

## Lasers and Accelerators for Science and Society

**2015 is the final year of the LA<sup>3</sup>NET project – and will be one to remember !** In only 2 months we will host a 2-day [Topical Workshop on Beam Diagnostics](#), as well as an [International Conference on Laser Applications at Accelerators](#) on Mallorca, Spain. All speakers are confirmed for both events and the latest developments in the areas of laser-based particle sources (laser ion sources and photo injectors), laser acceleration, as well as laser based diagnostics will be presented by experts from within and outside the LA<sup>3</sup>NET consortium. The event will take place at the Son Caliu Hotel and Resort and fees include accommodation and full board. *The number of places is strictly limited and I would strongly recommend to register 'now' to avoid disappointment !*

Another major event is taking shape: On 26<sup>th</sup> June the network will host a final project review meeting, combined with an **Outreach Symposium** at the Liverpool Convention Center.

**We have fantastic speakers confirmed**, including the DG of DESY, Prof. Helmut Dosch, the Head of STFC Science Programmes, Prof. Grahame Blair, Prof. Brian Cox from the University of Manchester and Prof. Victor Malka, two times ERC Advanced Grantee from LOA, Paris. All Fellows, supervisors and project partners will be invited to this event to celebrate the many successes of our network.

**The Royal Society has just published a document on 'Doctoral students' career expectations-principles and responsibilities'.** The society underlines the need to provide early stage researchers with broad skills that provide them with an excellent basis for their careers in academia or industry. The LA<sup>3</sup>NET training is built on these principles already and goes well beyond the recommendations in many areas. R&D into particle accelerators is ideal to provide researchers with a wide range of technical and career skills and maximize employability of early stage researchers. In addition, there is a strong need for many more researchers that are specialized in accelerator-based R&D, as highlighted by the [TIARA study](#). Thinking beyond the life time of the LA<sup>3</sup>NET project, **the international research community needs to work closely together to ensure continuity of the current training effort and train many more experts – let's do this together !**




Prof. Carsten P. Welsch, Coordinator

### Special Interest Articles

- EU Project Administration Day
- Partner News
- Upcoming LA<sup>3</sup>NET Workshop and Conference

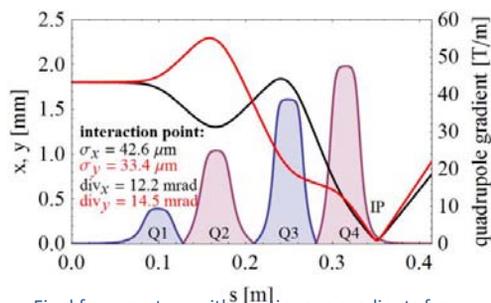
### Individual Highlights

- Research News
- LA<sup>3</sup>NET Workshop
- Secondments

## Research News

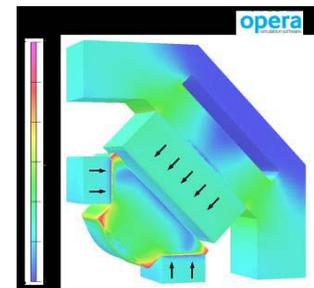
### Jakob Krämer's Work Progresses to the Installation and Commissioning Phase

**The design of an electron beam Final Focus System (FFS) to achieve high-flux laser-Thomson backscattering x-ray sources for ELBE linac at HZDR is presented.** Bunch compression in the ELBE beamline causes an increase in energy spread resulting in chromatic aberration in the FFS. Simulations showed that a telescope system consisting of four permanent magnet-based quadrupoles had significantly less chromatic aberrations than a quadrupole triplet. This would allow sub-ps electron beam focusing to match the laser spot size at the interaction point. Focusing properties like the position of the focal plane and the spot size are retained for electron beam energies between 20 and 30 MeV by adjusting the position of the quadrupoles individually on a motorized stage. The range of movement and effects of fringe fields was studied with TRANSPORT [1]. Due to the compact FFS design, fringe fields were overlapping and had to be superposed. Simultaneously modelling two of the quadrupoles in Opera [2] verified that this superposition is still in the linear regime. Therefore, it is sufficient to take line scans of the single quadrupoles' gradients and superpose them in a continuous model in TRANSPORT (see figure below).



