Abstract Submitted
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Monte Carlo Study of Entanglement Scaling in Random S=1/2 Heisenberg Chains HUAN TRAN, NICHOLAS BONESTEEL, Dept. of Physics and NHMFL, Florida State University — We present the results of a quantum Monte Carlo study of the S=1/2 Heisenberg chain with random antiferromagnetic nearest-neighbor coupling. Using the method of ground state projection in the singlet-bond basis, recently introduced by Sandvik,[1] we are able to directly confirm the expected freezing of the ground state into a random singlet phase at long length scales, while at the same time exactly capturing the nonuniversal (i.e. detail dependent) short-range bond fluctuations. By computing the bond-length distribution in the random singlet phase we are then able to determine the mean entanglement entropy, S_N, associated with a segment of $N \gg 1$ spins, both by self-averaging over segments for a particular realization of disorder, and by averaging over many distinct realizations of disorder. Our results confirm the $S_N \simeq \frac{\ln 2}{3} \log_2 N$ scaling found by Refael and Moore using real space RG,[2] showing that the "effective central charge" of the critical random S=1/2 Heisenberg chain is $\tilde{c} = \ln 2$. Work supported by US DOE.

[1]A. Sandvik, PRL **95**, 207203 (2005).
[2]G. Refael and J. E. Moore, PRL **93**, 260602 (2004).

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