

All good things come to an end...

This 17th issue of our LA³NET newsletter is also the last one. Five years after the project start, having successfully trained 19 Fellows, organized numerous workshops, schools, a conference and various outreach activities, we will limit future communication to updates on the project's [website](#).

LA³NET has been a tremendous success in terms of the number of publications, invited talks by Fellows and also impact on both, the world-wide laser and accelerator communities, as well as the general public. Following their projects within the network, our Fellows managed to secure new jobs and it is a pleasure to see that essentially all of them have decided to stay in research; an excellent confirmation that are training approach has worked and provided them with a good basis for their next career steps.

Is this really the end? Is all work completed? Well,...what we can clearly see is that there is still an enormous demand in early career researchers in both, industry and academia that even with a large scale initiative like LA³NET cannot be met. The large number of position vacancies in this newsletter are a good indicator that there are many exciting job opportunities for our Fellows in industry, as well as at universities.

We also found that there are areas within LA³NET that would benefit from an even stronger focus and more international collaborative research to address the challenges related to next generation research facilities, such as [EuPRAXIA](#). In particular *Novel Accelerators*, a growth area within accelerator science, requires innovative diagnostics solutions and advanced beam simulations to optimize all machine and experiment parameters.

In our workshop last month in Paris, the LA³NET community unanimously agreed that an internationally training initiative in this area would be both, timely and important. I will be working with our established and many new partners to gather the very best experts and develop an international training program that will address this challenge.

LA³NET has been an amazing journey and fantastic experience. It was a pleasure and privilege to coordinate our activities, and I would like to thank all project partners, in particular our Steering Community, our amazing Fellows and of course my fabulous project TEAM for all their support, collaboration and friendship!



Prof. Carsten P. Welsch, Coordinator

Special Interest Articles

- LA³NET Fellows start postdoctoral fellowships
- New collaboration between LA³NET Fellows
- Mateusz Tyrk featured in TalentScotland

Individual Highlights

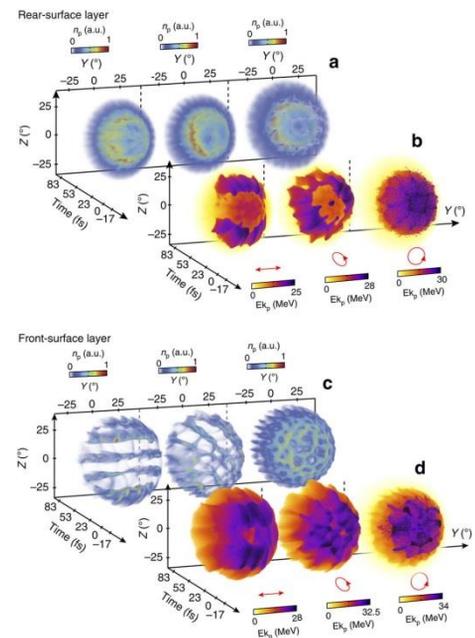
- LA³NET Topical Workshops in Paris
- LA³NET in IBIC 2016

Research News

Luca Stockhausen participates in study published in Nature Communications

Towards optical polarization control of laser-driven proton acceleration in foils undergoing relativistic transparency has been published in the Nature Communications, presenting results achieved by a team led by Prof Paul McKenna of the University of Strathclyde.

Control of the collective response of plasma particles to intense laser light is intrinsic to relativistic optics, the development of compact laser-driven particle and radiation sources, as well as investigations of some laboratory astrophysics phenomena. The authors recently demonstrated that a relativistic plasma aperture produced in an ultra-thin foil at the focus of intense laser radiation can induce diffraction, enabling polarization-based control of the collective motion of plasma electrons. In this paper they show that under these conditions the electron dynamics are mapped into the beam of protons accelerated via strong charge-separation-induced electrostatic fields. It is demonstrated experimentally and numerically via 3D particle-in-cell simulations that the degree of ellipticity of the laser polarization strongly influences the spatial-intensity distribution of the beam of multi-MeV protons. The influence on both sheath-accelerated and radiation pressure-accelerated protons is investigated. This approach opens up a potential new route to control laser-driven ion sources.



A comparison of spatial-density and kinetic energy distributions as a function of proton origin, with single-source layers.

Time-resolved (a) spatial-density distribution and (b) kinetic energy distribution, at $X=3\ \mu\text{m}$, for all three polarization cases (as labelled by the small red arrows) for rear-surface protons. (c,d) Same, for protons originating at the target front surface.

