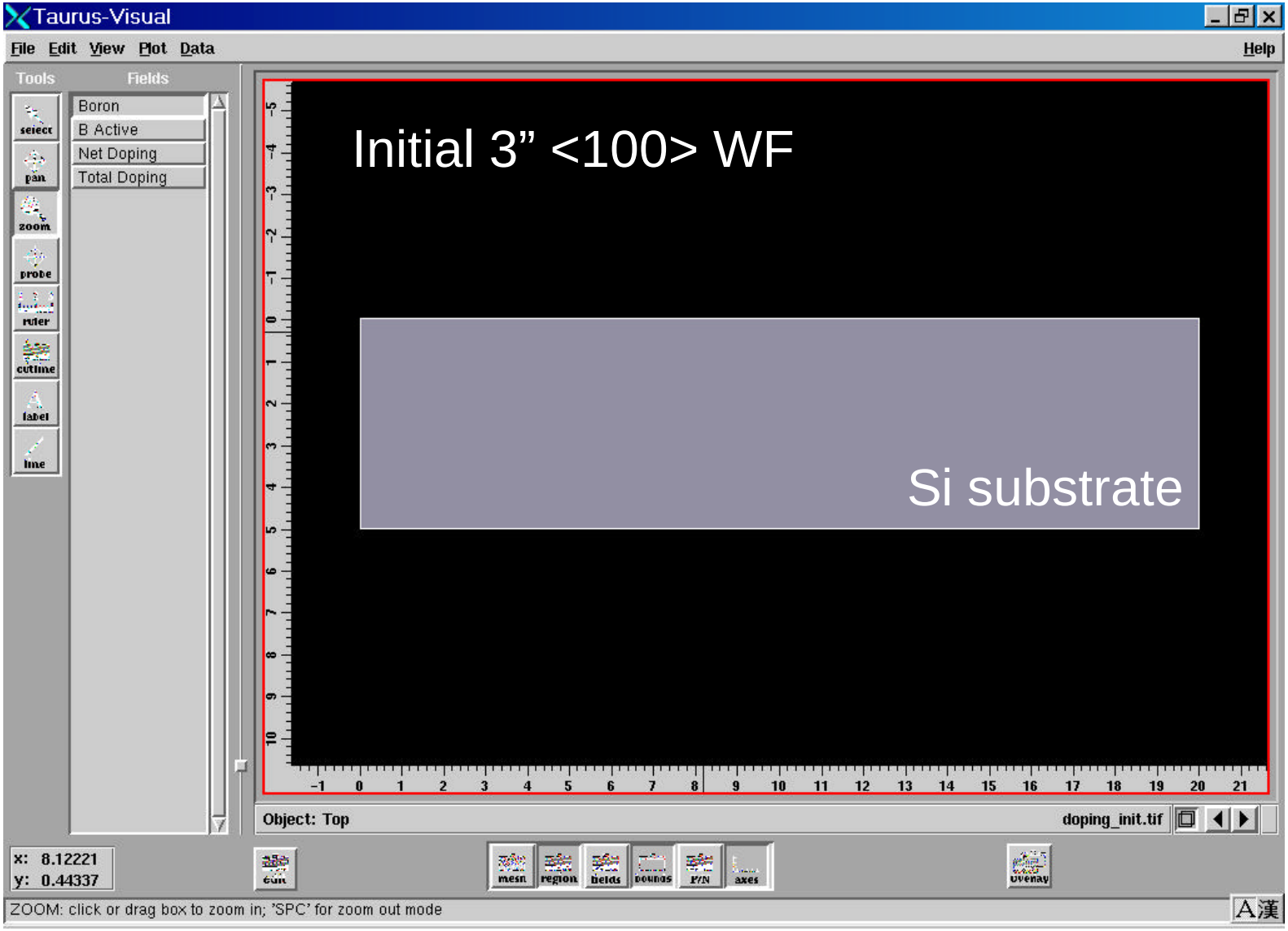
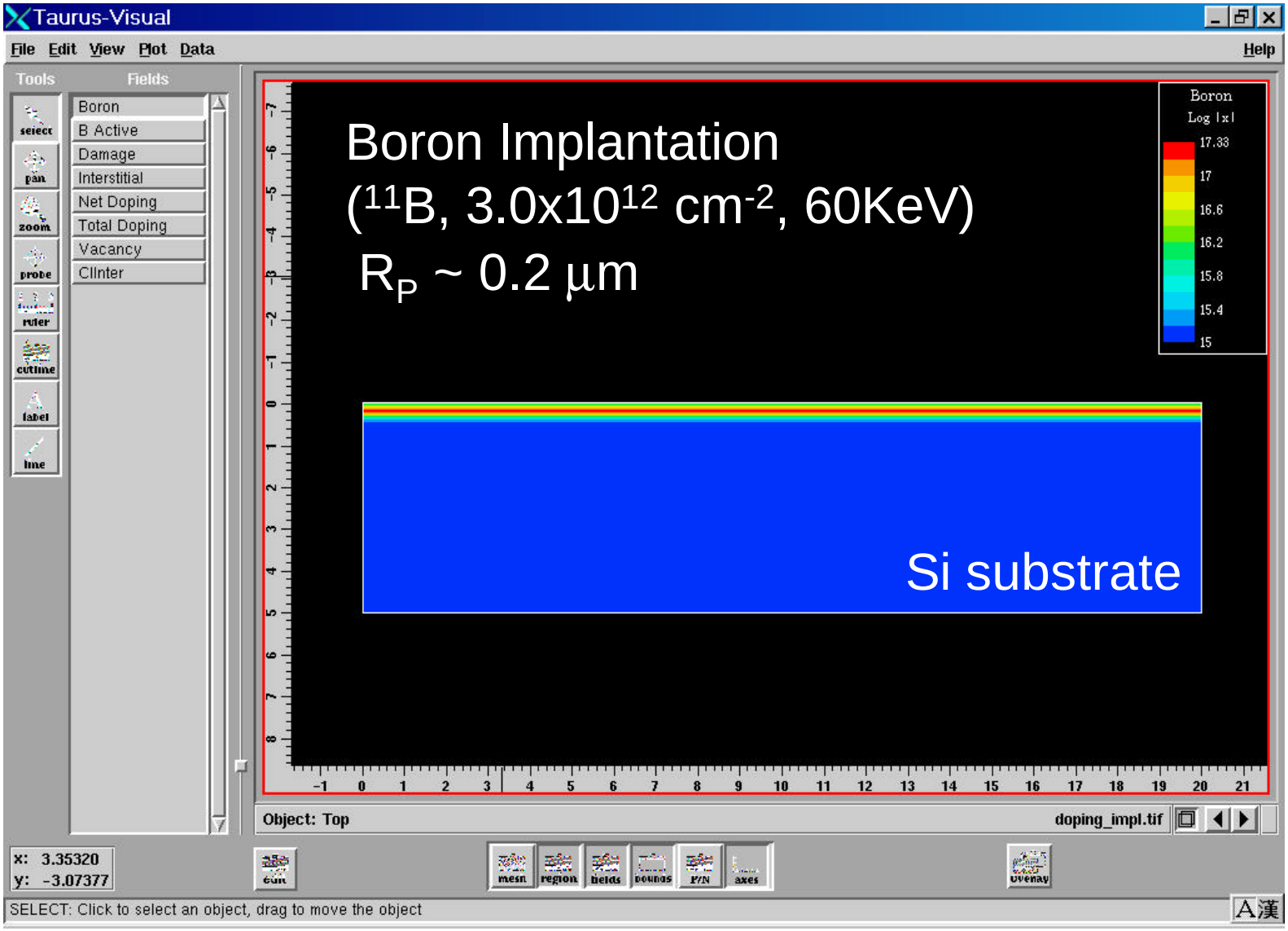
TSUPREM4 Process Simulation Results

