

Abstract Submitted
for the DPP11 Meeting of
The American Physical Society

Resonant K-alpha spectroscopy of a hot dense plasma created by the LCLS x-ray free electron laser BYOUNG-ICK CHO, K. ENGELHORN, R.W. FALCONE, P.A. HEIMANN, LBNL, S.M. VINKO, O. CIRICOSTA, A. HIGGINBOTHAM, C. MURPHY, J.S. WARK, Oxford, H.-K. CHUNG, IAEA, C.R.D. BROWN, AWE, T. BURIAN, L. VYSIN, L. JUHA, Academy of Sciences of the Czech Republic, H.J. LEE, M. MESSERSMIDT, W. SCHLOTTER, J. TURNER, B. NAGLER, SLAC, Y. PING, R.W. LEE, LLNL, S. TOLEIKIS, DESY, U. ZASTRAU, Friedrich-Schiller-Universitat — We present one of the first experimental studies of the interaction of high intensity x-ray free electron laser radiation with solid density matter. In the experiment performed at the LCLS, an intense 80 fs x-ray pulse at 10^{17} Wcm⁻² with photon energies of 1480 ~ 1560 eV is focused on a thin Al foil and K-alpha emission spectra are observed. Although x-ray photon energy is lower than the absorption edge, because of its high intensity the sample is surprisingly heated up to 100~200 eV in the pulse duration and a hot dense plasma is created. Observed x-ray spectra indicate this dense plasma resonantly interacts with the x-ray photons. The emission spectra are also simulated using the collisional-radiative code, SCFLY which provides information about the electron temperature and density, the charge state distribution and opacity. The comparison of experiment and simulation provides a detailed description of a dense plasma resonantly interacting with an intense x-ray pulse.

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Date submitted: 30 Sep 2011

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