

Fun4All Calorimeter Plots: Pion: FEMC behaviour and Barrel resolution without magnetic field

Simran
Lokesh Kumar
Panjab University, Chandigarh, INDIA

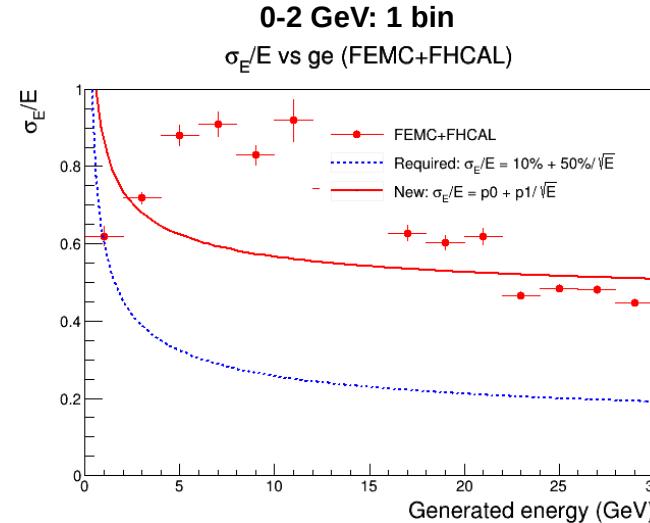
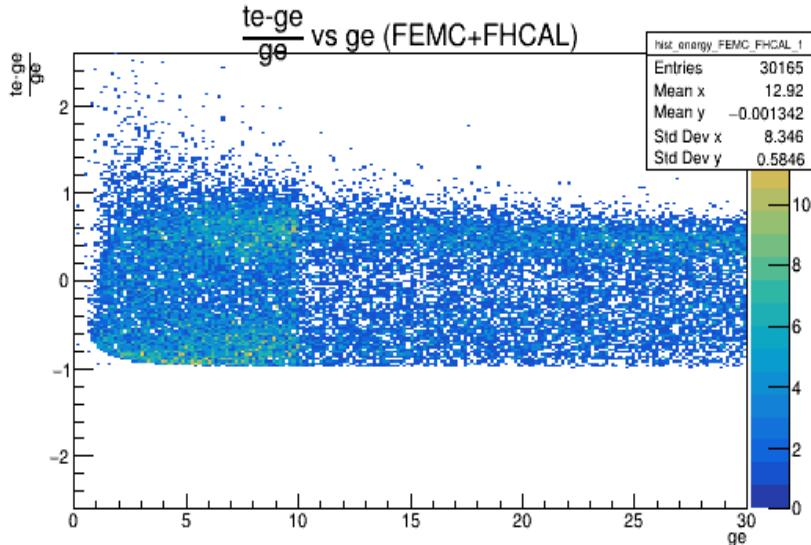
Fun4All QA Biweekly Meeting
March 11, 2022

Specifications:

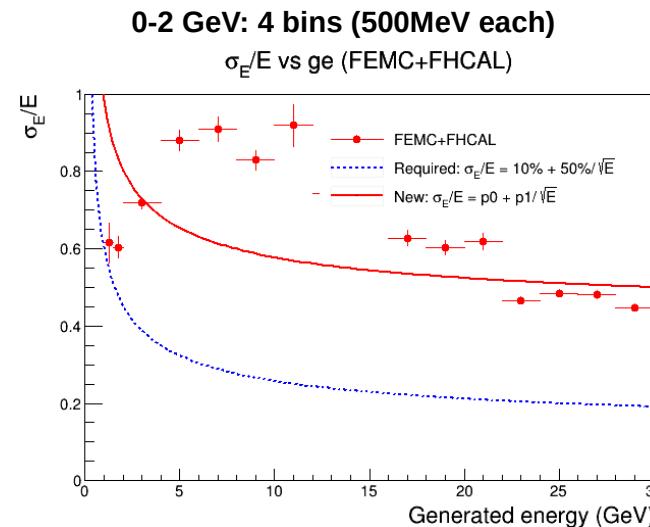
SIMULATION & ANALYSIS DETAILS FOR PION:

- Particles: pi-
- Events: 100000 (0-30 GeV), 50000(0-10GeV) [geta: -4 to 4]
- **Various Cuts used:**
 - NEW pseudorapidity cuts on calorimeters:
 - Pion:
 - CEMC, HCALIN, HCALOUT: $\eta = -0.98$ to 0.99
 - FEMC, FHCAL: $\eta = 1.32$ to 3.14
 - Clustering cut based on theta and phi values
 - Theta-dependent energy cut on individual tower energies
 - 0 cut on aggregated tower energies for each event
- Forward region: Magnetic field: ON
- Barrel region: Magnetic field: OFF

Forward Resolution (FEMC+FHCAL) (Magnetic Field: ON)

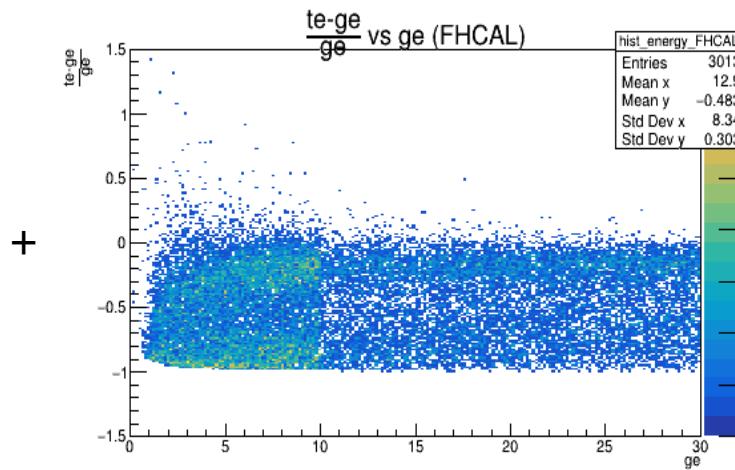
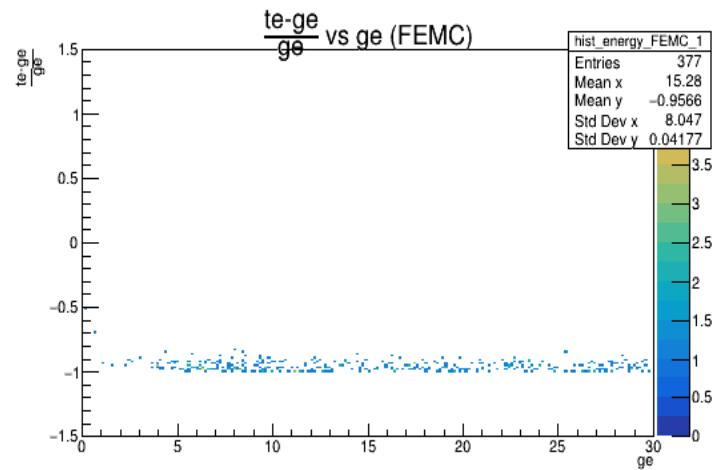


