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Microscopic Origin of the 0.7-Anomaly in Quantum Point Contacts J. VON DELFT, F. BAUER, J. HEYDER, Arnold Sommerfeld Center, Ludwig-Maximilians-Universität München, E. SCHUBERT, D. BOROWSKI, D. TAUBERT, Center for NanoScience, Ludwig-Maximilians-Universität München, B. BRUOGNOLO, Arnold Sommerfeld Center, Ludwig-Maximilians-Universität München, D. SCHUH, Institut für Angewandte Physik, Universität Regensburg, W. WEGSCHEIDER, Laboratory of Solid State Physics, ETH Zürich, S. LUDWIG, Center for NanoScience, Ludwig-Maximilians-Universität München — Despite the simple structure of quantum point contacts, their conductance properties exhibit anomalous features, collectively known as the "0.7-anomaly", whose origin is still subject to controversial discussions. We offer a detailed microscopic explanation for the 0.7-anomaly and the zero-bias peak that typically accompanies it: the common origin of both is a smeared van Hove singularity in the local density of states at the bottom of the lowest one-dimensional subband of the point contact, which causes an anomalous enhancement in the Hartree potential barrier, magnetic spin susceptibility and inelastic scattering rate. We present theoretical calculations and experimental results that show good qualitative agreement for the dependence of the conductance on gate voltage, magnetic field, temperature, bias voltage (including the zero-bias peak) and interaction strength. For low field and temperature we predict and observe Fermi-liquid behavior analogous to that known for the Kondo effect in quantum dots. At high energies, however, the analogy between 0.7-anomaly and Kondo effect ceases to be applicable.

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