Contribution ID: **373** Type: **not specified**

P4.037 Plasma Boundary Reconstruction in JET by Magnetic Measurements

Thursday, 20 September 2018 11:00 (2 hours)

The reconstruction of the Plasma Boundary (PB) in fusion reactors is a critical task in several applications, including plasma control and several off-line studies of the plasma configurations.
A widely shared definition for PB is the Last Closed Magnetic Surface (LCMS) within the vacuum vessel. In the limits of plasma equilibrium conditions, the PB reconstruction should imply the solution of the coupled electro-mechanical plasma equations. The problem is rather complex also in axisymmetric geometry and the solution requires numerical computations not compatible with the needs of a real time response. The problem is more and more complex in fully 3D geometries; therefore, some simplified purely electromagnetic approaches have been proposed, including the fitting of magnetic measurements or the equivalent plasma currents.
In any case, in 3D geometry, the LCMS reconstruction is very time-consuming because, despite new algorithms have reduced their complexity [1], the 3D Magnetic Surfaces (MSs) tracking is very demanding.
In this paper a new very effective algorithm is proposed. The limiter configurations are treated in 2 steps: (a) a preliminary analysis of the first wall to select the points with a vanishing normal field component; (b) the tracking of all the MSs including one of these points and the LCMS selection. The divertor configurations are identified with an iterative algorithm inspired by the bisection approach: at (k+1)-th iteration, the LCMS is looked for between the larger closed and smaller not closed surfaces at k-th iteration.
In both cases, large benefits are derived from the availability of a parallel computing architecture to carry out the simultaneous construction of a full set of MSs.
The paper discusses the application of the new methodology to various JET configurations.

[1] A. Chiariello, A. Formisano, F. Ledda, R. Martone, F. Pizzo. (2017). “Analytical representation of 3D magnetic surfaces”. IJAEM, 54(4), 627-645.

Presenter: MARTONE, Raffaele (Department of Engineering universitˆ degli Studi della Campania Luigi Vanvitelli)

Session Classification: P4