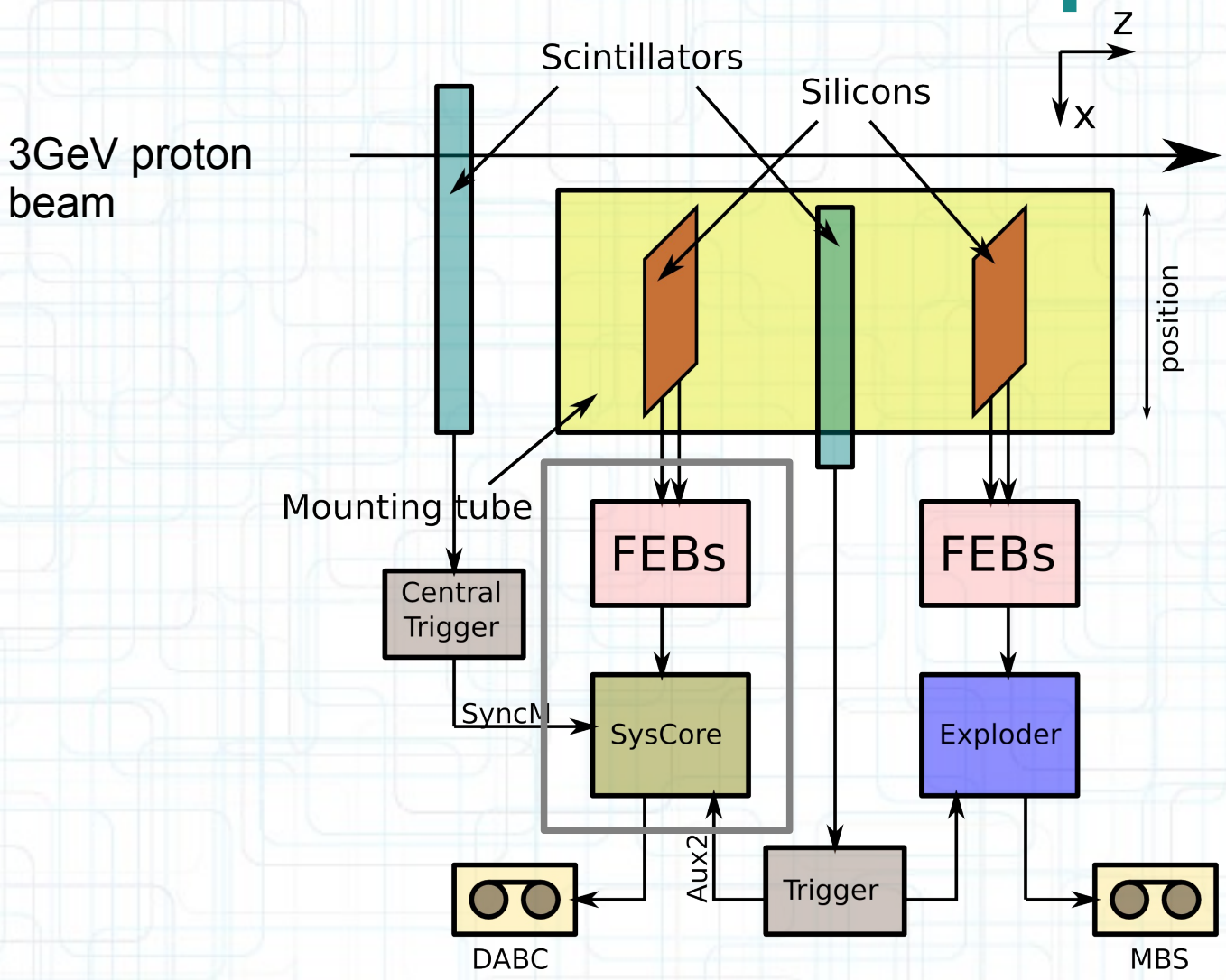
Silicon tests in Jülich – Nov11
22.11-28.11

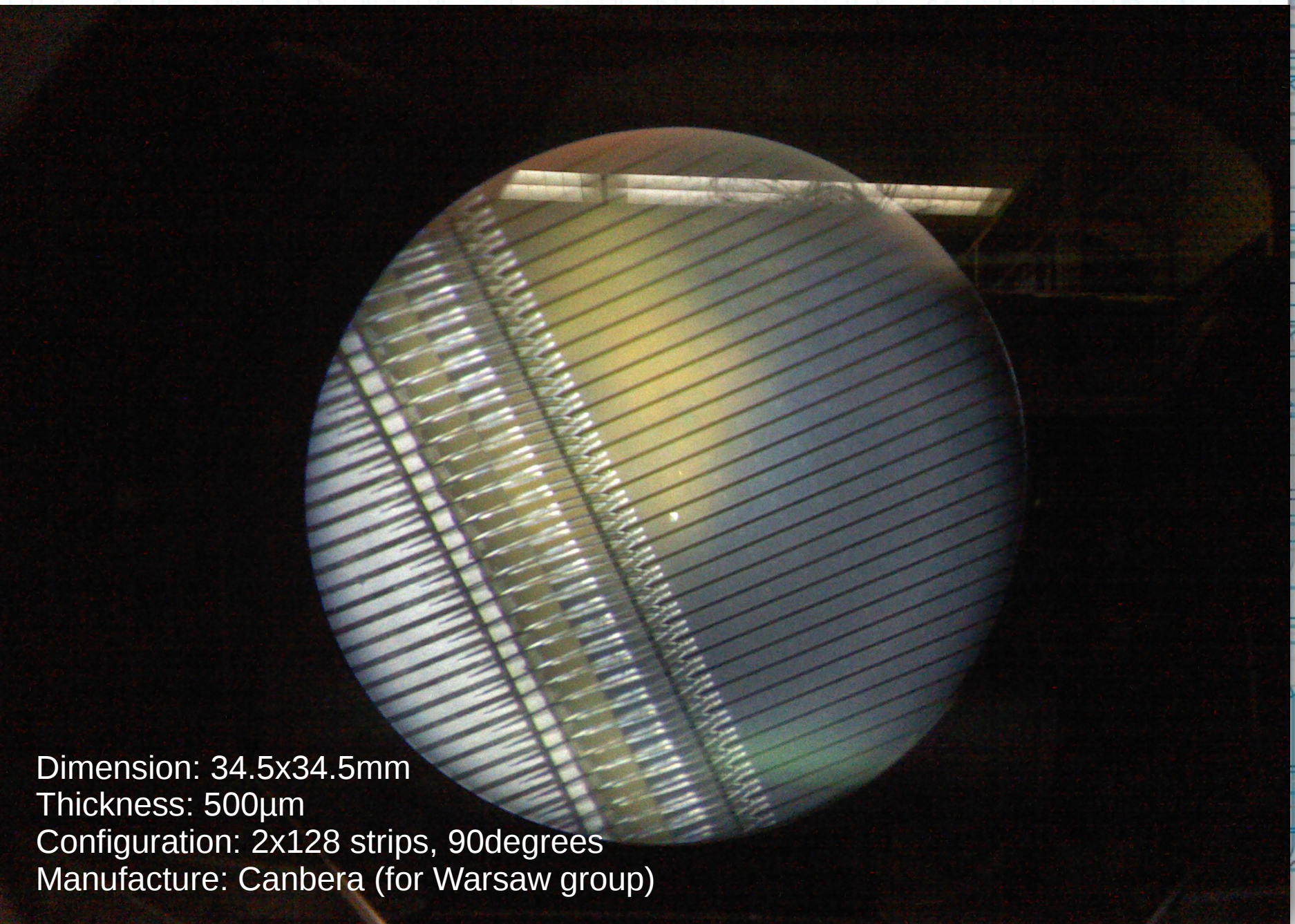
Experiment goals

- Test of Exploder readout under beam conditions (Piotr K.):
    - Detection efficiency for both sides of the detector
    - Comparison with SysCore setup
- Tests of SysCore readout with FEE (RL, EE)
- Tests of FEB with silicon detectors
- MIP signal from silicon's performance

Beam line setup

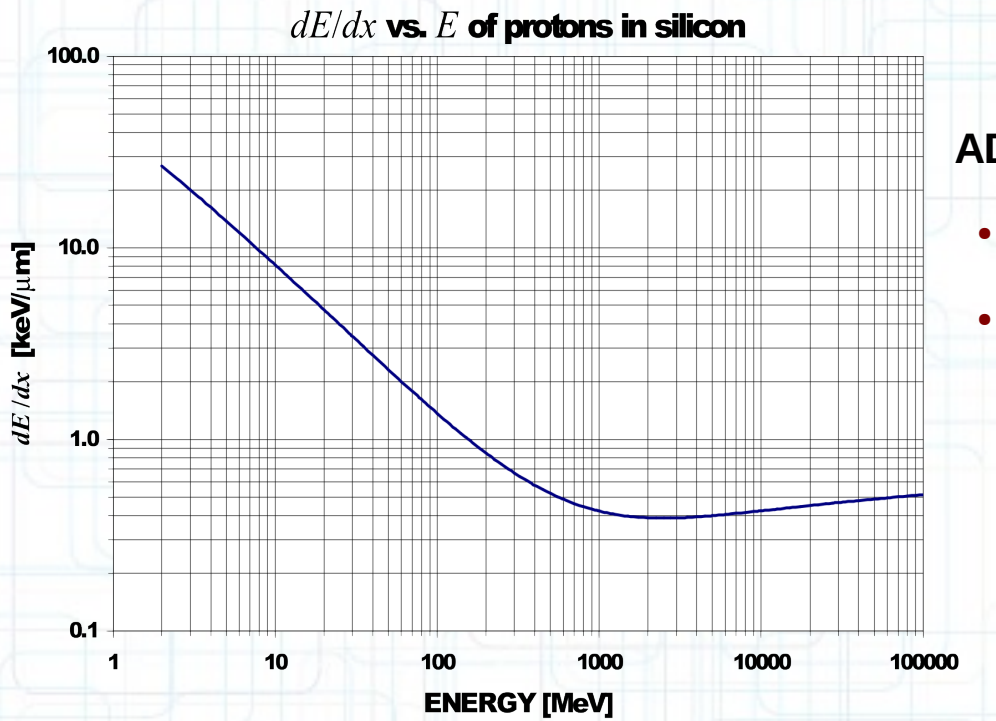


Silicon detector



Dimension: 34.5x34.5mm
Thickness: 500µm
Configuration: 2x128 strips, 90degrees
Manufacture: Canbera (for Warsaw group)

Basics



Introduction to Radiation Detectors and Electronics, 21-Jan-99 *Helmuth Spieler*
III. Energy Deposition in the Detector and Spectrum Formation

