

A_N vs. P_T Unfolding

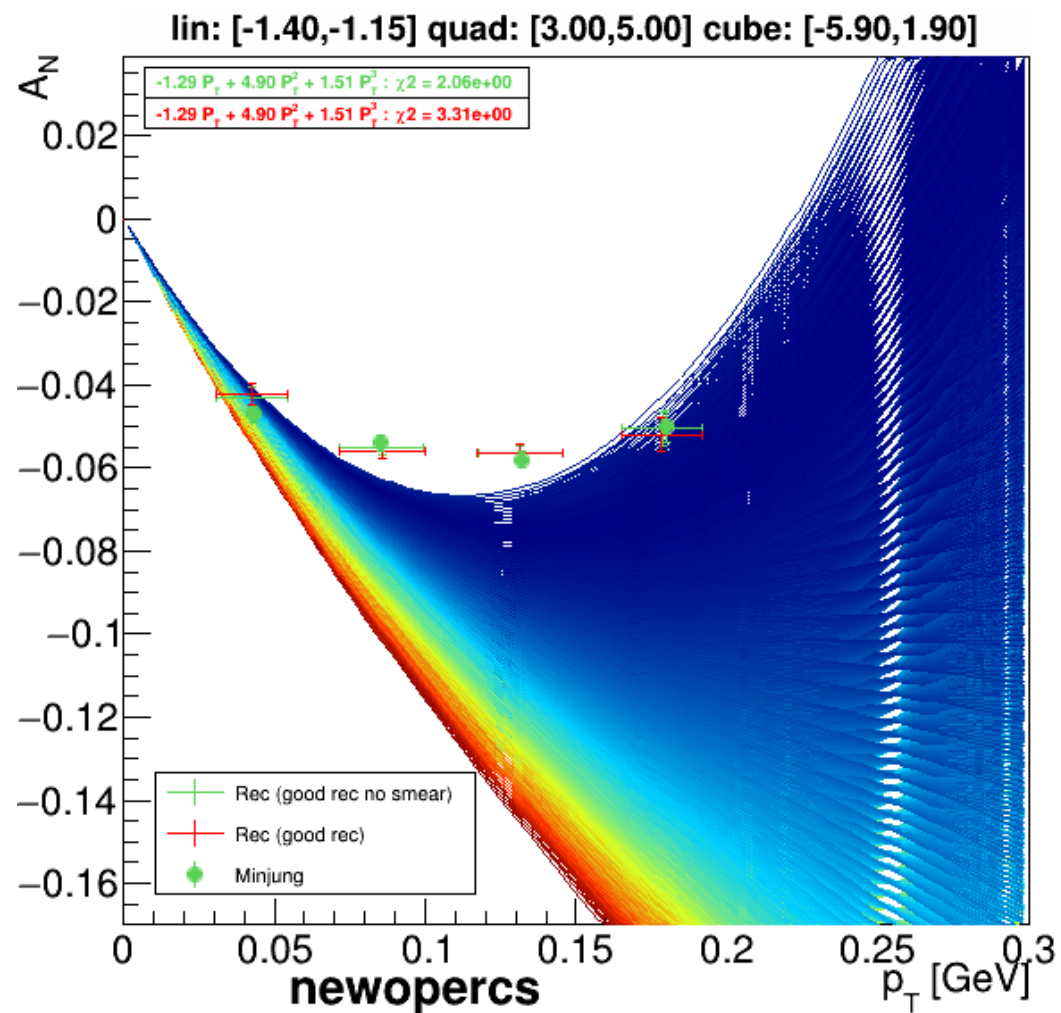
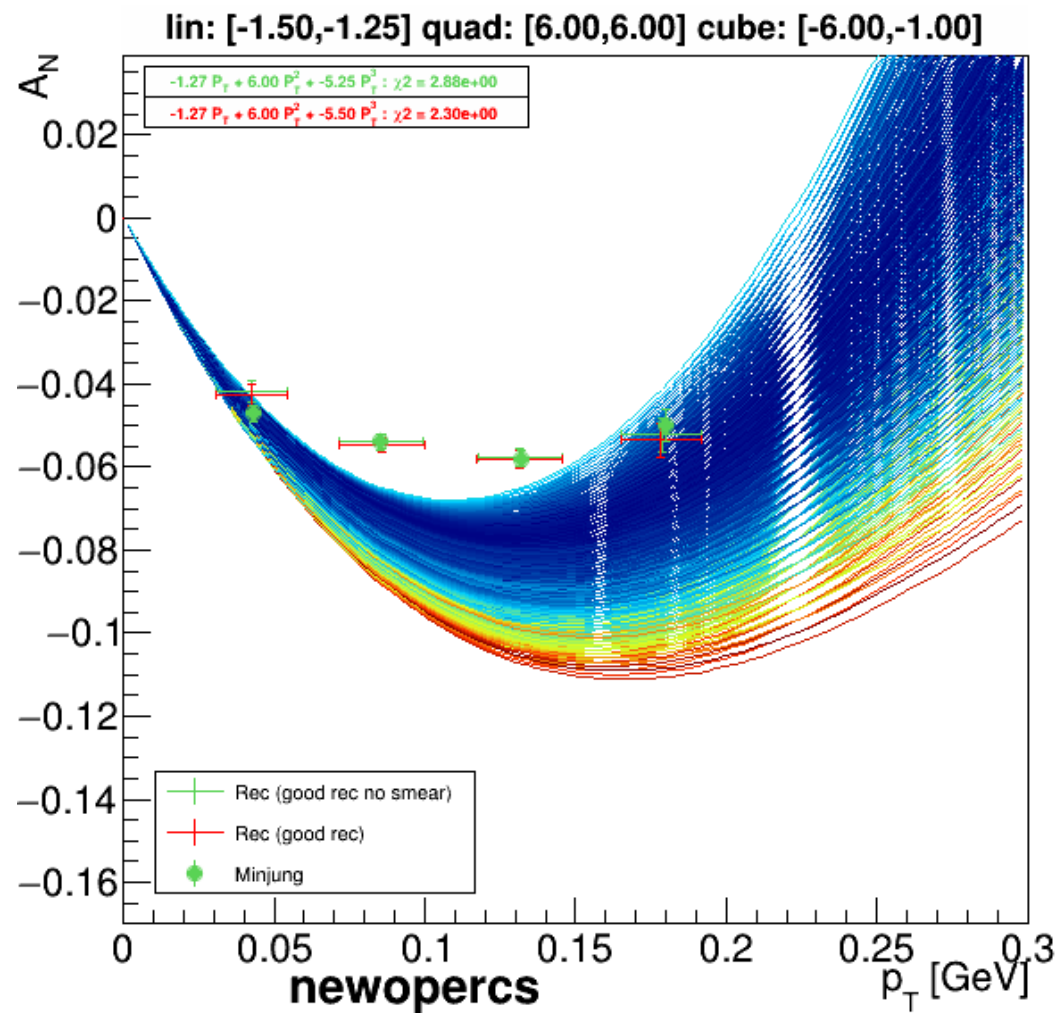
RadLab Meeting

