L1calo energy calibration with electrons

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KIP

24.03.2011

I got married

My surname is no longer Kleine-Limberg
My new surname:
Lepold

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My new surname:

Lepold

LEP old

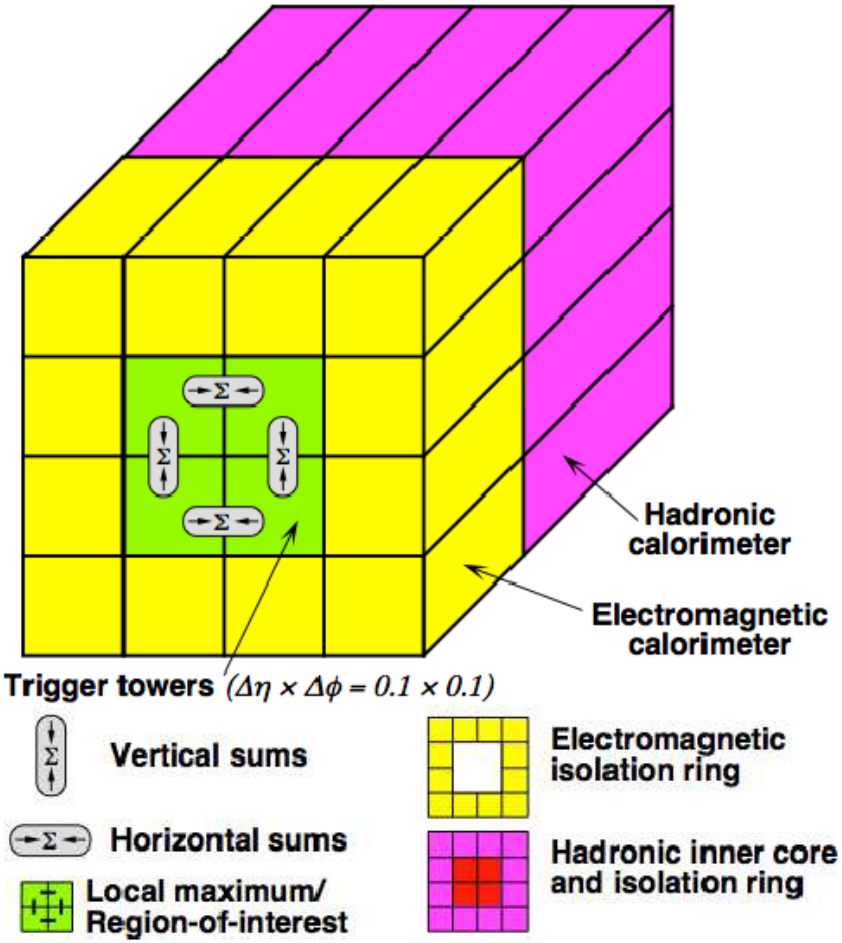
Introduction

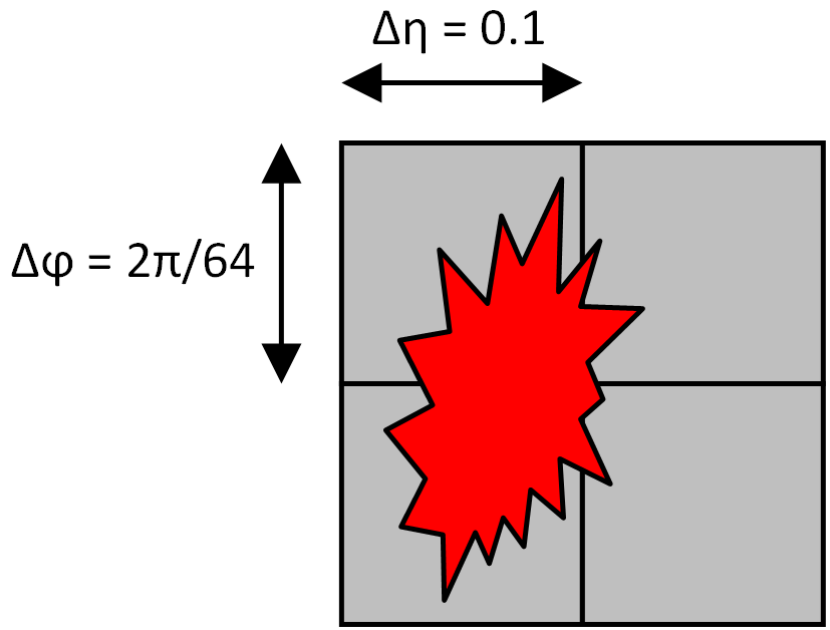
- Energy calibration of EM-L1Calo ($|\eta| < 2.5$)
- Study calibration with physics obejcts by using different e-definitions
- Evaluate calibration strategy with possible dead material corrections for e.
- Compare the L1calo calibration from periods G-I to offline-raw_cl and calib_cl
- Crosscheck my results with the December L1calo calibration

Datasets

- Periode G-I
- L1calo D3PDs, Egamma-stream
- Egamma GRL
- Requiering the e15_medium trigger
- Exclude the dead OTX-regions and the overlap region
- 20 GeV E_T-cut on offline energy
- Electron cluster cuts: medium, tight, Zee

The EM sliding window algorithm





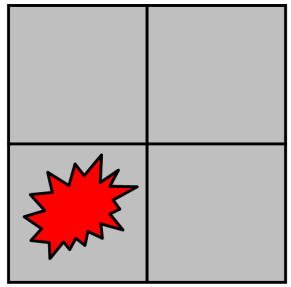
grey: Triggertower
red: offline cluster

The definition of response (R)

Response in general: $R = \frac{E_T^{\text{L1calo}}}{E_T^{\text{cluster}}}$

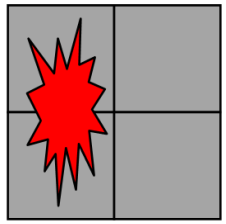
All energy in one tower.

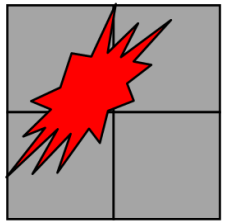
$R = \frac{E_T^{\text{tower}}}{E_T^{\text{cluster}}}$

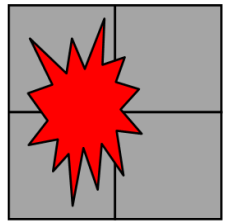


Energy in more towers.

$$R = \frac{E_T^{\text{RoI}}}{E_T^{\text{cluster}}} = \frac{E_T^{\text{maxTT}} + E_T^{\text{2ndTT}}}{E_T^{\text{cluster}}}$$



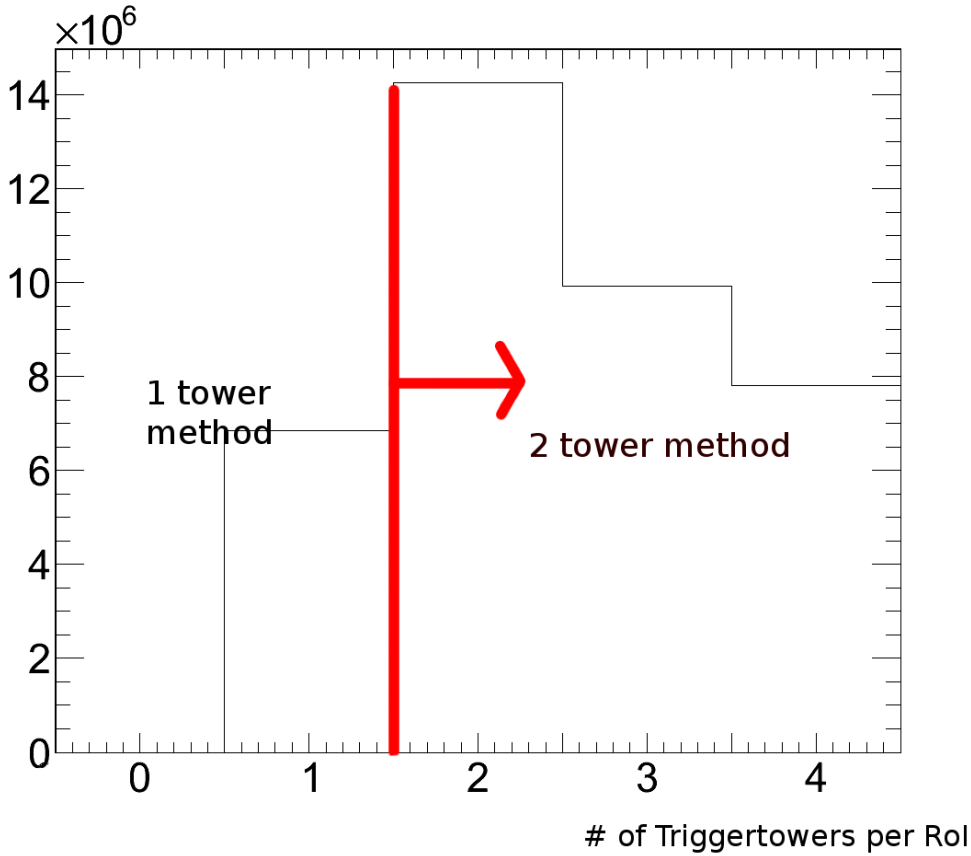




The R is used for the tower with higher E_T.

The EM sliding window algorithm

Number of TT fired per RoI (periode H-I).

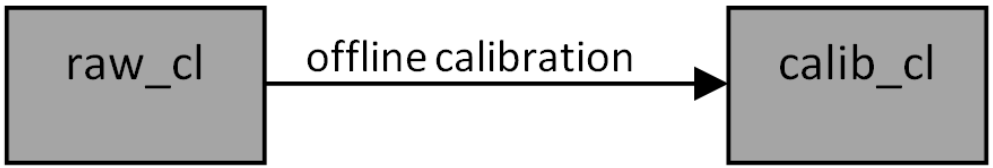


More statistics with two and more towers.

The offline energy calibration for e-cluster

Two types of offline clusters:

- Raw clusters (raw_cl) are not corrected for dead material.
- Calibrated clusters (calib_cl) are corrected.



4-weight method

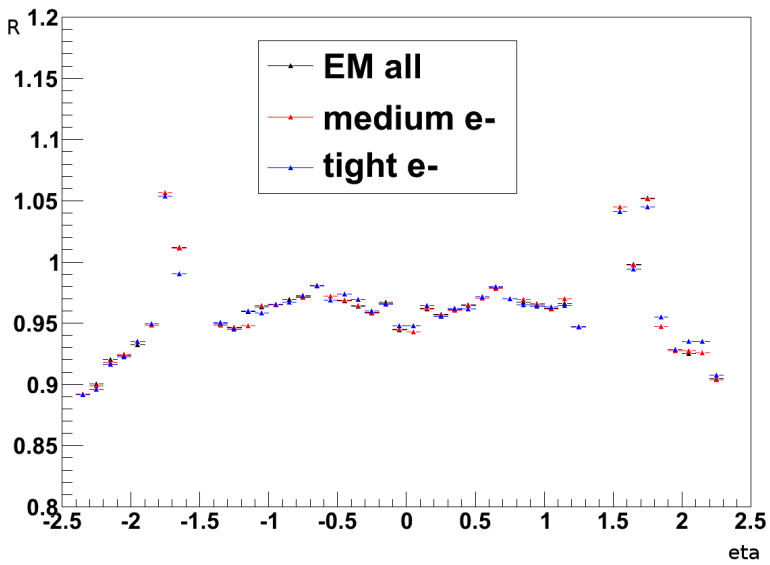
$$E_{reco} = A(B + W_{ps}E_{ps} + E_1 + E_2 + W_3E_3)$$

- E_{ps} and $E_1, ..., E_3$ are the cluster energies in the presampler and the three layers of the calorimeter.
- A is the global factor.
- B is the offset for the energy-loss before the presampler.
- W_i are the correction factors for the different layers.

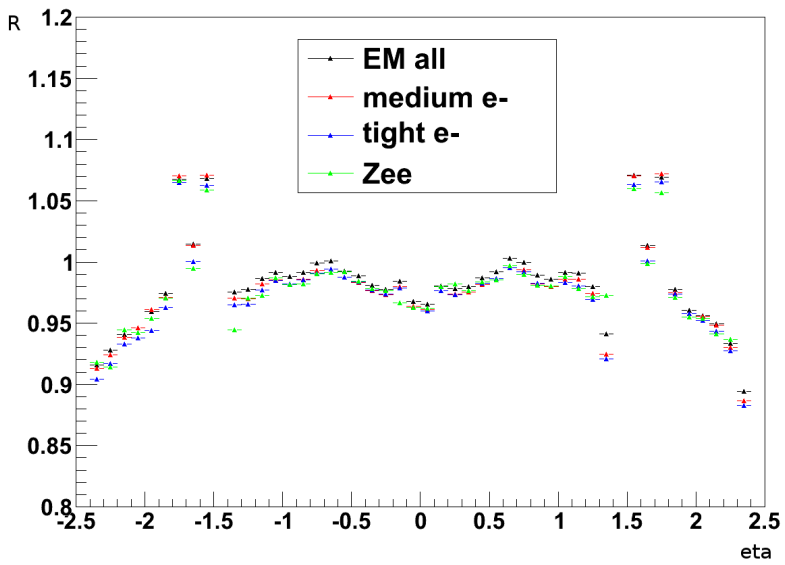
The response from L1calo

$R = \frac{E_T^{\text{L1calo}}}{E_T^{\text{raw\_cl}}}$, the offline E_T is raw_cl.

1 tower method



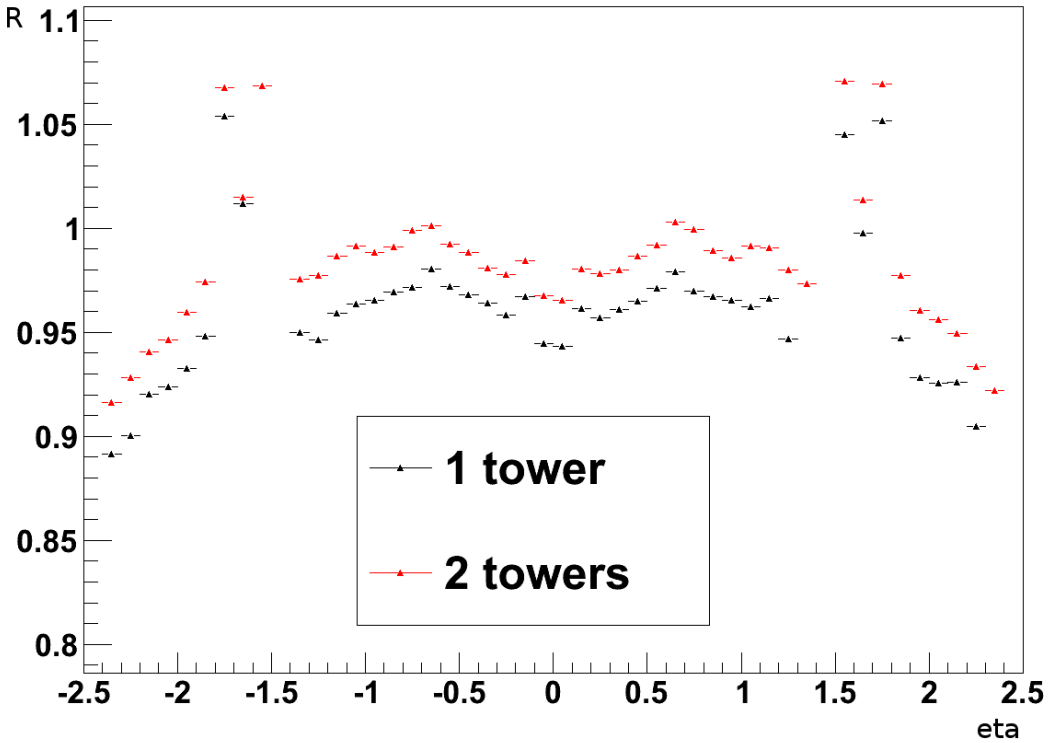
2 tower method



- No difference for different e selections.
- Expected to be 1 for a perfect pulser calibration.

