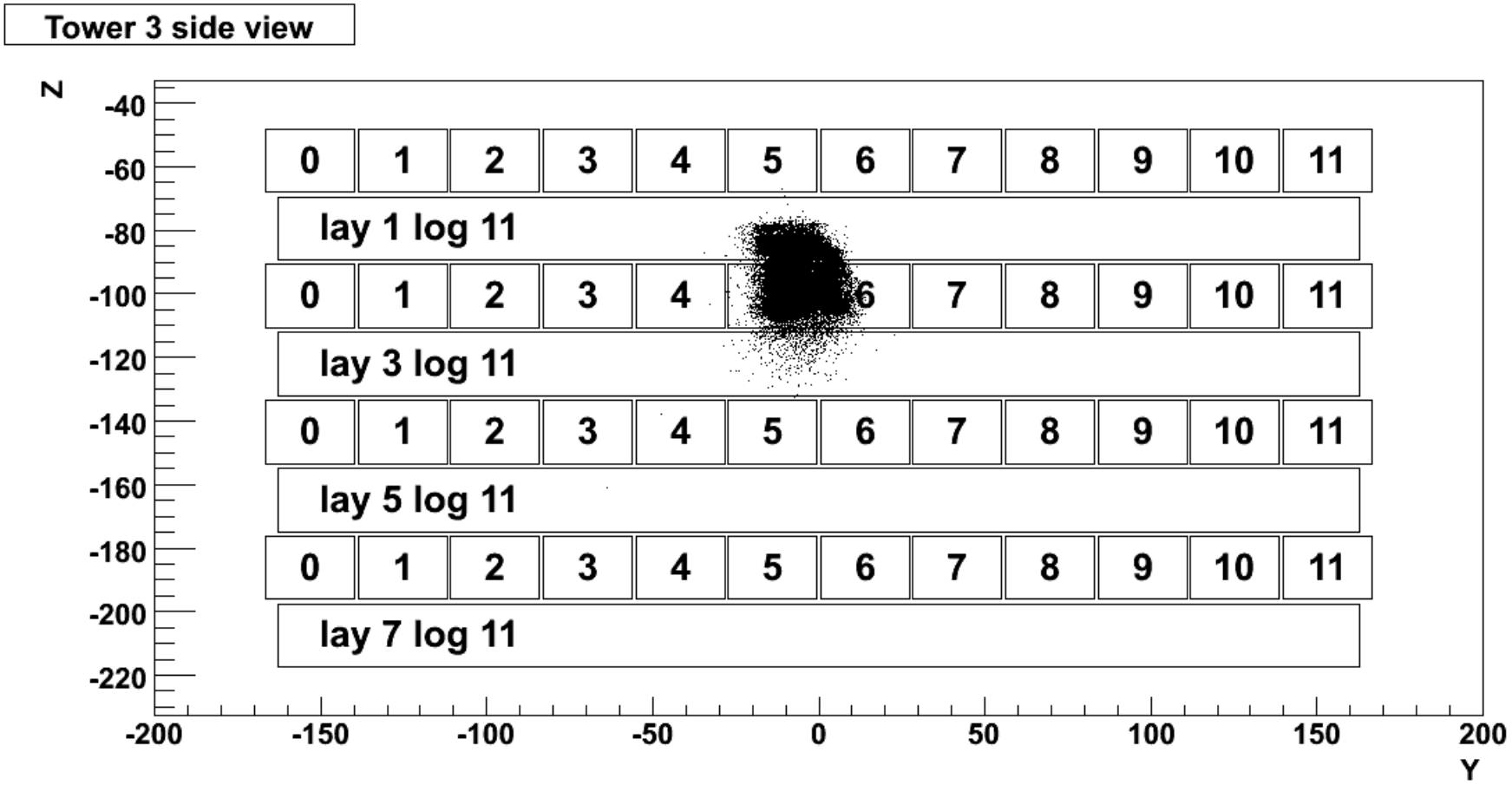
Analysis of 90deg electrons runs

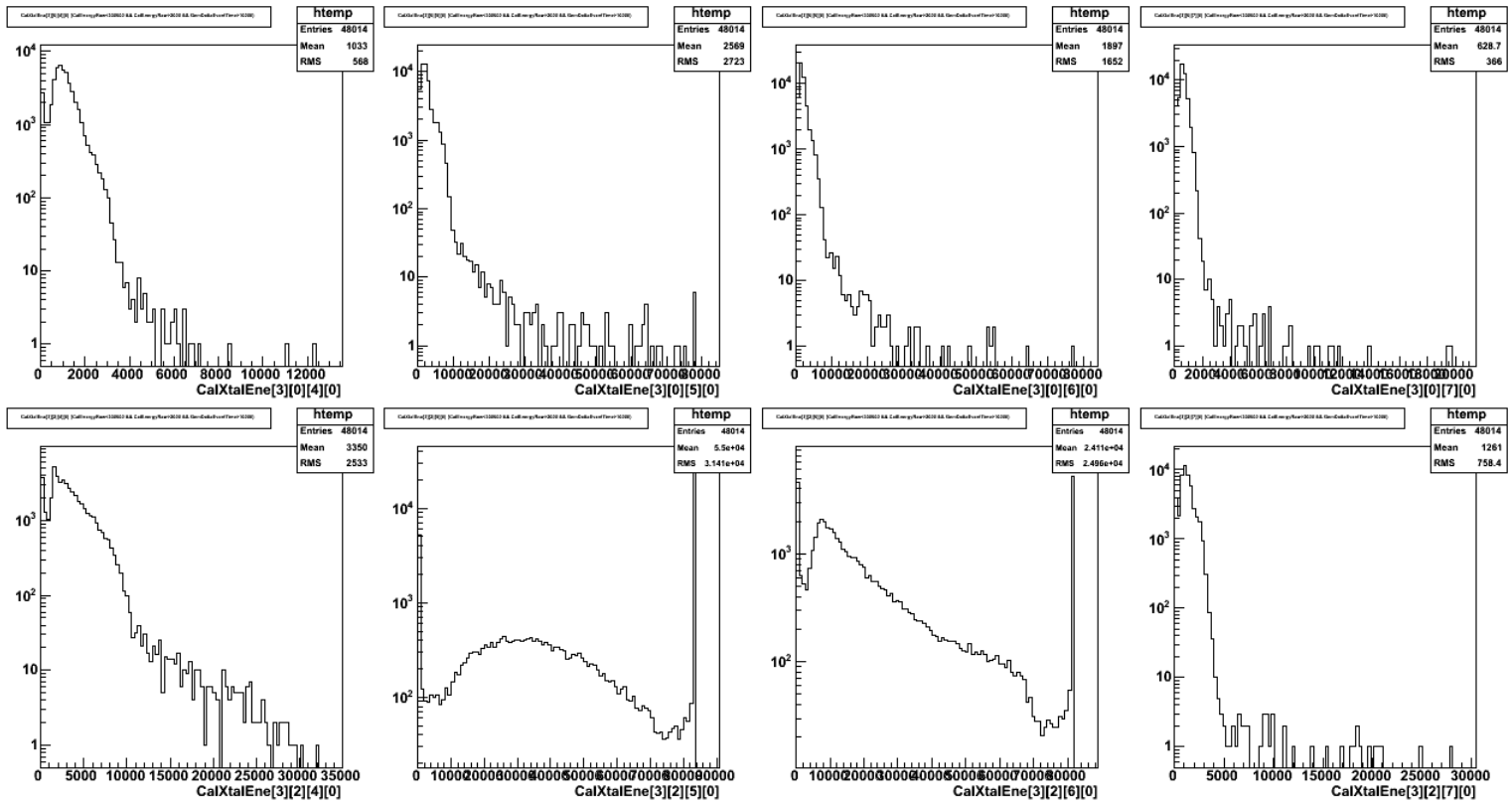
- Only two energies :
  - 700000821-822 : 5 GeV (749,13.92,-100.4)
  - 700001951 : 280 GeV (749,0,-79)
- This analysis has been triggered by Sasha's analysis of the run 700001951
- The idea is that the shower should be contained longitudinaly so the raw energy should give the beam energy
- BUT we have to take care of the lateral leakage !
- Gleam simulation of these two configurations (w/o beamtest06)

Analysis of the 280 GeV run (700001951)



Beam between layer 1 and layer 2

- Even layers : crystal axis is parallel to the beam direction
- Odd layers : crystal axis is perpendicular to the beam direction
- Remove events with saturation in crystals 5 and 6 of even layers (>70 GeV)

