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X-ray heating of a neon photoionized plasma experiment at Z R MANCINI, T LOCKARD, D MAYES, University of Nevada, Reno, G LOISEL, J BAILEY, G ROCHAU, Sandia National Laboratories, J ABDALLAH, Los Alamos National Laboratory — In experiments performed at the Z facility of Sandia National Laboratories a cm-scale cell filled with neon gas was driven by the burst of broadband x-rays emitted at the collapse of a wire-array z-pinch turning the gas into a photoionized plasma. Transmission spectroscopy of a narrowband portion of the x-ray flux was used to diagnose the plasma. The time-integrated data show a highly-ionized neon plasma with a rich line absorption spectrum that permits the extraction of the ionization distribution. Data analysis produced ground and low excited state areal densities and from the ratio of first-excited to ground state populations in Li-like neon a temperature of 194eV was extracted to characterize the x-ray heating of the plasma. To interpret this observation, we have performed modeling calculations of the spectral distribution of the x-ray drive, self-consistent modeling of electron and atomic kinetics, and radiation-hydrodynamic simulations. We found that to compute electron temperatures consistent with observation the details of the photon-energy distribution of the drive, x-ray attenuation through the cell window, and non-equilibrium collisional-radiative neon atomic kinetics need to be taken into account. This work was sponsored by DOE Office of Science Grant DE-SC0014451, and the Z Fundamental Science Program.

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