§7. Edge Plasma Measurement with Langmuir Probes Attached on the LID Divertor Head

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Edge plasma measurement is one of the most important issues for LID experiment on CHS. For this purpose, 4 Langmuir probe tips were attached on the LID divertor head. These probes could measure the plasma parameters in the m/n=1/1 island generated by the LID perturbation field.

Figure 1 shows the probes' configuration schematically. A couple of probe tips were set both at upper and lower central part of the divertor head, respectively. The probe tips were made of 1mmϕ tungsten wire and the exposed length was about 2mm. The probes near the edge were named U1(L1), and the others were named U2(L2). The duct's position was 4cm outer from the head edge.

Figure 2(a) is the calculated radial profile of $\iota/2\pi$ at the position of LID center with B_t=0.9T and the LID coil current I_{LID}=0.6kA. The normal divertor head edge position was R=1.258m, and it was moved from R=1.308m to 1.248m shot by shot. Every 1cm, the probes measured the ion saturation current, I_{is}, and the floating potential, V_f. The dotted line in Fig.2(a) indicates the position of U2(L2), which measured I_{is}. As indicated in Fig.2(a), the divertor head and probes were inserted into the island. Figure 2(b) and (c) are the typical radial profiles of I_{is} and V_f measured with L2 and L1, respectively. For the case with B_{LID}, a peak is shown in Fig.2(b). The peak position agrees with the calculated position of the outer separatrix of the island. The width of the SOL defined by the LID head is 4-6cm. Figure 2(c) shows that the V_f with B_{LID} is deeper than that without B_{LID}, and it is indicated that the edge temperature rises when the B_{LID} is applied. Figure 3 shows the ratio of the LID throat pressure. The ratio decreases with inserting the head. This result can be understood from Fig.2(b). The difference of total ion fluence to the head is not so large between the case with B_{LID} and without B_{LID}. The effective pumping of LID is due to the wet area position. With B_{LID}, the position comes into the duct, though the position is the edge of the head for the case without B_{LID}. For the calculation of particle balance, this effect must be considered.

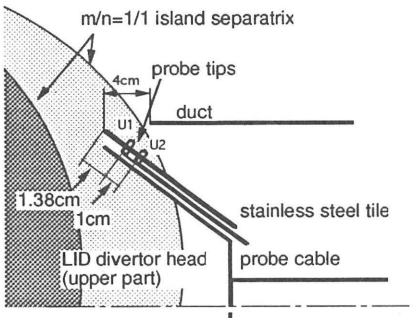

Fig.1 schematic view of the Langmuir probe configuration on the LID divertor head

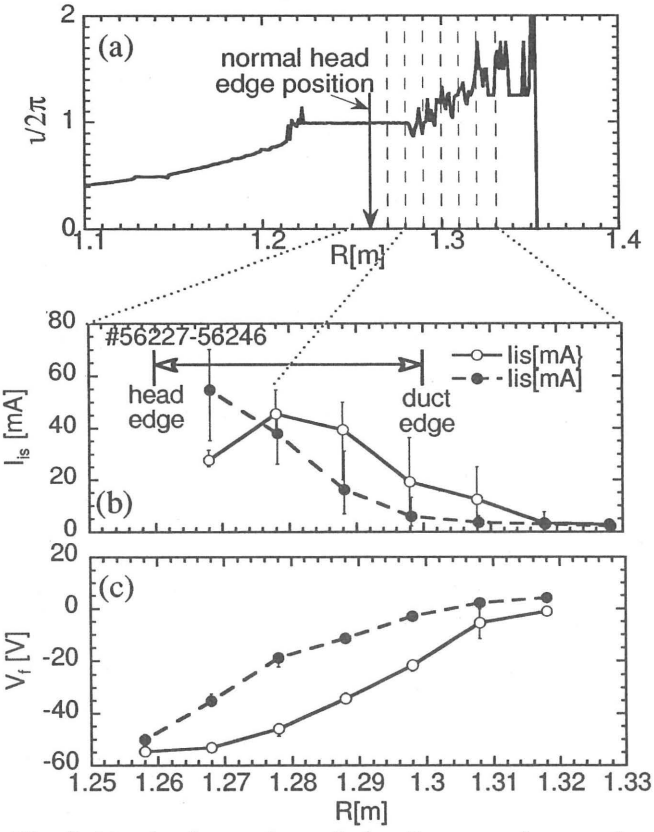

Fig.2 Typical results of the Langmuir porobes attached on the LID head. (a) $\iota/2\pi$ radial profile fot vacuum condition(calculated).(b) radial distributions of I_{is}. (c) radial distributions of V_f.

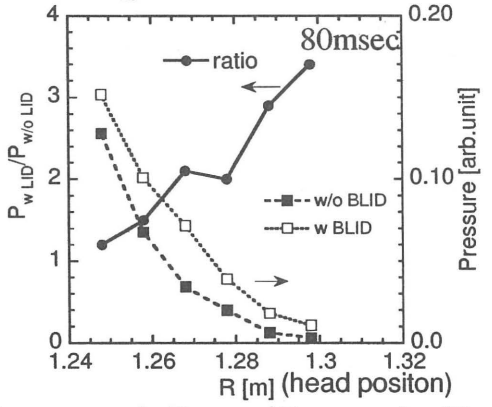

Fig.3 Pressure ratio $P_{w\ LID}$ / $P_{w/o\ LID}$.(t= 80msec)