# Fluctuation measurement in the edge plasma on TST-2

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Investigation for role of turbulent magnetohydrodynamics (MHD) fluctuation on confinement in high beta spherical tokamak (ST) is important to develop high confinement operation of fusion reactor. In particular, edge fluctuation near the last closed flux surface (LCSF) may have dominant importance in global confinement of tokamak plasmas [1]. In this presentation, we give results of edge turbulent fluctuation measurement with Langmuir probes and magnetic probes in ohmically heated plasmas on Tokyo Spherical Tokamak-2 (TST-2) [2].

The Langmuir probe has a number of electrodes, and is radially movable. The magnetic probes are fixed near the vessel wall. We focus on fluctuations of floating potential, ion saturation current, electron temperature, and poloidal magnetic field. In particular, temperature fluctuation measurement is a challenge to clarify effect of temperature gradient driven turbulence on heat transport. Current-voltage (I-V) characteristic waveforms were measured by sweeping bias voltage. The discharge duration of plasmas is around 20 ms, and MHD reconnection events [3] are observed in later part of the discharge. High energy electron tails are also observed in I-V waveform during plasma current ramp up phase at the beginning of the discharge. We analyzed fluctuation data free from the high energy electron and the MHD events.

At the beginning of the discharge, the fluctuations have spectral peak at around 10-20 kHz in the floating potential, ion saturation current, and magnetic field. After the initial current ramp up phase, the spectral peak shifts to 20-30 kHz and has a broadband signature. The floating potential fluctuation is correlated with the ion saturation current fluctuation, however, correlation between the floating potential fluctuation and the magnetic fluctuation is low. This may be caused by distance of observation location between the Langmuir probe and the magnetic probe. Average floating potential inside the LCFS is negative, and radial profile of the average floating potential has a positive gradient.

We sorted I-V characteristic waveforms into categories in term of floating potential intensity [4-6], and the electron temperature was derived at every category. Then, we obtained relationships between the floating potential intensity and the derived electron temperature. A preliminary result shows that average electron temperature is around 30 eV at average floating potential of -50 V, and amplitude of the electron temperature fluctuation is 7-10 eV. The electron temperature increases monotonically as the floating potential decreases, however, gradient of the relationship becomes steeper in high temperature region (> 45 eV) .

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