Implementation of one-qubit holonomic rotation gate by adiabatic passage

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Abstract
We propose a robust scheme, using tripod stimulated Raman adiabatic passage, to generate one-qubit rotation gate. In this scheme, a four-level atom interacts with three resonant laser pulses and time evolution of the corresponding coherent system is designed such that the rotation gate is implemented at the end of process. Rotation angle in this gate is holonomic and has a geometrical basis in the parameter space. We also explore the effect of spontaneous emission on the population transfer with numerical solution of Schrödinger and Liouville equations.

Keywords: One-qubit rotation gate, tripod-STIRAP, geometrical phase, spontaneous emission

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