



LASERLAB-EUROPE

The Integrated Initiative of European Laser Research Infrastructures IV

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Intermediate report on “Joint training events”

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<i>Deliverable Type</i>	
R = Report DEM = Demonstrator, pilot, prototype, plan designs DEC = Websites, patents filing, press & media actions, videos, etc. OTHER = Software, technical diagram, etc.	R
<i>Dissemination Level</i>	
PU = Public, fully open, e.g. web CO = Confidential, restricted under conditions set out in Model Grant Agreement CI = Classified, information as referred to in Commission Decision 2001/844/EC	PU

1 Introduction

The training of new generations of future users is considered as one of the main tasks of Laserlab-Europe. The objectives of Work Package 5 “Training and Development of User Communities” are:

- Train a new generation of researchers and technical staff to enable them to make optimum use of laser facilities, to exploit new experimental and theoretical approaches in photonics and laser-related science and to use them in novel applications with high industrial and societal impact;
- Develop new laser user communities in domains of science such as bio photonics, medicine, pharmacy, ICT, material research, environment, in industry, and in European regions where laser user communities are still less developed;
- Increase efficiency in these activities through cooperation with externally funded activities, aiming at a similar development of human resources, and in close collaboration with other European facilities, networks, projects and industry, such as FELs of Europe, ELI, EuroBioImaging, Photonics21, EOS, etc.

2 Objectives of Task 3

Under Task 3 “Cooperation with External Projects, Organisations, Industry and Existing Training Programmes”, Laserlab-Europe cooperates with existing specific training programmes organised by leading European institutions and organisations in laser science as well as by other networks and projects such as ELI, EuroBioImaging and FELs-of-Europe, thus creating and enhancing synergies between Laserlab-Europe and external training schools and workshops. Not only Laserlab-Europe’s users benefit from the cooperation with such external training programmes, but also the development of human resources needed for the pan-European large-scale infrastructures will be enhanced. In addition, such interaction helps to promote Laserlab-Europe and its access opportunities in diverse scientific communities.

A call for applications for cooperation with international training and summer schools is published annually on the Laserlab-Europe web page. The proposals are evaluated and selected by the Networking Board.

3 Work performed

During the first 24 months, two calls were issued and 12 proposals for training events were received, out of which four events were selected and co-funded by Laserlab. The events cover diverse topics relevant for the different fields of research addressed by the Laserlab-Europe consortium.

Venice International School on Lasers in Materials Science – SLIMS, 10-17 July 2016, Venice, Italy

The main purpose of the School was to educate graduate students, PhD students and young research scientists working in the field of laser-materials interactions 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. It offered a comprehensive overview on basic principles and a selection of relevant applications connected to the irradiation of materials with energetic laser beams.

The School comprised lectures in the field of laser-materials interaction and the underlying physics and promoted the active participation of students through posters and brief oral contributions. Prizes were awarded in a closing ceremony for the best student contributions.

Although the School targeted the level of PhD students, advanced undergraduate and Master students and also postdoctoral researchers joined in the school. In total, 32 students,

mainly from EU, Russia (3) and the USA (11), attended the School. Feedback from the participants on the format, the topics and the discussion possibilities was very positive.



Group picture of SLIMS-2016 attendees

The school included a presentation of Laserlab-Europe by Prof. M. Castillejo, Instituto de Química Física Rocasolano, CSIC, Madrid, Spain, who introduced the structure of Laserlab-Europe and its scientific and educational activities. The possibilities of research and collaboration open to young researchers in the framework of the Laserlab-Europe access programme were introduced to the students and participants as well.

In addition to Laserlab-Europe, the School was supported by the Politecnico di Milano, IUVSTA, the Intl. Union of Vacuum Science and Technology Associations, NSF, the National Science Foundation (USA) and IEEE Photonics Society.

Detailed information can be found at <http://www.slims.polimi.it/>.

