

Hub of Application Laboratories for Equipment Assessment  
In Laser Based Manufacturing

## Editorial

*Dear APPOLO newsletter readers,*



One of the most exciting and challenging activities during the first part of the year 2015 was the open competitive call for new partners and experiments. The exercise was full of interaction with completely new companies interested in validating their products at the APPOLO HUB or in the search of emerging applications for laser technologies in new fields. Exciting ideas were shared among the APPOLO HUB members in order to find the most experienced partner from the HUB to serve validation and assessment jobs for our potential customers. Plenty of requests were discussed leading to proposals submitted to the call. Highly experienced experts ranked all the proposals through a rigorous review process in which seven new experiments were selected for implementation. This brought us 14 new partners from 7 countries.

The new partners joining the consortium are made up of new beam guiding and system integration firms as well as laser companies. They also represent SMEs that have been invited to utilize the opportunity to validate their products at the APPOLO HUB and advance them to the industrial market.

In addition, the APPOLO consortium enhanced its efforts in development and validation of novel laser technologies for automotive, energy, engineering and electronics applications, with large multinational companies on board. Novel application fields in bio and nanotechnologies are further enhanced by innovative SMEs as end-users.

This enlargement of the consortium proceeds in parallel with efforts by research and industry teams in already planned APPOLO activities validating high efficiency and precise surface texturing, selective and damage-free scribing of thin films solar cells, and various approaches to the fabrication of metallic interconnects. Moreover, process monitoring developments during the second year encourage acquisition of reliable tools in controlling production lines. Lastly, I am pleased to report, that we as a team, were able to overcome challenges along the assessment value chains.

We hope you enjoy this edition of the APPOLO newsletter,  
Gediminas Račiukaitis, Project Coordinator

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# Focus Topic

## *APPOLO Open Call Results*

### **Seven new assessment experiments with fourteen new partners**

APPOLO has new project partners. Following the open call for assessment experiments involving new laser processing equipment for emerging manufacturing technologies based on ultra-short (sub-ns) pulses, APPOLO is proud to announce seven new assessment projects with fourteen new project partners. The projects that were selected span Europe, industry and application focus but also take advantage of APPOLO HUB's close collaboration between equipment supplier, end-user and a HUB application laboratory to demonstrate applicability of the new equipment or application for industrial use. Each is a 2-year, partly funded project and is intended to validate novel technologies and applications for commercialization into larger markets. The APPOLO HUB is a network of laser application laboratories that provide laser micromachining assessment services for industry partners and has the beneficial function of collecting and transferring experiences and technologies in ultra-short pulse lasers. The goal of these new projects is to increase the overall impact of the APPOLO project by adding new applications and end users.

### **Summary of the Assessment Experiments**

#### **1. A new fibre-based delivery system for pulsed laser beams (NEW DELI)**

The NEW-DELI project gathers together two SMEs, a technology provider, an end-user, and a lab belonging to the APPOLO HUB to experimentally assess a cutting edge ultra-short pulse fibre delivery system in a practical use case. This project has a relevant potential market since it targets the next generation of additive-subtractive manufacturing machines. Additive manufacturing from metal powders is the fastest growing material processing application and is revolutionizing many fabrication processes, especially of complex and highly customized parts. Further widening of its deployment requires tailoring the surface quality of the products.

This in turn calls for the combination of additive with subtractive manufacturing processes, the latter to be performed using ultra-short pulse lasers.

#### **2. Fast and Accurate Scanning for micro-milling of low friction surface Textures (FAST)**

A leading worldwide manufacturer and supplier of ball and roller bearings and liner motion products, together with SCANLAB AG, a world-leading OEM manufacturer of scan solutions in three dimensions, will seek to improve the 3D scanning system for the fabrication of functional surface textures on double curved surfaces to reduce friction. The aim of this project is to make scanning system improvements to increase the machine rate of the existing ultra-short pulse laser manufacturing process. Thereby, this project may lead to a more cost effective industrial application of laser micro-milling of surfaces to reduce friction, which in turn will help to introduce the technology into new and larger markets.

#### **3. Polymer NIR laser resonance texturing (PONT)**

Biomedical devices often need to function at a cellular level, meaning that their components' holes, cavities, channels and other features are in the micron range; thus the technology used for micromachining requires high levels of precision and control. The PONT project will evaluate the performance of resonant infrared ablation in the near infrared spectral range for micromachining polymers used in biomedical devices. The project aims at evaluating the performance of this resonant near-infrared ablation for high-precision and flexible manufacturing of bio-compatible and bio-active polymeric films such as chitosan and collagen used for titanium or ceramic prosthesis coating to promote living tissue reconstruction.