2020/07/08

3:00 PM (KST/JST)

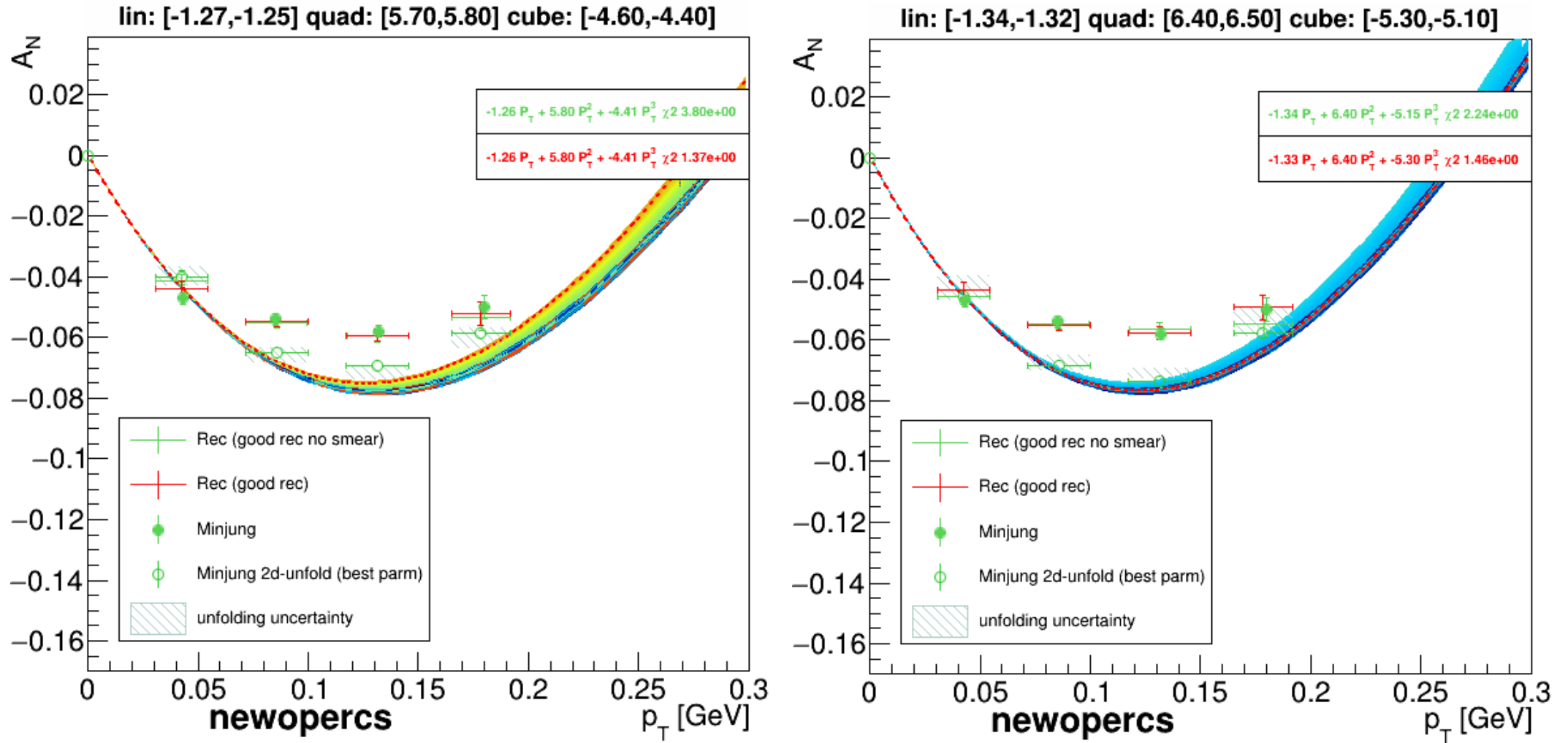
Benard Mulilo (KU/RIKEN)