$$\sigma_E/E = 42.94\% + 43.49\%/\sqrt{E}$$

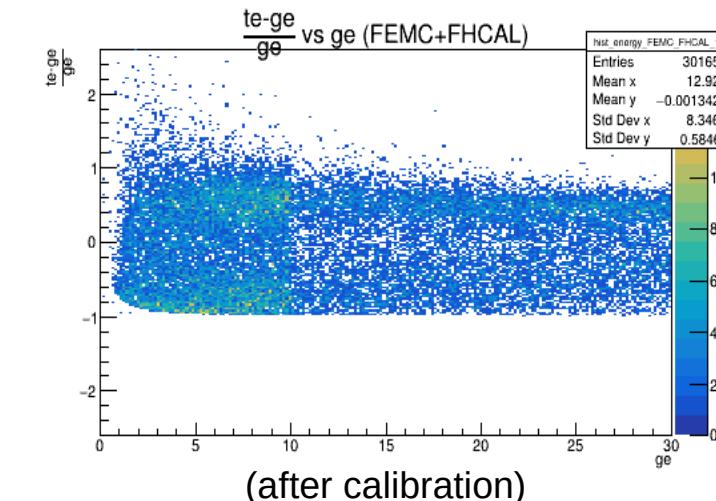


$$\sigma_E/E = 39.412\% + 58.1\%/\sqrt{E}$$

Forward Resolution (FEMC+FHCAL)

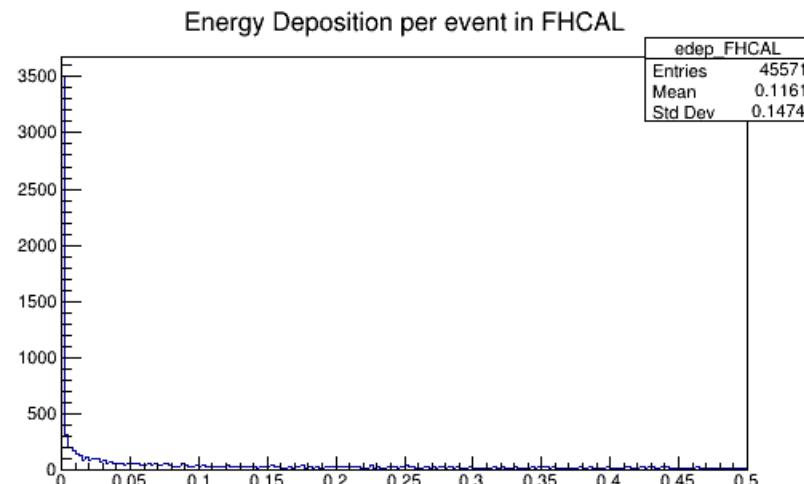
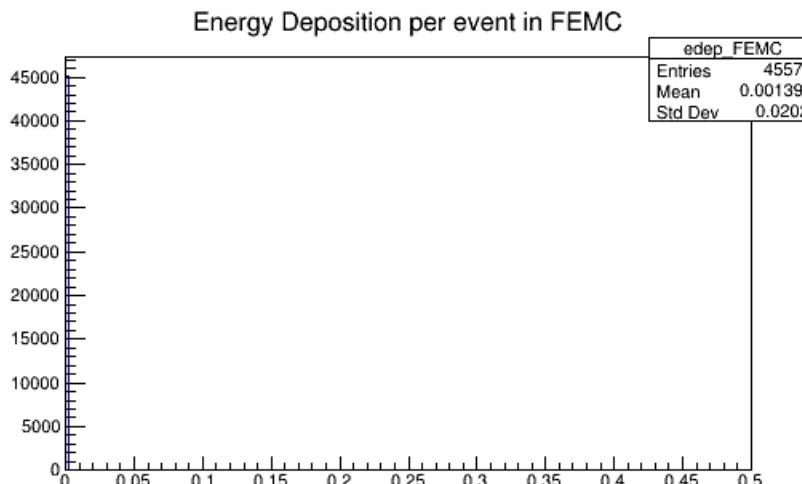
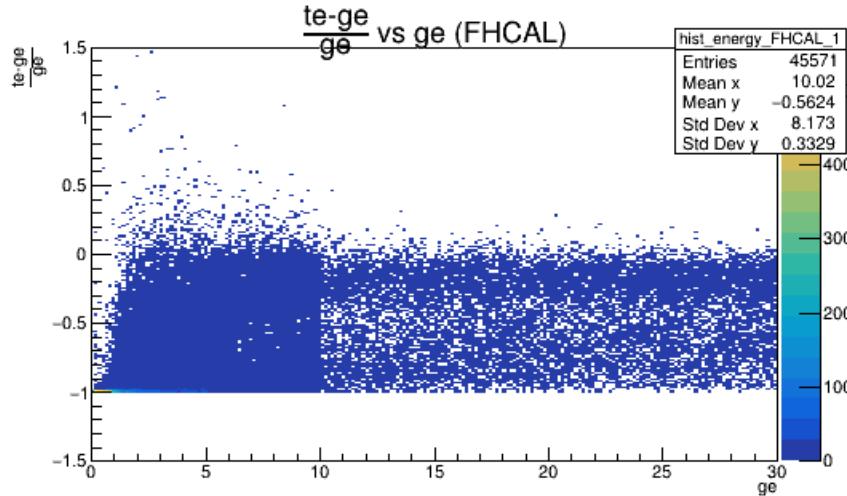
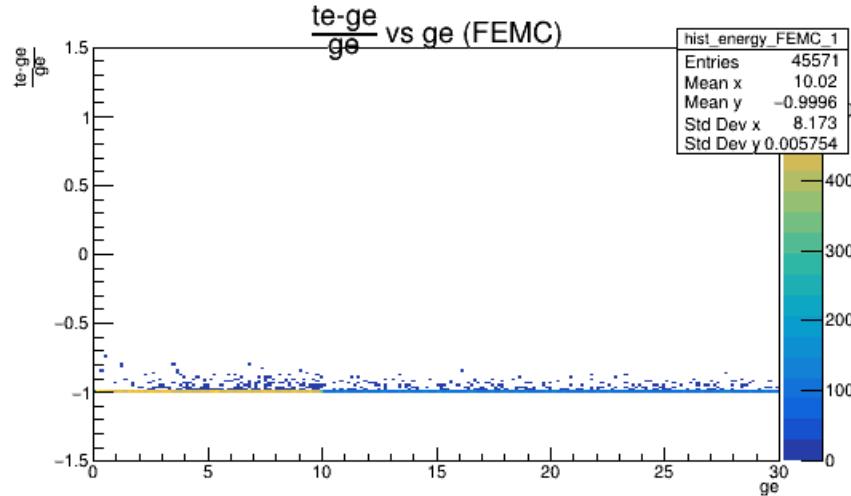


FEMC energies missing!



