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Measuring Mix in Direct-Drive Cryogenic DT Implosions Using Soft X-Ray Narrowband Backlighting C. STOECKL, R. EPSTEIN, G. FIKSEL, V.N. GONCHAROV, S.X. HU, D.W. JACOBS-PERKINS, R.K. JUNGQUIST, C. MILEHAM, P.M. NILSON, T.C. SANGSTER, W. THEOBALD, Laboratory for Laser Energetics, U. of Rochester — Rayleigh–Taylor mix is widely seen as the major source of perturbations, which limit the performance of low-adiabat cryogenic implosions in both direct- and indirect-drive inertial confinement fusion experiments. Backlit images of cryogenic direct-drive implosions recorded with a narrowband x-ray imager using an aspherically bent quartz crystal for the Si He_α line at $\sim$ 1.86 keV show a clear signature of carbon from the CD outer shell of the cryogenic target mixing into the DT layer at the end of the acceleration phase. These implosions are driven on a low adiabat with a high in-flight aspect ratio (IFAR). Comparison with post-processed 1-D hydrodynamic simulations show that the absorption seen in the backlit images is $\sim 5\times$ larger than expected, consistent with mixing $\sim 0.2\%$ of carbon into the DT shell. Experiments with a slightly higher adiabat and lower IFAR match the predictions of clean 1-D simulations showing no signature of carbon mix. This material is based upon work supported by the Department of Energy National Nuclear Security Administration under Award Number DE-NA0001944.

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