First Muons in CalDet

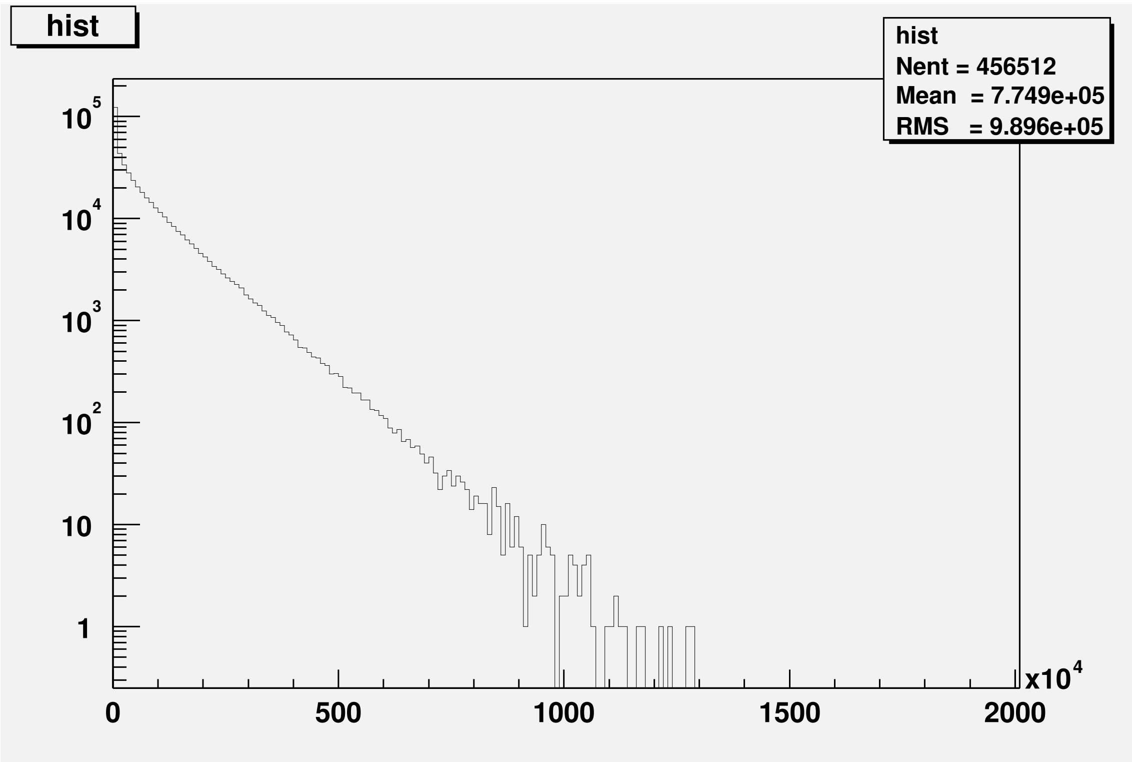
CalDet Setup and Data Taken

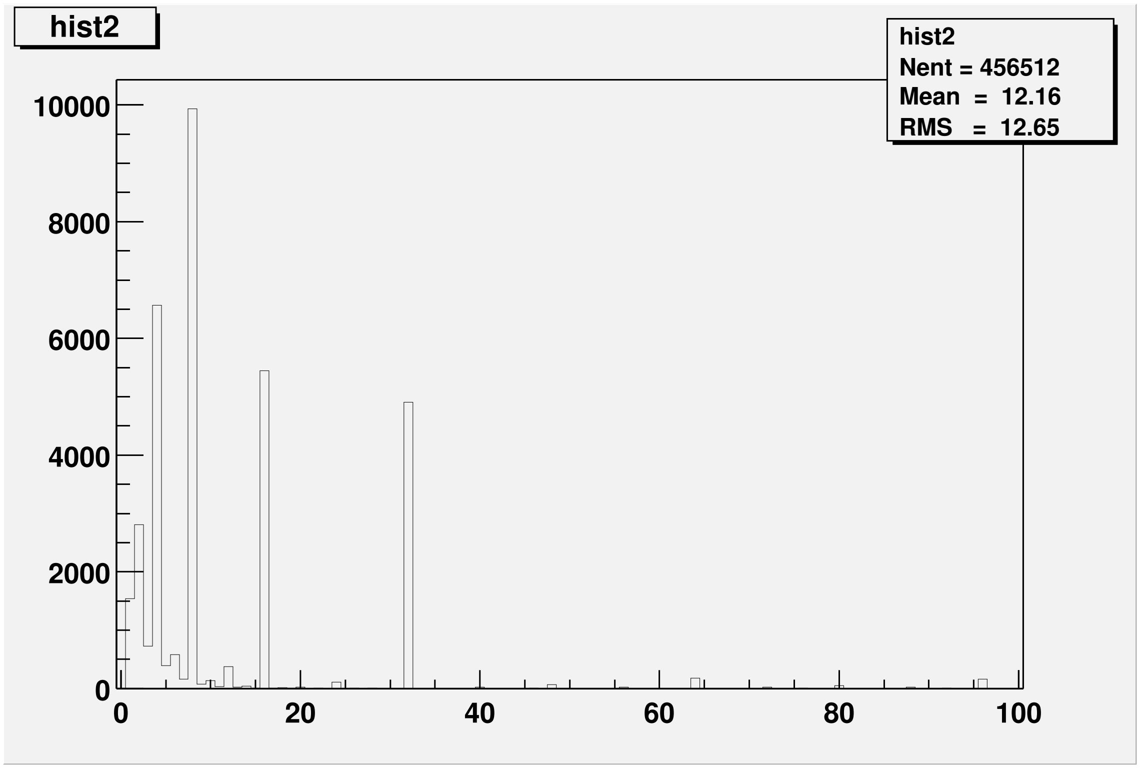
- 6 planes with horizontal strips near the back of the detector connected to MUX boxes
- Light injection fibres from real pulser box connected to LIMs and PINs; trigger fibre connected to another MUX box
- DAQ used to read out 3 MUX boxes + trigger MUX box only on one side (right hand side if you're the beam)
