

## Sometimes good news comes in twos !

### Firstly, the award of the 2013 Physics Nobel Prize to François Englert and Peter W. Higgs

“for the theoretical discovery of a mechanism that contributes to our understanding of the origin of mass of subatomic particles, and which recently was confirmed through the discovery of the predicted fundamental particle, by the ATLAS and CMS experiments at CERN’s Large Hadron Collider” is a fantastic recognition of outstanding scientific work. The prediction and discovery of the Higgs particle through the ATLAS and CMS experiments at CERN’s Large Hadron Collider (LHC) marks the culmination of decades of hard work by thousands of scientists and engineers from around the world.

Many oPAC partners have contributed for many years to the LHC, its commissioning, optimization, operation and now to R&D into future upgrades. The continuous optimization of the world’s highest energy accelerator requires close collaboration between institutions around the world in beam physics, beam diagnostics, simulation studies and the machine control and data acquisition system, i.e. across the whole oPAC research program. As a community, we need to see this fantastic award, as well as the Prince of Asturias Award to CERN (see this newsletter for more details), as an additional motivation to continue to develop the most advanced concepts and push the limits of technology ever further.

Secondly, the oPAC consortium met this month in Barcelona for the project mid term review meeting with the European Commission and an external reviewer. All Fellows, supervisors, as well as representatives from partner institutions joined us during two intense days. We talked about all aspects of project implementation and progress to date and were delighted to hear that oPAC was commended as a ‘great success’. You will find further details in this newsletter. As a network, we could not have hoped for a more positive feedback and I would like to thank all project partners for their fantastic work and support to date. I would also like to thank our friends at ALBA for being such great hosts and for giving us the opportunity to visit their state-of-the-art light source.

During the meeting we also finalized plans for **future oPAC events**: A Topical Workshop on „Libera“ will be held Slovenia between 9-11 April 2014 and hosted by Instrumentation Technologies, another one on „Beam Diagnostics“ will be held in Vienna, Austria on 8/9 May 2014 and hosted by CIVIDEC, and an oPAC School on Accelerator Optimization will be held at RHUL in London between 7-11 July 2014. Registration for all 3 events will open within the next few weeks. **Get involved !**



Carsten P. Welsch, Coordinator

### Special Interest Articles

- oPAC at IBIC13
- Fellows News
- Vacancies

### Individual Highlights

- Mid-Term Review Meeting
- Research Highlights



## oPAC Project found to be a 'Great Success'

The mid-term review meeting of the oPAC project took place on Monday 14<sup>th</sup> October 2013 in Barcelona, Spain and was hosted by project partner ALBA light source. All aspects of the project were critically reviewed by a representative of the European Commission

and an expert reviewer. This included Fellow progress in their R&D activities, training provided by each host institute and the network as a whole, events organized to date and planned, as well as all aspects of project management.



The meeting kicked off with a welcome address from ALBA Director, Dr. Caterina Biscari, followed by an introduction by the EC Project Officer. oPAC coordinator Prof. Carsten P. Welsch then presented a detailed overview of progress made in all aspects of the project. Meghan McAteer, elected Fellow spokesperson, continued with a presentation about feedback from all Fellows and their impressions within oPAC.

After a short break all Fellows gave presentations about their individual research and training to date, followed by questions. A closed session between Fellows and the reviewers concluded a long day.

**The project was found to be a 'great success' by the expert reviewer and both were impressed by the very good research progress made which has already resulted in a number of publications and even invited conference talks by Fellows.** They also commended the project on the management and dissemination and invited the project coordinator to share this 'best practice' with other ITN coordinators from across Europe later this year in Brussels.



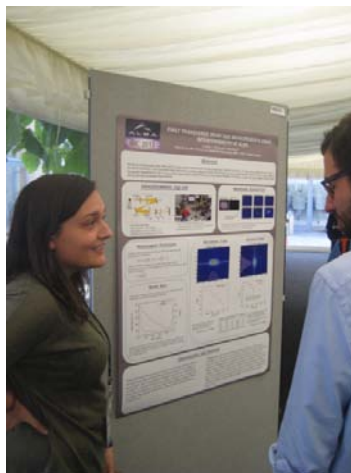
This is an excellent outcome and a result of the hard work of the consortium over the past two years.

## Major oPAC Presence at IBIC 2013

oPAC has been present at the second International Beam Instrumentation Conference (IBIC) hosted by Diamond Light Source in Oxford from Monday 16<sup>th</sup> to Thursday 19<sup>th</sup> September 2013.

IBICs programme of talks, tutorials, poster sessions and discussion groups has been designed to explore the physics and engineering developments and challenges of beam diagnostics and instrumentation for charged particle accelerators worldwide.

9 oPAC Fellows participated in the conference and poster sessions. Additional highlights were the talks from oPAC Fellows Laura Torino “Charge Distribution Measurements at ALBA” and Konstantin Kruchinin “Extremely Low Emittance Beam Size Diagnostics with Sub-Micrometer” which have raised the attention of the public.



