Partial linearized density matrix dynamics for dissipative, non-adiabatic quantum evolution

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An approach for treating dissipative, non-adiabatic quantum dynamics in general model systems at finite temperature based on linearizing the density matrix evolution in the forward-backward path difference for the environment degrees of freedom is presented. We demonstrate that the approach can capture both short time coherent quantum dynamics and long time thermal equilibration in an application to excitation energy transfer in a model photosynthetic light harvesting complex. The performance of the approach is also explored for a number of multidimensional multi-state model non-adiabatic relaxation problems.