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Quantum nonlinearity near optomechanical instabilities XUNNONG XU, MICHAEL GULLANS, JACOB TAYLOR, Joint Quantum Institute, University of Maryland/National Institute of Standards and Technology — We show that is possible to realize significant optomechanical nonlinearities at the few quanta level in strongly driven two-mode optomechanical systems. In particular, as the strength of the driving laser increases the energy of one of the optomechanical normal modes approaches zero and the associated harmonic oscillator length becomes large, which leads to an enhanced nonlinear coupling between this mode and the driven mode. This enhances the intrinsic nonlinearity of the optomechanical coupling by an amount scaling with sidebands resolution. We show that this could be measured in two-photon correlations when the system is in the side-band resolved regime with relatively large single-photon optomechanical coupling. These conditions are within the reach of current devices and especially of optomechanical photonic/phononic crystals.

Xunnong Xu
Joint Quantum Institute, University of Maryland/National Institute of Standards and Technology

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