OFFRE DE STAGE / ALTERNANCE

* Champ bloquant

Information générales

Entité de rattachement*	SPPF/GMICS
Référence interne/ Plan Emploi	Sans objet
Description de l'unité	The *Institut de Recherche sur la Fusion par Confinement Magnétique* (IRFM) is part of the Fundamental Research Department at CEA. For more than 50 years, its has been its mission to drive research on a novel energy source, magnetic confinement fusion, by participating in the European fusion programme. IRFM is located at the Cadarache CEA research centre. Its activities are structured around three axes : - contribute the ITER project and the accompanying programme (mainly the JT-60SA tokamak), - prepare the scientific ITER operation through experiment and control activities as well as theory and modelling, - establish a sound basis for a future nuclear fusion reactor. These activities are intimately connected with a particular effort of training future generations of fusion physics and technology experts. IRFM maintains and uses numerous R&D and test platforms, among which the main one is the WEST (Tungsten (W) Environnement Steady-State Tokamak) tokamak , designed as a testbench for ITER. It allows to test one of the key ITER components and to pursue plasma physics research in an international context, thanks to the numerous collaborations with the fusion teams worldwide.
Délai de traitement	3 mois

Description du poste

Domaine*	Physique du noyau, atome, molécule
Intitulé de l'offre*	Stager Master 2
Sujet de stage*	Validation of the turbulent impurity transport in the reduced gyrokinetic code QuaLiKiz
Description de l'offre*	The confinement time in tokamak plasmas is limited due to radial turbulent transport, also called anomalous transport. Modelling of this transport (with kinetic or fluid models) is important in order to understand and optimise the fusion reaction in future machines. This modelling work makes use of « first principle » models, e.g. nonlinear gyrokinetic theory, but also of reduced models, the latter being numerically much faster to solve. These reduced models are widely used to compute the turbulent heat and particle transport in tokamaks, in particular in the framework of integrated modelling where transport, sources and the magnetic equilibrium are all considered in the time evolution of the kinetic profiles (temperatures, densities, rotation). Thanks to the fast computational capabilities of reduced transport models to compute the turbulent (fluctuations of the electromagnetic potential) and neoclassical (collisional) fluxes, they open the possibility to model several plasma confinement times. The current project will focus on the validation of the turbulent impurity transport computed from the linear gyrokinetic code QuaLiKiz (https://gitlab.com/qualikiz-group/QuaLiKiz). These impurities are ubiquitous in tokamak plasmas (thermalised alpha particles resulting from the fusion reaction, or light/heavy impurities such as carbon and tungsten coming from the plasma facing components) and affect the transport (e.g. through dilution) but also the sources (e.g. Ohmic heating). Impurity transport modelling from « first principle » models has been validated against experimental observations, allowing to underline specific transport mechanisms such as the convective velocity associated to the toroidal rotation of the plasma. It is thus important to correctly describe such transport with reduced models. The validation of the turbulent impurity transport will be based on the comparisons of the different convective mechanisms and of the resulting peaking of the impurity (impurity density gradient). These comparisons will be performed against the gyrokinetic code GKW (https://bitbucket.org/gkw/gkw/wiki/Home) for a range of parameters covering the most encountered instabilities in the core of tokamak plasmas, i.e. the Trapped Electron Mode and the Ion Temperature Gradient driven mode. Following this validation effort, several propositions will be made to improve the robustness of impurity transport predictions with the reduced turbulent transport model QuaLiKiz. A strong collaboration with the Dutch Institute for Fundamental Energy Research is foreseen, in particular for the development of the QuaLiKiz neural network including impurity transport.
Moyens / Méthodes / Logiciels	matlab/python languages
Profil du candidat	Good knowledge in tokamak plasma physics, good competences in numerical simulations and matlab/python programming

Localisation du poste à pourvoir

Site	Cadarache
Lieu	F-13108 SAINT PAUL LEZ DURANCE cedex

Critères candidat

Diplôme préparé	Bac+5 - Master 2
Formation recommandée	Plasma physics
Possibilité de poursuite en thèse	oui

Programme

Segment CEA	Fusion nucléaire

Langues

Langues souhaitée*	Anglais
Niveaux*	Courant

Suivi RH

Suivie par (nom du tuteur)	Coquillat Anne
Disponibilité de poste*	