Abstract Submitted
for the DPP06 Meeting of
The American Physical Society

Time-Dependent Modeling of Feedback Control of Resistive Wall Modes in Low-Rotation DIII-D Plasmas[1] J.T. ALBRECHT, MIT, A.M. GAROFALO, Columbia U. — Resistive wall modes (RWMs) are plasma instabilities that occur at high beta in magnetically confined plasmas. In DIII-D, suppressing these instabilities via plasma rotation has allowed up to a factor of 2 increase in beta [1], which is a significant step forward toward realizing an economical fusion reactor. In the absence of plasma rotation, active feedback using magnetic coils is a promising approach to RWM stabilization. The finite bandwidth of realistic electronics poses two limitations on a linear feedback system: 1) limitation on the largest stabilizable growth rate, and 2) limitation on the largest stable feedback gain. Here, time-dependent simulations with a simple, ideal magnetohydrodynamics model show that the largest, linearly stable feedback gain can be exceeded with hardware limitations providing pseudo-stability. The largest stabilizable growth rate depends on the type of feedback sensor and algorithm. Modeling of the DIII-D feedback system is compared to experimental results.

[1] A.M. Garofalo, et al., Phys. Plasmas 9, 1997 (2002).

[1]Supported by a US DOE National Undergraduate Fusion Fellowship and DE-FG02-89ER53297

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Date submitted: 20 Jul 2006 Electronic form version 1.4