Non-universal power laws in transport properties of one-dimensional quantum dot

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We investigate discrepancies between recent experimental results on transport through one-dimensional quantum dots and universal power laws predicted by an idealized Luttinger Liquid description. The temperature dependence of Coulomb blockade peaks in one-dimensional quantum dots obeys non-universal power-laws from which different values of the interaction strength can be deduced. We find that, depending on the temperature range, measurements probe local or global properties of the interaction. In particular, we investigate the role of contacting semiconductor quantum wires and nanotubes connected to leads through tunnel junctions and compare to recent experiments. We conclude that a conventional Luttinger Liquid description of the quantum wire does explain the observed behaviour if specific properties of either experimental setup are carefully taken into account.

[1] T. Kleimann, F. Cavaliere, M. Sassetti, and B. Kramer, Phys. Rev. B (2002) in press, cond-mat/0208384