Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Influence of Boundary Conditions on the Critical Scaling of Finite Systems BENJAMIN VOLLMAYR-LEE, Bucknell University, ERIK LUIJTEN, University of Illinois — We investigate the influence of boundary conditions on the behavior of finite spin systems at criticality; in particular, a comparison is made between periodic boundary conditions and free boundary conditions. Via simulations, we find that the critical magnetization distribution of the short-range Ising model with free boundary conditions differs significantly from the periodic case. We also consider spin systems with long-range interactions $V \sim 1/r^{(d+\sigma)}$ where for $\sigma \leq 2$ the upper critical dimension is $d_c = 2\sigma$, which allows for accurate simulations for $d > d_c$ systems. Using analytic results from Brézin and Zinn-Justin for periodic boundary conditions, and generalizing the techniques developed by Rudnick, Gaspari, and Privman for free boundary conditions, we obtain explicit expressions for the scaling of the susceptibility and the shape of the magnetization and energy distributions at criticality. The numerical data exhibit excellent agreement with our analytic results, providing in most cases the first explicit test for these predictions.

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Date submitted: 19 Nov 2006 Electronic form version 1.4