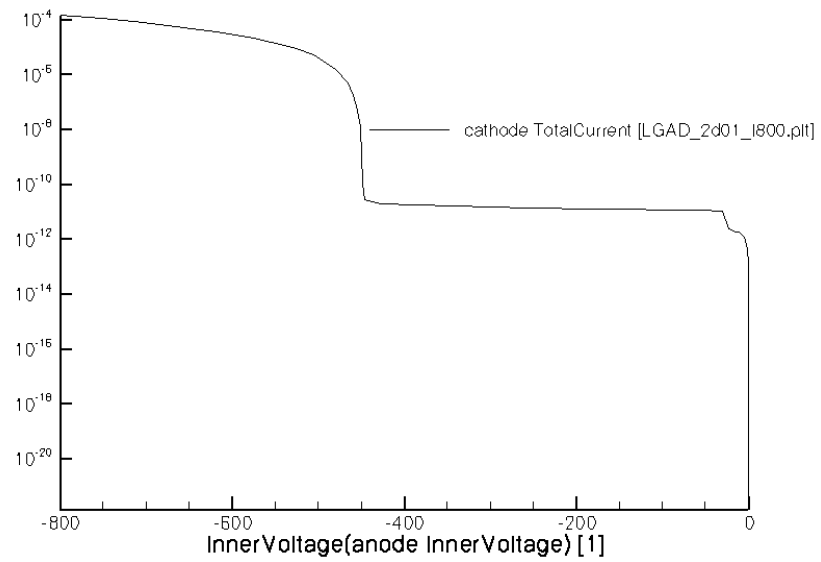
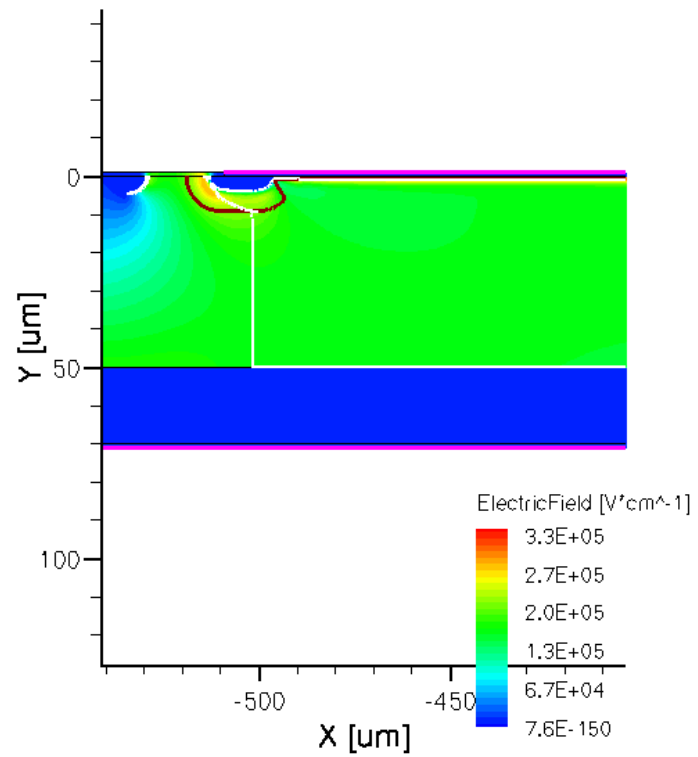