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Forward Resolution (FEMC+FHCAL): Recheck by regenerating statistics



Forward Resolution (FEMC+FHCAL): Recheck by regenerating statistics

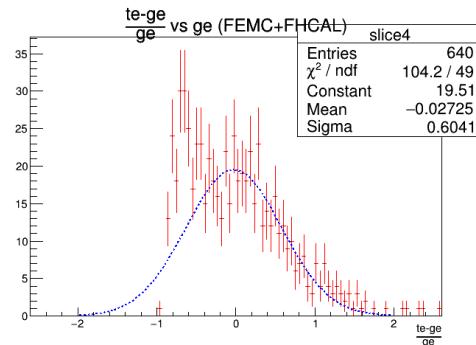
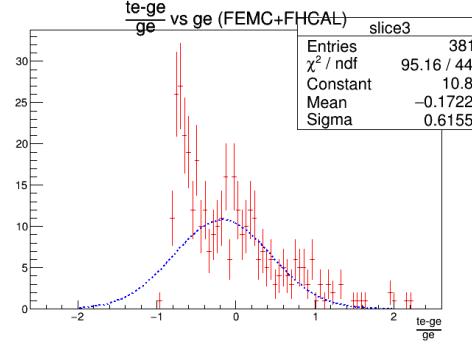
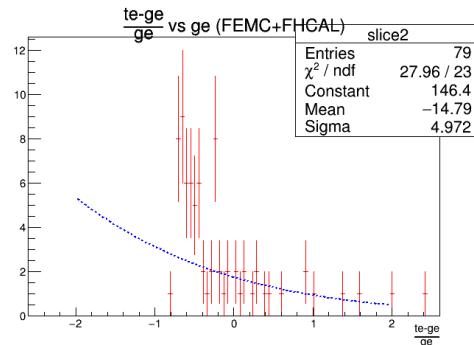
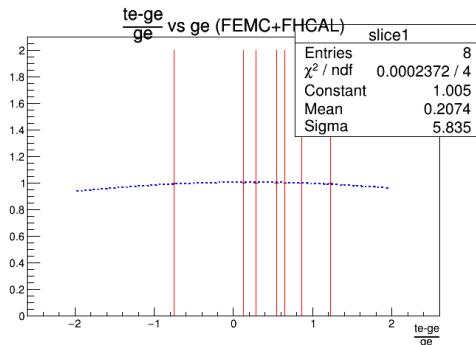
A file that may have connection with FEMC behaviour: (comes up while running the Fun4All_G4_EICDetector.C)

/cvmfs/eic.opensciencegrid.org/gcc-8.3/
release/release_new/new.4/share/
calibrations/ForwardEcal/mapping/
towerMap_FEMC_v007.txt

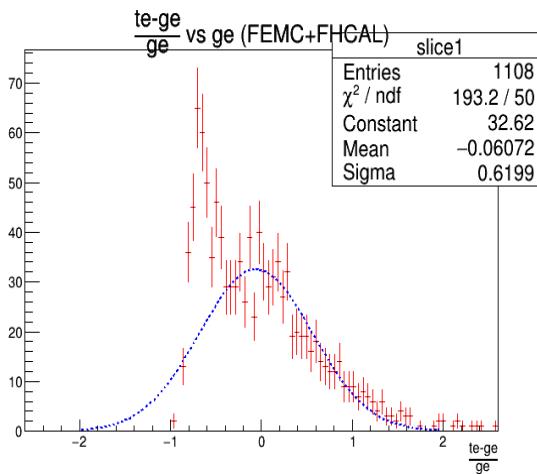
```
# Global detector geometry and transformation; lengths given in cm
Gtype 2
Gr1_inner 20
Gr1_outer 182.655
Gr2_inner 20
Gr2_outer 182.655
Gdz 37.5
Gx0 0
Gy0 0
Gz0 310
Grot_x 0
Grot_y 0
Grot_z 0
Gtower2_dx 5.535
Gtower2_dy 5.535
Gtower2_dz 37.5
#Tower type, idx_j, idx_k, idx_l, x[cm], y[cm], z[cm], dx[cm], dy[cm], dz[cm], rot_x, rot_y, rot_z
Tower 2 0 27 0 -177.12 -27.675 0 5.535 5.535 36.3 0 0 0
Tower 2 0 28 0 -177.12 -22.14 0 5.535 5.535 36.3 0 0 0
Tower 2 0 29 0 -177.12 -16.605 0 5.535 5.535 36.3 0 0 0
Tower 2 0 30 0 -177.12 -11.07 0 5.535 5.535 36.3 0 0 0
Tower 2 0 31 0 -177.12 -5.535 0 5.535 5.535 36.3 0 0 0
Tower 2 0 32 0 -177.12 0 0 5.535 5.535 36.3 0 0 0
Tower 2 0 33 0 -177.12 5.535 0 5.535 5.535 36.3 0 0 0
Tower 2 0 34 0 -177.12 11.07 0 5.535 5.535 36.3 0 0 0
Tower 2 0 35 0 -177.12 16.605 0 5.535 5.535 36.3 0 0 0
Tower 2 0 36 0 -177.12 22.14 0 5.535 5.535 36.3 0 0 0
Tower 2 0 37 0 -177.12 27.675 0 5.535 5.535 36.3 0 0 0
Tower 2 1 23 0 -171.585 -49.815 0 5.535 5.535 36.3 0 0 0
Tower 2 1 24 0 -171.585 -44.28 0 5.535 5.535 36.3 0 0 0
Tower 2 1 25 0 -171.585 -38.745 0 5.535 5.535 36.3 0 0 0
Tower 2 1 26 0 -171.585 -33.21 0 5.535 5.535 36.3 0 0 0
-UU-%%--F1 towerMap_FEMC_v007.txt Top L1 (Text) -----
Note: file is write protected
```

FEMC+FHCAL: Gaussian fits

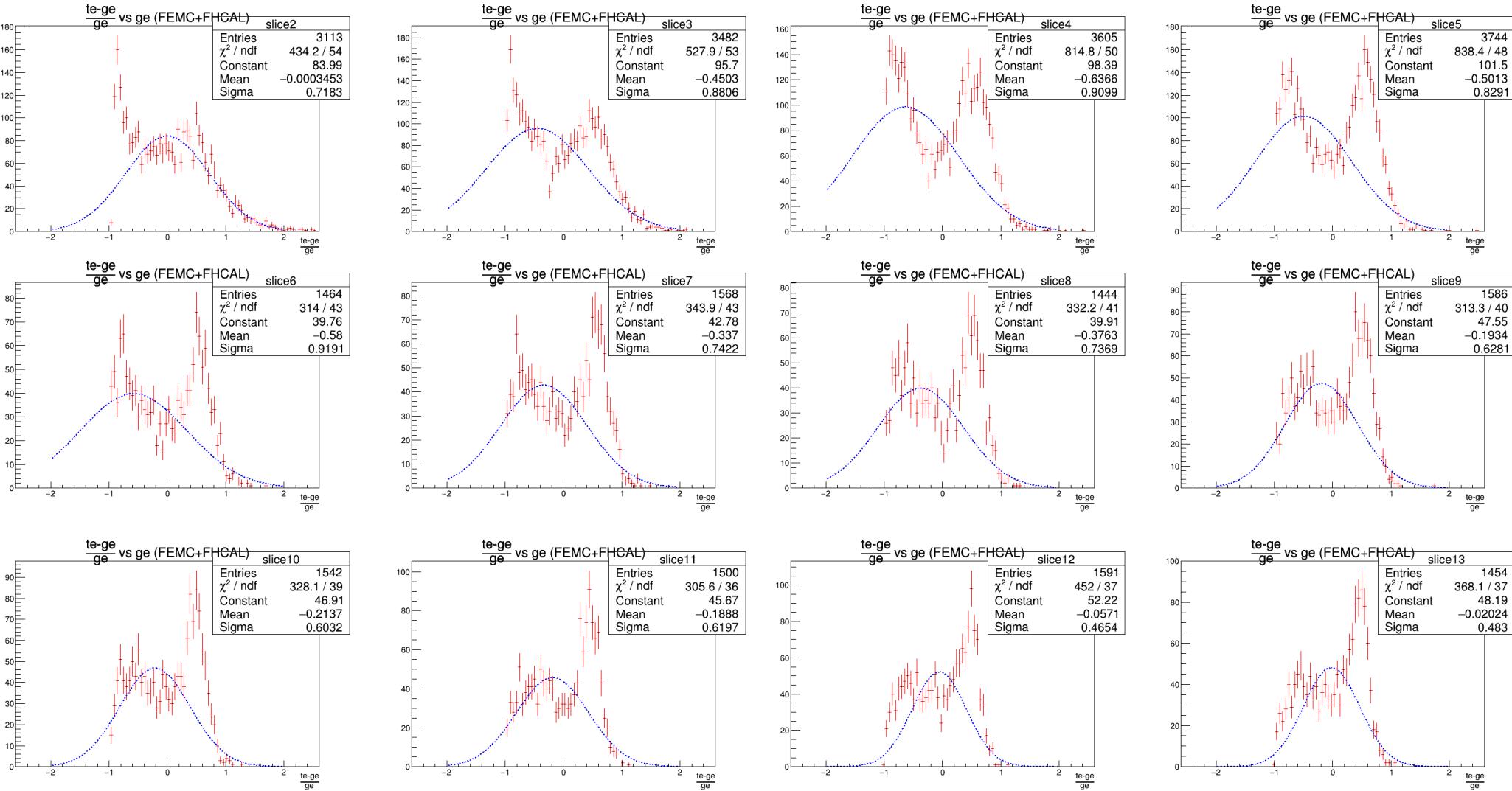
First four bins with fine binning:



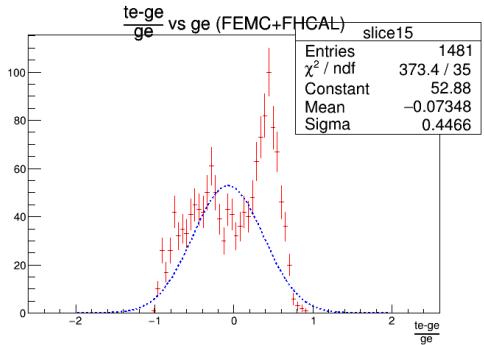
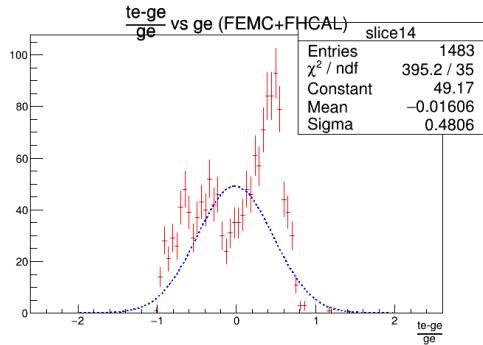
First three bins combined into one bin:



FEMC+FHCAL: Gaussian fits

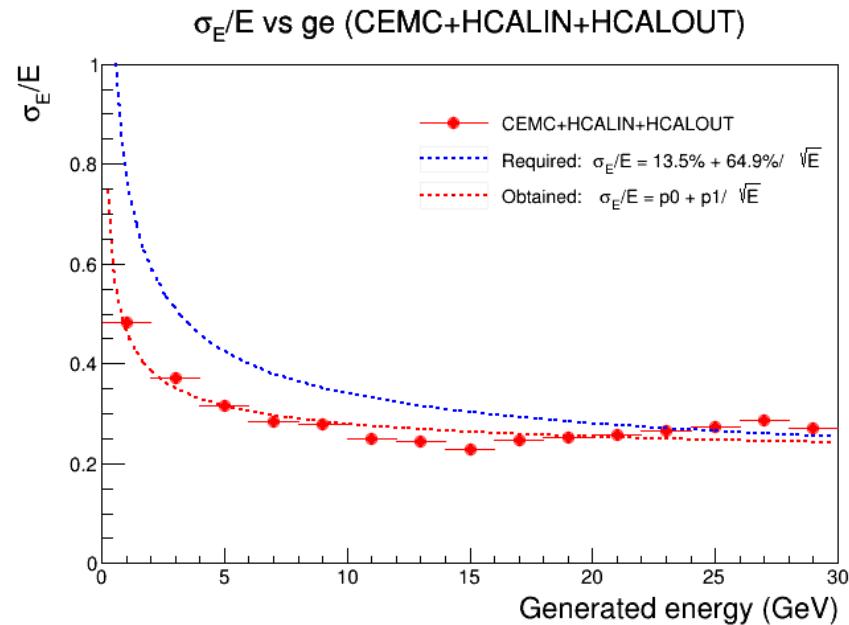
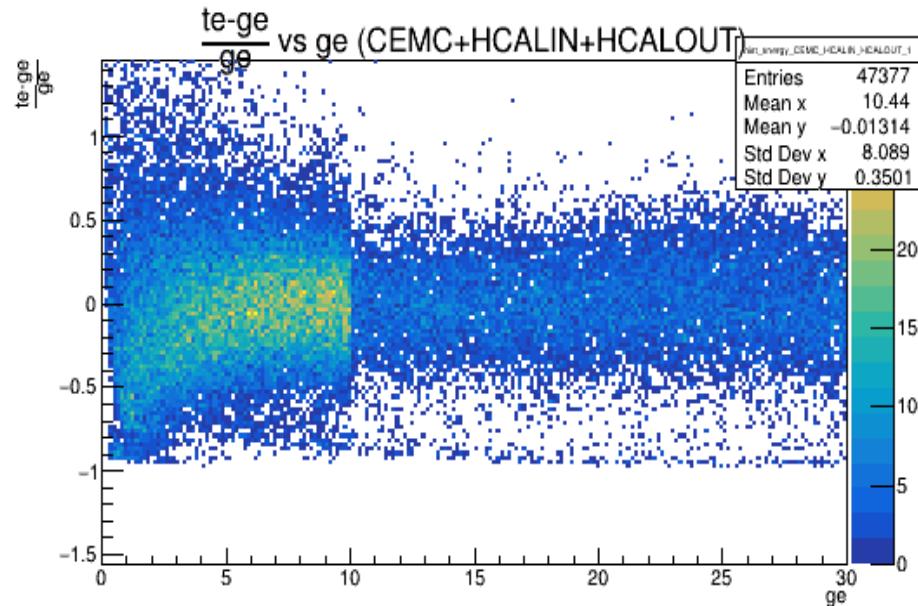


