

Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Sorting Category: 23. (T)

Quantum annealing for the ground state problem via exactly solvable models¹ YOHEI SAIKA, Wakayama National College of Technology, JUN-ICHI 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.

¹We were financially supported by Grant-in-Aid Scientific Research on Priority Areas “Deepening and Expansion of Statistical Mechanical Informatics (DEX-SMI)” of The Ministry of Education, Culture, Sports, Science and Technology (MEXT) No. 18079001.

Prefer Oral Session
 Prefer Poster Session

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Date submitted: 01 Dec 2008

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