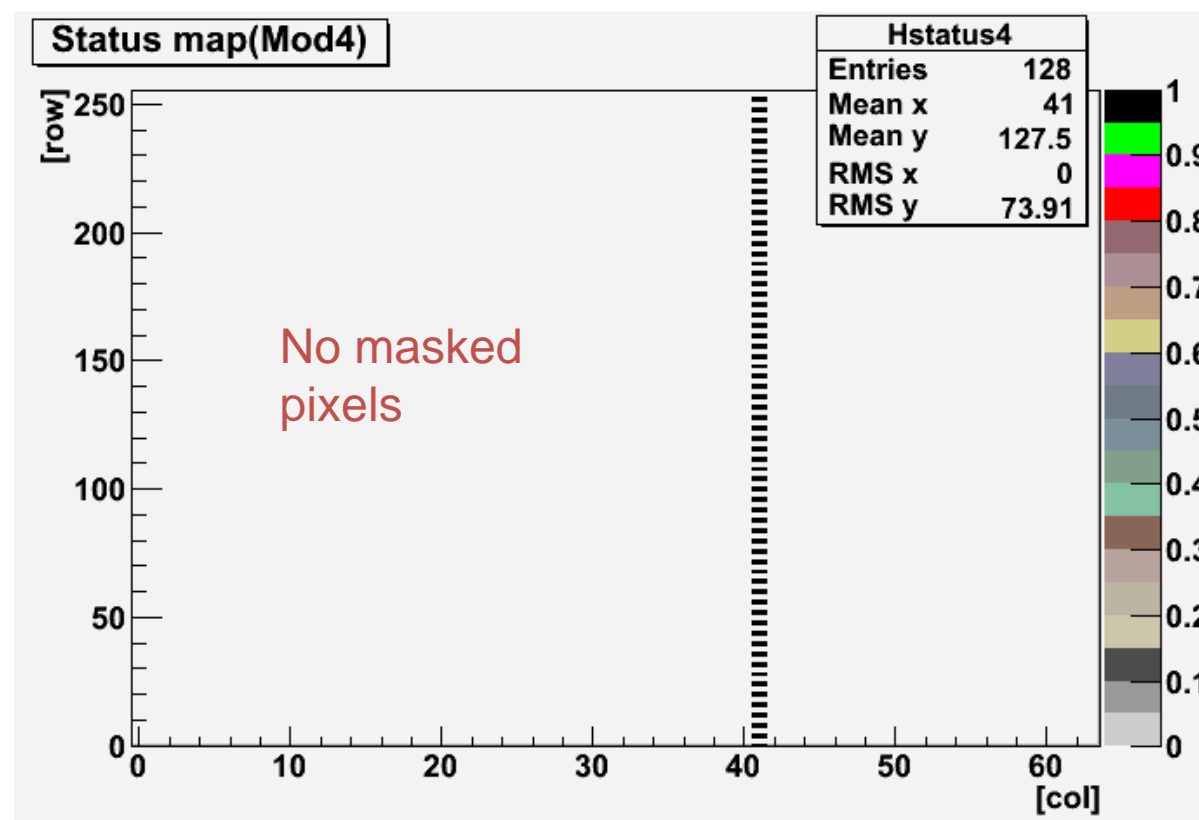
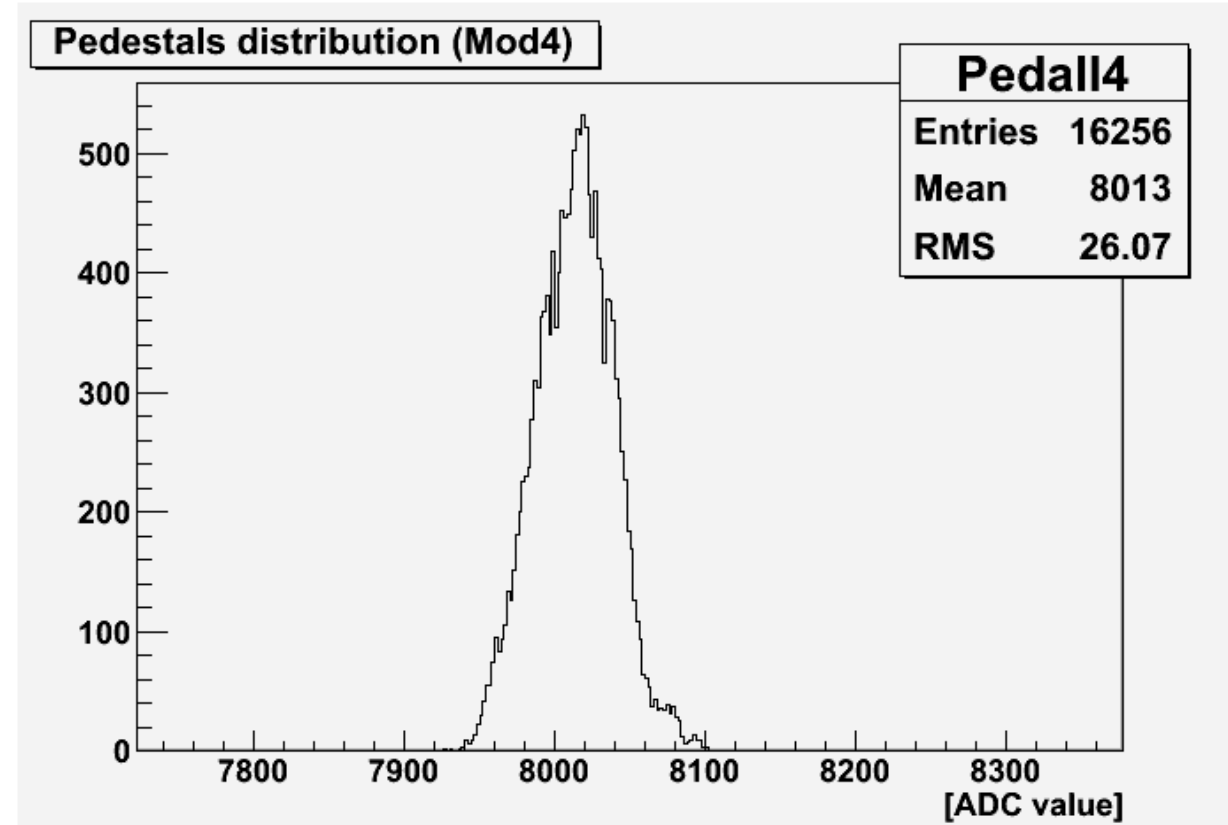
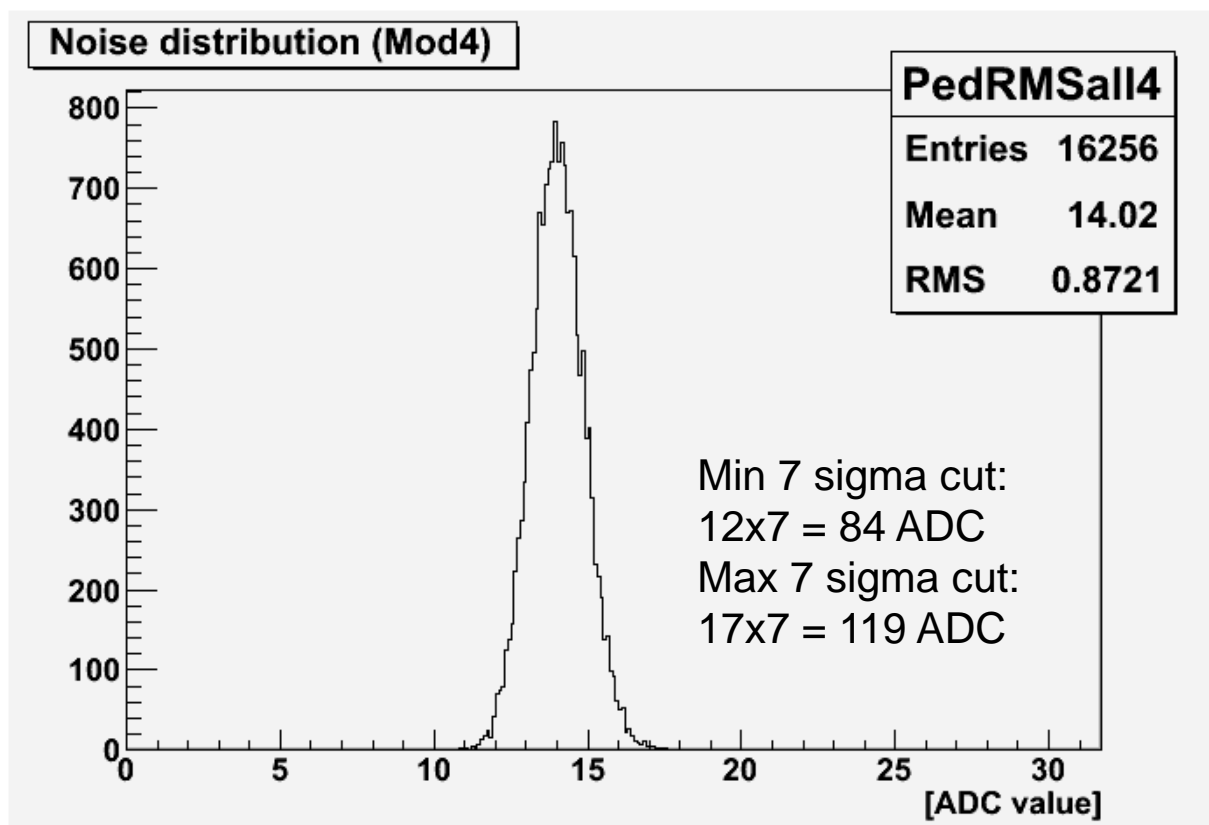
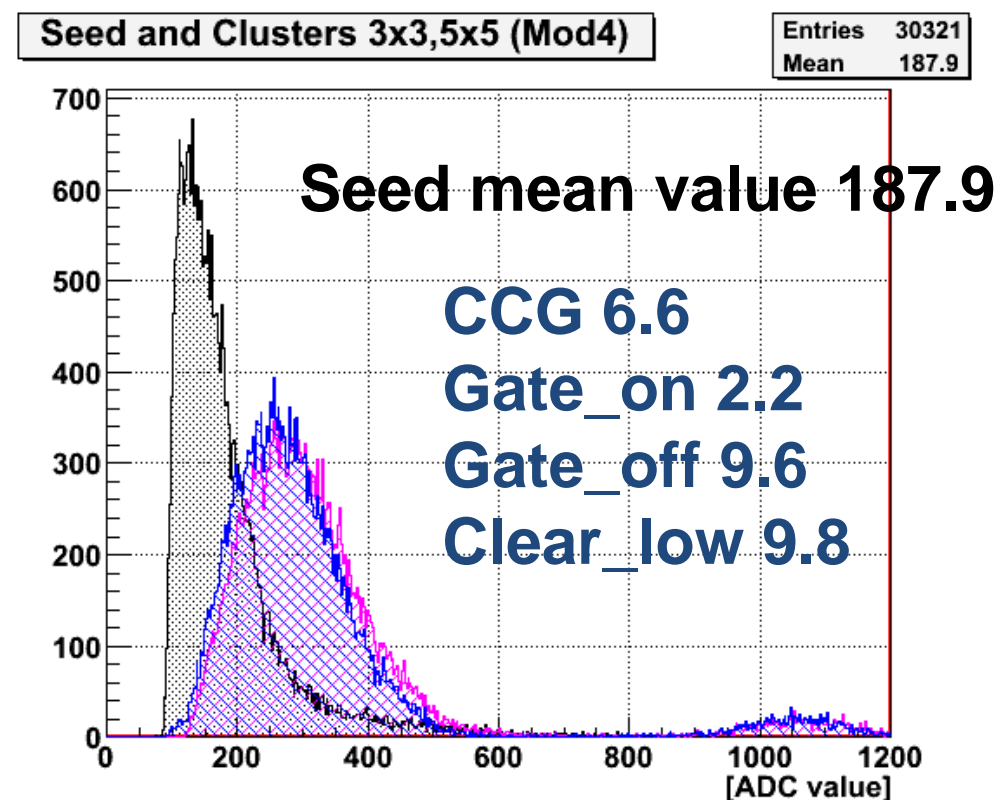
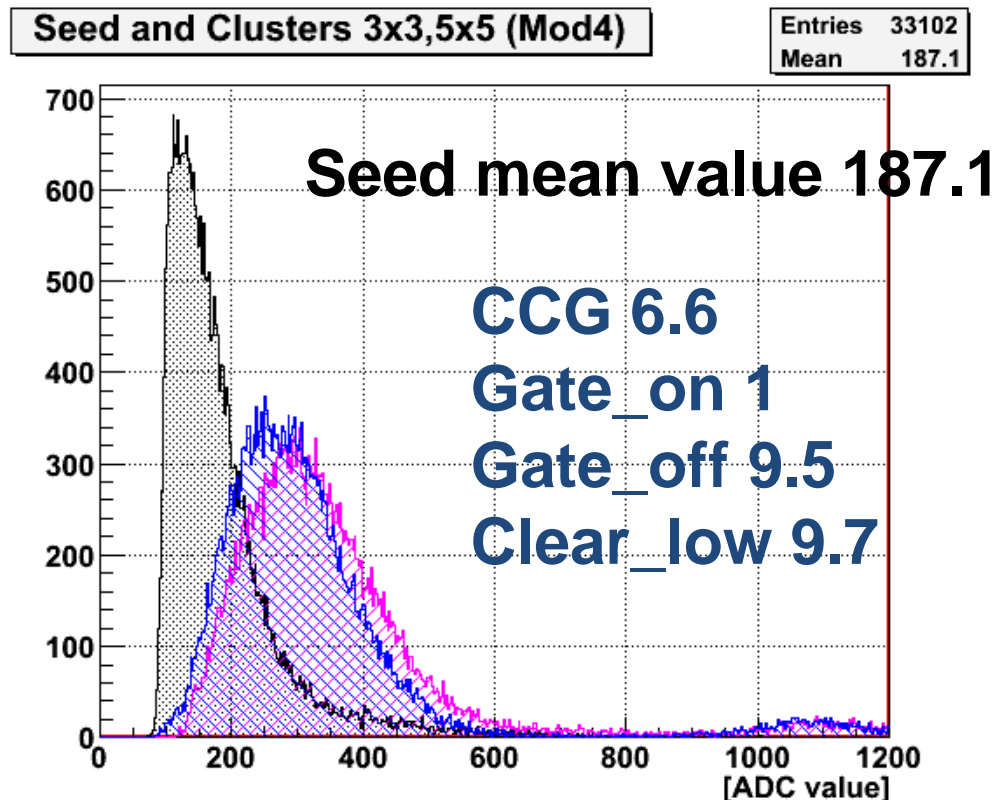
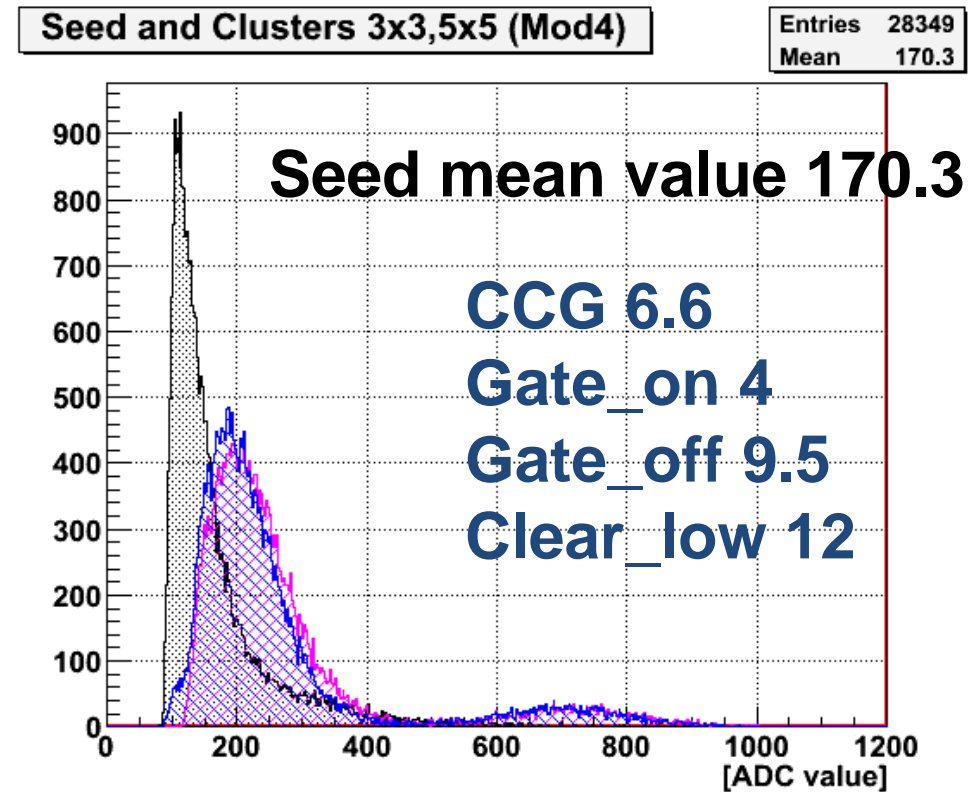
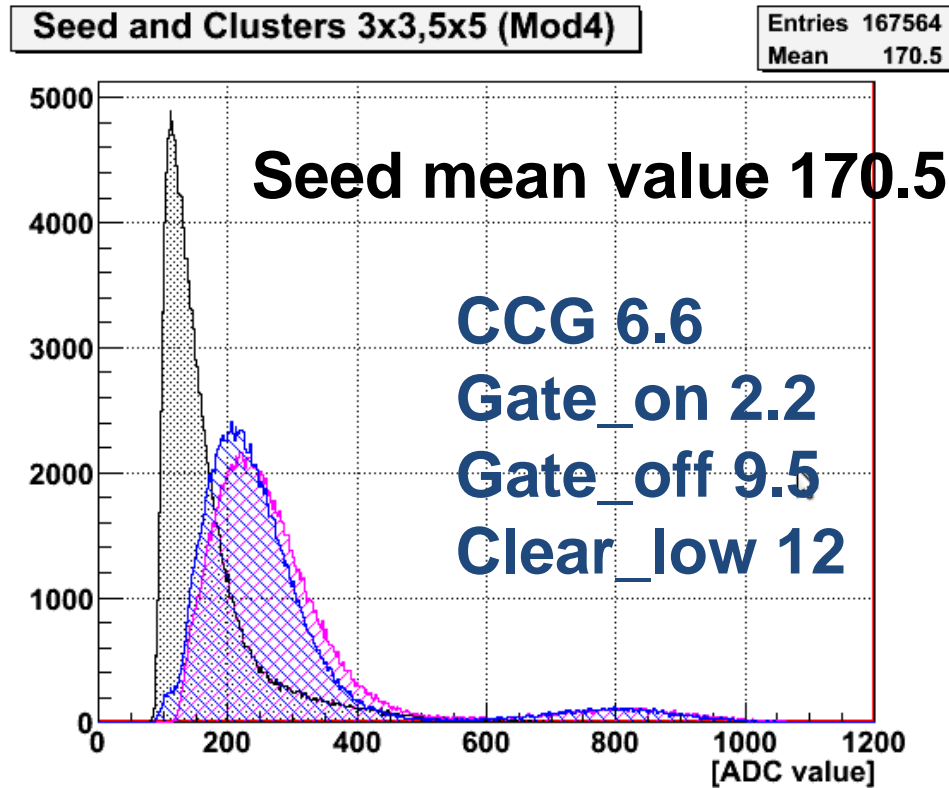