Final focus system with continuous gradients from 3D models, emittance=  $13\pi$  mm mrad,  $\delta E=0.01$ .

Since the electron beam is chirped for bunch compression upstream, the rms energy spread is increased to one or two percent and second order chromatic effects must be taken into account. For an emittance of  $13\pi$  mm mrad, the predicted rms spot sizes are about  $40\ \mu\text{m}$  with divergences of around 15 mrad. The permanent magnet quadrupoles to be used for the FFS were designed in 2D and 3D with the simulation software Opera. Harmonic content is obtained by Fourier analysis of the radial field component on a circle in 2D and on the surface of a cylinder in 3D respectively (see figure below). Ferromagnetic poles ensure a high field quality and adjustable shunts allow for fine adjustment of the field strength and compensation of deviations in the permanent magnet material.



3D field map of the magnet surface.

A compact final focus system for low energy electron beams was designed which were optimized for the reduction of chromatic aberrations. The performance of the permanent magnet-based quadrupoles designed was convincing with their low harmonic content and adjustability in strength. Production and testing of the magnets at Danfysik is complete and commissioning at HZDR in Dresden will take place the coming weeks.

[1] TRANSPORT Simulation Code, SLAC-R-530.

[2] Cobham Antenna Systems, Vector Fields Simulation Software, Kidlington, UK.

Article adapted from:

Electron Beam Final Focus System for Thomson Scattering at ELBE, J.M. Krämer, A. Baurichter, M. Budde, F. Bødker, A. Irman, U. Lehnert, P. Michel and U. Schramm. Proceedings of IPAC2014, Dresden, Germany. THPRO055.

<http://accelconf.web.cern.ch/AccelConf/IPAC2014/papers/thpro055.pdf>

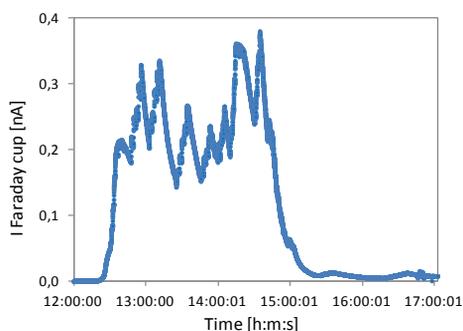
## Recent Results of Resonant Ionization Laser Ion Source at GANIL from Jose Luis Henares

**SPIRAL2 is a 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.** Resonant ionization Laser Ion Source (RILIS) will be one of the main techniques to generate the radioactive ion beam. GISELE (GANIL Ion Source using Electron Laser Excitation) is a test bench system developed to study a fully operational laser ion source available for Day 1 operations at SPIRAL2 Phase2. The aim of Jose Luis's project is to use GISELE to find the best technical solution which combines high selectivity and ionization efficiency with small ion beam emittance and stable long term operation. The optimization of the ion source is carried out by modifying the ionization tube geometries (four different geometries were built to be tested) and testing different materials to reduce the contaminants and molecular sidebands generated in the ion source. In addition, three elements will be characterized Sn, Zn and Ga which are the elements required for the first runs of SPIRAL2. The main goals are:

- **Ion source** development for SPIRAL2.
- Optimization and improvement of **RILIS** technology.
- **Efficiency, time profile & emittance** characterization of the ion beam.
- Reduction of **contaminants**.

LISBET is a new ion source body within GISELE for testing the geometries and behaviour of the future on-line ion source. The future ion source body requires specific 90° degrees geometry to be used in the SPIRAL2 facility. It consists of two tubes (first the atomizer tube and second the ionizer tube) fixed in an elbow-shape which allows specific control of the temperature for each part. A simulation of the complete test bench was developed in

order to optimize the extraction parameters and ameliorate the understanding of the underlying physics. With this simulation we improved the efficiency from 2.3% (as described in the poster at the Laser School at CLPU in Salamanca) to the actual  $4.53 \pm 0.09\%$  for a  $^{124}\text{Sn}$  ion beam. An emittance of  $16 \pi \text{ mm mrad}$  was also measured for an ionization cavity of 7 mm diameter. In collaboration with SPIRAL2 Detection Team, a new profiler detector that will be used in the SPIRAL2 beam line was tested with very low intensity ion beams and it was also used to measure the emittance of the ion beams. At the same time, a time profile acquisition system is currently being tested to verify that the results are physically consistent. On the other hand, in order to minimize the dipole dependence (and fluctuations errors), a Hall sensor has been installed and the dipole will be calibrated to minimize its effects.

