Newsletter
July 2013
Issue 4

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What will the future bring ?

Particle accelerators enable many of the most advanced fundamental studies and cutting edge industry and medical applications. Without accelerators, the most advanced methods to treat cancer and discoveries such, as the one made at the LHC at CERN in 2012, would not be possible.

International collaboration is key to the success of any large research facility and requires cooperation between academia, industry and research centres. Last month oPAC invited research leaders from all over the world to have a look into the crystal ball and present their vision of the future of accelerator research and development. More than 120 researchers participated to this two day long event that took place at CERN on June 26th/27th.

Talks covered an extremely broad range from femtosecond light sources, such as the LCLS in California, over the European Spallation Source ESS to laser acceleration as a new way to reach highest beam energies. The world's highest energy accelerator, the LHC at CERN, was the focus of the first session. Drs. Gianluigi Arduini and Frank Zimmermann summarized the research output of this unique machine to date and explained how an upgrade programme will pave the way for further discoveries.

User facilities then came into focus in the workshop. "State-of-the-art **third generation light sources** operate for roughly 5,000 hours/year, mostly in Top-up operation, and provide more than 95% beam time availability. A future aim will be to provide even higher brilliance and more coherence and significant technological progress is still needed to reach this challenging goal.", explained Dr. Amor Nadji, director of accelerators at the synchrotron light source Soleil in France.

To measure the detailed characteristics of a beam of charged particles, a powerful **beam instrumentation** system is required. "Particle Beam Diagnostic systems are continually evolving to meet the requirements of ever more powerful and sophisticated accelerators and ever more demanding specifications. There are many synergies between the developments required for all types of new accelerator facilities. This is an ideal subject for collaboration on an international level which has been strengthened and extended to universities and industry via European Networks, such as DITANET, LA^{3}NET and oPAC", said CERN's beam instrumentation group leader Dr. Rhodri Jones.

These are only a few examples from the excellent talks given during these two days. You can find all presentation on the project web site. The Grand Challenges workshop kick-started a **series of events** that will be organised by the oPAC consortium over the next few years and you will find information about planned events in this newsletter edition which I hope you will enjoy.

Prof. Carsten P. Welsch, Coordinator

The oPAC project at IPAC13

The 4th International Particle Accelerator Conference, IPAC13, took place in Shanghai, China, from 12th - 17th May, 2013. With 1,500 contributions and more than 1,200 delegates, IPAC is the largest conference in accelerator science and technology.

oPAC Partners were visible at IPAC with a large number of industry stands, scientific presentations and posters. On behalf of the consortium, Prof. Carsten Welsch presented a poster outlining the project's aims and selected research results to date and several of our Fellows were also in attendance; Meghan McAteer, Alessandro Valoni and Marcin Bartosik all contributed to the scientific programme through posters about their research projects. These included studies into a potential Large Hadron electron Collider (LHeC), cryogenic beam loss monitors and beam physics simulations for the LHC.

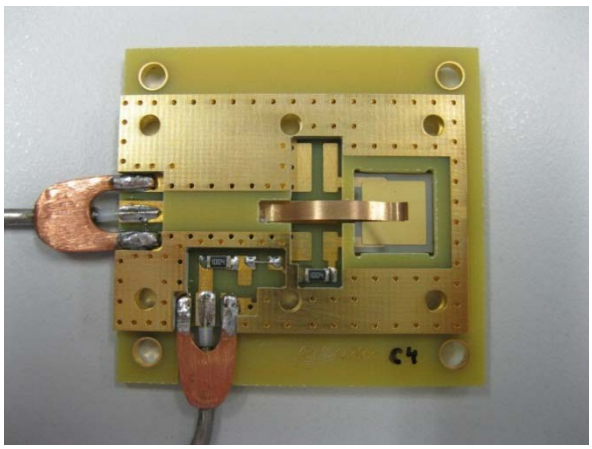
Cryogenic Beam Loss Monitors – Marcin R. Bartosik, CERN

At the LHC triplet magnets, close to the machine's interaction regions, the current Beam Loss Monitoring (BLM) system is sensitive to particle showers resulting from the collision of the two beams. With beams of higher energy and intensity resulting in higher luminosity, distinguishing between these interaction products and possible quench-provoking beam losses from the primary proton beams will be very challenging in the future. Therefore, investigations are underway to optimize the system by locating the beam loss detectors as close as possible to the superconducting coils of the triplet magnets. This means putting detectors inside the cold mass in superfluid helium at 1.9 K.

