Fun4All Calorimeter Plots

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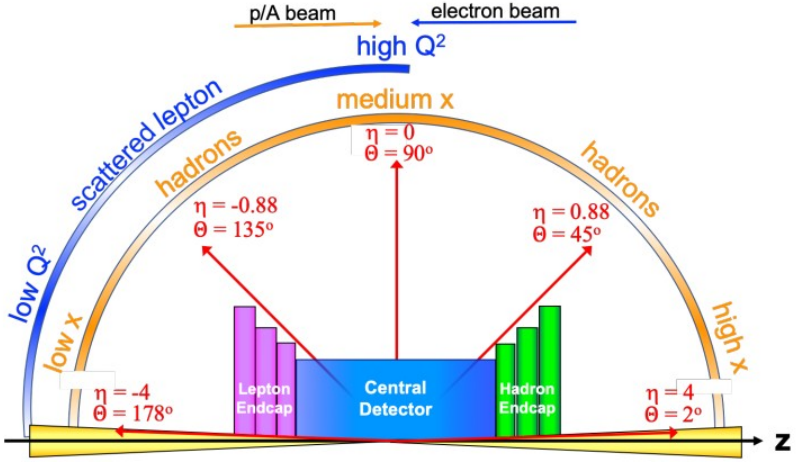
Details:

- Details for calorimeters:
  - EMCal: Material: Lead tungstate (PWO) crystals for η < − 2; For the other areas several options exist (Scintillating glass, Lead glass, etc.) depending on the geometrical constraints.
  - Hcal: Material: [Steel absorber (inner hcal) , Aluminium absorber (outer hcal)] + plastic scintillators
- Details for the slides:
  - Particles: e-, pi-, K-
  - Generated momentum (gp) range: 0-30GeV/c
  - Generated pseudorapidity (geta) range: -4 to 4
  - Generated phi (gphi) range: -pi to pi
  - Reconstructed energy cut on cluster energy (ce) and tower energy (te): 200 MeV
  - **Generated pseudorapidity (geta) cuts:**
    - **CEMC: -1.5 to 1.2**
    - **EEMC: -3.5 to -1.7**
    - **FEMC: 1.3 to 3.3**
    - **FHCAL: 1.2 to 3.5**
    - **HCALIN: -1.1 to 1.1**
    - **HCALOUT: -1.1 to 1.1**



A schematc showing how hadrons and the scattered lepton for different x-Q^2 are distributed over the detector rapidity coverage. Reference: EIC Yellow Report

(Reference: Electron-Ion Collider Detector Requirements and R&D Handbook Version 1.1)

Statistics:

Particle:	**Energy:**	**Statistics:**
Electron	0 – 10 GeV	100000
	0 – 30 GeV	100000
Pion	0 – 15 GeV	100000
	0 – 30 GeV	100000
Kaon	0 – 15 GeV	100000
	0 – 30 GeV	100000

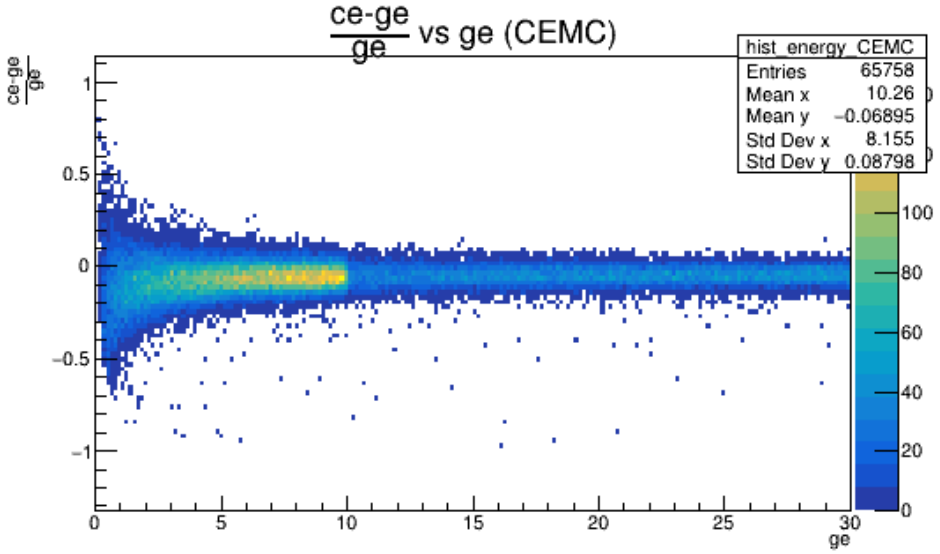
Electron

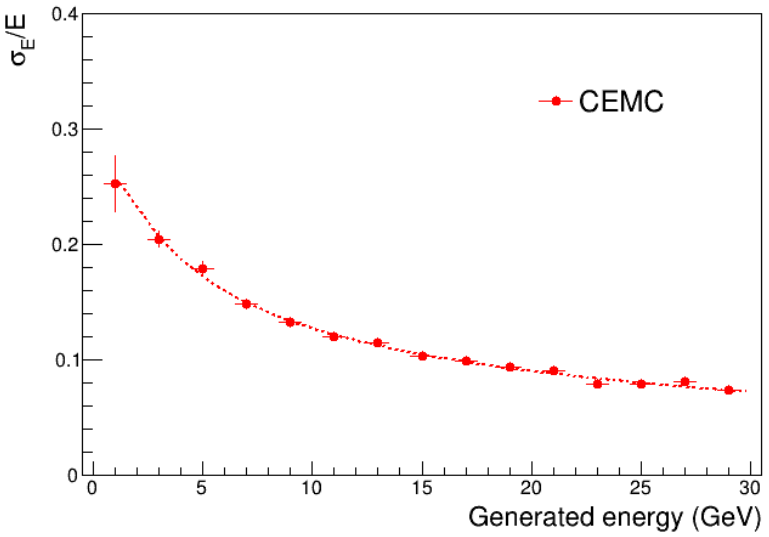
te : tower energy

ce: cluster energy

ge: generated energy

Electron – Energy resolution (CEMC) (η = -1.5 to 1.2)





Expected:

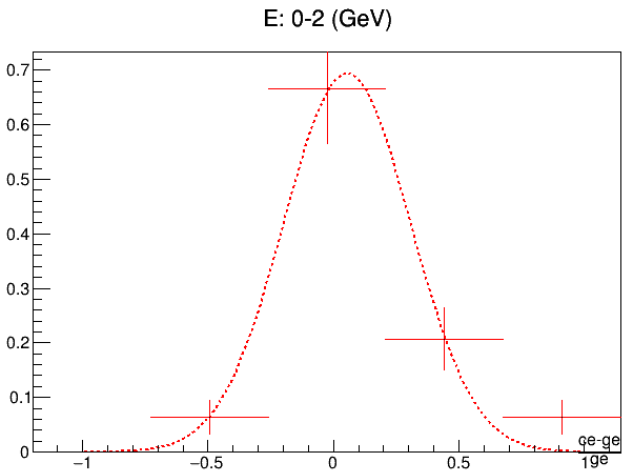
$\sigma_E/E = 2\%/E \oplus (12\text{-}14)\%/\sqrt{E} \oplus (2\text{-}3)\%$

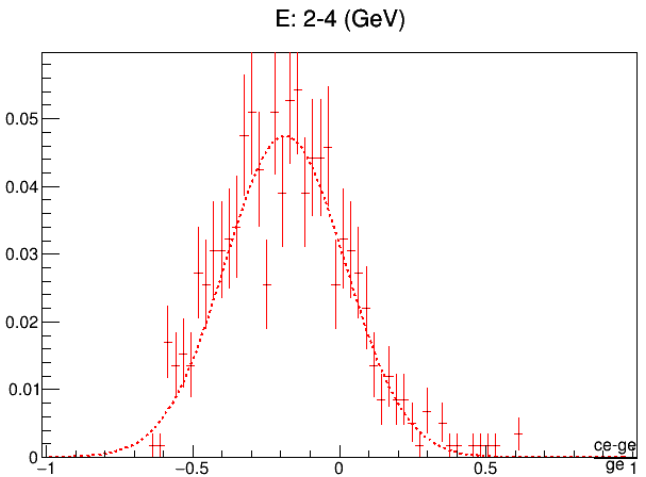
y=[0] + [1] / sqrt(x) + [2] / x

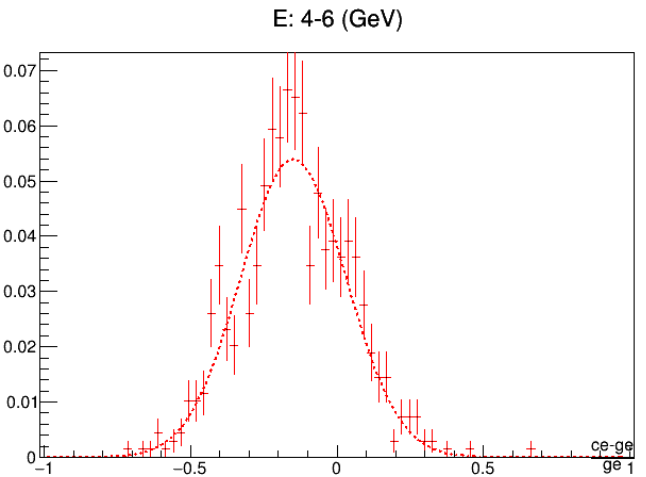
[0]: -0.0197721 (2%)
[1]: 0.554427 (55%)
[2]: -0.280474 (28%)

$\sigma_E/E = 28\%/E + 55\%/\sqrt{E} + 2\%$

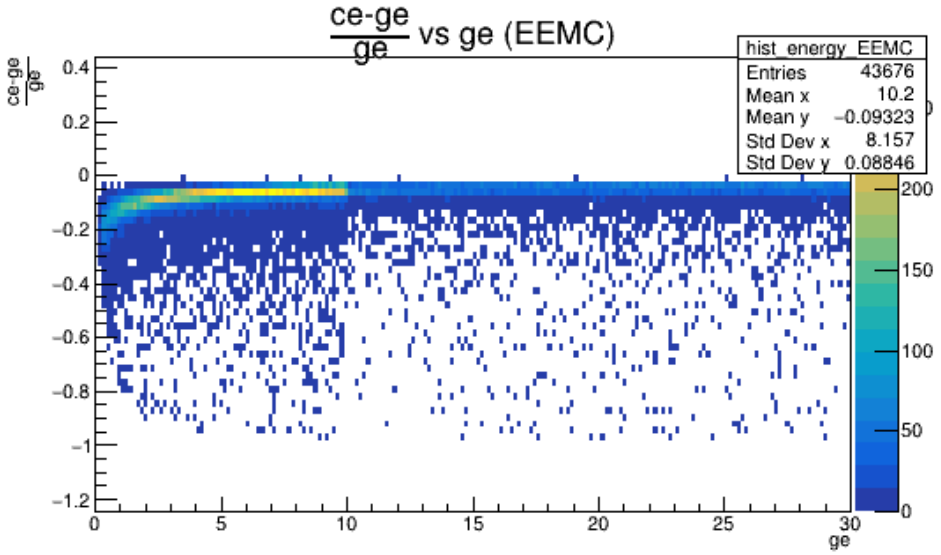
Electron – Energy resolution (CEMC) – Gaussian Fits

