Cosmic Test

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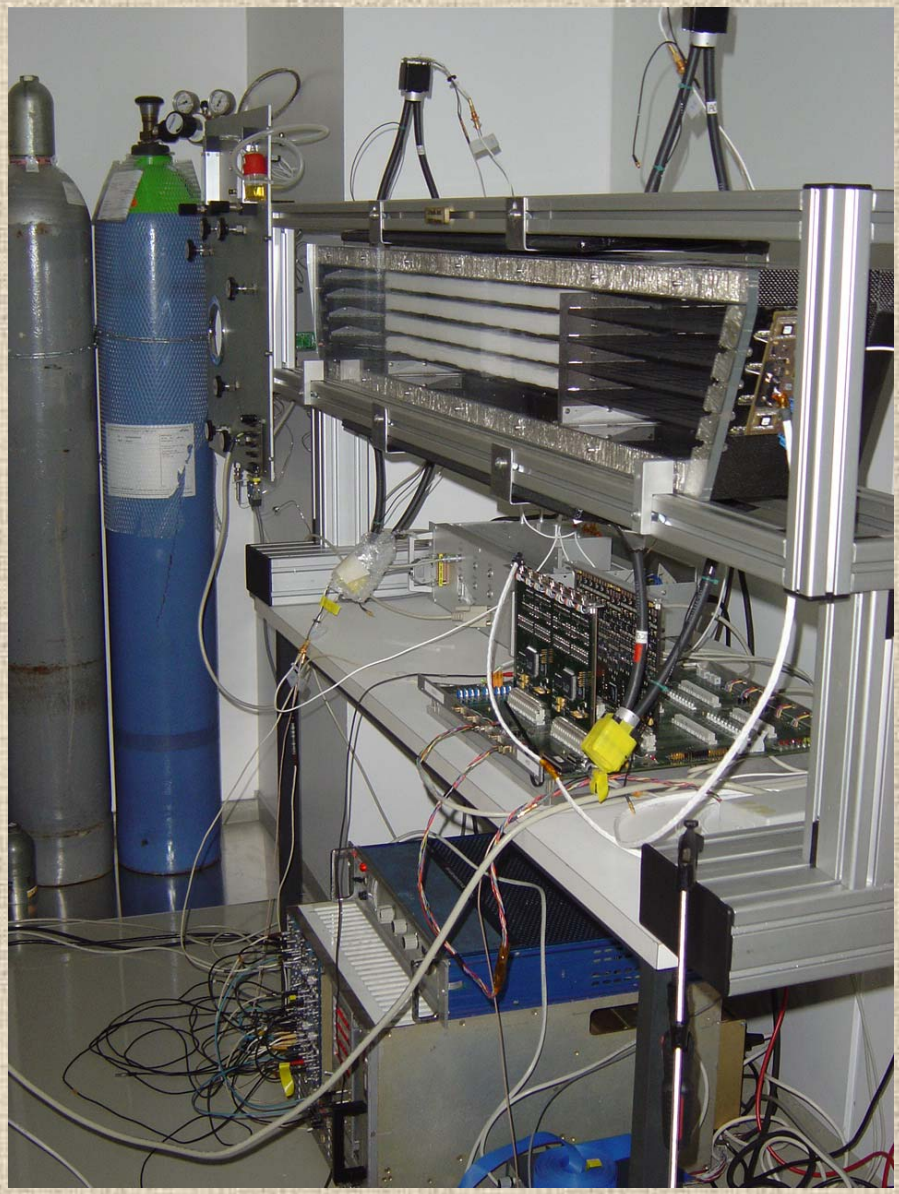
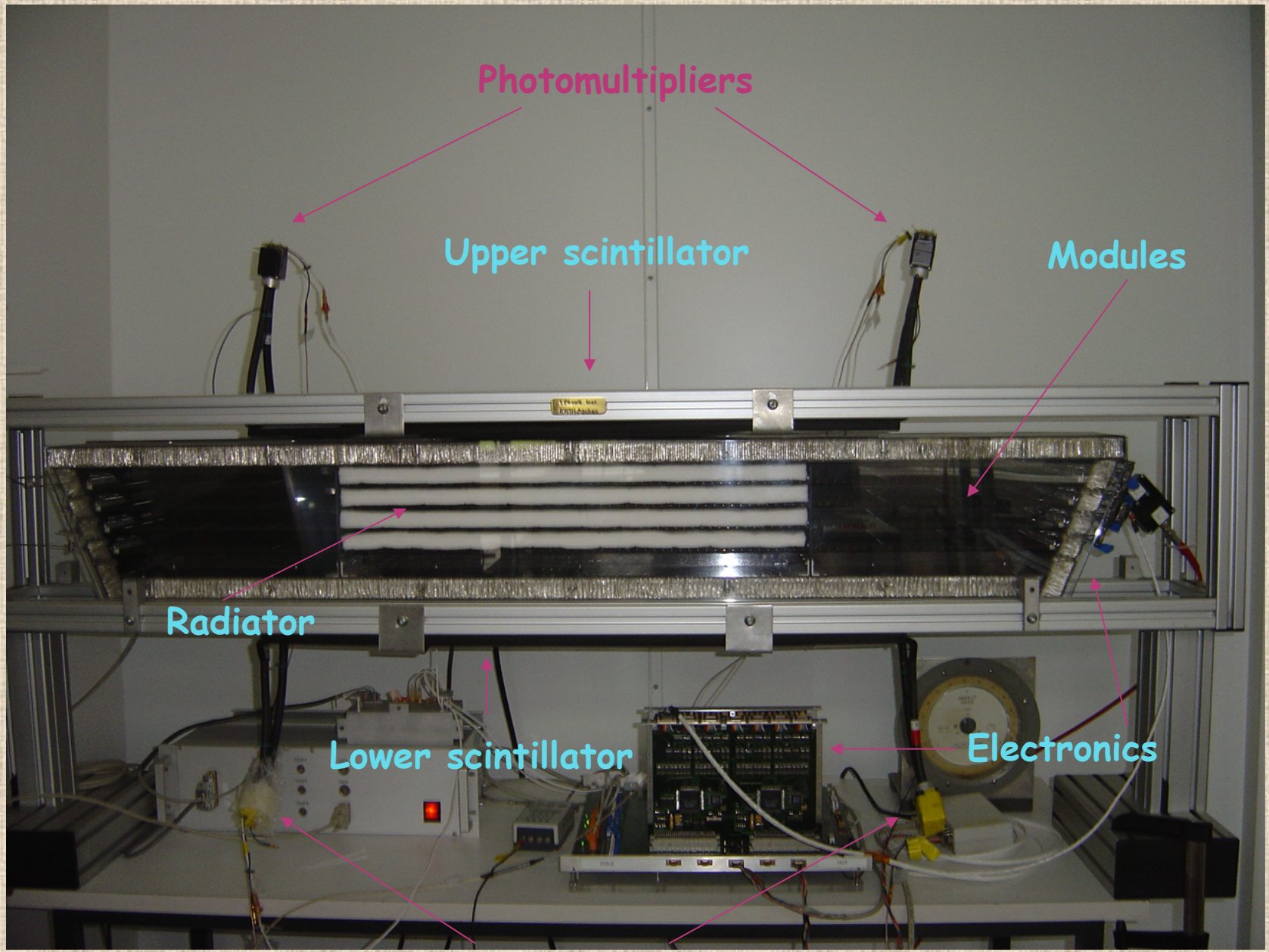
Roma, 20 Aprile 2006

