

Accelerator Scientists – Most Wanted, but Hard to Find

The 3rd oPAC Topical Workshop on Beam Diagnostics was held this week in Vienna, Austria. Hosted by our industry partner CIVIDEC, it provided a perfect and stimulating environment for detailed discussions of the state-of-the-art in instrumentation for charged particle beams. Around 50 participants from across Europe participated in the event and presented latest R&D results in beam profile and halo monitoring, instrumentation for medical accelerators and light sources, beam loss detection, as well as instrumentation for beams at the extremes of intensity. The workshop also allowed the participants to talk about current needs for additional research in key areas and discuss R&D plans over the next 5-10 years.

In the discussion, it became clear that despite past achievements through initiatives such as the [DITANET project](#) that trained more than 20 Fellows in beam diagnostics between 2008 and 2012, or oPAC, significantly more skilled researchers are still be required to match the needs of current and future accelerator projects. This impression is supported by the findings of the [TIARA project](#): Over the next five years a growth in total accelerator-related personnel of 18% is projected. However, despite some national efforts across the EU member states, there are still hardly any coordinated international training programs with skills shortages reported in a number of key areas, in particular beam dynamics, beam diagnostics and instrumentation, and accelerator applications. Whilst this should be good news for the oPAC Fellows who receive comprehensive training in essentially all these areas and should hence find an excellent job market, it underlines the need for many more early career scientists and engineers to be trained in our research area.

Engagement with the general public is an important goal of the oPAC project and scientific outreach is a key element of all Fellow R&D projects within the network. Already during our first researcher skills school in June 2013 all trainees were tasked to develop innovative outreach ideas. These ranged from animated cartoons, to a home-made Van-de-Graaf generator (which became reality very recently – see this newsletter edition!) to an APPcelerator mobile phone application. The oPAC Fellows have used these creative ideas as a basis for a number of school and university visits that allowed them to get in touch with a wide and very interested audience. Feedback on their presentations and events they contributed to was overwhelmingly positive and I am very grateful for the extra efforts they all have put into this important activity. Several oPAC partners, including our Fellow Daria Astapovych, were invited to contribute 90 minute-long scientific sessions on „Accelerating Green Technology“ and „Accelerated learning for success“ to this year’s Euro Science Open Forum (ESOF) which will be held in Copenhagen between 21-26 June 2014. Not least, the network as a whole will organise a dedicated „Accelerators for Science and Society“ outreach symposium in the Liverpool convention centre on 26th June 2015. No doubt, the latter is still some time to go – but **make sure you reserve the date and join us !**



Carsten P. Welsch, Coordinator

Special Interest Articles

- Libera Workshop
- 3rd oPAC Topical Workshop
- Fellows News

Individual Highlights

- Research News
- Upcoming Events
- Vacancies

Research News from oPAC

Application of Genetic Algorithms at Synchrotron SOLEIL -

Xavier Nuel Gavaldà



The optimization of a storage ring lattice is a multi-objective problem that involves a high number of constraints and a multi-dimensional parameter space. We use Multi-Objective Genetic Algorithm (MOGA) and the tracking code ELEGANT to optimize the linear and non-linear beam dynamics of the SOLEIL synchrotron light source.

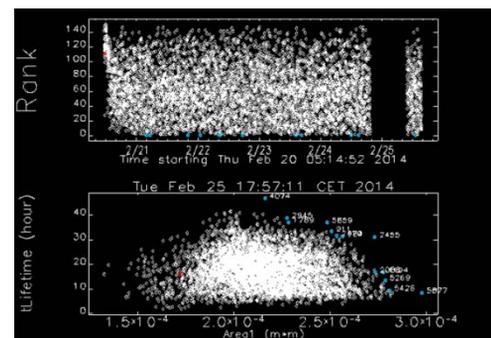
The first objective of this project is to optimize the effects of the sextupoles on the beam dynamics of the machine. The sextupoles are magnets used to correct the natural chromaticities introduced by quadrupoles, but at the same time they introduce non-linearities that can significantly reduce the dynamical aperture (DA) and the momentum aperture (MA). Both parameters are strongly related with the injection efficiency and the beam lifetime of the storage ring, respectively, and will be the objectives of our optimization.

