

Common noise algorithms for AMS-02 tracker

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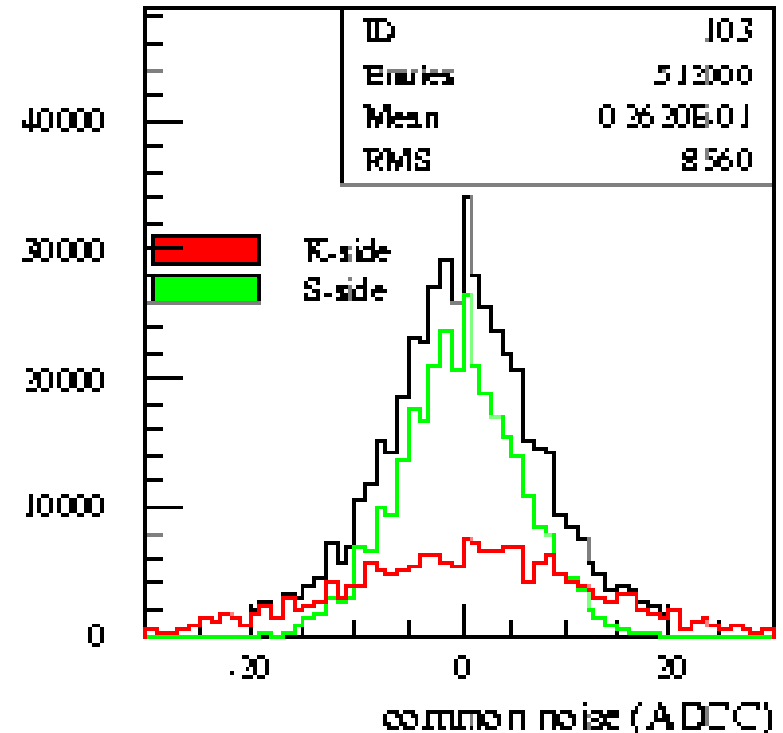
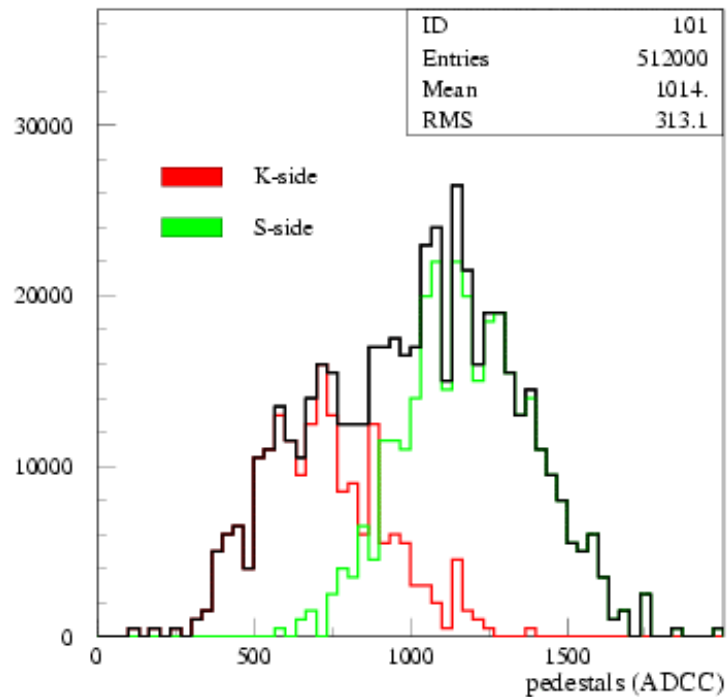
Outline

- Simulation program
- Features of generated events
- Average over all channels
- Dead channels
- Channels with signal
- Average over 8 channels
- Mediana

