EEMC Calibration Summary from 2003 p+p Data

The data provide three independent and complimentary handles on absolute calibrations, which agree to within ~10%:

MIP peaks

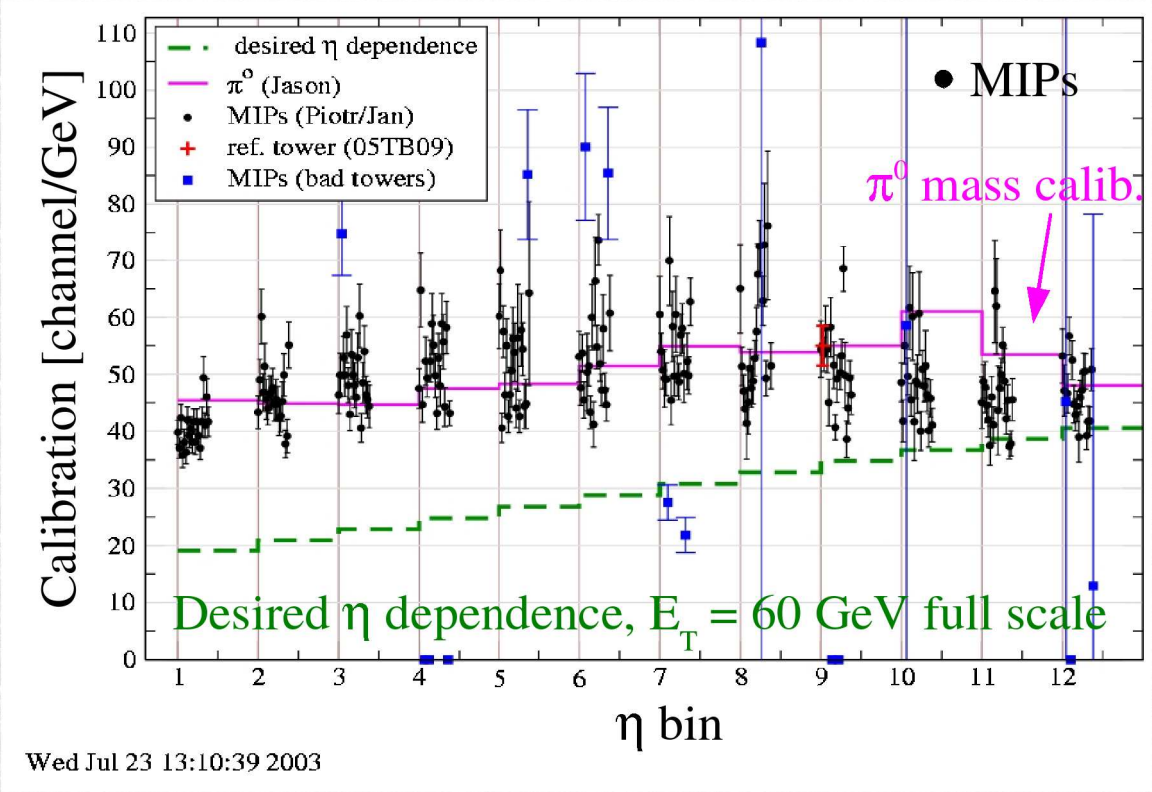
- ✔ $E_{MIP} \simeq 0.3$ GeV
- ✔ Eta bins 5-12

p/E of tracked electrons

- ✔ Independent of sampling fraction measurement
- ✔ $1.5 \leq E \leq 5.0$ GeV
- ✔ Eta bins 11,12

π^0 mass reconstruction

- ✔ $4.0 \leq E_\pi \leq 12.0$ GeV
- ✔ Eta bins 1-12
- ✔ Relies on MC simulation to correct η-dependent systematic errors

