Contribution ID : **251** Type : **not specified**

8.7 Time-Resolved and Multiple-Angle Thomson Scattering on Gas Puff Z-Pinch Plasmas

Tuesday, 17 April 2018 16:00 (120)

The conditions and dynamics of neon gas puff z-pinch plasmas at pinch time are studied on COBRA, Cornell's pulsed power generator (current rise time of ˜240 ns and ˜0.9 MA peak current). A 526.5 nm, 10 J Thomson scattering diagnostic laser enables probing of the plasma conditions of these implosions with both spatial and temporal resolution. The use of two laser pulses--both 3 ns in duration--that can be separated by up to 10 ns allows observation of time-resolved spectra for a total consecutive time of 6 ns. This setup, at 90° to the laser with a field of view of 0.4 mm on-axis, provides sub-nanosecond resolution of pinch evolution through stagnation. Two additional time-gated collection optics, one at 90° to the laser path and one at 30°, probe a 4 mm field of view across the axis. Based on whether the collection angle (and therefore the k vector) is large or small, the spectral feature dependence on the electron density is, respectively, more or less sensitive to variations in density [1]. By comparing the spectra from two angles, it is possible to ascertain an approximate electron density from the ion acoustic feature.
[1] D. Foula et al., PRL 95, 195005 (2005).
*Work supported by NNSA SSAP under DOE Cooperative Agreement No. DE-NA0001836 and LLNL subcontract no. B619181.

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Session Classification : Session #8, Tuesday Afternoon Poster Session