The Optimization of SITOuter & DCInner Layers' Position

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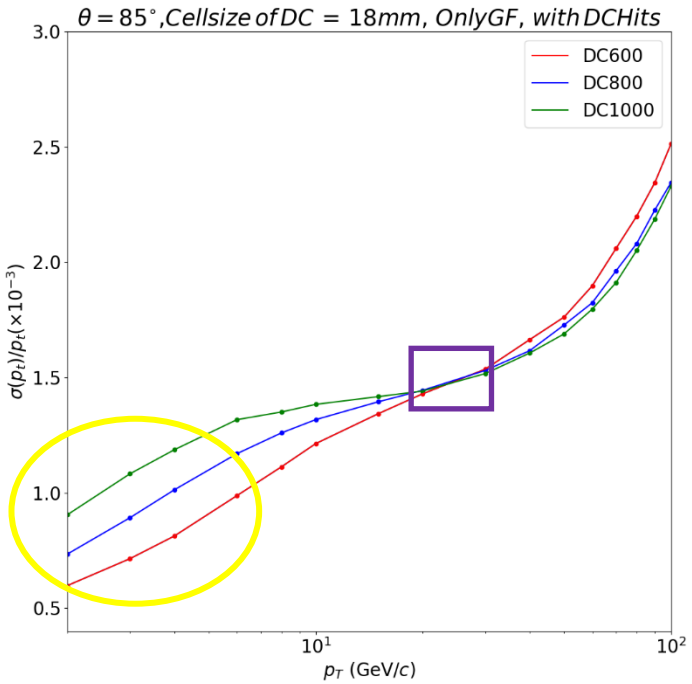
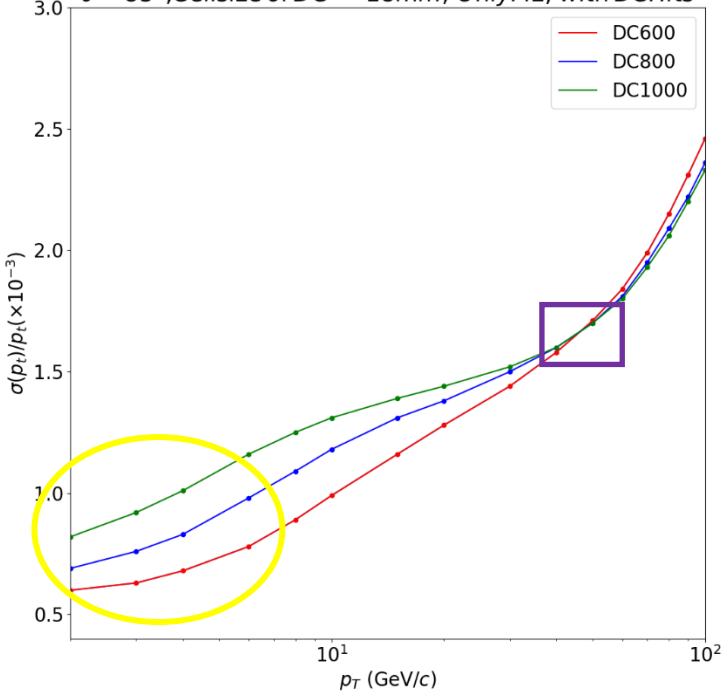
2022/6/9

3. The difference between Marlin & GenFit (Marlin's datas from GangLi)

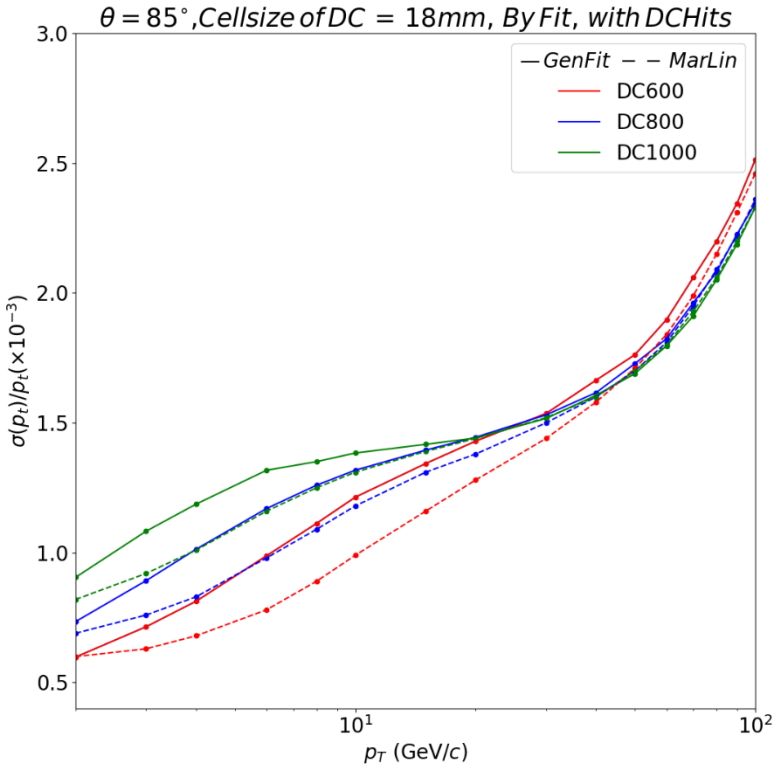
By GenFit:



By Marlin:



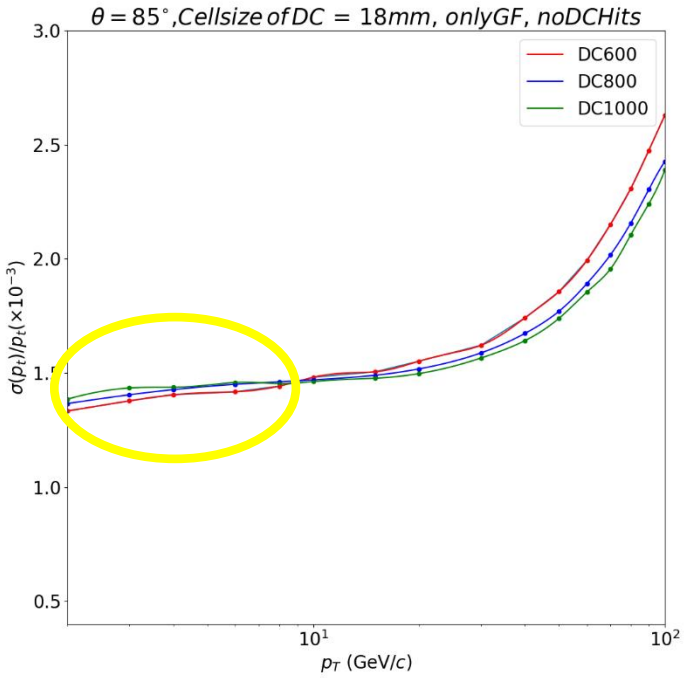
Compare:



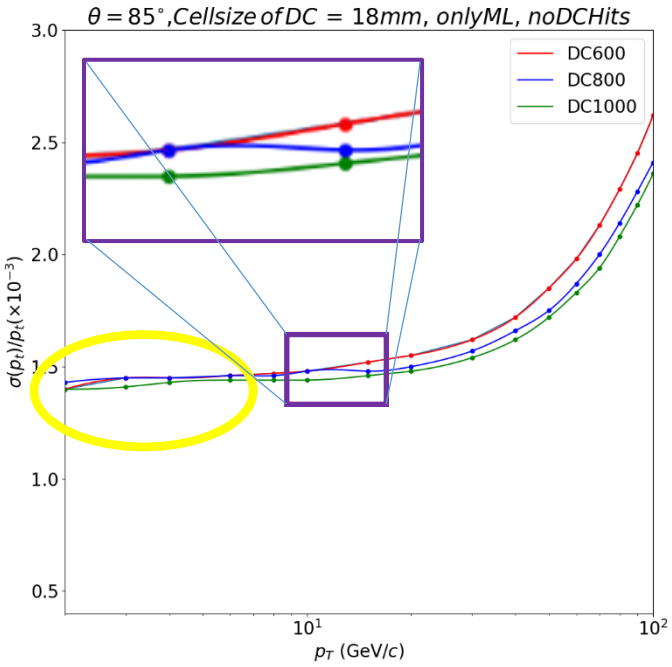
- The trend of the curves is similar. But GenFit's curve is still higher at low momentum.
- At low momentum, the slope of GenFit is bigger bigger than Marlin's.
- I thought multiple-scattering has a greater impact on GenFit.

3. Not Use the DC Hits(but there are still DC's materials)

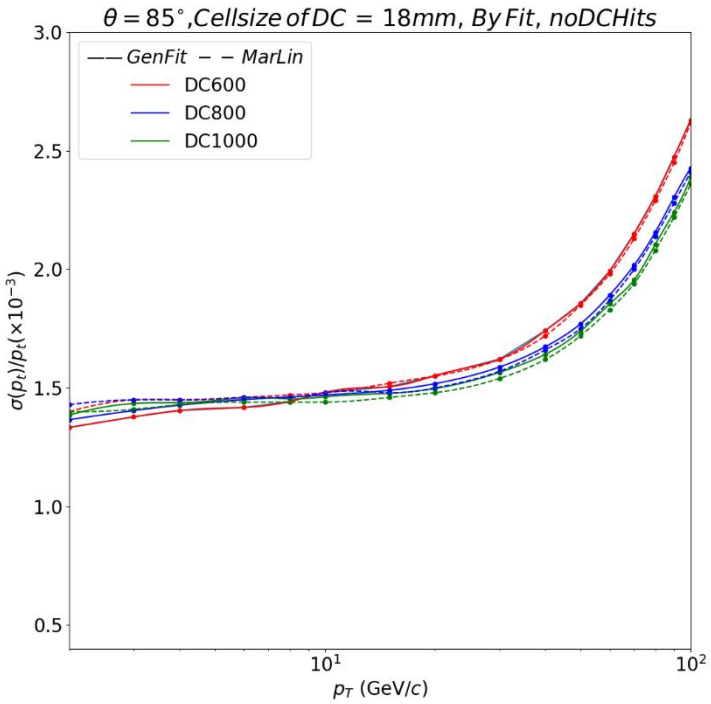
By GenFit:



By Marlin:



Compare:



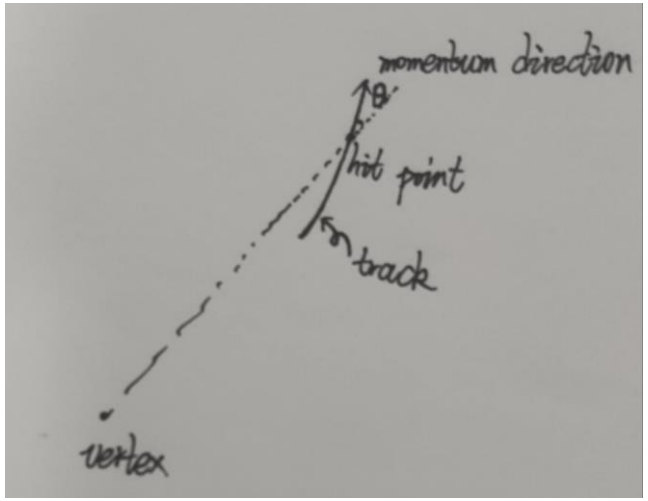
- When we don't use the DCHits, the result is very similar of these two full simulation tools.
- There are still a little difference. You can see it in the yellow circle.
- We can say the difference still comes from DC.

Review：

- There is no doubt that place DCinner at 600mm is better.
- The unnormal higher of GenFit's result comes from chamber's material.
- When we use DCHits, the curve's trend of GenFit is still different with Marlin's.
- These two full simulation tools' difference comes from DCHits.
- More statistics render the curve more smooth.

Then：

- We want to know which makes the difference between these two tools.