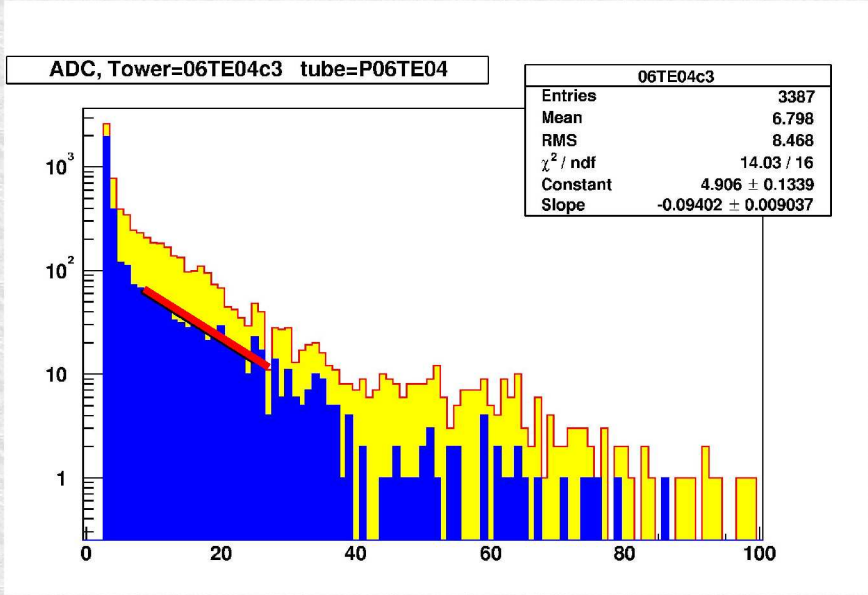


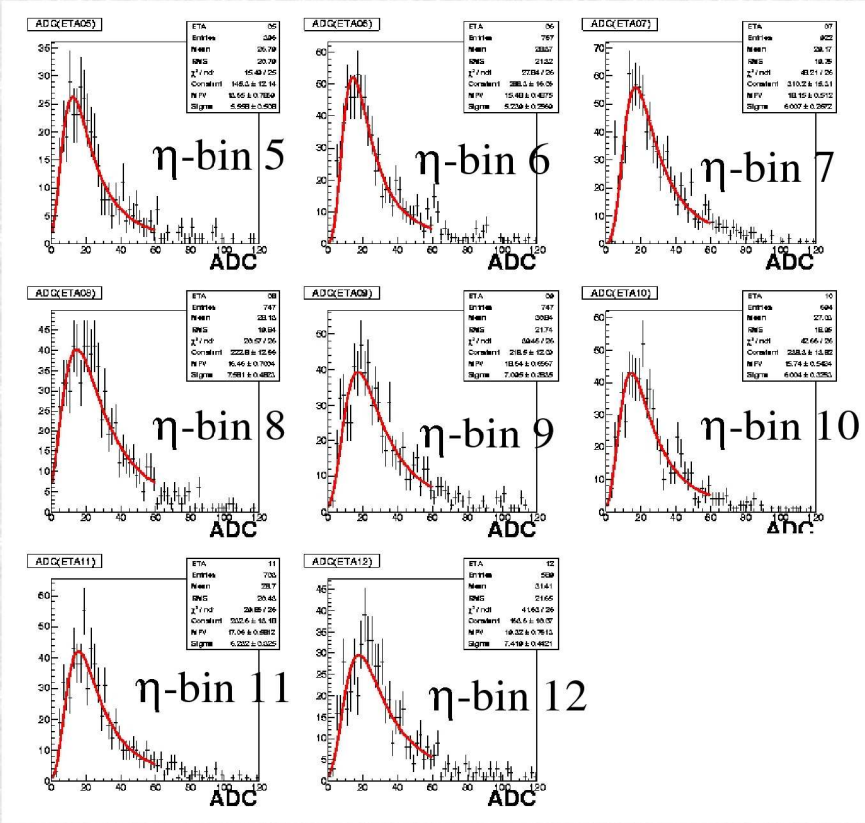
http://www.star.bnl.gov/eemc/calibration

MIP Peaks and Slopes

Use MIPs with TPC tracks which "pass through" a single tower. Landau fit to the observed ADC spectrum determines absolute gain of each tower.

Where MIP peak is unclear or no TPC tracking is available (e.g. η–bins 1-4), use slope of ADC spectra of isolated towers



