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Measurement of the Emissivity of Liquid Gallium Alloy for Temperature Measurements of Free-Surface Flows A. ARTHURS, J. RHOADS, E. EDLUND, E. SPENCE, H. JI — The Liquid Metal Experiment (LMX) has recently been equipped to study the heating of a flowing liquid gallium alloy subjected to an orthogonal magnetic field. The understanding of free-surface heat transfer in strong magnetic fields will be crucial to the design and implementation of a liquid metal first wall or divertor for fusion applications. An infrared camera is used to non-invasively study free-surface flow in LMX. To directly measure absolute temperature with the infrared camera in the presence of an external heat source, the emissivity ε of the flow must be known. To determine ε for the liquid gallium alloy, an experimental setup was developed to examine one-dimensional heating in a static pool of gallium with no magnetic field. Heat conduction was both observed with the infrared camera and computationally modeled with a theta-implicit, forward-in-time, centered-in-space code that solved the thermal diffusion equation. Comparison of camera data with computational results produced by the code will yield a value for ε , calibrating the infrared camera for use with LMX by facilitating absolute temperature measurements.

Adam Arthurs
PPPL (SULI); Harvard University

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