# Tracker simulation

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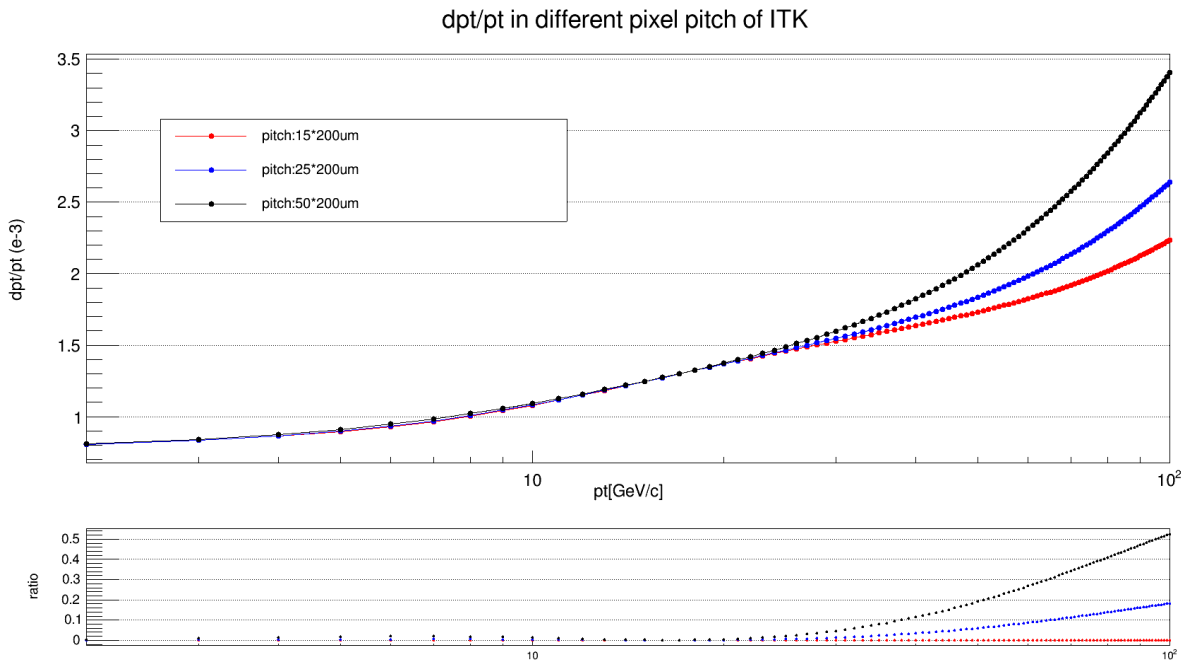
5.17

# Tracker Dimension (Barrel)

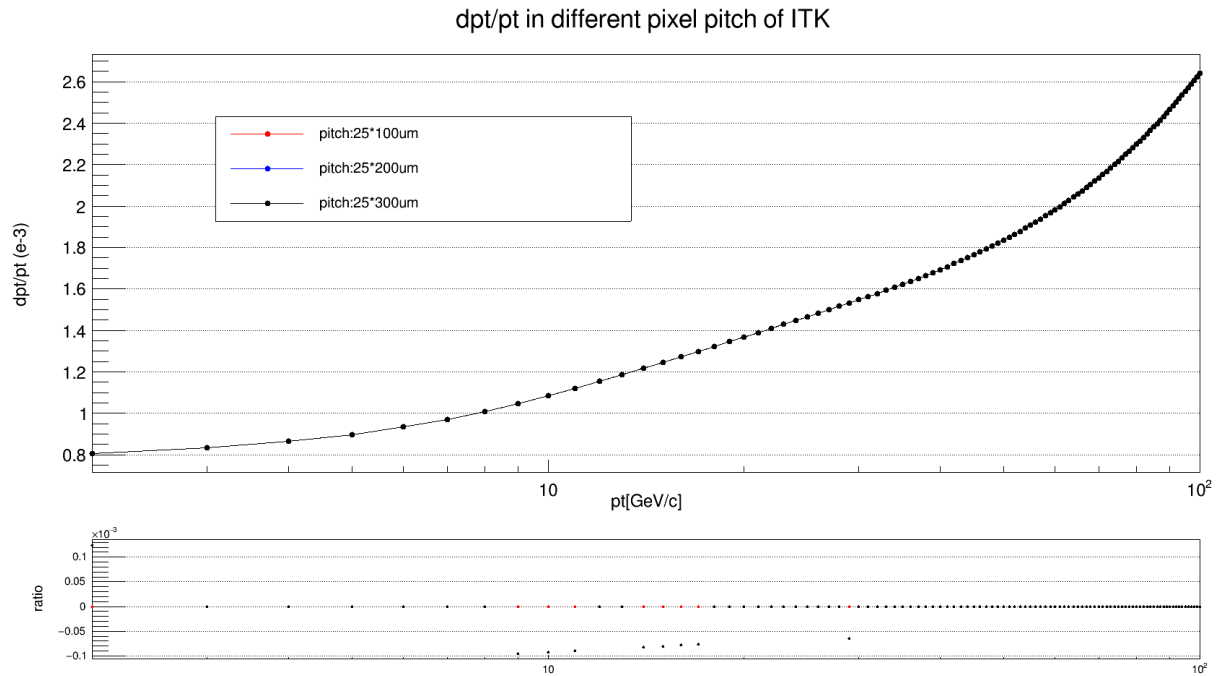
| Components | Radius(mm) | Half Z (mm) | $\sigma_{R\phi}(\mu m)$ | $\sigma_Z(\mu m)$ | Thickness($X_0$ %) |
|---|---|---|---|---|---|
| Beam Pipe | 10.35 | - | - | - | 0.172 |
| VTX (3 double layers) | 12.3/14.4/35.5/37.5/58.3/60.3 | | 2.8/6/4/4/4/4 | 2.8/6/4/4/4/4 | 0.155 |
| VTX-shell | 65 | | - | - | 0.139 |
| SITs (3 layers) | 150/250/500 | 740/1340/1890 | **7.2** | **86.6** | 0.650 |
| DC inner wall | 610 | 2980 | - | - | 0.110 |
| DC cell (66 x18x18) | 612-1800 | - | 100 | 2828 | 0.00127×66 |
| DC outer wall | 1802 | - | - | - | 1.349 |
| SET | 1811 | 2980 | **7.2** | **86.6** | 0.182 |

