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イオンセンシティブプローブ計測における温度異方性の評価

Evaluation of temperature anisotropy on ion sensitive probe measurement

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Ion temperature (T_i) is one of the key parameters for characterizing of the edge and the divertor plasmas, because the behavior of ions in these plasmas plays important role in heat and particle load to plasma facing components. Especially, at high collisionality, the T_i is strongly coupled with electron temperature. In order to measure the T_i, several methods such as a retarding field analyzer, an asymmetric cylindrical double probe, a tunnel probe are adapted as particle measurements. Ion Sensitive Probe (ISP) is also an electrical probe used for determining the T_i in the magnetized plasmas [1,2].

The concept of the ISP is based on the difference of the Larmor radii between ions and electrons in a magnetic field as shown in Fig. 1. Typical ISP consists of two cylindrical electrodes which are an ion collector (P-electrode) and an electron guard electrode (G-electrode). The ion collector collects ions only on the probe bias voltage near the plasma space potential. The ion energy analysis can be performed by using the current-voltage characteristics on P-electrode.

So far, the ISPs are adapted several T_i measurements in some linear devices PSI-2 [3], NAGDIS-II [4], CTP-HC [5] and so on. The edge and divertor plasma of Large Helical Device have been also investigated by a sophisticated multi-function probe with ISP [6]. Recently in Alcator C-Mod, systematic measurements of T_i in the SOL has been done [7]. However, the motion of ions and electrons around the ISP electrode has not described in detail. Especially, ion velocity components, namely perpendicular or parallel to the magnetic field, which is measured on the ion collector of ISP is unclear. In this study, we report the results of investigation for the temperature anisotropy on ISP comparing with laser induced fluorescence measurement using a tunable diode laser in the linear device CTP-HC.

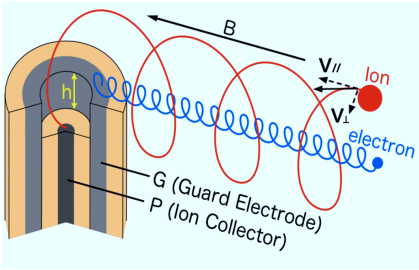

Fig.1: Schema of the trajectories of ion and electron around an ISP.

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