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Simulations of Low-q Disruptions in the Compact Toroidal Hybrid Experiment[1] E.C. HOWELL, J.D. HANSON, D.A. ENNIS, G.J. HARTWELL, D.A. MAURER, Auburn University — Resistive MHD simulations of low-q disruptions in the Compact Toroidal Hybrid Device (CTH) are performed using the NIMROD code. CTH is a current-carrying stellarator used to study the effects of 3D shaping on MHD stability. Experimentally, it is observed that the application of 3D vacuum fields allows CTH to operate with edge safety factor less than 2.0. However, these low-q discharges often disrupt after peak current if the applied 3D fields are too weak. Nonlinear simulations are initialized using model VMEC equilibria representative of low-q discharges with weak vacuum transform. Initially a series of symmetry preserving island chains are excited at the q=6/5, 7/5, 8/5, and 9/5 rational surfaces. These island chains act as transport barriers preventing stochastic magnetic fields in the edge from penetrating into the core. As the simulation progresses, predominately m/n=3/2 and 4/3 instabilities are destabilized. As these instabilities grow to large amplitude they destroy the symmetry preserving islands leading to large regions of stochastic fields. A current spike and loss of core thermal confinement occurs when the innermost island chain (6/5) is destroyed.

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E.C. Howell
Auburn University

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