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Driven Thermal Waves in Magnetized Plasmas: Diagnostic Uses, Wave-Field Modeling, and Cross-Field Structure[1] SCOTT KARBASHEWSKI, RICHARD SYDORA, University of Alberta, BART VAN COMPERNOLLE, General Atomics and University of California, Los Angeles, MATTHEW POULOS, University of California, Los Angeles — Results are presented from basic heat transport experiments performed in the LAPD at UCLA using a magnetized electron temperature filament. A CeB_6 cathode injects low energy electrons along a magnetic field into the center of a pre-existing plasma forming a hot electron filament embedded in a cold plasma. Previous experiments observed spontaneous thermal waves corresponding to a quarter-wave resonance. In new experiments, perturbations are added to the cathode bias to create an oscillating heat source. Probe measurements allow for the determination of the amplitude and parallel phase velocity of the resulting thermal oscillations over a range of driver frequencies. The results demonstrate the presence of a thermal resonance and are used to verify the parallel thermal wave dispersion relation based on classical transport theory. This technique provides a measure of the density normalized thermal conductivity, independent of the electron temperature. A heat equation in the form of a reaction-diffusion equation has been derived and the solution closely matches the observed thermal resonance. More recently, the cross-field structure of the waves has been investigated in both classical and anomalous transport conditions; a preliminary analysis of these experiments is presented.

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