subject 3a/b

3D numerical investigation of plasma transport in the Dynamic Ergodic Divertor (DED) at TEXTOR

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A summary of recent numerical studies of plasma transport in the ergodized edge plasma at TEXTOR-DED will be presented. They are based on the 3D code package EMC3-EIRENE. The 3D Monte Carlo code EMC3 solves consistently fluid equations for a main plasma (hydrogen component) and trace impurities, whereas EIRENE is a kinetic transport code for neutral particles.

Particle and energy deposition on the DED target plates and the correlation with the magnetic field topology is studied and compared to experimental measurements. In particular the impact of field lines with short connection length (shadow region) on local plasma parameters is investigated. In both, experiment and simulations, a significant reduction of plasma parameters is found there, consistent with the initial E3D predictions made prior to DED operation [1].

In the process of completing the physical model in EMC3-EIRENE, kinetic corrections in form of flux limiters and a so far neglected convective energy term in the energy balance equation were implemented in the EMC3 code. First results of these amendments are shown and compared with previous predictions.

Over the last year intensive calculations with carbon impurities have also been performed. This implies sensitivity studies of the model for atomic processes on plasma parameters and studies of the screening effect by the DED. It is found that the use of a Corona model approximation within the transport code instead of a more sophisticated collisional-radiative model leads to a significant overestimation of the radiated power, but has only small influence on temperature profiles except for high densities and high perpendicular transport cases. A pronounced reduction of carbon density at the inner simulation boundary (inside the last closed flux surface) after turning on the DED magnetic perturbation field despite an enhanced sputtered flux is found. This screening has not yet been observed in experiments on TEXTOR, and possible reasons for this discrepancy, if it prevails until the time of the meeting, will be discussed.

[1] Runov, Reiter et. al., Phys. Plasmas (2001) **8** 916