Newsletter
December 2015
Issue 14

Lasers and Accelerators – A unique partnership

One of the main goals of LA³NET over the past 4 years has been to bring the laser and accelerator communities closer together. We have organized numerous schools and workshops that have attracted a large number of experts from the two communities. This fruitful environment has stimulated many interesting discussions, knowledge exchange and also allowed exploiting the many existing synergies for fundamental research and industry applications.

LA³NET has been an important first step. The research outcomes of our Fellows have been presented at conferences around the world and have been published in many prestigious journals such as Optical Engineering, Nuclear Instruments and Methods, Nature Communications and Physical Review Letters. Many of our trainees have recently or will soon graduate(d) to PhD level and all of them have decided to continue their careers in research. To me, this is a strong indicator that LA³NET managed to focused on an R&D program of highest importance that was also ideal for training the next generation of laser and accelerator experts.

In order to fully exploit the many benefits from the comprehensive training program that we have developed over the years, it would be highly desirable if further (inter)national programs could be supported. Clearly, there is still much R&D needed to make laser-driven particle accelerators or dielectric 'micro' accelerators competitive with commonly used radiofrequency accelerators. Also, the specific properties of the beams in so-called "novel accelerators" have enormous potential for a wide range of research and industry applications. There is, however, a dramatic lack of experts with the relevant skills to push all these technologies. This has recently been highlighted by various media across Europe, including the BBC and the NewStatesman. It seems as if this is the time that international consortia, similar to LA³NET, should join forces and build up on the excellent basis that our network has established. This would help further strengthen the unique partnership between the worlds of lasers and accelerators.

An accelerator facility with industry-standard beam quality based on high gradient plasma acceleration ? What sounds like science fiction is the declared goal of the EuPRAXIA project. Being one out of only two recently funded European Design Studies that focus on future accelerator infrastructure EuPRAXIA joins laser experts, plasma scientists and the accelerator community to develop a conceptual design for a beyond state-of-the-art facility by 2020. Exciting times are coming up – watch this space !

Prof. Carsten P. Welsch, Coordinator

Research News

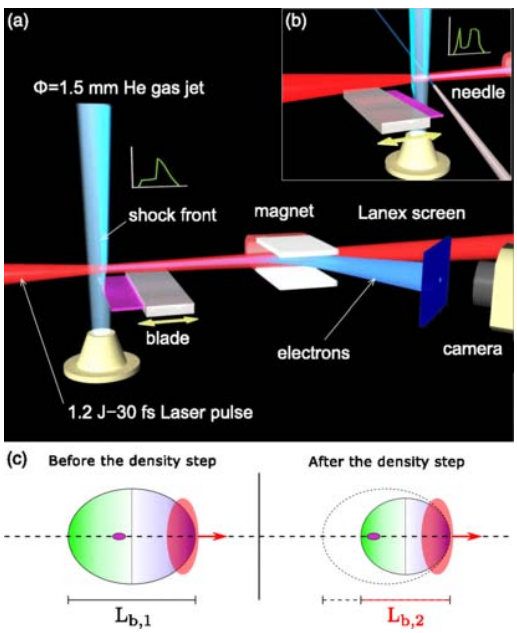
Andreas Döpp demonstrates a new technique of rephrasing electron beams

Andreas presents results on **'Electron Rephasing in a Laser-Wakefield Accelerator'** in a paper published in the **Physical Review Letters** in collaboration with the group led by **Prof. Victor Malka**.

As a response to an important limit for energy gain in laser-plasma wakefield accelerators which is the dephasing length, after which the electron beam reaches the decelerating region of the wakefield and starts to decelerate, the authors propose to manipulate the phase of the electron beam in the wakefield, in order to bring the beam back into the accelerating region, hence increasing the final beam energy.

This rephasing is operated by placing an upward density step in the beam path. Ideally, the density step is placed close to the dephasing length, where the head of the bunch enters the decelerating region. When the laser crosses the density jump, the bubble shrinks abruptly (see figure c below). Without the density step, the most energetic electrons at the head of the bunch would eventually enter the decelerating zone and their energy would decrease. In contrast, with the density step, electrons exit the decelerating region and shift almost instantly to the rear of the cavity where the accelerating field is larger, as shown in the figure c below. The maximum electron energy is therefore larger than in the case without the transition.

In a first experiment, the authors demonstrate the principle of this technique using a large energy spread electron beam. The density profile is obtained by creating a shock front in a supersonic gas jet, generated by placing a blade perpendicular to the gas flow emanating from the nozzle. In a second experiment, the density step is made with a second gas jet, which can be used to enhance the energy of monoenergetic electron beams. The technique presented can either be used to select a part of a broad energy spread electron beam and increase its energy or to enhance the energy of a monoenergetic electron beam, preserving its energy spread. Experimental results highlight in both cases a maximum energy enhancement of about 50% compared with a transition-free plasma density.



Schematic representation of the first (a) and second (b) experimental setup. The blade can move in and out the gas jet. The density profile is shown in green in the two cases near the gas jet. (c) Schematic representation of the bubble before and after the density step.

