Now. Use hit positon (x, y, z) Get pt from curve in the xy-plane



Calculate energy from pt and eta(theta) angle



Plan. Energy from calo

If including the EMCal(+HCal) Energy in the calculation maybe improve the resolution.



For example: In the current fitting, we have **pt = f(dphi)**,

instead use **pt = f(dphi) * g(E_emc)**,

where g could be something like gaus(E * cos(eta)), it might enhance the resolution.

Toy Combined Method

 $p_T = qBR$ on code: SagittaRByCircleFit() and CalcSagittaPt()

 $p_T = E \sin \theta$ on code: CalPtAndResolution_fromCaloTheta()

waiting Genki's results
$$\textcircled{b}$$
 $\sigma_{p_T}^2 = \left(rac{\partial p_T}{\partial E}
ight)^2 \sigma_E^2 + \left(rac{\partial p_T}{\partial heta}
ight)^2 \sigma_{ heta}^2$

Or we can get the sigma from resolution distribution

Assuming that the pT values obtained from the two methods are independent, we can simply combine them:

$$p_T^{ ext{combined}} = rac{p_{T1}/\sigma_1^2 + p_{T2}/\sigma_2^2}{1/\sigma_1^2 + 1/\sigma_2^2}$$
 .

smaller sigma - larger weight

Combine qBR and E*sin(theta)



std Dev y for all data: sigma1=0.33 sigma2=0.19



std Dev y for y-values between -0.5 and +0.5 sigma1=0.153 sigma2=0.15

 $\delta p_{T}/p_{T}$

1.5

0.5

Ω

-0.5

-1 -1.5

-2

-2.5[±]0

2.5

1.5

0.5

°0

2

Δ

E/p

2

4

90586

5.021

0.03048

2.822

0.3161

90586

5.047

1.001

2.850

0.3084

Better results?

Combined







To-do list

• Better evaluate the sigma1 and sigma2 Fit to get the resolution

$$p_T^{ ext{combined}} = rac{p_{T1}/\sigma_1^2 + p_{T2}/\sigma_2^2}{1/\sigma_1^2 + 1/\sigma_2^2}$$

- Evaluate the improvement of combine method (fit to obtain the resolution, check whether the combined method gives better pT resolution and E/p performance.)
- Better to combine the method of calculating pT from energy (pT dependence: position method better on low-pT, Energy method better on high-pT Treating the calorimeter energy and θ as a joint distribution into the fit function.)