Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Finite-size scaling in frustrated Heisenberg models[1] SASHA CHERNYSHEV, STEVEN WHITE, UC Irvine — Numerical studies of the 2D frustrated antiferromagnets are hindered by the absence of large-scale quantum Monte Carlo methods and by large finite-size effects in other methods. Using the effective σ-model we demonstrate that the most significant finite-size effects can be eliminated by an appropriate choice of the cluster aspect ratio, allowing for much more precise estimates of observables already in small systems. We show that such a "magic" aspect ratio depends on the boundary conditions, with a simple and convenient choice being precisely the geometry optimal for the DMRG method. Combining the improved DMRG accuracy with the use of non-traditional clusters for rapidly converging finite-size scaling, we study the ordering in the square- and triangular-lattice Heisenberg models. We demonstrate the vanishing of the leading finite-size effect $\sim O(1/L)$ in the order parameter M for the sequence of clusters with the "magic" aspect ratio (L_x/L_y close to 2), in agreement with the effective σ-model. We determine the thermodynamic limit of M for the square lattice with an error comparable to quantum Monte Carlo. For the triangular lattice, we verify the existence of three-sublattice magnetic order, and estimate the order parameter to be $M = 0.205(15)$.

[1]Supported by the DOE (DE-FG02-04ER46174, S.C.) and NSF (DMR-0605444, S.W.)

Alexander Chernyshev
UC Irvine

Date submitted: 21 Nov 2008 Electronic form version 1.4