Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Does finite-temperature decoding deliver better optima for noisy Hamiltonians? ANDREW J. OCHOA, Department of Physics and Astronomy, Texas A&M University, KOHJI NISHIMURA, HIDETOSHI NISHIMORI, Department of Physics, Tokyo Institute of Technology, HELMUT G. KATZGRABER, Department of Physics and Astronomy, Texas A&M University — The minimization of an Ising spin-glass Hamiltonian is an NP-hard problem. Because many problems across disciplines can be mapped onto this class of Hamiltonian, novel efficient computing techniques are highly sought after. The recent development of quantum annealing machines promises to minimize these difficult problems more efficiently. However, the inherent noise found in these analog devices makes the minimization procedure difficult. While the machine might be working correctly, it might be minimizing a different Hamiltonian due to the inherent noise. This means that, in general, the ground-state configuration that correctly minimizes a noisy Hamiltonian might not minimize the noise-less Hamiltonian. Inspired by rigorous results that the energy of the noise-less ground-state configuration is equal to the expectation value of the energy of the noisy Hamiltonian at the (nonzero) Nishimori temperature [J. Phys. Soc. Jpn., 62, 40132930 (1993)], we numerically study the decoding probability of the original noise-less ground state with noisy Hamiltonians in two space dimensions, as well as the D-Wave Inc. Chimera topology. Our results suggest that thermal fluctuations might be beneficial during the optimization process in analog quantum annealing machines.

Andrew J. Ochoa
Department of Physics and Astronomy, Texas A&M University

Date submitted: 05 Nov 2015 Electronic form version 1.4