Previous tests have shown that solid state single crystal chemical vapour deposition (scCVD) diamond and p+-n-n+ silicon detectors, as well as liquid helium ionization chambers are promising candidates. Studies will investigate the question of the detectors' radiation resistance during 20 years of nominal LHC operation, by reporting on results from high irradiation beam tests carried out at CERN in a liquid helium environment. Different Si detectors at cryogenic temperatures were tested for their radiation hardness, see e.g. top figure on the next page. In these measurements a total integrated fluence of $1.22 \cdot 10^{16}$ protons/cm^2 was reached, corresponding to an integrated dose of about 3.26 MGy for silicon.

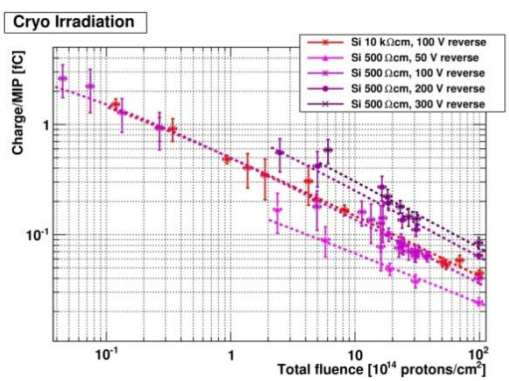
An irradiation effect on detector sensitivity was observed, see second figure on the next page. The forward bias modus leads to high signals at the beginning of the irradiation, but unfortunately the decrease in signal at higher fluence is faster compared to reverse bias modus. Further observations are that the forward bias for low resistivity silicon is less stable than for high resistivity silicon.

In liquid helium, the major downside of silicon compared to diamond disappears: the leakage current for silicon is below 100 pA at 400 V, even under forward bias for an irradiated diode. The performed experiments allowed the observation of how radiation affects the detector sensitivity for silicon and single crystal diamond.



Holder for direct current readout from Cividec.

For BLM application as a safety critical system, long term stability of the detectors is a high priority criterion. The data therefore requires more time for treatment to allow further application relevant conclusions and physical results. Silicon and diamond detectors have recently been installed on the cold mass of an LHC magnet. This location will enable to gain further experience with the detectors' long term performance and will bring an unprecedented insight to LHC beam losses. More experiments with current pulse response measurements using TCT with a pulse laser at cryogenic temperatures during irradiation are foreseen.



Dependence of the charge collected in Si detectors with a resistivity 500 Ωcm on fluence.

Large Hadron electron Collider - Alessandra Valloni, CERN

In preparation for a future Large Hadron electron Collider (LHeC) at CERN, an energy recovery linac (ERL) test facility is foreseen as a test bed for superconducting radiofrequency (SRF) development, cryogenics and advanced beam instrumentation, as well as for studies of ERL-specific beam dynamics. A CERN ERL test facility would comprise two linacs, each ultimately consisting of four superconducting (SC) five-cell cavities at ~802 MHz and two return arcs on either side. In such a scheme, a final electron energy of about 300 MeV will be reached. This machine should feature an average beam current above 6 mA to explore the relevant parameter range of the future LHeC.

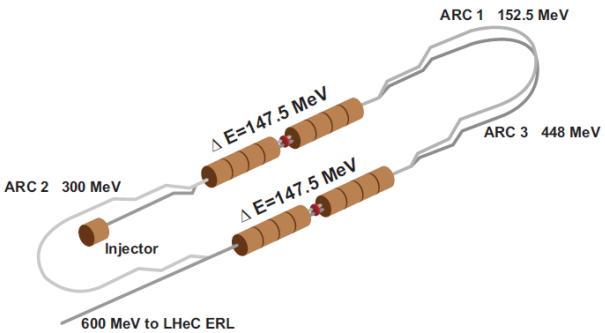


Illustration of an upgrade to the LHeC pre-accelerator. By modifying the machine backleg to include a second full cryomodule, the recirculator can deliver a higher beam energy of 600 MeV.

The accelerator consists of the following elements:

- 5 MeV injector with injection chicane;
- superconducting linacs;
- transport lines including spreader regions at the exit of each linac to separate and direct the beams via vertical bending and recombiner sections to merge beams and to match them for acceleration through the next linac;
- beam dump at 5 MeV.

