Abstract Submitted
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**Kinetic Modeling of Ultraintense X-ray Laser-Matter Interactions**[1] RYAN ROYLE, University of Nevada, Reno, YASUHIKO SENTOKU, Osaka University, Japan, ROBERTO MANCINI, University of Nevada, Reno — Hard x-ray free-electron lasers (XFELs) have had a profound impact on the physical, chemical, and biological sciences. They can produce millijoule x-ray laser pulses just tens of femtoseconds in duration with more than $10^{12}$ photons each, making them the brightest laboratory x-ray sources ever produced by several orders of magnitude. An XFEL pulse can be intensified to $10^{20}$ W/cm$^2$ when focused to submicron spot sizes, making it possible to isochorically heat solid matter well beyond 100 eV. These characteristics enable XFELs to create and probe well-characterized warm and hot dense plasmas of relevance to HED science, planetary science, laboratory astrophysics, relativistic laser plasmas, and fusion research. Several newly developed atomic physics models including photoionization, Auger ionization, and continuum-lowering have been implemented in a particle-in-cell code, PICLS, which self-consistently solves the x-ray transport, to enable the simulation of the non-LTE plasmas created by ultraintense x-ray laser interactions with solid density matter. The code is validated against the results of several recent experiments and is used to simulate the maximum-intensity x-ray heating of solid iron targets.

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