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The NIF Shear Experiment: Emergent Coherent Structures and Initial Conditions K. A. FLIPPO, F. W. DOSS, E. C. MERRITT, C. A. DI STEFANO, B. G. DEVOLDER, S. KURIEN, L. KOT, E. N. LOOMIS, T. J. MURPHY, T. S. PERRY, J. L. KLINE, Los Alamos National Laboratory, C. M. HUNTINGTON, S. R. NAGEL, S. A. MACLAREN, Lawrence Livermore National Laboratory, D. W. SCHMIDT, Los Alamos National Laboratory — The NIF Shear experiments are designed to stress turbulence models at high Atwood numbers, high convective Mach number, and in a highly compressible regime. The NIF laser system is used to drive two hohlraums on either end of the experiment, which convert the laser drive into a bath of soft x-rays, 250eV in temperature. The counter-propagating shocks and flow, pressure balance the shear layer, such that it can grow due to the KH instability in the center of the experiment for 20 ns. These experiments are the first High Energy Density (HED) hydro-instability studies to show emergent coherent Kelvin-Helmholtz (KH) structures arising from random broadband seeds, and the first to control the phenomenological evolution of the tracer layer by controlling the initial surface roughness conditions. The change in initial conditions forces the system evolution on a different path that does not appear to reach a universal nor self-similar state by the end of the experiment. The experiment was modeled using the multi-physics hydrodynamic code RAGE with the BHR turbulence model. The initial scale-length of the model is modified to match the data. When the model is turned off, the pure hydrodynamics do not capture the behavior of the mixing layer and cannot match the data.

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