Abstract Submitted
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Hybrid Optomechanics in Strong Coupling Regime[1] YOGESH PATIL, AJAY BHAT, HARRY CHEUNG, SUNIL BHAVE, MUKUND VENGALATTORE, Cornell University — We describe progress towards the realization of a hybrid optomechanical system consisting of an ultracold gas of atoms parametrically coupled to a microtoroidal optomechanical resonator. Our setup aims to harness the long-lived coherence of the collective atomic spin of an ultracold atomic gas to enhance the optomechanical coupling. This spin-mediated ultra-strong coupling aids in enhanced cooling of the mechanical resonator as well as in substantially increasing the sensitivity of micromechanical devices used in transduction applications, as also in inducing single-photon nonlinearities and other quantum processing [1]. We also report progress on using Raman sideband cooling and nondestructive imaging on fermionic species (^6Li), augmented by single site resolution imaging for effecting a quantum gas microscope.

[1] M. Aspelmeyer, T. J. Kippenberg, F. Marquardt, arXiv:1303.0733v1 (2013)

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Yogesh Patil
Cornell University

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