A two-pass recirculating linac will enable operation in energy recovery mode. Flexibility in the design will eventually permit additional passes to be supported to increase the final beam energy. The prototype architecture will produce 300 MeV beams with a target current of about 6 mA. Different candidate RF frequencies for the SC linac have been examined, and the final choice of ~802 MHz is mainly dictated by a compromise of cost considerations and beam dynamics issues, along with functional synergies with other existing systems.

A possible upgrade design following the installation of an additional cryomodule to raise the beam energy up to 600 MeV is shown in the above figure. In this new configuration the facility could represent a smaller clone of the final LHeC project and be adopted as a pre-accelerator/injector to the final 60 GeV machine.

How long does a beam survive?

Low energy storage rings are key instruments to address some of the fundamental questions of nature. Electrostatic rings in particular were used very successfully to study the interaction of various ion beams with all different kinds of target gases, ions, electrons and light. However, at very low energies and beam intensities, many physical effects act on the stored particles at the same time and need to be analysed to understand beam stability and life time.

In a paper by A. Papash, et al. just published in Phys. Rev. STAB the results from a comprehensive study into the beam behaviour in such storage rings is presented. The nonlinear and long-term beam dynamics and ion kinetics are described on the examples of ELISA, the first electrostatic storage ring in the world, the Antiproton Decelerator antiproton (AD) recycler ring, a possible upgrade to the AD complex at CERN, the magnetic Test Storage Ring (TSR) at the Max Planck Institute for Nuclear Physics in Heidelberg, and the novel ultra-low energy storage ring (USR), developed by the QUASAR Group.

It is shown that this model allows, for the first time, to provide a consistent explanation of beam growth and associated ion losses based on benchmarking of experimental data and at the same time to make predictions of the performance of future machines.

Find out more!

Spotlight on Training

It takes a range of skills and technologies in order to improve particle accelerator performances but in many cases scientists working in very different research areas find they have been working toward a common goal at a point where it is too late to collaborate. UK News from CERN (No. 17 March 2013) published an article on the training provided by the oPAC network and the holistic approach taken by us. It focused on some of the research projects being undertaken by Fellows and highlighted the importance of the role of our industry Partners and our dedicated Complementary Skills Schools in providing training that is relevant to future employment.

UK news from CERN

oPAC Events

Complementary Skills School

The oPAC Fellows came together in Liverpool for a week-long Complementary Skills School 3rd-7th June 2013.

Gaining of complementary skills is considered highly important for postgraduate researchers across Europe before they enter the global job market. This course aimed at providing all trainees with the necessary skills base for their future career in both, the academic and industry sectors. Fellows received training in specific skills that they could apply directly to the research projects, such as presentation skills, project management and scientific writing in addition more 'generic' skills to support them in their future careers.

All Fellows had to give presentations and write about their research projects during the week. They then received feedback from their peers and professional trainers with the aim of identifying best practice whilst giving every participant the opportunity to identify a presentation and writing style that works best for them.

To promote work between Fellows, small groups of six people were asked to develop a grant application for a 10 k€ innovative outreach event. They worked on this throughout the week with theory sessions on risk assessment and project management basics, such as the definition of milestones and deliverables, interleaving group work sessions. All groups developed a concept for an event that will promote research to the general public. They worked on resource planning, had to identify all stakeholders, decide on a marketing concept, characterise the potential impact and put together both, an actual grant application and a presentation with which they competed against the other teams.

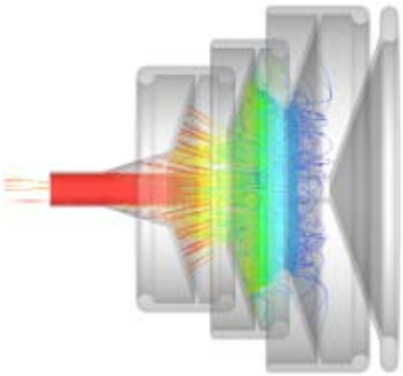
The intense training which was found stimulating and enriching by all participants was complemented by a tour of Liverpool on Monday, a visit to the Cockcroft Institute and Sci-Tech Daresbury on Wednesday, followed by a fun-packed race event at Warrington karting, and a formal dinner at Alma de Cuba on Thursday.