- I've looked at 2 runs which were taken, without light injection, specifically to find muons

Making Events

Grouping individual hits into events

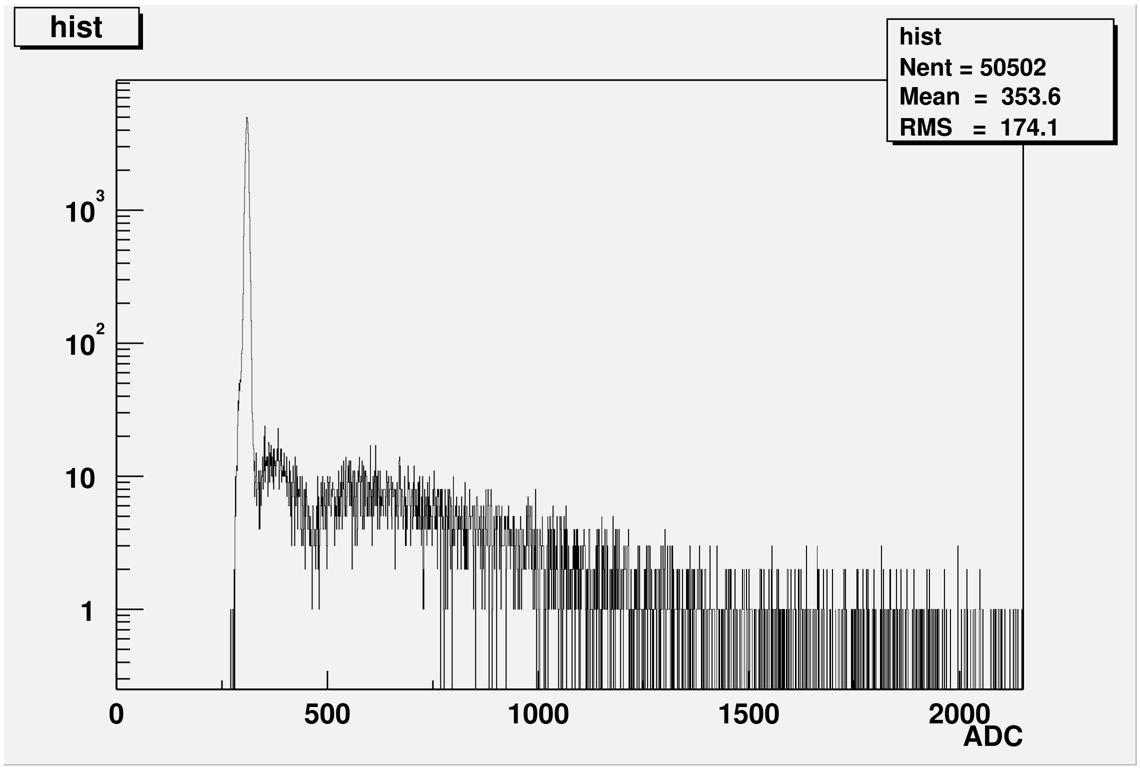
- DAQ + program written by G. Crone produces a tree with branches for variables such as VARC, VFB, VACHANNEL, ADC etc. Hits are time-ordered in tree but not in channel or chip order
- Want to group all hits occuring close in time into an event
- First look at time intervals between adjacent hits:

