Simulation Statistics

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Contents

Histograms for energy resolution of detectors by applying manual clustering, 100 MeV energy cut on aggregate towers and incorporating slice-wise calibration, for the following detector-particle pairs:

- Pion: CEMC + HCALIN + HCALOUT, FHCAL + FEMC

tphi : tower ϕ, ttheta : tower θ, te_{agg}: tower energies aggregated in an event
gphi : generated ϕ, gtheta : generated θ, ge: generated energy

Simulation Parameters

- Particles: pi^-
- Events: 150,000 pi^- (100,000 → 0-30 GeV/c, 50,000 → 0-2 GeV/c)
- momentum (p): 0 to 30 GeV/c
- Pseudorapidity (η): -4 to 4
- Azimuth (Φ): -π to π

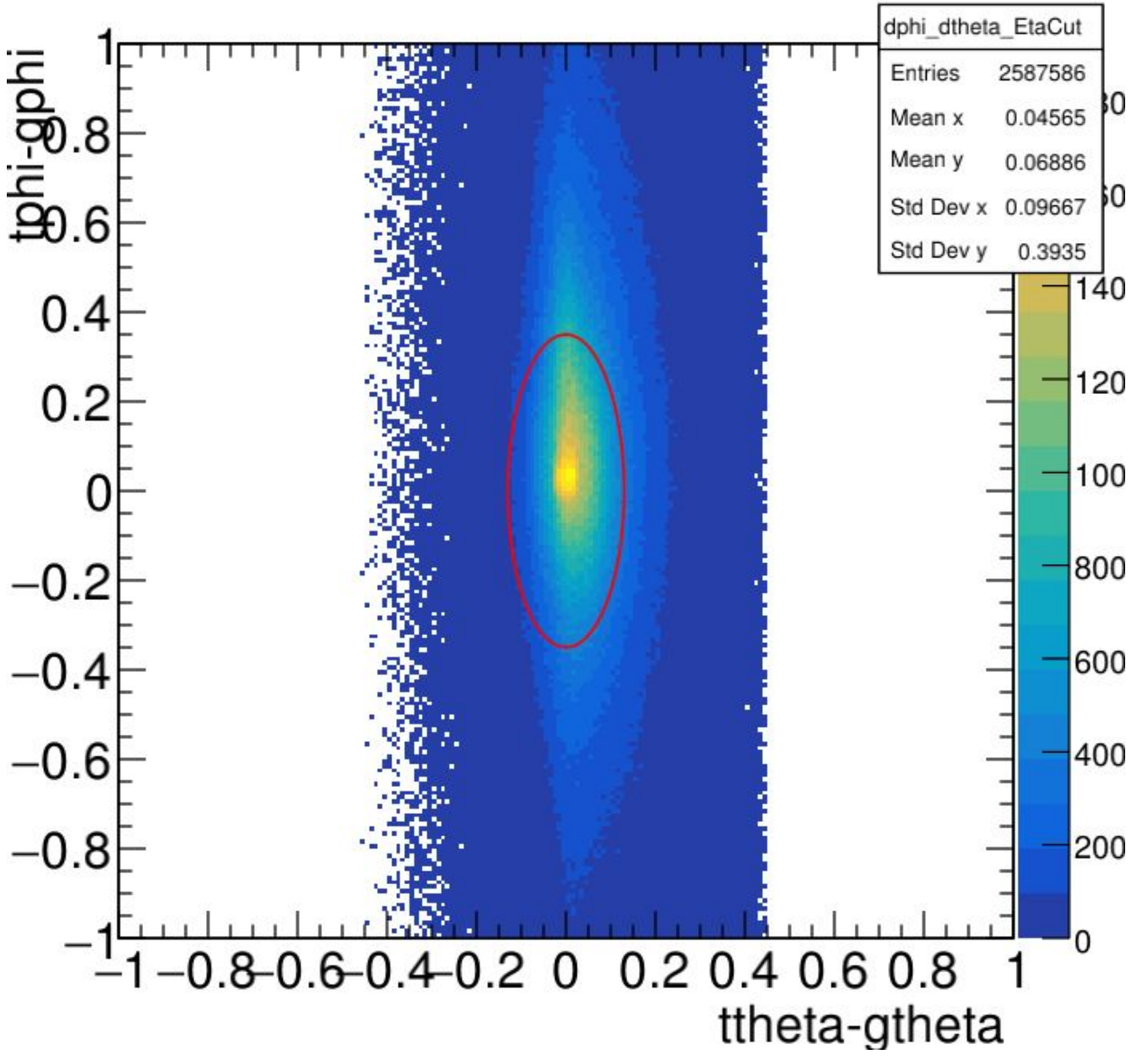
Cuts:

- Detector-wise η cuts, intersection for combinations
- Detector-wise Elliptical cuts in dphi vs dtheta plots
- Energy cut on aggregated Towers (100 MeV)

FEMC + FHCAL (pi^-)

FEMC (pi^-)

Elliptical cut on dphi vs dtheta, Explicit η cut: 1.3 to 3.3, 100 MeV Energy Cut



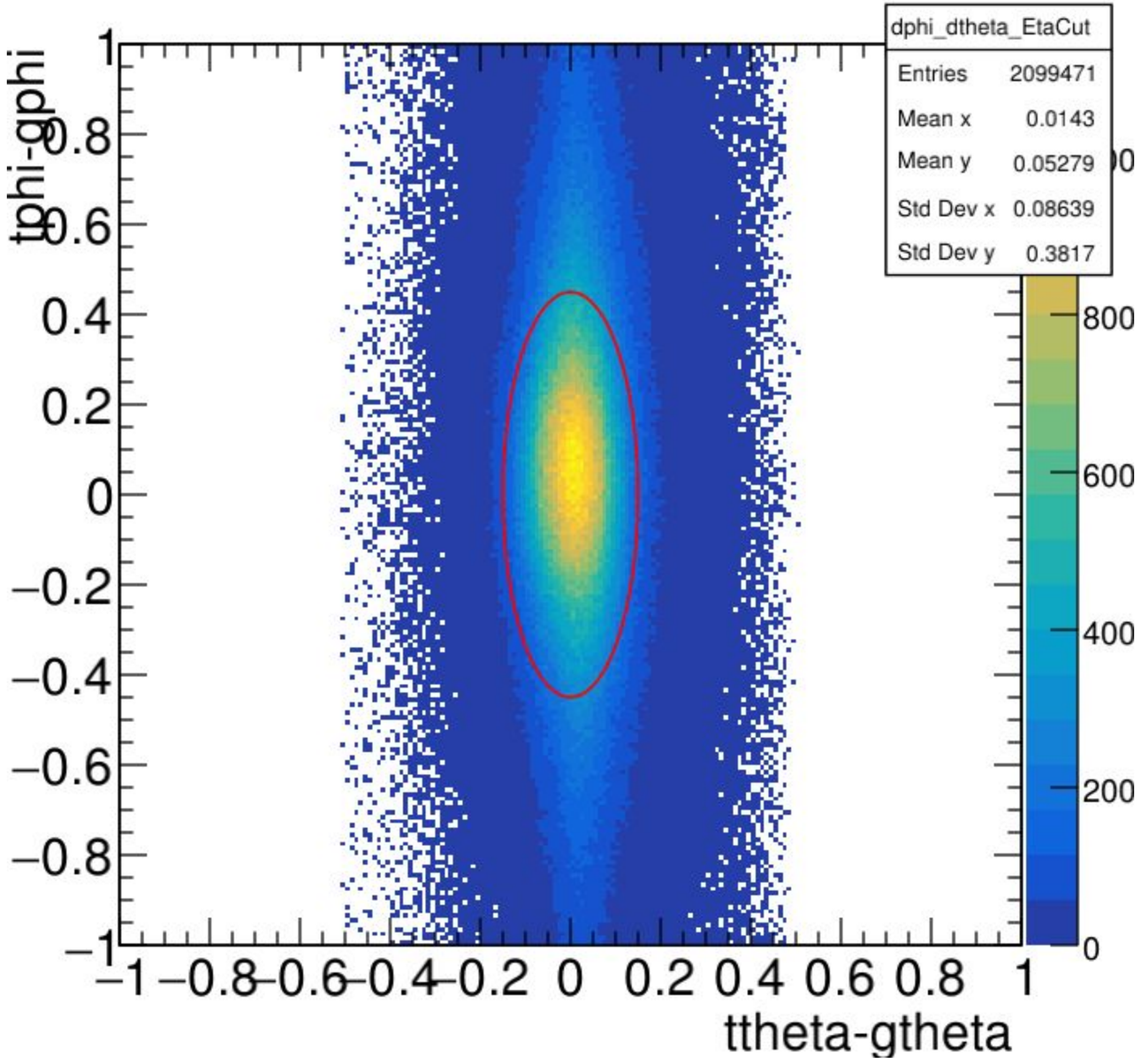
Elliptical Cut: Only the towers within the elliptical region (centered at origin) are considered for further analysis.

