

oPAC proudly presents...

The oPAC consortium has worked hard on the production of its first glossy A4 brochure. It provides a detailed insight into the oPAC project, gives background information about all oPAC Fellows and their R&D within the network and highlights the network's plans for international events that shall be organized during the lifetime of the project.

We are very happy with the result and optimistic that the brochure will present our Fellows in an attractive way to potential future employers and also help attract more researchers into our research and training efforts.

We distributed the brochure for the first time at the IPAC conference in Dresden this summer where we hosted a dedicated oPAC stand. Community feedback was extremely positive and in case you haven't received your personal copy yet – simply send us an email and we will post you one !

All Fellows joined our week-long Advanced School on Accelerator Optimization which was held at Royal Holloway University of London in July 2014. Internationally leading experts provided lectures throughout the week that covered all oPAC work packages and embedded the Fellows research activities into a much wider frame. We had a fantastic atmosphere throughout the week and it was nice to see how well all Fellows got along with each other. We are grateful for the enormous effort the lecturers put into the preparation of their talks and for the perfect support we received from the college.

Finally, I would like to draw your attention to a number of upcoming events: Led by our Fellows, oPAC is proud to organize a **Topical Workshop on Computer Aided Optimization of Particle Accelerators** between 11-13 March 2015 at GSI in Germany. A fascinating program has been put together and registration will open in the near future. Our sister network LA³NET will host a **Topical Workshop on Beam Diagnostics** and an **International Conference on Laser Applications at Accelerators** at the end of March 2015 on Mallorca. Both events are highly relevant also for oPAC research and since places will be strictly limited, I highly recommend to register right away !



Prof. Carsten P. Welsch, Coordinator

Special Interest Articles

- Research News from oPAC Fellows
- Upcoming Events
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Individual Highlights

- Accelerator Experts go to School
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Research News from oPAC Fellows

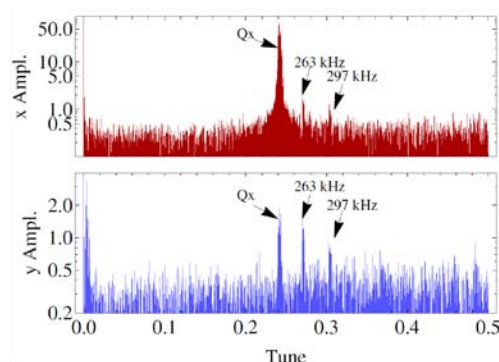
Optimization Studies into the CERN Booster - Meghan McAteer

As part of the LHC Injector Upgrade project, the CERN PS Booster will be required to operate at nearly doubled intensity with little allowable increase in emittance growth or beam loss. The larger tune footprint will make it no longer possible to avoid all dangerous resonances. A campaign of nonlinear optics measurements from turn-by-turn trajectory measurements, with the goal of characterizing and then compensating for higher-order resonances, is planned for after Long Shutdown 1. A commonly-used method for studying nonlinear optics in a synchrotron involves using an AC dipole to drive large coherent betatron oscillations, and then analyzing the frequency components of the trajectory. In the PS Booster, the significant direct space charge effects may complicate this procedure.

Simulations are hence needed to understand the effects of space charge on the response of the beam to the AC dipole and on the observed driven beam trajectories. The results of tracking simulations with space charge effects and an AC dipole, and comparisons of simulated results with trial measurements have been carried out by M. McAteer at CERN and are presented in more detail in [1]. In addition, a transverse instability has long been observed in the PS Booster near the beginning of the acceleration ramp. The instability is adequately suppressed by the transverse damper during normal operation, but without the damper over half of the beam intensity is lost. The cause of this instability had not been well-understood, but recent measurements

of the turn-by-turn beam trajectory have offered some insight.

The spectrum of turn-by-turn trajectory shows two prominent peaks in each plane, in addition to the tunes, as can be seen in the figure below.



Spectrum of horizontal and vertical beam trajectories during turns 85,000-90,000 [2].

These peaks always occur at a fixed frequency throughout the entire acceleration cycle. There is a very specific relationship between the frequency of these noise peaks and the horizontal tune when the transverse instability occurs, so it seems clear that they correspond to a real perturbing force on the beam, rather than spurious noise in the BPM electronics. It is expected that the cause of this perturbation can be located more precisely in the future when data from BPMs is available so it can ultimately be corrected [2].

[1] M. McAteer, et al, "The CERN PS Booster Space Charge Simulations with a Realistic Model for Alignment and Field Errors", Proc. IPAC14, TUPRI029, Dresden, Germany (2014).

[2] M. McAteer, et al, "Observation of Coherent Instability in the CERN PS Booster", Proc. IPAC14, THPRO082, Dresden, Germany (2014).

