Abstract Submitted
for the DAMOP15 Meeting of
The American Physical Society

Hybrid Quantum Optomechanics with Graphene Nanoresonators[1] AIRLIA SHAFFER, AJAY K. BHAT, YOGESH SHARAD PATIL, SUNIL BHAVE, MUKUND VENGALATTORE, Cornell University — We report on the realization of a hybrid quantum system consisting of a graphene nanoresonator coupled to an ultracold spin ensemble. This work is motivated by the large quantum nonlinearities inherent to graphene resonators, as well as the strong atom-resonator coupling due to their commensurate mass ratio. We fabricate micromechanical suspended graphene membrane resonators and study their properties, both through spectroscopic and interferometric imaging. With dark field images, we relate the nonlinear intermode coupling in graphene to the quality factors of the modes. This work provides a foundation for the studies of entanglement between a macroscopic graphene membrane and an auxiliary quantum system of ultracold atoms. Additionally, such graphene resonators can be used for force, position, and mass sensing in the quantum limit.

[1]This work is supported by the DARPA QuASAR program through a grant from the ARO and an NSF INSPIRE award.

Yogesh Patil
Cornell University

Date submitted: 30 Jan 2015 Electronic form version 1.4