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Thermodynamic considerations of mechanical oscillations CHIAO-HSUAN WANG, JQI/UMD, JACOB TAYLOR, JQI/NIST/QuICS — Recent experimental efforts in large-scale optomechanical systems have been made to observe coherent superpositions of macroscopic oscillators. However, the quantum harmonic oscillator treatment of macroscopic optomechanics may need further verification due to the presence of enormous numbers of internal degrees of freedom. We examine models of a mechanical oscillator coupled to many degrees of freedom in thermal contact with a bath, and find that spring-like classical oscillations can occur even if there is no underlying quantum mechanical oscillator. We provide a microscopic description of this thermal oscillator mechanism, and consider methods for distinguishing between quantum harmonic oscillations and other oscillatory behaviors.

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