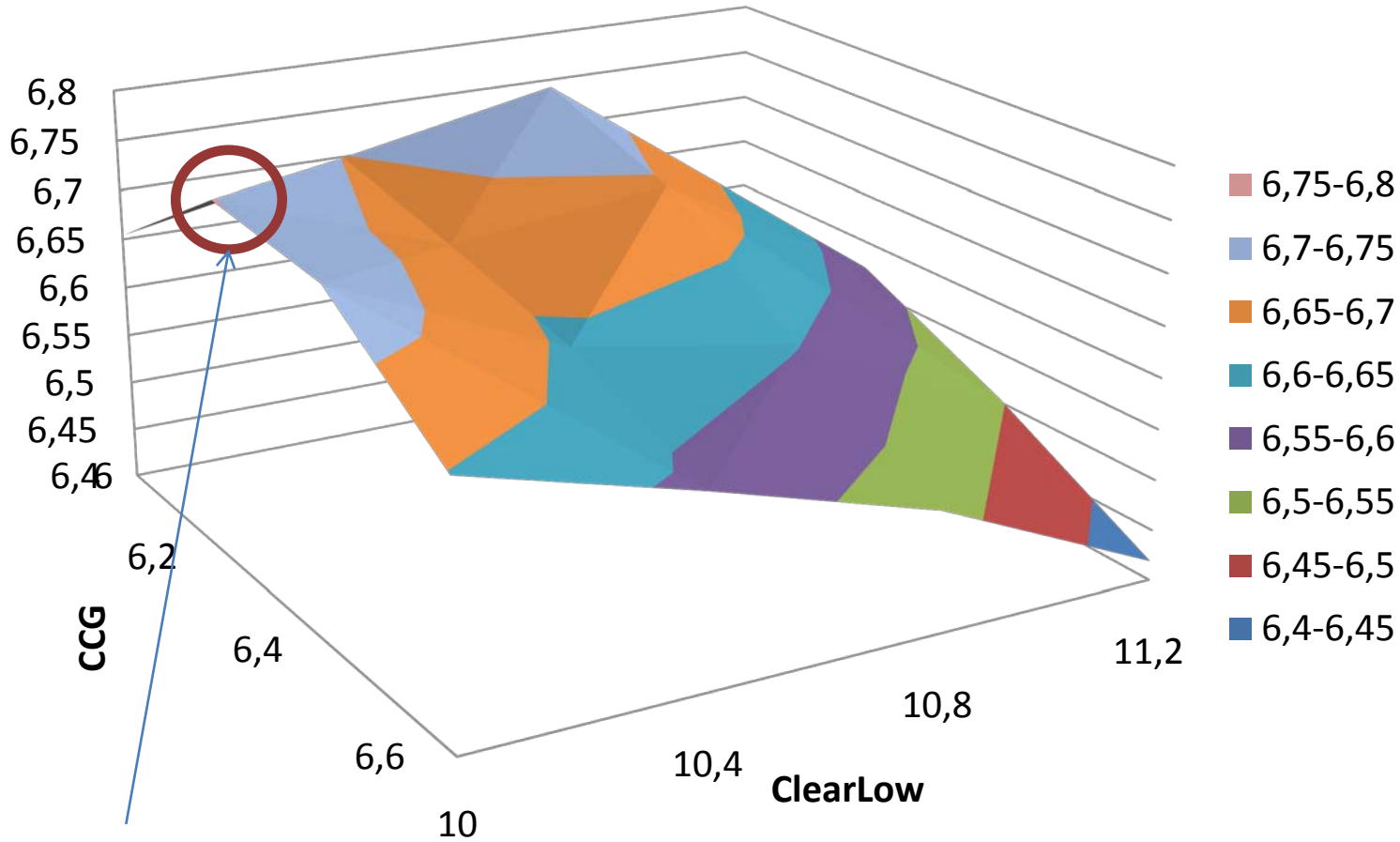
MATRIX H3.0.20 RUNS WITH AM241



Gain of the matrix can be changed by Common Clear Gate, Gate_on, Gate_off, Clear_low, Clear_off, Source voltages