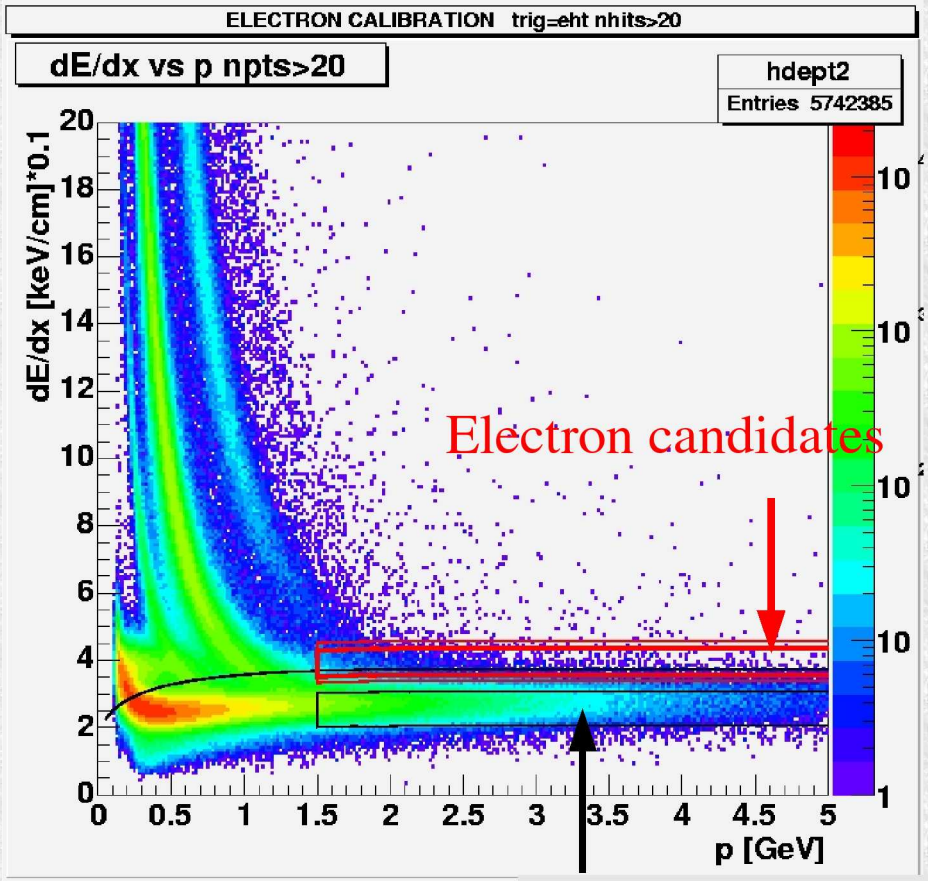


Both methods agree well where both are available.

http://www.star.bnl.gov/eemc/calibration

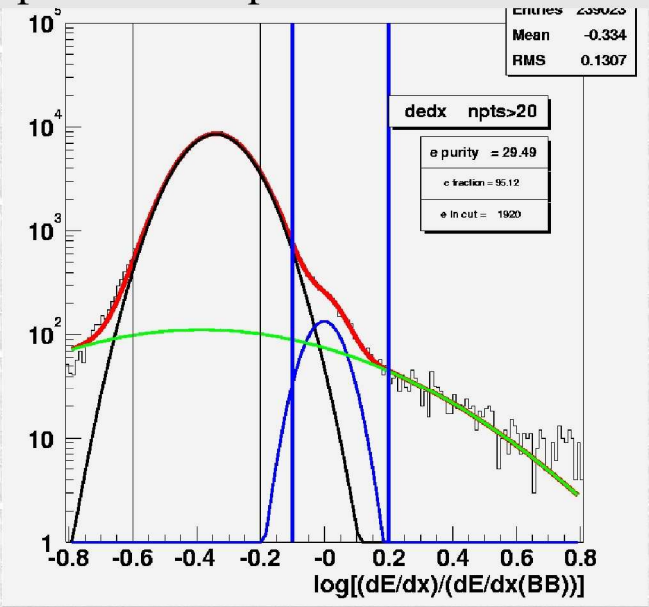
Electrons

Electrons selected using TPC dE/dx information. Relative tower gains from MIP's, absolute gains adjusted to match TPC momentum to EEMC Energy.

