NEWSLETTER

Issue 6, April 2017

Dear HEPTech members,

What an exciting time it has been since the last time I was asked to write the editorial for our newsletter! The world is certainly a different place in the last twelve months! I wonder if Tim Bestwick (STFC) discussed that when he met the current UK prime minister, more details later in this issue. However, one thing has not changed - the need for our science base to provide the next generation of researchers with the tools and motivation to engage with industry. That is why I am so excited by this year's HEPTech Symposium, being organised by our very good friends at GSI, which is my segue into introducing the interview with Tobias, also in this issue.

As I work with you all in HEPTech, the need to and challenges of engaging with industry are something that still drives what we do. It is fantastic to see ELI Beamlines gain their first patent and I hope that it is sucessfully commercialized, as obtaining the patent is just one step on the journey. To me, this is the classic end of technology transfer. I find it impressive how EPFL are involving their doctoral students in technology transfer, with their EPFLInnovators programme.

Thank you all for your help and I look forward to meeting you at a future event. In the meantime, let's get ready for the HEPTech Symposium.

Around the members

Around the members

ELI Beamlines gains the first patent in its history

A patent on an “alternative laser fusion system and method” filed by two ELI Beamlines lead scientists, Georg Korn and Daniele Margarone, was granted by the Patent Office of the Czech Republic three years after submission. The European Patent Office (EPO) application is still in process. The patent is shared with the Italian Institute Fondazione Bruno Kessler (FBK).

Ales Hala, head of the Centre for Innovation and Technology Transfer (CITT) which is integrated in the Institute of Physics – the host of the ELI Beamlines project – said, *“It is already the tenth patent we have gained for the Institute of Physics.”* CITT strongly supported the patent drafting and was also in charge of the administrative procedures for its application. Now CITT is going to administer its license.

The invention describes an innovative system, method and target for triggering ultra-clean (neutron-less) nuclear fusion. A temporally shaped laser pulse and an ad-hoc semiconductor target doped with boron are used to trigger the so-called proton-boron nuclear fusion with the consequent production of a high yield stream of alpha particles. A proof-of-principle of this scheme has also been shown experimentally by ELI and FBK researchers in a recent experiment at the PALS laser facility.

“We are proud of being the first inventors in the history of ELI Beamlines and hope that one day our invention can contribute to the generation of ultra-clean energy,” said Daniele Margarone.

Advanced DPSSL laser „DiPOLE 100″ delivers 1kW performance

(Photo: HiLASE)

„DiPOLE 100″, a fully diode pumped solid state laser (DPSSL) designed and constructed at STFC’s Central Laser Facility (CLF) at Rutherford Appleton Laboratory, was delivered under contract to the HiLASE Centre in the Czech Republic. In mid-December 2016, it achieved its full design performance, operating at an output energy of 100 J per pulse at 10 Hz (1 kW) for over 1 hour without operator intervention.

John Collier, Director of the CLF, said „This result is a vital milestone that moves the performance of high peak power lasers beyond the limits of conventional flash lamp pumping, opening up important new applications in materials processing, advanced imaging and fundamental science.“

Tomas Mocek, Head of the HiLASE Centre, said „This is the first time that a high-energy DPSSL system has broken the 1kW barrier. This performance is truly world leading and fully justifies our confidence in choosing DPSSL technology as the driver for applications-oriented RTD.”

Optimisation of laser parameters continues in 2017 to build up operational experience and to fully characterise the system after which it will be brought on line for user experiments.

Czech and British scientists are teaming up on a new laser centre of excellence

Scientists from the Czech Institute of Physics and the STFC’s Central Laser Facility in Oxfordshire, UK, will work together on a 5.5 year / 45 MEuro project to create a centre of excellence (CoE) for the industrial exploitation of new laser technology. The CoE is to be funded by the European Commission under the „Widespread Teaming“ programme within Horizon 2020, in cooperation with the Czech Ministry of Education, Youth and Sports.

