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A. Shafiei Aporvari- Cavity optomechanics

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In this work we are going to study cavity optomechanical systems where the coupling between electromagnetic radiation and mechanical motion is considered. In this fast-growing field, the interaction of radiation field with the vibrational motions of a mechanical oscillator has many promising applications such as precision force sensing and evaluations of quantum physics at macroscopic scales. The standard and simplest optomechanical setup is a Fabry-Perot cavity in which one of the two mirrors is a vibrating micromechanical object. In fact, it has been the first experimentally studied cavity optomechanical system. It is also possible to place a mechanical element inside the optical cavity such as a flexible membrane which could be exploited for applications such as quantum detection of weak forces, displacements, masses, and accelerations. In this research, our main aim is to perform a quantum theoretical analysis on the power-noise spectrum by considering the phase measurements in a cavity optomechanics setup involving a coherently driven membrane in the middle of the cavity. In other words, mechanical motion of the system is studied by monitoring the phase of the optical cavity output.