Evaluation of Au L-shell spectroscopy as a T_e diagnostic for NIF hohlraum plasmas

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Obtaining accurate measurements of hohlraum plasma conditions is challenging, yet highly valuable in understanding hohlraum energy transport and achieving predictive modeling capabilities of indirect drive inertial confinement fusion. This is particularly true in the gold bubble region, a plasma plume generated where the outer beams strike the hohlraum, as subsequent laser energy propagates through and heats the gold bubble plasma. To attain such measurements, high quality spectral data were obtained from L-shell transitions of gold plasma self-emission which can serve as a powerful Te diagnostic, as the observed spectral features shift in energy depending on the charge state distribution. Experimental data collected from dedicated hohlraum science experiments include time resolved spectra of the Au L-shell. The measured spectra are compared against synthetic spectra produced by postprocessing radiation-hydrodynamics simulations performed in Lasnex [1] with atomic kinetics code SCRAM [2]. As a benchmark, these results are compared with dopant K-shell spectra from He-like and H-like charge states of Zn co-located in the gold. The differences obtained from both Te sensitive diagnostic approaches will be discussed and compared against simulation results.

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References

[1] G. B. Zimmerman and W. L. Kruer, Plasma Phys. Controlled Fusion **2**, 51 (1975)

[2] S. Hansen, PhD dissertation, University of Nevada, Reno (2003)

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