Test Setup

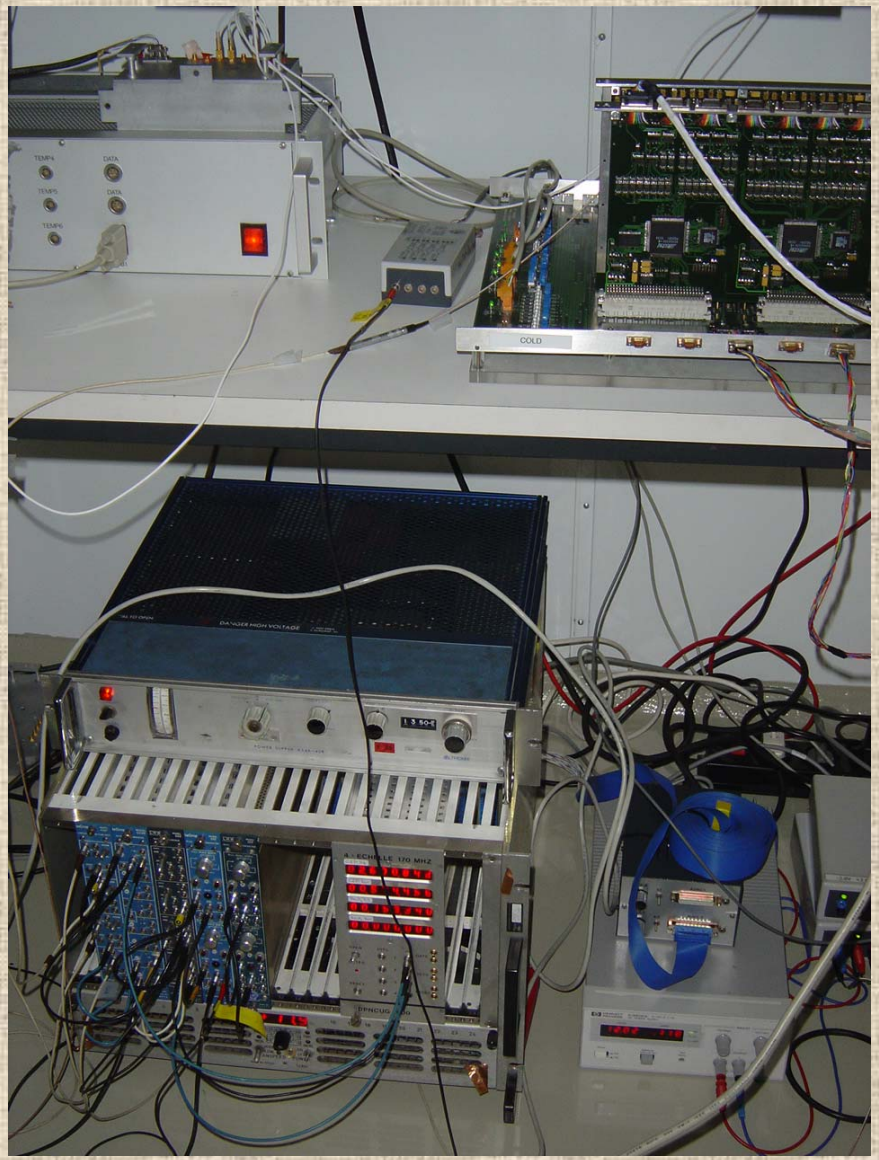


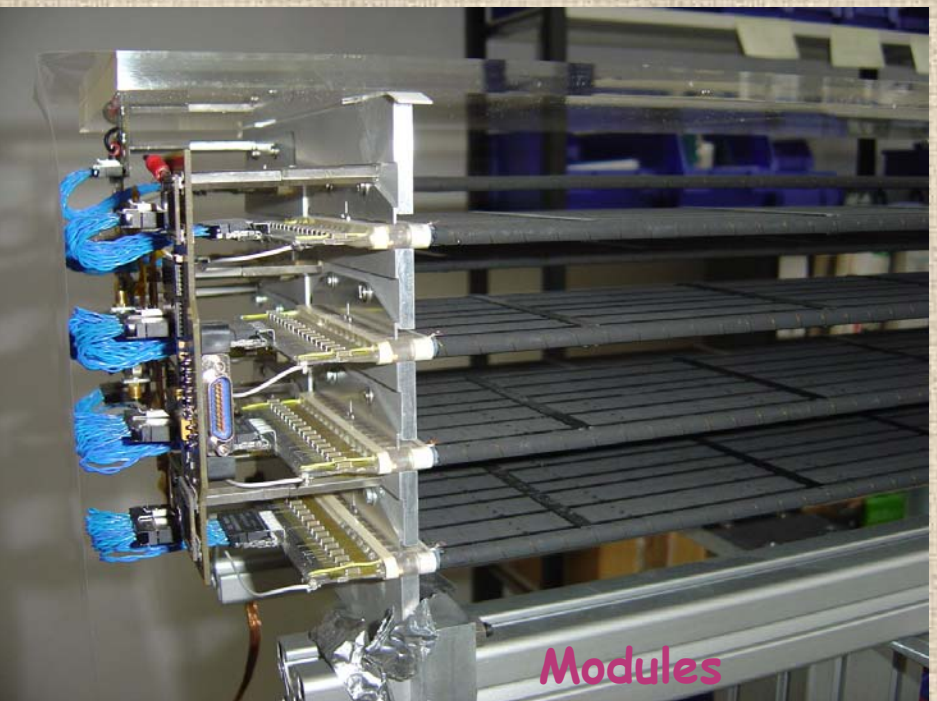
- 4 modules, 16 straws each
- 2 plains of scintillator (AMS01)
- Gas supply system
- Readout electronics
- NIM crate for trigger
- Ar/CO_2 (82:18) mixture source bottle


Photomultipliers
Upper scintillator
Modules
Radiator
Lower scintillator
Electronics
Photomultipliers

Gas distribution system

Trigger setup





Modules

Trigger

Each photomultiplier signal to discriminator input

Coincidence of upper photomultipliers

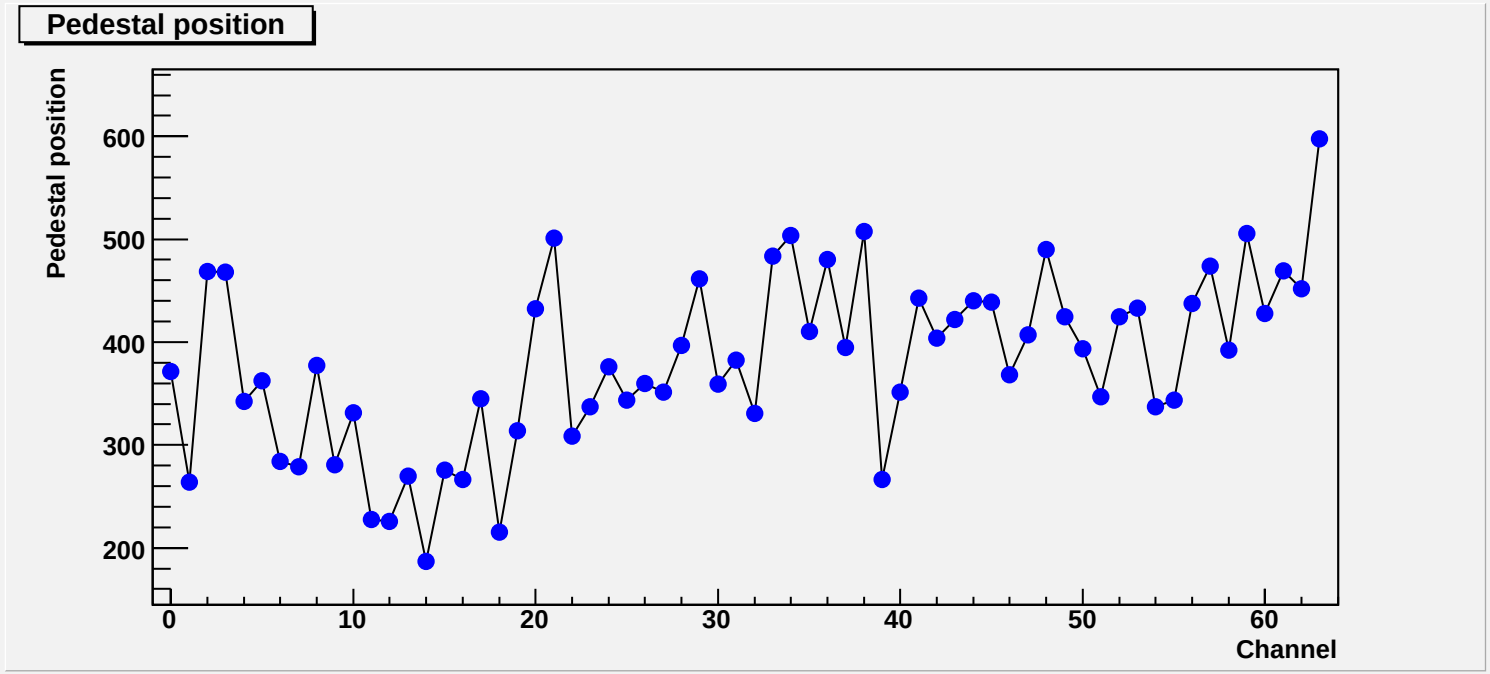
Coincidence of lower photomultipliers

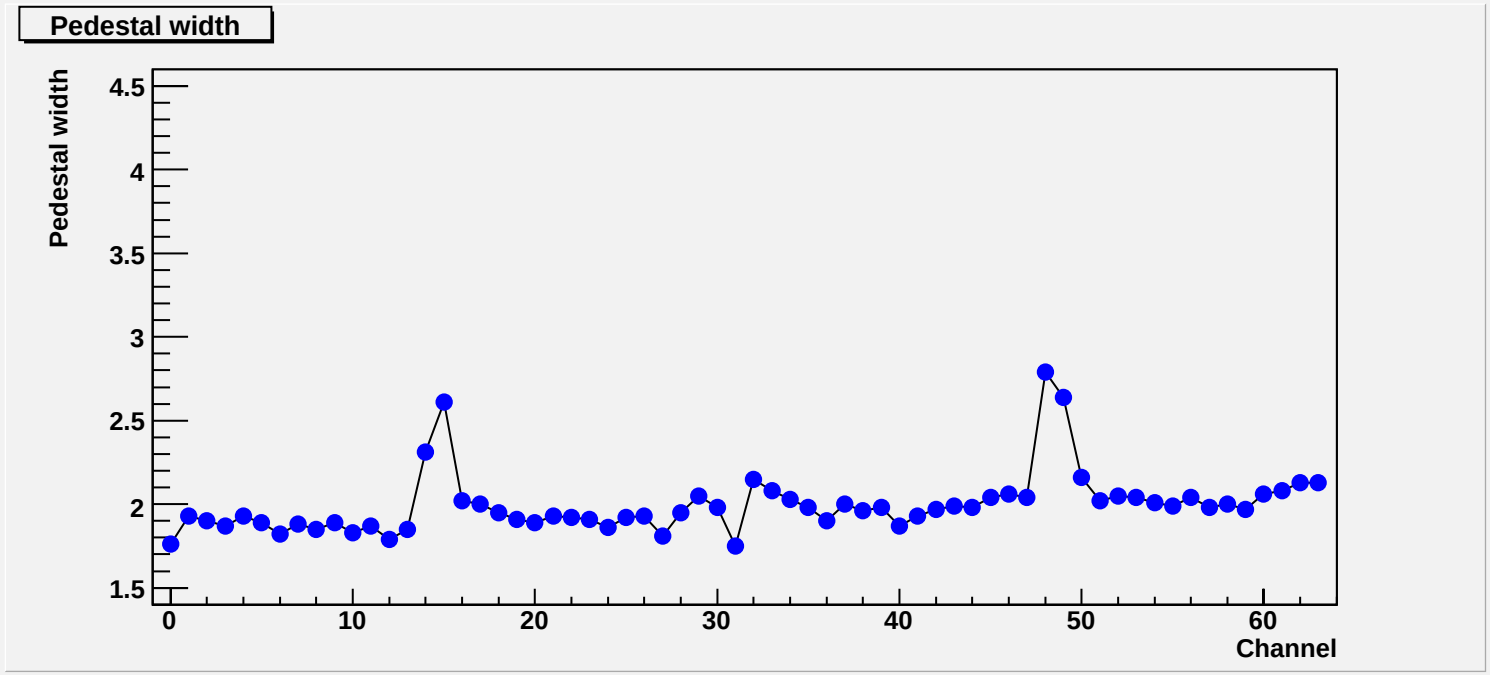
Coincidence of upper and lower scintillator plains

