

# Calibration and bad channels with new protoDUNE data

## ProtoDUNE sim/reco

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December 4, 2019

Updated 17:00 EST

# Introduction

I have been looking at the recent cosmic runs

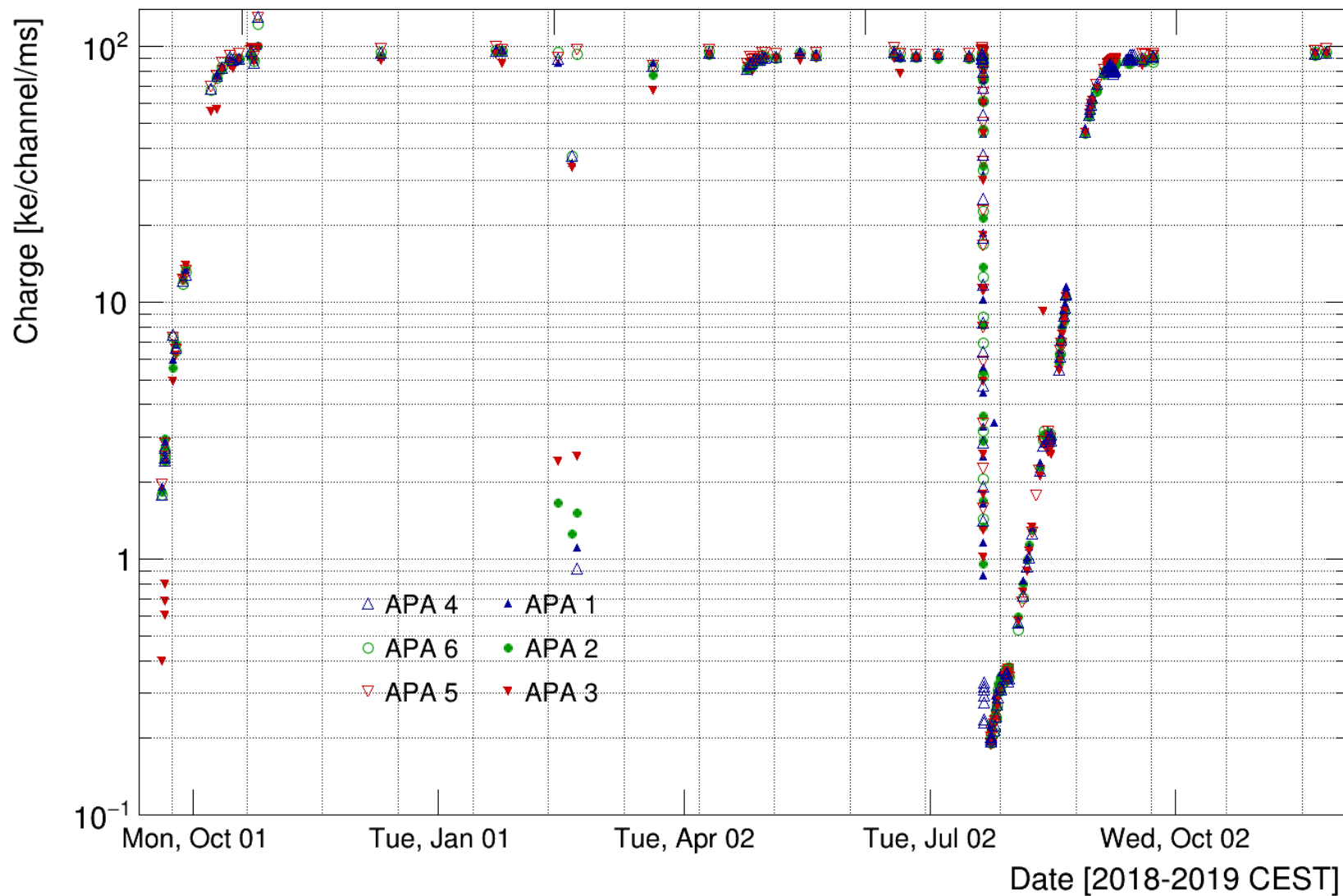
- Initially only CRT trigger
  - To capture horizontal muons
- Now CRT plus 1 Hz random
  - Latter provide unbiased monitor of detector performance

## Studies

- Signal strength
  - See talk Nov 27
  - Updated summary plot here
    - Recent data plus some old data to fill in gaps
    - <https://internal.dunescience.org/people/dladams/protodune/monitoring/roiChargeLogVsAllTime.png>
- Pulser calibration
- New bad channels

# Signal strength summary

ROI charge vs. time



# New calibration

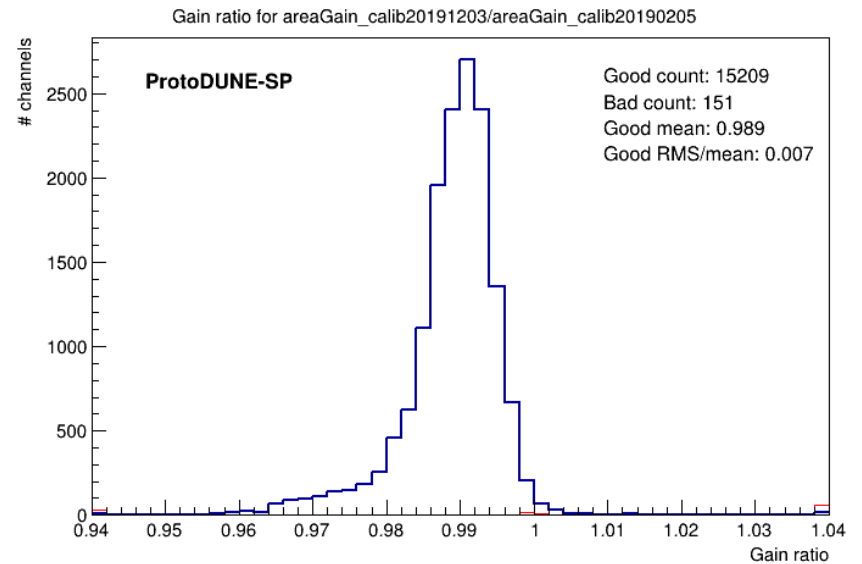
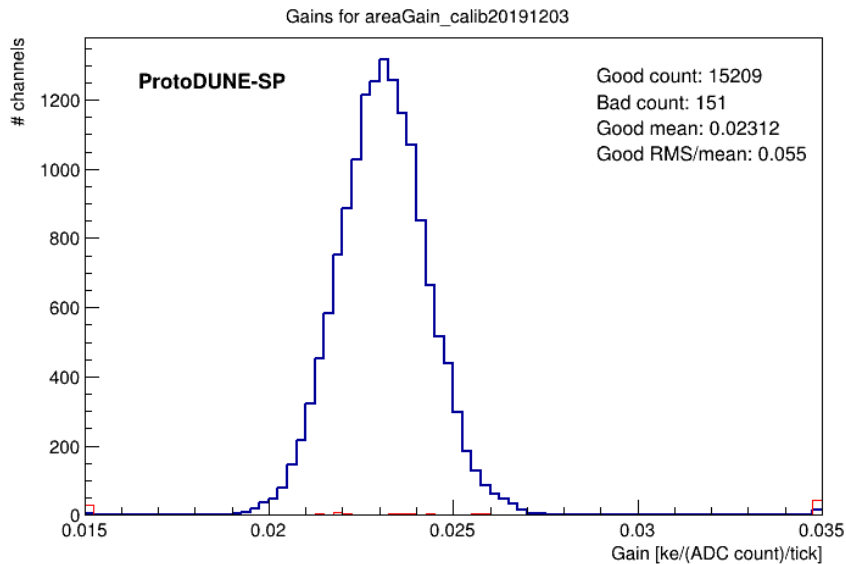
# New calibration

## Calibration data

- External pulser data taken Nov 28

## Calibration

- I processed this as for the Dec 2018 data
  - See DUNE-doc-15523 for the old calibration
- New gains are 1% lower
- new/old channel-by-channel RMS is 0.7% (including low tail)



# Bad channels

## Bad channel observations

- 7 more bad channels (not bad in 2018)
  - In addition to 17 from last week
  - 4 dead, 1 very noisy
- 16 new noisy channels
  - Probably noisy before—didn't look so carefully or critically
  - 2 new (near pedestal) sticky codes
    - Mitigating these might remove noisy flag
- 19 channels with nonlinear response
  - 3 blocks of 6 (ASIC) look shifted
  - 1 channel has jump(s)
  - See following plots
- My notes are on the following page

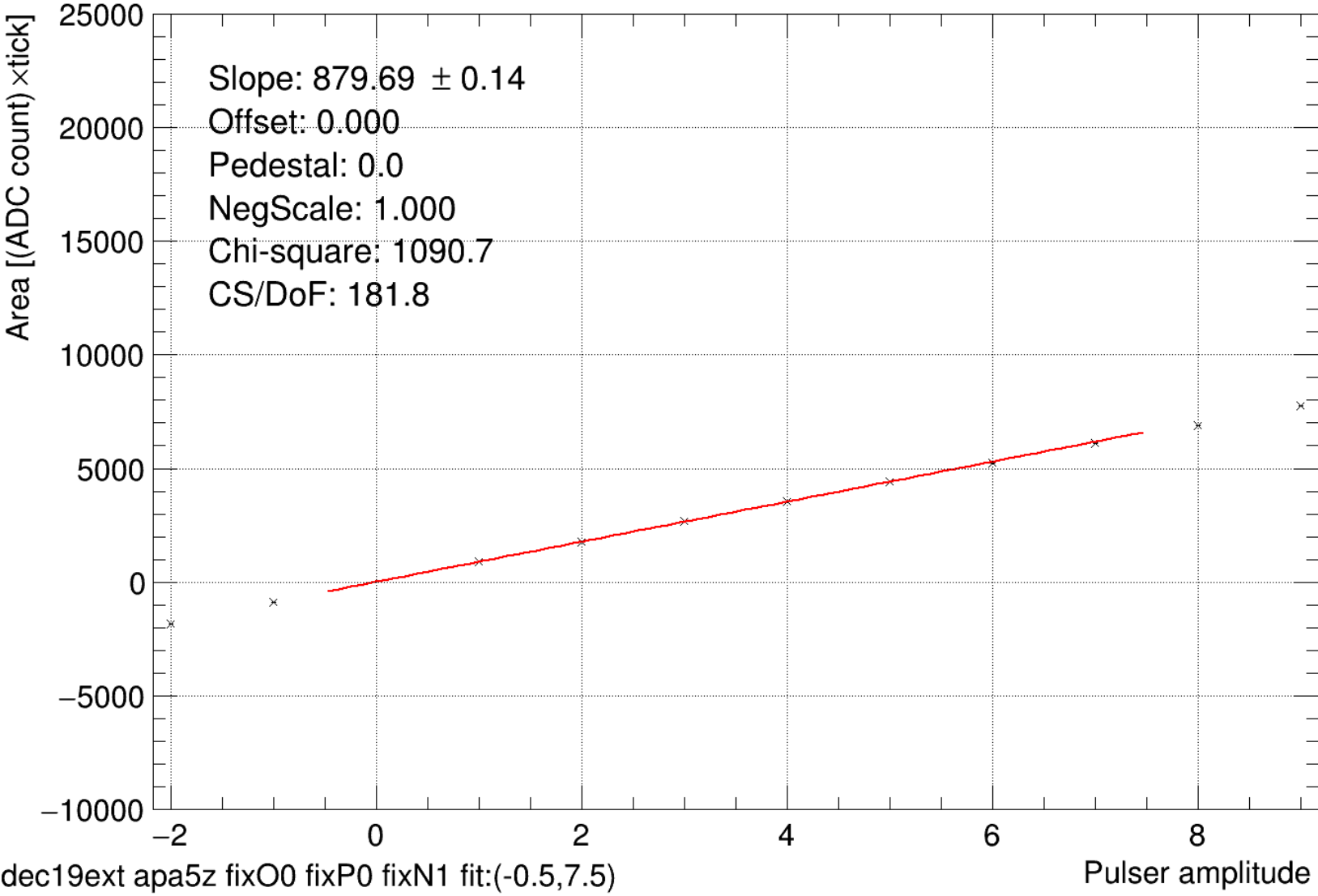
Run 10492  
Dec 2, 2019

Runs 5461 and 10527 pedestal WFs

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1u 10573 wide (50-->80), low tail (5%)   WFs look fine                               NOISY  
1u 10831 wide (95-->134)                 Both WFs sticking to pedestal zero          NOISY  
1u 11001 low RMS                          Good in old run, now dead                   BAD  
1u 11014 low RMS                          Good in old run, now dead                   BAD  
1u 11018 low RMS                          Good in old run, now dead                   BAD  
1v 11315 wide (55-->99)                  WFs look fine                               NOISY  
1v 11501 low RMS                          Good in old run, now dead                   BAD  
1v 11773 wide (55-->103)                 Many SC near pedestal for both            NOISY  
1c 12252 very wide (55-->390), bad shape  Pulser mostly stuck on one value for both NOISY  
1z 12382 very wide (43-->370), bad shape  Many SCs. New SC and worse in new run.    NOISY, add SC  
  
3u  426 wide (55-->100), low tail (1%)   Many SC near pedestal. Better now.        NOISY  
3v  867 wide (55-->100)                 Both pedestals fine.                       NOISY  
3v  1522 wide (65-->125)                 Both sticking near pedestal.              NOISY  
3z  2330 wide (41-->72), low tail (1%)   Both pedestals look fine.                  NOISY  
3z  2333 wide (40-->99), high tail (2%)  New SC. Old is fine.                       NOISY, add SC and check  
  
4u 12938 wide (70-->150)                 Pedestals look fine.                       NOISY  
4v 13748 wide (65-->87)                 Pedestals look fine.                       GOOD  
  
5z  4232 low RMS                          Big pulser offset in new data.             Recalibrate varying offset?  
5z  4234 low RMS                          Big pulser offset in new data.             Recalibrate varying offset?  
5z  4236 missing                          Big pulser offset in new data.             Recalibrate varying offset?  
5z  4238 missing                          Big pulser offset in new data.             Recalibrate varying offset?  
5z  4240 missing                          Big pulser offset in new data.             Recalibrate varying offset?  
5z  4242 missing                          Big pulser offset in new data.             Recalibrate varying offset?  
5z  4472 missing                          Big pulser offset in new data.             Recalibrate varying offset?  
5z  4473 split peak varies with DAC       Nonlinear response.                        BAD?  
5z  4474 missing                          Big pulser offset in new data.             Recalibrate varying offset?  
5z  4476 missing                          Big pulser offset in new data.             Recalibrate varying offset?  
5z  4478 missing                          Big pulser offset in new data.             Recalibrate varying offset?  
5z  4480 missing                          Big pulser offset in new data.             Recalibrate varying offset?  
5z  4482 missing                          Big pulser offset in new data.             Recalibrate varying offset?  
  
