

Diffusion in a stochastic magnetic field in ASDEX Upgrade

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Abstract

The chaotic magnetic field lines in the stochastic region contribute to the radial energy and particle transport. Such a transport can be characterized by diffusion coefficients. In [1,2] it was found that fast reconnection observed during amplitude drops of the neoclassical tearing mode instability in the frequently interrupted regime (FIR-NTM) can be related to stochastization. In this note for experimentally measured perturbations in ASDEX Upgrade tokamak we deduce by means of the mapping technique the field line diffusion coefficient related to this phenomenon. The maximum values of the local field line diffusion coefficient are of the order 10^{-5} to 10^{-6} m²/m which correspond to the electron thermal diffusivity of the order of 100 to 200 m²/s. Solution of the nonstationary diffusion equation with variable diffusion coefficient predicts that the temperature profile during the FIR-NTM event is shifted towards the plasma boundary within 50 μ s which is fast enough to explain experimental observations.

References

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