A benchmark experiment for x-ray emission and temperature diagnostics in accretion-powered photoionized plasmas

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A highly reproducible platform was developed on the Z facility for the study of photoionized plasmas in the ~20-200 erg.cm/s photoionization regime. Absorption and emission spectra were measured down to 5% reproducibility with high spectral resolution making the data suitable to benchmark photoionization and line formation models. These experiments have measured, for the first time in the laboratory, the radiative recombination continuum (RRC) from photoionized plasma that is used to determine the temperature of accretion-powered plasmas around compact objects. On Z, a careful experiment design was necessary to overcome the harsh environment associated with the MJ-class x-ray source, such that faint RRC emission from H-like to He-like silicon along with the He-like *n*p-1s, $n \leq 14$, series could be observed. Simultaneously, the temperature is inferred from the absorption spectrum under the partial LTE assumption providing a unique test on the temperature diagnostic accuracy.

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