Term project (Ver 1.0)

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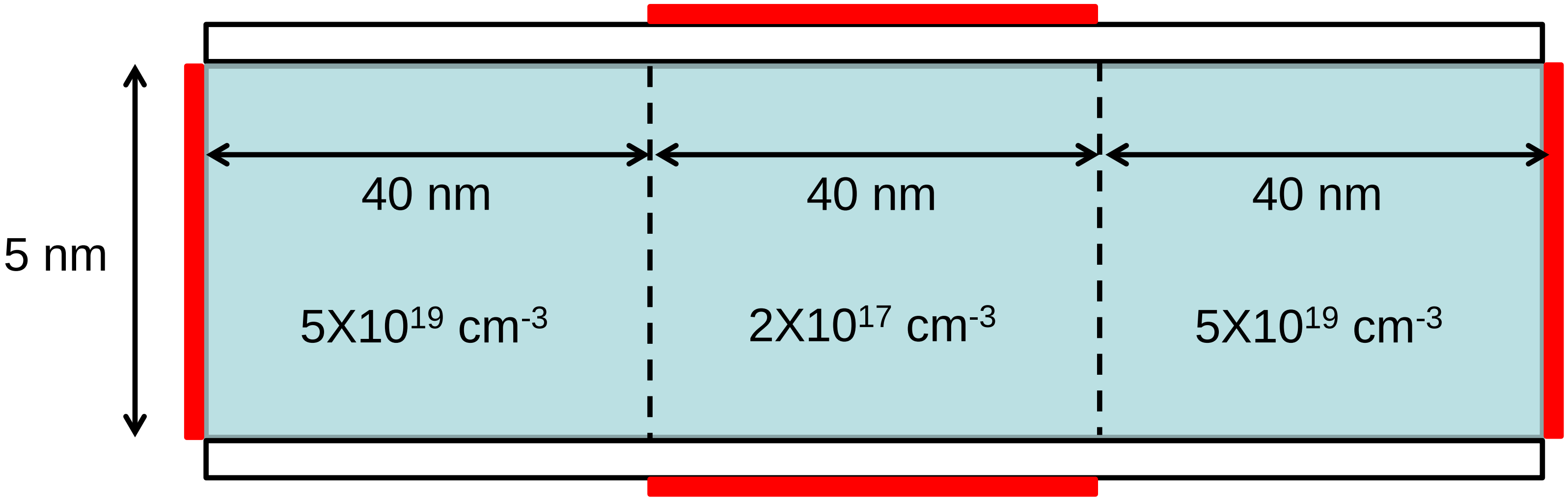
Term project (1)

- Due: AM08:00, <u>December 17</u> (No delayed submission)
- Your code and report should be submitted.
- There are many steps in the term project.
  - Nonlinear Poisson
  - Drift-diffusion
  - Schrödinger
  - Boltzmann

Term project (2)

- Double-gate
  - 5-nm-thick silicon & 0.5-nm-thick oxide at both sides
  - 40-nm-long gate (Workfunction: 4.3 eV)



Term project (3)

- Step1
  - Solve the nonlinear Poisson equation for the double-gate structure.
  - $V_S = V_D = 0$ and V_G varies from 0 V to 1 V. (0.1 V step)
  - Draw ϕ and n. (3D plot)

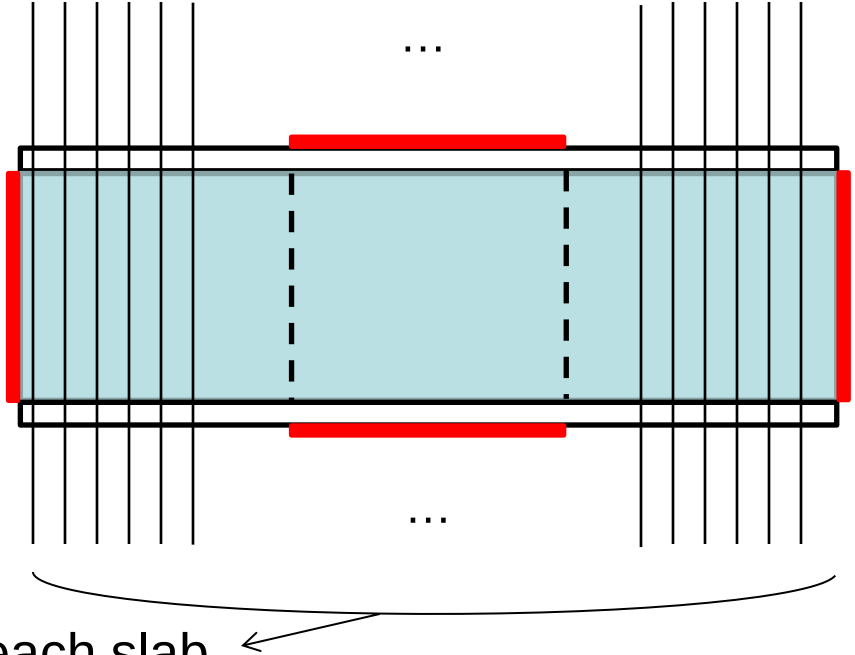
Term project (4)

- Step2
  - Solve the drift-diffusion equation for the double-gate structure.
  - Self-consistent simulation is mandatory.

  - $V_S = 0$
  - V_G varies from 0 V to 1 V. (0.1 V step)
  - V_D varies from 0 V to 1 V. (0.1 V step)
  - For each V_G, draw the drain current (I_D) as a function of V_D.
  - The electron mobility is assumed to be 1430 cm^2/V sec.

Term project (5)

- Step3
  - Solve the Schrödinger equation.
  - Use ϕ obtained in Step2.
  - (Non-self-consistent simulation)
  - $V_S = 0$
  - Consider V_G of 0.1 V and 0.5 V.
  - Consider V_D of 0.1 V and 0.5 V.
  - Consider three different valleys.
  - Calculate the lowest subband for each slab.



Term project (6)

- Step4
  - Solve the Boltzmann equation. (Scatterings are neglected.)
  - For each valley, only the lowest subband is considered.
  - Use ϕ obtained in Step2.
  - (Non-self-consistent simulation)
  - $V_S = 0$
  - Consider V_G of 0.1 V and 0.5 V.
  - Consider V_D of 0.1 V and 0.5 V.
  - Calculate the drain current (I_D) for the four cases.
  - For each case, draw f_0 of each valley. (3D plot)