



## LASERLAB-EUROPE

### The Integrated Initiative of European Laser Research Infrastructures III

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Work package 5 – Human Resources Development

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Final report on cooperation with other training programmes

Lead Beneficiary: 9 ILC

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<i>Deliverable Nature</i>	
R = Report, P = Prototype, D = Demonstrator, O = Other	R
<i>Dissemination Level</i>	
PU = Public PP = Restricted to other programme participants (incl. the Commission Services) RE = Restricted to a group specified by the consortium (incl. the Commission Services) CO = Confidential, only for members of the consortium (incl. the Commission Services)	PU

## 1 Introduction and objectives of WP5

This workpackage deals with the coordination of Human Resources (HR) Development for Laserlab-Europe. It includes a wide spectrum of activities, focused to enhance the efficient use of the facilities in the Transnational Access programme by attracting and educating new users, to develop the user community, and to reach new scientific sub-communities. The target groups of these activities are namely i) younger scientists at the doctoral or post-doctoral level, and ii) new research groups, e.g. from new members states within the EU or groups from scientific disciplines such as biology and medicine where the use of laser research infrastructures is not yet common practice.

The main Laserlab training objectives are:

- Developing and training of new user communities with no or little past experience in laser research, addressed by Task 1;
- Attracting and training of new users from new scientific communities (e.g. life sciences) in a multi-disciplinary perspective, addressed predominantly in Task 2;
- Coordinating externally funded activities, particularly education activities, for the development of human resources in close collaboration with other organisations, addressed by Tasks 3 and 4.

## 2 Short summary

- Within Task 1, three training schools have been organised: the User Training Workshop on Biophotonics, Kosice, Slovakia, 17-30 June 2013, the User Training Workshop on Laser Applications in Spectroscopy, Industry and Medicine, Riga, Latvia, 9-12 April 2014, and the User Training Workshop on Light-Based Technologies, Trnava, Slovakia, 2-4 September 2015.
- Under the scheme of Task 2: User Training in Lasers and Photonics for Biology and Health, 11 short-term training visits took place.
- In Task 3 Cooperation with existing training programmes, calls for proposals were issued and four external training programmes were selected and supported by Laserlab-Europe.
- Laserlab partners participate in the FP7 outreach projects “GoPhoton! - Photonics for everyone”, “LIGHT2015” and “Photonics4all”, which promote the importance of photonics and optical technologies to young people, entrepreneurs and the general public in all Member States of the EU during the International Year of Light and Light-based Technologies 2015 (IYL 2015). Within the framework of MoU’s, Laserlab-Europe, FELs of Europe and the ESFRI project ELI – Extreme Light Infrastructure, jointly advertise the training events of each other within their own networks and have started to discuss joint organisation of training events.

## 3 Task 3: Cooperation with existing training programmes

Task leader: ILC

Laserlab-Europe embraces existing specific training efforts organised and funded by leading European institutions and organisations in laser science. The aim is to gain coherence between Laserlab’s user training goals and external periodic initiatives, training schools and workshops. Not only will Laserlab-Europe users benefit from such existing external training programs, but such interaction will help to promote the Laserlab-Europe access opportunities at distinguished training sites.

For the selection of training events to be supported by Laserlab-Europe, calls for proposals for cooperation with international training and summer schools were published once a year.

In total, 10 proposals were received and evaluated by the Networking Board and four external training events were selected and supported during the lifetime of the project.

### ***3rd International School on Lasers in Materials Science – SLIMS, July 2012, Venice, Italy***

The Venice International School on Lasers in Materials Science (SLIMS) was held in Isola di San Servolo, Venice, Italy from 8th to 15th of July, 2012. It was organised in the framework of the activities of the Venice International University (VIU) and continued the tradition of the first two editions of the school that took place in the same location in 2008 and 2010. The main purpose of SLIMS is to provide PhD students and young research scientists, working in the field of laser-materials interactions, with robust fundamental knowledge that is often lacking in their training, so that they may benefit from interaction with colleagues working in areas neighbouring their own research field. While a number of well-established international conferences regularly bring together researchers working in the field of laser-materials interactions, the SLIMS School is unique in that it aims at educating doctoral students in the principles of laser-surface interactions, along with bringing students up to date with the current state of the art in laser materials processing.

The 2012 school targeted mostly the level of PhD students, however advanced undergraduate and Master students as well as post-doctoral researchers joined in this edition as well. Lectures were given by 17 international experts in the field of laser-materials interaction. A total number of 35 students from 13 countries attended the school, with 25 students coming from EU countries. One of the distinctive features of the School was the opportunity for students to discuss their on-going projects or research plans with the lecturers. The students were strongly encouraged to present posters that were displayed over the school duration in the lecture hall. The posters were discussed during the extensive poster sessions and at coffee breaks. The students also gave brief oral presentations of their research in dedicated sessions and participated in the Best Student Presentation Award competition (dedicated to the memory of Professor Roger Kelly).