# pt resolution of ITK

固定z向pitch 为200um，Rphi向pitch分别取15、25、50um

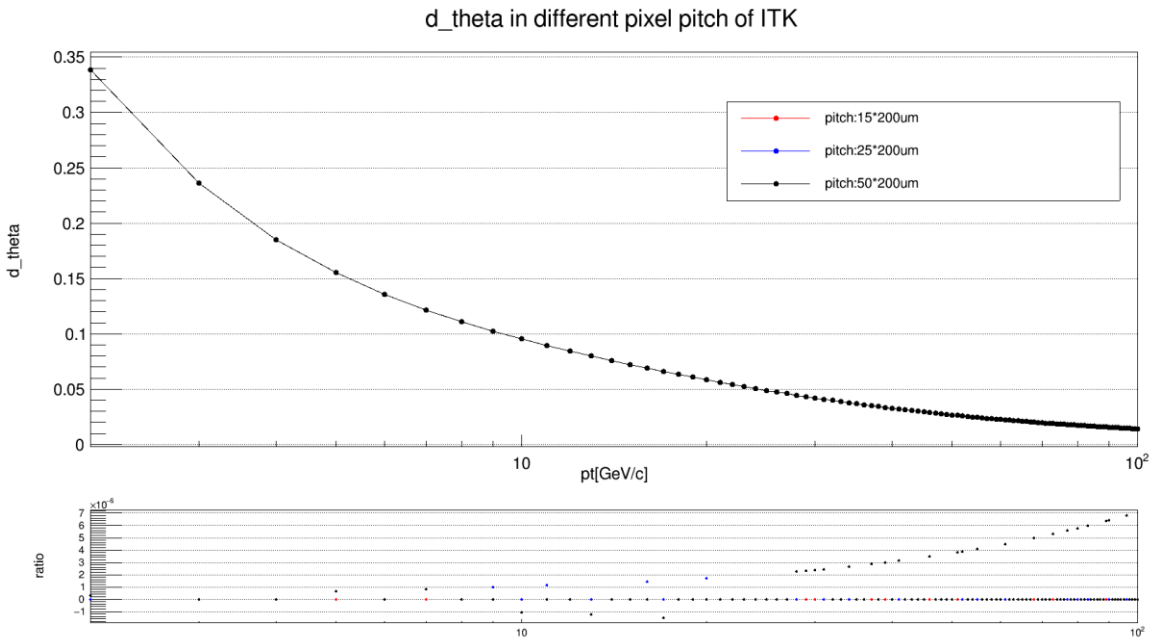



固定Rphi向pitch 为25um，z向pitch分别取100、200、300um

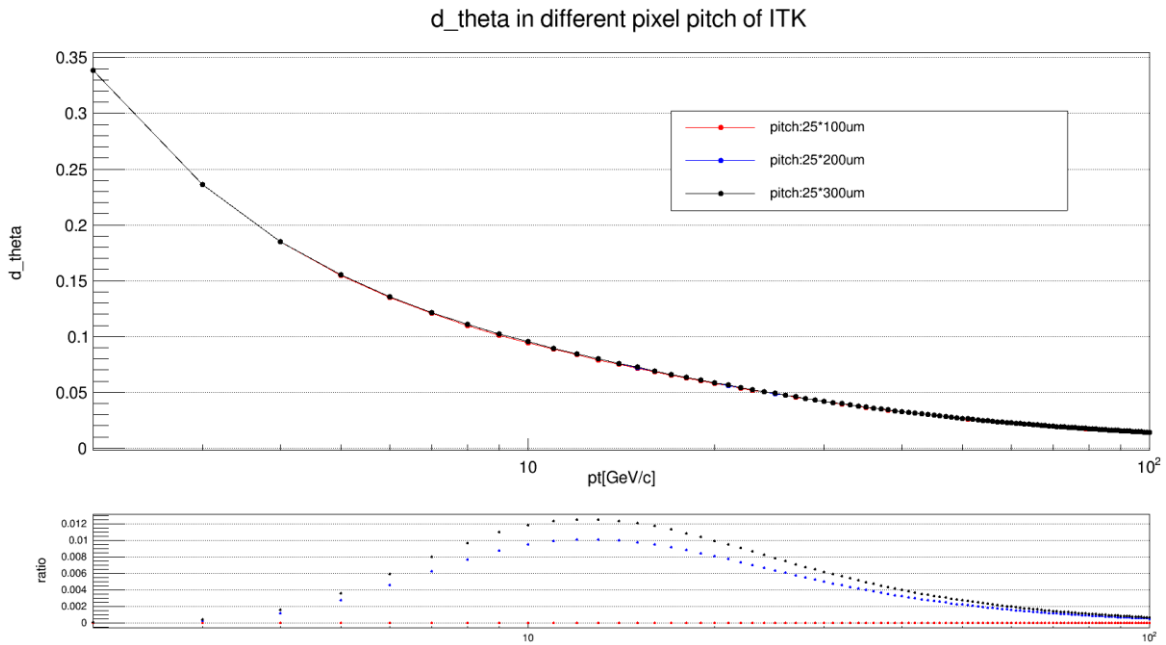


# theta resolution of ITK

固定z向pitch 为200um，Rphi向pitch分别取15、25、50um

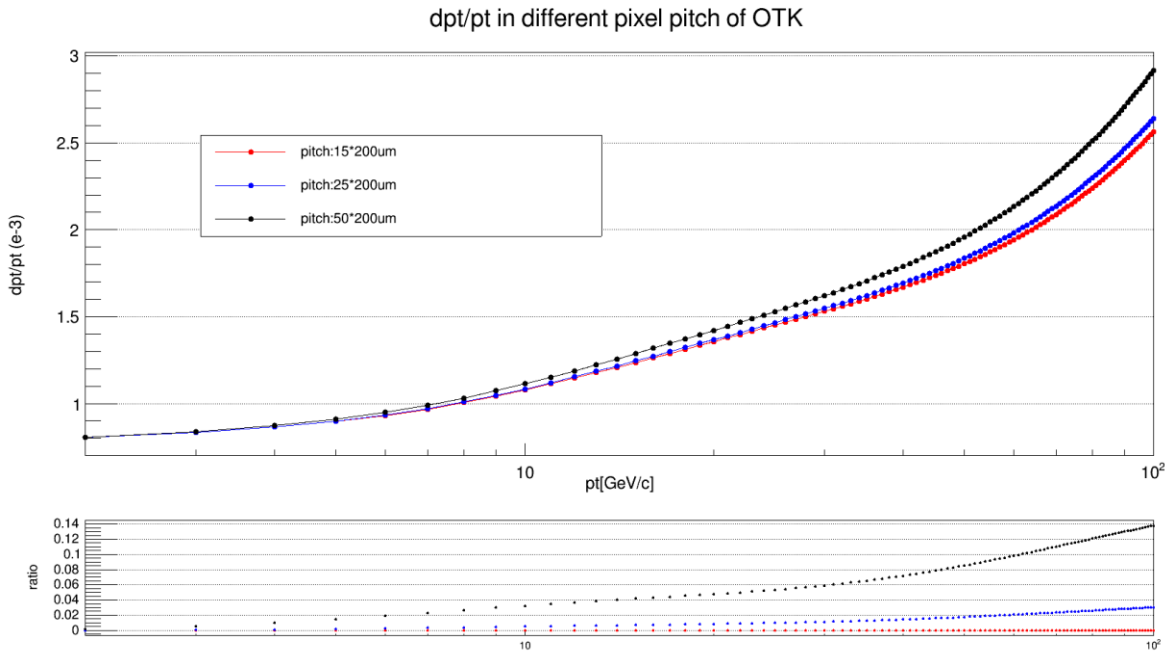



固定Rphi向pitch 为25um，z向pitch分别取100、200、300um

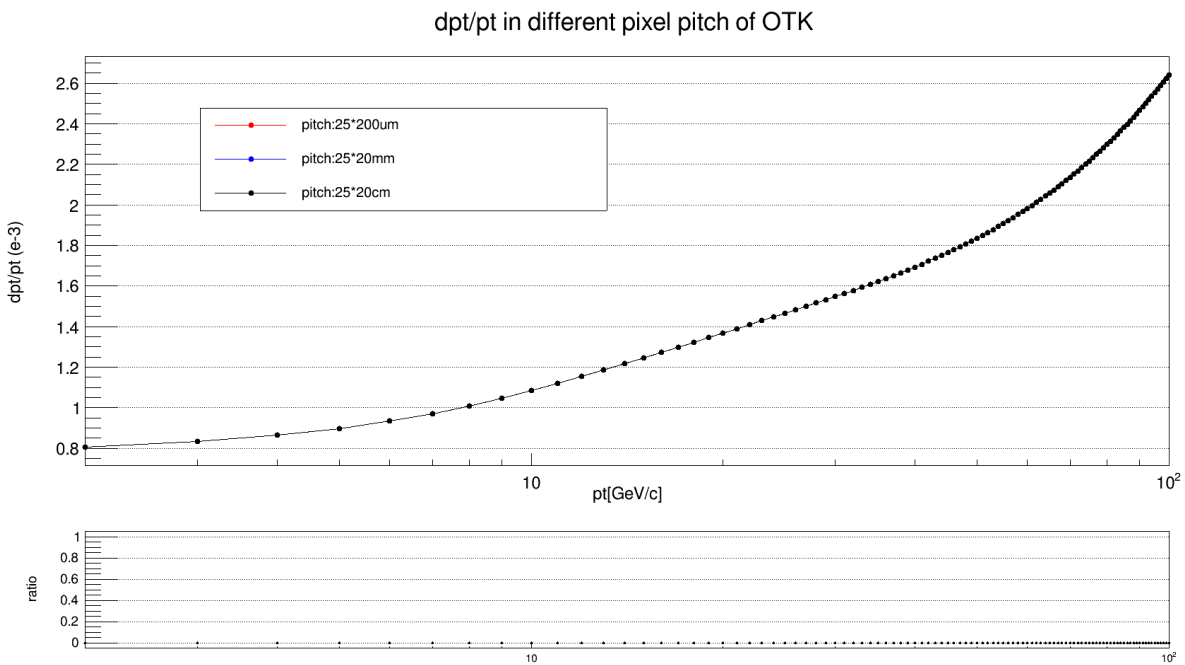