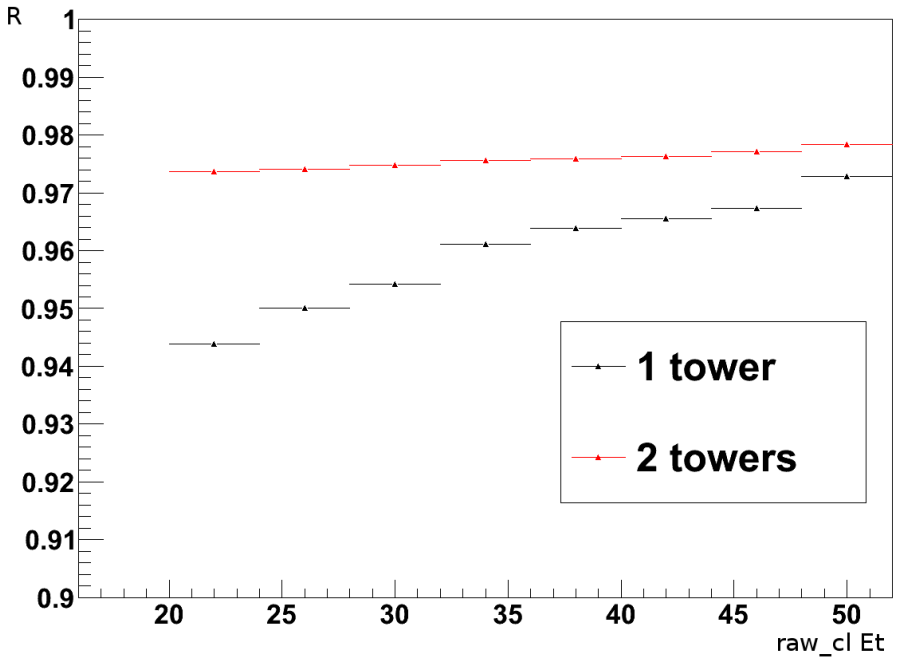
Comparision of the two methods

Response for EMall and raw_cl.



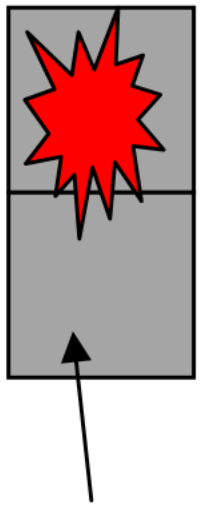
- The Response depends on the method.
- 1 Tower method 2-5% lower.

Comparision of the two methods



E_T difference ca. 3%.
$\Rightarrow$ at 20 GeV $\hat{=}$ 0.6 GeV.

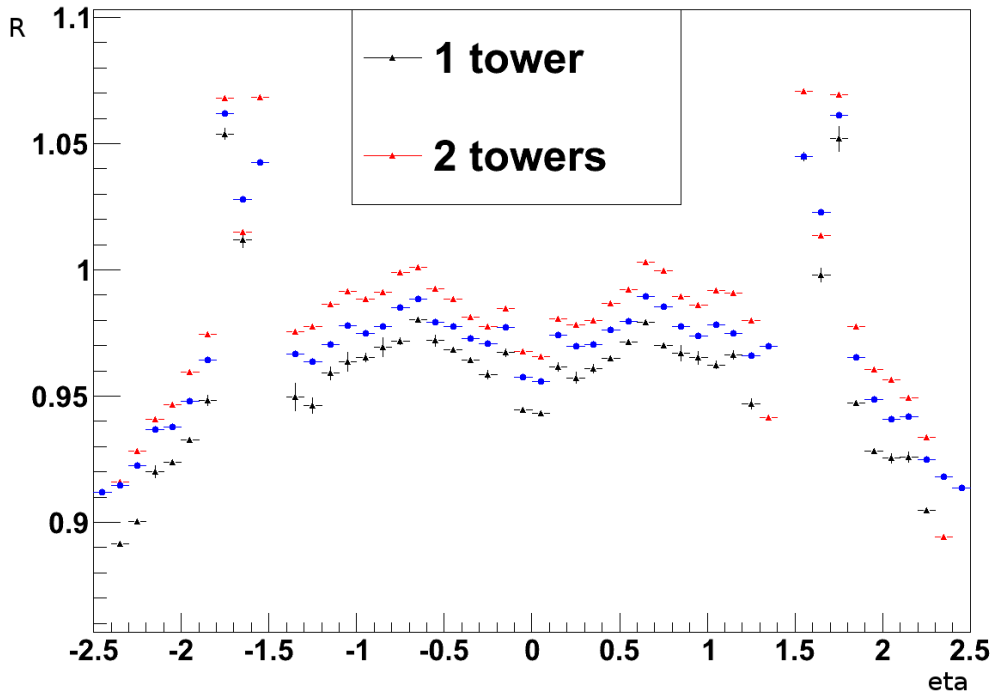
Reason:
the 1GeV noise-cut.



only 1 GeV in the
2nd tower

Compare to latest L1calo calibration

Blue dots are the results of calibration in December. Everything is calculated with LUT values.



