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Quantum spin glass and Sourlas codes JUN-ICHI INOUE, Graduate School of Information Science and Technology, Hokkaido University, Japan — Quantum version of Sourlas error-correcting codes are investigated from statistical mechanical point of view. Our problems are equivalent to those of quantum Ising spin glasses with p-body interactions. According to Ruján, we assume that information of the correct bits should be obtained from the equilibrium states of the Hamiltonian and the performance of the decoding results is estimated by the overlap between the original information bit and the sign of the local magnetization. We introduce the transverse field as a quantum fluctuation into the Hamiltonian and adjust this to the optimal value so that the overlap takes its maximum. At low temperature and small transverse field, we find analytically that the retrieval quality is dramatically improved. This analytical results are supported by quantum Monte Carlo simulations.

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