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Quantum annealing for the ground state problem via exactly solvable models[1] YOHEI SAIKA, Wakayama National College of Technology, JUNICHI INOUE, Graduate School of Information Science & Technology, Hokkaido University — In this study, in order to clarify the efficiency of quantum annealing for optimization, we study the ground state problem using solvable spin systems, such as the spin 1/2 quantum Ising-XY chain under the Lorentzian field. First, we exactly estimate static properties, such as the ground state energy and the energy gap. We find that the ground state energy depends on the selection of the control field, although the ground state energy is same if the control field vanishes respectively. We also find that the energy gap between the ground state and the first excited state is inversely proportional to the system size and becomes zero in the thermodynamic limit. Also, via the numerical simulation on the Schrodinger equation, we clarify that the quantum annealing using various control fields, such as the transverse field, the ferromagnetic Ising interaction, is available of the ground state problem not also for the spin 1/2 quantum Ising-XY chain and also for the random field Ising model.

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Yohei Saika
Wakayama National College of Technology

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