

Open Talk

7th February 2018

12:00 PM

Fermion Hall

Speaker :

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Affiliation:

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TITLE:

"Non-Markovianity of qubit evolution under the action of spin environment"

ABSTRACT:

Any open system dynamics is fundamentally characterized by the Markovianity or non-Markovianity of the system dynamics i.e. whether or not, there is any feedback of information into the system from the environment that has been previously transferred from the system. In order to investigate what essential feature in the system-environment interaction gives rise to non-Markovianity, we consider a toy model: a qubit system in contact with an environment of non-interacting qubits. We let the system interact with each environment qubit through a simple exchange of energy quanta. The complete interaction Hamiltonian is the sum of all these exchange interactions coupled with suitable coupling strengths. Following the idea of Rivas et al., we devise a non-Markovianity Witness for the model. We attach an ancilla qubit (which is not a part of the environment) to the system and set the joint system-ancilla initial state to a maximally entangled state. Departure from monotonicity, of decay of entanglement between system and ancilla is seen as a witness of non-Markovianity. We examine the system-environment dynamics of our model for a large class of couplings between system and individual environment qubits. We find that any form of time-independent or time-polynomial-space-independent coupling gives rise to non-Markovianity. Also, we witness non-Markovianity for certain parameter values of time-exponential-space-independent coupling, where the parameter in the coupling factor determines the rapidity of exponential decay. Moreover, we analyse some special cases of space-dependent-time-dependent coupling and find extremal values of the coupling parameter that gives rise to non-Markovianity. These extremal values represent transition values from fully non-Markovian to possibly Markovian dynamics.