Genetic Algorithms are a heuristic search that mimic the process of natural selection and generates solutions to optimization problems using techniques inspired by natural evolution, such as mutation, selection and evolution. In particular, the kind of genetic algorithm applied at SOLEIL ranks the best solutions from an initial random population based on the comparison of the objective values among all of them. Thereafter, it chooses two parents from this group of best solutions, called Pareto front, to generate two children. Finally, the algorithm mutates the children and randomly selects the parents for the next generation of solutions. The process is iterative and stops when the maximum number of generations is achieved.

MOGA optimizes multi-dimensional problems and needs to be provided with a list of constraints. In this study case, this multi-parameter space is defined by the settings of quadrupole and sextupole magnet strengths. The list of constraints is related to the optical parameters of the storage ring such as the betatron functions, the chromaticities and the tunes. These constraints have to be identified before starting using MOGA.

After the installation and validation of MOGA in the SOLEIL cluster in the summer of 2013, a

list of storage ring models were tested. Starting from the simplest case using 11 sextupole families, the complexity of these models has been increased over time to be as close as possible to the real machine. The last results using a model with 2 quadrupole families, 11 sextupole families, without magnetic errors and without vacuum chambers (Figure below) shows a promising increase of 10 mm in the DA and 100 h in the Touschek lifetime of the nominal lattice of SOLEIL storage ring. To be sure that these results are complete, it is necessary to check them against another code. In this case, they have been checked against TRACY III with a good agreement.

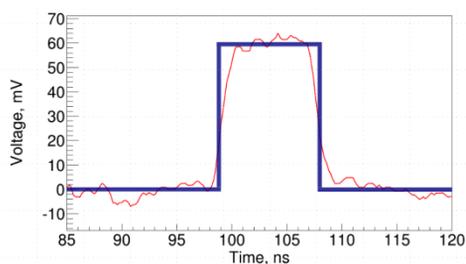


Another important point to study will be to improve the quality of the selection criteria and to speed up the optimization process. These kinds of computational tools require a cluster with hundreds of processors working continuously in some cases for more than one month. The reduction of the computation time will decrease the cluster resources dedicated to this kind of optimization increasing the CPUs dedicated to other tasks. The application of MOGA in the linear and non-linear beam dynamics of SOLEIL will be the basis to propose a list of possible upgrades of the accelerator. These upgrades will target a reduction of the effective horizontal emittance while keeping constant the ring circumference and the number of beam lines. As a consequence, the brightness of the facility will be increased.

Pulse shape analysis in neutron cross-section measurements

- Pavel Kavargin

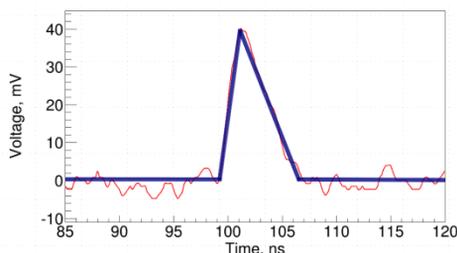
Diamond detectors can be used in a variety of particle detection applications. The unique properties of diamond include fast signal response, low leakage current, high thermal conductivity and high irradiation resistance. One of the features of a diamond detector equipped with a dedicated amplifier is the possibility to discriminate between particles that traverse the whole detector and particles that deposit all of their energy and stop inside the diamond. If a particle traverses the diamond, the pulse shape of a signal will be triangular. If a particle stops in the diamond, close to the electrode, the pulse shape will be rectangular. This property allows us to perform a pulse shape analysis for the discrimination between different particles. It is of a particular importance in neutron cross-section measurements. The pulse shape analysis can be used to distinguish the charged particles from the neutron inelastic reactions (rectangular pulse shape) from the photons of the gamma background (triangular pulse shape).



Rectangular pulse shape produced by an alpha particle in diamond. The theoretical pulse shapes are plotted in blue colour, the measured pulses are plotted in red colour.

