



Dear HEP Tech members,

This is our first edition of what I hope will become a regular newsletter for the HEP Tech network. In this edition we have a round up of news from across the network and are then focussing on one member. We want to share our success so other members know who to ask for help and advice.

Without giving too much away, I do want you to read the whole newsletter. I am very interested in hearing how the CERN Entrepreneurship Meet-ups work in the longer term. I want to go and visit Sofia Tech Park to see what it looks like, perhaps with a stop-over at GSI Green Cube. I had a very happy play with the Science to Business Database, at the Center for Technology Transfer of University of Belgrade. I am surprised to learn that my KTN colleagues have helped to make the UK the most advanced producer of goat milk in Europe!

I wish to thank Eleonora Getsova for all the hard work in producing this newsletter as Editor-in-chief. I look forward to the next newsletter. If you have any news to share, or wish to be interviewed for the next issue, please let us know. We welcome feedback on how to improve it and suggestions for future articles.



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Around the members



CERN Entrepreneurship Meet-ups – an open arena to entrepreneurship and innovation

In March 2015, the Knowledge Transfer Group launched the CERN Entrepreneurship Meet-Ups, aiming at gathering CERN people interested in entrepreneurship and innovation. Speakers from start-up companies or support actors are often invited to talk about a variety of topics, including business models, local training courses, start-up financing, and crowdfunding.

Before the summer break, the CERN Entrepreneurship Meet-Up team organized a pitching competition for aspiring entrepreneurs currently connected to CERN. Each of the 13 participants was given five minutes to present his/her idea, which ranged from automotive inverters for stationary solar installations to mobile phone applications for monitoring personal finances. Almost 60 people were present to cheer on their CERN colleagues and listen to the evaluation by a panel of judges.

As part of the Geneva Global Entrepreneurship Week in November 2015, a special meet-up was organized at IdeaSquare. The event was open to the public for the first time, and held in the form of a panel discussion on the subject 'The Creation of Interdisciplinary Start-Up Teams'. Close to 50 people attended the event.

More information: cern.ch/kt/meet-up

CERN Business Incubation Centres (BIC) Network

A 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.

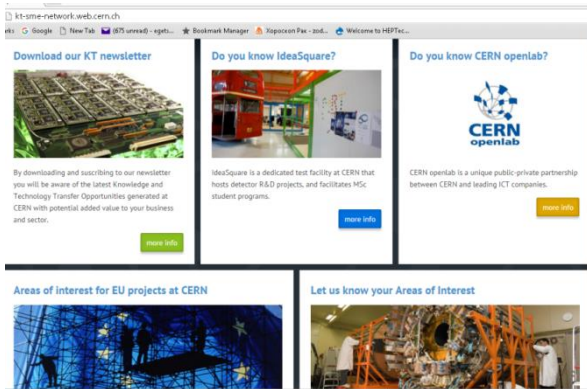
The BICs support the development and exploitation of innovative ideas in technical fields broadly related to CERN activities in high-energy physics, such as detectors, cooling technology and high-performance computing.

On 19 May 2015, representatives of the BICs of CERN technologies gathered under the same roof for the first time. The aim of this first "BIC day" was to help the BIC Managers build a closer network, by sharing experience and information, and to give them a possibility to openly express their needs to the CERN KT Group. All the BICs presented their offering and the ecosystem in which they are embedded. Presentations were also given by CERN on aspects such as opportunities in the EU Horizon 2020 programme and CERN technologies of interest for start-ups and small enterprises. The BIC day was followed by a half-day crash course in CERN technologies, open to all interested BIC managers. During the BIC day, the future strategy of the BIC network was debated. Discussions covered topics ranging from student entrepreneurship to venture capital investments. It was decided to continue organising one meeting per year, hosted in turn by the members of the network.

SME Network website

On 23 November 2015, the CERN KT Group launched a new website to encourage CERN researchers and businesses to share their technologies and expertise and to foster new partnerships.

Indeed, active communication with the industrial community is essential to achieve CERN's knowledge-transfer mission: maximize the return in transferring innovation from the laboratory's research to society, especially CERN Member States, and to promote the Laboratory's image as a centre of excellence for technology.



Small and Medium Size Enterprises (SMEs) account for 60-70% of the net new jobs created in most countries, and are often at the heart of innovation. The SME Network website is intended as an initial communication tool for promoting knowledge transfer collaborations based on mutual interests. Interested stakeholders, including SMEs, research centres, academia, as well as large industrial organizations, can subscribe to the website and gain access to a dedicated bi-annual KT newsletter. The newsletter will include up-to-date information on the technologies developed at CERN and their potential uses and benefits for the subscribers' business sectors. In turn, organizations belonging to the network will be able to share their specific interests related to CERN technologies and expertise.

More information: cern.ch/kt-sme-network

The miniature linear accelerator

In the framework of its medical application programme, CERN has progressed in the construction of a "miniature accelerator": a compact Radio Frequency Quadrupole (RFQ) proton linear accelerator operating at 750 MHz frequency, about twice what has been used so far in this type of accelerators.



Thanks to the higher frequency and to an innovative beam optics design, the accelerating gradient is more than twice that of conventional RFQs: in the prototype under construction, the protons reach an energy of 5 MeV in only two meters. Its external diameter is 13 cm, making this RFQ a simple light-weight accelerator that can easily be manufactured in small mechanical workshops.

The first application of this innovative accelerator is as injector for proton therapy linacs. A new generation of small and low-cost accelerators for the treatment of tumours is under development, with the goal of being installed directly in hospitals. High-frequency and high-energy (3 GHz, 230 MeV) linear accelerators are one of the most promising designs, but so far their performance has been limited by the lack of an appropriate injector. The new RFQ design constitutes an ideal injector for these accelerators and represents a remarkable boost to this technology. This first application has also generated interest from CERN's spin-off A.D.A.M. S.A. that, with financing of its parent company, will commercialize this accelerator as part of complete proton therapy systems, under a licence with CERN. Beyond proton therapy, the compactness, light-weight and low beam loss features of this RFQ design open several new perspectives for applications requiring operation in non-nuclear environments and/or portability. A 10 MeV design is being developed for a hospital-based

facility for on-demand production of PET isotopes; the accelerator could be installed in a standard hospital room next to the scanner, the radiation shielding being limited to the isotope production target requiring.

Acceleration of alpha particles to generate the isotopes required by new advanced radiotherapy techniques for cancer treatment is another application that could benefit of this compact low-cost linear accelerator. A new interesting application being explored is that of a portable accelerator for spectrometric analysis of artworks (archeometry). Particle-Induced X-ray Emission (PIXE) is a powerful yet nondestructive elemental analysis technique now used routinely by geologists, archaeologists, and art conservators. The innovative CERN design would allow to reach the 3 MeV energy required for PIXE analysis in about one metre. The portable 100-kg accelerator, equipped with an ion source and two racks of power supplies, could then be deployed in museums or used on site for the analysis of frescos and other non-transportable artefacts. In the industrial world, PIXE spectrometry could be used, for instance, in on-line continue analysis of coatings.

More information: <http://home.cern/about/updates/2015/07/miniature-accelerator-treat-cancer>



Sofia University @ Sofia Tech Park

Sofia Tech Park, a facility located in the outskirts of Sofia whose aim is to help science and research in Bulgaria interact with business more efficiently, was officially opened on 11 December 2015.



Sofia Tech Park is a state-owned company working to boost innovation, research and technological development through various projects for which it creates partnerships with private and public institutions.

The park's main focus areas are information and communication technologies, life sciences and green energy. It is intended to foster knowledge exchange between academia and business while supporting start-ups and innovative ideas, thus providing a catalyst for commercialisation of research and making Bulgarian science and entrepreneurship more competitive.

The total investment in Sofia Tech Park is 42.6 million Euro. The project is expected to generate 15,700 IT job openings. The Bulgarian government also hopes that it will convince young and talented people to stay in the country. A total of 11 laboratories for ICT, biotechnology and green energy will be hosted by the tech park.

Sofia University is one of the research organisations that will provide scientific content and infrastructure to the new laboratories of the first science and technology park in Bulgaria. One of them is the High Performance Computing (HPC) Lab. Its team has the task of informing end-users of the benefits of accessing such infrastructure and helping in the establishment of the interface between education, science and



business. The lab will focus on the training of students and postdocs on how to develop HPC applications in physical sciences, medicine, economics, forecast and aviation.

Researchers from Sofia University will also participate in the BioinfoTech laboratory equipped for prototyping, testing and small scale production of

microfluidics devices and their final electronic packaging. The focus will be on the development of instruments for automation of biomedical experiments, including medical tests, as well as of low cost consumables for such processes. The third laboratory at Sofia Tech Park, organised with the help of university researchers – the Biopharmaceutical Lab Complex – will contribute to the final process of development of new healthcare products: the incorporation of a purified drug molecule or plant extract into an appropriate delivery formulation.



Science to Business database maps scientific research

A “Science2Business” database was created as part of the innovation project “Mapping of scientific research potential of University of Belgrade”, funded by the Ministry of Education, Science and Technological Development of the Republic of Serbia.



The database is a response to the increasing need for intensifying collaboration between academia and industry and informing the broader public about the scientific potential of the University of Belgrade, which should be recognized as an initiator of the economic development of the country. The “Science2Business” database enables companies to get the

information about new technologies and knowledge easily and efficiently, which is the best way to protect and enhance their competitive advantage in the era of rapid technological development. It is carefully designed to be used by companies, research institutions and all parties interested in information about scientific achievements, new projects, available technologies and commercial services in the faculties and institutes of the University of Belgrade.

Access to the database is free of charge. It is available on the website of the [Center for Technology Transfer of University of Belgrade](#).



GSI Green IT Cube

The new high-performance computing center Green IT Cube at the GSI Helmholtz Center for Heavy Ion Research was officially opened on 22 January 2016.



The Green IT Cube will be one of the most powerful scientific computing centers in the world providing enormous computing capacity for experiments at the accelerator facilities of GSI, and, in future, FAIR.

The Green IT Cube is a highly energy-efficient computing center because it uses much less energy to cool its computers than conventional computing centers. Instead of air, the Green IT Cube cools its computers with water. This means the energy used for

cooling is only seven percent of the electrical power used for computing. This effective cooling process enables space-saving positioning of computers in the Green IT Cube. The cube-shaped building measures 27 x 30 x 22 meters and can hold 768 computer cabinets located side by side on six floors. Simultaneously saving energy and space, makes the Green IT Cube very cost-efficient. Investment costs for the building were about €12 million and were provided by the German federal government and the state of Hessen via a Helmholtz investment program.

The Green IT Cube is used by researchers to perform simulations and to develop detectors for FAIR. In addition, they will use it to analyze measurements obtained from experiments in the accelerator facilities of GSI, and, in future, FAIR, in order to gain fundamental insights into the structure of matter and the development of the universe. To make this possible, the Green IT Cube will be equipped with computer systems that meet the researchers' long-term needs for processing power, storage capacity and transfer rates.



The cube can house around 70 000 servers. They offer the superior processing power needed for simulating and analysing experiments at GSI and FAIR. The plan calls for 100 petabytes to store experiment data – the equivalent of around one million conventional PC hard drives. The very high data rates of these experiments can be recorded at a speed of over one terabyte per second. That is the equivalent of around 500,000 residential DSL connections.

The Green IT Cube was developed by Professor Volker Lindenstruth, head of scientific IT at GSI, his team, and his colleague Professor Horst Stöcker, in cooperation with the Frankfurt Institute for Advanced Studies (FIAS) and Goethe University Frankfurt. In June 2015, the Green IT Cube received an international award for the most innovative computing center at Datacloud 2015, the European conference on data centers and cloud computing.

Photos: G. Otto, GSI Helmholtzzentrum für Schwerionenforschung

Joint spin-off Class 5 Photonics-Laser project wins start-up prize

Class 5 Photonics - a joint spin-off of DESY and the Helmholtz Institute Jena (a branch of GSI Helmholtzzentrum für Schwerionenforschung), working in the field of high power lasers for science and industry, won the Start-up Challenge prize awarded by OptecNet Deutschland e.V.

The spin-off company competed against 14 other top-class start-up companies at the Optatec trade fair in Frankfurt. The physicists from Class 5 Photonics convinced the jury with their new innovative laser technology and outstanding business model.

“First, we separate a small part from an intensive Ytterbium:YAG laser pulse,” DESY scientist Dr. Michael Schulz illustrated the functional principle. “The smaller part of the pulse is then converted by nonlinear spectral broadening into a broadband laser pulse, the larger part of the pulse is frequency-doubled.” Subsequently, the physicists simultaneously shoot both parts of the pulse onto a nonlinear crystal, where the larger part of the pulse amplifies the smaller one.

This principle, called optical parametric amplification, does not need a classical laser medium, which must first store energy within the medium before it is discharged as a laser pulse. Optical parametric amplification also requires less maintenance for the novel high power lasers, the developers assure. Conventional titanium:sapphire lasers lose about a third of the input energy as wasted heat, which may cause strong heating of the system. “The optical parametric amplification solves this problem,” said Schulz, “there is only minimal heating.”

When all wavelengths of the amplified laser pulses are temporally superimposed, this produces an extremely short and intensive laser pulse. Moreover, the new system allows tuning over a broad wavelength range, in this case 700 to

900 nanometres. The users can then choose the most suitable wavelength for processing particular material. "With this technology, it is possible to build a turnkey system which serves a broad spectrum with ultrashort pulses," said Schulz. "We want our system to become a key technology on the laser market." More about Class 5 Photonics: <http://www.class5photonics.com/>

Opening of the Marburg Ion Beam Therapy Center: Cancer treatment using a process developed at GSI

The Marburg Ion Beam Therapy Center was opened on 11 November 2015. Treatment of the first patients at the center had started in October. Heavy ion therapy was developed at the GSI Helmholtzzentrum für Schwerionenforschung in Darmstadt. The accelerator facility was successfully used for the treatment of tumour patients between 1997 and 2008. A new accelerator facility of this kind is now going into operation in Marburg. It is the second such facility in Germany that is attached to a clinic and is capable of treating large numbers of patients.

The MIT will offer an efficient form of cancer therapy, with minimal side effects, to as many as 750 patients per year. Following the example of the Heidelberg Ion Beam Therapy Center, the Marburg facility uses a process of irradiation with ions that is based on research and development work done by GSI, the Heidelberg University Hospital, the German Cancer Research Center (DKFZ), and the Helmholtz Zentrum Dresden-Rossendorf.

This process is especially effective and gentle, because the ion beams penetrate into the body and have a particularly strong effect in the tumour tissue, where they are absorbed. In addition, the ion beams' effect can be directed with millimeter precision to individual points within the malignant tumour by means of the raster scan process developed at GSI, so that the healthy surrounding tissue is spared.

The experience gained from the GSI pilot project flowed directly into the design of an accelerator facility that is intended specifically for therapeutic use and designed to make routine clinical procedures possible. The Heidelberg Ion Beam Therapy Center HIT was then constructed on this basis. A significantly smaller accelerator facility was developed by GSI for this center. The Marburg facility has also been constructed according to this model.

In focus



The Knowledge Transfer Network (KTN) is the UK's innovation network (www.ktn-uk.co.uk). Its mission is to connect people who accelerate innovation.

It brings together businesses, entrepreneurs, academics and funders to develop new products, processes and services.

Working with large and small companies, government agencies and research organisations, with tech hubs and start-ups, public funding bodies, and private investors, KTN has built a unique network of more than 60,000 members across all industries and technologies that helps enterprising people and companies reach the full potential of their innovative capabilities.

Established by Innovate UK to build better links between science, creativity and business, the Knowledge Transfer Network has specialist teams covering all significant sectors of the economy, from defence and aerospace to the creative industries, the built environment to biotechnology and robotics. Its expertise in connecting sectors, disciplines

and skills with the right collaborations and business approach is what helps unlock the tremendous hidden value in people and companies.

KTN does this by initiating, facilitating and building the following collaborations:

Strategic Collaborations: gathering and analysing information on markets, technologies and other factors affecting them; working with industrial and research partners to develop technology roadmaps and appropriate innovation strategies.

Creative Collaborations: Bringing 'problem holders' and those with innovation challenges together with the businesses and researchers who have the talent and technology to develop viable solutions.

Cross-sector Collaborations: Encouraging those from different research fields and industrial sectors to share knowledge, generate commercial ideas and apply expertise in new ways.

Business Collaborations: Taking those with new ideas and technologies to the clients, distributors and platforms that can help to scale them up into world-beating products.

Investment Collaborations: Fostering relations between private and public funders and innovators requiring investment to develop new products and grow their business.

The KTN is not a funding body and has no regulatory powers. Although working closely with businesses, the KTN is not an industry group, government body or lobbying organisation beholden to any particular interests. As such, it is a trusted intermediary, committed to innovation, and working with everyone, big or small, commercial or public, wanting to achieve this.

KTN provides support in accessing expertise about projects, markets and research, connecting to UK and EU public funding calls and programmes, engaging with disruptive technologies in specialist groups, collaborating with industry and the research base, building the business case for investment, developing more sustainable business models.

