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**Macroscopic Quantum Superposition in Cavity Optomechanics**[1]

JIE-QIAO LIAO, LIN TIAN, School of Natural Sciences, University of California, Merced, California 95343 — Quantum superposition in mechanical systems is not only a key evidence of macroscopic quantum coherence, but can also be utilized in modern quantum technology. Here we propose an efficient approach for creating macroscopically distinct mechanical superposition states in a two-mode optomechanical system. Photon hopping between the two cavity-modes is modulated sinusoidally. The modulated photon tunneling enables an ultrastrong radiation-pressure force acting on the mechanical resonator, and hence significantly increases the mechanical displacement induced by a single photon. We present systematic studies on the generation of the Yurke-Stoler-like states in the presence of system dissipations. The state generation method is general and it can be implemented with either optomechanical or electromechanical systems.

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