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Dynamical Properties of Two Coupled Dissipative QED Cavities Driven by Coherent Fields

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Abstract: When two identical QED cavities driven by the coherent fields are located in a uniform environment, in addition to dissipation, there appears an indirect coupling between the two cavities induced by the background fields. We investigate the effects of the coherent fields, the dissipation as well as the incoherent coupling on the following dynamical properties of the system: photon transfer, reversible decoherence, and quantum state transfer, etc. We find that the photons in the cavities do not leak completely into the environment due to the collective coupling between the cavities and the enviroment, and the photons are transferred irreversibly from the cavity with more photons to the cavity with less ones due to the incoherent coupling so that they are equally distributed among the two cavities. The coherent field pumping on the two cavities increases the mean photons, complements the revived magnitude of the reversible decoherence, but hinders the quantum state transfer between the two cavities. The above phenomena may find applications in quantum communication and other basic fields.

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Key words: photon transfer, reversible decoherence, quantum state transfer, algebraic dynamical method, two coupled dissipative QED cavities driven by coherent fields

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