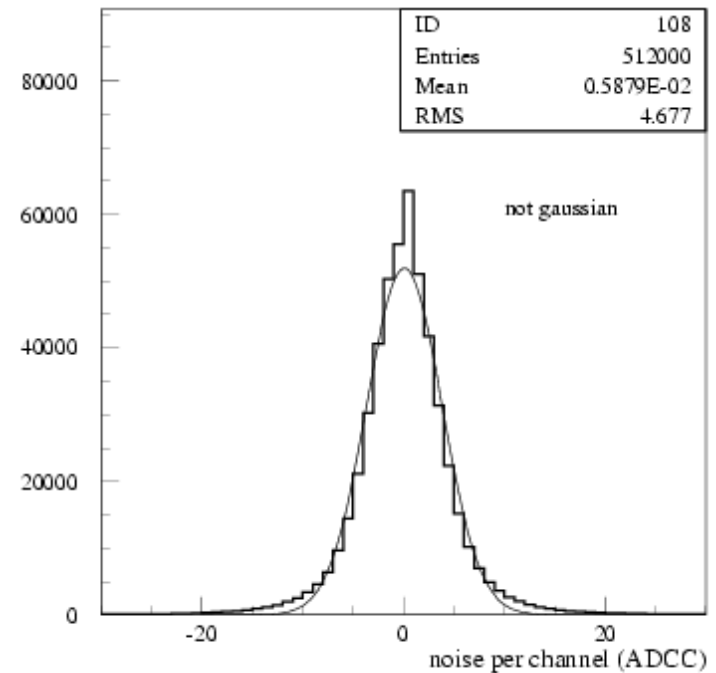
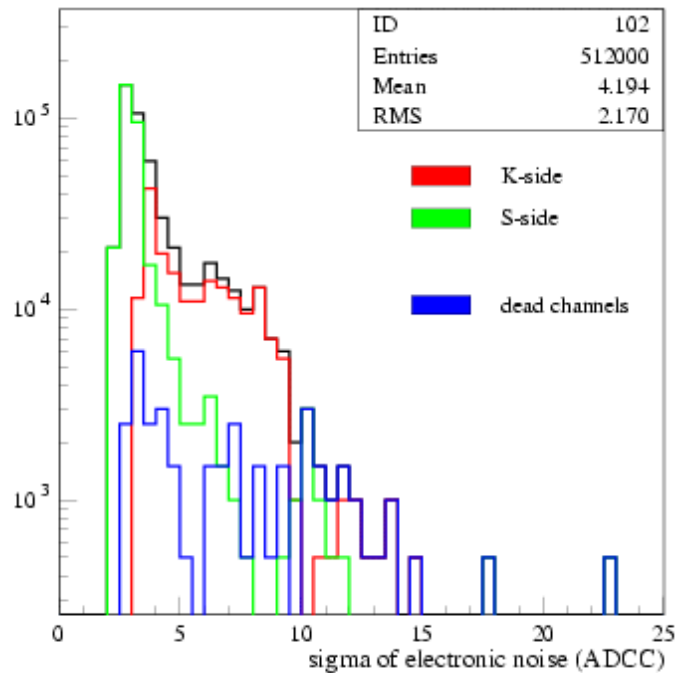
Simulation

- Use of simulation program from Geneve (simulates common noise, electronic noise, signal and pedestals)
- Statistical analysis on 500 events (protons and Carbon ions)

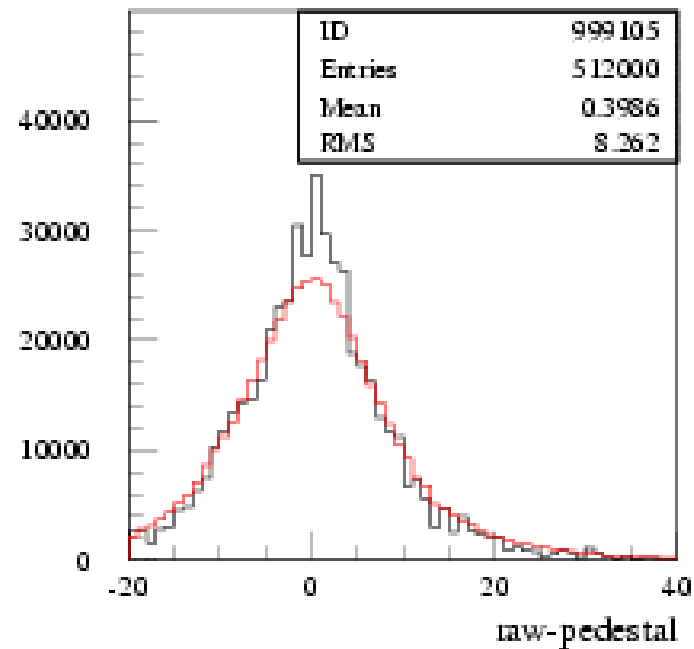
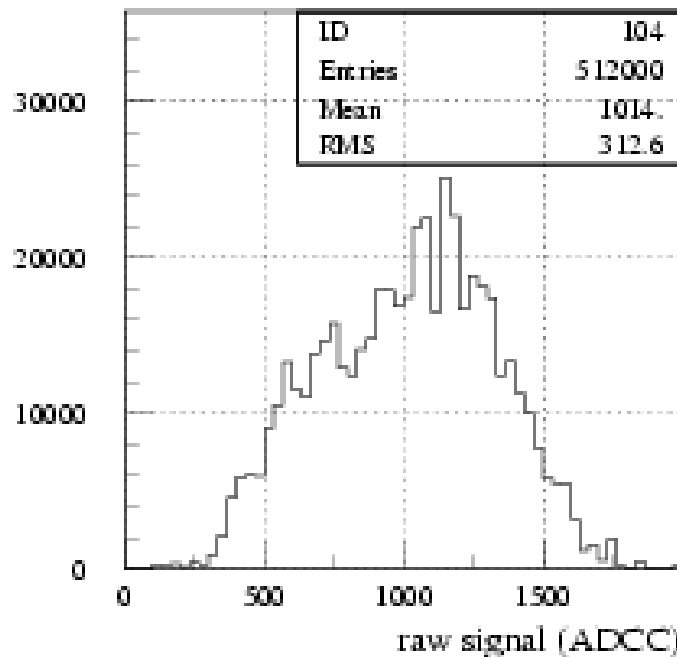
General features of events: pedestals and common noise



