Unfolding Inputs – Unpolarized/Polarized UPC MC

Benard Mulilo
KU/RIKEN

Feb. 27, 2020

Binning of P_T in Φ Bins 2D (P_T, Φ) Unfolding

True and reconstructed transverse momentum distributions (GeV/c):

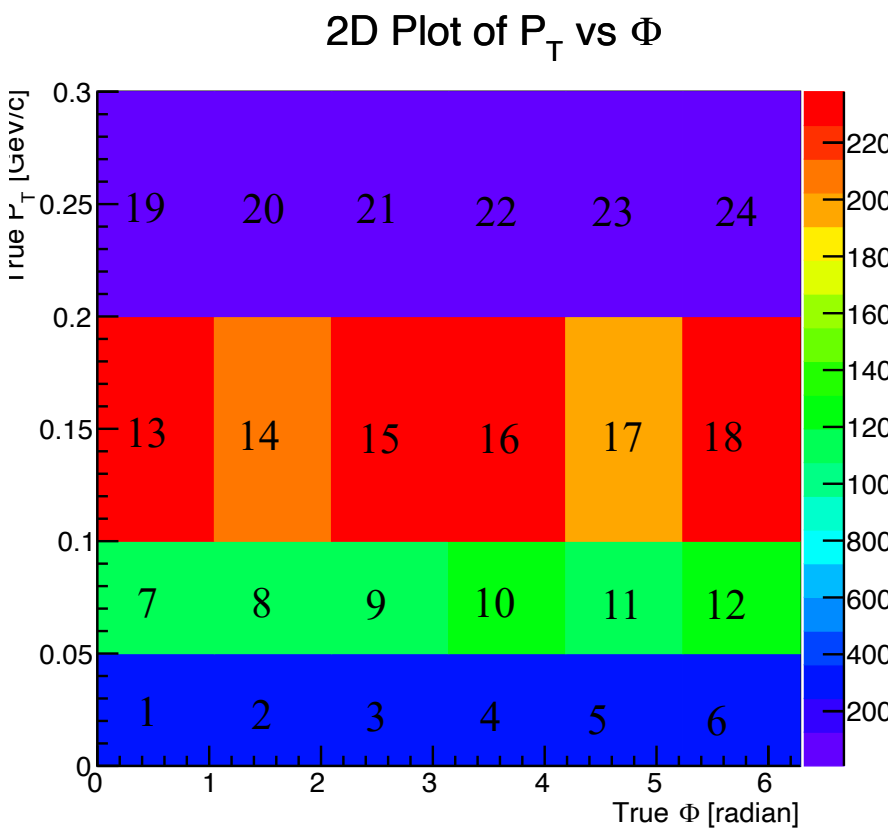
- P_T bins = 4 bins
- Minimum P_T = 0.0
- Maximum P_T = 0.3
- P_T slices = {0.0, 0.05}, {0.05, 0.10}, {0.10, 0.2}, {0.2, 0.3}