MEDEA ITN Summer School "Ultrafast dynamics with intense radiation sources", 18-21 October 2016, Crete, Greece

A four days summer school was organized for PhDs, which provided an overview on the generation of intense laser sources extending from the infrared to the extreme ultraviolet and X-ray spectral range. State-of-the-art applications of such sources to time-resolved investigations of electronic and nuclear dynamics in atoms and molecules were introduced and discussed by leading experts in the field. The invited speakers of the school were senior scientists, experts in the fields covered by the school programme and selected by the organisers to ensure the state-of-the-art scientific training.

During the school, two poster sessions were organised. It was a good opportunity of networking and to help the young scientists to report about their scientific progress in the development of their research projects. The poster session was opened to all the participant of the School.

The school was attended by 60 students mainly from different European academic institutions. The European facility ELI-ALPS (Extreme Light Infrastructure Attosecond Light Pulses Source) expressed a strong interest in the organisation of the school by directly supporting it and by encouraging the participation of junior scientists. Further support was provided by Laserlab-Europe.

Invited Speaker	Institution	Topics
A. KULEFF	Theoretische Chemie	Ultrafast charge migration: fundamental theoretical aspects
P. LAMBROPOULOS	FORTH, Crete Greece	Photoionization under intense XUV fields: the perturbative approach
K. SCHAFER	Louisiana State University, Baton Rouge USA	Theoretical description of attosecond processes
A. MAQUET	Universit'e Pierre et Marie Curie, Paris, France	Attosecond time delays
M. IVANOV	Max Born Institut Berlin, Germany	Molecules in intense laser fields
F. MARTIN	Universidad Autonoma Madrid	Theoretical description of attosecond molecular dynamics
L. GIANNESI	Sincrotrone ELETTRA Trieste, Italy	Free Electron Lasers in the extreme ultraviolet and X-ray spectral regions
N. BERRAH	University of Connecticut, USA	Time-Resolved Molecular Dynamics using the LCLS
R. DÖRNER	University Frankfurt, Germany	Ultrafast Dynamic investigated by recoil-ion and electron momentum spectroscopy
P. TZALLAS	FORTH, Crete Greece	Nonlinear effects in the attosecond domain
G. TSAKIRIS	Max Planck Institut for quantum Optics, Garching, Germany	Surface Harmonic Generation
E. CORMIER	University of Bordeaux, France- ELI-ALPS Szeged, Hungary	Mid-IR laser sources
J. BIEGERT	ICFO, Barcellona Spain	Soft X-ray generation and Laser-induced Electron Diffraction
J. LIMPERT	University of Jena, Germany	High-repetition rate fiber lasers
T. METZGER	TRUMPF Scientific Lasers Unterföhring, Germany	OPA driven by thin disk-lasers
S. KAHALY	ELI-ALPS, Hungary	Ultrafast charge dynamics at ultra-high intensity
H.J. WÖRNER	ETH, Zurich Switzerland	Attosecond charge migration
T. PFEIFER	Max Planck Institut for nuclear physics	Laser control of absorption profiles on the attosecond timescale
J. TISCH	Blackett Laboratory London UK	Generation and application of multi-colour attosecond pulses
F. LEPINE	University of Lyon, France- ELI-ALPS Szeged, Hungary	Application of attosecond pulses for the investigation of molecular dynamics
T. DE PAUW	EYEST	Outreach activities with the photonics Explorer Kit

Invited speakers and topics of the Summer School



Pictures of the Summer School – , FORTH - Crete, October 2016

Zakopane School of Physics Breaking Frontiers: Submicron Structures in Physics and Biology, 22-27 May 2017, Zakopane, Poland

The Zakopane School of Physics is organized by the Institute of Nuclear Physics Polish Academy of Sciences in Krakow every two years. The event has been organized since 1963. The 52nd Zakopane School of Physics, co-funded by Laserlab-Europe, was a very successful and remarkable event that combined the scientific interest with the opportunity for young scientists to meet experienced lecturers and to have valuable discussions. The School was dedicated to physics and biology issues studied by nuclear physics, ion beam methods and with the use of lasers. Special attention was paid to the opportunities that will be attainable through a new European XFEL research infrastructure.

The scientific programme consisted of invited lectures, contributed talks and poster presentations. 80 participants took part in the event, including 57 academic staff and experienced scientists, 13 doctoral candidates, and 10 students. Thanks to the co-financing by Laserlab-Europe 5 young researchers and students were waived from the participation fee.

The School covered the following topics:

Structures and properties of low-dimensional materials

- design, synthesis and characterization of nanostructured materials
- coatings, multilayers, thin films, nanoparticles
- nanopatterning – pre- and post-growth processing, self-assembly and self-organization
- biological applications of nanostructured materials and nanoscale magneto electronics

Physics for medicine and biology

- DNA, cell and tissue damage
- influence of external factors on cells and tissues properties
- biofilms and biomaterials, bio-markers and bio-sensors
- molecular and intercellular interactions

Towards protection of natural environment

- photosynthesis
- heavy metal stress, pollution, corrosion
- protection mechanisms evolved by living organisms
- monitoring and protection
- renewable sources of energy

Recent technical achievements in submicron structure investigations

- IR, X-ray and particle micro- and nano-beams
- advanced imaging techniques
- sample preparation

Detailed information on the LII Zakopane School of Physics can be found on the web page (<https://zakopane2017.ifj.edu.pl/index.html>).



Group photo of the participants of the LII Zakopane School of Physics

An exhibition stand with roll-up posters and information leaflets presenting the Laserlab-Europe project has been organised in the lobby of the school venue (see Fig. 2). The Laserlab-Europe poster was also presented at the entrance to the secretary office of the school. Laserlab-Europe leaflets and notepads have been put into the information package of the school given to each participant.



The exhibition stand presenting the Laserlab-Europe project during the LII Zakopane School of Physics.

Lasers in Medicine and Life Sciences - LAMELIS 2017, 12-21 July 2017, Szeged, Hungary

The city of Szeged is proud to have been chosen as the site of one of the four pillars of a massive European laser project entitled ELI (Extreme Light Infrastructure). The construction of ELI-ALPS (Attosecond Light Pulse Source), a facility dedicated to ultra-short laser pulses, has now finished. Apart from breaking new ground in the study of very fast atomic and molecular processes, it is also expected to bring about improvements in medicine and life sciences. It was now the fourth time the University of Szeged had organised the summer school entitled Lasers in Medicine and Life Sciences (LAMELIS) with the aim of discussing and disseminating the implications of these developments. The LAMELIS 2017 summer school was held between 12th and 21st July.

The summer school was open to both medical students and physics students and targeted undergraduate and postgraduate students. Although the theoretical depth of talks was tailored for medical students, the programme could also benefit physics students as they could learn of medical applications of lasers directly from distinguished experts of the field and receive first-hand information on the current status of ELI-ALPS.

The training goals were to present a compilation of modern laser applications in medicine and life sciences and discuss what new possibilities ELI-ALPS may open up in these, and to bring together future users and future developers of lasers and encourage continuous communication between them as early as the undergraduate years.

The training format consisted in 90-minute lectures, combined with laboratory visits and an extracurricular programme with speakers and students together.

The following topics and issues were discussed:

- the status of the ELI project
- Laserlab access opportunities
- optical coherence tomography
- dentistry and oral surgery
- micromanipulation
- generation and applications of terahertz radiation
- lasers in dermatology
- lasers in microcirculation
- hadron therapy
- transient absorption and fluorescence spectroscopy
- total internal reflection fluorescence (TIRF) microscopy
- ultrafast two-dimensional spectroscopy
- super-resolution microscopy

The school included laboratory visits:

- High-intensity Laser Laboratory (HILL)
- super-resolution microscopy laboratory
- two-photon polymerisation laboratory (Biological Research Centre, BRC, Szeged)
- direct laser writing to photopolymer layers (BRC)
- ultrafast fluorescence kinetics of biomolecules (BRC)
- differential polarisation laser scanning microscope (BRC)

and in addition, clinical facility visits:

- lasers in dermatology
- OCT in invasive cardiology
- OCT in ophthalmology

19 students (16 international and 3 Hungarian) and 22 speakers participated in the school. Feedback from the participants on the format and the topics was very positive.



Group picture of the participants of the LAMELIS 2017