

## Sharing our fascination for accelerators with others

Although accelerators are an underpinning technology that enables a large variety of fundamental research and industry applications, little is still known by the general public about these engines of discovery. oPAC has always put strong emphasis on the communication of our research results to wider audiences, including other scientific communities, policy makers, school children and the general public. All our Fellows have for example visited at least two schools each and have produced short videos about their research projects. These help explain the many challenges in every project and why more trained experts are still urgently needed in order to fully exploit the benefit from many of Europe's largest research infrastructures.

In a recent article in [Laboratory News](#) I have highlighted how International Training Networks such as oPAC help overcome the current skills gap in science. In particular, I am delighted to see how the brand-new [OMA project](#) will now build up on the training schemes and vision that we have developed within oPAC and train a new cohort of Fellows. The OMA project has an application deadline at the end of this month and I would like to ask you to help spread the word about these opportunities and encourage outstanding students to [apply](#) for one of the 15 vacant positions.

We have now finalized the programme and speakers for our upcoming [workshop on researcher careers](#) in Poland. This workshop will join the oPAC Fellows with those from the [LA<sup>3</sup>NET](#) project, as well as local students from around Krakow. We have excellent speakers from different sectors confirmed and I am sure they will present the multi-faceted opportunities that are today open to researchers. As this meeting will also serve as a Fellow reunion, I already look forward to hearing from our past trainees about their professional experiences after the end of our network.

The International Particle Accelerator Conference [IPAC'16](#) has been a great success for oPAC. As in previous years, oPAC Project Manager Dr. Ricardo Torres presented selected research highlights at a dedicated industry stand. Amongst others, he distributed copies of the 2<sup>nd</sup> edition of our [oPAC brochure](#) and promoted our upcoming [workshop beam loss monitoring techniques](#) in Barcelona, Spain. A poster on the research and training outcomes of oPAC that I presented triggered many interesting discussions with colleagues from around the world and illustrated well how much our Fellows have achieved through their work in the project. This newsletter is full of scientific results, Fellow achievements, as well as recent and future events. **Enjoy !**



Prof. Dr. Carsten P. Welsch, Coordinator

### Special Interest Articles

- oPAC at IPAC
- 2016 – a LEAP year
- Researcher Careers Workshop - Registration now open!

### Individual Highlights

- Interview with Xiangcheng Chen
- Emilia Cruz awarded PhD degree
- QUASAR Group obtains award from the Royal Academy of Engineering
- Cosylab voted Best Slovenian Employer of the Year 2015

## Research News

### Recent developments of the 1 MV AMS facility at the Centro Nacional de Aceleradores - Grazia Scognamiglio

**The Centro Nacional de Aceleradores (CNA) hosts a 1 MV accelerator mass spectrometry (AMS) apparatus since September 2005.** In order to improve its overall performance, several updates have been made on the existing facility during the last 10 years of operation. In a recent paper published by Grazia Scognamiglio and colleagues, two modifications conducted in 2015 are described.

To increase the transmission of the ions through the accelerator, the stripping gas on the 1 MV CNA machine was changed from Ar to He. The measured maximum transmission for almost every isotope results to be higher, especially for heavy masses: for instance, in the case of uranium in the 3+ charge state, the transmission increased from 11% with Ar gas to about 38% with He gas.

The second advance consisted of the substitution of the existing gas ionization chamber with a new one provided by ETH

Zurich. The ETH detector features with its miniaturized design and is optimized for low energy AMS (i.e. very low electronic noise and efficient charge collection). As the electronic noise is the most important contribution to the resolution for light ions, the total energy resolution has been reduced by 15% in the case of  $^{10}\text{Be}$ , allowing a better discrimination against its isobar,  $^{10}\text{B}$ . For the heaviest radionuclides where the quality of the spectra is determined by the charge carrier production in the gas, the resolution for 2.7 MeV uranium ions was improved by 30%, probably due to a more efficient charge collection.

This work has been published in Nuclear Instruments and Methods in Physics Research B375 (2016) 17–25.

<http://www.sciencedirect.com/science/article/pii/S0168583X16300088>

### Response of EBT3 films to low energy protons in the Bragg peak region - Cristina Battaglia

**One of the major advantages of proton or ion beams, applied in cancer treatment, is their excellent depth-dose profile exhibiting a low dose in the entrance channel and a distinct dose maximum (Bragg peak) near the end of range in tissue.** In the region of the Bragg peak, where the protons or ions are almost stopped, experimental studies with low-energy particle beams and thin biological samples may contribute valuable information on the biological effectiveness in the stopping region. Such experiments, however, require beam optimization and special dosimetry techniques for determining the absolute dose and dose homogeneity for very thin biological samples.

At the National Centre of Accelerators (CNA) in Seville, one of the beam lines at the 3 MV Tandem Accelerator was equipped with a scattering device, a special parallel-plate ionization chamber with very thin electrode foils and target holders for cell cultures. In this context, Cristina Battaglia and co-workers carried out the study for the calibration in absolute dose of EBT3 films for proton energies in the region of the Bragg peak, where the linear energy transfer (LET) effects are more significant for radiobiology studies, as well as the response of the EBT3 films for different proton energy values.



To irradiate the films in the Bragg peak region, the energy of the beam was degraded passively, by irradiating the films interposing some mylar foils to move the Bragg peak inside the active layer of the film. The results obtained for the beam degraded in mylar foils were compared with the dose calculated by means of the measurement of the beam fluence with an ionization chamber, showing effects of saturation in the films and the need to establish a new protocol for film dosimetry in this region.

This work has been submitted for publication in *Physical Review Accelerators and Beams*.



*Experimental setup for the irradiation of radiochromic films. The picture shows the kapton window, the ionization chamber and the holder for the film mounted together at the end of the beam line.*

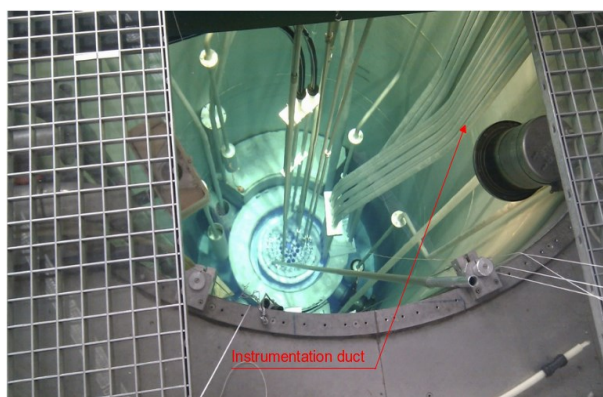
## A Novel Neutron Flux Monitor Based On Diamond Detectors at the Vienna TRIGA Mark II Reactor – Pavel Kavrigin

**A novel neutron flux monitor for nuclear applications was tested at the TRIGA Mark II research reactor at the Atominstitut of the Vienna University of Technology, Austria.**

This neutron flux monitor is based on a novel diamond detector technology, which allows measurements under high-irradiation conditions, exploiting the excellent radiation resistance of diamond. Measurements were performed at the core of the reactor where the reactor power was varied from 10 W to 250 kW. The response of the diamond detector shows an excellent linearity over the full range of reactor power. The results prove that diamond detector technology can be effectively used for neutron diagnostics in high irradiation environment.

The response function proves that the CIVIDEC B1-HV sCVD Diamond Detector is an effective instrumentation in neutron diagnostics. The detector response is linear up to the maximum power delivered by the TRIGA reactor. This result shows that diamond detectors can be effectively used in high irradiation environments, e.g. as a neutron diagnostics tool for nuclear reactors or a beam loss monitor for particle accelerators.

This work was presented at the International Conference of Accelerator Optimization (Seville, 7<sup>th</sup> – 9<sup>th</sup> October 2015) and at the International Conference on Research Reactors (Vienna, 16<sup>th</sup>– 20<sup>th</sup> November 2015).



*TRIGA reactor pool*

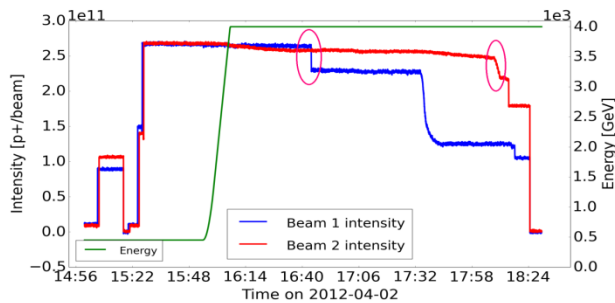
## Testing the accuracy of the LHC impedance model – Daria Astapovich



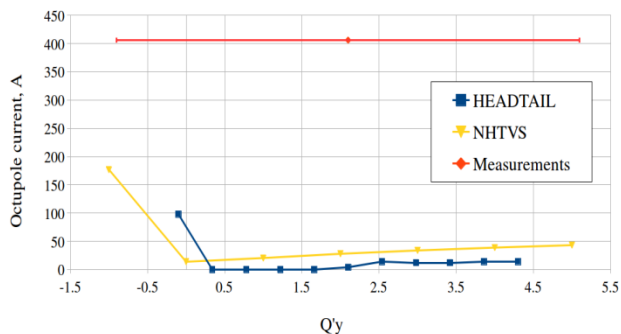
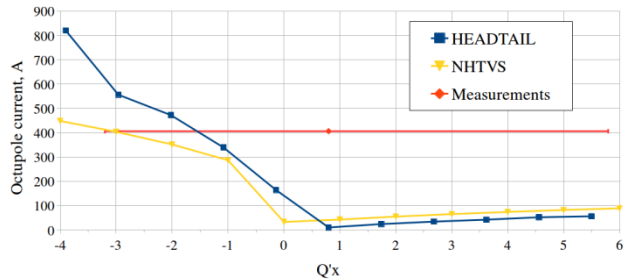
**The most important limitations to achieve high luminosities in an accelerator are transverse collective instabilities.** These instabilities have been regularly observed during the LHC Run I. In order to study the single-bunch instabilities, Daria Astapovich used the tracking code HEADTAIL and the numerical code NHTVS, using the LHC impedance model. To be able to do predictions for the future operation in the

LHC, it is necessary to verify the accuracy of the impedance model. One of the options to do it is to compare the octupole current threshold from simulations and the octupole current in the measurements.

