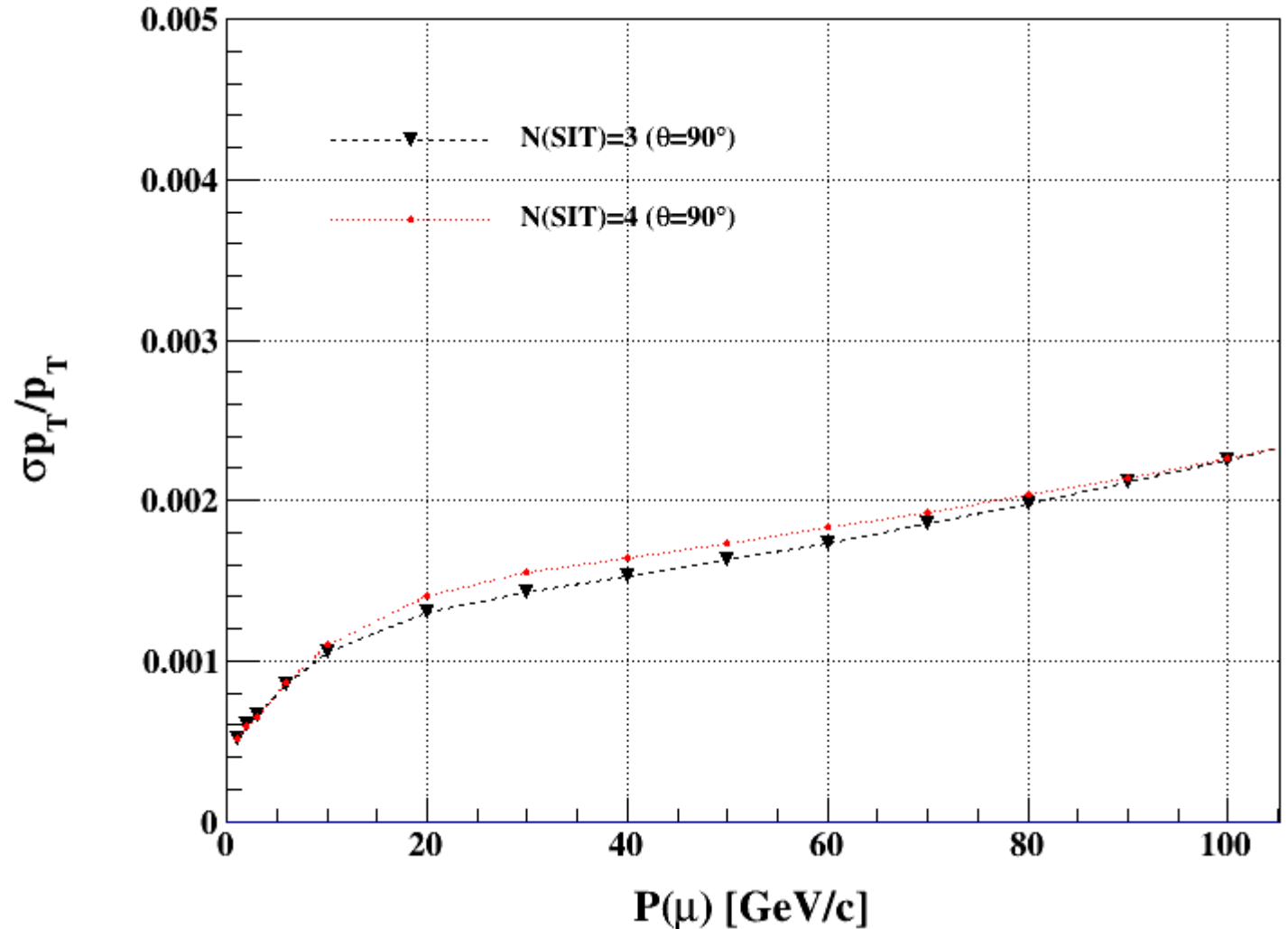
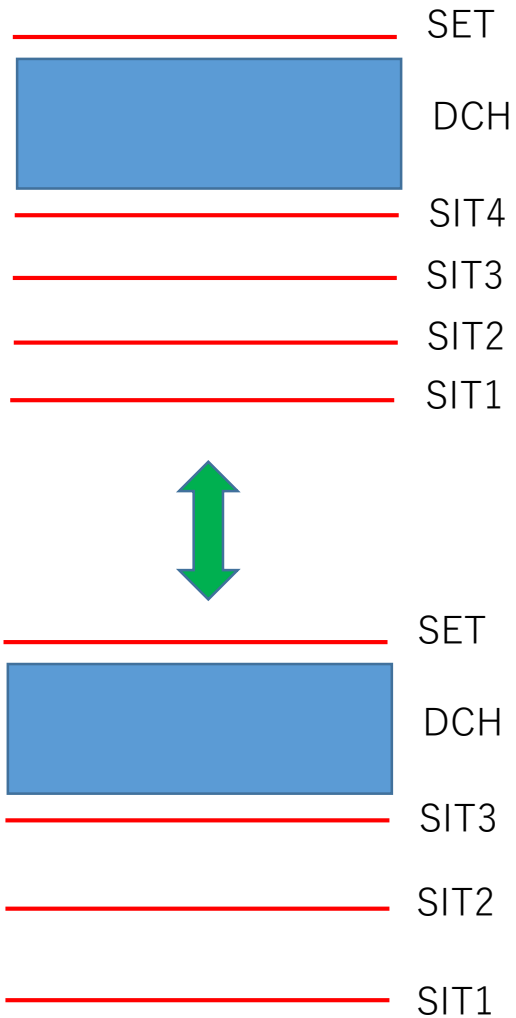