-> GenFit: Use SpacePoint

Modify the sigmaRPhi(0.11→0.1mm)

Modify the sigmaZ(1→2.828mm)

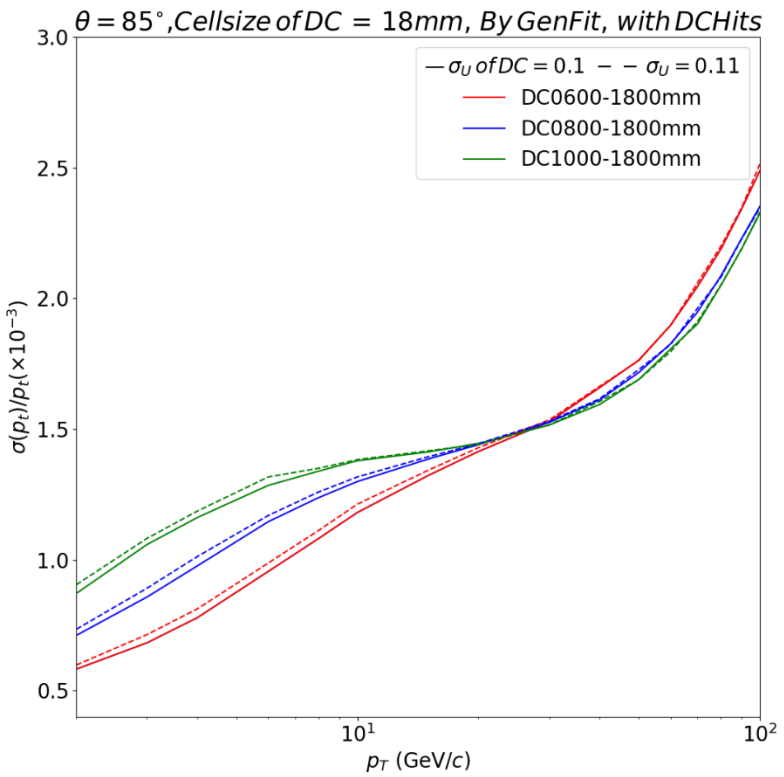
Entrances->51K

-> Marlin: digiDC.ApplyRatio=True

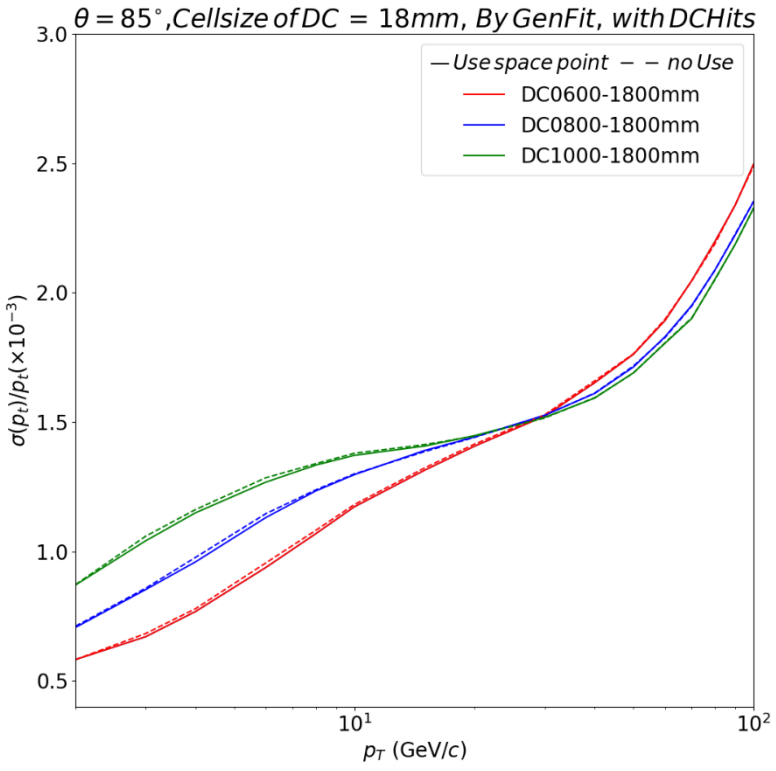
(which means the resolution of DC is multiplied by 1 over cosine of theta)

