THEORETISCH PHYSIKALISCHES KOLLOQUIUM

Donnerstag, den 10.05.2012

Es spricht:
Prof. Tomaz Prosen
University of Ljubljana, Slovenia

zum Thema:
" Non-equilibrium steady states of boundary-driven open quantum chains "

Abstract
We will discuss a general non-equilibrium setup by which one can approach the quantum transport problem in one dimension. One considers a strongly interacting quantum chain with fully coherent bulk dynamics and driven out of equilibrium in terms of Lindblad dissipators which only act on degrees of freedom near the boundary, i.e. at the ends of the chain. Non-equilibrium state carrying the physical currents is then approximated as the steady state of the corresponding Markovian master equation.

In this talk I will describe several interesting results which have recently been obtained along these lines. Firstly, using numerical methods inspired by the density matrix renormalization group, one can - quite remarkably - find examples of diffusive transport in clean, and even Bethe-ansatz integrable, strongly interacting systems (at high-temperature near-equilibrium conditions), such as the Heisenberg XXZ spin 1/2 chain and the one-dimensional fermionic Hubbard model.

Secondly, under far from equilibrium conditions, one can find several exact analytical solutions which describe steady states with anomalous transport properties. For example, in the Heisenberg XXZ chain under extreme boundary driving we show that the steady-state density operator of a finite system of size n is - apart from a normalization constant - a polynomial of degree 2n-2 in the coupling constant. In the isotropic case we find cosine spin profiles, $1/n^2$ scaling of the spin current, and long-range correlations in the steady state. Furthermore, the perturbative (weak coupling) version of our ansatz [Phys. Rev. Lett. 106, 217206 (2011)] is used to derive a novel pseudo-local conservation law of the anisotropic Heisenberg model, by means of which we rigorously estimate the spin Drude weight (the ballistic transport coefficient) in the easy-plane regime. This closes a long standing question in strongly correlated condensed matter physics.

Raum: 46-576
Zeit: 15:30 Uhr

Gäste sind herzlich willkommen.