The new centre of excellence will be based at the HiLASE facility at Dolni Brezany ***(Photo: HiLASE),*** in direct vicinity of Prague. HiLASE incorporates advanced solid state laser systems that are ideally suited to hi-tech industrial applications, opening up new processing techniques for surface hardening, semiconductor processing and micro/nano-machining, for example.

Brian Bowsher, STFC Chief Executive, said „I am delighted that this project has been selected for funding by the European Commission. STFC recently delivered a £10 million contract to HiLASE and the funding for this new centre of excellence will allow us to ensure that the research at the facility is fully exploited for industry. We also look forward to collaborating on the centre of excellence as an opportunity to build our ongoing partnership with our Czech colleagues“.

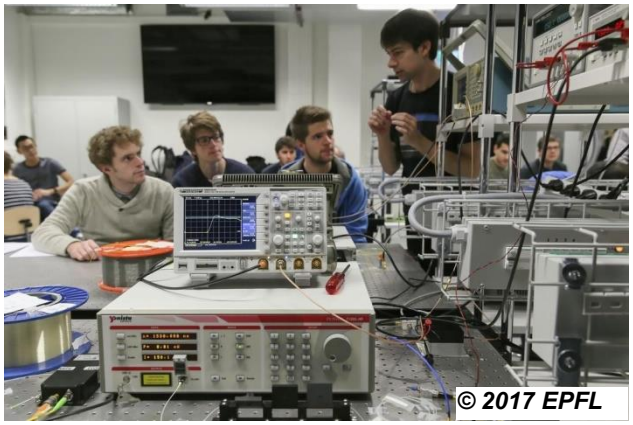
The H2020 programme will bring 10 MEuro to the project, with the remainder from the Czech Ministry of Education, Youth and Sports upon fulfilling the conditions of the Czech Operational Programme for Research, Development and Education. The funding will be used for further laser development based on the actual needs of high-tech industry and the transfer of STFC know-how supporting the effective cooperation with companies. The long term goal is to improve the financial independence of the new centre of excellence on public resources. The HiLASE CoE will also offer career opportunities for the most talented domestic and foreign researchers, and thus significantly strengthen the intellectual, knowledge and cultural level of the country.

ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE

A new doctoral programme for tomorrow's entrepreneurs

EPFLinnovators is a new programme designed to develop the innovation potential of EPFL's PhD students. The programme, which is geared towards the non-academic sector, is supported by the European Union's Marie Skłodowska-Curie programme, which is part of the Horizon 2020 framework.

One of EPFL's three missions is to promote the transfer of knowledge from research to industry. However, too many PhD students wait until the end of their studies to start considering career opportunities in industry or the creation of a start-up. That is why EPFL is launching *EPFLinnovators*, a programme that will provide new excellent PhD students with the training, experience and advice they need to become successful entrepreneurs.



Thirty-six participants will be selected among the PhD candidates of EPFL's 19 doctoral programmes to join *EPFLinnovators*. They will take additional classes and do a six-month to two-year work placement in a company. They will emerge from the programme with the scientific and entrepreneurial skills they need to become tomorrow's entrepreneurs.

The programme aims not only to bring out the PhD students' entrepreneurial spirit, but also to provide them with the tools they need to create successful start-ups after finalizing their PhD studies. Therefore, after completing the programme the PhD students will continue to receive start-up related support from EPFL, including contacts with investors and personalized guidance at EPFL Innovation Park. More information is available on the Doctoral School's webpage.

STFC spin-out grows its presence in key markets

STFC spin-out, The Electrospinning Company, (TECL) has secured a £650,000 investment to establish itself as the leading provider of clinical-grade electrospun biomaterials to the medical device industry.

Electrospinning is a process in which an electrical charge is used to produce fibres that are a hundred times thinner than a human hair. These fibres are electrospun into microscopic 3D scaffolds, much smaller than the eye can see. These microscopic materials can be used to develop nanofibre membranes that can be surgically placed in the body to promote natural repair by the host's own cells, improving healing and reducing internal scarring, and can be tailored to degrade, or resorb, once healing has taken place.

