

Fun4All QA Plots for Calorimeters

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Lokesh Kumar
PU, Chandigarh**

OUTLINE:

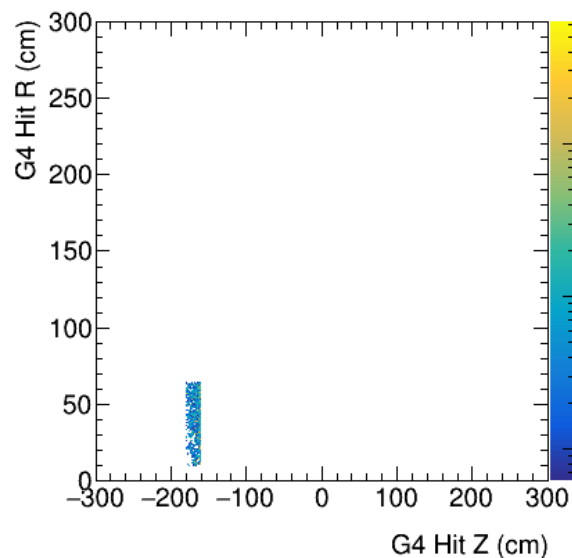
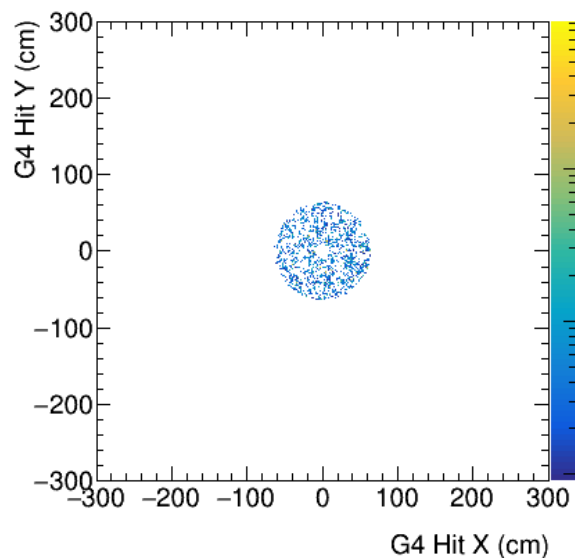
- Specifications
- Forward calorimeter plots
- Barrel calorimeter plots
- Track Projection plots
- Sum cluster plots
- Observations

Specifications:

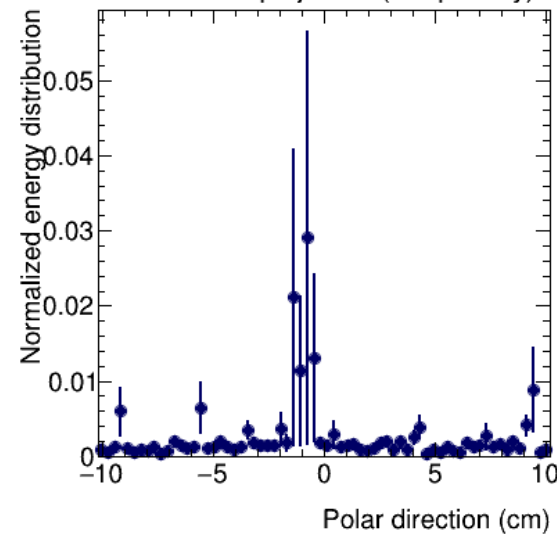
- Particle used: π^-
- No. of events: 1000
- Momentum range: 0.1 to 50.0
- Pseudorapidity ranges used:
 - 1.24 to 4 and -4 to -1.24 (specified for forward calorimeters in literature.)
 - 1.1 to 1.1 (specified for barrel calorimeters in literature.)

FORWARD CALORIMETERS

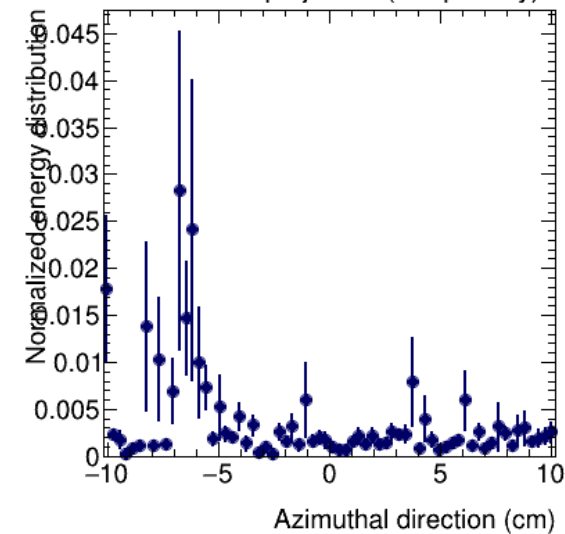
EEMC: eta: 1.24 to 4 (G4Hits)



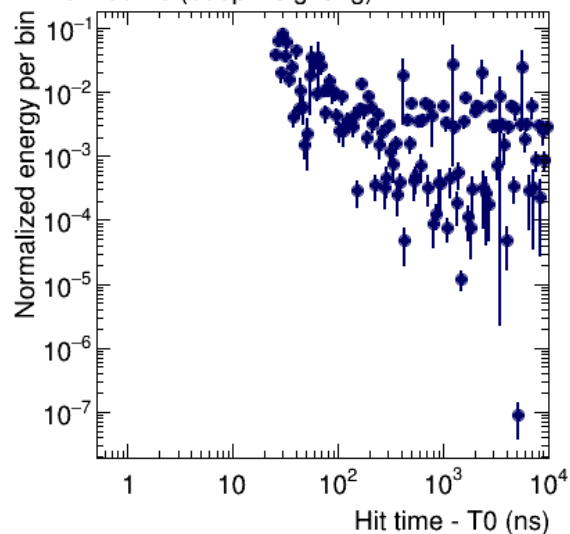
EEMC shower lateral projection (last primary)



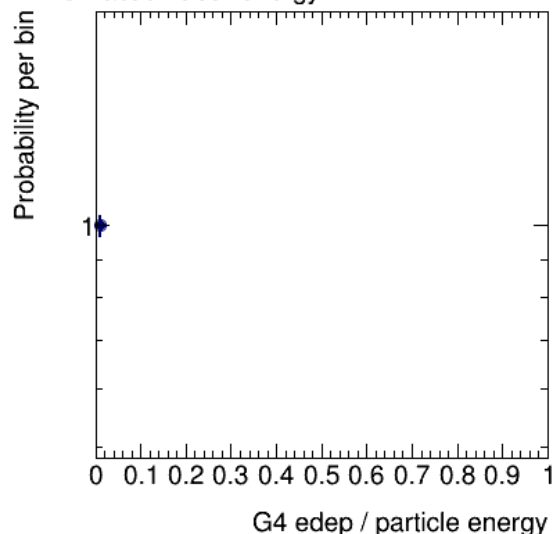
EEMC shower lateral projection (last primary)



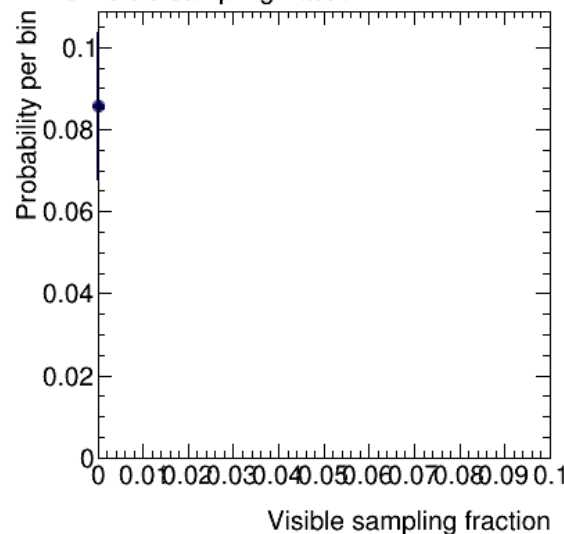
EEMC hit time (edep weighting)



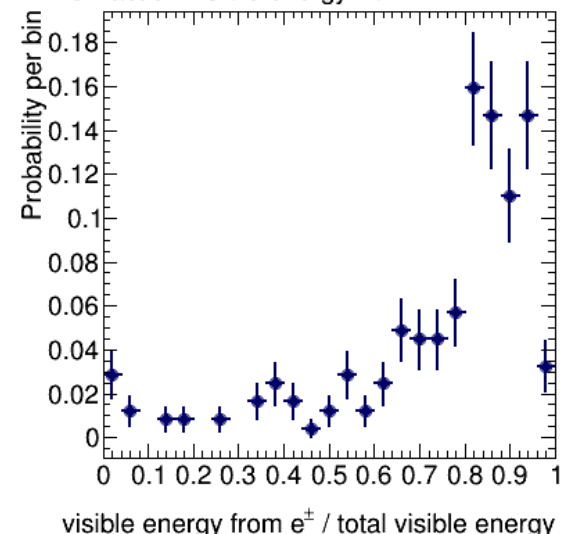
EEMC fraction truth energy



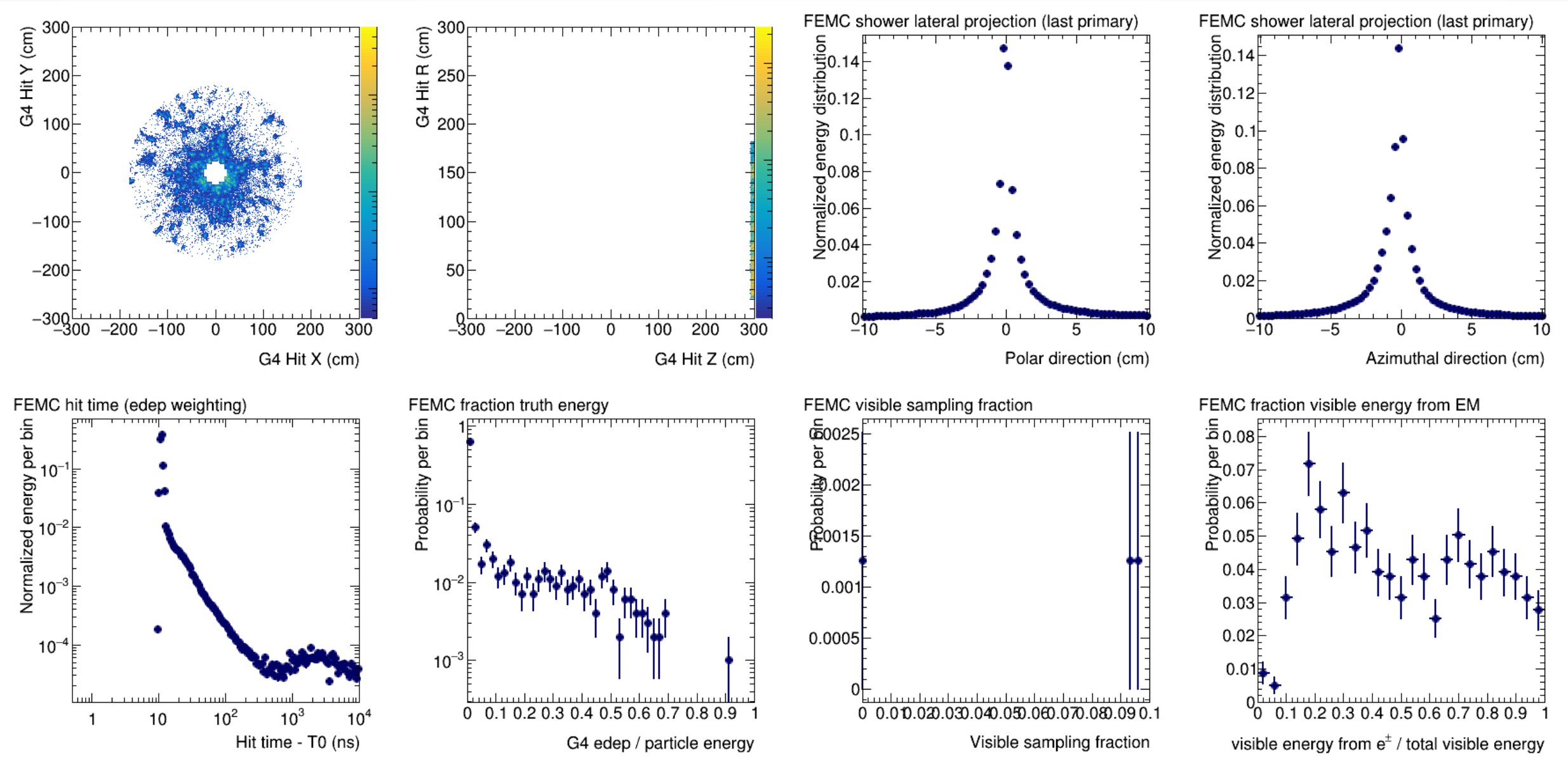
EEMC visible sampling fraction



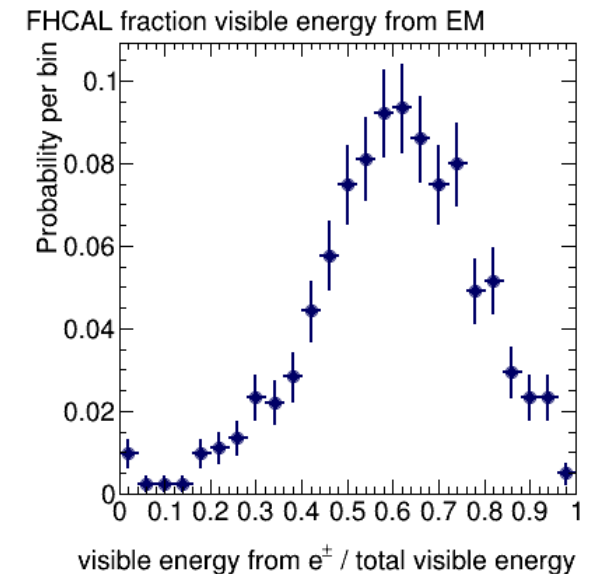
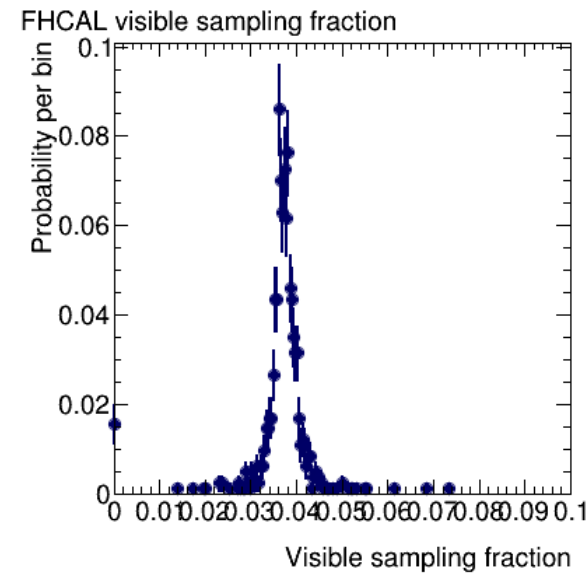
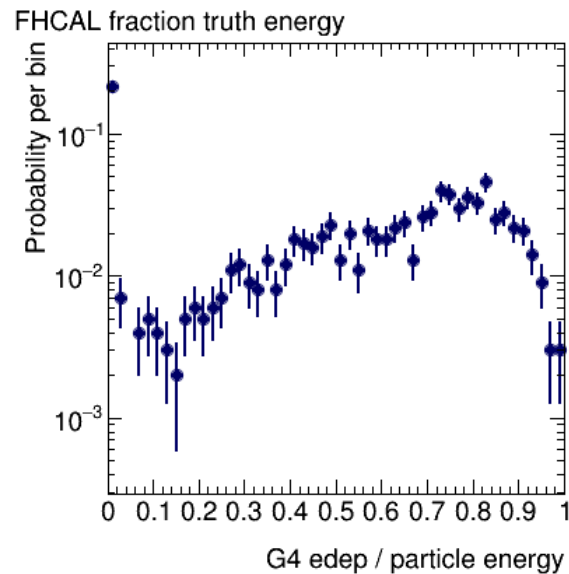
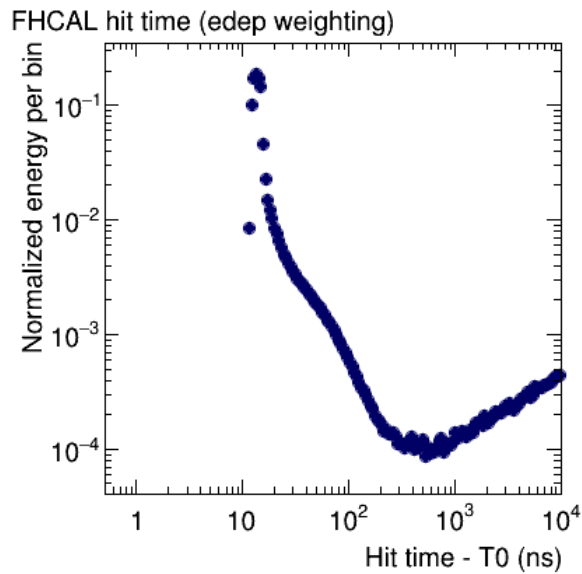
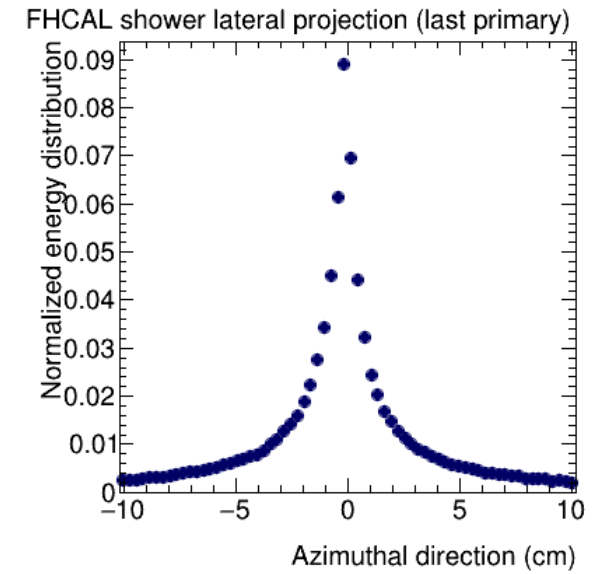
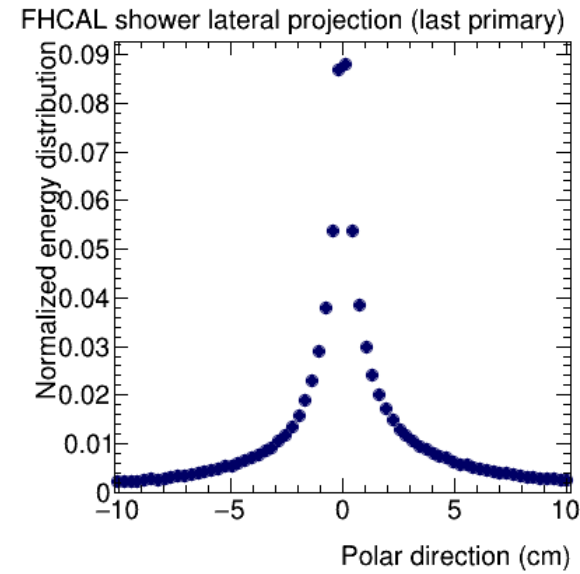
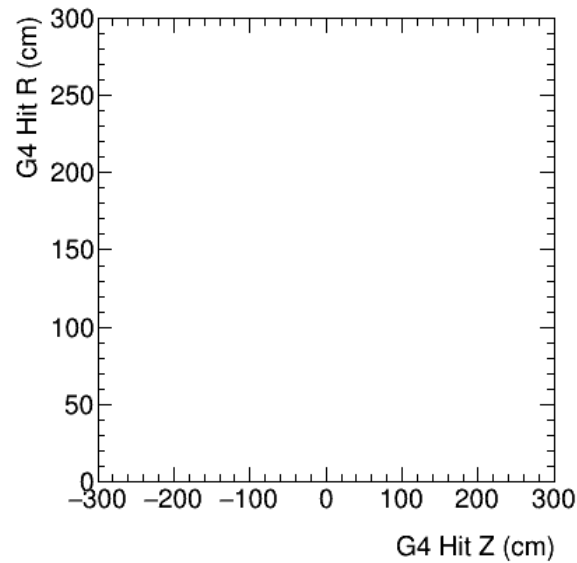
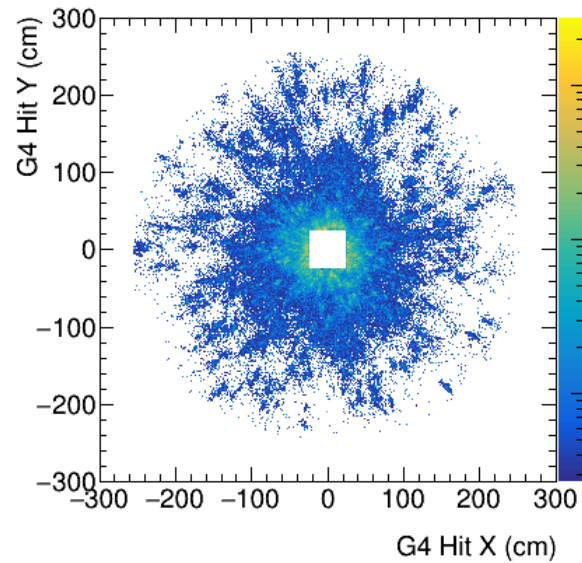
EEMC fraction visible energy from EM



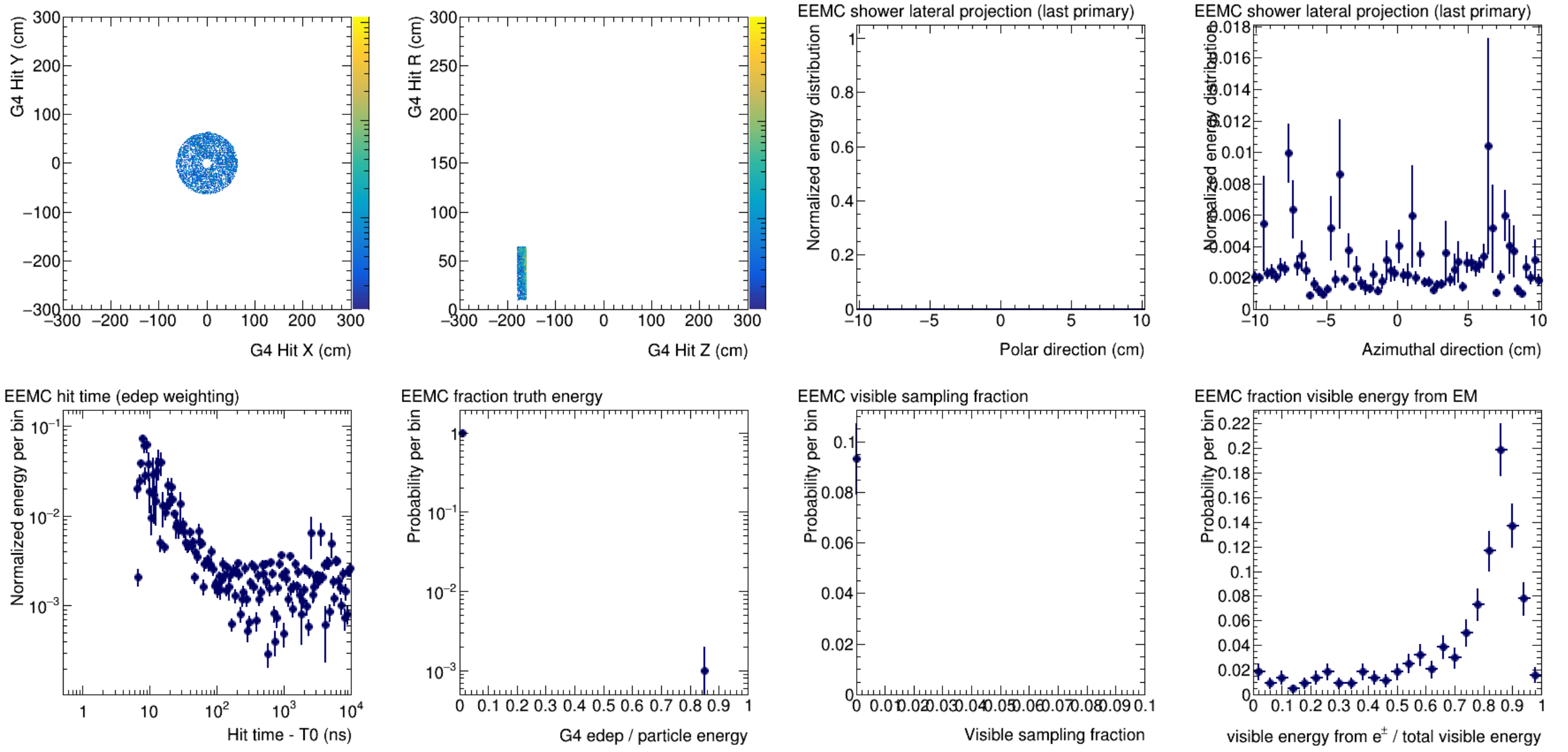
FEMC: eta: 1.24 to 4 (G4Hits)



