

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

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A Thomson scattering (TS) system was constructed and applied to the tandem mirror GAMMA 10/PDX to measure the electron temperature and density. In fund year 2013, we could measure three radial position's electron density and temperatures. In this fund year, we constructed new two five-channel polychromators with new avalanche silicon photo diodes with preamplifiers. Moreover, we have started to design and to construct the divertor Thomson scattering system.

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 the new polychromator systems (TS056 and TS149) with new APDs (Perkin Elmer, C30659-1060-3AH) and preamplifiers (Tokyo Opto-Electronics, PLM12A001-2). The signals are recorded by using the high speed oscilloscopes (Tektronix, DPO 4034 and IWATSU, DS5524). We can measure five radial positions' electron temperatures and densities in a single plasma shot. 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 mirror ($\phi = 20$ cm). However, more optimization of it is needed.

We started to design the end-divertor (E-Div.) module TS system. The E-Div. module TS system was designed to measure electron temperature from 0.1 eV to 50 eV with five channel polychromator (TS194, Ch. 1: 1060.5 nm, Ch. 2: 1059.0 nm, Ch. 3: 1056.0 nm, Ch. 4: 1050.0 nm, and Ch. 5: 1040.0 nm). Figure 2 shows the sensitivity of the polychromator. We made a optical fiber (Mitsubishidensen, CSMSLKSL SPH400-SU57/56) for TS signal transmitting

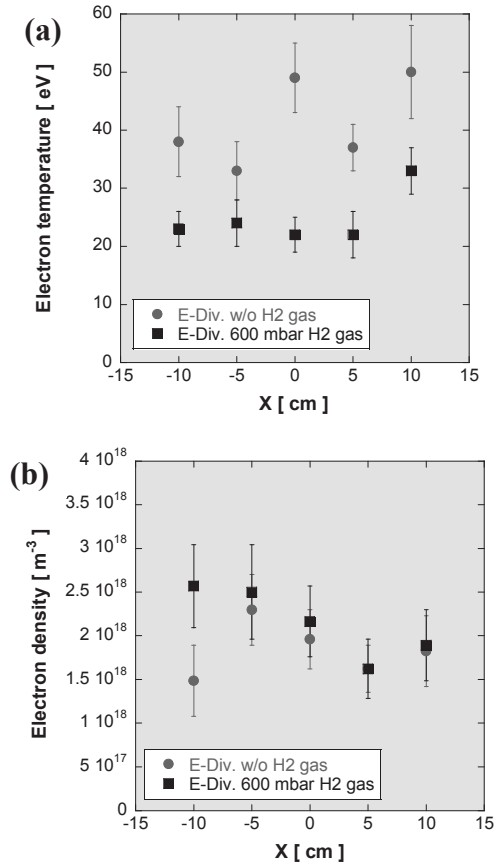


Fig. 1: (a) and (b) show the radial profiles of the electron temperature and density, respectively.

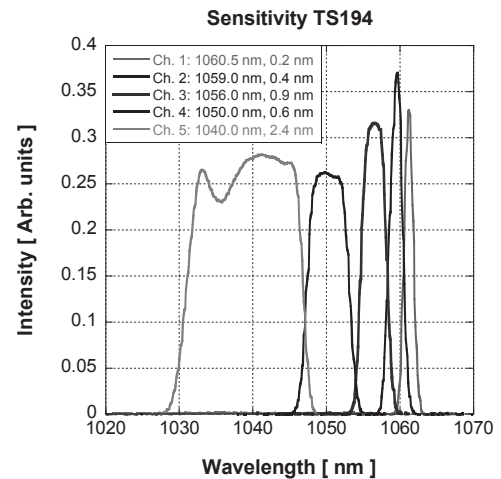


Fig. 2: Sensitivity of the polychromator.

from the end tank of the GAMMA 10/PDX end region to the outside.

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