Laura Torino's participation was supported by one out of only five IBIC13 scholarships.

**IBIC 2013**  
International Beam Instrumentation Conference



An industrial stand run by the EU Project TEAM also promoted oPAC along with LA<sup>3</sup>NET and DITANET, two other European ITN projects coordinated by the University of Liverpool from the Cockcroft Institute. The main goals achieved were assisting in dissemination and attracting delegates to the oPAC stand at IBIC, presenting the oPAC Fellows and their research achievements, publicising opportunities for organisations to

join the network as adjunct partners and introducing activities opened for external participation, such as project schools and awards.

**Thanks to oPAC Fellows and Partners the oPAC Project is recognized on the international stage for particle accelerators.**

[ibic2013.org](http://ibic2013.org)

## Research Highlights

### Charge Distribution Measurements at Alba - Laura Torino, ALBA



**Synchrotron Light sources are accelerator facilities producing synchrotron radiation to perform experiments in many fields of science.** ALBA is a third generation Synchrotron Light source, located close to Barcelona in Spain with a 3 GeV electron beam available for users since May 2012. The quality of the radiation used for the experiments directly depends from the longitudinal and transverse distribution of the electrons in the storage ring. Therefore these characteristics have to be continuously monitored with a non-invasive diagnostic system. To monitor the longitudinal charge distribution, the so-called filling pattern, different techniques were tested by oPAC Fellow Laura Torino at ALBA using analogue and electro-optical (EO) devices [1].

In the case of analogue devices, direct beam profile measurements were performed using a Fast Current Transformer (FCT) and the sum of the four buttons of a Beam Position Monitor (BPM), both located in the storage ring.

EO measurements are based on the correlation between the longitudinal distribution of the electrons in the machine and the temporal distribution of the produced synchrotron radiation. To measure the filling pattern, the visible part of the radiation was detected at the ALBA optical beamline Xanadu using a Photomultiplier tube (PMT). Results were observed directly with an oscilloscope and analyzed later. The same PMT was then used to measure the filling pattern with Time Correlated Single Photon Counting (TCSPC). This technique consists of measuring the distribution of the time difference between a given trigger signal and the arrival time of a single photon from the beam to the detector. In all cases the quantitative information on the charge per

bunch was achieved distributing the current read from the DCCT in the storage ring. A similar data analysis was applied to all acquired data to enable a comparison between different techniques. Results show that systematic errors induced by analogue or EO devices are different. This yields a good overall characterization of the filling pattern when combining the two techniques. Fig. 1 shows one train of the ALBA filling pattern measured with FCT and PMT. FCT (in blue) has a good time resolution but is affected by noise in the gaps. PMT (in red) has a slower decay time that makes identification of the last filled bunch of the train difficult, but gaps are not affected by noise at all. Currently the filling pattern is monitored online using mainly the FCT. Further developments of the TCSPC using a different detector are foreseen. To monitor the bunch by bunch transverse charge distribution interferometry is under development [2]. Preliminary measurements were performed at the ALBA optical beamline Xanadu where synchrotron radiation was selected, focused and guided through a double slit mask that produces an interference pattern. Data was then collected by means of a CCD camera and analyzed off-line.

Good results were obtained for both, horizontal and vertical beam-size with limitations mainly coming from imperfection in the in-vacuum mirror used to extract the visible radiation from the vacuum chamber. Improvements are expected in December when a new mirror will be installed. In the future it is planned to replace the CCD camera by a Fast Gated Camera that can be synchronized with the general ALBA timing system. On-line data analysis will be implemented to provide real time bunch by bunch transverse beam size measurements.

[1] L. Torino, U. Iriso, "Charge Distribution Measurements at ALBA", Proc. IBIC, Oxford, UK (2013).

[2] U. Iriso, L. Torino, "Transverse Beam Size Measurements Using Interferometry at ALBA", Proc. IBIC, Oxford, UK (2013)

## Ultra-low Emittance Beam Size Measurement - Konstantin

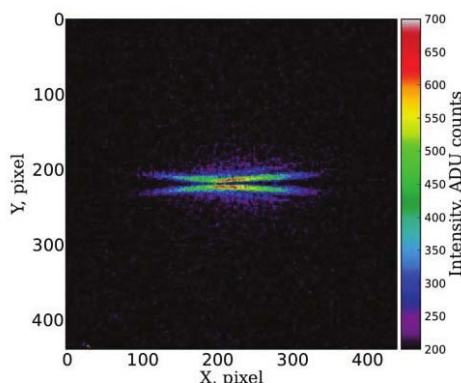
Kruchinin, RHUL

**Transverse electron beam diagnostics is crucial for stable and reliable operation of the future electron- positron linear colliders such as CLIC or Higgs Factory.**

The-state-of-the-art in transverse beam diagnostics is based on the laser-wire technology. However, it requires a high power laser significantly increases the cost of the laser-wire system. Therefore, a simpler and relatively inexpensive method is required.

