Abstract Submitted
for the NEF14 Meeting of
The American Physical Society

Modeling magnetic nanoparticle biosensors DANIEL REEVES, Dartmouth College Physics, JOHN WEAVER, Dartmouth College Physics and Radiology — Magnetic nanoparticles have attracted attention as sensors for specific molecules. By choosing an appropriate coating for the particles, they specifically interact with another substance. If the substance of choice is found, the particles can bind to it and form clusters. In clumping, the ensemble rotational Brownian dynamics of the particles are changed drastically, and through magnetic spectroscopy, the change can be quantified. In this work, we show the high sensitivity that is possible using this scheme. Additionally, with stochastic Langevin equation simulations of the nanoparticle dynamics, we show how the increases in the characteristic timescales of the particles due to binding can be modeled using log-normal distributions for particle sizes.

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Date submitted: 03 Oct 2014 Electronic form version 1.4