Abstract Submitted
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**Global MHD Mode Stabilization and Control for Tokamak Disruption Avoidance**[1] S.A. SABBAGH, J.W. BERKERY, J.M. BIALEK, J.M. HANSON, Y.S. PARK, Columbia U., R.E. BELL, D.A. GATES, S.P. GERHARDT, I. GOUMIRI, B. GRIERSON, PPPL, C. HOLCOMB, LLNL — The near-complete elimination of plasma disruptions in fusion-producing tokamaks is the present "grand challenge" for stability research. Meeting this goal requires multiple approaches, important components of which are prediction, stabilization, and control of global MHD instabilities. Research on NSTX and its upgrade is synergizing these elements to make quantified progress on this challenge. Initial results from disruption characterization and prediction analyses describe physical disruption event chains in NSTX. Analysis of NSTX and DIII-D experiments show that stabilization of global modes is dominated by precession drift and bounce orbit resonances respectively. Stability therefore depends on the plasma rotation profile. A model-based rotation profile controller for NSTX-U using both neutral beams and neoclassical toroidal viscosity is shown in simulations to evolve profiles away from unstable states. Active RWM control is addressed using dual field component sensor feedback and a model-based RWM state-space controller. Comparison of measurements and synthetic diagnostics is examined for off-normal event handling. A planned 3D coil system upgrade can allow RWM control close to the ideal n = 1 with-wall limit.

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