



LASERLAB-EUROPE

The Integrated Initiative of European Laser Research Infrastructures III

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Final report on User Training Schools

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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 member 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 1: User Training Schools

Task leader: ILC

The User Training Schools in Laserlab III are organised at two levels: as General Training Schools on the Pan-European scale, and smaller (regional) Thematic Training Schools focused towards potential user groups from selected scientific disciplines. While the General Training Schools will be organised at multi-national level and thus will involve a larger number of participants from the broader community, the Thematic Schools will be oriented to a smaller number of participants with extended hands-on training and an intensified learning phase in the specific theme.

Within the project duration, three User Training Schools have been organised.

User Training Workshop on Biophotonics, Kosice, Slovakia, 17-30 June 2013

The concept of thematic schools builds on the previous experience with Laserlab training events, blended with the successful training school concept VINO-STELLA. These advanced schools deal with specific topics in laser physics where training in experimental techniques is delivered directly on research equipment in a real laboratory and with the goal of resulting in real projects and/or journal publications.



SCHOOL OF BIOPHOTONICS 2013

**SLOVAKIA
KOŠICE, 17-30 JUNE 2013**
(EUROPEAN CAPITAL OF CULTURE 2013)

Based on these foundations, we organised a thematic workshop focused on Biophotonics in June 2013 in Košice, Slovakia. The school was held at the premises of Pavol Jozef Safarik University (UPJS) in Košice in collaboration of ILC, UPJS and Université P. et M. Curie, Paris (UPMC), and served to improve the theoretical and practical knowledge of doctoral students in advanced methods of biophotonics. One of the aims of the thematic school was to provide participants a personal contact with leading-edge laser and photonics instrumentation producers, which was ensured by close collaboration with our industrial partners as the school was supported by Becker & Hickl, GmbH, Berlin and Carl Zeiss, Slovakia.

The School of Biophotonics was attended by 18 PhD students and young researchers from 5 countries, the lectures and practical

trainings were imparted by 14 internationally recognized experts in the field of Biophotonics. An upgraded concept for Laserlab user training workshops provided students with a 10-day set of lectures on recent advances in biophotonic research, supplemented by practical demonstrations of the respective experimental techniques (spectroscopy, microscopy, time-resolved techniques). In addition, dedicated lectures on safety and good laboratory practice, as well as on ethical issues in biophotonics were included in the programme. Interdisciplinary teams (each of 3-4 students) were formed, which had to select and develop their own individual projects that were publicly defended and evaluated during the last day of the school. Prices were awarded for the best student contributions. Monitoring the outcome of the workshop was implemented by User Questionnaires, mapping the post-school comments gathered from all school attendees.

The budget of Laserlab Europe III dedicated to this meeting accounts only for about 50% of the total cost of the event and was realized by means of an agreement between ILC and UPJS in Kosice.

The School of Biophotonics in Kosice has been a great success and was organised again in 2014 with EU funds (<http://www.biophysics.sk/en/event/13/confere-nce-s-c-h-o-o-l-o-f-b-i-o-p-h-o-t-o-n-i-c-s-2014>).



User Training School on Laser Applications in Spectroscopy, Industry and Medicine, Riga, Latvia, 9-12 April 2014

During the second reporting period, the Laserlab-Europe Training School for Potential Users “Laser Applications in Spectroscopy, Industry and Medicine” was organized by and held at the Institute for Solid State Physics, University of Latvia, in Riga, 9-12 April 2014.



In contrast to Thematic Training Schools, General Training Schools are organised with a larger number of participants from the broader community. They aim to introduce some of the basic know-how for laser users together with blocks dedicated to hands-on training and to introduce research-related soft skills, including know-how on writing a project proposal, academic writing skills, etc. The mission of the Laserlab Training School was also to introduce networking opportunities of the Transnational Access Programme provided by Laserlab-Europe for scientists in Europe. The intention was to build up a closer contact between users and technology providers, to establish and enhance cooperation among the European laboratories in the biomedical laser research and advancing the involvement of East European research teams in the international projects and programmes.

The school and conference in Riga was focused on the following topics:

- Laser physics and spectroscopy;
- Biophotonics;
- Optical materials and phenomena;
- Optics in communication;
- Vision science.

