Abstract Submitted
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Kinetic Modeling of Ultraintense X-Ray Laser-Matter Interactions[1] RYAN ROYLE, YASUHIKO SENTOKU, ROBERTO MANCINI, Department of Physics, University of Nevada Reno, TOMOYUKI JOHZAKI, Graduate School of Engineering, Hiroshima University — High-intensity XFELs have become a novel way of creating and studying hot dense plasmas. The LCLS at Stanford can deliver a millijoule of energy with more than 10^{12} photons in a $\sim$ 100 femtosecond pulse [1]. By tightly focusing the beam to a micron-scale spot size, the XFEL can be intensified to more than 10^{18} W/cm^2, making it possible to heat solid matter isochorically beyond a million degrees (>100 eV). Such extreme states of matter are of considerable interest due to their relevance to astrophysical plasmas. Additionally, they will allow novel ways of studying equation-of-state and opacity physics under Gbar pressure and strong fields. Photoionization is the dominant x-ray absorption mechanism and triggers the heating processes. A photoionization model that takes into account the subshell cross-sections has been developed in a kinetic plasma simulation code, PICLS, that solves the x-ray transport self-consistently [2]. The XFEL–matter interaction with several elements, including solid carbon, aluminum, and iron, is studied with the code, and the results are compared with recent LCLS experiments.

[1] S. M. Vinko *et al.*, *Nature* **482**, 59-62 (2012).
[2] Y. Sentoku *et al.*, *Phys. Rev. E* **90**, 051102 (2014).

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