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A Scheme of Conditional Quantum Phase Gate for Dissipative Cavity QED System

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Abstract: We propose a scheme to implement a two-qubit conditional quantum phase gate via a single mode cavity and a cascade four-level atom assisted by a classical laser. The quantum information is encoded on the Fock states of the cavity mode and the two metastable ground states of the atom. Even under the condition of systematic dissipations, this scheme can also be realized with fidelity of 98.6% and success probability of 0.767.

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Key words: quantum phase gate, single cavity mode, cascade four-level atom, dissipation, fidelity

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