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Superfluid Expansion of a Rotating Fermi Gas[1] CHRISTIAN SCHUNCK, MARTIN ZWIERLEIN, ANDRE SCHIROTZEK, WOLFGANG KETTERLE, MIT — Pairing and superfluidity in strongly interacting Fermi gases are pure many-body effects: Fermion pairs exist only due to the stabilizing presence of the surrounding atoms. The pairs are thus dependent on density and can break as the density is decreased. In contrast to a Bose-Einstein Condensate (BEC) an expanding superfluid Fermi gas therefore eventually undergoes the phase transition to the normal state. Here we observe the expansion of a rotating, superfluid Fermi gas. As superfluids can contain angular momentum only in the form of vortices, the presence and absence of vortices in the gas is used to distinguish superfluid and normal parts of the expanding cloud. We find that superfluid Fermion pairs survive during expansion. Breakdown of superfluid flow is observed as the density, and hence the binding energy, decreases below a critical value.

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