NEWSLETTER

Issue 5, February 2017

Dear HEPTech members,

As always, there are plenty of very interesting activities around our labs. In this issue on the TT side, the focus is on Wigner RCP that recently joined the ESA technology transfer network and IFIN-HH that organised the 5th Balkan Symposium of Archeometry. On the detector development side, the focus is on LIP that managed to build low-cost large area neutron detectors using a well-established detector technology (Resistive Plate Chambers) and on INFN that successfully developed an innovative imaging system for hadron therapy they recently tested on a first patient.

You will also get an insight on the activities of the University of the Aegean, one of our new members including an interview of the Vice-rector of Research, Development, Finance and Infrastructure on the main achievements of the university with respect to technology transfer.

Thank you for your contributions to the HEPTech newsletter.

Enjoy the reading!

Jean-Marie Le Goff
Chairman of HEPTech

Around the members

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Wigner RCP represents Hungary in the ESA's technology transfer network

In December 2016, Hungary became the newest member of the European Space Agency's (ESA) technology transfer network. The membership will be arranged through the Hungarian Space Board, operating at the Ministry of National Development and will actively involve Wigner Research Centre for Physics (RCP) of the Hungarian Academy of Sciences.

To this end, Wigner RCP established a National Technology Transfer Point and appointed Zsuzsanna Tandi (in the picture, right) as an ESA Technology Broker who will lead a 5-member team. Mrs. Tandi is also a Wigner's representative at HEPTech. ***(Photo: Wigner RCP)***

The European network consists of technology transfer brokers who promote international exchange of views and experience, based on their knowledge, networking and expert teams and further initiate new developments to utilise transferred space technology. The network is active in 16 European countries and has initiated over 300 technology transfers to date.

Péter Lévai, Director General of the Research Centre emphasised that „*ESA's decision is based on the fact that the researchers of Wigner Research Centre for Physics have been successfully participating for decades in diverse space programmes supported by the Hungarian Space Board; consequently they have a broad expertise in certain areas of space technology. Simultaneously, the innovation activity of the Research Centre has significantly strengthened in recent years, thus well-experienced experts can help solve problems arising during technology transfer*". ***(Photo: Wigner RCP)***

This newly established cooperation aims to explore and support, including financially, as many initiatives and start-up projects as possible, able to utilise international space research innovations and know-how in non-space areas. It will also strengthen the innovation and technology transfer capacity of the country by generating new business opportunities for the space and non-space industry.

The Hungarian membership is expected to have a positive impact on economy and everyday life, since it will affect dynamically developing areas such as satellite navigation, telecommunications, meteorology, health care, and environmental protection.

The Fifth Balkan Symposium of Archaeometry bridged science and heritage

"Bridging Science and Heritage" was the topic of the Fifth Balkan Symposium of Archaeometry that took place from 25 to 29 September 2016 in the Carpathian resort of Sinaia, Romania. ***(Photo: HEPTech)***

This was the 5th edition of a tradition established in 2008, in Ohrid, Macedonia that continued in Istanbul (2010), Bucharest (2012), and Nesebar, Bulgaria (2014). The organizers of the Symposium 2016 were "Horia Hulubei" National Institute for Physics and Nuclear Engineering (IFIN-HH) Bucharest-Magurele together with the University of Bucharest.

The event focused on the application of modern physical and chemical methods in archaeometry, including nuclear methods and techniques used in dating, analysis, investigation and characterization of ancient artifacts, as well as their conservation and consolidation. Subjects from the related fields of archaeology and art history were included. The Symposium scheduled invited lectures, oral and poster presentations on the following topics: analytical methods for cultural heritage diagnostics, lithic materials, archaeometallurgy radiocarbon dating, GIS applications, preservation of cultural heritage – conservation and restoration, optoelectronic applications, experimental archaeology, and multidisciplinarity in archaeology.

