Fun4All Calorimeter Plots: Pion with corrected FHCal

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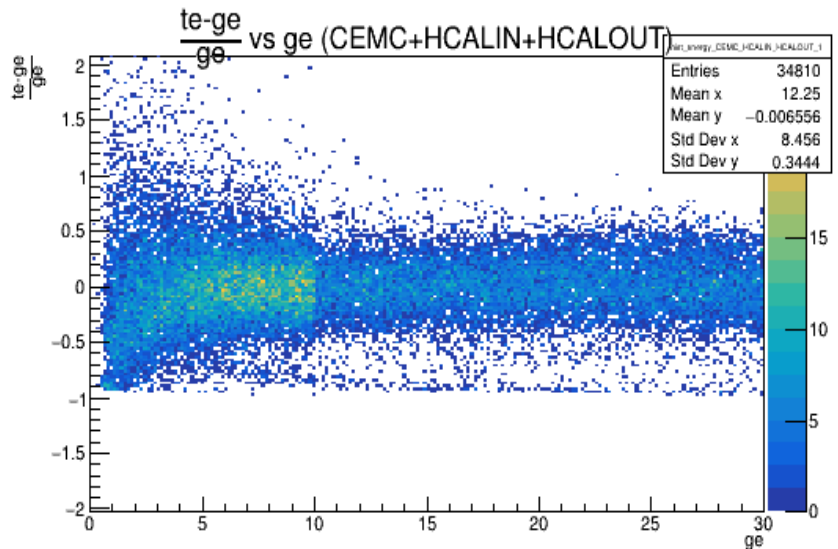
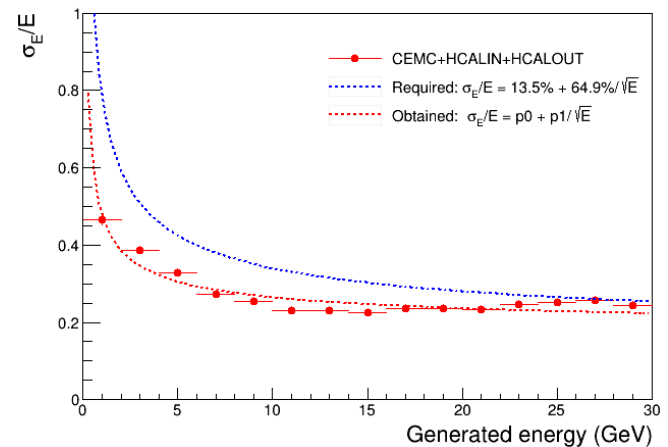Fun4All QA Biweekly Meeting
Feb 11, 2022

Specifications:

SIMULATION & ANALYSIS DETAILS FOR PION:

- Particles: pi-

- Events: 80000 (0-30 GeV), 50000(0-10GeV) [geta: -4 to 4]

- **Various Cuts used:**
  - **NEW** pseudorapidity cuts on calorimeters:
    - Pion:
      - CEMC, HCALIN, HCALOUT: η = -0.98 to 0.99
      - FEMC, FHCAL: η = 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

- Introduction of finer binning at lower energies: 0.5GeV bins from 0 to 2 GeV

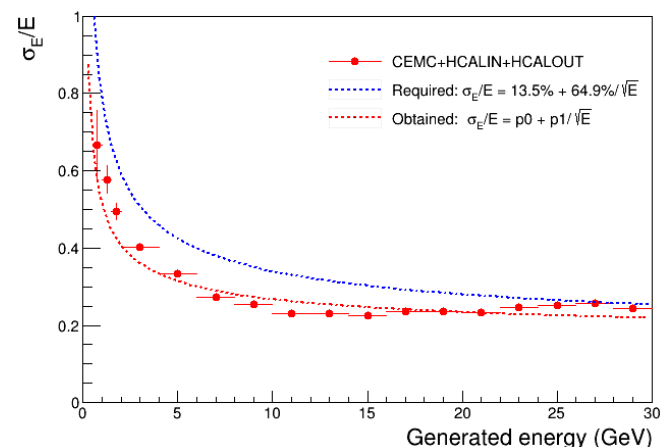# Barrel Resolution (CEMC+HCALIN+HCALOUT)

$\frac{te-ge}{ge}$ vs ge (CEMC+HCALIN+HCALOUT)

Entries	34810
Mean x	12.25
Mean y	−0.006556
Std Dev x	8.456
Std Dev y	0.3444

0-2 GeV: 1 bin

σ_E/E vs ge (CEMC+HCALIN+HCALOUT)

- CEMC+HCALIN+HCALOUT
- Required: $\sigma_E/E = 13.5\% + 64.9\%/\sqrt{E}$
- Obtained: $\sigma_E/E = p0 + p1/\sqrt{E}$

$\sigma_E/E = 16.5\% + 31.3\%/\sqrt{E}$

0-2 GeV: 4 bins (500MeV each)

σ_E/E vs ge (CEMC+HCALIN+HCALOUT)

- CEMC+HCALIN+HCALOUT
- Required: $\sigma_E/E = 13.5\% + 64.9\%/\sqrt{E}$
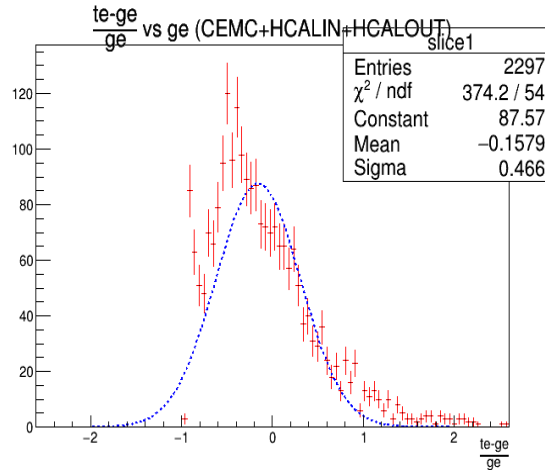- Obtained: $\sigma_E/E = p0 + p1/\sqrt{E}$

$\sigma_E/E = 15.3\% + 36.1\%/\sqrt{E}$
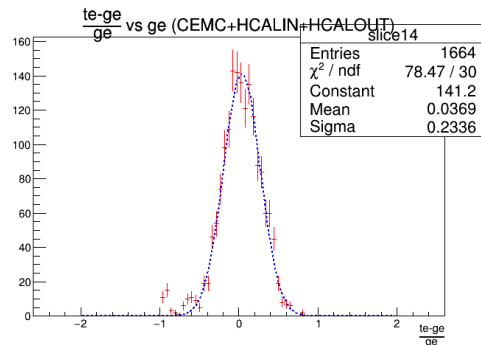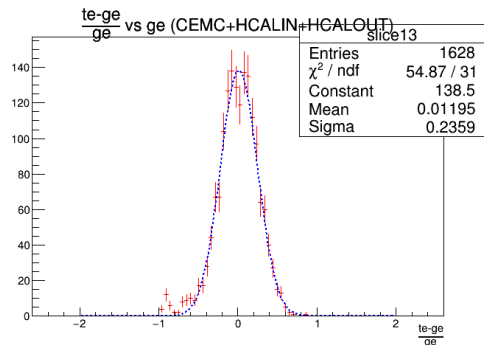
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CEMC+HCALIN+HCALOUT: Gaussian fits

