CBM progress report
20 VII 2021

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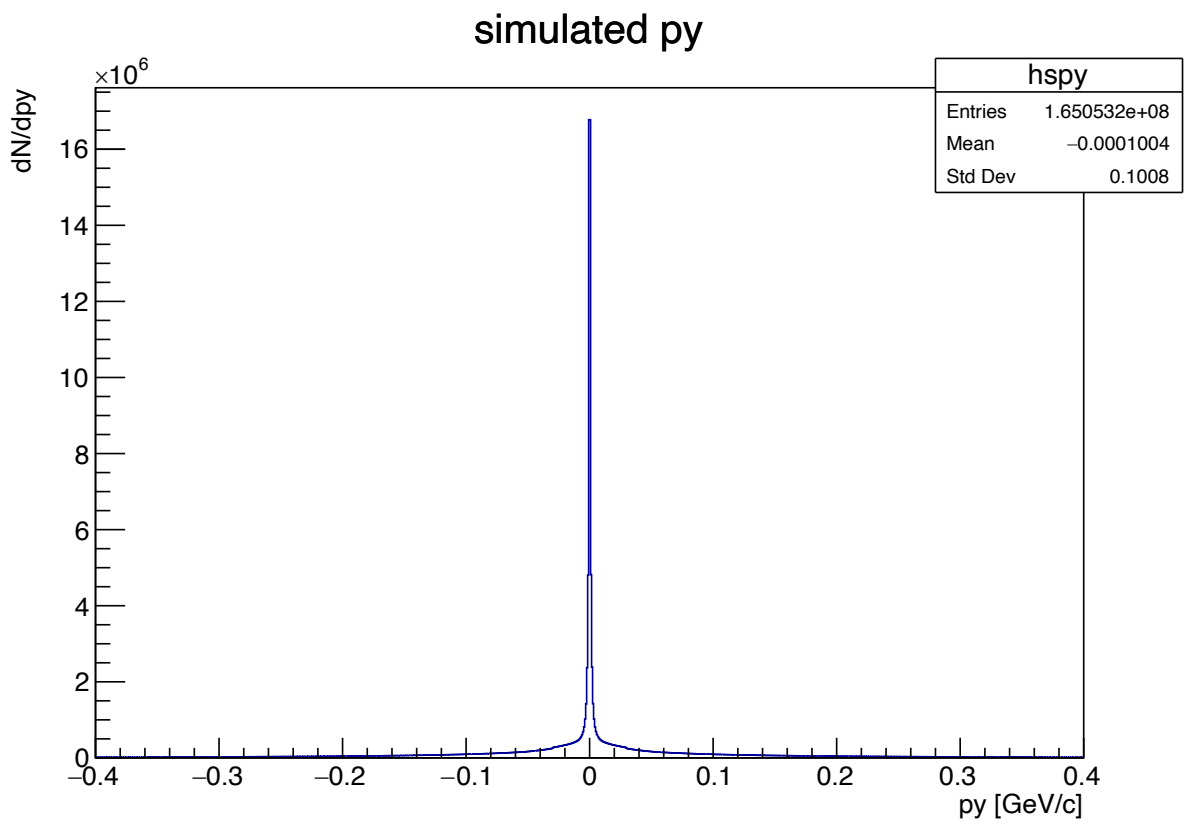
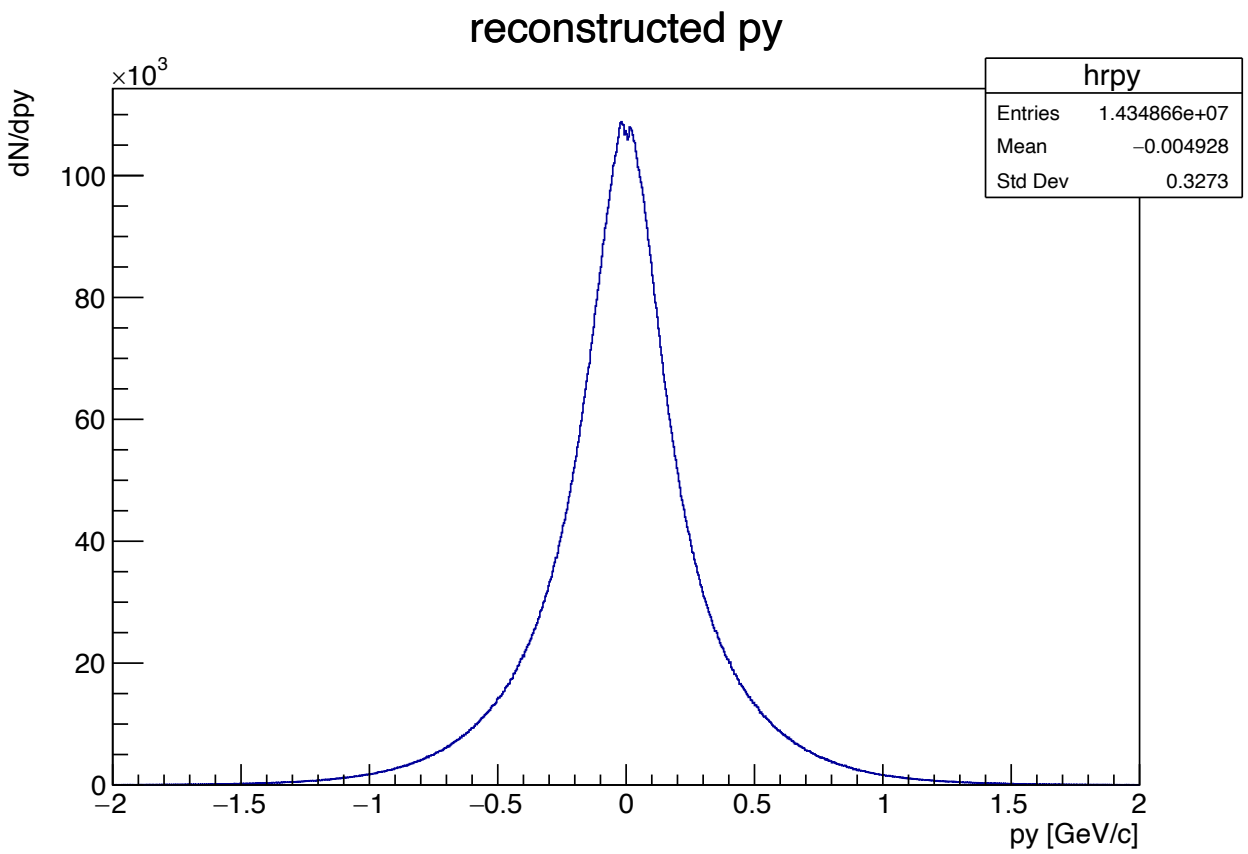
1. Analysis Tree

- Installing software
- Making first histograms from GEANT4 simulations
  (/lustre/cbm/users/lubynets/cbm2atree/outputs/apr20_fr_18.2.1_fs_jun19p1/dcmqgsm_smm_pluto/auau/12agev/mbias/sis100_electron_target_25_mkm/AT2

