

Abstract Submitted
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Non-linear mode coupling for quantum optomechanics SRIVATSAN CHAKRAM, AIRLIA SHAFFER, LAURA CHANG, YOGESH PATIL, MUKUND VENGALATTORE, Cornell University — We describe studies of resonantly enhanced parametric nonlinearities in an ultrahigh quality factor membrane resonator. The nonlinear coupling between two near-degenerate mechanical modes is induced by driving a third resonator mode. By varying the strength of the coupling, we demonstrate the continuous progression of the coupled system from linear “two-mode” dynamics to a highly nonlinear “three-mode” dynamics. The latter is characterized by a threshold behavior and mechanical bistability. This nonlinear coupling can be used for the amplification of weak phonon fields, signal transduction and thermomechanical squeezing. We also describe our progress on extending these studies to graphene nanoresonators. This work is motivated by the large quantum-limited nonlinearities inherent to graphene nanoresonators as well as the strong atom-resonator coupling due to the commensurate mass ratio.

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