09.12.99
HEC/FCAL TB
Analysis Meeting

Calibration of TB-99 Data

L.Kurchaninov, P.Strizenec

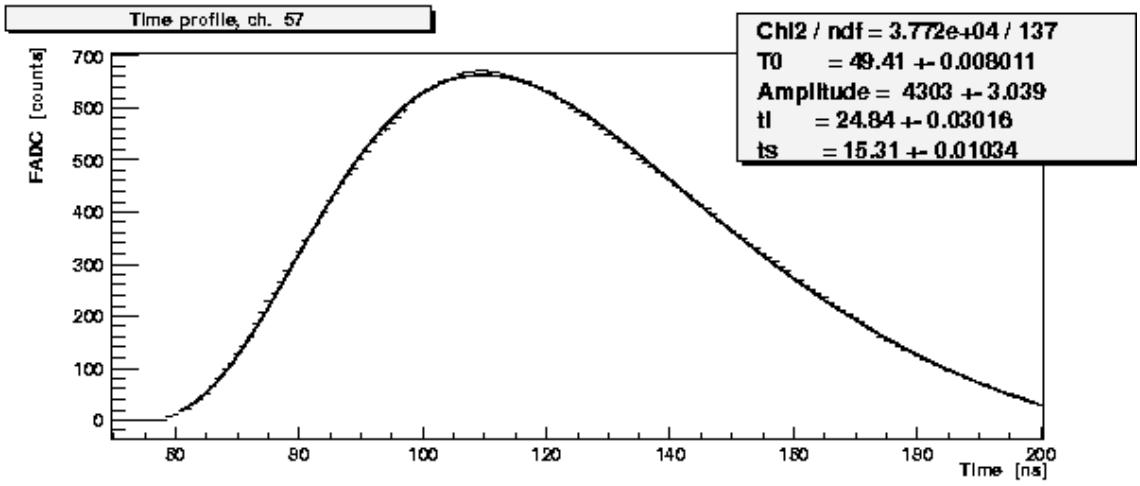
- Fit by electronics function
- Fit by multi-pole function
- Comparison with chain model
- Bad channels
- Weghting quality
- Proposal for 2000

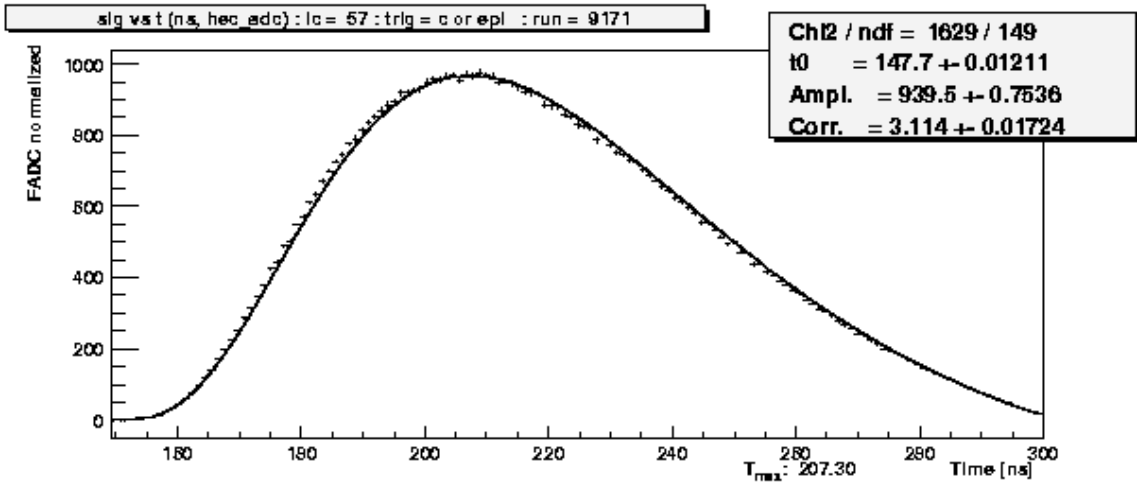
Fit of calibration data by “electronics” function

- This is a new approach, it was not used in 1998
- The model of the chain gives signal shape (both calibration and particle, details in HEC Note-076) Transform to time domain done by Mathematica v.4.0
- Calibration procedure:

  (1) fit calibration signal extracting 3 parameters: gain, preshaper time constant, and shaper time constant

