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Development of a diagnostic array for the measurement of velocity profiles across open-channel liquid metal flows ALEXANDER GILL, Colby College, MARK NORNBERG, HANTAO JI, JAYSON LUC PETERSON, PPPL — An array of potential probes utilizing the Hall effect to measure liquid metal flow velocity is developed and implemented in the Liquid Metal Experiment (LMX) at PPPL, a study of magnetohydrodynamic (MHD) stability in open-channel flow. The channel experiment has applications in the study of the dynamics of "plasma oceans" on the surface of neutron stars. Furthermore, liquid metal is studied as a possible material for plasma-facing components in fusion reactors, an avenue of research requiring an understanding of turbulent liquid metal flow under the influence of magnetic fields. Liquid gallium alloy circulates with a flow height of 1 cm through the open channel of dimensions 15 cm wide by 70 cm long within a uniform perpendicular magnetic field of strength up to 0.7 T. A series of 16 electrode pairs, one per centimeter from wall to wall across the width of the channel, detect potential differences across 2 mm sections of flow normal to the mean velocity and the magnetic field. For flow speeds of 0.2 m/s and magnetic field strengths of 0.1 T, a raw signal of about 40 μV is expected, which will be amplified with a gain of 1000. Velocity profiles will be measured at various heights in the flow. Design considerations, calibration procedures and results will be presented.

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