SFB/TRR 21 - Seminar

22. September 2011, Ulm

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Linear entanglement entropy and characterisation of quantum simulators for spin and lattice models

The simulation of quantum many body systems in quantum simulators has many advantages over classical simulations. These simulators use controllable quantum systems such as trapped ions or cold atoms in optical lattices to simulate more complicated systems. The difficulty in simulating a quantum system in a classical computer arises when the studied system contains a large amount of entanglement. Here we numerically study the amount of bipartite entanglement in three one-dimensional quantum systems using entanglement entropy. Using linear entanglement entropy and second order Rényi entropy we propose a scheme for the direct estimation of entanglement entropy in an experiment. The focus lies on time dependent calculations and a discussion of entanglement entropy near quantum phase transitions. The calculations are made using time evolving block decimation (TEBD) methods.

22. September 2011, 11:00 Uhr

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