Full article:

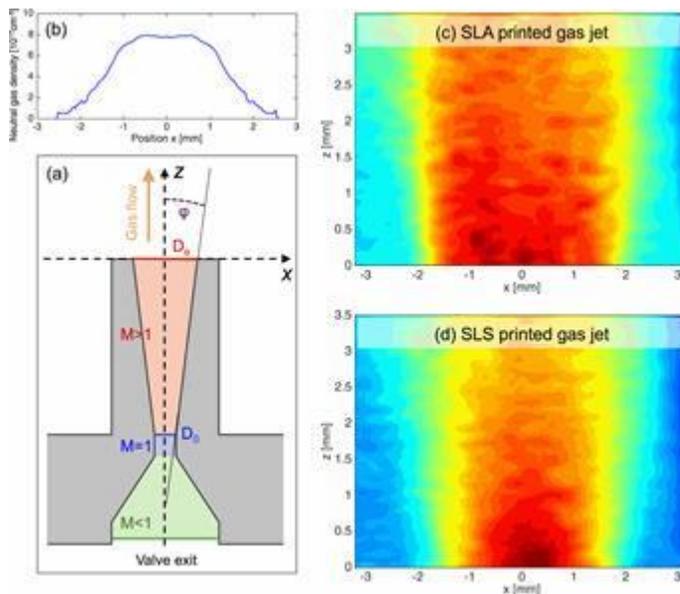
Towards optical polarization control of laser-driven proton acceleration in foils undergoing relativistic transparency, Bruno Gonzalez-Izquierdo, Martin King, Ross J. Gray, Robbie Wilson, Rachel J. Dance, Haydn Powell, David A. Maclellan, John McCreadie, Nicholas M.H. Butler, Steve Hawkes, James S. Green, Chris D. Murphy, **Luca C. Stockhausen**, David C. Carroll, Nicola Booth, Graeme G. Scott, Marco Borghesi, David Neely & Paul McKenna, Nature Communications 7, Article number: 12891 (2016). [doi:10.1038/ncomms12891](https://doi.org/10.1038/ncomms12891)

Andreas Döpp's results published in Review of Scientific Instruments

Results of Andreas' work performed with the LOA team led by Prof. Victor Malka have been published as *3D printing of gas jet nozzles for laser-plasma accelerators* in the Review of Scientific Instruments journal.

Recent results on laser wakefield acceleration in tailored plasma channels have underlined the importance of controlling the density profile of the gas target. In particular, it was reported that the appropriate density tailoring can result in improved injection, acceleration, and collimation of laser-accelerated electron beams. To achieve such profiles, innovative target designs are required. For this purpose, the authors have reviewed the usage of

additive layer manufacturing, commonly known as 3D printing, in order to produce gas jet nozzles. Notably they have compared the performance of two industry standard techniques, namely, selective laser sintering (SLS) and stereolithography (SLA). Furthermore they have used the common fused deposition modeling to reproduce basic gas jet designs and used SLA and SLS for more sophisticated nozzle designs. The nozzles are characterized interferometrically and used for electron acceleration experiments with the SALLE JAUNE terawatt laser at Laboratoire d'Optique Appliquée.



(a) Schematic design of a supersonic de Laval nozzle. Main parameters are the inner diameter D_0 and the exit diameter D_e , the Mach number M and the opening angle φ . (b) Interferometrically measured density profiles at $z = 0.3$ mm for a FDM printed jet. (c) and (d) show density profile maps $n_e(x, z)$ for SLA and SLS printed nozzles, respectively.

Full article:

3D printing of gas jet nozzles for laser-plasma accelerators, A. Döpp, E. Guillaume, C. Thaury, J. Gautier, K. Ta Phuoc and V. Malka, Rev. Sci. Instrum. **87**, 073505 (2016).

<http://dx.doi.org/10.1063/1.4958649>

Network News

LA³NET at IBIC 2016



Participants at IBIC16

Sun-drenched palm trees and luxury cruise liners dawdling in the balmy waters of the port of Barcelona presented a splendid backdrop to this year's edition of the International Beam Instrumentation Conference (IBIC) which took place from 11th to 15th September.



The industrial exhibition, held in conjunction with the Conference, featured once more the University of Liverpool and its European projects initiated by Prof Carsten Welsch. Information about LA³NET and its sister network [oPAC](#) was complemented with the new Initial Training Networks [OMA](#) – Optimization of Medical Accelerators, and the recently awarded [AVA](#) dedicated to accelerators for antimatter physics.