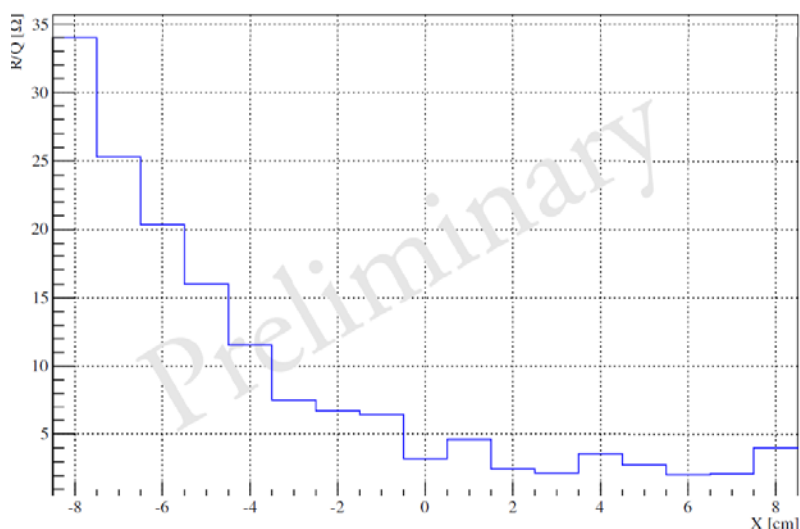


Perturbation Measurements of a Model Cavity at GSI -

Xiangcheng Chen

Lately several batches of perturbation measurements of a model cavity using ceramic rod and bead have been carried out by oPAC Fellow Xiangcheng Chen at GSI Darmstadt in Germany. The cavity was manufactured and delivered to GSI at the end of last year. It has been used as a prototype to prove the design concept of a cavity-based, transversely sensitive, heavy-ion detector by means of Schottky noises. Tests were carried out on a dedicated platform for shunt impedance measurements of the cavity. In

the setup the circular cavity stands on a 2-D high precision movement unit, consisting of two active tracks and two passive tracks. A 3 mm thick ceramic rod goes through the beam pipe and is fastened to a pair of height gauges at both sides of the cavity. Those gauges are aligned to the direction of the pipe and precisely fine tuned to the same height by hand. Two feed throughs are mounted on the circumference of the cavity and connected to a network analyzer via phase-stable supraflex cables.



Distribution of the shunt impedance [3].

The whole measurement setup lies on a vibration damped optical table to ensure least mechanical disturbance from the environment. The motor controller and the network analyzer are connected to a host PC via Ethernet cables and can thus be controlled by a deliberately developed Java code to realize automatic procedures for the measurements. Following the PC's commands, the cavity goes to each sampling position while the analyzer measures the transmission coefficient between the two ports and transfers the data back to the PC in

real time. Afterwards the data can be analysed offline using a purpose-written C++ code based on the ROOT library. Through evaluating the changes of the resonant frequencies of the cavity caused by perturbation of the inserted rod or bead at different places, one can deduce the shunt impedance of the cavity with respect to different beam positions inside the pipe. The figure above shows preliminary results of the reduced shunt impedance obtained via such measurements. See [3] for further details.

[3] X. Chen et al, "Conceptual Design of a Cavity-Based Position-Sensitive Heavy Ion Detector for the CR at FAIR", Proc. IPAC14, THPM101, Dresden, Germany (2014)

Device Control Database Tool (DCDB) – Pavel Maslov

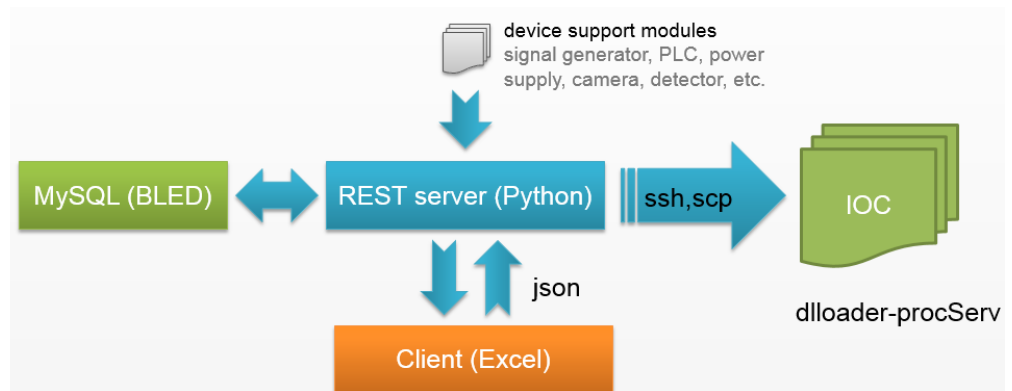


In a research facility containing numerous instruments, it is advantageous to reduce the amount of effort and repetitive work needed for changing the control system (CS) configuration: adding new devices, moving instruments from beam line to beam line, etc. Pavel Maslov at COSYLAB has developed a CS configuration tool which provides an easy-to-use interface for quick configuration of the entire facility.