Status from the LDT simulation

Ryuta

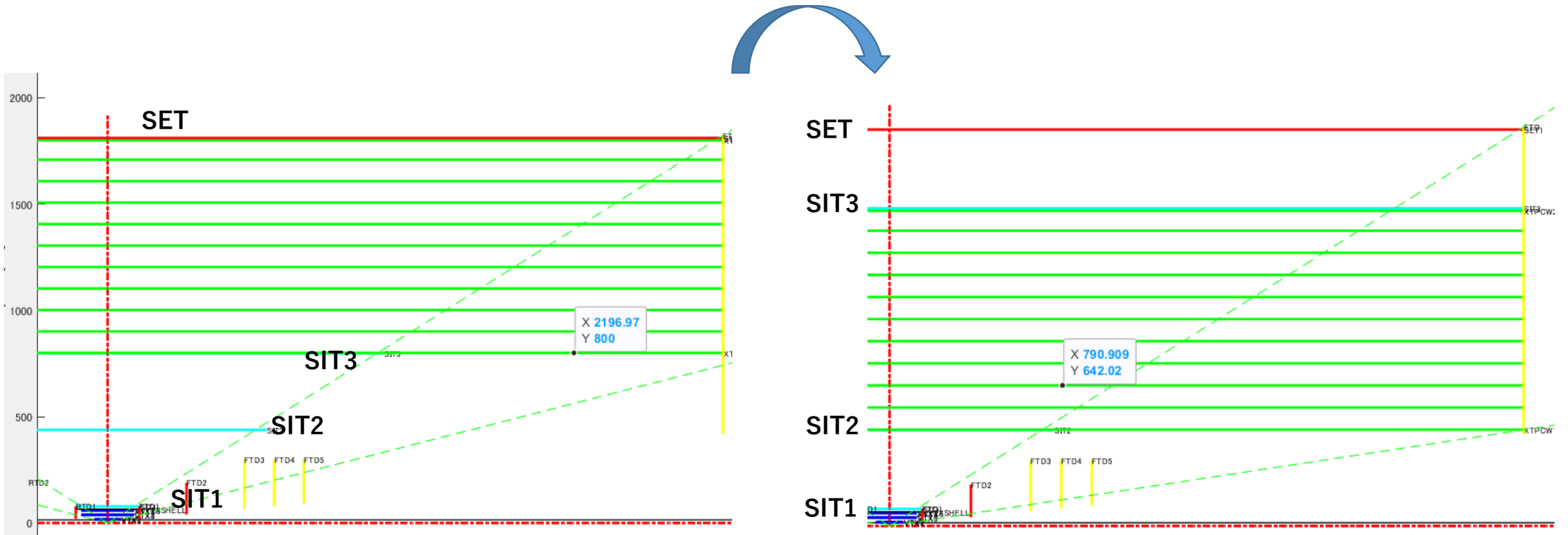
04/26/2021

Momentum resolution : $N_{SIT}=4$ vs 3



(previously discussed) 3SIT config. shows better resolution at this momentum range

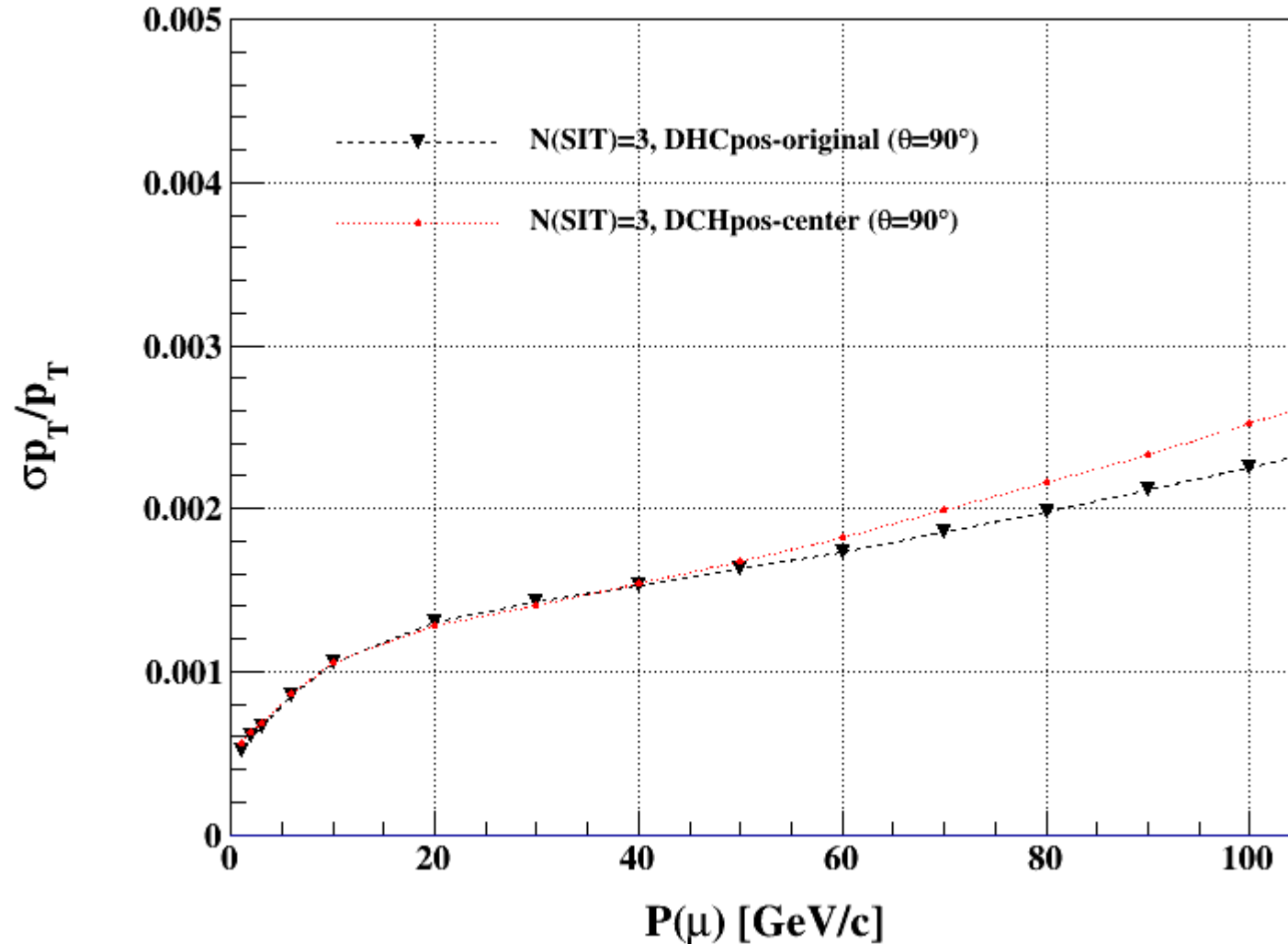
Change the DCH position



DCH size = 1000mm, $N_{\text{layers}}=100$ layers, are unchanged now.

