

# Dispersive Quantum Dynamics in Cavity Optomechanical Systems

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We shall report our results on the quantum dynamics of the cavity optomechanical system [1] in the dispersive regime of interaction where the externally applied coherent field frequency detuning from the optical resonator frequency is not equal to the mirror's oscillating frequency or to its multiples [2]. We have shown that under these circumstances, the steady-state phonon quantum dynamics can be monitored via photon detection and conversely. Particularly, the phonon or photon dynamics, as a function of the external field detuning, exhibits a multi-peak structure. Interestingly, the peak frequency intervals equal the Kerr-like induced nonlinearity in the system [3]. Moreover, multi-phonon emission processes occur as well, which can be stated *via* measuring the second-order phonon-phonon correlation function, respectively [2].

## References

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- [3] S Aldana, Ch Bruder and A Nunnenkamp, *Phys. Rev. A* **88**, 043826 (2013)