# Statue of Sensor

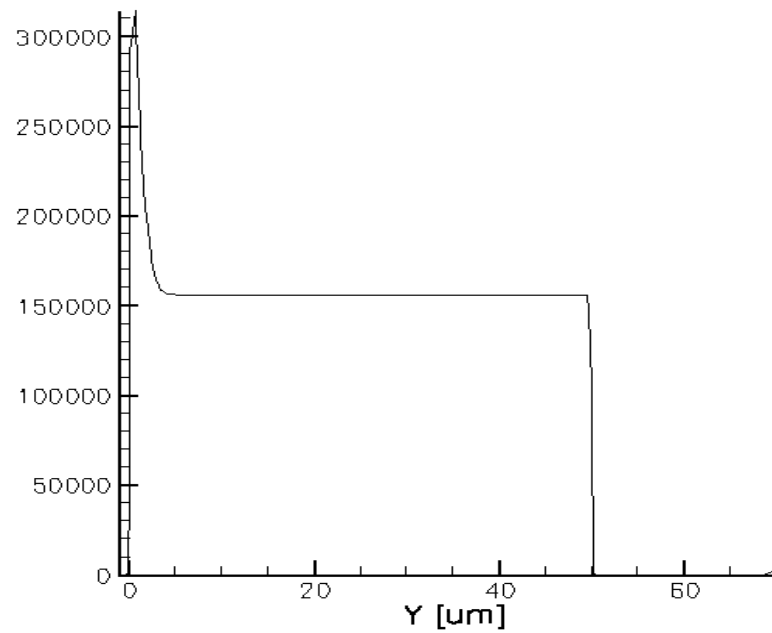
Mei Zhao

2018.9.27

• I\_V



- ElectricField [001: simulation/spad/LGAD\_2d01\_IV800.dat 0-0] X=-427



# Ion model

- Ion  $50\mu\text{m}\sim 3950e$

HeavyIon (

length=50

\*um

time=1e-9 \*1e-9 is nano second

\*s

direction=(0,1)

startpoint=(0, 0)

