

Subject: Transport and exhaust of particles: of the main plasma constituents

A 3D Monte-Carlo study of the W7-X island divertor transport for different magnetic configurations.

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With a magnetic structure depending on the rotational transform, the control coil current and the plasma beta, the low shear stellarator W7-X provides a high flexibility in modifying the edge magnetic islands to optimize the island divertor transport. The magnetic field around the islands is usually weakly stochastic and the degree of the stochasticity is affected by the shear, the control-coil field and the plasma current including the beta-effect. Understanding the impact of the magnetic field topology on the island divertor transport is essential to improve the island divertor performance.

In this paper, we analyze and compare the plasma and neutral transport for different divertor configurations using the 3D Monte-Carlo code EMC3-EIRENE. Three typical divertor configurations covering a wide topology range have been studied. The effect of change in magnetic topology on the recycling-related island divertor operation is studied and the transport characteristics are obtained. An optimization is done with respect to the density control and particle balance in steady-state operation.