The event comprised a large and very international group of young scientists. The training school was organized in collaboration with the tenth annual Developments in Optics and Communications (DOC) conference for young scientists, and the Laserlab-Europe networking activities were actively supported by the local student chapters of the Optical Society of America (OSA) and SPIE. This combined format had been tried first in 2010 with good results, so that advantage was taken of the synergy between the two events again in 2014.

Statistics:

- Total number of participants at the combined event: 122
- Participants in the Laserlab laboratory training: 60
- Countries represented by participants and speakers: 20 (Sweden, Denmark, Ireland, Canada, Bulgaria, Turkey, Poland, Israel, Latvia, Lithuania, Italy, the Netherlands, Hungary, the United Kingdom, Portugal, Finland, Spain, France, Slovakia, and Switzerland).

- Institutes hosting the laboratory exercises:
 - o University of Latvia Laser Centre
 - o Institute of Atomic Physics and Spectroscopy, Biophotonics Laboratory
 - o University of Latvia Institute for Solid State Physics
- Laboratory exercises:
 - o “Doppler Free Saturated Laser Absorption Spectroscopy of Rubidium Atoms in Atomic Vapor Cell Using Ti:Sapphire Laser System”
 - o “Optically Detected Magnetic Resonance in Nitrogen Vacancy Centers”
 - o “Parallel measurements of in-vivo skin autofluorescence lifetimes and photobleaching rates”
 - o “Time resolved luminescence of solid state materials in sub-nanosecond region”
 - o “Luminescence of solid state materials excited by wavelength tunable laser”
- Presenters of invited talks:

Prof. Peter E. Andersen (Denmark), Prof. Jens Biegert (Spain), Dr. Dusan Chorvat (Slovak Republic), Dr. Margarida Pires (Portugal), Prof. Valdas Sirutkaitis (Lithuania), Dr. Brian Vohnsen (Republic of Ireland), Dr. Ing. Miķelis Svilans (Canada, Latvia), Dr. Oskars Ozoliņš (Latvia)
- Overall conference statistics:

The conference featured 8 invited talks and over 35 contributed talks in the fields of laser physics and spectroscopy, optics in communication, optical materials and phenomena, biophotonics, and vision science. In addition, 48 posters were presented in the poster session on the last day.
- Publicity: 4 press releases and 2 articles

The participants evaluated the event positively, they had the chance to network with other young scientists from many countries and to learn about other fields of physics and new experimental techniques. This opinion was shared by many participants and judged to be a valuable experience, which was confirmed by 95% of the participant survey respondents. A suggestion for future potential Users' Training Events was to provide longer events with more extensive laboratory work.

User Training School on Light-Based Technologies, Trnava, Slovakia, 2-4 September 2015

The Training School on Light-based technologies was organised jointly by the International Laser Centre (ILC), Bratislava, and the University of Ss. Cyril and Methodius, Trnava, Slovakia in the framework of the Laserlab-Europe User Community Training schools for potential users on 2-4 September 2015. The workshop was designed to attract new users who are not specialized in these technologies, but who have potential to use light-based technologies in their respective work: namely Ph.D. students and research assistants in organic and inorganic chemistry, material and sensoric sciences and biomedicine. The workshop put together an interesting international group of young scientists who, for the most, participated in a Laserlab Training School for the first time. The training school was held at the University of Ss. Cyril and Methodius in Trnava that offered the premises for the whole workshop free of charge. The Workshop refreshment was also supported in part by the ILC Slovak SPIE Student chapter.

Statistics:

- Total number of participants: 60
- Participants in the Laserlab hands-on: 32
- Number of speakers: 16
- Representatives from companies: 6 from 3 companies (Carl Zeiss, Kvant, SiProgs)
- Countries represented by participants – 21 (Slovakia: Trnava, Bratislava, Kosice, Zilina), 11 (Hungary, Lithuania, Germany, Italy, Netherlands, Portugal and Romania) and speakers – 10 (Slovakia: Trnava, Bratislava, Zilina), 6 (Hungary, Lithuania, Germany, Italy).
- Hands-on exercises:
 - o “Advanced imaging” by Carl Zeiss
 - o “Time-resolved measurements” by International Laser Center and Becker&Hickl.
 - o “3D printing” by SiProgs, s.r.o.
 - o “Light Spectrometry” by Kvant, s.r.o.
 - o “Academic writing” by International Laser Center.
- Presenters and topics of plenary talks:
 - o Antonio Pifferi, Politecnico di Milano, Italy: Time Domain Diffuse Optical Imaging and Spectroscopy.
 - o Geza Groma, Institute of Biophysics, Biological Research Centre, Szeged, Hungary: Time-resolved fluorescence and its applications in the study of biomolecular environment.
 - o Dusan Pudis, University of Zilina: Photonic crystals in nature, technology and devices.
 - o Emo Chiellini, University of Pisa, Italy: Latest advancement in bioactive polymeric materials and their applications in the biomedical field (presented by S. Miertus, UCM).
 - o Vytautas Purylys, Vilnius University, Lithuania: Laser Fabrication of 3D Polymeric Micro/Nanostructures in photopolymers and glass.
 - o In addition, a representative of ELI-ALPS, Dr. S. Kahaly presented at the Laserlab Workshop.
- Overall conference statistics:

The workshop featured 5 main blocks, Block I on Introduction to spectroscopy and imaging gave bases to modern spectroscopy techniques and their applications, including diffuse optical imaging and polarization imaging. Block II on Study of Biomolecules and their environment discussed time-resolution and its applications in the study of biomolecular environment. Block III featured micro and nano-structured optical sensors, their design and applications. Block IV gave overview of bioactive polymeric and phototunable materials, including basics on pulsed laser deposition, photonic crystals in



nature and application of bioactive polymeric materials in biomedicine. Finally, Block V brought an advanced information on biopolymers and 3D visualization, including laser fabrication of 3D polymeric structures and use of biopolymers as scaffolds for tissue engineering, as well as overview of 3D visualization and model creation. In these blocks, the workshop featured 5 plenary talks, 1 in each block and 10 contributed talks. In addition, multiple posters with the Year of Light 2015 motifs were presented throughout of the workshop.

- Feedback from the participants

Very well organized, good lectures, learned lots of new things, good opportunity to find the technique you need, very nice programme, enthusiastic.

- Suggestions for the future Potential Users' Training Events

Shorter lectures, more time for hands-on training exercises, more information on Laserlab facilities and job possibilities.

In the afternoons of September 3 and 4, five laboratory hands-on trainings were offered at UCM. Participants were separated to 5 groups, every group spending 1 hour at each location. The hands-on were preceded by company presentation of the individual setups. Stand 1 featured Advanced imaging, where participants could employ fluorescent microscope from Carl Zeiss for exploring numerous samples. Second setup on time-resolved measurements featured ILC setup from Becker&Hickl, giving users insight into the time-resolved dimension of fluorescent measurements. 3rd setup gave basic information on light spectrometry, featuring basic properties of light, its separation and spectral features. 4th setup on 3D printing featured two 3D printers where participants can design and make objects of their own choice and learn about preparation, design and fabrication of 3D objects. Last hands-on was focused on improving academic writing skills, necessary for preparation of scientific publications, as well as on research study and grant preparation.



In the evening, 3 parallel sessions were organized, Session 1 was focused at Academic writing and research study protocol preparation; Dr. L. Bacharova gave overview on how to improve preparation of scientific papers and grant applications. Session 2 featured panel discussed at Careers in light-based technologies: Ing. M. Buciova, the national contact point for Horizon 2020 gave presentation on Marie-Curie fellowships and other European opportunities, Dr. A. Marcek Chorvatova gave overview of activities in the framework of SPIE student chapters and Dr. S. Kahaly presented latest advancements in the creation of the ELI

infrastructure in Szeged, Hungary. At the Session 3, Dr D. Chorvat gave information on how to apply for grants allowing work at Laserlab facilities, as well as on planned happenings during the Year of Light activities in Slovakia and abroad. At the end of this session, participants filled questionnaire and received Certificates of Attendance at the congress.

The participants evaluated the event and its organization very positively, they had the opportunity to make new connections and exchange information with colleagues from different countries. In this International Year of Light 2015 and light-based technologies, the Laserlab user training workshop gave them an opportunity not only to comprehend light and technologies based on this phenomenon, but also to learn about numerous possible applications of light-based technologies in their respective fields.