In a CERN Internal Notes article Daria presents the analysis of one of the single-bunch instabilities observed in 2012 and a comparison with the HEADTAIL and NHTVS codes.



*Instabilities observed on 2<sup>nd</sup> April 2012 during the collimator's "loss maps"*



*Comparison between the octupole current during the measurements and the threshold from HEADTAIL and NHTVS.*

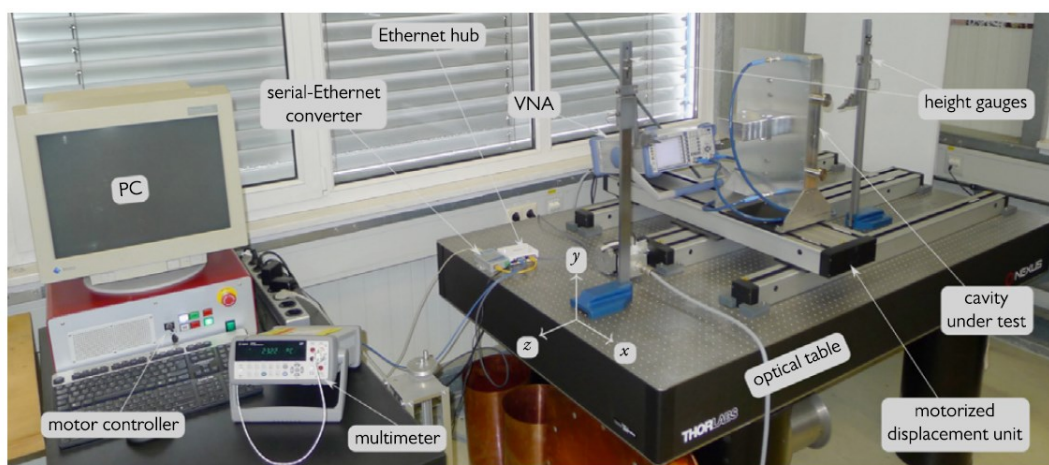
## Intensity-sensitive and position-resolving cavity for heavy-ion storage rings – Xiangcheng Chen

**A heavy-ion storage ring can be adapted for use as an isochronous mass spectrometer if the ion velocity matches the transition energy of the ring.** Due to the variety of stored ion species, the isochronous condition cannot be fulfilled for all the ions. oPAC fellow Xiangcheng Chen and co-workers from GSI (Germany), AGH University of Science and Technology (Poland), and the University of Surrey (England) have proposed an intensity-sensitive and position-resolving cavity to eliminate the measurement uncertainty stemming from the velocity spread.

In a paper recently published in Nuclear Instruments and Methods in Physics Research A, the authors discuss the correction method for the anisochronism effect in the measurement with the cavity. Then they introduce a novel design, which is operated in the monopole mode and offset from the

central beam orbit to one side. The geometrical parameters were optimized by analytic and numerical means in accordance with the beam dynamics of the future collector ring at FAIR. Afterwards, the electromagnetic properties of scaled prototypes were measured on a test bench. The results were in good agreement with the predictions.

The design process presented in the paper is intended for, but not limited to, the collector ring. It can easily be adapted to another cavity in a different ring. Apart from the collector ring, there are a few other heavy-ion storage rings that will be operational in the near future, such as the TSR at ISOLDE, the R3 at RIKEN, and the SRing at HIAF, which will offer more opportunities to test the position cavity and correction algorithm with radioactive ion beams.



*Setup of the test bench for the prototypes. The origin of the Cartesian coordinates is supposed to be in the center of the beam pipe, but intentionally shifted to outside for better visibility.*

This work has been published in Nuclear Instruments and Methods in Physics Research A 826 (2016) 39–47. <http://www.sciencedirect.com/science/article/pii/S0168900216302649>

## Designing the interaction region of the FCC-eh – Emilia Cruz

Former OPAC fellow Emilia Cruz, currently at the John Adams Institute, has recently presented her work on the design of the interaction region of the FCC-eh at the FCC Week in Rome.

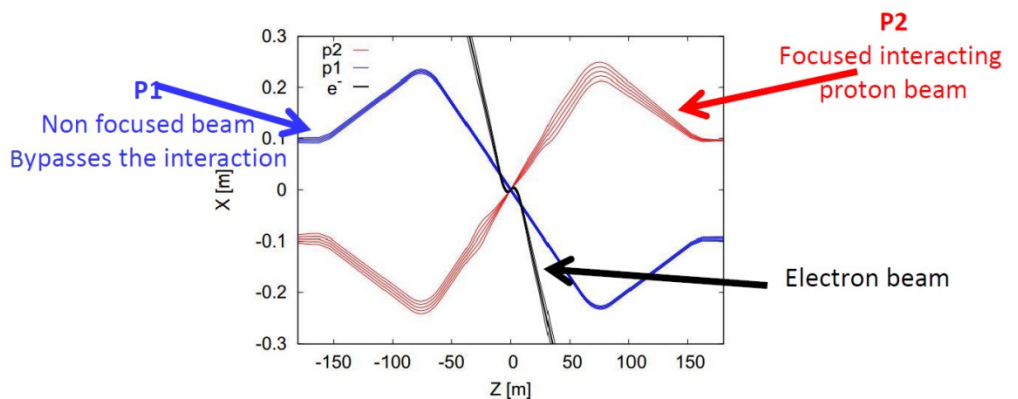
The FCC-eh would be integrated in the FCC-hh in a similar way as the proposed LHeC will be integrated in the High Luminosity LHC, i.e. it would implement a new Energy Recovery Linac (ERL) to circulate electrons and collide them with one of the proton beams of the hadron collider, so the two collider scenarios could work in parallel.