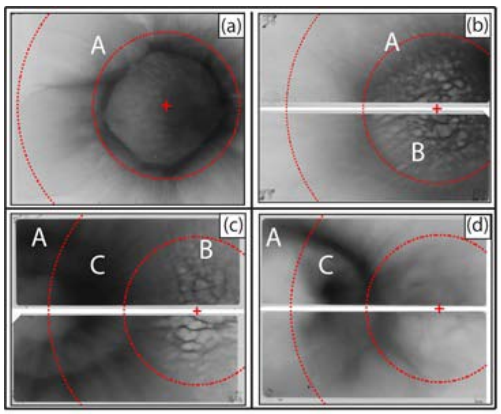
Adapted from **'Electron Rephasing in a Laser-Wakefield Accelerator'**, E. Guillaume, A. Döpp, C. Thaury, K. Ta Phuoc, A. Lifschitz, G. Grittani, J.-P. Goddet, A. Tafzi, S. W. Chou, L. Veisz, and V. Malka, Phys. Rev. Lett. 115 (2015) 155002.

Luca Stockhausen enriches our network with results on an enhanced mechanism of proton acceleration

These results have been published as '**Proton acceleration enhanced by a plasma jet in expanding foils undergoing relativistic transparency**' by a team led by **Prof Paul McKenna** of the University of Strathclyde in the **New Journal of Physics**.

The authors investigate ultraintense laser-driven proton acceleration from ultrathin target foils undergoing expansion and RIT (relativistically induced transparency) both experimentally and numerically. The angular separation and detection of signature components of target normal sheath acceleration (TNSA) and radiation pressure acceleration (RPA) indicate that both of these mechanisms occur. The physics underpinning energy enhancement in a high-energy, directional part of the proton beam is investigated. It is found, for the first time, that this is driven by the formation of a plasma jet, supported by a self-generated quasi-static magnetic field, at the target rear side. Direct laser acceleration of electrons which are trapped within the jet by the magnetic field significantly enhance their energy. These electrons stream through the sheath-accelerated proton layer, driving an electrostatic field which transfers energy to protons within a narrow angular range in the vicinity of the jet. Through the introduction of a controlled prepulse, it is shown that the final maximum proton energy is increased by a factor which is highly sensitive to the rising edge intensity profile of the laser pulse on the picosecond timescale.

The results provide new insight into the complex physics occurring in ultrathin foils undergoing relativistic induced transparency. It is shown that TNSA, RPA and transparency-enhanced/BOA acceleration can all occur, at different stages in the laser pulse interaction with the target, and that the individual mechanisms can be investigated by angularly separating the ion beams produced.



Proton spatial-intensity profiles in the energy range 5–7 MeV, in different conditions of the interaction.

The results highlight the importance of diagnosing and controlling the intensity contrast, not only in the tens of picosecond to nanosecond temporal range explored previously [1–3], but also on the picosecond rising edge of the laser pulse. This task will require significant investment, but it's an important step to the future development of laser-ion sources.

REFERENCES
[1] Kaluza M et al 2004 Phys. Rev. Lett. 93 045003
[2] Gray R J et al 2014 New J. Phys. 16 113075
[3] Esirkepov T et al 2014 Nucl. Instrum. Methods A 745 150

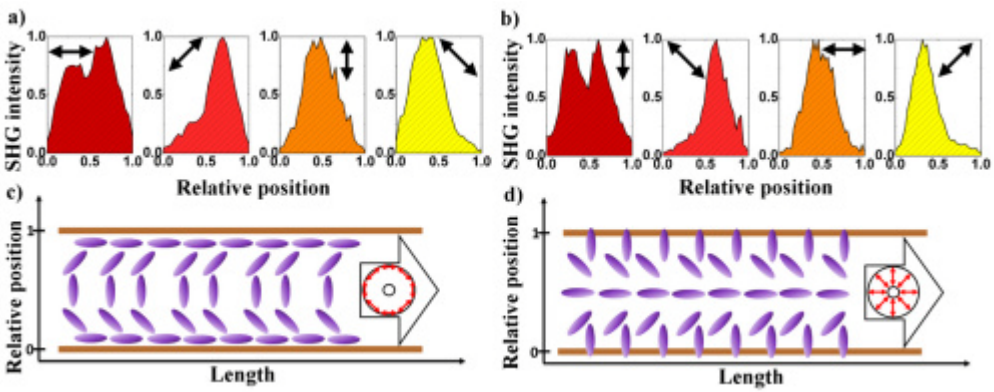
Adapted from **'Proton acceleration enhanced by a plasma jet in expanding foils undergoing relativistic transparency'**, HH W Powell , M King, R J Gray, D A MacLellan, B Gonzalez-Izquierdo, L C Stockhausen, G Hicks, N P Dover, D R Rusby, D C Carroll, H Padda, R Torres, S Kar, R J Clarke, I O Musgrave, Z Najmudin, M Borghesi, D Neely and P McKenna, New J. Phys. 17 (2015) 103033 (10.1088)

Mateusz Tyrk publishes new findings in the field of reshaping metallic nanoparticles

The results of Matt's project developed within LA³NET have recently been published in the **Optics Express** journal. The work on **'Radially and azimuthally polarized laser induced shape transformation of embedded metallic nanoparticles in glass'** presents new findings in the field of reshaping metallic nanoparticles.

