

## A good night's work joining researchers

**24 h. non-stop. No sleep. Science – outreach – event organization – and much more.** This is a brief summary of the first-ever QUASARthon – a 24 h event joining Marie Curie Fellows from the DITANET, oPAC, CATHI, LA<sup>3</sup>NET and SiPM projects, as well as other researchers from the pan-European QUASAR Group via video conference. A challenging and interesting experience that produced very good results. You will find more detailed information in this newsletter.

**LA<sup>3</sup>NET is a 'role model'.** The European Commission held a dedicated coordinators' meeting for new ITNs in Brussels last month. Based on the excellent feedback we received during our mid-term review meeting this summer, I was invited to talk about 'best practice in ITN coordination'. It was a great honour to present our experience to date and allowed for many good discussions with coordinators from across Europe.

**Registration for 2014 LA<sup>3</sup>NET events has just opened.** The consortium will organize a Topical Workshop on Laser Acceleration at HZDR in Dresden in April, as well as an international School on Laser Applications at CLPU in Salamanca. Places for both events will be strictly limited and based on the high interest in our past events, I would strongly suggest to register early to avoid disappointment.

**EuroScience Open Forum (ESOF)** is the biennial pan-European meeting dedicated to scientific research and innovation. At ESOF meetings leading scientists, researchers, young researchers, business people, entrepreneurs and innovators, policy makers, science and technology communicators and the general public from all over Europe discuss new discoveries and debate the direction that research is taking in the sciences, humanities and social sciences.

ESOF presents and discusses the frontiers of scientific and technological research in Europe, contributes to the development of a European scientific identity together with bridging the gap between science and society and stimulates policies to support scientific research.

Participation to the scientific programme is by invitation only. I am very pleased that we were invited to contribute two 90 minute sessions on 'accelerating green technology', as well as 'accelerated learning through success in science'. Both sessions are based on the research within LA<sup>3</sup>NET and already I look forward to presenting some of the most fascinating aspects of science and engineering.



Prof. Carsten P. Welsch, Coordinator

### Special Interest Articles

- Research News
- Fellow Activity
- Vacancies

### Individual Highlights

- 2<sup>nd</sup> Topical Workshop held at Fraunhofer ILT
- Registration open for next two LA<sup>3</sup>NET events



## 2<sup>nd</sup> Topical Workshop on Laser Technology and Optics Design

The programme of LA<sup>3</sup>NET events rolled on with the 2<sup>nd</sup> LA<sup>3</sup>NET Topical Workshop on 'Laser technology and optics design' held at the world-leading Institute for Laser Technology (ILT) at the Fraunhofer in Aachen, Germany (4<sup>th</sup> to 6<sup>th</sup> November 2013). The workshop addressed the key aspects of optics design relevant for particle

accelerators within a mainly training-based format and attracted over 50 participants from across Europe including all of the LA<sup>3</sup>NET fellows.

The presentations can be downloaded from the workshop website [indico.cern.ch](http://indico.cern.ch)



Proceedings were initiated by Prof. Reinhart Poprawe on behalf of our hosts at the Fraunhofer ILT in Aachen who described the work of the institute and the diverse current applications and future potential for laser technology.



Prof. Carsten Welsch followed this with an overview of the LA<sup>3</sup>NET project in the wider context of post graduate training and European accelerator research.

The training proper then got underway covering general optics design and an overview of different laser sources delivered by ILT researchers including the scientist-in-charge for the LA<sup>3</sup>NET project and local organization lead, Dieter Hoffmann. Prof. Allan Gillespie from the University of Dundee also gave a talk comparing photon beams with charged particle beams.

**The second day of the workshop addressed more advanced topics with details of beam characterization and optical component characterization occupying the full morning.** After lunch an exciting tour of the ILT labs demonstrated the state-of-the-art facilities including kW class femtosecond source development as well as non-linear optics facilities and LIDAR sources. The final parallel sessions of the day after the tour presented the delegates with a choice of two in-depth topics:

- High power enhancement cavities
- Tunable lasers and frequency conversion



After that strenuous day of talks and tours the delegates enjoyed the workshop meal in the historical setting of the Ratskeller within the town hall. This provided the perfect relaxed environment for networking and developing collaborations.

