Day 4 (Poster F)

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Title: Dissipation effects on fidelity and entanglement in quantum annealing at finite temperature

Abstract:
Quantum annealing can be used to solve combinatorial optimization problems. Starting from a system whose ground state is trivial，the ground state changes into a nontrivial ground state of the system to be solved through an adiabatic process. Some quantum computers，such as D-wave，can perform quantum annealing，but it involves finite temperature fluctuations even at very low temperatures. In the present study，we investigated how fidelity and entanglement depend on this fluctuation at finite temperatures. Our studies were based on a theoretical approach and numerical simulations using the dissipative von Neumann equation for typical spin systems including spin interactions and random matrix models (non-interacting model). Here we assumed that the relation between the temperature and dissipative ratio can be described by the fluctuation-dissipation theorem. Then how the fidelity depends on the parameter alpha = (dissipative ratio)/(temperature) shows how the annealing process is diffused by the dissipative noise at a finite temperature. As a result，for non-interacting models，the fidelity decreases with increasing alpha. However，it is suggested that the fidelity shows an asymptotic value for each temperature with increasing alpha for interacting models. This result supports the robustness of many-body systems. We also report the behavior of entanglements.