The Book of abstracts of the Symposium may be consulted at:
http://www.nipne.ro/events/conferences/bsa5/BSA-5_Abstracts_binded.pdf

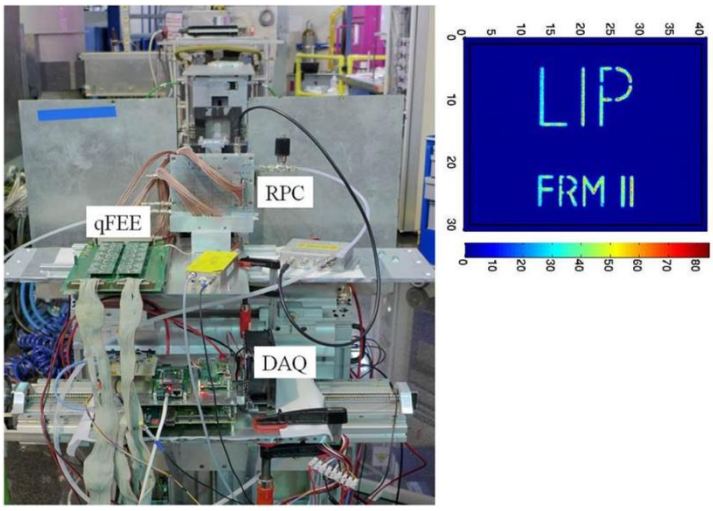
LABORATÓRIO DE INSTRUMENTAÇÃO E FÍSICA EXPERIMENTAL DE PARTICULAS

LIP's researchers are developing resistive plate chambers for neutron detectors

Resistive plate chambers (RPCs) are widely used for large area detectors (over 100m^2), as for instance, in high-energy physics to study the nature of the particles that constitute matter or in astroparticle physics to observe cosmic rays. These detectors, due to their simple structure are not expensive, which makes them very suitable for large area applications. Despite the simplicity, they provide very good spatial resolution and very fast timing. Researchers from LIP Coimbra, Portugal, are investigating the use of RPCs for neutron scattering detectors in the framework of the SINE2020 Detectors work-package.

The researchers believe the RPCs could be a good solution for neutron scattering as their built-in layered configuration is well-suited for multi-layer detector architectures, needed to ensure high detection efficiency. They are essentially discharging-free and robust detectors and thus there is no need for “baby-sitting” or continuous monitoring. Additionally, RPCs have a very simple structure: two plates - at least one of them made of a resistive material (e.g. glass or ceramic) and a gas-gap.

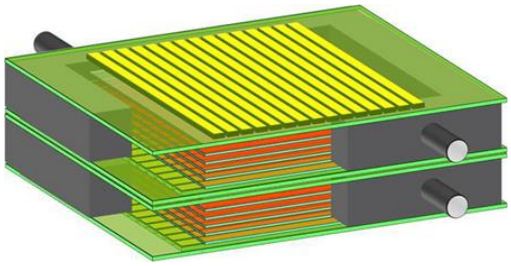
The team started by a simple RPC configuration (with only one gas-gap) and thus designed two prototypes - one with a $^{10}B_4C$-coating and another one without. Then they tested the two RPCs prototypes and observed that the detection efficiency of the RPC coated with $^{10}B_4C$ was just as high as expected (i.e. previously calculated via Monte Carlo simulations). The experimental results showed an extended plateau as a function of high-voltage, in a region where RPCs show low sensitivity to minimum ionizing particles, which means the detector is sensitive to neutrons while the sensitivity to gamma rays is expected to remain very low. A spatial resolution bellow 1mm FWHM was demonstrated in these preliminary tests.



(Experiments at FRM II. Photo: LIP)

After the initial good results, the team joined the SINE2020 project and started to investigate one of the main parameters of RPCs. Two prototypes were designed and tested at the FRM II Neutron Source in Garching, Germany. The resolution improved considerably, with results showing a 2D position resolution of at least 0,5mm FWHM for both coordinates.

At the moment the team is characterizing the gamma sensitivity of the two RPCs tested at FRM II with ^{22}Na and ^{60}Co gamma sources at LIP; they are examining the waveforms of the fast and slow component of the induced signals, with the intention to check the possibility of pulse shape discrimination (PSD) to reject gamma rays and background events. They are also designing and building a stack of double-gap RPCs with narrow gas-gap widths, taking into account the results obtained at FRM II.



