Dynamics of a quantum interacting system - Global approach extended beyond the Born-Markov and secular approximations-

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Open quantum interacting systems are prototypical in various fields such as quantum optics, quantum transport and quantum thermodynamics. The role of interaction between the subsystems in obtaining a master equation has been repeatedly discussed to describe a reasonable stationary state for the total relevant system [1-4]. A recent study on quantum thermodynamics[5] showing the necessity of the interaction to keep the thermodynamics 2nd law attracts renewed interest, called the global approach. However, the approach has been frequently discussed under the Born-Markov and secular approximations.

In this presentation, we show how the choices of the following points in deriving master equations affect the dynamics :

(1) interaction between the subsystems (global or local approach),

(2) the rapid oscillating terms in the dissipator (with or without the secular approximation),

(3) the finiteness of the correlation time of the environmental system (with or without Born-Markov approximation),

taking a model of energy transport under a local dissipation[6].

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