Simulation Statistics

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Contents

Histograms for energy resolution of detectors with manual clustering, 360 MeV energy cut on aggregate towers of EMCs (FEMC and CEMC), and slice-wise calibration, for the following detector-particle pairs:

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

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

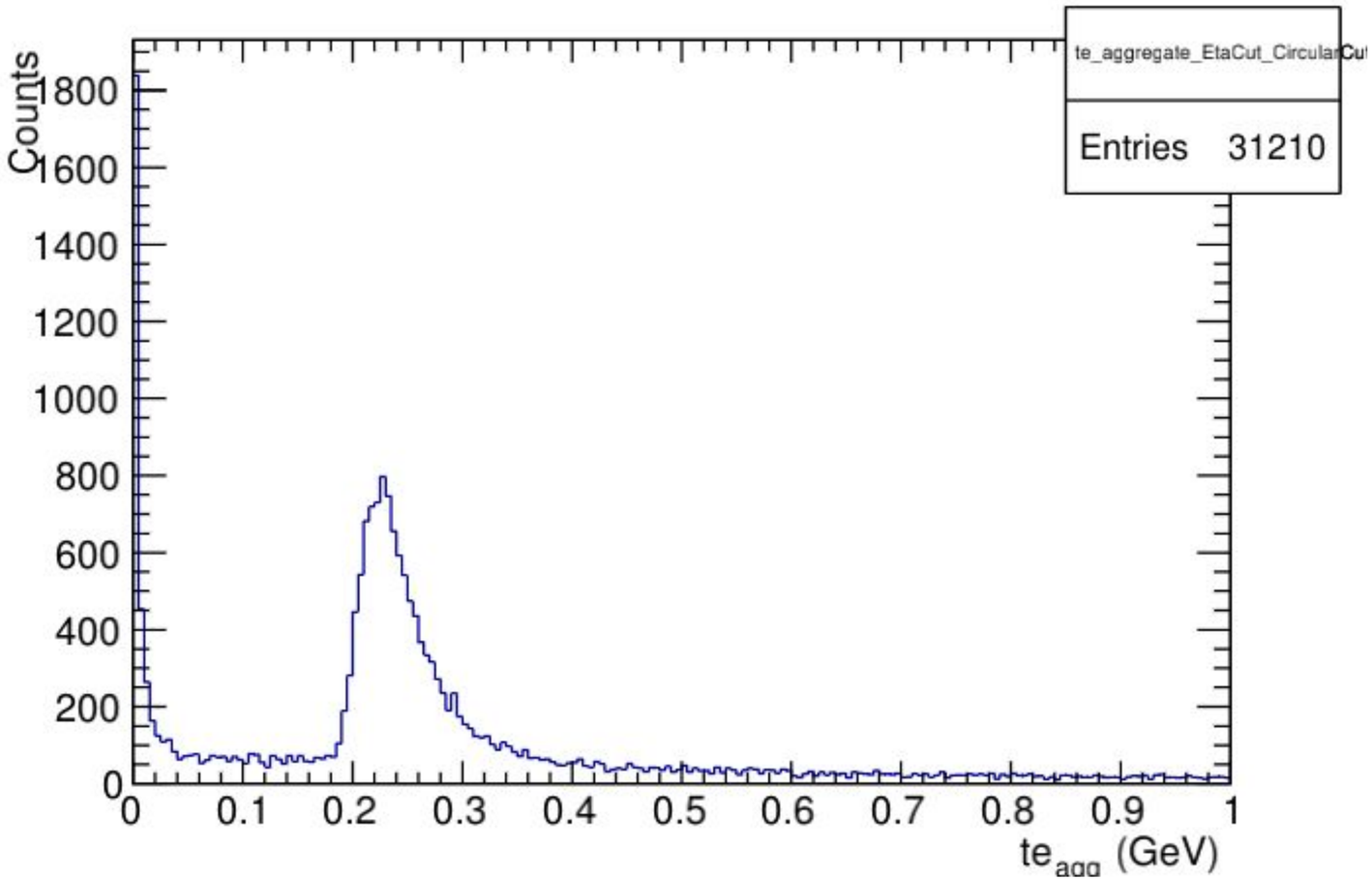
Cuts:

- Detector-wise η cuts, intersection for combinations
- Detector-wise Elliptical cuts in dphi vs dtheta plots
- Energy cut on individual Towers of EMCs (360 MeV)

FEMC + FHCAL (pi^-)

FEMC (pi^-)

te vs counts
Explicit η cut: 1.3 to 3.3
No energy cut

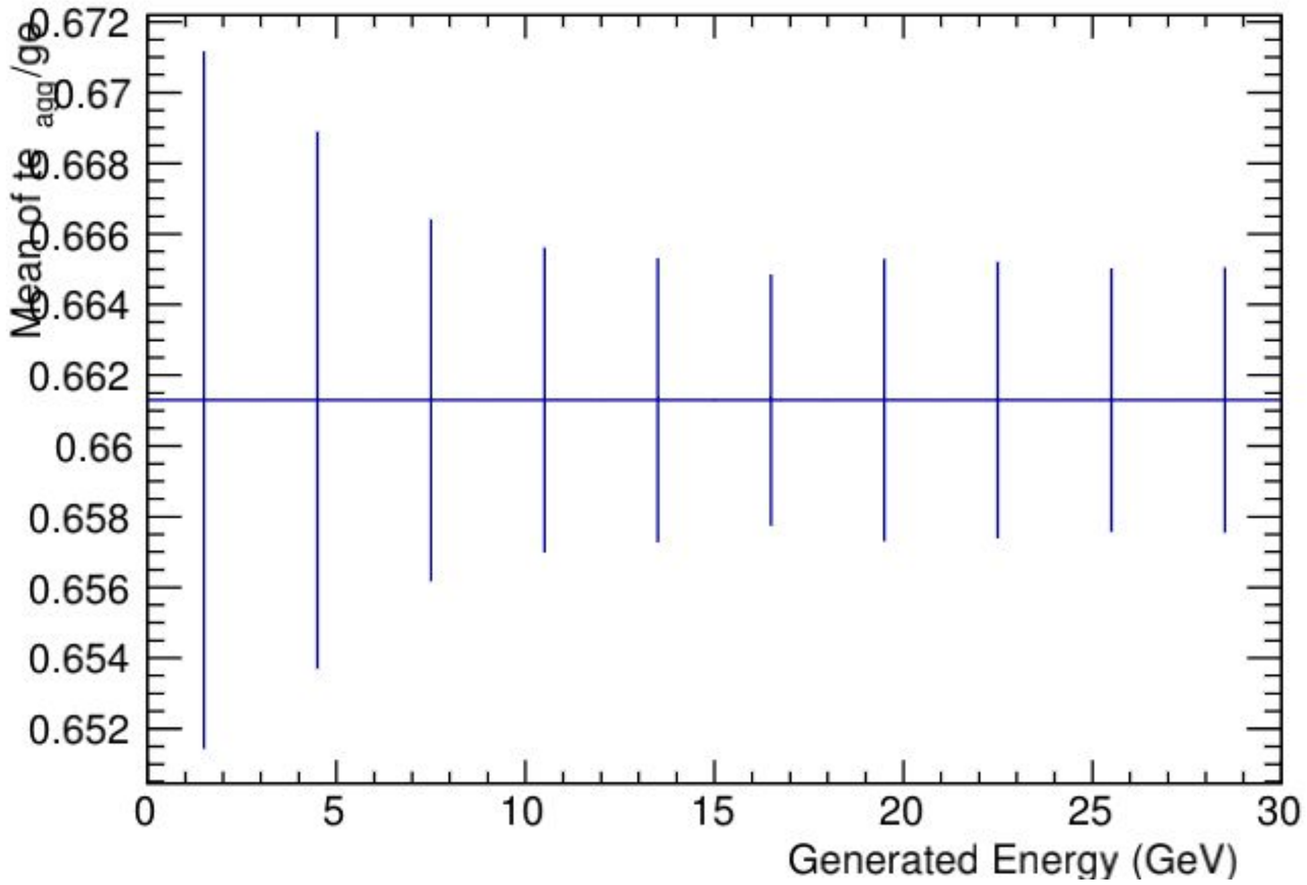


Energy deposition in FEMC to deduce MIPS threshold

FEMC + FHCAL (pi^-)

Elliptical cut on dphi vs dtheta
Explicit η cut: 1.3 to 3.3
360 MeV Aggregate Energy Cuts on EMC Towers

