Fun4All Calorimeter Plots: Pion: Hcal Resolution Check with standalone simulations

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Specifications:

SIMULATION & ANALYSIS DETAILS FOR PION:

- Particles: pi-
- Four instances studied:
 - FHCAL alone
 - FHCAL with FEMC in front
 - HCALOUT alone
 - HCALOUT with HCALIN and CEMC in front
- Events: 100000 (0-30 GeV) for each case
- Various Cuts used:
 - **NEW** pseudorapidity cuts on calorimeters:
 - Pion:
 - Barrel Region: η = -0.98 to 0.99
 - Forward Region: 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
- NO CALIBRATION APPLIED!

Barrel Region:



HCALOUT with HCALOUT & CEMC: te-ge <u>de</u> vs ge (CEMC+HCALIN+HCALOUT) hist_energy_total ge ge Entries 98435 15.18 Mean x -0.2428 Mean y 8.527 Std Dev x Std Dev y 0.2416 80 60 -0.5 40 -1.530 ge $\sigma_{\rm F}/{\rm E}$ vs ge (CEMC+HCALIN+HCALOUT) σ_E/E CEMC+HCALIN+HCALOUT **Better Resolution!** Required: $\sigma_{\rm E}/{\rm E} = 13.5\% + 64.9\%/\sqrt{{\rm E}}$ 0.8 Obtained: $\sigma_{E}/E = p0 + p1/\sqrt{E}$ 0.6 0. 0.2 10 20 25 15 30

Generated energy (GeV)

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Barrel Region:

HCALOUT with HCALOUT & CEMC:



Forward Region:

FHCAL alone:



FHCAL with **FEMC**: te-ge ae vs ge (FEMC+FHCAL) hist energy total ae-ge Entries 99135 15.14 Mean x -0.4572 Mean y Std Dev x 8.6 Std Dev y 0.2825 0.5 80 60 -0.5 40 -1.530 ge 25 $\sigma_{\rm F}/\rm E$ vs ge (FEMC+FHCAL) σ_E/E FEMC+FHCAL Required: $\sigma_{\rm E}/{\rm E} = 10\% + 50\%/\sqrt{\rm E}$ 0.8 New: $\sigma_{E}/E = p0 + p1/\sqrt{E}$ Misleading! 0.6 0.4 0.2 10 15 20 25

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5

30

Generated energy (GeV)

Forward Region:





Misleading!



Forward Region:

FHCAL with FEMC:





THANKS!