ECCE Tracking performance

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ECCE Tracking Working Group Meeting

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Simulation set up for IP8 @ 1.4 T

Electron end cap :
1. Trackers :
   - GEM station @ z= -160 m with -1.65 < eta < -3.5 and 2*pi coverage
   - 5 FST layers
2. Calorimeters
3. mRICH

Mid rapidity
1. Trackers :
   - Barrel
   - uRwell (2 layers @ R = 64.8 and 78.67 cm)
2. Calorimeters
3. DIRC

Hadron end cap :
1. Trackers :
   - GEM station @ z= 160 m with 1.65 < eta < 3.5 and 2*pi coverage
   - 5 FST layers
2. Calorimeters
3. RICH

- SIMPLE particle generator
- Phase space for particle generation
  - Zvtx @ (0,0,0+/-5) , 0.1 < pT < 30 GeV, -pi < phi < pi
  - $-1.65 < \eta < -3.5$: single e- /event
  - $|\eta| < 1.0$: 5 pi+/event and 5 pi-/event
  - $1.65 < \eta < 3.5$: 5 e- /event and 5 pi-/event
- All the subsystems were active

Thanks to Jin and Cameron for implementing MPGDs

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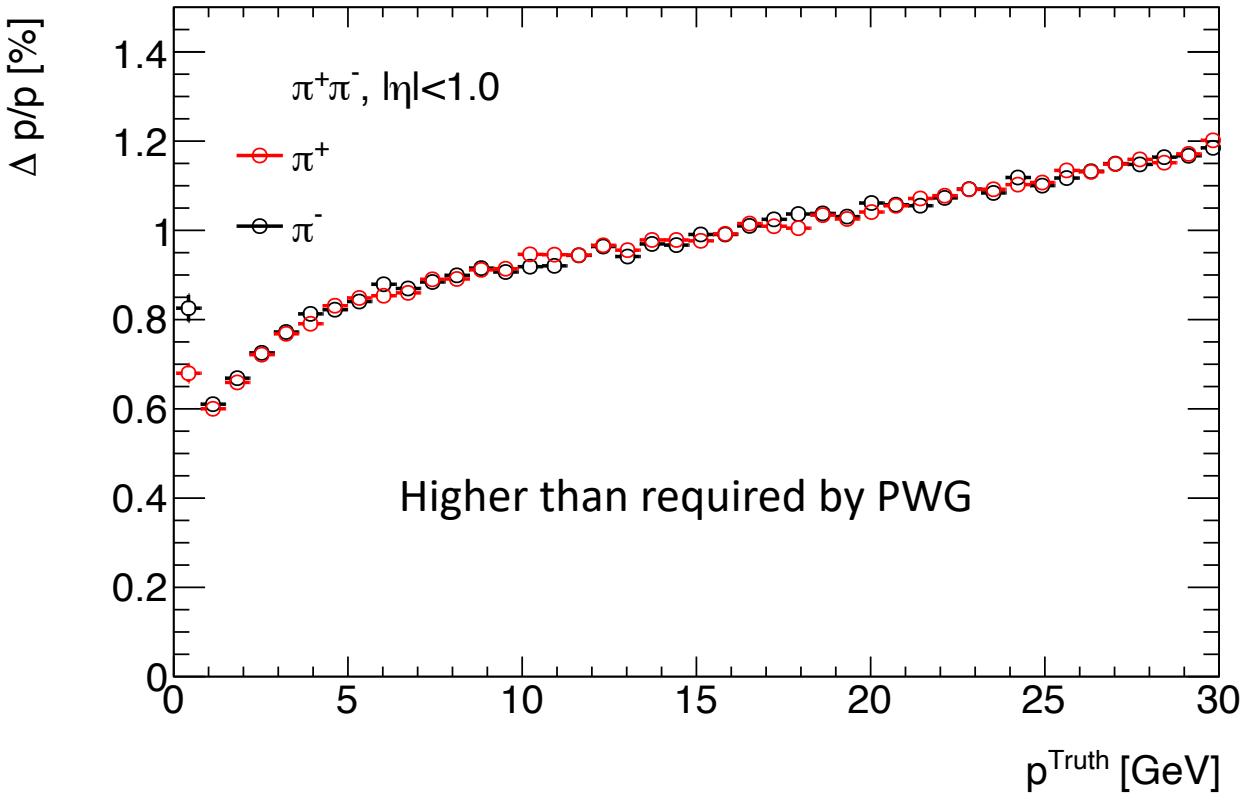
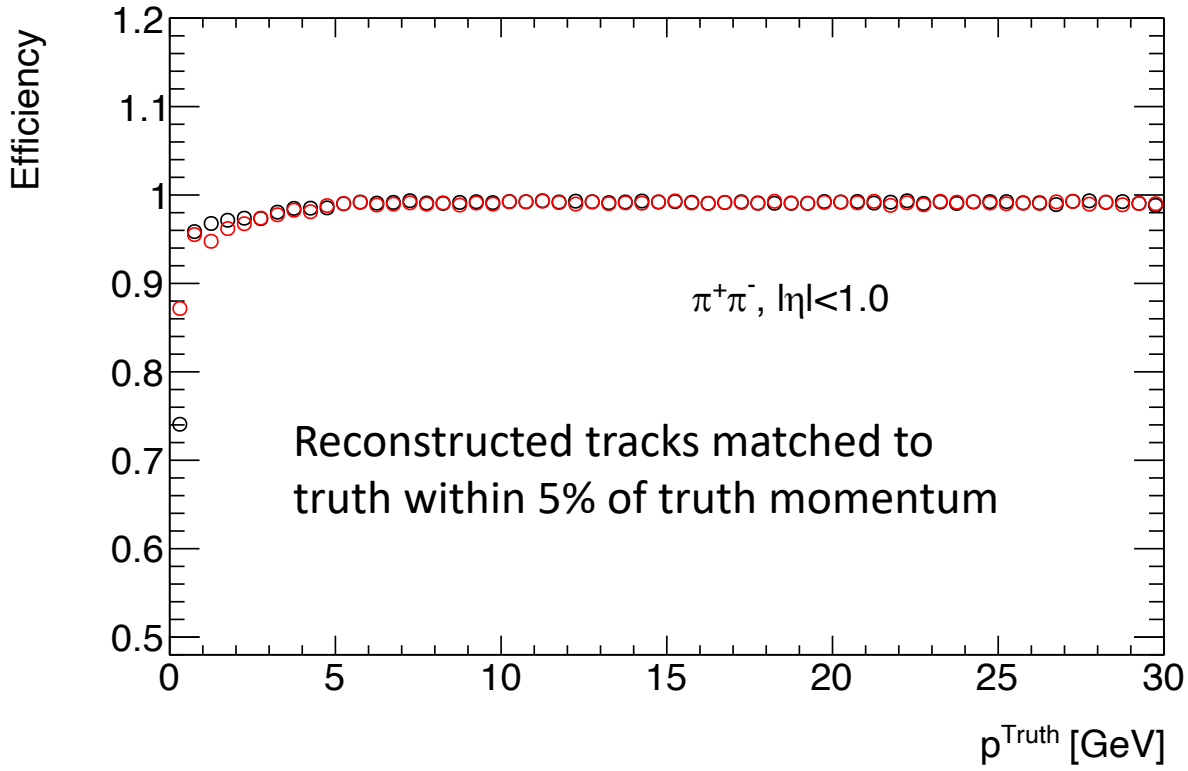
Momentum resolution and tracking efficiency