After calibration

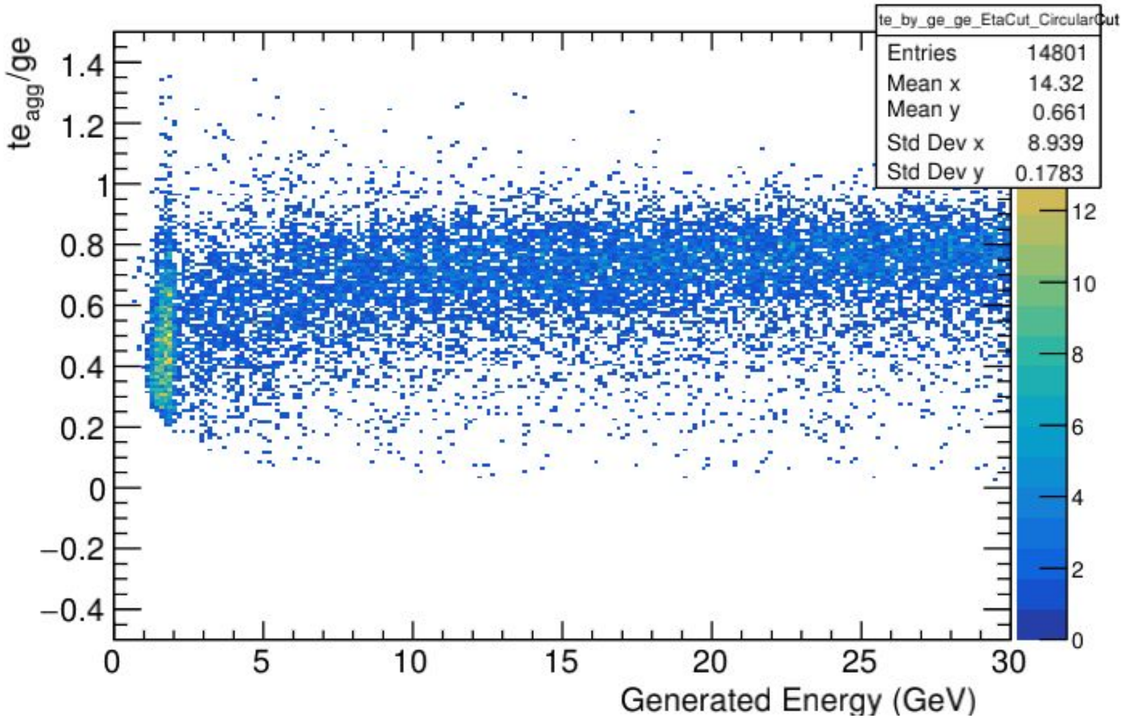


(te_{agg} → ∑(weight*te/calibrationFactor)/mean(∑(weight*te/calibrationFactor))

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
360 MeV Aggregate Energy Cuts on EMC Towers



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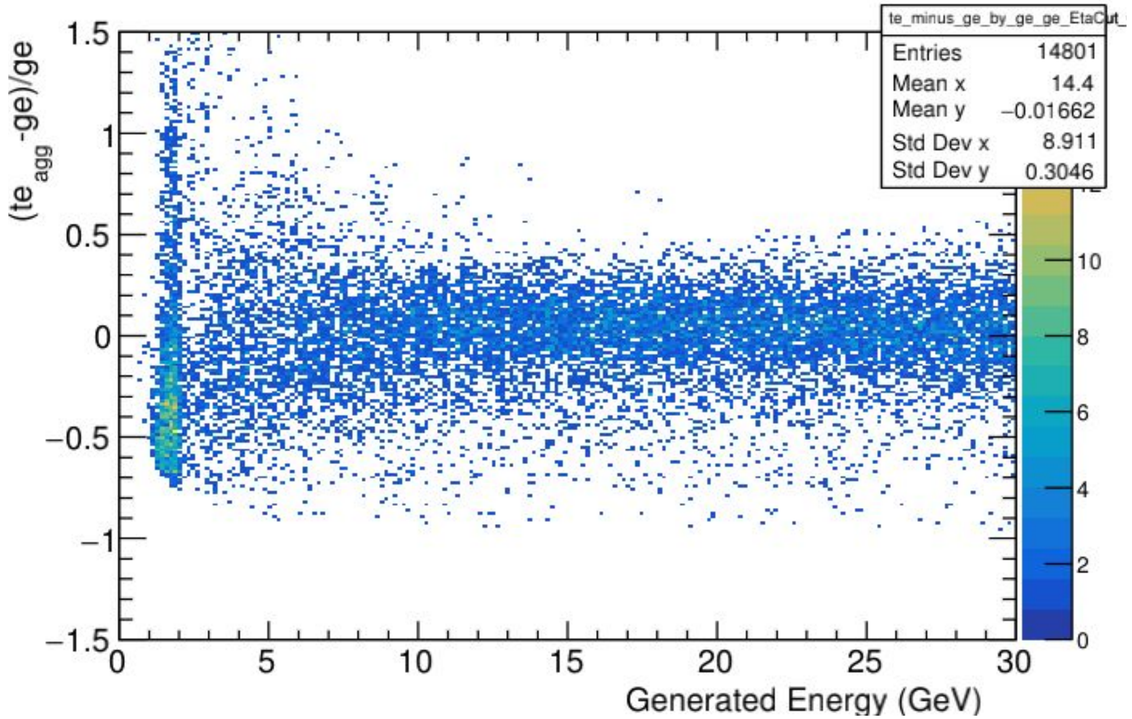


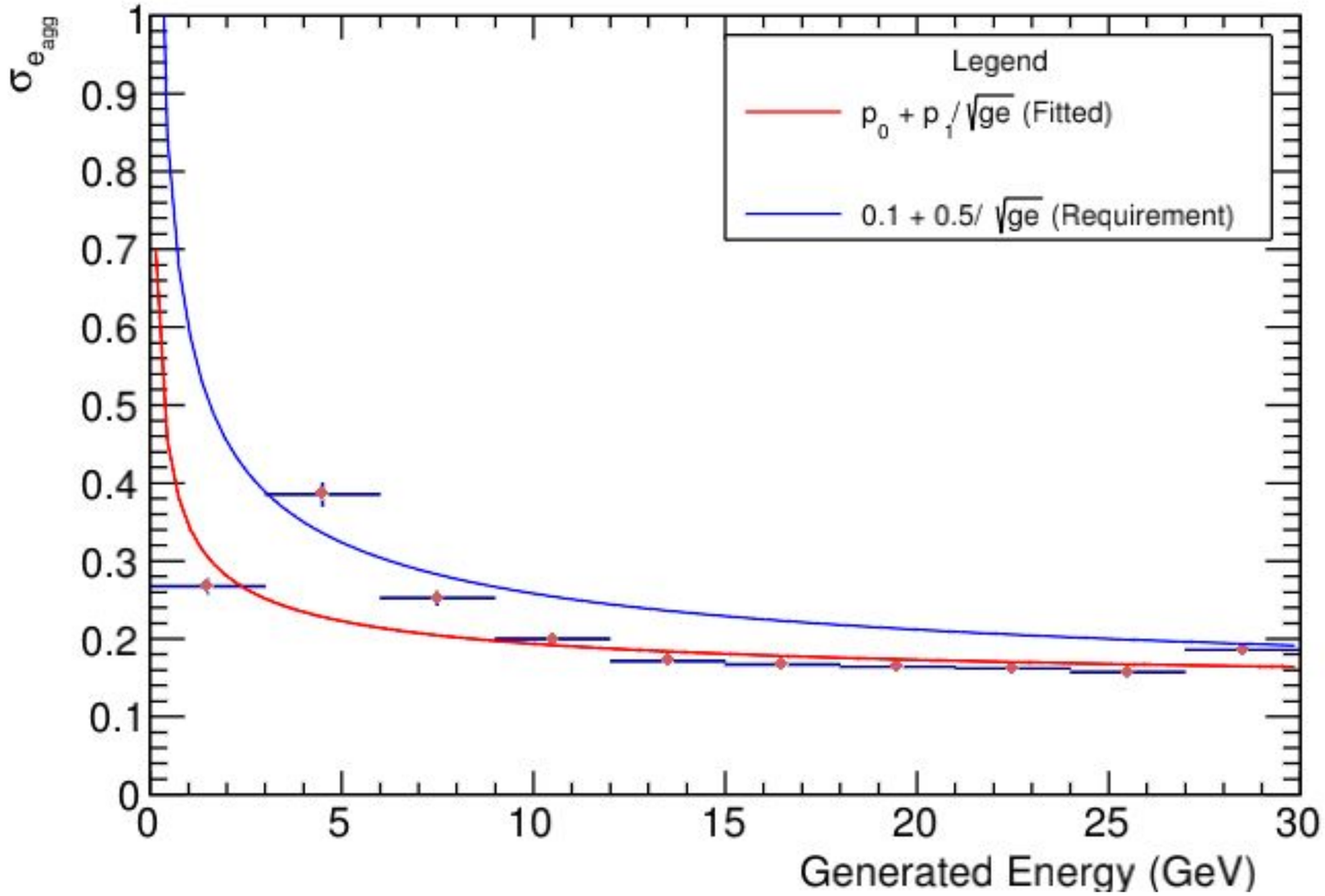
(te_{agg} → ∑(weight*te/calibrationFactor)/mean(∑(weight*te/calibrationFactor))

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

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

FEMC + FHCAL (pi^-)

σ_e_{agg} vs ge
Explicit η cut: 1.3 to 3.3
Elliptical Cut for Manual Clustering
360 MeV Aggregate Energy Cuts on EMC Towers



