hertz-Institute (HHI).

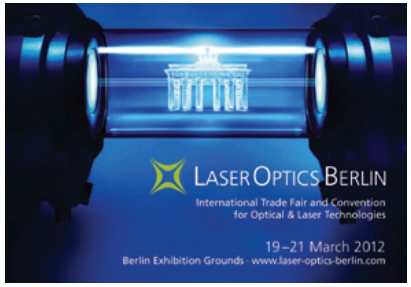
PHOTONICS INDUSTRY

The core of Berlin-Brandenburgs photonics and microsystems technology cluster is located in the Science and Technology Park Berlin-Adlershof. Within the area of 4.2 square kilometer work more than 4500 people in around 400 technology companies, at 12 non-university research institutions and at the natural science institute of the Humboldt University (HU). To date 57 photonics companies have settled around the high-caliber research institutions.

Optical Technologies have a significant economic impact in the Berlin-Brandenburg region. Companies of that branch are drivers for advancement in important future technologies. Berliner Glas KgaA, Herbert Kubatz GmbH & CO. for instance, develops and manufactures optical components and systems which guide the laser beam of a welding robot just as precisely the one in a medical laser for tooth or eye treatments. The application spectrum of beam forming systems reaches from semiconductor manufactures to sensor technology.

The laser scene in the capital region is alive and develops dynamically. Therefore a large number of developers and producers are settled around Berlin. Photon Laser Engineering GmbH for example develops and tests new methods of material processing via laser: welding, soldering, coating. That comes mainly in use for the production of automobiles, rail, air and space vehicles. Another specialist for laser material processing is Laser- und Medizin- Technologie GmbH, Berlin (LMTB), which developes solutions for upcoming industrial application like trepanning optics. But also the lasers themselves are produced in the capital region: The Spectra Physics GmbH as a part of the US technology corporation Newport, is a specialist for laser technology from solid-state lasers and diode lasers. Scansonic and Highyag produce complete laser machining heads and tools for laser material handling.

Aside from newly founded companies such as eagelyard Photonics GmbH, which is a spin-off from the FBH, or Jenoptik Diode Lab GmbH, there are also established companies, like, for instance, IBL Innovative Berlin Laser GmbH that were attracted by the cumulative optic competencies of the Berlin-Brandenburg region. Eagleyard Photonics GmbH on the one hand just lately introduced the first directly tune-



http://www.tsb-adlershof.de/files/tsb_downloads/german/Report_OT_MST_klein.pdf

able green laser, a key component for the micro projection, e.g. in cell phones and PDAs or game consoles. Within just six years, the number of employees of this company which is also settled in Adlershof could be increased from 2 to 25. Jenoptik Diode Lab GmbH, which is also a spin-off from FBH, specializes in the production of customer specific epitaxial layer structures as well as the development and production of laser bars and single emitters, which are used for the development and manufacture of high power diode lasers. On the other hand ILB Innovative Berlin Laser GmbH develops and produces solid-state laser systems and applications ranging from spectroscopy to drilling and tagging for more than 30 years. “As far as photonic systems are concerned, Germany is world leader. And Berlin-Brandenburg is one of the most interesting centers in this country”, summarizes eagleyard co-founder Jörg Muchametow.

The development and application of x-ray technologies manifests a long tradition in the Berlin-Brandenburg region. What began in 1895 with experiments of some x-ray tubes of Wilhelm Conrad Röntgen has become a research based future field in the region with a unique potential at a national and international level. It includes activities along the entire value chain – from basic research to product development into innovative companies. A significant number of small and medium enterprises, like Bestec GmbH, Crystal GmbH, IfG GmbH and Bruker AXS Microanalysis GmbH, are active in the x-ray technologies in the region.

Many other companies within this spectrum have settled in Berlin-Brandenburg: Schmidt & Haensch GmbH & Co., specialized in opto-electronic measurement technology; Sentech Instruments GmbH develops and produces precision measurement devices like ellipsometers and reflectometers; Femto Messtechnik GmbH develops photoreceivers and opTricon GmbH , in Adlershof, is a service provider for research and development in optical technologies. The crystalline optics from Crystal GmbH or Crystal Photonics GmbH are being used in the optical lithography, in the semiconductor industry and in communication and measurement technology.

Medical technology is also strong in Berlin and Brandenburg. Companies like Jenoptik subsidiary Acri. Tec AG, which manufactures lenses for eye implants or Leisegang Feinmechanik-Optik GmbH & Co, world market leader for optical examination instruments used in gynecology – help doctors and hospitals in their treatment of patients. Another successful story of a newly founded company is LTB Laser Technology Berlin which became one of the leading manufacturers of short-pulse lasers. In collaboration with the world renowned Adlershof institute Max-Born-Institute for Nonlinear Optics and Short Pulse Spectroscopy (MBI), LTB developed a laser that can analyze the fluorescence of melanin in our skin – with enormous potential in the fast, secure and simple skin cancer diagnosis.

Berlin-Brandenburg is also characterized by a highly dynamical field of sensors. Alongside there are enterprises, which offer from outset quite specific and technically challenging optical sensor solutions (e.g. Move & Traffic Controls GmbH, Hella Aglaia Mobile Vision GmbH, ASAS GmbH, uwe braun GmbH, or Elbau GmbH). Companies like First Sensor Technology GmbH, Aktiv Sensor GmbH and alre-IT Regeltechnik GmbH belong to the non optical sensors such as pressure sensors, acceleration sensors and temperature sensors.

In the field of microsystems technology Berlin-Brandenburg possesses an excellent potential in research, development and manufacturing, at national and international level. In the field of system design and system integration regional companies, like hmp Heidenhain Microprint GmbH, AEMtec GmbH or MSG Lithoglas AG for wafer level packaging, which identified their key to success in realization of applications in end-to-end integration technologies, e.g. RFID label with integrated sensors for shock and temperature load, optimization of warehouse logistic or integration of electronics into textiles.

OVERVIEW PHOTONICS AND MICROSYSTEMS TECHNOLOGY:

A report on science and industry from this sector was published in 2008 including a directory of companies and research institutions and several articles on science parks, historical developments and technology expertises. A hardcopy version is available on demand at TSB Innovationsagentur Berlin (roessler@tsb-berlin.de) or downloadable at www.tsb-adlershof.de.

Copenhagen

INTRODUCTION

At least 24 photonics companies are located in and around the Danish capital, employing about 1.000 people altogether. The industry is supported by a strong scientific background from the Technical University of Denmark and Risø National Laboratory, who employ more than 200 people in the field of photonics.

PHOTONICS SCIENCE

Copenhagen's driving force in photonics science is DTU Fotonik, Department of Photonics Engineering from the Technical University of Denmark, which was founded in 2008 by merging COM-DTU and parts of the optics department from Risø National Lab. Today DTU Fotonik employs about 220 people and is set up in 16 research groups, which are combined in 4 thematic clusters:

- Light sources and industrial sensors (incl. Diode lasers & LED systems, Optical microsensors & micromaterials, Optical sensor technology and Light energy & harvesting)
- Communication Technology (incl. Coding & visual communication, Metro-access & short range systems, Networks technology & service platforms and High-Speed optical communications)
- Nanophotonics (incl. Nanophotonic devices, Metamaterials, Quantum photonics, Nanophotonics theory & signal processing and Structured electromagnetic materials)
- Dynamic Photonics (incl. Fiber optics, devices & nonlinear

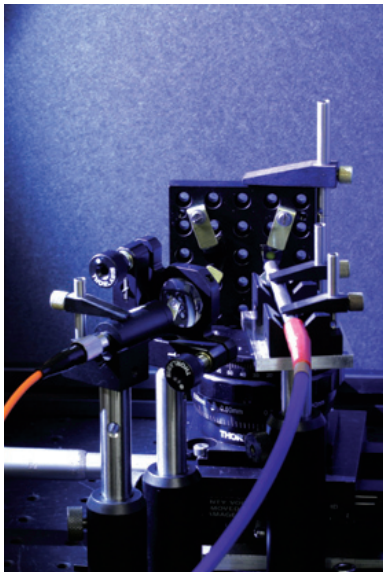
effects, Fiber sensors & supercontinuum, Terahertz technologies & biophotonics)

- A few DTU Fotonik innovation projects are:
- A LED system for display cases with 80% energy reduction
- Waveguide touch technology aiming at more cost efficient touch pads by using optical waveguiding for coupling out light by touching an acrylic plate
- UVC sterialisation of catheters
- A holographic cantilever reader with subnanometer resolution

PHOTONICS INDUSTRY

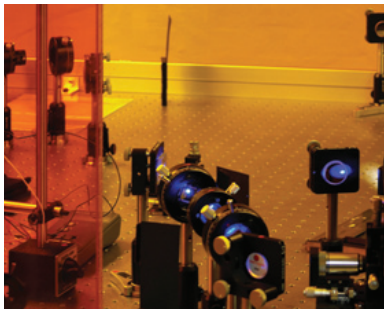
The driving forces in Copenhagen's photonics employment are OFS Fitel Denmark, specialized in ICT applications and JAI, manufacturer of industrial cameras for the machine vision, manufacturing, military, aerospace, homeland security, medical and scientific markets .

The broadest spectrum of products is offered by NKT Photonics, who merged with Crystal Fibres and Koheras, including photonic crystal fibres, fiber lasers, supercontinuum lasers, optical parametric oscillators and amplifier engines. Azpect Photonics and BFI Optilas offer a similar spectrum, but are mainly active as distributors for global photonics companies.



The majority of companies produce optical components like refractive optics, interference filters and mirrors (Ferroperm Optics, Delta Light & Optics and Kaleido Technology), Vertical Cavity Surface Emitting Lasers (VCSELs) (Alight Technologies) or components for optical data transmission (Ignis Photonyx, OptoTel and Tellabs).

The second focus is on industrial cameras and related systems and components (Copenhagen Sensor Technology, Devitech and JAI). Other companies active in analysis and measurement applications are Ibsen Photonics (optical spectrometers), JLI vision (optical inspection devices) and LuKa Opto-Scope (nano- and microstructure measurements).



Hymite, Iptronics and Tpack are working at the interface to microsystems / microelectronics technology offering silicon packages for SSL applications (Hymite), optical interconnects for computer manufacturing (Iptronics) or softsilicon chips for optical transport systems (Tpack).

Copenhagen's photonics profile is completed by the hologram printing company Stensborg, Saab Metech which offers calibration services for fiberoptic measurement equipment and Laser Interface, which develops laser projection systems, laserbased information displays and scanners in close cooperation with leading research institutions in Denmark and Germany.

OVERVIEW:

Company	Expertise
Azpect Photonics	Lasers, fiber optics, sensors and optical components (sales)
Alight Technologies	PBG-VCSELs
BFI Optilas	Lasers, fiber optics, test & measurement systems and optical components (sales)
Copenhagen Sensor Technology (CST)	Industrial cameras, electro-optical systems
Delta Light & Optics	Optical interference filters, microelectronics, sensor systems
Devitech	Thermal camera products and imaging components
Ferroperm Optics	Optical interference filters & coatings
Hymite	Engineered silicon packages for SSL applications
Ibsen Photonics	Phase masks, fused silica transmission gratings, FBG interrogation monitors and OEM spectrometers
Ignis Photonyx	Optical components for broadband networks
IPtronics	Parallel optical interconnects
JAI	Industrial cameras
JLI vision	Industrial vision systems
Kaleido Technology	Refractive optics
Laser Interface	Laser projection systems, laserbased information displays and scanners
LuKa Opto-Scope	Nano- and microstructure measurements / microscopes
NKT Photonics	Photonic crystal fibers, fiber lasers, supercontinuum lasers & accessories, optical parametric oscillators
OFS Fitel Denmark	Optical fibers, FTTX, fusion slicers and optical components
OptoTel	Optical components for data-, wireless- and telecommunications
Saab Metech	Calibration of fiberoptic measurement equipment
Stensborg	Hologram printing
Tellabs	Optical networks
Tpack	Softsilicon chips for optical transport systems

Helsinki

INTRODUCTION

Nanotechnology has been chosen as a strategic focus area in Finland.

