

TCAD Workshop 2021

2nd lecture

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問題1

Understand and explain what Simple2D_des.cmd is doing

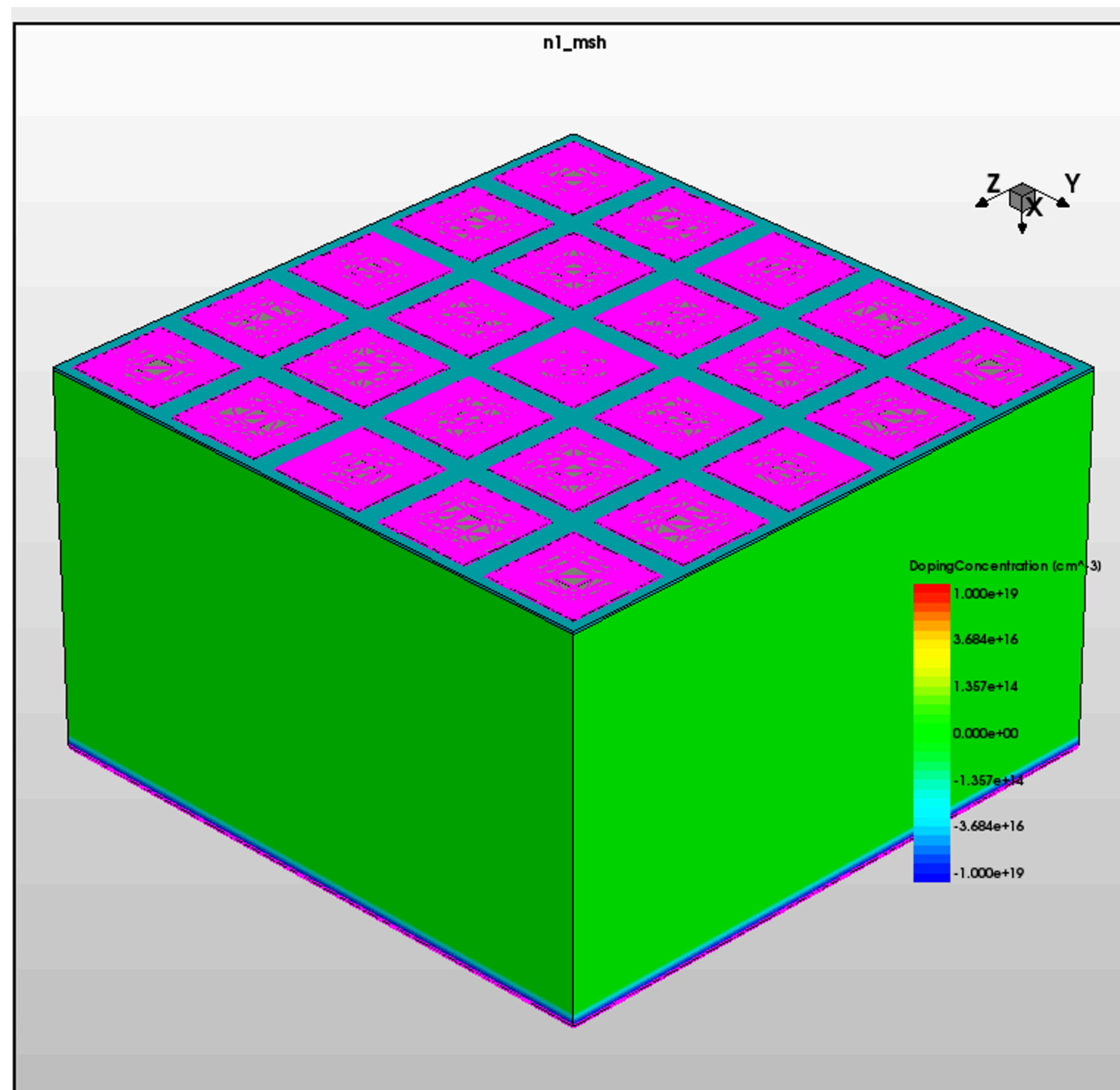
• 省略

問題2

Create a structure with 5x5 pixels of the structure created in the Simple3D example

- できました
- Simple3D_des.cmdで, inputとしてNX,NYを受け取って, 予め決めておいたpitchとsizeに基づいてpixelを配置するように記述。
- project内のinput NX,NYを3->5にしただけ

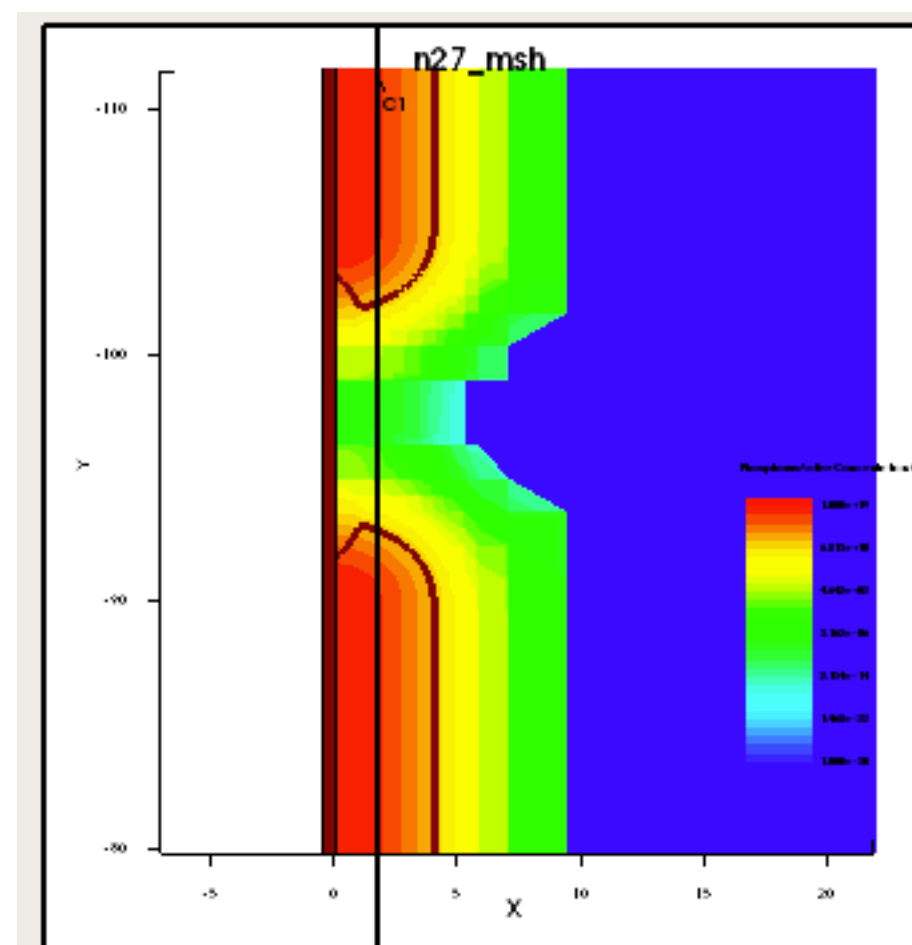
Project		Scheduler		SDE		IV		CV	
		NX	NY	fluence	Vop				
1	[n2]: --	[n3]: 5	[n1]: 5	[n7]: 3e15	[n4]: -800	[n9]: --			
2				[n8]: 0	[n6]: -70	[n10]: --			