**The final day for the workshop was initiated with the experimentalist's view on the realization of relativistic light intensities with ultrafast TW-laser for particle acceleration.** This was followed by an in-depth talk about design of beam transfer lines and imaging optics. The workshop was brought to a close with a discussion on the requirements for funding and future LA<sup>3</sup>NET events. This provided food for thought and helped focus attention on the way forward to capitalize on the relations already established between participants.

**Many thanks to Dieter Hoffmann at ILT for developing the schedule with LA<sup>3</sup>NET and for coordinating arrangements with the other local organizers at ILT, in particular Karin Ergen.** This ensured the smooth running of the workshop providing the ideal environment for delegates and maximizing benefit for all.



## Research News from LA<sup>3</sup>NET

### Jose Luis Henares publishes research results from the resonant ionization laser ion source system at GANIL

**In September Jose Luis Henares presented a poster of the results from his latest experiments at the International Conference on Ion Sources 2013 (ICIS'13) in Japan.** The article has now also been published in the conference proceedings report entitled Progress of Resonant Ionization Laser Ion Source Development at GANIL [1]. The work concerns the SPIRAL2 research facility under construction at GANIL for the production of Radioactive Ion Beams (RIB) by Isotope Separation On-Line (ISOL) methods and low-energy in-flight techniques. A Resonant

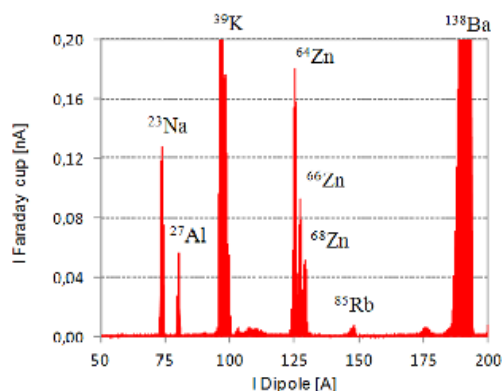
Ionization Laser Ion Source (RILIS) will be one of the main techniques to produce the radioactive ion beams. GISELE (GANIL Ion Source using Electron Laser Excitation) is a test bench developed to study a fully operational laser ion source available for Day 1 operations at SPIRAL2 Phase 2. The aim of this project is to find the best technical solution which combines high selectivity and ionization efficiency with small ion beam emittance and stable long term operation. Latest results about the new ion source geometry are presented.



LISBET is the new RILIS off-line ion source at GANIL.



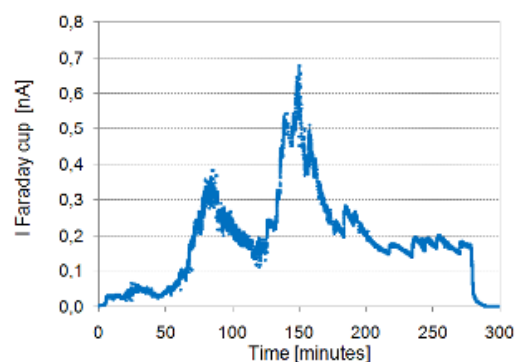
The results show that different species were found in the mass range of the spectrometer, see the figure below, most of them created by surface ionization in the ionization tube like Na, Al, K or Ba. The surface ionization occurs by thermal desorption when the atoms touch the walls of the hot cavity. The intensity of the surface ionization signal decreases over time. However, the natural isotopes of zinc generated by multi-step photo-ionization were detected as major components almost free of any reasonable background. An overall efficiency of  $0.5 \pm 0.1$  % was obtained for the zinc signal, composed of the partial efficiencies from atomization, ionization, transport and detection. The ion current during the course of one efficiency measurement is shown in the right figure below.



The mass spectrum of zinc and miscellaneous background ions from the LISBET ion source. All peaks except zinc are produced by the surface ionization

The signal peaks correspond to increases in the hot cavity temperature. The efficiency was calculated with the integrated ion current compared with the amount of atoms in the sample. It is observed that the sample

was not fully evaporated due to time restrictions, consequently, the efficiency only could be considered as a lower limit. As comparison, ISOLDE RILIS measured an efficiency of 4.9% with a dye laser system, different ion source geometry and different ionization scheme [2]. The possible causes of the relative lower efficiency are: only the first and the second ionization steps were saturated, less overlap between photons and ions was expected due to the relative large volume created by the diameter of the ionization tube and efficiency losses caused by relative low high voltage extraction may have occurred.



Ion current accumulated for <sup>64</sup>Zn during the efficiency measurement

In conclusion, the GISELE test bench is now fully operational for spectroscopic as well as efficiency measurements. A zinc ion beam was generated with the efficiency of  $\geq 0.5\%$ . A significant improvement of this value is expected after full optimization of the ion source parameters and conditions.

- [1] Progress of Resonant Ionization Laser Ion Source Development at GANIL (2013). J.L. Henares, Y. Huguët, T. Kron, N. Lécésne, R. Leroy, B. Osmond, F. Schneider, A.M. Sjödin, K. Wendt. Proc 15th International Conference on Ion Sources, Chiba, Japan.
- [2] Recent developments in production of radioactive ion beams with the selective laser ion source at the on-line isotope separator ISOLDE (2004). R. Catherall, V. N. Fedosseev, U. Köster, J. Lettry, G. Suberlucq, B. A. Marsh, E. Tengborn. Review of Scientific Instruments 75, 5, 1614.



## Latest Fellow Recruited

### Recently recruited Rui Pan underway with STFC

**Rui Pan** graduated from Capital Normal University (CNU), Beijing, China in 2007 with a bachelor's degree in Optical Engineering. During his study he completed two internships, one testing scintillators with cosmic rays at the Institute of High Energy Physics, Chinese Academy of Sciences, and the other testing aircraft engine turbine blades at the Institute of Aeronautical Materials in Beijing.

As he was very interested in the Terahertz field he then chose to study for a master's degree in Optical Engineering, graduating from CNU in 2010. The Master's course specialized in the principles of optics, nonlinear optics, advanced laser physics, and THz science and technology. His master's thesis focused on THz Time Domain Spectroscopy system and THz fast imaging, including electro-optical detection techniques.

In January 2011 Rui entered the DITANET network and worked on the development of

an electro-optical test set-up to measure longitudinal bunch profile on CALIFES which is a probe beam of CLIC test facility 3 at CERN. This work included the principle simulation, purchasing a customized laser and all the other devices/components, setting up the laser lab, designing & installing the optical beam transfer line, designing the system timing and synchronization, system commissioning and measurements. At the same time, Rui also worked toward a PhD with the University of Dundee in the topic of 'Electro-optic diagnostic techniques for the linear collider'.

**Rui joined the LA<sup>3</sup>NET project in December of 2013 working for the Science and Technology Facilities Council (STFC) in UK.**

The core of his project is working on developing a bunch arrival monitor with fs resolution by a 1.5  $\mu\text{m}$  fibre laser, based on electro-optic techniques.



## Fellow Activity

### Luca C. Stockhausen's Experimental Campaigns in the UK

**Luca C. Stockhausen participated in two experimental campaigns at the high power laser facilities of the Rutherford Appleton Laboratory (Didcot, UK) in collaboration with Paul McKenna's group at the University of Strathclyde (Glasgow, UK).** During the first experiment, Luca spent four weeks in the VULCAN Target Area Petawatt of the Central Laser Facility, which enabled him to acquire hands-on experience in setting up and conducting an experiment of laser-driven ion acceleration. VULCAN is high power laser system composed of a Nd:glass amplifier chain capable of delivering 2.6kJ of laser energy in nanosecond pulses and up to one petawatt (1015 W) peak power and 500J in a short, 500fs, pulse at 1054nm.



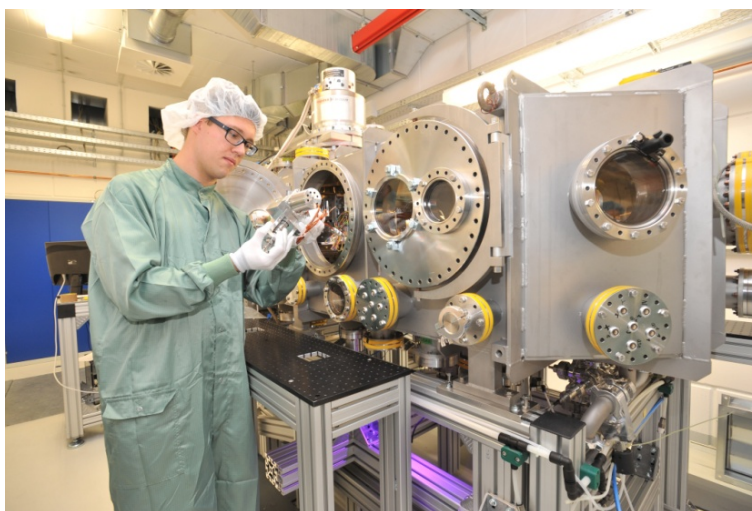
Inside the target area of the VULCAN Petawatt

Both experiments were aiming to investigate novel mechanisms of laser-driven ion acceleration and the dynamics of charged

The University of Strathclyde also hosted Luca for two and a half weeks in Glasgow, where he contributed to the analysis of the experimental data.

In a closely fought competition Jurjen was selected by the Fellows to represent them in issues relating to the network as a whole. The role also entails reporting back to the

Steering Committee on any queries, comments, complaints or suggestions that arise across the cohort of fellows.



The Fellows are well underway organizing themselves into working groups to arrange a **workshop** provisionally planned for 17-19 November 2014 in Berlin. The workshop will aim to give an overview to young researchers of possible future career steps in industry.

By bringing together potential future employees in industry with young researchers from the laser and acceleration field the

workshop will help to identify and solidify interesting future prospects for both sides.

The workshop will be open for external delegates and should be interesting for any young researcher that wants to explore future career possibilities.

More information regarding the workshop will be posted in the next newsletter.

## Partner News

### CLPU's VEGA – a unique Petawatt for Science and Innovation

**At the start of December the Spanish Pulsed Lasers Centre (CLPU) held their 3<sup>rd</sup> Users Meeting to create and consolidate a strong global users' community.** This is one of the main goals of the European Extreme Light Infrastructure (ELI) project with which CLPU collaborates via the ACI PROMOCIONA project. This third meeting emphasized CLPU's unique Petawatt laser VEGA which is a conventional CPA Ti:Sapphire system working at 30 femtoseconds after compression. It has

a single front end and three synchronized amplification lines to provide a diverse range of applications. Representatives of other LA<sup>3</sup>NET partners such as HZDR and the University of Strathclyde made formal presentations during the meeting.



### Next Generation of Accelerator Researchers

**The UK's inaugural National Accelerator Open Day was held at the Cockcroft Institute on 4<sup>th</sup> December 2013.** This was a chance to attract prospective accelerator science researchers from the pool of Physics Undergraduates and MSc students pondering their future careers. LA<sup>3</sup>NET partners STFC, CERN and the Universities of Liverpool and

Strathclyde were represented with staffed displays informing inquisitive students about their career options in the field.

This was the first open day of its kind and the response from students was very positive with the event promising to become an annual attraction.





## Exemplar LA<sup>3</sup>NET coordination recognised by European Commission (EC)



Following on from the success of the mid-term review the EC invited LA<sup>3</sup>NET coordinator Professor Carsten P. Welsch to share 'best practice' with other coordinators from across Europe at the **ITN Coordinators' Meeting held in Brussels on 15 November 2013**. The opportunity was taken to showcase the project while describing our approach to Fellow R&D, researcher skills

training, project management, as well as achievements in dissemination and communication.

This is an excellent outcome and clearly a result of the hard work of the consortium over the past two years. Many new contacts were established and discussions with other ITNs are underway.

## 24 hour QUASARthon achieves major output

As a member of the QUASAR Group Alex Alexandrova joined the other QUASARs from the Cockcroft Institute/University of Liverpool, CERN and at RIKEN in Japan for a **full 24 hours video conference meeting – the first-ever 'QUASARthon'**. The whole Group gathered to work on special tasks that can typically not be covered due to many other commitments including planning future publications and producing an outreach WEBCAST video for internet distribution.

The morning of the 13th November was dedicated to a full revision of the QUASAR Group welcome booklet and Group web site. Scientific outputs to be realized during the coming 12 months were the next focus: all group members drafted abstracts of journal papers and conference contributions they are planning to write in the near future. There was then a peer review session enabling a large number of abstracts to be finalized.



Communicating science was the next point on the busy agenda. Conference papers published in 2013 from outside the group were used as a basis for developing targeted questions for undergraduate students who are following the accelerator physics course at the University of Liverpool. This was followed by planning of a future conference and investigating into possible venues for the final LA<sup>3</sup>NET international conference to be held on Mallorca in 2015.

Finally, scientific outreach dominated the night with four different groups producing short films about research projects carried out by QUASARs at the moment. So watch out LA<sup>3</sup>NET fellows, Alex is now leading the way with her outreach webcast describing the significance of the Laser Velocimeter.





## The latest Additions to the LA<sup>3</sup>NET Network

**The University of Mainz and the Center for Free-Electron Laser Science in Hamburg (CFEL) are now adjunct partners.** Prof. Klaus Wendt from the University of Mainz and Dr. Andreas R. Maier from CFEL both attended the recent LA<sup>3</sup>NET workshop at the

**University of Mainz** With more than 35,000 students Johannes Gutenberg-Universität at Mainz is one of the ten largest universities in Germany. In the fields of natural science the Cluster of Excellence on "Precision Physics, Fundamental Interactions and Structure of Matter" (PRISMA), and the Graduate School of Excellence "MAterials Science IN MainZ" (MAINZ) are considered among the elite research groups worldwide while unique large-scale research equipment includes the TRIGA light water research reactor and the MAMI electron accelerator devoted to hadron physics.

In relation to LA<sup>3</sup>NET activity, researchers from the Institute of Physics of Mainz University have contributed pioneering work for production and spectroscopy of exotic nuclides at the world leading on-line facilities using laser systems. These activities date back to early pulse laser applications in gas cells in the 1960s, the first demonstration of high resolution techniques like collinear laser spectroscopy on radioisotopes in the 1970s, still active up to now, and range up to the

### The Center for Free-Electron Laser Science in Hamburg (CFEL)

CFEL is a cooperation of DESY, the Max-Planck Society and the University of Hamburg, located on DESY campus, with close connections to the European XFEL. The main topic of CFEL is to advance science with next generation light sources, especially studying matter on atomic length and time scales. LUX, the CFEL Junior Research Group for Laser-Plasma Driven Light Sources, was established in 2013 to build, operate and study new sources of femtosecond x-ray pulses.

A new 200 TW laser system was recently

Fraunhofer ILT taking the opportunity to meet the Steering Committee. Andreas also delivered a talk at the workshop on the design of beam transfer lines which was well received.

implementation of dedicated high repetition rate all solid state laser systems for resonant ionization laser ion sources and in-source spectroscopy. Nowadays these have been installed at ISOLDE, CERN, Switzerland; ISAC, TRIUMF, Canada; JYFL, Jyväskylä, Finland; GISELE, GANIL, France and PALIS, RIKEN, Japan and ISOL, RISP, Korea; while further collaborations extend to the US, Belgium and Russia.

Today the working group Quantum/LARISSA headed by Prof. Klaus Wendt contributes these development of lasers and techniques to the aforementioned applications in atomic and nuclear structure research and in on-line ion source optimization. In addition similar laser based techniques are applied at Mainz for highly selective ultra trace determination of radioisotopes in close collaboration with the Institute of Nuclear Chemistry and the TRIGA research reactor facility.

installed within a cooperation of DESY and the University of Hamburg, and will be used by the CFEL group to set up a series of experiments dedicated to laser-plasma acceleration of electrons and the subsequent generation of x-ray beams from these novel sources. The work directly links laser and (traditional) accelerator science, covering not only the laser-driven acceleration of electrons, but also all sorts of diagnostic techniques (involving lasers). The beamlines are currently being established and the first experiments are expected by the end of 2014.





## Vacancies in the Network

The newly created position at **GANIL** for an early stage researcher to work on the '**Study of resonant laser ionization in the REGLIS low energy branch of the S3 spectrometer at SPIRAL2-GANIL**' is still open.

In addition, recruitment is underway for a position on the '**Development of a compact,**

**fibre-based electron accelerator**' at the **University of Liverpool**.

For more details on the status of these projects and how to apply visit the website [www.liv.ac.uk/la3net/vacancies/](http://www.liv.ac.uk/la3net/vacancies/)



## Vacancies in oPAC



### Project Title: Optimization of the Layout of the LHC collimation system - Royal Holloway University of London

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

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

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



### Project Title: Optimization of $^{10}\text{Be}$ detection - University of Seville / Centro Nacional de Aceleradores

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

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

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



## Experimental Beam Diagnostics R&D

A Postdoc position is available in the QUASAR Group working alongside professional accelerator scientists based at the Cockcroft Institute at Sci-Tech Daresbury. The project will focus on work on a gas jet-based beam profile monitor, investigations into an online dose monitor for medical accelerators, studies into SiPM sensors and on longitudinal beam profile and beam arrival time monitors.

The post is available from 1<sup>st</sup> March 2014 for two years with the possibility of a one year extension. **The deadline for applications is 17<sup>th</sup> January 2014.**

Further information: <http://www.liv.ac.uk/working/jobvacancies/currentvacancies/research/r-584694/>



## Registration open for next two LA<sup>3</sup>NET Events in 2014

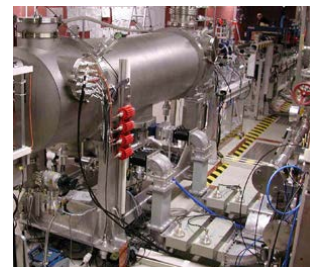
### Novel Acceleration Techniques Workshop

The 3<sup>rd</sup> Topical Workshop on Novel Acceleration Techniques is to be held at HZDR in Dresden, Germany between the 28<sup>th</sup> and 30<sup>th</sup> April 2014. Renowned speakers will be invited to present talks on the state-of-the-art based around five topic areas related to particle acceleration using lasers. In addition, delegates will be able to submit abstracts for consideration as contribution talks on the latest advancements in their own work. Selection of the talks will be based on relevance to the topic areas to give a balanced schedule. There will also be a discussion forum on future funding requirements in this field.

This workshop will cover the science and technology of novel acceleration schemes for ion and electron beams using lasers, including:

- Plasma wake field acceleration
- Dielectric accelerators
- Advanced diagnostics
- Scientific, medical and industrial applications

For more information and to register go to [www.la3net.eu](http://www.la3net.eu).



ELBE Module at HZDR

### School on Laser Applications

The 3<sup>rd</sup> School on Advanced Laser Applications has been set for 29<sup>th</sup> September to 3<sup>rd</sup> October 2014 with local organisers CLPU using the University of Salamanca as the venue. In addition to the lectures there will be study groups, a poster session with industry displays, an interactive panel session and evening seminars including outreach.

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 [www.liv.ac.uk/la3net/events/schools/...](http://www.liv.ac.uk/la3net/events/schools/...)



### Joke Box

**Did you hear about the turkey that was cooled to absolute zero?**

**It's OK now.**

Next edition: a beginner's guide to physics. Contributions welcome.

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## LA<sup>3</sup>NET Events

April 28 <sup>th</sup> –30 <sup>th</sup> 2014	Topical Workshop on Novel Acceleration Techniques, HZDR, Germany
Sept 29 <sup>th</sup> –Oct 3 <sup>rd</sup> 2014	School on Advanced Laser Applications at Accelerators, CLPU, Spain
June 26 <sup>th</sup> 2015	Symposium on Accelerators for Science & Society, Convention Centre, Liverpool, UK

## Other Events

Jan 6 <sup>th</sup> –Mar 13 <sup>th</sup> 2014	Joint Universities Accelerator School (JUAS), Archamps, France
Jan 16 <sup>th</sup> –17 <sup>th</sup> 2014	EUCARD2 Topical Workshop on Instabilities at Synchrotron SOLEIL
April 9 <sup>th</sup> –11 <sup>th</sup> 2014	oPAC Libera Workshop, Instrumentation Technologies, Solkan, Slovenia
May 8 <sup>th</sup> –9 <sup>th</sup> 2014	oPAC Workshop: Beam Diagnostics, Cividec, Vienna, Austria
June 15 <sup>th</sup> –20 <sup>th</sup> 2014	IPAC14, Dresden, Germany
July 7 <sup>th</sup> –11 <sup>th</sup> 2014	oPAC Accelerator School, Royal Holloway University of London, UK
Sept 1 <sup>st</sup> –5 <sup>th</sup> 2014	Linac14, Geneva, Switzerland

## NOTICE BOARD

Calling all early stage researchers - don't forget that the LA<sup>3</sup>NET prize is open to external applicants as well as researchers from within the network.

[www.liv.ac.uk/la3net/la3net\\_prize](http://www.liv.ac.uk/la3net/la3net_prize)

DEADLINE FOR THE NEXT NEWSLETTER 28 February 2014

We wish you a Merry Christmas and a Happy New Year !

## About LA<sup>3</sup>NET

The exploitation of Lasers for Applications at Accelerator facilities for ion beam generation, acceleration and diagnostics is the goal of this new Network within the FP7 Marie Curie Initial Training Network (ITN) scheme. In this frame, research centers, universities and industry partners from across Europe will develop beyond-state-of-the-art techniques and technologies through a joint inter-sectorial training program for early stage researchers within a unique European partnership.

LA<sup>3</sup>NET is funded by the European Commission under  
Grant Agreement Number 289191



[www.la3net.eu](http://www.la3net.eu)