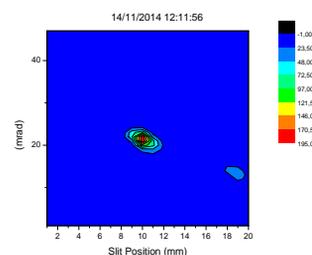


Ion current accumulated for  $^{124}\text{Sn}$  during the efficiency measurement (The total integrated ion current compared with the known amount of atoms in the original sample) with a result of  $4.53 \pm 0.09\%$ .

Several other minor improvements have recently been implemented which have helped in the whole experiment such as the sample preparation method, temperature calibration of the ion source and error correction in the Faraday cup. The next step is to complete the testing of the other geometries and repeat the optimized measurements for Ga and Zn.

This article is an update of the work presented earlier:

Progress of Resonant Ionization Laser Ion Source Development at GANIL, J.L. Henares, Y. Hugué, T. Kron, N. Lechesne, R. Leroy, B. Osmond, F. Schneider, A.M. Sjödin and K. Wendt. Proc. 15th International Conference on Ion Source, Chiba, Japan, September, 2013 ([HenICIS](#)) ([AIP1.4828370](#))



Emittance of  $16 \pi\text{-mm}\cdot\text{mrad}$  obtained with the optimised parameters.

## Network News

### EU Project Administration Training Day



In order to improve communication and facilitate project administration across the LA<sup>3</sup>NET project the [EU Project T.E.A.M.](#) organized a full day training event on European-funded project administration last December at the University of Liverpool. The work of the T.E.A.M. had been recognized as European 'success story' by the European Commission and had been showcased via various events and so the time was ripe to share best practice with partner organisations at this invitation-only event. The topics of training covered the following areas:

- Project audits from an auditor's perspective
- Project management and reporting from FP7 to Horizon 2020
- Experiences from FP7
- Best practice in ITN coordination

As well as ensuring the smooth running of the project through to the final reporting it is expected that bringing administration representatives together in this way will provide an excellent basis for future initiatives. Professor Carsten P. Welsch, head of Liverpool's Accelerator Physics Group declared the event a great success saying, 'The delegates clearly engaged with the speakers and the discussions were highly productive. The next step is to build on this to create a sustainable network of administrators as a forum for optimising processes in the same way that scientific communities function.'

In addition to Prof. Welsch, both Dr. Rob Ashworth and Ms. Samina Faisal made presentations at the event.

### Network for Administrators of EU Projects

In order to create a sustainable network a LinkedIn group has been established following the EU Project Administration Training Day as a cross-Europe network for FP7 and H2020 project administrators implementing projects from Marie Skłodowska-Curie Actions (MSCA), particularly ITNs. The group will act as a forum for sharing best practice, discussing queries and finding solutions to problems.

The aim of the group is to maintain the contacts made at this event to share information and experience related to the implementation of MSCA. It is also open for new members so if you are involved in administering European projects and are interested you can find the group via the following [link](#).



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

### Career Paths for Next Generation Researchers

**The Scientists Go Industry workshop was the brainchild of the LA<sup>3</sup>NET Fellows and was designed to explore the career options for post-doctoral level researchers.** The event was the culmination of over one year's preparatory work with the initial idea hammered out by the Fellows' representatives with the project management during the LA<sup>3</sup>NET's steering committee meeting held at the Fraunhofer ILT in November 2013. Thirteen invited speakers from industry and the commercial world made presentations about their own career pathways and what their work entails. This provided the fellows and external delegates with an insight into the full range of job opportunities available for them outside of academia. The two-day workshop also included networking opportunities where the attendees had a chance to explore their ideas in a more relaxed way with the industry representatives giving the presentations. The event was a sell-out showing that there is an appetite for investigating such alternative career paths.

The months of hard work by the Fellows in organizing the workshop paid off as the event ran like clockwork. The speakers stepped up to the mark to paint a bright picture of the spectrum of career pathways available with each session generating plenty of questions

and some lively discussion. The presentations are available from the workshop [website](#) as a resource for any physicist pondering their future.



