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# EX/P4-30: Response of MHD Stability to Resonant Magnetic Perturbation in the Large Helical Device

*Wednesday, 10 October 2012 14:00 (4h 45m)*

Penetration of a Resonant Magnetic Perturbation (RMP) and its effect on MHD stability have been investigated in the Large Helical Device (LHD). The existence of an error field is one of the common problems in magnetic confinement systems because it may degrade plasma confinement and trigger MHD instabilities. The RMP experiments have been done in many tokamaks and RFPs to identify the threshold of error field penetration, which is required for estimating the tolerance to the error field in ITER [1]. Here we have investigated the threshold of the perturbation field strength by changing the RMP field in varying magnetic shear and magnetic hill of LHD so as to find the common physics of the effect of an error field in both tokamaks and helical devices. Previous experiments in LHD showed that the m/n = 1/1 static island abruptly grows and leads to a minor collapse during a discharge[2]. The threshold of the appearance of the island clearly decreases with the magnetic shear reduced by controlling external coils and/or driving the plasma current. The spatial structure of the island is consistent with that of natural magnetic island as confirmed by electron beam mapping [3]. While these experiments are equivalent to those in the constant RMP (natural error field) condition, the threshold of the RMP strength to the penetration has been investigated in different magnetic shear configurations as the next step. As a result, the mode penetration is prevented by an enhancement of the magnetic shear and/or reduction of the magnetic hill in addition to the plasma flow effects. The penetration is accelerated as the plasma approaches the unstable regime against interchange modes. The experiment cancelling the ambient error field shows that the rotation of the m/n = 1/1 mode is locked and leads to minor collapse in such an unstable regime. The mode has an interchange type radial structure, at least, before the locking.

[1] T.C.Hender et al., Nuclear Fusion, 47 (2007) S128.
[2] S.Sakakibara et al., Fusion Science and Technology, 50 (2006) 177.
[3] T.Morisaki et al., Fusion Science and Technology, 50 (2010) 465.

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