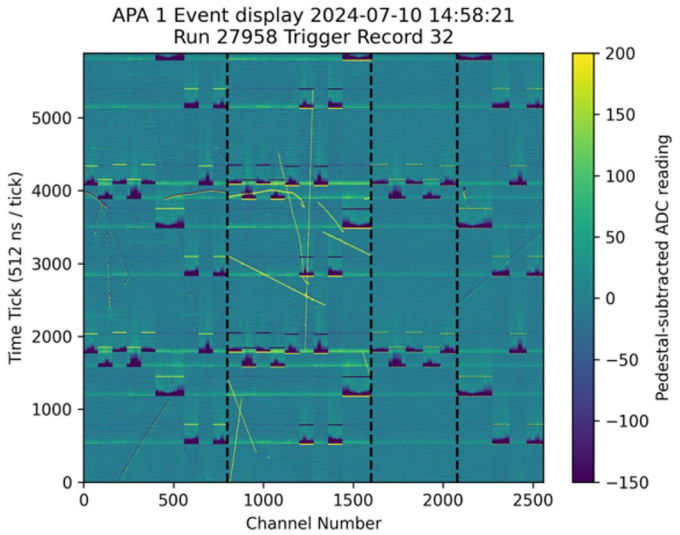
# FEMB Noise Scan

Xuyang Ning, Wenqiang Gu

# FEMB “Noise” - power rail drop

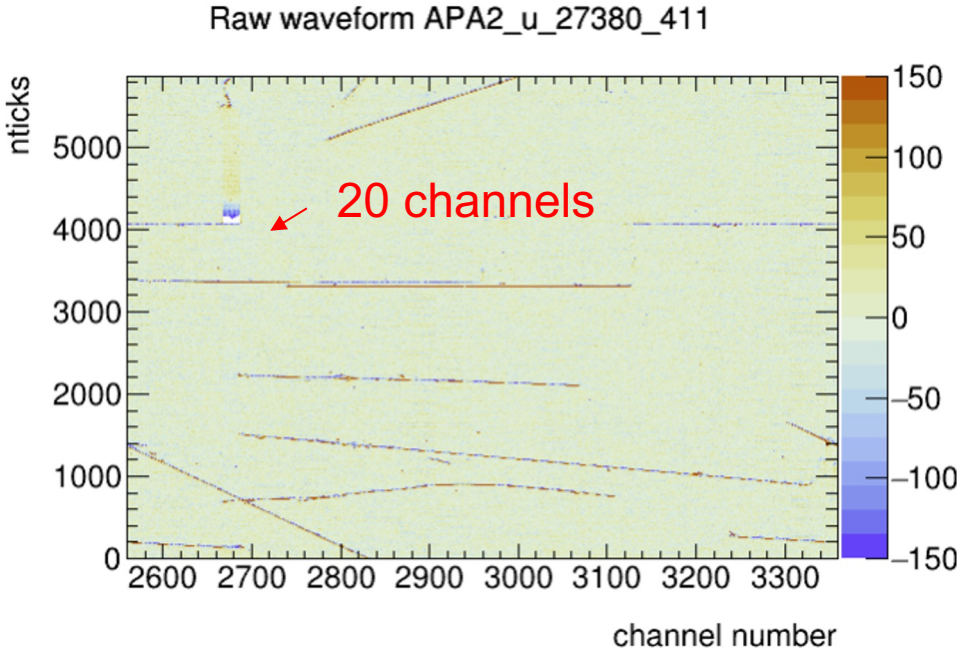
- Observed baseline distortion (undershoot & overshoot) in some U/V/W channels simultaneously
  - Confirmed in pulser data
- The probability of such problem seems better with lower preamplifier gain: 7.8mV/fC
- Shanshan’s explanation:
  - “... multiple FE channels with pulse draw sudden large current that exceed the capability of bypass capacitors for FE power rail, thus voltage of FE power rail frops slightly first and recovers.”
  - “Changing the gain doesn’t reduce input charge, instead it lowers the instant power consumption, and therefore, lowers current draw from bypass capacitors.”