A beam profile monitor based on Optical Transition Radiation (OTR) is very promising. The resolution of a conventional OTR monitor is defined by the root-mean-square of the so-called Point Spread Function (PSF) which describes the response of an optical system to a source distribution generated by a single charge. In the optical wavelength range the resolution is diffraction limited down to a few micrometers. The best resolution achieved so far by conventional OTR monitors is around a few micrometers [3]. However, in [4] it was demonstrated that the OTR PSF differs from a conventional PSF of an optical system. While the vertical polarization component of the OTR has a two-lobe structure which can be used to monitor the vertical beam size with sub-micrometer resolution. On the other hand if the beam is flat, which is true for linear colliders, the horizontal projection of the distribution represents a direct measurement of the horizontal beam size which gives an opportunity to measure the electron beam size in two directions in a single shot.

Transverse beam size measurements were recently carried out at the ATF facility in Japan showing that it is possible to achieve a sub-  $\mu\text{m}$  resolution, see figure to the left [5].



Typical image of the OTR spot taken with linear polarizer and  $550\pm 20$  nm optical filter.

The minimum measured vertical beam size was  $0.7541\pm 0.034$   $\mu\text{m}$  which is approximately 5 times better than the resolution of conventional OTR monitors. In order to further improve the resolution of the monitor, effects significantly influencing on the PSF width need to be reduced. One way is to use a special simulation tools for optical calculations to better understand of the PSF behaviour. It was shown in [9] that using such tools lead to results which are in a good agreement with real experimental data and can be used for very accurate simulations of the optical system to achieve the best resolution. Another way would be to use reflective instead of refractive optics. For example using an off-axis parabolic mirror could reduce chromatic aberration effects. However, using such mirror in a real experiment becomes challenging because of mirror alignment. Even small deflection of an incidence angle leads to significant image distortion. The idea of using reflective elements for OTR beam profile measurements and its influence on the resolution are subject to further studies.

[3] M. Ross, et. al., SLAC Pub. 9280 (2002).

[4] P. Karataev, et. al., PRL 107, 174801 (2011).

[5] K. Kruchinin, et al., "Extremely Low Emittance Beam Size Diagnostics with Sub-Micrometer Resolution Using Optical Transition Radiation", Proc. IBIC, Oxford, UK (2013).

## oPAC Events

### CST Workshop held at Cockcroft Institute, UK

Computer Simulation Technology AG together with The University of Liverpool hosted a Workshop at the Cockcroft Institute on Tuesday 8<sup>th</sup> October.

The aim of the event was to bring new, or potential, CST users up to speed with version 2013.

Topics covered included:

- Introduction to the CST front end
- Guidelines on meshing
- Modelling waveguide and cavities, Q factor calculations
- Solvers – T, F and E
- Ports



## Fellows News

### Alessandra Valloni: Invited to attend POETIC Workshop and to give a Presentation at the 25<sup>th</sup> North American Particle Accelerator Conference

oPAC Fellow Alessandra Valloni was invited to attend and speak at the fourth "Physics Opportunities at an Electron Ion Collider" (POETIC) workshop held on 2<sup>nd</sup> – 5<sup>th</sup> September 2013 in Jyväskylä, Finland.

The workshop follows a series that began at the INT 2010 fall program in Seattle and has continued with workshops at Stellenbosch, South Africa; Bloomington, Indiana and Valparaiso, Chile. The goal of this series of workshops is to continually bring together scientists, both from theory and experiment, to discuss new developments and the plans and science case for the next generation collider DIS experiments (EIC, LHeC) and

related physics. Alessandra contributed a 45 minutes talk about the "LHeC Design Study at CERN".



### POETIC2013





In addition, Alessandra was also invited to make a 30-minute invited oral presentation entitled “Beam Physics in Future Electron Hadron Colliders”, at the 25<sup>th</sup> North American PAC (NA-PAC’13) in Pasadena, California (29<sup>th</sup> September – 4<sup>th</sup> October). The conference attracted participants worldwide for a lively scientific programme including more than 40 hours of oral presentations, and over 800 poster presentations.



## Michal Jarosz presents: An Introduction to Accelerators

On the 4<sup>th</sup> of October oPAC Fellow Michal Jarosz visited XXVIII High School in Warsaw which he attended himself between 2003 - 2006. His former physics teacher, Mrs Agnieszka Kozłowska, invited him for this special visit. She helped him organize the visit by setting the venue and obtaining the blessing from the school directorate.

Physics, so he could introduce some formulas and advanced phenomena.

**Presentation of the ESS complex** and the usage of neutrons.

**Introduction to oPAC network** and showing explaining that participating in a project like this is within their reach.



The general reception was very good. The students seemed focused on the presentation for the whole time and, more importantly, Michal was asked many questions at the end. There was also another “unofficial” part where he talked a little bit about their future. They are just about to choose their University studies; so he gave them a few hints, advice and examples of a future career based on his own life choices. The students were exceptionally interested in this and kept asking questions even after the school bell rang.