NANOTECHNOLOGY CLUSTER PROGRAMME

Nanotechnology Cluster Programme belongs to the Centre of Expertise Programme of Ministry of Employment and Economy (3rd term 2007-2013), focusing on facilitating commercial utilization of new high class know-how and national level networking. The mission of the Nanotechnology Cluster Programme is to foster and strengthen the responsible and value adding implementation of nano and micro technologies and future materials in Finnish companies. Nanotechnology Cluster Programme is an efficient gateway to the Finnish expertise in nano and closely related technologies.

According to the study of Tekes FinNano programme, in the end of 2008 there were 200 nanotech companies in Finland, 65 selling their nanotech based products. Half of the Finnish nanotech companies were based in Helsinki Region. The same study revealed that the number of employees involved was 2900, and the whole industry turnover was over 300 MEur.

At the moment it is estimated that the number of companies involved in nanotechnology in Finland – counting in all maturity levels from commercial products to vision – would be at least 300, about 100 with commercially available products. Based on the 12/2008 status the total turnover of companies would be about 150 Meur in Helsinki Region, assuming that there is no radical change since 12/2008. The largest group of Finnish nanocompanies belong to a “horizontal” cluster of chemistry and materials, and 80% of these are based in Helsinki Region. Also the “horizontal” cluster of Instruments and tools is overrepresented in Helsinki Region with roughly 80% of the companies in metropolitan area. In addition, the local nanocompanies cover all relevant industries including eg ICT, electronics and MEMS, health and well-being, forestry, building and machinery.

In Helsinki Region there are 10 research organisations active in nano- and microtechnologies and future materials: Aalto University, University of Helsinki, VTT Technical Research Centre of Finland, Metropolia University of Applied Science, Centre for metrology and accreditation MIKES, IT Centre for Science CSC, Cancer Society of Finland, Finnish Institute of Occupational Health FIOH, Finnish Environment Institute SYKE and Hospital Distric of Helsinki and Uusimaa. 75 research groups active in Helsinki Region were reported on 05/2010, and the information on their key skills and activities can be found on www.nanobusiness.fi. According to the study the big emphasis of the local nano research supports electronics and MEMS industry as well as pharma& medical sector. Estimated 800-1000 researchers and scientists are employed, based on the number of research groups.

In addition to the nano companies and research there are numerous organizations involved in nanotechnology in Helsinki Region, including e.g.

- Authorities like Ministry of Employment and economy, health, environment, education
- Networking operators like Culminatum Innovation, Technology Centres Union
- Academic networking like Aalto Centre for new materials, National Graduate Schools
- Research funding like Tekes and Academy of Finland
- Private Funding like Inventure
- Innovation support like Foundation of Finnish Invetions, Spinno Incubator, Aalto MIND
- Invest in & marketing like Otaniemi development and Greater Helsinki Promotion
- Non-Governmental Organisations

UNIVERSITIES AND OTHER HIGHER EDUCATION INSTITUTIONS:

2 universities (Aalto University, University of Helsinki) and 1 University of Applied sciences (Metropolia).

Relevant science parks and networks *www.nanobusiness.fi*

Otaniemi Technology Hub, Viikki Campus, Kumpula Campus and Meilahti campus

MOST IMPORTANT PLAYER'S AND SHORT DESCRIPTION OF MAIN TOPICS

- **R&D institutions** see www.nanobusiness.fi e.g. University of Helsinki, Aalto University (including TKK), VTT Technical Research Centre of Finland
- **companies** 100-150 players, see www.nanobusiness.fi examples
- **network organisations** Nanotechnology Centre of Expertise in Helsinki region www.nanobusiness.fi is an independent contact point supporting the growth of nanotechnology based business. The services include partnering, promotion and project building for the Helsinki Region nanotechnology stakeholders. The centre develops the operational environment of the nanotechnology SME's and offers a neutral contact and information point to anyone interested in nanotechnology – thus acting as a gateway to Finnish and especially the metropolitan area nanotechnology.

PROFILE AND HOT TOPICS OF THE CLUSTER / TECHNOLOGY FIELD IN THE REGION (INCL. LISTING MAIN TOPICS COVERED)

Nanotechnology Centre of Expertise is an independent contact point supporting the growth of nanotechnology based business.

The knowledge is utilized in activating and supporting the nanotechnology stakeholders in Helsinki region (companies, research organizations, others)

The themes of 2010 are: Improved by Nano, safely by nano and profitably by nano. The improved by nano focus is in machinery and building.

OVERVIEW:

Company	Expertise
Aivon	SQUID detectors, cryogenic detectors and low-noise readout electronics
Beneq	Equipment and Technology for Functional Coatings
Biolin Scientific	The Smart Choice for Interface Design and Analysis
Canatu	NanoBud™ Based Electronic and Optical Thin Film Components
Carbodeon	Superhard nanomaterials for applications where toughness is at a premium
Enfucell	Thin, flexible & eco-designed SoftBatteries™
Genano	Air Purification Units. Creates clean air solutions for commercial and industrial applications
nLIGHT Corporation	Driving new application utilization of high-power semiconductor lasers and optical fiber, fiber components and sub-subassembles
nGlass	Glass Tiles
Nokia	Nano Sciences System Research Center develops nanotechnologies for mobile communication and ambient intelligence.
Okmetic	Silicon Solutions for Advanced Technologies. Supplies tailor-made silicon wafers for sensor and semiconductor industries and sells its technological expertise.
Panipol	Inherently Conductive Polymers
Picodeon – Surface Freedom™	The Picodeon Coldab™ process uses picosecond laser to make thin films and coatings
Picosun	Picosun develops and manufactures Atomic Layer Deposition (ALD) reactors for micro- and nanotechnology applications.
Planar Systems	Planar utilizes nanotechnology in the Electroluminescent (EL) manufacturing process when making the display glass
Teknos	Suppliers of industrial coatings and a major participant in the retail and architectural paint markets
Tikkurila	Decorate and Protect - potentials of nanotechnology are constantly being evaluated, and nanomaterials have already been used for years in several product applications
Vaisala	Develops, manufactures and markets products and services for environmental and industrial measurement
VTI Technologies	Forerunner in Motion and Pressure Measurement. Motion and pressure sensors include the automotive industry, medical, instruments as well as portable devices

