Abstract Submitted
for the DPP09 Meeting of
The American Physical Society

Wavenumber and Frequency Spectral Analysis from Free-Surface MHD Experiments B. BARTELL, Union College, M.D. NORNBERG, J.R. RHOADS, H. JI, PPPL — Characterizing turbulent free-surface magnetohydrodynamic flow in a region with a strong magnetic field is critical to understanding some astrophysical phenomena as well as designing a liquid-metal first wall diverter in a fusion reactor. To isolate the effect of a magnetic field on free-surface MHD, an experiment is performed in which liquid gallium flows down a wide aspect ratio channel perpendicular to a uniform, static, magnetic field of up to 2 kG. We measure disturbances in the flow at two locations by tracking the position of laser beam reflections from the liquid's surface with position sensitive photodiodes as a function of time. The distance between the incident lasers on the surface of the stationary liquid metal is 1.2 cm downstream. Given the two time-series and the distance between the measured locations on the surface, we estimate the local wavenumber and frequency spectra using two-point correlation analysis. Evidence from these spectra indicates that turbulence and wave features parallel to the magnetic field are largely damped as the magnetic field increases, thereby reducing the turbulence from three dimensions to two.

M.D. Nornberg
PPPL

Date submitted: 16 Jul 2009 Electronic form version 1.4