

Abstract Submitted
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Study of two-photon deterministic, passive quantum logical gates

JULIO GEA-BANACLOCHE, University of Arkansas, LENO PEDROTTI, University of Dayton — We use a “modes of the universe” approach to study a cavity-mediated two-photon logical gate recently proposed by Koshino, Ishizaka and Nakamura [Phys. Rev. A 82, 010301(R) (2010)]. This is the first conceptually feasible deterministic and passive (i.e., requiring no external auxiliary fields) two-photon gate enabling universal quantum computation. We show that the gate can work both in the good and bad cavity limits, provided only that the single-photon pulses are long enough. We derive analytical estimates for the size and scaling of the various error terms, including the effect of unequal atomic transition frequencies. Our formalism also allows us to follow the spectral evolution of the field + cavity system in the course of the interaction.

Julio Gea-Banacloche
University of Arkansas

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