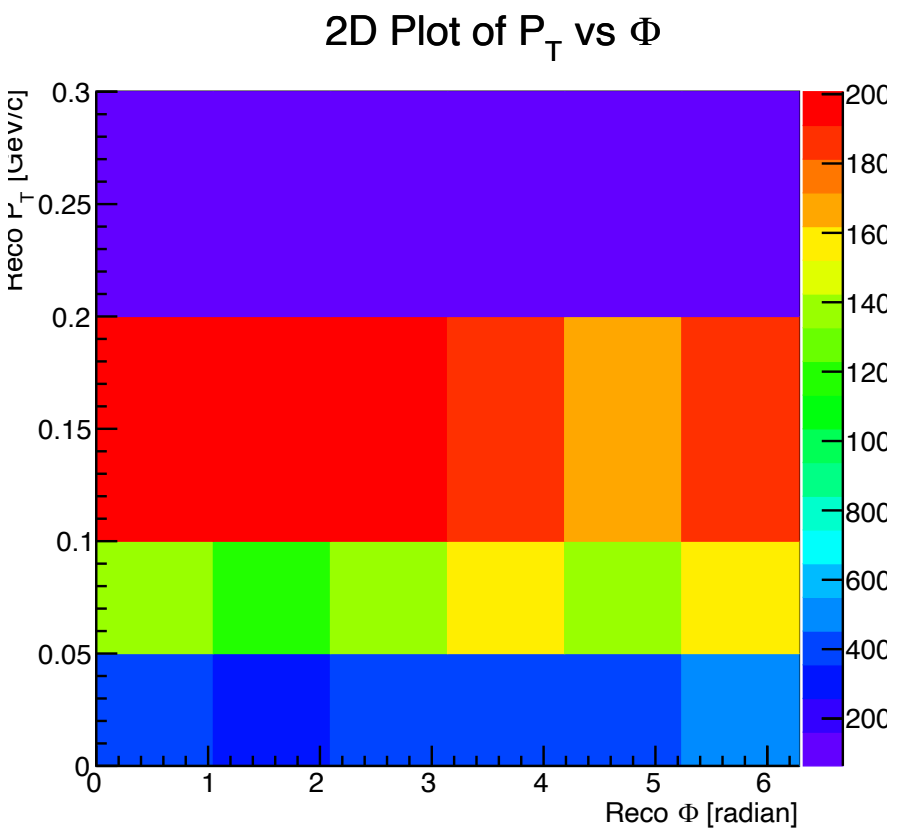
True and reconstructed azimuth, Φ (radians):

- Φ bins = 6 bins
- Minimum Φ = 0
- Maximum Φ = +6.28 (2*Pi)
- Φ slices = {0.0, 1/3*Pi}, {1/3*Pi,2/3*Pi}, {2/3*Pi, Pi} {Pi, 4/3*Pi}, {4/3*Pi, 5/3*Pi}, {5/3*Pi, 2*Pi}

P_T vs Φ (UPC)

Slide 5





Mapping 2D to 1D array of P_T in Φ bins

Mapping from 2D to 1D Pt in Phi was done according to the relation:

BinIndex = iptReco/True * nPhiBins + iphiReco/True,

With iptReco/True = ith pT bin; iphiReco/True = ith phi bin and nPhiBins = Total phi bins

```
iptReco == 1, iphiReco == 2, recopt == 0.078954 phi_reco == 3.136589 kRecoIndex == 8
iptTrue == 2, iphiTrue == 0, truept == 0.116071 phi_true == 1.034681 kTrueIndex == 12
iptReco == 2, iphiReco == 1, recopt == 0.132626 phi_reco == 1.748345 kRecoIndex == 13
iptTrue == 1, iphiTrue == 2, truept == 0.086070 phi_true == 2.883048 kTrueIndex == 8
iptReco == 1, iphiReco == 5, recopt == 0.084911 phi_reco == 6.012589 kRecoIndex == 11
iptTrue == 1, iphiTrue == 0, truept == 0.099365 phi_true == 0.518090 kTrueIndex == 6
iptReco == 2, iphiReco == 5, recopt == 0.136942 phi_reco == 6.008579 kRecoIndex == 17
iptTrue == 2, iphiTrue == 5, truept == 0.119147 phi_true == 5.660885 kTrueIndex == 17
iptReco == 1, iphiReco == 5, recopt == 0.057327 phi_reco == 5.350139 kRecoIndex == 11
iptTrue == 2, iphiTrue == 4, truept == 0.133015 phi_true == 4.808996 kTrueIndex == 16
iptReco == 1, iphiReco == 4, recopt == 0.096093 phi_reco == 4.721343 kRecoIndex == 10
iptTrue == 2, iphiTrue == 1, truept == 0.188186 phi_true == 1.379943 kTrueIndex == 13
iptReco == 2, iphiReco == 1, recopt == 0.192084 phi_reco == 1.385603 kRecoIndex == 13
iptTrue == 2, iphiTrue == 1, truept == 0.146256 phi_true == 1.487982 kTrueIndex == 13
iptReco == 0, iphiReco == 1, recopt == 0.036590 phi_reco == 1.919420 kRecoIndex == 1
iptTrue == 2, iphiTrue == 0, truept == 0.153937 phi_true == 0.154123 kTrueIndex == 12
iptReco == 2, iphiReco == 0, recopt == 0.113824 phi_reco == 0.250557 kRecoIndex == 12
iptTrue == 2, iphiTrue == 3, truept == 0.145905 phi_true == 3.890698 kTrueIndex == 15
iptReco == 1, iphiReco == 4, recopt == 0.086046 phi_reco == 4.429610 kRecoIndex == 10
iptTrue == 3, iphiTrue == 5, truept == 0.203233 phi_true == 5.842660 kTrueIndex == 23
iptReco == 2, iphiReco == 5, recopt == 0.183877 phi_reco == 5.742940 kRecoIndex == 17
iptTrue == 1, iphiTrue == 1, truept == 0.060201 phi_true == 2.029827 kTrueIndex == 7
iptReco == 2, iphiReco == 1, recopt == 0.105433 phi_reco == 2.020674 kRecoIndex == 13
iptTrue == 2, iphiTrue == 1, truept == 0.100620 phi_true == 1.218850 kTrueIndex == 13
iptReco == 1, iphiReco == 0, recopt == 0.099627 phi_reco == 0.725112 kRecoIndex == 6
```