It uses Microsoft Excel as front-end application and allows the user to quickly generate and deploy IOC configuration, such as EPICS start-up scripts, alarms and archive configuration, onto IOCs.

The DCDB tool utilizes a relational database which stores information about all elements of the accelerator.

The communication between the client, database and IOCs is realized by a REST server written in Python. The key feature of the DCDB tool is that the user does not need to recompile the source code. It is achieved by using a dynamic library loader, which automatically loads and links device support libraries, see figure below.



Overview of DCDB architecture.

Network News

oPAC at IPAC

oPAC Fellows Michele Carla, Laura Torino, Meghan McAteer, Pavel Maslov, Michal Jarosz, Xiangcheng Chen, Hector Garcia, Emilia Cruz, Konstantin Kruchinin and Xavier Nuel Gavalda, as well as oPAC Coordinator Prof. Carsten P. Welsch all attended IPAC this year.



by Prof. Welsch on the "Optimization of Accelerators and Light Sources within oPAC" triggered many interesting discussions with colleagues from all over the world. Together with a multitude of networking events IPAC turned out to be an ideal occasion to disseminate the oPAC project and create new contacts.

The Cockcroft Institute-based EU T.E.A.M. hosted a dedicated project booth to showcase results from oPAC, describing the project and answering questions from a constant stream of delegates. The conference was also the first event where the recently published oPAC brochure was distributed to a wide audience. It received excellent feedback and is expected to support all oPAC Fellows in their next career steps.



The 5th International Particle Accelerator Conference took place at the International Congress Center Dresden, Germany between 15-20 June 2014. IPAC is the largest conference in the field of particle accelerators and has been held consecutively in Asia, Europe and North America since 2010. It was a perfect venue for presenting the many research results that already originated from R&D within the oPAC network.

Dozens of poster presentations including a summary of the R&D advances presented



Promoting the network to industry and higher education

On Wednesday 25th June, the EU T.E.A.M. maintained a stand at Physics Innovate – the University of Liverpool's contribution to the city's Business Week. There was a good turnout for the event with plenty of representatives from industry. The event also featured a fascinating range of talks on the emerging practical applications from physics research held in the opulent Liverpool Town Hall Chambers.

During the same week the T.E.A.M. also presented the project's vision on "Researcher Skills Development" and "PGR Researcher Training within international networks" at the University of Liverpool's annual Learning & Teaching Conference.



Endorsement of oPAC approach to complementary skills training



Training in transferable skills that complement the technical research activities of post graduate researchers improves their professionalism and is essential for enhancing their employability. The complementary skills training developed within the oPAC framework had been commended as 'best practice' by the University of Liverpool. With further interest in the programme generated following presentations given at the national HEA Learning and Teaching Conference last year a workshop was organized by the EU Project T.E.A.M. to disseminate this approach further. The workshop entitled 'Enhancing the employability skills of postgraduate researchers (PGRs)' was delivered on the 11th June attracting delegates from all over the country.

The aim of the workshop was to stimulate thought and discussion about improving the effectiveness of PGR skills training by making it more relevant for the researchers

undergoing the training. The context of the requirements of employers for candidates with broad skills training was presented. The programme developers were joined by Dr. Paul Yates (HEA), Dr. Rosa Letizia (Lancaster University), Dr. Rob Ashworth and Rita Galan (University of Liverpool) to talk about the programme in the context of the need for this novel practical approach to PGR skills training. The perspective of researchers from the receiving end of the training was given by oPAC Fellow Blaine Lomberg (University of Liverpool) and DITANET Postdoc Dr. Adam Jeff (CERN).

In the final session contributions from delegates were encouraged and different aspects of PGR training were discussed in order to identify recommendations for best practice. This built on the lively informal discussions that had developed during the coffee and lunch breaks.



Celebrating 20 years of JUAS

oPAC Coordinator Prof. Carsten P. Welsch participated in the annual Joint Universities Accelerator School (JUAS) Advisory Board meeting and the special celebrations for the School's 20th anniversary. Both were held between the 23-25 April 2014 in Grenoble at the *Laboratoire de Physique Subatomique et de Cosmologie* (LPSC). Whilst the Advisory Board critically reviewed the 2014 schools

and agreed on the structure and content of the 2015 JUAS during the first two days, the anniversary event on the Friday brought together more than 100 scientists, lecturers, students and institutional partners to share a special day dedicated to the school. It was an opportunity to look back on the past twenty years and to debate the future.



