

CCD Simulation Using Crosslight APSYS

Simplified structure to demo basic stages of CCD operation

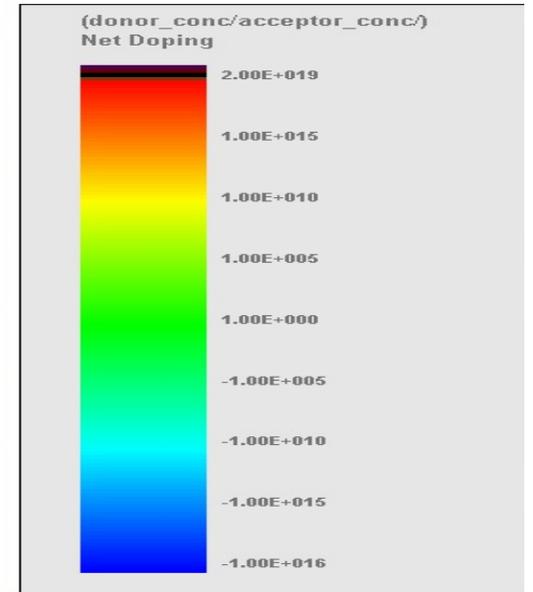
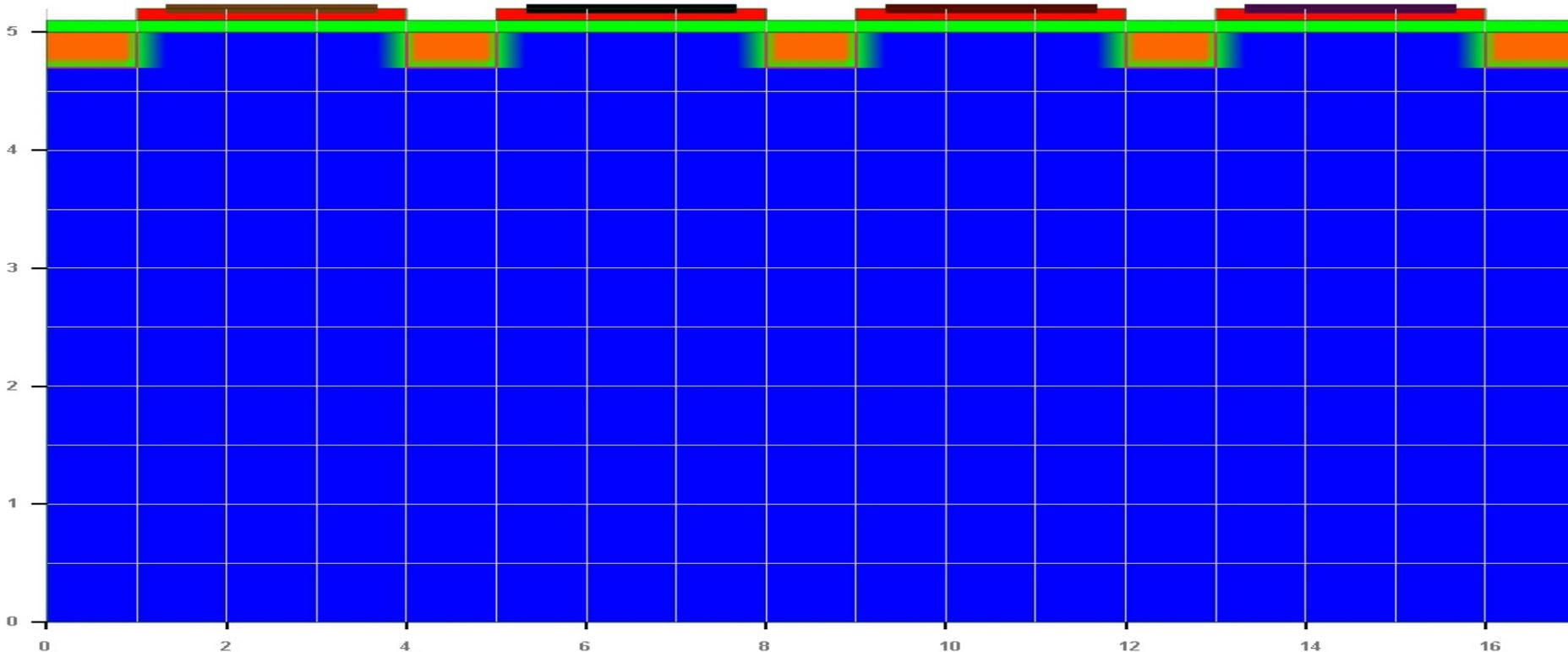
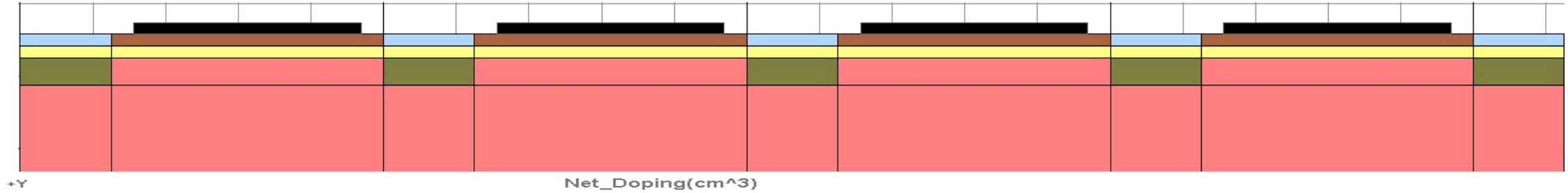