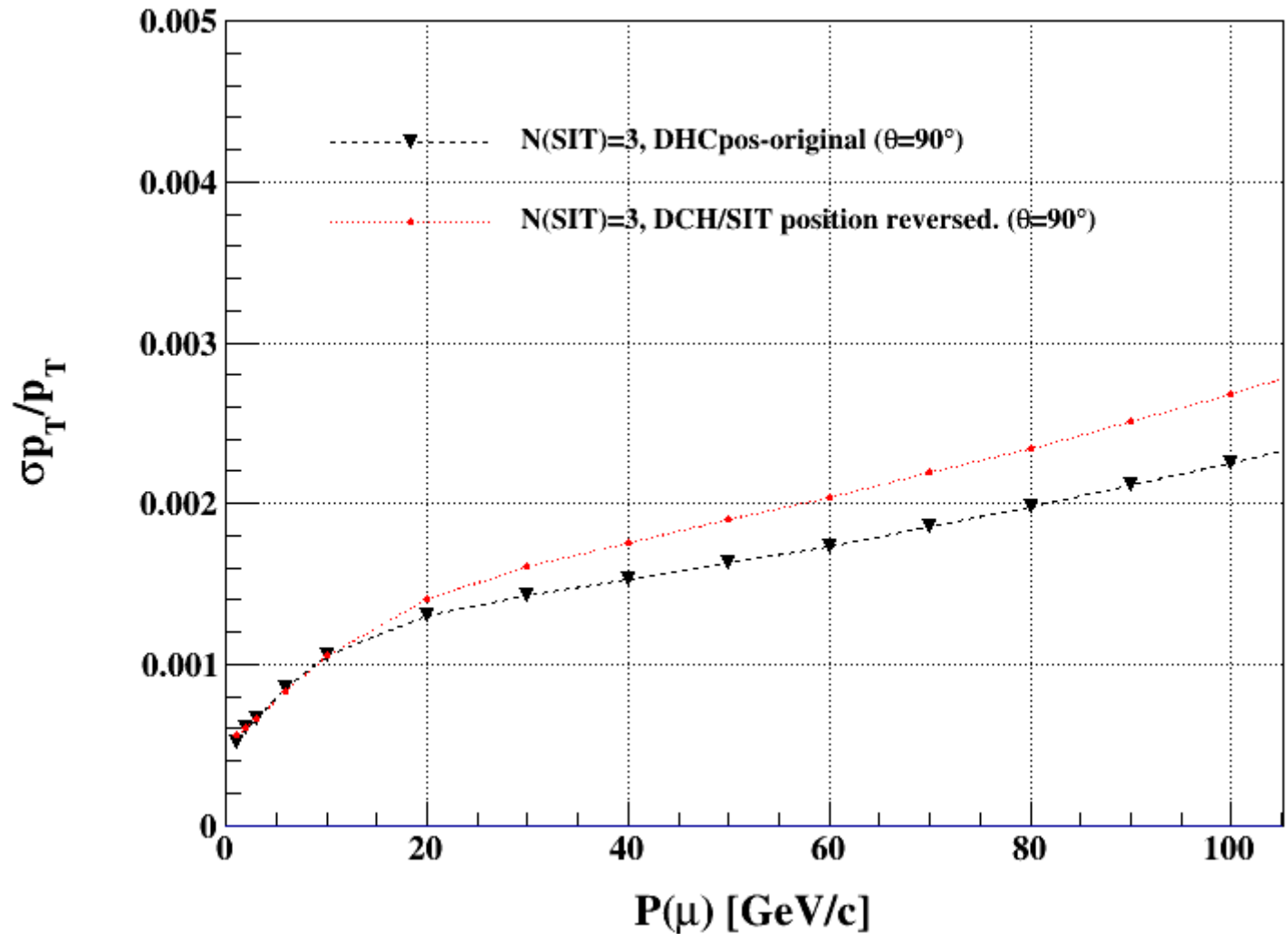
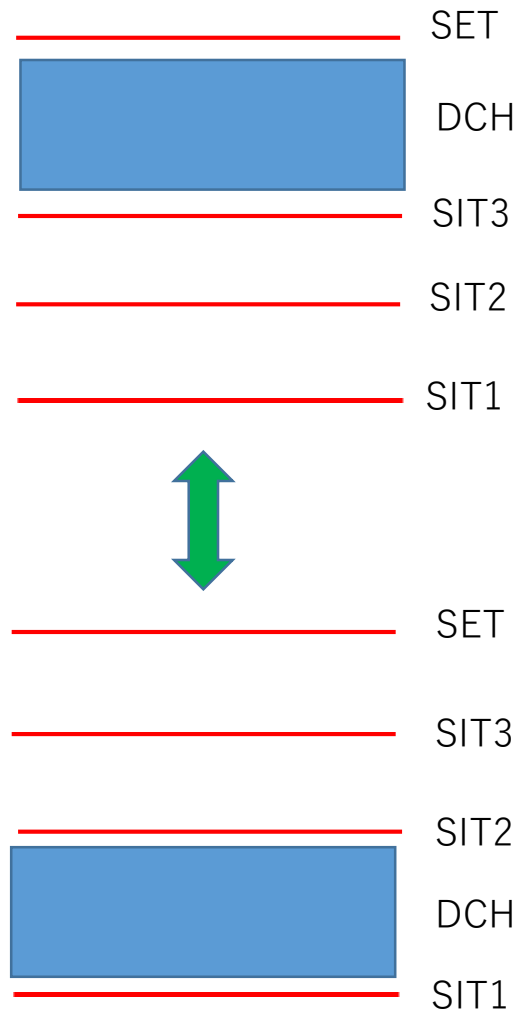
position of "SIT3" is shifted when the DCH is set at the center

Momentum resolution : DCH position center



At higher momentum, resolution for DHC-center config. became worse...

