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Thermal noise in complex systems

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Thermal noise is known to be a crucial limitation for high precision sensing devices like future gravitational wave detectors or lasers with extreme narrow linewidths. Mitigating Brownian thermal noise as an important issue requires the reduction of the mechanical loss of involved materials and/or their deliberate spatial distribution. In this contribution we discuss the influence of mechanical losses and their spatial distribution on thermal noise in complex optical systems. In these systems virtual pressures must be applied on differently oriented parts of the surface. We show how thermal noise of such systems can be described by finite element analysis and semi-analytic approaches.

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