Gate

Pedestal Analysis

- Run with HV power supply on but HV set to 0
- For each straw: histogram of pedestal position in each event
- Gaussian fit of the distribution to determine pedestal position and width

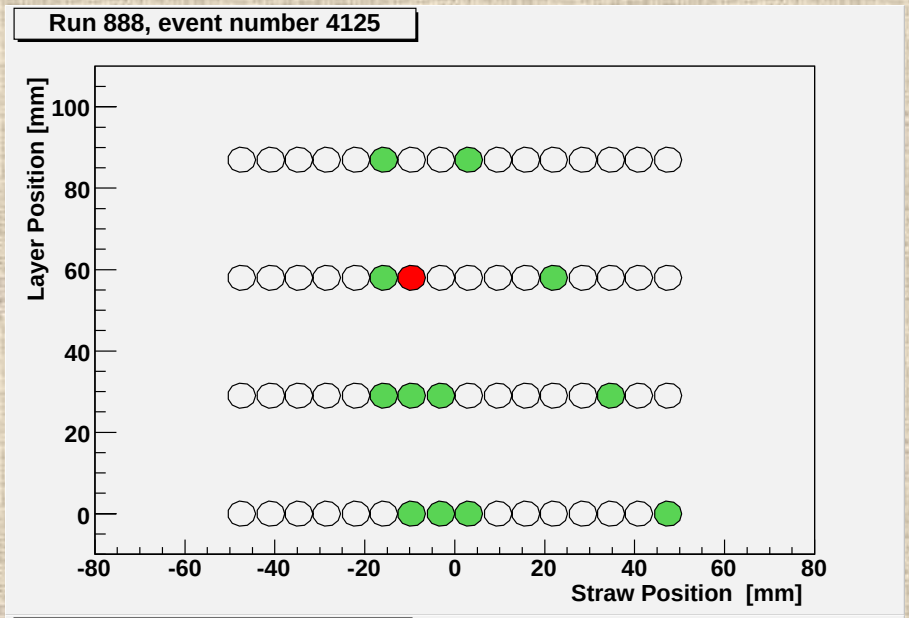

Pedestal position
Pedestal position
600
500
400
300
200
0
10
20
30
40
50
60
Channel