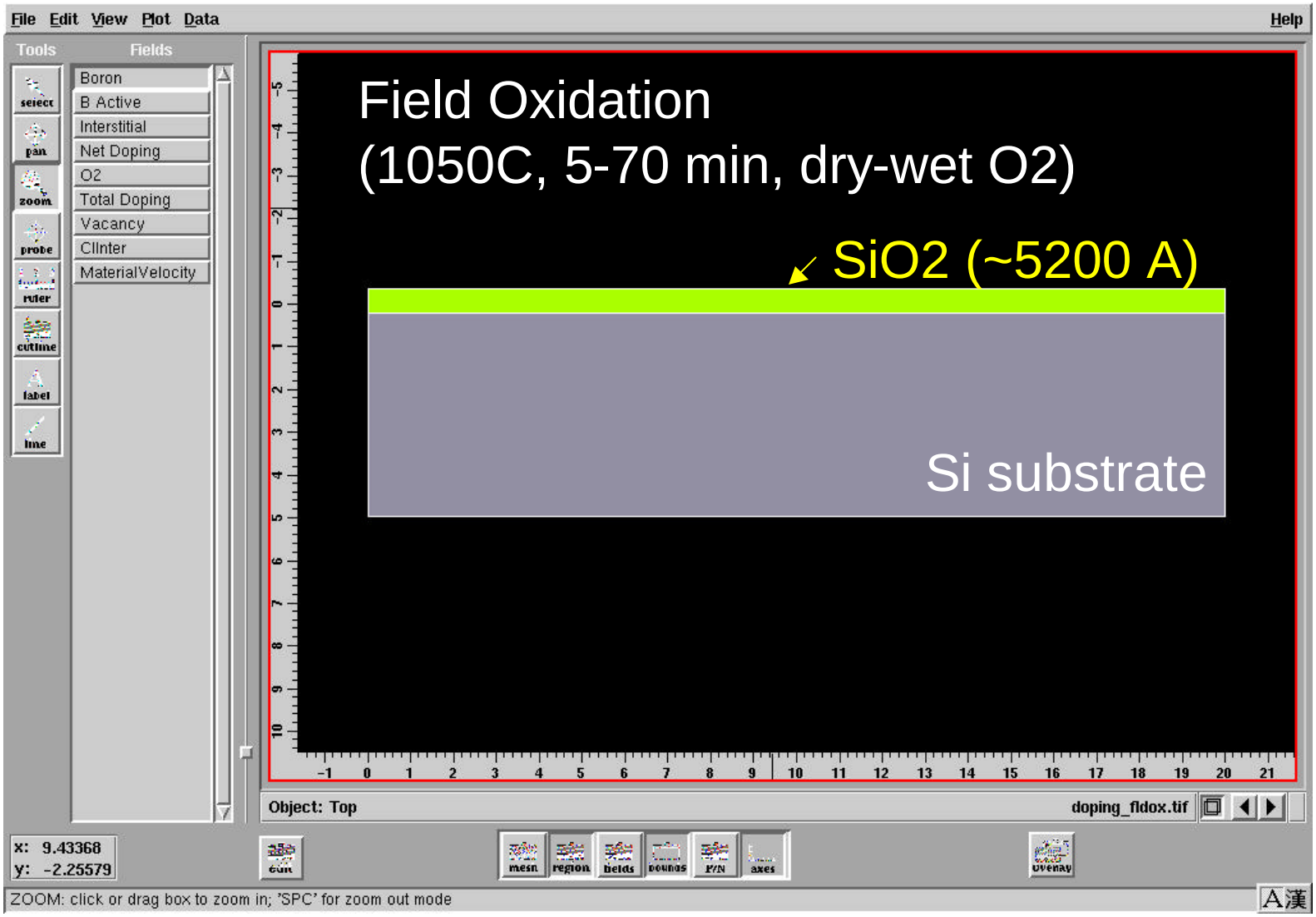
for EE143 MOSFET Device

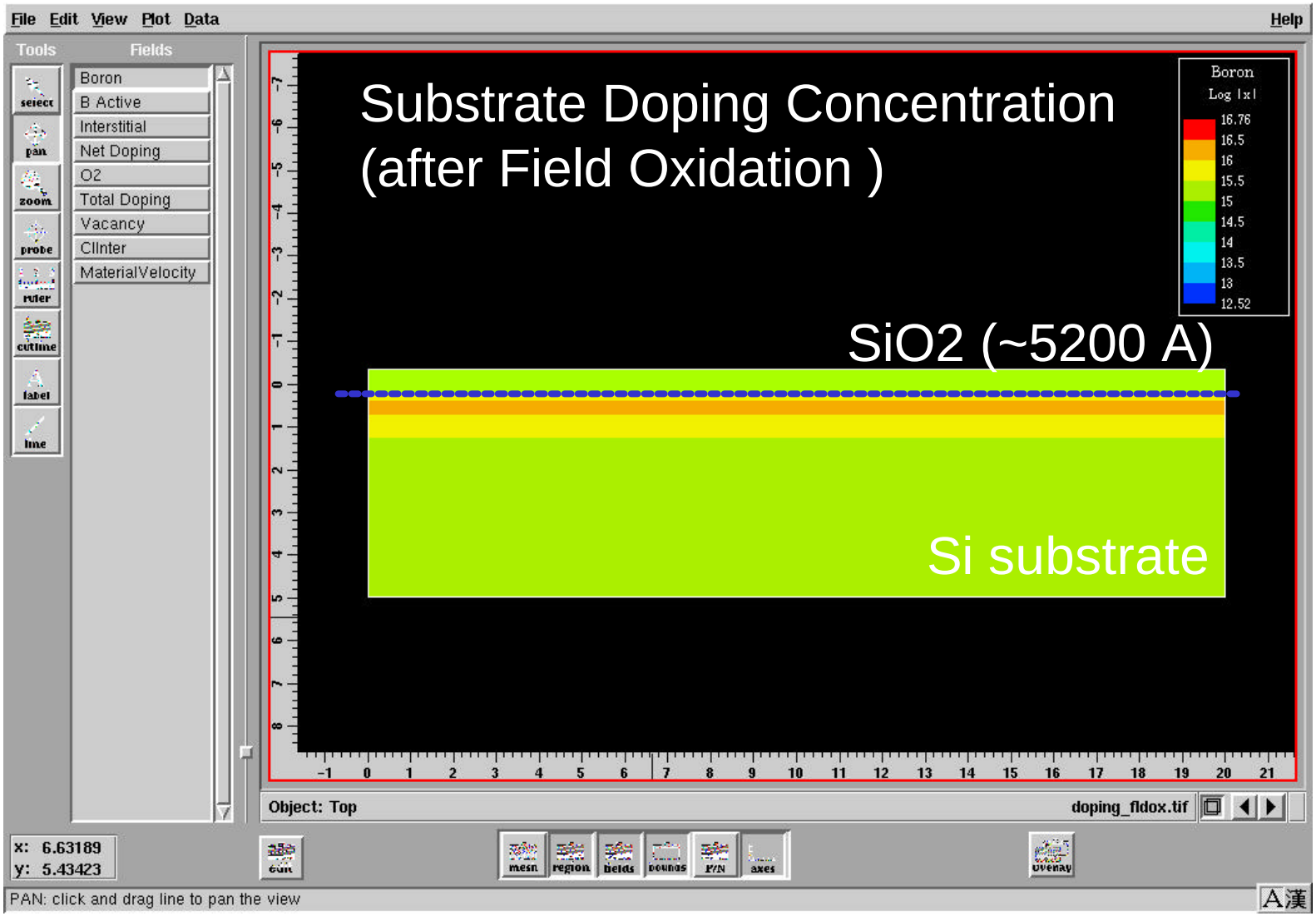
Fall 2002

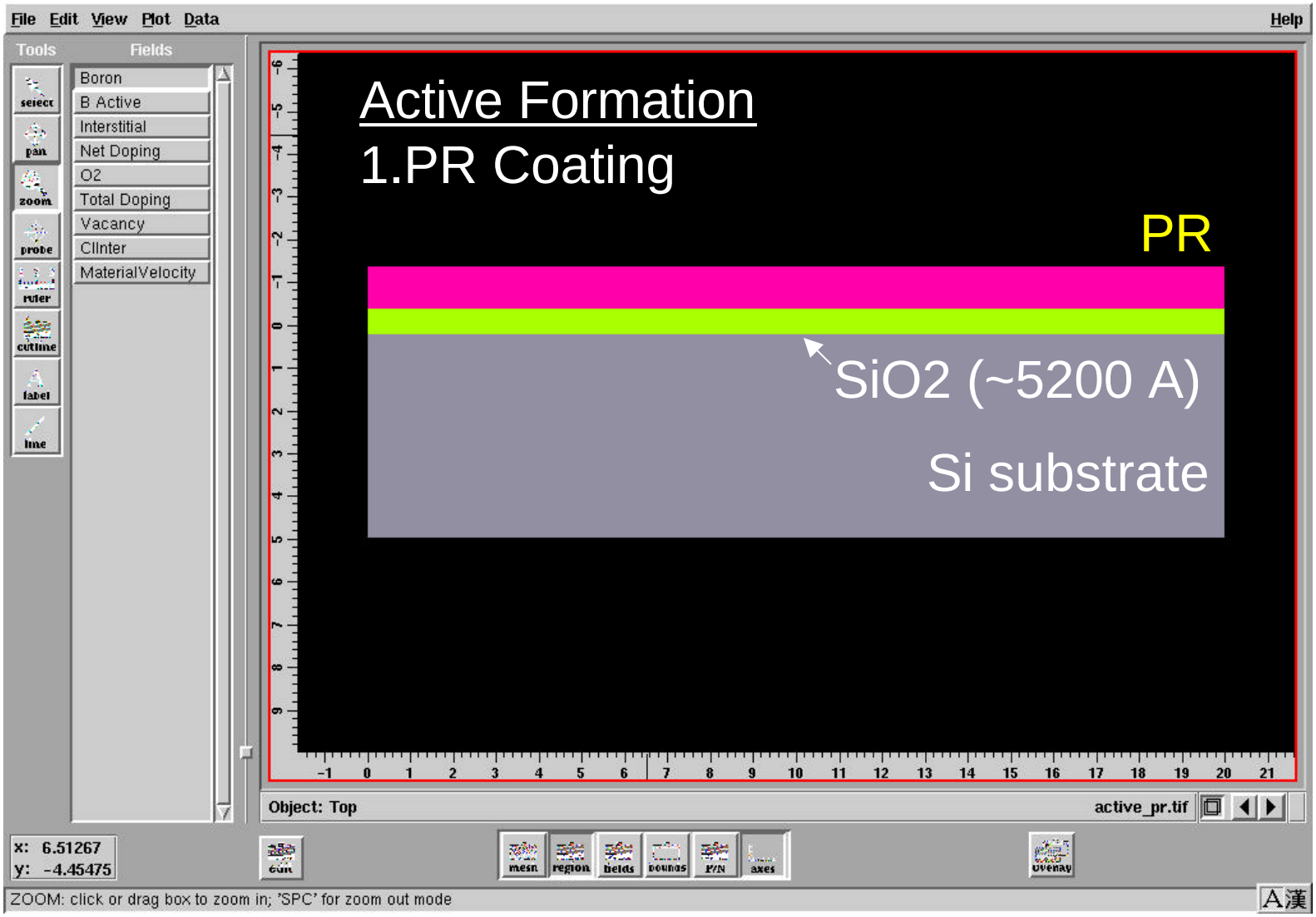
In courtesy of Daewon Ha

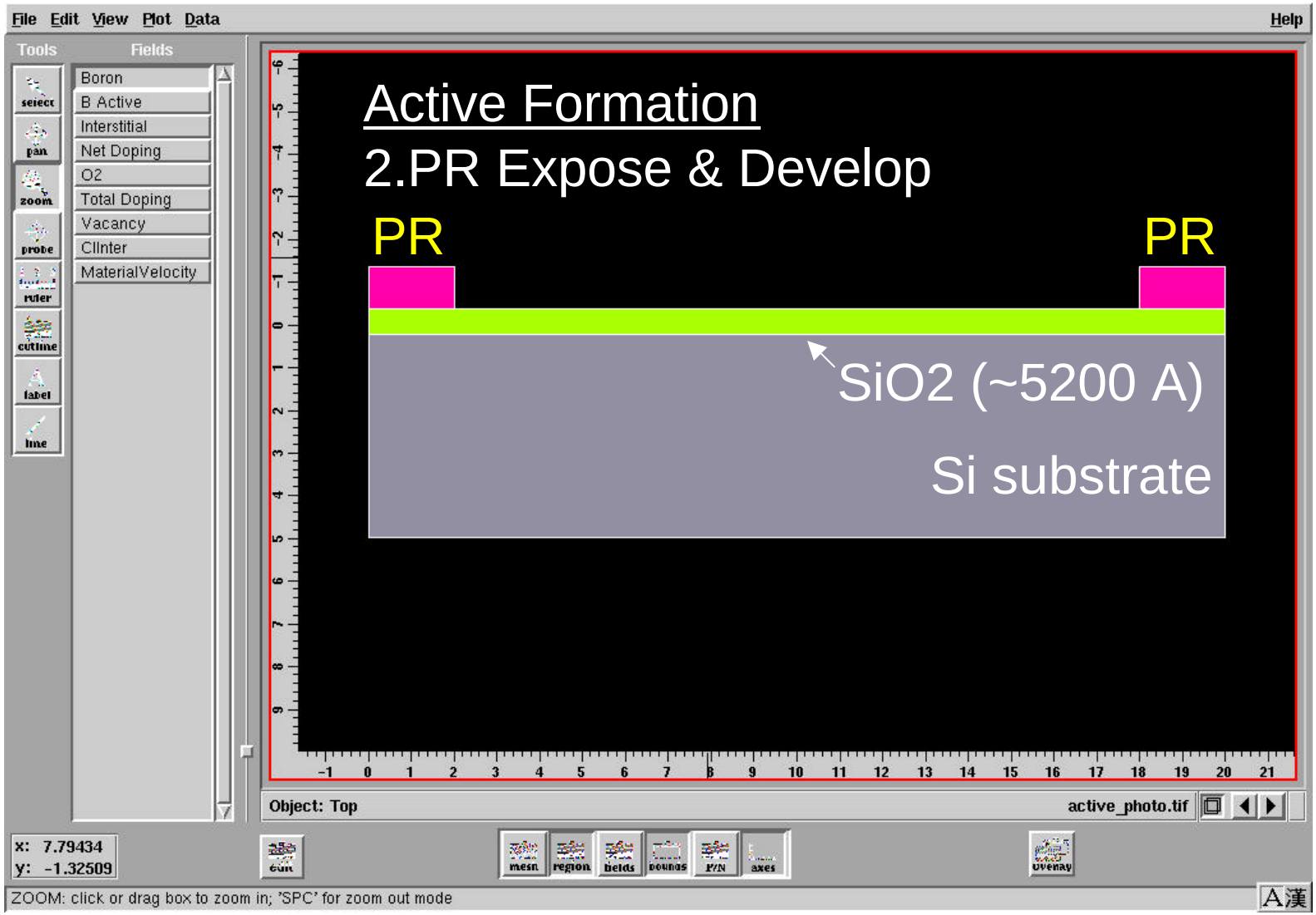

Taurus-Visual
File Edit View Plot Data
Help
Tools
Fields
Boron
B Active
Net Doping
Total Doping
Initial 3” <100> WF
Si substrate
Object: Top
doping_init.tif
x: 8.12221
y: 0.44337
ZOOM: click or drag box to zoom in; 'SPC' for zoom out mode

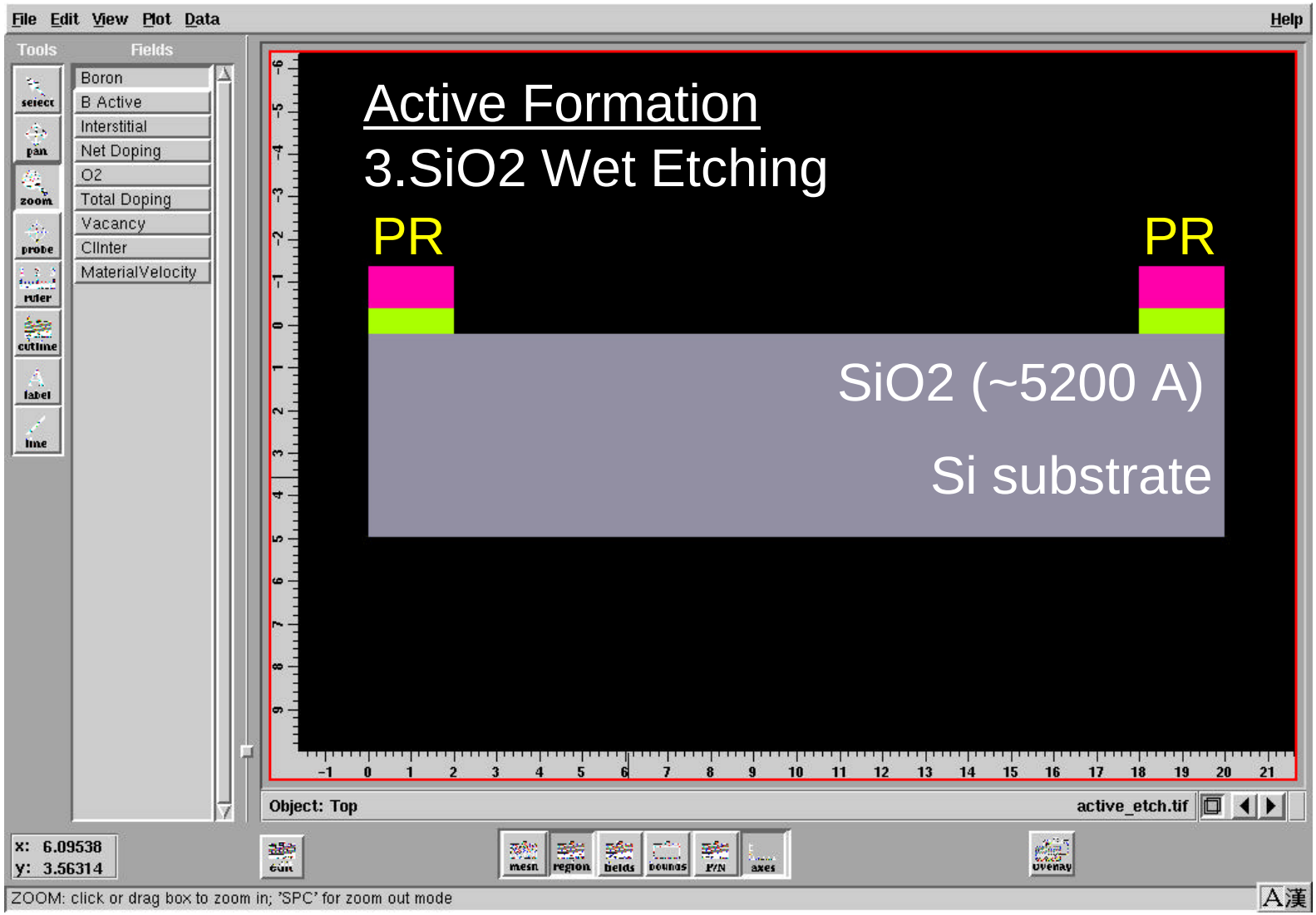

Taurus-Visual
File Edit View Plot Data
Help
Tools
Fields
Boron
B Active
Damage
Interstitial
Net Doping
Total Doping
Vacancy
ClInter
Boron Implantation
(11B, 3.0x10^12 cm^-2, 60KeV)
R_P ~ 0.2 µm
Si substrate
Boron
Log |x|
17.33
17
16.6
16.2
15.8
15.4
15
Object: Top
doping_impl.tif
x: 3.35320
y: -3.07377
SELECT: Click to select an object, drag to move the object

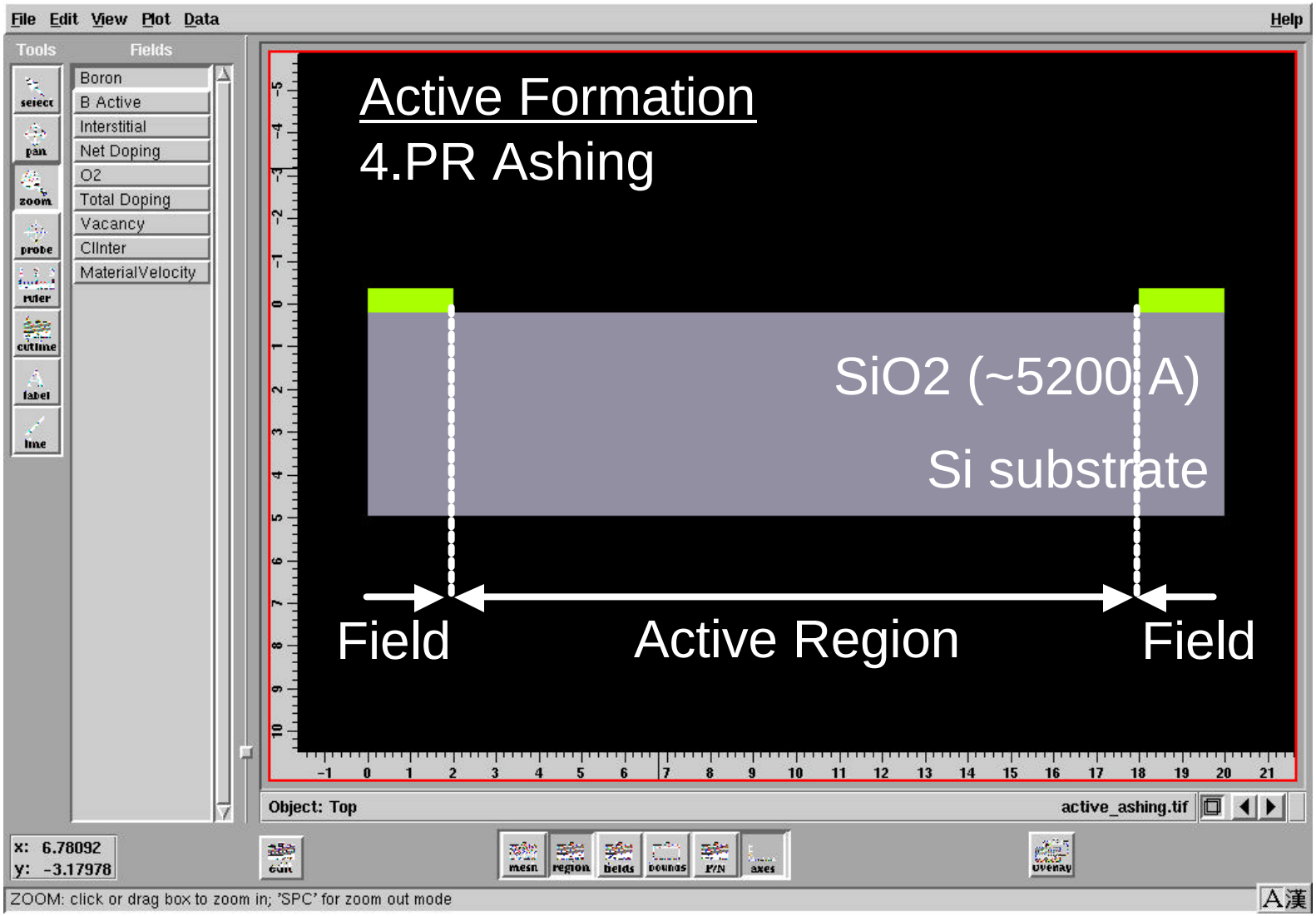

File Edit View Plot Data
Help
Tools
Fields
Boron
B Active
Interstitial
Net Doping
O2
Total Doping
Vacancy
ClInter
MaterialVelocity
Field Oxidation
(1050C, 5-70 min, dry-wet O2)
SiO2 (~5200 A)
Si substrate
Object: Top
doping_fldox.tif
x: 9.43368
y: -2.25579
ZOOM: click or drag box to zoom in; 'SPC' for zoom out mode

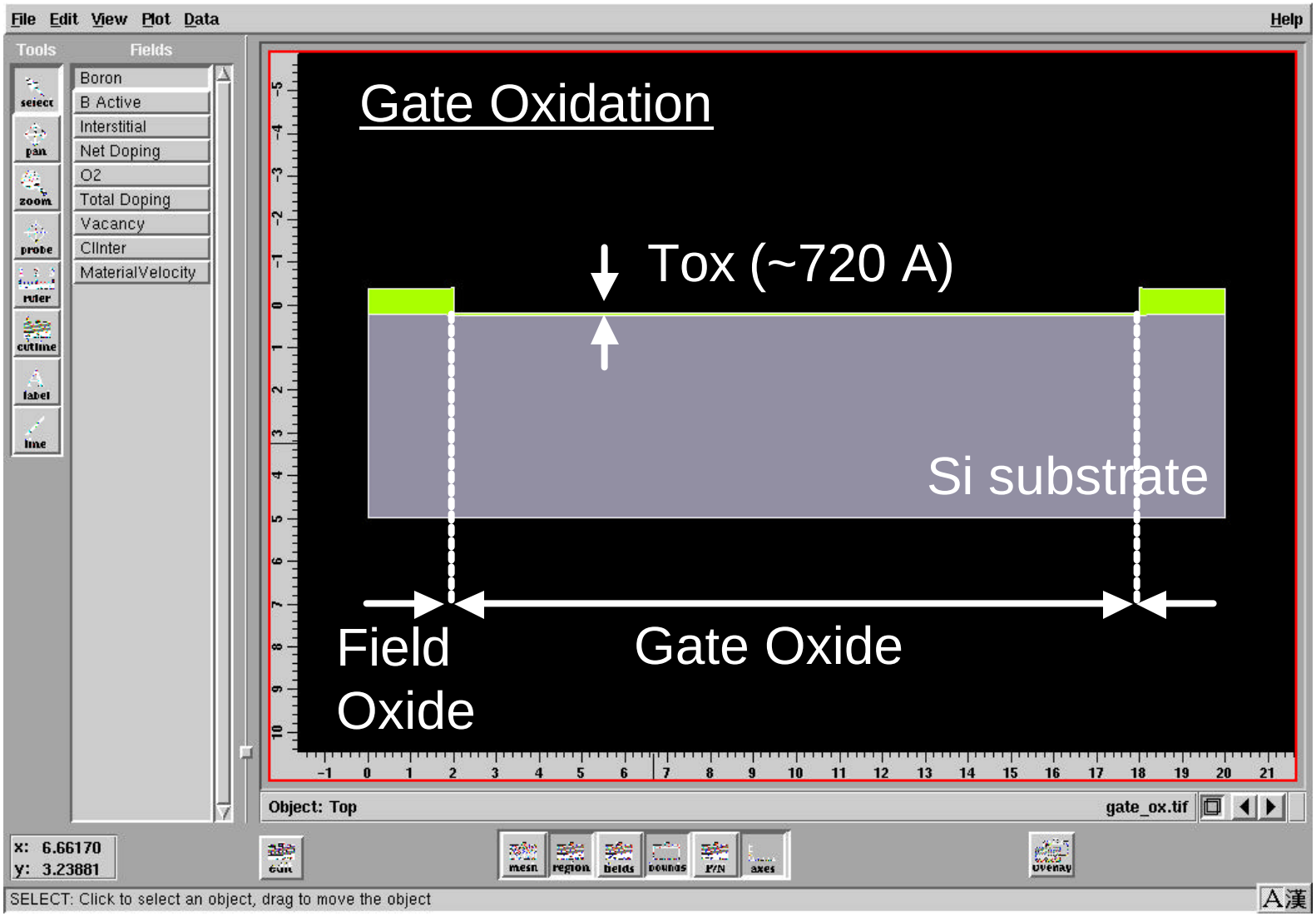

File Edit View Plot Data
Help
Tools
Fields
Boron
B Active
Interstitial
Net Doping
O2
Total Doping
Vacancy
ClInter
MaterialVelocity
Substrate Doping Concentration
(after Field Oxidation)
Boron
Log |x|
16.76
16.5
16
15.5
15
14.5
14
13.5
13
12.52
SiO2 (~5200 A)
Si substrate
Object: Top
doping_fldox.tif
x: 6.63189
y: 5.43423
PAN: click and drag line to pan the view

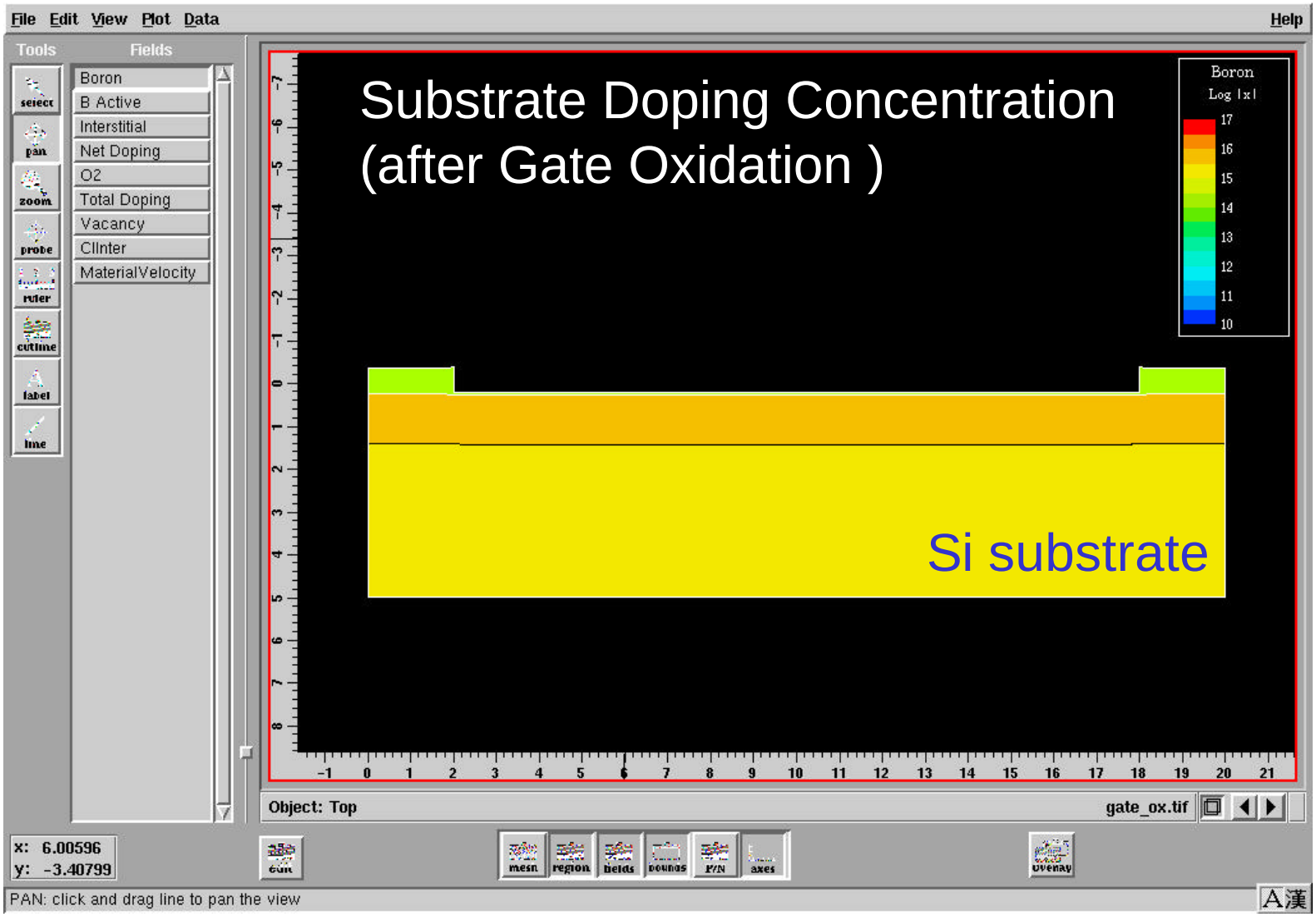

File Edit View Plot Data
Help
Tools
Fields
Boron
B Active
Interstitial
Net Doping
O2
Total Doping
Vacancy
ClInter
MaterialVelocity
Active Formation
1.PR Coating
PR
SiO2 (~5200 A)
Si substrate
Object: Top
active_pr.tif
x: 6.51267
y: -4.45475
ZOOM: click or drag box to zoom in; 'SPC' for zoom out mode

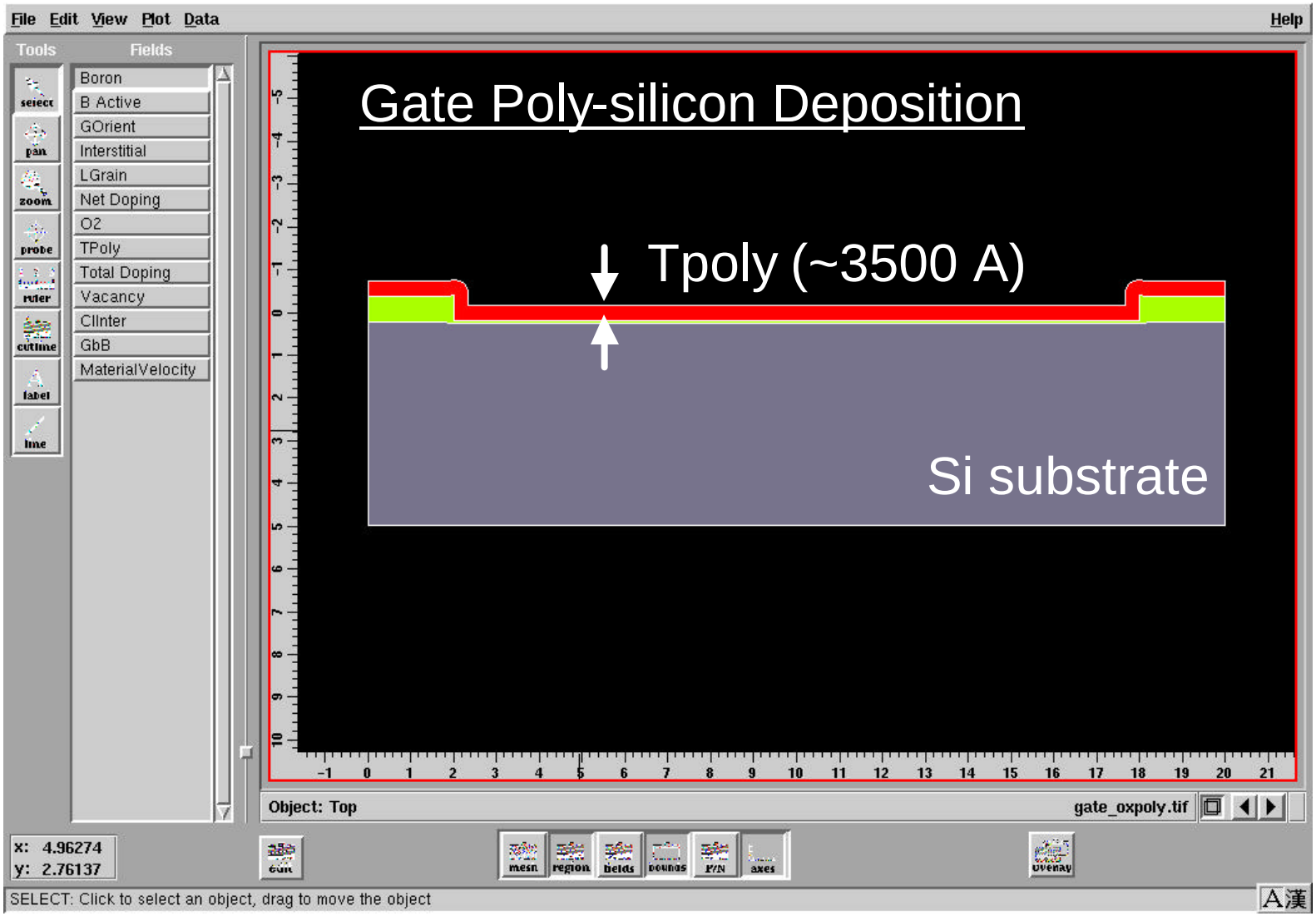

File Edit View Plot Data
Help
Tools
Fields
Boron
B Active
Interstitial
Net Doping
O2
Total Doping
Vacancy
ClInter
MaterialVelocity
Active Formation
2.PR Expose & Develop
PR
PR
SiO2 (~5200 A)
Si substrate
Object: Top
active_photo.tif
x: 7.79434
y: -1.32509
mesh
region
fields
bounds
axes
ZOOM: click or drag box to zoom in; 'SPC' for zoom out mode

