Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

TEM heat transport and fluctuations in the HSX stellarator: experiments and comparison with gyrokinetic simulation[1] J. SMONIEWSKI, B.J. FABER, University of Wisconsin-Madison, E. SÁNCHEZ, I. CALVO, Laboratorio Nacional de Fusión, CIEMAT, M.J. PUESCHEL, K.M. LIKIN, C.B. DENG, J.N. TALMADGE, University of Wisconsin-Madison — The Helically Symmetric eXperiment (HSX) has demonstrated reduced neoclassical transport in the plasma core with quasi-symmetry [Lore Thesis 2010], while outside this region the electron thermal diffusivity is well above the neoclassical level, likely due to the Trapped Electron Mode (TEM) [Weir PoP 2015, Faber PoP 2015]. We compare gyrokinetic simulations of the TEM to experimental heat flux and density fluctuation measurements for two configurations: Quasi-Helical Symmetry (QHS) and broken symmetry (Mirror). Both experiment and simulation show that the heat flux for Mirror is larger than for QHS by about a factor of two. Initial interferometer measurements provide evidence that density-gradient-driven TEMs are driving turbulence. Calculations of the collisionless damping of zonal flows provide another perspective into the difference between geometries. Similar to other stellarators [Monreal PPCF 2016], the zonal flow residual goes to zero at long wavelengths in both configurations. Additionally, the very short time decay of the zonal flow due to neoclassical polarization is constant between configurations. However, the collisionless damping time is longer and the zonal flow oscillation frequency is smaller in QHS than Mirror, consistent with reduced radial particle drifts.

[1]Work supported by the US DOE under grant DE-FG02-93ER54222.

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Date submitted: 14 Jul 2017 Electronic form version 1.4