6u  7715 very wide (55-->2300)           Pedestal was fine, now very noisy (amp?)   BAD  
6u  8234 wide (50-->100)                 Both pedestals sticking.                   NOISY  
6u  8290 tails (10%)                     Both pedestal mostly stuck                 NOISY  
6c  9941 tails (5%)                       SC bad goes to very bad.                   NOISY  
6c 10033 missing (tail @ ADC < 500)      OK then. Now dead (I think)                BAD  
6z  9545 low RMS                          Big pulser offset in new data.             Recalibrate varying offset?  
6z  9547 low RMS                          Big pulser offset in new data.             Recalibrate varying offset?  
6z  9549 low RMS                          Big pulser offset in new data.             Recalibrate varying offset?  
6z  9551 low RMS                          Big pulser offset in new data.             Recalibrate varying offset?  
6z  9553 low RMS                          Big pulser offset in new data.             Recalibrate varying offset?  
6z  9555 low RMS                          Big pulser offset in new data.             Recalibrate varying offset?  
6z  9641 low tail                          Big nonlinearity in pulser response.       BAD
```

# Good channel

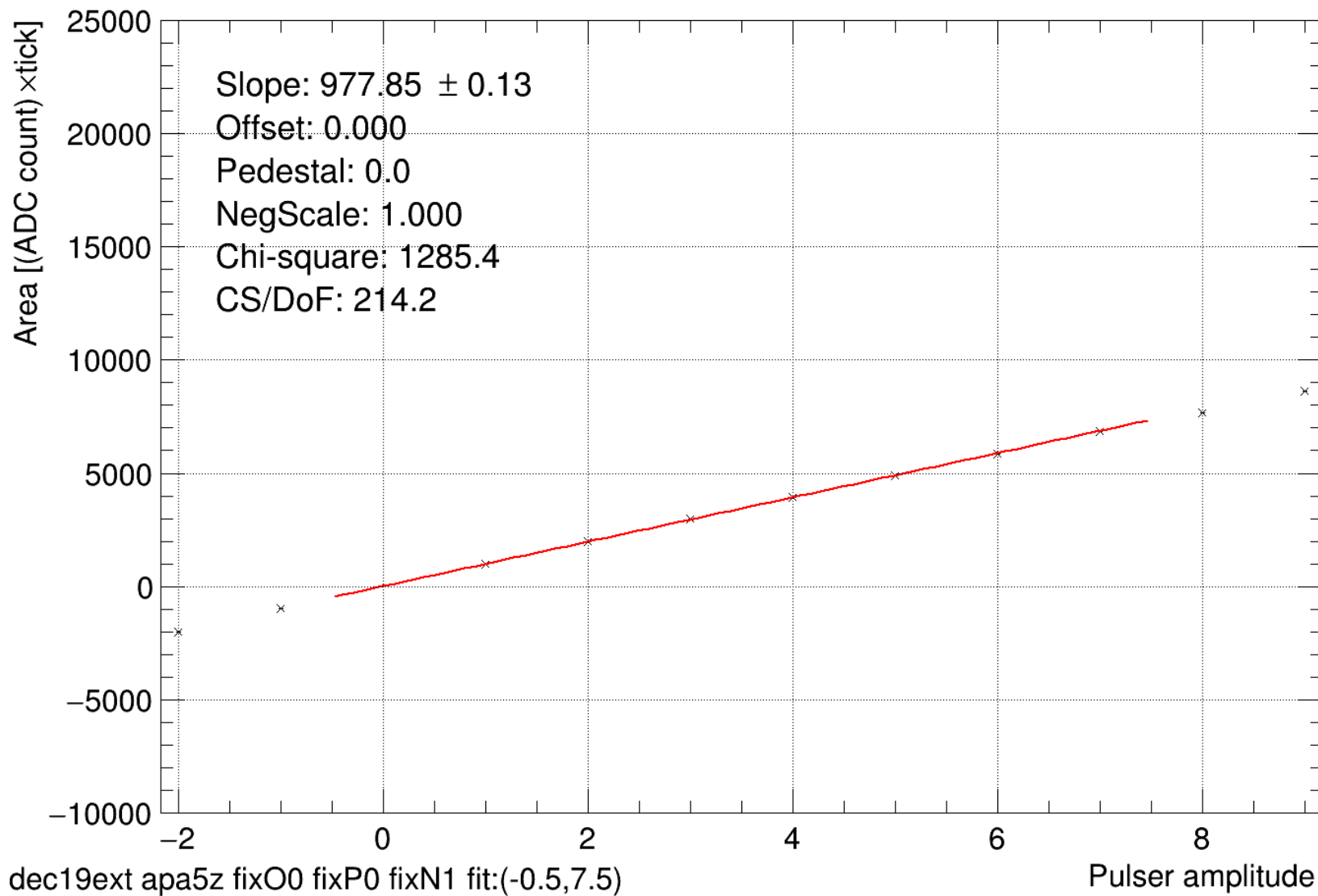
ROI area channel 4231





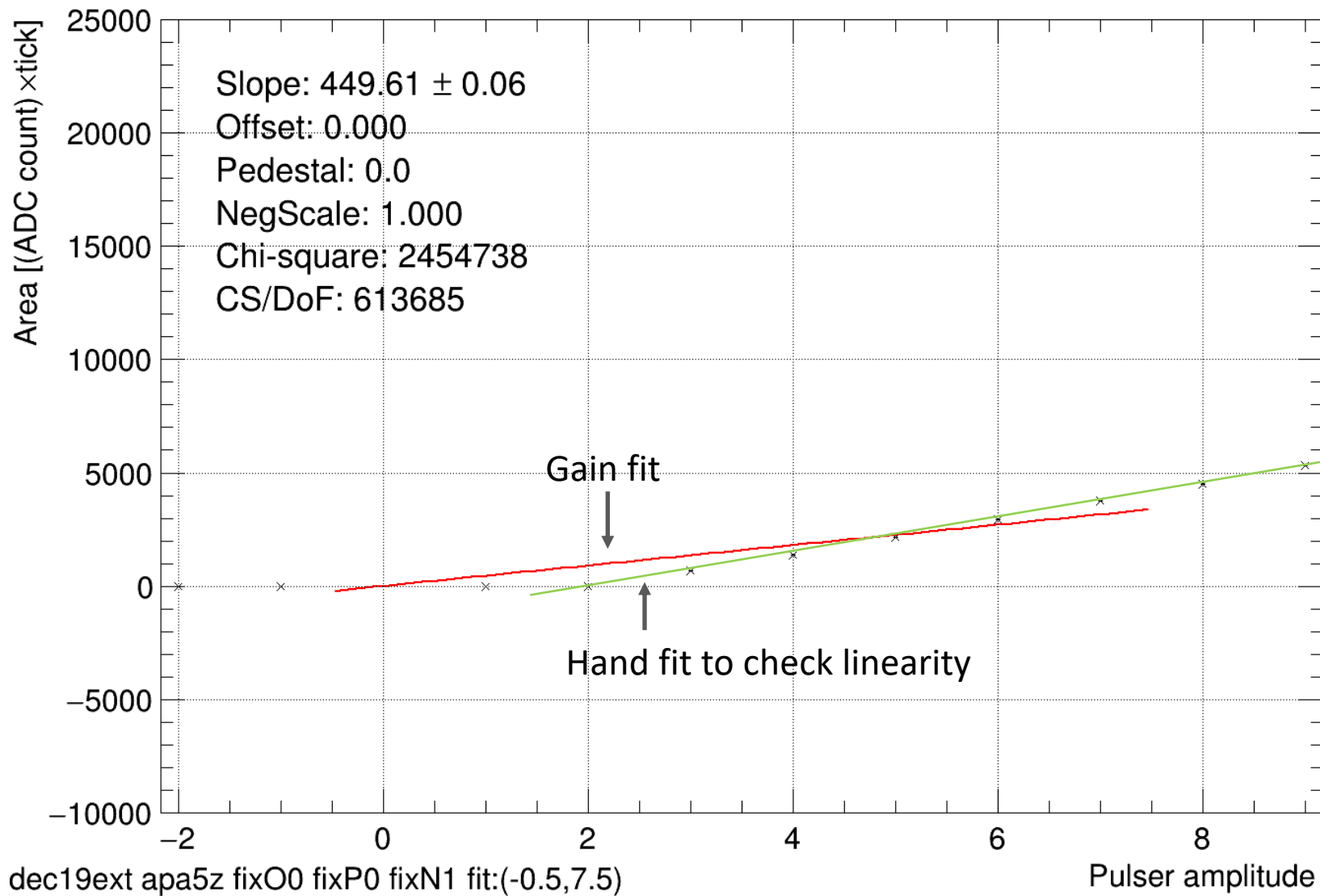
# Good channel

ROI area channel 4233



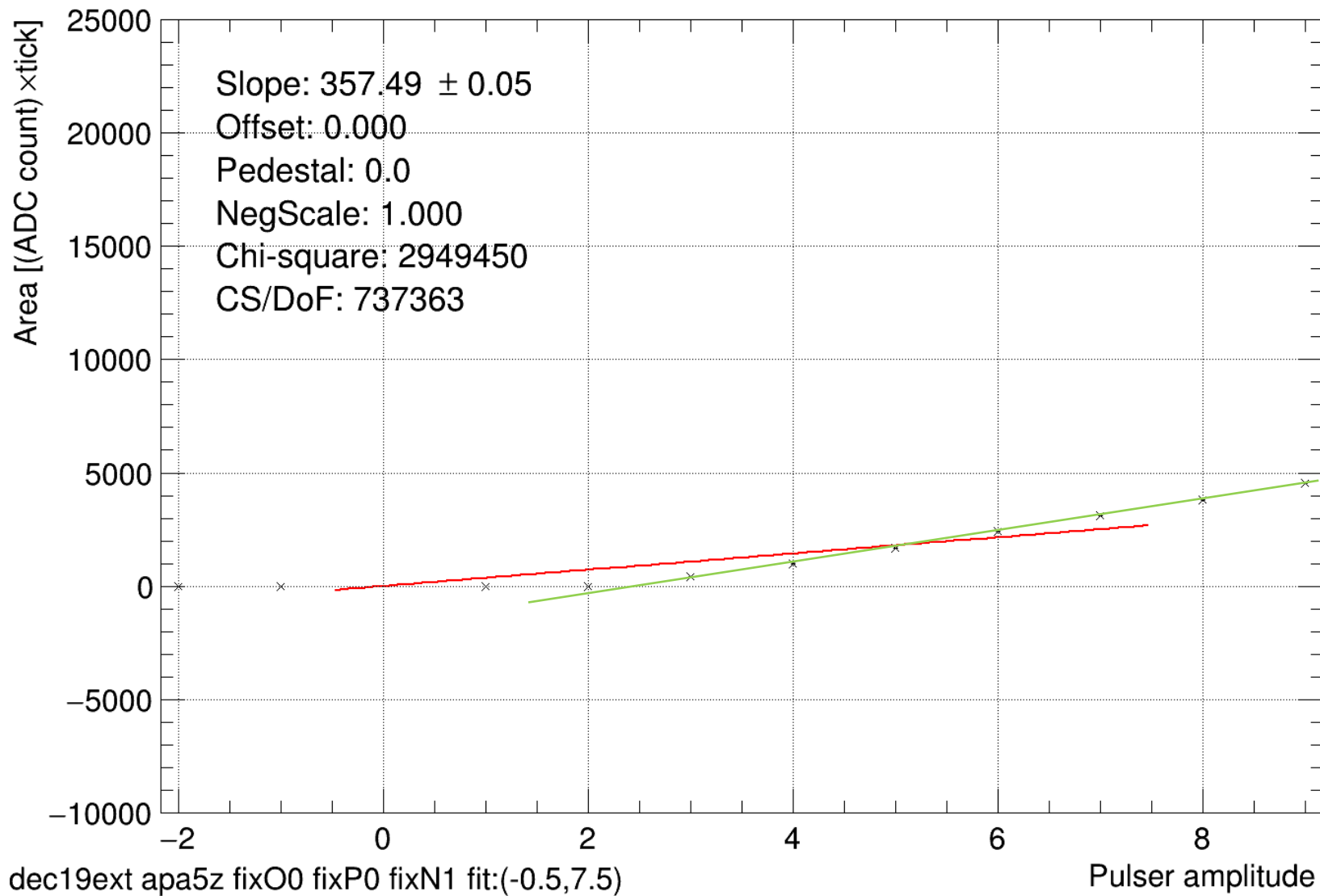
# Shift

ROI area channel 4232



