First results of the 4-chip project.

EuDHCAL

Friday 13 June 2008

Outline

- Electronic read-out calibration.
- Efficiency measurments.
- Simple event reconstruction.
- Summary.

Read-Out calibration

The purpose of the calibration is to have an homogeneous response of the electronics.

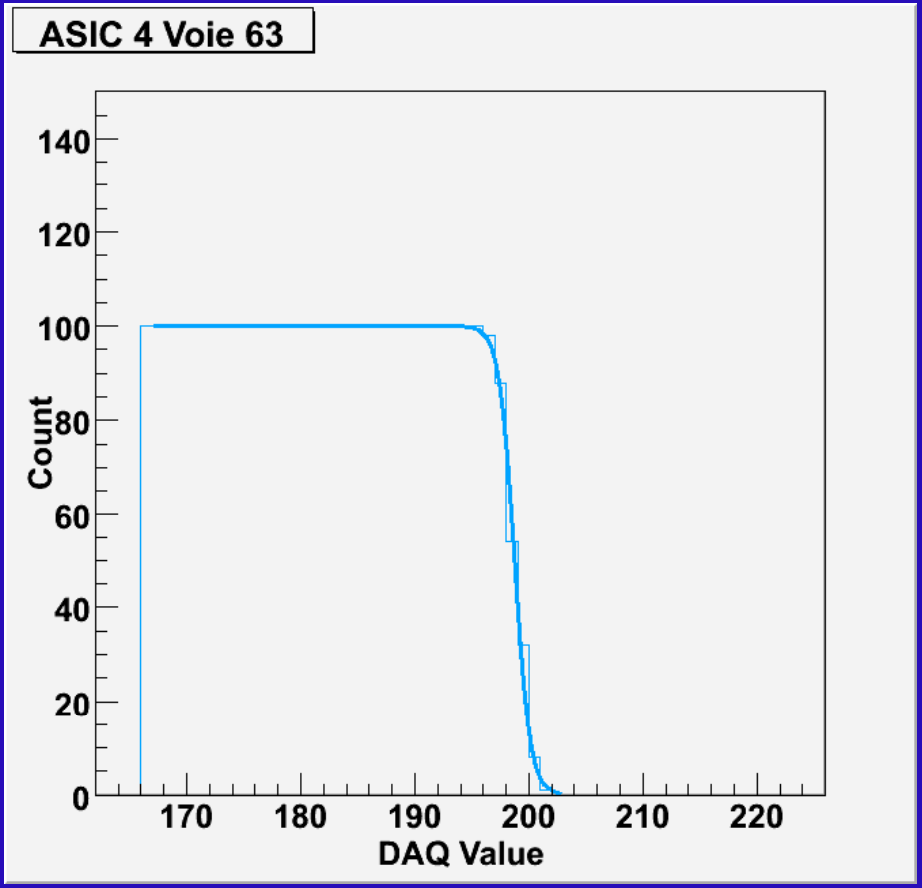
First step:

On each channel of the ASU we inject 100 times a 100fc charge. Then we change the DAQ (treshold) value, and do it again.

We make that for the whole dynamic range (DAQ: 0 to 1024)

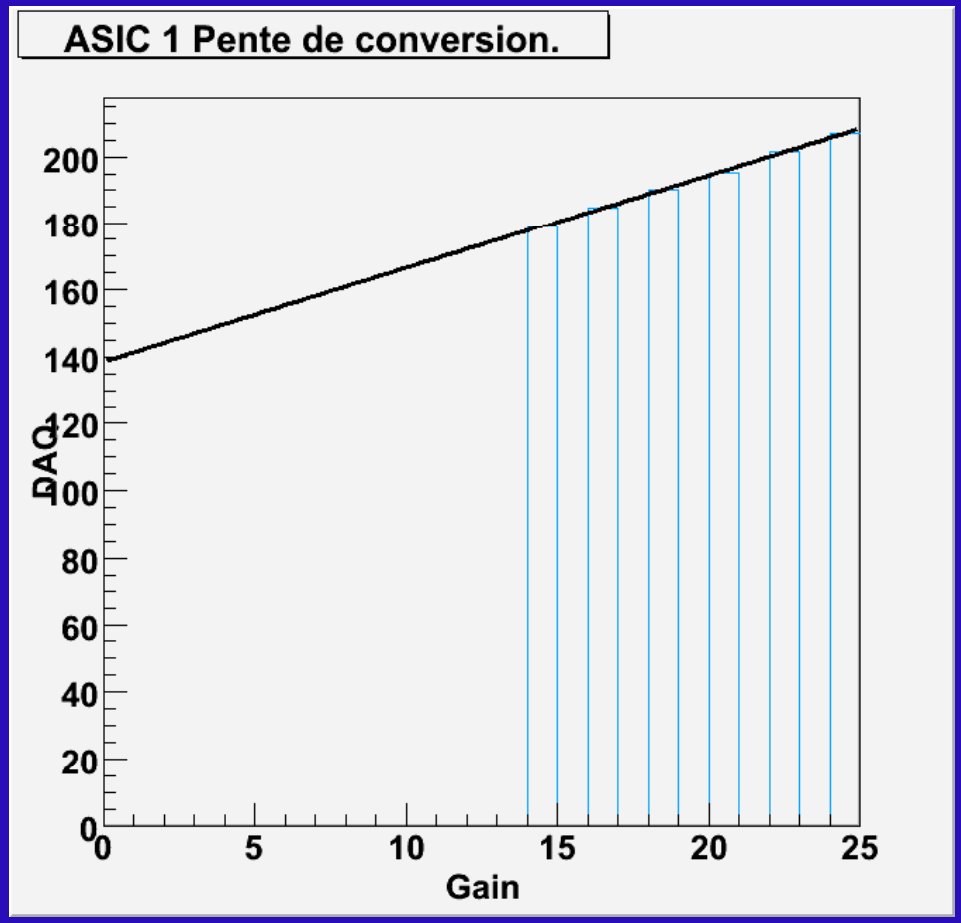
Then we got the S-curve (the response) of each channel.

