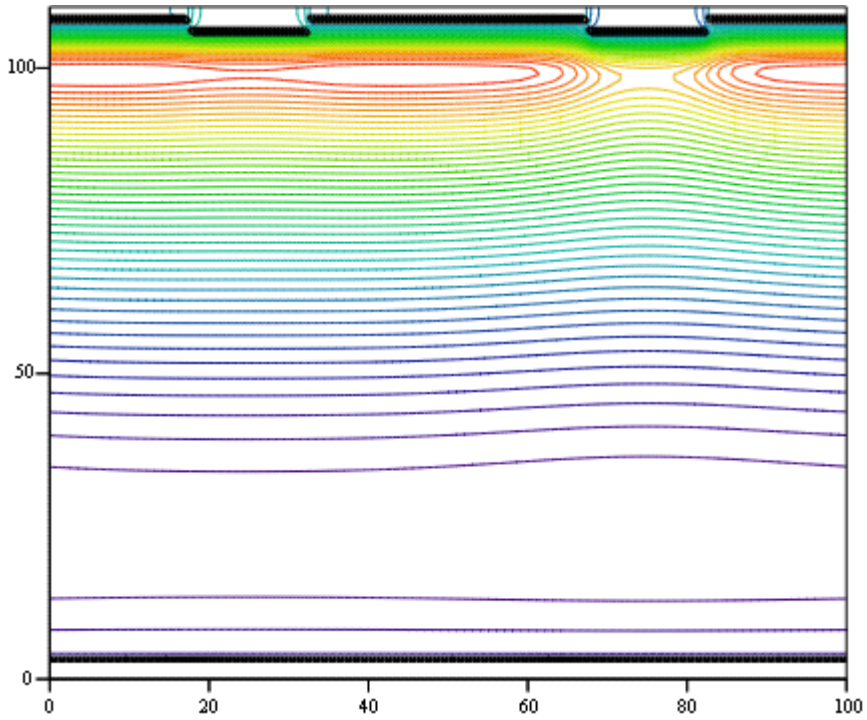
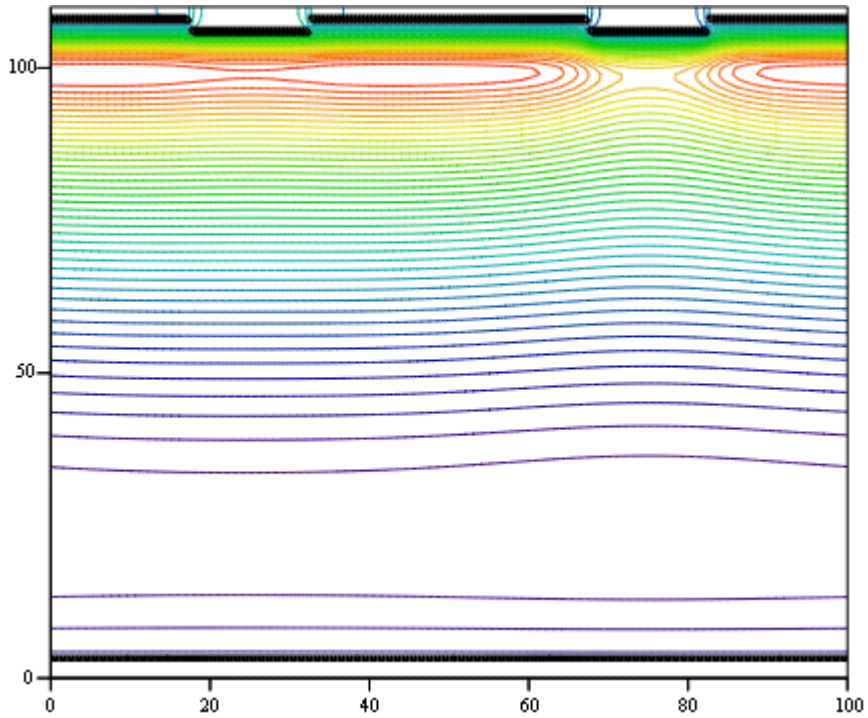
“Open Phase” CCD potential with pedestal

- Solve Laplace equation for open phase CCD by relaxation.
- ϕ_1 = 1.4 V, ϕ_2 = 0.6 V, “pedestal” $\phi_P = (\phi_1 + \phi_2)/2$, 2000 iterations:



Unc, εCPC2

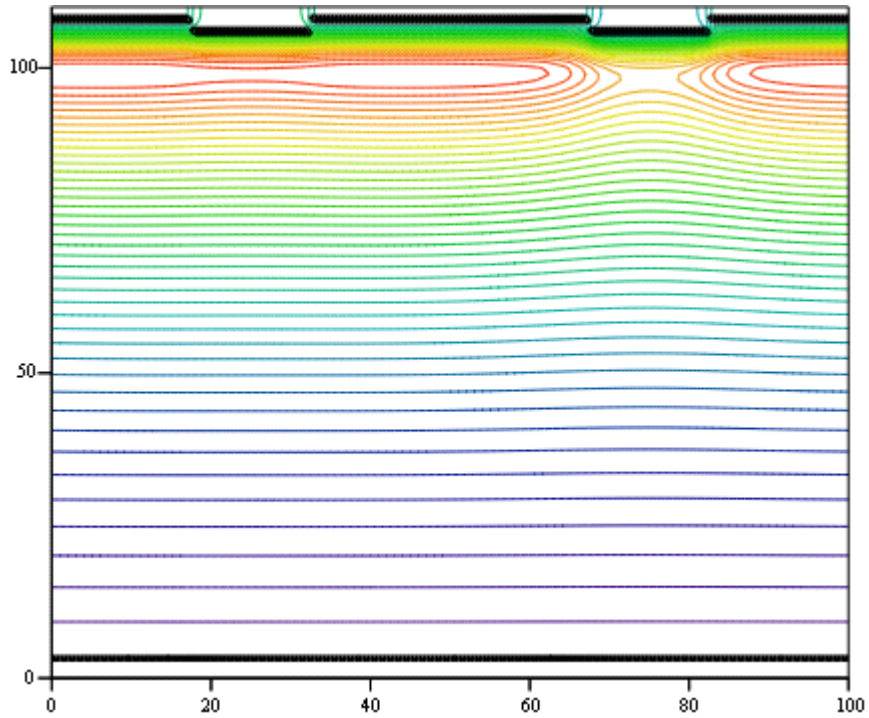
- Same gate potentials, 3000 iterations, very similar results: 2000 is enough!
- Minimum at bottom of CCD is unphysical (no dynamics in calc.).



Und, εCPC2

OPCCD potential with pedestal

- Reduce p dopant level to deplete CCD over greater depth, unphysical minimum removed:

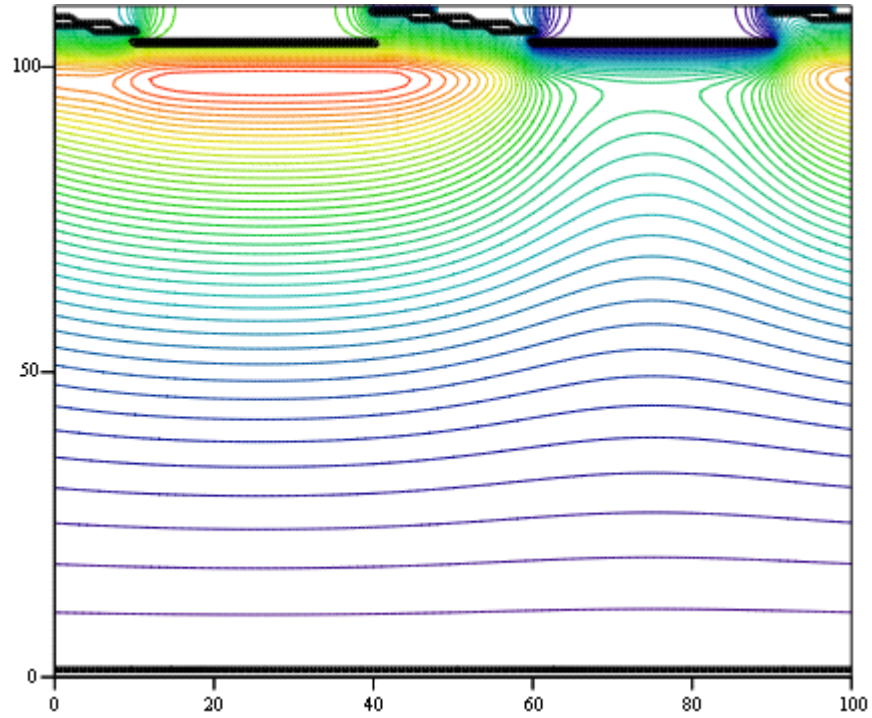


U1, εCPC2

- Can see from this example that lack of asymmetry means charge trapped in the buried channel will be driven both left and right: not what we want!
- Look at possible(?) designs that introduce asymmetry.
- Here, changing height of pedestal gate, with both small and large pedestal gate widths.