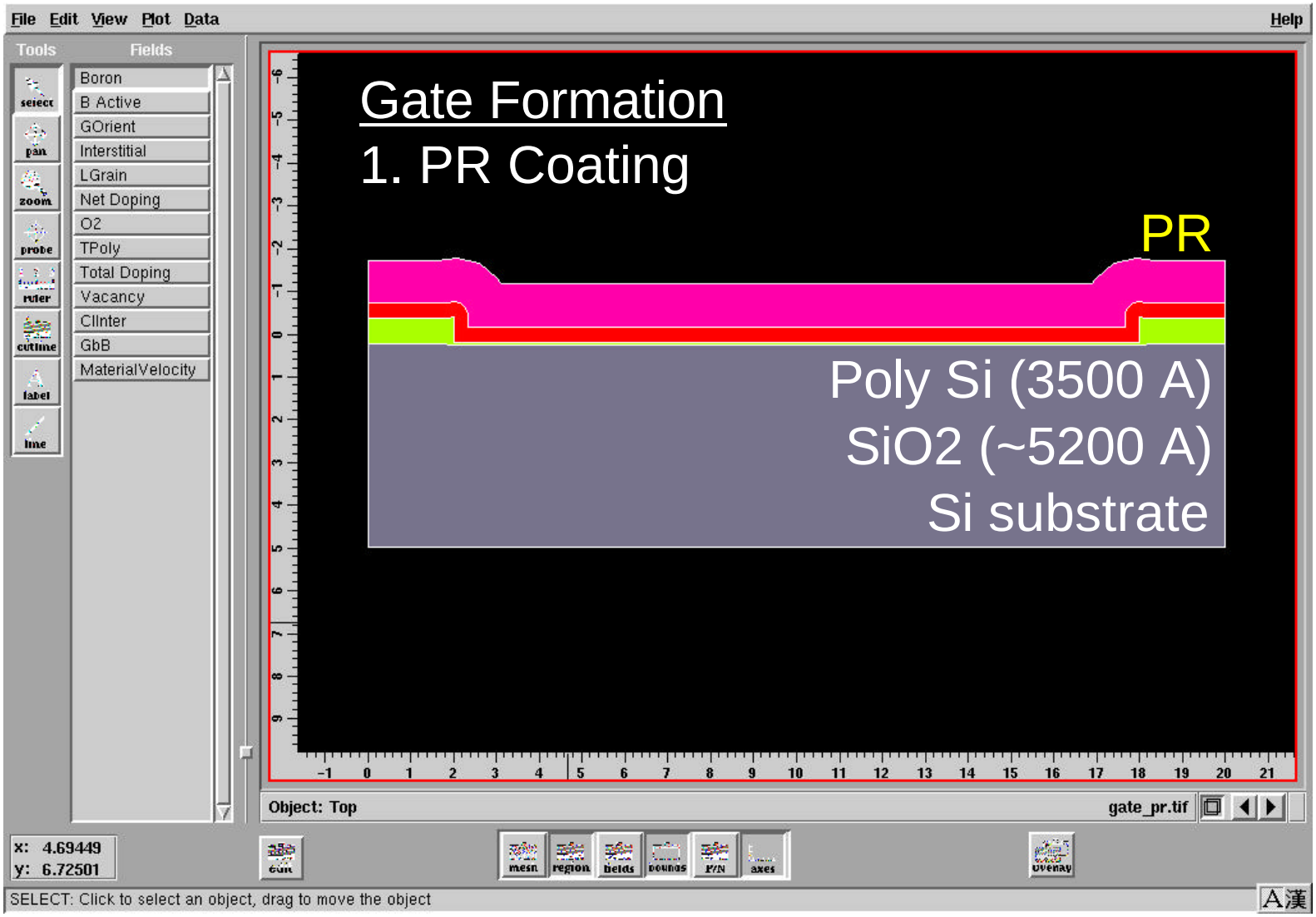

File Edit View Plot Data
Help
Tools
Fields
Boron
B Active
Interstitial
Net Doping
O2
Total Doping
Vacancy
ClInter
MaterialVelocity
Active Formation
3.SiO2 Wet Etching
PR
PR
SiO2 (~5200 A)
Si substrate
Object: Top
active_etch.tif
x: 6.09538
y: 3.56314
ZOOM: click or drag box to zoom in; 'SPC' for zoom out mode

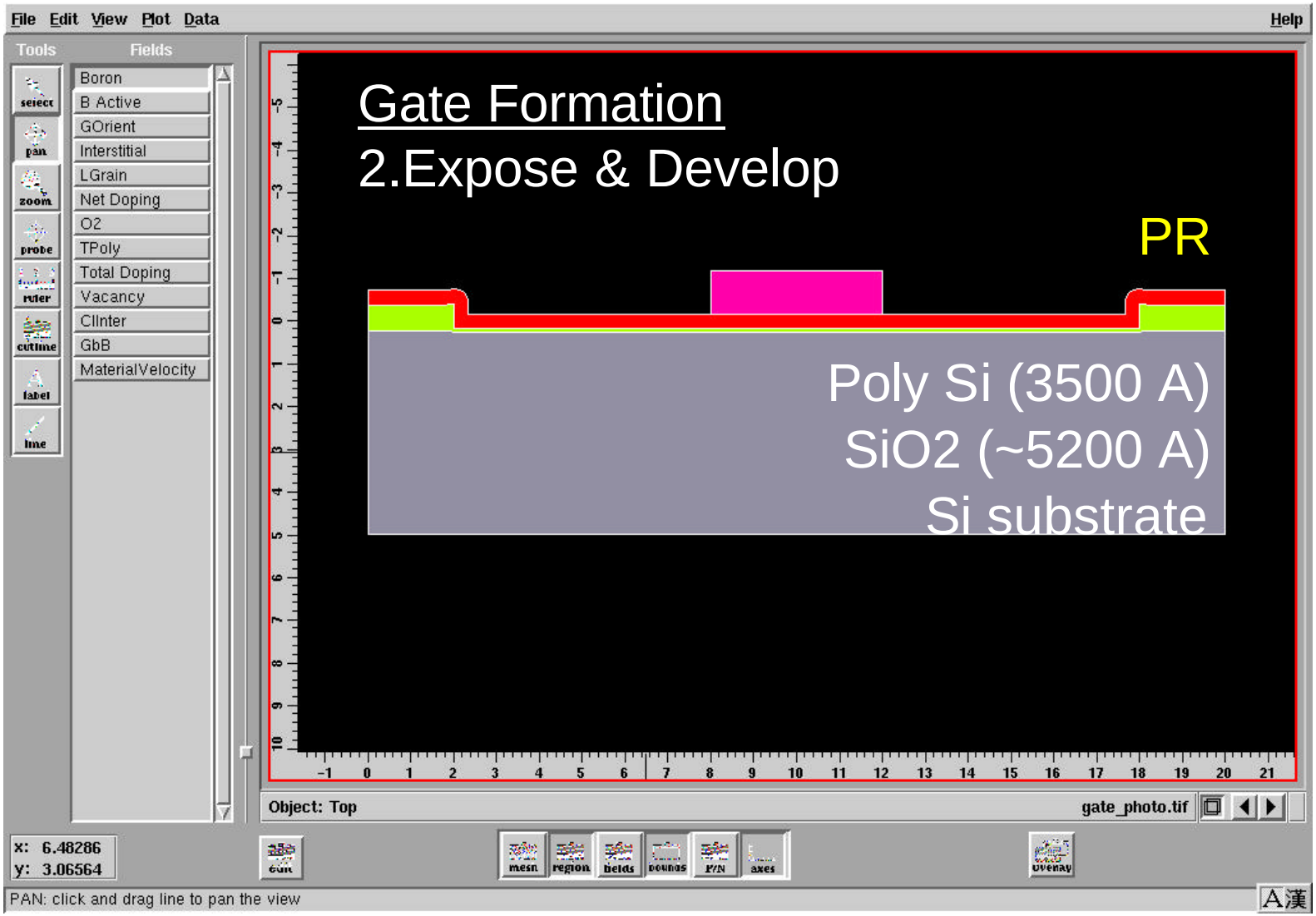

File Edit View Plot Data
Help
Tools
Fields
Boron
B Active
Interstitial
Net Doping
O2
Total Doping
Vacancy
ClInter
MaterialVelocity
Active Formation
4.PR Ashing
SiO2 (~5200 A)
Si substrate
Field
Active Region
Field
Object: Top
active_ashing.tif
x: 6.78092
y: -3.17978
ZOOM: click or drag box to zoom in; 'SPC' for zoom out mode

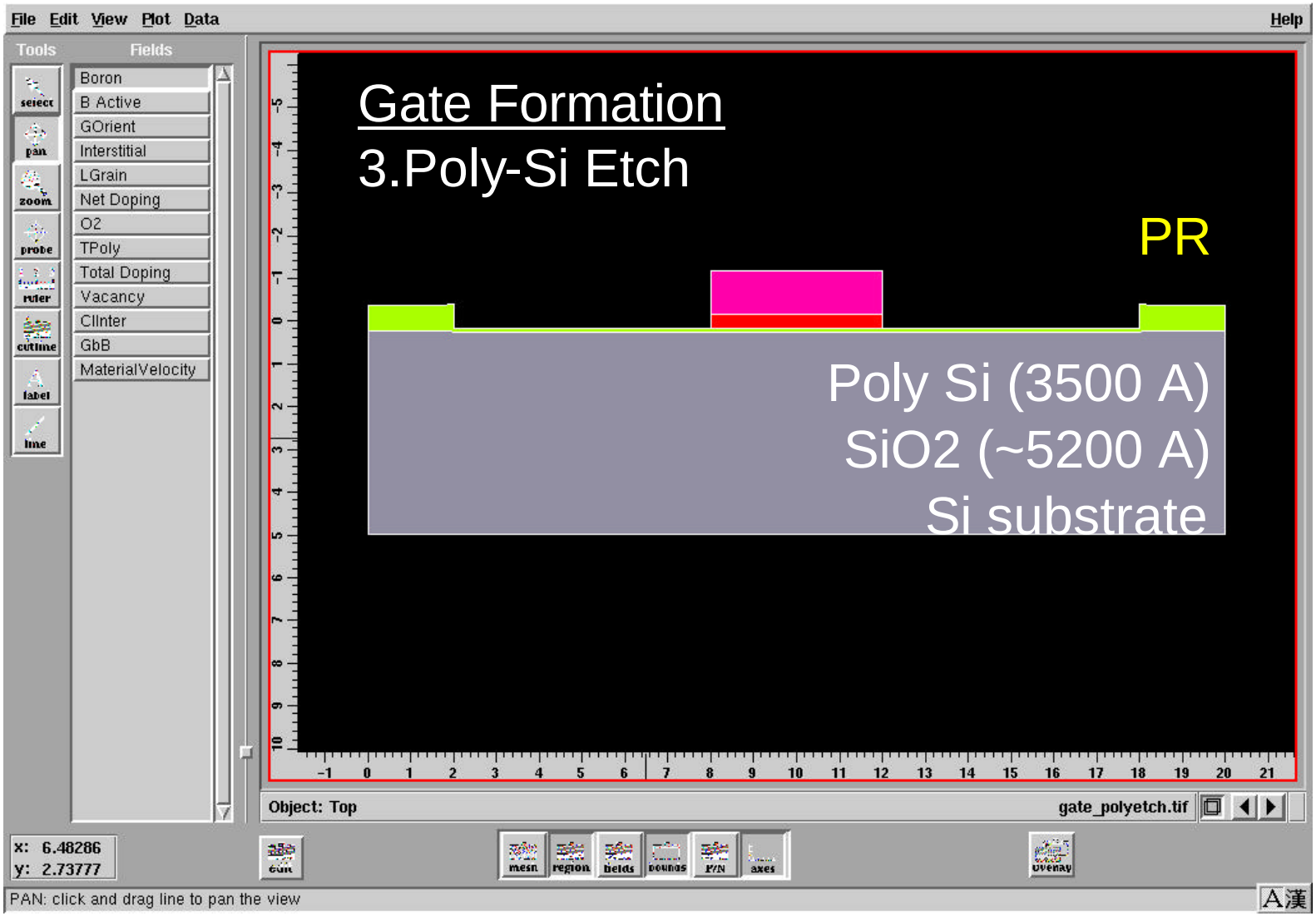

File Edit View Plot Data
Help
Tools
Fields
Boron
B Active
Interstitial
Net Doping
O2
Total Doping
Vacancy
ClInter
MaterialVelocity
Gate Oxidation
Tox (~720 A)
Si substrate
Field Oxide
Gate Oxide
Object: Top
gate_ox.tif
x: 6.66170
y: 3.23881
SELECT: Click to select an object, drag to move the object

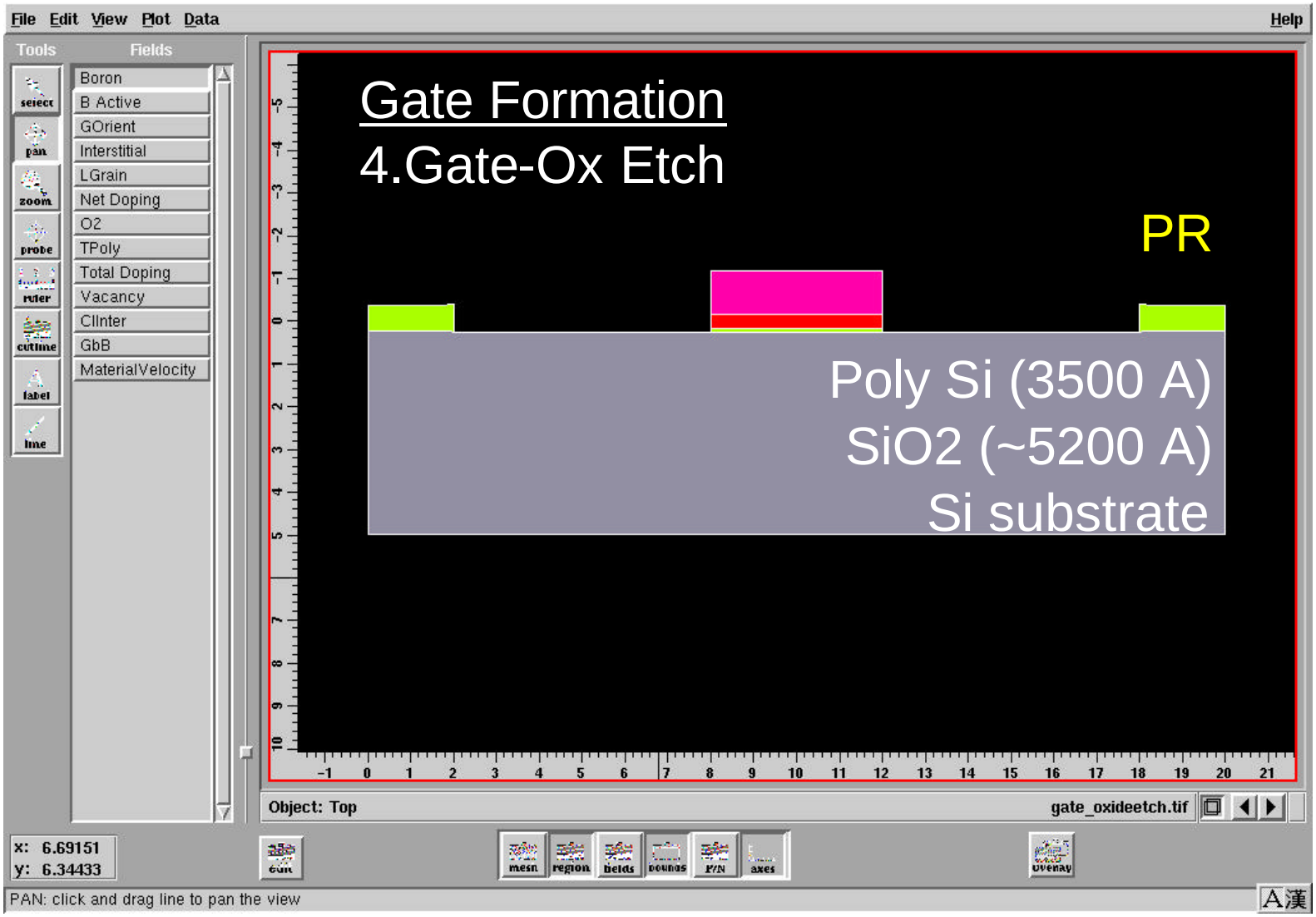

File Edit View Plot Data
Help
Tools
Fields
Boron
B Active
Interstitial
Net Doping
O2
Total Doping
Vacancy
ClInter
MaterialVelocity
Substrate Doping Concentration
(after Gate Oxidation)
Boron
Log |x|
17
16
15
14
13
12
11
10
Si substrate
Object: Top
gate_ox.tif
x: 6.00596
y: -3.40799
PAN: click and drag line to pan the view

