SFB/TRR 21 - Seminar
19. Mai 2009, Ulm

Cecilia Cormick
(University of Buenos Aires)

Studying entanglement dynamics in an ion trap

The evolution of the entanglement between two oscillators coupled with a common environment is non-trivial and has been extensively studied (Phys. Rev. Lett. 100, 220401). The long time limit exhibits qualitatively different behaviors (phases) depending on parameters such as the initial state and the temperature of the bath. The possible phases include cases where entanglement suffers from sudden death, others with infinite sequence of events of sudden death and revivals, or non-vanishing long-term entanglement. In this talk I will describe a simple way of realizing and observing these different scenarios in an ion trap experiment. The proposal involves three ions in a linear trap. The longitudinal degrees of freedom of two of them are used to realize the two oscillators while the central ion, subject to continuous laser cooling, is the gateway to a decohering reservoir. The scheme proposed is another instance of a quantum simulator that seems to be realizable with current technology. The simulation is an example of an interesting class which involves the observation and control of the evolution of quantum open systems in the non-Markovian regime.

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Universität Ulm, Raum N24 / 227
Albert-Einstein-Allee 11, 89081 Ulm

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