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Kinetic resistive wall mode stability evaluation and physics insight application in NSTX[1] J. BERKERY, S. SABBAGH, Columbia U., R. BETTI, U. of Rochester, R. BELL, A. DIALLO, S. GERHARDT, B. LEBLANC, J. MENARD, M. PODESTA, PPPL — Research on the National Spherical Torus Experiment (NSTX) has studied the stability of resistive wall modes (RWMs) in high-beta fusion plasmas for disruption avoidance. Stabilizing mechanisms for RWMs have been identified as the transfer of energy from the mode to thermal particles through rotational resonances and the effect of energetic particles to resist distortion of the magnetic field lines. These kinetic effects have been implemented in the `MISK` code and results have compared favorably with NSTX experiments including prediction of the marginal stability point and agreement with the trends of low-frequency MHD spectroscopy experiments. Further improvement of the already close agreement of `MISK` to experimental results is being pursued by comparison to a large database of NSTX discharges and implementation of additional physics in the code, including rotational effects on the fluid stability and the effect of pressure anisotropy. An ITPA MHD Stability Group joint analysis task verified several kinetic RWM codes, including `MISK`, and generally good agreement between the codes was achieved. A new disruption avoidance algorithm in NSTX-Upgrade will utilize the knowledge gained by kinetic stability physics insight, calculation, and comparison with experiment.

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