The visit started with a lecture that took around 35 minutes. It consisted of 4 major topics:

**Personal introduction** (emphasising that Michal is a graduate of the same school the students are attending at the moment).

**Technical part**, and also the largest, describing the principles of accelerators: basic physics around them, examples, and major facilities.

Important note: the class he was giving his talk to was a final grade class of Polish high-school (students aged 17-18) with a focus on



Michal considered the whole visit as very successful from both sides. On the one hand, the students enjoyed his talk and got insight into the perspectives of their future careers. On the other hand, he continued enhancing his presentation skills and tailoring them depending on the kind of audience. The teacher was “impressed by his show – show, because for sure this was not solely a presentation or a lecture. I have never seen (and I have seen a lot of similar tries) that somebody managed to keep the interest,

engagement, good humour and content of the listeners in such a good way. Bravo!”

**As part of the oPAC outreach activities, all oPAC Fellows were asked to give such talks to schools and to prepare short videos about their projects within the next six months. This will explain the challenges in their research projects to many primary, secondary and high school students across Europe.**

## Miguel Fernandes and Meghan McAteer have moved fast forward and rewind to our Origins

**Origins, an EU co-funded project has celebrated the 2013 Researchers Night bringing together Nobel laureates, young researchers and general public.**

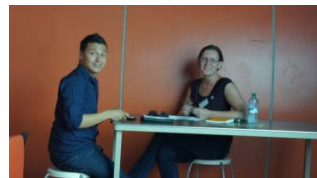
For the first time, a webcast produced at CERN in Geneva (English), UNESCO in Paris (French) and the National Institute for Astrophysics (INAF) in Bologna (Italian) has brought cosmologists and particle physicists to the stage, each place hosted different guest and exciting events.

oPAC Fellows Miguel Fernandes and Meghan McAteer participated in this project taking visitors both back to the origins of our Universe and forward to the future scientific achievements.

The project received 150 applications from the public for 20-minute meetings with CERN researchers. Researchers had an excellent opportunity to get the public interested and spread their excitement about their research.



Origins’ rich programme of events at three venues and in three languages is available on the [website](#), to meet oPAC Fellows look at their [profiles](#).





## Sehar Naveed's Secondment in Turkey

**oPAC Fellow Sehar Naveed visited Dr. Ozgur Ergul, Assistant Professor at Department of Electrical and Electronics Engineering of Middle East Technical University (METU) Ankara, Turkey, to develop a better understanding of the Multilevel Fast Multipole Algorithm (MLFMA) and to discuss the numerical methods and techniques suitable to the development of a simulation suite for low velocity Beam Position Monitors.**

During the secondment, Dr. Ergul provided tremendous support and helped Sehar in every way possible. With his efficient style of teaching, he made it easier for her to understand the working of the algorithm. He listened to

Sehar's questions patiently and satisfied her with his answers. Most of the discussion focused on the geometry of the model and the possible numerical remedies to tackle the problem of low frequency breakdown of such models. A time frame of the project was formatted and an action plan was also agreed upon by breaking down the project into a number of steps so to concentrate on each aspect according to the significance and importance of each one of them.

Sehar describes the experience as exciting and beneficial and hopes to put the acquired skills and knowledge into practice to overcome the obstacles that may arise during the course of the project.



## Congratulations to:

**Emilia Cruz Alaniz for being awarded the best first year student presentation prize from Cockcroft Institute Postgraduate Conference.**

Her talk "Design of the LHeC Interaction Region" aimed to give an overview of her research work in the past months and showed the advances and tasks pursued up to the moment with LHeC interaction region design.

During her speech, she put special emphasis in the importance of such an experiment by showing the results & discoveries coming from the different collisions' types. She also explained how these results have contributed to the confirmation of the Standard Model of particle physics.



**Konstantin Kruchinin and his wife on the birth of their daughter, Eva.**

Rumour says that she has already spoken her first words, "oPAC" being one of them!  
**Best wishes from the oPAC community.**



## Partner News

### Cosylab joins the DISCS (Distributed Information Services for Control Systems) Collaboration

**During design and construction of an accelerator, a heterogeneous set of engineering disciplines, methods and tools are used.** Data is stored in various databases and files, whose format is tailored to the discipline. This hinders design as data is replicated in multiple data stores and needs to be frequently reconciled. While during operation and maintenance phases exploitation of data is difficult, since the tools needed to access it are not commonplace or an authoritative version of data cannot be clearly identified.

The DISCS collaboration aims to build a framework for building high-level applications for commissioning, operation, and maintenance of an accelerator. Today, *Facility for Rare Isotope Beams* (Michigan, USA), *Brookhaven National Lab* (New York, USA), *European Spallation Source* (Lund, Sweden), *Institute of High Energy Physics* (Beijing, China) and *Cosylab* (Ljubljana, Slovenia) are members of the collaboration.

DISCS comprises of a set of cooperating services and applications, and manages data such as machine configuration, lattice, measurements, alignment, cables, machine

state, inventory, operations, calibration and design parameters.

In the collaboration, Cosylab is focusing on data needed for control system configuration. The configuration data of the thousands of equipment control computers can be stored in a central database and edited through a spreadsheet user interface. Thanks to the work performed by Pavel Maslov in the context of oPAC, the control system configuration module can also efficiently configure the equipment control computers, allowing for faster and less error-prone configuration of the control system.

For more information, please visit the collaboration's web site at [discs.openepics.org](http://discs.openepics.org).

#### Publication:

V. Vuppala, L.B. Dalesio, D. Dohan, G. Shen, K. Shroff, M. Vitorovic, K. Zagar, K. Rathsmann, G. Trahern, D. Liu, C.P. Chu, S. Peng, H. Lv, C. Wang, Z. Zhao: *Distributed Information Services for Control Systems*, ICALEPCS 2013, San Francisco, USA

### EUCARD2 Topical Workshop on Instabilities at Synchrotron SOLEIL

**Topical Workshop on Instabilities, Impedance and Collective Effects shall be organized by oPAC partner Synchrotron SOLEIL on the 16<sup>th</sup> and 17<sup>th</sup> January 2014 as a sub-series of Low Emittance Rings (LOWeRING) Workshops.** The goal of the workshop is to bring together experts working on collective beam instabilities and related subjects in low emittance lepton rings. The latter will include damping rings, test facilities for linear colliders, B- factories

and electron storage rings. The workshop will cover all potential important effects that may arise and jeopardise the performance of currently running and future low emittance lepton rings. Participants will benefit from the experience of colleagues who have theoretically and experimentally studied the physics and have developed and operated countermeasures.

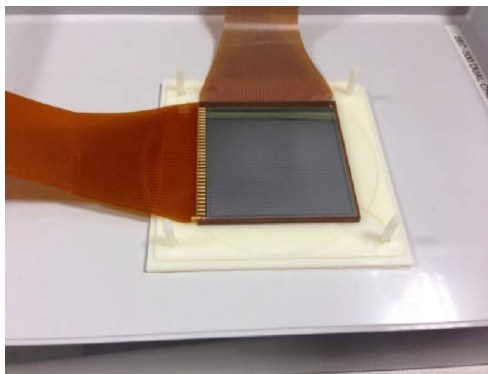
For more information, visit [www.synchrotron-soleil.fr/Workshops/2014/TWIICE](http://www.synchrotron-soleil.fr/Workshops/2014/TWIICE)



## Novel dual Single Sided Silicon Strip Detector Chip developed for Radiotherapy Treatment Verification

**Cancer is nowadays a leading cause of death worldwide, accounting for around 13% of all deaths (Globocan 2008 - [globocan.iarc.fr/](http://globocan.iarc.fr/)). This is why the scientific world is making effort to support mankind by developing techniques that help people to achieve a better quality of life.**

In complex radiotherapy treatments with photons, such as Intensity Modulated Radiotherapy (IMRT), dose distribution verification is highly advisable prior to real dose delivery to patient. In fact, the increasing sophistication and complexity of IMRT treatments is a major challenge for Treatment Planning Systems (TPS).



Novel dual single sided silicon strip detector chip for radiotherapy verification.

The oPAC project “*Design of a detection system to verify 2D dose maps for Intensity Modulated Radiation Therapy (IMRT) treatment*” aims to produce a novel optimized online readout system to obtain 2D dose maps at axial planes for radiotherapy treatment verification, which is based on clinical requirements. This work is in the frame of a scientific collaboration between the University of Seville, the National Accelerator Centre (CNA-Seville) and the Virgen Macarena University Hospital in Seville, Spain.

After successful results with a feasibility study performed with a commercial single sided W1-SS 500 detector, developed within the context of the projects RADIA and DITANET (*Diagnostic Techniques for future particle Accelerators*) and explained in details in references [1, 2, 3], a new detector concept was designed and developed in collaboration between the University of Seville, the National Accelerator Centre, ATI Sistemas, S. L. (Spain) and Micron Semiconductors Ltd. (England) also responsible for its construction [4].

The novel detector is now housed inside a slab phantom, at the Virgen Macarena Hospital. First measurements in order to characterize the detector, irradiating it with photon beams produced by clinical linacs at the Hospital, have been performed.



The detector installed inside a slab phantom, at the Virgen Macarena Hospital, positioned for irradiation by a clinical linac.

The dual SSSSD chip was developed within a special configuration in order to optimize uniformity and minimize foreign material around the large active area (64x64 mm<sup>2</sup>), and obtain a two-dimensional detector. Two independent BB7 SSSSDs [4] were mounted for the first time in a back to back perpendicular configuration. As another novelty, for clinical requirements, they were separated by a 500 µm kapton dielectric film, with the same dimensions as the silicon wafers, minimizing air gaps in between. This new configuration, called the dual SSSSD chip, was packed on kapton printed circuit board (PCB), instead of using the conventional FR4

material. Both silicon wafers were divided into 32 strips, 2 mm width each. The strips were connected to an in-house developed electronics by kapton cables. Thus, homogeneity of the detector's surroundings was optimized by using kapton material whose density is close to that of water (tissue equivalent).