As in any accelerator, the most challenging part of the designing the interaction region is meeting the requirements of both the detector and the accelerator. Moreover, smaller beam sizes mean tighter constraints. Often competing criteria are found, and compromises have to be taken, so Emilia's goal was to find the best design that will optimize the luminosity with less impact on the accelerator.

Emilia's design for the FCC-eh interaction region could work in parallel with the FCC-hh to have a complementary set of experiments, and it can be adapted to accommodate the luminosity requirements, thus offering more versatility than the LHeC.



The Future Circular Collider (FCC) study is a project led by CERN to produce a conceptual design of a post-LHC research infrastructure based on an energy-frontier circular collider. Currently it is contemplating three different options: a hadron-hadron (hh), electron-hadron (eh), or electron-electron (ee) collider.



FCC-eh interaction region: one of the proton beams collides with the electron beam from the ERL while the other proton beam bypasses the interaction.



## Network News

### oPAC at IPAC'16

As it has become habitual in the last few years, oPAC has had a strong impact in the International Particle Accelerator Conference (IPAC'16) held in the beautiful Korean seaside town of Busan.



In this year's edition, twelve posters had contributions from former oPAC fellows.



Among others, **Meghan McAteer** presented the results of Astra simulations to track the propagation of electrons emitted from the surfaces of the cavities to examine the effects of dark current in the BERLinPro injector.

**Alessandra Valloni**, also attending the conference, presented a couple of posters with MERLIN simulations of the LHC Collimation System with 6.5 TeV Beams and cleaning studies with advanced collimator materials for HL-LHC. **Manuel Cargnelutti** was representing Instrumentation Technologies at the industrial exhibition and also presented a poster about design and simulations of the cavity BPM readout electronics for the ELI-NP gamma beam system.

**Carsten Welsch** in turn, presented a work on high resolution and dynamic range characterisation of beam imaging systems, in which **Konstantin Kruchinin** was also involved, and a poster summarising the main results of the whole oPAC network.



The oPAC project was also present in the now traditional stand of the University of Liverpool at the conference exhibition, attended by oPAC project manager **Ricardo Torres** and fellow EU TEAM member **Magdalena Klimontowska**. Apart from promoting the training networks, the exhibitors had the chance to learn some rudiments of the Korean language and to taste the delicacies of Korean cuisine.

## 2016 – a LEAP Year

Since 1990 the LEAP (Low Energy Antiproton Physics) conference is held every two or three years to discuss the latest findings and exchange information about research with low energy antiprotons.



There has been some remarkable progress recently in experiments with low energy antiproton physics and new facilities such as the Extra Low Energy Antiproton Ring ([ELENA](#)) or the Facility for Low energy Antiproton and Ion Research ([FLAIR](#)) will offer even more exciting prospects for hitherto impossible experiments. Between 6<sup>th</sup> – 11<sup>th</sup> March 2016 the world's experts in this exciting research area met in the beautiful town of Kanazawa, Japan. They discussed the latest findings in antiproton physics and related fields. They also talked about future experiments and how to take maximum benefit from the improved beam quality that new facilities can provide.



The scientific program consisted of invited and contributed talks which allowed research leaders to present their latest findings. Poster sessions during the first two days allowed for further discussion.

Advanced diagnostics as they have been developed as part of the oPAC project, is key also for antimatter facilities. Marie Curie Senior Fellow Dr. Javier Resta-Lopez presented a poster on *“beam dynamics studies and design optimisation of new low energy antiproton facilities”* and PhD candidate James Hunt triggered many interesting discussions with a poster on *“beam quality measurements for low energy antiproton machines”*. This is an interesting method to characterize the stored antiproton beam that shall be implemented in ELENA later this year. Finally, oPAC coordinator Prof. Carsten P. Welsch gave a talk about *“beam diagnostics for low energy antiprotons”*.



An excursion to Shirakawa-go which was declared a World Heritage Site by UNESCO in 1995 completed an exciting week. All participants enjoyed the stimulating environment the LEAP provided and are looking forward to the next edition which will take the community to Paris, France in 2018.



## oPAC Events

### Researcher Careers Workshop – Registration now open!

The LA<sup>3</sup>NET and oPAC consortia are organizing a Researcher Careers Workshop in Kraków, Poland on 27<sup>th</sup> June 2016.

It will be an ideal opportunity for early stage researchers to find out about their career opportunities and interact with fellow young scientists from all over the world.

