Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

Ionization trends in a laboratory photoionized neon plasma experiment[1] DANIEL MAYES, ROBERTO MANCINI, KYLE SWANSON, University of Nevada, Reno, JAMES BAILEY, GUILLAUME LOISEL, GREGORY ROCHAU, Sandia National Laboratories, WCAPP COLLABORATION — We discuss an experimental effort to create and study laboratory photoionized plasmas relevant to the extreme conditions in x-ray binaries and active galactic nuclei. The physics models astronomers rely on to study such objects have had little laboratory testing due to the difficulty of accessing this plasma regime. Using the Z-Machine at Sandia National Labs, the experiment uses the intense broadband x-ray flux from a Z-pinch to drive and backlight a neon photoionized plasma contained in a cm-scale gas cell with atom number densities of 10^{17} to 10^{18} cm^{-3}. At the available gas cell positions, the x-ray flux reaches a peak of order 10^{12} W/cm^2[1]. Combinations of these parameters span an order of magnitude in ionization parameter value allowing the study of trends in astrophysically relevant photoionized plasmas. This differs from previous experiments characteristic of single values of ionization parameter. With K-shell line absorption spectroscopy, the resulting plasma conditions (e.g. ion areal densities and charge state distribution) are determined, which can be compared with simulation results to test atomic kinetics models for photoionized plasmas. [1]R.C. Mancini et al, Phys. Rev. E 101, 051201(R) (2020).

[1]This work was sponsored in part by DOE NNSA HEDLP grant DE-NA0003875, DOE Office of Science Grant DE-SC0014451, the Wootton Center for Astrophysical Plasma Properties, and the Z Facility Fundamental Science Program of SNL.

Daniel Mayes
University of Nevada, Reno

Date submitted: 29 Jun 2020 Electronic form version 1.4