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Universal Adiabatic Quantum Computing using Double Quantum Dot Charge Qubits CIARAN RYAN-ANDERSON, Univ of New Mexico; Sandia National Laboritories, N. TOBIAS JACOBSON, ANDREW LANDAHL, Sandia National Laboritories — Adiabatic quantum computation (AQC) provides one path to achieving universal quantum computing in experiment. Computation in the AQC model occurs by starting with an easy to prepare groundstate of some simple Hamiltonian and then adiabatically evolving the Hamiltonian to obtain the groundstate of a final, more complex Hamiltonian. It has been shown that the circuit model can be mapped to AQC Hamiltonians and, thus, AQC can be made universal. Further, these Hamiltonians can be made planar and two-local. We propose using double quantum dot charge qubits (DQDs) to implement such universal AQC Hamiltonians. However, the geometry and restricted set of interactions of DQDs make the application of even these 2-local planar Hamiltonians non-trivial. We present a construction tailored to DQDs to overcome the geometric and interaction contraints and allow for universal AQC. These constraints are dealt with in this construction by making use of perturbation gadgets, which introduce ancillary qubits to mediate interactions. Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

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