The workshop will cover important topics related to long term career planning, such as:

- Various career pathways for researchers: academic career, career in industry, in research centres, alternative career opportunities
- European grants (MSCA, ERC) and grants for young researchers in Poland
- International mobility and its importance for researcher's career.
- Career progression from academia to industry, managing a spin-off company, collaboration between academia and industry
- Pension information for mobile researchers

The speakers will come from different European countries and there will be

representatives of Polish institutions and companies. The speakers will share not only their knowledge, but also personal stories that can inspire future career choices.

The event will be attended by former Marie Curie Fellows from the LA<sup>3</sup>NET and oPAC networks and is open to all postgraduate and postdoctoral researchers interested in exploring different career opportunities. Bringing together young researchers from different countries will create exceptional networking opportunities for the workshop participants.

The event will take place in the Panoramic Room on the top floor of the International Cultural Centre in Krakow's Main Square.

More details about the event and registration:

<https://indico.cern.ch/event/512574/>

**There will be LA<sup>3</sup>NET and oPAC Fellow Reunion satellite events on the 26<sup>th</sup> and 28<sup>th</sup> June, including a visit to the brand-new Solaris light source.**



**RESEARCHER CAREERS WORKSHOP** Kraków, Poland  
27 June 2016  
Organized by University of Liverpool

University of Liverpool, Department of Physics is organizing a workshop which will be an ideal opportunity for young researchers to find out about their career opportunities.

Invited speakers from across Europe will talk about the career prospects in academia, industry and research centres which will help in the long term career planning. The important aspects of researcher international mobility and available grants will also be covered.

Bringing together young researchers from different countries will create exceptional networking opportunities for the workshop participants. The event is open to postgraduate and postdoctoral researchers interested in exploring different career opportunities.

Places will be strictly limited and early registration is strongly recommended.

A small participation fee of 100 PLN will be charged as a contribution to the workshop costs. A limited number of scholarships are available. Details can be found on the workshop page.

You can find full details in the Events section at:  
[www.la3net.eu](http://www.la3net.eu)  
[www.opac-project.eu](http://www.opac-project.eu)

Venue:  
International Cultural Centre  
Rynek Główny 25  
31-002 Kraków

Contact:  
Prof. Dr. Carsten P. Weibich  
University of Liverpool  
Cookcroft Institute  
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## Workshop on Beam Loss Monitors now open for registration

The oPAC consortium is dedicating its latest topical workshop to Beam Loss Monitors. Building on a series of successful workshops organised in the frame of the training network, this year's event will be conveniently held in Barcelona (Spain) on 15<sup>th</sup> – 16<sup>th</sup> September 2016, right after the International Beam Instrumentation Conference (IBIC).

This two-day international workshop will provide an overview of the current state of the art in beam loss monitoring. It will discuss research and development being undertaken and ambitions to further improve the performance of existing and future devices. It will also focus on Monte Carlo tools and accelerator collimation systems. The workshop will take place at the Residencia d'Investigadors, close to the city centre.

In addition to invited talks, there will be opportunities for contributed talks which will be selected from all submitted abstracts. The registration is now open until the 31<sup>st</sup> July 2016. Advance registration is required as places are strictly limited, and participants will need to contribute €100 towards the total costs.

For full details and registration please visit <https://indico.cern.ch/event/527597/>.



## Upcoming Events

### oPAC in IBIC'16



oPAC will be present once again at the International Beam Instrumentation Conference (IBIC'16) in Barcelona from 11<sup>th</sup> – 15<sup>th</sup> September 2016. This year's edition is being organised by oPAC partners ALBA-CELLS and will include several contributions from former oPAC fellows as well as from its coordinator Prof. Carsten Welsch. The overall project will be promoted from the stand of the University of Liverpool at the industrial exhibition that accompanies the conference. **Meet us at Booth #10!**

## Fellows News

### Interview with Xiangcheng Chen

*Xiangcheng Chen was born in Chaohu, China in 1989. His four-year bachelor study in the University of Science and Technology of China (USTC) nurtured his academic interests on particle and nuclear physics. Xiangcheng specialized in high-energy physics, successfully defending his bachelor's thesis in 2010.*

*Thereafter, he was enrolled in the University of Chinese Academy of Sciences (UCAS) as a master student, while he was working on the nuclear mass and lifetime spectroscopy at the Institute of Modern Physics (IMP) in Lanzhou. Being the center for heavy ion research in China, IMP provided him a perfect environment to develop his interests on mass and lifetime measurements of exotic nuclides in storage rings.*

*Xiangcheng joined oPAC in January 2013. As an oPAC fellow at GSI, he worked on the design and development of a position-resolving cavity as a Schottky noise detector for the Collector Ring (CR) at FAIR. He defended his doctoral thesis at Heidelberg University in November 2015.*

**What did attract you to the oPAC network? Has it fulfilled your expectations?**

An opportunity to study abroad, to experience foreign culture, to meet different people, and to see a bigger world. It surely fulfilled my expectations, and what's more, it has already exceeded them.

