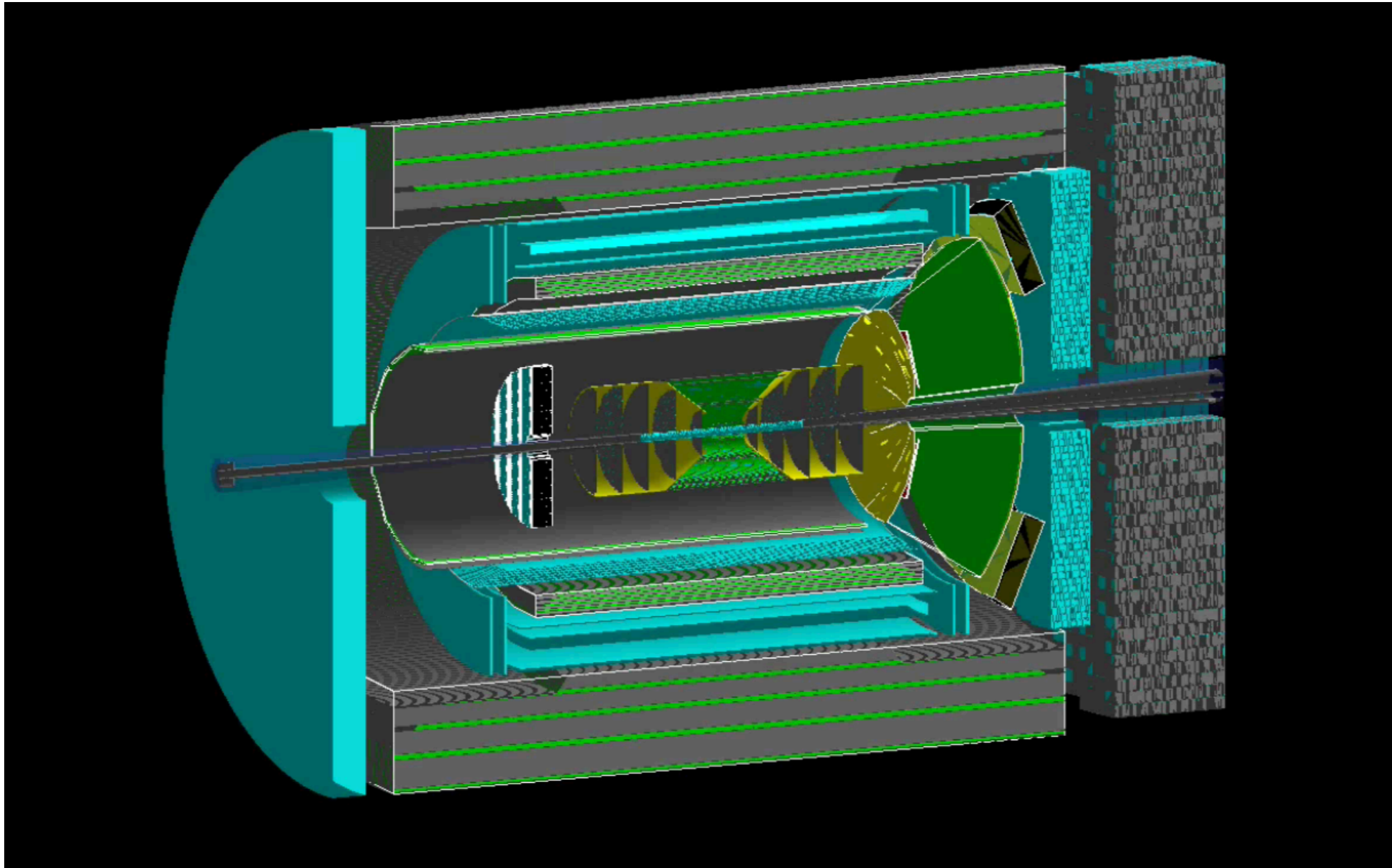


Jet Reconstruction in EIC Simulation

Fun4All on Cori

- Load the sPHENIX Singularity container
 - <https://github.com/sPHENIX-Collaboration/Singularity>
 - Converted to docker container, then uploaded to Cori
- Run Pythia through the full sPHENIX or EIC detector in using Fun4All (GEANT4 simulation)
- Create NTuples with jet & electron information
 - Important for studies such as: [arXiv:1912.05931](https://arxiv.org/abs/1912.05931)
- Submit Jobs
 - Either single threaded or more recently multi-threaded jobs

Adding AllSi to Fun4All EIC

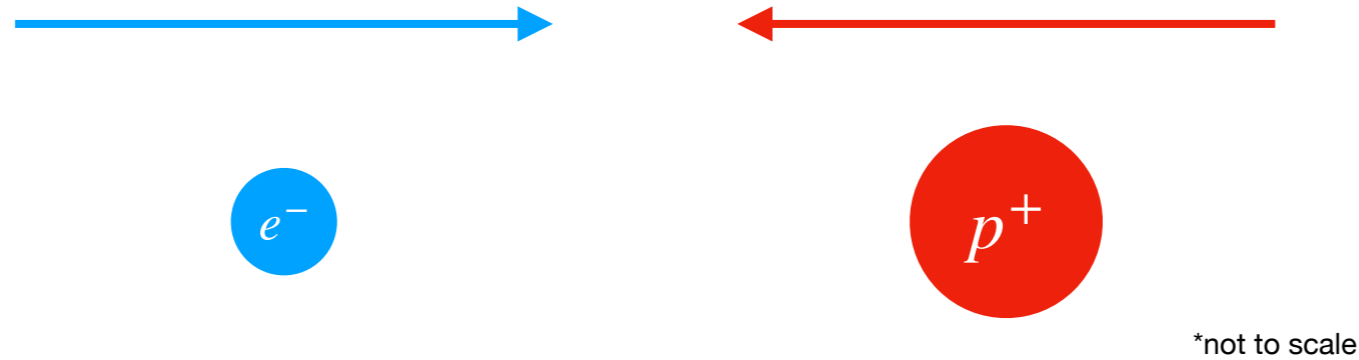


All Silicon Tracker + Central/Forward Calorimeters.

Also includes updated beam pipe from Rey

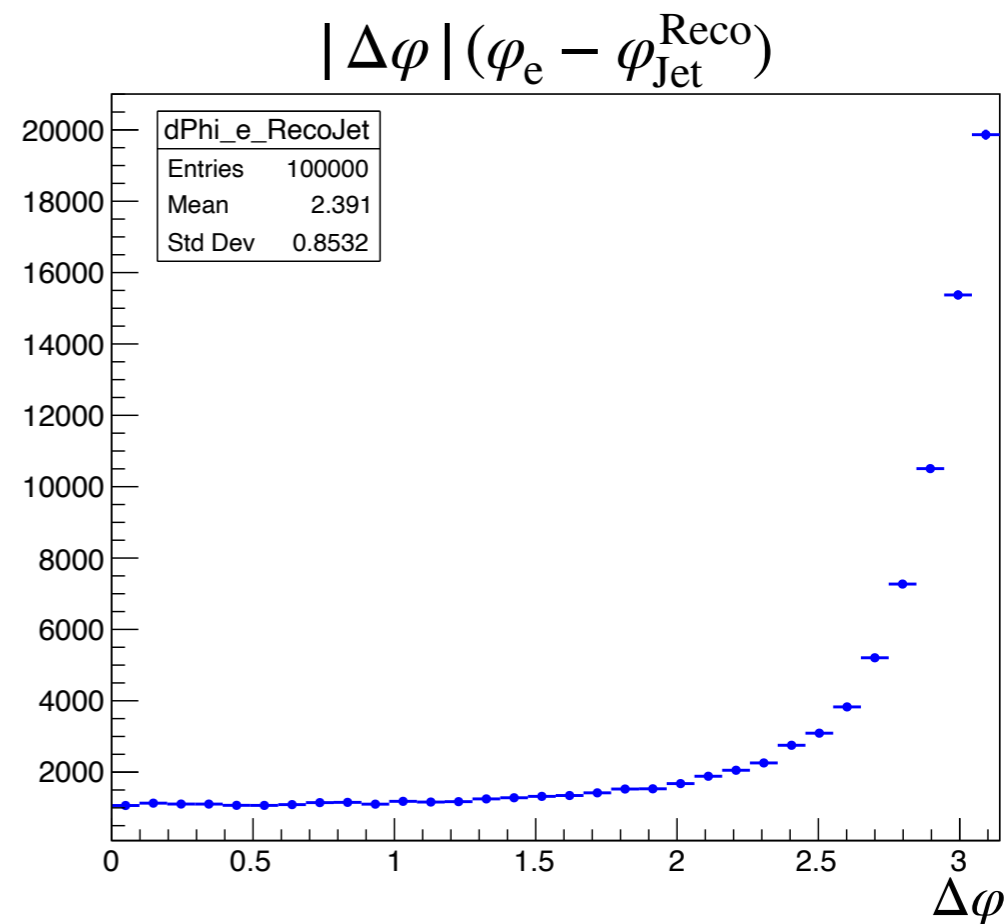
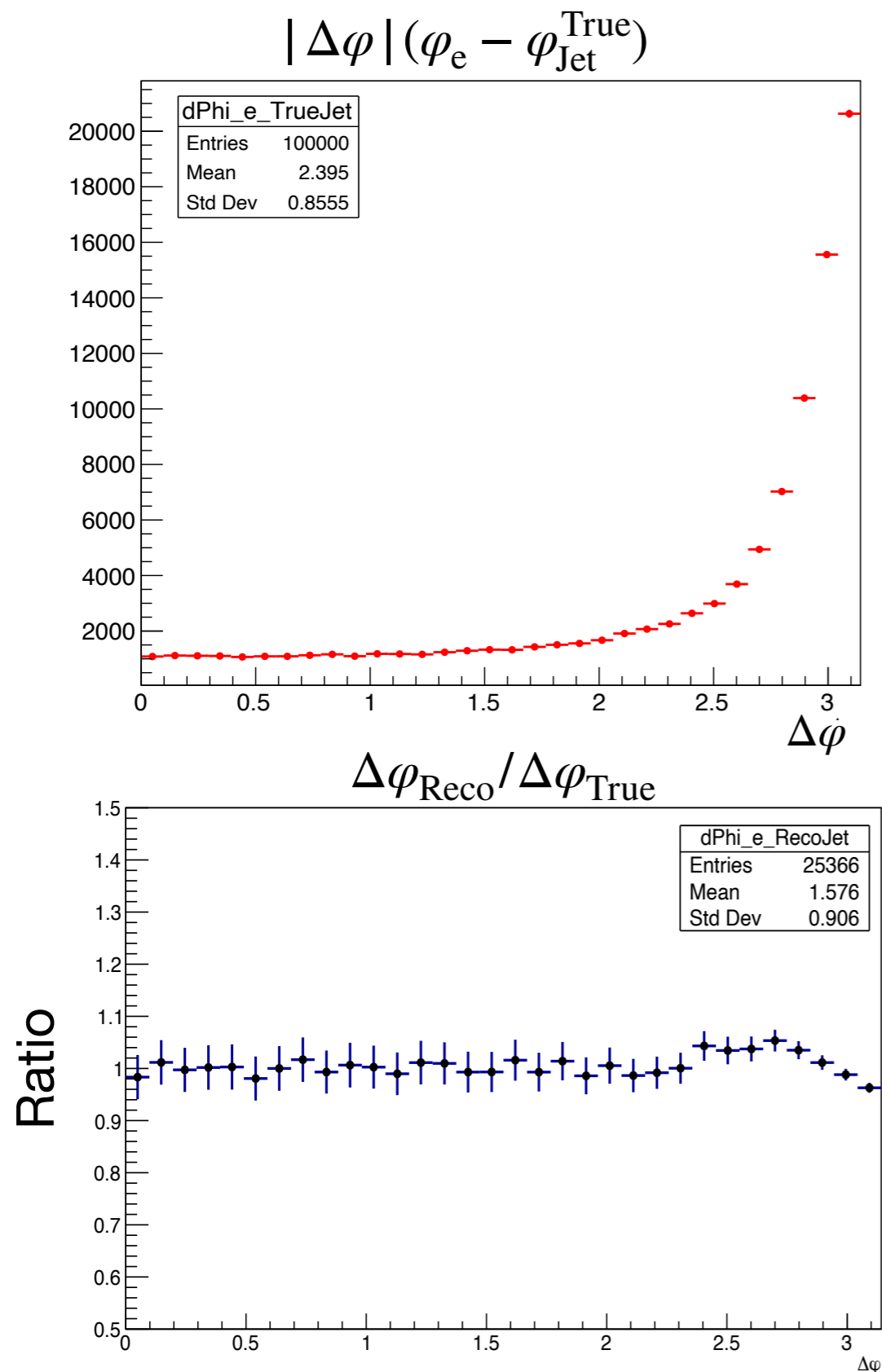
**G4_AllSi.C, Fun4All_G4_EICDetector.C, G4_Tracking_EIC.C, G4_Pipe_EIC.C,
G4Setup_EICDetector.C, G4_DSTReader_EIC, G4_Jets.C**

e+P PYTHIA Simulation



- PYTHIA 8
- $Q_{\min}^2 \geq 16 (\text{GeV}/c^2)^2$
- $\sqrt{s} = 89 \text{ GeV}$
- Electron beam: 20 GeV
- Proton beam: 100 GeV
- Jets:
 - $E_{\text{Reco}}^{\text{Jet}} > 3 \text{ GeV}$
 - Anti- k_T $R = 1.0$
 - # of Jet Constituents ≥ 3
 - ΔR (jet-electron) > 0.5
 - “Electron Veto”

