Energy conservation check

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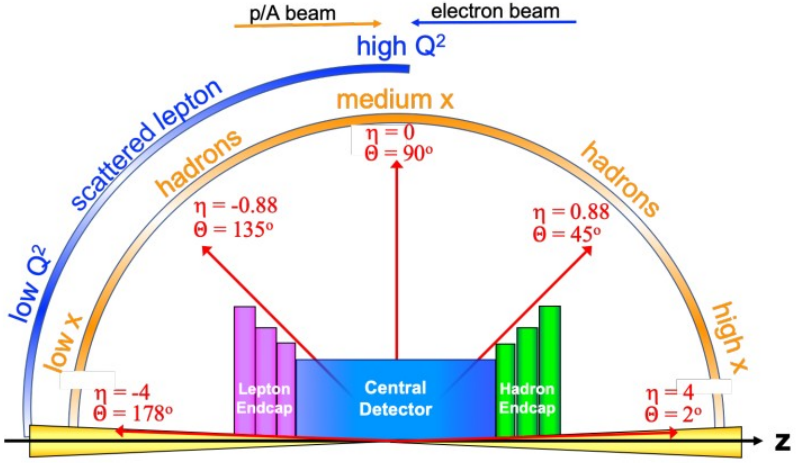
Details:

- Details for calorimeters:
  - EMCal: Material: Lead tungstate (PWO) crystals for $\eta < -2$; For the other areas several options exist (Scintillating glass, Lead glass, etc.) depending on the geometrical constraints.
    - Mid rapidity (Barrel) (CEMC): -1 to 1
    - Forward rapidity (Ion/Forward direction) (FEMC): 1 to 3.5
    - Backward rapidity (Lepton/Backward direction) (EEMC): -4 to -1
  - Hcal: Material: Steel absorber
    - Forward region (FHCAL): 1 to 4
    - Barrel (HCALIN, HCALOUT): -1 to 1
- Details for the slides:
  - Particles: e-, pi-, K-
  - Generated energy (ge) range: 0-30 GeV
  - Generated transverse momentum (gpT) range: 0-30 GeV (e-, pi-) and 0-40 GeV (K-)
  - Generated momentum (gp=sqrt(gpx*gpx+gpy*gpy+gpz*gpz)) range: 0-30GeV
  - Generated pseudorapidity (geta) range: -4 to 4
  - Generated phi (gphi) range: -pi to pi
  - Reconstructed energy cut on cluster energy (ce): 200 MeV

(Note: geta cuts have not been implemented in the following plots.)



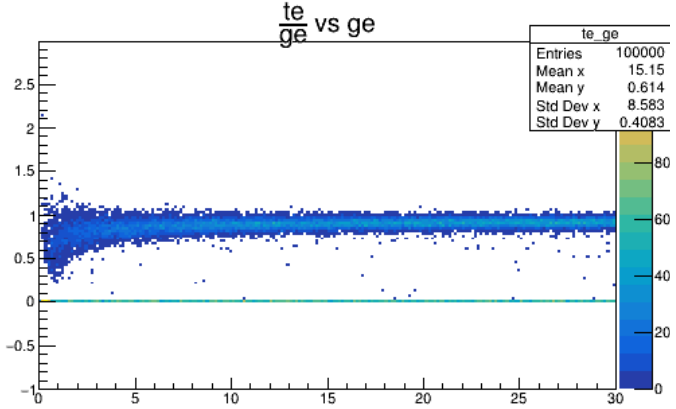
A schematc showing how hadrons and the scattered lepton for different x-Q^2 are distributed over the detector rapidity coverage. Reference: EIC Yellow Report

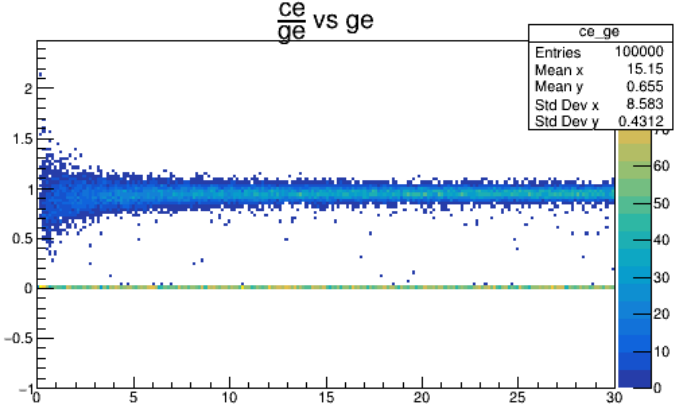
(Reference: Electron-Ion Collider Detector Requirements and R&D Handbook Version 1.1)

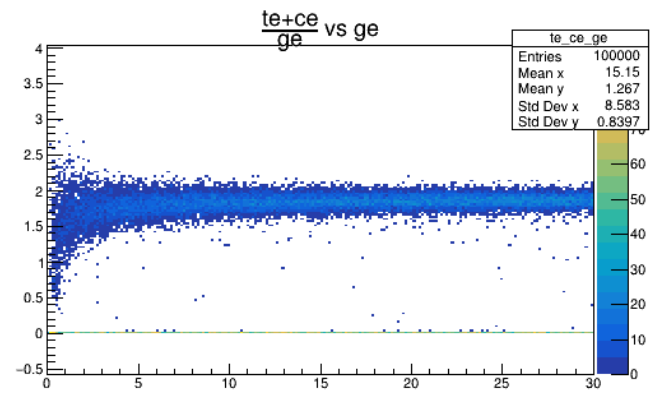
Electron

te: tower energy
ce: cluster energy
ge: generated energy

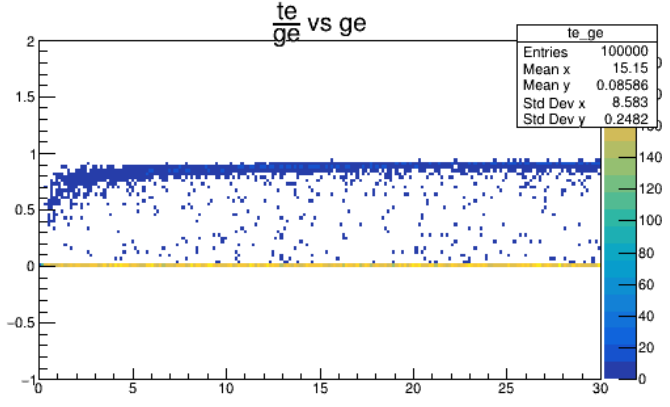
CEMC

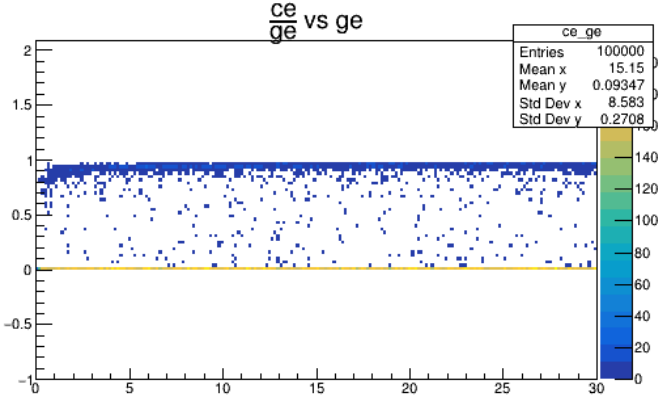


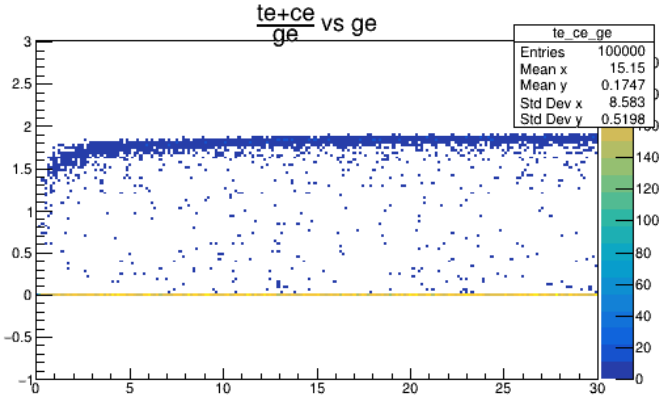




EEMC





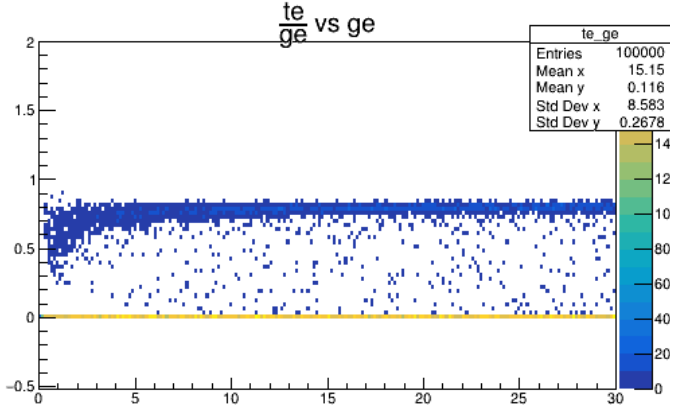


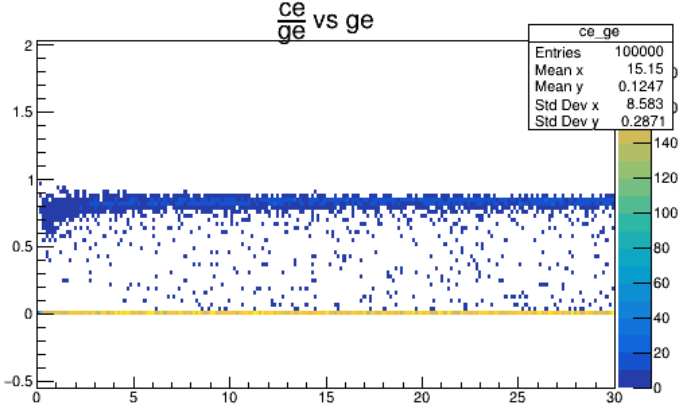
Note: CEMC has a number of points above 1 showing non-conservation of energy while EEMC looks fine.

