Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Monte Carlo Simulations of Random Frustrated Systems on Graphics Processing Units SHENG FENG, YE FANG, SEAN HALL, Louisiana State University, ARIANE PAPKE, University of Gottingen, CADE THOMASSON, KA-MING TAM, JUANA MORENO, MARK JARRELL, Louisiana State University — We study the implementation of the classical Monte Carlo simulation for random frustrated models using the multithreaded computing environment provided by the the Compute Unified Device Architecture (CUDA) on modern Graphics Processing Units (GPU) with hundreds of cores and high memory bandwidth. The key for optimizing the performance of the GPU computing is in the proper handling of the data structure. Utilizing the multi-spin coding, we obtain an efficient GPU implementation of the parallel tempering Monte Carlo simulation for the Edwards-Anderson spin glass model. In the typical simulations, we find over two thousand times of speed-up over the single threaded CPU implementation.

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Date submitted: 11 Nov 2011 Electronic form version 1.4