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Control of ideal and resistive magnetohydrodynamic modes in reversed field pinches with a resistive wall A.S. RICHARDSON, J.M. FINN, G.L. DELZANNO, Los Alamos National Laboratory — Numerical studies of magnetohydrodynamic (MHD) instabilities with feedback control in reversed field pinches (RFPs) are presented. Specifically, investigations are performed of the stability of $m = 1$ modes in RFPs with control based on sensing the normal and tangential magnetic field at the resistive wall. The control scheme is based on that of [Finn, Phys. Plasmas 13, 082504 (2006)], which is here modified to use a more realistic plasma model. The plasma model now uses full resistive MHD rather than reduced MHD, and it uses two realistic classes of equilibrium parallel current density profiles appropriate to RFPs. Results with these modifications are in qualitative agreement with [Finn, Phys. Plasmas 13, 082504 (2006)]: the feedback can stabilize tearing modes (with resistive or ideal wall) and resistive-wall ideal modes. The limit for stabilization is again found to be near the threshold for ideal modes with an ideal wall. In addition to confirming these predictions, the nature of the instabilities limiting the range of feedback stabilization near the ideal-wall ideal-plasma threshold are studied, and the effects of viscosity, resistive wall time, and plasma resistivity are reported.

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