Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Sorting Category: 12.1.3 (E)

Cavity Optomechanics with Graphene Resonators

ROBERT BARTON, ISAAC STORCH, VIVEKANANDA ADIGA, Cornell University, REYU SAKAKIBARA, University of California Berkeley, SI PING WANG, PEIJIE ONG, B. ILIC, Cornell University, PAUL MCEUEN, Kavli Institute, Cornell University, JEEVAK PARPIA, HAROLD CRAIGHEAD, Cornell University — Optical manipulation of micromechanical and nanomechanical resonators promises control of quantum states of macroscopic systems, among other applications. Because the spring constant of a resonator scales with its mass, there are advantages associated with using the lightest possible membranes as the mechanical elements. Here, we demonstrate that graphene, a one-atom-thick membrane, can be used as the mechanically active part of an optomechanical system. We show that a laser coupled to a Fabry-Perot cavity between a graphene resonator and a reflective backplane can both enhance and damp graphene motion. The enhancement of resonator motion is sufficient to induce self-oscillation, which is useful for applications in sensing and signal processing. These experiments demonstrate that graphene resonators are useful for optomechanical applications and show promise for resonator cooling toward the quantum ground state.

[X] Prefer Oral Session
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Date submitted: 19 Jan 2012 Electronic form version 1.4