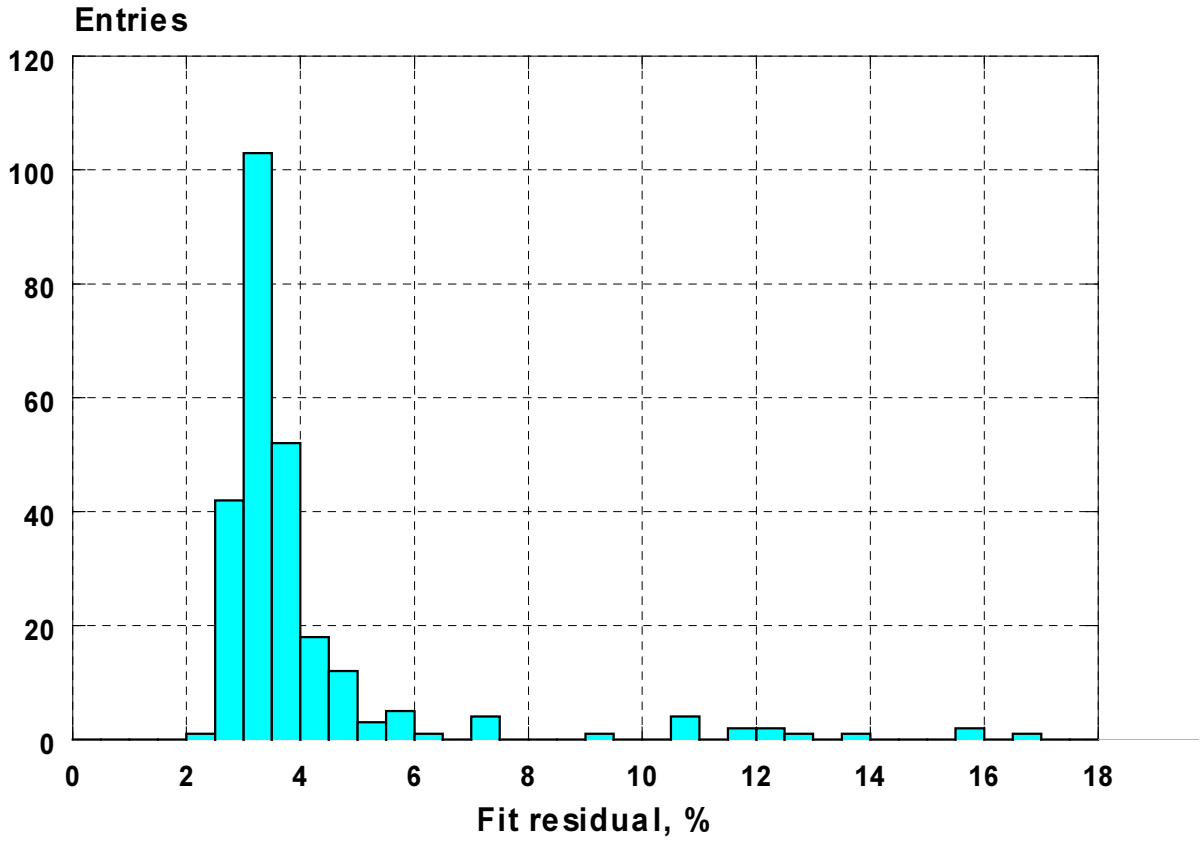
  (2) use these parameters to predict particle response and produce weights





Quality of the procedure

- It was found that the “electronics” function does not fit well the data, with residual in the range of few %



- Comparison to measured particle signals shows that:

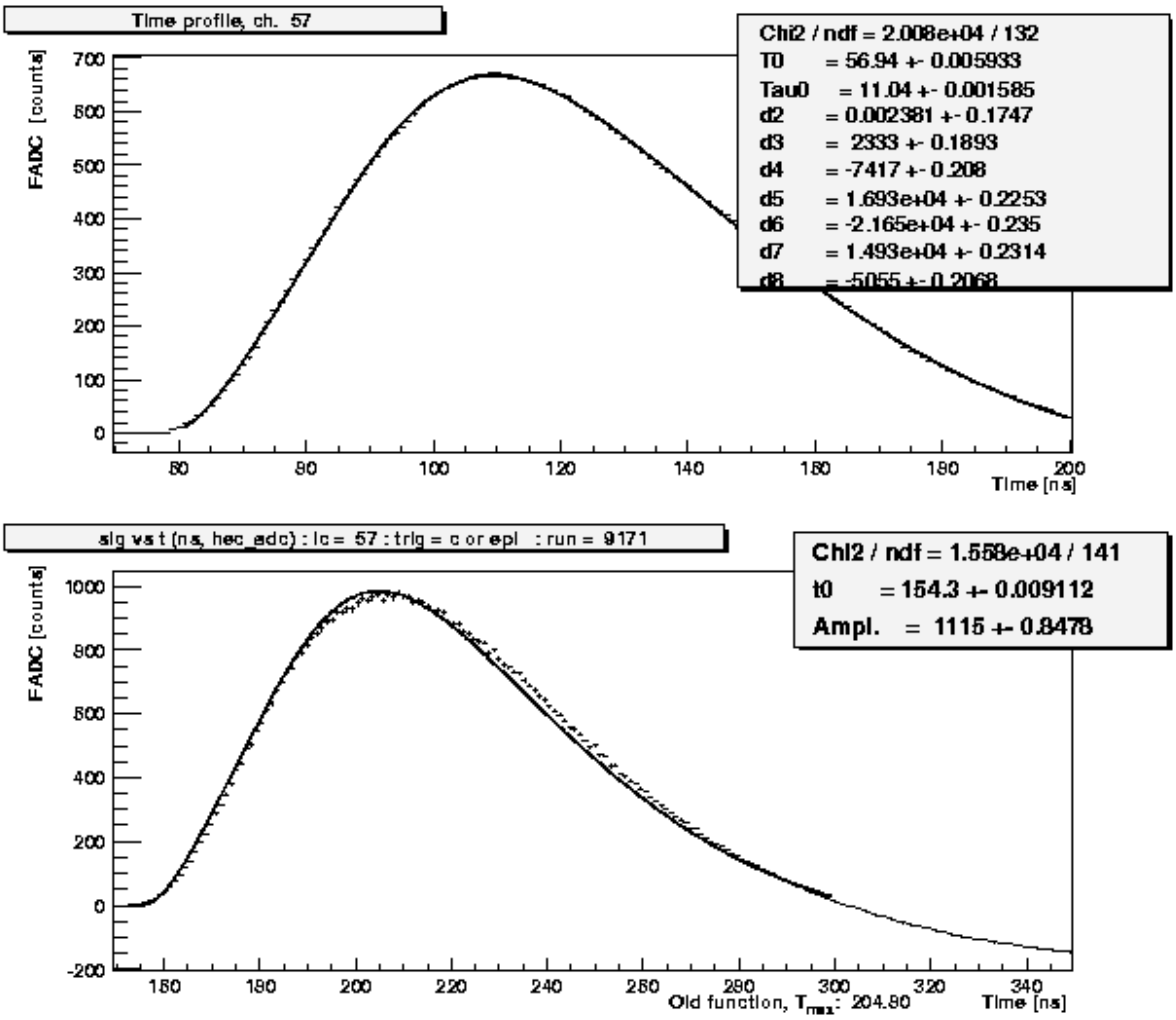
  (1) predicted particle signal systematically shorter than the real one

  (2) weights underestimate energy on 0.5 – 1.5% for good channels and up to 3% for bad channels

- So, the electronics function is too simple to describe all the details of the signals shape

