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Scalable Quantum Networks based on Few-Qubit Registers LIANG JIANG, Department of Physics, Harvard University, JACOB TAYLOR, Departement of Physics, Massachusetts Institute of Technology, ANDERS SORENSEN, The Niels Bohr Institute, University of Copenhagen, MIKHAIL LUKIN, Departement of Physics, Harvard University — We describe and analyze a hybrid approach to scalable quantum computation that is based on probabilistically connected optical network consisting of few-qubit quantum registers. We show that, in principle, two-qubit quantum registers, connected by probabilistic entanglement generation, suffice for scalable, deterministic quantum computation. We then show that with additional three qubits per register, robust non-local quantum operations can be implemented, even when state preparation, measurement, and entanglement generation all have limited fidelity. Finally, we discuss error thresholds relevant for scalability of our approach by mapping it to a general network error model.

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