Oslo

NCE MICRO- AND NANOTECHNOLOGY INNOVATION ON THE MICRO AND NANO LEVEL

NCE Micro- and Nanotechnology is the result of a long-term commitment to microtechnology in the region of Vestfold. The companies in the cluster comprise the most important commercial arena for micro- and nano-technology in Norway, and play a leading role in the Norwegian electronics and ICT fields. Most of the companies in the cluster are international lead-ers in their product areas – marketing and selling their products to major, demanding international customers.

BACKGROUND

Miniaturization in electronics is a key trend throughout the ICT sector and continues to develop at a rapid pace. To increase packing density and performance, research is being conducted internationally in several new technology areas related to integration and interconnection in three dimensions. This will require completely new technologies for use in product development, construction and assembly. The anticipated impact of this trend may be so vast that, in the long run, it could threaten the very basis of electronics production in Norway. If the Norwegian electronics industry is to keep pace with these developments, efforts to enhance expertise in this area must be implemented. It is essential to establish laboratories that are adequately equipped to conduct experiments and produce test products and prototypes.

INITIATIVES & PROJECTS

The projects carried out by NCE Micro- and Nanotechnology are grouped around the following main areas

of activity:

- Further develop the existing network
- Increase product development as a basis for commercialization
- Increase technology activities and R&D within cluster companies
- Implement trend analysis and strategic processes
- Establish new study programmes, a research centre and infrastructure

STRATEGY & OBJECTIVE

The overall objective of NCE Micro- and Nanotechnology is to promote the growth and renewal of the companies within the cluster and to establish new companies with international potential. A dynamic MNT community will be cultivated so that inter-natio-nally leading companies with international ownership will choose this region in which to develop and grow. A viable, well-coordinated regional innovation system will also be developed to ensure commercialization and future value creation that will continue after the NCE project has been concluded. Micro- and nano-technology companies in the cluster will benefit from increased sales and better utilisation of new solutions in miniaturization and the application of micro- and nanotechnology. NCE Micro- and Nanotechnology seeks to promote the development of new start-up companies and create more jobs within the cluster. Efforts will also be made to obtain funding for various projects from the EU, the Research Council of Norway, Innovation Norway, the European Space Agency and other funding sources.

OVERVIEW:

Company
Fjord International AS
GE Vingmed Ultrasound AS
Ignis AS
Jotron Electronics AS
Kongsberg Maritime AS
LifeCare AS
Memscap AS
Microcomponent AS
Microtech-Innovation AS
Norautron AS
Norchip AS
Norspace AS
OSI Optoelectronics AS
OSWO AS
poLight AS
Polydisplay AS / Technodisplay
Sensonor AS
Skagerak Energi AS
Techni AS

Riga

INTRODUCTION

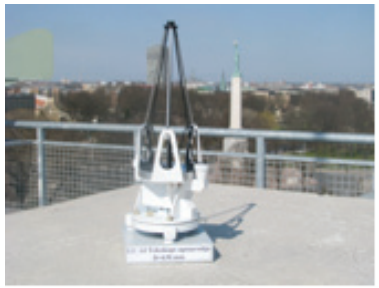
During the Soviet times, nanotechnologies played an important role in Latvia because of the supplies for the military and other strategic technological areas. The loss of military orders after Latvia gained independence lead to deep stagnation in the field. Currently, nanotechnologies have been recapturing scientific and economic interest in Latvia. A number of research institutions have turned towards nanoscience as a prospective area of technological development. Currently, active research is being carried out in the fields of functional and nano-structured materials, including nano-sized particles which can be used both in photonics, in microelectronics, in medicine and other fields.

The concept of Technology Transfer Contact Points belongs to the important networking instruments in Latvia. Contact points have been organised at the Riga Technical University, the University of Latvia and by Connect Latvia. Their aim is to organise contact points between entrepreneurs and scientists (researchers) thus linking entrepreneurs with sources of know-how and capital, to speed up the commercialization of innovation and to create additional jobs in Latvia (contact:laila.elina@rtu.lv).

ACTIVITIES IN NANOTECHNOLOGIES

Important player is Biomedical Engineering And Nanotechnologies Institute of the Riga Technical University that provides characterization and functionalization of nanoobjects: morphology, electrical charge, structural imperfections, thermal stability, structural relaxations. The typical objects to be measured: nanopowders/powders, nanofilms/films/coatings, nano and micro layers of the solids, etc.

R&D takes place at the Institute of Solid State Physics (ISSP) of the



University of Latvia and the Institute of Inorganic Chemistry at the Riga Technical University, main fields: functional and nano-structured materials, nano-sized particles; materials and technologies for optical information recording and imaging; development of new inorganic materials (such as single crystals, glasses, ceramics, thin films) for optics and electronics.

Other major research organizations are University of Latvia: Institute of Solid State Physics (ISSP), Institute of Atomic Physics and Spectroscopy, Institute of Polymer Mechanics, Institute of Physics Riga Technical University: Institute of Inorganic Chemistry, Institute of Silicate Materials of the Department of Material Science and Applied Chemistry Institute of Solid State Physics at the University of Latvia (ISSP), which is a leading organization in the field of materials science and engineering in Latvia with the focus on single crystals, ceramics, glasses, polymers, thin films and covers all scale from the level of the atoms and molecules to that of final devices. Main research directions of the Institute of Inorganic Chemistry of Riga Technical University include plasma chemistry and technology of inorganic compounds, manufacturing of nanosized powders, new ceramics, cermet materials and coatings.

ACTIVITIES IN DEVELOPMENT OF SPACE OBSERVATION INSTRUMENTS

Miletsones:

- 1957 – satellite observation station (ID Nr.1884 - still exists) foundation in Riga in University of Latvia (UL) site by USSR Academy of Science
- First satellites observations gave the push to develop in UL own satellite observation devices
- The first one: designing (M.Abele & K.Lapushka 1964 /1967) the first Soviet series manufactured tracking satellite photo camera AFU-75; used worldwide and produced till 1990-ies (~50 systems) – for weak space objects/ geostationar satellites; see next photo in Patakamaya –Bolivia 1976/77

New activities:

- Robotic SLR University of Latvia Institute of Astronomy together with University of Latvia Institute of Geomatics with ERAF fund: main constructor M.Abele (2003 – till now), under testing (J.Balodis).
- Universal telescope-collimator. 2009 project – ASc grant (2009), cooperative project with private company: main constructor M.Abele

OVERVIEW:

Company	Expertise
Neomat	Plasma chemical synthesis technology, nanopowders, production of nitrides, composites etc.
Riga Technical University	Characterization and functionalization of nanoobjects, Consulting on selection and application of the characterization and functionalization technologies and technique. Education and training on the above.
ISP Optics Latvia	European brunch of ISP Optics, which is the leading manufacturer of high quality infrared optics. It manufactures precision optical components, including windows, lenses, domes, prisms, aspheric and micro-optics, made from various crystalline materials.
High and engineering photonic labs	Company patented a revolutionary research - advanced optical system, with very focused optical beam, that gives improved technical parameters. This will be implemented in an innovative products, that can be used for different special purposes, where extraordinary features are essential.
Plasma & Ceramic Technologies	Development of the plasmachemical technologies of nanosize powders, working out the technologies for obtaining new materials by using nanosize powders, producing nanosize powders of refractory compounds and their homogenious composites.

Stockholm

INTRODUCTION

Stockholm is home of about 30 companies from the photonics sector, employing more than 1.500 people, which is more than 50 % of the Swedish workforce in photonics.

The science sector is dominated by three institutions: KTH Royal Institute of Technology, University of Stockholm and Acreo AB, who employ about 230 people in photonic departments and working groups.

PHOTONICS SCIENCE IN STOCKHOLM

The Royal Institute of Technology is Sweden's largest technical university with 3.700 employees and 12.200 students alltogether. Main orientations in optics and photonics are:

- Optoelectronics
- Semiconductor physics
- Nanophotonics
- Physical and quantum optics (also University of Stockholm)
- Optical networks
- Laser physics
- Biophotonics and cell physics
- Laser spectroscopy
- X-ray optics
- Optical metrology, holography

While the academic part of photonics science in Stockholm is covered by the KTH Royal Institute of Technology and the University of Stockholm, Acreo AB is a research institute which is focused on microelectronics, optics and broadband communication. Acreo has a

staff of 140 employees (70 in optics) and has spinned off 17 companies since 1999. The institute includes three photonics departments:

- Nanoelectronics (optoelectronics)
- Netlab (networking, optical transmission, services)
- Fiber photonics (fiber production and fiber components)

Acreo is also closely connected to several fiber optics companies in Hudiksvall (see also Fiber Optics Valley).

PHOTONICS INDUSTRY

The core of Stockholm's photonics industry is characterized by ICT applications. Ericsson as global player is a mayor driving force, located in KISTA Science City. Other companies, who are active in ICT/telecom applications are transmode, PacketFront, optoskand, Syntune, Zarlink, OptoNova, Optronic, Inmec or Proximion.

Another main application field is analytics, especially x-ray (excillum, Scint-X, Spectra, XCounter or mantex) and infrared technology (IRnova or FLIR Systems).

Laser manufactures like Cobolt, Swedelase or bopo are also producing for analytics markets (especially bioanalytics), but other fields of application are covered as well.

Spectrogon, Rolling Optics, Beneq or optoskand are operating in ealier stages of the photonics value chain producing optical components, materials, filters or coatings.

The photonics industry in Stockholm is supplemented by specialists, who are active in niche markets like laser pattern generators for lithography photo masks (Micronic Laser Systems), eye tracking (tobii), standoff explosives detection (portendo) or medical breathing gas analysers (Artema).

OVERVIEW:

Company	Expertise
Azpect Photonics	Lasers, fiber optics, sensors and optical components (sales)
Artema	Medical breathing gas analysers
Bergsäker	Automatic measurement systems
bopo	UV laser sources
Cobolt	Diode pumped solid state lasers
Ericsson	Optical transmission technologies
excillum	Microfocus x-ray sources
FLIR Systems	Thermal imaging infrared cameras
Inmec Network Technologies	Fiber optic splice enclosures
IRnova	Infrared detectors
mantex	Photon absorptiometery scanners
Micronic Laser Systems	Laser pattern generators
OptoNova	Automatic inspection systems
Optronic	Development-, manufacturing-, and outsourcing-services in optronics
PacketFront	Optical transmission technologies
portendo	Standoff treat detection
Proximion	Fiber bragg gratings
Rolling Optics	Optical microstructures and materials
Scint-X	Digital x-ray imaging
Sectra	X-ray technology
Spectrogon	Optical interference filters, holographic gratings
Swedelase Photonics	Diode pumped solid state lasers
Syntune	Optical components for broadband networks
tobii	Eye tracking and eye control
transmode	Optical transmission technologies
XCounter	Digital x-ray imaging
Zarlink	Laser drivers, fiber optic systems

Tallinn

INTRODUCTION

There are more than 50 companies dealing with optics and Microsystems but only some are producing some nano-system based products in Tallinn region.

Two optics/micro systems/nanotechnology research organizations.

Main fields include microscope development, development of new sensor-materials, measuring instruments and calibration devices based on nanotechnology impact of electromagnetic radiation on human health; new methods of laser diagnostics in medicine; impact of environment factors on health; assessment of effectiveness related to rehabilitation procedures; new methods for diagnosing cardiovascular diseases; optical methods for clinical monitoring.

