Abstract Submitted
for the DPP08 Meeting of
The American Physical Society

Effects of transverse magnetic field on channel flow of liquid gallium JOHN RHOADS, HANTAO JI, MARK NORNBERG, SCOTT PFEFFER, Princeton University — Interest in using liquid metals as first walls in fusion devices requires understanding of their behavior in strong magnetic fields. The effects of such a field applied orthogonal to the direction of flow of liquid gallium in a wide aspect ratio channel were studied through several diagnostics. Magnetohydrodynamic (MHD) theory was tested for surface waves in the deep liquid limit along with the cross-channel velocity profile. A non-invasive diagnostic consisting of an intensified-CCD camera capturing the positions of an array of reflected lasers was employed. The resulting dispersion relation was found to agree with linear MHD theory. Strong damping of turbulent structures was observed along the field lines, while no damping was observed in longitudinal waves. A second non-invasive diagnostic using a position sensitive photodiode was used to obtain the full frequency response of the surface waves, which implicates a transition to two-dimensional turbulence. An invasive potential probe diagnostic was developed to measure the local velocity to examine boundary layer characteristics. Experimental results and conclusions will be discussed.

John Rhoads

Date submitted: 17 Jul 2008 Electronic form version 1.4