Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Plasma response control using advanced feedback techniques MITCHELL CLEMENT, JAMES BIALEK, JEREMY HANSON, GERALD NAVRATIL, Columbia Univ — Recent DIII-D experiments show that a new, advanced algorithm improves resistive wall mode (RWM) stability control in high performance discharges using external coils. DIII-D can excite strong, locked or nearly locked kink modes whose rotation frequencies do not evolve quickly and are slow compared to their growth rates. Simulations and experiments have shown that modern control techniques will perform better, using 77% less current, than classical techniques when using coils external to the vacuum vessel for RWM feedback. ITER will have to deal with such modes, especially in steady state operation, and it is unclear whether or not rotation alone will be sufficient to counteract these modes. VALEN models the perturbed magnetic field from a single MHD instability and its interaction with surrounding conducting structures as a series of coupled circuit equations. RWM feedback based on VALEN outperformed a classical control algorithm using external coils to suppress the normalized plasma response to a rotating n=1 perturbation applied by internal coils over a range of frequencies. Work supported by the U.S. DOE under DE-FC02-04ER54698 and DE-FG02-04ER54761.

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Date submitted: 13 Jul 2017 Electronic form version 1.4