

Single Cell Software Compensation - Update

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September 6, 2010

Input:

- $\pi^{-/+}$ Runs from 10-80 GeV from CERN2007
- MC: FTF_BIC and QGSP_BERT of π^{-} Events from 10-80 GeV
- Reconstruction and digitization done with calice software version v04-01

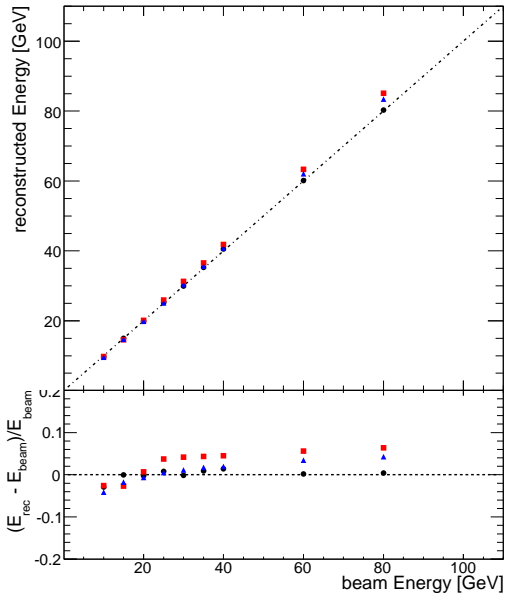
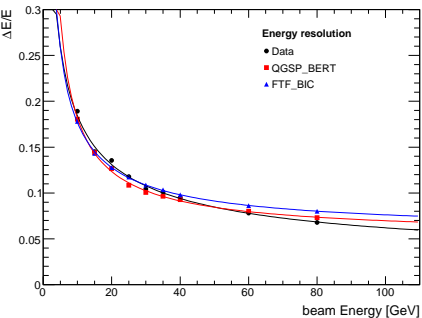
Cuts:

- $E_{hit} > 0.5$ MIP
- Shower has to start in layer 1-5 of HCAL
- Cherenkov cut to reduce electron/proton events
- Multiplicity counter cut for the π^{+} Runs. (Multiplicity counter did not work properly before.)

Initial event energy:

$$\begin{aligned}E_{rec}[GeV] &= E_{hcal}[GeV] + E_{tcmt}[GeV] \\ E_{hcal}[GeV] &= E_{hcal}[MIP] \cdot 0.03 \\ E_{tcmt}[GeV] &= E_{tcmt}[MIP] \cdot 0.03\end{aligned}$$

No software compensation



Extraction of weights

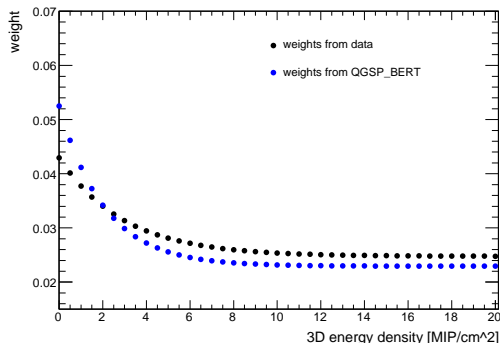
- Similar to CAN-15 - single cell software compensation
- Weight ω for each hit depends on hit energy and '3D'-energy density (ED)
- '3D'-energy density ED is calculated from all neighboring cells with a hit energy deposits larger than 0.5 MIP
- $E_{rec}[GeV] = E_{hcal}[GeV] + E_{tcmt}[GeV]$
 $E_{hcal}[GeV] = \sum_{hits} E_{hit}[MIP] \cdot \omega$
 $E_{tcmt}[GeV] = E_{tcmt}[MIP] \cdot 0.03$
- Weight energy density dependence: $\omega = a \cdot \exp(b \cdot ED) + c$;
the higher the energy density the lower the weight ω
- Energy dependence of ω in functions for a, b, c
- Comment: a separation into different energy density bins was used to extract the weights