# pt resolution of OTK

固定z向pitch 为200um，Rphi向pitch分别取15、25、50um

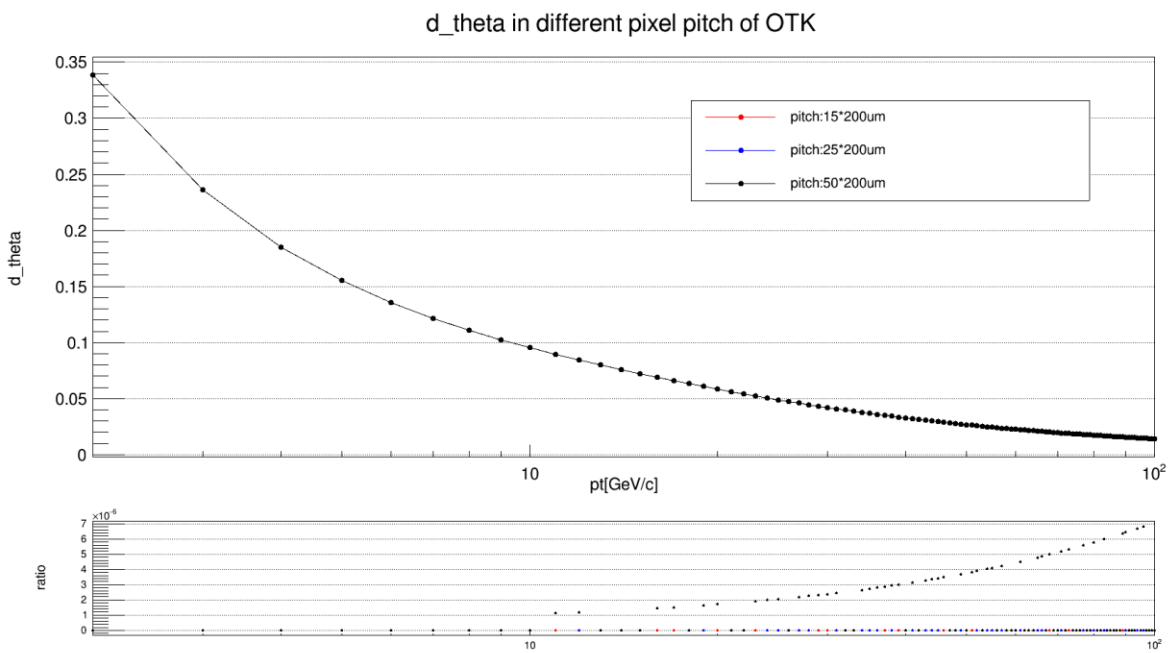



固定Rphi向pitch 为25um，z向pitch分别取200um、20mm、20cm

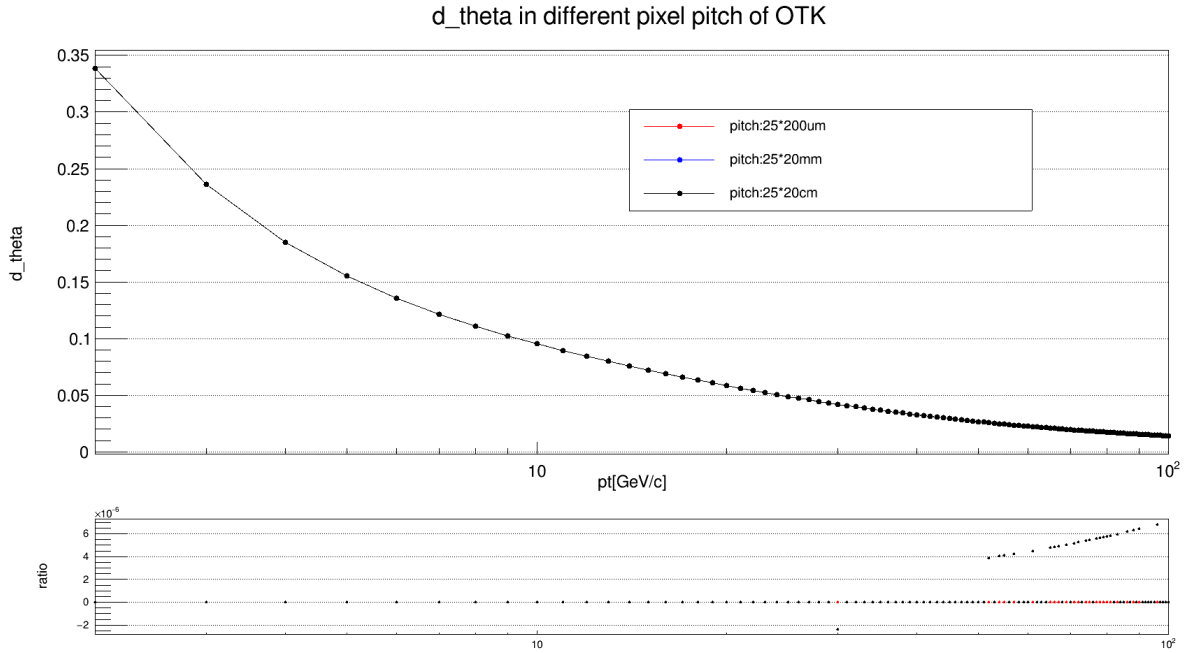


# theta resolution of OTK

固定z向pitch 为200um，Rphi向pitch分别取15、25、50um




固定Rphi向pitch 为25um，z向pitch分别取200um、20mm、20cm

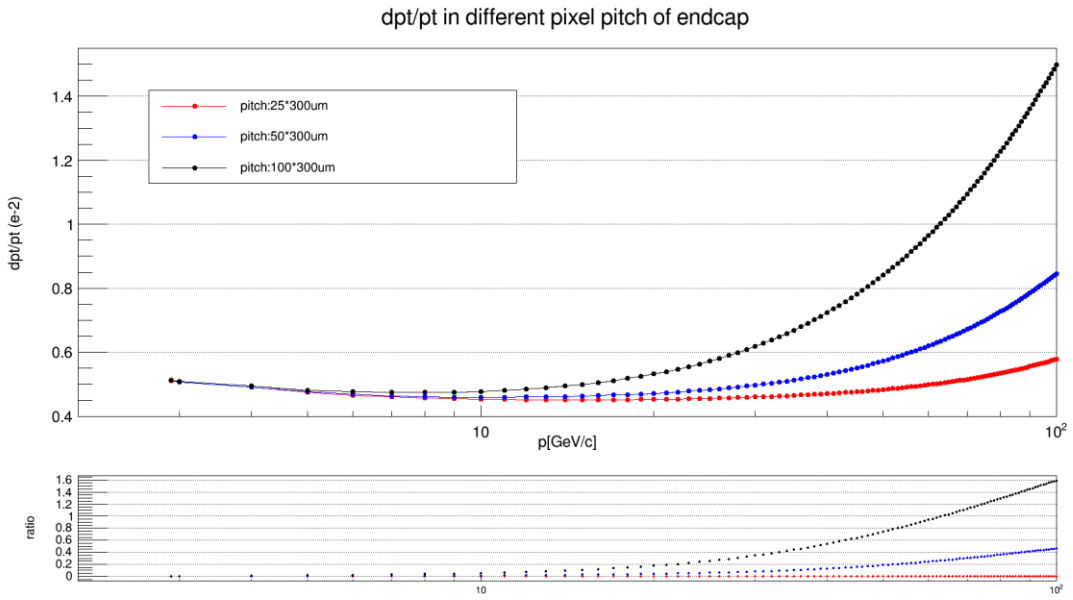


# Tracker Dimension (End Caps)

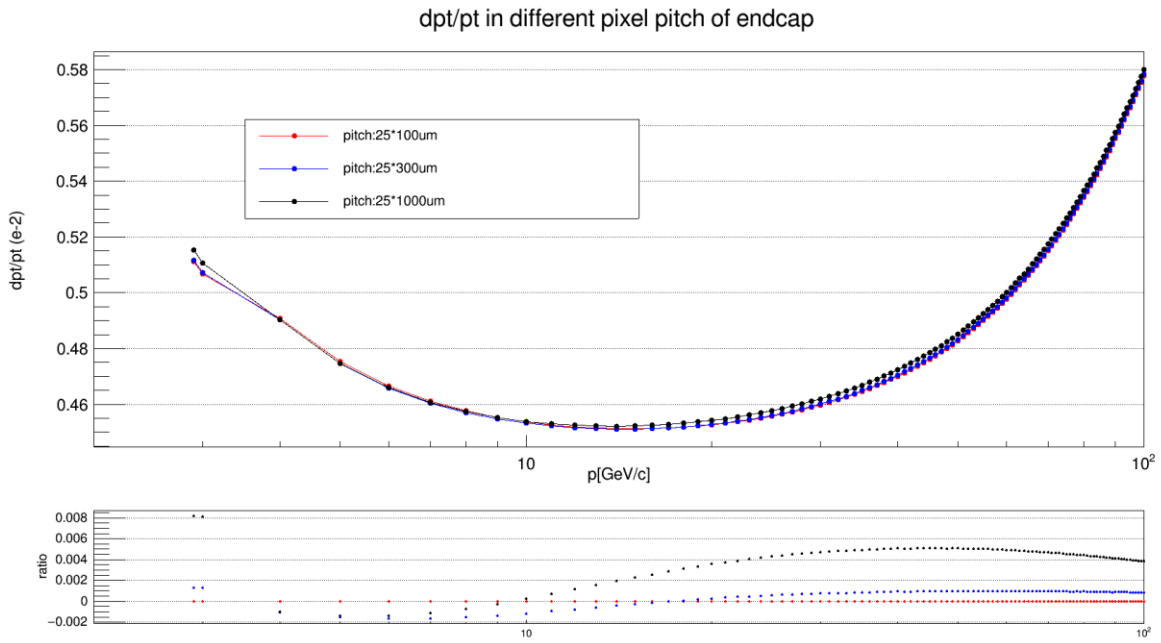
| Components | Z (mm) | Rin(mm) | Rout(mm) | $\sigma_{R\phi}$(mm) | $\sigma_R$(mm) | Thickness($X_0$ %) |
|---|---|---|---|---|---|---|
| VXD | 200 | | | | | 0.65 |
| SIT1 | 740 | 105 | 150 | **7.2** | **86.6** | 0.65 |
| SIT2 | 1340 | 191 | 250 | **7.2** | **86.6** | 0.65 |
| SIT3 | 1890 | 269 | 500 | **7.2** | **86.6** | 0.65 |
| SET | 2915 | 424 | 1811 | **7.2** | **86.6** | 0.65 |

