DE LA RECHERCHE À L'INDUSTRIE

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Open POST-DOC Position
At Institute for Magnetic Fusion Research
Plasma Heating & Confinement Department

Development and exploitation of a fusion reactor system code

Fusion by means of magnetic confinement aims at providing a new source of energy. Although it is still at the stage of research, with the development of the ITER experiment at Cadarache, it is important to start preparing the design of future magnetic confinement fusion reactors. The main target of the proposed activity is to contribute to the design of the DEMO concept, a pre-industrial demonstrator which is the next step after ITER.
One of the basic elements for this purpose is a system code which provides the capability to consistently design the various sub-systems of the reactor: plasma, in-vessel components, tritium breeding blankets, magnets, cooling systems, electricity production and recirculation, tritium cycle management. This can be obtained by coupling together a number of modelling codes, dedicated to the various sub-systems and exchanging information to guarantee the consistency of the design.

The IRFM began in 2011 to assemble a prototype of a new fusion system code called SYCOMORE (SYstem COde for MOdelling REactor), initiating an ambitious roadmap for the DEMO design. SYCOMORE is assembled within a modern Integrated Modelling Framework developed by the European (EFDA[1]) Integrated Tokamak Modelling Task Force. The proposed work includes the development and the exploitation of the SYCOMORE. The development consists primarily in the implementation of optimisation techniques within SYCOMORE, in order to realize optimisation studies of the reactors parameters, possibly using the URANIE framework. Other developments consist in coupling to SYCOMORE of additional sub-systems models developed by different contributors in CEA, and/or the refinement of the existing SYCOMORE workflow (i.e. how the codes are chained together to reach a self-consistent solution). The exploitation of SYCOMORE will cover a number of parametric / optimisation studies and emphasize the understanding of the interactions between reactor design parameters. The, results will be communicated and benchmarked within the frame of European (EFDA) activities.

The candidate must have competences in physics, modelling and code development. A background in magnetic fusion is an advantage.

Contacts: Frederic.Imbeaux@cea.fr, xavier.litaudon@cea.fr

[1] European Fusion Development Agreement