

Activities Report

2024





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1. INTRODUCTION

In 2024, the facility's main activity was defined by the progress of the project Construction and Equipment of Experimental Area 2 (AREX 2), a cornerstone initiative that will significantly enhance the Centre's added value while also impacting operational work with the VEGA system. This development required restricted planning of user access — with no competitive access calls during the year — and continuous adjustments to operations. Also noteworthy in 2024 was the authorisation of the Centre's new Radiation Protection Service and the approval, by the Nuclear Safety Council, of VEGA-3 as a new neutron-generation source. Finally, we would like to highlight the 16% increase in staff compared to the previous year, bringing the total workforce to 58 employees at the end of 2024.





2. VEGA UNIQUE INFRASTRUCTURE

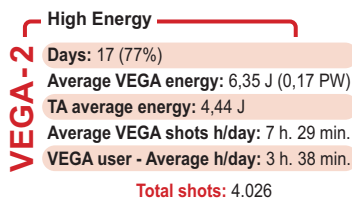
a. Experimental Campaigns

In 2024, the experimental activity of the Spanish Center for Pulsed Lasers (CLPU) was shaped by the postponed start of the facility's expansion works under the AREX2 project. Consequently, and given that no user access call was launched, for the aforementioned reason, it was deemed necessary to sustain operations until the beginning of the works by offering non-competitive access of a strategic nature: either towards the CLPU's own scientific and technical development, in support of similar facilities, or to foster the advancement of ongoing research lines, such as radioisotope production and the study of plasmas under extreme conditions.

Betatron source characterization through spectral noise fluctuation

The year opened with an experimental campaign led by the Head of the Scientific Area, Giancarlo Gatti, conducted in collaboration with the Istituto Nazionale di Fisica Nucleare (Laboratori Nazionali di Frascati) and Sapienza University of Rome (Italy) between 22 January and 16 February. The VEGA-2 system operated for an average of more than three hours per day, delivering a mean energy output of 4.44 joules in the experimental area.

Goal: Laser Wakefield Acceleration (LWFA) is a plasma-based electron acceleration technique widely regarded by the scientific community as highly promising. Betatron radiation, an X-ray source of considerable interest, arises naturally from the restoring forces within plasma channels. It is characterised by its ultrashort temporal duration and spatial coherence. This project aims to characterise both the temporal profile and the XUV emission range using methods based on noise fluctuations, such as shot-noise analysis.



This experimental research has played a key role in several of the Centre's initiatives.: the project 'Hybrid prototype base on laser boost of a Linac to obtain a ultrahigh high dose rate in radiotherapy', (Proof of Concept 2021 – 120933-



Daniele Francescone / La Sapienza Univ. di Roma

100), funded by the Spanish Ministry of Science and Innovation through the PRTR programme (co-funded by the European Union – Next Generation EU); the European project EuPRAXIA, selected for the 2021 update of the European Strategy Forum on Research Infrastructures (ESFRI) Roadmap; and as part of the joint research activity within the Laserlab-Europe project "PRImary and SEcondary Sources (bottlenecks, metrology, diagnostics tools) and advanced application workstations (PRISES)".

Daniele Francescone, a PhD student at Sapienza University of Rome and collaborator in the experiment, described the details of the study in an interview published on the Centre's official YouTube channel. The interview was produced for 'Pixels', a multimedia initiative of the CLPU's Scientific Culture and Innovation Unit, in collaboration with the Spanish Foundation for Science and Technology (FECYT) – Ministry of Science, Innovation and Universities:

https://youtu.be/mRGfmDmf_4k?si=xdDY6j2mTdPqWwnu

Study of the response of commercial CMOS sensors to relativistic electrons, gamma and betatron radiation

Afterwards, within the framework of the research and technology transfer project "Development and testing of new compact and low-cost CMOS technology systems for neutron, ionising radiation and charged-particle dosimetry"—an R&D project funded by the Spanish Nuclear Safety Council (CSN)—CLPU Senior Researcher Jon I. Apiñaniz led the experimental campaign "Study of the response of commercial CMOS sensors to relativistic electrons, gamma and betatron radiation", carried out exclusively by facility staff with the VEGA-2 laser.

Goal: The management of targets and diagnostics in high-repetition, high-intensity laser experiments remains one of the main challenges to be addressed and is currently the focus of development efforts within the scientific community. The CLPU is strongly engaged in this type of activity.

VEGA-2	High Energy
	Days: 4 (100%)
	Average VEGA energy: 6,54 J (0,19 PW)
	TA average energy: 4,58 J
	Average VEGA shots h/day: 5 h. 22 min.
	VEGA user - Average h/day: 2 h. 48 min.
	Total shots: 563

In more detail, conventional detectors do not allow for multi-shot operation and, in many cases, require complex and expensive equipment—costing tens of thousands of euros—with additional constraints such as cooling systems and high-voltage operation that limit their applicability.

CMOS imaging sensors represent the most viable commercial solution for visible-light detection, offering high resolution, high repetition rate, reduced cost (on the order of a few hundred euros) and ease of use. These sensors are expected to be sensitive to X-rays as well, although only a few studies have so far explored the use of CMOS technology for X-ray and particle detection. This project aims to investigate the response of commercial CMOS detectors to proton, electron and X-ray pulses in a laser-plasma experimental environment.

With an average use of nearly three hours per day in the experimental area, the campaign—conducted over four days, from 26 February to 1 March—recorded more than five hundred laser shots.

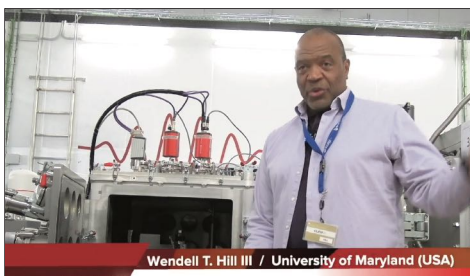
Diagnostics for quantitative assessment of spatiotemporal overlap of two-petawatt-class (PWC) pulses and the spatial quality of the focus of PWC pulses

From 11 to 22 March, a joint experimental campaign was carried out by the University of Maryland (United States), the University of Alberta (Canada) and the University of Salamanca (Spain), in collaboration with the Spanish Centre for Pulsed Lasers (CLPU), using the petawatt output of the unique VEGA laser system.

Goal: to characterise the spatio-temporal scheme of VEGA-3's double-pulse configuration. The spatio-temporal study will investigate the acceleration and expulsion of electrons in residual gases driven by

the laser's ponderomotive force through two complementary tests: by varying the delay between pulses within different ranges, and by introducing controlled distortions with a deformable mirror. This approach will allow the intensity distribution of the two pulses to be characterised and optimised.

The details of this experiment—which involved more than 3,500 laser shots—were explained by the scientist who led it, Professor Wendell



T. Hill III from the University of Maryland, in an interview produced for Pixels [an activity of the CLPU's Scientific Culture and Innovation Unit, in collaboration with the Spanish Foundation for Science and Technology (FECYT) – Ministry of Science, Innovation and Universities], and published on the Centre's official YouTube channel:

<https://youtu.be/CQawBuWbc8g?si=HouLSEc0zbp2nLYJ>

High-repetition rate laser-plasma interaction and production of radioisotopes

This experimental campaign, conducted from 9 to 19 April on the VEGA-3 system, was led by Professor Dimitri Batani from the University of Bordeaux (France). The experiment was carried out jointly with seven institutions: CELIA (France); ELI-Beamlines (Czech Republic); Texas A&M University (United States); the Institute of Plasma Physics and Laser Microfusion (Poland); and, in Spain, the University of Santiago de Compostela, the Galician

VEGA-3	High Energy
	Days: 10 (83,3%)
	Average VEGA energy: 34,55 J (1 PW)
	TA average energy: 25,57 J
	Average VEGA shots h/day: 7 h. 18 min.
VEGA user -	Average h/day: 5 h. 17 min.
	Total shots: 3.734

VEGA-3	High Energy
	Days: 13 (100%)
	Average VEGA energy: 35,58 J (1,09 PW)
	TA average energy: 27,81 J
	Average VEGA shots h/day: 8 h. 2 min.
VEGA user -	Average h/day: 5 h. 14 min.
	Total shots: 8.228

Institute of High Energy Physics (IGFAE) and the Spanish Centre for Pulsed Lasers.

Goal: The objective of this campaign was the production of radioisotopes through laser-matter interaction, using VEGA-2 (short focal length) and VEGA-3 (long focal length) configurations. The process aimed to induce alpha-particle generation via the proton-boron nuclear reaction. Due to the limitations of the target positioning system, the experiment was conducted at the maximum repetition rate of 1 Hz, allowing for the acquisition of statistically significant data. A pitcher-catcher configuration was employed, in which the first target element is refreshed while the second remains static. The measurement of radioisotopes was performed using the CLPU's germanium detector.

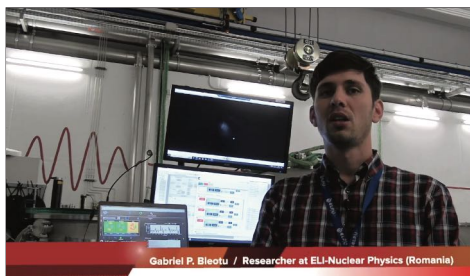
During the experiment, the laser system was fired more than 8,000 times, achieving an average power of 1.09 PW in VEGA and a corresponding energy of 27.81 J in the experimental area. Part of the experimental cost was covered by the project LASCAN – Production de radioisotopes par laser, led by the University of Bordeaux (France).

Pulse post-compression at the 200 TW station at CLPU

This experimental campaign was led by researchers from ELI-Nuclear Physics (Romania), in collaboration with members of the Centro de Láseres Pulsados (CLPU) and researchers from the Laboratoire

VEGA-2 High Energy

- Days:** 14 (87,5%)
- Average VEGA energy:** 6,68 J (0,19 PW)
- TA average energy:** 4,67 J
- Average VEGA shots h/day:** 11 h. 21 min.
- VEGA user - Average h/day:** 4 h. 44 min.
- Total shots:** 339.000



Gabriel P. Bleotu / Researcher at ELI-Nuclear Physics (Romania)

d'Optique Appliquée (France). The team operated the VEGA-2 system for an average of nearly five hours per day, completing a total of 339,000 laser shots from 13 to 24 May.

Goal: The field of high-intensity laser research and

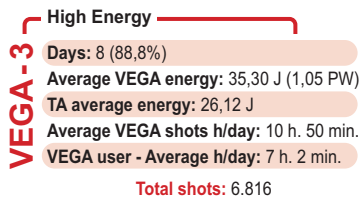
development is constantly evolving, driven by the need to provide effective sources of neutrons, ions and radioisotopes for therapeutic applications. The scalability of these sources relies on the achievable laser intensity, which makes it essential to invest in schemes that shorten pulse duration and increase energy levels. The first step of the experiment is to achieve pulse post-compression down to around 10 femtoseconds using a transparent plate and chirped mirrors. This requires highly precise temporal and spatial characterisation, compensating for dispersion terms through an acousto-optic crystal (Dazzler) and for aberrations using a deformable mirror. The campaign extends previous work performed at the one-joule level to multi-joule operation.

Further details about this experiment can be found on the CLPU's official YouTube channel, where ELI-NP researcher Gabriel P. Bleotu explained the purpose of the campaign, its relevance and its implications for the scientific community.

(<https://youtu.be/8FAgEjAc1CY?si=5cE1mVtdBQQROsVi>)

Commissioning of a neutron source generated from VEGA-3

This experiment is closely related to the procedures required to obtain authorisation from the Spanish Nuclear Safety Council (CSN) for neutron generation using the petawatt output of the unique VEGA laser system. Led by José Manuel Álvarez, Head of the CLPU's Radiological Protection Service, this campaign was the most collaborative undertaken in 2024, bringing together fourteen researchers on site from nine different institutions, most of them national. These included the Institute of Microelectronics of Barcelona, the Polytechnic University of Madrid, the Polytechnic University of Catalonia, the Institute of Corpuscular Physics, the University of Santiago de Compostela, the Centre for Energy, Environmental and Technological Research (CIE-MAT), the Institute for Molecular Imaging Instrumentation, the Autonomous University of Barcelona, and the Chilean Nuclear Energy Commission.



Goal: The campaign aimed to commission the neutron source, following the pre-operational tests carried out during a previous experimental phase. The experiment ran for just over a week in mid-June, during which more than 6,000 laser shots were fired, delivering an average energy of 26.12 joules in the experimental area.

Isochrone transport of selected proton beams

This was the last non-competitive strategic campaign conducted in 2024. Held from 15 to 30 July, it brought together researchers from two Spanish institutions — the Spanish Centre for Pulsed Lasers (CLPU) and the Polytechnic University of Madrid — and one from the United States, the Princeton Plasma Physics Laboratory.

Goal: Recent developments in the field of high-intensity lasers have led to new methods for proton generation that can be applied to studies of high-energy-density physics

(HEDP). However, the capture, selection and transport of these particle beams still pose significant challenges. In this campaign, a transport scheme using an isochronous magnet was tested. This setup is capable of selecting a specific

angular and energy window while simultaneously controlling the temporal dispersion of the source. The intended application of the transported beam focuses on the study of high-energy-density plasma physics (Warm Dense Matter) near the Bragg peak (1 MeV). The isochronous magnet can also be employed for higher-energy protons to investigate energy deposition in cold matter and biological tissues. This campaign made full use of the available high-energy operation days of VEGA-3. In the experimental area, an average energy of 26.27 joules was achieved, corresponding to 1.02 PW at the VEGA source.

VEGA-3 High Energy

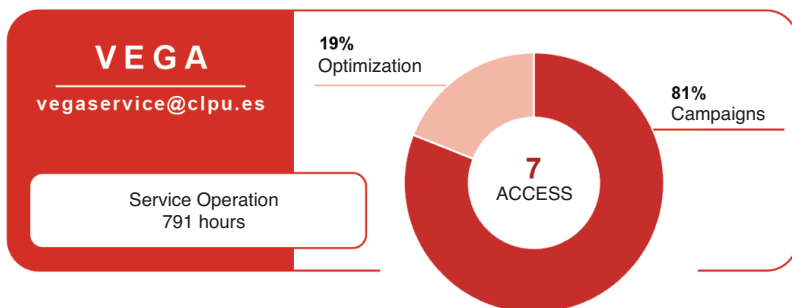
Days: 12 (100%)
Average VEGA energy: 35,49 J (1,02 PW)
TA average energy: 26,27 J
Average VEGA shots h/day: 2 h. 29 min.
VEGA user - Average h/day: 2 h. 15 min.
Total shots: 689



VEGA
CLPU PW LASER SYSTEM



Summary of VEGA access



In addition to these access opportunities, the CLPU also takes part in a number of European projects that facilitate researchers' mobility and their experimental access to different partner infrastructures within various research and development networks:

Laserlab Europe V (LL-V)

Goal

Laserlab Europe V marked the consolidation of Laserlab Europe AISBL, an association bringing together a European consortium of 47 leading laser laboratories across 22 countries. The association is dedicated to advancing laser technologies in Europe and strengthening the continent's leadership in laser science and technology. Most of its members provide open access to their facilities through a network-based, centralized access system. Although the project officially ended in November 2024, the association continues to operate, preserving the spirit and collaborative vision of the European initiative.