General features of generated events: electronic noise



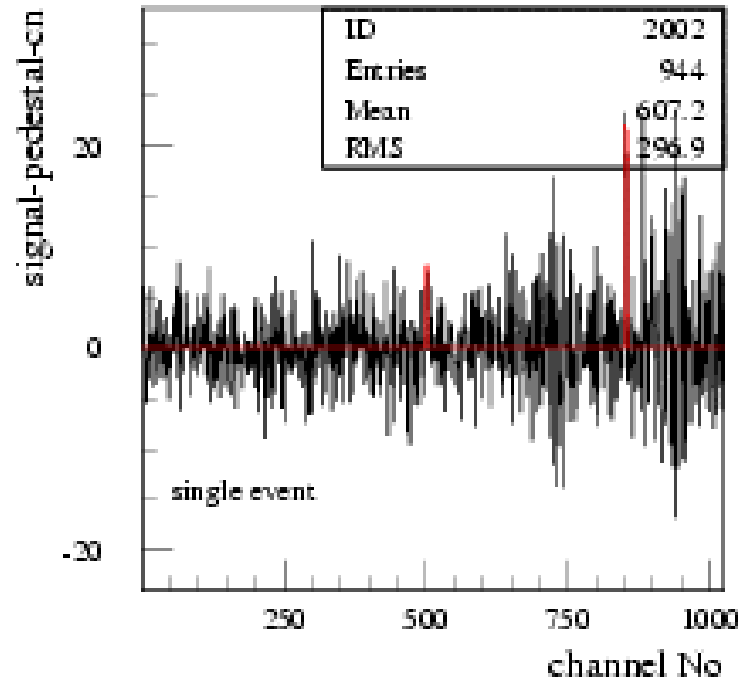
General features of generated events: raw event



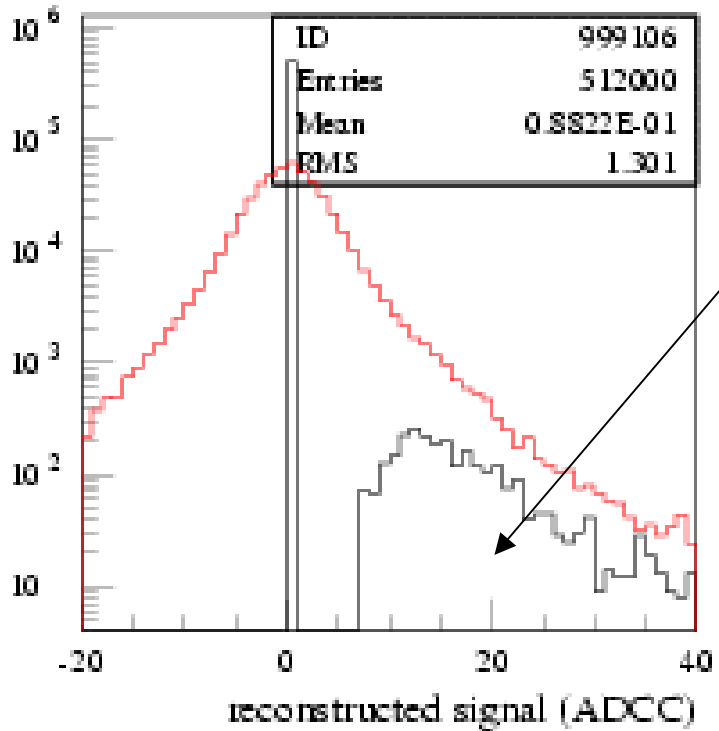
No electronic noise : black

With electronic noise: red

General features of generated events: signals in channels



General features of generated events: reconstruction



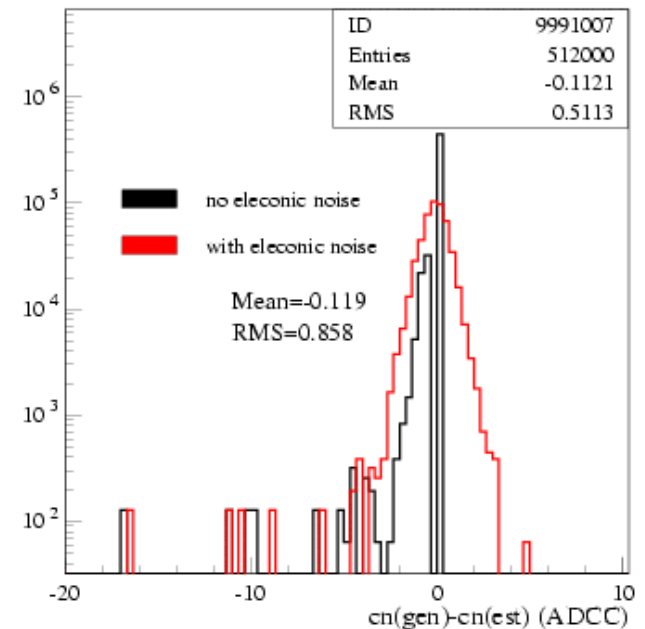
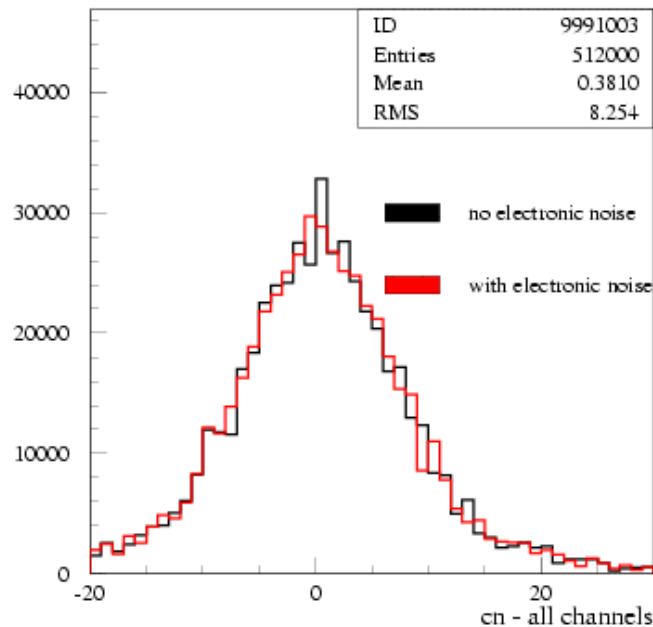
Generated physical signal