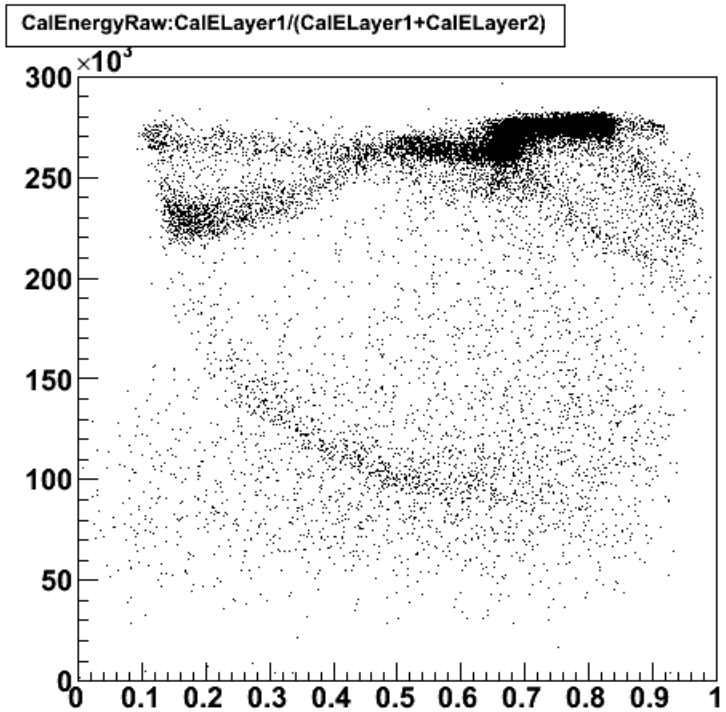


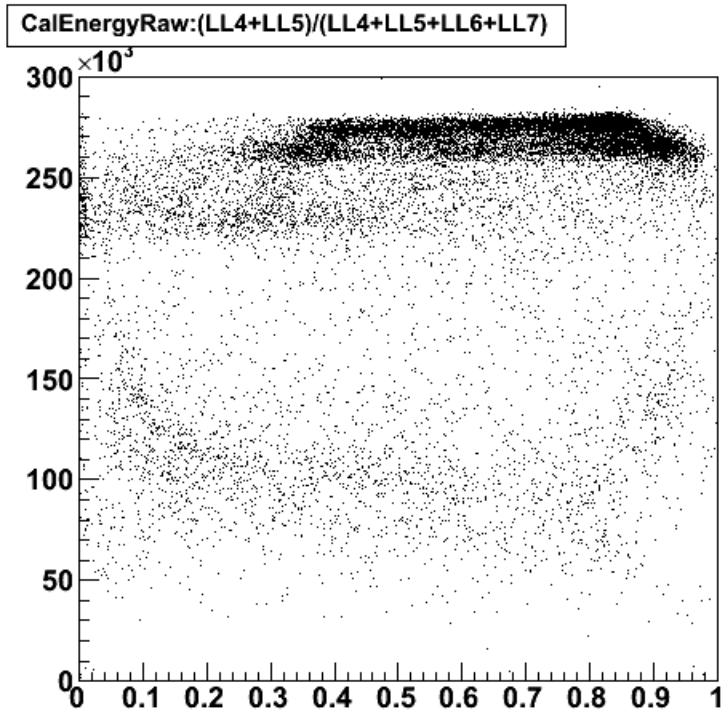
Fiducial cuts (1)

- The beam is ~ in between layer 1 and 2
- Selecting events shooting in layer 1 rather than in layer 2 because when shooting in layer 2 logs 5 or 6 should saturate
  - Using CalELayer1/(CalELayer1+CalELayer2)
  - And CalELayer0/(CalELayer0+CalELayer2)
- The beam is ~ in between log 5 and log 6
- Rejecting events just in between to avoid electrons seeing less radiation length because going through 2 logs
  - Comparing the sums of energy in even layers (0+2) and in logs 4, 5, 6 and 7
  - Notation
    - LL4 = CalXtalEne[3][0][4][0]+ CalXtalEne[3][2][4][0]
    - LL5 = CalXtalEne[3][0][5][0]+ CalXtalEne[3][2][5][0]
    - LL6 = CalXtalEne[3][0][6][0]+ CalXtalEne[3][2][6][0]
    - LL7 = CalXtalEne[3][0][7][0]+ CalXtalEne[3][2][7][0]

Fiducial cuts (2)

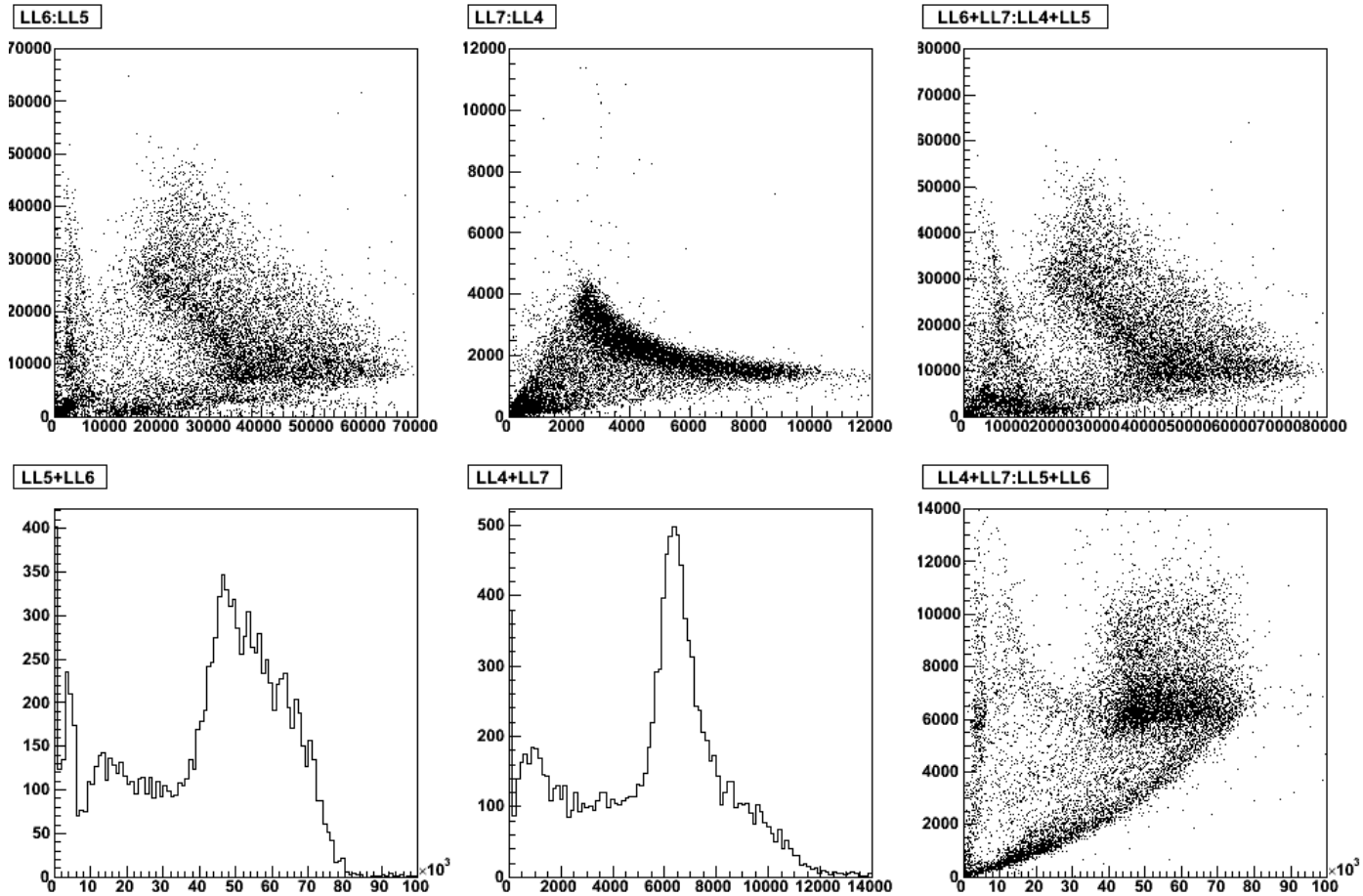
- -> CalELayer1/(CalELayer1+CalELayer2)>0.6
- For the other direction, se next slide





