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Simulating the time-dependent Schrödinger equation with a quantum lattice-gas algorithm[1] ZACHARY PREZKUTA, MARK COFFEY, Department of Physics, Colorado School of Mines — Quantum computing algorithms promise remarkable improvements in speed or memory for certain applications. Currently, the Type II (or hybrid) quantum computer is the most feasible to build. This consists of a large number of small Type I (pure) quantum computers that compute with quantum logic, but communicate with nearest neighbors in a classical way. The arrangement thus formed is suitable for computations that execute a quantum lattice gas algorithm (QLGA). We report QLGA simulations for both the linear and nonlinear time-dependent Schrödinger equation. These evidence the stable, efficient, and at least second order convergent properties of the algorithm. The simulation capability provides a computational tool for applications in nonlinear optics, superconducting and superfluid materials, Bose-Einstein condensates, and elsewhere.

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