Enhancing charging of a quantum battery using directional quantum jumps

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There is an increasing interest in research of quantum energy storage systems, known as quantum batteries (QBs) [1,2]. QBs are described as n-dimensional quantum systems with non-degenerate energy levels from which work can be reversibly extracted and energy can be reversibly deposited using cyclic unitary operations [3]. Quantum batteries have received a lot of attention because their charging time decreases with their capacity. One of the most crucial issues in QB design is optimizing the battery's charging process. Dissipation, a negative phenomenon that exists in all physical systems, must be considered during the optimization process.

Here we explore a potential of directional quantum jumps for improving QB's charging process. We present a system in which quantum jumps can improve charging time and charge level [4]. A two-stage charging protocol has been developed to achieve very good results for battery time and charge level while maintaining optimal and realistic parameters. The scheme we propose should be feasible experimentally.

References

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