Reset-gate

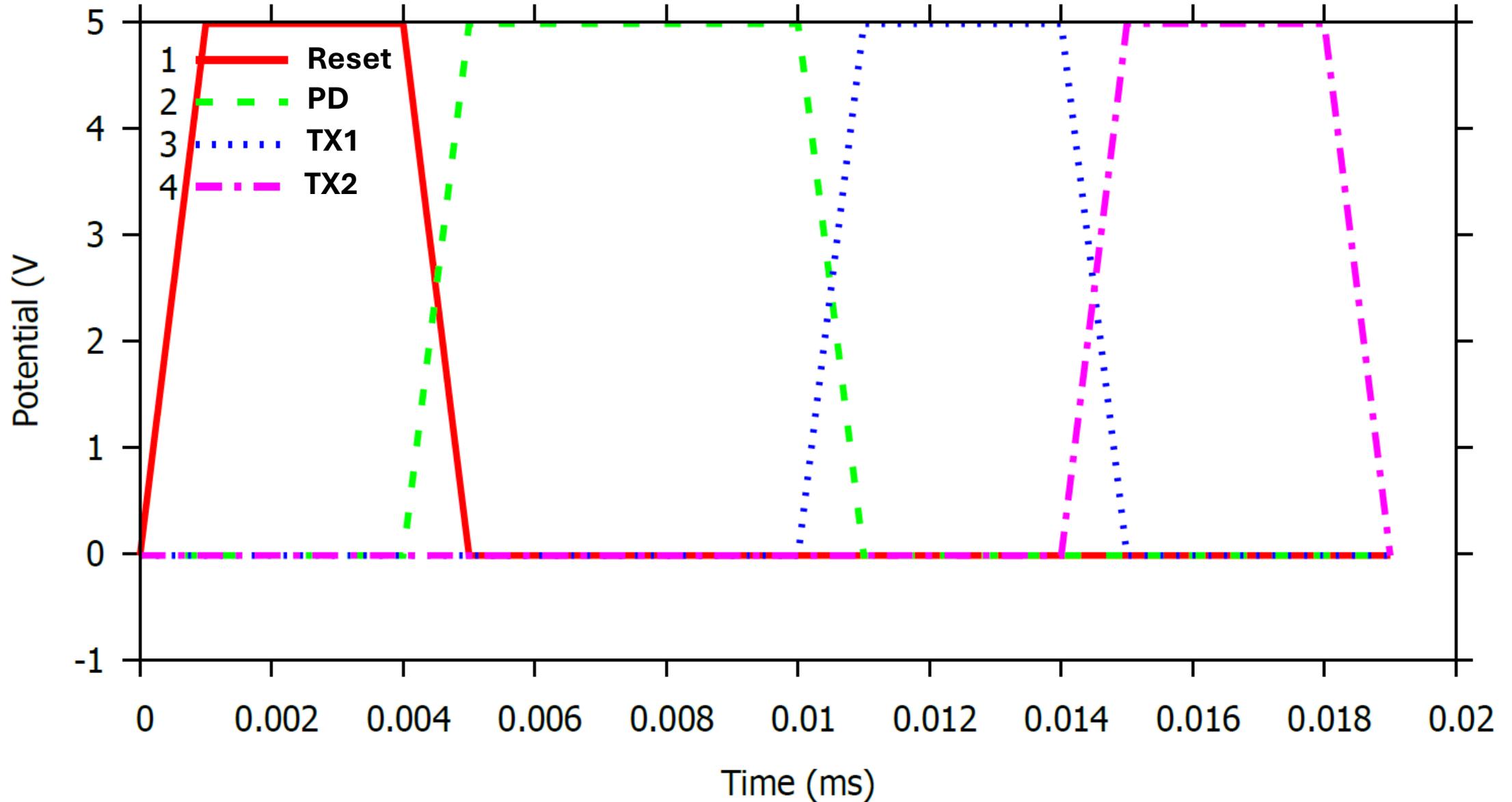
PD-gate

TX1-gate

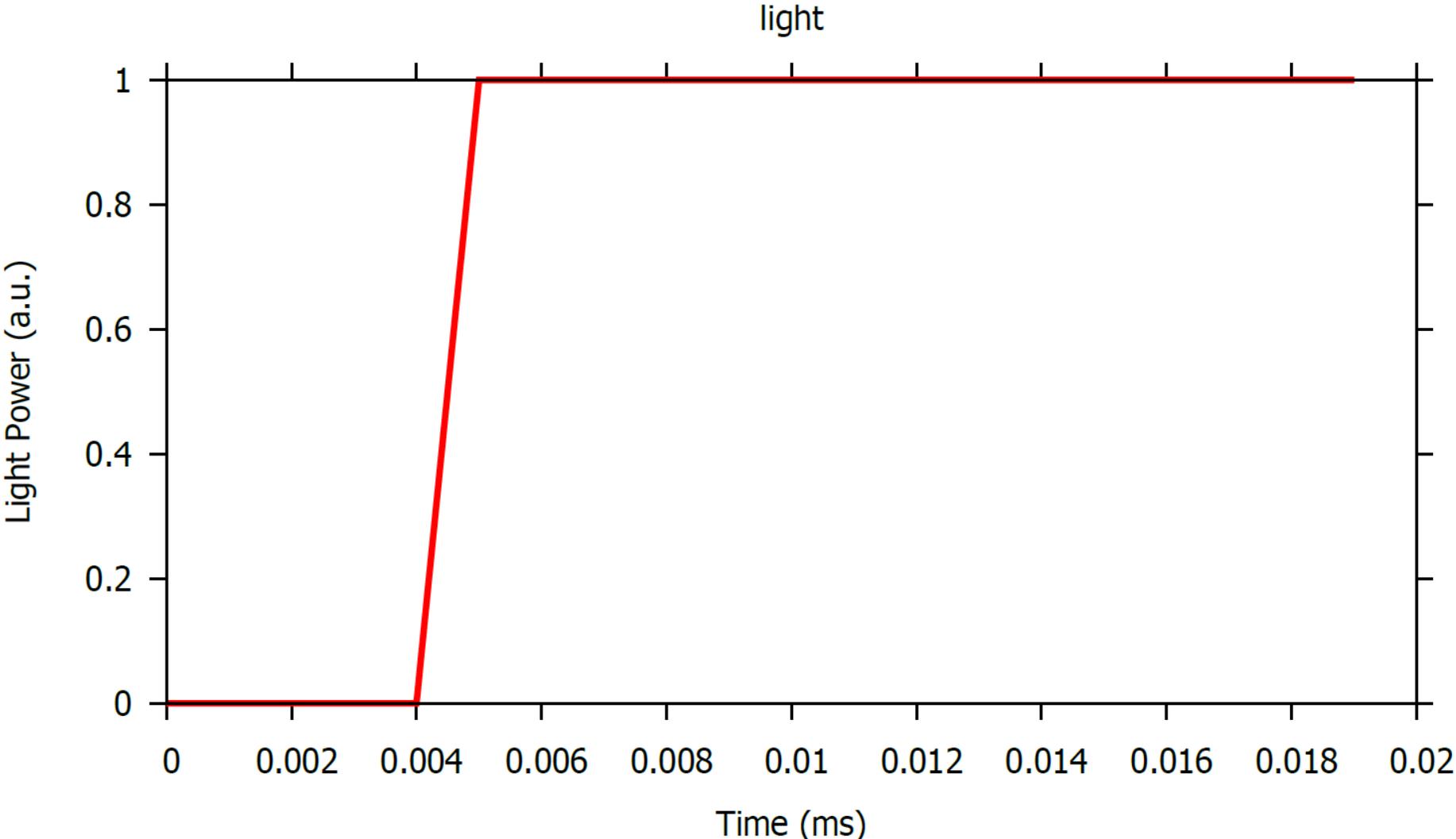
