Photonics,
A Key Enabling Technology
For Switzerland

Swissphotonics, the Swiss Technology Platform for Optics and Photonics

June 2014

Index

1. Photonics in Switzerland

Photonics is enabling modern equipment and modern life and is thus present nearly everywhere: In light barriers of elevator doors, in the often quoted bar-code reader, as high power beams cutting or welding metal, as light tweezers moving small parts, in fiber (actually: laser)-to-the-home communication, as sampling gate with atto-second resolution, or, in photovoltaic cells.

How do we define Photonics?

We all know "light" from first experience, during the day from the sun or during the night from lamps. "Light" behaves in a way which is not familiar to our standard experience, "light" behaves like a wave when it propagates but "light" behaves like a particle when it is generated or absorbed, e.g. in an lamp or in a photovoltaic cell.

In general, "Optics" is the science which deals with "light" when it behaves like a wave and "photonics" is the science which deals with "light" when it is generated (like in an LED) or absorbed (like in a photovoltaic cell).

The science of "Optics" has a very long history whereas the science of "Photonics" is just 100 years old and its major manifestation, the laser, is just 50 years old.

Many times, and in this text, the term "Photonics" is used inclusive, i.e. addressing photonics as well as optics.

Photonics Research and Industry in Switzerland

Materials for "Optics" need to be transparent and need to be extremely precisely shaped to a fraction of the wavelength of the light in order to letting the light pass and deflect without undesirable distortion. This is the branch of optical lenses. Switzerland has a long tradition in machining with high precision such lenses as well as to assemble them in precision measurement and analytical equipment.

On the contrary, materials for "Photonics" are opaque to light as their function is to convert "light" into electrical current (such as in a photovoltaic cell) or to convert electrical current into "light" (such as in an LED or Laser). Switzerland has a long tradition as a tool maker and an intense laser beam is the ideal tool, as it does not wear out and as it is very precise. Thus Switzerland has been active producing lasers as light beam sources for material processing as well as fabricating machines to put the laser beam source to use.

Switzerland is also very active in the research for new materials for photovoltaic cells. This knowledge is used to fabricate (and sell) equipment to manufacture photovoltaic cells. However there is no direct manufacturing of photovoltaic cells in Switzerland.

Switzerland is very active on photonics, as evidenced by Optec Consulting, the second highest photonics revenue per capita in Europe.

2. Photonics Market

Worldwide Photonics Market

The current global photonics market has grown from less than €100 billion to more than €400 billion in the last 15 years. Average growth rate has been 9%/year, with fluctuations between -20% and +30% per year, indicating the dynamics of this new technology.

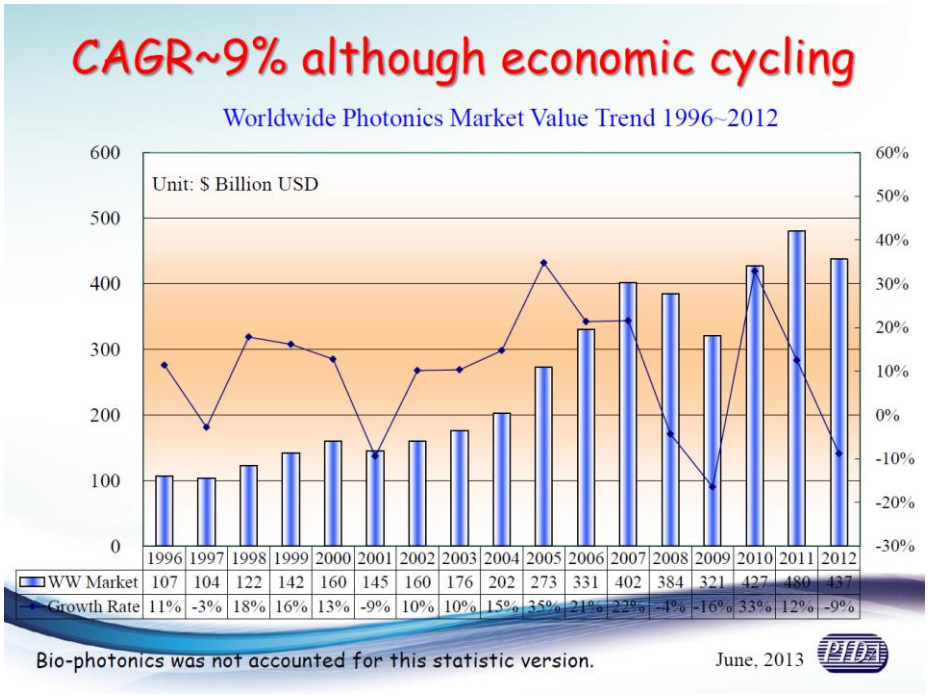


Figure 1 Worldwide Photonics market as recorded by PIDA

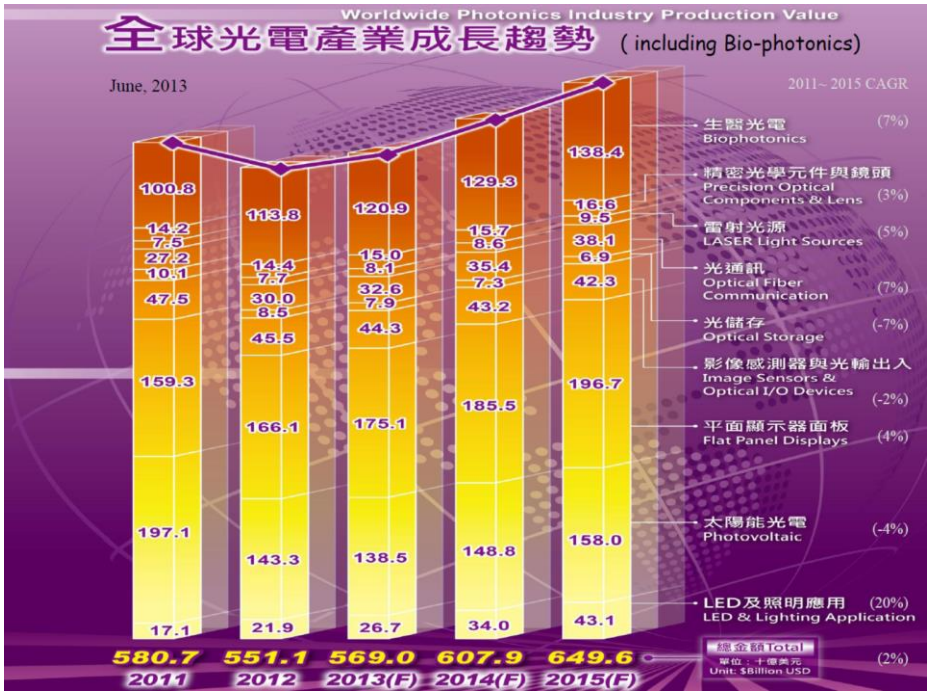


Figure 2 Predicted Photonic market as seen by PIDA

We have seen a downturn in 2012 but predict recovery and growth in the future across most fields, especially in LED lighting. Optical storage is the only market where we are expecting less revenue in the years ahead.

Of this global market, Europe has an overall share of 20%, rising to as much as 45% in specific key photonic sectors. Details on the European market can be found on the webpage of the European technology Platform, Photonics21.

Photonics is one of six recognized key enabling technologies as photonics is used, very much so as electronics, in systems enabled by this technology.

Swiss Photonics Market

Swissphotonics has charged Optech Consulting to provide a yearly analysis of the Photonics market in Switzerland. It is important to note that Optech Consulting does also do the market size analysis for Photonics21 and thus we have the same assumptions in sizing the markets. However, in Switzerland we include photovoltaics in our analysis

Switzerland has three major economic areas of interest.

1. Switzerland has a leading position in fabricating with high volume precision machined parts, among others, optical lenses which require submicron control of dimensions. These lenses are sold directly or, assembled in optical tools for analysis in life science. (see"Photonik, übrige Bereiche" in Figure 3)
2. Switzerland has a long tradition as manufacturer of high precision mechanical tools. It was soon recognized, after the invention of the laser 50 years ago, that a laser beam can serve as a high precision tool with no wear. (see "Lasermaterialbearbeitung" in Figure 3)
3. Switzerland has also a long tradition in manufacturing specialized equipment to manufacture photovoltaic cells. (see "Photovoltaik" in Figure 3)

The detailed 2012 market analysis is attached in Appendix 1 and we summarize here the main findings.

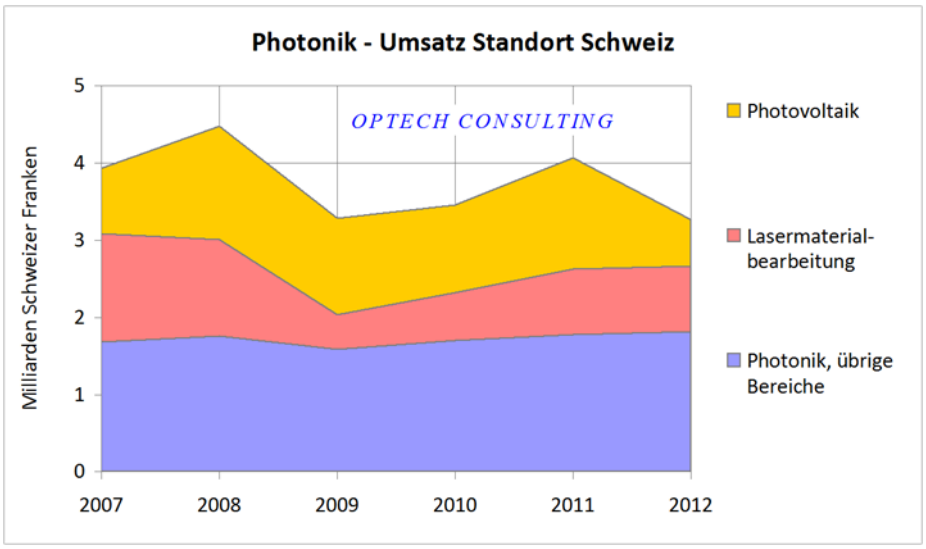


Figure 3 Photonics revenue as generated in Switzerland in CHF

Most of these products are exported and thus the exchange rate has an important impact on the statistics, as evidenced in Figure 4.

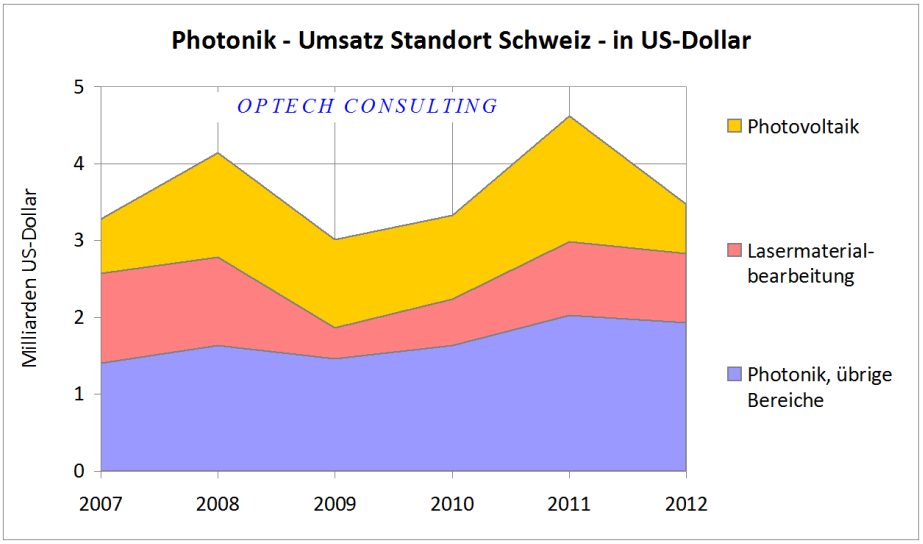


Figure 4 Photonics revenue generated in Switzerland in USD

As the rest of the world the Swiss photonic industry experienced the impact of the economic crisis in 2008/2009. However, after the significant downturn in 2008, revenues recovered with annual growth rates being greater than 10% in the photonics sector, which is 2-3 times faster than the overall growth of the European GDP and still faster than the growth of the global market. A much more detailed market report, broken down to individual companies is attached in Appendix 1.

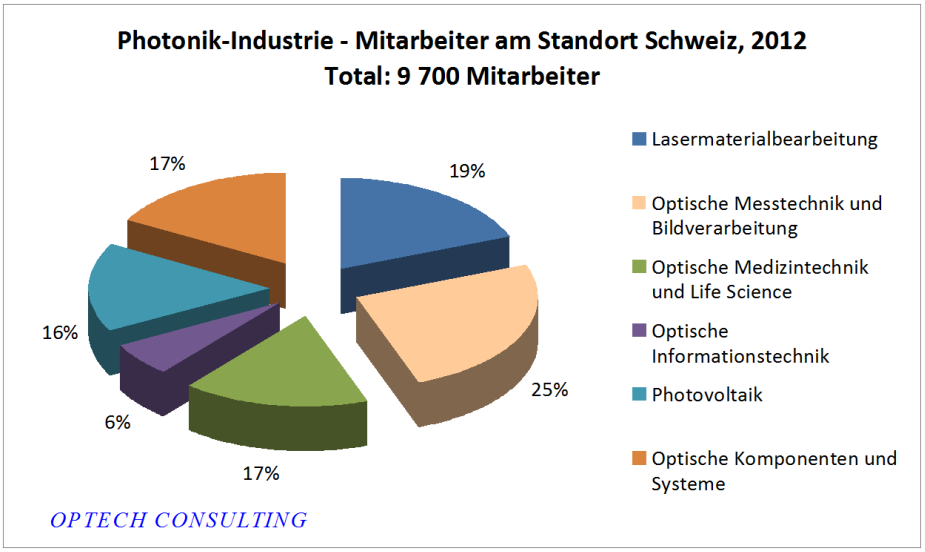


Figure 5 People being occupied in generating Photonics products

Photonics companies themselves currently employ about 9'700 people in Switzerland, with their local subcontractors employing many more. The sector is largely based on SMEs, where growth in demand is known to create proportionally more jobs than in a sector made up of big companies.

3. Verein Schweizer Laser und Photonik Netz

History

In 2006 institutes of several Universities of Applied Science (UAS), active in the field of material processing with laser beams, started the association "Swisslaser.net" in order to increase their research activities and to gain better access to CTI funding. At the same time, an industrial interest group "Power Photonics" met at the ETH Hönggerberg to advocate their cause to extend the diode laser applications from telecom to the industrial market. These groups combined and started the association “Swisslaser.net” und they started organizing workshops in order to bring institutes and companies together.

In 2008 Swisslaser.net received funding under CTI’s “R&D consortia: Excellence cooperates” initiative. In 2010 Swisslaser.net decided to expand the activities to the whole field of photonics in Switzerland and to actively include SNSF activities and then became in 2011 a registered association “Verein Schweizer Laser und Photonik Netz”.

In 2012 the general assembly decided to become active under the name “Swissphotonics” with revised bylaws (Statuten) Swissphotonics 2012, which were revised again by the general assembly 2012.

Organization

Swissphotonics is a non-profit association according to Swiss law with corporate and individual members, a president, managing director, executive board and an advisory board. The yearly business plan as well as the budget is determined in a yearly general assembly.

Vision

It is the vision of Swissphotonics to promote innovation, from science to the market, and to improve the revenue of its members.

Strategy

Switzerland has been very successful in promoting innovation by funding various educational and research organizations towards pushing the borders of science and technology, as shown in Figure 6

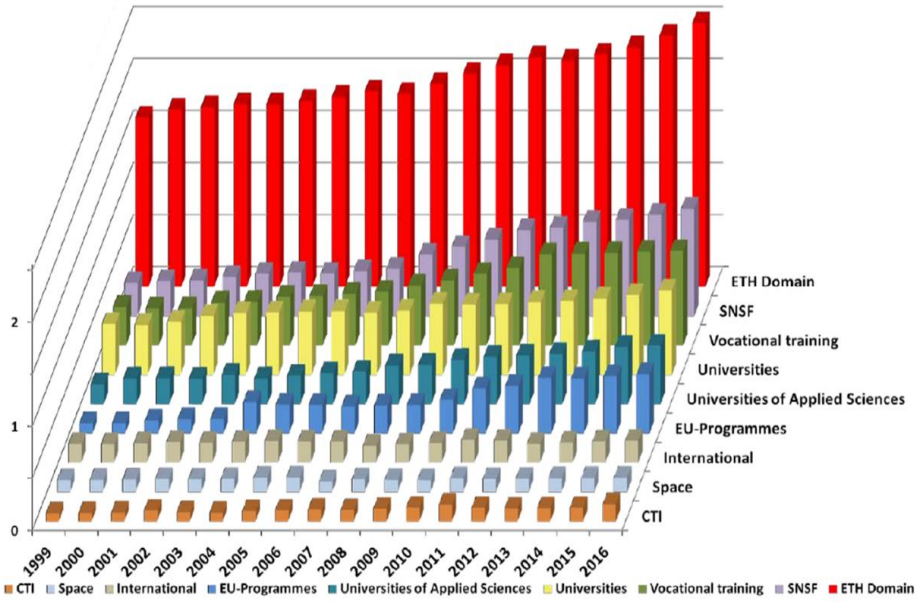


Figure 6 Overview on funding of education and research

Switzerland has also chosen not to determine programs top down, but to fill the research and educational programs by bottom-up proposals, i.e. it is the Swiss policy not to fund any innovation activity at the industry. Thus Swissphotonics major activity is to generate and support the creation of excellent bottom-up proposals, which then enter the competition for funding (for details see Appendix 2).

Swissphotonics Business Plan

The business plan of Swissphotonics is designed to support SMEs in their innovation activities within the framework of Swiss regulations

Workshops

Swissphotonics regularly organizes workshops on topics of interest. It is the goal of these workshops to find matching research partners and to generate research project proposals for the challenges of the SMEs. These workshops are designed to bring project leaders and professors together (for details see Appendix 3).

Seed money check

The chances for the funding of a project proposal critically depend on its quality and thus Swissphotonics has generated the tool of a “seed money check” which is designed to free up and pay for resources for the working out of a project proposal.

National Laboratories

Swissphotonics has created seven “Swiss National Laboratories” in order to optimize for SME access to the best matched research resource. Each “Swiss National Laboratory” is a virtual lab, as it includes all the interested professors of one topic. These professors provide one contact point for SMEs and this contact point guides them to the best matched institute to solve their challenge.

Swissmem specialist group “Photonics”

Swissmem has started, together with Swissphotonics, in 2013 a specialist group “Photonics”. This specialist group has as members only manufacturing companies. This group is designed to network the upper management (“C-level”) of Photonics companies.

Research funding

CTI

Matching funding

SNSF

calls

Horizon 2020

Calls

International Network

Swissphotonics is a member of Photonics21, an active member in the support action “Innopho21” and “Europho21”, as well as member of EPI, OIDA and IOA

4. Photonics 21 Workgroups

As for Europe the photonics sector in Switzerland can be split into various groups that have specific importance to the Swiss society, the national economy, and the growth and strength of the local market place. Although Switzerland has its own distinct characteristic, the country incorporates with its significant photonic revenue almost all relevant photonic topics that are also discussed on a European level. Among those Swiss Photonics Centers of excellence are:

- Information and Communication
- Photonic Tools for Manufacturing and Quality
- Life Science and Health
- Emerging Lighting, Electronics and Displays
- Security, Metrology and Sensors
- Design and Manufacturing of Optical Components and Systems
- Education, Training and Disruptive Research

Each of these centers has a distinct impact on the Swiss economy and society as it will be formulated for the most important topics in the next paragraphs. The vision of the future, research and development partners, and naturally the support and funding requirements will be described in more detail as well.

PHOTONICS ENABLED' INDUSTRIES	
Strengths	**Weaknesses**
➢ Active industrial community ➢ Nanophotonic research, materials strong at University level and ETH ➢ Integration, miniaturization, smart photonic engines key for success ➢ Robotic, micro-machining and automated placement tools key enabling technologies	➢ Investment into high-tech industry very slow and conservative ➢ High labor and production cost ➢ Swiss federal funding schema with no direct industry support
Opportunities	**Threats**
➢ Photonics as enabling technology for novel socio-economic challenges mainly in the energy sector: ○ Energy saving in the lightning sector (LED, OLED) ○ Alternative energies such as PV, and geothermal energies (alternative drilling technologies such as laser enhanced boring,..) ○ Datacom and telecom enabling technologies for smart, de-centralized energy routing	➢ Strong Swiss-Franc causes severe challenges to grow volume business ➢ Worldwide economic slowdown reduces market opportunities for technical innovation ➢ Energy related topics to become dominant funding direction

WG1: Information and Communication

The development of long term stable high power 980nm laser diodes at the IBM research center in Rueschlikon in the 80s was the base for the all optical network technology that has revolutionized out society as we know it, today. Powered by so called Erbium doped fiber amplifiers we are experiencing an explosion of world wide web-based services, which is only the beginning, and a simple consequence of the penetration of relatively conventional photonic technology into commercial communication systems.

PHOTONICS ENABLED INDUSTRIES	
Strengths	**Weaknesses**
Switzerland has a strong photonic research community and a long history in tele- and datacom (component-) development: • Global players on the high end component side manufacture in Switzerland • Strong theoretical and practical research at Universities • Expertise in III-V and Si based technologies • Major IT software companies such as Google, IBM use their centers in Switzerland as a key development location • Extensive effort to offer ”fiber to the home” from major telecom providers	No national support platform for IT related activities. National funding for IT related topics at lower priority Strong Swiss industrial players in Photonics components and systems experience severe pressure from low cost manufacturing in Asia
Opportunities	**Threats**
Create synergies between software, hardware companies to develop smart networks for next generation telecom and data communication. Combine IT challenges with energy related topics to expand Information technologies to smart energy networks (funding support by Swiss organizations) Joint proposals (national, European) Use knowhow from IT technologies for application in related industries (medical, industrial, digital print, energy networks).	Pure IT related topics have currently a lower awareness within the Swiss society in comparison to “energy research”. Asia might become the dominant player for all telecom related development activities on the hardware side.

WG2: Photonic Tools for Manufacturing and Quality

Manufacturing tools using photonic elements such as lasers are a central element in Switzerland's photonic economic landscape. With yearly revenues in the range of CHF 650 Million and around 2000 directly employed people, this segment contributes a lion share to the photonic market place in Switzerland.

Swiss industrial and research partners believe that photonics will be a strategic element and a key enabling technology in future manufacturing processes, even more so than it is already, today. With tools using light in the form of a laser, processes can be handled automatically and flexibly, producing components and products with extraordinary quality. The trend towards customization and the growing importance of industrial design, as observed most notably in consumer electronics, will require novel methods to enable new product shapes and lot-size-one production capabilities. The inherent flexibility the laser tool makes it the ideal choice for meeting these requirements. Furthermore, the advantages of the wearless working laser tool and of integrated monitoring and control systems based on intelligent photonic sensing techniques, will allow zero-fault production to be achieved, leading to higher product quality and reduced wastage.

The laser is a key element for a future sustainable economy in Switzerland. Innovative laser processes will increase the efficiency of photovoltaic devices and enable energy storage devices with higher capacities, which is a key requirement for future electric cars. The ability of the laser to machine materials that are otherwise very difficult to process using conventional tools, makes it an ideal tool for fabricating lightweight and high-strength constructions, such as crash-safe car bodies or wind turbine blades. Furthermore, the laser itself will play a major role in facilitating green manufacturing, since laser processes allow for precise, well-controlled and therefore highly efficient energy deposition on the work piece. A further environmental attraction of laser-based processes is the reduction of chemical usage, for example, by replacing the chemical etching baths currently used for the manufacturing of rotogravure cylinders by a laser cleaning process. Today, photonics is not solely a driver for innovation in manufacturing; the photonic technologies, laser tools and process systems are themselves becoming products in their own right. In this way, photonics aligns well with the mission of achieving sustainable development, employing efficient use of energy for flexible and resource-efficient production.

Public Partners for photonic manufacturing

The Swiss research landscape for photonic manufacturing has rapidly evolved during the past decade. To foster and coordinate research around photonic manufacturing the Swissphotonics NTN has recently established so called "Swiss National Photonic Laboratories" which should:

- Be a one stop contact for industry for a specific topic (see overview on industry: http://www.swissphotonics.net/libraries.files/Optech_Consulting-Photonik_Schweiz_2012-final.pdf).
- Establish a technology cluster between institutes which serve this topic. The cluster should ensure that customers are guided to the matching specialized institute to solve their problem.

- Enable local institutes to become more competitive in the international competition.
- Reduce overall cost by avoiding unnecessary duplication of infrastructure.

A Swiss National Photonic Laboratory, which is suited for the photonic manufacturing support is the so called SNAP. More details on this specific network are given in the Appendix.

Related to the current status of the photonic enabled manufacturing industries the Swiss working group has created a SWOT analysis as follows.

Industrial Manufacturing and Quality (SWOT)

PHOTONICS ENABLED' INDUSTRIES	
Strengths	**Weaknesses**
➢ Multiple SMEs with class leading laser system products mainly in the short pulse (ps, fs) range. ➢ Active integrator environment with focus on high end and high power systems. ➢ Bystronic and Trumpf have significant production capacities in Switzerland for 2D-cutting systems. ➢ Job-shop density (SMEs with up to 20 people and focus on mid volume production) is one of the highest in Europe. ➢ Component manufacturing of central devices with high quality (pump lasers, sensors, passive optics…) takes partly place in Switzerland. ➢ Active research community with strong technical background.	➢ Leading industries are slow in implementing laser systems for manufacturing processes. ➢ Investments in automation is often offset by transferring packaging activities to Asia. ➢ Chinese competition copy-past Swiss/European laser technology. ➢ High labor and living cost (currency exchange rate) lead to severe price pressure and consolidation in the market place. ➢ Lack of specialized photonic clusters that combine industries and research.
Opportunities	**Threats**
➢ In general growing demand for extra short pulse laser systems with new fields of applications. ➢ Micro-machining market (i.e. watch industry) with increasing interest in laser assisted manufacturing processes. ➢ New Photonics network creates additional demand on national level.	➢ Asian low cost competition. ➢ No strong support government support for laser industry (lack of funding). ➢ Slow investments from private sector.

Future challenges in Science and Technology

Based on the analysis above we can conclude that Swiss laser technology is in a leading position in terms of innovation and optical excellence, when compared to other regions. To ensure that this competitive edge is maintained, the principal research and engineering efforts have to focus on more efficient lasers (more light output for a given energy input), longer-lasting components that can be read-

ily recycled, and maintenance free manufacturing equipment. The markets for new processing strategies and new photon transmission or beam delivery systems are of particular interest for Swiss companies. Transferring and transforming raw optical power in “smart light” that can be efficiently applied to the work piece is a central element of Swiss excellence in photonics. In addition novel laser systems evolve to deliver light in shorter and shorter pulses. In that context “nano” is for the Swiss photonic research community already “old” technology as more and more power is delivered in pico-second and now femto-second pulses, which allow industry to process materials with qualities and properties that were out of reach a decade ago. Applying laser systems for additive manufacturing is the next central challenge involving all aspects of various Swiss research groups spread all over the country. It will require a distinct effort to combine those skills and to evolve the local teams at universities, institutes and KMUs to a meaningful player on European level.

One of the most challenging problems in laser source manufacturing is price pressure, a result of growing cost competition exerted mainly by Asia. The primary research areas have to cover all steps in the manufacturing process, from basic research and development through to the products themselves and their market penetration. In terms of the photon sources and optical components, the focus has to be set on reliable, reproducible and precise methods for automated assembly of photonic devices and lasers with improved performance in terms of power, beam properties, efficiency and size, as well as better spatial & temporal control and stability - and all at lower cost. Further aspects include adaptive reconfigurable beam delivery networks capable of high power and intensity. New applications are expected, for example through the application of ultra-short laser pulses. However, to take full advantage of such new laser sources, new high-speed beam deflection technology also needs to be developed in parallel. These improvements will be critical for extending laser technology on global scale to rapidly growing market sectors such as green manufacturing or mass customization of consumer goods.

In the drive to higher product quality, process monitoring, adaptive control of the laser manufacturing process, and quality inspection of laser manufactured goods need to be further developed and implemented in production. Aspects of integrating laser sources within machine tools, in particular robotic manufacturing tools, also require optimisation and standardisation. The physical and technical limitations of today’s optical components can only be overcome through interdisciplinary research efforts in manufacturing technologies, microsystem engineering, nanotechnology, telecommunications and optics. More fundamental limitations must be tackled by basic research on the interaction between light and matter, on novel materials, and on new structures with revolutionary photonic properties. This will require work in materials science, quantum optics, thermodynamics and solid-state physics.

This research will open the way to groundbreaking new optical components and the corresponding technologies for their fabrication. When combined with the results of accompanying fundamental work in laser beam/material interactions and process control, exciting new photonic processes for manufacturing will be realized, offering more flexibility, more functionality and greater productivity. Such innovative components and processes are the key to realizing this vision of strengthening and sustaining Europe’s leading position on the world market for photonic technologies and mechanical engineering.

WG3: Life Science and health

Switzerland recognizes the demographic change on global and national scale and responses, similar to its European neighbors, accordingly. In addition to this central challenge, photonic tools and instruments find their application in a broad range of life science and health related aspects. As a specific example we like to highlight an innovative integrated optical device for such a product development, the TOF blind cane, representative for multiple activities in this field in Switzerland.

TOF blind cane from MESA Imaging AG (Technoparkstrasse 1, 8005 Zuerich, Switzerland)

MESA's electronic blind cane is the result of a joint development with ReLAB at ETH Zürich, Zürich School of Arts and the Swiss Foundation „Access for All". Its core component is a time-of-flight line camera that captures the spatial information of the surroundings in real time. The internal processor then translates presence and position of obstacles into vibration patterns in the cane handle. It helps blind people find their way around, even in challenging environments with stairs, barriers or obstacles at the height of the head.

Blind Cane Key features

- High resolution 3D sensor (176 x 20 pixels)
- 90° vertical viewing angle
- Operates in sunlight
- Integrated motion sensors (3- axis accelerometer and gyroscope)
- 4 vibration elements for user feedback
- Battery powered (up to 5 hours in normal operation)
- Weight: 450g

As a contribution from the Working group related to the topic photonic tools for life science and health, the team prepared the following SWOT analysis.