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

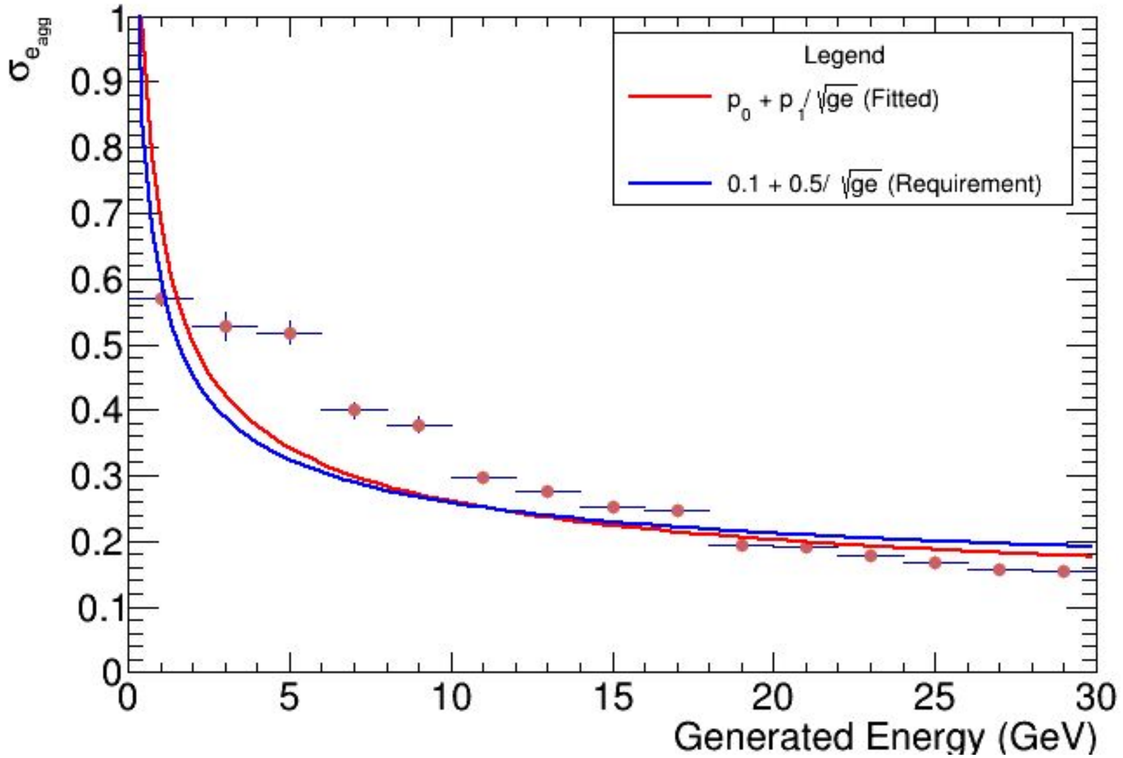
Number of bins = 10
Bin Width = 3 GeV

Fit Parameters:
p_o = (0.123222 +- 0.00462695)
p_1 = (0.222539 +- 0.0155956) $GeV^{0.5}$

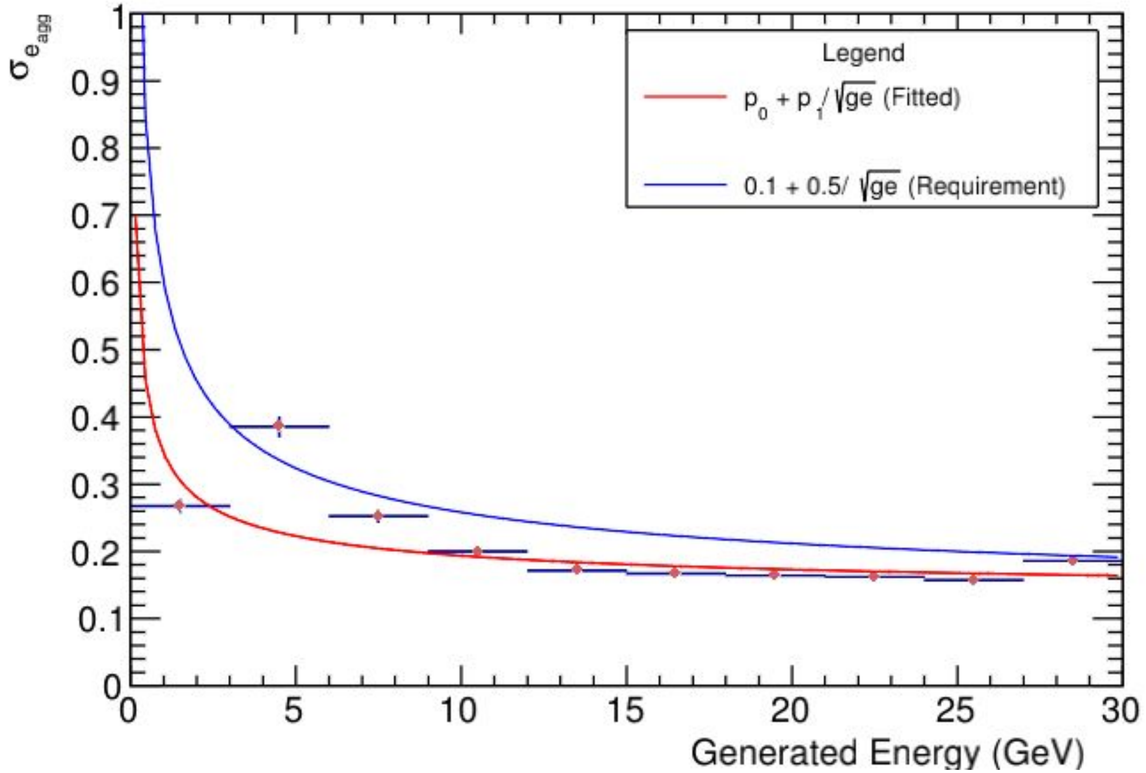
FEMC + FHCAL (pi^-)

Explicit η cut: 1.3 to 3.3
Elliptical Cut for Manual Clustering
360 MeV Aggregate Energy Cuts on EMC Towers

Cuts on individual EMC Towers



Cuts on aggregate EMC Towers



FEMC + FHCAL (pi^-)

Explicit η cut: 1.3 to 3.3
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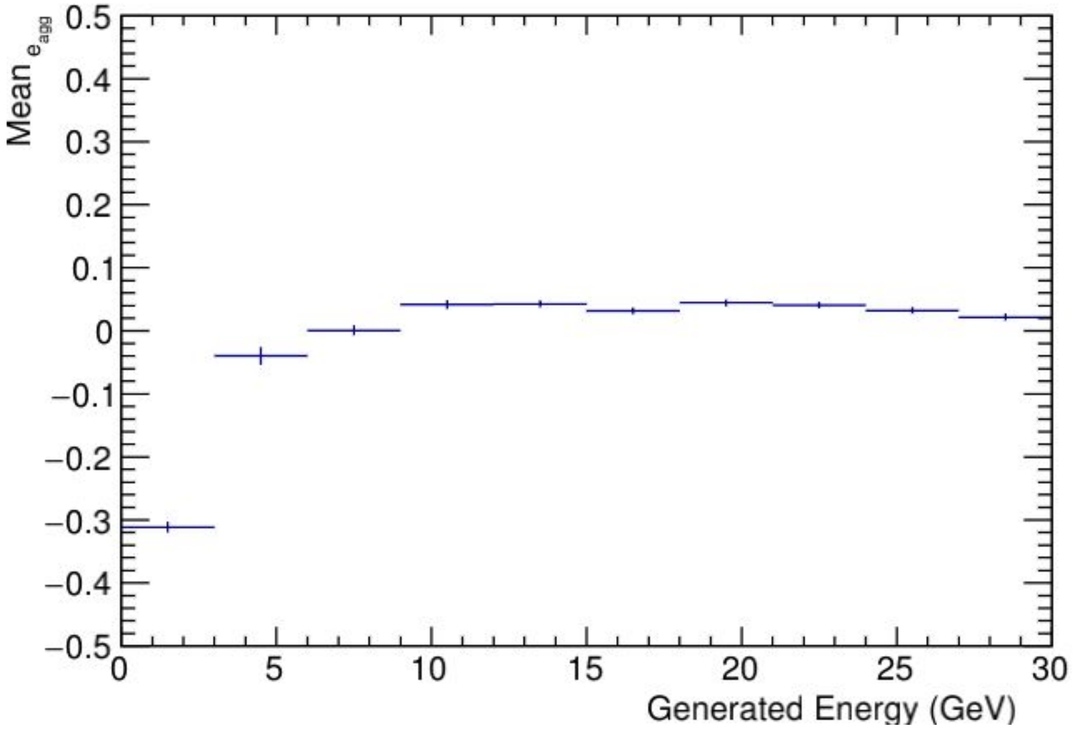
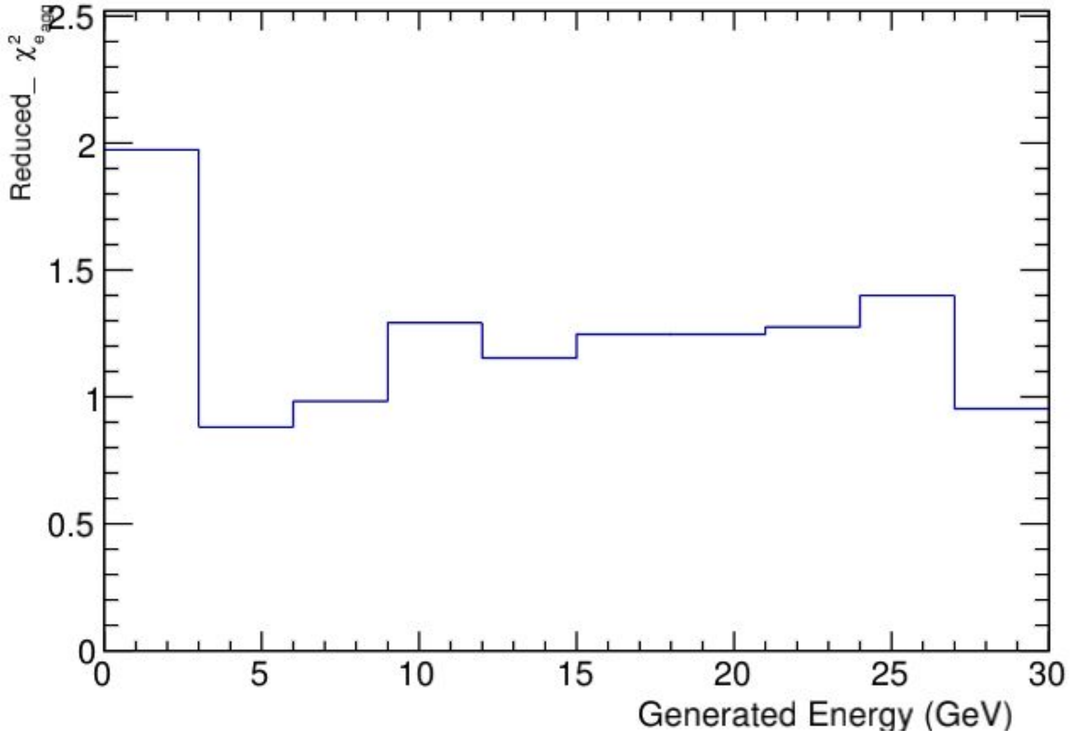


