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Transport Properties in Open Spin-1/2 Chains using Matrix Product States

In this talk we review our latest results on the boundary-driven XXZ model obtained using Matrix Product State simulations.
The out-of-equilibrium setting has been typically achieved by coupling the system to different Markovian reservoirs. This system has been studied both in the linear response regime close to infinite temperature, as well as far from equilibrium – both these cases display different phase transitions. We attempt to unify these previous results by providing new insights on the phase diagram of this model, by characterizing the transitions between the ballistic, diffusive, and insulating phases.
As an alternative, we present a different setting to study transport, based on the microscopic description of the reservoir. This structured environment presents novel emergent phenomena and non-Markovian properties. We then investigate the different transport regimes and provide evidence of a genuine out-of-equilibrium phase transition.

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