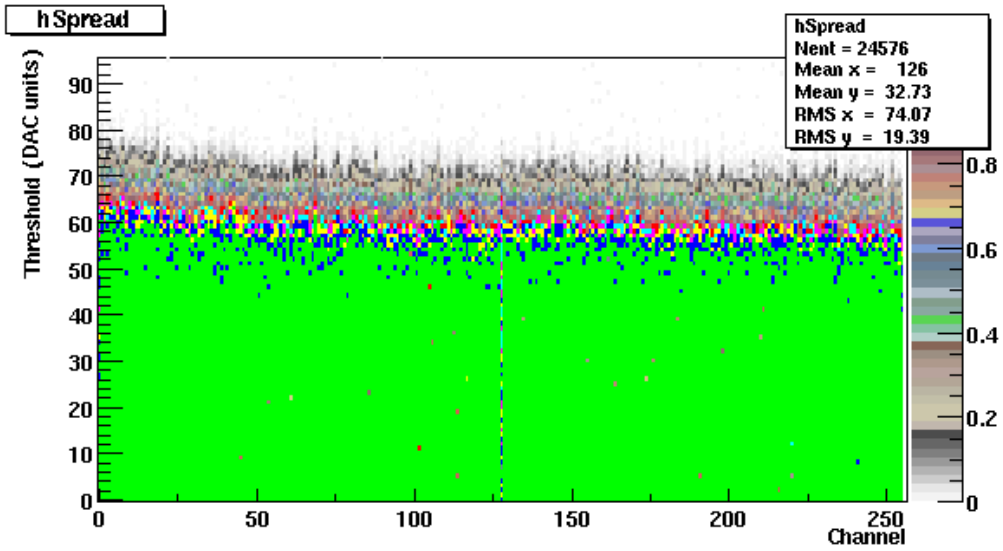
Prostate probe demonstrator

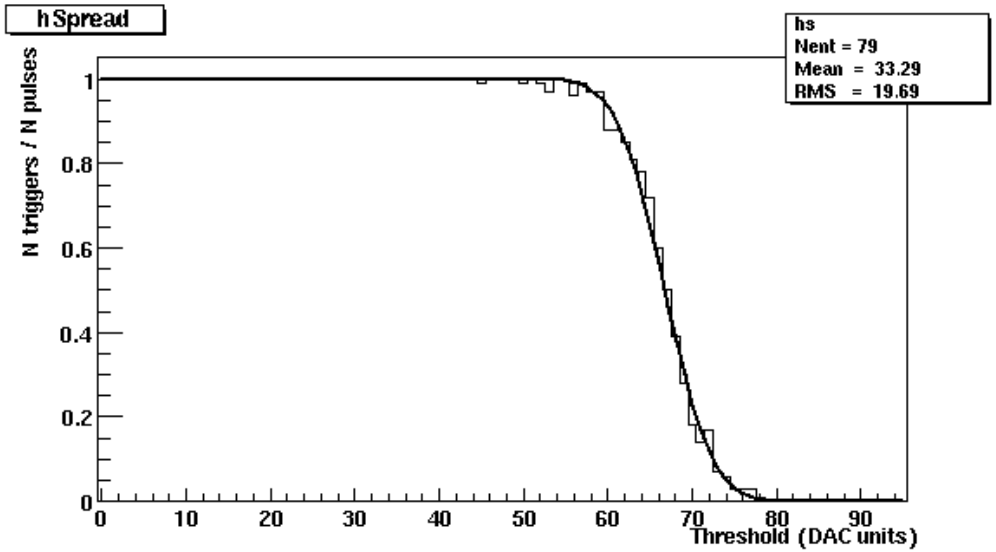
- VATAGP3 tests
  - Threshold scan
  - Alignment
  - TA pulse shape
- Pad sensors (Peter)
- Module performance
  - five vs. single module
- Scintillation detector
  - Calibration/position alignment

- DAQ
  - New hybrids
  - Distribution board/patch panel
- Mechanics

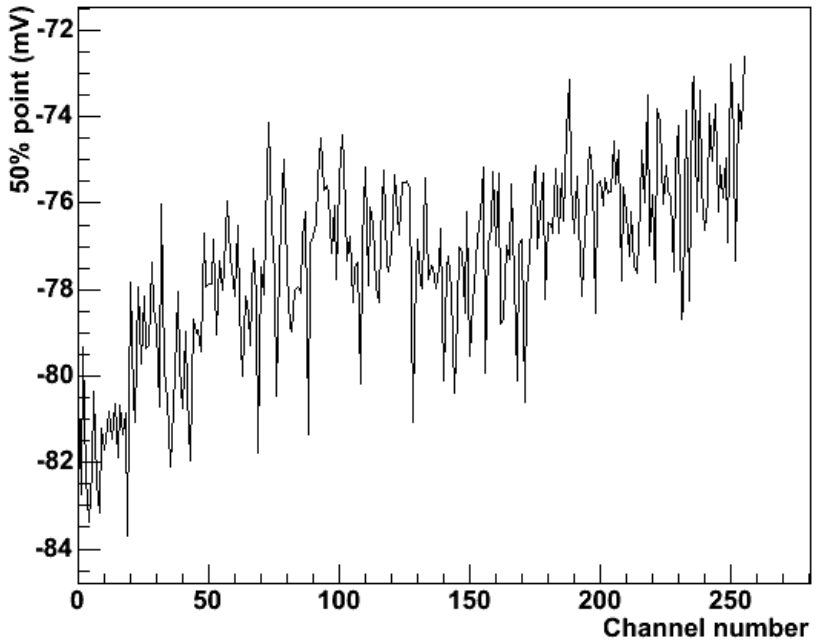
Chip tests



- For each channel, send pulse and make threshold scan.
- Count triggers you get for each threshold value.
- Fit of s-curve gives 50% point and noise.



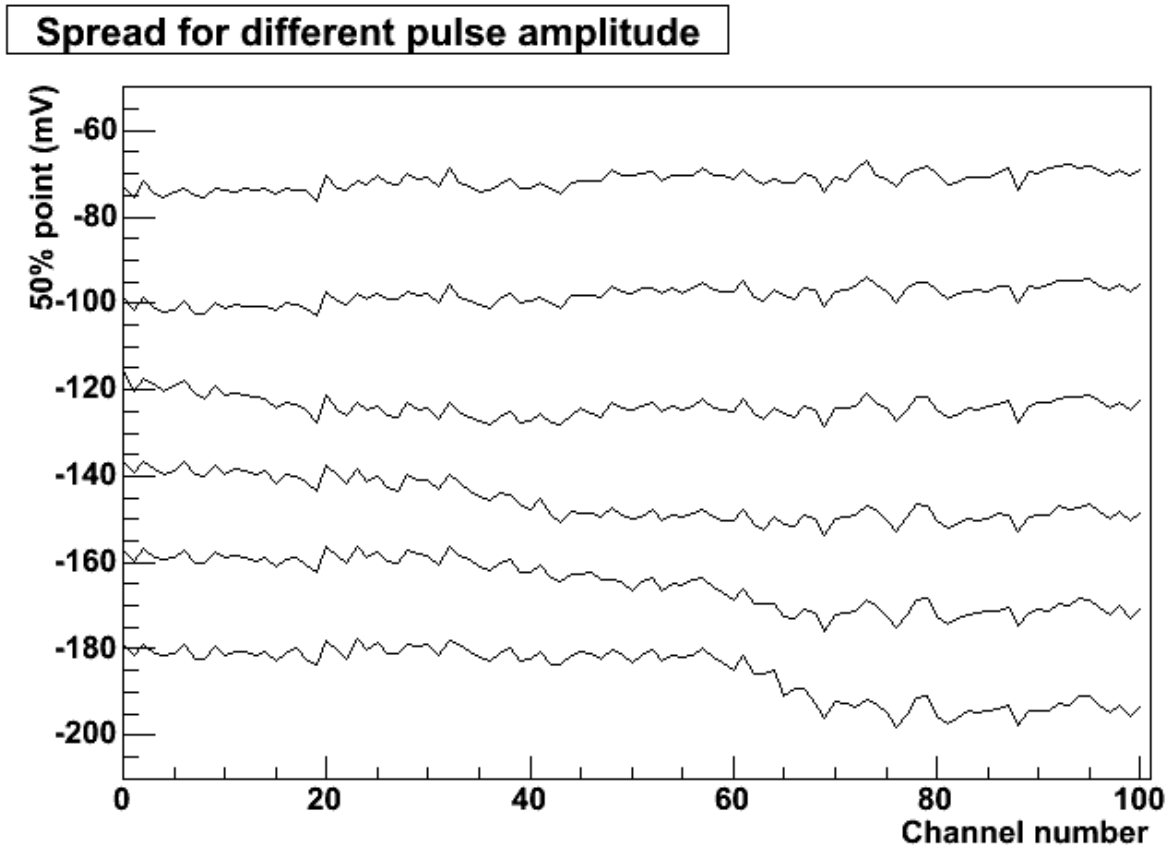
Threshold spread for two chips. Not corrected.



