PRELIMINARY STUDY OF SVX II PERFORMANCE

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Analysis Method

☞ Treat data in hybrid/chip/channel basis

❶ common mode calculation and subtraction

❷ pedestal and noise calculation. Pedestal subtraction

❸ search for hits

signal significance

hit definition

cluster search algorithm

❹ signal correlation

z vs ϕ

flat clusters

⚠ Analysis of only the first 256 channels (z and ϕ) per layer of Barrel 4 Ladder segment 0 and ϕ-wedge 2 of run: ar019488.0001phys

Common mode

- Method A) per chip

❶ common mode define per event as the mean of all channels (without signal) in that chip

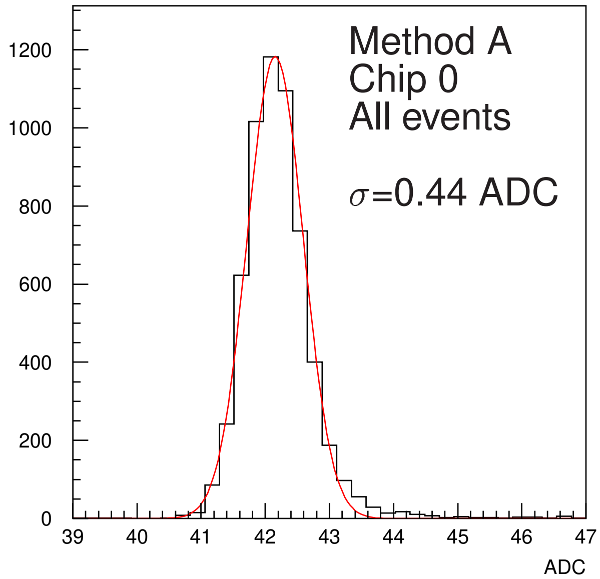
❷ iterative calculation (rejecting channels 3σ away) till stable solution is found

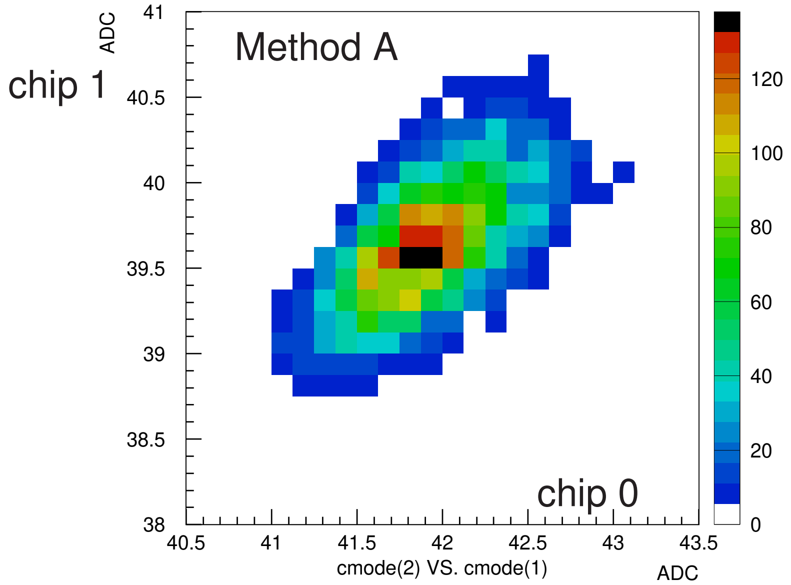
- Method B) per hybrid and per chip

❶ Iterative common mode calculation per hybrid (then subtract hybrid common mode)

❷ Chip common mode calculation as in method A

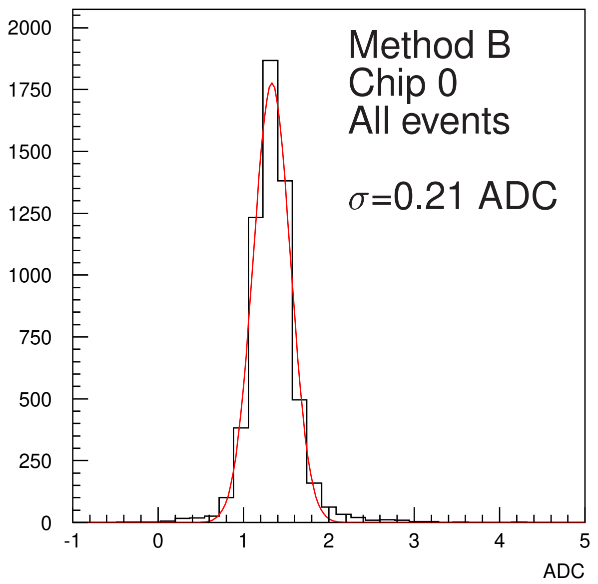
• Results on common mode (per chip)

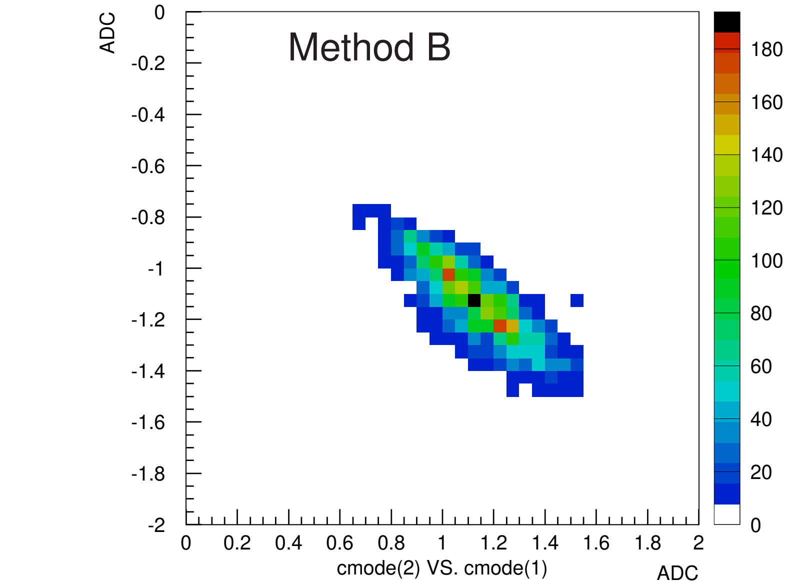




☞ Main contribution to the common mode comes from the hybrid

• Common mode calculation per hybrid and chip





Pedestal and noise

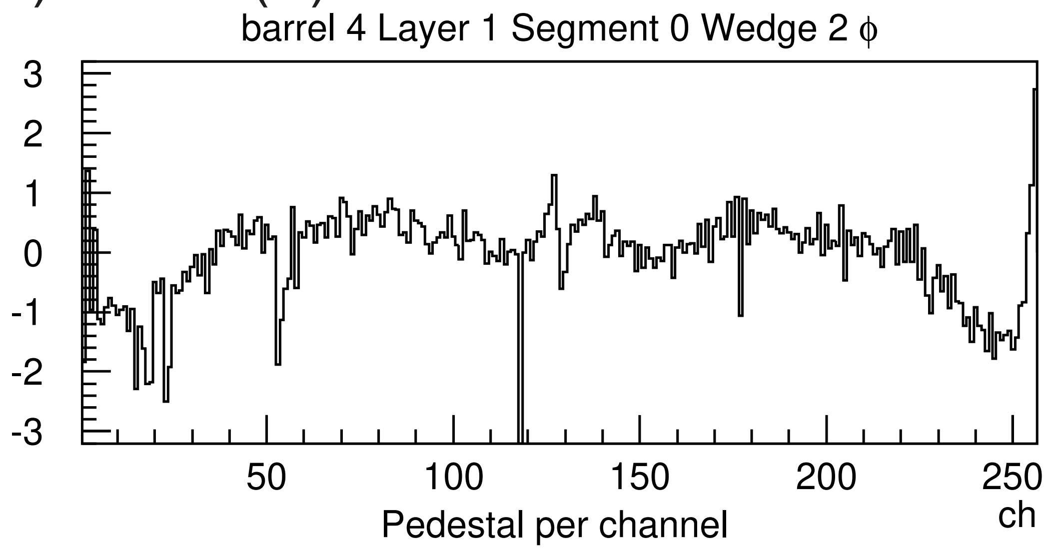
- 1^{st} subtract common mode
- Fit channel data to a Gaussian

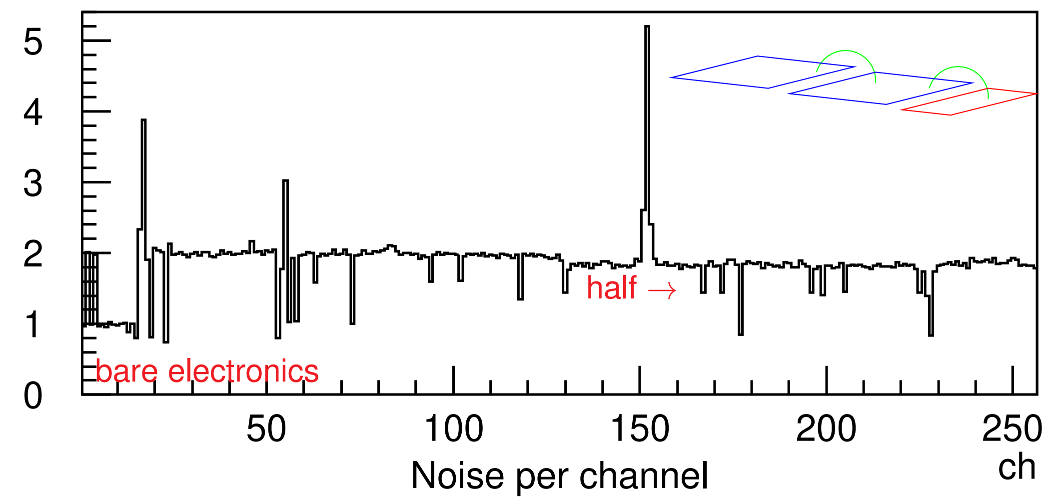
❶ use all events $\rightarrow$ fit Gaussian $\rightarrow$ μ_0 and σ_0

❷ use those events in $\mu_0 \pm 3\sigma$ interval and obtain

a) pedestal (μ)

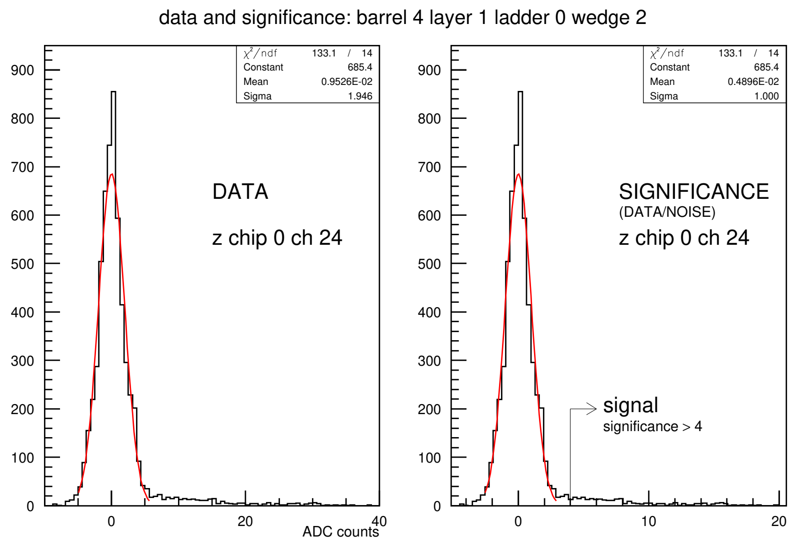
b) noise (σ)





Cluster search

☞ Once pedestal is subtracted and data is divided by noise $\rightarrow$ significance (s)



✎ Cluster search algorithm

❶ seed channels ($s \geq$4)

❷ add up to $\pm$ 10 neighbours with $s \geq$2

❸ search ends when no seeds remain

✎ Cluster properties

❶ primary channel (seed)

❷ size (strips in the cluster)

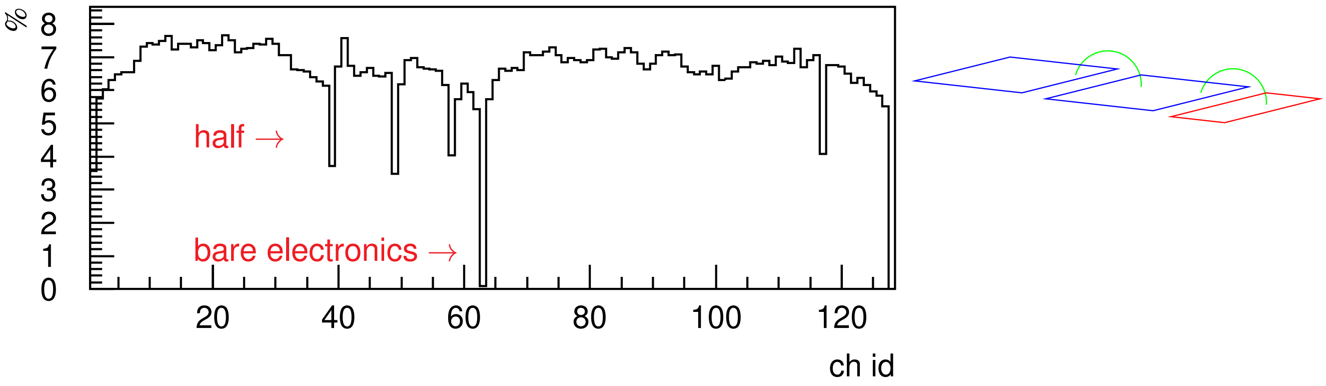
❸ charge ($q = \Sigma q_i$)

❹ significance ($s = \Sigma s_i$) (signal to noise)

