§21. Influence of Oblique Magnetic Field on Probe Measurement in the LHD Edge and Divertor Plasmas

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Plasma flow and ion temperature properties in stochastic magnetic boundary so called ergodic layer, which is equipped intrinsically in the scrape off layer in the ergodic divertor configuration tokamaks and heliotron-type devices, have not been understood well. In this study, we measured plasma flow and ion temperature in the stochastic magnetic boundary to reveal the details of the plasma.

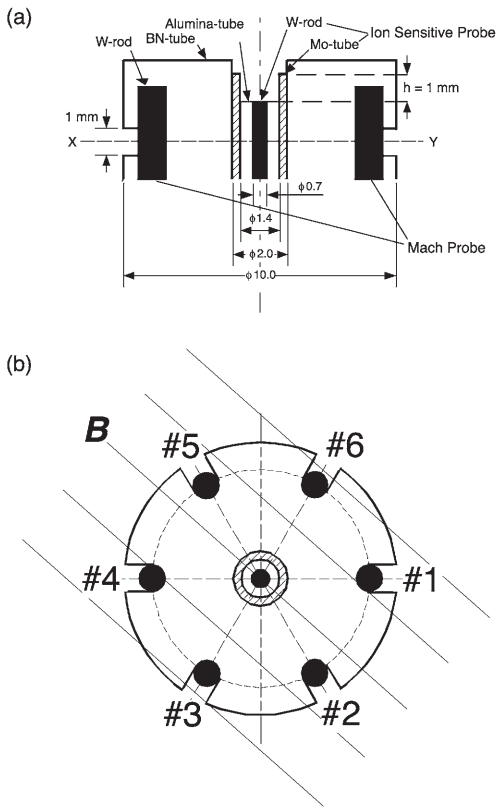

Fig. 1 The structure of the multiple functions probe head designed for the measurement in the LHD divertor and stochastic magnetic boundary. (a) Side view, (b) Cross section in X-Y plane as seen in (a). Solid lines indicate the angle of the magnetic field lines in the measured stochastic magnetic boundary for each probe..

Spatial profiles of the flow and ion temperature were simultaneously measured by using a movable multiple functions probe which consists of Mach probes and an ion sensitive probe [1] (Fig. 1). Compared with the boundary layer of tokamaks, the magnetic field structure of the LHD boundary region is much complicate. Although it is difficult to arrange a probe parallel to the magnetic field line during the probe traveling, the multiple functions probe has the advantage for the oblique magnetic field owing to the structure.

Ion saturation current obtained by the upstream and downstream probes assigned as #1 - #6 suggest that the change of plasma flow direction in the stochastic magnetic boundary as shown in Fig. 2. The pairs of probes for evaluating the Mach number have the same geometrical collecting areas each other. Evaluated Mach numbers using the ion saturation current clearly show the existence of plasma flow alternation. The experimental results are indeed consistent with predicted results of the three-dimensional simulation using EMC3-EIRENE code.

Further analysis of the experimental results taking the influence of inc ident angle of magnetic field line into account is expected to contribute to more detail understanding of the boundary plasma.

1) Katsumata, I., Contrib. Plasma Phys. **36**, (1996) S, 73.

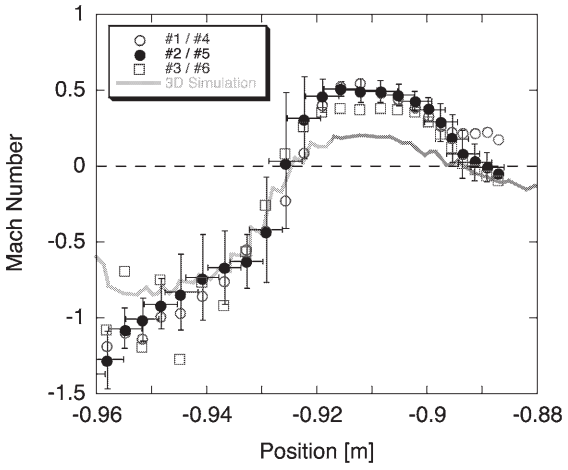

Fig. 2. Comparison of experimentally estimated Mach number with simulated one. Open circles, closed circles and open squares indicate the experimental results. Solid line shows the result of 3D simulation.