Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

Resonant Inelastic X-Ray Scattering Studies of a Solid-Density Plasma JUSTIN WARK, OLIVER HUMPHRIES, QUINCY VAN DEN BERG, MUHAMMAD KASIM, ALAN MISCAMPBELL, RYAN ROYLE, SAM VINKO, University of Oxford, UK, ROBIN MARJORIBANKS, University of Toronto, Canada, ERIC GALTIER, HAE-JA LEE, BOB NAGLER, LCLS — Resonant inelastic x-ray scattering (RIXS), while prevalent in atomic and condensed matter physics, has not been used to date in high-energy-density physics research. This can be traced to three important requirements: the x-ray source must be spectrally bright, stable, and have a tunable (narrow-bandwidth) wavelength so as to match the required resonance condition. Such requirements can now be met with the advent of X-Ray FELs such as LCLS. We show how the electronic structure of nickel, heated to form a solid-density plasma at temperatures of tens of eV on femtosecond timescales, can be studied by RIXS using LCLS. [1] We present single-shot measurements of the valence density of states in the x-ray-heated transient system, tuned over a range of incident photon energies, and extract simultaneously electron temperatures, ionization, and ionization potential energies. The RIXS spectrum provides a wealth of information on the valence structure of this solid-density plasma that goes beyond what can be extracted from x-ray absorption or emission spectroscopy alone. [1] O.S. Humphries, R.S. Marjoribanks, Q. van den Berg, E.C. Galtier, M.F. Kasim, H.J. Lee, A.J.F. Miscampbell, B. Nagler, R. Royle, J.S. Wark, S.M. Vinko, https://arxiv.org/abs/2001.05

Justin Wark
University of Oxford

Date submitted: 02 Jul 2020 Electronic form version 1.4