Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Valence-Bond Monte Carlo for Chains of Non-Abelian Quasiparticles HUAN TRAN, NICK BONESTEEL, Department of Physics and NHMFL, Florida State University — In non-Abelian FQH states, quasiparticles carry quantum numbers (topological charge) which characterize a degenerate Hilbert space. When these quasiparticles are close enough together, the degeneracy of this Hilbert space is lifted and the quasiparticles are said to interact.[1] Here we show that the valence-bond Monte Carlo method introduced by Sandvik[2] for spin-1/2 systems can be generalized to simulate 1D chains of such interacting non-Abelian quasiparticles. For uniform chains, our Monte Carlo results for the ground state energy agree with known exact values.[1] For random chains we confirm numerically that, as expected,[3] the ground state freezes into a random singlet phase. By suitably generalizing the notion of valence-bond entanglement entropy[4] to the non-Abelian case we also confirm the predicted result[3] that in this phase the entropy of a block of length L scales as $S_L^{\mathrm{VB}} \simeq \frac{\ln d}{3} \log_2 L$, where d is the quantum dimension of the quasiparticles. Work supported by US DOE.

[1] A. Feiguin *et al.*, PRL **98**, 160409 (2007).
[2] A. W. Sandvik, PRL **95**, 207203 (2005).
[3] N. E. Bonesteel and K. Yang, PRL **99**, 140405 (2007).
[4] F. Alet, *et al.*, PRL **99**, 117204 (2007); R. W. Chhajlany *et al.*, PRL **99**, 167204 (2007).

Huan Tran
Department of Physics and NHMFL
Florida State University
Tallahassee, FL 32310

Date submitted: 27 Nov 2007 Electronic form version 1.4