

Abstract Submitted  
for the DAMOP17 Meeting of  
The American Physical Society

**Engineering strong non-local interactions in a near-concentric cavity** EMILY DAVIS, GREGORY BENTSEN, TRACY LI, MONIKA SCHLEIER-SMITH, Stanford University — Photon-mediated interactions among atoms coupled to an optical cavity are a powerful tool for engineering quantum many-body Hamiltonians. We present an experiment aimed at generating non-local and dynamically controllable spin-spin interactions by strongly coupling  $^{87}\text{Rb}$  atoms to a near-concentric cavity. The tightly-focused waist of  $11\mu\text{m}$  combined with a high finesse of 60,000 yields a single-atom cooperativity of 50. Furthermore, the optical access afforded by the near-concentric geometry enables imaging and addressing with  $1\mu\text{m}$  resolution. We detail the current status of the experiment and progress toward many-body quantum control.

Gil Refael  
Caltech

Date submitted: 30 Jan 2017

Electronic form version 1.4