Abstract Submitted
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Overview of Results and Analysis from the National Spherical Torus Experiment[1] S.A. SABBAGH, Columbia University, FOR THE NSTX RESEARCH TEAM — NSTX research targets predictive understanding of plasma energy confinement, long-pulse stability, and first wall heat flux handling needed for a Fusion Nuclear Science Facility and ITER. Collisionality can unify confinement trends of lithiated and unlithiated plasmas. Reduced high-k turbulence and thermal transport are correlated with increased ExB shear. BES measurements show that the pedestal turbulence poloidal correlation length increases at higher n_e, ∇n_e, and decreases at higher T_i, ∇T_e. Plasma characteristics (e.g. increased τ_E) change nearly continuously with increasing Li wall conditioning and ELMs stabilize by density and pressure profile alteration at r/a $> 80\%$. RWM analysis shows stabilizing collisional dissipation is reduced at lower ν, but stabilizing resonant kinetic effects are enhanced. Disruption precursor analysis shows 99% of disruptions can be predicted within $\sim$10ms, with an 8% false positive rate. Halo currents can be toroidally asymmetric and can rotate at 0.5-2 kHz. Low frequency n=1 global kinks cause fast ion redistribution consistent with reduced CAE stability. The snowflake divertor configuration has greatly reduced peak divertor heat fluxes between, and during Type I ELMs. Coaxial Helicity Injection has produced plasmas with desired low density and inductance $\sim$0.35.

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