The paper presents the interaction of radially and azimuthally polarized ps-pulsed laser beams with glass containing spherical Ag nanoparticles. For the experiments a picosecond pulsed laser (10 ps) at 532 nm was employed delivering 2000 pulses per spot at 200 kHz. The observed peculiar shape modifications consist of a number of different orientations of nano-ellipsoids in the cross-section of each written line by laser. The directionality of the nano-ellipsoids within the irradiated area was set by the laser polarization components - radial or azimuthal.

A permanent SPR band shift has been observed in a multi-pulse irradiation regime. The authors used a Second Harmonic Generation cross-sectional scan method from silver nanoparticles in transmission geometry for characterization of the samples after laser modification. This effect gave a precise description of the structures obtained at the micro- and nano-scale, showing that the nanoparticles were elongated in different directions within each of the irradiated line cross sections. The opposing character of reshaping between the radial and azimuthal polarizations was presented. Macroscopically, linear optical properties for these two incident polarizations were in agreement.



Normalized SHG intensities as a function of the normalized line thickness for (a) azimuthally polarized irradiation and (b) radially polarized irradiation. Cross-sectional scans for different excitation beam (1064 nm) polarization directions - indicated by black arrows. Simplified depiction of the Ag ellipsoids orientations (c) and (d) within the line cross section according to (a) and (b) for both irradiation polarization directions - shown with red arrows.

The reshaping method presented in the paper adds an additional technique to shape manipulations of MGNs embedded in soda-lime glass. It expands the knowledge of already existing methods for versatile techniques of reshaping of nanoparticles with ultra-short laser pulses and can lead to nano-engineering of novel optical materials for applications in security and data storage.

Adapted from **'Radially and azimuthally polarized laser induced shape transformation of embedded metallic nanoparticles in glass'**, Mateusz A. Tyrk, Svetlana A. Zolotovskaya, W. Allan Gillespie, and Amin Abdolvand Opt. Express 23, 23394-23400 (2015) (23394)

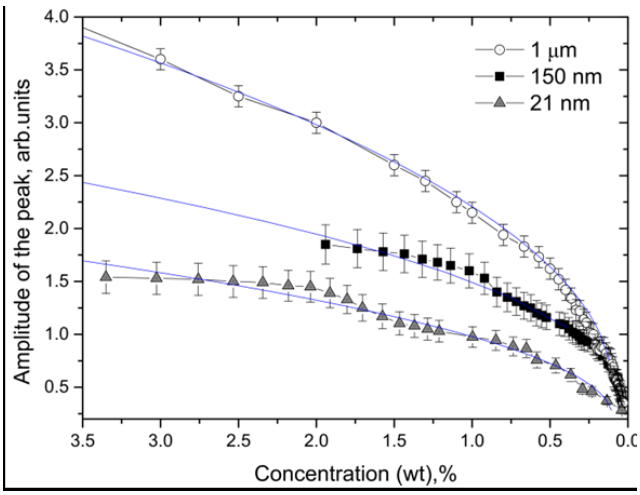
Proceedings of IBIC2015, Melbourne, Australia

'Beam characterisation using laser self-mixing' by Alexandra Alexandrova

Alexandra presents the results from theoretical and experimental studies into the factors influencing the performance and accuracy of a laser feedback interferometer. The laser velocimeter is based on the optical self-mixing effect and provides a low - cost, robust, compact and non-invasive sensor for velocity, displacement and density measurements of various targets.

Alex's study has been focused on the optimisation of a self-mixing sensor to measure the velocity of gas jet based beam profile monitors. A theoretical investigation into the spectrum expected for such a sensor has been presented together with a calculation of the expected level of backscattered signal from a gas jet. A range of different seeding materials added to a water flow was investigated, and such parameters as velocity, reflectivity, and concentration of the seeders in the fluid were under study. The laboratory experiments with TiO2 with different diameters (1 µm, 150 nm, 21 nm) showed the dependence of the peak spectrum amplitude from the concentration of seeders with a minimum concentration of 0.03 wt% still being possible to measure velocities with better than 3% accuracy.

Using the same type of seeders for the gas jet is currently under investigation since it should improve the self-mixing signal even more than liquids.