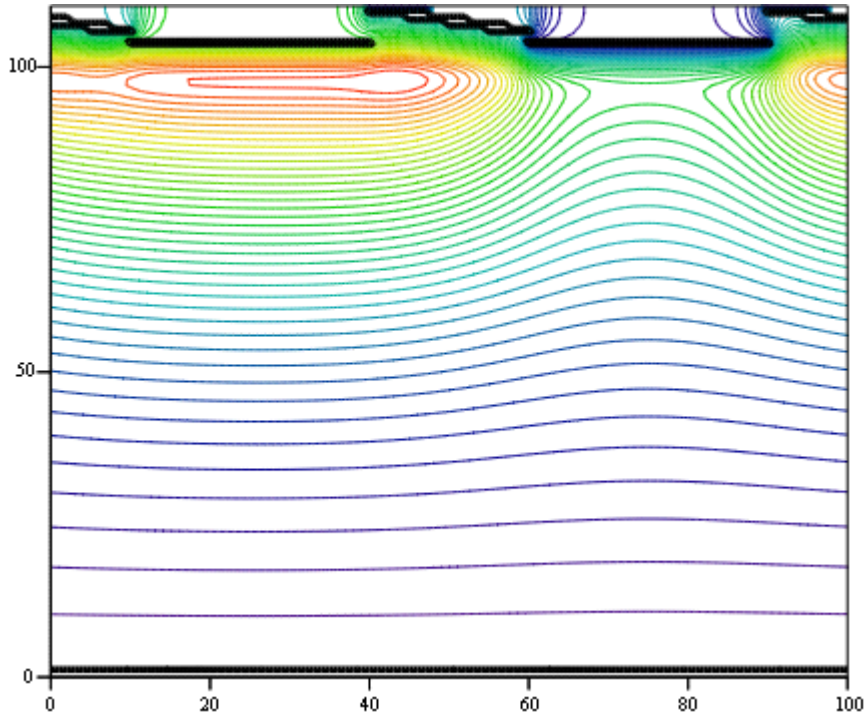
OPCCD potential, narrow pedestal varying height

- ϕ_1 = 2.0 V, ϕ_2 = 0.0 V.



U1, εCPC2

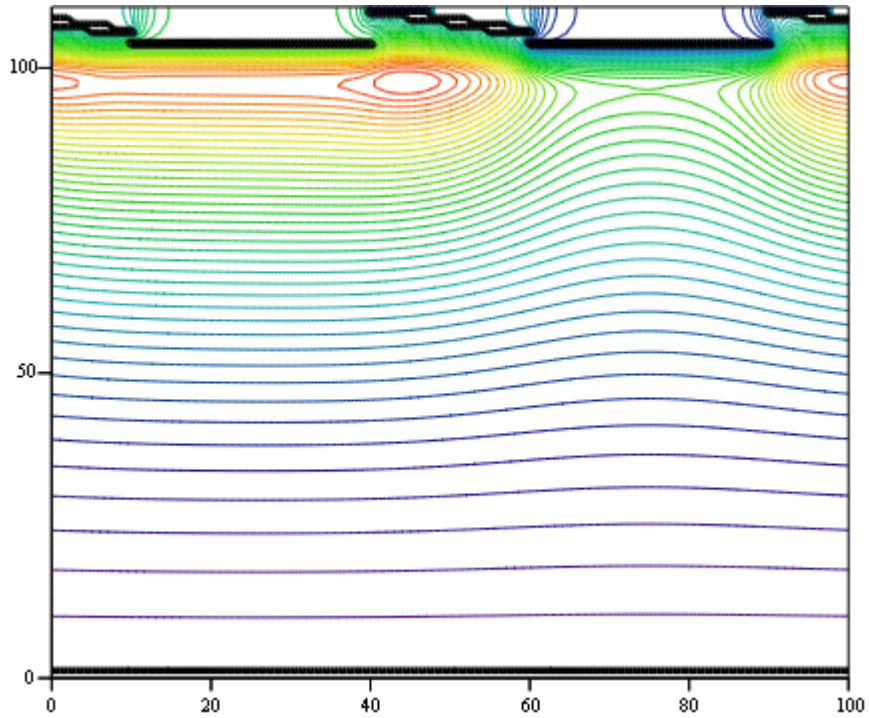
- ϕ_1 = 1.8 V, ϕ_2 = 0.2 V.



U1, εCPC2

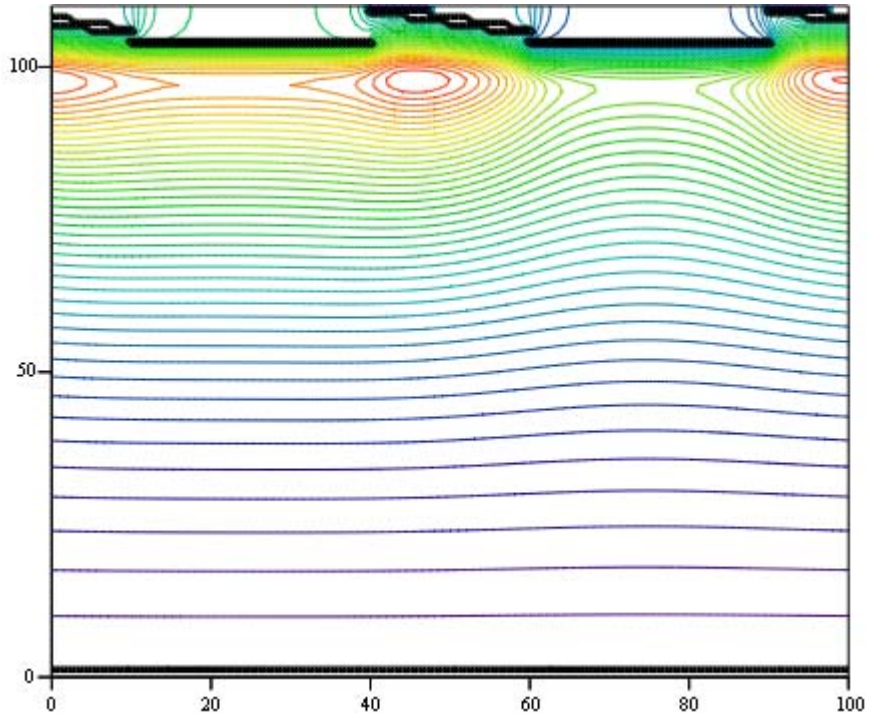
OPCCD potential, narrow pedestal varying height

- ϕ_1 = 1.6 V, ϕ_2 = 0.4 V.



U1, εCPC2

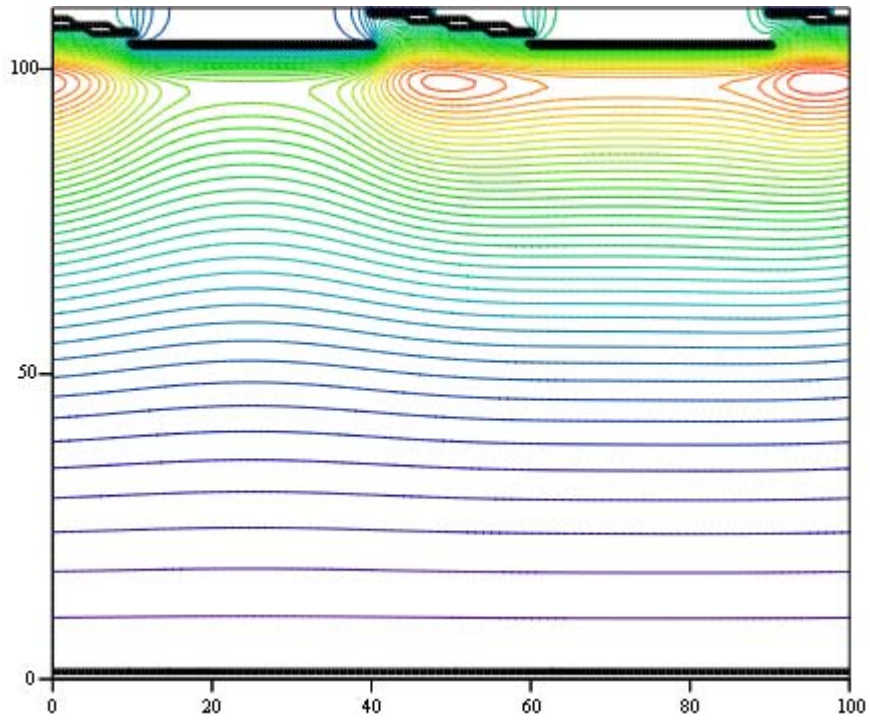
- ϕ_1 = 1.4 V, ϕ_2 = 0.6 V.



U1, εCPC2

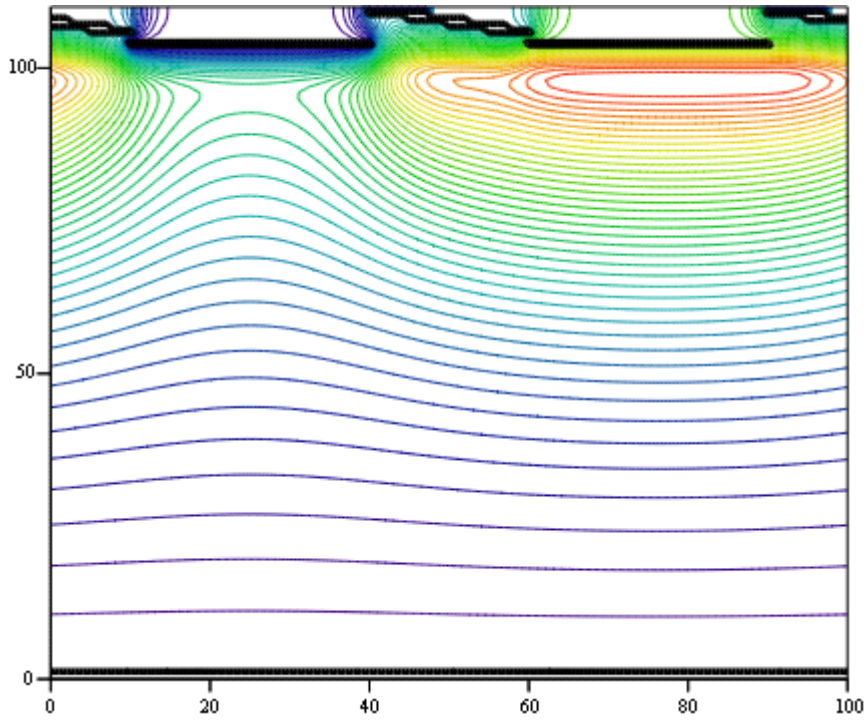
OPCCD potential, narrow pedestal varying height

- ϕ_1 = 0.6 V, ϕ_2 = 1.4 V.



U1, εCPC2

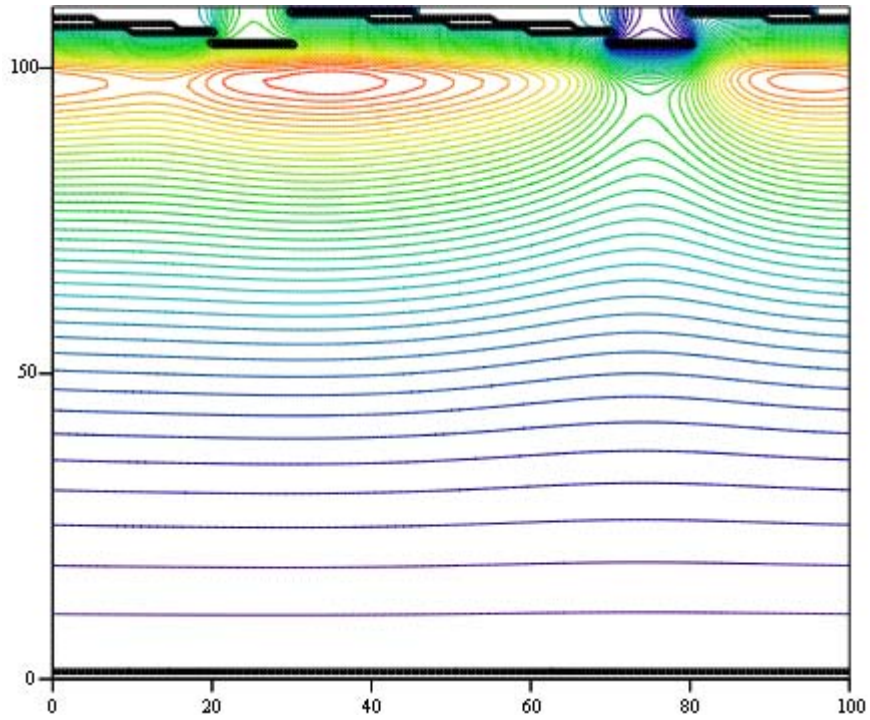
- ϕ_1 = 0.0 V, ϕ_2 = 2.0 V.



U1, εCPC2

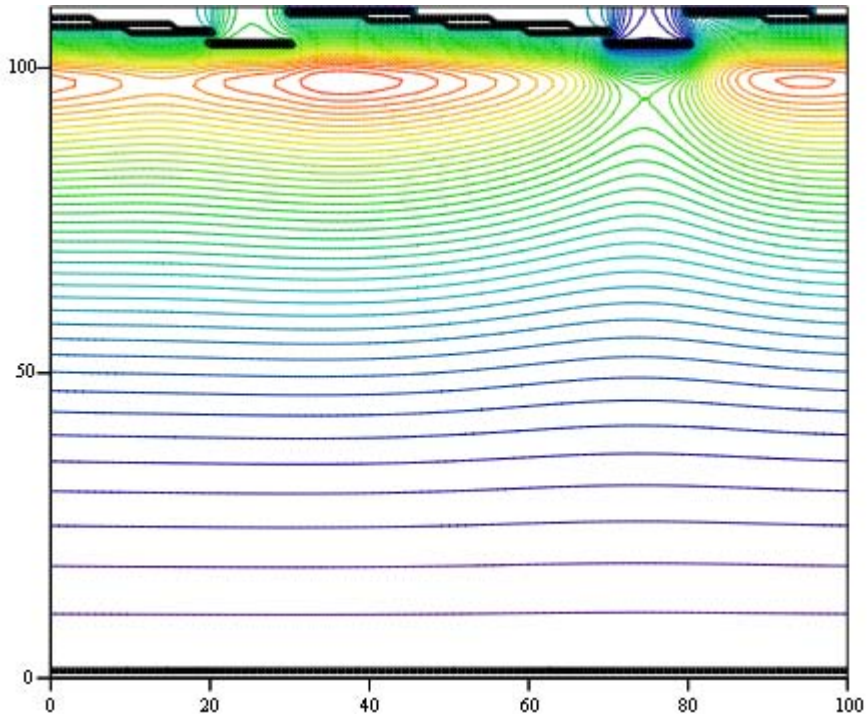
OPCCD potential, wide pedestal varying height

- ϕ_1 = 2.0 V, ϕ_2 = 0.0 V.



U1, εCPC2

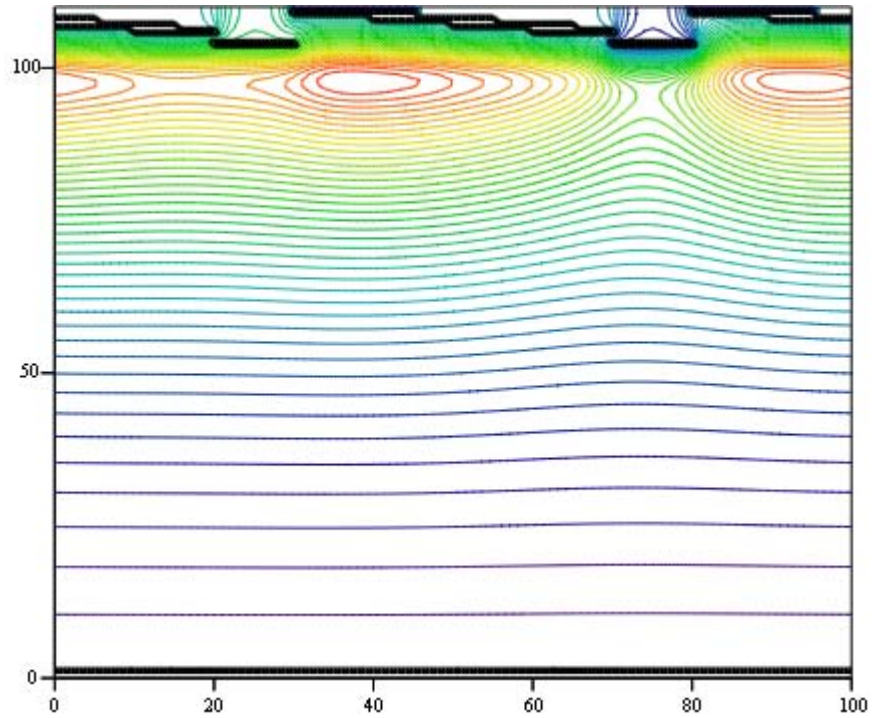
- ϕ_1 = 1.8 V, ϕ_2 = 0.2 V.



U1, εCPC2

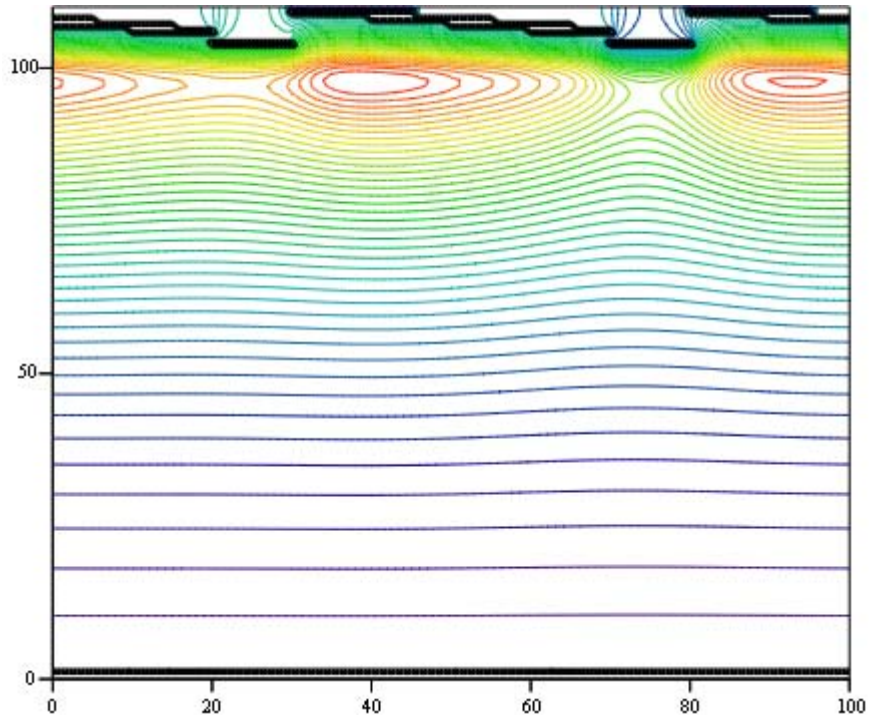
OPCCD potential, wide pedestal varying height

- ϕ_1 = 1.6 V, ϕ_2 = 0.4 V.



U1, εCPC2

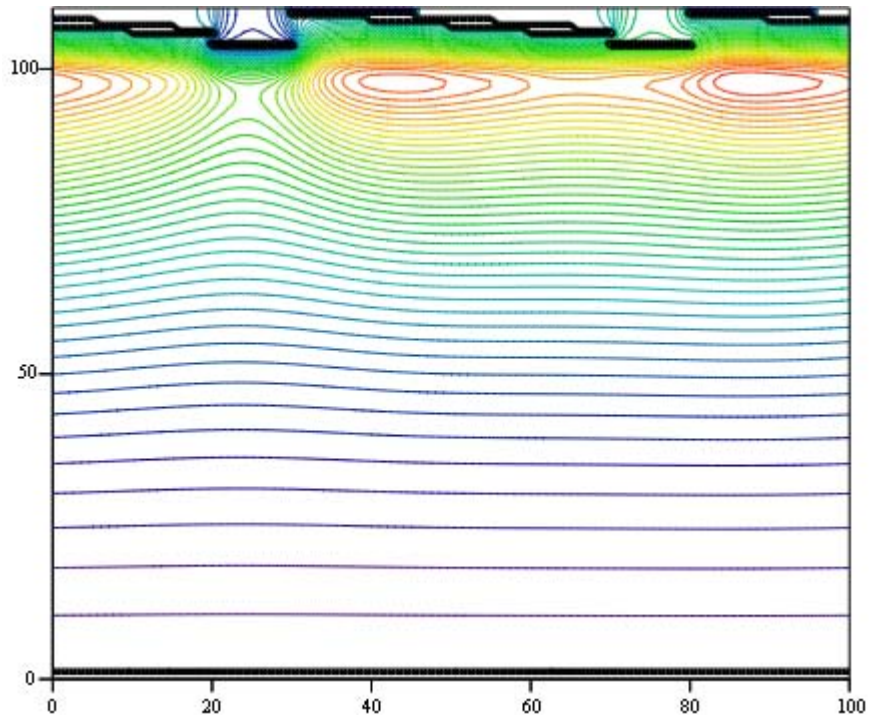
- ϕ_1 = 1.4 V, ϕ_2 = 0.6 V.



U1, εCPC2

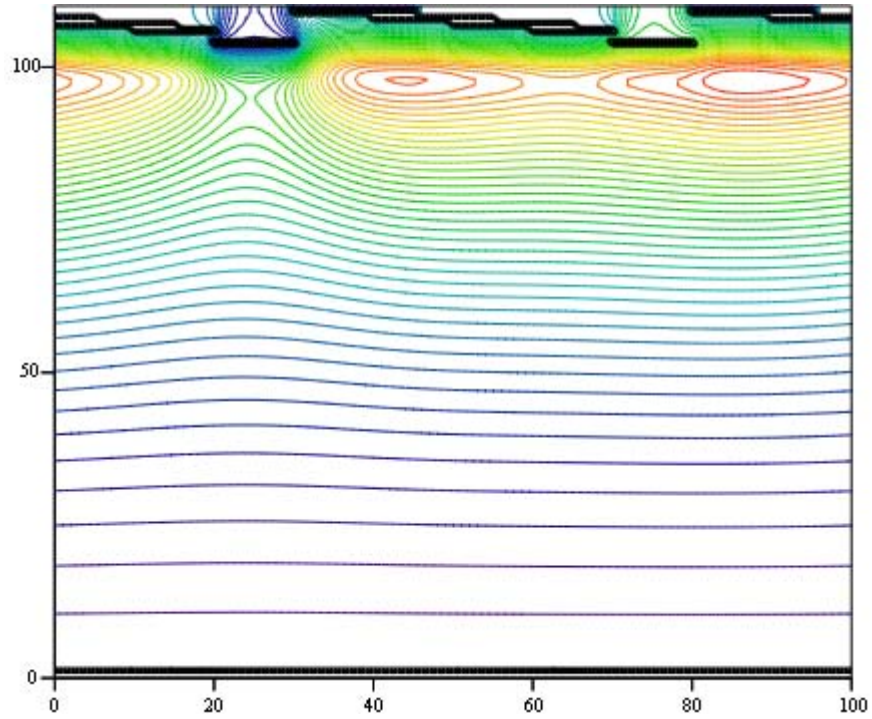
OPCCD potential, wide pedestal varying height

- ϕ_1 = 0.4 V, ϕ_2 = 1.6 V.