In order to measure a neutron cross-section in an inelastic reaction which produces charged particles (e.g. proton, alpha, triton) the products of the reaction must be counted

via the detector. The typical experimental setup includes the sample in which the neutron inelastic scattering occurs. It is mounted on the diamond detector which is used for the counting and spectroscopy of the products of the reaction. Since the gamma background in such a measurement can be quite significant, the background rejection is needed. However, the simple introduction of a signal pulse height threshold in the readout electronics can be insufficient. The background and the products of the reaction can generate signals with the same amplitude. In this case it is not possible to discriminate these particles using the pulse height threshold.



Triangular pulse shape produced by a Compton electron

The background gamma radiation produces Compton electrons in diamond. These electrons can traverse the diamond and exit the detector. The charged products of the inelastic reaction do not leave the diamond and their range in diamond is relatively short. The pulse shape analysis can be performed in order to identify the rectangular pulse shapes which correspond to the products of the reaction. This way they can be successfully discriminated from the triangular pulses generated by the background.

oPAC Events

10th Libera Workshop, 9th-10th April, Instrumentation Technologies Solkan, Slovenia



The 10th Libera Workshop, organized jointly by oPAC and Instrumentation Technologies, was held from the 9th – 11th April, providing a diverse range of experts working in the accelerator field from all over the world an opportunity to meet and exchange experiences.

Under the slogan ‘The Spring of New Ideas’, the workshop celebrated its 10th anniversary presenting an overview of a decade of experience with Libera and fresh perspectives to face the challenges of the future. There were Libera demonstrations and Satellite meetings on the 9th and 11th of April and a full program of talks on the 10th.

The workshop focussed on applications that use the Libera family of instruments – state-of-the-art instrumentation systems used for diagnostics and beam stabilisation at particle accelerators. The event was opened by instrumentation Technologies CEO, Dr. Rok Ursic who presented the talk “Growing together”, stressing the benefits of team development and networking. Benefits also shared by oPAC project.

oPAC was represented at the workshop with the attendance four Fellows: Manuel Cargnelutti, Pavel Kavrigin, Blaine Lomborg and Pavel Maslov. Manuel, whose oPAC

position is hosted by Instrumentation Technologies, presented a very interactive talk on “Libera spark-compact eBPM solution”, running a live simulation in the conference room. In addition, oPAC Project Manager Rita Galan presented a talk on “Researcher training within international networks”, providing an overview of International Training Network best practices and Industry and Academia collaboration. There was also time for networking at the workshop and to visit the House of Experiments in Nova Gorica, where participants could get ‘hands-on’ with some interesting experiments.



Libera
WORKSHOP 2014

3rd oPAC Topical Workshop on Beam Diagnostics, 8th-9th May 2014, Vienna, Austria

To fully understand and optimize the properties of a beam in an accelerator, storage ring or light source, powerful beam diagnostics are essential. Without an appropriate set of diagnostics, it would be impossible to control, let alone optimize, the most advanced research facilities. During this 2-day international workshop the current state of the art in beam profile, beam

intensity and beam loss monitoring was discussed, as well as the specific needs of medical accelerators and accelerator-based light sources. Each session was started by an invited talk from a leading expert in the respective field. This information was then complemented by talks from oPAC Fellows on their R&D projects, as well as selected contributed talks from other participants.



The workshop gave ample opportunity to discuss research and development being undertaken and ambitions to further improve the performance of existing and future facilities. A dedicated discussion session focused on international requirements in terms of collaborative projects, R&D needs in beam diagnostics over the next 5-10 years, as

well as a critical discussion of current researcher training efforts internationally. All talks can be accessed via the event's [indico page](#).

oPAC is grateful to [CIVIDEC Instrumentation GmbH](#) for being a perfect host and providing the basis for this very successful event.

Upcoming Event

oPAC Advanced School on Accelerator Optimization, 7th-11th July 2014, London, UK

This oPAC School covers accelerator optimization through beam physics studies, instrumentation R&D and charged particle beam simulations at an advanced level. It targets PhD students and Postdocs, as well as experienced researchers. The school will start with an introduction to each topic and is hence suitable also for researchers without previous experience in the field - the general teaching pace will be high to allow many

advanced topics to be covered too.