ADC properties

- 14 bits
- 1 ADC value ≈ 110 electrons

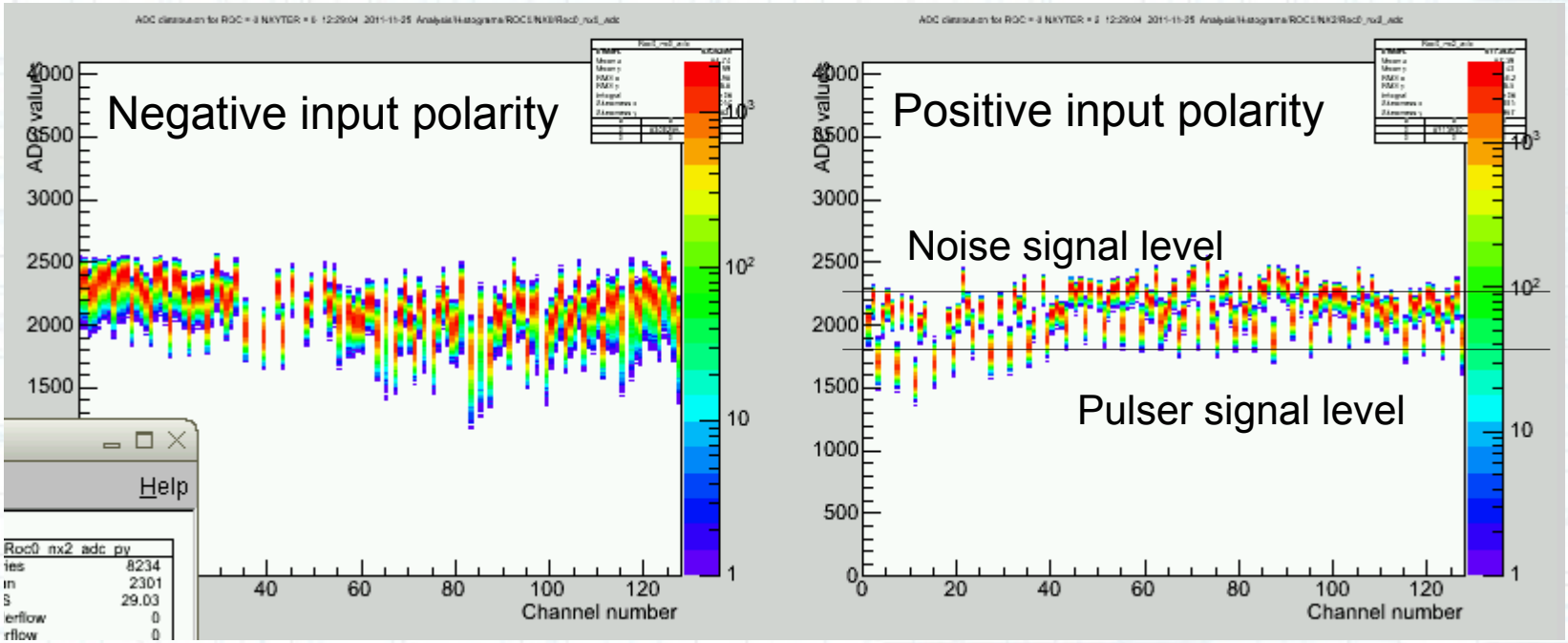
dE/dx for 3GeV protons in silicon	0.4 keV/µm	
Detector thickness	500 µm	300 µm
Energy deposition	200 keV	120 keV
Number of generated pairs (3.6 eV/pair)	56000	33000
ADC value position in compare to noise peak	-510	-300

Noise and pulser

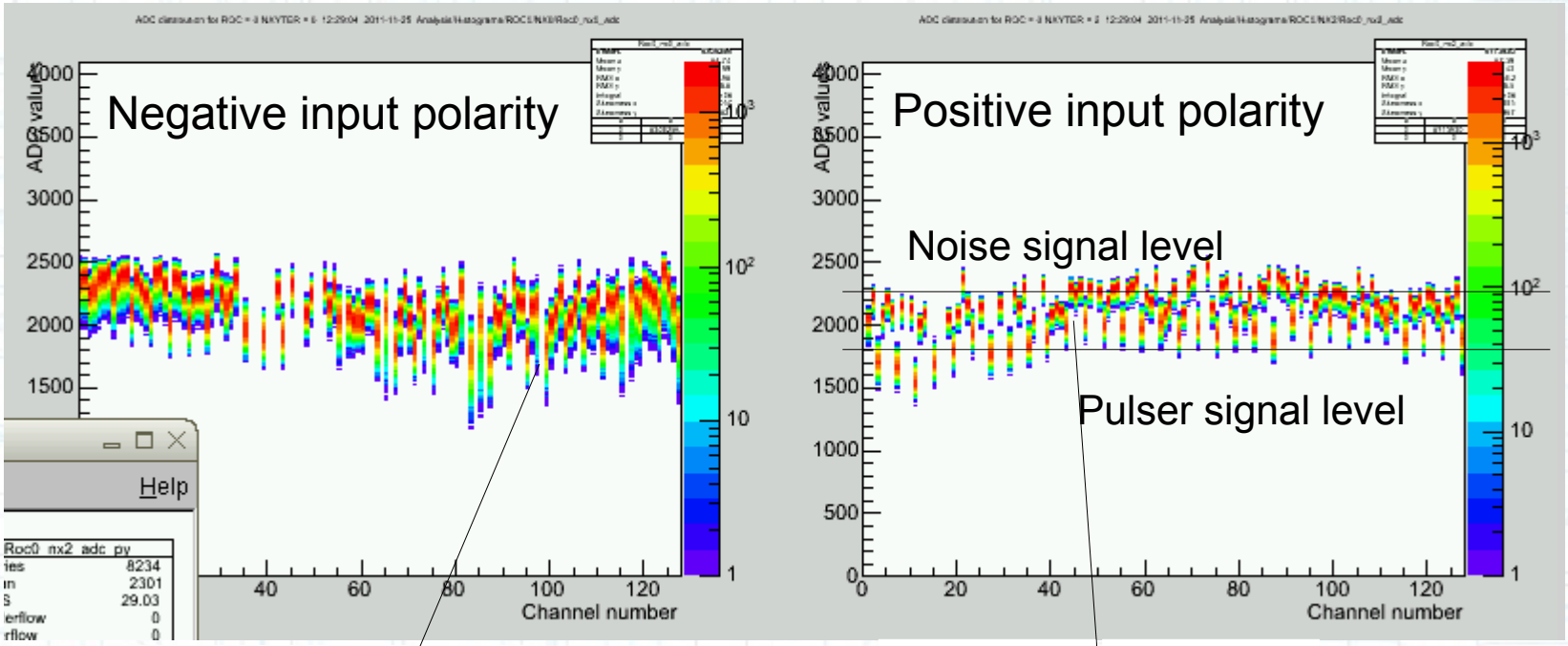
- n-XYTER operated in forced-Triggered mode with pulser
- Pulser set to

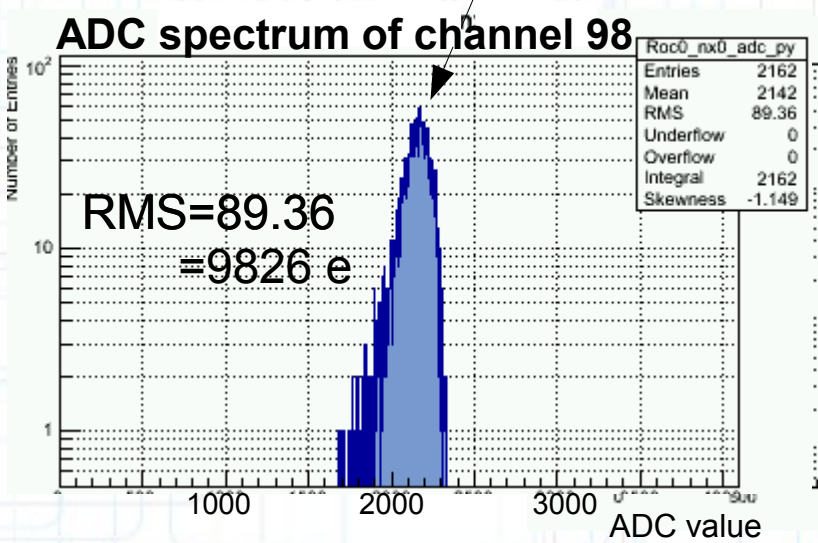
  11.1fC input charge
  = 69000 electrons
  = 1.2 MIP for protons in 500µm Si

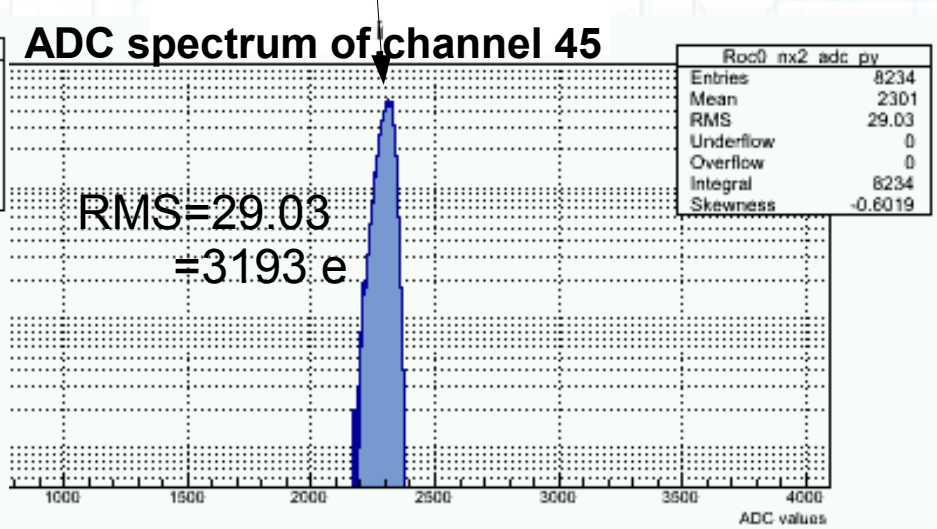
Noise and pulser



Noise and pulser

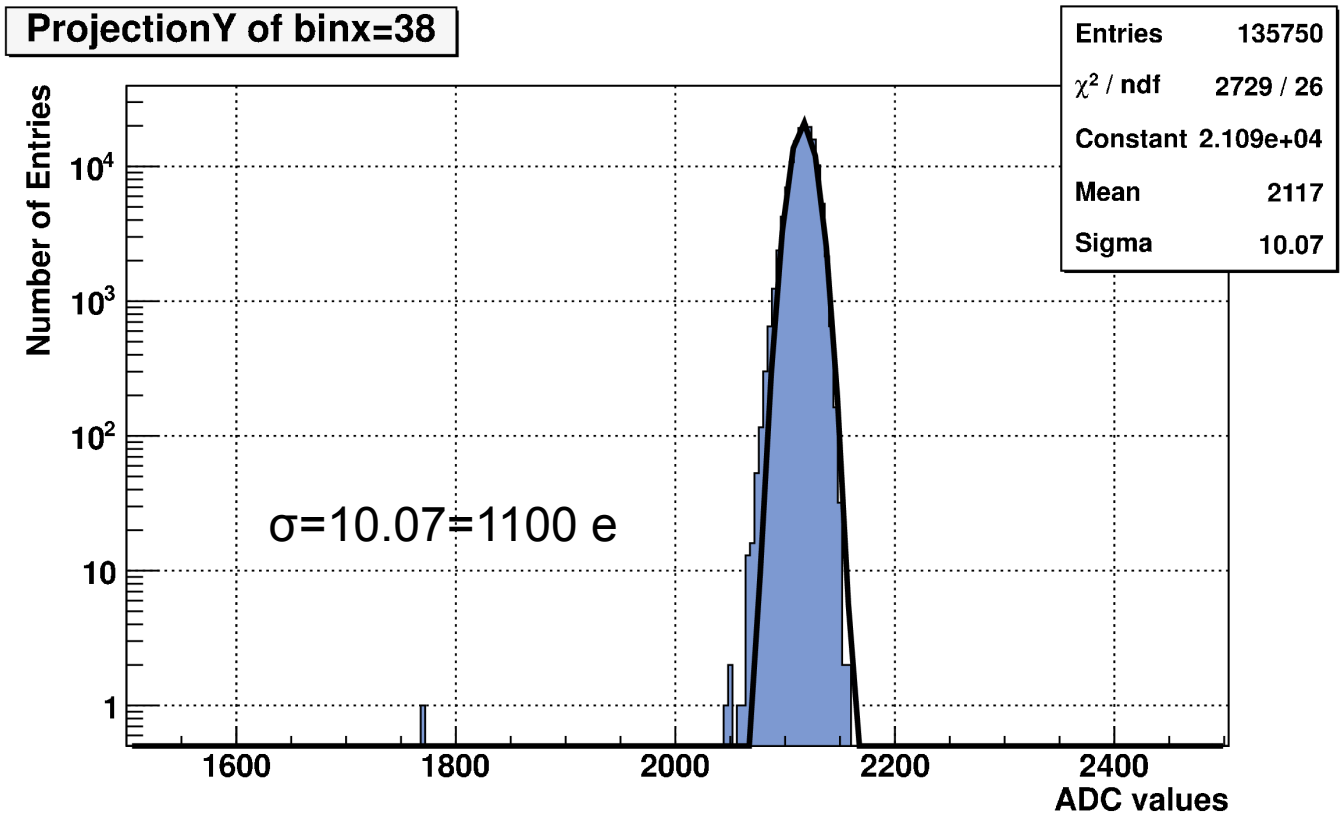






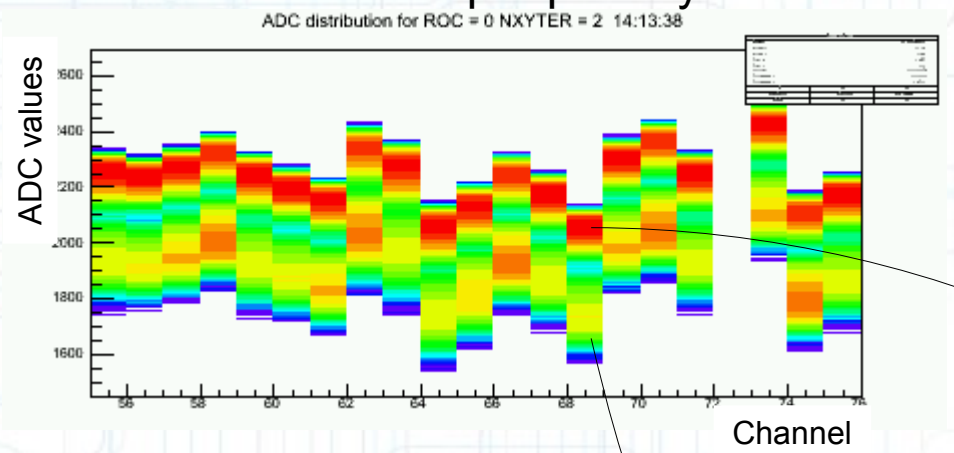
Noise and pulser

But there is still room for improvement



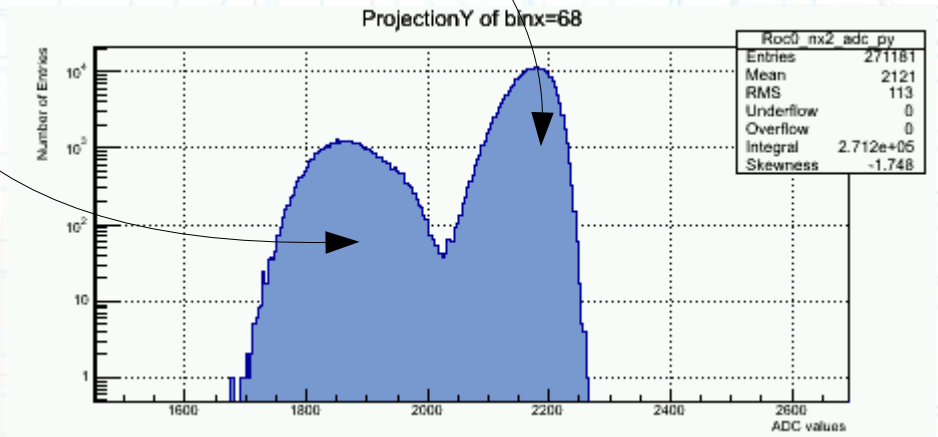
Noise and pulser

Positive input polarity



Noise

Pulser



1.2MIP

ADC values

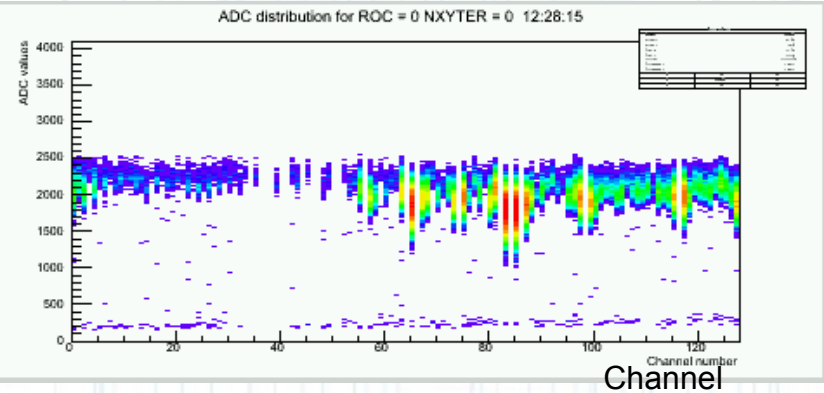
Pulser mixed with noise
in force-trigger mode

Main trigger correlations

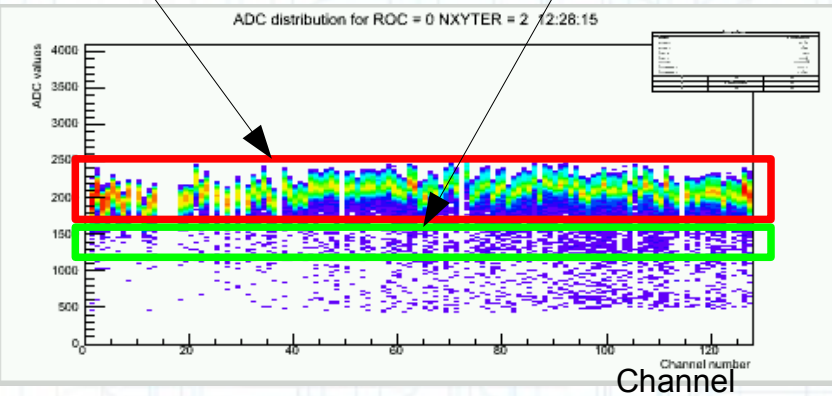
System trigger given on SYNC_M

Expected noise

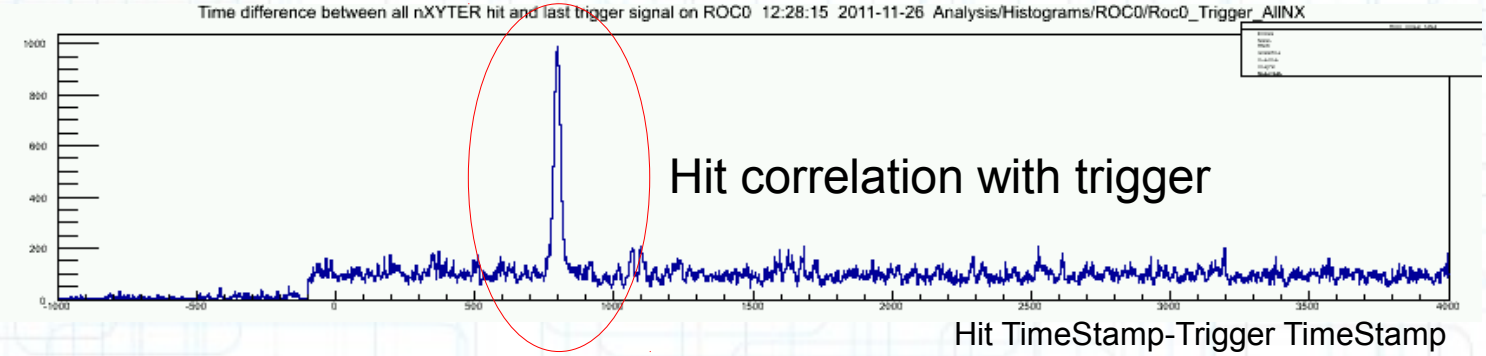
Expected signal



Channel



Channel

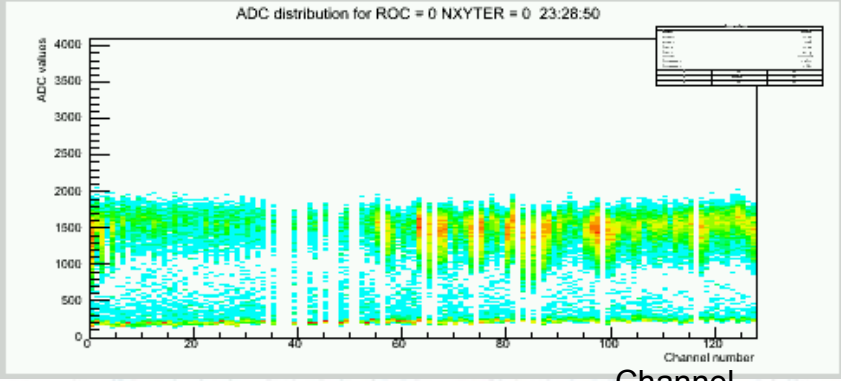


Hit TimeStamp-Trigger TimeStamp

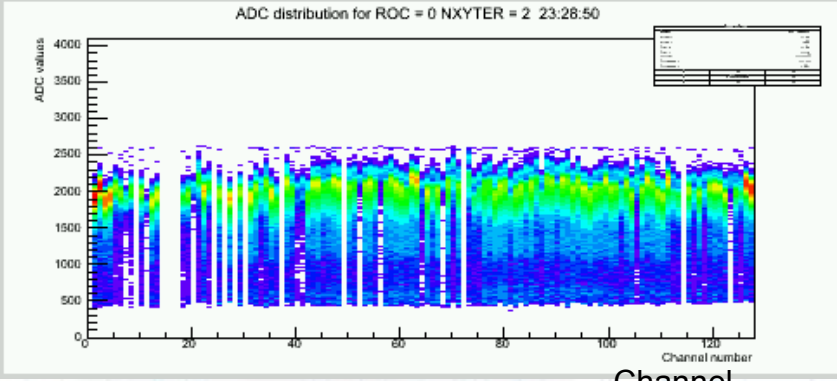
Clearly visible correlation with trigger on top of flat noise distribution.

Main trigger correlations

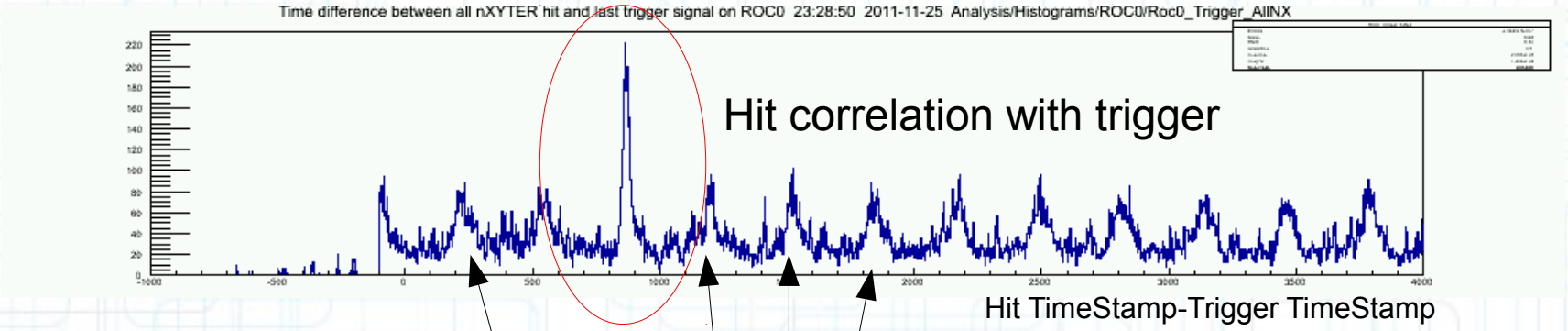
Threshold set to 0!



