

# Investigation on optimal limiter condition for stable sustainment of the potential confined plasma in GAMMA 10

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Stable sustainment of the potential confined plasma is a quite important issue for the tandem mirror machines. In GAMMA10, Electron Cyclotron Heating (ECH) is used for the formation of the axial confinement potential, and the electron heating in the central cell. In the experiments, degradation of the plasma performance is occasionally observed with ECH injection. From the view point of the plasma-wall interactions, the gas recycling from the limiters, H $\alpha$  emission, and the rigid rotation of the plasma column are carefully measured [1, 2]. The injection of ECH used for the formation of the axial confinement potential sometimes causes the off-axis rotation of the plasma column, and finally the discharge is stopped by the plasma-limiter interaction. It is suggested that the control of the plasma diameter is effective for the stable sustainment of the potential confined plasmas. In this study, the limiter condition for optimal plasma performance is investigated in the central cell. Three limiters are installed in the central cell, and two of them are capable of changing each diameter.

The investigation of dependence in limiter diameter was performed for two ECH experiments, which are for the formation of the confinement potential and for the electron heating in the central cell. In the experiment of the potential formation, the narrowing the limiter diameter decreased the diamagnetism of the plasma. However the widening the limiter diameter increased the diamagnetism. On the other hand, in the case of ECH for the electron heating, widened limiter diameter caused the plasma collapse at the same time of the ECH injection. From above results, it is speculated that there may exist a certain optimal condition in limiter diameter in order to satisfy the requirement for both ECH experiments.

We investigate the physical mechanism of the plasma collapse in ECH for the electron heating and an optimal configuration of the limiters for efficient ECH injection. In this paper, we also discuss the gas recycling from the limiters and the plasma-wall interaction measured by H $\alpha$  emission detector and medium-speed camera

[1] Y. Nakashima, N. Nishino, et al., J. Nucl. Mater. **363-365**, 616 (2007)

[2] Y. Nakashima, et al., Trans. Fusion Sci. Technol. **55**, No.2T, 38 (2009)