# pt resolution of endcap

固定R向pitch 为300um，phi向pitch分别取25、50、100um

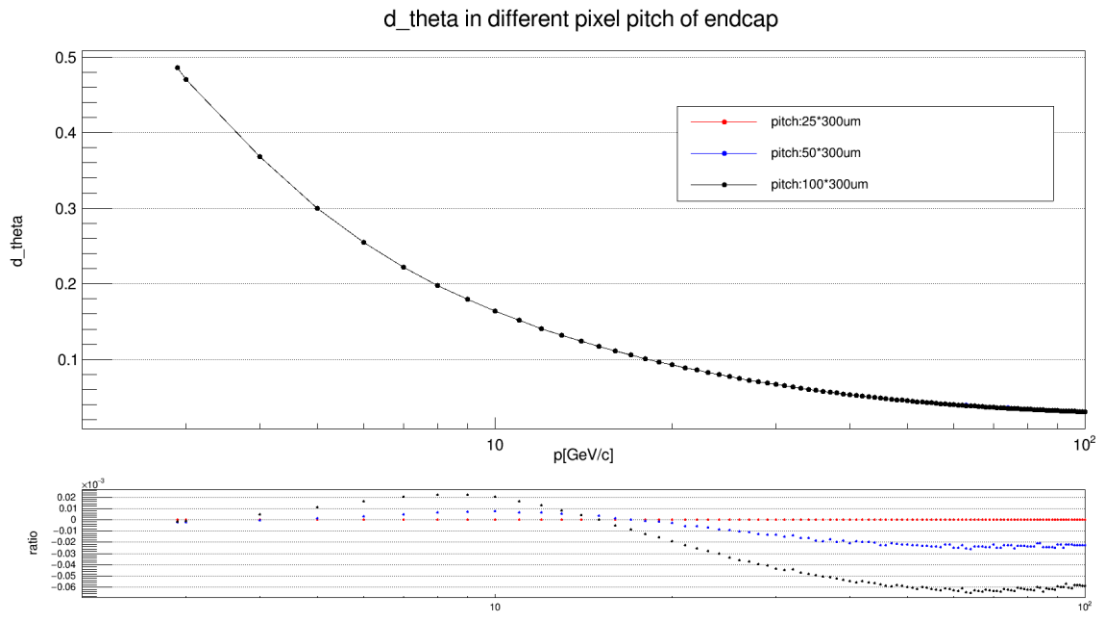



固定phi向pitch 为25um，R向pitch分别取100um、300um、1000um

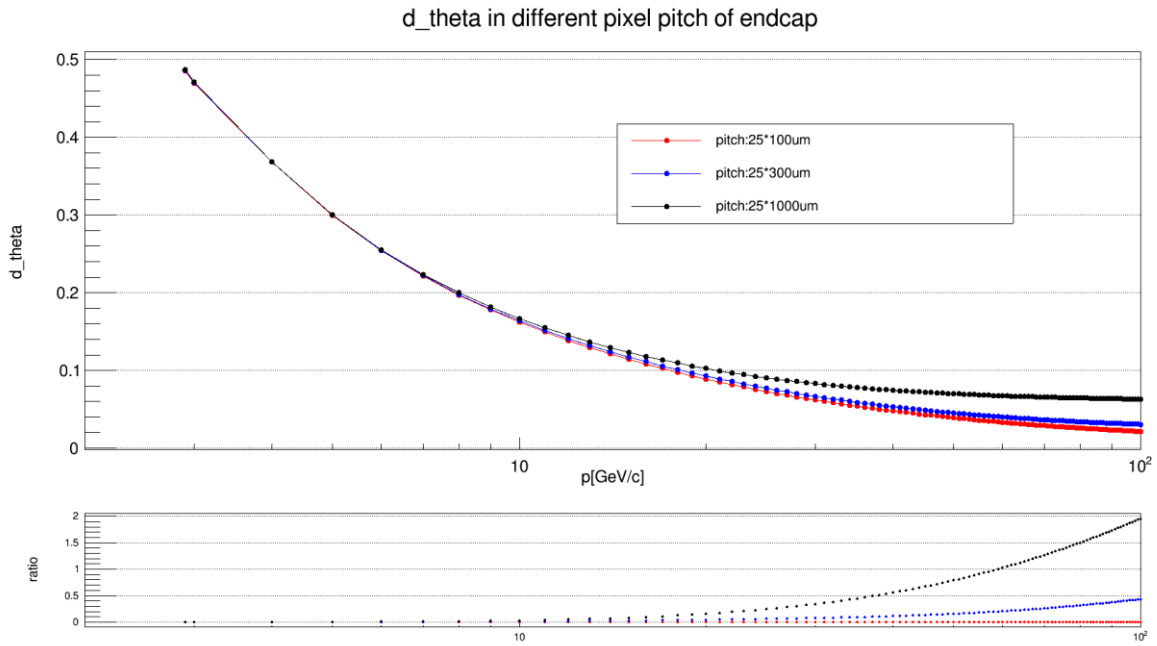


# theta resolution of endcap

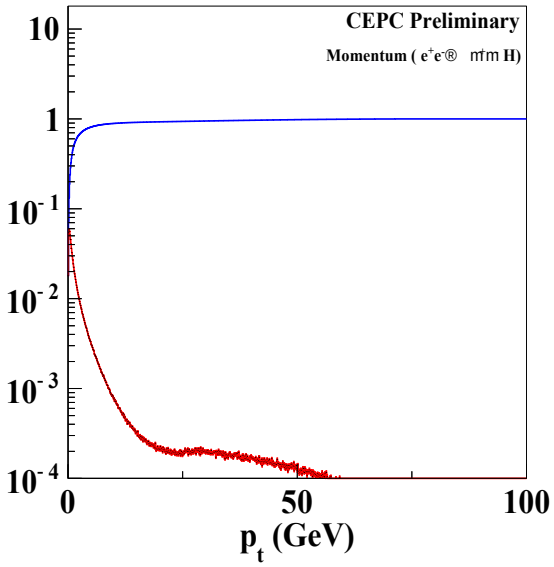
固定R向pitch 为300um，phi向pitch分别取25、50、100um