Scan of Linear, Quadratic and Cubic Parameter Values



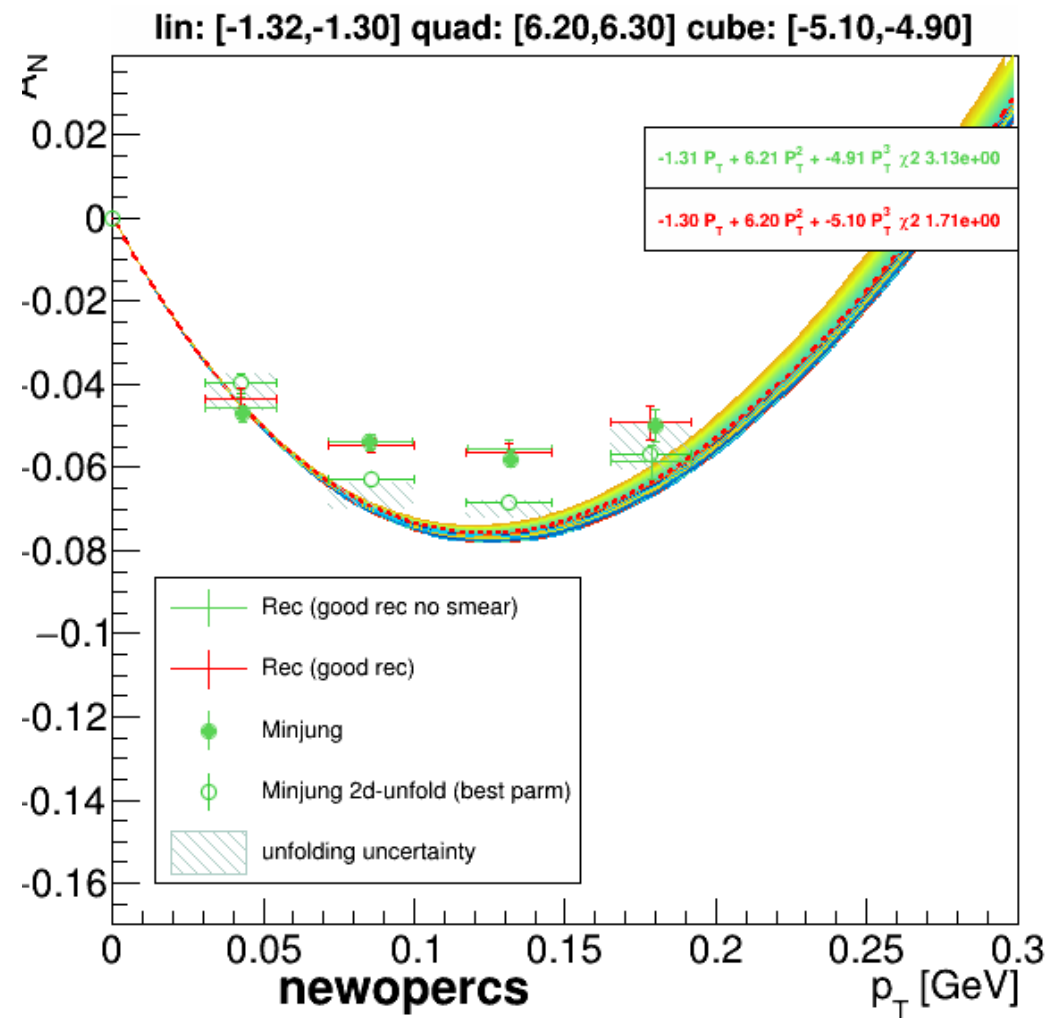
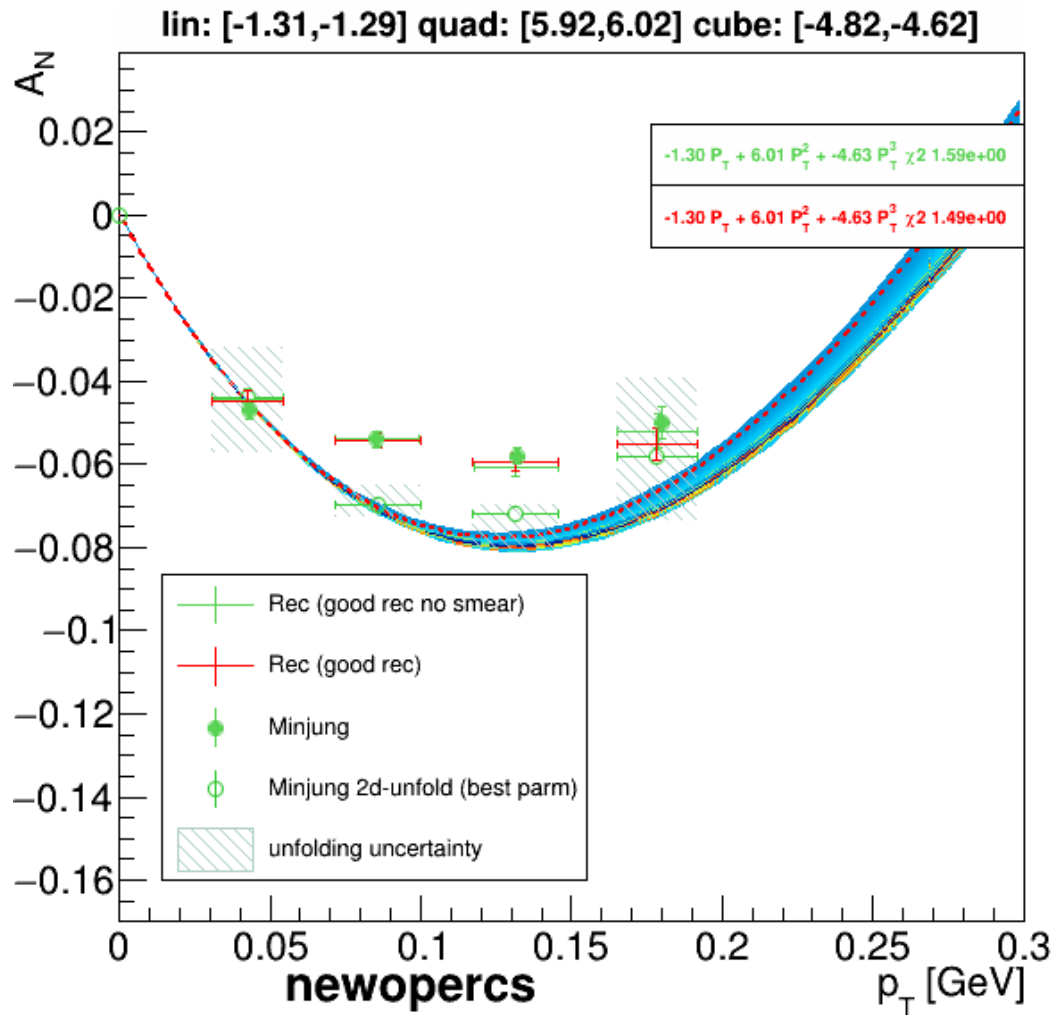
Need to zoom in by scanning a finer range of parameters for linear, quadratic and cubic and unfold

Zooming In for the Best Linear, Quadratic and Cubic Parameter Values



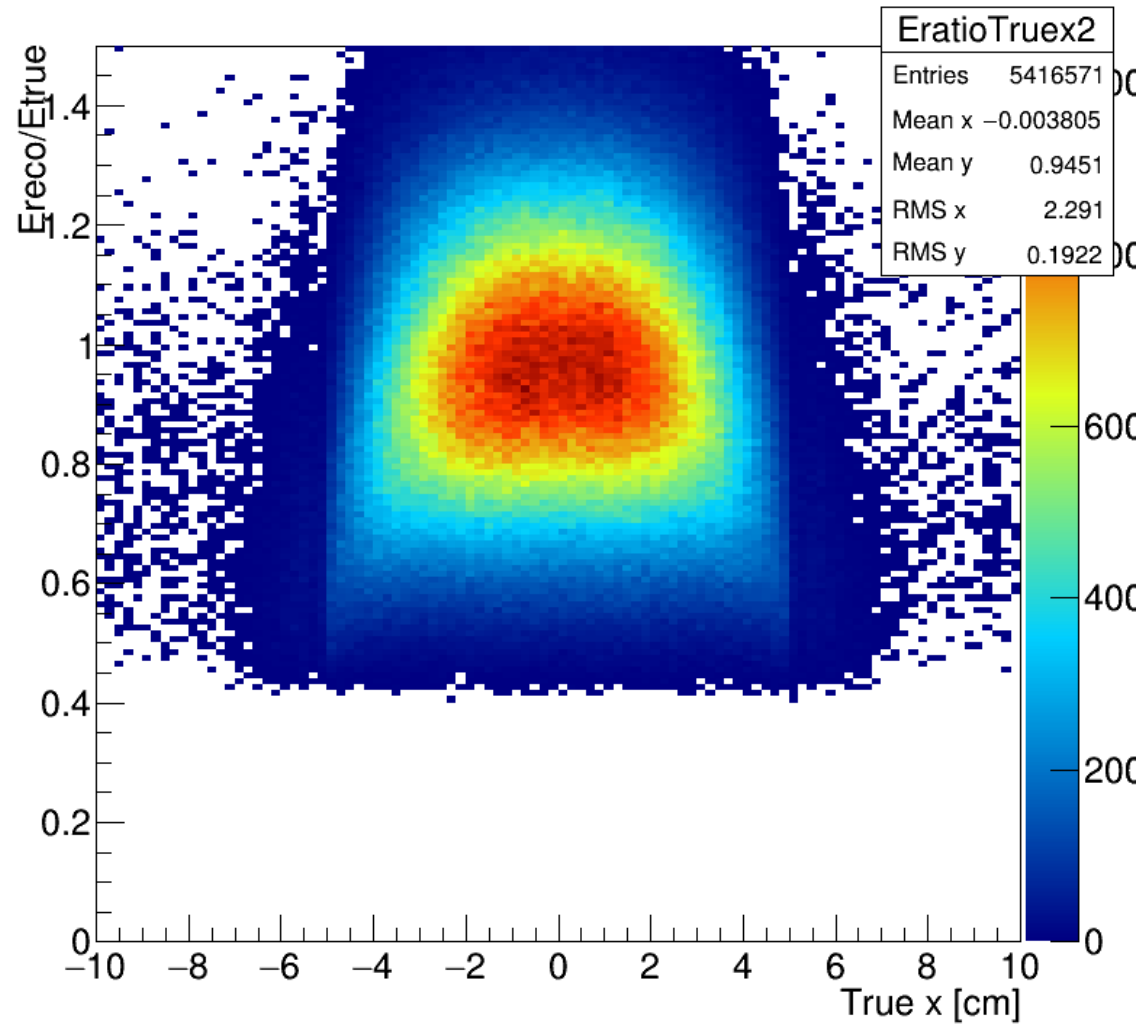
Best parameters so far (left panel) but can be finely zoomed in further.