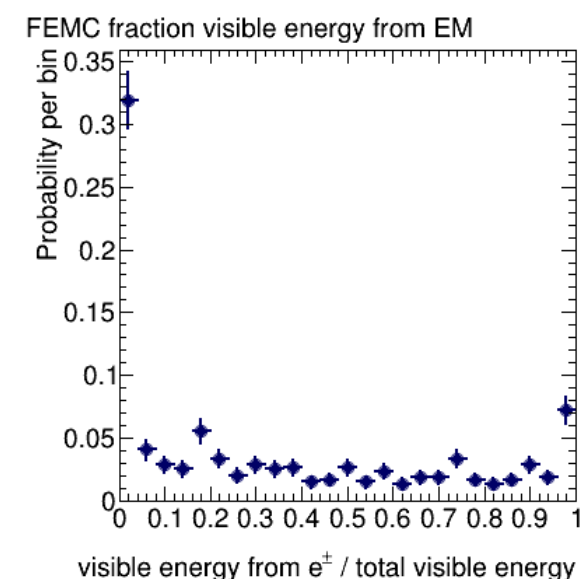
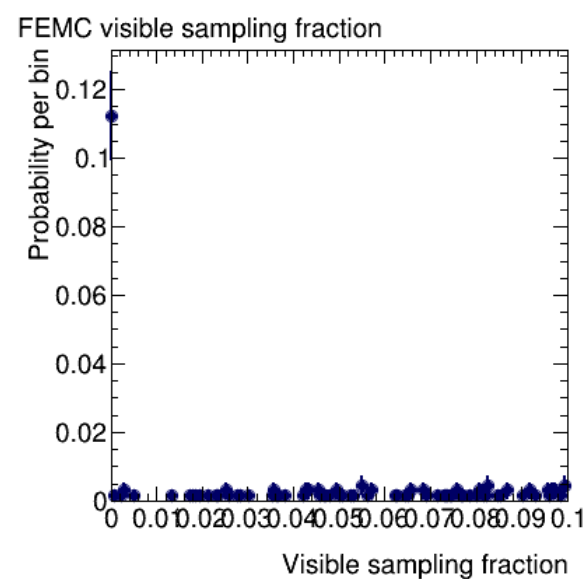
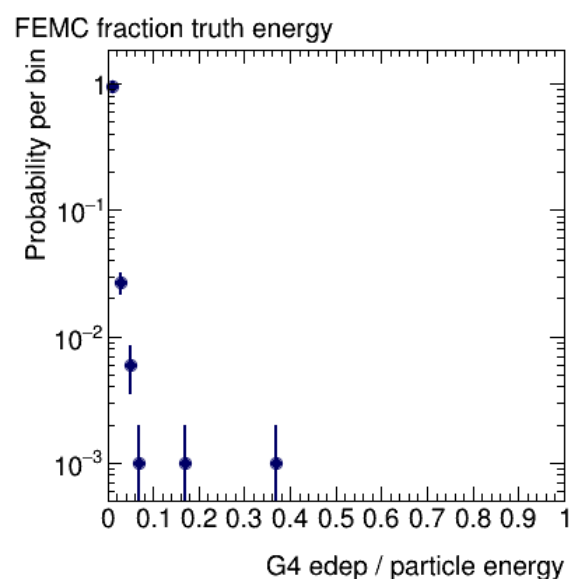
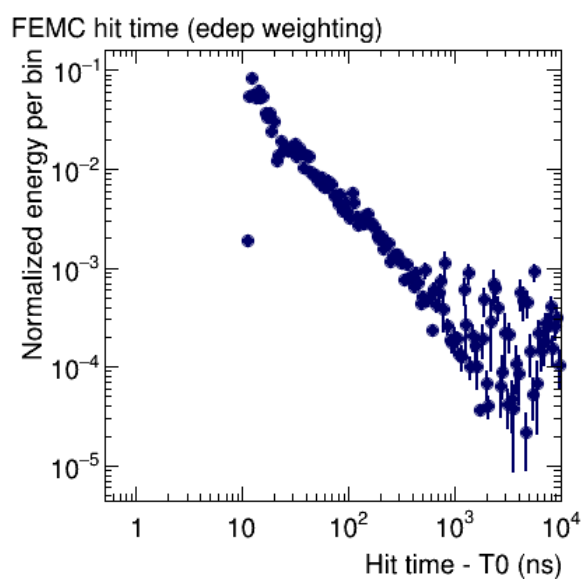
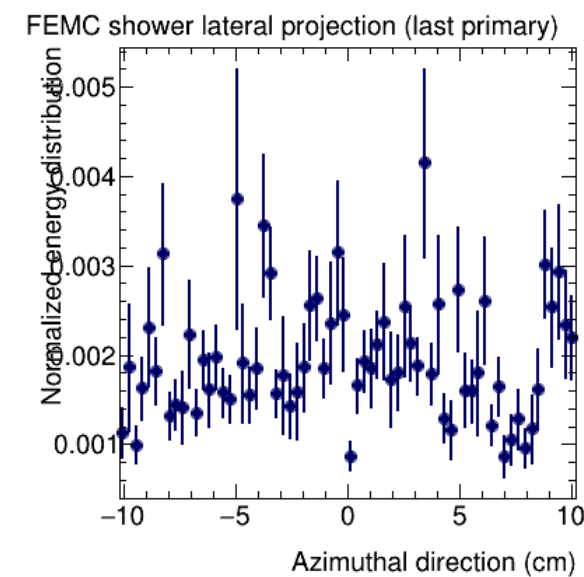
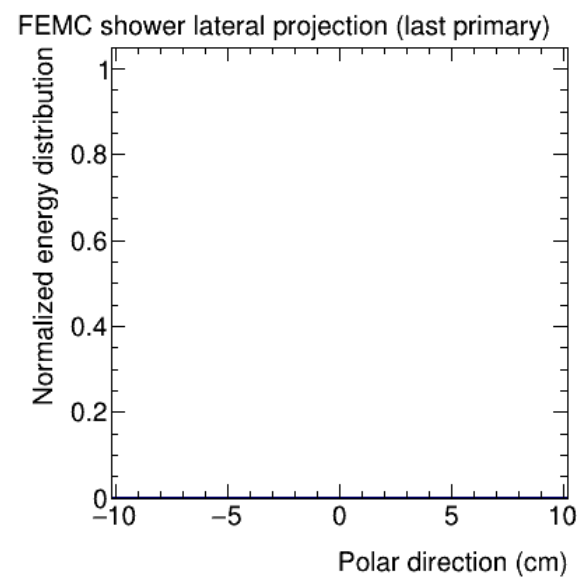
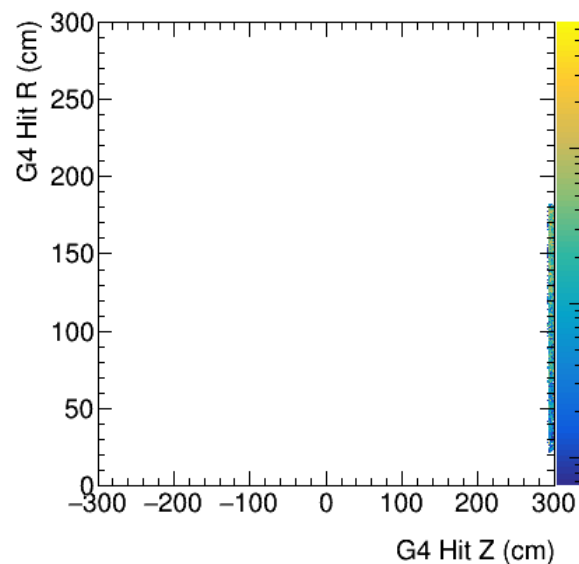
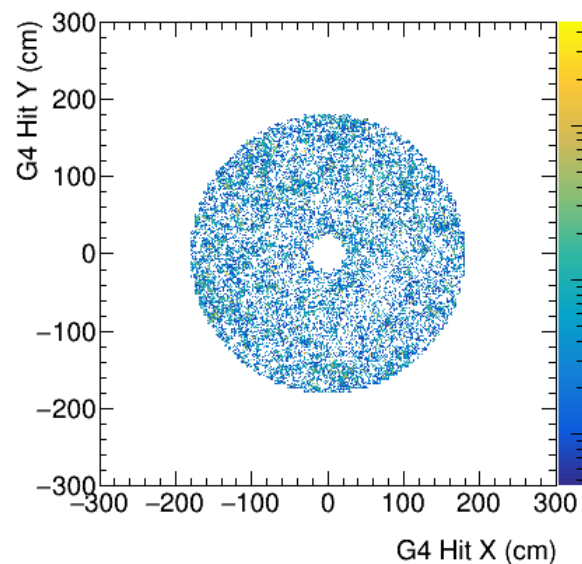
FHCAL: eta: 1.24 to 4 (G4Hits)



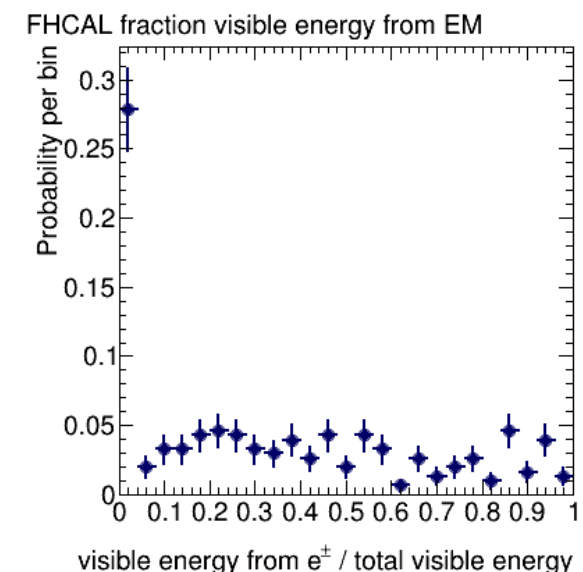
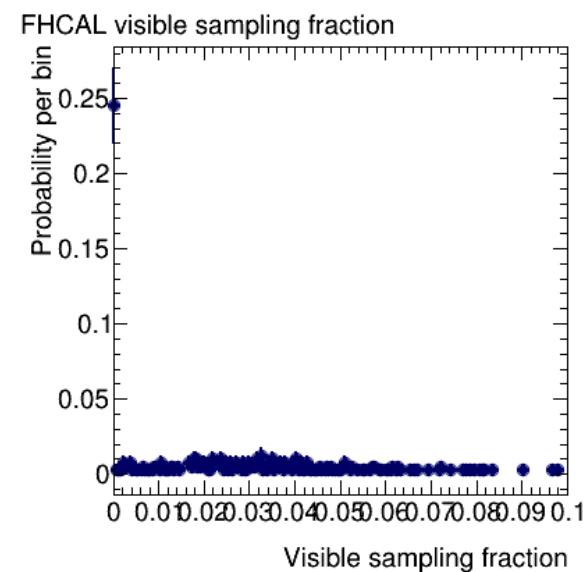
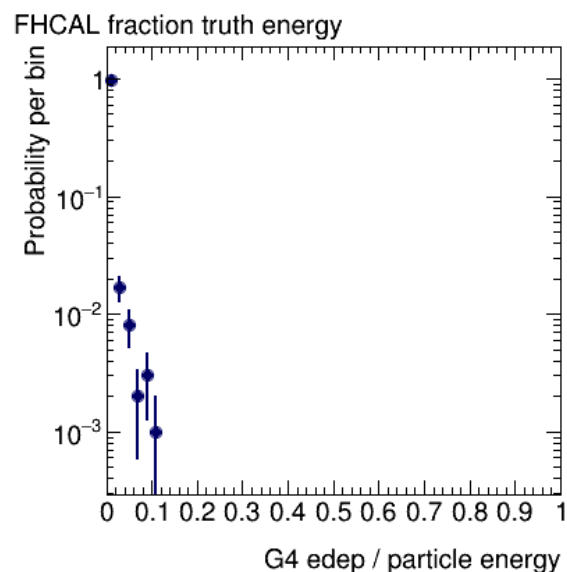
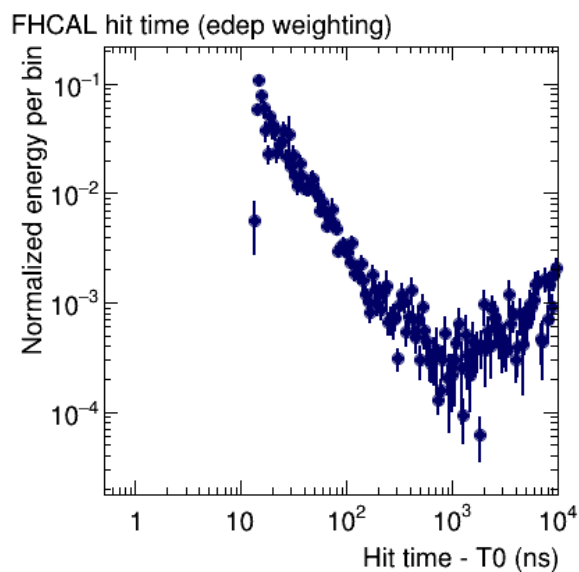
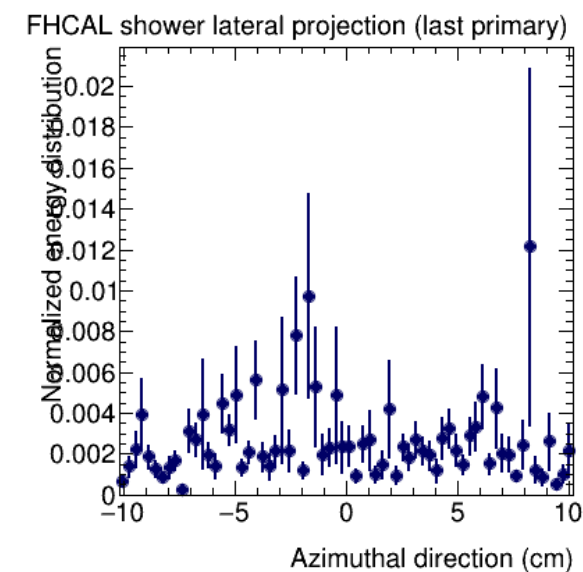
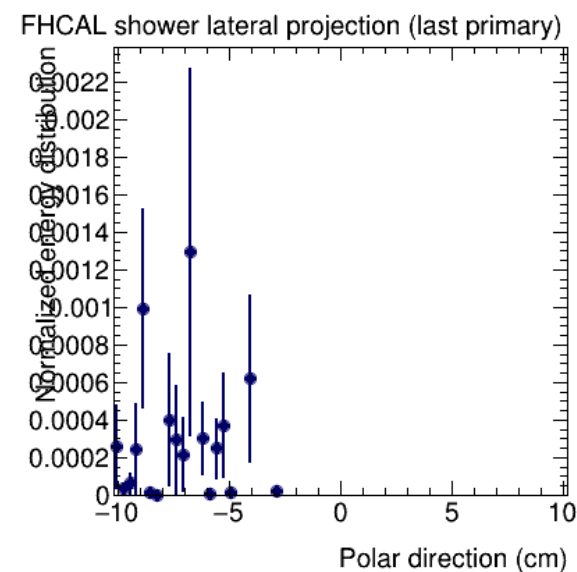
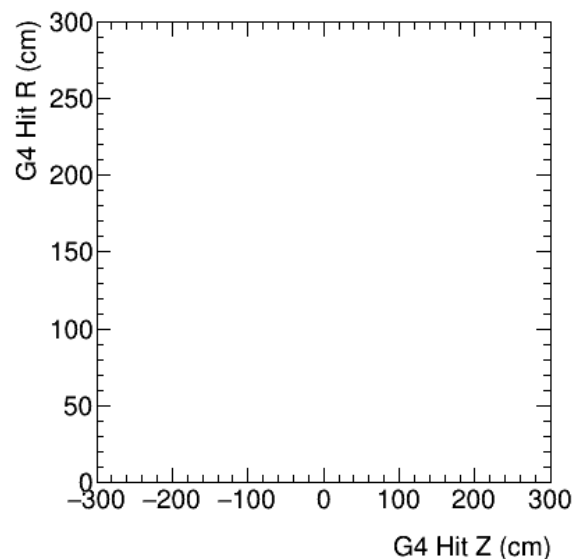
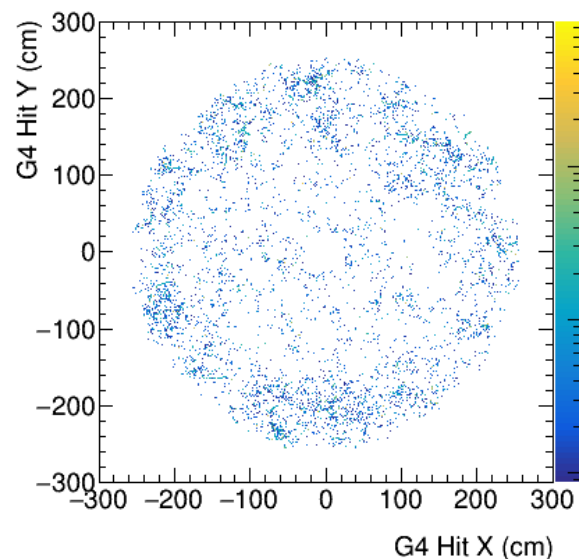
EEMC: eta: -1.1 to 1.1 (G4Hits)



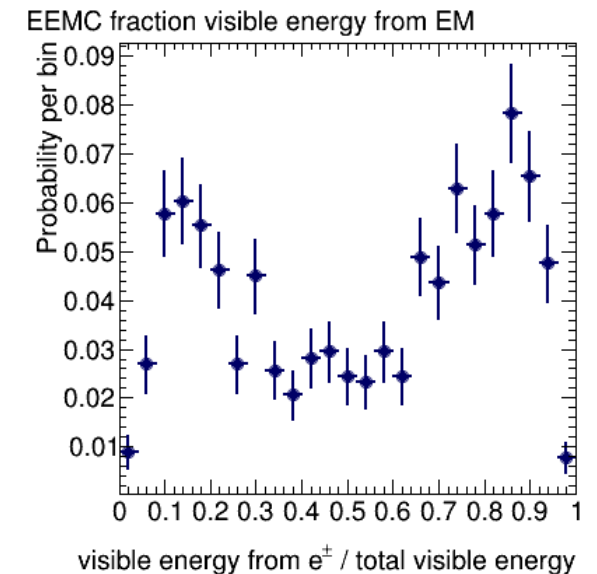
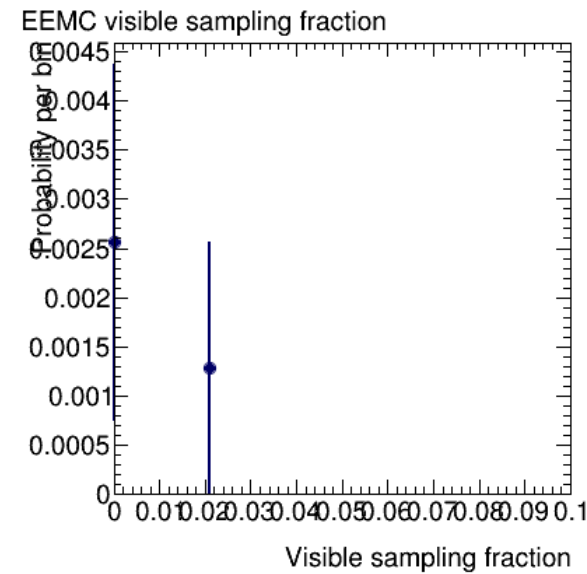
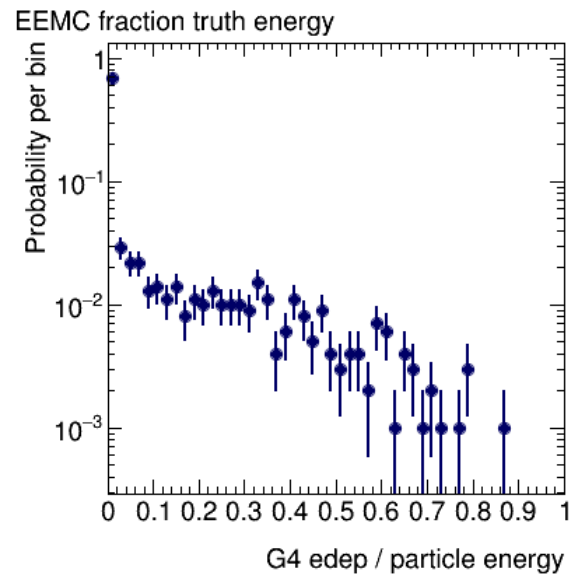
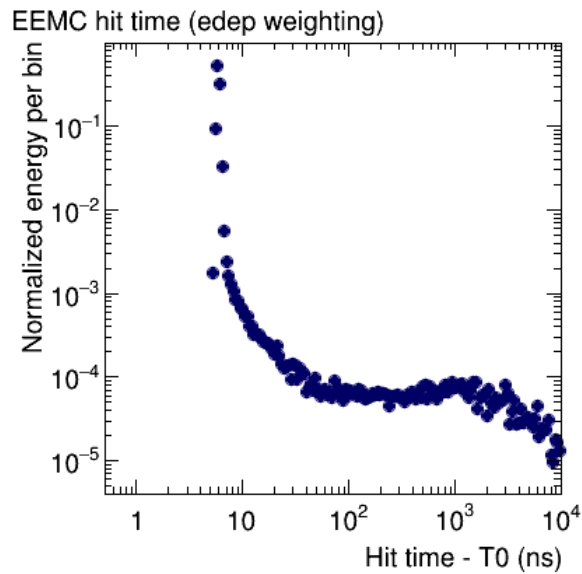
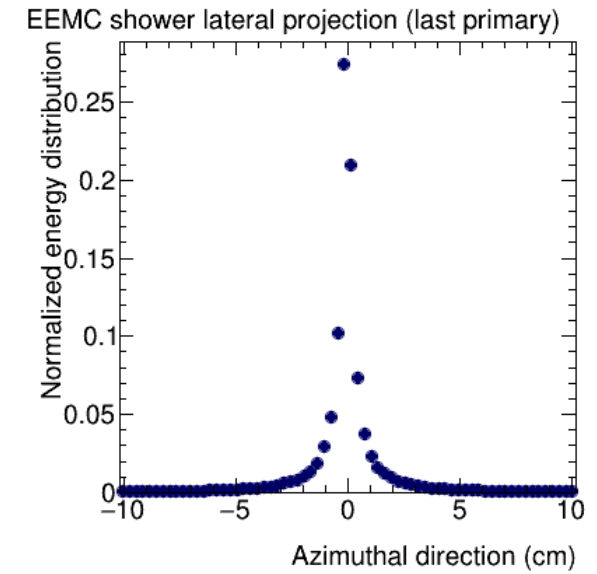
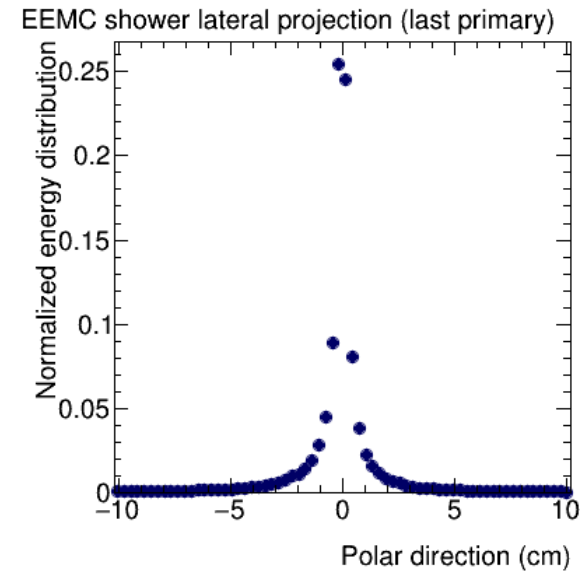
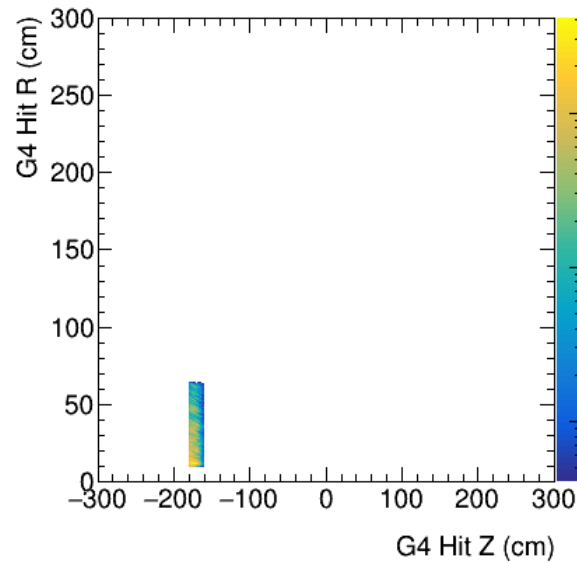
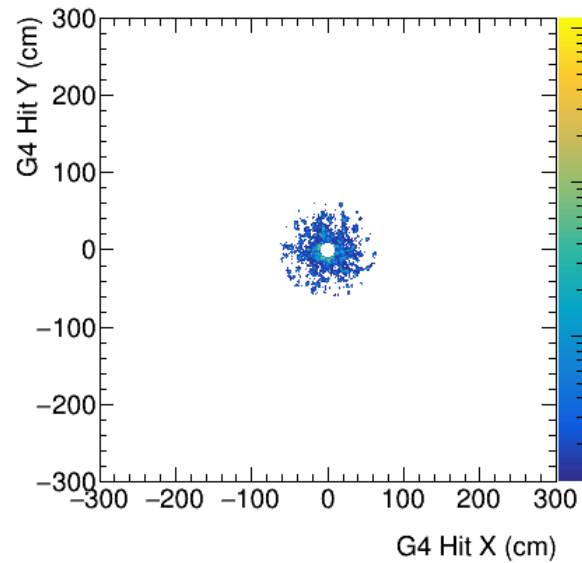
FEMC: eta: -1.1 to 1.1 (G4Hits)



FHCAL: eta: -1.1 to 1.1 (G4Hits)

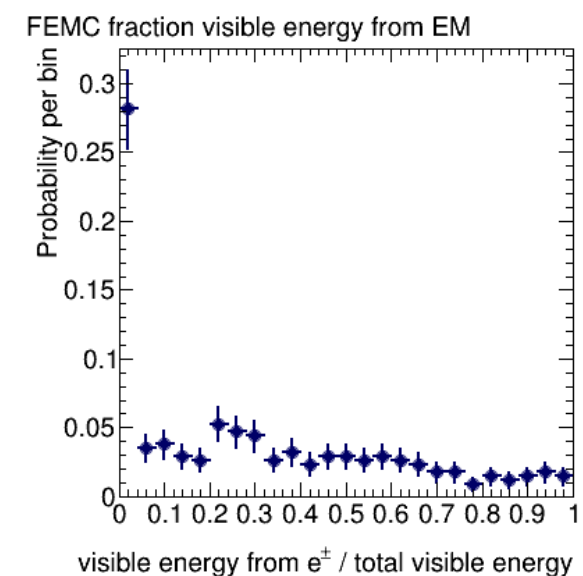
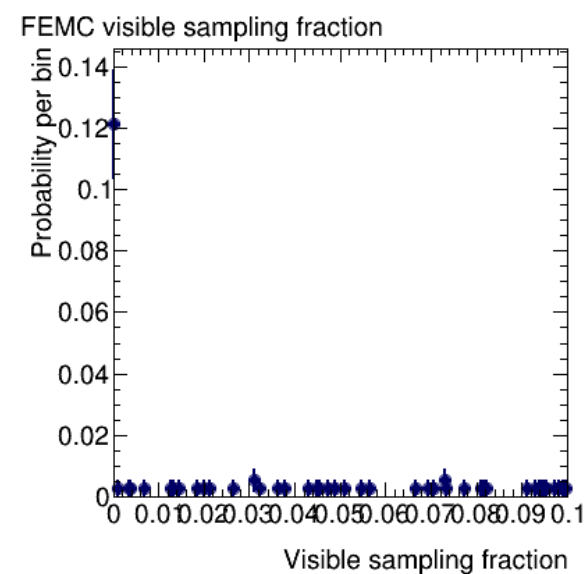
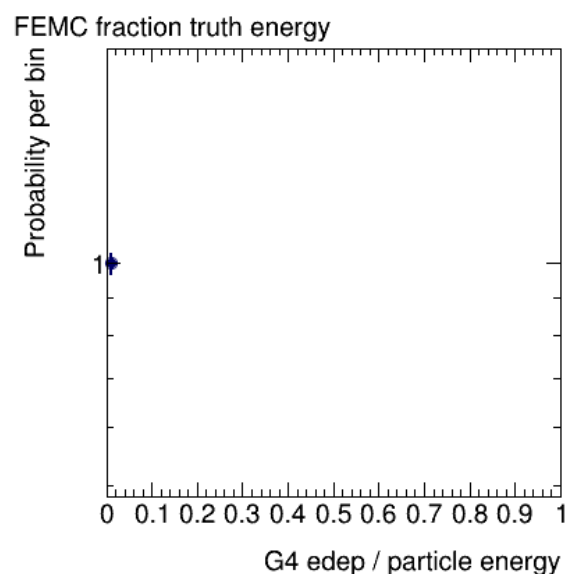
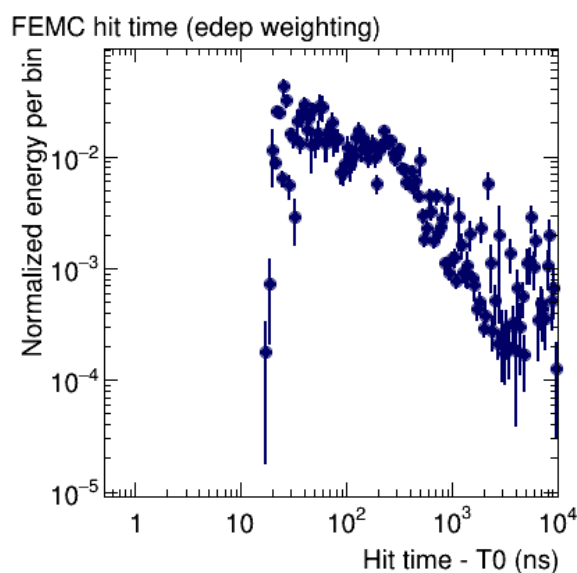
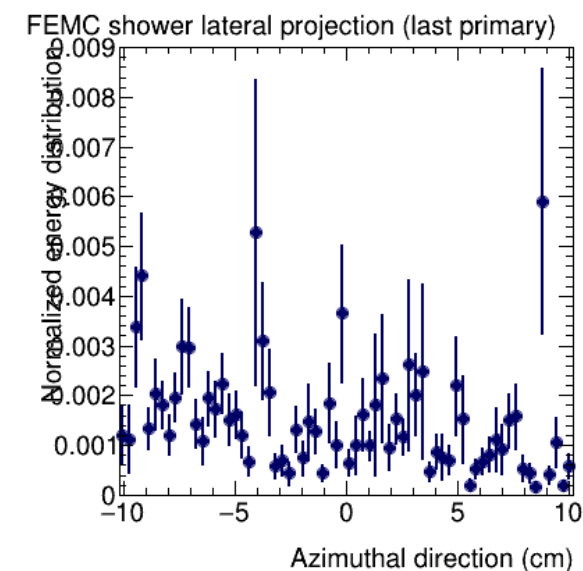
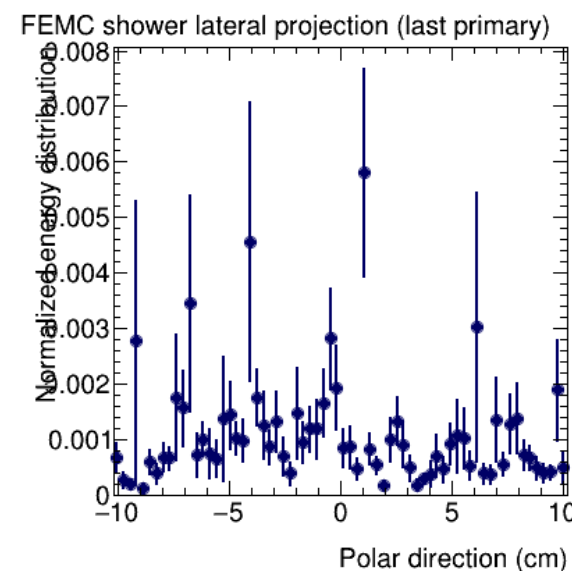
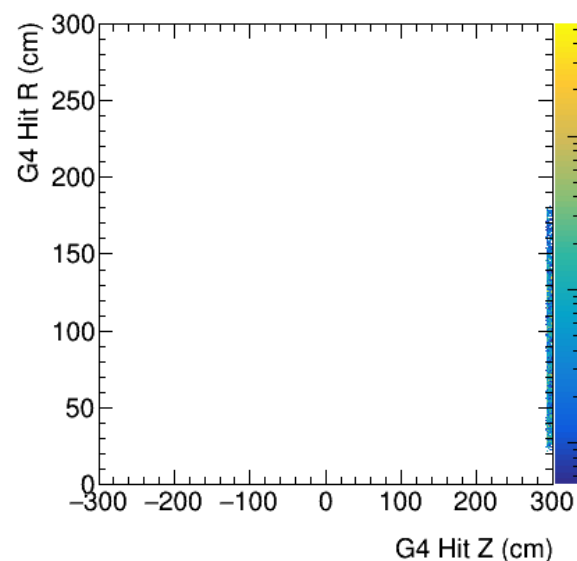
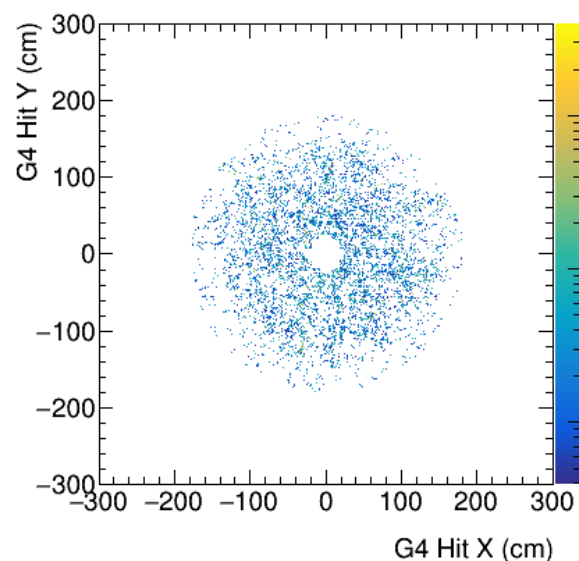