wt\_hi=1

\*um

let\_f=1.2624e-5

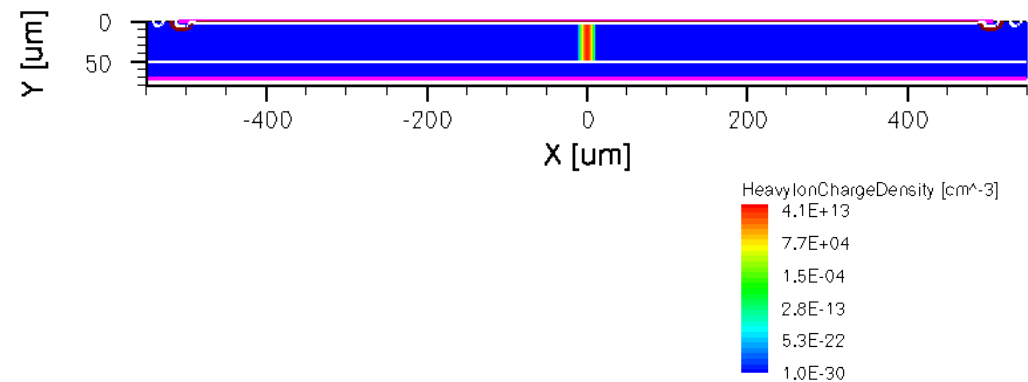
\*pC/um

\*78.9e/衿

Gaussian

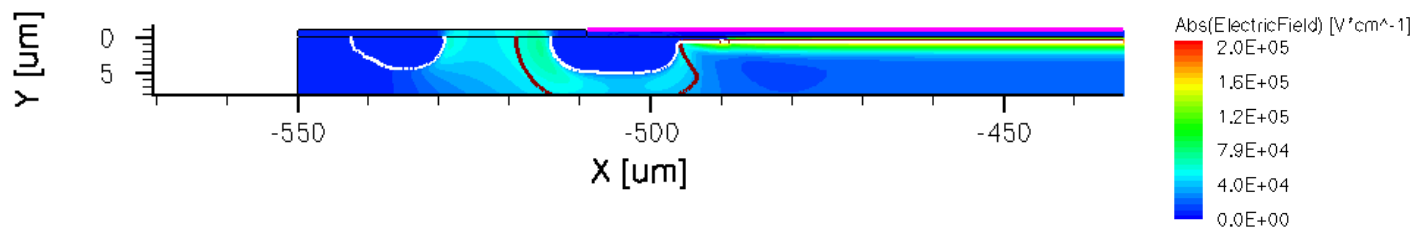
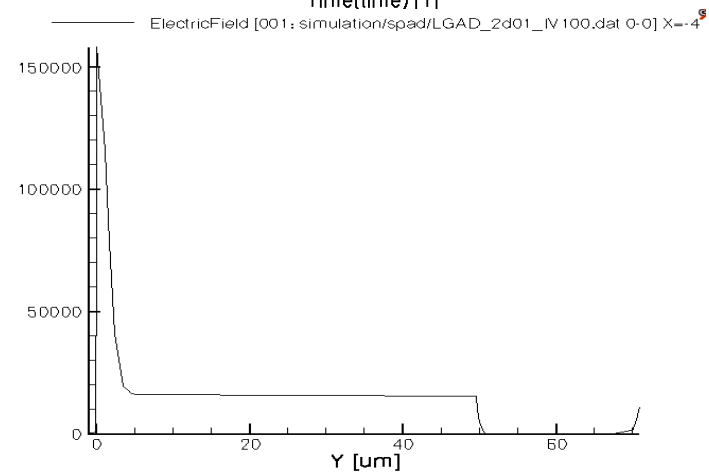
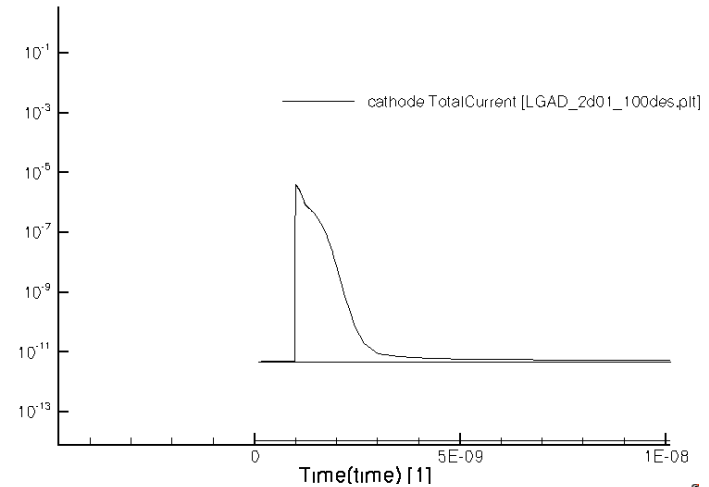