No electronic noise : black

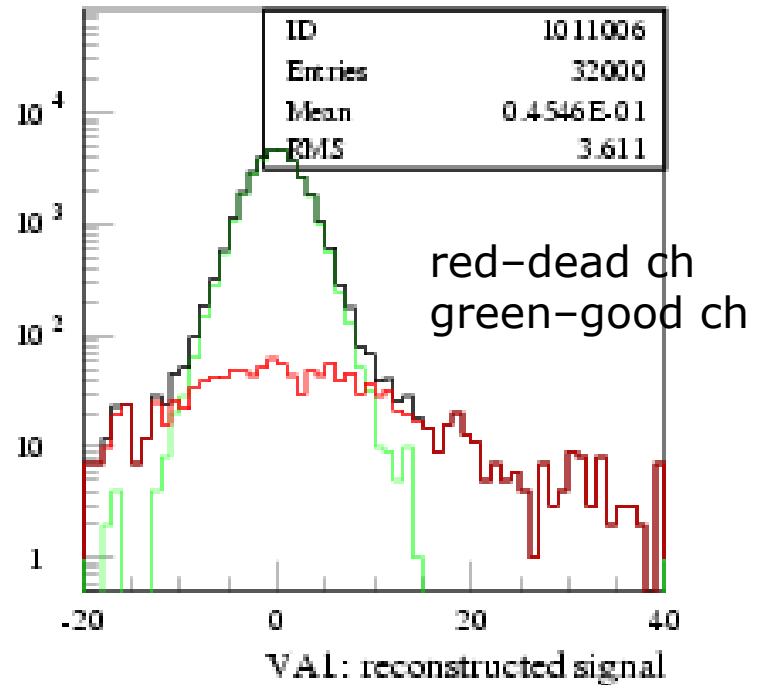
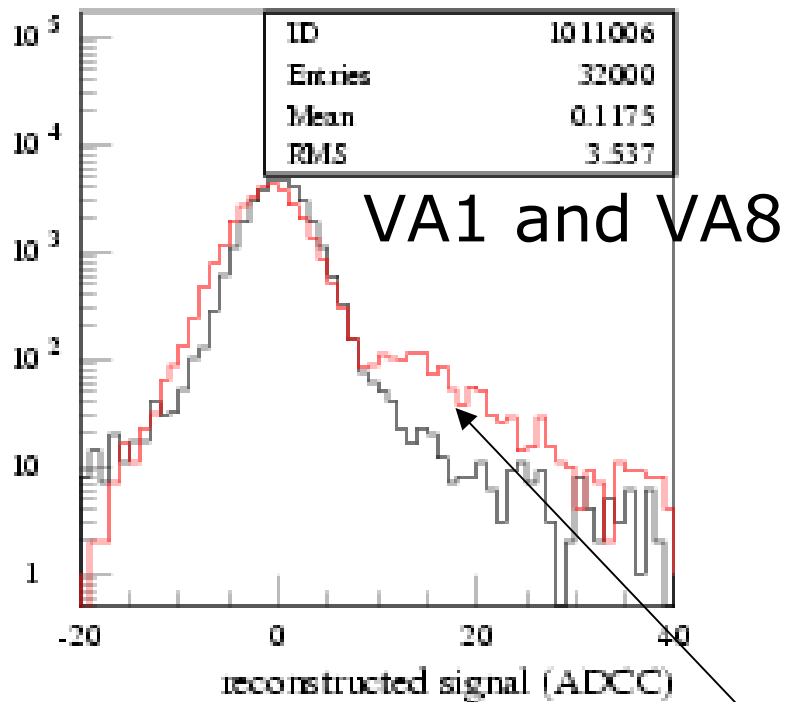
With electronic noise: red

Common noise estimation: average over all channels (standard met.)