This innovative method of training post-graduate students was presented at the UK's Higher Education Academy Learning and Teaching Conference 2013 where it was extremely well received. Following a roll out of similar training within the Faculty of Science and Engineering at the University of Liverpool our methods were identified as 'best practice' and as a result will now form the basis of university wide post-graduate training.

This course would not have been possible without the invaluable support from Prof. Peter Butler, John Schofield, Drs. Rosa Letitia, Robert Walgate, David T Joss, David Newton, many ASTeC staff who organised an interesting and informative lab tour on Wednesday and the EU T.E.A.M. - many thanks to all of them for their help and support!

oPAC Specialized Training Workshops

Two specialist training workshops have taken place on 24th and 25th June which were attended by all oPAC Fellows.



Computer Simulation Technology provided a one-day specialist training in their *Particle Studio*® Simulation suite on 24th June at CERN, Geneva. This important code is used by accelerator specialists around the world and often key to the design and optimisation of cavities, beam instrumentation or beam dynamics. Training included such topics as: Setting up your own structure in CST Studio Suite®; understanding how to define a particle source and apply the available emission models to it; loading different types of pre-calculated fields for the particle simulation; using the different post-processing capabilities to read out field and particle result data; parameterizing & optimizing created and imported structures; tuning the mesh for optimum speed and accuracy and how to run Wakefield simulations.

On 25th June our Partners Bergoz Instrumentation hosted the network Fellows at their site in France. This training provided insight into the resources available within typical SME technology partners and included training areas such as hands-on building a Wi-Fi receiver; retrieval and assembly of manufacturer data sheets for performance critical components; measuring of instruments a critical approach and provision of an overview of oscilloscopes and network analyzers.

The support of our Partners with regard to training is extremely important to the success of the network and our thanks are extended to the staff from CST and Bergoz who were involved in facilitating such positively received workshops and for providing our Fellows with excellent industry-related training!

oPAC Topical Workshop 'Grand Challenges in Accelerator Optimisation'

The oPAC network held a two-day international workshop on the Grand Challenges in Accelerator Optimisation at CERN on 26th and 27th June 2013. *Internationally renowned speakers provided an overview of the current state of the art in research and development at accelerators and light sources and highlighted existing limitations.*

Talks on day one of this interactive workshop, which was organized for the oPAC Fellows and open to the wider community, included an overview of the LHC and its upgrade programs by Dr. Gianluigi Arduini (CERN), long term ideas for high energy physics accelerators by Dr. Frank Zimmermann (CERN), insight into the challenges related to the design, commissioning and operation of 3rd generation light sources by the synchrotron Soleil's director of accelerators, Dr. Amor Nadji, as well as the particular challenges in the design and operation of high intensity proton accelerators, given by the head of the European Spallation Source accelerator group, Dr. Mats Lindroos.
The second day included contributions by FEL prize winner Dr. Daniel Ratner from SLAC who talked about the challenges found at LCLS to date and future research plans, CLPU director Prof. Luis Roso who summarized the achievements in laser acceleration R&D and Dr. Bjarne Nielsen, CEO of Danfysik, who highlighted the importance of collaboration between industry and academia and talked about his company's trend towards 'green' technology. A poster session in the afternoon gave all participants the opportunity to present their own research and allowed for close discussion of research results and future plans. The workshop ended with a special seminar titled 'Unravelling the Secrets of the Universe' by Dr. Richard Hawkings in which he summarized the R&D work that led to the discovery of a new particle at the LHC in 2012.

With a total of 120 participants the workshop was very well attended and provided ample opportunity for discussion between participants.

Further information

Steering Committee Meeting: Approved Future Events – notes for your diary

The oPAC Steering Committee met at CERN on 27th June to discuss the way forward for the project and plan its future programme of events. New events for 2014 were agreed to include Libera Workshop by Instrumentation Technologies (spring 2014), a Beam Diagnostics Workshop focusing on beam loss and beam profile monitoring at CIVIDEC in Vienna, Austria (8th and 9th May 2014) and an international School on Accelerator Optimization at Royal Holloway University of London, UK (7th to 11th July 2014). In June 2015 there will be a Symposium as a major outreach event which will be held in Liverpool, UK. Finally, the date for our end of project international conference in Seville, Spain was fixed for 7th to 9th October 2015.

There are two new members of the Steering Committee: Dr. Pavel Karataev is the new representative for Royal Holloway University of London and the oPAC Fellows have elected Meghan McAteer based at CERN as their student representative for the following 12 months.

