Fun4All Calorimeter Plots – Electron Energy Recalibration & Resolution

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Details:

- Particle: e-
- Statistics: 100000 (0-30 GeV) + 50000 (0-10 GeV)
- geta range: -4 to 4
- gphi range: -π to π
- Cuts employed:
  - Detector-wise geta cuts
    - CEMC: η = -1.5 to 1.2
    - FEMC: η = 1.3 to 3.3
    - EEMC: η = -3.5 to -1.7
  - Circular cuts on dphi and dtheta: for manual clustering
  - **Two types of energy cut on towers:**
    - **Aggregated tower energy cut: 100 MeV**
    - **Individual tower energy cut: 100 MeV**
- Photon digitization: turned off
- All sampling fractions updated

Electron

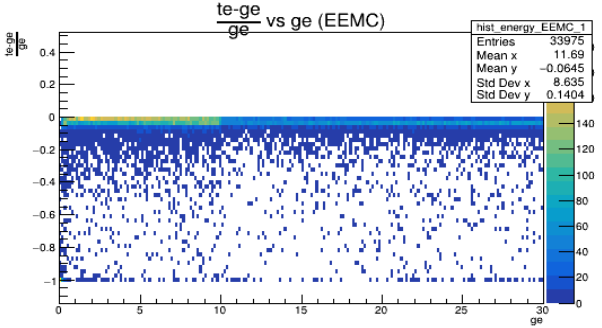
(CEMC, FEMC, EEMC)

Calibration procedure:
1. Obtain Tprofile plots for the calorimeters' te/ge vs ge plots.
2. Get a good fit function for that calorimeter.
3. Use this fit function to recalibrate the tower energy of the respective calorimeter (te/calibration factor).

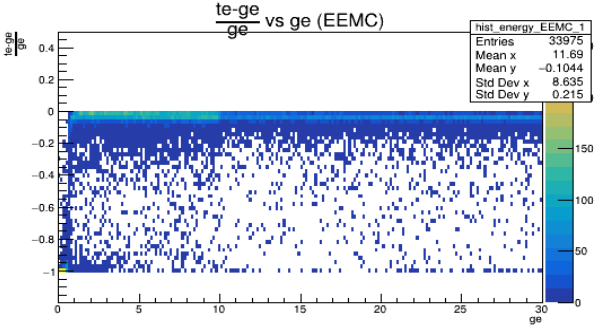
Comparison of all different types of cuts used and their effect on energy plot

Example: EEMC

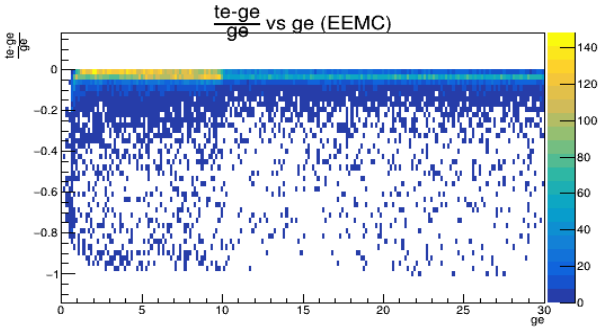
Without any cut (raw data)



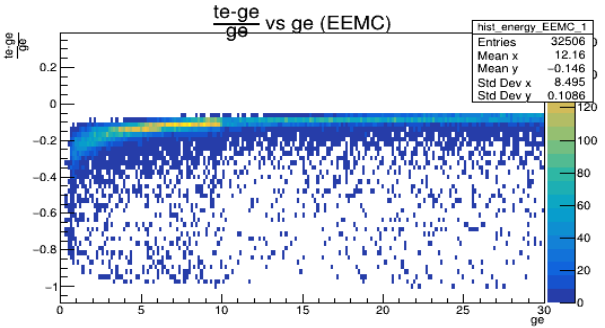
Circular cut on dtheta and dphi



100 MeV cut on aggregated tower energy for each event + Circular cut



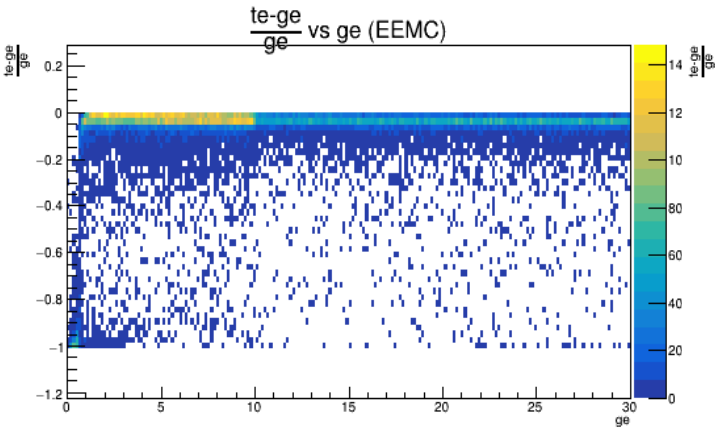
100MeV cut on each tower for an event + 100 MeV cut on aggregated tower energy for each event + Circular cut



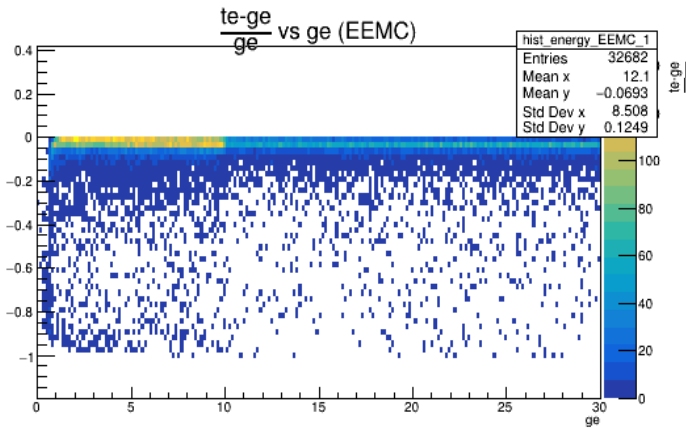
Comparison of aggregate tower energy cuts

Example: EEMC

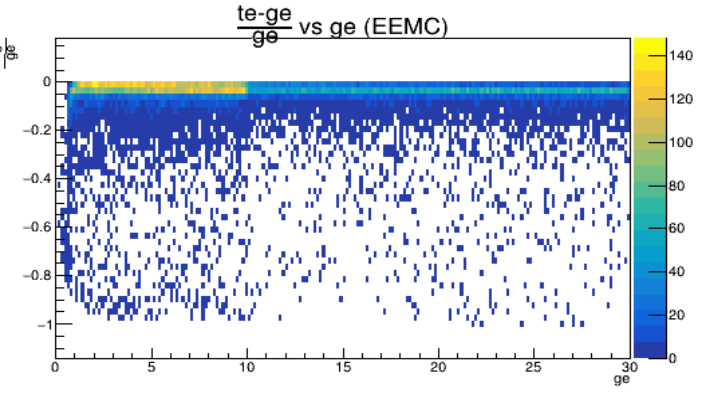
Agg tower energy cut > 0



Agg tower energy cut > 50MeV



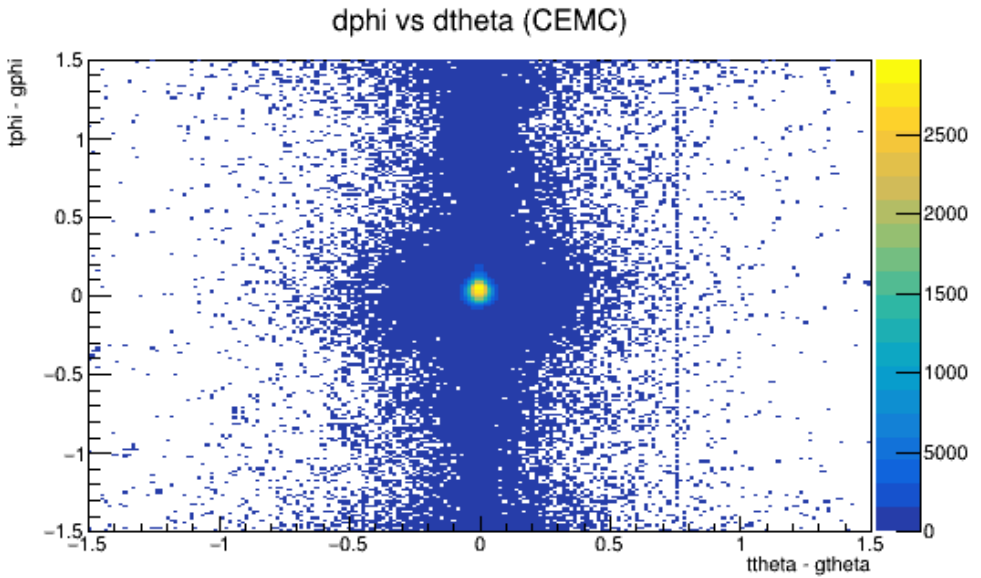
Agg tower energy cut > 100MeV

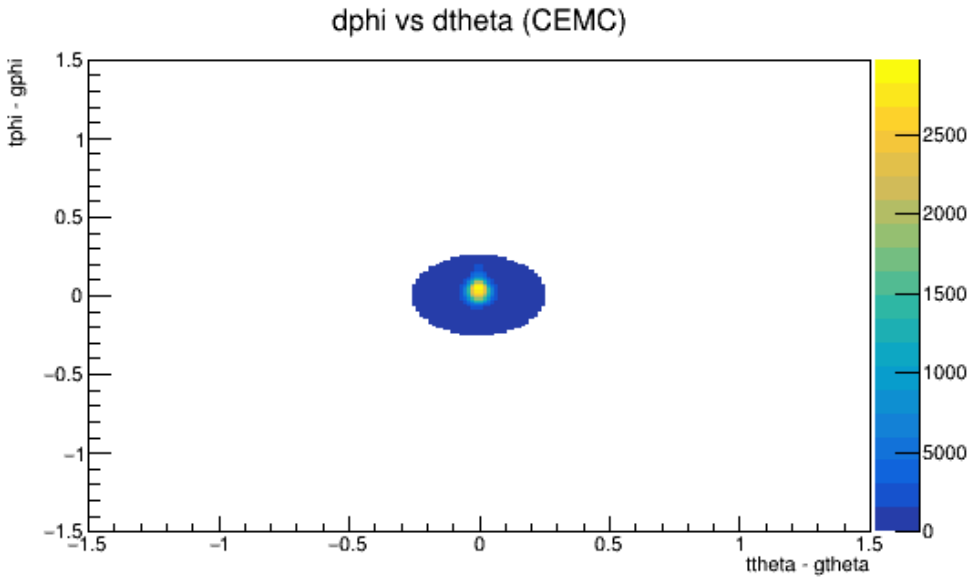


For this study, 100MeV energy cut is used on the aggregated tower energy for each event

CEMC

Manual Clustering: Circular cut on dtheta and dphi:



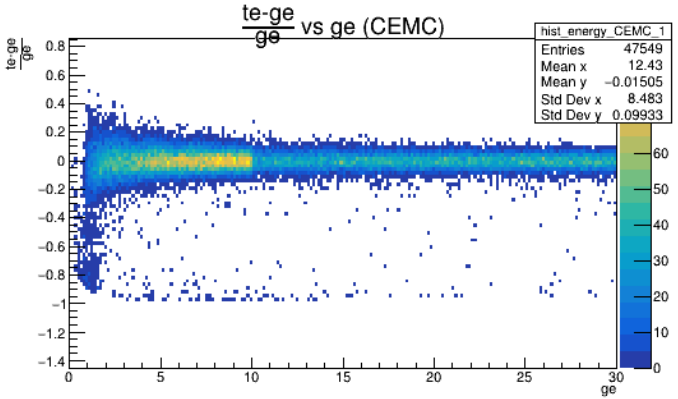


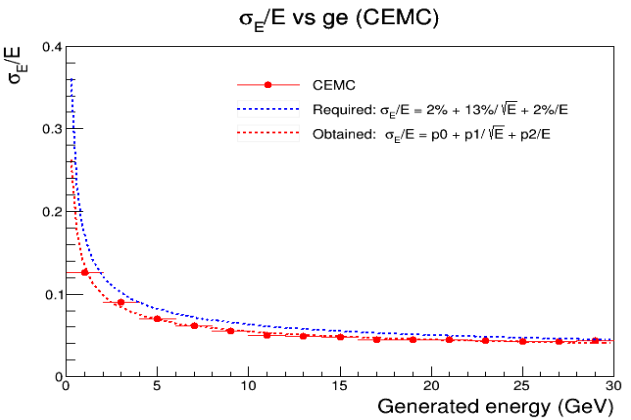
Radius: 0.25 units

100 MeV Energy cut on aggregated tower energy for each event

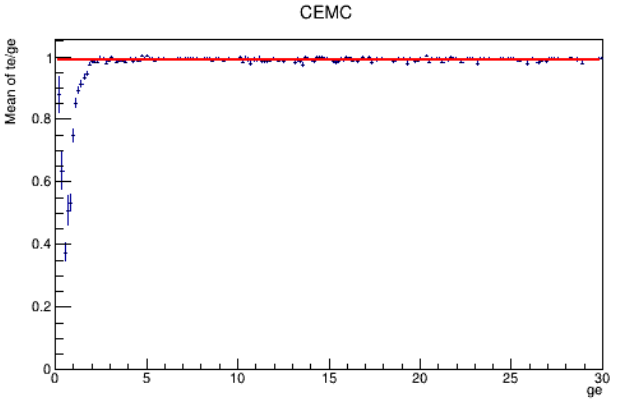
Before recalibration: CEMC

η = -1.5 to 1.2





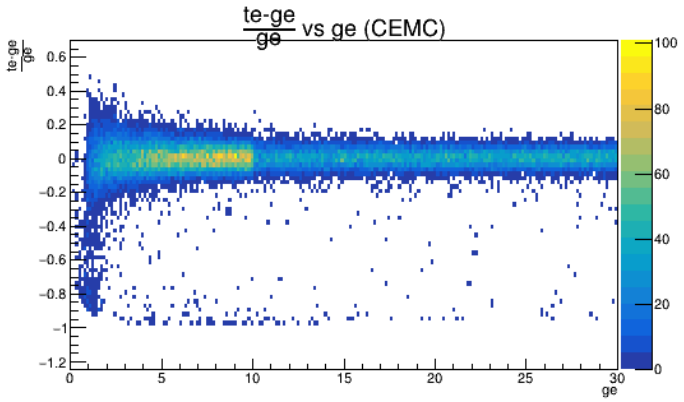
P0=0.0205302; p1=0.10534; p2=0.02

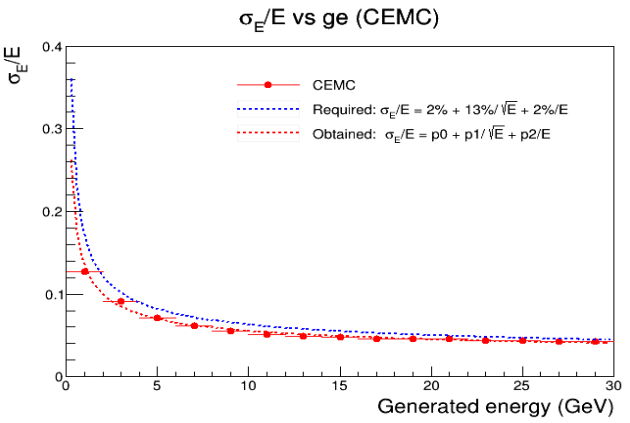


(pol0 fit)

p0 = 0.991468

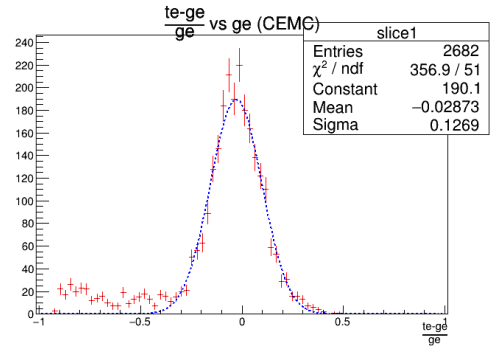
Recalibration using pol0 fit:

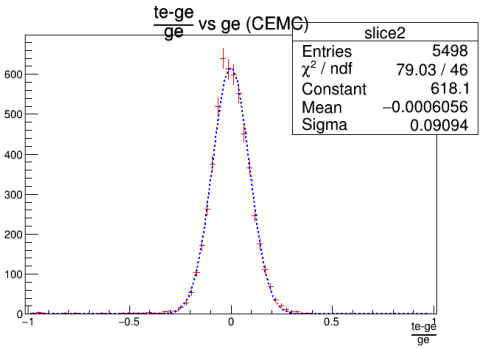


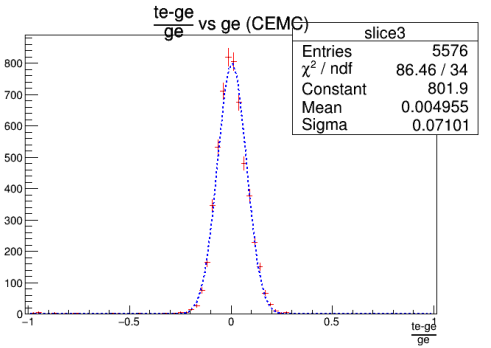


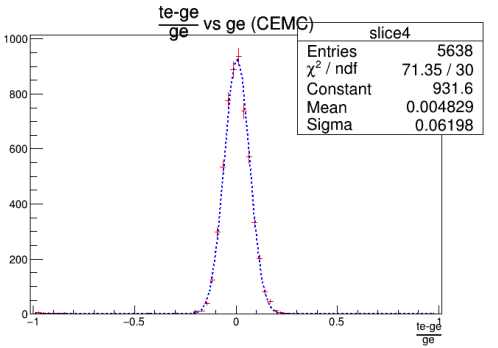
P0=0.0205302; p1=0.10534; p2=0.02

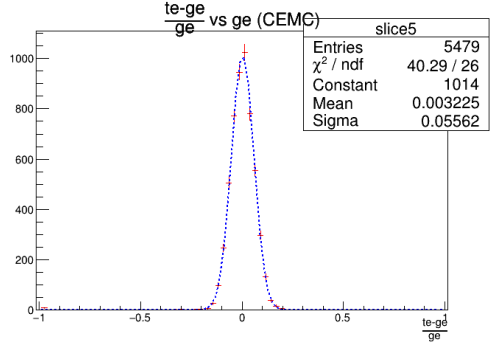
CEMC Gaussian fits (after calibration):

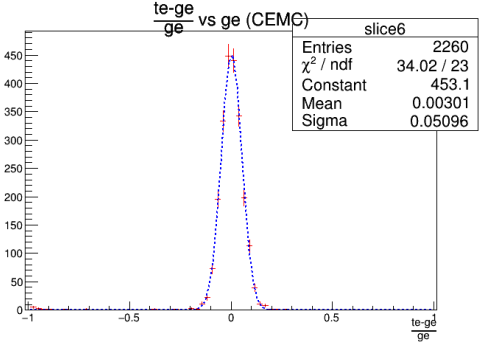


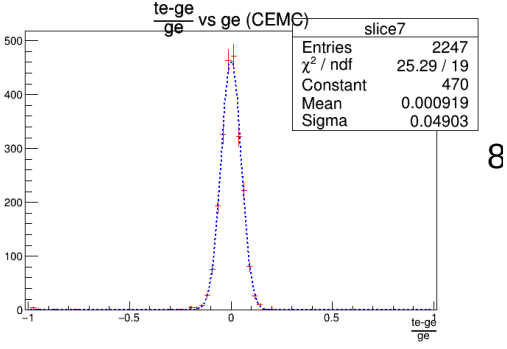


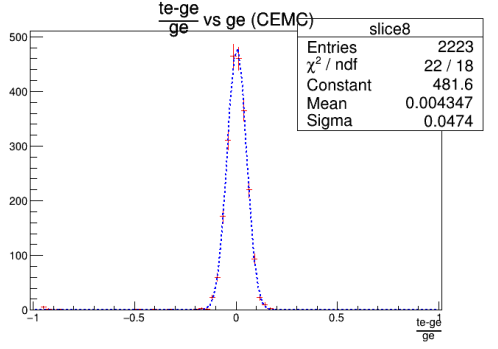


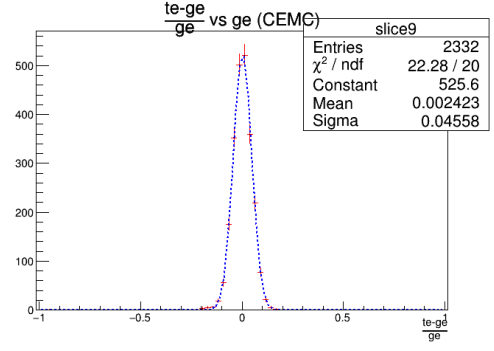


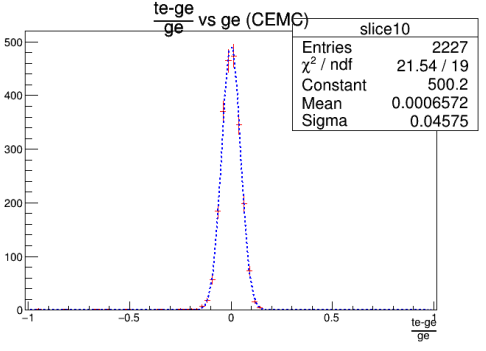


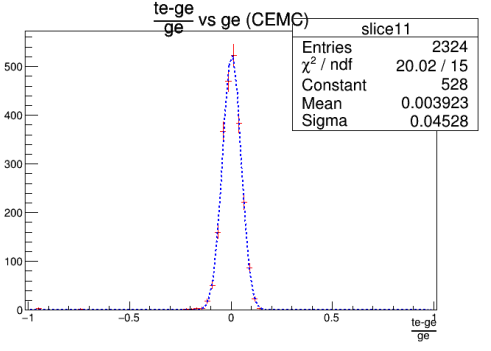


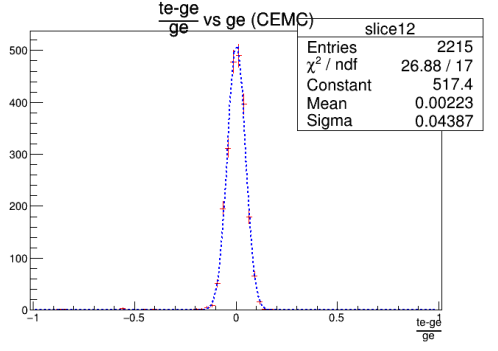




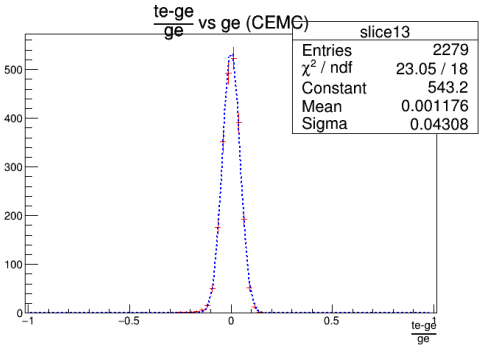


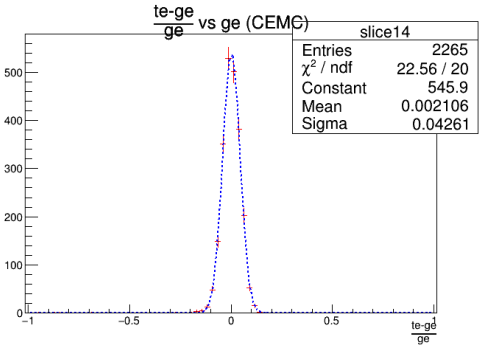


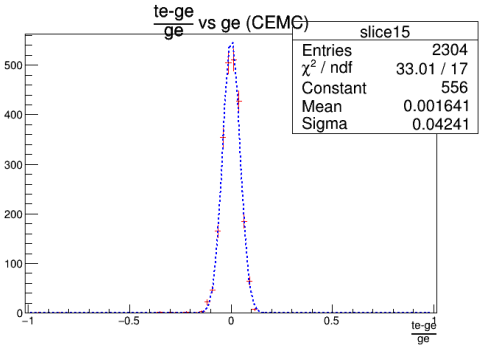




CEMC gaussian fits (after calibration):







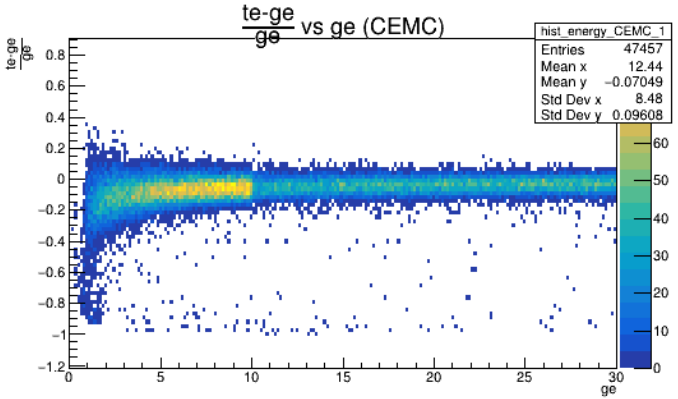
100 MeV Energy cut on the individual towers for each event