PHOTONICS ENABLED' INDUSTRIES	
Strengths	**Weaknesses**
➢ Presence of large scale companies and KMUs with the potential to adopt photonics for life science & health in the near future. ➢ Active research groups at University and Institute level. ➢ Leading in OCT research and product development.	➢ Photonics in life science requires often high up front investments for capital (analysis, read out systems). ➢ More complex systems require special training to use these photonic tools sufficiently. ➢ Long and cost intensive development until product release. ➢ Limited investment activities from venture capital.
Opportunities	**Threats**
➢ Strong interest in photonic based sensor technology. ➢ Special support programs for healthcare projects in Switzerland.	➢ Fragile balance between high development cost and achievable product gross margin (RIO) ➢ Too high expectations might lead slowdown in product development. ➢ Reduction in government funding causes negative impact on capital investment.

Visions, Activities and Partners

Switzerland has severe activities for improved microscopic and spectroscopic methods using novel optical designs and advanced short pulse laser systems to gain a deeper understanding of the cellular processes. Novel technologies such as OCT will provide gentler and less invasive imaging methods based on photonics or multimodal approaches bundling photonic and non-photonic techniques together. Where surgical procedures cannot be avoided, innovative endoscopic methods based on microscopic and spectroscopic approaches ("optical biopsy") will render these techniques gentler and less invasive. In addition, new femto-second lasers will allow precise surgery in transparent materials which will revolutionize the way we treat eye specific diseases, today. Diagnostics will be complemented by versatile 'lab on a chip' biosensors that are non-invasive, light-based, and ultra-sensitive. These optical tracking tools will allow the analysis of dynamic process using standard bio-sensor materials.

As an example for industrial partners in Switzerland some key enabling -optics- companies for above technologies are mentioned in the following:

- FISBA Optics
- Exalos
- Onefive
- Balzers
- MESA Imaging

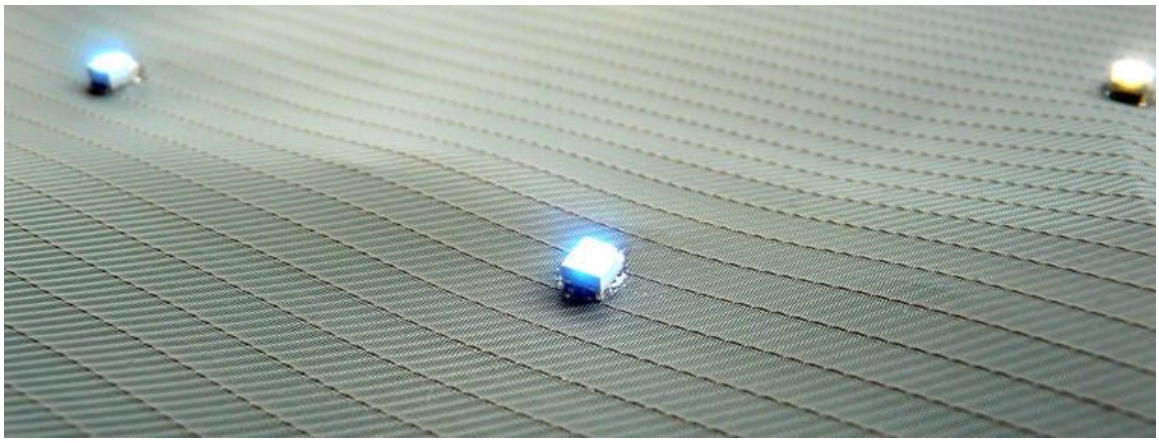
Besides the active industry, a vivid research community is active in Switzerland supporting life science and health related topics. Those research partners span from Universities, such as the ETHZ and the EPFL, over Fachhochschulen (ZHAW as an example) to specific Institutes such as the EMPA, CSEM for instance.

Future challenges in Science and Technology

Switzerland has a solid base of universities, research institutes and KMUs being active in life science and health care. This group is completed by larger –medical- companies who play a key role in this sector on international level. As photonic tools for life science and health care are mainly apparent in diagnosis and analysis, i.e. OCT, the development and qualification of these higher integrated systems is often time consuming and cost intensive. The required investment and the delayed ROI are therefore a major threat for Swiss start-ups and entrepreneurs being active in this field. Unfortunately, access to venture capital for these promising products is often limited given the long term nature of the product development. High expectations, high development cost and time consuming qualifications, often including clinical studies, are a major challenge we witness for KMUs in this industrial sector. Switzerland is responding to those circumstances with a life science team at the CTI (commission for technology and innovation), a distinct national support group that is funding research efforts at institute level to support KMUs in the early stage of a specific product development.

WG4: Emerging Lightning

Switzerland has a broad community with best in class skills to serve the lightning community with tomorrow's technologies. Central element is the material research in organic photonics and electronics in order to enable cost and performance breakthroughs in the emerging fields of lighting, plastic electronics and displays. In close cooperation with these research institutes, KMU's originating from the historic Swiss fabric industry, such as the Sefar AG¸ cooperating closely to enable new, smart lightning solutions for interior and exterior lightning architectural designs.



In order to serve the market drive for sustainability, scalability, adaptability, and ease of use the SWISS Photonics industry will focus on **material research**, **aspects of integration** and low cost, **efficient manufacturing technologies**, such as the "roll to roll" or multi-wafer system technologies.

To support these central research topics in the field of emerging lightning and novel luminaires Swiss Photonics has initiated another national laboratory to support and coordinate these efforts: **Swiss National Laboratory for Solid State Lighting (SSSL)**. Further details around this network are given in the appendix of this document.

To better understand the current situation of the Swiss emerging lightning market the working group created the following SWOT analysis for this sector.

PHOTONICS ENABLED' INDUSTRIES	
Strengths	**Weaknesses**
➢ Research activities for customized solutions, only. ➢ New interesting developments mainly around low cost high efficient OLEDs. ➢ Good pull from industry to develop OLED market segment mid-term. ➢ Integration and special solutions in the focus of the industry.	➢ No major LED manufacture in Switzerland. ➢ Funding and development activities small compared to energy related topics. ➢ Labor and production cost too high in Switzerland for significant manufacturing efforts. ➢ Difficult market access for new technologies (inexperienced SMEs with little support)
Opportunities	**Threats**
➢ Good technology base and research available. ➢ Funding of organic solar cell research yields additional activities around high brightness OLED development.	➢ Momentum and national market not sufficient for a sustainable development. ➢ Continuous prize / cost pressure from Asia.

Future challenges in Emerging Lightning

From the SWOT analysis it becomes apparent that major industrial partners are missing for the local research community. Although Switzerland incorporates world famous experts and research centers such as the EPFL and the CSEM in this field of technology it is therefore challenging to develop a local momentum in this sector. As a major industry sector is missing, a key challenge for Swissphotonics and the government bodies is the development of KMUs and start-up companies with specific products that can compete at a highly cost sensitive market place. Given the excellent know-how base of Swiss research institutes this sector is also an important field for joint European research activities.

WG5: Security, Metrology and Sensors

Parts of the Swiss heritage in the optical sensor technology find their roots in the Swiss watch industry and the related research centers aiming for more precise and compact technologies. Today these institutes such as the CSEM are worldwide regarded for their smart sensor design serving multiple markets. Swiss efforts related to these technologies include for instance highly accurate free space and fiber-based sensors for industrial sensing applications, ultra precise X-ray detectors and localized X-ray sources requiring a minimum of energy to reduce the x-ray dose needed for radiological examination for medical and safety applications. Related efforts include the exploitation of "new" windows in

the electromagnetic spectrum, for example THz radiation, which can penetrate many packaging materials, and thus has wide potential applications for security and food production. In particular drugs and explosives have characteristic signatures in the THz frequency range, thereby offering greatly enhanced capabilities for the detection of these materials.

Smart photonic sensors will rapidly impact numerous aspects of our everyday lives. Photonic technologies and in particular photonic sensors will play a critical role in achieving this. Compact, fully integrated, self-sustaining sensor arrays with low-energy consumption will be able to provide real-time, 3D measurement of key process parameters, allowing accurate monitoring of the full production process. The necessary skill set, such as special optical coatings, time of flight cameras, CMOS-sensor technologies, single photon detection, short pulse laser diodes, micro optical elements, polymer optics for these future technologies is already present in Switzerland, today. Improvements in manufacturing techniques (Industry 4.0) facilitated by such detailed knowledge of the process will make zero-loss production feasible, reducing economic risk and so maximizing commercial and ecological efficiency. Furthermore, the combination of optical sensors with low consumption light sources (OLED & LEDs) will provide key components of future smart lighting systems. To support these activities Swiss Photonics initiated the foundation of the Swiss National Optics Platform (SNOP), which is in detailed described in the appendix of this document.

To better understand the current situation of the Swiss security, metrology and sensors market the working group created the following SWOT analysis for this sector.

PHOTONICS ENABLED' INDUSTRIES	
Strengths	**Weaknesses**
➢ **Good research platform on component level** ➢ **Human resources and research institutes well setup to support this sector** ➢ **Companies with broad technical capabilities to realize and integrate products for the defense market**	➢ **Lack of government support** ➢ **Only selective industrial activities** ➢ **No major programs for joint development efforts** ➢ **Limited production volume** ➢ **No strong national market leading to limited demand** ➢ **Potential Swiss Supplier (SMEs) and major customers not well connected.**
Opportunities	**Threats**
➢ **Swiss products with high quality standards** ➢ **Highly regarded and reliable in this field.**	➢ **Strong outside competition on component level (low cost)** ➢ **Reduction of public spending for defense and security products** ➢ **Swiss neutrality leads to a general reduction in defense activities?**

Future challenges

As mentioned in the introduction Switzerland has an excellent platform to support future efforts in this field of technology. With reaching the quantum limit in some sensor technologies the challenges arise from smart integration and combination of elemental building blocks. By doing so we believe photonic sensors have the potential to deliver advanced diagnostic devices enabling treatments meeting the healthcare needs of an aging society in a cost-efficient manner. In addition photonic sensors will enable a more sustainable economy by providing highly efficient manufacturing techniques tailored to the specific needs of the product. Furthermore photonic sensors will make our daily life more convenient, safer and more secure by providing multi-functional and smart imaging sensors, for example in autonomously driven cars and surveillance cameras.

WG6: Design and Manufacturing of Optical Components and Systems

It is a remarkable circumstance that Switzerland has created a heritage in optical components design and manufacturing over the past four decades. Today's technologies span from specialized optical coatings, high power semiconductor laser diodes, QC-Lasers, VCSELs, SLEDs, passive optical components, sensors and subsystems to fully integrated systems for a wide range of markets and applications. Swiss optical valleys can be found all over the country forming a fascinating landscape of partners in research and industry. It is apparent that Swiss competitiveness of multiple industries is vitally dependent upon access to most advanced photonics technologies at the component and subsystem level. Without a differentiating technology, truly innovative products will surely be elusive, and without strong and permanent support in research and development this leading edge would soon fade away.

The most recent developments in Switzerland have proven that the economic impact of optical components is not only restricted to highly specialized device manufactures at low volume. Instead, by applying novel manufacturing technologies, Swiss companies are also competitive with in house volume production of their core components. It would be illusive not to recognize the importance and strategic advantage of Asian integrators for these components. However, by maintaining a supply chain in strategically important areas of component and systems technology, embracing high-volume manufacturing as well as high-value, specialized optical components from Switzerland have gained market share in a highly competitive environment.

Since central aspects of Switzerland's SWOT analysis for the "design and manufacturing of optical components and systems" are mainly covered by the previous sections, we'd like to pay attention in the future challenges we have identified for this highly important business sector in Switzerland.

Future challenges

From our perspective there are a number of priority areas for investment in generic photonic technologies that will have a high impact across a wide range of applications. These relate specifically for Switzerland to the following areas:

- Photonic integration, including the development of generic integration platforms with focus on compact and light weight modules that allow an easy to apply access to critical components.

- Technologies for cost-effective manufacturing of components and subsystems.
- Integration of photonics with microelectronics at the chip, board and system levels.
- Semiconductor optical device technology, with particular reference to semiconductor lasers incorporating novel material systems and subsystem integration of multiple optical components.
- Exploitation of new materials, including new semiconductors and nano-photonic materials (for example metamaterials & plasmonics), multifunctional fibres, and their associated fabrication technologies.
- New materials for an advanced thermal platform with expansion matched properties to central semiconductor materials such as GaAs, InP and GaN.

To support these activities Swiss Photonics has multiple efforts in selected National Laboratories as mentioned before. The important topic of optical integration is under the guidance of the **S**wiss **P**hotonic **P**ackaging **L**aboratory (SPPL), which is described in more detail in the appendix.

WG7: Education, Training and Disruptive Research

Photonics had a severe impact on the technical-educational environment in Switzerland over the past two decades. With the increasing industrialization of photonic tools and technologies in Switzerland the demand for skilled engineers and operators has gone up dramatically. In addition, Swiss Universities aim for more forward looking disruptive research topics in the photonics domain to maintain their leadership on international level. Furthermore it has been recognized to a certain extend that technical training is required to give future employees in the photonic industry the skill set that is required to be successful in this domain.

However, besides the progress and the vivid environment also Switzerland has strong contrast in its strength and weakness profile that has been summarized in the following SWOT analysis.

Education, Training and Disruptive Research	
Strengths	**Weaknesses**
➢ **Masters in Photonics Program, EPFL** ➢ **Strong technology market requiring trained employees with qualification in photonic tooling.** ➢ **Research of product related optical technologies embedded at schools and universities.** ➢ **Multiple young entrepreneurs pushing new technologies into the market** ➢ **Disruptive research at leading universities with strong exchange program** ➢ **Various industrial research centers / think tanks in Switzerland (i.e. IBM Rueschlikon, Google in Zürich,…)**	➢ **Insufficient number of trained personnel in photonics sector** ➢ **Increasing restriction for foreign employees working in Switzerland** ➢ **Graduate students from universities with insufficient practical experiences** ➢ **Photonic education and practical training between industry and educational institutions not well coordinated** ➢ **Insufficient number of female students in the field of photonics**
Opportunities	**Threats**
➢ **Specific support (financial, guidance) for Start-ups from the CTI (Commission for Technology and Innovation)** ➢ **Increasing collaboration for specific training and research in the photonic domain** ➢ **Swissphotonics NTN as market place for Swiss employment in photonics**	➢ **Lack of public and private funding for training and R&D** ➢ **Technical sector in hiring competition with other, better paying industries (financial sector)** ➢ **Brain drain into other countries with better technology network** ➢ **Conservative investment policy from financial sector**

To support this idea, Swiss Photonics has created the Swiss National Laboratory for Photonics Master Education (SPME).

Future challenges

It is crucial to reach out effectively to young people to fuel the Swiss photonics economy with talents now and in the future. To do so, we must analyze the wider public perception of photonics in the society, to understand what stimulates the interest in science and technology, and establish what motivates young students to pursue technical subjects in school. Furthermore it is important to consider which media are best for reaching out to these groups as today's young minds will be our skilled workforce in the future. So, generating interest in photonics must be started in primary and secondary schools, already. Special attention should be paid to motivating young women into physical sciences and engineering generally, and towards photonics in particular, because the female representation within the high-level photonics workforce is still too low. The involvement of teachers at all levels in innovative programs will be essential, so that they can stimulate and excite as they educate young students, engaging them in the world of photonics. To achieve the maximum impact, dedicated training programs for teachers need to be initiated.

Although Switzerland has a long track record in photonic industry, research and education, the technology is still relatively young. In particular with the dynamic development in the sector, industries would benefit from a closer interaction with academia providing refresher courses and extension courses for technical staff. Courses for operators dealing with photonics in many application fields (telecommunications, material workmanship, medicine, architecture, environmental monitoring, cultural heritage, etc.) could also be considered. Refresher courses for school teachers are of similar importance for a long-term strategy of photonics dissemination and success. At all education levels, mobility programs will be of great importance to meet the challenge of the global market, so a supportive infrastructure should be developed to foster and facilitate these.

