Recently, a plasma flow has been recognized to play an important role in magnetically confined plasmas, especially in open magnetic systems. The relation between radial electric field and azimuthal plasma rotation should be investigated for the confinement study in high power ICRF heating. We have measured ion Mach number \( M_i \) and flow direction at the peripheral region of the confined plasma in GAMMA10 by using a 4-tip type Mach probe. The purpose of the research is to investigate the \( E/B \) drift and diamagnetic drift and to clarify the effect of plasma flow on a radial electric field in the high power ICRF regime. Measurement of Mach number in GAMMA10 plasma has been performed with high power ICRF and ECRH at plug/barrier section.

4-tip type Mach probes were set in both east and west side at 1.28m apart from the center of GAMMA10 and moved radially in the peripheral region. It has four probe tips and Mach number and flow direction can be derived from the four signals.\(^1\)\(^2\)

In GAMMA10 high \( T_i \) mode were observed with high power ICRF heating using RF antennas (RF1: 10MHz, RF2: 6.4MHz) set at the central region. We have measured the Mach number \( M_i \) and pitch angle \( \phi \) of the ICRF heated plasma at \( r=18cm \) in the GAMMA10 device.\(^3\)\(^4\) Figure 1 shows typical waveform of Mach number \( M \) when a periodic behavior was observed in the Mach number. Axial and azimuthal component of Mach number \( M_z \) and \( M_\phi \) are also shown in the figure. The direction of the flow is outward in axial direction and ion diamagnetic rotation in azimuthal direction. This indicated that the central plasma rotates azimuthally in the direction of \( E \times B \) drift and flows to the end cell region. Both of \( M_z \) and \( M_\phi \) oscillated in phase.

Additional ICRF (RF3) was applied at 160ms in order to heat ions at the central region of GAMMA10. Figure 2 shows waveforms of line integrated density (NLCC) and axial Mach numbers \( M_z \) measured by using two Mach probes located at both west and east sides. \( M_z \) was 0.4 and positive at west side and negative at east side. The positive value of \( M_z \) corresponds to westward direction of plasma flow. Then the data shows that plasma flows outward in both directions. When the RF3 power was applied, an increase of line integrated density (NLCC) occurred as shown in the figure. \( M_z \) measured by both probes decreased to almost zero at the moment.

We should investigate further the effect of high-power RF heating to the plasma flow and the formation of radial electric field.