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Transverse spin diffusion in ultracold fermionic potassium STEFAN TROTZKY, CHRIS LUCIUK, SCOTT BEATTIE, University of Toronto, WILLIAM CAIRNCROSS, UC Boulder, ALMA BARDON, JOSEPH THYWISSEN, University of Toronto — This poster consolidates several measurements in our lab concerning the magnetization dynamics of fermionic potassium 40 at the Feshbach resonance for the two lowest-energy hyperfine states. Our experiment begins with a completely polarized gas in the $F = 9/2$, $m = -9/2$ state. Dynamics are initiated with a "superposition quench," in which each atom is put in an equal superposition of resonant eigenstates. Over the next several milliseconds, the gas demagnetizes due to the combined effect of an external gradient and diffusive spin currents. We observe four essential effects: (1) Spin diffusivity is close to $\hbar$ divided by the atomic mass, which is roughly what one would expect for quasiparticles whose lifetime is $\hbar$ divided by the Fermi energy; (2) A second Fermi surface is formed, and eventually equilibrates with the majority Fermi surface, resulting in an increase in entropy and temperature; (3) The contact parameter grows from zero to a steady-state value consistent with equilibrium; and (4) The spin current precesses around the local magnetization.

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