Abstract Submitted
for the DAMOP18 Meeting of
The American Physical Society

Dynamics of Fermi gases near s-wave and p-wave Feshbach resonances BEN A. OLSEN, SCOTT SMALE, KENNETH G. JACKSON, University of Toronto, PEIRU HE, JAMIR MARINO, ANA MARIA REY, JILA, NIST, and University of Colorado, Boulder, JOSEPH H. THYWISSEN, University of Toronto — Using a Fermi gas of potassium atoms, we explore different regimes of dynamics by varying the strength of s-wave and p-wave interactions. Near the zero crossing of the s-wave Feshbach resonance, we observe magnetization dynamics using a Ramsey sequence of radio-frequency pulses. For sufficiently weak interactions, the motional degrees of freedom are fixed, and the cloud realizes a quantum simulation of the collective Heisenberg lattice spin model in harmonic oscillator mode space. This system exhibits a dynamical phase transition between a ferromagnetic phase with long-lived magnetization, and a fast-decaying paramagnetic state. We also investigate the behavior of a spin-polarized cloud tuned near a p-wave Feshbach resonance. We report on the effects of strong confinement on energetics of the cloud, observed through loss features and radio-frequency spectroscopy. These studies have implications for the stability of Fermi gases with strong p-wave interactions.

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Date submitted: 26 Jan 2018 Electronic form version 1.4