



LASERLAB-EUROPE

The Integrated Initiative of European Laser Research Infrastructures V

Grant Agreement number: 871124

Work package 4 – NA3 – Training and Development of User Communities

Deliverable D4.1
Intermediate report on “User Training”

Lead Beneficiary: 13 – ILC

Due date: Month 24

Date of delivery: Month 24

Project webpage: www.laserlab-europe.eu

| <i>Deliverable Type</i> | | |
|----------------------------|--|----|
| R | Document, report | R |
| DEM | Demonstrator, pilot, prototype | |
| DEC | Websites, patent fillings, videos, etc. | |
| OTHER | | |
| ETHICS | Ethics requirement | |
| ORDP | Open Research Data Pilot | |
| DATA | data sets, microdata, etc. | |
| <i>Dissemination Level</i> | | |
| PU | Public, fully open, e.g. web | PU |
| CO | Confidential, restricted under conditions set out in Model Grant Agreement | |



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 871124.

1 Objectives

Engagement and stimulation of growth of future generations of users is one of the main tasks of Laserlab-Europe. This work package is dedicated to the development and coordination of user training activities as well as to the development of future user communities. The objectives are:

- to create a sustainable training platform for a new generation of researchers and technical staff, by increasing scientific excellence of the users in the field of photonics and laser-related research and its applications;
- to address professionals in geographic areas in Europe which display an under-representation of participation in the Laserlab-Europe access programme;
- to develop new laser user communities in domains of emerging and interdisciplinary science such as nano/biophotonics, ICT, materials research, biomedicine and biotechnology, environmental sciences, etc.;
- to create a virtual framework for information sharing related to education and training of users, exploiting available and newly developed multimedia content and e-learning materials.

Lead beneficiary: ILC

2 Task 1: User Training Schools

Task leader: ILC

The activity is focused on the development of a series of training schools with high quality standards, which shall provide a recognisable and sustainable Laserlab-Europe brand identifier, contribute to attract new users and build new generations of researchers and engineers. It addresses the optimum use of top-scale access-providing laser facilities and builds on past experience of Laserlab-Europe hands-on training activities in both advanced experimental techniques and theoretical approaches of data analysis. Following annual calls for proposals, the Laserlab-Europe user training schools are selected by the Networking Board.

As this activity was planned to be based on access to laboratories for hands-on training, this task was significantly affected by the COVID-19 restrictions. Therefore, the first call for training schools was issued only when it became clear that in-person training would not be feasible in the short term and that the format of user training events would have to be adapted to offer an alternative as long as the pandemic persists. Following the first successful online training event (see below), a second call was issued for training events to be implemented during the third year of implementation of the project, either in online or in-person format.

User Training Workshop on Data Analysis in Time-Resolved Imaging and Spectroscopy, 27 May 2021, online event

To cope with the COVID-19-related pandemic situation, a new format was designed in order to continue the user training activities. For the first time, a User Training Workshop on Data Analysis in Time-Resolved Imaging and Spectroscopy (TRIS) was organised fully online by the International Laser Centre of CSTI SR (ILC), Bratislava.



Thematically, the workshop focused on different data analysis approaches in time-resolved technologies of imaging and spectroscopy and their applications in medicine, biology, chemistry, materials and sensoric sciences for future users of Laserlab-Europe. Particular



emphasis was given to practical implementation of time-resolved techniques related to biomedical imaging, and especially to time-resolved fluorescence lifetime imaging (FLIM).

The objectives of the workshop were:

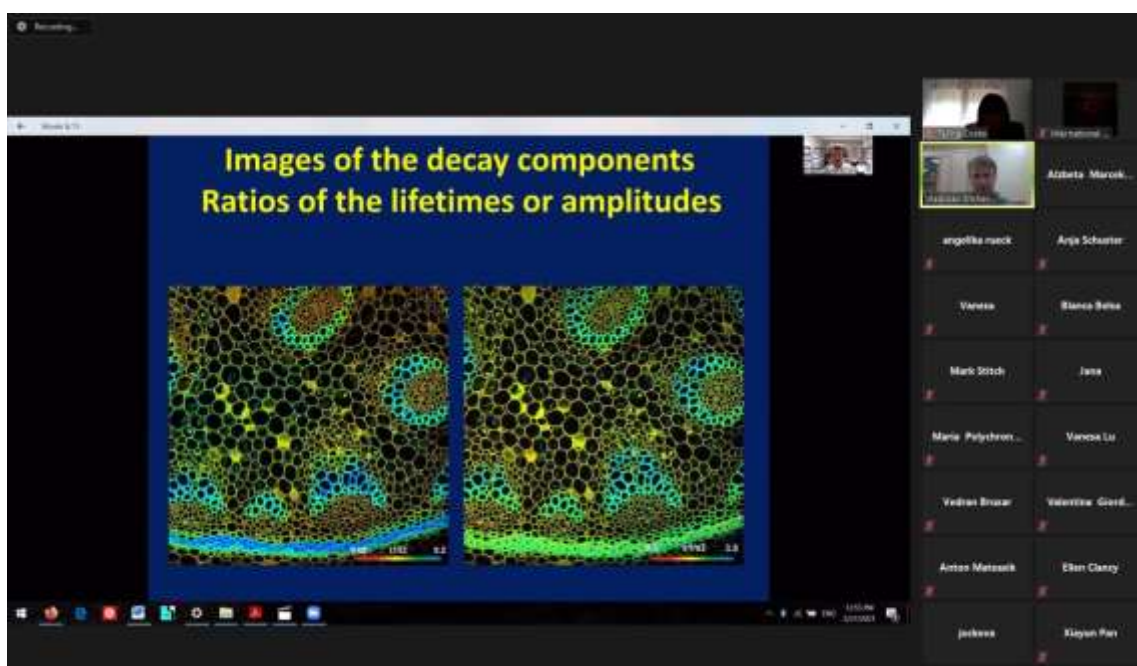
- to attract new users of Laserlab-Europe services and train a new generation of researchers to employ time-resolved technologies in their professional studies;
- to gather the general basics on concepts of time-resolution in photonics applications, namely time-resolved spectroscopy and imaging;
- to acquire an overview of the state-of the art of time-resolved technologies and their applications in medicine, biology, chemistry and materials sciences;
- to build a network of new potential users within the European laser community, to exchange knowledge among participants and initiate collaborations.

The one-day workshop consisted of 2 main blocks of lectures, followed by a block of hands-on training sessions. Block I provided participants with a basic introduction to modern time-resolved detection techniques and their applications in spectroscopy and imaging. Block II was focused on various applications such as fluorescence lifetime imaging (FLIM), time-resolved image processing, as well as time- and angle-resolved photoelectron spectroscopy. Block III consisted of three successive hands-on sessions, each for a different set of participants, which were dedicated to practical analysis of complex time-resolved data. The topics of the hands-on exercises were:

1. FLIM of cells, tissues, and whole animals (fireflies)
2. Autofluorescence of plants and algae (chlorophyll)
3. NAD(P)H spectroscopy in live cells and various solvents

These sessions allowed the participants to remotely access ILC computer workstations running FLIM data analysis softwares. Due to time constraints, discussions on specific issues raised by the attendees, which was planned to be included in the afternoon programme, was moved to separate online sessions on the following days.

The workshop brought together an interesting international group of almost 20 students, scientists and professionals. Feedbacks from the participants on the event and its organisation were positive. In spite of the wide range of the attendees' professional profiles, the information and experience gathered was considered to be scientifically interesting and helpful.



Lecture – Vladislav Shcheslavskiy (Becker-Hickl / PIMU University, Nizhny Novgorod, Russia)



Lecture – Angelika Rück (University of Ulm, Germany)

Lecture – Oleg Kornilov (MBI Germany)

The programme is available at <https://www.laserlab-europe.eu/events-1/laserlab-events/2021/training-workshop-data-analysis-in-time-resolved-imaging-and-spectroscopy>



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Data Analysis in Time-Resolved Imaging and Spectroscopy

| Thursday May 27 | |
|--------------------|---|
| 9:00 – 9:10 | Workshop Opening Welcome and general information |
| Block I. | INTRODUCTION TO TIME-RESOLVED SPECTROSCOPY AND IMAGING |
| 9:10 – 9:40 | Time-resolved techniques in material and biological sciences Jens Biegert (ICFO, Spain), Dusan Chorvat (ILC CSTI-SR, Slovakia) |
| 9:40 – 10:15 | Analysis of time-resolved spectra Dusan Chorvat (ILC CSTI SR, Slovakia) |
| 10:15 – 10:50 | Introduction to time-resolved imaging Alzbeta Marcek Chorvatova (ILC CSTI SR, Slovakia) |
| 10:50 – 11.00 | <i>Coffee break</i> |
| Block II. | ADVANCED TIME-RESOLVED TECHNIQUES |
| 11:00 – 11:45 | New algorithms in metabolic FLIM and oxygen induced PLIM Angelika Rück (University of Ulm, Germany) |
| 11:45 – 12:30 | Advanced FLIM data analysis and applications Vladislav Shcheslavskiy (Becker-Hickl / PIMU University, Nizhny Novgorod, Russia) |
| 12:30 – 13:15 | <i>Lunch</i> |
| 13:15 – 14:00 | Computer-aided analysis of multi-modal image data Anton Mateasik (ILC CSTI SR, Slovakia) |
| 14:00 – 14:45 | Time- and angle-resolved photoelectron spectroscopy Oleg Kornilov (MBI Germany) |
| 14:45 – 15.00 | <i>Coffee break</i> |
| Block III. | HANDS-ON USER TRAINING |
| 15:00 – 16:00 | Hands-on user training I. Remote access to FLIM and time-resolved spectra analysis |
| 16:00 – 17:00 | Hands-on user training II. (same as session I., different participants) |
| 17:00 – 18:00 | Hands-on user training III. (same as session I., different participants) |
| Round table | DISCUSSION |
| 18:00 – 18:30 | Round table |
| 18:30 | Workshop Closing |