(Design of a multi-gap RPC. Photo: LIP)

In the coming years, the plans are to build a multi-gap RPC, coated with $^{10}B_4C$ and test it with thermal neutrons. Monte Carlo simulations will help consider potential interactions of neutrons with all the materials involved in an experiment (e.g. windows and detector components) and how these influence detector performance.

INFN's innovative imaging system for hadron therapy successfully tested on a patient

INSIDE (Innovative Solutions for Dosimetry in Hadrontherapy) has been tested for the first time on a patient. This innovative imaging system, which uses particle accelerators, was built by the INFN in Turin to further enhance the efficiency of hadron therapy used for treatment of localised tumours.

INSIDE, which received € 1 million grant under the PRIN (Relevant National Interest Projects) program, is the result of a research project coordinated by the University of Pisa in collaboration with the Universities of Turin and Sapienza of Rome, Bari Polytechnic University and INFN.

For the trial phase, INSIDE was tested on the patient at the Italian National Centre for Oncological Hadron Therapy (CNAO) in Pavia. INSIDE is an innovative monitoring system, which uses detector technology to obtain images of what happens inside the patient's body during the hadron therapy treatment. This bimodal imaging system combines a positron emission tomography (PET) scanner with a tracking system for charged particle imaging and is capable of operating during radiation delivery to treat head and neck tumours. ***(Photo: INFN)***

Inauguration of a high-power cyclotron

The SPES (Selective Production of Exotic Species project) cyclotron was inaugurated at the Legnaro National Laboratories on 2 December 2016.

The high-power SPES cyclotron is a circular accelerator capable of producing and accelerating protons at a rate of ten million billion of protons per second. Two proton beams will be extracted from the cyclotron: one will be used in nuclear astrophysics, the other for applications, especially in medicine and also to study the properties of new materials, through neutron radiation. Funds from the production of radioisotopes for clinical applications will be crucial for financing the SPES project - an aspect that will also guarantee its independence and continuity.

(Photo: INFN)

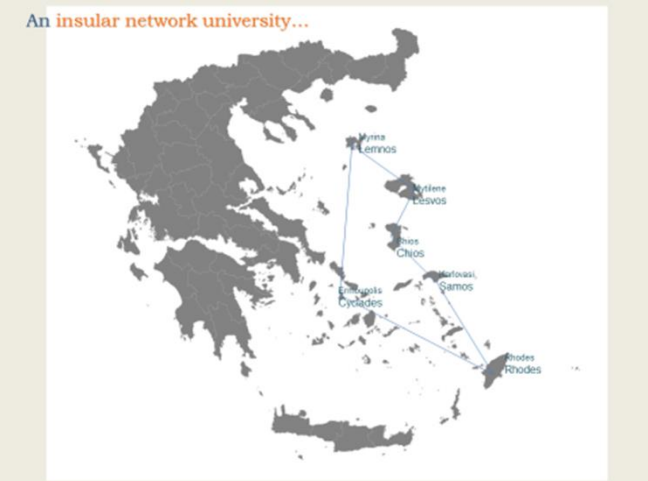
SPES is part of a broader European project called Eurisol (European Isotope Separation On Line facility) on which European nuclear physicists are working to develop three

radioactive ion beam facilities. A machine called SPIRAL2, with similar characteristics to the SPES' ones, is currently being built in France and the existing ISOLDE (Isotope Separator On Line DEvice) facility at CERN is being upgraded accordingly.

In focus

University of the Aegean, Greece

The University of the Aegean (UAegean) was founded in 1984, as a network of "academic ports of studies and research" successfully established in six campuses spread across the Aegean Archipelago (the islands of Lemnos, Lesvos, Chios, Samos, Rhodes and Cyclades), which makes it a unique natural, cultural and human environment to experience.



The university is committed both nationally and internationally to excellence, aiming to promote innovative, pioneering, cutting-edge research through systematic collaborations with a wide network of high-ranking universities. The track-record of basic and applied interdisciplinary, cross-cultural research has granted the UAegean a prestigious place among scientific and academic community, and a plethora of awards and distinctions has placed it at the forefront of science and technology.