The aim of developing such a detector was to allow 2D dose measurements, improve spatial resolution and perform radiotherapy treatment verification faster than with the previous prototype [1].

[1] Nuclear Instruments and Methods in Physics Research A: Accelerators, Spectrometers, Detectors and Associated Equipment - NIM A 673 (2012) 98-106.

[2] Physical Review Special Topics: Accelerators and Beams 15, 042802 (2012).

[3] Progress in Nuclear Science and Technology 2 (2011) 191-196.

[4] Micron Semiconductor Ltd, *Solid State Detectors and Internet Solutions*, Available on-line at <http://www.micronsemiconductor.co.uk/> (2013).

## CERN awarded Principe de Asturias Award for Technical and Scientific Research

**The Jury for the Prince of Asturias Award for Technical and Scientific Research, have decided to bestow the 2013 Award jointly to physicists Peter Higgs (UK), François Englert (Belgium) and the international institution CERN, the European Laboratory of Particle Physics, for the theoretical prediction and experimental detection of the Higgs boson.**

The Prince of Asturias Awards are intended to reward scientific, technical, cultural, social and humanitarian work carried out at an international level by individuals, institutions or groups of individuals or institutions. They are conferred in eight different categories: Arts, Literature, Social Sciences, Communication and Humanities, Technical and Scientific Research, International Cooperation, Concord and Sports.



The Awards Ceremony will be held in Oviedo (Principality of Asturias, Spain). Nominees should be outstandingly exemplary and their work, or contribution should be of acknowledged international standing in each of the categories that the Awards encompass.



The discovery of the Higgs boson is a prime example of how Europe has led a collective effort to solve one of the deepest mysteries of physics.

In 1964, the pioneering work of Higgs and of Englert and Brout (the latter died in 2011) established the theoretical basis for the existence of the so-called Higgs boson. This particle completes the Standard Model, which describes the fundamental components of Nature, and is responsible for certain elementary particles possessing

mass. For nearly half a century, efforts to find the Higgs boson were unsuccessful due to the enormous experimental difficulties associated with its precise and unequivocal detection. The Higgs boson was finally identified in 2012 by the ATLAS and CMS detectors of the LHC particle accelerator at CERN, a milestone for the entire scientific community. Higgs and Englert were awarded the 2013 Nobel prize in physics for their work.

## Red Pitaya on [www.redpitaya.com](http://www.redpitaya.com)

**Red Pitaya is a single-board, open instrumentation and control platform which replaces many expensive laboratory and field instruments at a surprising price tag.** It is based on the Xilinx Zynq All Programmable SoC, which combines a dual-core ARM Cortex-A9 with a heavy-duty set of peripherals and a chunk of Xilinx 7 series programmable logic.



Red Pitaya will continue as an Instrumentation Technologies spin-off company.

Now that the Kickstarter campaign is over, orders can be done through the website [www.redpitaya.com](http://www.redpitaya.com). Updates about developments in the Red Pitaya universe can be received via [subscription](#) or on

Earlier this month, Red Pitaya finished its [Kickstarter](#) funding campaign with \$256,125 worth of pledges, which is more than five times greater than the \$50K goal and also exceeds the two stated stretch goals.



## New to the Network



**Charlotte Roose** was born in Brussels, Belgium, in 1987. In 2008, she started engineering studies at the Institut Supérieur Industriel de Bruxelles (ISIB), Belgium. In 2011, she graduated of Bachelor's in Technological Engineering. During her 3rd year, she made an internship at the Cyclotron Research Centre (CRC) at the Université Catholique de Louvain (UCL). During that internship, she worked with the accelerator department – the main subject was the implementation of quality control on the heavy ion line, and the radioprotection department – the main subject was the analysis of activated concrete samples.

In 2013, she graduated of Master's in Physics and Nuclear Engineering at ISIB. For her Master's thesis, she undertook an internship

at the École Polytechnique de Montréal, Canada. The subject was the verifying the cross sections libraries used for the calculation of a cell of a supercritical water reactor fueled with thorium. The transport calculation was made for various libraries with the deterministic code DRAGON, developed by the École Polytechnique de Montréal. The results were compared to results obtained with the Monte Carlo code SERPENT in order to deduce the libraries relevance.

**Currently Charlotte is a Marie Curie Fellow at ESS within the oPAC Project.** Her research will focus on the development of non-invasive methods for measuring the beam profile in high intensity proton beams of the ESS accelerator.

