05pE20P

GAMMA10セントラル部におけるイオンエネルギーバランスの時間発展解析
Time Evolution Analysis of Ion Energy Balance in the GAMMA10 Central-cell

高橋樹仁、中嶋洋輔、細井克洋、武田寿人、市村和也、木暮諭、岩元美樹、細田甚成、
蒋佳希、清水啓太、長屋孝信、假家強、沼倉友晴、南龍太郎、今井剛、
池添竜也、大川和夫、市村真
TAKAHASHI Shigehito, NAKASHIMA Yousuke, HOSOI Katsuhiro,
TAKEDA Hisato, ICHIMURA Kazuya, KIGURE Satoru *et al.*

筑波大プラズマ研セ
PRC, Univ. Tsukuba

In GAMMA 10, a charge exchange neutral particle analyzer (CX-NPA) has been installed perpendicularly to the magnetic axis to obtain hot ions in the central-cell. CX-NPA is a parallel-plate type energy analyzer that analyzes neutral particle from the energy of 0.2 keV to 30 keV.

Electron cyclotron resonance heating (ECRH) has been used for potential formation to increase plasma density. The increase of diamagnetism (DMcc) is confirmed in the period of ECRH (Fig.1), which comes from the mechanism that loss by coulomb collision between ion and electron is controlled by the increase of electron temperature. Though we need to measure the radial profile of ion temperature by using CX-NPA in the stationary period of DMcc, it is difficult to measure it in the changing period.

So we develop the code for tracing time evolution of ion energy balance and investigate the transport of ion energy. In this paper, the mechanism that the onset of ECRH causes the relaxation of electron-drug and the increase of ion temperature is discussed with the analysis of measurement results by CX-NPA and time evolution analysis by using the code for tracing time evolution of ion energy balance.

The loss processes of ion energy which is injected by ICRH have been assumed as follows:

(1) Loss by coulomb collision between ion and electron.

$$P_{ie} \propto \frac{n_i \cdot n_e}{T_e^{3/2}}(T_i - T_e) \qquad (1)$$

(2) Loss by electric charge exchange reaction between ion and neutral hydrogen atom.

$$P_{CX}^{H_0} \propto n_i \cdot n_{H_0}(T_i - T_{H_0})\sigma_{cx}^{H_0} v \qquad (2)$$

(3) Loss by electric charge exchange reaction between ion and neutral hydrogen molecule.

$$P_{CX}^{H_2} \propto n_i \cdot n_{H_2}(T_i - T_{H_2})\sigma_{cx}^{H_2} v \qquad (3)$$

But axial direction loss of ion may not be ignored for considering the increase of collision frequency of ion because plasma density increases in the period of ECRH. So in the analysis of this experiment, we consider axial direction loss of ion as a part of loss processes of ion energy and the calculation is performed by quantifying it.

(4) Axial direction loss of ion.

$$P_{ax} \propto n_i \cdot \frac{n_i^{hot}}{n_i^{total}} \cdot (T_{i\perp} - T_{i//}) / \tau_{ii} \qquad (4)$$

In poster session we introduce the results of time evolution analysis of the radial profile of ion temperature. The detail of heat transportation from electron to ion is discussed in the period of ECRH and we investigate its effect to ion temperature.

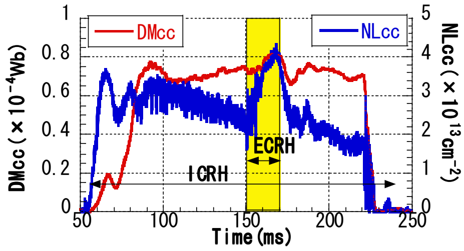

Fig1. Time evolution of DMcc and NLcc

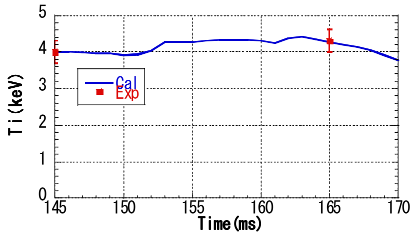

Fig2.Simulation result of central ion temperature

References

[1] M. Shoji, Y. Nakashima, et al. , Plasma Phys. Control Fusion. **43** (2001) 761 .