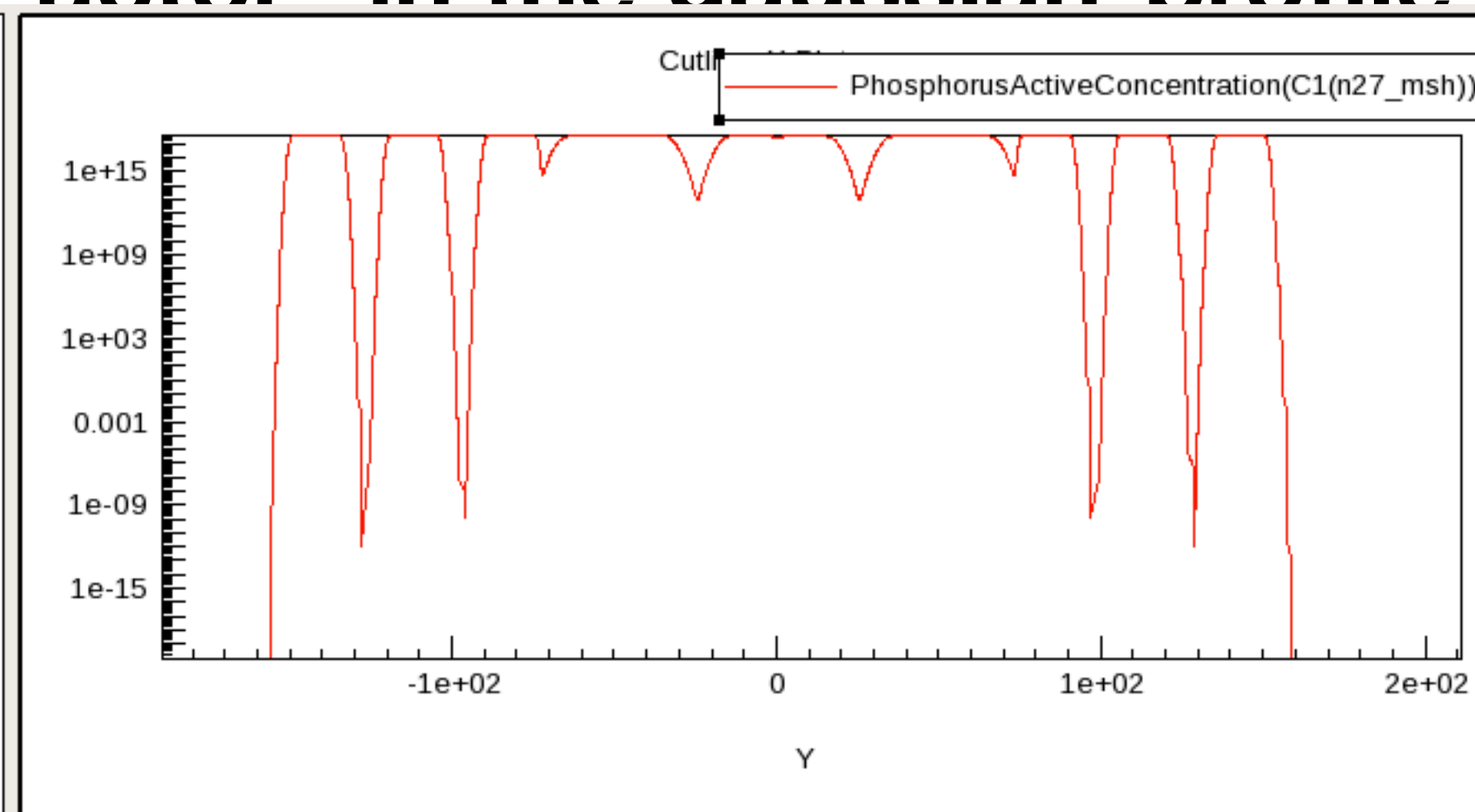
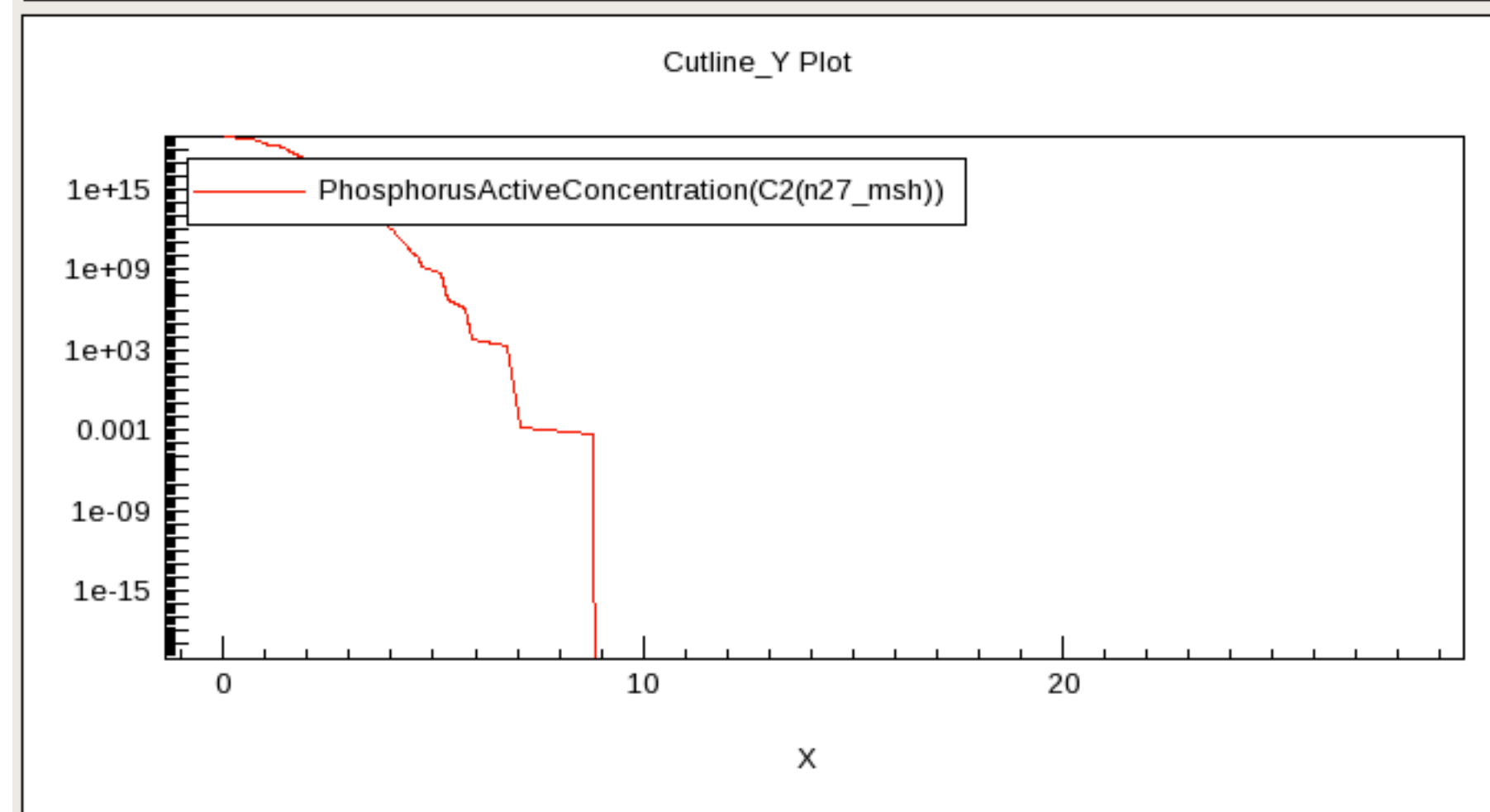
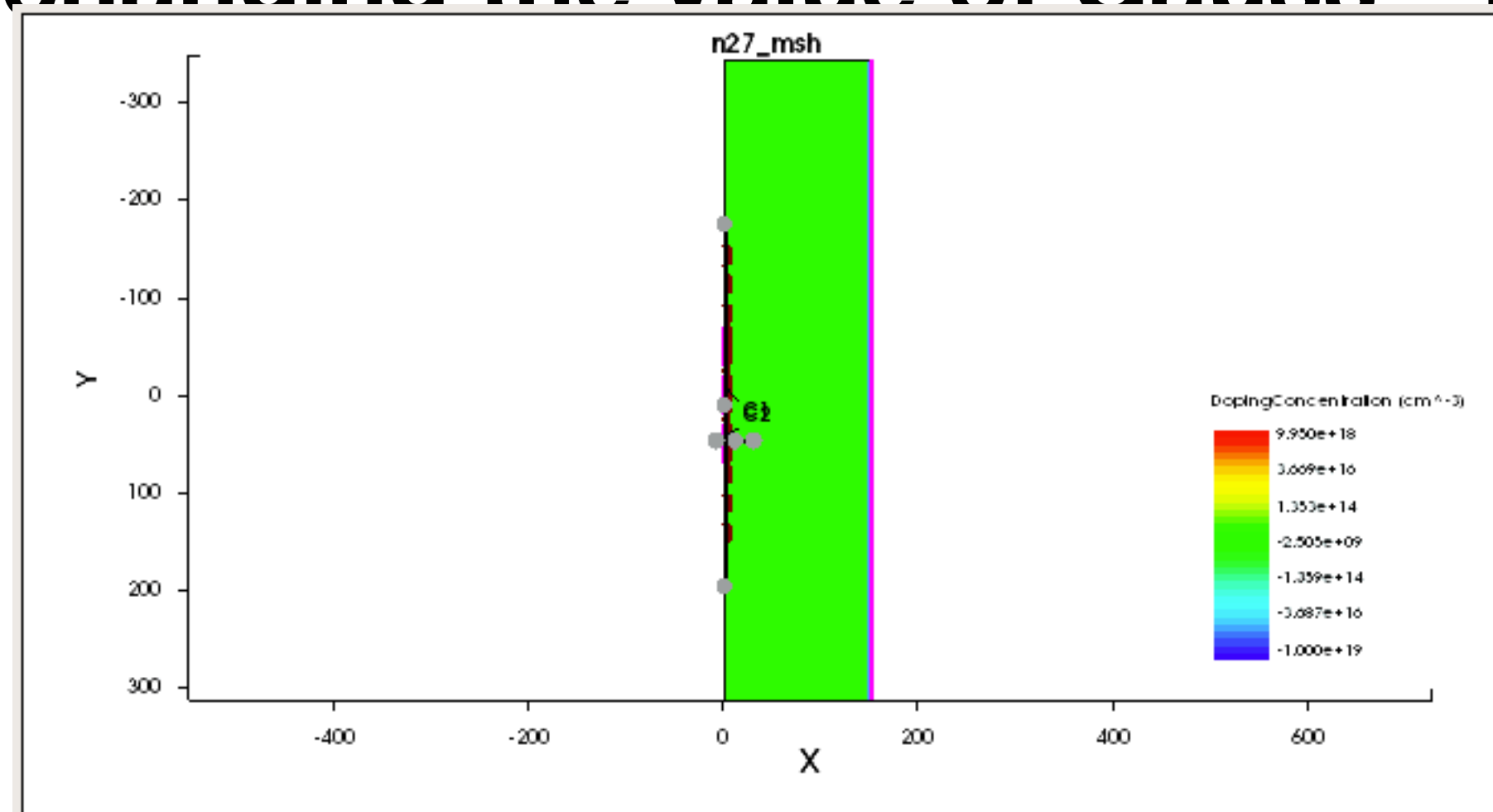
問題3

Plot of the vertical and horizontal profiles of the phosphorus doping level, the change with changing the value of Gauss' "Factor" in the gaussian-profile