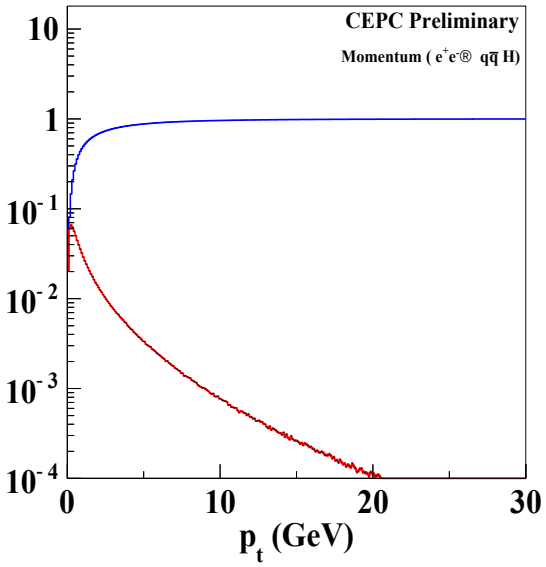


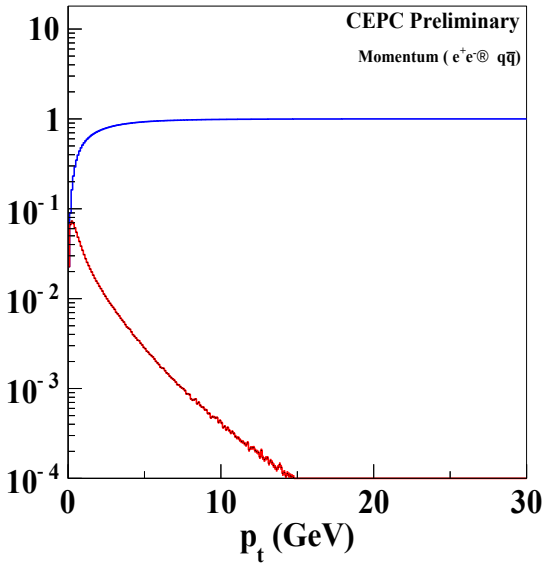

固定phi向pitch 为25um，z向pitch分别取100um、300um、1000um



# Pt spectrum


CEPC Preliminary
Momentum ( e+e- → μ+μ- H)
10
1
10-1
10-2
10-3
10-4
0
50
100
pt (GeV)

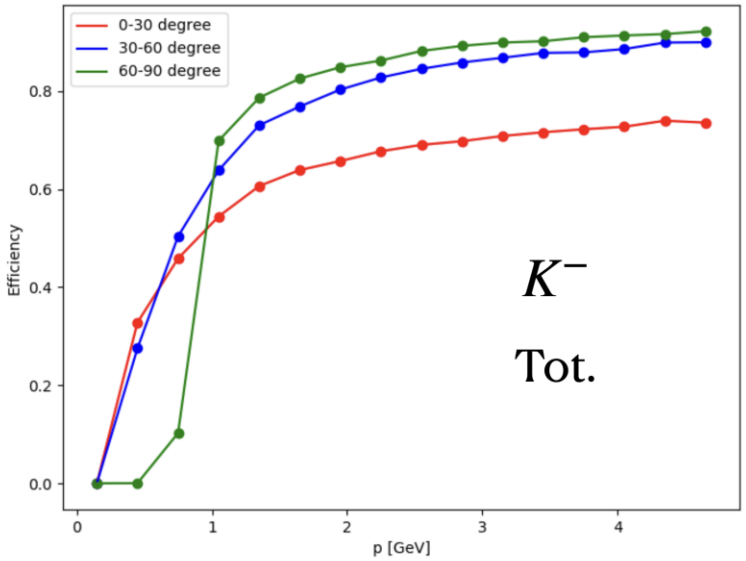

CEPC Preliminary
Momentum ( e+e- → qq̄ H)
10
1
10-1
10-2
10-3
10-4
0
10
20
30
pt (GeV)

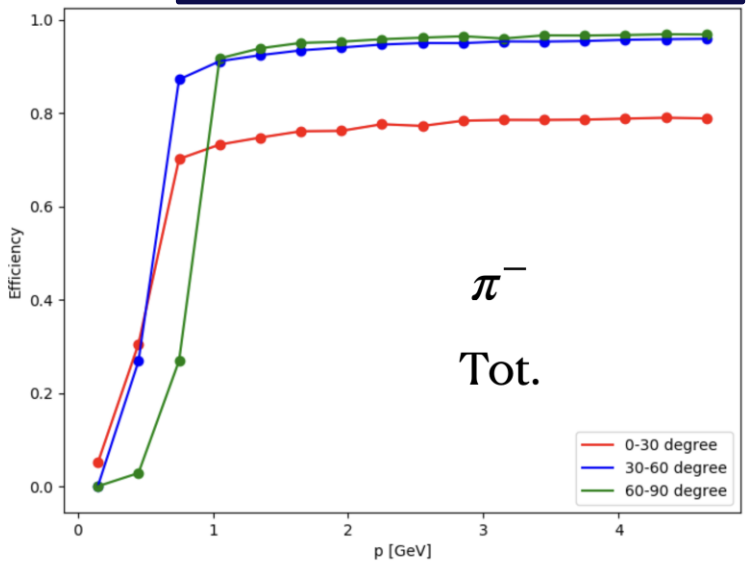

CEPC Preliminary
Momentum ( e+e- → qq̄)
10
1
10-1
10-2
10-3
10-4
0
10
20
30
pt (GeV)

# Low momentum tracks

- Fractions of low pt tracks (pt<1GeV && pt> 0.1 GeV)
  - e+e- → μμH: 42%
  - e+e- → qqH: 46%
  - e+e- → Z→bb: 51%
- Lots of tracks of p< 1 GeV hardly reaches ToF due to material and decay effect

