Proposal for a post-doctoral position
Inria / Maison de la Simulation

**Title:** High performance computing tools for tokamak simulations.

**Supervisors:**

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**Key-words:** Plasma physics, numerical simulation, finite elements, high order, non-structured meshes, high performance computing.

**Description:** PlaTo is a the simulation platform aimed to provide to Inria teams involved in the simulations of fusion plasmas, the computational tools for large scale parallel computations of turbulence and MHD instabilities in tokamaks. Now-a-days this platform is composed of several models relying mainly on finite volume approximations. The goal of these studies will be to enrich the capabilities of PlaTo by high order finite element approximations.

From a software development point of view, this implies a global structuring of the code to support both types of computational kernels while keeping the parallel efficiency. On the other hand, from a numerical approximation point of view, it will be necessary to develop SUPG type stabilization methods to deal with convection dominated flows. The resulting simulation tool will be applied to the simulation of hydrodynamic instabilities occurring in the plasma edge regions of tokamaks.

The works done in the present context will be used to improve and support the development of the JOREK [1] code used at IRFM (CEA) for the simulation of MHD instabilities in tokamaks.

The candidates to this proposal must possess some background on numerical schemes, plasma physics or computational fluid dynamics as well as good knowledge of parallel computing and excellent programming capabilities.

Duration: 1 year

Work Location: Maison de la Simulation, Bâtiment 565 – Digiteo, CEA Saclay, 91191 Gif-sur-Yvette cedex. e-mail: info@maisondelasimulation.fr

Application requirements The thesis must have been defended between January 2012 and December 2013, in a university located outside the Île-de-France region (this condition does not apply to disabled candidates). This position is open to foreign nationals. The final acceptance of each candidate depends on a security and defense procedure. Further details are available on Inria's web site.

How to apply: A CV, including a list of publications, with the 2 most significant publications, a cover letter, one or more letters of recommendation, and a statement of career plans subsequent to the post-doctoral position should be sent to Michel.Kern@inria.fr with a cc to info@Maisondelasimulation.fr

About Inria: Established in 1967, Inria is the only public research body fully dedicated to computational sciences.

Combining computer sciences with mathematics, Inria’s 3,400 researchers strive to invent the digital technologies of the future. Educated at leading international universities, they creatively integrate basic research with applied research and dedicate themselves to solving real problems, collaborating with the main players in public and private research in France and abroad and transferring the fruits of their work to innovative companies.

The researchers at Inria published over 4,800 articles in 2010. They are behind over 270 active patents and 105 start-ups. The 171 project teams are distributed in eight research centers located throughout France.

About Maison de la Simulation: Maison de la Simulation is a joint project of five partners (CEA, CNRS, INRIA, University of Orsay and University of Versailles-StQuentin) with the status of a "Unité de Service et de Recherche" (Service and Research Unit), whose aim is to support and stimulate the scientific community in order to get the best out of supercomputers, in particular those managed by the French GENCI and the European PRACE programs. Maison de la Simulation promotes the emergence in France of a HPC community, and develops the strong synergies between researchers and engineers from various fields necessary for the important scientific breakthroughs expected from HPC to materialize. These initiatives are targeted to the current HPC users, as well as to the research of new application fields for the HPC.