Since all countries will have similar needs in terms of knowledge and skills, the photonics community would benefit greatly from the establishment of a "European Skills Observatory for Photonics", wherein industry and academics could jointly collect and analyze developing trends in technology and research. The primary objective of this collaboration would be to anticipate the needs of the photonics sector in terms of workforce. Swissphotonics with its strong industrial member group could play a leading role in this activity.

5. NTN “Swissphotonics”

Verein Schweizer Laser und Photonik Netz, Zefix Nummer: CH-130.6.017.092-7
Sihleggstrasse 23, 8832 Wollerau www.swissphotonics.net

SWISSPHOTONICS is the Swiss National Thematic Network for PHOTONICS. It is a unique opportunity to combine all national key research and industrial players of this enabling technology to contribute to future concerns of the Swiss Society in the field of energy, life science and advanced technology. PHOTONICS has been identified by the European Horizon 2020 Framework Program for Research and Innovation as one of only 5 key enabling technologies (http://ec.europa.eu/research/horizon2020/index_en.cfm?pg=competitive-industry) because it is foreseeable that PHOTONICS will have a big impact on the life quality and the competitiveness of the European industry in the next decade.

In Switzerland, PHOTONICS is very important as Switzerland ranks #2 in Europe in PHOTONICS revenue per capita (just behind the Netherlands (Philips!)). PHOTONICS contributes with more than 5 Mrd CHF/year to the SWISS GNP and directly engages more than 20'000 employees in numerous SMEs and some big companies. PHOTONICS spans from classical optics over photovoltaics to lighting and lasers, and thus enables for instance the following industries and related research and development efforts in Switzerland:

- Solar energy industry
- Laser beam tool machine industry
- Pharmaceutical industry and life science
- Watchmaking industry
- Building industry (smart windows to save energy)
- Lighting (solid state lighting to save energy)
- Optical components (lenses, coatings)
- Services and banking (enabled by optical communication, FTTH)
- Bio Photonic Energy
- Measurement and testing industry

The SWISSPHOTONICS NTN will support innovation in Swiss companies within the PHOTONICS branch with no compromise. The industry, but especially SMEs, will get access to know-how from research institutes and access to financial sources from programs, through WORKSHOPS and ON-SITE COACHING.

- A National platform for PHOTONICS will be maintained to provide a SINGLE POINT OF CONTACT for SMEs. This will help them access services from institutes and matching the most appropriate institute to their needs.
- Access to INTERNATIONAL PROGRAMS (such as Horizon 2020, etc.) and NETWORKS (IOA, etc.) will be provided, especially for SMEs who usually do not have the resources to do this by themselves.
- Networking between SMEs at the project manager and engineer level will be supported by specifically designed programs.

The SWISSPHOTONICS NTN will help the CTI to execute its mission and multiply its resources. To maximize synergies with already existing administrational structures it is planned to establish the

SWISSPHOTONICS NTN on the base of the already existing SwissLaserNetwork (SLN), which is an important aspect of the new SWISSPHOTONICS NTN, anyway. Using the administrational SLN platform, which was just established with significant effort during the past three years, allows speeding up the formation of the new SWISSPHOTONICS NTN at considerable reduced cost. In addition, the already successful SLN has reached a high level of acceptance amongst its industrial and research partners and incorporates a high international reputation, which we see as an important value add for the proposed SWISSPHOTONICS NTN.

Relevance of "Photonics"

PHOTONICS is one of the 5 KEY ENABLING TECHNOLOGIES (KETs) in Europe, next to Nanotechnology, Micro- and Nanoelectronics (including Semiconductors), Advanced Materials, and Biotechnology.

Horizon 2020 program plans to spend around 80 Mrd EUR on three research programs between 2014 and 2020 on 1. Excellence in the science base (27.8 Mrd €), 2.Societal challenges (35.9 Mrd €) and 3.Industrial leadership (20.2 Mrd €) on innovation, funding for industry and SME, transition from research into marketable products with 5 KEY ENABLING TECHNOLOGIES (KET). (http://europa.eu/rapid/pressReleasesAction.do?reference=IP/11/1475&language=DE) PHOTONICS is also very important to the field of Clean Energy because making use of solar energy is largely based on PHOTONICS and also managing radiation loss (smart windows) is part of the PHOTONICS trade.

The group supporting this NTN submission believes it is of central importance that the Swiss Photonics Community is well organized in order to participate in these programs. Thrilled by the success of the predecessor Network, the SLN, we also realized it's of paramount importance to establish a broader Photonics Network Thematic in Switzerland, which recognizes the positive fundamental developments in other Photonic fields outside the broad Swiss laser related community. Thus the new SWISSPHOTONICS NTN plans to include thin film solar cell efforts, organic photonic materials for OLED and solar cell applications, research in Terahertz radiation, as well as advanced camera designs and other promising Swiss-Photonic activities to further enhance the "research and business location Switzerland". However, moving base technologies to an industrial level will require a distinct effort from industry and research partners to succeed within a highly competitive global environment. Therefore, the SWISSPHOTONICS NTN plans multiple activities which already made a positive impact for the SLN and are described in the next paragraphs in more detail. We believe that it is important that a Swiss National Thematic Network should do both, reflect the strength of Swiss industry and relate to the European Horizon 2020 strategy. SWISSPHOTONICS will fulfill both of these requirements.

Outside the Swissphotonics competence

The EU commission defines in detail the 5 key enabling technologies and thus PHOTONICS (and also what is NOT PHOTONICS) is clearly defined:

1. NANOTECHNOLOGY holds the promise of leading to the development of smart nano and micro devices and systems and to radical breakthroughs in vital fields such as healthcare, energy, environment and manufacturing;
2. MICRO- and NANOELECTRONICS, including semiconductors, are essential for all goods and services which need intelligent control in sectors as diverse as automotive and transportation,

3. PHOTONICS is a multidisciplinary domain dealing with light, encompassing its generation, detection and management. Among other things it provides the technological basis for the economical conversion of sunlight to electricity which is important for the production of renewable energy, and a variety of electronic components and equipment such as photodiodes, LEDs and lasers.
4. ADVANCED MATERIALS offer major improvements in a wide variety of different fields, e.g. in aerospace, transport, building and health care. They facilitate recycling, lowering the carbon footprint and energy demand as well as limiting the need for raw materials that are scarce in Europe;
5. BIOTECHNOLOGY brings cleaner and sustainable process alternatives for industrial and agrifood operations. It will for example allow the progressive replacement of non-renewable materials currently used in various industries with renewable resources, however the scope of applications is just at the beginning;

Creating a SWISSPHOTONICS NTN with a clear thematic separation makes perfect sense for the group supporting this Network. Although this enabling technology penetrates more and more fields of our today's life the industry and the research community is faced with similar technical challenges every day. As an example, out of a single GaAs wafer one could realize light emitting diodes which find their application in the field of medicine (i.e. hair removal), material processing (direct metal cutting), flat panel TV screen annealing and inter satellite communication. And still, the required know-how and technology remains almost identical from a Photonic perspective. This simple example shows the importance of an integrated and powerful Network to use the synergies and experiences of all partners to the advantage of the Swiss business location.

Structures

The SWISSPHOTONICS NTN is planned to be the formal continuation of the Swisslaser Network (SLN), which had already a broader "PHOTONIC scope" as recently requested from the CTI. Thus the SWISSPHOTONICS NTN will be organized as a registered, not-profit "Verein", i.e. Verein Schweizer Laser und Photonik Netz: Zefix Nummer: CH-130.6.017.092-7. As with any "Verein", the sign-off of the business plan, the election of the executive board as well as the controls of the finances are done by the yearly general assembly (Generalversammlung) of all members (see Art. 60ff Swiss Civil Code).

Mission

SWISSPHOTONIC aims to become the central national platform to establish a world-wide leading cluster of Swiss research and industrial partners in the photonic domain. SWISSPHOTONICS has a strong national focus to assure the whole PHOTONIC community in Switzerland can profit from its service and support. SWISSPHOTONICS envisions reaching out to all relevant players in all Swiss regions to assure the photonic community is well connected to generate maximum synergies between the various partners. SWISSPHOTONICS connects regional research groups with the right industrial partners to create joint development efforts and supports its affiliates in receiving funding from national and European programs. SWISSPHOTONICS serves companies and research facilities with market updates, field studies, workshops, direct support and a transparent webpage. SWISSPHOTONICS is regional set up to serve its members coming from basic to applied science, technology development, manufacturing and sales.

Business plan

Motivation

The competition for Swiss SMEs and already established companies on the international photonic markets is fierce, established products face a brutal pricewar, also due to the strong Swiss currency. The best way to succee for these companies is to be innovative and to secure market share early on. Roughly Swiss SMEs face two big CHALLENGES:

- International competition from SMEs and big companies whose innovation receives direct funding from their governments.
- The strong Swiss franc.

Swiss SMEs have also OPPORTUNITIES from

- First class, government funded, R&D institutes (ETH, PSI, Universitys of Applied Sciences UAS, ..) and national SNSF projects
- Liberal business policies
- Low taxes (if profitable)
- International network (EU funding, ..)
- Highly skilled and motivated employees
- Perfect infrastructure

Therefore the SWISSPHOTONICS business plan is designed to SUPPORT THE SWISS SMEs and more established players in the photonic market TOWARDS MEETING THESE CHALLENGES AND MAKING USE OF THE SWISS OPPORTUNITIES.

Structure

SWISSPHOTONICS' legal structure is a SWISS registered association (Verein) with bylaws (Statuten) with a yearly general assembly which elects the President, the executive board and the advisory board. SWISSPHOTONICS will be able to continue to work on the administrational base of the Swisslaser.net (SLN), registered under CH-130.6.017.092-7. The members are SMEs and big companies, research institutes and individual members. Since the majority of the members are SMEs it is guaranteed that the interests of the SMEs are taken care of (the yearly general assembly sets the business plan).

Swissphotonics spending

The budget is fully spent in order to support SMEs, research institutes and affiliated companies through

- workshops (to foster a truly Swiss network (in contrast to regional clusters), support access to R&D funds, initiate collaboration from SNSF to SME projects) in order to bring the optimum partners together for CTI project submissions;
- technical support of CTI projects in order to create even more success stories;
- create and maintain a lively contact to international networks and;
- maintain a webpage as a service to the community in order to attract new members.

Funding Swissphotonics

Funding an association to support SMEs is not easy. As is well-known, SMEs outside Switzerland receive direct cash funds from their governments. For us it is out of question to tax Swiss SMEs with a high SWISSPHOTONICS membership fee. Thus, we envision to keep the membership fee low, which means the SWISSPHOTONICS budget CANNOT be based on membership fees only. We did also probe into offering education (courses) and use the tuition fee to fund SWISSPHOTONICS, but we abandoned this plan because we would run into competition with the businesses of our members in the educational field (who make their living by offering courses). Sponsoring from bigger companies has also proven to be very difficult due to their financial constraints and the independency of the network from larger institutions. Sponsering from venture capital is not possible either, as VCs are fully engaged in the CTI start-up activities, which are heavily subsidized by CTI.

Thus, we do plan to fund SWISSPHOTONICS through funding from CTI, funding through active participation in EU projects and in-kind funding by volunteer work. We will also evaluate funding through conferences with participation and support of offset business, trade-shows and increasing the membership fee for institutes.

It is the wish from CTI that SWISSPHOTONICS NTN will receive only subsidiary support from the Swiss federation, i.e. less than 50% of the overall budget. Nevertheless one has to look at the overall budget of SWISSPHOTONICS and not only at the direct cash side. We will track and count all the internal efforts by the companies with CTI projects, initiated by SWISSPHOTONICS and we will track and count all the volunteer hours spent by our active members (executive board, etc.).

It is the goal of SWISSPHOTONICS NTN to meet the subsidiary requirement. In summary, we want to point out that we strongly believe it is the right approach to evolve SWISSPHOTONICS NTN based on the Swiss Laser Network (SLN) that was just built and continnously optimized with the support of the CTI experts over the past years. The high level of acceptance of the established network by all its members and various Swiss and international institutions will allow a swift transfer to the here submitted SWISSPHOTONICS NTN that will be ready for implementation right after the acceptance by the CTI. Due to the exeperiences with the previous SLN we also believe that the SWISSPHOTONI(CS NTN business plan is in all directions well thought-out and realistic and will serve as an excellent base to create significant value for the Swiss photonic industry and all its partners.

6. Workshop Format

Workshop timeline

• Timing

• Contact Christoph to set topic:

• T0-4 months

• Provide 50 to 100 word abstract of workshop

• Determine program and local chair

• Contact speakers to get commitment and working title:

• T0-3months

• Get verbal or e-mail agreement from all speakers

• Working title

• Provide list with working title, speaker e-mail list, and local chair to Beni

• Beni will then get details from speakers (CV, abstract, photo) and organize together with local chair lab-tour and apero between T0-3 months and T0-2 months

• Program published on website

• T0-2months. All details fixed

• First e-mail notification

• Second e-mail notification: 2 weeks prior to workshop Workshop Format

• Format

• Labtour before the workshop (morning)

• 2 to 3 talks from industry on market roadmap (state of the art and what technologies are requested by the market)

• break

• 2 to 3 talk from academia on technologies under development

• Discussion rounds

• in separate rooms with report back, or

• “Rump session” (3 to 5 people have 2 foils to make a stimulating

statement, followed by podium discussion (the 3 to 5 people stay on

podium, guided by program chair with involvement of audience)

• Apero richeWorkshop Responsibilities

• Responsibilities

• Program Chair

• Responsible to put program together and to contact speakers for working

title

• Local Chair

• Responsible for labtour and rooms

• General chair (Christoph+Beni+Christian)

• Beni will do all the detail work (contact speakers for detail, Apero, etc.)

• Christian will send out e-mails advertisement (T0-2months, T0-2weeks)Workshops Status Feb 2014

Title Location

Program

Chair Local Chair

General

Chair

Sponsor

Speakerlist

Labtour Webpage Workshop Comment

8. Swiss National Labs

SNAP

Mission

SNAP (Swiss National Application Laboratory for Photonic tools and manufacturing) is the one-stop-shop to serve and support the Swiss industry, especially SMEs, in the field of laser machining and photonic technologies in manufacturing.

Service

SNAP offers consulting services and recommends the best suitable institute, the best approach and drives its implementation. The institutes of SNAP then give the SME assistance for CTI projects if technology development is needed to solve the problem. SNAP is the prime test bed for advanced Swiss laser beam source developing companies. SNAP promotes photonic tools and photonic manufacturing.

Laser beam material processing covers

Laser micromachining and drilling of almost any material, i.e. metals, textiles, tissue, ceramics, glass, plastic and carbon composites

- Functional structures on surfaces
- Laser welding, soldering and brazing
- 3D-Laser surface treatment of many materials (polishing, hardening, structuring, marking, engraving,)
- Rapid manufacturing, 3D printing

Through the close cooperation of several institutes we are able to provide services that require specialized expertise or equipment, which extends beyond the scope of a single institution. Unique and expensive equipment are shared amongst the partners. In addition, we offer laboratories with staffing for rent (rent-a-lab), if required.