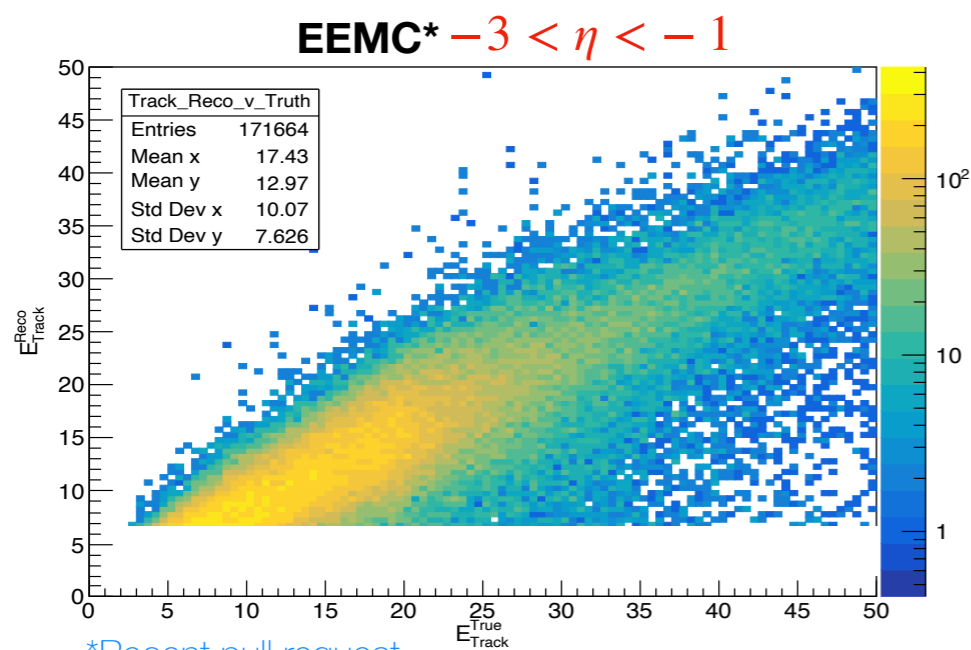
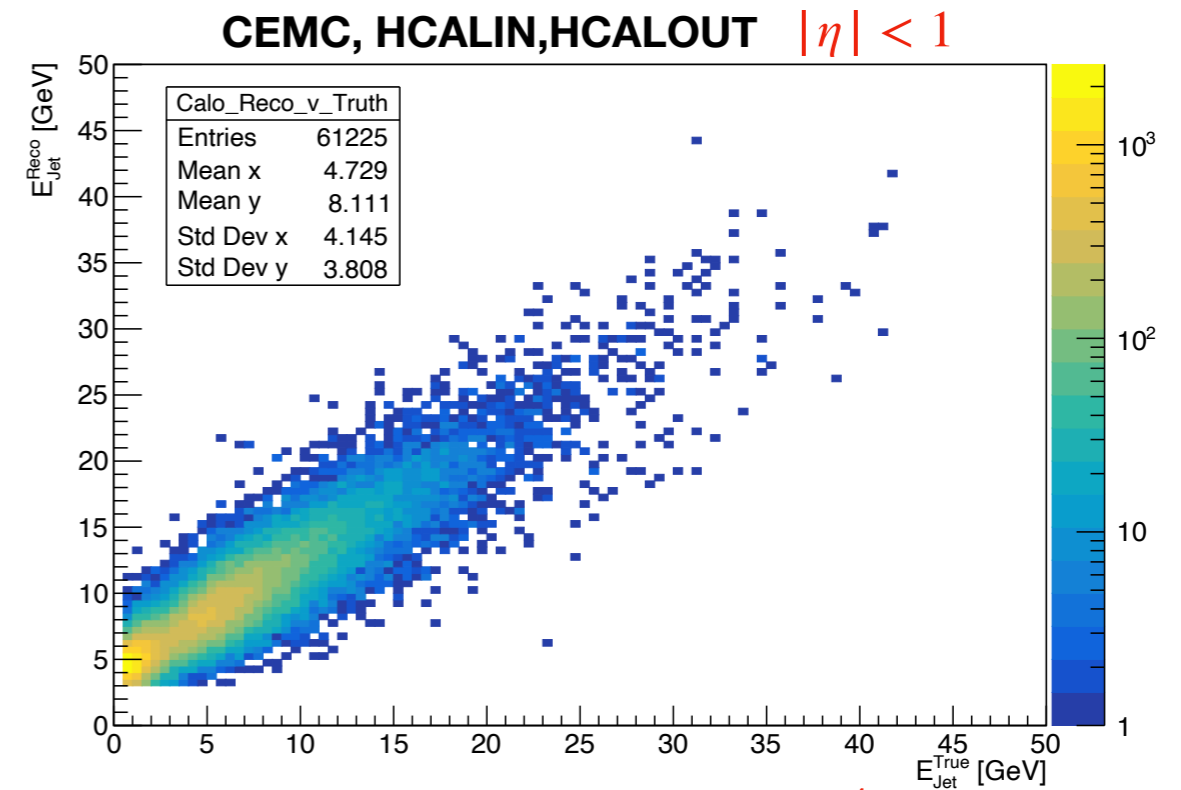
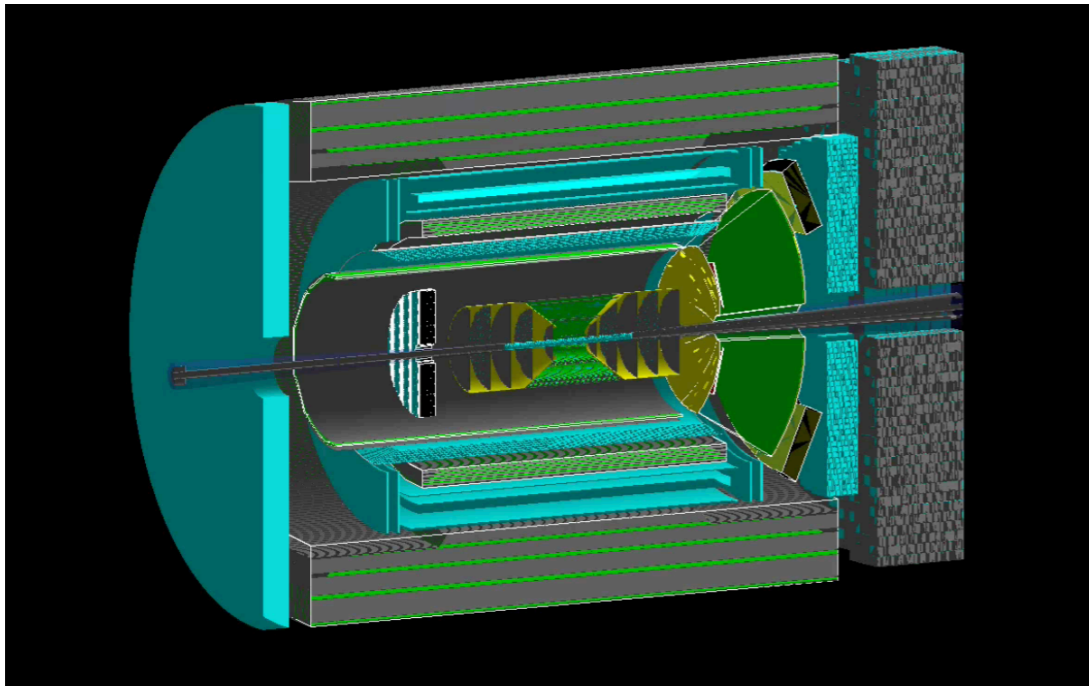
Jet & Electron Angular Separation



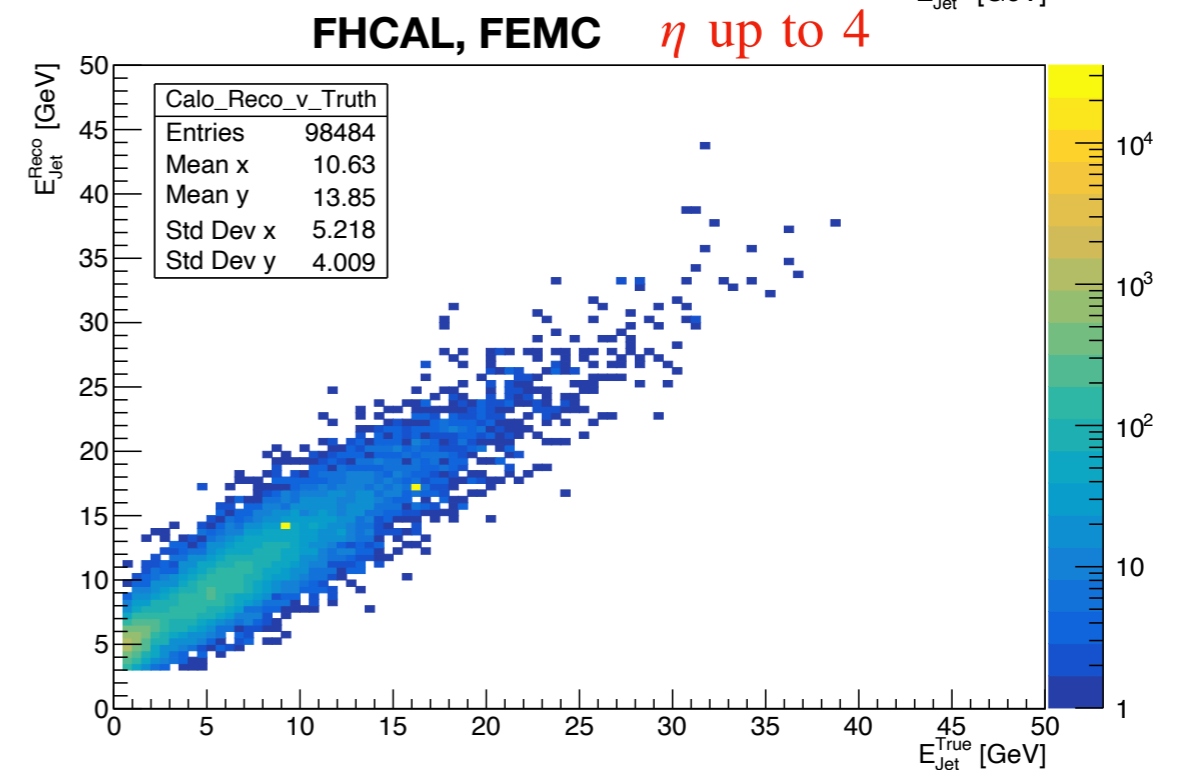
- Large Separation between electron and jets for these kinematics
- Similar separation between electron and both Reconstructed and Truth Jets

