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Temperature Measurements of Solid-Density Germanium Plasmas Created with an X-Ray Free-Electron-Laser JUSTIN WARK, SHENYUAN REN, MUHAMMAD KASIM, GABRIEL PEREZ CALLEJO, ORLANDO CIRICOSTA, RYAN ROYLE, SAM VINKO, University of Oxford, UK, THOMAS PRESTON, European XFEL, Hamburg, Germany, BRUCE HAMMEL, LLNL, HYUN-KYUNG CHUNG, NFRI, Republic of Korea, TOMAS BURIAN, VOJTECH VOZDA, IOP Prague, Czech Republic, MING-FU LIN, TIM VAN DRIEL, SLAC — We have used the focused femtosecond x-ray output from LCLS at photon energies of 1400 eV and intensities of order 10^{17} Wcm^{-2} to isochorically heat sub-micron thick foils of Ge to temperatures between 150-200 eV. L-shell X-Rays emitted from the solid-density plasma were recorded using a Bragg crystal spectrometer. An analysis of the bound-free recombination emission, including both its slope and relative intensity as a function of total energy in the FEL beam, allows for an accurate determination of the peak temperature of the plasma. Simulations using atomic-kinetics calculations show that the system cools due to the emission of blackbody radiation on a timescale of several picoseconds, and that the time-integrated recombination emission is heavily gated towards the peak temperature within the system, rapidly decaying on timescales shorter than the estimated inertial confinement time.

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