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Braking of Tearing Mode Rotation by Ferromagnetic Conducting Walls in Tokamaks RICHARD FITZPATRICK, IFS, Univ. of Texas at Austin — An in-depth investigation of the braking of tearing mode rotation in tokamak plasmas via eddy currents induced in external ferromagnetic conducting structures is performed. In general, there is a "forbidden band" of tearing mode rotation frequencies that separates a branch of high-frequency solutions from a branch of low-frequency solutions. When a high-frequency solution crosses the upper boundary of the forbidden band there is a bifurcation to a low-frequency solution, and vice versa. The bifurcation thresholds predicted by simple torque-balance theory (which takes into account the electromagnetic braking torque acting on the plasma, as well as the plasma viscous restoring torque, but neglects plasma inertia) are found to be essentially the same as those predicted by more complicated time-dependent mode braking theory (which takes inertia into account). Significant ferromagnetism causes otherwise electromagnetically thin conducting structures to become electromagnetically thick, and also markedly decreases the critical tearing mode amplitude above which the mode "locks" to the conducting structures (i.e., the high-frequency to low-frequency bifurcation is triggered). This research was funded by the U.S. Department of Energy under contract DE-FG02-04ER-54742.

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