



## LASERLAB-EUROPE

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

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Work package 7 – NA6 – International Relations

Deliverable D7.1

Report on International Relations

Lead Beneficiary: 30 – LLE-AISBL

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<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	



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## 1 Overall work package objectives

The objective of this work package is to establish links to laser-related communities and networks outside Europe with the aim to promote laser science and research beyond the ERA, to exchange information on best practices between research infrastructures, and to promote access opportunities offered by Laserlab-Europe to non-European users.

## 2 Task 1: Relations with International Laser Networks and Societies

Task leader: CNRS-LULI together with LU

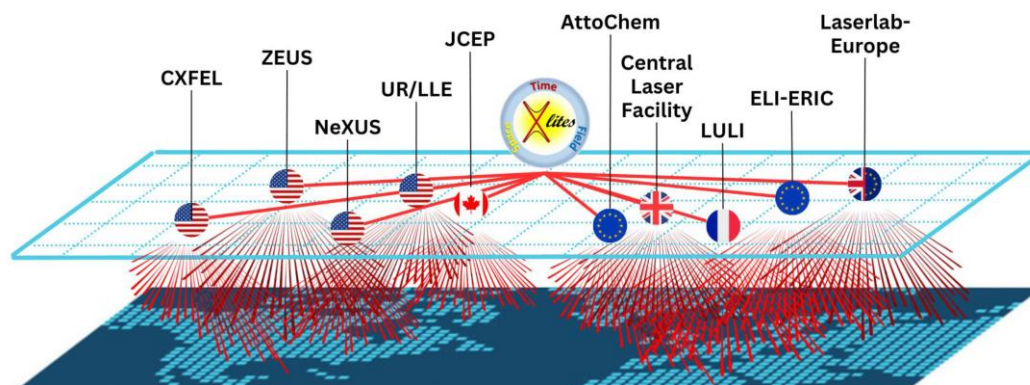
Laserlab-Europe aims at strengthening links with international laser and laser-oriented societies and networks in regions outside Europe. Among the identified networks, special emphasis has been placed on LaserNetUS in the United States of America and with the Asian Intense Laser Network (AILN).

LaserNetUS is a consortium of 12 high-intensity laser facilities and 1 supporting lab in North America (<https://lasernetus.org>). AILN is an organization established to promote the collaboration among Asian research groups in intense laser science and technology. In response to the opening of the Laserlab-Europe transnational access programme to international users, LaserNetUS and AILN have opened their calls in order to provide access free of charge to some of their facilities to European Users. In addition, representatives of these international networks are invited to Laserlab-Europe thematic workshops in order to share best practices and knowledge.

A Memorandum of Understanding between Laserlab-Europe and the US Department of Energy (DoE), which is organizing and funding LaserNetUS, has been drafted, with the aim to facilitate cooperation and to establish programmes of staff and student exchange as well as collaborations in areas of mutual interest and benefit to both partners. Unfortunately, such an MoU can only be signed between governmental entities (i.e. the European Commission and the DoE) or through bilateral MoUs between Laserlab-Europe and LaserNetUS nodes.

Even without a formal framework, collaborations were engaged. LaserNetUS representatives attended, for instance, the NEILS meeting in 2021 and Laserlab-Europe was invited to participate to the in the assessment of the field of high-energy-density physics conducted by the US National Academy of Sciences.

Laserlab-Europe has joined the *X-lites* network of networks, recently awarded sponsor support by the National Science Foundation. *X-lites* (Extreme Light in Intensity, Time and Space) aims at addressing the challenges and opportunities of laser-matter coherent interactions at the highest intensities, fastest times and shortest distances through workshops and personnel exchanges.



AILN being less centralised, only individual contacts have been established with some of its members, such as the Center for Relativistic Laser Science in South Korea. In addition, the Scientific Coordinator of Laserlab-Europe was invited to participate to the Program Committee



of the major Asian event, the annual conference of the Asia-Pacific Conference on Plasma Physics.

Links with international entities such as the International Committee on Ultrahigh Intensity Lasers (ICUIL) were also reinforced. ICUIL finds its members predominantly in North America, in the Asian/Pacific Area, and in Europe, where the members are almost exclusively members of Laserlab-Europe, making the consortium a natural and strong ICUIL partner. As an example, the ICUIL chair, one of the two co-chairs and the treasurer are representatives of Laserlab-Europe partners or key researchers from these labs. In return for their commitments, Laserlab-Europe benefits from participation in the ICUIL activities and conferences, from the close interaction with non-European laser research infrastructures, and from new scientific directions, which are being pursued on a global level, such as novel laser-based particle accelerators.

In 2024, ICUIL has launched two prizes, one for early career scientists and one for outstanding contributions in ultra-high intensity laser science and technology. This latter was awarded to U. Schramm (HZDR), one of the key partners of the Laserlab-Europe consortium.

The International Conference on Ultrahigh Intensity Lasers in 2022 (ICUIL2022) was held in the Jeju Island, Korea, with two keynote speakers as well as three invited speakers from Laserlab-Europe. The 10<sup>th</sup> International Conference on Ultrahigh Intensity Lasers (ICUIL2024) took place on the island of Cozumel, Mexico on 9-13 September 2024. It was the first of this series of conferences to be held in Latin America, recognizing the significant interest of many researchers in the region.

The ICUIL map of ultra-high intensity laser facilities worldwide – including the Laserlab-Europe research infrastructures – has been updated in 2020 and is available on the ICUIL website (<https://www.icuil.org>). A new version will be prepared for 2025.

The ICUIL newsletter provides opportunities for the Laserlab-Europe facilities to display their most recent developments and for the Consortium as a whole to present its access offer and publications (such as the European Laser Science and Technology Landscape and Roadmap).

Finally, the ICUIL2024 conference provided the opportunity to initiate contacts with the Clúster Mexicano de Fotónica whose President was one of the organizers of the event.

### **3 Task 2: Relations with Centres and Institutes in other Global Regions**

Task leader: LLE-AISBL

Extensive links exist with research centres and facilities in the Americas (with the United States, Argentina, Brazil, Ecuador, Peru and Mexico), in Asia (with Japan, China, South Korea and India), in Africa (with South Africa) and with Australia and Russia. The aim is to strengthen and consolidate the links by promoting user-training activities, staff exchange possibilities and especially access possibilities offered by Laserlab-Europe through personal and on-site attendance at meetings and conferences in these countries, or through lecture and panel participation activities in which Laserlab-Europe is promoted.

Below a few examples of such long-term links and collaborations are given.

#### Asia

LLAMS has strong ties with the Raman spectroscopy community in India, where Dr Freek Ariese (Director LLAMS) spent three years as visiting professor at the Indian Institute of Science in Bangalore.

CNRS-LULI has, through Ecole Polytechnique, a collaboration agreement with the Osaka University (Japan) which aims at promoting regular exchanges of professors and students through experimental campaigns on the LULI200 facility and on Japanese research infrastructures (either GekkoXII at the Institute for Laser Engineering, Osaka, or SACLA). The



development of a LiF-based x-ray detector (PRISES task 3.2) is partly done thanks to this collaboration.

LLC staff members held part-time appointments for several years at the South China Normal University (SCNU), Guangzhou, resulting in many joint publications and exchange of personnel. LLC is also part of a joint research center on spectroscopy for agricultural applications together with Henan Agricultural University, Zhengzhou, and SCNU.

LP3 is collaborating with XIOPM - Xian (China) on Bessel beam fs - dielectric structuration.

#### Latin America

Coimbra Laser Lab established relations with Brazilian research centres / universities, based on the interest in molecular spectroscopy and molecular interaction with bio-macromolecules, using ultrafast spectroscopy and time resolved fluorescence facilities (femto laser pumped) and photoacoustic calorimetry (pico and nanosecond pulsed laser pumped). CLL also has a long-standing cooperation with Prof. Vanderlei Bagnato, at the University of São Paulo (Brazil), from which two patents resulted and a project was submitted to Globalstars Brazil – Eureka network.

CLPU is collaborating with the Centre for Bioinformatics and Photonics, Colombia, the University of Buenos Aires and the Centro de Investigaciones Opticas, both in Argentina. Training events organised by CLPU regularly involve students from Mexico, Argentina and other third countries.

#### North America

CEA-CESTA has long term relationships with LLE (Laboratory for Laser Energetics, University of Rochester, NY, USA) and LLNL (Lawrence Livermore National Laboratory, CA, USA) on laser technologies, optical components and laser simulations, laser-plasma experiments and plasma diagnostics development. CEA-CESTA participates in the International Laser Operations Workshops and hosted the 14<sup>th</sup> edition of the International Laser Operations Workshop (ILOW) at the LMJ facility in France, in collaboration with CNRS-LULI who opened the APOLLON facility for a tour.

LP3 is collaborating with the University at Buffalo (USA) on nanoparticles and their use to fight cancer.

#### Africa and Middle East

ICFO is one of the hosting institutions in Spain for sabbatical fellowships for senior African women researchers. Annual calls of the Science by Women programme, established by the Women for Africa Foundation, are launched. The programme aims at promoting African women's leadership in scientific research and technology transfer and at fostering the capacity of research centres in their home countries. Egypt, Zimbabwe, Cameroon and South Africa were the home countries of the fellows hosted by ICFO.

LP3 is collaborating with University of Oran (Algeria) on LIBS and applications.

LLC has a history of supporting teaching, research and technology transfer related to optics, lasers and spectroscopy in developing countries, for example in Africa. Due to the pandemic, these activities were put on hold during 2020 and 2021, but resumed in 2022.

In March 2022, a workshop was held at University of Cape Coast (UCC), Ghana, hosted by Prof. Benjamin Andersson (sandwich alumni from the LLC). Participants included MSc. and PhD. students from UCC and two PhD students from Institut National Polytechnique Félix Houphouët-Boigny, Yammousoukro, Ivory Coast. Co-organizers and teachers were from the Lund Laser Centre (PhD. cand. Hampus Månefjord and Ass. Professor Mikkel Brydegaard). The workshop was one in a row organized by the African Spectral Imaging Network (AFSIN), supported by International Science Program (ISP), Uppsala, Sweden. In addition, the preparations (at the LLC) of these workshops are supported by a development grant from Swedish Research Council. The workshops aimed to support the African physics community



through capacity building and to provide realistic instrumentation which can serve as experimental platforms to pursue master and doctoral thesis work. The 2022 AFSIN workshop in Ghana included development of a 7-dimensional camera for studying light interaction with biological samples<sup>1</sup>. The workshop also covered 3D printing and field tests of a hyperspectral lidar system for vegetation analysis<sup>2</sup>. There are only a handful of truly hyperspectral lidar systems worldwide (resolving both range, photon energy and time), all of which build with expertise. The technology transfer to Ghana, resulting from this workshop, is remarkable since it can be replicated at low cost, operated in full daylight and achieve cm range resolution, 70 independent spectral bands and sample rates up to 120 Hz. The work is co-published with African colleagues.

Lastly, Laserlab-Europe was invited to participate in the event “Frontier Sciences and Technologies for Africa” to be held in Namibia, Windhoek in October 2025.

### Ukraine

Collaboration with Ukrainian scientists takes place mostly on topical basis, e.g. within the expert groups, as far as this is possible in view of destroyed laboratories. Individual Ukrainian scientists are working at partners in the consortium (e.g. in a theory group at MBI), depending on their expertise, but are not directly involved in the project tasks. In addition, Ukrainian scientists submitted access proposals and carried out experiments at Laserlab-Europe laboratories.

CEA-LIDYL and Laserlab-Europe AISBL are participants in the EURIZON project (2020-2025), which, after restructuring, focusses on coordination and support measures dedicated to support Ukrainian scientists and Ukrainian RIs. All training opportunities in Laserlab-Europe have been promoted towards Ukrainian scientists via the EURIZON project and have met with interest, even though sometimes participation was not possible due to travel restrictions.

Several project members, e.g. LLC and USZ, participate in the LASCALA master programme together with the Princeton University (USA) and the Weizmann Institute (Israel). LASCALA aims at training experts in the most advanced experimental and theoretical tools and concepts in accelerators, high power lasers and associated advanced sources, as well as in their applications for science and society. Students from more than 40 countries from all over the world benefitted from the programme. In the case of LLC, 50% of all LASCALA students that came to Lund were non-European.

An outcome of these international promotional activities is a sustained demand from “international” users for access to Laserlab-Europe facilities, an opportunity very much welcome by the Laserlab-Europe partners who collaborate with communities within and outside the EU (see deliverable D5.2).

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<sup>1</sup> H. Månefjord *et al.*, Rev. Sci. Instrum 93, 113709, 2022

<sup>2</sup> R. Boateng *et al.*, IEEE J. Sel. Top. Quant. Electron., 2023

