§13. Analysis of Edge Fluctuation with ICRF in a Tandem Mirror for the Purpose of Radial Transport Control

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A study on formation of DC electric field and flow shear by an application of ICRF is important irrespective of confinement magnetic configuration[1]. Present study has a purpose of clarification of physical mechanism of the relation among ICRF, DC field, and flow shear, and transport control based on the phenomena. As a fundamental study, edge fluctuation varying with ICRF non-linearly is analyzed in GAMMA10 tandem mirror.

In GAMMA10, low frequency fluctuations in the scrape-off layer plasma are observed by application of RF2 which is for central cell ion heating. Frequency spectrum measured by probes shows a fundamental oscillation of 5 kHz, and 2∼4th order harmonic oscillations exist during whole period of a shot.

Macroscopic parameters of line density and diamagnetic signal increase as RF power increases as shown in Fig. 1. The increasing rates, however, vary at around net power of 50 kW.

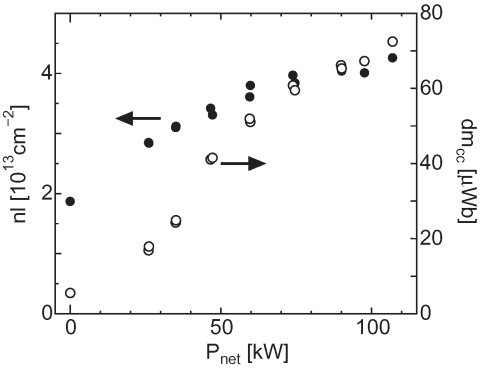

Fig. 1 Line density and diamagnetic signal versus RF net power.

Low frequency fluctuations also vary at the same threshold power. Figure 2 indicates samples of spectrum. Here, (a) and (b) are for relatively higher RF net power(90 kW) and for lower one(35 kW), respectively. As shown in the figure, the fluctuation consists of plural number of frequencies for (a). On one hand, it consists of a single frequency for (b).

Dispersion relation of the fluctuation also measured by an axially aligned probe array. Figure 3 shows frequency versus phase difference between probe signals for highly correlated components. In the relatively higher RF net power case(a), fluctuation has a constant velocity from center to throat, although it has almost no phase difference in the lower one(b). The former one is considered to be an electron drift wave, and the latter one is a flute wave.

The characteristics of edge fluctuation were observed, which varied non-linearly with ICRF power and had correlation with macroscopic parameters.

Reference

1) O. Sakai and Y. Yasaka: Phys. Plasmas **2**, 3249 (1995).

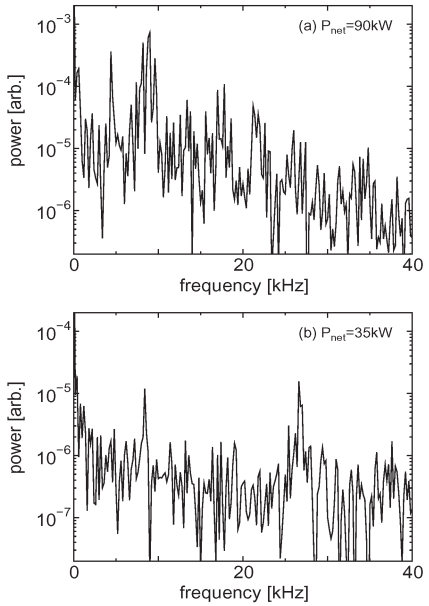

Fig. 2 Samples of spectrum of fluctuation: higher RF net power(a) and lower one(b).

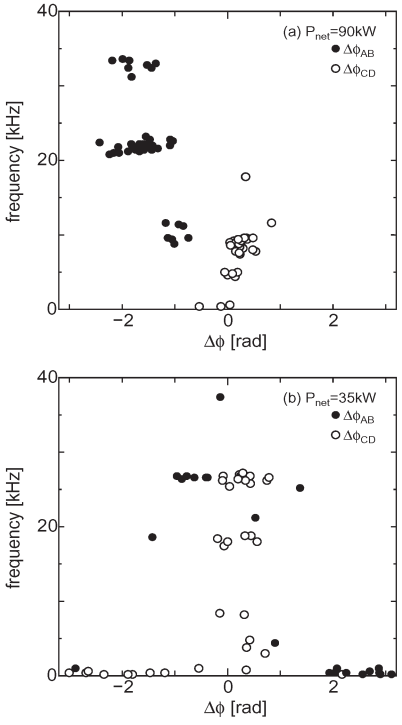

Fig. 3 Dispersion relations of fluctuation: higher RF net power(a) and lower one(b).