Preliminary results of Jet energy resolution in a segmented detector

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03-19-07

Outline

- MC Files Used for :
  - Jets
- Results (Energy Resolution) :
  - Jets
- Conclusions/Ongoing Work

MC Files Used

- The MC files used are the ones the Adam has produced so far for :
  - A Segmented detector made out of lead glass composed of 10000 layers of 1 mm thickness each.
  - Single pions of energies 1- 5 - 10 and 20 GeV
  - Single electrons of energies 1- 5 – 10 and 20 GeV
  - The layers are “grouped” in various configurations of “active” (only ionization light read out) and “Cherenkov” (only Cherenkov light is read out) layers.
- These single files are used in order to “calibrate/correct” the detector response

  (so far only “ideal case” where each single particle resolution is estimated using its calibration/correction factors)

MC Files Used cont'd

- The Jet MC files are produced from merging the single ones in several different ways in order to obtain:
  - Jets composed of only 20 GeV pions ("High" case)
  - Jets composed of ("Basic" case)
    - 52% of 1 GeV pions,
    - 21% of 5 GeV pions,
    - 17% of 10 GeV pions and
    - 10% of 20 GeV pions
  - Jets composed of only 5 GeV pions ("Low" case)
  - Jets composed of only 100 GeV pions ("Extra low" case)
  - All of the above assuming an electromagnetic fraction of 0
  - The Jet MC Files are used to obtain the energy resolution of the "detector" when the calibration done using single particles is applied (in particular the 5 GeV pion calibration files)

Results : Energy Resolution of Jets

- What we studied:

  – 1) Energy resolution of each Jet configuration (“High, “Basic”, “Low” and “Extra Low”) for a particular “Calorimeter” configuration which is :

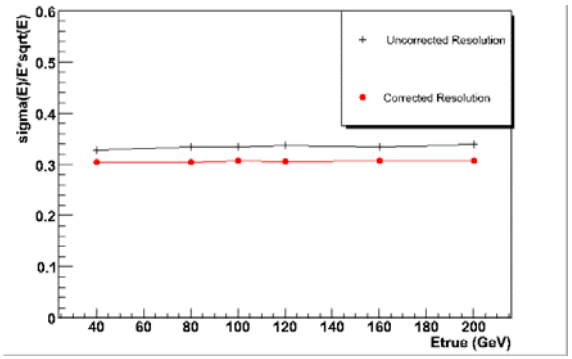
  3 cm of Active Layer, 2 mm of Cerenkov Layer, 18 mm of Passive Layer

  - We intend to repeat the above for more calorimeter configurations and when varying the EM Fraction.

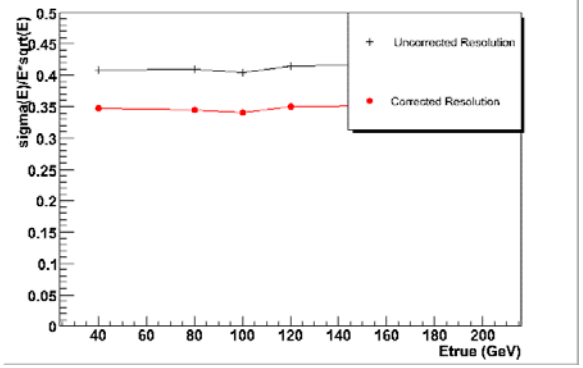
Results : Energy Resolution of Jets

"Low" "Basic" "High"

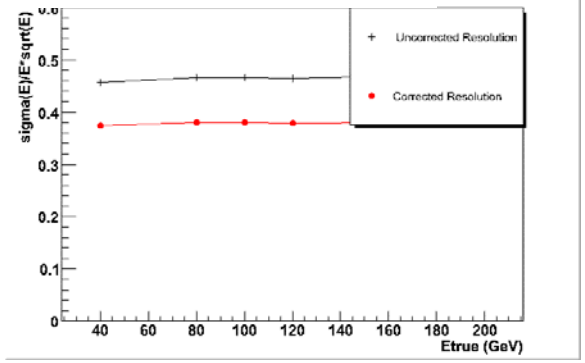
Jet Energy Resolution



Jet Energy Resolution

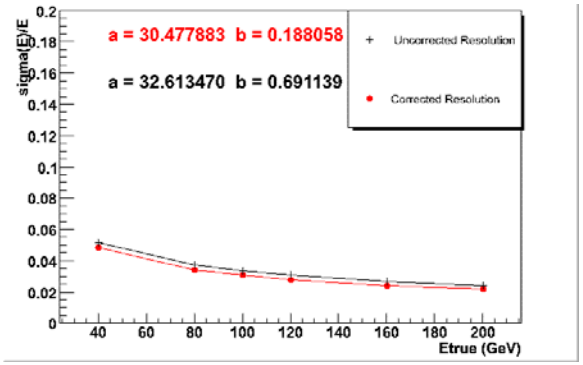


Jet Energy Resolution

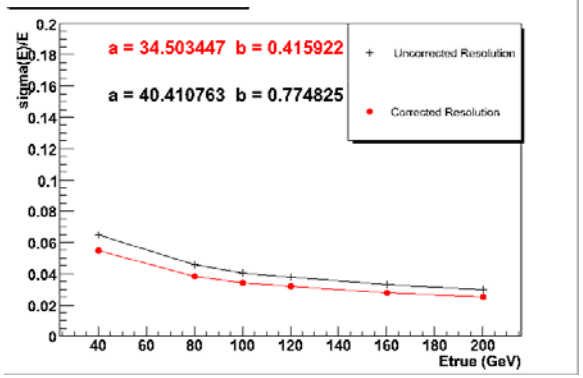


$\sigma(E)/E \bullet \sqrt{E}$ vs E

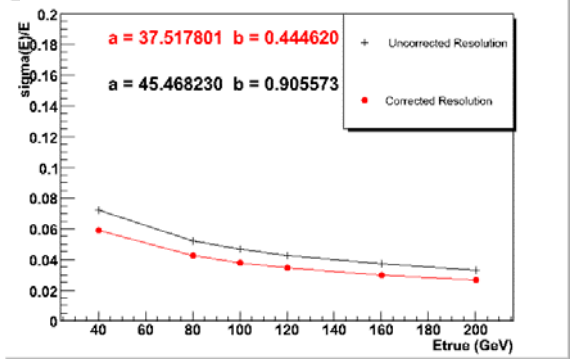
Jet Energy Resolution



Jet Energy Resolution



Jet Energy Resolution



$\sigma(E)/E$ vs E

- Black is uncalibrated response , Red is calibrated (corrected) response using 5 GeV pions.
- The results are encouraging : The corrected response yields always an improved energy resolution & the energy resolution is of the order of ~ 34%/ sqrt(E).

Summary & Conclusions

- **The energy resolution of Jets, in the case of a segmented Calorimeter with 3cm Active Layer, 2mm Cerenkov Layer and 18 mm Passive Layer , is improved by ~ 15% when we use the "calibration/correction" procedure discussed in previous presentations.**

- **This improvement is independent of the :**
  - **Energy of the single pions used for calibration (for pion energies above 5 GeV)**
  - **Jet composition (low or high energy pions)**

- **We would like to further develop and study the same analysis for various calorimeter configurations (and different correction procedures)**

- **More next time …**