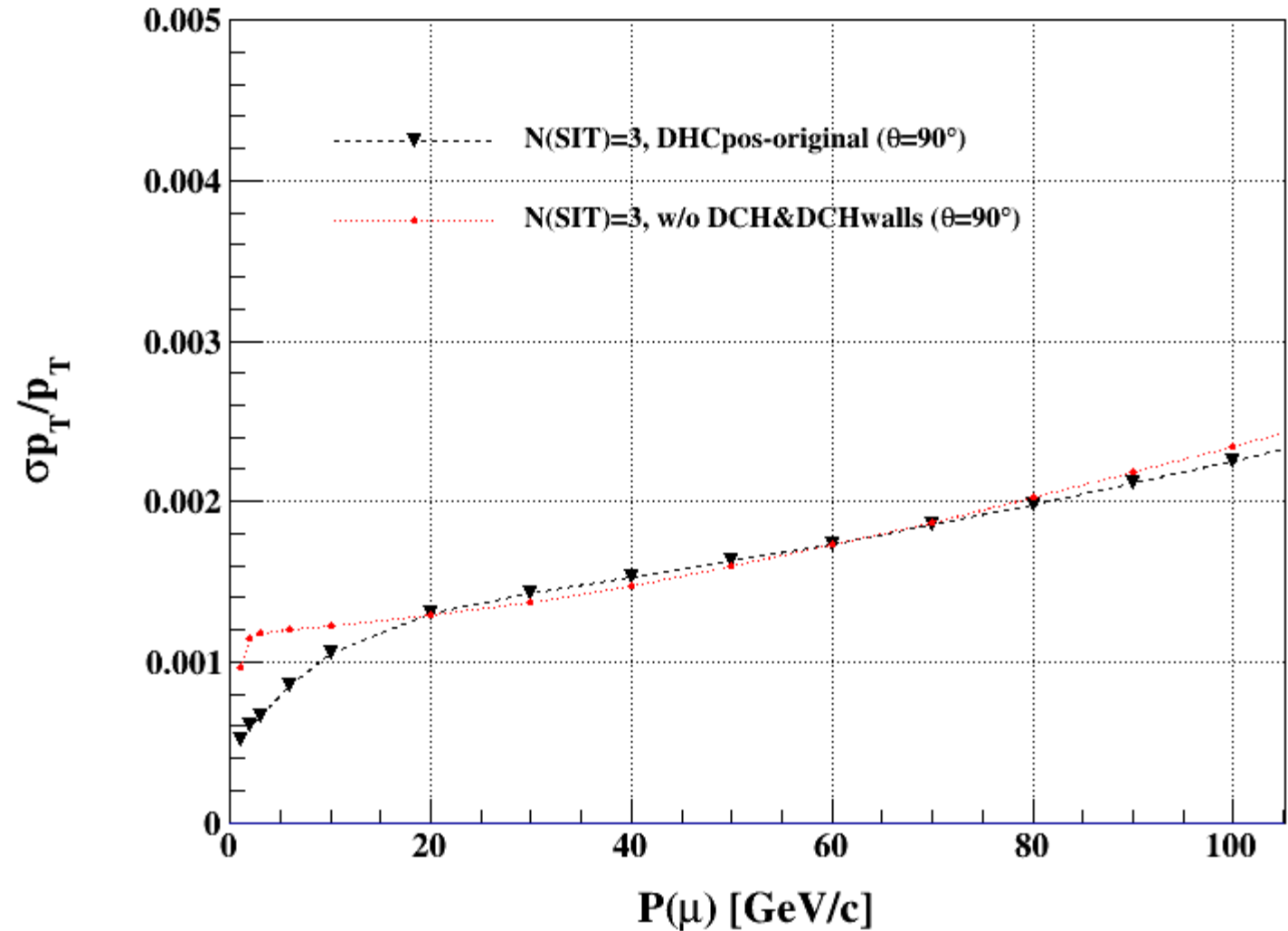
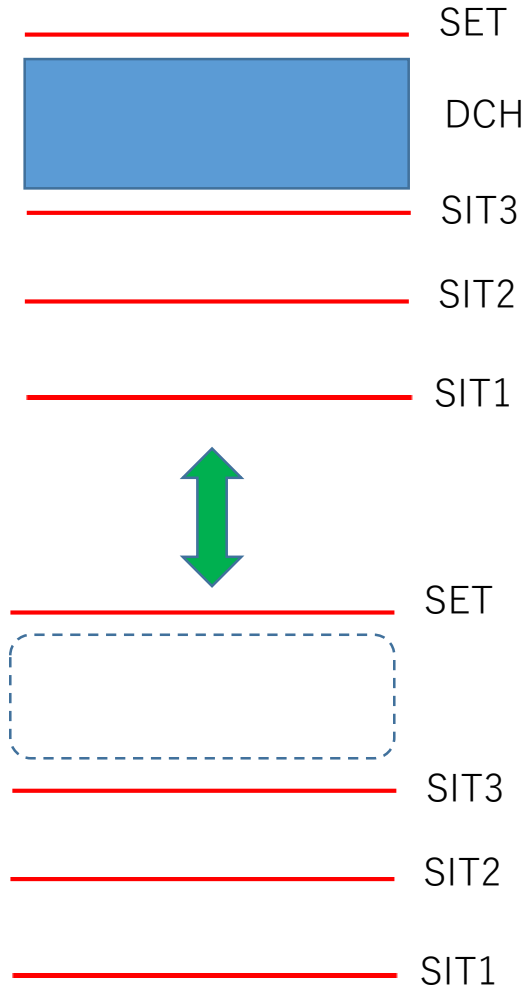
Momentum resolution : Another trial (“reverse” config)



This option is not promising .

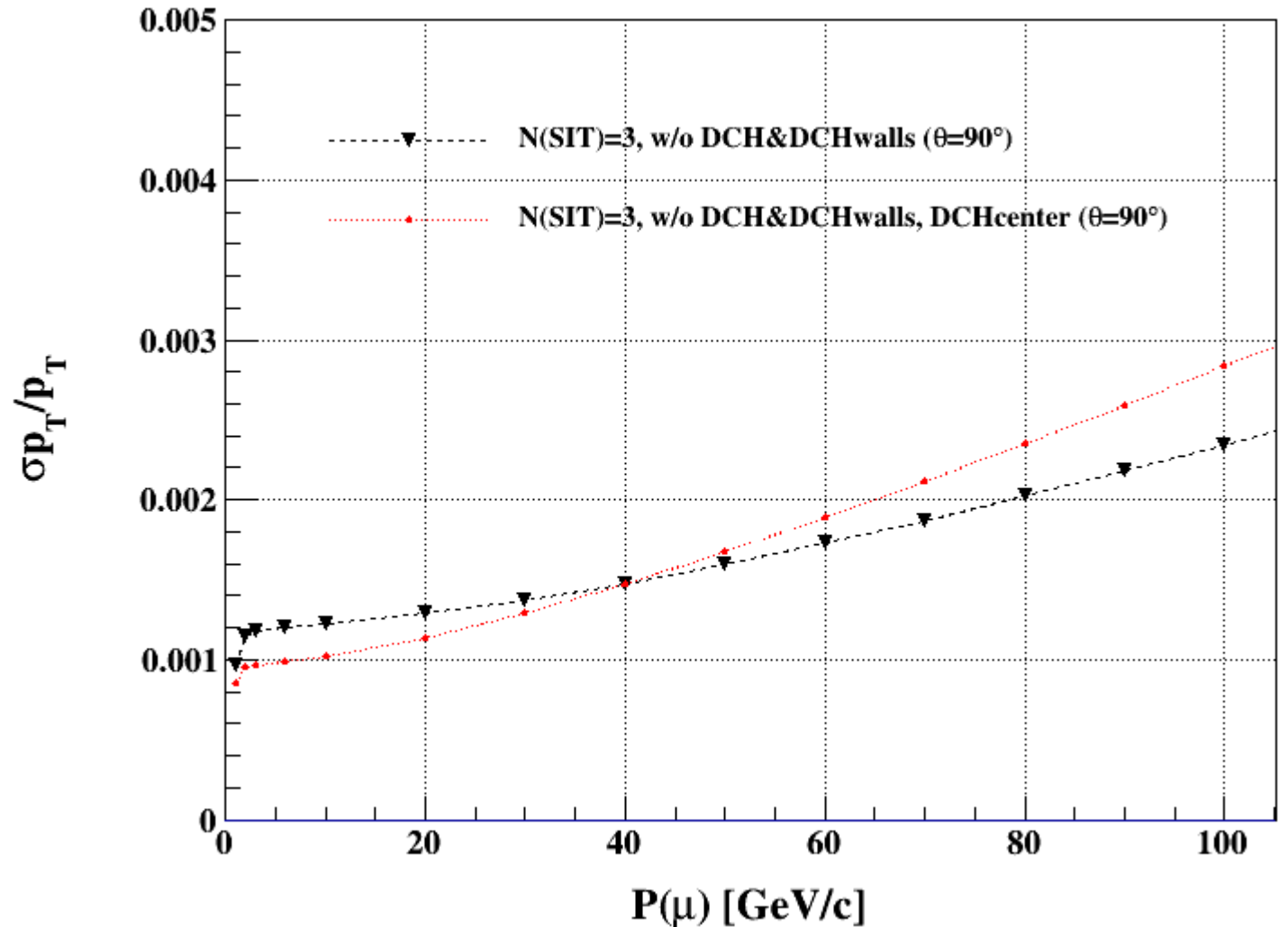
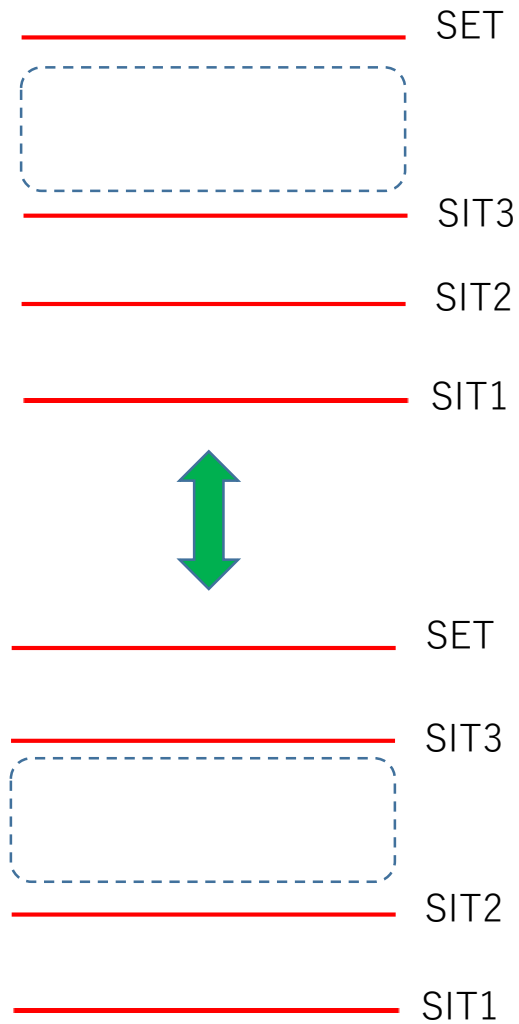
Try to compare momentum resolution without the drift chamber

