Contribution ID: **137** Type: **Oral**

Predictive integrated modelling of plasmas and their operation scenarios towards exploitation of JT-60SA experiment

Thursday, October 25, 2018 9:30 AM (20 minutes)

Plasmas and their operation scenarios have been predicted by using integrated modelling codes towards the exploitation of JT-60SA experiment. Through the close collaboration between Japan and EU including the model validation and verification using JT-60U and JET experimental data, the following key results were obtained in various modelling activities. Improved modelling predicted a steady-state high-beta ($\beta_N > 4$) plasma with an internal transport barrier (ITB), its controllability to sustain the ITB location and target performance, and its tolerance to the core accumulation of impurity seeded to reduce the divertor heat load below 10 MW/m^2, with actuator powers within the machine capability. Integrated rotation and pedestal modelling for inductive scenarios revealed that the rotation with the neoclassical toroidal viscosity (NTV) due to the toroidal magnetic field ripple degrades the pedestal height, but it is high enough to achieve target parameters, and error field correction coils in JT-60SA have the potential to control the rotation by changing NTV. The obtained predictions clarified the JT-60SA capability to explore the plasma scenarios indispensable to ITER and DEMO.

Country or International Organization

Japan

Paper Number

PPC/1-1

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Session Classification: EX/5, PPC/1 - TH/3 Integrated Modelling & Transport

Track Classification: PPC - Plasma Overall Performance and Control