Contribution ID: **337** Type: **Poster**

Pressure Driven MHD Instabilities in Intrinsic and Externally Enhanced Magnetic Stochastic Region of LHD

Thursday 16 October 2014 14:00 (4h 45m)

MHD activities in the region where the magnetic flux surfaces are disturbed by the externally applied field are now extensively studied in the context of the physics of ELM mitigation. Magnetic stochasticity plays important role as well in the high-beta experiment of the Large Helical Device (LHD), where topologically similar magnetic stochastic region is formed naturally outside the last closed flux surface (LCFS). Characteristic of the MHD instabilities within the stochastic region of LHD is studied. It is noted that pressure-driven modes are always unstable in peripheral region of the LHD because the peripheral region stays in the magnetic hill. The plasma expands from the LCFS in high-beta experiments. There appear MHD instabilities with amplitude of 10^-4 of the toroidal magnetic field. From the mode number of activities (poloidal / toroidal mode number m/n = 2/3, 1/2, 2/4), the location of corresponding rational surface is near the LCFS or certainly outside the LCFS and is consistent with fluctuation measurements. Parameter dependence of the saturation level is then examined for evaluation of impact of MHD activities. The saturation level increases with the increase of the pressure gradient. Degree of stochasticity is an important factor to affect the saturation level. Since the thickness of the stochastic region and the degree of stochasticity is increased with the increase of plasma beta, the stochasticity becomes more important in high-beta conditions. In order to study the dependence on the stochasticity exclusively, experiments with the resonant magnetic field perturbation (RMP) with m/n = 1/1 is made. While the magnetic island is formed around the iota=1 surface, the stochasticity outside the nested region is enhanced. Amplitude of m/n = 2/3 and 2/4 modes are reduced by this RMP field when the normalized RMP coil current exceeds 0.3 kA/T. Since the local pressure gradient and the local plasma parameters are not changed by the RMP, this reduction is thus caused by the change of the magnetic field structure itself. Local flow velocity or the flow velocity shear can also affect the MHD stability. However, in the present LHD experiment, change in the velocity is small at the mode rational surface. Stochastisation of the magnetic field found to be an effective tool to suppress the MHD activities without causing degradation of the pressure gradient.

Country or International Organisation

Japan

Paper Number

EX/P6-29

Author: Dr OHDACHI, Satoshi (National Institute for Fusion Science)

Co-authors: Dr TSUCHIYA, Hayato (National Institute for Fusion Science); Prof. WATANABE, Kiyomasa (National Institute for Fusion Science); Dr SUZUKI, Yasuhiro (National Institute for Fusion Science)

Presenter: Dr OHDACHI, Satoshi (National Institute for Fusion Science)

Session Classification: Poster 6