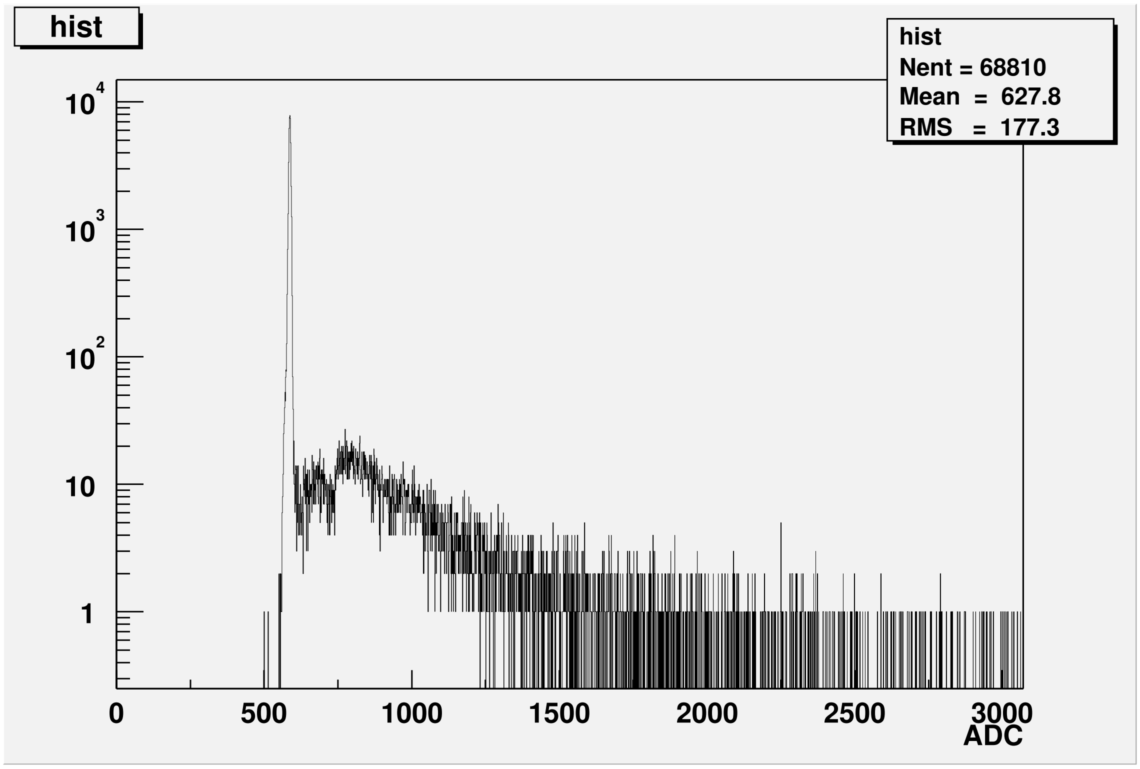



hist2
hist2
Nent = 456512
Mean = 12.16
RMS = 12.65
10000
8000
6000
4000
2000
0
0
20
40
60
80
100

Making Events

- Read through tree and fill temporary arrays until time interval between one hit and the next is >35 units
- Do common mode subtraction to channels in which there are hits (to do this I have to assume that when there's a dynode trigger an entire chip really is read out...)
- Map vachannels to their respective plane and strip numbers (as well as pins, trigger and common mode channels) and save an "event" in a new tree




hist
hist
Nent = 68810
Mean = 627.8
RMS = 177.3
10^4
10^3
10^2
10
1
0
500
1000
1500
2000
2500
3000
ADC