With academic staff and scientists enjoying worldwide recognition and with more than a hundred state-of-the-art laboratories and research groups, the UAegean encourages and supports research in an ethical, sustainable, productive, multicultural and application oriented environment, on a team and individual basis. Specialized, cross-country fast-track research agendas cover a broad range of disciplines and are frequently at the core of joint Memoranda of Understanding.

Over the 33 years of its existence, the UAegean has evolved into an international research–oriented university offering 17 undergraduate (BA or BSc) and 62 MSc or MA postgraduate programmes in modern interdisciplinary thematic areas such as environment, communication systems, cultural informatics, shipping, logistics and transport, product design, food and nutritional sciences, education design and Mediterranean studies. Currently, it has 5 faculties and 17 departments.

The UAegean academic community incorporates 11 576 undergraduate students, 1 280 postgraduate students, 629 PhDs, 323 faculty members, 66 special scientific and 247 administrative personnel.

(Lesvos island campus, photo UAegean)

The research areas at the university cover societal challenges (culture, economy, society, geography, humanities), ICT research and innovation (mathematics, ICT, engineering), green and blue growth (food and nutrition, environment, maritime research, shipping and transport).

Research funding sources are nationally funded programmes (48%), revenue from community services (32%) and EU-funded programmes (20%). The total funding for the period 2014-2016 amounted to 26.562.354 euro. Forty percent of it was allocated to R&D activities.

UAegean participates in two large Horizon 2020 projects and in the National Strategy for Research, Technological Development and Innovation (2014-2020) with 4 research infrastructures. It is the coordinator of the **Intelligent Research Infrastructure for Shipping, Supply chain, Transport and Logistics (EN.I.R.I.S.S.T.)**. The project aims to formulate a business intelligent platform in shipping, transport, logistics and supply chain management that will combine business analytics, visualization techniques, technology advanced knowledge and innovative processes by offering high quality research services to users from different countries, including from the peripheral and outermost regions of Europe.

The university is a partner in three other research infrastructures (RI) such as:

- ✓ **"DeTAnet: Detector Development and Technologies for High-Energy Physics".** The project proposes an upgrade of the electronics and detector development infrastructure, which is currently distributed across several laboratories in universities and research institutes, in order to support R&D activities in advanced instrumentation for the benefit of the Greek high-energy physics (HEP) groups and ultimately the Greek electronics industry. The main goals of the proposal are: (i) to support and consolidate all instrumentation-related activities of the Greek HEP groups; (ii) To introduce to the Greek industry new technologies that have been or are currently developed in HEP; (iii) To involve Greek companies in research and construction projects at CERN in order to increase the industrial return to Greece.
- ✓ **"So.Da.Net_CESSDA_GR: the Greek RI for social sciences"** (www sodanet.gr)
- ✓ **"FoodOmicsGR: A consortium for comprehensive molecular characterisation of food products".**

(*Rhodes campus, photo: UAegean*)

UAegean collaborates with business and administration from several economic sectors through the "Aegean Start-ups" – a business accelerator distributed among the six islands where the university holds campuses. ***(in the picture: Chios campus, photo: UAegean)***. It is connected with 10 other facilities/cities in Greece and in Europe. This business accelerator is demand oriented while utilizing the "powers" of the Aegean such as tourism, shipping, culture, agriculture, food and beverage.

An Aegean Start-ups "round" includes four stages: (i) Launch of an international call for new entrepreneurial ideas tackling specific needs per sector; (ii) Evaluation and selection of Top-3 ideas; (iii) Seed financing and market support for the establishment and operation of the start-up with the involvement of several stakeholders such as local business, chambers of commerce, municipalities and district officials, individual companies, NGOs, business mentors, other incubators, etc.; and finally (iv) "Go to Market" stage.

A Platform of Aegean Start-ups (www.aegean-startups.gr) supports a digital submission and screening system, a team enhancement and collaboration system, as well as crowdlike and crowdfunding possibilities, a remote mentoring and digital training system, and information on the market status and needs.