- gaussian-profile: gaussian状にdopingするprofile。
- Factor: 側面の形状を決めるparameter



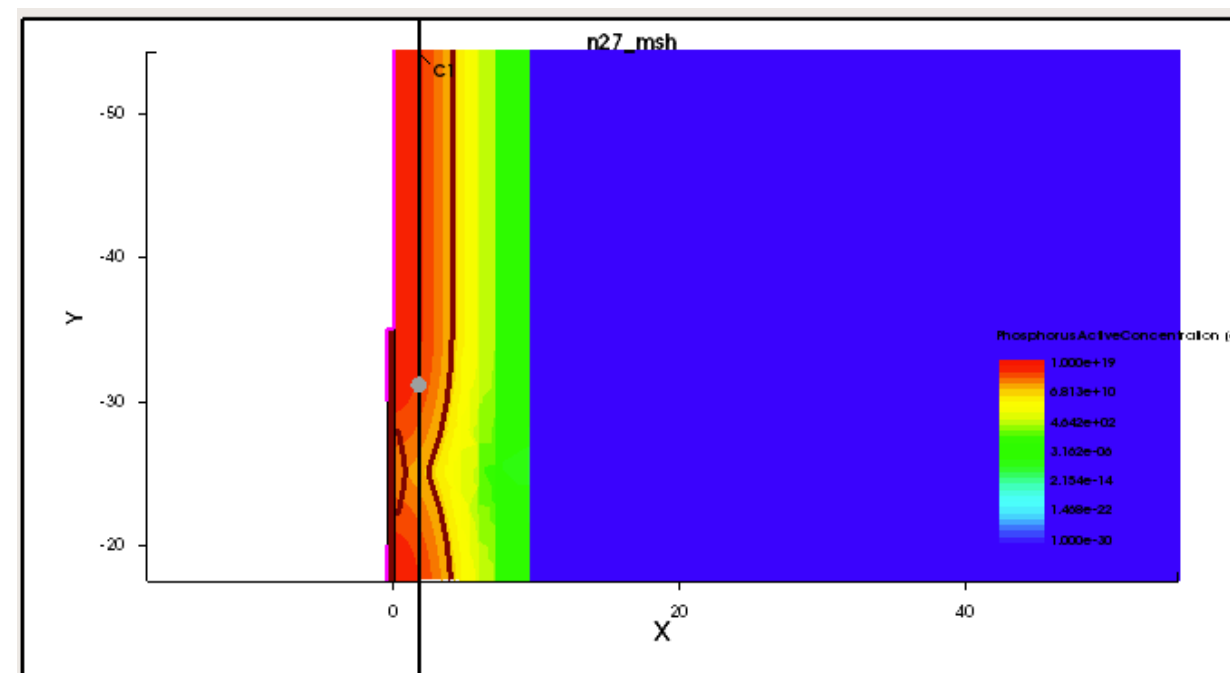
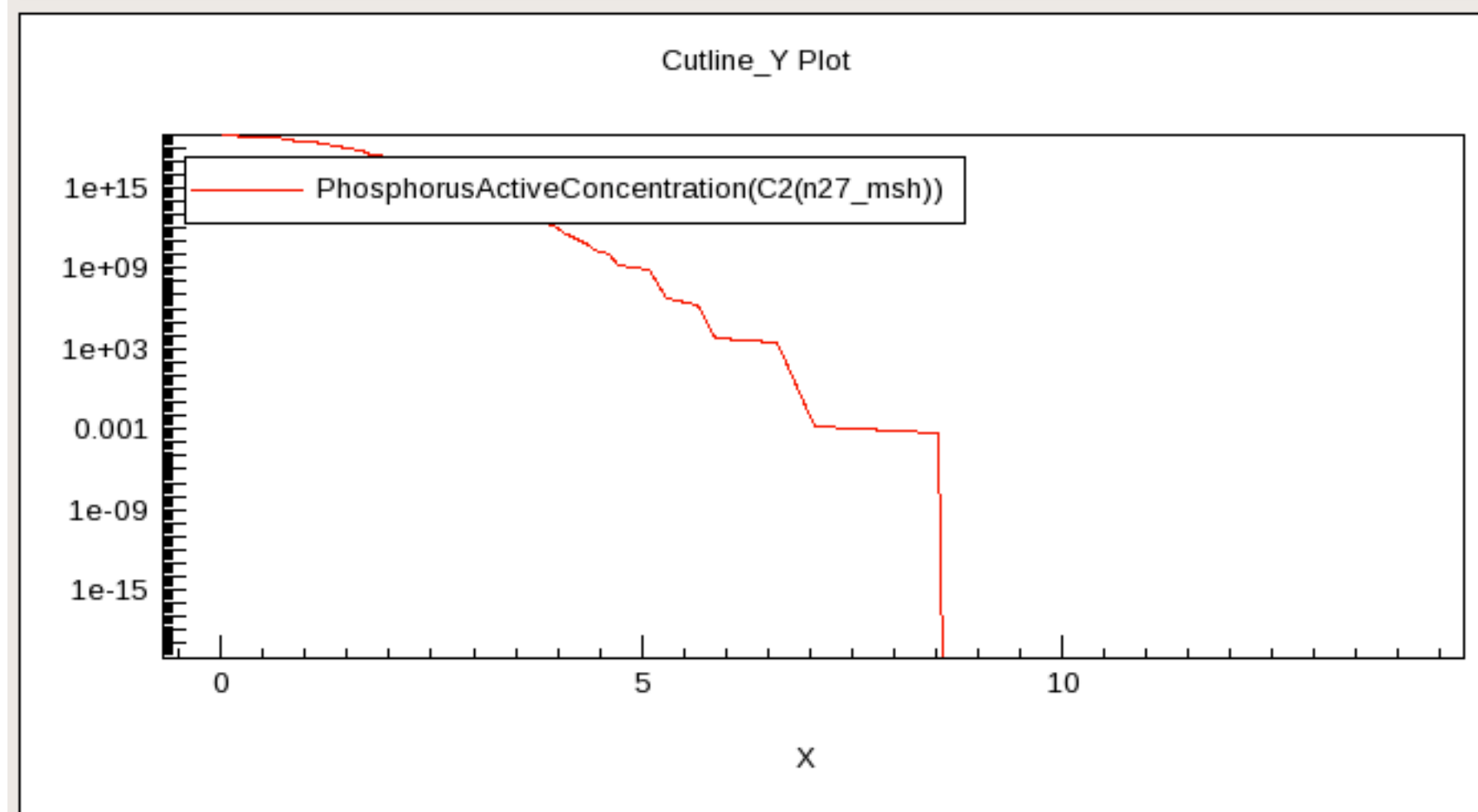
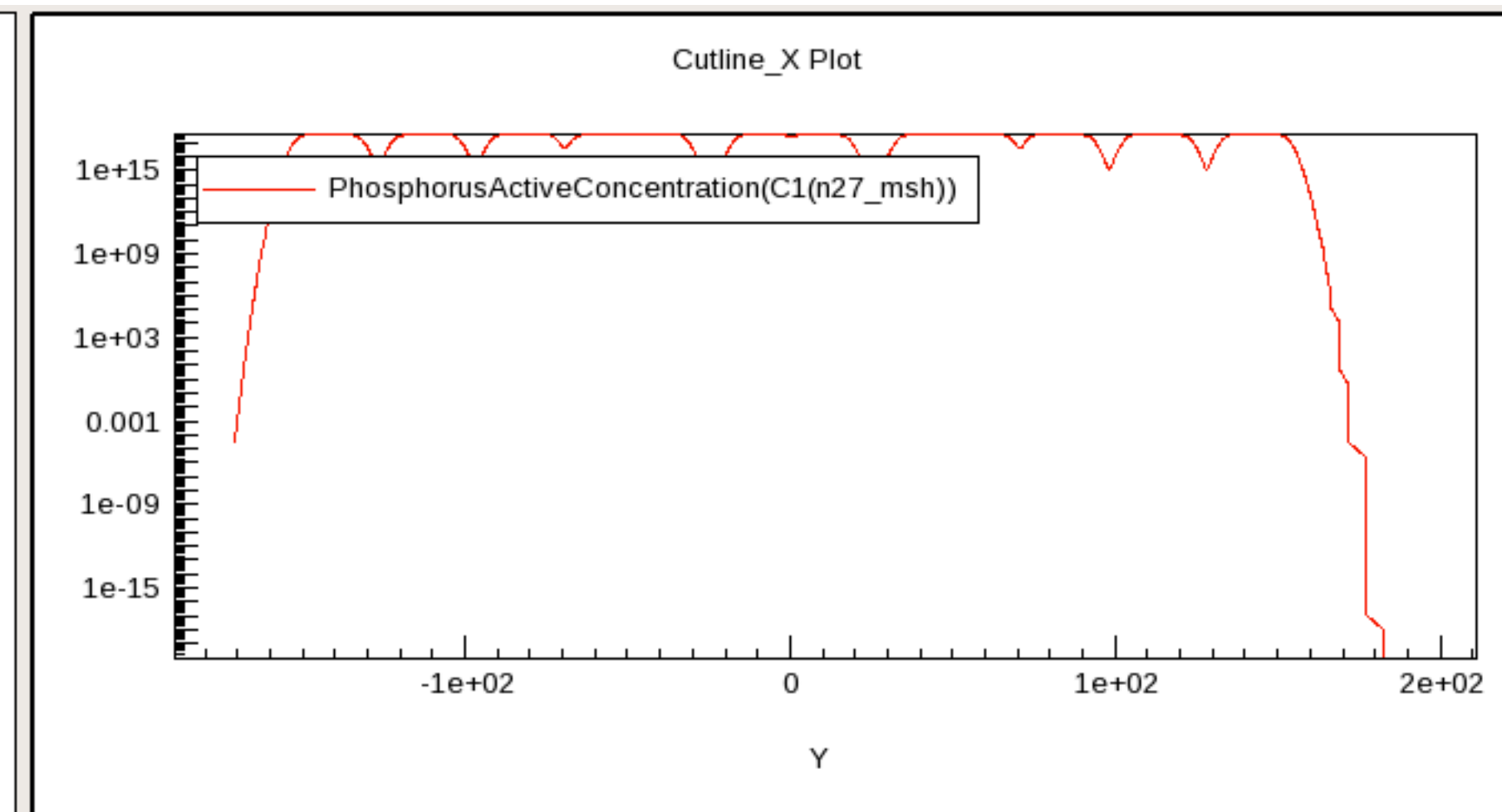
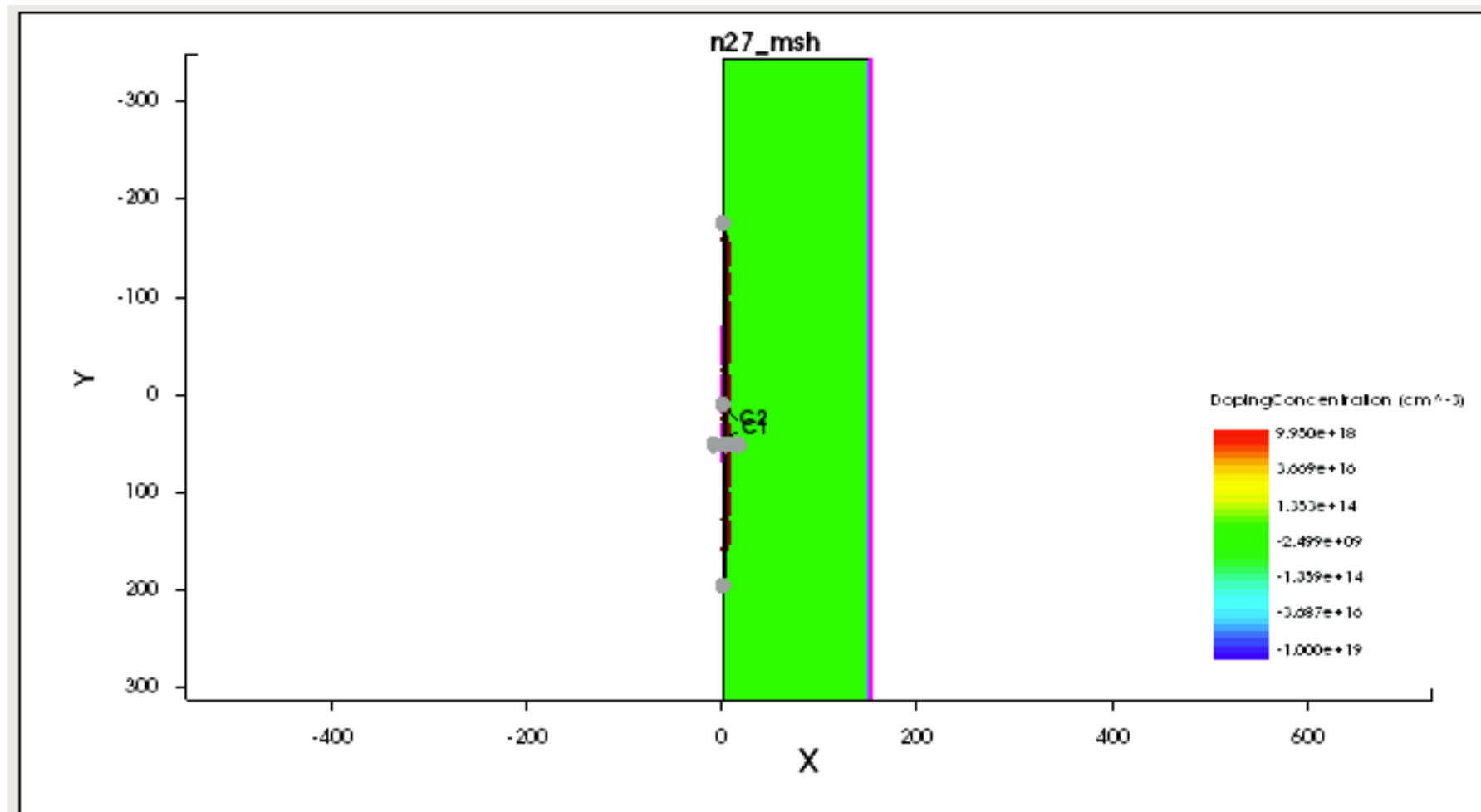
NGR = 0.8



