§77. Trigger Mechanism of Blob Using Hybrid Directional Probe

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Non-linear particle transports such as blob have been observed in SOL of spherical tokamak plasmas and intensively studied using high speed cameras. Behaviors of trapped energetic electrons in this SOL are very important for formation of tokamak configuration and non-inductive current drive using electron cyclotron wave heating. In this study, non-linear particle transports and characteristics of trapped energetic electrons are experimentally investigated using a directional probe installed in QUEST.

Figure 1 shows the probe head structure. Four thermal probe are mounted around probe body with an interval of 90 degrees, and three electrostatic Langmuir probe channels are linearly located at the center of the probe head. The probe position can be controlled with 2 steps linear drives. The longer one is slowly driven by an electrical motor, and the other is quickly driven by pressured air during a shot.

Figure 2 (a) shows a typical example of heat flux measurement far from the last closed flux surface in the current ramp-up phase using electron cyclotron wave. The heat flux is evaluated by the time evolution of thermal probe signal, which has been developed in the last year. The trapped energetic electrons have an orbit widely spreading outward of the last closed flux surface. The observed heat flux profile indicates the profile of trapped energetic electrons and the dependence of the probe direction indicates that the current is driven by trapped energetic electrons in this region.

Figure 2 (b) shows the heat flux as a function of probe angle. A sinusoidal dependence can be seen in all time slices. The energetic electrons are considered to be directed in the ctr-direction with poloidal drift. The investigation of the time evolution of the heat flux is progressing in order to understand the formation mechanism of tokamak configuration with electron cyclotron wave heating technique.

Recently, oscillations of heat flux and plasma flow in SOL plasma have been also observed to respond the plasma current. The experimental investigation of the linkage of heat flux, plasma flow and plasma current is very interesting subject for understanding of the dynamics of SOL plasmas, which is a next target in this study.

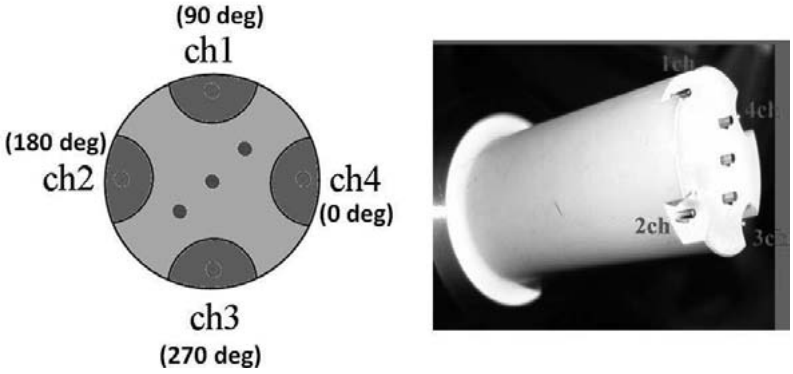

Fig. 1 Schematic and picture of probe head.

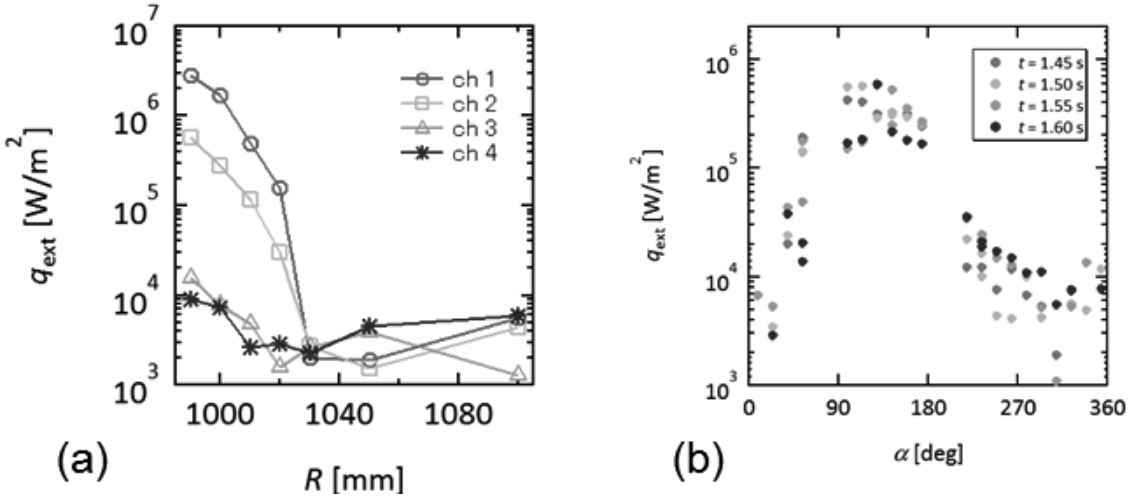

Fig. 2 (a) Heat flux profile measured by thermal probe, and (b) directional heat flux.