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8.26 Diagnosing fuel areal-density asymmetries using knock-on deuteron spectra for the 1D campaign at the OMEGA laser facility

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Determining fuel areal-density asymmetries is vital to assessing the performance for inertial confinement fusion implosions. The Charged Particle Spectrometry Suite (CPS's) at the OMEGA facility has been used to infer the fuel areal-density asymmetries in cryogenic deuterium-tritium implosions by measuring the spectrum of knock-on deuterons in different directions. These knock-on deuterons are produced by elastic-scattering between primary DT neutrons and deuterium fuel. The CPS's, which are located along different lines-of-sight, provide a complimentary measurement to the neutron-based measurements. In this work, we discuss the results from the current effort to use the existing CPS systems to diagnose fuel areal-density asymmetries in cryogenic DT implosions that are part of the 1-D Campaign. Preliminary data analysis reveals that measured fuel areal densities vary up to ~2x along different measurement lines-of-sight, which suggests significant asymmetries and perhaps systematic 3-D effects. This work was supported in part by US DOE (Grant No. DE-FG03-03SF22691) and LLE (subcontract Grant No. 412160-001G).

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