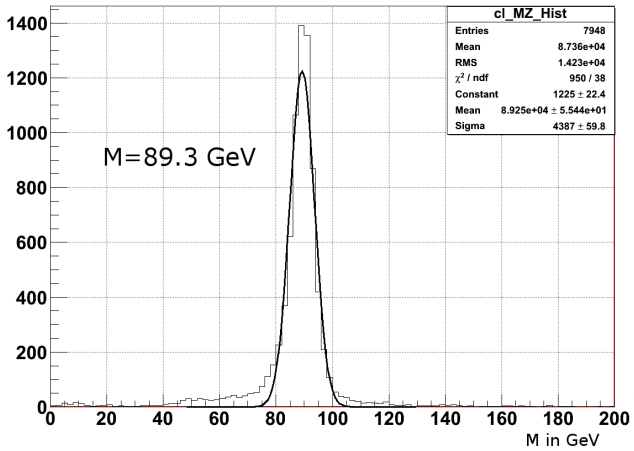
- difference to 1 tower: noise cut
- difference to 2 towers: ?

Thanks to Yuriy for the LUT plot.

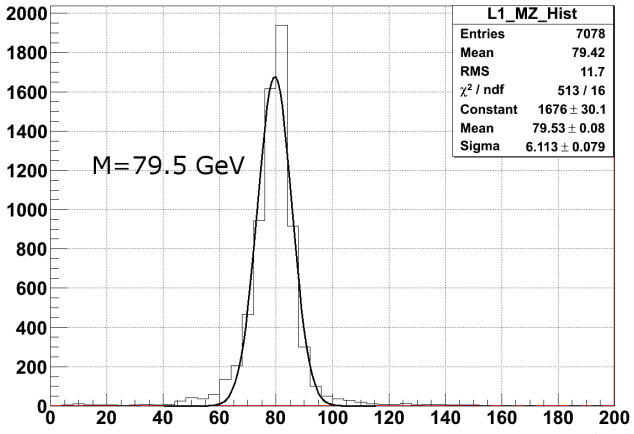
Motivation for dead material correction

Z mass calculated with:

calib_cl information.



L1 information.



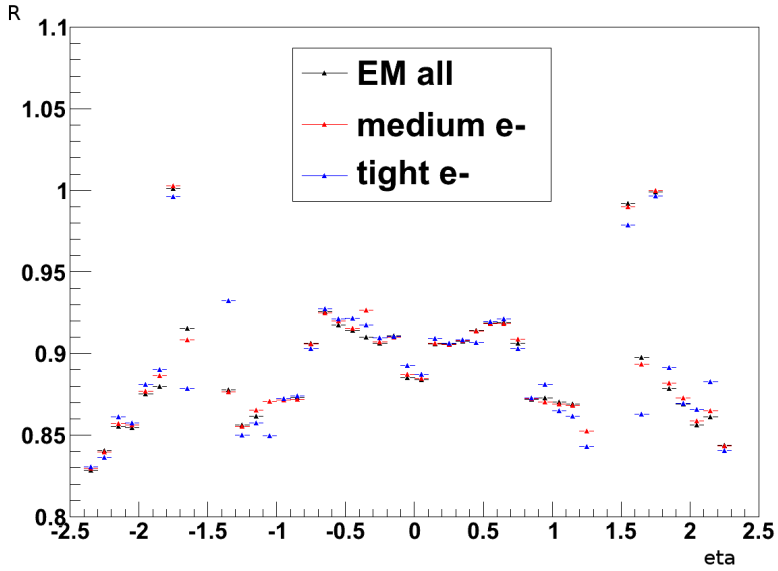
Egamma default cuts:

- At least 1 vertex in every event.
- At least 1 vertex with 3 tracks.
- el_author = 1 or 3
- medium isolated e
- opposite charge e

