RMP ENHANCED TRANSPORT AND ROTATION SCREENING IN SIMULATIONS OF DIII-D PLASMAS

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ABSTRACT

Nonlinear magnetohydrodynamic simulations of an equilibrium in the DIII-D geometry with applied resonant magnetic perturbations (RMP) are performed. The reduction in pedestal density observed in RMP experiments is explained in terms of $\mathrm{E}\times\mathrm{B}$ convection cells crossing the separatrix. Results are obtained both in the absence of plasma rotation and for two rotation profiles having different values at the separatrix. The effects of rotation on RMP screening as well as on the density transport mechanism are obtained from the simulations. Poloidal mode spectra from the simulations show amplification of the resonant components of the error field for the non-rotating plasma. With rotation, this amplification is reduced and a toroidal phase shift appears. At the highest value of rotation, an oscillation in the toroidal mode number $n = 3$ is observed. These results are considered in light of analytic error field theory.

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