Abstract Submitted
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High-fidelity universal quantum gates through quantum interference FRANK GAITAN, Southern Illinois University, RAN LI — Numerical simulation results are presented which suggest that a class of non-adiabatic rapid passage sweeps first realized experimentally in 1991, and which give rise to controllable quantum interference effects observed in 2003 using NMR, should be capable of implementing a universal set of quantum gates $\mathcal{G}$ that operate with high-fidelity. $\mathcal{G}$ consists of the Hadamard and NOT gates, together with variants of the phase, $\pi/8$, and controlled-phase gates. Sweep parameter values are provided which simulations indicate will produce the different gates in $\mathcal{G}$, and for each gate, yield an error probability $P_e < 10^{-4}$. These simulations suggest that the universal gate set produced by these rapid passage sweeps show promise as possible elements of a fault-tolerant scheme for quantum computing. We discuss current challenges facing experimental implementation of this approach to universal quantum computing.

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