$$Cn(est) = \Sigma_{64}(sig - ped) / 64$$



Common noise estimation: average over all channels



physical signal

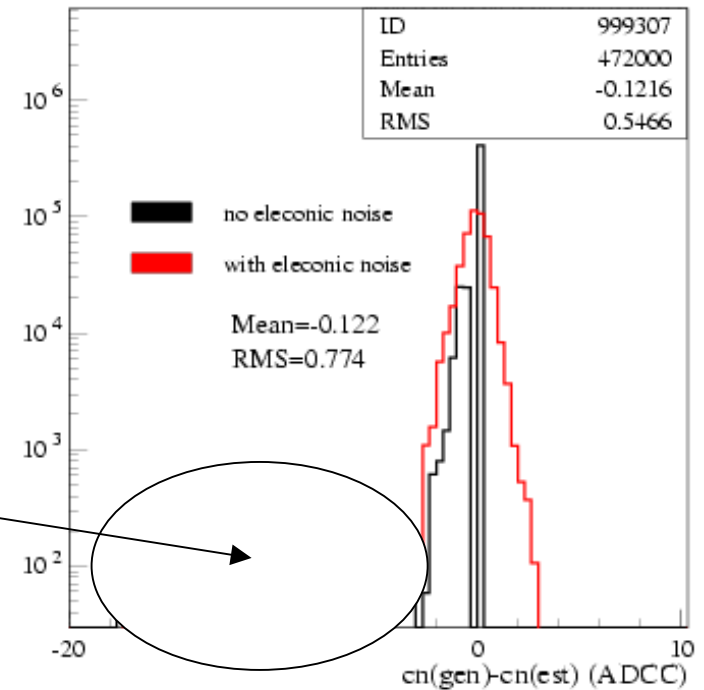
=>remove dead channels

Common noise estimation: no dead channels

$$Cn(est) = \sum_{64 - N_{dead}} (sig - ped) / (64 - N_{dead})$$

due to true, physical signals

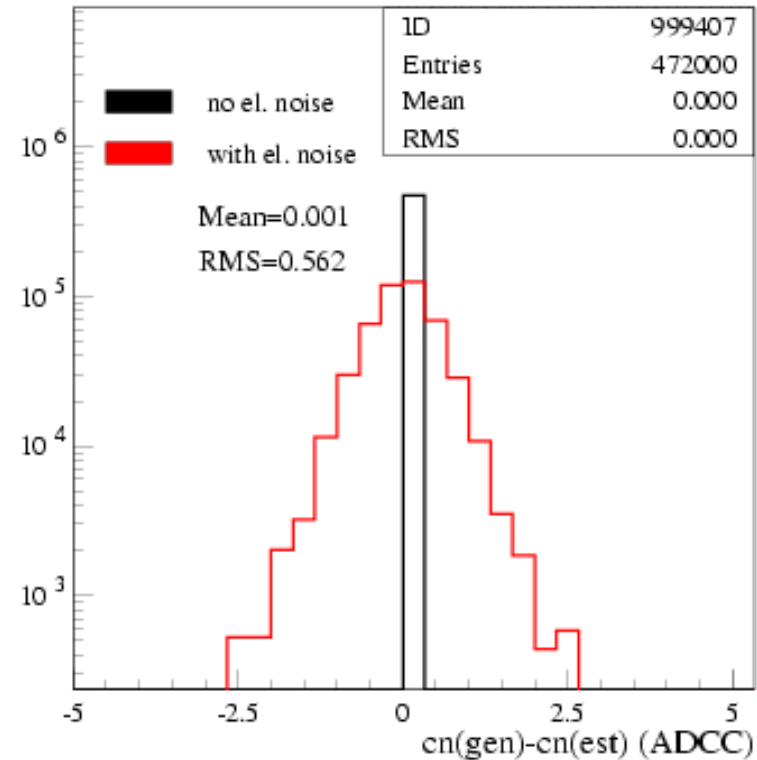
(seems not very dangerous, but imagine ions here...)



Common noise estimation: no dead no signal channels

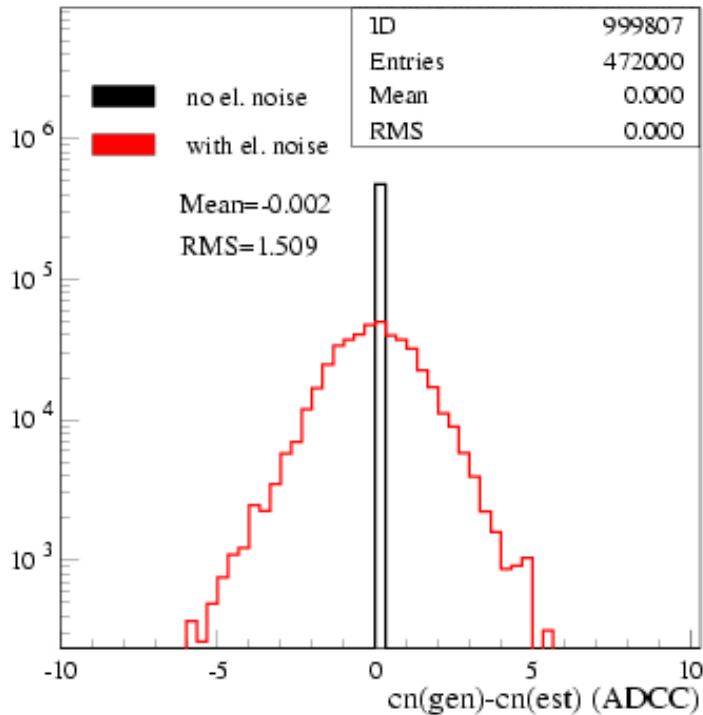
$$Cn(est) = \sum_{64 - \text{dead} - \text{sig}} (\text{sig} - \text{ped}) / (64 - N_{\text{dead}} - N_{\text{sig}})$$

Channels with signal
are known from MC
=> find an estimator



Common noise estimation: let us use only 8 channels

We are using not-dead
and-physical channels



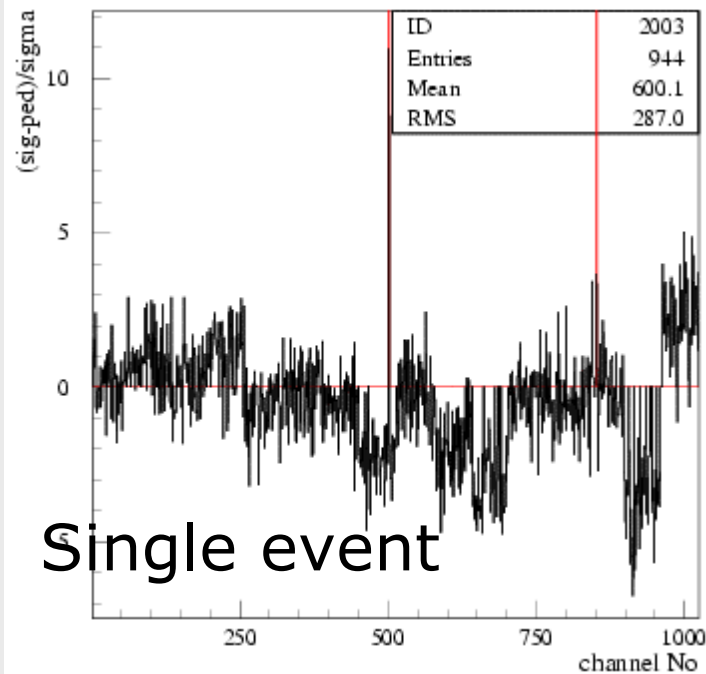
All possible channels:

RMS is: **0.562** ADCC

8 channels:

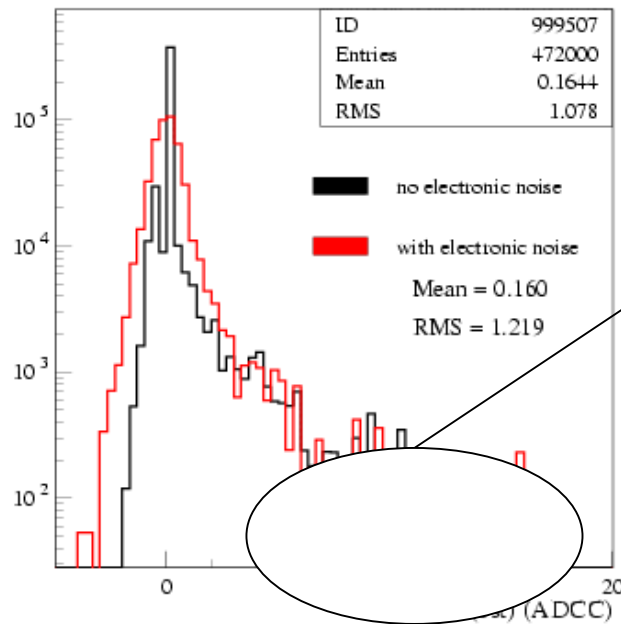
RMS is: **1.525** ADCC

So how to find channels with signal: 4sigma method



for channel with
signal > 4sigma
we increment CN by
4sigma

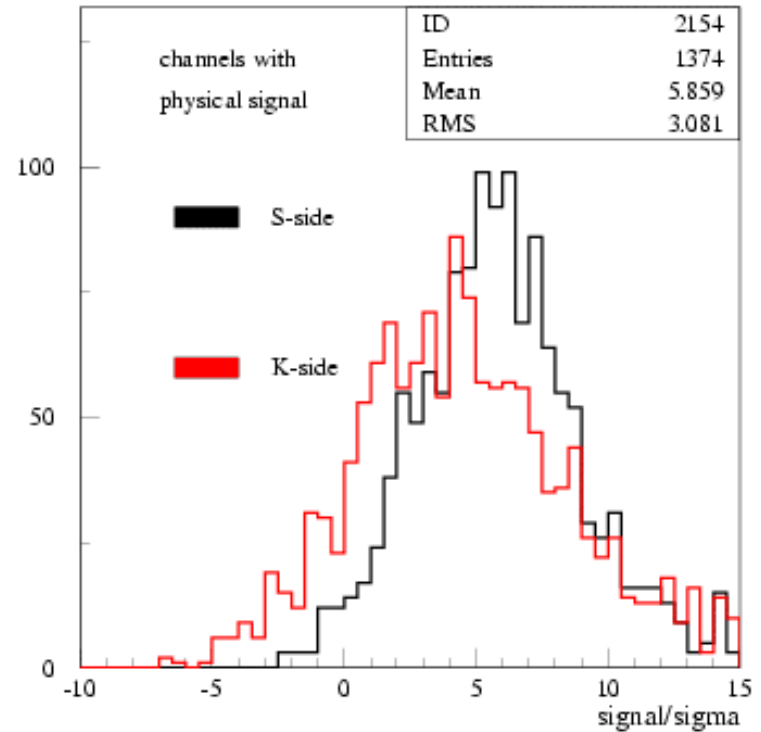
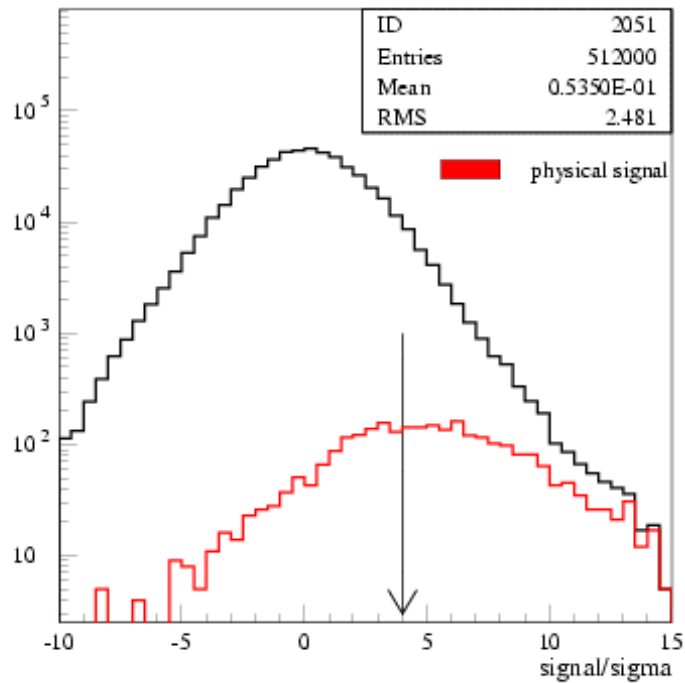
So how to find channels with signal: 4sigma method