U1, εCPC2

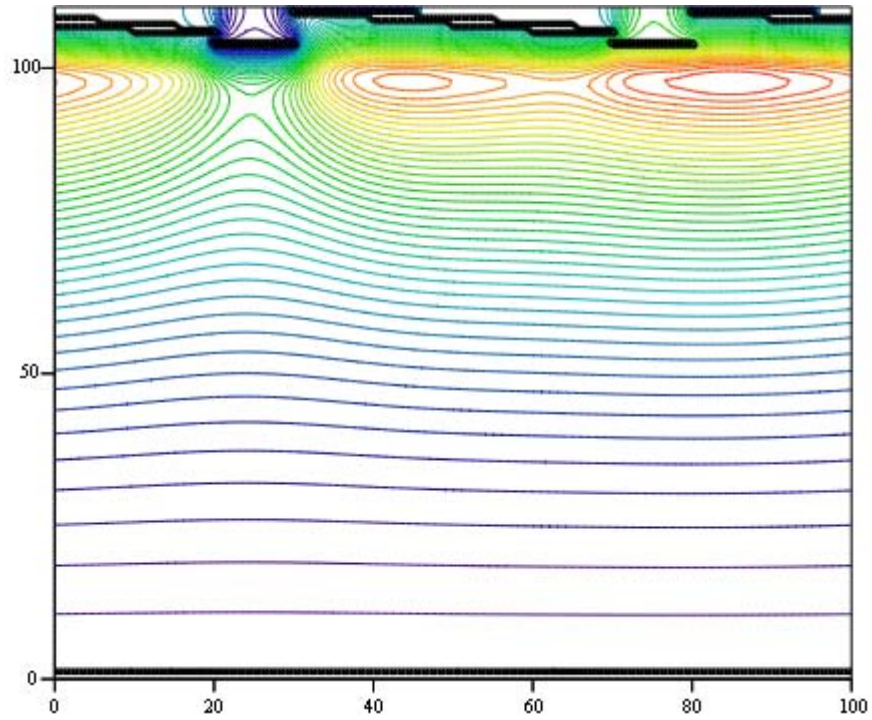
- ϕ_1 = 0.2 V, ϕ_2 = 1.8 V.



U1, εCPC2

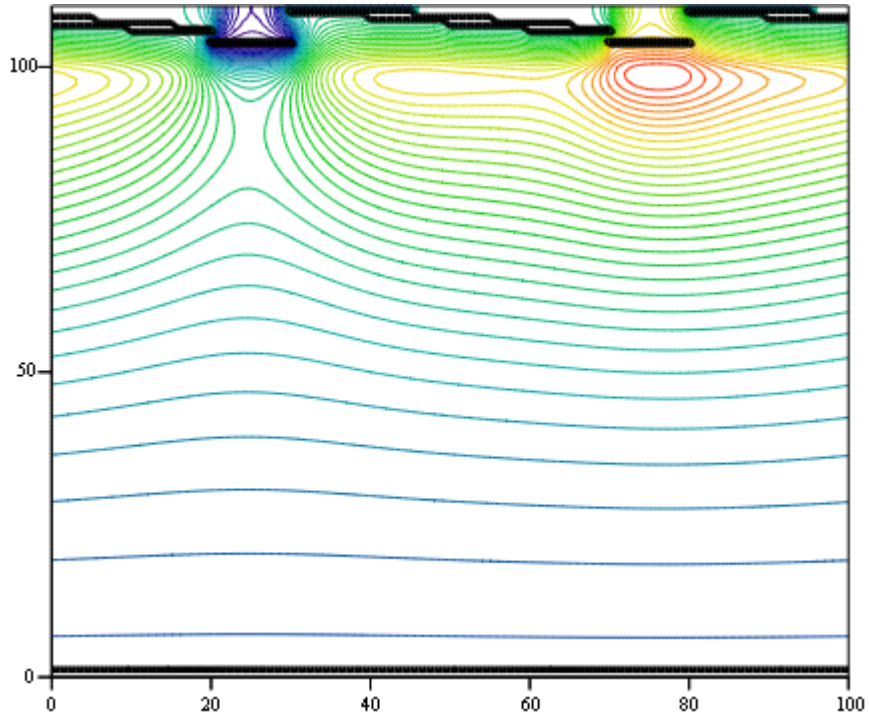
OPCCD potential, wide pedestal varying height

- $\phi_1 = 0.0$ V, $\phi_2 = 2.0$ V.



U1, εCPC2

- $\phi_1 = -1.0$ V, $\phi_2 = 3.0$ V.



U1, εCPC2