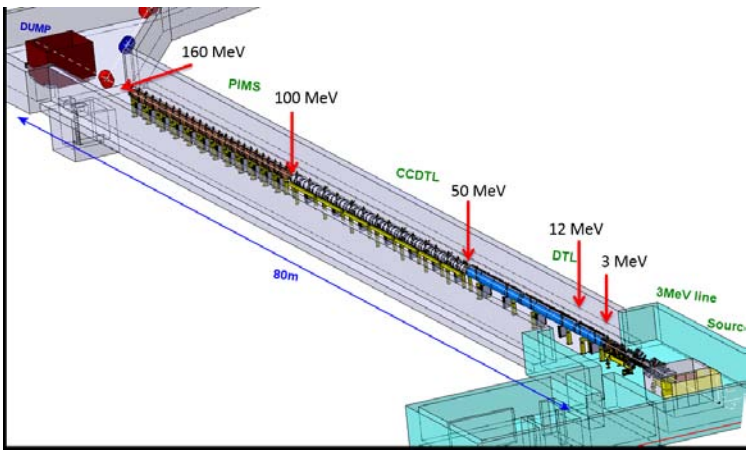
The experimental influence of the concentration of TiO2 seeders in the flow of water on the spectrum of the self-mixing signal with a fixed flow velocity (at 1.3 m/s).

Adapted from **'Beam Characterization Using Laser Self-Mixing',** A.S. Alexandrova, C.P. Welsch, Proc. IBIC2015, Melbourne, Australia (2015) (tupb070)

‘Design of a laser-based profile monitor for LINAC4 commissioning at 50 MeV and 100 MeV’ by Thomas Hofmann

Thomas presented the design of a laser-based profile monitor for commissioning of CERN’s LINAC4 accelerator at 50 MeV and 100 MeV, as part of the development of a non-destructive profile and emittance monitor foreseen for the final 160 MeV beam.

The system is based on a low power laser which is scanned through the H^- beam. Electrons, which are photodetached from the ions by the laser, are deflected by a steerer magnet and measured by a diamond detector. The custom designed diamond detector is tailored to minimize the disturbance
due to the electromagnetic field of the passing main beam. The laser source will be installed in the LINAC4 Klystron gallery located 75 m away from the profile station and an optical fiber will transport the laser to the tunnel. The laser propagation for different pulse length and peak power values was characterized with laboratory tests with such a long fiber.



LINAC4 facility indicating the beam energy that will be reached during the different commissioning stages. The laser stripping system has already been tested at 3 MeV and 12MeV periods and is presently setup for 50MeV and 100 MeV before being permanently installed at 160MeV.

According to the present LINAC4 schedule, first beam tests at an energy of 50 MeV were foreseen in the last quarter of 2015. The next tests at 100 MeV will take place in early 2016 and will be used to gain more experience in operating the novel profilemeter to feed-in to the design of the final system. This final system will be installed permanently at the LINAC4 top energy of 160 MeV and will be designed to monitor both horizontal and vertical transverse profiles (via electron monitoring) and the transverse emittances (via H^0 monitoring).

Adapted from **'Design of a Laser-based Profile Monitor for LINAC4 Commissioning at 50 MeV and 100 MeV’**, T. Hofmann et al., Proc. IBIC2015, Melbourne, Australia (2015) (tupb055)

Network News

LA³NET issue of Physics Procedia

The International Conference on Laser Applications at Accelerators - LA³NET 2015 was held in Mallorca in March 2015. The Conference was the culmination of a series of technical schools and topical workshops delivered by the LA³NET project and brought together around 70 researchers from the laser and particle accelerator communities.
The sessions were organized along the network's research work packages and led by renowned speakers. Each session included contributions from early stage researchers and external delegates, and stimulated many interesting discussions.
The three-day event yielded almost 40 conference talks, including presentations from all LA³NET Fellows. Ten proceedings have been published in a special issue of Physics Procedia, with another ten selected for publication in Nuclear Instruments and Methods A.
The proceedings are available online at: Physics Procedia, Volume 77, Pages 1-66 (2015)

LA³NET featured in the Cockcroft Institute

Everyone visiting the Cockcroft Institute has recently had a chance to see a presentation about LA³NET and its achievements.

All the Fellows have been presented in the video which emphasizes their research results and looks back on the network events and training. The video has been displayed in the main hall of the Cockcroft Institute for three months and has attracted attention of visitors and staff.

The Cockcroft Institute
of Accelerator Science and Technology

LA^{3}NET success story attracting students at the Accelerator Open Day

The results from LA^{3}NET were presented at the National Particle Accelerator Open Day 2015 to promote research, employment and training opportunities offered within ITNs.

The Open Day took place recently at the Cockcroft Institute and it was aimed at undergraduate and postgraduate students looking for employment or studentships in the fields of accelerator science and technology.

An exciting programme of events including talks and lab tours was provided to the students. They also had the chance to speak to current PhD students, Postdocs and academics from the CI partner universities, as well as national laboratory and industry staff.

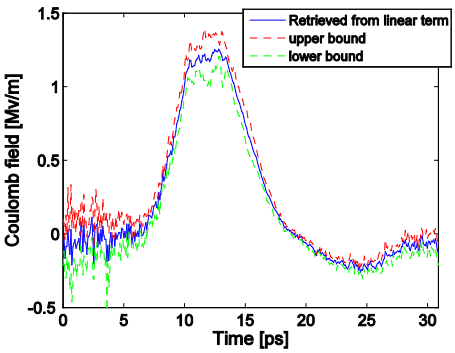
Hopefully the positive experiences and many success stories of LA^{3}NET will prompt current students to pursue a career in accelerator science. We also hope that more national and international training initiatives will now follow in LA^{3}NET's footsteps.

