## §9. Characteristics of Edge Fluctuations during Electrode Biasing

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We have been making use of 5-pin Langmuir probe to measure $n_e(t)$, $V_f(t)$, $T_e(t)$ and $E_\theta(t)$ simultaneously to study the electrostatic fluctuation in the SOL[1]. Here, we report the characteristics of the fluctuation measured in the JIPP T-IIU with biased electrode experiments in which the electrostatic fluctuation is affected significantly.

Typical parameter observed in the SOL are summarized in the table. These are not different from the reported results in other tokamaks, though $\tilde{T}_e$ seems to be a bit larger. The fluctuation induced particle flux $\Gamma(= \frac{1}{B_t} < \tilde{n}_e \tilde{E}_p >)$ is about $1 \times 10^{21} m^{-2} s^{-1}$. Compared with the density gradient, the cross field density coefficient $D_\perp = 2 \sim 4 m^2 s^{-1}$. That is large enough to explain the width of the SOL plasma.

the previous article). The modification of profiles is shown in Fig. 1. The electrostatic fluctuation is also changed in this narrow area, especially in the positive bias case(Fig.1(c) and Fig.(2)). Since the radial electric field is partly affected, this is unrelated to suppression by the electric field shear. We now examine the effect of the parallel currents on the electrostatic fluctuation in the SOL.

| $n_e$ | $T_e$ | $V_f$ | |
|---|---|---|---|
| $3 \times 10^{-18} m^{-3}$ | $20 \sim 30$ eV | $0 \sim -3$ V | |
| $\lambda_{n_e}$ | $\lambda_{T_e}$ | $k_\theta$ | |
| 1.5 cm | $3 \sim 5$ cm | $\sim 1$ cm$^{-1}$ | |
| $\tilde{n}_e/n_e$ | $\tilde{T}_e/T_e$ | $\tilde{V}_f/T_e$ | $\frac{<\tilde{n}_e \tilde{V}_f>}{<\tilde{n}_e><\tilde{V}_f>}$ |
| $0.1 \sim 0.4$ | $0.2 \sim 0.5$ | $0.2 \sim 0.4$ | $0.1 \sim 0.5$ |

Table 1: SOL plasma parameters (2 cm outside the LCFS). $B_t$=2.8 T, $I_p$=180kA and $\overline{n_e}$=1$\sim$3 $\times 10^{19} m^{-3}$.
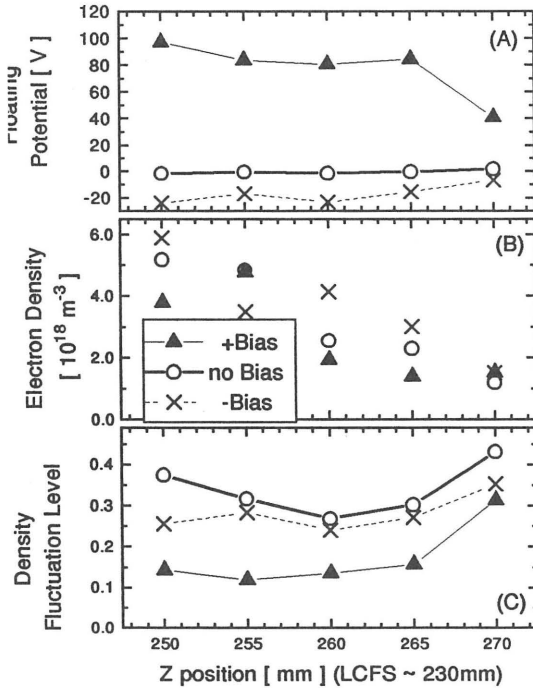


Fig.1: The floating potential(A), the electron density(B) and the fluctuation level of the density(C) profiles. The condition is almost same as Table 1. The electrode is about 4cm inside the LCFS.

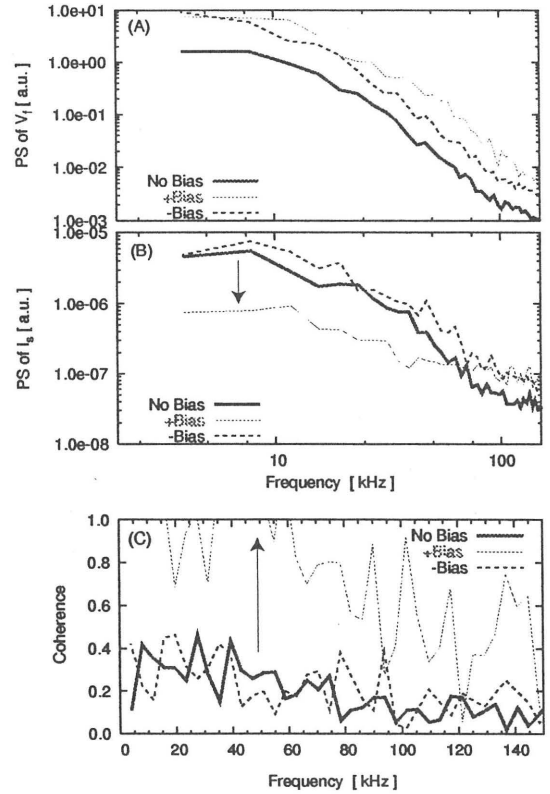With biased electrode, narrow band of SOL plasma connected to the electrode is affected (See



Fig.2: The power density spectra of the floating potential (A) and the ion saturation current(B). The coherence spectrum of the floating potential 12mm away from each other poloidally is also shown(C).

References
1) S. Ohdachi *et al.* , Annual Report of National Institute for Fusion Science 1995, p. 179