$\Delta\eta$

Backward, Central & Forward Calorimeter Jets

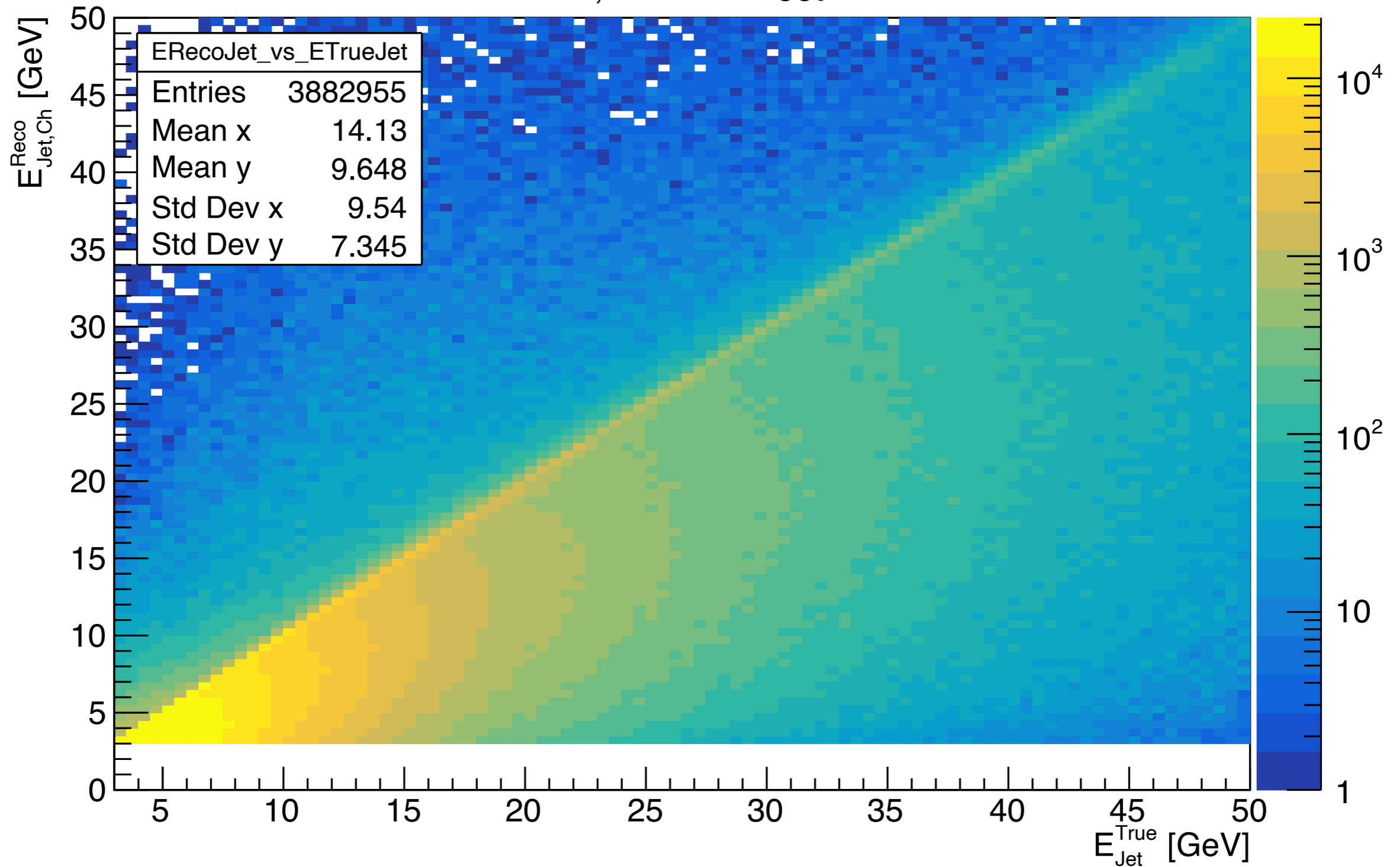


[*Recent pull request](#)



All Silicon Tracker Jets

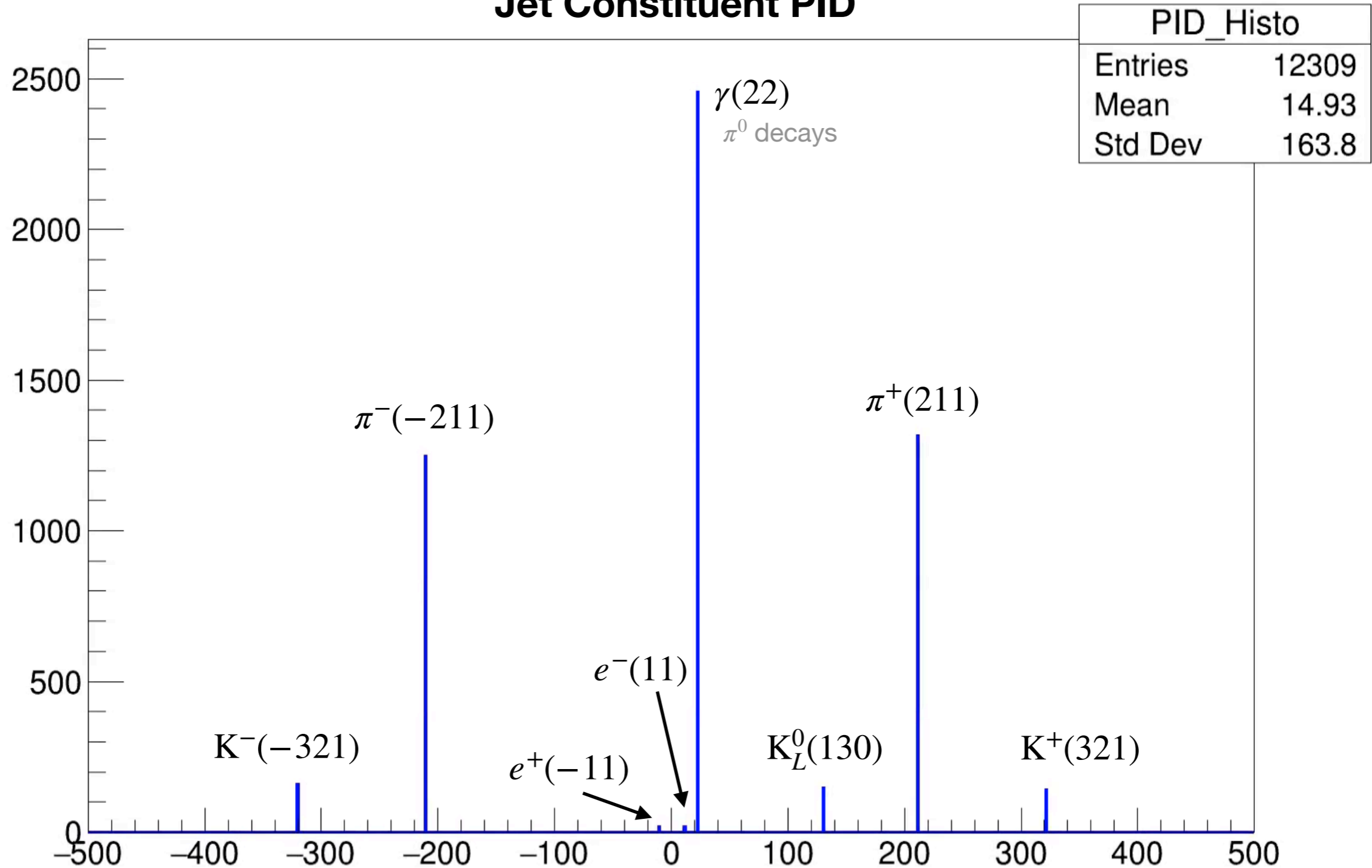
$E_{\text{Jet,Ch}}^{\text{Reco}}$ vs. $E_{\text{Jet}}^{\text{True}}$