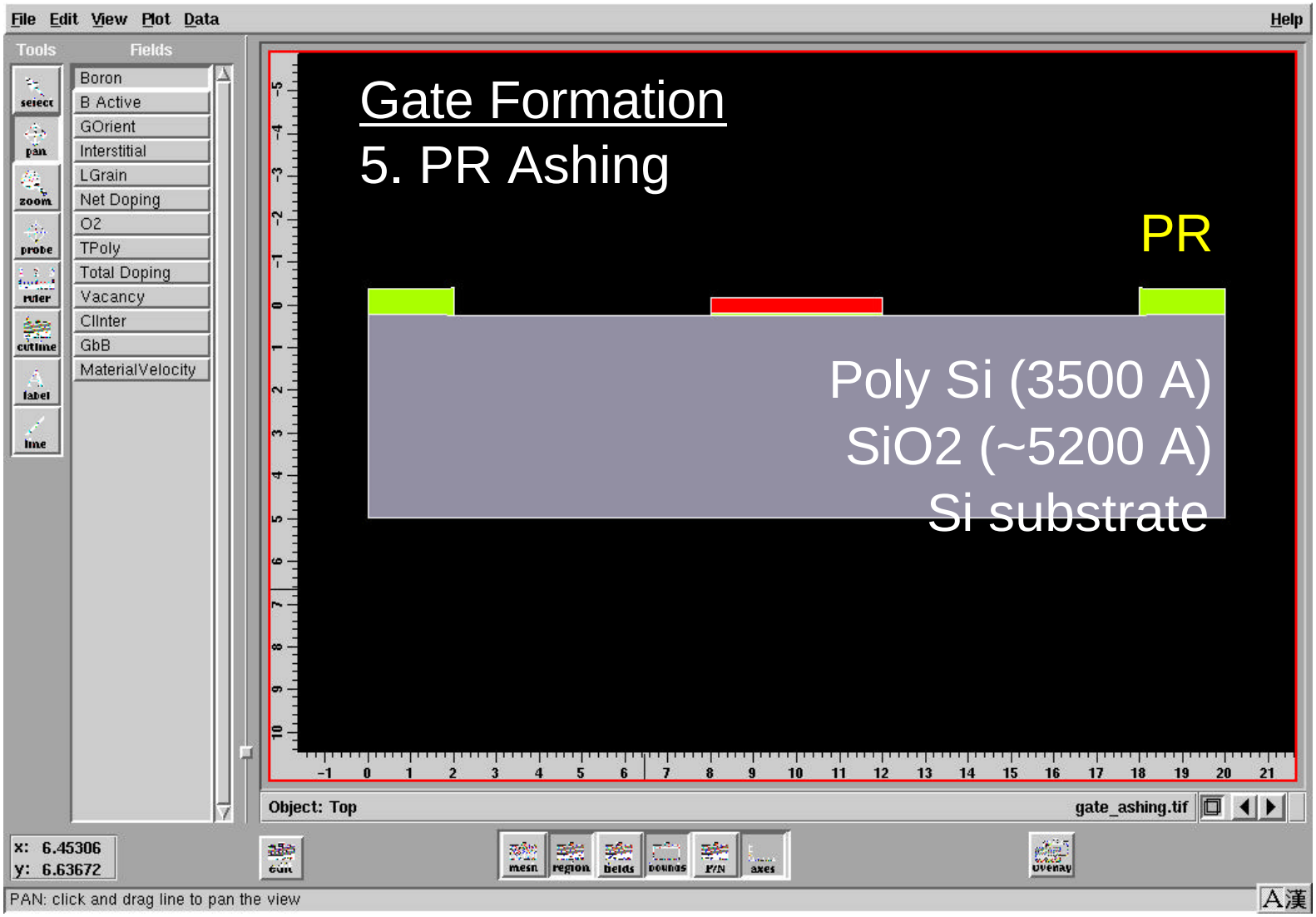

File Edit View Plot Data
Help
Tools
Fields
Boron
B Active
GOrient
Interstitial
LGrain
Net Doping
O2
TPoly
Total Doping
Vacancy
ClInter
GbB
MaterialVelocity
Gate Poly-silicon Deposition
Tpoly (~3500 A)
Si substrate
Object: Top
gate_oxpoly.tif
x: 4.96274
y: 2.76137
SELECT: Click to select an object, drag to move the object

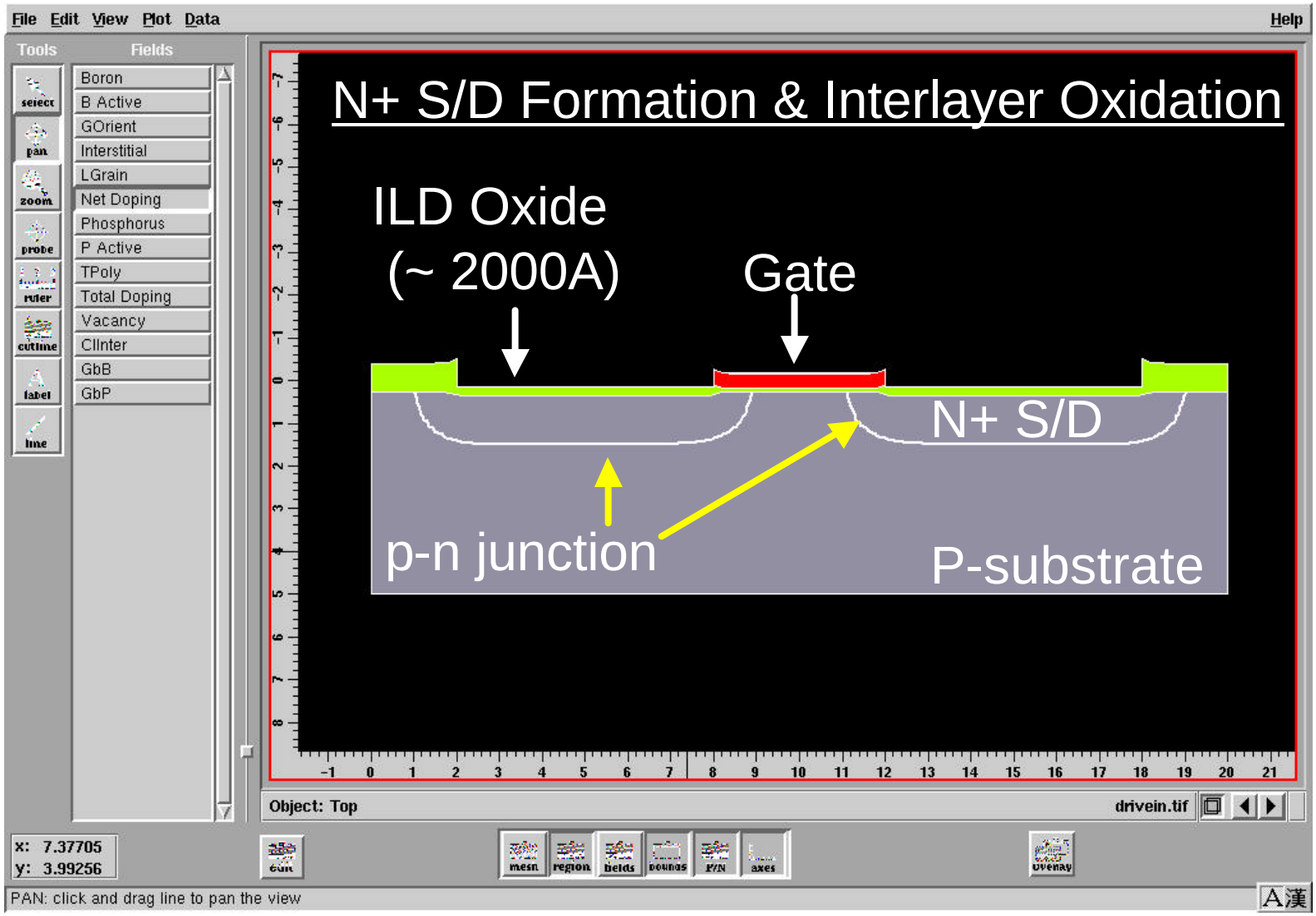

File Edit View Plot Data
Help
Tools
Fields
Boron
B Active
GOrient
Interstitial
LGrain
Net Doping
O2
TPoly
Total Doping
Vacancy
ClInter
GbB
MaterialVelocity
Gate Formation
1. PR Coating
PR
Poly Si (3500 A)
SiO2 (~5200 A)
Si substrate
Object: Top
gate_pr.tif
x: 4.69449
y: 6.72501
SELECT: Click to select an object, drag to move the object

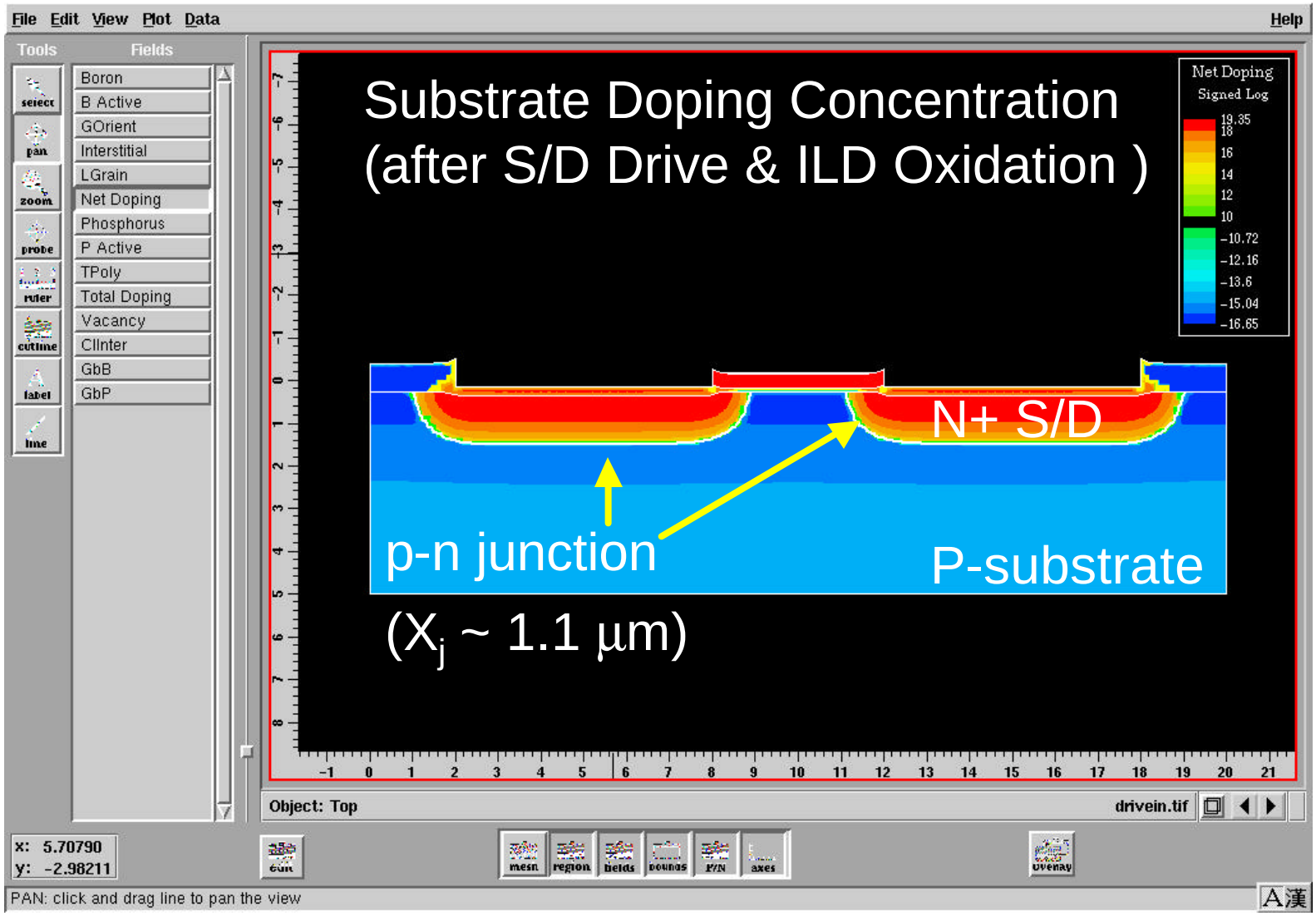

File Edit View Plot Data
Help
Tools
Fields
Boron
B Active
GOrient
Interstitial
LGrain
Net Doping
O2
TPoly
Total Doping
Vacancy
ClInter
GbB
MaterialVelocity
Gate Formation
2.Expose & Develop
PR
Poly Si (3500 A)
SiO2 (~5200 A)
Si substrate
Object: Top
gate_photo.tif
x: 6.48286
y: 3.06564
PAN: click and drag line to pan the view

