

CKF validation

# Motivation

- Check the performance improvement for track reconstruction after using SVD->CDC CKF
- Check the performance of CKF based TF comparing default TF
- Find the reason of hit missing in CDC

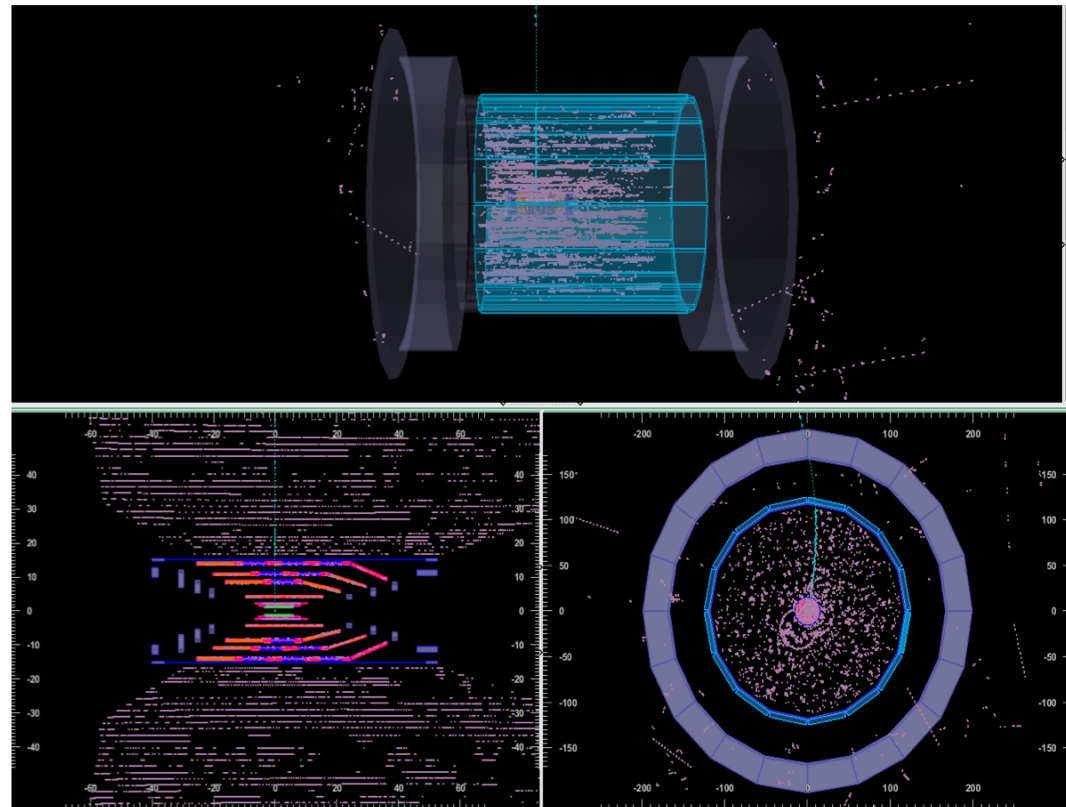
# SVD to CDC CKF

- Branch name:  
feature/VXD\_CDC\_CKF
- Filter1:           [>0.5], [0.5, 0.3], [0.3, 0]
- HelixDistance< 2.3,    2.17,       2.19
- Filter2:
- Residual <        2,       1.78,       1.75
- Residual2<       1.1,       0.6,       0.7
- Filter3:

# MC sample

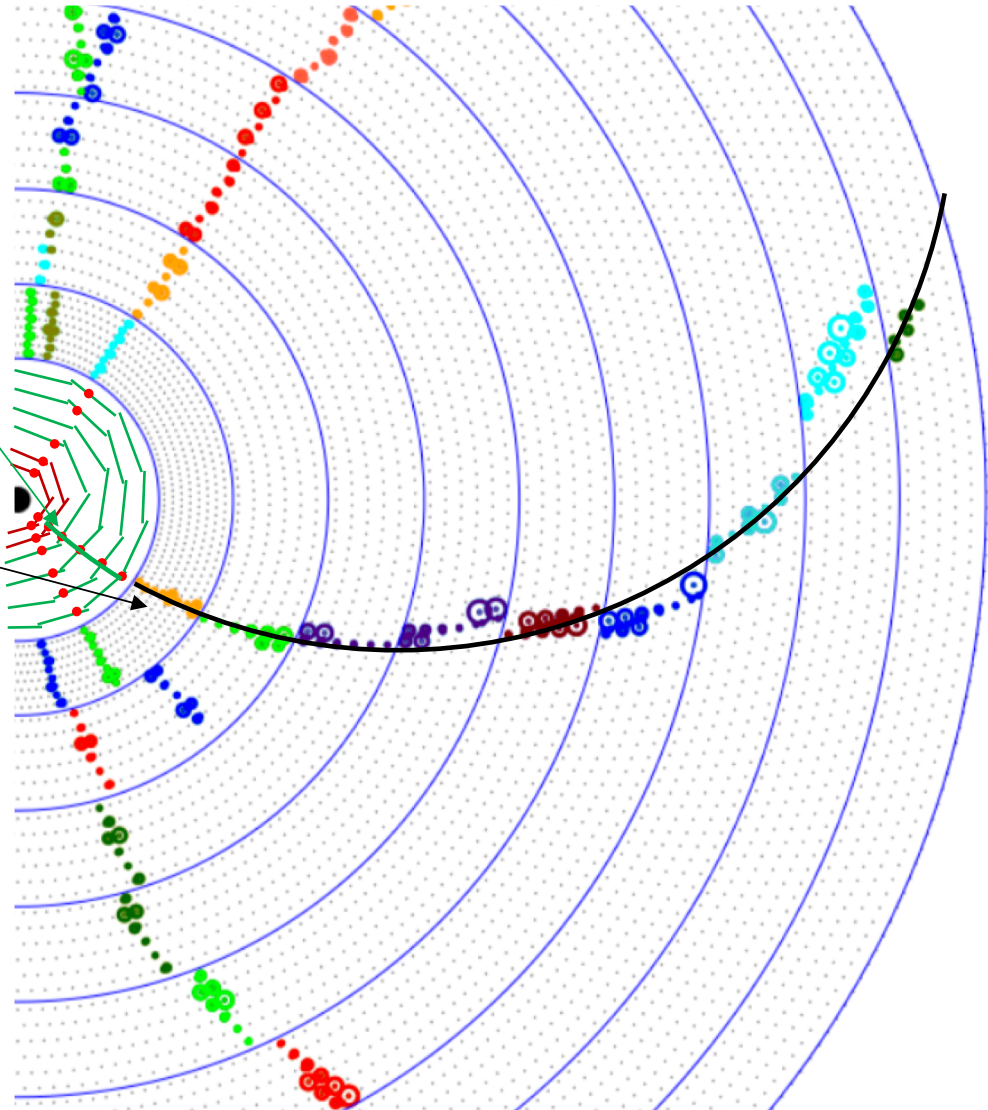
- 2000 single muon events With Phase3 BG.
- Configuration:

```
param_pGun = {  
  'pdgCodes': [13],  
  'nTracks': 1,  
  'varyNTracks': 0,  
  'momentumGeneration': 'uniform',  
  'momentumParams': [0.2, 3.5],  
  'thetaGeneration': 'uniform',  
  #'thetaGeneration': 'uniformCos',  
  'thetaParams': [90.0, 90.0],  
  'phiGeneration': 'uniform',  
  'phiParams': [0., 360.],  
  'xVertexParams': [0.0, 0.0],  
  'yVertexParams': [0.0, 0.0],  
  'zVertexParams': [0.0, 0.0],  
}
```



