Exercise: Resonant Tunneling Diode

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Calculate the transmission coefficient of the double barrier structure for the following three cases:

(a) \( V_1 = V_2 = 0.4 \text{ eV}, \ L_1 = L_2 = 4 \text{ nm}, \ W = 5 \text{ nm} \).

(b) \( V_1 = 0.6 \text{ eV}, \ V_2 = 0.4 \text{ eV}, \ L_1 = L_2 = 4 \text{ nm}, \ W = 5 \text{ nm} \).

(c) \( V_1 = 0.6 \text{ eV}, \ V_2 = 0.3 \text{ eV}, \ L_1 = 4 \text{ nm}, \ L_2 = 5 \text{ nm}, \ W = 5 \text{ nm} \).

Notation: \( V_i \) is the height of the barriers, \( L_i \) describes the width of the barriers (\( i = 1 \) for barrier 1, and \( i = 2 \) for the second barrier) and \( W \) is the well width. Assume that the potential energy term \( V(x) \) is zero in the source, well and detector regions. Assume that the effective electron mass equals to \( m = 0.065 \times 9.1 \times 10^{-32} \text{ kg} \). Comment on the nature of the resonances with respect to the symmetry and the widths and the heights of the two potential barriers.