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Suppression of Brownian motion by electrodynamic confinement in aqueous solution WEIHUA GUAN, MARK REED, Department of Electrical Engineering, Yale University, SONY JOSEPH, PREDRAG KRSTIC, Physics Division, Oak Ridge National Laboratory — Trapping and manipulating single molecule or colloid particles in aqueous solution provides the opportunity to study intrinsic individual characteristics rather than averaged ensemble properties. In this study, a planar aqueous electrodynamic trap on a chip is fabricated and studied. Individual charged particles can be trapped in aqueous solution by a "Paul trap" type rotating electric field. The trap utilizes the strong alternating electrophoretic force and dynamically traps charged particles in the center of the planar device. The trap is characterized by investigating the stable trapping region with its characteristic driving parameters. The impact of the Brownian noise on the stability of the trapping and on the root- mean-square (rms) value of the position fluctuations are investigated. Compared to conventional Paul trap which works in vacuum or gaseous phase, our electrodynamic trap demonstrates for the first time a successful aqueous trapping. This technique opens the possibility to spatially control the object in aqueous solution and can lead to lab-on-a-chip systems controlling single molecules.

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