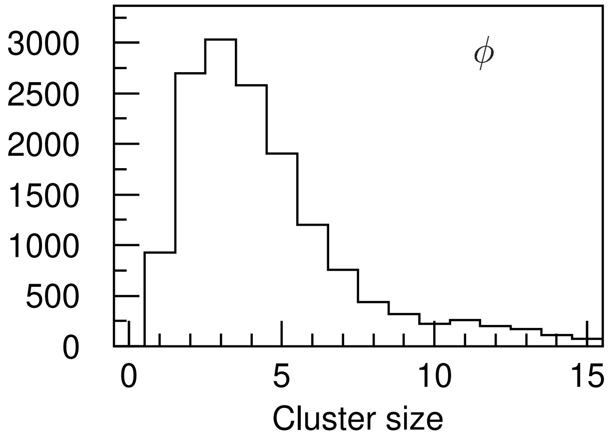
⚠ Accept only those clusters with $s \geq$5

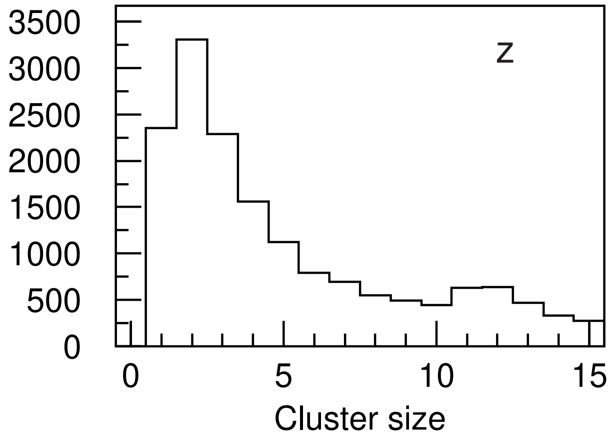
Results

❶ Occupancy

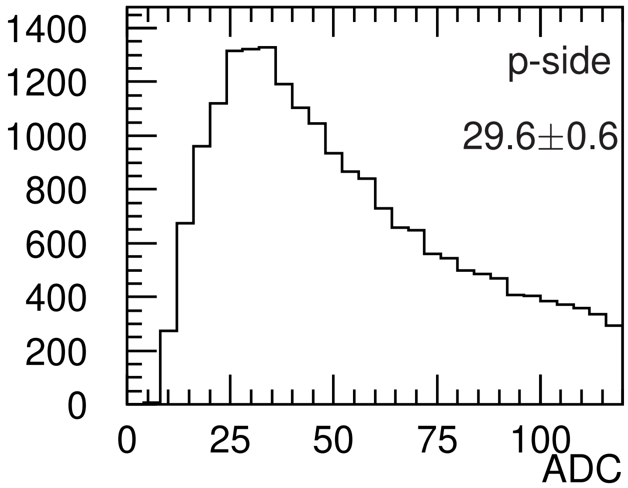


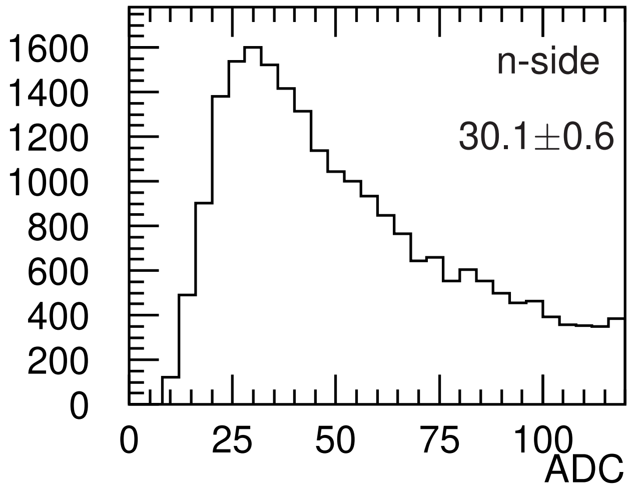