Channel



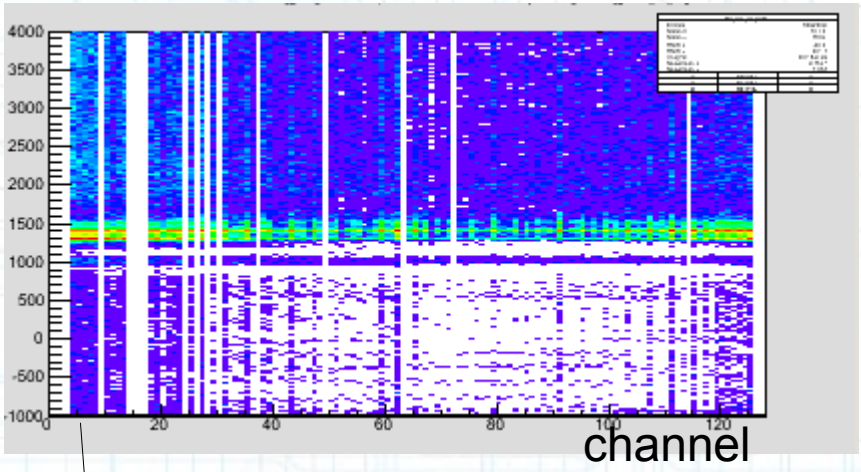
Channel



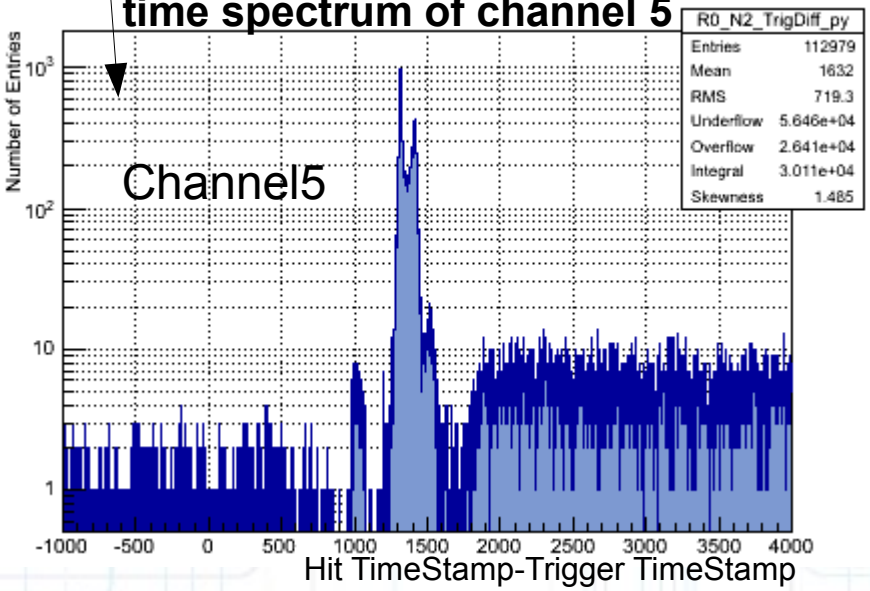
Strange structure probably due to buffer overflow?
Spill/beam structure? - needs more info.

