Job Title: Postdoctoral Researcher (Plasma Boundary Modelling) IO-PDR-2

Requisition ID **6427** - Posted - (France, 13067 St Paul Lez Durance Cedex) - **Science and Technology Expertise** - **New Posting**

The ITER Organization brings together people from all over the world to be part of a thrilling human adventure in southern France—building the ITER Tokamak. We require the best people in every domain.

We offer challenging full-time assignments in a wide range of areas and encourage applications from candidates with all levels of experience, from recent graduates to experienced professionals. Applications from under-represented ITER Members and from female candidates are strongly encouraged as the ITER Organization supports diversity and gender equality in the workplace.

Our working environment is truly multi-cultural, with 29 different nationalities represented among staff. The ITER Organization Code of Conduct gives guidance in matters of professional ethics to all staff and serves as a reference for the public with regards to the standards of conduct that third parties are entitled to expect when dealing with the ITER Organization.

The south of France is blessed with a very privileged living environment and a mild and sunny climate. The ITER Project is based in Saint Paul-lez-Durance, located between the southern Alps and the Mediterranean Sea—an area offering every conceivable sporting, leisure, and cultural opportunity.

To see why ITER is a great place to work, please look at this video

Application deadline: 24/07/2022
Domain: Science & Operation Domain
Department: Science, Controls & Operation Department
Division: Science Division
Section: Experiments & Plasma Operation Section
Group: Not applicable
Job Family: Scientific Coordination
Job Role: Post Doc Researcher
Job Grade: P1
Language requirements: Fluent in English (written & spoken)
Contract duration: Up to 5 years

Purpose

As a Post Doc Researcher specialized in plasma boundary modelling, you will contribute to the continued assessment of the ITER tungsten divertor performance and the extension of existing plasma boundary simulations to include a higher fidelity description of the plasma-wall interaction at the ITER main chamber walls. You will contribute to, and provide analysis of, a new database of simulation results improving on the existing description of neutral recirculation in the divertor and main chamber, as well as extending this database to new operating regimes. You will contribute to the provision of ITER plasma backgrounds extending to all plasma-facing components (PFC) for use by ITER Organization (IO) staff and external collaborators studying the key areas of material migration and fuel retention or required for diagnostic and plasma control system design tasks.

Background

The physics design for the ITER divertor and fuelling/pumping throughputs rely on an extensive database of plasma boundary simulations using the SOLPS-4.3 code suite. These simulations are currently being re-run and significantly expanded with the most up-to-date version of the code, SOLPS-ITER, which has been developed under the auspices of and is hosted by the IO. The code is used worldwide in many

research institutions within the ITER Partners. This database expansion includes a new, much higher fidelity description of the divertor structures in 2D, so that the realistic pathways of the neutral gas can be tracked, pumping and gas injection modelled more accurately, and pressure distributions in the sub-divertor region computed. A further important development, expected to be available for first use within this postdoctoral research project, is a new extended numerical grid capability, allowing the plasma solution to be computed right out to all PFC surfaces. This represents a major upgrade of the code, many years in preparation, and will enable more self-consistent modelling of the main chamber recycling. Along with the improved neutral recirculation description, this should provide more realistic assessments of the impact of neutral leakage to the main chamber for a range of operating conditions.

Major Duties/Roles & Responsibilities

- Analyses the results of higher fidelity SOLPS-ITER simulations of the ITER tungsten divertor performance, comparing with existing (SOLPS-4.3 and previous SOLPS-ITER versions) runs at lower fidelity, identifying the impact of the improved description of neutral recirculation;
- Conducts additional simulations where necessary depending on the findings from analysis of the new database, possibly including sample simulations with plasma fluid drifts activated;
- Uses the expanded database to provide improved scalings across a wider parameter range for boundary conditions set by the divertor for core plasma transport simulations;
- Undertakes detailed analysis of the run database to investigate parametric relationships between key control parameters recently identified on the basis of 2-point (and reverse 2-point) modelling applied to the existing ITER SOLPS database;
- Contributes to the testing and first implementation, for ITER, of the new SOLPS-ITER “extended grids” capability to model the impact of main chamber recycling on plasma boundary performance;
- Depending on the success of the extended grids application, provides validated plasma backgrounds, within the ITER Integrated Modelling Analysis Suite (IMAS), for use by external collaborators and IO Science Division staff working on the prediction of ITER fuel inventory growth rates during fusion power operation;
- Participates in the benchmarking activities between SOLPS-ITER and other plasma edge codes (e.g. SOLEDGE3X, EMC3-Eirene, JOREK, EDGE2D-Eirene, etc…), in particular through the activities of the Edge and Divertor Modelling Group within the ITER Scientist Fellow Network;
- Participates in the further integration of SOLPS-ITER into the IMAS platform;
- Contributes to the dissemination of scientific results in the area of ITER plasma boundary simulations in scientific journals, conferences and workshops;
- May be requested to be part of any of the project/construction teams and to perform other duties in support of the project;
- May be required to work outside ITER Organization reference working hours, including nights, week-ends and public holidays.

Measure of Effectiveness

- Provides a comprehensive analysis of the new, improved SOLPS-ITER plasma boundary simulation database;
- Provides updated scalings for boundary conditions required by core plasma simulations and investigates the consistency of database results with relationships between key detachment control parameters established by analytic (2-point) modelling;
- Depending on the success of the extended grids implementation, reacts promptly to provide first examples of plasma backgrounds extending to all PFC surfaces for specific plasma scenarios;
- Authors and contributes to scientific publications and internal reports in the area of ITER plasma boundary modelling;
- Communicates well and maintains high professional standards when interfacing with staff from the ITER Organization and ITER Members’ R&D institutions and Domestic Agencies.

Experience & Profile

- ***Professional Experience:***

- At least 3 years' experience in the field of plasma boundary simulations in magnetic confinement devices.

- ***Education:***
  - PhD or equivalent degree in fusion plasma physics or engineering or other relevant discipline
- ***Language requirements:***
  - Fluent in English (written and spoken).
- ***Technical Competencies and demonstrated experience in:***
  - Specialized Domain of Expertise: Plasma boundary physics in magnetic confinement devices including the application/development of large plasma boundary modelling codes;
  - Programming languages and analysis software (e.g. Fortran, Python, Matlab or similar);
  - Specific expertise with the SOLPS plasma boundary modelling code suite is a distinct advantage, as is familiarity with the IMAS platform;
  - Problem Solving: Assessing problems, identifying root causes and reaching practical solution;
  - Demonstrating 'out of the box' thinking and ability to adapt easily;
  - Producing clear technical documentation and publishing or presenting technical and/or scientific reports on specific topics.
- ***Behavioral Competencies:***
  - Collaborate: ability to facilitate dialogue with a wide variety of contributors and stakeholders;
  - Communicate effectively: ability to adjust communication content and style to deliver messages to work effectively in a multi-cultural environment;
  - Drive results: ability to persist in the face of challenges to meet deadlines with high standards;
  - Manage complexity: ability to analyse multiple and diverse sources of information to understand problems accurately before moving to proposals;
  - Instill trust: ability to apply high standards of team mindset, trust, excellence, loyalty and integrity.

Others ***Necessary qualifications***

- The applicant must have received their PhD since 1 January 2019, or must receive their PhD prior to the deadline for beginning the Fellowship at the ITER Organization.
- The e-Recruitment system will require you to:
  1) Fill-in an online application file
  2) Upload your Curriculum Vitae (including a list of your publications and photocopies of your highest academic qualification) merged in one unique PDF document
  3) Upload a letter of motivation (limited to 1 page) merged with at least two letters of recommendation into one unique PDF document

The following important information shall apply to all jobs at ITER Organization:

- Maintains a strong commitment to the implementation and perpetuation of the ITER Safety Program, ITER Values (Trust; Loyalty; Integrity; Excellence; Team mind set; Diversity and Inclusiveness) and Code of Conduct;
- ITER Core technical competencies of 1) Nuclear Safety, environment, radioprotection and pressured equipment 2) Occupational Health, safety & security 3) Quality assurance processes. Knowledge of these competencies may be acquired through on-board training at basic understanding level for all ITER staff members;
- Implements the technical control of the Protection Important Activities, as well as their propagation to the entire supply chain;
- May be requested to work on beryllium-containing components. In this case, you will be required to follow the established ITER Beryllium Management Program for working safely with beryllium. Training and support will be provided by the ITER Organization;
- May be requested to be part of any of the project/construction teams and to perform other duties in support of the project;

- Informs the IO Director-General, Domain Head, or Department/Office Head of any important and urgent issues that cannot be handled by line management and that may jeopardize the achievement of the Project’s objectives.