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Kibble-Zurek universality in a strongly interacting Fermi superfluid JEE WOO PARK, BUMSUK KO, KYUHWAN LEE, YONG-IL SHIN, Seoul National University — Near a continuous phase transition, systems with different microscopic origins display universal dynamics if their underlying symmetries are compatible. In the Kibble-Zurek (KZ) mechanism, a thermally quenched system reveals such dynamics through the creation of topological defects, whose universal nature is encapsulated in a characteristic scaling exponent that describes the dependence of the defect density on the quench rate. Here, we report the observation of the Kibble-Zurek universality in a strongly interacting Fermi superfluid. A linear temperature quench applied to an oblate sample of ^{6}Li atoms near a Feshbach resonance creates as many as 50 vortices in the superfluid phase, and their counting statistics reveals the characteristic power-law scaling of the KZ mechanism. Importantly, as the systems microscopic description is tuned from bosonic to fermionic, the KZ exponent remains constant at a value that is consistent with the inhomogeneous KZ mechanism for a BEC in a harmonic trap, revealing the underlying $U(1)$ gauge symmetry of the system. However, when the quench rate is sufficiently increased, the destructive collisions among vortices limit the vortex density to a value that is inversely proportional to the interaction dependent area of the vortex cores.

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