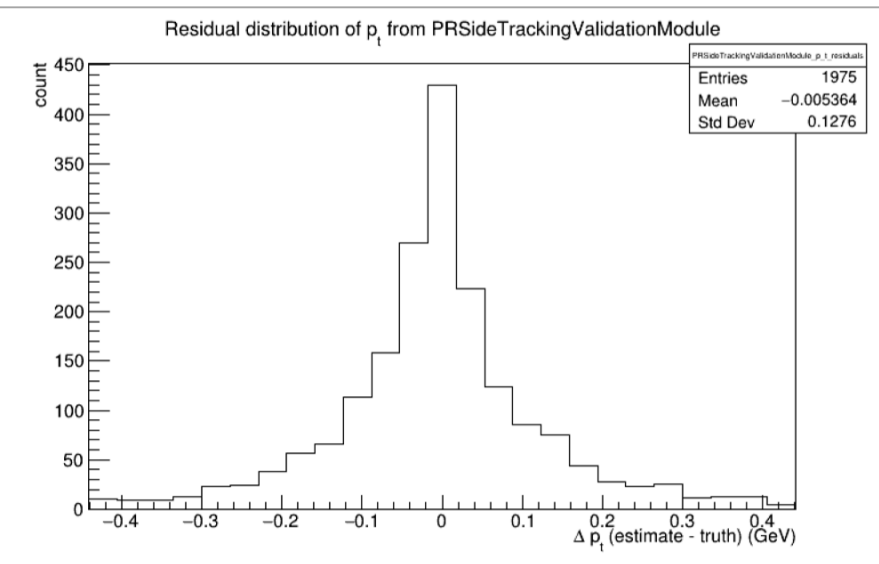
# Resolution of track parameters

- Get track reconstructed by SVD only and after perform the CKF extrapolation
- Straightforward expectation is the resolution should be improved significant