Zooming In for the Best Linear, Quadratic and Cubic Parameter Values

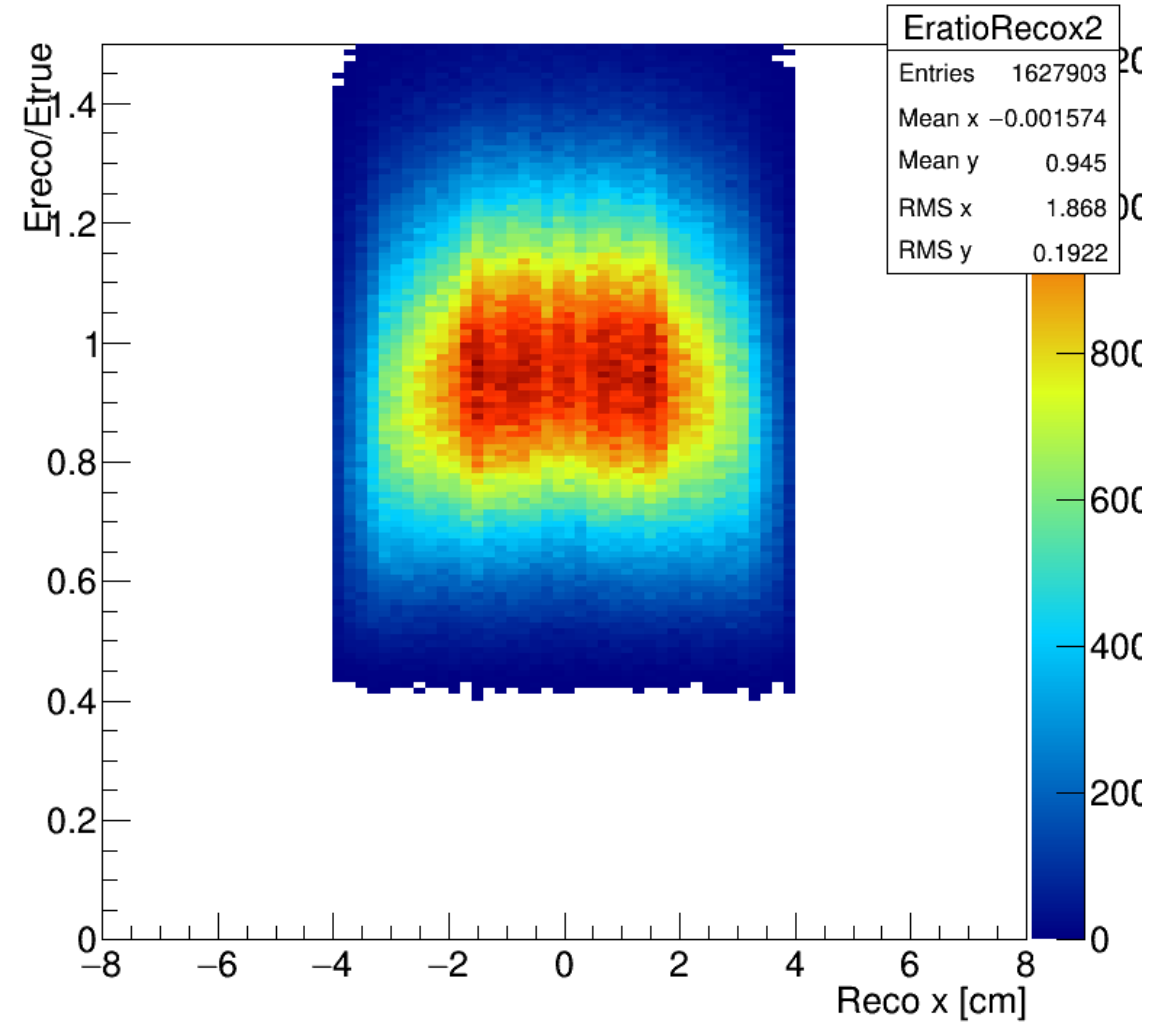


Checking of the E_{reco}/E_{true} as a function of position true x/ reco x 2D distributions