EEMC: eta: -4 to -1.24 (G4Hits)

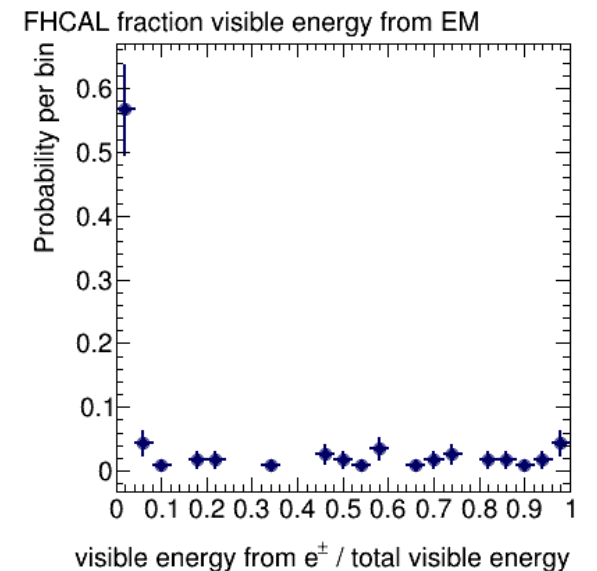
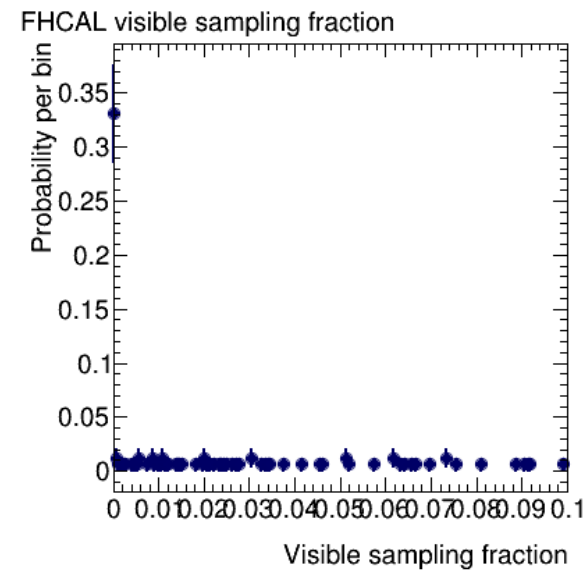
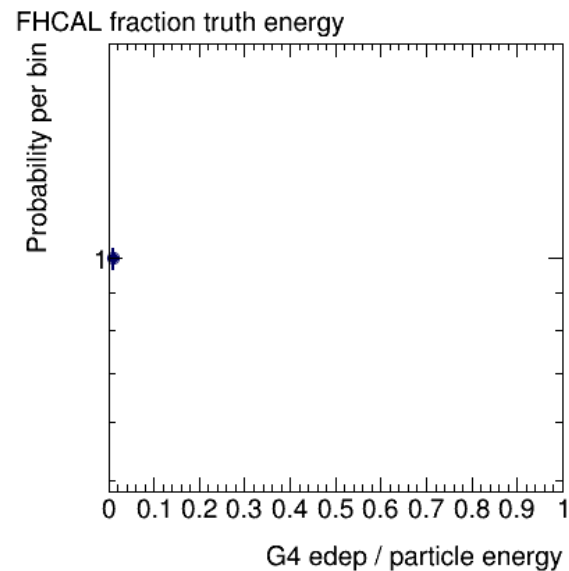
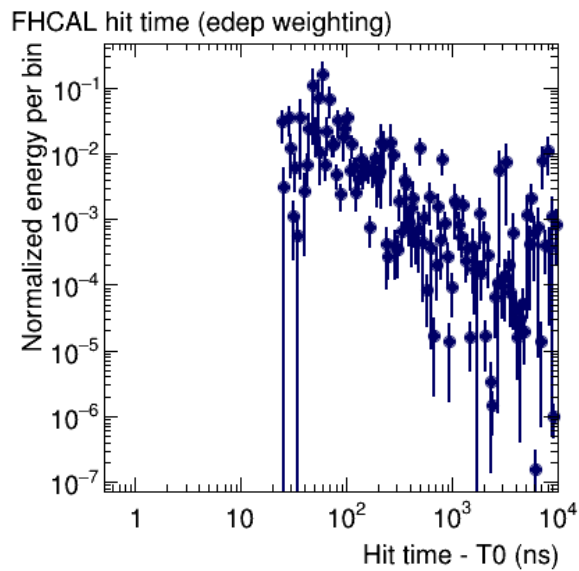
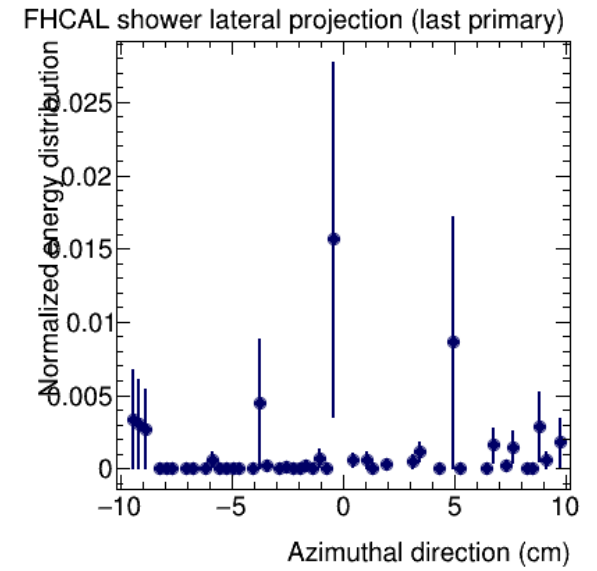
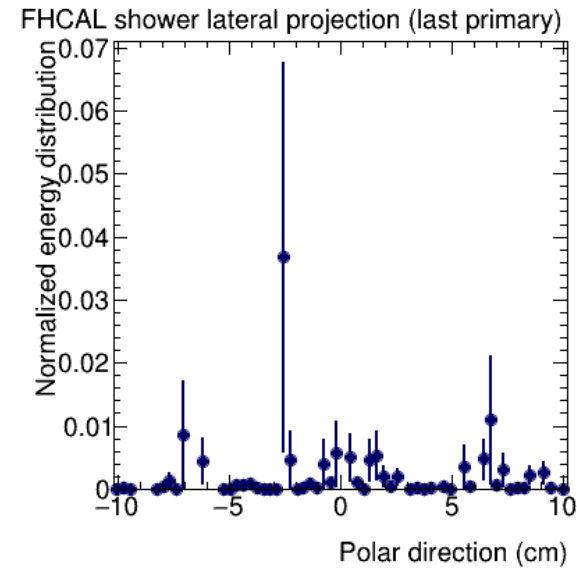
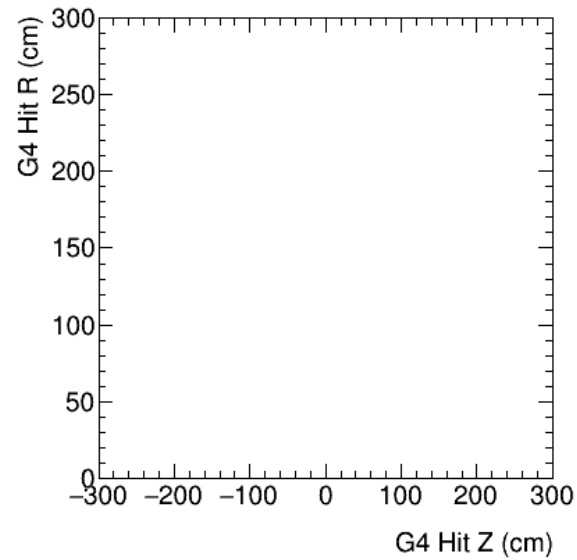
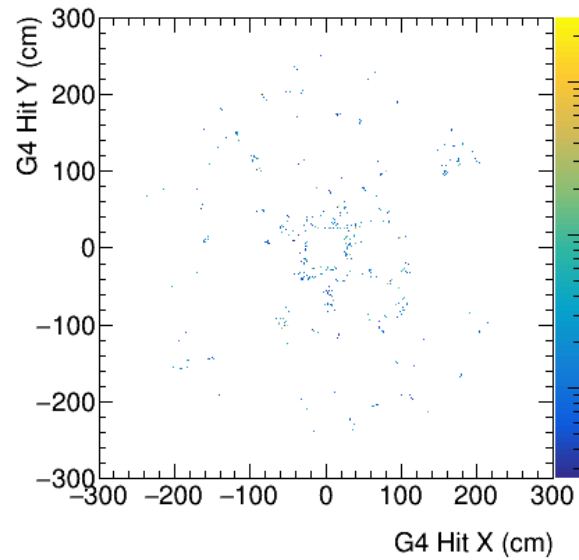


FEMC: eta: -4 to -1.24

(G4Hits)

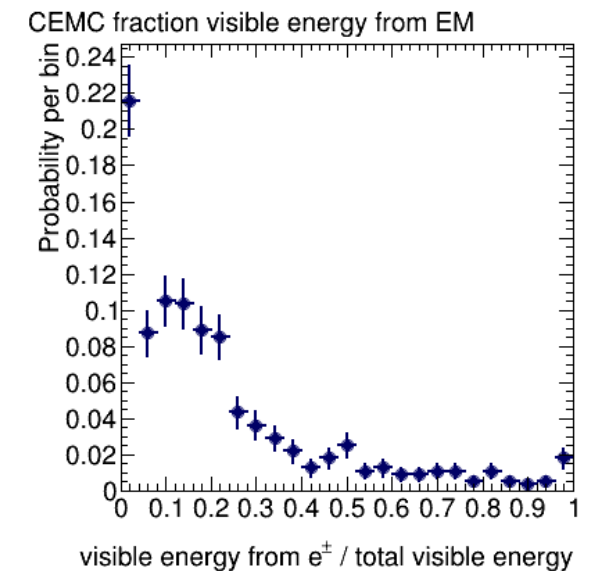
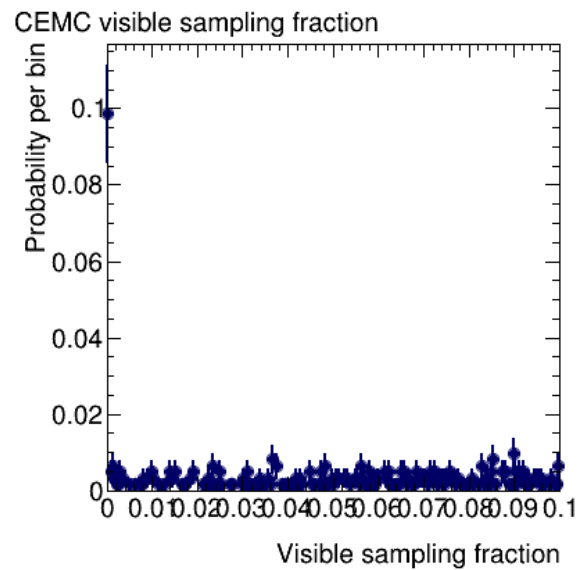
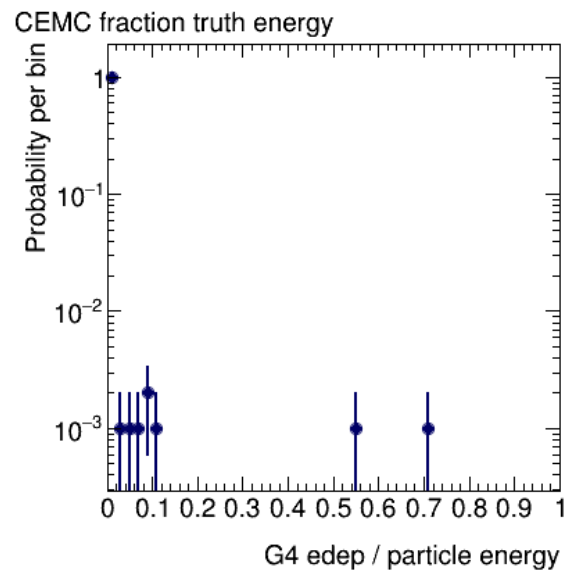
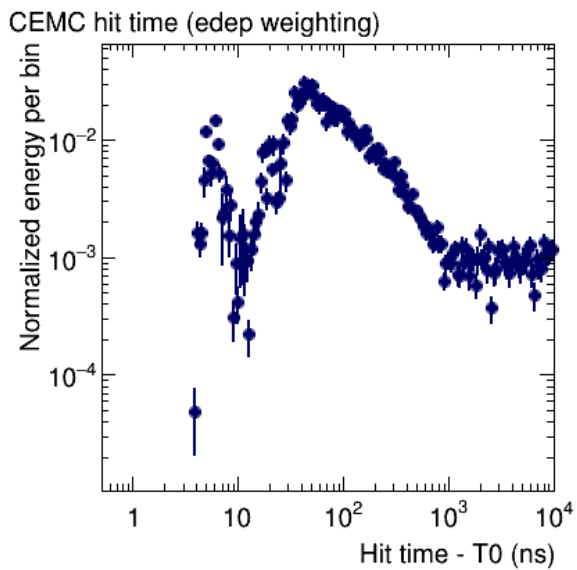
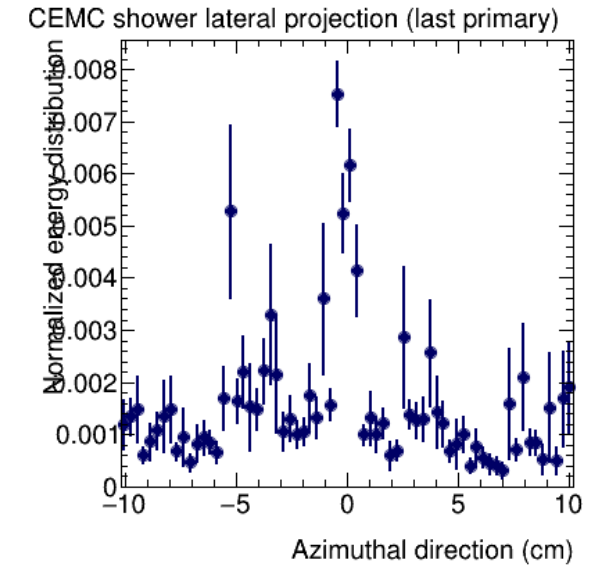
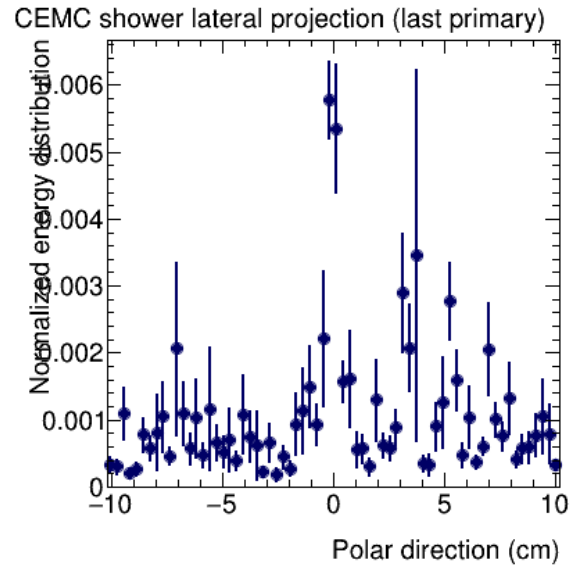
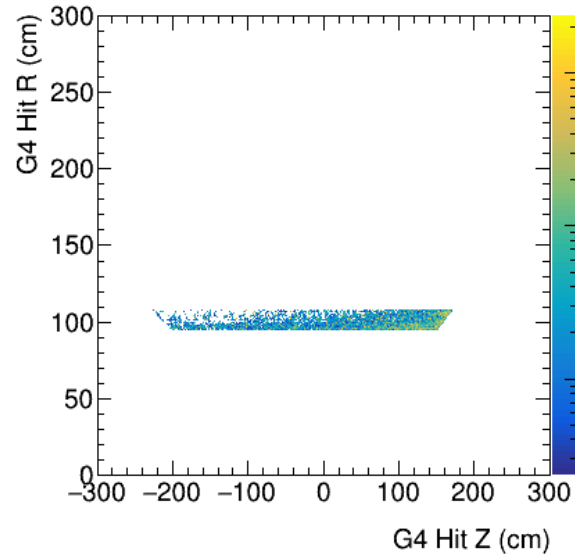
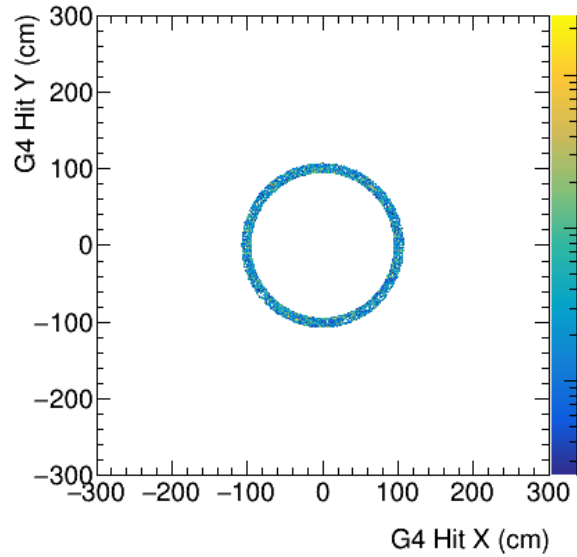


FHCAL: eta: -4 to -1.24 (G4Hits)

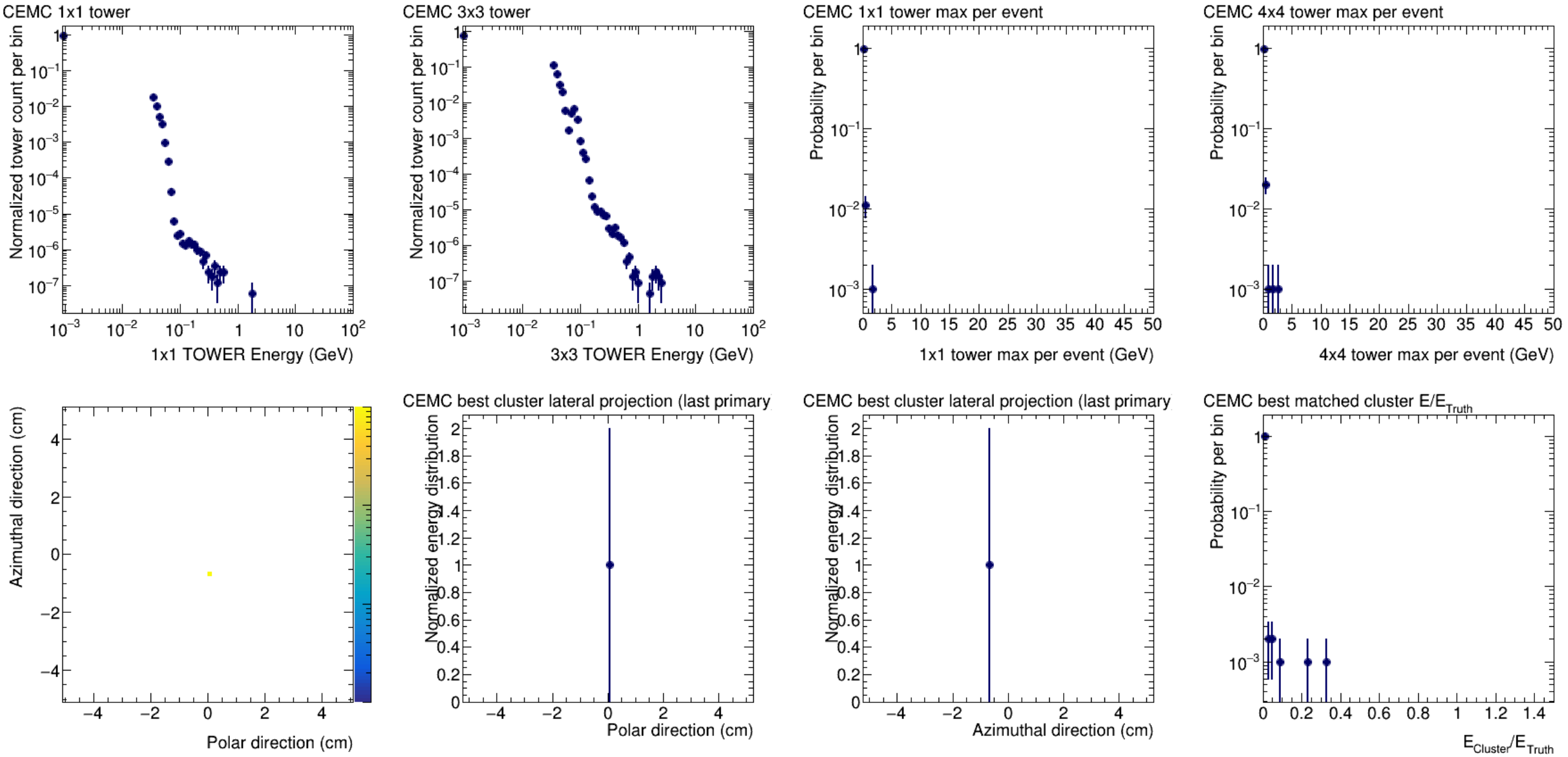


BARREL CALORIMETERS

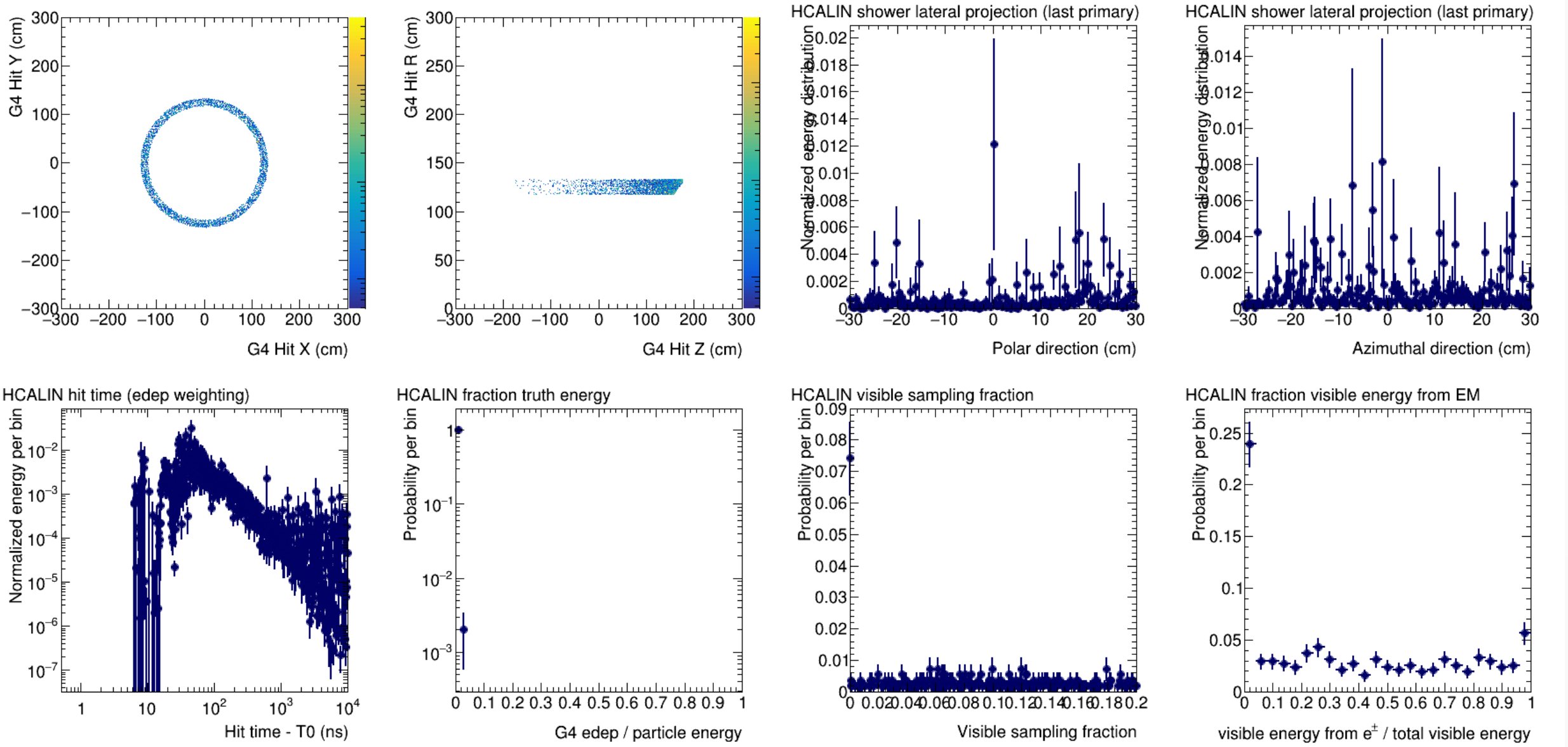
CEMC: eta: 1.24 to 4 (G4Hit)



