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Cavity cooling of a microlever

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Few years ago P. F. Cohadon, A Heidmann, and M. Pinard demonstrated that laser-cooling of the vibrational modes of a mirror can be achieved by subjecting it to a radiation pressure, actively controlled through a servo loop adjusted to oppose its brownian thermal motion. Atoms in an optical trap on the other hand can be laser-cooled passively without such active feedback, because their random motion is intrinsically damped through their interaction with radiation. In very close analogy with laser-cooling of atoms we have developed a simple and direct experimental method for passive optical cooling of a micromechanical resonator. We established that exploiting cavity-light induced forces allow to quench efficiently the brownian vibrational fluctuations of a gold-coated silicon microlever from room temperature down to an effective temperature of 18 K. Extending this method to optical-cavity-induced radiation pressure might enable the quantum limit of the lever vibrational ground state to be reached.