The achievements of the LA³NET training networks were further highlighted by contributions to the scientific program by Prof Carsten P. Welsch himself.

The stand also promoted the European design studies [EuPRAXIA](#) – for a compact European plasma accelerator with industrial beam quality – and [EuroCirCol](#), for a future 100 TeV hadron-hadron circular collider.

IBIC is the world's largest conference on particle beam instrumentation and this year it was attended by some 400 scientific experts and industrial delegates, therefore it was a unique opportunity to showcase LA³NET's achievements and boost the visibility of the project in the world of particle accelerators.



LA³NET at Europe's largest higher education conference

More than 5,000 higher education professionals from all corners of the world have participated in the 28th European Association for International Education's (EAIE) annual conference held in Liverpool, 13th - 16th September.

LA³NET project manager Magda Klimontowska together with James Hunt, PhD student from the University of Liverpool, led the 'Accelerator Researcher Career' session at Europe's largest higher education conference. They were joined by Michael Holroyd, a managing director of Inventya Limited, to explore the conflict between the standard training received by postgraduate students and the demands of the technology industry for highly qualified researchers.

In the session chaired by James Hunt, Michael Holroyd presented the specific industry needs and expectations in terms of highly qualified graduates and Magda Klimontowska responded to this with an overview of the postgraduate training model developed for the Fellows within LA³NET. This included highlights from specific training events, feedback from Fellows, as well as an overview of the training provision within the network.

Presentations were followed by a set of questions from the audience.



LA³NET Events

LA³NET Topical Workshops in Paris

The latest events of the LA³NET network took place in Paris on 23rd – 26th October. A workshop on Novel Accelerators and one on Laser Ion Sources were organized in the beautiful surroundings of the *Université Pierre et Marie Curie Campus de Cordeliers* and gathered more than 70 experts from all over the world.

The [Novel Accelerators workshop](#) programme focused on high power laser-driven accelerators, dielectric laser accelerators, and beam-driven wakefield accelerators. The workshop thus joined three communities that all aim at reducing the size, cost and complexity of particle accelerators and light sources, even though all approach this challenge very differently. The workshop also provided an opportunity for a presentation of the AWAKE experiment. All talks were followed by questions and stimulated many in-depth discussions. Tuesday afternoon was dedicated to discussions around the most important research challenges in all three areas and in particular how a new training initiative could help tackle them.



The [Laser Ion Sources workshop](#) took place in parallel and was organized in collaboration with the RESIST project and GANIL, one of the key partners in the LA³NET project. This workshop focused on techniques using lasers for resonant particle ionization, including pre-LIST techniques to enhance ion beam purity, advancements in efficiency, selectivity and spectral resolution, as well as new concepts and development of laser technologies for RILIS. The workshop delegates appreciated the opportunity of exchanging ideas and expertise.

Both workshops were organised and directed by Professor Welsch with support from LA³NET project manager Magda Klimontowska from the EU Project TEAM based at the Cockcroft Institute, and colleagues from GANIL. The events were sponsored by LA³NET and Laser Quantum. Although LA³NET formally finished a year ago, the consortium decided to continue collaboration beyond the original timeframe,

including the organisation of scientific events for the wider research community. It is clear that the enormous demand on experts working at the interface between lasers and accelerators cannot currently be met and the consortium strives to initiate future national and international projects to address this problem.



Upcoming Events

ANAR2017 Workshop

The Advanced and Novel Accelerators for High Energy Physics Roadmap Workshop 2017 will take place at CERN on April 2017, 25th -28th .

Organised at the initiative of the ICFA panel for [Advanced and Novel Accelerators](#), the ANAR2017 workshop aims at discussing issues to be addressed in the near future to be in a position to identify promising technologies for future advanced accelerators, and to establish an international scientific and strategic roadmap. The general goal is to define an international roadmap towards colliders based on advanced accelerator concepts, including intermediate milestones, and to discuss the needs for international coordination.

The workshop is open to the scientific

community at large. It is organized around working groups that will examine the various schemes that are currently under active investigation (LWFA, PWFA, DWA, DLA) as well as those that need to be addressed in the near- mid- and long-term to reach parameters relevant to a high-energy collider.

The last part of the workshop will be dedicated to discussion of the working group results and to the strategy to push forward the development of advanced accelerators in the context of the next international project at the TeV scale.

The results will be synthesized in a document that will be broadly distributed.

Please visit the [website](#) for updates about registration and general information.