Application of Software Compensation

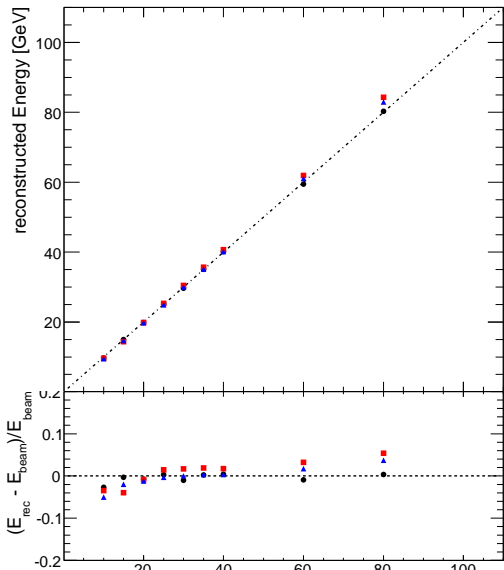
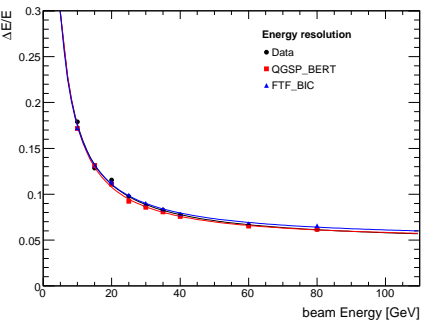
- No energy density bins division is used, but minimal energy density is fixed to avoid extremely high weights for low energy densities
- Initial event energy (see slide 2) is used for the energy dependence of the weight

Different weights sets:

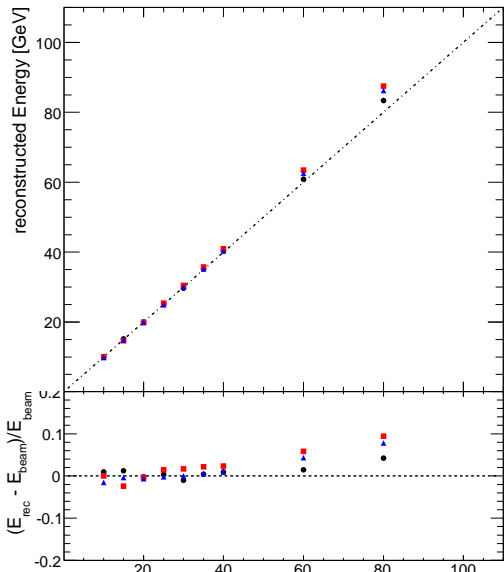
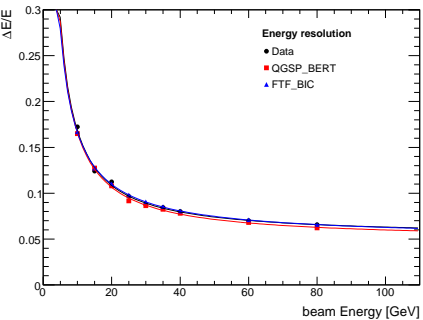
- Weights extracted from data
- Weights extracted from simulation with physics list QGSP_BERT



Weights extracted from data

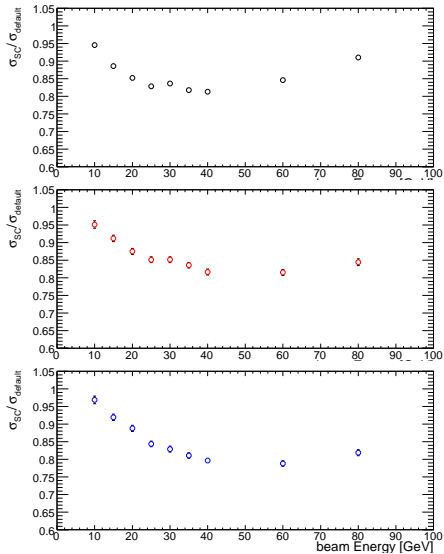


Weights extracted from QGSP_BERT

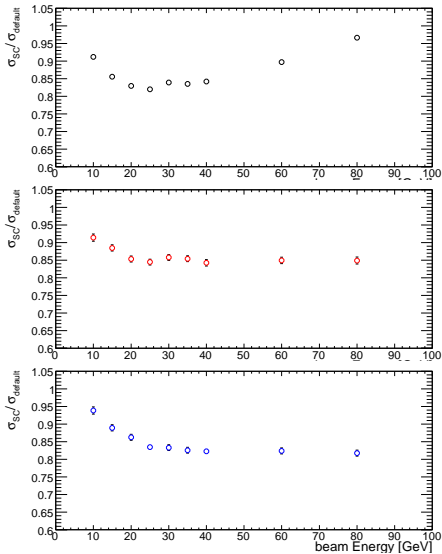


Improvement

SC with weights from data



SC with weights from Monte Carlo



- Updated CAN-15 results - new software version, better calibration
- Changes in weights extraction and application ('3D' energy density, no bin division in application,..)
- Weight extraction from MC improved

To do:

- Better understand behavior of simulation for resolution at high energies
- Extract weights from simulation with physics list FTF_BIC
Improve high energy behavior
- Work on comments from you ...