§10. Study of Radial Transport of Bounce Ions by Means of Control of Radial Potential Profile of Core Plasma

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In order to measure the density profile of the periphery plasma, the lithium beam probe method is applied successfully in National Institute for Fusion Science. The beam probe method is also suitable for the measurement of the density profile at the inner mirror throat of the plug/barrier cell in the tandem mirror.

The bounced ion by the electrostatic plug potentials plays an important role in the improvement of the confinement time in the tandem mirror.

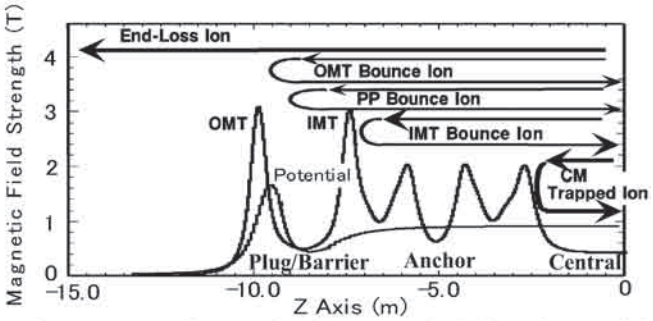

Fig.1. Bounce ions and axial magnetic field and potential profiles

The transport of the plug potential bounce ion was investigated numerically, and the moderate radial potential profile was useful to suppress the ion transport into the loss region due to the slight discrepancy between the magnetic flux tube and the equi-potential surface. 1) The bounce ions were also measured directly by using a charge exchange bounce ion analyzer located near the inner mirror throat of the plug/barrier cell. We selected both pitch angle and energy of the charge exchange neutral particle caused by the bounce ion, and identified the plug potential (PP) bounce ion, the outer mirror throat (OMT) bounce ion and the inner mirror throat (IMT) bounce ion as shown in Fig.2. The density profile of the plasma is required to estimate the quantity of the bounce ion.

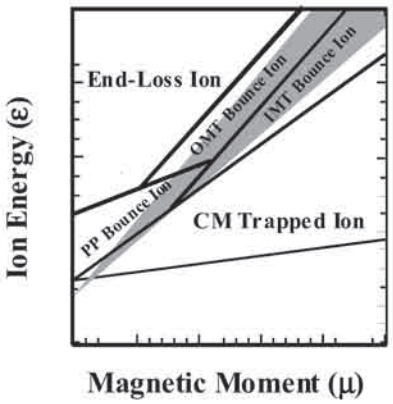

Fig.2. Measurable region of the bounce ions

The plug potential bounce ion and the outer mirror throat bounce ion were measured as shown in Fig. 3.

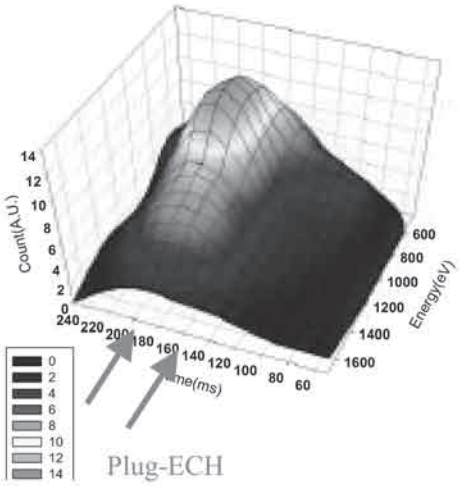

Fig.3. PP bounce ion and OMT bounce ion are created during plugging

The bounce ion was investigated with the radial potential profile of the central solenoid measured by the gold neutral beam probe. The neutral particle density and the plasma density profiles are required in order to estimate the quantity of the bounce ion. We try to set the lithium beam probe at the IMT region for measurement of the plasma density profile.

Reference

1) Ishii, K., et al., Transactions of Fusion Science and Technology **47,** No.1T (2005) 78