Supervisory Board Review

The annual meeting of our Supervisory Board also took place at CERN 28th June. All oPAC Fellows and representatives from many Partner institutes took part in this event. First, the coordinator provided an overview of the work to-date within the project reflecting on the recruitment process and the training that has already taken place. Future events were announced and dissemination to-date presented. Participants were briefed on the requirements for the Project's Mid Term Review with the European Commission which will take place in Barcelona in October 2013. The Fellows were then provided an opportunity to introduce themselves to the board and feedback their impressions.

Visions for the Future of Accelerators

oPAC coordinator Prof. Carsten P. Welsch contributed to the EuCARD2 kickoff meeting held at CERN June 10th - 14th 2013. He gave a talk about *the role and goals of EU funding from the viewpoint of universities* as part of a dedicated 'Visions for the future of Particle Accelerators' workshop. The meeting was attended by almost 200 delegates from around the world and formed an excellent platform to discuss the ambitious research plans of the accelerator community.

Future Events

oPAC at IBIC 2013

oPAC will be represented at the Beam Instrumentation Conference (IBIC13) in Oxford, UK 16th – 19th September 2013 where members of the EU Project T.E.A.M., based at the Cockcroft Institute in Daresbury, will host an industry stand. This will provide an excellent opportunity to raise the profile of the network and showcase the projects being undertaken by our Fellows in addition to highlighting the training events offered and our Partners involved from both, industry and academia. The stand will be open from Monday morning until Wednesday afternoon - please come along and visit us at Exhibitor Hall 1, Stand 10.

We look forward to seeing you!

IBIC 2013 Homepage

Mid-Term Review Meeting

The project's Mid-Term Review with the European Commission has now been set for Monday 14th October 2013 in Barcelona, Spain. This meeting will be attended by representatives from all Partner institutions and Fellows, representative from the Research Executive Agency (REA) in Brussels and an external reviewer. During the meeting the project coordinator will outline the general progress made, scientific achievements, training events and networking activities. In addition, an overview of future events will be given. Each Fellow will be asked to give a short presentation about their background, research and training activities within the oPAC project.

These talks, in combination with a formal report that will be submitted before the meeting, will form the basis of the assessment of project progress.

New to the Network

Sarmadi Almecci earned her Bachelor of Science degree in Physics from The George Washington University in Washington DC, USA in 2004. Following graduation, she accepted a post-baccalaureate research assignment at Los Alamos National Laboratory. Her work in radiation detection was first presented at the Institute of Nuclear Materials Management meeting and later awarded at the annual Los Alamos Summer Student Symposium and American Nuclear Society Conference. Afterwards, she was invited to further her research experiences with field study in the International Safeguard's division at the United Nations' International Atomic Energy Agency in Vienna, Austria. Most recently, Sarmadi participated in Georgetown University's dual program in science and international policy studies on a full tuition scholarship. Her research will focus on testing different methodologies for ^{10}Be detection.

Maria Cristina Battaglia was born in Comiso, Italy in August 1988. She moved to Catania to pursue her professional goals by studying Physics at the University of Catania in 2007. In 2010, she obtained her Bachelor's degree in Physics and commenced her Master's in nuclear physics at the University of Catania. As a Master's student, she participated in an Erasmus exchange programme and studied one semester at The University of Coimbra, Portugal. During her stay she developed her Master's thesis in the application of medical physics; in particular, she worked on the development of a novel imaging technique named 'Orthogonal Ray Imaging'. She obtained her Master's degree in November of 2012. Her research will focus on the development of detection system for verifying 2D methods of image reconstruction for Intensity Modulated Radiotherapy.

Pavel Maslov was born and raised in St. Petersburg, Russia. In 2004 he was enrolled into the faculty of Robotics and Technical Cybernetics. Pavel went to the military department of the Polytechnic University in his 3rd year, up until he graduated as Reserve officer of Anti-aircraft Rocket Forces in 2010. During his 6th year at the Polytechnic he joined AIESEC, a global youth non-profit organization that develops leadership capabilities, where he worked as a volunteer for a year. He earned his Bachelor's and Master's degrees in Automation and Control from the St. Petersburg State Polytechnic University, both with honours. His Master's thesis is entitled "Precise control of the Stewart platform (hexapod robot)".
Following this he was employed as an engineer and programmer by the D.V. Efremov Scientific Research Institute of Electrophysical Apparatus and has been deeply involved in a joint international R&D project aiming to demonstrate the scientific and technical feasibility of fusion power, also known as ITER. As a result of his work, Pavel implemented a distributed control system (based upon EPICS, a widely used open-source software suite for controlling particle accelerators, radio telescopes, etc.) in the Fast Discharge Unit for ITER and a data acquisition system for the high-current test stand at the Pulsed power lab. He also acquired practical experience whilst conducting physical experiments using various cutting edge electrical instruments. The main focus of his research will be the study and optimization of control systems for particle accelerators.