FEMC+FHCAL: Gaussian fits



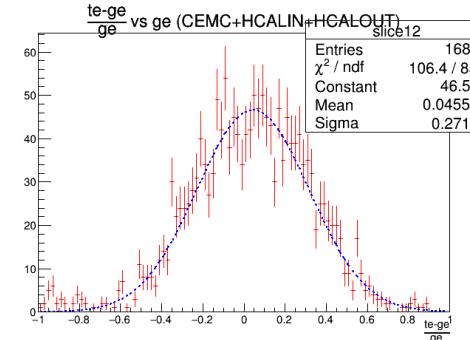
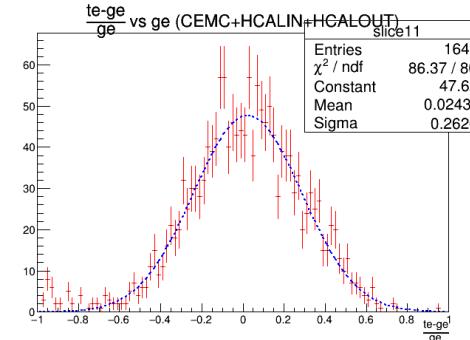
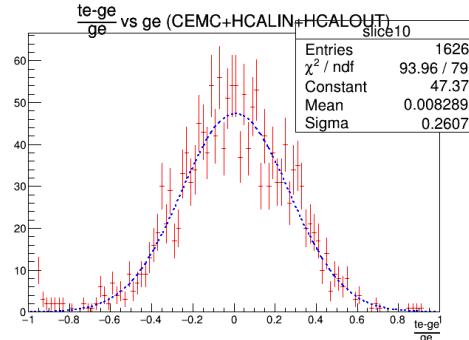
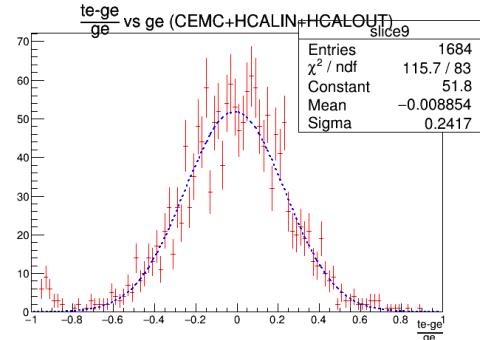
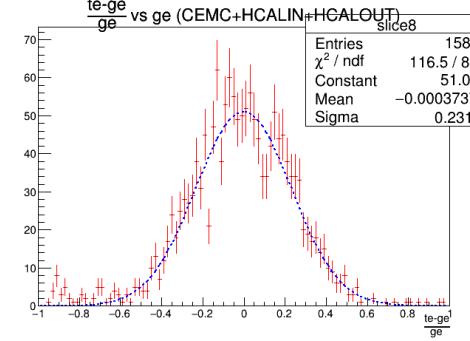
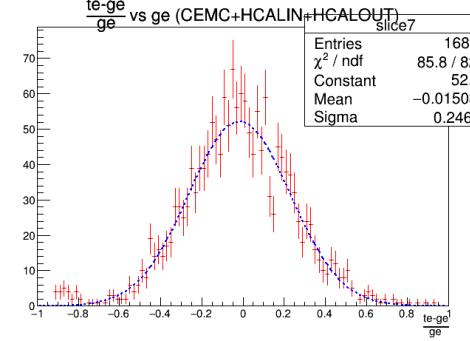
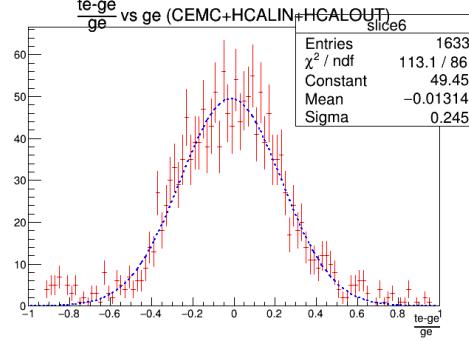
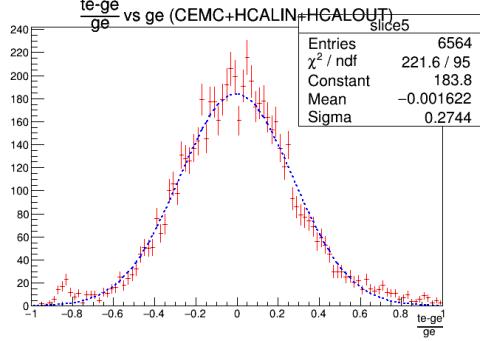
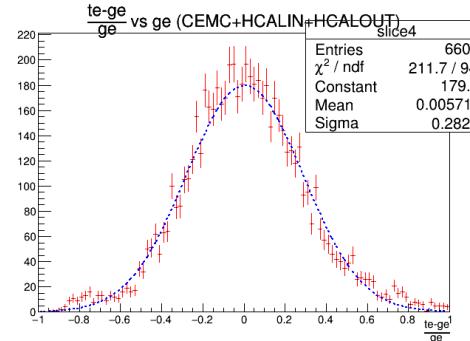
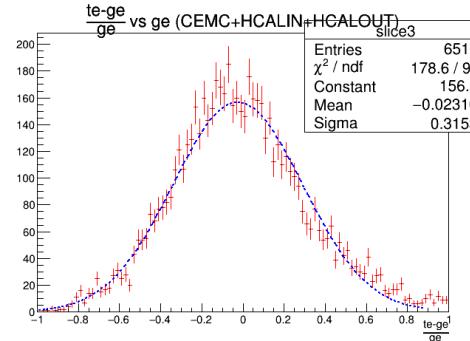
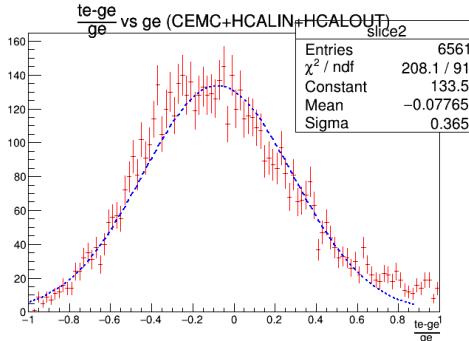
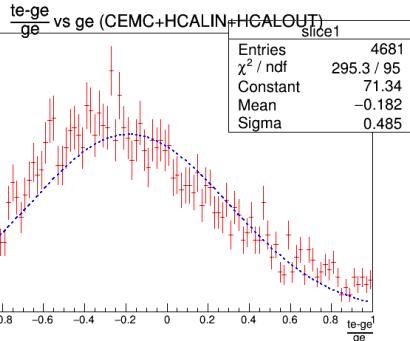
Barrel Resolution (CEMC+HCALIN+HCALOUT)

