Optomechanical interactions in high-finesse cavities offer a new promising route for the ongoing experimental efforts to achieve and to control the quantum regime of massive mechanical systems using the available toolbox of quantum optics. For example, they allow to cool mechanical degrees of freedom of movable mirrors via radiation-pressure backaction, in principle even into their quantum ground state. Ground-state cooling will eventually require to realize the scheme in a cryogenic environment. We have taken this next step and realized stable operation of a high-finesse cavity inside a $^4$He cryostat [1]. This allowed us to show radiation-pressure laser cooling of a micro-mechanical kHz resonator from a base temperature of 5 K to approximately 1.3 mK, which corresponds to a thermal occupation factor of $\langle n \rangle = 32 \pm 4$ [2]. Heating effects, e.g. due to absorption of photons in the micromirror, could not be observed. The cooling performance is only limited by the thermal coupling to the environment, which can be further reduced by improving the mechanical quality factor of the mechanical resonator and by further reducing the environmental temperature. We will discuss the relevance of these results for the preparation and control of mechanical quantum states.

References