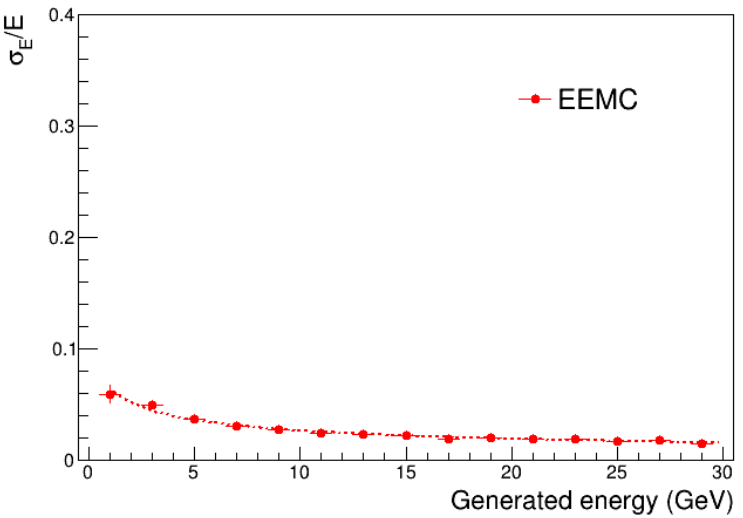






Electron – Energy resolution (EEMC)(η = -3.5 to -1.7)





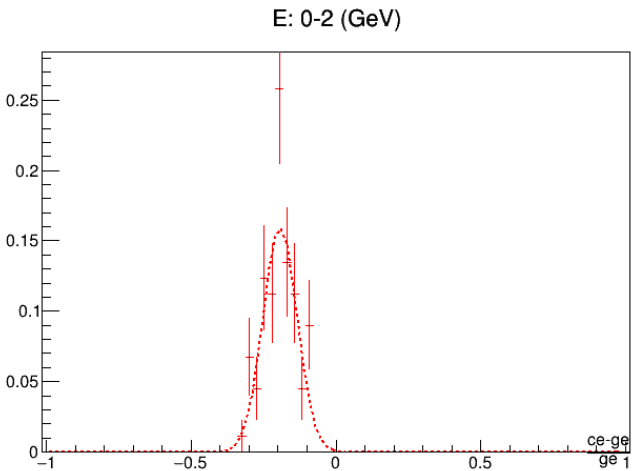
Expected:
$\sigma_E/E = 1\%/E \oplus 2.5\%/\sqrt{E} \oplus 1\%$

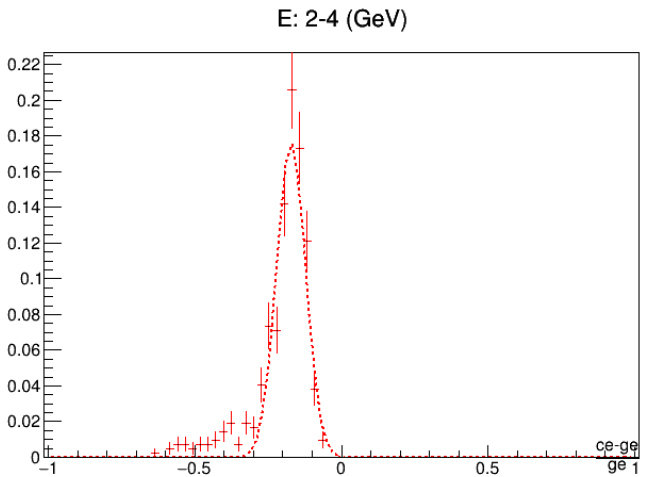
y=[0] + [1] / sqrt(x) + [2] / x

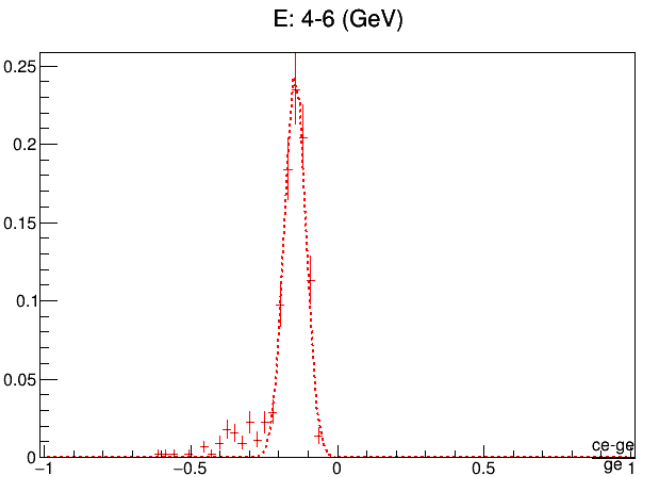
[0]: -0.000854542(0.1%)
[1]: 0.0960975 (10%)
[2]: -0.0301715 (3%)

$\sigma_E/E = 3\%/E + 10\%/\sqrt{E} + 0.1\%$

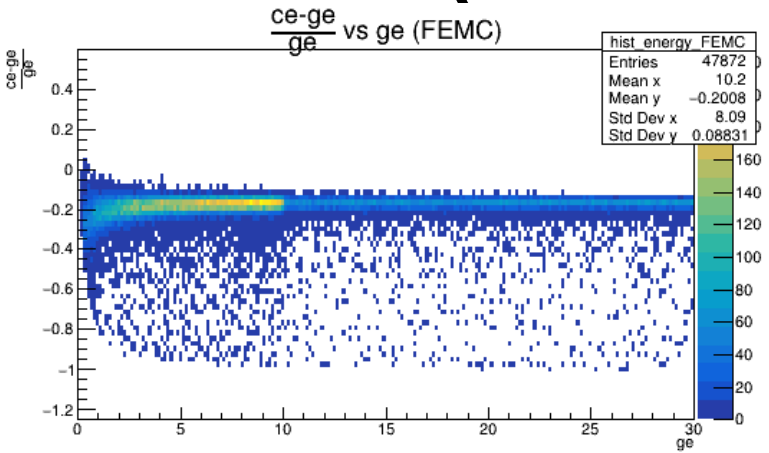
Electron – Energy resolution (EEMC) – Gaussian Fits

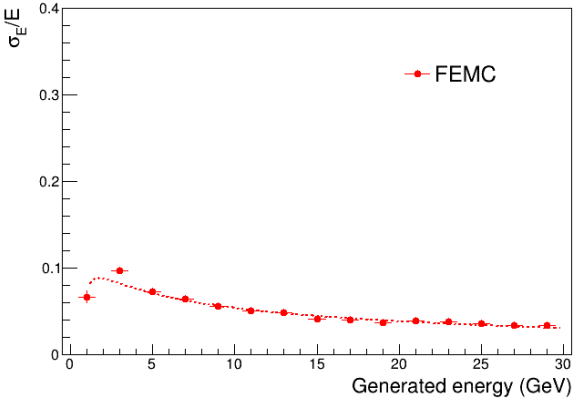


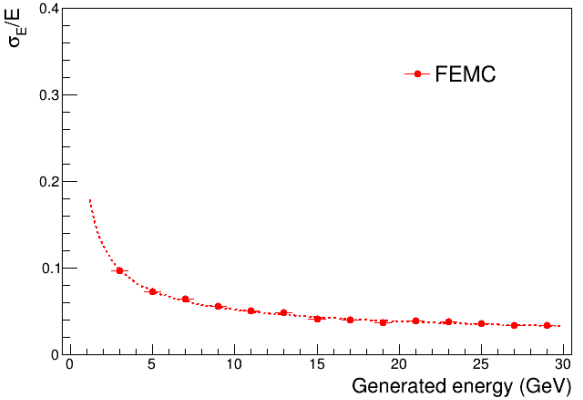




Electron – Energy resolution (FEMC)(η = 1.3 to 3.3)







Expected:

$\sigma_E/E = 2\%/E \oplus (4*\text{-}12)\%/\sqrt{E} \oplus 2\%$

y=[0] + [1] / sqrt(x) + [2] / x

[0]: -0.018808(2%)
[1]: 0.263326 (26%)
[2]: -0.173641 (17%)

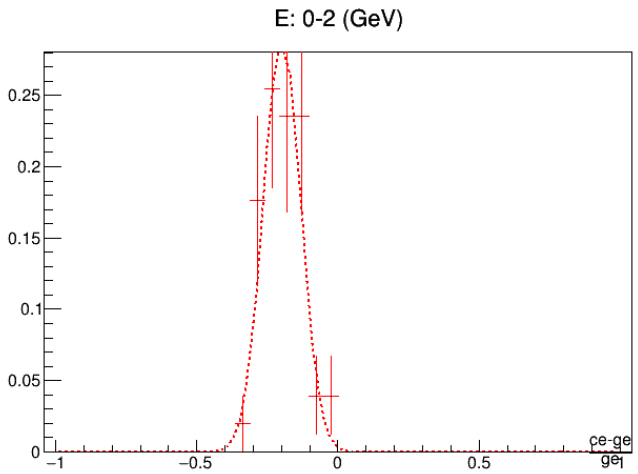
$\sigma_E/E = 17\%/E + 26\%/\sqrt{E} + 2\%$

