



Status of the High-Power Laser Experimental Areas at ELI-NP

D. Doria¹

- 1) *Affiliation Extreme Light Infrastructure (ELI-NP), and Horia Hulubei National Institute for R&D in Physics and Nuclear Engineering (IFIN-HH), Bucharest-Magurele, Romania*
E-mail : domenico.doria@eli-np.ro

The The ELI-NP (Extreme Light Infrastructure - Nuclear Physics) research facility is approaching full operational status. Last year, the capability of the laser system of achieving 10 PW was demonstrated. The ELI-NP experimental areas for the high-power laser will provide users with 2 laser beams up to 10 PW each, simultaneously [1, 2]. The laser wavelength is centred around 810 nm and the laser pulse has a typical duration of 25 fs. Recently, the commissioning of the 100 TW experimental area has already been successfully attained with an LWFA experiment on electron acceleration. In this experiment, the laser beam was focused by a parabolic mirror with F/28 to a maximum peak intensity of $I_0 \sim 1.7 \times 10^{19} \text{ Wcm}^{-2}$ and interacted with a gas-jet of 2 mm output diameter. The beam's energy fluctuation was $< 5\%$ and its pointing stability $\pm 7 \mu\text{rad}$ during a full day's run, which is of high standard. We shot on two different gases: pure He, and a gas mixture of He and 2% Nitrogen. A wide parametric scan was undertaken on-line, facilitated by many diagnostics tools delivering data on a shot-to-shot base.

The commissioning experiments for the 1 PW area are scheduled for the second half of 2021 and will start with the acceleration of proton via TNSA. The laser beam will be focused to a peak intensity of up to $I_0 \sim 5 \times 10^{21} \text{ Wcm}^{-2}$ onto solid targets of various thicknesses and materials. A large variety of detectors will be employed to characterize the by-products of the interaction. The setup and the goals of the commissioning experiments will be presented.

References

- [1] K. A. Tanaka *et al.*, Matter and Radiation at Extremes **5**, 024402 (2020)
[2] D. Doria *et al.*, JINST **15** C09053 (2020)