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Quantifying the Stochastic Dynamics of the Elastic Probe used in Cavity Optomechanical Force Micropscopy STEPHEN EPSTEIN, MARK PAUL, Virginia Tech — Atomic force microscopy has revolutionized surface science and is now as essential tool for micro and nanoscale studies in science and engineering. Cavity optomechanical force microscopy consists of an atomic force microscopy probe that is placed in close proximity to a microfabricated optical cavity. The interaction between the probe and the optical cavity is used to quanitfy the probe dynamics. Cavity optomechaincal force microscopy extends conventional atomic force microscopy by being more sensitive with increased frequency resolution. In many situations of interest the probe operates while immersed in a viscous fluid which can strongly affect the probe dynamics. In this talk we quantify the stochastic dynamics of the elastic probe when driven by Brownian motion where the dominant source of dissipation is the surrounding viscous fluid. We use deterministic finite-element numerical simulations with the fluctuation-dissipation theorem to quantify the stochastic dynamics of the probe for the precise conditions and geometries used in current experiments.

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