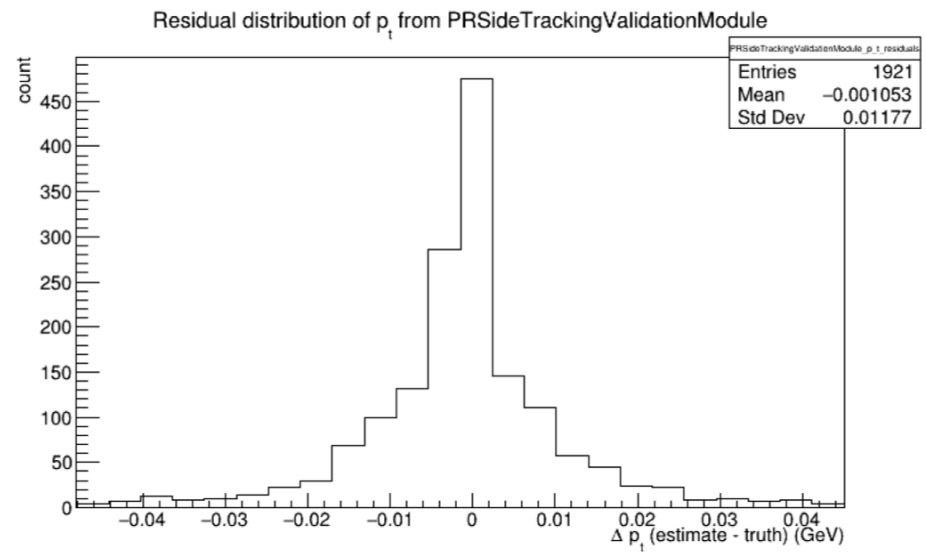
# Pt resolution

SVD



Mean = -0.0054 GeV  
Sigma = 0.1276 GeV

SVD + CDC

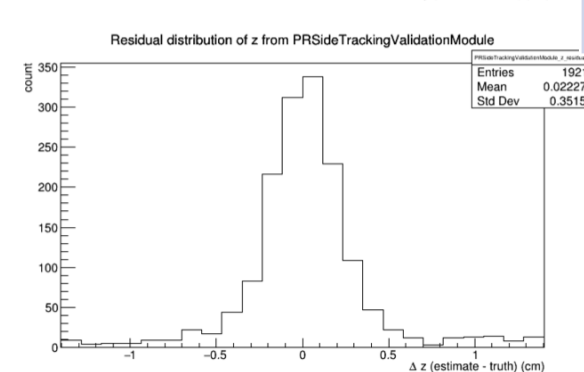
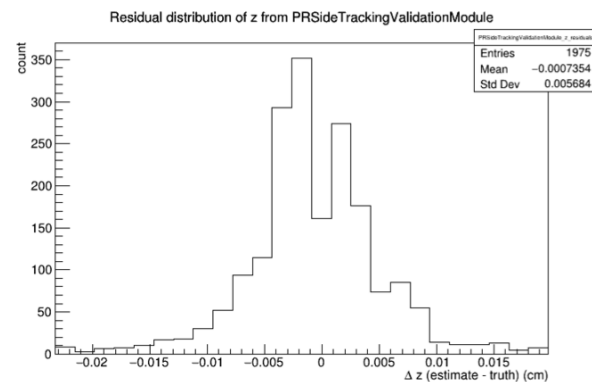
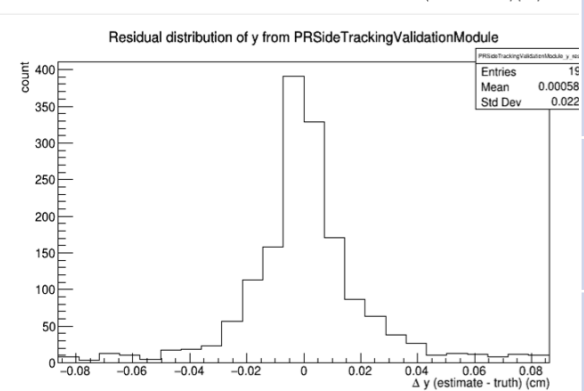
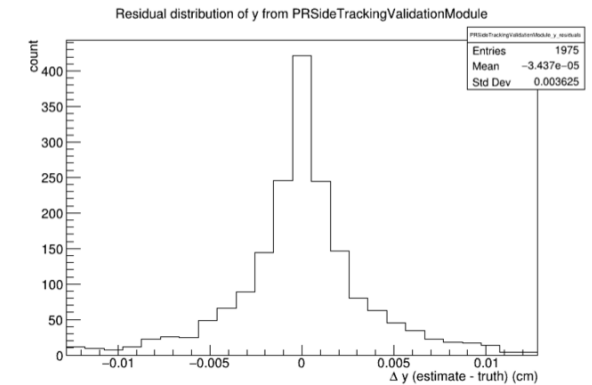
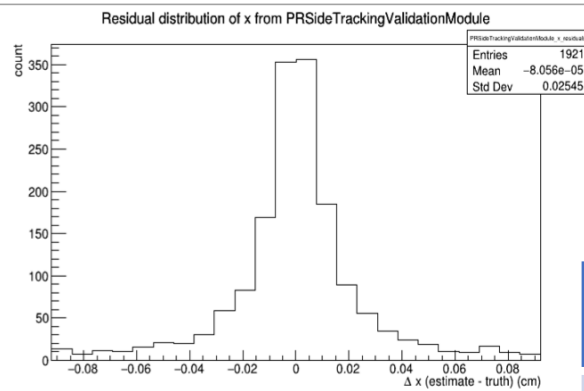
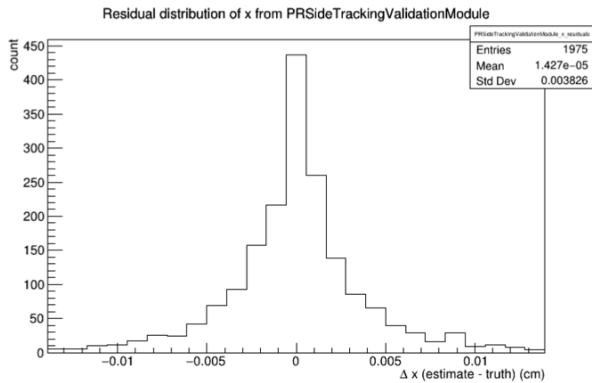


Mean = -0.0011 GeV  
Sigma = 0.0117 GeV

# $x_0, y_0, z_0$ resolution

SVD

SVD + CDC

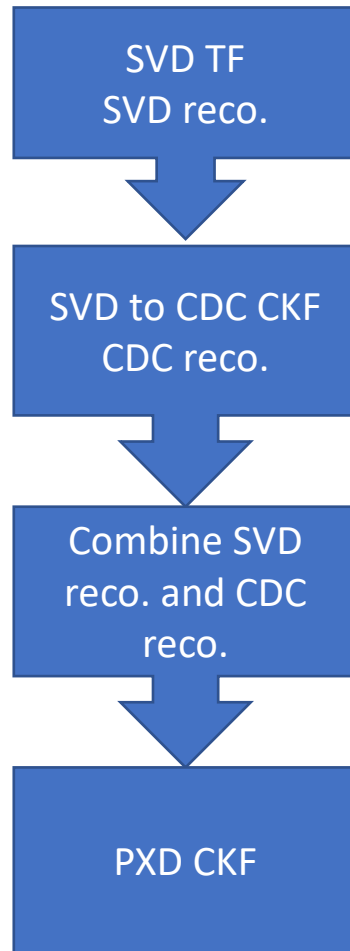


| Unit cm |          | SVD      | SVD+CDC  |
|---------|----------|----------|----------|
| $x_0$   | m        | 1.43e-5  | -8.06e-5 |
|         | $\sigma$ | 3.83e-3  | 2.55e-2  |
| $y_0$   | m        | -3.44e-5 | 5.90e-4  |
|         | $\sigma$ | 3.63e-3  | 2.25e-2  |
| $z_0$   | m        | 7.35e-4  | 2.23e-2  |
|         | $\sigma$ | 5.68e-3  | 0.352    |

