Abstract Submitted
for the DPP12 Meeting of
The American Physical Society

**Resistive Wall Mode Physics and Control to Sustain High Normalized Beta in NSTX**[1] J.W. BERKERY, S.A. SABBAGH, J.M. BIALEK, Y.S. PARK, Columbia U., S.P. GERHARDT, R.E. BELL, B.P. LEBLANC, PPPL — High bootstrap current fraction and efficient fusion production needed in continuously operating spherical torus fusion devices require plasmas with low plasma internal inductance, $l_i$, and high beta. Present research in NSTX focuses on greater understanding and verification of kinetic resistive wall mode (RWM) stabilization physics and analysis of improved active control techniques that have reduced disruptions in these plasmas. MISK code calculations indicate that the largest stabilizing kinetic effect comes from resonance between the mode and the precession motion of trapped thermal ions. The stabilizing effect of energetic particles depends on their anisotropic distribution, which also modifies the pressure-driven destabilization term. Long-pulse plasmas have reached $\beta_N/l_i > 13$. A positive and counter-intuitive result is that the greatest disruption probability does not occur at the highest $\beta_N$, or $\beta_N/l_i$, but at lower values closer to the $n = 1$ no-wall stability limit. The result can be understood by evaluating kinetic RWM stability for time-varying plasma rotation and equilibrium profiles, and is further examined by resonant field amplification evolution in kinetically stabilized plasmas at high $\beta_N$.

[1]Supported by U.S. DOE Contracts DE-FG02-99ER54524 and DE-AC02-09CH11466.

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Date submitted: 19 Jul 2012 Electronic form version 1.4