The school will be hosted by [Royal Holloway University of London](#), UK and take place from 7th -11th July 2014. The registration fee of £700 covers course fee, accommodation and full board. The deadline for registration and payment is 31st May 2014.

More information and registration can be found at the School's [Indico page](#).



Fellows News

Day of the Doctorates - Journées Des Doctorants 2014, Université Paris-Sud, France



oPAC Fellow Xavier Nuel Gavaldà was a member of the organization committee of the 5th 'Journées des Doctorants' of the Doctoral School MIPEGE of the University of Paris-Sud (France) held on the 9th and 10th of April 2014 (<http://www.ed-mipege.u-psud.fr/>). The objective of this event was to share knowledge and promote scientific exchanges between the PhD students and the Directors of the Doctoral School MIPEGE. Xavier also presented a talk with the latest results from his project 'Optimization of the performance of Synchrotron SOLEIL using genetic algorithms'.



Particle & Accelerator Physics Master Class 2014, Cockcroft Institute, UK



The Cockcroft Institute at STFC Daresbury Laboratory hosted its exciting annual event of mixed lectures and practical activities in the field of Particle and Accelerator physics. The Particle and Accelerator Physics Master Class (PPMC) 2014 lasting from the 25th – 27th March, was primarily to attract Year 12/13 students from around the north and north-west region of England. This year's PPMC involved a fun programme of mixed lectures and practical sessions ranging from Particle Physics and the LHC at CERN to Vacuum Science, Cryogenics and Accelerator machines and the physics/technology behind them.



The event started with students attending lectures *en masse*, they were then split into groups for the practical activities. They were also guided around the Daresbury Laboratory to the ALICE and EMMA accelerators and given a quiz to complete during the day.

In the group activities, students were challenged with real-life problems regarding current particle accelerators and were involved in hands-on exercises using Particle Physics simulators and Accelerator Physics computational tools. These activities were to reveal what real-scientists are working on in these fields and the obstacles faced each day.

oPAC Fellow Blaine Lomberg volunteered to demonstrate at the event, challenging students to use an Accelerator Physics computational tool called MAD (Methodical Accelerator Design), in order to simulate beam dynamics and optimize beam optics. Blaine guided the students in the use of MAD to investigate the complications involved in achieving high luminosity in particle colliders.

Sehar Naveed attended CEM 2014

oPAC Fellow Sehar Naveed, University of Liverpool, attended the Ninth International Conference on Computation in Electromagnetics, CEM 2014. The event took place at Imperial College London, UK from 31st March - 1st April 2014.

CEM 2014

Ninth International Conference on
Computation in Electromagnetics



CEM is considered to be a flagship event in computational electromagnetics and offered extremely valuable networking opportunities. The event brought together over a hundred participants from 24 countries - students and researchers engaged in methods and techniques of computational electromagnetic, engineers facing the challenges of hazards and EMC/EMI and designers of low frequency as well as high frequency devices. The event was technically

co-sponsored by the Magnetics Society of the IEEE, UK Magnetics Society, ACES and International Compumag Society.

The talks and poster contributions were divided into groups based on Theory and methodology; Numerical methods and techniques; Algorithms and formulations; Multiphysics, coupled problems, optimisation; Modelling and simulation of devices and systems. The interactive poster session, preceded by "one-minute, one-slide" presentations allowing authors to highlight their work, was very well received by all delegates.

CEM 2014 was found to be well organised, extremely informative and engaging with the tradition of keynote lectures and invited 'scene setting' introductory talks on selected themes. The participants were also provided the opportunity to see exhibitions from electromagnetic software vendors Ansys, Cobham, CST and Infolytica.

oPAC Fellows at EIC14

Emilia Cruz Alaniz and Alessandra Valloni visited The International Workshop on Accelerator Science and Technology for Electron Collider (EIC14), hosted by Thomas Jefferson National Accelerator Facility (JLAB) in Newport News, USA 17th-21st March 2014. Both oPAC researchers were invited speakers at this international event.

Alessandra gave a talk about 'Preliminary design of the CERN ERL test Facility' and Emilia presented 'The LHeC IR and Its Compatibility with HL-LHC'.



The Big Bang National Event - It all started with the Big Bang!!

