§10. Development of YAG-Thomson Scattering System in GAMMA 10/PDX

Yoshikawa, M., Ohta, K., Wang, X., Kohagura, J., Shima, Y., Sakamoto, M., Imai, T., Ichimura, M., Nakashima, Y. (Univ. Tsukuba), Minami, T. (Kyoto Univ.), Kawahata, K., Yamada, I., Funaba, H.

A YAG-Thomson scattering (TS) system was constructed and applied to the tandem mirror GAMMA 10/PDX to measure the electron temperature and density [1-3]. We added a five-channel polychromator with new avalanche silicon photo diodes with preamplifiers. Moreover, we added additional mirror for TS light signal intensity increase. We started to design the divertor TS system and made a TS signal optical collection system in the divertor region.

The TS system is constructed with the laser, the incident optics, the light collection optics, the signal detection electronics, and the data recording system. Details of the system is shown in elsewhere. We prepared a new polychromator system with new APDs (Perkin Elmer, C30659-1060-3AH) and preamplifiers (Tokyo Opto-Electronics, PLM12A001-2). The output signals of the polycromators are recorded by using the high speed oscilloscopes (IWATSU, DS5524) with data acquisition program (IWATSU, MultiVControl V2.23). We can measure six radial positions' electron temperatures and densities in a single laser shot. Moreover, we can measure 10-Hz radial electron temperature and densities in a single plasma shot by using its data acquisition program. Fig. 1 (a) and (b) show the radial electron temperature and density, respectively. To improve the TS signal intensities of X = -10, -15 and -20 cm, we added the second collection mirror $(\phi = 20 \text{ cm}, \text{R} = 1200 \text{ mm})$. The TS signal intensities at X = -10 cm and -15 cm with additional mirror are about 1.2 and 1.9 times those without it, respectively. Unfortunately, at X = -20 cm, we could not obtain the TS signals.

We designed the end-divertor (E-Div.) module TS system made a TS signal optical collection system in the



Fig. 1: (a) and (b) show the radial profiles of the electron temperature and density, respectively.

divertor region. The E-Div. module TS system was designed to measure electron temperature from 0.1 eV to 50 eV with five channel polychromator. We set the YAG-laser pass from the central region to the end region.

We developed the TS system to measure multiposition and multi-period electron temperatures and densities. Moreover, we started to construct the E-Div. module TS system for E-Div. plasma study.

[1] M. Yoshikawa, et al., Fusion Science and Technology, 68 (2015), pp. 99-104.

- [2] M. Yoshikawa, et al., JINST, 10, (2015)T08003.
- [3] M. Yoshikawa, et al., JINST, 10, (2015) C11006.