Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Picosecond Time-Resolved Temperature and Density Measurements with K-Shell Spectroscopy C.R. STILLMAN, P.M. NILSON, S.T. IVANCIC, C. MILEHAM, D.H. FROULA, Laboratory for Laser Energetics, U. of Rochester, I.E. GOLOVKIN, Prism Computational Sciences — The thermal x-ray emission from rapidly heated solid targets containing a buried-aluminum layer was measured to track the evolution of the bulk plasma conditions. The targets were driven by high-contrast 1ω laser pulses at focused intensities up to 1×10^{19} W/cm^2. A streaked x-ray spectrometer recorded the Al He$_\alpha$ and lithium-like satellite lines with 2-ps temporal resolution and moderate resolving power ($E/\Delta E \approx 1000$). Time-integrated measurements over the same spectral range were used to correct the streaked data for variations in photocathode sensitivity. Linewidths and intensity ratios from the streaked data were interpreted using a collisional radiative atomic kinetics model to provide the average plasma conditions in the buried layer as a function of time. Experimental uncertainties in the measured plasma conditions are quantified within a consistent model-dependent framework. The data demonstrate the production of a 330±56 eV, 0.9±0.3 g/cm^3 plasma that evolves slowly during peak He$_\alpha$ emission. This material is based upon work supported by the Department of Energy National Nuclear Security Administration under Award Number DE-NA0001944.

C.R. Stillman
Laboratory for Laser Energetics, U. of Rochester

Date submitted: 18 Jul 2017 Electronic form version 1.4