Fit of calibration data by “multipole” function

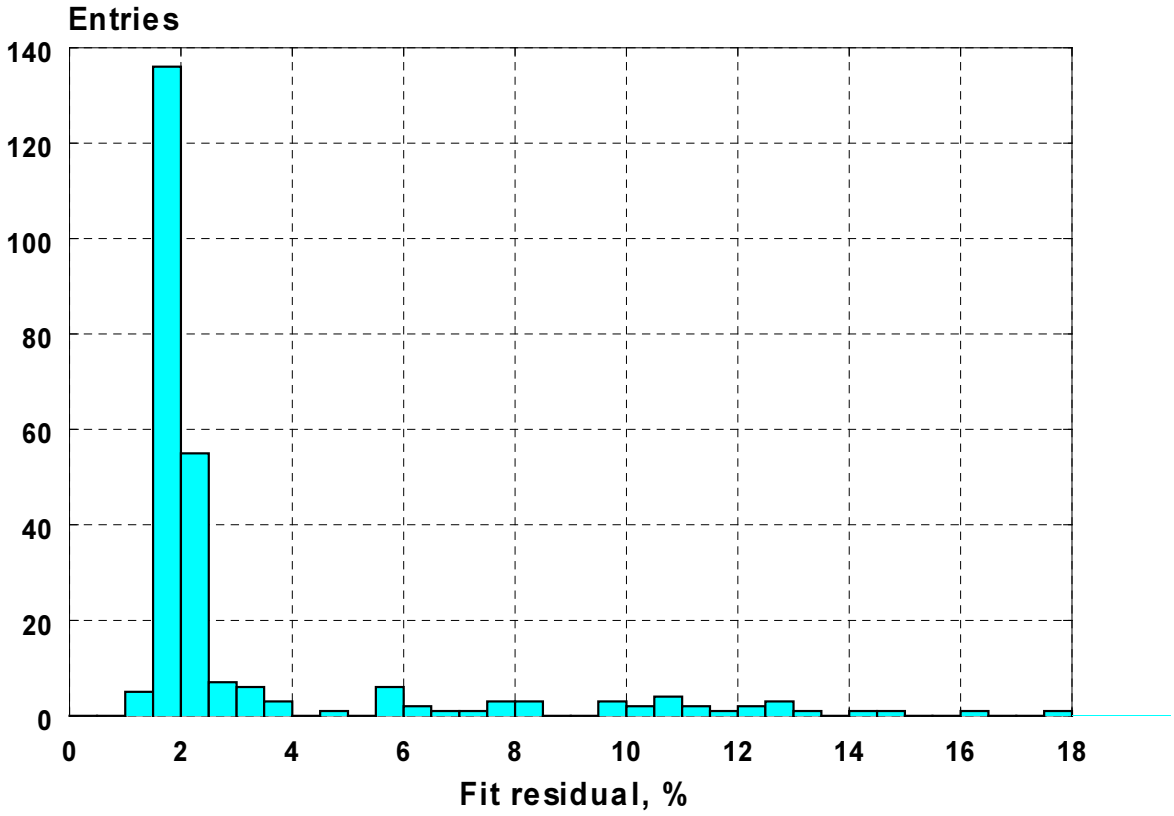
- This is the method, used in 1998
- The chain is described by 8 poles, values are taken from the fit of calibration signal
- Then, the function convoluted with triangular ionization current



- Bad prediction of particle signal, main reason is different cable length for calibration and ionization current, it is not taken into account.

