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10.43 Estimating Equatorial Electron Temperature in a NIF Hohlräum Using Time-Resolved X-Ray Emission Spectroscopy of Mid-Z Tracer Elements*

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Spectrally and temporally resolved x-ray emission of highly charged mid-Z ions is utilized for characterizing the electron temperature (T_e) in the equatorial region of a laser-driven ignition-type NIF hohlraum. Line-intensity measurements are used to infer the ionization balance and electron temperature. Spectral analysis shows a peak electron temperature of $T_e = (2.7 \pm 0.4)$ keV at the hohlraum equator between the high-density-carbon capsule ablator and the gold wall of the hohlraum. While we find agreement with post-shot simulations during the peak of the laser drive, some disagreement between the measured and simulated T_e remains in the earlier part of the laser heating. We present a detailed error analysis of the spectroscopic measurements, the corresponding error in the electron temperature, and a discussion of the requirements for the spatial, temporal, and spectral resolution in order to constrain the radiation-hydrodynamic models currently used to simulate the plasma conditions. *This work was performed under the auspices of the U.S. Department of Energy by LLNL under Contract DE-AC52-07NA27344.

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