

Open Quantum Systems out of Equilibrium

Content

- Classical Master equation: time evolution of probabilities
- Reduced density matrix of an open system, time evolution,
- (Approximate) elimination of environment:
(Pauli) Master equation, Lindblad equation, simple applications
- Properties and Microscopic derivation
- Solution methods:
 - Exact/analytical solution of small systems
 - Equations of motion
 - Stochastic wave function approaches
 - Noninteracting fermions
- Examples and applications:
qubits, electron transport, quantum dots,
decoherence and quantum measurements, optical cavities.
- Relation with nonequilibrium Green's functions

Literature

You can borrow most of these books from in our institute library

- G. Schaller, *Open Quantum Systems Far From Equilibrium*,
Lecture Notes in Physics, Springer
- H.-P. Breuer and F. Petruccione, *The Theory of Open Quantum Systems*, (Oxford University Press, 2009)
- C. W. Gardiner and P. Zoller, *Quantum Noise*
Springer series in Synergetics (Springer)
- H. J. Carmichael, *Statistical Methods in Quantum Optics: Master Equations and Fokker-Planck Equations*,
Vol. 1 of Texts and monographs in physics (Springer).
- C. Cohen-Tannoudji, J. Dupont-Roc, G. Grynberg, *Atom-Photon Interactions: Basic Processes and Applications* (Wiley-VCH, 2004)
- E. Arrigoni and A. Dorda. *Master Equations Versus Keldysh Green's Functions for Correlated Quantum Systems Out of Equilibrium*, pages 121-188. Springer International Publishing, Cham, 2018.