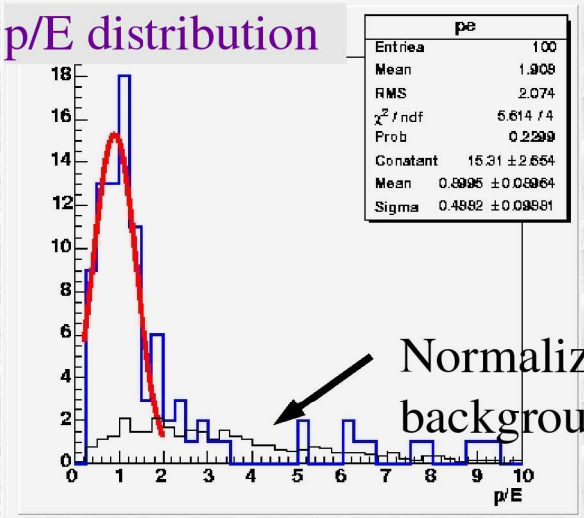


Background region

Energy-loss divided by Bethe-Bloch prediction – purities from 25-65%



p/E distribution

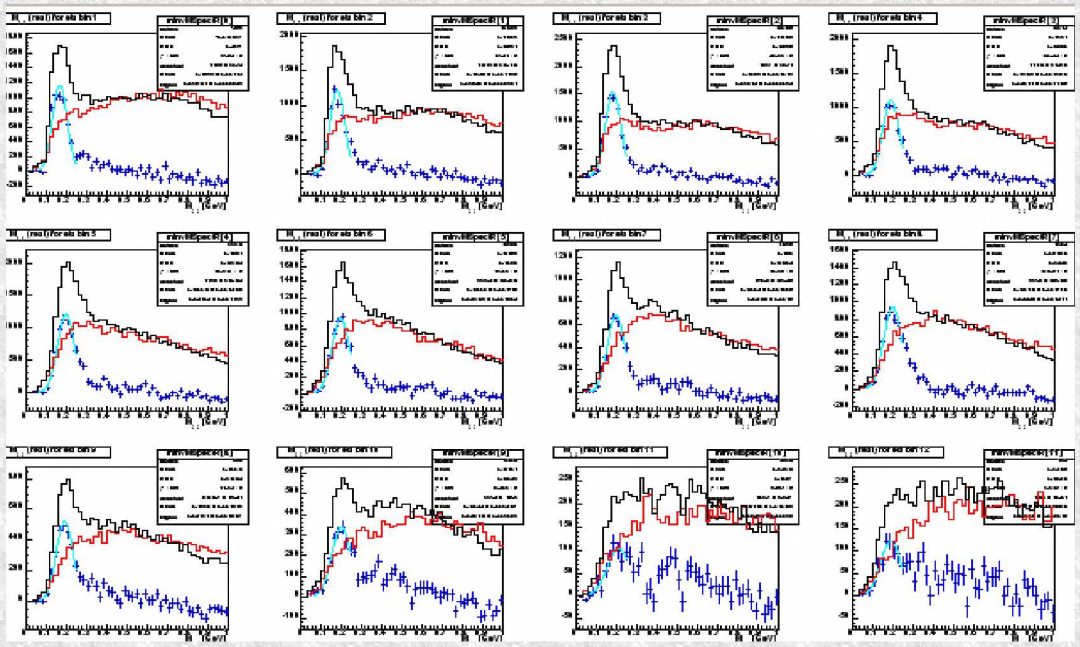


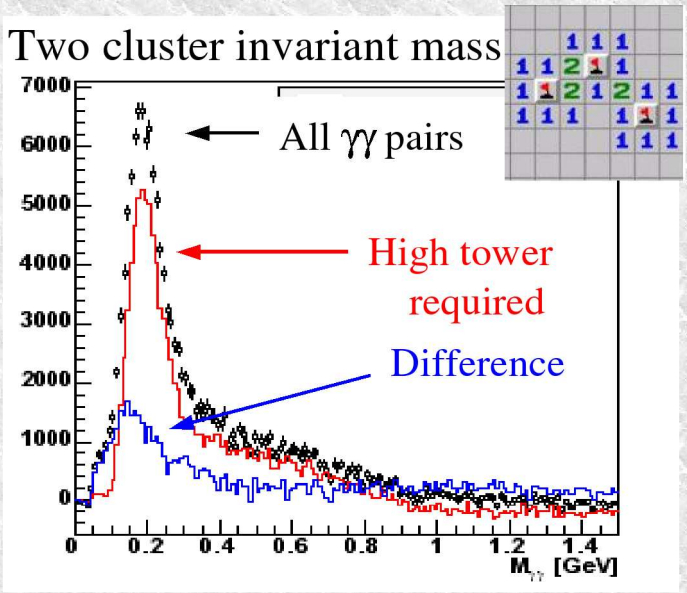
Normalized background

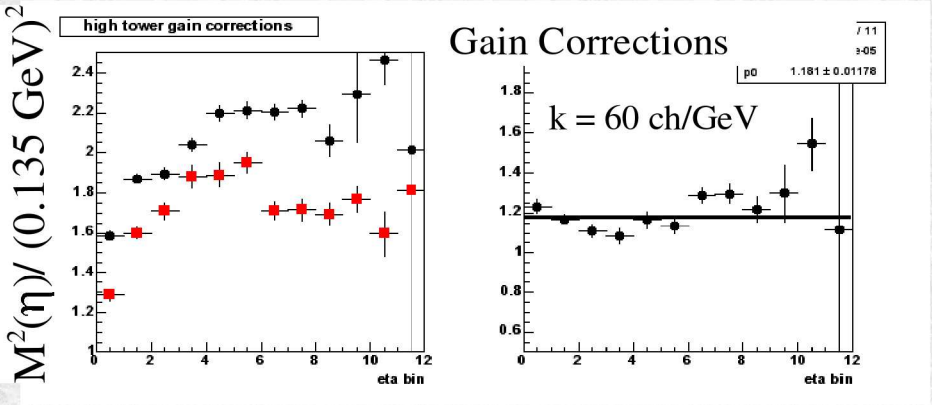
http://www.star.bnl.gov/eemc/calibration

π^0 Reconstruction from Towers Only

Clusters formed around "seed" towers with E > 0.7 GeV. Invariant mass spectra of "resolved" cluster pairs show clear π^0 mass peak.