Chip tests: comparison with source

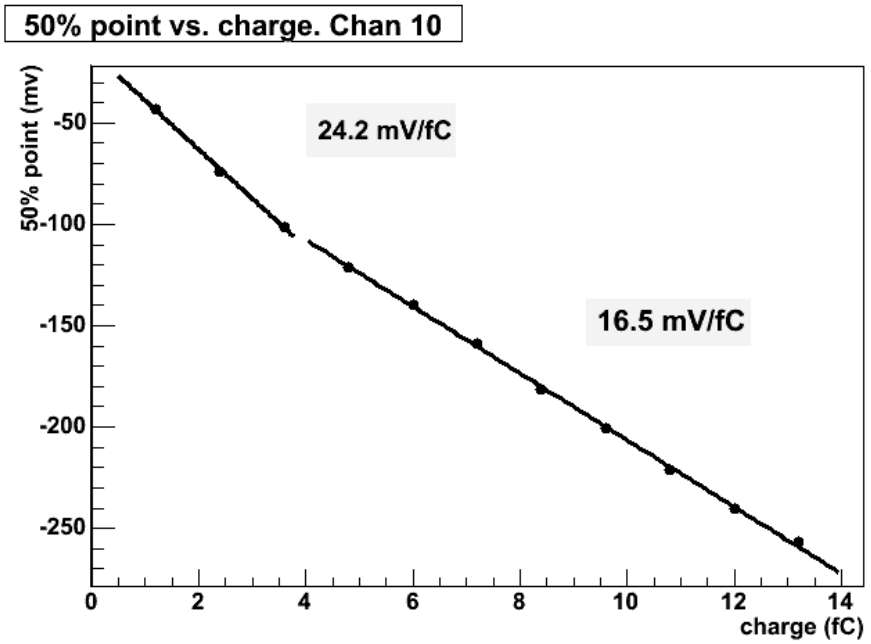
- Pulse and Am source give similar results.
- Source less noise (no test mode).

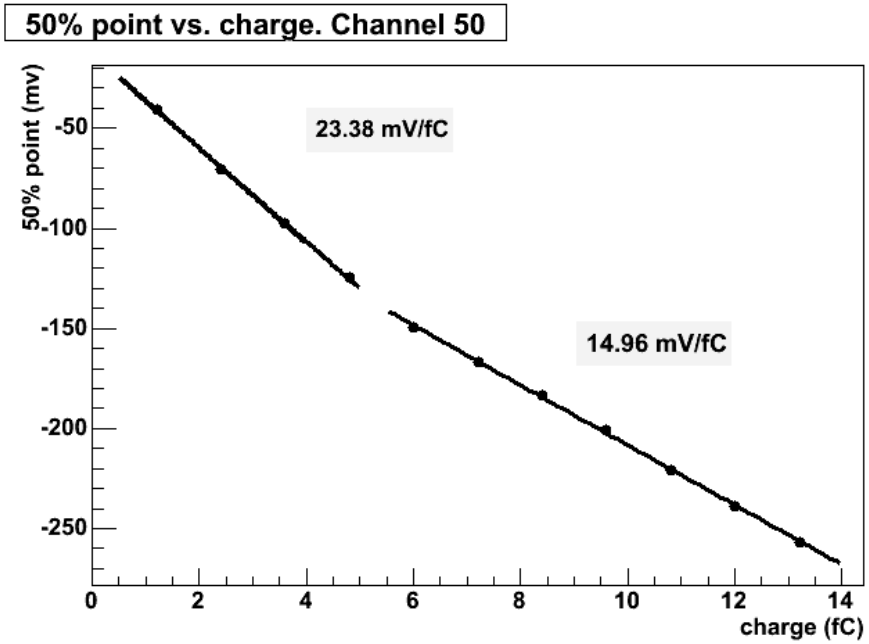
Chip tests: spread for different pulse amplitude

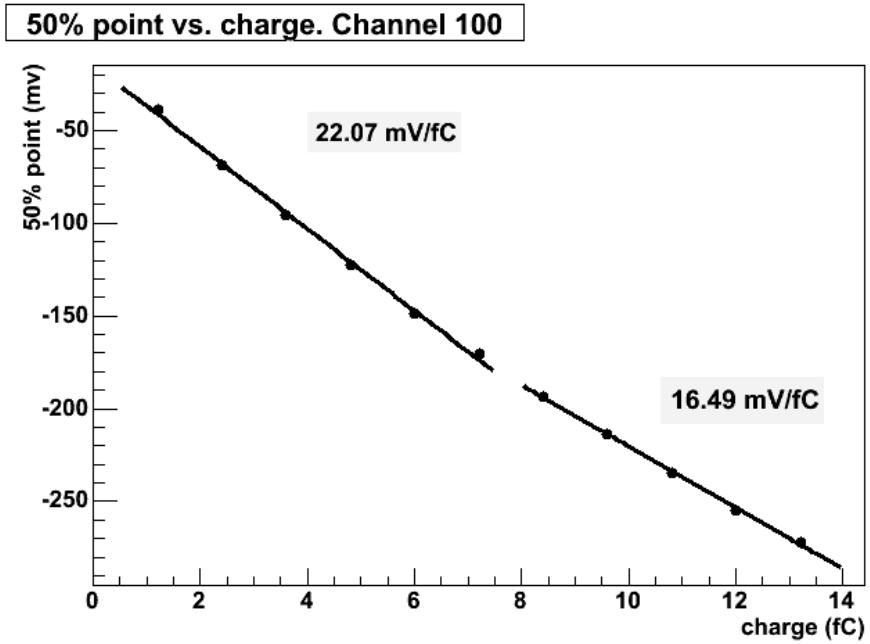


- Alignment must be made at the threshold and settings at which you want to run

Chip tests: spread for different pulse amplitude

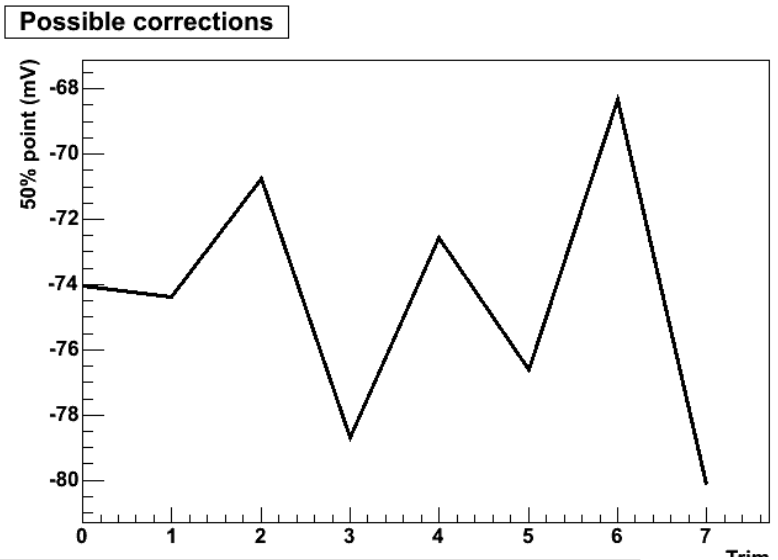


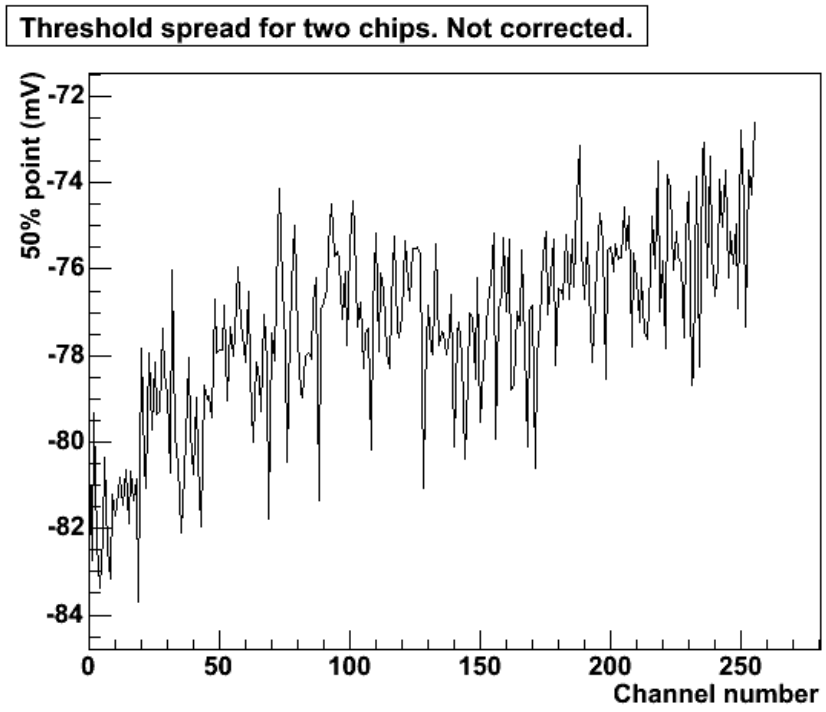


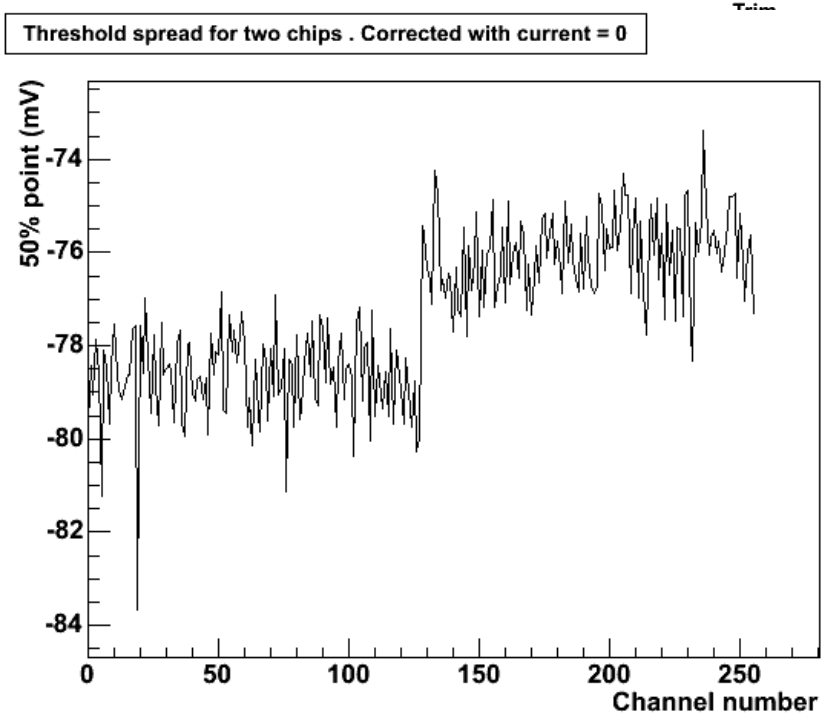


Chip tests: threshold alignment

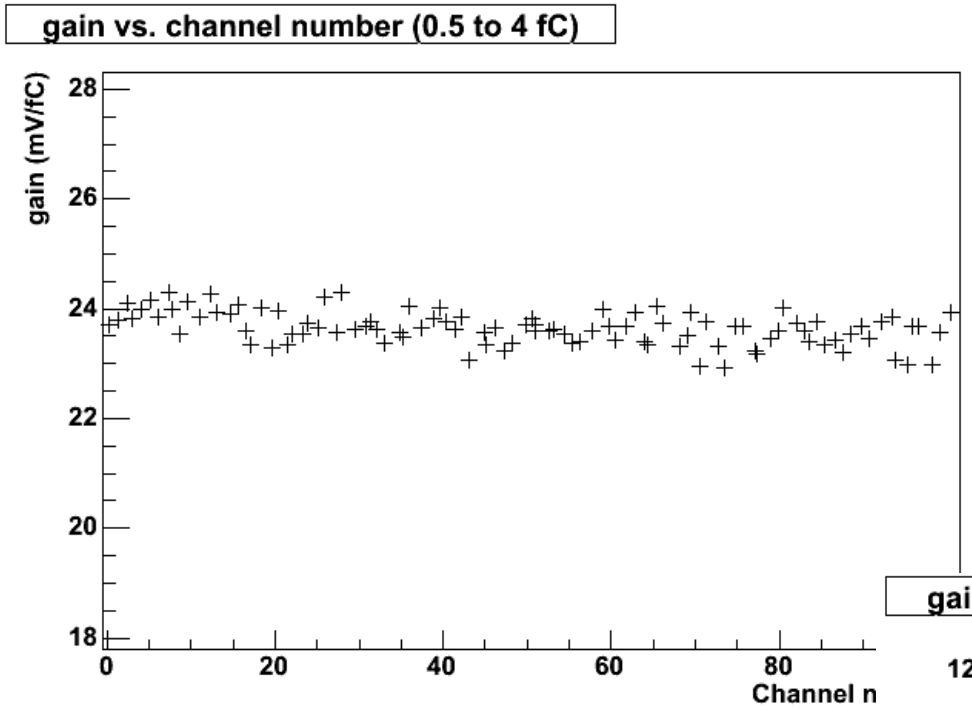
- One chip within 2 mV
- Two chips within 6 mV. Separated (worst case I've seen).
- What about 10 chips?