❷ Cluster size



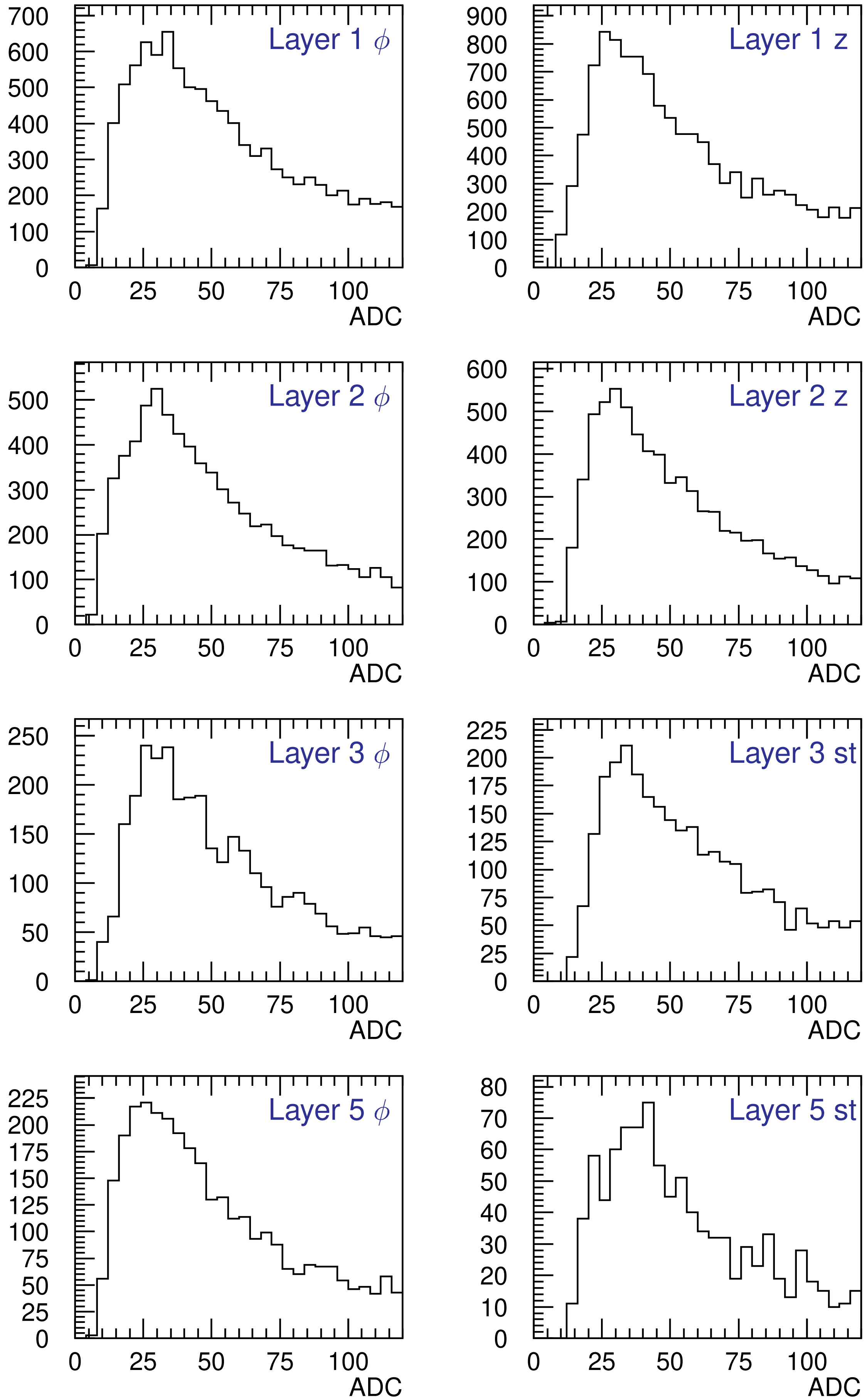


❸ Cluster charge

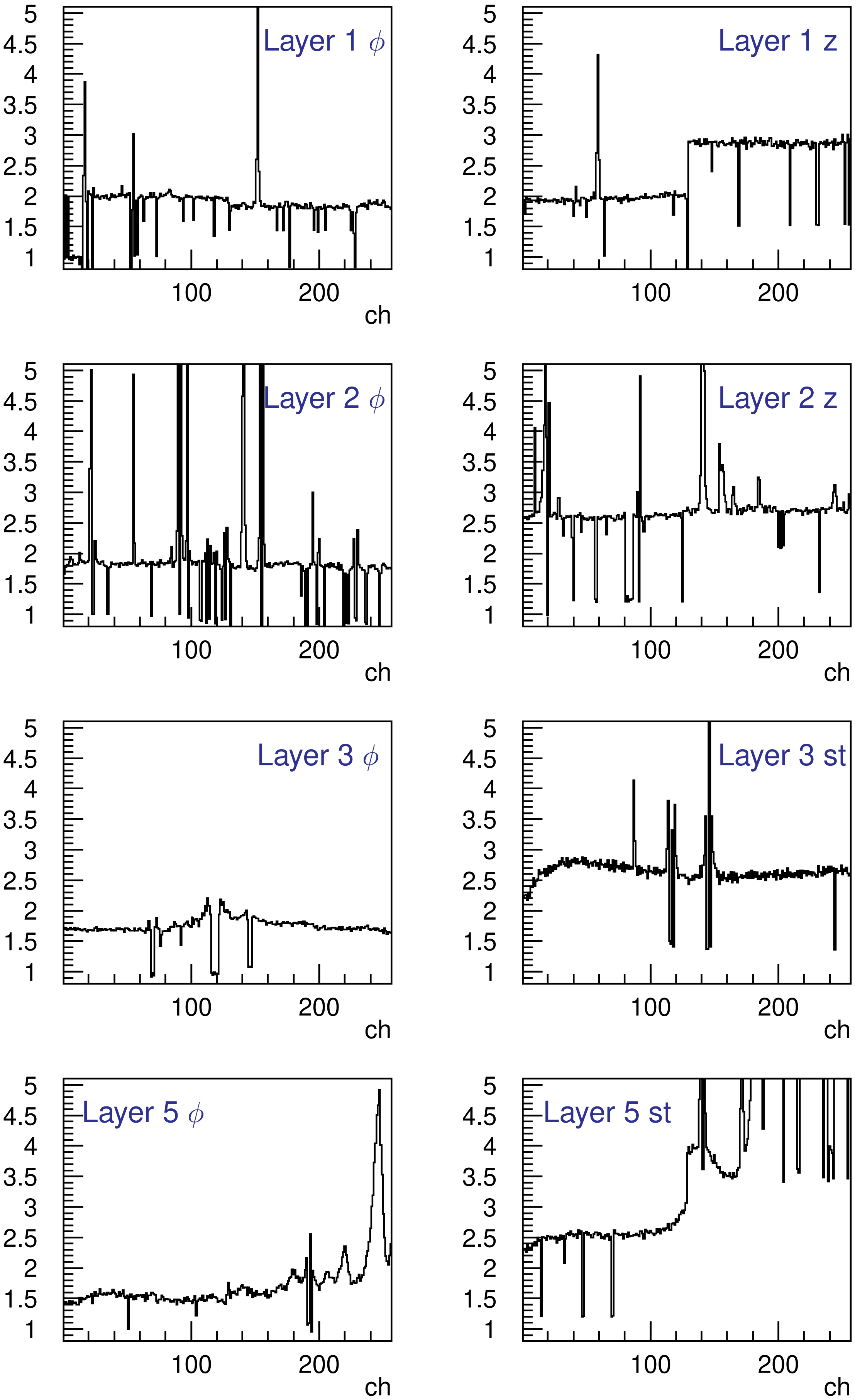




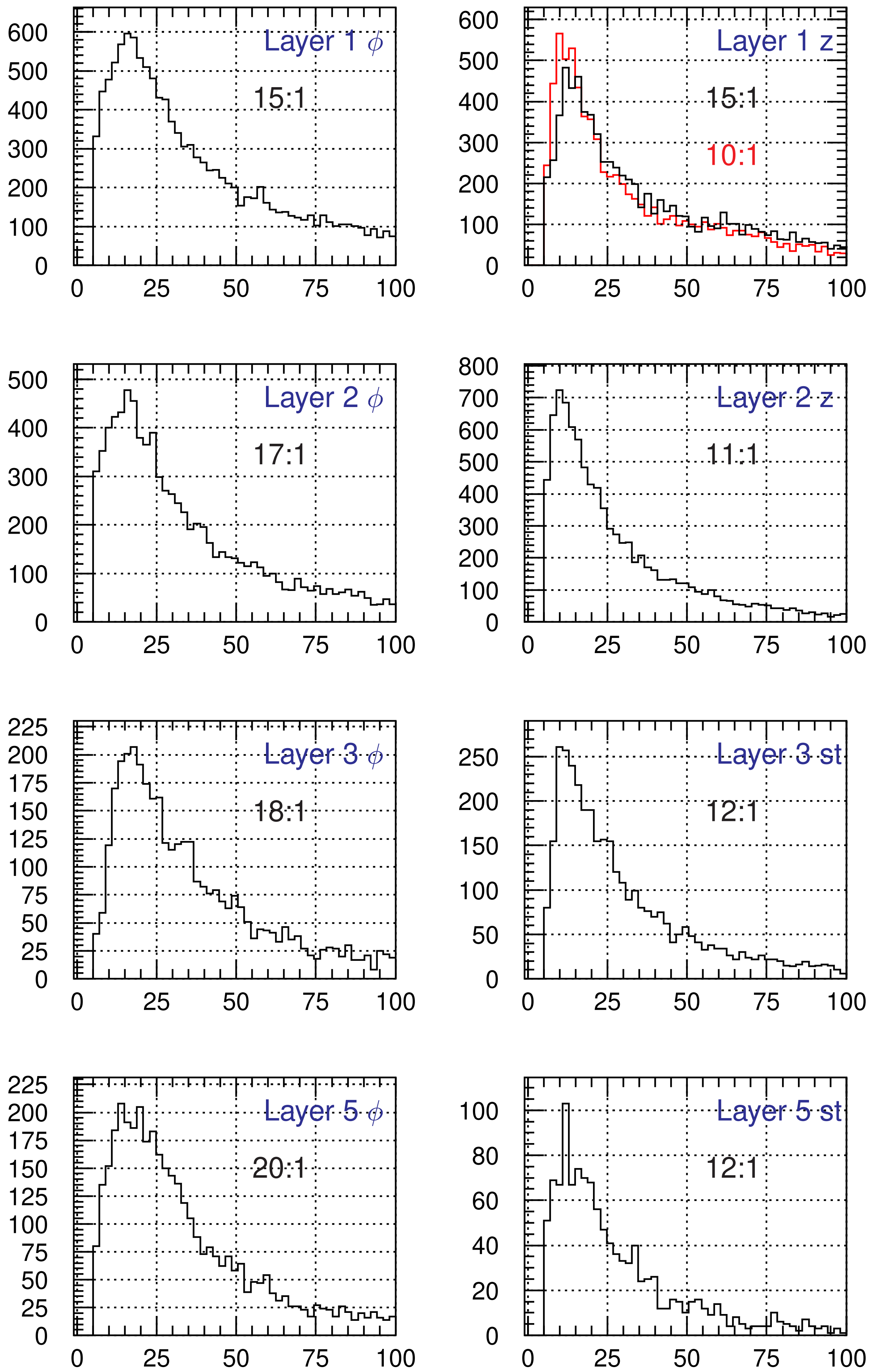
Charge of the clusters



Noise of the channels