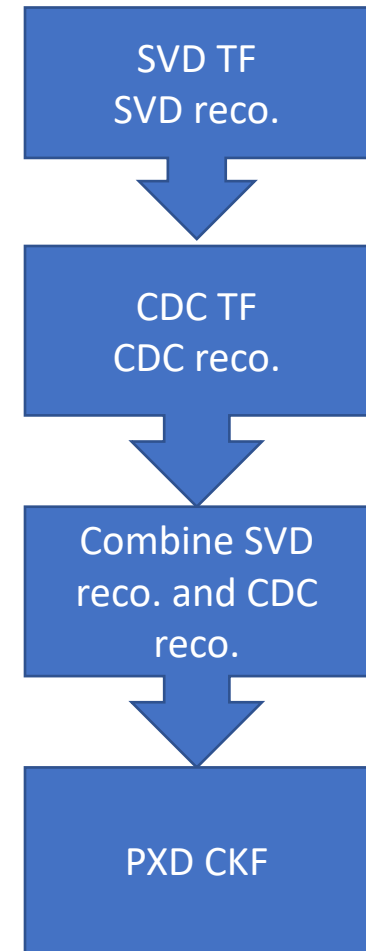
Not from fit  
Obtained from Histogram

# Compare CKF TF and default TF

- CKF TF

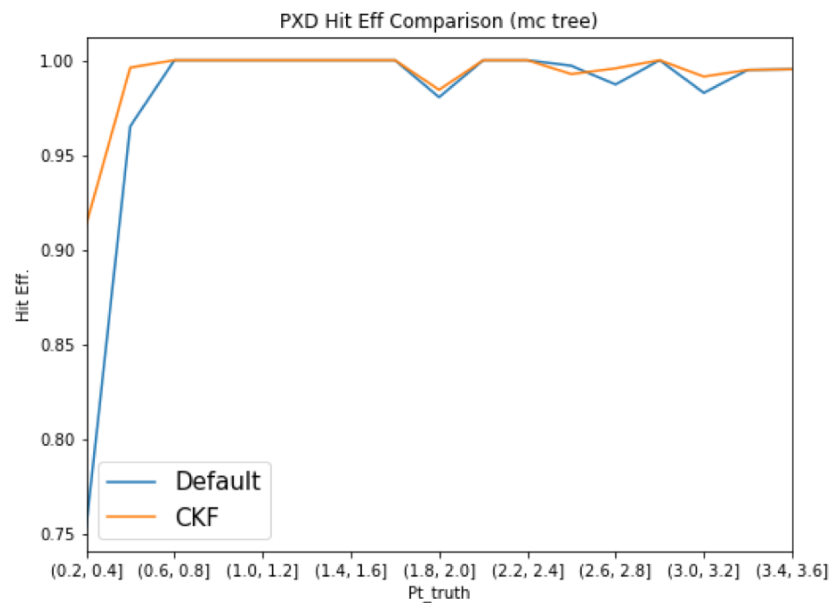
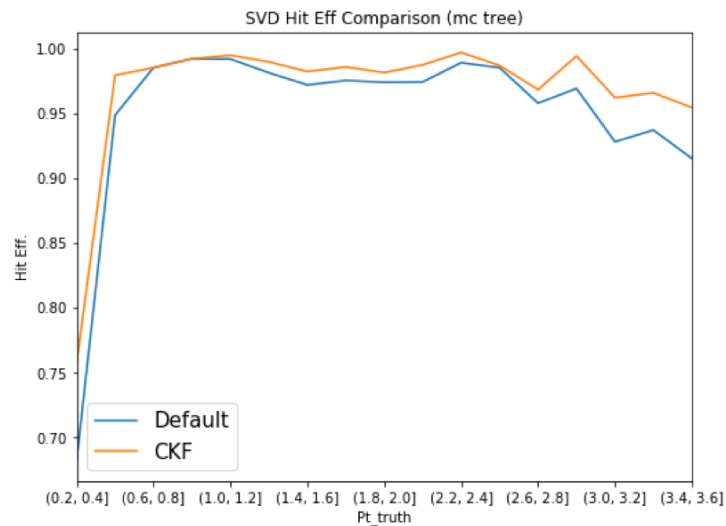
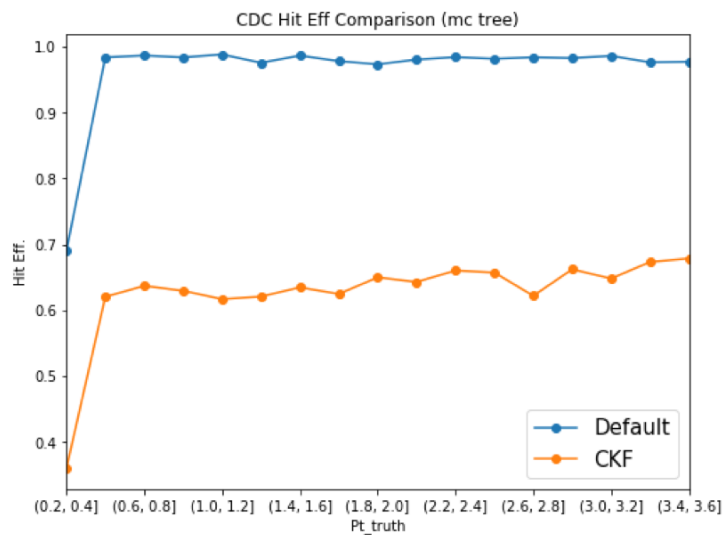


## Default TF

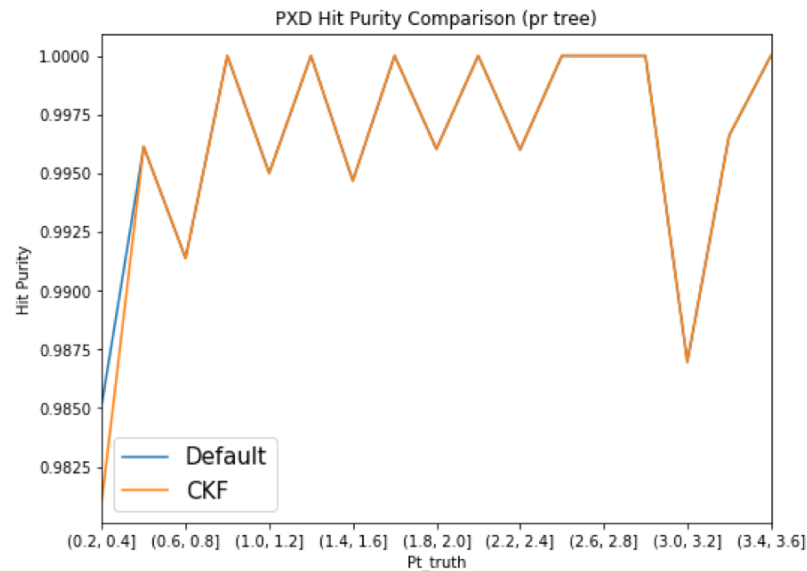
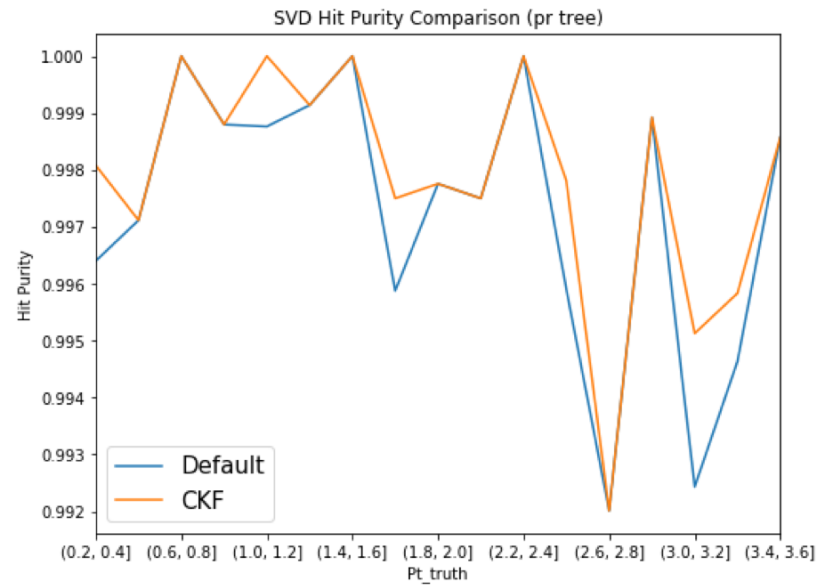
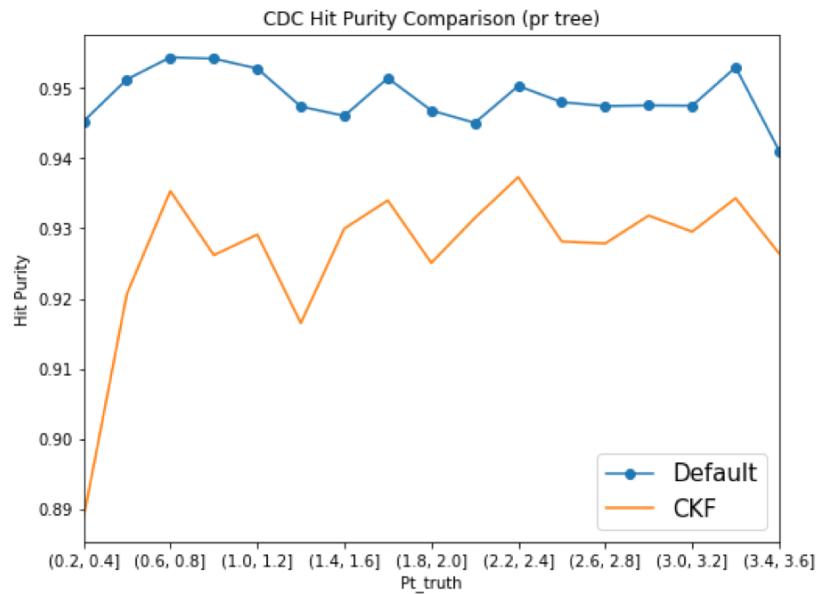


???