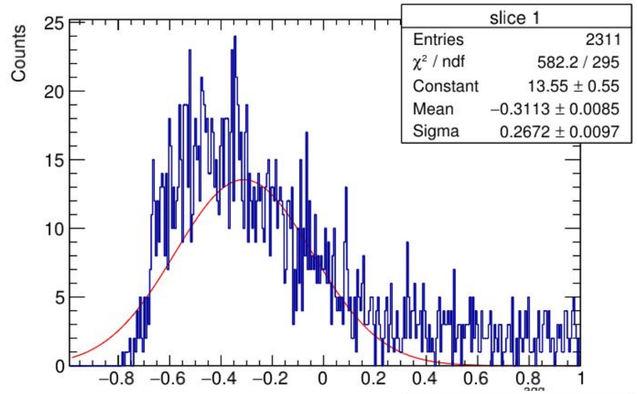
Mean of the Gaussians fitted to the slices of the calibrated $(te_{agg}-ge)/ge$ vs ge plot.

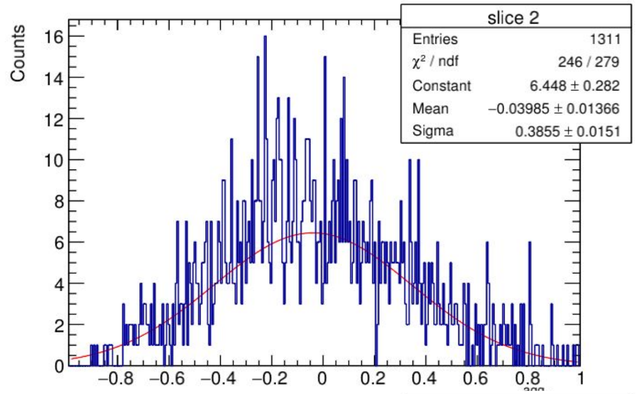


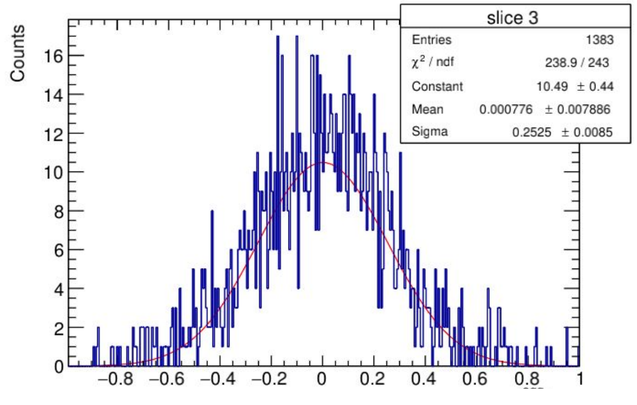
Reduced_χ2 of the Gaussians fitted to the slices of the calibrated $(te_{agg}-ge)/ge$ vs ge plot.

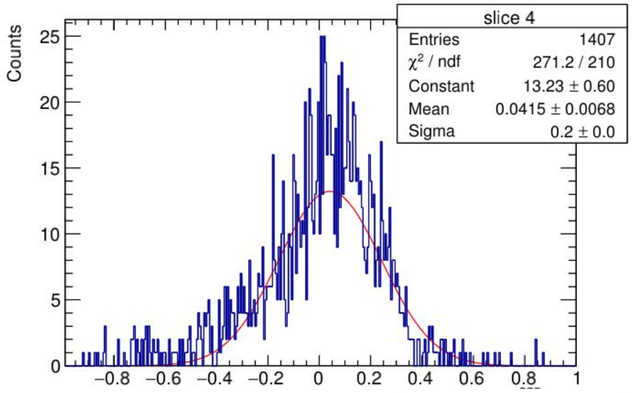
FEMC + FHCAL (pi^-)

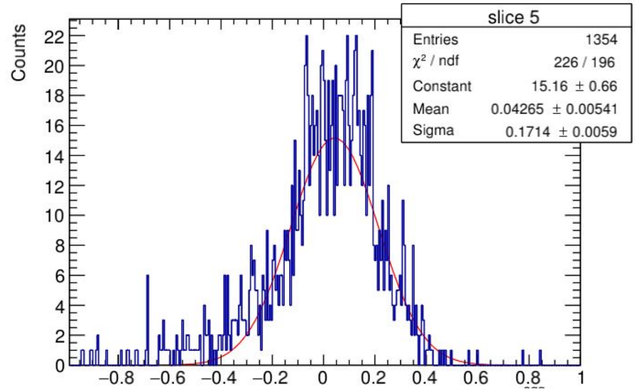
Fitted Gaussians

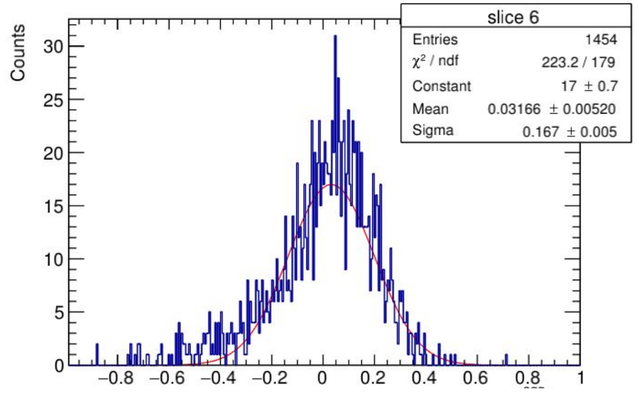


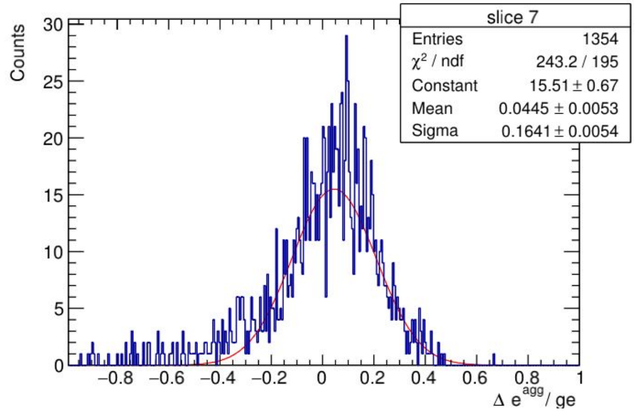


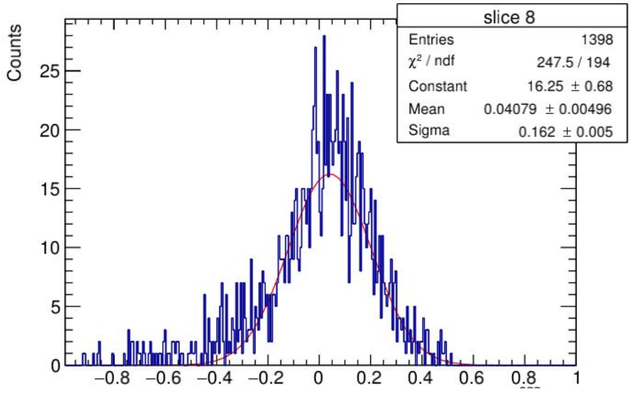


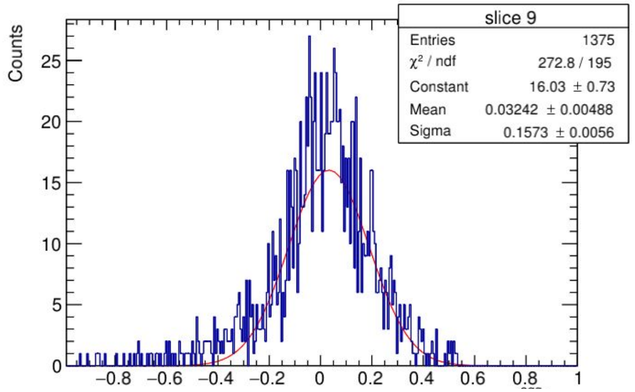


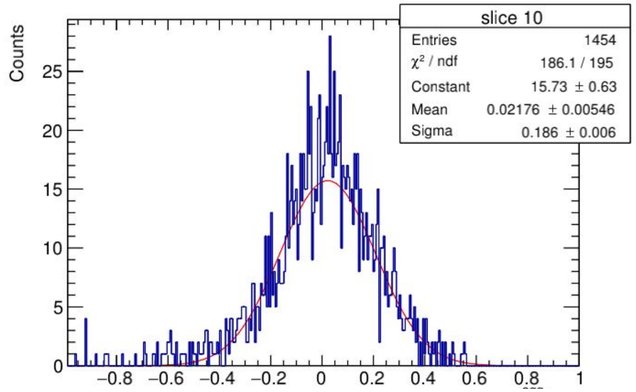










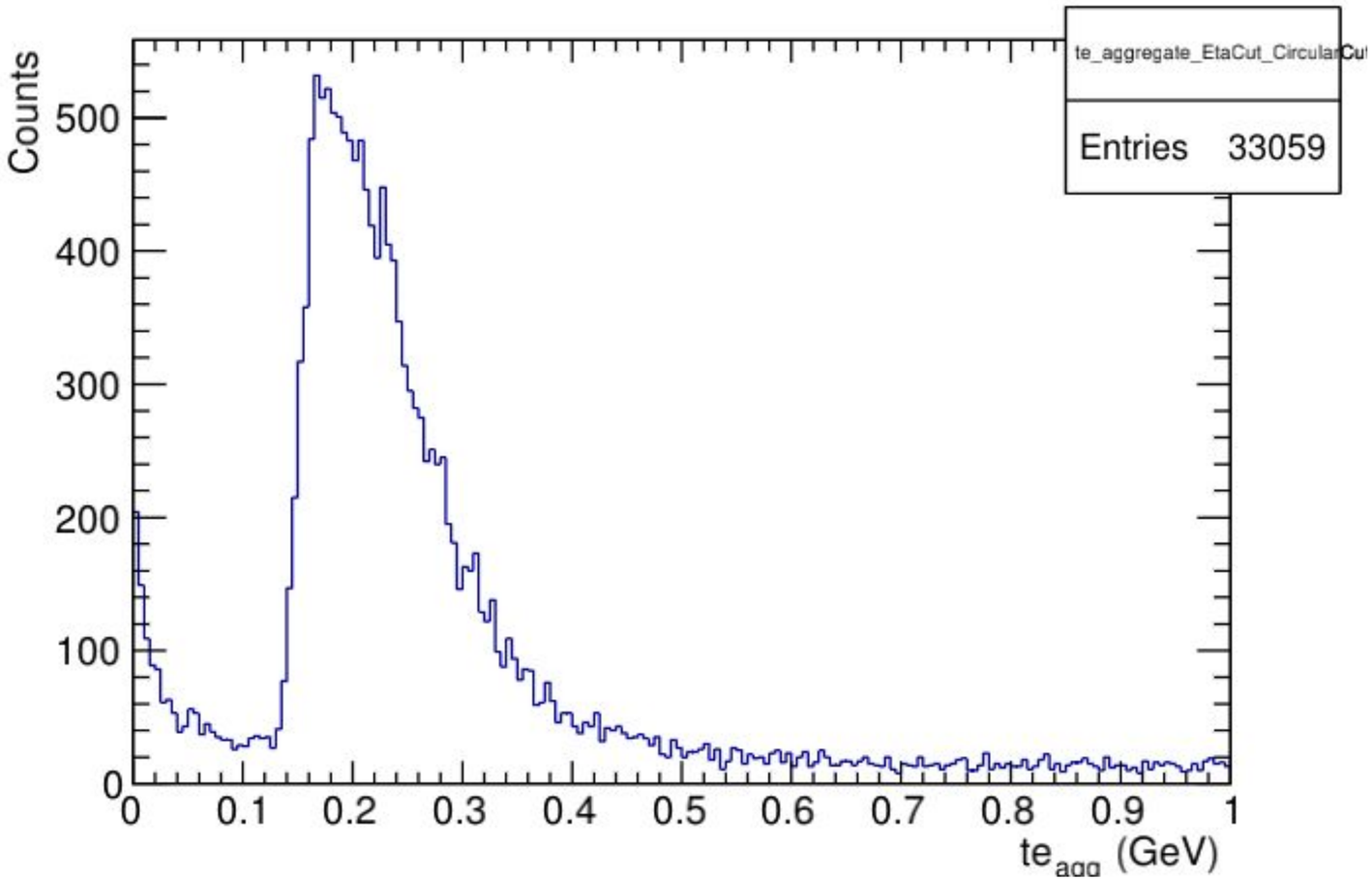


The x-axes denote $\Delta e_{agg}/ge$

CEMC + HCALIN + HCALOUT (pi^-)

CEMC (pi^-)

te vs counts
Explicit η cut: -1.1 to 1.1
No energy cut

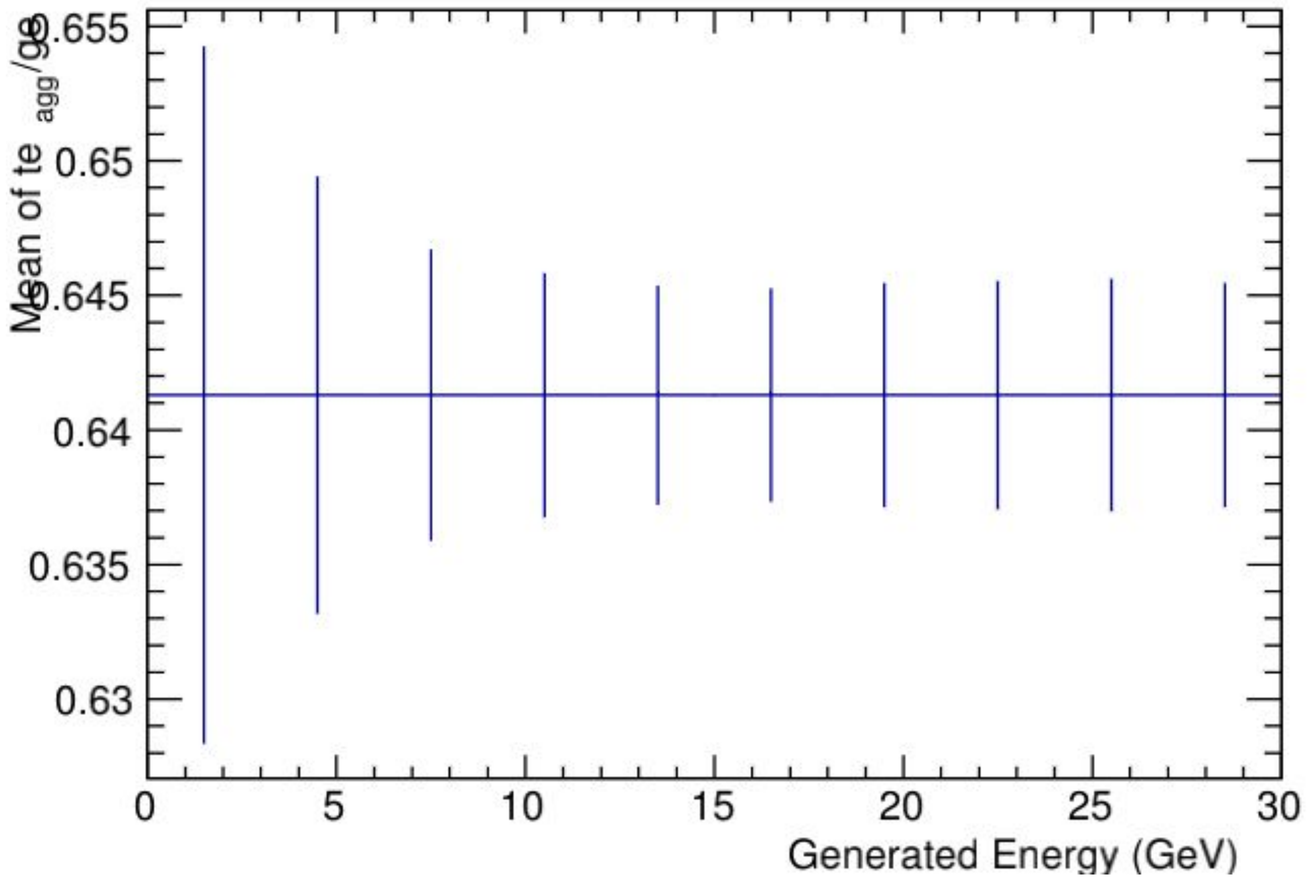


Energy deposition in CEMC to deduce MIPS threshold

CEMC + HCALIN + HCALOUT (pi^-)

Elliptical cut on dphi vs dtheta
Explicit η cut: -1.1 to 1.1
360 MeV Aggregate Energy Cut on EMC Towers

After calibration



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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.

