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**Free-surface MHD channel flow experiments** M.D. NORNBERG, H. JI, J. LUC PETERSON, J.R. RHOADS, PPPL — 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. Interest in using liquid metals in a first-wall application in fusion devices raises important questions about the stability of a flowing liquid metal subject to 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. The design of the channel, pneumatic transfer system, and pumping scheme is presented. Laser Doppler Velocimetry measurements using tracer particles in water are used to model the velocity profile as a turbulent boundary layer. Measurements of the wave propagation characteristics in the liquid metal demonstrate the surfactant effect of surface oxides and the reduction of turbulent fluctuations by a cross-channel magnetic field. Although streamwise waves are not damped, the turbulent structures generating them are suppressed. Implications for turbulent mixing will be discussed.

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