Calculation of current-voltage characteristic of a resonant-tunneling diode (RTD) and using the adiabatic approximation for simulation of conductance quantization in quantum point contact (QPC) Results

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1. Transfer matrix method

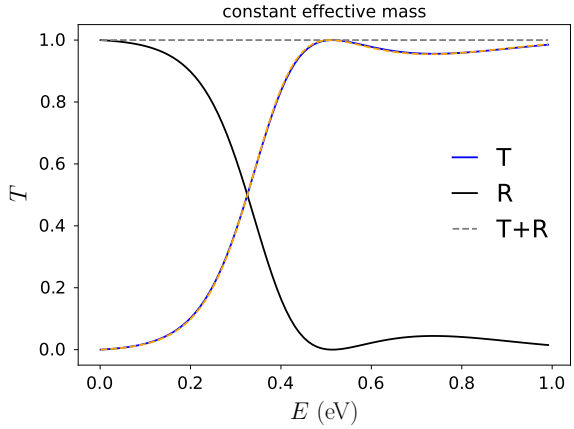

Figure 1: Transmission and reflection coefficient through potential barrier with constant effective mass as a function of energy. The dashed orange line shows the analytical solution.

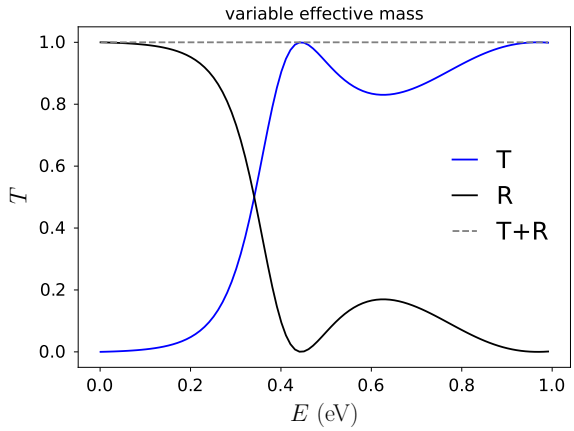

Figure 2: Transmission and reflection coefficient through potential barrier with spatially varying effective mass as a function of energy.

2. Resonant-tunneling diode.

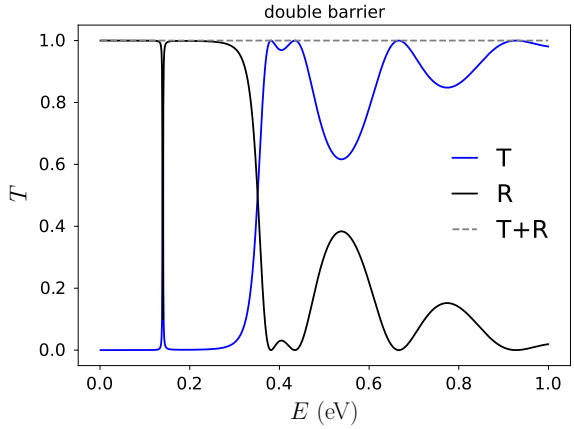

Figure 3: Transmission and reflection coefficient through a double potential barrier with spatially varying effective mass as a function of energy .

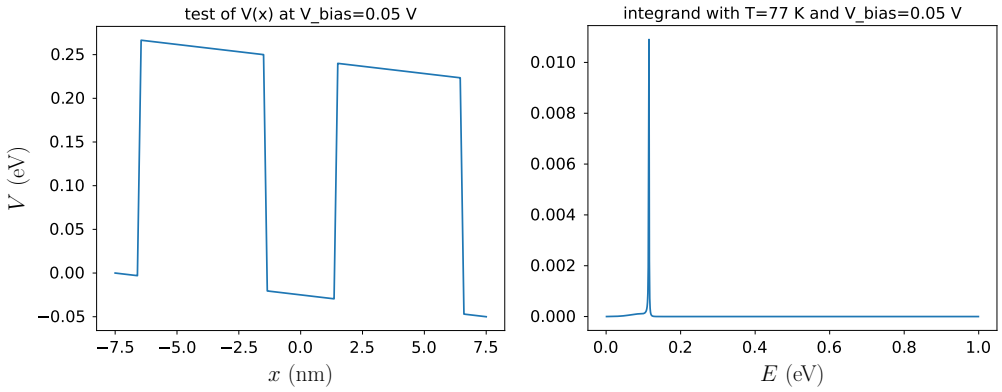

Figure 4: **Test results:** Example potential profile and the integrated function. These result are not obligatory but it is helpful to plot them as a test.

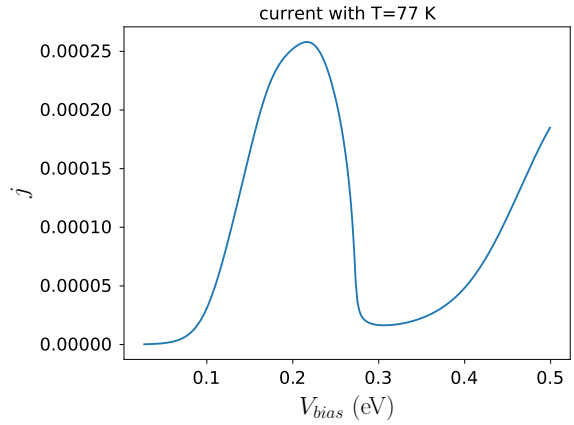

Figure 5: Current-voltage characteristic of a resonant-tunneling diode, assuming temperature 77 K.

3. Conductance quantization in a QPC within the adiabatic approximation

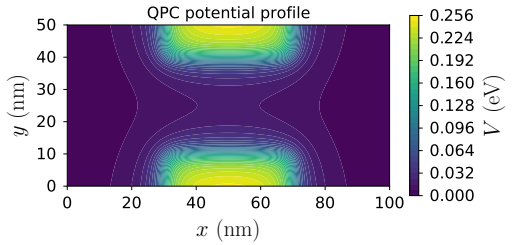

Figure 6: **Test results:** Potential profile of the QPC.

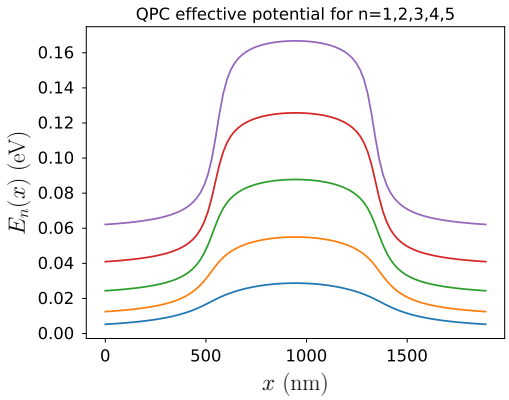

Figure 7: The effective potential $E_n(x)$ for $n = 1, 2, 3, 4, 5$.

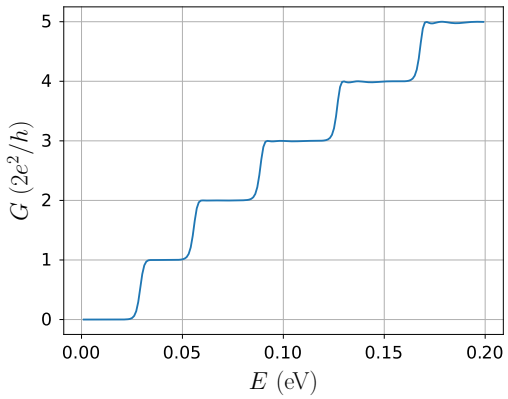

Figure 8: The QPC conductance as a function of incident electron energy.

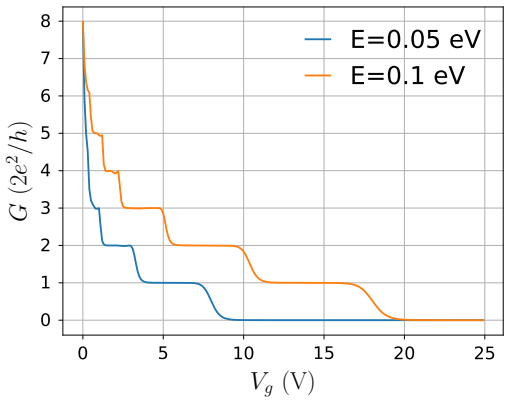

Figure 9: The QPC conductance as a function of the gate voltage V_g at incident electron energy $E = 50$ meV and 100 meV.