E_{reco}/E_{true} vs True x (for good ev) newopercs

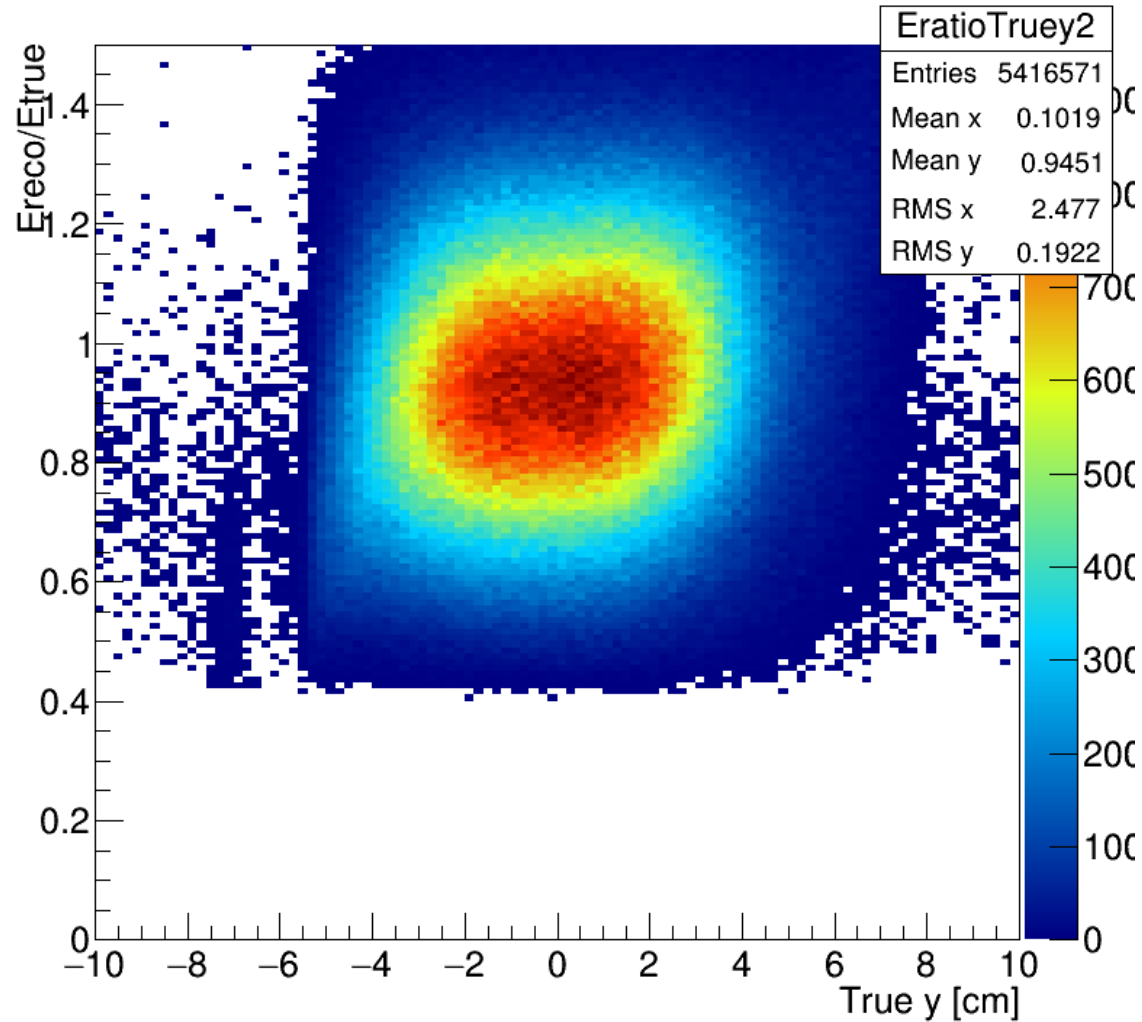


E_{reco}/E_{true} vs Reco x (for good ev) newopercs

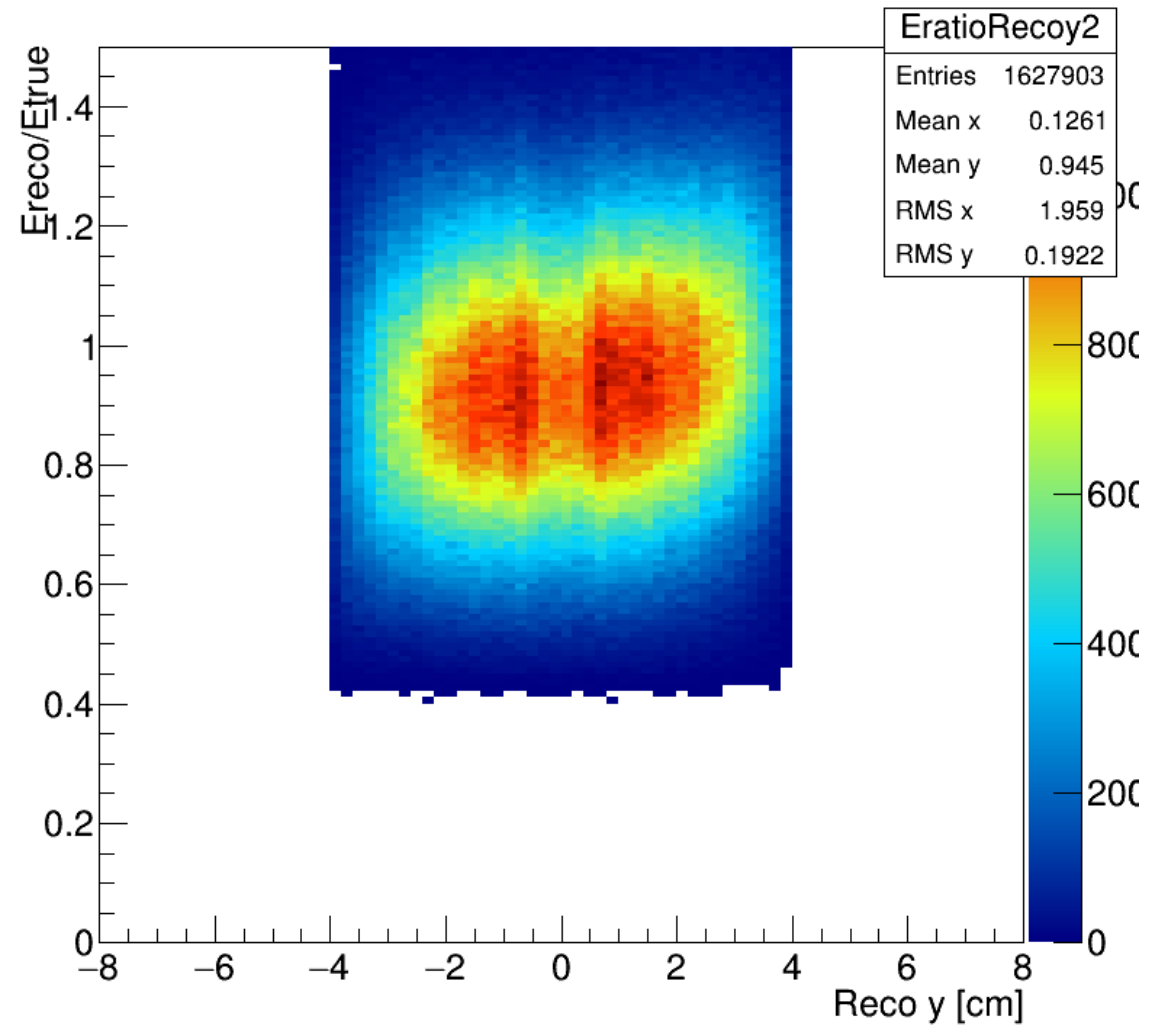


Checking of the E_{reco}/E_{true} as a function of position true y/ reco y 2D distributions