Magnetic field: OFF

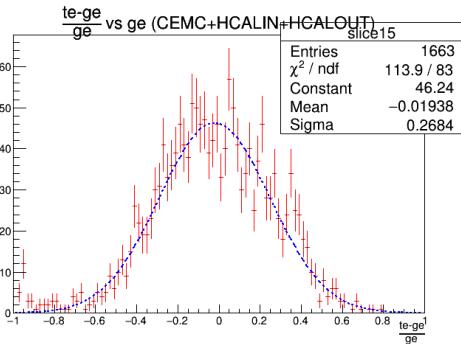
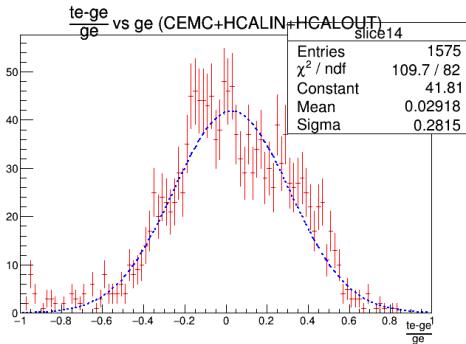
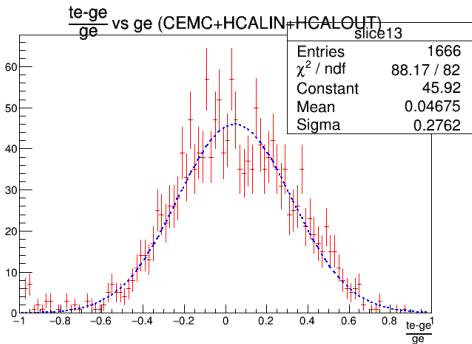


$$\sigma_E/E = 19.27\% + 26.98\%/\sqrt{E}$$

CEMC+HCALIN+HCALOUT: Gaussian fits



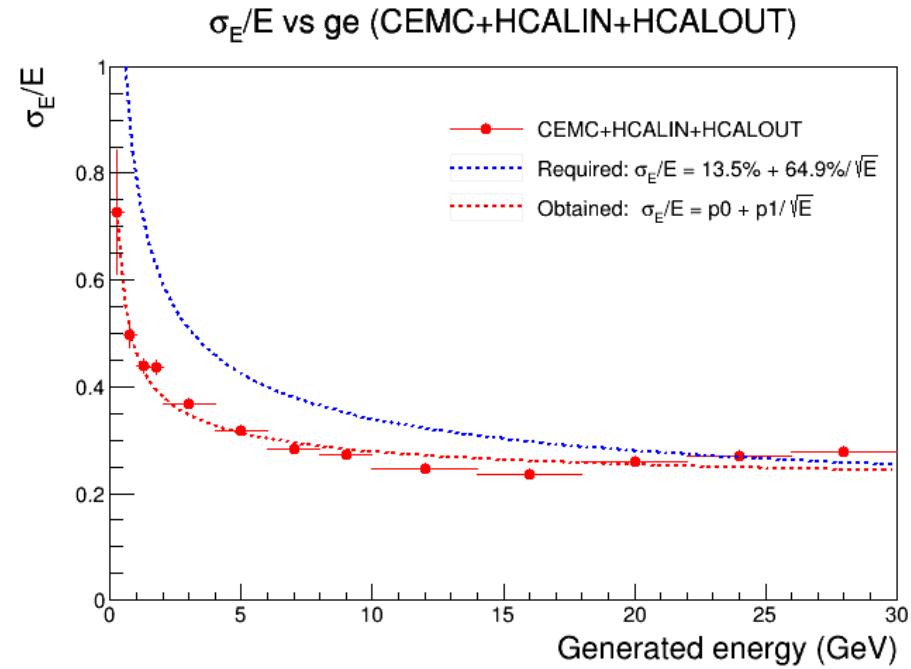
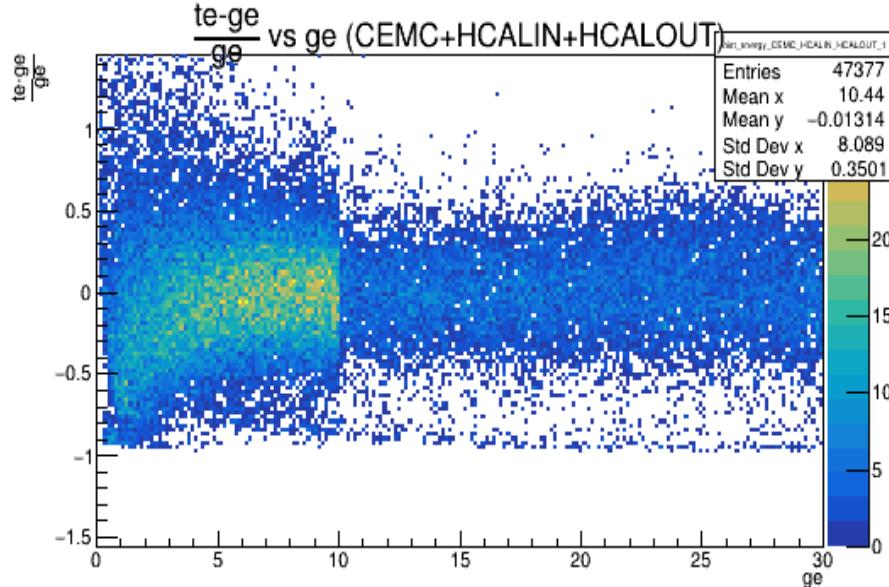
CEMC+HCALIN+HCALOUT: gaussian fits



Barrel Resolution (CEMC+HCALIN+HCALOUT)

