Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Transport and Zonal Flows at Ion and Electron scales in the MST Reversed-Field Pinch ZACHARY WILLIAMS, JAMES DUFF, M.J. PUESCHEL, PAUL TERRY, University of Wisconsin-Madison, Physics Department, UNIVERSITY OF WISCONSIN-MADISON COLLABORATION —
Reversed-field pinches (RFPs) operating in an improved-confinement regime, Pulsed Poloidal Current Drive (PPCD), exhibit microturbulence that contributes to heat and particle transport. Gyrokinetic simulations are used to characterize various PPCD discharges with differing values of $\eta \equiv d\mathrm{lnT}/\mathrm{dlnn}$. Zonal flows play an important role in regulating ITG, TEM, and ETG transport in these discharges. Residual magnetic fluctuations from tearing modes in RFPs degrade zonal flows, setting flux levels and critical gradients. In the absence of such fluctuations, RFPs can generate very large zonal flow amplitudes, resulting in negligibly small fluxes. Potential mechanisms for this strong zonal flow generation are addressed here, including zonal flow residuals, secondary instability, and strong density gradients. Beyond fluxes, comparisons between simulation and the experiment are sought out through the study of carbon impurities. Additionally, longer-term plans for experimental comparison are introduced here through the investigation of fast ion dynamics, with a focus on particle diffusivity to assess NBI heating for RFPs.

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Date submitted: 11 Jul 2016 Electronic form version 1.4