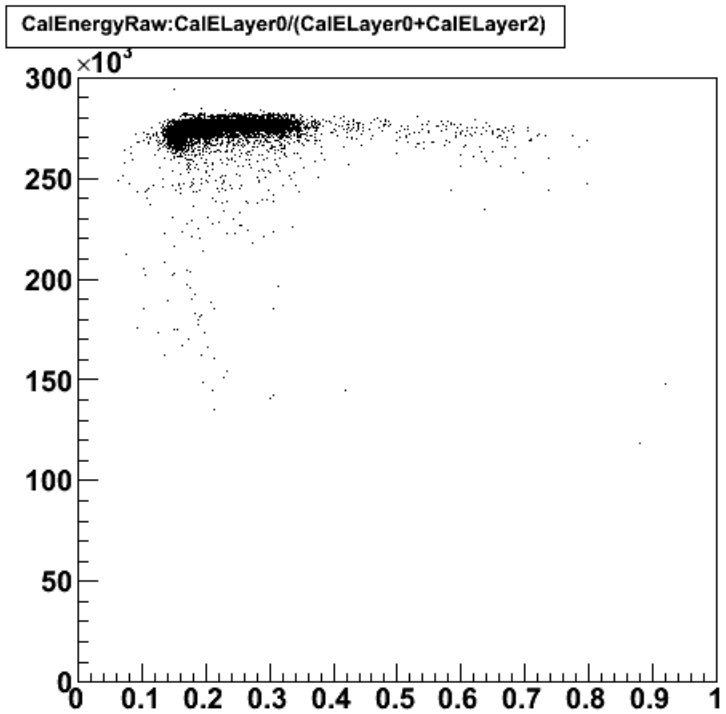
Fiducial cuts (3)

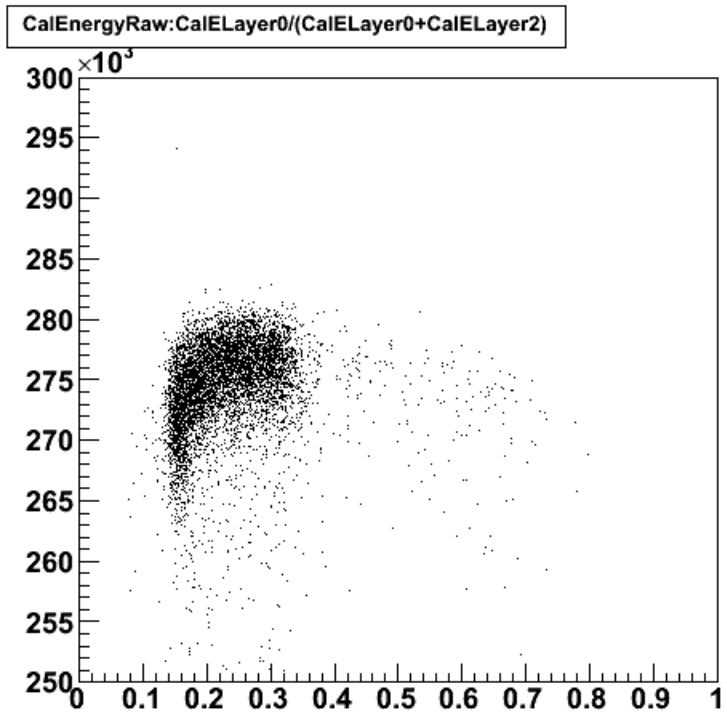
- -> LL5+LL6>35000 && LL4+LL7>5000



CalEnergyRaw

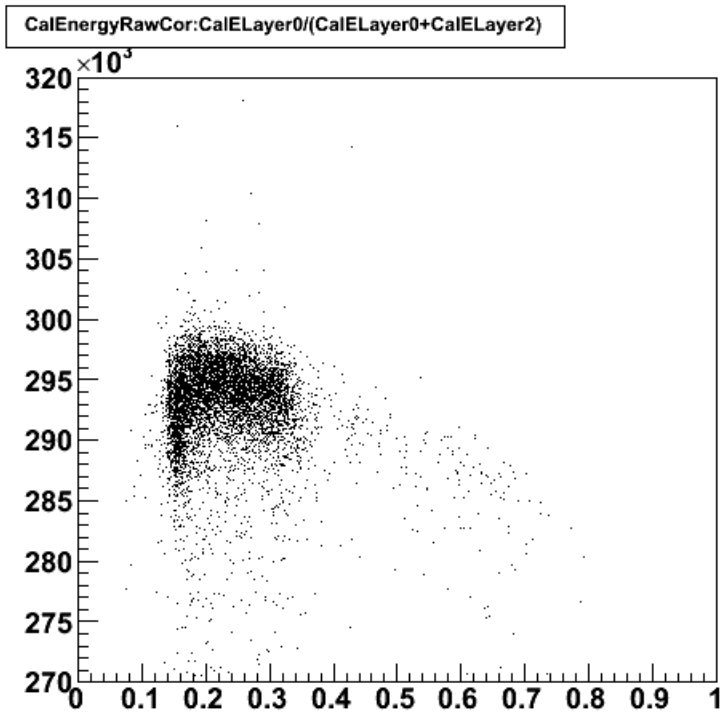
- CalELayer0/(CalELayer0+CalELayer2) = 0.5 means that the beam is in the center of layer 1 (along the vertical direction) -> CalEnergyRaw ~ 275 GeV

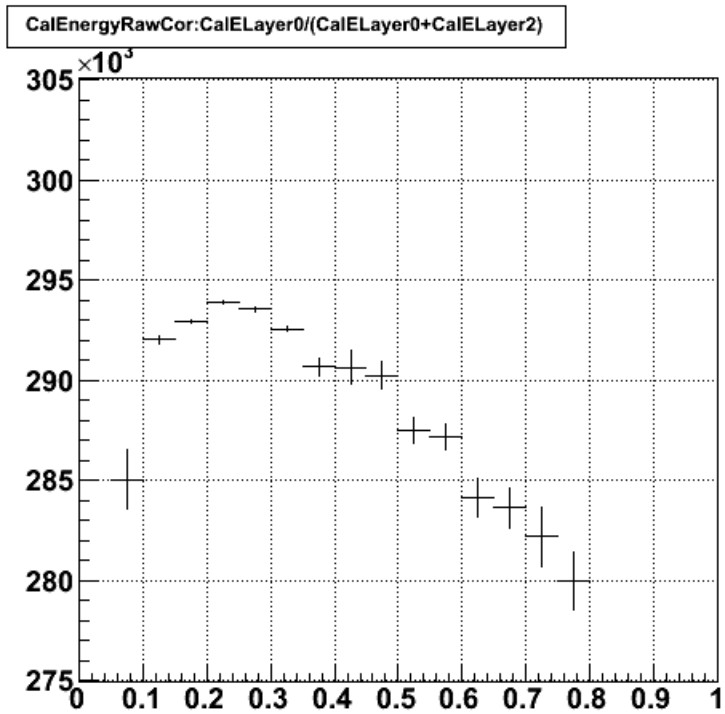




Corrected CalEnergyRaw

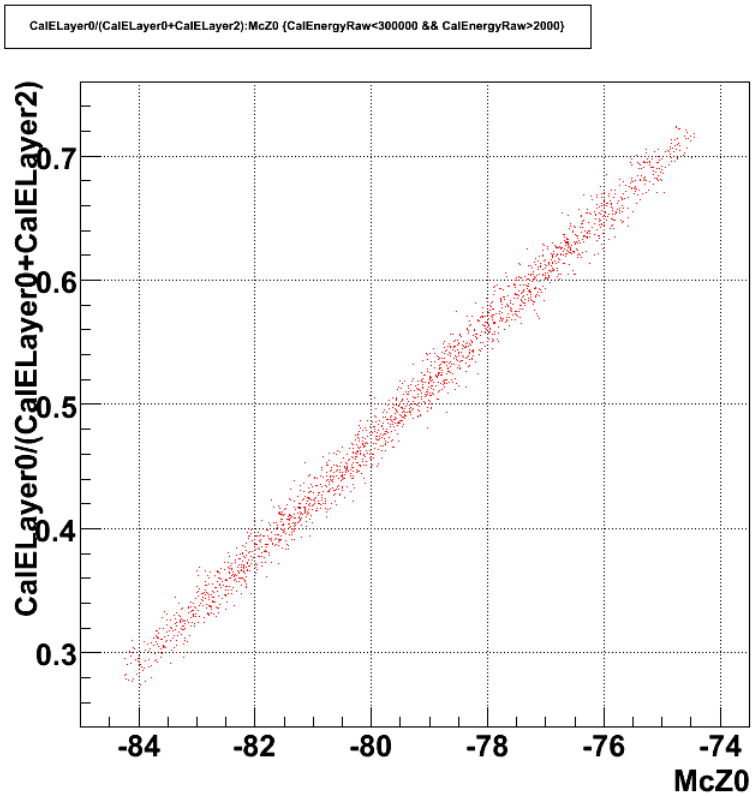
- When CalELayer0/(CalELayer0+CalELayer2) = 0.5 the raw energy is exactly corrected for lateral leakage by using : CalEnergyRawCor = CalEnergyRaw+CalELayer3+CalELayer4+CalELayer5+CalELayer6+CalELayer7
- 290 GeV / 282 GeV -> energy overestimation of (at least) about 3%

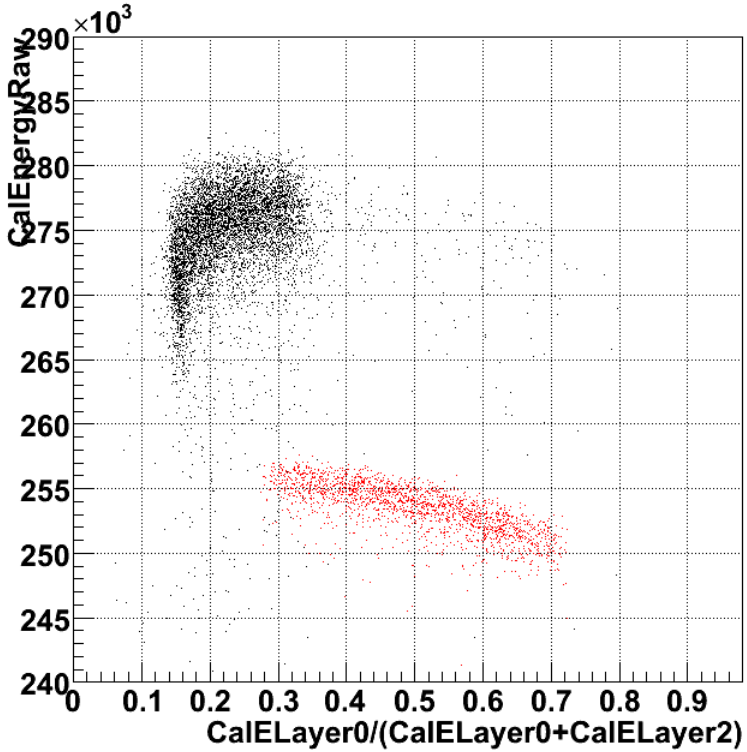




Comparison with Gleam simulation

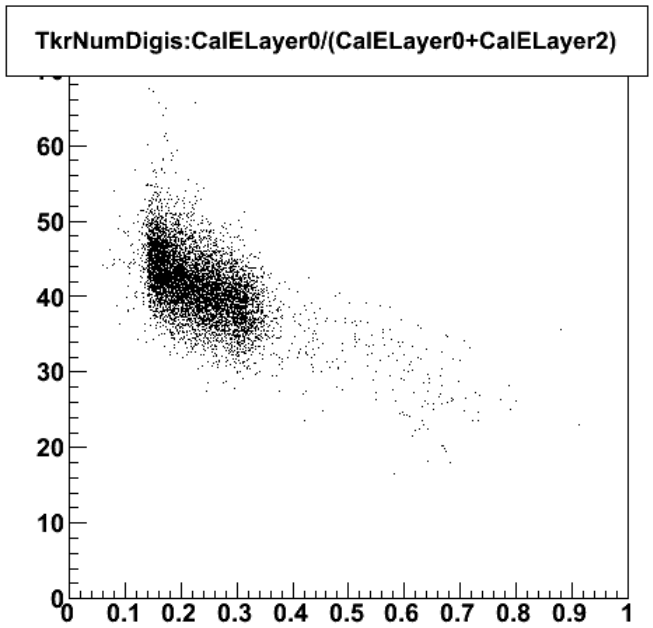
- CalELayer0/(CalELayer0+CalELayer2) is a good measurement of the vertical position (if perfect intercalibration)
- At the center of layer 1 : 275 GeV / 255 GeV -> data/MC ~ 8%

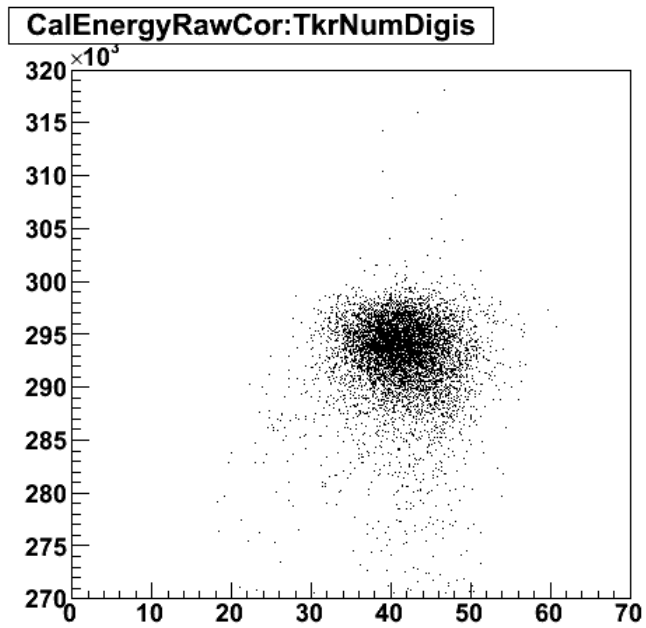




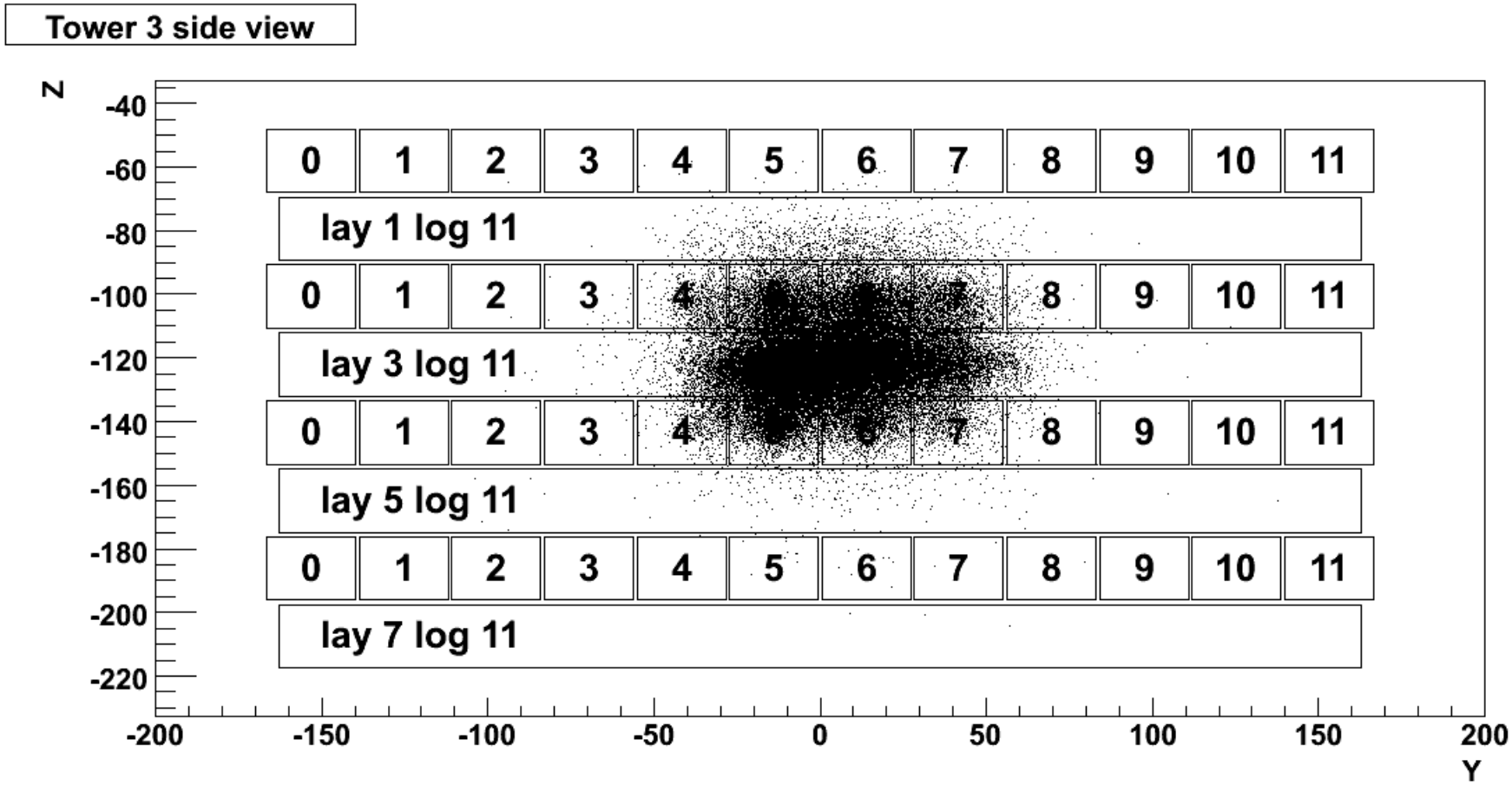
Look at TkrNumDigis

- TkrNumDigis is correlated with the vertical position of the beam
- The deeper in the calorimeter, the larger tracker activity ????