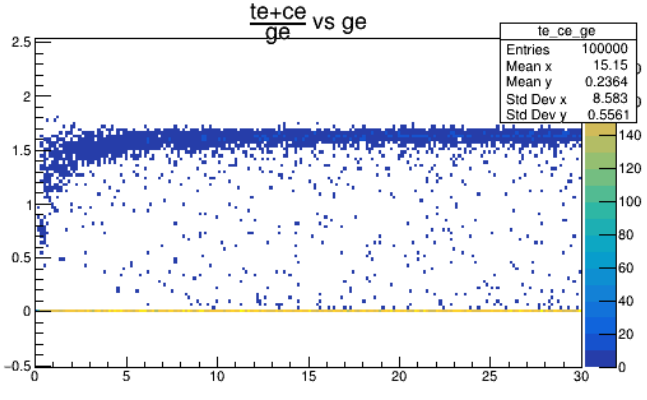
Electron

te: tower energy
ce: cluster energy
ge: generated energy

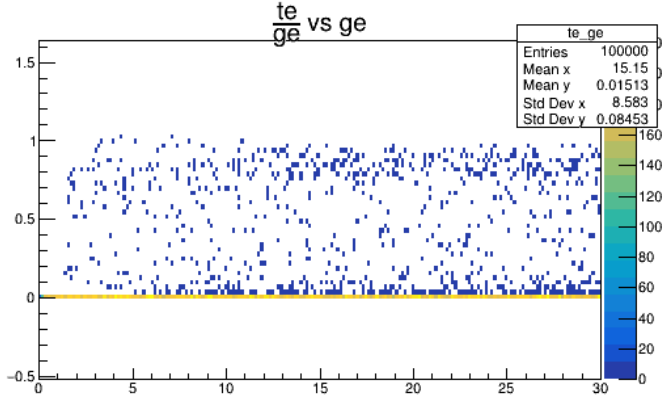
FEMC

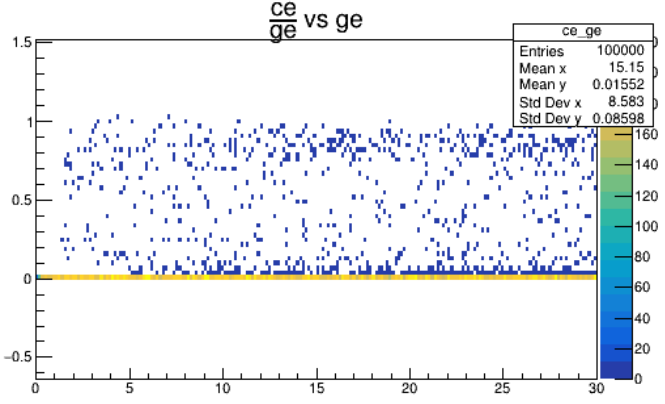


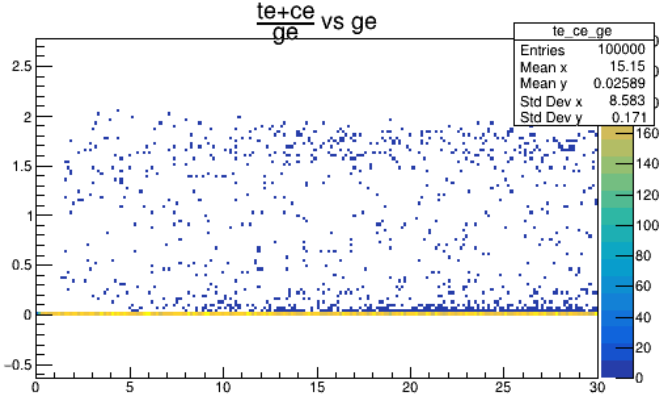




FHCAL





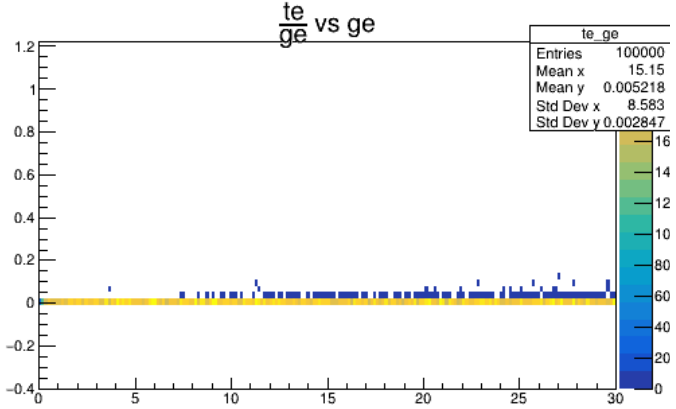


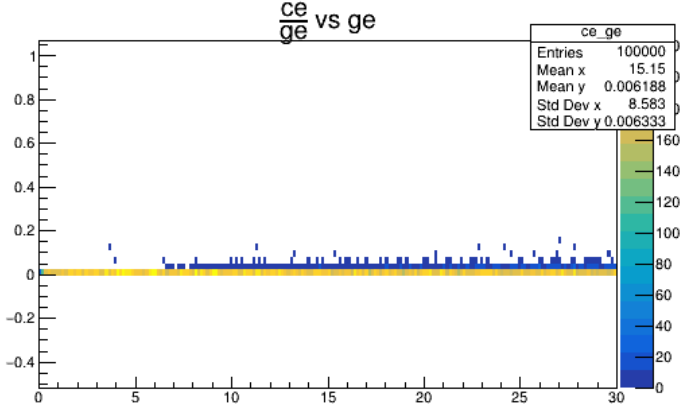
Note: The energies are conserved in both FEMC and FHCAL.

