Electron-electron interaction effects in a quantum point contact

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We consider the effect of electron-electron interactions in quantum point contacts (QPC's) on the first quantized plateau. The length L of the interacting region of the QPC is of order the Fermi wave length, $L \sim \lambda_F$, so the translational invariance is broken and hence the electron-electron interaction does not have to conserve momentum. We find low-temperature transport properties by perturbation theory in the interaction. The conductance is suppressed from $2e^2/h$ (at zero temperature) by increasing the temperature T as $\delta G \propto T^2$ for low temperatures. The full temperature-dependent conductance is obtained from self-consistent second-order perturbation theory and flattens out at higher temperatures, but still smaller than the Fermi temperature.[1]

[1] A. M. Lunde, A. De Martino, R. Egger and K. Flensberg, condmat/07071989