Heinz-Peter Breuer

(Universität Freiburg)

Memory and Information Flow in the Dynamics of Open Quantum Systems

In complex quantum systems one often encounters dynamical processes which deviate not only quantitatively but also qualitatively from the relatively simple behavior predicted by a Markovian time evolution. In view of the large variety of conceptually different methods that have been developed to treat non-Markovian systems in recent years, the following questions arise: How can one rigorously define quantum non-Markovianity and how can one quantify the degree of non-Markovian behavior in a way which does not refer to any specific mathematical representation or approximation of the dynamics? Here, we construct a measure for the degree of non-Markovian behavior in open quantum systems. The measure is based on the trace distance between quantum states which quantifies the distinguishability of these states, and can be interpreted in terms of the information flow between the open system and its environment. The measure takes on nonzero values whenever there is a flow of information from the environment back to the open system, which expresses the presence of memory effects and thus represents the key feature of non-Markovian dynamics.

19. November 2010, 15:30 Uhr

Universität Ulm, Raum N24/252
Albert-Einstein-Allee 11, 89081 Ulm

CO.CO.MAT