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Measurement of Radiation Pressure in an Ambient Environment
DAKANG MA, JOSEPH GARRETT, JEREMY MUNDAY, University of Maryland - College Park — Light has momentum and thus exerts "radiation pressure" when it is reflected or absorbed due to the conservation of momentum. Micromechanical transducers and oscillators are suitable for measurement and utilization of radiation pressure due to their high sensitivities. However, other light-induced mechanical deformations such as photothermal effects often obscure accurate measurements of radiation pressure in these systems. In this work, we investigate the radiation pressure and photothermal force on an uncoated silicon nitride microcantilever under illumination by a 660 nm laser in an ambient environment. To magnify the mechanical effects, the cantilever is driven optically from dc across its resonance frequency, and the amplitude and phase of its oscillation are acquired by an optical beam deflection method and a lockin amplifier. We show that radiation pressure and photothermal effects can be distinguished through the cantilever's frequency response. Furthermore, in a radiation pressure dominant regime, our measurement of the radiation force agrees quantitatively with the theoretical calculation.

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