Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

Effect of detector exposure time on the apparent diffusion coefficient measured by single particle tracking[1] SHAHRAM POUYA, MANOOCHEHR KOOCHESFAHANI, RICHARD DI LIU, Michigan State University — We present results from simulation of Brownian motion of nanoparticles where we also take into account the averaging imposed by the exposure period E of the detector. The diffusion coefficient is estimated from the measured displacements of the particles over a prescribed delay time Δt. Results from free diffusion simulations show a clear dependency of the estimated diffusion coefficient on the time-averaging of the detector, decreasing linearly with $E/\Delta t$. An analytical solution is presented that corroborates this behavior. The simulation is further extended to describe wall-bounded diffusion similar to motion of nanoparticles next to a solid wall. Results show a similar trend to that observed in free diffusion but with an overall reduced diffusion coefficient due to hindered motion imposed by the wall. This study emphasizes the importance of the influence of detector exposure time in measurements using single particle tracking such as near wall velocimetry techniques using quantum dots or other nanoparticles.

[1]This work was supported by the CRC Program of the National Science Foundation, Grant Numbers CHE-0209898 and CHE-0714028.

Shahram Pouya
Michigan State University

Date submitted: 03 Aug 2008 Electronic form version 1.4