Thomson Scattering Diagnostic on the ETE Tokamak: Status and Progress

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A conventional one-channel Thomson scattering (TS) system was implemented to measure the electron temperature and density profiles on the ETE tokamak plasma with a resolution of 15 mm along 50 cm inside the plasma [1]. The TS is based on a 10 J Q-switched ruby laser that probes the plasma horizontally at the mid-plane. An f/6.3 lens images the scattered light on a 7 m long fiber bundle with effective cross-section of 4.5mmx1.5mm that is spectral analyzed by a 5-channel filter polychromator. Temperatures from 20 eV to 160 eV with densities as high as 3.5×10^{19} m^{-3} were measured during the optimization phase of the ETE plasma discharge.

Presently, the TS diagnostic is being upgraded aiming at the simultaneous measurement of electron temperature and density of a plasma profile with ten spatial points per polychromator. This multipoint Thomson scattering (MTS) diagnostic is based on the time-delay technique that consists in using fibers of different lengths to relay the light signals to the same polychromator [2]. The proposed system uses large core monofibers (d = 0.8 mm, NA = 0.39, average attenuation: 7 dB/Km) with micro-lenses (d = 3 mm, f = 15 mm) allowing a resolution inside the plasma of 4 mm. For this MTS setup the estimated length of the fibers increases 14 m progressively from channel to channel, from a minimum of 8 m to the maximum length of 134 m. The overall transmission is estimated to be 52% for the first fiber and 42% for the last one [3].

This work describes in details the present TS system and the results obtained during the improvement phase of the ETE discharge. Also shows the MTS project and the first results.

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References

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