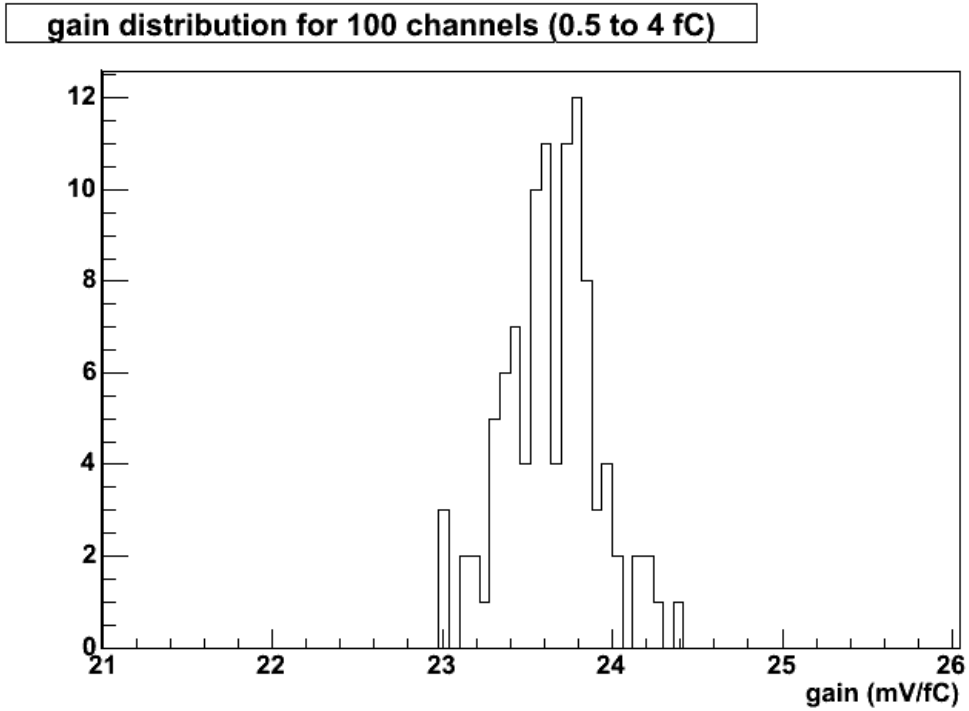




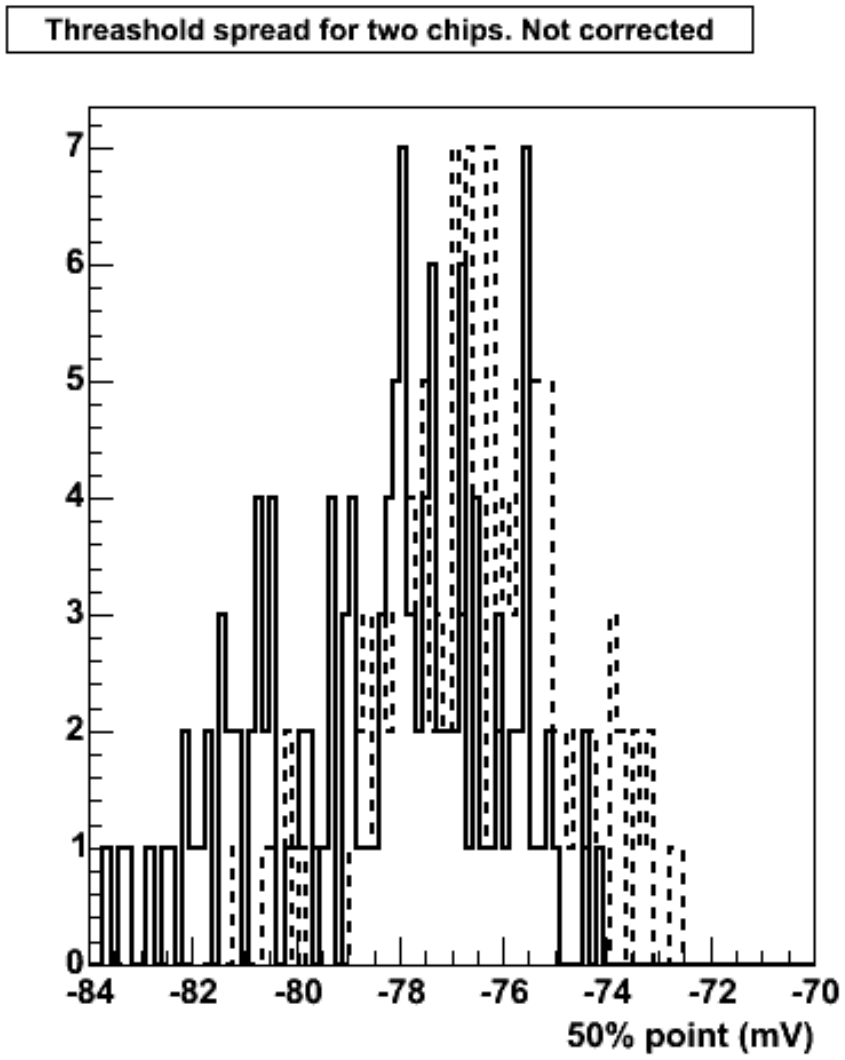


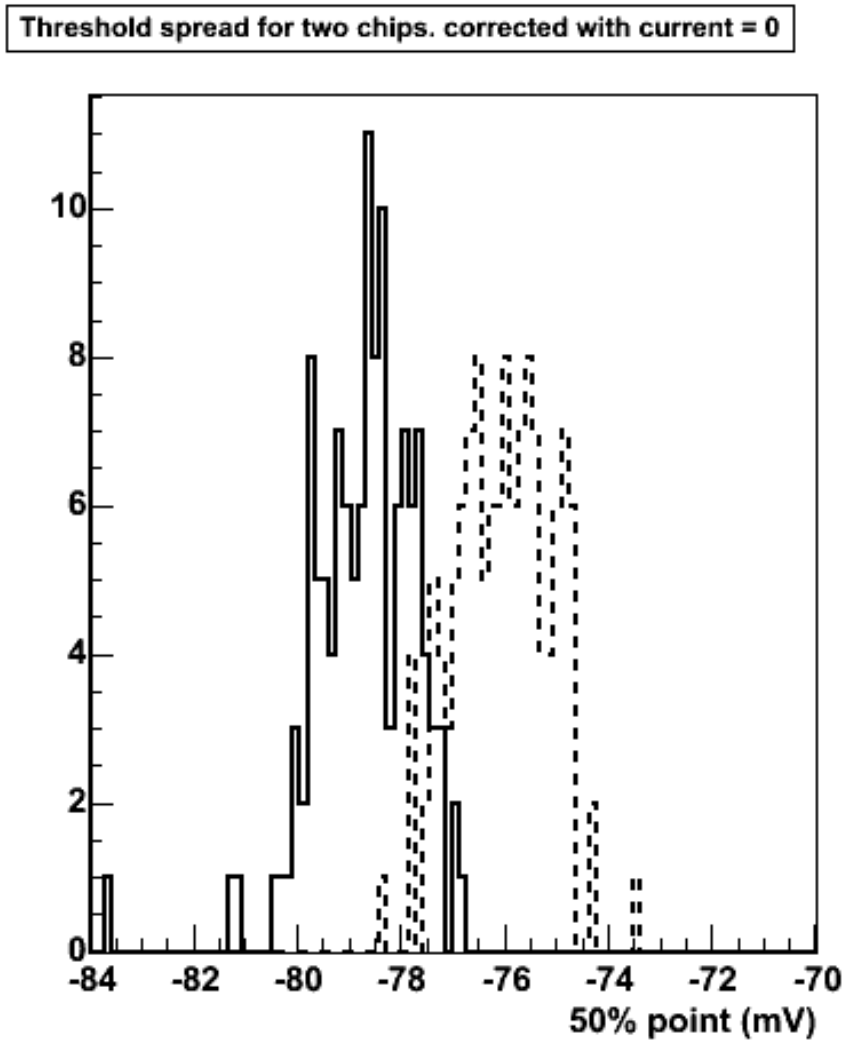
Chip tests: gain





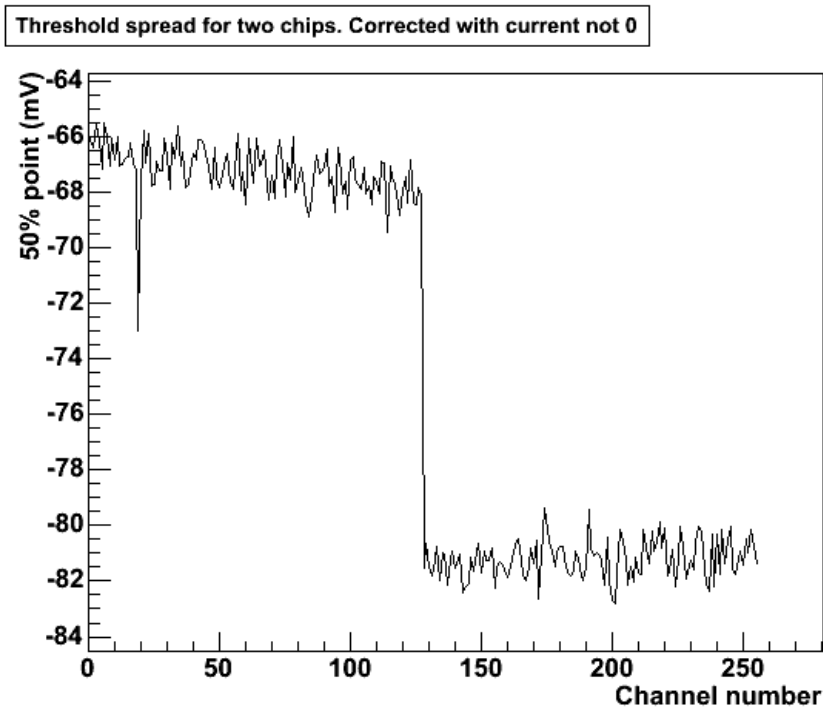
Chip tests: threshold alignment

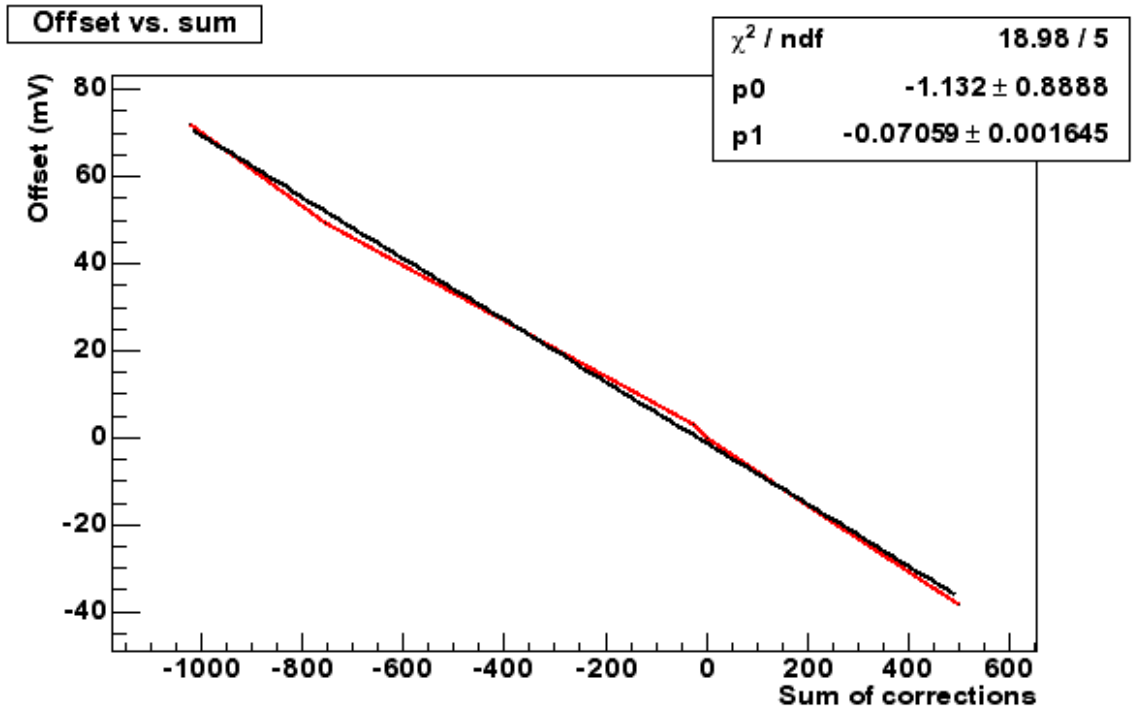




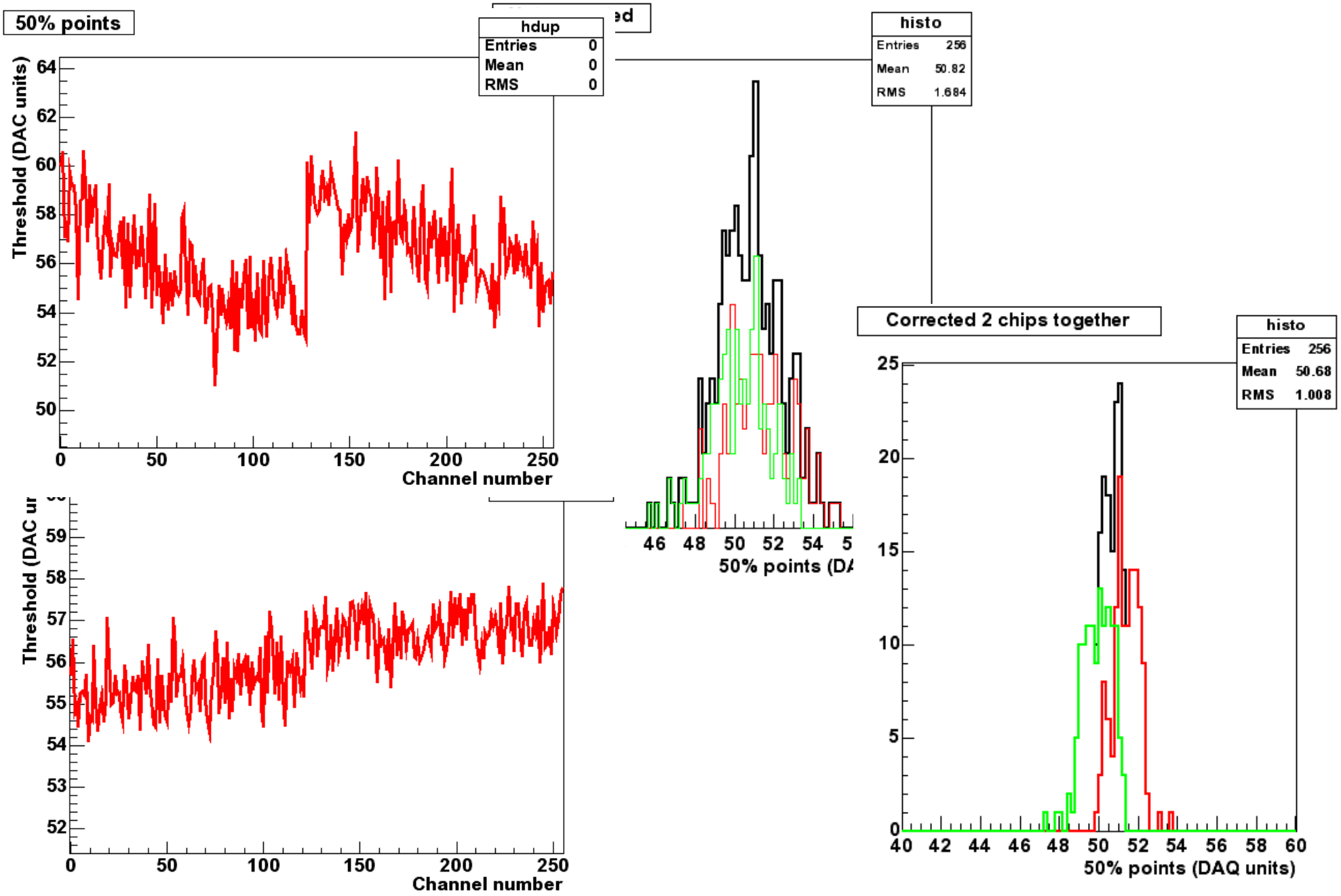
Chip tests: threshold alignment

- Trim corrections must be compensated



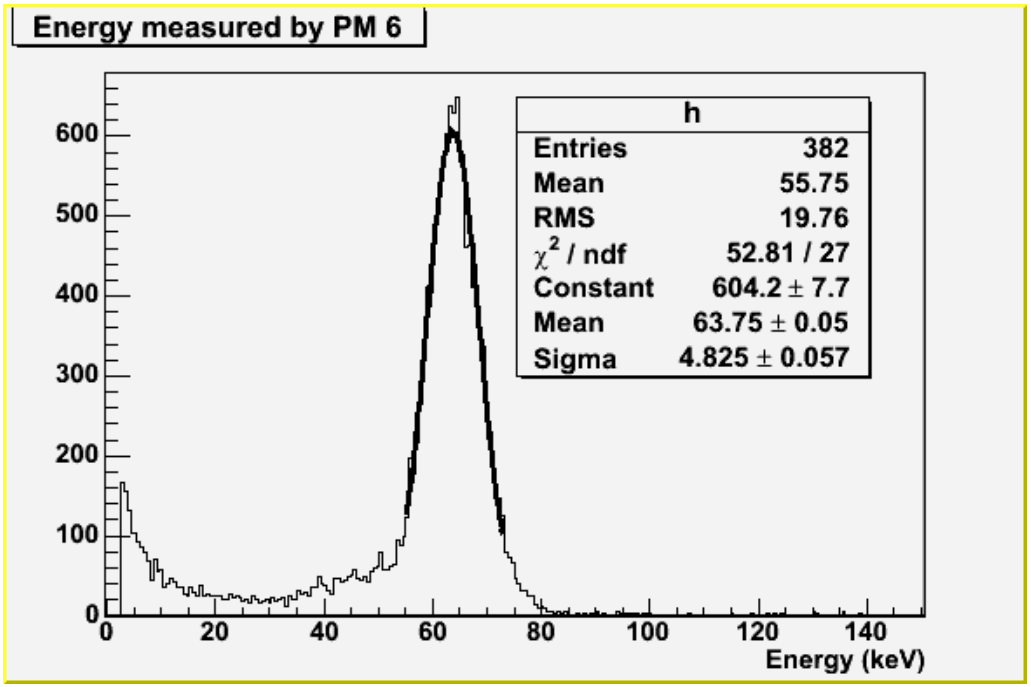


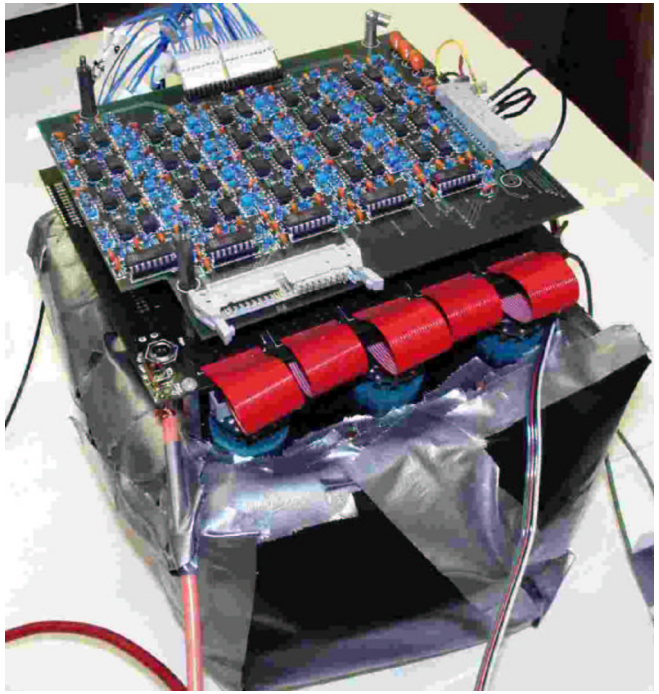
Chip tests: threshold alignment



Calibration of SPRINT module

- Data taken with a collimated Co source every 2 mm in X and Y. 10000 ev per position.
- Determination of center of the PM´s: finding the source position for which the mean of the peak in the spectrum has the highest ADC value.
- Energy calibration and Position reconstruction.





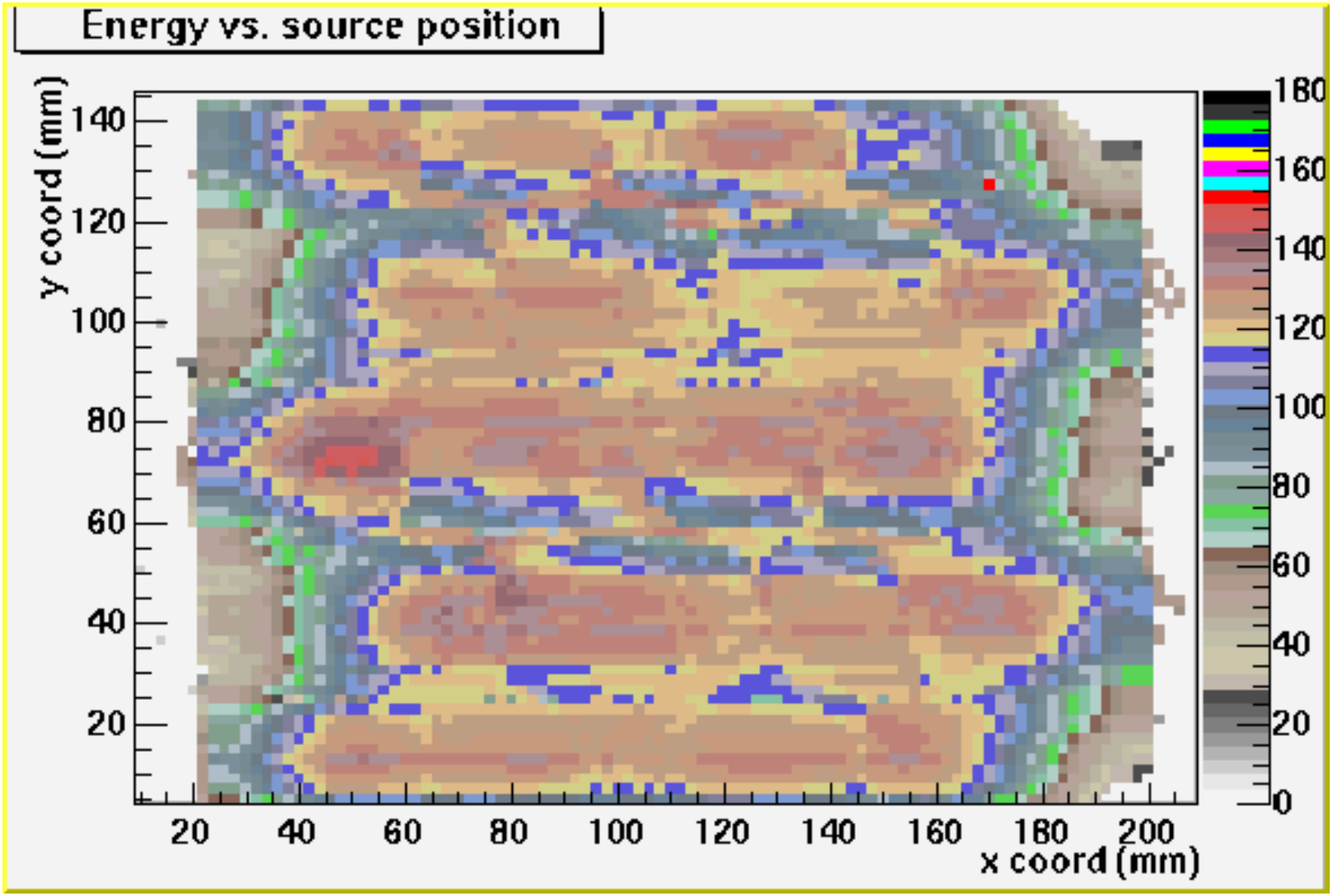
Energy calibration

- Energy obtained at each position as the sum of the mean of the peak times the gain of the PM for all PM's that triggered. $E = \sum g_i \times ADC_i$

- Two ways of obtaining gi:
  - Cobalt energy where the peak is at its maximum ADC value / ADC value at maximum
  - Fit for all positions finding gi that makes E closer to the energy of the source

Energy calibration

Energy calibration



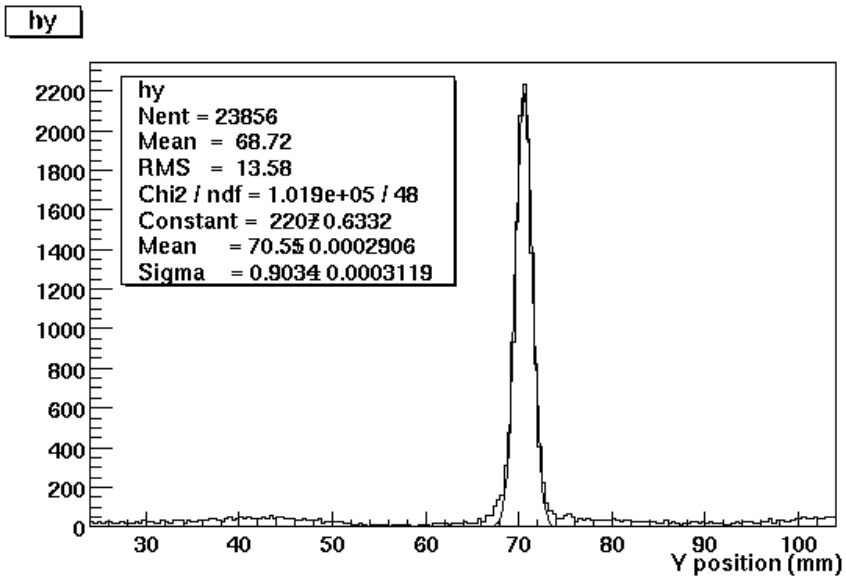
Position reconstruction

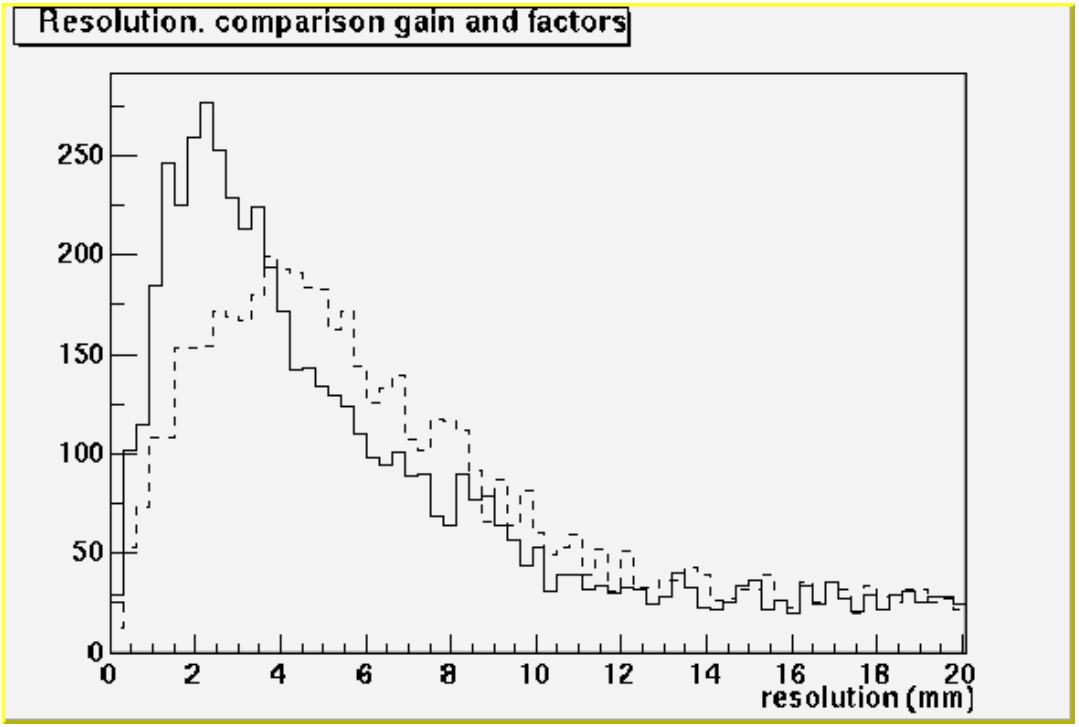
- Two methods:
  - Knowing ADC signal and gain:

$$P_c = \sum ADC_i \times g_i \times p_{ci}$$

  - Fit of position factors, independently for x and y

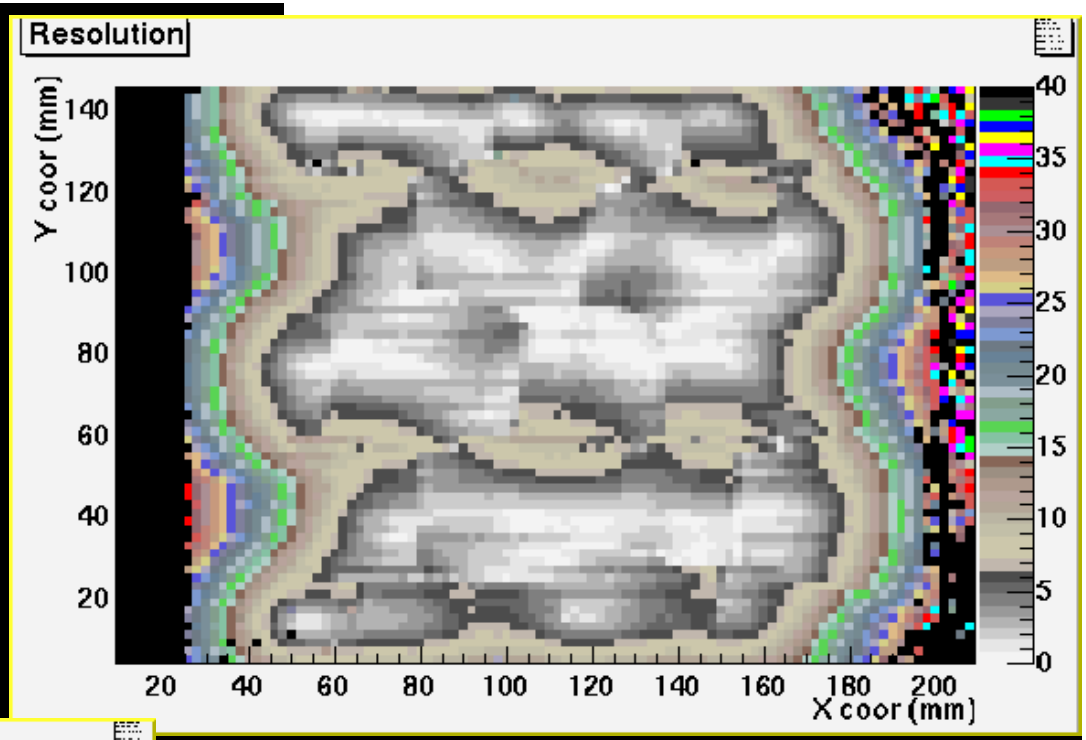
$$P_c = \sum ADC_i \times f_{ci} \times p_{ci}$$