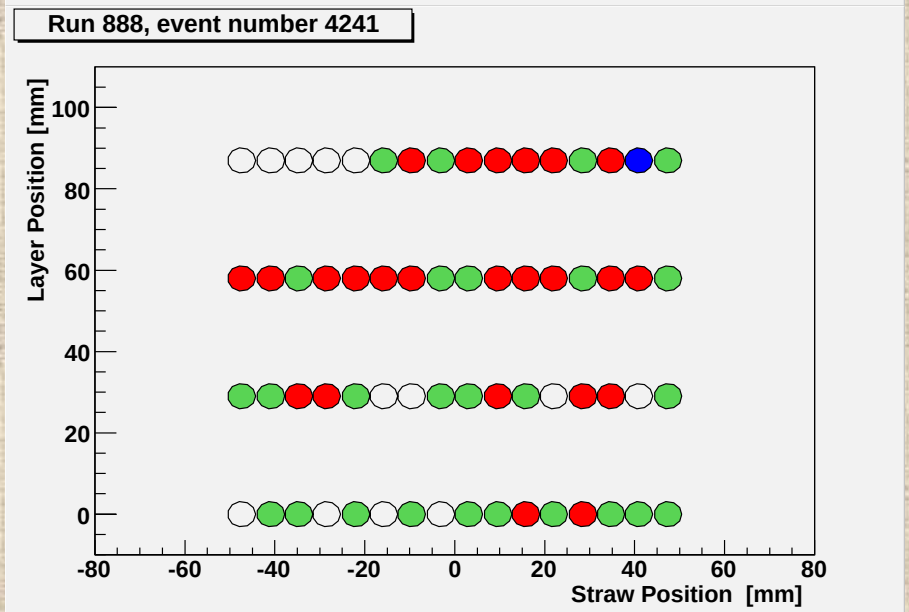

Pedestal width
Pedestal width
4.5
4
3.5
3
2.5
2
1.5
0
10
20
30
40
50
60
Channel

Events Selection

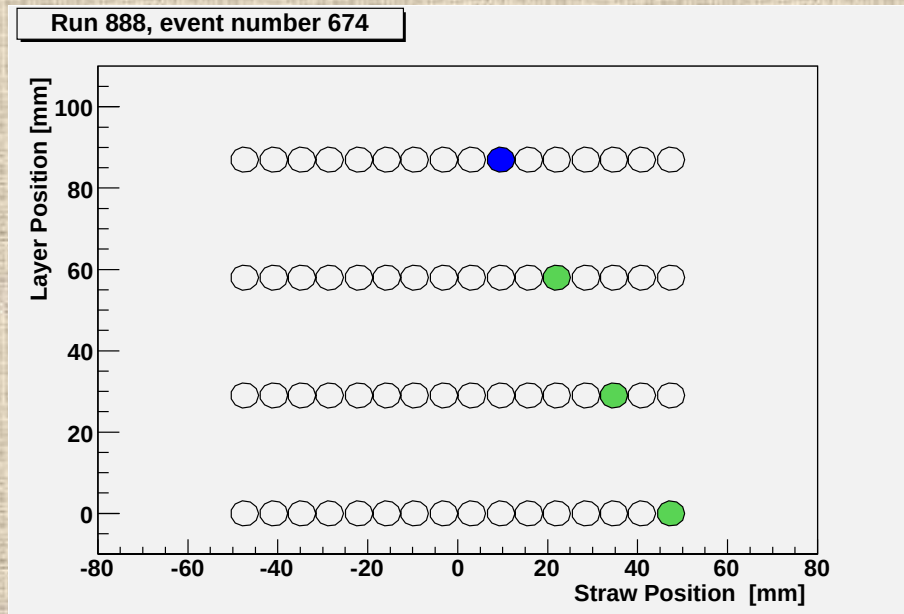
- Require clean single track events only
- Good single track event: 3, 4 or 5 hits in the event; 3 or 4 hits on track
- Hit: 4σ above pedestal

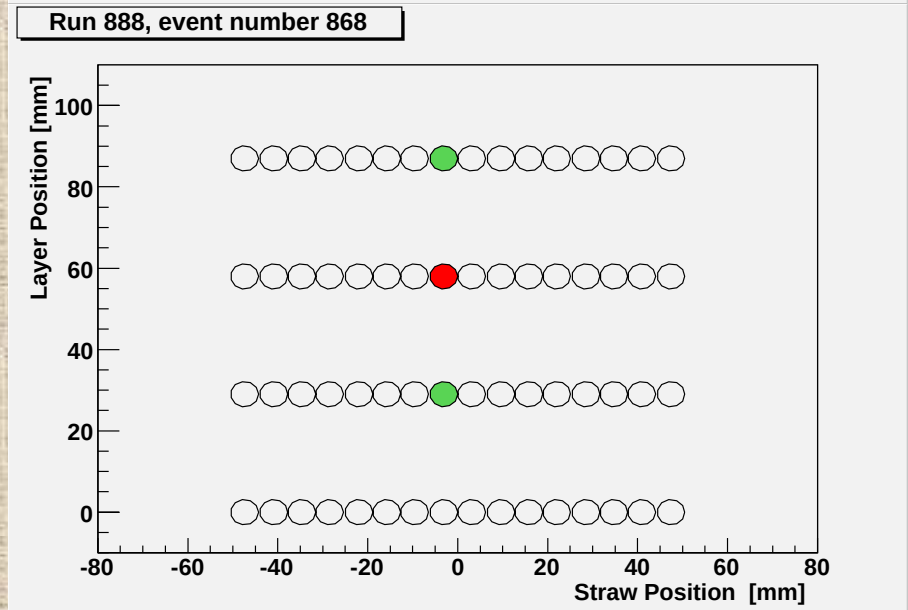
Bad events





Good events





Color code

- PH < 4σ above pedestal
- 4σ < PH < 10σ above pedestal
- 10σ < PH < 150σ above pedestal
- PH > 150σ above pedestal

Track reconstruction

- Determine pedestal subtracted pulse height
- Require 3 or 4 layers with exactly 1 hit
- With these single hits on layer
  - linear fit through these
  - check residuals for each hit in the event
  - if residual < 1.5*straw radius flag hit as hit on track
  - Select events with 3 or 4 hits on track