The workshop was kindly hosted by the Helmholtz Association in Berlin on 16<sup>th</sup> -18<sup>th</sup> November. Congratulations are due to all of the LA<sup>3</sup>NET Fellows who were involved in organizing and delivering the event with assistance from Prof. Welsch, Dr. Rob Ashworth and the [EU T.E.A.M.](#) based at the Cockcroft Institute.

LA<sup>3</sup>NET also extends a special thank you to the speakers who gave up their precious time and made the event such a great success.



## Upcoming Events

### Laser and Accelerator Communities Merge for Cross-discipline Exchange of Knowledge

The next LA<sup>3</sup>NET workshop on beam diagnostics will be held in conjunction with an international conference on Laser Applications at Accelerators on Mallorca.

#### Beam Diagnostics Workshop 23<sup>rd</sup> -24<sup>th</sup> March 2015

**Diagnostics systems are essential constituents of any accelerator revealing the properties of a beam and how it behaves in a machine.** Lasers provide the highest time and spatial resolutions for transverse and longitudinal beam profile measurements, they allow the detection of density differences in particle beams with high dynamic ranges and permit measurements of very important machine parameters such as the momentum compaction factor and beam emittance. These aspects will be covered as part of the workshop which will be structured around the following broader topic areas:

- **Beam profile and emittance measurements**
- **Compton backscattering theory and sources**
- **Optical techniques for ultra-short bunches**
- **RF techniques for ultra-short bunches**
- **Novel sensors and technologies**

Each topic will be initiated by a renowned speaker invited to give a talk of 40 minutes about the state-of-the-art and their own research in this field. This will be followed by 20 minute talks by other delegates about their own latest research results. All participants in the workshop are invited to use the 'Submit a new abstract' link to upload abstracts for consideration by the Programme Committee. The cost of the workshop is €350 to cover accommodation and all meals.

**The registration deadline is 20<sup>th</sup> February 2015.** More information can be found [here](#).



#### Laser Applications at Accelerators Conference 25<sup>th</sup> -27<sup>th</sup> March 2015

**Lasers are used in a variety of applications for accelerators from ion generation and acceleration through to diagnostic techniques essential for performance optimization.** This conference will bring together laser and accelerator researchers to share their results from these combined fields.

Renowned speakers have been invited to lead sessions with contributed talks from delegates to be chosen in advance from the abstracts submitted. Ten full length articles from the conference will be published in a dedicated section of the regular edition of Nuclear Instruments and Methods A subject to peer review and approval and the proceedings will be published in Physics Procedia. Delegates are invited to submit

abstracts for 15 minute contribution talks to be selected by the Programme Committee. This 3-day international conference will contain sessions in the following areas:

- **Particle beam generation**
- **Laser-based ion generation**
- **Electron acceleration**
- **Applications at the interface between lasers and accelerators**
- **Diagnostics**

The cost of the conference is €650 to cover accommodation and all meals. **The registration deadline is 20<sup>th</sup> February 2015.** Partial financial support for deserving early stage researchers to attend is still available. More information can be found [here](#).

## Symposium 26<sup>th</sup> June 2014

A symposium on Accelerators & Lasers for Science and Society will be held at the Liverpool Convention Centre aimed at promoting interest in science among the general public. It will also be an occasion for reviewing the project achievements and

celebrating its many successes, so put the date in your diary !

Full details to follow on the [website](#) and in the next newsletter with regular updates available via the project's [Facebook](#) site.

## Fellows Activity

### Two further Fellows take up Positions in LA<sup>3</sup>NET

We would like to welcome Lara Hijazi at GANIL and Matthieu Veinhard at CERN, the profiles are described below:

**Lara Hijazi** completed her bachelor degree in fundamental and high energy physics in the Lebanese University - Nabatieh branch in 2012 and then she completed her first masters also in the Lebanese University-Beirut branch in 2013. She took her second masters in Paris Sud University within NPAC (nuclear, particle astroparticle and cosmology) in 2014 where she followed the nuclear physics domain working at the Institute of Nuclear Physics of Orsay (IPNO) in collaboration with GSI Germany which was related to hadronic physics.

In September 2014, Lara joined the LA<sup>3</sup>NET network to work on improving and developing the laser system to be used in the REGLIS device at Spiral 2 facility. She will also work on designing, building and testing a tracking system for the scan of frequency doubled light by synchronizing a remote controlled grating laser with a motorized SHG crystal.