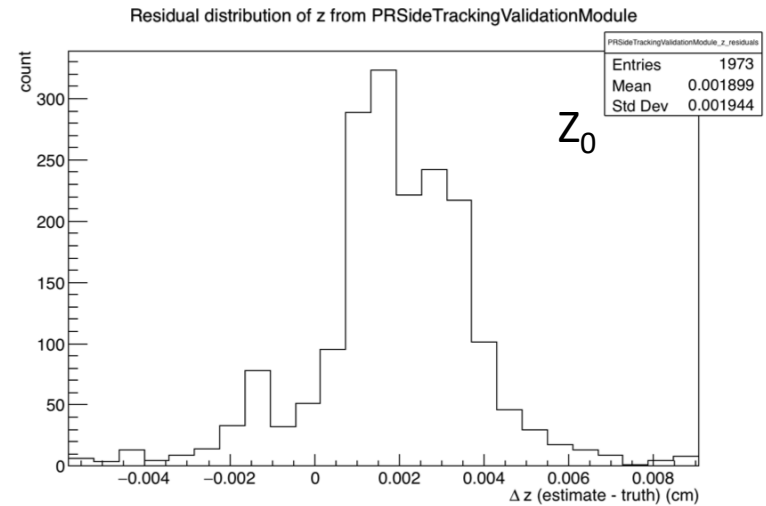
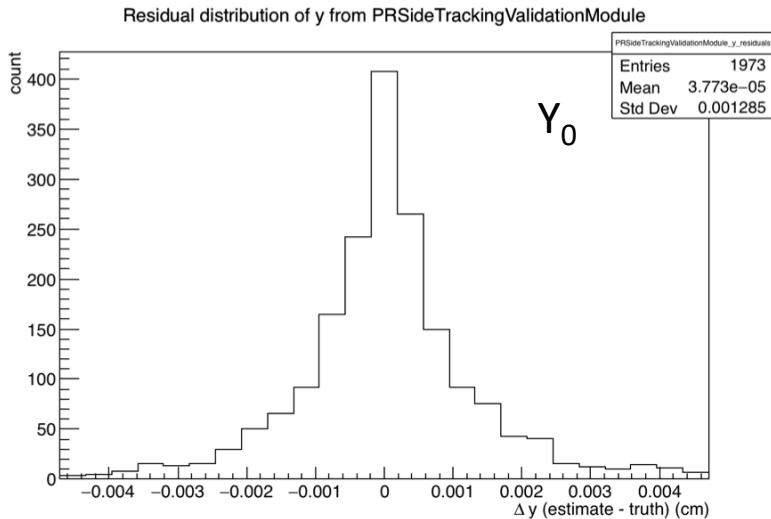
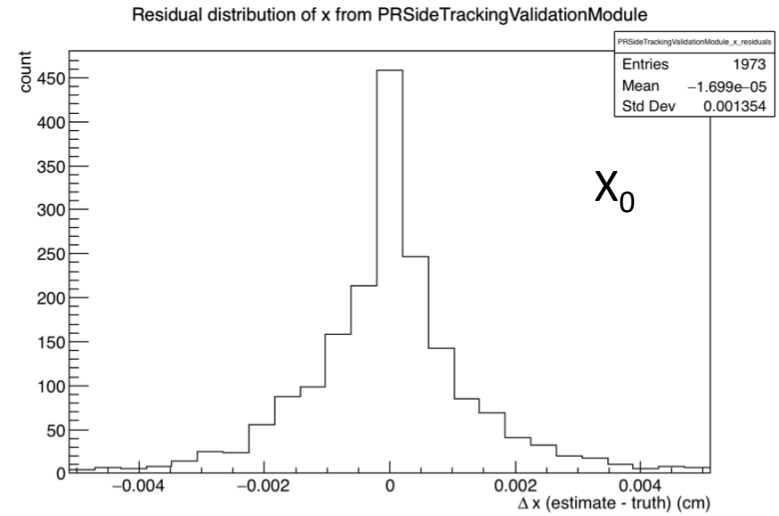
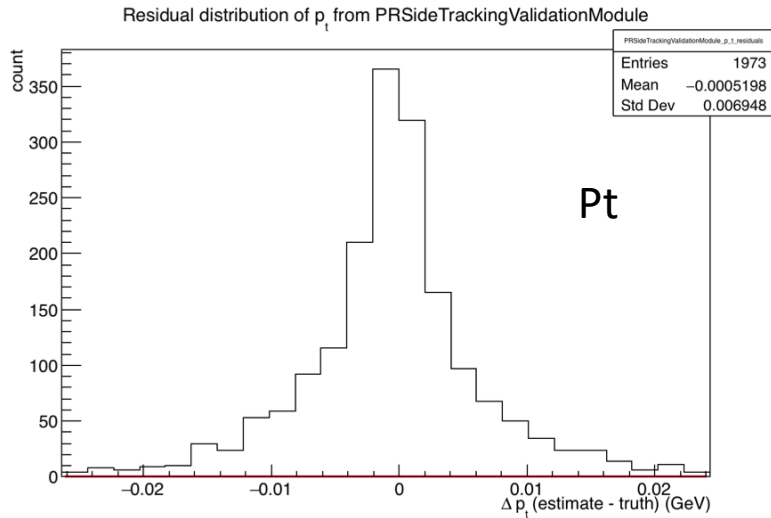
# Hit efficiency