First four bins with fine binning:
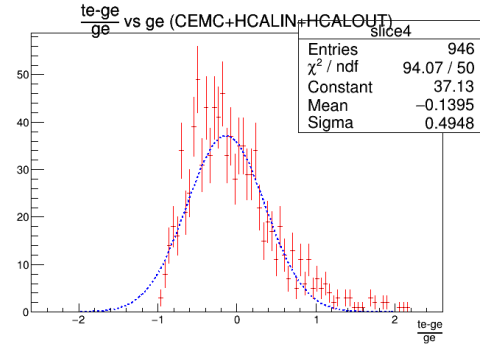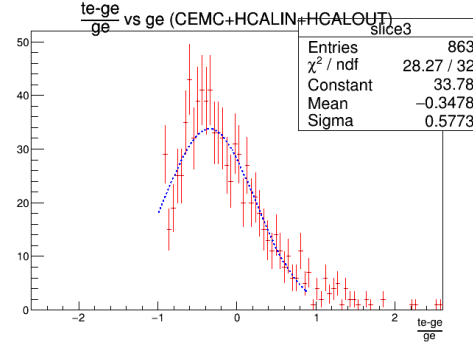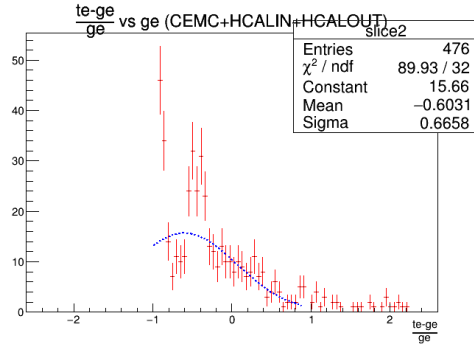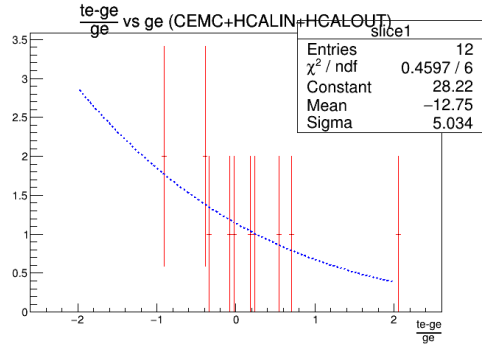
First four bins combined into one bin:

4

CEMC+HCALIN+HCALOUT: Gaussian fits
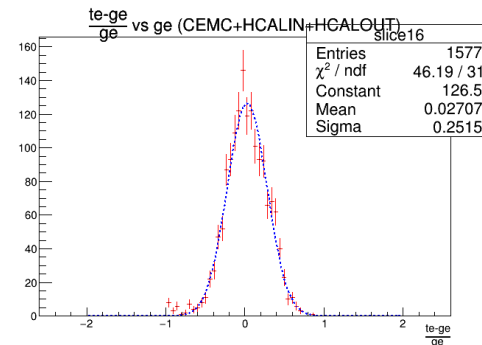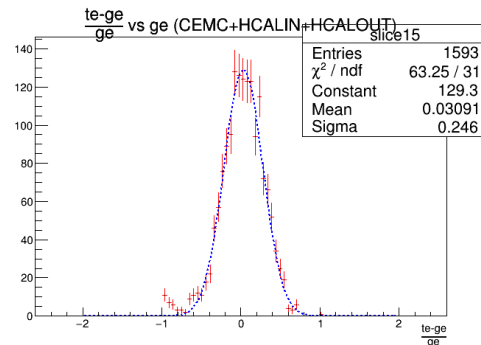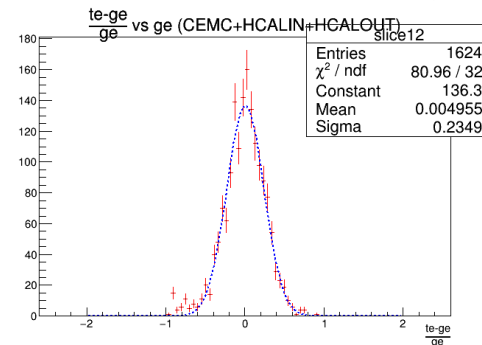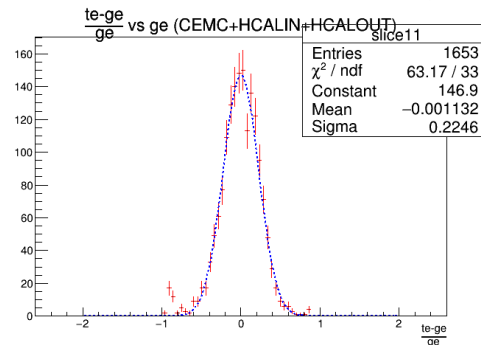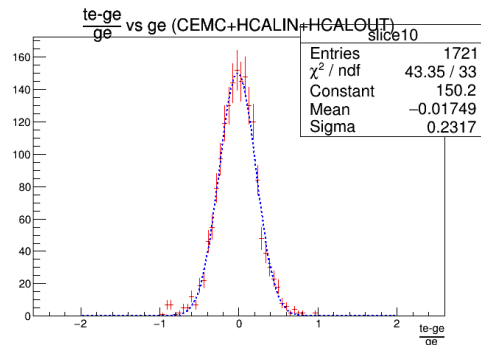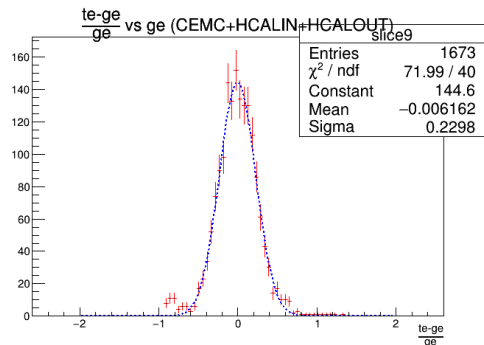
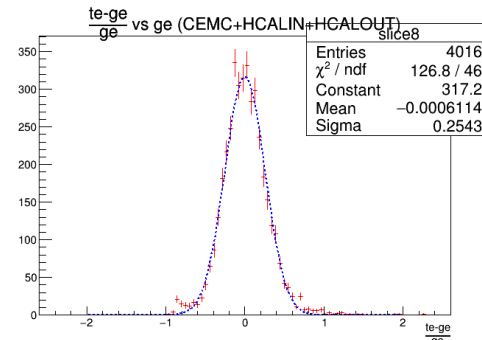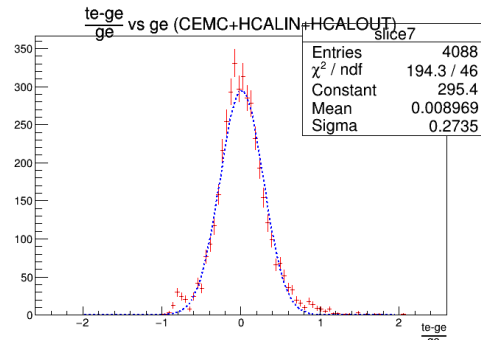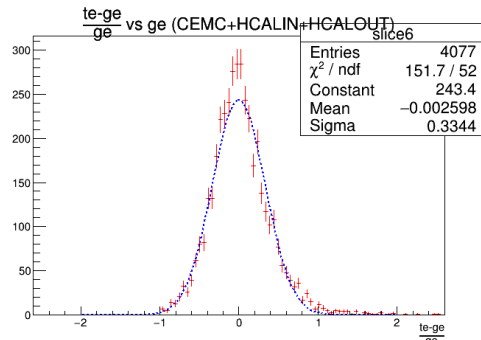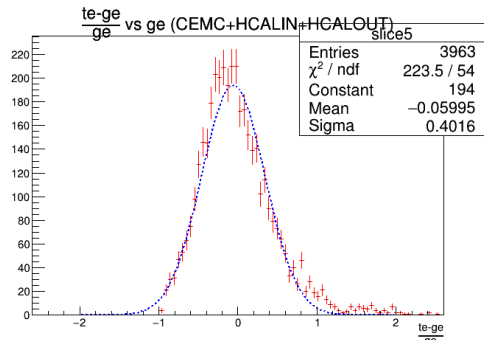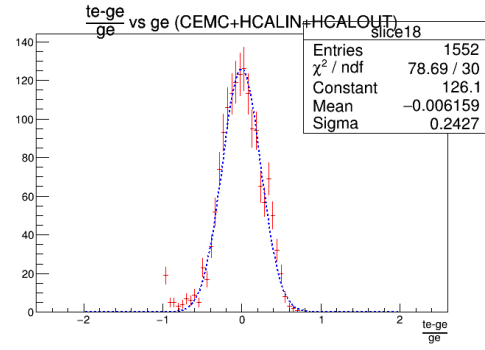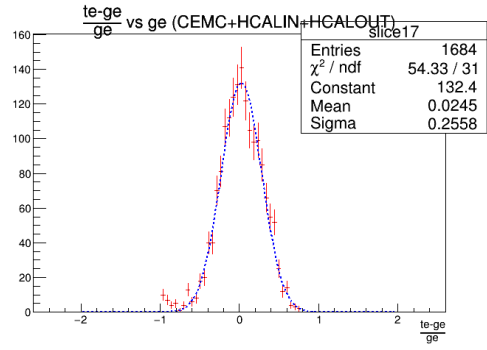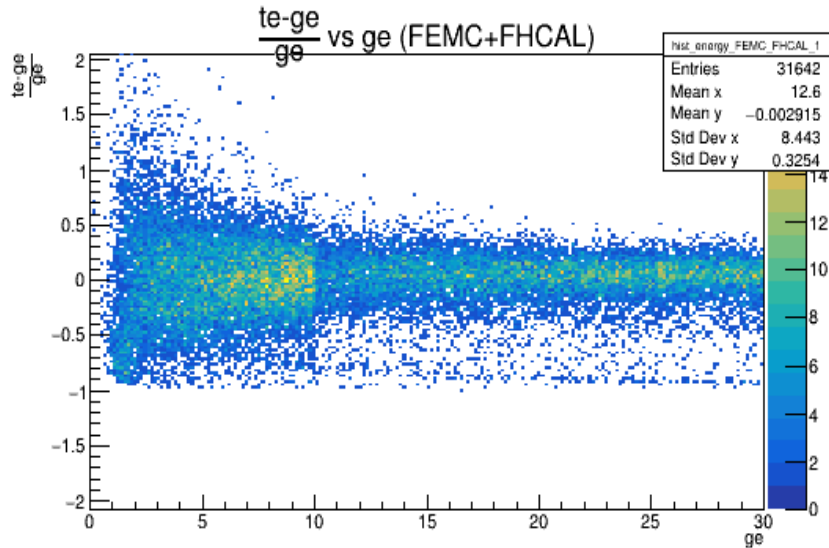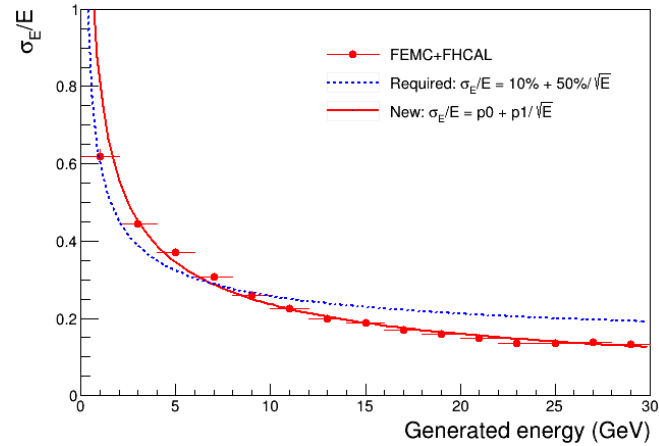# CEMC+HCALIN+HCALOUT: gaussian fits