**Matthieu Veinhard** was born in Neuilly sur Marne in France in 1990. He studied applied physics at the University Paris VI - Pierre et Marie CURIE in France where he graduated with a bachelor degree in 2012. After a year of ERASMUS exchange at the University of Manchester (the equivalent of the first year Master's degree), he continued his Master's studies in Fusion Sciences at the University Paris VI in 2013 specializing in Inertial Confinement Fusion. This course provided both knowledge and experience in Laser-Plasma interactions, as well as a general expertise in Laser physics. During the summer of 2014, he defended his Master's thesis on the investigation of Laser photo-detachment as a tool to measure the negative ion density in a highly electronegative plasma, aimed to be used for space propulsion. There, he designed, aligned and validated a laser

diagnostic setup that provided the first measurements of the plasma electronegativity.

In October 2014, he joined the LA<sup>3</sup>NET project in partnership with the CERN Resonance Ionization Laser Ion Source (RILIS) team at ISOLDE, the radioactive ion beam facility of CERN. There, he will be involved in the development of narrow line-width lasers for high resolution RILIS applications. A synthetic combination of solid state and dye laser technology will be in the focus of the project. Once developed, this laser technology will be applied for a high-resolution Doppler-free 2-photon in-source spectroscopy of short-lives radio-isotopes.



## Back to School

In outreach news, Jose Luis Henares was the latest fellow to head back to school to spread the word about the benefits of pursuing a career in science. A report from the school explains how fortunate they are to have a former student such as Jose to recount his experiences as a researcher at GANIL and having worked at CERN on the most powerful particle accelerator in existence.



## Secondments

### Continuing Industry Exposure

**Mateusz Tyrk is to spend two weeks away from Dundee on a stint with Research Instruments.** Mateusz will be engaged in technical work to complete the design calculations for the sizing of components required for the modification of a superconducting radio frequency cryomodule which will operate at 2 Kelvin with superfluid helium. All components have to be fitted for the expected helium consumption and related pressure drops. The mechanical design work will then be completed by Research Instrument's design workshop based on Mateusz's calculations.

Hanspeter Vogel, the managing director of Research Instruments, has also recently supported the project as an invited speaker at the Scientists Go Industry workshop organised by the fellows last November in Berlin.

In addition, **Jose Luis Henares** is in discussions with Albrecht Bertels to finalise the details of his secondment to **Laser Quantum** in Germany. The placement will entail finding out what goes on in the company in terms of design, R&D and fabrication followed by the tracking of one specific project.

### Collecting Experimental Data

**It was a busy year travelling for Luca Stockhausen taking part in collaborative experiments with the SILIS Group** of University of Strathclyde in Glasgow, Scotland, led by Prof Paul McKenna and at the VULCAN Petawatt and ASTRA GEMINI laser facilities at the Rutherford Appleton Laboratory in Didcot, United Kingdom. He also visited the Extreme Plasma Physics Group at Instituto Superior Tecnico in Lisbon,

Portugal led by Prof Luis O. Silva. This was for simulation work towards laser-driven ion acceleration with a focus on ultra-thin targets.

Meanwhile, CLPU colleague **Andreas Döpp** was been working with Kim Ta Phuoc collecting data from Thomson backscattering experiments at the Laboratoire d'Optique Appliquée in Paris.



## Other Activity

Last year **Andrii Borysenko** received some beamtime on the SwissFEL test injector facility with the main aim to measure longitudinal bunch profiles from a test injector using an electro-optic technique. He also completed his secondment with Cobolt in Sweden and is planning to work with Aquenos to get further insight into the workings of different types of SMEs (small and medium sized enterprises).

**Rui Pan** has also had some beamtime in Switzerland working at CERN to carry out electro-optic bunch profile measurements on the CTF3 probe beam.

**Pengnan Lu** was at CERN for a period as well undergoing laser training and Thomas Hofmann from CERN visited the Royal London Holloway University as part of an ongoing collaboration.

One of **Stanimir Kisiov's** first assignments was to attend a three week training at GANIL, France on the theory for exploring nuclear structure experiments.



## Partner News

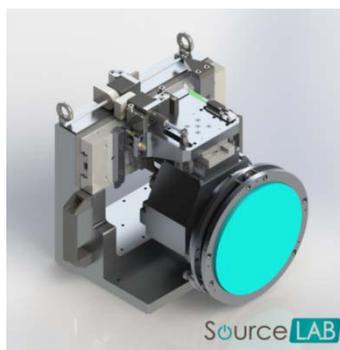
### SourceLAB joins LA<sup>3</sup>NET

Following invitation to speak at the Scientists Go Industry workshop Dr. François Sylla applied for his company SourceLAB to join LA<sup>3</sup>NET as an adjunct partner and this was swiftly approved by the steering committee.

SourceLAB is a spin-off from the Laboratoire d'Optique Appliquée (LOA) with a mission to develop and commercialize innovative solutions for compact sources of particles and radiation (electrons, ions, X-rays and neutrons) using ultra-intense lasers to meet the growing market needs for scientific research equipment, industrial non-destructive testing and medical imaging. These new generation sources are based on the revolutionary technology of laser-plasma acceleration to provide the most intense acceleration that exists. This will promote interest in exploring some unanswered questions of efficacy, safety, compactness and cost of accelerators. With the controlled interaction of an intense laser as the primary source with target matter, a beam of particles

and secondary source radiation can be generated with remarkable properties in terms of energy, pulse length and directional control. SourceLAB proposes to provide targets of high-precision to control the interaction, along with all the environmental technology for the generation and the control of the desired secondary source.

Visit <http://www.sourcelab-plasma.com/> for more detailed information.



SourceLAB

## Compact Magnet Systems for Extremely Bright Synchrotron Light Sources



In 2014, Danfysik could celebrate two major events. One was the company's 50th anniversary, and the other was the successful completion of the compact magnet system for the 3 GeV and 1.5 GeV synchrotron light source MAX IV in Lund, Sweden, and for Solaris (1.5 GeV) in Poland.

For the MAX IV project, three different types of compact multiple-bend achromatic sections were supplied for the 3 GeV and the 1.5 GeV synchrotron light sources. Multipole and combined function elements were integrated into a single magnet yoke with lengths ranging from 2.5 m to 4.5 m.

To meet the precise field requirements in a compact system, extreme mechanical tolerances were necessary across the compact multi-function magnet block (lattice element), maximum 4.5 m length and 8 tons. The performance of each magnetic element was measured using a special Danfysik ultra-stable Hall mapping and rotating coil measuring system. This enabled the engineering and scientific staff at Lund to preconfigure the lattice elements for quick installation and commissioning.



Compact magnet systems are smaller and thus the number of elements can be increased. This results in an extremely low emittance. The low emittance makes possible an extremely bright synchrotron light.

The advantage here is not only better performance, but also reduced costs for the magnetic elements and savings during installation due to simpler handling and alignment.

## Job Advertisements Vacancies in the QUASAR Group

**There are currently several openings for PhD and Postdoc positions in the group.** PhD projects include R&D into the characterization of the longitudinal and transverse energy distribution of electrons emitted from photocathodes in close collaboration with colleagues from ASTeC, as well as studies into advanced optical diagnostics for accelerators and light sources where new ways to measure beam emittance and longitudinal beam profile shall be developed. Finally, there is an opportunity for work on laser-electron beam Interaction in a state-of-the-art synchrotron light source. The latter is a joint PhD project with oPAC partner

SOLEIL. You would carry out most of your first year of studies in the UK, join the team at SOLEIL for year 2 and 3, and finally complete all data analysis and write your thesis in the UK during the final year.

A postdoc position is available for diagnostics R&D related to the European Spallation Source (ESS) in Sweden.

For further information about either of the projects or to apply, please send an email to [Prof. Carsten P. Welsch](mailto:Prof.Carsten.P.Welsch).



## Searching for Opportunities and Vacancies

**There is less than nine months to go in the LA<sup>3</sup>NET project and many Fellows are due to complete their contracts sooner than this.** Consequently, the next steps in their career ladder are being planned and this pool of talent is becoming available for employers. However, waiting to be headhunted or hoping that your current position will be automatically extended may not prove to be secure strategies.

