Cavity Optomechanics

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Contents

1 Introduction

Historical review:

- Ashkin, focused laser beams can trap and control dielectric particles; Laser cooling;
  Application: optical atomic clocks, precision measurements
- Braginsky, dynamical influence of radiation pressure; quantum fluctuations of it, established the standard quantum limit for continuous position detection
- theoretical: squeezing of light, QND detection of the light intensity, quantum nonlinearities for extremely strong optomechanical coupling, give rise to nonclassical and entangled states of the light field and the mechanics
- experimental: optical feedback cooling; feedback damping, self-induced oscillations
- systems: membranes; nanorods; microdisks; microspheres; optical waveguides; nanomechanical beam inside a superconducting transmission line microwave cavity
- motivations: sensitive optical detection of small forces, displacements, masses and accelerations; interconvert information between solid-state qubits and flying photonic qubits

2 Optical Cavities and Mechanical Resonators