The morning session was opened by Annick Billebaud, LPSC Director, with welcoming remarks and a brief history of the Laboratory where JUAS was first conceived in the early 1990's. She was followed by Hans Hoffmann, ESI President, who presented the 3 schools organized by the Institute.

Alex Mueller, Research Director at CNRS/IN²P³, then discussed the challenges faced by today's machines and the technology paths currently explored in high energies and high powers.

In his talk, Steve Myers, former CERN Director of Accelerators, made a review of particle accelerators in the 20th century and those foreseen for the 21st century with many applications other than in high energy physics.

The coffee and lunch breaks were excellent opportunities to meet colleagues and exchange ideas. After the break, Luigi Palumbo, Director of the Department of

Applied Sciences for Engineering at Rome's La Sapienza University, presented a detailed overview of Accelerator training around the world.

Finally, Louis Rinolfi, current JUAS Director, presented the past, present and future of the JUAS School in which he paid tribute to former JUAS Directors and all partners who have made this school such a great success over the last twenty years.

oPAC has supported JUAS in recent years and many oPAC Fellows have had the chance to profit from this first class Accelerators School. During the last year oPAC Fellow Michele Carla stood out being one of the best two students in the final exam and winning a grant to visit IPAC'14. Next year's JUAS Advisory Board meeting will be hosted by oPAC at the University of Liverpool/Cockcroft Institute.

Further information can be found [here](#)

oPAC at the Euro Science Open Forum (ESOF) 2014

The Euro Science Open Forum (ESOF2014) gathered thousands of researchers, politicians, entrepreneurs, business representatives and journalists for presentations and discussions of new science and research policy in Copenhagen, Denmark between 21-26 June 2014. oPAC Coordinator Prof. Welsch has a long history in contributing to this important biannual science outreach event and was invited to organize and chair three sessions at this year's ESOF with oPAC playing a major role in all of them.

Later in the week Prof. Welsch led two sessions on “accelerating researcher training” and “accelerating green technologies”. On the basis of the networks oPAC, DITANET and LA³NET a first interactive session explained how international mobility, cross sector exposure, training through cutting edge research and participation in multi-disciplinary workshops all contribute to a unique learning experience. LA³NET Fellow Andreas Döpp from CLPU and oPAC Fellow Daria Astapovych contributed to this session together with Seamus Hegarty from CERN who provided an HR perspective on the effects of researcher training within Marie Curie Initial Training Networks.

For the session on green technologies Prof. Welsch was joined by Danfysik's VP Dr. Arnd Baurichter and the company's former CEO Dr. Bjarne Roger Nielsen, as well as oPAC Steering Committee member Dr. Andreas Jansson from ESS in Sweden. They described the important role accelerators have for science and society and how new technologies can help design and build research facilities with minimum environmental impact. All talks received very positive feedback and triggered interesting questions from the audience.



Contributions started on Sunday 22nd June when oPAC Fellow Daria Astapovych from CERN was joined by colleagues from the LA³NET project, including LA³NET Project Manager Dr. Rob Ashworth, Fellow Jakob Krämer and Danfysik supervisor Dr. Michael Budde to speak about training within International Training Networks. They described the university coordinator viewpoint, the industry perspective and the experiences and expectation of early career researchers. In this way the functioning of these most advanced learning programs was explained. The presentations were made to a packed hall in the fine settings of the Carlsberg Museum in Copenhagen stimulating a range of questions about the networks, how they are managed and the impact.



oPAC Event

Accelerator Experts go to School



A week-long oPAC advanced School on Accelerator Optimization took place from 7th to 11th July 2014. The event was hosted by Royal Holloway University of London (UK) and was joined by around 80 delegates from across Europe. The School covered accelerator optimization through beam physics studies, instrumentation R&D and charged particle beam simulations at an advanced level. It opened with a welcome address by the RHUL Vice-Principal for Research and Enterprise and Dean of Science Prof. Paul Hogg. All aspects of accelerator optimization were then presented by lecturers from universities, research centres and industry throughout the week and led to many interesting discussions between participants.

lecture about different roads into the antimatter-world by Dr. Michael Doser from CERN. The School provided excellent opportunities for networking with colleagues from other institutions and included also a visit to the city of London.



Meetings of the oPAC Steering Committee and Supervisory Board also took place during a busy week and plans were made for future events and all R&D projects within the network were discussed. Prof. Carsten P. Welsch, oPAC coordinator, said: "We received excellent feedback from the participants and had a fantastic atmosphere throughout the week. The large number of participants underlines that there is a growing need for similar training events and oPAC will provide many additional training opportunities in the near future."

