Abstract Submitted
for the APR12 Meeting of
The American Physical Society

Gyrokinetic Studies of Turbulence Reduction with Reverse Shear ETG Transport Barriers or Lithium Walls G.W. HAMMETT, J.L. PETERSON, E.M. GRANSTEDT, R. BELL, W. GUTTENFELDER, S. KAYE, B. LEBLANC, D.R. MIKKELSEN, D.R. SMITH, H.Y. YUH, Princeton Plasma Physics Lab, J. CANDY, General Atomics — The National Spherical Torus Experiment (NSTX) can achieve high electron confinement regimes that are super-critically unstable to the electron temperature gradient (ETG) instability. These electron internal transport barriers (e-ITBs) occur when the magnetic shear becomes strongly negative. Using the gyrokinetic code GYRO, the first nonlinear ETG simulations of NSTX e-ITB plasmas demonstrate reduced turbulence consistent with this observation. This is qualitatively consistent with a secondary instability picture of reduced ETG turbulence at negative shear (Jenko and Dorland PRL 2002). Local simulations identify a strongly upshifted nonlinear critical gradient for thermal transport that depends on magnetic shear. Global simulations show that ETG-driven turbulence outside of the barrier is large enough to be experimentally relevant, but cannot propagate very far into the barrier. We also use GYRO to study turbulence in regimes that might be expected in the Lithium Torus eXperiment (LTX). While lithium has experimentally been shown to raise the edge temperature and improve performance, there can still be some turbulence from density-gradient-driven trapped electron modes, and a temperature pinch is found in some cases. (Supported by DOE.)

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Date submitted: 11 Jan 2012 Electronic form version 1.4