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LHD高ベータプラズマにおけるNBIビーム圧力の同定
Evaluation of NBI Beam Pressure in LHD High-Beta Plasmas

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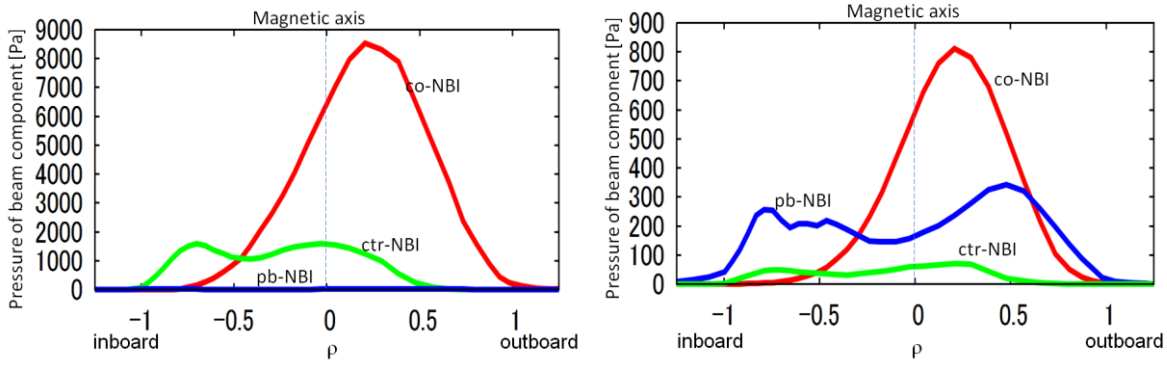
With the use of the NBs, a volume averaged beta has been reached 5% in the low field[1]. In the high beta plasma of the LHD, it has been pointed out that the beam pressure and/or the pressure anisotropy significantly affect the properties of MHD equilibrium and stability[2]. Therefore, it is one of the important issues to identify the beam-pressure in the total plasma pressure. In this study, the beam-pressures are calculated by the Monte Carlo method. We investigate the pressure anisotropy and the 3-dimensional profile of the beam pressures. In the LHD high-beta plasma, there is a lot of re-entering fast ions which re-enter in the region of the closed flux surfaces after they have once passed out of the Last Closed Flux Surface (LCFS)[3]. They are regarded as the lost particles in the conventional analyses using the magnetic coordinates. To include the re-entering fast ions, the Monte-Carlo code, MORH[4], on the basis of the orbit following in the real coordinates are used for evaluation of the beam pressure.

Figure 1 shows the parallel and perpendicular components of the beam pressure in each neutral beam injections (NBIs). In the LHD high beta plasma, the parallel component of the beam pressure by the tangentially injected NBI (co-NBI) is made up of a majority of the beam pressure. The perpendicular components of tangentially injected NBs are about one-tenth of their parallel components. The beam pressure of perpendicular injected NBI (pb-NBI) is exceedingly-small and its value is almost comparable with the perpendicular component of the beam pressure by the tangentially injected NBs.

In the conference, the 3-dimensional profiles of the beam pressures are shown is discussed. In addition, the effect of the re-entering fast ions on the beam pressure will be shown.



(a) Parallel component (b) Perpendicular component

Figure 1. Beam Pressure in each NBIs.
The horizontal axis denotes Equatorial plane (Z=0) on the horizontally elongated poloidal plane and is expressed by the normalized minor radius (ρ), where the minus and the plus regions correspond to the torus inboard side and the outboard side, respectively.

Reference

[1] H. Yamada, et al., Nucl. Fusion **51** (2011) 09421.
[2] Y. Asahi, et al., Proc. of 38th EPS Conference on Plasma Physics. (2011) P1.076
[3] R. Seki, et al., Plasma Fusion Res. **3** (2008) 016.
[4] R. Seki , et al., Plasma and Fusion Res. **5** (2010) 027.