Contribution ID: **108** Type: **oral**

Path integral formalism of quantum thermodynamics

Tuesday, September 5, 2017 11:50 AM (20 minutes)

Path integral formalism of quantum mechanics and quantum field theory has greatly influenced the theoretical developments of physics. For example, a path integral description of open quantum systems has been used to study the dissipative dynamics of the quantum systems, known as the Caldeira-Leggett model of the quantum Brownian motion. Studies of thermodynamics in the dissipative quantum systems have attracted renewed interest quite recently, owing to the experimental verification of the nonequilibrium equalities and the experimental implementation of quantum information heat engines.

In this presentation, we develop a formalism for quantum thermodynamics based on path integral methods. This may give new insights and understandings about the work and heat in quantum systems. In doing so, we use the Caldeira-Leggett model and study the work and heat statistics. This allows us to study the non-Markov, non-rotating wave, strong coupling regime without making any approximations. Using the path integral method, we have derived the quantum work and heat functionals depending on the path integral trajectories of the system. Taking the semi-classical limit, we proved analytically the convergence of the work and heat functionals (and thus their statistics) to their classical counterparts.

Primary author: FUNO, Ken (Peking University)

Presenter: FUNO, Ken (Peking University)

Session Classification: Session 5