#### **4. Laser patterning of DRUM-moulds for large-area nano-imprinted polymer films (LADRUM)**

The aim of this project is to assess fast scanning technology together with ultra-short laser ablation processing to realize a fast patterning process of metal surfaces for writing hierarchical patterns onto coated cylinders that can be used for roll-to-roll nano-imprint lithography (R2R-NIL) processes. Nano-imprinted web patterns have wide applications in such fields as the automotive industry, to biomedical products, and self-cleaning surfaces.

## 5. Ultra-fast galvo-scanners for laser micromachining (FastGALVO)

Within the assessment experiment project, the newest generation of “ultra-fast” galvo-scanners will be validated within three different applications defined by two industrial end users. Recent advances in galvo-scanners have allowed the possibility to address power reserves in order to increase the maximum marking speed while maintaining or even improving higher accuracy. The results are expected guide the decision on the kind of applications and processes for which it is economically advantageous to use such a galvo-scanner vs. polygon scanners.

## 6. New Ultrafast Laser equipment for DECOrative finishing in automotive Chrome plated parts (DECOUL Cr)

This experiment addresses the assessment of new equipment to find optimal solutions for high added value laser texturing with ultrafast lasers for the automotive market. The idea is to improve the quality of special finishing produced by laser in chrome plated parts. This proposal is focused on assessing new laser sources, and specifically developed beam guiding systems to improve the morphological quality of particular ornamental finishing in automotive chromed plated parts. The laboratory of the APPOLO Hub participating in the experiment will be UPM which would cover the whole value chain from laser and other equipment suppliers, including machinery integrators, to the real assessment of innovative technologies for the automotive sector, thus offering new opportunities of business generation.

## 7. Novel SUB-Ns system assessment for Jewellery and Luxury fine marking and engraving Laser applications (SUN-JELL)

Nowadays, ultrafast lasers are already available in the market, however, only for 24/7 industrial operations. SISMA, a leading company in the industrial laser system manufacturing for material processing, and LAC, one of SISMA key-customers, found in APPOLO the right means to finalize their mutual project. While their prohibitive cost, high complexity and need of frequent maintenance and optical alignment make ultrafast lasers unsuitable business projects, thanks to the assessment support of the HUB member FTMC, the project will move forward. The aim of this project is the assessment of a Class 1 industrially accessible and feasible Q-switched laser system, operating in the sub-ns region for high-quality marking applications in jewelry.

We are glad to welcome the new project partners in the APPOLO Hub. Due to the new projects, APOLLO is able to increase its overall impact by adding new applications to the HUB as well as implementing novel assessments of value chains.

# <<News<<<News

## Grand Opening of Hertz-Application-Lab at IOM

After two years construction, the new Hertz-Application Laboratory of ion beam and material modification was inaugurated in mid-June 2015. The 4 Mio EURO cost of the new Hertz-Application Laboratory was co-funded by the German Federal Ministry (BMBF) and the Free State of Saxony. This included installation of a 10 MeV electron accelerator on the premises of IOM. With the aid of the acceleration technology provided by Mevex Corp., material modifications or time resolved baseline investigations can be conducted. The equipment will be used in joint projects with academic and industrial partners to develop industry-oriented high tech solutions.



© IOM

IOM Hertz-Application-Lab

Find the full article at:

[http://www.iom-leipzig.de/nachrichten-veranstaltungen-vorlesungen/stellenangebote/stellenangebot/?tx\\_ttnews%5bt\\_tnews%5d=39&cHash=a0a4075f097902c964c86ad326b88e67](http://www.iom-leipzig.de/nachrichten-veranstaltungen-vorlesungen/stellenangebote/stellenangebot/?tx_ttnews%5bt_tnews%5d=39&cHash=a0a4075f097902c964c86ad326b88e67)



### <News<<<News<

#### Flisom closes 4<sup>th</sup> financing round with pilot plant inauguration

Flisom, which started out as a ETH Zurich spin-off in 2005 and grew to its current size on the EMPA campus in Dübendorf, is developing roll-to-roll production technologies for low-cost, high-performance CIGS thin film solar cells on flexible plastic foil. Potential applications for Flisom's flexible solar module manufacturing technology include building integrated photovoltaics (BIPV) or building applied photovoltaics (BAPV). Within the last years, Flisom improved the design of roll-to-roll manufacturing machines for processing and scaled them up from 50 cm width to 1 meter width rolls.