3. Compare the old GenFit with the new

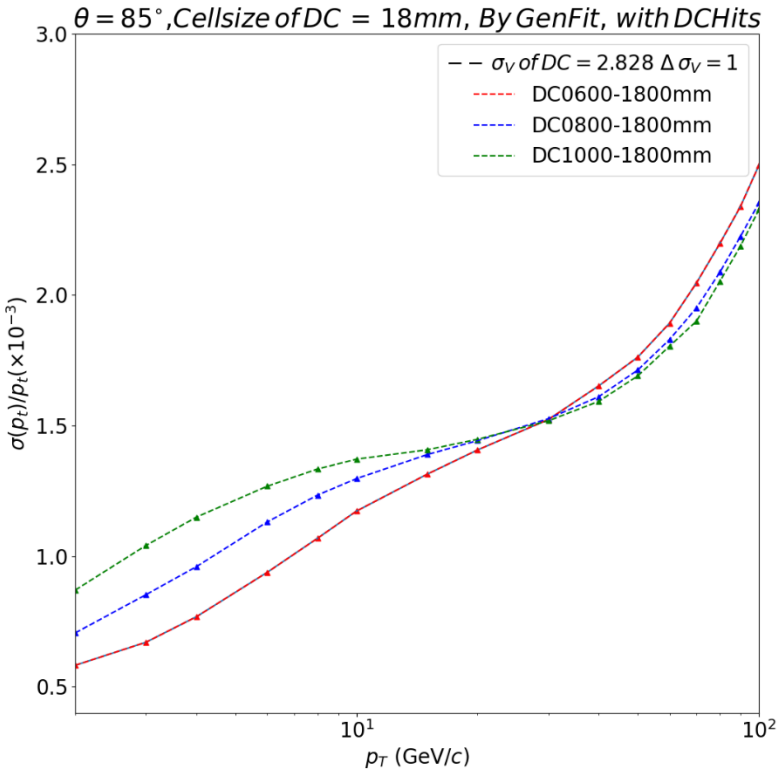
DC's sigamRPhi 0.11->0.1mm



DC use SpacePoint

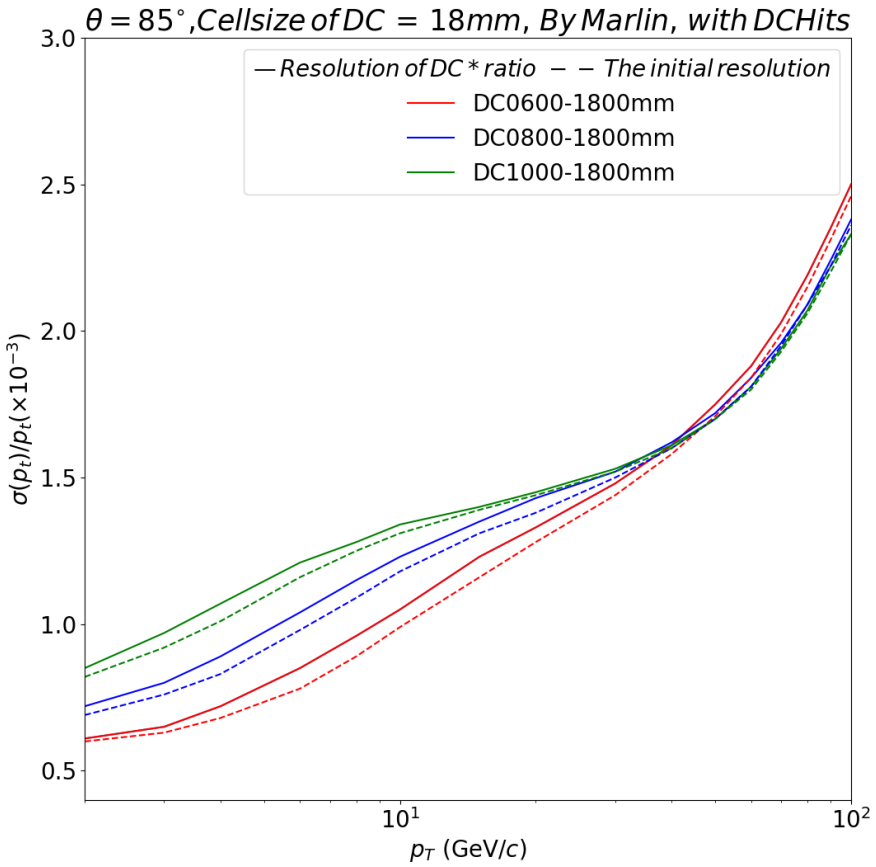


DC's sigamZ 1->2.828mm



- The trend of the curves is similar. And the sigamPt comes from the new version is smaller, but there is almost no changing when we only changed the sigmaZ of DC.

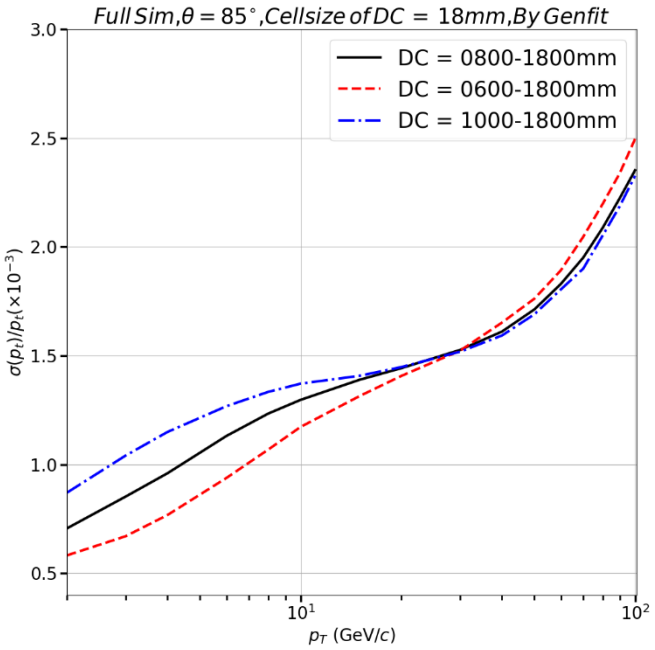
3. Compare the old Marlin with the new

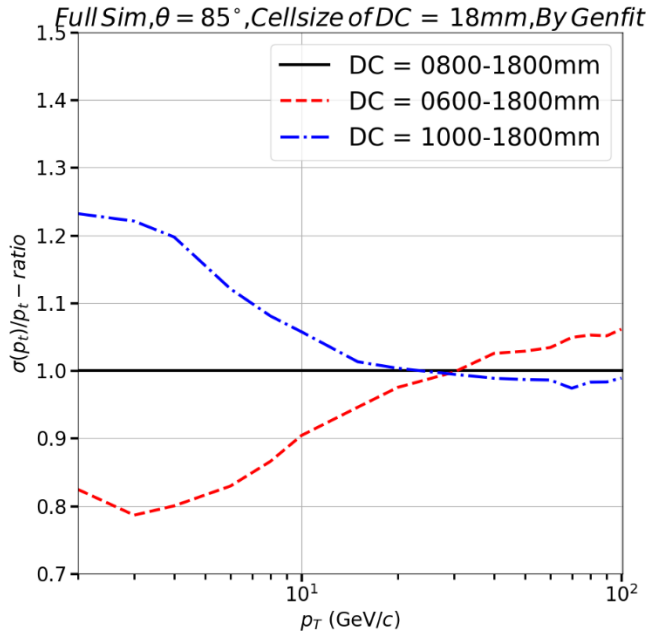


- The trend of the curves become more similar with the GenFit's.

