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Valence-Bond Monte Carlo Study of the 1D t-J Model JULIA WILDEBOER, NICHOLAS BONESTEEL, Dept. of Physics and NHMFL, Florida State University, ANDERS SANDVIK, Dept. of Physics, Boston University — We show that the valence-bond Monte Carlo (VBMC) method [1] can be applied to the one-dimensional t-J model. In this projector Monte Carlo approach, the ground state of the model is sampled directly from a generalized valence-bond basis consisting of states with fixed hole configurations and electron spins singlet correlated in pairs to form valence bonds. For $n < 0.6$, where n is the number of electrons per site, as J/t is increased from 0, the 1D t-J exhibits a quantum phase transition at which a spin-gap opens, followed by a transition to a phase separated state for large J/t [2]. Using VBMC, we calculate the valence-bond entanglement entropy [3] (roughly, the average number of valence bonds leaving a block of size L) as the system is tuned through the transition to the spin gap phase. [1] A. Sandvik, PRL 95, 207203 (2005). See, e.g., A. Moreno, A. Muramatsu, and S.R. Manmana, PRB 83, 205113 (2011). [3] F. Alet, S. Capponi, N. Laflorencie, and M. Mambrini, PRL 99, 117204 (2007).

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