**Why did you choose to go to GSI?**

Before I came to GSI, the institute I worked at is a heavy-ion research facility in China. Since GSI is the flagship in this field, going to GSI is naturally the first idea crossing my mind at that time. Then I just went for it by sending out my application.

**Can you explain in a few words what your project was about and what have you achieved?**

It's about detecting at which revolution orbit an ion is when it is circulating in a storage ring.

I started with a design concept which utilizes a cavity-based Schottky resonator with transverse sensitivity, then optimized its geometry by analytic and numerical means. Afterwards, I have constructed prototypes for the bench top measurements. Of course the results have justified the original design concept.

**What has oPAC provided you professionally?**

A variety skills of language, presentation, communication, critical thinking, independent working, and so on.

**What are your professional plans now that oPAC has finished?**

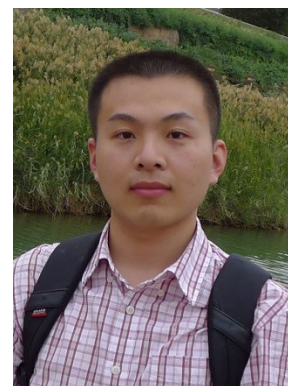
I am already back to my former institute in China. They offered me a position of research associate. My plans now would be to explore a new research field of Schottky spectroscopy in isochronous mode with a heavy-ion storage ring.

**What will be your most cherished memory from oPAC?**

Every moment when I hung out with the wonderful fellows!

**And the one you'd rather forget?**

That our former project manager Rita has left the network before it ends. (We still like you, Ricardo :-))



Dr. Xiangcheng Chen

## Emilia Cruz awarded PhD degree

**Emilia Cruz, former oPAC hosted by the University of Liverpool, came back to the land of the scouse to defend her PhD. The thesis entitled “Modelling the effects of high luminosity optics in the upgrades of the Large Hadron Collider” was very well received by the examiners, who didn’t hesitate to acknowledge the great work done by the fellow.**

The thesis addresses the difficulties arising from having high luminosity collisions in two proposed upgrades for the large hadron collider: the Large Hadron electron Collider (LHeC) and the High-luminosity LHC (HL-LHC). First the flexibility of the design of the interaction region was studied to find the optimal design that will achieve the highest luminosity with the least impact on the machine. Secondly, the impact of the fringe fields of the new quadrupoles to be implemented in the HL-LHC insertions was studied in terms of the stability of the beam. Increasing the luminosity in the upgrades of the LHC, both in proton-proton and electron-proton collisions, comes with great challenges. Careful studies need to be performed to ensure the feasibility of the

different lattices. Making use of the theory behind beam dynamics, and the tracking codes developed at CERN (MADX and SixTrack) Emilia was able to make an extended study regarding the feasibility of the integration of the LHeC Interaction Region into the HL-LHC lattice to achieve a luminosity of  $L = 10^{33} \text{ cm}^{-2} \text{ s}^{-1}$ .

For the case of fringe field studies, the benchmarking of a new tracking code (SAMM) was presented, and a combination of different techniques was used to produce accurate representations of the fringe fields of the inner triplet quadrupoles. The combination of a number of techniques opens up not only opportunities for research into the effects of quadrupole fringe fields, but more generally studies that require the implementation of complex nonlinear elements in a beamline.

Emilia is happy to share this news with the oPAC community and she would like to acknowledge the support she has received during the 3 years of her research project.

**Congratulations, Emilia!**

## Partner News

### Five years of synchrotron light in ALBA

*By ALBA Synchrotron facility, Cerdanyola del Valles (Spain)*

**The oPAC partner ALBA is celebrating its fifth anniversary. On the 16th of March 2011, the electron accelerator of the ALBA Synchrotron near Barcelona (Spain) emitted synchrotron light for the first time.**

Eight years after the project's approval, it was possible to produce and see synchrotron light in the accelerators complex of the facility. That moment was the starting point of the ALBA Synchrotron that, one year later, began the first experiments.

The ALBA Synchrotron is celebrating five years of the commissioning of the accelerator. "It was a very exciting moment because we were testing the work done in previous years and, if everything was right, we would be able to start with the experiments very soon", says Francis Pérez, head of the Accelerators' division and former responsible of the Radiofrequency and Diagnostics section at that time.



Dr. Emilia Cruz



Nowadays, the accelerators' complex of ALBA works about 6,000 hours per year with over 97% availability, and hosts every year more than 1,000 researchers. New improvements have been done like the top-up working mode or a new fast orbit feedback system, both to increase beam stability. ALBA is in operation with seven beamlines (or laboratories) which are available to perform

experiments in different scientific areas. At the end of 2016, the eighth beamline, devoted to infrared microspectroscopy, will enter in operation. In 2018 and 2020, two new beamlines will be also ready for experiments. ALBA has been a key partner in the oPAC network, hosting fellows Laura Torino and Michele Carlá.



*Roundtable during celebrations of ALBA's 5<sup>th</sup> anniversary*

## CST launches CST STUDIO SUITE Version 2016

**Computer Simulation Technology (CST®), one of the industrial partners of the oPAC network, has announced the release of the 2016 version of the electromagnetic simulation tool, CST STUDIO SUITE®.** The latest edition has been developed to both extend the capabilities of the software and to improve its foundations.