Charged Truth Jets

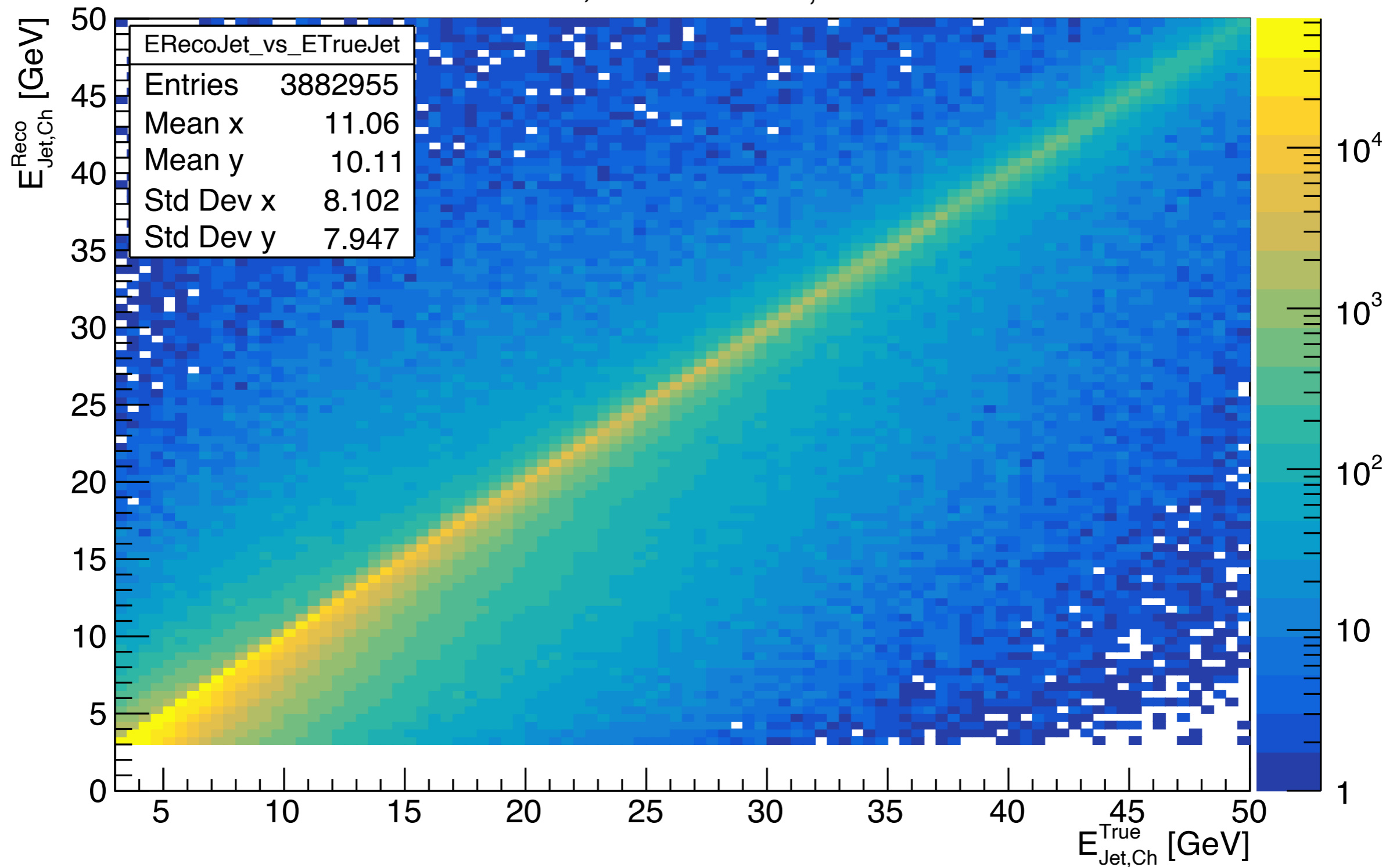
$$p_{\text{charged}}^{\text{jet}, \mu} = p_{\text{total}}^{\text{jet}, \mu} - p_{\text{neutral}}^{\text{jet}, \mu}$$