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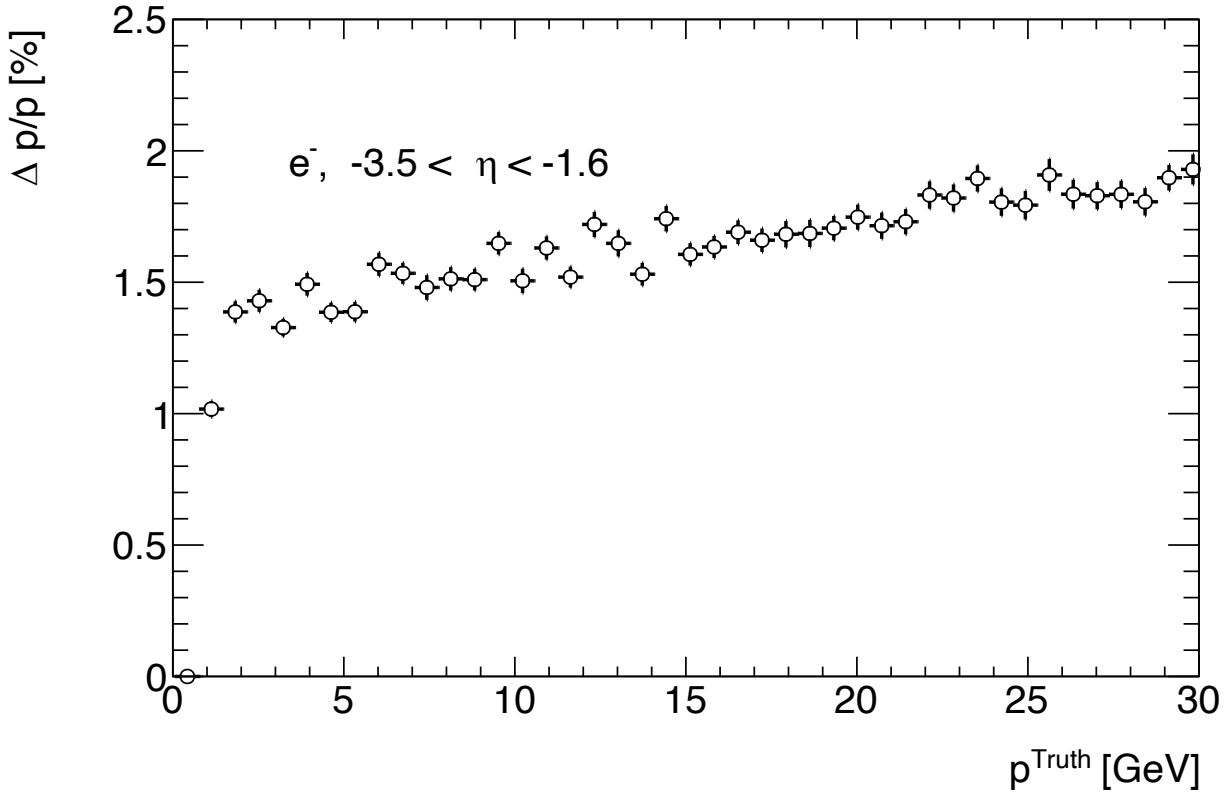