Finding Muons

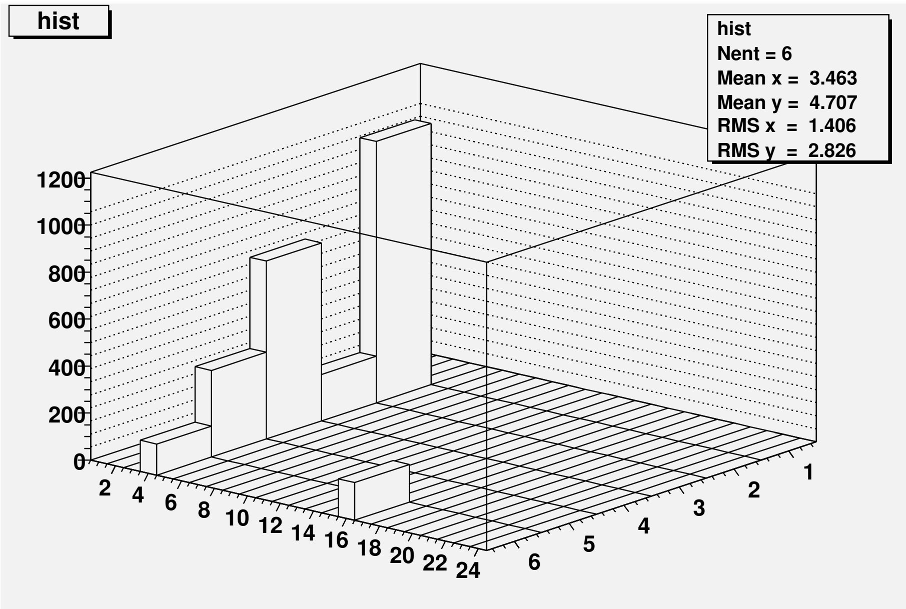
Looking for tracks:

- First have to find pedestals from spectra, so for each strip I fitted a Gaussian just to the peak
- Looking for beam muons from the PS, so demand a horizonal track either passing through:

  - same strip in each plane; or

  - shallow angle wrt horizonal (i.e. strip number increases or decrease by one at each plane)
- To be included as a track hit, the threshold value used was 100 ADC counts above pedestal

Typical 5-hit track:

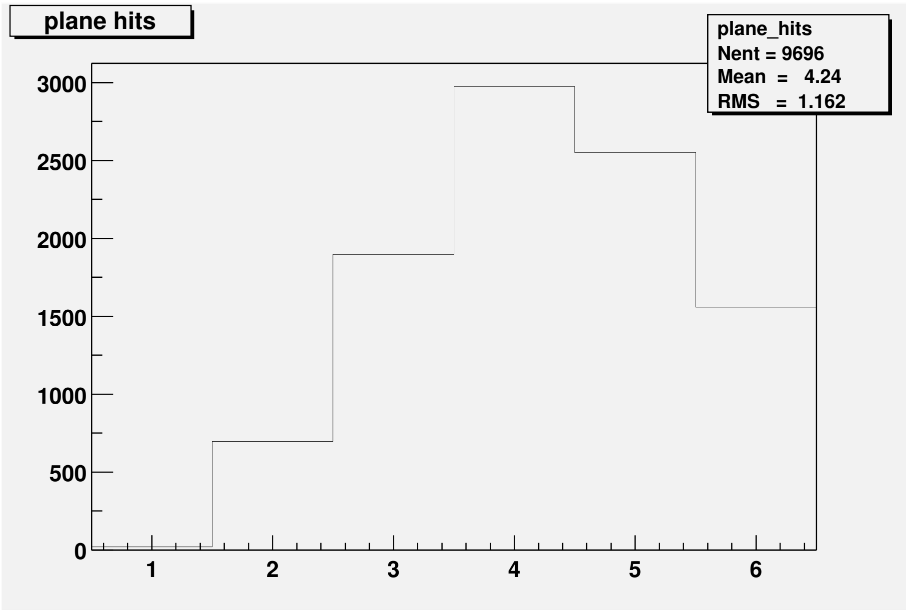


Finding Muons

To improve statistics, look for a track in at least 3 planes.

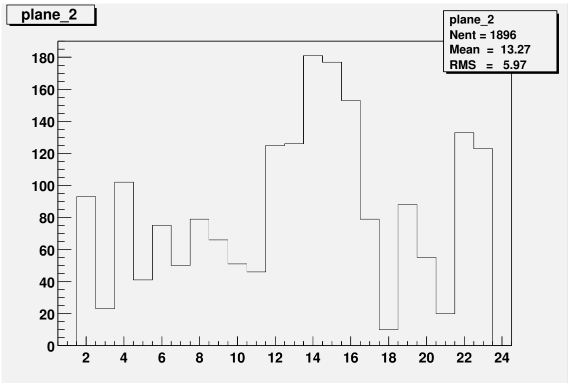
Find: $\sim 0.7\%$ of events are muons in both runs analysed, giving about 12000 muons in total