**Rita Galan has joined the oPAC Project as Manager on 1<sup>st</sup> September 2013.**

Rita has Master's degrees in Chemical Engineering and Integrated Management Systems: Risk prevention, Health, Safety, Quality and Environment. She is also qualified as an Internal Auditor for ISO 14001 / ISO 9001 / OHSAS 18001 and is a certified Health, Safety and Ergonomics Superior Technical Expert. Her education and work activities have been carried out in different countries in enriching multicultural teams becoming a proficient speaker of four languages (English, French, German and Spanish).

Her work has provided her with first-hand experience of industry, multinational

companies and recognised research centres such as the European Organization for Nuclear Research (CERN). Her responsibilities have included project management of biogas projects at national and international level, environment – safety management in the HSE Unit at CERN, dissemination and communication campaigns like being CERN guide, risk analysis and preparing recommendations for renewing an electroplating plant, business development of international companies and contributing to research at the University Erlangen-Nuremberg. Rita is now the first point of contact for all oPAC partners and Fellows.



## Position Vacancies

### oPAC - Royal Holloway University of London

Project title: Optimization of the layout of the LHC collimation system

**Early stage researcher vacancy at RHUL to look into an optimization of the layout of the LHC collimation system** to minimize beam related backgrounds in the ATLAS detector at CERN and also look into optimizing the LHC injection region to minimize activation in that

region.

More information can be found [here](#).

Application can be sent via: [www.rhul.ac.uk/.../centreforparticlephysics.aspx#Apply](http://www.rhul.ac.uk/.../centreforparticlephysics.aspx#Apply)



## oPAC - University of Seville / Centro Nacional de Aceleradores

### Project title: Optimization of $^{10}\text{Be}$ detection

**Interesting research opportunity into the physical processes involved in  $^{10}\text{Be}$  detection by AMS, the search for the optimum settings of the existing system and the design of modifications to increase both, the sensitivity and the efficiency.** The results of this project will have strong impact on other small AMS facilities, as this radionuclide is

probably the most requested from those measured by AMS after  $^{14}\text{C}$  since it can be used as a dating tool or as a measurement of solar exposure.

Further information:

[www.liv.ac.uk/opac/projects/us/](http://www.liv.ac.uk/opac/projects/us/)



## oPAC - University of Seville / Centro Nacional de Aceleradores

### Project title: Ion implantation at particle accelerators for nanoparticle production

**Interesting research opportunity to study the ion implantation of noble metals (Au, Ag, Pt, Pd) thin films of transparent metal oxides ( $\text{SiO}_2$ ,  $\text{TiO}_2$ ), and the subsequent coalescence of nanoparticle after thermal annealing,** specifically, the differences in the formation of nanoclusters in host with different morphologies, homogeneous or nanostructured.

Interest in metal nanoparticles (NPs) embedded in dielectric matrices has been renewed in recent years due to their potential applications in a wide range of high technological domains.

Further information:

[www.liv.ac.uk/opac/projects/us/](http://www.liv.ac.uk/opac/projects/us/)



## LA<sup>3</sup>NET - University of Liverpool

### Project title: Development of a compact, fibre optics-based electron accelerator

**A vacancy for an early stage researcher to work on the Development of a compact, fibre optics-based electron accelerator has arisen in the LA<sup>3</sup>NET project.** The project will cover experimental and numerical studies into novel ultra-compact accelerators and be embedded into an international collaboration. The post is for the University of Liverpool based at the Cockcroft Institute in Daresbury and will run until the end of September 2015. The candidate must be in

the first 4 years of their research careers which can include PhD studies but they must have not yet been awarded a PhD. The project outline is described on the website: [www.liv.ac.uk/la3net/projects/uliv/](http://www.liv.ac.uk/la3net/projects/uliv/).

For more information please contact the LA<sup>3</sup>NET coordinator and scientist in charge at Liverpool [Prof. Carsten P. Welsch](mailto:Prof. Carsten P. Welsch).