Actions

The CLPU's participation as a user-oriented laser facility focuses on providing experimental access to its infrastructure for the international scientific and technical community. In 2024, however, none of the previously mentioned access activities were proposed for co-funding under the Transnational Access programme. It is worth noting the five scientific publica-

tions from 2024 linked to this project through access to the VEGA system, along with five additional papers associated with the Joint Research Activities [see Publications section]. Furthermore, several staff exchanges were carried out within the framework of the Staff Exchange programme [see Training section for details]



Radiation Facility Network for the Exploration of effects industry (RADNEXT)

- Goal** This European project aims to address the urgent need to monitor and mitigate the effects of space radiation on electronic components. It operates as a transnational access network that brings together several research infrastructures, including the Spanish Centre for Pulsed Lasers (CLPU). The project, which began in 2021, is scheduled to conclude in mid-2026.
- Actions** During 2024, this network launched several transnational access calls; however, none of the selected proposals requested access to our infrastructure.



Recyclable Materials Development at Analytical Research Infrastructures (Remade@ARI)

- Goal** This European project promotes the circular economy by fostering the development of innovative and sustainable materials for key components across various sectors. It provides scientists researching the proper-



ties and structures of recyclable materials with a wide range of tailored services, including easy, assisted, and coordinated access to more than 50 European infrastructures, among them the Spanish Centre for Pulsed Lasers (CLPU), which participates through Laserlab-Europe. Launched in 2022, the project is scheduled to conclude in August 2028.

Actions

During 2024, no access requests to the CLPU facilities were submitted through this network.



Research Infrastructure Access in Nanoscience & Nanotechnology (RIANA)

Goal

A project funded under Horizon Europe, it supports both curiosity-driven research in nanoscience, addressing open scientific questions with long-term impact, and challenge-oriented research in nanotechnology, focused on specific issues with short- and medium-term impact. The project began in March 2024 and will run for four years, providing a single-entry access point to 69 research infrastructures grouped into seven European research networks, including Laserlab-Europe, through which access to the Spanish Centre for Pulsed Lasers is available.

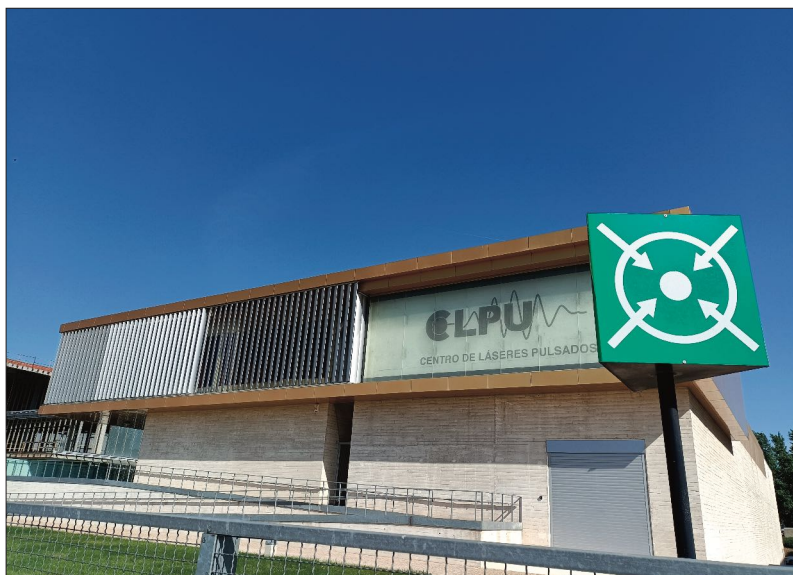
Actions

Throughout 2024, no access requests to the facilities of the Spanish Centre for Pulsed Lasers were submitted through this network.



European Laser Research Infrastructures serving Science and Industry (LASERS4EU)

- Goal** It is a European project that provides a streamlined access platform to a wide network of 29 leading laser research infrastructures across Europe. The initiative is aimed at both scientists and industry users.
- Actions** The project was launched at the end of 2024, and therefore no access requests to our facilities have yet been submitted through the platform. Given the ongoing expansion works at the Spanish Centre for Pulsed Lasers, it is likely that the laser user service of the unique system will not reopen before 2026. Nevertheless, the project is scheduled to conclude in early 2028.



b. Infrastructure Optimization

The infrastructure is strongly committed to the continuous enhancement of the laser system as a key strategy to keep VEGA at the cutting edge of technology. The goal is to establish it not only as the most advanced ultra-intense, ultra-fast laser system in Spain, but also as an internationally recognised scientific and technological reference. With these strategic priorities in mind, specific activities aimed at the enhancement of VEGA were carried out throughout 2024:

- o Study on the Reduction of Inhomogeneities: The 1-joule amplifier, shared by VEGA-2 and VEGA-3, plays a key role in ensuring both the final spatial profile and the energy and pointing stability of the two beamlines. For this reason, a comprehensive analysis was carried out this year to reduce inhomogeneities in the amplifier, addressing both spatial and stability-related factors. This study has made it possible to evaluate potential solutions, particularly with a view to enabling the simultaneous operational use of both outputs.
- o Integration of a Spatio-Temporal Characterisation System into the Laser Lab Metrology Table: Throughout the year, the required qualification tests for the system's installation were completed. The process involved close collaboration with the LUMES Excellence Group at the University of Salamanca, which supported the verification of the BLASHI system, and with the University of Munich, which contributed to the evaluation of the FALCON system. In addition, two Staff Exchange placements under Laserlab-Europe were carried out at the UK Central Laser Facility, both focused on testing the tilt sensor along the VEGA laser beamchain. The results obtained allowed for the characterisation of these parameters in VEGA and marked the starting point for the permanent installation of both the BLASHI system and the tilt sensor within the infrastructure.
- o Remote Start-Up System for the VEGA Front-End: In 2024, the testing phase of the fully functional hardware and software prototype was launched, with the objective of reducing on-site waiting times during the initial start-up stage.
- o Beam Pointing Stabilisation in the VEGA System: In collaboration with the TIDOP Group at the University of Salamanca, the TCUE

project for the development of the 'SincroBeams' prototype has been completed. This prototype represents the first step towards achieving beam pointing stabilisation in the VEGA system, enabling higher-quality beam transport to the experimental areas — including AREX2, which is currently under construction.

- o **Reduction of Critical System Failures:** Although the rate of system shutdowns due to failures has not been high during VEGA's operational period, an upward trend had been observed since 2021, leading to a thorough analysis in 2023. In 2024, the corrective measures identified in the previous year were successfully implemented to prevent failures associated with the degradation of power supplies and capacitors in the pump lasers. Compared to the previous period, these measures resulted in a 40% reduction in such failures across the system in 2024. The main infrastructure development, however, lies in the expansion of the experimental area through the construction of a new annex building. This goal is being achieved through the project "Construction, Equipment and Commissioning of Experimental Area 2 (AREX2)", funded by the Spanish Ministry of Science, Innovation and Universities under the 2021 call.

The initiative not only serves as a driver for job creation but also enables the growth of the consortium's specialised staff. The total investment amounts to nearly three million euros, co-financed 50% by the European Recovery, Transformation and Resilience Plan (PRTR) through Next Generation EU funds, and 50% by the infrastructure's own resources. The following sections outline the specific actions carried out within the framework of the project in 2024, which, as previously mentioned, have an impact on the regular operation of the user facility:

Construction and Equipment of Experimental Area 2 (AREX 2)

Goal	To design, build, and equip a new experimental area that will increase the flow of users and experimental campaigns, both in number and in the diversity of re-
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Actions

search fields. It also aims to maximise the laser system's high repetition rate, enable simultaneous experimental campaigns in different areas, and install secondary sources to facilitate access for the national community with limited expertise in laser technologies. In addition, the project seeks to implement advanced remote access capabilities and develop a stable experimental data storage system that will integrate the infrastructure into the open data ecosystem.

Throughout 2024, during the construction and fit-out of the new bunker, the following milestones were achieved:

- Contract award for the construction of the new experimental area (29 February 2024) and contract signature (12 March 2024).
- Contract signature for health and safety coordination and for project and works quality control services (12 April 2024).
- Approval of the execution design by the Project Supervision Office of the Ministry of Science, Innovation and Universities (25 October 2024).
- Prior market consultation, drafting and publication of the tenders for the supply of equipment (SU04/2024) and vacuum components (SU07/2024). In addition, vacuum pumping-capacity calculations were completed and the extension of the centralised vacuum system was designed; the sizing calculations for the expansion of the gas system were carried out, the gas cabinet was enlarged, and the associated alarm systems were adapted.

c. Radiation Protection Service

One of the period's most significant achievements—and a reflection of the Centre's growth—was the commissioning of the Radiation Protection Service (SPR), operational since 29 July 2024. This service is essential to ensure safety when working with ionising radiation. As set out in Article 25 of Royal Decree 1029/2022 (Regulations on the protection of health against risks from ionising radiation), Spain's Nuclear Safety Council (Consejo de Seguridad Nuclear, CSN) may require the creation of a specialised radiation protection unit—either in-house or contracted—to advise the Centre and to perform the functions needed to ensure safe practice and compliance with the applicable regulations. Accordingly, at the CSN's request, the former Radiation Protection Unit was naturally evolved into this new service; its head has held the specific statutory qualification required by law since 15 July 2024. Additional radiation protection technicians have joined him to complete the service's organisational structure.

d. Laboratories/Complementary Workshops

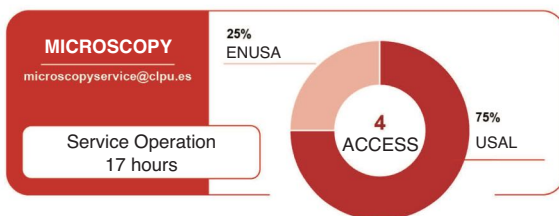
The presence of support laboratories within a research infrastructure constitutes a key added value for both users and the facility itself. For users, their availability translates into greater versatility, continuity in scientific work, and opportunities to develop new lines of research without needing to draw on external resources. The service portfolio broadens and diversifies the Centre's user community. In addition, these laboratories strengthen operational autonomy and optimise the use of each experimental campaign. From an institutional perspective, they add value by consolidating the facility as a strategic, self-sufficient node within the national and international scientific ecosystem.

Microscopy

All services delivered in 2024 were external and centred on the facility's principal instrument: a Carl Zeiss EVO HD25 scanning electron microscope (SEM). The system is equipped with six detectors: an Everhart-Thornley secondary electron (SE) detector; a variable-pressure secondary electron (VPSE) detector; a five-segment backscat-

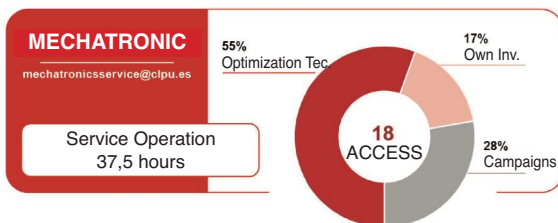
tered electron (BSE) detector; a scanning transmission electron microscopy (STEM) detector; an energy-dispersive

X-ray spectroscopy (EDS) detector; and an electron backscatter diffraction (EBSD) detector. For further information, please refer to the website: <https://www.clpu.es/en/microscopy-features/>



Mechatronic Workshop

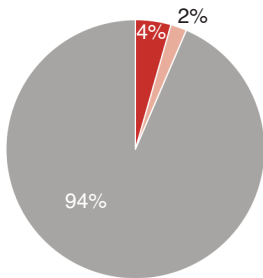
The machining and electronics workshop is a key strategic resource within our infrastructure, ensuring autonomy in adapting and customising equipment to the specific needs of each user. This capability not only removes external dependencies but also enables us to optimise our own designs, shorten execution times, and raise the quality of the service provided. Equipped with a continuous five-axis milling machine—one of the few in Spain outside the aeronautical or automotive sectors—the machining area is complemented by auxiliary tools such as a lathe, vertical drill press, jigsaw, and other equipment for the precise fabrication of complex components. The electronics area, in turn, enables the development and repair of advanced devices, supported by high-end professional instrumentation.



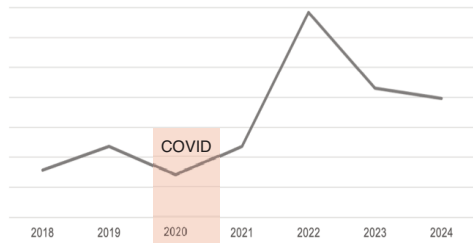
e. 2024 User Access Summary

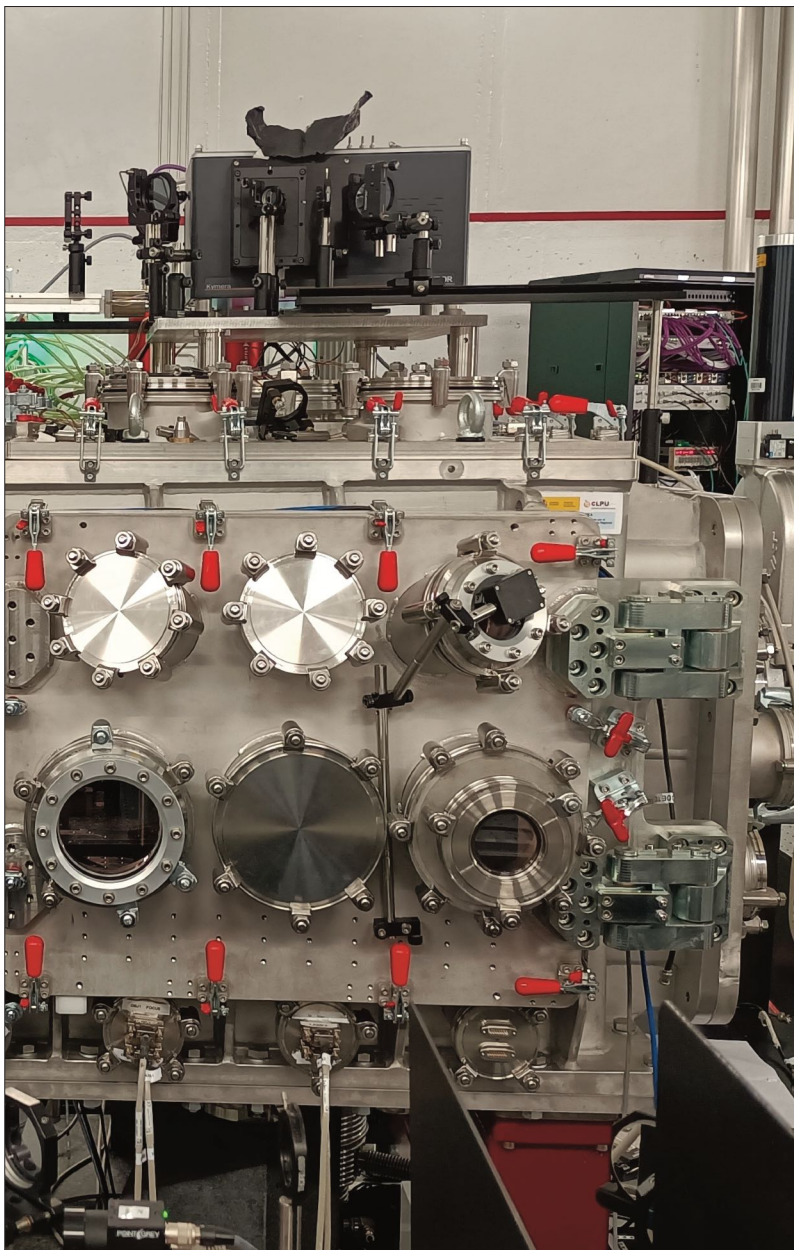
Service Access

■ Mecatronic ■ Microscopy ■ VEGA



VEGA Access over time





3. RESEARCH AND TRAINING

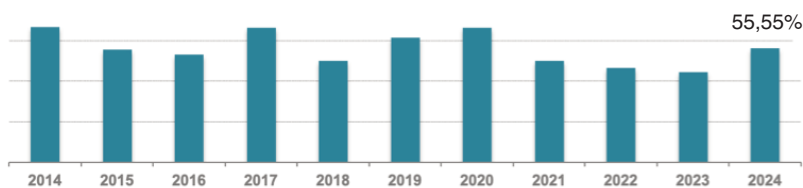
As a user facility, and with the aim of delivering the best service to scientists conducting experiments at our installations, it is essential that the Centre stay current through highly specialised, continuous training. This also requires the development of in-house research lines, with their associated projects, which contribute, for example, to optimising the system's technology—thereby increasing its uniqueness—innovating in target design for high repetition rates, and exploring new diagnostics. In this way, the facility's staff help drive forward progress across the scientific and technological domains that underpin work with ultra-intense lasers: plasma physics, fusion, astrophysics...

a. Scientific Contributions

Throughout 2024, the Centre's specialised staff published 24 articles in leading scientific journals, reporting results from in-house and/or collaborative research. They also presented 36 contributions at major scientific and technical events in the field (see Annex I for details).

