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Deterministic Random-Length Computation with Weakly Entangled Cluster States ADAM G. D'SOUZA, DAVID L. FEDER, Institute for Quantum Information Science, University of Calgary — Universal quantum computation can be accomplished via single-qubit measurements on a highly entangled resource state, together with classical feedforward of the measurement results. The best-known example of such a resource state is the cluster state, on which judiciously chosen single-qubit measurements can be used to simulate an arbitrary quantum circuit with a number of measurements that is linear in the number of gates. We examine the power of the orbit of the cluster states under GL(2,C), also known as the SLOCC equivalence class of the cluster state, as a resource for deterministic universal computation. We find that, under certain circumstances, these states do indeed constitute resources for such computations, but of random length.

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