Dimensions:

semi-minor axis = 0.13 units
semi-major axis = 0.35 units

FHCAL (pi^-)

Elliptical cut on dphi vs dtheta, Explicit η cut: 1.3 to 3.3, 100 MeV Energy Cut



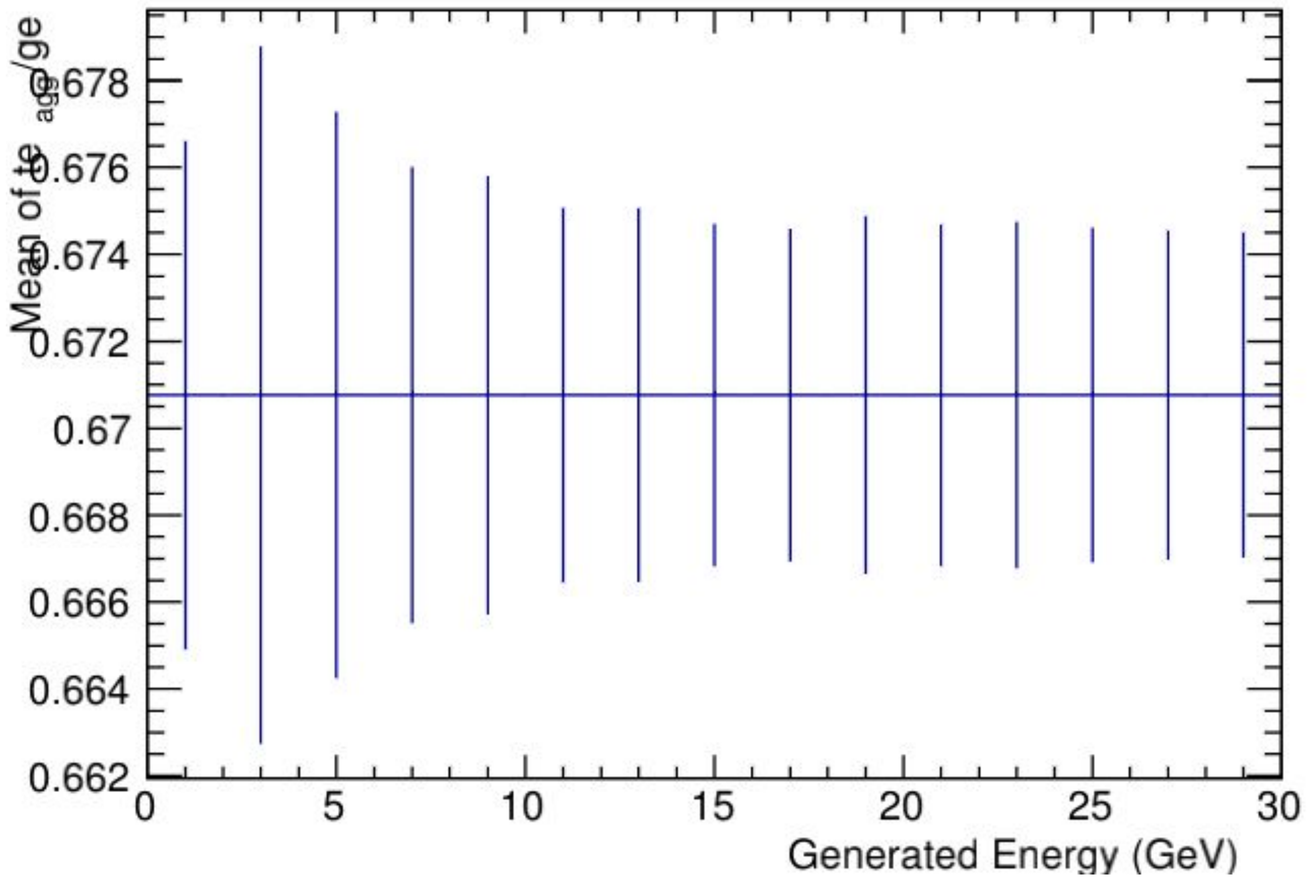
Elliptical Cut: Only the towers within the elliptical region (centered at origin) are considered for further analysis.

Dimensions:

semi-minor axis = 0.15 units
semi-major axis = 0.45 units

FEMC + FHCAL (pi^-)

Elliptical cut on dphi vs dtheta
Explicit η cut: 1.3 to 3.3
100 MeV Aggregate Tower Energy Cut

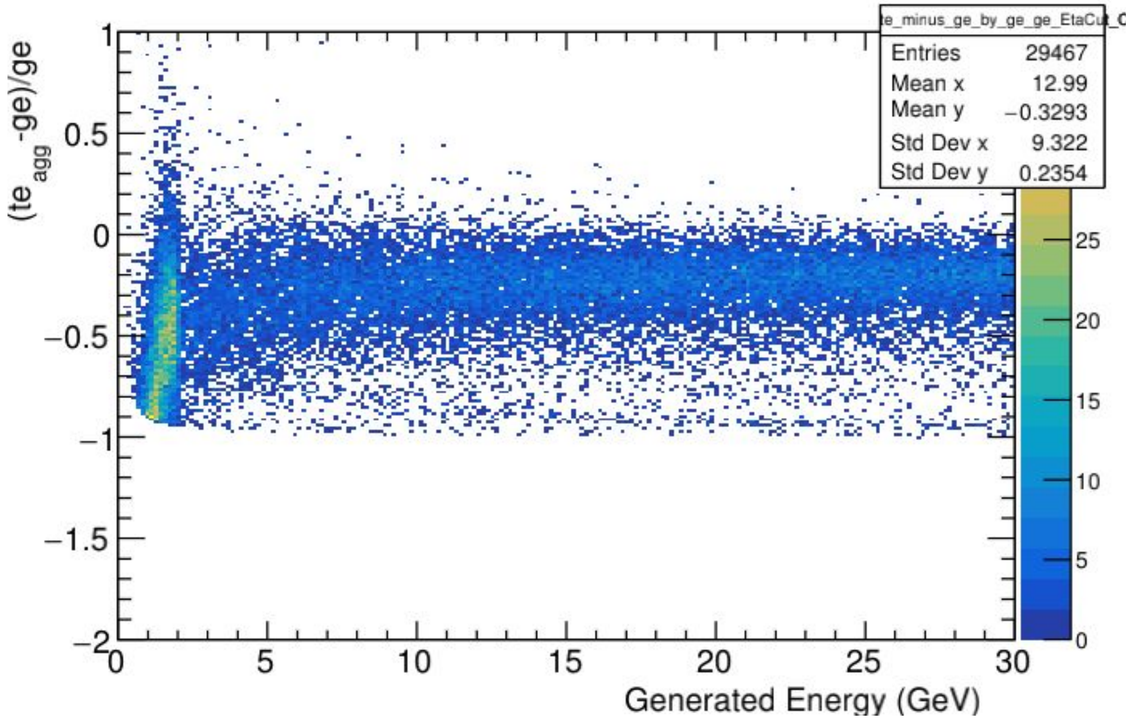


(te_{agg} → ∑(weight*te/calibrationFactor)/mean(∑(weight*te/calibrationFactor))