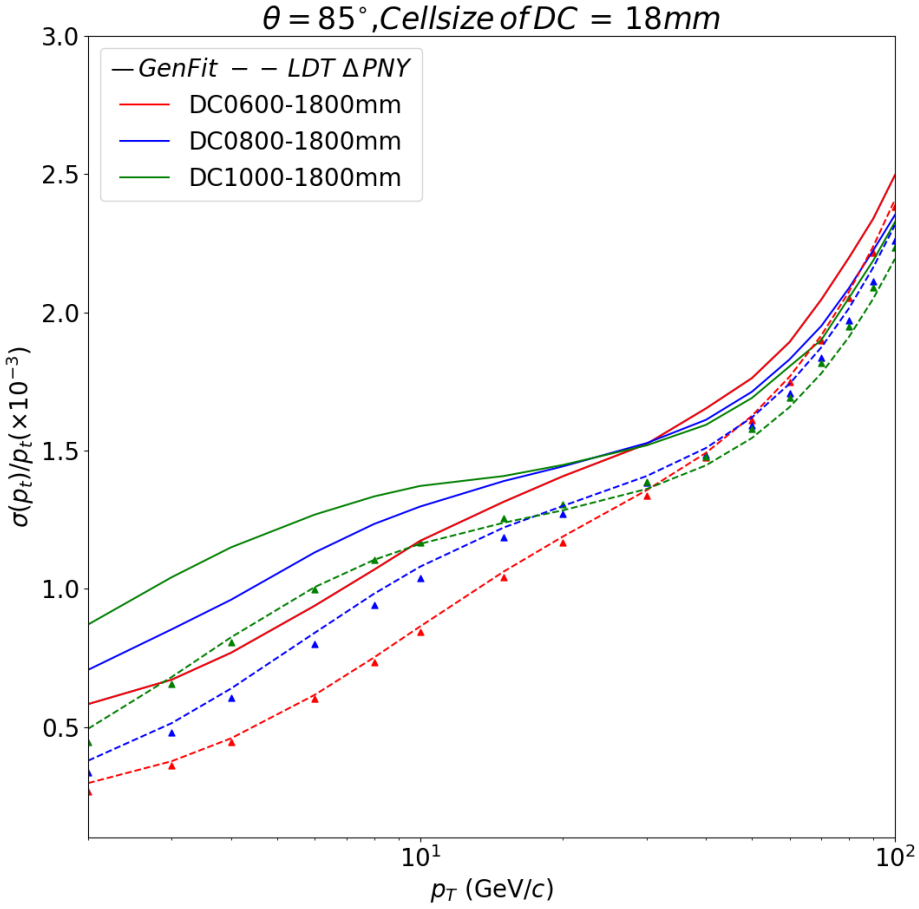
3. The verification by other tools

GenFit's result





Compare the GenFit, LDT, Fast cal

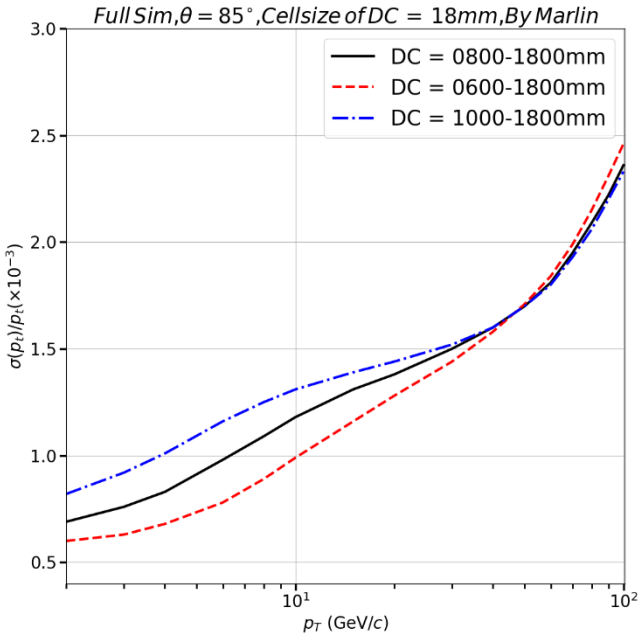


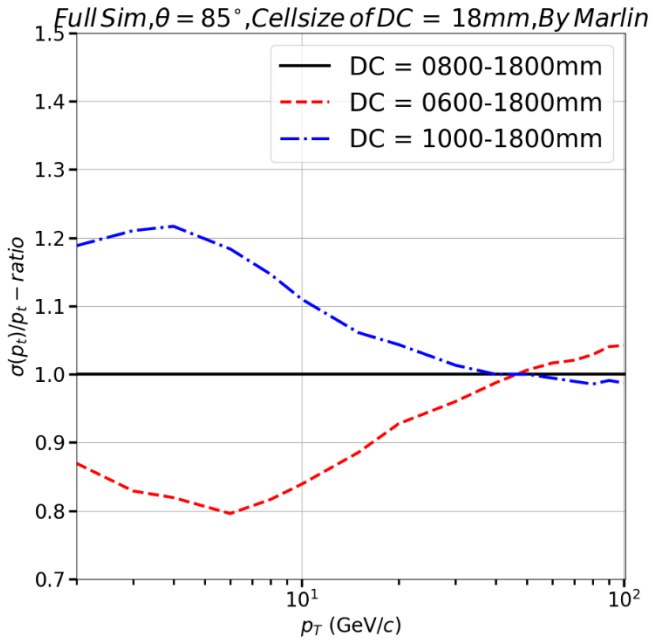
- The result and the trend of curves are similar.

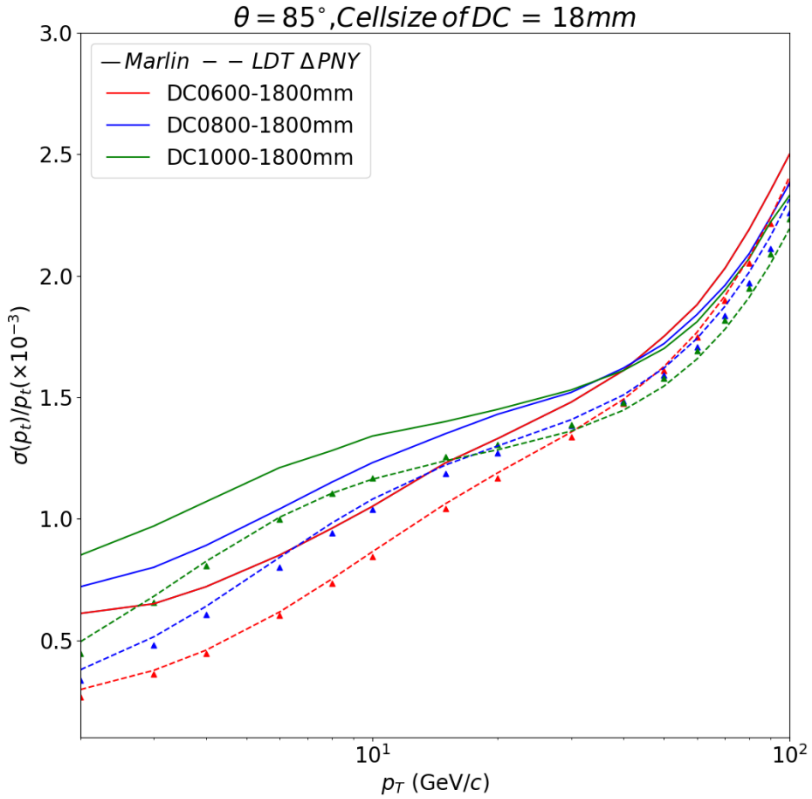
3. The verification by other tools(By marlin, marlin's data comes from GangLi)

Compare the Marlin, LDT, Fast cal

Marlin's result



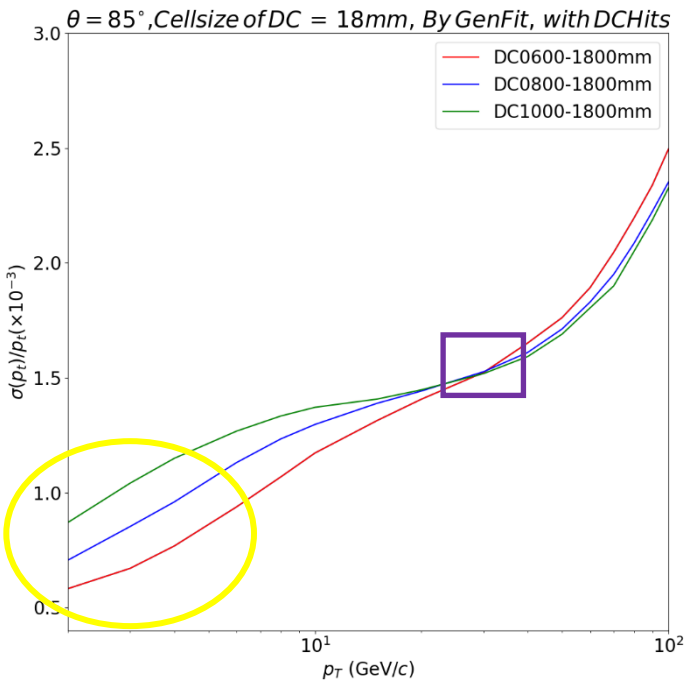




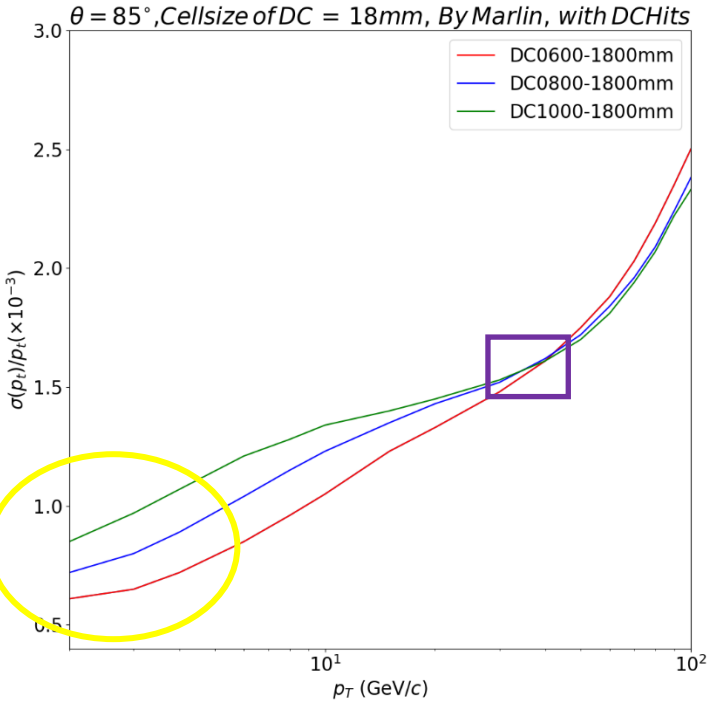
- The result is similar. But the trend of marlin's is different with the others, especially at low momentum. The curve of marlin is flatter than the others at low momentum.

3. The difference between Marlin & GenFit (Marlin's datas from GangLi)

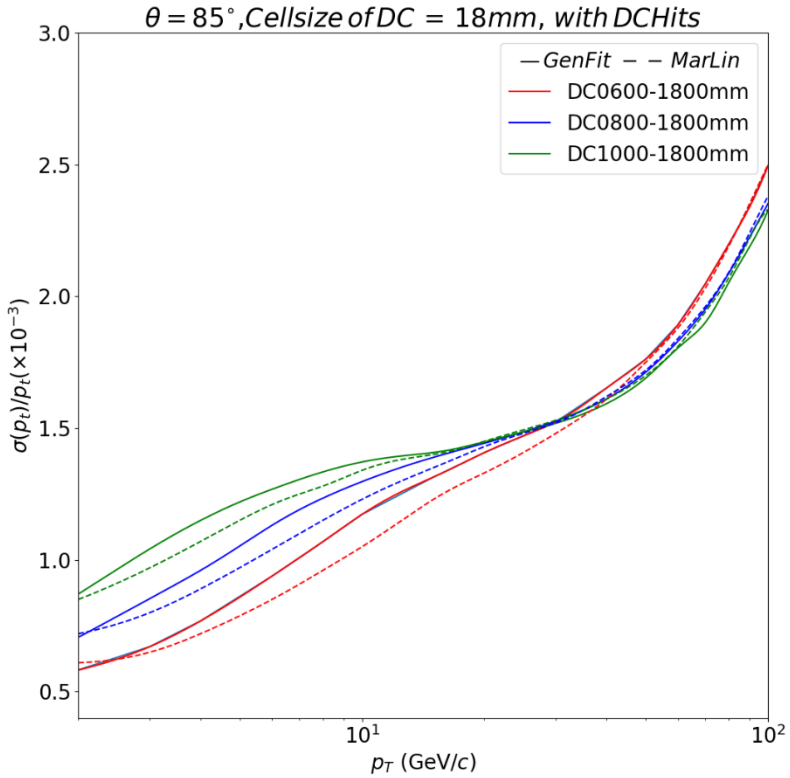
By GenFit:



By Marlin:



Compare:



- The trend of the curves is similar.
- At low momentum, the slope of GenFit is usually bigger than Marlin's.