Of particular interest were also the tutorials held during the week, the lively poster session on Thursday afternoon, the seminar about the discovery of the Higgs particle by Prof. Phil Burrows, University of Oxford, and a

Further information can be found on the School's [indico page](#).

Upcoming Event

Computer-Aided Optimization of Particle Accelerators Workshop

More than 30,000 particle accelerators are in operation around the world, advancing research in fundamental science, medicine, and industrial applications. As the limits of technology are pushed to achieve higher intensity, energy, and efficiency, sophisticated tools are necessary for the continued optimization of these machines. This three-day international workshop will provide an overview of computational tools currently being used to advance the state of the art in numerous aspects of accelerator physics. In addition to invited and contributed talks, the workshop will host industry displays and a poster session open to all participants. **The workshop will take place between 11th-13th March 2015**, hosted by GSI Helmholtz Centre for Heavy Ion Research, Darmstadt, Germany.

Topics include:

- Particle physics simulations for optimizing beam instrumentation
- Design and optimization of state-of-the-art accelerator elements
- Control systems interface for data acquisition and analysis
- Beam dynamics with nonlinear and collective effects
- Generation of synchrotron radiation and propagation through optical elements

Registration for this event will open in a few weeks. As usual the indico page can be accessed via the [oPAC home page](#).

Fellows News

Michele Carla: Outreach to Schools

oPAC Fellow Michele Carla has given several talks to a number of school classes in Barcelona. This included visits to several schools during spring 2014, as well as school visits to Alba over the summer. To familiarize the pupils with the challenges related to accelerator R&D he gave an overview talk covering accelerators from the early days to the current large scale scientific infrastructures, such as Alba. The students were fascinated by Michele's explanation and particularly interested in a live demonstration of an electrostatic Van-de-Graaff generator that he had prepared especially for the presentation.

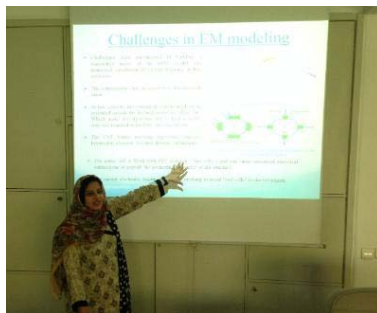
Michele enjoyed the experience and said that it was a pleasure to see young students interested in science and technology.



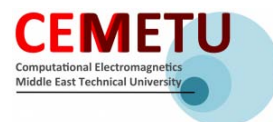
Sehar Naveed attended School in Ankara

A dense course on “The Introduction of Multilevel Fast Multipole Method”, organized by the Computational Electromagnetics group (CEMMETU) Department of Electrical and Electronics Engineering at Middle East Technical University, Ankara, Turkey, was held from May 5th-23rd, 2014. It was hosted by Dr. Ozgur Ergul, an Assistant Professor at the aforementioned University and the principal investigator of the CEMMETU research group. The purpose of the workshop was to provide a strong foundation of the theory and to discuss the problems related to the practical implementation of the method in various computational domains.

The workshop comprised of intense lecture series covering all the underlying concepts, interactive exercise and tutorial sessions, weekly presentations of students and lab sessions of the mathematical modelling of different geometrical structures. It provided a great networking opportunity for a diverse group of students and researchers from computational backgrounds to assess and share the research findings so to improve the quality of their work.



oPAC Fellow Sehar Naveed attended the three week course, where she presented a talk on “Modelling and Electromagnetic Simulations Studies of Beam Position Monitors (BPMs) for Extra Low Energy Rings (ELENA)”, giving an overview of the challenges in the numerical simulations of such low energy devices. She also got the opportunity to visit Bilkent University where she attended a Seminar with the whole CEMMETU research group. She described her experience as a memorable one and is looking forward to implementing the newly gained knowledge, skills and competencies in her on-going project.



Laura Torino at the Festival of Science and Technology

On June 14th oPAC Fellow Laura Torino took part in the Festival of Science and Technology with a demonstration about how to build a homemade particle accelerator.

The Festival of Science and Technology is organized by the Barcelona City Council Culture Institute with the aim of bringing science closer to the general public and promoting citizen participation.

The Parc de la Ciutadella became a laboratory for this event with interactive activities addressed to families, oPAC partner ALBA showed how a particle accelerator works. The objective of the activity was to explain ALBA's facility with homemade equipment, using concepts such as electric charge or electric charge conduction.

