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FTP/P1-11: Plasma Characteristics of the End-cell of the GAMMA 10 Tandem Mirror for the Divertor Simulation Experiment

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In this paper, detailed characteristics and controllability of plasmas emitted from the end-cell of the GAMMA 10 tandem mirror are described from the viewpoint of divertor simulation studies. In the case of only ICRF plasma, the heat flux of 0.8 MW/m^2 has already been achieved and proportionally increased with the ICRF power for ion heating. The energy analysis of ion flux by using end-loss ion energy analyzer (ELIEA) proved that the obtained high ion temperature (100 - 400 eV) was comparable to SOL plasma parameters in toroidal devices and was controlled by changing the ICRF power. Parallel ion temperature Ti// determined from the probe and calorimeter shows a linear relationship with the stored energy in the central-cell and agrees with the results of ELIEA. Recently additional plasma heating experiment using ICRF in the anchor-cell (RF3) was carried out in order to improve the performance. The time behavior of the plasma line-density and end-loss ion flux is shown in Fig. 4. A significant enhancement of the line-density is observed and the resultant ion flux becomes two times higher than that without RF3. The particle flux is estimated to be 6.5×10^22 particles/s•m^2, which indicate an effectiveness of additional heating with ICRF wave in the neighboring cells toward the improved E-divertor experiments for achieving the targeted parameters of this project (PHEAT ~20 MW/m^2, Γi = 10^23-24/ m^2 sec).

We have started various experiments such as radiator gas injection onto the tungsten target and visible measurement of plasma-gas-material interactions with a fast camera. Numerical simulation studies have also started in the end-cell for understanding the behavior of plasmas in divertor simulation experiments. In this spring a large-sized divertor experimental module will be installed and radiative cooling experiments of the end-cell plasma are planned by using gas injection into the module for realizing the detached plasma condition.

[1] Y. Nakashima, et al., Fusion Eng. Design volume 85 issue 6 (2010) 956-962.

[2] Y. Nakashima, et al., Trans. Fusion Sci. Technol. 59 No.1T (2011) 61-66.

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