INTERNSHIP PROGRAM FOR INTERNATIONAL STUDENTS

INTERNSHIP SUBJECT FORM

Name of the Host Laboratory	Laboratoire d'Optique Appliquée
Website of the Host Laboratory	https://loa.ensta-paristech.fr/
Research Group	UPX (Ultrafast sources of Particles and X rays)
Internship Supervisor	Prof. Sebastien Corde
Internship Subject	Particle acceleration in the relativistic interaction of laser, particles and plasmas
Student's level	☐ Advanced Undergraduate Students (3rd or 4th year) ☒ Master's students (1st or 2nd year) ☐ PhD students
Proposed Duration	☐ 3 months ☒ 4 months ☒ 5 months ☒ 6 months
Prerequisites	Bachelor and Master in Physics
Internship description (max. 15 lines)	Nowadays, particle accelerators based on radio-frequency (RF) technology are being used in a very broad range of applications, from free-electron lasers or medicine to particle colliders for high-energy physics. The electric field of these accelerators is however limited to 100 MV/m because of the breakdown of the metallic RF cavity that contains the electromagnetic field. As we push the frontier of particle physics to higher particle energies, conventional RF accelerator techniques are attaining their limit, and the prospect for next-generation machines, beyond the Large Hadron Collider (LHC) at CERN, is hindered by the prohibitive size and cost of such machines. New concepts are therefore emerging to circumvent this barrier. The use of an ionized gas –or plasma– is one such concept, where the already broken-down medium can sustain electric fields that are several orders of magnitude larger than the RF limit. These plasma accelerators are holding out the promise of more compact and more affordable particle accelerators. They are increasingly considered as a mean to push the energy frontier of particle physics even higher. The internship will involve both the relativistic interaction between laser pulses and plasmas and between particle beams and plasmas. By taking advantage of the specific properties of these interactions, the goal is to demonstrate that one can produce and accelerate new types of particle beams with unprecedented quality, and as a result enable new radiation sources of X-rays and gamma-rays.