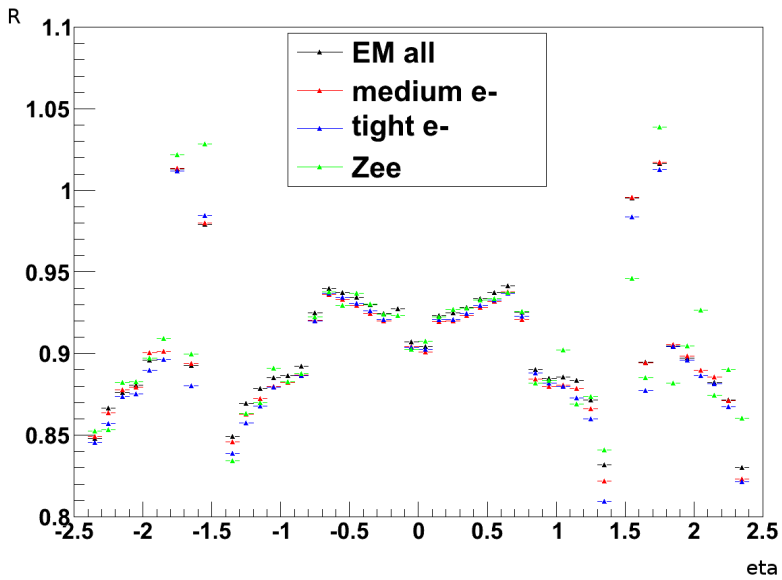
The response from L1calo

$R = \frac{E_T^{\text{L1calo}}}{E_T^{\text{calib\_cl}}}$, the offline E_T is calibrated.

1 tower method



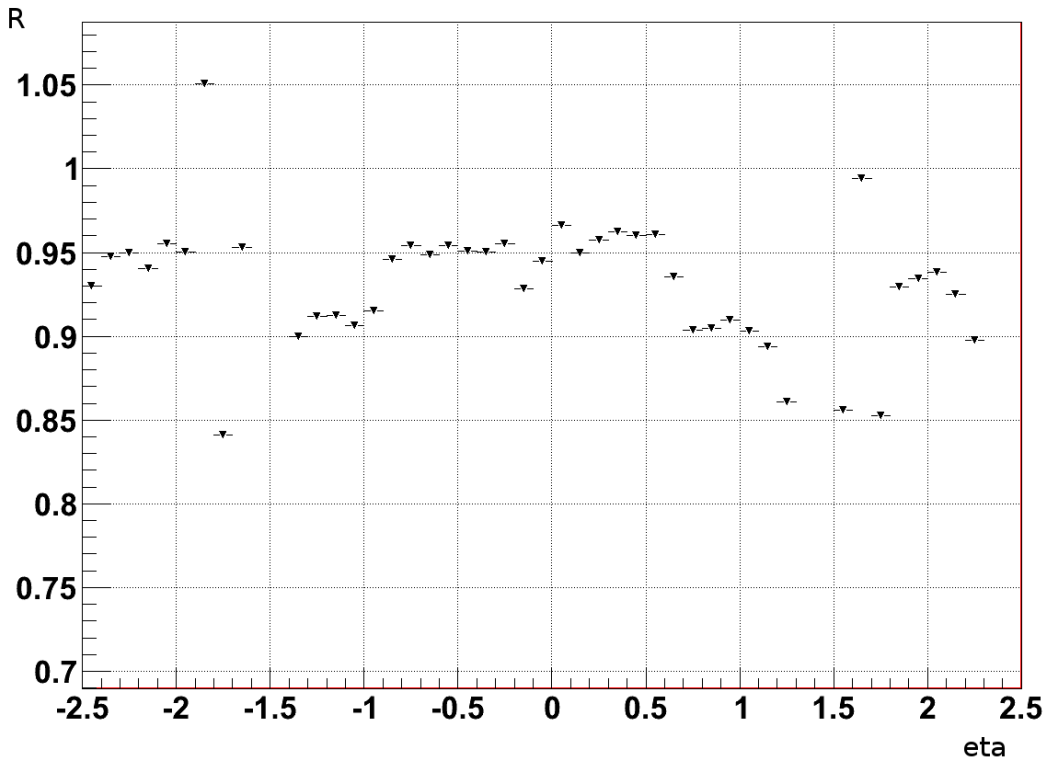
2 tower method



- No difference for different e selections.
- A difference of 2-5% between the two methods too.

How would it look like in 2011 data?