Factor = 3.0, NGR = 0.8

問題3

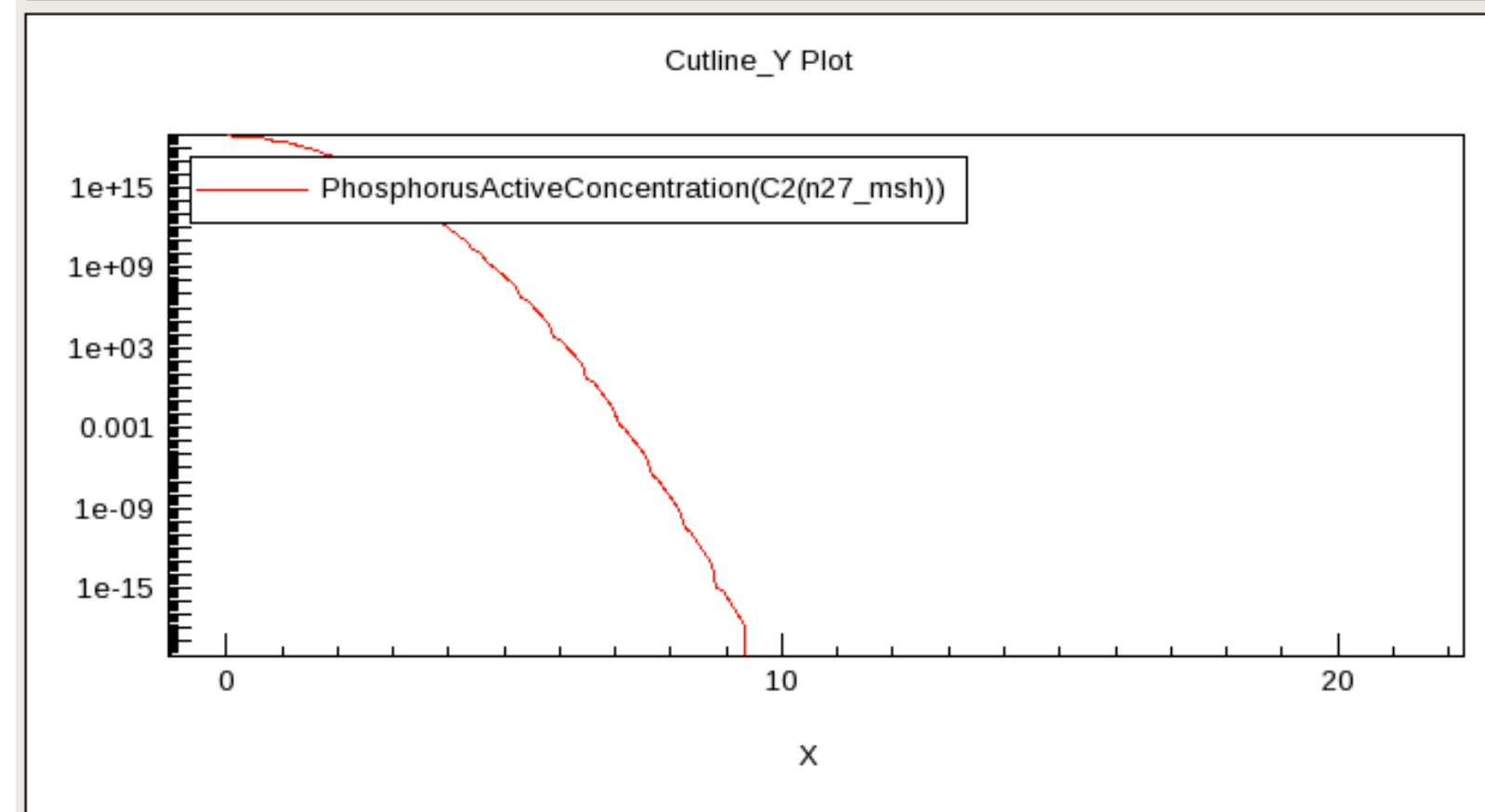
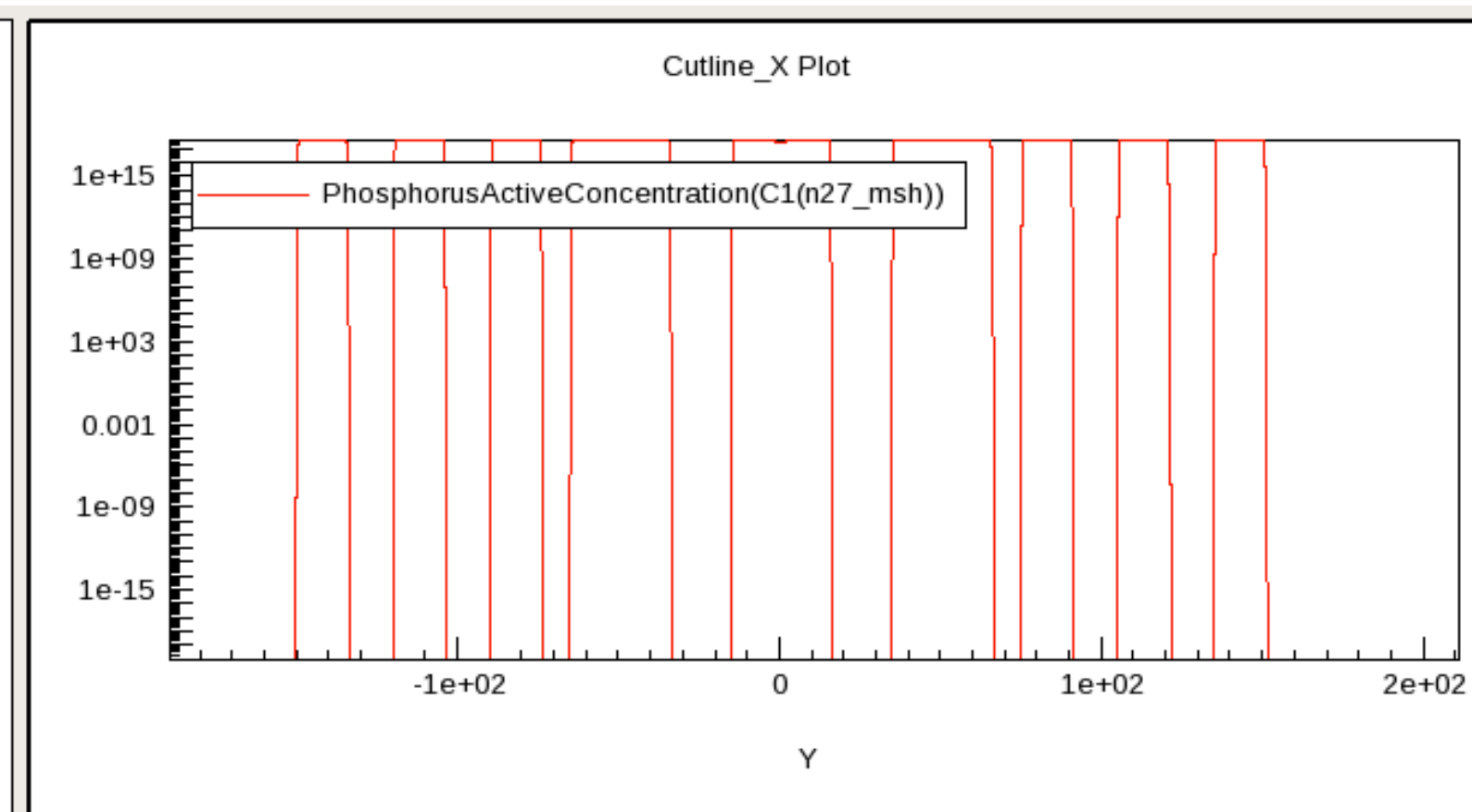
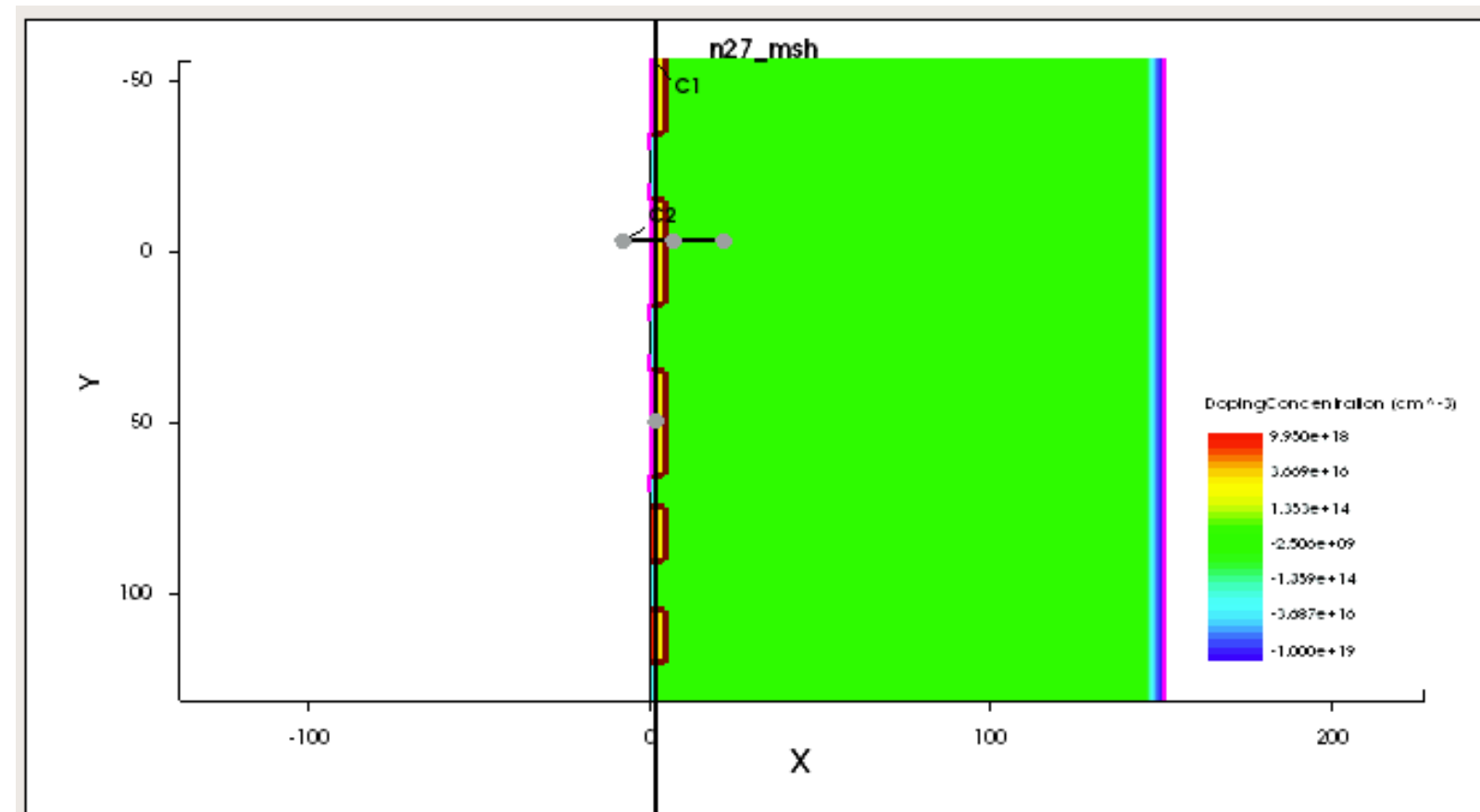
- gaussian-profile:
gaussian状にdopingするprofile。