CEMC + HCALIN + HCALOUT (pi^-)

(te_{agg}-ge)/ge vs ge
Explicit η cut: -1.1 to 1.1
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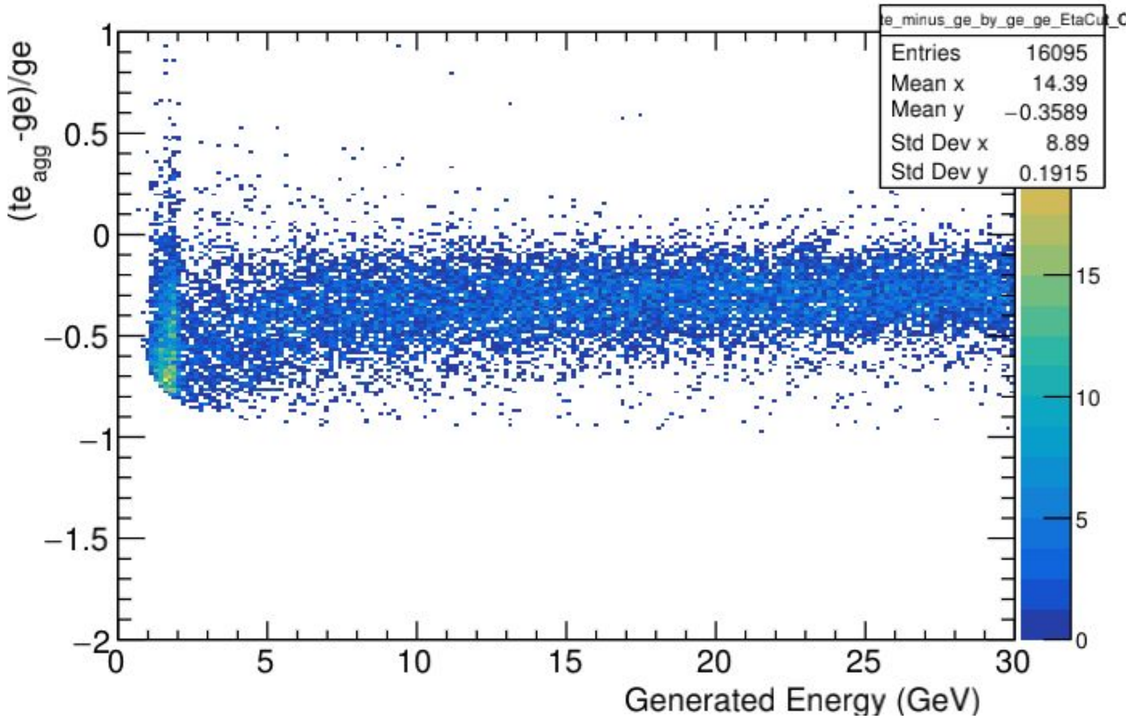

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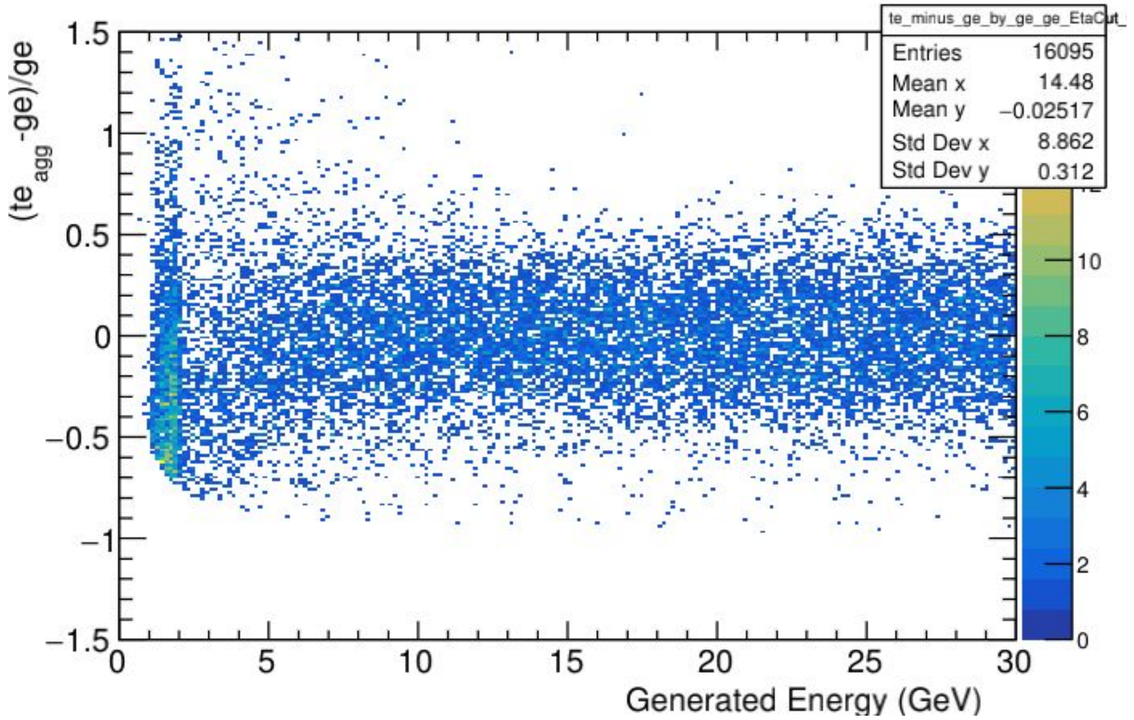

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σ_e_{agg} vs ge
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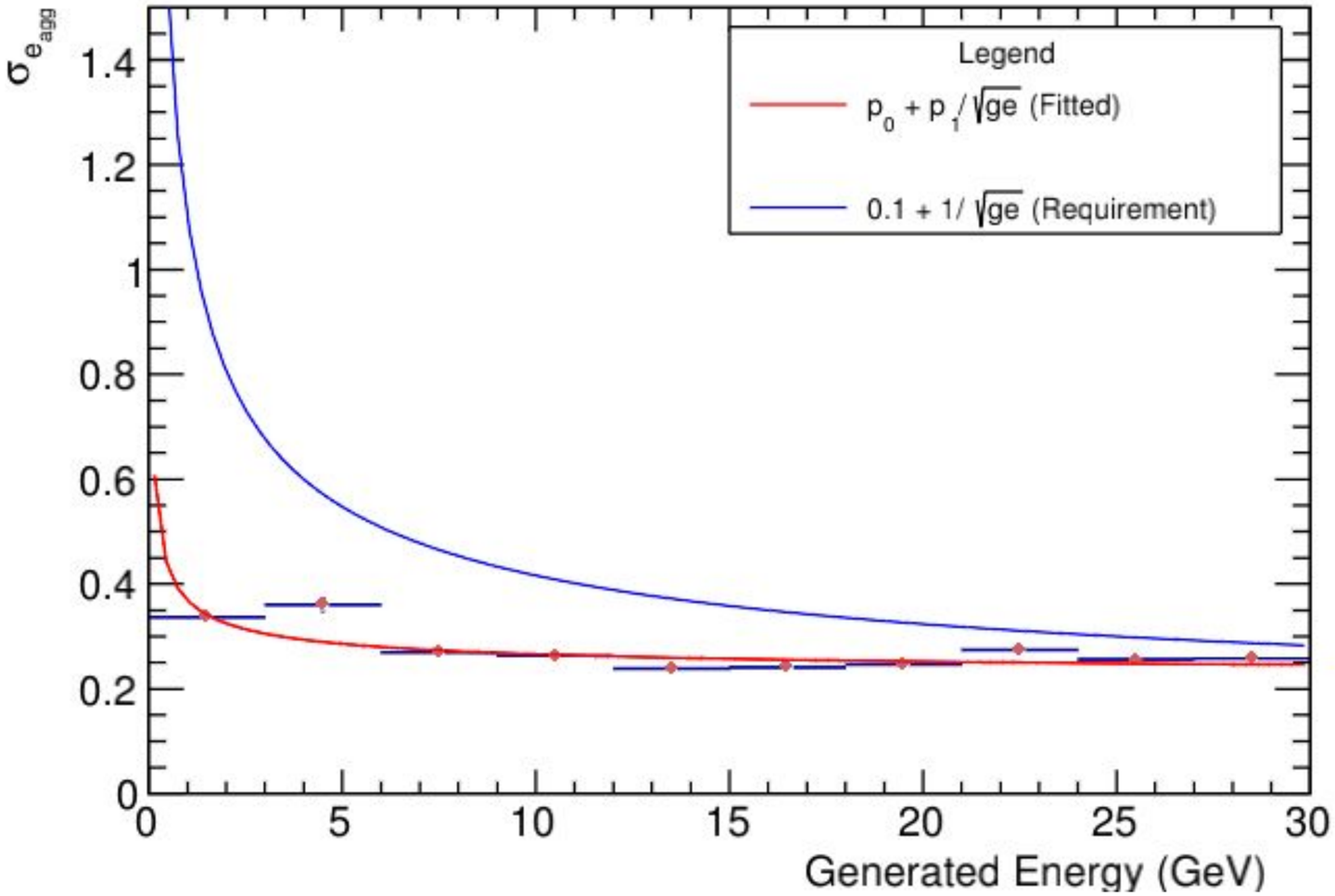

σe refers to the standard deviation of the Gaussian fitted to a slice of the calibrated $(te_{agg}-ge)/ge$ vs ge plot.

