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Towards a Fermi-Liquid description of the 0.7 Anomaly in Quantum Point Contacts FLORIAN BAUER, JAN HEYDER, ENRICO SUBERT, Ludwig-Maximilians-Universitaet Muenchen, DAVID BOROWSKI, None, DANIELA TAUBERT, Ludwig-Maximilians-Universitaet Muenchen, DIETER SCHUH, Universitaet Regensburg, WERNER WEGSCHEIDER, ETH Zuerich, JAN VON DELFT, STEFAN LUDWIG, Ludwig-Maximilians-Universitaet Muenchen — In addition to plateaus in integer values of $G_0 = \frac{2e^2}{h}$, the linear conductance of a quantum point contact (QPC) shows an anomalous shoulder at around $0.7G_0$ that evolves in a characteristic fashion with rising magnetic field and temperature. We present a microscopic theory for the 0.7 conductance anomaly, based on a one-dimensional tight binding model with a local interaction, a smooth potential barrier and a homogeneous magnetic Zeeman field. We calculate the conductance as a function of magnetic field and temperature using standard second order perturbation theory. Furthermore we use a more sophisticate method, the functional Renormalisation Group (fRG), to obtain a more reliable description at zero temperature and finite magnetic field. We analyze the leading temperature T and magnetic field B dependence of the conductance, which define, respectively, low-energy scales $T_\star$ and $B_\star$ and find that both $T_\star$ and $B_\star$ depend exponentially on gate voltage, whereas the ratio $\frac{B_\star}{T_\star}$ is almost independent of gate voltage. This result indicates that the low-energy behavior of the 0.7 anomaly displays Fermi-liquid behavior. We present new experimental data that corroborate this conclusion.

Florian Bauer
Ludwig-Maximilians-Universitaet Muenchen

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