FCC Week 2017

In 2017 the FCC Week will take place in Berlin, Germany between May 29th and June 2nd. The registration and abstract submission is now open, as well as application for the FCC Innovation Award via poster submission. The annual meetings of the worldwide Future Circular Collider study <http://cern.ch/fcc> (FCC) are major international events that review the progress in every domain which is relevant to develop feasible concepts for a

next generation frontier particle accelerate based high-energy physics research infrastructure. This 3rd meeting is jointly organised by CERN and DESY. It is also the annual meeting of the EuroCirCol <http://eurocircol.eu/> EC Horizon 2020 Research and Innovation Action project.

For details and registration please check: <https://fccw2017.web.cern.ch/>



EAAC2017 announced

The 3rd European Advanced Accelerator Concepts workshop (EAAC2017) will take place in the island of Elba in Italy, September 25th -29th, 2017.

The conference is organized in the context and with sponsoring of the EU/ARIES funded European Network for Novel Accelerators (EuroNNAc3), a network of 52 institutes and universities. EU funding for this network has now been extended up to 2021. Additional

sponsors for EAAC2017 are CERN, DESY, Ecole Polytechnique and INFN.

The workshop will be followed by a 1-day EuroNNAc3 network meeting by invitation only.

A special session on the Horizon2020 EU design study on a European Plasma Research Accelerator with eXcellence In Applications (EuPRAXIA <http://www.eupraxia-project.eu/>) will be included in EAAC2017.



Fellows News

LA³NET Fellows start postdoctoral fellowships



Jose Luis Henares has recently undertaken a postdoctoral position at CENBG (Centre Etudes Nucléaires de Bordeaux Gradignan). The general objective of the ENL group (Excitations Nucléaires par Laser) at CENBG is to measure the properties and mechanisms of nuclear excitation in plasmas. To create the nuclei that interest us we need beams of accelerated ions, typically generated by high-

power short-pulse lasers (TW, PW). The ENL group has an expertise in nuclear excitation rate calculations in plasmas and diagnostics to perform nuclear spectroscopy. The subject of Jose's postdoc project Laser plasma ion acceleration is to optimize the production of intense beam by both simulations and experiments.



Andreas Döpp has started a postdoctoral fellowship at LMU Munich University. He has joined professor Stefan Karsch's research group and currently participates in experiments on hybrid plasma wakefield acceleration and advanced X-ray imaging. From 2017 onwards he is going to work at the

new Centre for Advanced Laser Applications (CALA), where he will be involved in setup and operation of the Thomson-scattering beamline SPECTRE and the beam test facility ETTF.

New collaboration between LA³NET Fellows

Last month two former LA³NET Fellows, Jose Luis Henares and Stanimir Kisyov, met at LULI laboratory for an experiment performed in collaboration between CENBG (France) and ELI-NP (Romania).

The experiment investigated *Gamma spectroscopy of short lived nuclear states produced by laser-driven high energy proton sources*.



From left to right: Guilhem Revet, Jose L. Henares, Florent Boulay and Stanimir Kisyov.

Alexandra gives an Ignite Talk in Liverpool

Ignite is a series of speedy presentations. Presenters get 20 slides, which automatically advance every 15 seconds. The result is a fast and fun presentation which lasts just 5 minutes. Ignite events take place all over the world <http://www.ignitetalks.io/> and recently it was held in Liverpool.

LA³NET Fellow Alex Alexandrova took the challenge to give an Ignite talk about particle accelerators and their applications:

"Do you know of any particle accelerators? Maybe CERN? Did you know that there are more than 30,000 accelerators around the world! It's a bit of an unexpected number, isn't it? Would you like to know what they are used for? What kind of cool things are done with them around the world? I am

here to talk about it and to tell you everything you would like to know about particle accelerators in our society and how beneficial they are."



To watch her talk go to:

<https://youtu.be/qhygkF5lwWk?t=1129>

Mateusz Tyrk featured in TalentScotland

An interview with former LA³NET Fellow Mateusz Tyrk has been published in the professional services portal TalentScotland.

Mateusz, originally from Poland, joined LA³NET in 2012 as an Early Stage Researcher at the University of Dundee. Within his project Mateusz worked on developing novel electro-optic (EO) materials. After completing Marie Curie fellowship six months ago he

started working as an Optics Application Engineer in PowerPhotonic Ltd in Scotland. He is responsible for technological design of micro-optics products and identifying markets and customers for them.

Matt's success story can now inspire other young people to pursue career in research and engineering.

