Abstract Submitted
for the DPP11 Meeting of
The American Physical Society

Electron Thermal Transport due to Magnetic Diffusion in the MST RFP J.A. REUSCH, J.K. ANDERSON, D.J. DEN HARTOG, C.B. FOREST, C.P. KASTEN, D.D. SCHNACK, H.D. STEPHENS, University of Wisconsin - Madison — Comparison of measurements made in the MST RFP to the results from extensive nonlinear resistive MHD simulations has provided two key observations. First, trapped particles reduce electron thermal diffusion; inclusion of this effect is required for quantitative agreement of simulation to measurement. Second, the structure and evolution of long-wavelength temperature fluctuations measured in MST shows remarkable qualitative similarity to fluctuations appearing in a finite-pressure simulation. These simulations were run at parameters matching those of 400 kA discharges in MST ($S \approx 4 \times 10^6$). In a zero β simulation, the measured χ_e is compared to the thermal diffusion due to parallel losses along diffusing magnetic field lines, $\chi_{st} = v_\parallel D_{mag}$. Agreement is only found if the reduction in χ_{st} due to trapped particles is taken into account. In a second simulation, the pressure field was evolved self consistently assuming Ohmic heating and anisotropic thermal conduction. Fluctuations in the simulated temperature are very similar in character and time evolution to temperature fluctuations measured in MST. This includes $m = 1$, $n = 6$ fluctuations that flatten the temperature profile as well as $m = 1$, $n = 5$ fluctuations that generate hot island structures near the core shortly after sawtooth crashes. This work supported by the US DOE and NSF.

Joshua Reusch
University of Wisconsin - Madison

Date submitted: 15 Jul 2011

Electronic form version 1.4