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*Efficient Quantum Algorithms for Simulating Lindblad Evolution*

The Lindblad equation is the natural generalization to open systems of the Schroedinger equation. We give a quantum algorithm for simulating the evolution of an  $n$ -qubit system for time  $T$  under the Lindblad equation with local terms. The gate cost of the algorithm is optimal within polylogarithmic factors. A key component of our algorithm is a new "linear combinations of unitaries" construction that pertains to channels which we believe is of independent interest. This is joint work with Chunhao Wang.