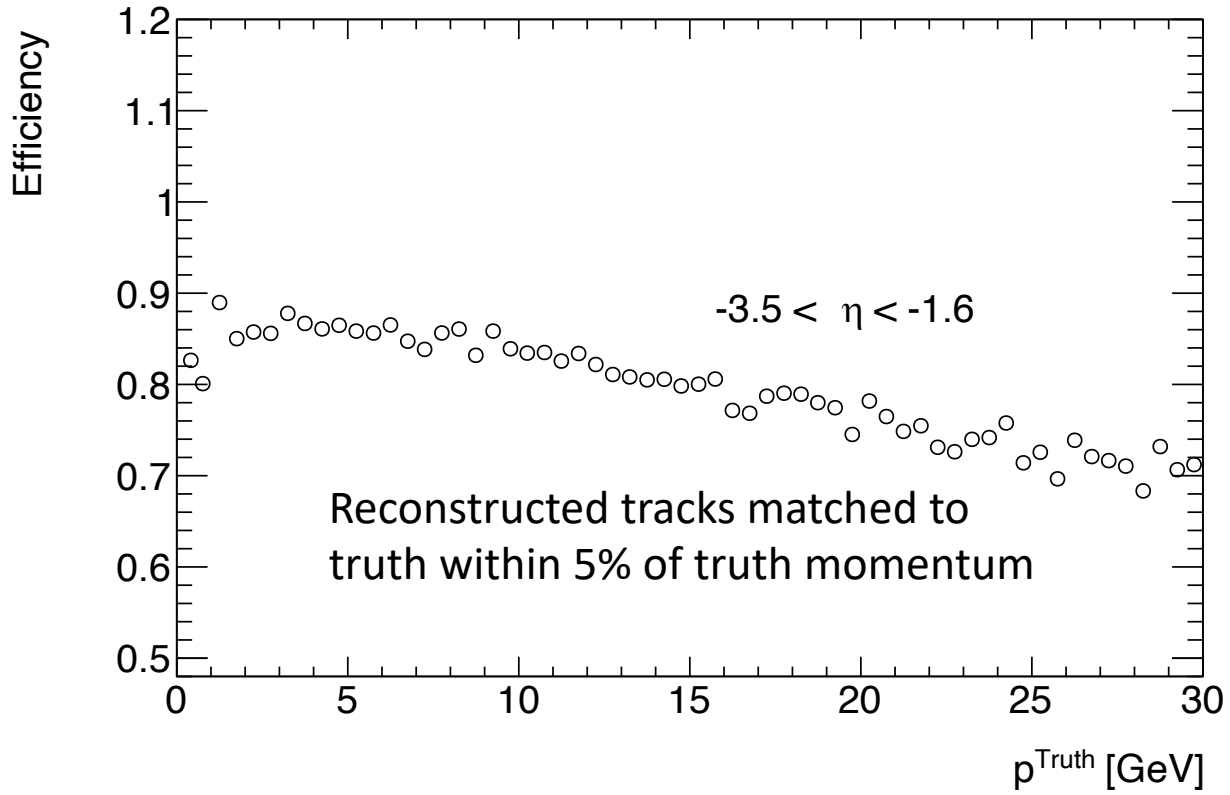
Momentum resolution and tracking efficiency





What are the requirements by PWG at electron end cap ?

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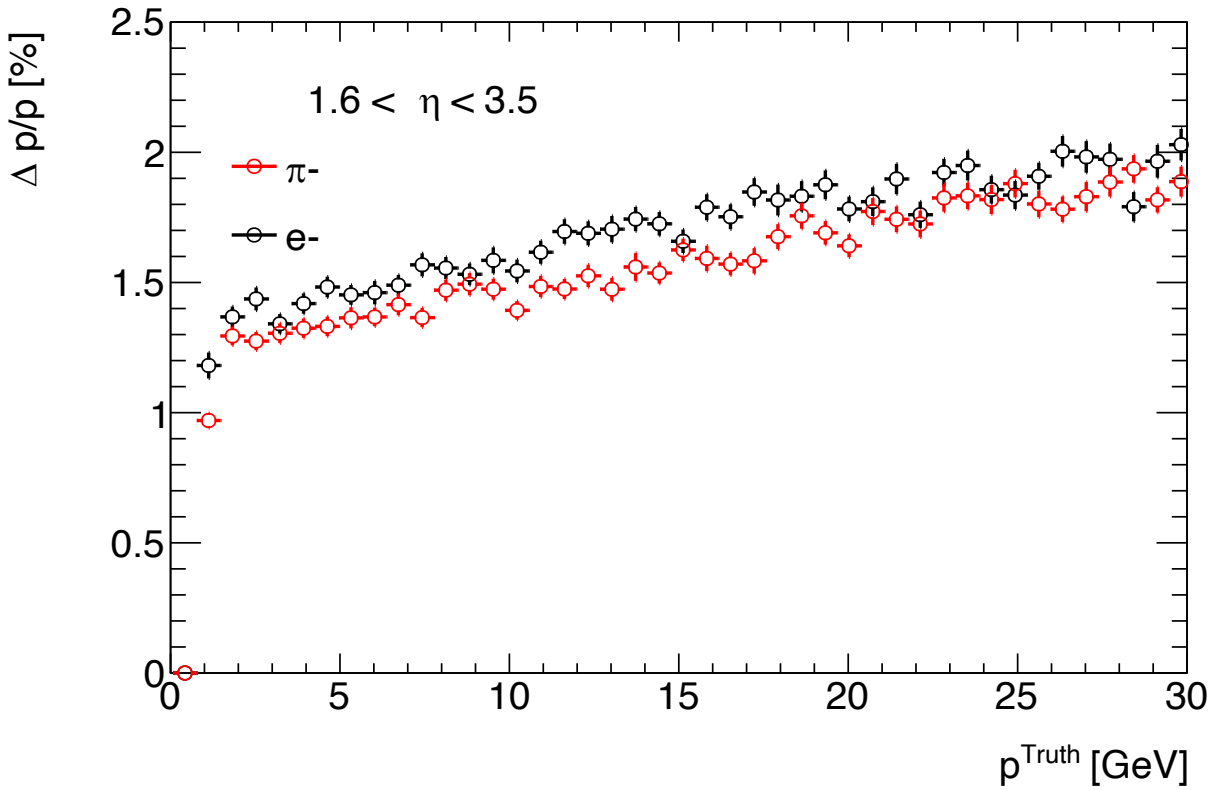
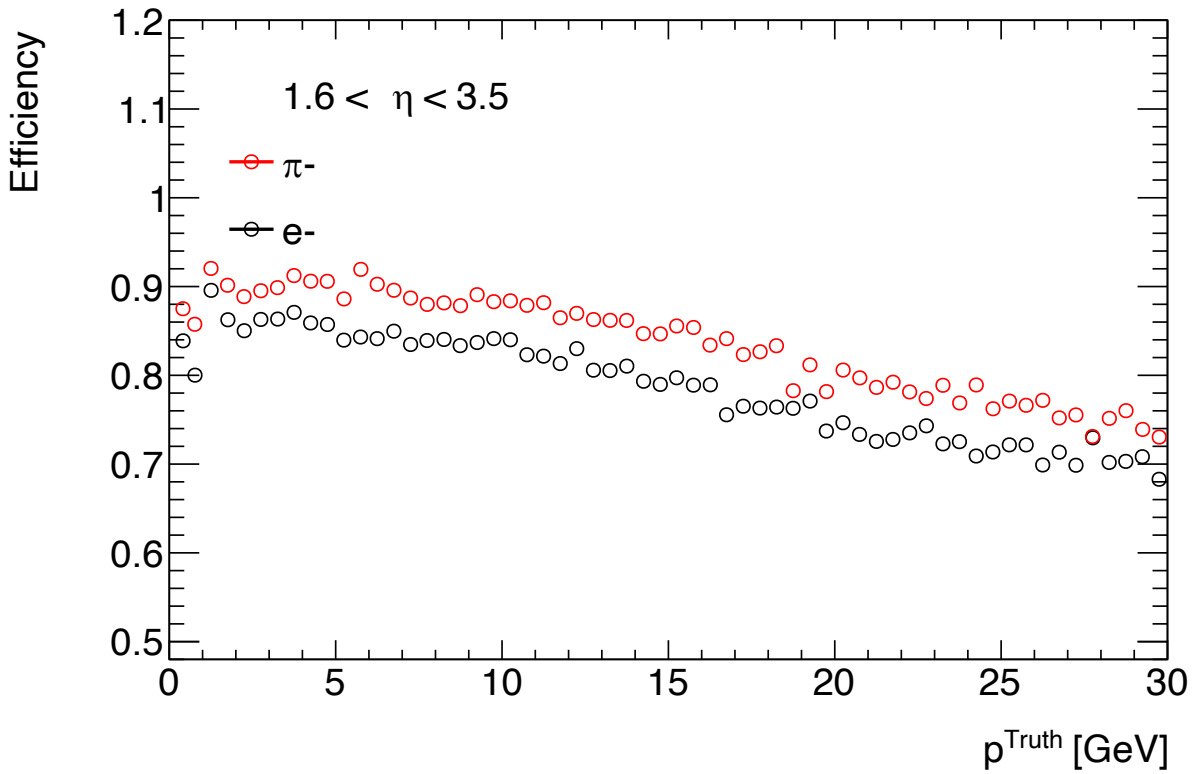
Momentum resolution and tracking efficiency





What are the requirements by PWG at hadron end cap ?