## Publications

- 'First Transverse Beam Size Measurements Using Interferometry At Alba'**, L. Torino, IBIC 2013, Oxford UK, 16-19 September 2013
- 'Cryogenic Current Comparator As Low Intensity Beam Current Monitor In The Cern Antiproton Decelerators'**, M. Fernandes, IBIC 2013, Oxford UK, 16-19 September 2013
- 'Beam Loss Monitoring At The European Spallation Source'**, M. Jarosz, IBIC 2013, Oxford UK, 16-19 September 2013
- 'Operation Of Silicon, Diamond And Liquid Helium Detectors In The Range Of Room Temperature To 1.9 K And After An Irradiation Dose Of Several Mega Gray'**, M. R. Bartosik, IBIC 2013, Oxford UK, 16-19 September 2013
- 'Development Of Compact Electronics Dedicated To Beam Position Monitors In Injectors And Boosters'**, M. Cargnelutti, IBIC 2013, Oxford UK, 16-19 September 2013
- 'Extremely Lowemittance Beam Size Diagnostics With Sub-Micrometer Resolution Using Optical Transition Radiation'**, K. Kruchinin, IBIC 2013, Oxford UK, 16-19 September 2013
- 'Recent Results of the Diamond Beam Loss Monitors at LHC'**, P. Kavrigin, et al., Proc. IBIC 2013 Conference, Oxford, UK (2013)
- 'Charge Distribution Measurements at ALBA'**, L. Torino, et al., Proc. IBIC13, Oxford,UK (2013)
- 'Transverse beam size measurements using interferometry at Alba'**, L. Torino, et al., Proc. IBIC13, Oxford, UK (2013)
- 'Beam Position Monitor R&D for keV ion beams'**, S. Naveed, et al., Proc. IBIC13, Oxford, UK (2013)
- 'Beam Halo Monitor Based on an HD Digital Micro Mirror Array'**, B. Lomborg, et al., Proc. IBIC, Oxford, UK (2013)
- 'Beam Physics in Future Electron Hadron Colliders'**, A. Valloni, O. Brüning, M. Klein, D. Schulte, F. Zimmermann, CERN, Geneva, Switzerland (2013)
- 'Beam Instrumentation R&D within oPAC'**, C.P. Welsch, Proc. IBIC, Oxford, UK (2013)
- 'LHeC IR Optics Design Integrated Into the HL-LHC Lattice'**, E. Cruz, et al., Proceedings IPAC, Shanghai, China 2013.
- 'Backward X-ray Transition Radiation from Multi-layered Target for Submicron Beam Diagnostics'**, K. Kruchinin, et al., Proceedings IPAC13, Shanghai, China 2013.
- 'Sub-micrometre resolution laser wire transverse beam size measurement system'**, K. Kruchinin, et al., Proceedings IPAC13, Shanghai, China, 2013.
- 'Modelling resulting from magnetic and beam based measurements of the ALBA gradient dipoles'**, X. Nuel Gavaldà, et al., Proceedings IPAC13, Shanghai, China, 2013.



### oPAC Events

April 9 <sup>th</sup> – 11 <sup>th</sup> 2014	oPAC Libera Workshop, Instrumentation Technologies, Solkan, Slovenia
May 8 <sup>th</sup> - 9 <sup>th</sup> 2014	oPAC TW on Diagnostics, Vienna, Austria
July 7 <sup>th</sup> - 11 <sup>th</sup> 2014	oPAC School on Accelerator Optimization, London, UK
June 22 <sup>nd</sup> - 23 <sup>rd</sup> 2015	oPAC TW on Technology Transfer, Liverpool, UK
June 24 <sup>th</sup> – 25 <sup>th</sup> 2015	oPAC School on Advanced Researcher Skills, Liverpool, UK
June 25 <sup>th</sup> 2015	Symposium on Accelerators for Science and Society, Liverpool, UK
Oct 7 <sup>th</sup> – 9 <sup>th</sup> 2015	oPAC International Conference, Seville, Spain

### Events

Nov 4 <sup>th</sup> – 6 <sup>th</sup> 2013	LA <sup>3</sup> NET Workshop on Laser Technology & Optics Design, Aachen, Germany
Jan 6 <sup>th</sup> – Mar 13 <sup>th</sup> 2014	JUAS 2014, Archamps, France
Jan 16 <sup>th</sup> – 17 <sup>th</sup> 2014	EUCARD2 Topical Workshop on Instabilities at Synchrotron SOLEIL
April 28 <sup>th</sup> – 30 <sup>th</sup> 2014	LA <sup>3</sup> NET Workshop on Novel Acceleration Schemes, Dresden, Germany
June 15 <sup>th</sup> – 20 <sup>th</sup> 2014	IPAC 14, Dresden, Germany

#### Project Coordinator

Prof. Carsten P. Welsch  
 Cockcroft Institute  
 Sci-Tech Daresbury  
 Keckwick Lane  
 Warrington, WA4 4AD  
 United Kingdom

PHONE:  
 +44 (0) 1925 86 4352

FAX:  
 +44 (0) 1925 60 3192

E-MAIL:  
 carsten.welsch@cockcroft.ac.uk

#### Project Manager

Rita Galan

PHONE:  
 +44 (0) 1925 86 4346

FAX:  
 +44 (0) 1925 86 4206

E-MAIL:  
 rita.galan@cockcroft.ac.uk

#### Newsletter Editor

Alexandra Welsch

PHONE:  
 +44 (0) 1925 86 4046

FAX:  
 +44 (0) 1925 86 4206

E-MAIL:  
 alexandra.welsch@cockcroft.ac.uk

## NOTICE BOARD

DEADLINE FOR CONTRIBUTIONS TO THE NEXT NEWSLETTER **20<sup>th</sup> December 2013**

## About oPAC

The optimization of the performance of any Particle ACcelerator (oPAC) is the goal of this new network within the FP7 Marie Curie Initial Training Network (ITN) scheme. oPAC aims at developing long term collaboration and links between the involved teams across sectors and disciplinary boundaries and to thus help defining improved research and training standards.



[www.opac-project.eu](http://www.opac-project.eu)

oPAC is funded by the European Commission under Grant Agreement Number 289485