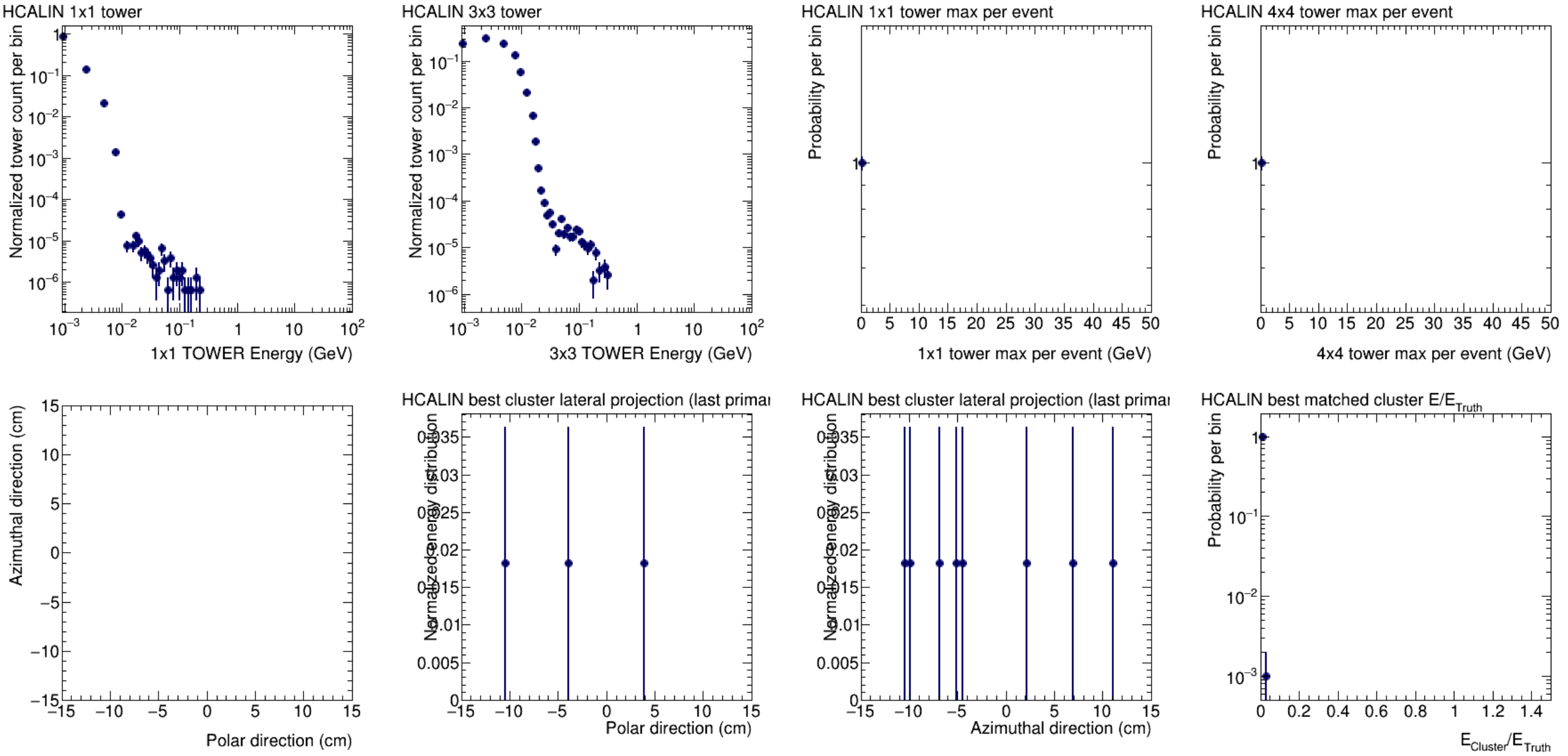
CEMC: eta: 1.24 to 4 (TOWER CLUSTER)



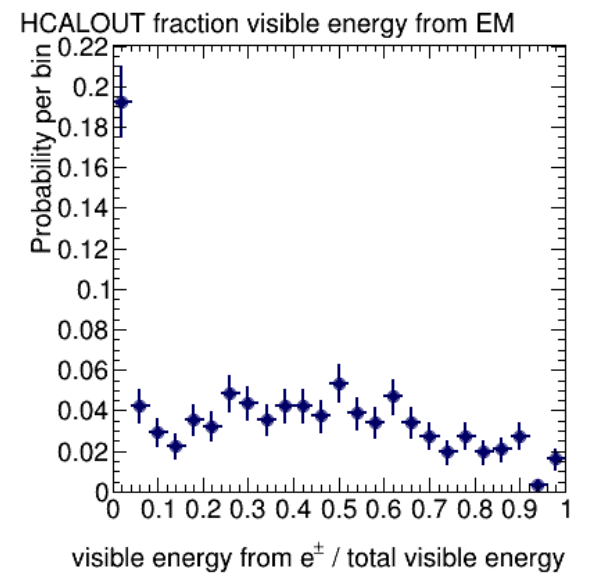
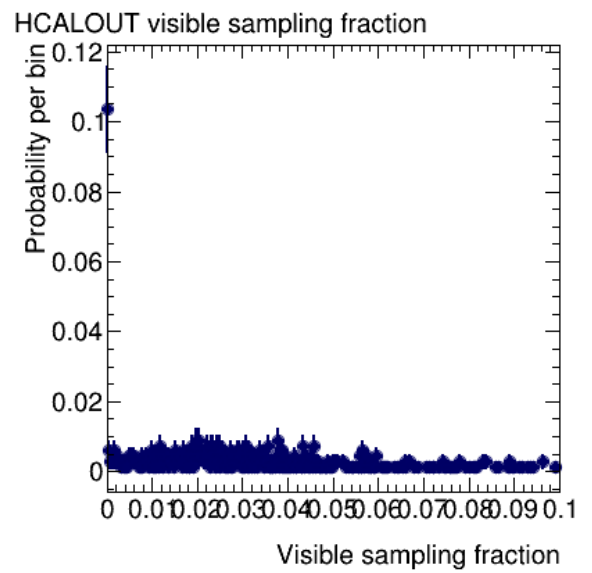
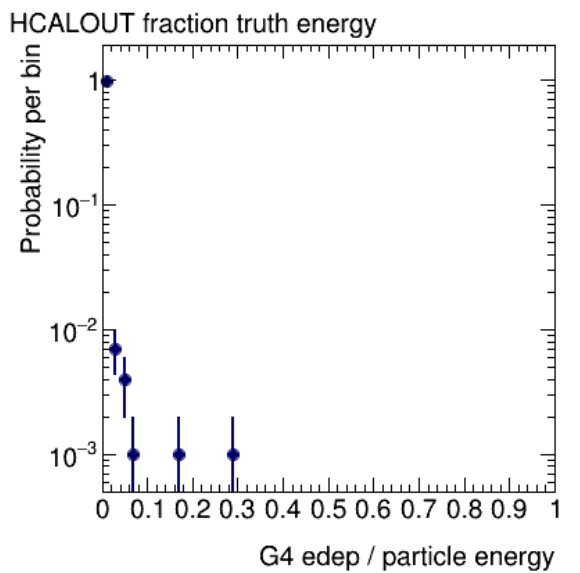
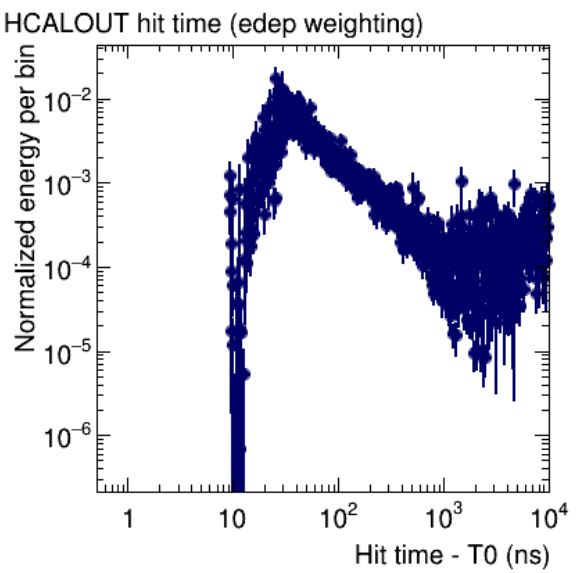
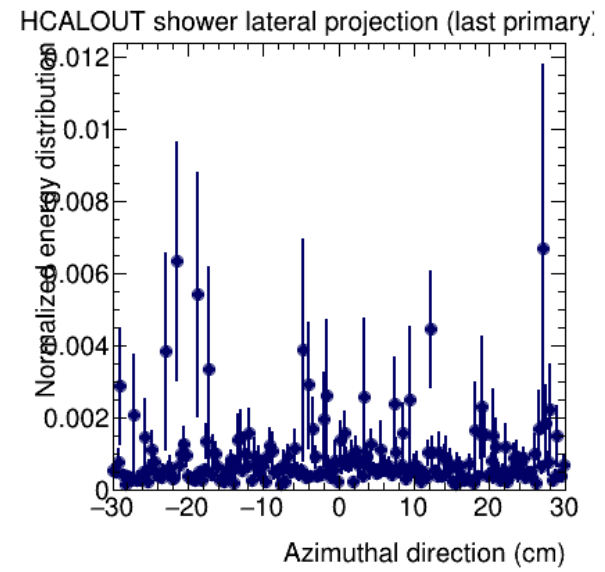
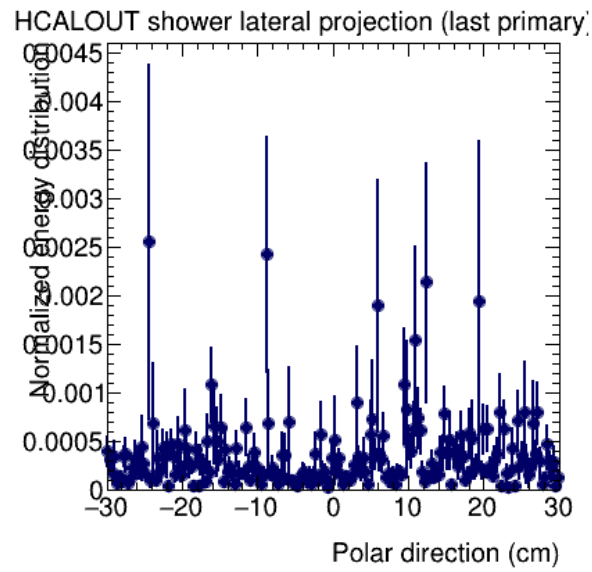
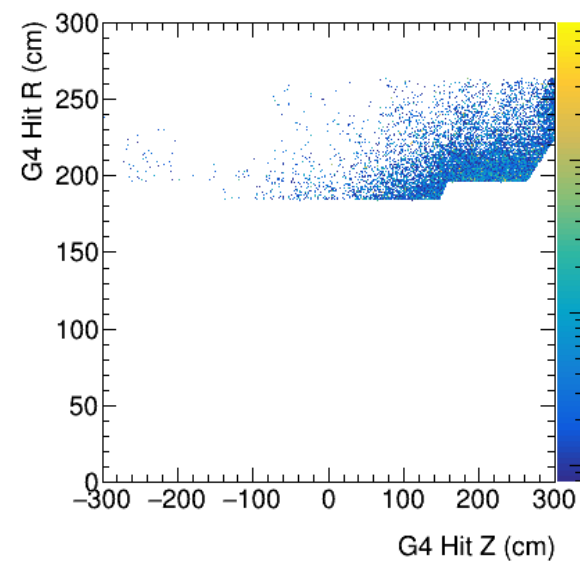
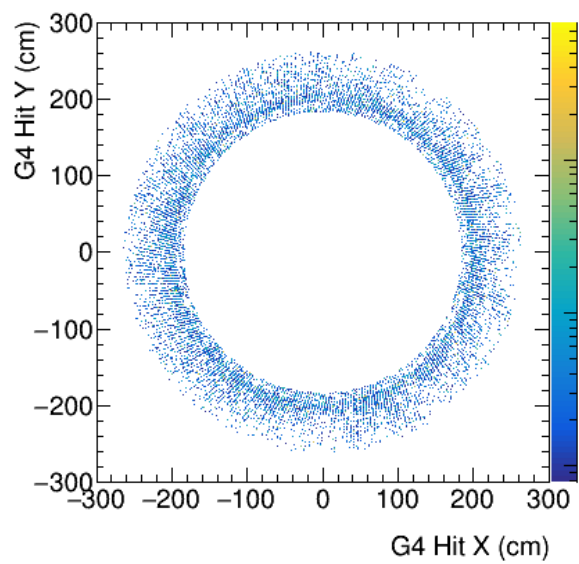
HCALIN: eta: 1.24 to 4 (G4Hits)



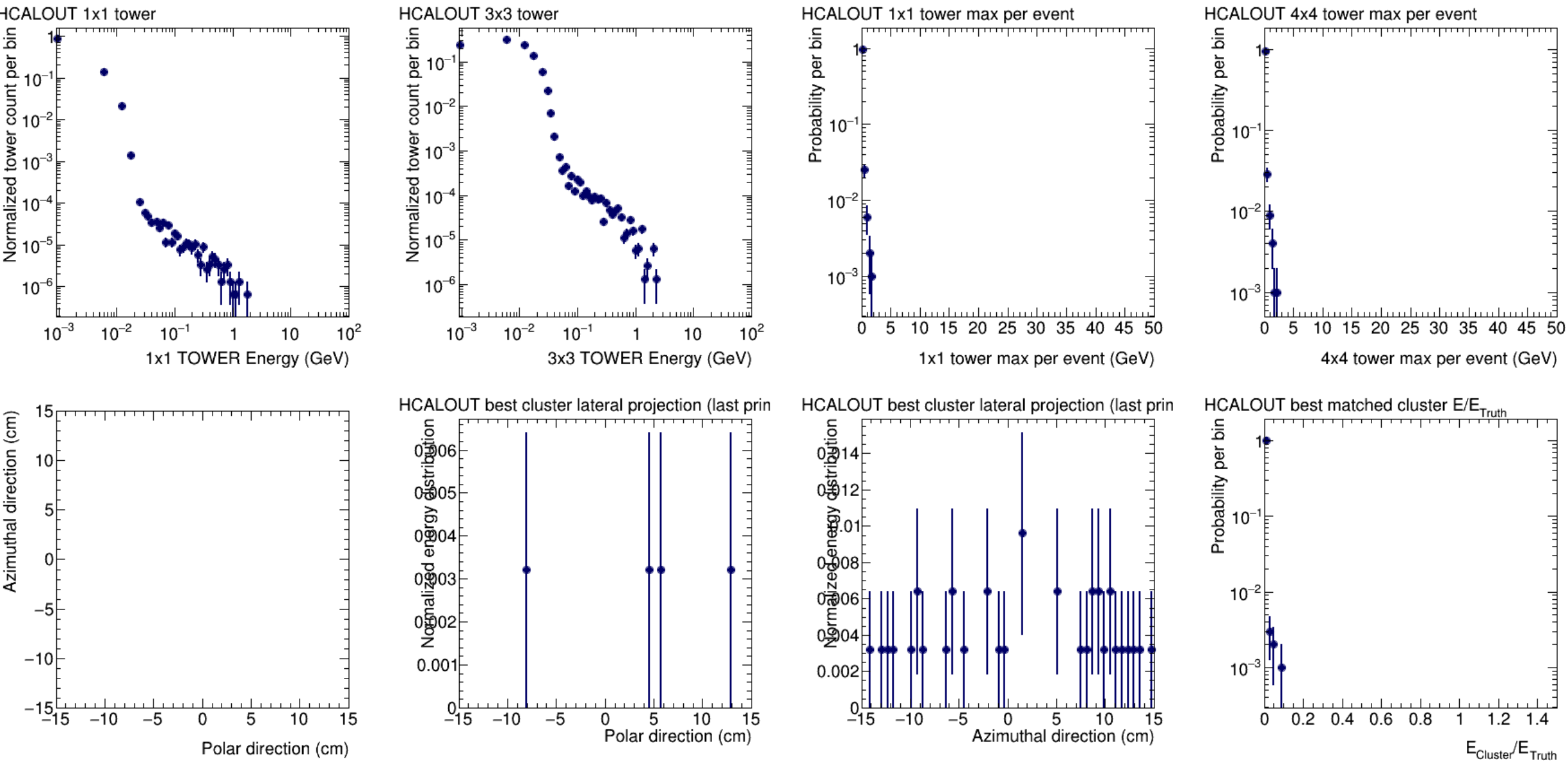
HCALIN: eta: 1.24 to 4 (TOWER CLUSTER)



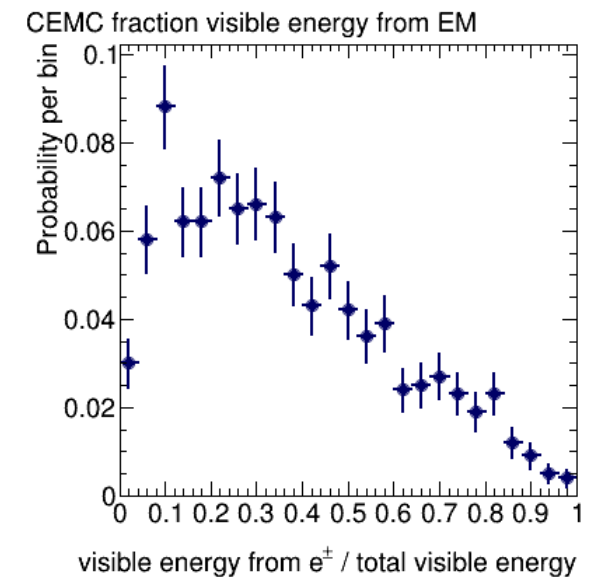
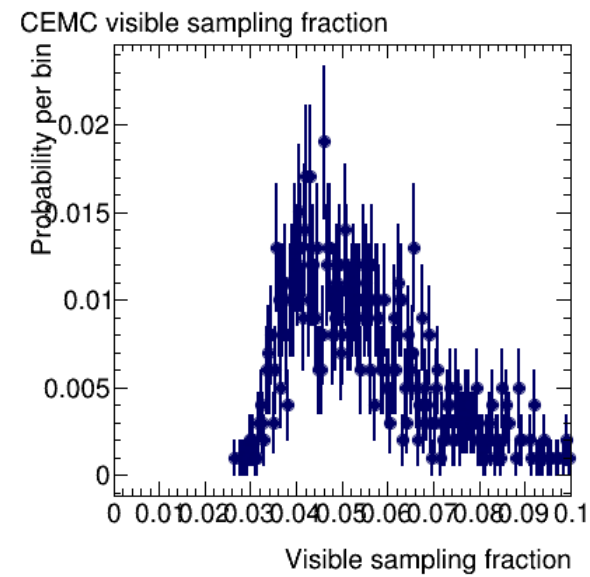
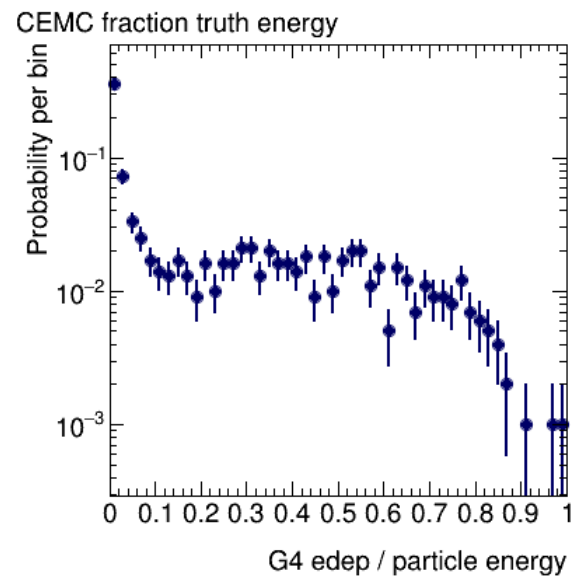
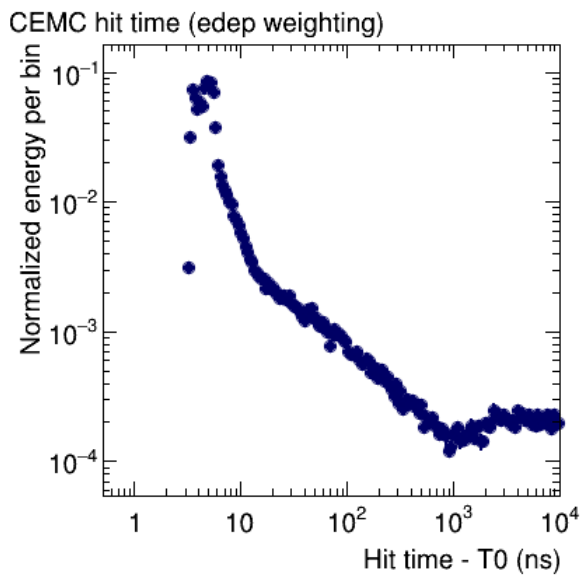
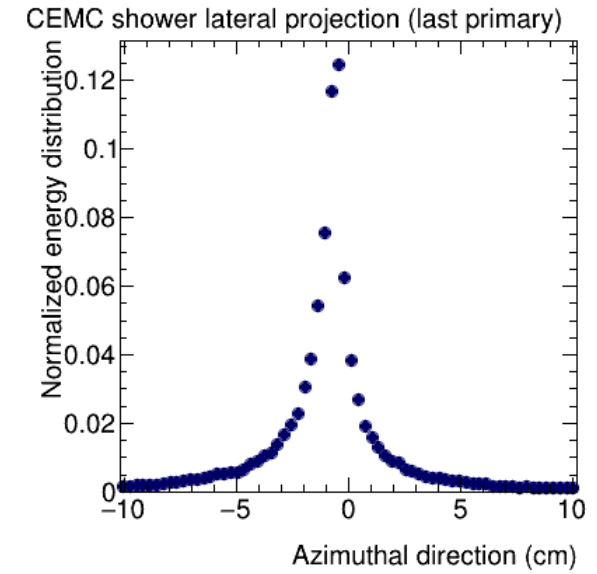
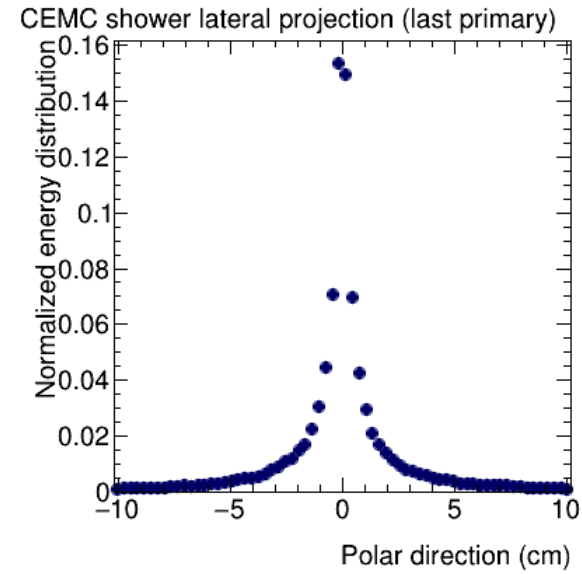
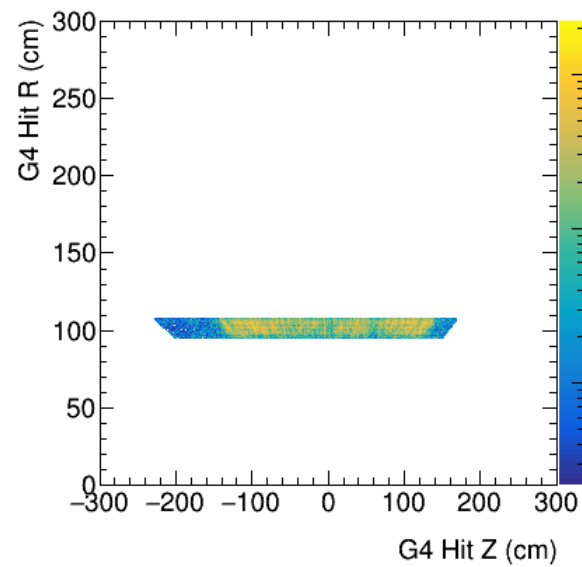
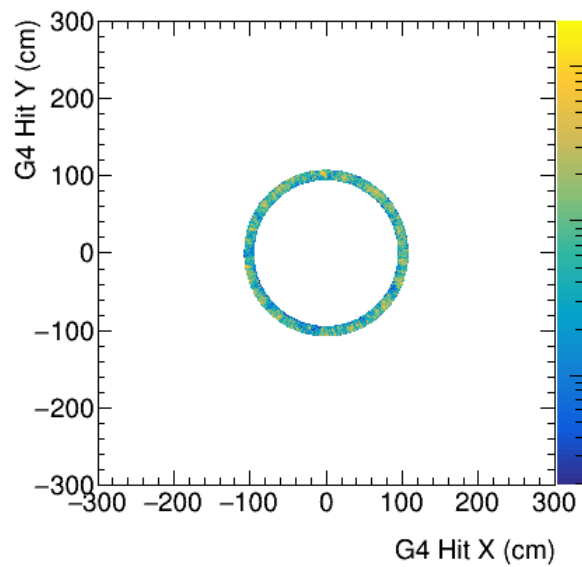
HCALOUT: eta: 1.24 to 4 (G4Hit)



HCALOUT: eta: 1.24 to 4 (TOWER CLUSTER)

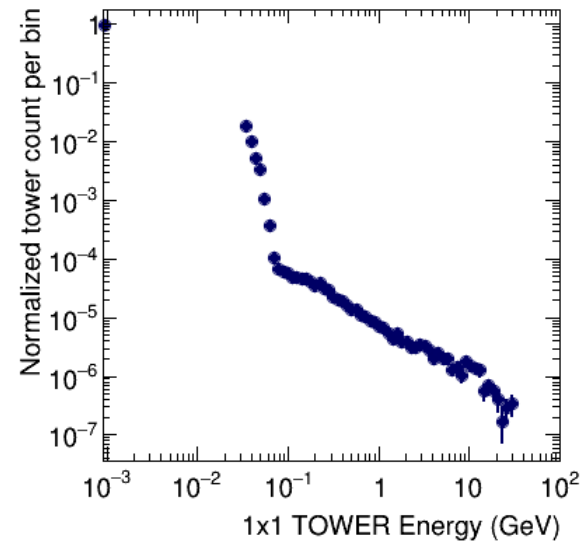


CEMC: eta: -1.1 to 1.1 (G4Hit)

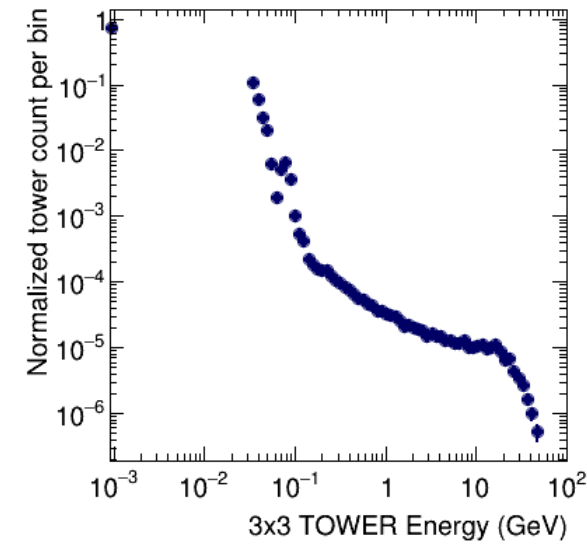


CEMC: eta: -1.1 to 1.1 (TOWER CLUSTER)