**Flexible Solar Modules Manufacturing**

© Flisom

Flisom figures are impressive: the number of employees has increased from 15 to 55 in just one and a half years. The brand new 4.500 square meter pilot production plant in Niederhasli near Zurich, with a production capacity of 15 MW installed solar energy, represents the interim culmination of Flisom's development. Long-standing research cooperation between Flisom and EMPA, the Swiss Federal Laboratories for Materials Science and Technology, was the basis for this successful scale-up from lab to industrial levels. Combining EMPA's world-class CIGS processing knowhow with Flisom's proprietary laser patterning tools meanwhile led to the production of a monolithically interconnected mini-module on plastic film with an overall efficiency of 16.9%.

Find the full press release at:

[http://www.empa.ch/plugin/bean/empa/Article\\_PrintArticle?prartid=158780&wo=1](http://www.empa.ch/plugin/bean/empa/Article_PrintArticle?prartid=158780&wo=1)



**Grand Opening Pilot Plant**

© Flisom

Flisom growth development is just beginning: at the inauguration of its pilot production plant, Flisom secured another investment of CHF 10 million following an earlier investment of CHF 42.5 million just two years ago. The recently announced investment, which is the 4<sup>th</sup> funding round for Flisom, comes from the company's existing strategic investor, the Tata Group, a global enterprise headquartered in India. With the aid of the investment from the 3<sup>rd</sup> financing round received in 2013, Flisom was able to refurbish the factory building with a number of roll-to-roll processing machines.



**Grand Opening Pilot Plant**

© Flisom

According to Flisom CEO, Ulfert Rühle, the next step is to transfer the process know-how on the high-tech machines using specifically customized designs. In the long term, the 15 MW plant will serve as a blueprint for establishing larger production plants with a capacity of well over 100 MW. Executive Director of Tata Industries, K.R.S. Jamwal, adds further « *This investment marks Tata Group's interest in next-generation technology for the solar photovoltaic industry.* »

# ***APPOLO conducted Online Monitoring in Laser Processing Workshop***

On the 5<sup>th</sup> of June APPOLO organized a workshop entitled, "Online Monitoring in Laser Processing," was organized at LUT (Laboratory of Laser Materials Processing) in Lappeenranta, Finland. Laser micro machining and laser surface structuring are innovative manufacturing technologies that are useful in a wide range of machinable materials. However, novel innovative processes require online monitoring measurements combined with an adequate quality management. Therefore the addressed workshop sought to address the following topics:

- **development and validation of online laser processing monitoring and beam control systems,**
- **online process control during the assessment experiments,**
- **tool assessment and tool integration into laser processing monitoring and,**
- **real-time control and control algorithms development in laser processing.**

After opening remarks by Antti Salminen (Head of LUT Laboratory) which included presenting the APPOLO project within the FP7 framework, scientists from abroad as well as several experts from Finland discussed the state of the art in:

- **online monitoring (Dr. Tech. Andrey Samochvalov; PhD Candidate Ville-Pekka Maitlainen),**
- **laser processing visualization (Dr. Tech. Taito Alahautala),**
- **laser micro welding and scribing (M.Sc. Tech. Ville Hevonkorpi) as well as,**
- **ultrashort laser ablation (Dr. Tech. Jarno Kaakkunen) from NOKIA.**

Around 30 attendees joined the workshop. The attendees varied from academic doctoral students and senior researchers to company CEOs. Some visual impressions of the workshop can be found below:



Find more information at:

<http://www.appolo-fp7.eu/workshops.html>

# Meet the Consortium



© EKSPLA

EKSPLA is a manufacturer of advanced solid state lasers, laser systems and optoelectronics for basic research and industrial applications. EKSPLA products are used in a wide range of applications areas including material research, sum-frequency generation spectroscopy, flash-photolysis, plasma generation and diagnostics. The most common industrial applications; material processing, micromachining, inspection, marking, engraving and ablation have to be considered.

EKSPLA was founded more than 20 years ago by a small team of engineers united around the idea of making the most advanced lasers in the world. From the start, the whole team had a deep mutual respect and believed in and supported each other. Instead of asking "why me?" they asked "who, if not me?" These qualities remain at the heart of the EKSPLA culture.



