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Generating Pseudo-Random Quantum States with Cluster Computation[1] WINTON G. BROWN, Dartmouth College, YAAKOV S. WEINSTEIN, The MITRE Corporation, LORENZA VIOLA, Dartmouth College — We revisit existing algorithms for generating pseudo-random pure quantum states in the light of cluster-state quantum computation. Reformulation of previous network-based algorithms in terms of appropriate measurement patterns suggests a (nearly) optimal distribution of local single-qubit gates, which results in a significant improvement in the asymptotic rate of purity decay. Surprisingly, this distribution is not the one corresponding to arbitrary random single qubit rotations. We find that the rate at which the expected purity approaches the prediction based on the Haar measure is asymptotically constant with respect to the number of logical qubits. Connectivity of the underlying qubit coupling topology as well as the occurrence of saturation and cut-off effects are analyzed.

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