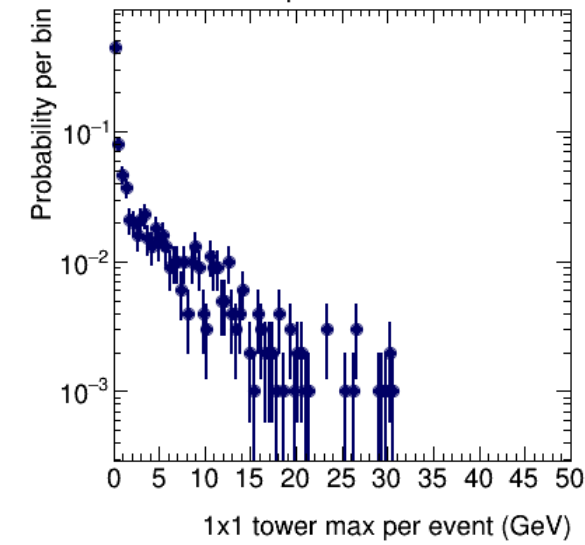
CEMC 1x1 tower



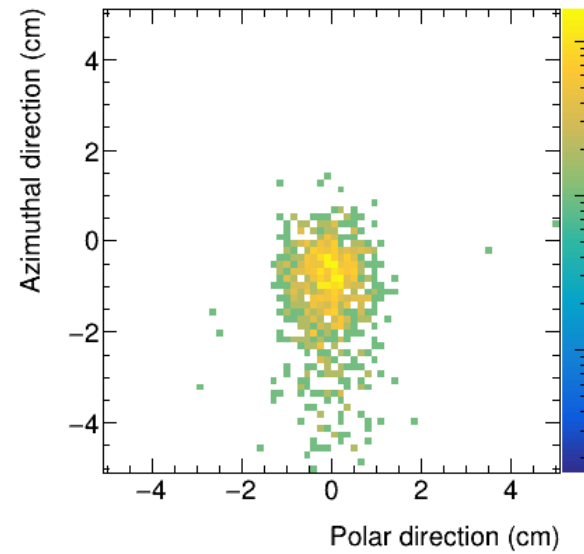
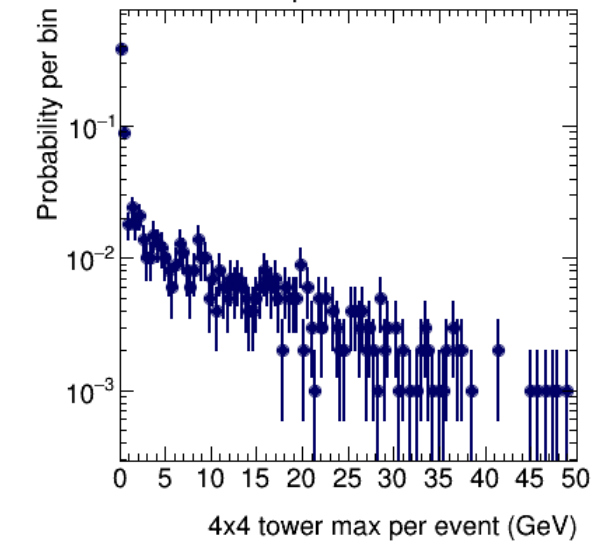
CEMC 3x3 tower



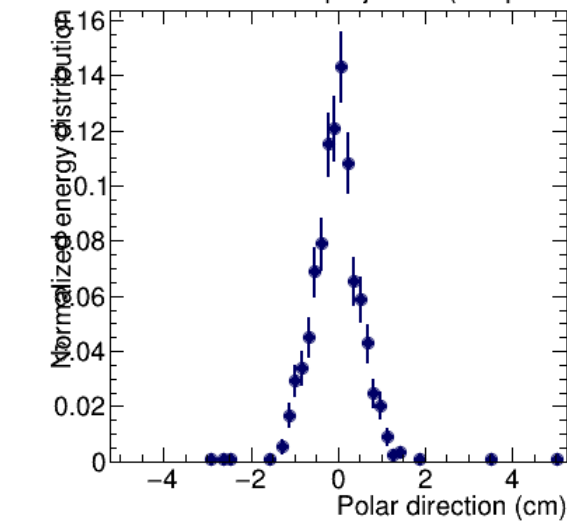
CEMC 1x1 tower max per event



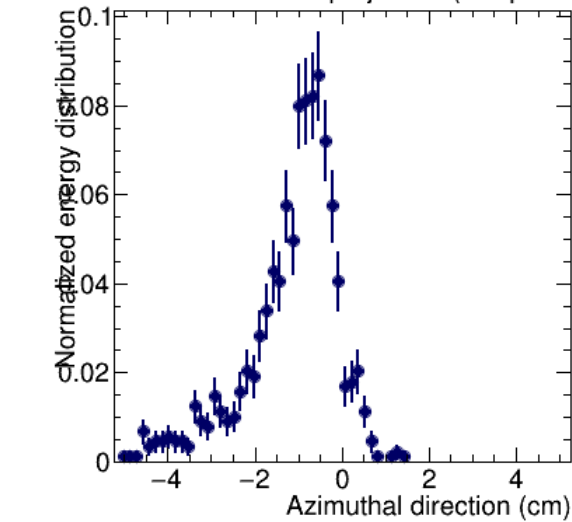
CEMC 4x4 tower max per event



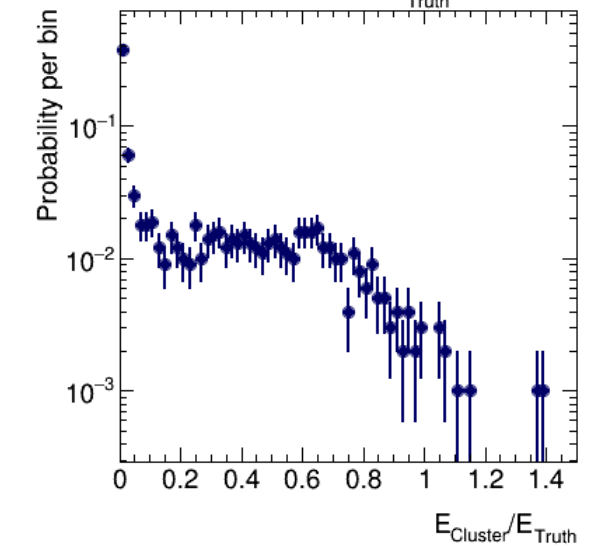
CEMC best cluster lateral projection (last primary)



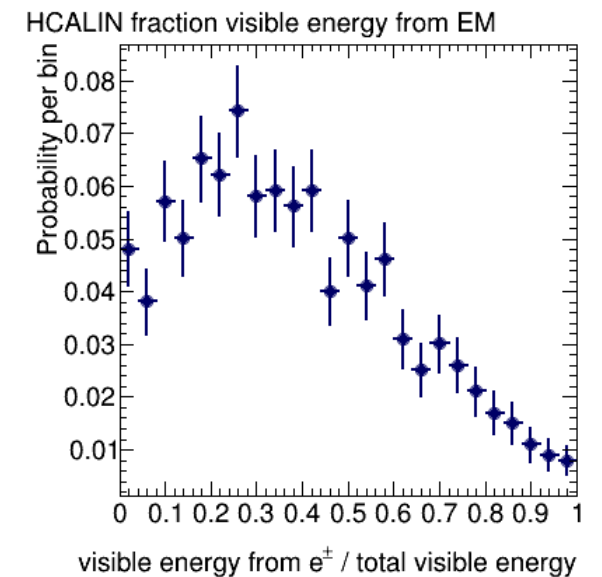
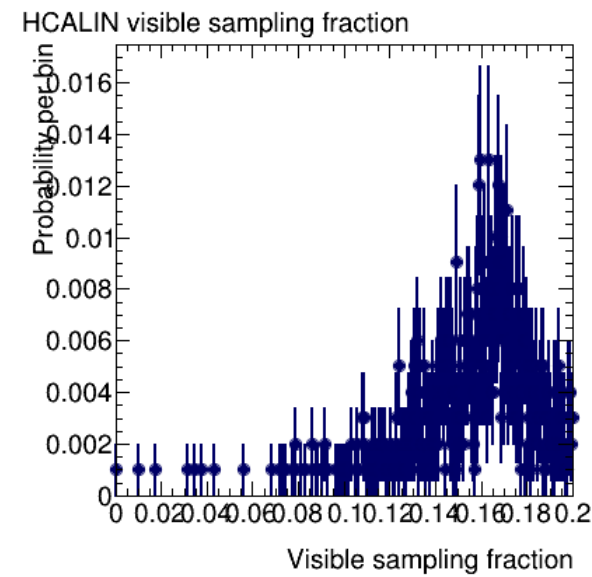
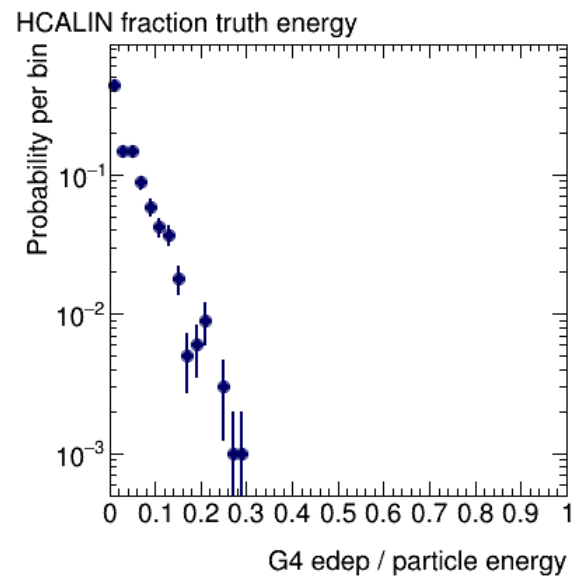
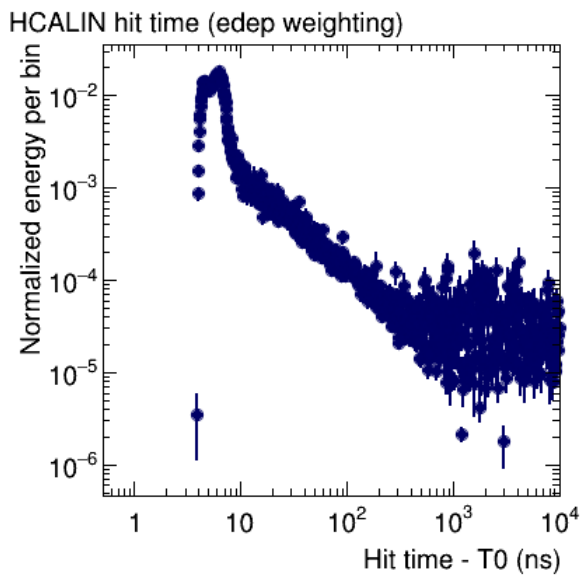
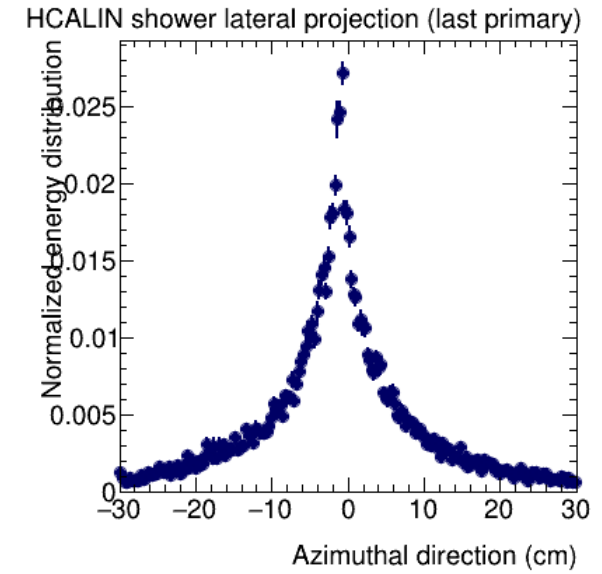
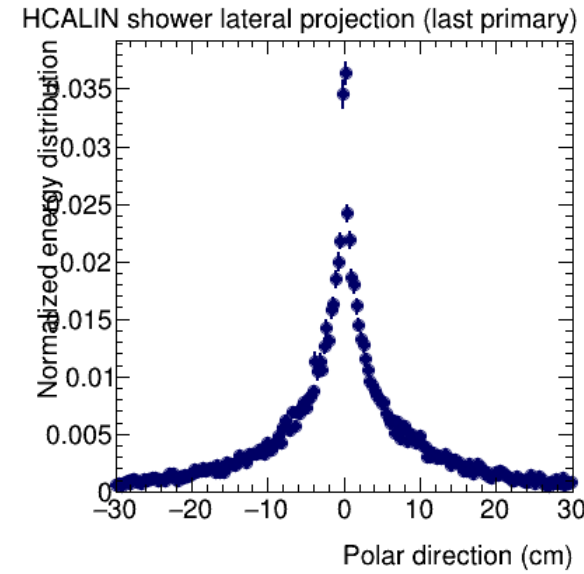
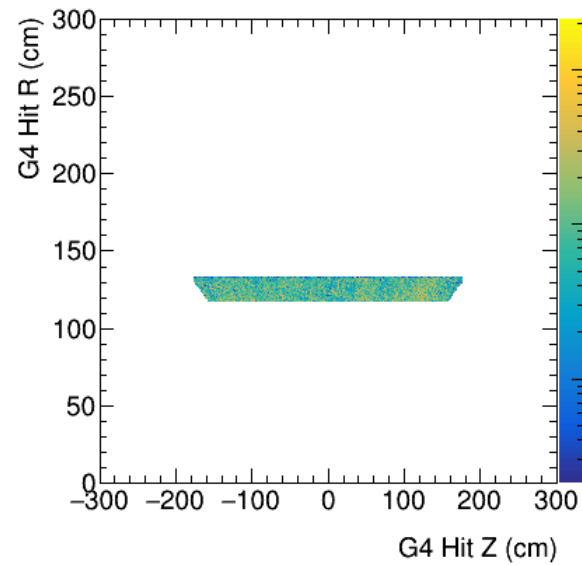
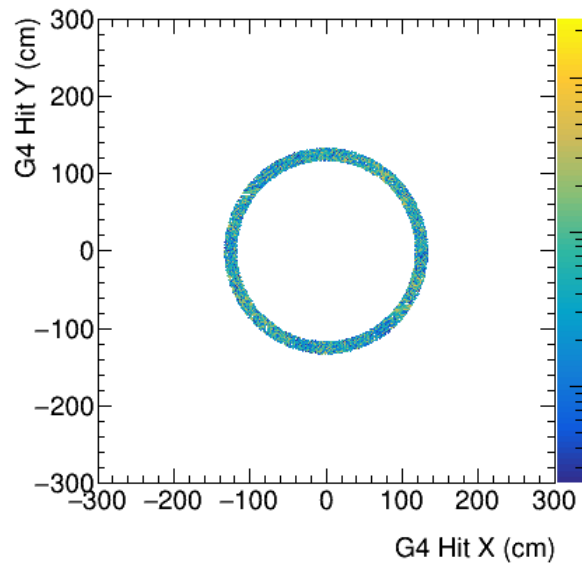
CEMC best cluster lateral projection (last primary)



CEMC best matched cluster E/E_{Truth}

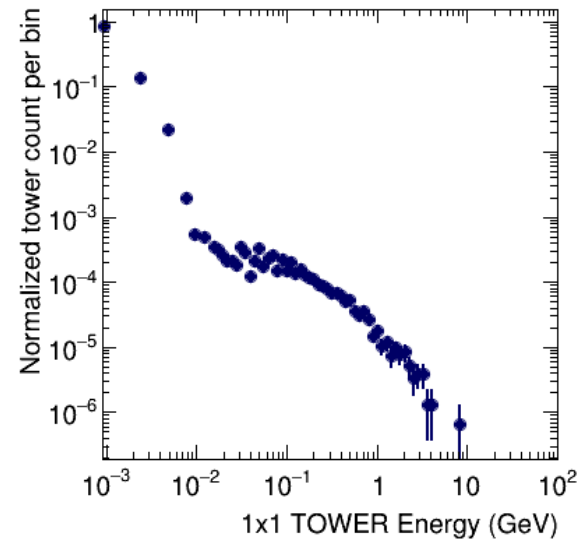


HCALIN: eta: -1.1 to 1.1 (G4Hit)

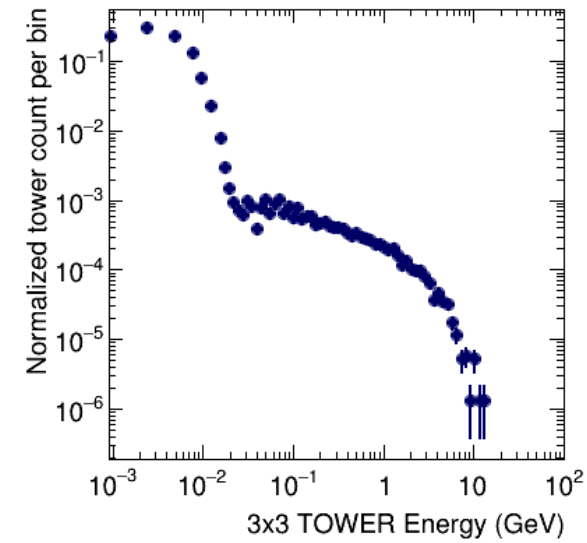


HCALIN: eta: -1.1 to 1.1 (TOWER CLUSTER)

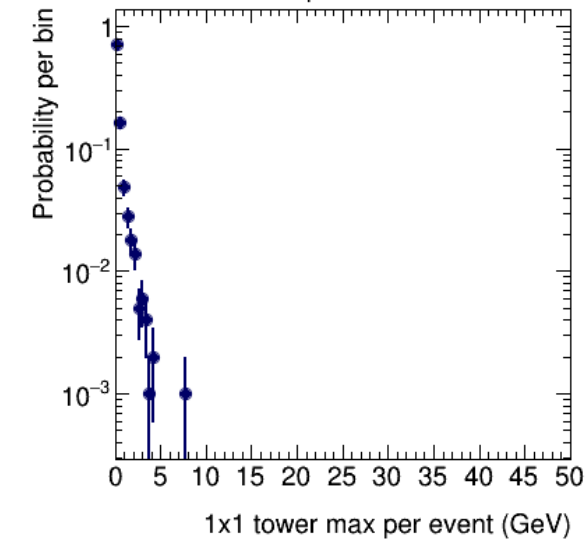
HCALIN 1x1 tower



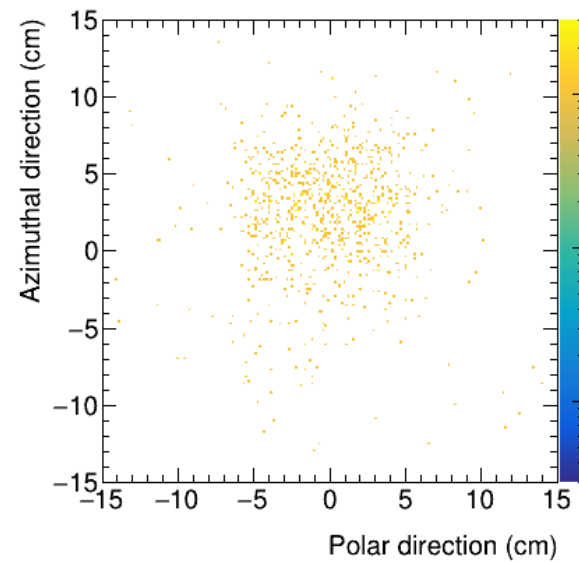
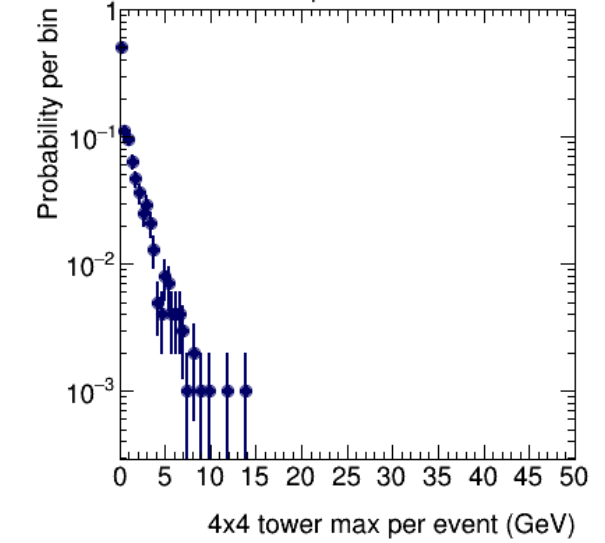
HCALIN 3x3 tower



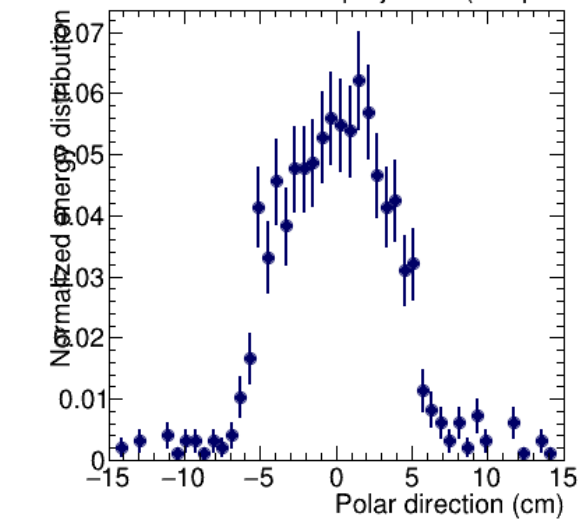
HCALIN 1x1 tower max per event



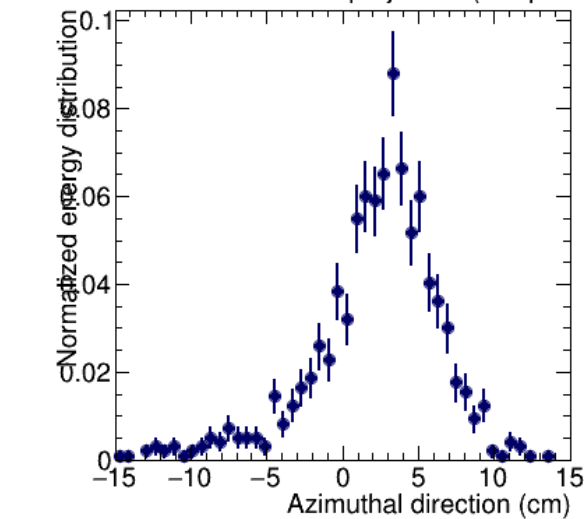
HCALIN 4x4 tower max per event



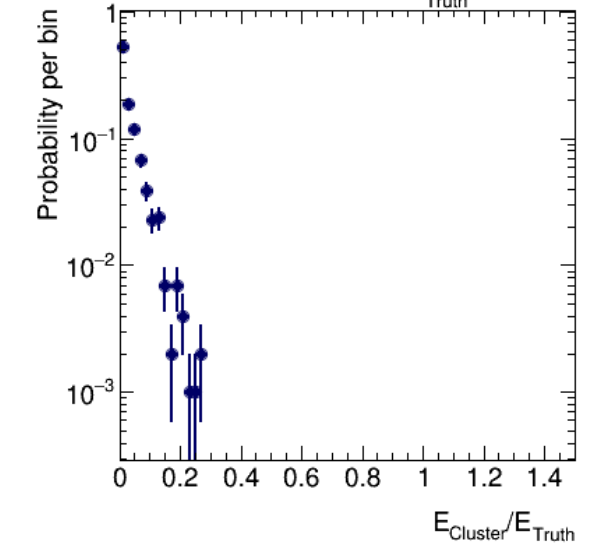
HCALIN best cluster lateral projection (last primary)



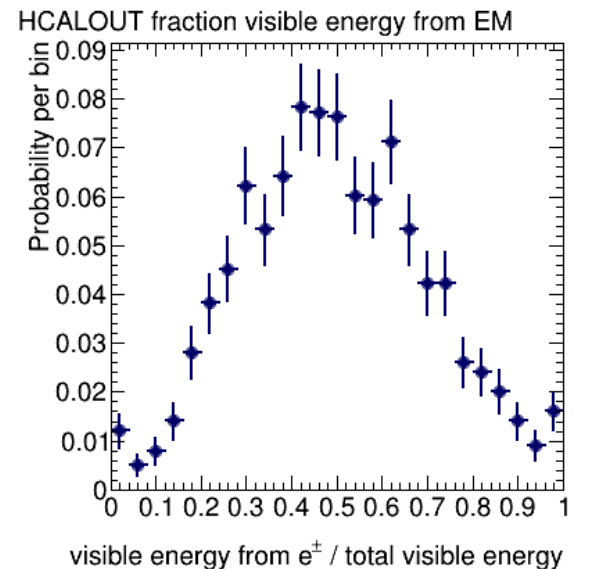
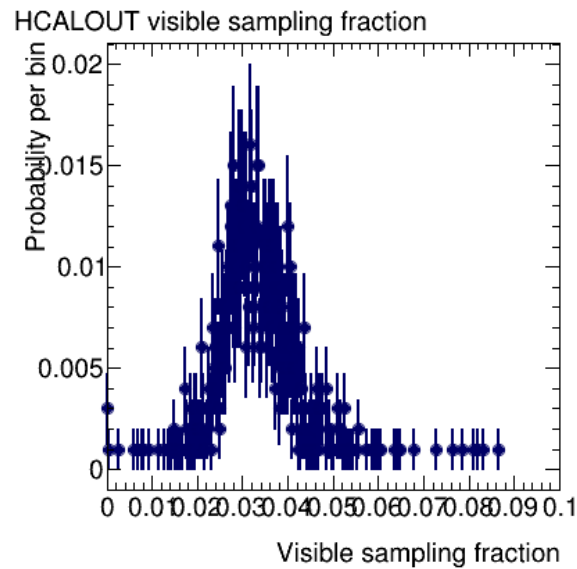
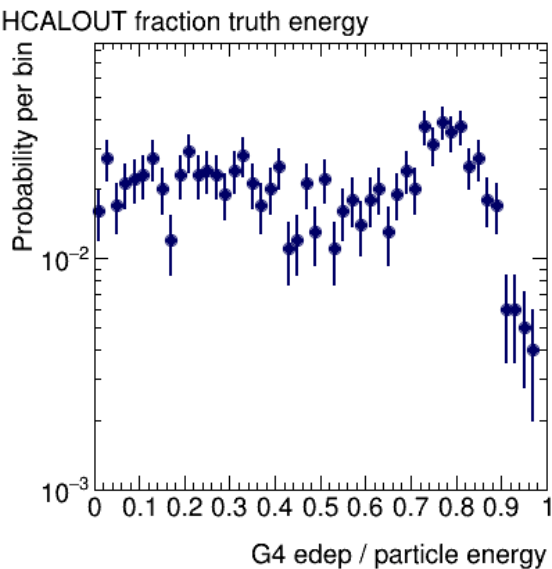
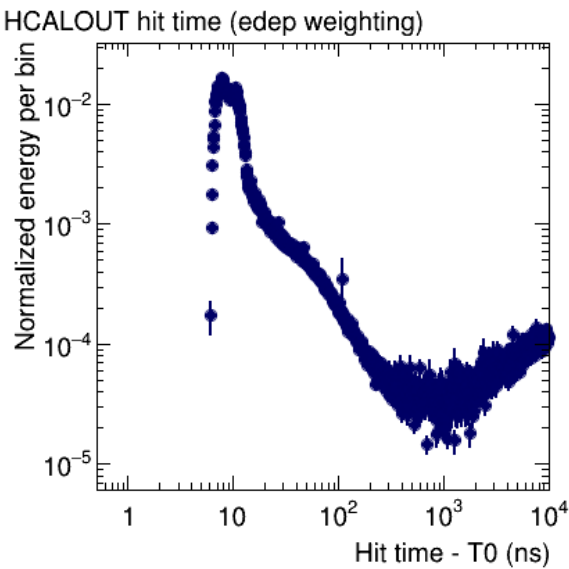
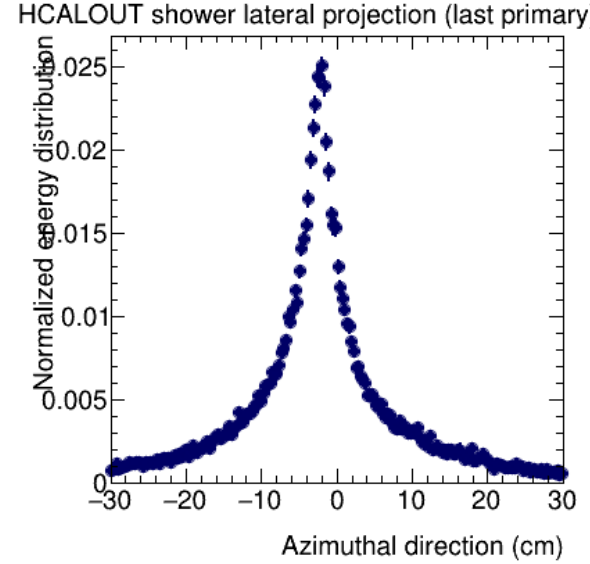
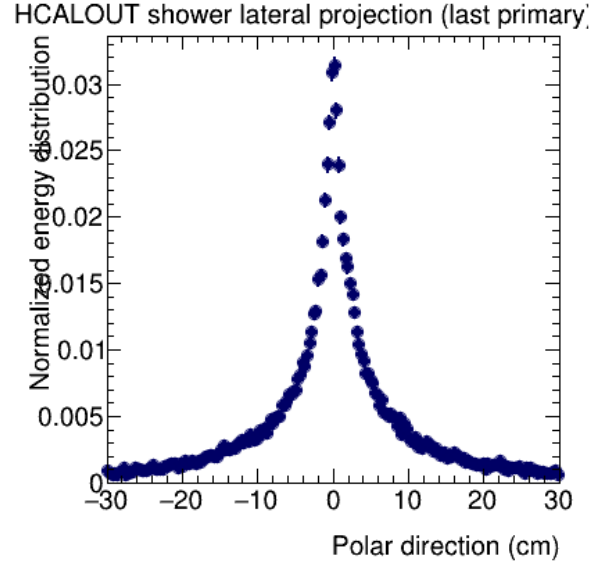
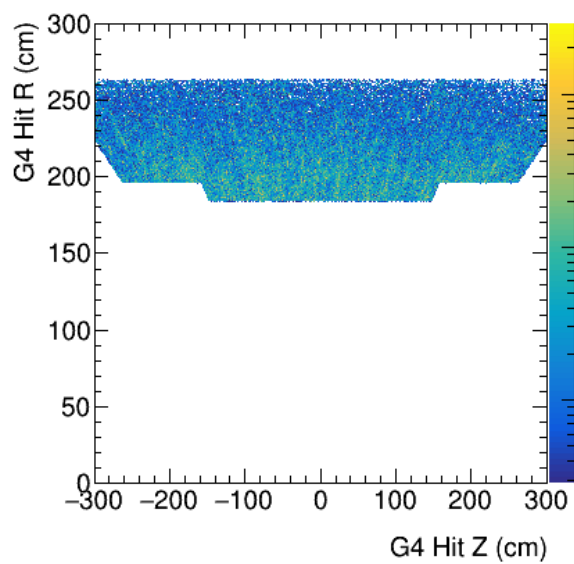
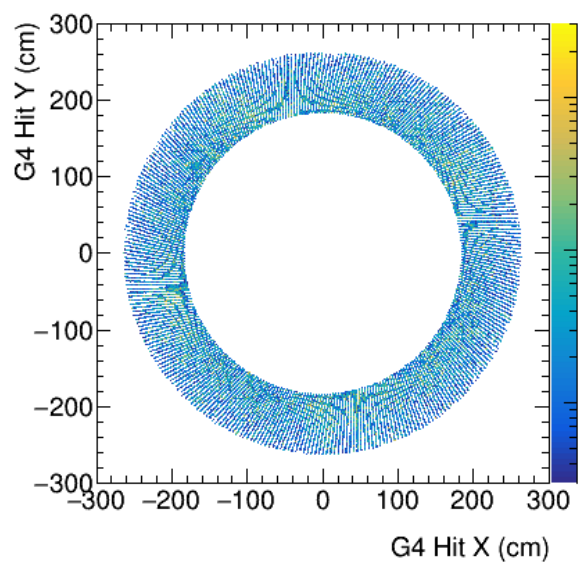
HCALIN best cluster lateral projection (last primary)



