NEWSLETTER

Issue 2, May 2016

Dear HEPTech members,

First and foremost, I would like to let you know that the Evaluation Committee has selected 16 participants for the HEPTech Symposium 2016 in Bucharest, Romania. We are excited about their potential and are looking forward to see the difference in how they can make the most of their research!

In the second edition of our Newsletter I am very happy to see the evolution of our partners in large European projects on their road to operation. ESS has completed its first installation in the process of building this fantastic infrastructure. ELI-NP marked a great step forward finalising the world's first 10 petawatt laser with Thales Optronique, and ELI Beamlines is further progressing after its inauguration ceremony last October. I believe these pan-European cooperation projects, together with FAIR and the European XFEL in Germany, are paving the way of our international collaboration in science, and will prove a success in the future on how we can take the innovation coming from research into society in an impactful and meaningful manner.

I was very curious in learning about the EssentialTech programme and the specific methodology of EPFL to drive projects, focused on technology with potential for sustainable impact in poverty reduction. This is the sort of impact science should strive to make as it has the greatest value.

We also have the chance to learn about the new research project of HiLASE, the initiatives of the CERN Business Incubation Centre at the Technopolis ICT Business Park in Thessaloniki, and to read a very interesting focus piece on the recent developments at IFIN-HH.

António Pacheco,
HEPTech Coordination Manager

Around the members

Institute of Physics of the Academy of Sciences (ELI Beamlines), Czech Republic

European Spallation Source (ESS)

École polytechnique fédérale de Lausanne (EPFL), Switzerland

National Technical University of Athens, Greece

In focus: Horia Hulubei National Institute of Physics and Nuclear Engineering (IFIN-HH), Romania

The interview: Dan Dumitru Enache Ph.D., Head of the Center for TT and Marketing at IFIN-HH, Romania

HEPTech upcoming events

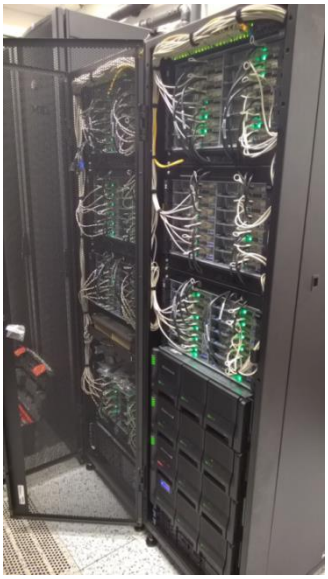
Around the members

The ELI Beamlines Laser centre is open

The first implementation phase of the ELI Beamlines project was officially concluded with an inauguration ceremony of the laser facility that took place on 19 October 2015 in Dolní Břežany. *(Photo: ELI-Beamlines)*

Currently, the final arrangements are underway and the laser hall is being prepared for installation of new technologies. The entire complex will be available for research from January 2018.

Major technological developments are the P3 chamber, which is the largest experimental chamber for civil and academic research of laser plasma in the world, as well as the delivery of the HHG device, which generates ultrashort coherent pulses of XUV radiation for material research and applications in bio-molecular sciences (e.g. imaging of biological samples with high temporal and spatial resolution).



A month after the inauguration of the laser facility, Eclipse, ELI Beamlines' high performance computing cluster started operations. Equipped with 1344 CPUs, 10.7 TeraBytes of RAM (well over a thousand times the RAM of an off-the-shelf computer with 8GB RAM), and close to a PetaByte of storage space (the equivalent of two-thousand 500 GB capacity hard-drives), Eclipse will become an important tool in support of experimental design and data analysis activities. From radiation safety studies to laser beam propagation and laser-target interactions, Eclipse will support scientists and engineers in modeling and simulation tasks essential for today's cutting-edge research. Eclipse is also an important building block in support of ELI's goal of strengthening its core capabilities and the interactions of its personnel in simulation, theory and experiments. *(Photo: ELI Beamlines)*

Currently, ELI Beamlines has more than 280 employees, nearly 70% of them are scientific and technical staff (35% are foreigners – mainly from France, Italy, Germany, Poland, Spain, United Kingdom, and also from countries outside the EU - such as India, Canada, USA, Mexico, Russia, China, and Cuba). The international scope of the center is focused on joint cooperation with European research infrastructures which is evident by the recent conclusion of a Memorandum of Cooperation with synchrotron Elettra in Trieste (Italy) and by the starting of the project ELITRANS, financed by the European Commission for € 3.5 m. This project will help to transform the three ELI pillars - in the Czech Republic, Romania and Hungary - into one unified pan-European research infrastructure.