TX2-gate



Bias sequences applied on different gates

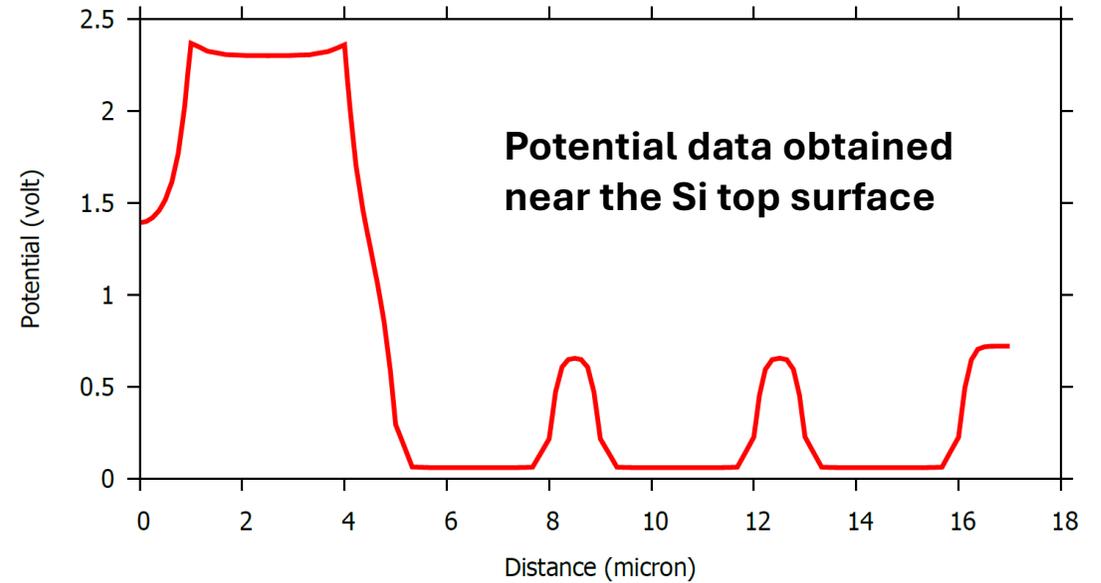
