INTERNSHIP PROGRAM FOR INTERNATIONAL STUDENTS

INTERNSHIP SUBJECT FORM

Name of the Host Laboratory	Laboratoire de Physique des Plasmas (LPP)
Website of the Host Laboratory	https://www.lpp.polytechnique.fr/
Research Group	Low-temperature plasmas
Internship Supervisor	David Pai
Internship Subject	Coupled propagation of homogeneous ionization waves at a plasma-semiconductor interface
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	Pursuit of a Master's level degree in physics, electrical engineering, or a related disci-pline with a background in at least one of the following areas: plasmas, semiconductor physics, optical spectroscopy.
Internship description (max. 15 lines)	Plasma interface problems remain a major challenge in pure and applied research in atmospheric-pressure plasmas (APP). The use of complex materials instead of bulk metals/dielectrics as electrodes or propa-gation surfaces has not yet been fully explored for the enhancement of APP properties. This internship topic focuses on finding new approaches for producing strong interactions at APP interfaces, with an emphasis on photoelectric effects related to semiconductors. In previous work, we demonstrated that a surface with a silicon-on-insulator (SOI) architecture is capable of promoting the homogeneous propagation of a surface ionization wave [1]. True uniformity is uncommon for APP because of the tendency of ionization waves to break up into localized filaments known as streamers. We hypothesized that this homogeneous propagation becomes possible in our case thanks to a photoelectric effect that strongly couples the plasma with the SOI surface. This implies the existence of a second plasma composed of electrons and holes in the silicon that travels along with the APP. The objective of the internship will therefore be to determine experimentally whether APP and an electron-hole plasma can co-propagate adjacently along an interface. Then, we will construct a physical model of the phenomenon based on existing models of streamers. The precise mechanism of uniform propagation will be the product of this combined experimental and modeling study.

The boxes marked with cross implies eligible