Number of bins = 10
Bin Width = 3 GeV

Fit Parameters:
p_o = (0.218467 +- 0.00527894)
p_1 = (0.150429 +- 0.0165214) $GeV^{0.5}$

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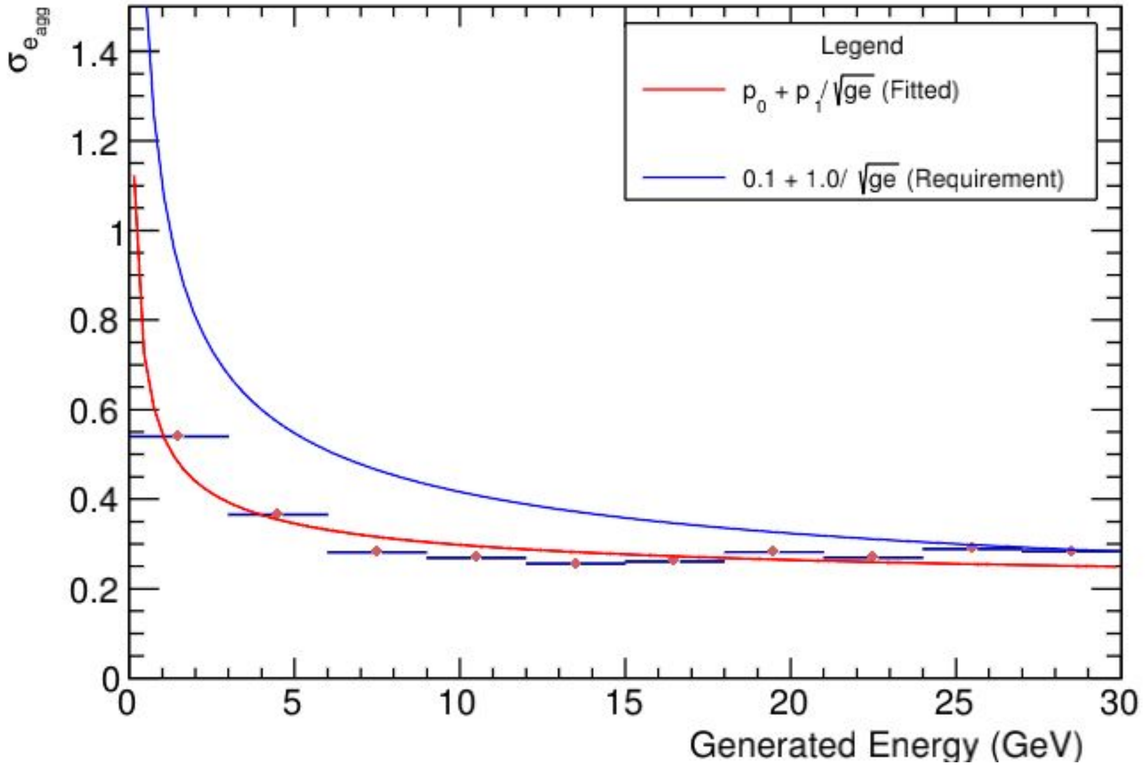

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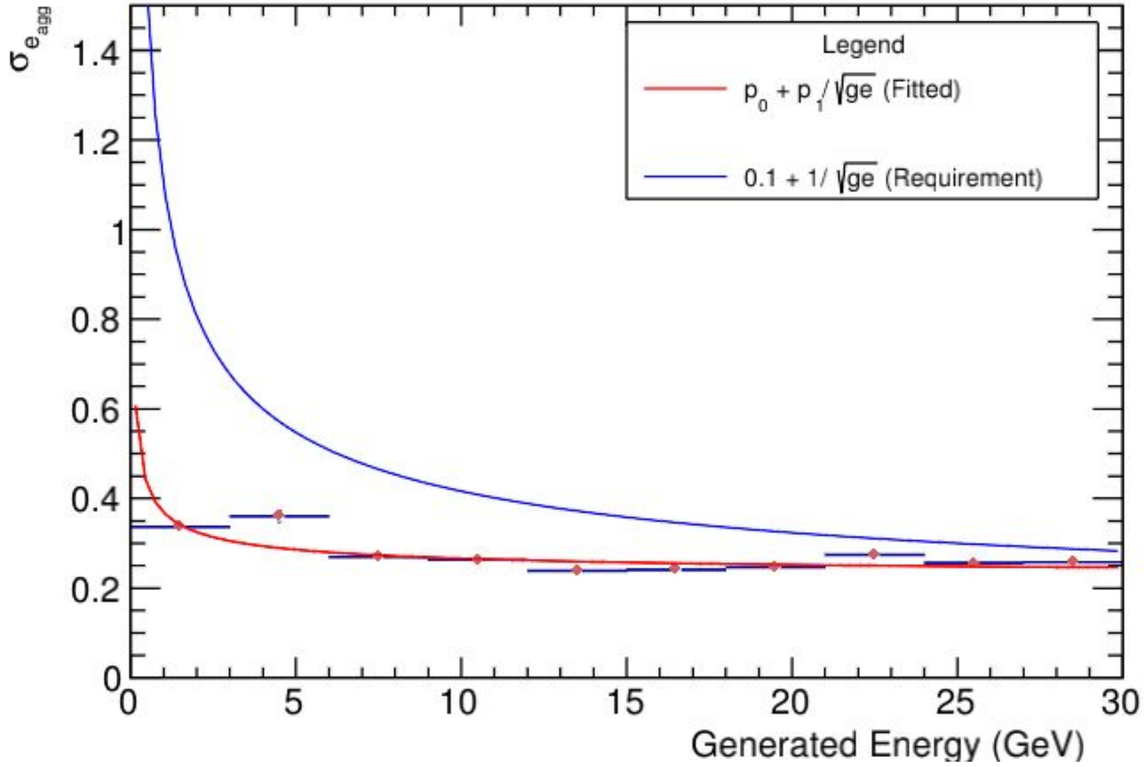

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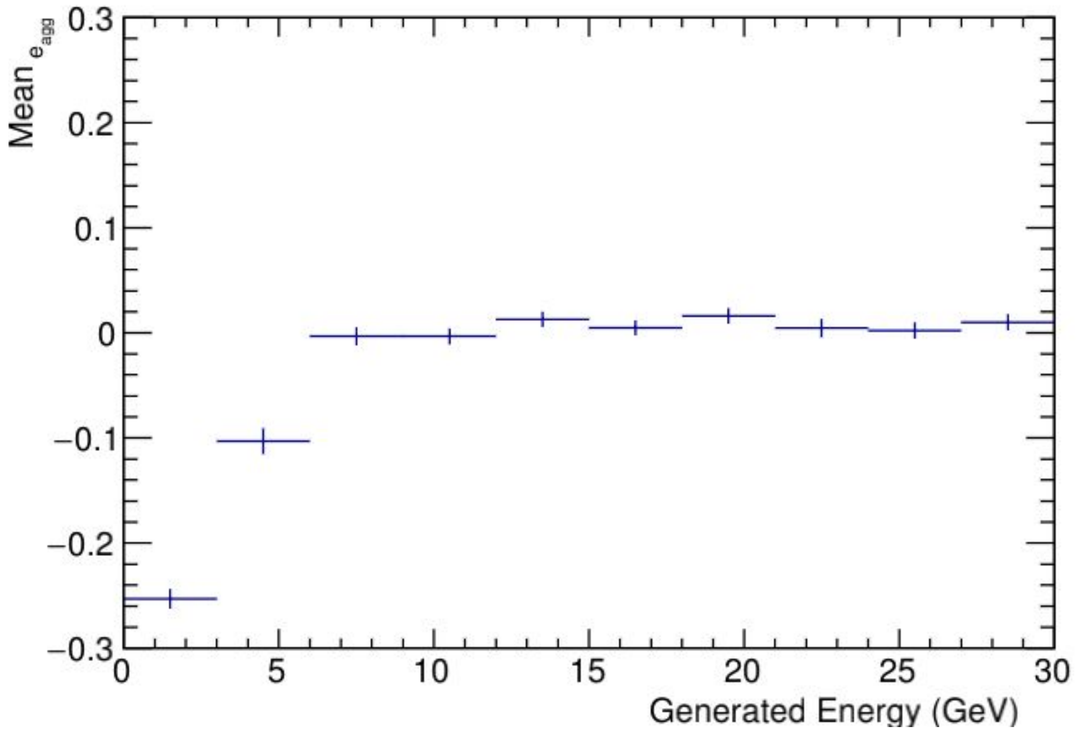
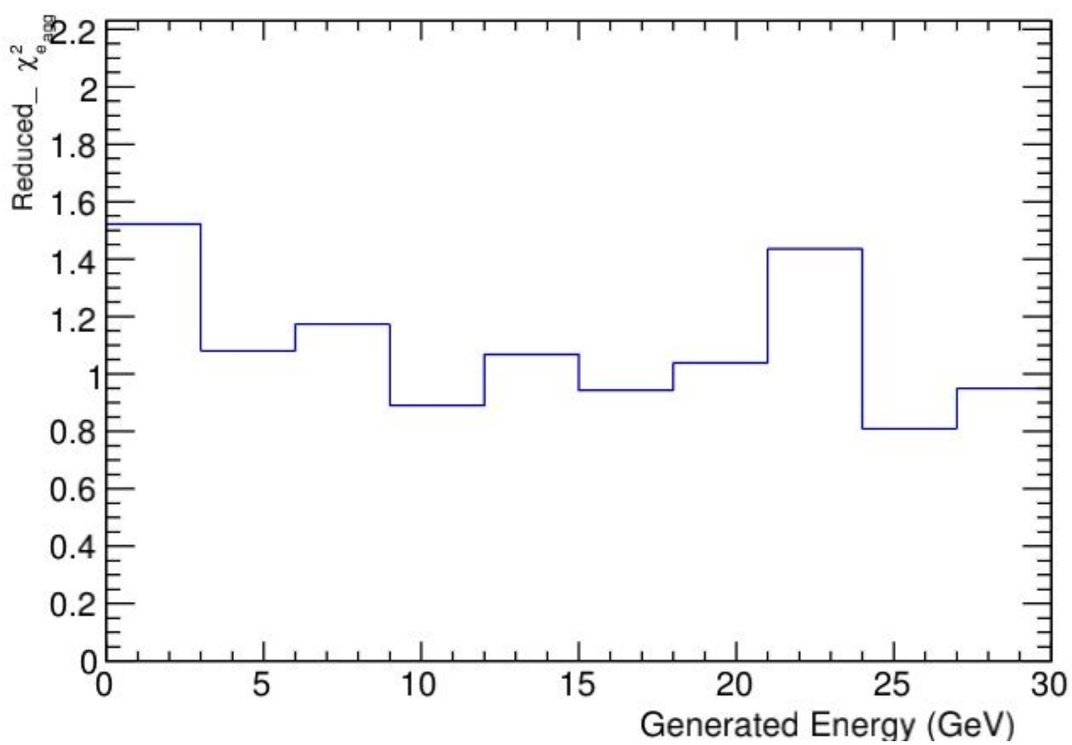


Mean of the Gaussians fitted to the slices of the calibrated $(te_{agg}-ge)/ge$ vs ge plot.



