Diffusive Anomalies and Coulomb Blockade in Quantum Wires and Carbon Nanotubes

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We study the influence of electron–electron interactions on the density of states in weakly disordered quasi–one–dimensional systems. This is particularly interesting at the Fermi edge, where the interaction leads to a strong suppression of the density of states. A non-perturbative treatment of the Coulomb interaction allows a correct description of these diffusive anomalies in all voltage regimes, thereby generalizing the results by Altshuler and Aronov. Including the interaction between electrodes, we extend the approach to Coulomb blockade of tunneling [1]. We discuss finite size effects and the related dimensional crossovers. A comparison with recent measurements on carbon nanotubes shows the experimental relevance of the results.

[1] Jörg Rollbühler and Hermann Grabert, Phys. Rev. Lett. **87**, 126804 (2001).