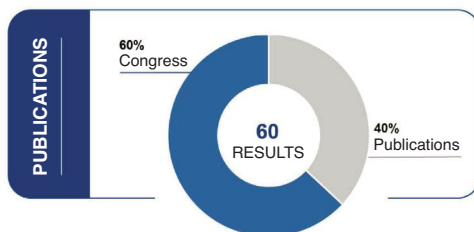
Year-on-year trend in Q1 & Q2 Journals

Total Publications/Year 100%



Evolution of publications according to number of researchers and PhDs

This figure should be read in light of the fact that the infrastructure reached full operational status in 2019; hence, efforts were primarily directed towards commissioning.



b. Projects

Keeping a cutting-edge centre up to date entails not only technological optimisation but also sustained staff training and research. Accordingly, a range of research projects is undertaken, of varying scope and focus, all directly aligned with the infrastructure's strategic lines. In 2024, these included several applied-research projects and a substantial number devoted to training, underscoring the value the Centre places on the human resources that sustain and foster the facility as an international reference—the value of knowledge in a highly specialised field.

Integrated management & reliable operations for user-based laser scientific excellence (IMPULSE)

Goal	This initiative seeks to coordinate, bring together, and consolidate a global platform to manage Europe's most advanced high-power, short-pulse laser facilities: the Extreme Light Infrastructure (ELI) facilities. Funded by the European Union, with a budget of 20 million and a duration of 42 months, it aims to drive science and innovation using cutting-edge laser technologies.
Actions	After several years of implementation, IMPULSE concluded its activities in April 2024. Despite this, the period stands out for eight publications in specialised journals [see Scientific Contributions], as well as the absolute calibration of a Thomson parabola spectrometer equipped with a microchannel plate (MCP) for high-repetition-rate measurements. The approach was based on cross-correlation with a test calibration experiment in which protons with energies of 2–5 MeV were generated. To obtain additional data points, a theoretical approach using numerical simulations with a similar MCP design was employed, followed by a comparison of the results with other diagnostics used in the same experiment: time-of-flight measurements and another Thomson parabola spectrometer equipped with image plates (Image Plates). In addition, the final two months were devoted to drafting the report, preparing manuscripts, and closing out the project.



IMPULSE



EuPRAXIA

Goal	EuPRAXIA is one of the projects included in the 2021 Roadmap of the European Strategy Forum on Research Infrastructures (ESFRI), and is the first to target the development of a research infrastructure focused on novel plasma-acceleration methods using innovative laser and linear-accelerator (linac) technologies. With a duration of 48 months, the project is scheduled to conclude in the fourth quarter of 2026.
Actions	Over the course of 2024, coordinated activities were organised to produce a scientific paper (now forthcoming) that provides a detailed review of the full range of techniques for implementing plasma channels capable of guiding plasma, laser pulses, and electrons over centimetre-scale lengths. The pros and cons of each technique were assessed with a view to application at EuPRAXIA Site 1 and Site 2, phase 1 (1 GeV) and phase 2 (5 GeV). The paper also reports the technology maturity of each technique (e.g., TRLs) and the numerical-simulation and diagnostic tools employed. Organisation has begun for a conference/workshop to be held in the next reporting period. With respect to the evaluation of the second pillar of EuPRAXIA-PP (laser acceleration), during 2024 the CLPU withdrew its candidacy but not its involvement: through the evaluation committee, Giancarlo Gatti continued to contribute to the definition and analysis of the proposals submitted by the three candidates. This evaluation was delivered at the end of 2024 for consideration by the Coordination Board in 2025. Regarding the Board of Financial Sponsors, Giancarlo Gatti organised meetings with ALBA (another Spanish

participant) to identify a representative of the funding bodies to EuPRAXIA.



Targets in ultra-intense laser interaction, particle production & applications (TULIPAN)

Goal The project's main goal is to develop, test, and compare different types of targets capable of operating at high repetition rates, in order to make laser-driven particle acceleration operational and effective under such conditions. Specifically, the analysis will focus on proposals for a solid tape target and a high-pressure, high-density gas target.

Actions Here are the key actions undertaken in 2024:

- Publication of the article "Stability and debris-migration of a solid tape target delivery system for intense laser-matter interactions towards high-repetition-rate" in Plasma Physics & Controlled Fusion (<https://iopscience.iop.org/article/10.1088/1361-6587/ad2690>).
- Drafting and submission of the article "High-repetition-rate solid-density tape target delivery system for ultra-intense laser-matter interaction at PW-class laser facilities," which will be published in High Power Laser Science and Engineering.
- Upgrade and commissioning of version 3+ of the solid tape target; measurement of deviations arising from system-induced vibrations.
- Upgrade of the high-pressure gas system to enable work in explosive atmospheres in accordance with ATEX regulations; initiation of the DOPEX com-

pliance document, detailing measures and procedures for safe operation.

- Assembly of the high-pressure gas test bench in the laboratory area.



New approaches for used extreme lasers (NAPEL)

Goal	This project arises from the need to develop new ultrashort-pulse, high-intensity lasers to enhance the strategic value of the ICTS. To that end, its goal is to develop a suite of simulations and models that support the experimental implementation of novel concepts, with particular emphasis on generating new frequencies via a new scheme, and on the development of amplifiers based on thulium-doped crystals suited to the intended operating conditions.
Actions	Key actions undertaken in 2024 include: • Recruitment of two researchers to join the project, one funded through an FPI predoctoral fellowship to undertake a PhD. • Launch of the project's theoretical study by modelling a laser using the rate equations. • On the experimental side, several laboratory set-ups were implemented, achieving second-harmonic generation with a Ti:sapphire laser between consecutive pulses, thereby demonstrating the capability to synchronise ultrashort pulses in space and time.



Advanced particle beams, plasmas and laser experiments (APPLE)

Goal	This project aims to develop an experimental platform to research the interaction of particles with extreme states of matter that have not yet been explored and cannot be achieved by other means.
Actions	During the 2024 reporting period, the following actions were undertaken under this project: • Manuscript preparation reporting results from the 2023 experimental campaign on VEGA-3, dedicated to proton acceleration using a femtosecond double-pulse configuration. • May 2024: participation in an experimental campaign at Colorado State University (USA) to measure the characteristics of protons generated via TNSA in hemispherical targets and their ability to produce plasma in a secondary target. • July 2024: experimental campaign at the CLPU with VEGA-3 on the isochronous transport and characterisation of laser-accelerated proton beams. • Code development for trajectory calculations of proton beams selected by the isochronous-selection platform. • Construction, testing, and measurement of an isochronous magnet. • Proton-pulse measurements. • Study, focusing, and transport for an isochoric-heating laser. • Modification of the XUV spectrometer for direct detection via integration of a new camera. The system was characterised and calibrated using calibration sources and optical simulations, and deployed in a characterisation campaign applying it to XUV beams generated by laser-plasma (betatron) interaction in January 2024.

- Preparation of a platform for transport and spectral as well as spatio-temporal control of the ion beam using magnetic elements.



Sensors and an Irradiation Platform for Cell Cultures and Dosimetry Applications (SIRACUSA by its Spanish initials)

Goal	The project's primary aim is to conduct radiobiological studies with cell cultures using ultraintense protons accelerated by ultrashort laser pulses. It pursues two overarching objectives: a differential analysis of DNA-repair mechanisms and RNA damage as a function of dose rate, and the development of cost-effective, high-spatial-resolution dosimeters based on off-the-shelf digital image sensors.
Actions	The project began in September 2024. In this reporting year, the main actions were the kick-off meeting and the evaluation and purchase of cameras for the project. We also hired a student and started drafting proposals for experimental campaigns at several facilities, including our own.



EUROfusion

Goal	It is a consortium whose mission is to advance the development of fusion-energy reactors, guided by a vision of a world in which fusion power plants supply the electricity grid with CO ₂ -free energy, complementing other sources of generation. To this end, it funds research activities at 28 of its member organisations across 26 EU Member States, under the joint programme "European Roadmap to the Realisation of Fusion Energy" within Euratom Horizon Europe.
Actions	As part of this project, CLPU contributed to three scientific publications (see 'Scientific Contributions').



c. Training

Highly qualified training for scientific, technical, and administrative staff in the field of high-intensity lasers is a strategic priority for the CLPU—both now and for the future. In this context, four research secondments were carried out during 2024, most of them supported by the 'Staff Exchange' programme under the European project Laserlab-Europe V (LLE-V):

- Alejandro Huerta travelled to Colorado State University (USA) to conduct a systematic study of the focusing properties of spherical foils as part of an experimental campaign held 22 April–17 May at the Laboratory for Advanced Laser for Extreme Photonics (ALEPH).
- Michael Ehret and Iuliana Vladisavlevici undertook training on measuring radiation emitted by laser–plasma interactions at the UK's Rutherford Appleton Laboratory, 13–26 October [LLE-V].
- Cruz Méndez, Head of the Centre's Technical Area, visited Barcelona to explore synergies and strengthen collaboration at the Institute of Photonic Sciences, 10–15 November [LLE-V].

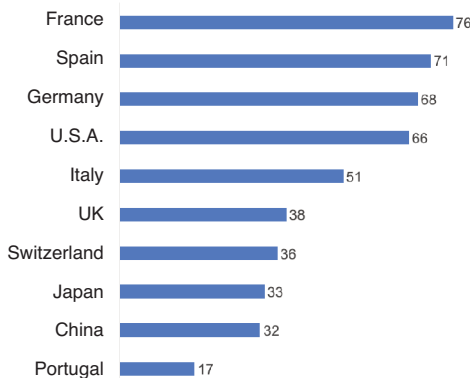
- José Antonio Pérez, Senior Researcher, completed a stay at the Scottish Centre for the Applications of Plasma-based Acceleration (SCAPA), 18–30 November, for a scientific collaboration between the two institutions [LLE-V].

Also noteworthy are the seminars and courses given by members of the Centre's specialised staff:

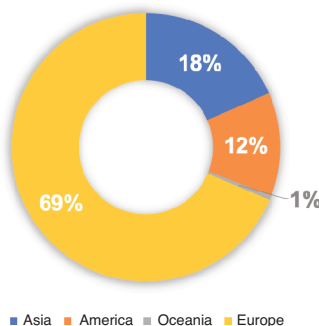
- Antonia Morabito, within the EU IMPULSE project, gave on 12 March the seminar "Design & Optimization of laser pixie beamline for material science application" as part of the Nanolabs Talks organised by Politecnico di Milano.
- As part of the Laserlab Talks, Teresa Cebriano gave a virtual lecture on 17 April titled "Radiation Sources based on laser-plasma interaction and applications in materials science."
- José Antonio Pérez-Hernández taught on the University of Salamanca master's programme Physics and Technology of Lasers (3 ECTS), delivering the course Physics of Intense Fields as an external lecturer.
- Researchers from the Centre provided a training course to staff of Spain's Nuclear Safety Council, Radiological Protection in Laser Facilities, 27–30 May (14 hours of theory and 8 hours of practical sessions).
- Michael Ehret gave an invited seminar on 16 October entitled "Currents from relativistic laser interaction as metrology for system stability of HRR laser secondary sources," during his research stay in the UK.
- On 5 November, Evgeny Filippov gave the invited talk "Characterization of particles generated by laser-plasma interaction in ICF-related conditions" in the GSI Plasma Physics seminar series.

Of particular significance was the hosting of the 50th Conference on Plasma Physics, a flagship international meeting in the field of plasma physics that brought together more than 600 researchers from four continents, with especially large contingents from institutions in France, Spain, and Germany.

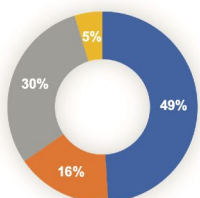
Top 10 Countries of Origin



Continental Origin

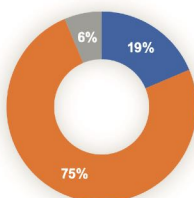


Education Level / Occupation



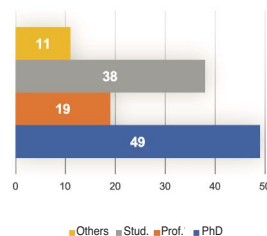
■ PhD ■ Prof. ■ Student ■ Other

Gender



■ Woman ■ Man ■ Doesn't say

Women by Education Level



■ Others ■ Stud. ■ Prof. ■ PhD

In the same context, it is worth noting that 18 students undertook training placements at the Centre, spanning different levels and specialisations, thanks to agreements with various academic institutions and other research centres. Specifically, during the year we hosted 8 undergraduate students (7 from the University of Salamanca and 1 from Carlos III University of Madrid), 1 student from the USAL master's programme in Industrial Engineering, and—also through USAL—one bachelor's thesis (TFG) student and one master's thesis (TFM) student, in addition to 4 doctoral candidates. These were joined by 3 students from IES Venancio Blanco (Salamanca), who completed workplace training.