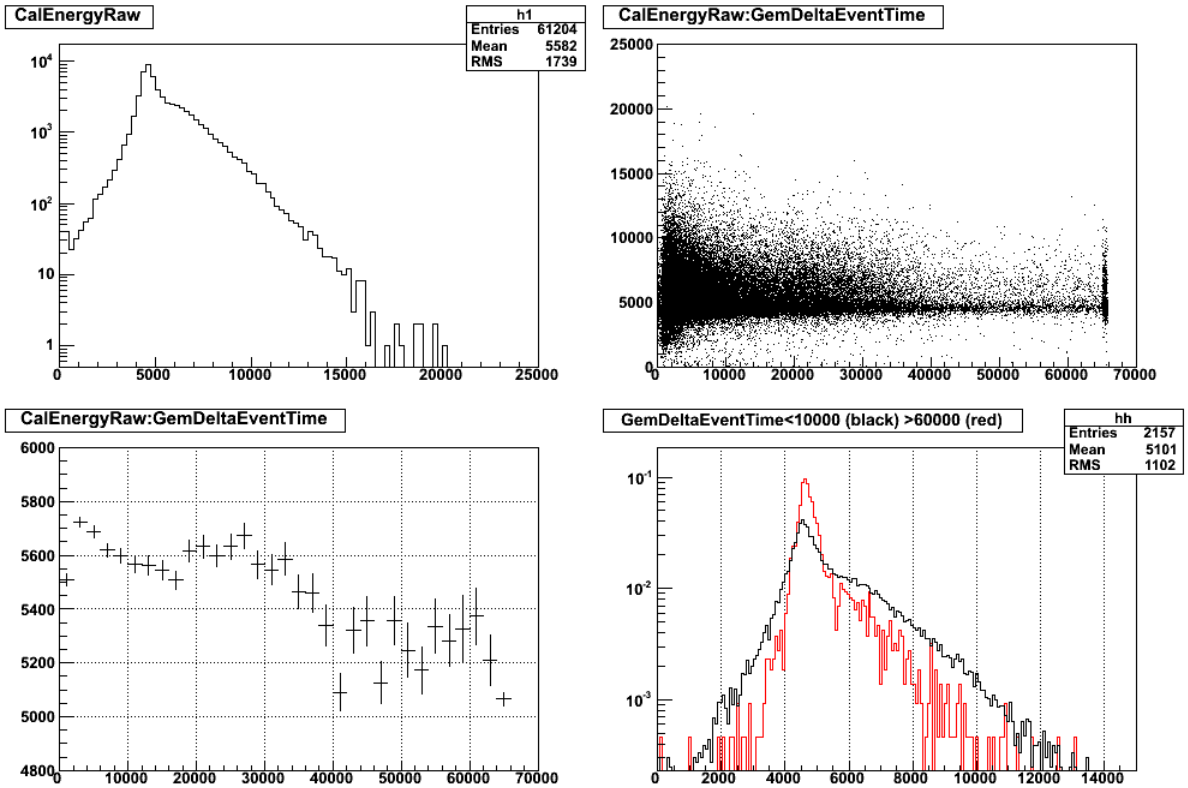


Analysis of the 5 GeV runs (700000821-822)



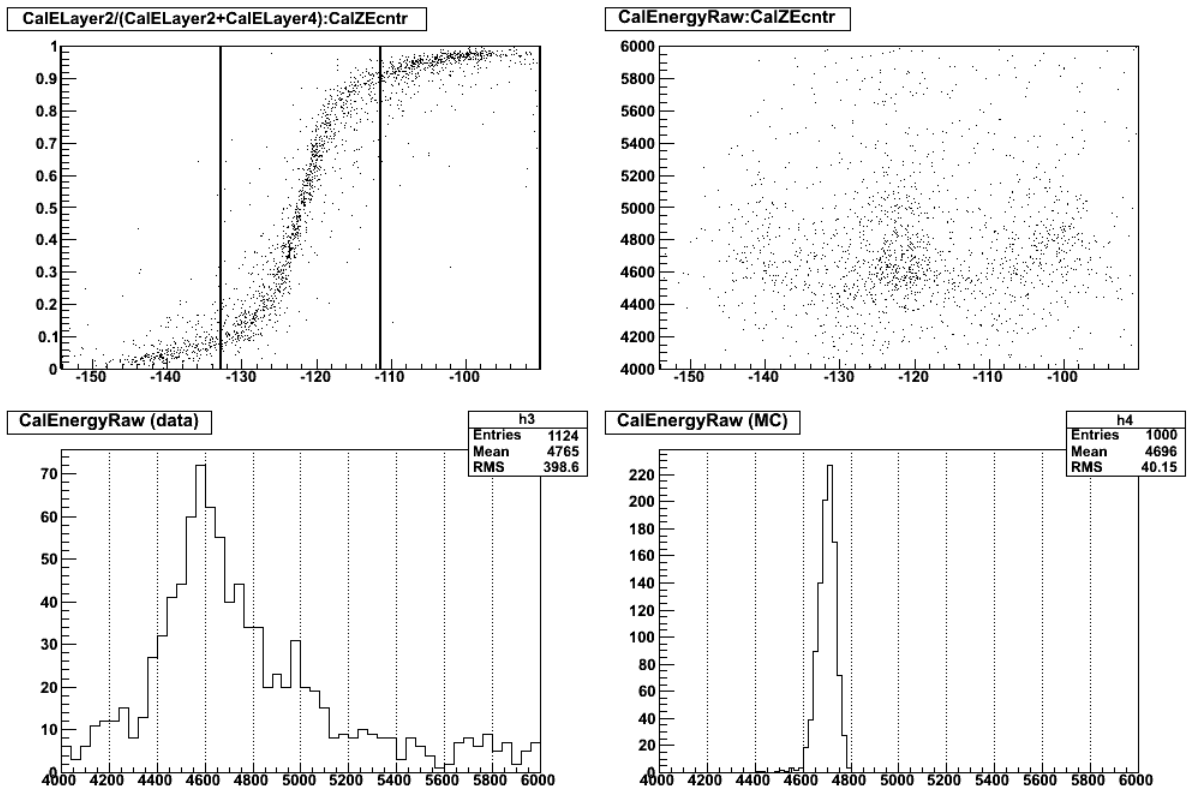
High acquisition rate : 100 Hz

- Pile-up is clearly seen
- Average CalEnergyRaw decreases with GemDeltaEventTime
- But the main peak is slightly at higher energy for large GemDeltaEventTime



Comparison of CalEnergyRaw

- Using CalZEcntr to select events inside layer 3
- Data ~ 4600 MeV < MC ~ 4700 MeV (data?Mc ~ -2%)
- The widths are very different !



Conclusions

- Only 2 energies are available in this 90deg configuration for electrons
- The 5 GeV run is problematic because of high rate
- The event selection is not easy (w/o tracker !)
- CalEnergyRaw comparison :
  - At 5 GeV : data/MC ~ -2% (but data width = 2 x MC width)
  - At 280 GeV : data/MC ~ +8% (and data width > MC width)
- Adjacent crystal x-talk correction is needed at 280 GeV
- Check with standard beamtest simulation (importance of simulating McYDir != 0 ?)
- Other runs at intermediate energies would have been highly appreciated…