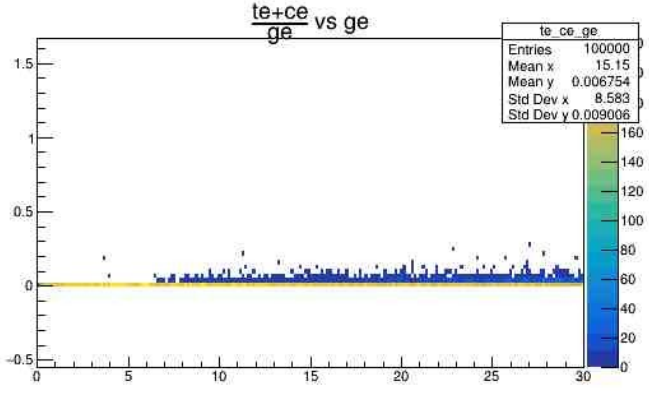
Electron

te: tower energy
ce: cluster energy
ge: generated energy

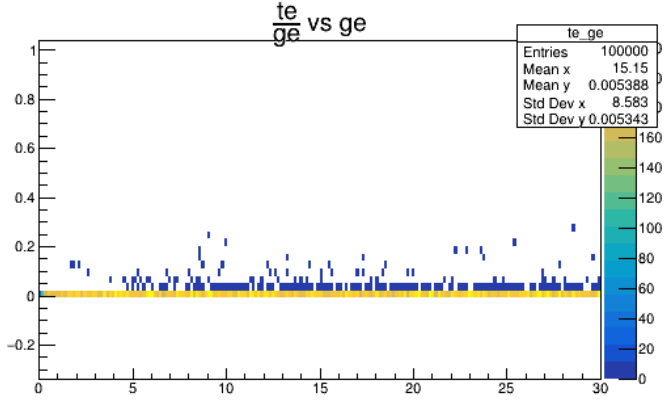
HCALIN

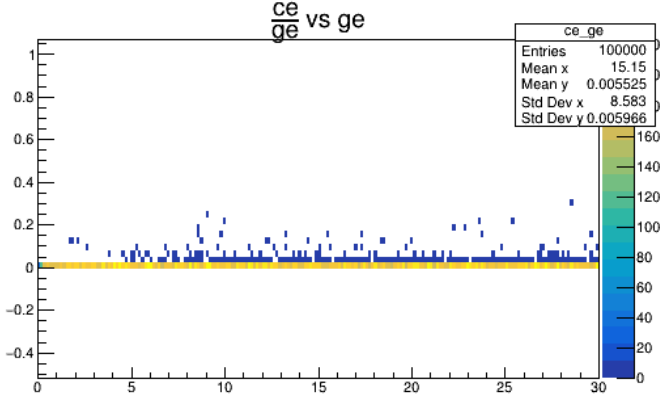


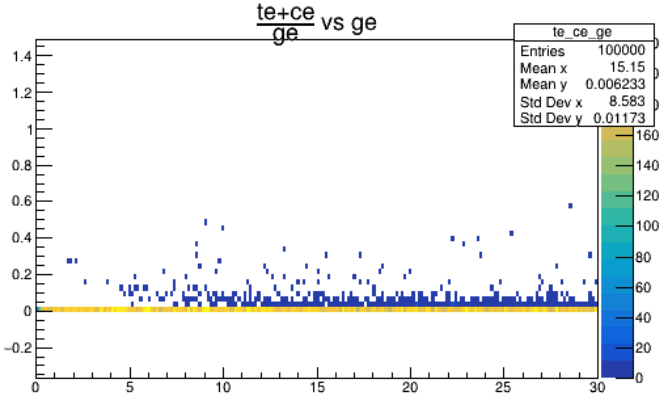




HCALOUT





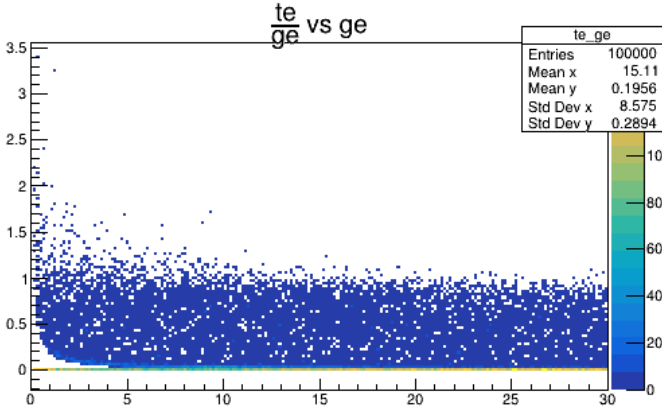


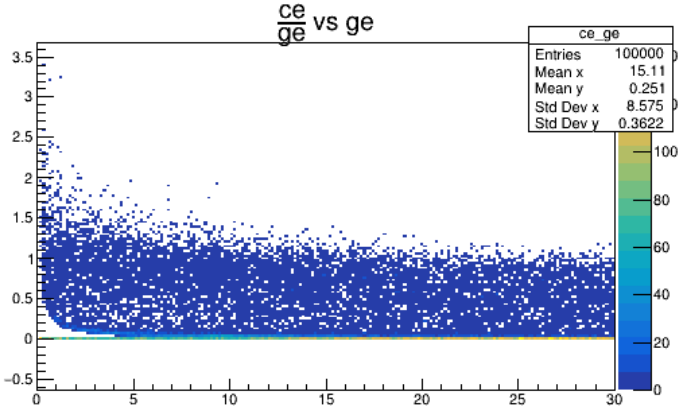
Note: The barrel Hcals shows less deposition of electron energy since it is a lepton.

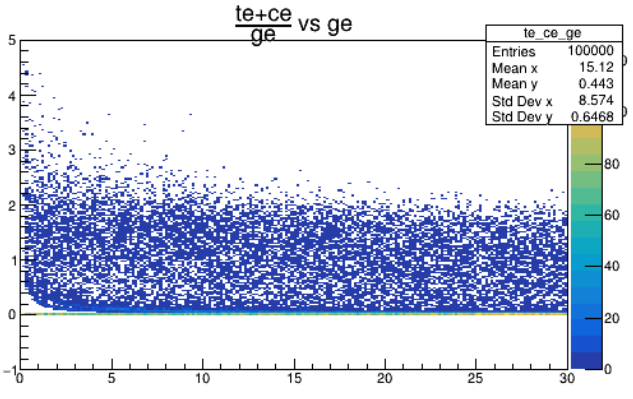
Pion

te: tower energy
ce: cluster energy
ge: generated energy

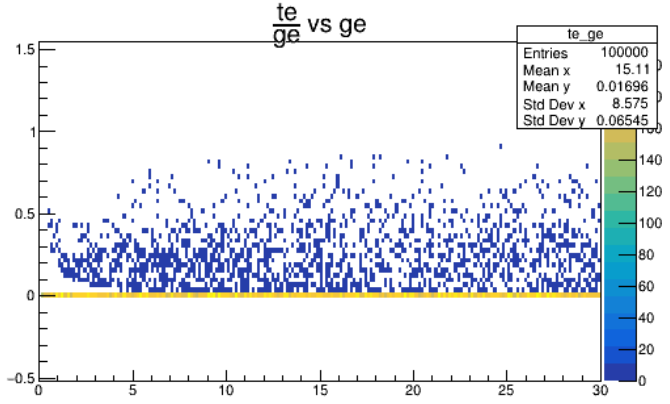
CEMC

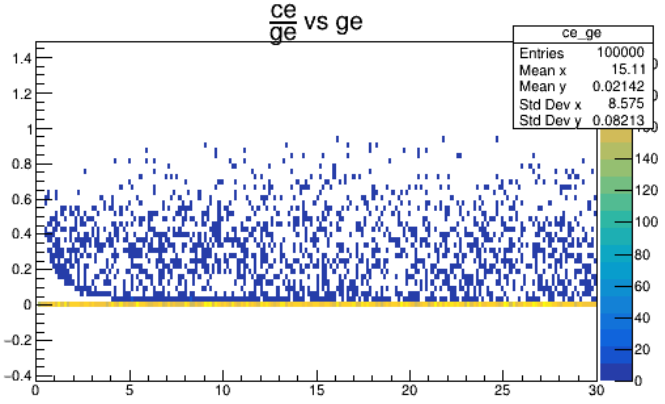


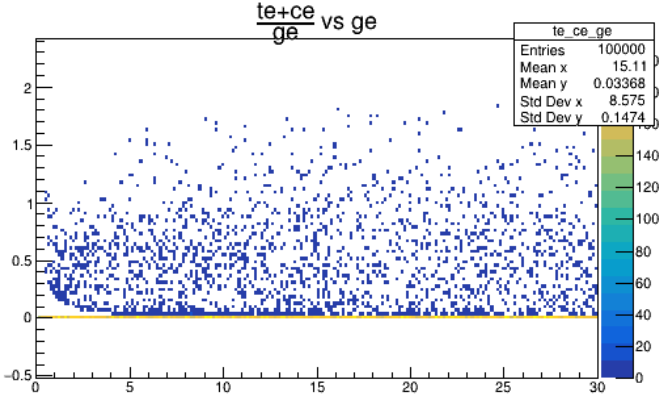




EEMC





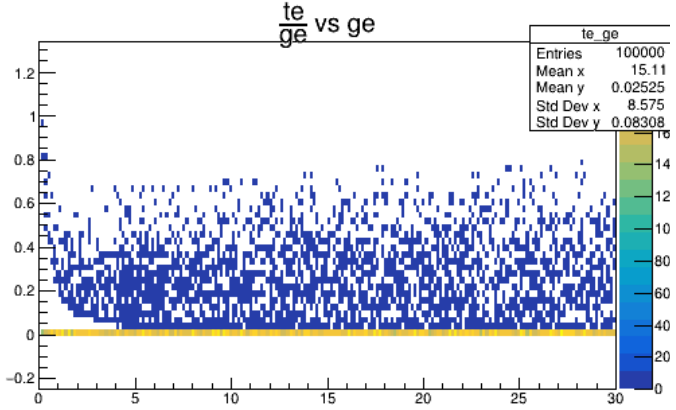


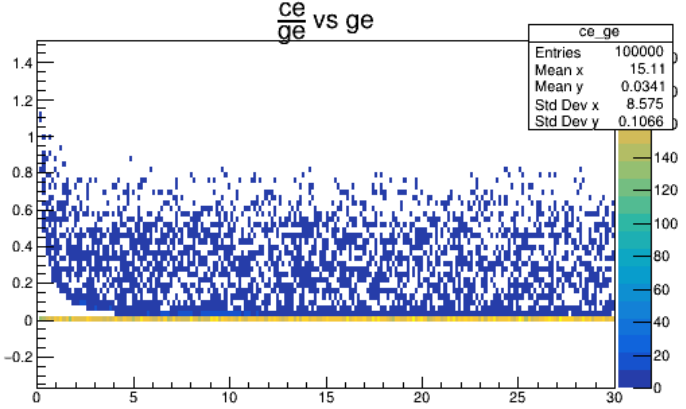
Note: CEMC has a large number of points above 1 showing non-conservation of energy while EEMC looks fine.

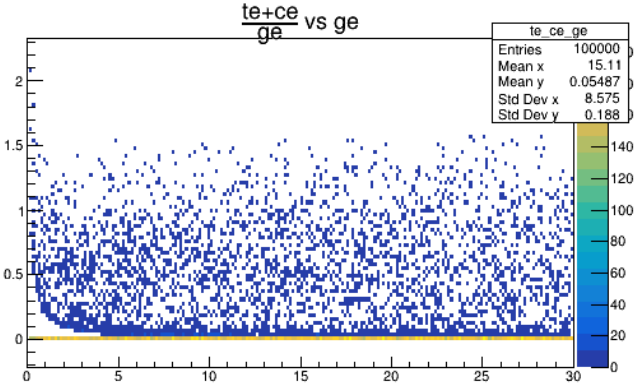
Pion

te: tower energy
ce: cluster energy
ge: generated energy

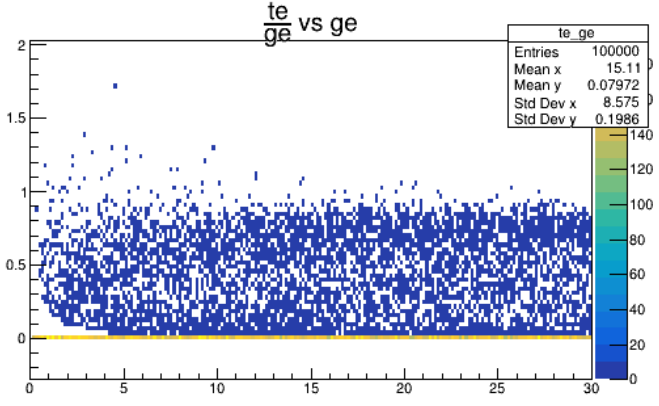
FEMC

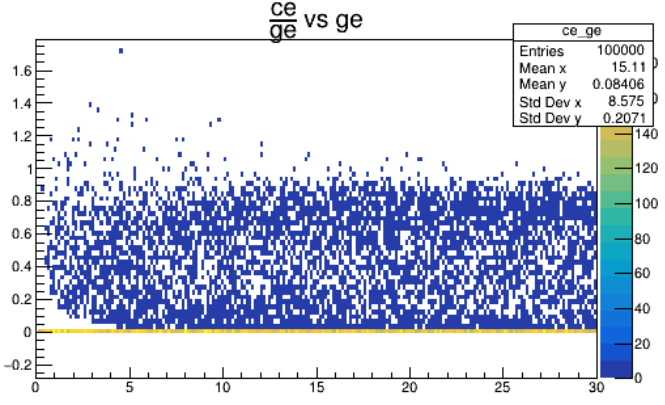


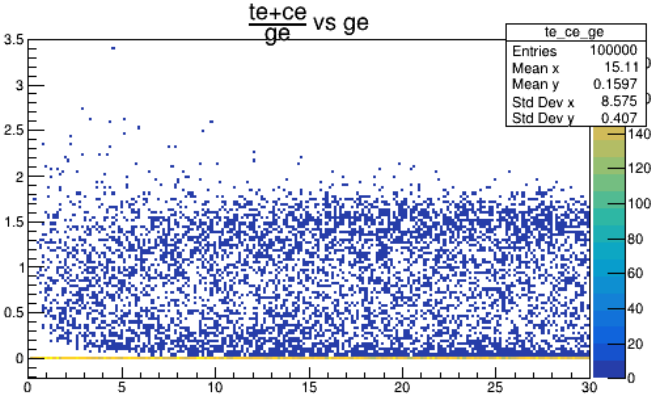




FHCAL







Note: The energies are conserved in FEMC while in FHCAL, there is some non-conservation at low energies.

Pion

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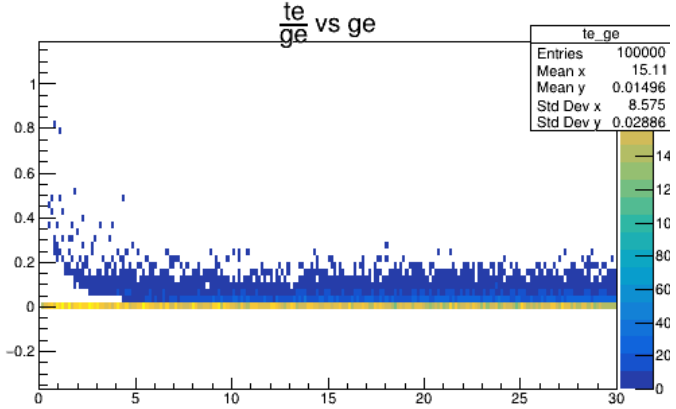
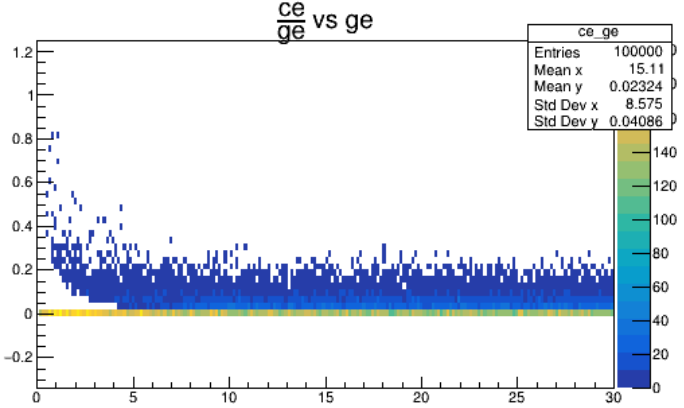
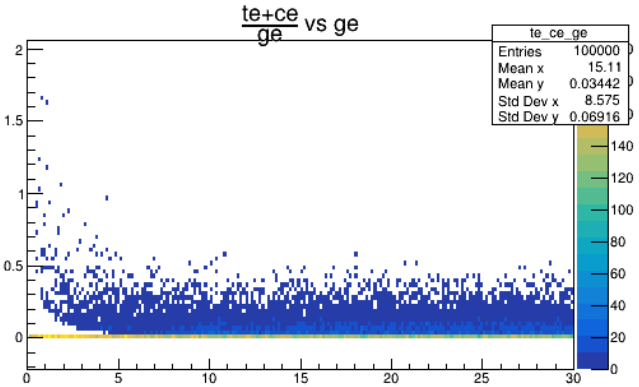
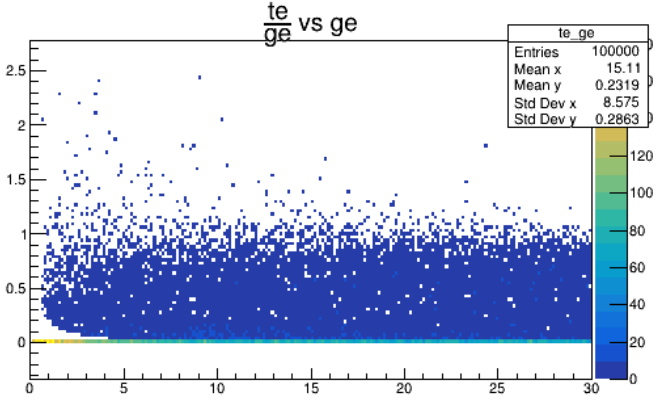
HCALIN