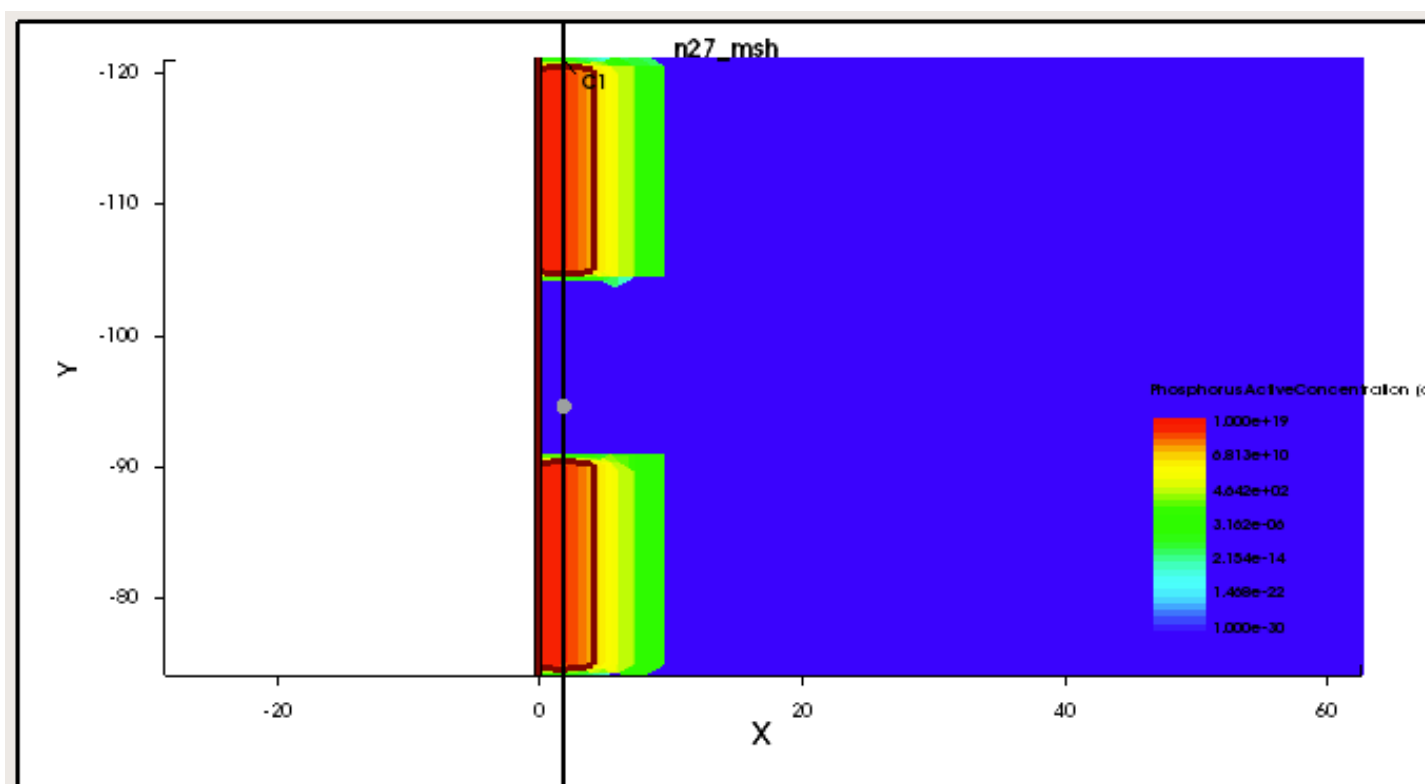
NGR = 3.0

NPlus = 3.0, NGR = 3.0

問題3

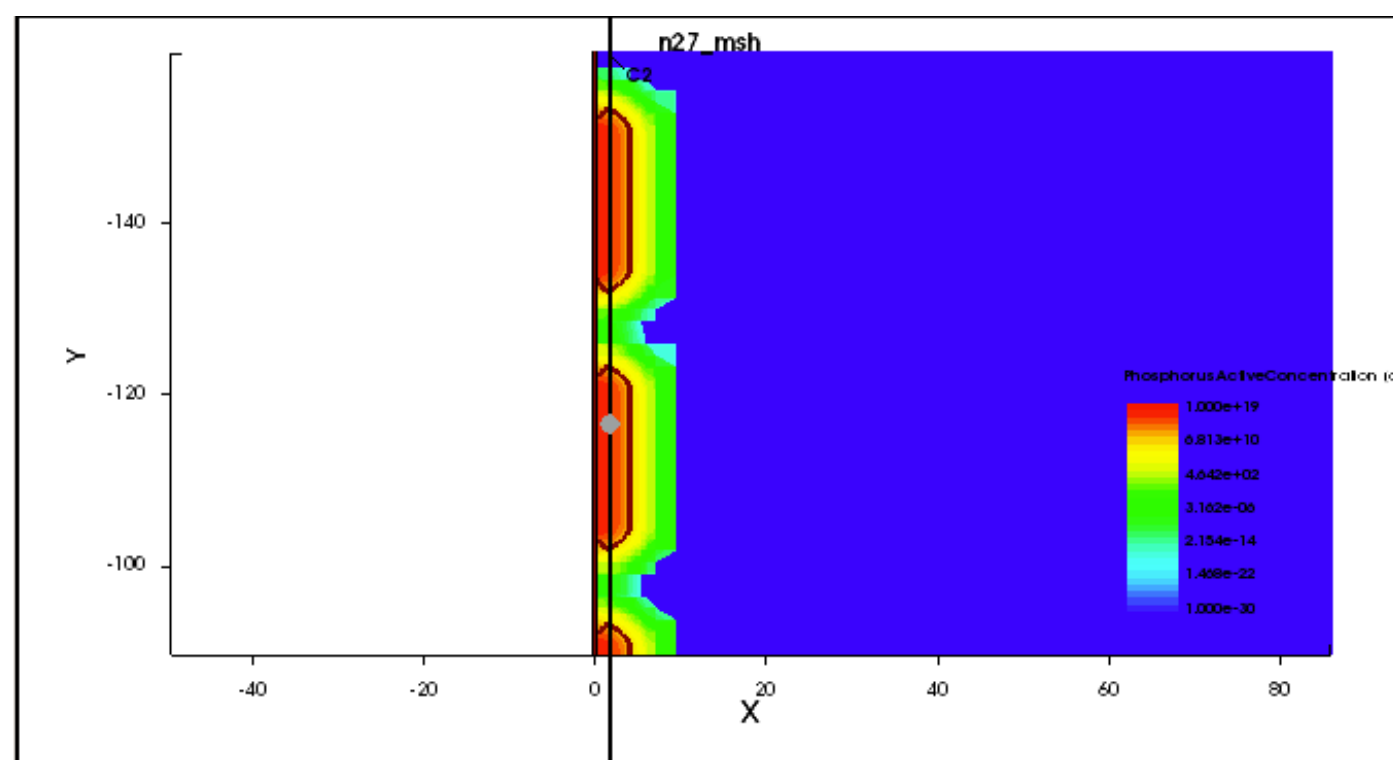


NPlus = 0.1, NGR = 0.1

