Quantum Monte-Carlo for Non-Markovian dynamics

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In fusion and fission processes, the reorganization of nucleons is fast with respect to the evolution of their relative distance and leads to dissipation in the motion of the nucleus. Thus, the internal degrees of freedom of the nucleus act as an environment which couples to the dynamics of the nucleus. One of the challenges in such an Open Quantum System is to incorporate non-Markovian effects in a correct way [1]. Recently, our group has revisited this issue and proposed a new method based on an exact Stochastic Mean-Field reformulation of the original problem [2,3]. The Mean-Field approach allows to use a Monte-Carlo sampling as compared to earlier approches where diverging paths appear. The connection between this new theory and Feynman influence functional theory will be discussed. The method will first be illustrated in the Caldeira-Leggett model [3], and then in the more realistic case of fission, where the effect of dissipation on barrier transmission will be discussed.

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