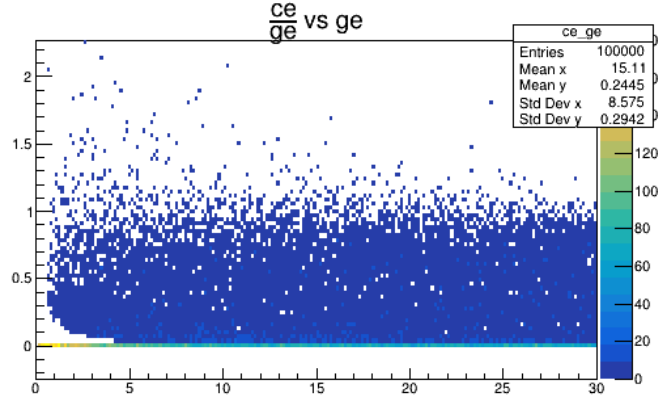


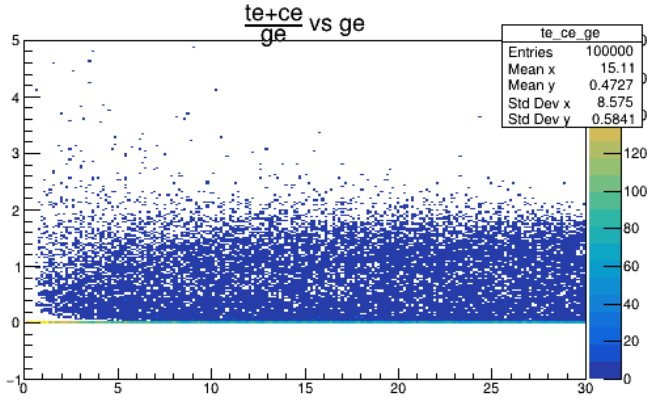




HCALOUT







Note: The inner HCal shows less deposition of pion energy while there is some non-conservation of energy in the outer Hcal

Kaon

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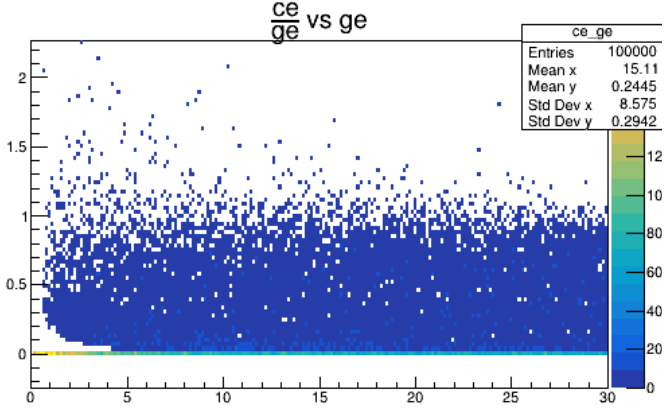
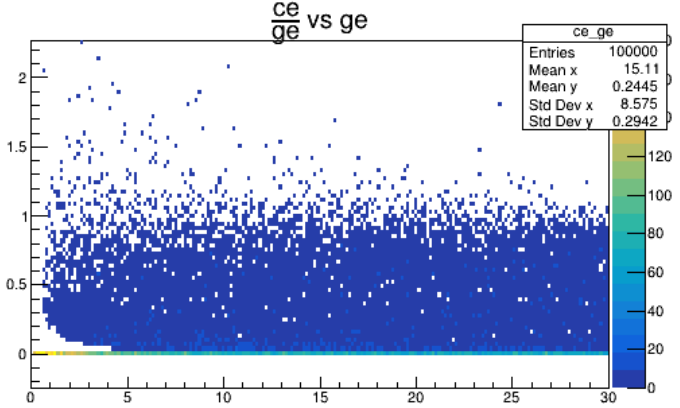
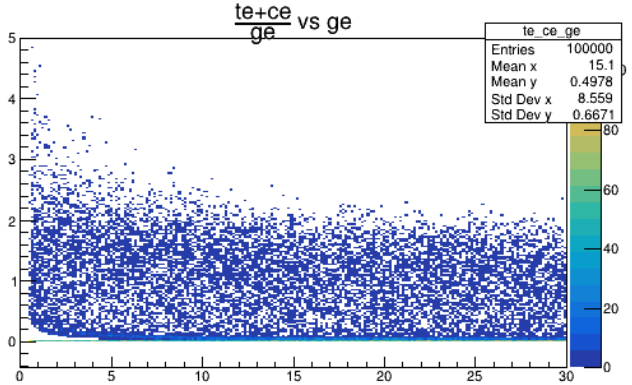
ge: generated energy