E_{reco}/E_{true} vs True y (for good ev) newopercs



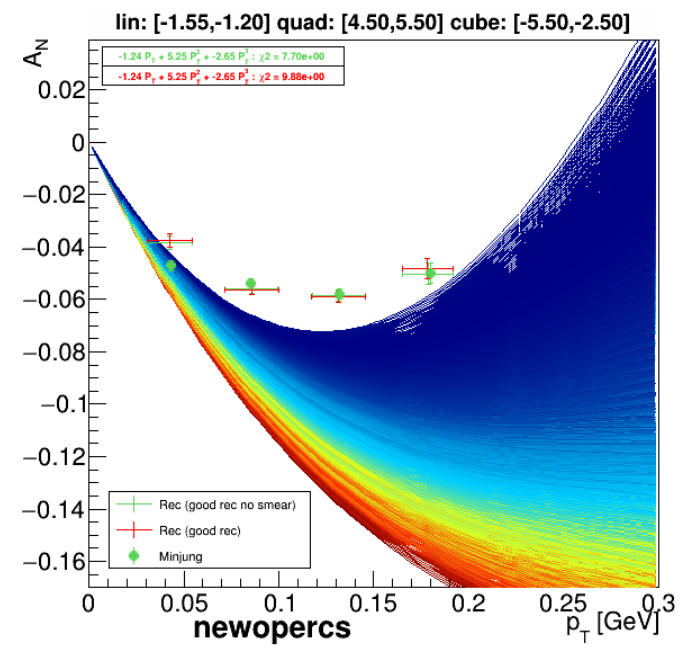
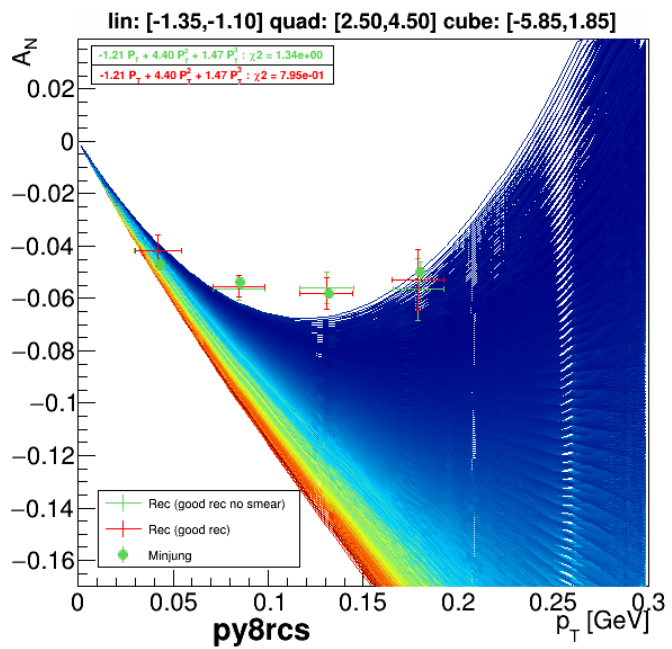
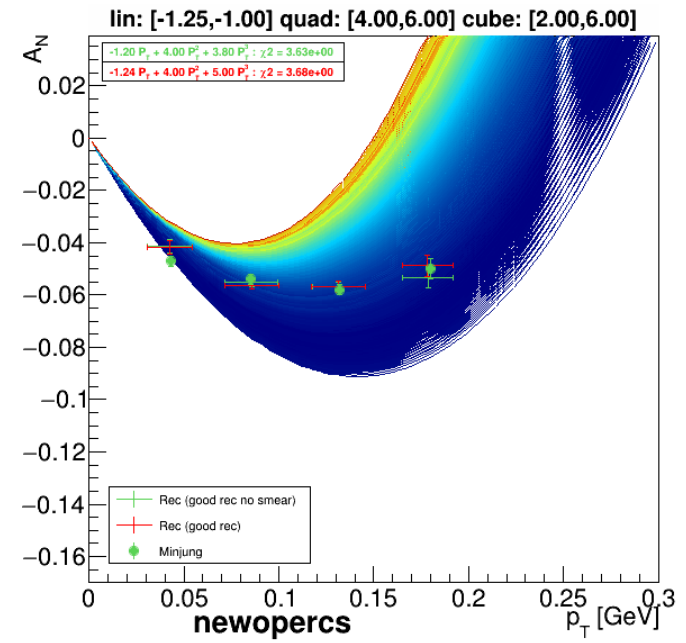
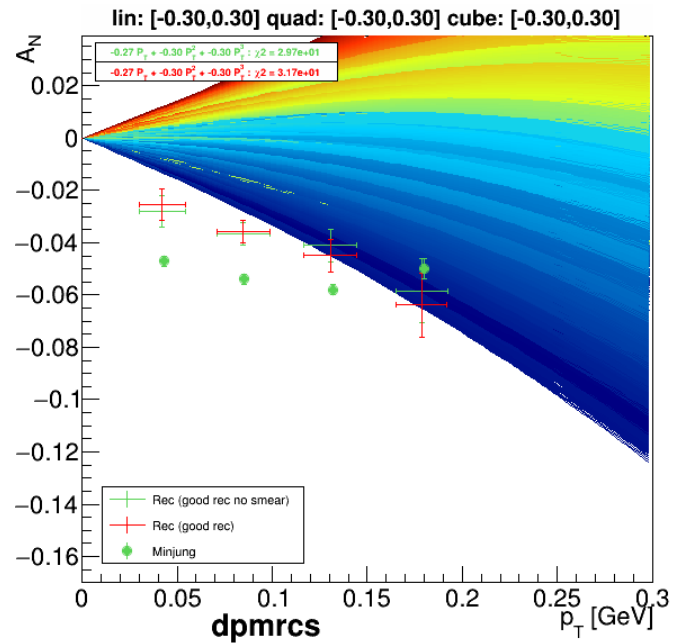
E_{reco}/E_{true} vs Reco y (for good ev) newopercs