Laura Torino, as member of the Accelerators division performed several demonstrations to almost 80 people who visited the Marie Curie tent.



oPAC Members Collide

The STFC, UK has sponsored the development of an exhibit focussing on the LHC which opened to the public at the Science Museum in London last year. It has now been transferred to the Manchester Museum of Science and Industry (MOSI), and was opened to the public in May. An adults-only evening on 6th June was a way for scientists and researchers in particle and accelerator physics to engage with visitors, demonstrate some science and answer questions on the LHC and accelerators in general.

The event included a roller dance which demonstrated in a fun way how particles can interact, as well as "Standard Model" bracelet making, by threading beads onto elastic to represent up quarks, down quarks and gluons. There were many other practical science-fact demonstrations from a wide range of people from the CERN physics community.

oPAC Fellows Blaine Lomborg and Emilia Cruz Alaniz participated in this outreach activity and were available for questions at the Cockcroft Institute stand throughout the event. They had the opportunity to hold a

series of conversations (called 'Collisions') throughout the night. These conversations covered CERN and particle physics-related topics.



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

Alessandra Valloni participated in Compact Energy Recovery Linac Commissioning

oPAC Fellow Alessandra Valloni participated in the Compact Energy Recovery Linac commissioning at KEK (High Energy Accelerator Research Organization, Tsukuba, Ibaraki Prefecture, Japan).

On Thursday 12th June Alessandra gave a seminar talk about "Accelerator Development for LHeC and LTF". In her talk she presented

an overview of the LHeC & LTF design, recent activities and also gave an outlook on further developments.

Secondments

Within the frame of their 3-year research projects, the oPAC Fellows have many opportunities to build international links.

This includes contributions to international conferences, participation to topical workshop and schools as opportunities to start discussions, establish new contacts and present the results from their own research.

Manuel Cargnelutti, oPAC Fellow at Instrumentation Technologies recently spent six weeks at the European Spallation Source (ESS) in Lund, Sweden.

The ESS project is still in the early stage: groundbreaking will take place in October 2014 and first neutrons are foreseen for 2019. Current work includes establishing collaborations in the area of beam instrumentation, which is also the main topic of Manuel's project.

The purpose of his visit was to evaluate the performance of one of Instrumentation Technology's products, the Libera Single Pass H, under ESS beam conditions. This is an instrument intended for phase, position and charge monitoring in hadron and heavy ion Linacs. To give a realistic picture of the device performance, different testing setups were evaluated, including all signal and

Scientific secondments are special opportunities where Fellows can spend some time working at a different institute, thus gaining additional insights that fall outside of their core R&D activities and help broadening their experiences and skills.

environment conditions foreseen for final ESS Linux operation.

Manuel found the secondment to be a very fruitful experience. Several details and requirements were defined in collaboration with experts from the host institute, and the results were critically reviewed. A report on the activities carried out was written which found significant interest also outside of this collaboration. Manuel said he really enjoyed the experience. "It was great to break the habits and to move in a new country, where I had never been before. Sweden for many things is impressive if compared to southern European countries: for me it seems twenty years ahead concerning the standard of living and the concept of family. Hopefully the future will bring other experiences like this!"



Emilia Cruz, oPAC Fellow at the University of Liverpool spent four weeks at the European Organization for Nuclear Research (CERN) for her secondment.

There, she worked with experts enhancing her knowledge of the tracking code SIXTRACK aiming to test the stability of the proton beams, via the dynamic aperture, for different upgrades of the LHC.

This includes the High Luminosity Large Hadron Collider (HL-LHC) upgrade that shall increase the luminosity in the experiments CMS and ATLAS significantly. In addition, it will also allow to expand these studies and include the Large Hadron Electron Collider (LHeC) upgrade, where one proton beams would collide with a 60 GeV electron beam.



Partner News

Automated machine tuning with a new RCDS optimization algorithm - Xiaobiao Huang, Jeff Corbett, SLAC, USA

For optimum accelerator performance, we frequently need to tune the machine using manual or computer-controlled knobs that effect different machine parameters. Unfortunately, the tuning process can be time-consuming and inefficient, particularly when there are more than a few knobs. For this reason it is desirable to automate the process. In general, machine tuning is a multi-variable, nonlinear optimization problem. It is special in that the objective function is a measured quantity and is inherently noisy. In practice, most optimization algorithms are not suitable for *online* applications because they are designed to work with smooth mathematical equations. For online optimization, noise in the objective function can cause these algorithms to take incorrect steps and hence fail to approach the true optimum. Recently an algorithm specifically designed for online applications, the *Robust Conjugate Direction Search* (RCDS) [4, 5] was developed to overcome this difficulty. Technically, RCDS combines the power of Powell's conjugate direction method [6] with

a robust, noise-resistant line optimizer.

The new RCDS algorithm was recently tested in simulation studies and then demonstrated for online optimization applications at SPEAR3. An early example was to minimize the linear coupling using 13 independent skew quadrupoles. In this case the objective function was chosen to be the Touschek-dominated beam loss rate evaluated at 6-second intervals. Despite the relatively large noise component in the measured objective function, the algorithm found the best solution after only 200 iterations starting from an initial condition with all skew quadrupole fields zero. Other applications on SPEAR3 include injection kicker bump matching, transport beam line steering, and optimization of transport beam line optics. More recently the RCDS method was applied at the LCLS XFEL to optimize the undulator field taper for maximum radiated pulse energy.

For more information please contact [Xiaobiao Huang](#).

[4] X. Huang, J. Corbett, J. Safranek, J. Wu, Nucl. Instr. Methods, A 726 (2013) 77-83.

[5] Matlab package for the RCDS method is available from the corresponding author

[6] M.J.D. Powell, Computer Journal 7 (2) (1964) 155.

Detecting a beam – without touching it !

A non-invasive, gas jet-based, beam profile monitor has been developed in the QUASAR Group at the Cockcroft Institute, UK. This new instrument allows on-line measurement of the 2-dimensional transverse profile of particle beams with negligible disturbance to either primary beam or accelerator vacuum. The monitor is suitable for use with beams across a wide range of energies and intensities and hence a very promising device not only for fundamental research, but also for accelerators used for cancer treatment or material implantation.

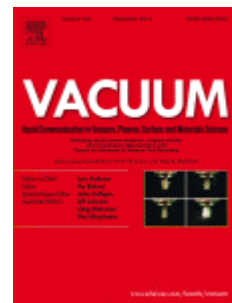


AIP Applied Physics Letters

In this setup a nozzle skimmer system shapes a thin supersonic gas jet into a curtain. This is then crossed with the beam that shall be analysed, causing ionization of the jet's atoms. These ions are then imaged onto a position-sensitive detector and yield the transverse beam profile. Proof of principle measurements were recently published in [Applied Physics Letters](#) and details about the dynamics of gas jet formation, transport and shaping can be found in an article published in [Vacuum](#).

oPAC Fellow Blaine Lomberg who contributed simulation studies into the ion extraction scheme said: "This monitor offers manifold opportunities for non-invasive beam monitoring and seems also well suited for beam halo monitoring. This links it closely to my oPAC project on high dynamic range beam profile measurements using a micro mirror array and we are now trying to understand and optimize all aspects of this novel device".

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

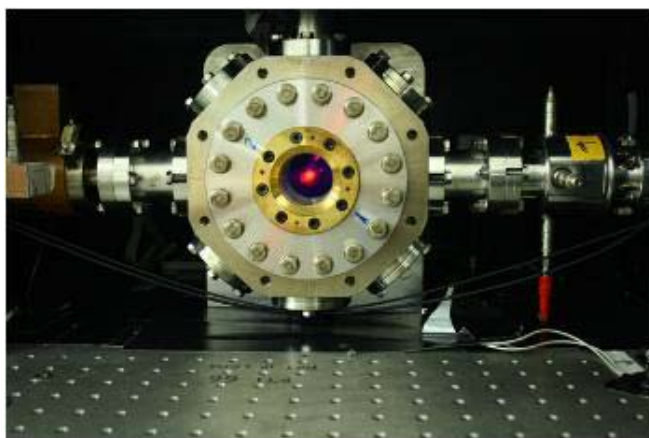


Topical Workshop on Beam Diagnostics

Lasers provide the highest time and spatial resolutions for transverse and longitudinal beam profile measurements, they allow the detection of density differences in particle beams with high dynamic ranges and permit measurements of very important machine parameters such as the momentum compaction factor and beam emittance. Today they play a crucial role in state-of-the-art beam diagnostics systems. Current R&D and future research challenges in this area will be addressed in a dedicated Topical Workshop on laser-based Beam Diagnostics that will be held on Mallorca, Spain between 23rd-24th March 2015.

The event will be organized by [LA³NET](#) and structured around the different topic areas relating to beam diagnostics. Each topic will be initiated by a renowned speaker invited to give a talk of 40 minutes about the state-of-the-art and their own research in this field. This will be followed by 20 minute talks by other delegates about their own research.

Registration has just opened and can be accessed via this [link](#).





Laser Applications at Accelerators Conference 2015

Particle accelerators are propellers for future science enabling fundamental research and new technology developments. Lasers are used in a variety of applications for accelerators from ion generation and acceleration through to diagnostic techniques essential for performance optimization.