Partner News

SOLEIL Light Source

Enhanced European Coordination for Accelerator Research and Development (EuCARD^2), France - Laurent Nadolski

The aims of the oPAC project are to enable cutting edge research in accelerator R&D and develop long-term collaboration and links between both cross-sector and disciplinary boundaries. To this end we are happy to announce a new EC funded network EuCARD^2 which is investigating 'Low Emittance Rings (LOW-e-RING)' following the identification, by two International Committee for Future Accelerators (ICFA) Workshops, of a synergy between damping rings for electron colliders, synchrotron light sources and advanced factories (e^+/e^- colliders), which are facing similar problems in the control of very low emittance beams. The objective of this network is to move research communities towards a common goal in defining theoretical and technological solutions and promoting common technical choices. Research will focus on enabling evaluation of methods, approaches and numerical tools for designing ultra-low emittance optics; methods of evaluating the impact of impedances and instabilities in low emittance rings and promote interactions concerning insertion devices, magnets and alignment in low emittance rings.

Under the auspices of the EuCARD^2 project, the Third Low Emittance Ring Workshop was held in Oxford in July 8th-10th 2013 and hosted by the John Adams Institute for Accelerator Science which attracted some 200 participants.

Further information

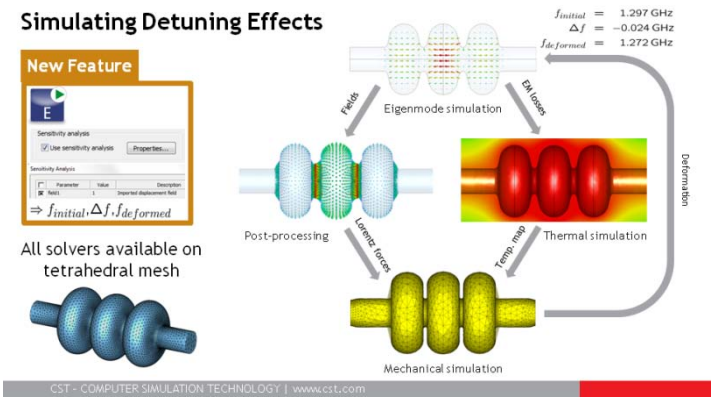
CST Interview Series: Spotlight on University Research

Frank Hamme

At the International Microwave Symposium 2013, CST announced an on-going interview series highlighting the importance of research in universities. The interview series showcases the research of past CST University Publication Award winners and celebrates the 10-year anniversary of the Award. Distributed annually to authors who have published papers with simulations referencing CST STUDIO SUITE® software tools, the Award demonstrates a strong relationship with academia and the on-going interview series showcases the importance of this partnership to support the research projects of university institutes. The interview series has touched on research projects such as antenna designs for an experimental mini-satellite, the development of a UWB radar system for medical applications, and electromagnetic pulses for medical imaging. Read the interviews on the CST blog and find out more about the CST University Publication Award.

Updated CST Studio Suite

Calculating Detuning from Mechanical Deformation.
Advances in the Eigenmode solver of CST MICROWAVE STUDIO® now allow mechanical deformations to be used as the basis of sensitivity analysis. This permits the detuning caused by deformation from sources such as heating and Lorentz forces to be easily calculated for resonant cavities. This advance is one of several updated features of CST STUDIO SUITE® Service Pack 2. The slide demonstrates the simulation workflow for analyzing detuning of an accelerator cavity.



Open Prize - Instrumentation Technologies, Slovenia

oPAC Partners Instrumentation Technologies are running a competition to find the most original measurements made using their Libera equipment. The competition is open to all and the winner will received a €700 prize in addition to fully-funded participation in the 10th Libera Workshop in 2014.