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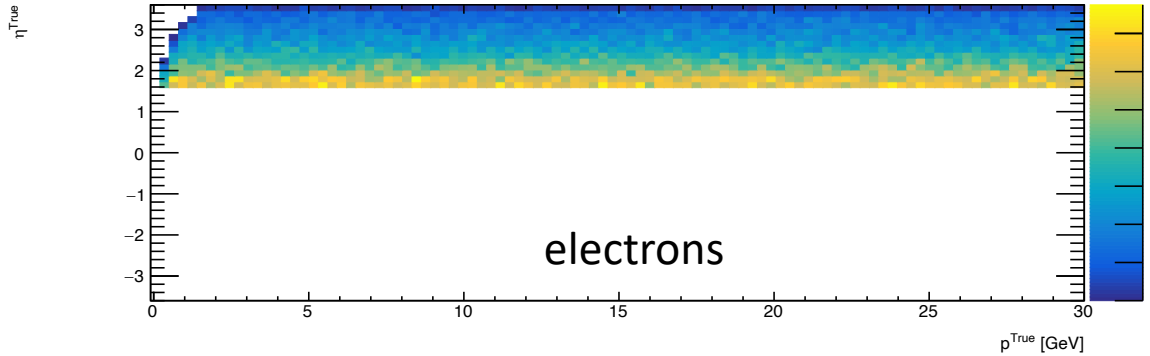
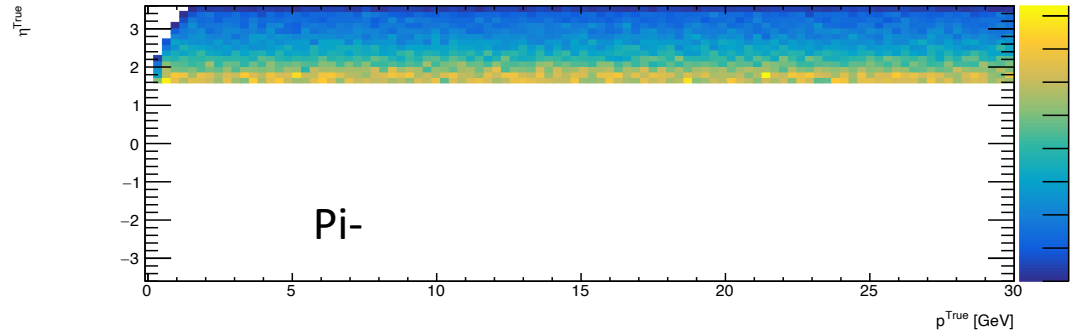
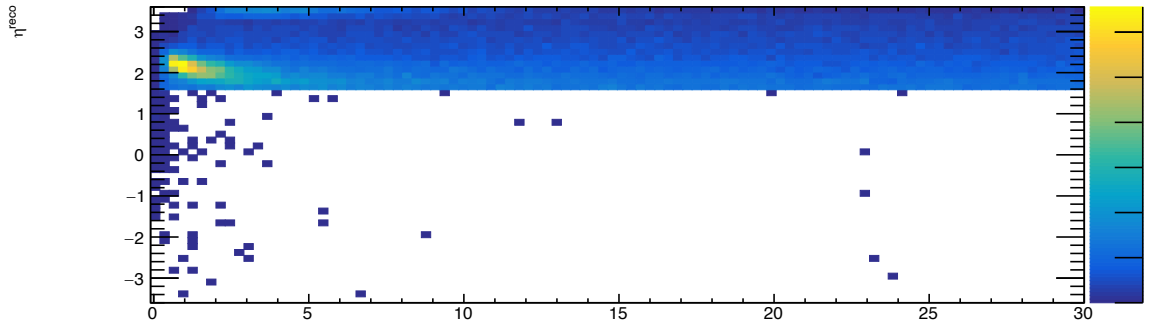
Current status and future proposals on MPGDs :