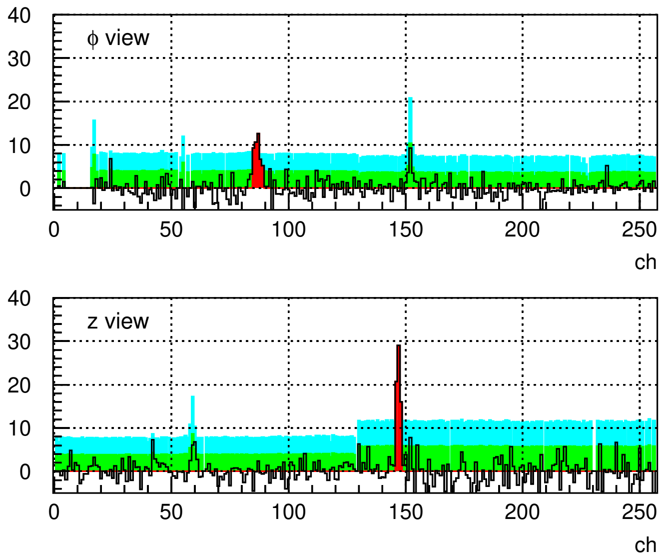


Signal to noise

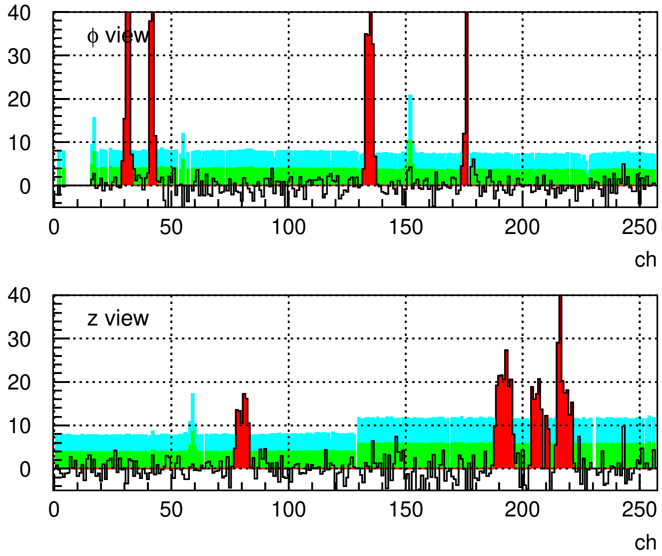


Signal correlation: Z vs ϕ

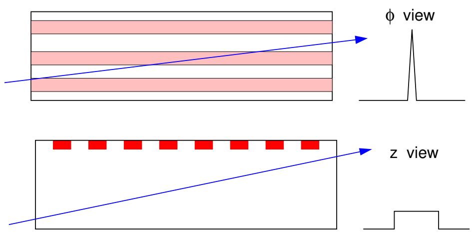
❶ 1 cluster

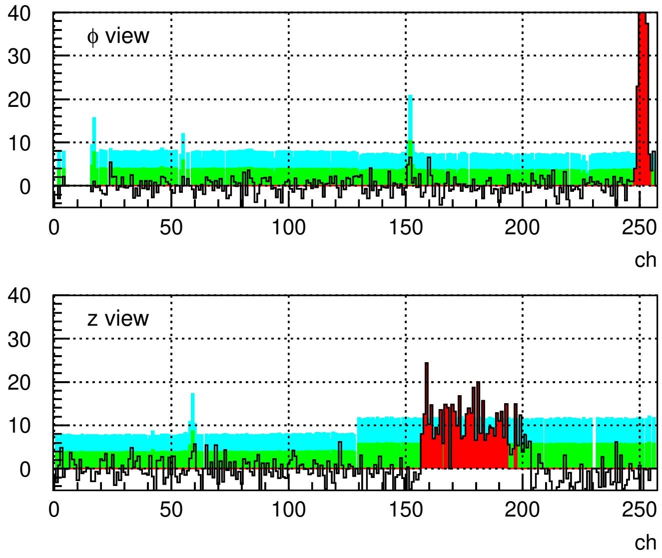