Further information

Low Emittance Rings Prize Awarded – EuCARD^2 Project

The Low Emittance Ring collaboration network within EuCARD^2 awarded their prize to a PhD student with particularly meritorious work in the field of Low Emittance Rings beam dynamics and technology. The selection for the prize took place during the Low Emittance Rings workshop 2013 held in Oxford in July. The awards were based on poster presentations prepared by the student candidates and the results were announced during the workshop dinner. The prize winners were Eirini Koukovini Platia from EPFL/CERN and Simone Liuzzo from ESRF/University of Rome. The prize included a letter from the Organizing Committee and financial support for participation to a major accelerator conference of their choice.

Publications

'Strawman Optics Design for the CERN LHeC ERL Test Facility', Allessandra Valloni, Oliver Sim Brüning, Rama Calaga, Erk Jensen, Max Klein, Rogelio Tomas, Frank Zimmermann (CERN, Geneva), Alex Bogacz, David Douglas (JLAB, Newport News, Virginia) Proceedings IPAC2013 ID: 2721.

'Determination of Octupole and Sextupole Polarities in the LHC', Meghan J. McAteer, Yngve Inntjore Levinsen, Ewen Hamish Maclean, Tobias Persson, Piotr Krzysztof Skowronski, Ralph Jeffrey Steinhagen, Rogelio Tomas (CERN, Geneva) Proceedings IPAC2013 ID: 3678.

'Preliminary Results of Linear Optics From Orbit Response in the CERN PSB', Meghan J. McAteer, Christian Carli, Bettina Mikulec, Rogelio Tomas (CERN, Geneva), Masamitsu Aiba (PSI, Villigen PSI) Proceedings IPAC2013 ID: 3683.

'Characterisation of Si Detectors for use at 2 Kelvin', Marcin Ryszard Bartosik, Carlos Arregui Rementeria, Bernd Dehning, Thomas Eisel, Christoph Kurfuerst, Mariusz Sapinski (CERN, Geneva), Vladimir Eremin, Elena Verbitskaya (IOFFE, St. Petersburg) Proceedings IPAC2013 ID: 3002.

'Radiation Tolerance of Cryogenic Beam Loss Monitor Detectors', Christoph Kurfuerst, Carlos Arregui Rementeria, Marcin Ryszard Bartosik, Bernd Dehning, Thomas Eisel, Mariusz Sapinski (CERN, Geneva), Erich Griesmayer (CIVIDEC Instrumentation, Wien), Christian Fabjan (HEPHY, Wien), Vladimir Eremin, Elena Verbitskaya (IOFFE, St. Petersburg) Proceedings IPAC2013 ID: 2735.

'Accelerator Optimization within the oPAC Project', Carsten Peter Welsch (Cockcroft Institute, Warrington, Cheshire; The University of Liverpool, Liverpool) Proceedings IPAC2013 ID: 3101.

'Nonlinear and long-term beam dynamics in low energy storage rings', A. Papash, A. Smirnov and C.P. Welsch, Phys. Rev. ST Accel. Beams 16, 060101 (2013).

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oPAC Events	
Oct 14th - 15th 2013	oPAC Mid-Term Review, Barcelona, Spain
Spring 2014	Libera Workshop, Instrumentation Technologies
May 8th - 9th 2014	oPAC Topical Workshop on Diagnostics, Vienna, Austria
July 7th - 11th 2014	oPAC Accelerator School, London, UK
Oct 7th – 9th 2015	oPAC International Conference, Seville, Spain

Events	
August 26th - 30th 2013	35th Free-Electron Laser Conference, New York City, USA
Sept 2nd - 6th 2013	9th International Workshop on Adaptive Optics for Industry & Medicine , Stellenbosch, South Africa
Sept 16th - 19th 2013	IBIC 2013, Oxford, UK
Sept 29th – Oct 4th 2013	Particle Accelerator Conference, Pasadena, USA
Oct 6th -11th 2013	ICALEPCS 2013, San Francisco, California, USA
Nov 4th – 6th 2013	Laser Technology & Optics Design, Aachen, Germany
April 28th – 30th 2014	Novel Acceleration Schemes, Dresden, Germany

NOTICE BOARD

Don't forget! oPAC Fellows should complete their questionnaires for the Mid-Term Review report and Partners ensure their paperwork is completed.

DEADLINE FOR CONTRIBUTIONS TO THE NEXT NEWSLETTER
30th September 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.

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