The KWANT package – electron transport simulations in magnetic field

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1 Scattering by the potential

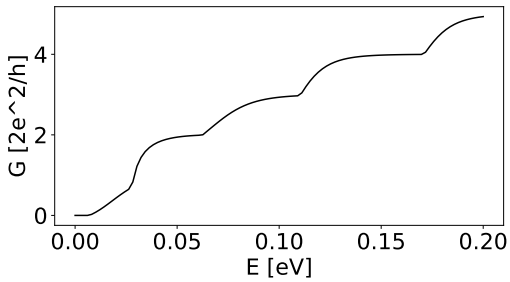

Figure 1: Conductance as a function of energy of the incident electron in a system with a Gaussian scattering potential localized in the center of the nanowire.

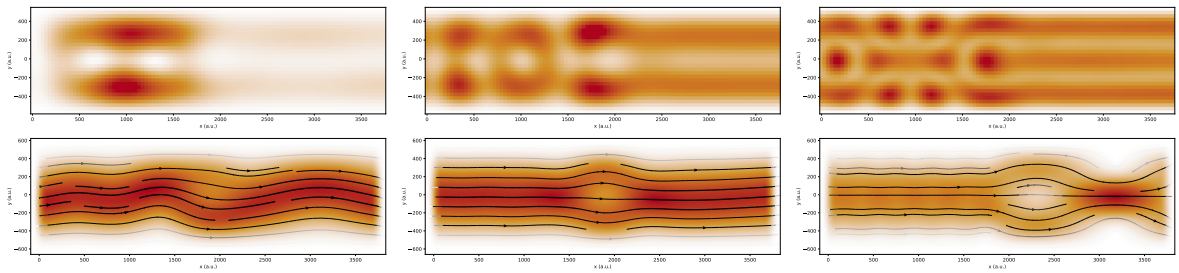

Figure 2: Wave function and current density maps in a system with a Gaussian scattering potential localized in the center of the nanowire. The maps in the columns are at $E = 0.03, 0.05, 0.1$ eV, respectively.

2 External magnetic field / quantum Hall effect

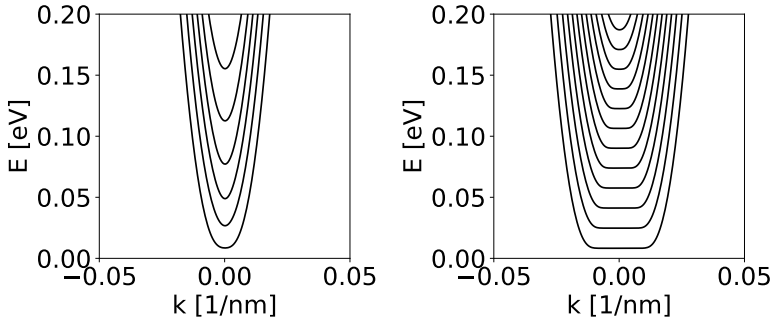

Figure 3: Dispersion relation in the nanowire calculated at $B_z = 2$ T with $W = 40, 100$ nm.

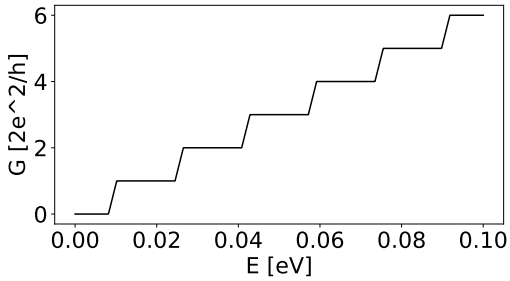

Figure 4: Conductance as a function of energy of the incident electron at $B_z = 2$ T and $W = 100$ nm.

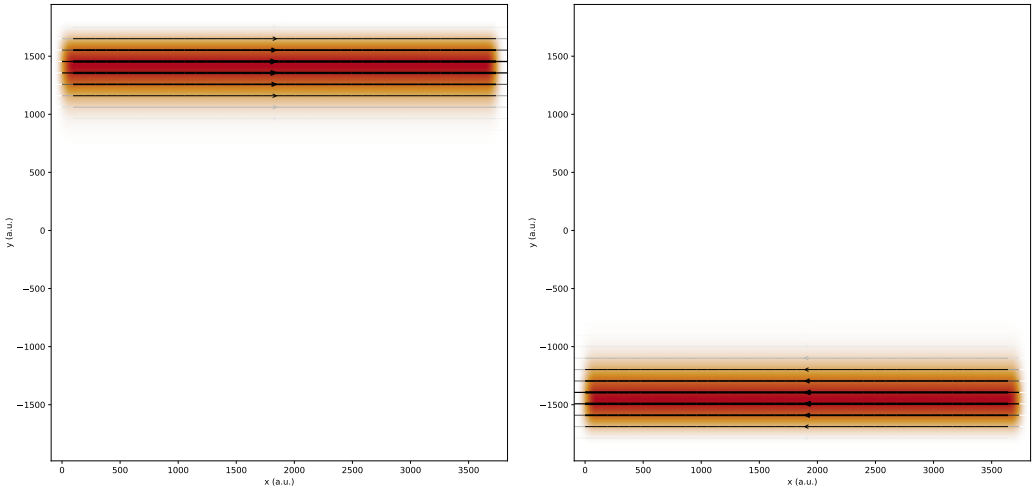

Figure 5: Wave function of the lowest energy subband for electron incident from the left and right contact. Results at $B_z = 2$ T and $W = 100$ nm (here $E = 0.02$ eV).

3 Y-shaped junction

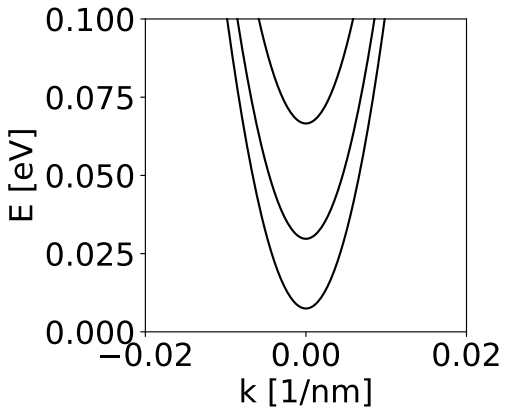

Figure 6: Dispersion relation in the left contact.

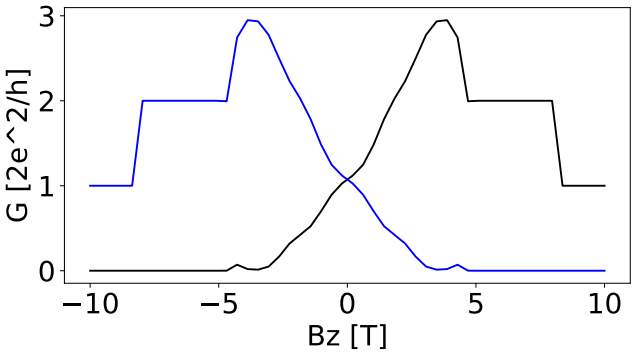

Figure 7: Conductance from the from the left lead to the upper and lower right lead as a function of magnetic field B_z at $E = 0.1$ eV. The plot may vary depending on the actual geometry of the Y-junction.

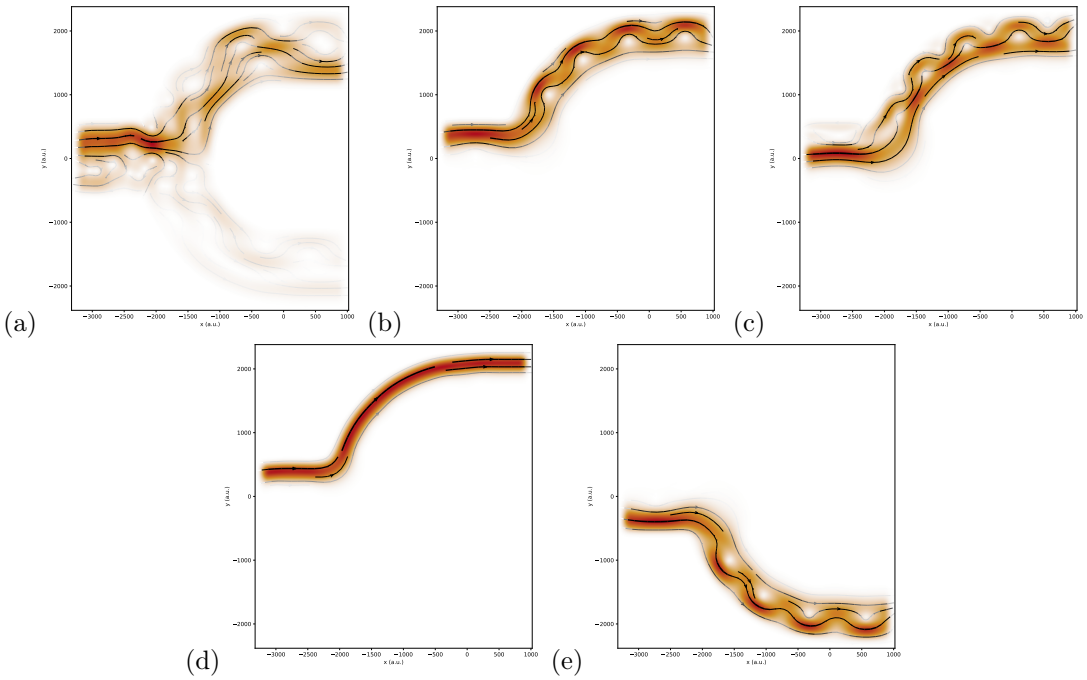

Figure 8: Current density maps at selected B_z values: (a) $B_z = 1$ T, (b-c) $B_z = 5$ T: (b) 1st and (c) 2nd mode, (d) $B_z = 10$ T, (e) $B_z = -5$ T [(a), (b), (d) and (e) show the 1st mode]. The incident electron energy $E = 0.1$ eV.