An exciting, science-tastic Big Bang event at National Exhibition Centre (NEC) in Birmingham, UK was held over 4 days from 13th-16th March 2014.



The event is the UK's most popular Science and Technology fair boasting large exhibitions from different career sectors e.g. academia, industry and commerce. The event is continuously growing in popularity with participation this year of over 55,000 attendees of all ages travelling from all over the UK. It provides the ideal chance for students and teachers to meet real scientists and engineers, talk with them about their work, and gain an insight into what it is they do. Some of the key aspects of the fair are to share advice on career prospects and job opportunities, as well as insight into new knowledge and ideas for teaching in the classroom. The event ended with a contest between students from schools across the UK, and after much work a well-deserved National Winner was selected. The NEC Birmingham "Big Bang" will continue to grow with further events already planned for 2015 and 2016.

oPAC Fellows Blaine Lomberg and Emilia Cruz Alaniz, from the Cockcroft Institute attended the event to help run a stand and to demonstrate some of the functional principles of how a particle accelerator would need to operate. Blaine explained that this stand is an outstanding way to promote science and its relevance by showcasing

mind-blowing demonstrations which illustrate aspects of the scientific work carried out by the oPAC Network at the Cockcroft institute. The stand exhibit included the innovative vacuum demonstrations that used a large bell jar to show off various fascinating and intriguing aspects of vacuum science. Other exhibitions on show were the popular Van de Graaff generator to drive a miniature electrostatic accelerator. The Cockcroft stand was very attractive, students and teachers were astonished by the operation of the electrostatic accelerator causing like charges to repel, demonstrating how hairs can be made to repel each other and stand on-end, visitors were shown how the same high voltage source could be used to accelerate a charged particle.

The stand also included a demonstration of the Meisner effect, in which Blaine showed how a piece of superconductor when cooled with liquid nitrogen forces a magnet to 'levitate'. The phenomena captivated visitors prompting questions and interest.



Blaine and Emilia expressed great enthusiasm during the Big Bang event. They both believed the event was a success and hope the students and teachers learnt from the experience. Blaine commented that he aims to get more students interested in science and is really looking forward to regional events at St. George's Hall and the World Museum in Liverpool which will take place later in the year.

Congratulations to Michele Carla!

Michele Carla attended JUAS 2014 – Course 1 Sciences & Physics of Particle Accelerator.

The 5 weeks course including more than 100 hours of lectures and tutorials, written examinations and visits to several laboratories and workshops at CERN and ESRF.

He not only had the opportunity to attend lectures from some of the best accelerator

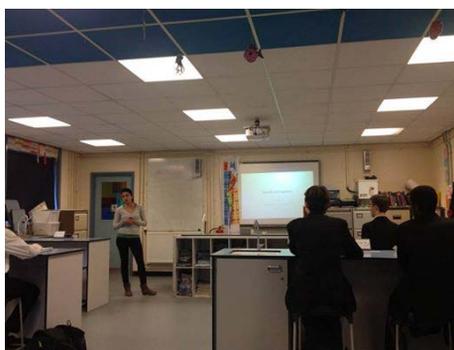
specialists coming from European national research institutes, universities and industries, but also to stand out being **one of the best two students in the final exam and winning a grant to visit IPAC'14.**



oPAC School Visits

Many oPAC Fellows have been visiting schools in recent months, some of them share their experiences and impressions:

Emilia Cruz Alaniz visited **Childwall Sport and Science Academy School in Liverpool**. She talked to A-level students about the standard Model, its history, how we detect particles, the Higgs, the LHC and the upgrades of the LHC. The students were impressed by Emilia's talk and asked her many questions.



Martina Sofranac visited the **high school Vaso Aligrudic in her hometown Podgorica, Montenegro.**

The students, aged 18, were very interested in her talk on accelerators and encouraged Martina to give details on her current work.



Xavier Nuel Gavaldà visited his **high school** on 24th of April 2014 **in his hometown, Reus, Spain.** First, Xavier explained in a didactic way the role and the importance of the particle accelerators in the actual science using the most known example: the LHC of CERN.

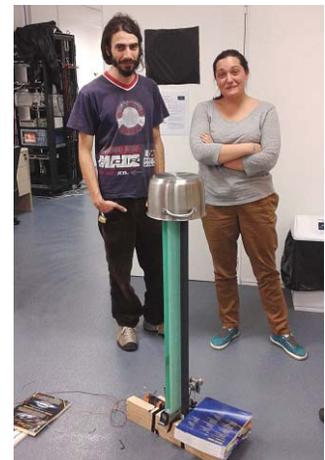
Secondly, he introduced the structure of the synchrotron light sources and the applications of these facilities to discover the properties of the matter.

Xavier enjoyed seeing his teachers from high school, sharing his knowledge with young students and answering their questions.



Laura Torino and Michele Carla went to a high school in the vicinity of Alba: **'Instituto de Educación Secundaria de Castellar' in Castellar del Valles, Spain** to give a scientific presentation to A-levels students.

The students aged 16 to 18 were very impressed with their visit and Laura and Michele enjoyed not only their visit but also the preparation for their visit. They even constructed a Van der Graaff Generator themselves to take it to the high school!



New to the Network

Hector Garcia was born in Barcelona, Spain, in 1987. He studied Physics at the University of Barcelona and after completing his degree, he started his Master studies in Particle Accelerators at the same University. His master thesis was carried out in collaboration with CERN and focused on the optics design of an emittance measurement station at the RTML line for CLIC. After presenting his Master's thesis, he participated in the Joint Universities Accelerator School (JUAS) before getting a position at CERN as a PhD student. In recent years he focused on the study and optimization of the Final Focus

System for future linear and circular colliders, especially on CLIC and ILC. During his PhD, he attended the Linear Collider School 2011 in Monterey, California. He will receive his PhD within the next few months.

His research within the frame of a Marie Curie Fellowship within the oPAC project is focused on the design and optimization of the collimation system for LHC and HL-LHC. This work will be carried out at Royal Holloway, University of London.



Salvatore Bruschetta was born in Palermo in 1990. He completed his Bachelor Degree in Energetic Engineering, nuclear profile, at the University of Palermo, graduating in February 2012. The title of his thesis was "Measurement of the neutron flux produced by a Cyclotron for the creation of PET radio pharmaceuticals". Afterwards he continued his studies with a Master Degree in Energy and Nuclear Engineering at the same University.

electron accelerator plant for industrial and research applications". Later in 2013, during his Erasmus experience in Prague, he worked on his thesis "Non-destructive quantitative analysis of various materials and evaluation of acquired data with XRF".

Within oPAC Salvatore will be working on ion implantation at particle accelerators for nanoparticle production at the University of Seville/Centro Nacional de Aceleradores (CNA) in Spain.



Partner News

Libera Spark – Beam Position Electronics based on the System-on-chip Platform

Instrumentation Technologies brand Libera, has a new family member for electron beam position processing – Libera Spark. With the advances in system-on-chip (SoC) technology, the CPU and FPGA are today enclosed in the same device. This enables high-speed processing, inherent fast communication and memory sharing between the two entities.



In this new product line the advantages of the new architecture in the development of booster BPM electronics are exploited. Its requirements are relaxed compared to up-to-now Libera beam position monitors, however, proper design of the RF part of the instrument is still a challenge. Furthermore, with optimized FPGA design a low overall power consumption can be targeted so that the instrument can be cooled passively and

powered over Ethernet. The first prototypes have been tested in detail by oPAC Fellow Manuel Cargnelutti and sent to the first customer, the European Synchrotron Radiation Facility (ESRF), which intends to use 75 Libera Spark BPMs on the booster ring.

In order to promote the new instrument and show how fast and easy it can be used, Manuel presented a live demonstration during the [Libera Workshop](#), held on 10th April in Nova Gorica, Slovenia.



LER (low emittance ring) conference in Frascati

The 4th Low Emittance Rings Workshop (LOWεRING 2014) will be organized by the INFN at LNF, Frascati from the 17th to the 19th of September 2014.

The goal of the workshop is to bring together experts from the scientific community working on low emittance lepton rings. This community, represented in the LOWεRING network and the Ultimate Storage Ring

workshops collaboration, includes light source storage rings, linear collider damping rings and future e+/e- circular collider projects.

