OFFRE DE STAGE / ALTERNANCE

* Champ bloquant

Information générales

Entité de rattachement*	SPPF/GMPP
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*	Optique et optronique
Intitulé de l'offre*	Modellling of an Xray spectrometer with a spherical crystal on WEST
Sujet de stage*	The student will have to model an X ray crystal spectrometer that is currently installed on the WEST tokamak. Modelling a spectrometer is a long-term effort. This effort has started already and the student's work will be incorporated into it as a contribution to an open-source python library. This internship will teach the student the basics of spectroscopy, the basics of collaborative code development and of diagnostic maintenance and operation. This internship may be followed by a PhD thesis during which the focus will be put on the physics being the measured spectra and the analysis of the observed spectral lines. A candidate interested by the possible PhD thesis should then show a taste for and basic knowledge in atomic physics and / or spectroscopy in general.
Description de l'offre*	Tokamaks are, to this day, the most advanced technological option on the way towards electricy production by nuclear fusion of hydrogen isotopes. WEST is a medium-sized tokamak located at CEA/Cadarache, superconducting coils allow for tens of seconds of plasma duration. The main plasma physical quantities (temperature, density...) are measured by ~40 diagnostics. one of them is a 2D X-Ray spectrometer with a spherical crystal, and it is used for measuring the plasma temperature. Indeed, the Xray photons coming from the plasma are bragg-diffracted on the crystal, and the resulting spectrum is focalised on a 2D X ray camera.located on the crystal's Rowland circle. The Ar16+ spectrum in the [3,94; 4] angstrom interval is thus visualized with a good resolution. The width of the spectral lines and their amplitude ratio can then be used to get good estimates of the plasma temperatures. This diagnostics is giving good results, but the so far, the measured spectra are spatially integrated along the system's lines of sight into the plasma, thus smooting out all local features of the plasma emissivity field. A useful approach to try and reconstruct the local emissivity before it is integrated, is to model the spectrometer (i.e.: to make a 'synthétic diagnostic'). From this, the plasma emissivity spatial distribution can be used as an input (provided by a simulation code) to compute what the corresponding measurements ("synthetic measurements") would be. When compared to the experimental measurements, they give an insight on the features of the emissivity field that have a good chance of being valid. Modelling the diagnostic presupposes a good understanding of its working principles. the student will thus be trained as a junior diagnostician and will learn the basics of a 2D Xray spherical crystal spectrometer. He/she will get familiar with the technical and experimental constraints as well as with the theoretical key points. He/she will contribute to creating the numerical tools (some of which already exist) for modelling the spectrometer and include them into an open-source python library for synthetic diagnostics called tofu. He/she will learn the good practices for code development in terms of unit testing, versioning, continuous integration, documentation and collaborative work. The objective is that non-specialist colleagues should be able to use the toolbox to model other spectrometers. An extension to grating UV spectrometers may be evisaged if there is time.
Moyens / Méthodes / Logiciels	Python, git
Profil du candidat	Physicist, with good training in optics, atomic physics and / or spectroscopy. He/she should like coding (Python), collaborative work and hava a taste for experimental data and service to a research community.

Localisation du poste à pourvoir

Site	Cadarache
Lieu	F-13108 SAINT PAUL LEZ DURANCE cedex

Critères candidat

Diplôme préparé	Bac+5 - Diplôme Ecole d'ingénieurs
Formation recommandée	Atomic physics, plasma physics, optics
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*	Fevrier-Mars 2021