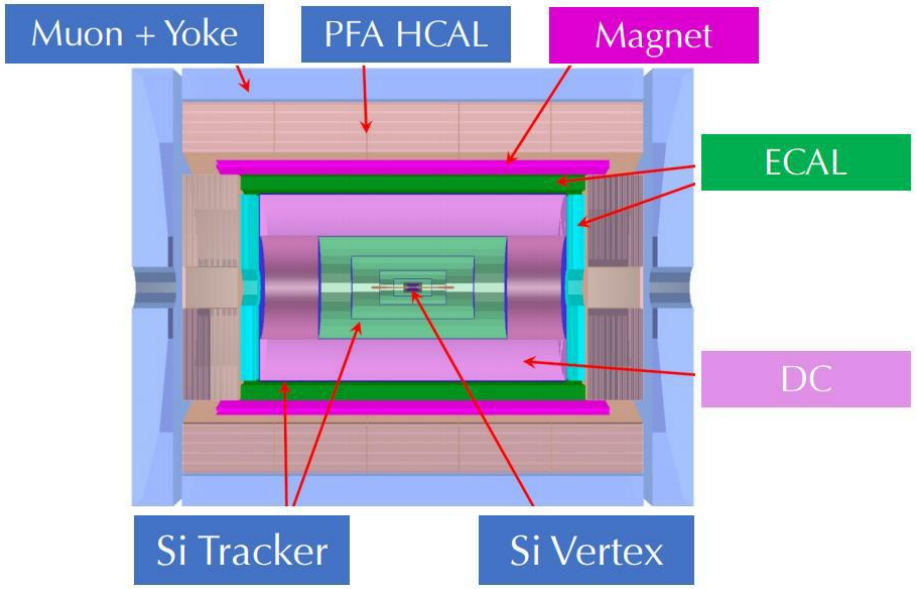
Summary

- There is no doubt that place DCinner at 600mm is better.
- When we use DCHits, the curve's trend of GenFit is different with Marlin's.
- These two full simulation tools' difference comes from DCHits.
- We changed some options of these two full simulations, the difference becomes smaller.
- But we still don't know which vary in trend of the result.

