Abstract Submitted
for the DAMOP16 Meeting of
The American Physical Society

Nonequilibrium quantum dynamics in optomechanical systems[1]
YOGESH SHARAD PATIL, HIL F. H. CHEUNG, AIRLIA SHAFFER, KE WANG, MUKUND VENGALATTORE, Cornell University — The thermalization dynamics of isolated quantum systems has so far been explored in the context of cold atomic systems containing a large number of particles and modes. Quantum optomechanical systems offer prospects of studying such dynamics in a qualitatively different regime – with few individually addressable modes amenable to continuous quantum measurement and thermalization times that vastly exceed those observed in cold atomic systems. We have experimentally realized a dynamical continuous phase transition in a quantum compatible nondegenerate mechanical parametric oscillator. This system is formally equivalent to the optical parametric amplifiers whose dynamics have been a subject of intense theoretical study [1]. We experimentally verify its phase diagram and observe nonequilibrium behavior that was only theorized, but never directly observed, in the context of optical parametric amplifiers. We discuss prospects of using nonequilibrium protocols such as quenches in optomechanical systems to amplify weak nonclassical correlations and to realize macroscopic nonclassical states.

[1] H. F. H. Cheung *et al.* arXiv:1601.02324 (2016)

[1]This work was supported by the DARPA QuASAR program through a grant from the ARO and the ARO MURI on non-equilibrium manybody dynamics.

Yogesh Sharad Patil
Cornell University

Date submitted: 27 Jan 2016 Electronic form version 1.4