Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Stochastic magnetization dynamics of biochemically bound magnetic nanoparticles DANIEL REEVES, Department of Physics and Astronomy, Dartmouth College , JOHN WEAVER, Department of Physics and Department of Radiology, Dartmouth College — Understanding the dynamics of magnetic nanoparticles in applied magnetic fields is critical for biosensing and therapeutic applications. In biological environments, the nanoparticles may clump together and the resultant dynamics are interesting and important. We show simulation schemes using stochastic Langevin equations that describe the particle rotations in various conditions and suggest ways to improve the applications. Biochemical binding is described in terms of changes of the size distribution from network theory perspective. Also, using log-normally size distributed particles, a master variable is derived that contains all the significant variables. This compacts the parameter space, quickens simulation, and improves intuition. An approximate closed form solution to the magnetization harmonics in an oscillating field is given in terms of this variable using the Langevin function.

Daniel Reeves
Dartmouth Coll

Date submitted: 10 Nov 2014 Electronic form version 1.4