30D06P

YAG-Thomson散乱計測システムを用いたGAMMA 10セントラル部の電子温度・密度分布計測

Measuring radial profiles of electron temperature and density in GAMMA 10 central plasma using YAG-Thomson scattering system

吉川正志[1]、小波蔵純子[1]、嶋頼子[1]、坂元星都[1]、関口諒[1]、坂本瑞樹[1]、中嶋洋輔[1]、市村真[1]、今井剛[1]、南龍太郎[1]、細井克洋[1]、北出崇二[1]、河原崎遼[1]、山田一博[2]、安原亮[2]、川端一男[2]、舟場久芳[2]、南貴司[3]

M. Yoshikawa[1], J. Kohagura[1], Y. Shima[1], S. Sakamoto[1], R. Sekiguchi[1], et al.

[1]筑波大プラ研セ、[2]核融合研、[3]京大エネ理工

[1]PRC, Univ. Tsukuba, [2] NIFS, [3]IAE, Kyoto Univ.

Thomson scattering (TS) method is one of the most reliable diagnostic to measure the electron temperature and electron density in plasmas. The effective concept for increasing of TS signals is required in the low plasma density plasmas, such as GAMMA 10 plasma and peripheral region of fusion plasmas. In GAMMA 10, the yttrium-aluminium-garnet (YAG)-TS system has been constructed with the laser, the incident optics, the light collection optics, the signal detection electronics, and the data recording system (Fig. 1). The large solid angle of TS collection optic system are used for this YAG-TS system. We carried out the Rayleigh and Raman scattering experiments for system setting and density calibration.

In GAMMA 10, the electron temperature and density were measured by a soft X-ray measurement and microwave interferometer systems. In these days, direct electron heating by electron cyclotron heating experiments in the central cell have been carried out. The density and potential fluctuation suppression during the confinement potential formation have been studied by using a gold neutral beam probe system. Moreover, the super molecular beam injection (SMBI) experiments have been started for plasma fueling study. In GAMMA 10, the typical electron density, electron and ion temperatures are about 2×10^{12} cm^{-3}, 0.1 keV and 5 keV, respectively, during confinement potential formation.

We designed GAMMA 10 YAG-TS system for measuring electron temperature and density in a single plasma shot. To obtain a TS signal with a good signal-to-noise ratio, we developed an optical-collection system with a large solid angle. Moreover, we added the multi-channel optical fiber system with the polychromators for obtaining the radial TS signals in a single plasma shot. We used the new avalanche photodiode (APD) in the polychromator. In order to obtain the multi-position and -period TS signals in a single plasma shot, we introduced the multievent charge-to-digital converter (QDC). We checked the linearity of QDC system and carried out the signal intensity calibration.

We apply the YAG-TS system in the SMBI experiments to measure the electron density and temperature radial profiles. Then we can successfully obtain the electron density and temperature radial profiles. We are developing the multi-pass TS system for increasing the TS signals. We could successfully construct the double pass TS system. Moreover, we are constructing the multi-pass TS system for more than 3 pass TS system.

In this presentation, we show the results of the electron density and temperature measurements in SMBI experiment and present status of GAMMA 10 TS system.

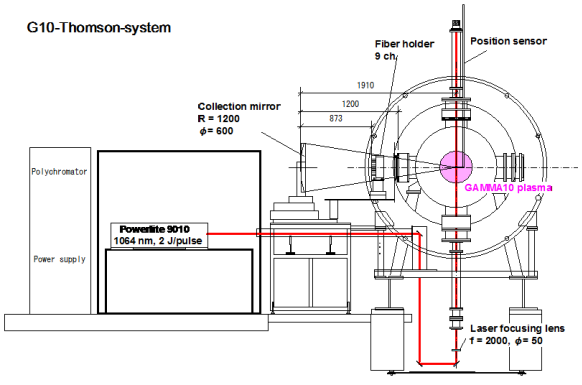

Fig. 1: GAMMA 10 TS system.