**EKSPLA Picosecond Laser "Atlantic"**

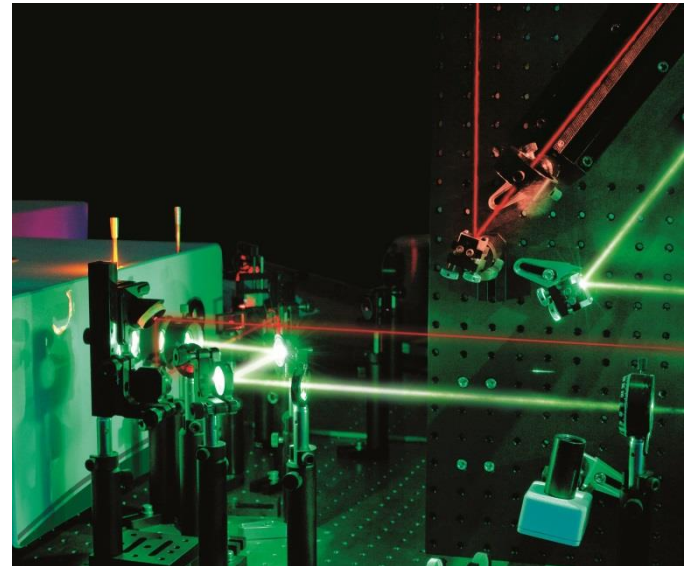
© EKSPLA

The company began its path of success in 1983 when the first picosecond laser was sold at its first launch event. As a spin-off out of EKSMA the new established company of EKSPLA entered into international markets.

Nowadays EKSPLA exports more than 90% of its products to more than 60 countries worldwide. The

company has built up a distributor network in more than 30 countries. Their main customers include *CERN, Cambridge University, Lawrence Livermore National Laboratory, NASA, RIKEN Nishina Center* in Japan and *the Chinese Academy of Sciences*.

Employing long years of experience and 120 employees in total, EKSPLA focuses on high performance advanced solutions. The in-house design and manufacturing capabilities ensure effective development and launching of new products. EKSPLA is providing its products and services according to the ISO 9001 standard to its customers. Lasers are available from single customized unit to OEM series.



**Assembly of Laser**

© EKSPLA

High peak power laser systems, short pulse generation and amplification, tunable nonlinear optical parametric oscillators/generators/amplifiers and nonlinear spectroscopy are among EKSPLA core competencies. The company claims a large part of the global market for scientific picosecond lasers and is one of the few in the world that make SFG spectrometers for material surfaces investigation.

Since the introduction of industrial picosecond diode-pumped solid state (DPSS) lasers by EKSPLA versatile tasks in industrial material processing can be realized. For instance direct laser marking is a widely used flexible and modern method for obtaining permanent marks containing traceability and identification information.

Direct laser marking is one of the EKSPLA's capabilities which are required within the APPOLO project.



EKSPLA is contributing to APPOLO in the following areas:

- customization of EKSPLA picosecond lasers with capability to control advanced scanning approaches and higher harmonics generation for laser material processing
- creation of a 1.34  $\mu\text{m}$  ps-laser prototype for validation in CIGS scribing processes with customization by scaling repetition rate and average power
- combined creation of a harmonics module for this prototype and testing of nonstandard wavelengths applications

EKSPLA efforts in R&D are evidently crowned with success. EKSPLA has recently updated its ultrafast fiber lasers line *LightWire* with new fiber laser models. Especially the new picosecond laser FP 200 is an excellent choice for seeding solid state linear amplifiers, eliminating the need for regenerative amplification. It can even be operated to optimize output from amplifiers for specific applications. Along with an optional second harmonic module it can also be used for applications like raman or fluorescence spectrometry and microscopy.



#### Ultrafast Fiber Lasers

© EKSPLA

The inventiveness of EKSPLA and broad knowledge of its engineers and physicists coupled with versatile skills of its further staff will leverage the APPOLO objectives.

In conclusion, the participation of EKSPLA within the APPOLO project is providing outstanding solid state laser knowhow to achieve the before-mentioned APPOLO objectives.

## Interview...

...with **Dr. Andrejus Michailovas**,  
Science Director of EKSPLA



**What are the biggest challenges in the field of laser-based manufacturing today?**

On the one hand, there is a growing demand for solutions tailored for specific processes and applications. Developers require various product customizations, like advanced scanning and control capabilities, higher harmonics generations or even non-standard wavelengths. On the other hand, when developing tailor-made products we need to keep in mind that they should be production line ready and reliable - 24/7 operations is a must.