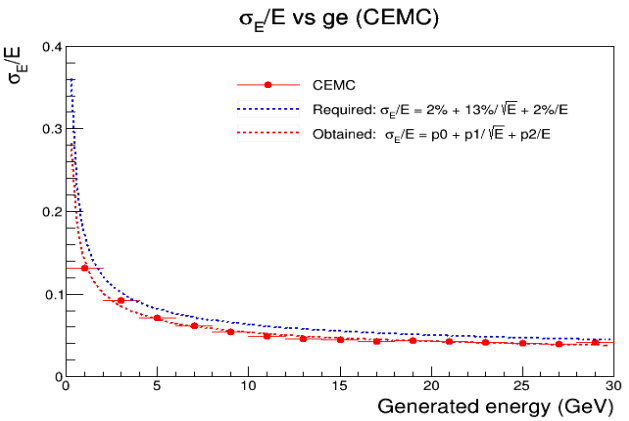
+

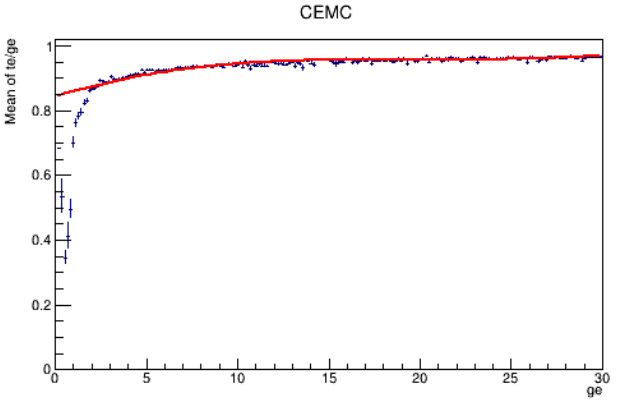
100 MeV energy cut on the aggregated tower energy for each event

Before recalibration: CEMC

η = -1.5 to 1.2



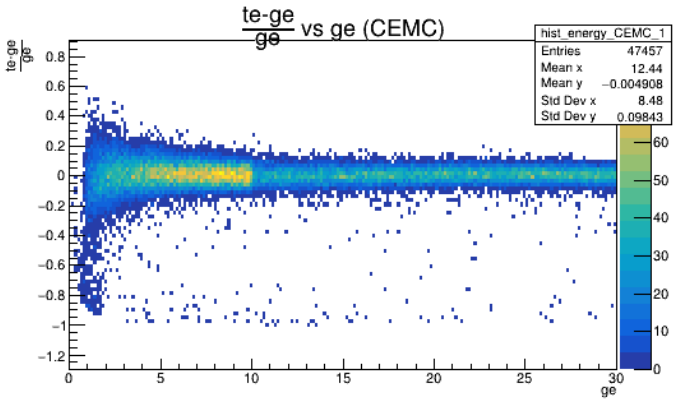


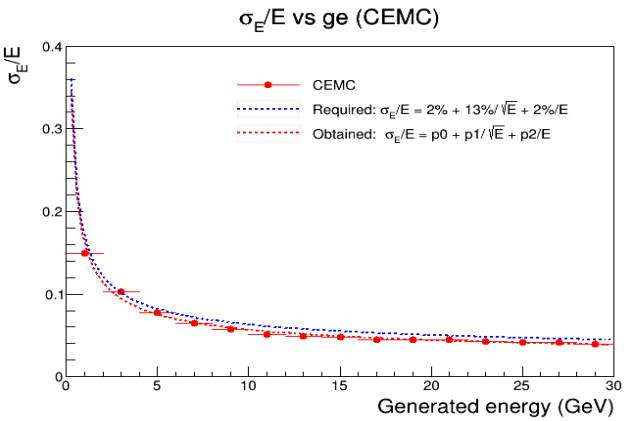


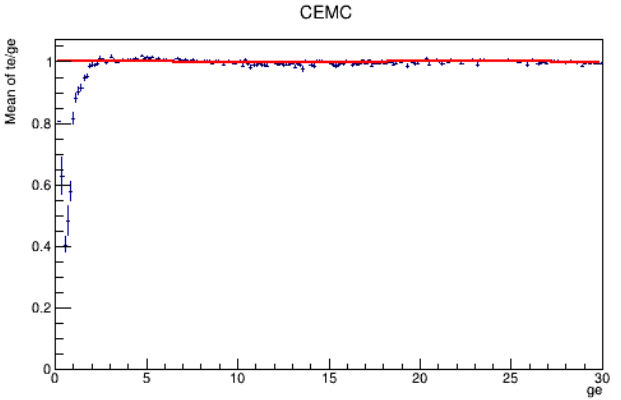
p0=0.0164032; p1=0.114193; p2=0.02

(pol3 fit)

Recalibration using pol3 fit:



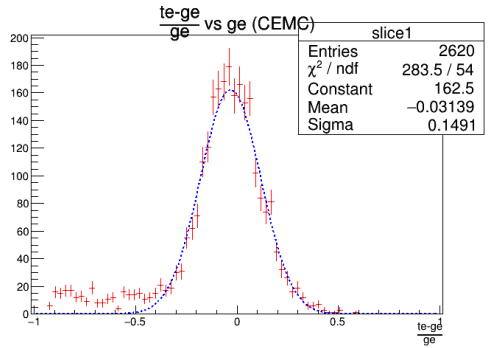


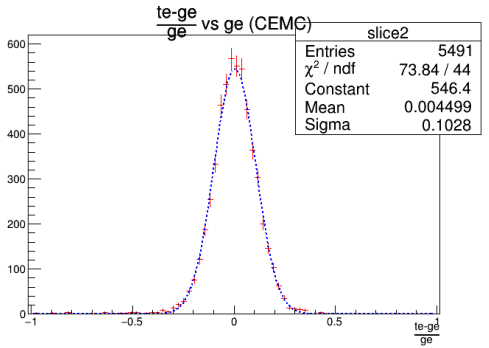


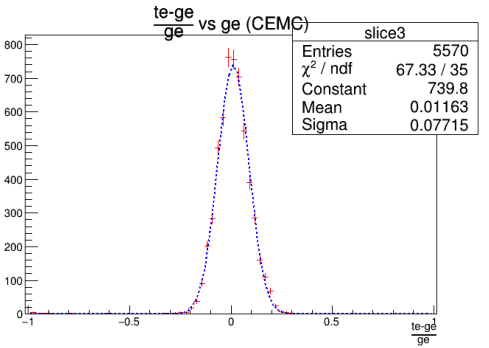
p0=0.0142342; p1=0.128812; p2=0.02

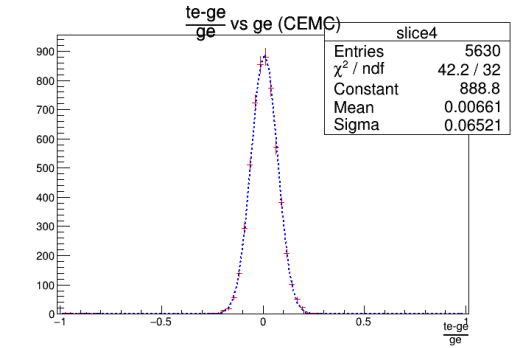
(pol3 fit)

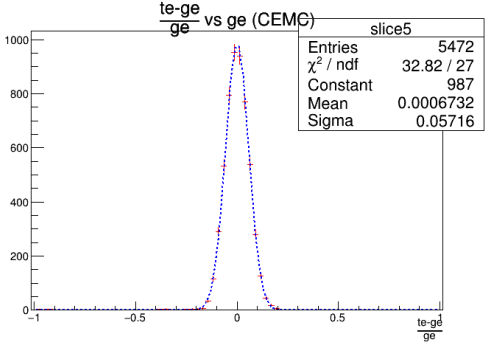
CEMC Gaussian fits (after calibration):

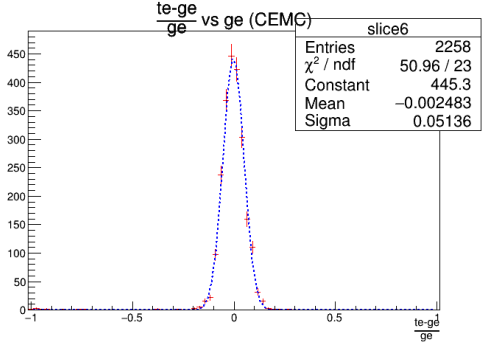


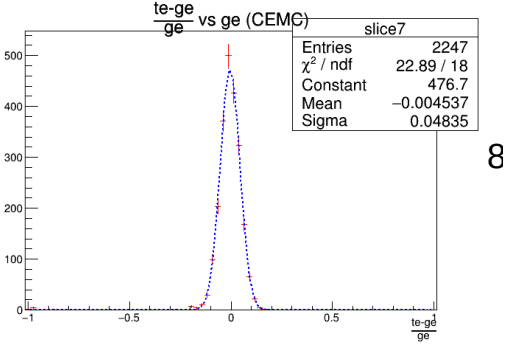


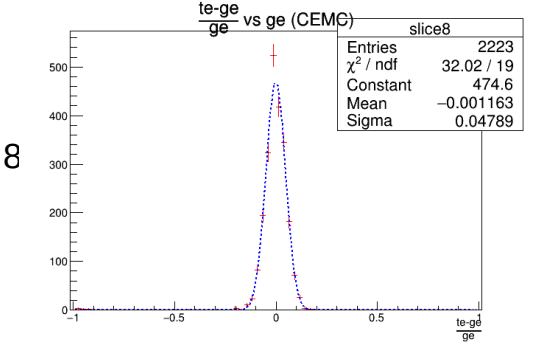


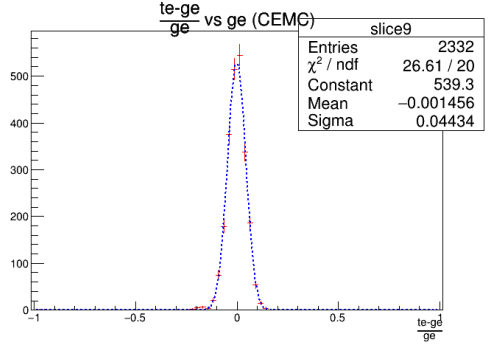


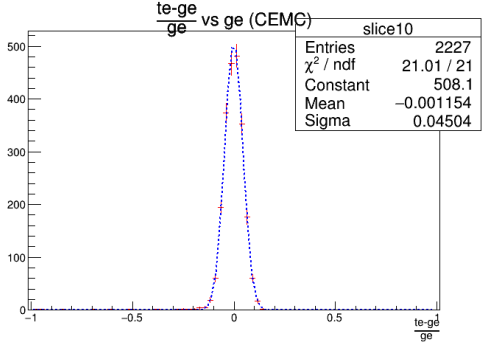


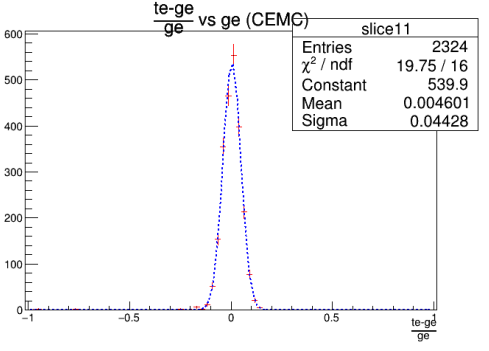


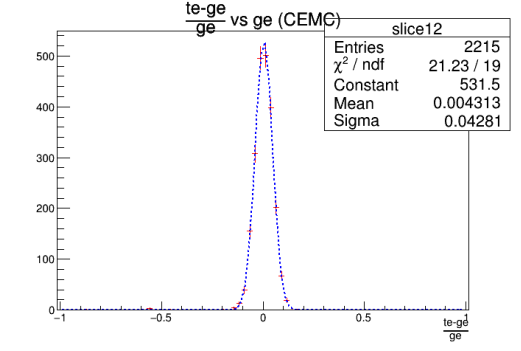




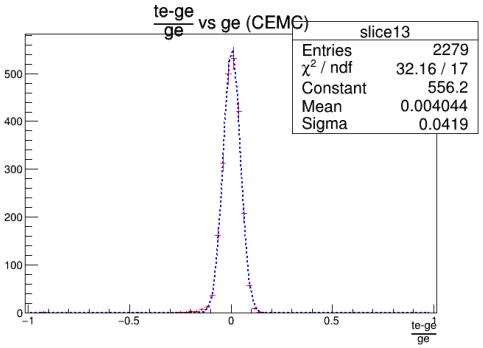


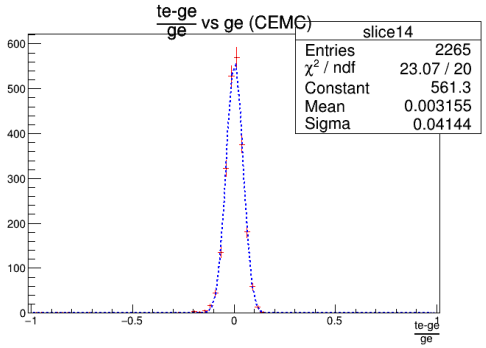


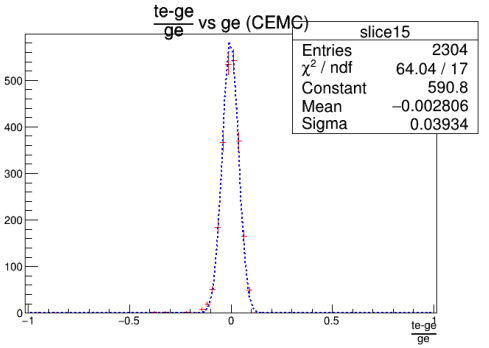




CEMC gaussian fits (after calibration):

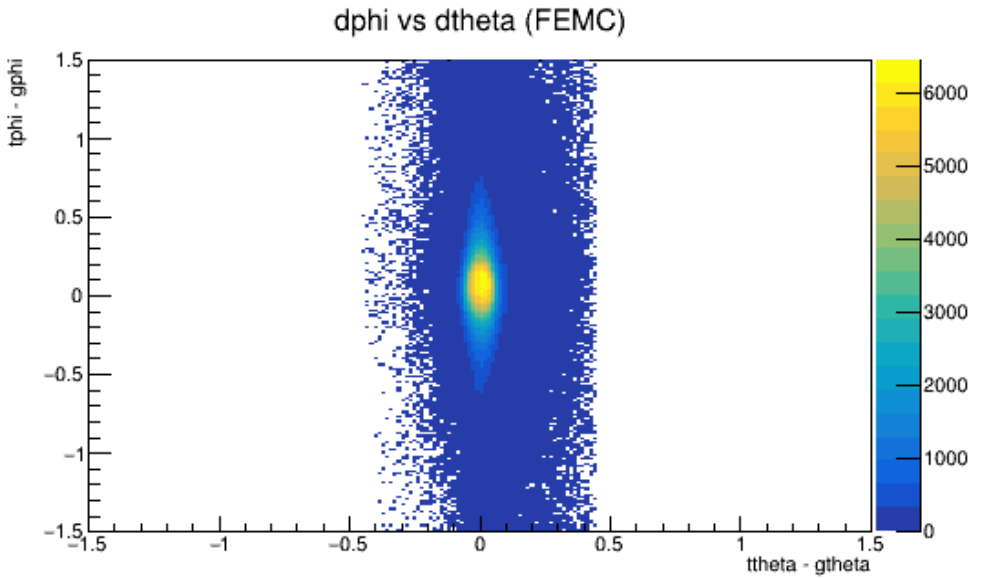


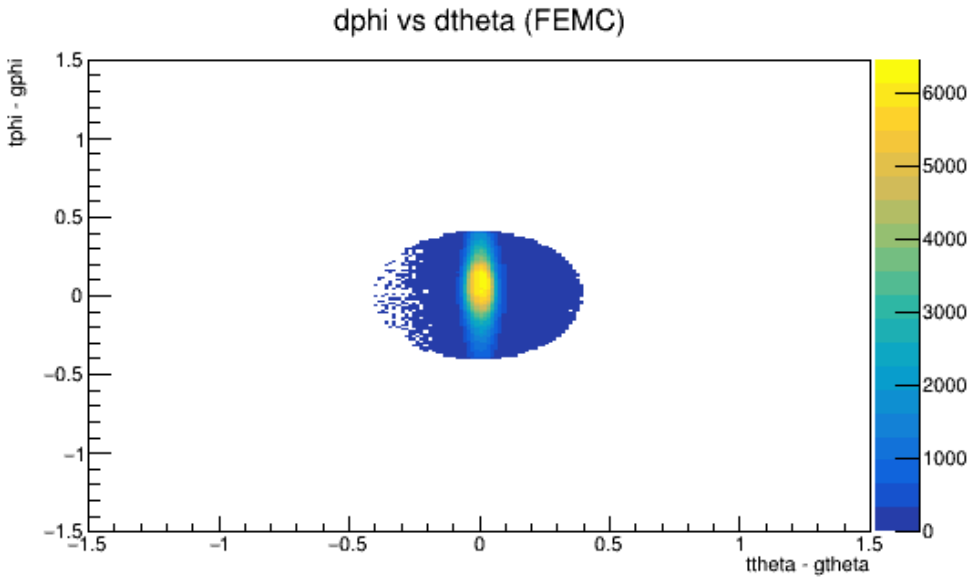




FEMC

Manual Clustering: Circular cut on dtheta and dphi:



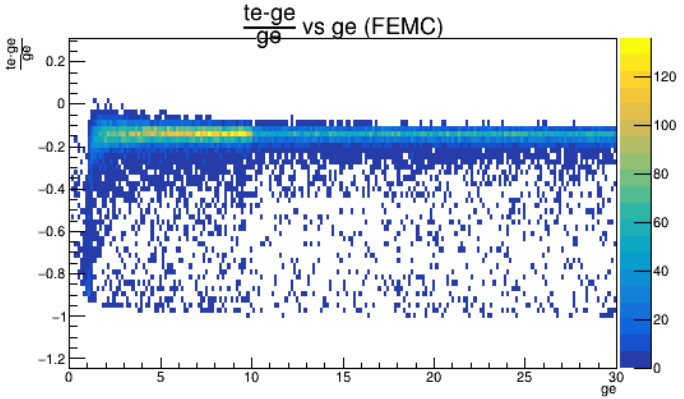


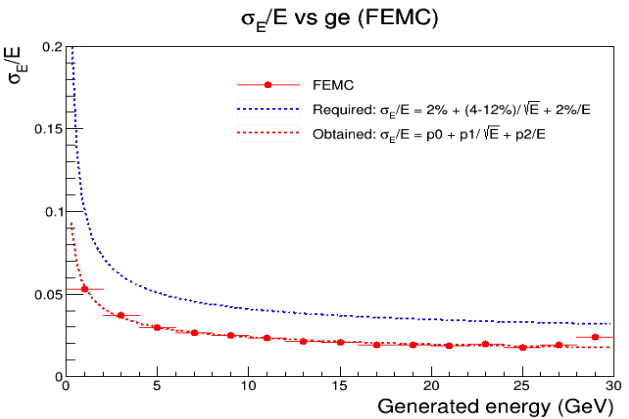
Radius: 0.4 units

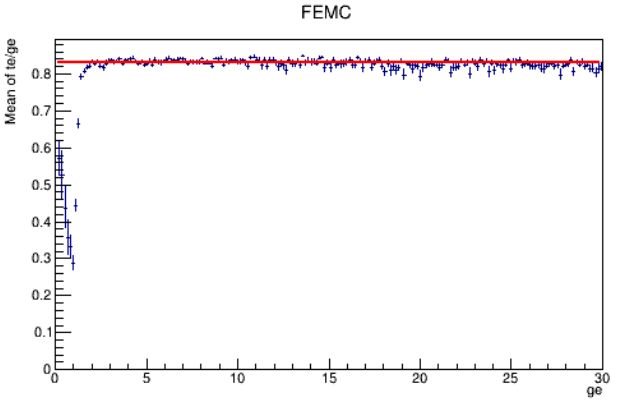
100 MeV Energy cut on aggregated tower energy for each event

Before recalibration: FEMC

η = 1.3 to 3.3





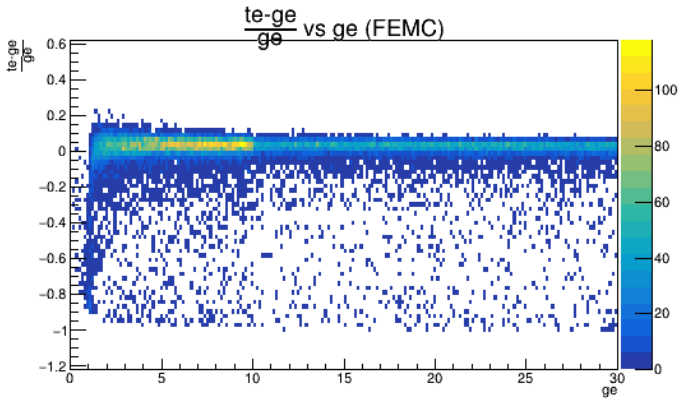


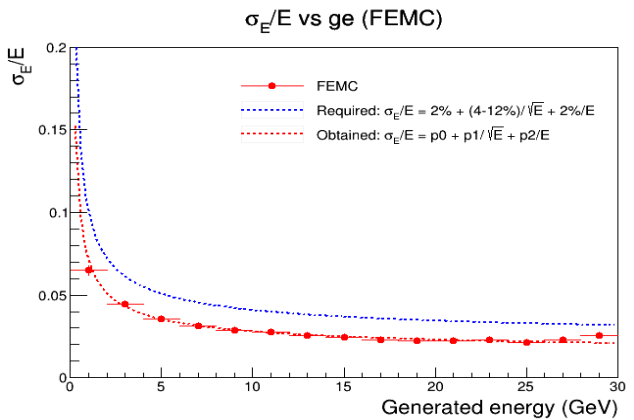
p0=0.00850391; p1=0.049664; p2=-0.00370873

(pol0 fit)

p0 = 0.830733

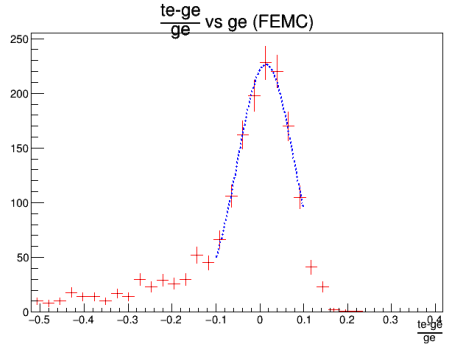
Recalibration using pol0 fit:

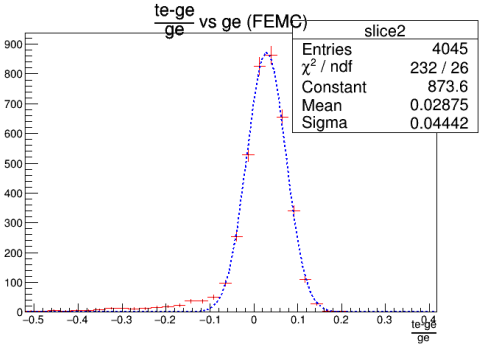


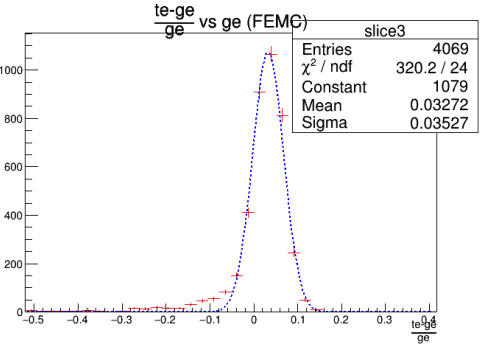


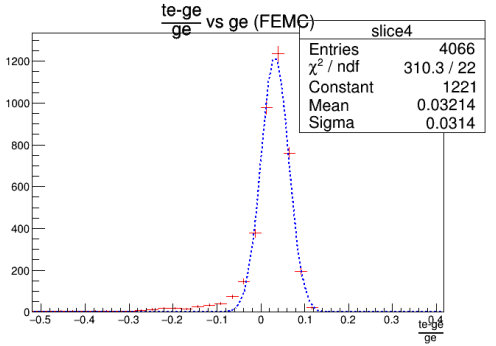
p0=0.0115892; p1=0.0484642; p2=0.0108484

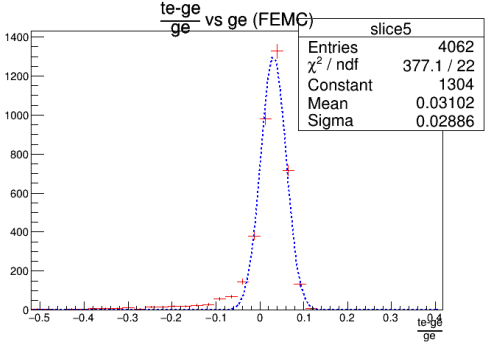
FEMC Gaussian fits (after calibration):