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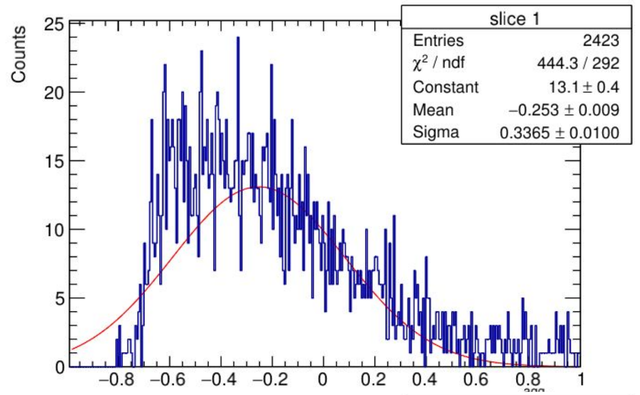

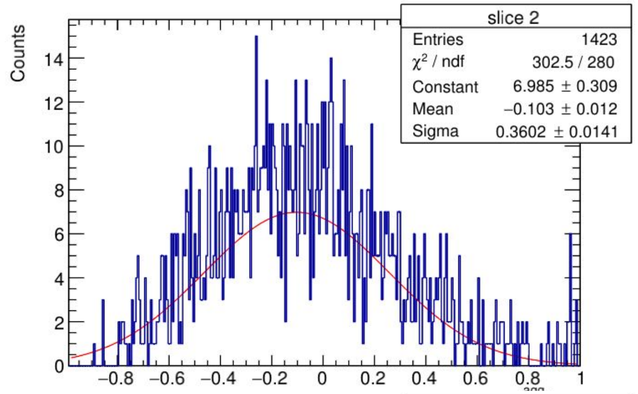

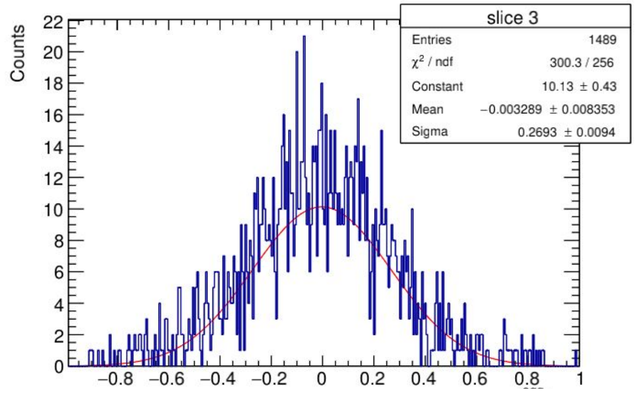

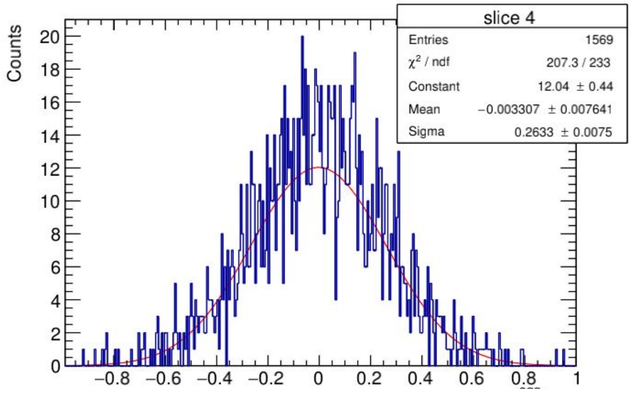

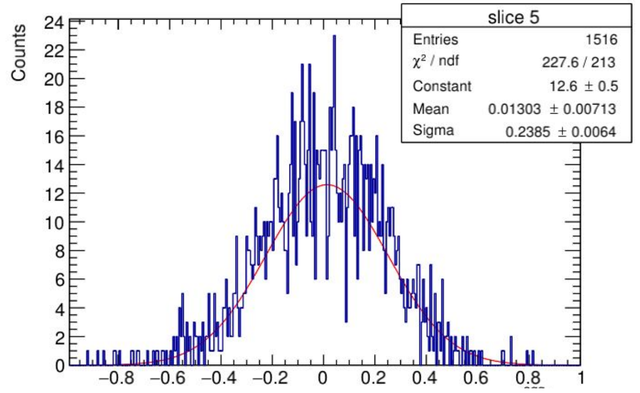

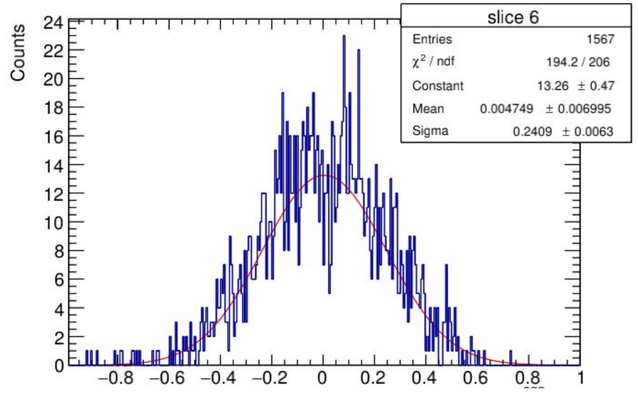

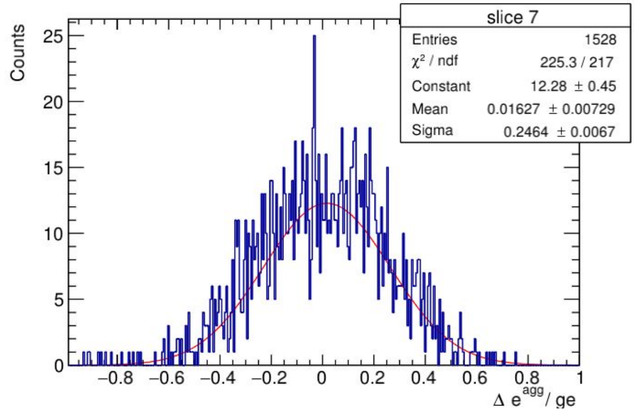

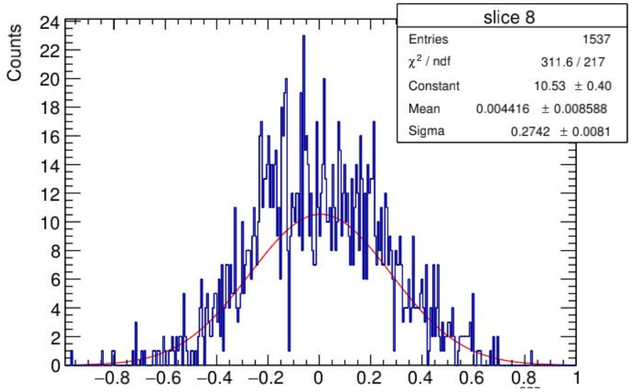

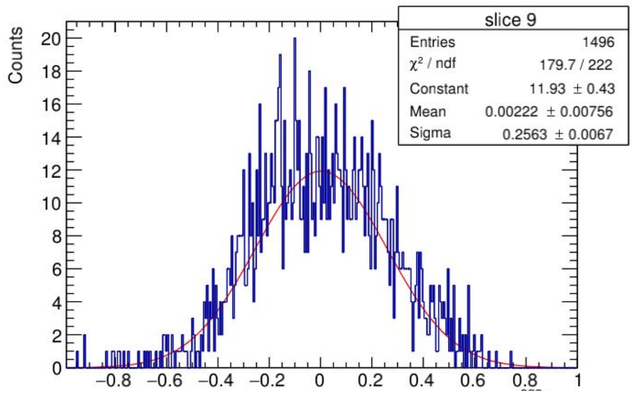

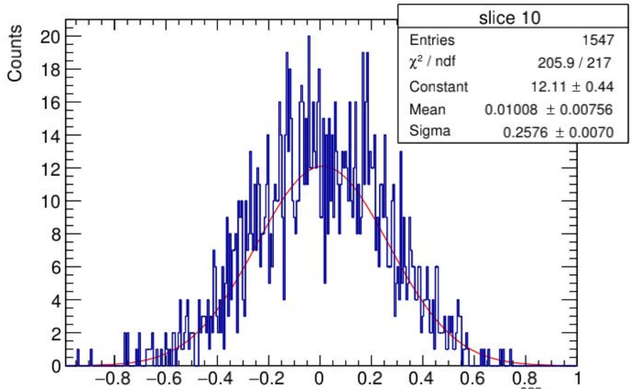

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