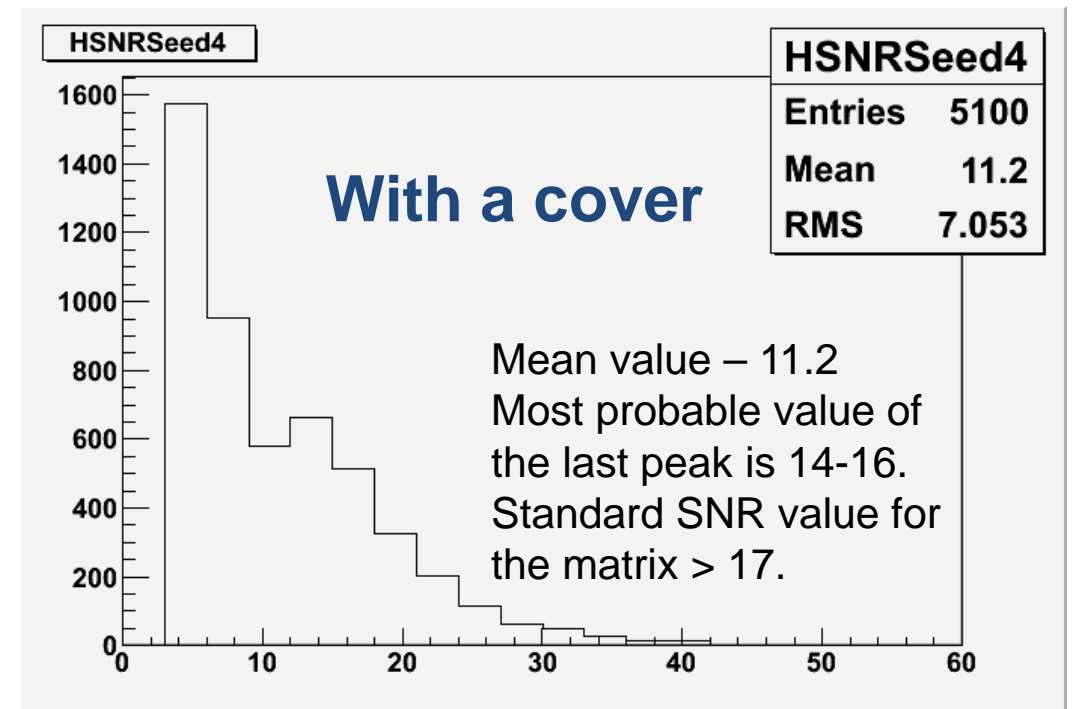
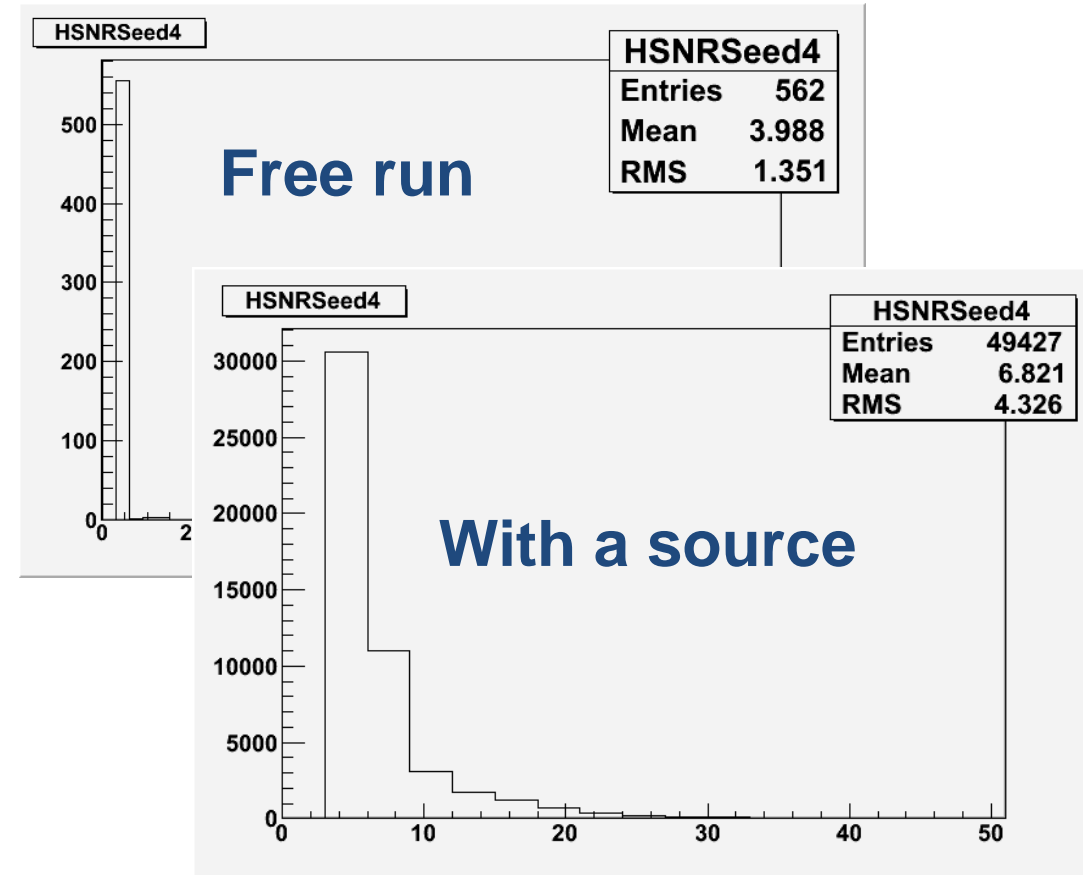


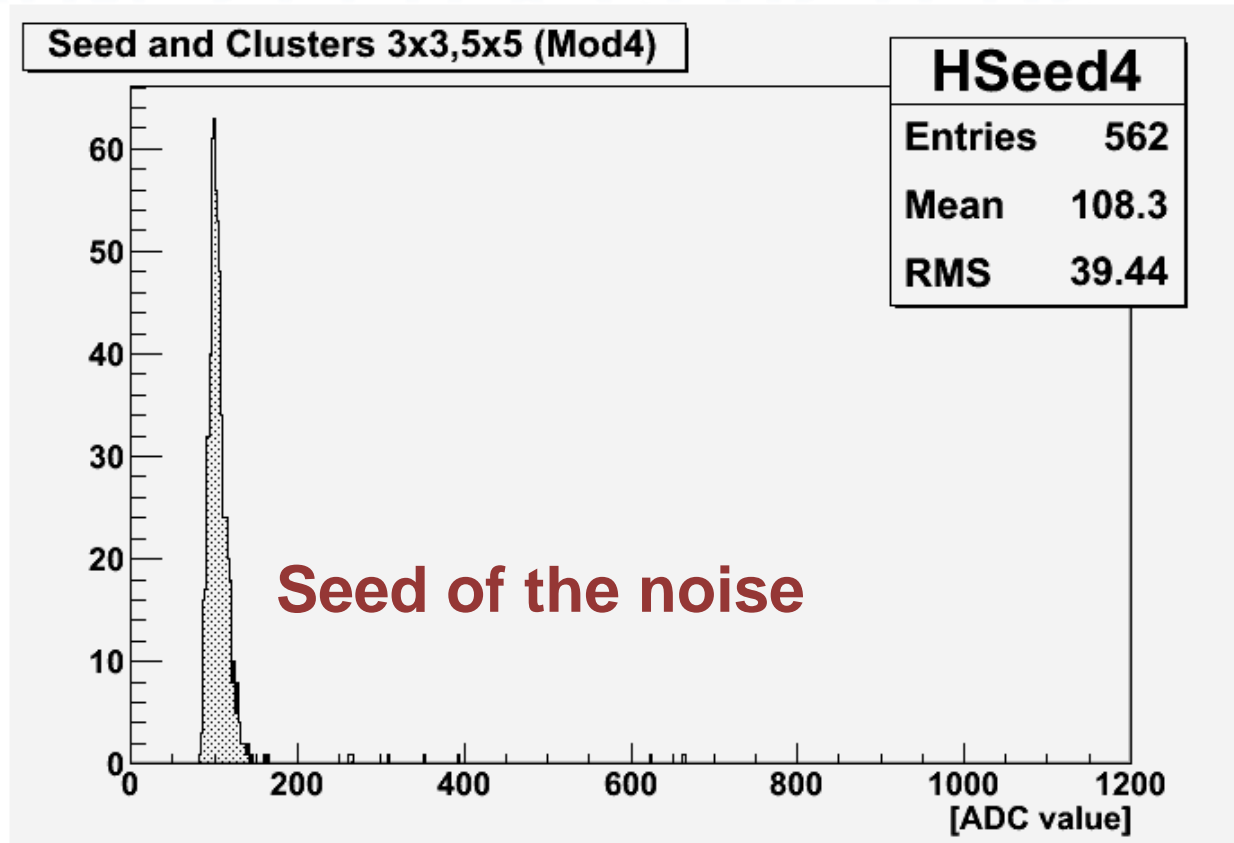
SNR (Seed mean value)



CCG 6.2V
Clear_Low 10V

Voltages for all further runs:
CCG – 5.8; Gate_on – 2.4; Gate_off – 9.6;
Clear_low – 9.6; Clear_high – 10.4.