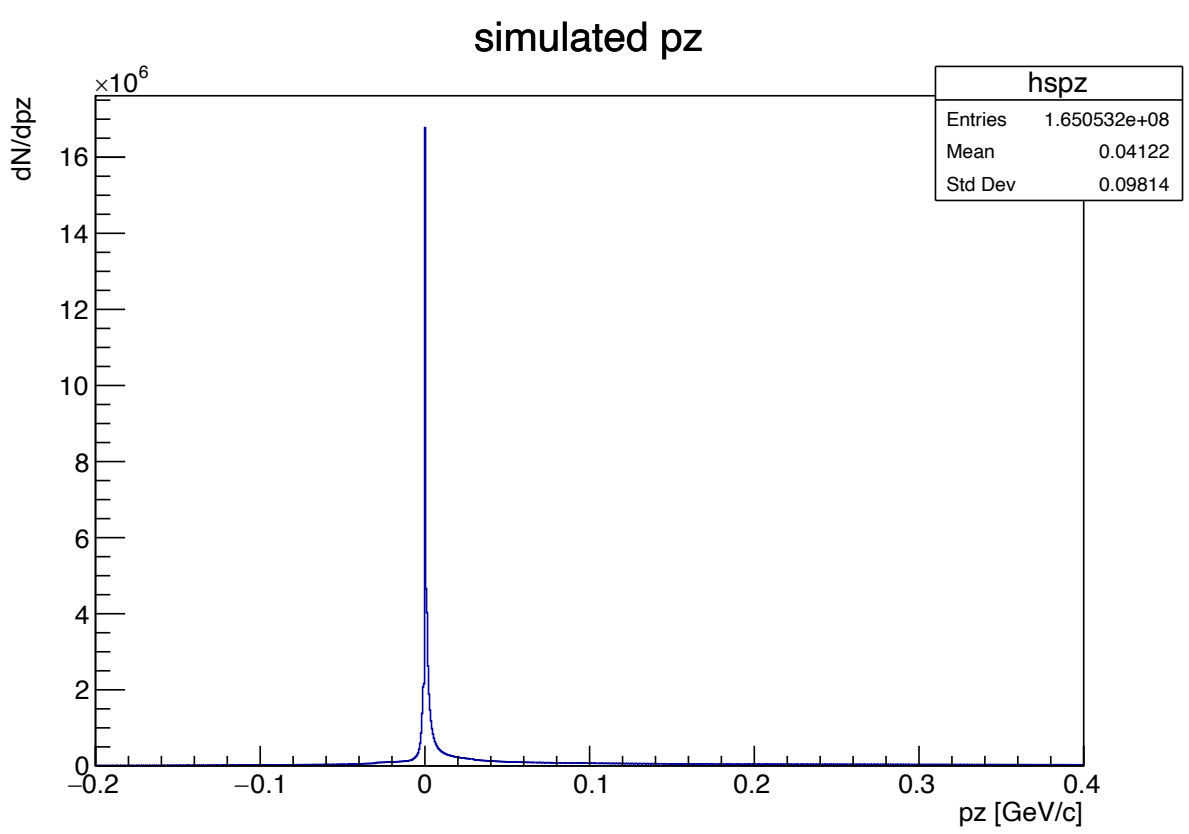
- Running our own macros via ssh

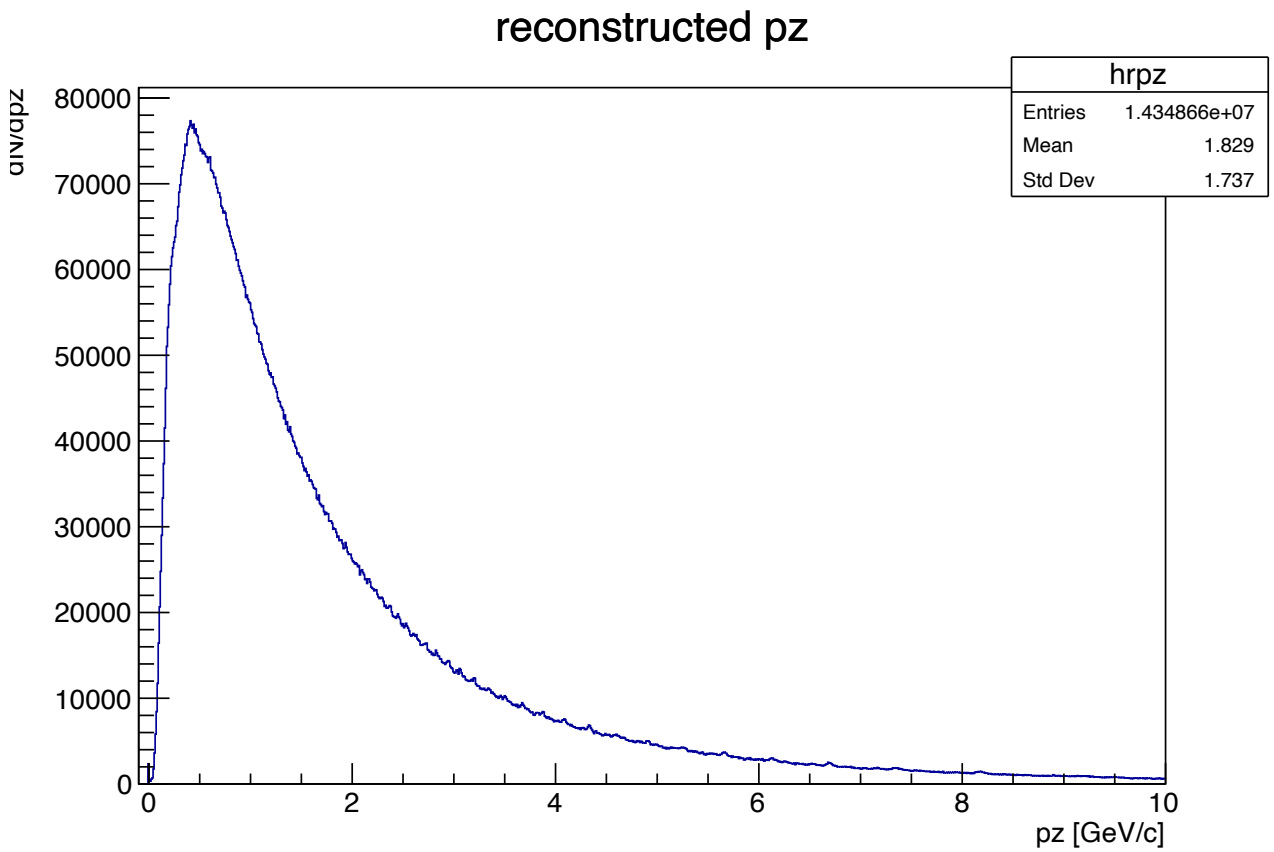
Momentums – e.g., p_y



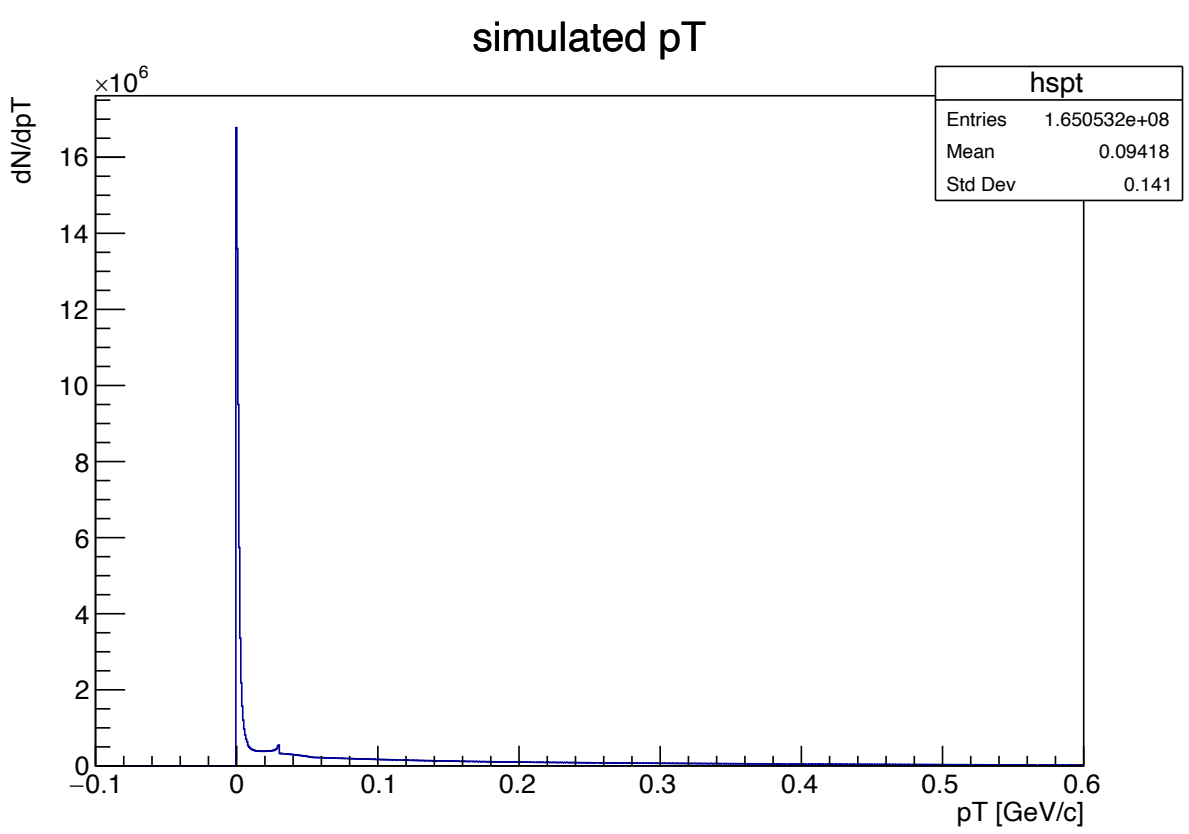


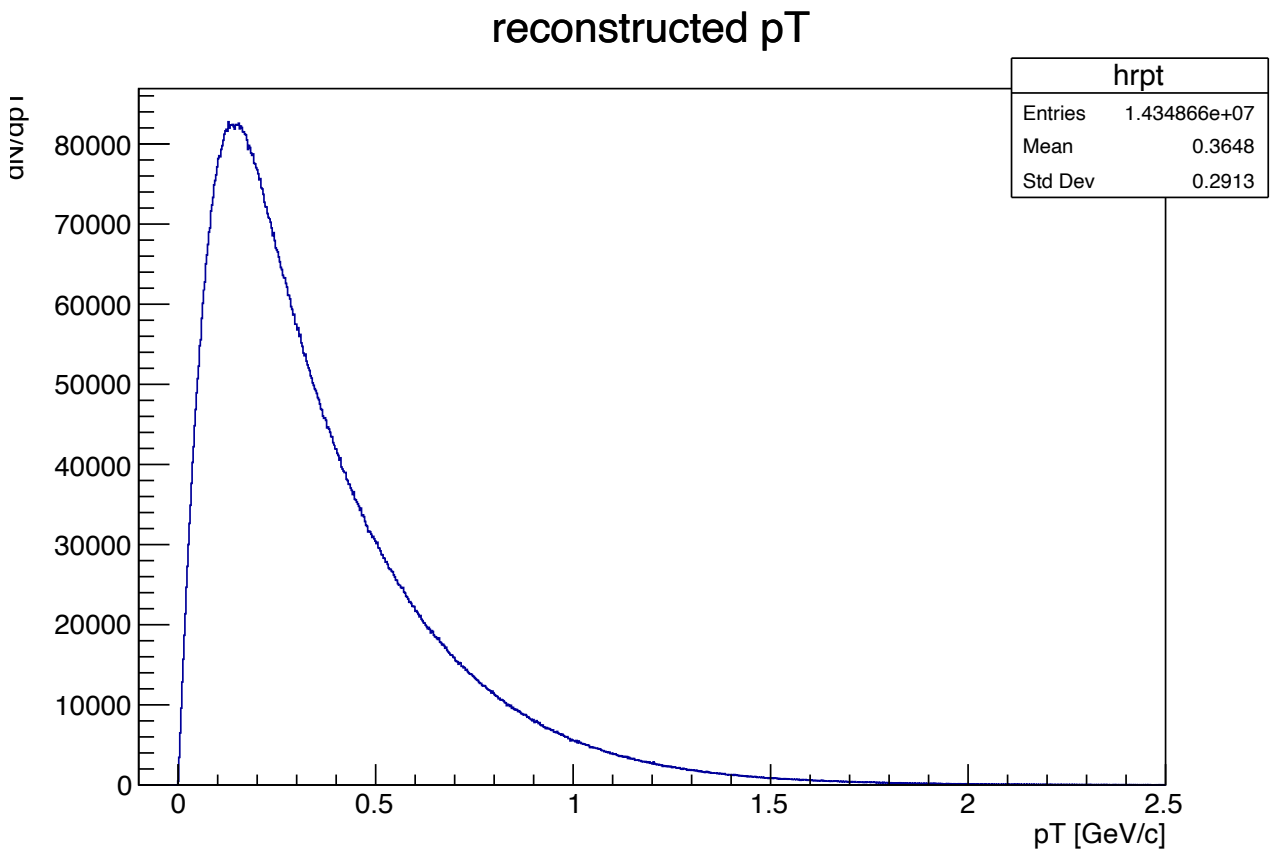
Momentums – e.g., p_z



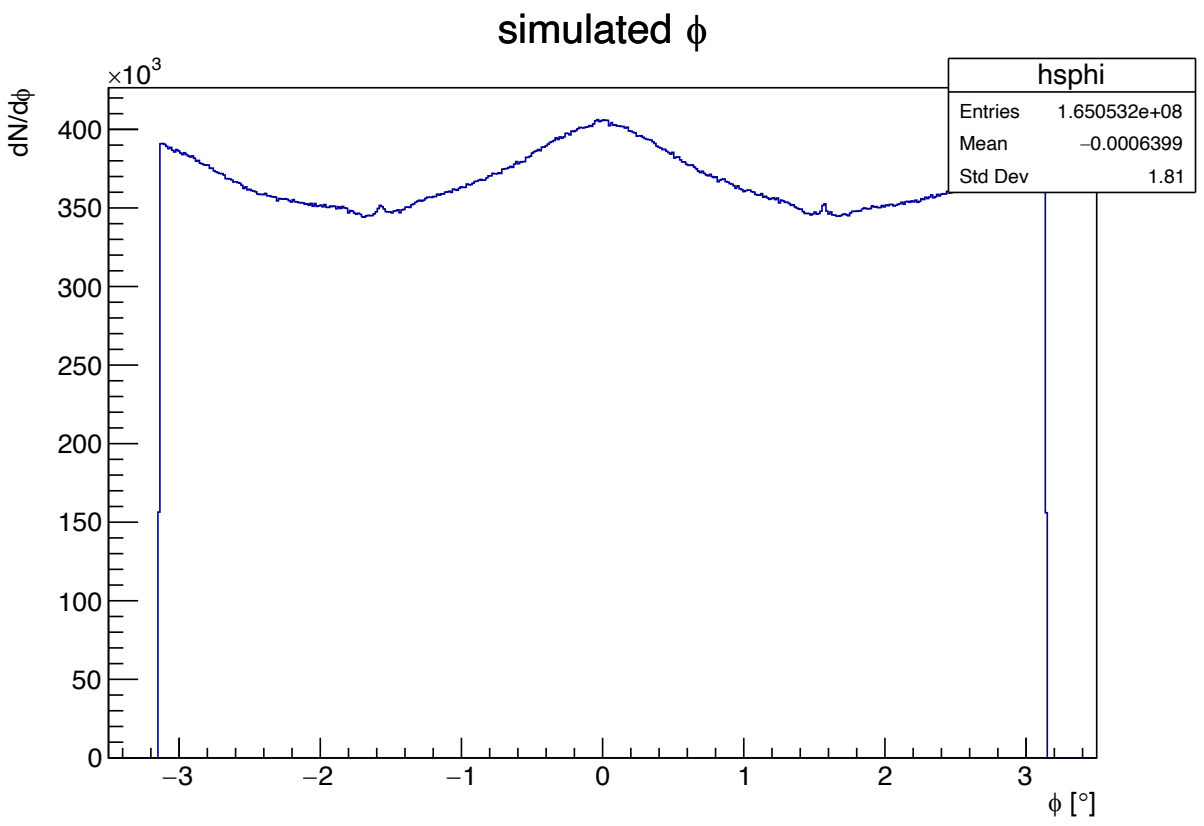


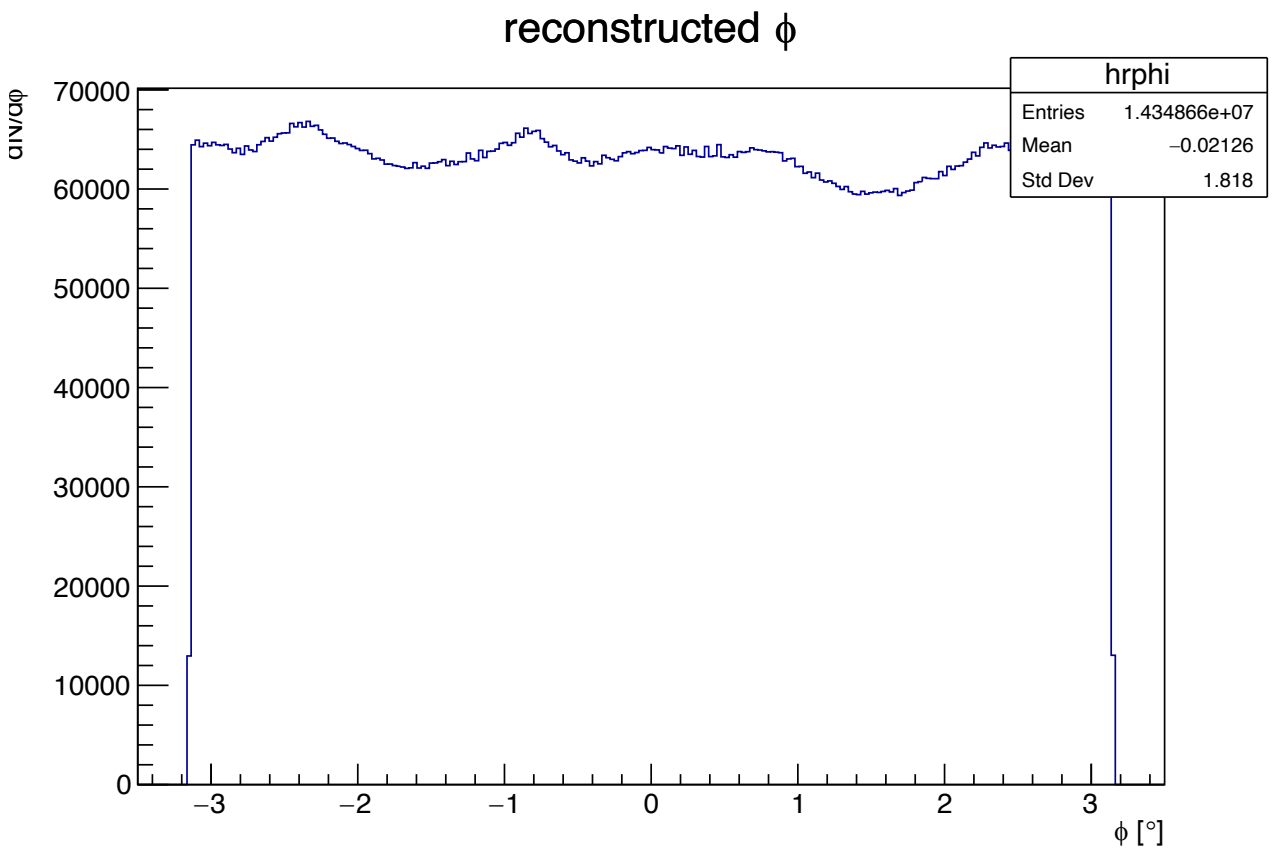
Momentums – e.g., p_T



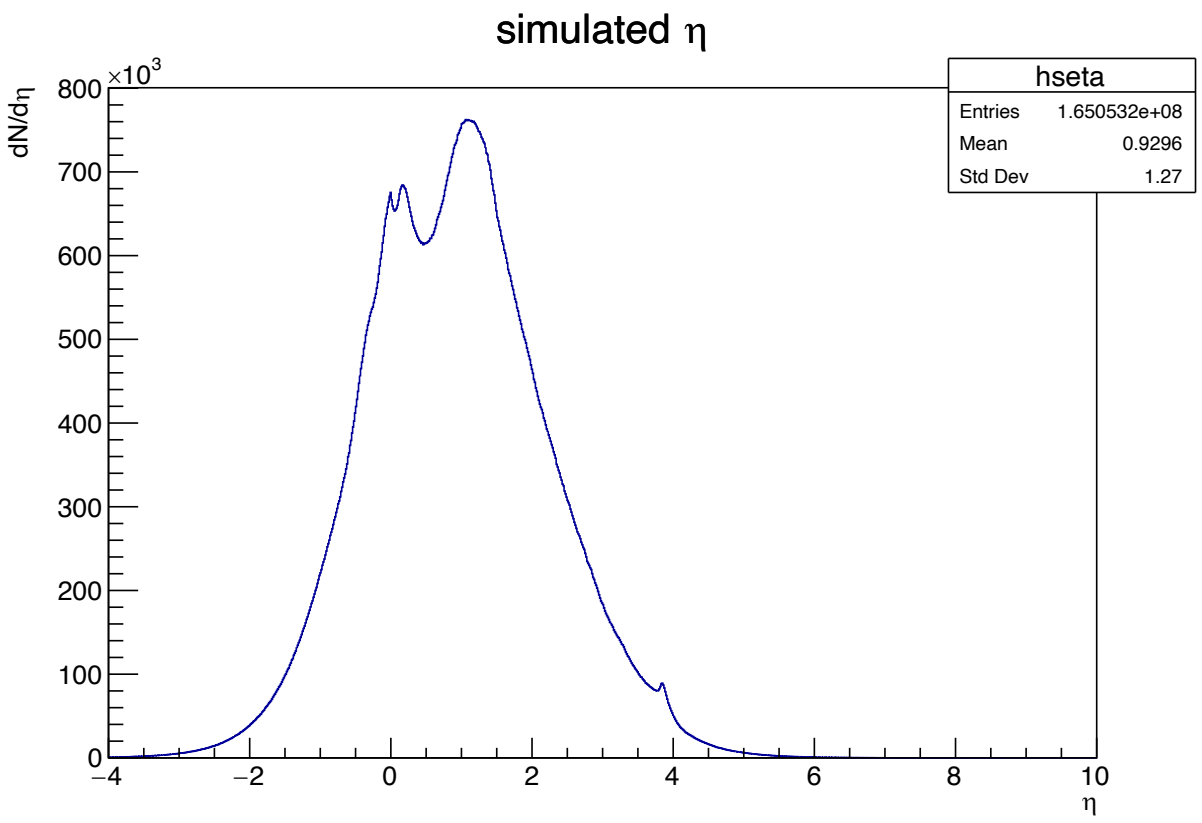


