Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Symmetry Breaking in Matrix-Product States[1] CHEN LIU, ANDERS SANDVIK, Boston University, YU-CHENG SU, YING-JER KAO, National Taiwan University — We consider matrix-product states for the transverse-field Ising chain of finite and infinite size N and small matrix sizes $D = 2 - 8$. The matrices are variationally optimized using several methods. For finite N, below the critical field, there are energy minimums for symmetric as well as symmetry-broken states. The energies cross at a field strength $h_c(N, D)$; thus the transition is first-order in this approximation. However, for $N \to \infty$ the transition is continuous for any D. We find that the asymptotic critical behavior is then always mean-field like (the magnetization exponent $\beta = 1/2$), but a window of the exactly known power-law scaling ($\beta = 1/8$) emerges as D increases. We point out that even if the energy is optimized to the level of double precision ($\approx 10^{-12}$ relative error) there is significant finite-size smoothing of the magnetization curve. Higher precision is required to access the asymptotic critical behavior.

[1]NSF DMR-0803510

Chen Liu
Boston University

Date submitted: 16 Nov 2009 Electronic form version 1.4