



# Operation and characterization of S3B system and DEPFET matrix

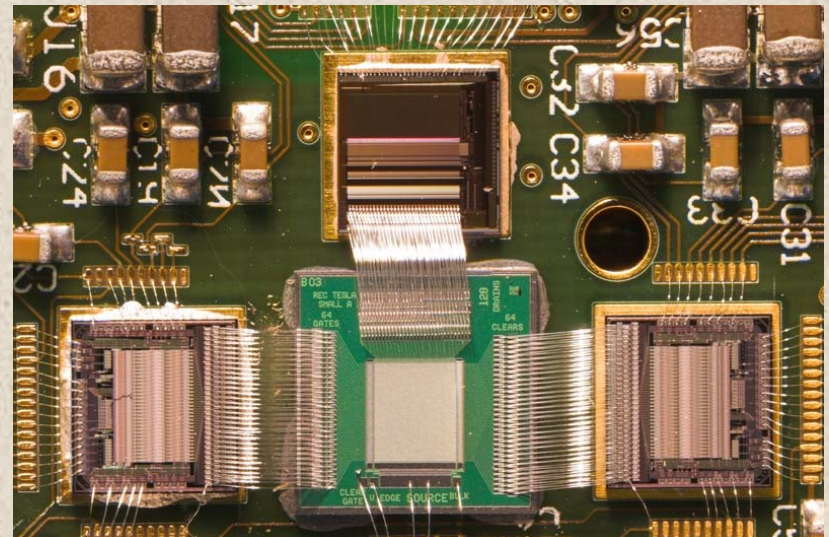
J. Višniakov, P. Vazquez

# S3B System & Matrix



Power Supply  
Board ID 20

DEPFET Matrix  
H 3.0.13



# S3B System & Matrix (2)

*Gate\_on* voltage is shortcuted

The screenshot displays a software interface for an S3B System & Matrix. The interface includes a control panel at the top with the following fields:

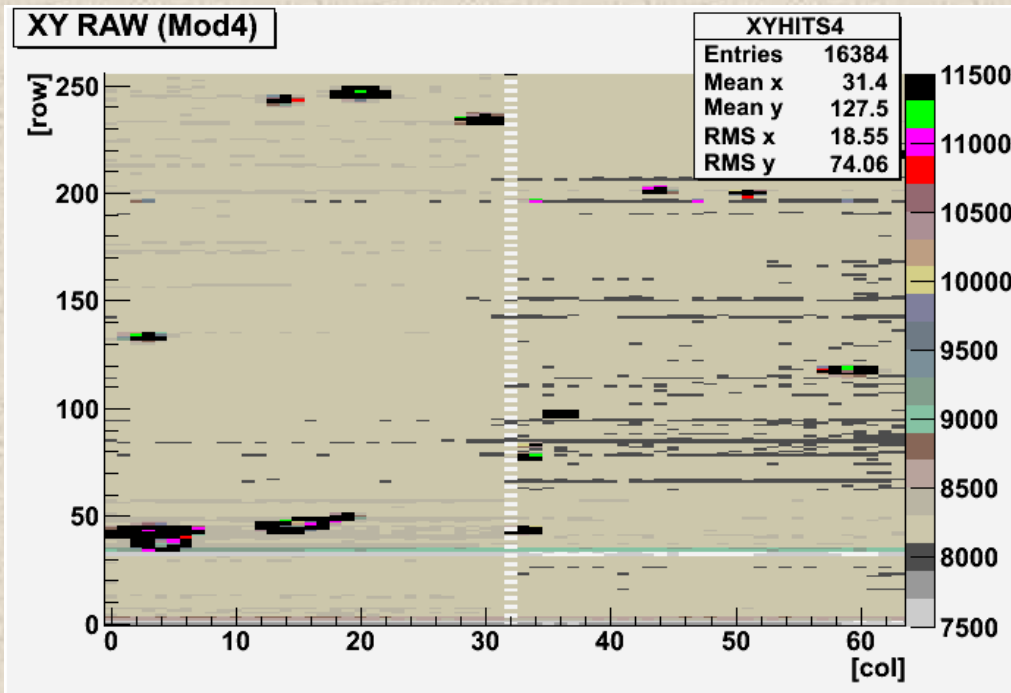
- Host: localhost
- Port: 32767
- Linux ID: -1
- Supply ID: 20
- Status PowerSupply: On

Below the control panel is a "Loaded File" field. The main area of the interface is a grid of 23 power supply channels, each with a setpoint, voltage, current, and status indicators. The channels are:

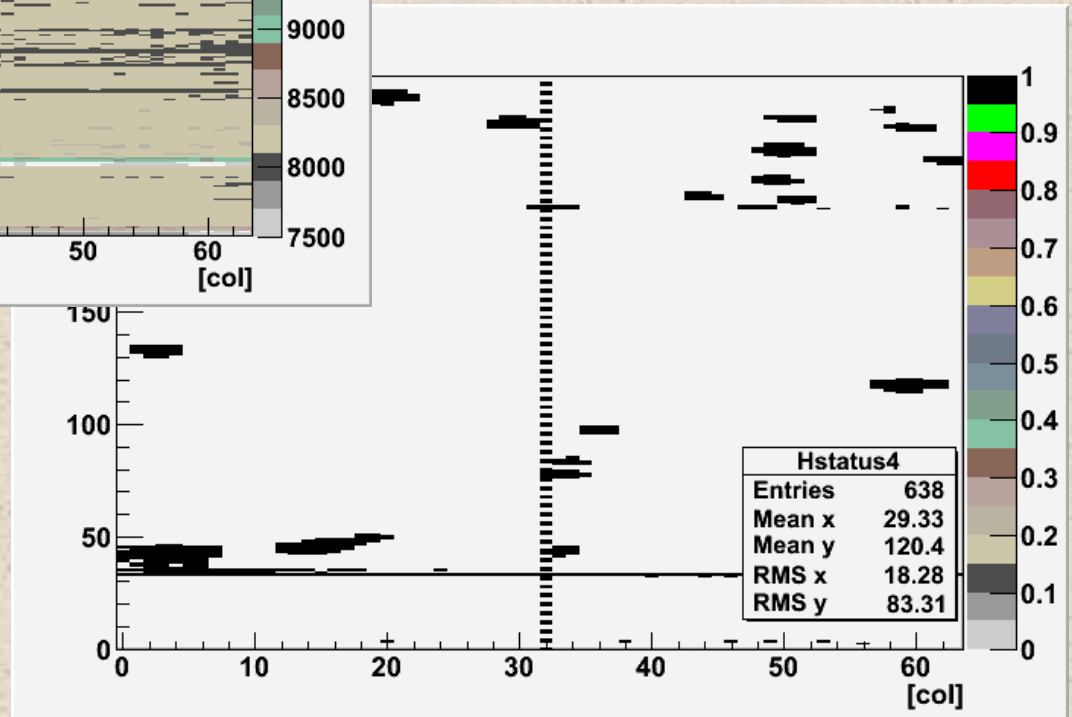
Channel	Setpoint	Voltage	Current	Status
(10) Source	7.00	06.95 V	035.2 mA	Blue
(11) Bulk	16.00	15.82 V	000.2 mA	Blue
(15) CCG	6.40	06.35 V	000.1 mA	Blue
(8) Gate_on GS_GND	2.00	-00.25 V	022.9 mA	Red
(7) Gate_off GSw 9	9.60	09.48 V	025.1 mA	Blue
(9) Clear_low CS_GND	9.80	09.69 V	000.1 mA	Blue
(3) Clear_high CSw 9	10.40	10.30 V	002.7 mA	Blue
(12) CURO A	2.50	02.50 V	052.3 mA	Blue
(16) CURO D	2.50	02.41 V	030.3 mA	Blue
(13) TIA+	2.80	02.79 V	042.2 mA	Blue
(14) TIA-	0.80	-00.77 V	-042.9 mA	Blue
(0) CSw DVDD	3.30	03.30 V	039.0 mA	Blue
(1) CSw 3	3.40	03.40 V	000.6 mA	Blue
(2) CSw 6	6.70	06.67 V	000.6 mA	Blue
(4) GSw DVDD	3.30	03.28 V	027.7 mA	Blue
(5) GSw 3	3.20	03.18 V	000.1 mA	Blue
(6) GSw 6	6.40	06.34 V	000.1 mA	Blue
(17) +5V	4.80	04.67 V	002.3 mA	Blue
(23) HV	180.00	180.1 V	-049.1 mA	Blue

A "Debug window" is open at the bottom right, showing "set max 1".

# DEPFET matrix

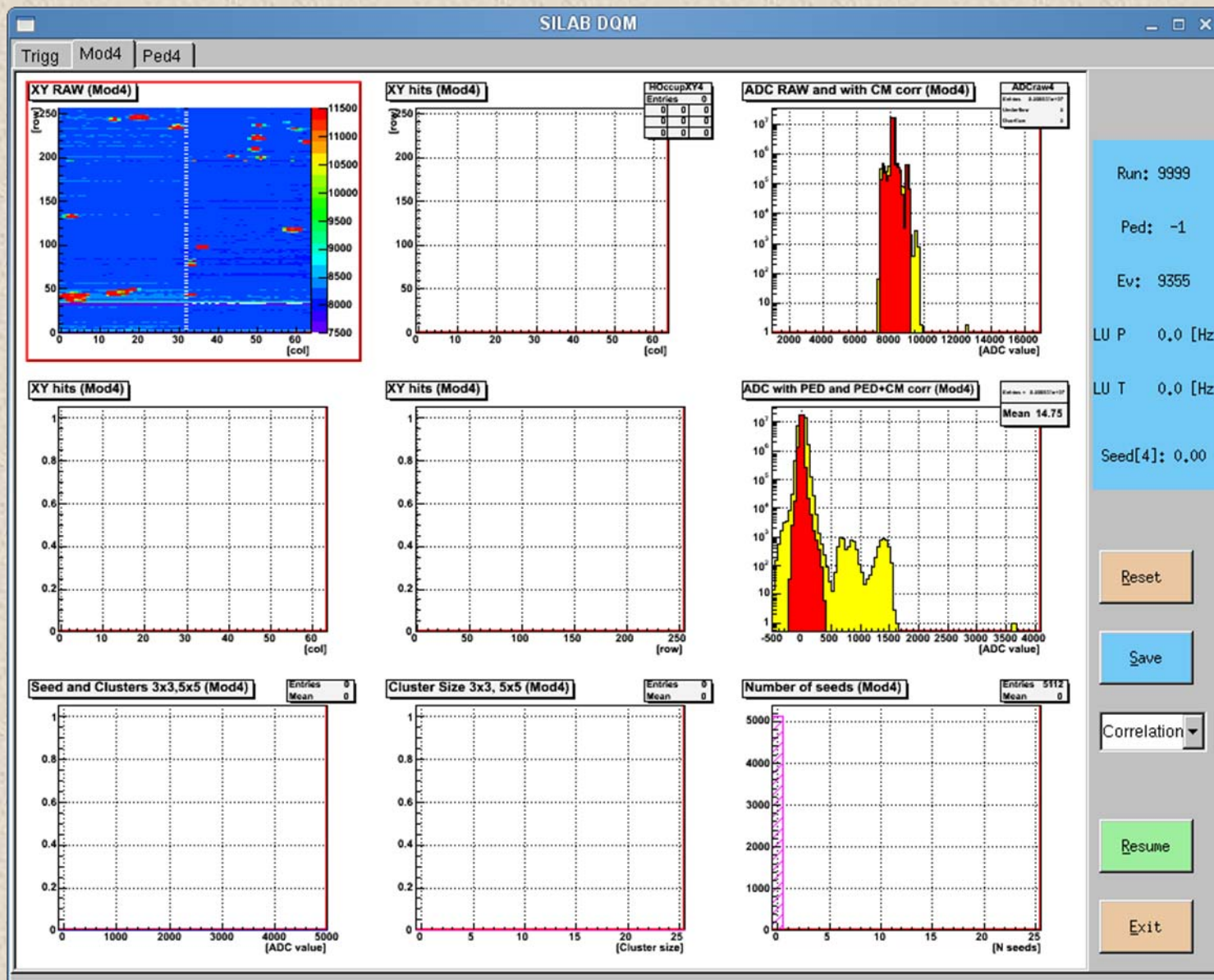


Almost 4 % of hot pixels

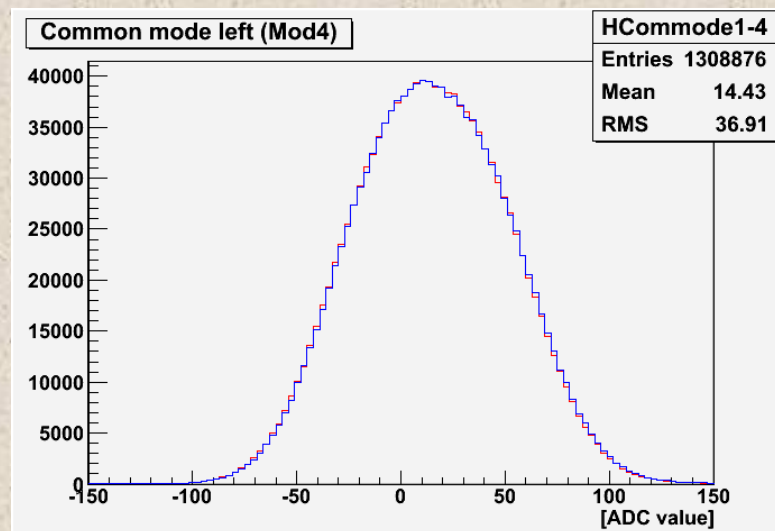
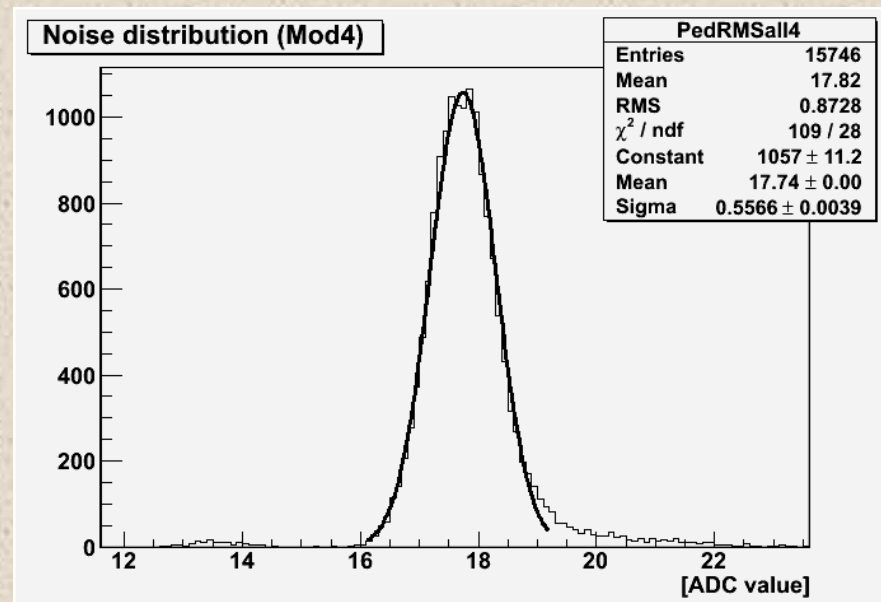
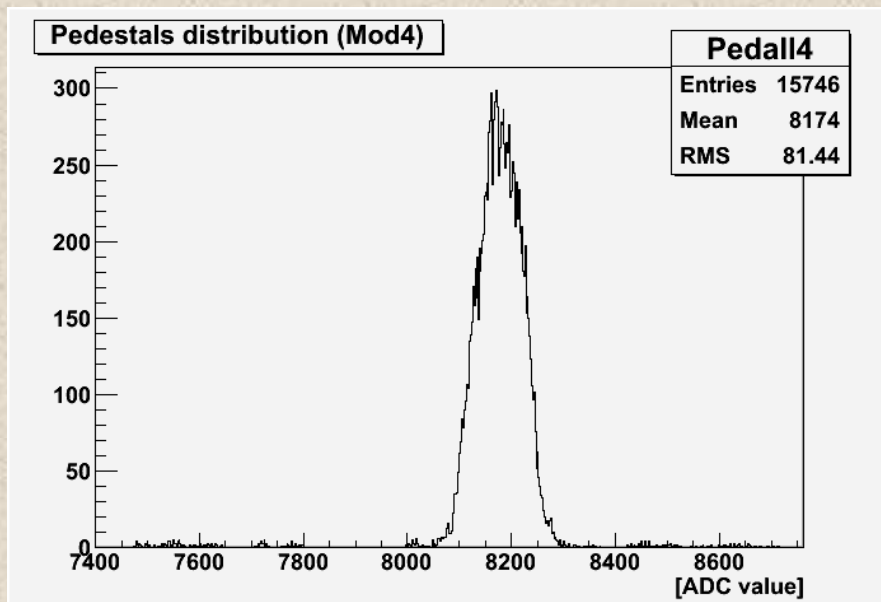


It is necessary to mask additional 20 % of bad pixels to get clear signal

# Run without a source



# Pedestals, noise and CM



# Source – Am241

Radiation data for Am-241

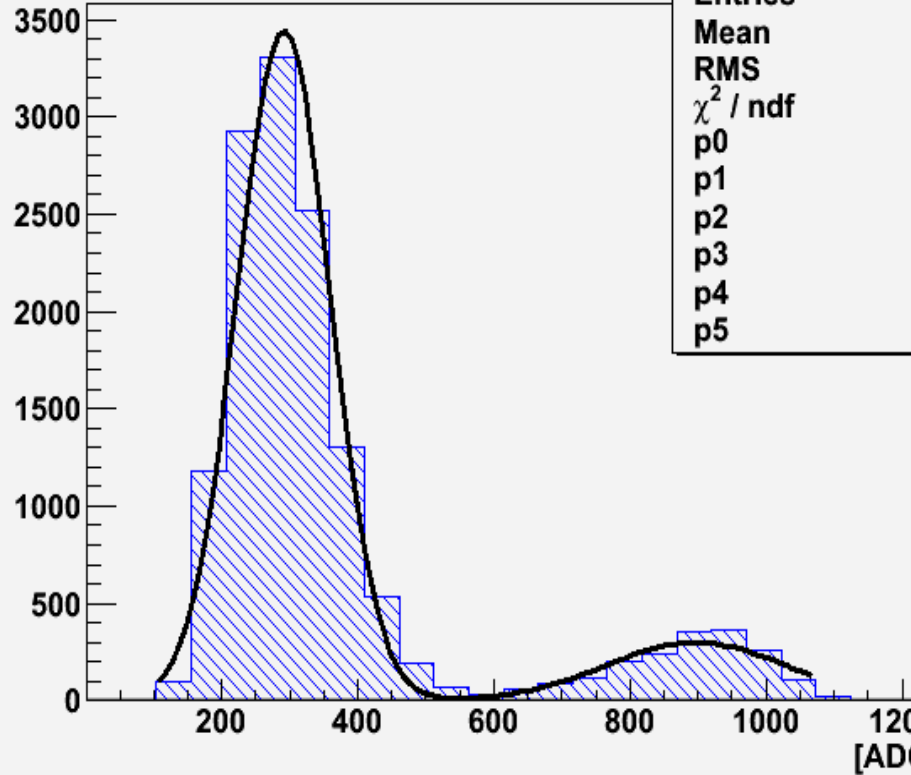
Type	Energy	Percentage
Alpha	5485 keV	84.5
Alpha	5443 keV	13.0
Gamma	59.5 keV	35.9
Gamma	26.3 keV	2.4
Gamma	13.9 keV	42

The dose from the Am241 after absorbing in the 50  $\mu\text{m}$  Al foil

Energy, keV	Am 241. rate, %	Al. Absorbed, %	Si. Absorbed, %	Si after Al from Am241. Absorbed, %
15	42	10	66	25
26	2,4	2,8	25	0,6
60	35,9	0,3	3,3	1,2

# Am241 Spectrum

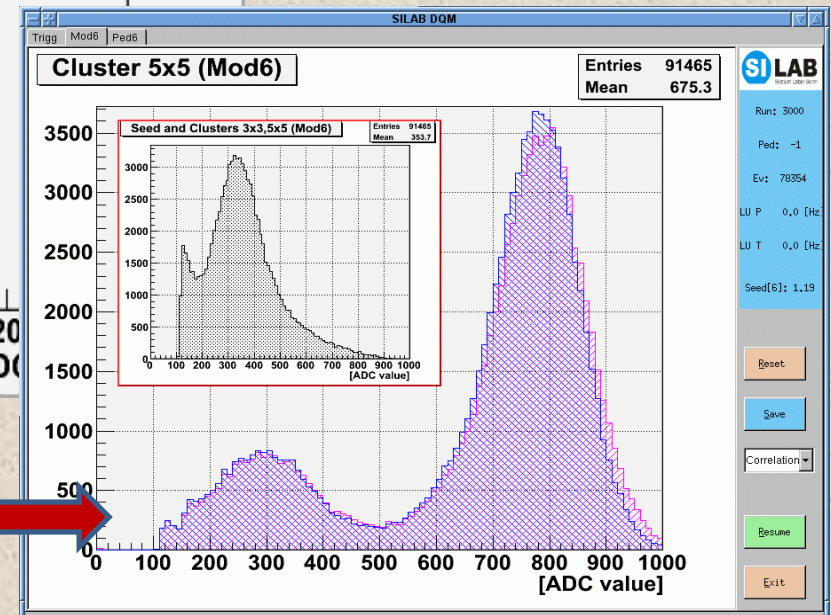
Cluster 3x3 (Mod4)



HCluster94

Entries	14007
Mean	370.3
RMS	215.4
$\chi^2 / \text{ndf}$	616.5 / 13
p0	$3441 \pm 40.9$
p1	$291.1 \pm 0.7$
p2	$68.57 \pm 0.52$
p3	$298.4 \pm 11.1$
p4	$897.2 \pm 3.8$
p5	$-131.9 \pm 5.2$

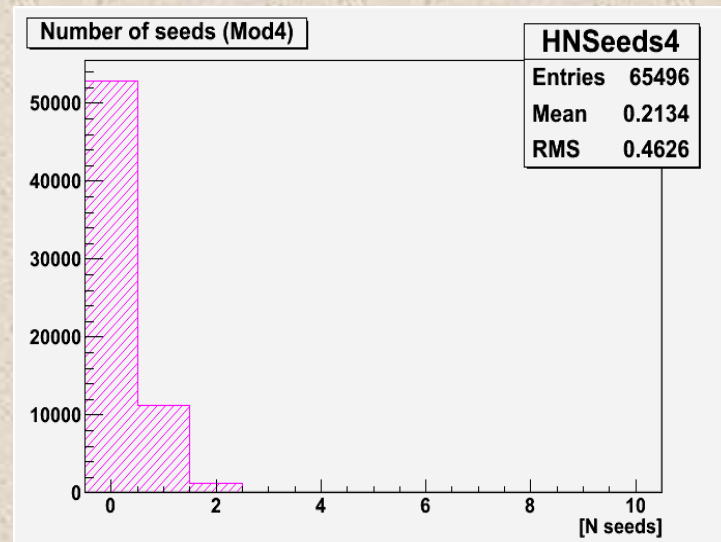
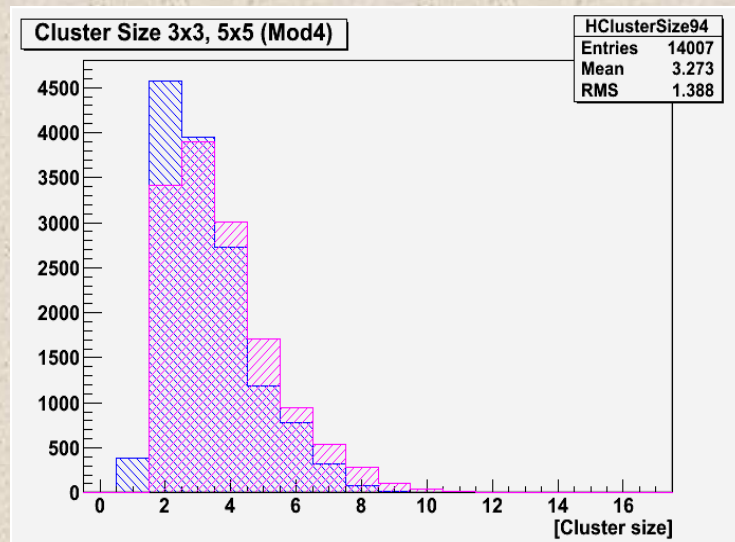
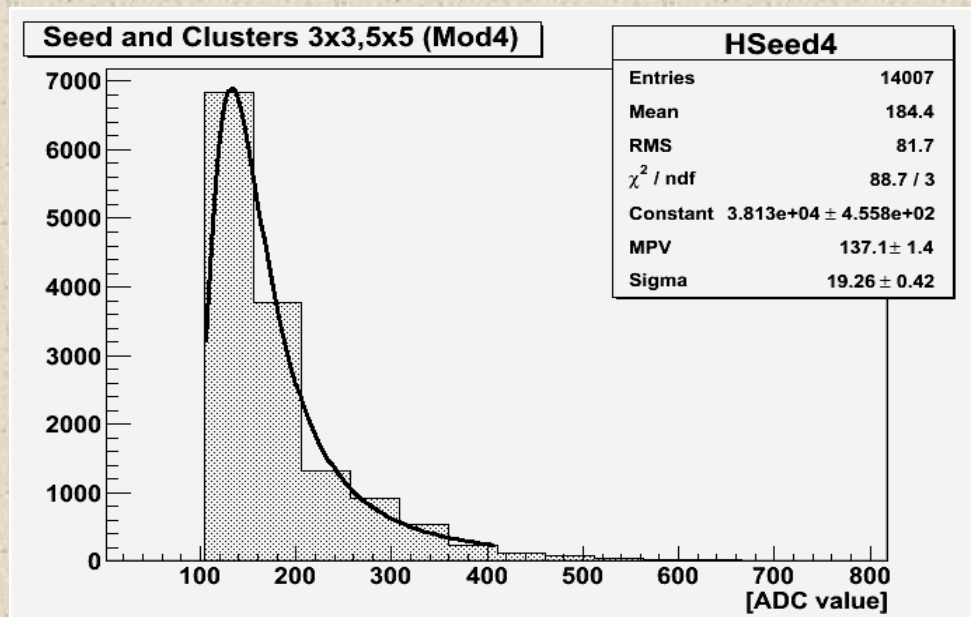
ratio p4/p1 is 3.08  
ratio p0/p3 is 11.5



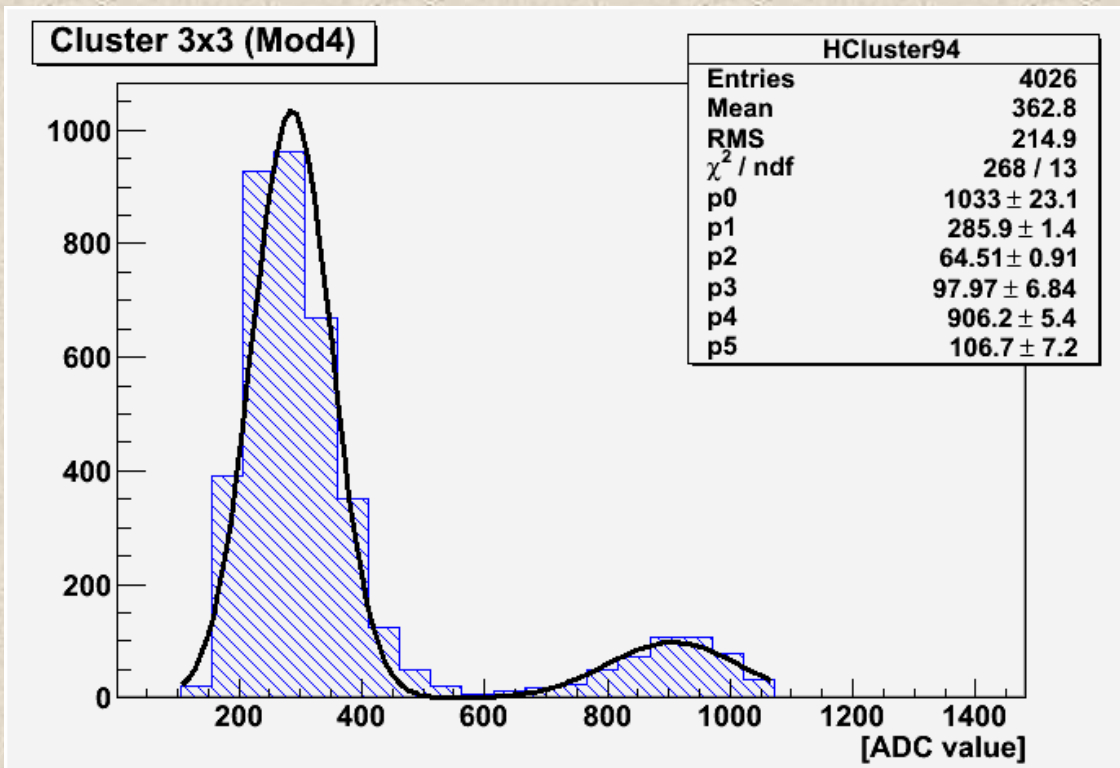
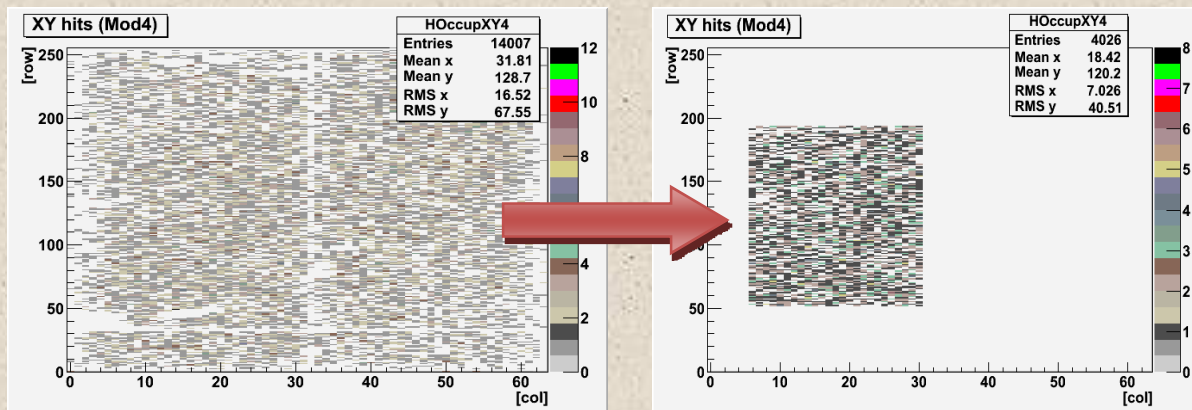
German's plot  
Mean values' ratio is 2.56  
Constants' ratio is 4.5 (but with  
the bigger second peak)



# Am241. Seeds & Clusters

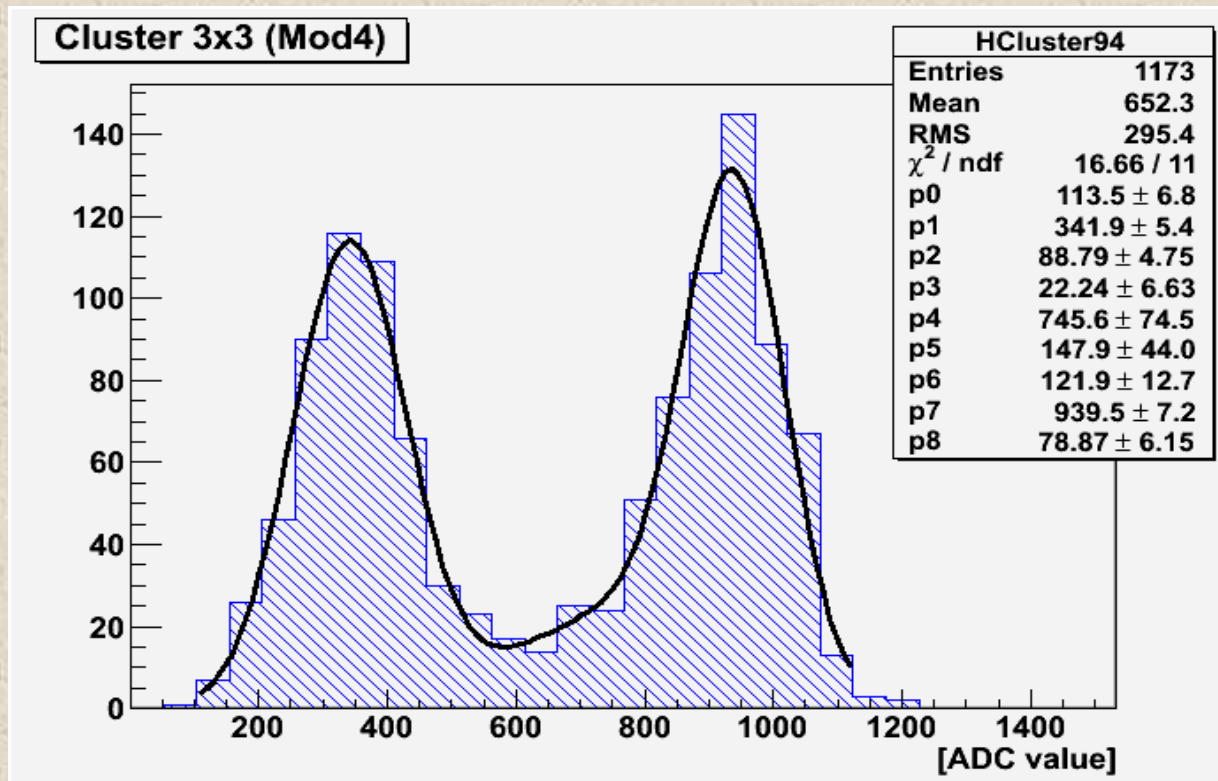


# Masking of biggest part



Ratio  $p_4/p_1$   
for the cluster  
3x3 is 3.17

# Matrix covering

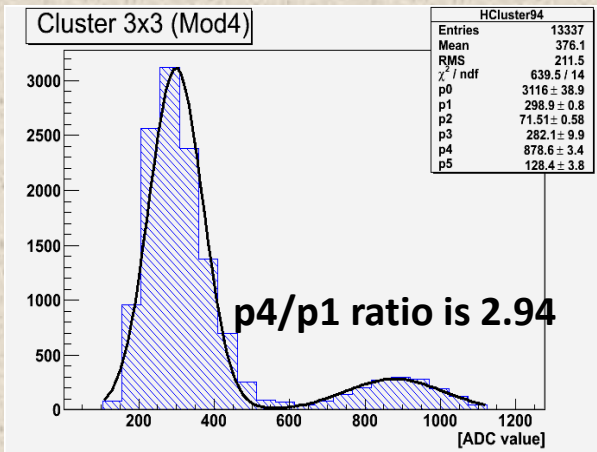


E, keV	Absorption for different Al thickness, %			
	50 $\mu\text{m}$	1.05 mm	2.05 mm	3.05 mm
14	25	2.9	0.34	0.04
26	0.6	0.34	0.2	0.11
60	1.2	1.1	1.02	0.94

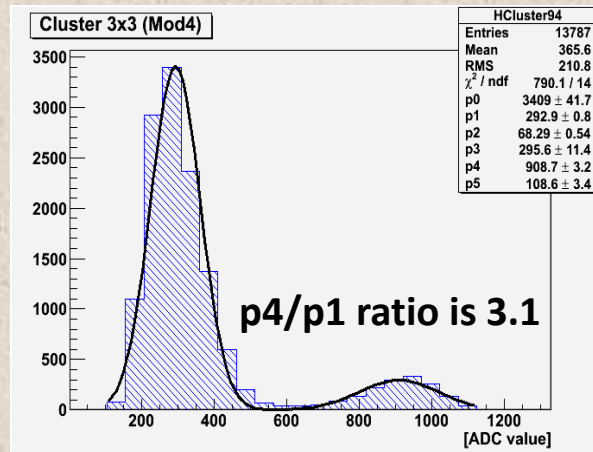
Ratio between the first and the last peak is 2.75

# Operating point selection

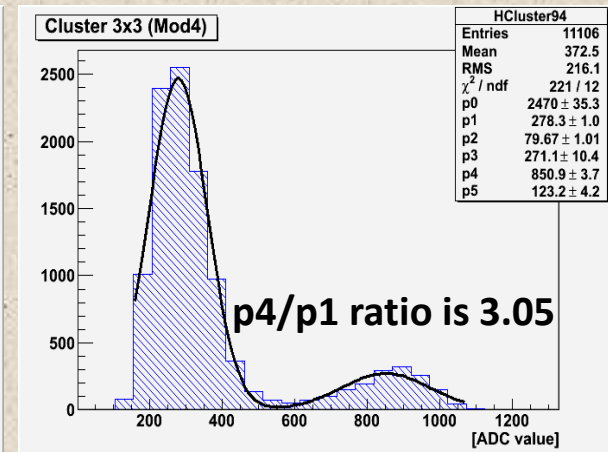
*Clear\_low* 9.5V (minimal)  
CCG is 5.9V



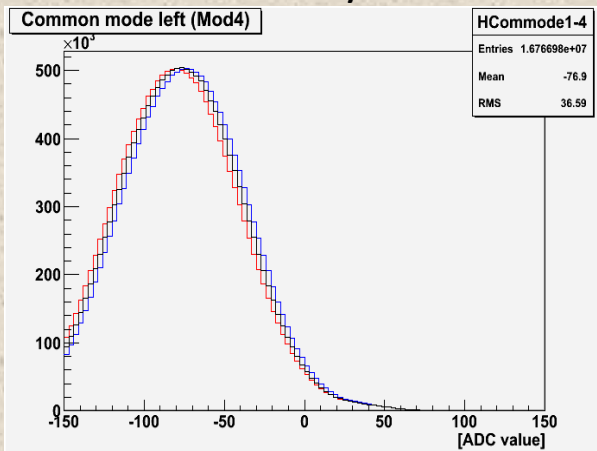
*Clear\_low* 9.5V (minimal)  
CCG is 6.2V



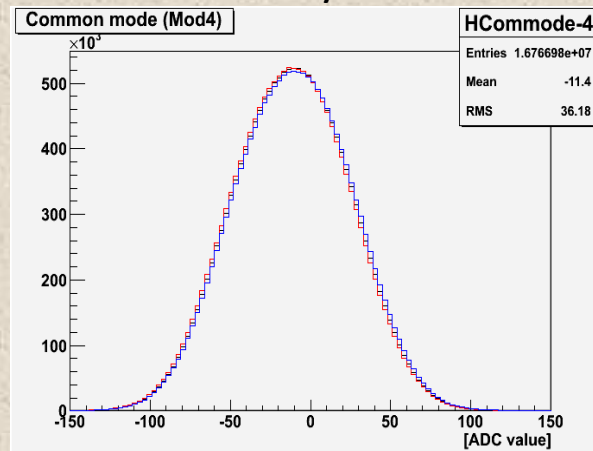
*Clear\_low* 10.2V (minimal)  
CCG is 6.8V



