



Année universitaire/Academic year 2022-2023

PROPOSITION DE STAGE / INTERNSHIP PROPOSAL

Organisme/Institution : CNRS

Laboratoire/Laboratory : LAPLACE

Adresse du lieu de stage/Lab address : Université Paul Sabatier. Toulouse.

Responsable de stage/Supervisor : Gwenael Fubiani

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Conditions de stage (rémunération,voyage,logement,cantine, ...)/internship conditions (stipend,travel,lodging, food,...) : ? about 550 euros/month

Titre/Title : **Advanced models for plasma-wall interaction in the divertor of a Tokamak**

Résumé/Abstract :

Carbon-free power production using magnetic confinement fusion is an ambitious scientific and technological endeavor requiring a sustained research effort. Among the challenges on the path to fusion reactors, the management of heat exhaust is one of the most critical ones. The strategy to manage the extreme heat fluxes to the reactor wall relies on the dissipation of the plasma's energy through interaction with the neutral gas present in the edge of the plasma due to plasma-surface interaction.

Plasma-wall interaction and the correct description of the properties of the sheath that forms in front of surfaces is of crucial importance. It is the link between plasma conditions at the magnetic pre-sheath entrance (used as boundary conditions for fluid models) and the distribution function of ions in angle and energy at the wall. Experimental evidence from tile topography in Tore Supra (the Tokamak in CEA Cadarache) showed that a guiding center approximation misses important features of this distribution. It turns out that finite ion Larmor radius effects must be taken into consideration for the calculation of the ion incidence angle while impacting the divertor surface (the magnetic field lines are at grazing incidence). This affects consequently the reemission angle of neutrals off the wall and has implications on the plasma-neutral interaction and hence on the overall properties of detached plasmas. The internship will be both of theoretical and numerical nature. The candidate will use and modify a 1D/2D-3V parallelized explicit Particle-In-Cell algorithm developed in house (written in Fortran 90) to model the plasma behaviour in front of the divertor surface.

Possibilité de thèse Oui/Non / Pursuing into PhD Y/N ? Yes

Contrat-financement probable / Expected contract-funding ? Thesis fully funded by the ANR PLATUN