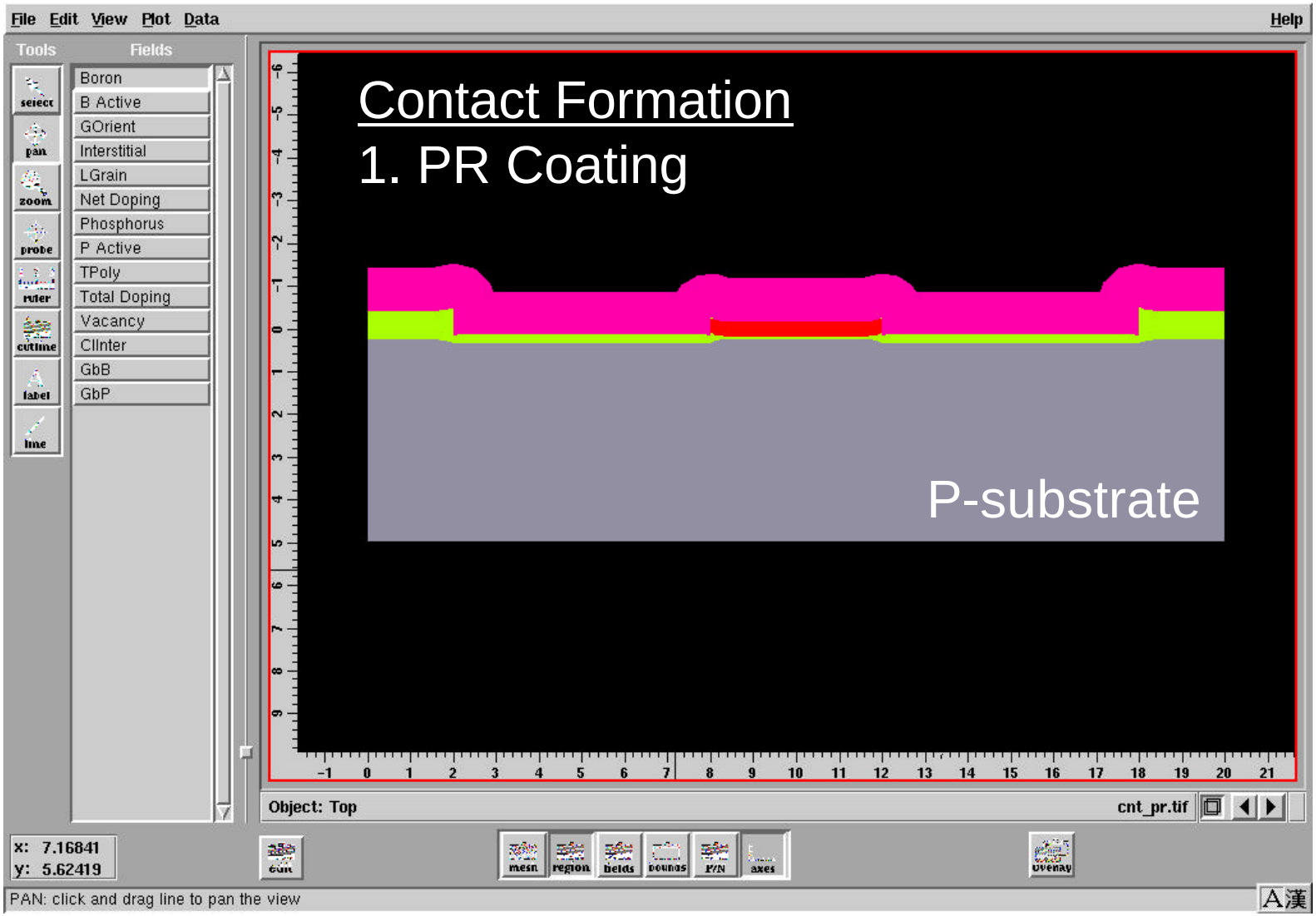

File Edit View Plot Data
Help
Tools
Fields
Boron
B Active
GOrient
Interstitial
LGrain
Net Doping
O2
TPoly
Total Doping
Vacancy
ClInter
GbB
MaterialVelocity
Gate Formation
3.Poly-Si Etch
PR
Poly Si (3500 A)
SiO2 (~5200 A)
Si substrate
Object: Top
gate_polyetch.tif
x: 6.48286
y: 2.73777
PAN: click and drag line to pan the view

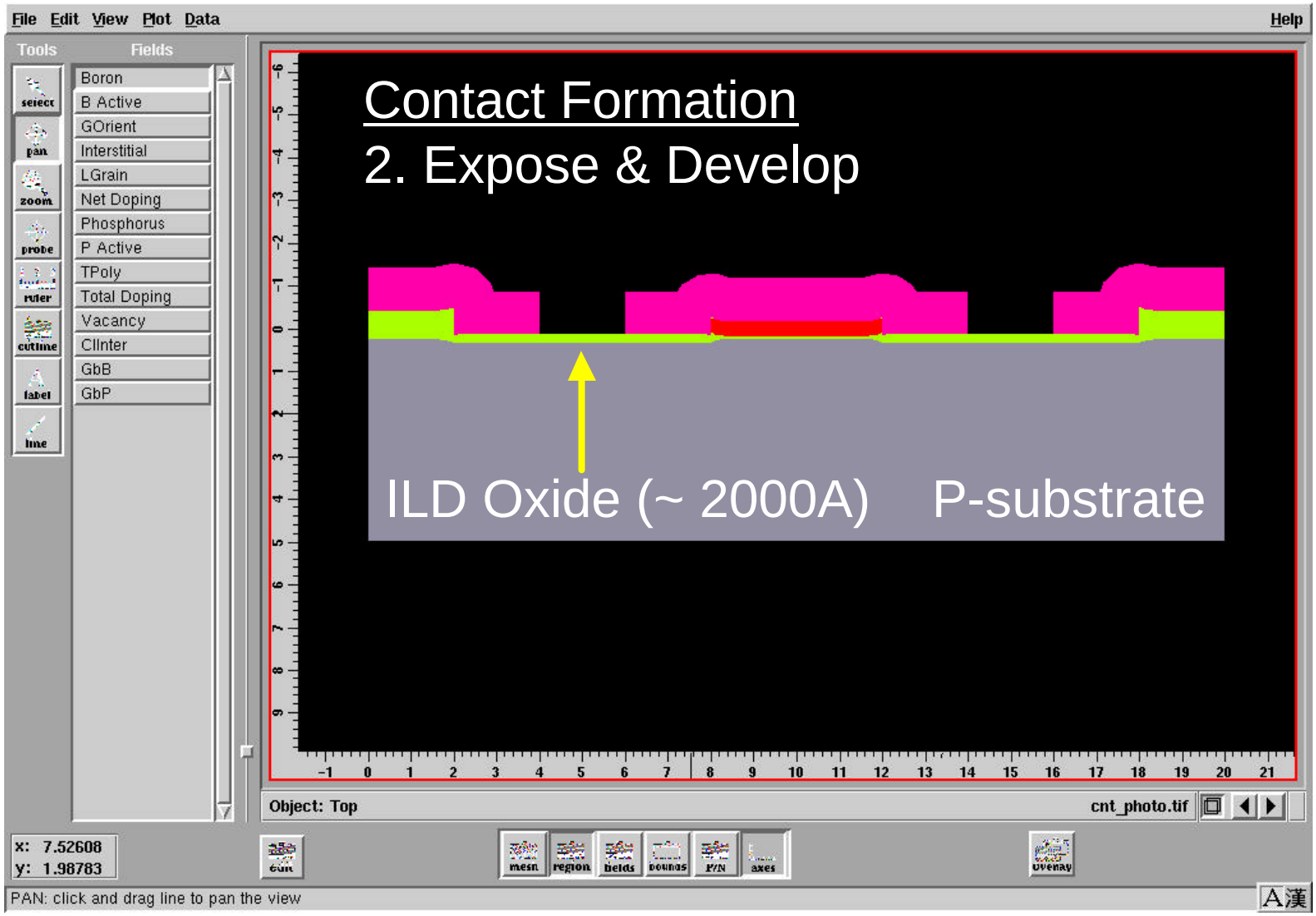

File Edit View Plot Data
Help
Tools
Fields
Boron
B Active
GOrient
Interstitial
LGrain
Net Doping
O2
TPoly
Total Doping
Vacancy
ClInter
GbB
MaterialVelocity
Gate Formation
4.Gate-Ox Etch
PR
Poly Si (3500 A)
SiO2 (~5200 A)
Si substrate
Object: Top
gate_oxideetch.tif
x: 6.69151
y: 6.34433
PAN: click and drag line to pan the view

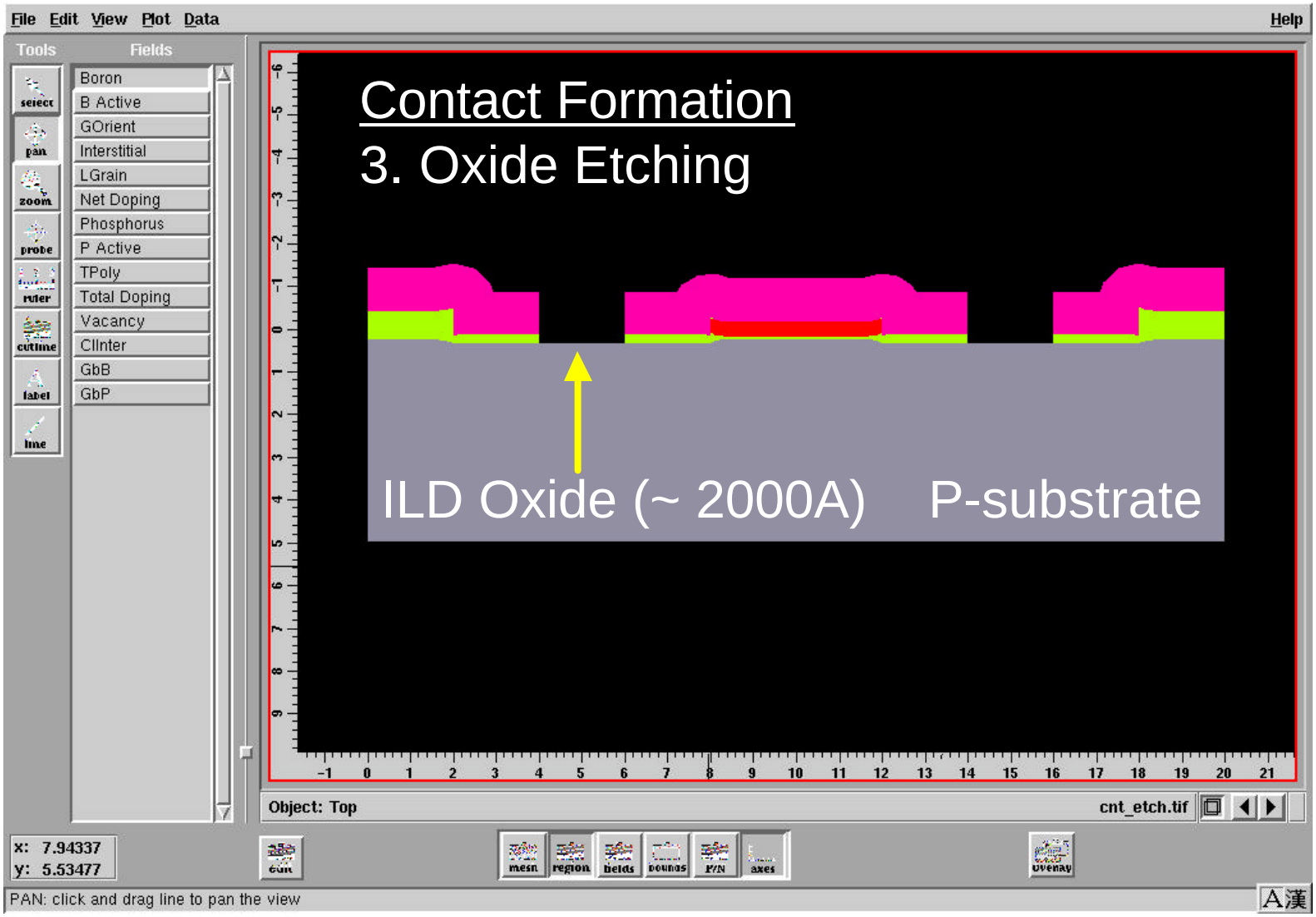

File Edit View Plot Data
Help
Tools
Fields
Boron
B Active
GOrient
Interstitial
LGrain
Net Doping
O2
TPoly
Total Doping
Vacancy
ClInter
GbB
MaterialVelocity
Gate Formation
5. PR Ashing
PR
Poly Si (3500 A)
SiO2 (~5200 A)
Si substrate
Object: Top
gate_ashing.tif
x: 6.45306
y: 6.63672
PAN: click and drag line to pan the view

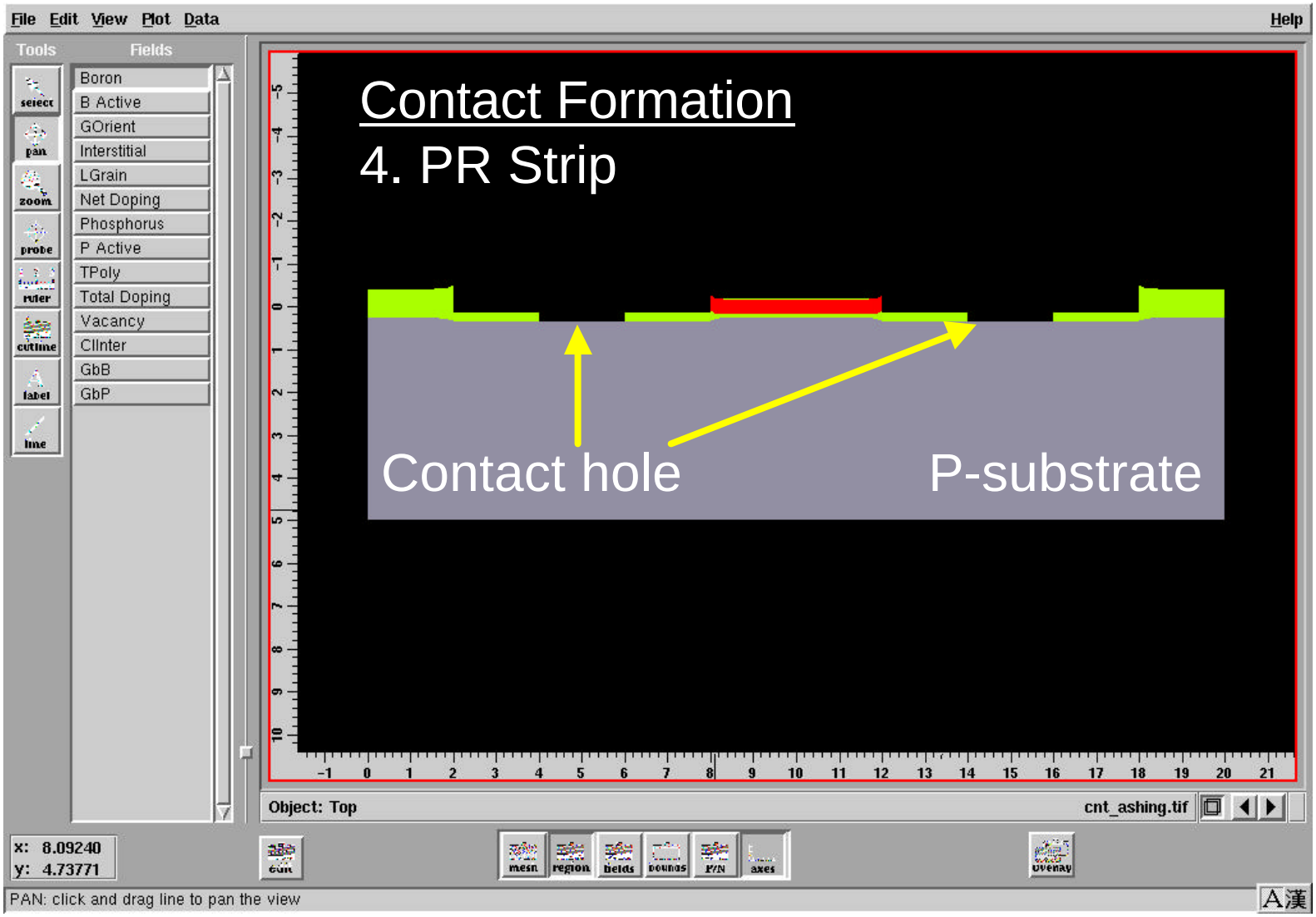

File Edit View Plot Data
Help
Tools
Fields
Boron
B Active
GOrient
Interstitial
LGrain
Net Doping
Phosphorus
P Active
TPoly
Total Doping
Vacancy
ClInter
GbB
GbP
N+ S/D Formation & Interlayer Oxidation
ILD Oxide
(~ 2000A)
Gate
N+ S/D
p-n junction
P-substrate
Object: Top
drivein.tif
x: 7.37705
y: 3.99256
PAN: click and drag line to pan the view