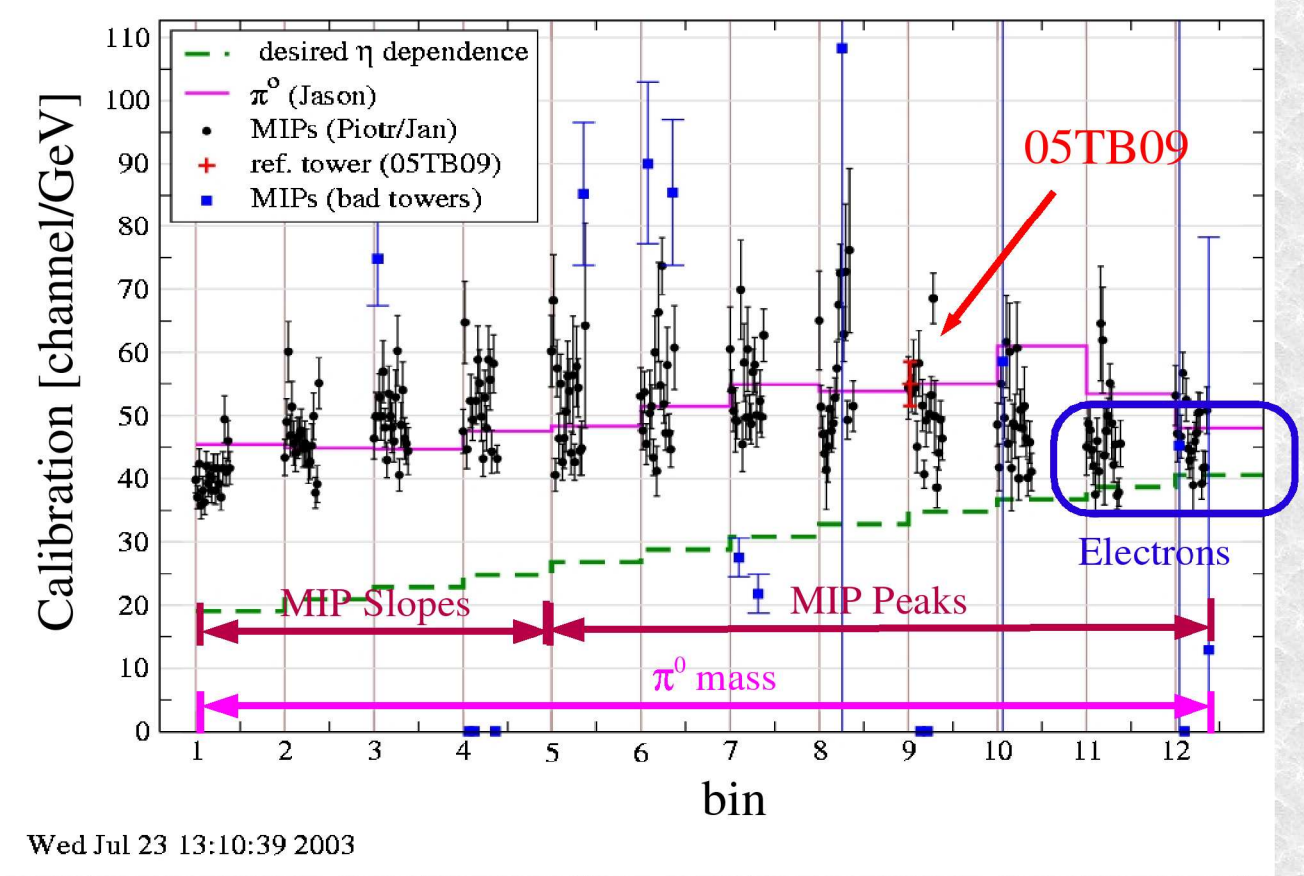


- ✔ Use EHT data.
- ✔ Events sorted by η bin of the most energetic cluster (required in pair).
- ✔ Invariant mass in each η bin (after correction for systematic errors by Monte Carlo) used to correct relative gains.

http://www.star.bnl.gov/eemc/calibration

The Big Picture

In summary, we have three different methods for measuring relative and absolute gains which are in good overall agreement.



Absolute Calibrations:

MIP's: 52 ch/GeV
Electrons: 55±5 ch/GeV
π^0's: ~60 ± ~10 ch/GeV

- ✔ Different ranges in η
- ✔ Different energies
- ✔ Agree on shape and absolute scale

http://www.star.bnl.gov/eemc/calibration

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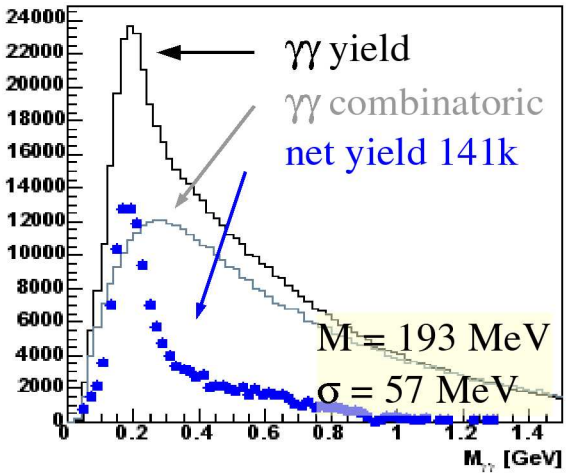
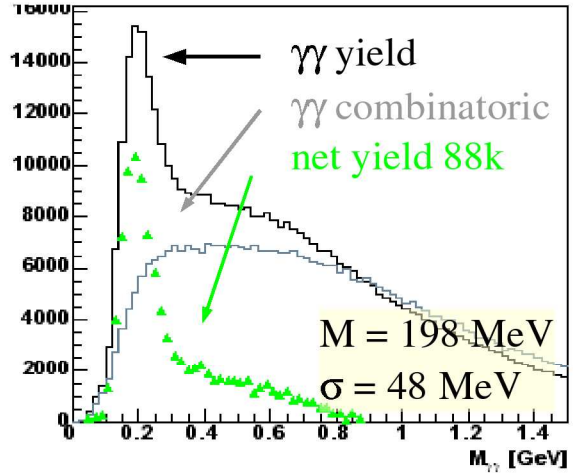
The Details – π^0 Mass Distributions

Comparison between "triggered" and incidental π^0's

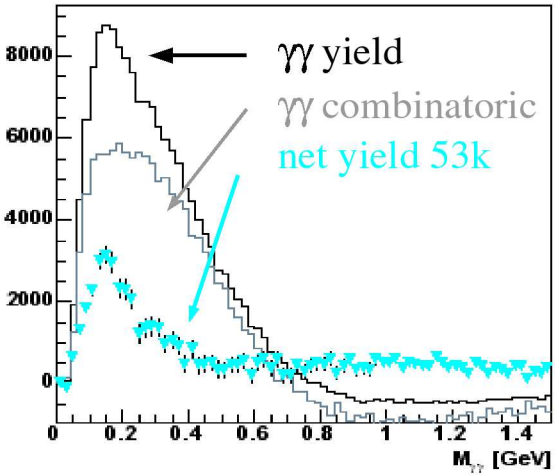
All EHT cluster pairs

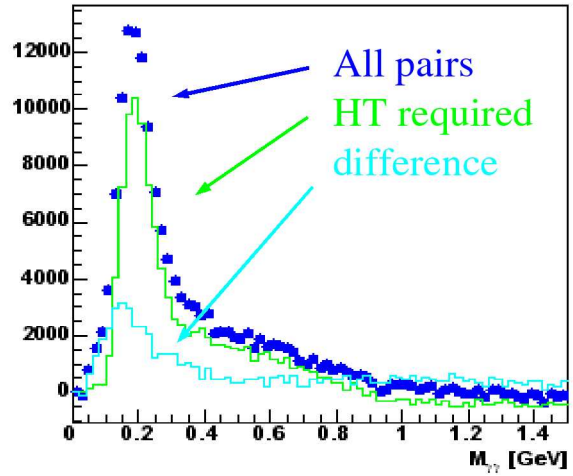


High Tower required

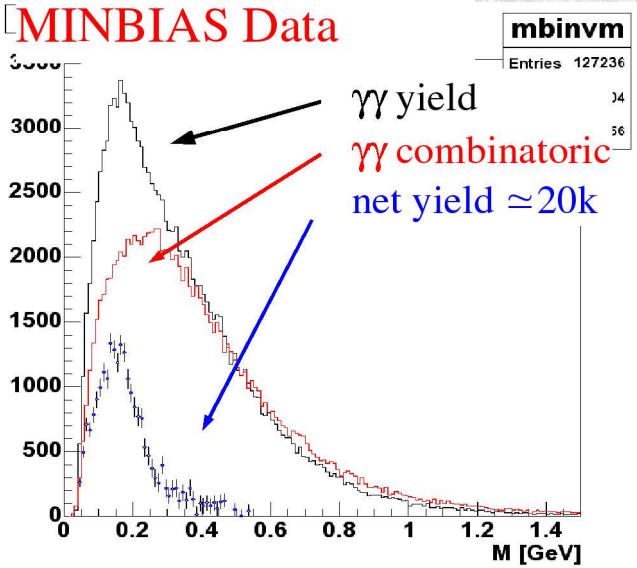


"Incidental" = All – Required





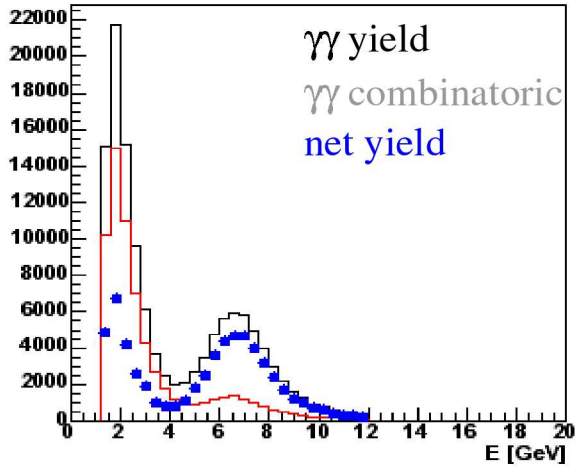
MINBIAS Data



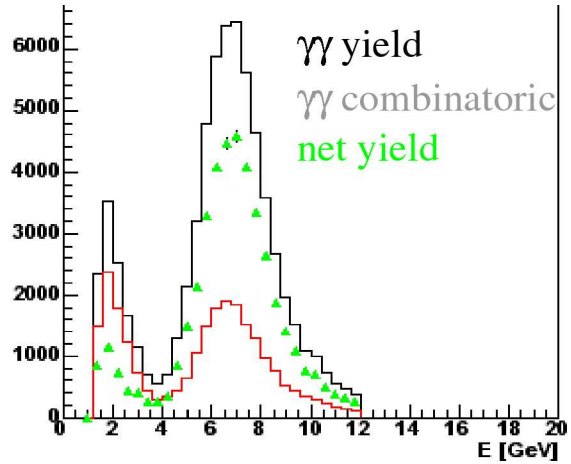
The Details – π^0 Energy Distributions

Comparison between "triggered" and incidental π^0's

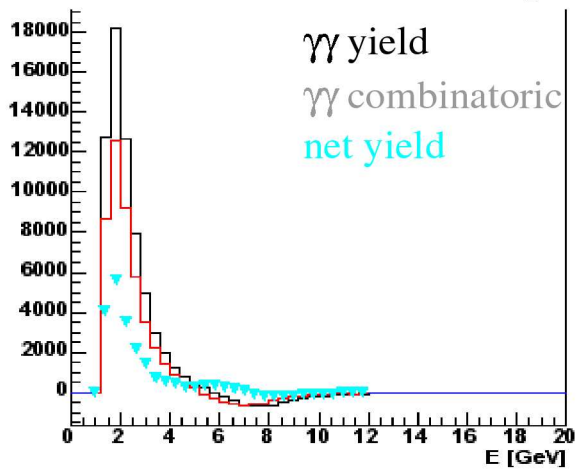
All EHT cluster pairs

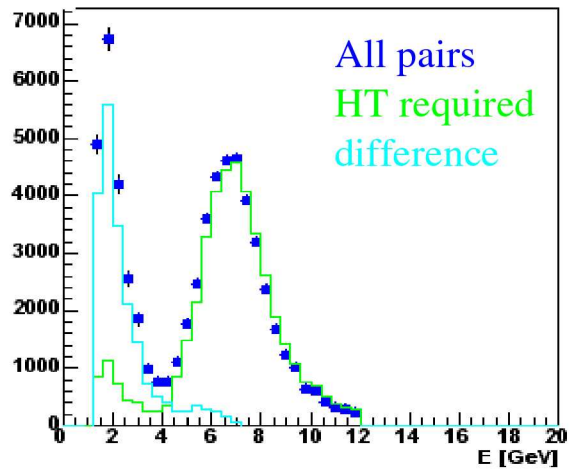


High Tower required



"Incidental" = All – Required





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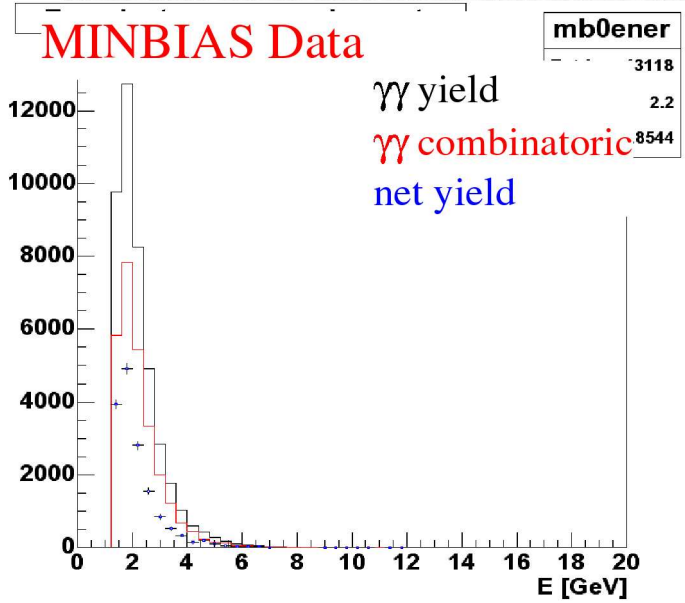
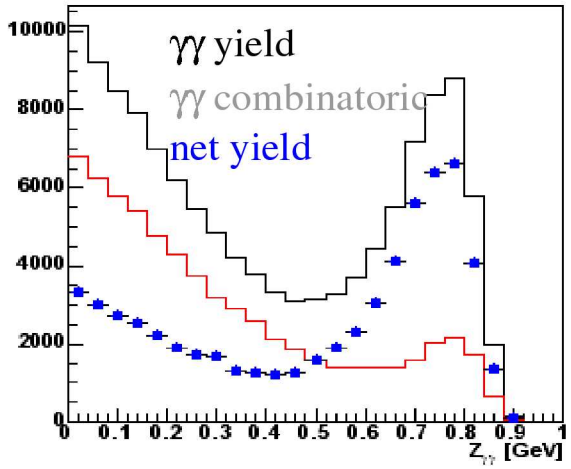