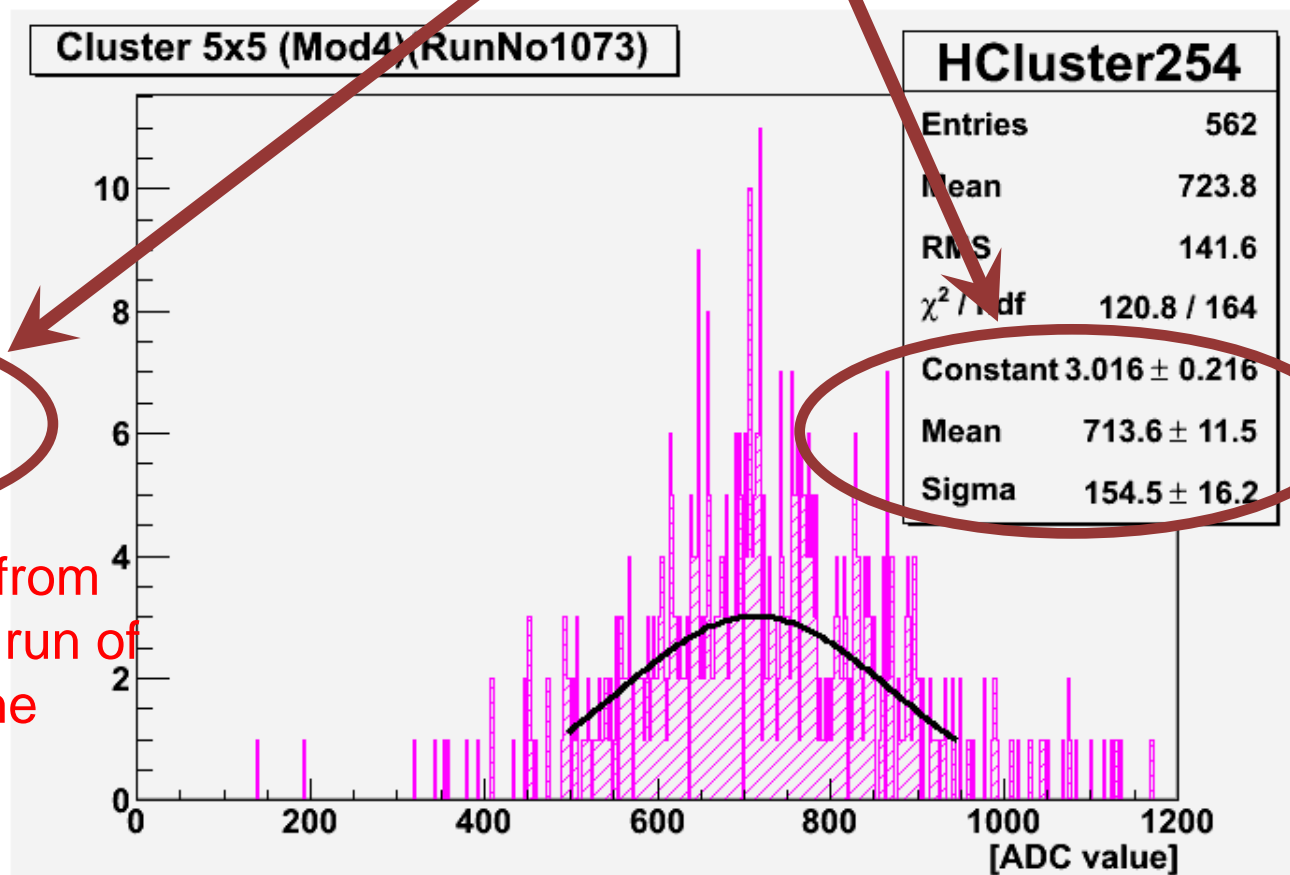
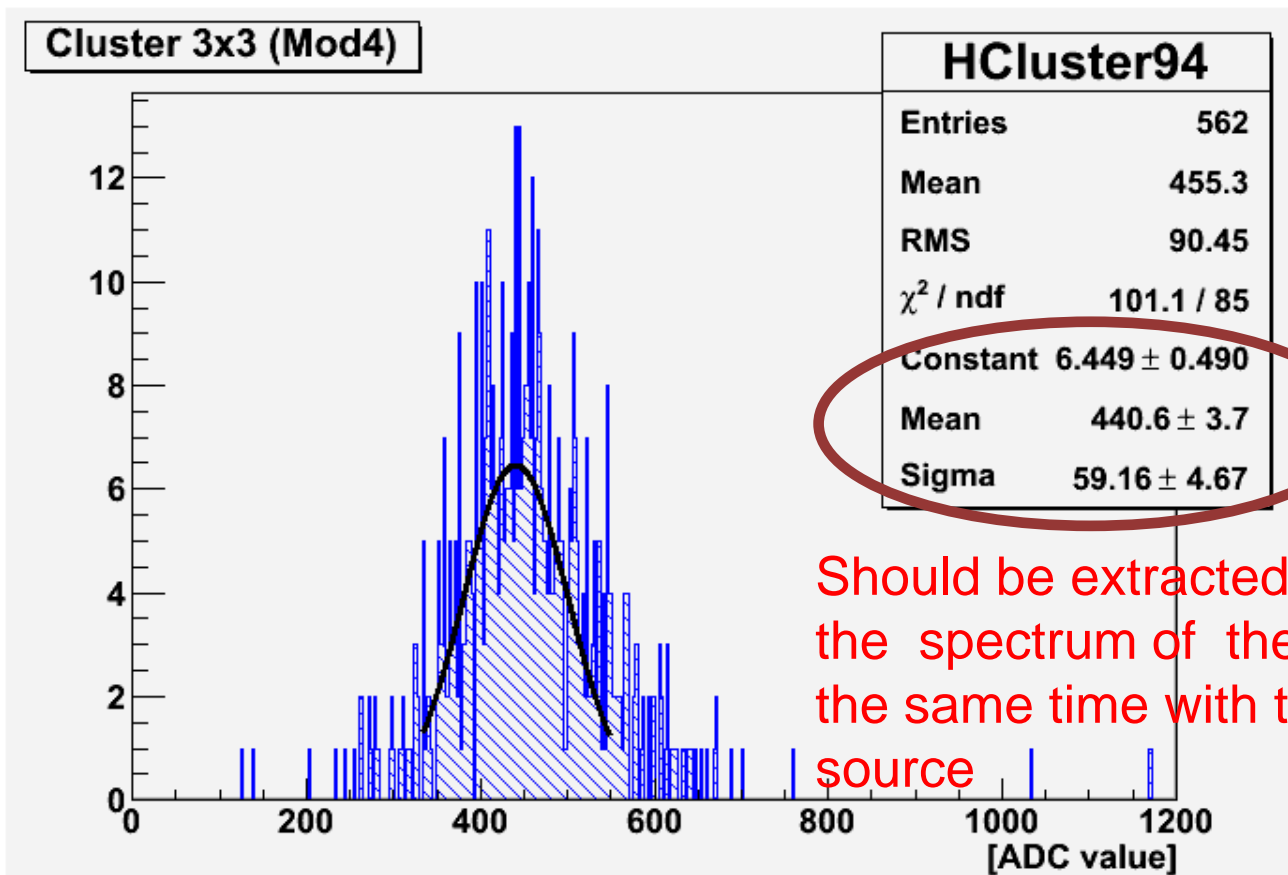


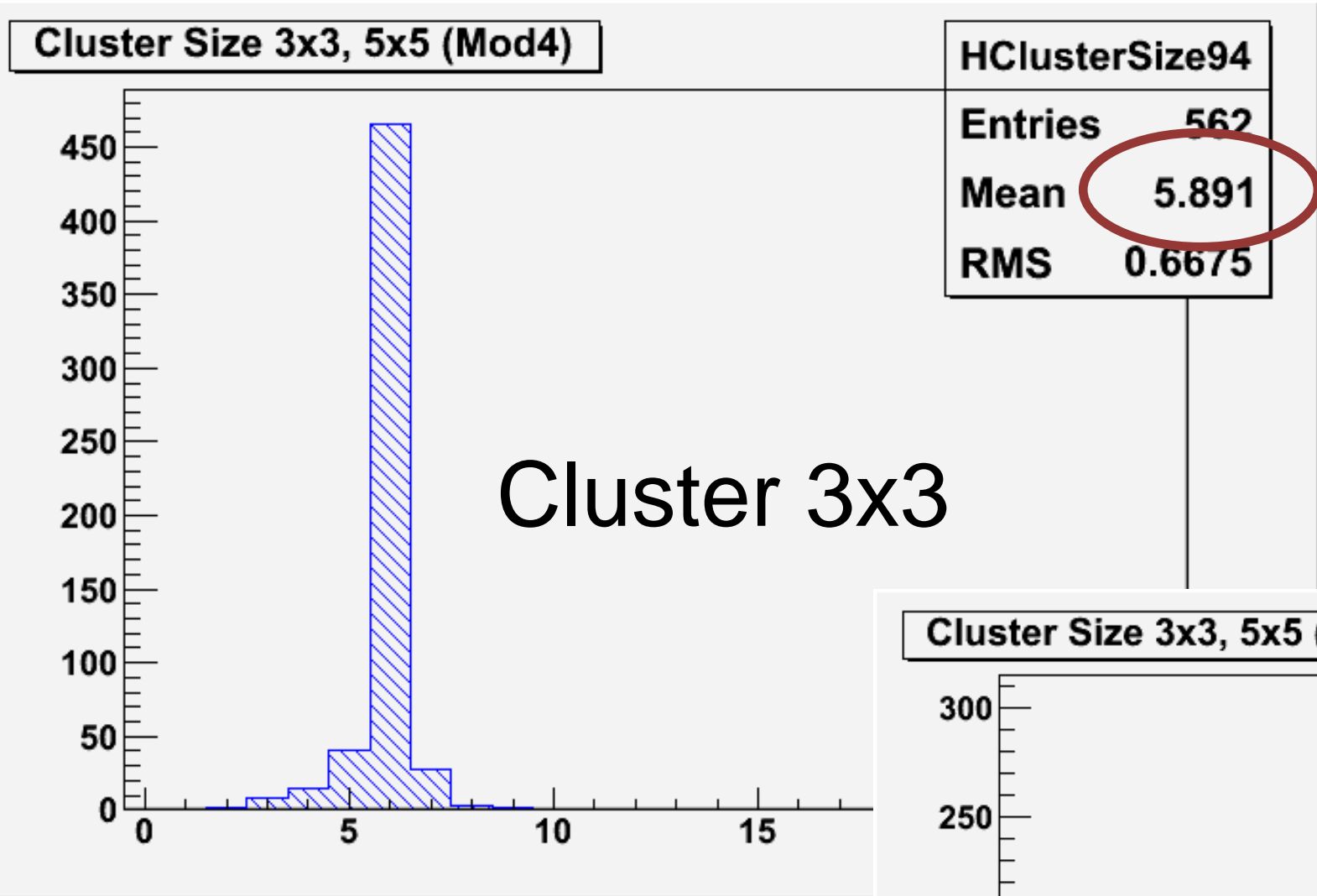


Run number: 1073
 Run time: 1500 sec.
 Number of events: 57000
 Number of entries: 562

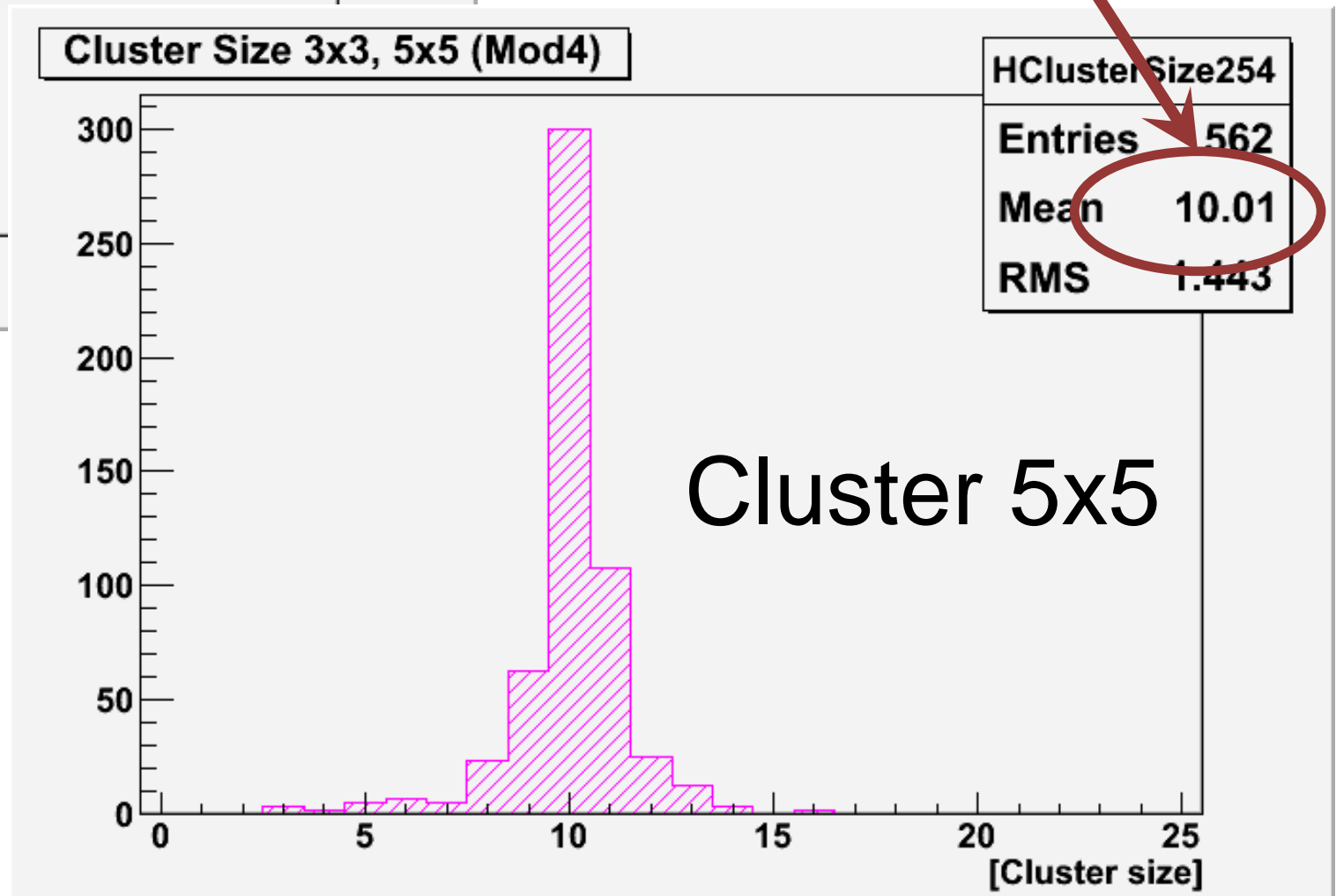
↓
 ≈ 0.01 event/trigger \Rightarrow
 $\approx 1\%$ of noise