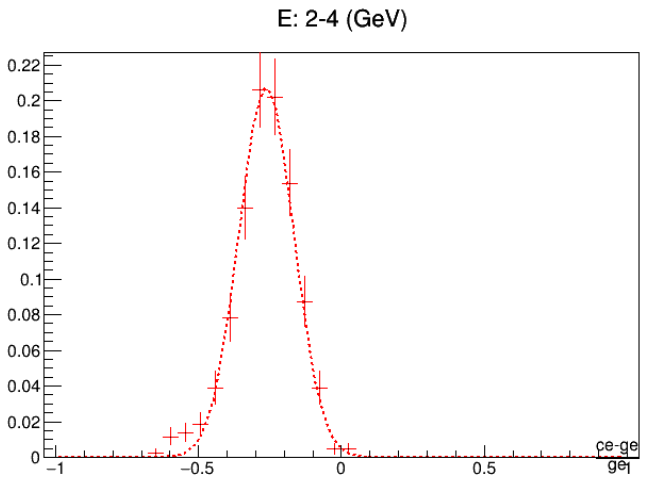
y=[0] + [1] / sqrt(x) + [2] / x

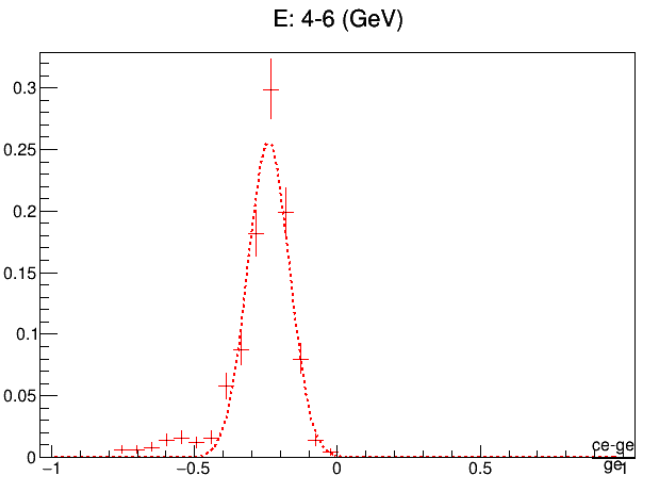
[0]: 0.0109607(1%)
[1]: 0.103019(10%)
[2]: 0.0822036 (8%)

$\sigma_E/E = 8\%/E + 10\%/\sqrt{E} + 1\%$

Electron – Energy resolution (FEMC) – Gaussian Fits

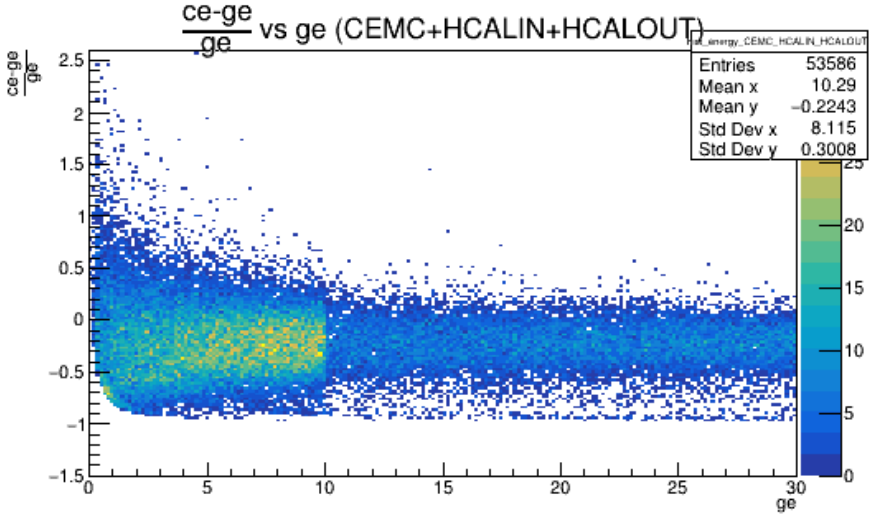


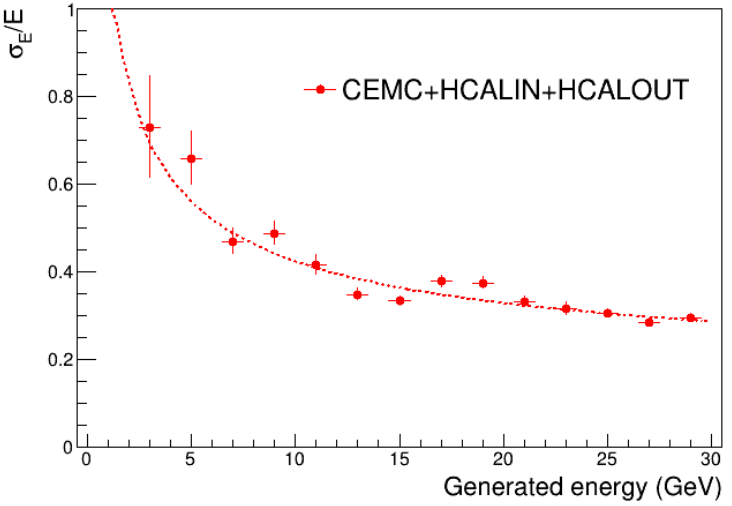




Pion

Pion – Energy resolution (CEMC+HCALIN+HCALOUT)(η = -1.1 to 1.1)





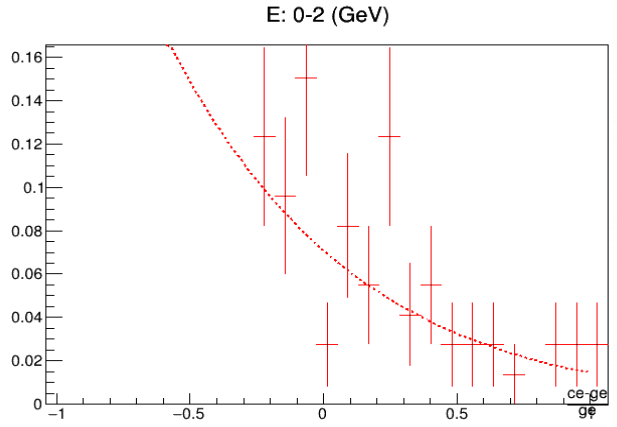
Expected:
σ_E/E = 100% / sqrt(E) + 10%

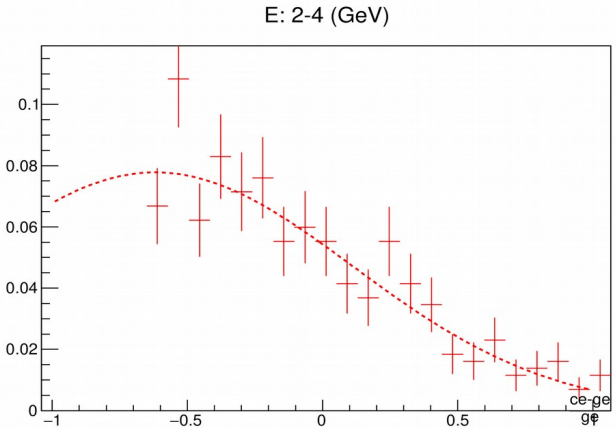
y=[0] + [1] / sqrt(x)

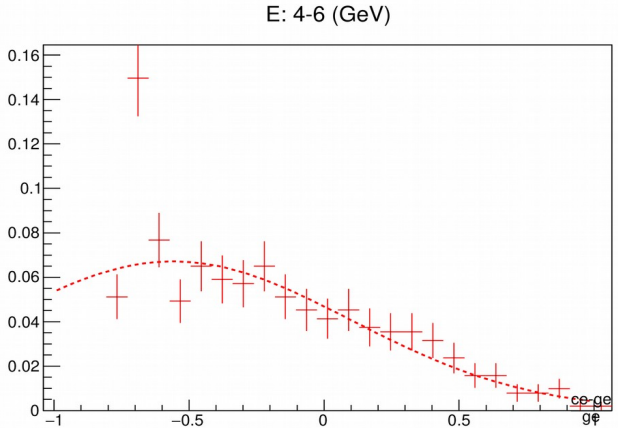
[0]: 0.0979300(10%)
[1]: 1.032185 (103%)

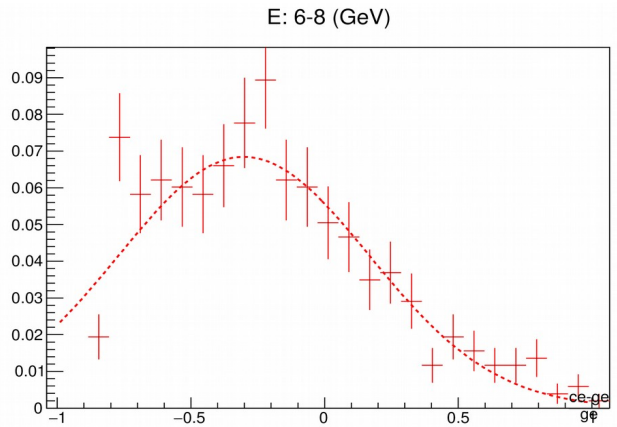
σ_E/E = 103% / sqrt(E) + 10%

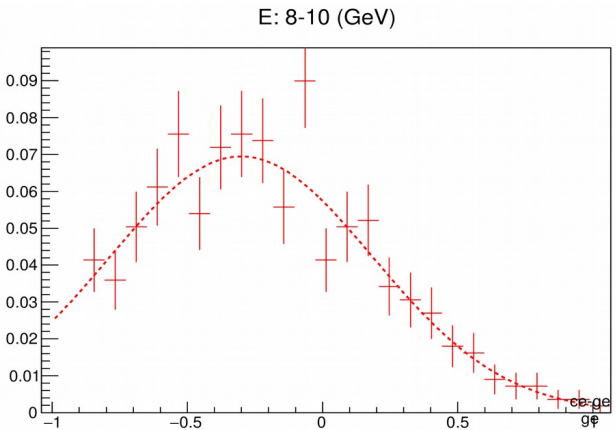
Pion – Energy resolution (CEMC+HCALIN+HCALOUT) – Gaussian Fits