PicoCoulomb

)



# Simulation

- 100V 1e16
- Without avalanche model  
4000e
- With avalanche model  
4562e
- Electric field intensity



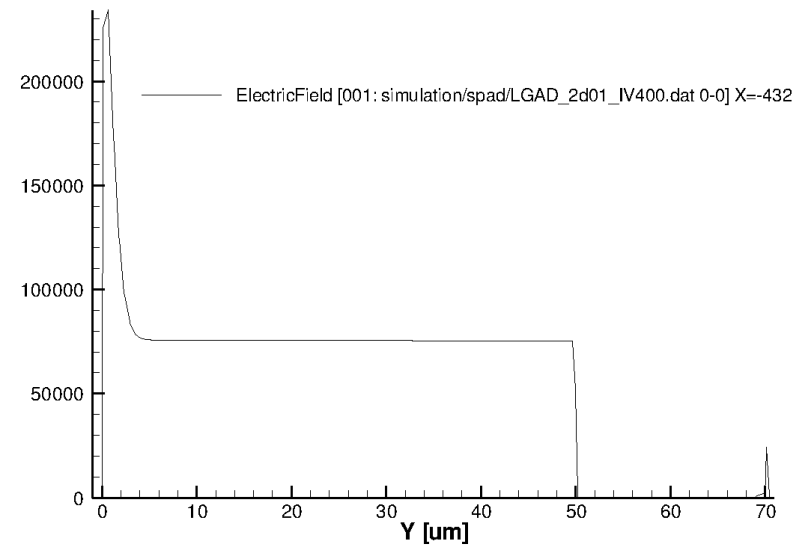
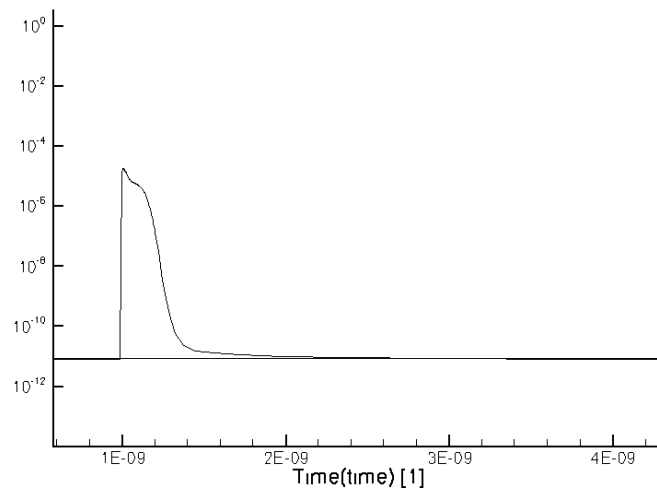
# Questions