Fellows Activity

Three LA^{3}NET Fellows have successfully completed their PhD Congratulations to Rui Pan, Andreas Döpp and Luca Stockhausen!

Rui Pan recently had his viva voce examination. The examiners recommended only minor amendments and decided Rui to be awarded the PhD degree once the thesis is resubmitted.

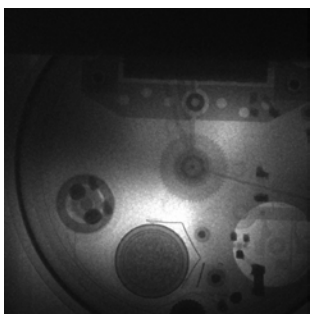
His thesis `Electro-optic diagnostic techniques for the CLIC linear collider' describes a bunch profile monitor, based on electro-optic spectral decoding (EOSD), and implemented in the CLIC Test Facility 3 at CERN. Rui compares the measurement results from the EO monitor with the measurements by coherent transition radiation on streak camera. He presents the measurement on bunch charge dependence and studies the timing resolution of the bunch profile monitor in both theory and numerical calculation.
In his thesis Rui presents how he managed to retrieve the Coulomb field strength from the measurements. He summarises frequency analysis approach of electro-optic effect based on frequency mixing process. From the theory analysed in frequency domain, a non-crossed polarization measurement includes all three of the probe laser background term, the linear term to Coulomb field and the quadratic term to Coulomb field. Three methods are induced based on this frequency analysis result to retrieve Coulomb field strength which is emitted from electron beam. The measured 1.3 MV/m field strength agrees with calculation result.
An experiment is designed to study the role of incident beams' size and non-collinear incident beams in EO technique. Due to phase matching process, the non-collinear angle induces emitting angular chirp by frequency after EO crystal. This frequency offset may lead to frequency loss in fibre coupling, and thus lead to bunch length broadening in a measurement for short electron bunch.



Retrieved Coulomb field (in blue). The 95% confidence interval determined bounds are shown in red (upper) and green (lower).

Andreas Döpp was awarded the doctoral degree as a result of his viva examination on 4 December.

In his thesis entitled 'Laser-Plasma Light Sources: Research and Developments for increased control, stability, gain and brightness' Andreas presents a new perspective for the laser plasma light sources.
In analogy to development of conventional acceleration technology, where each part of the process is optimised independently, the work of now Dr. Andreas Döpp implements a similar strategy for laser plasma light sources. His thesis covers therefore such aspects as improving injection, acceleration and collimation of electron beams in laser-plasma accelerators and radiation generation schemes for laser-plasma light sources. He presents the experimental observation of electron rephasing and demonstration of electron beam focussing using a laser-plasma lens. He also studies different regimes of injection and three different mechanisms of radiation generation: bremsstrahlung conversion, betatron radiation and Thomson backscattering.



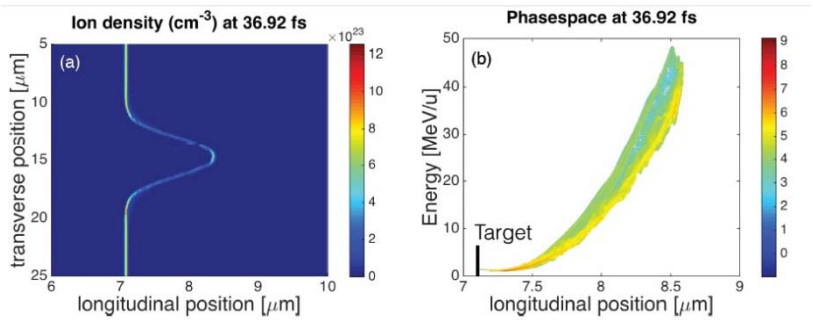
Radiography using Compton-backscattered photons.

Luca Stockhausen has been the latest LA^{3}NET fellow to culminate his project with a PhD degree. The doctoral dissertation took place on 11 December in the historic buildings of the University of Salamanca.

The 15th Century premises provided a contrasting background for the cutting-edge research presented by the fellow. In his project, the now Dr. Stockhausen has used some of the world's most powerful laser beams, in collaboration with the University of Strathclyde, to investigate the dynamics of the plasma electrons that drive the acceleration of protons and heavy ions in thin foil targets. The results presented give an unprecedented insight into the complex mechanisms operating in the laser-plasma interaction, where relativistic effects – relativistically induced transparency – plays an important role.

The work also included computer simulations in which Dr. Stockhausen has been exploring the acceleration of protons and ions up to > 100 MeV energies by the radiation pressure exerted by ultra-intense laser pulses on sub-micrometer thin foil targets. One of the schemes proposed by Luca predicts the generation of 150 MeV proton beams with 10% energy dispersion with readily available laser systems.

The experimental realization of such a scheme would represent a huge step forward in the development of some of the applications envisaged for laser-driven accelerators, like particle therapy.