3 Task 2: E-learning and Education

Task leader: FVB-MBI

The task aims at broadening the impact of the Laserlab-Europe human resources development activities through the creation of training videos from the user training schools and through the identification of relevant existing e-learning materials in collaboration with “NA2 – Scientific and Technological Exchanges, Task 5 Thematic Networks”. This initiative permits reaching the entire community, irrespective of geographical or thematic focus of training events, thus increasing effectiveness.

The lectures from the User-Training Workshop on Data Analysis in Time-Resolved Imaging and Spectroscopy (TRIS) are available online in the Laserlab-Europe cloud, for internal use of Laserlab-Europe members and participants in the training event.

A collection of links to existing e-learning materials of interest or use to Laserlab Europe users has been put on the Laserlab webpage.

Presentations of the offers of access providing facilities are under preparation and will be made available shortly, starting with the facilities that have been added to the previously existing offer at the start of the present project, i.e. CLPU, HiLASE, HZDR and LACUS.

E-learning

Online learning materials potentially of interest or use to Laserlab Europe users.

Some of the Laserlab Europe partner organisations have made course material available online, and users are invited to see whether this might be of interest to them.

Recurring Tutorials from Science@FELs

The first tutorial was held in March 2021. Upcoming tutorials: September 6, October 4 and November 8, 2021
 If you are interested, please register at www.desy.de/foetutorials
 NB: the Zoom-link will be sent along with the registration confirmation via Email.

Lecture courses and Workshops

PaNOSC e-learning platform, offering courses on photon and neutron scattering along with how to use python code or software for data reduction and modelling.

EPFL and the University of Geneva, [International Online Workshop: Electrons, Photons and Plasmons](#) (in English) March 10-12, enrolment closed.

CNRS are running an [online edition of the Femto-UP school](#) (in English). Preparation opens March 1st, courses begin March 4th, enrolment closed.

EPFL, an introduction to plasma physics (in English). Recurring course, next session begins July 29th, ongoing for 8 weeks. Recurring course, next session b

EPFL, on applications of plasma physics (in English). Recurring course, next session begins July 29th, ongoing for 10 weeks

EPFL, on image processing and analysis for life scientists (in English). Recurring course, next session begins July 29th, ongoing for 7 weeks.

European Theoretical Spectroscopy Facility, a [collection of modules](#) covering various aspects of spectroscopic theory (currently being expanded, in English)

Université Paris-Saclay, a series of seminars ("MOOC") covering nanoscience and nanotechnology along with its technical applications from biomedicine to physics (in French and English) enrolment closed.

Université Paris-Saclay, a series of seminars ("MOOC") discussing the fundamentals of x-ray crystallography (in French and English) 2 November 2020 - 16 January 2021, enrolment closed.

Short Presentations

[Instructional materials based on the Q-Chem/QMol software](#). This page contains instructions how to use Q-Chem for teaching via the QMol interface, links to tutorials, manuals, videos, as well as a selection of computational assignments that can be given to students as homework or in-class exercises. For low-volume users, Q-Chem offers a free service: such users can submit short Q-Chem jobs (up to 5 min) to the Q-Chem server without purchasing a license.

Centro de Láseres Pulsados, a series on the [basics of pulsed lasers](#) (in Spanish).

Wigner Research Centre for Physics, a [series of presentations](#) aimed to the general public (in Hungarian).

Videos

Q-Chem, a comprehensive ab initio quantum chemistry software for accurate predictions of molecular structures, reactivities, and vibrational, electronic and NMR spectra: "Teaching with Q-Chem" webinar recording

HiLase Centre Webinars on [laser-induced damage thresholds](#), on [thermo-optical modelling of optical components](#), and on [developing a](#)