- Ion type/cathode voltage?
- Solution: Filed plate, doping depth  
(the dose and the depth of the gain layer)
- Gain simulation?
  
- Tape-out  
leakage current from bulk and from surface, contact resistances, van der  
pauw, MOS with and without p-spray implant beneath, several  
GR termination structures  
PIN Gain=1
- More time for simulation and design

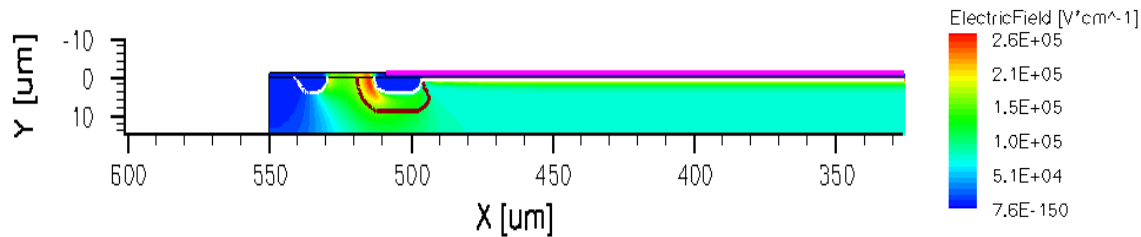
Discussion

# Simulation

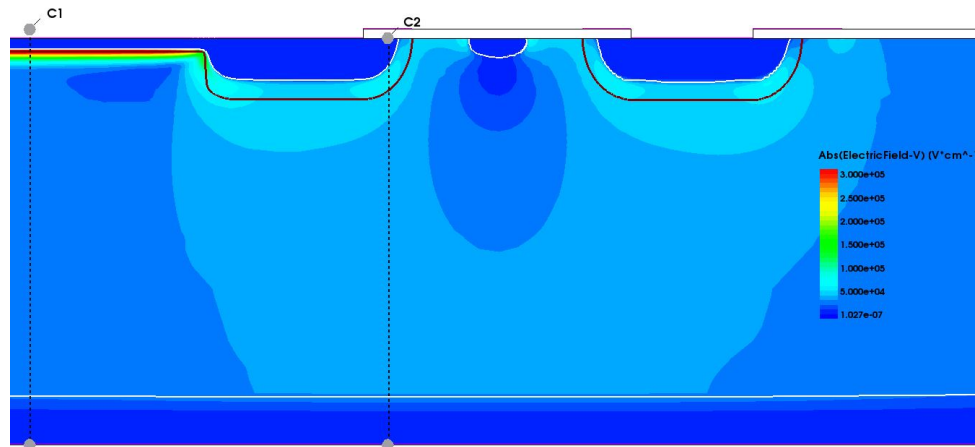
- 400V 1e16  
7000e



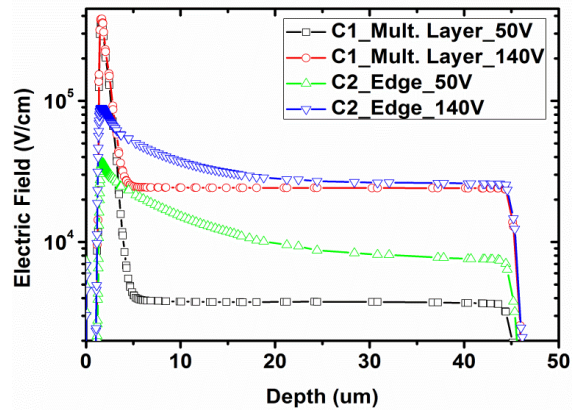
- Electric field intensity



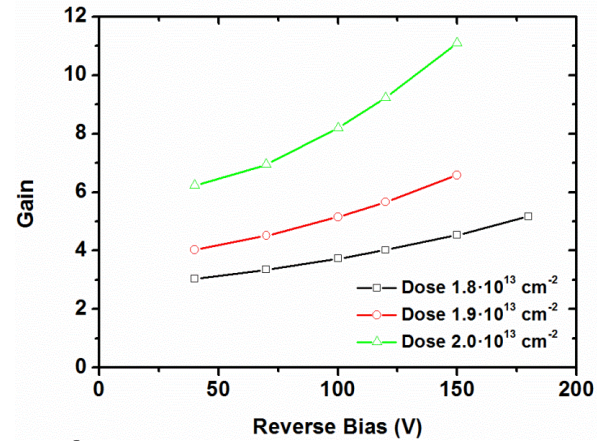
# CNM



Electric Field Simulation



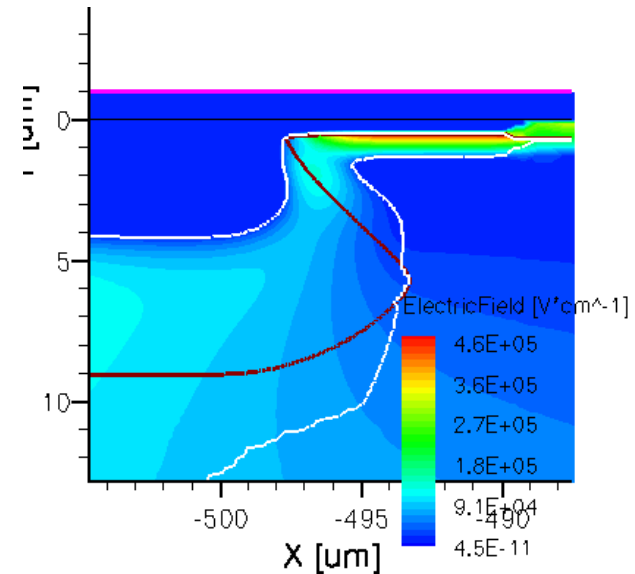
HGTD Gain (Temperature 295)



- P layer: Electric Field higher, Gain
- 140V— $E \sim 20000$ ---Gain 3-4

# Results

- Gain layer: change thickness of n+  
Same voltage, Gain smaller.
- Gain layer: change doping of p layer  
 $1e16 \rightarrow 3e16 \rightarrow 5e16 \rightarrow 1e17$   
 $450V \rightarrow 50V \rightarrow 22V$   
break down voltage lower  
Simulation of the Gain
- Space between P stop and n JTE  
Affect the break down voltage  
Also need to improve
- Field plate  
break down voltage increases~  
Also need to improve





# Next Work

- Field plate  
material, thickness, Space
- Ion implantation concentration → Doping  
profile  
1.8e13 100keV, 1.9e13 100keV, 2e13 100keV
- Temperature