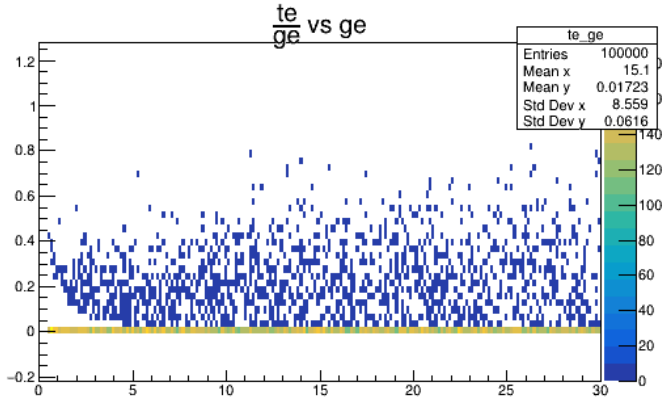
CEMC

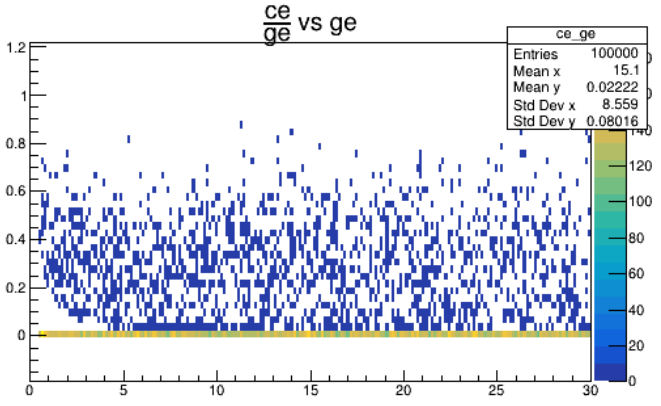


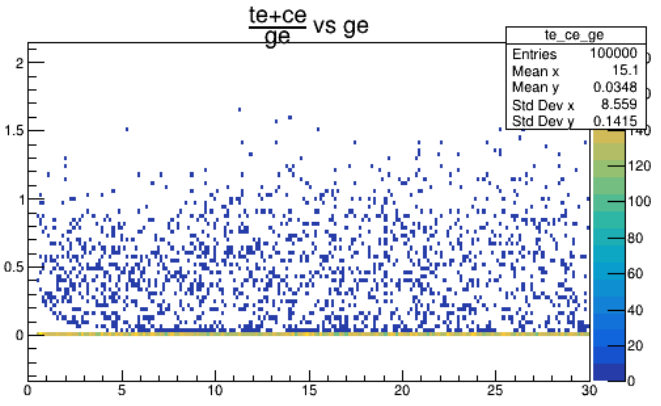




EEMC







Note: CEMC has a large number of points above 1 showing non-conservation of energy while EEMC looks fine.

Kaon

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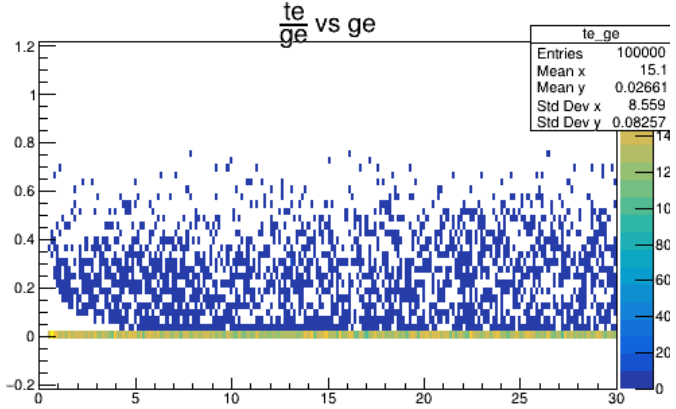
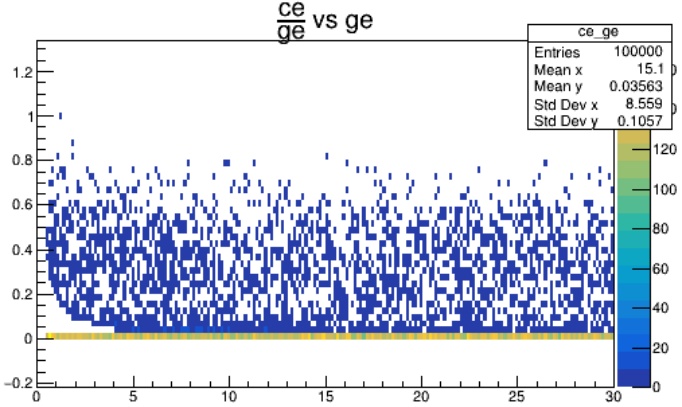
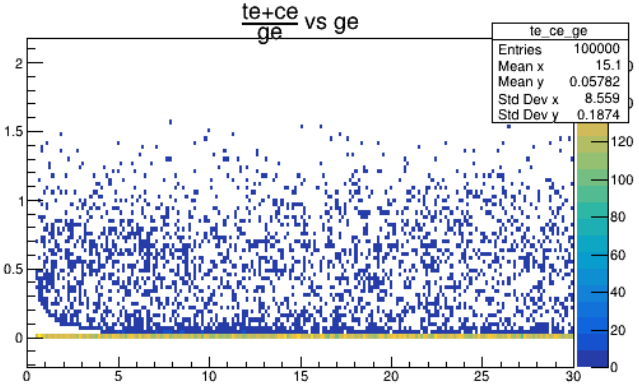
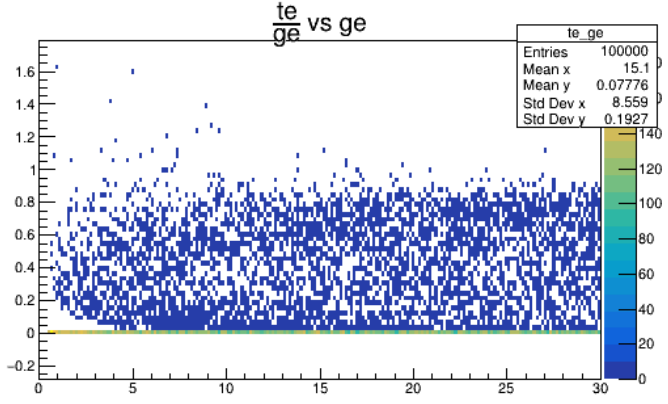
FEMC

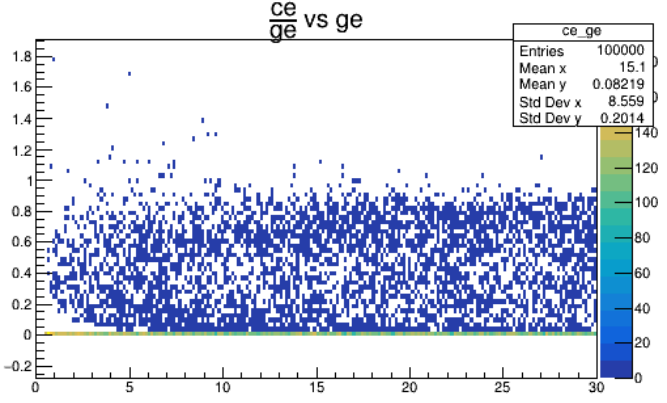


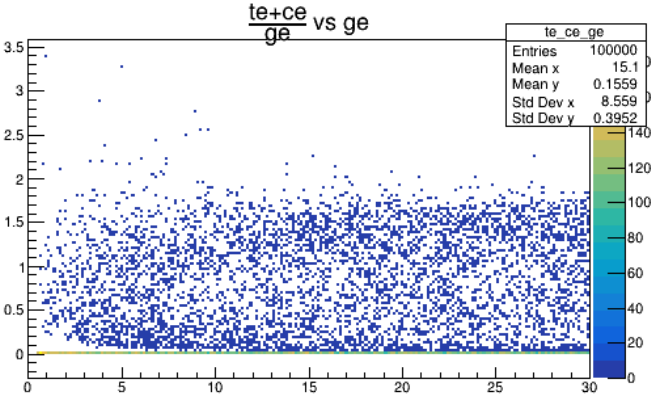




FHCAL







Note: The energies are conserved in FEMC while in FHCAL, there is some non-conservation at low energies.

