Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

Bifurcation to Enhanced Performance H-mode on NSTX D.J. BATTAGLIA, C.S. CHANG, S.P. GERHARDT, S.M. KAYE, R. MAINGI, PPPL, D.R. SMITH, UW-Madison — The bifurcation from H-mode (H_{98} <1.2) to Enhanced Performance (EP)H-mode (H_{98} = 1.2 - 2.0) on NSTX is found to occur when the ion thermal (χ_i) and momentum transport become decoupled from particle transport, such that the ion temperature (T_i) and rotation pedestals increase independent of the density pedestal. The onset of the EPH-mode transition is found to correlate with decreased pedestal collisionality (ν^*_{ped}) and an increased broadening of the density fluctuation (dn/n) spectrum in the pedestal as measured with beam emission spectroscopy. The spectrum broadening at decreased ν^*_{ped} is consistent with GEM simulations that indicate the toroidal mode number of the most unstable instability increases as ν^*_{ped} decreases. The lowest ν^*_{ped}, and thus largest spectrum broadening, is achieved with low pedestal density via lithium wall conditioning and when Z_{eff} in the pedestal is significantly reduced via large edge rotation shear from external 3D fields or a large ELM. Kinetic neoclassical transport calculations (XGC0) confirm that Z_{eff} is reduced when edge rotation braking leads to a more negative E_r that shifts the impurity density profiles inward relative to the main ion density. These calculations also describe the role kinetic neoclassical and anomalous transport effects play in the decoupling of energy, momentum and particle transport at the bifurcation to EPH-mode. This work was sponsored by the U.S. Department of Energy.

Devon Battaglia
PPPL

Date submitted: 23 Jul 2015 Electronic form version 1.4