HCALIN best matched cluster E/E_{Truth}

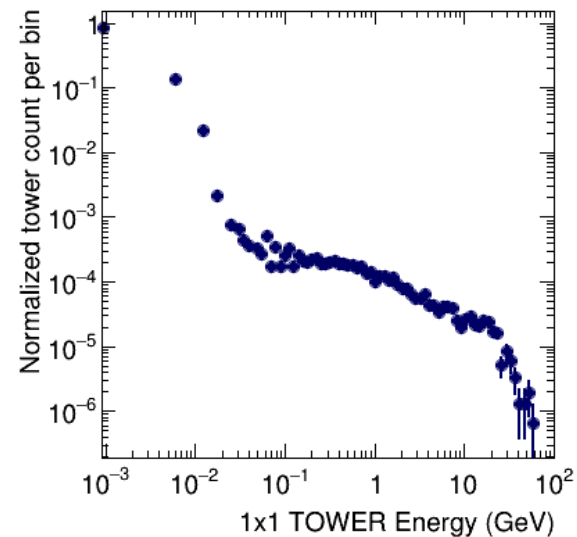


HCALOUT: eta: -1.1 to 1.1 (G4Hit)

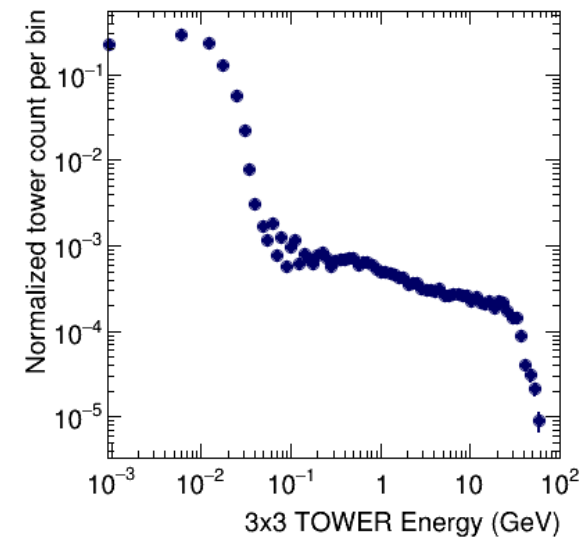


HCALOUT: eta: -1.1 to 1.1 (TOWER CLUSTER)

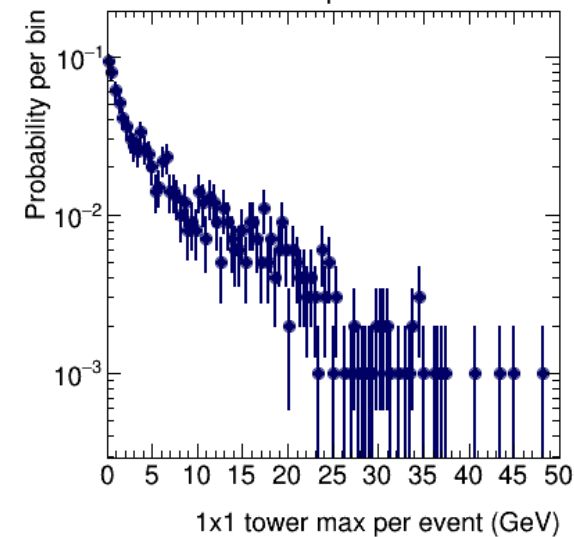
HCALOUT 1x1 tower



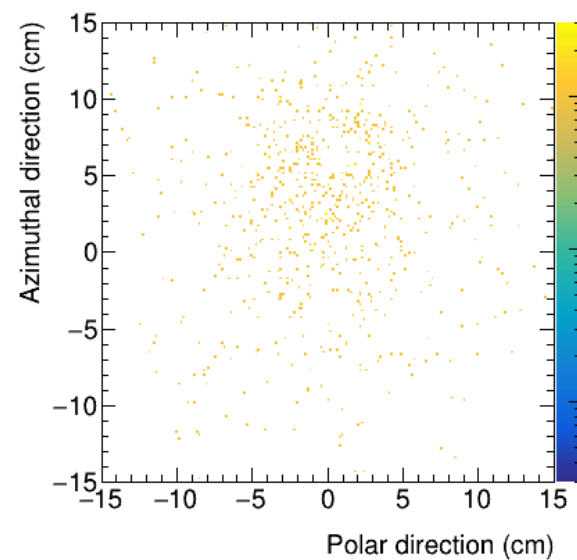
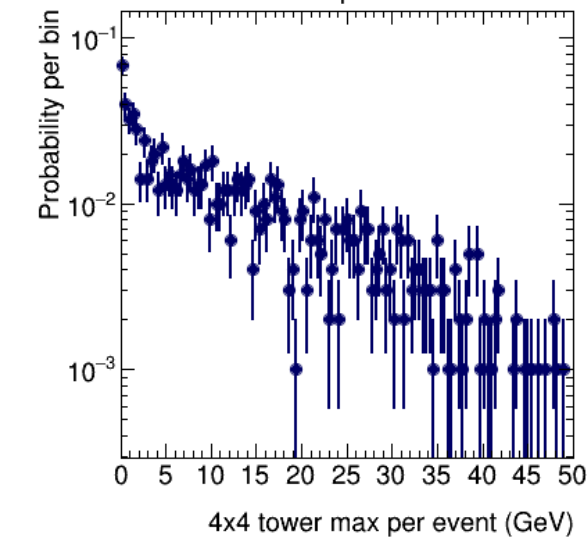
HCALOUT 3x3 tower



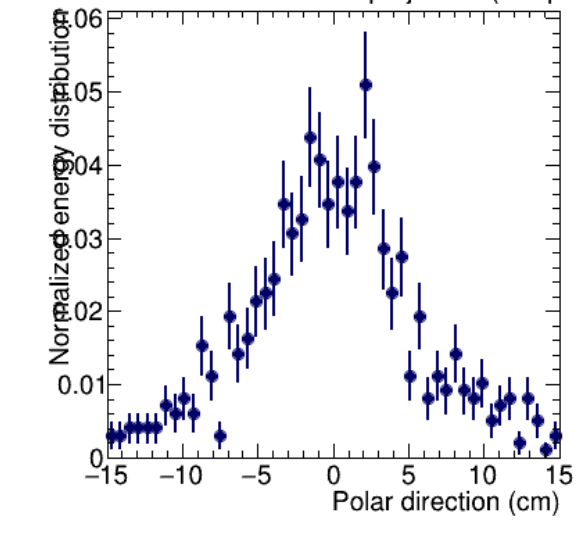
HCALOUT 1x1 tower max per event



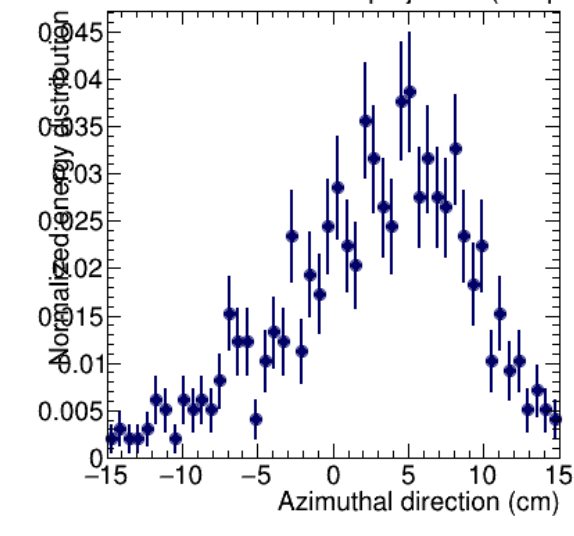
HCALOUT 4x4 tower max per event



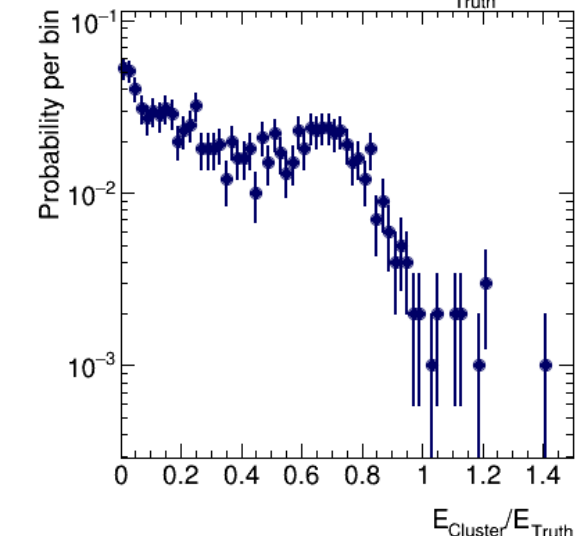
HCALOUT best cluster lateral projection (last prin



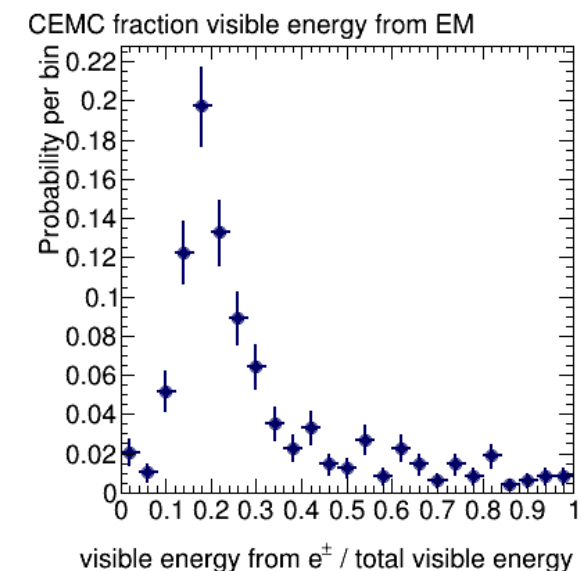
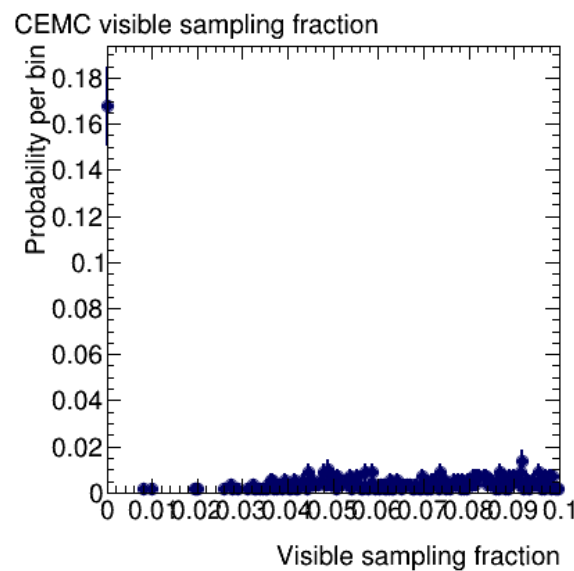
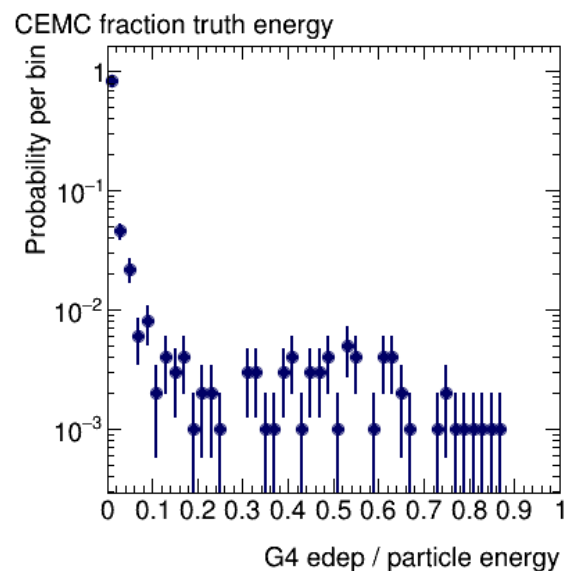
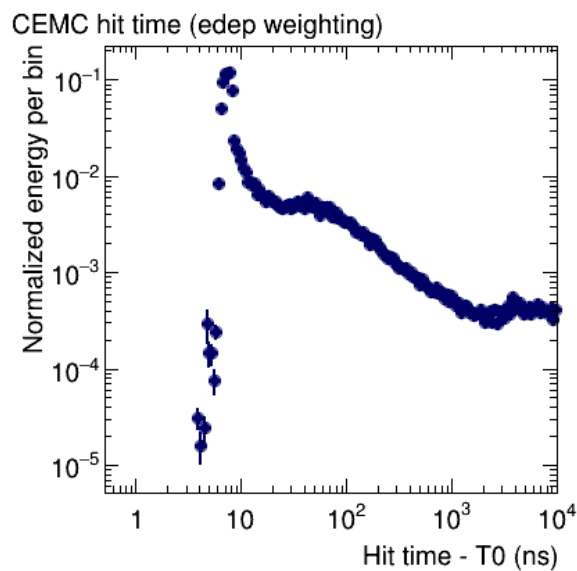
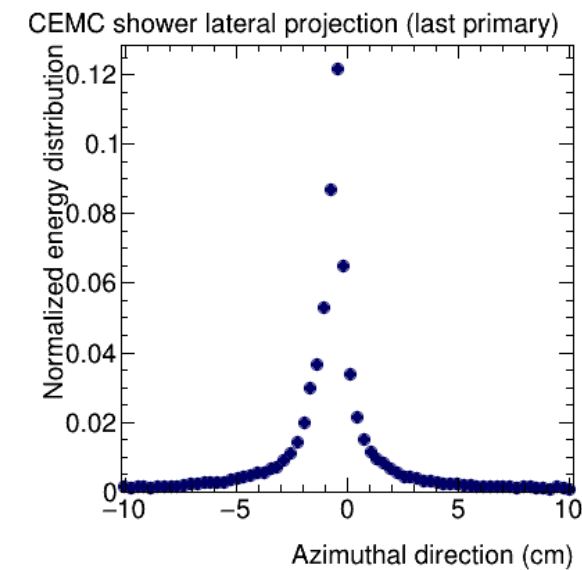
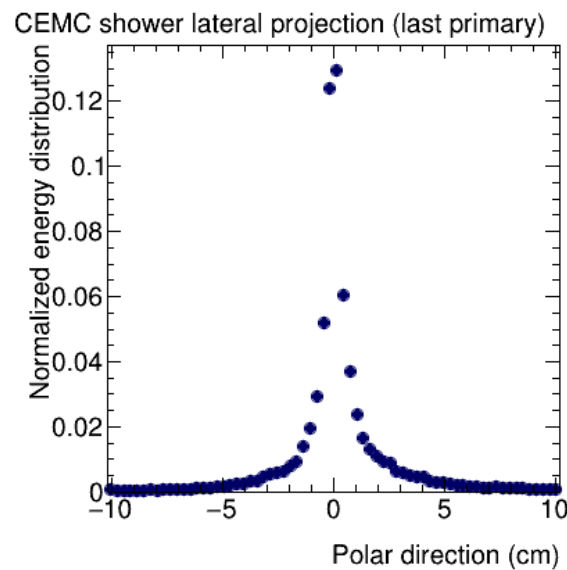
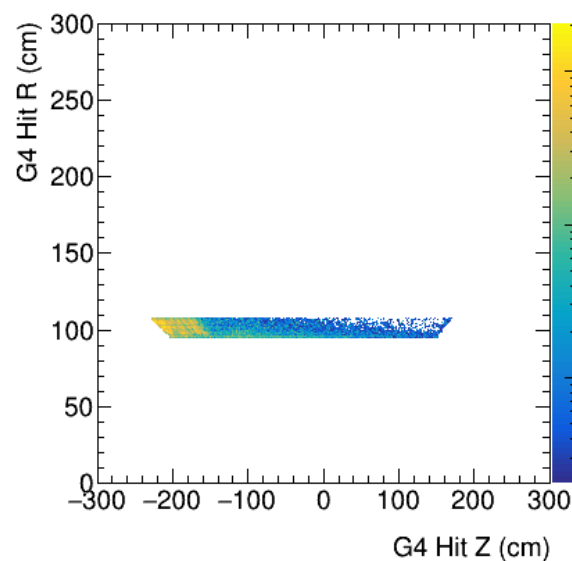
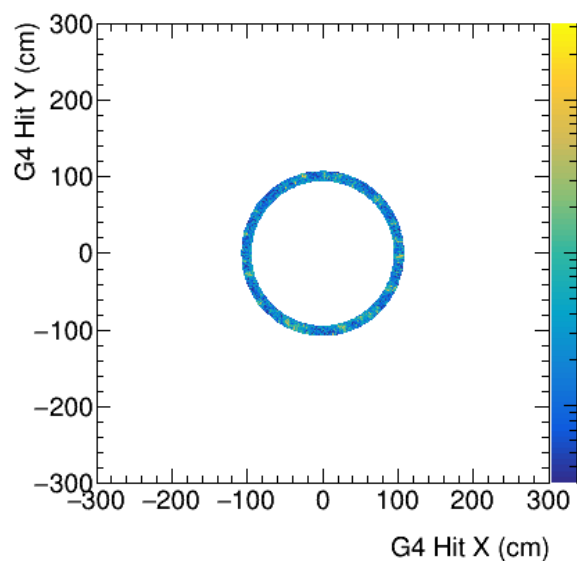
HCALOUT best cluster lateral projection (last prin



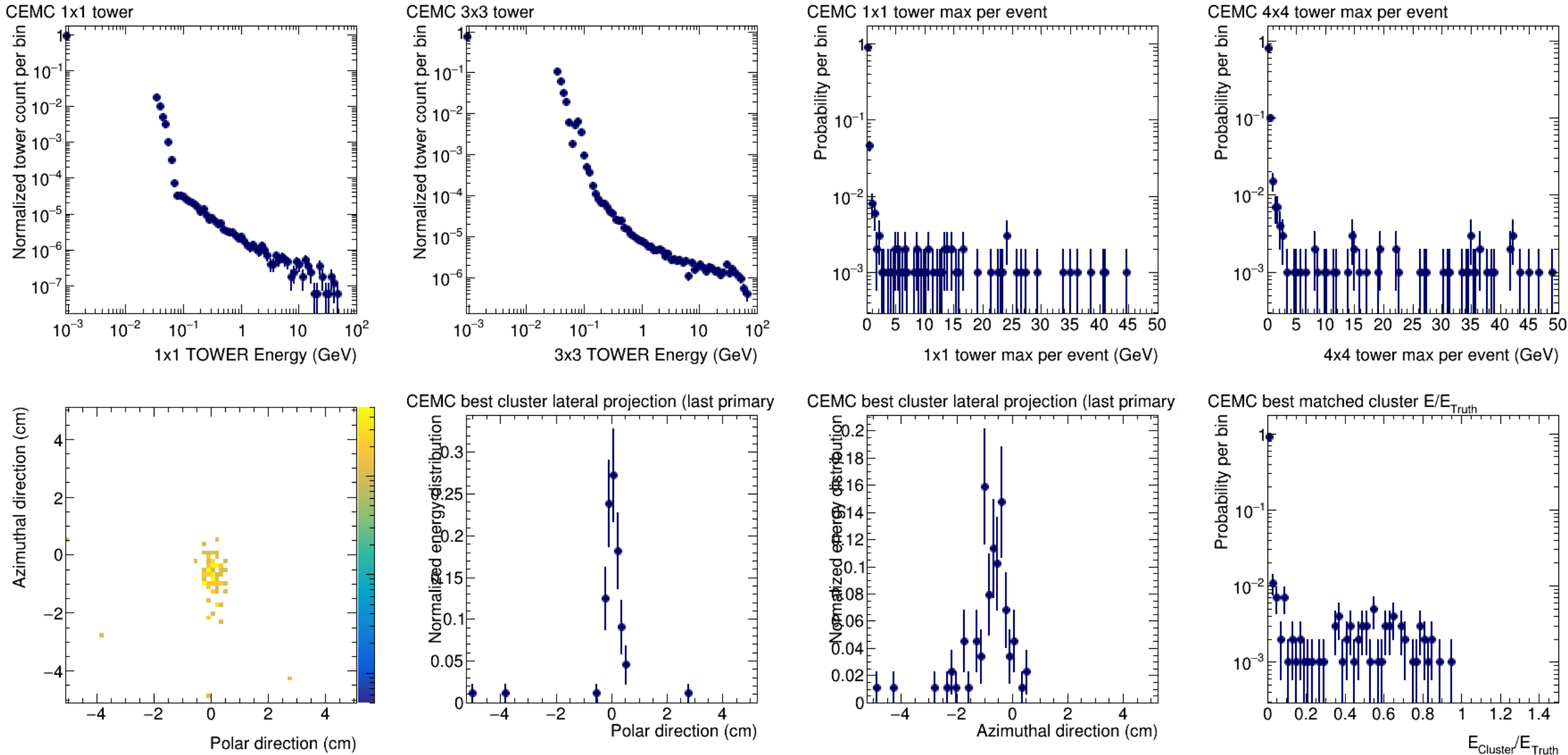
HCALOUT best matched cluster E/E_{Truth}



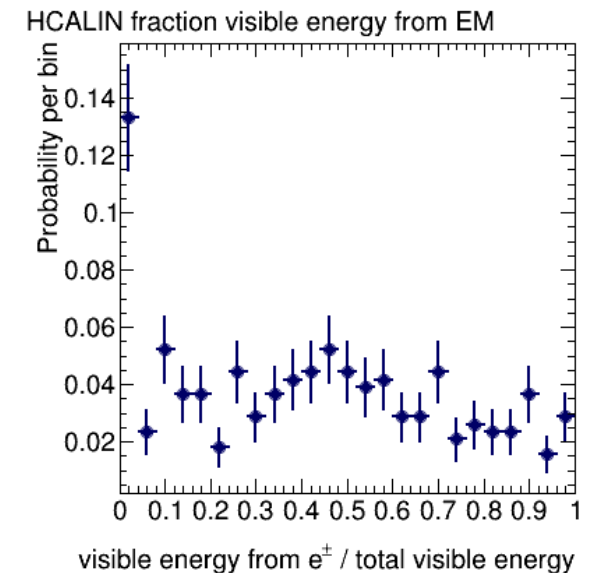
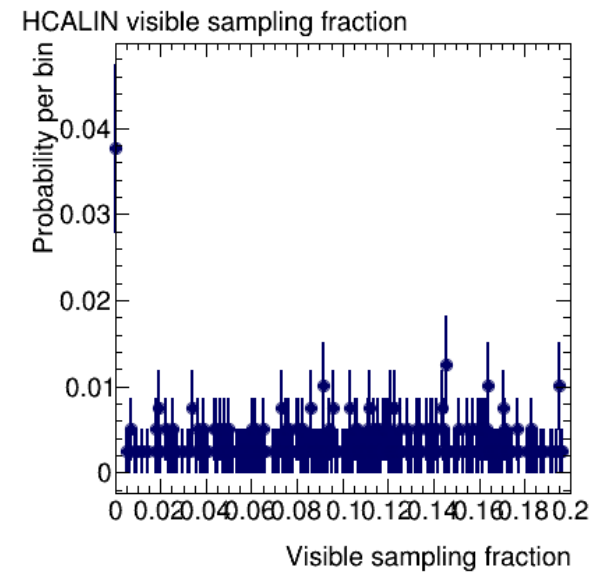
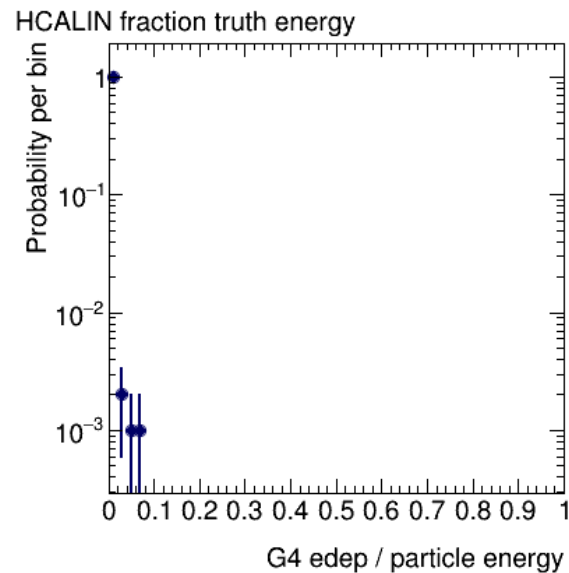
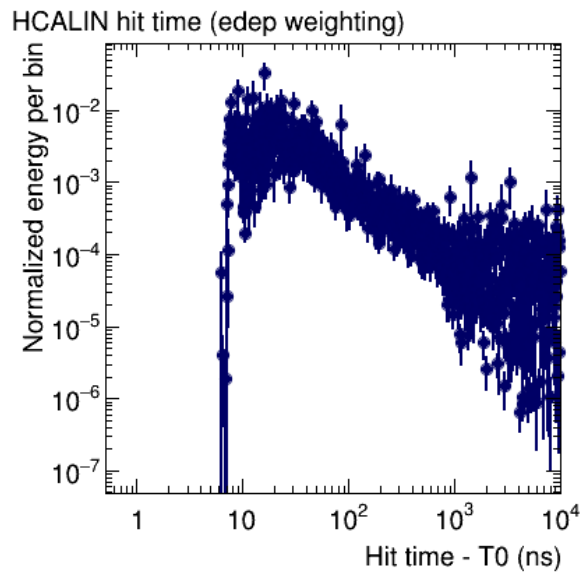
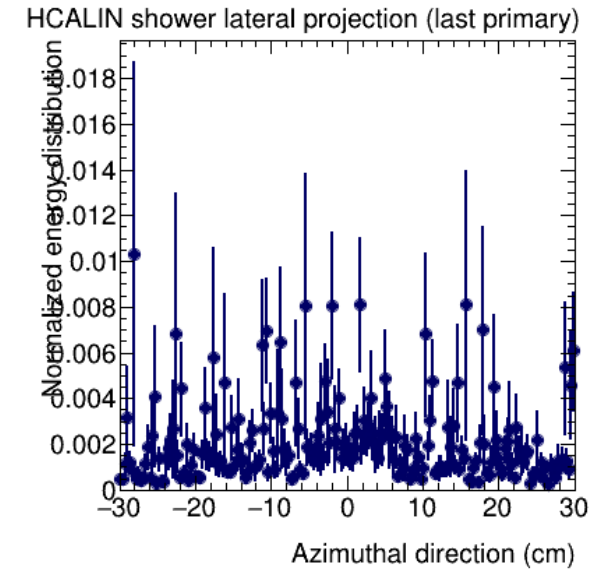
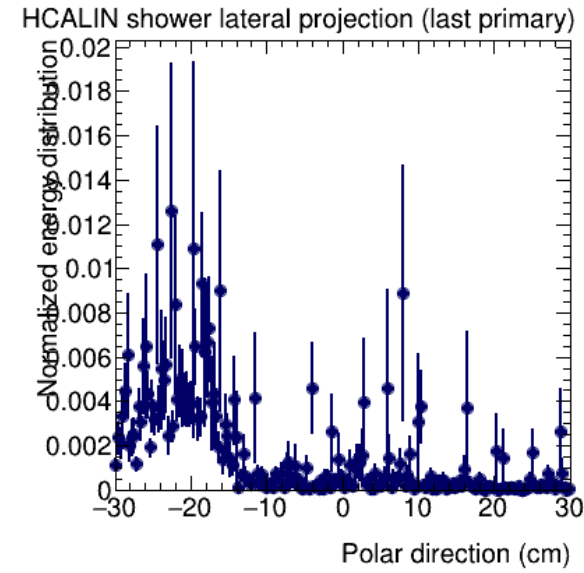
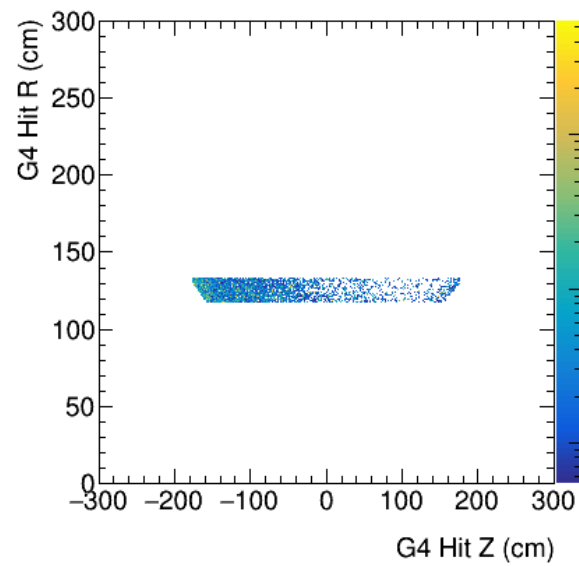
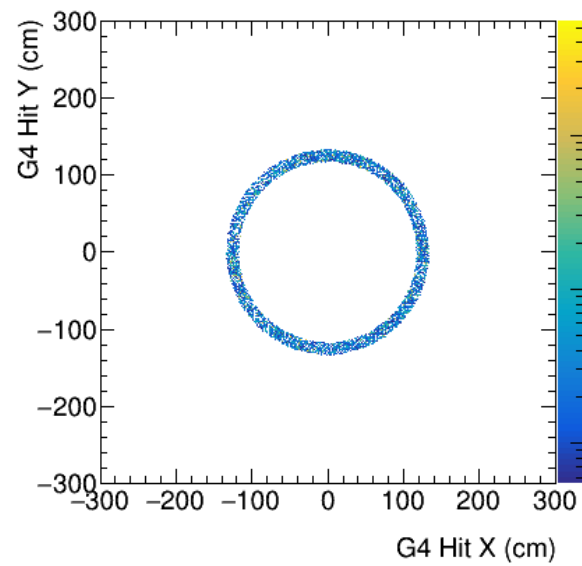
CEMC: eta: -4 to -1.24 (G4Hit)