Cluster parameters of the noise



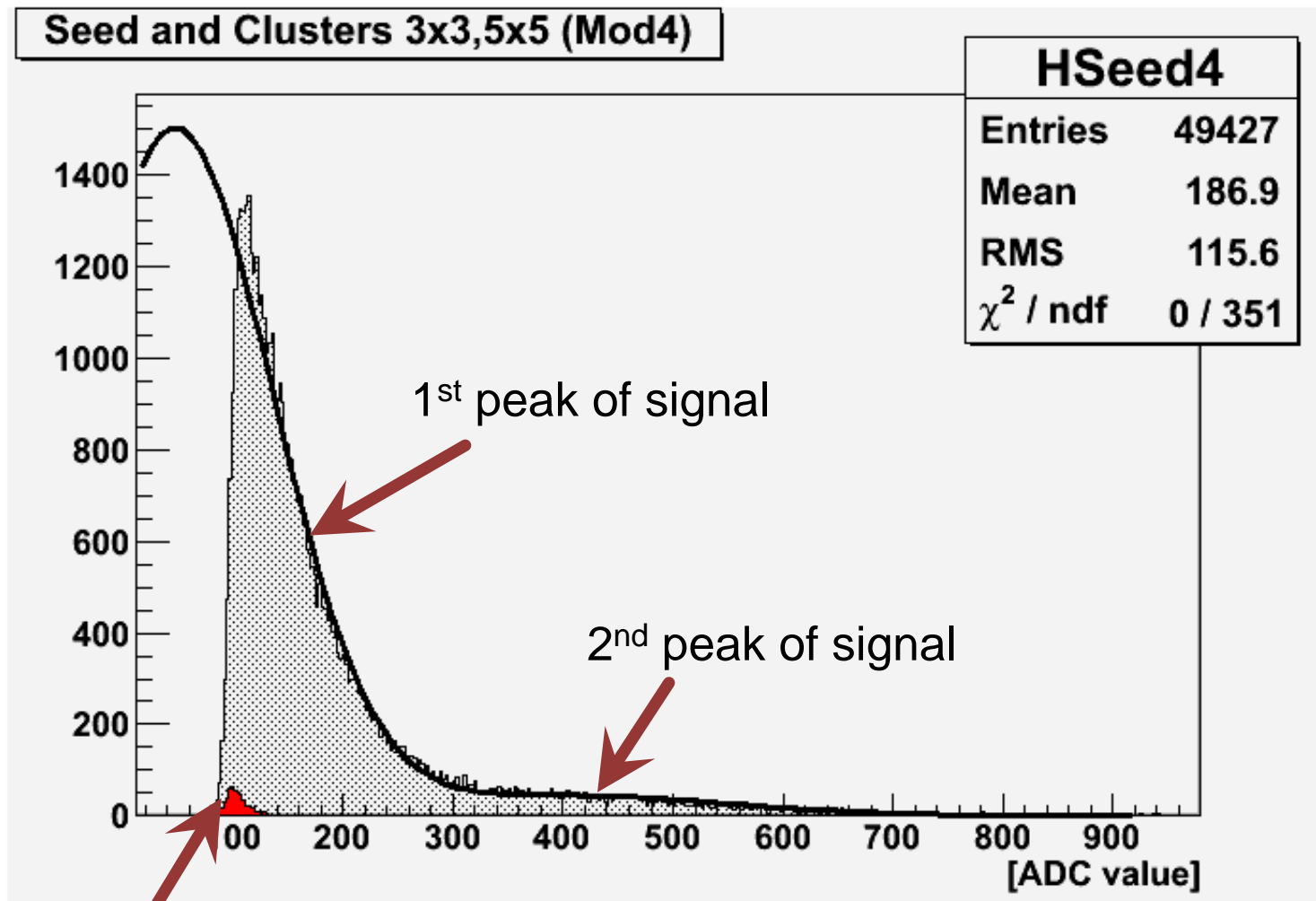


Two lines of each cluster are with noisy pixels



For cluster 3x3:
 Seed x cluster = $108 \times 5.9 = 637.2$ ADC
 But the mean value of energy is 440 ADC
 \Rightarrow neighbor pixels in the same cluster have lower energies.

The same for cluster 5x5:
 Seed x cluster = 1080 ADC
 Mean value of energy – 713 ADC.



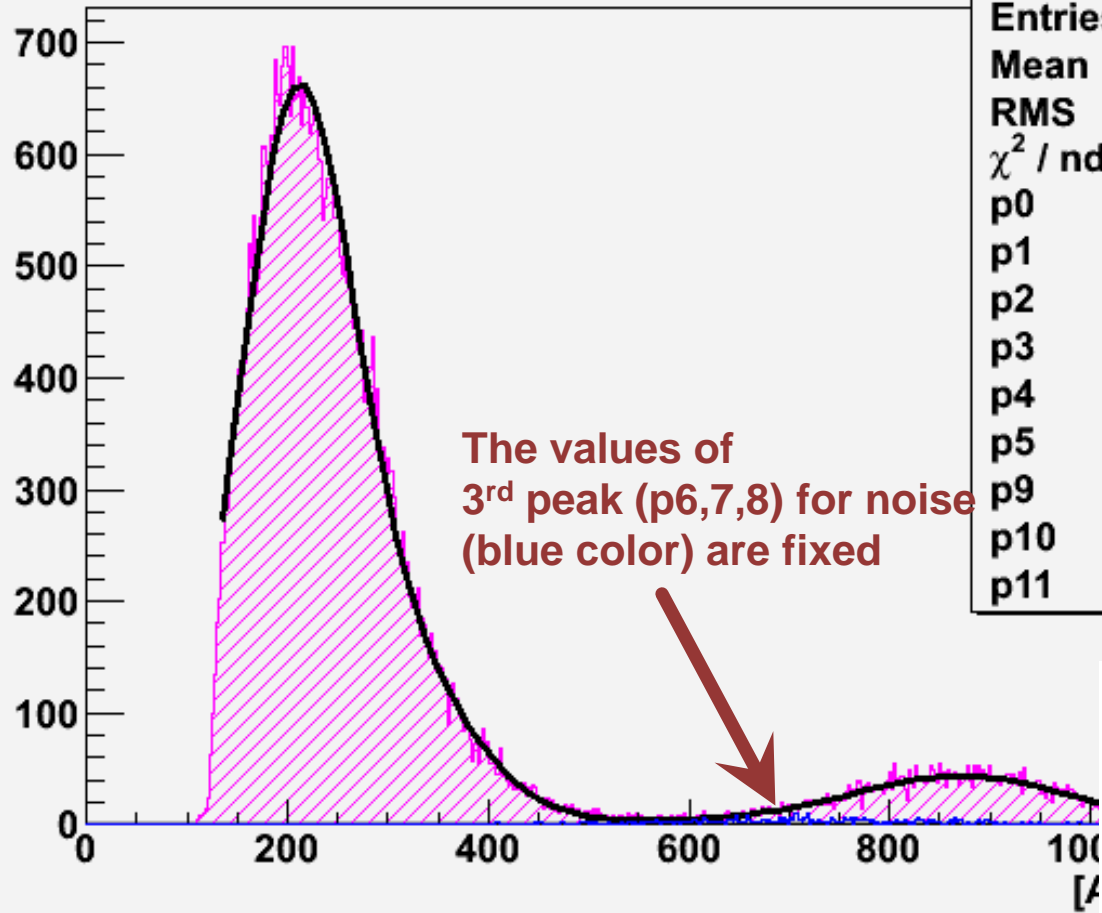
Run number: 1072
 Run time: 1500 sec.
 Number of events: 58000
 Number of entries: 49427

↓

≈0.85 event/trigger ⇒
 ≈ 85% of signal with a noise

Noise seed from the free run

Cluster 5x5 (Mod4)(RunNo1072)



HCluster254	
Entries	49427
Mean	308.5
RMS	210
χ^2 / ndf	574.6 / 416
p0	502.1 ± 25.3
p1	206.2 ± 1.0
p2	53.67 ± 1.42
p3	198.5 ± 20.5
p4	266.6 ± 7.7
p5	88.09 ± 2.25
p9	40.96 ± 0.82
p10	875.1 ± 1.8
p11	107.9 ± 1.6

3 signal peaks:

P0 – constant 1

P3 – constant 2

P9 – constant 4

P1 – mean 1

P4 – mean 2

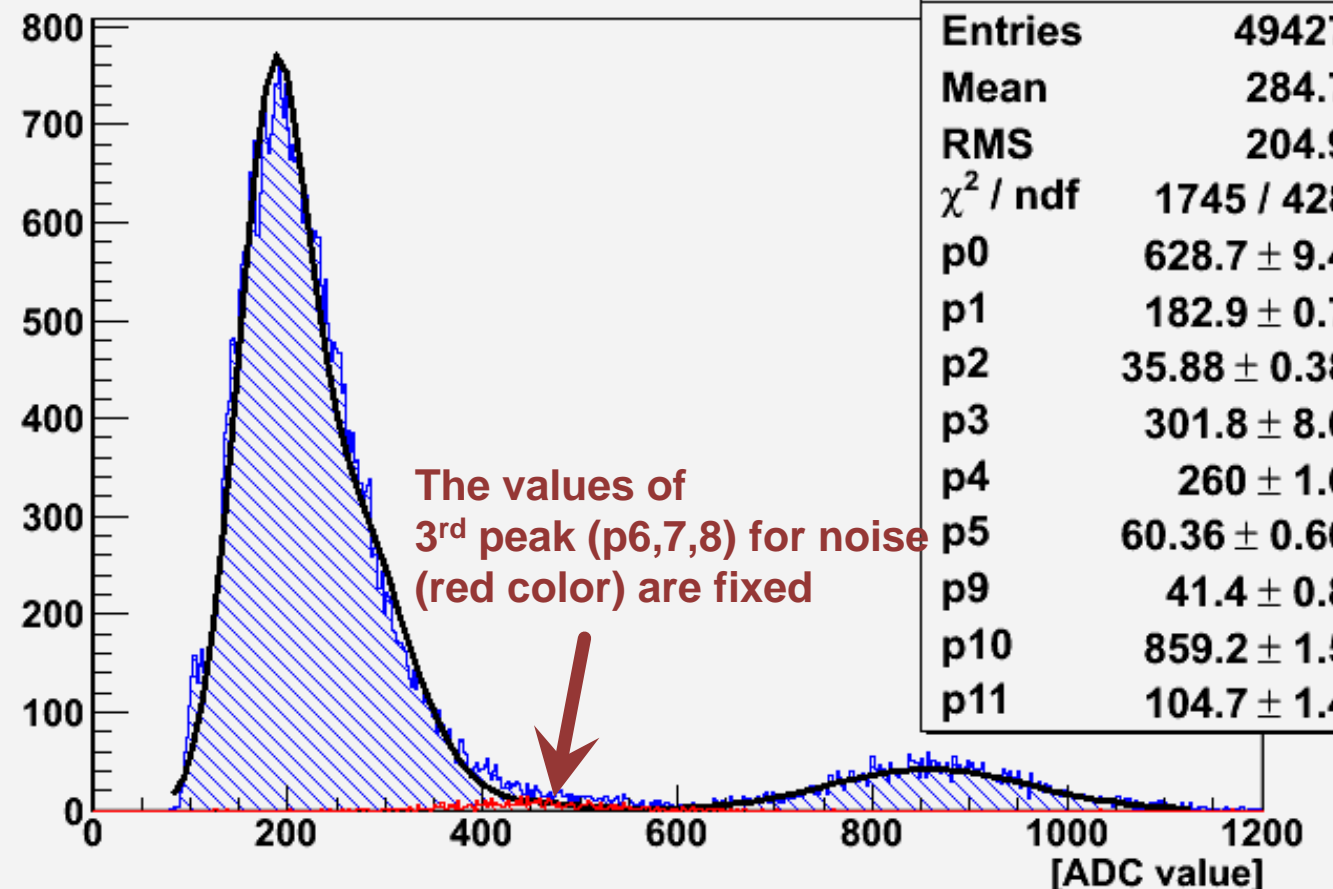
P10 – mean 4

P2 – sigma 1

P5 – sigma 2

P11 – sigma 4

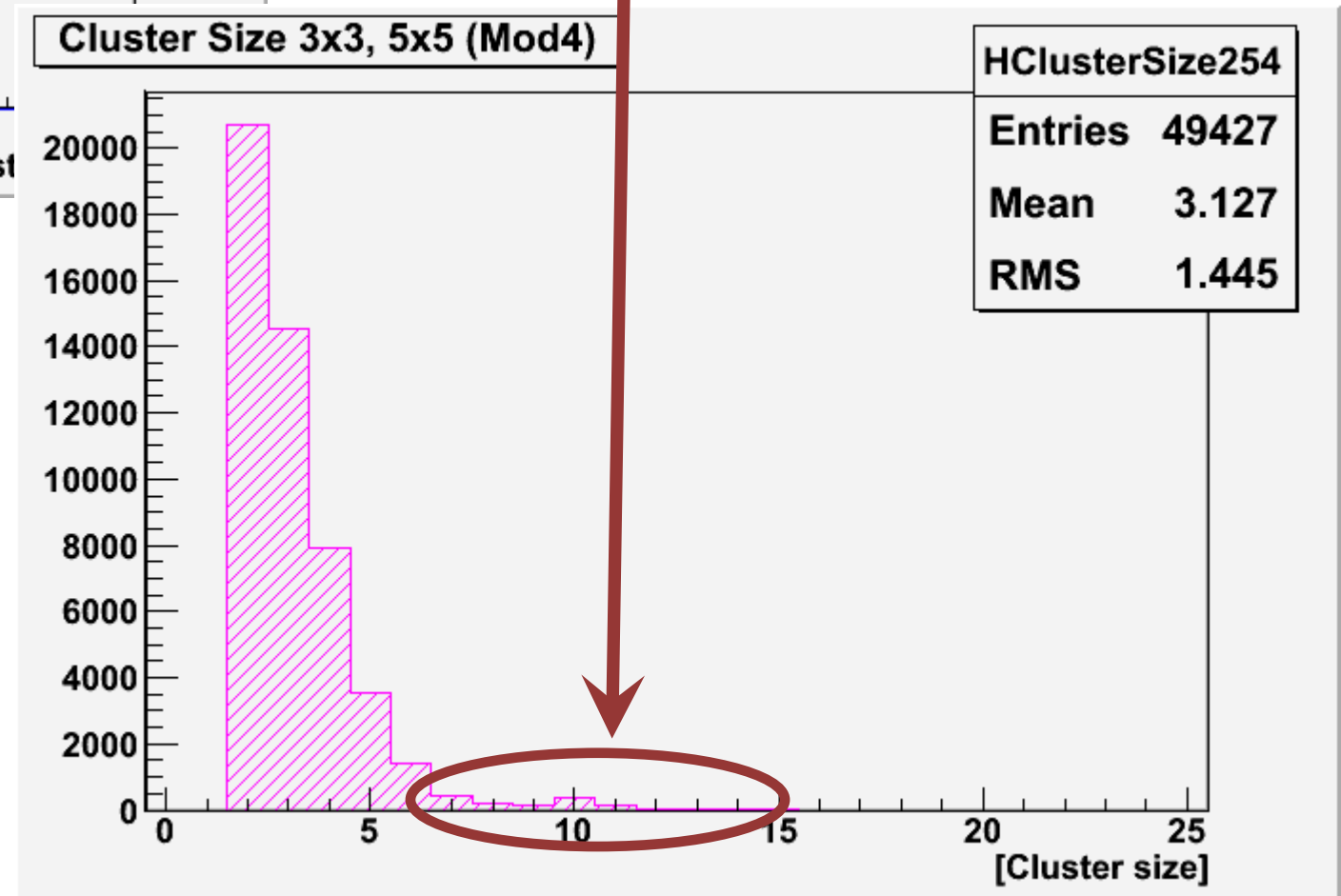
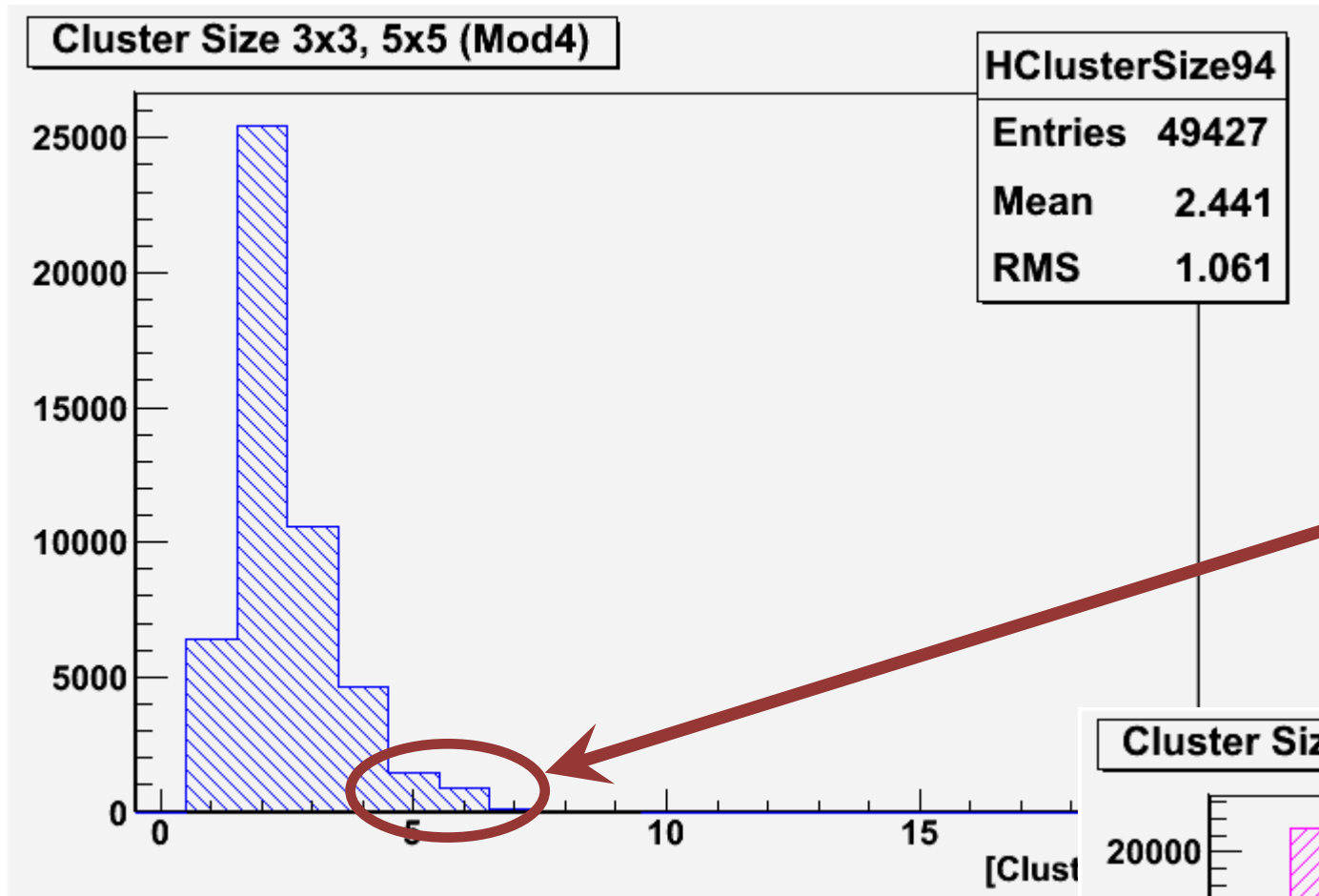
Cluster 3x3 (Mod4)



HCluster94	
Entries	49427
Mean	284.7
RMS	204.9
χ^2 / ndf	1745 / 428
p0	628.7 ± 9.4
p1	182.9 ± 0.7
p2	35.88 ± 0.38
p3	301.8 ± 8.0
p4	260 ± 1.6
p5	60.36 ± 0.60
p9	41.4 ± 0.8
p10	859.2 ± 1.5
p11	104.7 ± 1.4

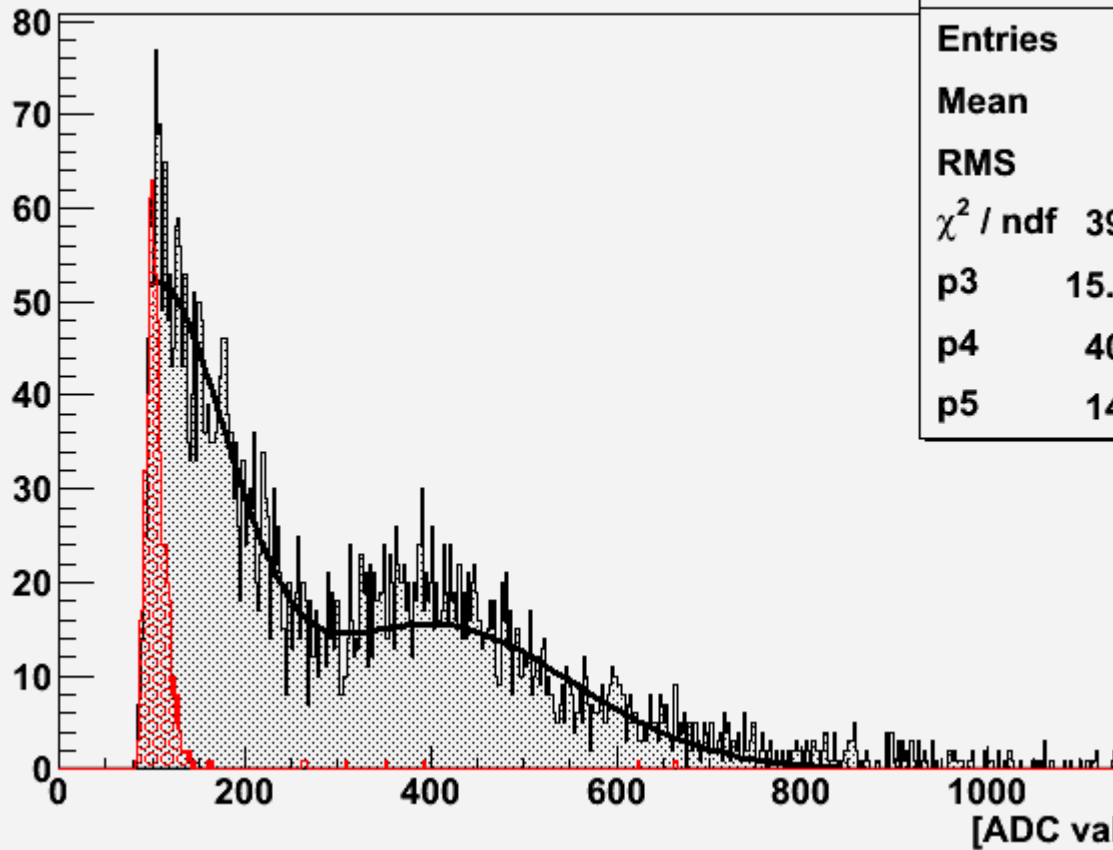
Cluster	Peak	Constant	Mean	Sigma	Ratio C_1/C_n	Ratio M_4/M_n	σ/E
5x5	1 st	502.1	206.2	53.67	1	4,2	26,0%
	2 nd	198.5	266.6	88.09	2,5	3,3	33,0%
	3 rd	3	713.6	154.5	Noise		
	4 th	40.96	875.1	107.9	12,3	1	12,3%
3x3	1 st	628.7	182.9	35.88	1	4,7	19,6%
	2 nd	301.8	260	60.36	2,1	3,3	23,2%
	3 rd	6.5	440	59.2	Noise		
	4 th	41.4	859.2	104.7	15,2	1	12,2%