Simulations of Radiation Pressure Acceleration in ultrathin targets

Beam Diagnostics – Down Under

Between 13th -17th September 2015 beam diagnostics experts from around the world gathered in Melbourne, Australia for the International Beam Instrumentation Conference IBIC.

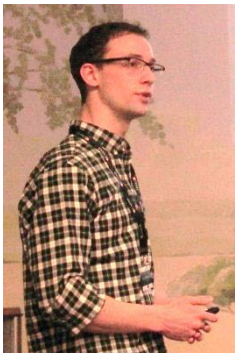
IBIC is an established annual conference series that gathers the world's beam instrumentation community. It is dedicated to exploring the physics and engineering challenges of beam diagnostic and measurement techniques for charged particle accelerators and light sources worldwide.

LA^{3}NET Fellows **Thomas Hoffmann** and **Alexandra Alexandrova**, together with network coordinator Prof. Carsten P. Welsch, all contributed to this conference and presented recent research results.
Thomas presented results from studies using a novel laser wire scanner at CERN's LINAC4 facility whereas Alexandra showed most recent results using nanoparticles in laser self-mixing setups for velocity measurements of various fluids. Prof. Welsch gave overview presentations about Fellow achievements to disseminate their R&D results and help them secure future positions.

Time to present your research results

LA^{3}NET Fellows have recently contributed to various workshops and conferences.

Jakob Krämer presented a poster on "Electron beam final focus system for Thomson scattering at ELBE" at the 2nd European Advanced Accelerator Concepts Workshop in Isola d'Elba, Italy and at the "International Conference on Extreme Light" in Bucharest, Romania where he also gave a talk on "Linear and nonlinear Thomson scattering from the PHOENIX x-ray source" (as co-author).



Andreas Döpp and Luca Stockhausen contributed to the 11th National Optics Meeting (Reunión Nacional de Óptica) held in Salamanca, Spain. Andreas gave a talk on "Electron rephasing in a laser-plasma accelerator" and Luca presented a poster on "Laser-driven ion acceleration from ultrathin targets".

Yelong Wei gave a talk presenting main aspects of his research project "Investigations into grating-based dielectric lase-driven accelerator" at the 4th Annual Postgraduate Conference held at the Cockcroft Institute in Daresbury, UK. He presented his project to other postgraduate students and a judging panel made up of lecturers and senior CI staff.

Partner News

New ITN awarded to train the next generation of medical accelerator experts

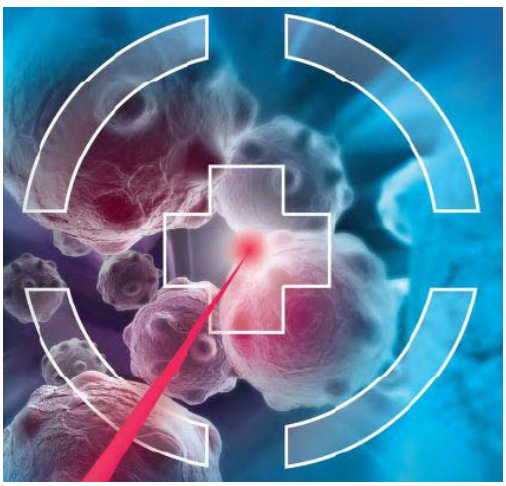
Building on the success of the LA³NET project, a new 4M€ Marie Skłodowska-Curie Initial Training Network has been granted to a consortium led by University of Liverpool, to train the next generation of medical accelerator experts.

The new network coordinated by Prof. Carsten P. Welsch from the Cockcroft Institute / University of Liverpool, is called Optimization of Medical Accelerators - OMA and it comprises a total of 24 universities, research facilities and private companies from across Europe. It will train 15 early stage researchers to carry out research in the development particle beam therapy for treating cancer, including treatment facility design, numerical simulations for the development of advanced therapies and novel imaging techniques.

Although significant progress has been made in the use of particle beams for cancer treatment, extensive research is still needed to maximize healthcare benefits. Prof. Welsch said: "The field of particle therapy has steadily developed over the last six decades, first in physics laboratories, and starting in the late 90's in dedicated clinical installations. By March 2013 about 110,000 people had received treatment with particle beams, the vast majority having been treated with protons and around 15,000 patients with heavier ions such as helium, carbon, neon, and argon."

"OMA will push the limits in treatment facility design, imaging techniques and treatment optimization through advanced numerical studies. A network of European universities, research centers, clinical facilities and industry partners with outstanding expertise in this area will jointly develop advanced schemes to assure the best possible cancer care for patients."

Professor Welsch added: "I am absolutely delighted that this collaboration has been funded. In close collaboration with our project partners we will provide a broad and interdisciplinary training program to our Fellows to develop them into outstanding researchers. We will also organize many events for the wider research community to stimulate knowledge exchange and generate a lasting impact."



The project is currently recruiting for its Fellowship positions that will be based at institutions across Europe. Researchers from around the world are invited to submit their application by 28th February 2016.

Further information on the vacancies available through the project can be found at here

To find out more about OMA, visit: www.oma-project.eu .

This project has received funding from the European Union's Horizon 2020 research and innovation program under the Marie Skłodowska-Curie grant agreement No 675265.

