**SOFT 2018** 



Contribution ID: 396

Type: not specified

## P4.060 Heavy ion beam probe design and operation on the T-10 tokamak

Thursday, 20 September 2018 11:00 (2 hours)

Paper describes recent advances in Heavy Ion Beam Probing (HIBP), a unique diagnostics to measure the core plasma potential in the T-10 tokamak (R = 1.5 m, a = 0.3 m, B tor = 1.5 - 2.5 T). Fine focused (< 1 cm) and intense (<130 mkA) Tl+ beams with energy up to E = 330 keV, equipped by advanced control and data acquisition system provides the measurements in the wide density interval  $n_e = (0.3 - 5)x10^{19} \text{ m}-3$  and the wide range of plasma current 100 < I pl < 330 kA in Ohmic and ECR-heated plasmas. The multichannel parallel plate electrostatic energy analyzer with a high temporal ( $\ge 1$  ms) and energy (DE / E < 5x10-5) resolution simultaneously provides data on the mean value of plasma potential phi and its oscillations (by the beam extra energy), plasma density oscillations (by the beam current) and poloidal magnetic B\_pol oscillations (by the beam toroidal shift) in each of 5 sample volumes (SVs). When SVs are poloidally shifted, we can determine the poloidal electric field E\_pol=(phi1- phi2)/x, x~1 cm, and the electrostatic turbulent particle flux G\_E×B~n\_e E\_pol /B\_tor. Cross-phase of density oscillations allows us to find the poloidal phase velocity of perturbations, or the plasma turbulence rotation, and the poloidal mode number m. Time evolution of local values of plasma parameters and/or fragments of radial profiles (as long as 2-6 cm) can be measured in a single shot at Low Field Side. The whole profile in the range (0.25 < rho < 1) is available shot by shot for B\_tor < 2.2 T. High gain (107 V/A) preamplifiers with 500 kHz bandwidth allows us to study broadband turbulence and various types of quasicoherent modes including tearing MHD modes and Geodesic Acoustic Modes.

Presenter: MELNIKOV, Alexander (Tokamak Division National Research Centre 'Kurchatov Institute')

Session Classification: P4