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Rotation Gates with Controlled Adiabatic Evolutions in Open Systems (Article)

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Abstract

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Single quantum rotation gates can be perfectly implemented in a closed system using the controlled adiabatic evolutions process proposed by Itay Hen that may lead to build some quantum circuit blocks [Phys. Rev. A, 022309 (2015)]. These adiabatic evolutions yield to vanishing geometric phases. In this work, we extended Itay's work by considering a more realistic model where the qubits are subjected to decoherence effects during the adiabatic evolution process. We demonstrate that, in the case of an open system, the decoherence leads to nonvanishing geometric phases and drastically reduces the performance of the quantum rotation gates bellow the fidelity target (0.999).

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