MATEUSZ A TYRK, POLAND, POWERPHOTONICS

Cześć, my name is Mateusz. Scotland is a welcoming country where there are lots of great outdoor activities to enjoy.



The interview can be found here:

https://www.talentscotland.com/work/success-stories/mateusz-a-tyrk_poland_-powerphotonic

Partner News

Multimillion Euros Project on Antimatter Research announced

AVA (Accelerators Validating Antimatter physics) is a new European research and training network between universities, research centers and industry. Within the project a cohort of 15 Fellows will be employed to carry out cutting edge research and follow a highly innovative training program. The project was selected for funding in one of the European Union's most competitive funding schemes and will benefit from almost 4 M€ of funding over its 4-year duration. AVA targets new scientific and technical developments in antimatter research and aims at boosting the career prospects of its Fellows.

The project will be coordinated by LA³NET Coordinator Prof Carsten P. Welsch. Through the coordination of LA³NET Prof Welsch and his EU TEAM have a proven track record in the coordination of large scale European networks. AVA will directly build up on experience and expertise gained within these earlier initiatives and train the next generation of researchers.

Within AVA, the project partners will pursue a closely connected R&D program across three scientific work packages. The first one focuses on facility design and optimization, addressing beam life time and stability issues in lowest energy storage rings, as well as beam cooling, deceleration and extraction processes. Work package 2 addresses the

design, development and testing of novel beam diagnostics and in particular the establishment of a dedicated instrumentation and detector test stand, to fully determine the characteristics of an antiproton beam. Finally, novel low energy antimatter experiments will be carried out through involving beyond state-of-the-art beam handling, storing and analysis techniques.

A structured combination of local and network-wide trainings will also be offered within AVA. This will follow the example of the LA³NET project and include courses at the different host institutions, alongside network-wide trainings which will be made available to the wider scientific community.

Currently AVA is offering 15 Fellowships to talented, energetic, highly motivated early career researchers that will be employed by the different project partners across Europe.

Possibilities for enrolling into a PhD programme exist. Each researcher will benefit from a wide ranging training programme that will take advantage of both local and network-wide activities. Excellent salaries will be offered. **The application deadline is 31st January 2017.**

More information about the project can be found in the project home page:

<http://www.ava-project.eu>

and in the AVA video:

<https://youtu.be/m6NWbzBUFaU>



The AVA project will allow cutting edge research and promote training innovations



Watch the video: <https://youtu.be/m6NWbzBUFaU>

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 721559.

oPAC Topical Workshop on Beam Loss Monitors

The latest Topical Workshop of the oPAC network has taken place in Barcelona on 15th – 16th September, right after the International Beam Instrumentation Conference (IBIC), and it was devoted to Beam Loss Monitors.



The workshop attracted around 30 delegates to discuss the latest developments in the BLM

systems of facilities from all over the world, from the Stanford Linear Accelerator Center in California to the Australian Synchrotron down under, not forgetting European machines like XFEL, ESRF, and the LHC.

The comparatively reduced size of the meeting allowed for longer and more in-depth discussions that had been possible during the much larger IBIC conference, offering the delegates a better opportunity for exchanging ideas and expertise.

The workshop on BLMs culminated an intense week of discussions on particle beams instrumentation in Barcelona.

The slides presented at the meeting can be accessed at

<https://indico.cern.ch/event/527597/timetable/#all>



Carsten Welsch named co-editor of Instruments



instruments

LA³NET Coordinator, Prof Carsten P. Welsch has recently joined the Editorial Board of the journal Instruments.

Instruments is a new peer-reviewed, open access journal focused on scientific instrumentation and on the related methods and theory.

The main objective of Instruments is to provide a forum for advanced research on instruments, experimental apparatus, techniques and data processing for fundamental science and its applications. Transcending the specialised field for which a particular instrument was developed, the journal will aim at a broad interdisciplinary public.

The editor's ambition is to select high quality papers presenting major achievements and truly innovative results in instrumentation for various research fields, such as physics, engineering, chemistry, material science, biology, medicine, etc. This broad spectrum of disciplines should naturally promote the submission of trans-disciplinary papers.

On behalf of the Editorial Board, you are cordially invited to choose Instruments to submit your high quality, innovative papers. They will be subject to a rigorous peer-review process and, if accepted, published online within a short time.