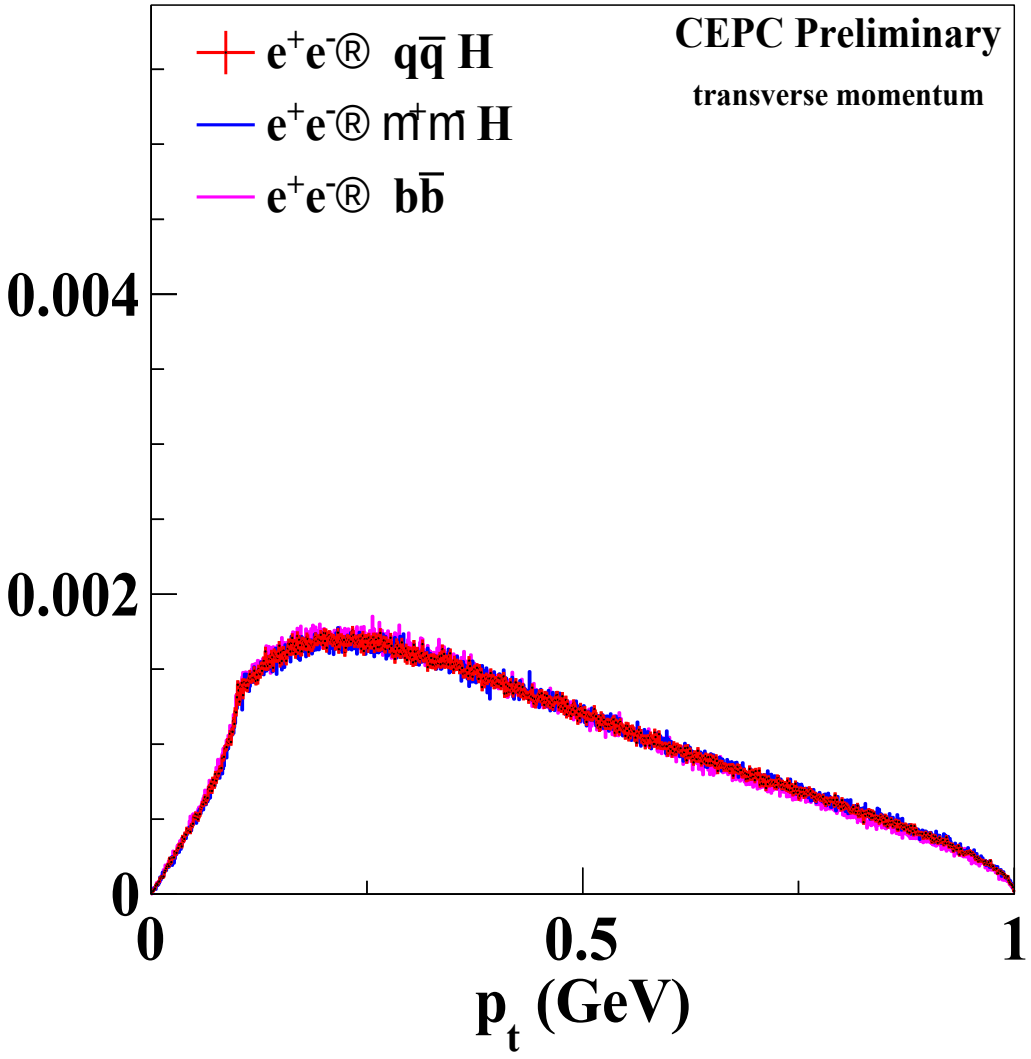
Based on CDR detector
Done by SSS in CEPCSoft



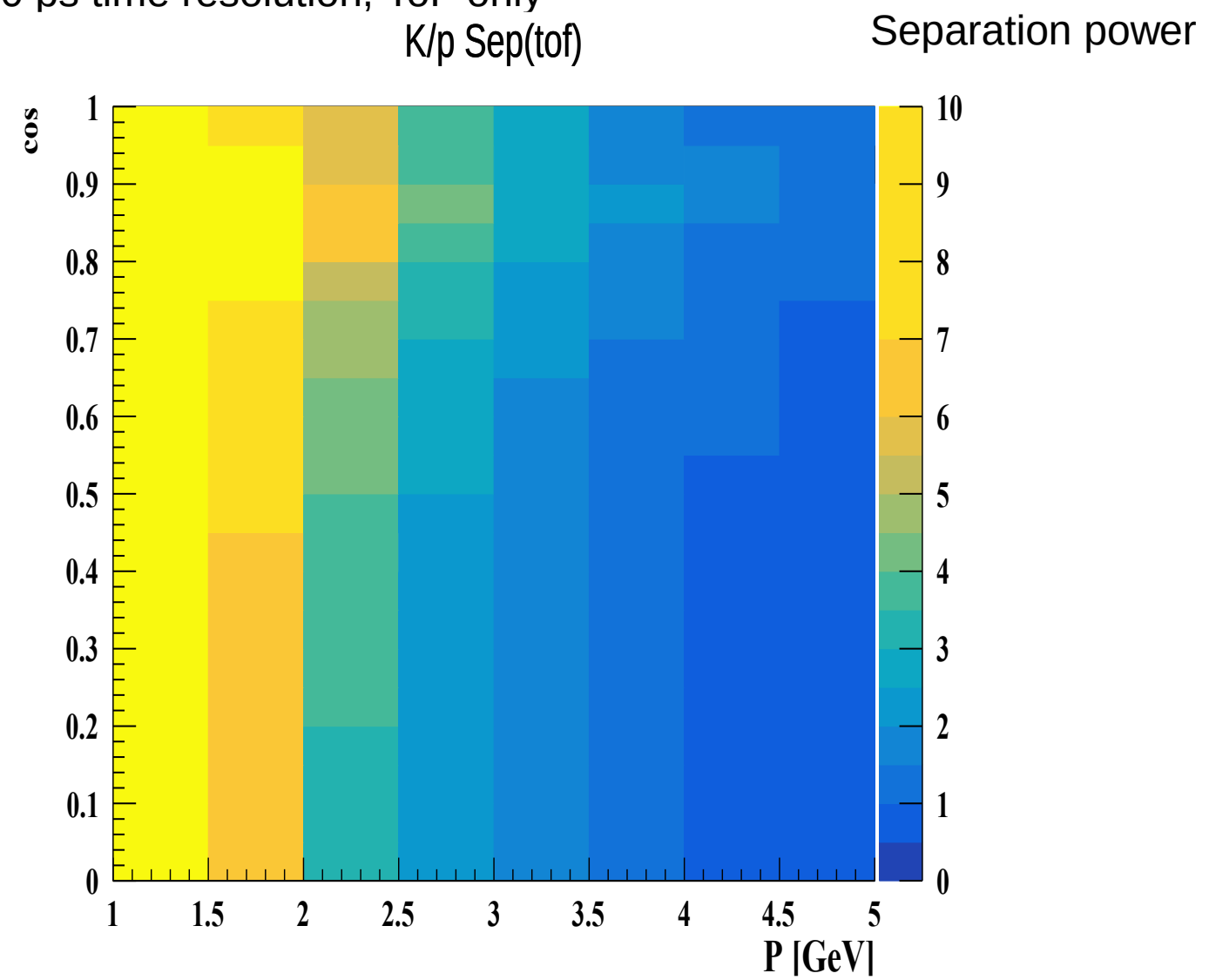

Curling when pt < 0.8 GeV ( even larger due to materials )

