Contribution ID: **352** Type: **Poster**

EAST Snowflake Experiment: Scenario Development and Edge Simulations

Wednesday 15 October 2014 08:30 (4 hours)

Snow Flake Divertor (SFD) configuration has been proposed as one valid way to reduce the plasma-wall interaction. For technological reasons, SFD configuration is difficult to realize and control in real experiments, especially for a tokamak like EAST that does not have dedicated divertor coils designed to locally shape the magnetic field topology. For this reason, Quasi-SFD (QSF) static equilibrium configurations (where two poloidal field Bp=0 points are close enough to produce a large region with poloidal field close to zero in the divertor region) have been studied by using EFIT and FIXFREE equilibrium codes. The tokamak simulation code (TSC), a numerical model of the axisymmetric tokamak plasma and the associated control systems, has been then used to model the EAST QSF scenario (300kA/1.8T). During the simulation, iso-flux control scheme is used to control plasma shape, and the poloidal field (PF) coils current is limited to be smaller than 15% of the actual allowed technical limits. TSC outputs will be preliminary used to set the plasma control system (PCS) operating during the experiments. CREATE-NL tools has been used to linearize the configuration, in order to increase the QSF to higher plasma current, and a dedicated control algorithm will be developed to use magnetic topology as a control actuator of the local radiation in presence of impurities seeding. The analysis of vertical stability growth rates of QSF configurations with 2D and 3D models is ongoing. Preliminary results on the comparison of edge simulations between the standard divertor (SD) and SFD will be also presented. First QSF experiment will be performed during next EAST restart.

Paper Number

EX/P3-4

Country or International Organisation

Italy

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Session Classification: Poster 3