Momentum resolution : with/without DCH



SITs are the original position. dpt/pt became worse at low momentum

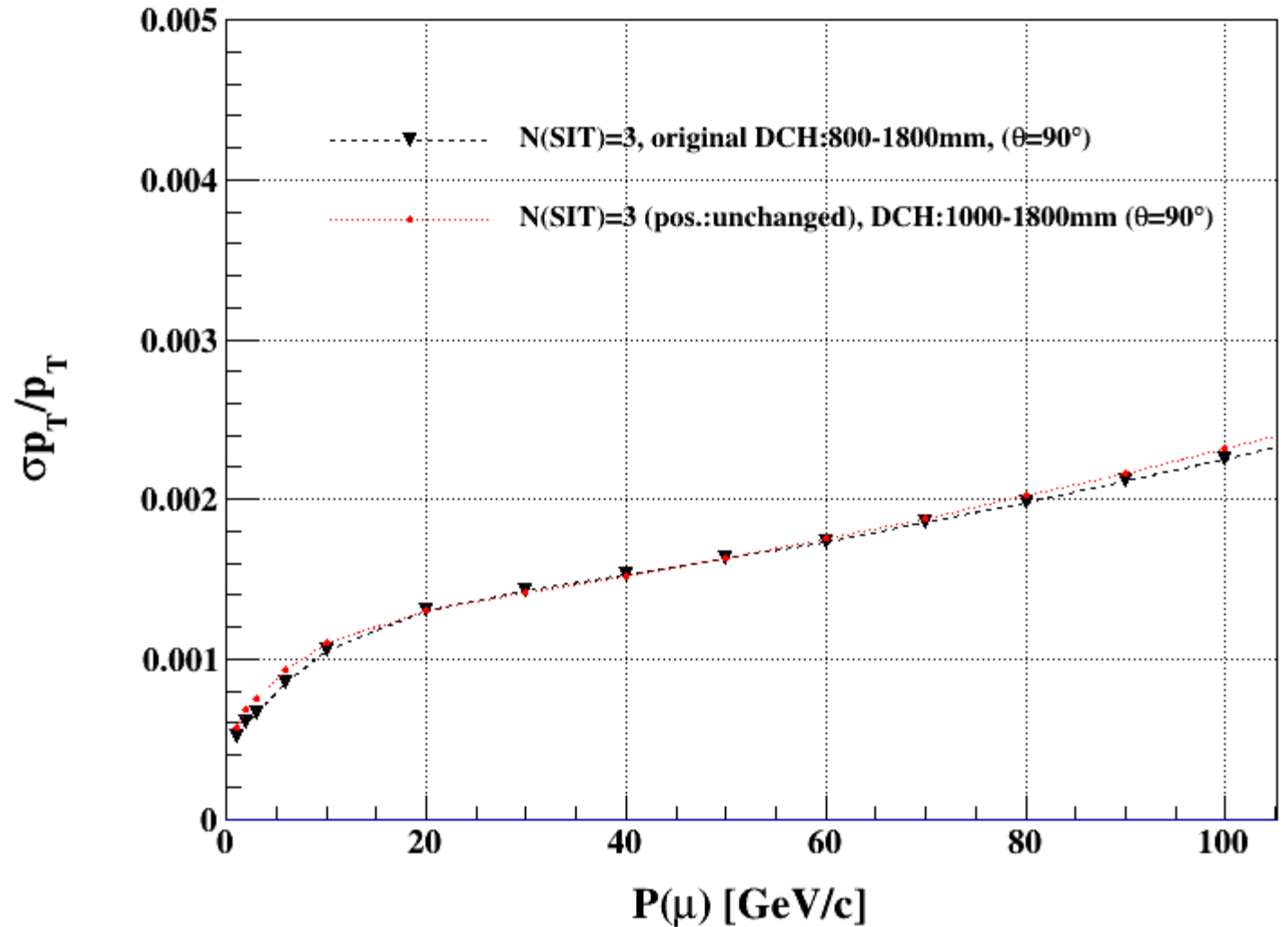
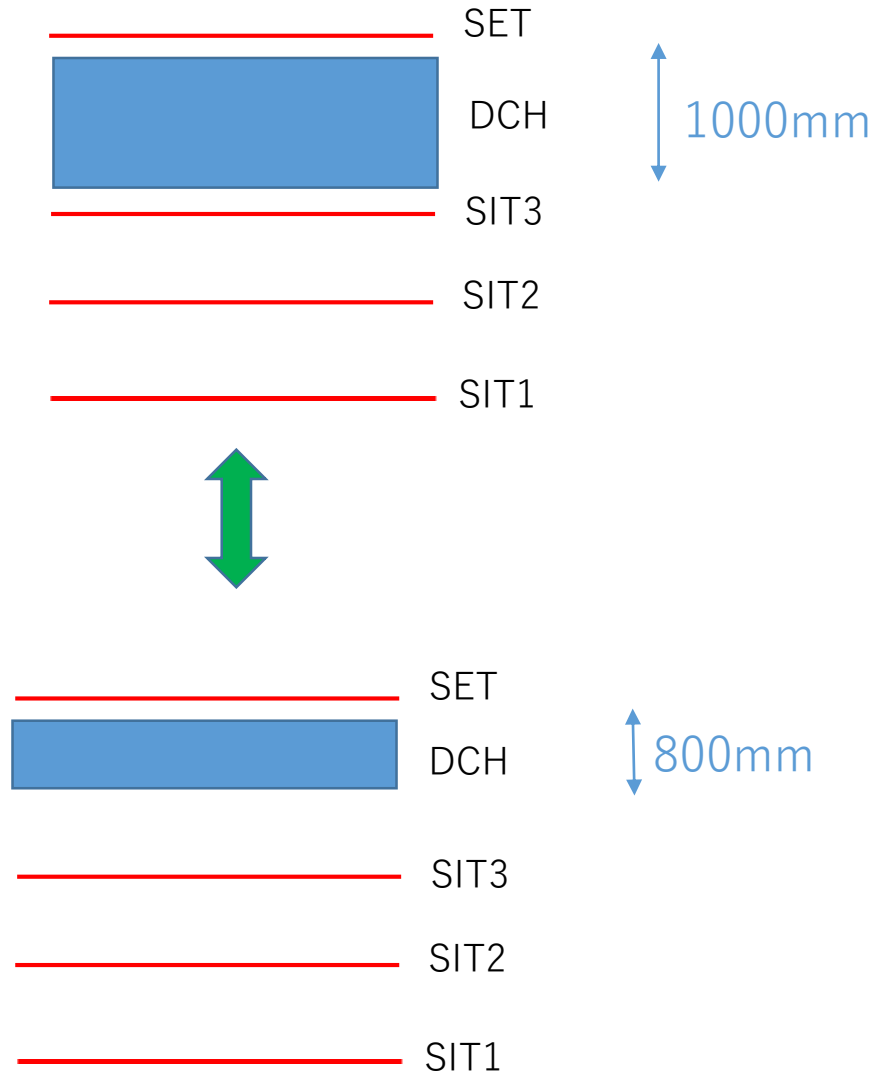
Momentum resolution : comparison configs w/o DCH



