Overview of Recent Results from the National Spherical Torus Experiment* S.A. SABBAGH, Columbia University, FOR THE NSTX TEAM — Both spherical torus devices for fusion development and ITER require high energy confinement, sustained stability, and manageable first wall heat fluxes. NSTX research targets a predictive understanding of these needs. Low-k microtearing simulations predict lower collisionality, $\nu$, to be nonlinearly stabilizing. Measured ion gyro-scale fluctuations transiently decrease after the H-mode transition, while high-k scattering shows electron gyro-scale fluctuations may increase at lower $\nu$. Other channels for transport such as high frequency Alfvénic modes are examined. Increased RWM stability is expected at lower $\nu$ only if stabilizing precession drift/bounce resonance conditions are maintained. Improved RWM control now includes radial and poloidal field sensors, and state space feedback with a 3D conducting structure model. Non-inductive current fractions of 65-70% have been sustained. Divertor heat flux width strongly decreases as $I_p$ increases but snowflake divertor studies have reduced the heat flux significantly. Beneficial effects due to lithium depend nearly continuously on the amount of pre-discharge Li evaporation. Mo divertor tiles have been installed to determine the impact of Li-coated metallic PFCs at strike point locations. Coaxial helicity injection has produced 0.37MA peak current and yielded a 40% inductive flux savings for ohmic startup to 1MA plasma current. *Work supported by U.S. DOE contract DE-AC02-09CH11466.

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