SNAP conducts one tutorial seminar at the yearly EPMT trade-show in Geneva and holds several workshops per year on the latest progress to advance the laser machining technology and tools.

Customers

SMEs have difficulties to keep up with the rapidly developing laser machining tools and processes due to limited funds and know how. SNAP helps closing this gap for the Swiss SMEs in order to increase their international competitiveness. SNAP will also assist in getting access to external funding for technology development (CTI) or product development (EU projects) and is actively contributing to the European research agenda through the European technology Platform “Photonics 21” in WG2.

Single contact point and coordinator

Beat Lüscher, beat.luescher@fhnw.ch, Tel: +41 56 202 74 62
FHNW / IPPE, Windisch AG

Team (from west to east)

1. HES Genève (HEPIA), Prof. Dr. Jacques Richard

2. HEC Neuchâtel (Haute Ecole-ARC), Prof. Dr. Herbert Keppner
3. EMPA Thun (EMPA), Prof. Dr. Patrik Hoffmann
4. EMPA Dübendorf (EMPA), Dr. Rolf Brönnimann
5. CSEM Alpnach (CSEM), Dr. Janko Auerswald
6. UAS Burgdorf (BFH), Prof. Dr. Beat Neuenschwander
7. UAS Windisch (FHNW IPPE), Beat Lüscher
8. Inspire AG (at ETH Zürich), Josef Stirnimann

Network

SNAP is one of the seven Swiss national Photonics Labs of the Swiss Photonics network. The SNAP team holds regular internal meetings to align their strategies and to share their experience. SNAP is a member of the *Schweizer Verein für Schweisstechnik* (SVS) and works actively in the European Technology Platform "Photonics 21 in WG2.

Useful links

Bayerisches Laser Zentrum

EPMT - Salon International Environnement Professionnel Micro Technologies

Photonics 21, Workgroup 2 - Industrial Manufacturing and Quality

SVS

SNFL

Mission

SNFL (**S**wiss **N**ational **F**iber **L**ab) is the one-stop-shop to serve and support the Swiss industry, especially SMEs, in the field of optical fibers, fiber lasers and fiber related photonic systems. SNFL will promote innovation and novel product development using optical fibers. We will also ensure continuity and protection of unique know-how in customized fiber drawing that exists in Switzerland.

Service

SNFL offers consulting services and provides easy and direct access to concepts, prototypes and know-how for the benefit of Swiss SMEs helping them to become internationally more competitive. The institutes of SNFL will also give SMEs assistance for CTI projects if technology development is needed to solve a specific problem.

SNFL services include

- Conception and simulation of novel active or passive fibers and waveguides
- Realization and drawing of active and passive fiber prototypes
- Interfacing fibers and waveguides to systems
- Conception and prototyping of fiber and waveguide sensing devices
- Transferring know-how to industry by workshops, ad hoc initiatives and joint research projects

Through the close cooperation of several institutes we are able to provide services that require specialized expertise or equipment, which extends beyond the scope of a single institution. Use of unique and expensive equipment and installations (e.g. the fiber drawing tower at Berne University for making customized fibers) are shared amongst the partners. In addition, we offer laboratories with staffing for rent (rent-a-lab), if required.

Customers

Technical applications of optical fibers are often not obvious. Insofar, SMEs have difficulties to even identify potential uses. SNFL helps closing this knowledge gap for the Swiss SMEs in order to increase their international competitiveness. SNFL will also assist in getting access to external funding for technology development (CTI) or product development (EU projects).

Our main target customers are

- The Swiss machinery industry (integration of optics and lasers in machines)
- The Swiss laser industry
- Sensor industry
- Biomedical sector (diagnostics, laser treatment)

Single contact point and coordinator

Prof. Dr. Valerio Romano, valerio.romano@bfh.ch, Tel: +41 34 426 42 54
BFH-TI, Applied Fiber Technology Group
Burgdorf

Team (from west to east)

- EPFL, Group for Fiber Optics (GFO), Luc Thévenaz
- EPFL, Laboratory of Photonic Materials and Fibre devices (FIMAP), Fabien Sorin
- University of Bern, Institute of Applied Physics (IAP), Manuel Ryser
- BFH-TI, Applied Fiber Technology group, Valerio Romano
- FHO-NTB, Institute for Micro- and Nanotechnology (MNT) - Photonics group, Markus Michler

Network

SNFL actively participates in international technology platforms (e.g. The European Technology Platform Photonics 21 - Workgroup 2, Industrial Manufacturing and Quality), scientific conferences and has access to a wide network of additional expertise through cooperation.

Useful links

Photonics 21, Workgroup 2 - Industrial Manufacturing and Quality

SSSL

Mission

SSSL is a cooperation initiative of research institutes in the field of Solid State Lighting (SSL) and shall become a reference for Swiss companies and research organizations active in the SSL domain.

Services

SSSL provides consulting and contract R&D services for the Swiss industry with a focus on SMEs helping them to find research partners, knowledgeable people, employees and specialists. SSSL contributes to building a national SSL cluster that will allow Switzerland to be more competitive on an international level and to better serve the needs of Swiss companies active in the field of lighting and luminaires. Seminal talks will be organized with the collaboration of industrial partners or in the framework of the dissemination activities of running projects (e.g. LASSIE-FP7) in order to increase the awareness on the technological, social and economic challenges of SSL.

The main services comprise

- Feasibility and case studies
- Supply of test components, characterization and metrology
- Access to standard know-how and equipment in SSL

Through the close cooperation of several institutes we will be able to provide a comprehensive span of services that require specialized expertise or equipment, which extends beyond the scope of a single institution. Unique and expensive equipment are shared amongst the partners.

Customers

LED and OLED technology as well as the corresponding optics, electronics and mechanical design is developing very quickly driven by constantly evolving new applications. SMEs usually have only very limited resources in terms of funds, know-how and specialized staff and have therefore difficulties in keeping pace. SSSL helps Swiss SMEs to speed up their product development in order to increase their international competitiveness. SSSL will also assist in getting access to external funding for technology development (CTI) or product development (EU projects) and is actively contributing to European research programs (LASSIE-FP7 — **L**arge **A**rea **S**olid **S**tate **I**ntelligent **E**fficient luminaires and Photonics 21, Workgroup 4 — Emerging Lighting, Electronics and Displays).

Single contact point and coordinator

Dr. Rolando Ferrini, rolando.ferrini@csem.ch, Tel: +41 61 690 60 13
CSEM SA, Muttenz

Team

Currently evaluating other partners

Network

Regular round table meetings will be organized with the industrial/academic partners to align the activities of the SSSL with current industrial demand and to examine on-going requests from customers and/or new potential stakeholders.

Useful links

LASSIE-FP7
Photonics 21, Workgroup 4
Light+Building trade show

SPPL

Mission

The **S**wiss **P**hotonic **P**ackaging **L**aboratory (SPPL) aims to be a one-stop shop contact for the Swiss industries for Photonic Packaging. Initially it will be based at CSEM in Alpnach, which has a long tradition in microsystems packaging. It is planned to build up a network with all interested research organizations within Switzerland.

Service

Switzerland is leading in developing novel photonic devices. Such photonic devices need special packaging, taking into account the electrical as well as the optical interface, which is expensive and which requires special skills, as there are currently hardly any standards in photonics packaging. The partners within the SPPL can offer both contract development and small series production. A reduction of the overall packaging development costs will be achieved by avoiding unnecessary duplication of infrastructure.

Our main services comprise:

- Design services and consulting for miniaturizing existing devices
- Development and integration of micro-optical, micro-mechanical and electronic systems into self-contained packages
- Interfacing with external electronics, optical fibers and waveguides

CSEM will serve as entrance point for customer requests, which will be discussed within the SPPL to ensure the best solution for the customer. The CSEM location in Alpnach has a well-equipped photonics packaging infrastructure in a clean room environment including die bonders, flip-chip bonders, fine alignment stages, and laser welders allowing welding, soldering and high-precision (below 1 µm) adhesive bonding. Hermetic sealing is offered as well as biocompatible packaging.

Customers

The center has successfully carried out a number of photonic packages for renowned Swiss SME clients. SMEs often have difficulties to keep up with the rapidly developing opto-electronic and opto-mechanical miniaturisation and integration usually due a lack of funding, unawareness of recent progress of technology and specialized know how. SPPL helps closing this gap for Swiss SMEs in order to increase their international competitiveness. New products can be conceived by applying the sophisticated expertise of the SPPL partners. SPPL will also assist in getting access to external funding for technology development (CTI) or product development (EU projects) and is actively contributing to the European research agenda through the European technology Platform “Photonics 21”.

Single contact point and coordinator

Dr. Stefan Mohrdiek, Stefan.Mohrdiek@csem.ch; Tel: +41 41 672 7528
CSEM, Alpnach

Team

Currently evaluating other partners

Network

There is close collaboration with the following networks:

- Photonics21, Workgroup 6: European Technology Platform for Photonics — Optical Components and Systems
- EPIC: European Photonics Industry Consortium
- IEEE Components, Packaging and Manufacturing Technology Society, Switzerland Chapter
- HTA: Heterogeneous Technology Alliance
- EPoSS: European Technology Platform on Smart Systems Integration

SNOP

Mission

SNOP (**S**wiss **N**ational **O**ptics **P**latform) functions as a one-stop shop to serve and support Swiss SMEs in all fields of Optical Technology. SNOP provides first advice to customers new to the field and advanced technology services to existing users. SNOP – with its two locations in Buchs (SG) and Neuchâtel (NE) — shall be the contact point for all of Switzerland.

Services

We offer advice, application help and solutions in applied optical technologies.
Our services cover:

- Optical coatings
- Micro optics
- Optical metrology
- Optical components and systems

The close cooperation of three complementary institutes allows for providing services that require specialized expertise or equipment, which extends beyond the scope of a single institution. Unique apparatuses will be shared amongst the SNOP team. Insofar, we can provide a Single-Point-of-Contact for the customer and yet offering diverse services for varied applications. The customer does not have to tie up valuable development resources for coordination tasks amongst research institutions.

We shall hold workshops and dedicated information meetings like the following:

- "**Photonics Valley Round Table**" twice a year in Buchs and "**Microtechnic Meeting**" once a year in Neuchâtel: Half a day get-togethers of the optical industries to allow networking, enable new cooperation projects, discuss general problems for optical industries, etc

- „**Produktions-Messtechnik in der Praxis**" - A practically oriented symposium on metrology, in German, every uneven year in Buchs.

Customers

Although a traditional focus of Applied Optical Technology is in Metrology, Machine Vision and Imaging, we aim to serve any industry, since novel Technologies may be applicable in many currently unknown fields. We are open to any challenge.
SMEs usually do not have the means, expertise or finances at hand to undertake complicated investigations in novel technologies. SNOP will be instrumental in closing this gap. We are there to assist Swiss SMEs in finding the best available solution that fulfils their specific needs, in order to increase their international competitiveness.

SNOP will also assist in getting access to external funding for technology development (CTI) or product development (EU projects) and is actively contributing to the European research agenda through the European technology Platform "Photonics 21, Workgroup 5 - Security, Metrology and Sensors".

Single contact point and coordinator

Prof. Dr. Andreas Ettemeyer, andreas.ettemeyer@ntb.ch, Tel: +41 81 755 34 87
Institut für Produktionsmesstechnik Werkstoffe und Optik (PWO)
NTB, Buchs SG

Team

- NTB Buchs, Prof. Dr. Andreas Ettemeyer
- University Neuchâtel, Prof. Dr. Thomas Südmeyer
- EPFL Neuchâtel, Prof. Dr. Hans Peter Herzig

Network

SNOP participates in international technology platforms (Photonics 21), scientific conferences and has access to a wide network of additional expertise through cooperation.

Useful links

Photonics 21, Work Group 6 - Design and Manufacturing of Components and Systems

SPME

Mission

The **S**wiss National Laboratory for **P**hotonics **M**aster **E**ducation (SPME) aims at the promotion of a consolidated national Master education program in Photonics technologies that serves the short and long term needs of the Swiss industry, in particular SMEs, for highly skilled employees.

Service

We shall provide a coordinated approach to establish a Swiss wide Photonics Education on a Master level that covers a comprehensive range of theoretical knowledge as well as practical skills. Industry needs will be identified, addressed accordingly, prioritized and implemented to meet those needs. In the end, we will have established a filled pipeline of highly skilled and motivated students who can be employed in any industry that uses Photonics technologies.

Customers

Predominantly the Swiss SME Photonics industry as well as any related industry that applies Photonics technologies as parts of their products.

Single contact point and coordinator

Prof. Dr. Christophe Moser, christophe.moser@epfl.ch, Tel: +41 21 693 61 10
Laboratory of Applied Photonics Devices (LAPD)
EPFL Lausanne

Team (from west to east)

- EPFL, Laboratory of Applied Photonics Devices (LAPD), Christophe Moser
- University of Bern, Institute of Applied Physics (IAP), Valerio Romano
- NTB Buchs, Andreas Ettemeyer

Network

SPME works closely with Workgroup 7 of Photonics 21

Useful links

EPFL - Master in Applied Optics
NTB - Master in Optical System Engineering

Comments

If you have any comments regarding the Swiss National Labs, please post them here.

Swiss Photonics Master Education (SPME)

This effort serves to coordinate various initiatives in Switzerland to introduce and to teach a photonics master program at ETHs, Universities as well as UAS. Coordinator is Prof. Dr. Christophe Moser from EPFL LAPD. The work group has met the first time on March 28, 2013 in Burgdorf.

A global strategy will be outlined which consists of matching industrial short and long term needs in the Swiss photonics industry with photonics master education efforts at all levels: ETH - UNI - HES (UAS).

SPME works closely with workgroup 7 of Photonics 21.

SPVR

Mission

The **S**wiss **P**hoto**V**oltaic **R**esearch Platform (**SPVR**) serves as an independent forum for the coordination of photovoltaic R&D activities in Switzerland. The SPVR promotes cross-fertilization and standardization of photovoltaic research.

Service

SPVR strives in bringing all interested parties from research, industry and academia together. We shall organize workshops and discussions, which shall allow deeper interaction than is possible in the usual meeting places (e.g. trade shows and conferences). Although competition should be maintained amongst rival institutions and companies sharing of special equipment or even the joint definition and use of standardized methods and equipment will bring the industry a huge step forward saving valuable resources.

Swiss research institutes play a leading role in the development of the 3rd (flex) and 4th (e.g. organic) generation of PV cells. SPVR will further this position in the international research community.

Customers

Besides the big players in the photovoltaic industry numerous SMEs and start-ups with limited resources are around. SPVR will be instrumental in helping SMEs to get access to funding or finding collaboration partners.

Single contact point and coordinator

Prof. Dr. Frank Nüesch, frank.nueesch@empa.ch, Tel.: +41 58 765 4740
Department for Functional Polymers
EMPA, Dübendorf

Team

- EMPA, Dübendorf, Department for Functional Polymers, Frank Nüesch
- SUPSI (UAS), Institute for Applied Sustainability to the Built Environment (ISAAC),Cannobio, Roman Rudel

Network

Photonics 21 Workgroup 4 — Emerging Lighting, Electronics and Displays

Useful links and downloads

SUPSI-ISAAC

9. Apppendix

Swissmem

Market report

OPTECH CONSULTING

PHOTONIK IN DER SCHWEIZ
WIRTSCHAFTLICHE BEDEUTUNG

Untersuchung für SWISSLASER
November 2013

Optech Consulting Dr. Arnold Mayer

Hintergrund dieser Studie

Der vorliegende Bericht zur wirtschaftlichen Bedeutung der Photonik in der Schweiz wurde von Optech Consulting im Auftrag von SWISSLASER erstellt.

