

Subject:

4) Influence of stochastisation on barriers / ELM mitigation

Estimate of the Shielding of the External Magnetic Field Perturbations by the plasma and the Resulting Ergodicity in DIII-D

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A method of ELM control using non-axisymmetric external magnetic field perturbations has been proposed and successfully tested in DIII-D (Moyer et al, Phys. Plasmas 12, 56119--1--11, 2005). An important issue using this method is to have a minimal influence of these perturbations on the transport in the core plasma. So far, the theoretical studies of magnetic field ergodization and heat transport in such ergodized fields performed for DIII-D used a vacuum perturbation field.

Those calculations show that both, the magnetic field topology as well as the plasma temperature should be affected by the perturbations rather deep in the core plasma. However, in the experiments the core plasma appears to be not affected by the perturbations.

A possible explanation can be the shielding of the magnetic field perturbations by the plasma response currents. In the present report this shielding effect is estimated with the help of the perturbation magnetic field model taking into account the plasma response currents in the kinetic approximation (Heyn et al, Nucl. Fusion 46, S159-S169, 2006) developed for cylindrical geometry.