CEMC: eta: -4 to -1.24 (TOWER CLUSTER)

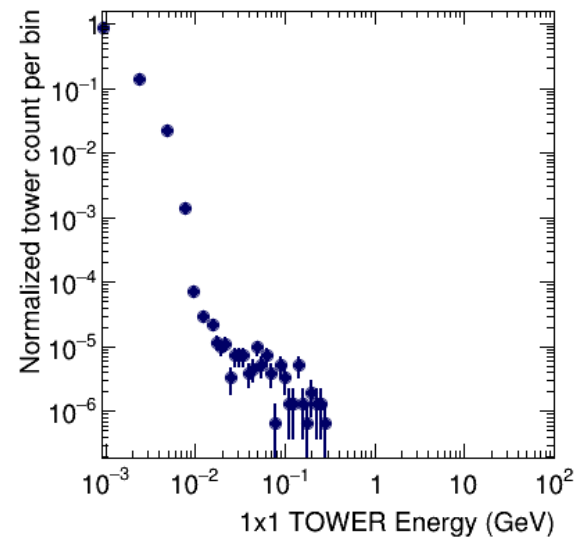


HCALIN: eta: -4 to -1.24 (G4Hit)

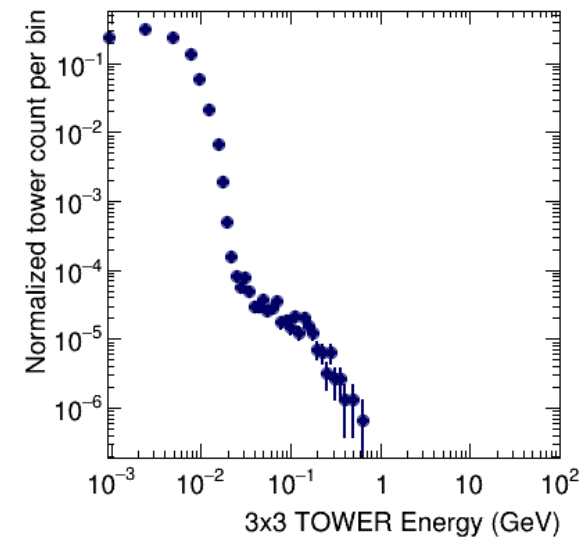


HCALIN: eta: -4 to -1.24 (TOWER CLUSTER)

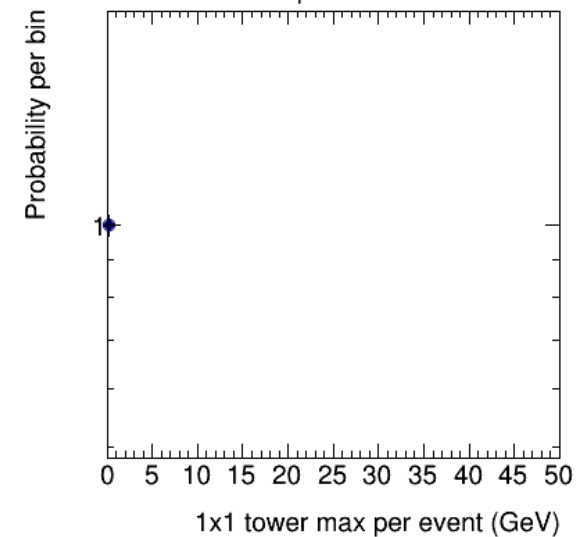
HCALIN 1x1 tower



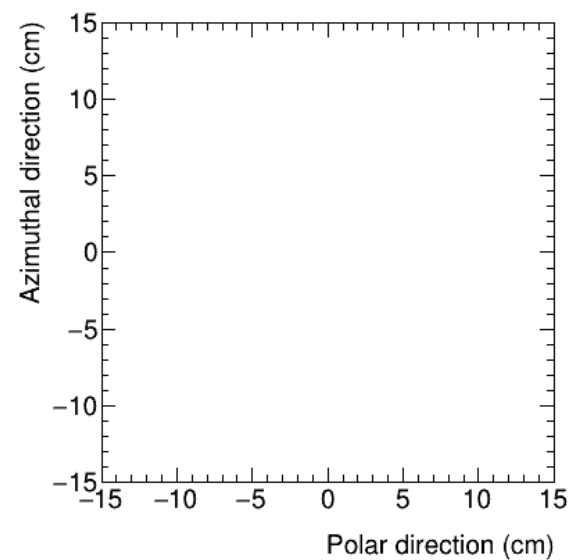
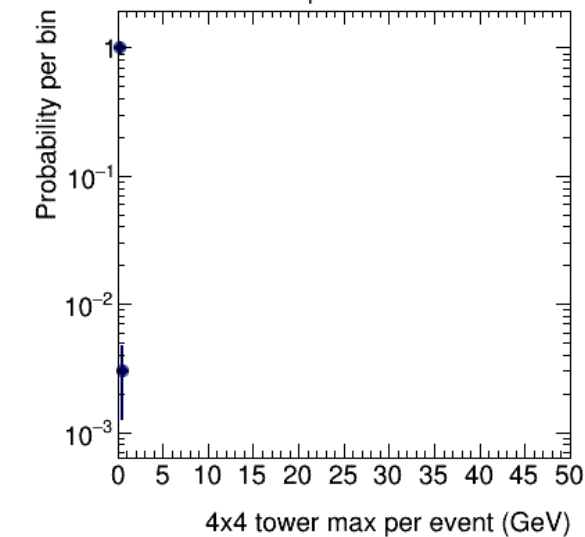
HCALIN 3x3 tower



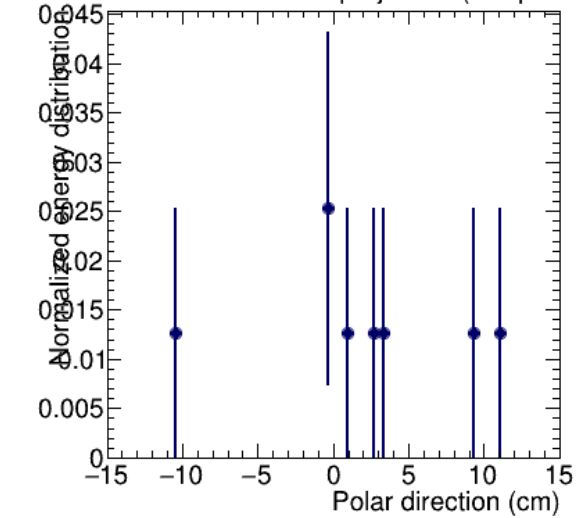
HCALIN 1x1 tower max per event



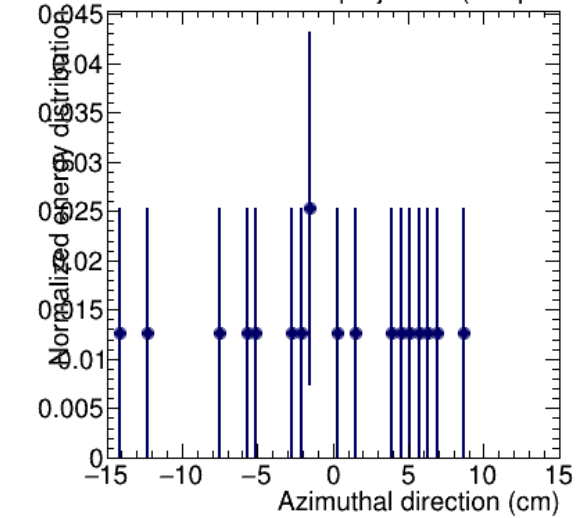
HCALIN 4x4 tower max per event



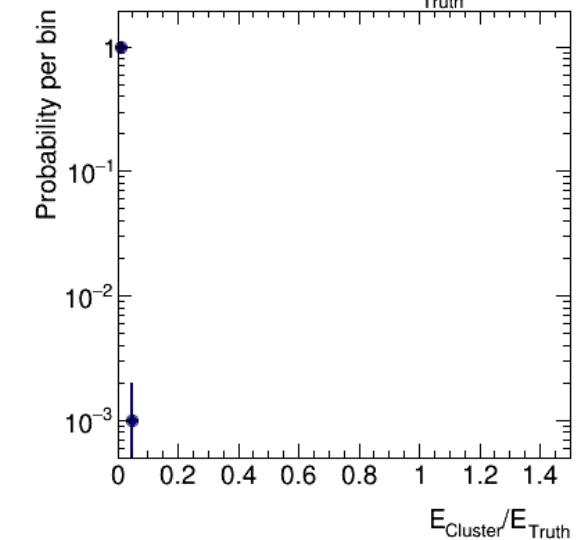
HCALIN best cluster lateral projection (last primary)



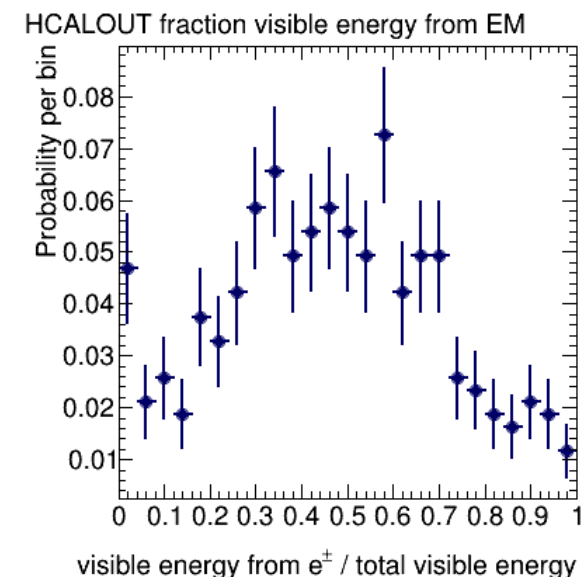
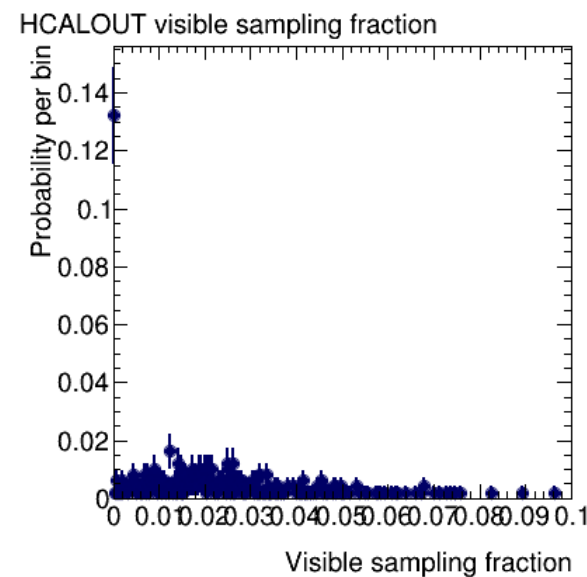
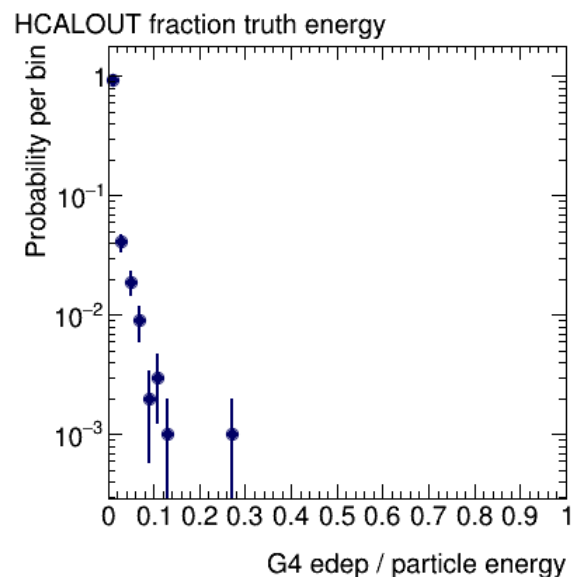
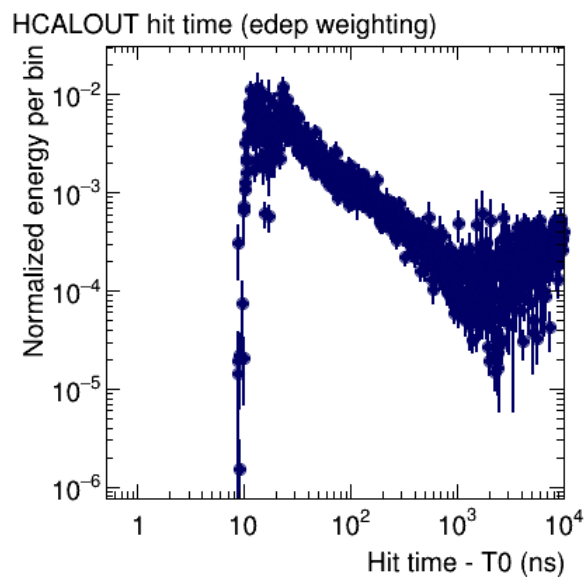
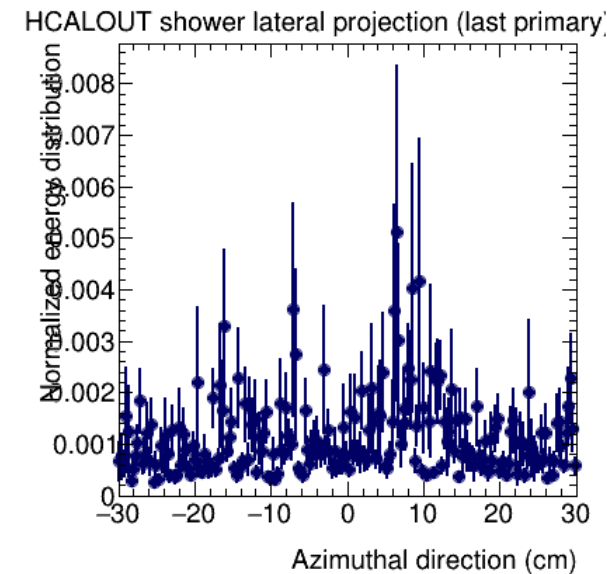
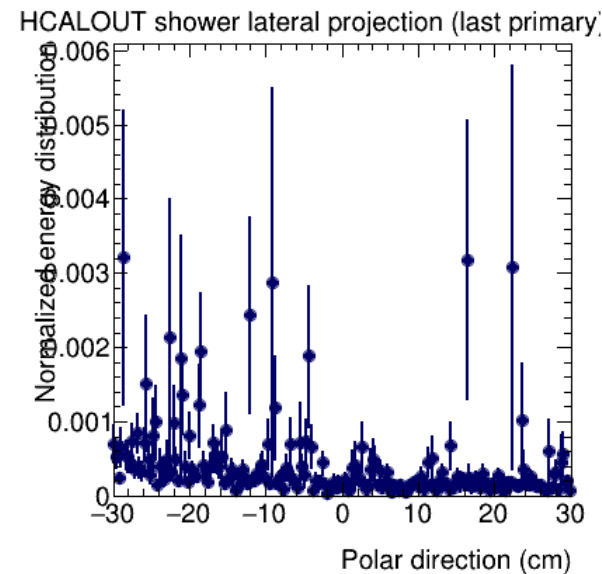
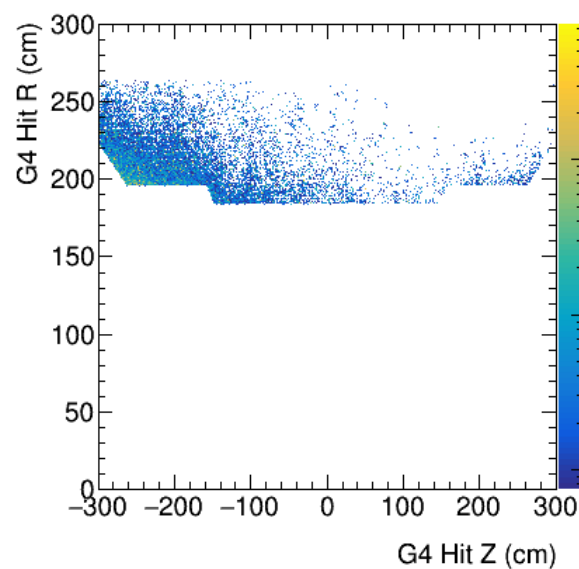
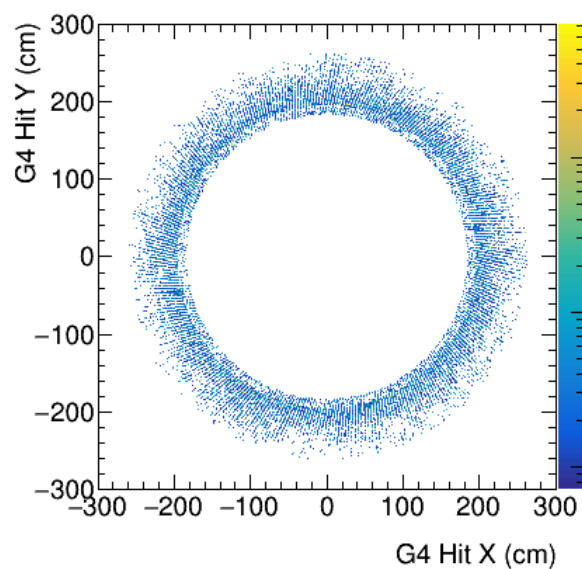
HCALIN best cluster lateral projection (last primary)



HCALIN best matched cluster E/E_{Truth}



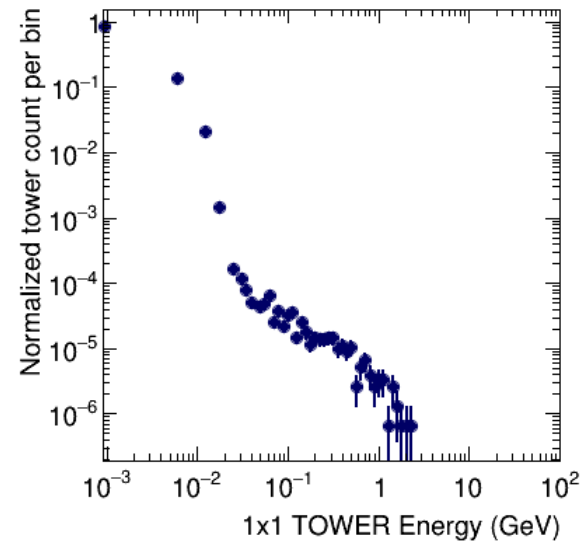
HCALOUT: eta: -4 to -1.24 (G4Hit)



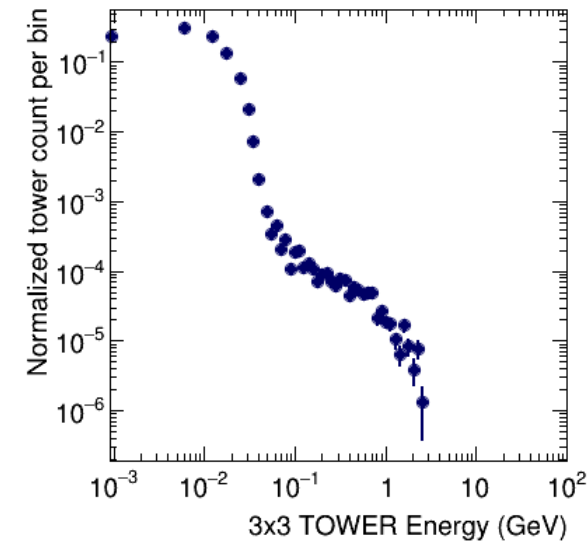
HCALOUT: eta: -4 to -1.24

(TOWER CLUSTER)

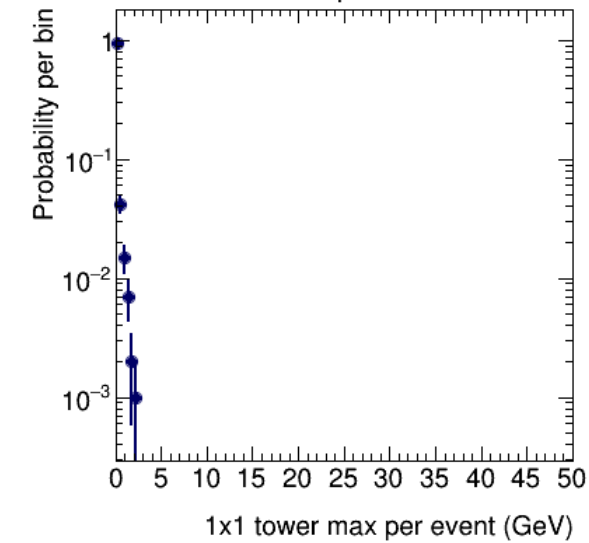
HCALOUT 1x1 tower



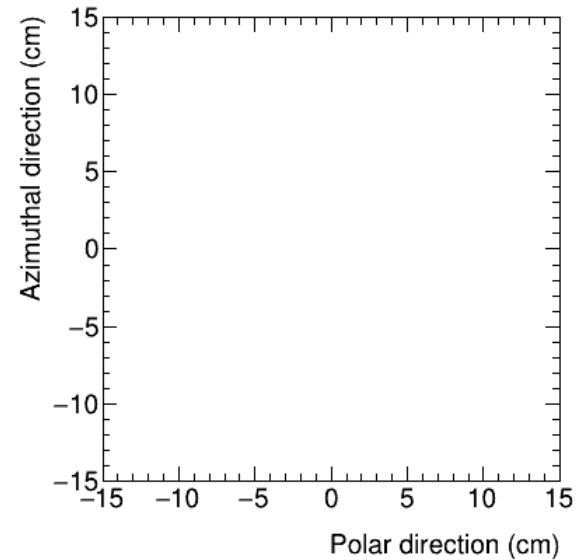
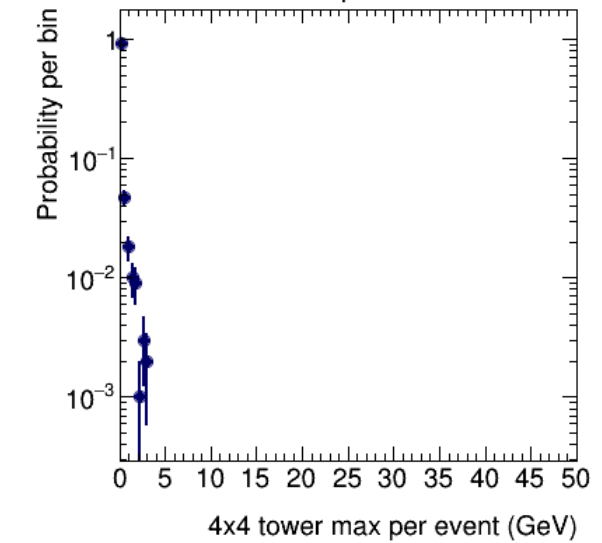
HCALOUT 3x3 tower



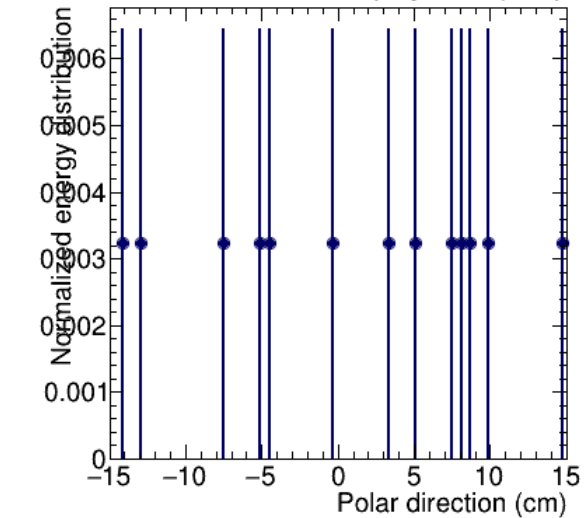
HCALOUT 1x1 tower max per event



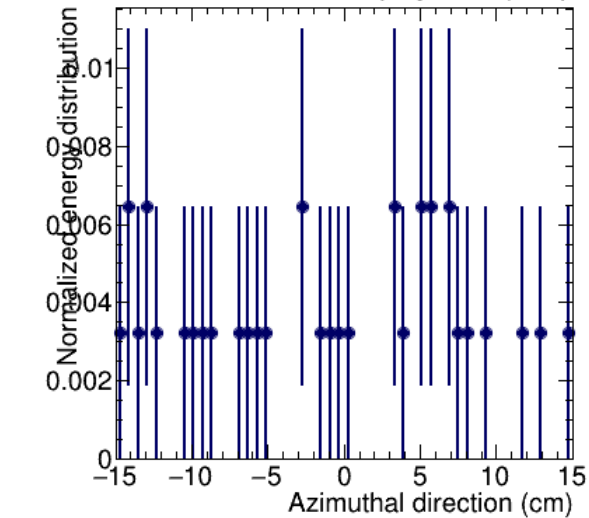
HCALOUT 4x4 tower max per event



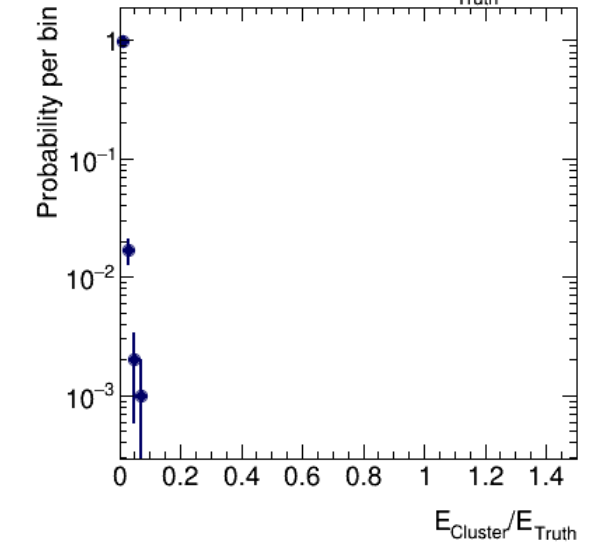
HCALOUT best cluster lateral projection (last prin



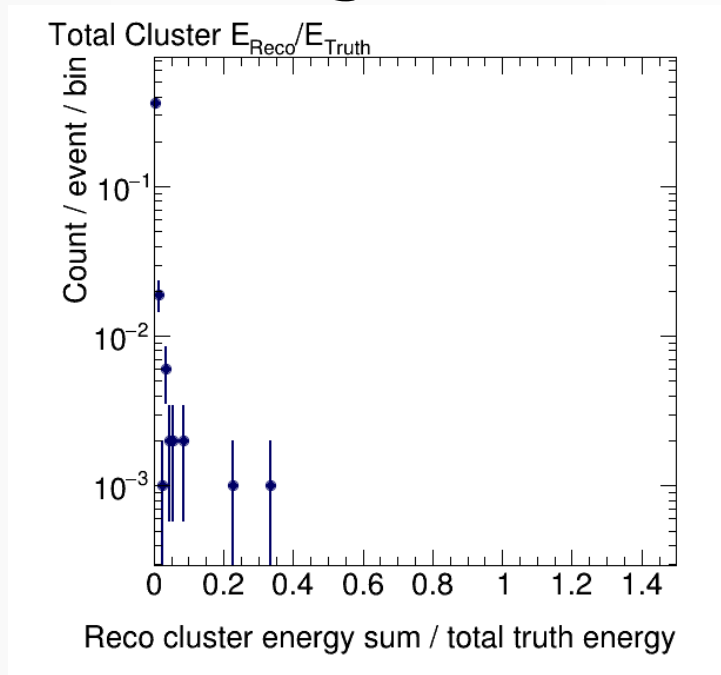
HCALOUT best cluster lateral projection (last prin



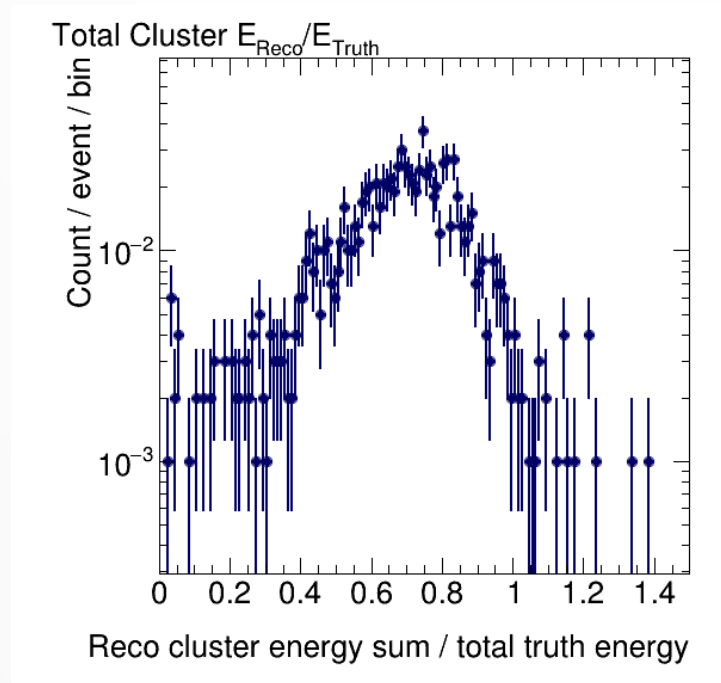
HCALOUT best matched cluster E/E_{Truth}



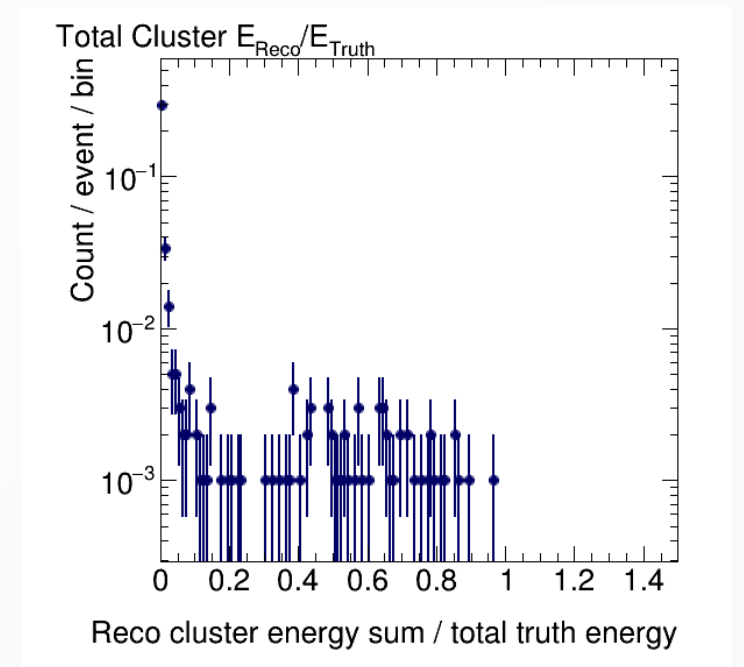
- All Calorimeter_Sum_TrackProj plots are empty.
- Calorimeter_Sum_TrackProjEP plots for various eta ranges are:



eta: 1.24 to 4



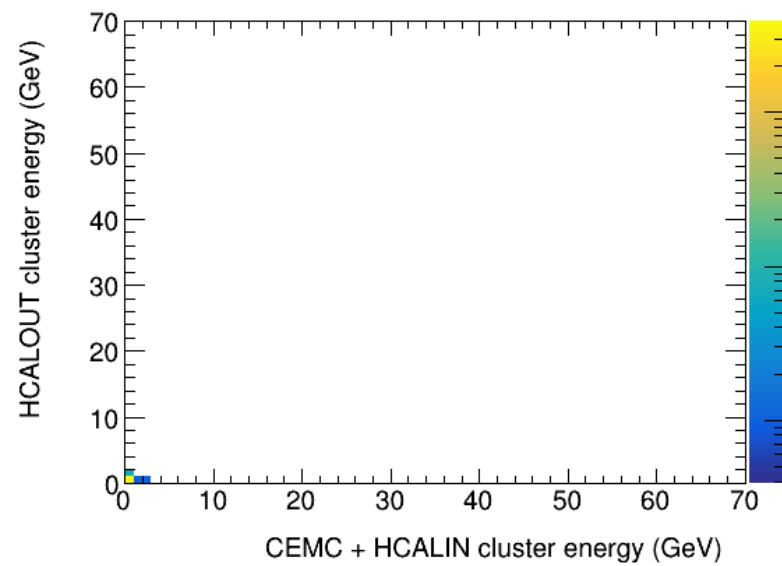
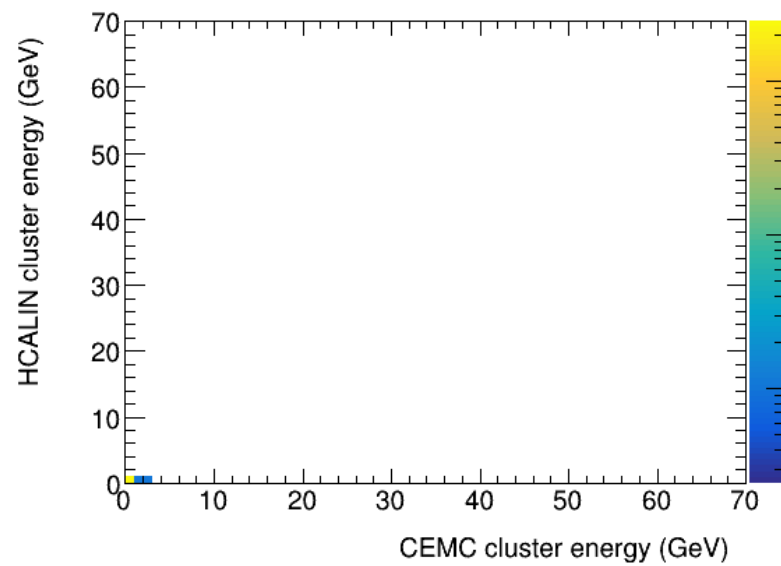
eta: -1.1 to 1.1



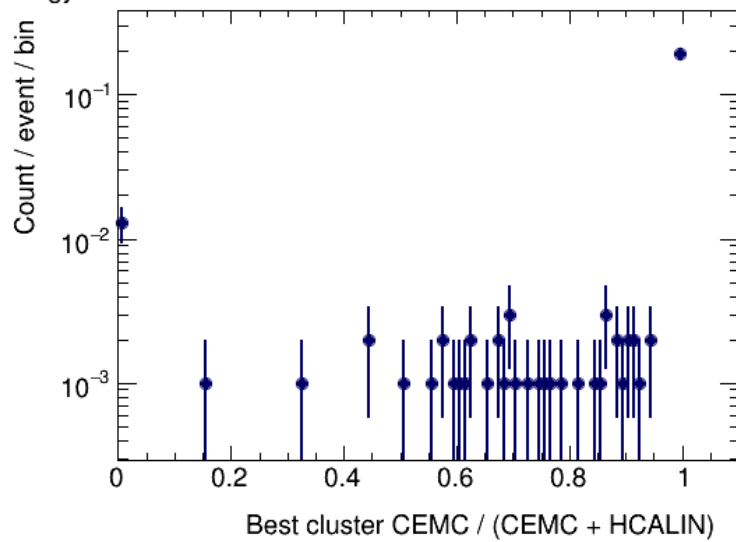
eta: -4 to -1.24

CALORIMETER_SUM_CLUSTER PLOTS

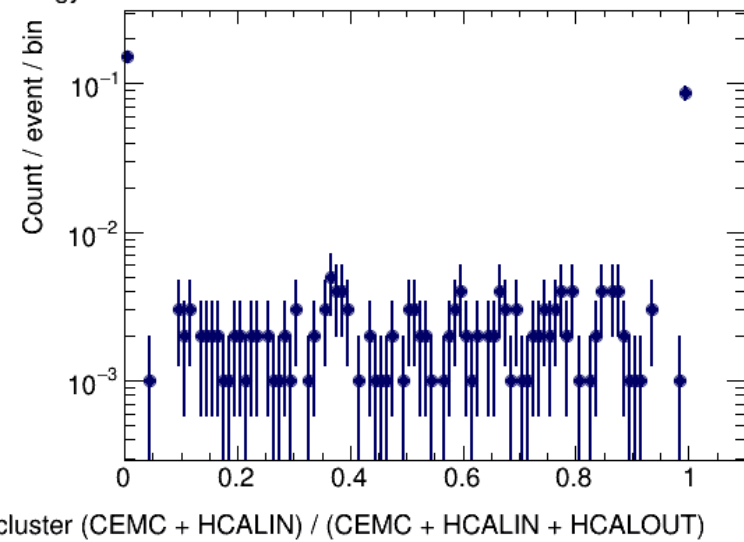
Eta: 1.24 to 4



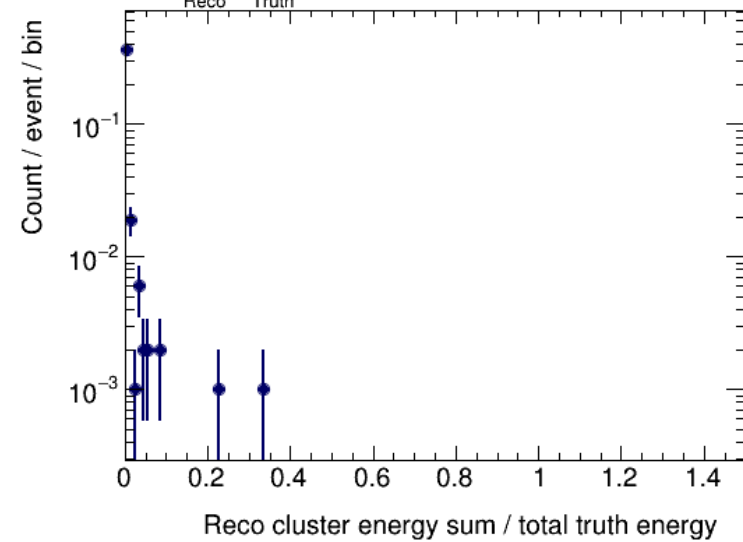
Energy ratio CEMC VS HCALIN



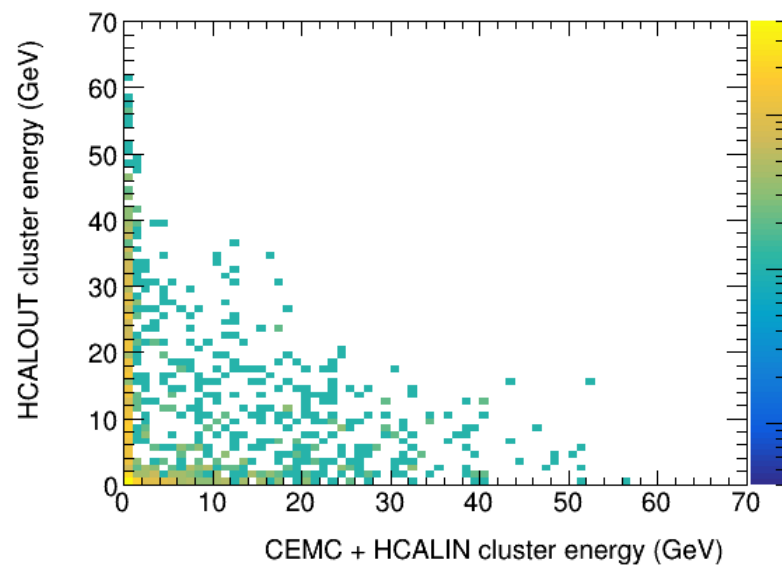
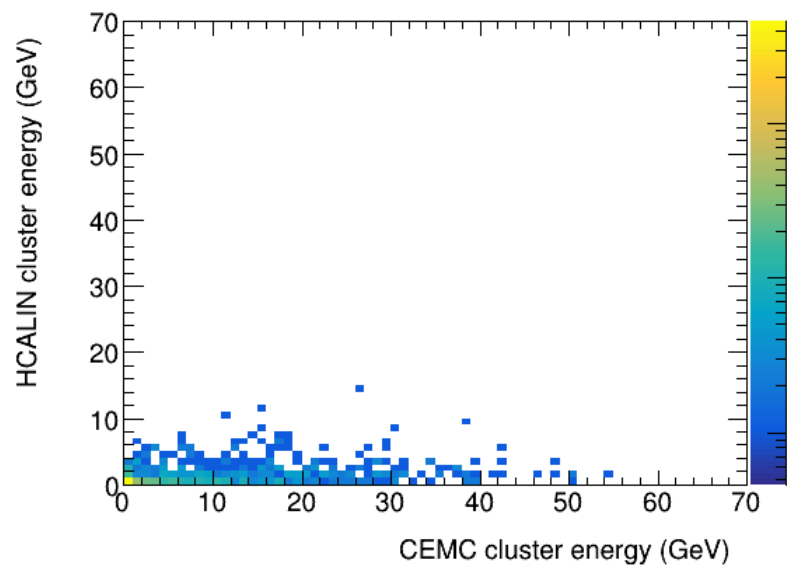
Energy ratio CEMC + HCALIN VS HCALOUT



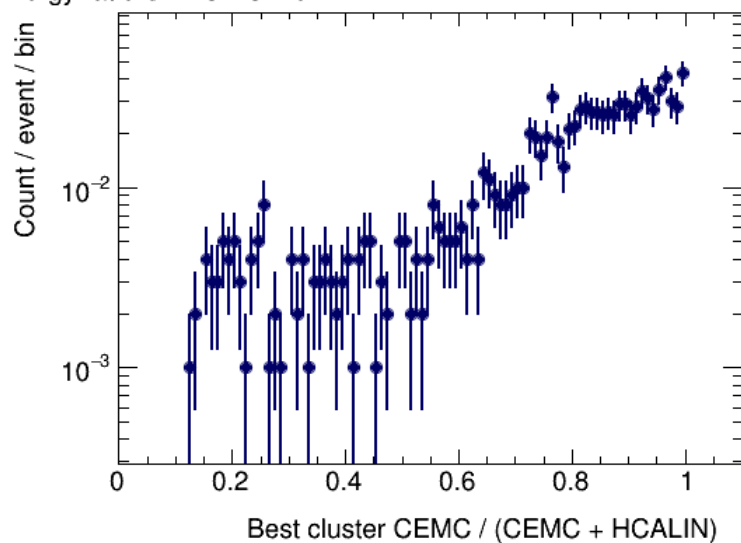
Total Cluster $E_{\text{Reco}}/E_{\text{Truth}}$



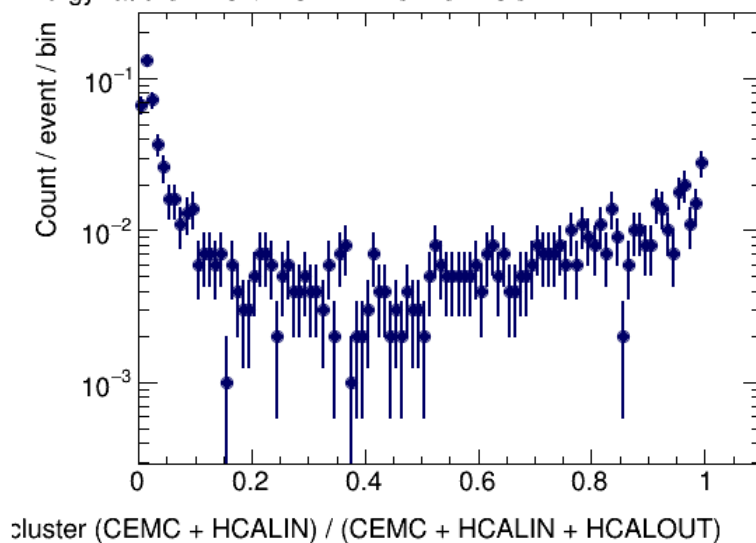
Eta: -1.1 to 1.1



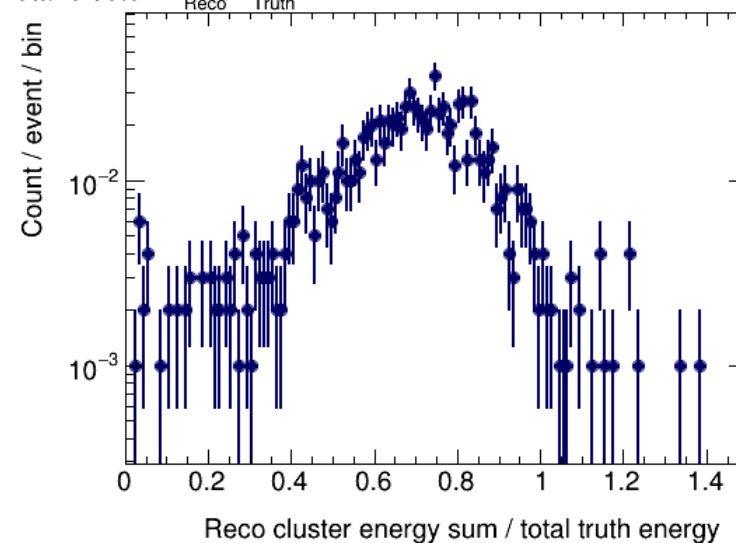
Energy ratio CEMC VS HCALIN



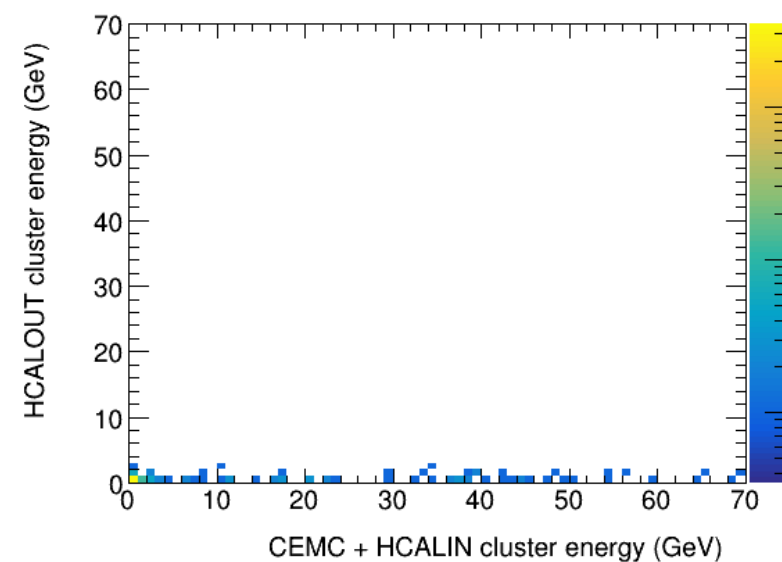
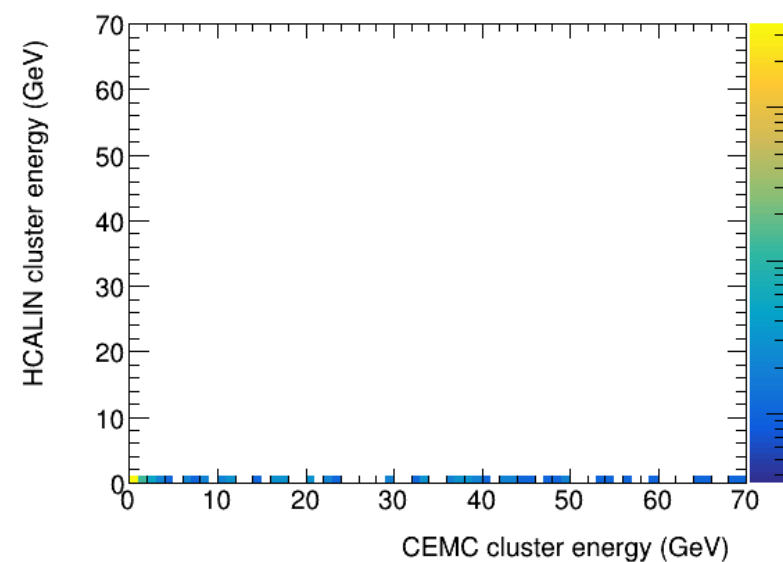
Energy ratio CEMC + HCALIN VS HCALOUT



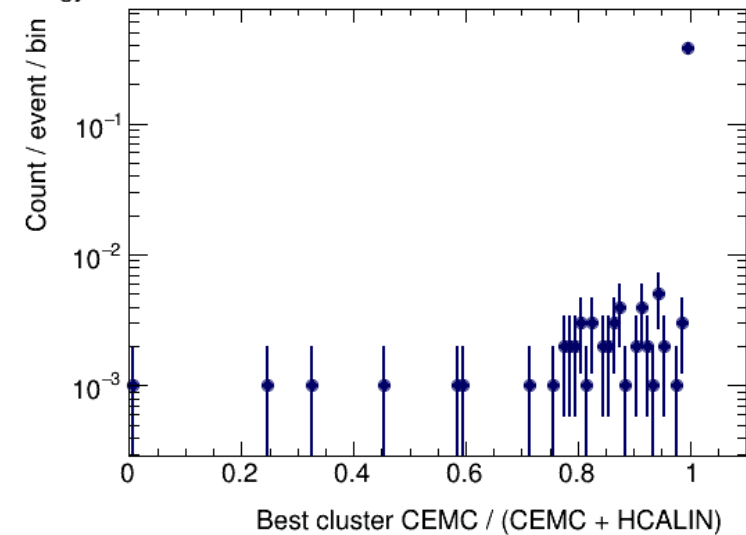
Total Cluster $E_{\text{Reco}}/E_{\text{Truth}}$



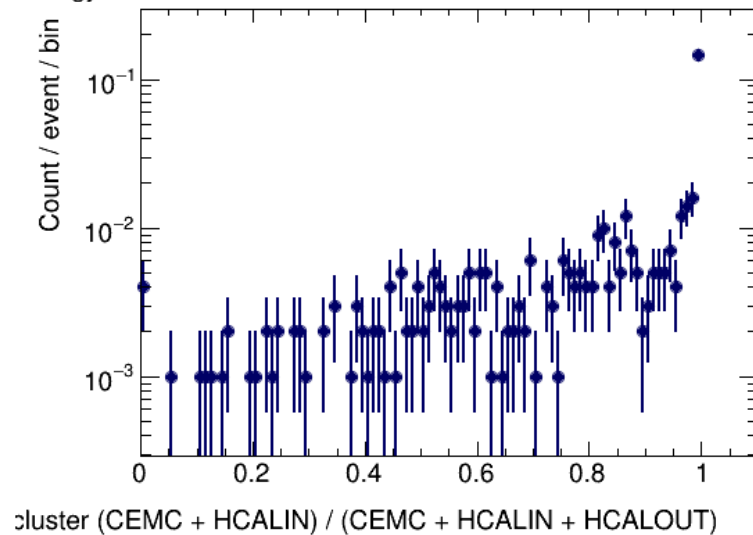
Eta: -4 to -1.24



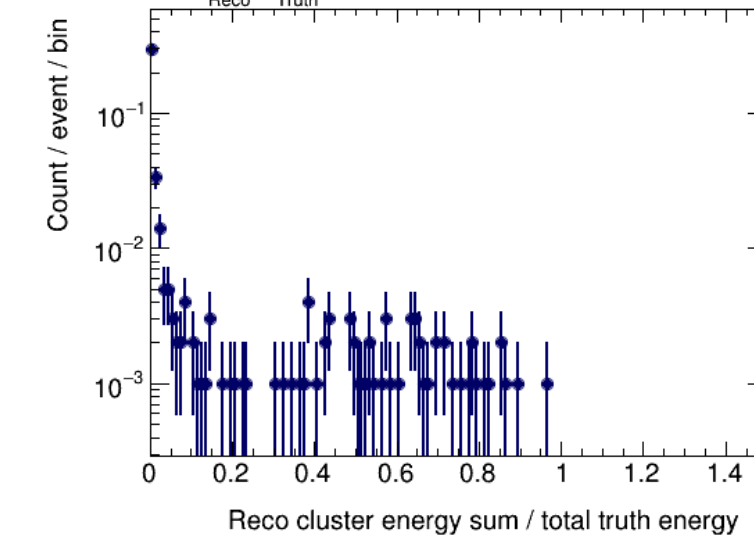
Energy ratio CEMC VS HCALIN



Energy ratio CEMC + HCALIN VS HCALOUT



Total Cluster $E_{\text{Reco}}/E_{\text{Truth}}$



Observations:

- There are few empty plots in case of forward calorimeters.
- This observation is consistent with the eta ranges that we have specified for forward and barrel calorimeters. We have fewer data points for barrel calorimeters at high eta values while reverse is true for forward calorimeters. Further, Tower cluster plots for barrel calorimeters, Track Projection plots, Calorimeter_Sum_Cluster plots (concerned with barrel calorimeters) are empty for high eta values and filled at mid eta values