Abstract Submitted
for the DPP11 Meeting of
The American Physical Society

NSTX operation with reduced gas fueling[1] DENNIS MUELLER, Princeton University, THE NSTX TEAM — The National Spherical Torus Experiment, NSTX, has successfully produced shaped plasmas that transition to H-Mode early and which have long plasma current, I_p, flattop durations. These plasmas have low internal inductance, l_i, and the density rises throughout the discharge. Presently, the successful discharges in NSTX have used gas puffing or a high-recycling wall to obtain good, stable, plasmas free from deleterious MHD. For the NSTX upgrade, it is important to have lower-collisionality plasmas in order to maximize the non-inductive current drive. This talk will describe the efforts to achieve stable, lower-density, high-performance plasmas by reducing the high gas fueling rate that has, so far, been required to routinely produce high-performance plasmas in NSTX. A concern is that locked modes are more common in low-density plasmas and will limit low-density operation. A range of plasma start-up and ramp-up scenarios will be explored using minimal gas fueling. These scenarios include low-voltage (<1.5 V/turn) start-up, slow I_p ramp-up rate, higher-voltage (>4 V/turn) initiation at full aperture, and the use of low or zero solenoid pre-charge. The latter will help clarify if motion of the toroidal-field bundle inside the solenoid winding during the pre-charge is responsible for error-field induced mode locking.

[1]Work supported by U.S. DOE contract DE-AC02-09CH11466

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Date submitted: 15 Jul 2011 Electronic form version 1.4