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Simulated dynamics and feed-back control of locked and nearly-locked islands[1] W. CHOI, K.E.J. OLOFSSON, R. SWEENEY, F.A. VOLPE, Columbia U., M. OKABAYASHI, PPPL — A model has been developed at DIII-D to model and predict the dynamics of saturated m/n = 2/1 tearing modes subject to various torques. The modes are modeled as surface currents with finite moment of inertia, interacting with the error fields, magnetic perturbations applied by internal and external active coils, the conducting wall, and the graphite tiles. This model also accepts input auxiliary torques (viscous drag, neutral beam torque, etc). Using this island dynamics model, a feed-back controller has been designed to control the phase of locked modes in the presence of drag from the wall and other disturbances. Preliminary results show a simple fixed-gain controller connected to realistic external coils can follow the desired phase for a range of island sizes. For a given current in the control coils, a maximum entrainment frequency exists and is dependent on island width. The controller is expected to be useful in assisting island suppression with electron cyclotron current drive, as well as to prevent mode locking and possible disruption.

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