

Subject No. 5

Divertor functions of Heliotron devices

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The Large Helical Device (LHD) is installed with two divertor configurations : the Helical Divertor (HD), in which thick ergodic layer surrounds the core plasma and the divertor legs with 1 ~ 2 m length connects the ergodic layer with the divertor plates, and the Local Island Divertor (LID), where the $n/m=1/1$ island is induced at the periphery and the separatrix is used as SOL to guide the plasma to the divertor plate (the LID head). These are operated alternatively by changing the edge magnetic field configurations.

The divertor performance of the Large Helical Device (LHD) is studied for the two configurations, the Local Island Divertor (LID) and the Helical Divertor (HD). It is shown that the both divertor configurations play important roles for obtaining high performance plasma in LHD : the large pumping capability of LID to keep the low edge density in the IDB-SDC (Super Dense Core plasma sustained by Internal Diffusion Barrier) plasma, the large wetted area and the flexibility of strike point sweep of HD to reduce power load on the divertor plates in the long pulse operations. Possible effect of the ergodic layer on impurity screening is discussed by using the 3D edge transport modelling, where it is found that the drag force exerted by the plasma flow could dominate over the thermal force, providing the impurity screening effect. The further improvements needed to the current divertor configurations are discussed. New divertor design for the future upgrade of LHD is presented.