Joint CQSE and CASTS Seminar

Weekly Seminar
Nov. 25, 2016 (Friday)

TIME Nov. 25, 2016, 14:30 ~ 15:30
TITLE Non-Markovian dynamics of two-time correlation functions
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Abstract

Recently, a general theory [1] of non-Markovian dynamics is developed for open quantum systems of bosons (fermions) interacting with a general bosonic (fermionic) environment, where exact dynamics of the open system is explored through the nonequilibrium Green's functions (two-time correlation functions) which account for all the information of non Markovian back-action memory effects. Using this approach, we examined [2] the non-Markovian noise power spectrum obtained through the Fourier transform of the exact two time correlation function for a resonator system coupled to an electromagnetic reservoir characterized by a low frequency 1/f noise at finite temperature. We then investigated [3] the transient dynamics of photon statistics through two-time correlation function g2 for optical fields. We find that the transient correlations at different time yield a smooth transition from antibunching to bunching photon statistics in the weak system-environment coupling regime. In the strong-coupling regime, the two-time correlations exhibit bunching antibunching oscillations that persists both in the transient process and in the steady-state limit. The photon bunching-antibunching oscillations is a manifestation of strong non-Markovian dynamics, where the system remains in nonequilibrium from its environment. We have also introduced [4] a non Markovianity measure using two-time correlation functions which shows interesting short-time and long-time behaviors depending upon the properties of the system and reservoir. Such a non-Markovianity can be directly measured in experiments since two-time correlation functions are experimentally measurable.

[1] W. M. Zhang, P.-Y. Lo, H.-N. Xiong, M. W.-Y. Tu, F. Nori, Phys. Rev. Lett. **109**, 170402 (2012).
[2] Md. Manirul Ali, Ping-Yuan Lo, Wei-Min Zhang, New. J. Phys. **16**, 103010 (2014).
[3] Md. Manirul Ali, Wei-Min Zhang, submitted to Phys. Rev. A (arXiv: 1606.02397).
[4] Md. Manirul Ali, Ping-Yuan Lo, Matisse Wei-Yuan Tu, Wei-Min Zhang, Phys. Rev. A **92**, 062306 (2015).