Since its establishment in 2014, KTN has generated a whole variety of success stories covering a wide range of economic sectors. The following list provides a short glimpse in its achievements:

- ✓ KTN created the Forensic Science UK Innovation Database, which provides a centralised resource for researchers and stakeholders, and encourages collaborative research projects.
- ✓ KTN developed the Medicines Manufacturing Landscape portal, an interactive tool highlighting the UK's strengths and capabilities in medicines manufacturing.
- ✓ KTN assisted in the development of a safe and effective treatment for diabetic retinopathy by supporting a multidisciplinary, collaborative research project and helping PolyPhotonix identify local supply chains.
- ✓ A KTN-supported funding opportunity played a key role in Nexus developing new technology that enables digital interaction in physical space, allowing the company to become a global leader in a growing field. The funding has resulted in Nexus growing its interactive division substantially — a division which now has a turnover of over £2m.
- ✓ KTN helped form a consortium that created pioneering technology to detect interference to GPS receivers which helps protect critical infrastructure in the UK and the US.

- ✓ KTN played a key role in the growth of Versarien from a start-up to an advanced materials manufacturing company employing over 100 people in just four years by introducing the company's founders to a cutting-edge material that prevents electronic devices from overheating.
- ✓ KTN has helped in the development and commercialization of a software tool to exploit digital gaming techniques for construction.
- ✓ Aviagen, the world's largest breeder of meat-type chickens, won funding for two highly innovative projects to increase its genomics R&D activity with help from KTN.
- ✓ KTN assisted Yorkshire Dairy Goats on its journey to become one of the largest, most advanced producers of goat milk in Europe by introducing it to a key academic partner.
- ✓ KTN connected CrowdEmotion with key academics involved in emotional biometric research, helping it to develop and commercialise novel emotion recognition software.
- ✓ Through its networking events, KTN helped Shadow Robot build partnerships with many organisations that will benefit from cutting-edge robotics technology. The resulting collaborations allowed their technology to benefit from over £1.5m from various funding opportunities and broaden its applications.
- ✓ KTN has assisted in the development and commercialization of an innovative photovoltaic roof tile that is more effective and aesthetically pleasing than conventional solar panels.
- ✓ KTN has supported Biome Bioplastics in the identification and development of novel bio-derived platform chemicals, which will lead to bioplastics that offer a competitive alternative to oil-based polymers.

The interview



Ian Tracey

Head of Access to Funding and Finance

KTN, UK

Ian, KTN has so many achievements in just two years! What is the success formula?

Well, we have been lucky that we are actually older than 2 years. The current company, which is about two years old, was a merger of 15 previous companies that undertook this task. This gave us a pipeline of projects that we can build upon. This pipeline is very important, as it often takes a long time from initial meeting companies, introducing them to partners who can help and then seeing the end result in new jobs etc.. Often, this will be more than two years, and without the legacy, we would still be building up our capabilities at the moment.

Does KTN generate revenue from its mediation/brokerage activities (i.e. from connecting the right people)?

Nearly all our income is from the UK government as a grant. We focus on output metrics, rather than input metrics. What I mean by this, every month we inform our government grant giver (Innovate UK, the UK innovation agency) what we have done in the last month. We do mention activity, so many meetings held, so many companies met, but the thing they are most interested in, what success have we had. I like this approach, as I personally believe, when you focus on inputs, you can often make the required number of meetings but not necessarily with the right people!

We do have some minor grants from other government agencies and the EU. We occasionally charge a modest entrance fee, mainly to reduce the number of people who fail to turn up at the event, and it normally covers the food costs for the event. As far as I know, we have not undertaken any significant paid-for consultancy work, from the private sector.

What is the most profit making activity area of KTN?

We do not talk about profit making activity, but concentrate on what change we have enabled. So one project that I consider successful, is the Venturefest programme. This is a series of 9 regional one day innovation showcases. We were given about £ 500,000 from Innovate UK, working with local partners, we raised an approximately additional £1 million of sponsorship which caused 7 000 innovators: investor connections, resulting in £7 million anticipated benefits being reported by the companies. So it was £500 000 into £7 000 000 - governments tend to like that!

The HEPtech network will benefit from the experience of KTN in connecting the right people through the academia-industry matching events that KTN will host and co-organise together with HEPtech during the year.

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 at CERN
- ❖ HEPtech Board Meeting, June 13th at CERN
- ❖ HEPtech Symposium June 19th to 25th in Bucharest, Romania
- ❖ 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

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