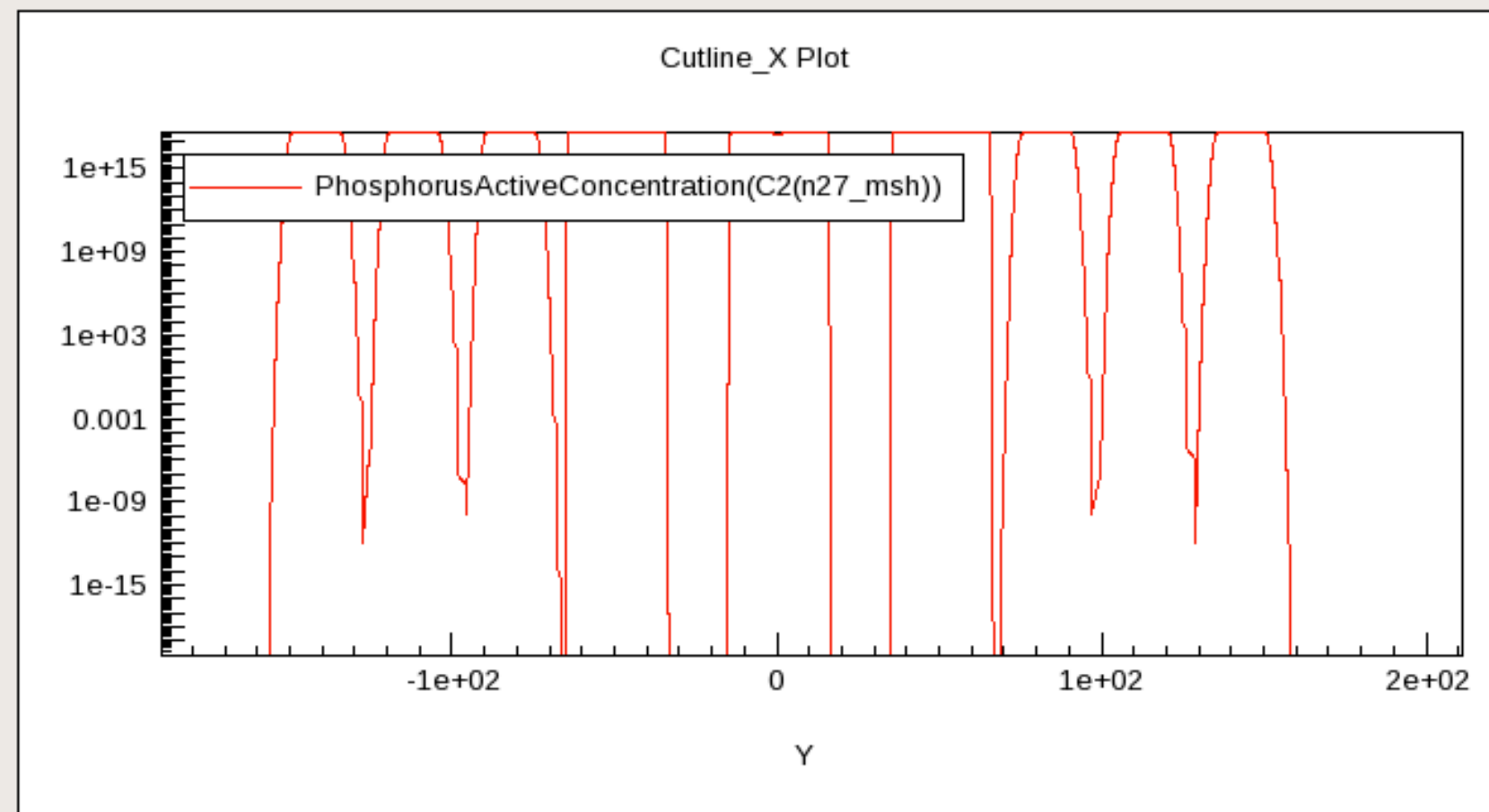
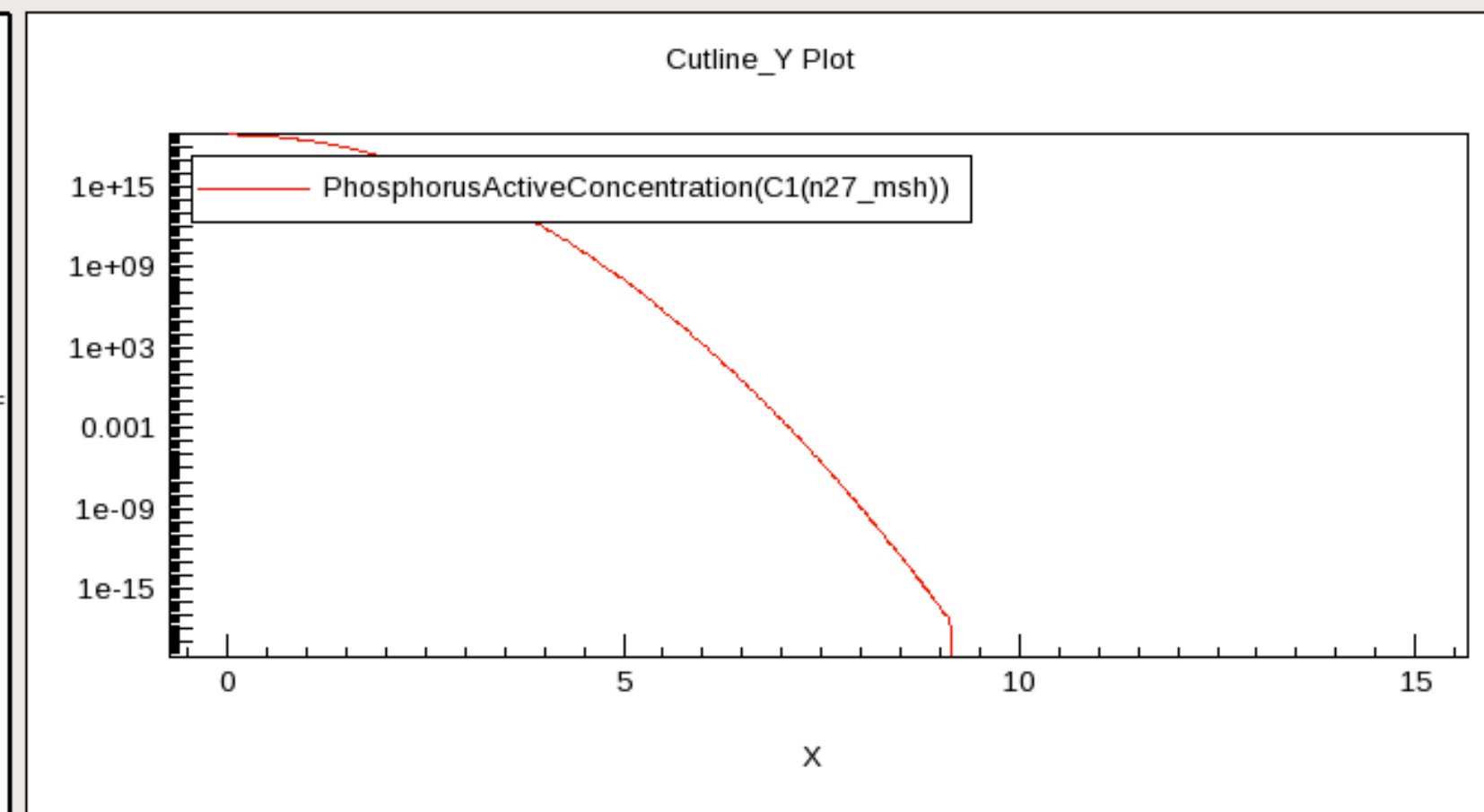
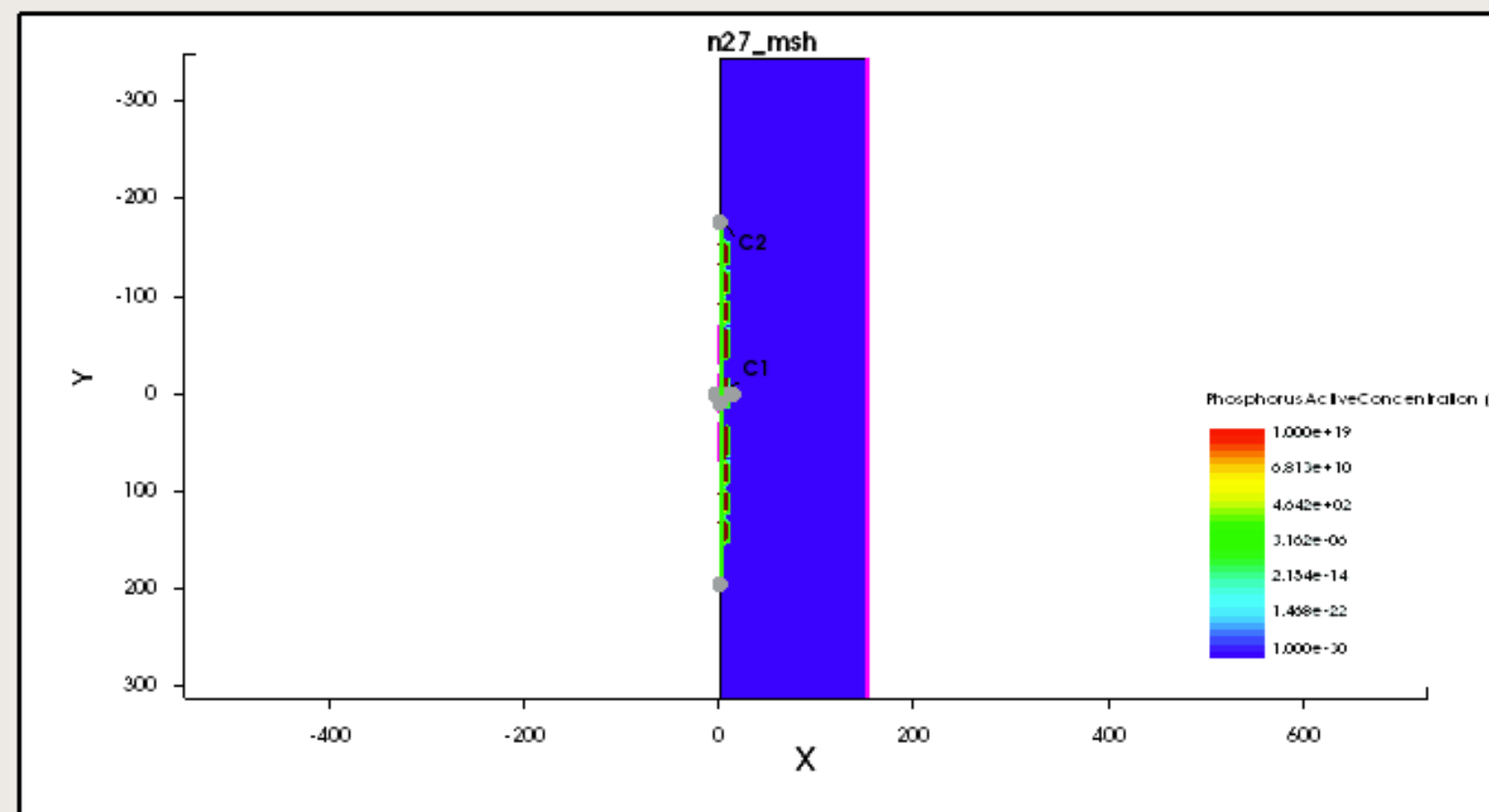