CST STUDIO SUITE is an EM simulation software package containing solvers for applications across the electromagnetic

spectrum, as well as multiphysics and particle applications. All of its tools are available within a single graphical user interface with strong integration between them. Engineers and researchers in a wide range of industries use CST STUDIO SUITE to develop new ideas, optimize their products, and ensure standards compliance. The 2016 release of CST STUDIO SUITE packs in a number of new features that allow simulation to be used in new ways in the design process.



## CNA launches a call for participants to the “4<sup>th</sup> Competition for the Promotion of Scientific Culture”

The oPAC partner Centro Nacional de Aceleradores (CNA) has launched a call for participants in the fourth edition of its Competition for the Promotion of Scientific Culture.

The goals of this competition, sponsored by Oerlikon Leybold Vacuum, are to promote scientific vocations among young people, to bring science closer to Society, and to raise public awareness about the importance of scientific research.

The call is addressed to the general public, researchers in training (PhD students), undergraduate students, or any person interested in scientific research.

The topic of the competition is Experimental Science and Technology of Particle Accelerators. In order to participate, the contestants must submit a maximum of two videos describing an experiment related to

nuclear physics, particle accelerators, radiation detectors, or any other area related to the topic of the competition. Very importantly, the experiments must be original, and the video, showing the design, construction, and operation of the experiment, must be posted on YouTube. The application for the competition will include a link to the video and a text describing the experiment in an accessible way. The first prize will be a laptop.

The period for application is 1st May to 30th June 2016. The winner will be announced on 15th September 2016.

For more information and to download the application form please visit the website <http://bit.do/ivconcursoculturacientificacna> or ask CNA's Outreach Officer, Sergio David León Dueñas at [redescna@us.es](mailto:redescna@us.es)



## Cosylab Voted Best Slovenian Employer of the Year 2015 (Medium-sized Enterprises)

**The oPAC partner Cosylab has been voted the Best Slovenian Employer of the Year 2015 in the category of medium-sized enterprises (50 to 250 employees), in the annual search for the best employer held by the daily Slovene newspaper, Dnevnik.**

We can't say it better than the Selection Board said it, so here are their words:

"In the Knowledge Society of the 21st century, Cosylab represents a good example of how to manage talent. Unburdened by having to keep up appearances with how a company "is supposed to be run", the founders of the company have transposed the virtues of academia into the business environment and have thus created a level-playing field and a relaxed corporate culture.

With a clear leadership stance, Cosylab fulfills its vision of global progression through an imaginative and efficient system for the growth of the organization and its people.

Cosylab supports an unexpected collage of corporate practices, such as rewarding individual contributions to the success of the whole, rewarding loyalty – years of service in the company, measuring success by keeping track of how much project managers have contributed per period to the growth of production, and the "Academy" process, through which a Team has the privilege and the responsibility of accepting or rejecting a potential co-worker. All these practices contribute to the growth of Cosylab's unique organizational culture, which fosters undisputed market results: continuous business and people growth, market-segment leadership, profitability and – with 132,000 Euros – an exceptionally high yearly added-value per employee."

Cosylab has been a key partner in the oPAC project, hosting fellow Pavel Maslov.

**Congratulations Cosylab!**



*Award ceremony for Slovenia's employer of the year*

## FCC Week in the Eternal City



**From Monday, 11 April to Friday, 15 April, more than 450 scientists, leaders of high-tech industry, universities and research centres gathered in Rome, to review the progress on Future Circular Collider (FCC) concepts for the post-LHC era.**

The FCC study started off in 2014 as a response to a request of the European Strategy for Particle Physics. The study embraces today 74 institutes from 26 countries and is hosted by CERN. The European Union supports this activity through the EuroCirCol Horizon 2020 infrastructure development project.

Ricardo Torres, from the Quasar group, was there representing the University of Liverpool as a member of the EuroCirCol collaboration. The meeting in Rome showed that the FCC collaboration is growing to a global collaboration network. Michael Benedikt, FCC study leader, mentioned: "This puts a responsibility on our shoulders to keep the momentum and try to attract more collaborators in our effort of designing future circular machines that will serve the global scientific community." It also showed a clear increase in the number of young researchers

involved in the study as compared to last year's FCC Week in Washington.

Michael Benedikt discussed the milestones passed since the Washington meeting and gave an overview of the progress in the different fronts of the study. The core of the FCC project is a hadron collider called FCC-hh – which aims at colliding proton beams with a centre of mass energy of 100 TeV – as well as scenarios for an electron collider (FCC-ee) and a proton-electron collider (FCC-eh).

Gian Guidice, Head of CERN's Theory Department, delivered an inspiring talk about the physics motivation following the recent discoveries at the LHC as well as in other fields of fundamental physics and reflected on the future of the High-energy field.

A report discussing the opportunities for physics discoveries with a future 100 TeV hadron circular collider was presented during the meeting.

Fabiola Gianotti, CERN Director General, gave an overview of the CERN roadmap for the next decades, whereas Asian and American counterparts presented the planned activities for future colliders in their respective areas of the world.



