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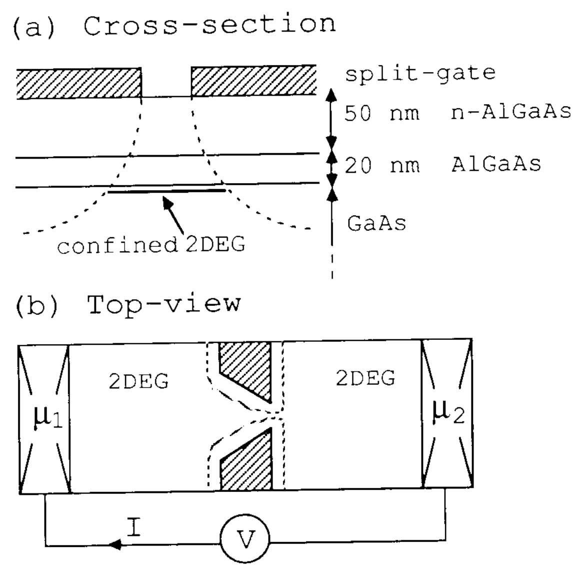

***FIG 1.2. (a)** Cross-section of a GaAs/AlGaAs hetero structure with typical layer thicknesses. A negative voltage V_g applied to the metal split-gate confines the electrons laterally in the 2DEG. **(b)** Top-view of a QPC. The dotted line indicates the depletion region in the 2DEG, which is tuned by V_g. The two wide 2DEG regions act as reservoirs, emitting electrons through the QPC with energies up to their electro chemical potentials μ_1 and μ_2. A voltage difference $V = (\mu_1 - \mu_2)/e$ results in a net current I through the QPC.*

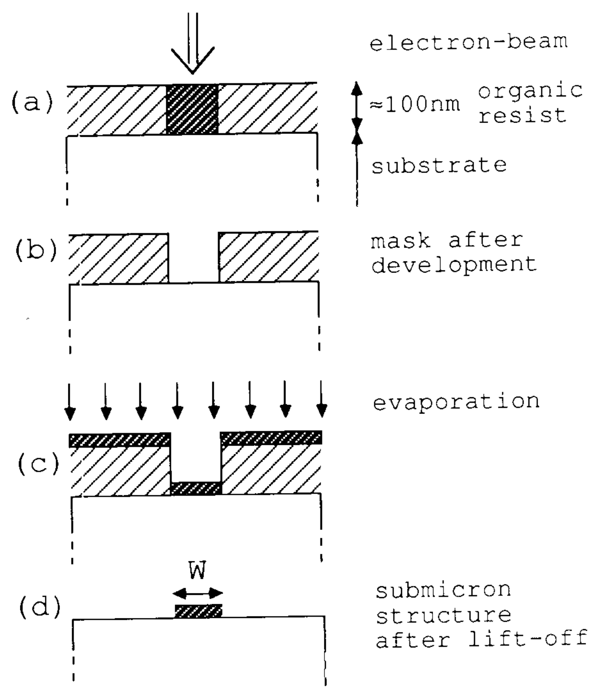

***FIG. 1.3.** Outline of the electron-beam lithography procedure for fabricating submicron structures.*

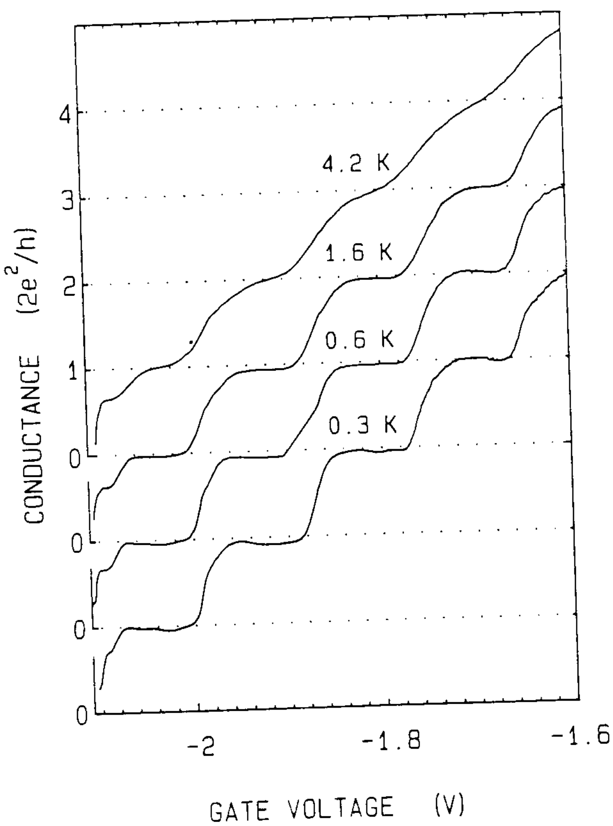

FIG. 1.6. Conductance versus gate voltage at B = 0 and different temperatures. Increasing the temperature thermally averages the higher plateaus first (from Ref. 25).

width of 250 nm. These considerations are reminiscent of the states of a particle-in-a-1D-box, which, as we show below, is the basic idea behind the conductance quantization.

We note that the conductance quantization is not exact. First, a series resistance ($\approx 400\ \Omega$) originating from the wide 2DEG regions has been subtracted to line up the plateaus at their quantized values.[22] Furthermore, the plateaus are not completely flat. This may be due to scattering at impurities in the vicinity of the QPC or, as we discuss below, the abruptness of the constriction.

We now show that the conductance quantization results from transport through 1D subbands. To calculate transport through a QPC we start with the Hamiltonian: