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GAMMA10におけるダイバータ模擬プラズマの特性評価
Characterization of divertor simulation plasma in GAMMA 10

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In the tandem mirror device GAMMA 10/PDX, divertor simulation experiments have been promoted using an end region [1, 2]. Recently, a divertor simulation experimental module (D-module) has newly been installed at the end region. A variety of experiments about divertor physics and plasma-wall interaction (PWI) can be carried out using the D-module, which consists of a stainless-steel rectangular chamber (500×480 mm, 700 mm in length) with an inlet with diameter of 200 mm and two tungsten plates (350×300×0.2 mm) composing V-shape with their open-angle from 15 to 80 degrees. A gas injection system is prepared for radiation cooling and detachment studies. At the back of the D-module, an exhaust door for pumping is attached and its clearance is adjustable.

The divertor simulation plasmas near the V-shaped target plate are characterized by measurement of electron temperature and density using Langmuir probes and spectrometers in order to study divertor physics and PWI. The Langmuir probes are installed at 13 locations on the upper target plate. Because effective ion temperature is as high as 200 to 400 eV in the GAMMA 10/PDX end region, finite ion temperature effect is taken into account in estimation of electron density from the ion saturation current [3]. He gas is also injected to estimate the electron temperature and density from the He I line intensity ratios using a collisional-radiative model [4]. A viewing field of the spectrometer for the He I lines is at 150 mm away from the corner of the V-shaped target (on axis).

Figure 1 shows dependence of electron temperature and density measured using the Langmuir probe on the open-angle of the V-shaped target. These dependence is considered to be related to PWI such as recycling. This figure also shows the results without and with an additional ICRF. With the additional ICRF, the electron temperature decreases and the density increases. In the mirror-confined core plasma (central region), diamagnetism decreases by ~ 50 % and line-averaged density increases by ~ 50 % due to the additional ICRF. Therefore, the electron temperature and density near the V-shaped target change according to the core plasma parameters.

In this presentation, we will also show results measured using the spectrometer, along with change in the plasma parameters near the V-shaped target by the gas injection for radiation cooling and so on.

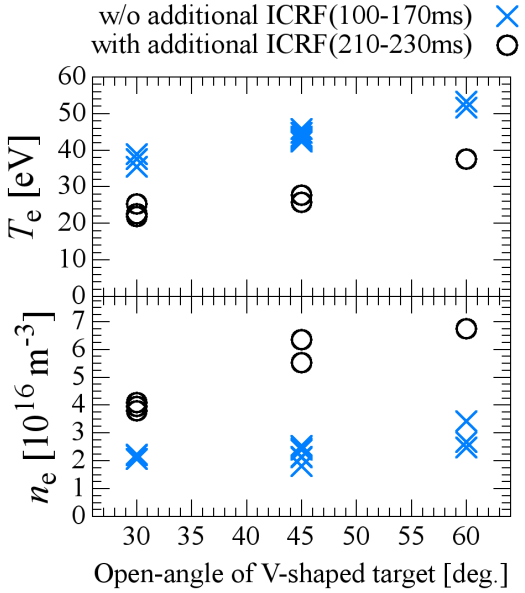

Fig. 1. Electron temperature T_e and density n_e measured using the Langmuir probe.

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[2] Y. Nakashima, *et al.*, Journal of Nuclear Materials **415** (2011) S996.
[3] A. Tsushima and S. Kabaya, Journal of the Physical Society of Japan **67** (1998) 2315.
[4] M. Goto, Journal of Quantitative Spectroscopy & Radiative Transfer **76** (2003) 331.