Until now, quality control issues relating to a lack of consistent and scalable manufacturing methods have hindered clinical use of such materials. However, with its advanced technology and know-how, the company has been able to overcome these challenges and is now positioned to profit from the increasing interest in the use of biomaterials. ***(Photo: STFC)***

The Electrospinning Company was established in 2010 as a spin-out by the UK Science and Technology Facilities Council (STFC). The Harwell-based company offers services to translate electrospun scaffold innovations or prototypes to clinic-ready products. It provides reliable production, scale-up methodology and documentation to support regulatory submissions.

Dr Liz Kirby, Head of Innovations at STFC, said: "As an STFC start-up, I am very excited to hear about the Electrospinning Company's funding success and recent progress. This is a fantastic example of how world class science, teamed with the right business and innovation support in a small company's early days, can help it flourish and achieve success."

The Electrospinning Company was the first company to join the European Space Agency's Business Incubation Centre at the Harwell Campus (ESA BIC Harwell) when it first opened in 2010. Set up to help start-ups with brilliant ideas using space technology to address the really significant challenges facing our society, it was at the ESA BIC Harwell that the company refined its cutting edge technology that combined equipment originally designed for use in space programmes with the electrospinning process.

The £650k funding has come from a network of UK angel investors, including Angels 5K, LBA, Minerva, Wroxall, Angels in MedCity and OION, as well as from the Rainbow Seed Fund. It will now enable the company to invest in production capacity, quality systems and business development, with a focus on growing its presence in the key US market.

Industrial Strategy plans launched at STFC's Daresbury Laboratory

The British Prime Minister Theresa May launched proposals for a Modern Industrial Strategy during her visit to Sci-Tech Daresbury in January 2017. Accompanied by her cabinet colleagues, the Prime Minister met with senior STFC staff before holding her first regional cabinet meeting at Daresbury Laboratory's Campus Technology Hub (CTH). There, she launched a green paper on the proposed Industrial Strategy, which outlines plans for investment in science, research and innovation, development of technical skills in science, technology, engineering, maths and digital proficiency, and support for businesses and entrepreneurs as they start and grow.

STFC Chief Executive Dr Brian Bowsher said: "It was fantastic to welcome the Prime Minister and her colleagues to Daresbury Laboratory to showcase UK science and innovation at its very best, and to talk with her about opportunities for us to support the UK's industrial ambition."

Following the Cabinet Meeting, the Prime Minister toured VELA (the Versatile Electron Linear Accelerator), an exciting research tool which can be used by industrial teams and academics for research and product development.

Theresa May meets Tim Bestwick (Executive Director of Business and Innovation at STFC), Susan Smith (Head of STFC Daresbury Laboratory) and Brian Bowsher (STFC Chief Executive) outside the Campus's newest electron beam accelerator (Photo: STFC)

Sci-Tech Daresbury is home to more than 120 research organisations and high-tech businesses across fields including advanced engineering and materials, biomedicine and healthcare. The campus supports, directly and indirectly, almost 2,000 jobs across the UK.

The Campus Technology Hub at STFC's Daresbury laboratory - where ideas turn into reality

At STFC's Daresbury Laboratory, the Campus Technology Hub (CTH) is a new and exciting workspace where entrepreneurs and small companies can come together with people from STFC, its industry and academia partners to turn their ideas into reality.

The need for a facility like the CTH is keenly felt by many small businesses and entrepreneurs. It was conceived to allow small businesses and entrepreneurs to access the technology, equipment and skills they need to further develop their ideas without having to invest heavily. This can cut development costs, accelerate innovation and reduce the time it takes to get to market.

The CTH is a key part of the Sci-Tech Daresbury campus and this makes it different to a standalone engineering facility. There are open plan workbenches, workshops and facilities, which can all be reconfigured as each project requires. Everything is designed to be accessible to those looking to solve their engineering challenges. ***(Photo: STFC)***

CTH provides 430m² laboratory space for 'proof of concept' projects; a range of high-specification equipment, including 3D-printers (multi-materials) and 3D-scanners, electronic test and measurement equipment, machining and electron beam processing; flexible power, network and benching for project-specific builds; configured and flexible workspace available for multi-users; and technical training and in-house expertise. The facility could be used for exploratory research, concept development, proof of concept, prototyping, development of field-trial products, testing, evaluating and whatever else one can think of.

In focus

Showcasing the numerous faces of research excellence

GSI is a limited liability company. Associates are the German Federal Government (90%), the State of Hessen (8%), the State of Rhineland-Palatinate (1%) and the Free State of Thuringia (1%). They are represented in the board of directors by the Federal Ministry of Education and Research and the respective ministries. GSI is a member of the Helmholtz Association, Germany's largest research organisation.

GSI operates a worldwide unique large-scale accelerator facility for heavy ions and currently employs about 1.350 people. In addition, annually about 1.000 researchers from universities and other research institutes around the world use the facility for their experiments.

The goal of the scientific research conducted at GSI Helmholtzzentrum für Schwerionenforschung is to reach a better understanding of the structure and behavior of the world that surrounds us.

In the coming years the new international accelerator facility for research with antiprotons and ions (FAIR), one of the largest research projects worldwide, will be built at GSI. Alongside Germany, FAIR's shareholders are Finland, France, India, Poland, Romania, Russia, Slovenia and Sweden. The United Kingdom is an associated partner.

The new facility, where various physics programmes can be operated in parallel, will offer outstanding research opportunities and discovery potential for about 3000 scientists from about 50 countries. In the course of the coming decades the experiments will reveal consolidated findings about so far unknown states of matter and still missing information about the evolution of the Universe from the Big Bang to the present.

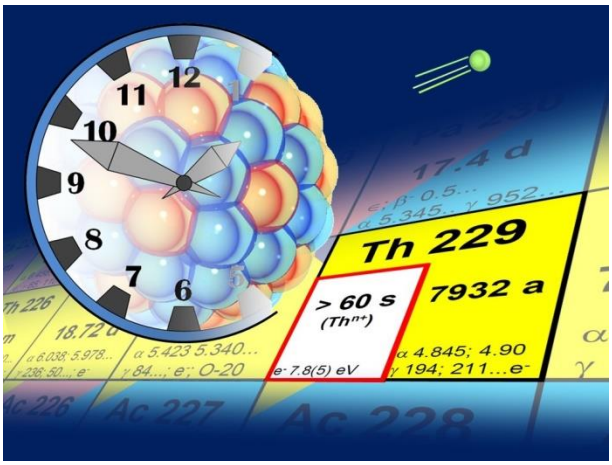
The existing GSI facility (left) and the new FAIR complex (right, with lake and large accelerator ring in the forest; photo montage: ion42 for FAIR)

The construction of the FAIR accelerator facility is gaining momentum. Preparatory work has started to link the existing accelerator systems of GSI Helmholtzzentrum für Schwerionenforschung to the new FAIR facility. An important milestone here is the erection of two approximately 100-meter-long

retaining walls that are up to eight meters tall. These walls are being built near GSI's SIS18 accelerator ring, which will connect to the FAIR facility.

The new accelerator facility will be fully operational in 2025. The execution of civil works on the site will start in the summer this year and is expected to be substantially completed at the end of 2022. After that the installation of the state-of-the-art accelerator and experiment facilities will begin.

Meanwhile, as to prove that GSI is not only focused on FAIR, a team of researchers, including scientists and engineers from GSI, made one of the ten most important discoveries of 2016, according to *Physics World,* the magazine of the British Institute of Physics. The experiments in question lay one of the foundations for the development of a nuclear clock with previously unattained precision. The scientists reported on the first-ever direct detection of the exotic thorium isomer Th-229m. This is a decisive step that brings us closer to being able to build an ultra-precise nuclear clock based on this isomer that could help improve the timekeeping precision by a factor of around ten. A nuclear clock features a multitude of potential applications, including the search for dark matter and gravitational waves. It would also provide ultra-high sensitivity to detect potential time variations of fundamental constants.