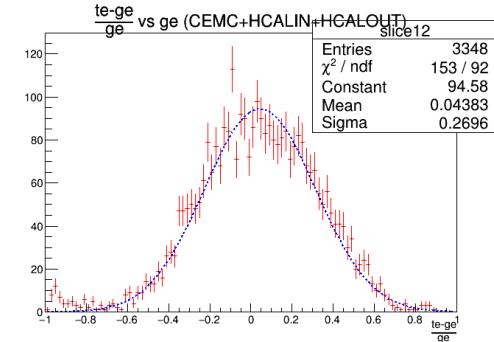
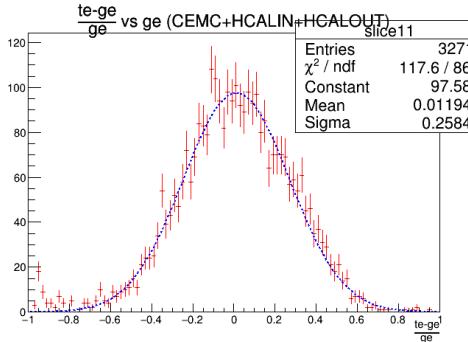
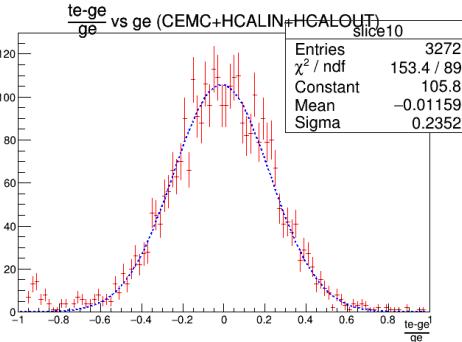
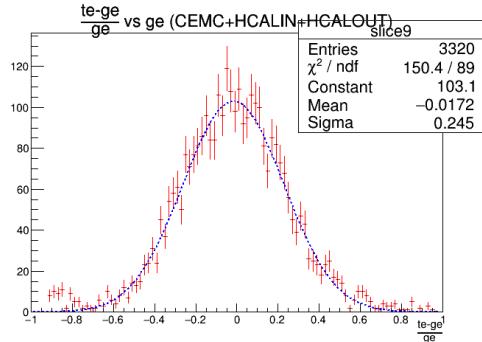
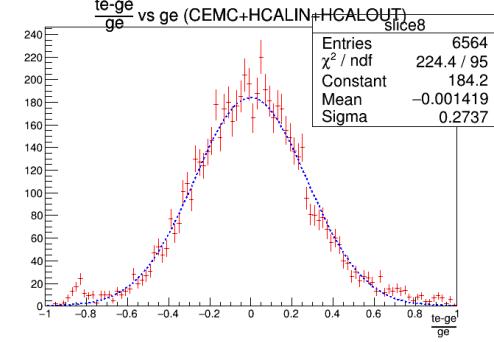
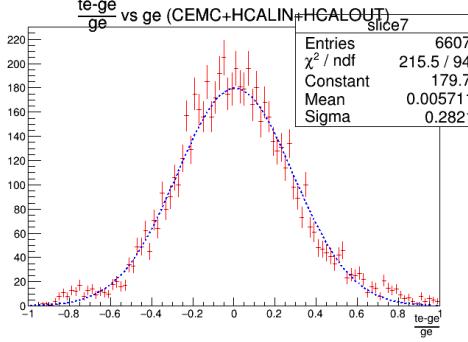
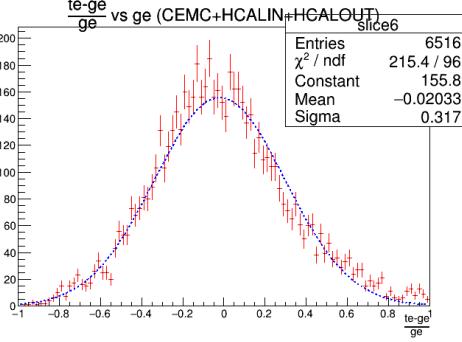
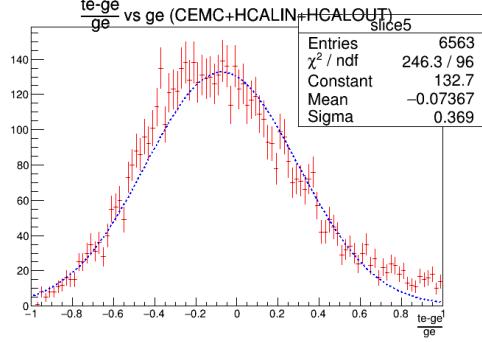
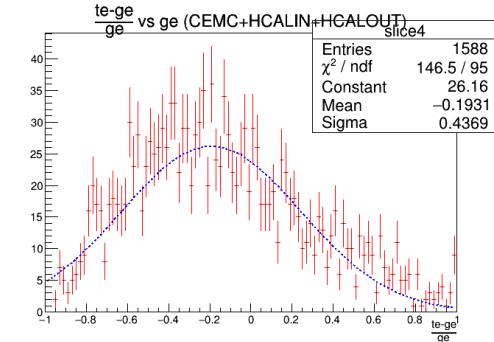
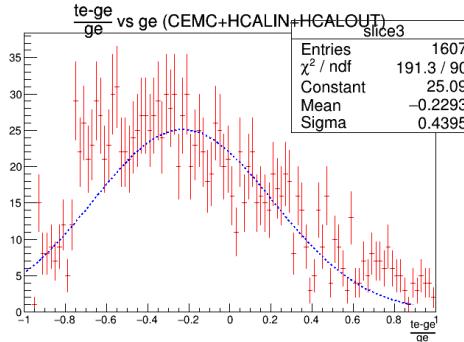
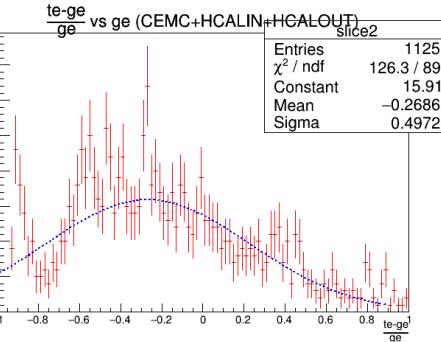
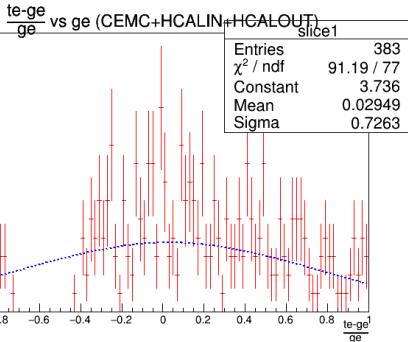
Magnetic field: OFF

