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Quantum Adiabatic Markovian Master Equations TAMEEM ALBASH, SERGIO BOIXO, DANIEL LIDAR, PAOLO ZANARDI, University of Southern California — We develop from first principles Markovian master equations suited for studying the time evolution of a system evolving adiabatically while coupled weakly to a thermal bath. We derive two sets of equations in the adiabatic limit, one using the rotating wave approximation that results in a master equation in Lindblad form, the other without the rotating wave approximation but not in Lindblad form. We use our formalism to study the evolution of Ising spin Hamiltonians and compare to experimental results from the D-Wave One Rainier chip. In particular, we study an Ising Hamiltonian that gives markedly different predictions for the ground state spectrum when solved using classical thermal annealing versus quantum annealing, and our master equations give qualitatively consistent results with the results of the D-Wave chip.

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