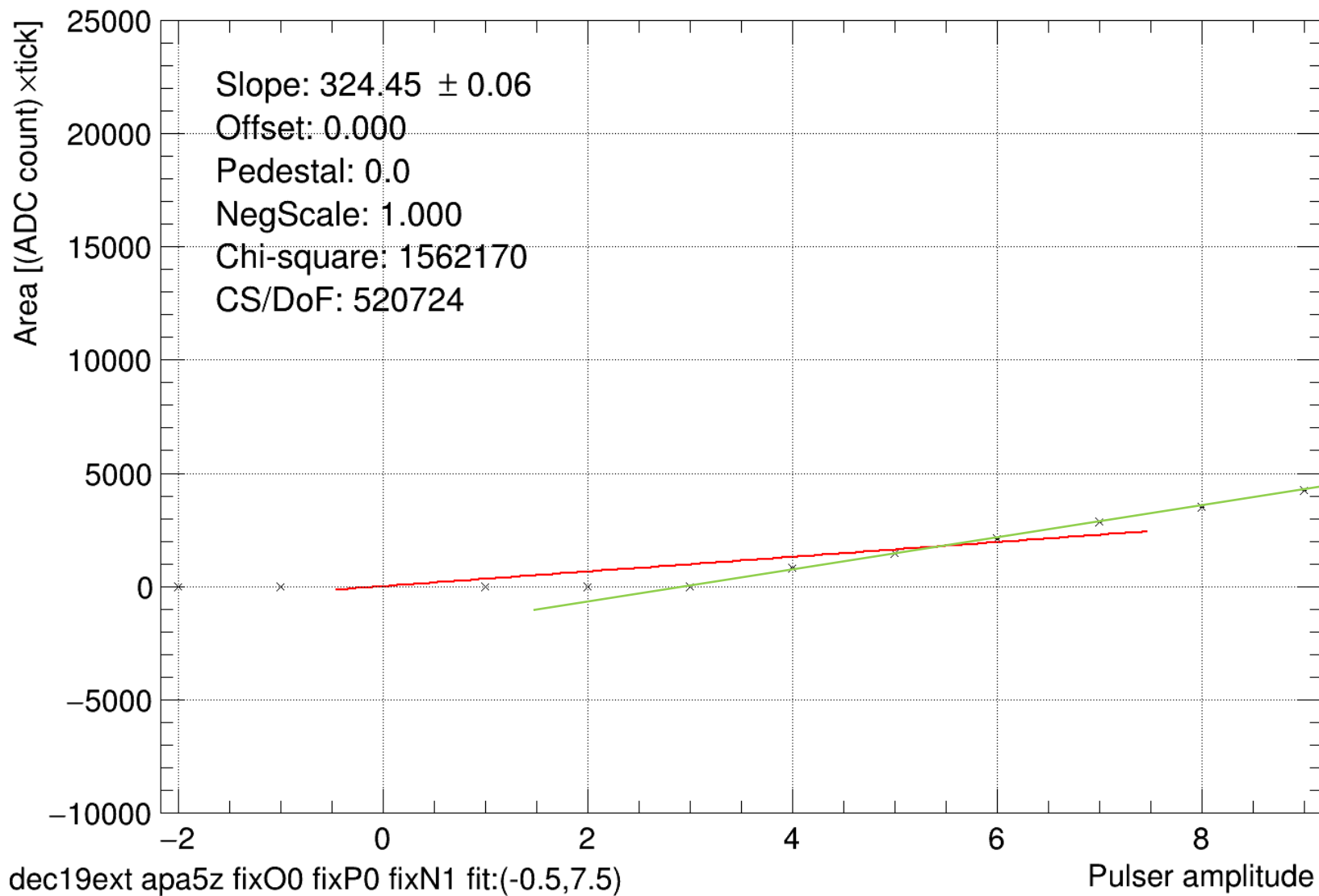
# Shift

ROI area channel 4234



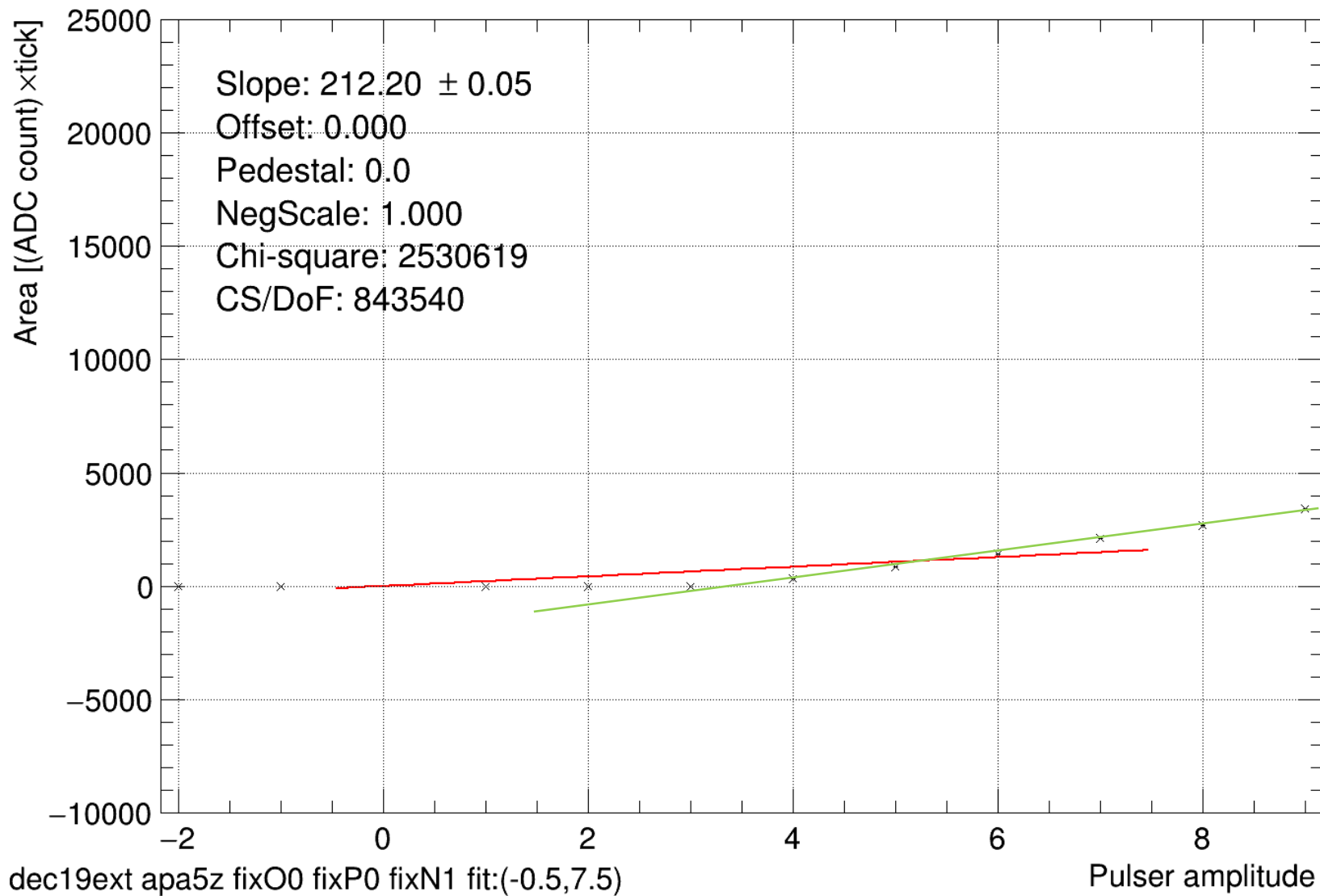
# Shift

ROI area channel 4236



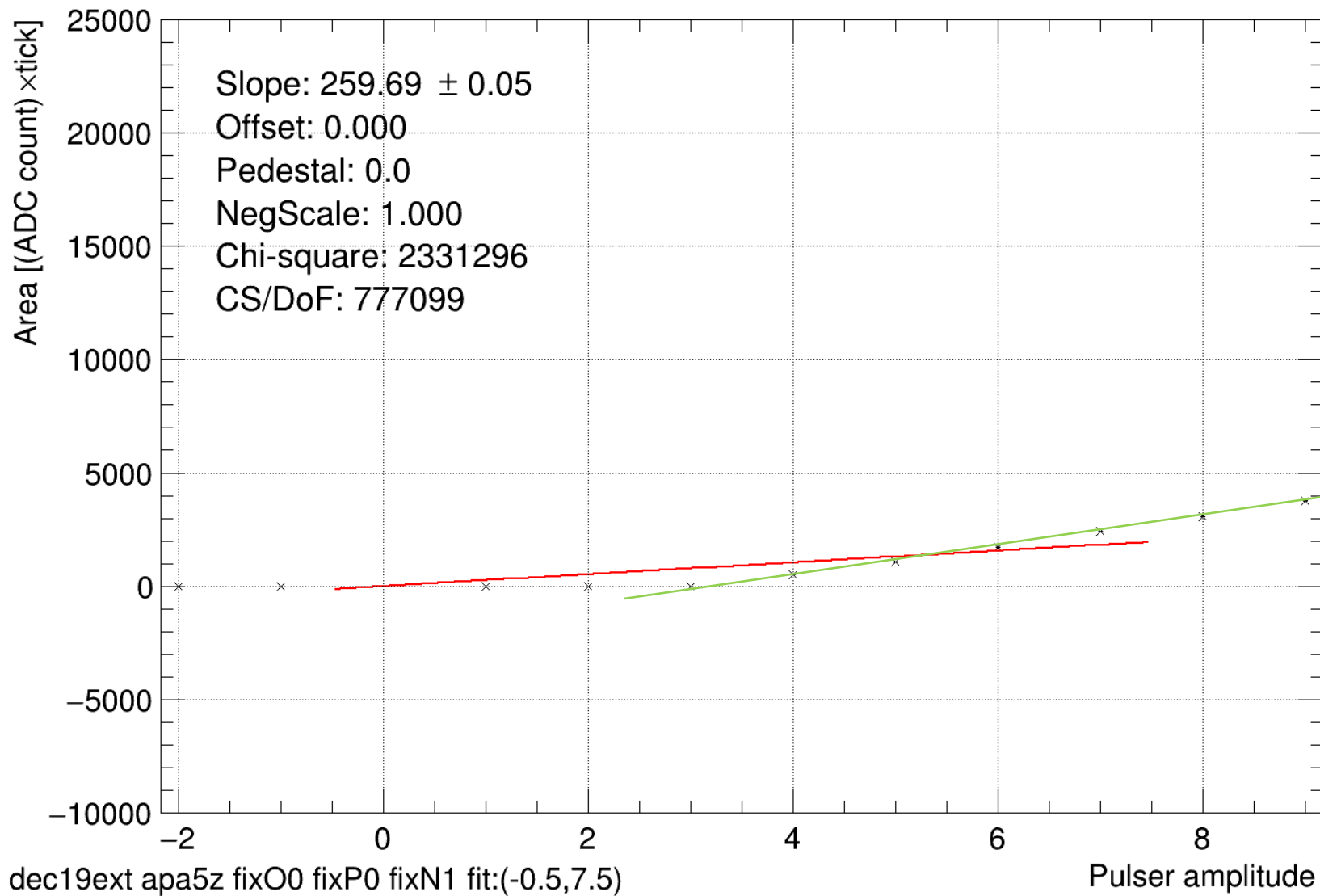
# Shift

ROI area channel 4238



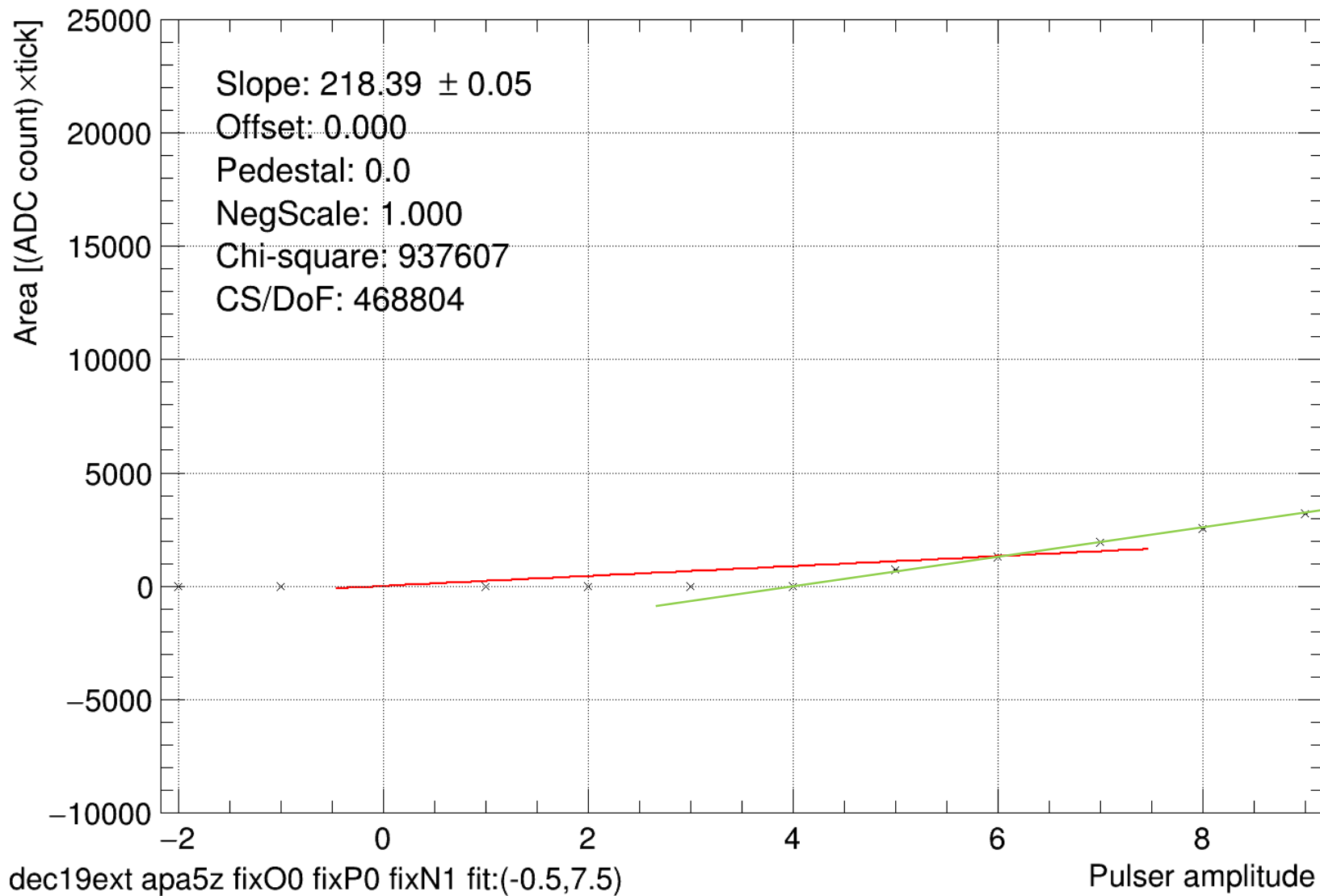
# Shift

ROI area channel 4240



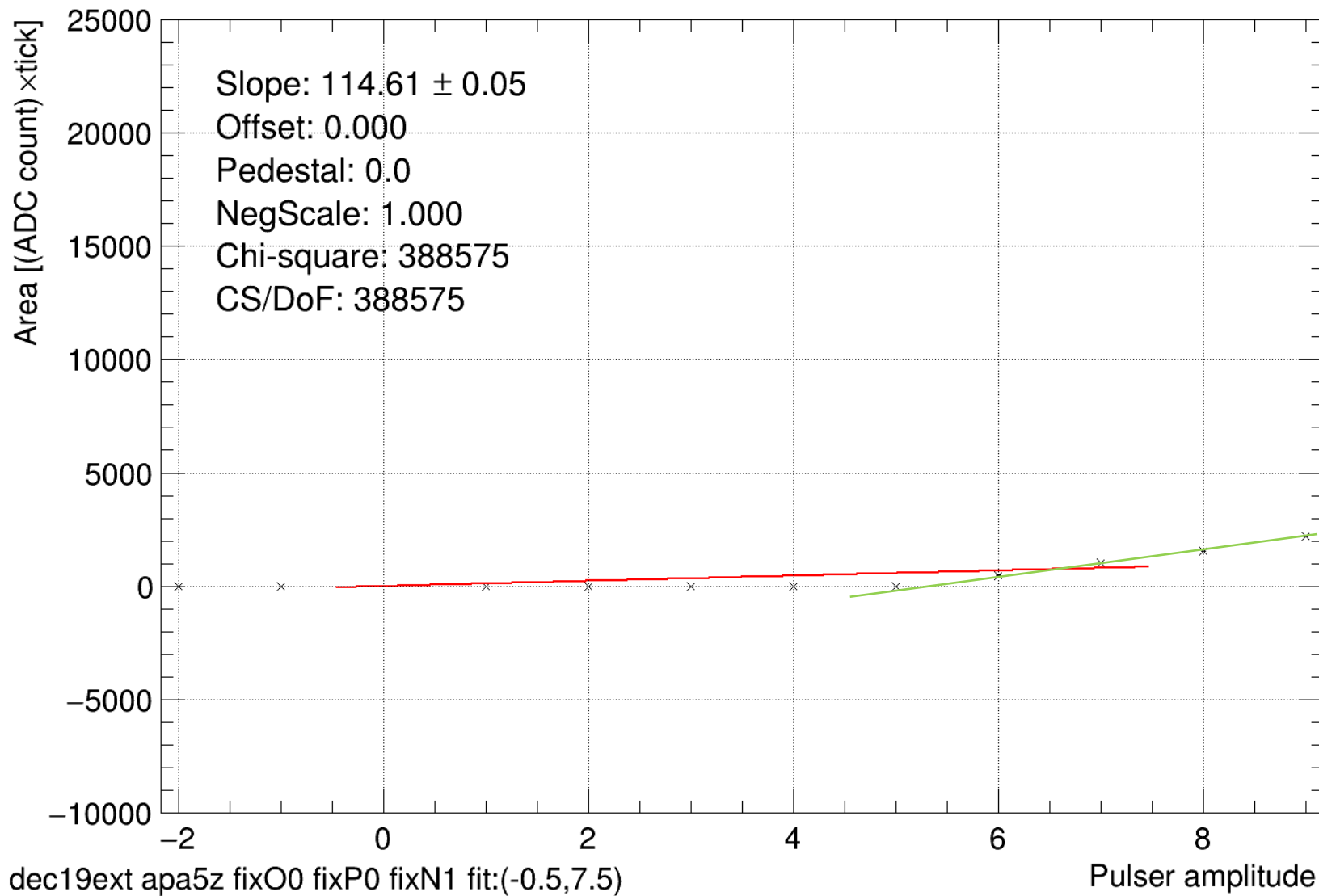
# Shift

ROI area channel 4242



# Shift

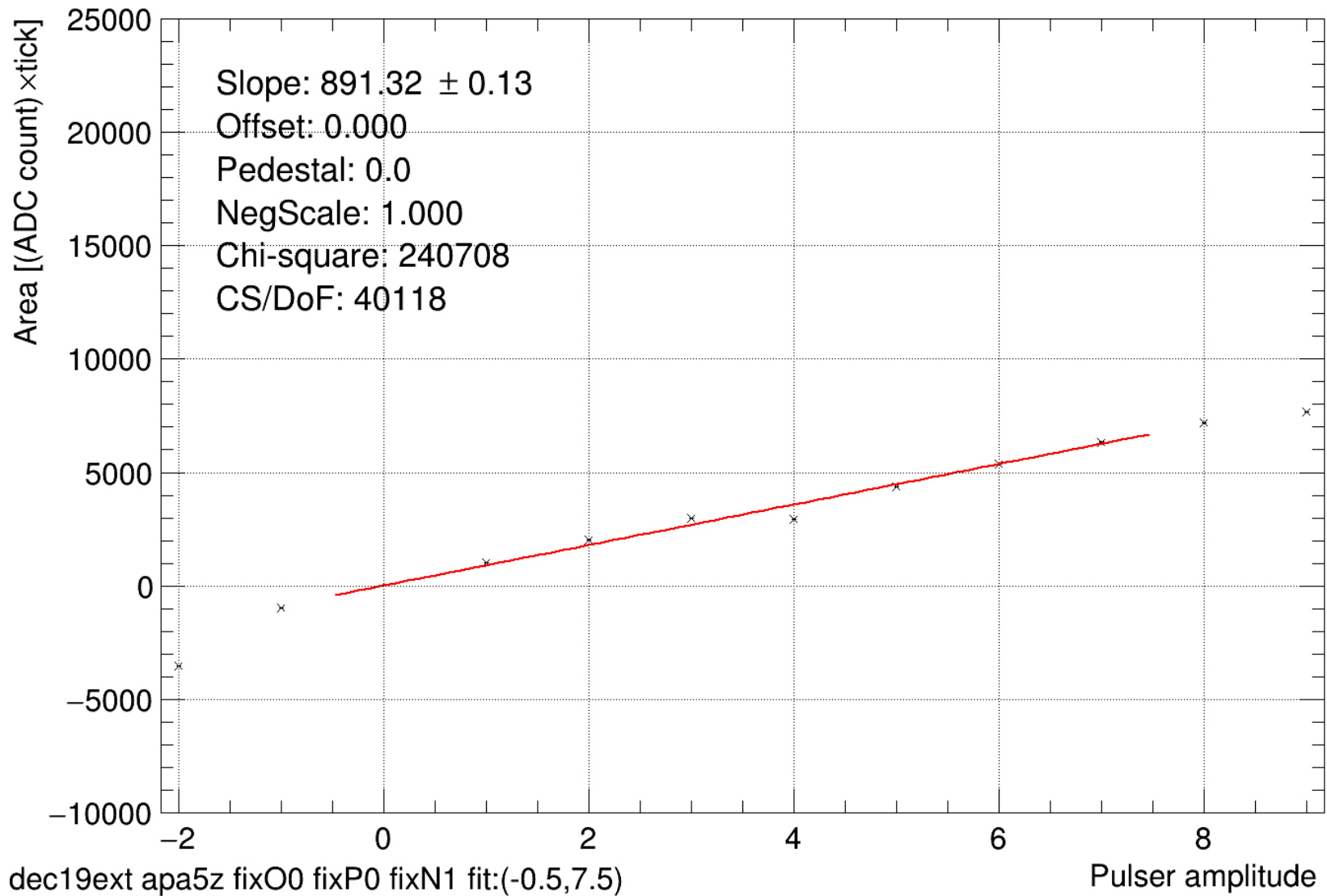
ROI area channel 4472





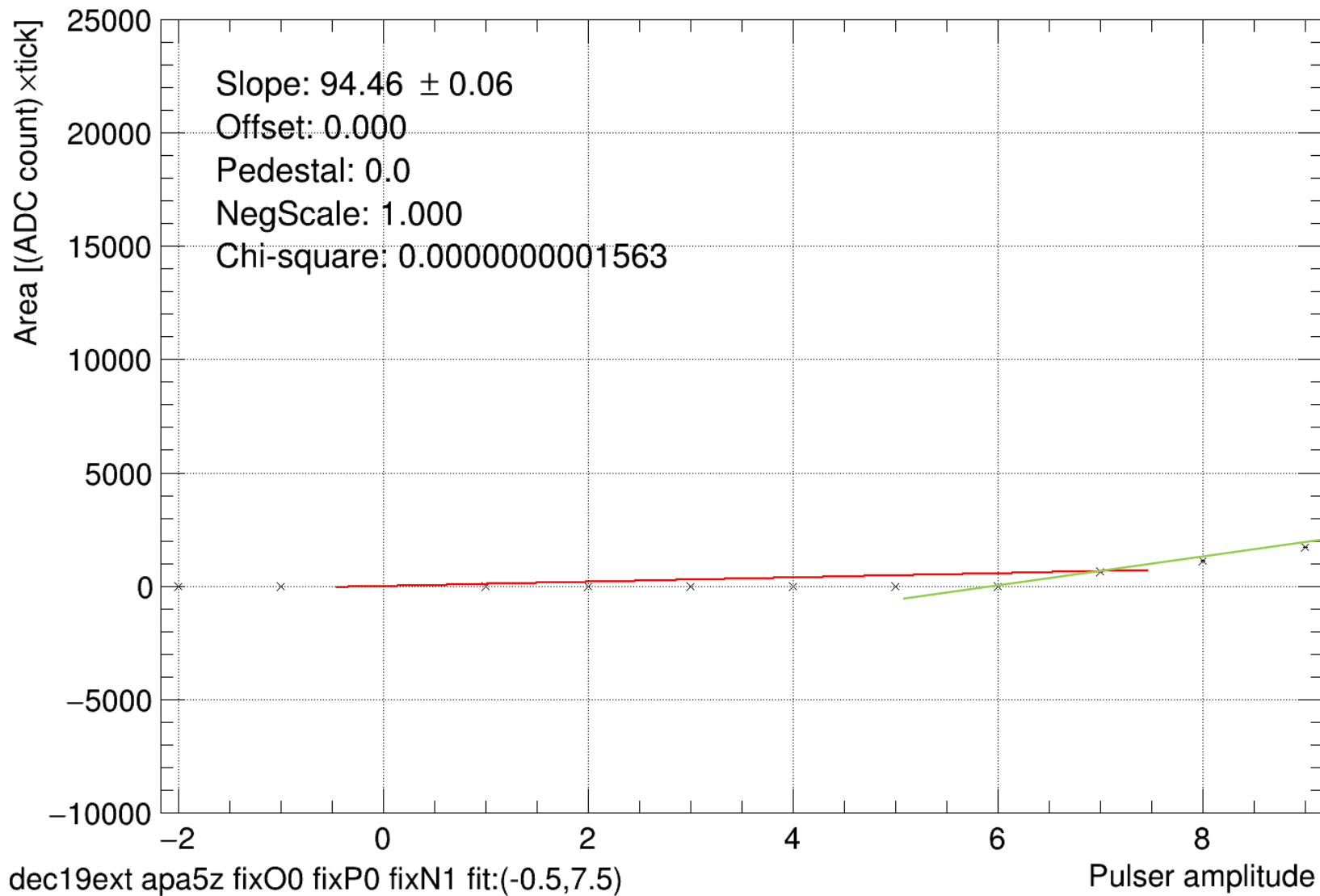