OPTICS, MICRO SYSTEMS AND NANOTECHNOLOGY

Optics, micro systems and nanotechnology in Estonia the main industry using the photonics/micro/nano systems are the producers of electronic devices. Estonian photonics/micro/nano systems companies act as sub-contractors of some foreign companies. In this sector of the Estonian economy the companies are rather medium-sized enterprises with relatively big turnover, at least in comparison to the Estonian ICT sector.

THE LEADING ORGANIZATIONS IN THE FIELD OF PHOTONICS/MICRO/ NANO SYSTEMS

The leading organizations in the field of photonics/micro/ nano systems include the Nanotechnology Development Competence Centre (http://www.spmtips.com) which was established at Tartu University in February 2005. Centre's activity is concentrated on development of new sensor-materials, measuring instruments and calibration devices based on nanotechnology.

TTU Technomedicum (http://www.cb.ttu.ee) that has been established at Tallinn University of Technology in 2006. Technomedicum is an innovative and interdisciplinary scientific institution linking together Tallinn University of Technology, hospitals, and other organizations/ institutions related to healthcare. Main areas of research are

- Impact of electromagnetic radiation on human health
- New methods of laser diagnostics in medicine
- Impact of environment factors on health
- Assessment of effectiveness related to rehabilitation procedures
- New methods for diagnosing cardiovascular diseases
- Optical methods for clinical monitoring

Estonian Nanotechnology Competence Centre is a consortium of industrial and science partners formed for performing common research in the field of nanotechnology, results of which will be bases for development of new products and/or new research of consortium partners.

Nanotechnology center is formed of specialists from both instrumentation R&D and applied nanotechnology. Orientations include nanotools (SPM probes), nanometrology (calibration gauges, test structures, equipment) and nanosensors as case projects from applied nanotechnology.

The future activities of the centre will not be limited to above-mentioned directions and other applied nanotechnologies can be considered.

PHOTONICS COMPANIES IN ESTONIA

Photonics companies in Estonia include Laser Diagnostic Instruments AS, Neweks Ltd., and Interspectrum OU. There is no organization or association developing the field and no national instruments exist within the field of photonics/micro/ nano systems to improve networking.

Vilnius

INTRODUCTION

Scientific laser research in Lithuania was started in the seventh decade of the last century. Due to the intensive research activities performed by scientists of Vilnius University and the Institute of Physics, Lithuania now is one of the largest exporters of specific laser systems in the world. At present in the country there are over 10 companies engaged in production of lasers and laser systems based on own research. The annual sale of its production has come close to € 29 million and over 86% of laser production is exported to the international market. Lithuania has several research centers:

- Vilnius University
- Institute of Physics
- Semiconductor Physics Institute

Carrying out world-class laser research. These centers develop the competence which provides qualified experts for laser technologies.

Lithuanian laser researchers have developed a few unique light sources and start performing applied laser research in the field of industrial laser systems. Qualification and experience of specialists guarantees development of laser products of the highest quality to the international market.

LASER CLUSTER

The Lithuanian laser cluster oriented mainly to manufacture of scientific research equipment and facilities outstrips other traditional spheres of manufacture. No other branch of industry in Lithuania dominates the world markets, whereas picosecond lasers created by the Lithuanians constitute half the market, femtosecond parametric light am-

plifies account for as much as 80 per cent of the world market. Lithuanian lasers are even more widely used not only in scientific research but they are also being introduced in industry or medicine.

Products development areas are:

- Solid state lasers, pico- femto-laser systems and nano-sources
- Optical parametric oscillators
- Specialized custom and microchip laser systems
- Application laboratory and microfabrication devices
- Laser supply and refrigerating units
- Specialized spectrometers
- Benches for laser micro-processing
- Optical components

R&D project areas are

- Dynamic holography in semiconductor characterization
- THz imaging and spectroscopy
- New tools for nanopatterning
- Cell diagnostics and nanosurgery
- Two photon polimerization

Laser and Light Science and Technology Association have been established in 2004. This association brings together institutions and enterprises for the development of its activities in one of the Lithuanian Government approved high-tech priorities. www.ltoptics.org

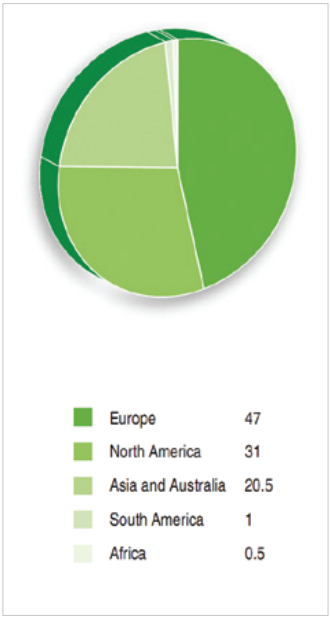
LASER INDUSTRY

Laser industry and science are among the strongest areas of Lithuania's knowledge economy. The success of Lithuanian laser technologies is driven by:

- fundamental and applied research in the field of laser physics and technology conducted in Lithuania already for more than forty years;
- strong science and manufacture collaboration infrastructure;
- professional training and availability of high-quality specialists.

The Lithuanian laser industry, firmly positioned on the global market, holds more than half of the world market for high-energy pico-second lasers as well as ultra-fast parametric light generators.

The Lithuanian laser sector players export about 85 % of their products to 100 countries around the world. The majority – three quarters of total production - is sold in Europe and North America. However, the rapidly growing Asian market is another target for the Lithuanian laser manufacturers.



Distribution of Laser Exports by Continents www.ltoptics.org

Products manufactured by Lithuanian companies hold nearly 10 % of the global market of lasers used for scientific research. Lasers for industrial applications – material processing and machining – are also of great potential for expansion.

Laser manufacturing sector of Lithuania shows a 15-20% growth per year. Lithuania exports its laser products to 100 world countries, among which there are the largest EU, USA and Japanese laboratories and research centers.

Currently, 16 laser technology companies, employing over 450 highly qualified specialists, operate in Lithuania. The number of employees increased more than twofold over the last five years. Every tenth Lithuanian laser industry professional holds a PhD.