More News

Join Young Academy of Europe

The Young Academy of Europe is now recruiting new members. They are looking for outstanding young scientists who:

- Present scientific excellence at the international level that has been recognized by European or national bodies
- Have a wide interest in science and science policy at the European level
- Have demonstrated leadership abilities
- Are presently carrying out research in the European Union or an associated country
- Have obtained their doctoral degree no longer than 12 years ago (credit is given for childcare and national service).

The YAE Selection Committee decision on the admission of new members will be based on the scientific qualification and achievements of the candidates, as well as their willingness to actively contribute to the YAE. These points should be clearly addressed in the application. Detailed information on the admission criteria and nomination process can be found in the YAE website: <http://yacadeuro.org>

European Commission launches a pilot service to boost exploitation of research results

Did you start thinking about the exploitation of the results of your project? Did you know that considering exploitation planning already early in the project helps in developing the key results and actions for their exploitation? The "[Common Exploitation Booster](#)" can help you with this! This pilot initiative provides four types of services, for projects and results in different levels of maturity:

- [Analysis of Exploitation Risks](#), to scout the route towards the market and better tackle risks;
- [Exploitation Strategy Seminar](#) a joint working session to streamline the exploitation strategy and go to market action plan;
- [Business Plan Development](#) to design a convincing and actionable plan for exploitation;
- [Brokerage and Pitching Event](#) where partners present their results to peers, potential users and investors, in order to pave the way to follow-ups.

Your project can profit from these services. They are provided by external consultants under confidentiality agreement, and the costs of the consultancy are covered by the European Commission.

This [online leaflet](#) provides basic information of the services and the procedure for applying them. More information can be found from the [contractor's website](#) or asked by email from EC-CSC-Exploitation-Support@ec.europa.eu.

Common Exploitation Booster is a pilot service. **Requests can be introduced until end of November 2016** [here](#), after ensuring the support of your project officer. The implementation of the services can be timed between December 2016 and April 2018, for example in the context of a project consortia meeting.



Vacancies

[Early Stage Researcher fellowships within AVA network](#)

AVA project, Application deadline: 31st January 2017.

[Permanent academic post \(Lecturer/Senior Lecturer/Reader\) in Laser Applications for Particle Accelerators](#)

University of Liverpool/The Cockcroft Institute, Application deadline: 16th December 2016.

COSYLAB is currently hiring software, hardware and medical engineers. They are looking to fill a large number of positions in their HQ in Ljubljana (Slovenia), with options to work in Switzerland, USA, China or Japan. Please contact jobs@cosylab.com for more details.

Selected Publications

Towards optical polarization control of laser-driven proton acceleration in foils undergoing relativistic transparency, Bruno Gonzalez-Izquierdo, Martin King, Ross J. Gray, Robbie Wilson, Rachel J. Dance, Haydn Powell, David A. Maclellan, John McCreddie, Nicholas M.H. Butler, Steve Hawkes, James S. Green, Chris D. Murphy, **Luca C. Stockhausen**, David C. Carroll, Nicola Booth, Graeme G. Scott, Marco Borghesi, David Neely & Paul McKenna, Nature Communications 7, Article number: 12891 (2016). [doi:10.1038/ncomms12891](https://doi.org/10.1038/ncomms12891)

3D printing of gas jet nozzles for laser-plasma accelerators, **A. Döpp**, E. Guillaume, C. Thauray, J. Gautier, K. Ta Phuoc and V. Malka, Rev. Sci. Instrum. **87**, 073505 (2016). <http://dx.doi.org/10.1063/1.4958649>

Joke Box

YOU MATTER.

**Until you multiply
yourself times the speed
of light squared.
Then you Energy.**

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Events

Feb 27 th – March 1 st 2017	PHOTOPTICS 2017, Porto, Portugal
April 25 th – 28 th 2017	ANAR2017 Workshop, CERN, Switzerland
May 14 th - 19 th 2017	IPAC'17, Copenhagen, Denmark
May 29 th – July 2 nd 2017	Future Circular Collider Week 2017, Berlin, Germany
Aug 20 th – 24 th 2017	IBIC'17, Grand Rapids, MI, USA
Sept 25 th – 29 th 2017	EAAC2017, Elba, Italy

NOTICE BOARD

Please note this is the last LA³NET newsletter. We will continue to post news on our website and the following social media channels:

Quasar Group: www, [Facebook](#) and [Twitter](#)

We remain open to suggestions regarding the organization of events for the wider laser and accelerator communities under the LA³NET umbrella.

Please contact the [Project Coordinator](#) if you would like to express interest in such activities and find out more.

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.



www.la3net.eu

