Abstract Submitted
for the DAMOP20 Meeting of
The American Physical Society

Simulation of XXZ Spin Models using Sideband Transitions in Trapped Bosonic Gases[1] ANJUN CHU, JILA, NIST and Dept. of Physics, University of Colorado Boulder, JOHANNES WILL, Institut für Quantenoptik, Leibniz Universität Hannover, JAN ARLT, Institut for Fysik og Astronomi, Aarhus Universitet, CARSTEN KLEMPT, Institut für Quantenoptik, Leibniz Universität Hannover, ANA MARIA REY, JILA, NIST and Dept. of Physics, University of Colorado Boulder — We theoretically propose and experimentally demonstrate the use of motional sidebands in a trapped ensemble of ^{87}Rb atoms as a way to engineer tunable long-range XXZ spin models. We benchmark our simulator by probing a ferromagnetic to paramagnetic dynamical phase transition in the collective XXZ model plus additional transverse and longitudinal fields via Rabi spectroscopy. Based on experimental observations, we reconstruct the boundary of the dynamical phases and show good agreement with mean-field theoretical predictions. We also theoretically analyze the achievable spin squeezing in our XXZ simulator, opening the possibilities of using motional sidebands to push the frontiers of metrology via quantum entanglement.

[1]This work is supported by AFOSR, DARPA, ARO, NSF, JILA-NSF and NIST.

Anjun Chu
JILA, NIST and Dept. of Physics, University of Colorado Boulder

Date submitted: 29 Jan 2020 Electronic form version 1.4