OFFRE DE STAGE / ALTERNANCE

* Champ bloquant

Information générales

Entité de rattachement*	SPPF/GTS
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*	Energetic particle losses in WEST
Sujet de stage*	Exploitation of a particle tracking code (GCT) to estimate particle losses on the first wall of the WEST tokamak under various conditions
Description de l'offre*	Losses of particles, i.e. particles escaping the confined plasma, result in heat fluxes on the plasma-facing components (PFCs) of magnetic fusion devices. This phenomenon can result in large fluxes, particularly when the particle being lost are energetic, i.e. are characterized by energies much larger than typical other particles present in the plasma (thermal species). In order to ensure that fusion reactors are exploited in safe conditions, it is important to be able to predict the level of heat flux caused by these particle losses depending on the plasma conditions and on the level of power injected by the auxiliary heating systems. This can be done by following the particles from their initial position in the confined plasma to the location where they hit the PFCs. By sampling several classes of plasma particles and performing the appropriate averages, it is then possible to estimate the relevant heat fluxes. GCT (Guiding-Center Tracking), a kinetic code developed recently in Aix-Marseille University and CEA Cadarache, can be used for this purpose. It integrates the particle trajectories in 5D (3 positions + 2 velocity components), taking into account the plasma equilibrium, background profiles, and various potential perturbations of the confining magnetic field. WEST, the tokamak currently in operation in Cadarache (France), is characterized by a relatively large level of magnetic ripple caused by the finite number of magnetic field coils, which results in toroidal modulations of the magnetic field. The associated losses (ripple losses) can be fairly large, especially since WEST routinely employs large levels of radiofrequency (RF) heating power which creates substantial energetic ion and electron populations in the plasma. It is therefore crucial to estimate the associated heat flux in high power plasmas. The internship proposed consists of applying GCT to WEST, and deduce the heat flux on the WEST PFCs. The work will consist in using GCT to estimate the losses depending on magnetic ripple, RF power, plasma scenario... These simulations will be compared to experimental values whenever possible, and then be used to deduce scaling laws, allowing the dependence of the heat flux on the main parameters to be explicitly and rapidly obtained. The outcome is the capability to predict under which conditions WEST is operated in safe conditions, and to optimize the plasma scenarios to minimize ripple losses.
Moyens / Méthodes / Logiciels	Fortran, parallel computing
Profil du candidat	Physicist with a background in high performance computing

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	non

Programme

Segment CEA	Fusion nucléaire

Langues

Langues souhaitée*	Anglais
Niveaux*	Courant

Suivi RH

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