❷ Many clusters

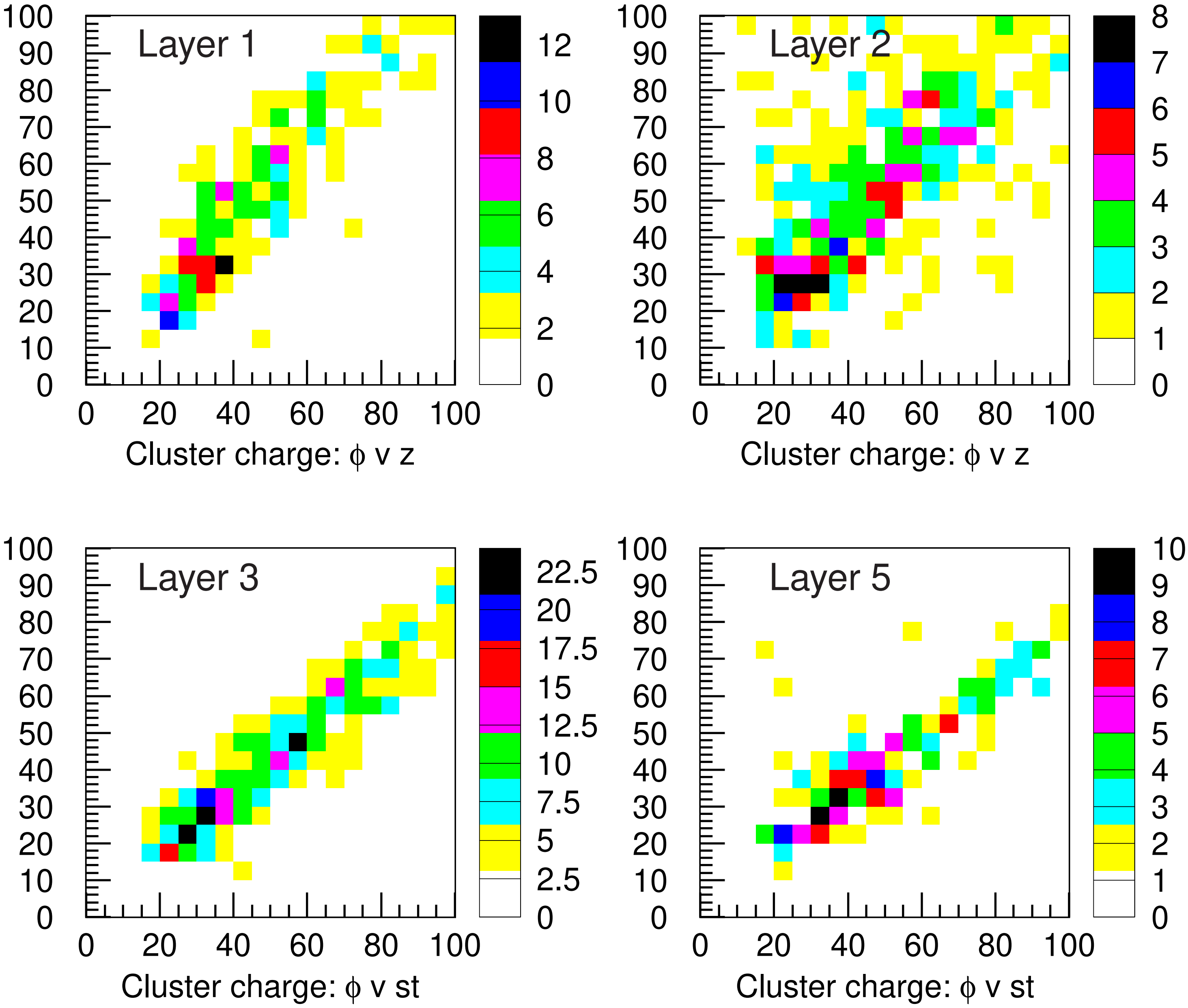


❸ 1 flat cluster

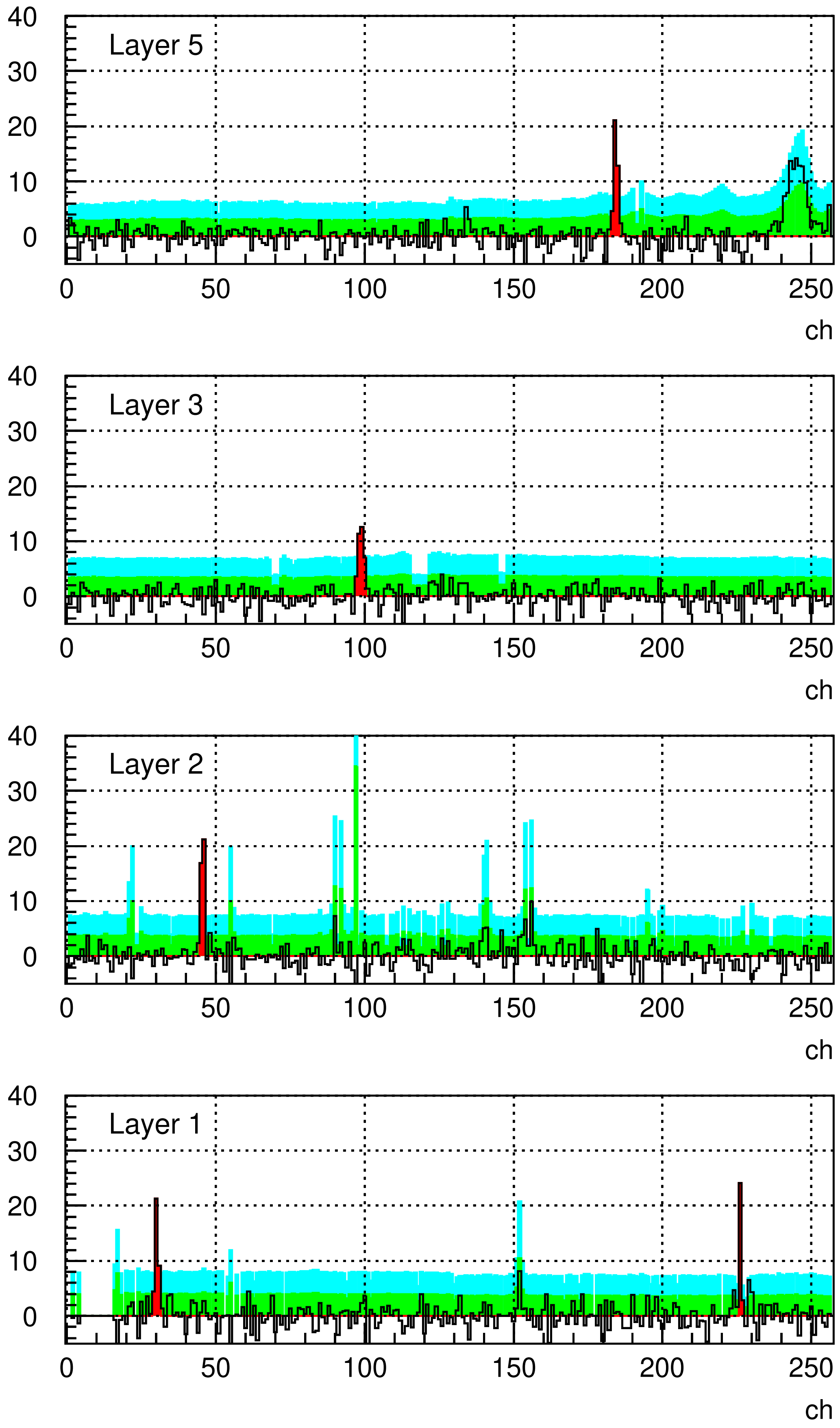


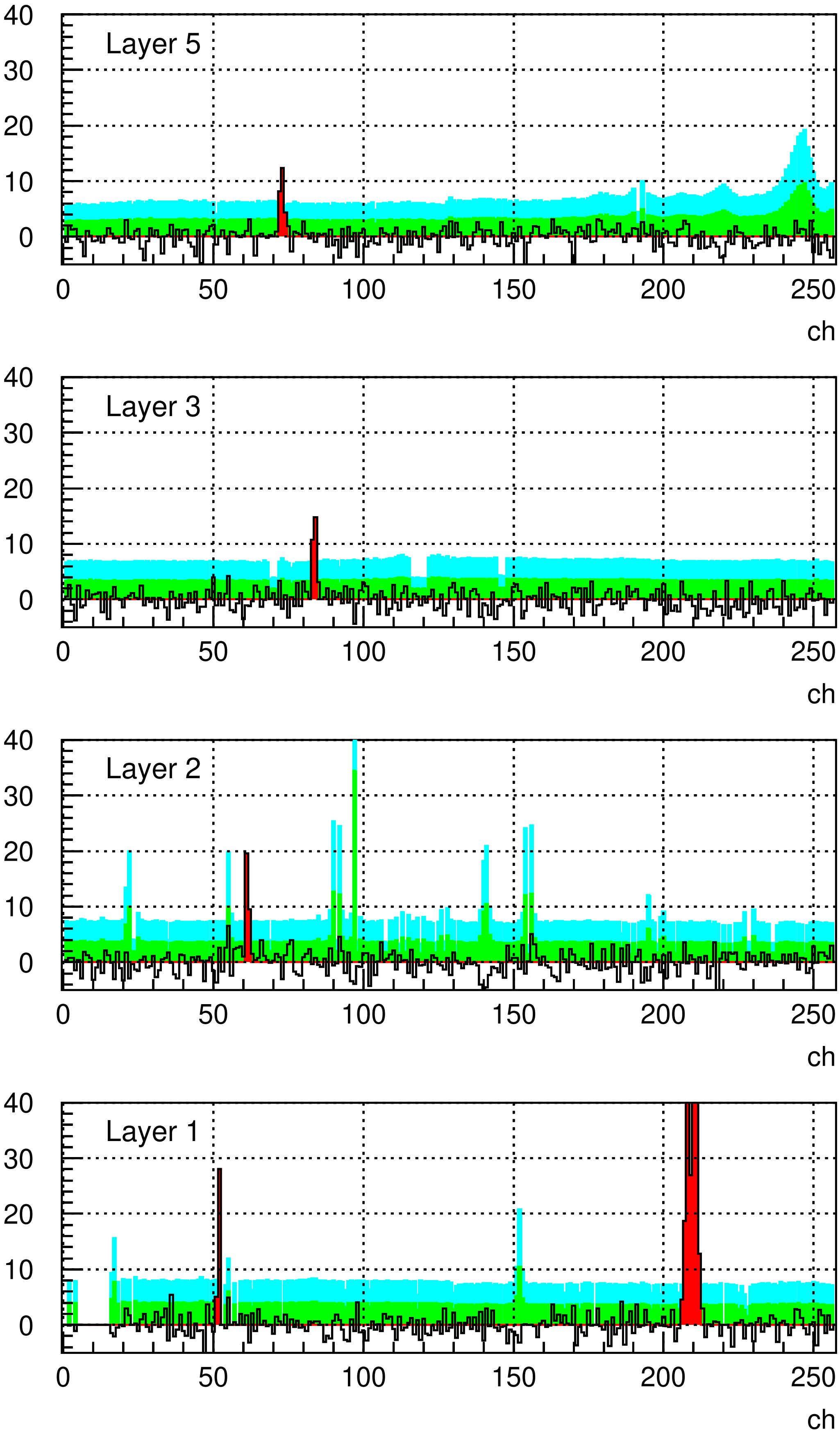


- Charge correlation: n-side vs p-side



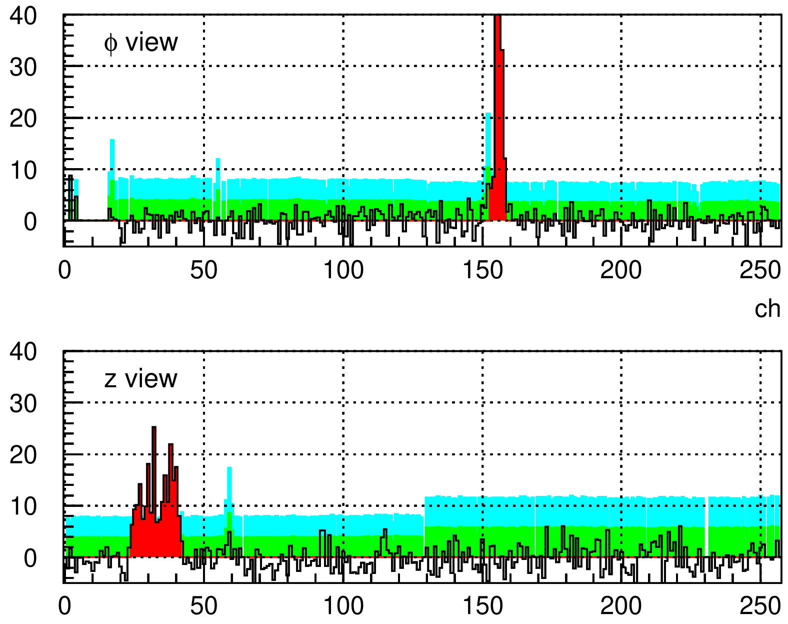