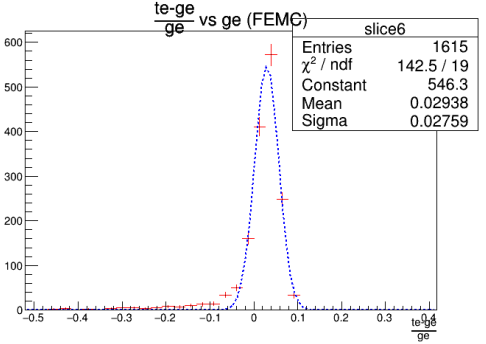


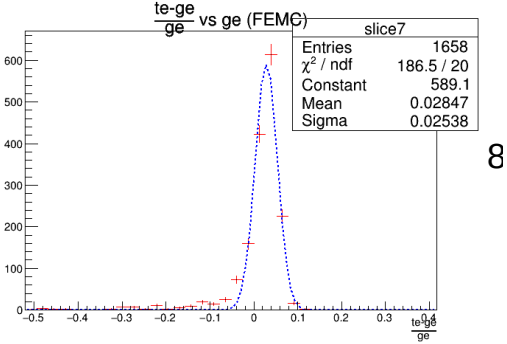


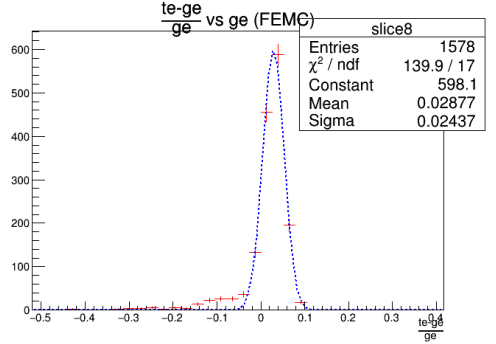


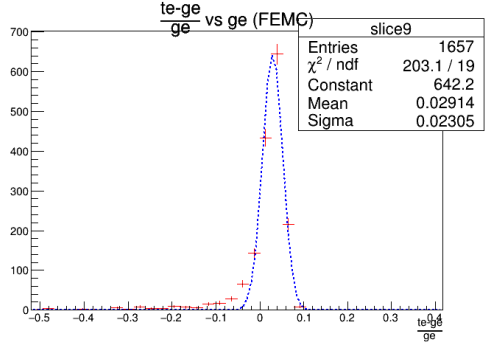


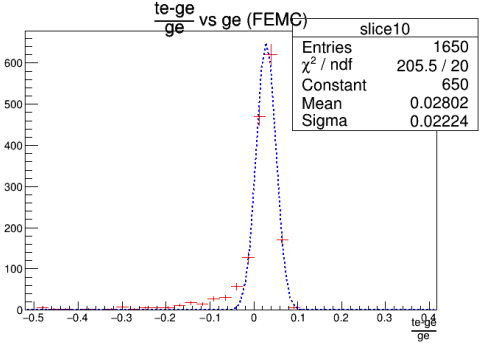


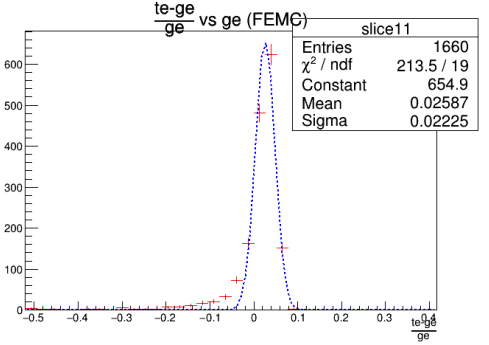


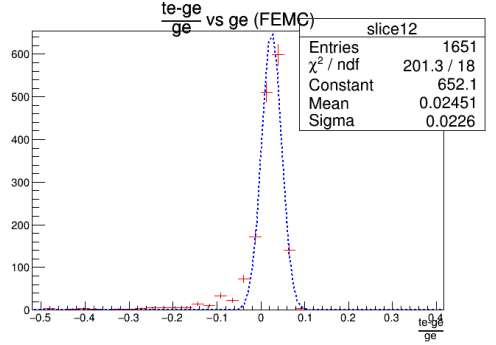




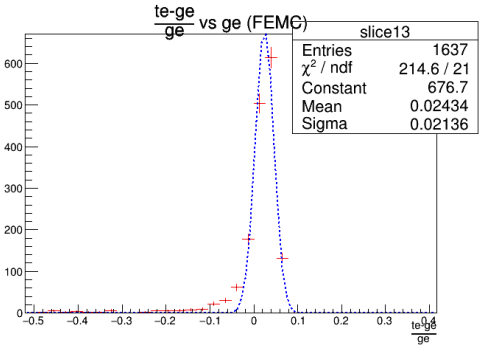


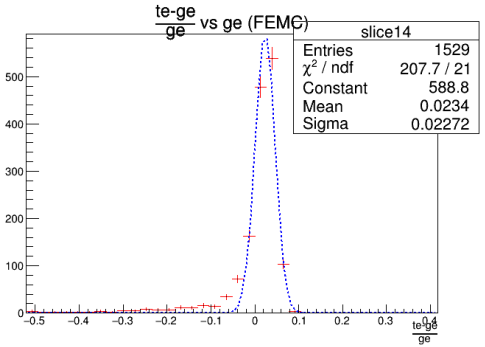


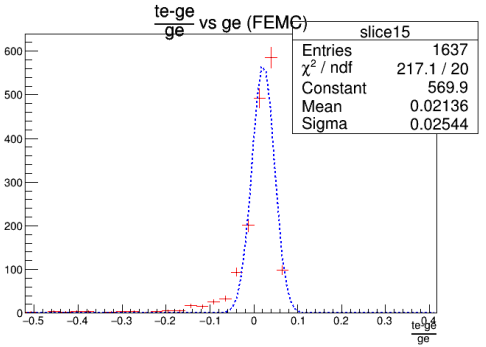




FEMC gaussian fits (after calibration):







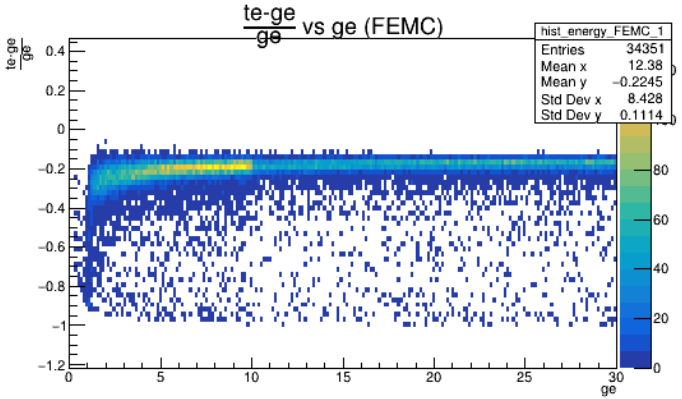
100 MeV Energy cut on the individual towers for each event

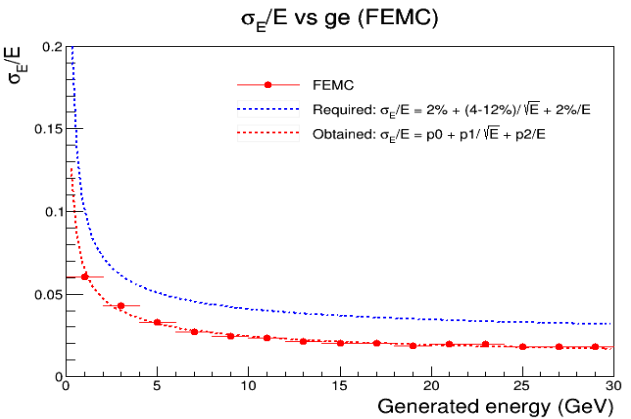
+

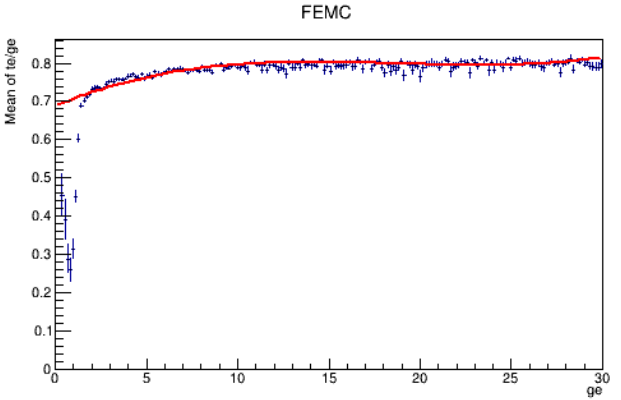
100 MeV energy cut on the aggregated tower energy for each event

Before recalibration: FEMC

η = 1.3 to 3.3



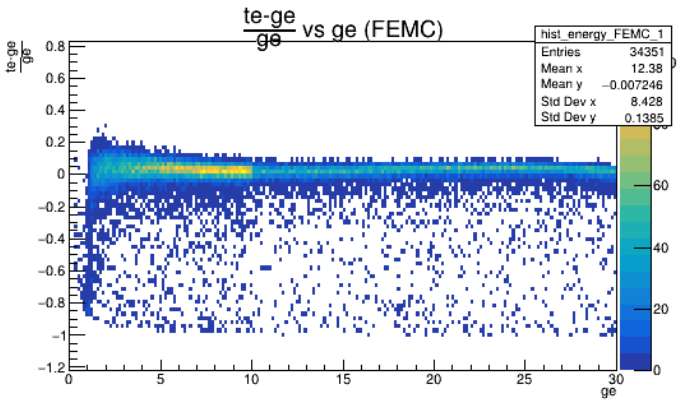


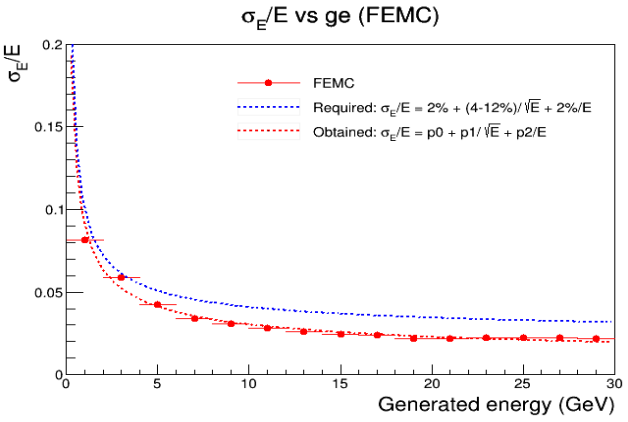


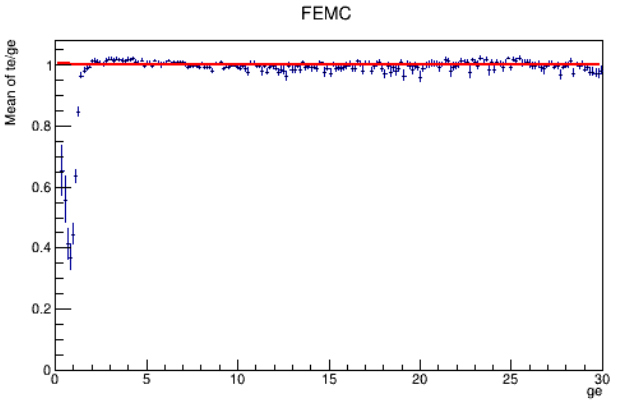
(pol3 fit)

p0=0.014103; p1=0.00499252; p2=0.0790424

Recalibration using pol0 fit:



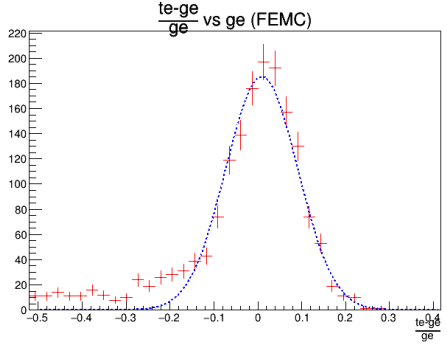


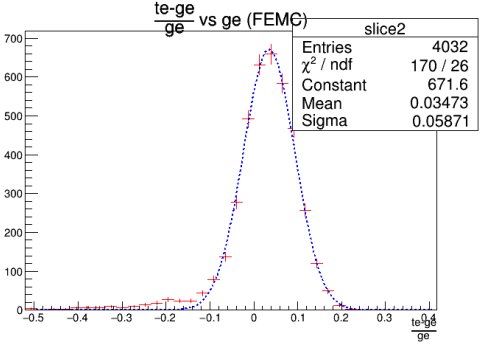


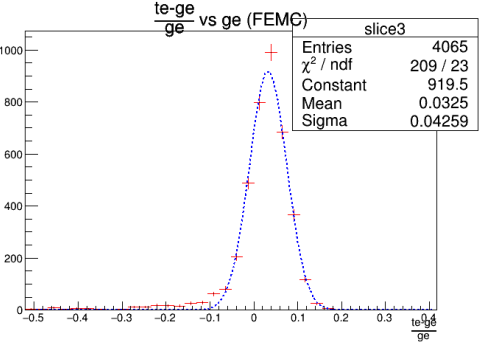
(pol3 fit)

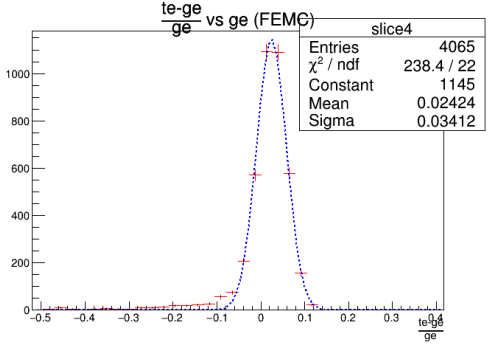
p0=0.0051807; p1=0.0770019; p2=0.00836012

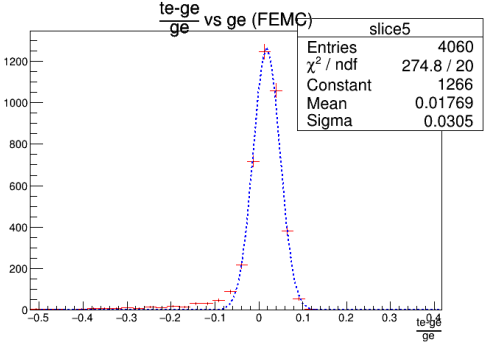
FEMC Gaussian fits (after calibration):

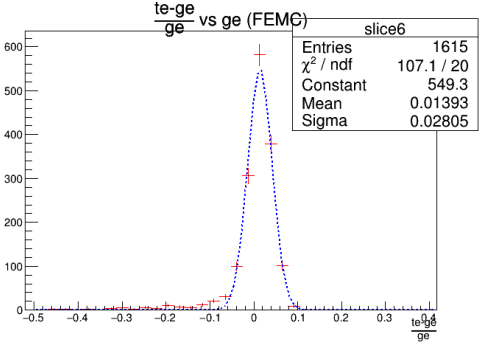


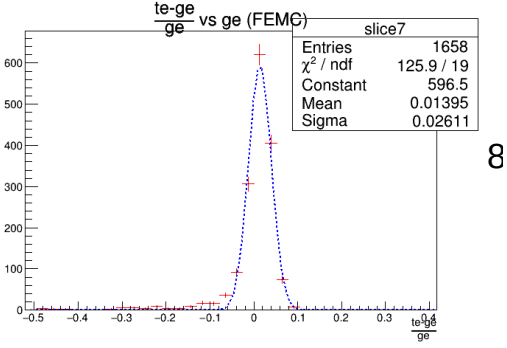


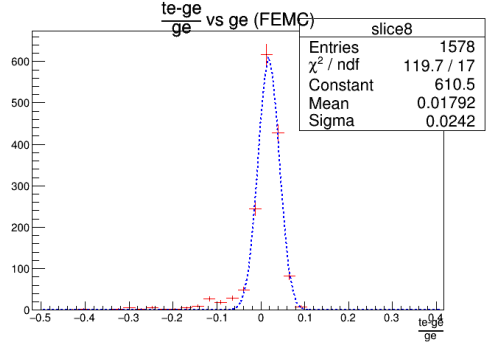


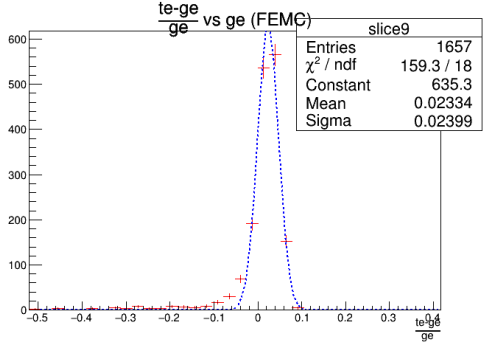


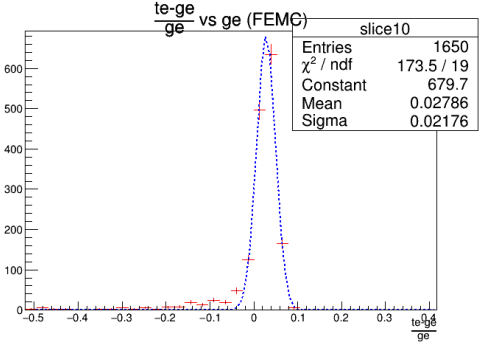


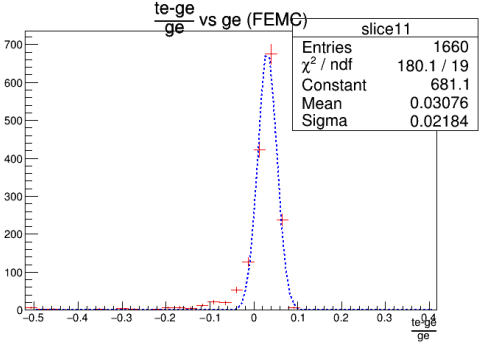


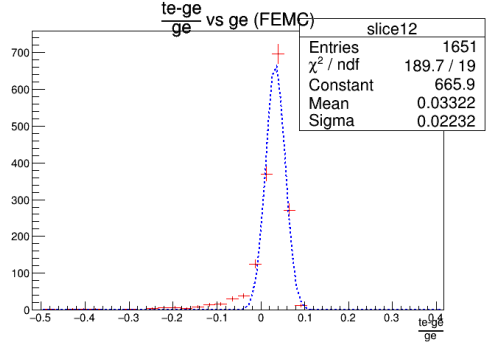




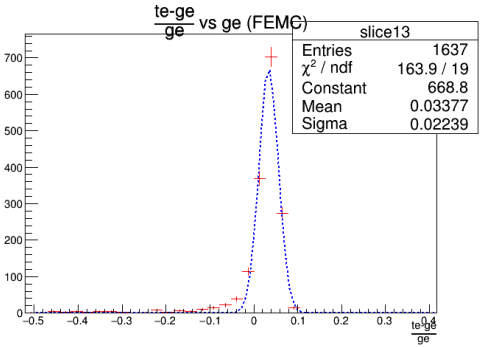


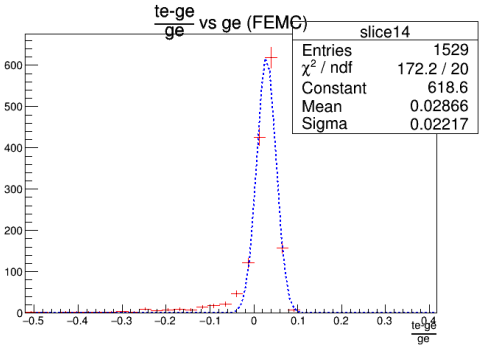


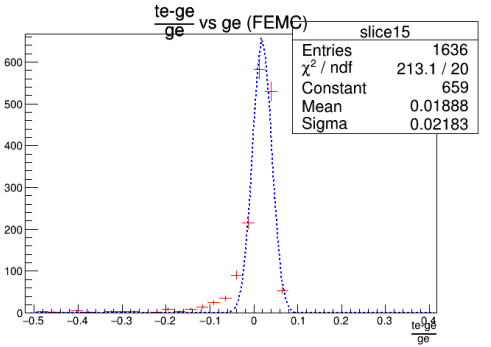




FEMC gaussian fits (after calibration):

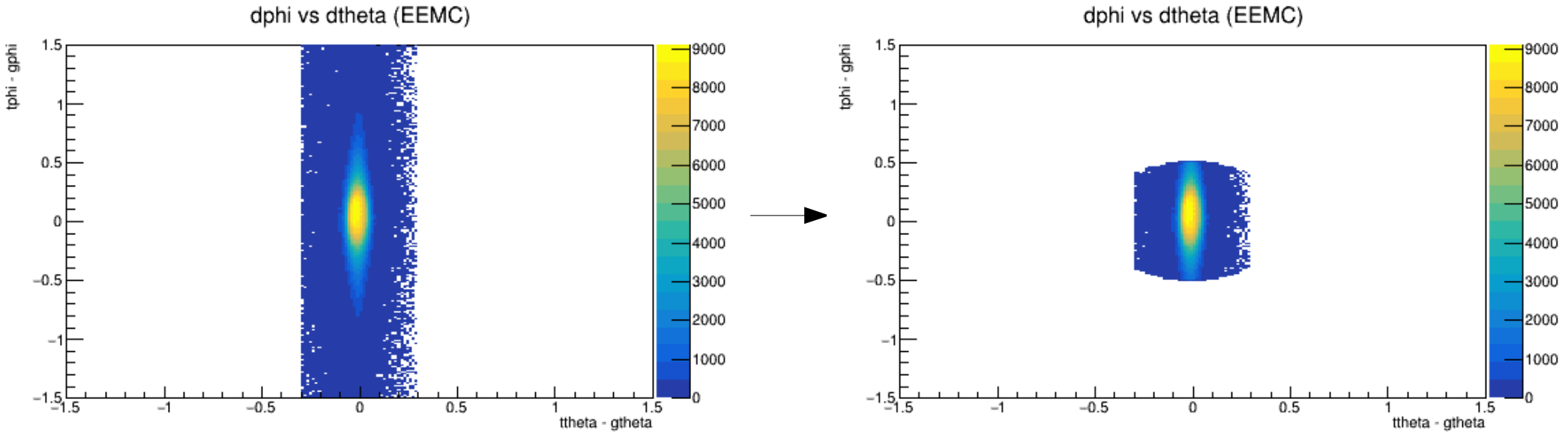






EEMC

Manual Clustering: Circular cut on dtheta and dphi:

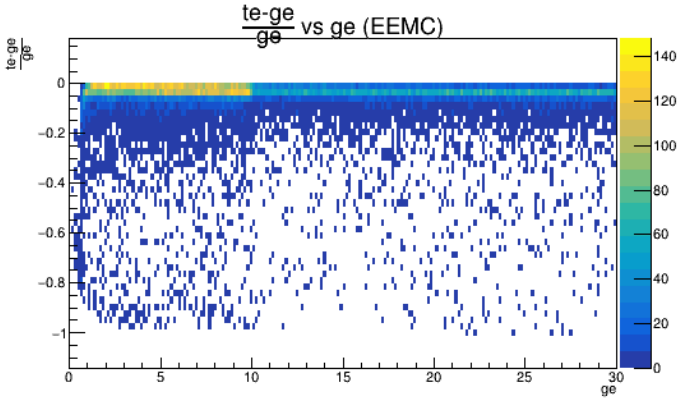


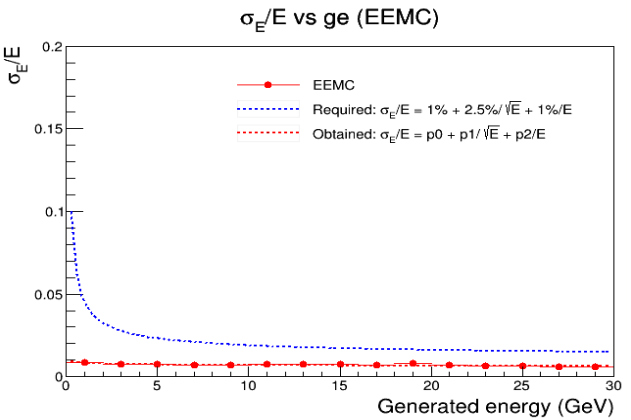
Radius: 0.5 units

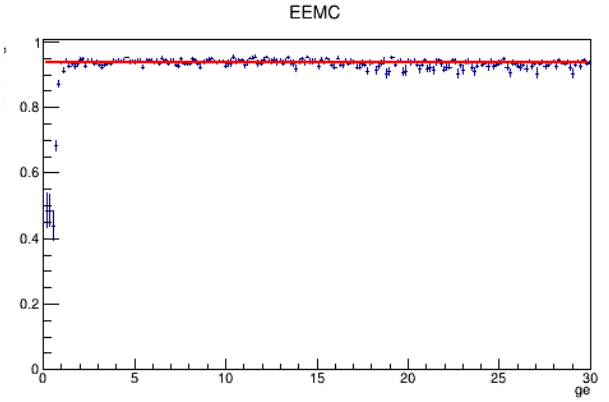
100 MeV Energy cut on aggregated tower energy for each event

Before recalibration: EEMC

η = -3.5 to -1.7





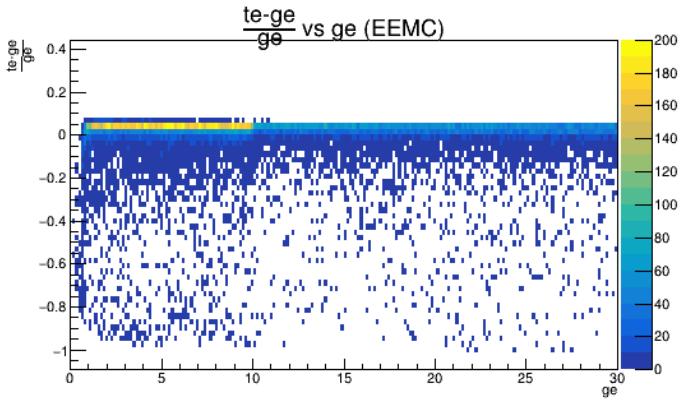


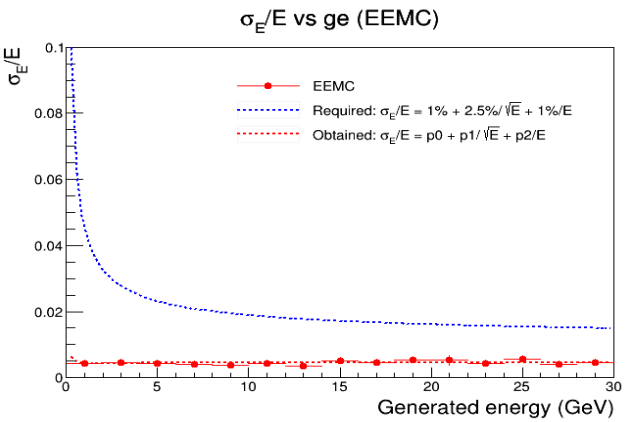
p0=0.00586027; p1=0.00355051; p2=-0.000994373

(pol0 fit)

p0 = 0.939041

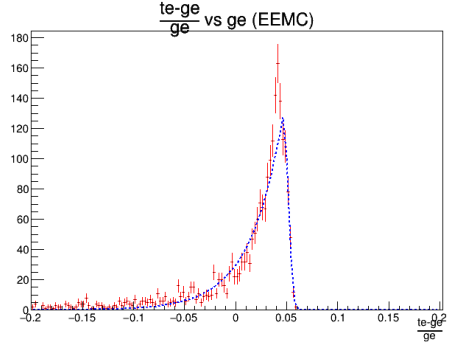
Recalibration using pol0 fit : Crystal ball fitting for slices

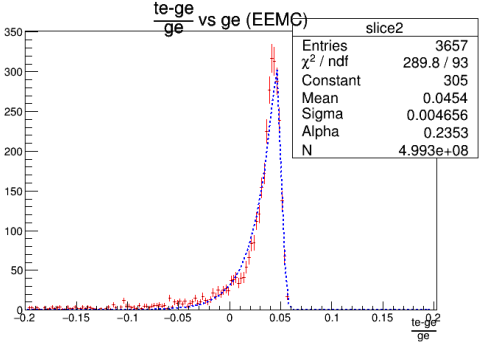


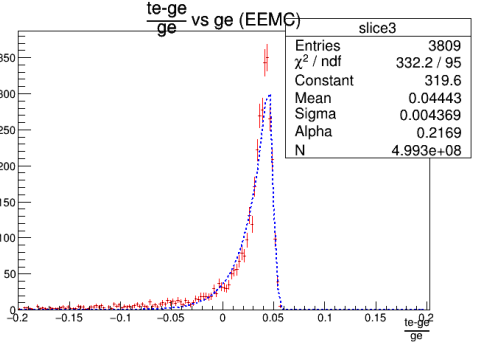


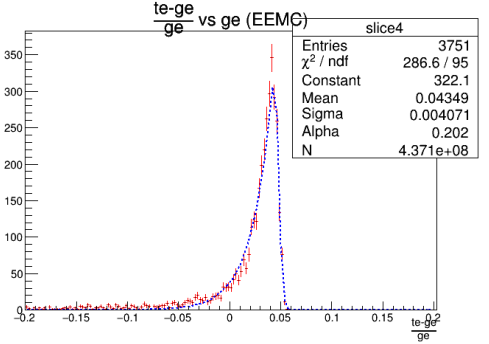
p0=0.00493094; p1=-0.00162239; p2=0.00117333

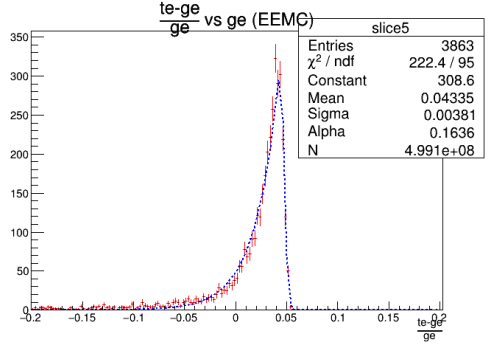
EEMC Crystal ball fits (after calibration):

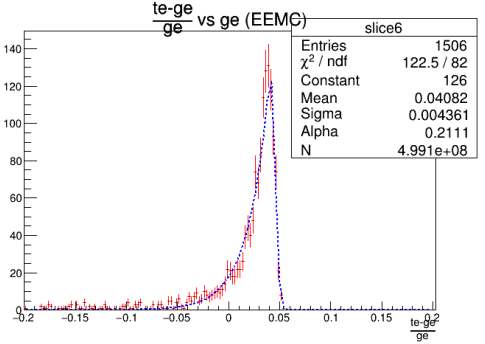


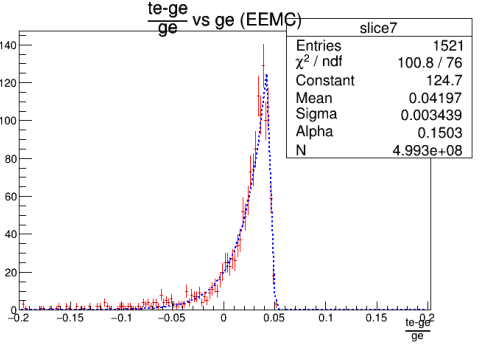


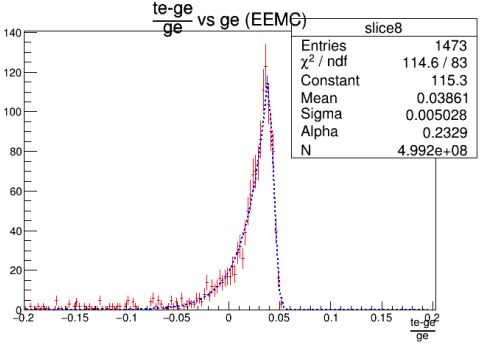


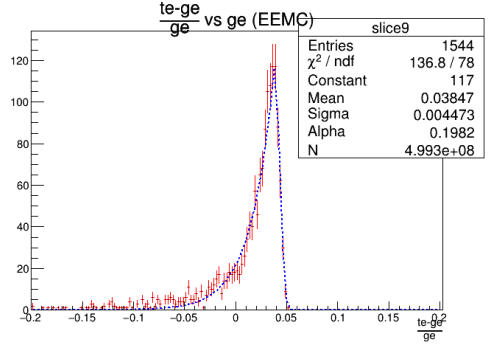


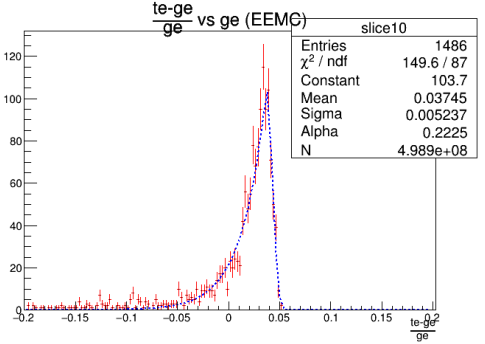


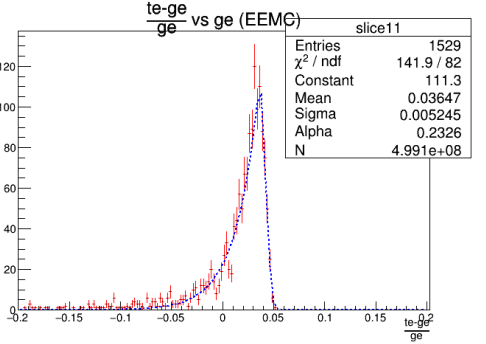


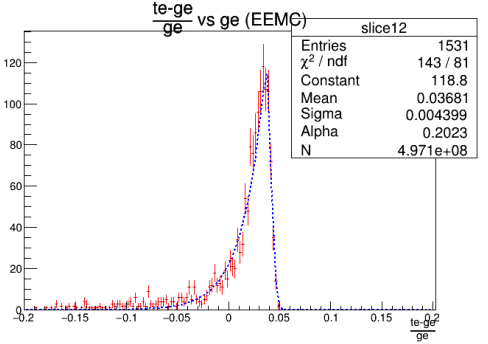




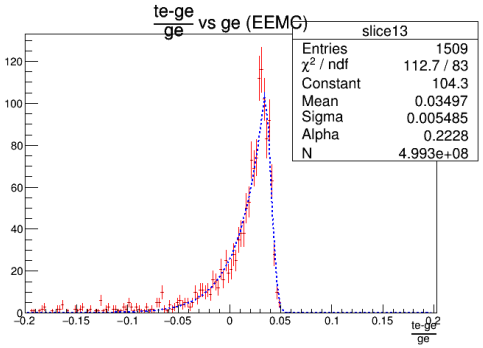


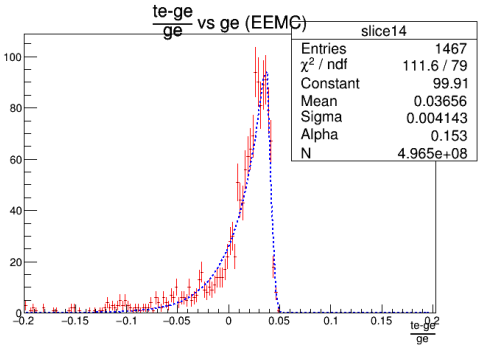


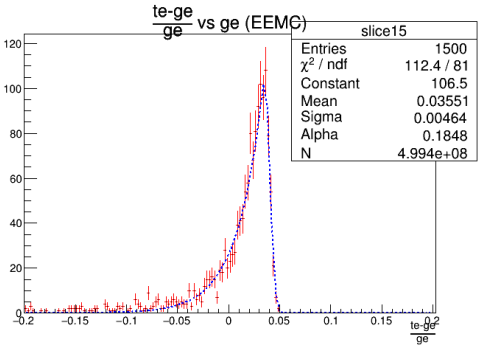




EEMC Crystal ball fits (after calibration):







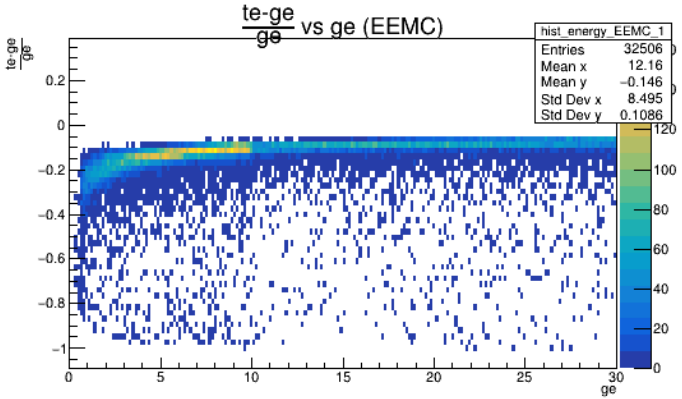
100 MeV Energy cut on the individual towers for each event

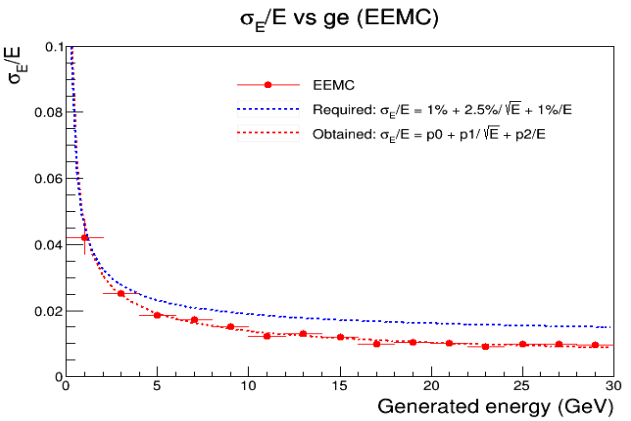
+

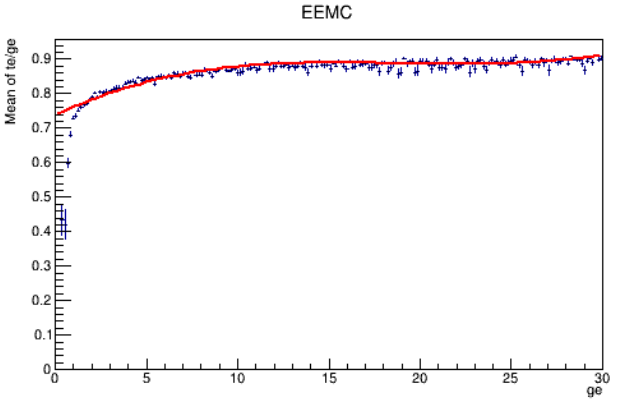
100 MeV energy cut on the aggregated tower energy for each event

