Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

Creation of optically-thin solid-density plasmas using LCLS T. PRESTON, S.M VINKO, O. CIRICOSTA, P. HOLLEBON, J.S. WARK, University of Oxford, UK, T. BURIAN, J. CHALUPSKY, V. VOZDA, IOP, Prague, Czech Republic, M. MINITTI, G. DAKOVSKI, SLAC, F. HALL, C. SPINDLOE, CLF, STFC, UK, U. ZASTRAU, XFEL, Germany — The advent of X-ray free-electron-lasers such as LCLS provides the capability to truly isochorically heat solid-density matter on femtosecond time-scales [1]. K-shell emission from such plasmas has provided new information on ionization potential depression [2] and collisional ionisation rates [3]. However, in previous work the targets were 1-μm thick, resulting in high-opacity on the K-shell transitions. We report here results of a detailed study of K-shell emission from exactly solid-density Mg plasmas with thicknesses ranging from 500 down to 25 nm – just over 100 atoms across. A curve-of-growth analysis exhibits text-book behavior, and confirms peak optical depths for the thinnest targets well below unity, in excellent agreement with simulations. The rich data-set provides information on line-widths, collisional dynamics, and radiation transfer in solid density plasmas.

[1] S.M. Vinko *et al.*, Nature, **482**, 59 (2012)
[2] O. Ciricosta *et al.*, Phys. Rev. Lett., **109**, 065002 (2012)
[3] S.M. Vinko *et al.*, Nat. Comm., **6**, 6397 (2015)

Justin Wark
University of Oxford, UK

Date submitted: 21 Jul 2015 Electronic form version 1.4