Contribution ID: **23** Type: **talk**

Wormhole quantum Monte Carlo for quantum dissipative spin systems

Tuesday 21 January 2025 16:15 (45 minutes)

The phases and phase transitions of low-dimensional quantum magnets are often described using simple quantum spin models. It is an open question how the properties of these systems are affected by a coupling to the environment, which is always present in any experimental realization. One of the simplest setups for such an open quantum system is the spin-boson model where a single spin is coupled to a bosonic bath with a continuous spectrum. In this talk, I will show how spin-bath interactions can be simulated efficiently within the directed-loop and worm algorithms using retarded interactions. To this end, I will introduce the novel wormhole updates which allow for nonlocal moves through a world-line configuration. The novel wormhole updates give access to a new class of retarded spin-flip interactions relevant for the description of quantum dissipative systems and light-matter coupling. I will demonstrate this algorithm using two examples: First, I will discuss an SU(2)-symmetric spin-boson model which exhibits a fixed-point annihilation that can be tracked numerically and gives rise to a plethora of critical and pseudocritical phenomena. Moreover, I will present work on the quantum Heisenberg chain where the local coupling to an ohmic bath stabilizes long-range antiferromagnetic order beyond the Mermin-Wagner theorem.

Author: WEBER, Manuel (TUDresden)

Presenter: WEBER, Manuel (TUDresden)

Session Classification: Tuesday afternoon