Abstract Submitted
for the DAMOP20 Meeting of
The American Physical Society

SU(N) enhanced interactions and reduced number fluctuations in a quantum degenerate Fermi gas[1] THOMAS BILITEWSKI, LINDSAY SONDERHOUSE, CHRISTIAN SANNER, ROSS B. HUTSON, AKIHISA GOBAN, LINGFENG YAN, WILLIAM R. MILNER, JILA, NIST, and University of Colorado Boulder, ANA MARIA REY, JILA, NIST and University of Colorado,Boulder, JUN YE, JILA, NIST, and University of Colorado Boulder — We study theoretically and experimentally an interacting $SU(N)$ Fermi gas of ^{87}Sr, where N can be as large as 10, in the quantum degenerate regime. The presence of N distinct spin species results in an enhanced interaction due to the larger number of available scattering partners, thus, leading to significant interaction effects even for a nominally weakly interacting gas. Using all 10 spin states during evaporation allows to have efficient sample preparation while reaching deep degeneracy, with $T/T_F = 0.07$ in under 3 s. We employ a kinetic approach and scaling ansatz to obtain the equilibrium and out of equilibrium phase space distribution of the interacting harmonically trapped gas, which allow us to extract the in-situ and time-of-flight density profiles as well as the isothermal compressibility. While generically the effects of lower temperature or interactions are difficult to disentangle, we demonstrate the interacting nature of the system via the time-of-flight density anisotropy. The experimentally measured density profiles and number fluctuations are in good agreement with the theoretical predictions, and enable a precise thermometry and characterisation of the interacting quantum gas.

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Date submitted: 01 Feb 2020 Electronic form version 1.4