Backup

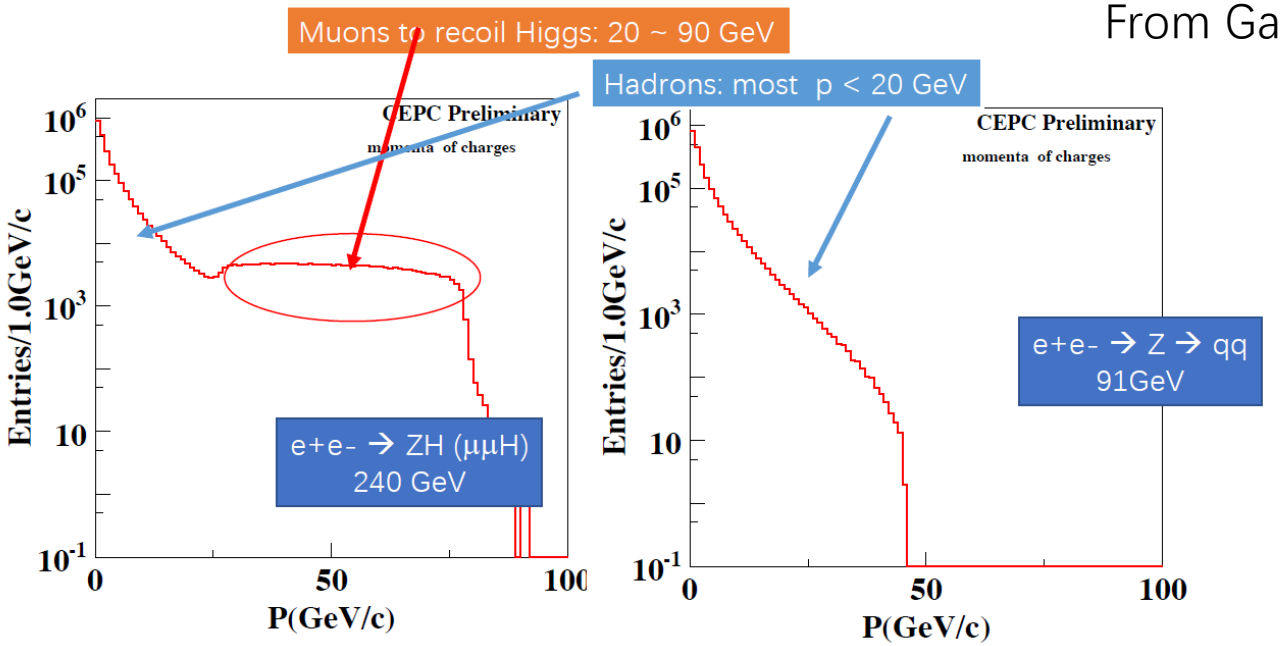
1. Introduction

The 4th CEPC conceptual Tracker



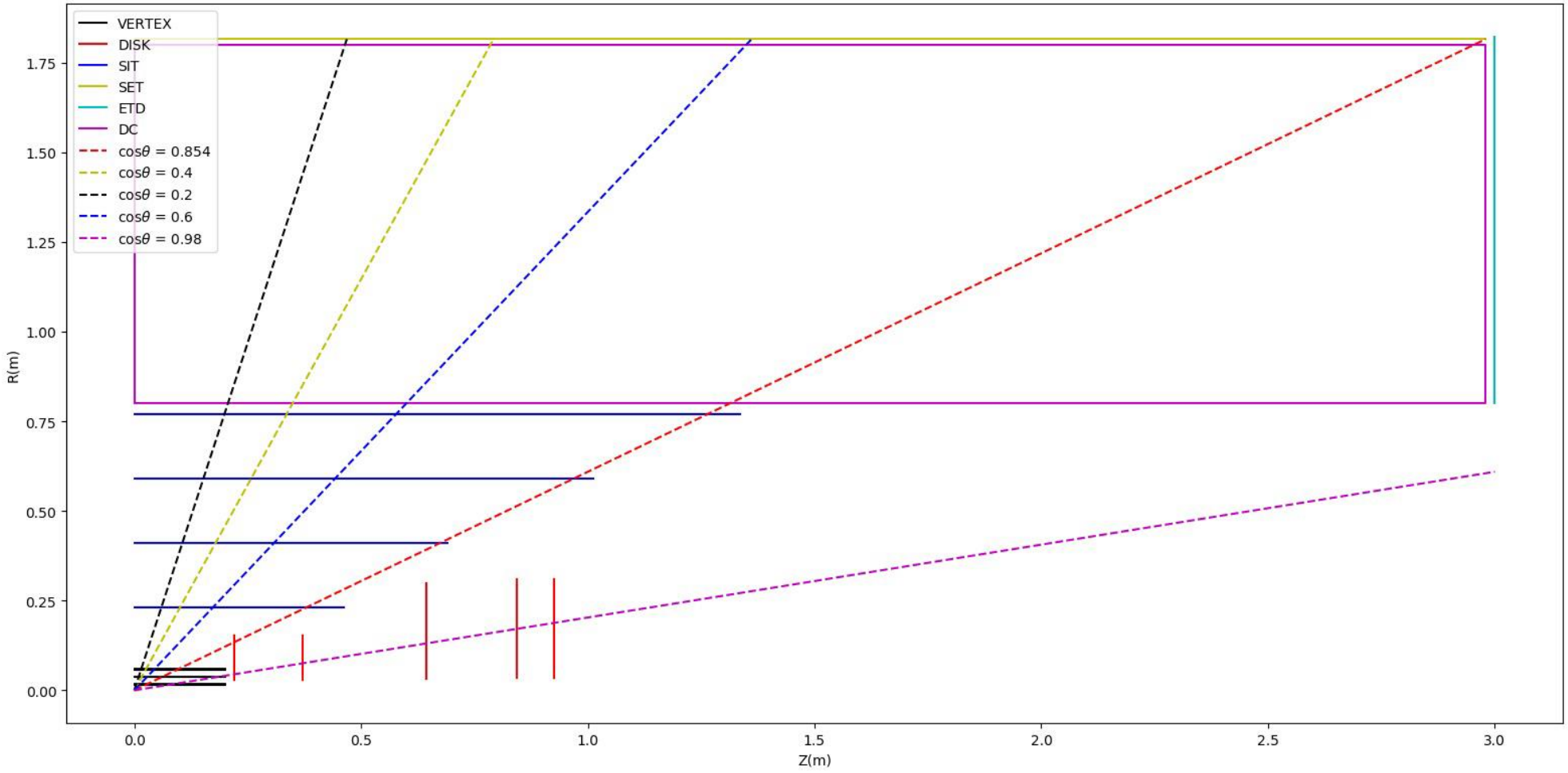
Momenta of tracks @ 240 & 91 GeV

From GangLi



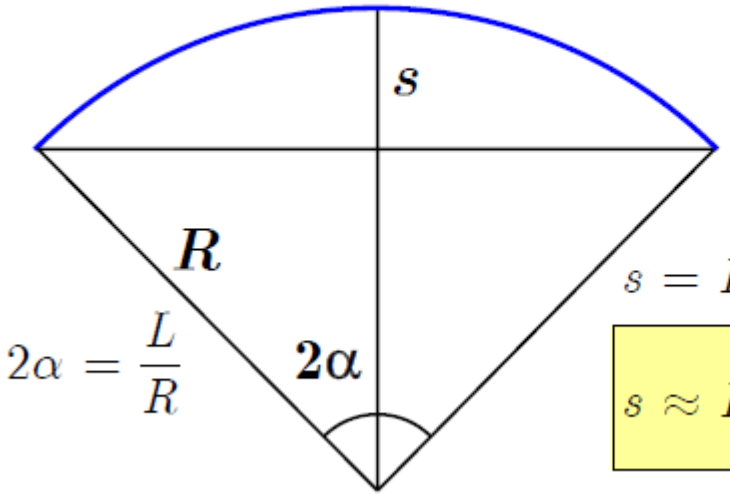
- Particle ID with a drift chamber is a key feature for the 4th conceptual detector
- Most hadrons from Higgs/Z pole data are below 20 GeV/c
- The tracker should have sufficient momentum resolution for particles < 20 GeV/c

1.2 Introduction-CEPC Detector's geometry



1.3 Introduction-Sagitta

the sagitta s



$$2\alpha = \frac{L}{R}$$

$$s = R(1 - \cos\alpha)$$

$$s \approx R\frac{\alpha^2}{2} = \frac{L^2}{8R}$$

- In order to get a better sagitta value, we thought it's necessary to place a sensitive enough detector at the middle of a whole Trcker

1.4 Tracker parameters （-1800）

Components	Radius(mm)	$\sigma_{R\phi}$(μm)	σ_Z(μm)	Thickness(X_0 %)
Beam Pipe	10.35	-	-	0.172
VTX	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	0.156/0.156/0.154/0.154/0.153/0.153#
VTX-shell	65.245	-	-	0.139
SITs	81.5/332.2/582.7; 81.5/430.9/780.6; 81.5/520.8/920.5;	7.2/7.2/7.2	86.6/86.6/86.6	0.661/0.651/0.650#
DC inner wall	611.9;809.9;989.9	-	-	0.110
DC cell (66;55;45 x18x18mm)	612;810;990-1800	100	2828	0.00127×layernum##
DC outer wall	1801.93	-	-	1.349
SET	1811.3	7.2	86.6	**0.182***
TotalAir				0.262**

#average for ϕ(0,2π)

##GasHe_90Isob_10 without wire, if Air, 0.00592% per cell

* Sensor face to IP, 0.468% lie after sensor

** Dominant lie between SITs