Before recalibration: EEMC

η = -3.5 to -1.7



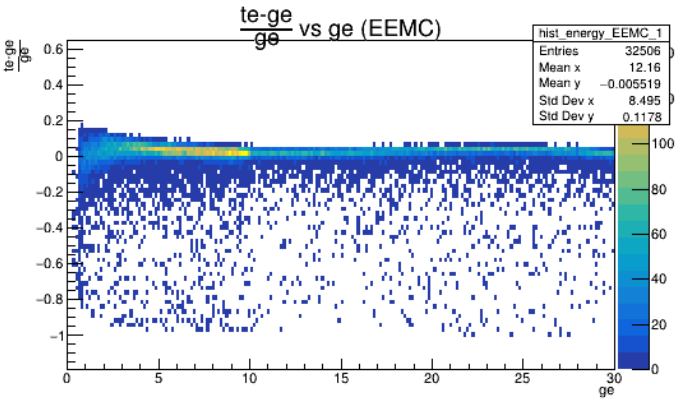


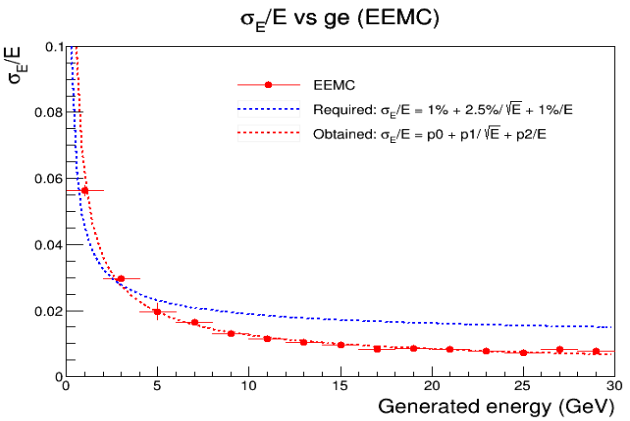


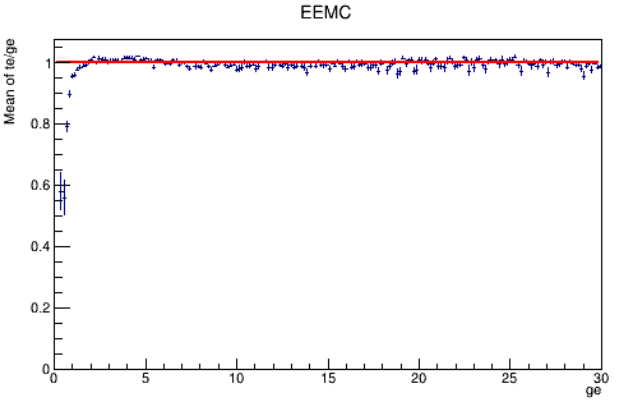
(pol3 fit)

p0=0.00233752; p1=0.0330123; p2=0.0104012

Recalibration using pol0 fit : Crystal ball fitting for slices



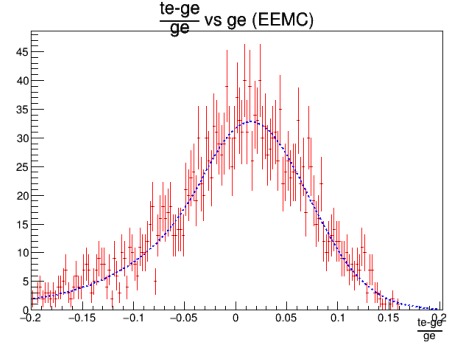


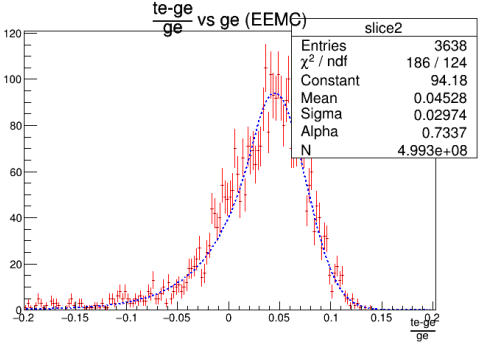


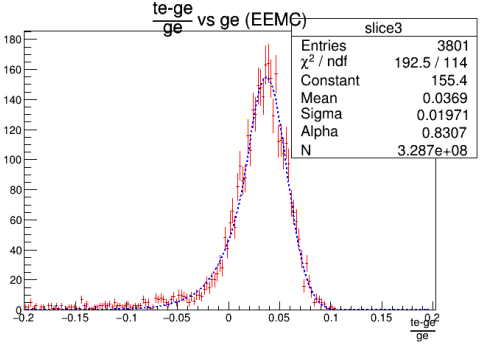
(pol3 fit)

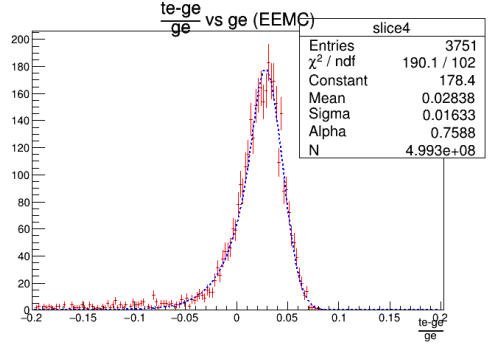
p0=0.000224497; p1=0.0293039; p2=0.0311775

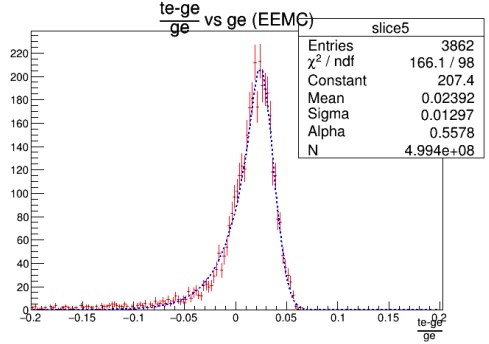
EEMC Crystal ball fits (after calibration):

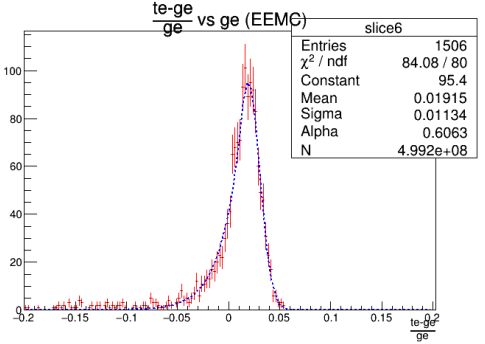


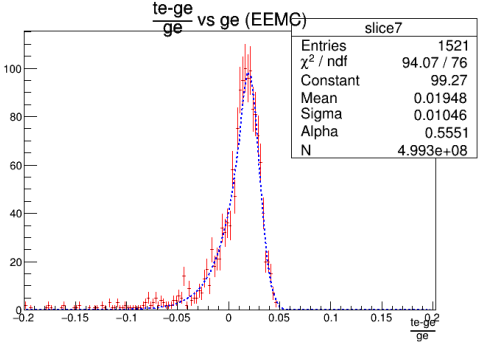


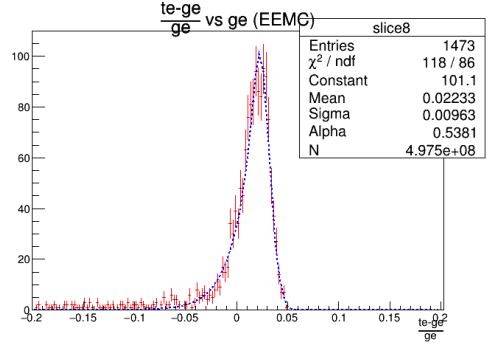


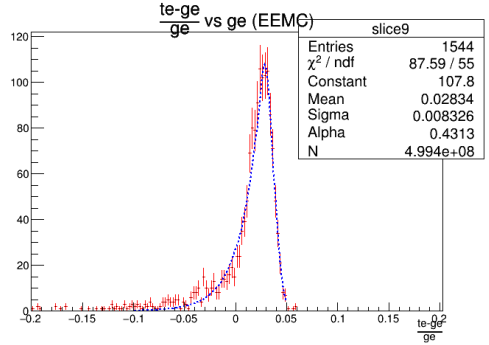


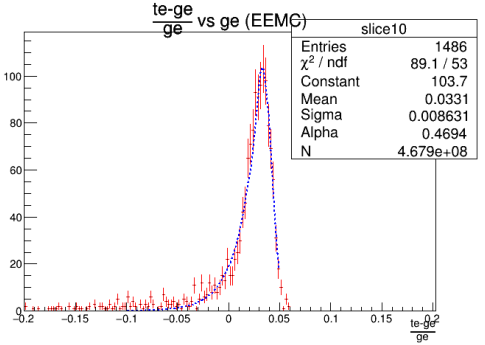


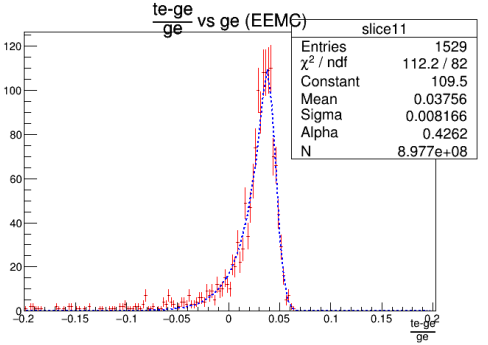


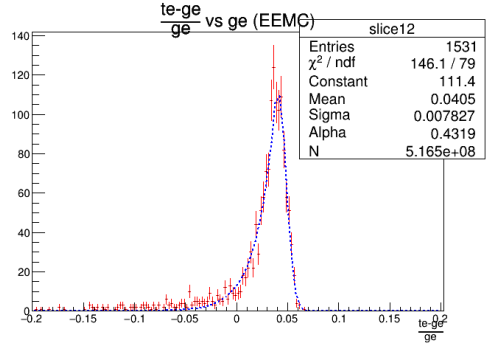




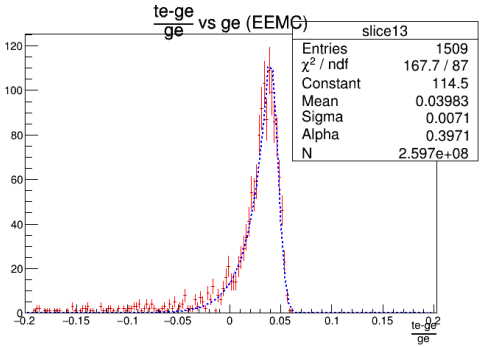


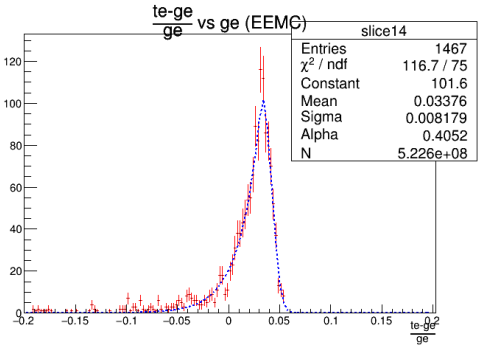


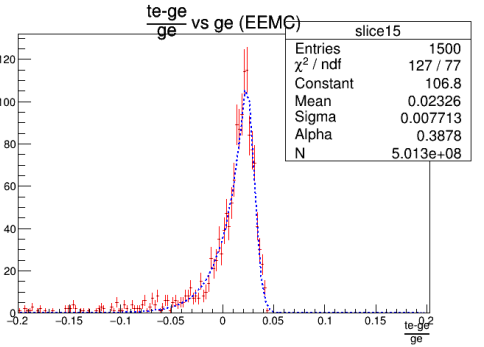




EEMC Crystal ball fits (after calibration):







THE END