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Universal defect formation dynamics in a strongly interacting Fermi gas BUMSUK KO, JEE WOO PARK, KYUHWAN LEE, YONG-IL SHIN, Seoul National University — Systems of different microscopic origins exhibit universal properties near a continuous phase transition if they share generic features such as their symmetries and dimensionality. Here, we report the observation of the Kibble-Zurek (KZ) universality in a strongly interacting Fermi gas. In the KZ mechanism, when a system is linearly quenched across the critical point, the universal nature of the dynamics is manifested in a power-law exponent that governs the dependence of the density of spontaneously created defects on the quench rate. By linearly quenching the temperature of an oblate sample of ^{6}Li atoms near a Feshbach resonance, we create as many as 50 vortices in the sample and demonstrate the characteristic KZ scaling. When the nature of superfluidity is tuned from bosonic to fermionic, the scaling exponent remains constant at a value that is consistent with the prediction of the inhomogeneous KZ mechanism for a harmonically trapped BEC, revealing the underlying $U(1)$ gauge symmetry of the system. However, as the quench rate is increased, the destructive collisions among vortices with opposite sign limit the vortex density to a value that is inversely proportional to the square of the interaction-dependent healing length of the superfluid.

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