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Femtosecond imaging of surface heat transport in solid target excited at relativistic intensity HANS LANGHOFF, MIKE DOWNER, BEN BOWES, University of Texas at Austin, JOHN NEES, BIXUE HOU, University of Michigan — We present an extension of recent fs microscopy experiments [1] in which a planar Al target is excited by a 24 fs pump focused to intensity up to $3 \times 10^{18} W/cm^2$ in a 1 micron radius spot; subsequent heat propagation along the target surface appears as a region of reduced reflectivity that is imaged by a delayed probe pulse. Isotropic expansion of the surface heated region out to 15 microns within 500 fs is observed for pump intensities above $10^{18} W/cm^2$. We present a theoretical model in which the pump drives hot electrons into the target via a mixture of $j \times B$ heating and resonance absorption (RA), and a return current heats the target. Ultrafast expansion of the heated surface layer is explained by two-dimensional diffusive motion of returning electrons that undergo damped oscillations between vacuum and a sub-surface layer confined by positive surface charges. Isotropy of the observed expansion is consistent with dominance of RA over $j \times B$ heating, indicating prepulse heating is important. [1] B. Bowes et al., Opt. Lett. 31, 116 (2006).

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