

Abstract Submitted  
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**Macroscopic optomechanical superposition via periodic qubit flipping**<sup>1</sup> WENCHAO GE, M. SUHAIL ZUBAIRY, Institute for Quantum Science and Engineering (IQSE) and Department of Physics & Astronomy, Texas A&M University, College Station, Texas 77843, USA — We propose a scheme to generate macroscopic superpositions of well distinguishable coherent states in an optomechanical system via periodic photonic qubit flipping. Our scheme does not require a single-photon strong coupling rate of an optomechanical system. The generated mechanical superposition state can be reconstructed using mechanical quantum state tomography. The proposed scheme relies on recycling of an atom, fast atomic qubit flipping, and coherent state mapping between a single-photon superposition state and an atomic superposition state. Our scheme can generate macroscopic superposition states with very large separation which is not restricted by decoherence of the atomic state or decay of the cavity photon. We discuss the experimental feasibility of our proposal under current technology.

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