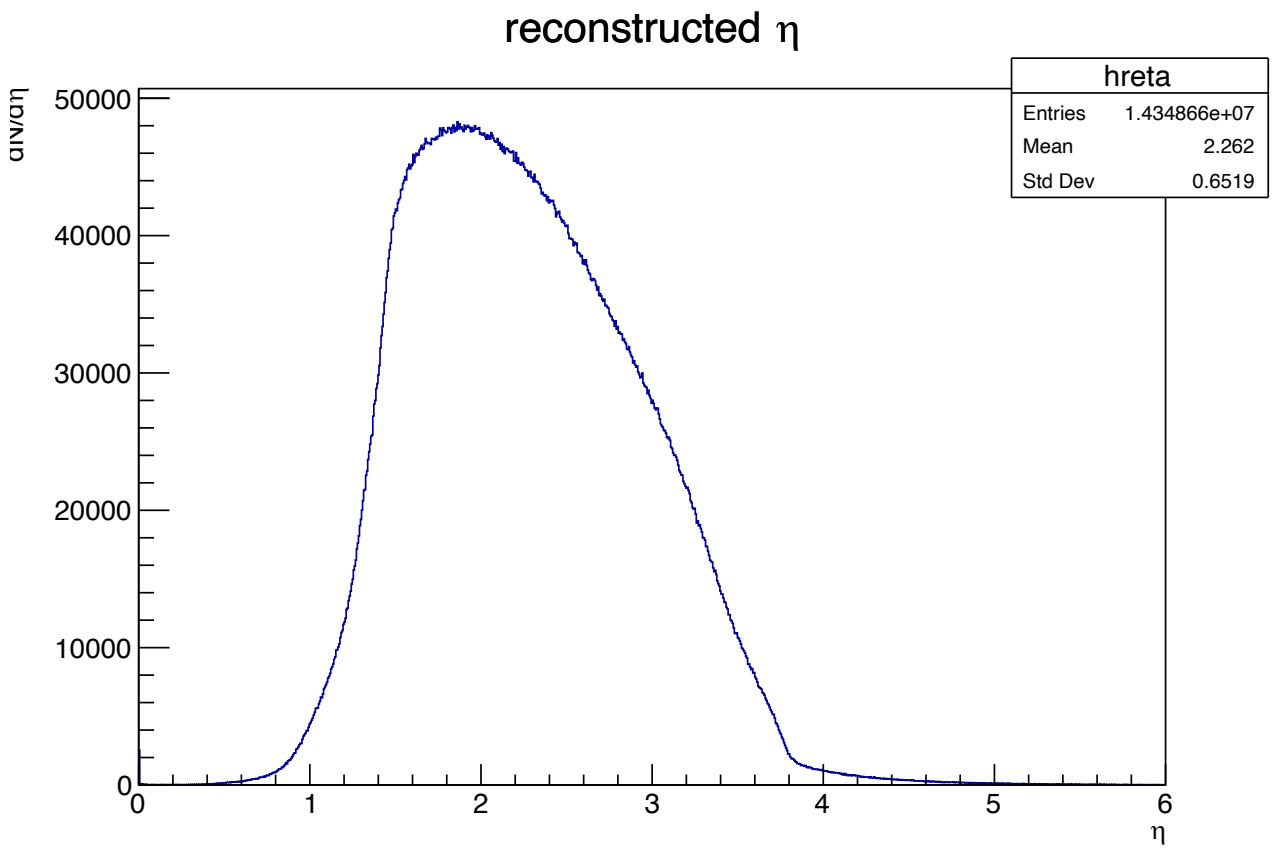
Azimuthal angle



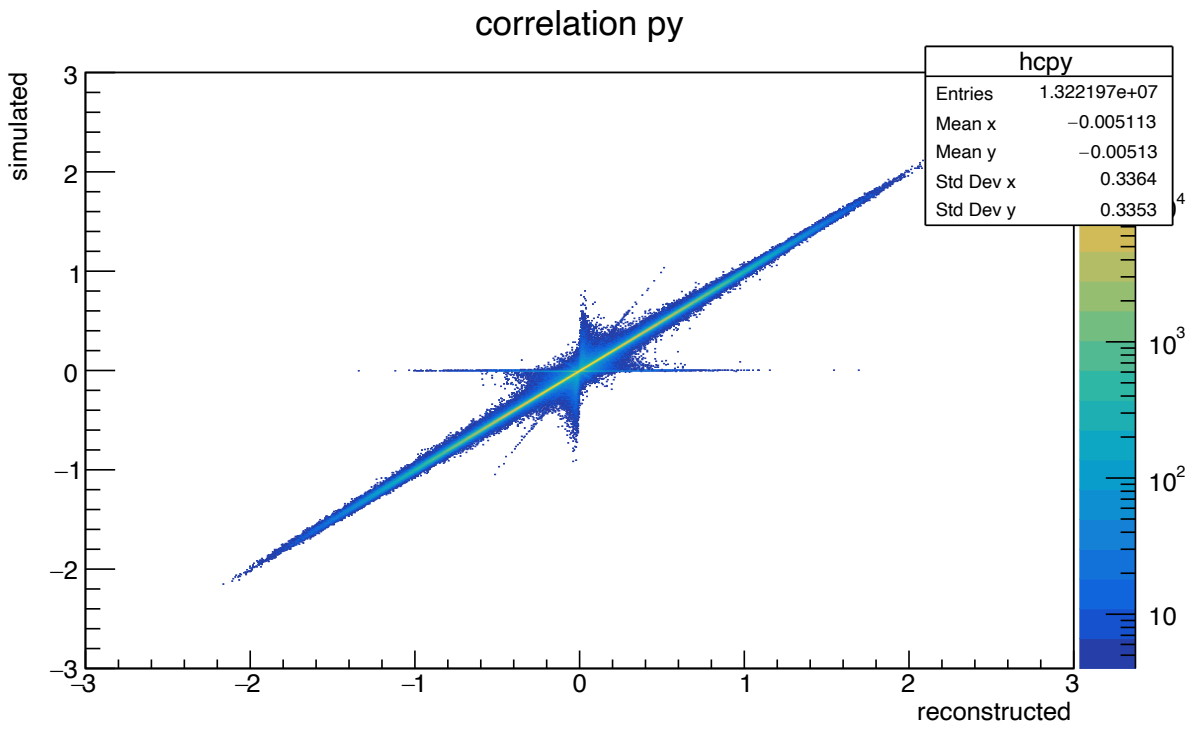


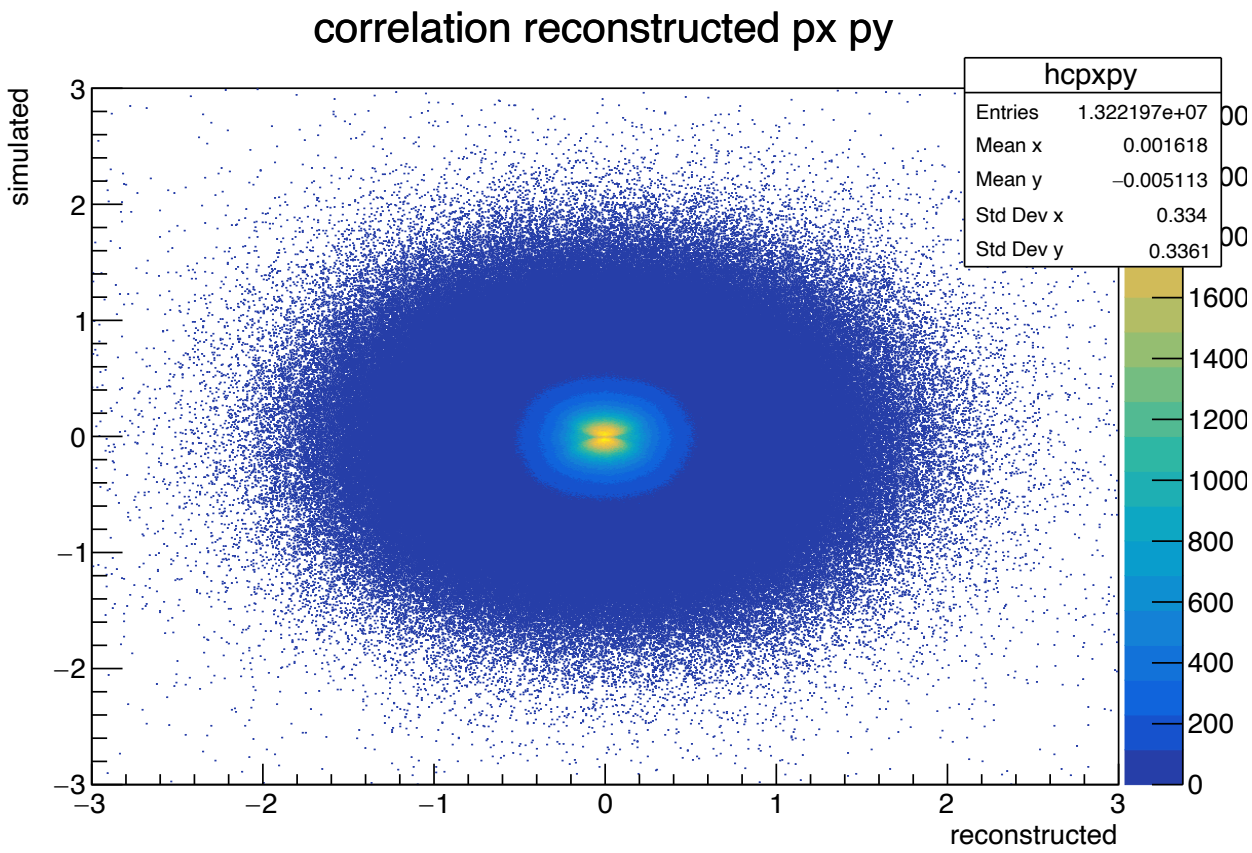
Pseudorapidity



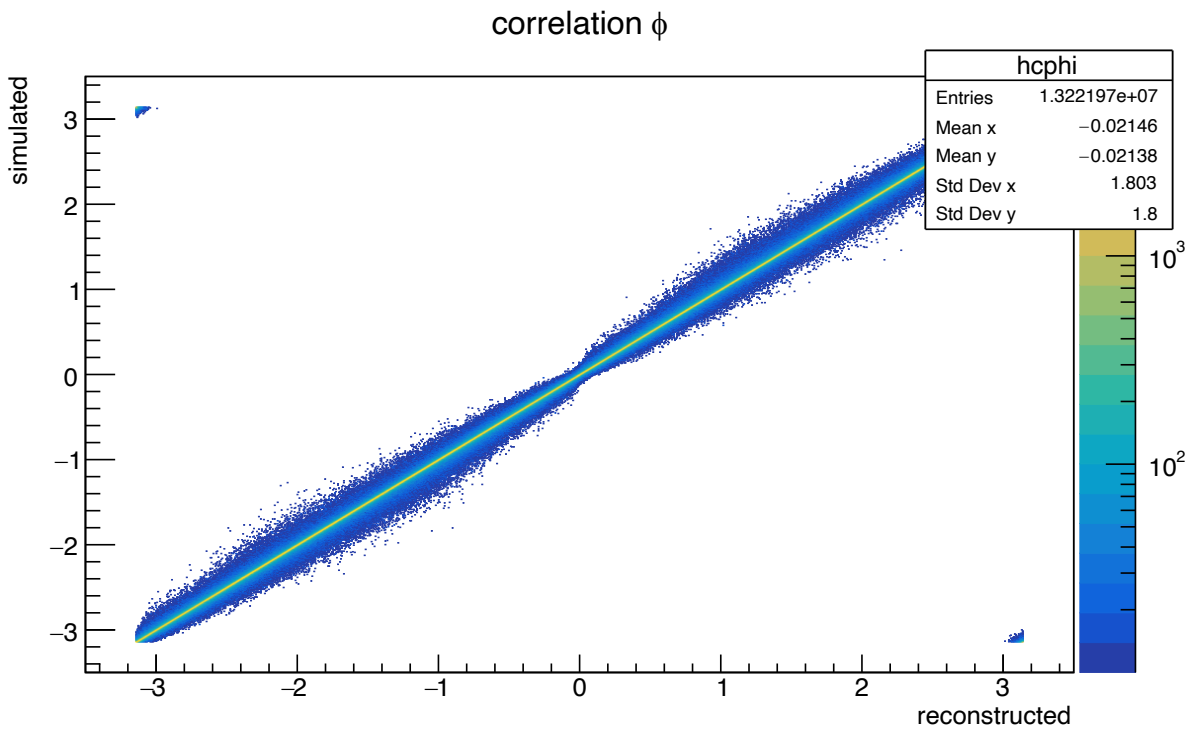


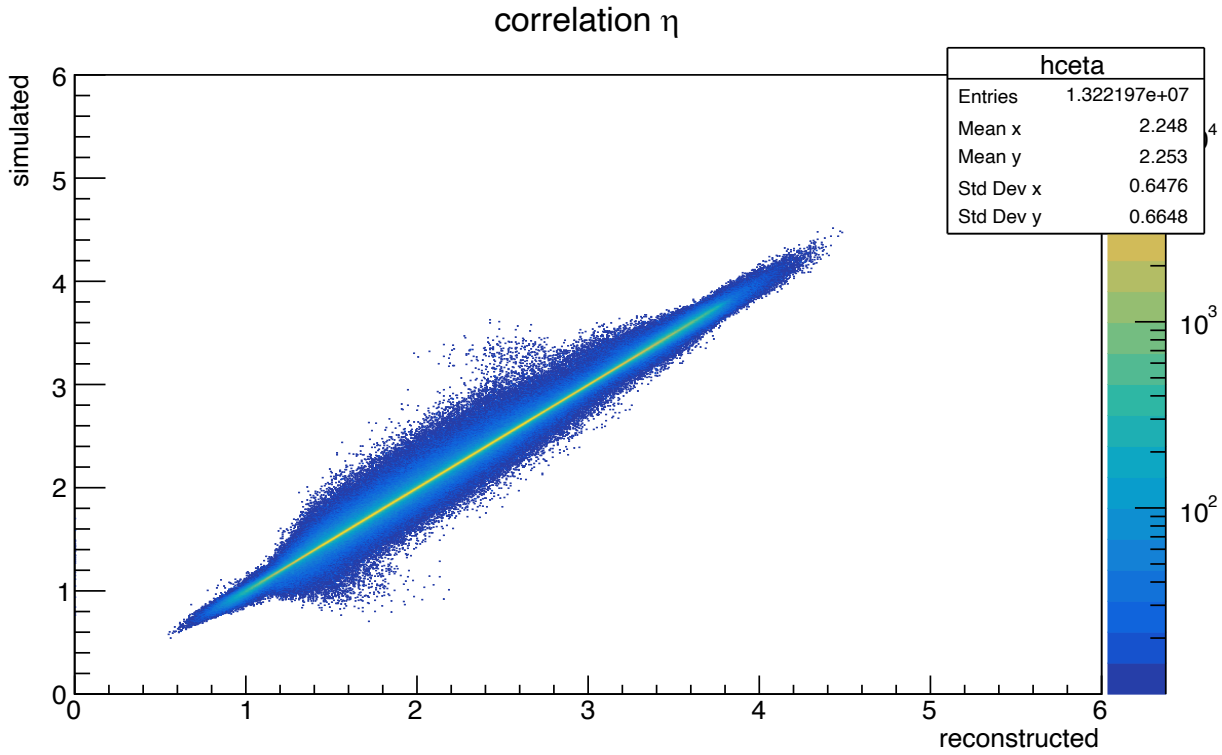
Correlations: sim-rec p_y, rec p_x- p_y



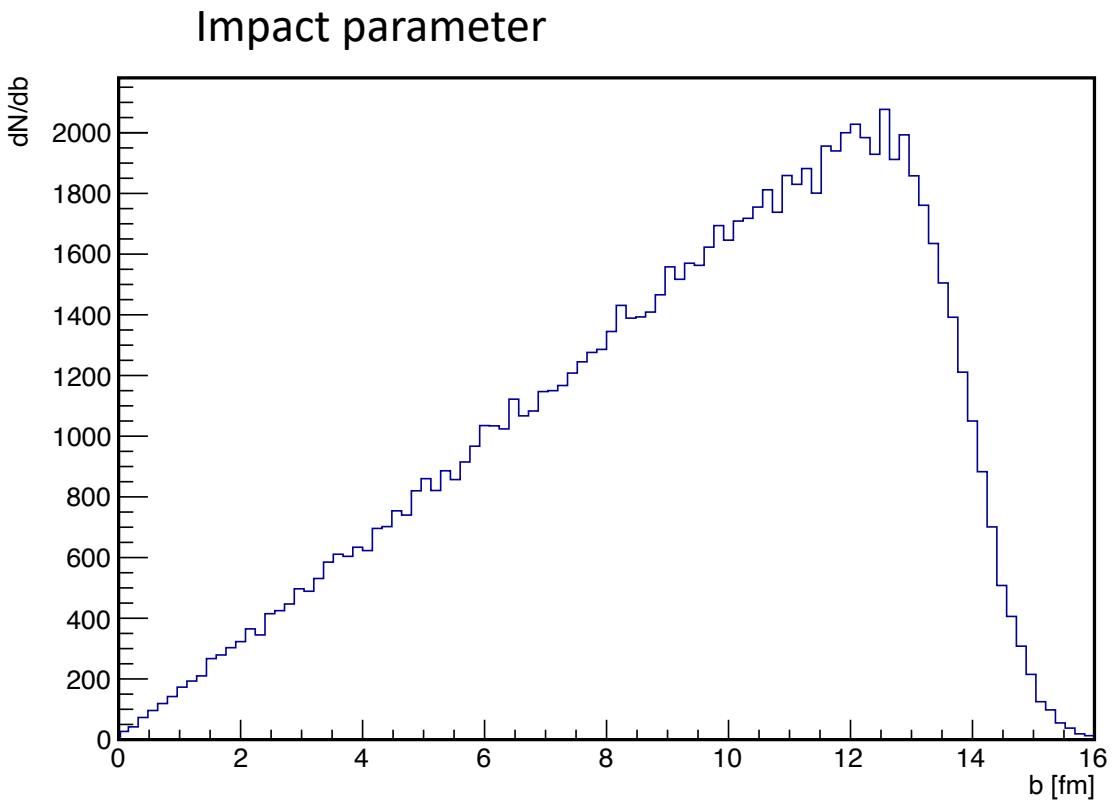


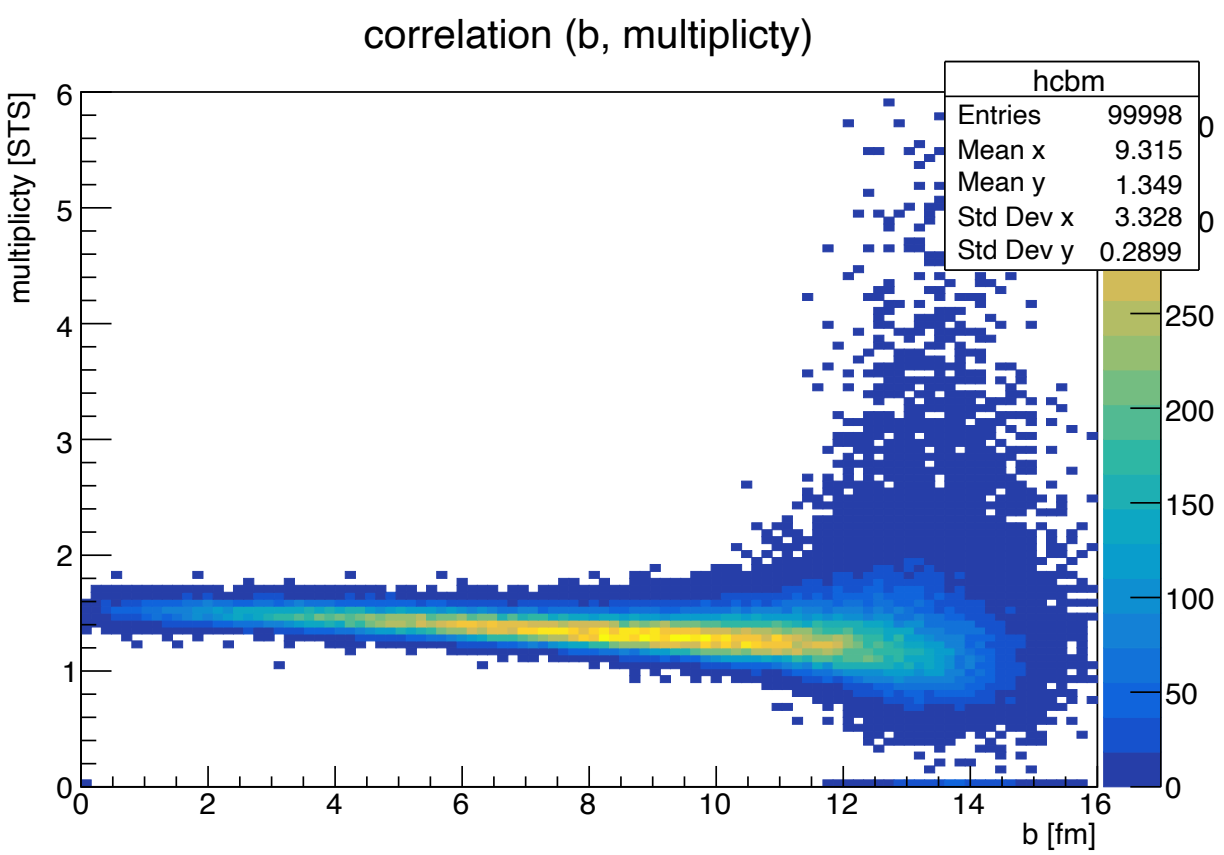
Correlations: sim –rec azimuthal angle, sim-rec psuedorapidity





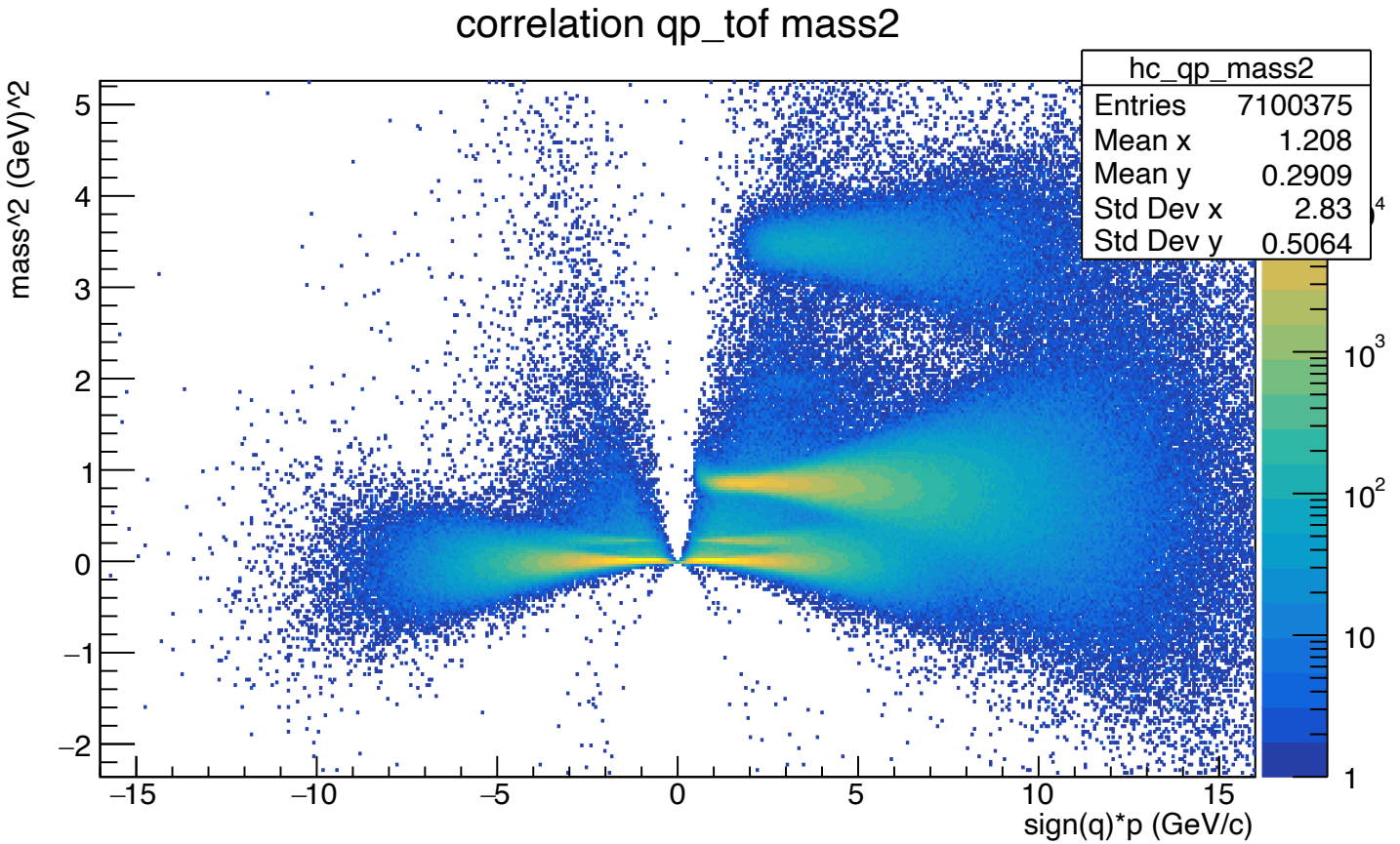
Correlations: impact factor - multiplicty





Correlations: sign(charge)*momentum – mass^2

Important for reconstruction of charged particles (more in Jan's work)

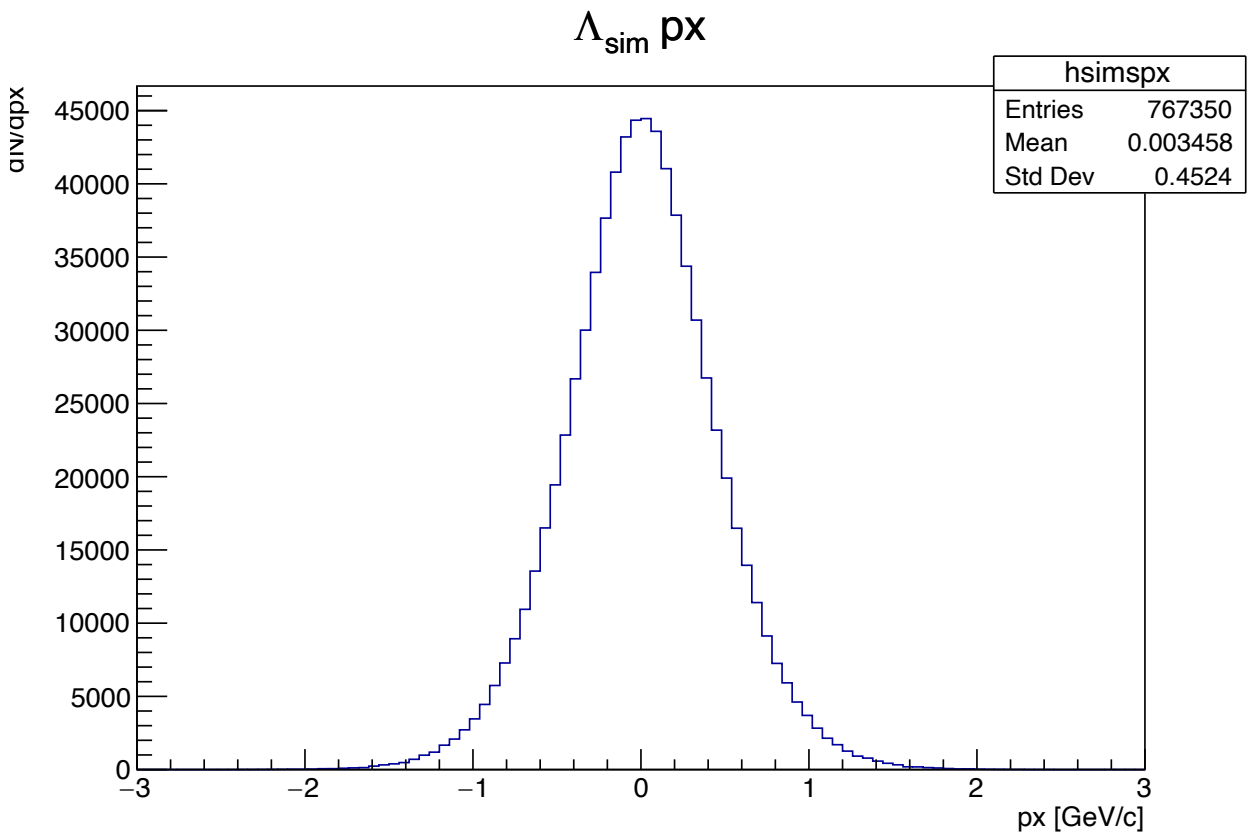


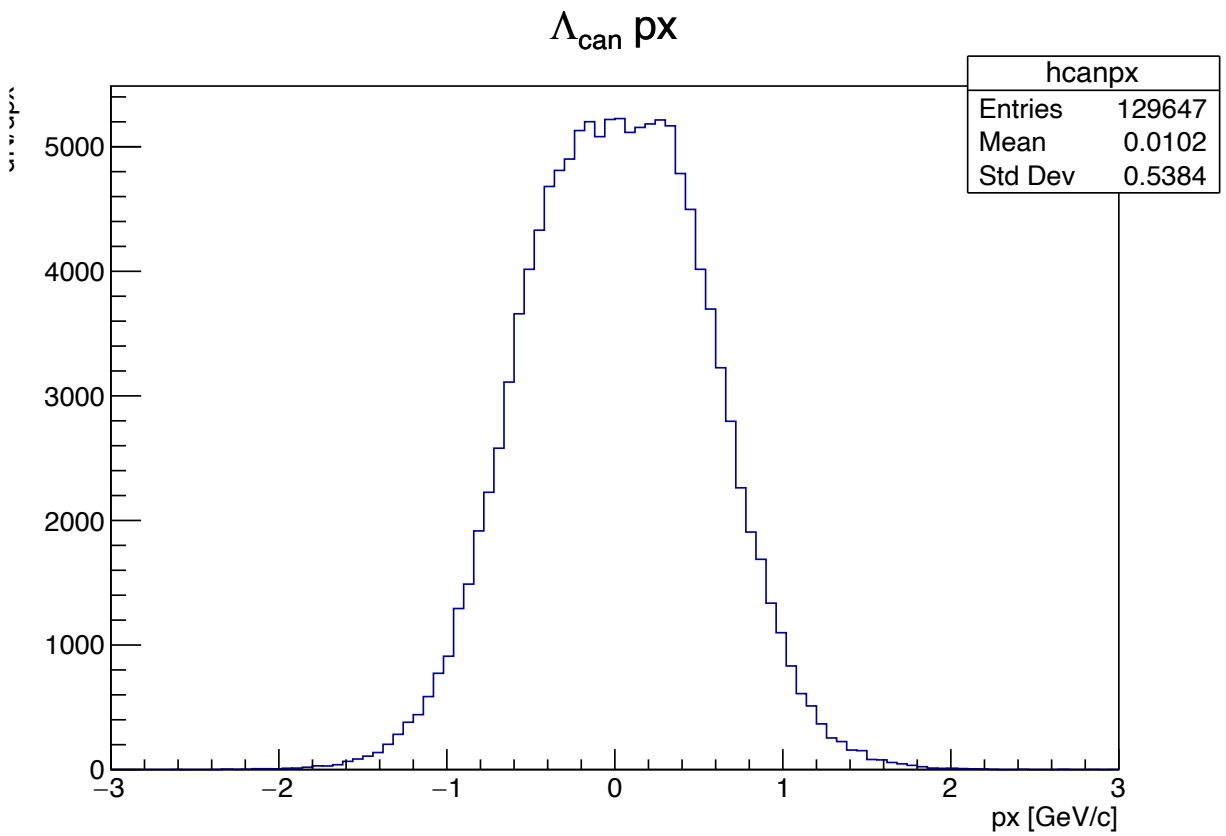
2. PFSimple – framework for short-lived particles reconstruction

- Installing software
- Making first histograms from GEANT4 simulations (auau/12agev/mbias/sis100_electron_apr20_target_25_mkm/TGeant4) – for 100 files, each 1000 events – TBD: histograms from 5.000.000 events

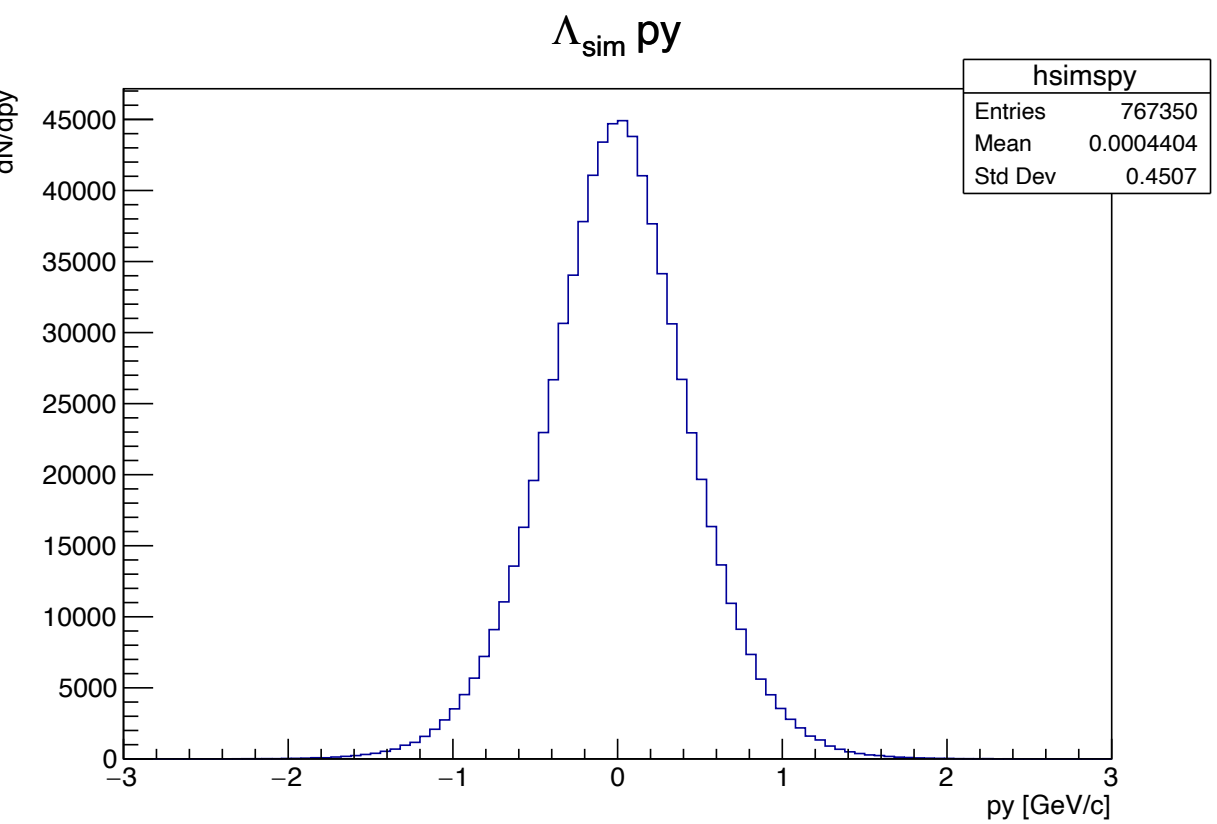
- Running our own macros on batch farm (slurm)
- Histograms shown for 0.99825 cos cut