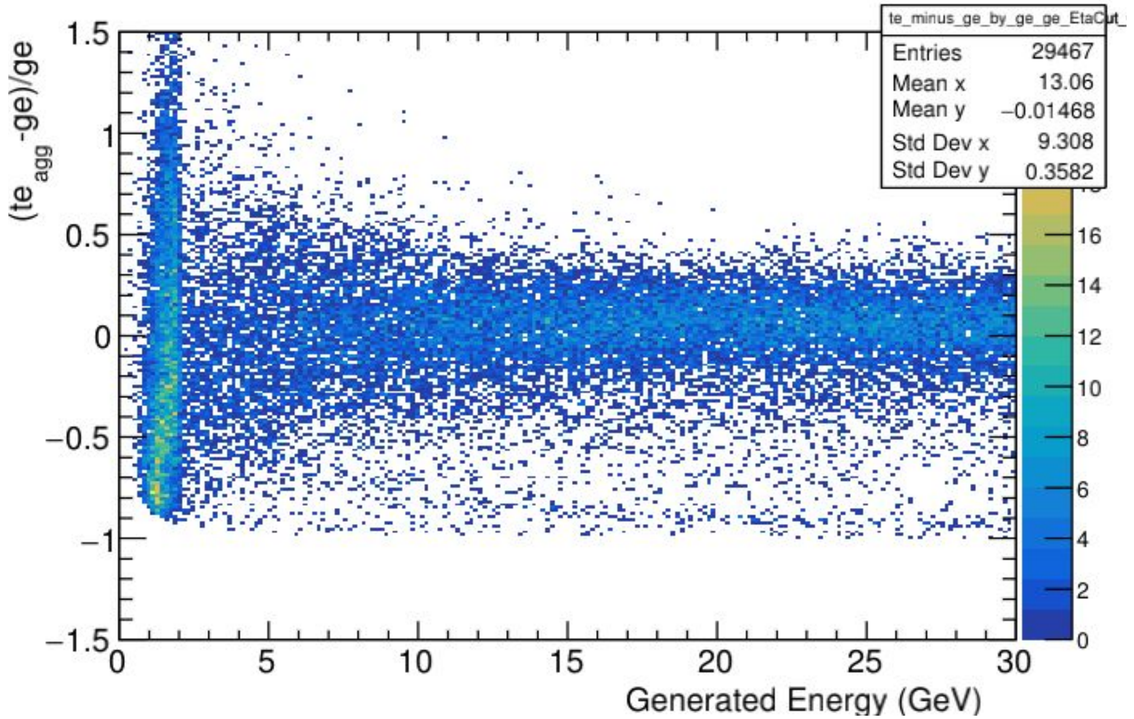
Each slice of $(te_{agg}-ge)/ge$ vs ge plot will be calibrated on the basis of dividing by a calibration factor which equals to the Mean of te_{agg}/ge corresponding to that particular slice in this plot.

FEMC + FHCAL (pi^-)

(te_{agg}-ge)/ge vs ge
Explicit η cut: 1.3 to 3.3
100 MeV Aggregate Tower Energy Cut



After calibration



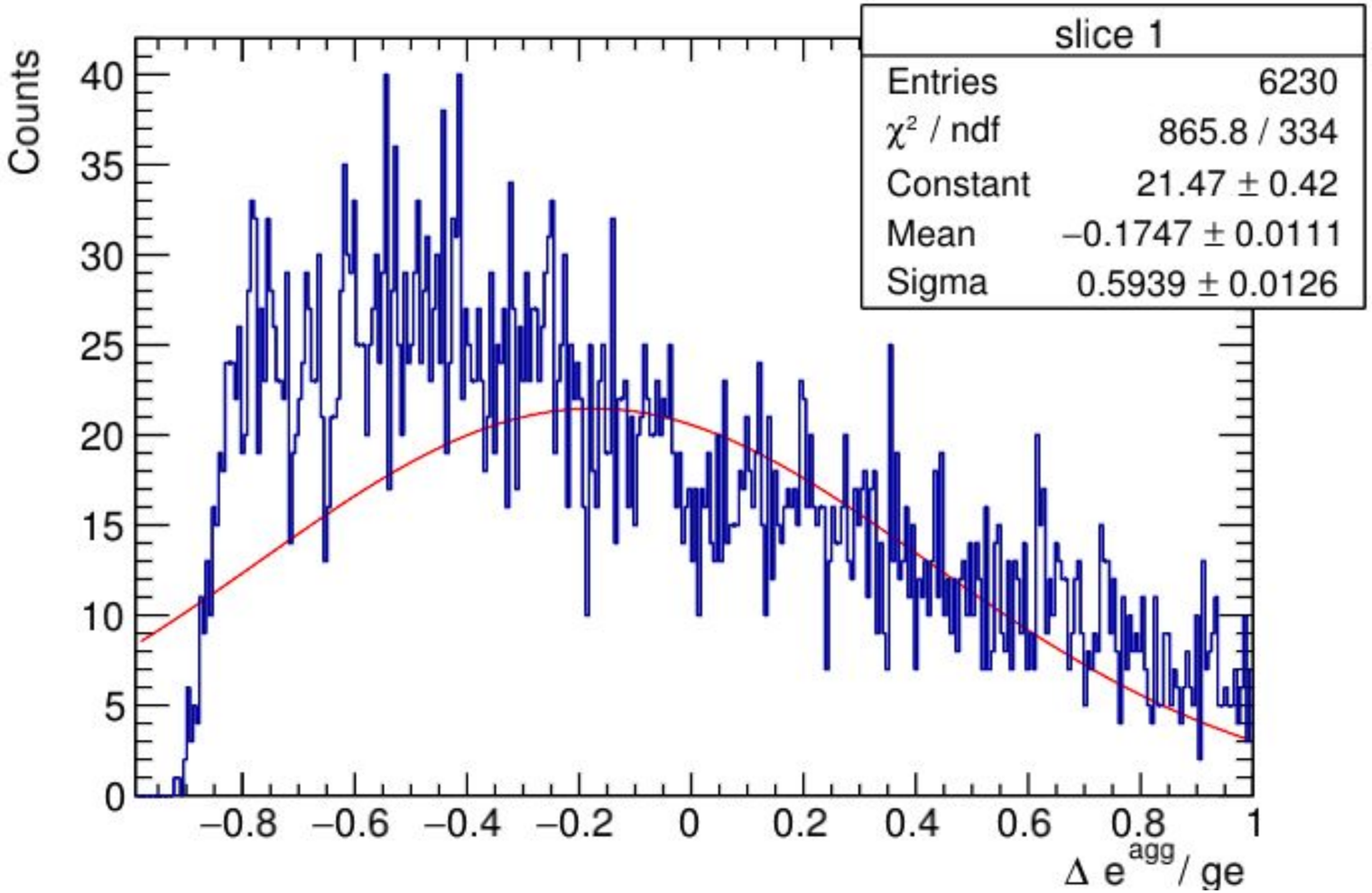
(te_{agg} → ∑(weight*te/calibrationFactor)/mean(∑(weight*te/calibrationFactor))

calibrationFactor(ge) = mean(te/ge) ; detector-wise; function of ge

weight = mean(te/ge) ; detector-wise; independent of ge

FEMC + FHCAL (pi^-)

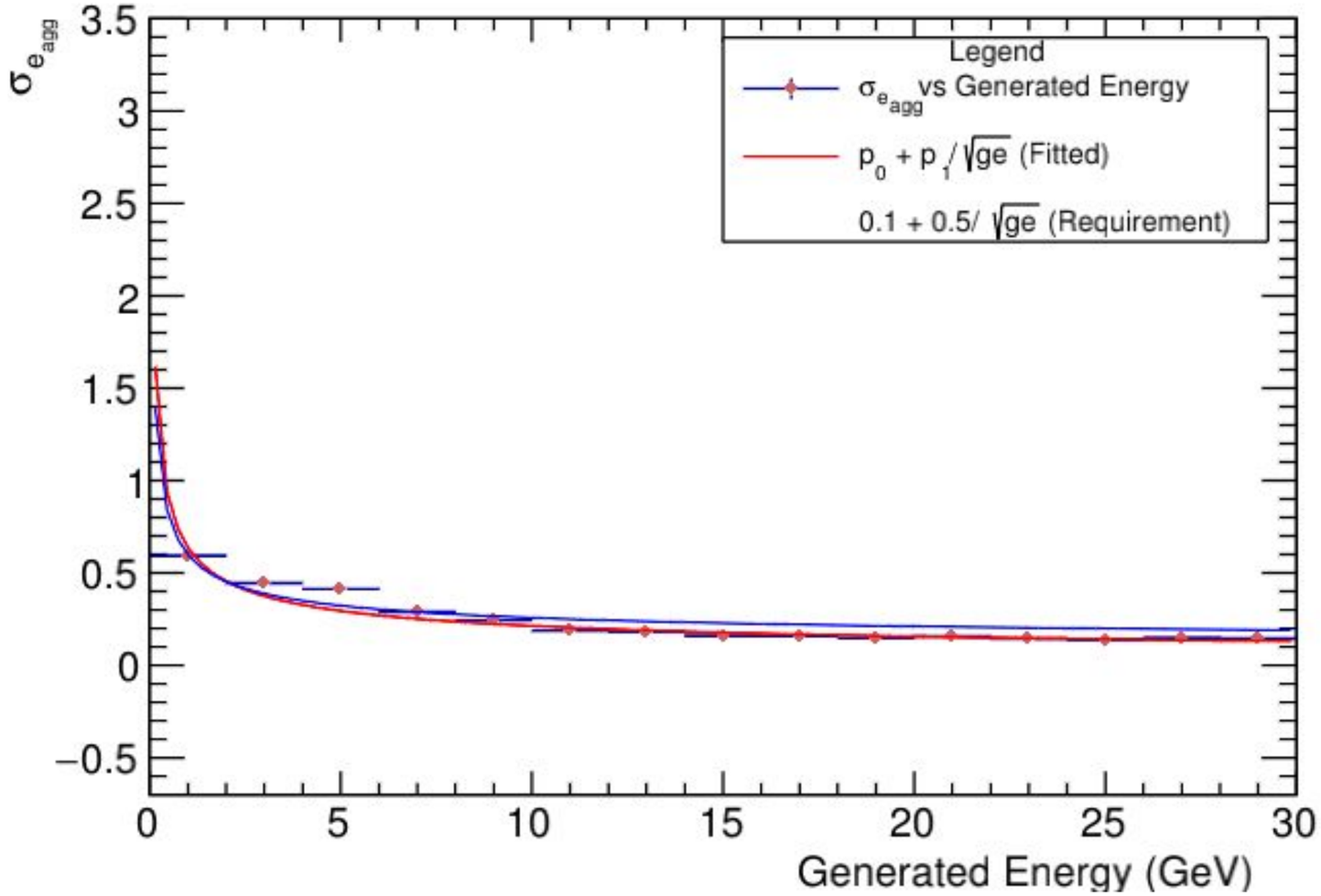
(te_{agg}-ge)/ge vs ge
Gaussian fit for the first slice (0-2 GeV)



Number of bins = 350 from -0.99 to 1

FEMC + FHCAL (pi^-)

σ_e_{agg} vs ge
Explicit η cut: 1.3 to 3.3
Elliptical Cut
100 MeV Aggregate Tower Energy Cut



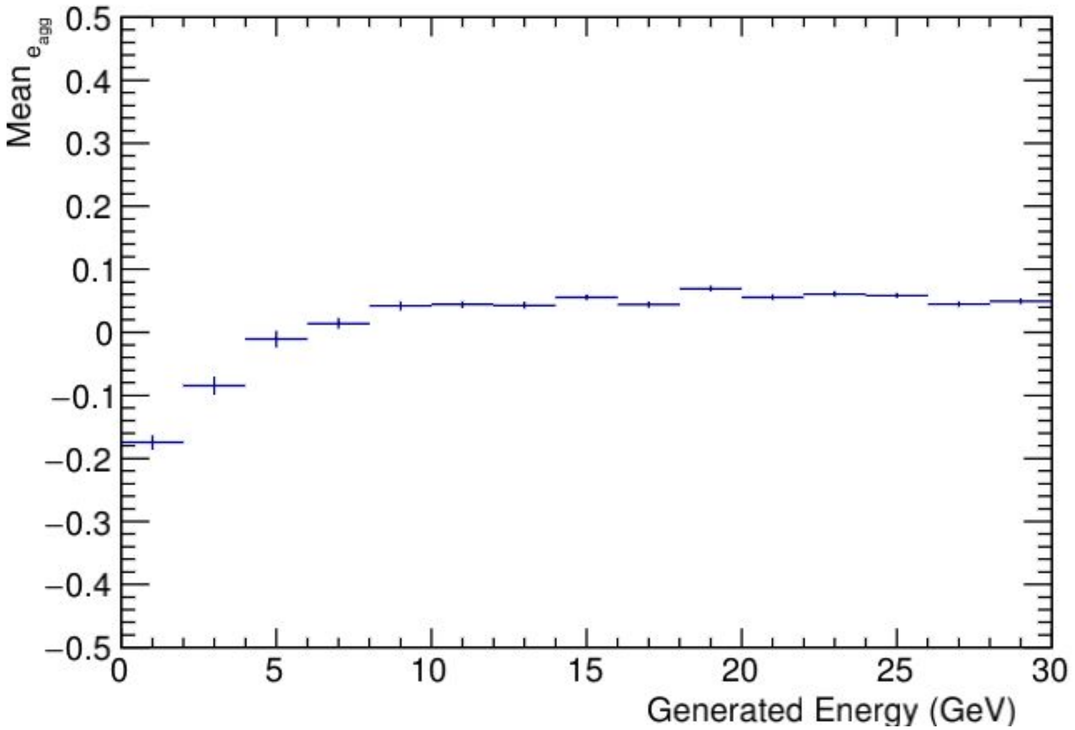
σe refers to the standard deviation of the Gaussian fitted to a slice of the calibrated $(te_{agg}\text{-}ge)/ge$ vs ge plot.

Number of bins = 15
Bin Width = 2 GeV

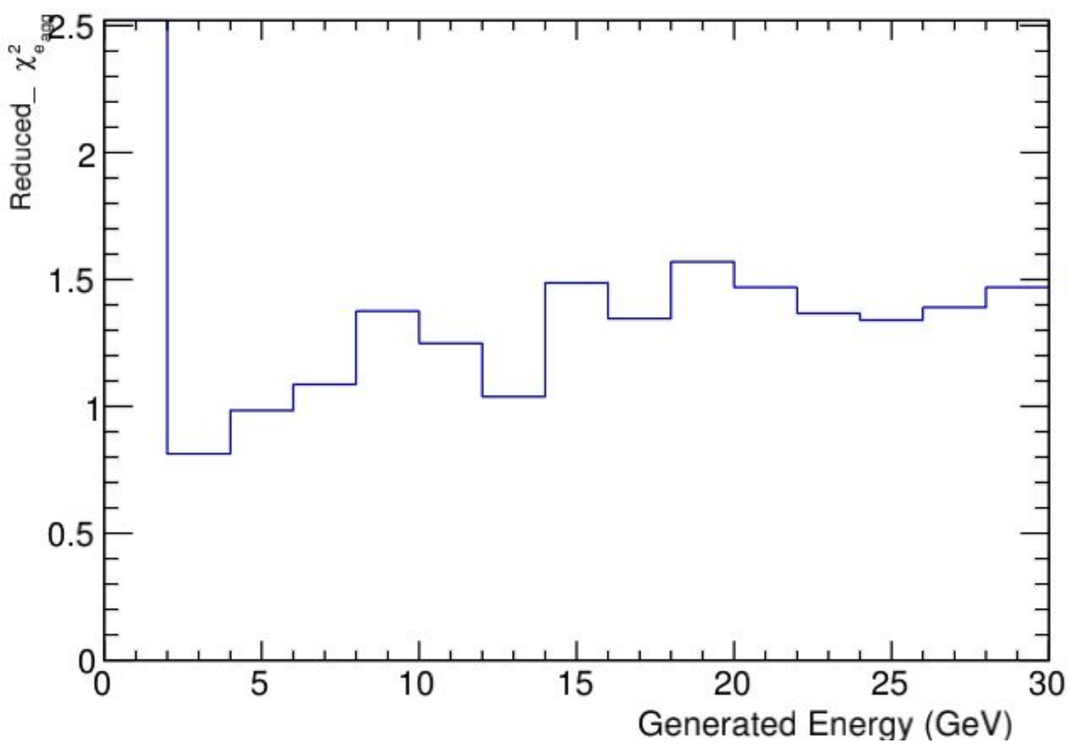
Fit Parameters:
p_o = (0.0183350 +- 0.003643344)
p_1 = (0.619024 +- 0.0136655)$GeV^{0.5}$

