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EX/P8-13: Experiment for Stabilization of Tearing Mode in KSTAR

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Tearing mode (TM), a type of current-driven resistive instability was observed in L-mode plasmas during 2011 campaign of KSTAR. It was usually observed in discharges with the magnetic perturbation (MP) intended to suppress edge localized mode (ELM). When with $n = 1$ MP, TM was appeared just after ramping down of the MP coil current. There are two electron cyclotron heating and current drive (ECH/CD) systems available in 2011 campaign equipped with movable launchers which can change the poloidal and the toroidal angle in between shots for control of MHD activities operating at power of ~ 0.3 MW and ~ 0.6 MW for 110 GHz and 170 GHz, respectively. The island position can be estimated by electron cyclotron emission imaging (ECEI) as well as ECE diagnostics in KSTAR. In 2011 campaign, based on the collected information of the (2,1) island position, a discharge is designed for suppression of the (2,1) mode by adjusting the EC launcher angles to the estimated island position for suppression of the mode assuming that the plasma condition is similar to other shots with the (2,1) mode.

In this work, the experiment for stabilization of (2,1) tearing mode, shot 6272, is analysed by experimental observations and simulations. Particularly, the effect of ECH to suppression of the mode is investigated by simulations with ECH effects [1] newly included to the modified Rutherford equation (MRE) [2]. Mirnov coil (MC) arrays and ECE are mainly used for analysis of the island width and location as well as the mode number. ASTRA, coupled with the MRE solver [3] with ECH effects is used for integrated simulations of plasma equilibrium, transport, heating and current drive, and magnetic island evolution, in a self-consistent way. The results will be expected to contribute to prepare a feedback controller of NTMs for high performance plasmas in KSTAR.

References

- [1] D. De Lazzari, et al., Nucl. Fusion, Vol. 49 075002, 2009
- [2] R.J. LaHaye, et al., Nucl. Fusion, Vol. 46 451, 2006
- [3] Yong-Su Na, et al., 23th IAEA FEC, THS/P2-04, 2010

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Collaboration (if applicable, e.g., International Tokamak Physics Activities)

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