Quality of the multipole fit

- residual of the fit is better because of many free parameters

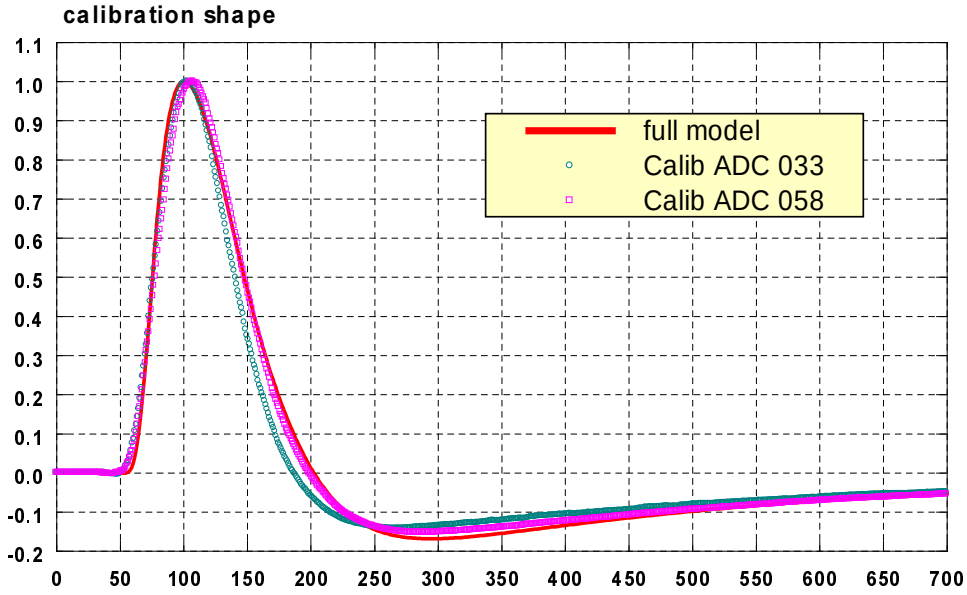


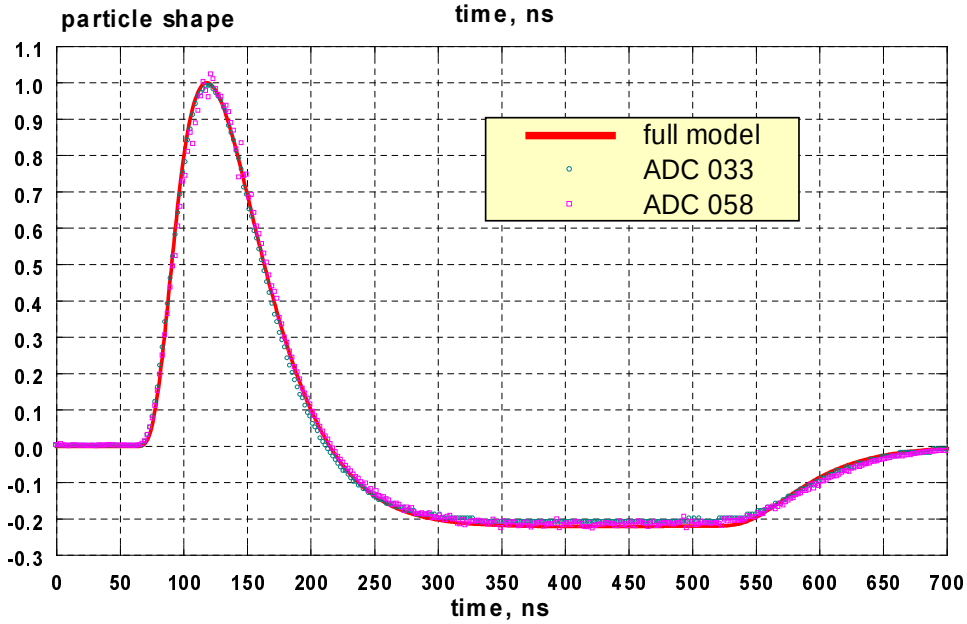
- For 98 data calibration cable was twice shorter, so this method reconstructed better the particle signal. We looked more attentively and found that the energy underestimation was 0.5 – 1%

- This method will not be efficient in ATLAS

Comparison signals with PSPICE model

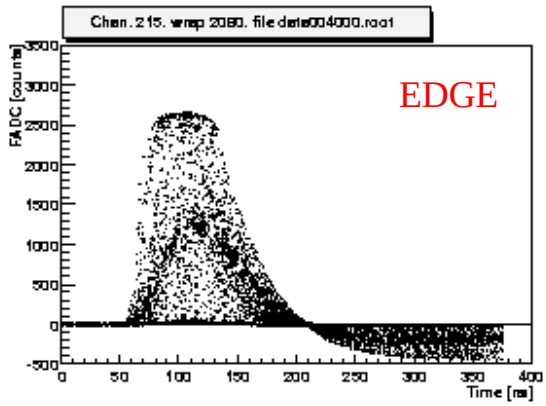
- In order to understand the chain, we compared measured signals with the PSPICE model, where all details are implemented
- In 1999 data only 2 channels with long shape are available

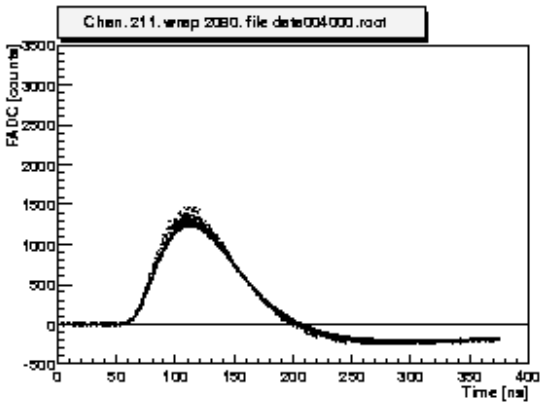


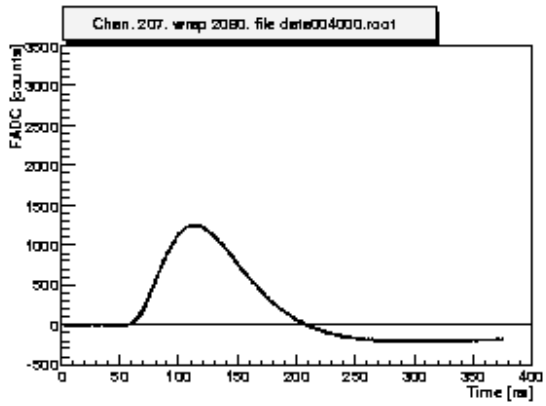


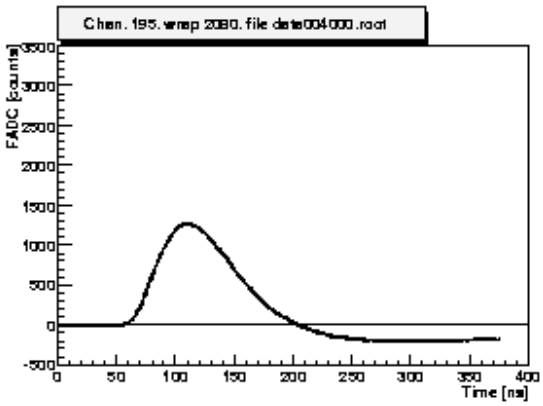
- Better for particle, so some imperfections in calibration chain. Additional investigations are required

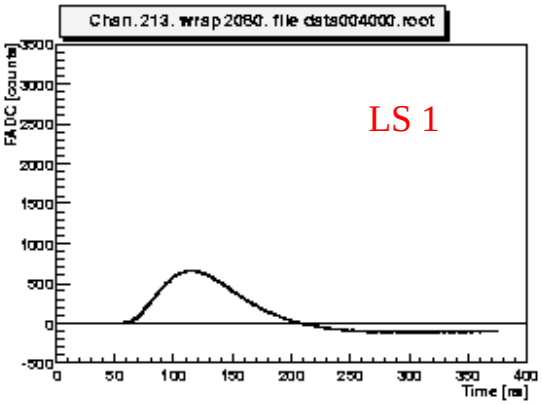
Bad channels (large fit residual)

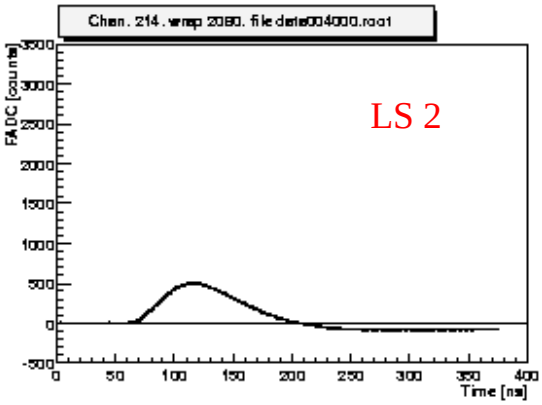


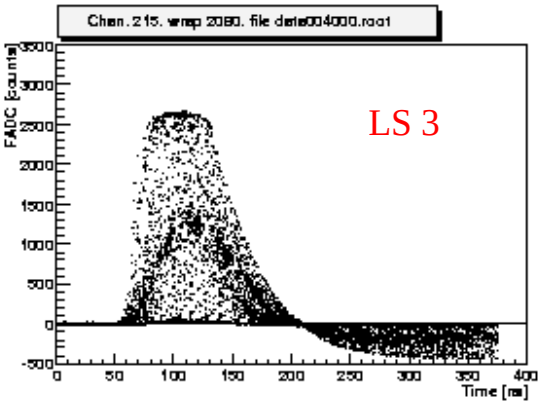


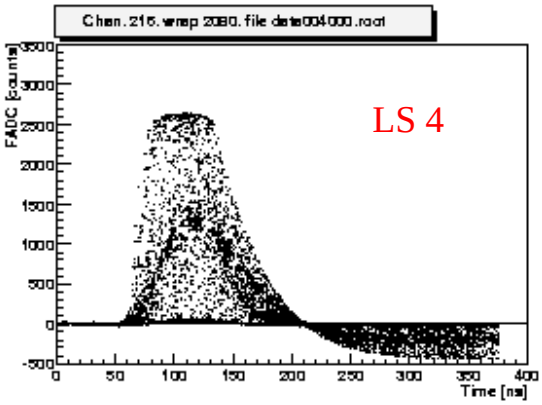






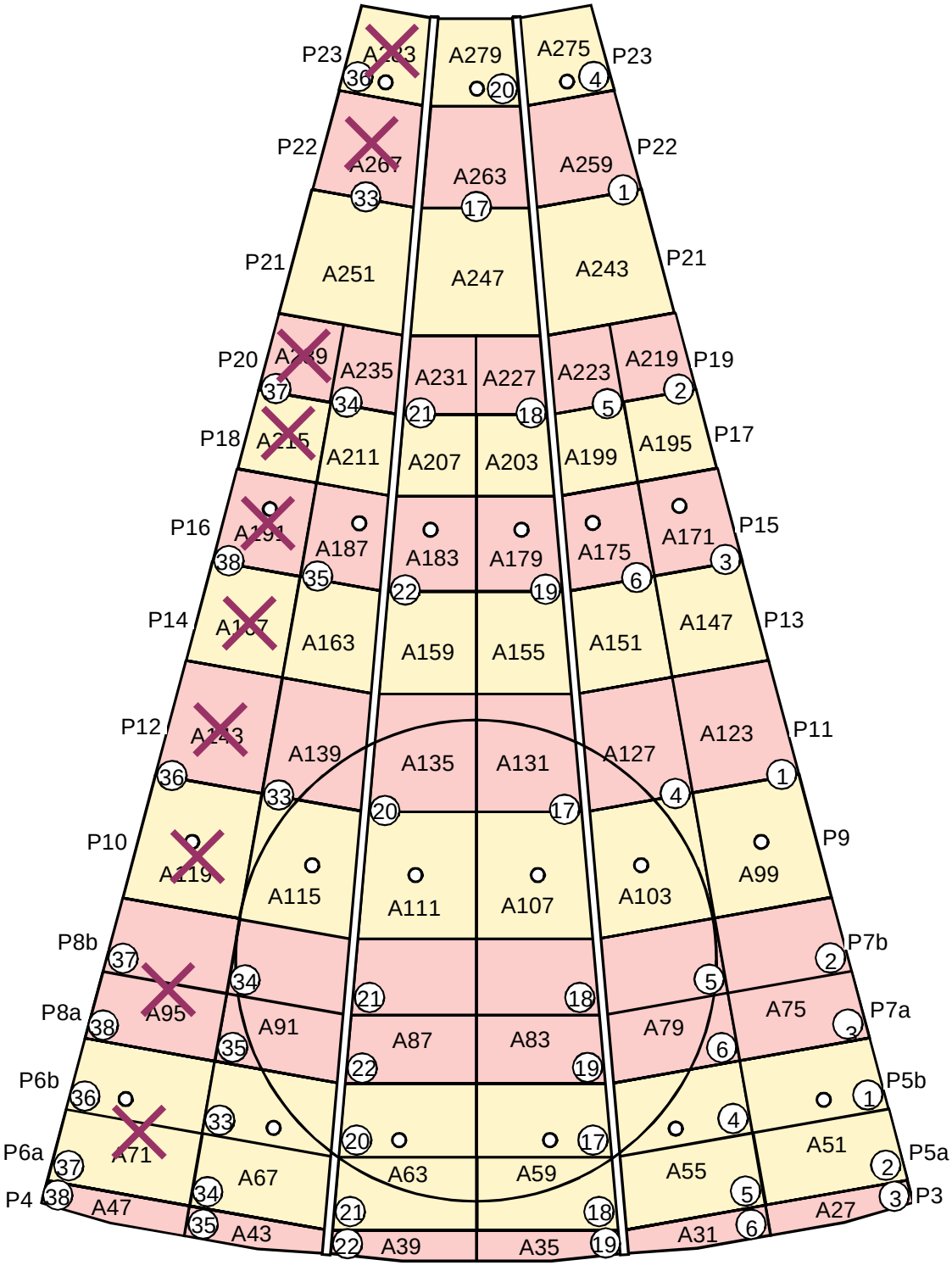






Location in the modules

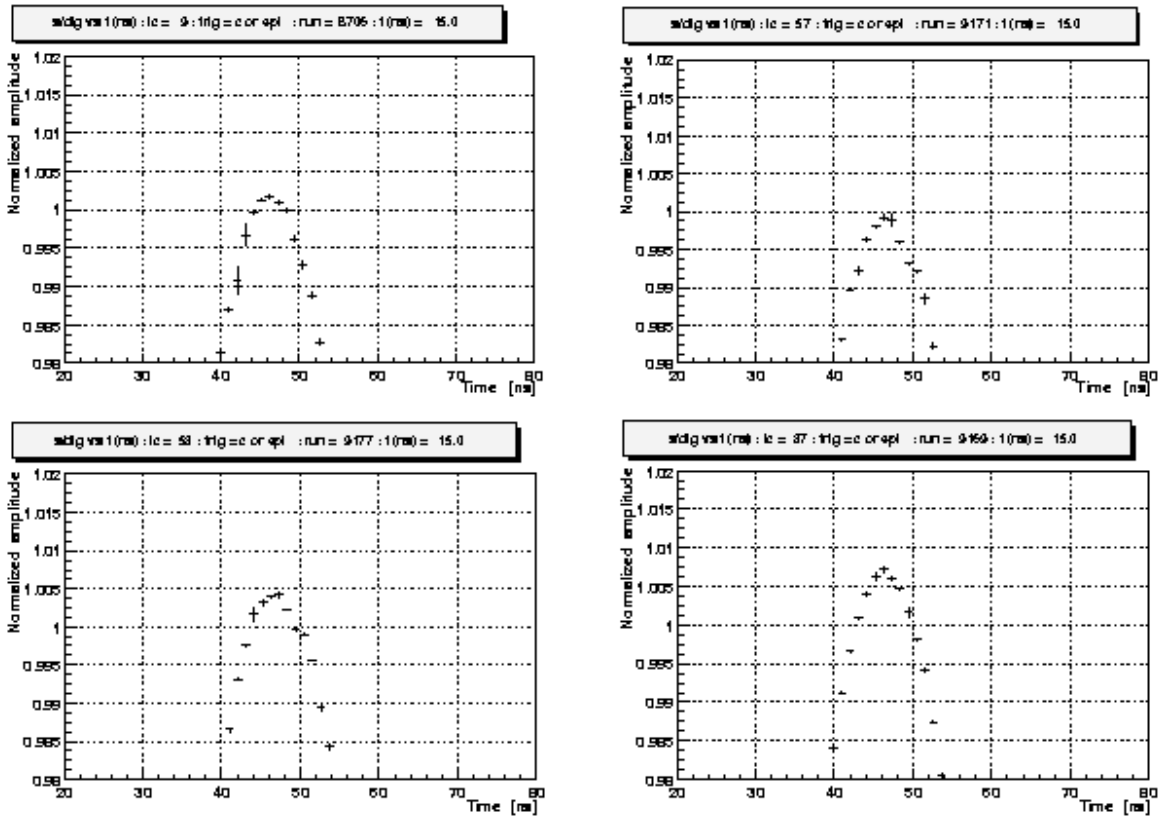
- Found in rear module, in the edge



- Possible reason – patchpannel grounding/loading

Weighting quality

- Both approaches give weights underestimating energy on few %



- To reach better accuracy, more accurate description of calibration chain is required, we are working in this direction

- During these studies, several sets of weights have been produced:
  - 990822 elec func, calib=exp
  - 990901 the same with some corrections
  - 990902 the same with more corrections
  - 990912 multipole, calib=exp
  - 990918 the same with different fit range
  - ****** multipole, calib=exp+step
  - ****** elec func, calib=exp+step

Proposal for 2000

- Additional studies of problems has to be done, all components are needed for measurements: module, cabling, PSB, FEB, ...

- Technical run could be scheduled for March (April)-2000

- For calibration and electronics the measurements (all in warm) proposed:
  - ➢ signals studies by oscilloscope in all main points through the chain (FT, CDB, SL, PSB, FEB) for several channels
  - ➢ few full “long” calibration runs
  - ➢ bad channels studies and improving
  - ➢ noisy channels

- This work can take ~ 10 days

- For TB-200 and further to establish the procedure to check the quality of calibration, we never had it before. We need it for TB and for ATLAS

- A possible method is to compare the measured calibration pulse with the model

- The first version can be developed and tested in technical run