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Verification of Universal Relations in a Strongly Interacting Fermi Gas[1] TARA DRAKE, JOHN GAEBLER, JAYSON STEWART, UC Boulder, JILA, DEBORAH JIN, UC Boulder, JILA, NIST — Many-body fermion systems are important in many branches of physics, including condensed matter, nuclear, and now cold atom physics. In many cases, the interactions between fermions can be approximated by a contact interaction. A recent theoretical advance in the study of these systems is the derivation of a number of exact universal relations that are predicted to be valid for all interaction strengths, temperatures, and spin compositions. These equations, referred to as the Tan relations, relate a microscopic quantity, the amplitude of the high-momentum tail of the fermion momentum distribution, to the macroscopic thermodynamics of the many-body system. Our experiments aim to verify the Tan relations in a strongly interacting gas of fermionic atoms. Specifically, we measure the fermion momentum distribution using two different techniques, along with the rf excitation spectrum, and determine the effect of interactions on these microscopic probes. We then measure the potential energy and release energy of the trapped gas and test the predicted universal relations.

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