# pt distribution of tracks with p < 1 GeV



# PID performance with only ToF

50 ps time resolution, ToF only



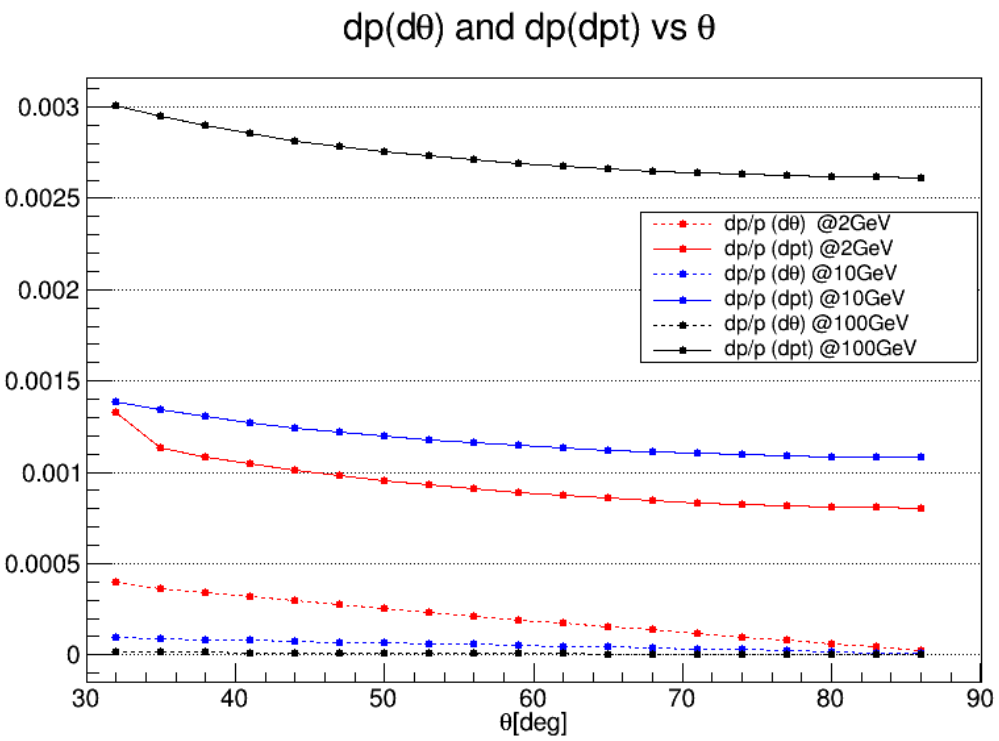
# Tracks can reach ToF

| Barrel or End cap | qqH(%) (3T) | mmH(%)(3T) | Z→qq (2T)(%) |
|---|---|---|---|
| Barrel | 34.5 | 32.3 | 48.9 |
| End cap | 46.4 | 42.1 | 49.7 |

Barrel : |cos theta| < 0.85

Barrel (3T): pt > 0.81 GeV & p < 3. GeV
Endcap (3T): pt > 0.20 GeV & p < 3. GeV
Barrel (2T): pt > 0.54 GeV & p < 3. GeV
Endcap (2T): pt > 0.20 GeV & p < 3. GeV

# contribution of dθ&dpt for dp

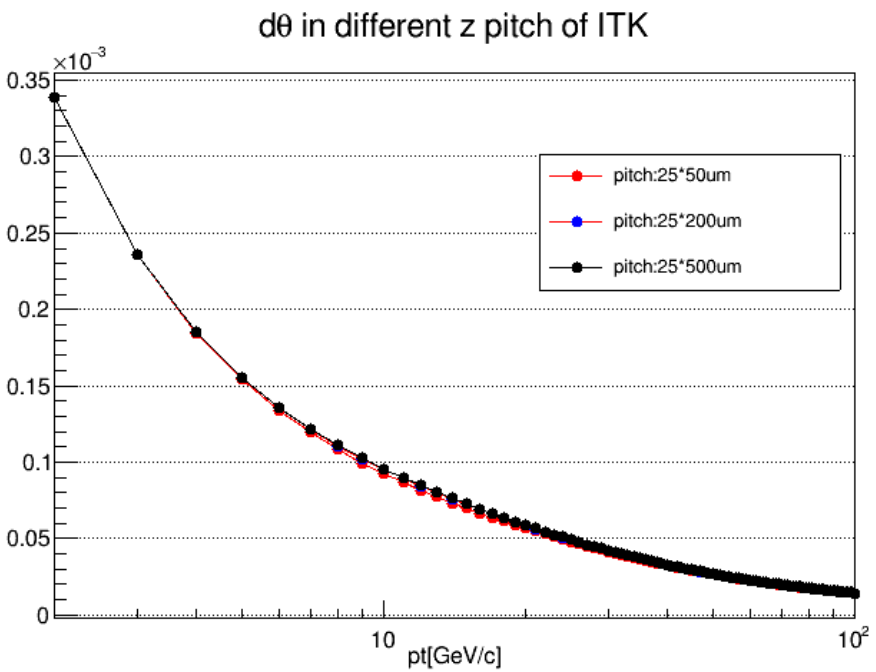



$(dp/p)^2 = (dpt/pt)^2 + (d\theta/\tan\theta)^2$

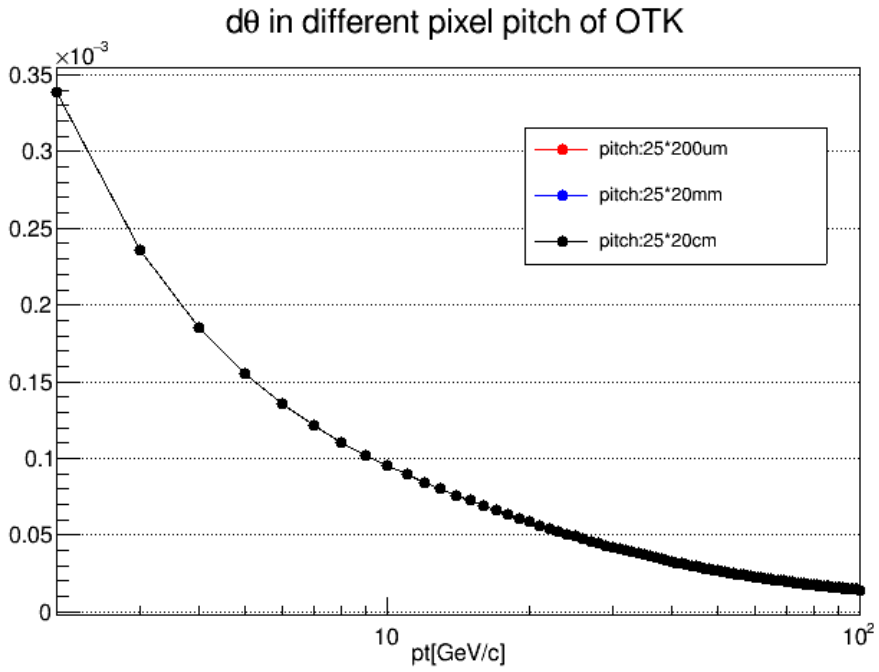
θ :32°~86°，31.8°是OTK边缘的角度

**pt=2GeV时， dθ/tanθ 的值约为 dpt/pt 的1/3；pt=10、100GeV时，两者差别在一个数量级以上**

# dθ in different z pitch of ITK&OTK




固定OTK 的z向pitch为10cm




固定ITK 的z向pitch为200um

**改变ITK 和OTK的z向分辨对 θ的分辨影响都较小**