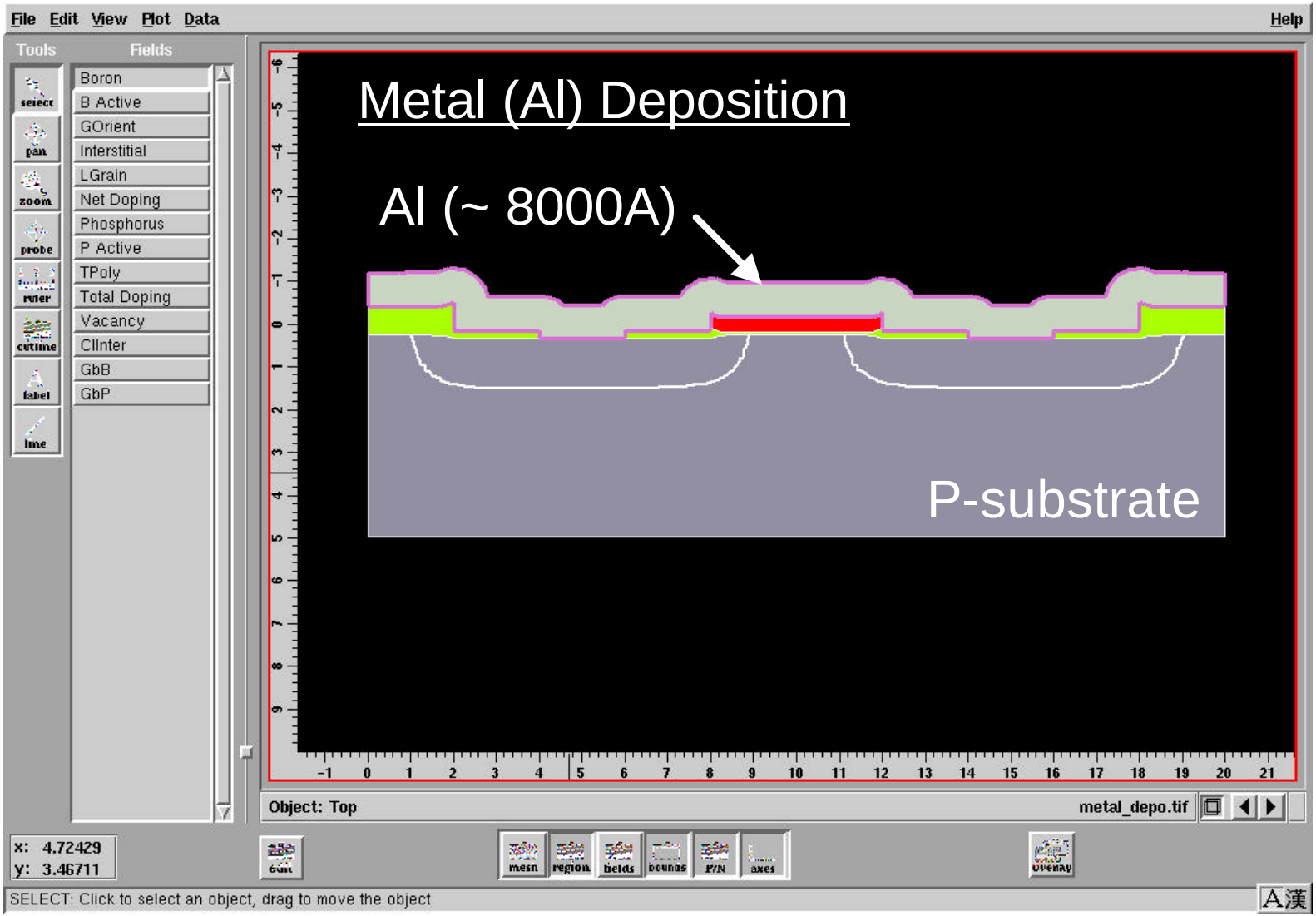

File Edit View Plot Data
Help
Tools
Fields
Boron
B Active
GOrient
Interstitial
LGrain
Net Doping
Phosphorus
P Active
TPoly
Total Doping
Vacancy
ClInter
GbB
GbP
Net Doping
Signed Log
19.35
18
16
14
12
10
-10.72
-12.16
-13.6
-15.04
-16.65
Substrate Doping Concentration
(after S/D Drive & ILD Oxidation)
N+ S/D
p-n junction
P-substrate
(Xj ~ 1.1 µm)
Object: Top
drivein.tif
x: 5.70790
y: -2.98211
PAN: click and drag line to pan the view

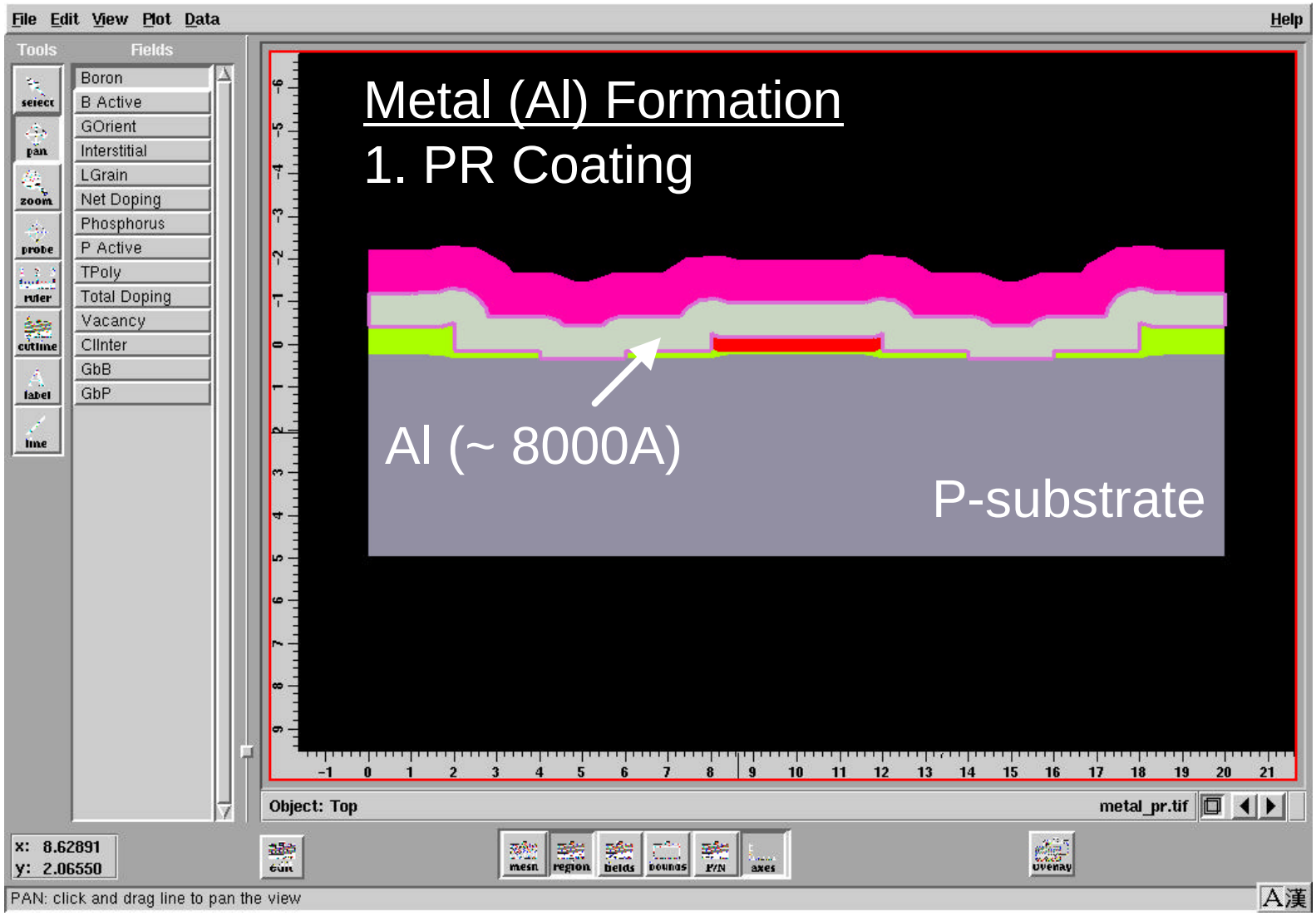

File Edit View Plot Data
Help
Tools
Fields
Boron
B Active
GOrient
Interstitial
LGrain
Net Doping
Phosphorus
P Active
TPoly
Total Doping
Vacancy
ClInter
GbB
GbP
Contact Formation
1. PR Coating
P-substrate
Object: Top
cnt_pr.tif
x: 7.16841
y: 5.62419
PAN: click and drag line to pan the view

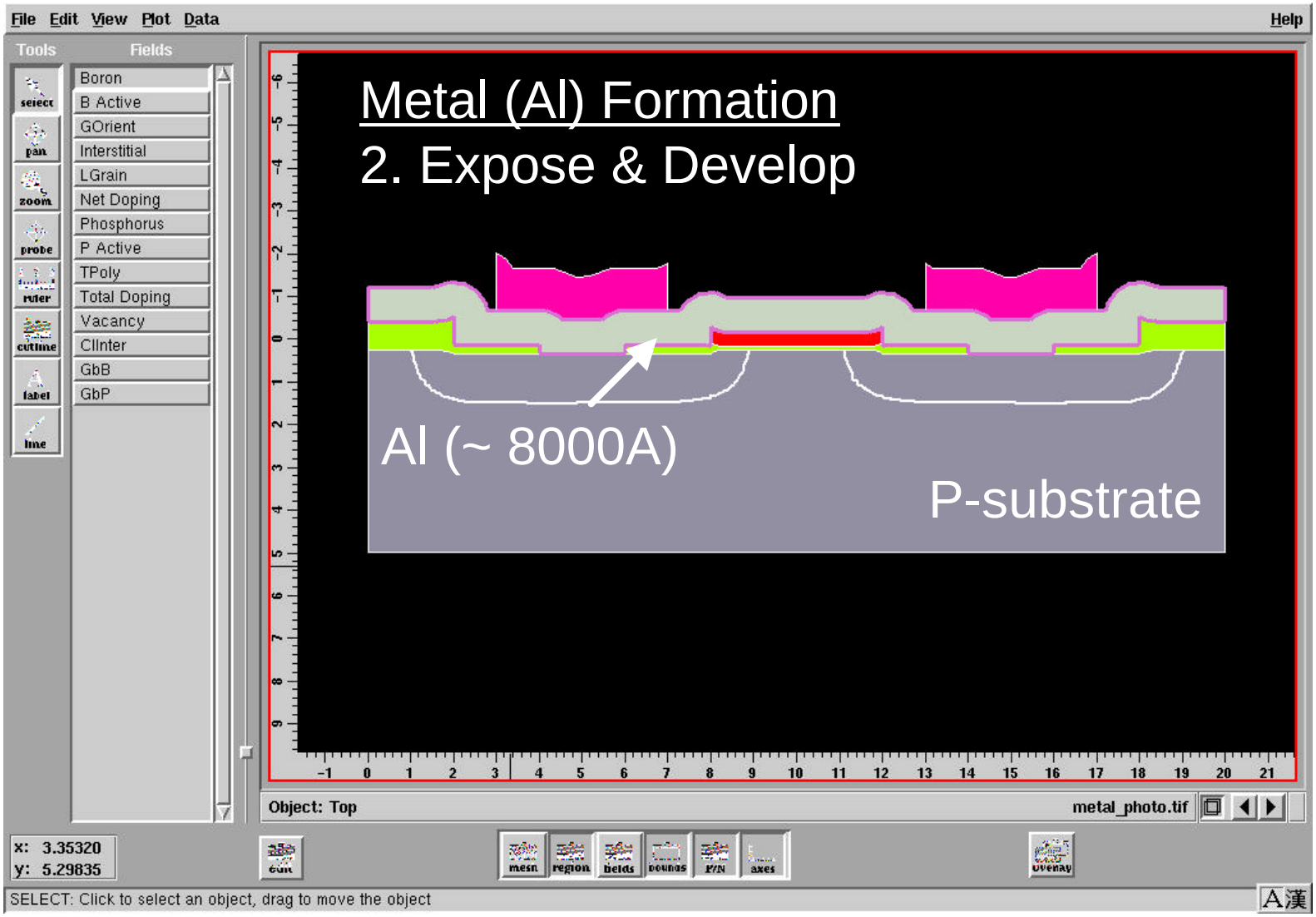

File Edit View Plot Data
Help
Tools
Fields
Boron
B Active
GOrient
Interstitial
LGrain
Net Doping
Phosphorus
P Active
TPoly
Total Doping
Vacancy
ClInter
GbB
GbP
Contact Formation
2. Expose & Develop
ILD Oxide (~ 2000A)
P-substrate
Object: Top
cnt_photo.tif
x: 7.52608
y: 1.98783
PAN: click and drag line to pan the view