This section presents eleven projects linked to human resources and specialised training:

Programa Investigo SEPE (National Investigo Hiring Scheme)
(Hiring: Pablo Vicente González – Division: Scientific)

Actions

Over the reporting year, the researcher hired under the Programa Investigo advanced the work planned for this line, delivering:

- An expanded, server-hosted library of CAD designs for the Centre's standardised components.
- Full 3D modelling of in-house experiments, including the design and fabrication of bespoke tools and parts as required.
- The roll-out of a circular-economy procedure focused on recycling discarded material: first, standardising (where feasible) on a single material for all printed parts to streamline recycling; next, scouting a partner to upcycle the waste into new 3D-printing filament.
- In the second semester, contributions to the design of high-repetition-rate targets: enhancements to the design workflow, assessment of alternative materials, and development of improved target-mounting systems for testing.
- A complete survey and labelling of all point-to-point BNC (Bayonet Neill–Concelman) links from the experimental area to the control room, with a reference document detailing the exact end-points of every connection.



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Programa Investigo SEPE (National Investigo Hiring Scheme)
(Hiring: Roberto García Bravo – Division: Scientific)

- Actions** Over the reporting year, the hired technician completed the following objectives:
- Development of a digital control system using a PLC S7-1200 for an infrared laser system, designed with a reusable architecture to enable future adaptation to other systems.
 - Implementation of sensors to monitor key laser parameters: a temperature probe to measure coolant temperature in real time, and a flow sensor to verify correct system operation.
 - Integration of an HMI (Human-Machine Interface) with the PLC S7-1200 control system, allowing users to visualize and adjust laser parameters intuitively.
 - Assembly of flashlamp systems.
 - Programming of a SCADA (Supervisory Control and Data Acquisition) system for direct operator control.
 - Planning, assembly, and configuration of motor controllers used in experiments on VEGA-2 and VEGA-3.
 - Electronic support for the repair and assembly of auxiliary systems required for the proper execution of experimental campaigns.



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NAPEL Project – Predoctoral Contract (Hiring: David Gutiérrez – Division: Scientific)

Actions

On 1 August, a predoctoral researcher was hired under the NAPEL project (New Approaches for used extreme lasers). During the remainder of the reporting year, the work focused on:

- An initial ramp-up in photonics and lasers.
- Study of key concepts in pulsed-laser physics, including mode-locking and phase matching.
- Fundamentals of numerical simulation for ordinary differential equations (ODEs) and partial differential equations (PDEs).



Programa Investigo Junta de Castilla y León (Regional Investigo Hiring Scheme) (Hiring: Luis Carlos Parada – Division: Scientific)

Actions

By the end of the first quarter of 2024, the contract concluded with the following achievements:

- Simulation of mechanical systems to develop a prototype beam splitter using compliant mechanisms, evaluating a set of design variants to optimise metrics such as stress and peak deformation.
- Design and thermo-mechanical simulation of a thin-disk laser gain module based on Yb:YAG, including the selection of a bonding material to maximise the system's energy efficiency.

- Commissioning and layout of a dedicated work-bench, together with the design of end-effector gripping tools for a robotic arm.

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Programa Investigo Junta de Castilla y León (Regional Investigo Hiring Scheme)

(Hiring: Adrián Silvestre de Prada Belda – Section: TIC)

Actions

By mid-2024, the contract came to a close, having delivered:

- A first operational release of the digital laboratory platform, laying the groundwork for full automation via additional modules.
- Automated capture of experimental data so that, under varied campaign scenarios, data are stored without manual intervention, optimising classification and reducing processing and analysis time.
- Development of an integration API (Application Programming Interface) that not only standardises access to heterogeneous data sources but also links with other internal tools, giving researchers greater flexibility for real-time data analysis.

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Programa Investigo Junta de Castilla y León
(Regional Investigo Hiring Scheme)
(Hiring: Alejandro Sánchez Batuecas – Section: TIC)

Actions

By mid-2024, the contract concluded with the following outcomes:

- Deployment of a multicast configuration for the industrial cameras used across the entire experimental set-up, enabling a single camera feed to be viewed simultaneously from multiple locations.
- Support to experimental campaigns through lightweight PowerShell scripts for storage-folder creation, permission assignment, and related tasks, as well as integrating applications with the remote-control systems.
- Implementation of the required security measures in the experimental area and the control room to ensure full compliance with the Spanish National Security Scheme (ENS by its Spanish initials).
- Installation of humidity and temperature monitoring sensors in the Data Centre (CPD by its Spanish initials) to improve oversight of energy consumption. In the same vein, Power Distribution Units (PDUs) were fitted to enable monitoring of servers, storage arrays, and other equipment, supporting reporting and evidence-based decisions that help reduce energy consumption.

Programa Investigo Junta de Castilla y León
(Regional Investigo Hiring Scheme)
(Hiring: Isabel Rodríguez Pérez – Division: Scientific)

Actions

By late August 2024, the contract ended with the following achievements:

- The researcher conducted both theoretical and experimental work on particle-beam handling, contributing to the following experimental campaigns at the Centre:
 - Radiation effects of laser-accelerated protons on living cells, which investigated the effects of proton-beam irradiation on live cells.
 - Protons Characterization, Transport and Applications, towards experimental stations, focused primarily on measuring proton-beam emittance.
 - Development of Tape Targets in VEGA for high repetition rate experiments and optimisation of related HRR diagnostics, in which she collaborated on the analysis of more than 8,000 proton spectra to determine maximum energies; this analysis underpins the paper "High-repetition-rate solid-density tape target delivery system for ultra-intense laser-matter interaction at PW-class laser facilities," accepted for publication in High Power Laser Science and Engineering.
 - Study of the response of commercial CMOS (complementary metal-oxide-semiconductor) sensors to relativistic electrons, gammas and betatron radiation, where she carried out experimental data acquisition and analysed selected spectra.
 - As part of the scientific team for Betatron Source Characterization through spectral

noise fluctuation, she trained in the use of optical systems and software for the spatial and spectral characterisation of high-energy electron beams, as well as photons with energies of several keV.

The long-term goal of all these experiments is the integration of lasers into hospital environments, made possible by their compactness and stability.



Programa Investigo Junta de Castilla y León
(Regional Investigo Hiring Scheme)
(Hiring: María Luisa Berlanga Coppola – Division: Scientific)

Actions

By late August 2024, the contract concluded with the following achievements:

- Study of particle production from laser-plasma interaction focused on two target types: a gaseous target generated by a supersonic gas jet and a solid target produced by a tape-winding system.
- Experimental assembly of a high-pressure gas test bench to characterise, via laser interferometry, the physical properties of different nozzles (density profile and dynamics). These gas targets are used at the Centre to generate protons and ions.
- Analysis of ionic species present in particle beams and assessment of their potential use as secondary particles. A significant presence of oxygen, carbon and iron ions, among others,

was identified—elements that will be key for future high-repetition-rate irradiation studies.

- Participation in the following experimental campaigns:
 - Development of Tape Targets in VEGA for high repetition rate experiments and optimisation of related HRR diagnostics, contributing—together with other researchers—to the analysis of more than 8,000 proton spectra to determine maximum energies; this analysis underpins the paper “High-repetition-rate solid-density tape target delivery system for ultra-intense laser–matter interaction at PW-class laser facilities,” accepted in High Power Laser Science and Engineering.
 - Experimental data acquisition and analysis of selected spectra in both High-energy laser-driven hadron sources based on optimised nanostructured targets and Study of the response of commercial CMOS (complementary metal–oxide–semiconductor) sensors to relativistic electrons, gammas and betatron radiation, aimed at developing a laser–plasma-based source capable of irradiation and radioisotope production.
 - Diagnostics for quantitative assessment of spatiotemporal overlap of two petawatt-class (PW-class) pulses and the spatial quality of the focus of PW-class pulses, contributing to the scanning of image-plate detectors required for accurate detection and estimation of electrons in interactions with low-density targets.

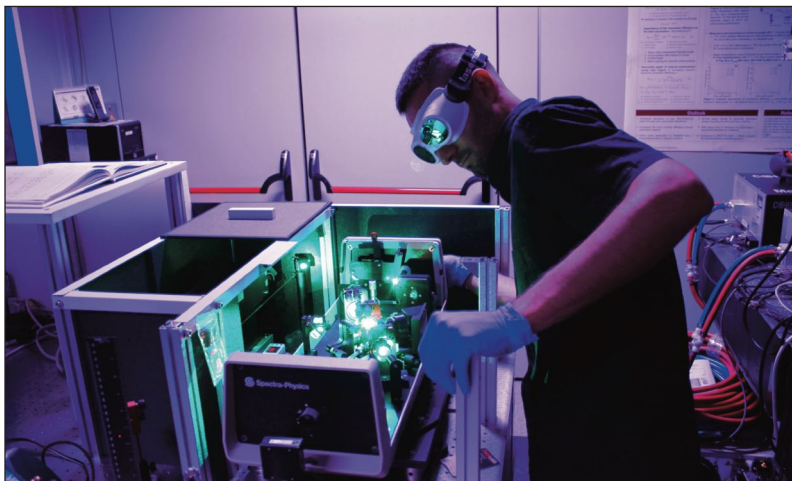
The long-term goal of all these experiments is the integration of lasers into hospital environments, made possible by their compactness and stability.

Programa Investigo Junta de Castilla y León
(Regional Investigo Hiring Scheme)
(Hiring: Nardjesse Boudjema – Division: Scientific)

Actions

By late August 2024, the contract came to a close, having delivered the following results:

- Delivered the oral contribution “Mechanism, Diagnostics and Applications of Laser-Driven Ion Acceleration” at the Annual International Congress of Doctoral Students (CAIED), 1–2 February 2024.
- Presented the poster “Temporal Beam Diagnostic Online—On-Target and Focal-Spot Optimisation of Femtosecond Petawatt-class Laser Systems for Laser–Plasma Interaction” at the 50th EPS Conference on Plasma Physics, Salamanca, 12–18 July 2024.
- Took part in experimental set-up and result analysis for the following campaigns carried out at the Centre:



- o Betatron Source Characterization through spectral noise fluctuation
- o Efficient Proton Acceleration via Double-Pulse Laser Approach using a Fresnel lens as the main diagnostic
- o Efficient Proton Acceleration via double-pulse laser approach
- Co-author of the following publication under review:
 - o Experimental and computational evaluation of alpha-particle production from laser-driven proton–boron nuclear reaction in a hole-boring scheme (under review at Physics of Plasmas).
 - o Measurement of femtosecond incoherent X-ray pulses using shot-noise-driven fluctuations in plasma betatron (under review at Physical Review Letters)



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Programa Investigo Junta de Castilla y León

(Regional Investigo Hiring Scheme)

(Hiring: Javier Pisonero Carabias – Division: Technical)

Actions

Mid-September 2024 marked the conclusion of the contract, with the following contributions to the VEGA laboratory's energy-transition effort:

- Initial design of an integrated management-and-telemetry system with sufficient sensitivity to capture and analyse trends in critical HVAC and

electrical-consumption variables. To this end, the necessary software interfaces were developed using open-source electronics platforms (Arduino and Raspberry Pi), automating the orderly storage of data on the Centre's back-end systems. A collaboration was also launched with the Béjar fablab (Salamanca) to co-design Internet of Things (IoT) devices capable of distributed, automated measurement and data logging across the laboratory. The ultimate aim is to optimise facility cooling through more efficient use of HVAC resources.

- Targeted study of component cooling/heating to shorten warm-up times associated with system thermalisation. Within this framework, a new line of laboratory characterisation was opened using 2D/3D optical tracking based on Digital Image Correlation (DIC) to analyse the deformation of different materials and components.
- Cooling studies for components enabling stable VEGA operation at high repetition rate, with the goal of shortening campaign turnaround. ANSYS simulation software was used to build a mathematical model of the behaviour of the diffraction gratings in VEGA-2 and VEGA-3 during operation. On the basis of these results, a maximum-deformation model was proposed for each grating over a full day of shots.
- Participation in the working group for the design, implementation, and documentation of a prototype that allows for the remote activation of pumping lasers to optimize campaign times. The system was launched in September 2024.

Programa Investigo Junta de Castilla y León
(Regional Investigo Hiring Scheme)
(Hiring: Ana Vaquero Villares – Division: Technical)

Actions

By the end of 2024, the contract concluded with the following contributions to the VEGA laboratory's energy-transition effort:

- Together with colleagues, the technician received training on installing a local Apache server and received additional training in HTML, CSS, PHP, JavaScript and WordPress. Building on this, she installed the server locally and created a page in HTML and CSS without templates. The existing applications were then reinstalled with their databases separated to improve maintainability. Reliable application performance supports equipment reuse and strengthens preventive and corrective maintenance, reducing downtime due to failures.
- Hardware and software management and analysis to enable orderly collection of lab-planning data in an IoT environment. Following a period of training, the technician implemented data-mining algorithms for filtering across acquisition systems, dates and system conditions, achieving robust labelling for subsequent use.
- Optimisation of the database used to store these data and upgrade of the platform required to make them available to data-science users, in compliance with the Centre's data policy and the Spanish National Security Scheme (ENS by its Spanish initials). In support of this task, the hired staff received training in SQL and MySQL, restructuring the database in Boyce–Codd normal form (BCNF) to facilitate user access and subsequent export to HDF5 files.

Finally, it is worth noting the ongoing programme of both specialised and general training for staff that has been rolled out across the facility throughout 2024:

- On 29 January 2024, Alessandro Curcio of the Istituto Nazionale di Fisica Nucleare (INFN) gave the talk "Betatron source characterization through spectral noise fluctuation", in connection with the experimental campaign he led.
- "'Scientific and technical activities of the Guillermo Velarde Institute for Nuclear Fusion", delivered by its director, Pedro Velarde, on 31 January 2024.
- The Centre's communication team gave the talk "The Enigma of the Incommunicative Scientist: Communication at the CLPU" on 28 February 2024.
- On 5 March 2024, Smrithan Ravichandran of the University of Maryland gave the talk "Diagnostics for quantitative assessment of spatiotemporal overlap of two petawatt-class (PW-class) pulses and the spatial quality of the focus of PW-class pulses", in connection with the eponymous experiment conducted at the Spanish Centre for Pulsed Lasers (CLPU).
- On 22 March 2024, Wendell T. Hill III of the University of Maryland gave the talk "Precision Measurement of the Quantum Vacuum with Petawatt Lasers.
- On 25 April 2024, José Manuel Álvarez Pastor, head of the Centre's Radiological Protection Unit, gave the talk "Laue lens in nuclear astrophysics."
- On 14 May 2024, Professor Ángeles Pérez-García of the University of Salamanca gave the talk "Ultra intense Magnetic Fields in Astrophysics & Fundamental Physics: Synergies and Challenges for Laser Physics."
- On 15 May 2024, ELI-NP early-career researcher Gabriel P. Bleotu gave the talk "Pulse Post-Compression at the 200 TW Station at the CLPU."
- On 7 June 2024, Giacomo Manessi of ELSE Nuclear gave the talk "Diverse Approaches to Neutron Spectrometry and Applications" in the Centre's Meeting Room.

- On 25 June 2024, Mario Martínez (IFAE), Spain's coordinator for the European "Einstein Telescope" gravitational-wave project, delivered a seminar titled "The Einstein Telescope: A 3rd-Generation GW Observatory in Europe."
- On 27 June 2024, Sophia Malko of the Princeton Plasma Physics Laboratory gave the talk "Magnetised High-Energy-Density Plasma Experiments at the OMEGA Laser Facility" during a special Plasma Physics seminar.
- On 27 June 2024, Pravesh Patel of Focused Energy delivered the talk "From Ignition on NIF to Inertial Fusion Energy" during the special Plasma Physics seminar.
- On 27 June 2024, Masakatsu Murakami of Osaka University presented "Generation of Giga-Electron-Volt Proton Beam by Intense Laser-Driven Micro-Nozzle" during the special Plasma Physics seminar.
- On 1 July 2024, Luis Abrontes and Almudena Lindoso of Universidad Carlos III de Madrid gave the talk "Radiation Effects and Irradiation Testing of Electronic Circuits."
- On 30 July 2024, Andreas Döpp of the Petawatt Users Laser Sources and Experiments (PULSE) group at Ludwig-Maximilians-Universität (LMU) Munich delivered the seminar "On the Confluence of Data-Driven Techniques and Laser-Plasma Acceleration."
- On 5 September 2024, Elvira Romera Gutiérrez, a councillor at the Spanish Nuclear Safety Council (CSN), gave the talk "Regulatory Challenges at the CSN," following the body's authorisation of the creation of the Spanish Centre for Pulsed Lasers' Radiological Protection Service.
- On 28 November 2024, Alicia Palacios of Universidad Autónoma de Madrid, a signatory of the Women4Quantum manifesto, delivered the seminar "Attosecond pump-probe spectroscopy: theoretical methods for the description of correlated electron & nuclear dynamics."

4. TRANSFER AND INNOVATION

a. Innovation Laboratory – LITeL (by its Spanish initials)

For more than twenty years, the European Union has considered laser technology part of its Key Enabling Technologies (KETs), a category encompassing cutting-edge technologies with cross-sector impact in science and industry. As an essential branch of photonics, lasers have proved their ability to enable innovation in other fields; underlined their importance for European technological sovereignty—and thus for reducing dependence on other countries in this strategic sector; defined their role in the digital and green transitions as precise, efficient tools; and demonstrated high economic impact across the industrial value chain. Beyond its unique VEGA system, the Spanish Centre for Pulsed Lasers (CLPU, by its Spanish initials) has designed a versatile space to drive the uptake of laser technology in industrial and societal processes: the Laser Technology Innovation Laboratory (LITeL). Its goal is to generate new laser light sources, advanced photonic technology, laser components and, more broadly, new laser platforms based on solid-state media and associated frequency-conversion techniques, to accelerate industrial digitalisation across multiple sectors and to catalyse innovation through laser technology. Laser resonators also play a central role in this laboratory, as they determine the output quality of any laser. Tailored resonator designs can address many scientific and technical challenges: control of beam parameters (power, spatial profile, pulse duration, and so on) is relevant to all laser applications and is a key driver of new technologies and uses.

Although LITeL has worked on projects related to industrial production and medicine, in recent years it has focused on dual-use technologies, participating in several defence projects. In 2024, the CLPU signed collaborations on three defence-related projects, two of which are highlighted below:

- OPTIMAS, a project backed by a strong European consortium of 12 entities across 7 countries, in which Spain has a notable presence with 6 organisations involved, including the Spanish Centre

for Pulsed Lasers (CLPU) and Monodon Research and Innovation, Navantia's innovation unit and the proposal coordinator. The project aims to endow high-speed, high-throughput communications with exceptional security by integrating state-of-the-art encryption technologies such as quantum key distribution (QKD).

- DIAL, awarded through the Ministry of Defence's Directorate-General for Armament and Materiel (DGAM), the project goes to the joint proposal by Indra and Escribano Mechanical & Engineering, temporarily associated as a joint venture (UTE). With the advice and collaboration of our Unique Scientific and Technical Infrastructure (ICTS), it aims to develop an instrumented laser-weapon demonstrator (DIAL, by its Spanish initials) to counter remotely piloted aircraft systems (RPAS/UAVs).

b. Collaborations

The Centre continued its engagement with the sector's leading strategic platforms, fostering active innovation and consistently strengthening public-private collaboration:

Ineustar, the Spanish Association for the Science Industry



Over the years, this private, non-profit association has built an efficient network linking companies, research centres, and other organisations involved in the conception, design, construction, operation and maintenance of scientific facilities and instruments across all fields. In line with this mission, our two entities have collaborated on notable activities such as "Towards a National Strategy for Nuclear Fusion" (14 October) and the drafting of the proposal "Ultra-intense radiation from structured micro-targets for solar-cell integrity studies" for the 2024 Interreg-SUDOE call.

Defence Industry Cluster (CID by its Spanish initials)



Founded in 2019 as a non-profit association, the CID works to strengthen Spain's defence technology and industrial base. It brings together more than 70 organisations that collaborate on innova-

tion projects, capability development, and access to national and international sector programmes. The Cluster actively promotes technological capacities with both military and dual-use applications. One flagship initiative is the CID Industrial and Technological Plan (Plantech-CID), launched in 2024 and involving dozens of companies to drive strategic solutions. In collaboration with the Spanish Centre for Pulsed Lasers (CLPU, by its Spanish initials), the CID promoted the Technical Workshop "Tecnología láser en el ámbito de la industria de defensa", held on 24 June 2024.

Spanish R&D Platform on Radiological Protection – PEPRI (by its Spanish initials)



Launched in 2014 by the Spanish Society for Radiological Protection (SEPR), the platform promotes research and innovation in ionising and non-ionising radiation. It brings together more than one hundred organisations from the health, scientific, industrial and academic sectors. Since 2017 it has been chaired by the Nuclear Safety Council (CSN). PEPRI is organised into eleven working groups covering areas such as medical applications, waste management and radiological emergencies. Its mission is to identify R&D needs and align national capabilities with European priorities. In 2024 it marked its tenth anniversary, reaffirming its role as a leading forum in the field.

Fotónica 21



It serves as the Spanish national node of Photonics21, the European Technology Platform for Photonics. It was created within the framework of the Spanish Technology Platforms promoted by the Centre for the Development of Technology and Innovation (CDTI). Its main objectives include coordinating Spain's strategic positioning at the European level, representing the national photonics ecosystem, facilitating the participation of Spanish organisations in international projects, and helping to align European priorities with the needs and strengths of Spain's industrial and scientific landscape.

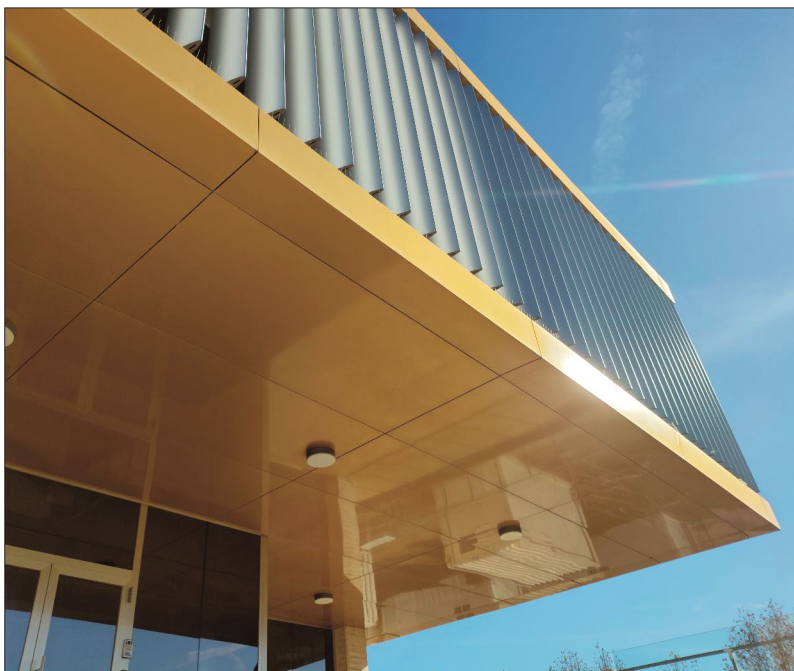
Enterprise European Network



This European platform, launched by the European Commission in 2008 under the Single Market Programme, is designed to boost business innovation and internationalisation. It brings together a broad network of experts from technology clusters, universities, research centres, regional development agencies, and chambers of commerce and industry. The Spanish Centre for Pulsed Lasers (CLPU, by its Spanish initials) participates in this network through its link with the ENN-GalacteaPlus consortium, which serves as the contact point for the north-west of the Iberian Peninsula. This involvement strengthens the CLPU's integration into the European innovation and technology-transfer ecosystem

c. Contributions

The Centre's ongoing development of industrial laser innovations, its



pursuit of synergies to broaden the user community, and its growing engagement with dual-use technologies are reflected in its expanding presence at technology-focused events. During 2024, the Centre participated in the following events:

TECHNOLOGY EVENTS

Rodríguez-Frías, M. D., panellist in the round table "The role of Spanish industry in addressing the technological challenges of the Large Scientific Facilities (GIC) and the Unique Scientific and Technical Infrastructures (ICTS), and institutional support. Participation in Europe's Large Scientific Facilities: business opportunities for organisations in Castilla y León," 30 January (Valladolid, Spain) [round-table panellist].

Rodríguez-Frías, M.D., 'Arma laser de alta potencia para C-RPAS: SIGILAR (COINCIDENTE 2018) / DIAL', workshop with companies "23" FUERZA 2035 – Multi-role Air-Defence Platform (AAA) at low and very low altitude, 30 March (Madrid, Spain) [talk].

Rodríguez-Frías, M.D., working group "Aerospace Flagship Initiative," Research and Innovation Strategy for Smart Specialisation of Castilla y León, 4 June (Valladolid, Spain) [participation].

Rodríguez-Frías, M. D., panellist in the round-table discussion "Particle Physics, Lasers and Fusion," 3rd Science Industry Day – ICTS: Expanding Horizons, 13 June (Madrid, Spain) [round-table].

García, P., panellist on the 'Innovation and Research' roundtable at the V Congreso "Libro Blanco para el desarrollo de Salamanca", 28 October (Salamanca, Spain) [Roundtable participation].

Spanish Centre for Pulsed Lasers — Open Day aimed at companies in the University of Salamanca's Science Park, 6 November (Salamanca, Spain) [Open Day].

Rico, M., and Lera, R., "Laser directed-energy weapon demonstrator for neutralising UAV/RPAS threats", 11th National R&D in Defence and Security Congress, 12–14 November (Jaén, Spain) [Talk]



d. Innovation Projects

Knowledge transfer, by fostering innovation, has been delivered through the actions set out in three major projects:

Hybrid prototype based on laser boost of a Linac to obtain an ultrahigh high dose rate in radiotherapy – Hybrilin

Goal	Building on the results of earlier in-house research such as “Particles Accelerated by Laser for Medical Applications (PALMA)” and the strong scientific and technological standing of radiology and oncology in Salamanca, this project was launched in late 2021 with the initial aim of modifying an existing conventional accelerator to design and prepare the first laser-based device to enable FLASH radiotherapy.
Actions	The development of this innovation project was completed in late November, with the following final actions highlighted: the experimental campaign “Betatron source characterization through spectral noise fluctuation”, conducted early in the year [see ‘Experimental Campaigns’], which verified the feasibility of ultrafast temporal electron diagnostics using spectroscopy techniques in the XUV range; in addition, operating points for scaling under low-energy conditions were confirmed; an invited talk at the TIM24 Physics Conference; and the publication of four peer-reviewed and/or open-access journal articles [see ‘Scientific Contributions’].



Development and testing of new compact, low-cost CMOS technology systems for neutron, ionising radiation and charged-particle dosimetry

- Goal**
- EThis action, part of the Nuclear Safety Council (Consejo de Seguridad Nuclear, CSN) R&D&I call, assesses the feasibility of using commercial off-the-shelf CMOS image sensors for neutron detection/dosimetry by analysing their response to the main neutron-conversion products: gammas, electrons and protons. In parallel, the sensor's dynamic range, damage threshold and durability will also be determined.
- Actions**
- In line with the project's planned objectives, the following key actions were carried out in 2024:
- A non-competitive experimental campaign achieved the detection of gamma photons generated by bremsstrahlung from laser-accelerated relativistic electrons. This is the first observation of the type of signal produced by high-energy electrons on a CMOS image sensor.
 - A hire was made to collaborate on developing data-processing software and analysing the experiments conducted within the project's scope.
 - Design of the cooled prototype was initiated.
 - Experiments were carried out using the X-ray station, with very positive results towards the project's objectives.
 - Work continued on preparing the project's first scientific publication.
 - Procurement procedures were initiated for new camera models.

Development and optimisation of the experimental beamlines at VEGA (DOLEV by its Spanish initials)

Goal	Its main goal is to strengthen and consolidate the role of the CLPU as a reference centre at local, regional and national levels. The aim is to position it as a technological infrastructure serving both the scientific community and the business sector—from innovative companies to traditional industries seeking to add value to their products. To this end, the proposed actions range from improving laser reliability to developing new experimental tools and systems for managing the experimental data generated.
Actions	This project comprises two main actions: • Automation and optimisation of data management in experimental campaigns. Throughout 2024, enabled by the recruitment of three new developers, three key systems were developed and implemented, optimising efficiency and accuracy in experimental campaigns: - o Workspace: By late 2024, development of this web platform was at an early stage. Its aim is to facilitate progress tracking for experimental campaigns, offering researchers real-time access to relevant information and improving coordination among the teams involved in the day-to-day running of the experiments. - o Autofocus: Significant progress has been achieved on this AI-based control system using deep-learning techniques, which will enable self-calibration of the motorised actuators of the parabolic mirrors in the beam-transport. This system is expected to replace manual work currently carried out by two people, delivering more precise calibration and saving researchers' time during the campaigns.

- o AutoTarget: This control system has been implemented to automatically locate impact holes in solid matrix targets, representing a significant optimisation of time.
- Launch of an innovation and support station. In this initiative, the completion of the tender for the acquisition of a new commercial laser system stands out in 2024. This system will enhance the microprocessing capabilities. Furthermore, due to the system's own characteristics, discussions have been held with several companies and research centres regarding the analysis of potential novel applications that could be explored.



5. DISSEMINATION AND TRANSPARENCY

a. Unit for Scientific Culture and Innovation– UCC+i (by its Spanish initials)

At the end of 2024, the Spanish Centre for Pulsed Lasers (CLPU) received its renewal as a Unit for Scientific Culture and Innovation, after successfully passing the evaluation process carried out by the Spanish Foundation for Science and Technology (FECYT), part of the Ministry of Science, Innovation and Universities. This entity grants the distinction to scientific and technological institutions, universities, research centres, and other entities related to science for their work in promoting and disseminating scientific culture and innovation in society, thereby enhancing the understanding and appreciation of these fields among citizens. In this context, during the first half of 2024, the UCC+i continued with its programme of activities, supported by co-financing from FECYT in its 2022 call.



