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PROPOSITION DE STAGE 2016-2017

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Niveau du stage : M2
Durée du stage : 6 mois

sujet du stage :

Titre : Emission model of the ablation cloud of a Hydrogen pellet

Contexte et objectifs :
Pellet injection is mandatory for the fueling of next generation devices (ITER, DEMO…). Nevertheless, the experimental reproduction of the conditions expected in these devices is not possible in present day tokamaks. Predictions are thus exclusively based on modelling, a consequence of which is that it is mandatory to validate the available ablation/deposition codes as thoroughly as possible. It is only at this price that it will be possible to extrapolate their predictions to reactor-like devices with a high enough degree of confidence.
An essential step of this validation process is the determination of the main characteristics of the pellet ablation cloudlets (dimensions, density and temperature, distribution of the different atomic excited states). This is done through the analysis of fast camera images around a number of selected wavelengths, and of the spectrum in the wavelength domain λ = 300-700 nm. This analysis requires an emission model (both lines and continuum) coupled with a 3-D radiative transfer calculation in the cloudlet.
A first version of such a model already exists. The work to be done consists in:

- Compare in flat geometry the predictions of the model with more sophisticated computations;
- Calculate / classify the different cloud shapes and images that can be obtained depending on the density and temperature distributions (only one maximum at the cloudlet center, two maxima separated by a dark region…). The LHD fast camera database will be used for this step.
- Develop an algorithm for determining automatically the best average parameters of an ablation cloudlet from fat=st camera images and emission spectrum.

Nature du travail à réaliser par l'étudiant :
Code development.
Data analysis and exploitation.

Domaine de spécialité, compétences :
Prolongement possible thèse : OUI