Observation of *m*=2/*n*=1 Magnetic Island on the Foot Point of Electron Internal Transport Barrier using Soft X-ray CCD Camera in the Large Helical Device

T. Kobuchi[1)], K. Ida[2)], M. Yoshinuma[2)], K.Y. Watanabe[2)], Y. Liang[3)] and LHD group[2)]

e-mail : takashi.kobuchi@qse.tohoku.ac.jp
[1)] *Department of Quantum Science and Energy Engineering, Tohoku University*
[2)] *National Institute for Fusion Science*
[3)] *Institut für Plasmaphysik, Forschungszentrum Jülich*

Non-rotating *m*=2/*n*=1 magnetic island is measured with the tangential soft x-ray CCD camera in the plasma with electron internal transport barrier (eITB) in the Large Helical Device (LHD). The contour of emission is reconstructed from the best fit of measured soft x-ray intensity to that calculated soft x-ray intensity based tangential image measured with CCD camera. By including *m*=2/*n*=1 component into the emission profile, the size and phase of magnetic island are derived. The magnetic island in eITB is found to locate near the foot point of the peaked electron temperature profile from the soft x-ray image. The transition from L-mode to the eITB is observed [1,2], when electron cyclotron resonance heating (ECRH) is focused to magnetic axis of a plasma sustained by the neutral beam injection (NBI). When the NBI is injected to counter to the equivalent plasma current, the typically peaked electron temperature profile appears within a normalized average radius $\rho < 0.3$ in the low electron density ($< 1.0 \times 10^{19}$ m^{-3}). The magnetic island becomes large enough to be measured with soft x-ray CCD camera. In the co-NBI heated plasma, there is no clear magnetic island observed. Because of the steep gradient of an electron temperature in the plasma with eITB, the location of magnetic island is obtained accurate enough to discuss the relation between eITB foot and magnetic island. In this paper, a relationship between the foot point of eITB and the magnetic island measured with tangential soft x-ray image is discussed.

[1] Y. Takeiri, et al., Phys. Plasma 10, 1788 (2003)
[2] T. Shimozuma, et al., Plasma Phys. Control. Fusion 45, 1183 (2003)