To Do

Period	Task
July 9 ~ July 15	<ul style="list-style-type: none"><li data-bbox="894 394 2372 508">▪ Unfold A_N vs P_T also for exponential and power functions as is being done for polynomial case.
July 16 ~ July 22	<ul style="list-style-type: none"><li data-bbox="894 539 2397 706">▪ Compare unfolded results with uncertainty for polynomial, square, exponential functions for various MC samples (OPE, DPMJET, PYTHIA6, PYTHIA8 and UPC).

BACKUP



Run 15 neutron asymmetry for inclusive pp collisions in the ZDC – 2D Unfolding

Strategy

Using Minjung's ZDC neutron asymmetry for run 15 inclusive pp data, the strategy is to:

- Translate the pt dependent A_N 's into yields.
- Apply the 2D unfolding in P_T and azimuth, Φ
- Extract the unfolded asymmetries (A_N 's)

The strategy requires extraction of asymmetries and reweighting procedures for pp monte carlo samples: pythia, dpmjet and the one pion exchange (OPE).

Algorithm

Asymmetry extraction algorithm is:

Algorithm

1. Create two spin states using TRandom Number Generator:
Spin up (0)
Spin down (1)
2. Create spin depended weight according to Taylor series of a polynomial in the form:

$$w = 1 + (a + b * P_{T,T} + c * P_{T,T}^2 + d * P_{T,T}^3) \cos(\varphi_T + spin * \pi)$$

the parameters are:

a = constant

b = linear

c = quadratic

d = cube

spin * pi = phase shift

spin = 0 (up)

1 (down)

Note: Other functional forms can also be scanned and tried to describe data asymmetries.

Algorithm...

3. Scan parameters for different functional forms over a wide range using chi-square based on the reconstructed asymmetries from pp collision monte carlo samples and run 15 pp asymmetry results (Minjung's result) to find the best parameter, i.e. parameter with lowest,

$$\chi^2 = \sum_i \frac{(A_{N,i}^{Minjung} - A_{N,i}^{w,reco})^2}{(\Delta A_{N,i}^{2,Minjung} + \Delta A_{N,i}^{2,w,reco})}$$

4. Extract the asymmetry using the best Chi-squared parameters,

$$A_N = \frac{N_{\Phi\uparrow} - N_{\Phi\downarrow}}{N_{\Phi\uparrow} + N_{\Phi\downarrow}}$$