§49. QUEST Plasma Measurement Using a Fast Video Camera

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QUEST is the largest ST in JAPAN and its most important aim is to maintain steady state plasma with RF current drive. In QUEST plasma peripheral turbulence like filament structure was found and this turbulence exists with open magnetic field configuration such as ECRH plasma. Blobs like filament structure were found in many machines such as NSTX, MAST, DIIID, LHD, Heliotron J, TJII. However, it is unknown that above filament was the same as blobs observed at other machine. Therefore, we termed the filament structure in QUEST plasma as blob-like structure. In this year we studied the propagation of the radius direction of this blob-like structure.

Experimental Setup

Fig. 1 shows the locations of a fast camera and probe system. Probe head has 6 electro-static probes and two are for ion saturation current measurement, and two are floating potential measurement. The positions of probe tips are changed by the radial direction, therefore the phase delay due to the radial propagation can be measured. Using ECRH plasma with open magnetic field configuration (no plasma current or a little plasma current) the blob-like structure are measured by the fast camera and above probe system.

Results and discussion

Fig. 2 shows the ExB drift velocity deduced by floating potential data and the radial propagation velocity of blob-like structure deduced by the phase delay of ion saturation current. Both are almost the same value. The velocity of blob-like structure could be deduced from the fast camera images too. Fig.3 shows these radial velocities (square-marker) and the ExB drift velocity deduced by floating potential measurement (scanning position shot by shot). Above results show that the propagation of the blob-like structure would be due to ExB drift and its velocity increased with the radial position. The electric field E deduced by floating potential was almost constant at every radial positions. Therefore, the increase of ExB at larger radius was due to the decrease of the toroidal magnetic field. The toroidal magnetic field is ~0.1T but the ion temperature should be very low (reasonably assumed) and the ion Larmor radius should be smaller than the radius of the V.V. Then it is thought that above ExB drift is valid on physical meaning

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Conclusion

The propagation of the blob-like structure in QUEST ECRH plasma was measured by two independent methods and the results pointed that blob-like structure propagated with the ExB drift velocity.

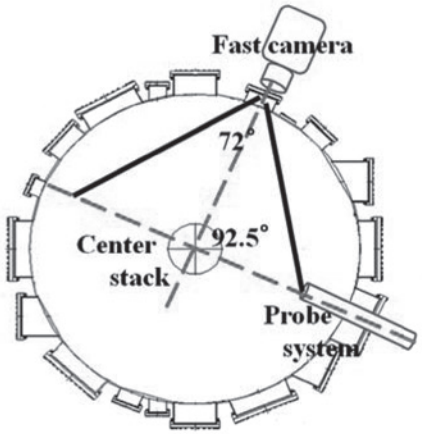

Fig.1 Schematic of the location of a probe system and a fast-speed camera in the QUEST mid-plane view.

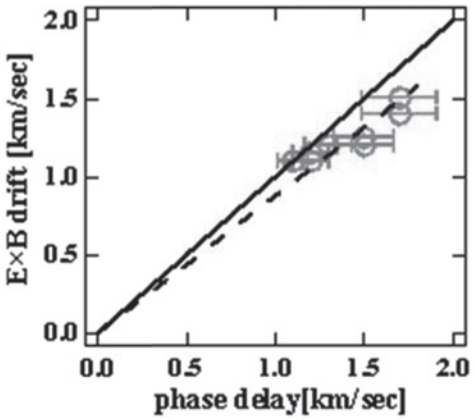

Fig.2 E × B drift velocity and radial propagation velocity were compared in R= 0.8m region. The line shows the case that both velocities are the same.

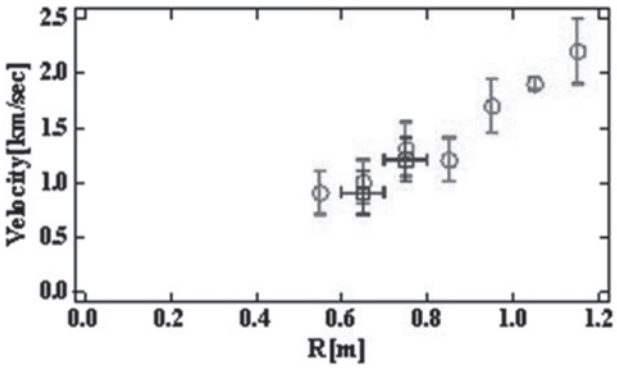

Fig.3 Radial profiles of the E×B velocity estimated by radial scanning measurement and the fast camera image. The circle-marker shows the E×B velocity and the square-marker shows the fast camera image.