**To which extent can APPOLO help to face those challenges?**

APPOLO provides an excellent infrastructure in solving these tasks. Close cooperation with partners enables to outsource some specific knowledge in design and developing of product prototypes. Furthermore, the presence of application labs and integrators with valuable knowhow gives feedback on process requirements as well as laser user experience.

# Meet the Consortium



© AMSYS

Amsys Ltd. is a small and dynamic privately owned company founded in 1989. The company is based in Jerusalem (Israel) and currently employs seven employees. The core areas of competence of Amsys are physics, optics, spectroscopy, electronics, fine mechanics, and image processing. The company specializes in electro-optical measurement and inspection systems with emphasis on compact devices.

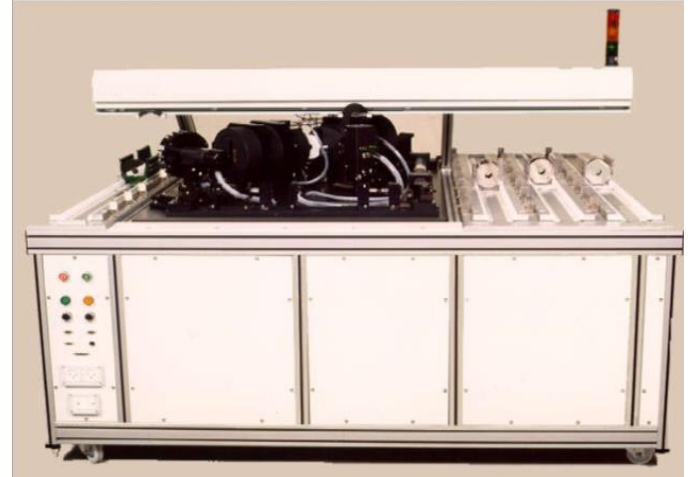


**AMSYS Laser Interferometer**

© AMSYS

Amsys follows an integrative system approach, from the development of core technologies to design and manufacturing of complete devices and systems. i2D (idea to device) is the company motto. The company has wide experience in optics-based surface inspection and metrology as well as measurement of a plethora of 3D objects. In particular they possess special capabilities in interferometry; diffractive optics; high-speed optical inspection of large-area glass and opaque surfaces with nanometer sensitivity based on laser scanning; measurement and tracking of position and orientation of objects in 3D space; complex alignment problems; and evaluation of shape and geometrical dimensions of various objects.

The company business is primarily based on various R&D projects, custom designs, prototyping and small series manufacturing, as well as support for startups. In parallel, the company is also developing product-type devices for metrology and process control.

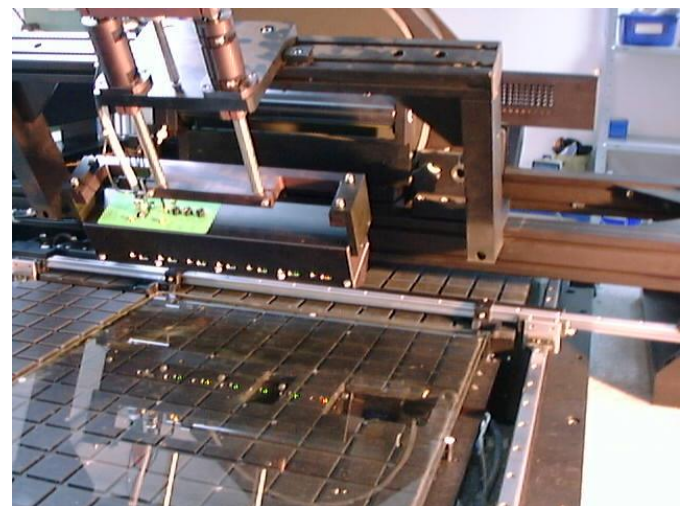


**Automatic Machine for Inspection of Hard Disk Substrates**

© AMSYS

Amsys is contributing to APPOLO in two main areas:

- building an online monitoring system for laser material processing equipment
- development of a combined focus and 2D-tilt measuring system for closed-loop robotic control in 3D laser processing



**Inspection of glass substrates by AMSYS solution**

© AMSYS



# Meet the Consortium

## Engage AG



Engage AG was founded in October 2003 and is focussing on IP Asset Management as well as on the founding and set-up of growth-oriented high tech companies. Therefore, the key competence of engage AG is creating value from intellectual property. In the field of IP Asset Management engage AG supports its customers and partners in the identification and the protection of marketable ideas and research results by means of industrial property rights, as well as in the elaboration and implementation of sustainable property right strategies. Both areas are linked together by the need to support or protect early stage research ideas and results for further development. Engage AG operations go along with close cooperation referring to leading universities and research institutions.