PHOTOPTICS 2016

The 4th edition of PHOTOPTICS (International Conference on Photonics, Optics and Laser Technology) will feature 3 different tracks on Optics, Photonics and Lasers, covering both theoretical and practical aspects. Researchers, engineers and practitioners interested in any of these fields are welcome to join the Conference in Rome and present their work on new methods or technologies, advanced prototypes, systems, tools and techniques, as well as general survey papers indicating future directions.

Accepted papers, presented at the conference by one of the authors, will be published on the Proceedings of PHOTOPTICS, with an ISBN. Acceptance will be based on quality, relevance and originality. Both full research and work-in-progress reports are welcome. There will be both oral and poster sessions.

Companies interested in presenting their products/methodologies or researchers interested in holding a tutorial, workshop or special session are invited to contact the conference secretariat or visit the conference website.

Please check more information at http://www.photoptics.org

LA³NET have established an academic partnership with PHOTOPTICS and will be represented at the conference within the European Project Space.

Joint Universities Accelerator School

The next edition of JUAS will be held at the European Scientific Institute in Archamps (France) from January to March 2016 and is open to 2nd year Master, PhD students and professionals.

Founded in 1994, JUAS delivers an academically accredited training programme in accelerator science collaboration with CERN and a cluster of 15 European universities.

The 2016 programme was finalised following the meeting of the JUAS International Advisory Board, hosted by the University of Liverpool at the end of April. The school comprises two five-week sessions: 1) Sciences and physics, and 2) Technologies and applications of particle accelerators. Classes are taught by leading specialists in their fields, and each session is concluded by an examination which enables students to earn ECTS credits recognised by their home university. The school is organised by European Scientific Institute with the support of 15 major European Universities and CERN.

PRE-REGISTRATION FOR JUAS 2016 IS NOW OPEN. For information please go to: **http://www.esi-archamps.eu/Thematic-Schools/JUAS**

juas
Joint Universities Accelerator School

EU funds design study for European plasma accelerator

Three million euros for European Plasma Research Accelerator with eXcellence In Applications (EuPRAXIA) project.

The European Union supports the development of a novel plasma particle accelerator with three million euros from the Horizon2020 program. The EU project EuPRAXIA (European Plasma Research Accelerator with eXcellence In Applications) will produce a design study for a European plasma research accelerator building on work carried out by some of the LA³NET partners. Plasma acceleration promises to shrink costs and size of particle accelerators for science, medical applications and industry significantly.

"EuPRAXIA will define the missing step towards a new generation of plasma accelerators with the potential for dramatically reduced size and cost," said EuPRAXIA coordinator Ralph Assmann from DESY. "It will ensure that Europe is kept at the forefront of accelerator-based science and applications." The EuPRAXIA consortium brings together 16 laboratories and universities from five EU member states, including LA³NET partners STFC, LOA, University of Strathclyde, and University of Liverpool. In addition, it includes 18 associated partners from eight countries, involving leading institutes in the EU, Japan, China and the United States.

Plasma acceleration uses electrically charged plasmas, generated by strong lasers, instead of the usual radio frequency used in conventional accelerators, to boost particles like electrons to high energies. The new technology, pioneered at some of the LA³NET participating laboratories, has demonstrated accelerating fields a thousand times beyond those presently used.

By the end of 2019, EuPRAXIA will produce a conceptual design report for the world's first 5 GeV plasma-based accelerator with industrial beam quality and dedicated user areas. EuPRAXIA is the required intermediate step between proof-of-principle experiments and versatile ultra-compact accelerators for industry, medicine, and research.

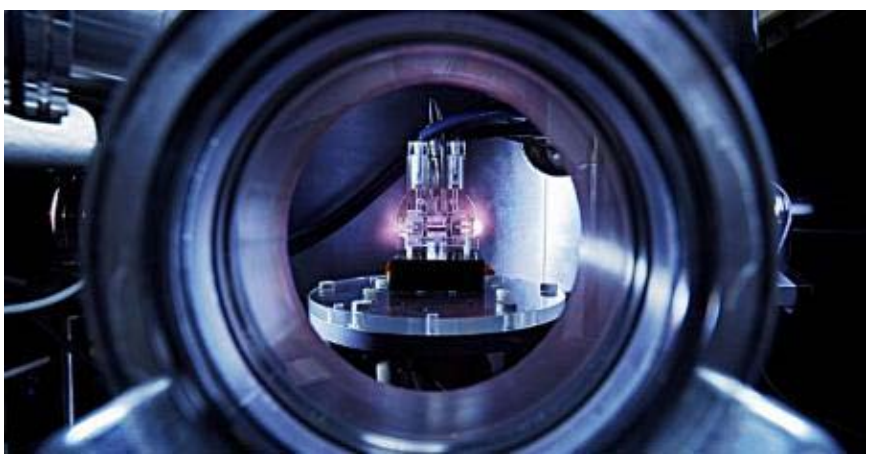


Image of a plasma cell. Credit: Heiner Müller-Elsner/DESY

LA³NET partners play a key role in EuPRAXIA. They will contribute to the design of the plasma structures required for a laser-driven electron source, as well as for a laser-driven accelerator stage. Based on previous research they will also study the diagnostics required to monitor the shot-to-shot operation of plasma structures and contribute to the diagnostic of wakefield structures and electron beams. The University of Liverpool will also lead the communication and outreach tasks of the design study.