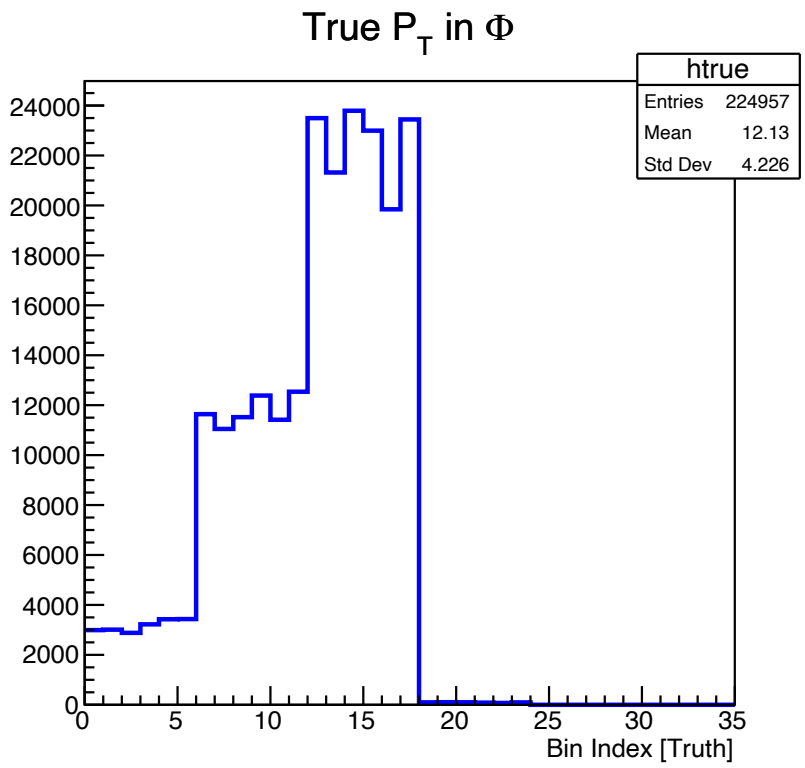
For example, in the top row, iptReco bin = 1 and iphiReco bin = 2 are mapped in bin 8 when a 2D array is converted into 1D array according to the formula given above, i.e.