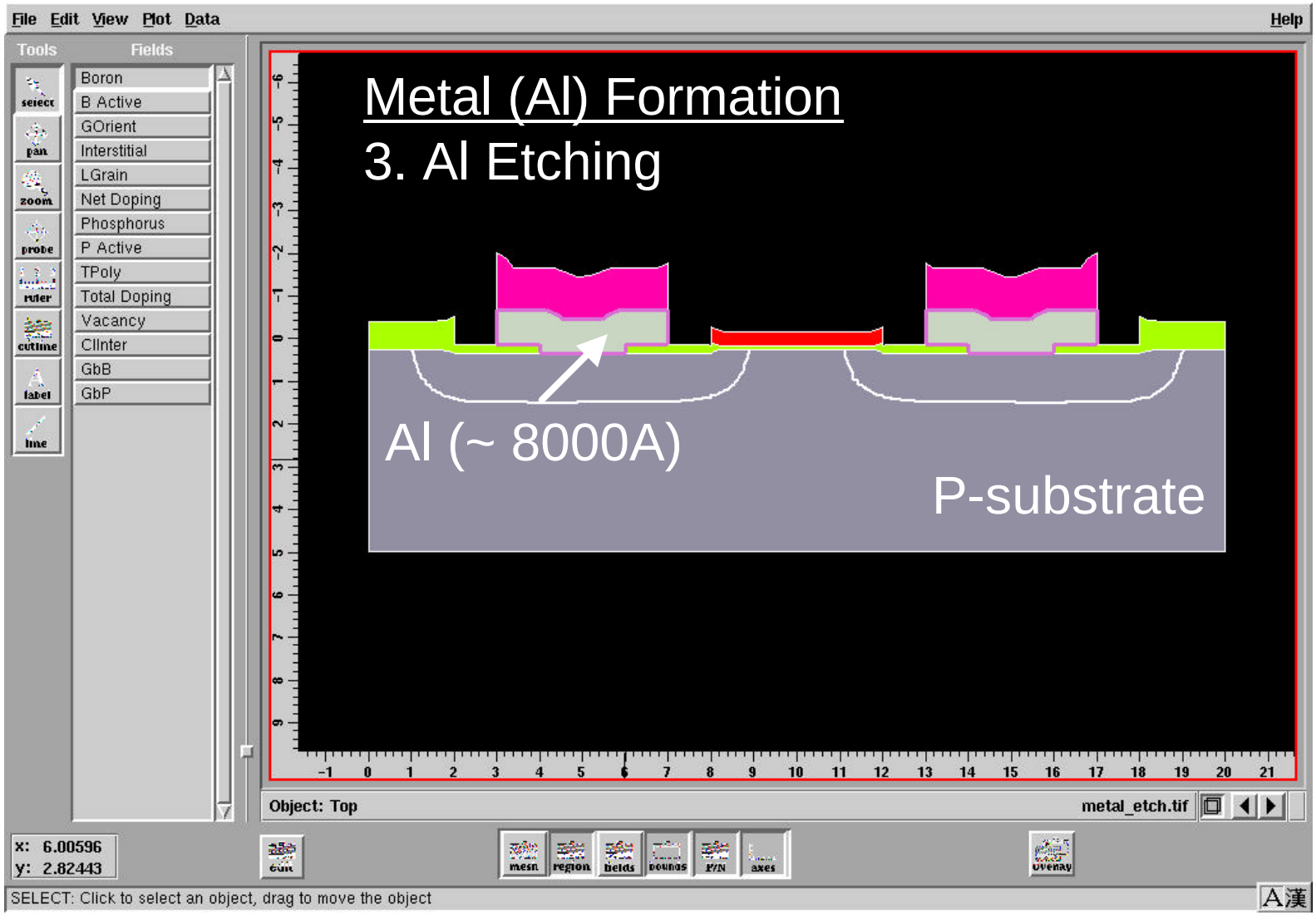

File Edit View Plot Data
Help
Tools
Fields
Boron
B Active
GOrient
Interstitial
LGrain
Net Doping
Phosphorus
P Active
TPoly
Total Doping
Vacancy
ClInter
GbB
GbP
Contact Formation
3. Oxide Etching
ILD Oxide (~ 2000A)
P-substrate
Object: Top
cnt_etch.tif
x: 7.94337
y: 5.53477
PAN: click and drag line to pan the view

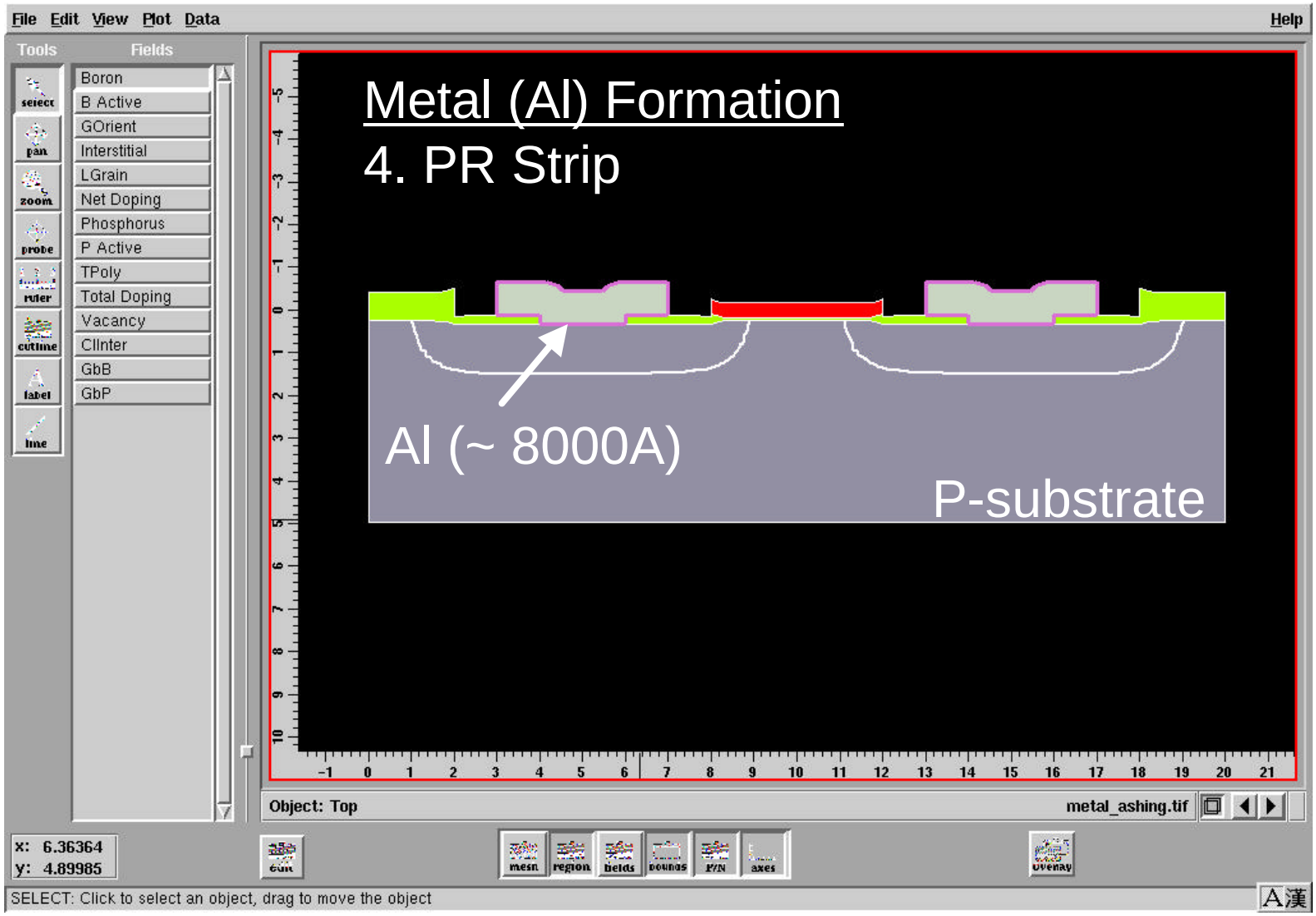

File Edit View Plot Data
Help
Tools
Fields
Boron
B Active
GOrient
Interstitial
LGrain
Net Doping
Phosphorus
P Active
TPoly
Total Doping
Vacancy
ClInter
GbB
GbP
Contact Formation
4. PR Strip
Contact hole
P-substrate
Object: Top
cnt_ashing.tif
x: 8.09240
y: 4.73771
PAN: click and drag line to pan the view

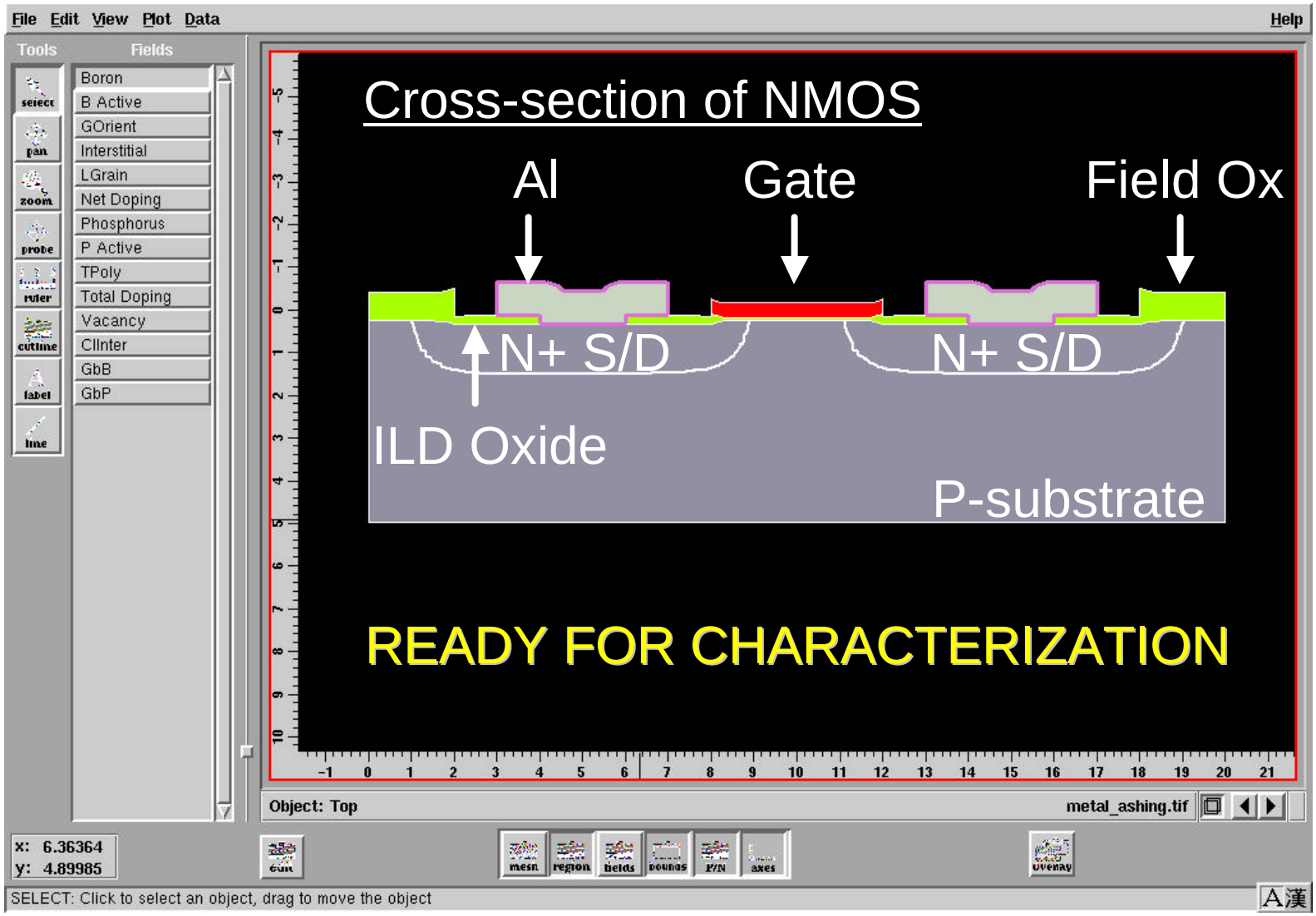

File Edit View Plot Data
Help
Tools
Fields
Boron
B Active
GOrient
Interstitial
LGrain
Net Doping
Phosphorus
P Active
TPoly
Total Doping
Vacancy
ClInter
GbB
GbP
Metal (Al) Deposition
Al (~ 8000A)
P-substrate
Object: Top
metal_depo.tif
x: 4.72429
y: 3.46711
SELECT: Click to select an object, drag to move the object


File Edit View Plot Data
Help
Tools
Fields
select
pan
zoom
probe
ruler
cutline
label
line
Boron
B Active
GOrient
Interstitial
LGrain
Net Doping
Phosphorus
P Active
TPoly
Total Doping
Vacancy
ClInter
GbB
GbP
Metal (Al) Formation
1. PR Coating
Al (~ 8000A)
P-substrate
Object: Top
metal_pr.tif
x: 8.62891
y: 2.06550
mesh
region
fields
bounds
axes
overlay
PAN: click and drag line to pan the view


File Edit View Plot Data
Help
Tools
Fields
Boron
B Active
GOrient
Interstitial
LGrain
Net Doping
Phosphorus
P Active
TPoly
Total Doping
Vacancy
ClInter
GbB
GbP
Metal (Al) Formation
2. Expose & Develop
Al (~ 8000A)
P-substrate
Object: Top
metal_photo.tif
x: 3.35320
y: 5.29835
SELECT: Click to select an object, drag to move the object


File Edit View Plot Data
Help
Tools
Fields
Boron
B Active
GOrient
Interstitial
LGrain
Net Doping
Phosphorus
P Active
TPoly
Total Doping
Vacancy
ClInter
GbB
GbP
Metal (Al) Formation
3. Al Etching
Al (~ 8000A)
P-substrate
Object: Top
metal_etch.tif
x: 6.00596
y: 2.82443
SELECT: Click to select an object, drag to move the object


File Edit View Plot Data
Help
Tools
Fields
Boron
B Active
GOrient
Interstitial
LGrain
Net Doping
Phosphorus
P Active
TPoly
Total Doping
Vacancy
ClInter
GbB
GbP
Metal (Al) Formation
4. PR Strip
Al (~ 8000A)
P-substrate
Object: Top
metal_ashing.tif
x: 6.36364
y: 4.89985
SELECT: Click to select an object, drag to move the object


File Edit View Plot Data
Help
Tools
Fields
Boron
B Active
GOrient
Interstitial
LGrain
Net Doping
Phosphorus
P Active
TPoly
Total Doping
Vacancy
ClInter
GbB
GbP
Cross-section of NMOS
Al
Gate
Field Ox
N+ S/D
N+ S/D
ILD Oxide
P-substrate
READY FOR CHARACTERIZATION
Object: Top
metal_ashing.tif
x: 6.36364
y: 4.89985
SELECT: Click to select an object, drag to move the object