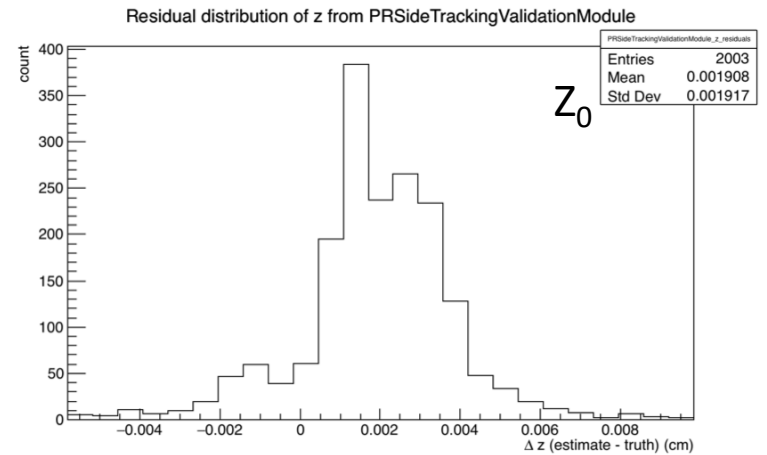
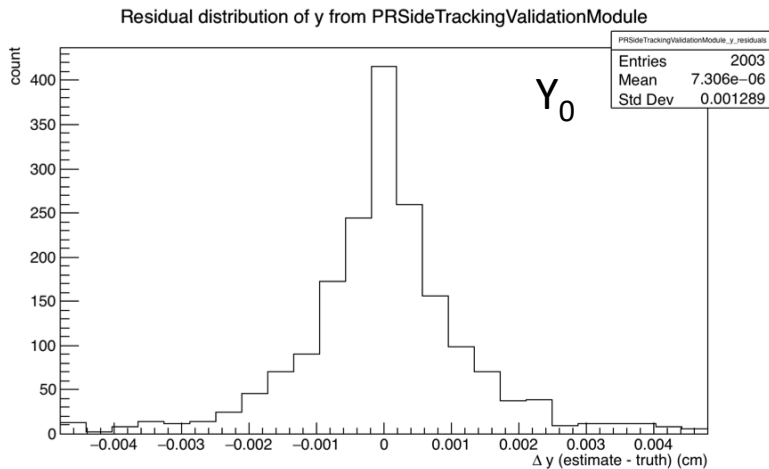
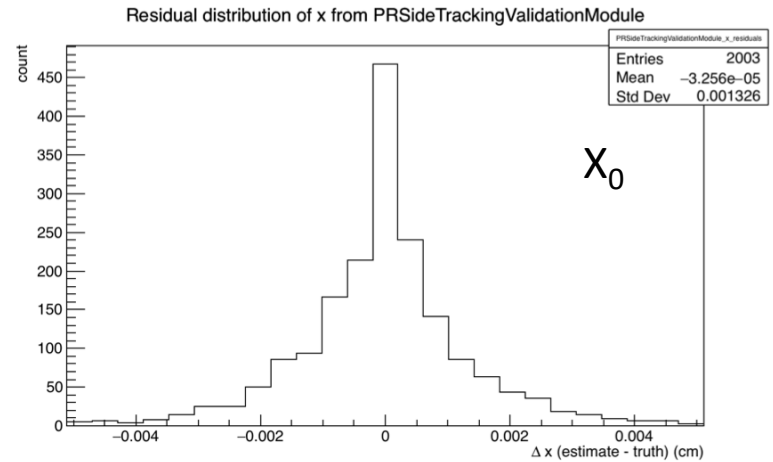
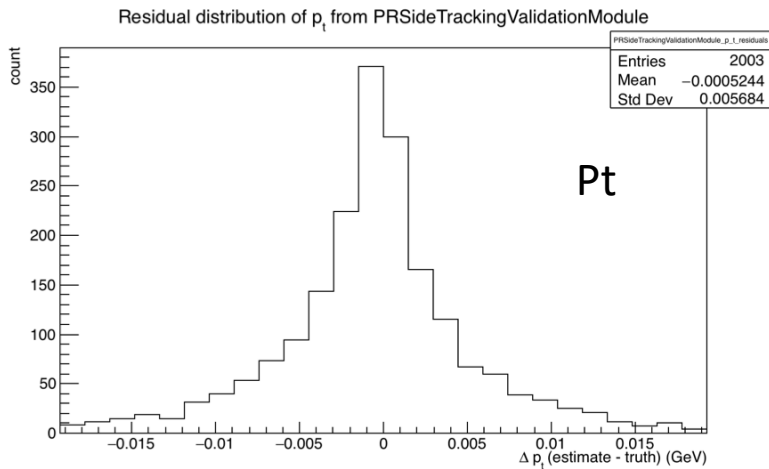
# Hit purity