Relevant information about the workshop organization and scientific programme will be available shortly on the workshop web site: <http://agenda.infn.it/event/ler2014>



School on Advanced Laser Applications organised by LA³NET

The 3rd School on Advanced Laser Applications has been set for 29th September to 3rd October 2014 hosted by the Centre for Ultrashort, Ultraintense Pulsed Lasers (CLPU) at the University of Salamanca in Spain. In addition to lectures about the applications of lasers for accelerator operation, laser acceleration and laser-based diagnostics there will be study groups, a poster session with industry displays, an interactive panel session and evening seminars. There will also be opportunities for discussion and networking during a tour of the CLPU facilities and at evening events.

Recognized specialists from outside the network will be engaged to complement partner expertise to cover topics such as:

- Introduction to lasers, accelerators and FELs
- Laser ion, electron and x-ray sources,
- Laser acceleration,
- Laser based beam diagnostics,
- Industrial applications.

For more information and to register go to the [LA³NET School home page](#).



Vacancies in the Network

Post-doc position on studies towards FEL amplification with laser plasma acceleration at Synchrotron SOLEIL
[http://www.synchrotron-soleil.fr/images/File/soleil/DivisionAdministration/Personnel/2014/SOU-Post-Doc-COX\(1\).pdf](http://www.synchrotron-soleil.fr/images/File/soleil/DivisionAdministration/Personnel/2014/SOU-Post-Doc-COX(1).pdf)

The post-doc will work on the start-to-end simulations of COXINEL, including data from a PIC or CALDER-PIC simulations, the accelerator transport with the code developed at SOLEIL (based on BETA) followed by FEL simulations (GENESIS and other appropriate codes developed together with PhLAM). The post-doc will first properly

implement the tools, in particular, he/she will try to apply and extend the Accelerator Tool Box to the presently existing code. Then, the post-doc will perform extensive sensitivity studies to parameters. He will also model the electron beam characterisation at the different steps, in close links with the SOLEIL Fellows in charge of the diagnostics. He/she will compare the different schemes of LWFA electron beam manipulation such as the reference COXINEL one with the transverse gradient undulator, in particular in terms of robustness. He/she will also explore and propose new strategies and ideas for an optimum electron beam handling and characterisation.

Post-doc position on cryogenic undulator at Synchrotron SOLEIL <http://www.synchrotron-soleil.fr/images/File/soleil/DivisionAdministration/Personnel/2014/SOU-Post-Doc-Cryo.pdf>

The post-doc activities are focused on the study and construction of an innovative Cryo-Ready undulator of 3 m long and 15 mm period.

The post -doc will first participate to the assembly and correction of the magnetic system at room temperature, with a usual bench of in-vacuum undulators in the SOLEIL clean room of the magnetic measurement

hall. He/She will study constraints related to the small gap of 3mm, at this gap magnetic errors are mainly dominated by mechanical deformations (high magnetic forces) and the strength non-linear magnetic interactions (soft magnetic materiel).

He/She will then develop, install and setup the innovative magnetic bench in the vacuum chamber of the undulator. This bench will comport a measurement system including a Hall probe for the local magnetic field measurements and a stretched wire for the magnetic field integral measurements.



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oPAC Events

July 7 th - 11 th 2014	oPAC School on Accelerator Optimization, London, UK
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

June 15 th – 20 th 2014	IPAC 14, Dresden, Germany
Sept 1 st – 5 th 2014	LINAC 14, Geneva, Switzerland
Sept 17 th – 19 th 2014	Low Emittance Rings Workshop LER2014. Second annual meeting of EuCARD-2 WP6. Hosting laboratory: LNF-INFN, Frascati, Italy
Sept 29 th – Oct 3 rd 2014	School on Advanced Laser Applications at Accelerators, Salamanca, Spain
Nov 17 th – 18 th 2014	Scientists go Industry: Laser and Accelerator Physics, Berlin, Germany

NOTICE BOARD

DEADLINE FOR CONTRIBUTIONS TO THE NEXT NEWSLETTER **31st August 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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