Abstract Submitted
for the DPP09 Meeting of
The American Physical Society

Free-surface MHD channel flow experiments M.D. NORNBERG, J.R. RHOADS, H. JI, PPPL, B. BARTELL, Union College — Surface waves and turbulence are essential components to processes in both astrophysical and laboratory plasmas. Energetic events such as X-ray bursts from neutron stars are thought to be related to the waves generated by accretion of material onto the dense plasma ocean on the star surface. In fusion devices, interest in using liquid metals as a first-wall raises important questions about surface stability with strong magnetic fields and high heat flux. A liquid metal channel experiment is used to study the basic physics of free-surface MHD effects in turbulent channel flow. Surface wave turbulence is characterized by measuring the deflection of a laser beam reflected off the surface of the liquid metal using a position sensitive photodiode. The frequency spectrum of measured fluctuations satisfy a power law whose slope is altered by applying a magnetic field orthogonal to the flow due to damping of waves parallel to the field. The changes to the turbulent spectrum are further characterized by calculating the wavenumber spectrum using two-point correlation analysis of measurements from a pair of reflected lasers to demonstrate the magnetic damping.

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Date submitted: 16 Jul 2009 Electronic form version 1.4