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GAMMA 10 SMBI 実験における侵入長の評価
Evaluation of Penetration Depth in GAMMA 10 SMBI Experiments

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Gas fueling control is one of the important issues to obtain high performance plasmas. Fueling control enables the profile control of the core plasma and reduction in neutral particle in the peripheral area. Supersonic molecular beam injection (SMBI) has attracted attention as a new method of particle supply. GAMMA 10 tandem mirror is an open magnetic plasma-confining device with thermal barrier [1]. The central-cell of GAMMA 10 is the main region to confine the plasma. SMBI has been installed at the central-cell. A fast camera also has been installed at the central-cell. In order to investigate the neutral particle and the plasma behavior, the visible emission intensity from the plasma was captured by a fast camera. It has been observed that the neutral particle from SMBI was spread less than that from conventional gas puff in the previous experiments.

The penetration depth is the same important issue for understanding SMBI effects. SMBI has an additional effect of the plasma edge cooling. It was observed that the edge electron temperatures during SMBI were lower than that in the case of conventional gas puff, in spite of a similar edge density [2]. Electron temperature profile affects the penetration depth in terms of the mean free path of the neutral particles. Monte-Carlo simulation code (DEGAS [3]) was used in order to analyze the neutral particle behavior in GAMMA 10 [4]. Figure 1 shows the fully 3-D mesh model applied to the central cell. In this study, the penetration depth (λ_{pnt}) was defined as the peak position of radial profile of the Hα emission intensity calculated by this code. λ_{pnt} was investigated under the condition of the several T_e profiles. Figure 2 shows the evaluation method of the penetration depth.

In this presentation, we will show the simulation results how the penetration depth depends on the radial T_e profile. Ionization rate from SMBI will also be investigated.

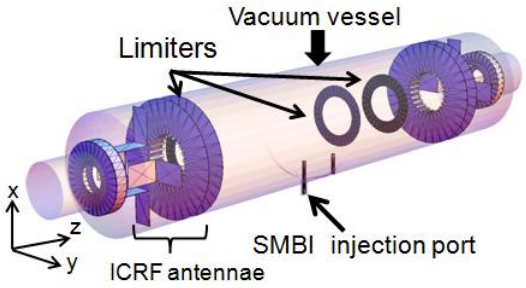

Fig. 1 Fully 3-dimentional DEGAS mesh model including SMBI port

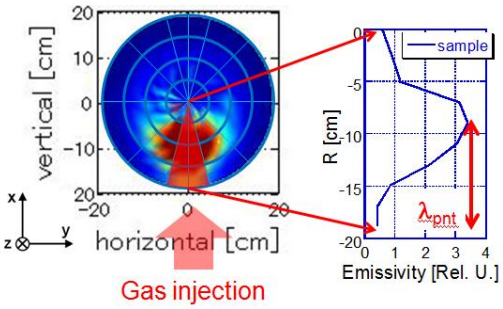

Fig. 2 Evaluation method of penetration depth

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