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Particle dynamics in a virtual harmonic potential[1] MOMCILO GAVRILOV, YONGGUN JUN, JOHN BECHHOEFER, Dept. of Physics, Simon Fraser University, Burnaby, BC, Canada — The recently developed Anti-Brownian ELectrokinetic (ABEL) trap is a device for trapping and manipulating single fluorescent particles in solution. The ABEL trap acquires an image of a Brownian particle in order to estimate its position and then apply an electrical force to bring it to the desired position. This feedback system allows us to explore properties of a single molecule in its natural environment. Although the ABEL trap has been used in a number of biophysical studies, there is no complete theory to describe how the ABEL trap actually works. In this talk, we will present the first complete theory of the ABEL trap that takes into account parameters such as the particle's diffusion constant, feedback frequency, camera exposure time, observational noise, response delay, and feedback gain. The theory predicts successfully the power spectrum density of particle motion for given trap parameters. We will present the case of an imposed harmonic virtual potential, comparing theoretical predictions to simulation and experimental results.

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