Engage AG started the close cooperation with leading universities and research institutions in the framework of a cooperation agreement several years ago. By means of systematic process ideas, technologies and research results are identified and evaluated from a commercial point of view. Particularly promising business ideas resulting from research are then commercialised in close cooperation with the key researchers. At several locations regional research institutions and the private partner engage AG have joined forces in a PPP (Public Private Partnership) thus providing the framework conditions required for a successful commercialisation of research results. Most of the partners come from research centers of the Helmholtz Association and the Leibniz Association as well as from leading universities.

The key competence of engage AG is creating value from intellectual property. Engage AG screens a large number of ideas, technologies and research results and evaluates them from a commercialization perspective. By means of a process, which has been developed over several years, technologies are selected, which are expected to achieve an above-average performance in the future. After a protection with industrial property rights appropriate commercialisation strategies are elaborated and implemented.

In case of founding a growth-oriented high-tech company together with the key researchers providing the cutting edge technologies engage AG takes over entrepreneurial responsibility in order to develop a sustainable business model, which generates revenues for the benefit of all parties involved. Almost all portfolio companies of engage AG are based on cutting edge technologies, which are mostly protected by several international industrial property rights.

Engage AG is able to revert to a global network of renowned experts in different technology and application fields. In particular, the members of the Global Advisory Board have excellent contacts. Reliable evaluations and conclusions regarding the state-of-the-art of relevant markets are significant to identify the commercialization potential. Furthermore, decision makers of potential licensees or buyers of property rights can be easily contacted. Engage AG and its staff can be characterised by the dealing with different perspectives of the research and entrepreneurial world.

In the course of the past five years, engage AG:

- has screened far more than **1,000 technologies** and research results to determine their suitability for a sustainable commercialization,
- was commissioned to screen more than **350 concrete inventions** of our clients' employees in regards to patenting, and commercialization potential,
- has achieved the granting of property rights in more than **50 cases already; another 250 cases** are pending in patent offices
- has signed approximately **70 licensing agreements** that can help to generate substantial commercialization results for engage's clients

Through the company's international activities engage AG built up a global network covering several technologies and areas of application. Engage AG offers invaluable support regarding the state-of-the-art in technology and relevant markets. Engage AG is commissioned to coordinate the research and development activities within the APPOLO project.

## Interview...

*...with Peter Häfner Senior Innovation manager at engage AG*



***What are the biggest challenges in the field of laser-based manufacturing today?***

*Advantages in laser and scanning technologies offer a wide range of exciting new opportunities for industrial users, as the abundance of applications APPOLO partners are working on demonstrates. A main challenge is to convince new users to invest in laser technologies for their manufacturing purposes. It will be particularly challenging to convince small and medium-sized companies to bet their money on a technology many still consider risky and not mature enough.*

**To which extent can APPOLO help to face those challenges?**

*The APPOLO partners and particularly the assessment labs, interlinked via the APPOLO HUB, can help inexperienced new users to reduce the risk involved. This will be done by assessing in a fast, affordable and reliable way whether the investment in laser technology will yield the as desired results and if the investment will eventually pay off.*

## <News<<<News<

### **Onefive receives ISO 9001:2008 & ISO 13485:2003 certification**

In June 2015 Onefive GmbH obtained ISO 9001:2008 and ISO 13485:2003 certifications. Founded in 2005 the company has been delivering industrial-grade femtosecond and picosecond laser modules that can be applied in the fields of nano-surgery, microscopy and other medical devices. The certifications have been accredited by DQS Medizinprodukte GmbH. The ISO 9001:2008 certification demonstrates that the company is committed to provide cutting edge technologies and to produce it with the highest levels of quality in all phases of the product's life. The ISO 13485:2003 standard specifies the requirement for a Quality Management System to ensure the production of devices that strictly fulfill the regulatory requirements of medical device production.

Onefive CEO, Lukas Krainer, states: "We are very thankful to our customers for their continued trust in our products, which led, in the last three years, to an increasing demand of our laser modules for several high-precision applications. Our highest priority is to satisfy our customers with continuous strong commitment to produce safe and accurate devices of the highest industrial standards."