Forward Resolution (FEMC+FHCAL)

$\frac{te\text{-}ge}{ge}$ vs ge (FEMC+FHCAL)

hist_energy_FEMC_FHCAL_1	
Entries	31642
Mean x	12.6
Mean y	−0.002915
Std Dev x	8.443
Std Dev y	0.3254

0-2 GeV: 1 bin

σ_E/E vs ge (FEMC+FHCAL)

FEMC+FHCAL

Required: $\sigma_E/E = 10\% + 50\%/\sqrt{E}$

New: $\sigma_E/E = p0 + p1/\sqrt{E}$

$\sigma_E/E = -2.64\% + 83.05\%/\sqrt{E}$

0-2 GeV: 4 bins (500MeV each)

σ_E/E vs ge (FEMC+FHCAL)

FEMC+FHCAL

Required: $\sigma_E/E = 10\% + 50\%/\sqrt{E}$

New: $\sigma_E/E = p0 + p1/\sqrt{E}$

$\sigma_E/E = -4.15\% + 89.1\%/\sqrt{E}$

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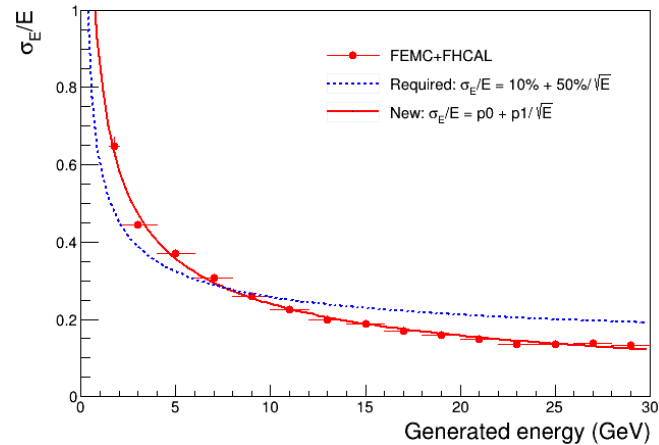
FEMC+FHCAL: Gaussian fits