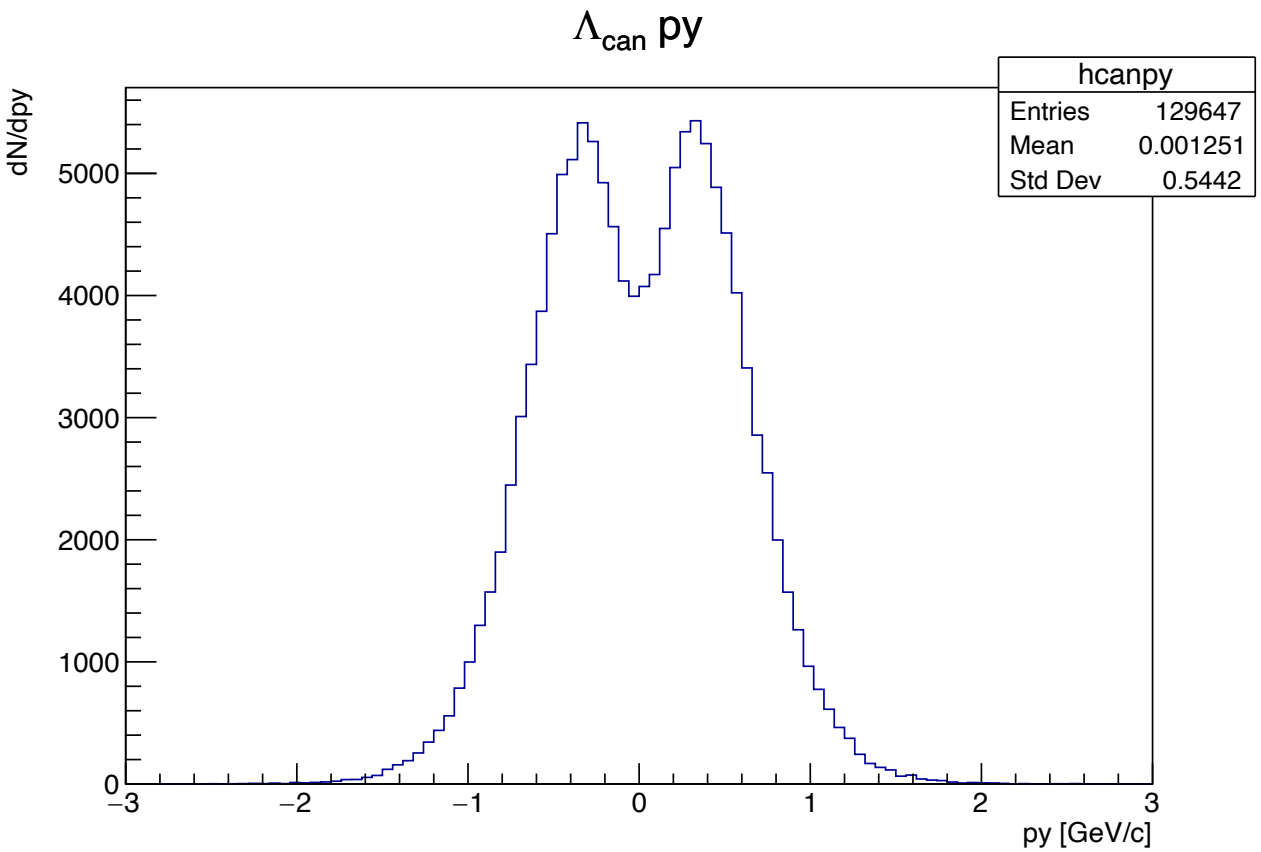
Momentums – e.g., p_x



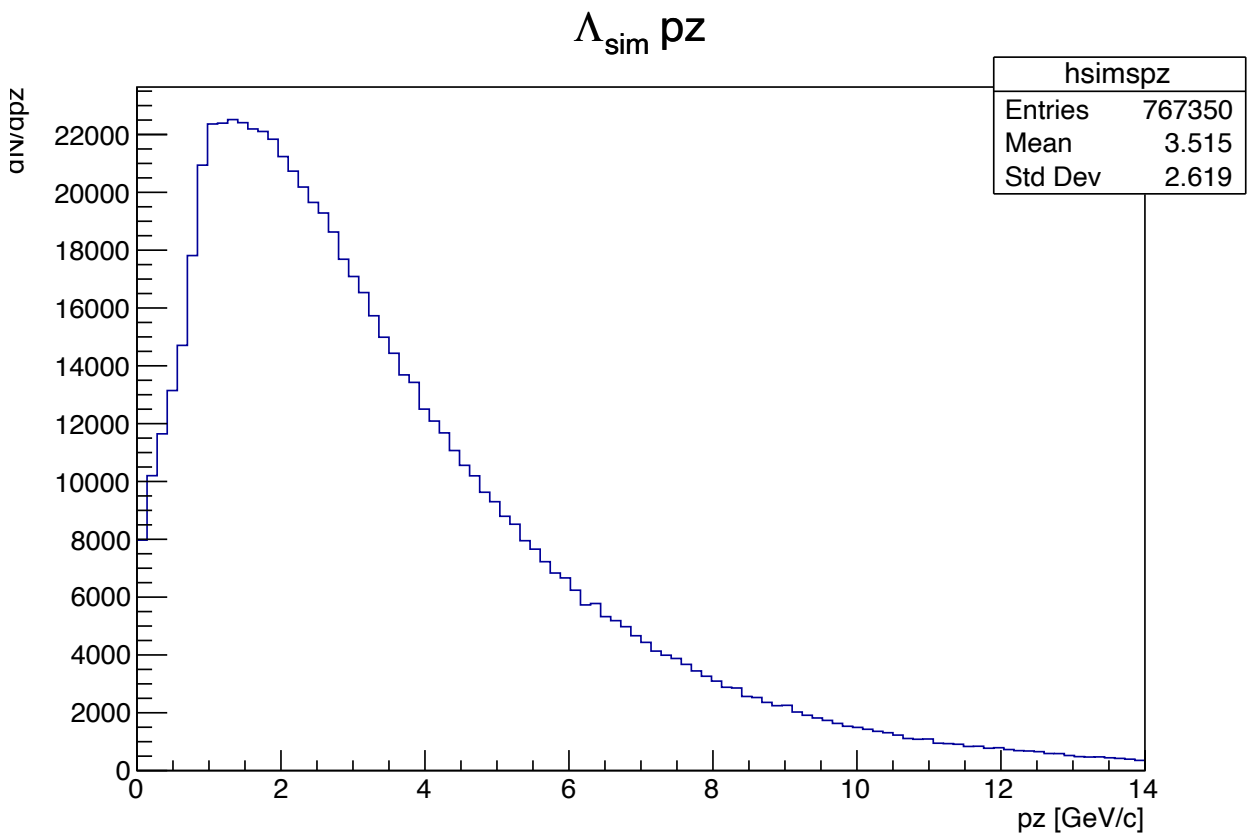


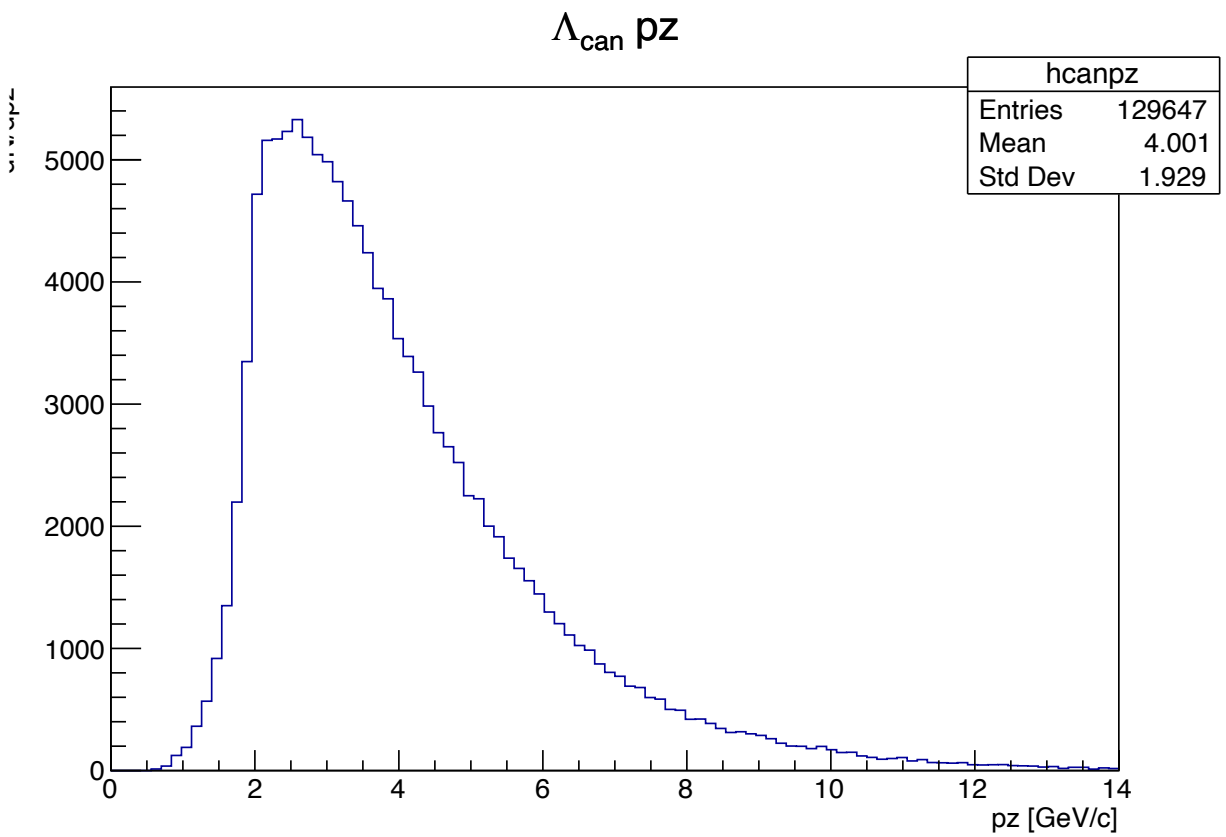
Momentums – e.g., p_y (sic!)