# Resolution comparison CKF



# Resolution comparison Default

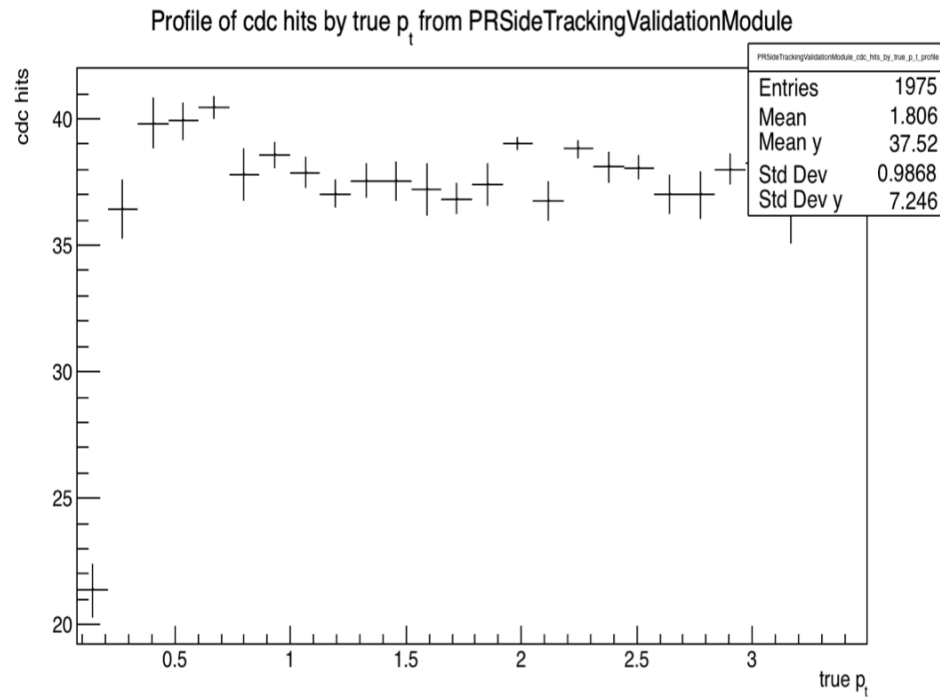


# Resolution comparison

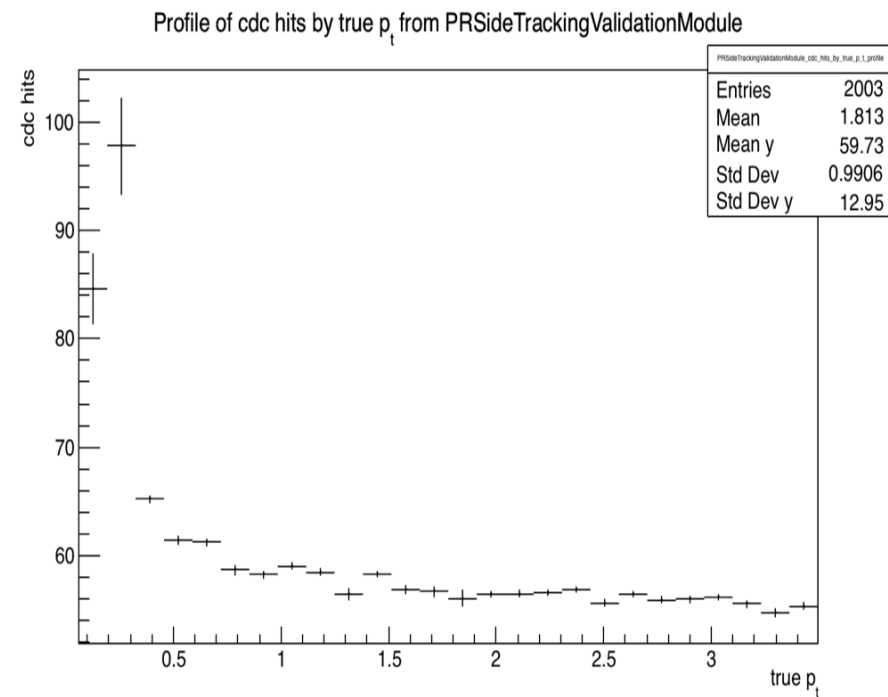
|       |       | CKF       | Default   |
|-------|-------|-----------|-----------|
| Pt    | mean  | -5.20 e-4 | -5.24 e-4 |
|       | sigma | 6.95 e-3  | 5.68 e-3  |
| $x_0$ | mean  | -1.70 e-5 | -3.26 e-5 |
|       | sigma | 1.35 e-3  | 1.33 e-3  |
| $y_0$ | mean  | 3.77 e-5  | 7.31 e-6  |
|       | sigma | 1.29 e-3  | 1.39 e-3  |
| $z_0$ | mean  | 1.90 e-3  | 1.91 e-3  |
|       | sigma | 1.94 e-3  | 1.91 e-3  |

# Hit number in CDC

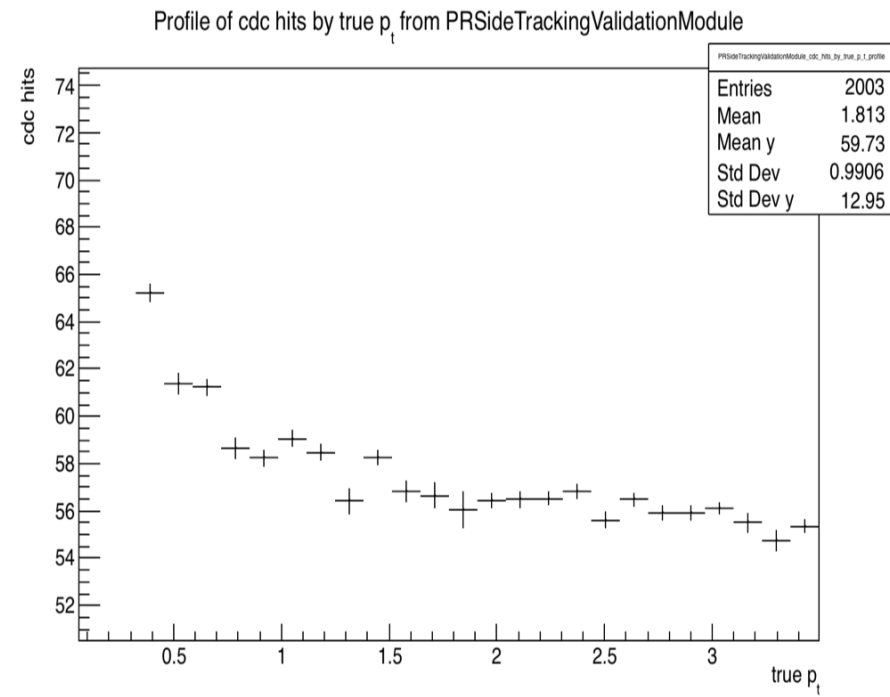
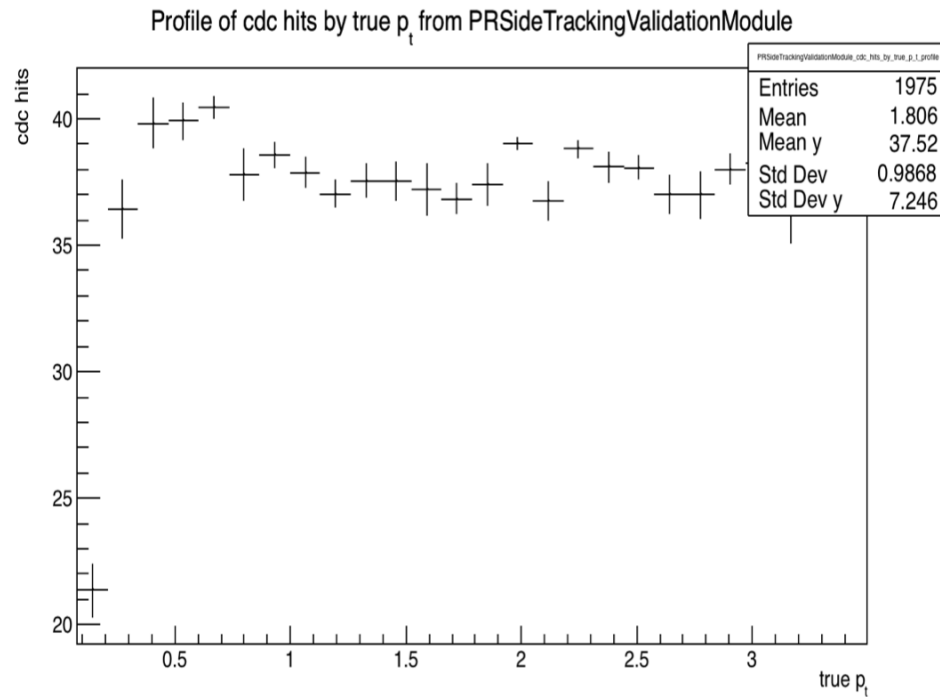
CKF



Default



# Hit number in CDC



# Next step

- Find the reason of hit missing
- Optimize filter

# Backup

# TF efficiency

