05aE38P

GAMMA 10ダイバータ模擬実験に向けたMPD Jetの適用
Application of MPD Jet for Divertor simulation experiment in GAMMA 10

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GAMMA 10/PDX [1-3] is able to produce end-loss flux of 100~400 eV ion temperature (relevant to tokamak SOL plasma [4]) with the help of powerful ICRF heating and mirror confinement. The high temperature of the end-loss flux is quite useful to study PWI and divertor physics. Thus it is important to find operation mode of GAMMA 10/PDX which produces more energetic and dense end-loss flux. Past research shows that the simplest way to control the parameters of end-loss flux is to control the power of ICRF. On the other hand, since the mirror machine has open-ended magnetic field, it is possible to inject plasma particles directly along the magnetic field by using plasma gun such as magneto plasma dynamic jet (MPD Jet). Such use of the MPD Jet can be new method to increase and/or control the parameters of the end-loss flux (Fig. 1). Objectives of this research are to find new operation mode and to expand the range of plasma parameters of GAMMA 10/PDX tandem mirror by using the MPD Jet.

Two MPD Jet systems of 6 MW discharge energy are mounted in the end-cells (east end-cell and west end-cell) of GAMMA 10/PDX. In standard operations, the MPD Jet systems are used for startup of the initial target plasma. In our new operation mode, instead of the MPD Jet, the initial target plasma is ignited by electron cyclotron resonance heating (ECRH) [5]. After the start up, a dense plasmoid is injected into the mirror confined plasma by east MPD Jet. It was found that the plasma parameters in the new start up mode are almost the same as in standard operations. It was also observed that the particle flux to west end-cell was increased by east MPD Jet, which means that the plasmoid penetrated the ICRF plasma and reached to the other end-cell. As the results of east MPD injection, plasma density of the east anchor-cell was increased by 80% and the end-loss flux to the west was almost doubled (Fig.2). These results indicate that application of the plasma injection by MPD Jet into the tandem mirror can be a powerful tool for studies of PWI and divertor plasmas. In the presentation, we will show the detailed results of the MPD Jet injection experiment and we will discuss effectiveness of the MPD Jet for increasing the end-loss flux in GAMMA 10.

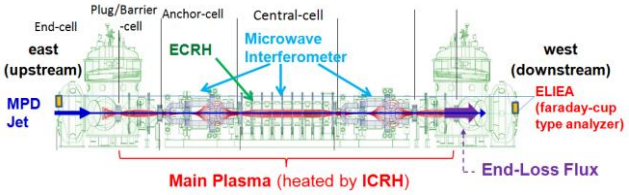

Figure 1 Schematic view of GAMMA 10/PDX vacuum vessels. Locations of MPD Jet, Mirror Confined Plasma, End Loss Flux, ECRH, and main diagnostics are shown as arrows.

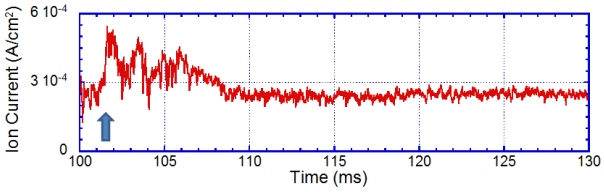

Figure 2. Ion Current signal measured by ELIEA in the west end-cell. The effect of MPD injection is seen at t = 101.5 ms.

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