“Helper” trigger correlations

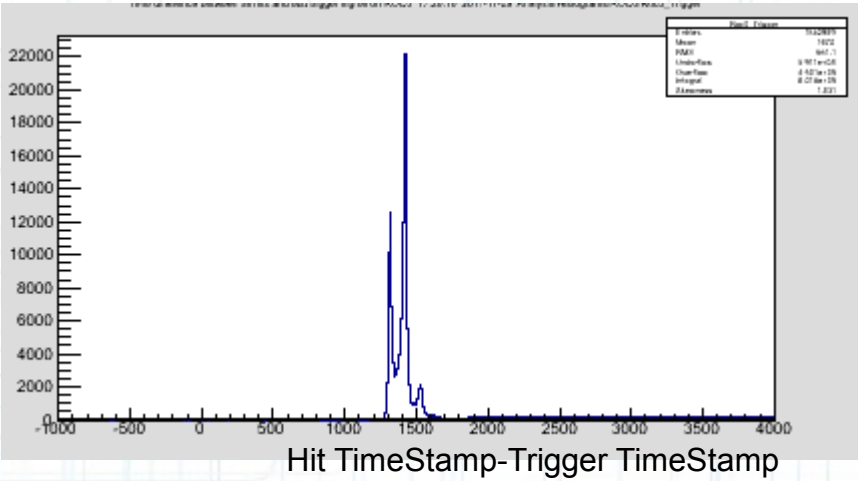
“Private” trigger given on Aux2



time spectrum of channel 5

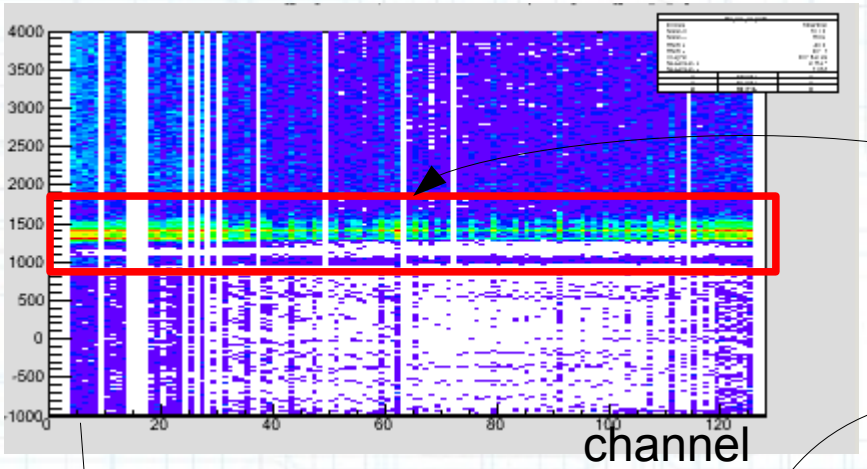


time spectrum of all channels



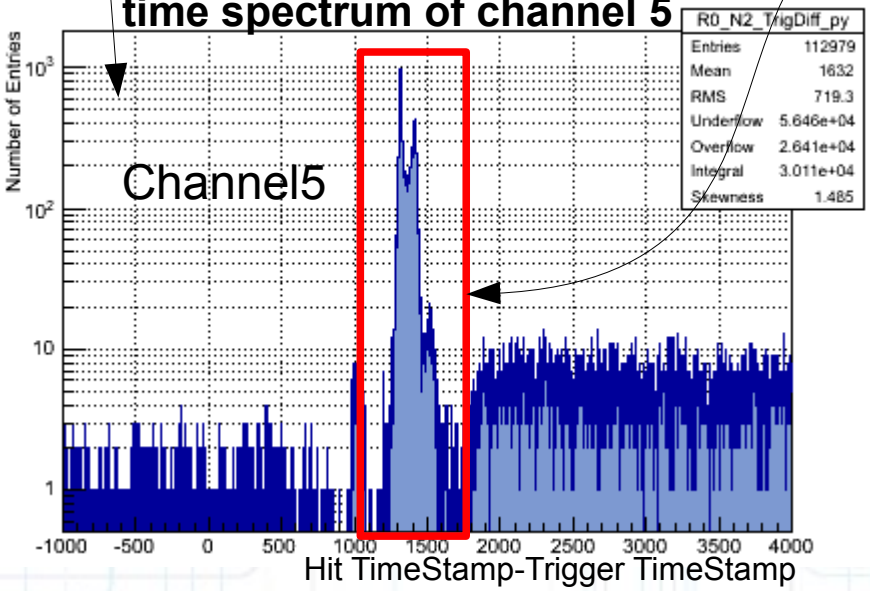
“Helper” trigger correlations

“Private” trigger given on Aux2

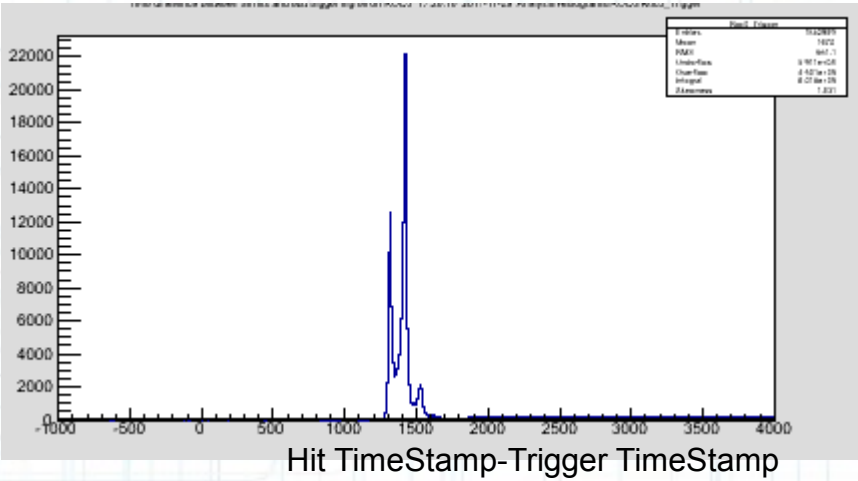


~Time-correlation cut range

time spectrum of channel 5

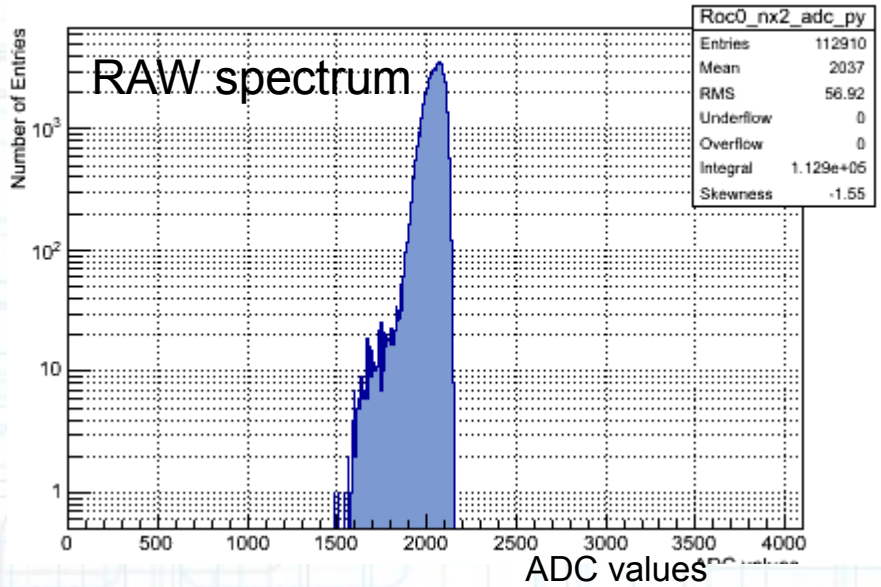


time spectrum of all channels



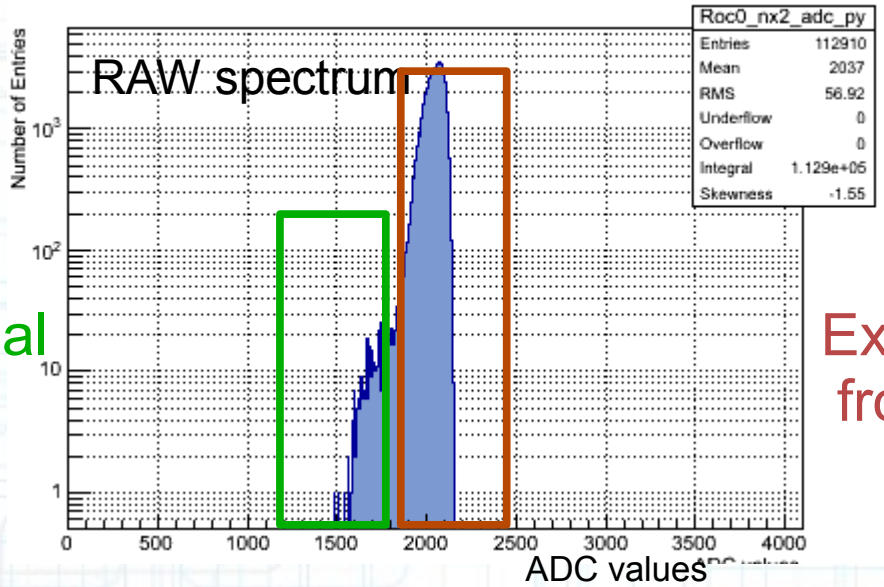
“Helper” trigger correlations

Exapmle for channel 5



“Helper” trigger correlations

Exapmle for channel 5

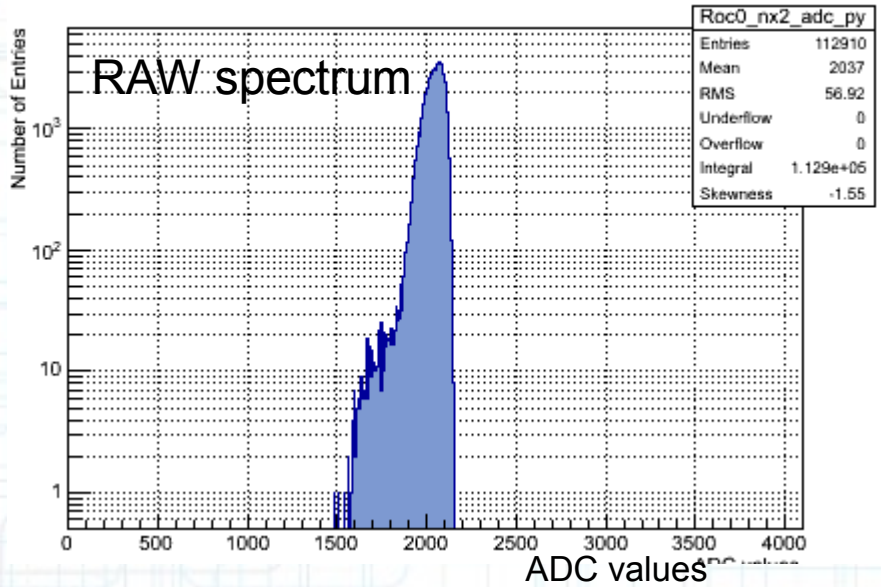


Expected signal from Protons

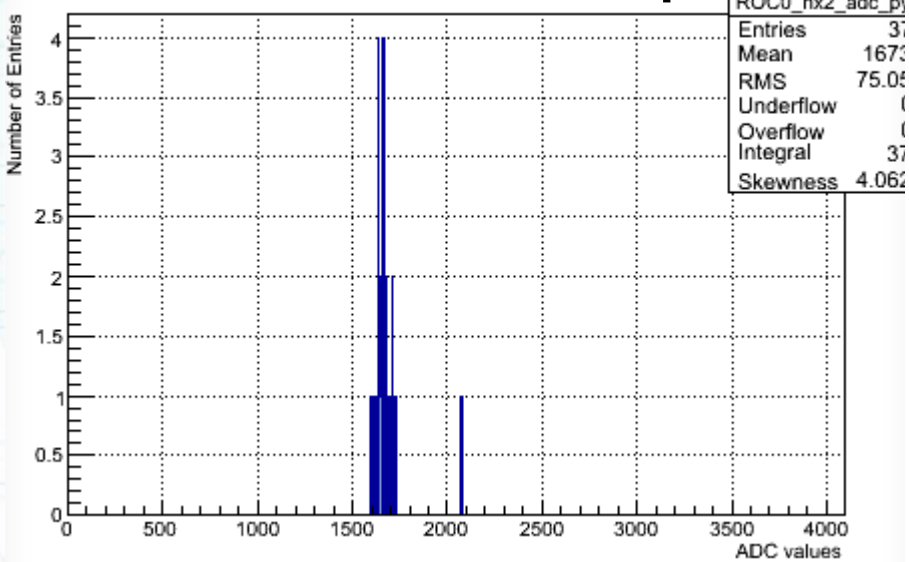
Expected signal from Noise

“Helper” trigger correlations

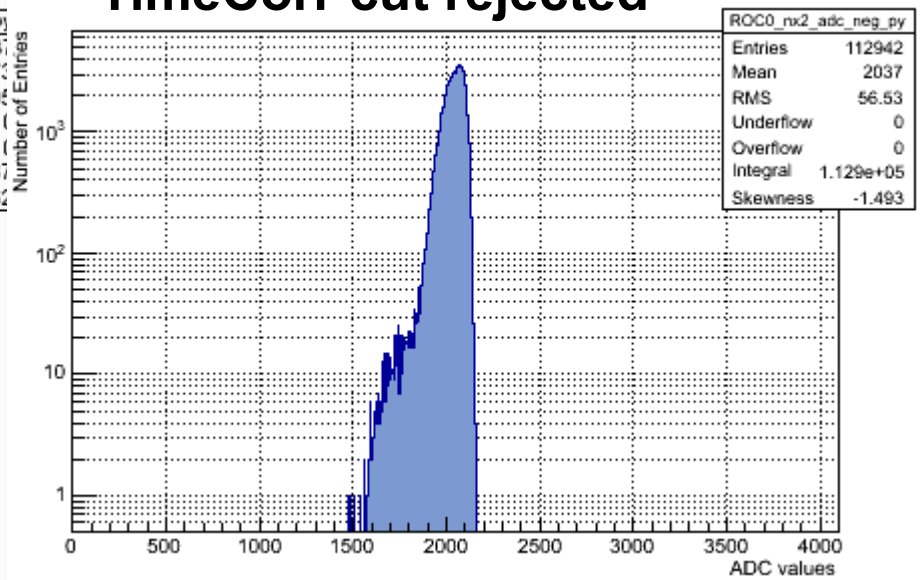
Exapmle for channel 5



TimeCorr cut accepted

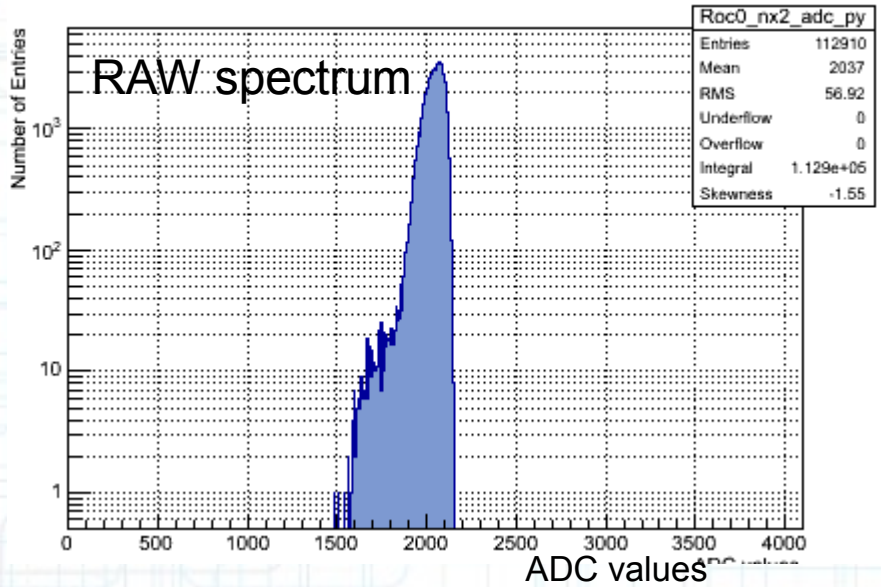


TimeCorr cut rejected

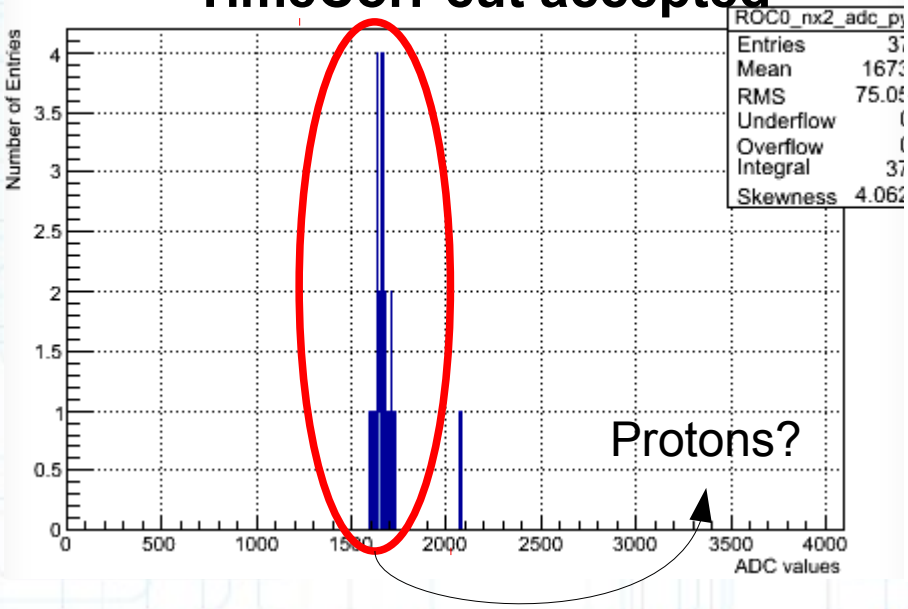


“Helper” trigger correlations

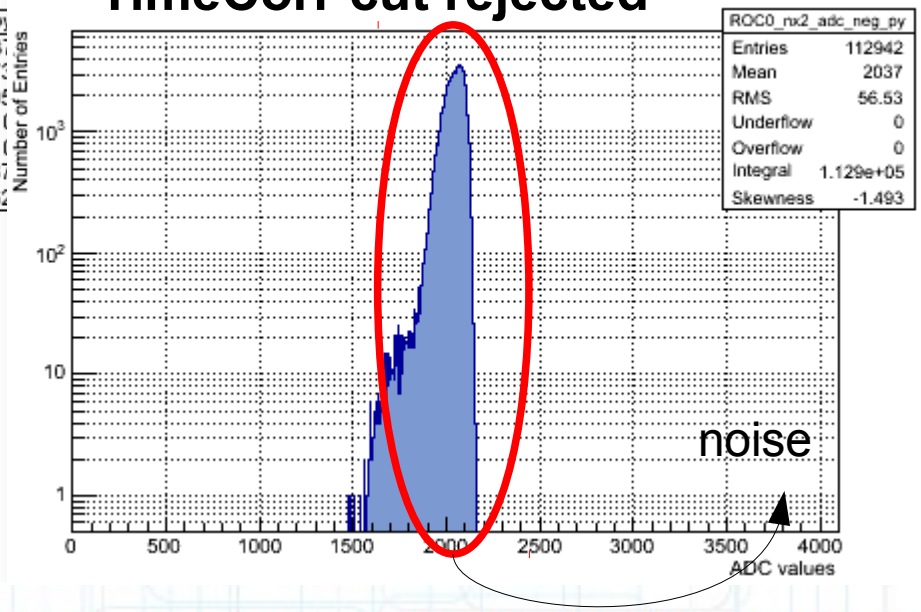
Exapmle for channel 5



TimeCorr cut accepted

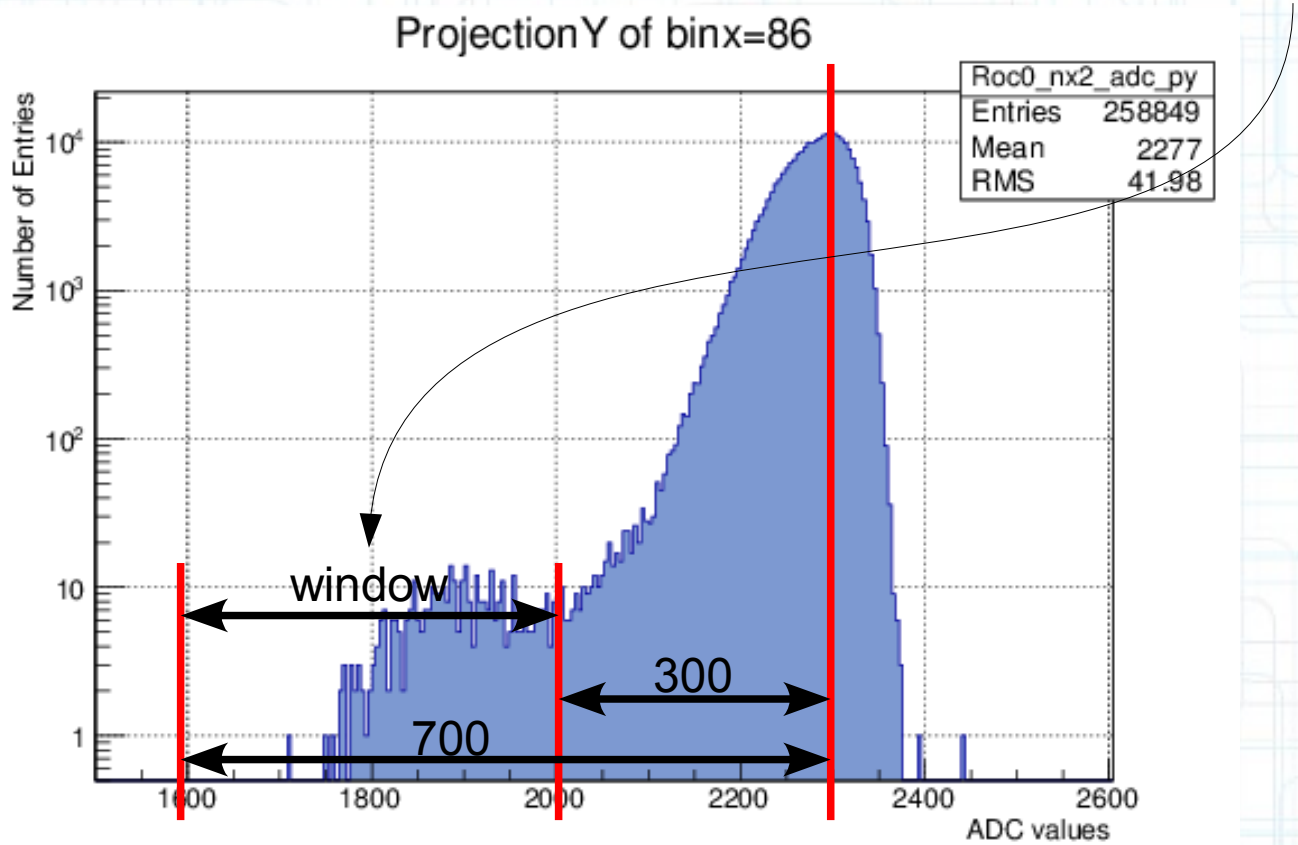


TimeCorr cut rejected



ADC spectrum cuts

- File 0227 (Saturday, 26.11)
- Trigger: Aux2
- Cut on ADC spectrum in window [noise-700; noise-300]



ADC spectrum cuts

- File 0227 (Saturday, 26.11)
- Trigger: Aux2
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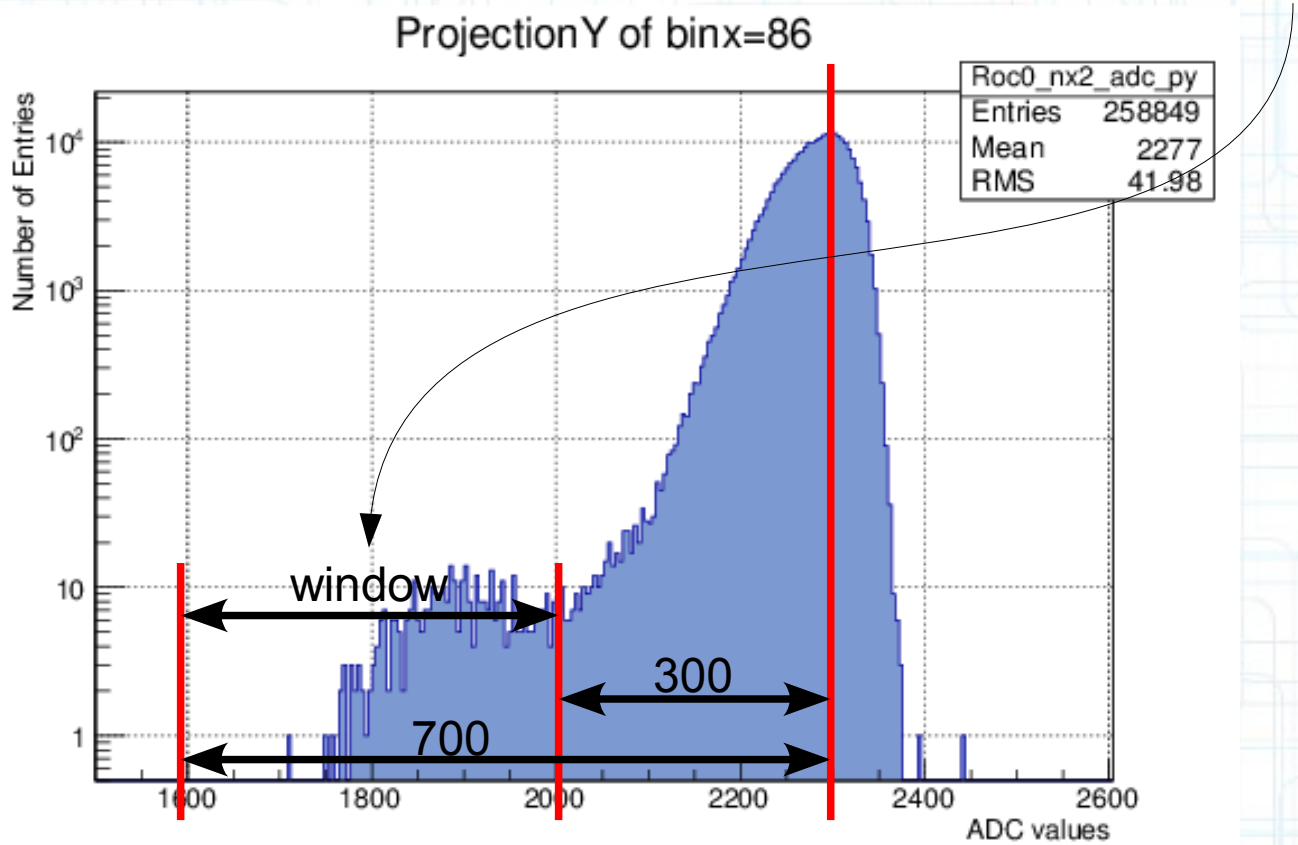
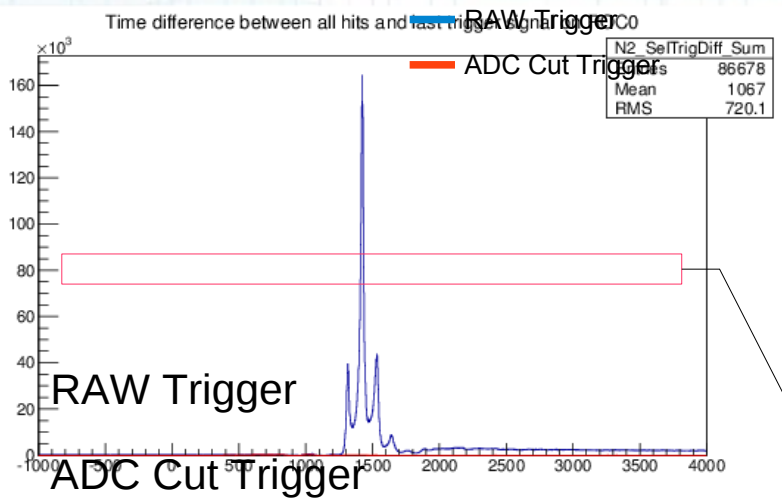
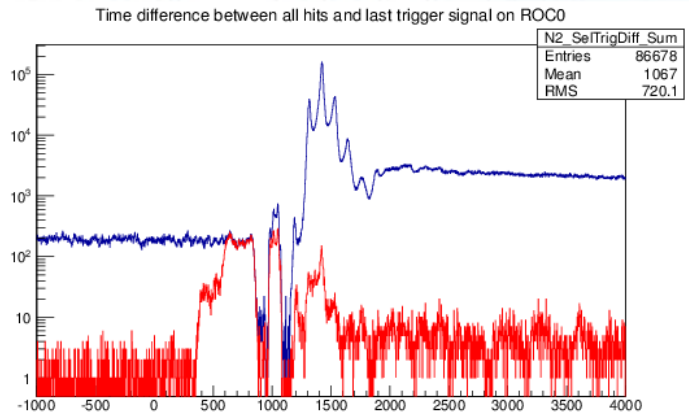
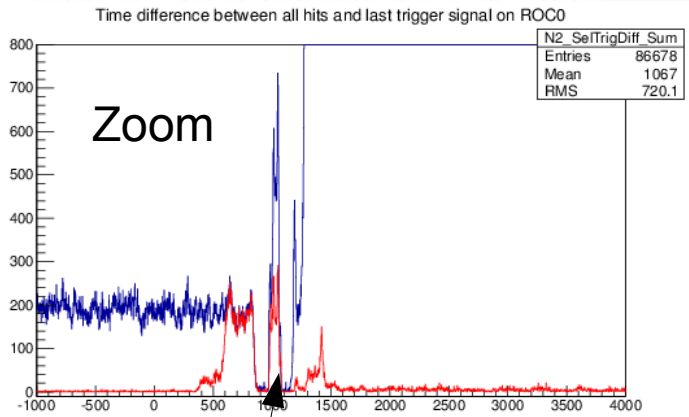


ADC spectrum cuts



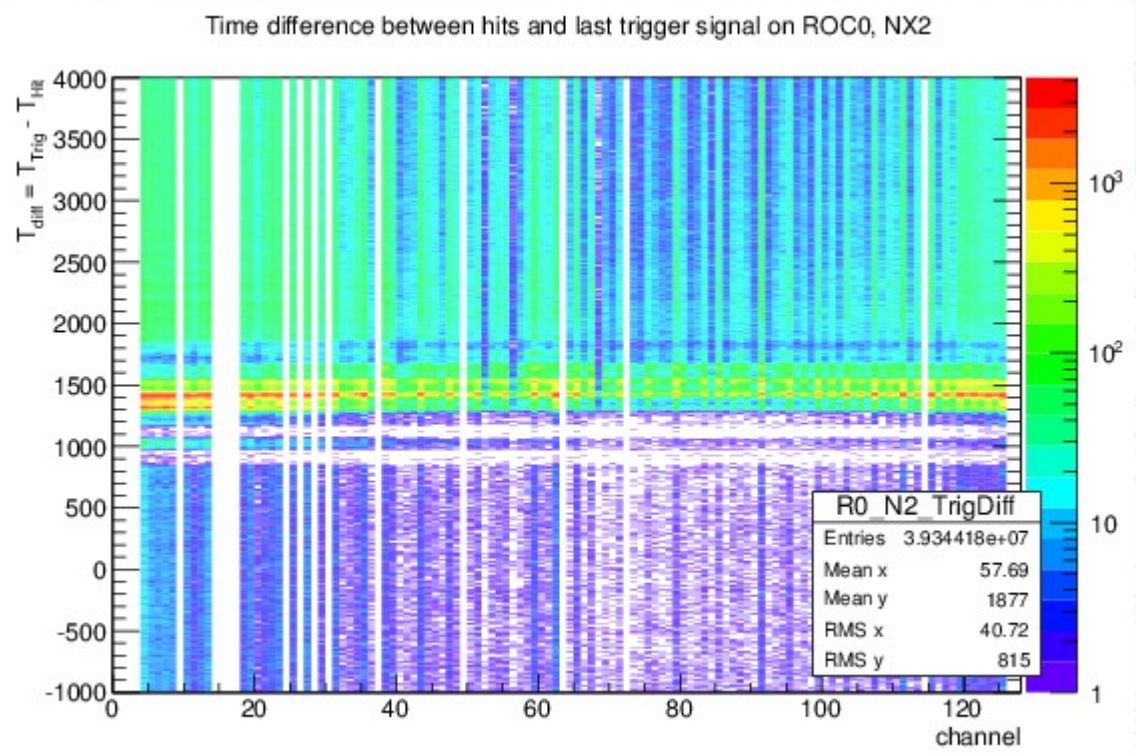


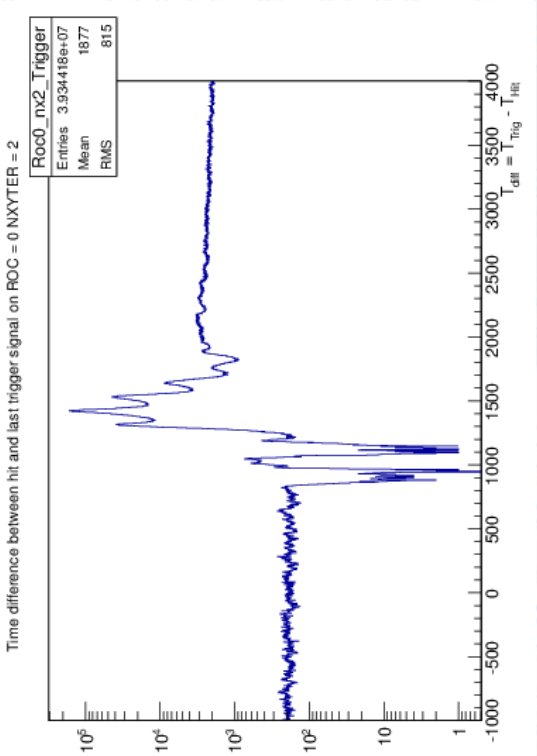


Why no correlation with dominating peak?

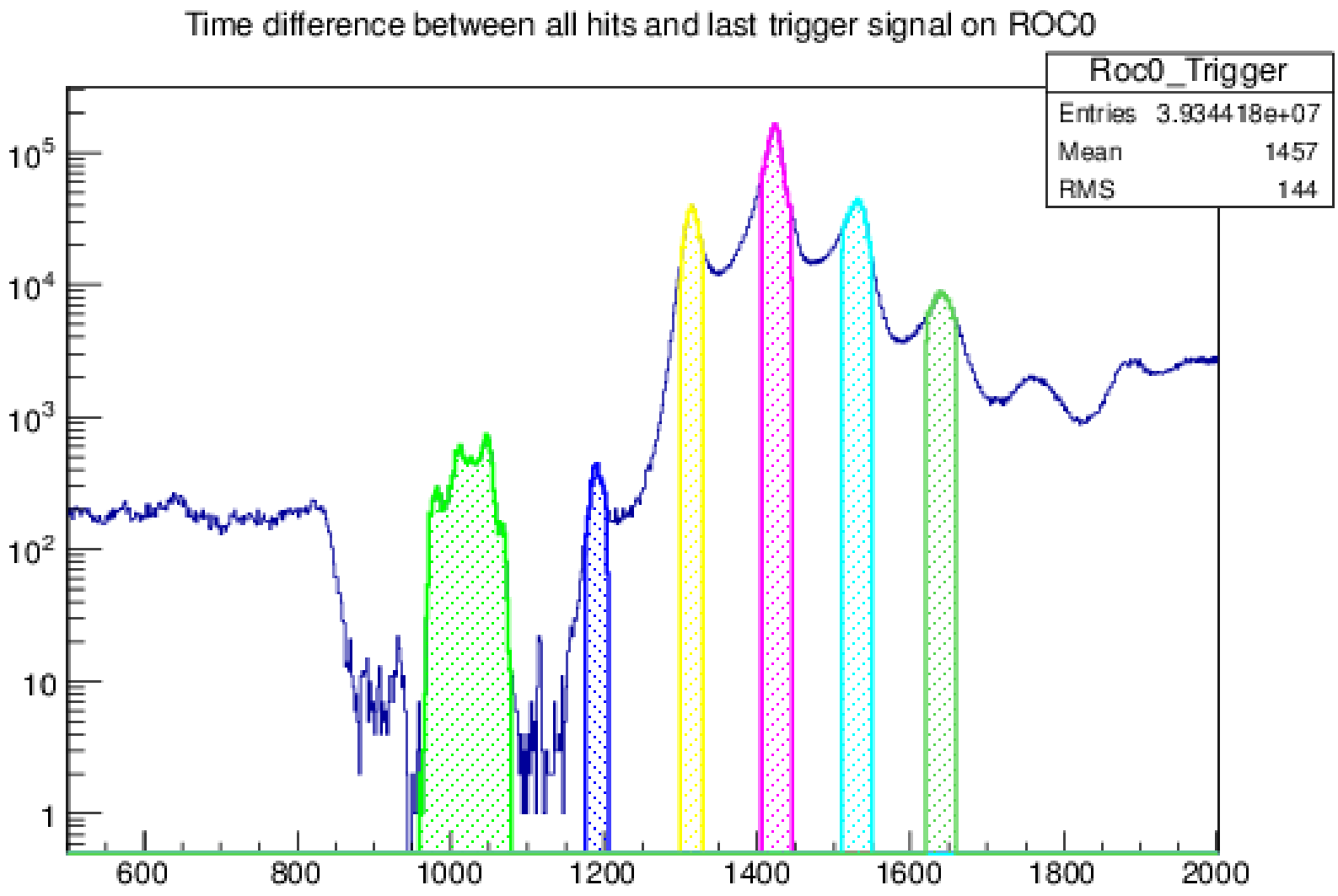
Pulser?