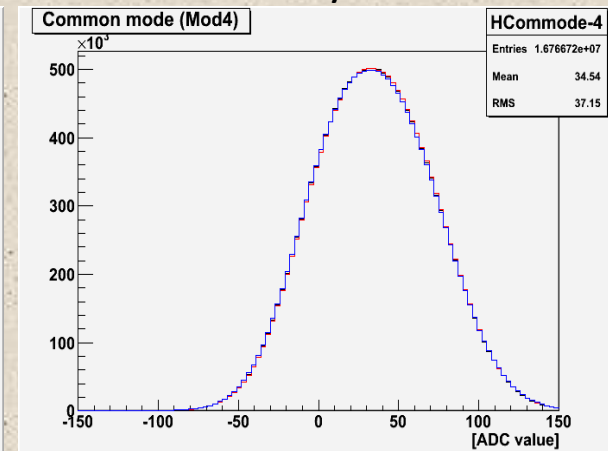
CM is shifted by -76.9 ADC



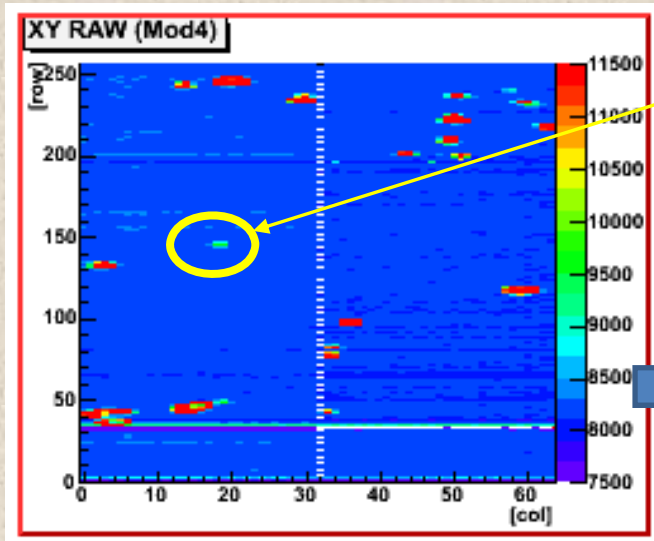
CM is shifted by -11.4 ADC



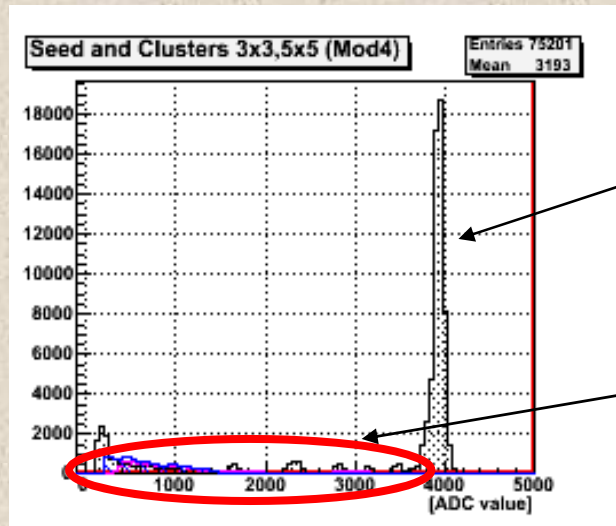
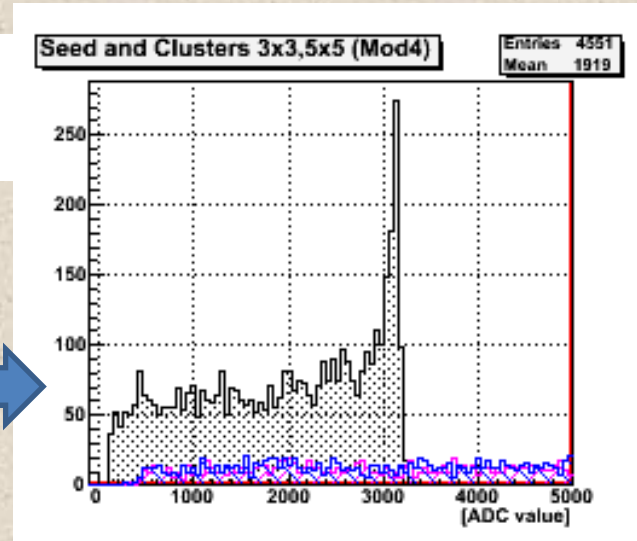
CM is shifted by 35.4 ADC



# Laser



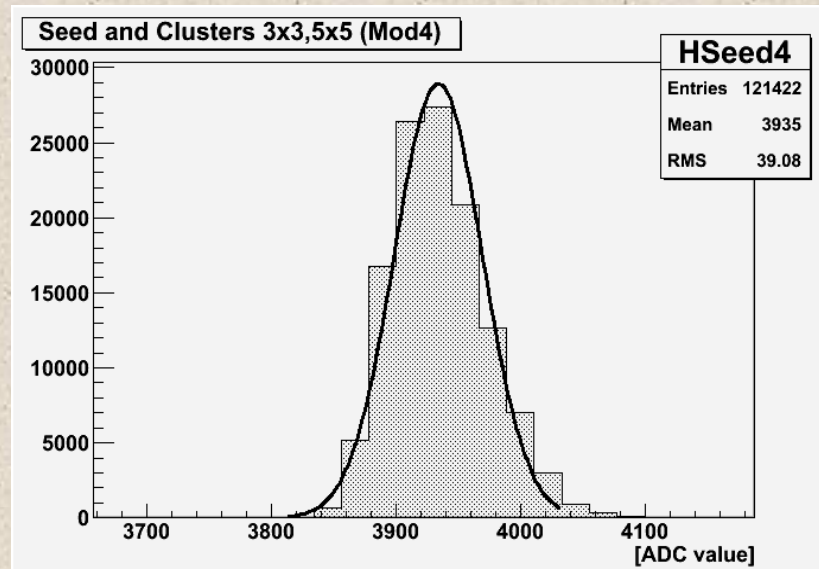
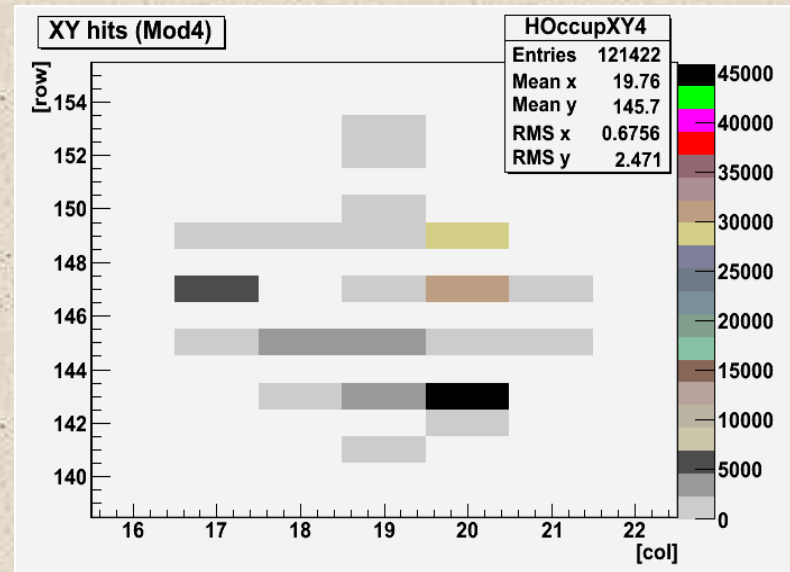
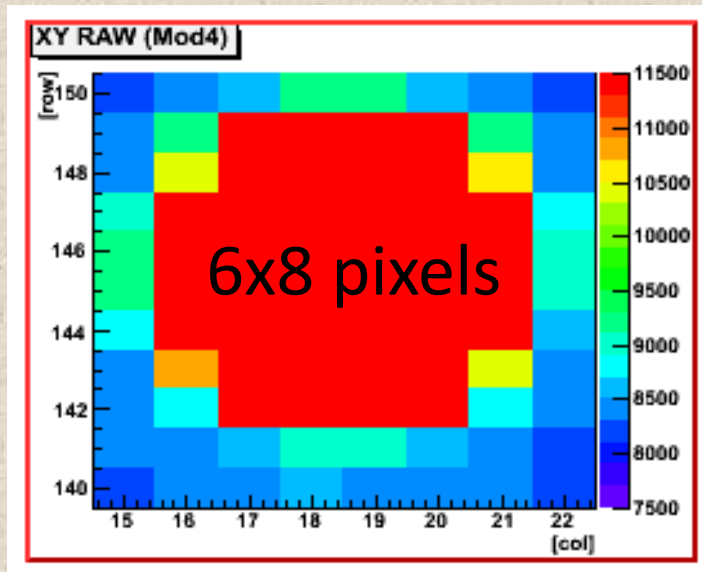
Light of the laser without a pulse



