Electron temperature and density profile measurement on the TST-2

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Non-inductive plasma current start-up experiments using the lower hybrid wave (LHW) have been performed on the TST-2 spherical tokamak. Profiles of the electron temperature T_e and density n_e were measured by Thomson scattering (TS) by accumulating many TS signals from reproducible discharges with plasma current $I_p \sim 5$ kA started-up and sustained by LHW power of 20 kW. The T_e profile was hollow while the n_e profile was centrally peaked. T_e, n_e and the electron pressure p_e at the plasma center were 6 eV, 6×10^{17} m^{-3}, and 0.6 Pa, respectively. On the other hand, the total pressure at the plasma center including the fast electron pressure and the ion pressure, deduced from EFIT equilibrium reconstruction code was 20 Pa. Therefore, it is inferred that the fast electron pressure is dominant. In order to obtain sufficient TS signal without such accumulation and to enhance the SN ratio, a multiple-pass TS measurement system with an optical cavity has been developed. In the cavity, a laser pulse can be confined coaxially between two mirrors by a fast switching of the voltage applied to the pockels cell. The first coaxial multiple-pass TS measurement for tokamak plasmas has been performed successfully, with a factor of 5 greater photon counts compared to the conventional single-pass configuration. A new optical system with improved optical efficiency is being developed. Results obtained with the improved system will be presented.

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