Abstract Submitted
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Adiabatic State Conversion and Photon Transmission in Optomechanical Systems[1] LIN TIAN, University of California, Merced — Light-matter interaction in optomechanical systems in the strong coupling regime can be explored as a tool to transfer cavity states and to transmit photon pulses. Here, we show that quantum state conversion between cavity modes with different wavelengths can be realized with high fidelity by adiabatically varying the effective optomechanical couplings. During this adiabatic process, the quantum state is preserved in the dark mode of the cavities, similar to the adiabatic transfer schemes in EIT systems. The fidelity for gaussian states is derived by solving the Langevin equation in the adiabatic limit and shows negligible dependence on the mechanical noise. We also show that an input pulse can be transmitted to an output channel with a different wavelength via the effective optomechanical couplings. The condition for optimal transmission is derived in the frequency domain. Input pulses with a narrow spectral width can be transmitted with high fidelity. For input pulses with a large spectral width, the shape of the output pulses can be manipulated by applying time-dependent effective couplings. (1) L. Tian, arXiv:1111.2119. (2) L. Tian and H. L. Wang, Phys. Rev. A 82, 053806 (2010).

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