The School also included a presentation of Laserlab-Europe by Marta Castillejo, one of the School Directors and Chair of the Board of User Representatives in Laserlab-Europe, emphasizing the opportunities for access as well as the user training events. A round of questions and discussion about Laserlab took place after the presentation.



Recipients of the 2012 R. Kelly Award at SLIMS 2012 with Prof. P.M. Ossi

***Training School for Advanced X-ray Spatial and Temporal Metrology (with COST action MP1203), Dubrovnik, Croatia, 29 September - 2 October 2014***

The first training School on “Advanced spatial and temporal X-ray metrology” has been organised in Dubrovnik, Croatia by the COST Action MP1203 with financial support from Laserlab-Europe and RTRA (Réseau thématique de recherche avancée) “Triangle de la physique”. The School was organized by Dr. M. Fajardo from Portugal, Dr. N. Krstulovic from Croatia, Dr. E. Oliva and Dr. P. Zeitoun from France.

The School welcomed about 40 early-stage trainees and 6 senior trainers from 16 European countries plus one trainer from USA. Female researchers represented about 38% of the trainees and 33% of the trainers.



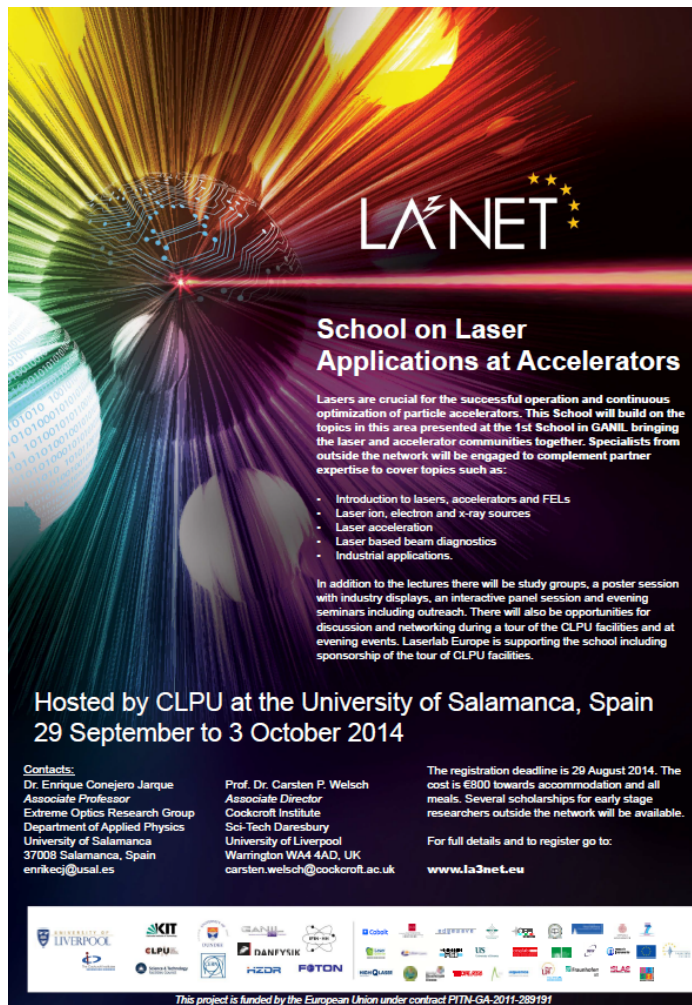
The School covered most topics related to advanced X-ray metrology:

- Basics of optical aberration and techniques to correct them (lessons + hands-on training),
- Techniques (at-wavelength and using visible sources) for the metrology of X-ray optics,
- Temporal metrology of ultrafast X-ray sources,
- Overview of coherent and incoherent X-ray sources (from table-top to very large-scale facilities),
- Basics of spatial and temporal coherence,
- 3D coherent and incoherent X-ray images.

The survey organized at the end of the School showed that the School was very much appreciated by the trainees. The COST Action MP1203 management committee thus plans to organize a second Training School during the year 2016.



## **LA<sup>3</sup>NET 3rd School on Laser Applications, Salamanca, Spain, 29 September, 3 October 2014**



**LA<sup>3</sup>NET**

### School on Laser Applications at Accelerators

Lasers are crucial for the successful operation and continuous optimization of particle accelerators. This School will build on the topics in this area presented at the 1st School in GANIL bringing the laser and accelerator communities together. Specialists from outside the network will be engaged to complement partner expertise to cover topics such as:

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

In addition to the lectures there will be study groups, a poster session with industry displays, an interactive panel session and evening seminars including outreach. There will also be opportunities for discussion and networking during a tour of the CLPU facilities and at evening events. Laserlab Europe is supporting the school including sponsorship of the tour of CLPU facilities.