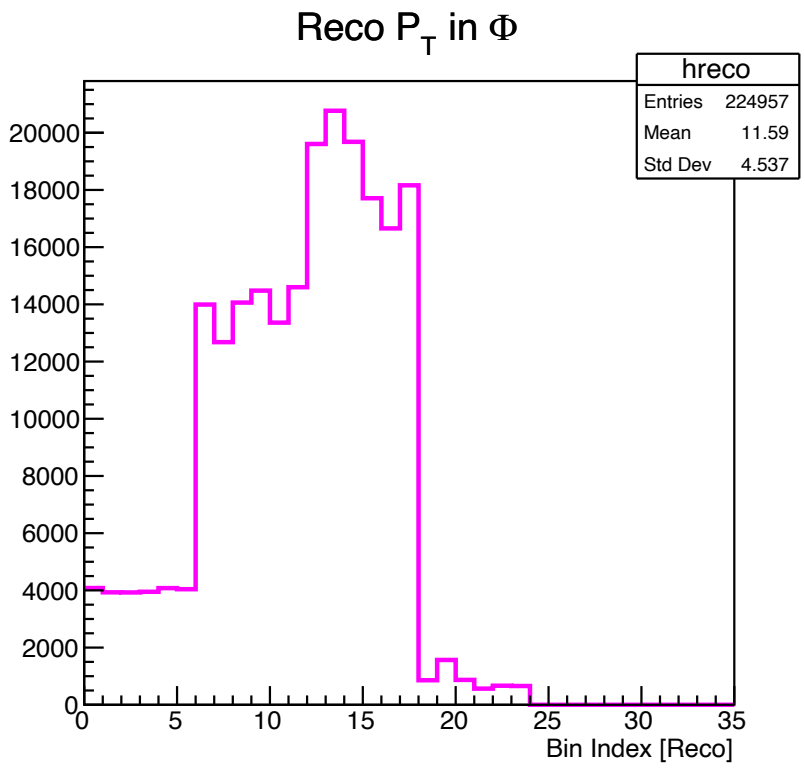
1 * 6 + 2 = 8 bin index

With pt and phi float values corresponding to 0.078954 and 3.136589, respectively.

