Two-photon optomechanical hopping

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We study the interaction between two electromagnetic resonators separated by a vibrating two-sided perfect mirror. We started from its canonical quantisation generalising the results of Ref. [1]. The vibrating mirror separates both sides of the cavity at the classical level, but not quantum-mechanically. We report about the peculiar two-photon hopping mechanism which is not ascribable to a tunnel effect, but to an effective interaction between the three bosonic sub-systems. We describe this interaction within the effective Hamiltonians James' approach [2], and we use quantum trajectories to single out events otherwise invisible in statistical outcomes [3].

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[3] V. Macrì, F. Minganti, A. F. Kockum, A. Ridolfo, S. Savasta, F. Nori, "Revealing higher-order light and matter energy exchanges using quantum trajectories in ultrastrong coupling", Phys. Rev. A 105, 023720 (2022)