To find out more about the project visit http://www.eupraxia-project.eu.

The T.E.A.M. - A European 'success story'

The LA³NET network – and its sister projects oPAC and OMA – is managed by the EU Project T.E.A.M. (Training, Enterprise, Administration, Management) based at the Cockcroft Institute / University of Liverpool. Their hard work allows making the most out of these large scale research projects and is vital for maintaining excellent links to project partners from around the world.

To date, we have organized numerous events around the world, trained a large number of researchers and continuously highlight the importance of accelerators for science and society. We have now produced a short video that summarizes some of the many T.E.A.M. activities.

Enjoy!

https://youtu.be/UUs_M5WOAu8

Shortage of accelerator scientists highlighted in New Statesman

The weekly political and cultural magazine New Statesman has just published an article by Prof. Carsten P. Welsch highlighting the risks that a shortage of trained accelerator scientists poses on the advancement of key technologies.

The New Statesman article also points out the contrast between the huge investment being made by Europe in new accelerator facilities and the lack of training programmes specialised in accelerator science.

The response from the accelerator community has been immediate: "I applaud you for the New Statesman piece identifying the challenges of insufficient accelerator scientists. I see the same problems, and would be glad to be part of any solution" says a professor from the Scottish Universities Environmental Research Centre.

The article can be downloaded here

More News

EU funding for Open Access journals

The European Commission has recently launched a pilot action to fund open access peer-reviewed publications from finalized FP7 projects. This initiative is implemented by the project OpenAIRE2020.

If any of the LA³NET partners is planning to publish peer-reviewed articles in Open Access journals after the end of the project they might be able to use the funds made available through this pilot to cover the publication fees (Article Processing Charges or APCs). Also open access monographs, book chapters or conference proceedings can be funded if these are occurring after the end of the grant (and not eligible for reimbursement from the project budget).

You can find more information on the post-grant pilot here:

https://postgrantoapilot.openaire.eu/#home

Vacancies

Marie Curie Early Stage Career Fellowship – OMA project
Several locations around Europe

2016/17 Junior Research Fellowships
Durham University, UK

Post-Doctoral Fellow for the Inelastic Scattering Beamline ID20
European Synchrotron Radiation Facility, France

Postgraduate Opportunities
Royal Holloway, UK

RF Electronics Engineer - 81728
Lawrence Berkeley National Laboratory, US

Faculty Position in Accelerator Physics
Michigan State University, US

PhD Project Opportunities within the QUASAR Group
University of Liverpool / Cockcroft Institute, UK

Selected Publications

'International Conference on Laser Applications at Accelerators, LA³NET 2015, 25-27 March 2015, Mallorca, Spain', edited by Michael Budde, Allan Gillespie, Enrique Conejero Jarque, Nathalie Lecesne and Carsten P. Welsch, Physics Procedia, Volume **77**, Pages 1-66, (2015) (18753892/77)

'Proton acceleration enhanced by a plasma jet in expanding foils undergoing relativistic transparency', HH W Powell , M King, R J Gray, D A MacLellan, B Gonzalez-Izquierdo, L C Stockhausen, G Hicks, N P Dover, D R Rusby, D C Carroll, H Padda, R Torres, S Kar, R J Clarke, I O Musgrave, Z Najmudin, M Borghesi, D Neely and P McKenna, New J. Phys. 17 (2015) 103033 (10.1088)

'Electron Rephasing in a Laser-Wakefield Accelerator', E. Guillaume, A. Döpp, C. Thaury, K. Ta Phuoc, A. Lifschitz, G. Grittani, J.-P. Goddet, A. Tafzi, S. W. Chou, L. Veisz, and V. Malka, Phys. Rev. Lett. 115 (2015) 155002.

'Radially and azimuthally polarized laser induced shape transformation of embedded metallic nanoparticles in glass', ***Mateusz A. Tyrk***, Svetlana A. Zolotovskaya, W. Allan Gillespie, and Amin Abdolvand Opt. Express 23, 23394-23400 (2015) (23394)

Joke Box

A neutron walked into a bar and asked,
"How much for a gin and tonic?"

The bartender smiled wryly and replied,
"For you, no charge."

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Events	
Jan – March 2016	JUAS 2016, Archamps, France
March 6th – 11th 2016	LEAP 2016, Kanazawa, Japan
May 8th – 13th 2016	IPAC 16, Busan, Korea
Sept 11th – 15th 2016	IBIC 16, Barcelona, Spain
Sept 25th – 30th 2016	LINAC 16, East Lansing, MI, USA
Oct 25th – 28th 2016	PCAPAC 2016, Campinas, Brazil

NOTICE BOARD

DEADLINE FOR THE NEXT NEWSLETTER **29th February 2016**

About LA³NET

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.