# Jump

ROI area channel 4473



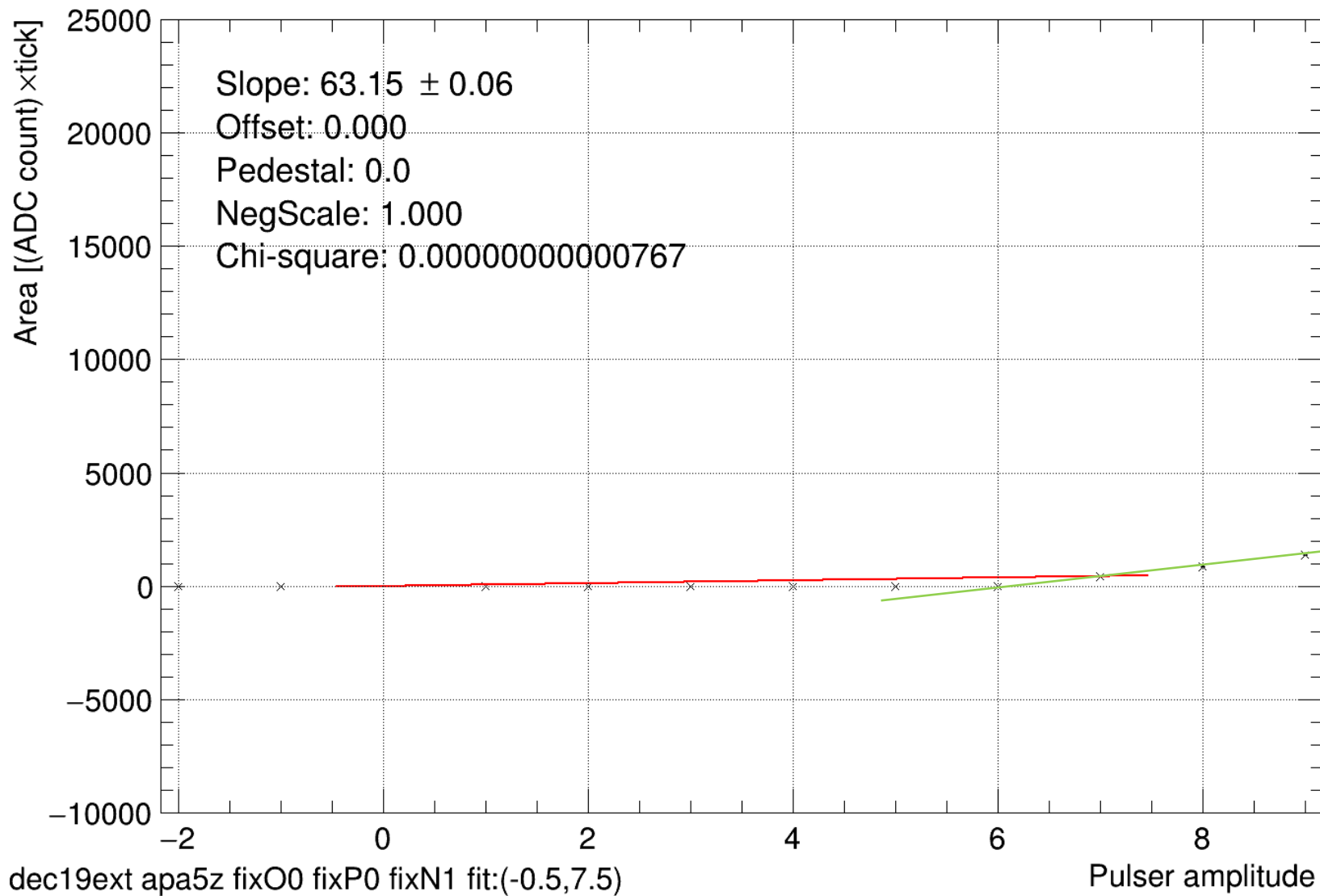
# Shift

ROI area channel 4474



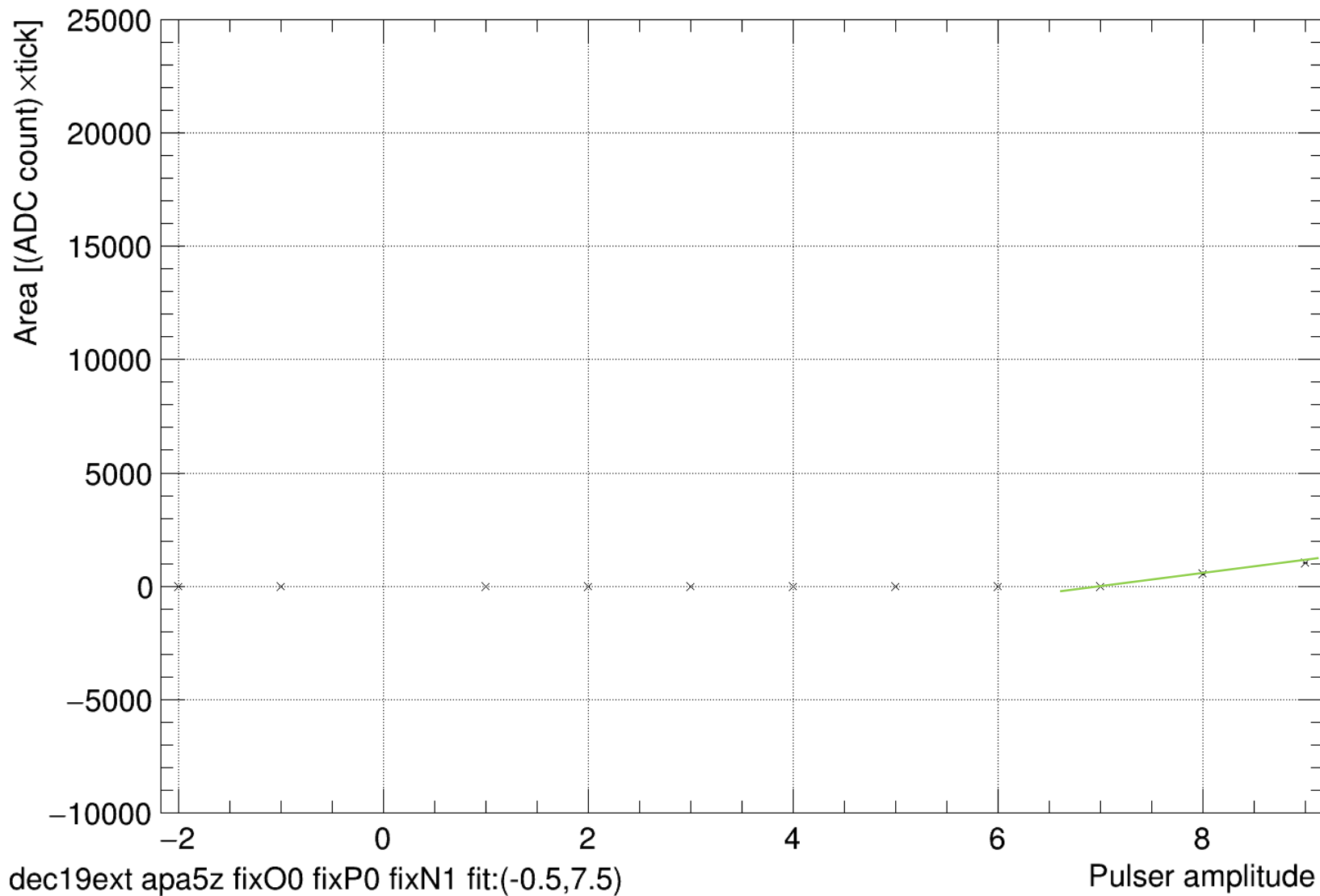
# Shift

ROI area channel 4476



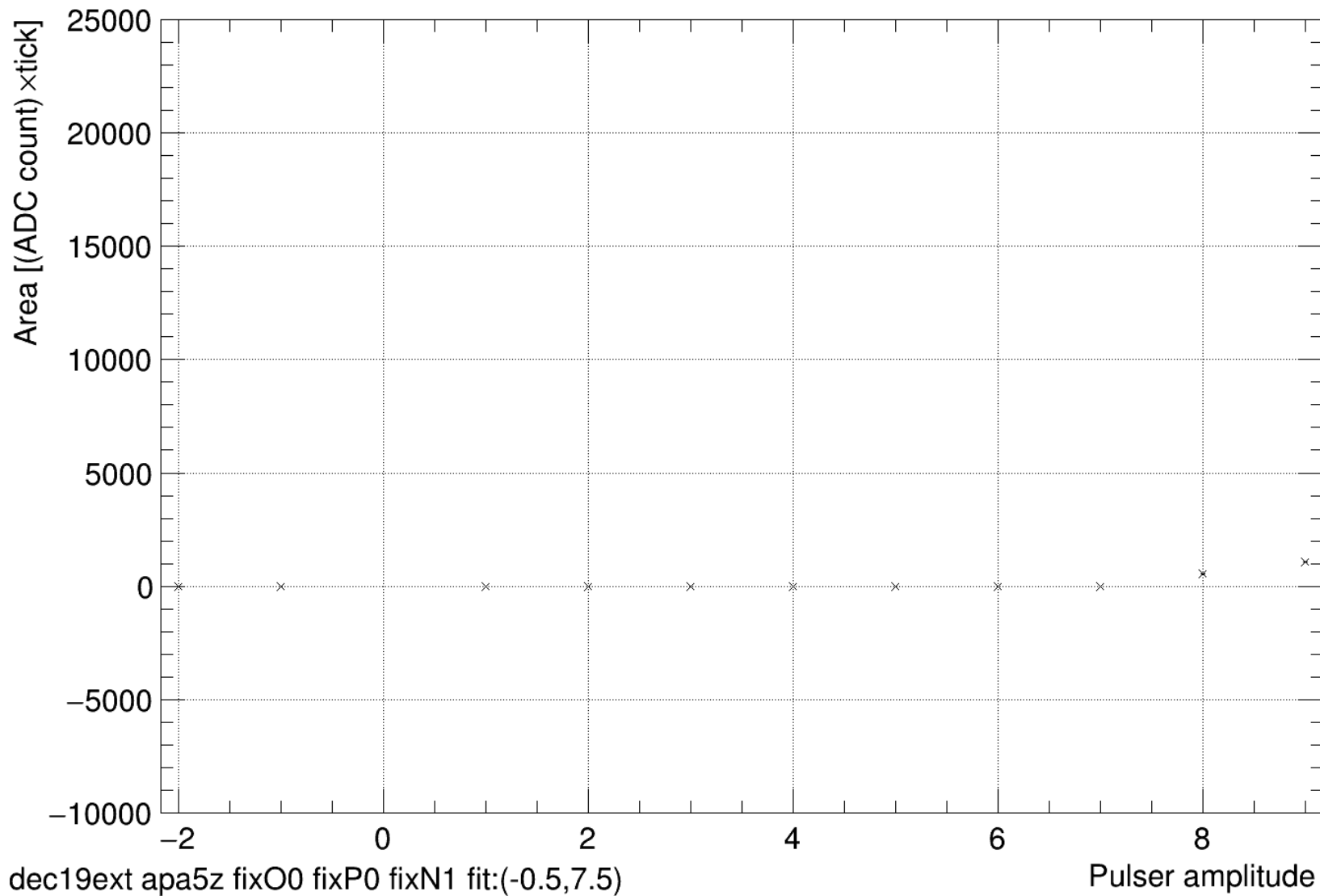
# Shift

ROI area channel 4478



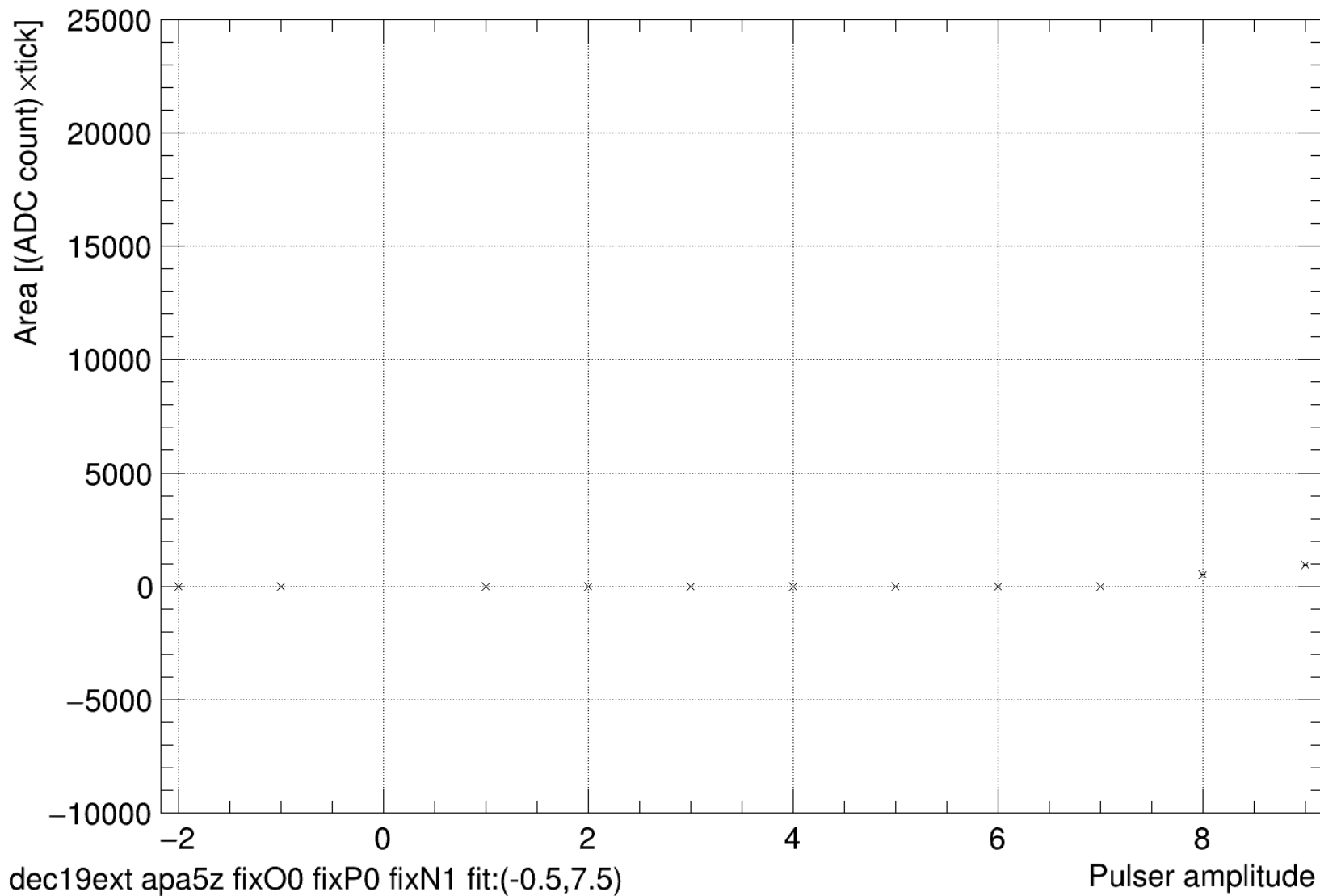
# Shift

ROI area channel 4480



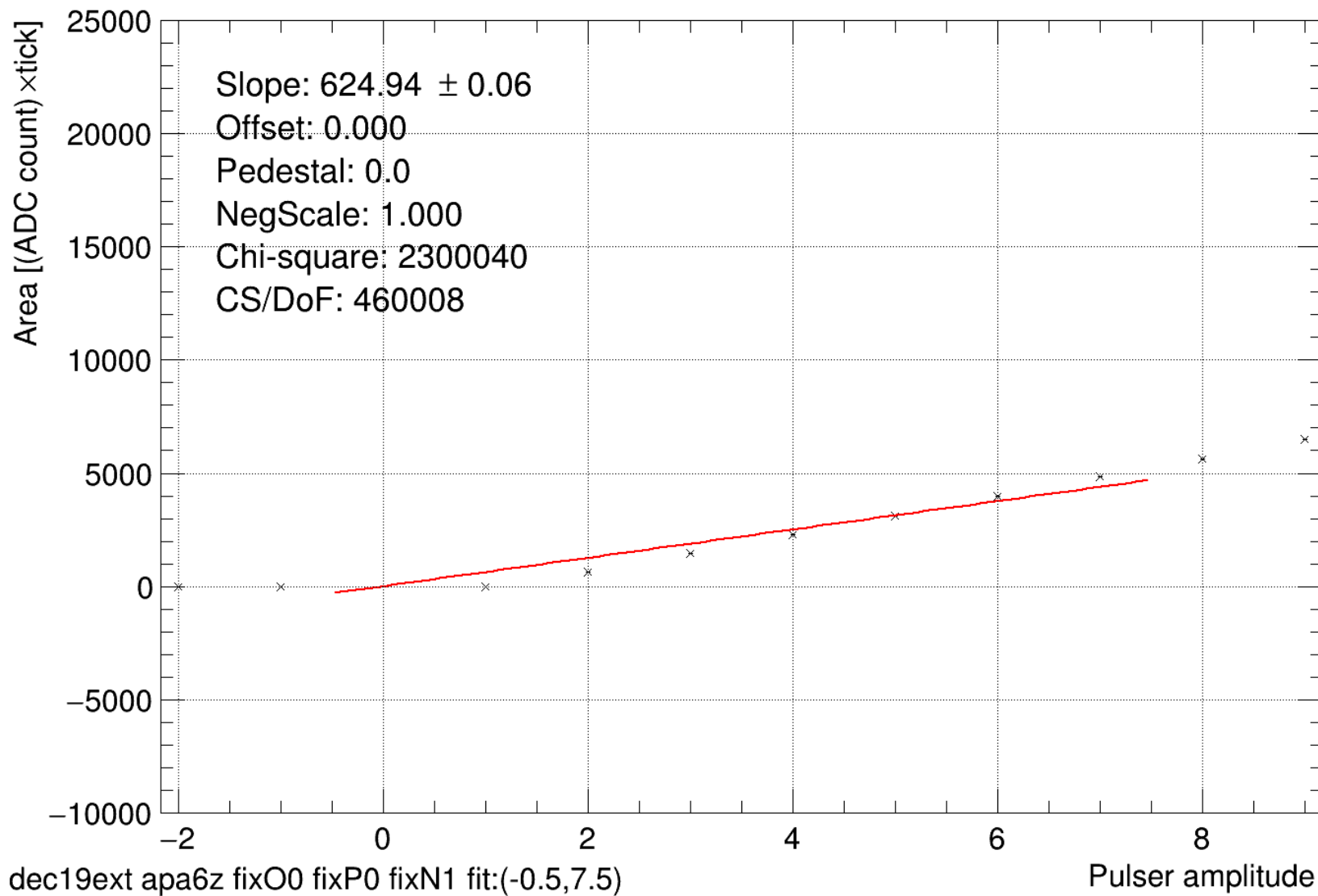
# Shift

ROI area channel 4482



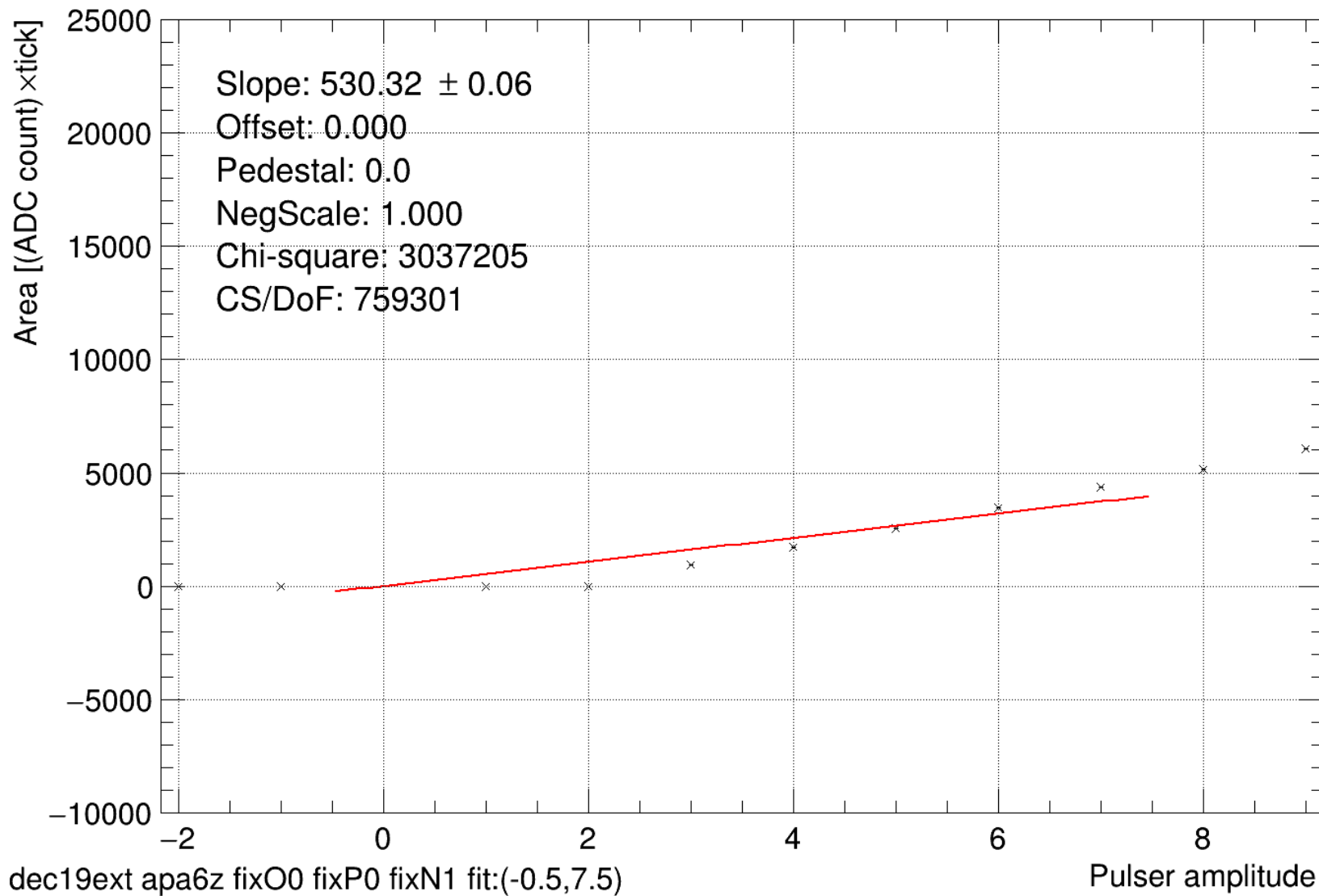
# Shift

ROI area channel 9545



# Shift

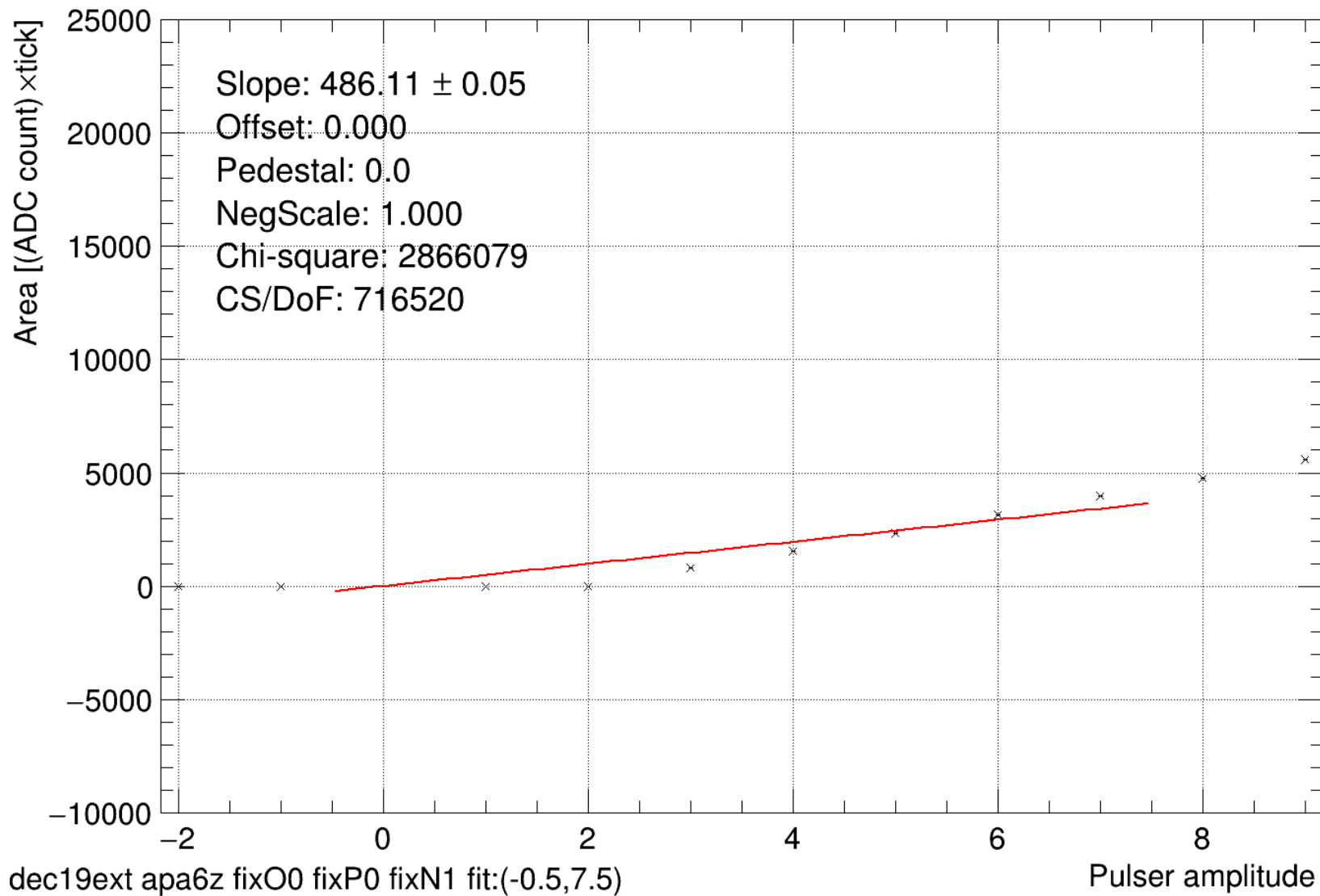
ROI area channel 9547





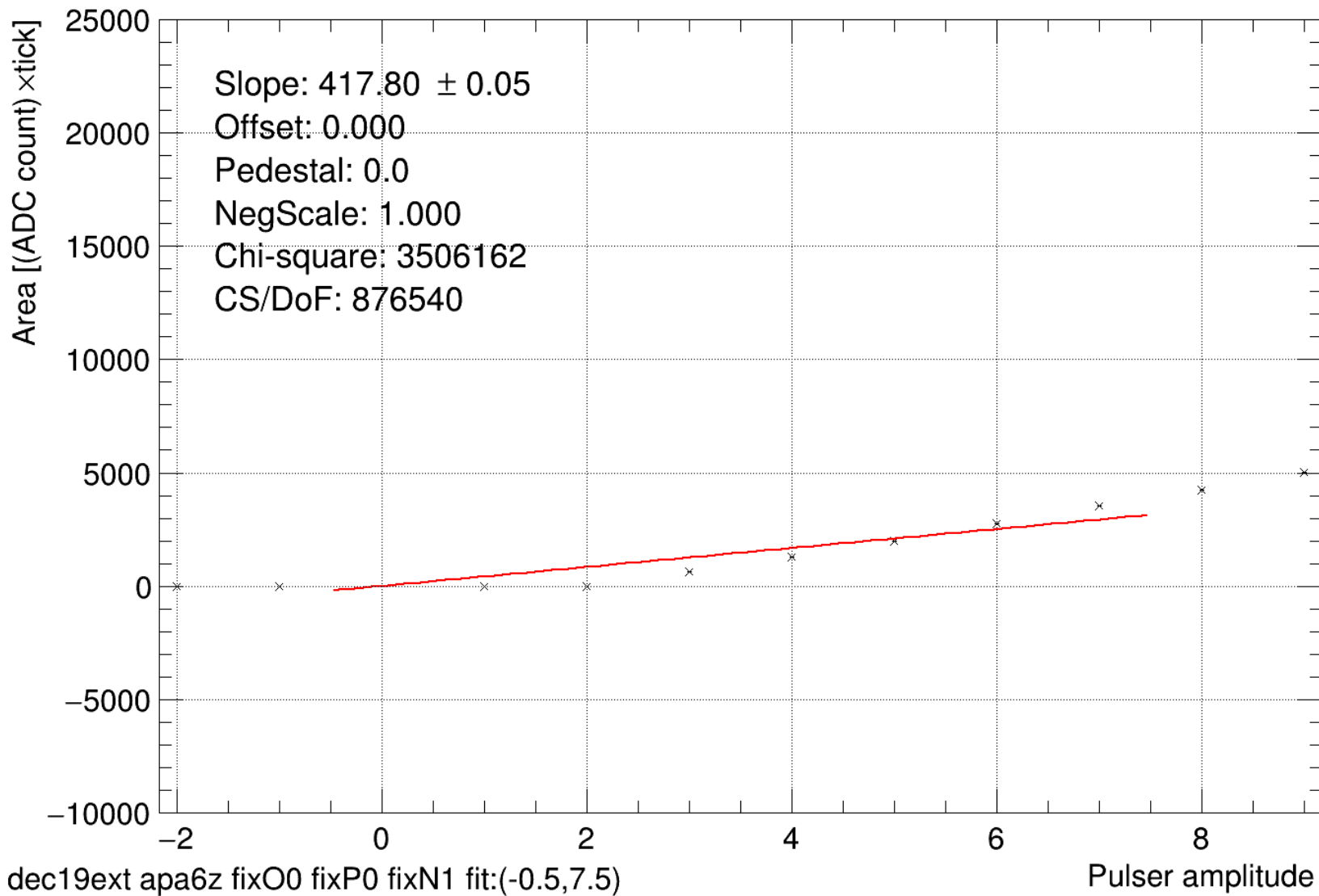
# Shift

ROI area channel 9549



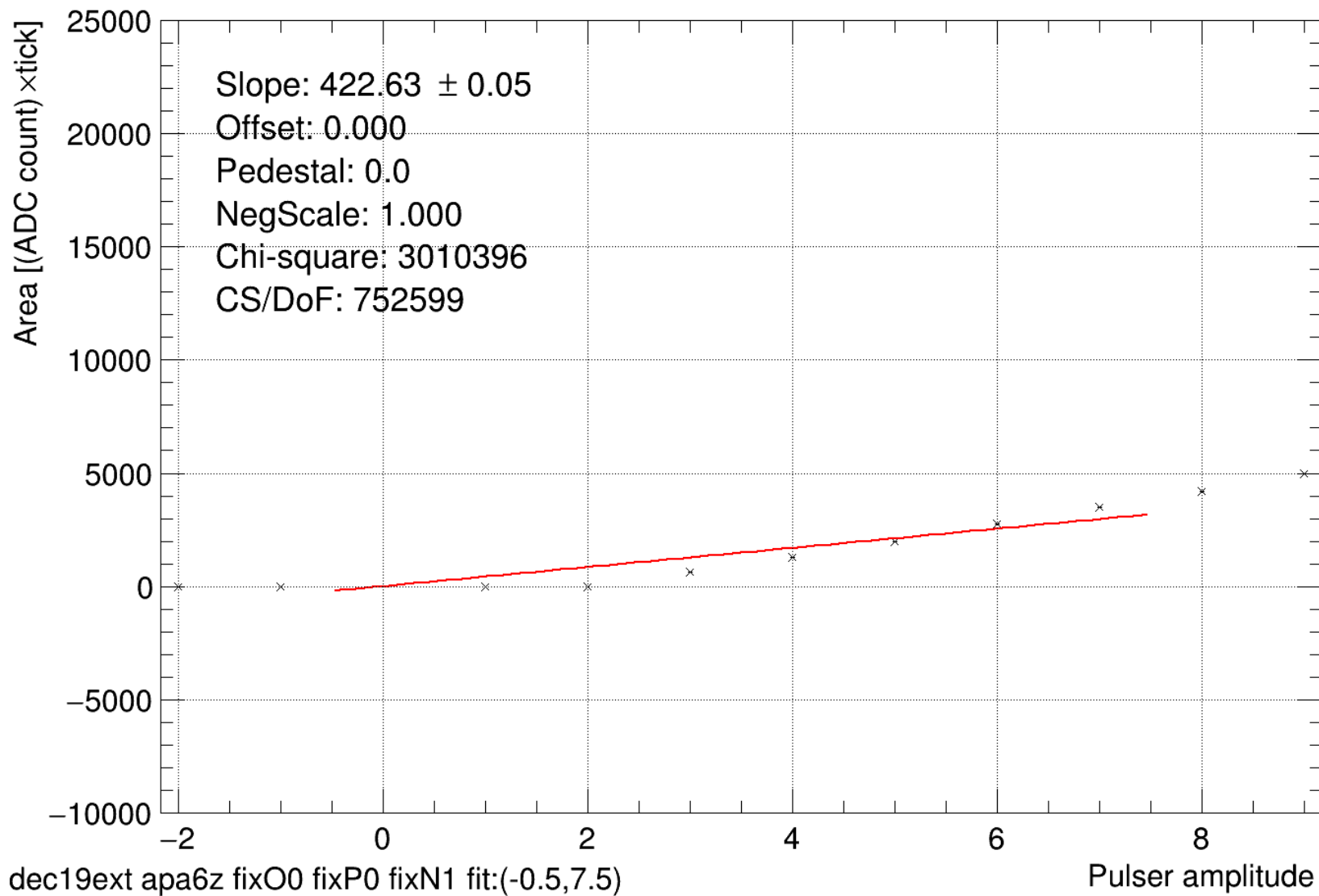
# Shift

ROI area channel 9551



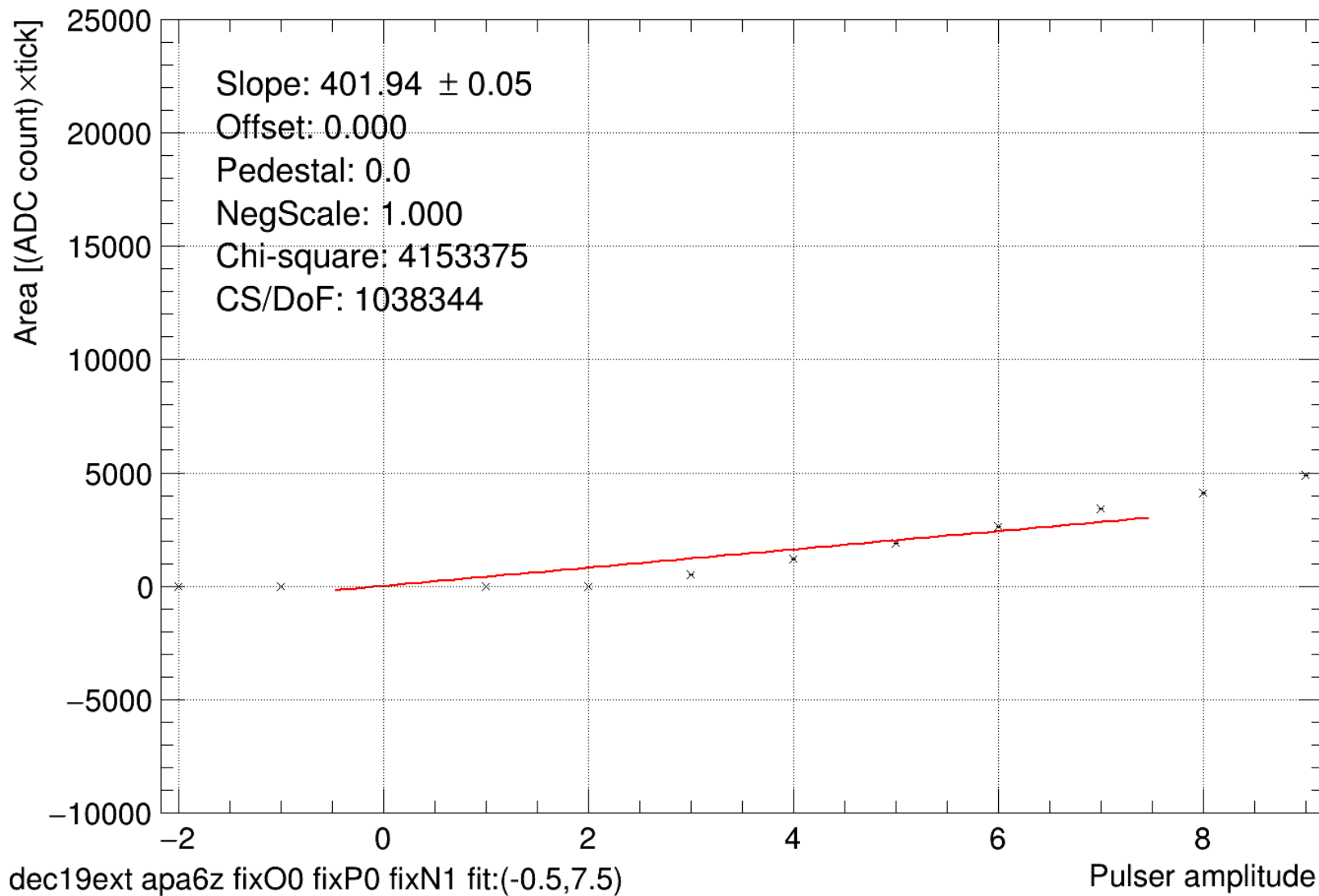
# Shift

ROI area channel 9553



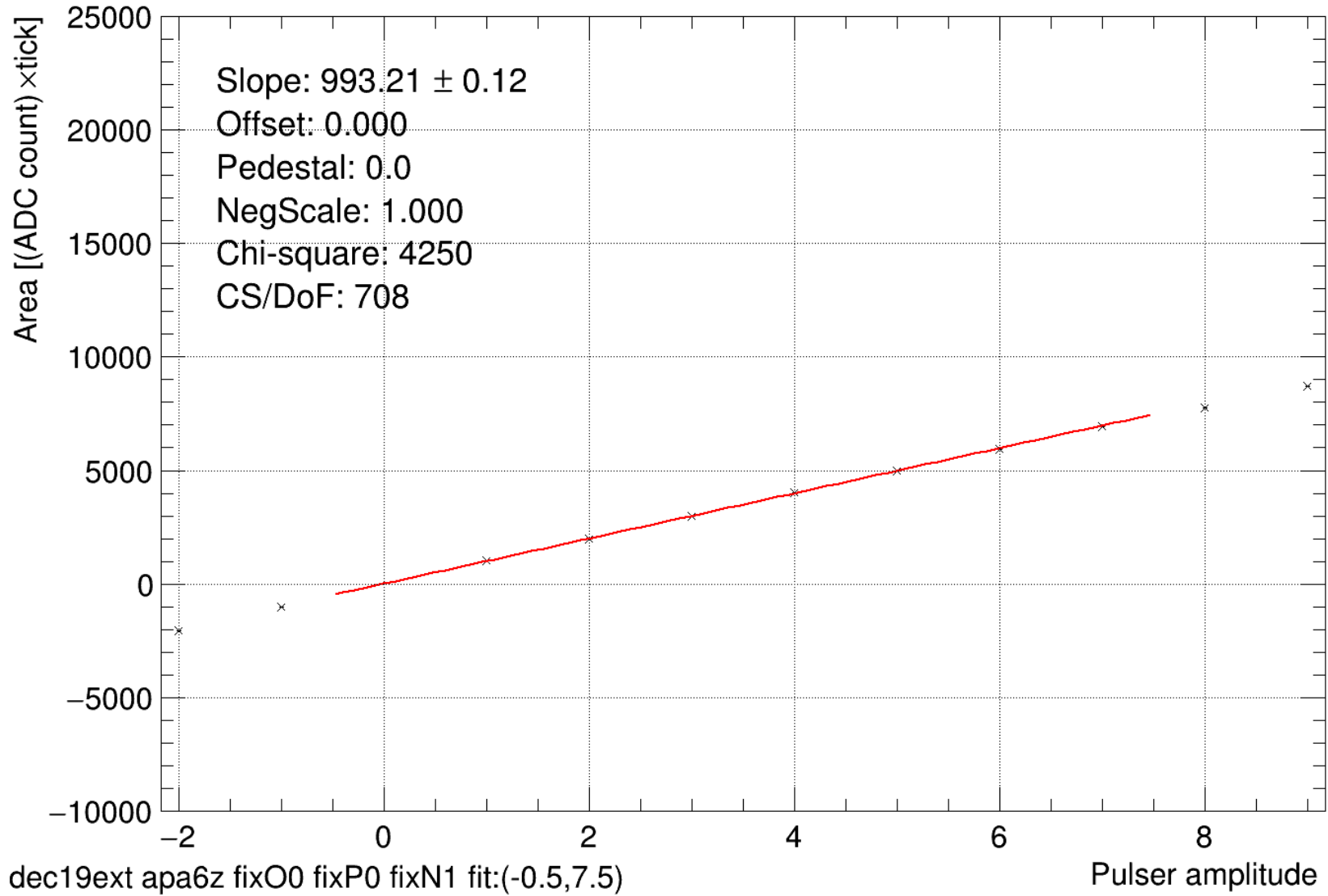
# Shift

ROI area channel 9555



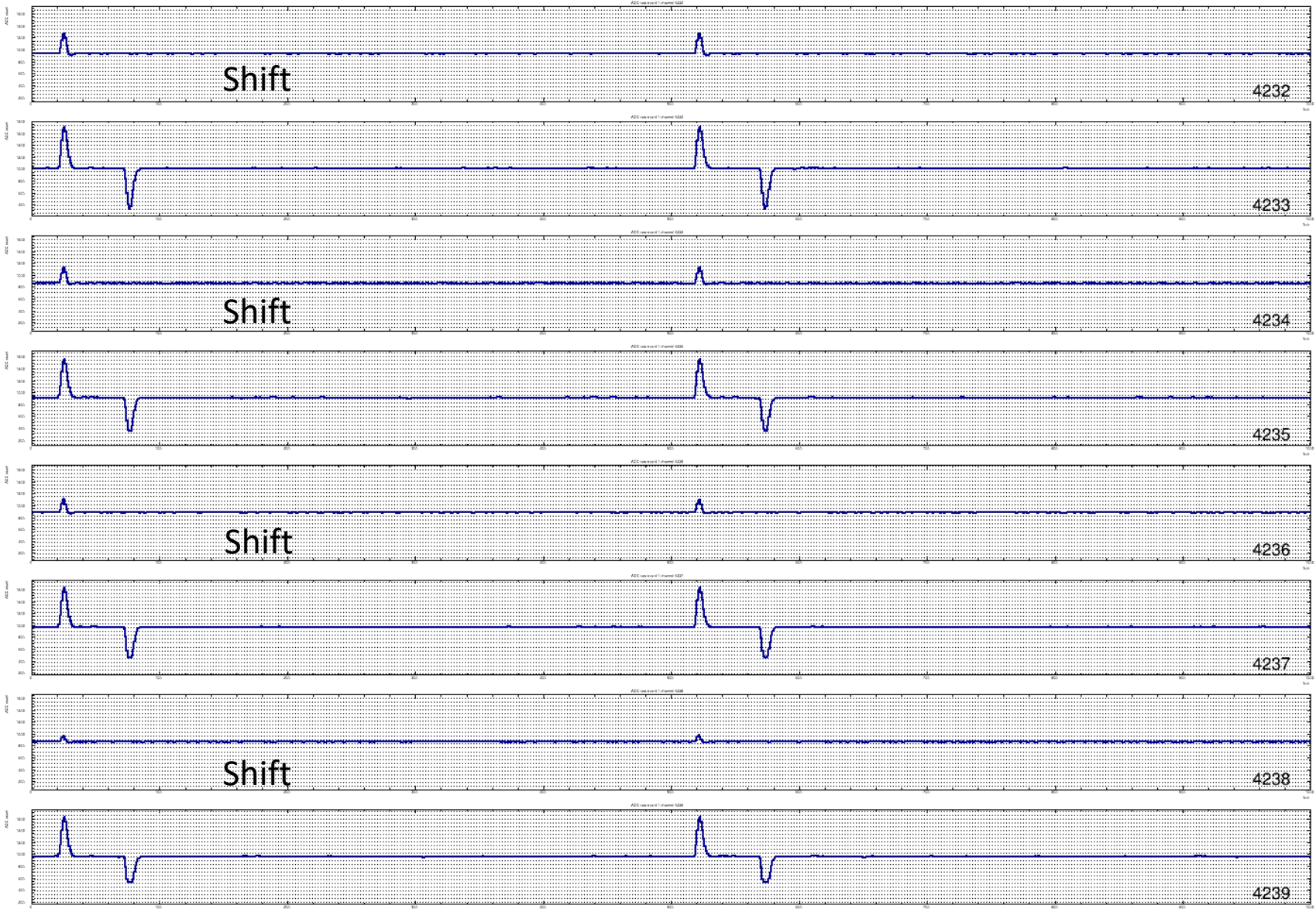
# Good

ROI area channel 9557

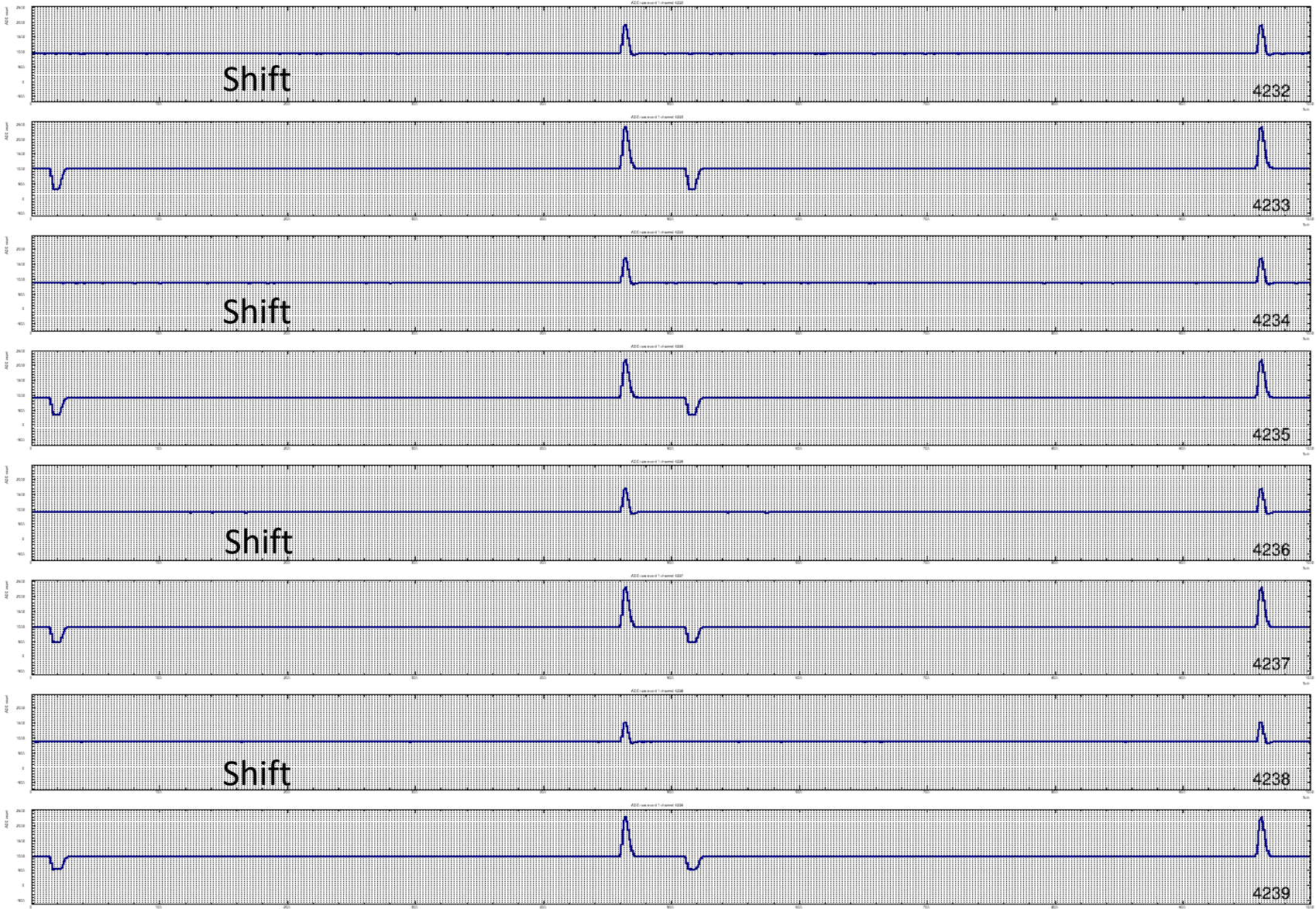