Jet Constituent PID



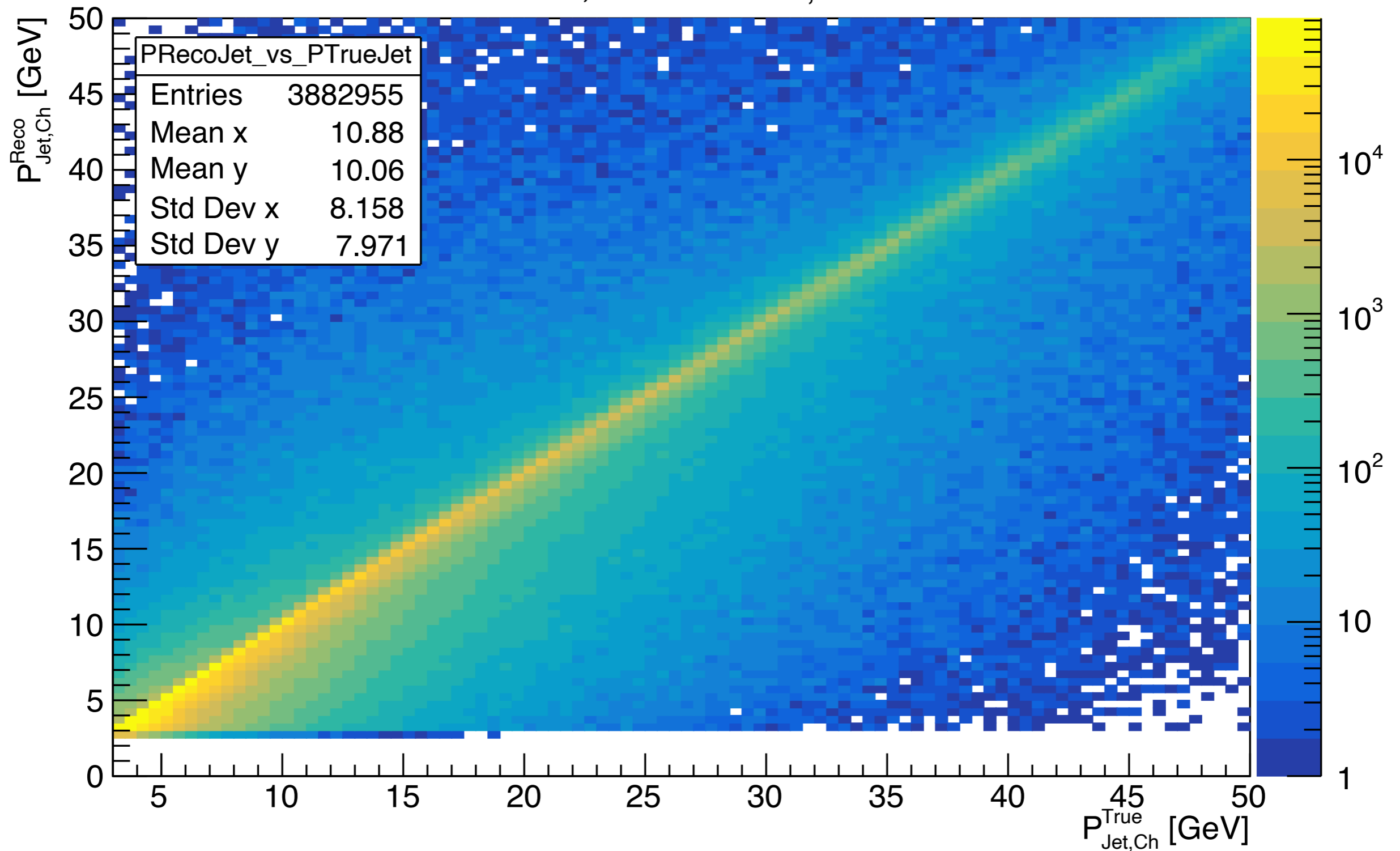
(Charged) Energy Response

$E_{\text{Jet,Ch}}^{\text{Reco}}$ vs. $E_{\text{Jet,Ch}}^{\text{True}}$

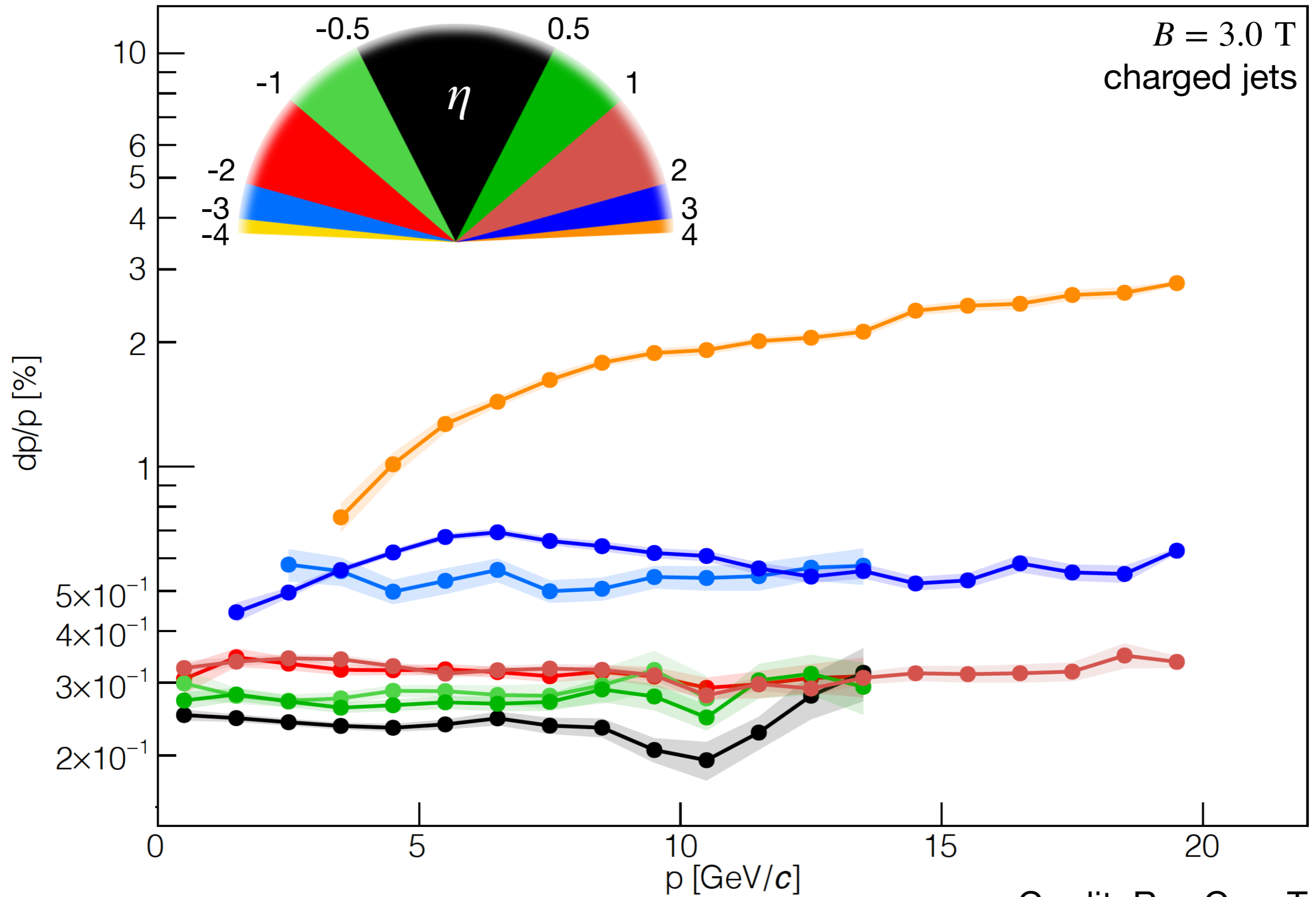


(Charged) Momentum Response

$P_{\text{Jet,Ch}}^{\text{Reco}}$ vs. $P_{\text{Jet,Ch}}^{\text{True}}$

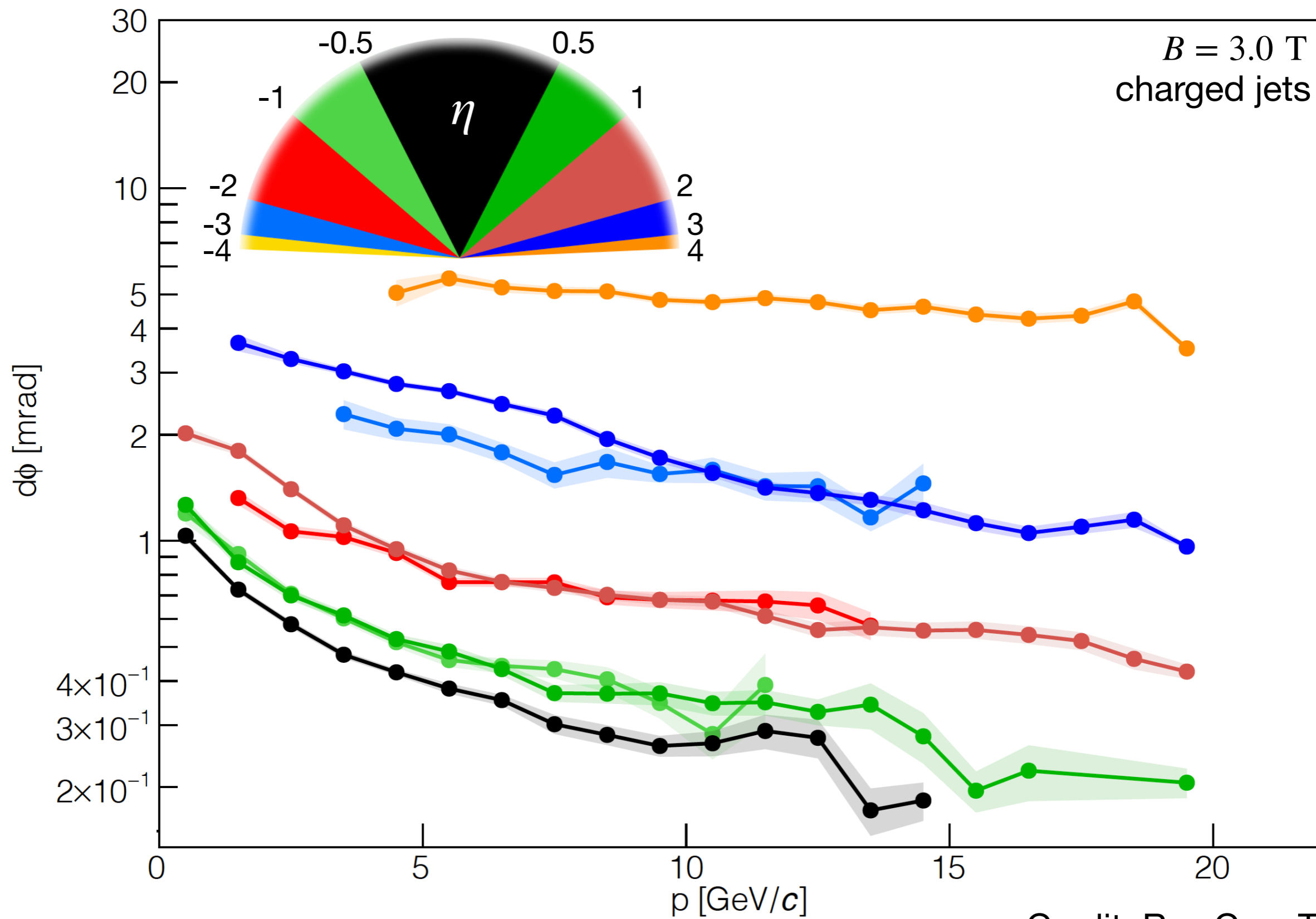


Jet momentum resolution



Credit: Rey Cruz Torres

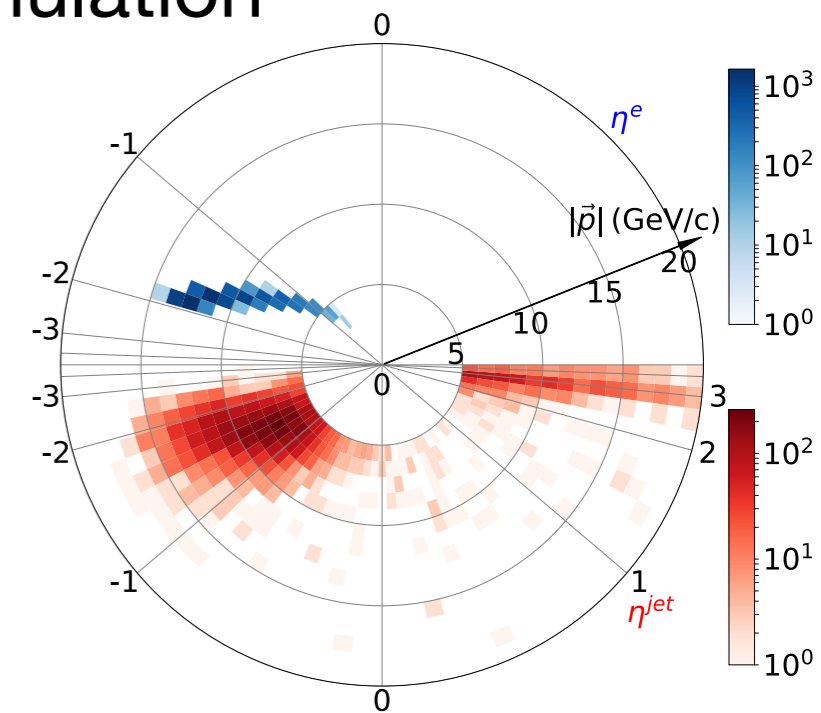
Jet phi resolution



Credit: Rey Cruz Torres

Next Steps

- Jet Energy Resolution + Parametrization
 - Momentum shown today
- Look at jet from struck quark and beam remnant separation with detector simulation
 - As in arXiv:1912.05931
- Track + Calorimeter Jets