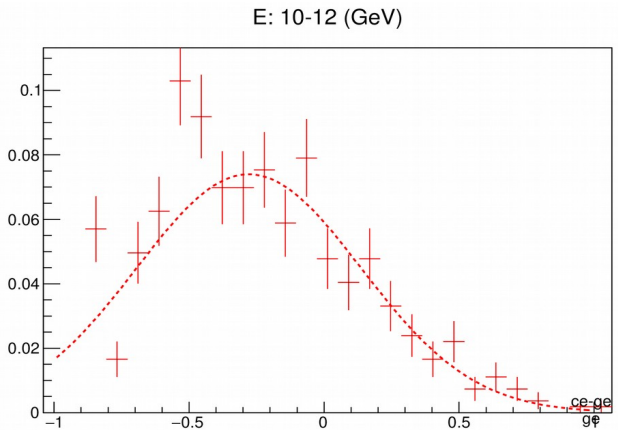




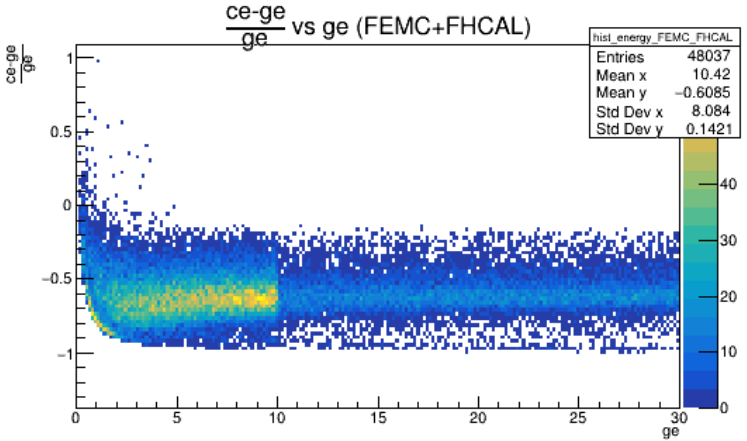


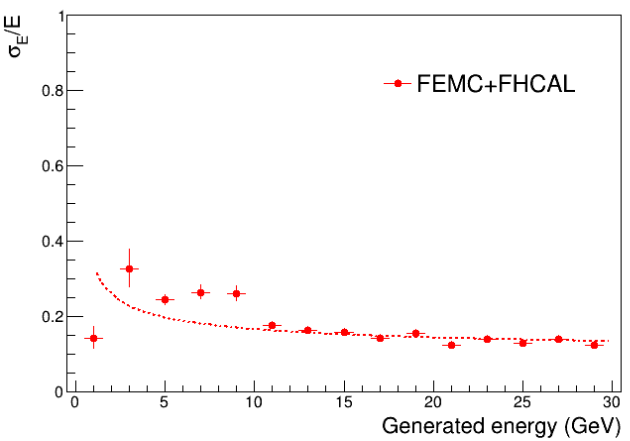


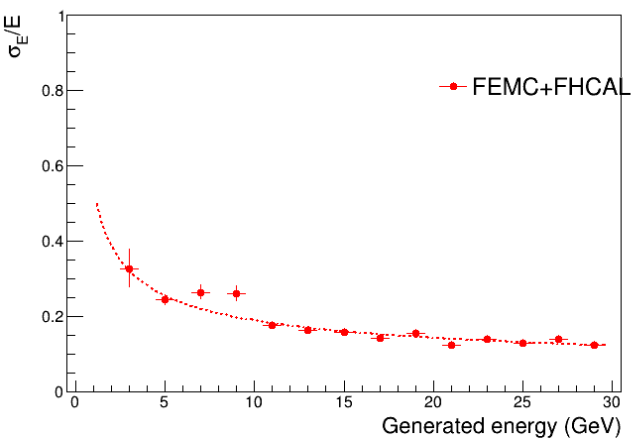




Pion – Energy resolution (FEMC+FHCAL)(η=1.3 to 3.3)







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

y=[0] + [1] / sqrt(x)

[0]: 0.0900319(9%)
[1]: 0.240391(24%)

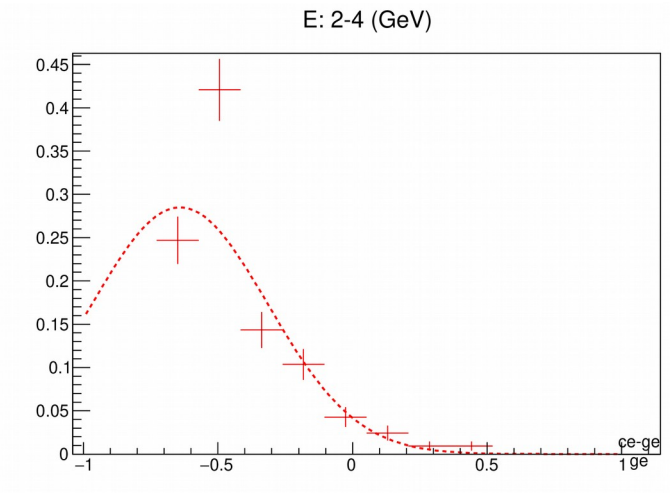
$\sigma_E/E = 24\% / \sqrt{E} + 9\%$

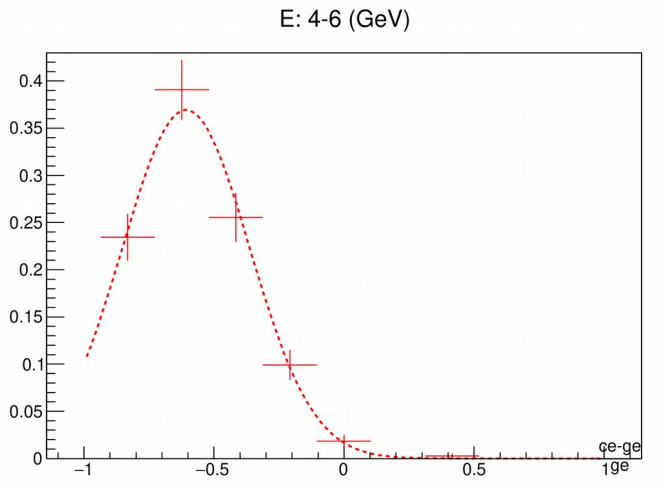
y=[0] + [1] / sqrt(x)

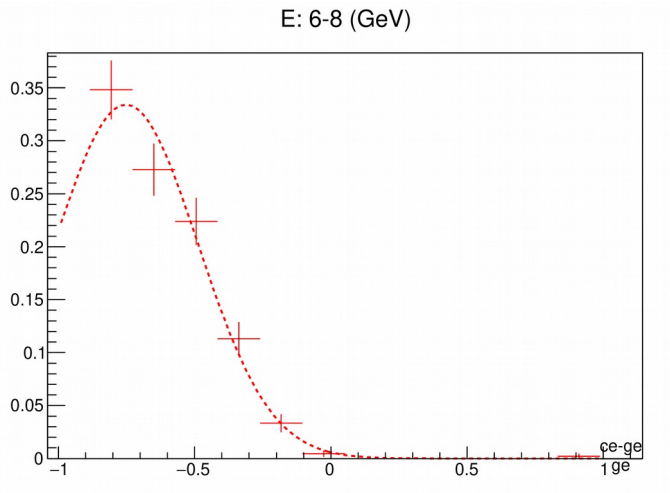
[0]: 0.0307430(3%)
[1]: 0.502210(50%)

$\sigma_E/E = 50\% / \sqrt{E} + 3\%$

Pion – Energy resolution (FEMC+FHCAL) – Gaussian Fits

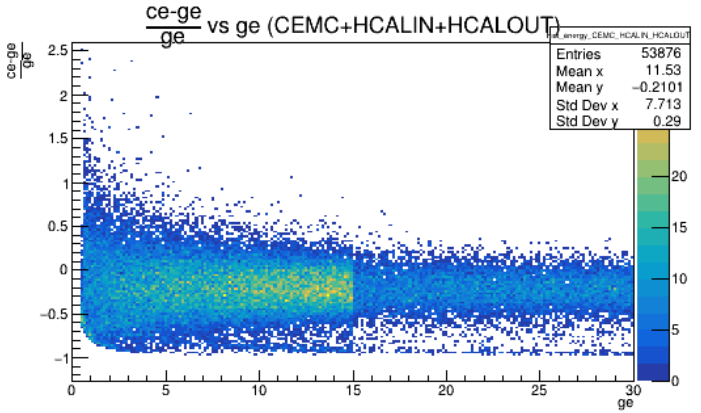


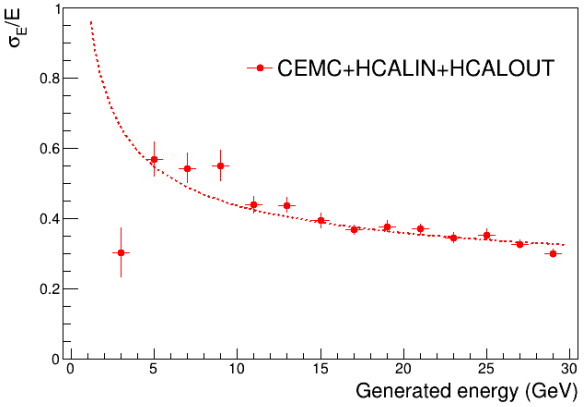


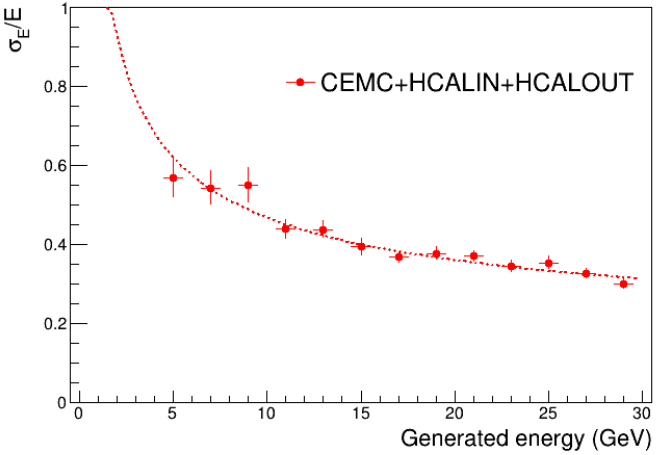


Kaon

Kaon – Energy resolution (CEMC+HCALIN+HCALOUT)(η = -1.1 to 1.1)







Expected:
σ_E/E = 100% / sqrt(E) + 10%

y=[0] + [1] / sqrt(x)

[0]: 0.170014(17%)
[1]: 0.844608(84%)

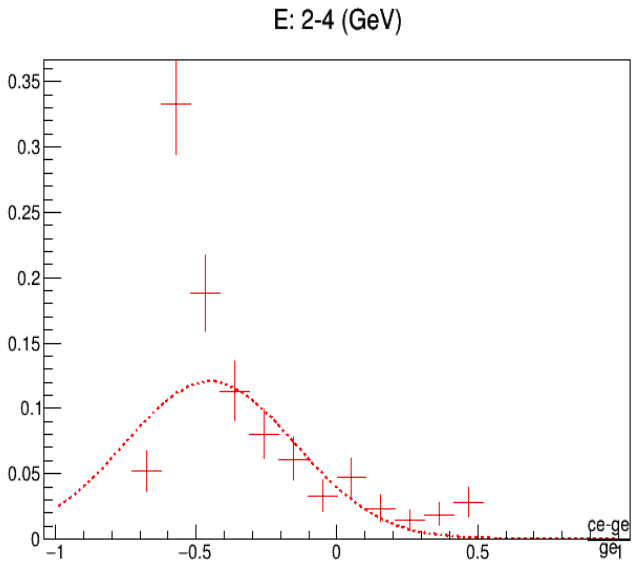
σ_E/E = 84% / sqrt(E) + 17%

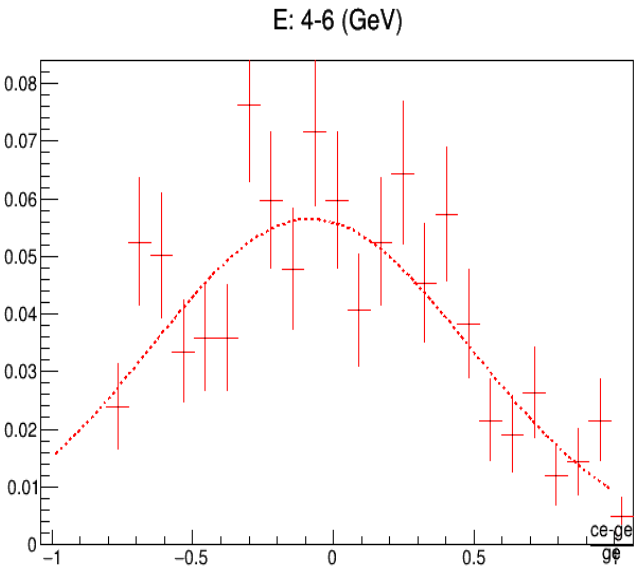
y=[0] + [1] / sqrt(x)

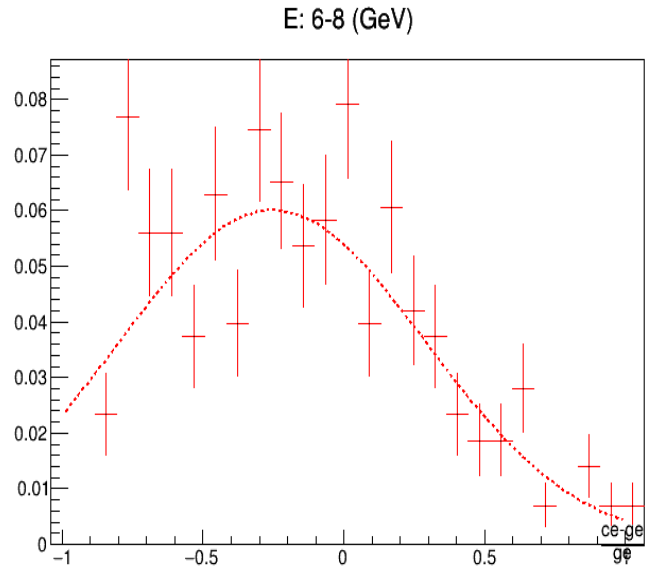
[0]: 0.101328(10%)
[1]: 1.15945(115%)

σ_E/E = 115% / sqrt(E) + 10%

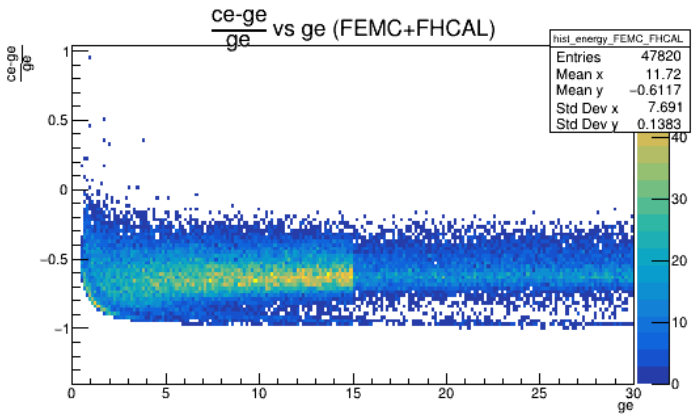
Kaon – Energy resolution (CEMC+HCALIN+HCALOUT) – Gaussian Fits

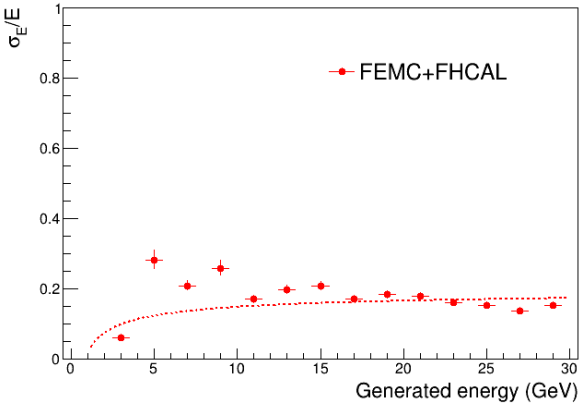


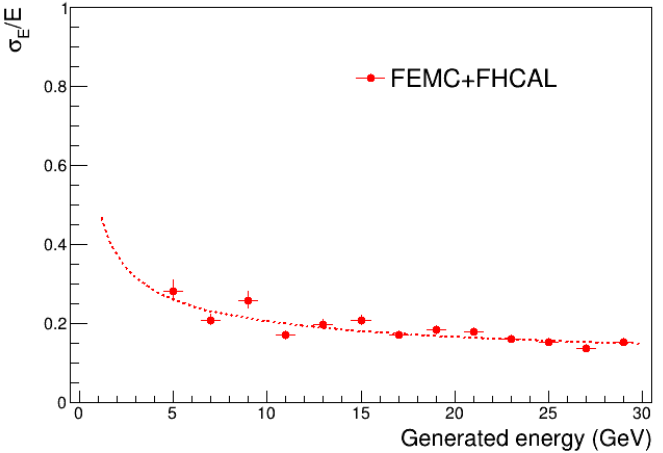




Kaon – Energy resolution (FEMC+FHCAL)(η=1.3 to 3.3)







Expected:
σ_E/E = 50% / sqrt(E) + 10%

y=[0] + [1] / sqrt(x)

[0]: 0.207324(21%)
[1]: -0.186596(19%)

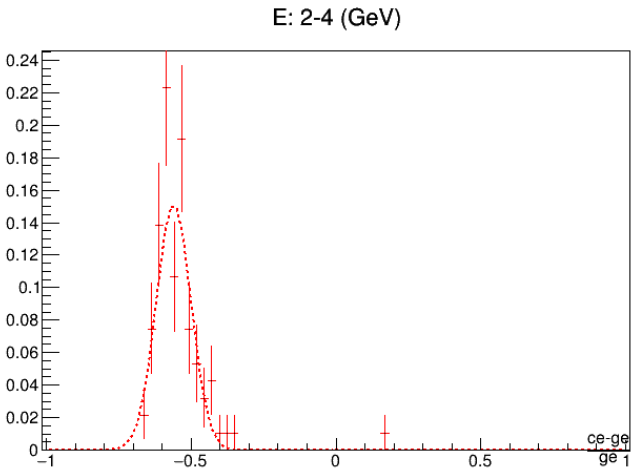
σ_E/E = 19% / sqrt(E) + 21%

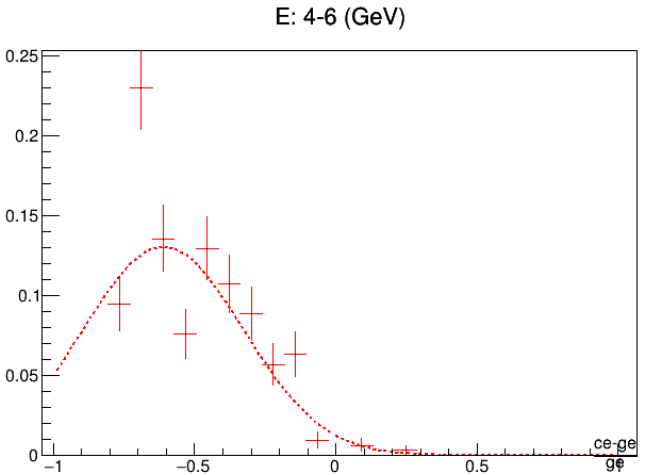
y=[0] + [1] / sqrt(x)

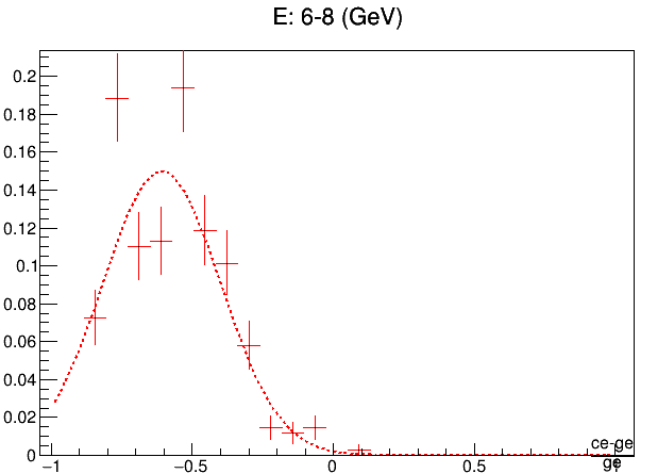
[0]: 0.0705173(7%)
[1]: 0.425355(43%)

σ_E/E = 43% / sqrt(E) + 7%

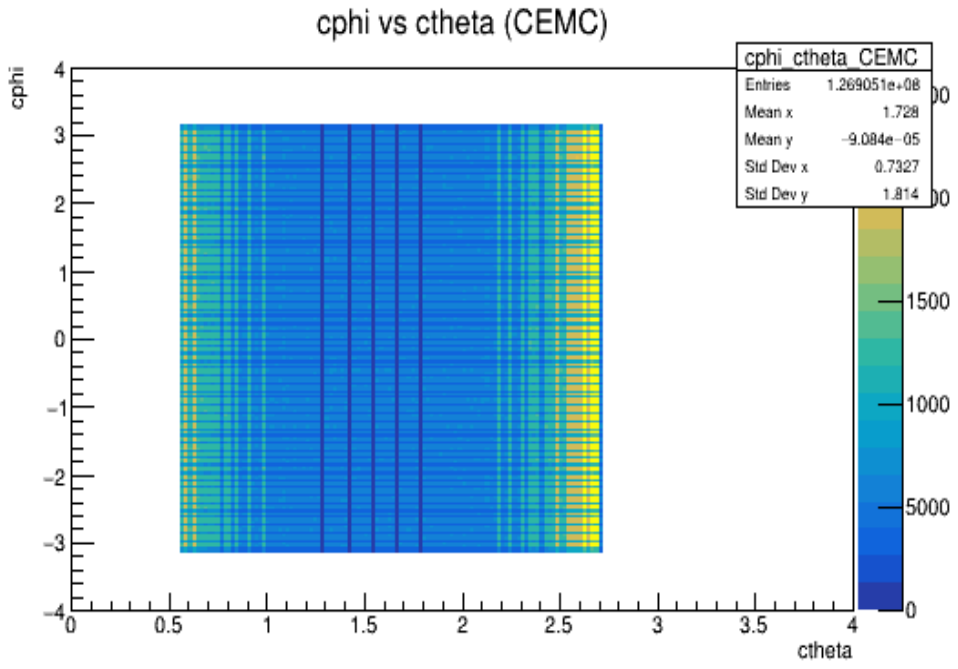
Kaon – Energy resolution (FEMC+FHCAL) – Gaussian Fits

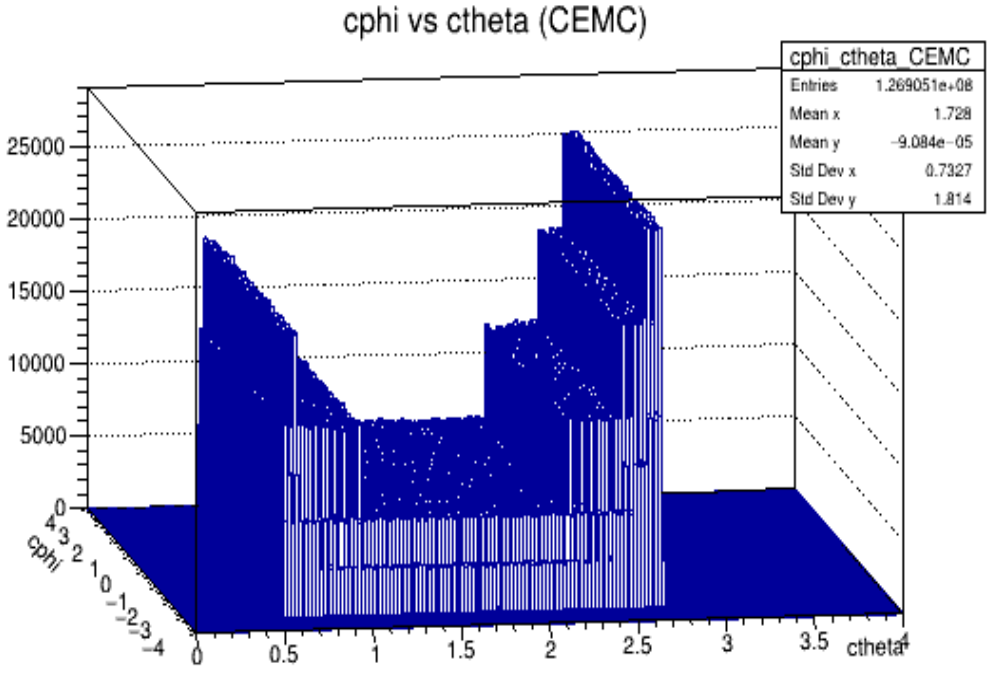




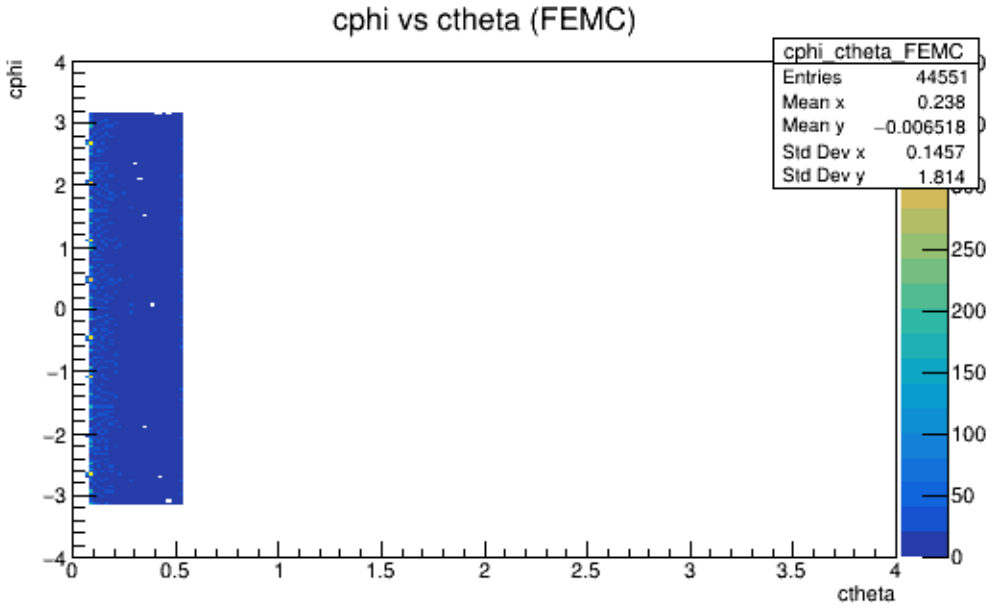


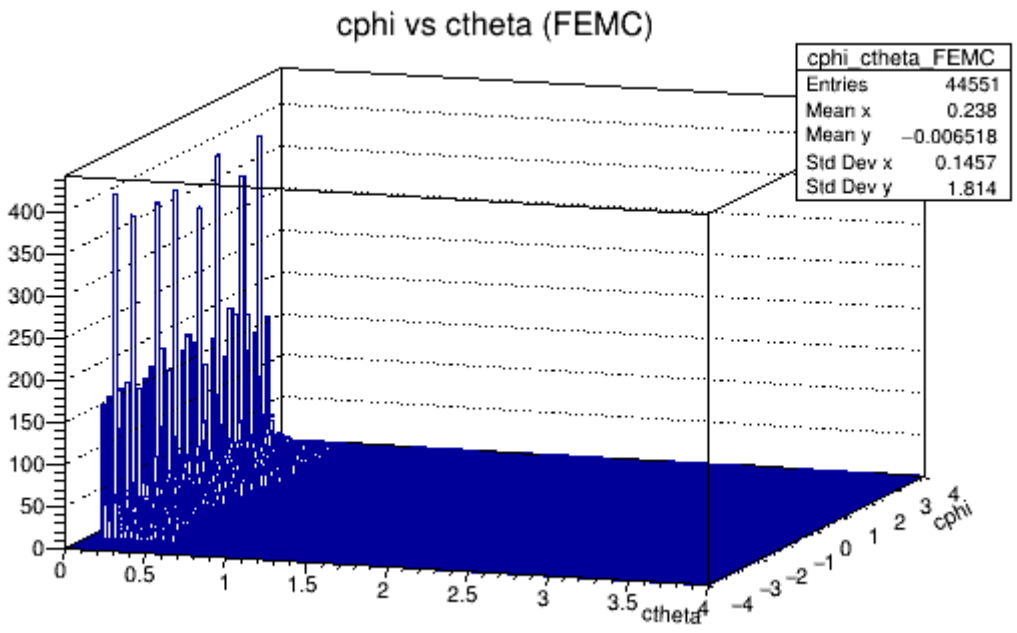
Theta vs phi plots (Electron)



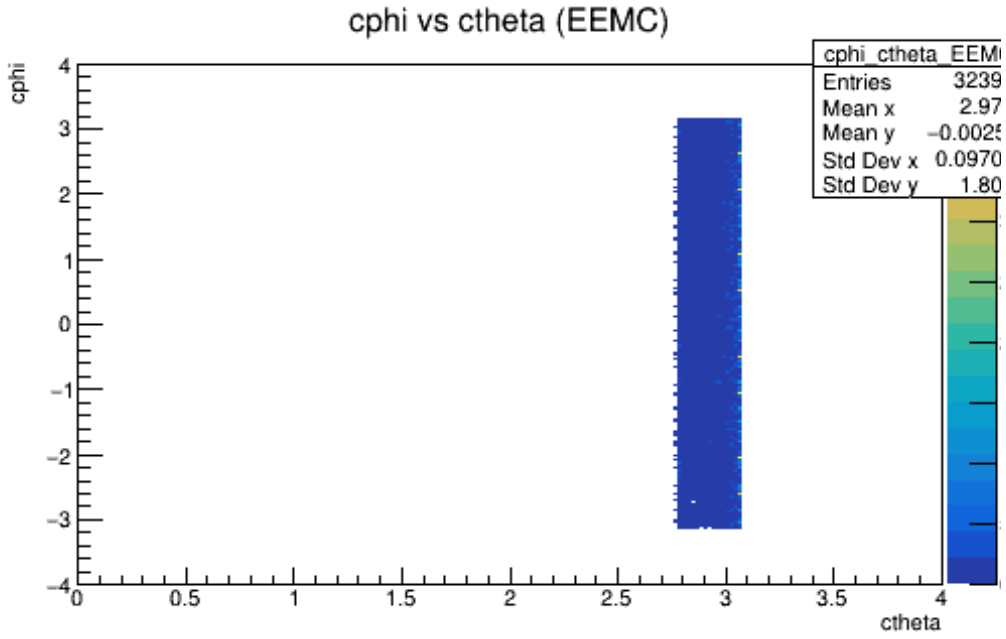


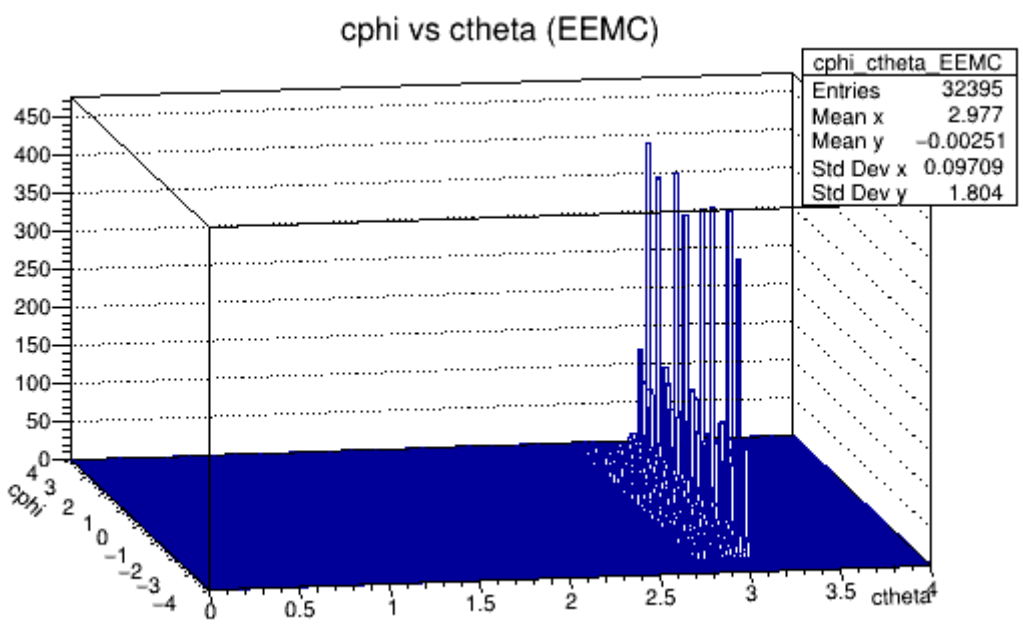
Theta vs phi plots (Electron)



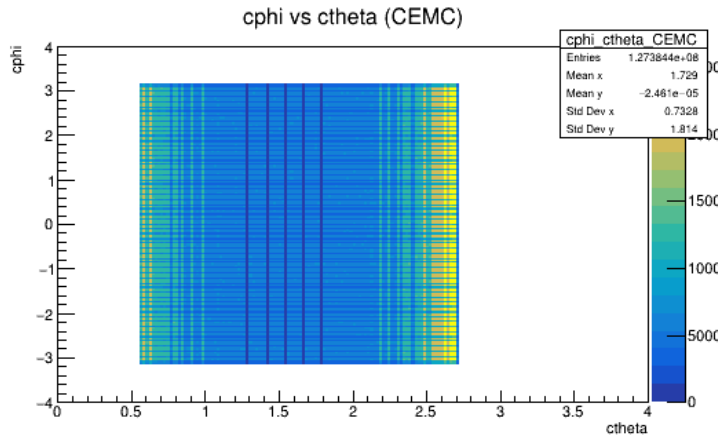


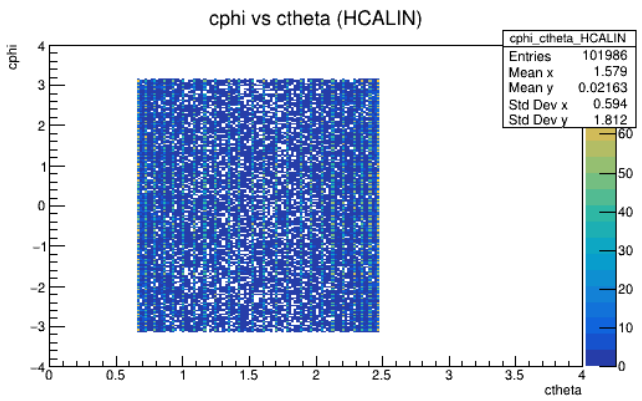
Theta vs phi plots (Electron)

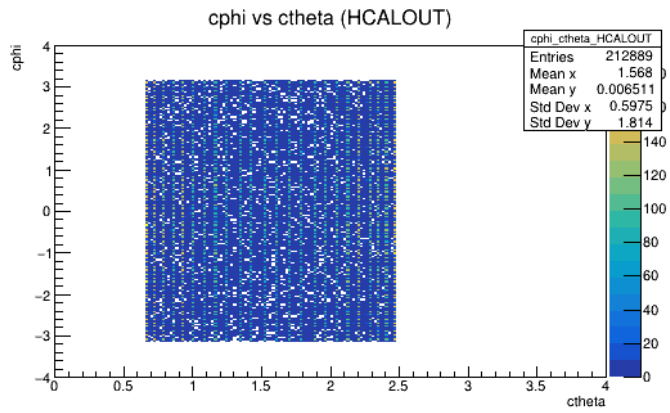


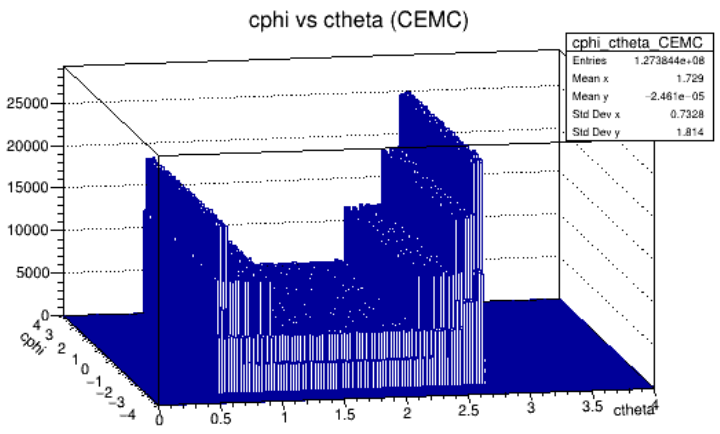


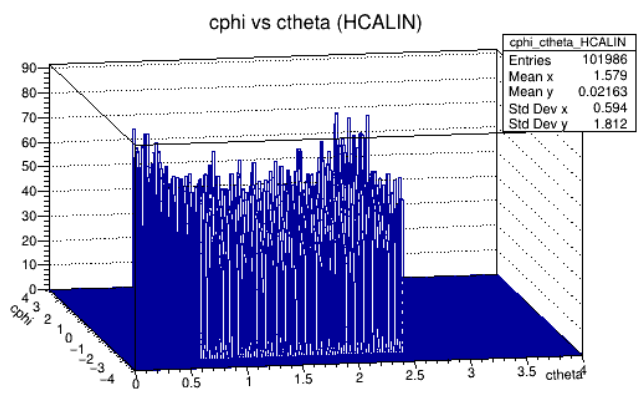
Theta vs phi plots (Pion)

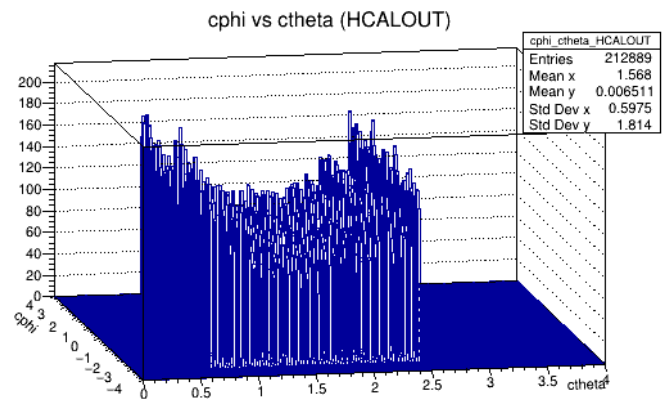




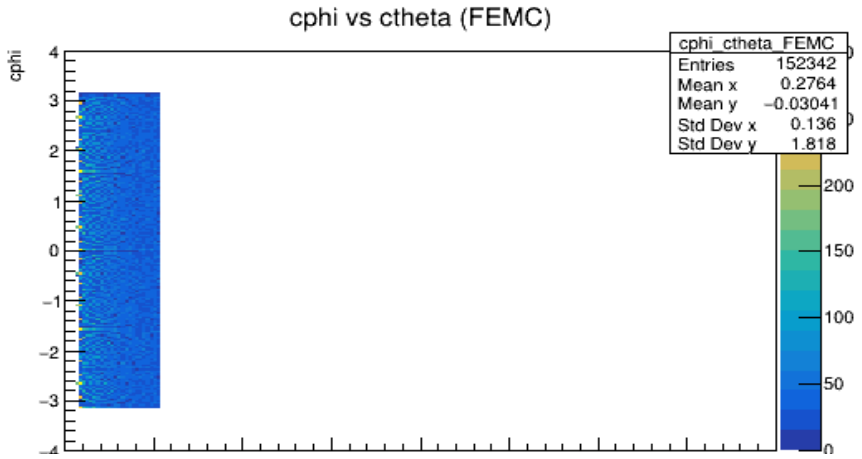


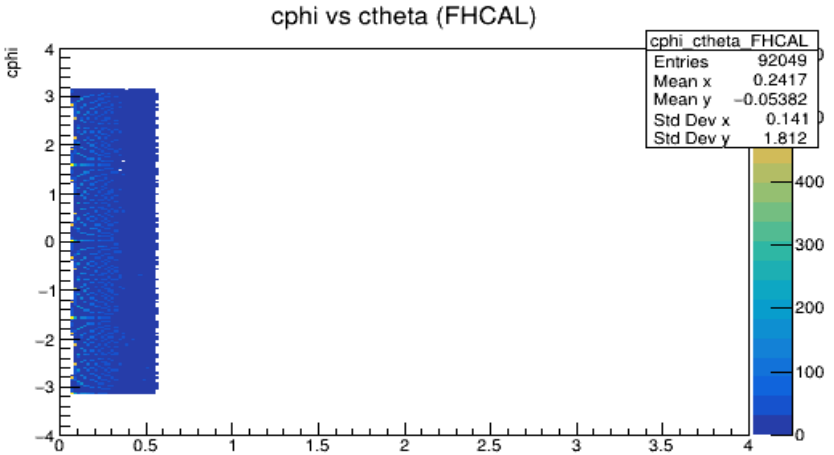


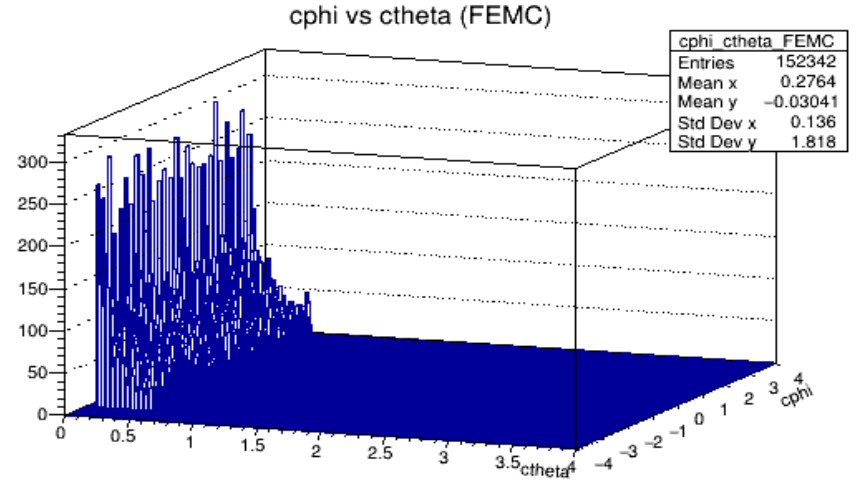


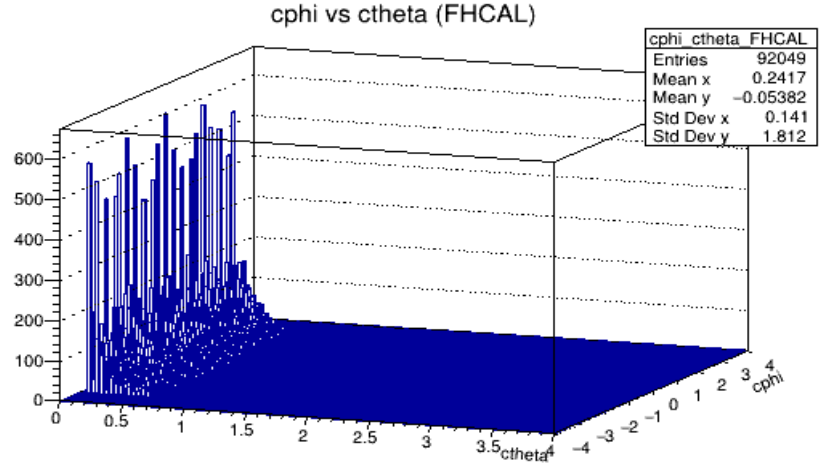


Theta vs phi plots (Pion)

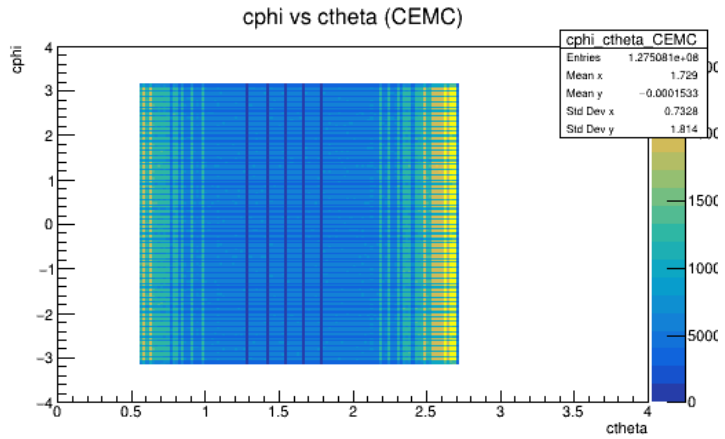


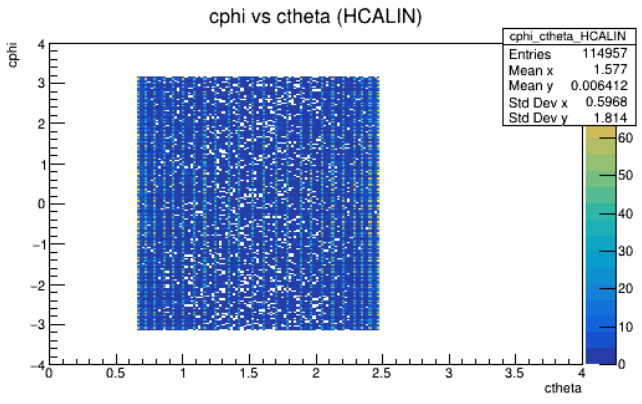


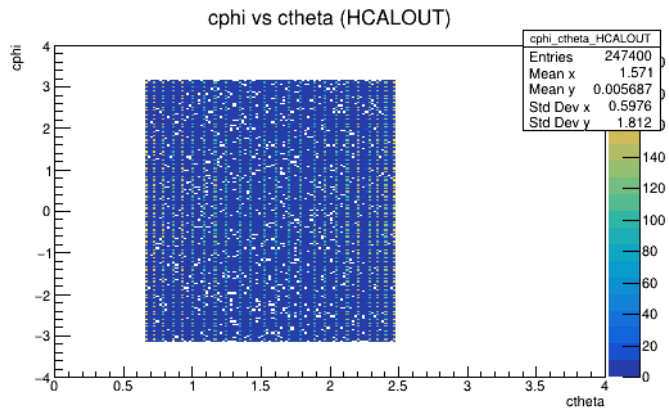


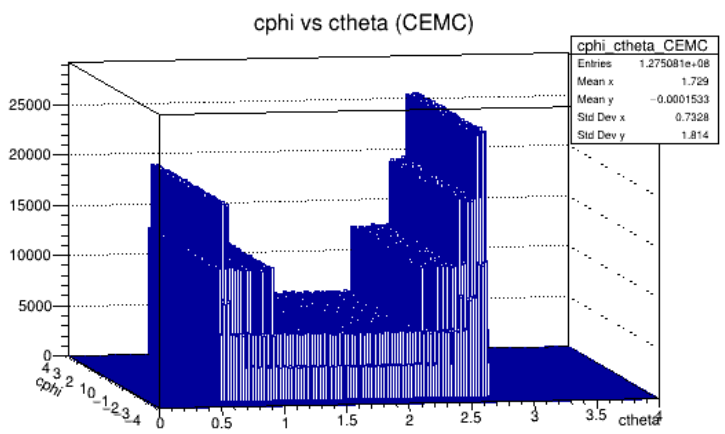


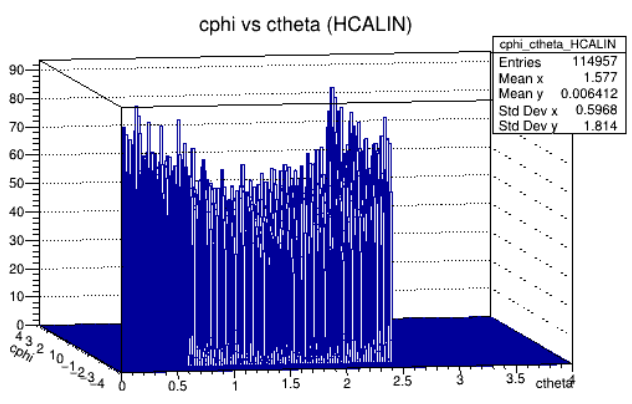
Theta vs phi plots (Kaon)

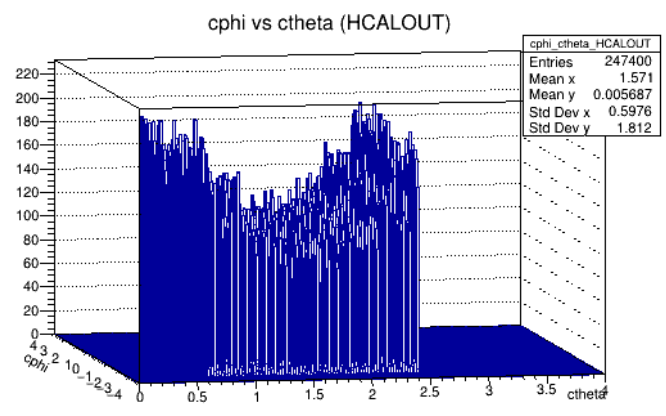




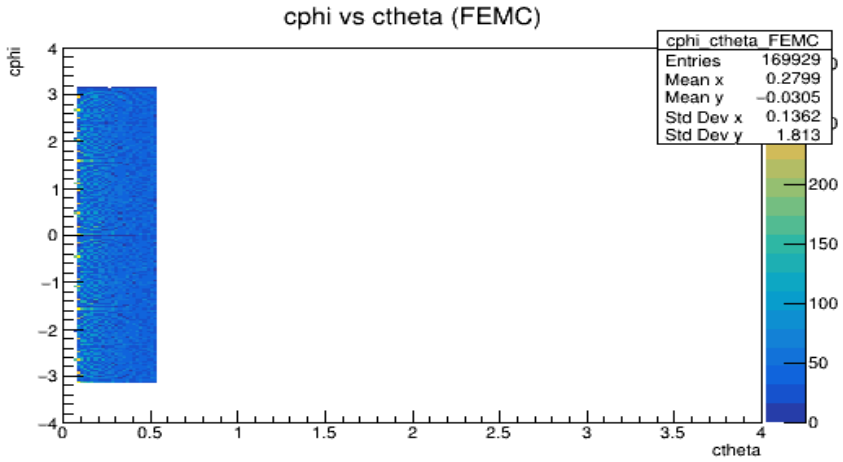


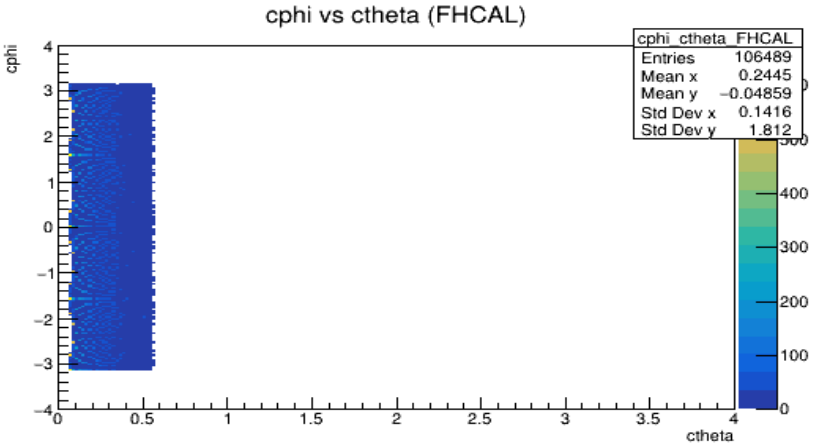


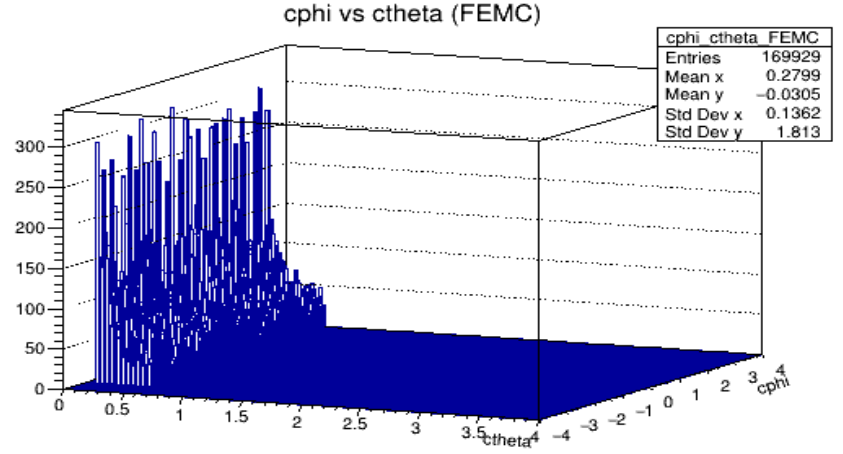


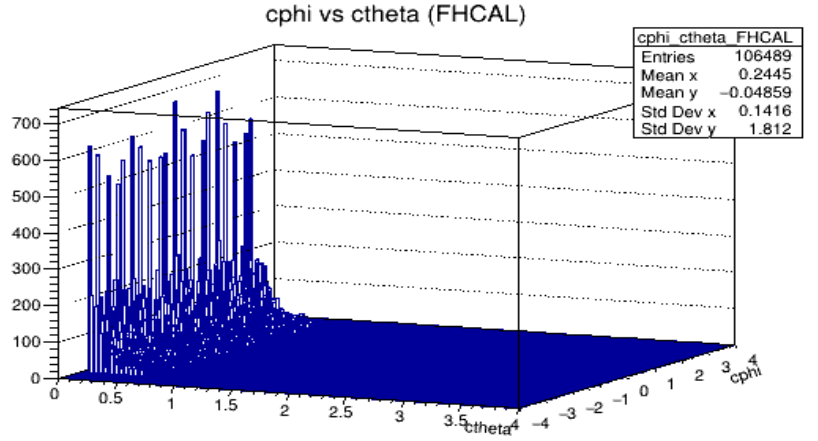


Theta vs phi plots (Pion)









THE END