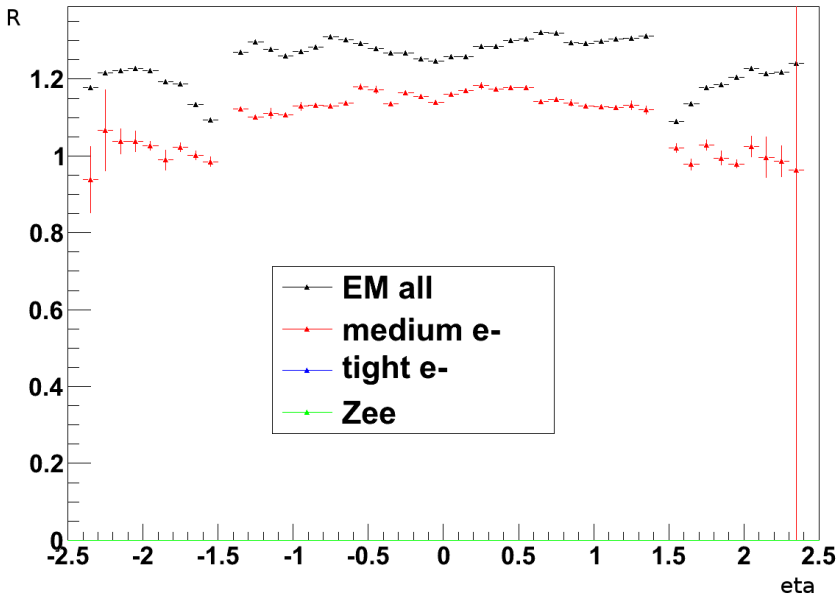
Estimated calibration with calib_cl:

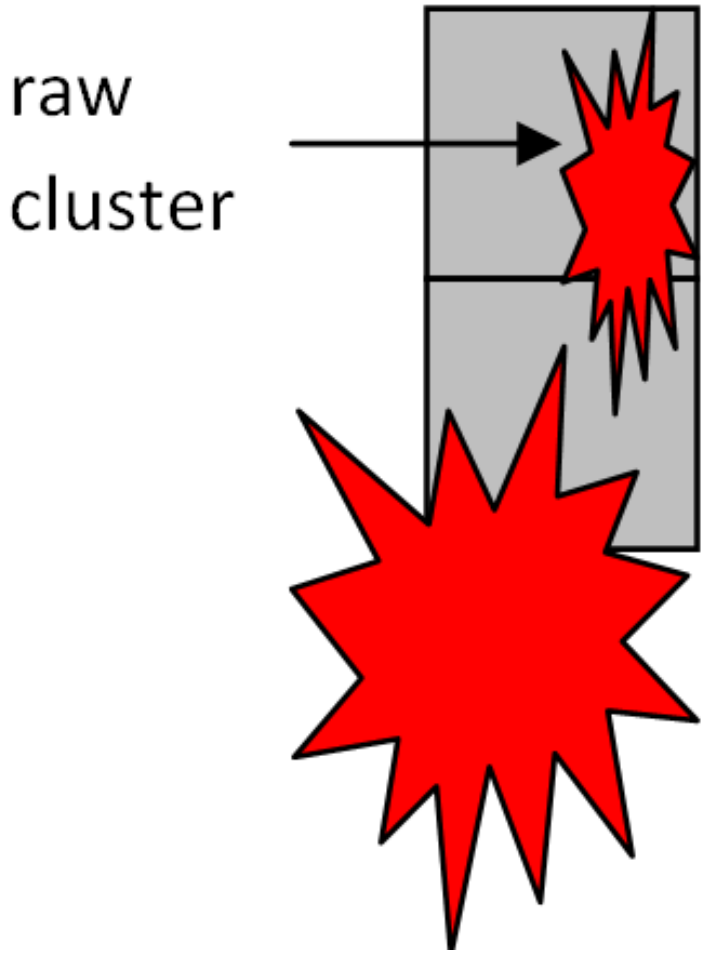


- 5% undercalibrated.
- Uniform response.
- Some areas with a variation of 3-5%.

Short look in HI (run 169884)

No RoIs with only one tower.





Conclusions and Outlook

Conclusions:

- The response depends on the method.
- The response does not depend on e-selection.
- Without dead material correction L1calo will fluctuate about 5-8%.

Outlook:

- Look in 2011 pp-collisions.
- Compare the results to Monte Carlo.
- Look into the φ-dependence of the response.