0.1 Calorimeter

GEn Calorimeter consists of 3 main parts PreShower array, scintillators and Shower array.

PreShower: 2x27 blocks 8.5X37X8.5 cm.

Scintillator: 13 blocks 17X64X4 cm.PMT-s on each side.

Shower: 7X27 blocks 8.5X8.5X37 cm.

Calorimeter trigger is 'OR' of 26 Total Sum sigmals. Each Total SUm signal involve 4 PreShower blocks signals and 14 Shower blocks signals (Figure 1).

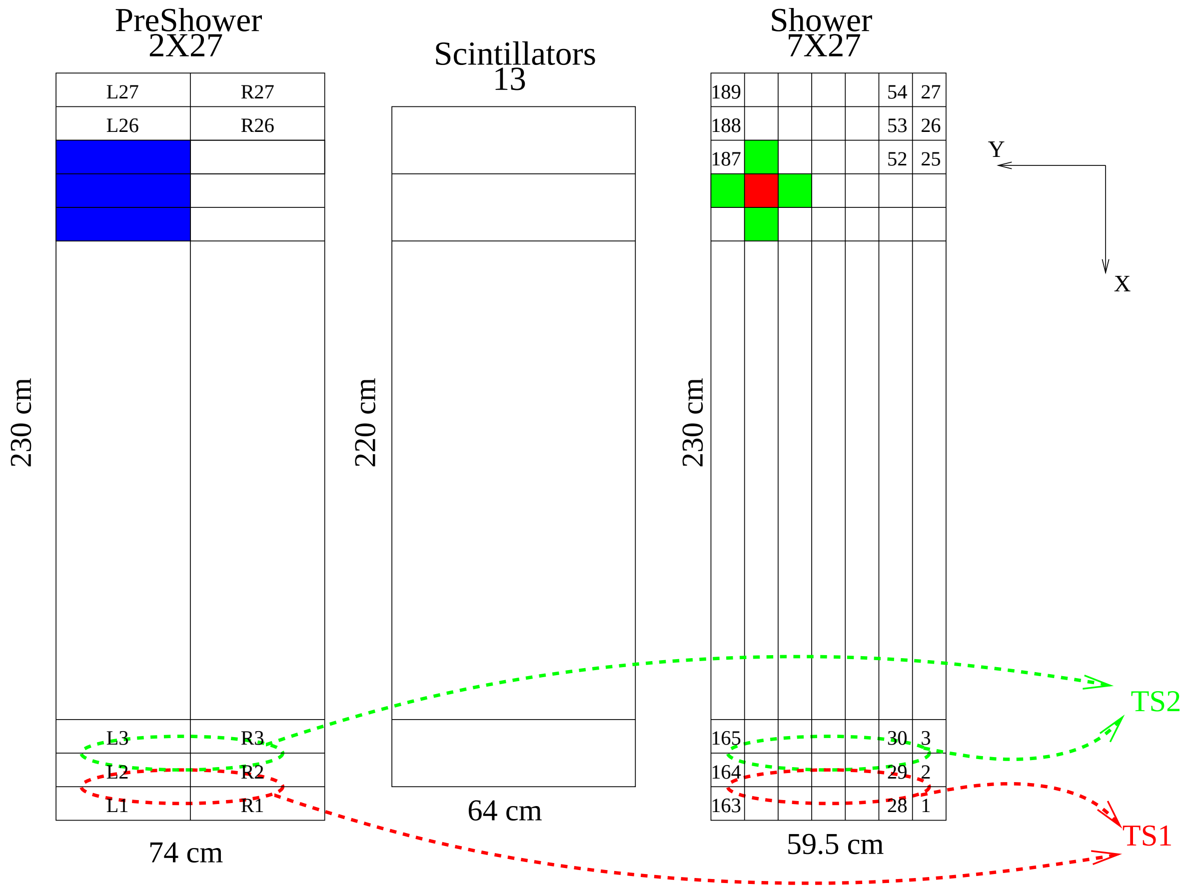

Figure 1: BigBite calorimeter(front view)

0.2 Calibration

0.2.1 Problem definition

The goal of shower detector channels calibration is to define a coefficients for the amplitude value transformation to the energy deposition for every Preshower and Shower modules. Magnitudes of amplitudes from each of shower detector blocks has been equalized preliminary by the high voltage tune using signals from cosmic rays. The last attempt to achieve that goal was made using block-by-block calibration using qasyelastic events from 3-rd kinematics.

0.2.2 Algorithm and results

Algorithm for j-th block is as follows:

1. Choose qasyelstic events

2. Choose from all qasyelastic events, events when j-th block is central block of the cluster.

3. For chosen events plot following distribution:

$$C_{sh} \cdot A_{sh}^0 + A_s h^s ide + C_{ps} \cdot A_{ps} - (E_{tr} - \bar{E}_{tr}), \tag{1}$$

where k_{sh} and k_{ps} are calibration constants for shower cluster central block and preshower block respectively; A_{sh}^0 is amplitude of shower cluster central block; E_{tr} and $\bar{E}_{tr}$ - energy from tracking fro each event , and mean value of tracking energy distribution. $A_s h^s ide$ and A_{ps} are given by the following equations:

$$A_{sh}^{side} = \sum C_i \cdot A_{sh}^i, \tag{2}$$

here C_i and A_i are calibration constant and amplitude of one of the neighbours of central block, summing is done for 4 neighborsrs (Figure 1, green blocks)

$$A_{ps} = \frac{1}{2} \sum A_{ps}^i, \tag{3}$$

here A_{ps}^i is amplitude of PreShower block, summing is done for 3 PS blocks corresponding to chosed shower cluster(see Figure 1,blue blocks). We need to find C_{sh} and C_{ps} parameters values corresponding to minimum sigma in distribution 1 For first iteration calibration constants $C_i$for neighbour blocks were fixed to 1.0. When C_{sh} and C_{ps} are known for one block the same procedure should be done for one of its neighbours (for example upper one), but now we know calibration constant for previous block and one of the C_i parameters will be the $C_s h$ parameter from previous iteration. That procedure should be done for each block in column 2 times(from bottom to top and visa-versa). Then when doing the same for neighbour column, the calibratrion constants from previous one should be used in calibration procedure. Calibration using described algirithm were done for 4 columns of Shower detectorr (2,3,5 and 6). Results for all blocks in these columns as well as result for 2 individual blocks shown on figures 2, 3, 4 .

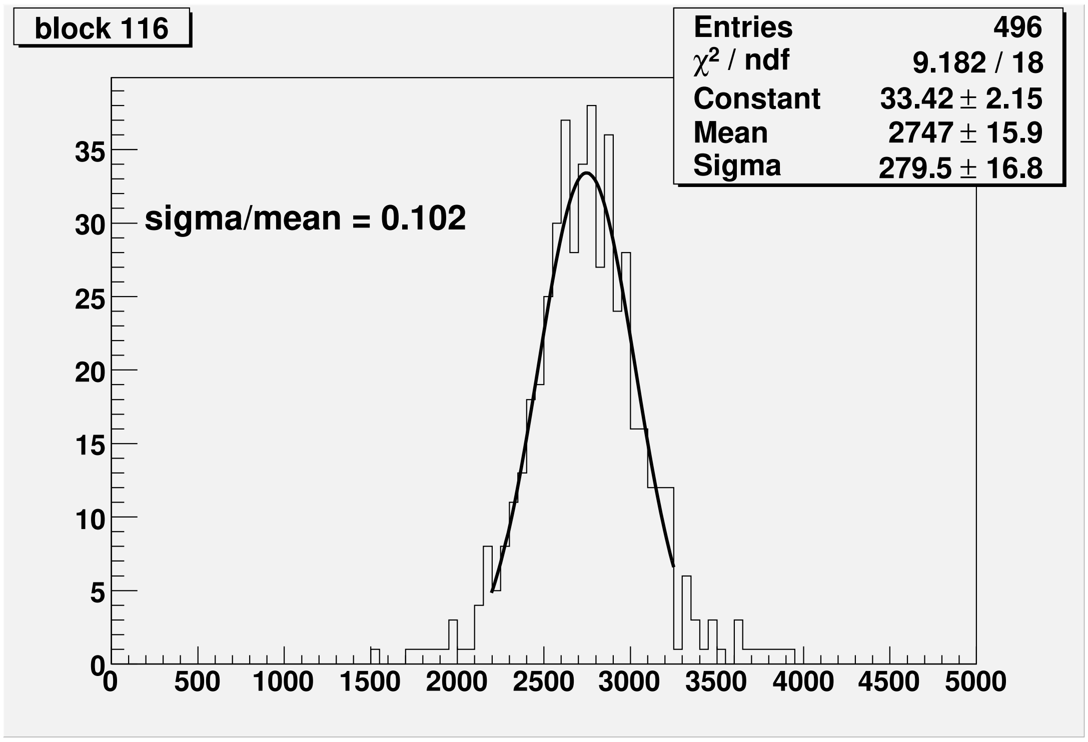

Figure 2:

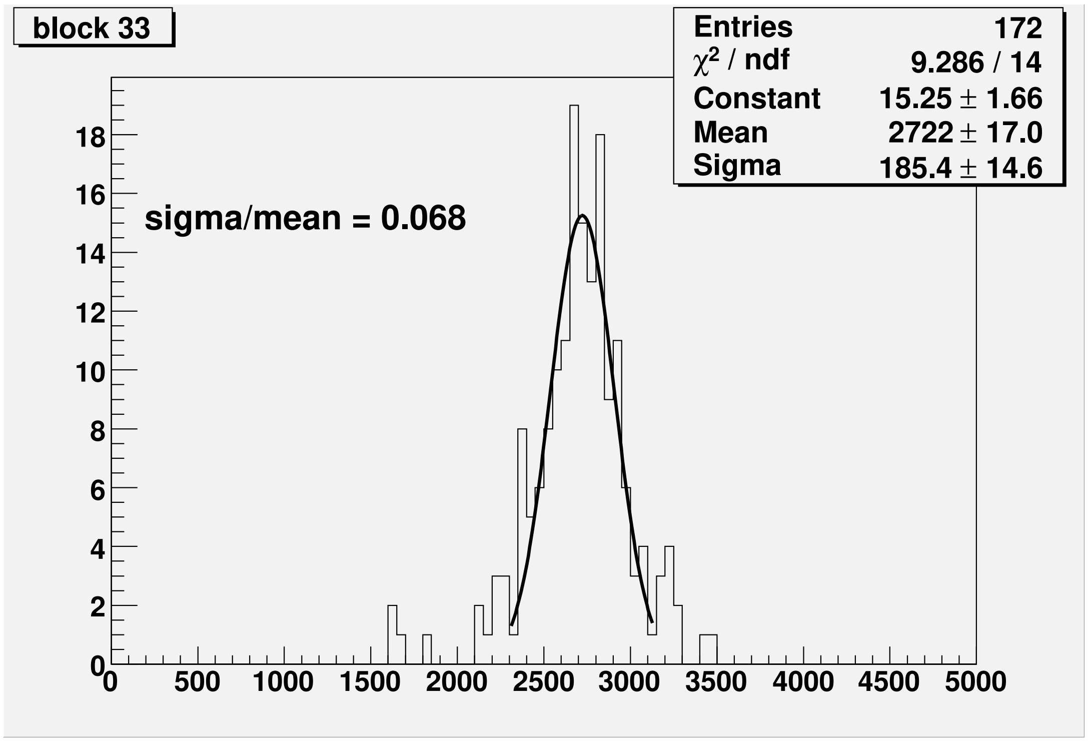

Figure 3:

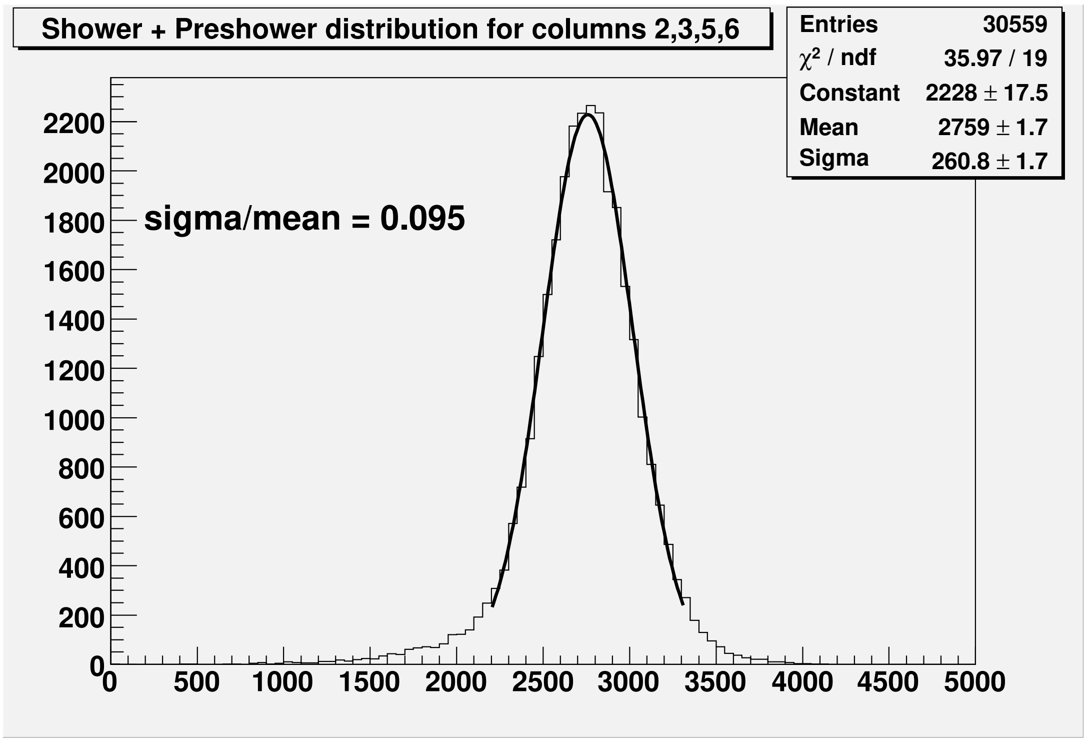
Shower + Preshower distribution for columns 2,3,5,6
Entries 30559
χ^2 / ndf 35.97 / 19
Constant 2228 ± 17.5
Mean 2759 ± 1.7
Sigma 260.8 ± 1.7
sigma/mean = 0.095
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000

Figure 4: