

# PROPOSITION DE STAGE

ANNÉE UNIVERSITAIRE 2024/2025

## INFORMATIONS

**Organisme/Institution :** Université Paris-Saclay

**Laboratoire/Laboratory :** Laboratoire de Physique des Gaz et des Plasmas

**Adresse du lieu de stage/Lab address :** Bat 210, Campus d'Orsay, Université Paris Saclay

**Responsable de stage/Supervisor :** Brigitte CROS

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**Conditions de stage (rémunération, voyage, logement, cantine, ...)/internship conditions (stipend, travel, lodging, food, ...):**

## RÉSUMÉ DU SUJET / INTERNSHIP DESCRIPTION

Experimental study of electron acceleration by laser wakefield in plasma

Laser Wakefield Acceleration (LWFA) [1] is a promising mechanism to achieve high-quality, ultra-short electron bunches with relativistic energies over short distances. LWFA relies on the interaction of ultra-short, intense laser pulses with plasmas to excite high amplitude accelerating fields which accelerate relativistic electron beams with high peak current. This physical phenomenon relies on the nonlinear coupling of multiple parameters, and can be achieved for a large number of parameter sets, depending on the desired electron beam properties and final use.

In the proposed work, the mechanisms of electron injection and acceleration in the plasma will be studied experimentally in order to optimise the electron beam quality. An experimental campaign is planned with the DRACO laser system of the Helmholtz-Zentrum Dresden (HZDR) [2] during the internship. The LPGP team is developing a gas cell that will be used during these experiments. The use of this cell allows to preform the plasma profile, control the non-linear laser evolution, and provides a way to explore a large domain of parameters.

The proposed internship includes the participation to the experimental campaign in Dresden and is a unique opportunity for the intern to be involved in the experimental team work for setting-up and data acquisition. Following experiments, the intern will be based at LPGP in Orsay and contribute to data analysis and interpretation of results.

The desired candidate has a taste for experimental activity involving the use of laser beams and team work, a good knowledge of physics (plasma physics, geometric and physical optics, lasers, electromagnetism), the capacity and the motivation to adapt and write well-structured and documented Python scripts for data analysis, critical thinking and some experience in writing reports with LaTeX.

[1] E. Esarey et al., Rev. Mod. Phys. 81, 1229 (2009),

<https://journals.aps.org/rmp/abstract/10.1103/RevModPhys.81.1229>

[2] <https://www.hzdr.de/db/Cms?pOid=40859&pNid=2096&pLang=en>

Ce stage pourra-t-il se prolonger en thèse ? Possibility of a PhD ? : Yes

Si oui, financement de thèse envisagé ou acquis / financial support for the PhD ? acquis