First four bins with fine binning:
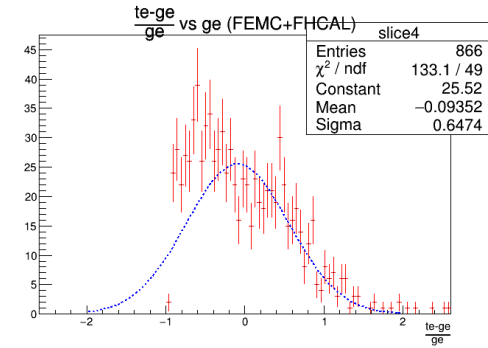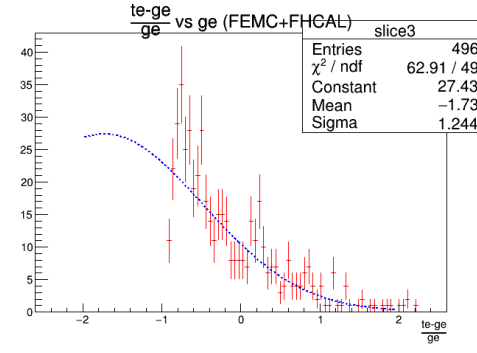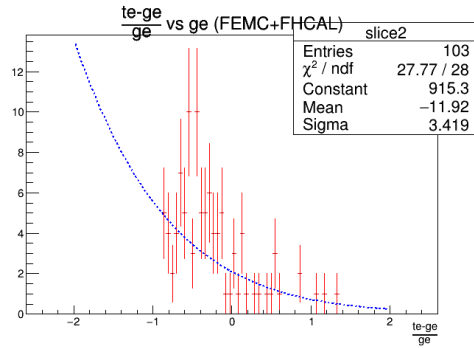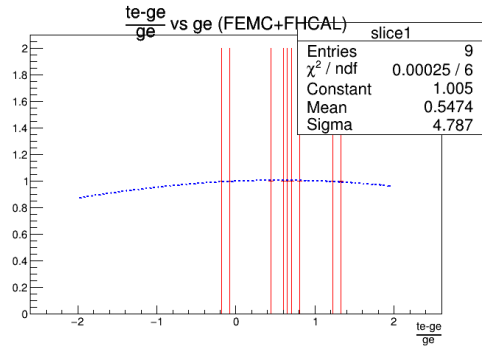
First three bins combined into one bin:
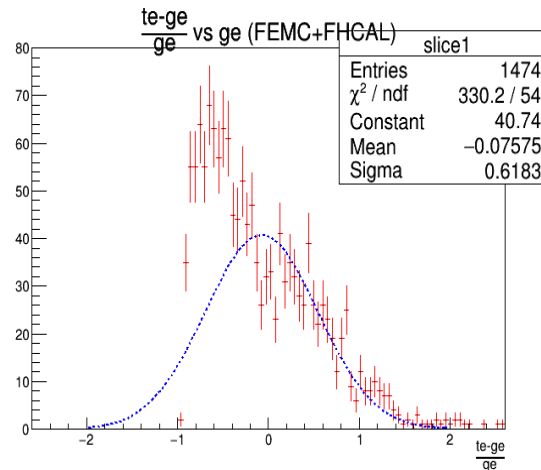
FEMC+FHCAL: Gaussian fits

	slice5
Entries	3667
χ^2 / ndf	159.3 / 52
Constant	164.9
Mean	0.003659
Sigma	0.445

	slice6
Entries	3647
χ^2 / ndf	76.29 / 49
Constant	200.9
Mean	−0.01432
Sigma	0.3701

	slice7
Entries	3793
χ^2 / ndf	70.42 / 41
Constant	250.9
Mean	−0.009542
Sigma	0.3081