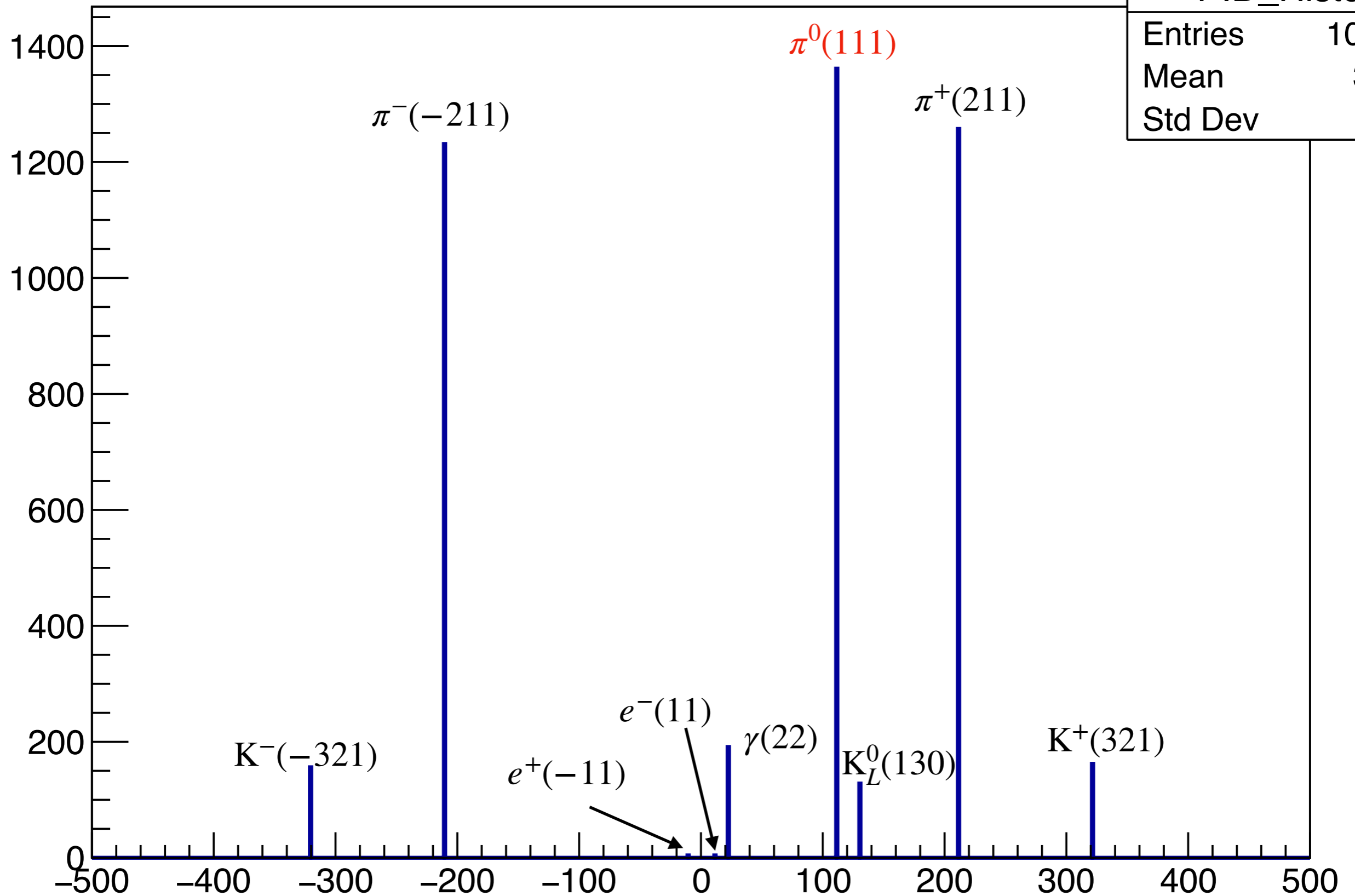


(b) Kinematic distributions of the scattered electrons and jets

Backup

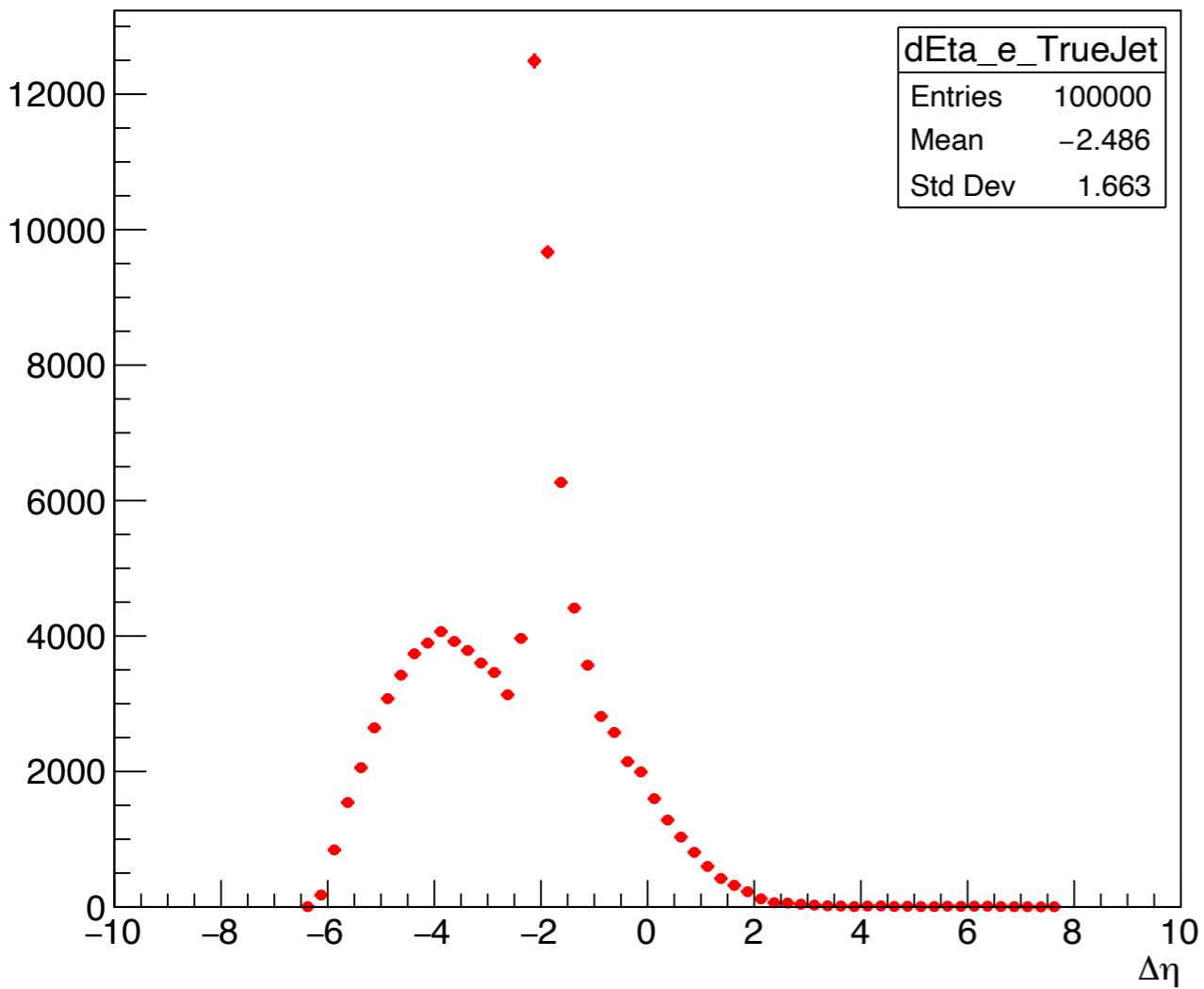
111:mayDecay = false

Jet Constituent PID

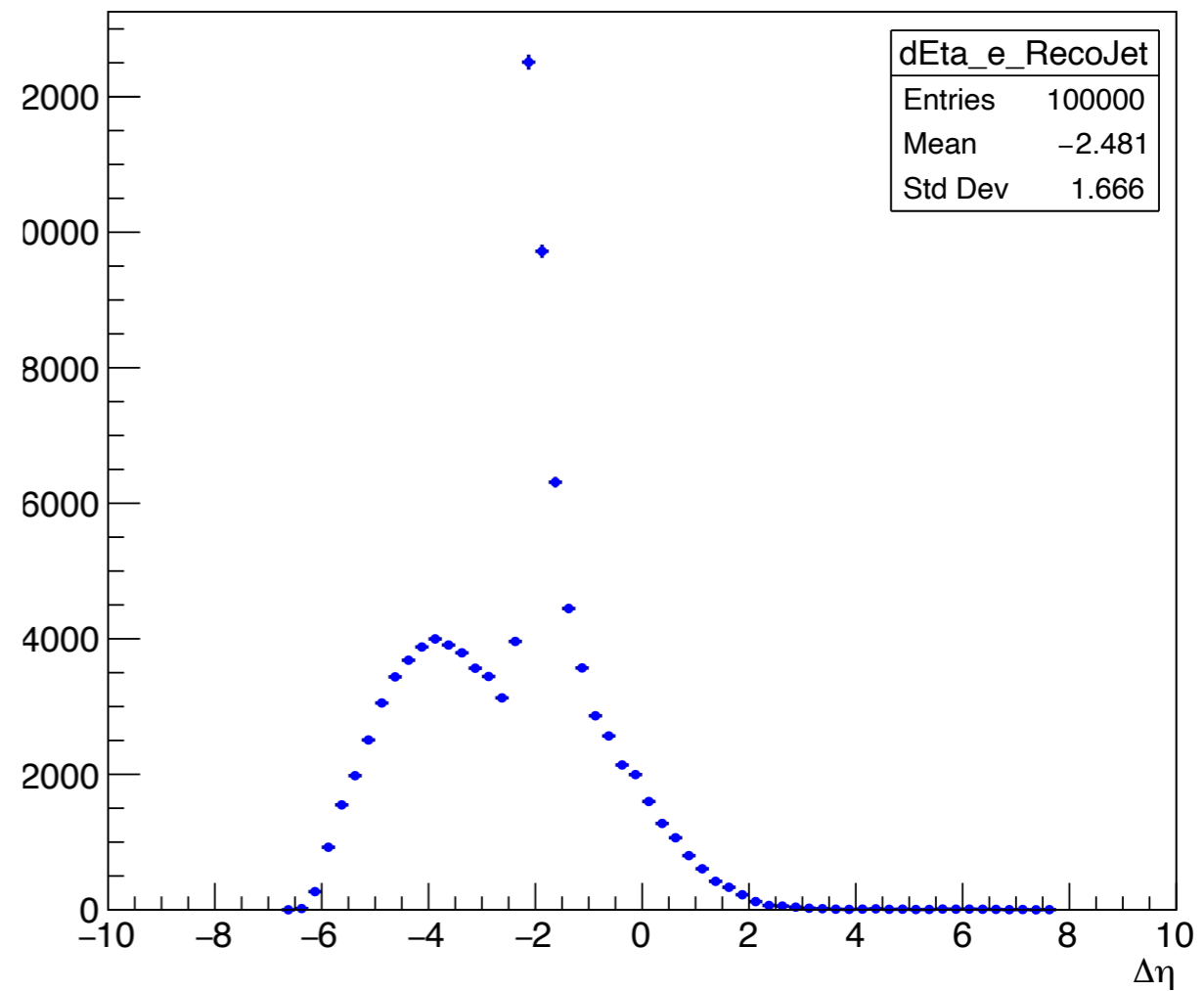


PID_Histo	
Entries	10015
Mean	39.9
Std Dev	186

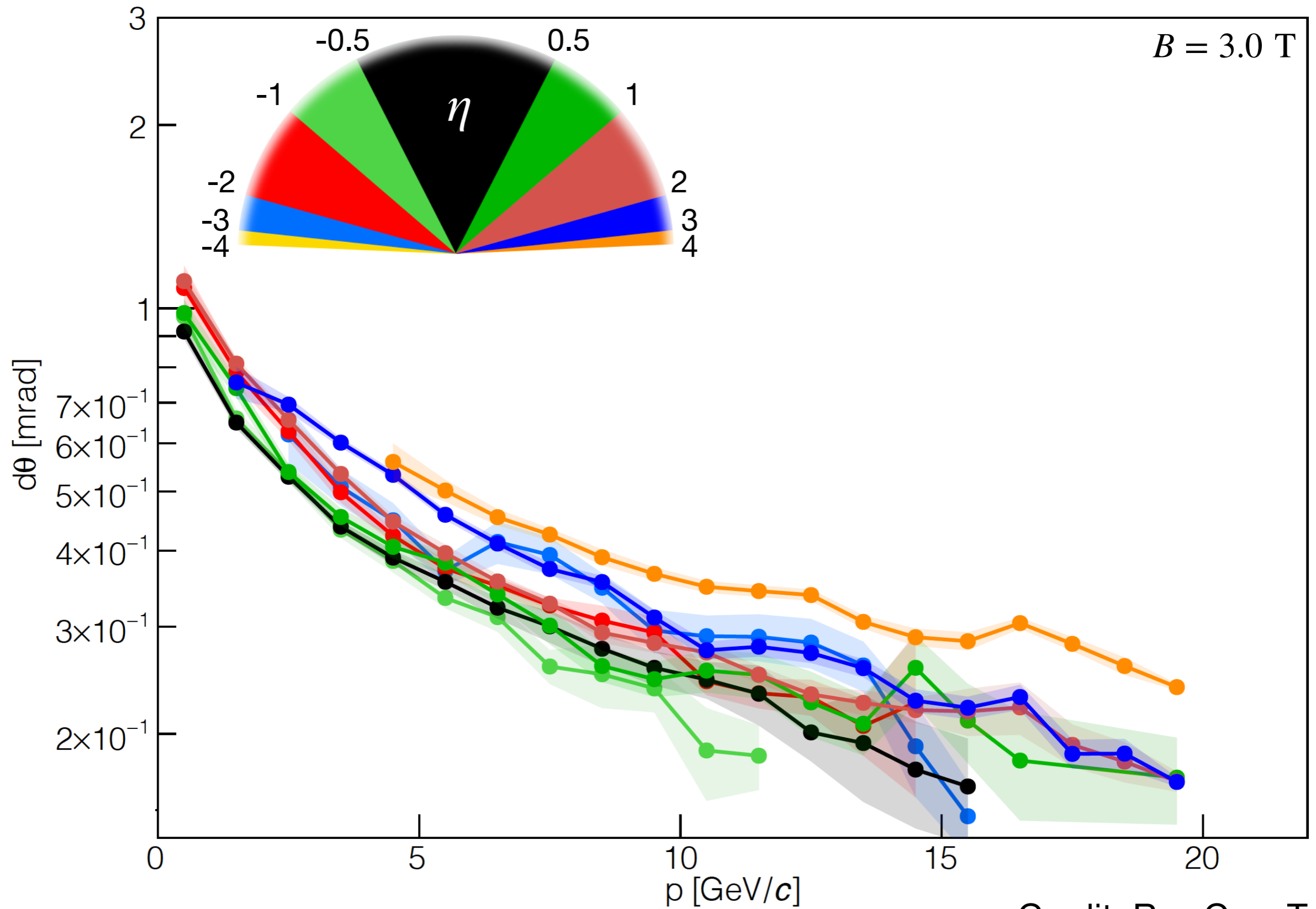
$\Delta\eta (\eta_e - \eta_{\text{Jet}}^{\text{True}})$



$\Delta\eta (\eta_e - \eta_{\text{Jet}}^{\text{Reco}})$



Jet theta resolution



Credit: Rey Cruz Torres