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Thomson Scattering for Differentiating Sources of Spatial Velocity Distributions in Gas-Puff Z-Pinches[1] SOPHIA ROCCO, JACOB BANASEK, E. SANDER LAVINE, WILLIAM POTTER, DAVID HAMMER, Cornell University — The conditions and dynamics of neon gas-puff z-pinch plasmas during the implosion phase are studied on the COBRA pulsed power generator (rise time ˜240 ns to 0.9 MA peak current). A 526.5 nm, 10 J, 2.2 ns Thomson scattering diagnostic laser enables probing of the plasma conditions with both spatial and temporal resolution. Collective scattering spectral profiles are observed from which electron and ion temperatures and plasma fluid flow velocity can be obtained from the low-frequency ion acoustic spectral feature. Under some plasma conditions electron temperature and density can be obtained from the high-frequency electron plasma wave spectral feature. Scattered laser light from the same scattering volume can be split to two spectrometers of differing bandwidths in order to obtain both the ion acoustic and the electron plasma wave features. The width of the electron plasma wave feature is affected by gradients in the electron density as well as electron temperature, T_e. By comparing the T_e derived from the electron plasma wave feature to that derived from the ion acoustic feature, it may be possible to detect the presence of small-scale, local density variations in the plasma. Past experiments show that including a spatial velocity distribution when fitting the ion acoustic spectra in some cases improves the fit quality; with density fluctuations included in the analysis, the presence of non-thermal, small scale hydromotion in the scattering volume may be indicated.

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Sophia Rocco
Cornell University

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