Energy deposition analysis

- For good single track events, for each straw: fill histogram with pedestal subtracted pulse height of hits on track
- Fit Landau
- Determine MPV for each straw

Intercalibration

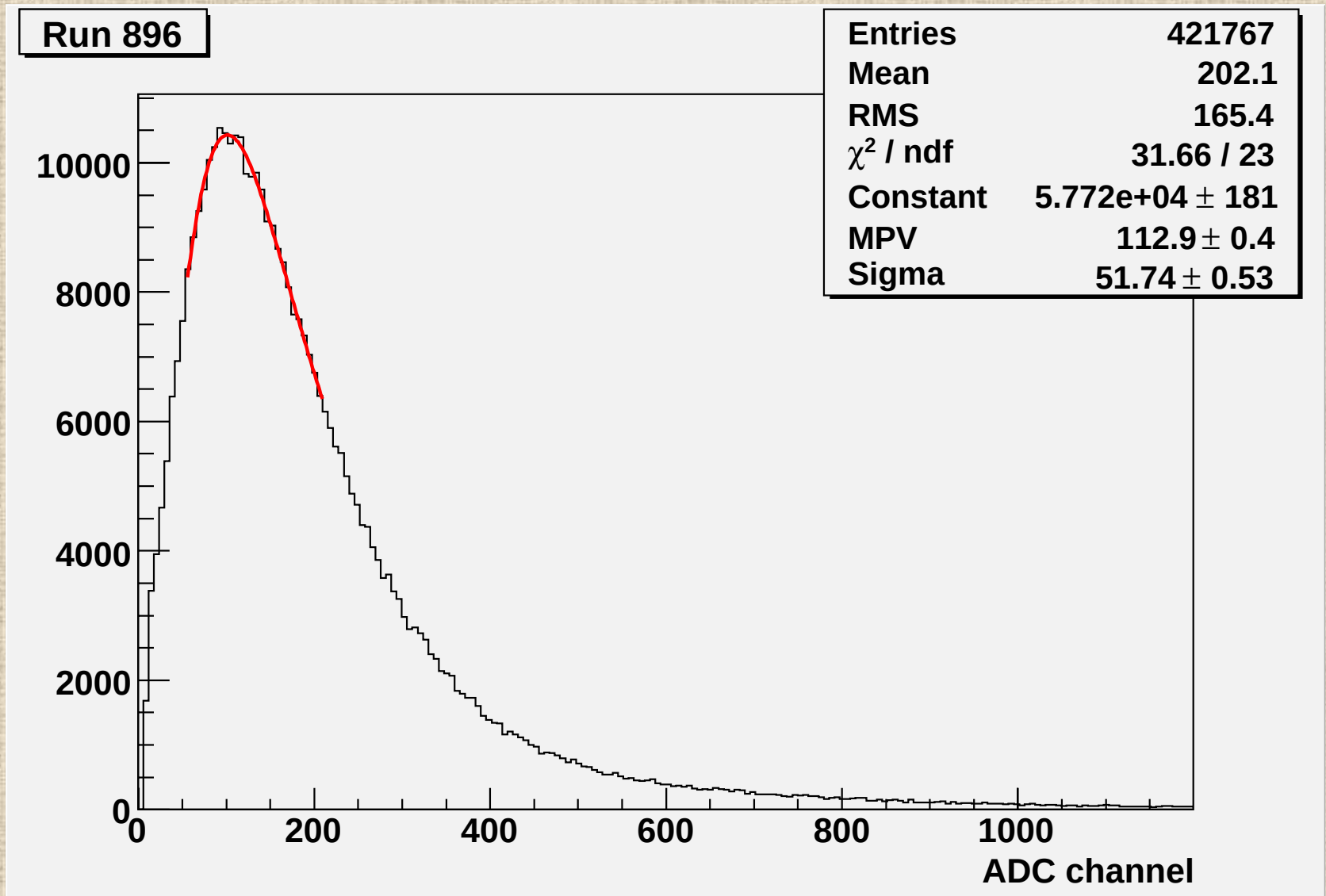
- MPV for different straws vary due to:
  - tube geometry
  - variation of gain from wire offset
  - VA chip gain difference in the readout of each straw

- Determine mean MPV over all 64 straws
- Define correction factor for straw i as

$$CF_i = \text{mean MPV} / MPV_i$$

- Intercalibrated hits: $(PH_i - Ped_i)*CF_i$
- Fill one histogram with all intercalibrated hits on track
- Fit Landau to determine run MPV

