Rotation Gates with Controlled Adiabatic Evolutions in Open Systems

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OPEN SYSTEMS & INFORMATION DYNAMICS
Volume: 25 Issue: 3
Article Number: 1850013
DOI: 10.1142/S1230161218500130
Published: SEP 2018
Document Type: Article

Abstract

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, 022303 (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 below the fidelity target (0.999).

Keywords

Author Keywords: Single quantum rotation gates; controlled adiabatic evolutions; geometric phases; open system; decoherence

KeyWords Plus: QUANTUM; PASSAGE

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Funding

<table>
<thead>
<tr>
<th>Funding Agency</th>
<th>Grant Number</th>
</tr>
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<tbody>
<tr>
<td>Sheikh Thani Bin Abdullah Foundation</td>
<td></td>
</tr>
<tr>
<td>Humanitarian Services (RAF)</td>
<td></td>
</tr>
</tbody>
</table>

Publisher

WORLD SCIENTIFIC PUBL CO PTE LTD, 5 TOH TUCK LINK, SINGAPORE 596224, SINGAPORE

Journal Information

Impact Factor: Journal Citation Reports

Categories / Classification

Research Areas: Physics; Mathematics

Web of Science Categories: Physics, Mathematical; Statistics & Probability

Citation Network

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