Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Transition rates for a Blume-Capel model coupled to a phonon bath KYUNGWHA PARK, Virginia Tech — In nanoscale systems ranging from semiconductor quantum dots to arrays of magnetic nanoparticles or nanoscale magnetic molecules, dynamic properties play a crucial role in understanding the underlying physics and in designing systems of interest for applications. Dynamic properties are highly sensitive to transition rates used, so it is crucial to use a physically correct stochastic dynamic to examine dynamic properties. However, spin Hamiltonians do not provide generic dynamics, so a dynamic should be determined from microscopic Hamiltonians. As the first step towards deriving a realistic spin dynamic of nanoscale systems, we consider the ferromagnetic S=1 Blume-Capel model on a square lattice in which each spin is weakly coupled to a d-dimensional phonon bath, and derive transition rates from a spin-phonon coupling Hamiltonian. Based on the derived transition rates, dynamical properties such as metastability and nucleation are studied in the low-temperature limit using kinetic Monte Carlo simulations. The properties obtained from the phonon-assisted transition rates are compared with those from the Glauber transition rate.

Kyungwha Park
Virginia Tech

Date submitted: 26 Nov 2007 Electronic form version 1.4