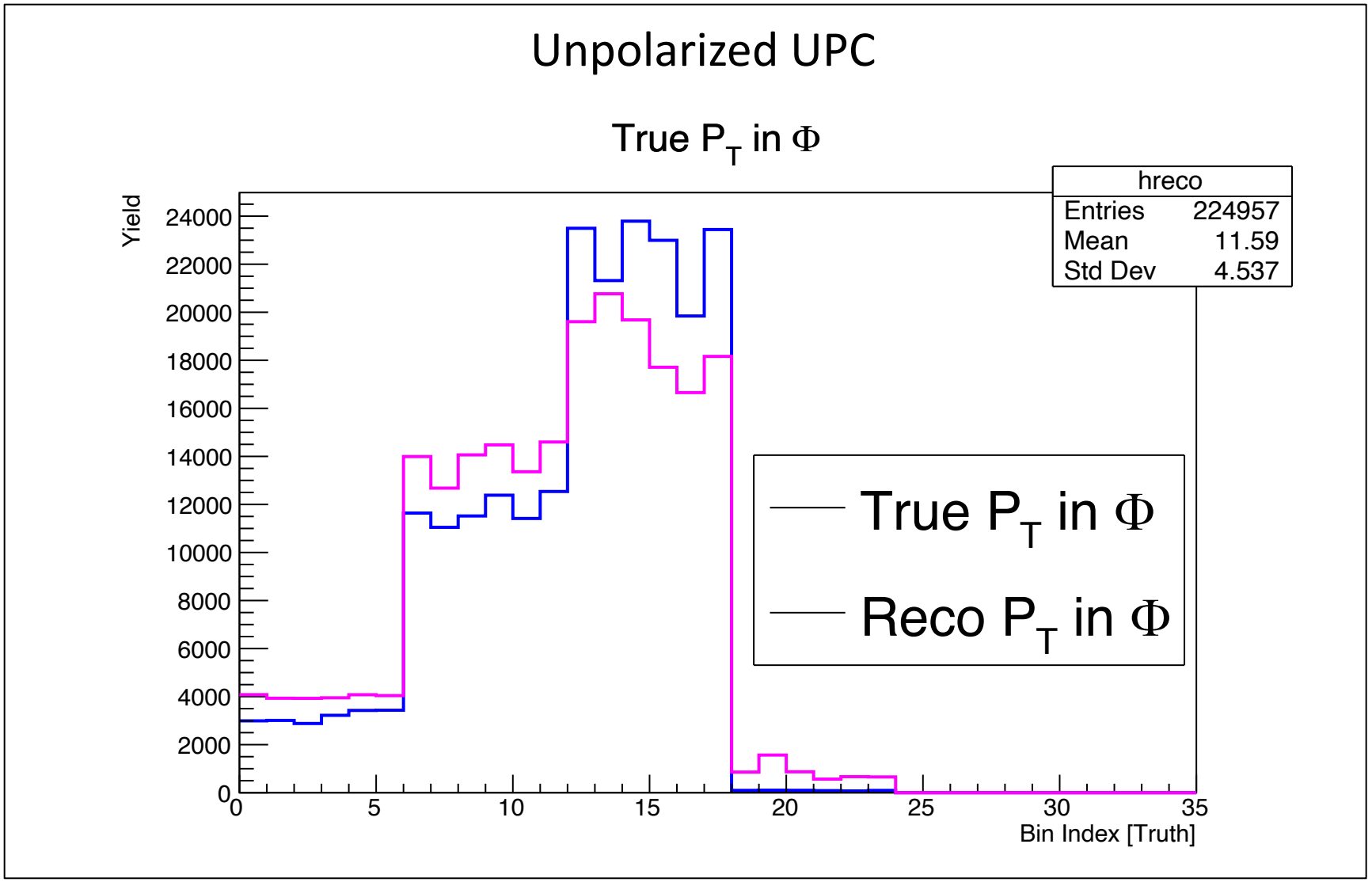
Mapped True and Measured P_T in Φ Spectra

Unpolarized UPC





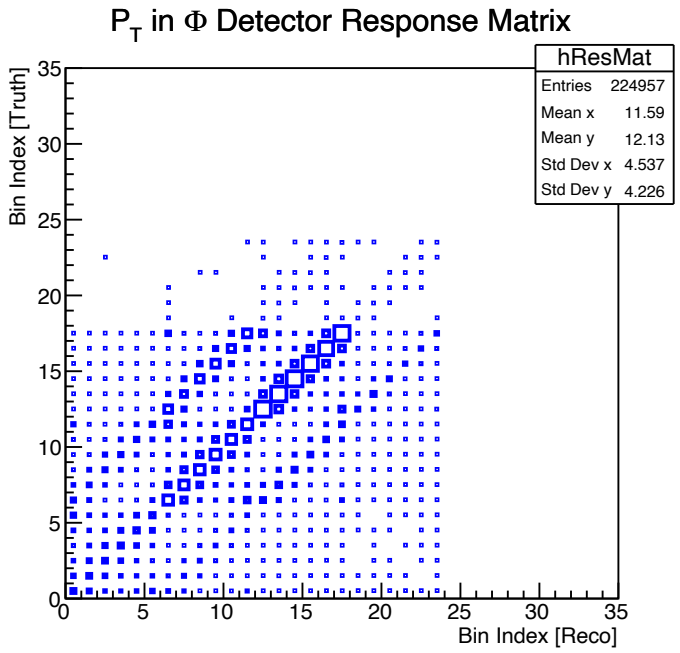
Superposed True & Measured P_T in Φ Spectra

