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# Investigating Ion Energy Partitioning in Gas-puff Z-pinches with Thomson Scattering

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The conditions and dynamics of neon gas-puff z-pinch plasmas during the implosion phase are studied on the COBRA pulsed power generator (current rise time of ˜240 ns and ˜0.9 MA peak current). A 526.5 nm, 10 J, 2.2 ns Thomson scattering diagnostic laser enables probing of the plasma conditions during these implosions 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 but collected at differing angles with respect to the laser repeatedly imply ion temperatures that are inconsistent across viewing angles if the width of the ion acoustic spectral feature peaks are interpreted as solely due to ion temperature. Similarly, spectra collected along two Thomson scattering vectors, one parallel and one perpendicular to the imploding sheath and azimuthal magnetic field but from the same scattering volume, yield inconsistent ion temperatures. This indicates the presence of a source of non-thermal peak broadening that changes with scattering angle, and differs depending on orientation with respect to the imploding plasma sheath. The discrepancies may be a result of non-thermal, small scale hydromotion in the scattering volume.

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