SITs position affect the momentum resolution (higher momentum side is mainly decided by this)

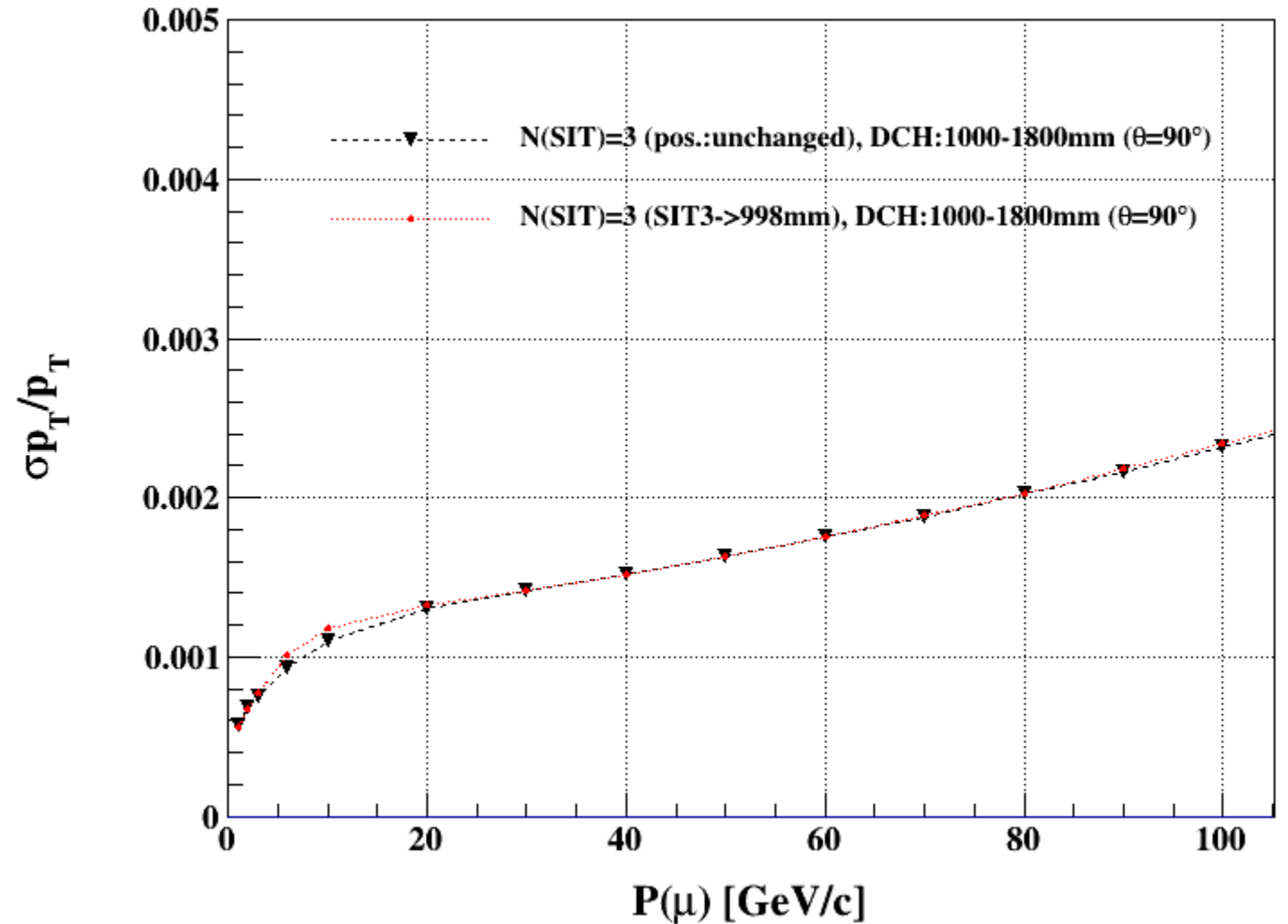
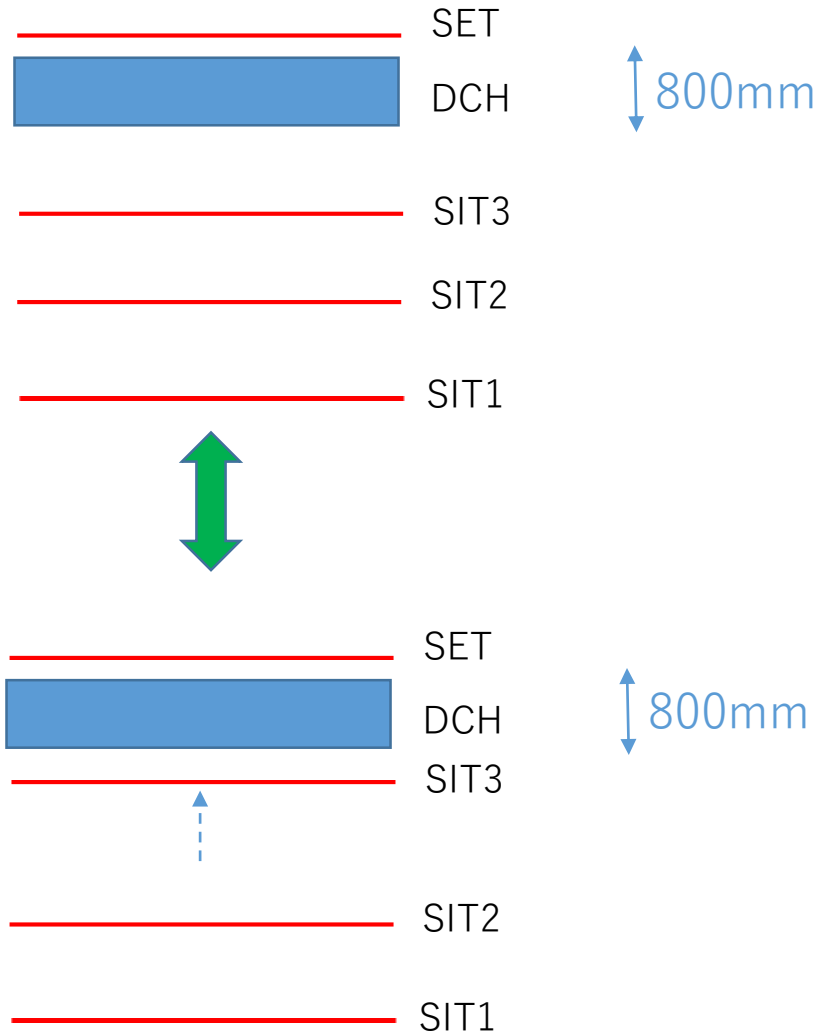
Changing the DCH size
1000mm -> 800mm