FEMC + FHCAL (pi^-)

Explicit η cut: 1.3 to 3.3
Elliptical Cut
100 MeV Aggregate Tower Energy Cut



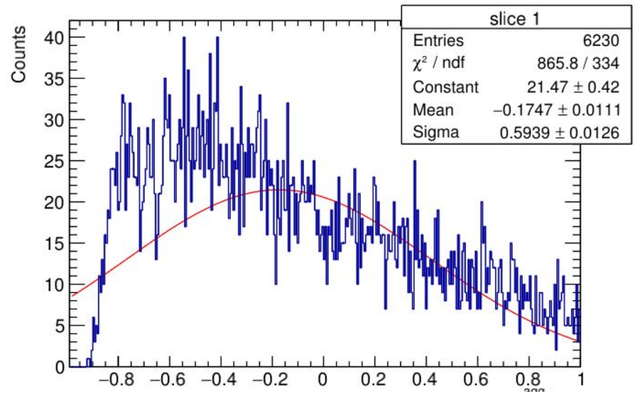
Mean of the Gaussians fitted to the slices of the calibrated $(te_{agg}-ge)/ge$ vs ge plot.

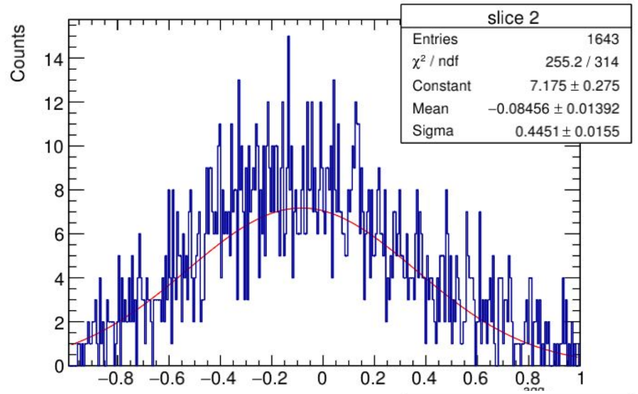


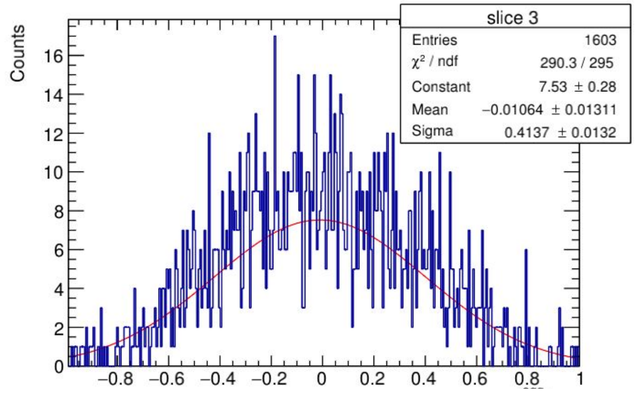
Reduced_χ2 of the Gaussians fitted to the slices of the calibrated $(te_{agg}-ge)/ge$ vs ge plot.

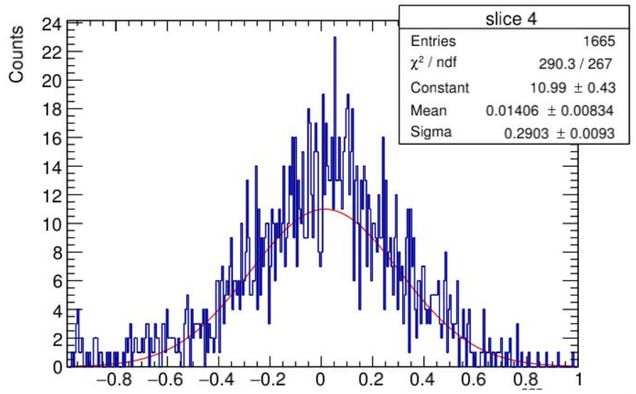
FEMC + FHCAL (pi^-)

