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Time-resolved measurement of the contact parameter in a strongly interacting Fermi gas ALMA BARDON, CHRIS LUCIUK, SCOTT BEATTIE, STEFAN TROTZKY, JOSEPH THYWISSEN, University of Toronto, Department of Physics, Toronto (ON), Canada — Two-component Fermi gases with strong interactions play an important role in different physical scenarios ranging from atomic nuclei to neutron stars. A number of universal relations for these systems built around a central parameter called the "contact" have been developed in 2005 by S. Tan. Neutral fermionic atoms cooled to quantum degeneracy provide a highly controllable test bed for such relations. We use ultracold samples of ^{40}K in two different Zeeman states to study the time-evolution of the contact parameter by means of radiofrequency spectroscopy to a third weakly-interacting state. Starting with a spin-polarized gas of atoms in a coherent superposition of the two interacting internal states, we observe a build-up of contact as the sample evolves towards an incoherent, fully interacting mixture. Our observations connect single-particle coherence dynamics with the evolution of the contact. We are able to affect the latter deterministically by controlling the single particle coherence via spin echoes. Once the sample has fully decohered, atom loss dominates the contact dynamics. We investigate the time-evolution of the Fermi gas over a wide range of interactions using a Feshbach resonance.

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