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## EX/P3-17: Measurement and Simulation of Electron Thermal Transport in the MST Reversed-Field Pinch

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Comparison of measurements made in the MST Reversed-Field Pinch (RFP) to the results from extensive single-fluid nonlinear resistive MHD simulations provides two key observations. First, thermal diffusion from parallel streaming in a stochastic magnetic field is reduced by particle trapping in the magnetic mirror associated with the toroidal equilibrium. Second, the structure and evolution of long-wavelength temperature fluctuations measured in MST shows remarkable qualitative similarity to fluctuations appearing in a finite-pressure nonlinear MHD simulation. New high-time-resolution measurements of the evolution of the electron temperature profile  $[T_e(r,t)]$  through a sawtooth event in high-current RFP discharges have been made using the recently enhanced capabilities of the multi-point, multi-pulse Thomson scattering diagnostic on MST. Thermal diffusion is calculated by performing a low resolution fit of the  $\chi_e$  profile to the electron temperature data via the energy conservation equation, assuming Fourier's law  $q_e = -ne \chi_e \nabla T_e$ . These measurements are then compared directly to simulations using the nonlinear, single-fluid MHD code DEBS, run at parameters matching the RFP discharges in MST. These simulations display MHD activity and sawtooth behavior similar to that seen in MST. In a zero beta simulation, the measured  $\chi_e$  is compared to the thermal diffusion due to parallel losses along diffusing magnetic field lines,  $v_{\text{par}} D_{\text{mag}}$ , where  $D_{\text{mag}}$  is determined from the simulation by tracing magnetic field lines. Agreement within uncertainties is only found if the reduction in thermal diffusion due to electron trapping is taken into account. In a second simulation, the pressure field was evolved self consistently assuming Ohmic heating and anisotropic thermal conduction. Although these pressure-evolved simulation results need further confirmation, the fluctuations in the simulated temperature are very similar in character and time evolution to temperature fluctuations measured in MST.

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