- ✓ Theoretical gamma absorptions in the silicon and Al foil (50 μm) for 3 signal peaks are 25; 0.6; 1.18%. That gives ratio C_1/C_n – **1; 41.6; 21.1** respectively.
- ✓ Three energies of the gammas for Am241 (13.9, 26.3, 59.5) give theoretical ratio M_4/M_n – **4.28; 2.26; 1**.
- ✓ Ratio σ/E shows that the last peak has the lowest distribution scattering.



Contribution of the noise is not essential for the runs without a covering

Seed and Clusters 3x3,5x5 (Mod4)



HSeed4	
Entries	5100
Mean	310.6
RMS	196.7
χ^2 / ndf	398.8 / 305
p3	15.52 ± 0.49
p4	400.6 ± 4.7
p5	149.7 ± 5.2

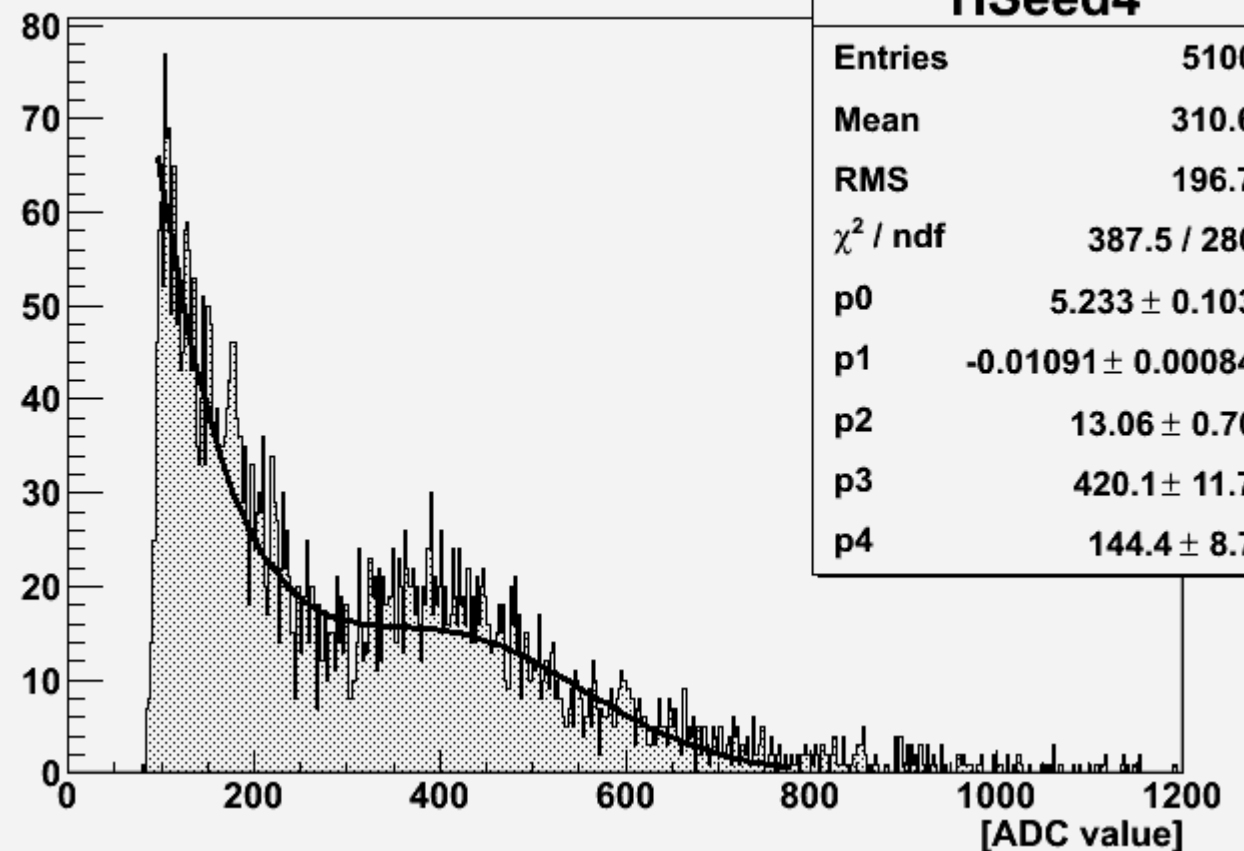
Matrix is covered 2.4 mm of Al

Run number: 1075
 Run time: 1670 sec.
 Number of events: 64000
 Number of entries: 5100

Less than 8% of signal with a noise!
 ⇒ around 13% of noise in all data!

Gauss approximation for 1st peak

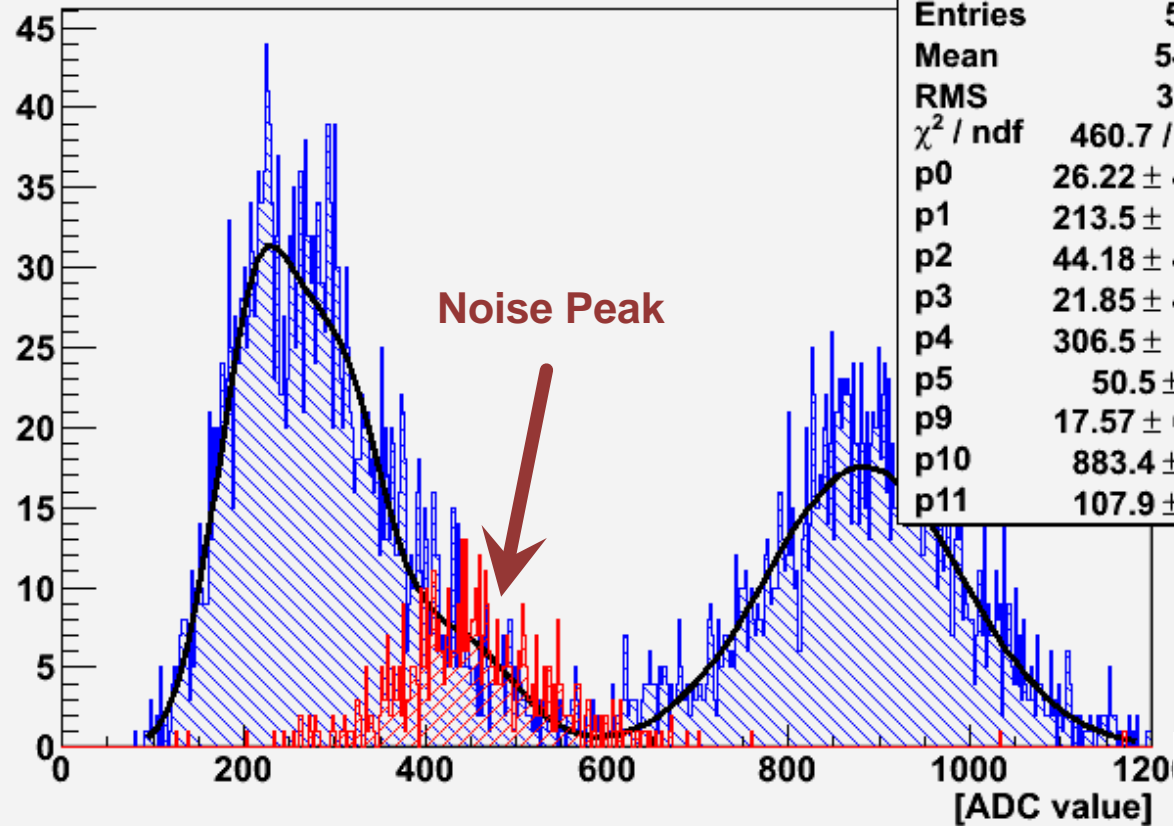
Seed and Clusters 3x3,5x5 (Mod4)



HSeed4	
Entries	5100
Mean	310.6
RMS	196.7
χ^2 / ndf	387.5 / 280
p0	5.233 ± 0.103
p1	-0.01091 ± 0.00084
p2	13.06 ± 0.70
p3	420.1 ± 11.7
p4	144.4 ± 8.7

Exponential approximation
 for 1st peak

Cluster 3x3 (Mod4)



HCluster94	
Entries	5100
Mean	540.8
RMS	311.2
χ^2 / ndf	460.7 / 427
p0	26.22 ± 4.73
p1	213.5 ± 10.8
p2	44.18 ± 4.73
p3	21.85 ± 4.03
p4	306.5 ± 15.3
p5	50.5 ± 5.9
p9	17.57 ± 0.54
p10	883.4 ± 2.5
p11	107.9 ± 2.4

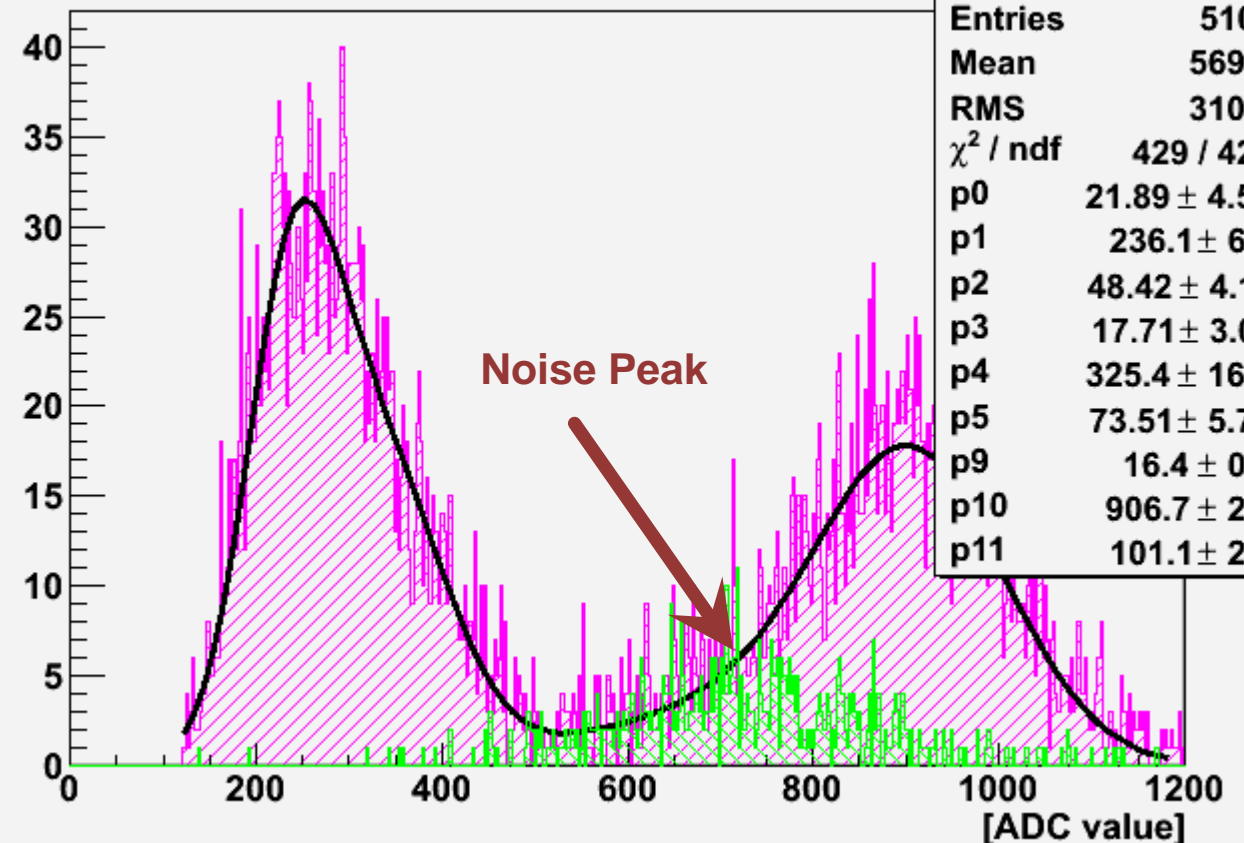
Radiation data for Am-241

Type	Energy	Percentage
Gamma	59.5 keV	35.9
Gamma	26.3 keV	2.4
Gamma	13.9 keV	42

$$3^{\text{rd}} / 1^{\text{st}} = 4.28$$

$$3^{\text{rd}} / 2^{\text{nd}} = 2.26$$

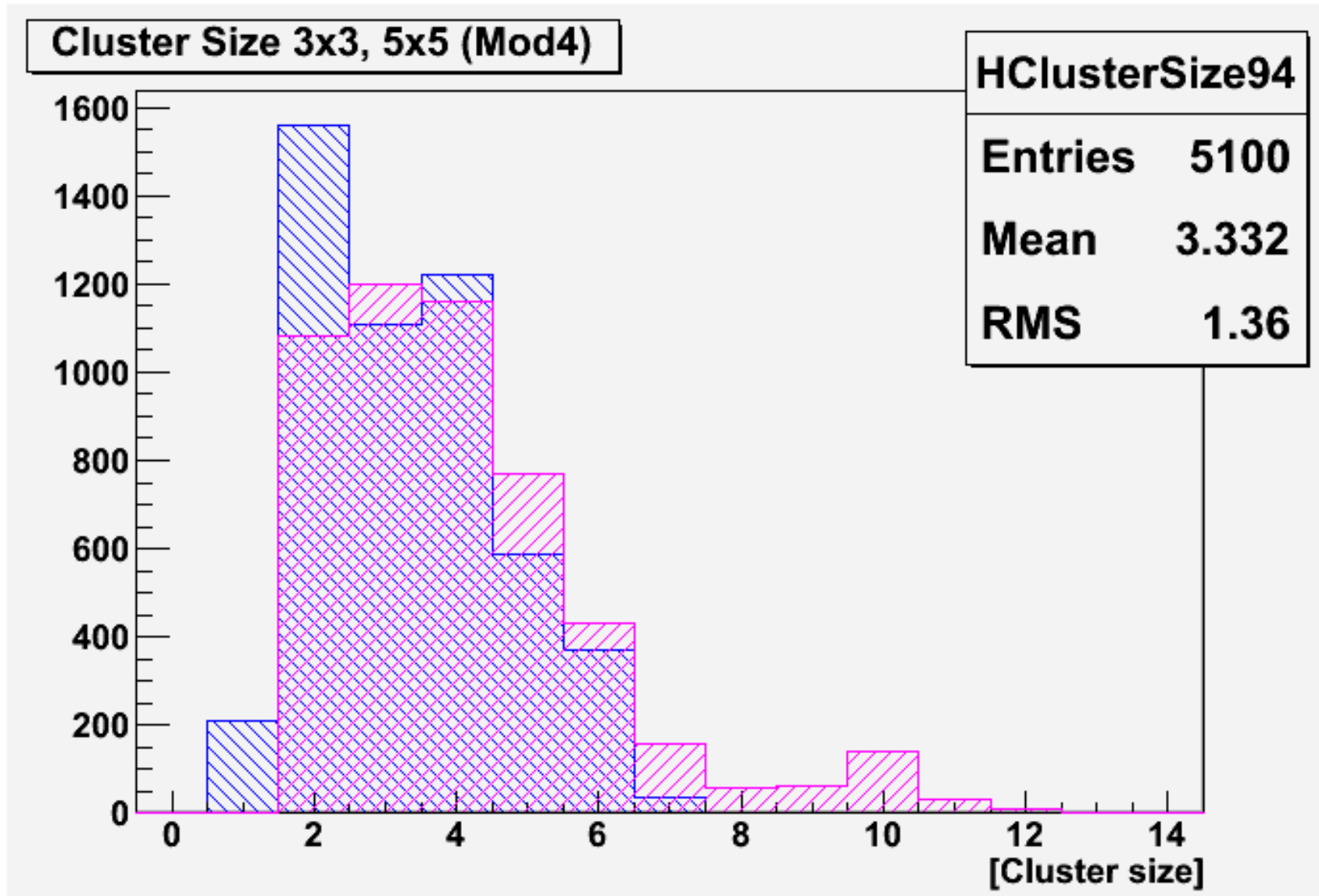
Cluster 5x5 (Mod4)(RunNo1075)



HCluster254	
Entries	5100
Mean	569.2
RMS	310.3
χ^2 / ndf	429 / 424
p0	21.89 ± 4.55
p1	236.1 ± 6.3
p2	48.42 ± 4.10
p3	17.71 ± 3.02
p4	325.4 ± 16.3
p5	73.51 ± 5.73
p9	16.4 ± 0.6
p10	906.7 ± 2.9
p11	101.1 ± 2.6

Cluster	Peak	Constant	Mean	Sigma	Ratio C_1/C_n	Ratio M_4/M_n	σ/E
5x5	1 st	21.89	236.1	48.42	1	3,84	20,5%
	2 nd	17.71	325.4	73.51	1,24	2,79	22,6%
	3 rd	3	713.6	154.5	Noise		
	4 th	16.4	906.7	101.1	1,33	1	11,2%
3x3	1 st	26.22	213.5	44.18	1	4,14	20,7%
	2 nd	21.85	306.5	50.5	1,20	2,88	16,5%
	3 rd	6.5	440	59.2	Noise		
	4 th	17.57	883.4	107.9	1,49	1	12,2%

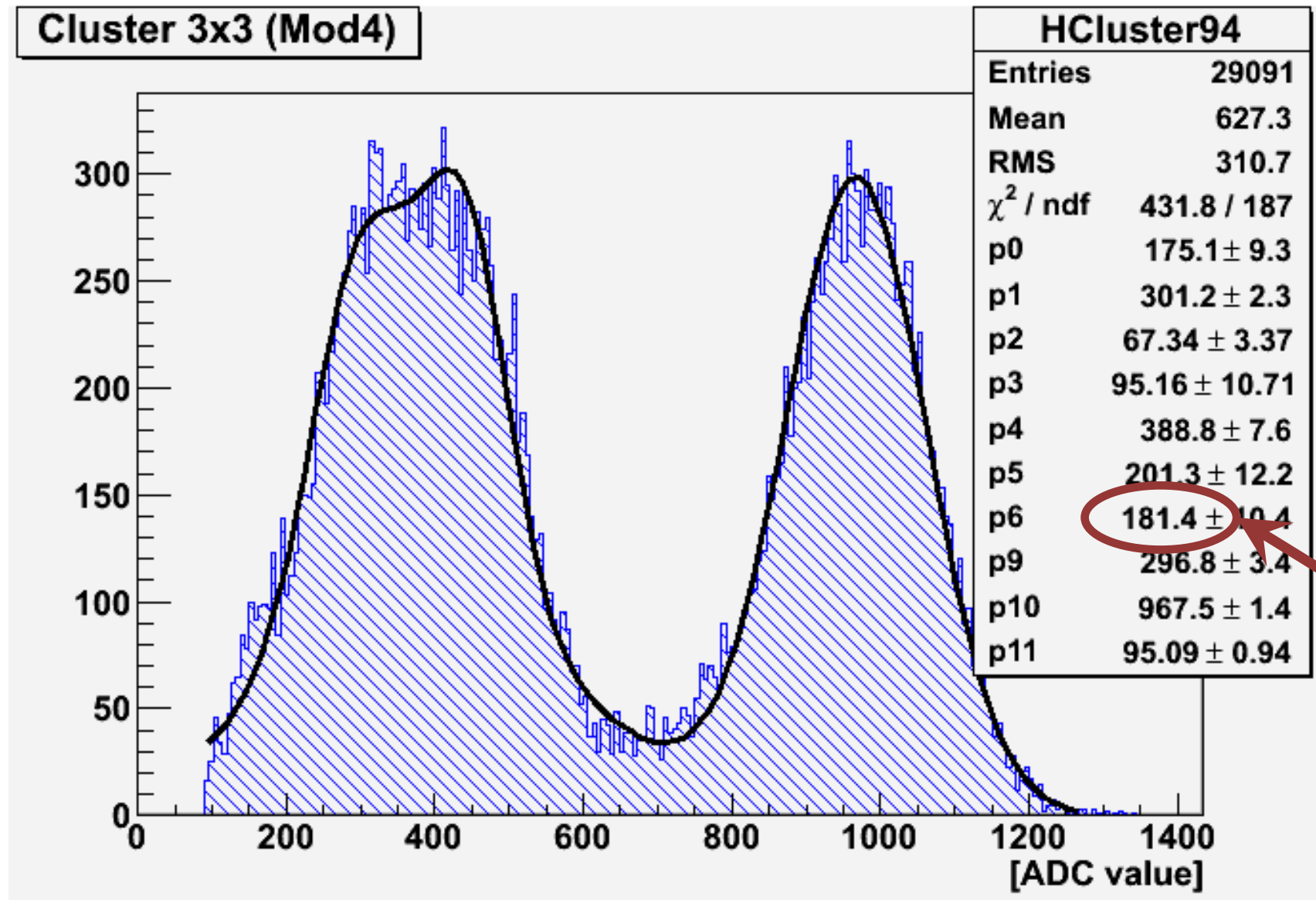
- ✓ Theoretical gamma absorptions in the silicon and Al plate of 2.45 mm for 3 signal peaks are 0.14; 0.15; 0.99%. That gives ratio C_1/C_n – **1; 0.93; 0.14** respectively. Our first peak is still biggest.
- ✓ Three energies of the gammas for Am241 give theoretical ratio M_4/M_n – **4.28; 2.26; 1**.
- ✓ Ratio σ/E shows that the last peak has the lowest distribution scattering.



Mean values of cluster size of 3x3 and 5x5 for run without covering are 2.44 and 3.13 respectively.

Now mean value for cluster 3x3 is 3.33 – significant shift by one pixel per cluster made by the noise.

Matrix is covered 3.6 mm of Al
Run for 4 hours



Noise peak amplitude

Noise peak is greater than first two signal peaks!

1. Very low activity of the source, we can't achieve high SN ratio;
2. To run the laser... still.