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Signatures of nonlinear optomechanics and engineering of nonclassical mechanical steady states[1] KJETIL BORKJE, Niels Bohr Institute, University of Copenhagen — Motivated by recent improvements in coupling strength between light and mechanical motion, we study the strong coupling regime of cavity optomechanics theoretically. We focus on the regime where the optomechanical coupling rate is still small compared to the mechanical resonance frequency, but where the mechanically induced Kerr nonlinearity is significant. The response of the system to an optical drive is characterized. The average photon number in the cavity as a function of drive detuning can feature several peaks due to multi-photon transitions. Furthermore, we show that by optically driving the system at multiple frequencies, multi-photon transitions can facilitate the engineering of nonclassical steady states of the mechanical oscillator.

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