During a 3-day international conference organized by LA³NET the following areas will be covered:

- Laser-based particle sources
- Laser-driven particle beam acceleration
- Lasers for beam diagnostics and fs timing systems
- System integration

The Laser Applications at Accelerators Conference will take place 25th - 27th March 2015 at the Son Caliu Hotel, Palmanova, Mallorca, Spain.



The program will consist of invited talks from all above areas, as well as contributed talks that will be selected by the Programme Committee from all contributions to the event. **The conference proceedings will be published in a special edition of Nuclear Instruments and Methods A.**

Registration can be completed via the [event's indico page](#).



Selected Publications

Journal Papers

'**Laserwire at the Accelerator Test Facility 2 with submicrometer resolution**', L. J. Nevay, K. Kruchinin, et al., Phys. Rev. ST Accel. Beams 17, 072802 (2014) ([072802](#))

'**Laserwire: A high resolution non-invasive beam profiling diagnostic**', L. Corner, K. Kruchinin, et al., Nucl. Instr. Meth. A740 (2014) ([S0168900213014241](#))

Conference Contributions

'**Towards a low alpha lattice for the ALBA storage ring**', M. Carlà, et al., IPAC 14, Dresden, Germany (2014) ([MOPRO089](#))

'**LHeC IR Optics Design Integrated into the HL-LHC Lattice**', E. Cruz Alaniz, et al., IPAC 14, Dresden, Germany (2014) ([TUPR0070](#))

'**Multi-objective optimization of the non-linear beam dynamics of Synchrotron Soleil**', X. N. Gavaldà, et al., IPAC 14, Dresden, Germany (2014) ([MOPME007](#))

'**Studies into beam loss patterns at European Spallation Source**', Michal Jarosz, et al., Proc. IPAC 14, Dresden, Germany (2014) ([THPME165](#))

'**Considerations for a Cavity-Based Position-Sensitive Heavy Ion Detector for the CR at FAIR**', X. Cheng, Proc. IPAC 14, Dresden, Germany (2014) ([THPME101](#))

'**Simulation and Observation of Driven Beam Oscillations with Space Charge in the CERN PS Booster**', Meghan McAteer, et al., Proc. IPAC 14, Dresden, Germany (2014) ([THPRO081](#))

'**Filling pattern measurements at ALBA using time correlated single photon counting**', L. Torino, U. Iriso, Proc. IPAC 14, Dresden, Germany (2014) ([THPME162](#))

'**Simulations of the ion spatial distribution in a gascurtain based beam profile monitor**', B.B.D. Lomberg, et al., IPAC 2014, Dresden, Germany (2014) ([THPME135](#))

'**Design of a detection system to obtain 2D dose maps for radiotherapy complex verification treatment**', M.C. Battaglia, Proc. X Latin American Symposium on Nuclear Physics and Applications, Montevideo, Uruguay (2013)

'**Beam Physics in Future Electron Hadron Colliders**', A. Valloni, et al., Proc. 25th North American Particle Accelerator Conference, NA-PAC'13, Pasadena, USA (2013) ([VALNA-PAC13](#))

oPAC Events

March 11 th - 13 th 2015	CAoPAC : Computer Aided Optimization of Particle Accelerators, GSI, Darmstadt, Germany
June 22 nd – 23 rd 2015	4 th oPAC Topical Workshop Technology Transfer, University of Liverpool, Liverpool, UK
June 24 th – 25 th 2015	Advanced Researcher Skills School, University of Liverpool, Liverpool, UK
June 26 th 2015	Symposium on Accelerators for Science and Society, Liverpool, UK

Events

Sept 29 th – Oct 3 rd 2014	LA ³ NET School on Advanced Laser Applications at Accelerators, Salamanca, Spain
Nov 17 th – 18 th 2014	LA ³ NET Topical Workshop: Scientists go Industry, Berlin, Germany
March 23 rd – 24 th 2015	Workshop on Beam Diagnostics, Palmanova, Mallorca, Spain
March 25 th – 27 th 2015	Laser Applications at Accelerators Conference, Mallorca, Spain
May 3 rd - 8 th 2015	International Particle Accelerator Conference, Virginia, USA

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Host institutions and principal investigators must acknowledge the support received when any data or achievements resulting from research funded by the European Union are communicated such as in journals, patents, presentations, etc. The European flag emblem must be included along with the following statement:

'This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 289485.'

The Marie Curie and FP7 Logos shall no longer be used !

DEADLINE FOR CONTRIBUTIONS TO THE NEXT NEWSLETTER **30th November 2014**

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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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

Newsletter Editor

Alexandra Welsch

PHONE:
+44 (0) 1925 86 4046

FAX:
+44 (0) 1925 86 4206

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



www.opac-project.eu