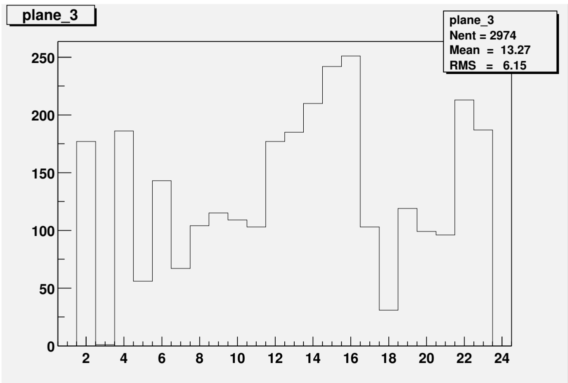
Two chips on the first MUX box (for the first two planes) were dead

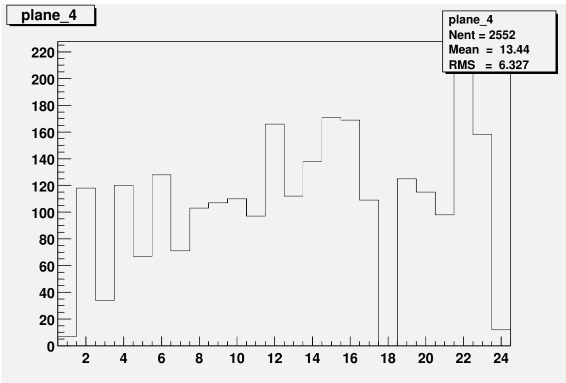


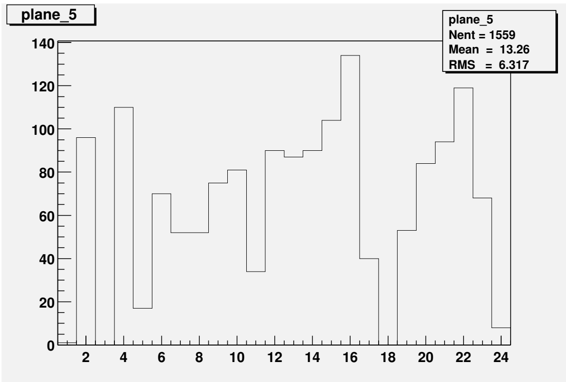
Strip Hits

Strip hit distributions in each plane



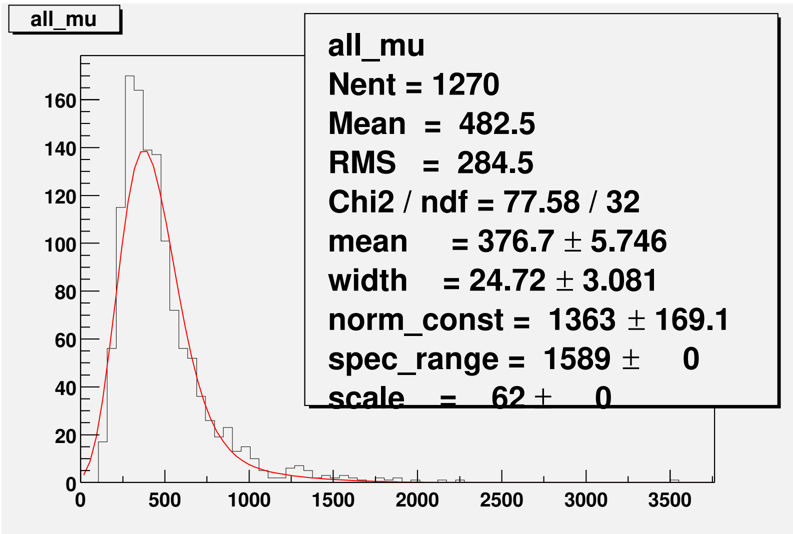



plane_4
plane_4
Nent = 2552
Mean = 13.44
RMS = 6.327
0
20
40
60
80
100
120
140
160
180
200
220
2
4
6
8
10
12
14
16
18
20
22
24


plane_5
plane_5
Nent = 1559
Mean = 13.26
RMS = 6.317
0
20
40
60
80
100
120
140
2
4
6
8
10
12
14
16
18
20
22
24

Muon Enery Spectra

Looking at all hits in all strips:



Just looking at one strip: