Abstract Submitted
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Quantum Optomechanical Heat Engine[1] KEYE ZHANG, Quantum Institute of Light and Atoms, Department of Physics, East China Normal University, Shanghai, P.R. China, FRANCESCO BARIANI, PIERRE MEYSTRE, College of Optical Sciences, University of Arizona, Tucson, Az, 85721, USA — We investigate theoretically a quantum optomechanical realization of a heat engine. The coupling between the cavity field and the mechanical resonator results in normal mode excitations whose quantum character depends on the pump detuning and on the coupling strength. By varying that detuning it is possible to transform their character from predominantly phonon-like into photon-like modes of different frequencies and coupled to two thermal reservoirs at different temperatures. We exploit this property to propose an Otto cycle along one branch of the normal modes and calculate its total work and efficiency. We discuss basic properties of that scheme for different optomechanical systems: in the optical domain it is possible to extract work from the thermal energy of a mechanical resonator, while in the microwave range one can in principle exploit the cycle to extract work from the blackbody radiation background coupled to an ultra-cold atomic ensemble.

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