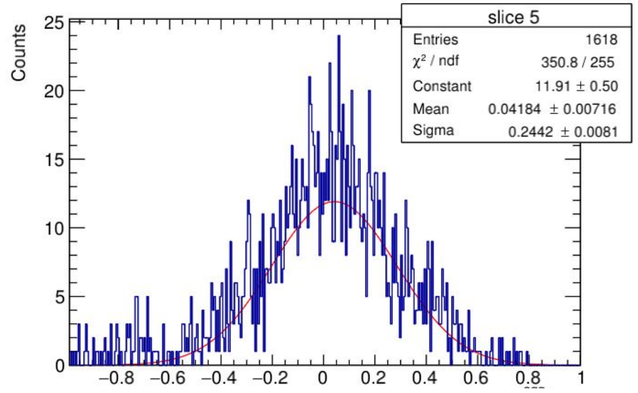
Fitted Gaussians

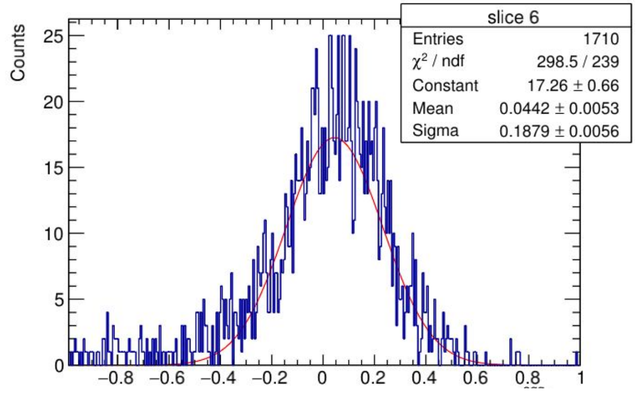


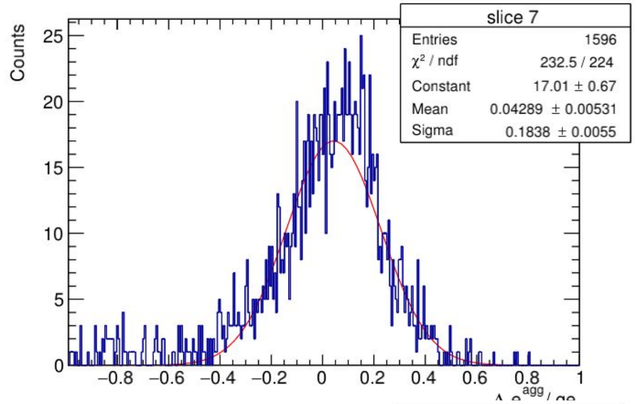


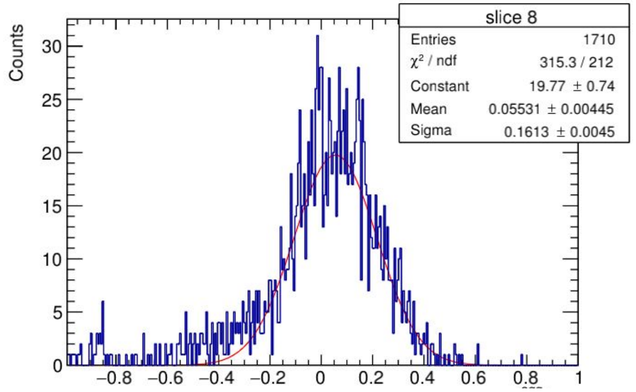


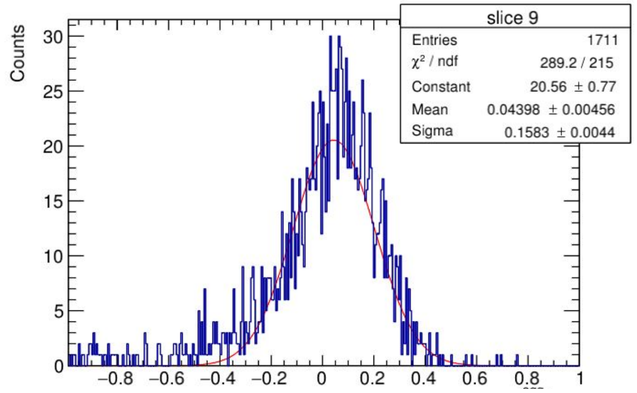


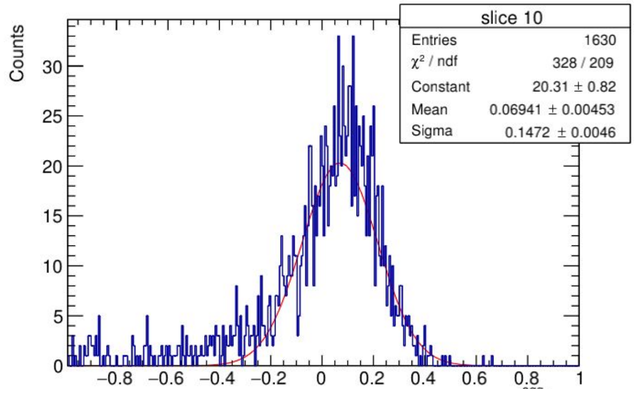


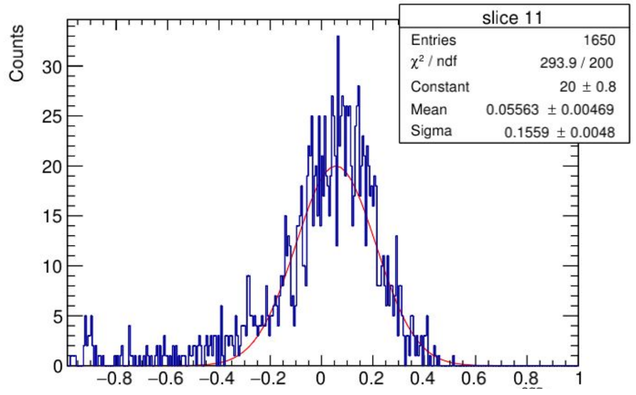


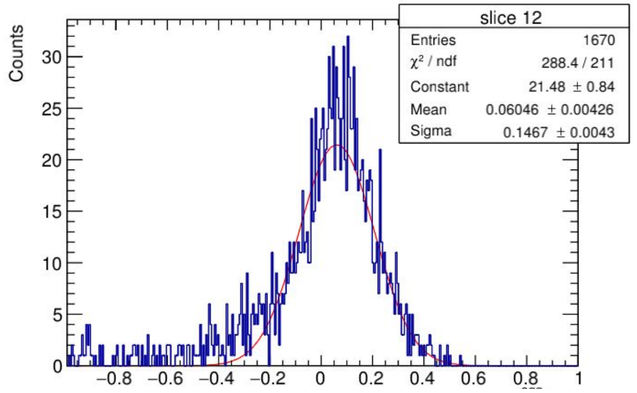








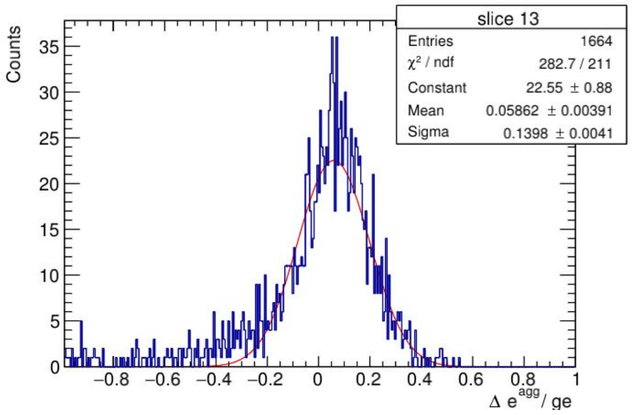


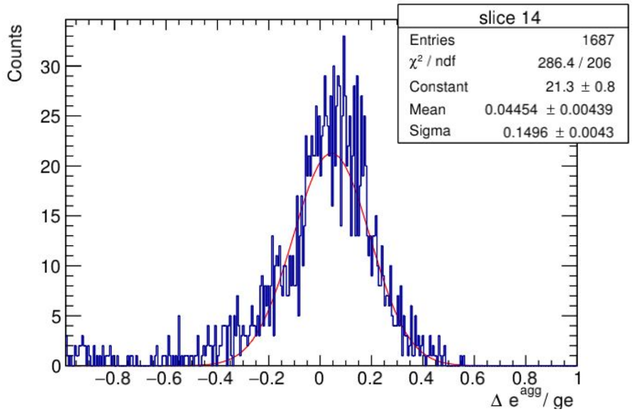


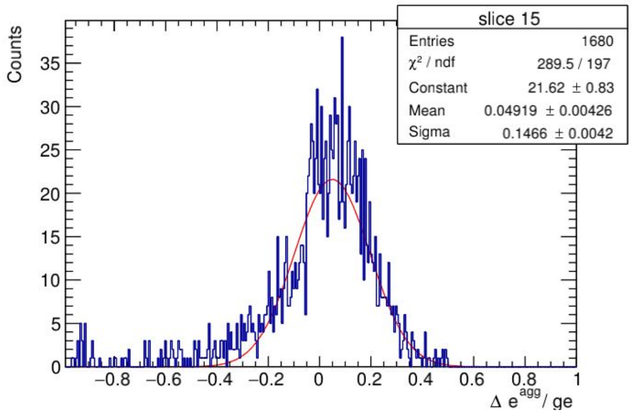
The x-axes denote $\Delta e_{agg}/ge$

FEMC + FHCAL (pi^-)

