Abstract Submitted
for the APR09 Meeting of
The American Physical Society

Flow stabilization of the ideal MHD resistive wall mode[1] S.P. SMITH, S.C. JARDIN, PPPL, J.P. FREIDBERG, MIT, L. GUAZZOTTO, U. Rochester — We demonstrate for the first time in a numerical calculation that for a typical circular cylindrical equilibrium, the ideal MHD resistive wall mode (RWM) can be completely stabilized by bulk equilibrium plasma flow, $\mathbf{V}$, for a window of wall locations *without* introducing additional dissipation into the system. The stabilization is due to a resonance between the RWM and the Doppler shifted ideal MHD sound continuum. Our numerical approach introduces[2] $\mathbf{u} = \omega\xi + \mathbf{i}\mathbf{V}\cdot\nabla\xi$ and the perturbed wall current[3] as variables, such that the eigenvalue, ω, only appears linearly in the linearized stability equations, which allows for the use of standard eigenvalue solvers. The wall current is related to the plasma displacement at the boundary by a Green's function. With the introduction of the resistive wall, we find that it is essential that the finite element grid be highly localized around the resonance radius where the parallel displacement, $\xi_{\|}$, becomes singular. We present numerical convergence studies demonstrating that this singular behavior can be approached in a limiting sense. We also report on progress toward extending this calculation to an axisymmetric toroidal geometry. [1]Work supported by a DOE FES fellowship through ORISE and ORAU. [2]L.Guazzotto, J.P Freidberg, and R. Betti, Phys.Plasmas 15, 072503 (2008). [3]S.P. Smith and S. C. Jardin, Phys. Plasmas 15, 080701 (2008).

Sterling Smith
PPPL

Date submitted: 12 Jan 2009 Electronic form version 1.4