Rotational shielding of resonant magnetic perturbations from an H-mode pedestal*, I. Joseph, V.A. Izzo, R.A. Moyer, *UCSD*, T.E. Evans, T.H. Osborne, M.J. Schaffer, *General Atomics,* A.H. Boozer, M.S. Chance, J.E. Menard J.-K. Park, *PPPL*, M.F. Heyn, I.B. Ivanov, S.V. Kasilov, *EURATOM-ÖAW, ITP Graz, Austria,* A.M. Runov, R. Schneider, *MPI-Greifswald* – The application of resonant magnetic perturbations (RMPs) to an H-mode plasma can suppress edge localized modes by reducing the edge pressure gradient below the Type-I peeling-ballooning MHD stability threshold. An important paradox in the description of this process is that the RMPs produce large particle transport, but little thermal transport. Although the applied fields produce a stochastic band of overlapping islands in the infinitely resistive vacuum limit, the perturbations are predicted to be strongly modified by the near-ideal response of a collisionless plasma. Unless the perturbation induces large enough Lorentz braking forces at the resonant surfaces to overcome the force of viscous friction in the bulk plasma, a thin boundary layer of current will flow near the rational surface that will act to screen out the applied field. In single fluid theory, the plasma core, where the resistivity is small and large ExB rotation predominates, is predicted to lie in the inertial limit where no actual reconnection can take place. Calculations using the NIMROD code show qualitative agreement with core screening, but the dimensionless parameters of the simulation lie in the visco-resistive limit and allow some amount of reconnection. Order unity resonant field amplification was observed in the simulation, demonstrating that such estimates can only be correct to order of magnitude. In theory, electron diamagnetic rotation is large enough to flow counter to the ions near the plasma edge in the standard DIII-D ELM suppression scenario, and this requires a two-fluid description of the plasma response. In fact, the width of the resonant current channel is predicted to become smaller than an ion gyroradius, requiring kinetic analysis. While two-fluid theory would predict a large torque on the ions, a kinetic model in a cylindrical plasma demonstrates that the electrons experience most of the torque. As the Lorentz force acts to brake the electron flow, the electrons accelerate the ions through the electric field. In fact, Carbon-VI impurity ions are observed to spin up during RMP application in a narrow region near the plasma edge. A phenomenological model of the magnetic plasma response has been developed by discarding the poorly known details of the non-ideal physics involved in the reconnection process. The Ideal Perturbed Equilibrium Code (IPEC) is used to describe the ideal MHD plasma interior and the VACUUM code is used to describe the resistive stochastic exterior. This two state model allows the boundary between the ideal and stochastic regions to be placed at an arbitrary point within the separatrix and can accurately account for resonant field amplification.

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