Nuclear clock based on a transition of thorium-229 in the atomic nucleus. For the first time electrons emitted in the deexcitation of the isomer into the ground state could be directly detected. (Photo: GSI)

To be in service of society has always been the vital credo of GSI. Recently, its scientists took part in development and testing of a new method for future treatment of cardiac arrhythmia. This is a condition that can lead to permanent damage as a result of stroke or may cause sudden heart failure.

The research was carried by a team of biophysicists from GSI and physicians from Heidelberg University and the Mayo Clinic in the United States. Beams of carbon ions have been used successfully to treat tumors and could represent a non-invasive alternative to the present treatment with cardiac catheters or drugs. The irradiation of tissue with carbon ions promises to be gentler and potentially more effective than treatment with catheters. When the method is technically mature, the procedure will take only a few minutes, in contrast to the sometimes hours-long catheter operations. One crucial advantage is that the ions can penetrate to any desired depth.

In addition to the scientific excellence, the Technology Transfer Office of GSI has always been one of the most active members of the HEPTech network. Last year, together with HEPTech they organised and hosted an academia-industry matching event which proved to be an extremely successful pioneering initiative exploring the novel connections between nanotechnology and high-energy physics.

This year, from 19th to 23th June, GSI is hosting the HEPTech Symposium – the network's flagship event dedicated to early-stage researchers with entrepreneurial potential in high-energy physics and

related scientific domains. For one week, 20 outstanding young researchers will have the opportunity to observe the unique environment of GSI while meeting internationally renowned technology transfer experts and entrepreneurs such as Markus Nordberg and Pete Lomas. Speakers at the Symposium will be also leading experts of CERN such as Bernard Denis who is going to reveal the secrets of successful negotiations, Jean-Marie Le Goff who will discuss the theory and practice of intellectual property protection, Ian Tracey of KTN, UK, who will transfer his experience to the young researchers preparing them for their first meeting with investors.

Prof. Dr. Orestis Terzidis, Head of the Institute for Entrepreneurship, Technology Management and Innovation (EnTechnon) at the Karlsruhe Institute of Technology, Germany will present the specifics of the entrepreneurship in physics and Dr. Robert Riedel, CEO of Class 5 Photonics, DESY, Germany will share his experience how the entrepreneurial spirit could be employed for the creation of a start-up. The participants will learn the basics of project management from Janina Fengel, Center for Research and Development at the University of Applied Science in Darmstadt, while Dr. Margarete Kessler and Adrian Stypka from Enterprise Europe Network Hessen will guide them through the various funding opportunities for research.

The hosts have also envisaged an exciting social and networking programme for the participants.

The interview

Dr. Tobias Engert,

Head of Technology Transfer at GSI

What do you consider your main achievement as Head of Technology Transfer at GSI?

The main achievement of Technology Transfer at GSI is to find and provide a way from an idea or invention to an innovative product. With the background of GSI as a traditional fundamental research institute.

What are the challenges to the technology transfer at GSI in the light of FAIR?

In fact, to screen the wide range of technologies and inventions developed for FAIR, to provide funding and specialists for validation projects and at the end, to have a successful market launch.

In particular, to find right industry partners to perform such kind of validation projects and to transfer knowhow and technology, are further challenges. Furthermore in terms of FAIR, it is and will be a challenge to gain an overview about the large variety of different high level technologies developed at GSI/FAIR and the worldwide partners of FAIR consortium.

What is your technology transfer success formula?

The combination of scientific knowledge of a physicist and engineer with skills in business administration and management. But the essential characteristics are motivation and passion for the transfer and opening of science to society.

HEPTech upcoming events

- Steering Committee, May 3rd at CERN with video conference
- HEPTech Board Meeting, June 7th at CERN
- HEPTech Symposium, June 19th to 23rd in Darmstadt, Germany
- AIME on Cryogenics, September 13th – 15th, Karlsruhe, Germany

Editor-in-chief: Eleonora Getsova,
HEPTech Communication Officer