§89. Effect of Experimental Conditions on Divertor Plasma Flows in Heliotron-E

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In contrast to [1], this communication is devoted to effects on divertor plasma flow (DF) distribution of the experimental conditions at a fixed magnetic configuration, such as methods of plasma heating, the absorbed power, the radial distribution of power absorbed, etc. All data presented below were obtained with 2cm inward shift of magnetic axis, and the designations used are those introduced in [1].

In Table 1 for different experimental conditions indicated in the first column shown are: the normalized total DF, Γ_{total}/n_e, and indices of asymmetry of DF distribution, Γ_{in}/Γ_{out} and $\Gamma_{up}/\Gamma_{down}$. Note, that for a fixed magnetic configuration the Γ_{total}/n_e ratio can be an index of plasma loss rate, because the outward shift of magnetic surfaces is negligible even for highest plasma pressure, according to previous measurements.

As it is seen, all characteristics of DF distribution are influenced by any variation of experimental conditions. The most impressive differences of all data are observed between cases when plasma is initiated by fundamental ECH (53GHz) or by second harmonic ECH (106GHz). In the latter case, the asymmetry of DF distribution has the lowest value. However, at the same time, the index of plasma loss rate is about three times of the value for 53GHz.

Comparing Γ_{total}/n_e ratios for different conditions, one can see that it increases with heating power increase, with increments depending on the method of heating and the amount of power absorbed. As an example, the increment of Γ_{total}/n_e ratio rise during 53&106GHz ECH-2 phase practically does not depend on the NBI power absorbed, whereas this ratio decreases significantly with increasing the NBI power for 53GHz ECH only.

In some experiments the DF distributions were measured with lithium pellet injection. Figure 1 shows the data for probe arrays located at Θ=180° (a) and 270° (b) for the original H-E configuration (ΔR=0). Three series of points correspond to different time intervals through a discharge: 1- just before the pellet injection, 2- soon after pellet injection, 3- just before switching off the NBI power. One can see that after pellet was injected the DF distribution inside both probe arrays became wider. The pellet injection leads also to a change in the in/out and up/down asymmetry indices.

[1] See previous communication.

Table.1.

Experimental conditions	Γ_{total}/n_e (mA/10^{11}cm^{-3})	Γ_{in}/Γ_{out}	$\Gamma_{up}/\Gamma_{down}$
ECH-1 (53 GHz)	5.1	1.26	0.15
ECH-1 (106 GHz)	15.1	0.8	0.42
NBI-1	12.7	0.69	0.1
NBI-1+ECH-2 (53 GHz)	26.2	0.7	0.1
NBI-1+ECH-2 (53&106GHz)	26.2	0.85	0.15
NBI-2	22	0.81	0.2
NBI-2+ECH-2 (53 GHz)	25	0.74	0.16
NBI-2+ECH-2 (53&106GHz)	30	0.63	0.15

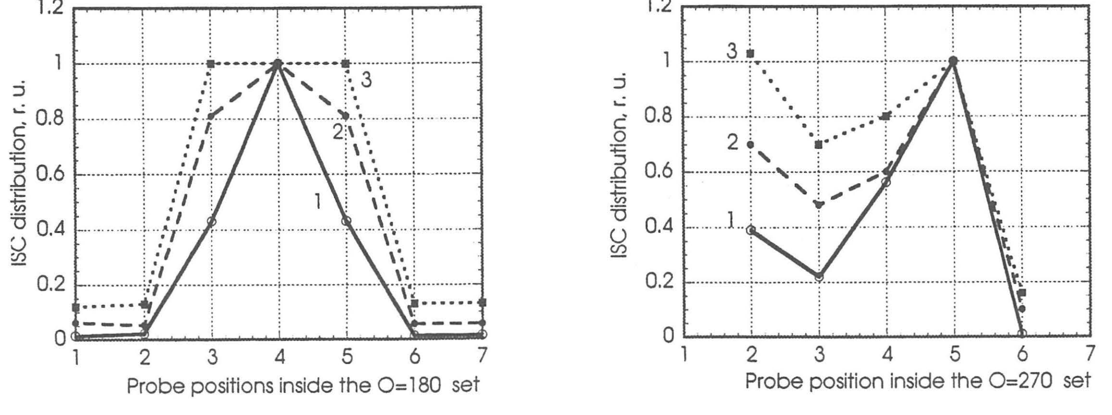

Fig.1. Ion saturation current distributions inside Θ=180° (a) and 270° (b) probe arrays.