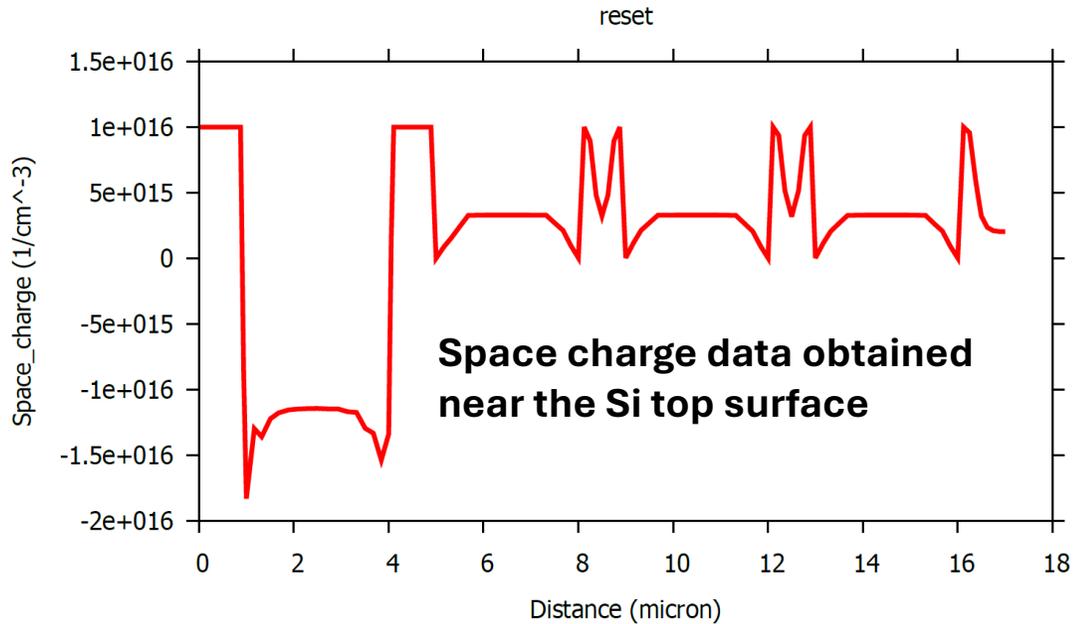
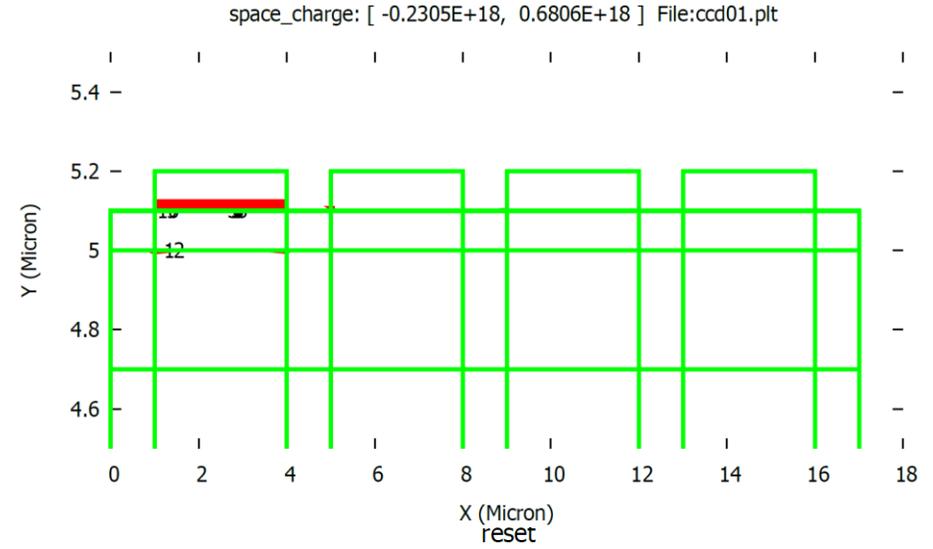
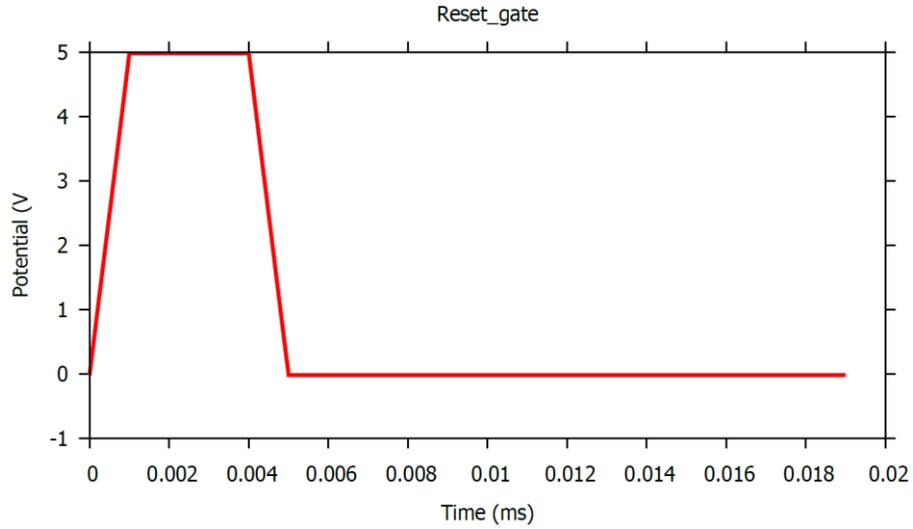