We fit it to find the DAQ value of the inflection point.



Read-Out calibration

Second step:
We do again the S-curves for differents gain values, in order to construct for each channel the linear law between the inflexion DAQ value, and the gain.



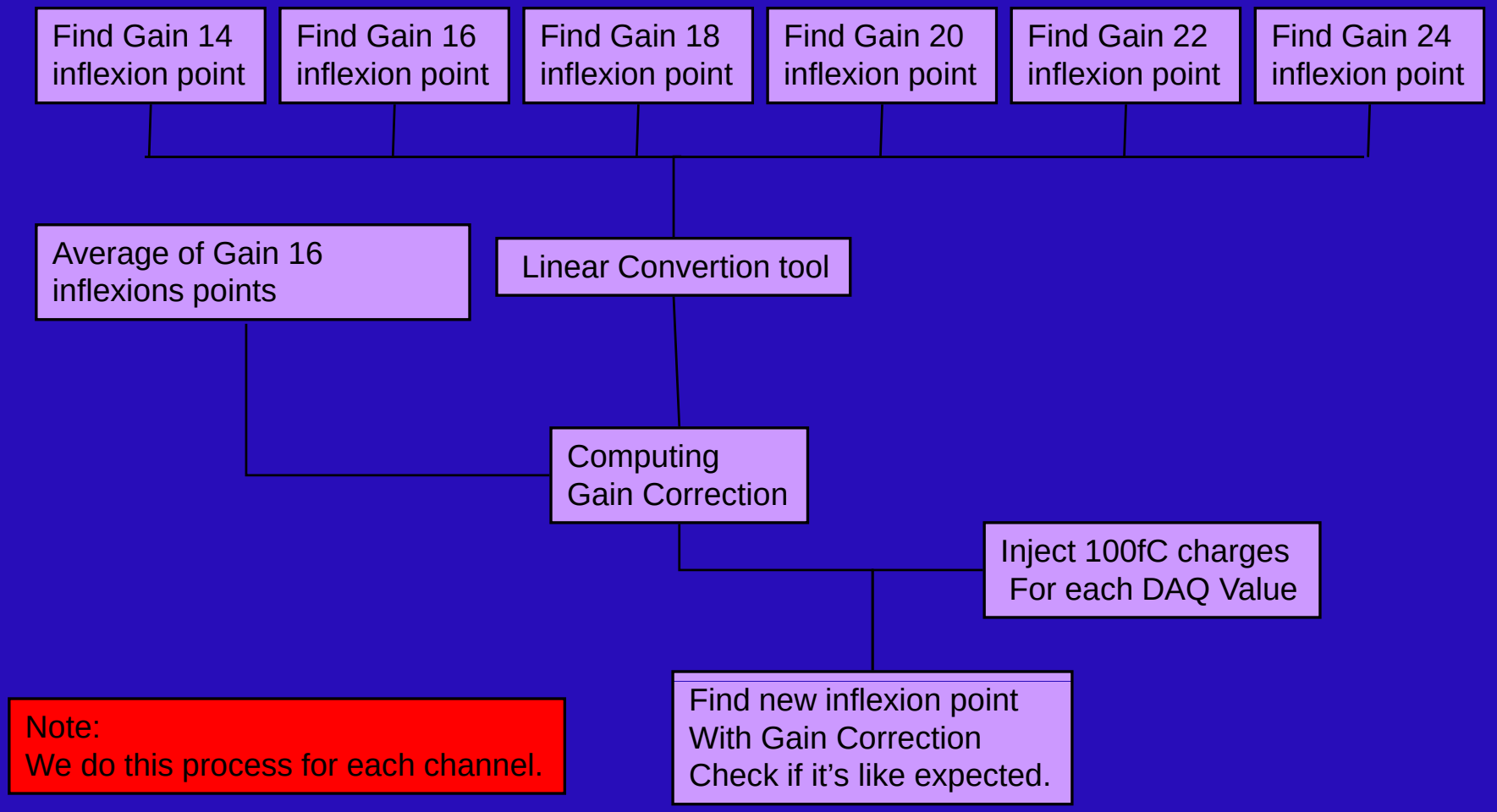
Read-Out calibration

Last step:

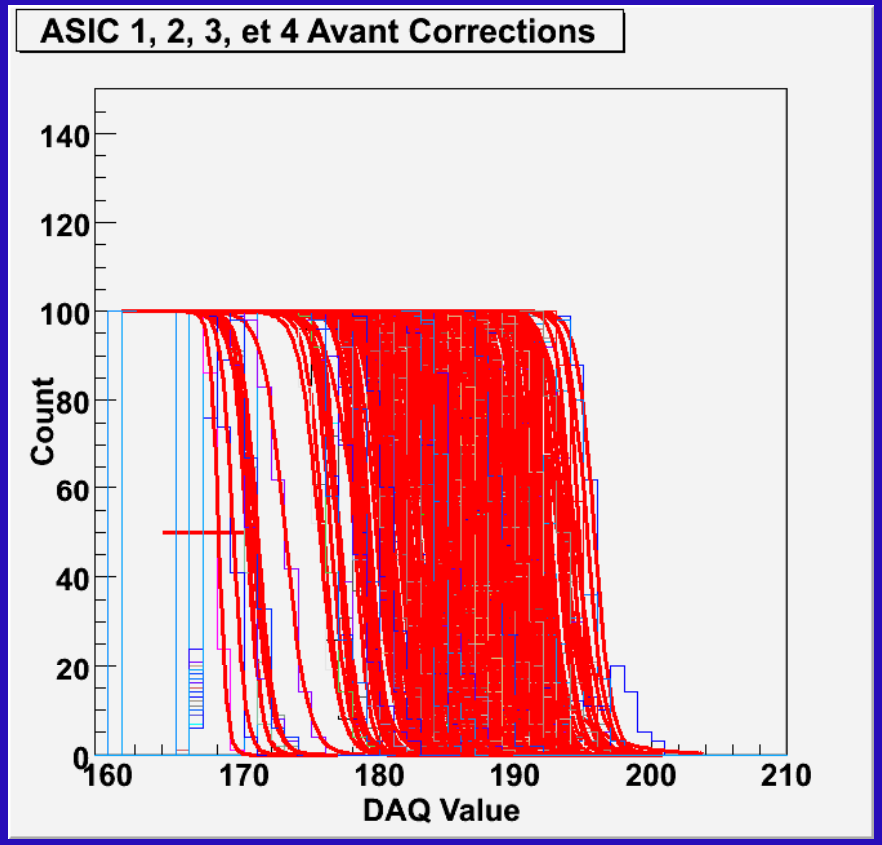
Then we take the average inflexion value of the 256 channels found at gain 16 (unitary physical gain), and we use the linear convertion laws to adjust each channel’s gain, in order to have the same level response on the whole ASU.

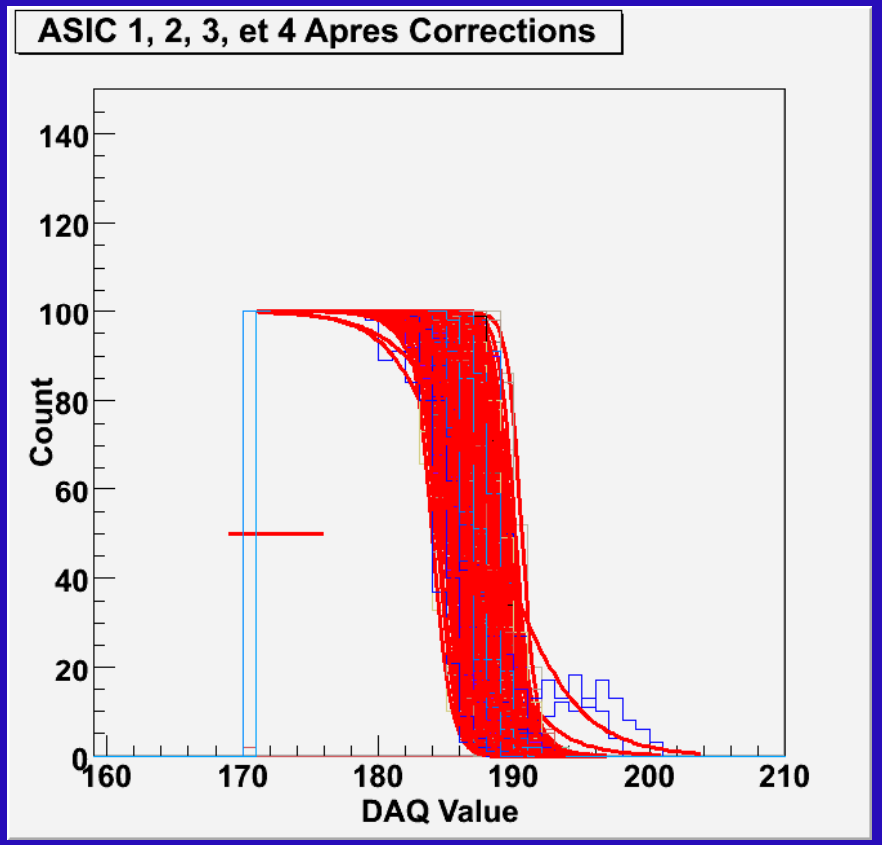
Read-Out calibration

Summary of the calibration process:



Read-Out calibration

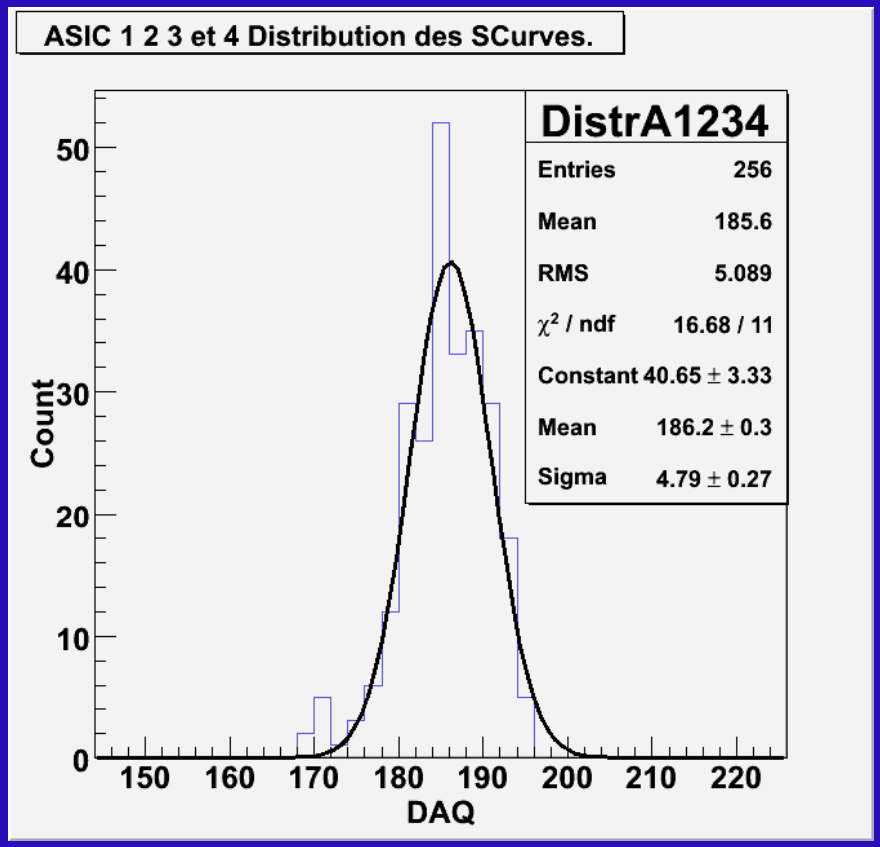


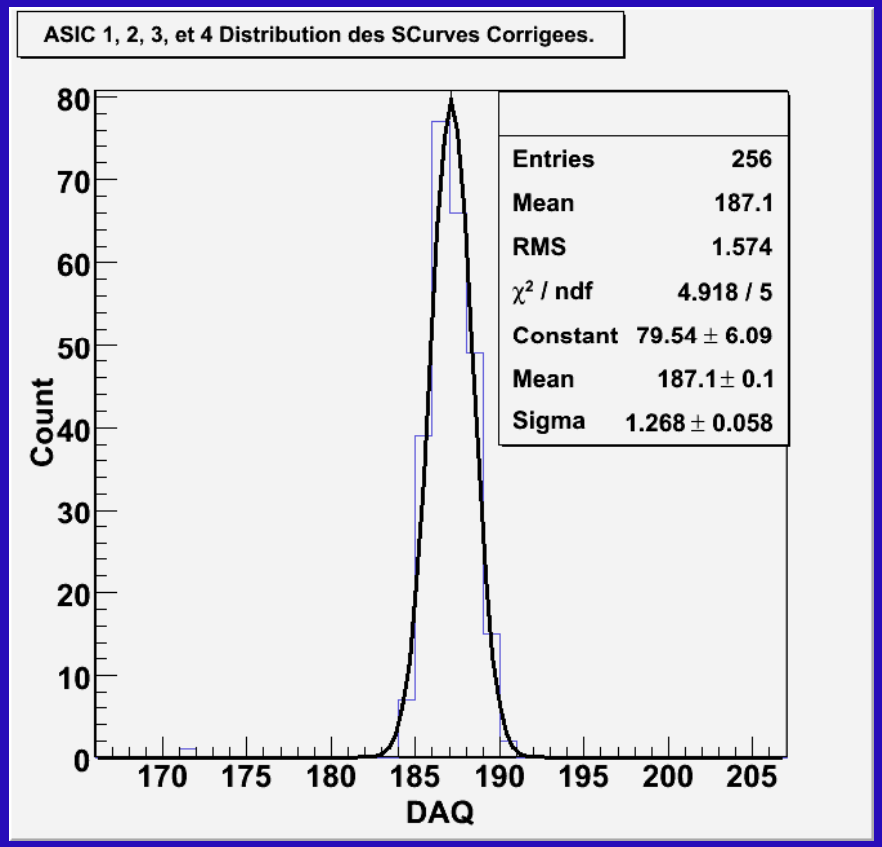


Trigger level for the 256 channels of the PCB.

Before & After gain-correction.

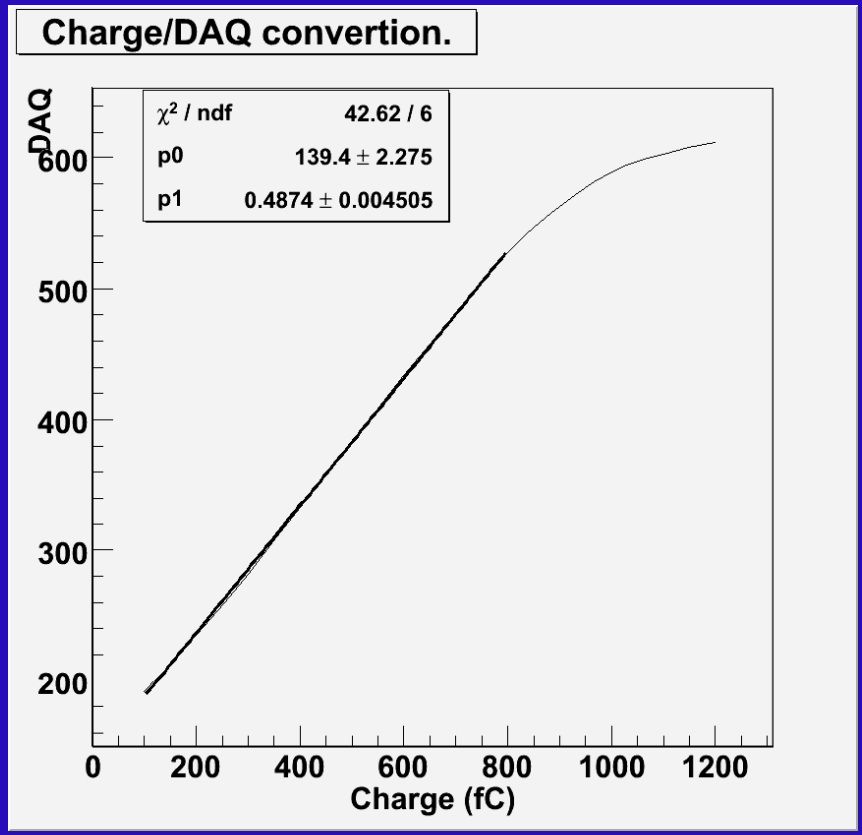
Read-Out calibration





We reduce trigger dispertion by a factor 3

Charge/DAQ Convertion



1DAQ=0,48fC

The chip is linear in RPC typical dynamic range.

Read-Out calibration

Advantages:

- More homogeneous electronic response.
- It can increase the efficiency (see below).

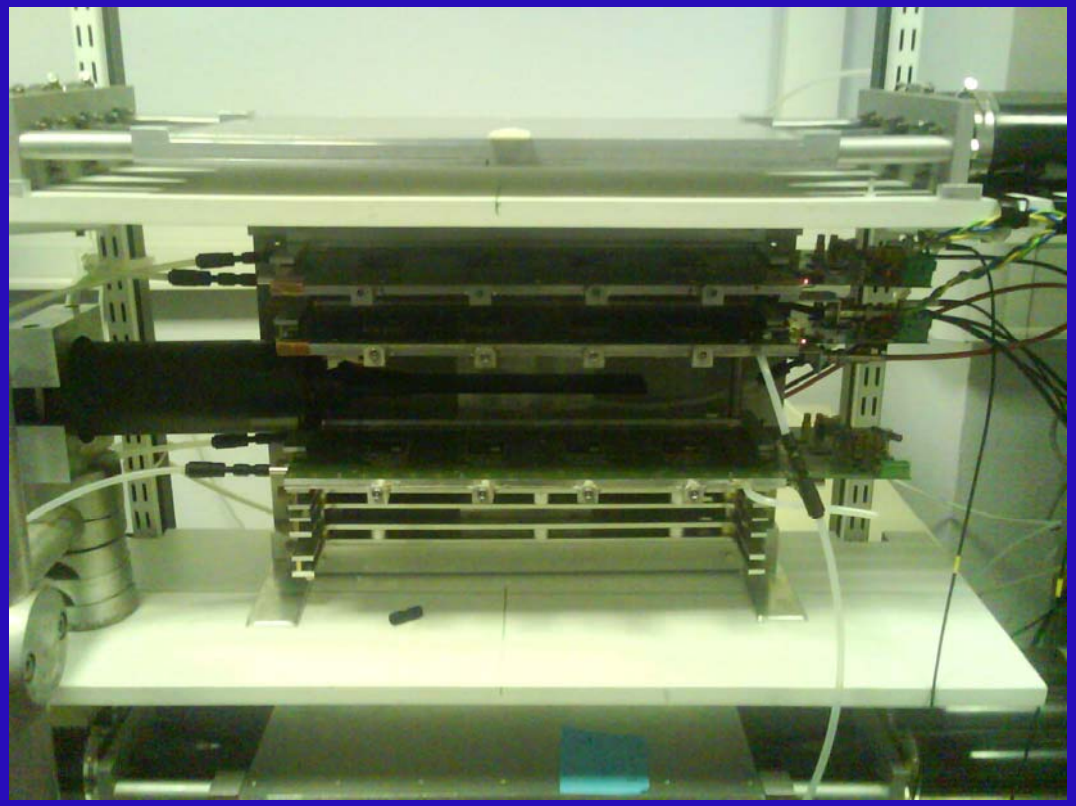
Restrictions:

- In order to have the same inflexion point on all the channels, we need a chip with more precise gain adjustment.
- The calibration process is time-consuming.

On going (for the next PCB version):

• Complete automatisation of the aquisition & analysis process, to generate the gain corrections quickly.

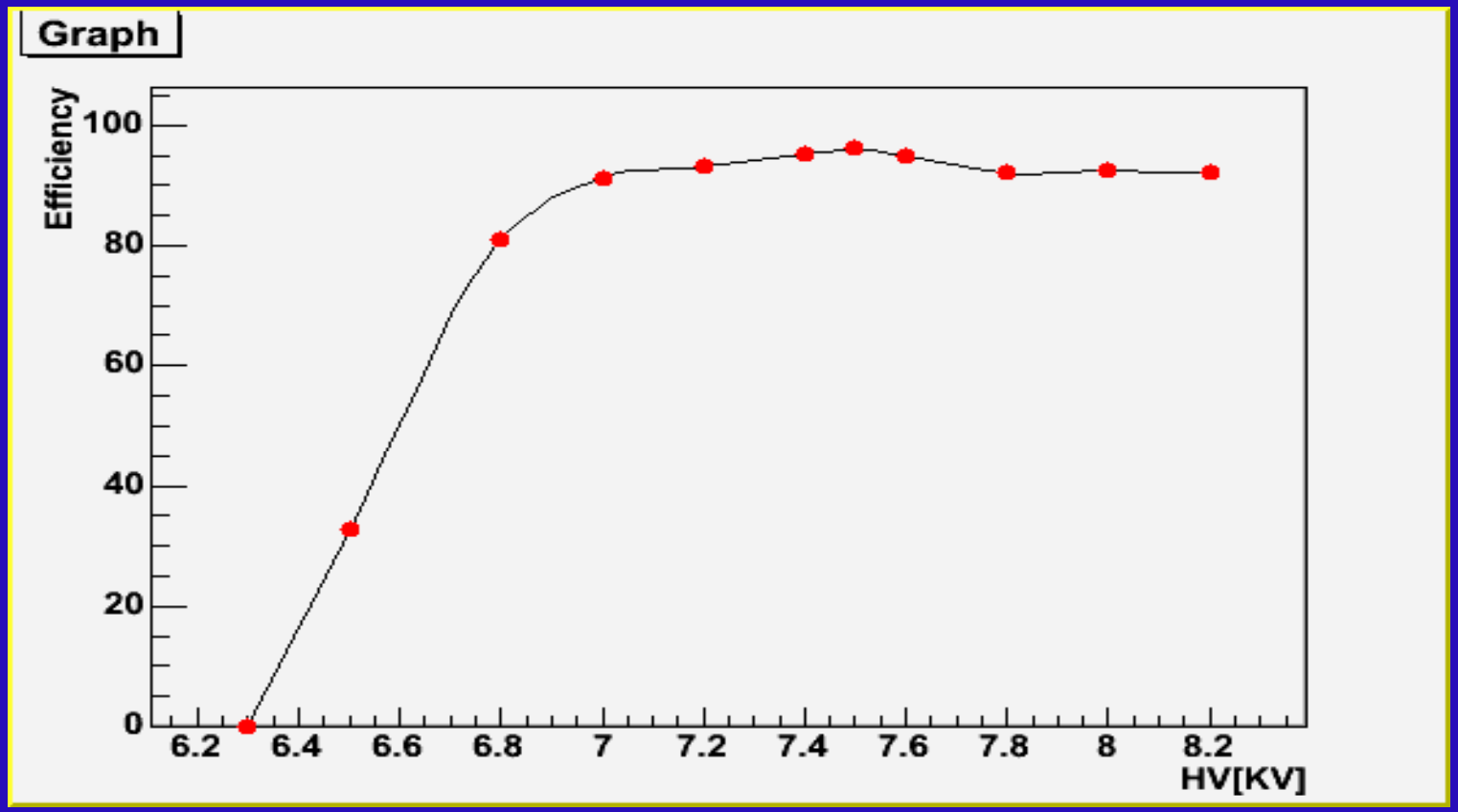
Cosmic Setup



Three GRPC+ASU inside cosmic bench allows:

- Efficiency measurments.
- Simple event reconstruction.

Efficiency trigging with PM



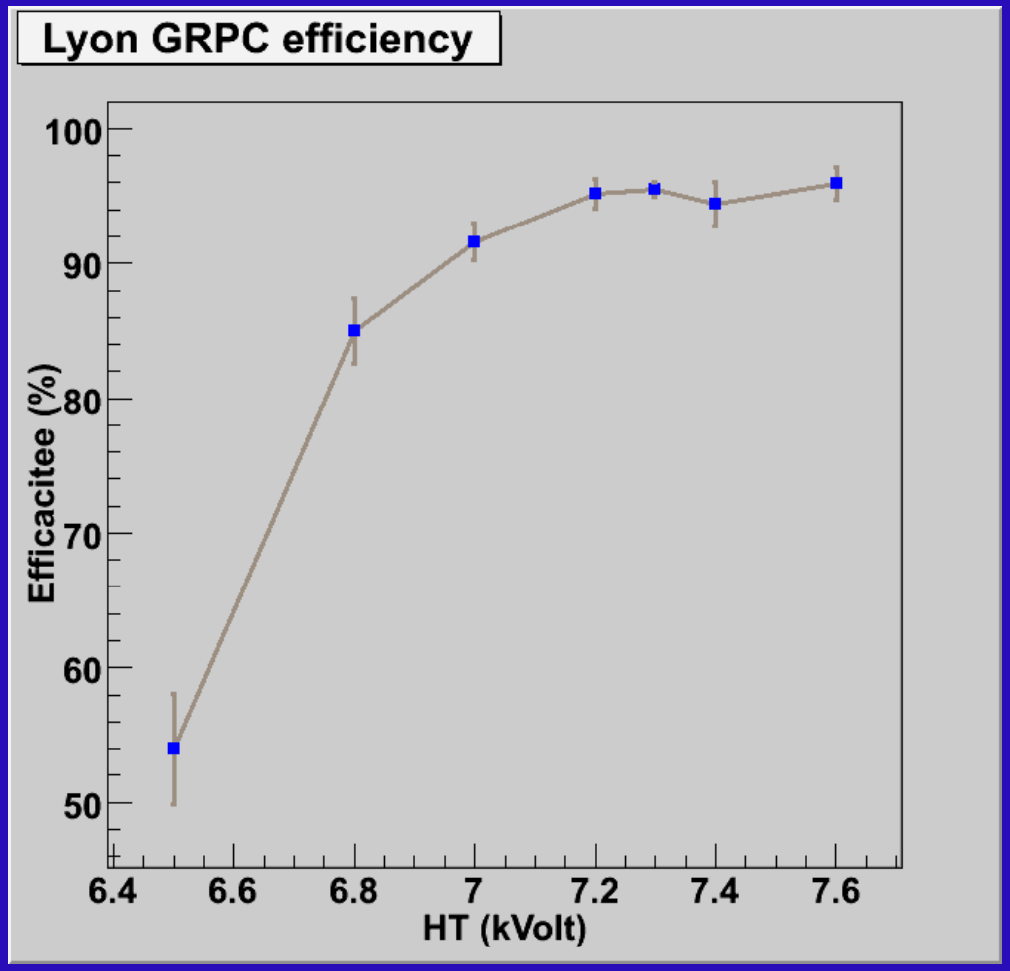
Treshold ≈ 100 fc

Efficiency measurment with three GRPC

- One trigger: each time we find hits in the top and bottom detectors
- One good event: if the theorical middle point (computed with top & bottom hit), is compatible with the real middle point.
- Efficiency: Good events / Triggers

Note: Top & Bottom GRPC are from Protvino

Efficiency measurment with three GRPC



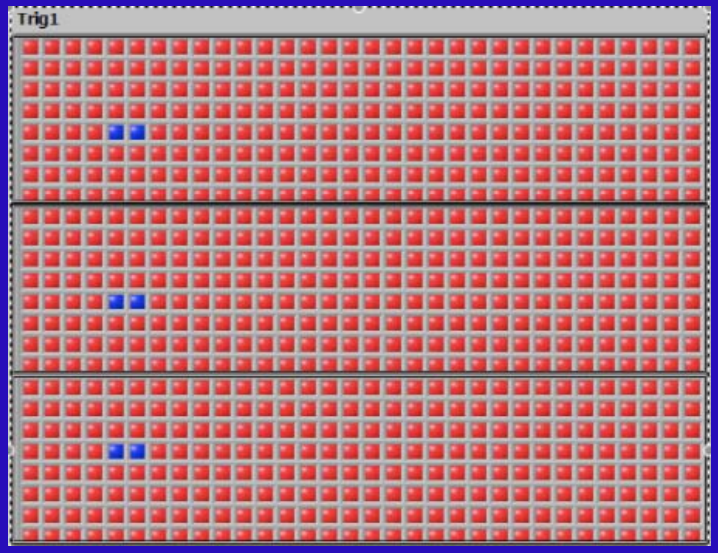
This efficiency curve is obtained using gain corrections.

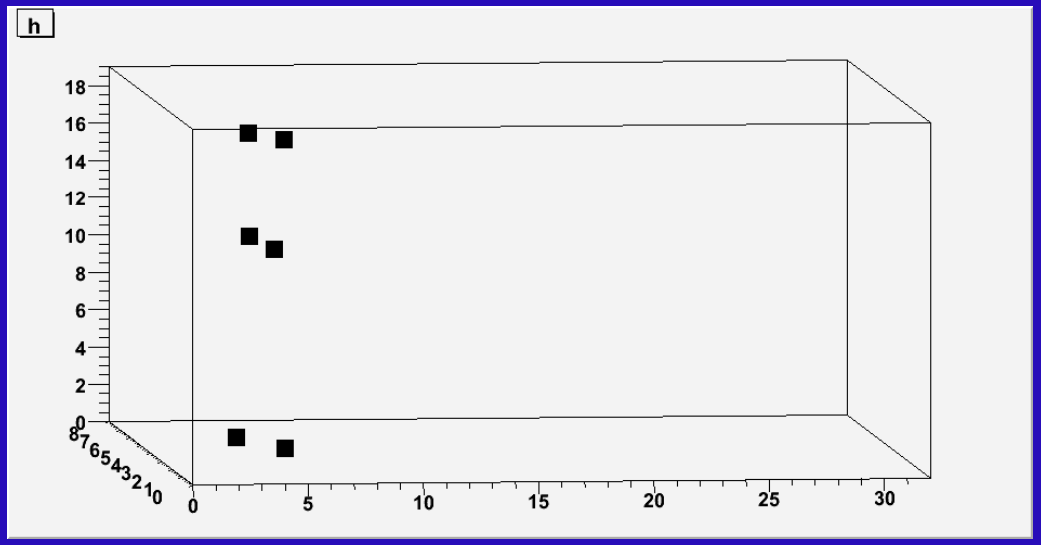
Interest of the gain correction

At 7300kV:

- Without gain correction efficiency is 91,2%
- With gain correction we measure 95,5%
- We increase efficiency about 4,3% with the calibration.

Simple event reconstruction





The same event in the aquisition software, and after offline reconstruction.

Summary

Ready for the test-beam

- ASU calibration is done.
- Reconstruction and analysis is feasible on row-data.

Next step:

- Data convertion from row-files to a better format (less space/CPU consuming), to permit clustering an analysis, on big events files.
- Finalise analogic readout aquisition for the test-beam.