UCC+i Activity Programme – ICTS Spanish Center for Pulsed Lasers

Goal	This project outlines the activity programme designed by the Unit, reflecting the strategic communication line of the Centre and the specific objectives of the call. A total of 8 activities are defined, targeting different audience groups: the general public, non-university students, university students, groups with diverse capabilities, and members of communities with limited access to the scientific field.
Actions	The year 2024 marked the second half of the project's execution period. During this time, the following specific actions were carried out:

- Garabalux: The fourth edition of the Centre's drawing competition for primary school students, which was held regionally for the first time. The competition guidelines were published at the end of January, and the winners were announced on May 16, in celebration of the International Day of Light. In June, we visited the schools of the winners and finalists (Salamanca and Burgos) for the awards ceremony, which included a workshop prior to the event.
- Forgotten by Science: A new podcast added to the Centre's Luciérnagas channel (<https://go.ivoox.com/sq/1366227>) to mark the International Day of Women and Girls in Science (February 11). A total of eight episodes were produced, highlighting the scientific and human value of the following researchers:
 - o Cecilia Payne-Gaposchkin. The astronomer who uncovered the secret of the stars (14/02/24)
 - o Ada Lovelace. The mother of programming (26/02/24)
 - o Ángela Ruiz Robles. The Galician inventor of the e-book (21/03/24)
 - o Sophie Germain. The self-taught mathematician (29/04/24)
 - o Barbara McClintock. The scientist who discovered jumping genes (20/05/24)
 - o Florence Nightingale. The heroine of hospitals (17/06/24)
 - o Maria Mitchell. Pioneer of astronomy (26/06/24)
 - o Mary Leakey. The grand dame of palaeontology (27/06/24)
- Chameleons: workshops for early-career university researchers across science and the humanities, and upper-secondary students, aimed at impro-

ving their communication skills. They were held on 5–7 February and attracted about thirty registrants.

- Lumos: outreach workshop organised to mark the International Day of Light at the “El Tormes” shopping centre. Through simple experiments, it explained concepts such as wave, colour, reflection, polarisation and radiation. Five sessions were held: two at the weekend aimed at families, and three on a weekday for pupils from three different schools in the province of Salamanca
- Kindling Caravan: an activity in which the Teia outreach workshop was redesigned to take it to long-stay paediatric patients in the hospital classrooms at the Salamanca and Burgos hospital complexes.
- Playing with Light: a series of workshops adapted for people with cognitive and/or physical disabilities. Over the course of the project’s implementation period in 2024, a total of five activities were carried out.
- Pixels: Around May 2024, the official YouTube channel published the videos featuring interviews with users of the Centre. Specifically:
 - Wendell T. Hill (Maryland University, USA). Diagnostics for quantitative assessment of spatio-temporal overlap of 2 PWC pulses & the spatial quality of the focus of PWC pulses. Youtube>>
 - Daniele Francescone (‘La Sapienza’ University, Rome): Betatron sources characterization through spectral noise fluctuation. Youtube>>
 - Fabrizio Consoli (ENEA, Italy): Laser-Initiated $11\text{B}(\text{p},\alpha)\text{2}\alpha$ Fusion Reactions in energetic, intense and high-rate laser facilities. Youtube>>
 - Francesco Mirani (POLIMI, Italy): High-energy laser-driven hadron sources based on optimi-

zed nanostructured targets. Youtube>>

- Klaus Spohr (ELI NP, Romania): Laser driven population and release of the 2.4 MeV isomer in $^{93}\text{m}\text{Mo}$ – Mo, towards a Nuclear Battery. Youtube>>



Likewise, a new UCC+i activity programme proposal was submitted to the Call for Grants for the Promotion of Scientific Culture, run by the Spanish Foundation for Science and Technology (FECYT) of the Ministry of Science, Innovation and Universities.

In addition, the Teia activity was continued outside its own project, aimed at the youngest children. It was relaunched through the Salamanca City of Knowledge Foundation, generating far more requests than could be accommodated. In fact, more than 80 requests were received, but only thirteen could be taken on during the 2023–2024 school year, as it had to run alongside the UCC+i's own programme. Specifically, in 2024 the workshop was delivered at eight schools in Salamanca, reaching more than 300 pupils in the second and third years of pre-primary and the first year of primary education.

b. Transparency

In line with its strategic actions for good governance, the Spanish Centre for Pulsed Lasers introduced in 2024 an integrated management platform tailored to research centres, Fundanet. This application enables the centralised, efficient administration of projects, calls, staff and funding. It facilitates administrative and financial monitoring of scientific activity, ensuring compliance with legal and funder requirements. Its use enhances traceability, transparency and resource optimisation in R&D facilities.

CLPU completed the 2024 Evaluation Plan of the Council for Transparency and Good Governance (CTBG), meaning that once again this year the Centre's compliance with obligations on proactive disclosure and the public's right of access to information has been assessed. The CTBG's initial report, CLPU's observations, the CTBG's response and its final report are available at the following link on the Council's portal:

https://www.consejodetransparencia.es/ct_Home/Actividad/Evaluaciones/Evaluacion2024/2024/SPI.html

As can be seen, the Mandatory Information Compliance Index (ICIO) for 2024 stands at 76.1%. Compared with 2023, this represents an increase of 38.8 percentage points, attributable to the implementation of fifteen of the recommendations issued in 2023.

Likewise, CLPU again collaborated with the Transparency Commissioner of Castile and León in the preparation of its 2024 Annual Report, providing information on the right of access to public information and compliance with proactive disclosure obligations.

Alongside this, the Centre implemented an internal whistleblowing channel to enable confidential and secure reporting of possible irregular conduct and legal or ethical breaches within the organisation. Its main purpose was to prevent and detect fraud, harassment, corruption and other malpractice, thereby fostering an environment of integrity and transparency. It also supported regulatory compliance and the continuous improvement of internal processes.

Lastly, during this period the Centre established its Health and Safety Committee, composed of two employee representatives and two representatives of the Management.

c. Visits to the Centre

The unique scientific facility opens its doors to specialist and non-specialist audiences alike to promote its activities and to encourage scientific careers. Throughout 2024, the Centre received a total of 17 visits (not counting those inherent to the Centre's routine operations):

- 2024-01-31 The director of the 'Guillermo Velarde' Institute for Nuclear Fusion, Pedro Velarde, met with the Centre's management and gave a seminar.
- 2024-02-27 The Director-General of the European infrastructure Extreme Light Infrastructure (ELI), Allen Weeks, and the Deputy Director-General for the Internationalisation of Science and Innovation at the Ministry of Science, Innovation and Universities, Inmaculada Figueroa, visited the facilities and held a joint meeting with the Spanish Centre for Pulsed Lasers (CLPU) to strengthen synergies towards a future collaboration agreement.
- 2024-04-05 The Secretary-General for Research at the Ministry of Science, Innovation and Universities, Eva Ortega Paíno, chaired the regular meeting of the Governing Council, met with the Centre's staff, and toured the facilities to learn first-hand about the science and technology of this ICTS facility.
- 2024-04-17 Alfonso Bourgon de Izarra, Director of the Defence Industry Cluster, met with the management and visited the laboratories to learn about the cutting-edge technology of the ICTS and its transfer potential.
- 2024-04-24 Students on the University of Salamanca's Master's in Physics and Laser Technology visited the Centre's facilities.

- 2024-04-26 A large group of science-track upper-secondary students from IES Venancio Blanco (Salamanca) visited the facility to learn about the science and applications of VEGA. They were also introduced to the support laboratories and the mechatronics workshop
- 2024-04-26 Undergraduate Computer Engineering students on the University of Salamanca visited the facility to learn about the technological challenges involved in operating a laser system such as VEGA, relevant to their discipline.
- 2024-05-10 Undergraduate students on the Degree in Industrial Technologies Engineering and the Degree in Energy Engineering at the Polytechnic University of Madrid visited the ICTS to learn about its capabilities and their relevance to the development of their respective specialisations.
- 2024-05-14 Colonel Roberto Jenaro, an armaments engineer in the Spanish Army, met with the scientific leads of the industrial projects and with CLPU's management, and toured the facilities to learn about the infrastructure's high-end capabilities and potential synergies with the Defence sector.
- 2024-05-20 Representatives from the National Institute for Aerospace Technology (INTA) under the Ministry of Defence, and from Indra and Escribano Mechanical & Engineering (EM&E), met with staff at the Spanish Centre for Pulsed Lasers (CLPU) in connection with a joint project to develop laser technology for defence applications. After the meeting, they were given a guided tour of the facilities.
- 2024-06-05 A Chinese delegation from Henan Polytechnic University, led by its rector, visited the Spanish Centre for Pulsed Lasers in search of synergies between the two organisations..
- 2024-06-07 The Centre's management team (the Director and the General Manager) presented the CLPU's capabilities to a delegation from Central Connecticut State University (USA), led by President Zulma Toro, who visited Salamanca hosted by the CEO of the University of Salamanca's International Courses.

- 2024-06-13 Students from the Laser course at the University of Zaragoza took a guided tour of the Centre to learn about the capabilities of Spain's most powerful laser system.
- 2024-06-24 Attendees at the 13th Iberian Gravitational Waves Congress visited the Centre to explore the potential of laser technology for their research.
- 2024-06-25 Attendees at the technical workshop "Laser Technology in the Defence Industry" visited the Centre as the concluding event of the session.
- 2024-11-11 Visit by several members of European universities participating in the USAL Erasmus Mundus programme, whose objectives include strengthening international academic and scientific networks to promote cultural exchange and academic and scientific excellence.
- 2024-12-11 Members of the management team from the Centre for the Study of Human Evolution (CENIEH) held a bilateral meeting at the Centre's facilities to collaborate on human resources management.



6. SUMMARY OF PROJECTS

The following section lists the 20 projects under implementation as of 31 December 2024.

UF - VEGA INFRASTRUCTURE

3.208.312,00 €

Entity	Title	CLPU IP	Duration	Amount
MCI	Área Experimental 2	Giancarlo Gatti	01/09/21 - 30/06/26	3.018.000,00 €
UE/H2020	RADNEXT	José Manuel Álvarez	01/06/21 - 31/05/26	77.120,00 €
UE/H. Europe	ReMade at ARI	Giancarlo Gatti	01/09/22 - 31/08/26	46.872,00 €
UE/H. Europe	RIANA	Treresa Cebriano	01/03/24 - 28/02/28	20.000,00 €
UE/H. Europe	Lasers4EU	J.A. Pérez Hernández	01/10/24 - 30/09/28	46.320,00 €

UF - RESEARCH AND TRAINING

744.406,18 €

Entity	Title	CLPU IP	Duration	Amount
MCI	HRR - TULIPAN	J. Luis Henares y J.A. Pérez Hernández	01/09/22 - 31/08/25	78.650,00 €
UE/H. Europe	EuPRAXIA	Giancarlo Gatti	01/11/22 - 30/10/26	10.000,00 €
MCI / SEPE	Programa Investigo	Roberto Lera	24 meses	66.217,84 €
MCI / SEPE	Programa Investigo	Diego de Luis	24 meses	66.217,84 €
MCIU	NAPEL	Roberto Lera	01/09/23 - 31/08/26	170.000,00 €
MCIU	APPLE	Giancarlo Gatti	01/09/23 - 31/08/26	187.500,00 €
MCIU	Contrato Predoctoral (NAPEL)	Roberto Lera	01/08/24 - 31/07/28	111.758,00 €
MCIU	SIRACUSA	Jon I. Apiñániz	01/09/24 - 30/06/27	43.750,00 €
EURATOM	EUROfusion	J.A. Pérez Hernández	01/04/23 - 31/12/25	10.312,50 €

UF - TRANSFERENCE AND INNOVATION

3.139.209,01 €

Entity	Title	CLPU IP	Duration	Amount
CSN	Desarrollo de nuevos sistemas de tecnología CMOS	Jon I. Apimániz	29/12/22 - 28/12/26	88.957,34 €
MCI	DOLEV	Giancarlo Gatti	01/01/23 - 31/12/26	742.500,00 €
EDF23	OPTIMAS	Roberto Lera	01/12/24 - 31/05/28	267.912,50 €
Contrato	DIAL	Mauricio Rico	22/12/23 - 21/12/27	1.838.160,50 €
Contrato	(Confidencial)	M. Rico y R. Lera	01/09/24 - 31/12/25	201.678,67 €

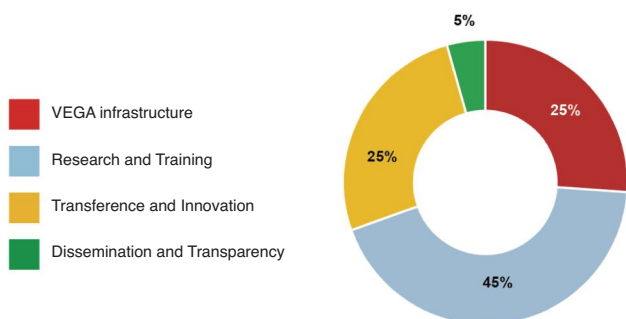
UF - DISSEMINATION AND TRANSPARENCY

18.000,00 €

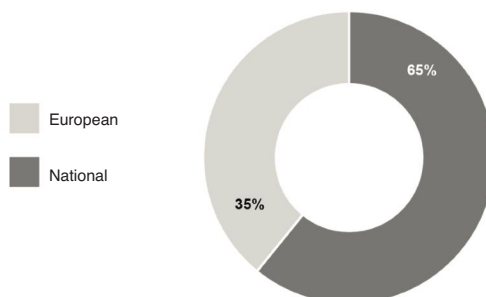
Entity	Title	CLPU IP	Duration	Amount
FECYT	G-UCCI 2025	Yaiza Cortés	01/07/25 - 30/06/26	18.000,00 €

7.109.927,19 €

Nature (association with the Functional Units)



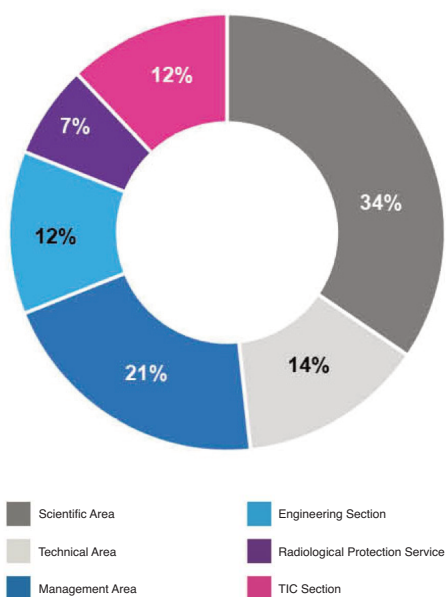
By the geographical scope of the call



7. HUMAN RESOURCES

The value of the infrastructure's workforce is another of the Centre's strategic pillars; the Centre is acutely aware of the high level of specialisation that the facility demands of its staff.

Staff as at 31 December 2024

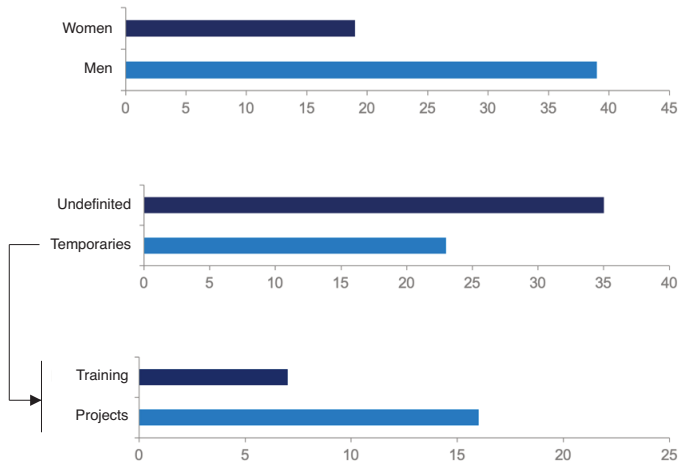


Recruitments
In / Out

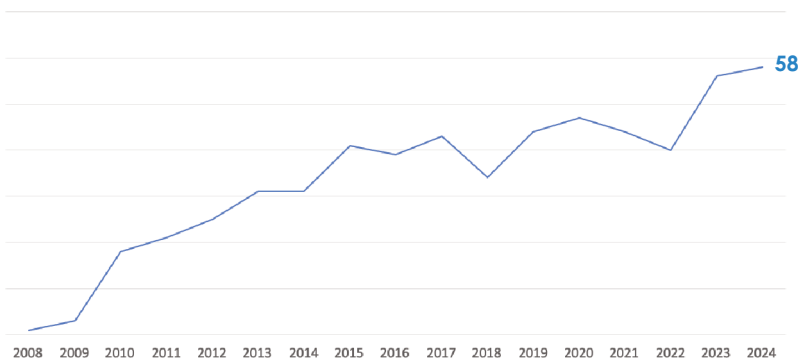
- 20

+17

Staff Distribution



Staff Trend over Time



SCIENTIFIC CONTRIBUTIONS

PAPERS

M. R. D. Rodrigues; A. Bonasera; M. Scisciò; J. A. Pérez-Hernández; M. Ehret; F. Filippi; P. L. Andreoli; M. Huault; H. Larreur; D. Singappuli; D. Molloy; D. Raffestin; M. Alonzo; G. G. Rapisarda; D. Lattuada ; G. L. Guardo; C. Verona; Fe. Consoli; G. Petringa; A. McNamee; M. La Cognata; S. Palmerini; T. Carriere; M. Cipriani; G. Di Giorgio; G. Cristofari; R. De Angelis; G. A. P. Cirrone; D. Margarone; L. Giuffrida; D. Batani; P. Nicolai; K. Batani; R. Lera; L. Volpe; D. Giulietti; S. Agarwal; M. Krupka; S. Singh and F. Consoli, Radioisotope production using lasers: from basic science to applications, Matter and Radiation at Extremes, 09, 037203 (2024).

[Publicación vinculada a la campaña experimental de acceso competitivo de la tercera convocatoria 'Laser-initiated $11\text{B}(p,\alpha)2\alpha$ Fusion Reactions in energetic, intense and high-rate laser facilities', liderada por el investigador de ENEA (Italian National Agency for New Technologies, Energy and Sustainable Economic Development) Fabrizio Consoli]

[Publicación vinculada al proyecto 'Laserlab-Europe: The integrated initiative of European Laser Research infrastructure' V (GA871124)]

Ehret, M.; de Luis, D.; Apiñaniz, J.; Henares, J.L.; Lera, R.; Pérez-Hernández, J.A.; Puyuelo-Valdés, P.; Volpe, L and Gatti, G., Stability and debris-migration of a solid tape target delivery system for intense laser-matter interactions towards high-repetition-rate, Plasma Physics & Controlled Fusion, 66, 045003 (2024)

[Publicación vinculada a las siguientes campañas experimentales de carácter estratégico: 'Enhancement of Tape Targets at VEGA

through the Characterization of Evaporation Craters' dirigida por el científico del CLPU Michael Ehret, y 'High repetition rate simultaneous temporal profile characterization and laser acceleration with the tape target for the VEGA 3 beamline' dirigida por el investigador del Centro, Roberto Lera.

[Publicación vinculada a los proyectos propios: 'Campañas experimentales multidisparo con alta tasa de repetición (ECQ2018-005230-P)'; 'Blancos de alta tasa de repetición en interacciones láser ultraintensas, producción de partículas y aplicaciones –TULIPAN– (PID2021-125389OA-100)'; 'Transporte y manipulación de partículas en aceleradores láser: nuevos escenarios en radioterapia FLASH –TYMPAL– (CLP263P20), e 'Integrated management and reliable operations for user-based laser scientific excellence –IMPULSE– (GA871161)']

Vlachos, C.; Ospina-Bohórquez, V.; Bradford, P. W.; Pérez-Callejo, G.; Ehret, M.; Guillon, P.; Lendrin, M.; Vaisseau, X. Albertazzi, B.; Sous-san, E.; Koenig, M.; Malko, S.; Kaur, C.; Gjevre, M.; Fedosejevs, R.; Bailly-Grandvaux, M.; Walsh, C. A.; Florido, R.; Suzuki-Vidal, F.; McGuffey, C.; Saret, J.; Beg, F. N.; Chodukowski, T.; Pisarczyk, T.; Rusiniak, Z.; Dostal, J.; Dudzak, R.; Calisti, A.; Ferri, S.; Volpe, L.; Woolsey, N. C.; Gremillet, L.; Tikhonchuk, V., and Santos, J. J., Laser-driven quasi-static B-fields for magnetized high-energy-density experiments, *Physics of Plasmas* 31, 032702 (2024)

[Publicación vinculada a dos de los proyectos europeos en los que participa el CLPU: 'Laserlab-Europe: The integrated initiative of European Laser Research infrastructure' V (GA871124), y 'EUROfusion (GA 101052200)'].

M. Ehret, J. Cikhart, P. Bradford, I.M. Vladisavlevici, T. Burian, D. de Luis, J.L. Henares, R. Hernández-Martín, J.I. Apinaniz, R. Lera, J.A. Pérez-Hernández, J.J. Santos and G. Gatti., High-repetition-rate source of nanosecond duration kA-current pulses driven by relativistic laser pulses, *High Power Laser Science and Engineering* - 10.1017/hpl.2024.14 (2024)

[Publicación vinculada a la campaña de investigación propia 'Development of Tape Targets in VEGA for high repetition rate experiments and optimization of related HRR diagnostics', liderada por el investigador del Centro, José Luis Henares'].

[Publicación vinculada a los proyectos propios: 'Hybrid prototype based on laser boost of a Linac to obtain an ultrahigh high dose rate in radiotherapy – Hybrilin (PDC2021-12933-I00), 'Campañas experimentales multidisparo con alta tasa de repetición (ECQ2018-005230-P)'; 'Blancos de alta tasa de repetición en interacciones láser ultraintensas, producción de partículas y aplicaciones –TULIPAN– (PID2021-125389OA-I00)'; 'Transporte y manipulación de partículas en aceleradores láser: nuevos escenarios en radioterapia FLASH -TYMPAL- (CLP263P20), e 'Integrated management and reliable operations for user-based laser scientific excellence -IMPULSE- (GA871161)']

Gjevre, JM; Perez-Hernandez, JA; Lera, R; Salgado-Lopez, C; Ehret, M; Zeraouli, G; Roso, L; Fedosejevs, R, Focal cone high harmonic generation driven by a 400TW laser, Applied Optics 63, 13, pp 3600-3608 (2024)

[Publicación vinculada a la campaña experimental de la tercera convocatoria de acceso abierto competitivo 'High Harmonic Hot Spot' liderada por el investigador de la Universidad de Alberta (Canadá) Robert Fedosejevs].

[Publicación vinculada a los proyectos propios: 'Campañas experimentales multidisparo con alta tasa de repetición (ECQ2018-005230-P)'; 'Blancos de alta tasa de repetición en interacciones láser ultraintensas, producción de partículas y aplicaciones –TULIPAN– (PID2021-125389OA-I00)'; 'Integrated management and reliable operations for user-based laser scientific excellence —IMPULSE— (GA871161), y 'Laserlab-Europe: The integrated initiative of European Laser Research infrastructure' V (GA871124)].

Ehret, M.; Volpe, L.; Apiñaniz, J.I.; Rodríguez-Frías, M.D. and Gatti, G., Influence of the Experimental Setup on Electromagnetic Pulses in the VHF Band at Relativistic High-Power Laser Facilities, *Photonics* 2024, 11(5), 459 (2024)

[Publicación vinculada a la campaña experimental de carácter estratégico 'Puesta en marcha de una fuente de neutrones generada a partir de VEGA-3', liderada por el jefe del Servicio de Radioprotección del Centro, José Manuel Álvarez.]

[Publicación vinculada a los proyectos propios 'Ensayos para la producción intencionada de neutrones con el acelerador láser-plasma VEGA-3 (05-00495-0101)' e 'Integrated management and reliable operations for user-based laser scientific excellence —IMPULSE— (GA871161)].

Ospina-Bohórquez, V; Salgado-López, C.; Ehret, M. ; Malko, S.; Salvadori, M. ; Pisarczyk, T.; Chodukowski, T.; Rusiniak, Z.; Krupka, M.; Guillon, P.; Lendrin, M.; Perez-Callejo, G.; Vlachos, C.; Hannachi, F.; Tarisien, M.; Consoli, F.; Verona, C.; Prestopino, G.; Dostal, J.; Dudzak, R.; Henares, J.L.; Apiñaniz, J.I.; De Luis, D.; Debayle, A.; Caron, J.; Ceccotti, T.; Hernández-Martín, R.; Hernández-Toro, J.; Huault, M.; Martín-López, A.; Méndez, C.; Nguyen-Bui, TH.; Perez-Hernández, J.A.; Vaisseau, X.; Varela, O.; Volpe, L.; Gremillet, L.; Santos, J.J., Laser-driven ion and electron acceleration from near-critical density gas targets: Towards high-repetition rate operation in the 1 PW, sub-100 fs laser interaction regime, *Physical Review Research* 6, 2 (2024)

[Publicación vinculada a la campaña competitiva de la segunda convocatoria 'Ion acceleration by ultra-intense laser interaction with high density gas jet - towards PW power regime', liderada por el investigador de la Universidad de Burdeos, Joao J. Santos]

[Publicación vinculada a los proyectos propios: Integrated management and reliable operations for user-based laser scientific excellence -IMPULSE- (GA871161); 'Laserlab-Europe: The integrated

initiative of European Laser Research infrastructure' V (GA871124); 'Campañas experimentales multidisparo con alta tasa de repetición (ECQ2018-005230-P)', y 'Transporte y manipulación de partículas en aceleradores láser: nuevos escenarios en radioterapia FLASH —TYMPAL— (CLP263P20)'].

Huault, M.; Ehret, M.; De Luis, D.; Pérez Hernández, J.A.; Apiñaniz, J.I.; Henares, J.L.; Malko, S.; Touati, M.; Gordillo, N.; Gutiérrez Neira, C.; Metzkes, J.; Shramm, U.; Zeil, K.; Roso, L.; Gatti, G. and Volpe, L. A Scintillator Detector for Spatiospectral Characterization of Proton Beams at High Repetition Rate, IEEE Transactions on Instrumentation and Measurement, vol. 73, 7004812 (2024)

[Publicación vinculada a la campaña experimental de acceso abierto competitivo de la segunda convocatoria 'Proton/Electron Beams' Space/Time Characterization, liderada por el jefe del área Científica, Giancarlo Gatti].

Peñas, J.; Alejo, A.; Bembibre, A.; Apiñaniz, J.O.; García-García, E.; Guerrero, C.; Henares, J.L.; Hernández-Palmero, I.; Méndez, C.; Millán-Callado, M.A.; Puyuelo-Valdés, P.; Seimetz, M. and Benlliure, J., Production of carbon-11 for PET preclinical imaging using a high-repetition rate laser-driven proton source, Scientific Reports 14, 11448 (2024)

[Publicación vinculada a la campaña competitiva 'Laser-driven neutrons for nuclear physics experiments and applications at CLPU', perteneciente a la tercera convocatoria y dirigida por el investigador del Centro Nacional de Aceleradores Carlos Guerrero].

Volpe, L.; Cebriano Ramírez, T.; Sánchez Sánchez, C.; Pérez, A.; Curcio, A.; de Luis, D.; Gatti, G.; Kebladj, B.; Khetari, S.; Malko, S.; Pérez-Hernández, J.A. and Rodríguez-Frías, M.D. A Platform for Ultra-Fast Proton Probing of Matter in Extreme Conditions, Sensors, 24(16), 5254 (2024)

[Proyecto vinculado a los proyectos propios 'Transporte y manipulación de partículas en aceleradores láser: nuevos escenarios en radioterapia FLASH —TYMPAL— (CLP263P20) y 'Advanced particle beams, plasmas and laser experiments —APPLE— (PID2022-137339OA-I00)].

Gatti, G.; Mirani, F.; Rastelli, D.; Mazzucconi, D.; Henares, J.L.; Morabito, A.; Pola, A. and Passoni, M., Design of a semiconductor-based proton spectrometer for laser-driven sources applications, IEEE Transactions on Instrumentation and Measurement (2024)

[Publicación vinculada al proyecto europeo en el que participa el CLPU 'Laserlab-Europe: The integrated initiative of European Laser Research infrastructure' V (GA871124)].

K. L. Batani, S. Malko, M. Touati, J.-L. Feugeas, A. D. Lad, K. Jana, G. R. Kumar, D. Raffestin, O. Turianska, D. Khaghani, A. Tentori, D. Mancelli, A. S. Martynenko, S. Pikuz, R. Benocci, L. Volpe, G. Zeraoui, J. A. Perez Hernandez, E. Garcia, V. Narayanan, J. Santos and D. Batani, Characterization of blast waves induced by femtosecond laser irradiation in solid targets, High Power Laser Science and Engineering, Vol. 12, e59 (2024)

[Publicación vinculada al experimento de la primera convocatoria 'Generation of Transient Very Strong Shocks by fs-Lasers' dirigido por el investigador de la Universidad de Burdeos, Dimitri Batani].