Der Bericht umfasst Daten zu Produktionsvolumen und Beschäftigung im Jahr 2012 sowie vorläufige Daten für das Jahr 2013. Der Bericht setzt eine Reihe von Untersuchungen fort, die mit dem Datenjahr 2007 begann.

Die Daten in diesem Bericht beruhen auf publizierten Daten von Unternehmen, auf vertraulich mitgeteilten Daten, sowie Berechnungen und Abschätzungen von Optech Consulting. Bei der Darstellung wurden alle Daten soweit aggregiert, dass keine Rückschlüsse auf nicht publizierte Unternehmensdaten möglich sind.

Für umsatzstarke Segmente der Photonik sowie für die Photonik insgesamt ist die Datenbasis ausreichend, um Zeitreihen für das Produktionsvolumen anzugeben. Für Segmente mit geringeren Umsätzen ist die Grössenordnung von Umsatz und Beschäftigung angegeben. Eine Rückrechnung auf Zuwachsraten ist hier nicht möglich.

Überblick

Produktion am Standort Schweiz im Jahr 2012

Das Produktionsvolumen Photonik am Standort Schweiz im Jahr 2012 belief sich auf 3.3 Mrd. CHF[1].

Das grösste Volumen hiervon entfällt auf die Lasermaterialbearbeitung. Im Jahr 2012 wurden in der Schweiz Laser und Lasermaschinen im Wert von 850 Mio. CHF hergestellt.

Es folgt die optische Messtechnik & Bildverarbeitung mit einem Produktionsvolumen von rund 700 Mio. CHF.

Für das nächstgrössere Volumen steht die Photovoltaik mit einem Volumen von rund 600 Mio. CHF.

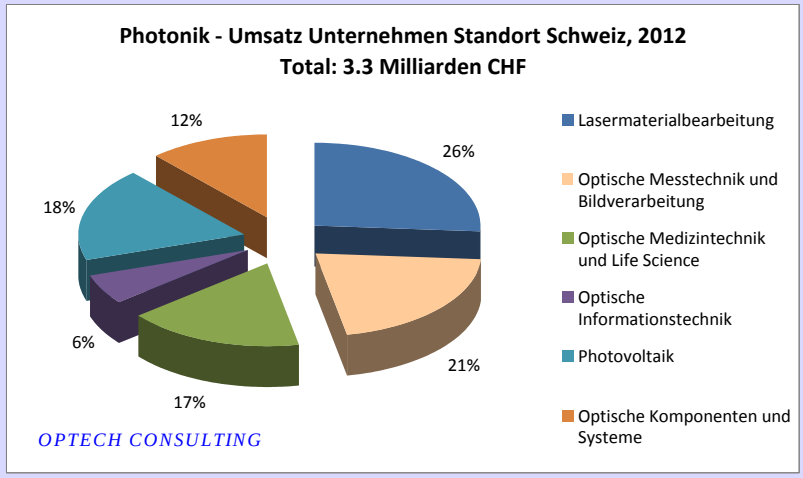
Es folgt der Bereich Medizintechnik & Life Science mit rund 550 Millionen CHF.

Der Bereich der optischen Komponenten & Systeme trägt ein Produktionsvolumen von rund 400 Mio. CHF bei.

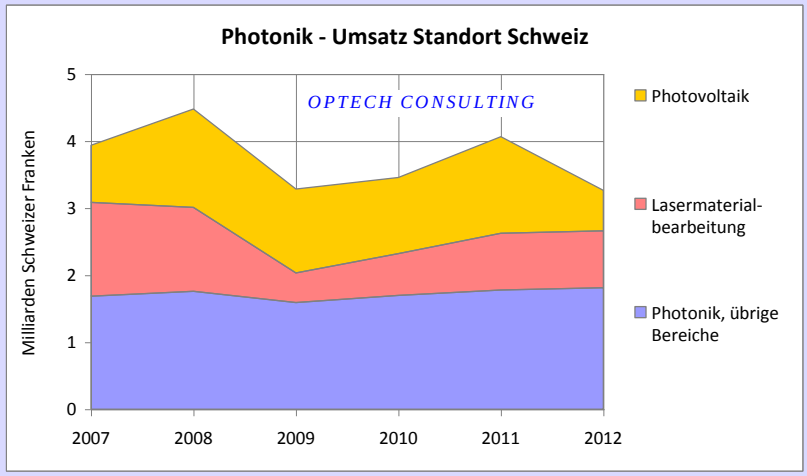
Alle weiteren Bereichen umfassen insgesamt ein Volumen von rund 150 Mio. CHF. Hier sind insbesondere die optische Kommunikationstechnik und die optisch-basierte Drucktechnik eingeordnet.

1) Die erhobenen Daten beziehen sich überwiegend auf Unternehmensumsätze, vereinfachend wird hier der Begriff „Produktionsvolumen“ verwendet.

Überblick



Überblick



Überblick

Trend der Produktion am Standort Schweiz im Jahr 2012

Das Produktionsvolumen der Schweizer Photonik-Industrie erreichte im Jahr 2012 rund 3.3 Mrd. CHF, nach 4.1 Mrd. CHF im Vorjahr. Der Rückgang ist bedingt durch einen starken Nachfragerückgang im Bereich Photovoltaik. Das Produktionsvolumen in allen anderen Bereichen der Photonik entwickelte sich in Summe leicht positiv.

Im Jahr 2012 erfasste die globale Krise in der **Photovoltaik** auch die Hersteller in der Schweiz. Das inländische Produktionsvolumen in diesem Bereich erreichte nur noch rund 600 Mio. CHF, nach rund 1.5 Mrd. CHF im Vorjahr. Schweizer Hersteller sind insbesondere in der Anlagen- und Maschinenproduktion zur Herstellung von Solarzellen und Modulen stark vertreten. Die Nachfrage nach diesen Anlagen ging weltweit aufgrund der Überkapazitäten im Solarzellenmarkt stark zurück.

Das Schweizer Produktionsvolumen in der **Lasermaterialbearbeitung** tendierte im Jahr 2012 seitwärts bei rund 850 Mio. CHF.

Das Schweizer Produktionsvolumen in den **übrigen Bereichen** der Photonik erreichte im Jahr 2012 mit insgesamt rund 1.8 Mrd. CHF einen neuen Rekordwert. Gegenüber dem Vorjahr beträgt der Zuwachs ca. 2%.

Überblick

Trend der Produktion am Standort Schweiz im Jahr 2012

Im Einzelnen entwickelte sich das Produktionsvolumen in den „übrigen Bereichen“ im Jahr 2012 wie folgt:

• Optische Messtechnik & Bildverarbeitung: Produktionsvolumen ca. 700 Mio. CHF, Zuwachs im Jahr 2012 im niederen einstelligen Bereich.

• Optische Medizintechnik & Life Science: Produktionsvolumen 550 Mio. CHF, unverändertes Niveau gegenüber dem Vorjahr.

• Optische Informationstechnik: Produktionsvolumen rund 150 Mio. CHF, Zuwachs im Jahr 2012 im einstelligen Bereich durch positive Entwicklung im Segment Faseroptik.

• Optische Komponenten & Systeme: Produktionsvolumen 400 Mio. CHF, unverändertes Niveau gegenüber dem Vorjahr.

Überblick

Langfristiger Trend der Produktion am Standort Schweiz

Die Photonik-Industrie ist **weltweit** eine Wachstumsbranche. Die Umsatzsteigerungen sind langfristig höher als das globale Wirtschaftswachstum[1]. Dem langfristigen Wachstumstrend sind konjunkturelle Schwankungen überlagert. Diese betreffen insbesondere Photonik-Produkte, die dem Investitionsgüterbereich zuzurechnen sind wie die Lasermaterialbearbeitung und die optische Messtechnik & Bildverarbeitung. In den letzten Jahren wies auch die Photovoltaik starke Nachfrageschwankungen auf.

Die **Schweizer** Photonik-Industrie stand im Verlauf der Jahre seit 2007[2] zunächst unter dem Einfluss der Wirtschaftskrise von 2009. In den Jahren seit 2010 hat der aufwertende Schweizer Franken die Wettbewerbsfähigkeit und den Umsatz der stark exportorientierten Branche erheblich belastet. Der veränderte Wechselkurs hat bis heute starke Auswirkungen, obwohl die grössten Wechselkursverschiebungen drei Jahre zurückliegen. Die Auswirkungen betreffen insbesondere die Profitabilität, die Wettbewerbsfähigkeit und die Gewinnung von Neugeschäften.

1) Umsatz und Prognose für die Photonik-Industrie weltweit und in Europa wurden von Optech Consulting in mehreren Studien untersucht; vgl. www.optech-consulting.com/html/photonicsreports.html.

2) Für das Jahr 2007 wurden erstmals Daten zur Photonik in der Schweiz erhoben.

Überblick

Langfristiger Trend der Produktion am Standort Schweiz

Das bisher grösste Produktionsvolumen erzielte die Schweizer Photonik-Industrie im Jahr 2008 mit nahezu 4.5 Mrd CHF. Im Jahr 2012 lag das Volumen mit 3.3 Mrd. CHF um 27% tiefer. Der Umsatzrückgang wurde vorallem verursacht durch die Bereiche **Photovoltaik** (Rückgang um rund 850 Millionen CHF) und **Lasermaterialbearbeitung** (Rückgang um rund 400 Millionen CHF). In beiden Bereichen lagen Sonderentwicklungen vor. Die **übrigen Bereiche** der Photonik konnten in Summe das Produktionsvolumen im Zeitraum 2008 bis 2012 trotz der Belastungen durch die Wechselkursentwicklung steigern und erreichten im Jahr 2012 ein neues Rekordvolumen von rund 1.8 Mrd. CHF, knapp über dem bisherigen Spitzenwert aus dem Jahr 2008. Dies umfasst die Bereiche optische Messtechnik & Bildverarbeitung, Medizintechnik & Lifescience, Informationstechnik sowie optische Komponenten & Systeme.

Im Bereich **Photovoltaik** wurde das bisher größte Produktionsvolumen in der Schweiz mit rund 1.5 Mrd. CHF im Jahr 2008 erzielt, ein Wert der, nach zwischenzeitlichem Rückgang im Jahr 2009, auch wieder im Jahr 2011 erreicht wurde. Im Jahr 2012 brach das Produktionsvolumen in der Schweiz auf nur noch rund 600 Mio. CHF ein. Grund hierfür ist ein drastischer Einbruch der weltweiten Nachfrage für Anlagen und Maschinen zur Herstellung von Solarzellen und Modulen aufgrund der globalen Überkapazitäten im Solarzellenmarkt.

Überblick

Langfristiger Trend der Produktion am Standort Schweiz

In der **Lasermaterialbearbeitung** wurde das bisher grösste Produktionsvolumen in der Schweiz mit 1.4 Mrd. CHF im Jahr 2007 erzielt. Dem dramatischen Nachfrageeinbruch im Krisenjahr 2009 auf nur noch 440 Mio. CHF folgte eine rasche Erholung in den Jahren 2010 und 2011. Das Volumen von derzeit rund 850 Mio. CHF liegt jedoch deutlich unter der alten Höchstmarke. Ein Grund hierfür sind Belastungen durch den starken Schweizer Franken. Ein weiterer Grund ist die Gewichtsverlagerung der globalen Nachfragemärkte nach Asien, die auch Produktionsverlagerungen nach sich zog.

Überblick

Trend der Produktion am Standort Schweiz im Jahr 2013

Die folgenden Angaben zur Umsatzentwicklung im Jahr 2013 beruhen auf Daten und Informationen, die zum Zeitpunkt der Datenrecherche (Oktober / November 2013) verfügbar waren.

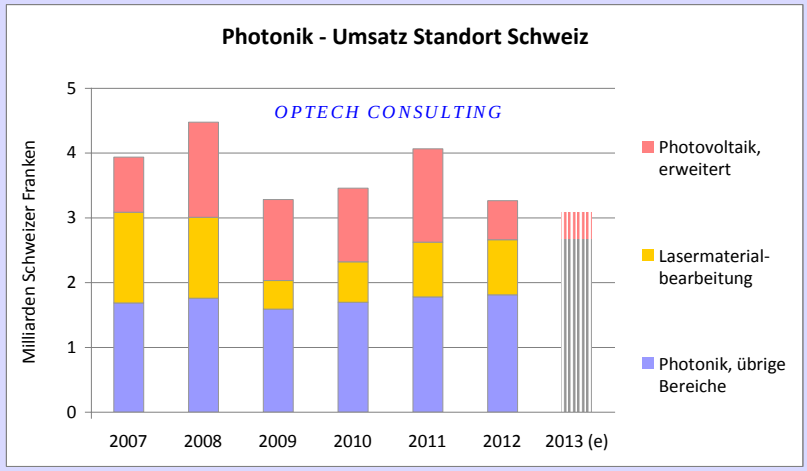
• In der Photovoltaik zeichnet sich ein weiterer deutlicher Rückgang des Produktionsvolumens ab. Dies ist vorallem bedingt durch die weltweit weiter rückläufigen Ausrüstungsinvestitionen der Solarzellen- und Modulhersteller. Die Dynamik des Abwärtstrends hat sich im Jahresverlauf abgeschwächt und einzelne Unternehmen berichten in jüngster Zeit von einer Bodenbildung oder einer wieder anziehenden Nachfrage.

• In der Lasermaterialbearbeitung ist wie im Vorjahr ein Seitwärtstrend des Produktionsvolumens zu erwarten.

• Für die übrigen Bereiche der Photonik zeichnet sich insgesamt ein Seitwärtstrend mit leicht positivem Vorzeichen ab.

• Wegen des grossen Gewichts des Bereiches Photovoltaik deutet sich für 2013 ein moderater Rückgang des Produktionsvolumens der Schweizer Photonik insgesamt ab.

Überblick



Überblick

Trend der Schweizer Produktion in US-Dollar

Die Schweizer Photonik-Industrie ist mit einem Auslandsabsatzanteil von rund 90% stark exportorientiert. Entsprechend sind Umsatzentwicklungen auch vor dem Hintergrund von Wechselkursveränderungen zu bewerten.

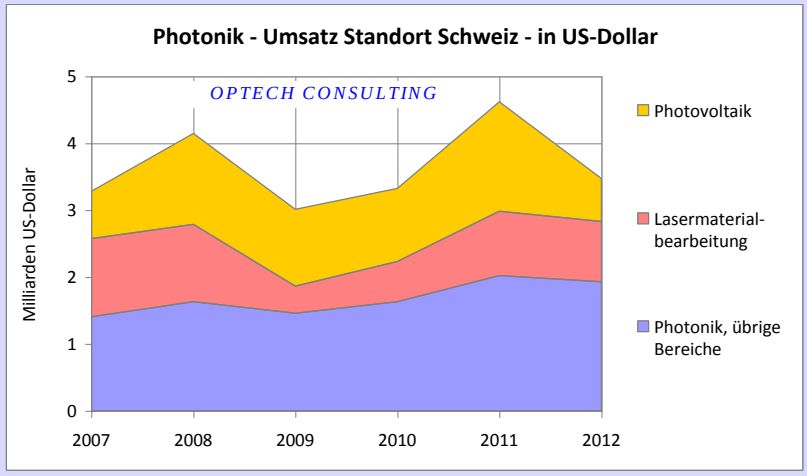
Im Zeitraum von 2007 bis 2012 wertete der Schweizer Franken um 36% gegenüber dem Euro und um 28% gegenüber dem US-Dollar auf (jeweils bezogen auf die durchschnittliche jährliche Währungsrelation).

