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Microscopic Theory for the 0.7 Anomaly in Quantum Point Contacts - the Role of Geometry- and Interaction-Enhanced Spin-Fluctuations JAN HEYDER, FLORIAN BAUER, ENRICO SCHUBERT, DAVID BOROWSKY, DANIELA TAUBERT, Ludwig-Maximilians University, DIETER SCHUH, University Regensburg, WERNER WEGSCHEIDER, ETH Zurich, JAN VON DELFT, STEFAN LUDWIG, Ludwig-Maximilians University — We present a detailed microscopic analysis of some local observables of a quantum point contact (QPC) to gain better understanding of the origin of the 0.7 conductance anomaly. We model the system by a one-dimensional tight binding model with local interactions, a smooth potential barrier and a homogeneous magnetic field. We calculate conductance G, local density n and local magnetization m as a function of magnetic field at zero temperature, using the functional Renormalization Group (fRG). Our potential can be tuned to describe the smooth crossover from a single barrier, representing a QPC, to a double barrier, modelling a quantum dot (QD) exhibiting the Kondo effect. We find that both geometries show interaction-enhanced spin-fluctuations, manifested via an enhanced local spin susceptibility, for gate voltages that lead to an anomalously large negative magnetoconductance, characterized by an anomalously small low-energy scale B_*. This finding explains why both the Kondo effect and the 0.7-anomaly exhibit a very similar conductance behavior at sufficiently low magnetic fields and temperatures ($T, B \ll T_*$), amenable to a similar Fermi-liquid description. We also show that at high fields ($B \gg B_*$) the analogy between Kondo effect and 0.7-anomaly breaks down.

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