Areal density measurement from a photoionized Neon plasma using the Lyman alpha transition

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Abstract

Photoionized plasmas are a special class of plasmas that occur frequently in astrophysical phenomenon. Though difficult to create on Earth, experiments on the Z-Machine at Sandia National Labs have begun to explore these plasmas in an effort to study the atomic kinetics involved and to provide data to be used to benchmark spectral synthesis models for photoionized plasmas. The focus of this work was to obtain areal density measurements from time-resolved absorption spectra of a Neon photoionized plasma by utilizing the Lyman alpha transition in absorption. The areal-density is based on H-like Neon ions in the initial state of the transition, i.e. the ground state. In order to do this, a suite of IDL programs were developed to reduce the data, extract transmission spectra, and calculate synthetic data. With these tools, several sets of shot data from Z experiments were studied. Sensitivities in the areal density measurement with respect

to our processing and analysis procedures as well as comparisons with time-dependent collisional-radiative atomic kinetics calculations were also investigated.

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