Light sequence versus time



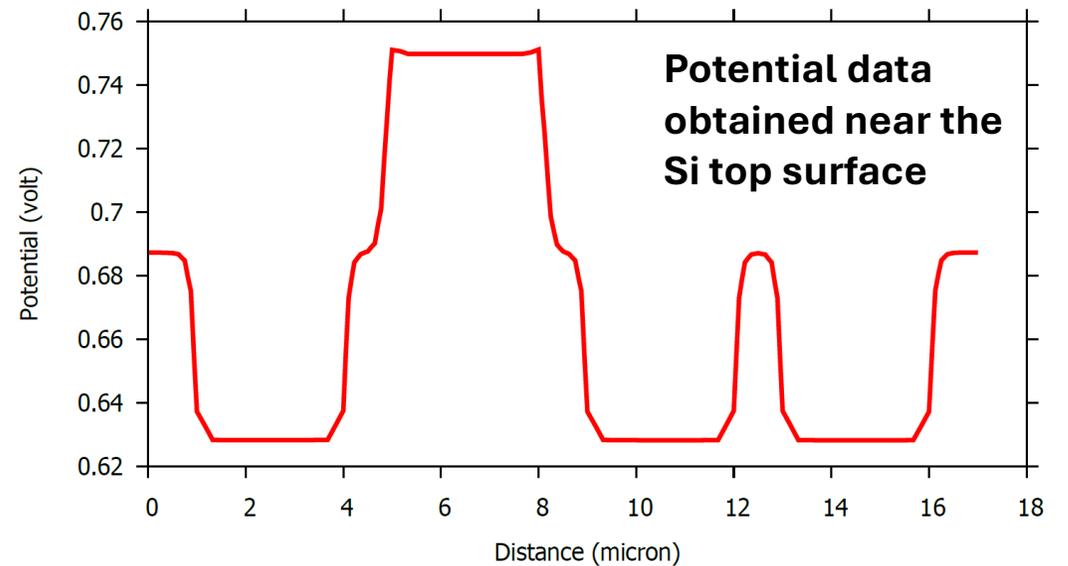
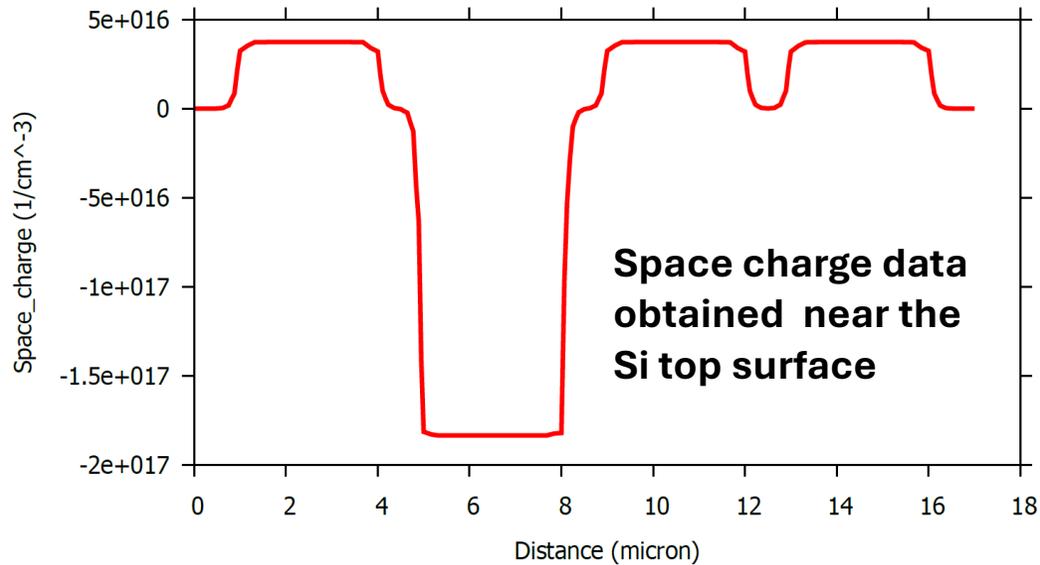
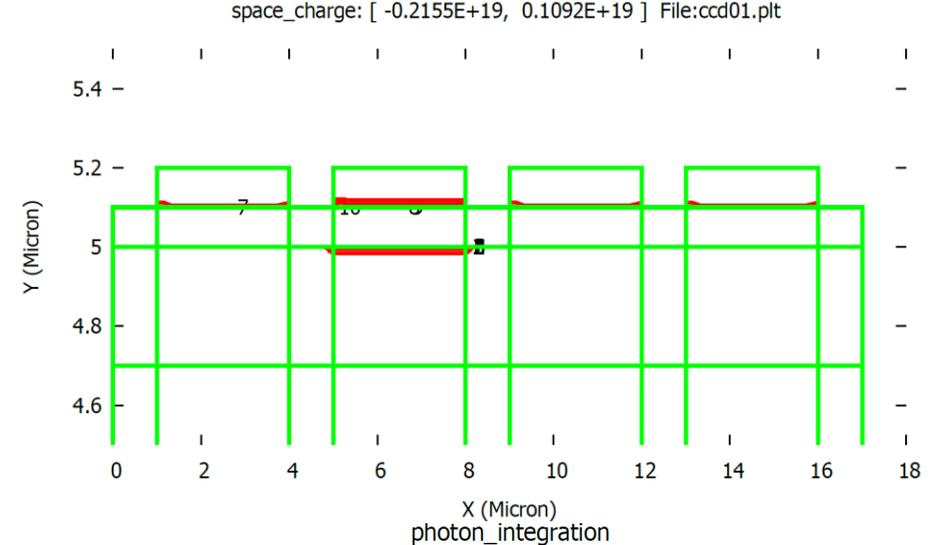
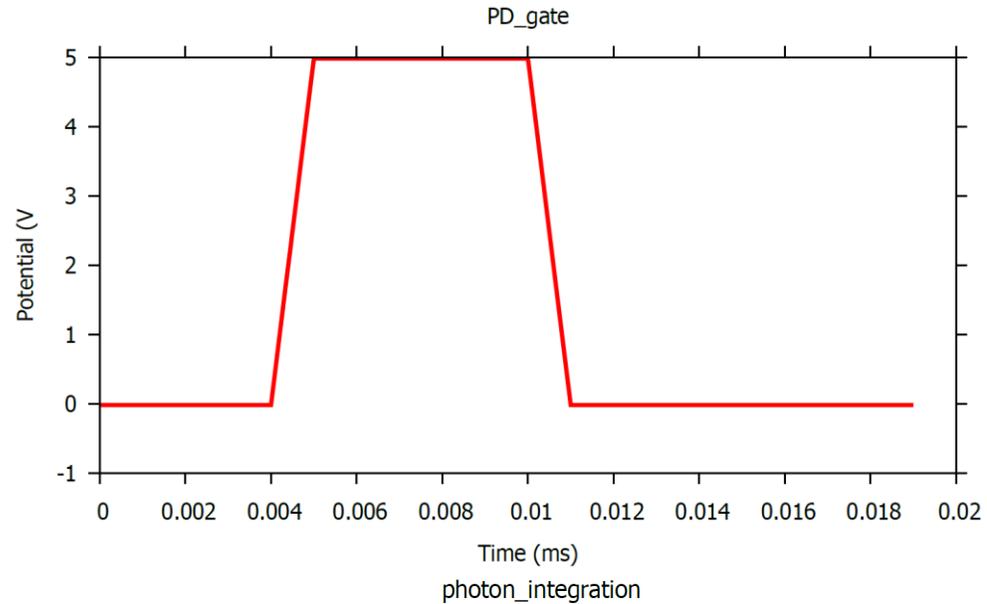
If there is no bias applied on the PD gate, the e-h pairs would recombine right away under the PD gate. The light is always on as long as CCD camera shutter opens. It is the bias on the PD gate that really matters.

