

Photoionized plasma experiments at NIF driven by a long-duration x-ray drive

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A new experimental platform has been established at the NIF laser facility in which a plastic-tamped iron-magnesium sample is driven by two gold-halfraum x-ray sources characterized by a bright and broadband x-ray flux with a sustained radiation temperature of 180eV for 12ns. The x-ray flux produces and sustains a photoionized plasma populated with magnesium K-shell and iron L-shell ions. The suite of diagnostics includes DANTE to monitor the performance of the radiation source, gated x-ray imaging to observe the expansion of the photoionized iron-magnesium plasma and thus extract the density, and two OPSPEC x-ray spectrometers equipped with elliptically bent KAP crystals to record self-emission and transmission spectra from iron and magnesium ions to characterize charge state distribution, temperature, and plasma emissivity and opacity. We discuss the measurements obtained in two experimental campaigns performed at the NIF, data interpretation and analysis, and the application of the data to benchmark astrophysical models and codes employed in the analysis of x-ray astronomy observations.

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