24pE11P

GAMMA 10/PDXにおける高粒子束生成に向けた軸方向プラズマ輸送の研究

Analysis of the axial plasma transport to produce high performance plasma flow in GAMMA 10/PDX

市村和也，中嶋洋輔，Md. Maidul Islam，Md. Shahinul Islam，清水啓太，大内理人，
福井良磨，新井瑞穂，横土敬幸，平田真史，池添竜也，江角直道，坂本瑞樹，市村真，
今井剛
ICHIMURA Kazuya, NAKASHIMA Yousuke, Md. Maidul Islam, Md. Shahinul Islam,
SHIMIZU Keita, et al.

筑波大プラズマ
PRC, Univ. of Tsukuba

A large tandem mirror device, GAMMA 10/PDX is currently utilized for divertor simulation experiments since the machine is able to produce the end-loss plasma particle flux which has high temperature ($T_{i//}$ = 100~400 eV, T_e = 40 eV) in simple geometry [1]. As a feature, the tandem mirror has 27 m machine length and large plasma radius. Also, high power (300 kW) Ion Cyclotron Range of Frequency (ICRF) systems are equipped and used for plasma production and heating.

In recent experiments, the end-loss ion flux relevant to the ITER scrape off layer plasma (1.6×10^{23} particles/m^{2}s) was obtained by superimposing the additional ICRF wave heating into minimum-B regions of the tandem mirror. With the ICRF heating, large increase in the electron line-density in the central-cell (NLCC) and the end-loss particle flux were observed [2]. The behavior of the electron line density, plasma temperature and the amount of end-loss ion flux during the experiments suggested that the mechanism of the axial ion loss was changed due to the increase of ion collision frequency. In contrast with the standard operations of GAMMA 10/PDX, plasma parameters in high-density operations stays in the range of high collision frequency. In such collisional plasma, the end-loss ion particle flux shows linear dependence on the plasma density instead of the parabolic dependence seen in plasmas of low collision-frequency. Figure 1 shows the experimental and theoretical dependence of the end-loss ion particle flux on NLCC. With the high collision plasma, it was observed that the increase of plasma potential enhances the axial transport of particles. In the presentation, detailed results of experiments and the discussion on the change of ion confinement time will be reported.

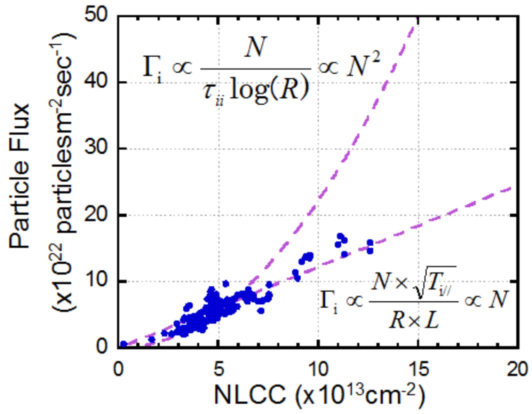

Fig. 1 Dependence of the end-loss ion particle flux on the line density at the central-cell.

References:
[1] Y. Nakashima et al., J. Nucl. Mater. **438** (2013) S738.
[2] K. Ichimura et al., Trans. Fusion Sci. Technol. **63** 1T (2013) 209-212.