A series of parallel sessions dwelled on the more technical aspects of the study: magnet development, vacuum and cryogenics, beam dynamics, experiments and detectors, implementation and operation, etc. There was a session devoted to the civil engineering aspects of the project, where several options for the FCC tunnel layout were presented.

The socio-economic impact of large-scale research infrastructures was discussed in a plenary talk by Prof. Massimo Florio, from the Department of Economics. This impact was also stressed in the public event "Macchine per Scoprire: Dal Bosone di Higgs alla Nuova Fisica" that took place on the 14 April in the Auditorium Parco della Musica in Rome. CERN

Director-General Fabiola Gianotti, and other leading scientists and economists discussed about the latest discoveries in physics, the societal benefits of large research facilities and the challenges lying ahead.

FCC Week 2017 will take place in Berlin from 29 May to 2 June. The FCC Week 2017, will offer the necessary space to review the baseline parameters of the different areas of the study along with available technological options in light of the preparation of a rigorous conceptual design report by 2019.

A collection of news articles about the topics discussed in the FCC Week 2016 can be found here [https://storify.com/FCC\\_study](https://storify.com/FCC_study)

## QUASAR Group obtains award from the Royal Academy of Engineering



# ROYAL ACADEMY OF ENGINEERING

**The QUASAR Group from the University of Liverpool has obtained a prestigious Royal Academy of Engineering Ingenious Award to engage the public with engineers and engineering.**

The aim of the awarded project is to organise a series of 'Particle Accelerator Engineering Workshops' for pre-sixth students. This activity will provide the students a unique opportunity for getting a taste of hands-on practical engineering by building machines related to particle accelerators (Van de Graaff

generator, rail gun, salad-bowl accelerator, etc.) in small teams supervised by researchers from the field. Resources will be developed in the form of 'how to...' worksheets which will be complemented by accessible videos made available via public websites.

Several secondary schools from the Merseyside and Cheshire areas have already shown a great interest in the initiative. The workshops will be held at the Cockcroft Institute over six days in June and July.



## Vacancies

### [Marie Curie Early Stage Career Fellowship – OMA project](#)

Several locations around Europe

### [Postdoctoral Research Associate \(PDRA\) position to work on the machine-detector interface of the Future Circular Collider](#)

The Cockcroft Institute / University of Manchester

### [Fellowship Opportunities within the QUASAR Group](#)

Cockcroft Institute / University of Liverpool

### [Postdoctoral Research Associate for work on HLLHC Diagnostics](#)

Cockcroft Institute / University of Liverpool

### [Instrumentation Engineer](#)

ADAM, Geneva

## Selected Publications

### **Recent developments of the 1 MV AMS facility at the Centro Nacional de Aceleradores, G.**

Scognamiglio, E. Chamizo, J.M. López-Gutiérrez, A.M. Müller, S. Padilla, F.J. Santos, M. López-Lora, C. Vivo-Vilches, M. García-León, Nuclear Instruments and Methods in Physics Research B 375 (2016) 17–25.

### **Intensity-sensitive and position-resolving cavity for heavy-ion storage rings, X. Chen, M. S.**

Sanjari, P. Hülsmann, Yu.A. Litvinov, F. Nolden, J. Piotrowski, M. Steck, Th. Stöhlker, P. M. Walker, Nuclear Instruments and Methods in Physics Research A 826 (2016) 39–47.

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Events	
June 8 <sup>th</sup> – 10 <sup>th</sup> 2016	12 <sup>th</sup> Libera Workshop, Solkan, Slovenia
June 13 <sup>th</sup> – 18 <sup>th</sup> 2016	12 <sup>th</sup> International Conference on Electron Beam Technologies, Varna, Bulgaria
June 15 <sup>th</sup> – 28 <sup>th</sup> 2016	2016 CERN-JINR European School of High-Energy Physics, Skeikampen, Norway
June 27 <sup>th</sup> 2016	Researcher Careers Workshop
June 29 <sup>th</sup> – July 1 <sup>st</sup> 2016	EuroNNac and EuPRAXIA Workshop on a European Plasma Accelerator, Pisa, Italy
Sept 11 <sup>th</sup> – 15 <sup>th</sup> 2016	IBIC 16, Barcelona, Spain
Sept 15 <sup>th</sup> – 16 <sup>th</sup> 2016	oPAC Topical Workshop on BLM, Barcelona, Spain
Sept 25 <sup>th</sup> – 30 <sup>th</sup> 2016	LINAC 16, East Lansing, MI, USA
Oct 24 <sup>th</sup> – 26 <sup>th</sup> 2016	LA <sup>3</sup> NET Topical Workshop on Novel Accelerating Techniques, Paris, France
Oct 24 <sup>th</sup> – 25 <sup>th</sup> 2016	LA <sup>3</sup> NET Topical Workshop on Laser Ion Sources, Paris, France
Oct 25 <sup>th</sup> – 28 <sup>th</sup> 2016	PCAPAC 2016, Campinas, Brazil

## NOTICE BOARD

DEADLINE FOR CONTRIBUTIONS TO THE NEXT NEWSLETTER 15<sup>th</sup> July 2016

### 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.

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

