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Equation Of State Measurements of Warm Dense Copper Heated By Laser Accelerated Proton Beams GILLISS DYER, SAMUEL FELDMAN, DONGHOON KUK, CRAIG WAGNER, ERHARD GAUL, MICHAEL DONOVAN, MIKAEL MARTINEZ, TEDDY BORGER, MICHAEL SPINKS, University of Texas, Austin, SHENG JIANG, FRANKI AYMOND, KRAMER AKLI, The Ohio State University, TODD DITMIRE, University of Texas, Austin — We report equation of state (EOS) measurements of solid density transition metals heated to temperatures of 1 to 50 eV by laser accelerated pulsed proton beams. Matter at these densities and temperatures, referred to as warm dense matter (WDM), will exhibit long-range coupling, partial ionization and thermal energies comparable to the Fermi energy, making theoretical predictions of state properties very challenging. Mbar pressures likewise make such states difficult to study in the lab. In this work we use a terawatt or petawatt laser to accelerate MeV protons from a source foil, which then heat an adjacent sample foil. We probe the sample foil on a picosecond timescale using streaked optical pyrometery, time resolved interferometry, and XUV imaging. Previously we and various other groups have applied these techniques to the study of aluminum, one of the best-understood metals from the standpoint of high energy density equations of state. Here we present measurements of Cu, Cr, and Ag. Transition metals such as these are of particular interest because of modeling challenges posed by a partially filled $d-$orbital.

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