For those thinking of a **postdoc position** there was a recent [blog](#) in **Naturejobs** that may give some inspiration. In the search for a position this article talks about the importance of networking and contacting potential employers and so being part of a Marie Curie training network with all the potential contact is probably one of the best places to be. Other advice includes searching out Fellowships or sources of funding such as grants that can be pursued either directly or via someone in an appropriate position at the institute where you would like to continue your research.

For job opportunities and Fellowships to continue your **research career in Europe** including from Horizon 2020 funded through Marie Skłodowska-Curie Actions the best place to look is [EURAXESS](#). It allows searching by country or research field to get an idea of what positions may be available.

More specifically, there are **national schemes for funding fellowships** such as the [Humboldt Research Fellowships](#) for postdoctoral researchers which funds non-nationals to work in Germany.

Alternatively, an interesting website for getting inspiration about potential **industry employers** is <http://www.gradcracker.com/> although this UK site is aimed at graduates and so would require further investigation once a company caught your eye.

## Selected Publications

Along with various proceedings the project produced already several articles in peer-reviewed journals, including:

'**Azimuthal asymmetry in collective electron dynamics in relativistically transparent laser-foil interactions**', R. J. Gray, D. A. MacLellan, B. Gonzalez-Izquierdo, H. W. Powell, D. C. Carroll, C. D. Murphy, L. C. Stockhausen, D. R. Rusby, G. G. Scott, R. Wilson, N. Booth, D. R. Symes, S. J. Hawkes, R. Torres, M. Borghesi, D. Neely, P. McKenna (2014) New Journal of Physics, 16. ISSN [1367-2630](#)

'**Numerically optimized structures for dielectric asymmetric dual-grating laser accelerators**', A. Aimidula, M. A. Bake, F. Wan, B. S. Xie, C. P. Welsch, G. Xia, O. Mete, M. Uesaka, Y. Matsumura, M. Yoshida, and K. Koyama, Physics of Plasmas, Vol.21, Issue 2 (2014) ([1.4866020](#))

## Joke Box

**H<sub>2</sub>O is the formula for water.  
What is the formula for ice?  
H<sub>2</sub>O cubed.**



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

March 23 <sup>rd</sup> -24 <sup>th</sup> 2015	Beam diagnostics workshop, Mallorca, Spain
March 25 <sup>th</sup> -27 <sup>th</sup> 2015	LA <sup>3</sup> NET Conference, Mallorca, Spain
June 22 <sup>nd</sup> - 23 <sup>rd</sup> 2015	Advanced researcher skills school, Liverpool, UK
June 24 <sup>th</sup> - 25 <sup>th</sup> 2015	Knowledge transfer and spin-off workshop, Liverpool, UK
June 26 <sup>th</sup> 2015	Symposium on Accelerators for Science & Society, Convention Centre, Liverpool, UK

## Other Events

Feb 16 <sup>th</sup> –March 20 <sup>th</sup> 2015	JUAS: Technology & Applications, Archamps, France
March 11 <sup>th</sup> -13 <sup>th</sup> 2015	oPAC Topical Workshop on Computer Aided optimization of Particle Accelerators, GSI, Darmstadt, Germany
May 3 <sup>rd</sup> – 8 <sup>th</sup> 2015	IPAC15, Richmond, Virginia, USA
May 25 <sup>th</sup> – June 5 <sup>th</sup> 2015	CAS on Accelerators for Medical Applications, Vösendorf, Austria
June 7 <sup>th</sup> – 10 <sup>th</sup> 2015	Laser Probing (LAP2015), East Lansing, Michigan, USA
Aug 23 <sup>rd</sup> –28 <sup>th</sup> 2015	FEL 2015, Daejeon, South Korea
Sep 13 <sup>th</sup> – 17 <sup>th</sup> 2015	IBIC, Melbourne, Australia
Oct 7 <sup>th</sup> - 9 <sup>th</sup> 2015	oPAC Accelerator Optimization Conference, Seville, Spain

## NOTICE BOARD

Registration will soon be closing for the [Topical Workshop on Beam Diagnostics](#) and the [International Conference on Laser Applications at Accelerators](#) to be held towards the end of March 2015. Both events will be held at the [Son Caliu Resort in Mallorca](#), Spain and a special discount of €50 applies for those attending both events.

DEADLINE FOR THE NEXT NEWSLETTER 31<sup>st</sup> March 2015

## 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.

*This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 289191.*



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