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4.47 Measurements of nonresonant inelastic X-ray scattering for the characterization of warm dense Argon plasmas at the Linac Coherent Light Source

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Bound-free contributions to X-ray Thomson scattering, or nonresonant inelastic X-ray scattering from core or semi-core electrons, is a powerful technique to probe matter in extreme conditions. Here we present measurements of high signal-to-noise, spectrally resolved X-ray scattering from cryogenic solid Argon, enabling future studies of ionization, densities, temperatures, and conductivity dynamics from ps-laser driven samples approaching material temperatures of 1 eV. Our results show energy resolved measurements of incoherent X-ray scattering with unprecedented dynamic range using a 120 Hz coherent X-ray laser coupled with a novel Argon micro-jet platform. Measurements were performed using an energy-dispersive spectrometer equipped with a Highly Annealed Pyrolytic Graphite (HAPG) crystal in combination with a Cornell-SLAC Pixel Array Detector (CSPAD) that was configured in the von Hamos geometry.

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