Contribution ID: **473** Type: **Poster**

EX/P8-11: Effects of RF-Heating Induced MHD Activities on the Toroidal Rotation in Tokamaks

Friday, 12 October 2012 14:00 (4h 45m)

The magnitude of toroidal rotation velocity is reduced by electron cyclotron resonance heating (ECRH) or ion cyclotron resonance frequency (ICRF) regardless of the direction of toroidal rotation. This can be explained by the neoclassical toroidal viscosity (NTV) by MHD activities. Toroidal rotation changes due to ECRH have been observed in many devices such as DIII-D, JT-60U and ASDEX-Upgrade. However, there is no widely accepted explanation for the effects of ECRH on the toroidal rotation. The results from various experiments are very complicated and indicate no clear tendency. In this paper, we introduce the results from KSTAR on the rotation changes due to radiofrequency heating. The rotation was reduced when ECRH and ICRF were injected in the central region both in H-mode and L-mode. It was found that central ECRH induces the MHD instabilities inside q=1 surface. The magnetic field perturbation driven by the MHD instabilities causes the NTV, which is otherwise assumed to be negligible. Thus, the toroidal rotation can be damped by the NTV. In this research, we calculate the ECRH-driven torque density from the rotation profile. The NTV torque density also is estimated from delta B to give a comparison with the ECRH-driven torque density.

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Session Classification: Poster: P8

Track Classification: EXS - Magnetic Confinement Experiments: Stability