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Ground state problem of frustrated spin systems due to quantum annealing using the transverse interaction¹ YOHEI SAIKA, Wakayama National College of Technology, JUN-ICHI INOUE, Hokkaido University — We investigate the performance of quantum annealing (QA)/quantum adiabatic evolution (QAE) using the transverse interaction for the ground state problem of frustrated spin systems. As a first example, by solving the Schrodinger equation for a small size system which has the degenerate ground states of the target system, we find that the QA/QAE selectively obtain the optimal solution among the degenerate classical ground states, if we assume the kinetic energy appropriately. Then, we also investigate the ground states of the quantum annealing system composed of the frustrated spin system whose ground state has the macroscopic degeneracy in the thermodynamic limit. The spin wave approximation finds that one ordered state becomes stable among the degeneracy in the ground states of the target system, if we introduce the appropriate kinetic energy term into the quantum annealing system, such as the transverse interaction. These results suggest that the QA/QAE can selectively obtain the ground state if we assume appropriate models of the kinetic energy term.

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