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Determination of the Charge State Distributions and Electron Temperatures from X-ray Spectra in Au Plasmas at the OMEGA Laser
M.J. MAY, M.B. SCHNEIDER, H.K. CHUNG, D.E. HINKEL, K. WIDMANN, R.F. HEETER, LLNL — The determination of the charge state distributions (CSD) of highly ionized Au in Non-LTE high-density plasmas ($\sim 10^{21}$ cm^{-3}) is critical for benchmarking radiation-hydrodynamic physics codes. Predictive calculations of the CSD have produced widely varying results. Previous experiments on NOVA have had some success in guiding the models at 2 keV. We present Au CSD's inferred from reduced-scale hohlraum target experiments at the OMEGA Laser at much higher electron temperatures. Measurements of the 5f→3d transitions in Ni- to Ar-like Au and the 3d→2p transitions in Co- to Ne-like Au have been compared to atomic modeling from the Hebrew University Lawrence Livermore Atomic Code to infer the CSD and average ionization state (Z=58.5±1.3). Improvements in these measurements were possible due to a new spectrometer, the MSPEC, which can accommodate a variety of crystal mounts (e.g. elliptical and convex) and has a better spectral range and resolution than previous instruments. Comparisons of the experiments with CSDs calculated by FLYCHK indicated a plasma electron temperature between 7 and 8 keV. This work was performed by the University of California LLNL under the auspices of the DOE under contract W-7405-ENG-48.

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