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A Fault-Tolerant Scheme of Holonomic Quantum Computation on Stabilizer Codes with Robustness to Low-weight Thermal Noise[1] YICONG ZHENG, TODD BRUN, Univ of Southern California, USC QIP TEAM — We show an equivalence relation between fault-tolerant circuits for a stabilizer code and fault-tolerant adiabatic processes for holonomic quantum computation (HQC), in the case where quantum information is encoded in the degenerated ground space of the system Hamiltonian. By this equivalence, we can systematically construct a fault-tolerant HQC scheme, which can geometrically implement a universal set of encoded quantum gates by adiabatically deforming the system Hamiltonian. During this process, quantum information is protected from thermal excitation by an energy gap that does not change with the problem size.

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