Betrachtet man die Umsatzentwicklung der Schweizer Photonik-Industrie in US-Dollar, dann ergibt sich im Vergleich zur Darstellung in Schweizer Franken ein stark unterschiedliches Bild:

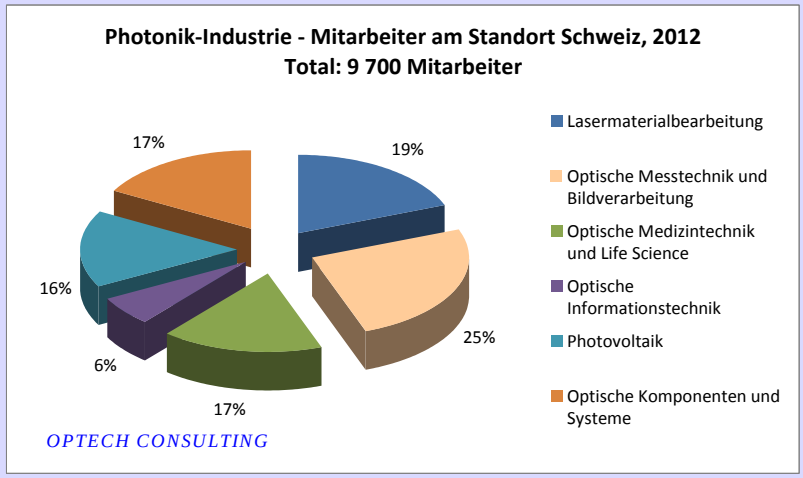
• Das Gesamtvolumen der Schweizer Produktion in Höhe von 3.5 Mrd. US-Dollar liegt über dem Wert von 3.3 Mrd. US-Dollar für das Jahr 2007 (Beginn der Zeitreihe). Produktionsrückgänge in den Bereichen Photovoltaik und Lasermaterialbearbeitung wurden durch Steigerungen in den übrigen Bereichen der Photonik mehr als kompensiert.

• Die „übrigen“ Bereiche der Photonik - optische Messtechnik & Bildverarbeitung, optische Medizintechnik & Life Science, optische Informationstechnik, optische Komponenten & Systeme - konnten das Produktionsvolumen um mehr als 30% steigern, von rund 1.4 Mrd. US-Dollar im Jahr 2007 auf 1.9 Mrd. US-Dollar im Jahr 2012. Die mittlere jährliche Zuwachsrate beträgt rund 6%.

Überblick



Überblick



Überblick

Mitarbeiter

Zum Jahresende 2012 beschäftigte die Schweizer Photonik-Industrie ca. 9700 Mitarbeiter.

Die meisten Mitarbeiter sind mit 25% der Beschäftigten im Bereich optische Messtechnik & Bildverarbeitung angestellt, gefolgt vom Bereich Lasermaterialbearbeitung (19%), optische Medizintechnik & Life Science (17%), Optische Komponenten & Systeme (17%), sowie Photovoltaik (16%). Auf die optische Informationstechnik, diese umfasst in der Schweiz vor allem Unternehmen der Kommunikationstechnik und der Drucktechnik, entfallen 6% der Mitarbeiter.

Im Vergleich zum Vorjahr nahm die Beschäftigung im Jahr 2012 um 5% ab. Ausschlaggebend hierfür war die Entwicklung im Bereich Photovoltaik, wo aufgrund der aktuellen Branchenkrise im Jahresvergleich mehr als 25% der Arbeitsplätze in der Schweiz verloren gingen. Die Beschäftigungsentwicklung in den anderen Bereichen der Photonik war insgesamt leicht positiv (+1%).

Seit dem Jahr 2007 hat die Anzahl der Mitarbeiter in der Photonik in der Schweiz um insgesamt 2% zugenommen. Die Entwicklung war in den einzelnen Bereichen unterschiedlich. In den Bereichen optische Informationstechnik (+15%), Medizintechnik & Life Science (+9%), Photovoltaik (+9%) und optische Komponenten & Systeme (+5%) nahm die Beschäftigung zu. Im Bereich optische Messtechnik & Bildverarbeitung war die Beschäftigung annähernd stabil (-2%). Im Bereich Lasermaterialbearbeitung nahm die Beschäftigung ab (-12%).

Überblick

Vergleich mit der Photonik in Europa und weltweit

Das globale Produktionsvolumen Photonik umfasste im Jahr 2011[1,2,3]:

- Weltweit rund 350 Mrd. EUR
- In Europa rund 60 Mrd. EUR
- In Deutschland 27 Mrd. EUR

Im Vergleich dazu betrug das Umsatzvolumen der Schweizer Photonik-Industrie in demselben Jahr 3.3 Mrd. EUR (4.1 Mrd. CHF) bzw. anteilig:

- 5.5% der Produktion in Europa
- Ca. 1% der weltweiten Produktion

1) Optech Consulting in „Branchenreport Photonik“, 2012, Herausgeber BMBF, VDMA, Spectaris, ZVEI; vgl. www.optech-consulting.com/html/photonicsreports.html.

2) Für das Jahr 2012 liegen keine Daten zur weltweiten und europäischen Photonik-Produktion vor.

3) Zu beachten ist, dass die Photonik im vorliegenden Bericht im Vergleich zum genannten „Branchenreport Photonik“ zum Teil unterschiedlich abgegrenzt ist. Insbesondere umfassen die Daten für die Schweiz Produktionsanlagen sowie Komponenten der Photovoltaik, die im „Branchenreport Photonik“ nicht einbezogen sind.

Überblick

Vergleich mit der Photonik in Europa und weltweit

Die Produktion in der Schweiz hält in folgenden Bereichen besonders hohe Anteile an der europäischen Produktion (2011):

- Lasermaterialbearbeitung: ca. 20% Anteil
- Photovoltaik: zweistelliger Prozentanteil. Genaue Vergleichsdaten für Europa sind in der Bereichsabgrenzung des vorliegenden Berichts nicht verfügbar (vgl. Fussnote auf der vorherigen Seite).
- Medizintechnik & Life Science: ca. 6% Anteil
- Bildverarbeitung & Messtechnik: ca. 6% Anteil
- Optische Komponenten & Systeme: ca. 4% Anteil

Überblick

Vergleich mit der Photonik in Europa und weltweit

Das weltweite Produktionsvolumen in der Photonik ist in den Jahren 2008 bis 2011 von rund 280 Mrd. EUR auf 350 Mrd. EUR angestiegen[1], entsprechend einer mittleren jährlichen Zuwachsrate von 7.7%.

Das Produktionsvolumen in der Photonik in der Schweiz ist in demselben Zeitraum von rund 2.85 Mrd. EUR auf 3.3 Mrd. EUR angestiegen, entsprechend einer mittleren jährlichen Zuwachsrate von rund 5%. Zu beachten ist, dass das Produktionsvolumen in Schweizer Franken in diesem Zeitraum gefallen ist, von 4.5 Mrd. CHF auf 4.1 Mrd. CHF.

Im internationalen Vergleich hat sich der Standort Schweiz im betrachteten Zeitraum seinen umsatzmässigen Anteil nahezu behauptet, trotz der Aufwertung des Schweizer Franken, die in diesen Zeitraum fiel. Allerdings ist anzumerken, dass dies bei vielen beteiligten Unternehmen mit Preisnachlässen und entsprechenden Auswirkungen auf den Gewinn einher ging. In Diskussionen zu dieser Untersuchung wurde darauf hingewiesen, dass die Gewinnung von Neugeschäften am Standort Schweiz derzeit schwierig ist. Der Anpassungsprozess an die neue Wechselkurssituation scheint noch nicht abgeschlossen zu sein.

1) Optech Consulting in „Branchenreport Photonik“, 2012, Herausgeber BMBF, VDMA, Spectaris, ZVEI; vgl. www.optech-consulting.com/html/photonicsreports.html.

Lasermaterialbearbeitung

Produkte

- Lasersysteme
  - Makrobearbeitung
    - Lasersysteme zum Schneiden
    - Lasersysteme zum Schweissen
    - Lasersysteme zum Beschriften
    - Lasersysteme zum Gravieren etc.
  - Mikrobearbeitung
    - Lasersysteme für die Produktion von Halbleitern, Leiterplatten, Flachdisplays, Solarzellen etc.
- Laser
  - CO2-Laser
  - Festkörperlaser
  - Diodenlaser
  - Excimerlaser

Lasermaterialbearbeitung

Kennzahlen Schweizer Industrie 2012

Produktion

Das Produktionsvolumen (Umsatz Standort Schweiz) lag im Jahr 2012 bei 850 Mio. CHF, ungefähr auf demselben Niveau wie im Vorjahr.

Seit dem Jahr 2007, mit dem Spitzenumsatz von 1.4 Mrd. CHF, ist das Produktionsvolumen um nahezu 40% gefallen. Zwischenzeitlich, im Jahr 2009, war das Produktionsvolumen sogar auf weniger als 450 Mio. CHF gefallen, oder nahezu 70% unter den Höchstwert aus dem Jahr 2007.

Die Gründe für den Umsatzrückgang sind vielfältig. Zunächst war im Jahr 2009 in der Branche weltweit ein Umsatzrückgang von rund mehr als 40% zu verzeichnen. Der Umsatzrückgang war im Bereich der Laserblechschneidanlagen noch deutlich größer. Die Produktion in der Schweiz ist stark auf dieses Segment konzentriert.

Weitere Gründe für den Umsatzrückgang waren der ansteigende Kurs des Schweizer Franken, sowie die Verschiebung der globalen Nachfrage nach Asien, die auch Produktionsverlagerungen nach sich zog.

Im Jahr 2011 wuchs das Produktionsvolumen um 35%, nach einer Steigerung um mehr als 40% im Jahr 2010. Dies reichte jedoch nicht aus, um den alten Höchststand wieder zu erreichen.

Lasermaterialbearbeitung

Kennzahlen Schweizer Industrie 2012
- Fortsetzung -

Beschäftigung

Der Bereich Lasermaterialbearbeitung beschäftigte im Jahr 2012 in der Schweiz ca. 1850 Mitarbeiter, ebenso viele wie in den beiden Vorjahren 2010 und 2011.

Im Vergleich zum Höchststand in den Jahren 2007 und 2008 entspricht dies einem Rückgang der Beschäftigung um 10% bis 15%. Dieser Rückgang ist moderat im Vergleich zum Umsatzrückgang von nahezu 40%.

Lasermaterialbearbeitung

Kennzahlen Schweizer Industrie 2012
- Fortsetzung -

Lasermaterialbearbeitung als Teil der Schweizer Photonik und internationaler Vergleich

Die Lasermaterialbearbeitung steht für 26% der Photonik „Made in Switzerland“ (insgesamt 3.3 Mrd. CHF).

Die 1850 Beschäftigten stehen für rund 19% aller Beschäftigten in der Photonik in der Schweiz (insgesamt ca. 9700 Beschäftigte).

Das Schweizer Produktionsvolumen (Umsatz Standort Schweiz) in der Lasermaterialbearbeitung entspricht ca. 9% der weltweiten Produktion[1].

1) Nach Erhebungen von Optech Consulting betrug weltweite Produktionsvolumen für Lasersysteme zur Materialbearbeitung im Jahr 2012 ca. 7.8 Mrd. EUR.

Lasermaterialbearbeitung

Hersteller und Produkte

Hersteller (alphabetisch)	**Wichtige Photonik-Produkte am Standort Schweiz**
Bystronic (Conzzeta)	Laser-Flachbettschneidanlagen, Hochleistungs-CO2-Laser
Lasag (Rofin Sinar)	Festkörperlaser zum Feinschneiden und Feinschweissen
Leister	Laser-Kunststoffschweisssysteme
Oclaro	Hochleistungslaserdioden (Aktivität in Zürich im Jahr 2013 an II-VI Inc. veräussert)
Soutec (Andritz)	Laserschweisssysteme
Synova	Schneidanlagen auf Basis Laser-Micro-Jet
Tokyo Electron (vormals Oerlikon Solar)	Laser-Strukturierungsanlagen für Solarzellen
Trumpf	Laser-Flachbettschneidanlagen, Laser-Beschrifter

Weitere Hersteller: Laser Automation, Swisstec, Sysmelec

Messtechnik und Bildverarbeitung

Produkte

- Bildverarbeitung
  - Systeme (inkl. Software)
  - Komponenten: Kameras, Beleuchtung etc.
- Optische Messtechnik
  - Binärsensoren
  - Messgeräte
    - Messgeräte für die Halbleiterindustrie
    - Messgeräte für faseroptische Netzwerke
    - Spektrometer und Spektrometermodule
    - Messgeräte für die Bauindustrie, Geodäsie
    - Sonstige Messgeräte: für Geometrie, Dynamik, Partikel etc.

Messtechnik und Bildverarbeitung

Kennzahlen Schweizer Industrie 2012

Produktion und Beschäftigung

Das Produktionsvolumen in der Schweiz lag im Jahr 2012 bei rund 700 Mio. CHF.

Der prozentuale Umsatzzuwachs im Vergleich zum Vorjahr lag im unteren einstelligen Bereich.

Die Branche beliefert ein breites Spektrum von Industriebereichen. Bedingt durch die starke Exportorientierung in einem wettbewerbsintensiven Umfeld hat die ungünstige Währungsrelation im Jahr 2012 wie schon im Vorjahr den Umsatz belastet.

Im Bereich optische Messtechnik & Bildverarbeitung waren in der Schweiz im Jahr 2012 ca. 2500 Mitarbeiter beschäftigt. Dieser Wert liegt auf dem Vorjahresniveau.

Messtechnik und Bildverarbeitung

Kennzahlen Schweizer Industrie 2012
- Fortsetzung -

Charakterisierung und Vergleich international

Der Bereich optische Messtechnik & Bildverarbeitung steht nach Umsatz für 21% der Photonik „Made in Switzerland“.

Die 2450 Beschäftigten stehen für 25% aller Beschäftigten in der Photonik in der Schweiz.

Das Schweizer Produktionsvolumen im Bereich optische Messtechnik & Bildverarbeitung entspricht ca. 6% der Produktion in Europa und ca. 2% der weltweiten Produktion.

Messtechnik und Bildverarbeitung

Hersteller und Produkte

Hersteller	Bildverarbeitung	Binärsensoren, Lichtschranken	Sonstige Optische Messtechnik
Leica Geosystems			Geräte zur räumlichen Vermessung für Bauindustrie, Geodäsie etc.
Cedes		X	
Baumer	X	X	

Weitere Unternehmen (alphabetisch):

AOS, Altrona, Automelec, Brunner, BR Automation, Colybris, Compar, Contrinex, Elag, Fabrimex, Fisba Optik, Heliotis, id Quantique, iTech, Inspecto, IR Microsystems, Luciol Instruments, Lynceetec, Machine Vision, Mesa Imaging, Photonfocus, Projectina, Qualimatest, Qualivision, Robco, Sensoptic, Sontec, Systron, Volpi, Weinberger.

Medizintechnik und Life Science

Bereiche und Produkte

Bereiche

- Medizintechnik: Therapeutische Systeme, Diagnostiksysteme (In-Vivo- und In-Vitro-Diagnostik)
- Life Science: Systeme für pharmazeutische und biotechnologische F&E, Wirkstoffentwicklung)

Wichtige Produkte

- Endoskope und Endoskopiesysteme
- Brillengläser und Kontaktlinsen
- Therapeutisch-medizinische und kosmetische Lasersysteme
- Bildgebende Systeme: CR-Systeme (Computed Radiography), DR-Systeme (Digital Radiography), Fluoreszenz-Diagnostiksysteme, OCT-Systeme (Optical Coherence Tomography), Systeme für die Ophthalmologie
- Mikroskope und Operationsmikroskope
- Kapillarelektrophoresesysteme, DNA Sequenzer, Zellsortierer
- Plate- und Array-Reader/Scanner

Nicht einbezogen

- Nicht-photonische bildgebende Systeme (Kernspinresonanzsysteme, konventionelle Röntgensysteme)
- Systeme mit geringem Photonik-Anteil wie z.B. Pulsoximetriesysteme

Medizintechnik und Life Science

Kennzahlen Schweizer Industrie 2012

Produktion

Produktionsvolumen in der Schweiz 2012: ca. 550 Mio. CHF

Das Produktionsvolumen liegt ungefähr auf Vorjahresniveau und gut 10% höher als im Jahr 2007.

Beschäftigung

Beschäftigte: 1600.

Die Beschäftigung liegt auf Vorjahresniveau und damit rund 10% höher als im Jahr 2007.

Medizintechnik und Life Science

Kennzahlen Schweizer Industrie 2012
- Fortsetzung -

Charakterisierung und Vergleich international

Optische Medizintechnik & Life Science steht umsatzmässig für 17% der Photonik „Made in Switzerland“ und nach der Anzahl der Mitarbeiter ebenfalls für 17%.

Das Schweizer Produktionsvolumen optische Medizintechnik & Life Science entspricht rund 6% der Produktion in Europa und 2% der weltweiten Produktion. Ohne die Berücksichtigung von Brillengläsern und Kontaktlinsen steht das Schweizer Produktionsvolumen im Bereich optische Medizintechnik & Life Science für ca. 10% der Produktion in Europa.

Medizintechnik und Life Science

Hersteller und Produkte

Hersteller	**Photonik-Produkte**
Leica Microsystems	Mikroskope, konfokale Lasermikroskope
Haag-Streit	Geräte für Ophthalmologen; bei Möller-Wedel in Deutschland auch Operationsmikroskope
Roche Diagnostics	Glucose-Messgeräte; DNA, RNA Analysesysteme, PCR
Swissray	Digitale Radiografiesysteme
Tecan	Microplate Readers, Microarray Scanners

Weitere Unternehmen (alphabetisch): Andromis, Fiberoptic, Heliotis, Lynceetec, Xenlux.

Optische Informationstechnik

Produkte Optische Kommunikationstechnik

Systeme für optische Netzwerke
- Telekommunikation: Fernübertragung, Metrobereich, Accessbereich
- Lokalen Netzwerke
- Kabel-TV (CATV) und Closed Circle TV (CCTV)

- WDM-Systeme
- Sonet / SDH / OED / MSPP-Systeme
- DCS, OCS (Bandbreitenmanagementsysteme)
- Netzwerkausrüstung für PONs
- optische Ethernetsysteme

Komponenten für optische Netzwerke
- Transmitter und Receiver, optische Faserverstärker
- Optische Koppler, Isolatoren, Abschwächer etc.

Optische Informationstechnik

Produkte Optische Drucktechnik

Lasersysteme für den Offsetdruck

- Druckplattenbelichter (Druckvorstufe)
- Digitale Druckmaschinen

Lasersysteme (Druckvorstufe) für den Hochdruck / Flexodruck

Lasersysteme (Druckvorstufe) für den Offsetdruck

Optische Informationstechnik

Kennzahlen Schweizer Industrie 2012

Produktionsvolumen in der Schweiz, 2012: 150 Mio. CHF

Beschäftigte: ca. 700

Der Umsatz stieg im Jahr 2012 im einstelligen Prozentbereich an, nachdem er in den beiden Vorjahren seitwärts tendierte. Der Anstieg war bedingt durch das Segment Kommunikationstechnik.

Im Jahr 2013 wird weiteres Wachstum im Segment Kommunikationstechnik erwartet. Dagegen werden Umsatz und Beschäftigung im Segment Drucktechnik durch den Konkurs eines Unternehmens rückläufig erwartet.

Optische Informationstechnik

Hersteller und Produkte Optische Kommunikationstechnik

Hersteller	**Photonik-Produkte**
Albis Optoelectronics	Photodioden
Beam Express	VCSELs
Diamond SA	Netzwerklösungen, faseroptische Verbinder
Huber+Suhner	Passive faseroptische Komponenten, Stecker, Faserkabel und Kabelsysteme
Oclaro	Laserdioden (Aktivität in Zürich im Jahr 2013 an II-VI Inc. veräussert)
Xenlux	passive Komponenten, Module

Optische Informationstechnik

Hersteller und Produkte Optische Drucktechnik

Hersteller	Photonik-Produkte
2012: Lüscher AG 2013: Lüscher Technologies AG (Wifag-Polytype Holding AG und Heliograph-Gruppe)	Druckvorstufensysteme (Laser-Druckplattenbelichter) für den Offsetdruck, Systeme für den Textil- und Siebdruck
Daetwyler (Heliograph-Gruppe)	Druckvorstufensysteme für den Tiefdruck (Lasergravursysteme und mechanische Gravursysteme) sowie für den Flexodruck (Laserstrukturierungssysteme).

Photovoltaik

Produkte

Solarzellen und -module

- kristalline Solarzellen und Module
- Dünnschichtsolarzellen und Module
- Solarzellen und -module auf Basis neuer Technologien, gedruckte, flexible Solarzellen

Wafer für kristalline Solarzellen

„Solar Grade“ Silizium für Wafer

Produktionsanlagen für kristalline und Dünnschichtsolarzellen und –module[1]

Inverter und Photovoltaik-Verbinder

1) Laserbearbeitungssysteme für die Herstellung von Solarzellen sind im Bereich „Lasermaterialbearbeitung“ berücksichtigt und im Bereich „Photovoltaik“ nicht enthalten. Nicht Laser-basierte Produktionsanlagen für Solarzellen- und module sind im Segment „Photovoltaik“ enthalten. Es sei angemerkt, dass Produktionsanlagen für andere Photonik-Produkte (ausserhalb der Photovoltaik) in der vorliegenden Studie nicht berücksichtigt sind.

Photovoltaik

Kennzahlen Schweizer Industrie 2012

Produktionsvolumen in der Schweiz 2012: ca. 600 Mio. CHF

Beschäftigte am Standort Schweiz 2012: ca. 1500

Die Daten für die einzelnen Unternehmen für den Standort Schweiz beruhen soweit vorhanden auf publizierten Daten sowie im Übrigen auf Berechnungen und Abschätzungen anhand publizierter Daten.

Die Daten zu Produktionsvolumen und Beschäftigung beziehen sich auf den Bereich Photovoltaik, d.h. nicht auf Gesamtumsatz und -beschäftigung der beteiligten Unternehmen.

Viele Unternehmen der Branche haben Produktionsstandorte in mehreren Ländern. Die genannten Daten zu Beschäftigung und Umsatz beziehen sich nur auf den Standort Schweiz. Es sei darauf hingewiesen, dass für die Inlandsproduktion mangels entsprechender Informationen zum Teil Schätzungen anhand der Beschäftigungsdaten verwendet wurden.

Photovoltaik

Kennzahlen Schweizer Industrie 2012

Das Produktionsvolumen im Bereich Photovoltaik am Standort Schweiz nahm im Jahr 2012 um mehr als 50% gegenüber dem Vorjahr ab.

Die Anzahl der Mitarbeiter ging gegenüber dem Vorjahr um rund 25% zurück (inkl. temporär Mitarbeitende).

Für das Jahr 2013 zeichnet sich, bedingt durch die weltweit weiter rückläufigen Ausrüstungsinvestitionen der Solarzellen- und Modulhersteller, ein weiterer deutlicher Rückgang bei Umsatz und Beschäftigung ab. Die Dynamik des Abwärtstrends hat sich im Jahresverlauf 2013 abgeschwächt und einzelne Unternehmen berichten in jüngster Zeit von einer Bodenbildung oder wieder anziehender Nachfrage.

Photovoltaik

Hersteller und Produkte

Hersteller	Photovoltaik-Produkte
Meyer Burger	MB Wafertec: Sägetechnologien und Trennverfahren für die Solar-, Halbleiter- und Optikindustrie 3S Photovoltaics, gebäudeintegrierte Solarsysteme 3S Modultec, Produktionsanlagen zur Herstellung von Solarmodulen Pasan: Messtechnik für Solarzellen und –module Roth & Rau (deutsches Tochterunternehmen mit wenig Mitarbeitenden in der Schweiz)
TEL Solar (Tokyo Electron), vormals Oerlikon Solar, im Jahr 2013 Merger Toyko Electron und Applied Materials	Komplettanlagen für die Produktion von Silizium-Dünnschicht-Solarmodulen

Photovoltaik

Hersteller und Produkte - Fortsetzung

Hersteller	Photovoltaik-Produkte
Flisom	flexible Solarzellen (Entwicklung)
Applied Materials Switzerland (vormals HCT Shaping Systems)	Drahtsägen für Solar-Wafer
Komax Solar	Produktionssysteme für kristalline und Dünnschichtsolarzellen und Module
Multi-Contact	Elektrische Verbinder für die Photovoltaik
Sputnik Engineering	netzgekoppelte Solarwechselrichter

Optische Komponenten und Systeme

Produkte

Optisches Glas

Optische Komponenten
- Linsen
- Planoptische Komponenten
- gefasste und ungefasste Komponenten
- verkittete Linsen

Opto-elektronische Komponenten
- Kameraröhren (Halbleiterbildsensoren sind der Informationstechnik zugeordnet)
- Laser (ohne Materialbearbeitung, Medizintechnik, Kommunikationstechnik)
- Optische Sensorelemente (ohne Kommunikationstechnik)

Standardkomponenten mit grossen Umsätzen sind dem jeweiligen Anwendungsbereich zugeordnet (z.B. Laser zur Materialbearbeitung, Bildsensoren für Digitalkameras etc.

Optische Systeme
- Objektive (ohne Objektive für die Mikrolithografie; in der Produktionstechnik eingeordnet).
- Klassische Optiksysteme wie Teleskope, Spektive, Ferngläser, 35 mm Kameras, Ausrüstung für die Bearbeitung von Fotos und Filmen
- Professionelle Video- und Fernsehkameras

Optische Komponenten und Systeme

Kennzahlen Schweizer Industrie 2012

Produktionsvolumen in der Schweiz 2012: ca. 400 Mio. CHF

Beschäftigte: ca. 1600

Im Jahr 2012 tendierte der Branchenumsatz seitwärts, nach einer Steigerung von gut 5% im Vorjahr.

Auch die Anzahl der Mitarbeiter 2012 ist im Jahresvergleich unverändert, nach einem leichten Anstieg im im Vorjahr.

Einzelne Unternehmen dieses Bereiches entwickelten sich in den letzten Jahren teilweise sehr unterschiedlich. Hierin kommt auch die starke Diversifikation des Bereiches zum Ausdruck, der zahlreiche Abnehmerindustrien und unterschiedliche Produktintegrationsstufen umfasst.

Der Bereich optische Komponenten & Systeme steht für 12% der Photonik „Made in Switzerland“ und für 17% der Beschäftigten.

Das Schweizer Produktionsvolumen entspricht rund 5% der Produktion in Europa und 2% der weltweiten Produktion.

Optische Komponenten und Systeme

Hersteller und Produkte

Hersteller	Photonik-Produkte
Fisba Optik	Optische und mikrooptische Komponenten und Systeme, Lasermodule, Messgeräte
SwissOptic	Optische Komponenten und Systeme, Beschichtungen
Schott Suisse (vormals Schott Guinchard)	Optisches Glas, Optische Komponenten
Balzers Optics, Liechtenstein	Optische Komponenten
Vectronix	Wehrtechnische Systeme, Beobachtungssysteme, Range Finders

Weitere Unternehmen (alphabetisch):

Alpes Laser, Bookham, Escatec, Exalos, Fiberoptic, Fischer Connectors, id Quantique, IMT, Industrial Laser Electronics and Engineering I.L.E.E., Leister, Mikrop, Onefive, Silitec Fibers, Sinar, Rainbow Photonics, Spectros, Süss Microoptics, Time-Bandwidth Products, Volpi, Zünd Optics, WZW Optic, Xenlux, Zünd Optics.

OPTECH CONSULTING

PHOTONIK IN DER SCHWEIZ
WIRTSCHAFTLICHE BEDEUTUNG

Optech Consulting Dr. Arnold Mayer
Bahnhofstrasse 20A
8274 Tägerwilen / TG
Tel. +41 71 667 0990
www.optech-consulting.com

Photonics

Photonics is all about making the properties of light usable for technological developments. Optical technologies cover a wide range of areas, from lasers and laser systems for materials processing, through photovoltaics, image processing and metrology to medical and information technologies.

The Photonics division is an industry network for developers, manufacturers and suppliers of photonic and optical systems and/or system components, as well as for representatives of universities and research institutions. Photonics is a key technology for the medium of light and has substantial leverage within other industries and service sectors. With annual growth of 7.5%, photonics plays a major role in creating new jobs.

The division works closely on innovation promotion with Swissphotonics, the national thematic network (NTN) for photonics.

Members

- APM Technica AG, Heerbrugg / SG
- Axetris AG, Kägiswil / OB
- Berner Fachhochschule, Hochschule für Technik und Architektur Burgdorf, Burgdorf
- Bystronic Laser AG, Niederönz / BE
- CEDES AG, Landquart / GR
- Class 4 Laser Professionals AG, Lyss / BE
- Escatec Switzerland AG, Balgach / SG
- ESPROS Photonics AG, Sargans / SG
- Fachhochschule Nordwestschweiz -Hochschule für Technik, Windisch / AG
- Feinwerkoptik Zünd AG, Werdenberg / SG
- Fisba Optik AG, St. Gallen / SG
- flo-ir GmbH, Oberdorf / NW
- greenTEG AG, Zürich / ZH
- Hochschule für Technik und Wirtschaft HTW Chur, Chur / GR
- I.L.E.E. AG, Urdorf / ZH
- IMT Masken und Teilungen AG, Greifensee / ZH
- Inspire AG, Zürich / ZH
- Interstaatliche Hochschule für Technik Buchs NTB, Buchs / SG
- MESA Imaging AG, Zürich / ZH
- Mikrop AG, Wittenbach / SG
- Optotune AG, Dietikon / ZH
- ROFIN-LASAG AG, Thun / BE

- SCHOTT Suisse SA, Yverdon / VD
- Sercalo Microtechnology Ltd, Neuchâtel / NE
- Spectros AG Präzisionsoptik & Feinmechanik, Ettingen / BL
- SUSS MicroOptics SA, Hauterive / NE
- SwissOptic AG, Balgach / SG
- Swissphotonics NTN
- Synova S.A., Ecublens / VD
- Time-Bandwidth Products AG, Schlieren / ZH
- Trumpf Laser Marking AG, Grüsch / GR
- TRUMPF Maschinen AG, Baar / ZG
- Vectronix AG, Balgach / SG
- WZW OPTIC AG, Balgach / SG
- Xenlux AG, Buochs / NW
- Zünd precision optics, Diepoldsau / SG