Problem with tail!

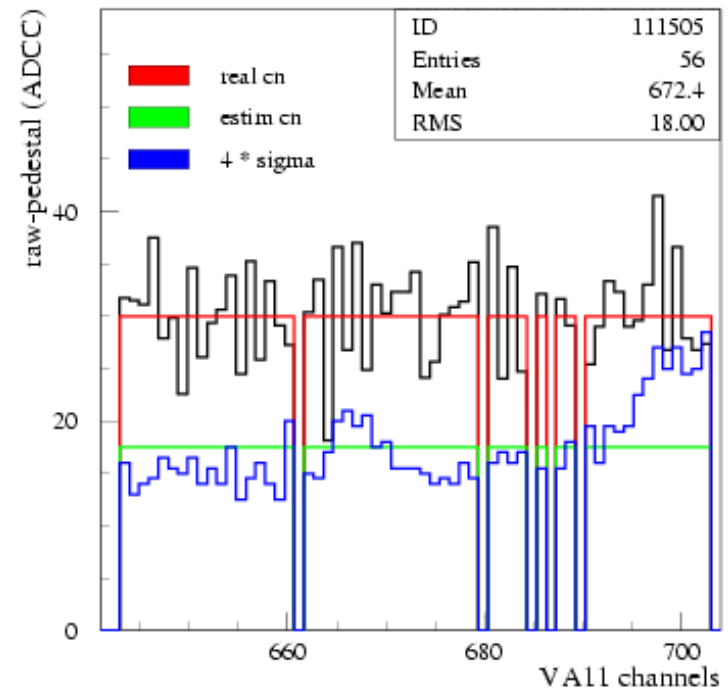
What are these events?

So how to find channels with signal?



But: a problem with high common noise

Event with
generated common
noise = 30 ADCC,
Always larger than
4sigma!!!