Signal correlation: through layers




Layer 5
Layer 3
Layer 2
Layer 1
40
30
20
10
0
0
50
100
150
200
250
ch

Flat clusters

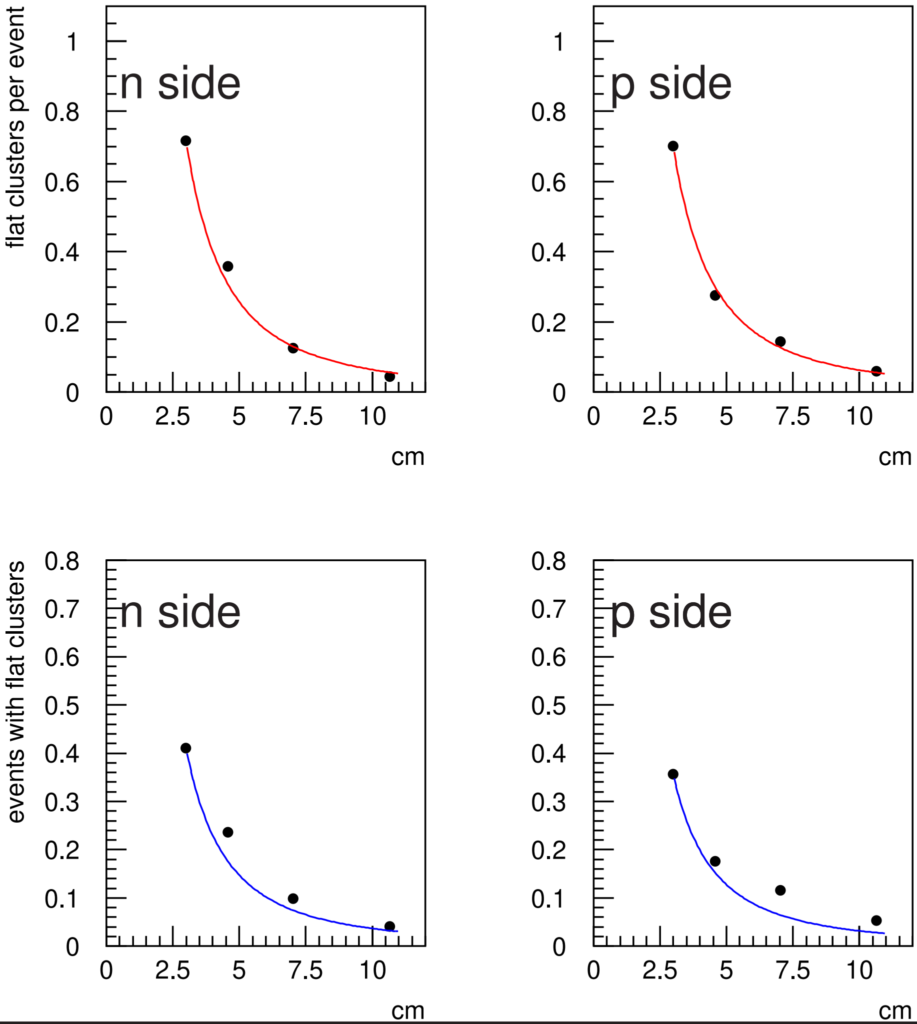
- Clusters with very large charge deposition



