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Investigation of the Complex Relationship Between Plasma Rotation and Resistive Wall Mode Stabilization in NSTX J.W. BERKERY, S.A. SABBAGH, H. REIMERDES, Columbia University, R. BETTI, B. HU, University of Rochester, J. MANICKAM, PPPL — Recent resistive wall mode (RWM) experiments in NSTX show that the role of plasma rotation in mode stabilization is more complex than past tokamak research indicates. These experiments show that the RWM can be destabilized in high rotation plasmas while low rotation plasmas can be stable, which calls into question the concept of a threshold or "critical" plasma rotation for stability. Theoretical stabilization mechanisms are tested against experimental discharges with various plasma rotation profiles created by applying either n=2 or 3 non-resonant magnetic braking. Kinetic modification of the ideal stability criterion is calculated using experimental equilibrium reconstructions. Analysis of multiple NSTX discharges predicts near-marginal mode growth rates just before RWM instability is experimentally observed, with trapped ions providing the dominant kinetic resonances. Increasing or decreasing the rotation in the calculation drives the prediction farther from the marginal point, showing that unlike simpler "critical" rotation theories, kinetic theory allows for a more complex relationship between plasma rotation and RWM stability. Supported by U.S. DOE Contracts DE-FG02-99ER54524 and DE-AC02-76CH03073.

J.W. Berkery
Columbia University

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