

§8. Electron Temperature and Density Measurements by Using the Thomson Scattering System in GAMMA 10

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An yttrium-aluminum-garnet (YAG) Thomson scattering (TS) system was constructed and applied to the tandem mirror GAMMA 10 device to measure the electron temperature and density [1]. A large solid-angle TS light-collection system was achieved by use of a spherical mirror system and large numerical aperture of bundled optical fiber. We constructed two five-channel polychromators with new avalanche silicon photo diodes (Perkin Elmer, C30659-1060-3A). Calibration experiment for TS optical system was performed by Rayleigh and Ramman scattering. We applied the new charge to digital converter (QDC) system (CAEN, V792) for multi-channel and multi-period TS signal measurements.

The YAG-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. The new QDC system linearity was checked by injecting 10 ns rectangular pulses (Fig. 1). We applied the YAG-TS system to measure the electron

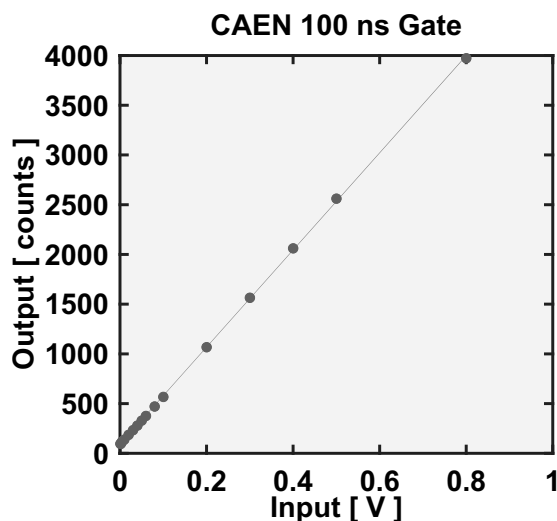


Fig. 1. Output counts of CAEN V792.

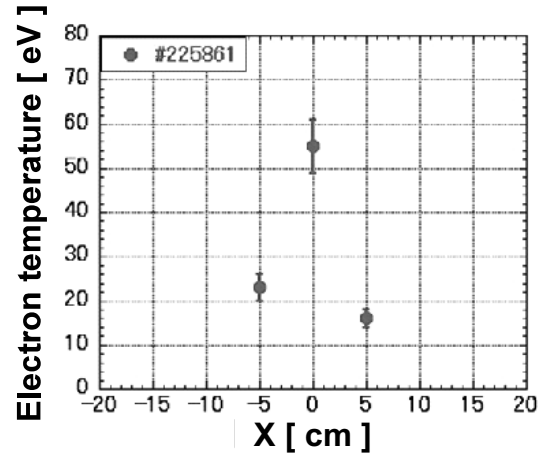


Fig. 2. Three positions measurement by using three oscilloscopes.

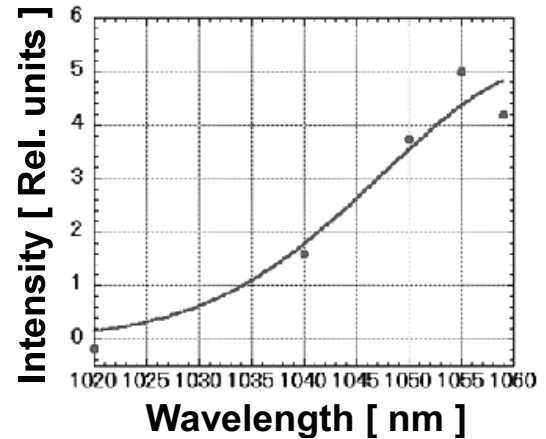


Fig. 3. TS signal obtained by using QDC system.

temperature and density of GAMMA 10 plasma with three oscilloscopes. Figure 2 shows the electron temperature radial profile obtained by using a single plasma shot. We can successfully obtained radial electron temperature and density radial profile in a single plasma shot. Figure 3 shows the TS signal obtained by using newly installed QDC. The electron temperature obtained by this QDC is larger than that obtained by using the oscilloscope. We have to improve signal to noise ratio of QDC system with applying the amplifier system.

- 1) Yoshikawa, M., et al.: JINST. 7 (2012) C03003.