§42. Monte Carlo Analysis of Beam Pressure in High Beta Plasma of LHD

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The high beta experience in LHD has been done in the low magnetic field with the low density plasma heated by the NBI. In such plasmas it is thought that the plasma pressure attributed to the injected NB (the beam pressure) is relatively high. Thus, in the MHD equilibrium study of the high beta plasma in LHD, it is important to identify the beam pressure from the total pressure precisely. The purpose of the present study is to evaluate the ratio of the beam pressure to the total pressure by the Monte Carlo calculation of the NBI particles in the high beta plasma of LHD.

We developed a Monte Carlo code *MORH*,[1, 2] by which the distribution functions after the relaxation of the high energy particles are obtained. In the MORH code, the effect of re-entering particles on the distribution function can be taken into account, since the particle loss boundary is set at the vacuum vessel wall. Additionally, the effect of the charge exchange loss is also included in the code. In the present study, the beam pressures in the high beta plasma of LHD are evaluated.

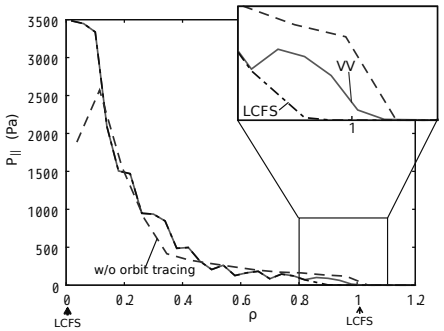
Using the MORH code, we analyzed the tangentially injected NB. Figure 1 shows the obtained beam pressure due to the tangentially injected NB. It is seen from Fig. 1 that there exists the effect of the re-entering particles only around the LCFS and that the beam pressure is almost isotropic.

The perpendicularly injected NB is also analyzed by using the MORH code. The obtained beam pressure due to the perpendicularly injected NB are shown in Fig. 2. Figure 2 suggests that the effect of the re-entering particles is seen the whole plasma region and that the beam pressure due to the perpendicularly injected NB shows the strong anisotropy.

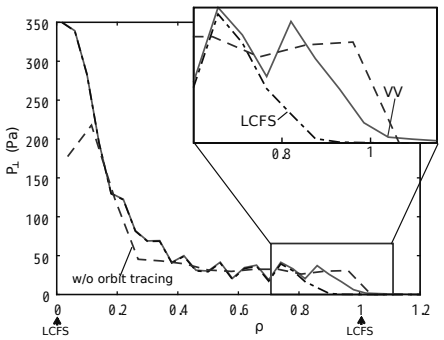
We developed the Monte Carlo code, MORH and evaluate the beam pressure due to the NB in the high beta plasma of LHD. Especially, the isotropy of the beam pressure and the effect of the re-entering particle on the beam pressure was discussed. The comparison between the calculation and the experience will be done.

1) R. Seki, Y. Matsumoto, Y. Suzuki, K. Y. Watanabe, K. Hamamatsu and M. Itagaki: J. Plasma Fusion. Res. **5**, 014(2010).

2) R. Seki, Y. Matsumoto, Y. Suzuki, K. Y. Watanabe, K. Hamamatsu and M. Itagaki: J. Plasma Fusion. Res. **5**, 027(2010).

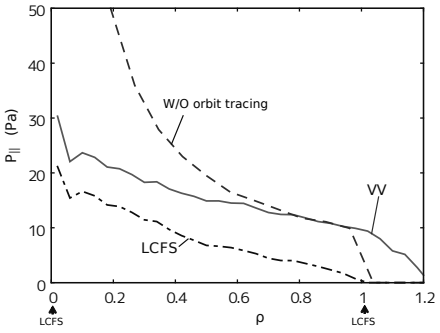


(a) beam pressure parallel to the Magnetic field

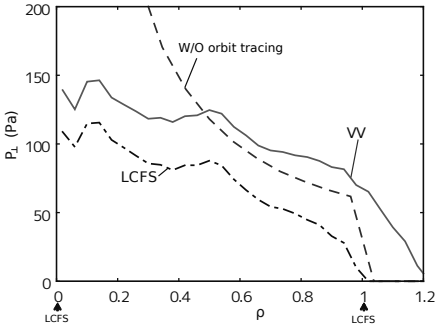


(b) beam pressure perpendicular to the Magnetic field

Fig. 1: Beam pressure due to the tangentially injected NB.



(a) beam pressure parallel to the magnetic field



(b) beam pressure perpendicular to the magnetic field

Fig. 2: Beam pressure due to the perpendicularly injected NB.