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Self-Consistency of Stark Broadening Predictions in a Multi-Element HED Plasma

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The interpretation of spectral line shapes for plasma characterization is well established as a diagnostic technique for determining electron/ion density, an essential parameter for predicting radiation dynamics, local thermodynamic equilibrium, and atomic kinetics in laboratory and astrophysical environments. Specifically, Stark broadening is often used to diagnose a plasma's electron density via a tracer element. We are interested in improving or validating Stark broadening models and their ability to predict the plasma density from multiple elements within the same plasma self-consistently. In order to do so, we diagnose transmission spectra through ~0.4-um-thick Mg-NaF foil on Sandia's Z facility. This foil is tamped with varying amounts of CH, allowing for electron densities of $1x10^{21}$-$1x10^{22}$ cm^{-3} to be reached. The foil is heated such that He-like charge states were reached for all three elements, allowing for investigation of Multi-element Stark broadening. The amount of broadening found from different elements, and different tamper thicknesses will be discussed further.

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