[Publicación vinculada al proyecto europeo en el que participa el Centro 'EUROfusion (GA 101052200)']

Pisarczyk, T.; Renner, O.; Rusiniak, Z.; Dudzak, R.; Domanski, J.; Rafalak, W.; Chodukowski, T.; Badziak, J.; Krupka, M.; Singh, S.; Tchórz, P.; Rosinski, M.; Krasa, J.; Agraval, S.; Klir, D.; Cikhardt, J.; Zaraszydłowska, A.; Dostal, J.; Ettel, D.; Vlachos, C.; Ehret, M.; Bradford, P.W.; Marchenko, H.; Gajdos, P.; Szymanski, M.; Jelinek, S.; Miklaszewski, R.; Batani, D.; Batani, K.; Santos, J.; Ospina-Bohórquez, V.; Volpe, L.; Borodziuk, S.; Krus, M. and Juha, L., Influence of the mag-

netic field on the emission of hot electrons and ions from ablative plasma produced from a disc-coil target irradiated by the 3rd harmonic of the PALS iodine laser, *Plasma Phys. Control. Fusion*, 66, 115007 (2024)

Labani, M.; Clerico, V.; Diez, E.; Gatti, G.; Amado, M. and Pérez-Rodríguez, A., Optimization of soft X-ray Fresnel Zone Plate fabrication through joint electron beam lithography and cryo-etching techniques, *Nanomaterials*, 14(23), 1898 (2024)

[Publicación vinculada al proyecto propio 'Hybrid prototype based on laser boost of a Linac to obtain an ultrahigh high dose rate in radiotherapy – Hybrilin (PDC2021-12933-I00)]

Cebriano Ramírez, T., Curcio, A., Apiñaniz Aginako, J.I., De Luis, D.; Morabito, A.; Salgado-López, C.; Filippov, E.; Rodríguez Frías, M.D.; Volpe, L. and Gatti, G., Design and implementation of the first proton beam transport line in VEGA-3 Petawatt laser system, *Scientific Reports*, 14, 29935 (2024)

[Publicación vinculada al proyecto propio 'Transporte y manipulación de partículas en aceleradores láser: nuevos escenarios en radioterapia FLASH —TYMPAL— (CLP263P20)']

Y. Kuramitsu, T. Taguchi, F. Nikaido, T. Minami, T. Hihara, S. Suzuki, K. Oda, K. Kuramoto, T. Yasui, Y. Abe, K. Ibano, H. Takabe, C. M. Chu, K. T. Wu, W. Y. Woon, S. H. Chen, C. S. Jao, Y. C. Chen, Y. L. Liu, A. Morace, A. Yogo, Y. Arikawa, H. Kohri, A. Tokiyasu, S. Kodaira, T. Kusumoto, M. Kanasaki, T. Asai, Y. Fukuda, K. Kondo, H. Kiriyaama, T. Hayakawa, S. J. Tanaka, S. Isayama, N. Watamura, H. Suzuki, H. S. Kumar, N. Ohnishi, T. Pikuz, E. Filippov, K. Sakai, R. Yasuhara, M. Nakata, R. Ishikawa, T. Hoshi, A. Mizuta, N. Bolouki, N. Saura, S. Benkadda, M. Koenig and S. Hamaguchi, Optimization of laser-driven quantum beam generation and the applications with artificial intelligence, *Phys. Plasmas*, 31, 053108 (2024)

A. Reija, D. Esteban, A. Alejo, J. I. Apiñaniz, A. Bembibre, J. Benlliure, M. Ehret, J. García López, M. C. Jiménez-Ramos, J. Juan-Morales, C. Méndez, D. Pascual, M. D. Rodríguez Frías, M. Rodríguez Ramos and M. Seimetz, Design and Implementation of an Energy Selector for Laser-Accelerated Protons, *Instruments*, 8(3), 36 (2024)

[Publicación vinculada al acceso no competitivo 'Radiation effects of laser-accelerated protons on living cells' dirigido por el investigador Michael Seimetz, del Instituto de Instrumentación para Imagen Molecular -I3M-].

A. Tarifeno-Saldivia, Calvino, A. De Blas, B. Brusasco, A. Casanovas-Hoste, A.M. Cives, G. Cortés, R. García, F. Molina, N. Mont-Geli, M. Pallàs, C. Pavez, Ambient dosimetry in pulsed neutron fields with LINrem detectors, *Radiation Physics and Chemistry*, 224 (2024)

[Publicación vinculada a la campaña competitiva 'Laser-driven neutrons for nuclear physics experiments and applications at CLPU' perteneciente a la tercera convocatoria y liderada por el investigador del Centro Nacional de Aceleradores, Carlos Guerrero].

A. Curcio, A. Cianchi, G. Costa, A. Del Dotto, F. Demurtas, M. Ferrario, M.D. Rodríguez Frías, M. Galletti, J.A. Pérez-Hernández and G. Gatti, Reconstruction of lateral coherence and 2D emittance in plasma betatron X-ray sources, *Scientific Reports*, volume 14, 1719 (2024).

[Publicación vinculada a dos de los proyectos europeos en los que participa el CLPU: 'Hybrid prototype based on laser boost of a Linac to obtain an ultrahigh high dose rate in radiotherapy – Hybrilin (PDC2021-12933-I00)', 'Laserlab-Europe: The integrated initiative of European Laser Research infrastructure V' (GA871124) y 'EUROfusion (GA 101052200)']

Pastor, I.; Álvarez-Estrada, R.F.; Roso, L. and Castejón, F., Classical Scattering of High-Energy Electrons off Ultra-Intense Laser Beams Taking into Account Radiation Reaction, *Photonics*, 11(2), 113 (2024)

[Publicación vinculada a dos de los proyectos europeos con participación de la ICTS: Integrated management and reliable operations for user-based laser scientific excellence —IMPULSE— (GA871161), y 'Laserlab-Europe: The integrated initiative of European Laser Research infrastructure' V (GA871124)].

Pastor, I.; Álvarez-Estrada, R.F.; Roso, L. and Castejón, F., Thomson Scattering and Radiation Reaction from a Laser-Driven Electron, *Photonics*, 11(10), 971 (2024)

[Publicación vinculada a dos de los proyectos europeos con participación del Centro: : Integrated management and reliable operations for user-based laser scientific excellence -IMPULSE- (GA871161), y 'Laserlab-Europe: The integrated initiative of European Laser Research infrastructure' V (GA871124)].

V. Ospina-Bohórquez, A. Debayle, J. J. Santos, L. Volpe and L. Gremillet, Ion acceleration from the interaction of ultrahigh-intensity laser pulses with near-critical density, nonuniform gas targets, *Phys. Plasmas*, 31, 013102 (2024)

[Publicación vinculada al proyecto europeo en el que participa el CLPU 'Laserlab-Europe: The integrated initiative of European Laser Research infrastructure' V (GA871124)].

L Roso, R Lera, Smrithan Ravichandran, A Longman, C Z He, J A Pérez-Hernández, JI Apiñaniz, R Mahnot, V Mateu, R Fedosejevs and WT Hill, Progress in Ultrafast Intense Laser Science XVII. Chapter "The Born Versus Heisenberg Quantum-Vacuum Controversy and Beyond", in: Yamanouchi, K., DiMauro, L.F., Hill, III, W.T. (eds) Progress in Ultrafast Intense Laser Science XVII. Topics in Applied Physics, vol 151. Springer, Cham.

[Publicación vinculada a la campaña competitiva de la tercera convocatoria 'Direct comparison of nonlinear, relativistic Thomson scattering radiation, ejected electrons and parent ion charge state', liderada por el investigador de la Universidad de Maryland (EE.UU.), Wendell T. Hill III].

[Publicación vinculada a los proyectos propios: Integrated management and reliable operations for user-based laser scientific excellence —IMPULSE— (GA871161); 'Laserlab-Europe: The integrated initiative of European Laser Research infrastructure' V (GA871124); y 'Blancos de alta tasa de repetición en interacciones láser ultraintensas, producción de partículas y aplicaciones —TULIPAN— (PID2021-125389OA-100)

Curcio, A.; Gatti, G.; Volpe, L., Chiadroni, E.; Migliorati, M.; Mostacci, A.; Palumbo, L and Petrarca, M. Dose increment in ultrashort particle irradiations via coherent stopping power, *Physical Review Research*, 6, 033334 (2024)

[Publicación vinculada al proyecto propio 'Hybrid prototype based on laser boost of a Linac to obtain an ultrahigh high dose rate in radiotherapy – Hybrilin (PDC2021-12933-I00)].

CONTRIBUTIONS IN CONGRESSES / CONFERENCES

Pérez-Hernández, J.A., Laser-plasma station at CLPU for studying strategies for mitigation of laser-plasma instabilities, Workshop on Laser-Plasma interactions for inertial fusion energy, 11 - 12 abril, ELI Bemalines (Praga, Rep. Checa). [Ponencia]

Rodríguez-Frías, M.D., Governing Board Meeting, IMPULSE Closing Meeting, 17 abril, Bruselas (Bélgica) [Participación]

Álvarez-Pastor, J.M., 'Lente de Laue en astrofísica nuclear', CLPU Pizza Seminar, 25 de abril (Salamanca, España) [Ponencia].

Ehret, M., Advances in high-repetition-rate metrology of laser-driven ion beams and electromagnetic pulses at the CLPU, Workshop on the CPAN Network on Instrumentation and Detectors, 8 - 10 mayo, Valencia (España) [Ponencia]

Volpe, L., 'Efficient Proton Acceleration via double pulse laser approach', 19th Direct Drive & Fast Ignition Workshop, 21 - 24 de mayo (París, Francia) [Ponencia]

Pérez-Hernández, J.A., General Assembly Laserlab European Consortium, 27-30 mayo, Instituto Superior Técnico de Lisboa (Lisboa, Portugal) [Miembro]

Vladisavlevici, I., Applied Physics & Interdisciplinarity Seesion 01, TIM 24 Physics Conference, 30 mayo al 1 junio, Universidad de Timisoara (Timisoara, Rumanía) [Moderadora]

Vladisavlevici, I., Laser-driven particle sources and simulations at CLPU, TIM 24 Physics Conference, 30 de mayo al 1 de junio (Timisoara, Rumanía) [Ponencia invitada]

Gatti, G., participación en la mesa redonda 'Oportunidades en el sector público y centro e investigación', II Jornada sobre oportunidades para jóvenes investigadores en fusión, 20 de junio (Madrid, España) [Participación mesa redonda]

Ehret, M., Laser Plasma Physics for Fusion Science at CLPU, Workshop on Laser Fusion Research Opportunities at FAIR, 21 junio (Wixhausen, Alemania) [Ponencia]

Gatti, G., The CLPU as a multidisciplinary laser facility, 13rd Iberian Gravitational Waves Meeting, 24 - 26 junio (Salamanca España) [Ponencia]

Méndez, C., "VEGA laser: facility status and near future capabilities, XIV Reunión Nacional de Óptica, 3 - 5 julio (Murcia, España) [Ponencia invitada]

García-García, E., Characterisation of the Double Pulse configuration for the PW class laser system VEGA-3 at CLPU, XIV Reunión Nacional de Óptica, 3 - 5 julio (Murcia, España) [Ponencia]

Vaquero, A., Improving pulse self-compression in photonic crystal fibers using particle swarm optimization algorithm, XIV Reunión Nacional de Óptica, 3 - 5 julio (Murcia, España) [Ponencia]

Ehret, M., Insight into the physics of laser-driven coils for optically-triggered generation of quasi-static magnetic fields, 50th EPS Conference on Plasma Physics, 8 - 12 de julio (Salamanca, España) [Ponencia]

Pérez-Hernández, J.A., Commissioning experiment on proton acceleration and characterization with the petawatt-femtosecond class Laser VEGA-3 at CLPU, 50th EPS Conference on Plasma Physics, 8 - 12 de julio (Salamanca, España) [Ponencia]

Álvarez Pastor, J.M., Radiation Protection at CLPU's Ultra-High Intensity Laser VEGA, 50th EPS Conference on Plasma Physics, 8 - 12 de julio (Salamanca, España) [Póster]

Cives, A.M., Study of radiation and particle sources based on plasma using thermoluminescence dosimeters at CLPU, 50th EPS Conference on Plasma Physics, 8 - 12 de julio (Salamanca, España) [Póster]

Boudjema, N., "On line-on target" temporal beam diagnostic at high power and focal spot optimization of femtosecond petawatt-class lasers systems for laser-plasma interaction, 50th EPS Conference on Plasma Physics, 8 - 12 de julio (Salamanca, España) [Póster]

García-García, E., VEGA double pulse setup stability measurements: keys for driving laser wakefield accelerators, 50th EPS Conference on Plasma Physics, 8 - 12 de julio (Salamanca, España) [Póster]

Méndez, C., VEGA beamlines reorganization for driving user plasma accelerators, 50th EPS Conference on Plasma Physics, 8 - 12 de julio (Salamanca, España) [Póster]

Cebriano, T., Magnetic transport and focusing of laser-accelerated ultrafast proton beams, 50th EPS Conference on Plasma Physics, 8 - 12 de julio (Salamanca, España) [Póster]

Henares, J.L, Short-pulse Ti:Sa PW-class laser interaction with near-critical density gas targets to drive ion acceleration, 50th EPS Conference on Plasma Physics, 8 - 12 de julio (Salamanca, España) [Póster]

Huerta, A., High repetition rate energy selector for generation of quasi monoenergetic pencil like proton beams, 50th EPS Conference on Plasma Physics, 8 - 12 de julio (Salamanca, España) [Póster]

Rico, M y García-García, E., participación en mesas redonda con presentación del Network on Extreme Intensity Laser Systems (NEILS 2024), 22 - 23 de julio, Abingdon (Reino Unido) [Participación mesa redonda]

Ehret, M., 'Advances in high-repetition-rate metrology of laser-driven ion beams and electromagnetic pulses at the CLPU', 37th European Conference on Laser Interaction with Matter (ECLIM 2024), 16 - 20 de septiembre (Lisboa, Portugal) [Ponencia]

Ehret, M., High-repetition-rate metrology of laser-driven ion beams and electromagnetics pulses at CLPU, 37th European Conference on Laser interaction with matter, 16 - 20 septiembre (Lisboa, Portugal) [Ponencia]

Gatti, G., Laser acceleration activities at the CLPU, 2nd Workshop on Applications of Nanostructures in the field of Accelerator Physics (NanoAc 2024), 17 - 18 septiembre (Valencia, España) [Ponencia Invitada]

Ehret, M., Influence of the magnetic field on properties of hot electron emission from ablative plasma produced at laser irradiation of a disc-coil target by 3-harmonic of PALS iodine laser, 18 - 22 de septiembre (Varsovia, Polonia) [Póster]

Gatti, G., Desarrollo de tecnología, tecnología láser y puntos comunes LFE', Jornada CDTI 'Hacia la estrategia nacional de fusión nuclear', 14 de octubre (Madrid, España) [Ponencia Invitada]

Salgado, C., participación en la mesa redonda 'Instituciones Públicas', Congreso al Futuro. I Congreso de Formación y Empleo en Ciencias, 17 - 19 de octubre (Valladolid, España) [Participación mesa redonda]

Galán, F., 'Improving pulse self-compression in photonic crystal fibers with machine learning techniques', V Ultrafast Science & Technology Spain (USTS 2024), 6 - 8 de noviembre (Sitges, España) [Ponencia]

Gatti, G., 'Femtosecond X-ray pulse duration measurement through noise spectral fluctuation analysis', V Ultrafast Science & Technology Spain (USTS 2024), 6 - 8 de noviembre (Sitges, España) [Ponencia Invitada]

García-García, E., 'Low jitter Double Pulse configuration for a PW class high repetition rate laser system', V Ultrafast Science & Technology Spain (USTS 2024), 6 - 8 de noviembre (Sitges, España) [Póster]

Alejo, A., 'Production of pre-clinical activities of ^{11}C for PET imaging using a HRR laser-driven proton source', V Ultrafast Science & Technology Spain (USTS 2024), 6 - 8 de noviembre (Sitges, España) [Ponencia]

García-García, E., 'Spatiotemporal characterization of PW-class laser', V Ultrafast Science & Technology Spain (USTS 2024), 6 - 8 de noviembre (Sitges, España) [Póster]