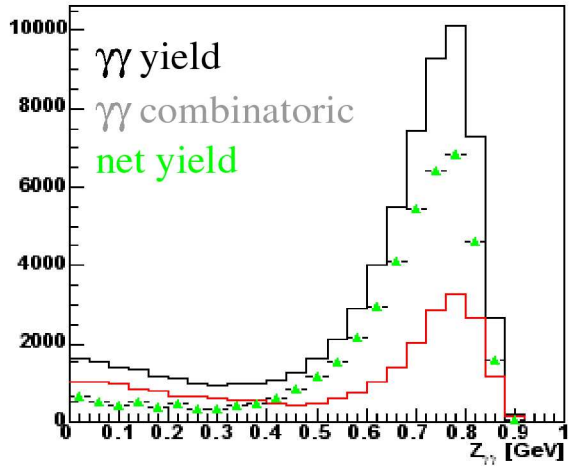
The Details – π^0 – $Z = |E_1 - E_2| / E_1 + E_2$ Distributions

Comparison between "triggered" and incidental π^0's

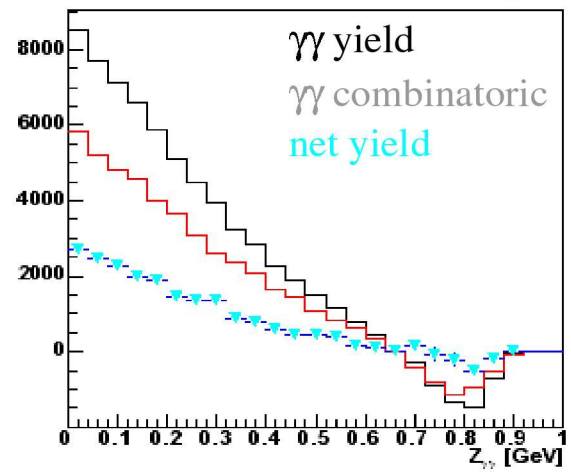
All EHT cluster pairs

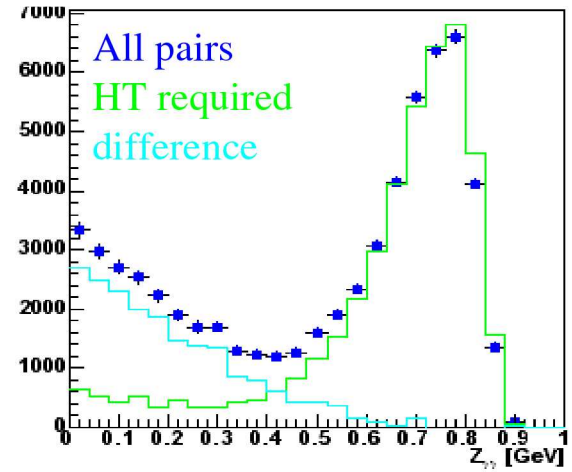
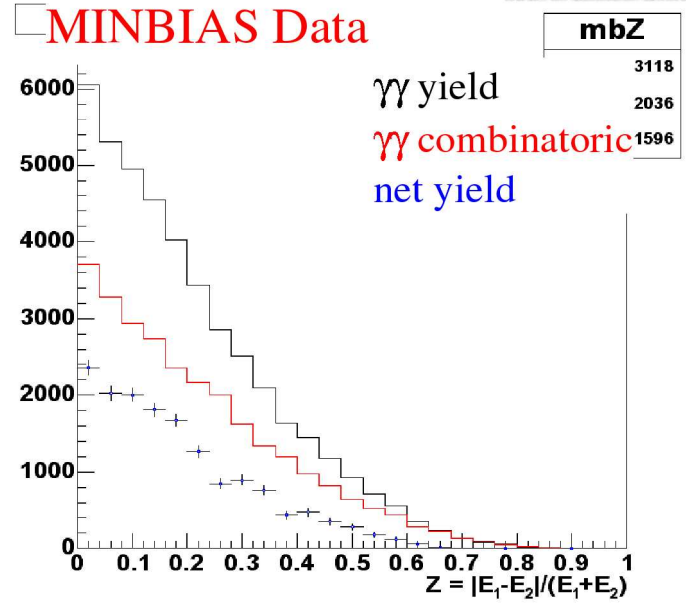


High Tower required



"Incidental" = All – Required





MINBIAS Data