Kaon

te: tower energy
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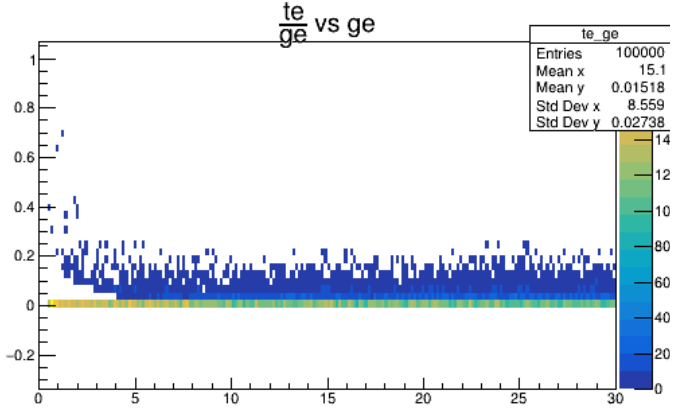
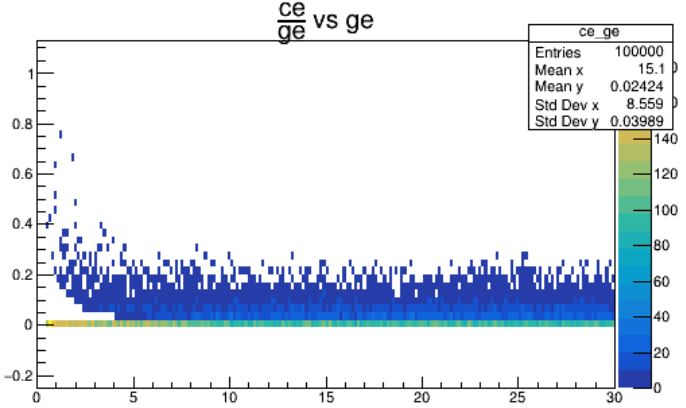
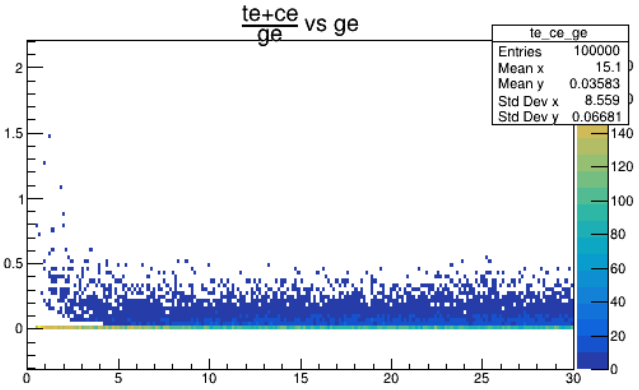
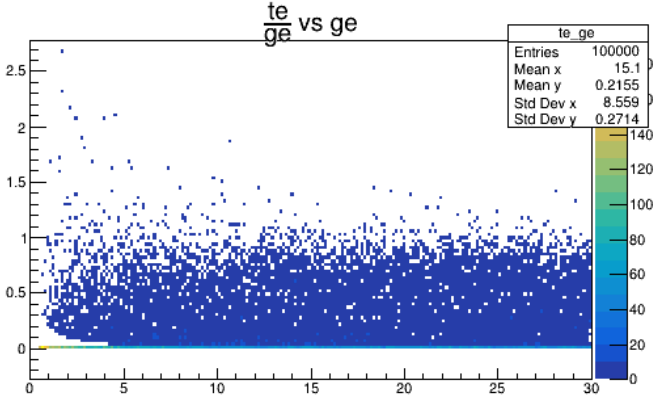
HCALIN

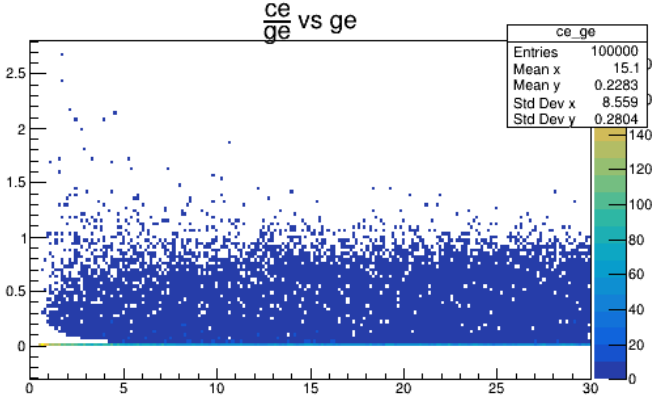


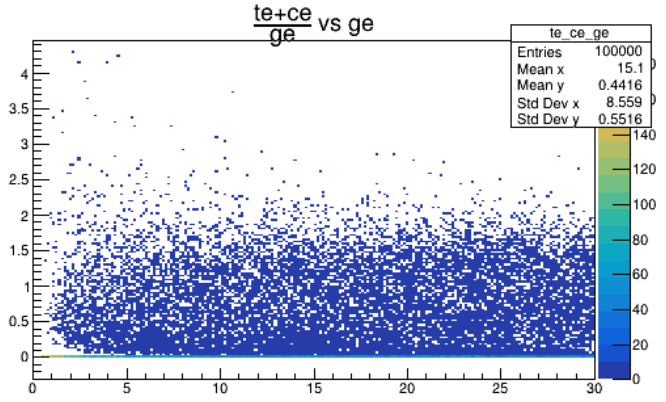




HCALOUT







Note: The inner HCal shows less deposition of pion energy while there is some non-conservation of energy in the outer Hcal

Conclusion:

- There is non-conservation of energy in case of barrel calorimeters while the forward calorimeters look fine.