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Observations of vortex merger and growth reduction in a dual-mode, supersonic Kelvin-Helmholtz instability experiment WILLOW WAN, University of Michigan, GUY MALAMUD, ASSAF SHIMONY, Nuclear Research Center, MATT TRANTHAM, SALLEE KLEIN, University of Michigan, DOV SHVARTS, Nuclear Research Center, CAROLYN KURANZ, R PAUL DRAKE, University of Michigan — The Kelvin-Helmholtz instability (KHI) generates vortical structures and turbulence at an interface with shear flow. This instability is ubiquitous in natural and engineering systems including astrophysical environments and laboratory plasmas. Detailed measurements of modulation amplitude growth reduction and vortex merger evolving from well-defined initial conditions can benchmark hydrodynamic models and theories. This experiment provides the first measurements of the vortex merger rate of well-characterized seed perturbations evolving under the influence of the KHI in a supersonic flow. These data were obtained by utilizing a sustained laser pulse to drive a steady shockwave into low-density carbon foam, introducing shear along a precision-machined plastic interface. The evolution and merger of the modulations was measured with x-ray radiography and reproduced with 2D hydrodynamic simulations. This work is funded by the U.S. Department of Energy, through the NNSA-DS and SC-OFES Joint Program in High-Energy-Density Laboratory Plasmas, grant number DE-NA0001840, and the National Laser User Facility Program, grant number DE-NA0002032, and through the Laboratory for Laser Energetics, University of Rochester by the NNSA/OICF under Cooperative Agreement No. DE-FC52-08NA28302

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