**Hosted by CLPU at the University of Salamanca, Spain  
29 September to 3 October 2014**

**Contacts:**

Dr. Enrique Conejero Jarque Associate Professor Extreme Optics Research Group Department of Applied Physics University of Salamanca 37008 Salamanca, Spain enriquec@usal.es	Prof. Dr. Carsten P. Welsch Associate Director Cookcroft Institute Sci-Tech Daresbury University of Liverpool Warrington WA4 4AD, UK carsten.welsch@cookcroft.ac.uk	The registration deadline is 29 August 2014. The cost is €800 towards accommodation and all meals. Several scholarships for early stage researchers outside the network will be available.  For full details and to register go to:  <b>www.la3net.eu</b>
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The Spanish Pulsed Lasers Centre (CLPU) in Salamanca, Spain hosted the Advanced School on Laser Applications at Accelerators on behalf of the LA<sup>3</sup>NET consortium. LA<sup>3</sup>NET is an FP7 Marie Curie Initial Training Network (ITN), focussing on the exploitation of lasers for applications at accelerator facilities for ion beam generation, acceleration and diagnostics.

The event comprised lectures from internationally renowned speakers, study sessions, an industry-focussed day and poster/industry exhibition attracting over 70 participants from all over the world. Lecturers from institutions such as CERN in Geneva, UCLA in the USA, DESY in Germany and COSYLAB in Slovenia covered all areas of laser applications, including beam generation, acceleration and diagnostics.

The first day included talks about an introduction to lasers, the history of accelerator development in Europe, accelerator applications, as well as beam generation, acceleration and diagnostics. Day two included

lectures on laser ion sources, photo injectors and Free Electron Lasers (FELs), in addition to a two-hour study session giving delegates a chance for a hands-on look at some of the topics covered. An outreach talk about “attosecond science” by Prof. Luis Plaja in the evening on the main University of Salamanca campus attracted more than 100 students from the university and local high schools in addition to the school participants. The presentation in Spanish with English slides was a most entertaining and enlightening success which was well received by the audience across both languages and so proved worthwhile for inclusion in future events in other countries.

The following days covered advanced topics in ion and electron acceleration, commonly used simulation codes for accelerator design and optimization, as well as industry applications of accelerators and lasers. This was complemented by a visit to the facilities at CLPU - an intriguing excursion to the forefront of laser technology and applications with a tour of five laboratories. This included the mechatronics lab where components are manufactured, a laser lab where investigations are underway to investigate the application and effects of ultra-short x-ray pulses for radiographs and a new laser development lab for the first Spanish tuneable femtosecond laser. In addition, the tour covered the user target room for the first and second phase terawatt Vega lasers which are currently operational and then the pièce de résistance, the new building where all three Vega lasers will be housed to achieve petawatt capability for end-user experiments. There was also a second study session and a lively poster display and industry exhibition, sponsored by Danfysik.

The course triggered many interesting discussions and allowed early stage researchers and post-doctoral students from all over Europe to put their research into a much broader

context. Laserlab Europe supported the school including sponsorship of the tour of CLPU facilities.

***International Training Session OPCPA, Bordeaux, France, 19-21 January 2015***

The International Training Session on OPCPA (Optical Parametric Chirped-pulse Amplification) took place at Université de Bordeaux and the Pyla training centre of the Institut d'Optique d'Aquitaine from 19-21 January 2015. The training session was attended by 33 people.



The objectives of the training session were to provide a basic knowledge in both linear and non-linear optics, to understand the parametric process, to learn how to simulate and design the various stages involved in parametric amplification (SHG, OPO, OPA, OPCPA) and to present state-of-the art OPA and OPCPA devices. In addition, the training session meant to foster a network at the national and international level, as well as to facilitate the exchange of knowledge and to share know-how between the attendees, and to trigger collaborations.

In order to fulfill the last three objectives mentioned above, the missions and the actions of the Laserlab-Europe and FEMTO networks (partners and co-funders of the OPCPA training) were presented by Eric Cormier, and Guy Buntinx (coordinator of the FEMTO network), respectively.

The training session was organized following a three-day schedule. The first day was dedicated to basics in linear and nonlinear optics, the fundamental principles of parametric amplifier architectures, properties of linear and nonlinear optical materials and crystals used in different architectures and at different wavelength ranges of interest. The first day was concluded by an introduction and review of numerical simulation methods (in connection with the computer session).

In addition to lectures and scientific presentations, the session was offering practical training. The presence of trainers in theoretical courses also helped to ensure coherence and efficiency in the continuity of the first two days of training.

The second day of training was devoted to the presentation (30-minute lectures) of practical realization of OPCPA systems. The 11 presentations were intended to cover the broadest and most representative overview of technologies, materials, architectures, energy, pulse durations and wavelengths available.

The third day was devoted to practical work. In order to ensure the best conditions for this session, enrolment was limited to 25 participants. The group was split to work at four workstations, instructed and supervised by five trainers and a technician. The proposed activities were: frequency doubling, numerical simulation, Kerr effect and continuum generation, and parametric amplification.

During these three days of training, several opportunities (coffee break, lunch) were used to help creating contacts between participants and trainers.