Trigger cuts

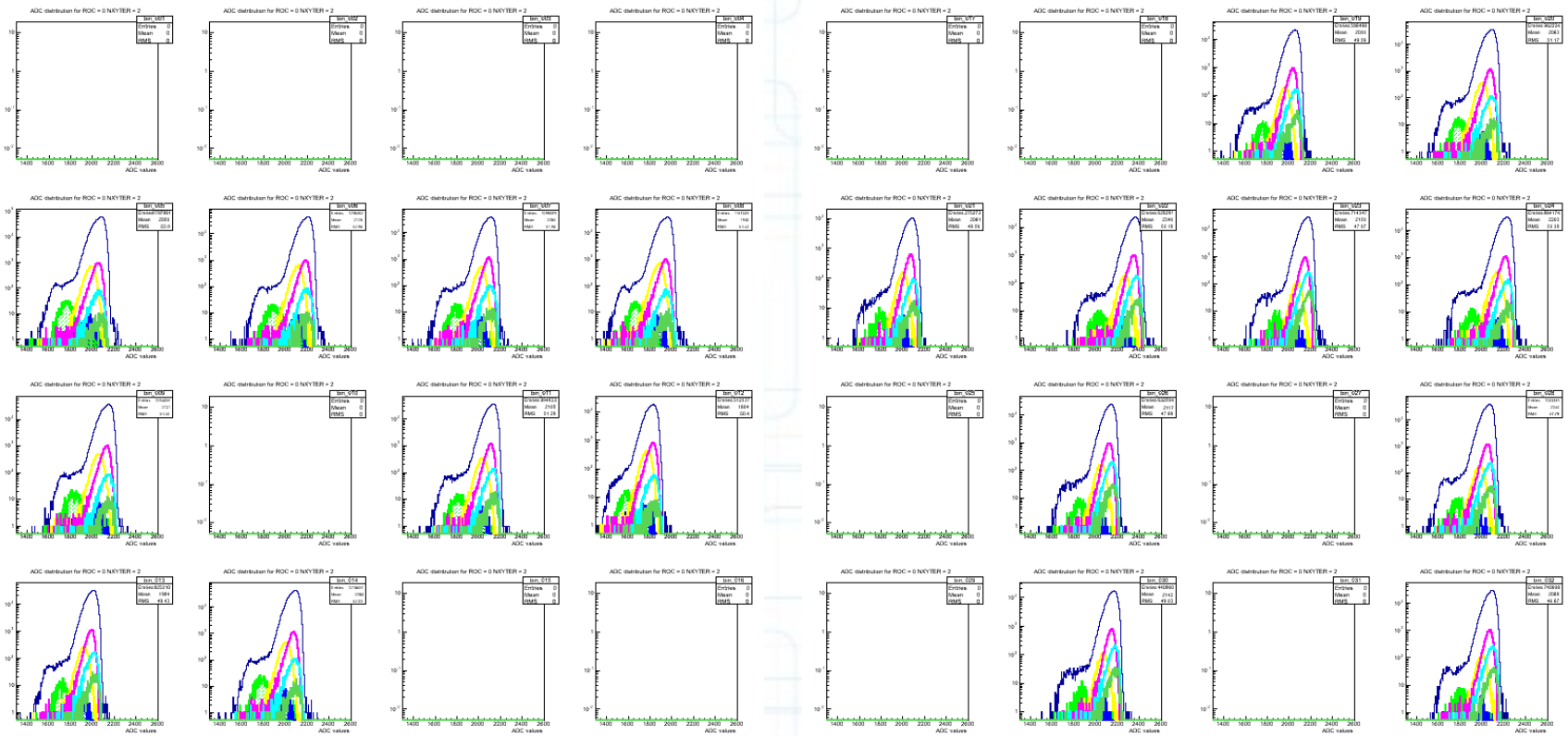




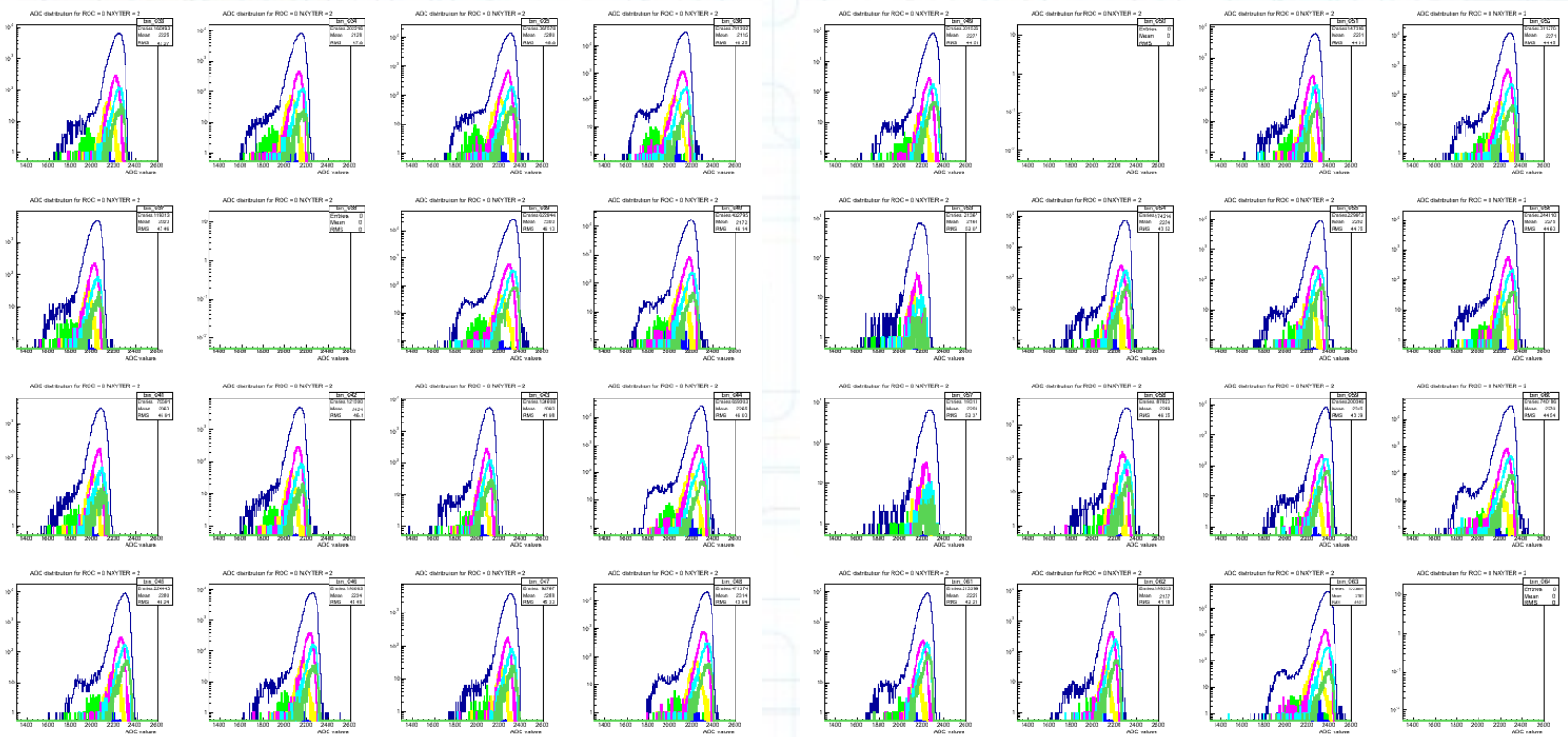
Trigger cuts



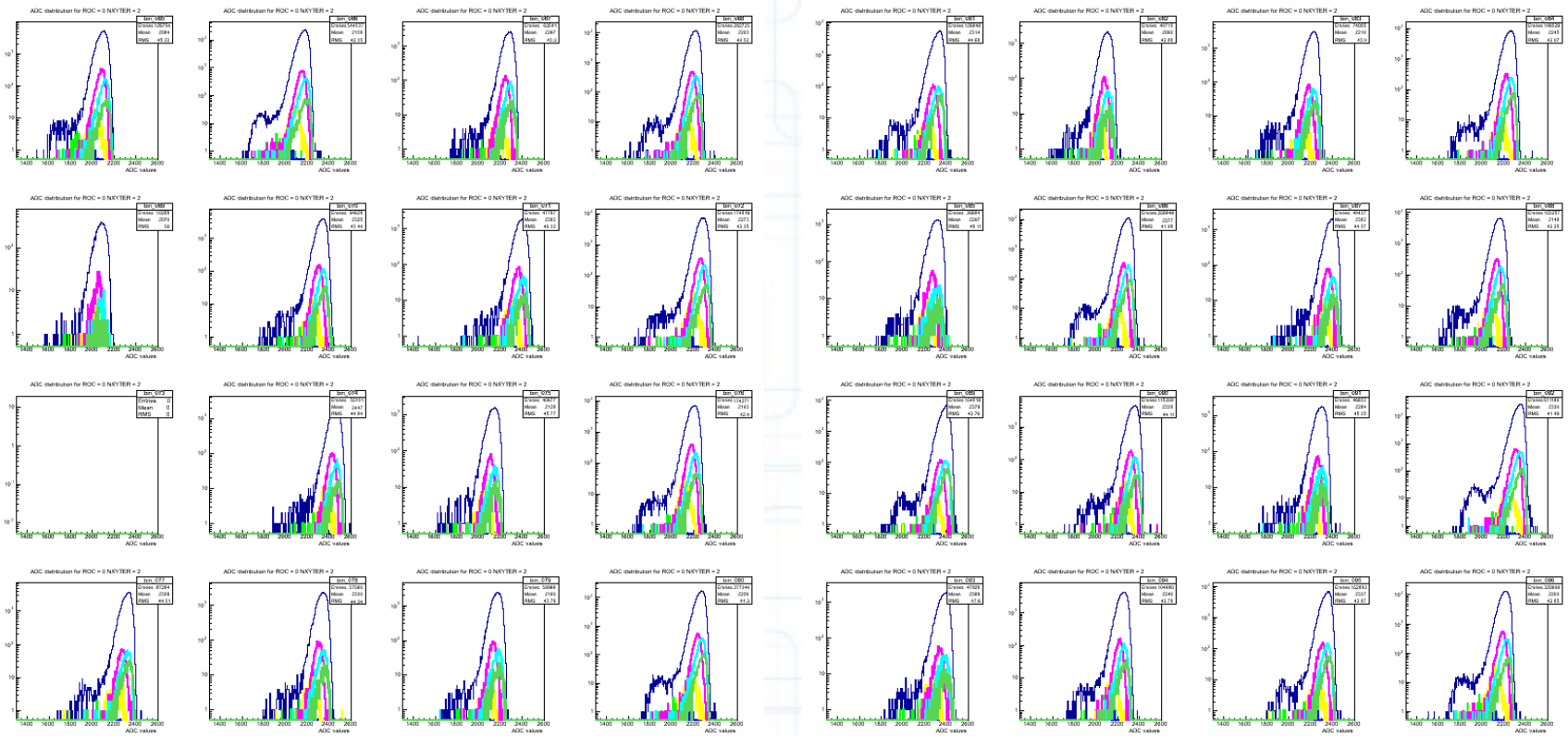
Trigger cuts - ADC



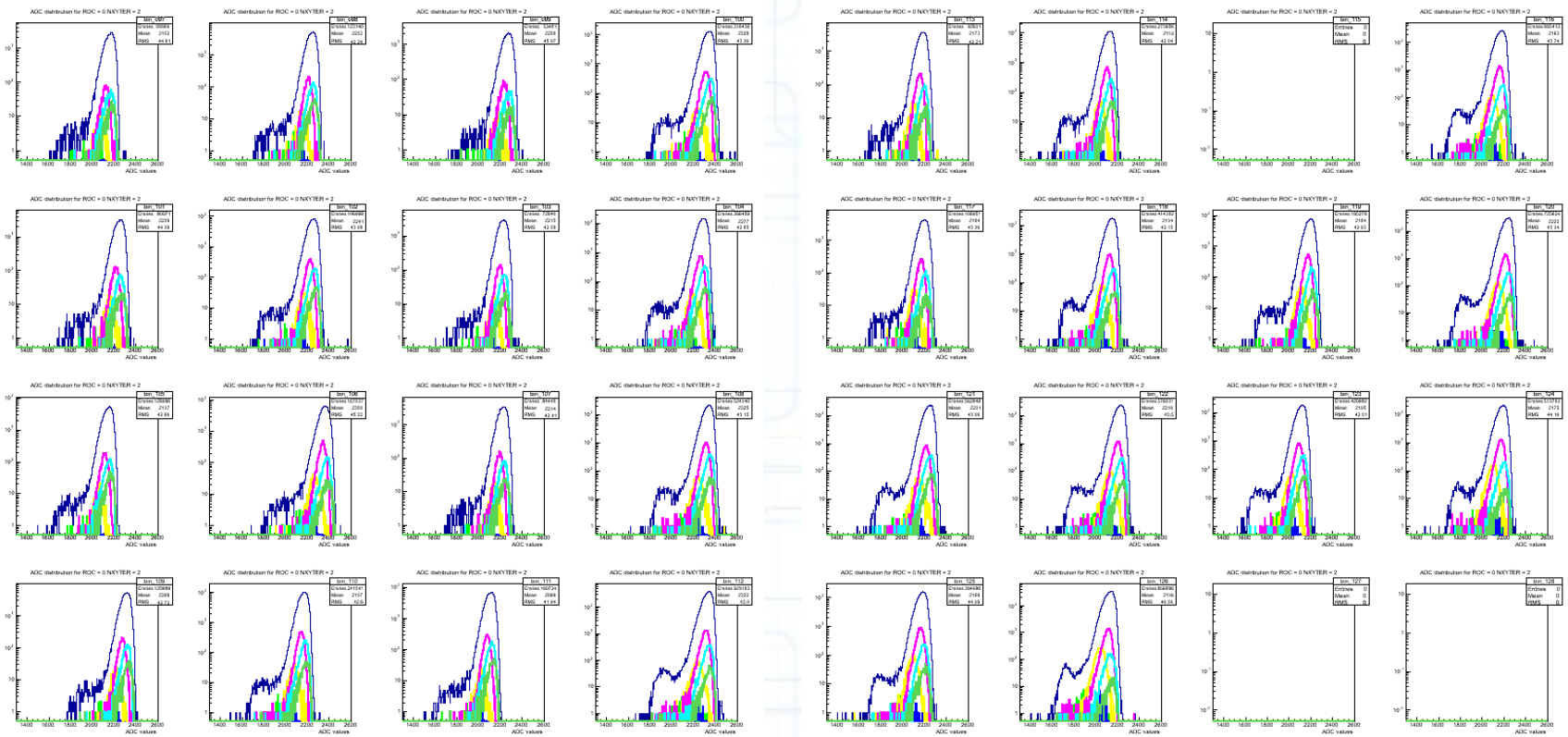
Trigger cuts - ADC



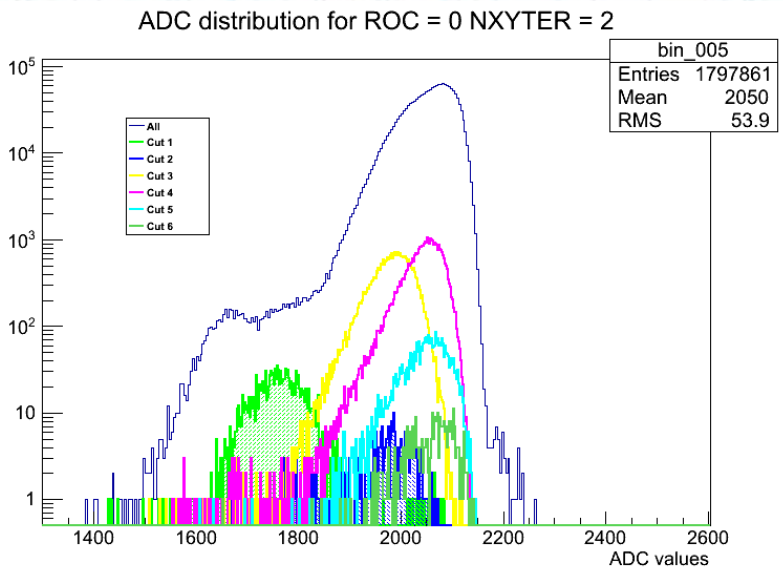
Trigger cuts - ADC

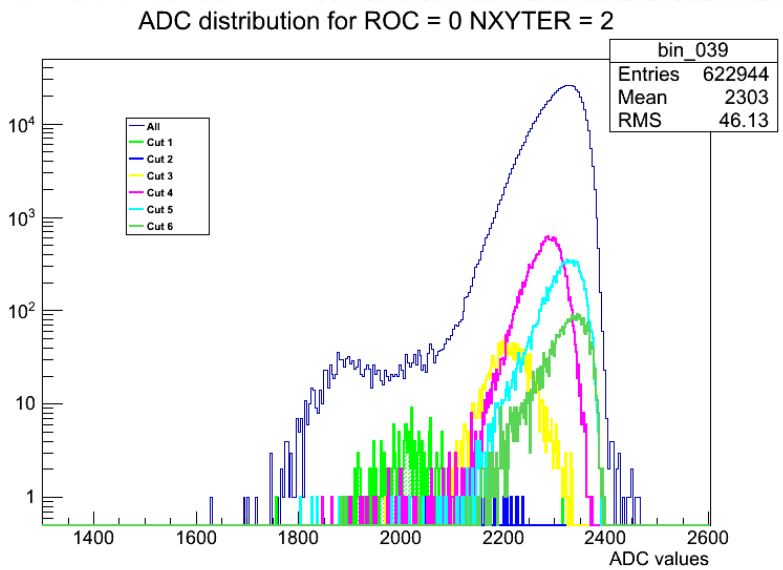


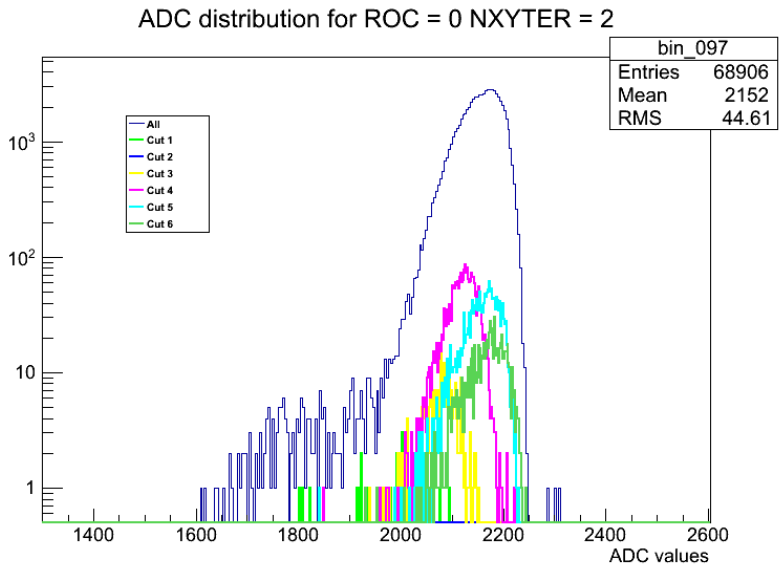
Trigger cuts - ADC

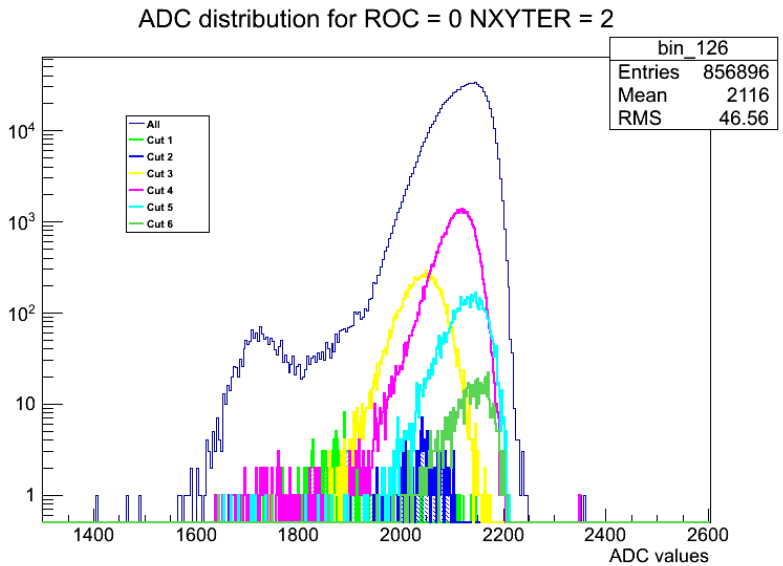


Trigger cuts - ADC









Outlook

- Check more files for correlation with main trigger and “helper” trigger → search for clear proton signal.
- Verify the pulser contamination in the presented data.
- Back to the labor with our readout and detector: noise, spectra with sources.