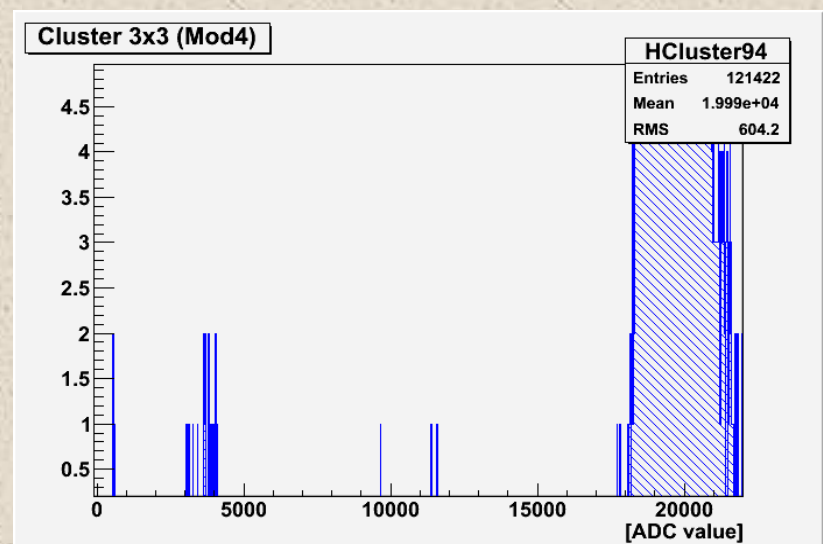
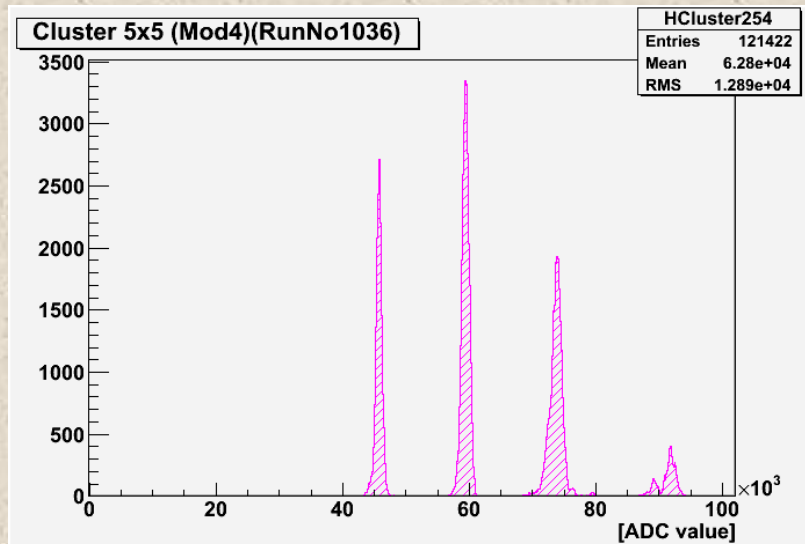
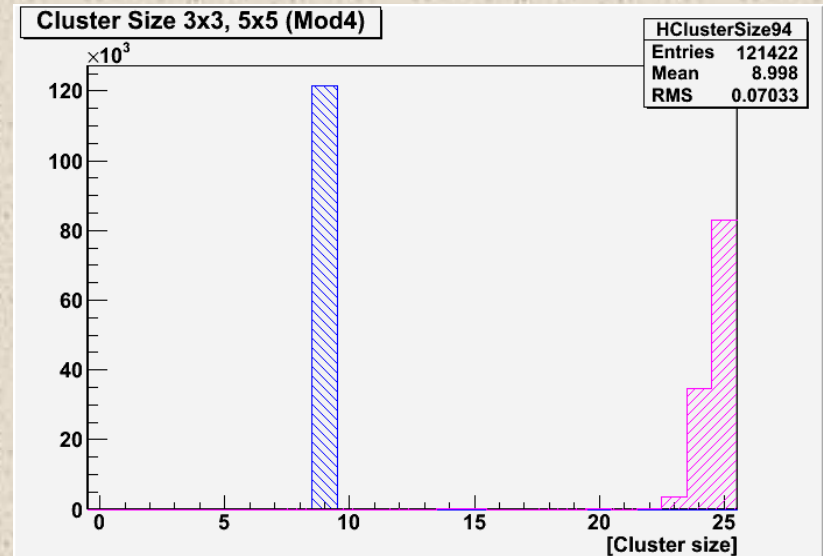
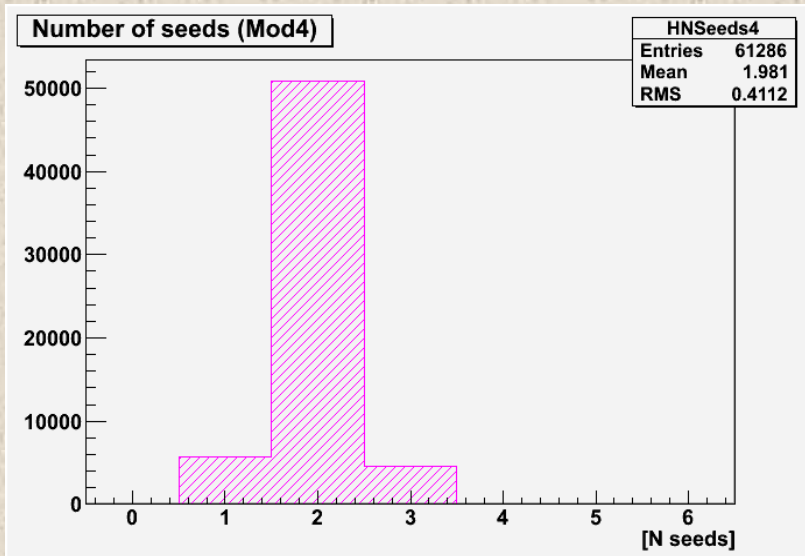
Seed peak of the laser

Noise of the laser emitting without a pulse

# Laser focusing



# Laser. Not correct data



# Conclusions:

1. Well estimated pedestals should be applied each time together with masking out of additional hot pixels;
2. There are three peaks in Am-241 spectrum, but it doesn't correspond to calculations, but rather well suits the data from other groups (Germans);
3. It is not possible to make significant shift of operating point selection by changing supplying voltages, because the matrix of class B;
4. Laser should be well focused with some changes in data acquisition software. And only after that we will be able to analyze data from it.