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Quantum opto-mechanics with micromirrors: combining nano-mechanics with quantum optics

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ABSTRACT

Studying the quantum behavior of macroscopic systems has attracted great interest from the scientific community around the world. Such quantumsystems might eventually play an important role in quantum information processing, allow to reach unprecedented sensitivity levels in metrology applications and enable fundamental tests of quantum physics. In this thesis we haveinvestigated the dynamics of a macroscopic mechanical resonator coupled to light. Using the radiation-pressure interaction between the optical field and the mechanical structure we have performed several experiments that pave the way towards full coherent quantum control of the mechanical motion. The experiments presented here include passive radiation-pressure cooling of the mechanical oscillation close to its quantum ground state, a strongly interacting optomechanical system, as well as radiation-pressure based down-conversion.