Variable binning

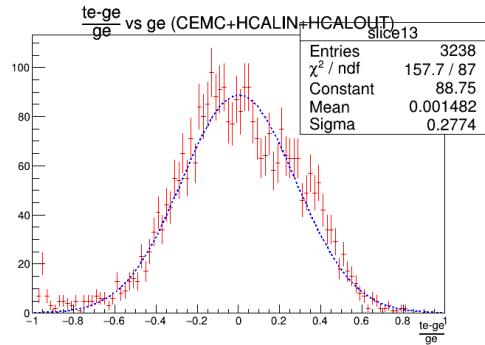


$$\sigma_E/E = 19.44\% + 26.57\%/\sqrt{E}$$

CEMC+HCALIN+HCALOUT: Gaussian fits



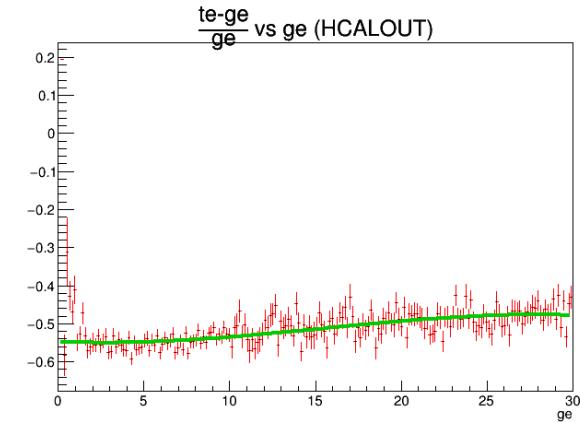
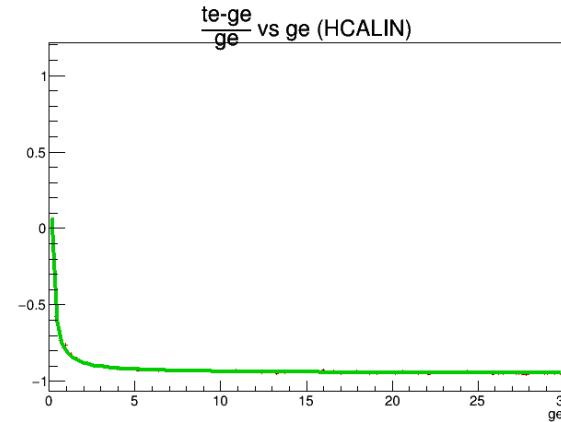
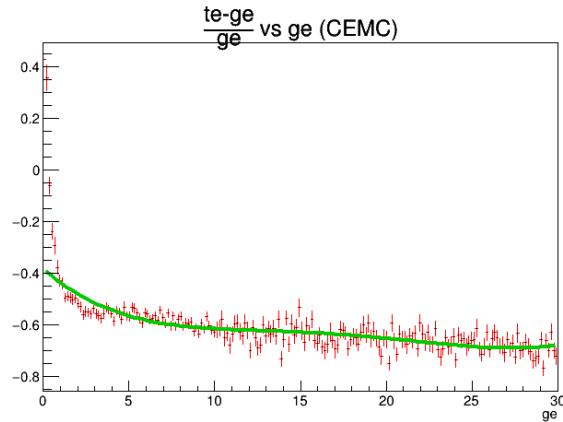
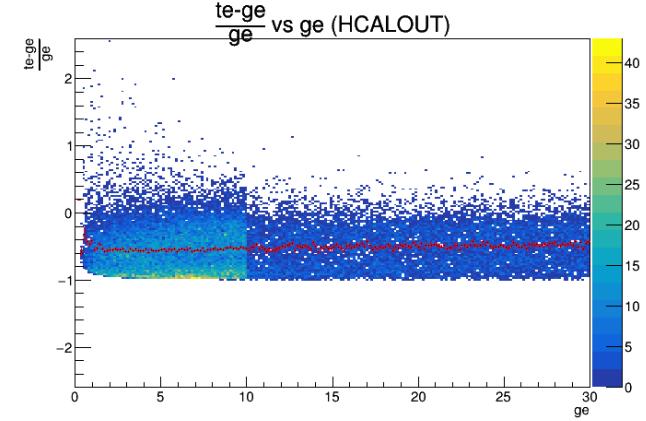
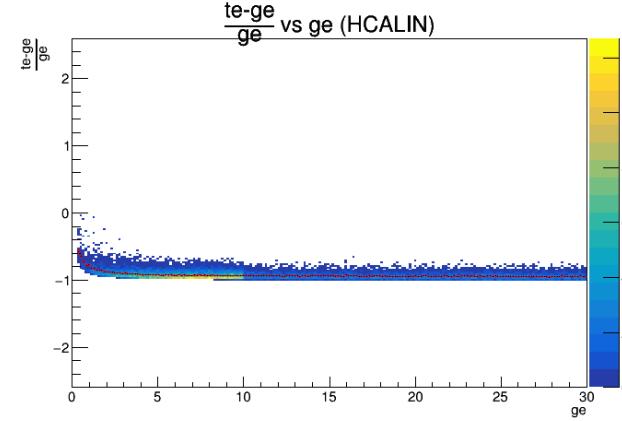
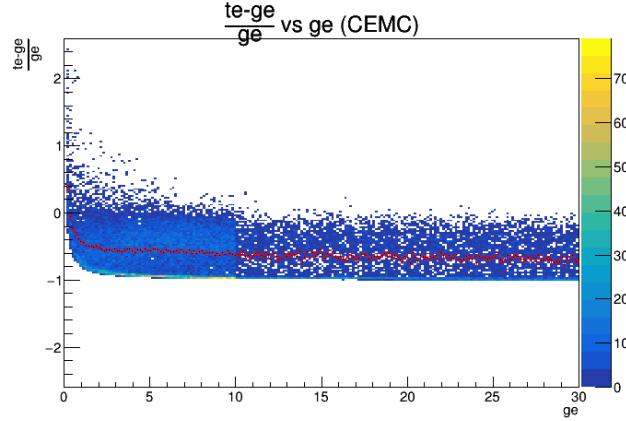
CEMC+HCALIN+HCALOUT: gaussian fits



Barrel Resolution (CEMC+HCALIN+HCALOUT)

Magnetic field: OFF

Calibration Steps



CEMC weight = 0.413856

HCALIN weight = 0.0732445

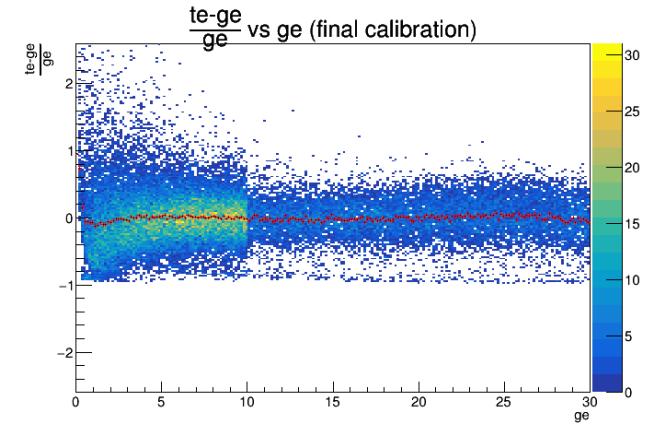
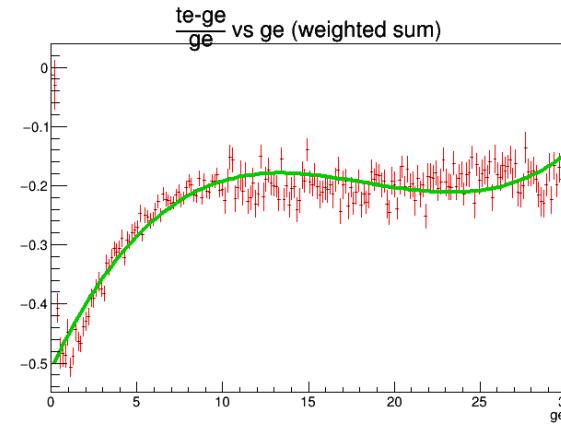
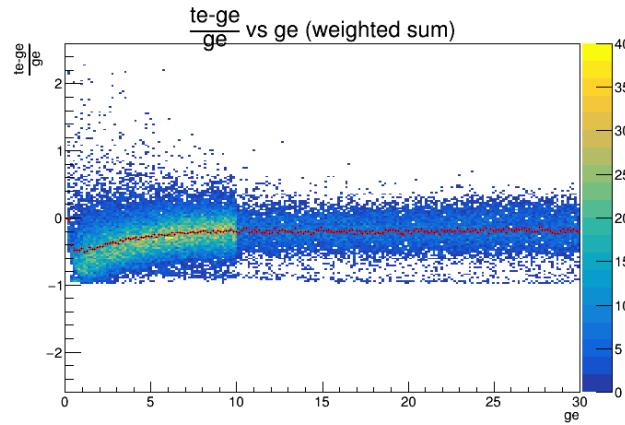
HCALOUT weight = 0.475179

Sum of weights = 0.96228

Barrel Resolution (CEMC+HCALIN+HCALOUT)

Magnetic field: OFF

Calibration steps:



THANKS!