Furthermore Onefive announced that due to increased demand for Onefive's laser modules, it has acquired new production and development facilities. The acquisition should significantly help to optimize the efficiency of Onefive's production lines while at the same time offering state of the art research and development facilities to its ever growing staff. The infrastructure investments include an agreement to acquire clean rooms that will be equipped with water and gas processing equipment. Relocation to the new facilities covering more than 2500 sq. meters will be completed by the end of fall 2015.

Find the full article at:

<http://www.onefive.com/news.html>

## <News<<<News<

### ***EKSPLA presented results of 1342nm laser development***

Within the symposium Optics + Optoelectronics executed by the Society of Photo-Optical Instrumentation Engineers (SPIE), EKSPLA Ltd. has demonstrated the results of Aleksej M. Rodin, and Mikhail Grishin, Andrejus Michailovas relating to design optimization of high average output power picosecond and nanosecond laser operating at 1342 nm wavelength for selective material processing.

Laser emission near 1342 nm wavelength is important for example for wafer marking or deep tissue imaging. Representatives of EKSPLA could generate pulses with the average output power of 11 W at repetition rate of 300 kHz. That is the highest average output power in picosecond mode of operation at 1342 nm wavelength.

Such a set of output laser parameters satisfies the requirements for selective CIGS scribing with high yield and throughput in the industry. Also a fraction of output power has been converted in optical pulses of 5 W at 671nm wavelength with 60 % efficiency.

Efficient wavelength conversion in 671 nm wavelength is interesting for high brightness RGB projectors or optical data storage. The results were presented on the 14th and 15th April in Prague at the Conference "High-Power, High-Energy and High-Intensity Laser Technology".

Detailed Results will be published in Optics & Laser Technology vol. 76(2016), p.46–52.

Find the full article at:

Aleksej M. Rodin, Mikhail Grishin, Andrejus Michailovas, Center for Physical Sciences and Technology, High average power picosecond and nanosecond laser operating at 1342 nm wavelength

## <News<<<News<

### **Next Scan Technology announces new scan head model at PHOTONICS 2015**

At the Laser World of Photonics, that took place June 22<sup>nd</sup> - 25<sup>th</sup>, Next Scan Technology has presented a new scan head model which enables 300 nm wide laser processing. Simultaneously high numerical aperture (NA) optics have been released to more than 30.000 visitors of the fair. The NA optics achieve smaller spot sizes and improve the overall processing quality. With the full telecentric mirror optics, the set up represents a compact all-in-one, ready to use scanner head.

## <News<<<News<

### ***Abengoa and Shikun & Binui closed financing for Ashalim***

Abengoa secured financing for the Israeli solar thermal plant Ashalim by closing a non-recourse project financing together with its partner Shikun & Binui a global active infrastructure group. The total investment of the project will be approximately USD 1 billion. The 110 MW solar thermal electricity (STE) plant Ashalim will be able to store energy in order to produce electricity whenever required after sunset. It will feature parabolic trough technology with a 4.5 hour thermal energy storage system using molten salts. The plant will produce energy to serve more than 69,000 households, by using clean energy technologies. Construction of Ashalim is expected to start before the end of July 2015. Abengoa is a member of the Appolo Hub which applies innovative technology solutions for sustainability in the energy sector.

Source: [http://www.abengoasolar.com/web/en/acerca\\_de\\_nosotros/sala\\_de\\_prensa/noticias/2015/abg\\_20150716.html](http://www.abengoasolar.com/web/en/acerca_de_nosotros/sala_de_prensa/noticias/2015/abg_20150716.html)



# Upcoming Events 2015/16

18.10.15 – 22.10.15	Atlanta, USA	ICALEO - 34 <sup>th</sup> Int. Congress on Application of Lasers and Electro-Optics
04.11.15	Burgdorf, Switzerland	APPOLO Workshop Swisslaser-net
10.11.15 – 13.11.15	Munich, Germany	Productronica
19.11.15 – 20.11.15	Mittweida, Germany	Lasertagung Mittweida
13.02.16 – 18.02.16	San Francisco, USA	SPIE Photonics West 2016

*We invite you to meet us at these events and to get to know more about APPOLO and the partners*

## ICALEO 2015

The 34<sup>th</sup> International Congress on Application of Lasers & Electronic-Optics serves as a platform for researchers and end-users to meet and review amongst others the state-of-the-art in laser micro processing. From its inception, ICALEO has been devoted to the field of laser processing at macro, micro, and nano scales and is viewed as the premier source of technical information in the field.

