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Interacting electrons in 1D beyond the Luttinger-liquid limit: transport and relaxation

Location: Hörsaal A (1.3.14)
Time: Monday, January 3rd, 2011, 14 h s.t.

Abstract:

We develop transport theory of one-dimensional electrons in quantum wires. Effects of interaction manifest as three-particle collisions due to the severe constraints imposed by the conservation laws on the two-body processes. We find that interaction-induced corrections to conductance and thermopower rely on the scattering processes that change number of right- and left-moving electrons. The latter requires transition at the bottom of the band which is exponentially suppressed at low temperatures. Conversely, correction to thermal conductance is governed by the processes where all particles lie near the Fermi points and thus exhibits only power-law dependence on temperature. We address the role of electronic relaxation and derive an exact expressions for electrical and thermal conductances at arbitrary relation between the wire length and corresponding relaxation length. We also discuss the role of spin-charge separation at low temperatures. Our theory is based on the scattering approach that is beyond the Luttinger-liquid limit.