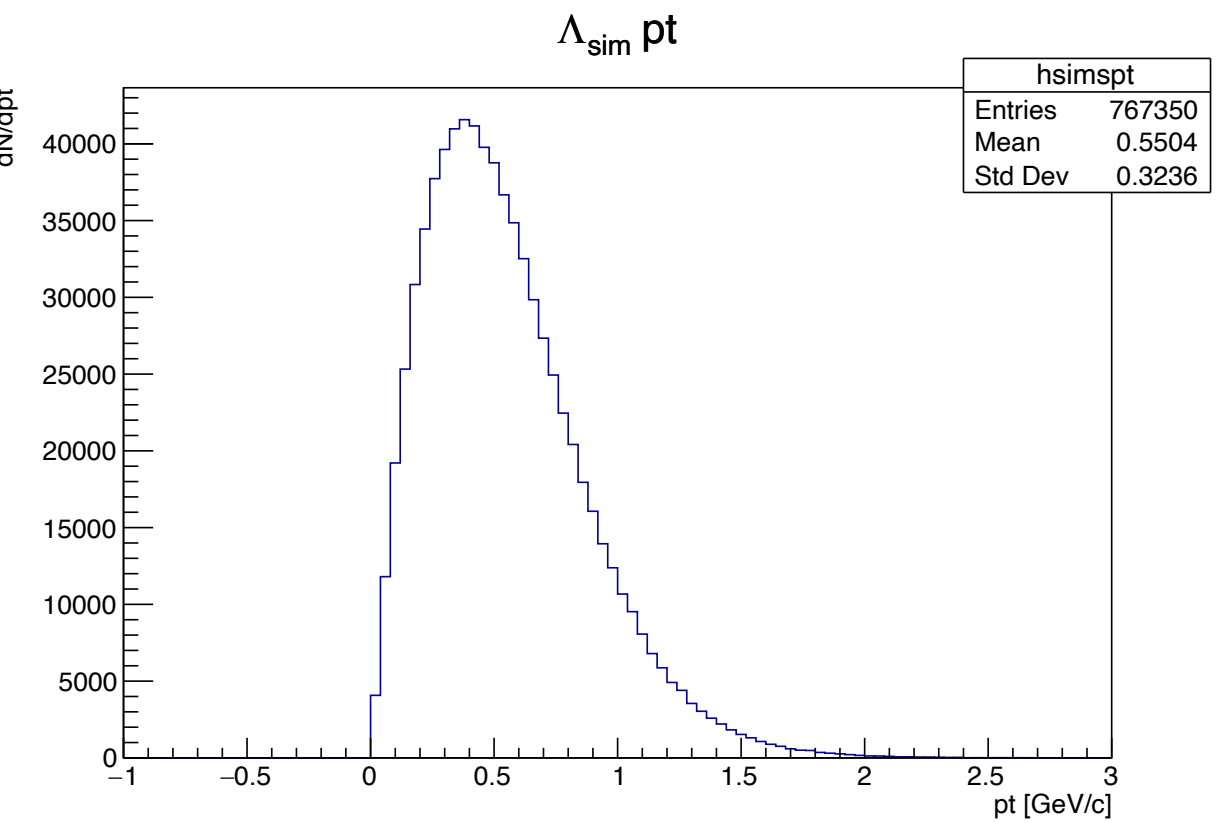


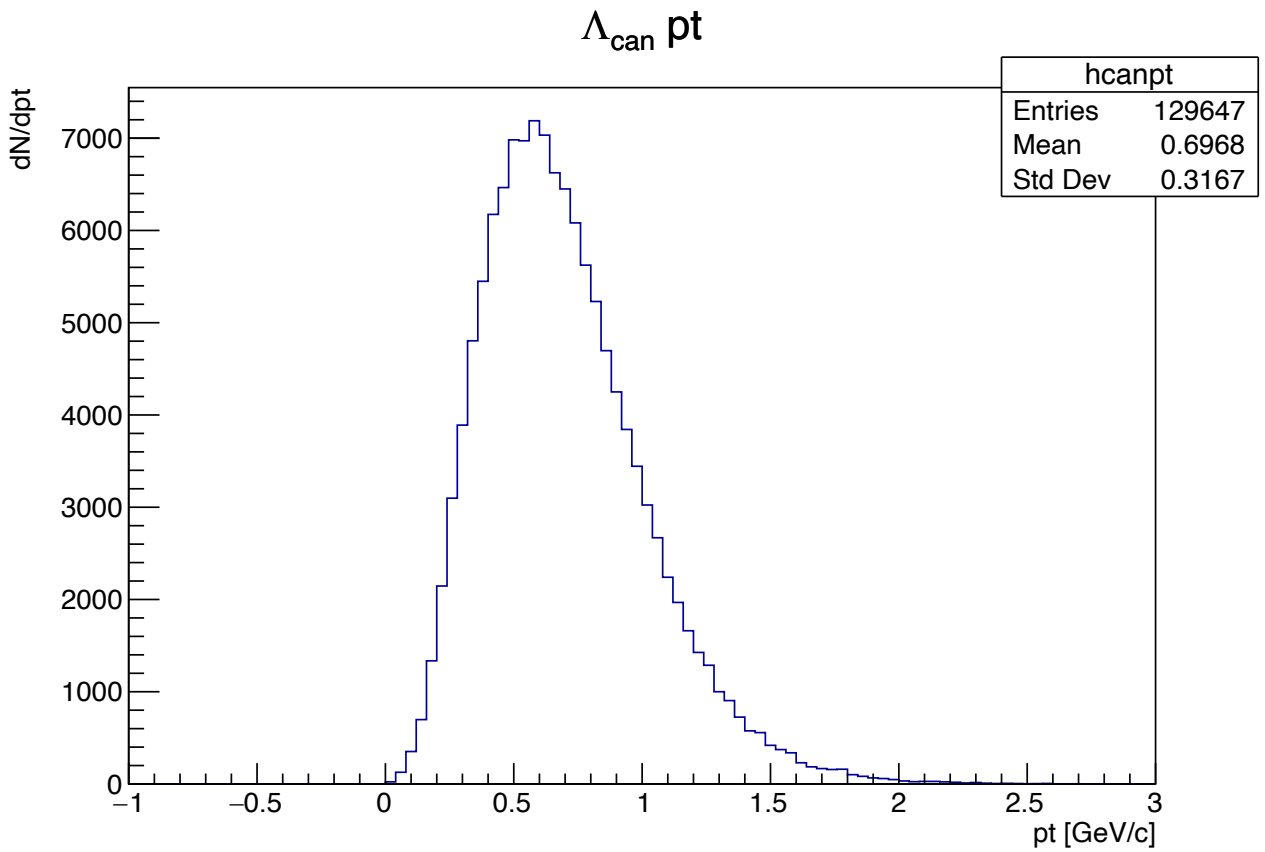
Momentums – e.g., p_z



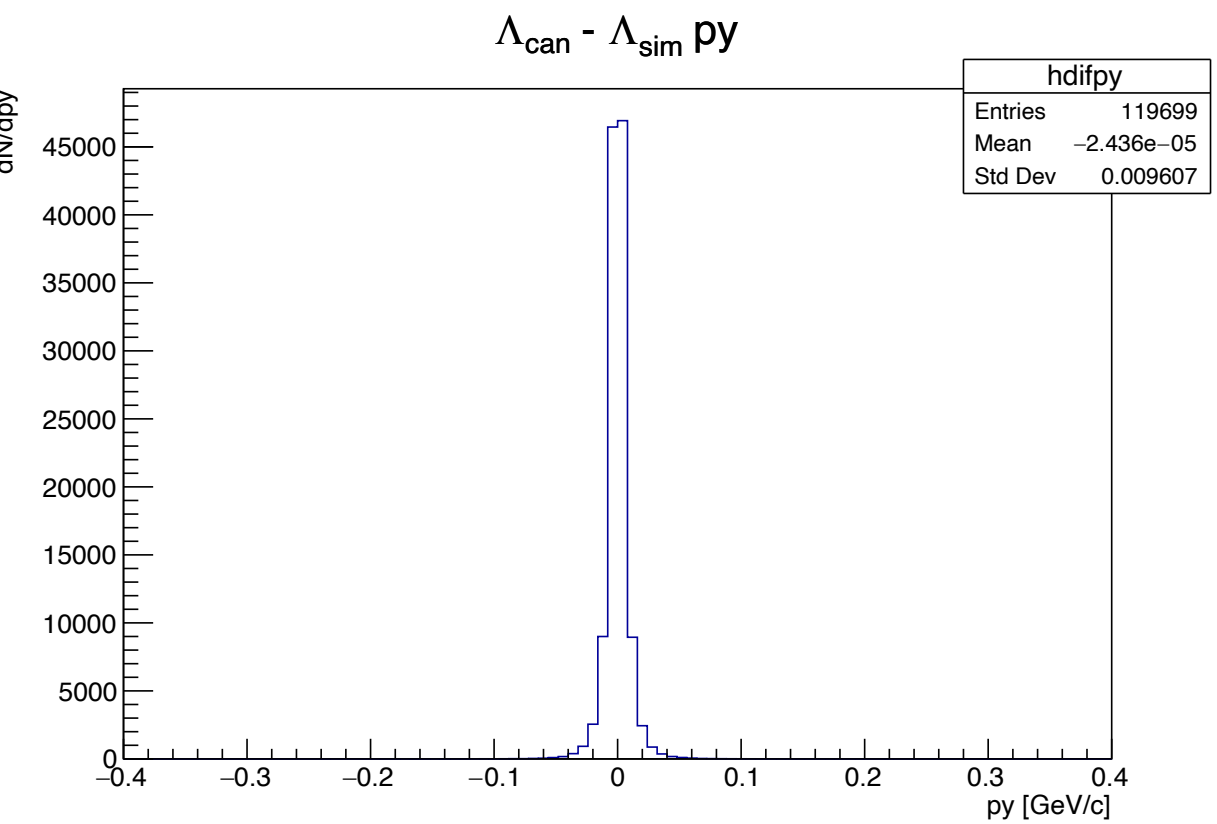


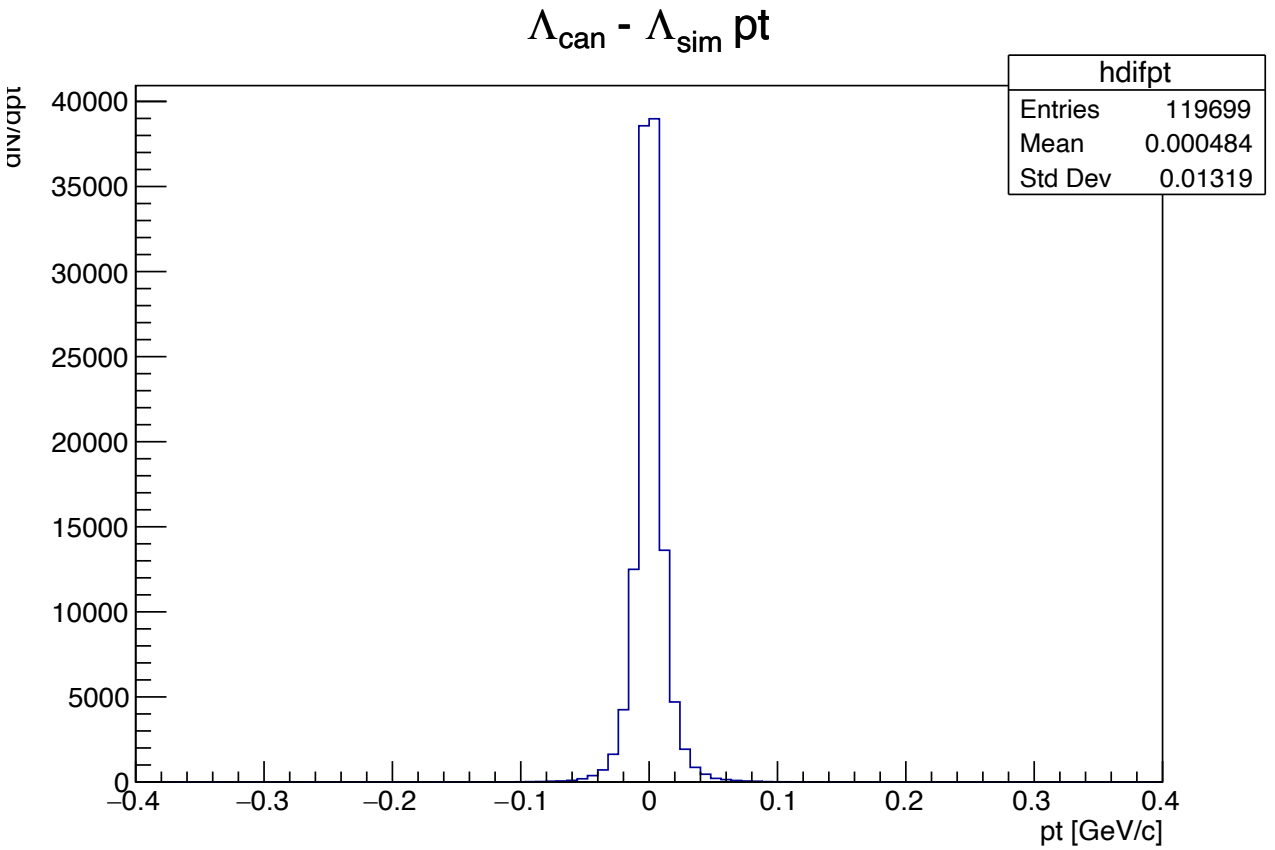
Momentums – e.g., p_T



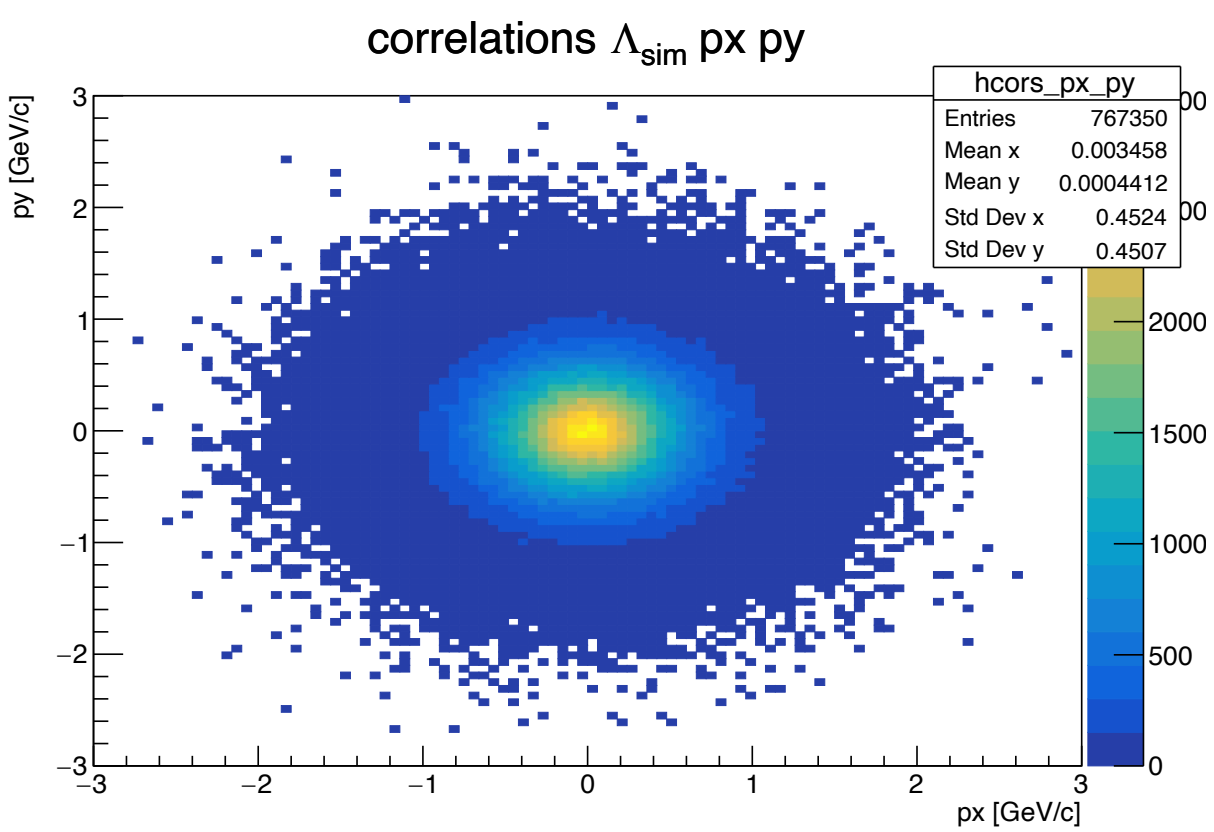


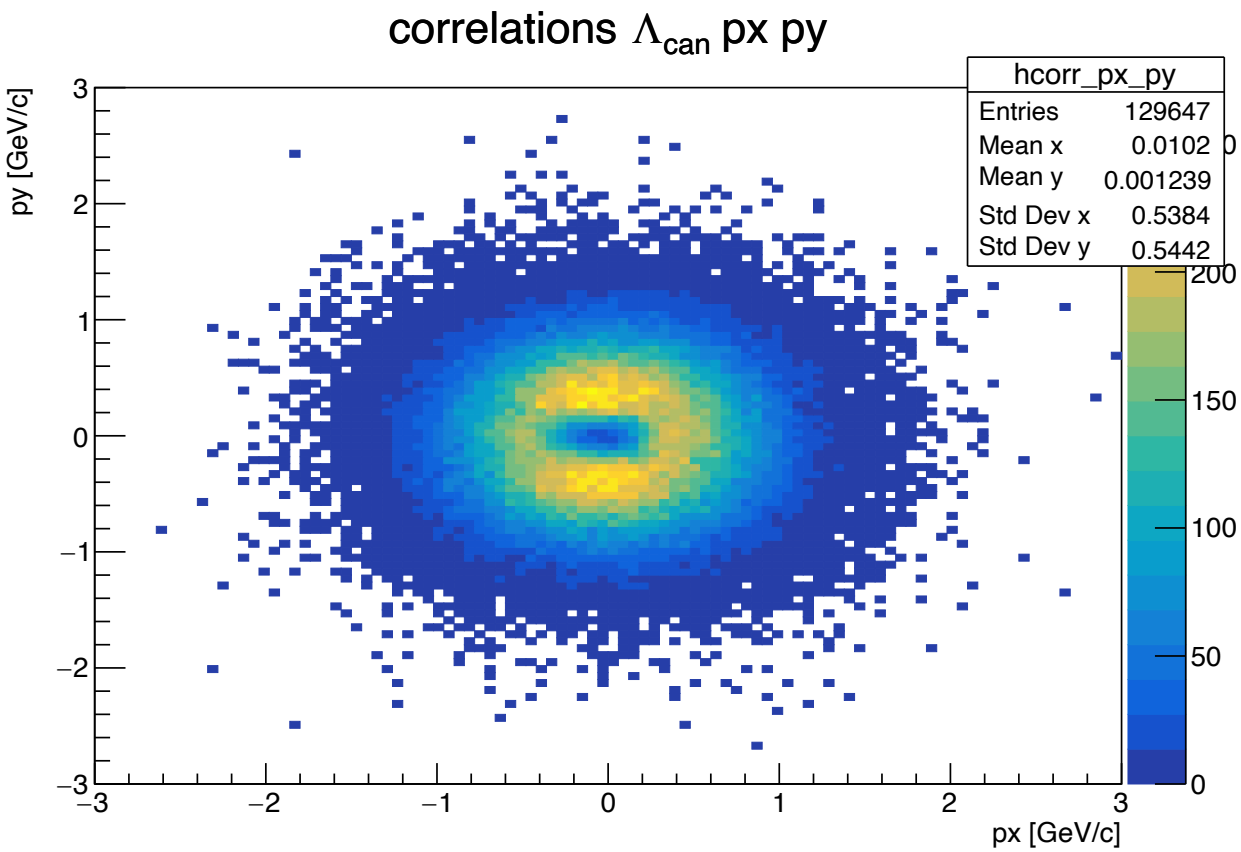
Momentums – difference between candidates (reconstructed) and simulated



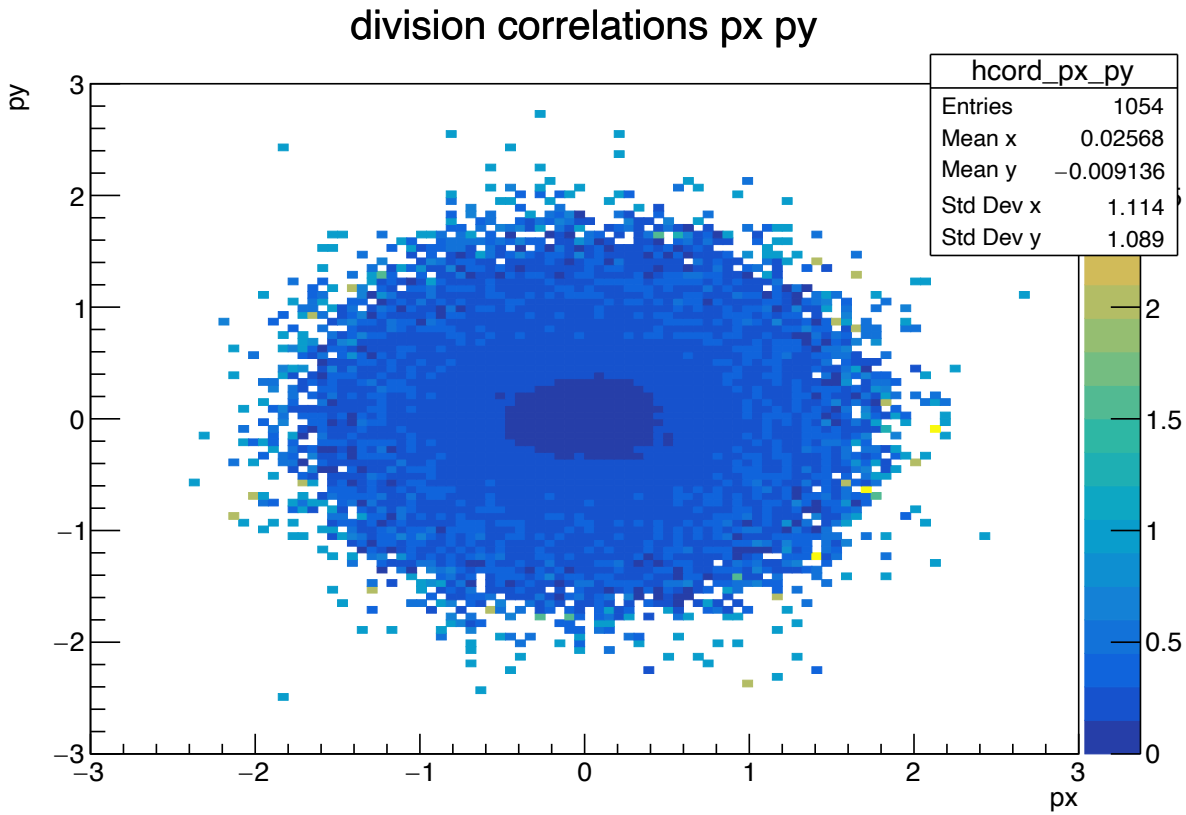


Correlations: rec-sim p_x- p_y

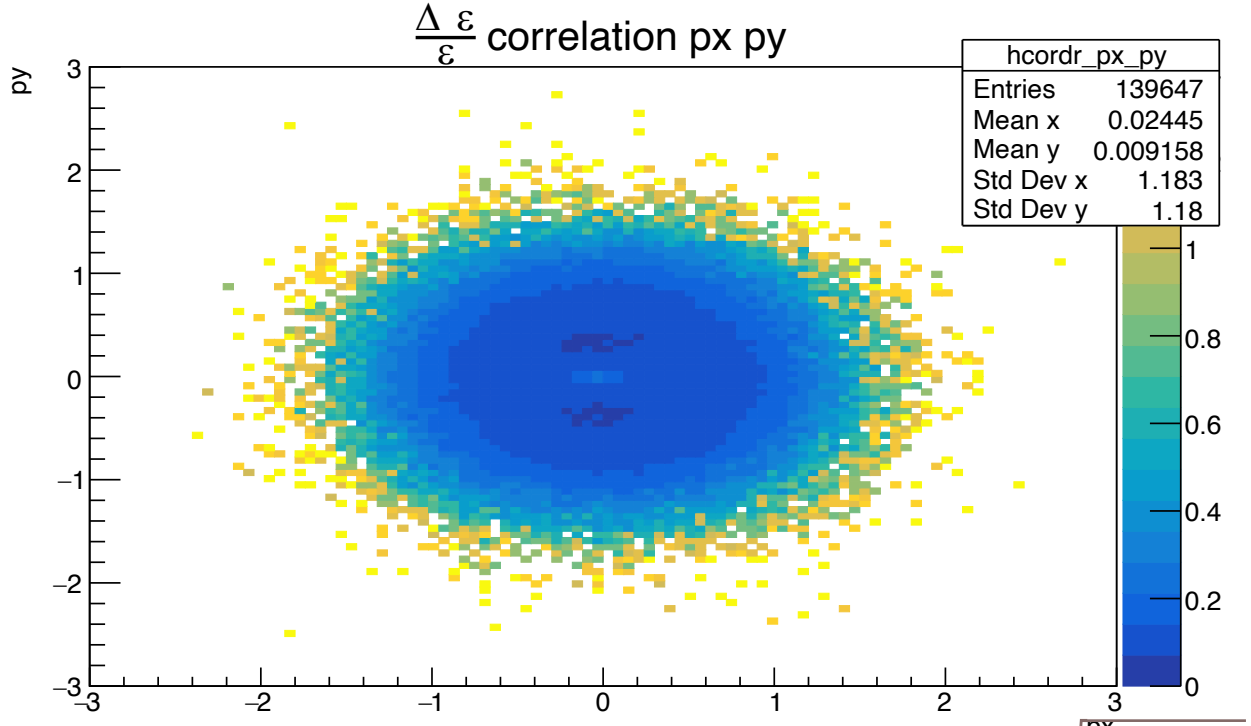




Correlations: rec-sim p_x- p_y



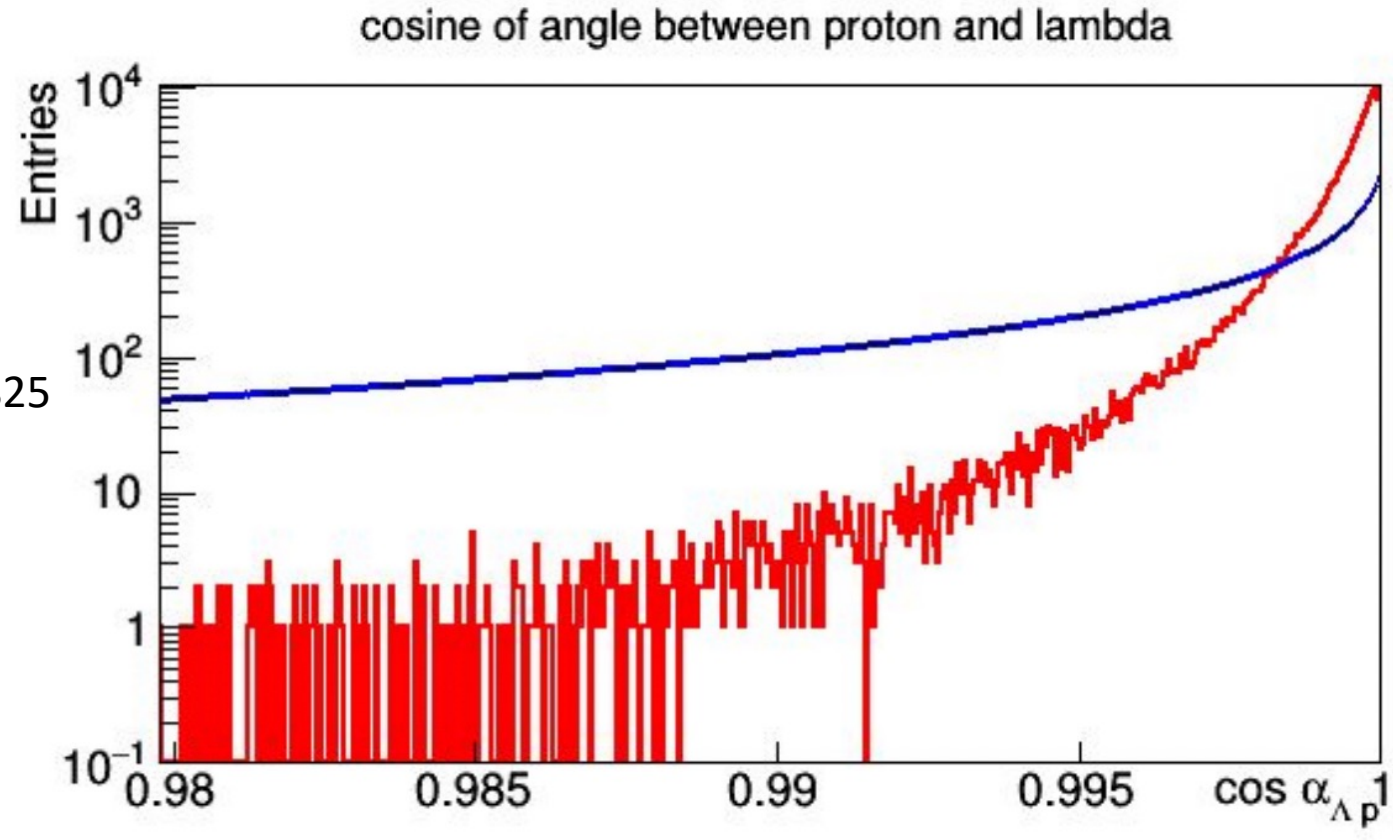
$$\varepsilon = \frac{N_r}{N_S} \qquad \Delta N = \sqrt{N}$$



$$\Delta\varepsilon^2 = \left(\frac{\delta\varepsilon}{\delta N_s}\right)^2 \cdot \Delta N_s^2 + \left(\frac{\delta\varepsilon}{\delta N_r}\right)^2 \cdot \Delta N_r^2 \Rightarrow \quad \frac{\Delta\varepsilon}{\varepsilon} = \sqrt{\frac{1}{N_r} + \frac{1}{N_s}}$$

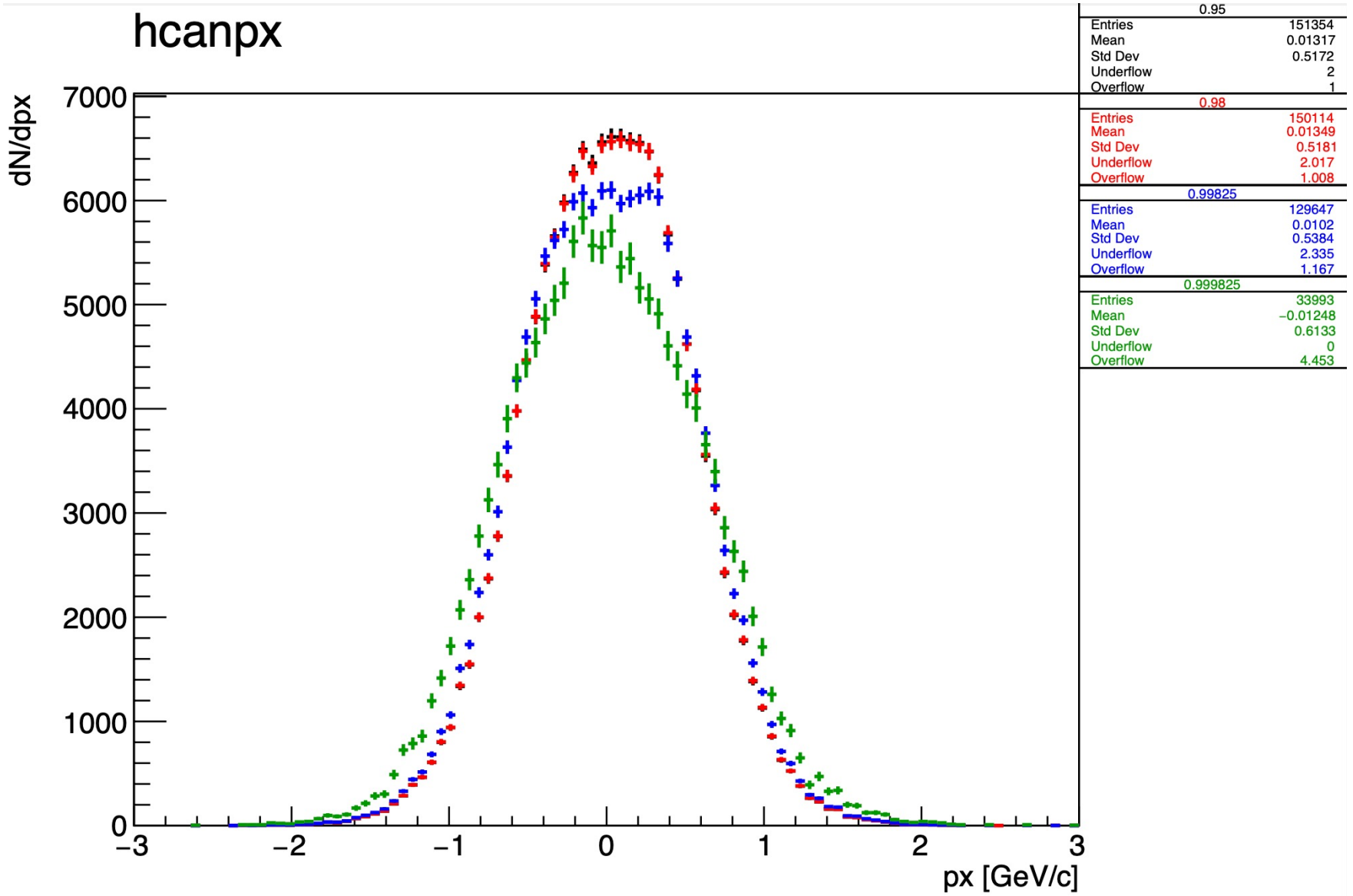
Cosine cut

- The value of cos $\alpha_{\{\Lambda\, p\}}$ has a big impact on the efficiency of the reconstruction method.
- The value used in the graphs above was 0.99825
- We can compare it with different values:

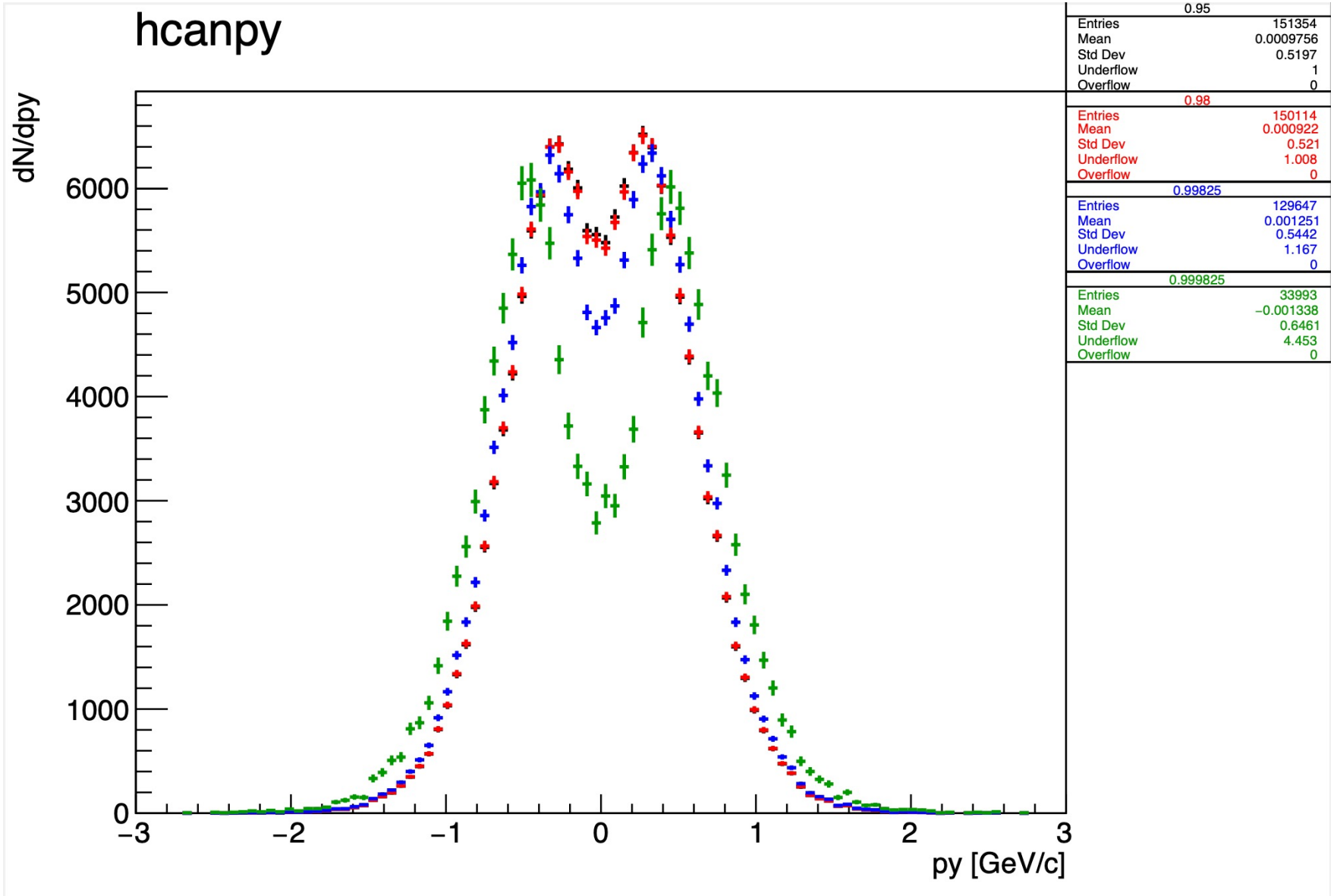


@ Oleksii Lubynets:
https://indico.gsi.de/event/10062/contributions/48045/attachments/33320/43053/PFSimple4Lambda_Highlights_36CM.pdf

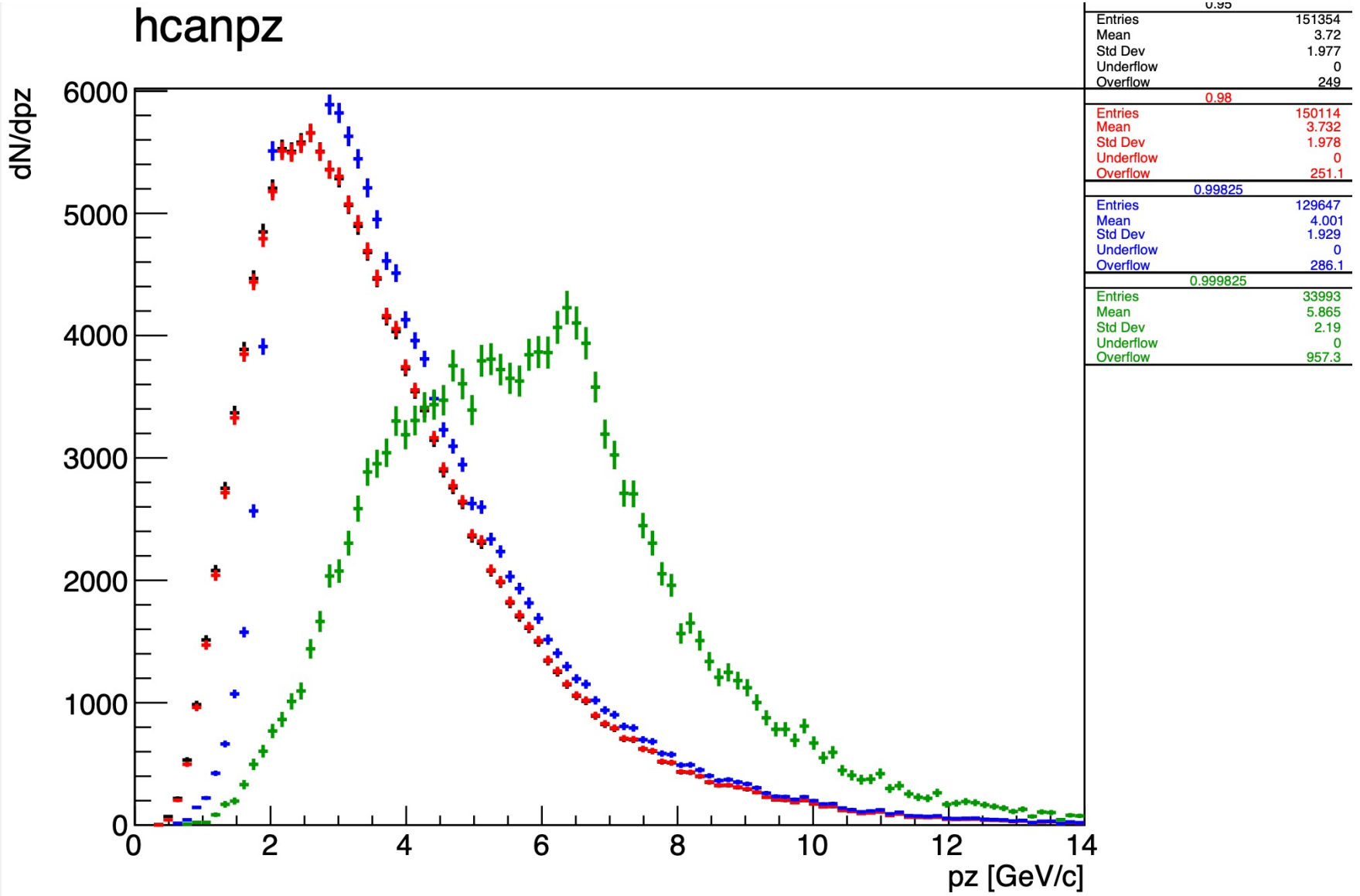
Momentums – e.g., p_x



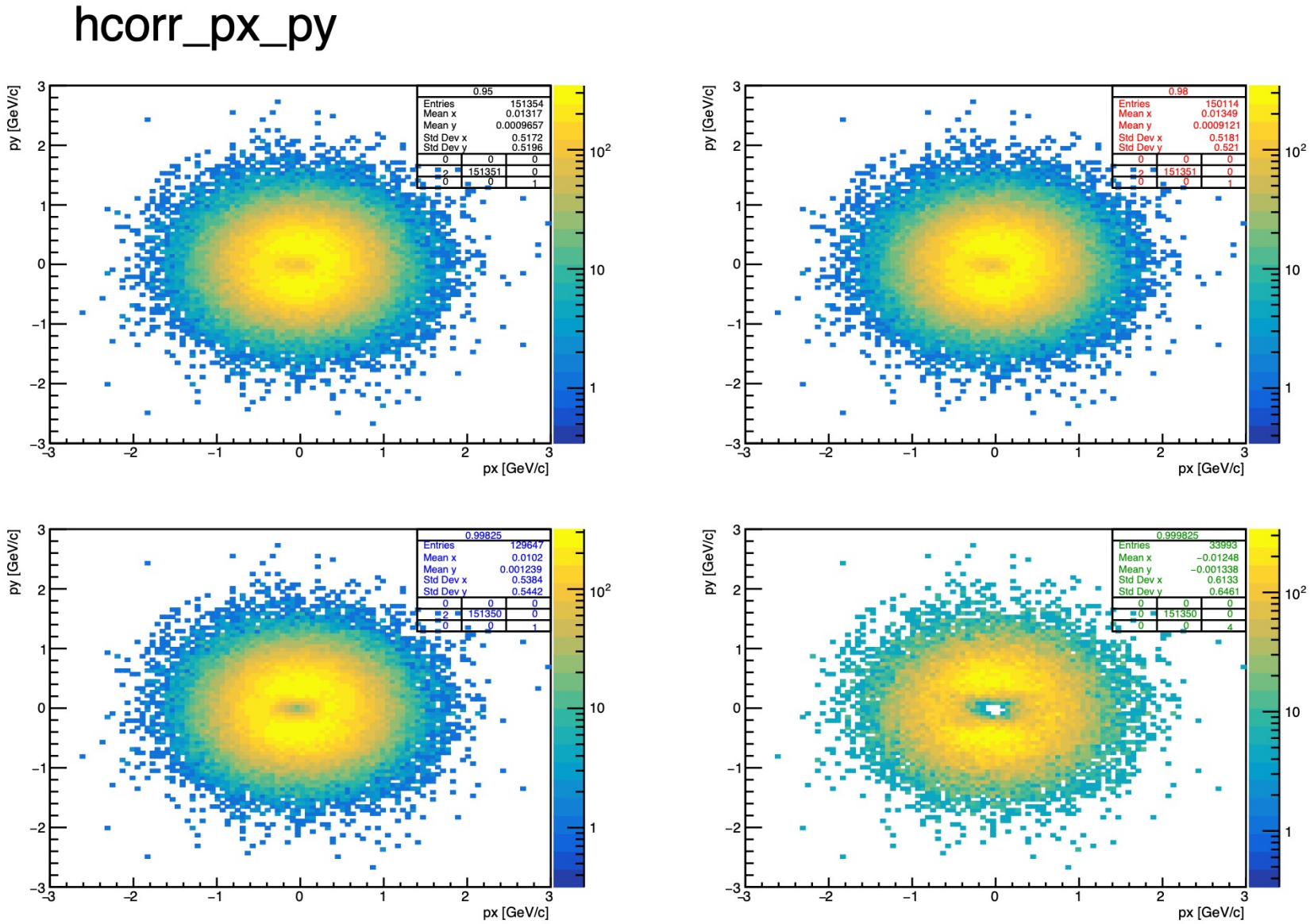
Momentums – e.g., p_y



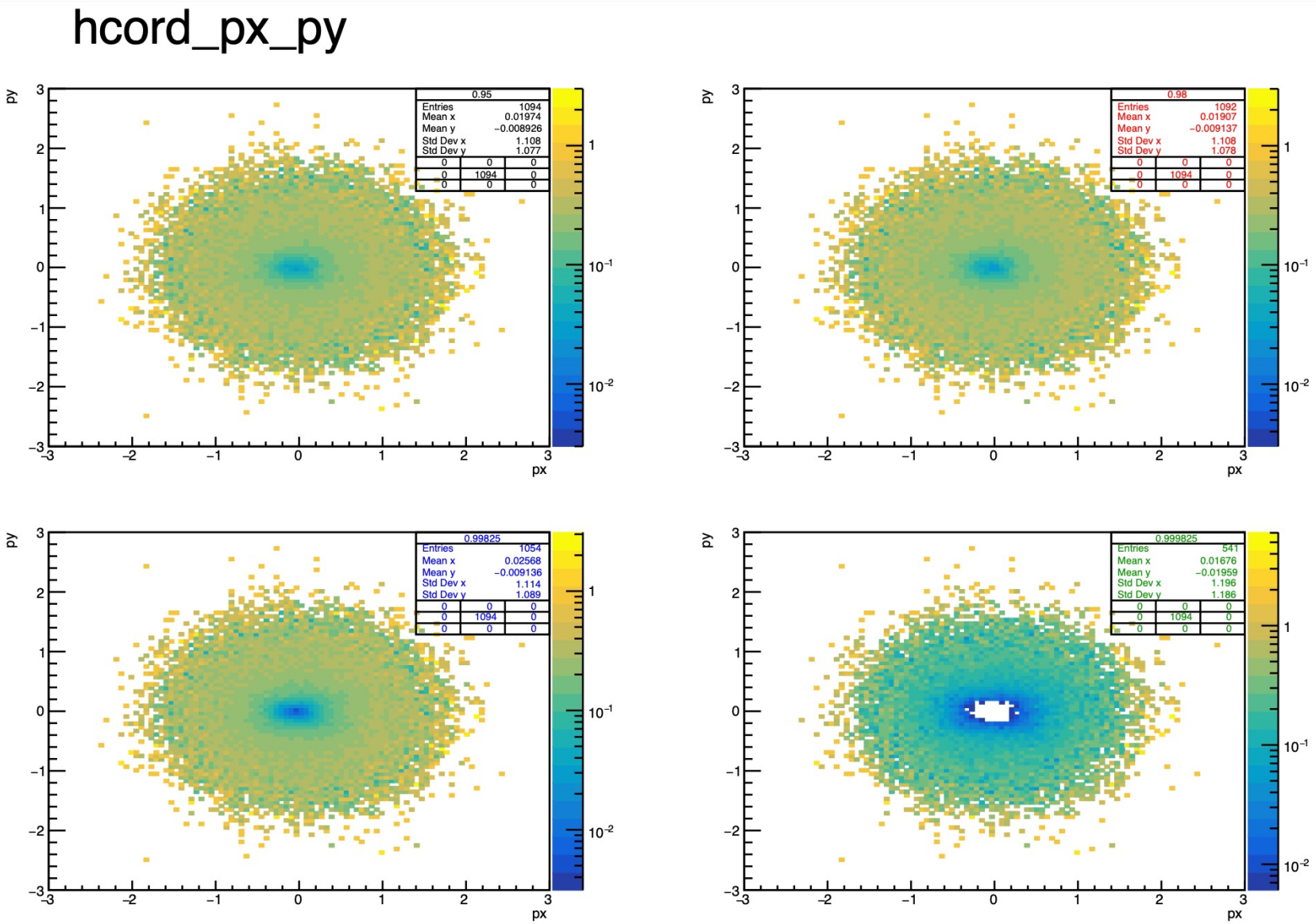
Momentums – e.g., p_z



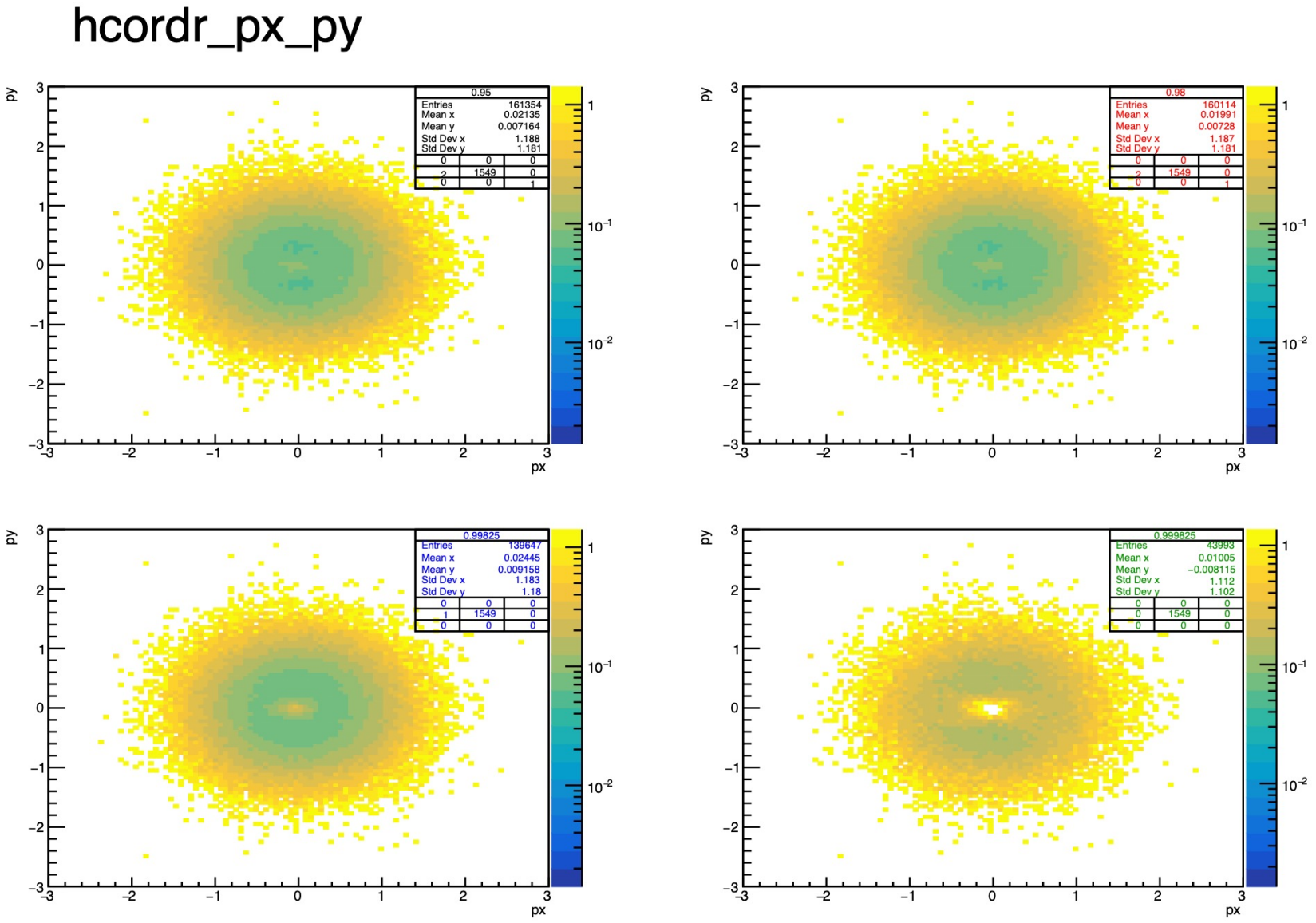
Correlations: reconstructed p_x- p_y



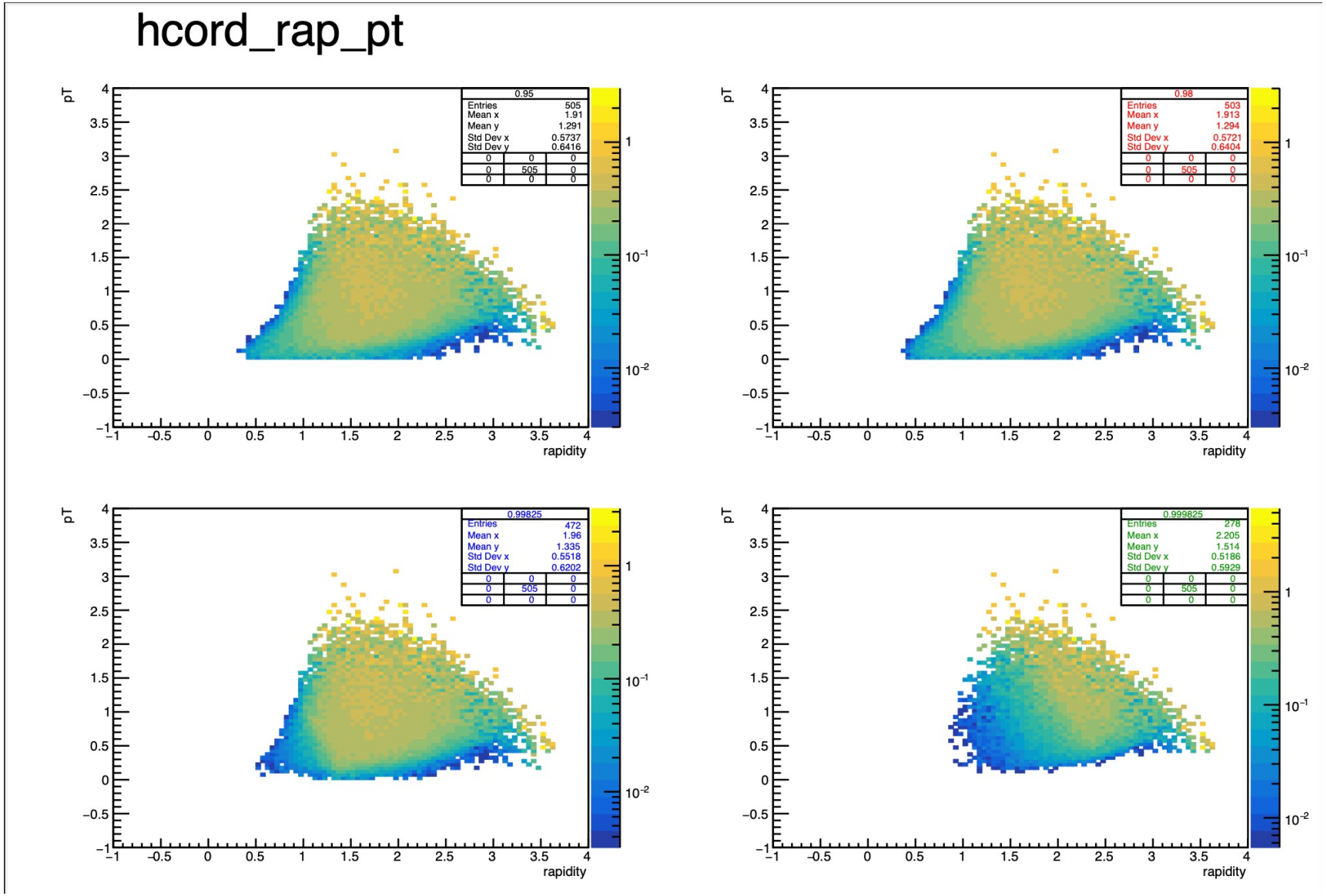
Correlations: rec-sim p_x- p_y (division)



Correlations: rec-sim p_x- p_y (relative error)



And for more correlations… e.g., rapidity-p_T



Correlation rapidity-p_T (to be discussed)