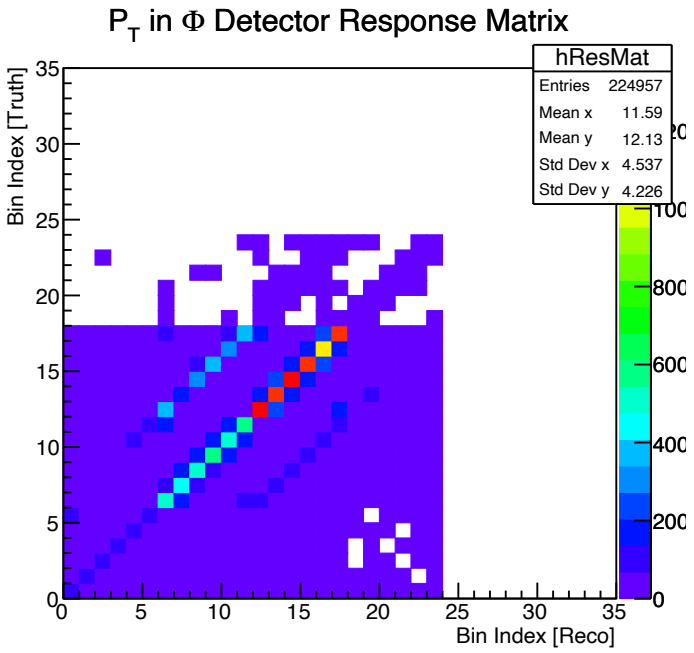


Unfolding Input – Response Matrix

④ Smearing response matrix: 2D plot extracted from the Reco and True P_T in **Φ** spectra of UPC MC.