For its outstanding design, the ELI Beamlines infrastructure won the 2016 MIPIM award (an internationally-renowned real estate competition) for 'Best industrial and logistics development' at a ceremony that took place in March 2016 at the Palais des Festivals in Cannes. *(Photo: ELI Beamlines)*

HiLASE attracts a key world player in semiconductor industry

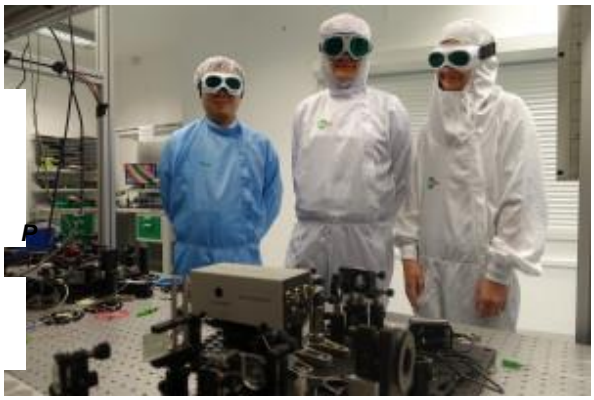
HiLASE Centre and Gigaphoton Inc., a Japanese leading-edge technology company in the semiconductor industry, signed a two-year effective collaboration agreement on a joint research project, launched on 1 April 2016.

Gigaphoton Inc. is involved in developing, producing, and marketing of excimer laser light sources, extreme ultra violet light sources, and lithography light sources for lithography tool suppliers in the global semiconductor industry.

The HiLASE team has been actively working on the development of high-repetition lasers and laser systems for industrial applications, including extreme ultraviolet (EUV) lithography. Following the successful in-house R&D at HiLASE in the past few years, both teams joined their forces aiming to extend the current technological limit of the 100 kHz, 500 W picosecond thin-disk laser to the 1 MHz, 1 kW level.

The HiLASE building in Dolní Břežany, Czech Republic, (*Photo: HiLASE)*

The project with a total budget of 200.000 EUR is fully funded by Gigaphoton Inc., which clearly shows the ability of HiLASE to attract the interest of private industry. The successful cooperation on this research project will enable HiLASE to fulfil its role as a driver of innovations and a reliable partner for high-tech industry with global impact.



Researchers from HiLASE and Gigaphoton at the HiLASE laboratory*, (Photo: HiLASE)*

Gigaphoton's laser light sources have been introduced by most semiconductor manufacturers in Asia and are gaining rapid acceptance in Europe and in the USA. As a result, in just over 11 years, Gigaphoton Inc. has increased its world market share to almost 50%, from a single-digit market share in 2000, when it was founded.

ESS – major steps forward to its accelerator future

The European Spallation Source is one of the largest science and technology infrastructure projects being built today. The facility design and construction includes the most powerful linear proton accelerator ever built, a 4-tonne, helium-cooled tungsten target wheel, 22 state-of-the-art neutron instruments, a suite of laboratories, and a supercomputing data management and software development center.

On 8 April 2016, the ESS Construction and Accelerator teams, together with the Skanska Construction team, marked the structural completion of the accelerator tunnel with a so called 'topping-off' event - typically held in Sweden with the completion of buildings in construction projects.

Excavation of the tunnel began in September 2014. Approximately 16,500 cubic meters of concrete and 2,075 tons of reinforcement were used for the tunnel and connected areas. The finished 537-meter-long accelerator tunnel will come and go from sight quickly, as it will be buried under five to six meters of earth.

The month of March marked the first successful ESS installation. A cryogenic venting pipe in the accelerator tunnel is in place as part of ongoing design work at the construction site.

