Abstract Submitted
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**Extreme Atomic Physics at 5- to 100-Gbar Pressures** S. X. HU, P. M. NILSON, V. V. KARASIEV, Laboratory for Laser Energetics, Uni. of Rochester, S. B. HANSEN, SNL, T. WALTON, I. E. GOLOVKIN, Prism Computational Sciences — Inertial confinement fusion (ICF) implosions can create extreme high-energy-density (HED) states of matter such as super-high densities and temperatures. For example, a stagnating ICF shell accesses pressures up to hundreds of Gbar (˜$10^{16}$ Pa) due to spherical convergence, even for an non-igniting target. How atomic physics might change in these extreme conditions is an intriguing and fundamental question that remains to be understood by the HED physics community. A better understanding of such extreme atomic physics can, in turn, help diagnose the stagnated-shell conditions. For these purposes, we have initiated a combined experimental and theoretical campaign on OMEGA to examine detailed atomic physics at super-high pressures above ˜5 Gbar using stable Cu-doped CH-shell implosions. Time-resolved, high-resolution spectroscopy has been used to simultaneously measure $K_\alpha$ and $K_\beta$ emission/absorption of Cu in the stagnating shell during the hot-spot formation. These observations have been interpreted by radiation-hydrodynamic simulations coupled with either commonly used collisional-radiative (NLTE) models or self-consistent density-functional-theory–based multi-band kinetic modeling. We will present our understanding of extreme atomic physics and how we can apply this time-resolved spherical spectroscopy to tracking the return shock and heat-wave propagation in a stagnating ICF shell. This work is supported by the DOE/NNSA under Award Number DE-NA0003856 and US NSF Grant No. PHY-1802964.

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