	slice8
Entries	3794
χ^2 / ndf	90.07 / 37
Constant	296
Mean	0.002887
Sigma	0.2596

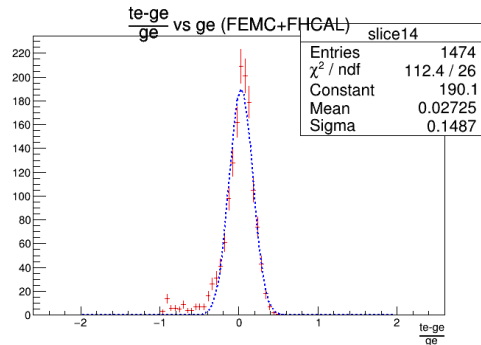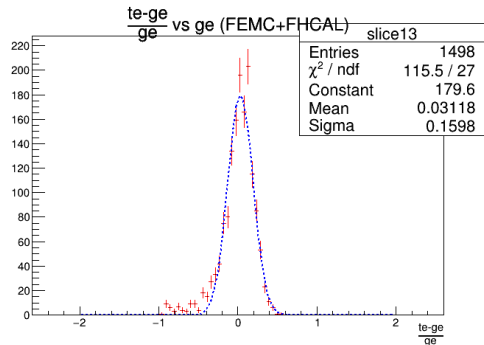|	slice9
Entries	1468
χ^2 / ndf	70.24 / 31
Constant	129.4
Mean	0.02627
Sigma	0.2241

	slice10
Entries	1508
χ^2 / ndf	81.29 / 30
Constant	148.1
Mean	0.03269
Sigma	0.2

	slice11
Entries	1537
χ^2 / ndf	95.35 / 31
Constant	158.7
Mean	0.04499
Sigma	0.1884

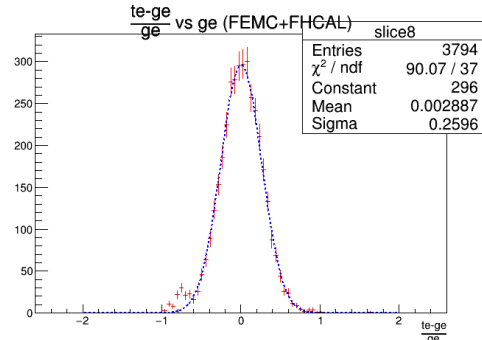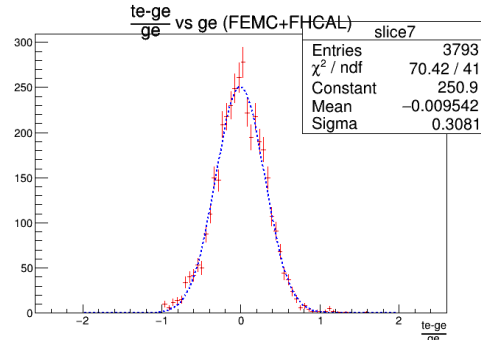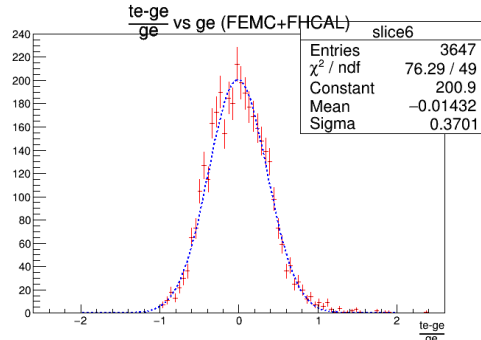|	slice12
Entries	1571
χ^2 / ndf	117.8 / 30
Constant	178.8
Mean	0.02593
Sigma	0.1686

	slice13
Entries	1498
χ^2 / ndf	115.5 / 27
Constant	179.6
Mean	0.03118
Sigma	0.1598

	slice14
Entries	1474
χ^2 / ndf	112.4 / 26
Constant	190.1
Mean	0.02725
Sigma	0.1487

	slice15
Entries	1577
χ^2 / ndf	119.8 / 26
Constant	223
Mean	0.03161
Sigma	0.1356

	slice16
Entries	1601
χ^2 / ndf	128.3 / 26
Constant	226
Mean	0.0232
Sigma	0.1352

FEMC+FHCAL: Gaussian fits

THANKS!