

Abstract Submitted  
for the MAR15 Meeting of  
The American Physical Society

**Reproducing the D-Wave Entanglement Results in Candidate Models** TAMEEM ALBASH, University of Southern California, ITAY HEN, FEDERICO SPEDALIERI, Information Science Institute, DANIEL LIDAR, University of Southern California — The demonstration of entanglement on the D-Wave devices [1] relies on the assumption that the populations derived from measurement correspond to energy eigenstate populations of the quantum Hamiltonian. We therefore ask whether leading model candidates for the D-Wave devices are able to reproduce this entanglement signature. We focus our work on a quantum adiabatic Markovian master equation (ME) [2] and a Monte Carlo rotor model (SSSV) [3]. We show that the ME reproduces both the energy spectrum and the thermal state populations of the quantum Hamiltonian extremely well, hence agreeing with the experimental results. SSSV on the other hand fails to reproduce either, a consequence of the absence of discrete energy states in this model.

[1] T. Lanting, A. J. Przybysz, A. Y. Smirnov, F. M. Spedalieri, M. H. Amin, A. J. Berkley, R. Harris, F. Altomare, S. Boixo, P. Bunyk, N. Dickson, C. Enderud, J. P. Hilton, E. Hoskinson, M. W. Johnson, E. Ladizinsky, N. Ladizinsky, R. Neufeld, T. Oh, I. Perminov, C. Rich, M. C. Thom, E. Tolkacheva, S. Uchaikin, A. B. Wilson, and G. Rose, *Physical Review X* 4, 021041 (2014).

[2] T. Albash, S. Boixo, D. A. Lidar, and P. Zanardi, *New J. of Phys.* 14, 123016 (2012).

[3] S. W. Shin, G. Smith, J. A. Smolin, and U. Vazirani, arXiv:1401.

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Date submitted: 14 Nov 2014

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