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Positivity of open quantum systems with coherent transition in non-thermal bath SHENG-WEN LI, MOOCHAN KIM, MARLAN SCULLY, Texas AM University — Thermal equilibrium is an idealistic model in theoretical physics. Indeed most baths in daily life are non-thermal ones. When we study a realistic biological system exchanging energy with its non-thermal bath around, it is essential to consider the effects caused by such non-thermal baths, especially when the quantum system has coherent transitions (Agarwal-Fano interference). Due the presence of the coherent transition, the density matrix of the system may have negative probabilities during the evolution, which indicates the invalidity of the Markovian master equation we often used, even when the system-bath coupling strength is quite weak. Especially, when the bath is very far from equilibrium, this negative probability problem becomes much more serious. Fortunately, we find that if we consider some non-Markovian correction to the decay rates, the negative probability problem could be resolved.

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