Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Effect of dipolar nanoparticle interaction on transverse magnetic susceptibility: particle pair model[1] ELIZABETH PLOWMAN, Drexel University, ONDREJ HOVORKA, University of Southampton, GENNADY FRIEDMAN, Drexel University — Determining nanoparticle dipolar interactions from experimental measurement of magnetic moments is a classical inverse problem in magnetism. It is important in a variety of applications including magnetic information storage and Magnetic Particle Imaging (MPI). Historically, magnetic moment relaxation has been used to characterize system parameters including dipolar interactions. However, the results are sensitive to particle size distribution. We demonstrate that dipolar coupling strength in a nanoparticle-pair can be determined from transverse magnetic susceptibility, a readily measured parameter. Moreover, we demonstrate that this method is insensitive to particle size, rendering it more robust for real-world experiments. We present both analytical and numerical models for transient and steady-state transverse magnetic susceptibility and resulting interaction strength of our two-particle system. In the analytical model master equation is employed. The particles are assumed to be immobile and the set of possible states is discrete. In the numerical models both master equation and Landau-Lifshitz-Gilbert dynamics are employed. In these models random particle anisotropy directions are taken into account. The results of each model are compared.

[1]National Science Foundation GRFP

Elizabeth Plowman
Drexel University

Date submitted: 15 Nov 2013 Electronic form version 1.4