05aE31P

GAMMA10アンカー部における高周波密度揺動の振る舞いと定量評価に向けた取り組み

Behavior of high-frequency density fluctuation in the GAMMA10 anchor cell and a trial toward its quantitative evaluation

岡田拓也[1], 池添竜也[1], 市村真[1], 平田真史[1], 横山拓郎[1], 飯村拓真[1], 齋藤裕希[1], 岩本嘉章[1]
隅田脩平[1], 渡邊和征[1], 吉川正志[1], 小波蔵純子[1], 嶋頼子[1]
OKADA Takuya[1], IKEZOE Ryuya[1], ICHIMURA Makoto[1], HIRATA Mafumi[1]
YOKOYAMA Takuro[1], IIMURA Takuma[1], SAITO Yu-ki[1] *et al.*

筑波大学　プラズマ研究センター[1]
Plasma Research Center, University of Tsukuba[1]

In the GAMMA10 tandem mirror, ion-cyclotron range of frequency (ICRF) waves have been used for plasma production, heating and sustainment of MHD stability. In a high power ICRF experiment on the GAMMA10 tandem mirror, plasma with beta of a few percentage and strong temperature-anisotropy is produced in the central cell. As a result of the heating, the excitation of an Alfvén-ion-cyclotron (AIC) mode has been observed. On recent experiments in which anchor cell plasma was directly heated by an additional ICRF heating system, the AIC mode was excited also in the anchor cell, indicating the successful heating and resultant formation of high-temperature plasma with anisotropy in the anchor cell.

The frequencies of the AIC modes excited in the GAMMA10 central cell are between 5.6 MHz – 6.0 MHz, just below the frequency of 6.36 MHz which is used for the ICRF heating on the central cell. On the other hand, the frequency of the AIC mode excited in the anchor cell is about 9MHz, which is outside the frequency range of the AIC modes in the central cell; it is the ion cyclotron frequency near the midplane of the anchor cell. In the frequency spectrum, furthermore, there is a different feature between the AIC modes in the central cell and the AIC mode in the anchor cell. While several sharp peaks are observed in the central cell, single peak is observed in the anchor cell. (Sometimes two peaks are observed.) This difference may be attributed to the axial width of the strong temperature-anisotropy region; the anchor cell has narrower mirror field region than that of the central cell.

We observed the excitation of the AIC mode by using a reflectometer. Figure 1 shows the line density of the anchor cell where an additional ICRF heating was applied and the frequency spectrum of a reflectometer signal. By applying the additional ICRF power directly to the anchor cell as shown in Fig. 1 (a), the line density increases remarkably and the AIC mode is spontaneously excited near 9.0 MHz as shown in Fig. 1 (b). To investigate the detailed character of the AIC mode and the difference between central and anchor cells, we are aiming at evaluating the electric field intensity of the AIC modes. We have tried to separate the phase modulation component from the amplitude modulation component included in the density fluctuation of the MHz range by using heterodyne detection method.

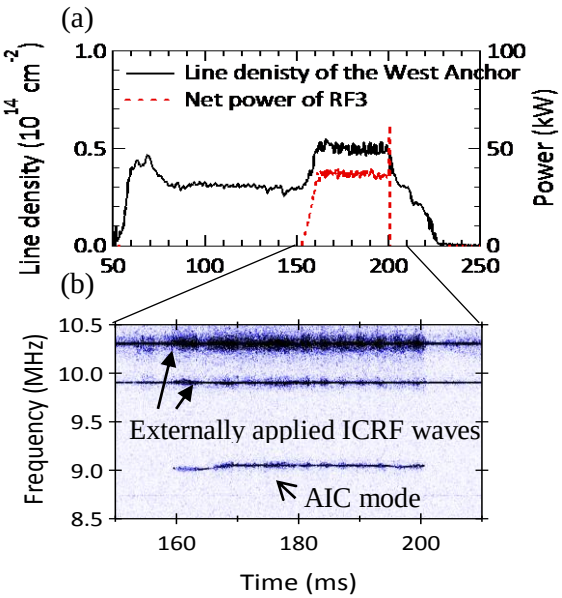

Fig. 1. (a) Line density of the anchor cell and (b) the frequency spectrum of a reflectometer signals.

Acknowledgments

This work was partly supported by a Grant-in-Aid for Scientific Research from JSPS, Japan (No. 25400531) and by the bidirectional collaborative research programme of the National Institute for Fusion Science, Japan (NIFS12KUGM067).