In this year the congress is focusing on topics like diode lasers for processing and pumping, laser process monitoring and control, laser processing of biological materials, lasers in nanotechnology and environmental technology, laser hybrid processing, laser manufacturing for alternative energy sources, and laser business development.

Especially laser process monitoring and control is of special interest considering the recent APPOLO workshop of online monitoring in laser processing. The APPOLO Hub will be represented by the Bern University of Applied Science. Prof. Dr. Markus Neuenschwander will report about laser structuring with 100W of average power and sub-ps pulses.

Source: <https://www.lia.org/conferences/icaleo>

## Productronica

**Productronica** is known as the world's leading trade fair for electronics development and production. Over the past 40 years, Productronica has developed into a leading international trade fair, focusing on all relevant innovations in the field of electronics and always staying updated to changing markets.

The trade fair addresses five different clusters e.g., printed circuit board manufacturing, production support and the future markets cluster. Laser micro-processing as well as online monitoring tools are potentially needed in all these segments to improve productivity and quality standards. The trade fair connects product innovations with practical needs.

Visitors from more than 80 countries will meet more than 1.200 exhibitors in 7 halls to discuss the latest developments and production needs in electronics. That will give a special momentum to APPOLO partners which can only be experienced at the Productronica.

Source: <http://productronica.com/trade-fair/for-the-press/newsroom/>

## Lasertagung Mittweida

Within the framework of the 24<sup>th</sup> scientific conference at "Hochschule Mittweida" the **Lasertagung Mittweida** will take place. The congress is concentrating on micro- and nano-laser methods as well as on laser-technical innovations in laser-induced processes. Beside two keynote presentations by representatives of the TU Wien and the "Karlsruher Institut für Technologie" (KIT), several APPOLO partners will also attend the conference. Klaus Zimmer from IOM Leipzig will speak about the "Scribing of CIGS Thin Films Integrated Interconnection of Solar Cells" on the first day. Furthermore, the APPOLO partner Next Scan Technology will also attend as an exhibitor, presenting its novel technological solutions.

Source: <http://www.lasertagung-mittweida.de/index/>

## SPIE Photonics West 2016

The upcoming **SPIE Photonics** conference happening the 13<sup>th</sup> through the 18<sup>th</sup> of February is one of the most significant conferences of laser, photonics and biomedical optics. It is expecting more than 20,000 attendees and approx. 1,250 exhibiting companies, including the APPOLO partners Next Scan Technology B.V., Lumentum, Daetwyler Graphics AG, Bern University of Applied Science, and the Center for Physical Sciences and Technology (FTMC).

Registration opens at the end of October but make sure to register on time since the 2015 exhibition was sold out. Even more, do not miss the plenary sessions and hot topics complemented by technology as well as industry events.

Source: <http://spie.org/x10.xml?WT.svl=mddh1>

## APPOLO Workshop Swisslaser-net

According to APPOLO's principle of establishing and coordinating connections between end-users of laser technologies for micro-fabrication and application laboratories as well as laser equipment manufacturers (SMEs), the consortium is holding the Swisslaser-net workshop at the 4<sup>th</sup> of November in Burgdorf, Switzerland.

The workshop is focussing on "High Throughput and High Precision Laser Micro Machining with Ultra Short Pulses". Speakers from APPOLO partners as well as from other companies and research institutes will present and discuss actual demands, physical basics, principal limits and new innovative solutions. Swissphotonics is the Swiss National Thematic Network for photonics and has the declared goal of improving the competitiveness of its members through the organization of events like workshops and roundtables. Due to the support of Swissphotonics, APPOLO provides a platform for knowledge exchange in the field of photonics. Besides the Bern University of Applied Science, the University of Stuttgart as well as the Fraunhofer IPT will attend at the workshop as representatives of the science community. Furthermore, a wide range of SMEs will contribute to the expected fruitful discussion. To mention only a few, Trumpf Maschinen AG, Holoeye Photonics AG, Scanlab AG, Pulsar Photonics GmbH, Amphos GmbH, Lumentum, and the BCI-Group will enrich the program of the APPOLO workshop.

Ten presentations on a plethora of specific topics will be held in short slots of 20 minutes. The goal of the workshop is to create an overview about the actual trends and developments in laser systems and equipment for micro machining with ultra-short pulses. After all, this should encourage the development of new ideas for industrial applications.

Source: <http://www.swissphotonics.net/workshops/workshop-datenbank?2213>



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