# Waveforms

# DAC=4

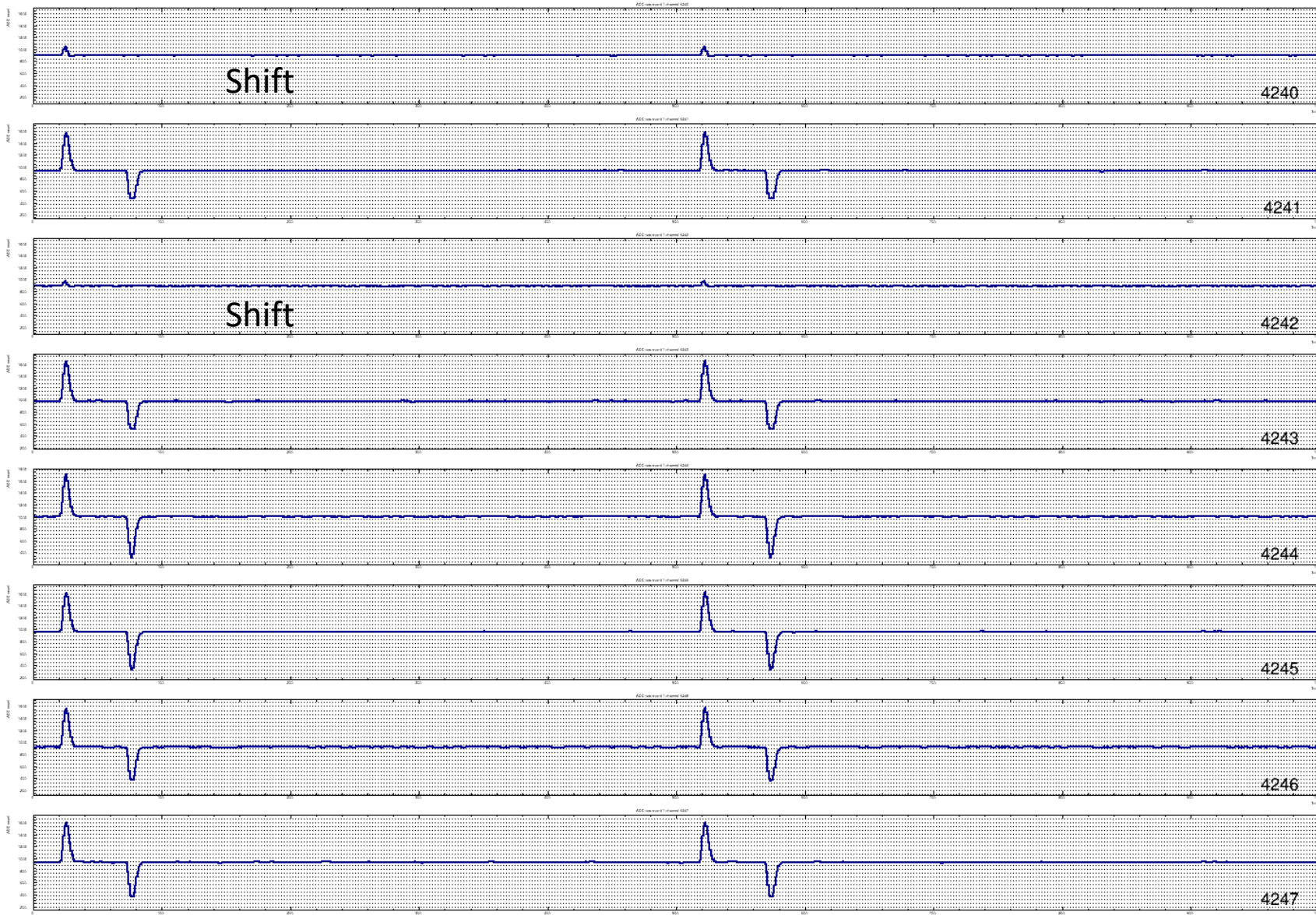


# DAC=8





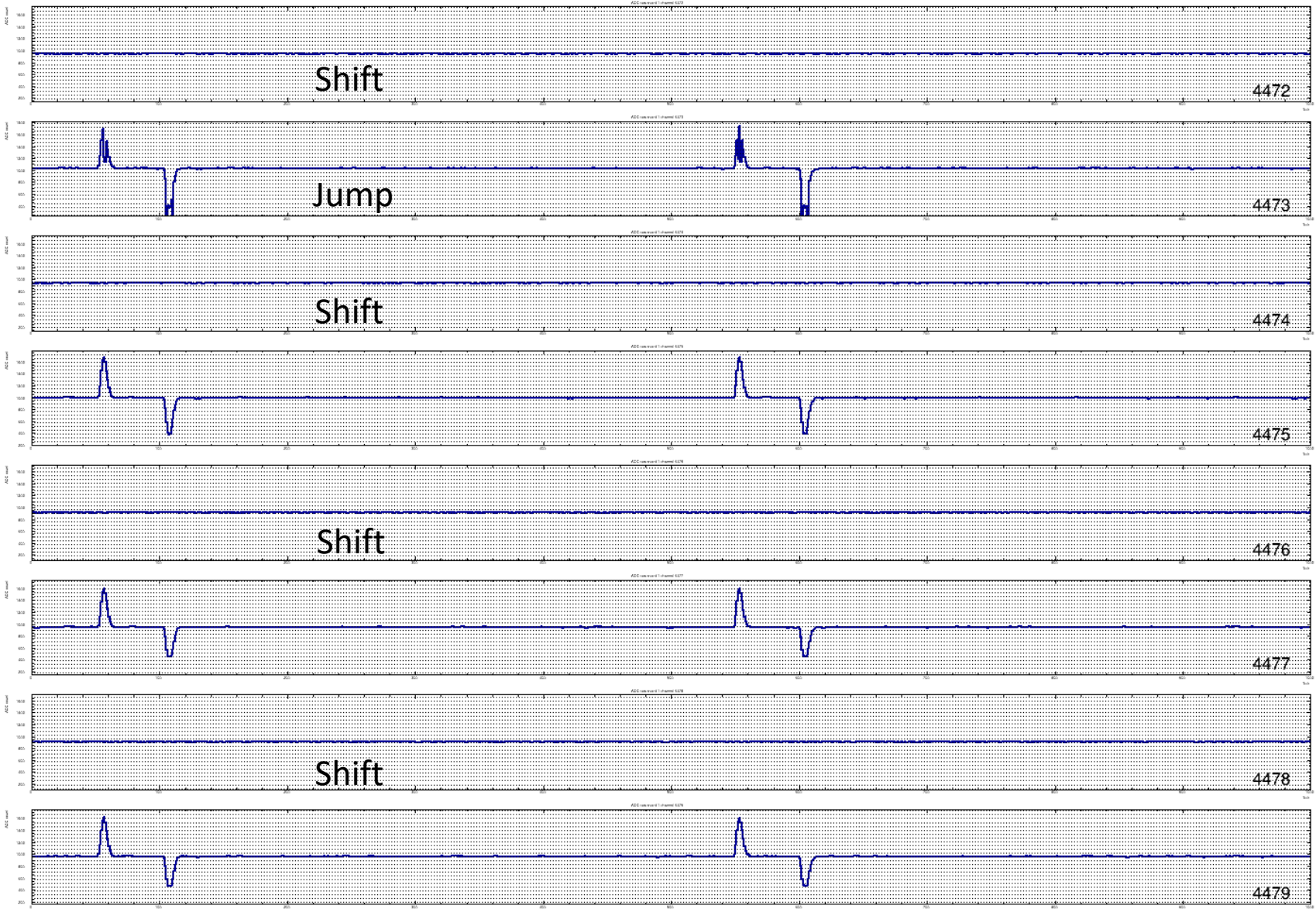
# DAC=4



# DAC=8

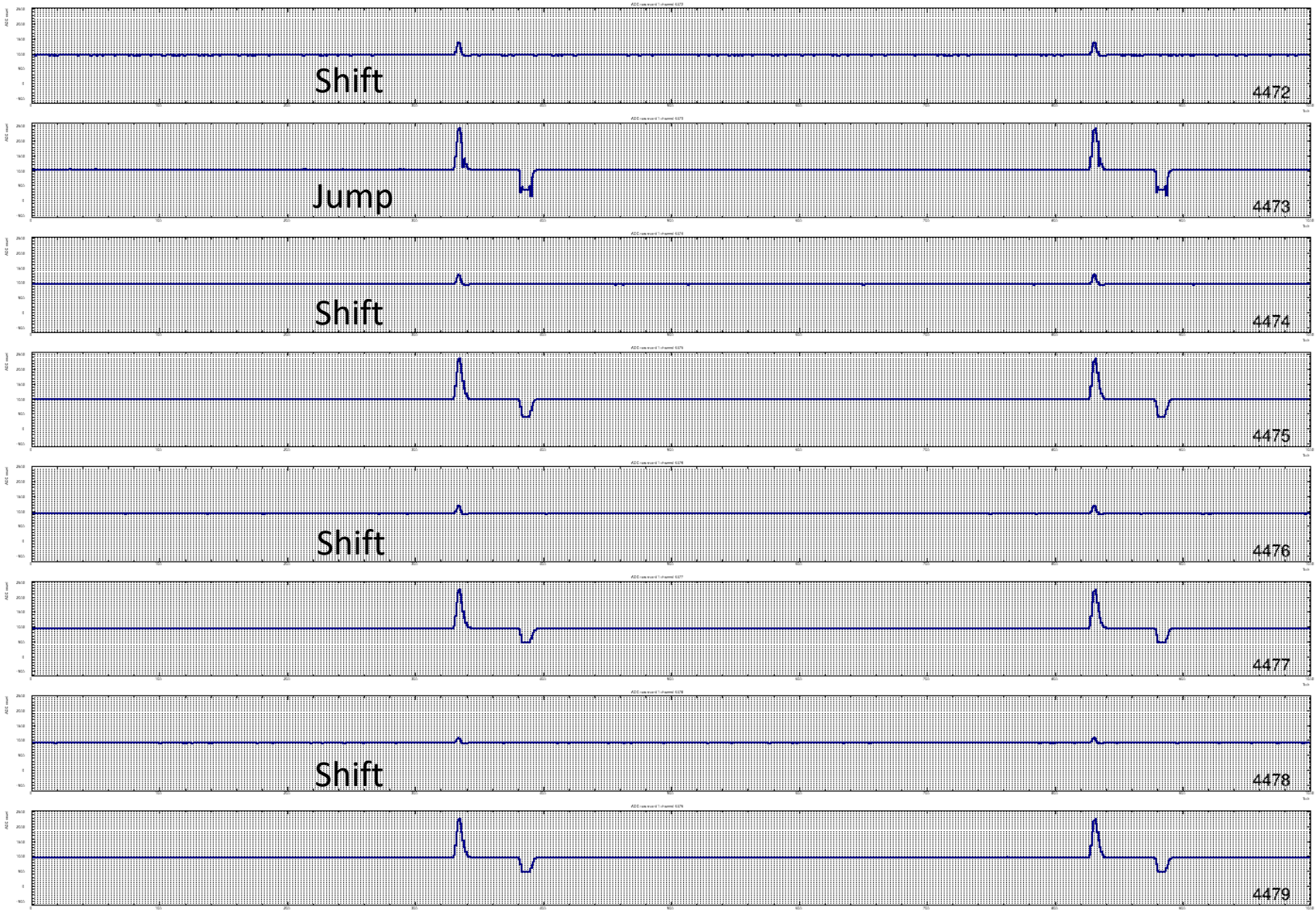


# DAC=4

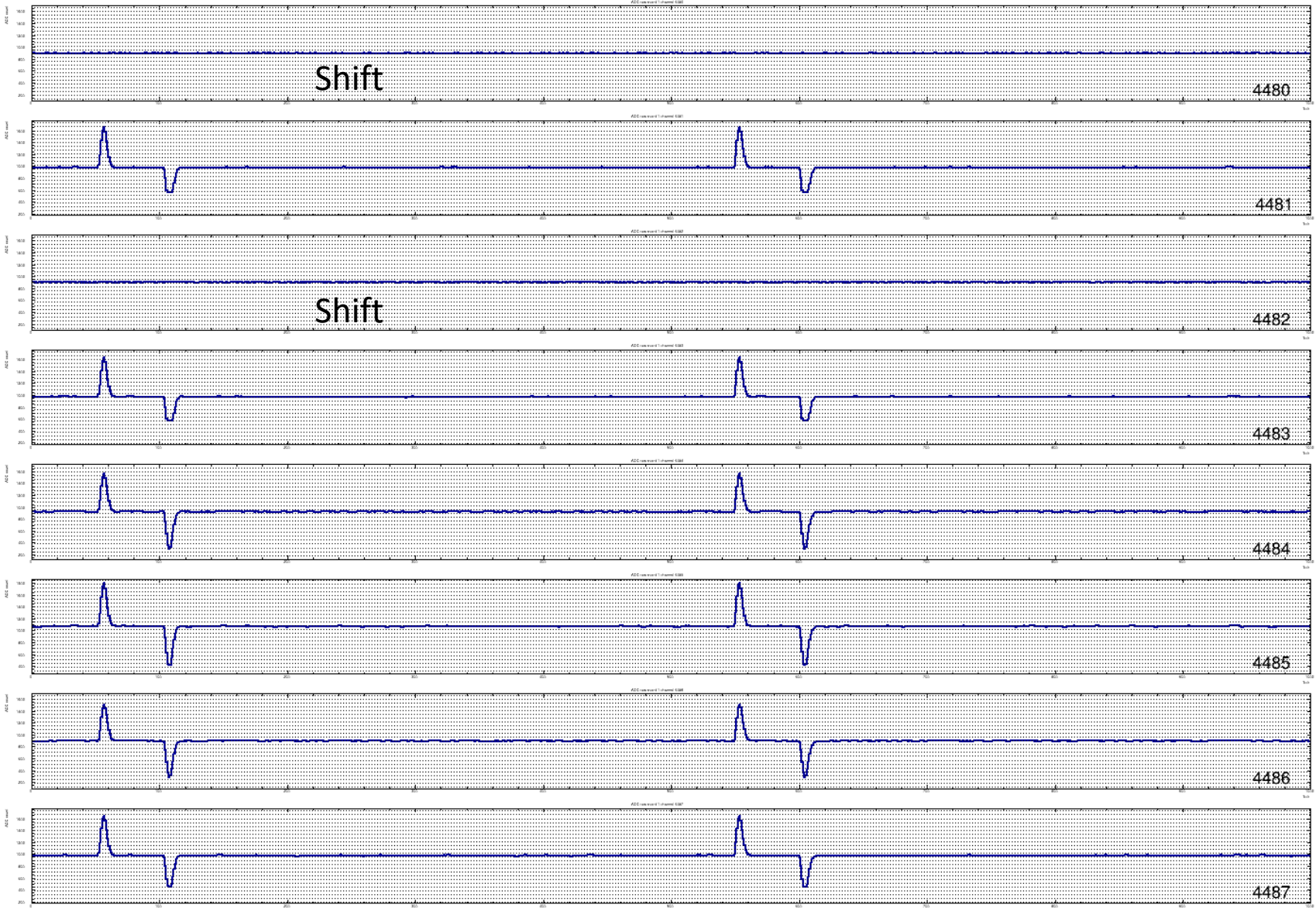




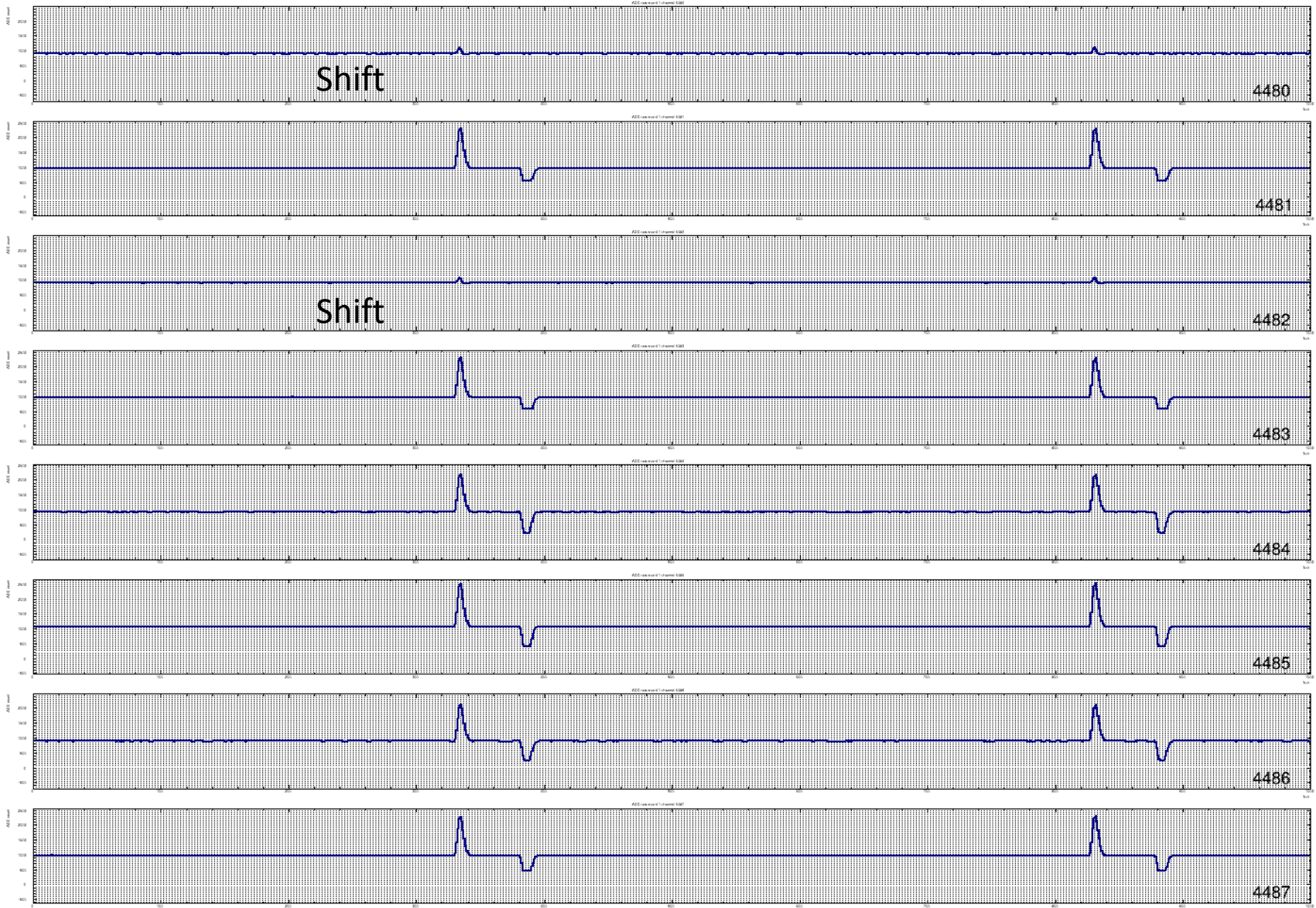
# DAC=8



# DAC=4

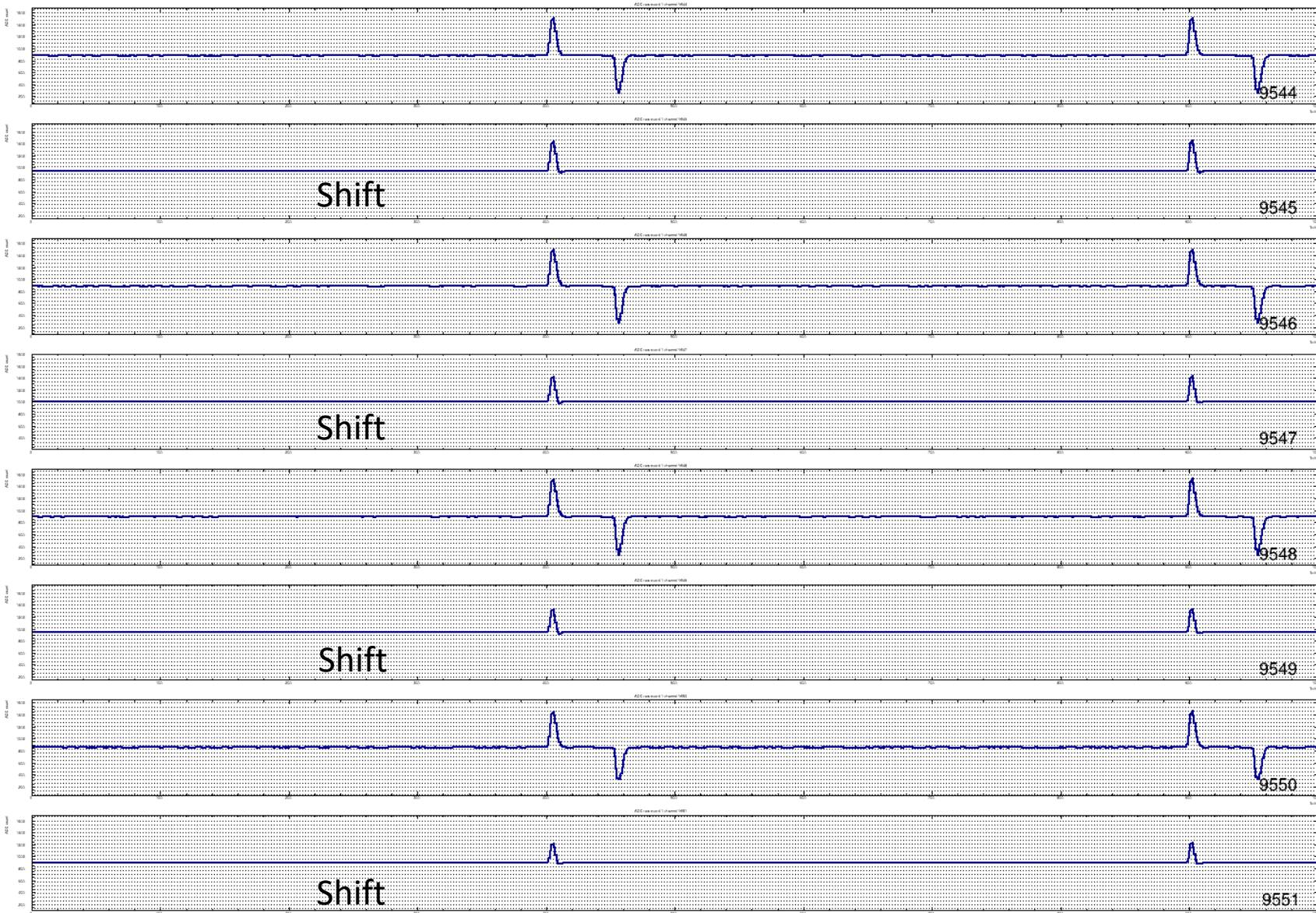


# DAC=8

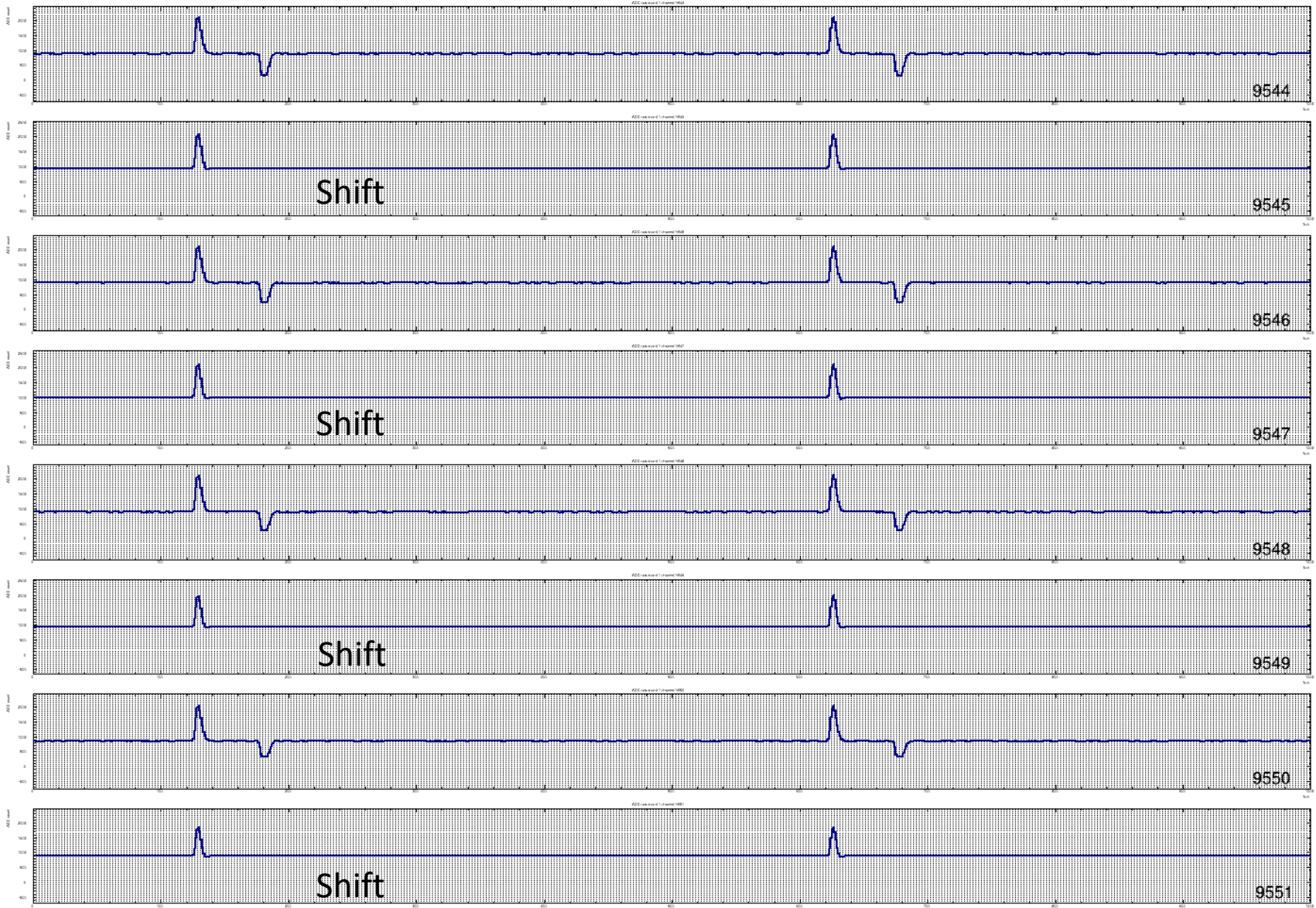




# DAC=4

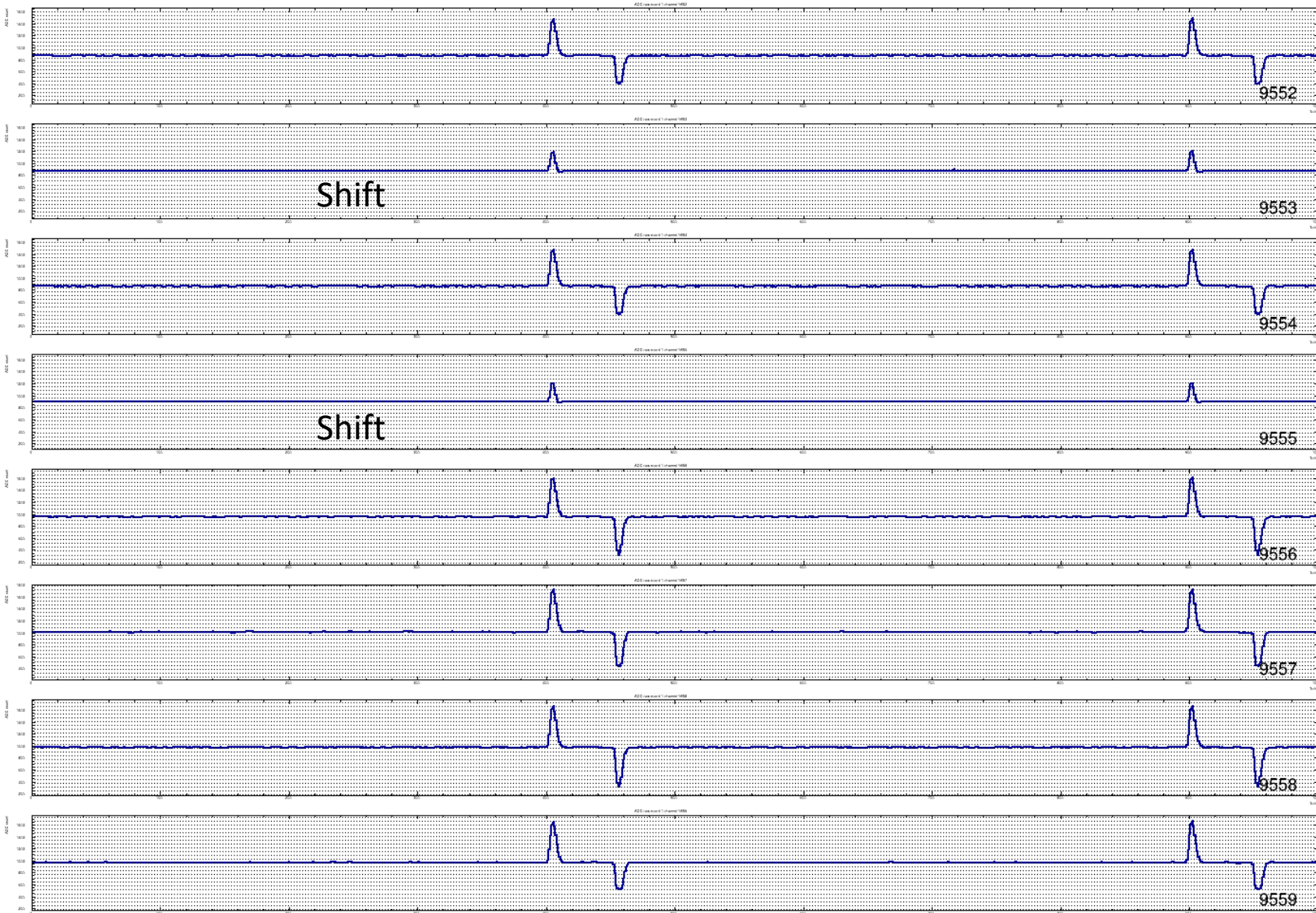


# DAC=8





# DAC=4



# DAC=8