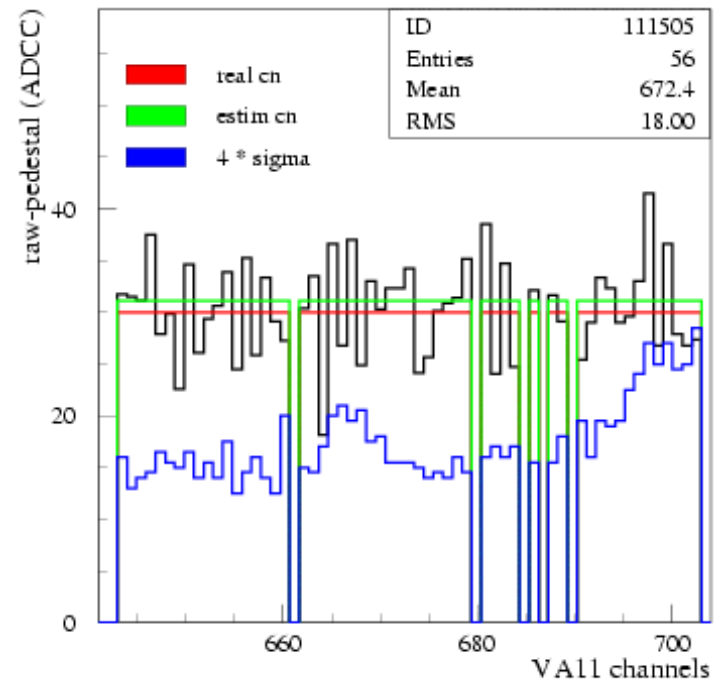
So we must modify algorithm

Use the first

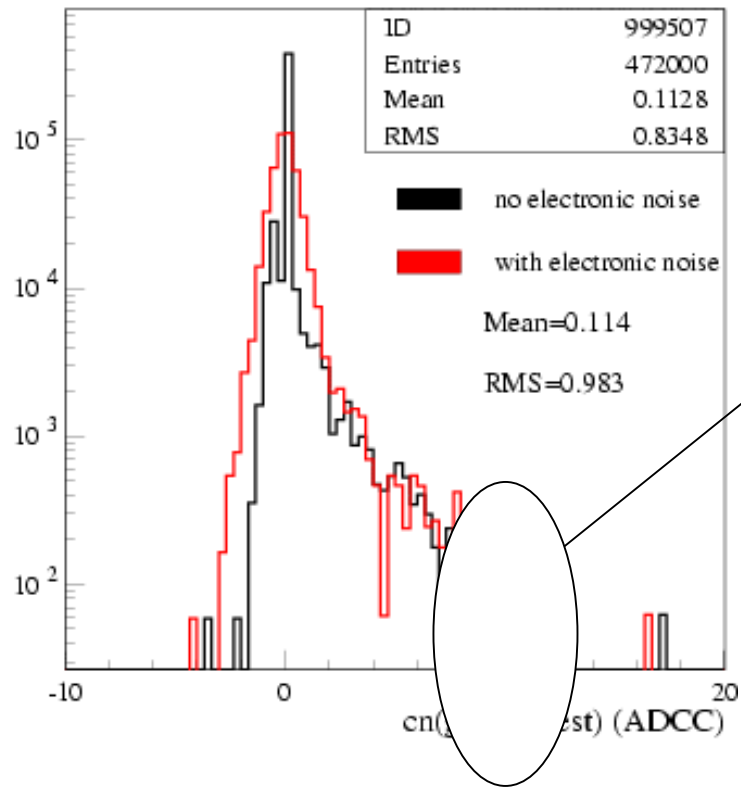
8 channels to
determine

A pre-cn value

(iterative procedure)



Modified 4sigma algorithm



still some tails

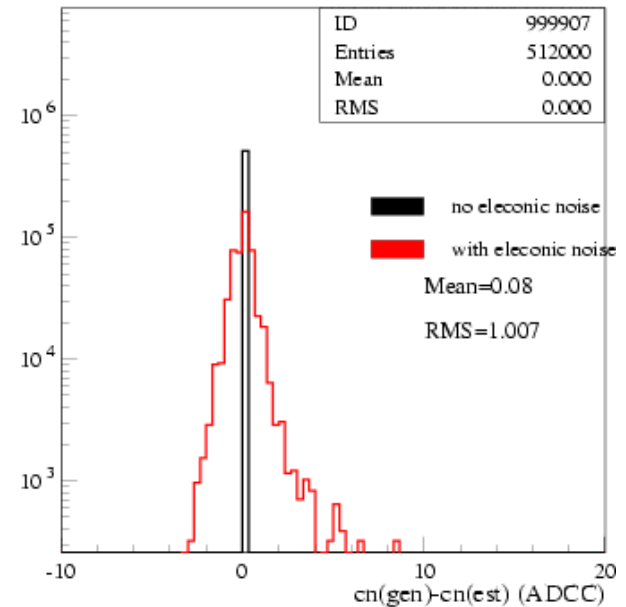
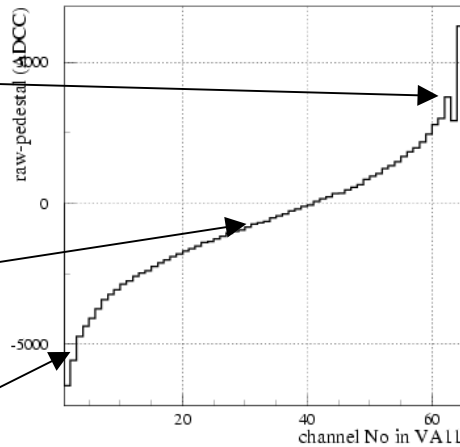
Mediana method

Another proposition
but rather complicated

channels with
signal

mediana

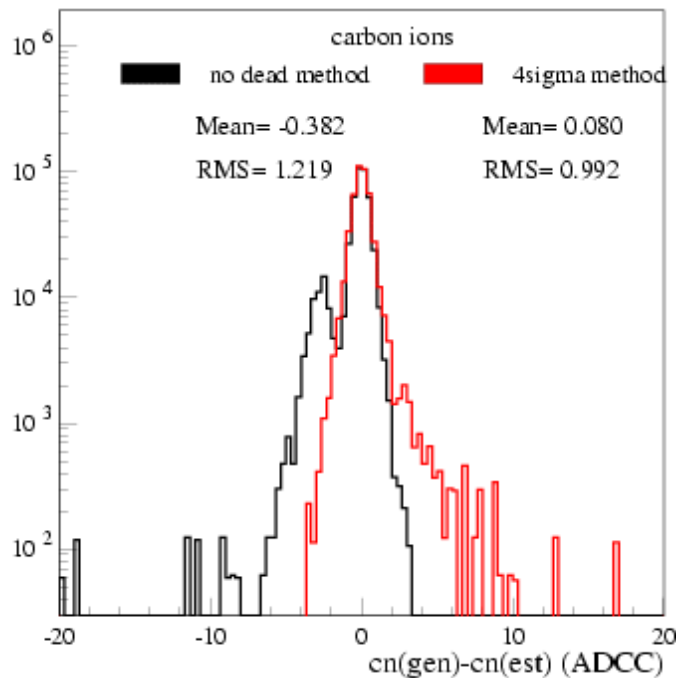
dead channels



Summary

Method	mean	RMS
Stand	-0.119	0.858
No dead	-0.122	0.774
No dead No signal	0.00	0.562
8 chann	0.00	1.525
4 sigma	0.114	0.983
median	0.08	1.007

But we really gain for ions



Algorithm parameters
does not depend whether
we work with MIPs or
with ions