At almost 12 meters long and more than half a ton in weight, the stainless-steel cryo vent pipe, or line, will help ensure proper ventilation of cooled helium gas in an unlikely event of an emergency in the accelerator tunnel. The new pipe—which is designed for the accelerator's very low operating temperature of 2 Kelvin (-271°C)—is a safety feature of the tunnel. Other such measures include emergency exits and specialised fire sprinkler systems. *(Photo: ESS / Wolfgang Hees)*

The first accelerator systems are planned for installation this fall. Early access to some buildings and facilities, including several areas of the accelerator systems, will be available this year. Full access to the Linac tunnel and front end building is expected in the spring of 2017.

The European Spallation Source is a research infrastructure committed to the goal of building and operating the world leading facility for research using neutrons.

ESS facility – conceptual design image

(Photo: ESS/Team Henning Larsen Architects)

ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE

Essential technologies employed for global poverty reduction

Some technologies have the potential to improve millions of human lives in the world's poorest regions in a sustainable manner. These technologies are ***essential*** in the sense that they can help meet people's most fundamental needs. EPFL has set up a program to foster the development of such essential technologies.

EssentialTech program defines eight categories of technologies that are essential to achieving the Millennium Development Goals for poverty reduction. These are technologies related to water and sanitation, food and agriculture, pharmaceuticals, medical equipment, energy, construction, transportation, and Information and Communication technologies. The program puts the technologies in the context of a ***comprehensive value chain*** – from understanding needs to monitoring the real impact of these technologies and contributing to their long-term viability. In order to have a significant and sustainable impact, the technologies are considered in a broad context, which includes looking at scientific, economic, societal, environmental and institutional factors. The program requires an interdisciplinary and multicultural collaborative approach and partnership with the private sector, public authorities and civil society – particularly with stakeholders from developing countries.

The **EssentialTech** program involves a specific methodology to drive projects through successive *phases* and to assess the progress at different *gates*, according to key principles. This methodology allows the projects to be led in accordance with the program philosophy and increases the chances of positive and sustainable impact on poverty reduction.

Through an extended network of specialists from various disciplines and regions, the program provides access to the required expertise and support in order to address the different issues that are specific to each project's step. It is implemented through various projects. One of them is the project of the EPF Lausanne GlobalDiagnostiX. A novel X-ray technology, specifically designed for the context of resource-poor settings, was jointly developed by a consortium of several public and private partners. Two-thirds of humanity has still no access to medical diagnostic imaging. This first robust and low-cost digital radiography technology can reach large yet untapped markets, achieving both profitability and social impact.

Photo: ©2015 EPFL

The main challenge is to develop an appropriate digital radiography machine, including an ultrasound imaging module, for a total cost of ownership over 10 years of below $50,000. This concept also involves an innovative business model where the purchase price includes the maintenance costs.

In particular, the device must meet the following criteria:

- take high-quality images for typical applications in a district hospital in remote and resource-poor areas;
- allow for up to five hours of uninterrupted work in case of unreliable or unavailable electrical supply;
- be resistant to high temperatures, humidity and dust;
- be safe and easy to use, even by partially-trained staff from different cultures and languages;
- be compliant with applicable international standards and regulatory directives.

The system will include a solution to transfer the images to remote doctors (teleradiology) in order to compensate for the insufficient number of radiologists and specialists in developing countries. The start-up company Pristem (http://pristem.com) will soon take over the further development and industrialisation of the system.

The National Technical University of Athens – an active promoter of CERN technologies in Greece

In the framework of the establishment and operation of a Business Incubation Center (BIC) of CERN technologies at the Technopolis ICT Business Park of Thessaloniki, the Greek BIC recently initiated two public events with the academic and industrial communities to promote CERN achievements and innovative technologies. Both events were organized with the support of the National Technical University of Athens (NTUA).

The first one, ***CERN Technologies – Entrepreneurship Opportunities***, took place on 14th January 2016, in Thessaloniki, bringing together a large number of participants, interested in the CERN innovative products. It was organised by the Technopolis ICT Business Park, the Aristotle University of Thessaloniki and the National Technical University of Athens. The follow-up discussion was focused on the start-ups developing new products designed for the international market, taking into account the opportunities for innovative applications based on their cooperation with the CERN BIC in Thessaloniki.

The Technopolis BIC building in Thessaloniki *(Photo: Technopolis BIC:)*

The second event was organised by the Democritus University of Thrace (DUTH) in the town of Xanthi. It attracted a large number of participants who were updated on the cooperation activities of the Technopolis ICT Business Park with CERN. The forum decided to establish a local unit of the CERN BIC at DUTH for coordinating the companies, researchers, and even students willing to collaborate with the Technopolis BIC.

One of the invited speakers at both forums was the NTUA's Prof. Evangelos Gazis, who is also an Industry liaison officer of CERN for Greece.

Prof. Gazis - the third one from the left.
(Photo: Technopolis BIC)

The events were in line with the agreement between CERN and the Greek BIC that a high tech incubator, at the premises of Technopolis ICT Business Park, will provide CERN technologies to Greek firms and entrepreneurs developing innovative products and services for the Greek and European markets. Additional events will follow during the year, covering the country's academic and industrial centers.

An international network of Business Incubation Centres (BICs) of CERN technologies has been established to assist entrepreneurs and small high-tech businesses in taking innovative technologies from technical concept to market using CERN technologies or expertise.

The BICs support the development and exploitation of innovative ideas in technical fields broadly related to CERN activities in high-energy physics, such as detectors, cooling technology and high-performance computing.

In focus

Horia Hulubei National Institute of Physics and Nuclear Engineering (IFIN-HH), Romania

With a contribution of almost 10% of the national scientific output and staff of over 700 employees, IFIN-HH (www.nipne.ro) is one of the most important public R&D organizations in Romania. The institute is dedicated to the research and development in physical and natural sciences, mainly Nuclear Physics and Nuclear Engineering, and in related areas including Nuclear Astrophysics and Particle Physics, Field Theory, Mathematical and Computational Physics, Atomic Physics and Physics of Condensed Matter, and Life and Environmental Physics. In all these fields, IFIN-HH conducts theoretical and experimental research.

Taking advantage of its pivotal role on the Magurele Physics Campus (the geographical denomination of the region surrounding the town of Magurele, 15 km south of Bucharest) and the further development of the local research and logistic infrastructure due to the undergoing implementation of the ELI-NP project, IFIN-HH started several initiatives aimed at fostering the research, development and innovation in the region:

Magurele High Tech Cluster (MHTC), established in 2013 initially as a regional gathering of academia and industry entities around IFIN-HH, is now one of the most important science and technology oriented clusters in Romania. It has almost 90 members, out of which 52 SMEs from industry, 18 R&D institutes, 5 universities, local authorities and NGO's. Its main objectives are linked with the setup of ELI-NP, the largest research infrastructure investment in south-eastern Europe, applying the results achieved and technologies developed there, and also consolidating the management, increasing the internal cohesion through joint projects, and securing the budget for the next 2–5 years.

Magurele Science Park is another initiative of IFIN-HH, launched last year in collaboration with the Ilfov County Council, Magurele Town Council and MHTC. Now having a legal base, the association will develop a state-of-the-art Science and Technology Park in the proximity of IFIN-HH, which will attract both large companies and newly established flexible start-ups, in future experiments and IP creation.

The Extreme Light Infrastructure – Nuclear Physics (ELI-NP) consists of two components: the first is made of two high-power lasers – two arms of 10 petawatts each (where 10 petawatts represent 10% of the solar power), and the second is a gamma radiation generator with performance characteristics, unique in the world. Commonly known as the Magurele laser, the equipment to be installed this summer is much more complicated than the name shows.

(Photo ELI-NP) ***ELI-NP in March 2016…***

Assembling the equipment will be a very complex work which is to be completed in 2018. Once this step is finished, the experiments will begin. The focus of the research will be Nuclear Physics at the world's first facility of this kind.

