# CALL FOR PROPOSALS

## User-assisted commissioning call for the P3 infrastructure at ELI-Beamlines

The ELI Beamlines user facility invites proposals for commissioning experiments in its E3 Experimental Hall [1,2], which serves experiments in the context of high-power laser-matter interaction.

We invite specially qualified users to assist with commissioning of the beamlines and diagnostic setups and to perform early experiments.
The commissioning experiments of the new P3 platform are expected to place between November 2022 and February 2023. Beam-time allocation and timing will be at the discretion of ELI-Beamlines.

### The aim of the call is to

1) Make use of available experimental configurations, targetry and diagnostic setups to initiate the first high-level user experiments

2) Implicate the potential user community to participate in future upgrades and to help define scientific directions for the infrastructure and identify additional necessary diagnostic systems

3) Initiate the process of building a user community around the P3 infrastructure

4) Provide expert advice and training to scientific & engineering staff, administrative support staff (user office) and support teams to optimize user operation for the future

## The experimental hall and chamber

The general layout is shown in Fig. 1 & 2. A street-view style overview of the hall and inside of the chamber can accessed here: https://my.matterport.com/show/?m=fkP3VjGbYyq

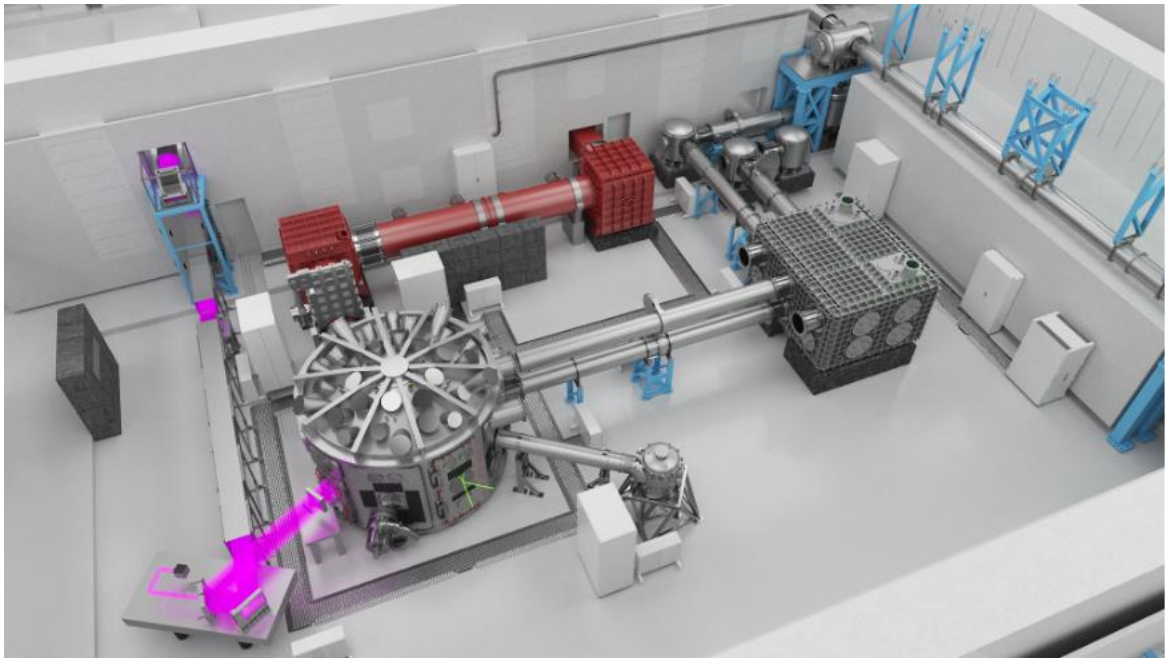


*Figure 1: Layout of the experimental hall E3 expected at the end of 2022.*

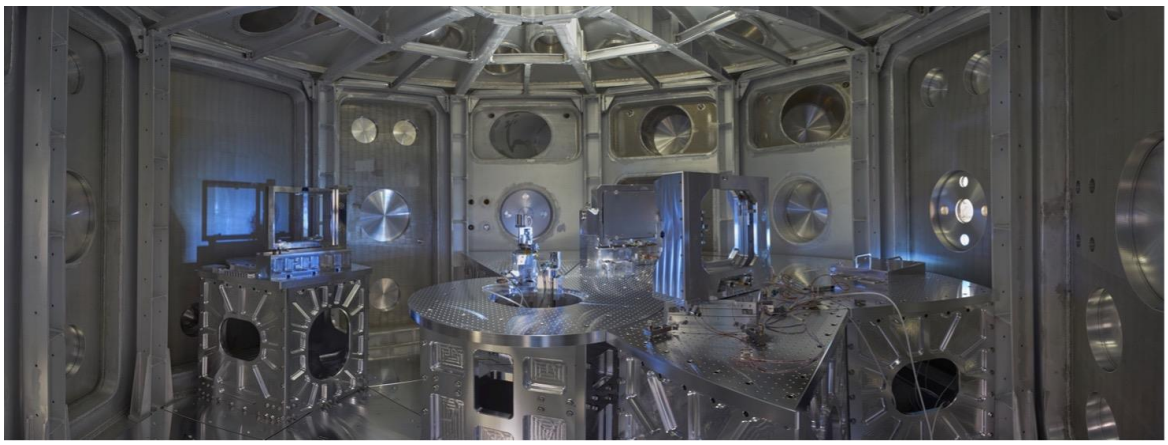


*Figure 2: Inside of the P3 chamber.*

## Expected configurations for the user-assisted commissioning period

The experimental configurations possible inside P3 are shown in Fig. 3.

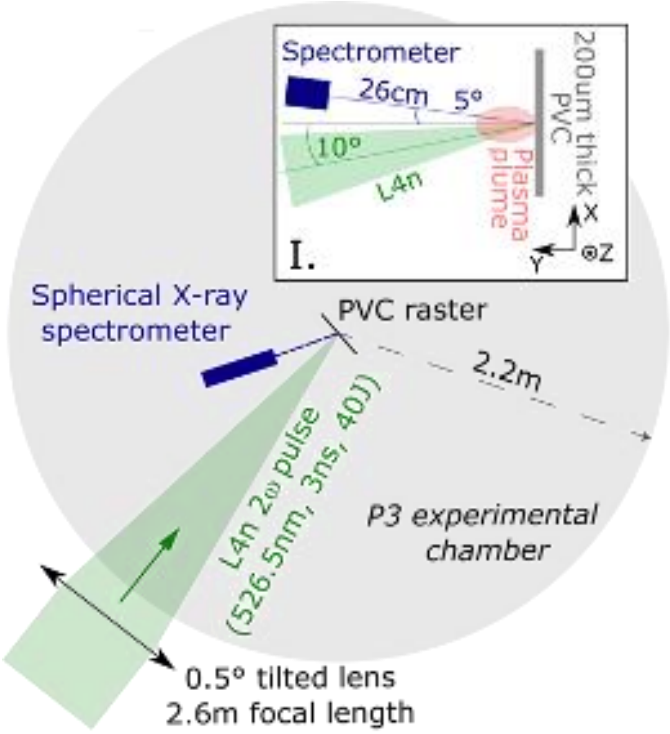



*Figure 3: L4n setup inside P3.*

Details of the setup configurations must be discussed with the P3 scientific staff.

### Experimental setup

The experimental setup inside the P3 chamber will be performed jointly by the user(s) and the P3 staff members. ELI-Beamlines will not be held liable for any damage.

### Laser parameters

L4n: ~600 Joules in 1-10 ns frequency-doubled (526.6 nm) with a shot rate of once every 3 minutes or better [4,5]. The total shooting time available during the user-assisted campaign is subject to laser-availability.

### Diagnostic systems

Users may bring their own diagnostic systems, provided their implementation has been approved by the P3 staff and the safety team. Note that all user equipment installed in a vacuum must comply with ELI BL particulates and chemical cleanliness standards. Since this process may take significant time, users will be asked to define their final experimental setup as soon as possible during the preparation process. Available in-house diagnostic systems available:

- Two spherical X-ray spectrometers (0.6 keV – 10 keV, precise range determined by the crystal used) – Now
- One 2D spherical Ka imager (Ti or Cu) - Now
- Electron spectrometers (up to 25 MeV) – from January 2023
- VISAR and SOP – from spring 2023
- Thomson parabola (up to 60 MeV)– from spring 2023
- X-ray streak camera (700 fs best resolution in the range 1 – 10 keV) – from spring 2023
- Gamma-ray spectrometer (> few hundred MeV range) – from spring 2023
- Shadowgraphy and interferometry using the L3-HAPLS alignment beam – from January 2023
- Note: the 2 PI-MTEs used for the X-ray spectrometers and imager can also be used independently to study something else, they cover the 0.6 keV to 10 keV range

## Targetry

ELI-Beamlines can provide/help with three kinds of targetry systems:

- Raster-style targets (solid or foam inset).
- Tape target system: see reference [3] for details.
- Gas-jet system: Gas nozzles with different opening sizes from a few hundred microns to several millimeters are available. These nozzles together with solenoid valves provide a gas density of a wide range of $10^{18}$ – $10^{20}$ $cm^{-3}$. The density can be adjusted by setting the proper backing pressure of the jet. We can also provide nozzle characterization using a high-resolution interferometer providing the density map of the jet.
- 3D-printed holders for difficult geometries

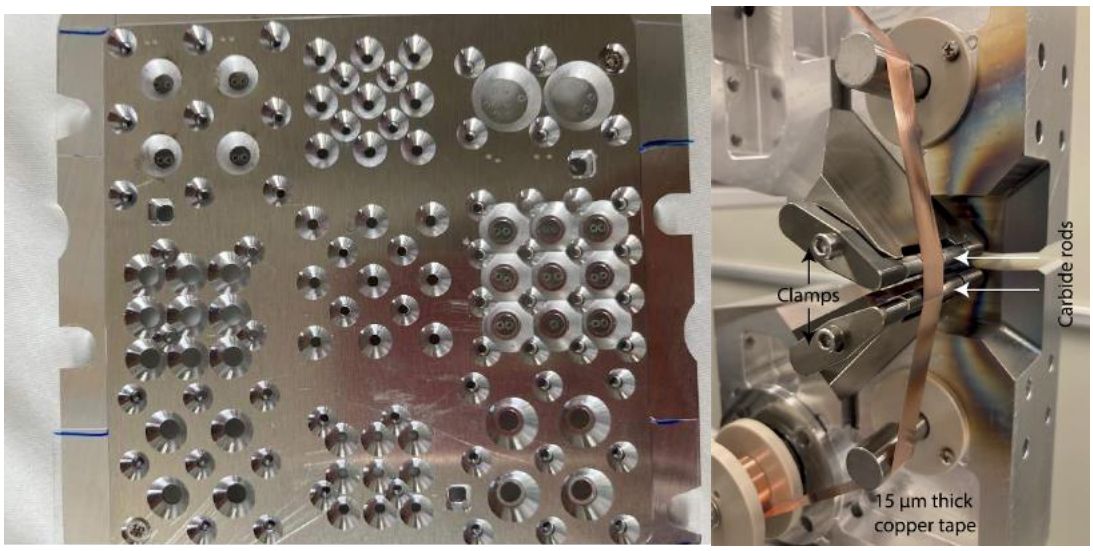
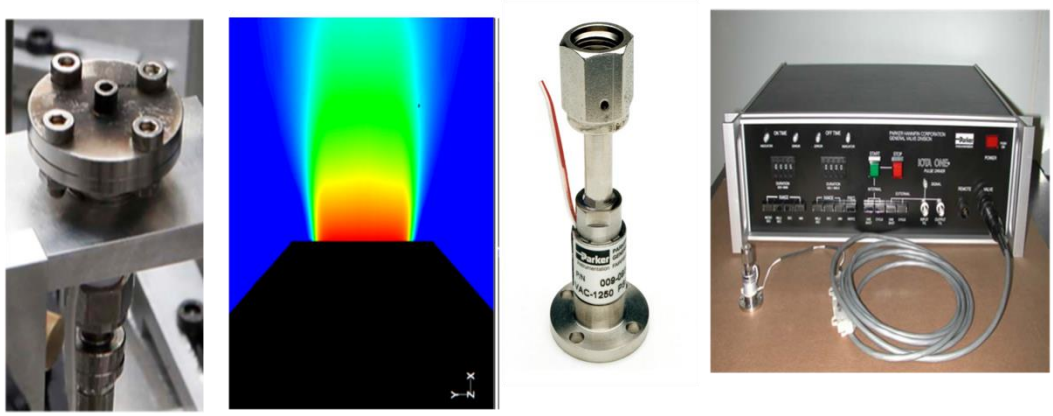



*Figure 4: Raster-type system (left) and tape-target (right).*



a) Gas Nozzle b) Density profile of the nozzle c) Parker Valve d) Iota one pulse jet driver

*Figure 5: Gas-jet nozzle system. An example of density profiles for a cylindrical 4 mm Laval nozzle and typical supersonic gas jet system (a,b)*

## Deadline for applications

The deadline for submission of the proposal is 5.11.2022. The number of accepted proposals will depend on the available beamtime and facility constraints (e.g. ongoing installation work in E3). As the installation is still in a ramp-up phase, flexibility might be expected from the potential user.

## Application procedure and admittance

On-line application forms are generated from the instrument pages. The user will be asked to structure the proposal according to the basic section below:

i. detailed scientific description of the project

ii. technical requirements (laser, diagnostics, etc.)

iii. information about the applicant team expertise in the field

The proposal should be around 3 pages long.

All applications will be processed by the user administration at ELI Beamlines user.office@eli-beams.eu. Submitted proposals will go through a feasibility assessment headed by the lead scientist of the P3 infrastructure and be selected or rejected based on an evaluation against the aims of the call stated above and the feasibility of the proposed experiments. Experiments will be scheduled or rejected on the basis of scientific merit in relation to the aims of the call, technical feasibility, and safety assessment. Results will be communicated to the applicants by the user office of ELI Beamlines.

The lead scientist of the P3 infrastructure will assign one suitable researcher of the ELI Beamlines' team to be the local Person Of Contact (PoC) for the experiment. The ELI PoP will automatically become a co-proposer (local PI) of the commissioning experiment. The PoP will be responsible for communications with the users before, during, and after the experiment, including aspects related to bringing user equipment to

ELI Beamlines. Beam time of about 4 weeks will be allocated (see below for more details) with approximately 8 hours of user beamtime per day.

Before gaining access to the premises of ELI Beamlines, users must complete relevant trainings (e.g. general safety, laser safety training). This will be provided by the ELI Beamlines safety team either as on-line training or on-site training as appropriate. A list all relevant safety trainings can be found here.

Useful general information about the ELI Beamlines facility can be found in the ELI Beamlines User-guide.

## Relevant information for Applicants

The applicants are encouraged to be familiar with the Data Policy and the User Publication Policy.

User-owned equipment can be included in the experimental. The user shall be familiar and follow the Instructions for bringing user equipment.

Other relevant information can be found in the document Application procedure and admittance.

## References

[1] S. Weber et al., P3: an installation for high-energy density plasma physics and ultra-high intensity laser-matter interaction at ELI-Beamlines, Matter Radiat. Extremes 2, 149 (2017)
[2] S. Borneis et al., Design, installation and commissioning of the ELI-Beamlines high-power, high-repetition rate HAPLS laser beam transport system to P3, High Power Laser Sci. Eng. 9, e30 (2021)
[3] F. Condamine et al., High-repetition rate solid target delivery system for PW-class laser-matter interaction at ELI Beamlines, Rev. Sci. Instrum. 92, 063504 (2021)
[4] N. Jourdain et al., The L4n laser beamline of the P3-installation: towards high-repetition rate high-energy density physics at ELI-Beamlines, Matter Radiat. Extremes 6, 015401 (2020)
[5] F. Condamine et al., Commissioning results from the high-repetition rate nanosecond-kiloJoule laser beamline at the Extreme Light Infrastructure, Plasma Phys. Control. Fusion (accepted for publication) (2022)