HIBP MEASUREMENTS OF THE PLASMA ELECTRIC POTENTIAL ON T-10

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The radial electric field has been considered to have an important effect on the confinement and anomalous transport in the plasma. The experimental research of the mechanisms determining the radial electric field in a toroidal plasmas started recently. The Heavy Ion Beam Probe (HIBP) diagnostics is the only technique for direct measurements of plasma electric potential. HIBP diagnostic was installed on T-10 (R = 150 cm, a = 33 cm) tokamak to measure the local values of the plasma potential. and its fluctuations. The Cs^+ and Tl^+ ions with the energy up to 210 keV and intensity about a few dozens μA were used. The measurements have been performed in the points of the detector grid determined by the calculations of the trajectories of the probing particles. The detector grid was located in the outer part of the meridional plasma cross-section close to the equatorial plane. The used energies allow to perform the measurements at r = 18 - 33 cm. The specially developed high voltage stabilizer was used. It allowed to keep the analyzer and accelerator voltage stability on the level $\Delta U/U \sim 10^{-5}$.

The measurements on T-10 tokamak were devoted to MHD effects on the plasma potential and the investigation of the plasma parameter fluctuations. Plasma potential, density and magnetic potential fluctuations were measured in the regimes with various types of MHD activity. It was obtained the negative electric potential well towards minor axis in MHD quiet regimes. MHD active regimes have the potential well with twice smaller depth. The difference in the potential value between of the discharges with and without MHD activity can reach 400-600 V. In MHD-active regimes electric field is very low, almost zero, where $q \sim 2$ (19 cm < r < 25 cm). Plasma electric potential, density and magnetic potential oscillations were observed in the frequency range ~ 1 kHz. The poloidal magnetic field and electron density oscillations are antiphazed. The region of the high level poloidal field oscillations coincides with $q \sim 2$ zone.