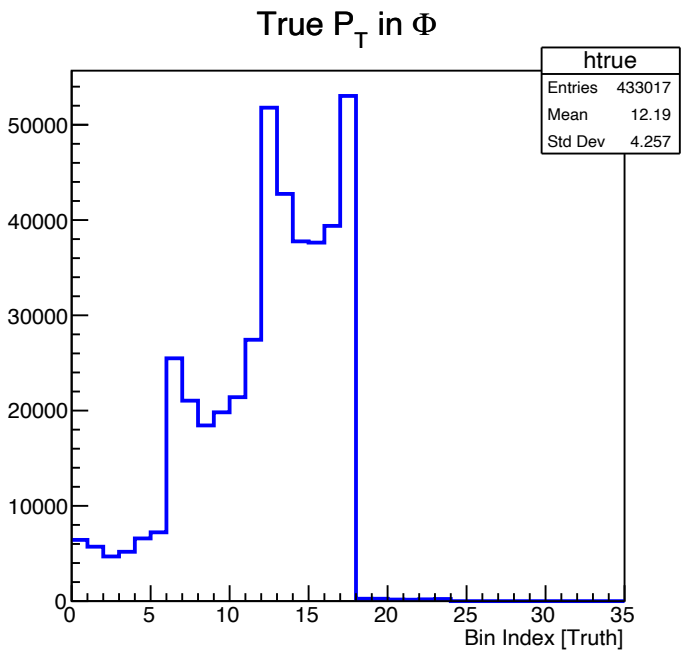
Unpolarized UPC

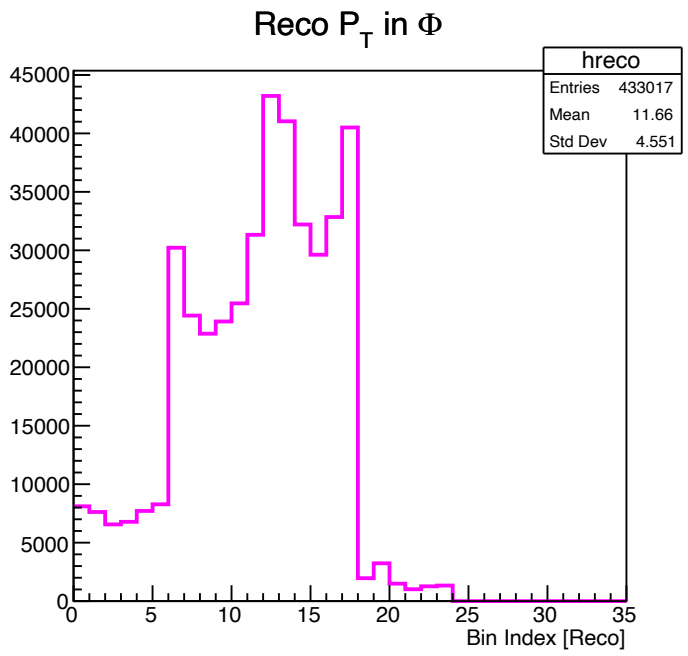




Mapped True and Measured P_T in Φ Spectra

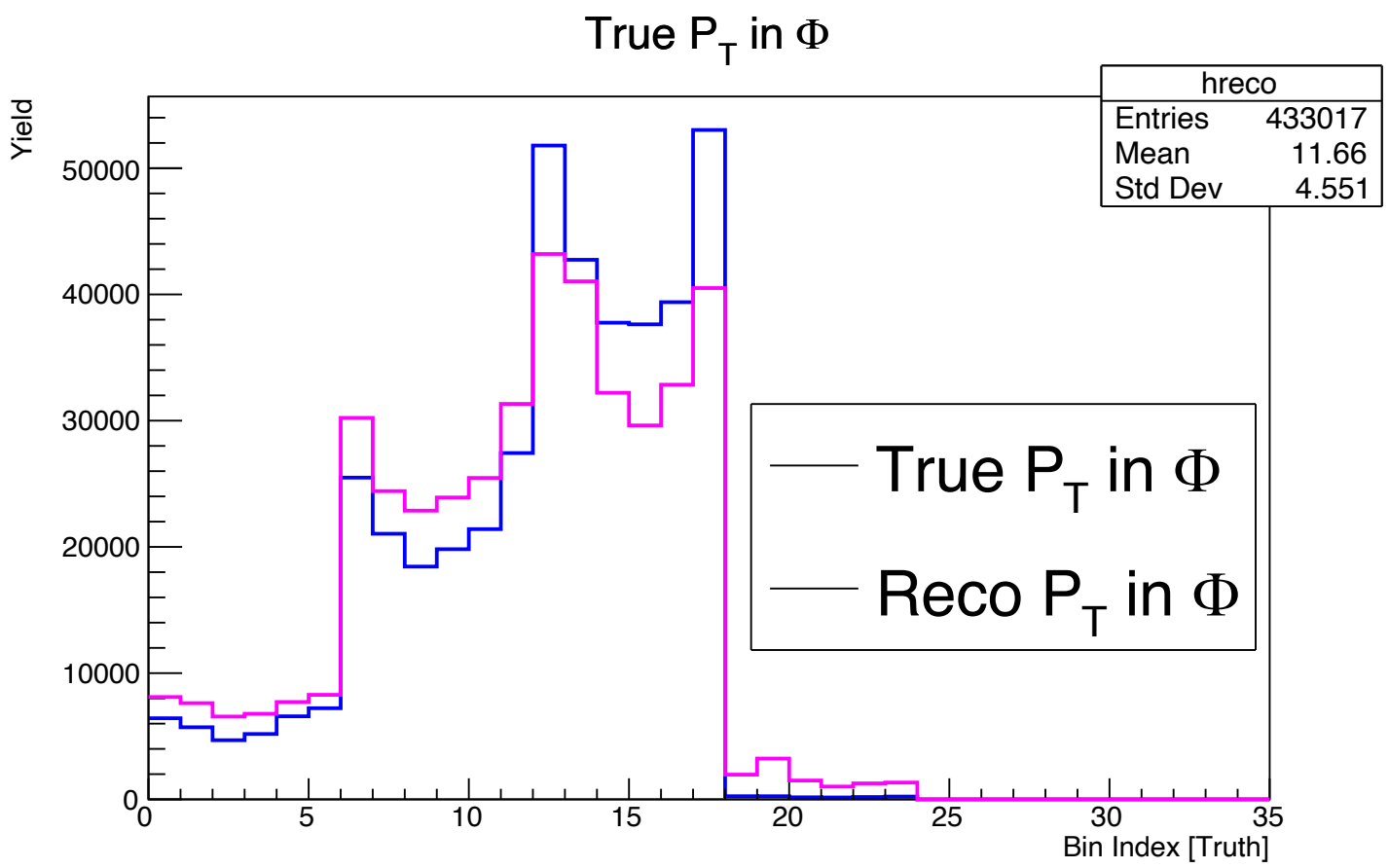
Polarized UPC





Superposed True & Measured P_T in Φ Spectra

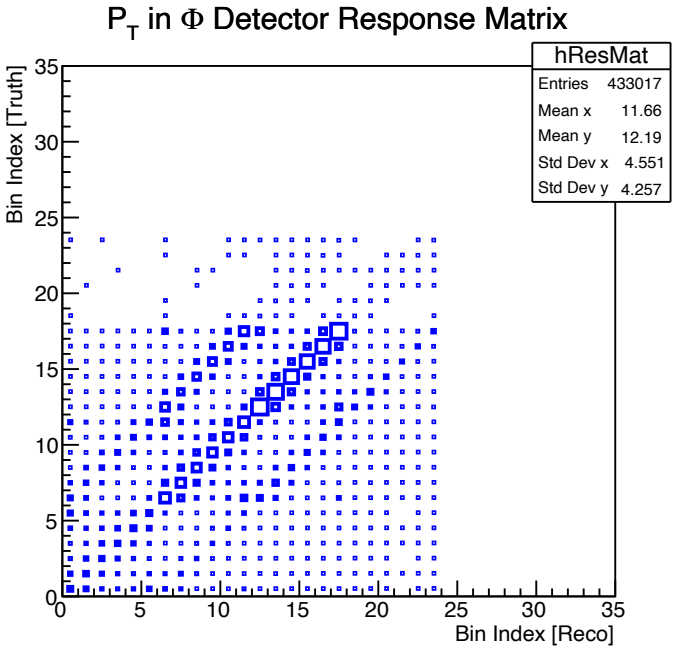
Polarized UPC

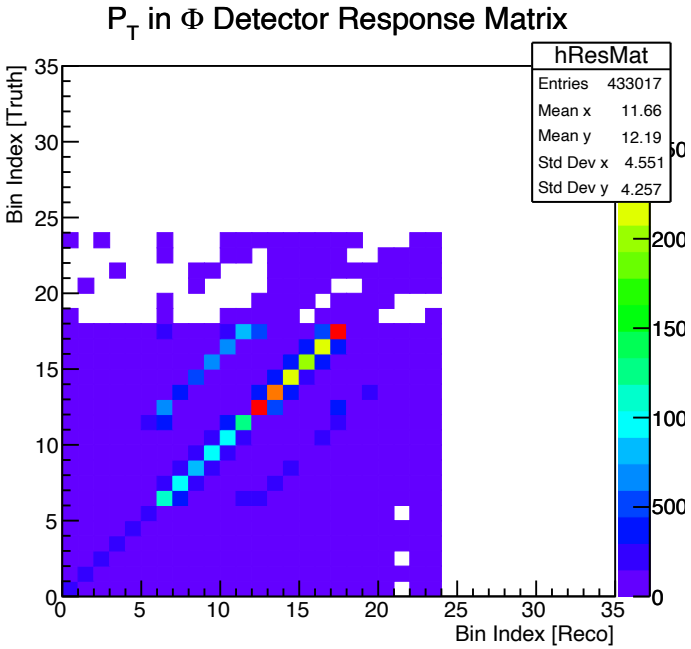


Unfolding Input – Response Matrix

④ Smearing response matrix: 2D plot extracted from the Reco and True P_T in **Φ** spectra of UPC_AN+0.2 MC.

Polarized UPC





BACKUP

Unfolding Input – Response Matrix

④ Detector response matrix: 2D plot extracted from the Reco and True P_T spectra of MC.