

## DRF: Thesis SL-DRF-20-0698

### RESEARCH FIELD

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Plasma physics and laser-matter interactions / Corpuscular physics and outer space

### TITLE

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Study of transport of boron powders injected in the WEST tokamak and its effect on plasma performance

### ABSTRACT

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Research on thermonuclear fusion as a new source of energy is carried out in facilities called tokamaks, where matter is brought to high temperature (up to the plasma state) and confined by magnetic fields. Interaction of plasmas with the inner walls of the vacuum chamber of tokamaks releases impurities, which can affect plasma performance. Different conditioning methods are used to control the surface state of the vacuum chamber, and thus impurity fluxes. These mainly use low-temperature plasmas (glow or radio-frequency discharges) in hydrogen or helium, but also deposition of thin layers of elements such as boron, because of its ability to trap by chemical affinity impurities like oxygen. With the advent of metallic Plasma Facing Components and the extension of plasma duration in superconducting devices, like the WEST tokamak, operated in the Institute of Research on Magnetic Fusion (CEA Cadarache, France), innovative wall conditioning technics operated during plasma to maintain optimal surface state and performances are under development.

The aim of this thesis is to characterize and evaluate the relevance for WEST and next step fusion devices of a boron powder injection method directly into plasmas. The work will consist on the one hand to participate in experiments on WEST (also on ASDEX-Upgrade in Germany) and to analyze experimental data (location of the boron deposits, effect on plasma performances). In order to understand the transport of injected boron, the candidate will work with plasma edge codes (eg. SOLEDGE-2D) and impurity transport codes (eg. GTR). This work, combining experiments and numerical simulation, will aim at consolidating the understanding of the physics of wall conditioning in a metallic environment and predicting consequences for future fusion devices.

### LOCATION

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Institut de recherche sur la fusion par confinement magnétique

Service Tokamak Exploitation et Pilotage

Groupe Pilotage, Asservissements & Scénarios

Place: Cadarache

Start date of the thesis: 01/09/2020

### CONTACT PERSON

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## UNIVERSITY / GRADUATE SCHOOL

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## THESIS SUPERVISOR

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