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Conduction-Zone Measurements Using X-Ray Self-Emission Images[1] A.K. DAVIS, D.T. MICHEL, A. SEFKOW, Y.H. DING, R. EPSTEIN, S.X. HU, J.P. KNAUER, D.H. FROULA, Laboratory for Laser Energetics, U. of Rochester — Time-gated soft x-ray self-emission images of directly driven implosions were measured to probe the hydrodynamic conditions between the critical-density surface and the ablation front of a CH target (conduction zone) at the beginning of a laser pulse. The self-emission at each point in the coronal plasma depends on the local electron temperature and the ion density, and the intensity measured at the diagnostic plane is the line-integrated emissivity through the target. Measured 2-D images of spherically symmetric implosions were angularly averaged and compared with synthetic self-emission profiles generated from 1-D hydrodynamic simulations to benchmark the hydrodynamic parameters in the corona. This comparison was performed for a range of times early in the implosion to study the formation and evolution of the conduction zone. This measurement is significant for inertial confinement fusion since it governs the length of time that the plasma is too small to provide substantial beam smoothing through thermal conduction, determining the laser imprint efficiency. The conduction zone has previously proven challenging to probe because the density is too high for optical diagnostics and because the temperature is too high for x-ray radiography.

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Amanda Davis
Laboratory for Laser Energetics, U. of Rochester

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