The researchers aim to find solutions and answers to a series of problems that are not yet known or are still unsolved. For example, the experiments to be carried out at Magurele might result in a revolutionary method of treating cancer, if surgery is not an option anymore. The researchers might also simulate cosmic radiation to see how the materials used for building space stations and spacecraft behave in a very long journey such as a manned mission to Mars.

…and ELI-NP when completed. (*Photo: ELI-NP)*

Moreover, the researchers also aim to find answers to fundamental problems of physics, such as the synthesis of chemical elements in the universe.

According to Dr. Nicolae-Victor Zamfir, Director General, ELI-NP is on track. It started in January 2013 and the plan is to finish in December 2018. The Director explains that the project involves four components: installing equipment, constructing the experimental set-ups, hiring around 200-250 qualified scientists and researchers, and completing the civil construction of the new facility.

In November 2015, ELI-NP/IFIN marked a giant step forward when it celebrated finalizing the world's first 10 petawatt laser by Thales Optronique, France. Around 100 researchers, engineers and assistants have been hired since then and the first projects are expected to start in the new building by June 2016.

The interview

Dan Dumitru Enache Ph.D.,

Head of the Center for Technology transfer and Marketing at the Romanian National Institute for Physics and Nuclear Engineering

Dan, what is the role of the Center for Technology transfer and Marketing in the recent developments concerning IFIN-HH?

After a period of increments in knowledge and skills, the Center for Technology Transfer and Marketing (CTTM – *http://www.nipne.ro/cttm/*) is focusing on three main aspects:

- Developing the interest of researchers towards applied research through specialized seminars and dissemination of information;
- Making a first evaluation of the intellectual property owned by several departments and researchers;
- Planning the opening of the TTO of ELI-NP which will be created using the expertise of the Center of Technology Transfer and Marketing of IFIN-HH.

Are there any challenges to the Center originating from the dynamic situation around the ELI-NP or from other recent developments?

To create a breeding ground for the typical beneficiaries, CTTM helped for the setup of the Magurele High Tech Cluster (MHTC; www.mhtc.ro), an open association of research and business entities, legally established in June 2014. Moreover, for the first time in Romania's history, governmental, regional and local authorities together with academia and business entities launched a consortium (February 2015) to pursue the realization of the Magurele Science Park (MSP; http://www.mhtc.ro/magurele-science-park/), associated to ELI-NP, to further offer specialized services and logistics, fiscal incentives and a dedicated area for those interested to settle down and make use of the availability of ELI-NP.

The knowledge and technology transfer, the stimulating effects on high tech industries, the exciting opportunities for companies to perform frontier research as well as to foster the research to the benefit of innovative companies, are all these positive impacts viable for those who will be prepared and able to exploit ELI-NP.

This year you are going to host the annual HEPTech Symposium focusing on early stage researchers. What will make the IFIN-HH-hosted event unique and unforgettable for the participants?

The annual Symposium for early stage researchers hosted by IFIN-HH (19 – 25 June 2016) will provide an excellent opportunity for the participants to develop their entrepreneurial skills, their abilities for intellectual property protection, for negotiations, and for pitching their projects.

The Romanian event will be a memorable one due to the high quality of lectures, logistic setup, hospitality of hosts, taste of food, and many pleasant surprises.

We use this opportunity to express our gratitude to our Network members for their strong support and to welcome the participants in the HEPTech Symposium.

HEPTech upcoming events

- Workshop on Stakeholder analysis for funding opportunities in High Energy Physics May 10th at CERN
- Steering Committee May 11th at CERN with VideoConference
- AIME on Cryogenics June 9th -10th at CERN
- HEPTech Board Meeting, June 13th at CERN
- HEPTech Symposium June 19th to 25th in Bucharest, Romania
- Steering Committee September 22nd at CERN with VideoConference
- Steering Committee October 27th at CERN with VideoConference
- AIME on Nanotech for HEP October 20th at GSI, Darmstadt, Germany.
- AIME on IEEE NSS MIC October 29th to 5th November, Strasbourg, France.
- AIME on SiPM (IEEE NSS MIC) October 30th Strasbourg, France.
- AIME on SC in Acc Medical November 25th CIEMAT, Madrid, Spain
- HEPTech Board Meeting, December 9th at CERN

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