Abstract Submitted
for the DPP10 Meeting of
The American Physical Society

Progress in the Development of Advanced Spherical Torus Plasmas in NSTX S. GERHARDT, D. GATES, J. MENARD, M. BELL, R. BELL, J. CANIK, S. KAYE, H. KUGEL, E. FREDRICKSON, B. LEBLANC, R. MAINGI, S. SABBAGH, V. SOUKHANOVSKII, K. TRITZ, H. YUH — Recent experiments in the National Spherical Torus Experiment have explored lithium conditioned, high-beta, high elongation plasmas over a range of q_{95}. Notable achievements include a very low surface voltage of 130 mV sustained through the current flat-top and an NSTX record plasma stored energy of 440 kJ. In the absence of MHD activity, the current profile can be modeled as the sum of inductive currents, neoclassical pressure-driven currents, and neutral beam driven current with classical collisional processes only. However, when core MHD is present, anomalous fast ion diffusivity is required to match the current profile. Overall, cases with 65-70% of the current driven non-inductively are common at higher field and lower current. Thermal transport in these plasmas is comparable to that predicted by the standard ITER H-mode scaling, and shows stronger I_P and weaker B_T scaling than in NSTX experiments that did not benefit from lithium conditioning and such strong shaping. Many of these discharges exhibited very low internal inductance, leading to a reduced no-wall beta-limit and enhanced resistive wall instability. This work was funded by the U.S. DOE under contract DE-AC02-09CH11466.

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Date submitted: 16 Jul 2010 Electronic form version 1.4