

Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Experimental measurements of heat flux and density fluctuations compared to gyrokinetic simulation in the HSX stellarator¹
J. SMONIEWSKI, B. J. FABER, University of Wisconsin - Madison, M. J. PUESCHEL, Institute for Fusion Studies, University of Texas at Austin, K. M. LIKIN, J. N. TALMADGE, University of Wisconsin - Madison — The Helically Symmetric eXperiment (HSX) has demonstrated reduced neoclassical transport in the plasma core with quasisymmetry, but strong anomalous transport outside this region. Previous work²³⁴ suggests this transport is due to the Trapped Electron Mode (TEM). This study compares linear and nonlinear gyrokinetic simulations to experimental heat flux and density fluctuation measurements for two configurations: Quasi-Helical Symmetry (QHS) and broken symmetry (Mirror). Linear growth rates are smaller in Mirror, while the nonlinear heat flux is actually larger. Experimental thermal diffusivity measurements agree with the difference between configurations from nonlinear simulation. Reflectometer measurements provide a direct connection to turbulence amplitudes, localized to the peak driving gradient. Fluctuations of the reflectometer phase are predicted to be linearly related to density fluctuations, and measurements are interpreted via a 2D model. We present the scaling of reflectometer fluctuations with respect to driving gradients, and compare to the scaling of density fluctuations from simulation.

¹Supported by US DOE under grant DE-FG02-93ER54222.

²W. A. Guttenfelder, Thesis, UWMadison, 2008.

³G. M. Weir, et al., PoP 22, 2015.

⁴B. J. Faber, et al., PoP 22, 2015.

J. Smoniewski
University of Wisconsin - Madison