Reset gate biased



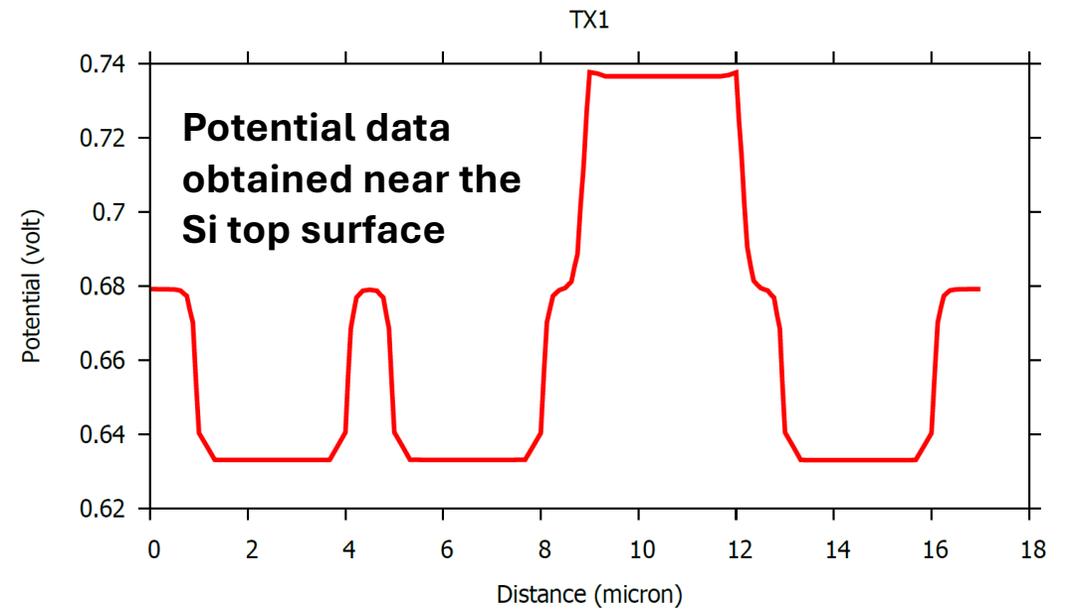
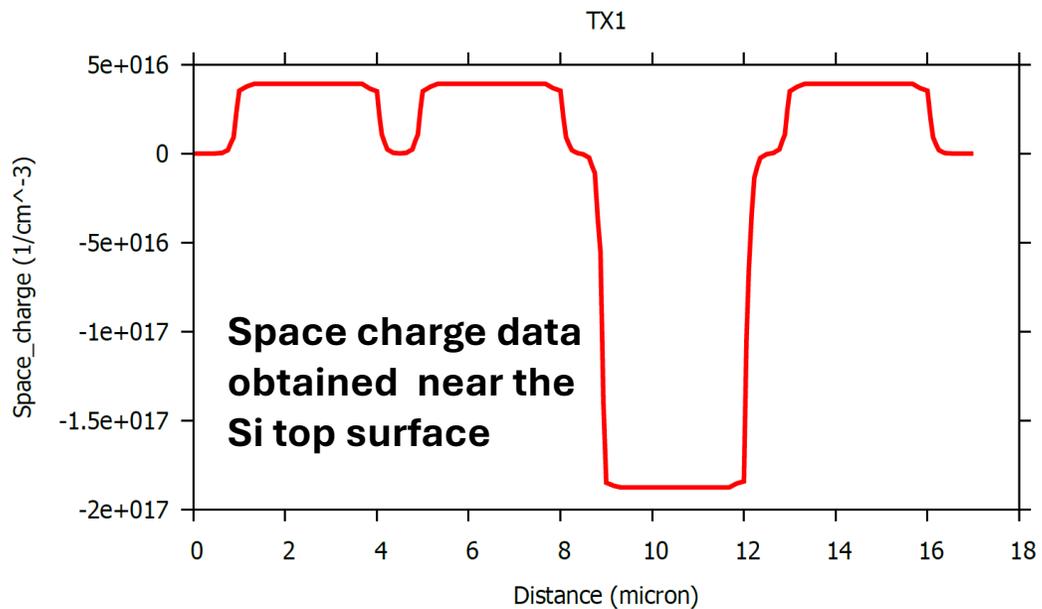
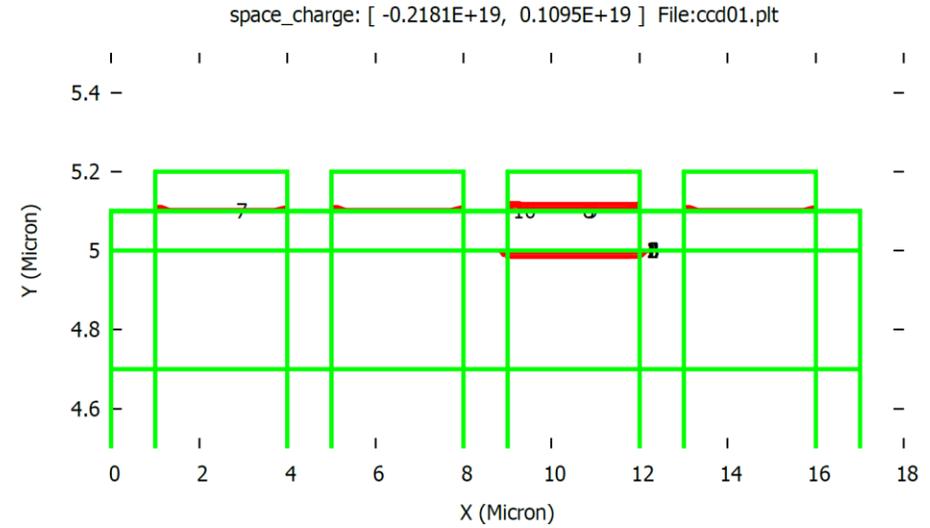
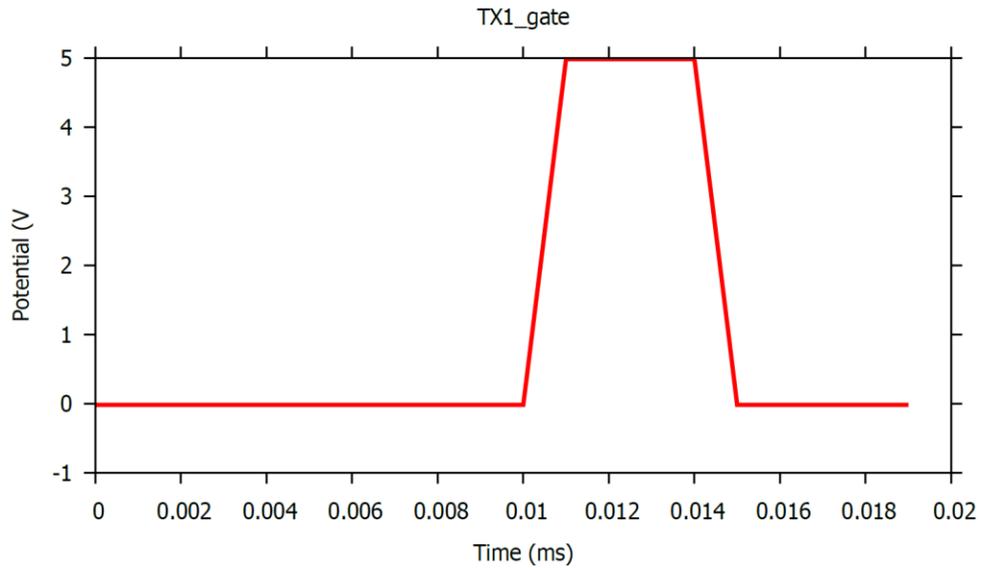
When the reset gate is applied 5 V, all the residual charge carriers from PD are transferred under the reset gate.