- Study of clusters with Q $>$ 5Q_{mip}

clusters →

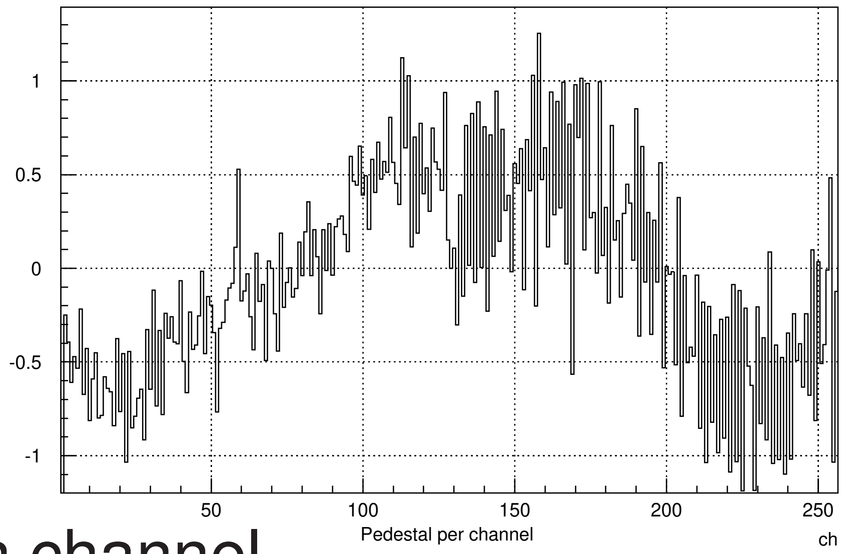
events →



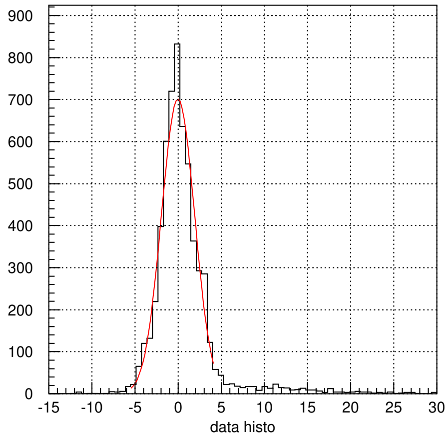
Problems

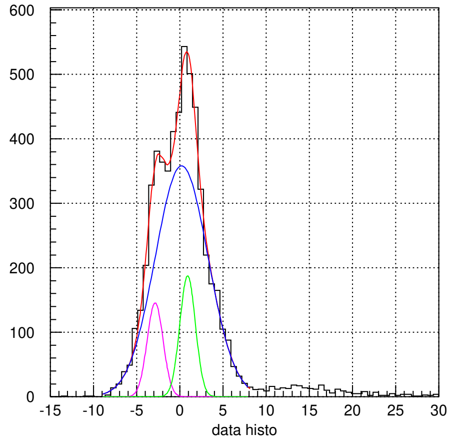
- Problem in common mode and noise determination

❶ Pedestal

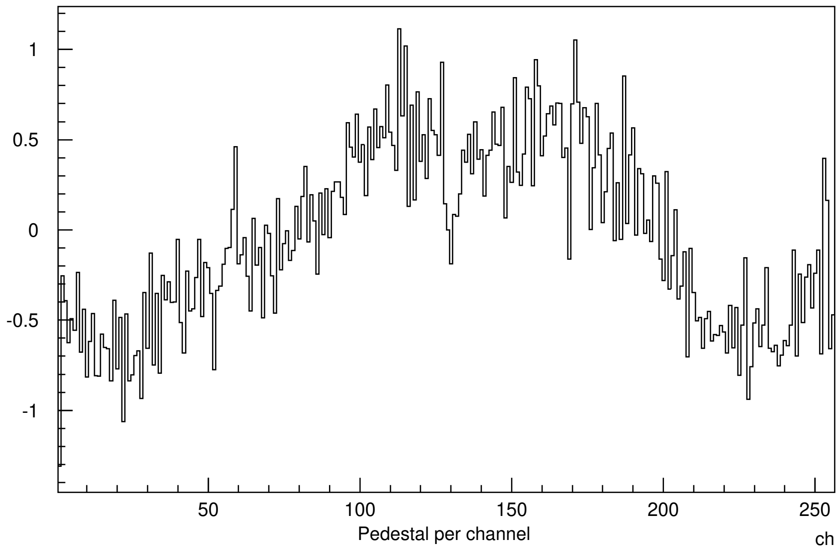


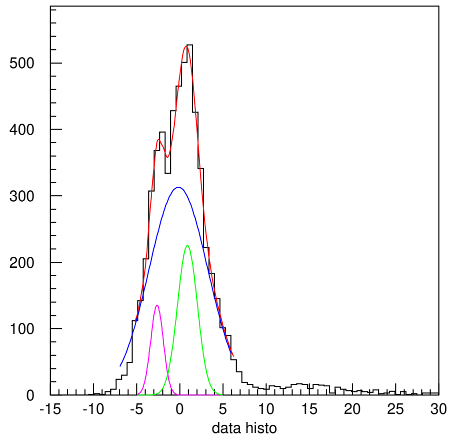
❷ Data in each channel





❸ Split common mode calculation in 2 groups





Summary

❶ Preliminary study of the performance of the SVX II is presented

❷ Determination of common mode, pedestal and noise

☞ Hybrid common mode

❸ The charge collected in the p- and in the n-side are equal

❹ The noise is larger in the n-side

❺ Signal to noise ratio is (local variations):

- p-side $\rightarrow$ 17:1
- n-side $\rightarrow$ 12:1

❻ Flat clusters are produced by particles at low angle