§51. Experimental Study of Ion Tail Production in ECH/ECCD Plasmas of LHD

Kobayashi, S., Nagasaki, K., Yamamoto, S. (IAE, Kyoto Univ.), Murakami, S. (Dep. Nucl. Eng., Kyoto Univ.), Osakabe, M., Igami, H., Isobe, M., Ozaki, T., Goncharov, P.R., Yoshimura, Y., Kubo, S., Shimozuma, T., Muto, S., Saito, K., Kasahara, H., Kumazawa, R.

In several torus devices, tail ion has been observed even in the electron heated plasmas by ECH[1,2]. These phenomena have been considered to be due to the (1) anomalous electron-ion coupling in the slide-away regime of the superthermal electron or (2) acceleration by LH waves excited by the parametric decay wave processes. In the previous experimental campaign, increase in the CX flux due to ECH power modulation has been observed in the low density ECH plasmas, however, the ratio of the high energy CX flux to the low energy one has not been changed clearly by the modulation.

In this experimental campaign, we tried the high field side (HFS) injection of ECH microwave in order to investigate the excitation of the LH-decay waves and its effect on the tail ion formation. The 84 GHz microwaves were launched from HFS in X-mode and O-mode at the low density condition of 0.2-0.7 x 10^{19} m^{-3}. The injection power of 84 GHz ECH was modulated rectangularly at 5, 10 and 38 Hz. The maximum position of the power absorption profile was estimated to be about ρ = 0.55 by ECE measurement using FFT analysis, which differed from the geometrical absorption position of launched EC microwaves (ρ = 0.78). As shown in Fig. 1, a peak spectrum of the high frequency fluctuation around 180 MHz was observed, indicating excitation of LH waves. Since the difference in the power spectra of the fluctuation between O-mode and X-mode launch was not clear, the effect of the multi-reflection of the launched microwaves should be considered. Figure 2(a) and 2(b) show the time evolution of the ECH power, Hα intensity and CX flux measured with Compact NPA (perpendicular pitch angle) and E//B NPA (parallel pitch angle) systems in the X-mode and O-mode launch plasmas, respectively. Both parallel and perpendicular CX flux increased synchronously with the ECH power modulation in the X-mode and O-mode launch cases. Since the ratio of the CX flux of 5.8keV to 1.6 keV was not so sensitive to the power modulation and the waveform of the CX flux was similar to that of the Hα intensity, we should take the change in the neutral density into account to discuss the effect of the excited waves on the formation of the ion tail in ECH plasmas. This work is performed with the support and under the auspices of the NIFS Collaborative Research Program. (NIFS2006/KLBB003)

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2) Kaneko, M., Kobayashi, S. *et al.* 30st EPS Conf. Plasma Phys. St. Petersburg, ECA **Vol.27A**, P-3.28 (2003).

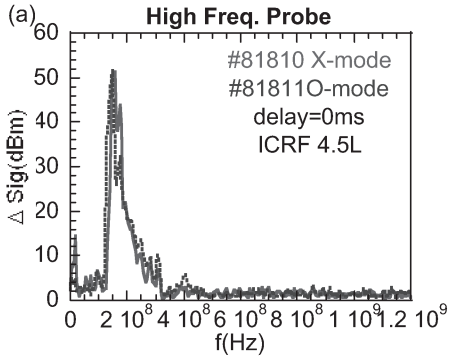

Fig. 1. Power spectrum by high frequency probe measurement with ICRF antenna.

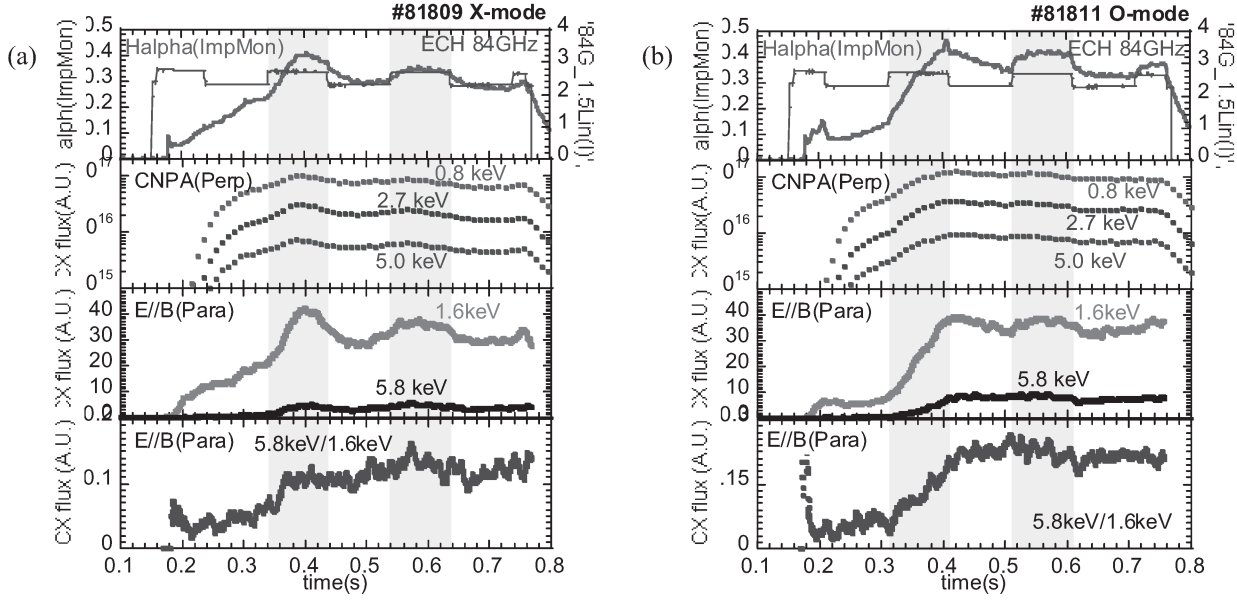

Fig. 2. Time evolution of Hα intensity, ECH power, CX flux measured with compact NPA (CNPA) and E//B NPA and CX flux ratio of 5.8keV to 1.6keV in (a) X-mode and (b) O-mode launch of HFS injection of ECH.