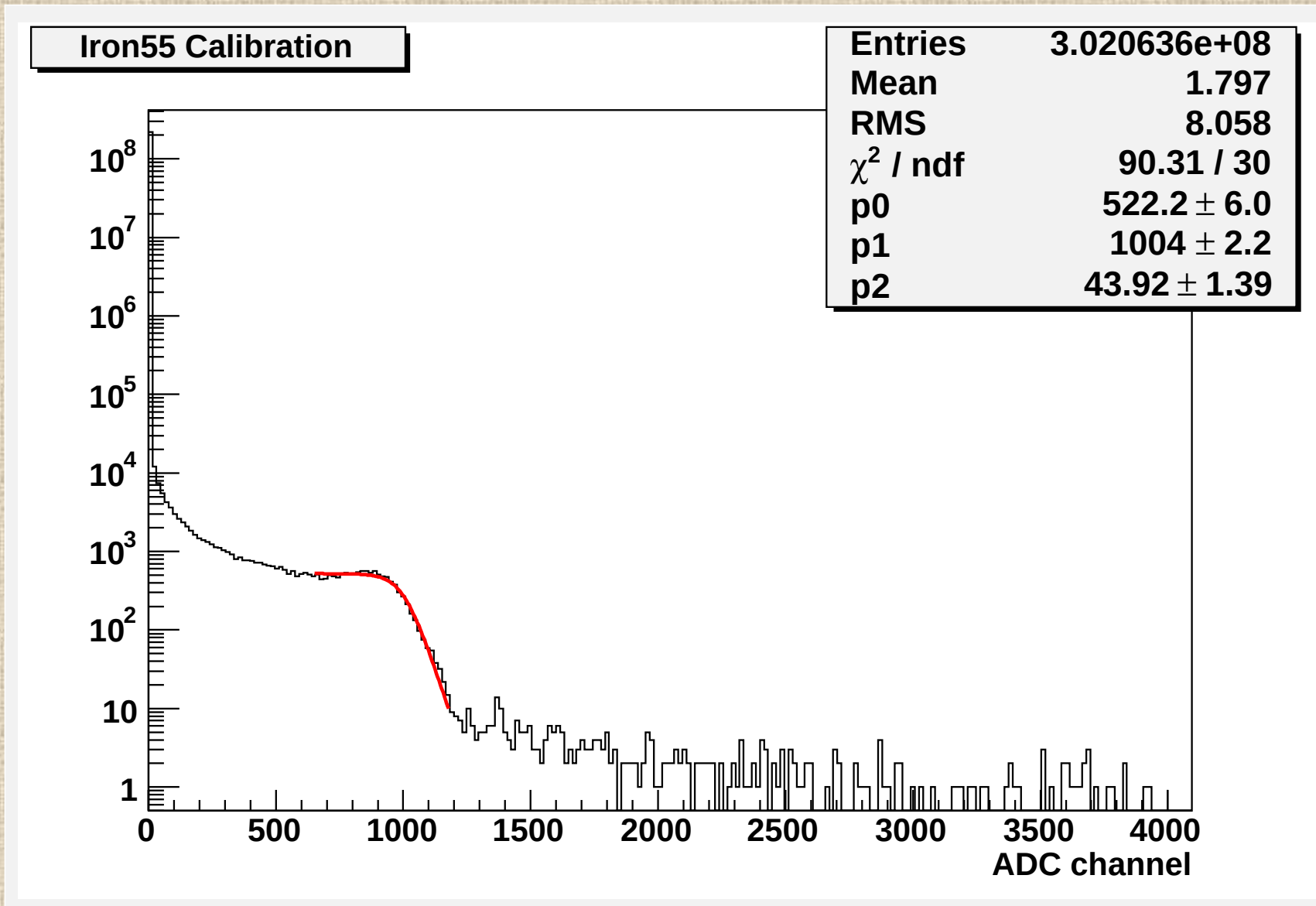
HV = 1400 V, P = 1028.4 mbar, T = 22.7 °C



^{55}Fe Energy Calibration

- 5 ^{55}Fe sources put on a piece of radiator over the right side of the upper module
- Millions of events recorded at
  - HV = 1400 V, P = 1028.1 mbar, T = 22.81 °C
- 1 KHz random trigger used to select events
- Histogram filled with pedestal subtracted, intercalibration corrected, pulse height over all straws

- No possibility to trigger the source signal only → cosmic contribution also
- Right edge of profile correspond to photopeak



Determination Of Photopeak Position

- Fermi function fit of the right edge of the distribution

$$f(x) = A/(e^{(x - B)/C} + 1)$$

- Correlation between C and σ_{gauss} used to determine photopeak position

$$ADC = B - 2.92 \cdot C + 0.007 \cdot C^2$$

(Thomas Kirn AMS-02 TRD Meeting, Boston, November 30th 2000)

- Found (889.26 ± 107.12)ADC = 5.9 keV
- To do: scale obtained result to energy

Next: Determination Of Diethorn Gain Parameters

- With the results of several runs at different HV, P & T (density) fit data using Diethorn formula

- Study gain variation as a function of gas density variation and HV variation