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Spectral Dependence of Stratified Electrothermal Instability in Tamped Aluminum 6061 with Current in a Skin Layer[1] BRUNO BAUER, TREVOR HUTCHINSON, University of Nevada, Reno, THOMAS AWE, Sandia National Laboratories — The stratified electrothermal instability (ETI) was recently observed on the surface of thick aluminum 6061 pulsed with rapidly rising lineal current density ($3 \times 10^{15}\,\mathrm{A\,m^{-1}s^{-1}}$) for 70 ns.[2] A transparent 70-μm-thick Parylene-N coating tamped the aluminum expansion and suppressed surface plasma. The evolution of the aluminum surface emission pattern was recorded with time-resolved microscopy (3-μm resolution). The images were converted into a series of blackbody surface-temperature maps. Analysis of these temperature maps provides information on the evolution of temperature fluctuations, as a function of axial wavelength and azimuthal width. Perturbations with axial wavelength longer than 20 μm grow, while those with axial wavelength shorter than 10 μm decay. Comparing the spectral dependence of growth/decay rates with MHD simulations could test the modeling of ETI positive feedback and of damping by thermal conduction.

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[2]T.M. Hutchinson, T.J. Awe, B.S. Bauer, K.C. Yates, E.P. Yu, W.G. Yelton, and S. Fuelling, 'Experimental Observation of the Stratified Electrothermal Instability on Aluminum with Thickness Greater than a Skin Depth, submitted (2017) to Phys. Rev. Lett. Also see Invited Talk by T.J. Awe at this APS-DPP meeting.

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