OVERVIEW:

Company	Expertise
Eksma	The group of companies working in a field of lasers, optical technologies, medical and laboratory equipment instalations.
Ekspla	Solid State Lasers and Laser Systems, Laser and Optoelectronics Components, Laser Spectroscopy, Industrial lasers, Laser Power Supplies and Cooling Units and Laser Material Processing Systems.
Altechna & Co.	Services: Optical components quality control tests, optical coatings, laser engraving, repolishing and recoating. Applications: SiNx ablation, Back contact laser firing, Edge isolation, Laser marking for cSi solar cells; Multi-photon polymerization, optical fiber drilling, sapphire patterning and steel drilling.
Light Conversion	Laser system “TOPAS” of femtosecond and picosecond parametric amplifiers and Femtosecond Yb:KGW based laser system “PHAROS”.
Eksma Optics	Optical components, Nonlinear and laser crystals, Opto-mechanical components, Nd:YAG Laser line components, Femtoline components, Laser diodes and modules nad Optical systems.
ELAS	Micro machining solutions with nano-, pico- and femto- second lasers.
Optida	Antireflection, High-Reflection & Custom coating, Partial reflection, Polarisers, Beamspliting, Filtering services.
Standa	Opto-mechanical products, Optics, Lasers & Measurements.
Teravil	Terahertz laser devices and systemas.
Lifodas	Fiber Optic Components and Fiber Optic Test & Measurement solutions.
Optronika	Laser installations, techniques and laser shows.
Geola Digital	Optical 3D holograms, holo-materials and photomaterials.
Lazerinės idėjos	Laser technologies for industrial, advertising and entertainment business applications.
Aštuonetas	Laser engraving, cutting & welding.

Warsaw

INTRODUCTION

The photonics industry and science sector in the Mazovia region represents almost 60% of Polish human resources in photonics and has recently started the process of generating managed network structures within the **Optoklaster - Mazovian Photonic Technology Cluster**. Optoklaster consists of 22 members including 17 companies, 1 business environment institution and 4 research institutions and is managed by the Institute of Applied Optics, Warsaw. Focus areas are:

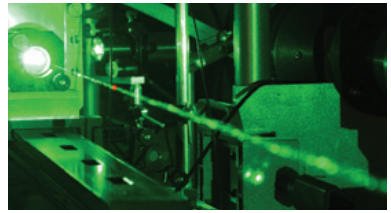
- Radiation sources
- Radiation detection
- Materials, elements and optoelectronics subassemblies
- Optoelectronic and metrology devices

These product-oriented focus areas are combined with topics from services, education and investigation and implementation of new technology fields.

Fostering the transfer of knowledge and technology from science to industry is the main task of Optoklaster. The five research institutions organized within the network are: the Institute of Applied Optics, the Institute of Electronic Materials Technology, the Institute of Optoelectronics of the Military University of Technology and the Institute of Physics of the Polish Academy of Sciences.

Besides Optoklaster associations like the Consortium Polish Optoelectronics, the Photonics Society of Poland, the Polish Laser Network Pollasnet and the Polish Technological Platform for Opto and Nanoelectronic are active in the networking of photonics companies and institutes on a national level.

Every two years the International Trade Fair for Optoelectronics and



Photonics - Opton is hosted in Katowice. Main areas of the event are:

- Laser Material Processing
- Lasers and their medical applications
- Optoelectronic sensors
- Optical measurement systems
- LED lighting
- Photovoltaic systems
- Biomedical optics
- Optical imaging
- Original equipment manufacturer

PHOTONICS SCIENCE

Key players in the Mazovian photonics science sector are:

- Institute of Physics PAS, specialised in physics of semiconductors and magnetics
- Institute of Optoelectronics MUT with expertise in optoelectronics and laser teledetection
- Institute of Applied Optics, active in industry oriented optical measurement technology, interferometry, diffractive optics, fiber measurement, ophthalmic
- Institute of Electronic Materials Technology, which operates in the fields of semiconductors (Si, III/V, SiC, other), optical piezoelectric, active glasses, optical fibers, composite materials, active and transparent nanoceramics, optoelectronics devices

The research institutes support the industry with designing, manufacturing and researching new sources of laser radiation, detectors and new materials for the use in optoelectronics. The engineering and scientific staff has expertise in photonics including optics, solid-state physics, semiconductor technologies, infrared technology, optical and laser metrology, security systems and electronics.

PHOTONICS INDUSTRY

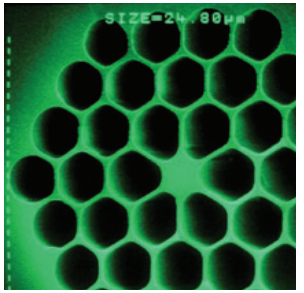
The major fields within Mazovia's photonics industry are laser technology as well as optical components and systems.

One of the most renowned companies is Solaris, who are active in both fields as Solaris Laser and Solaris Optics. Solaris manufactures fiber fiber and CO2 lasers, which are made for applications in material processing, especially marking and coding of products. The optics division of Solaris is specialized in precision components, optical subassemblies and assemblies such as lenses, windows, prisms, dividers, polarizers, optical filters and pockels cells. Another company working in both fields is CTL - Centre of Laser Technology. Although laser systems and laser subassemblies for medical applications are the company's core sector, CTL also offers IR optics or safety glasses.

Other suppliers for the medical and biotechnology sector are ESLT - Electric System & Laser Technology, and Sensomed. ESLT's solid state lasers are used in medicine as well as for cutting, welding and drilling metal and non metal materials. The company's portfolio includes also production of subassemblies and components for solid state lasers. Sensomed has developed a laser positioning system, which was designed for proper positioning of patients during gamma or x-ray treatments in hospitals. Besides that Sensomed also offers optoelectronical equipment for educational means at high schools.

The medical sector in Mazovia includes Wamed, a producer of medical and laboratory equipment, which already operates since 1949 and offers medical lasers for various applications as well as optical caps.