NGR = 0.1

問題3

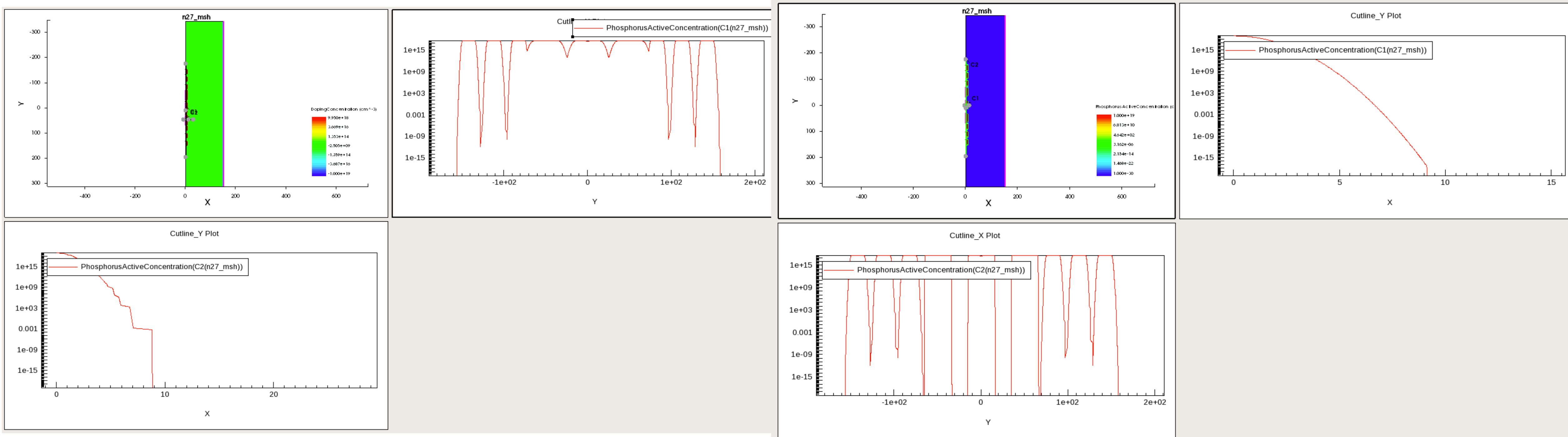


NGR = 0.8



NPlus = 0.1. NGR = 0.8

問題3



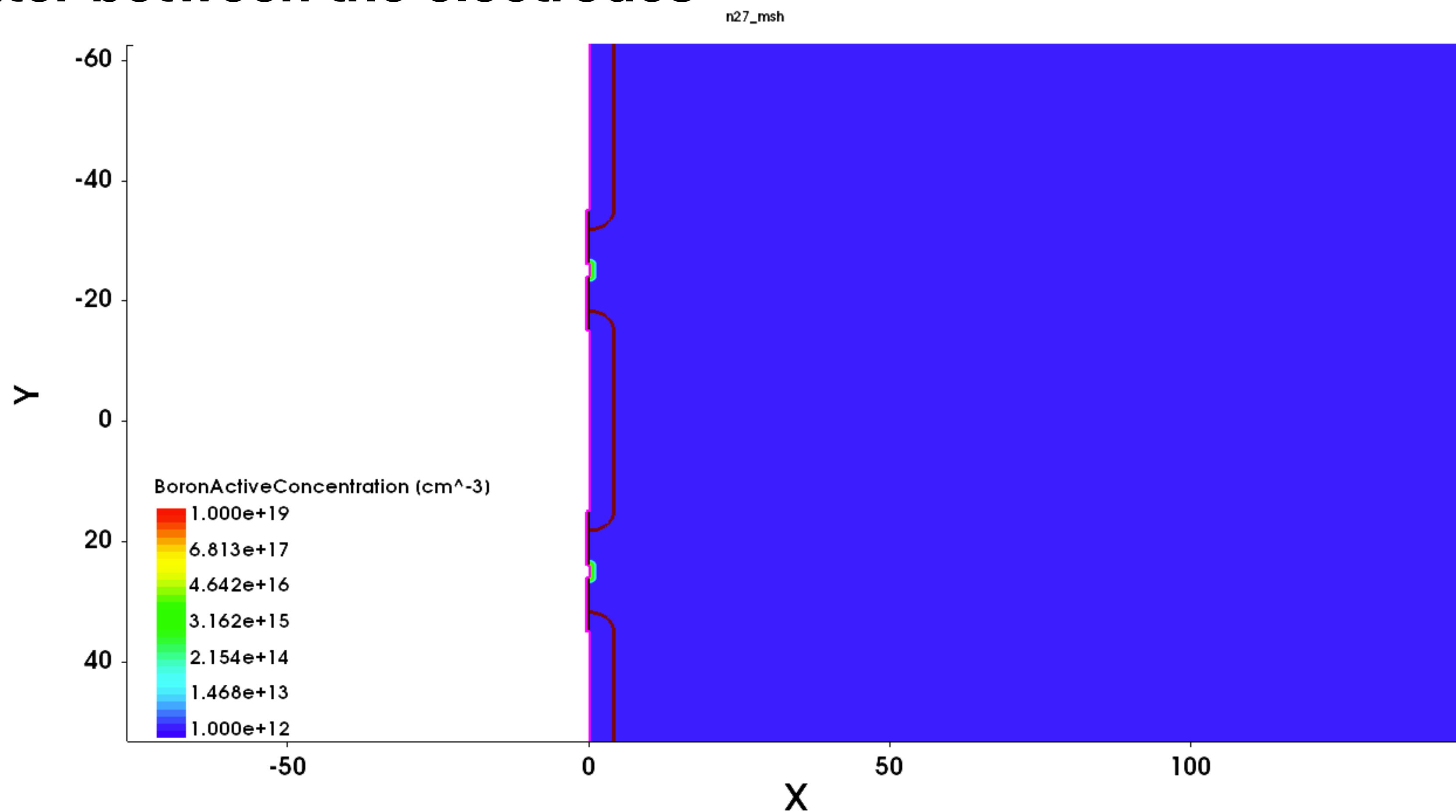
Factor = 3.0, NGR = 0.8

NPlus = 0.1, NGR = 0.8

- NPlus のfactorを小さくするほど、P-Dope分布がより鋭敏、滑らかに
⇒刻み幅を表すparameter?
- NGR(n-ガードリング)のfactorを小さくするほど、電極周りのGRのP分布が局所的に
⇒gaussianの刻み幅が大きいと、より緩慢に分布するため、重なり合いによって広がりが起こる?

