Reduced Hierarchy Equations of Motion Approach to Open Quantum Dynamics

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http://theochem.kuchem.kyoto-u.ac.jp/members/tanimura.htm

In this course of lectures, I will teach the essence of quantum dissipative dynamics using the PowerPoint lecture note "Reduced hierarchy equations of motion" available at the above WWW site. I will first introduce a system-bath model to explain how fluctuation and dissipation as well as irreversibility of the system arises from the environment, and the concept will be illustrated with some examples from chemistry and biology. I then explain the path integral formalism using the lecture notes "Learn Schrödinger, Dirac & Feynman formalisms in 90 minutes" available at the same WWW site. The quantum master, Redfield, and Fokker-Planck equations will be derived from a standard perturbative expansion approach with the use of the interaction picture. We then treat the same system on the basis of the path integral formalism to derive the Feynman-Vernon influence functional. The Fokker-Planck equations will be derived from this in hierarchy. The derived hierarchy equations can deal with strong system-bath coupling and non-Markovian noise. Various applications of the hierarchy equation of motion approach, including linear and nonlinear spectroscopies, electron transfer, photo dissociation, chemical reactions, quantum tunneling, and quantum information problems will also be discussed.

REFERENCES (Open Access; the related pdf see http://theochem.kuchem.kyoto-u.ac.-jp/public/)

Y. Tanimura, J. Phys. Soc. Jpn, 75, 082001 (2006).

Y. Tanimura, J. Chem. Phys. 141, 044114 (2014); 142, 144110 (2015)

CONTENTS (about two sections per lecture)

地点: 北大化学学院 A717

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5月13日 – 5月15日 （3:00pm–5:00pm）