TopGaN's company name gives a first impression of what the company is doing: Gallium nitride (GaN) based laser diodes and modules, which can be applied in blue-violet-UV spectral range as well as GaN substrates and epitaxy wafers.



Vigo System is an internationally operating specialist for infrared technology, producing IR detectors, preamplifiers, TEC controllers and accessories. Scientific instru-

ments like thermographic cameras, picosecond time & frequency counters, picosecond time-interval generators and measurement systems are also included in Vigo's product portfolio.

Another important player is the Warsaw based company PCO, which employs more than 500 people. PCO produces optoelectronic devices for the military, such as observation devices, helmet mountable displays and laser warning systems, night-vision sights or periscopes.

The photonics companies in Mazovia are also supported by complex services from the Polish Federation of Engineering Associations – NOT.

OVERVIEW:

Company	Expertise
AMBER	Laser technology, Laser biostimulators
AWAT	Optoelectronics, Information technology, control-measuring apparatus
CTL - Centre of Laser Technology - LASERINSTRUMENTS	Medical lasers and accessories, photocoagulators, IR optics and laser measurement equipment, safety glasses
ESLT - Electric System & Laser Technology	Medical lasers, industrial lasers, laser components
Eurotek International	Electrooptical system sales and service
Korporacja Wschód	Portables and stationary x-ray equipment for radiography, technical endoscopes, devices for document authenticity control, optical and electronic devices
MIKROEL	Electronic microcontrollers
Optolab	Optical spectrometry, precision mechanics, nebulizers, optical components
PCO - Przemysłowe Centrum Optyki	Photonics for military applications
SEMICON	Laser modules, laser line generators, PCB assembly in the SMT and THT technology
SENSOMED	Optoelectronics, laser positioning systems for medical applications
SENSOR-NET	Design and manufacturing electronic – measurement unit
SOLARIS LASER	Industrial fiber and CO2 lasers coding for marking and engraving systems
SOLARIS OPTICS	Precision components, subassemblies and assemblies
Top-Gan	GaN laser diodes and modules, epitaxy wafers, GaN substrates
VIGO SYSTEM	IR detectors and modules, cameras and measurement systems
WAMED, The Producer of Medical and Laboratory Equipment	Medical and laboratory equipment

Market Access Points
(Information on how to access the markets)

Market Access Points (MAP) are powerful BaSIC instruments, created to help SME finding improved and easy access to the markets in the Baltic Sea Metropolitan areas. MAPs support innovative growth companies (SME) from partner metropolises in a smooth settling within other regions in the Baltic Sea area. A qualified Market Access team offers synchronised services related to internationalisation needs for the client companies from partner metropolises.
Core of the offered Services are Soft Landing Tools to explore, settle and operate in the BSR markets.

BaSIC Market Access Point Services

The BaSIC Business Welcome Services offering local Case Manager for Companies and Settling in Baltic Sea Region services

Exploring markets phase services – Business Welcome Services

- BaSIC local Case Manager for Companies

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- Settling into the market services
- Existing good practice services in the new business locations

Operating in markets services – Regional Business Services

- Regional Business Services
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- WISTA-MANAGEMENT GMBH, Berlin Adlershof Science and Technology Park (BaSIC partner) – Helge Neumann
  In collaboration with the other contributors in Berlin region
- Berlin Partner GmbH – Rolf Seliger
  web page on www.adlershof.de/foerderprogramme/?L=2
  Presents e.g. Technology Orientation service at Adlershof Science and Technology Park.

COPENHAGEN SERVICES

- Business Link – the Greater Copenhagen Region (BaSIC partner) – Steen Lohse
- Scion DTU (BaSIC partner) – Marie Friis Madsen
  In collaboration with other contributors in Copenhagen region
- City of Copenhagen – Erik Norgaard
  web page on www.copcap.com
  Presents the Copenhagen Capacity services in Copenhagen.

HELSINKI SERVICES – Greater Helsinki Services

- Culminatum Innovation (BaSIC partner) – Pertti Vuorela
  In collaboration with the other contributors in Helsinki region
  Helsinki Business Hub
  web page on www.culminatum.fi/en
- Greater Helsinki Promotion GHP – Tatu Laurila & Marika Mäkelä
  web page on www.helsinkibusinesshub.fi
  Presents the regional Soft Landing service model and the players in Greater Helsinki area.

OSLO SERVICES

- Oslo Teknopol (BaSIC partner) – Kevin Gallagher
  In collaboration with the other contributors in Oslo region
- Agency for Business Development Services – Marius Sandvik
  web page on www.oslo.teknopol.no
  Presents the Teknopol, Agency for Business Development Services in City of Oslo.

RIGA SERVICES

- Riga Technical University (BaSIC partner) – Diana Buka
- City of Riga (BaSIC partner) – Normunds Strautmanis
  web page on www.investinriga.com
  In collaboration with the other contributors in Riga region.

STOCKHOLM SERVICES

- Kista Science City (BaSIC partner) – Maja Brisvall
  In collaboration with the other contributors in Stockholm region
- Stockholm Business Region Development – Kirsi Kangas
  web page on www.stockholmbusinessregion.se
  Presents the Stockholm Business Region Development services in Stockholm.

TALLINN SERVICES

- Tallinn Science Park Tehnopol (BaSIC partner) –
  Jaanus-Martti Kangur
  In collaboration with the other contributors in Tallinn region
- Enterprise Estonia
  web page on www.tehnopol.ee
  Presents the Soft landing services by Tehnopol in Tallinn.

WARSAW SERVICES

- City of Warsaw (BaSIC partner) – Aleksandra Słoniec
  In collaboration with the other contributors in Warsaw region
- Center for Technology Transfer and Entrepreneurship Development,
  Warsaw University of Technology
  web page on www.ctt.pw.edu.pl

VILNIUS SERVICES

- Sunrise Valley (BaSIC partner) – Egle Baltrūnė
  web page on www.sunrisevalley.lt
  In collaboration with the other contributors in Vilnius region.
- Lithuanian Development Agency
  web page on www.businesslithuania.com
  Presents also other services, such as consultations available, infrastructure available and events organised in Vilnius.

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