



Quantum multi-time probabilities: non-Markovianity and non-classicality

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More than a century after the birth of quantum theory, the question of which properties and phenomena are fundamentally quantum – i.e., they cannot be reproduced by any classical theory -- remains under active investigation. In this talk, I will discuss to what extent non-classicality can be linked to specific features of open quantum systems undergoing sequential measurements at different times.

I will first recall the general definition of multi-time correlators in open quantum systems, as well as the Kolmogorov consistency conditions that characterize classical stochastic processes.

I will then review some recent results that connect non-classicality to the dynamics of, respectively, quantum coherences or quantum correlations, depending on the Markovian or non-Markovian nature of the process under investigation.

Finally, I will briefly discuss how the multi-time correlators of an open quantum systems can be connected in a non-perturbative way to the global system-environment Hamiltonian, thus ensuring a comprehensive microscopic description under general dynamical regimes.