A **Knowledge Technology Office** (KTO) was established in 1996, as part of the UAegean's Research Unit. It is a mediator between the research staff of the university and non-academic environment (market and society) at regional, national, European and international level. Its mission is to facilitate and increase researchers' participation in R&D projects and to promote innovation.

The KTO provides the following services:

- Research funding and marketing: newsletters for funding opportunities, advice and support on participation in Greek and European R&D funded programmes
- Services concerning management and financial control of projects, such as development of methodological tools for project management, consulting services, cluster development (joint projects in targeted industrial sectors)
- Technology transfer, including: IPR management; networking in knowledge transfer issues, in innovation and exchange of good practices; organization of knowledge transfer events; activities that generate and encourage regional technological innovation, entrepreneurship and human capital development; stimulation of PhDs, recruitment, career development and mobility of researchers.

The interview

Prof. Amalia Polydoropoulou

Vice-rector of Research, Development, Finance and Infrastructure, University of the Aegean, Greece

What are the main achievements of the University of the Aegean in technology transfer?

UAegean developed the "UAegean Innovation 2021" – a special initiative to strengthen its role as a regional innovation centre. This initiative contemplates the creation of a "Knowledge Transfer Hub in the Aegean Sea", dealing with the "entrepreneurial discovery" of suitable regional specializations in the North and South Aegean regions. Fostering innovation policies in the three regions of the Aegean Sea, UAegean researchers developed more than 150 innovative project ideas for cooperation with the regional stakeholders (industry, municipalities, and others).

In the previous national funding framework for cooperation - entrepreneurship and competitiveness, UAegean participated in more than 15 projects in cooperation with Industry (20 SMEs), with a total budget of 1.250.000 euro, in the fields of ICT and navigation technologies, coastal applications, security systems, nanotechnologies, earth observation, climate change and environment.

The four new UAegean's research infrastructure (RI) projects within the National Roadmap for RIs, provide new investment funds for research and technology for the next years.

The UAegean start-ups initiative, the summer schools, and the life-long learning activities offer knowledge, skills and entrepreneurship environment for young researchers and society.

What are the challenges that you face in the technology transfer activities?

Challenge 1. To establish strong relationships with the regional governments in order to create region-based job opportunities for the local communities. An efficient solution is to facilitate start-ups in acquiring university technology, acknowledging the fact that universities highly contribute to the economic development.

Challenge 2. To discover and develop patentable inventions, spin-offs, licenses and to promote collaboration with industry; while maximizing the social impact of technology taking into account similar European examples.

How do you intend to contribute to the activities of HEPTech and what benefits do you expect from your HEPTech membership?

We plan to extend our strong cooperation between CERN programmes and the high-energy physics group of the Department of Financial and Management Engineering. We are also going to encourage the involvement

of our scientists and researchers from other departments such as: Engineering and Computer Sciences; Shipping, Trade and Transport; Design and New Product Development, Natural Environmental Sciences, Marine Sciences, Food Science & Nutrition, etc.

We will be glad to involve other HEPTech members in our activities and in the implementation of the UAegean's research infrastructures and the AEGEAN Start-ups Initiative.

We are looking forward to sharing knowledge and experience in business development, technology transfer activities, start-ups and common e-incubators through summer schools, conferences, and workshops.

We would like to get the staff of our KTO trained using the HEPTech's experience and guidance.

The benefits expected from our HEPTech membership are summarized as follows:

- Participation in common educational activities, knowledge transfer and innovation;
- Collaboration in joint projects funded by internal or external resources in the areas of innovation, big data analysis, physics, engineering and medical physics, transport and logistics, business/economics, etc.; and
- Further expansion of the research network and increased international resonance of the UAegean.

HEPTech upcoming events

- Steering Committee - March 20th 2017
- Steering Committee – May 3rd 2017
- Board Meeting - June 7th 2017
- Steering Committee - September 6th 2017
- Steering Committee - November16th 2017
- Board Meeting – December 4th 2017

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