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Transverse Demagnetization Dynamics of a Unitary Fermi Gas[1]
EDWARD TAYLOR, McMaster University, ALMA BARDON, SCOTT BEATTIE, CHRISTOPHER LUCIUK, WILLIAM CAIRNCROSS, DANIEL FINE, NATHAN CHENG, GRAHAM EDGE, University of Toronto, SHIZHONG ZHANG, University of Hong Kong, STEFAN TROTZKY, JOSEPH THYWISSEN, University of Toronto — Understanding the quantum dynamics of strongly interacting fermions is a challenge raised by diverse forms of matter, including high-temperature superconductors, neutron stars, and quark-gluon plasmas. An appealing benchmark is offered by cold atomic gases in the unitary limit of strong interactions, where the system is both scale-invariant and known to obey universal thermodynamics in equilibrium. Here we study the dynamics of a transversely magnetized unitary Fermi gas in an inhomogeneous magnetic field. We find that demagnetization is caused by diffusive spin transport with a diffusion constant that saturates at low temperatures to the conjectured quantum-mechanical lower bound $\hbar/m$, where m is the particle mass. The development of pair correlations is observed by measuring Tan's contact parameter.

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