Fitted Gaussians





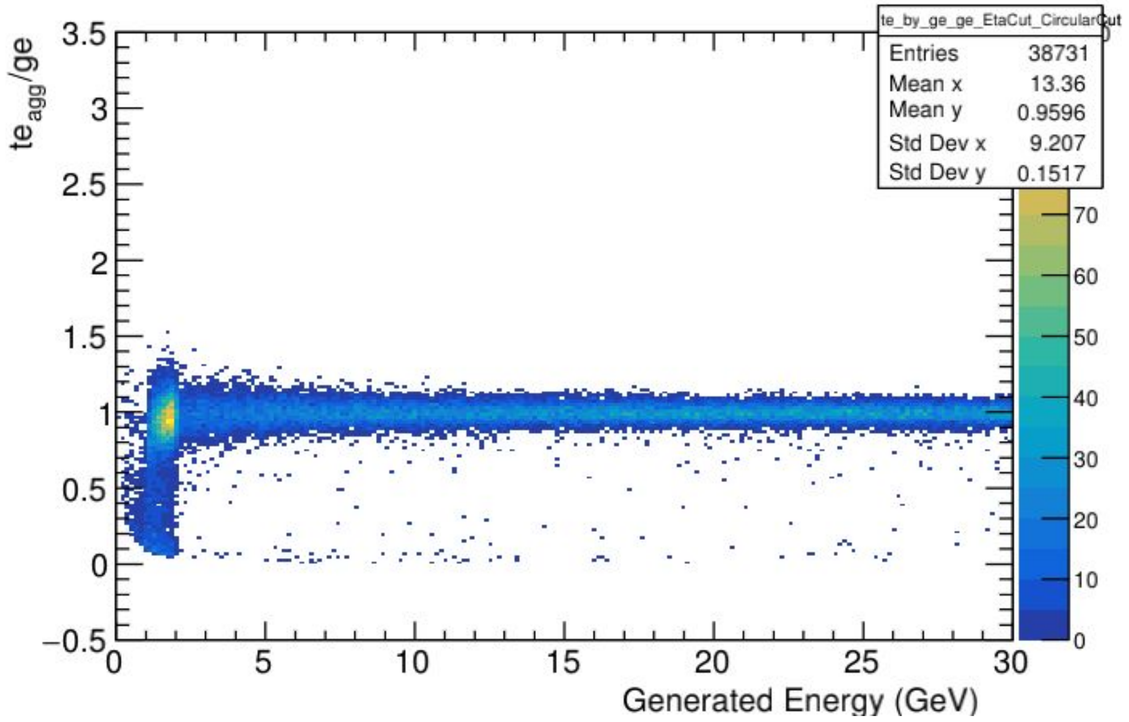


The x-axes denote $\Delta e_{agg}/ge$

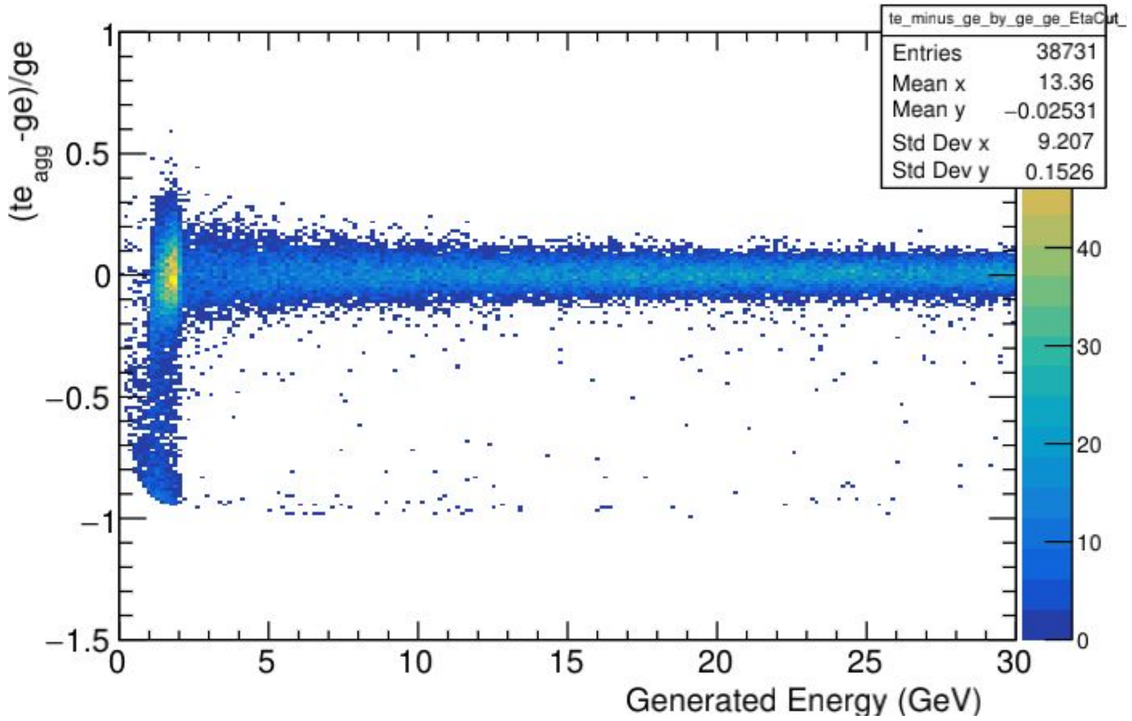
CEMC + HCALIN + HCALOUT (pi^-)

CEMC + HCALIN + HCALOUT (pi^-)

(te_{agg}-ge)/ge vs ge
Explicit η cut: -1.1 to 1.1
Elliptical cut
100 MeV Aggregate Tower Energy Cut



After calibration



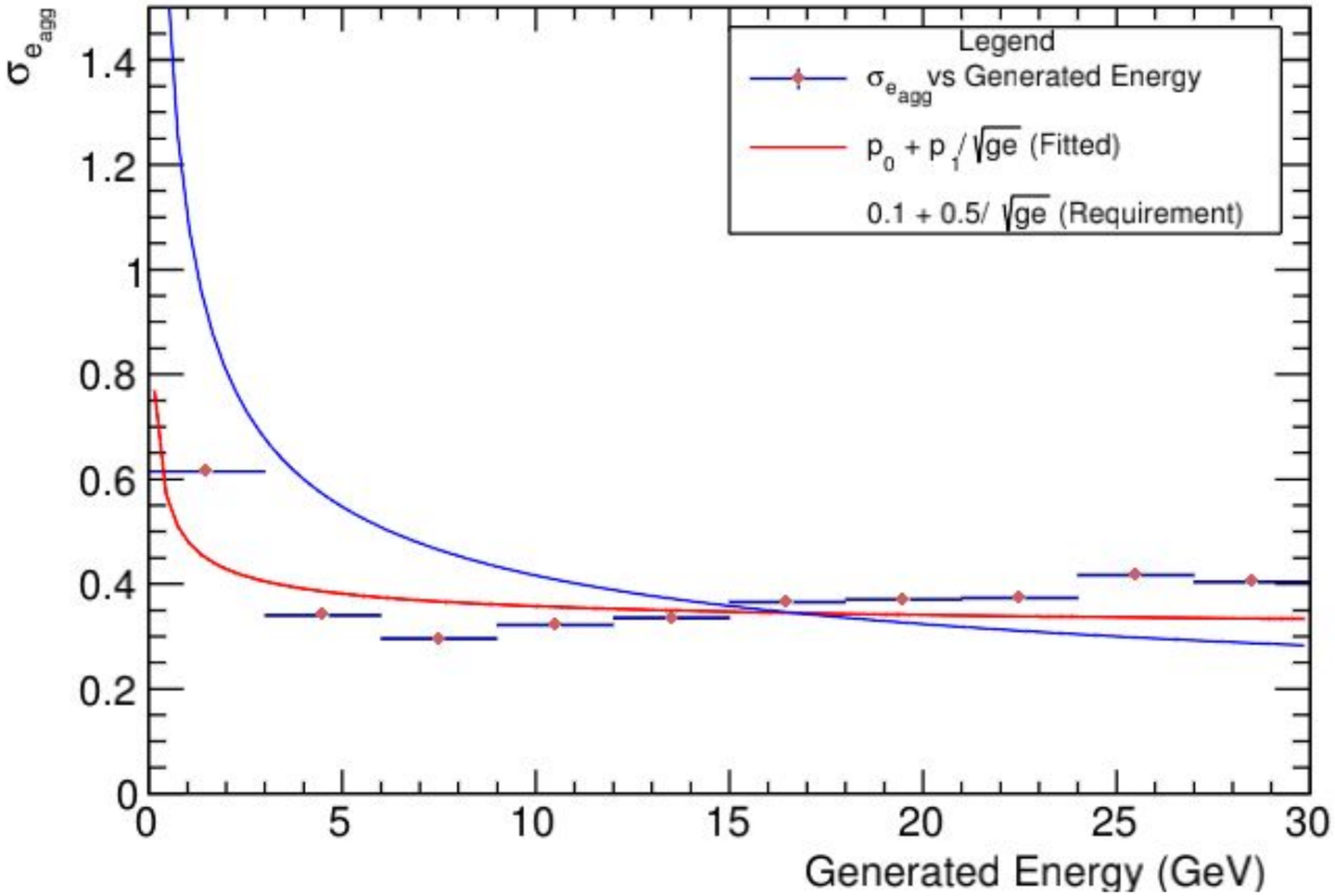
(te_{agg} → ∑(weight*te/calibrationFactor)/mean(∑(weight*te/calibrationFactor))

calibrationFactor(ge) = mean(te/ge) ; detector-wise; function of ge

weight = mean(te/ge) ; detector-wise; independent of ge

CEMC + HCALIN + HCALOUT (pi^-)

σ_e_{agg} vs ge
Explicit η cut: -1.1 to 1.1
Elliptical cut
100 MeV Aggregate Tower Energy Cut



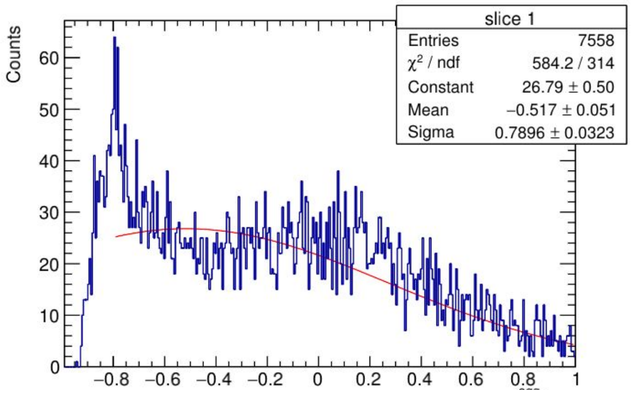
σe refers to the standard deviation of the Gaussian fitted to a slice of the calibrated $(te_{agg}-ge)/ge$ vs ge plot.