PD gate biased



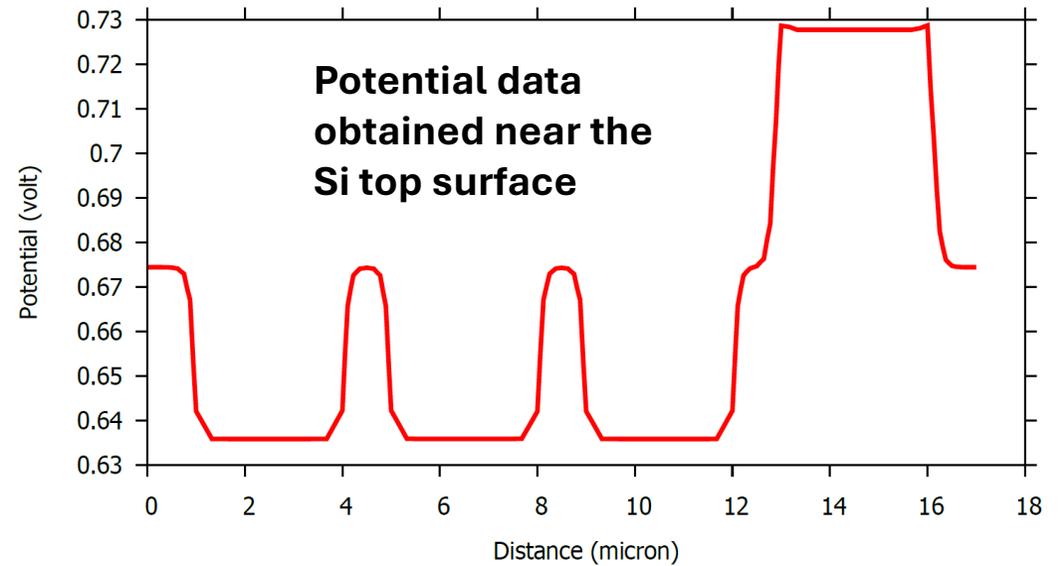
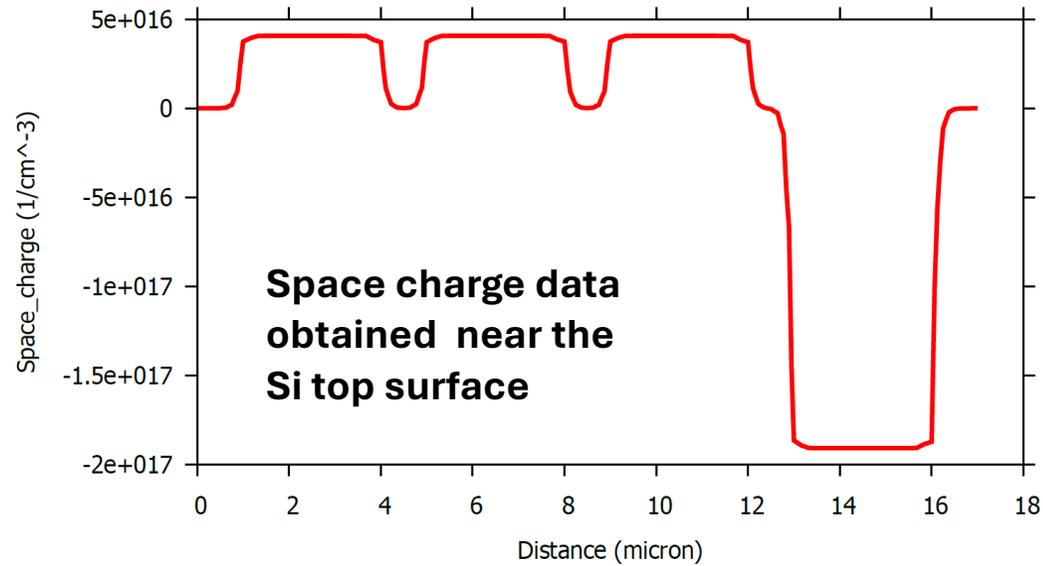
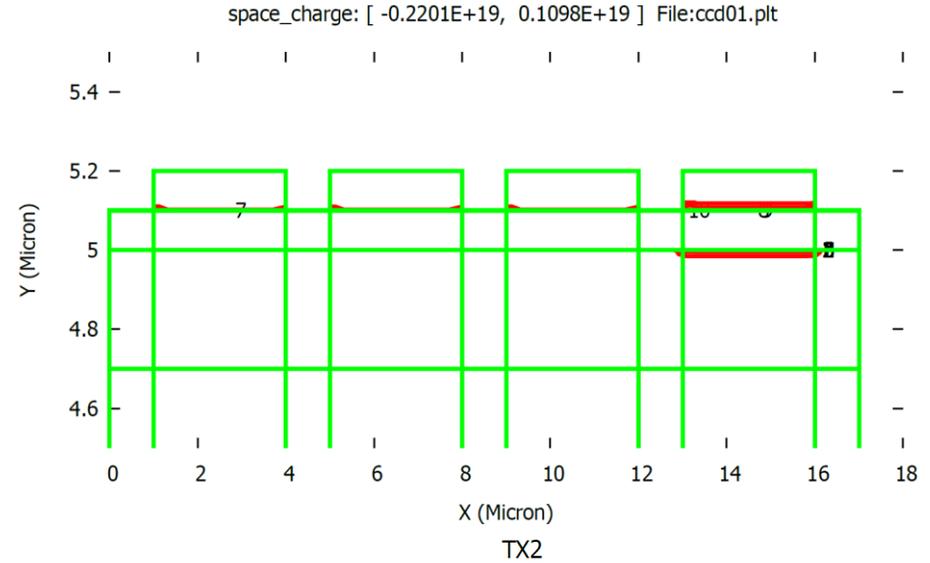
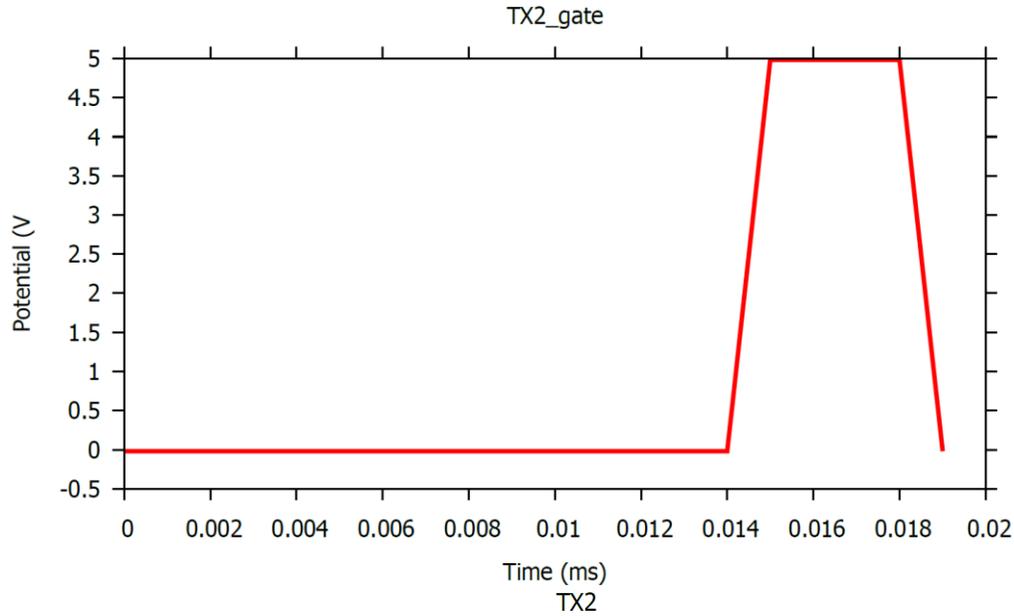
When the PD gate is applied a 5 V bias, the charge carriers are built up under the PD gate.

TX1 gate biased



When the TX1 gate is applied a 5 V bias, the charge carriers from PD are transferred under the TX1 gate.

TX2 gate biased



When the TX2 gate is applied a 5 V bias, the charge carriers are transferred under the TX2 gate.

Summary

- **Crosslight-APSYS is suitable for simulation of the dynamic behavior of CCD.**
- **Photon-integration, and charge transfer, signal detection are easy to extract and study.**
- **Good convergence behavior for transient simulation in micron second scales.**