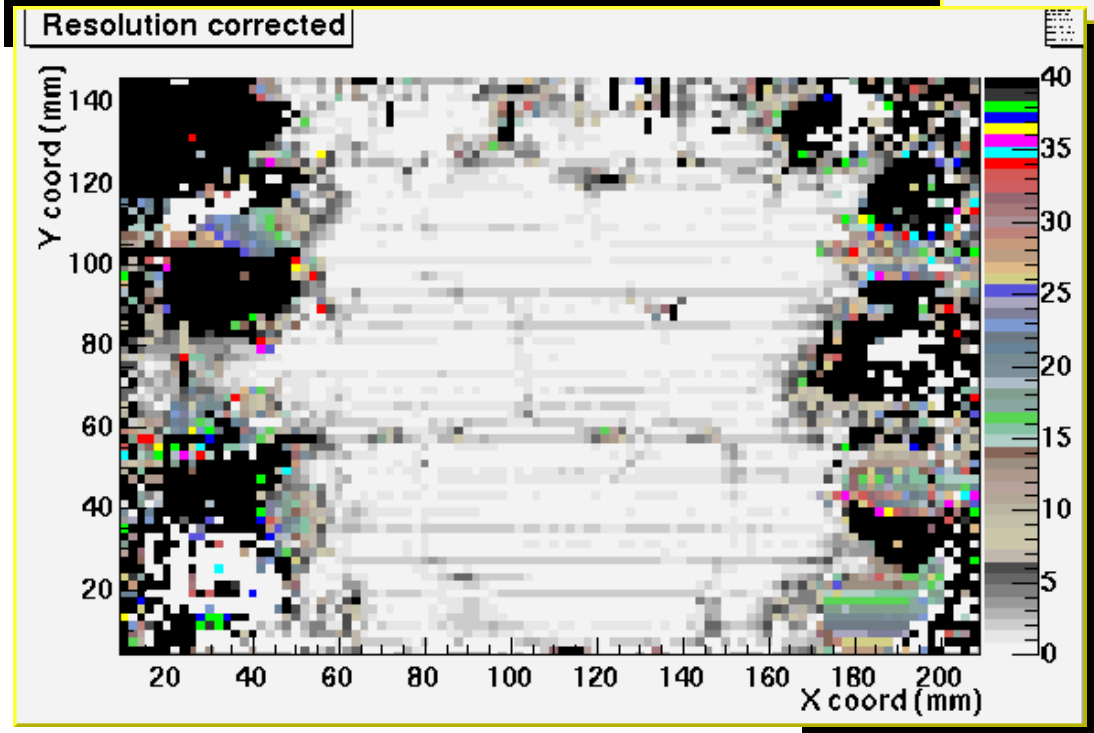




Position reconstruction

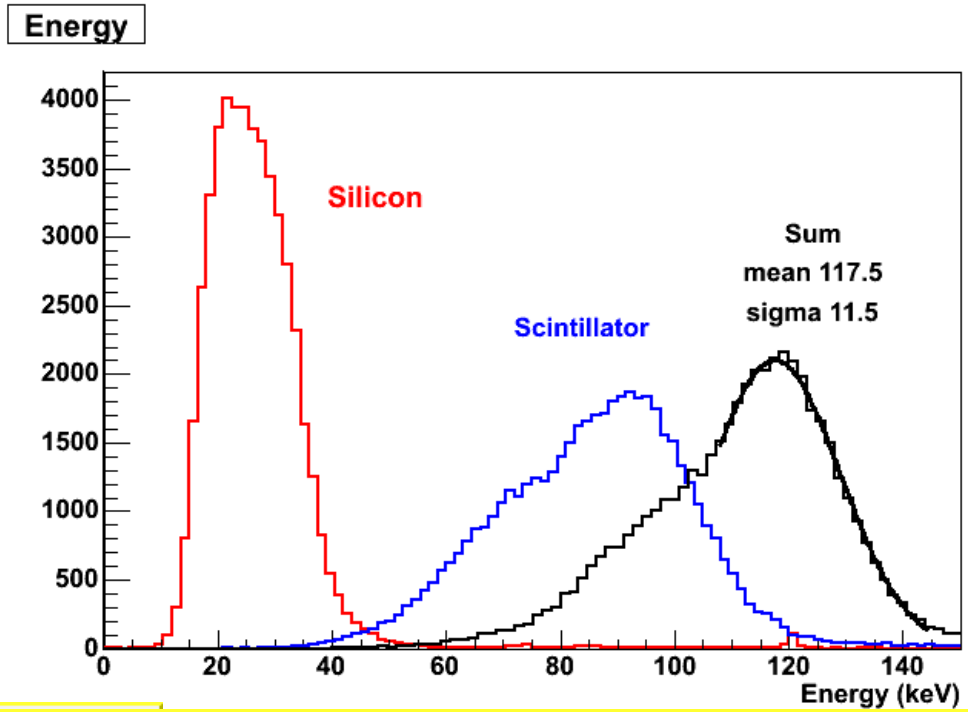
- Improved by correcting. Three methods tested. Best results obtained shown here.

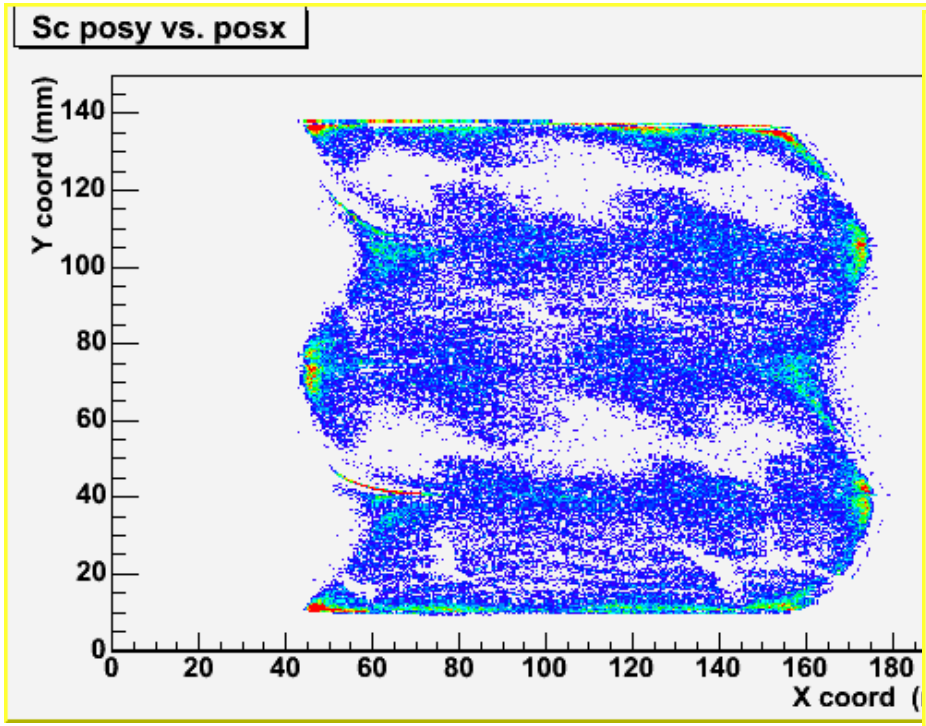

Resolution
Y coor (mm)
X coor (mm)

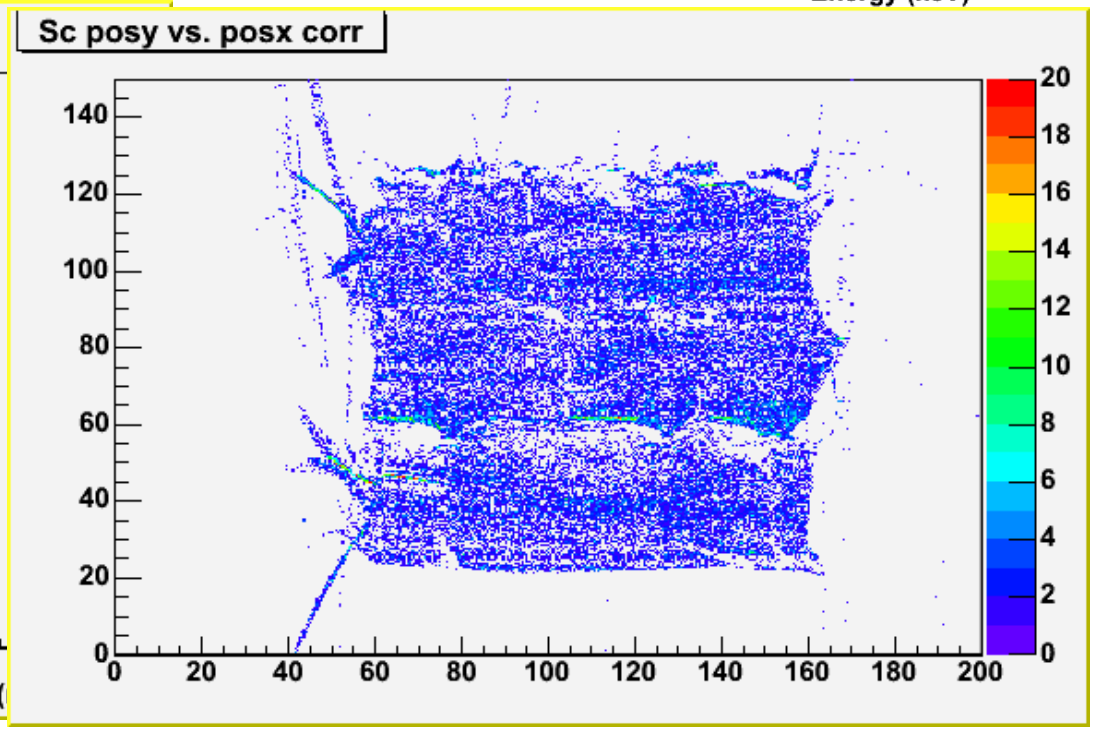

Resolution corrected
Y coord (mm)
X coord (mm)

Previous tests: April 04

- Preliminary analysis with previous calibration
- Data ready for image reconstruction.

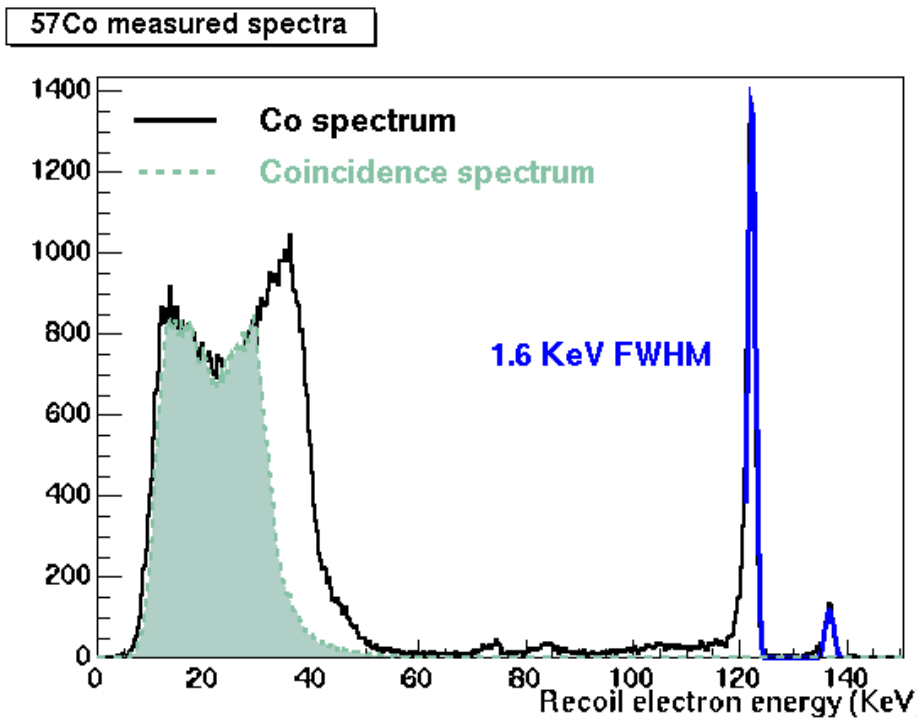


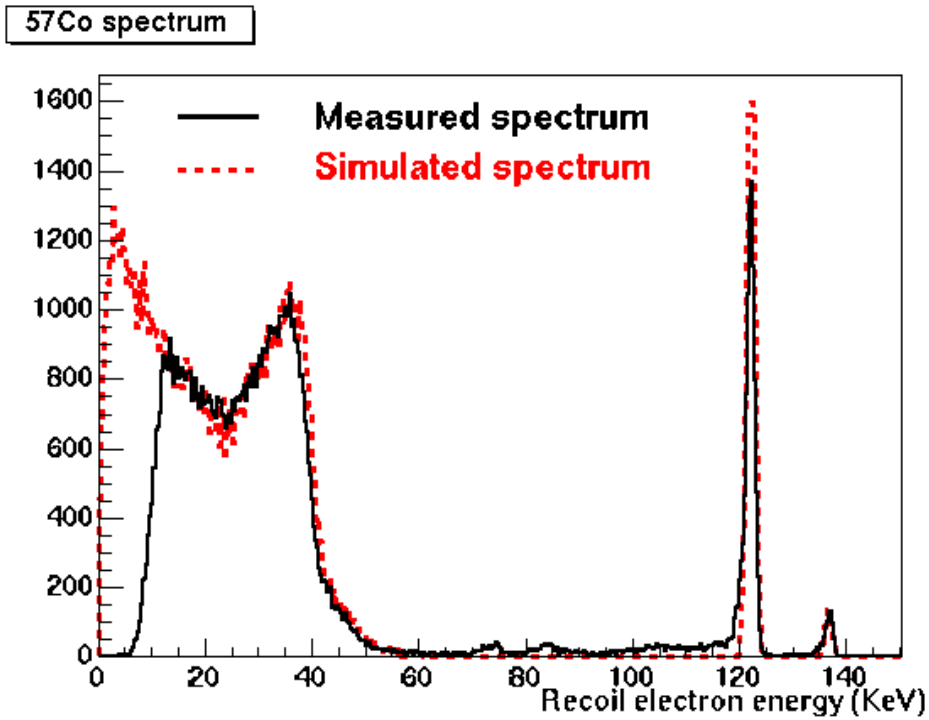




Previous tests: Aug 03

- 57Co source: 2 gamma rays: 122 KeV and 136.5 KeV. 500 μm sensor. 1.6 KeV FWHM resol.
- Coincidence spectrum for 90º setup.
  - Almost no signals above 50 keV.
  - High energy signals cut by geometry.



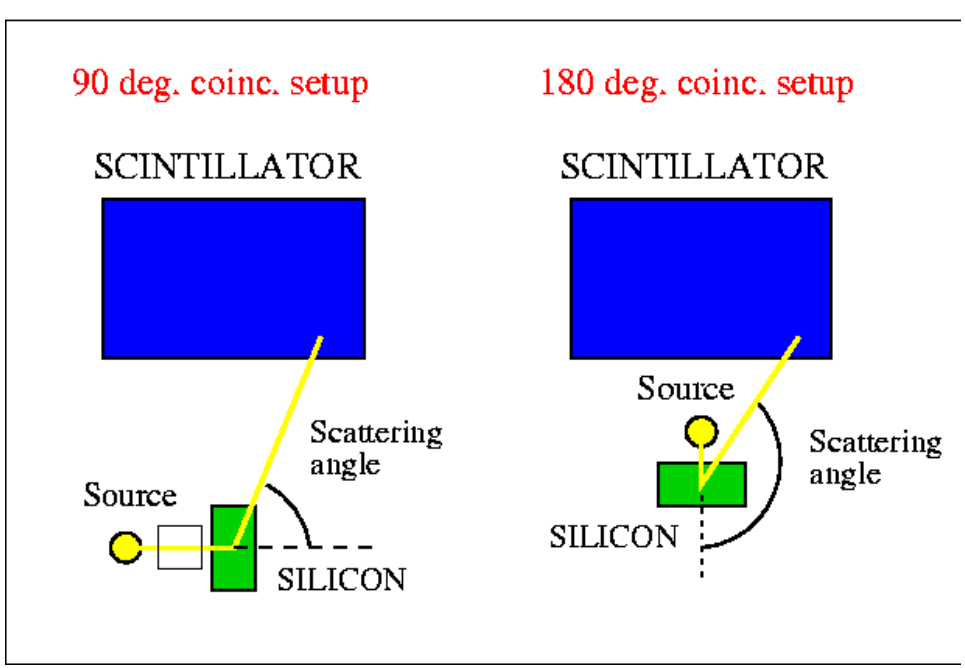


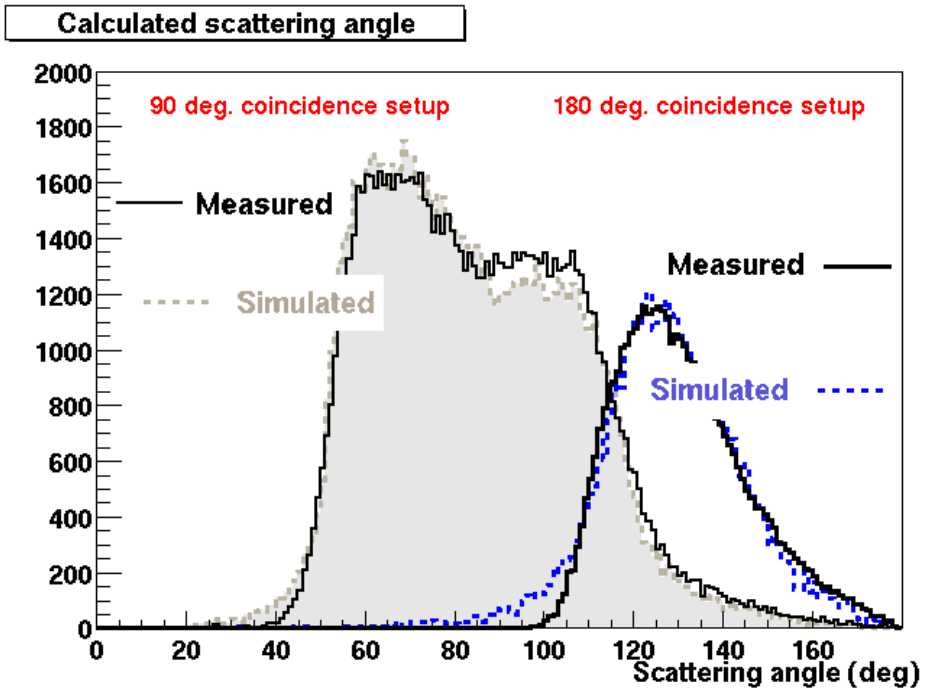
Previous tests: Aug 03

- Two coincidence setups: 90º and 180º.
- Angle reconstructed from energy deposited in Silicon:

$$\cos\Theta = 1 - mc^2 \times \left(1/E_{scin} - 1/E_0\right)$$

- Simulations done to compare with the data.





Mechanics