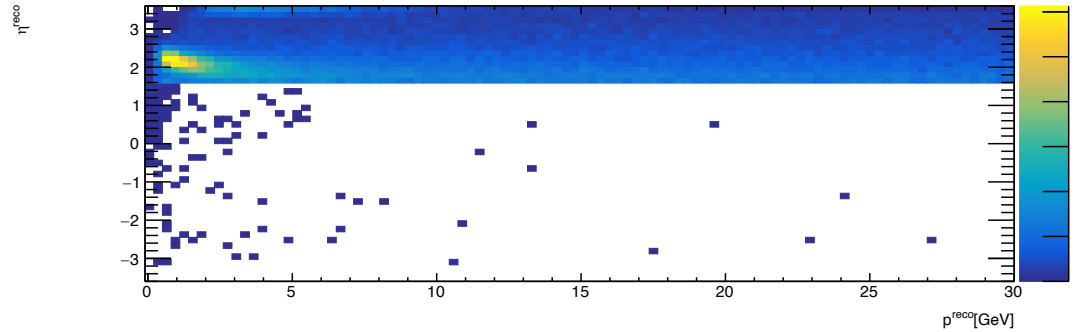
- GEMs :
  - Single station on both electron and hadron going side. No GEM layer in mid rapidity region. Gas is changed to Argon in the current simulation from Methane as default version.
  - Single station composed of one gain element (single GEM). In reality it will triple GEM layers for single station. Thickness of single station (~2 cm) is fine but radiation length will change while using triple GEM layers for single station unless radiation length of 0.48% has been hardcoded somewhere in geometry.
- mRwell (very new technology, less than a decade old) :
  - Layers are well defined cylindrical shape with single tile along Z. Will change later in the form of dividing single tile along z into multiple tiles. Might add some additional material budget.
  - Size of each tiles, whether cylindrical or planar shape, readout channels , number of tiles etc needs to be determined based on R&D with large size prototypes. Material scanning of implemented geometry not yet done to know about radiation length.
- Micro-Megas (almost as same age as GEMs) : Alternative to mRwell
  - More stable than GEMs and more flexible.
  - Lots of R&Ds are done and the technology is well established as compared to mRwell.
  - Radiation length of 0.4% and work is in progress by SACLEY to reduce it to 0.07% .
  - If used as central barrel alternate to mRwell, it will be in the form of 4 tiles along Z.
  - Has been implemented in high rate experiment like ATLAS and also in the form of large size like in CLAS12 @ Jefferson Lab experiment as barrel tracker and forward tracker.
  - Not yet in ECCE simulation but will implement in private version to look at performance study in barrel region
  - Simulation studies are ongoing with micromegas as barrel tracker for ATHENA.

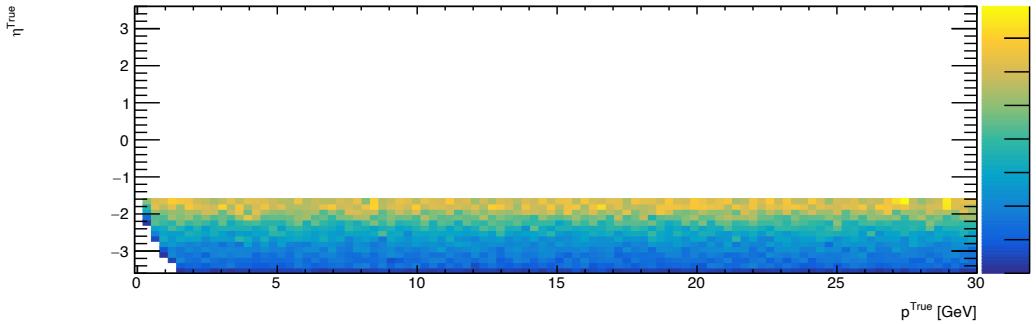
Backup

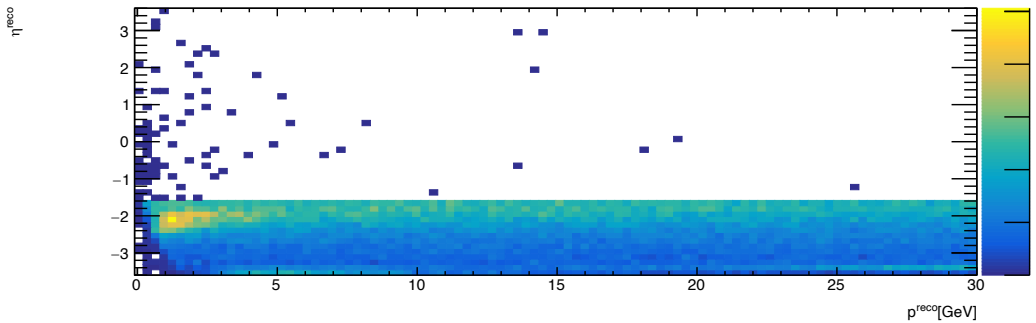

η^{True}
electrons
p^{True} [GeV]


η^{True}
Pi-
p^{True} [GeV]


η^{reco}


η^{reco}
p^{reco}[GeV]


η^{True}
p^{True} [GeV]


η^{reco}
p^{reco}[GeV]