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The role of hot electrons in the generation of anomalous X-ray spectra from ultra-intense laser-plasma interactions[1] AMINA HUSSEIN, University of Alberta, KIRK FLIPPO, Los Alamos National Laboratory, FRANKLIN DOLLAR, University of California, Irvine, LAN GAO, KEN HILL, Princeton Plasma Physics Laboratory, STEPHANIE HANSEN, Sandia National Laboratory, RONNIE SHEPHERD, Lawrence Livermore National Lab, NICHOLAS BEIER, HUNTER ALLISON, YASMEEN MUSTHAFA, MAHEK LOGANTHA, University of California, Irvine — An accurate description of excited atomic states in high-energy-density matter remains an experimental and theoretical challenge. Using the ALEPH laser at Colorado State University, we perform high-resolution X-ray spectroscopy of exotic matter produced via laser-solid interactions at ultra-relativistic intensities ($I \sim 10^{21}$ W/cm^2). We examine the origin of anomalous X-ray emission from copper foil, foam and buried layer targets through precise measurements of K-shell fluorescence and hot electron emission, as well as spectroscopy of XUV plasma emission. These measurements also elucidate the generation and propagation of hot electrons under self-generated electric and magnetic fields, providing crucial constitutive data for HED matter in an ultra-high intensity regime.

[1]DOE LaserNetUS program

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