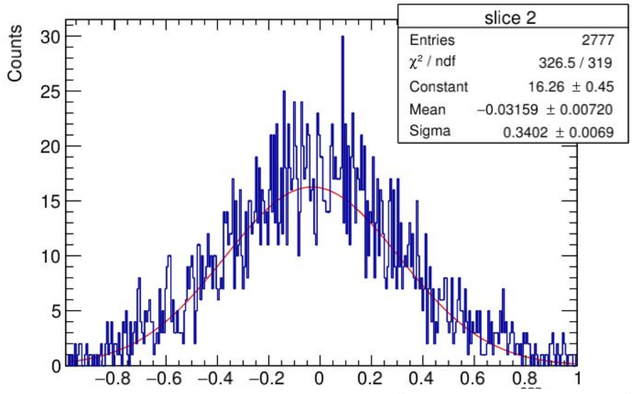
Number of bins = 10
Bin Width = 3 GeV

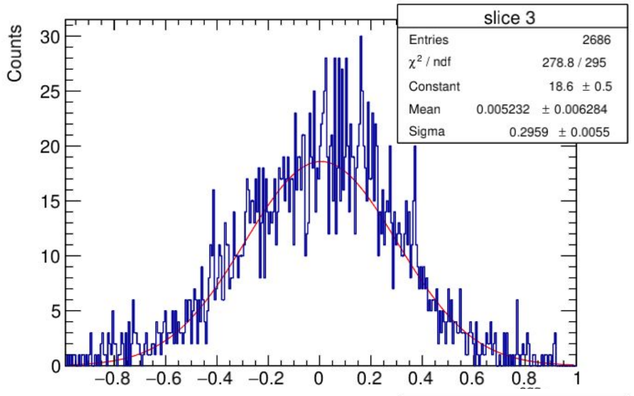
Fit Parameters:
p_o = (0.300277 +- 0.00584957)
p_1 = (0.181573 +- 0.0173502) $GeV^{0.5}$

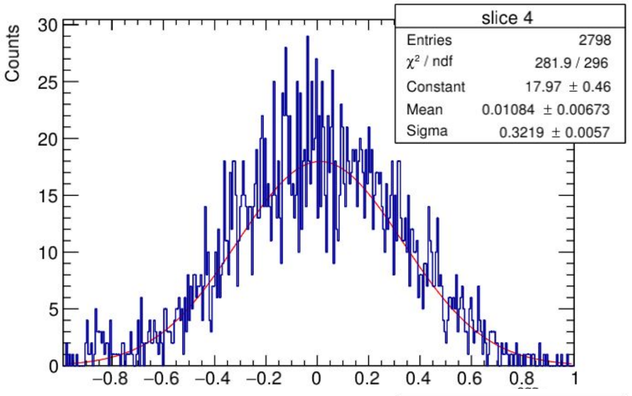
CEMC + HCALIN + HCALOUT (pi^-)

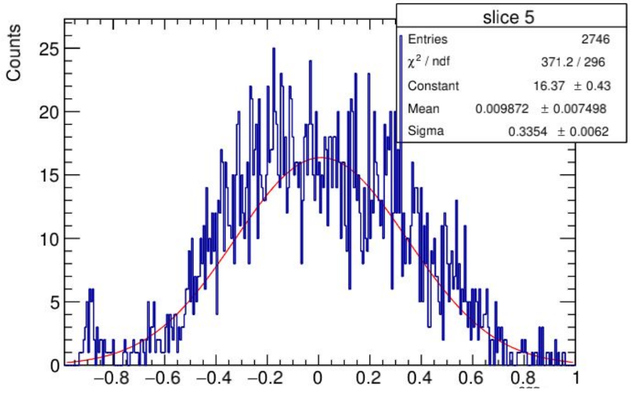
Fitted Gaussians

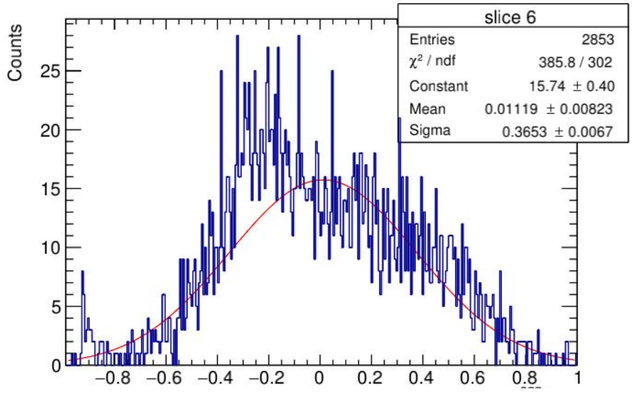


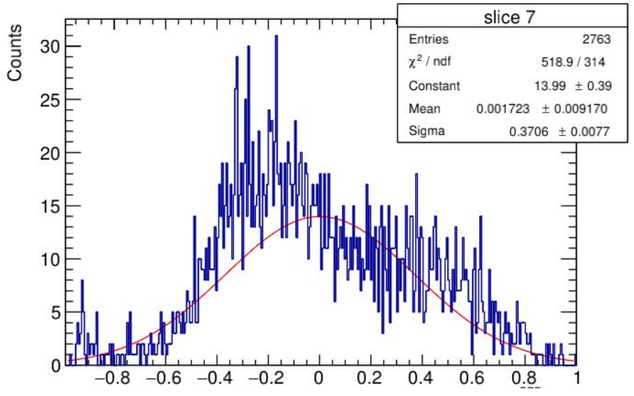


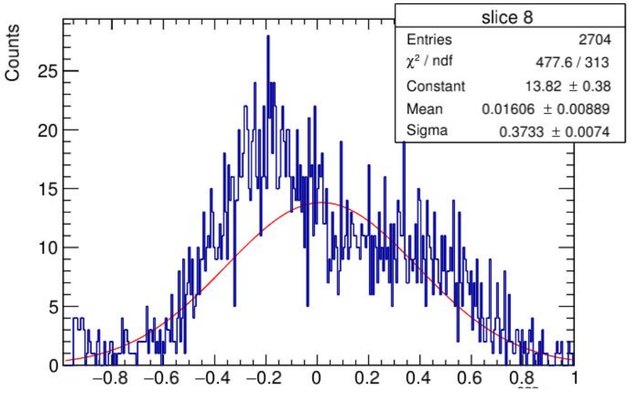


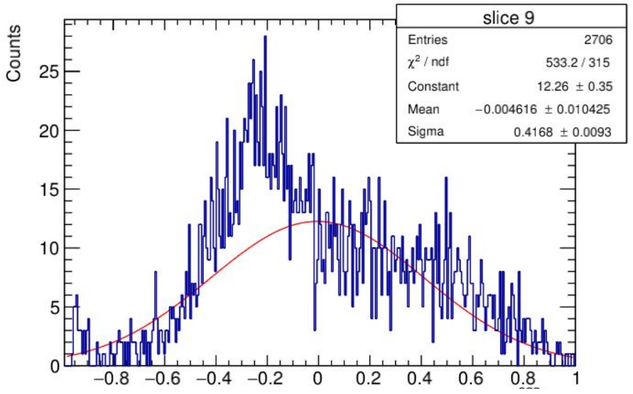


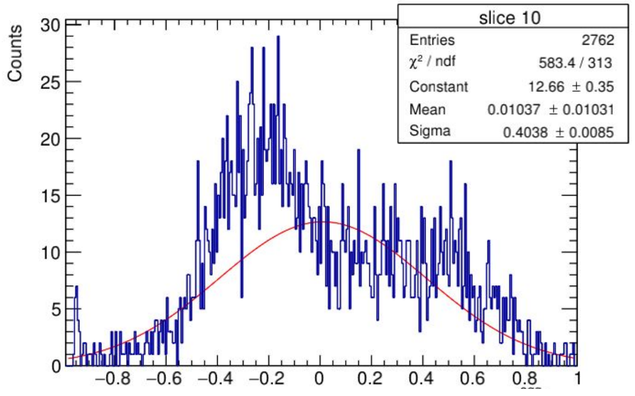












The x-axes denote $\Delta e_{agg}/ge$