Momentum resolution : comparison by changing DCH size



SIT position is unchanged. These configuration show resolution of very same level.

Momentum resolution : Change the position of SIT3



Not so much difference is observed.

Summary

Comparison of momentum resolution (in $[0,100]$ GeV) by changing followings:

- $N_{\text{SIT}} = 4$ vs 3
- Position of DCH at the center of tracker vs default
 - A branch study of this comparison without DCH
- Position of DCH at the “bottom” of tracker vs default
- DCH size : 1000mm (default) vs 800mm

, , , and the default configuration (3SIT, DCH size :1000mm, DCH position: “upper”) is the optimal one within those.

Note that all of those are from 90 degree particle incident angle.

Configuration file for “3SIT” geometry

```
01 LiC Detector-Toy (barrel)
02 LDC-basic-Japan
03 Version: 120208
04 Vertex Detector (VTX)
05
06 Number of layers : 8
07 Description (optional) : |-Beamt.-|-----Vertex detector-----|
08 Names of the layers (opt.) : XBT, VTX1, VTX2, VTX3, VTX4, VTX6, XVTX6, XVTXSHELL
09 Radii [mm] : 14.5, 16.0, 18, 37.0, 39, 58, 60, 65
10 Upper limit in z [mm] : 4225, 62.5, 62.5, 125, 125, 125, 125, 145
11 Lower limit in z [mm] : -4225, -62.5, -62.5, -125, -125, -125, -125, -145
12 Efficiency RPhi : 0, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 0
13 Efficiency 2nd coord. (eg. z): -1
14 Stereo angle alpha [Rad] : pi/2
15 Thickness [rad. lengths] : 0.0015, 0.0015, 0.0015, 0.0015, 0.0015, 0.0015, 0.0015, 0.0015
16 error distribution : 0
17 0 normal-sigma(RPhi) [1e-6m] : 2.8, 6, 4, 4, 4, 4
18 sigma(z) [1e-6m] : 2.8, 6, 4, 4, 4, 4
19 1 uniform-d(RPhi) [1e-6m] :
20 d(z) [1e-6m] :
21
22 Silicon Inner Tracker (SIT)
23
24 Number of layers : 5
25 Description (optional) : |-----Inner tracker-----|TPC inner wall|
26 Names of the layers (opt.) : SIT1, SIT2, SIT3, XTPCW1, XTPCW2
27 Radii [mm] : 78.0, 438.0, 798.0, 799, 1801
28 Upper limit in z [mm] : 150.0, 750.0, 1300, 2900, 2900
29 Lower limit in z [mm] : -150.0, -750.0, -1300, -2900, -2900
30 Efficiency RPhi : 1.00, 1.00, 1.00, 0, 0
31 Efficiency 2nd coord. (eg. z): -1,
32 Stereo angle alpha [Rad] : pi/2,
33 Thickness [rad. lengths] : 0.0065, 0.0065, 0.0065, 0.002, 0.01
34 error distribution : 0
35 0 normal-sigma(RPhi) [1e-6m] : 7.2
36 sigma(z) [1e-6m] : 86.6
37 1 uniform-d(RPhi) [1e-6m] :
38 d(z) [1e-6m] :
39
```

```

40 Time Projection Chamber (TPC)
41  $\sigma^2 = \sigma_0^2 + \sigma_1^2 \sin(\beta)^2 + C_{diff}^2 * 6\text{mm}/h * \sin(\theta) * L_{drift}[\text{m}]$ 
42 Number of layers : 100
43 Radii [mm] : 800,1800
44 Upper limit in z [mm] : 2900
45 Lower limit in z [mm] : -2900
46 Efficiency RPhi : 1
47 Efficiency z : 1
48 Thickness [rad. lengths] : 0.00003356
49  $\sigma_0(\text{RPhi}) [1e-6\text{m}]$  : 100
50  $\sigma_1(\text{RPhi}) [1e-6\text{m}]$  : 0
51  $C_{diff}(\text{RPhi}) [1e-6\text{m}/\text{sqrt}(\text{m})]$  : 0
52  $\sigma_0(z) [1e-6\text{m}]$  : 2828
53  $\sigma_1(z) [1e-6\text{m}]$  : 0
54  $C_{diff}(z) [1e-6\text{m}/\text{sqrt}(\text{m})]$  : 0
55
56 Silicon External Tracker (SET)
57
58 Number of layers : 1
59 Description (optional) : |-----External Tracker-----|
60 Names of the layers (opt.) : SET1,
61 Radii [mm] : 1811,
62 Upper limit in z [mm] : 2900,
63 Lower limit in z [mm] : -2900,
64 Efficiency RPhi : 1.00,
65 Efficiency 2nd coord. (eg. z) : -1,
66 Stereo angle alpha [Rad] : pi/2,
67 Thickness [rad. lengths] : 0.0065,
68 error distribution : 0
69 0 normal-sigma(RPhi) [1e-6m] : 7.2,
70 sigma(z) [1e-6m] : 86.6,
71 1 uniform-d(RPhi) [1e-6m] :
72 d(z) [1e-6m] :
73
74 Magnetic field and beam spot
75
76 Solenoid magnetic field [T] : 3.0
77 Range in x [mm] : -0.0 0.0
78 Range in y [mm] : -0.0 0.0
79 Range in z [mm] : -0.0 0.0

```