Contribution ID: **34** Type: **Poster**

TH/P2-03: Model Validation and Integrated Modelling Simulations for the JT-60SA Tokamak

Tuesday 9 October 2012 14:00 (4h 45m)

JT-60SA will be at the forefront of the international fusion programme for many years, both before and during the D-T phase of the ITER operation. The preparation of its scientific programme is now progressing in the framework of a Japan-EU collaboration and integrate advances coming both from experiments on other tokamaks and theoretical developments. As for ITER and DEMO, integrated modelling of full discharges will be the main ingredient to perform this preparation effectively and on a rational and coherent basis. To this end, a coordinated Japan-EU modelling activity has started with the ambitious goal of providing predictive simulations of the main JT-60SA scenarios.
The first milestone of this activity is the critical comparison and benchmark of Japanese and EU models and codes used for integrated tokamak modelling. The benchmark of the H&CD codes, in particular of NBI codes for the complex injector configuration of the JT-60SA machine will be discussed.
The second milestone is the validation of the main models and simulation framework used in both Japanese and EU integrated modelling suites of codes. These include, e.g., energy and particle transport models, pedestal models, rotation sources and transport, synthetic diagnostics. It is assumed that simulations of JT-60SA scenarios should be based at least on experimental results of the two machines that are the most similar, for size and configuration: JT-60U and JET. On this basis, a validation exercise has been undertaken, involving: data exchange of reference JT-60U and JET shots, representing the main scenarios (H-mode, hybrid, advanced); predictive simulations of the reference shots with both Japanese and EU codes and models, with the aim of finding a unified modelling framework that works for both machines: this should give the maximum confidence for prediction of JT-60SA.
The first results of this comparison will be presented and discussed, with particular emphasis on the transport model comparison.
The third milestone is the predictive modelling of JT-60SA scenario, logically to be carried out after the previous steps are completed. Nevertheless, preparation of this activity has been done by simpler models, both 0-D and 0.5-D. These results and the methods used to obtain them will be presented and discussed.

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Session Classification: Poster: P2

Track Classification: THC - Magnetic Confinement Theory and Modelling: Confinement