問題4

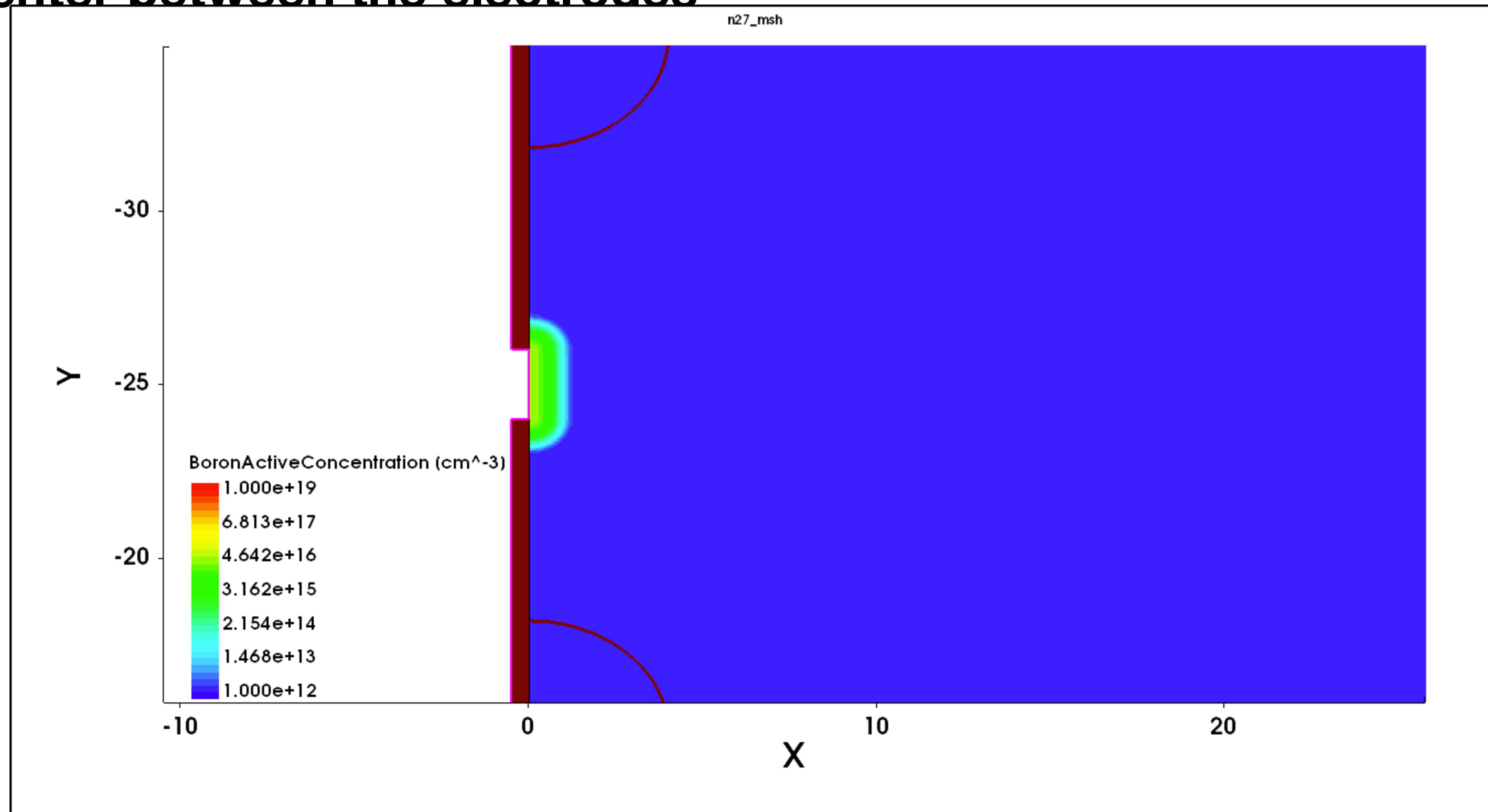
Formation of boron doping (p-stop) with a width of 2 μm and a depth of 1.2 μm in the center between the electrodes



できました

問題4

Formation of boron doping (p-stop) with a width of 2 μm and a depth of 1.2 μm in the center between the electrodes



問題4

- Simple2D_dvs.cmdの内容：
 - (序盤) 定数とかの定義
 - (条件分岐) 電極の数 $NSTRIP E \% 2 == 0,1$ に応じて場合分け
電極位置へのドープとcontactの生成
 - (GR) ガードリングの記述, ドープ
 - (メッシュ) メッシュ

$NSTRIP E \% 2 == 1$ の場合をみる。

問題4

P-dopeのprofile(Nplus)

Y=0の電極へのP-dope

“For” loop

命名規則

i-th電極の+側=*name1,

-側=*name2

と命名

name1, name2へのP-dope

```
;if NSTRIPE %2 == 1,next cmd will run.
(begin
  (define j 1)
  (define defname "Nplus")
  (sdedr:define-gaussian-profile defname "PhosphorusActiveConcentration" "PeakPos" 0 "PeakVal" Pan "ValueAtDepth" Plow "Depth" Xj "Gau
ss" "Factor" 0.8)

  (sdedr:define-refeval-window "RefVal_Nplus_0" "Line"
    (position 0 (- 0 (* 0.5 LNplus_stripe)) 0)
    (position 0 (+ 0 (* 0.5 LNplus_stripe)) 0)
  )
  (sdedr:define-analytical-profile-placement "Place_Nplus_0" defname "RefVal_Nplus_0" "Both" "NoReplace" "Eval")

  (do ((i 1 (+ i 1))) ((> i (inexact->exact (* 0.5 (- NSTRIPE 1))))))

    (define refevalname1 (string-append "RefVal_Nplus_" (number->string j) ) )
    (define placename1 (string-append "Place_Nplus_" (number->string j) ) )
    (define addPrefeavalname1 (string-append "RefVal_AddP_" (number->string j) ) )
    (define addPplacename1 (string-append "Place_AddP_" (number->string j) ) )

    (define refevalname2 (string-append "RefVal_Nplus_" (number->string (+ j 1)) ) )
    (define placename2 (string-append "Place_Nplus_" (number->string (+ j 1)) ) )
    (define addPrefeavalname2 (string-append "RefVal_AddP_" (number->string (+ j 1)) ) )
    (define addPplacename2 (string-append "Place_AddP_" (number->string (+ j 1)) ) )
    (set! j (+ j 2))

    (sdedr:define-refeval-window refevalname1 "Line"
      (position 0 (- (* i Lstripe_pitch) (* 0.5 LNplus_stripe) ) 0)
      (position 0 (+ (* i Lstripe_pitch) (* 0.5 LNplus_stripe) ) 0)
    )
    (sdedr:define-analytical-profile-placement placename1 defname refevalname1 "Both" "NoReplace" "Eval")

    (sdedr:define-refeval-window refevalname2 "Line"
      (position 0 (- 0 (+ (* i Lstripe_pitch) (* 0.5 LNplus_stripe) )) 0)
      (position 0 (- 0 (- (* i Lstripe_pitch) (* 0.5 LNplus_stripe) )) 0)
    )
    (sdedr:define-analytical-profile-placement placename2 defname refevalname2 "Both" "NoReplace" "Eval")
  )
)
```

i=1

電極間へのB-dope

B-dope profile

```
;*****p-dope suruyo
(define defname "AddPdope")
(sdedr:define-gaussian-profile defname "BoronActiveConcentration" "PeakPos" 0 "PeakVal" pspray "ValueAtDepth" Plow "Depth" XaddP "Gau
ss" "Factor" 0.8)

(sdedr:define-refeval-window addPrefeavalname1 "Line"
  (position 0 (- (- (* i Lstripe_pitch) (* 0.5 Lstripe_pitch)) 1) 0)
  (position 0 (+ (- (* i Lstripe_pitch) (* 0.5 Lstripe_pitch)) 1) 0)
)
(sdedr:define-analytical-profile-placement addPplacename1 defname addPrefeavalname1 "Both" "NoReplace" "Eval")

(sdedr:define-refeval-window addPrefeavalname2 "Line"
  (position 0 (- 0 (- (- (* i Lstripe_pitch) (* 0.5 Lstripe_pitch)) 1)) 0)
  (position 0 (- 0 (+ (- (* i Lstripe_pitch) (* 0.5 Lstripe_pitch)) 1)) 0)
)
(sdedr:define-analytical-profile-placement addPplacename2 defname addPrefeavalname2 "Both" "NoReplace" "Eval")
;*****p-dope sitayo
```

Name1,name2の

Dope位置の決定,

dopeの実行

```
(set! end-active (+ (* i Lstripe_pitch) (* 0.5 LNplus_stripe) ) )
```

i=1

NSTRIPE % 2 == 0 への
拡張も容易に可能。