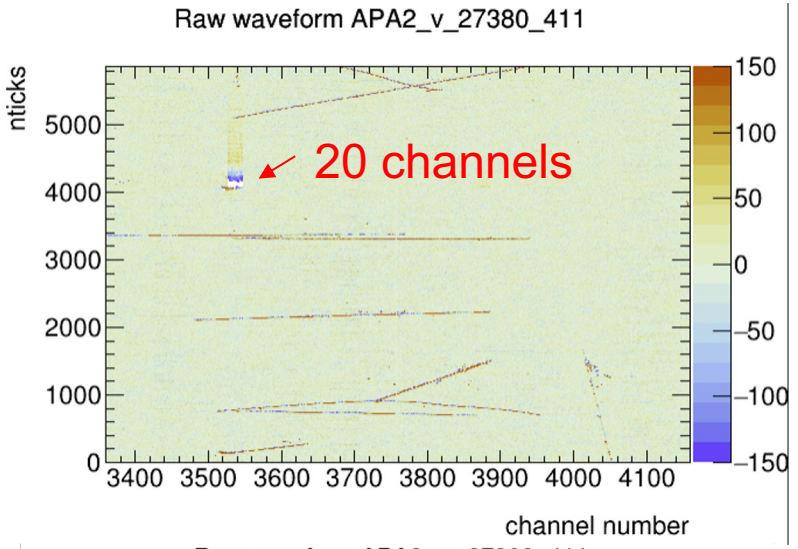
Roger Huang

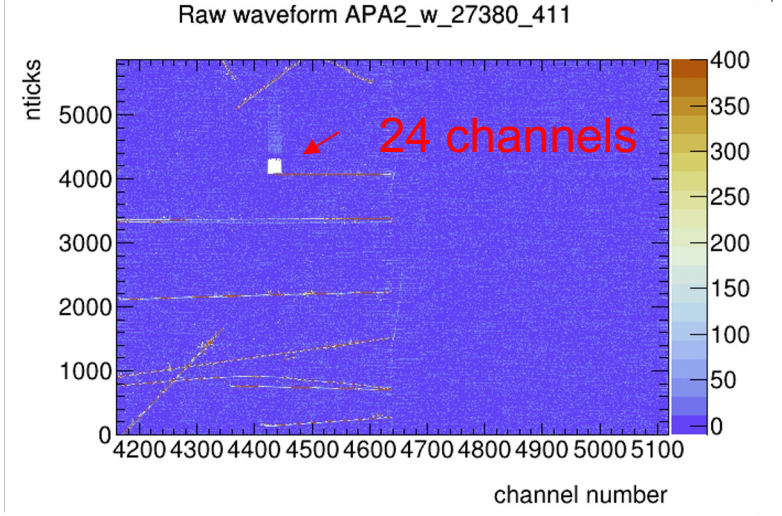



Pulser data

# Waveform with the noise

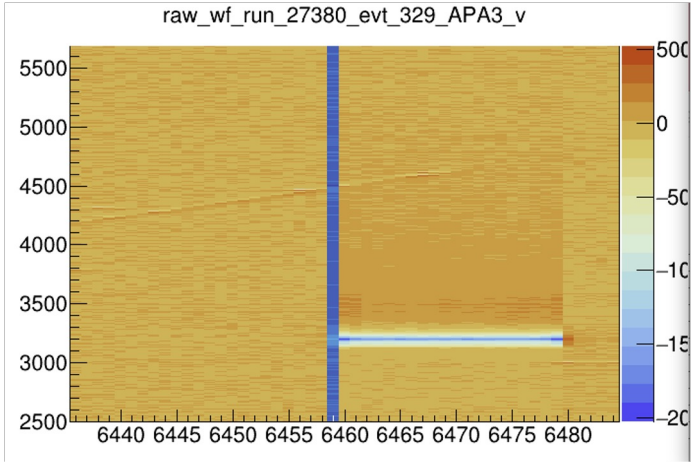


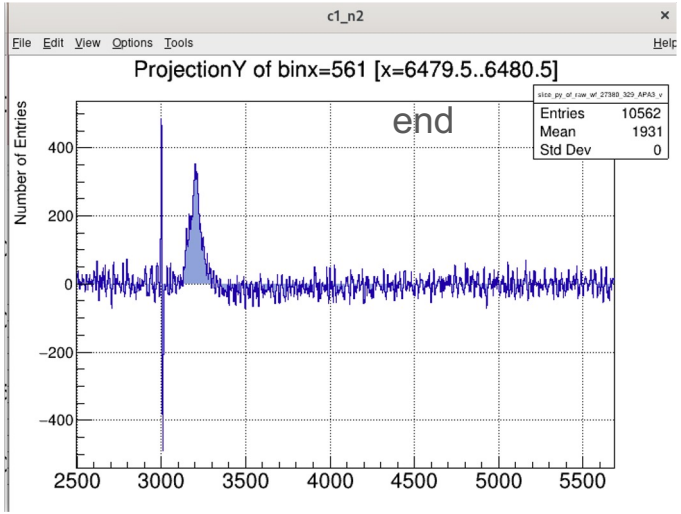



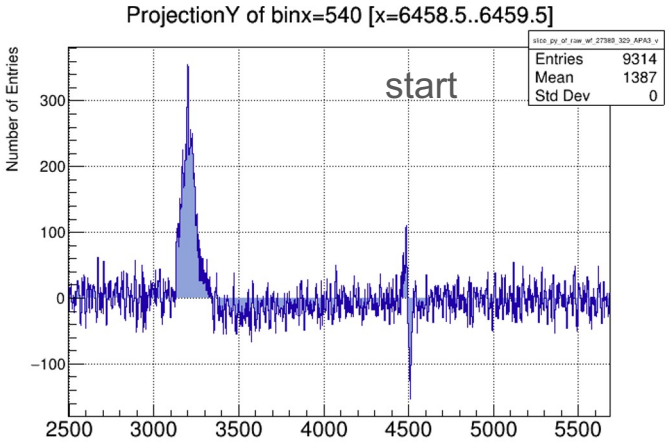



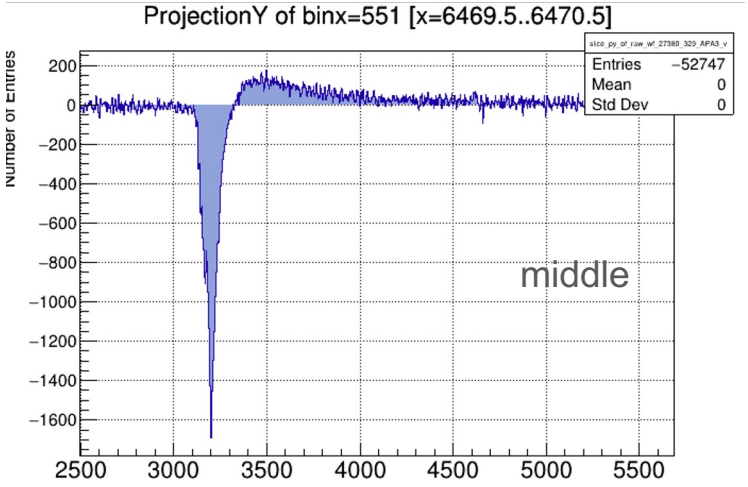

- 20 + 20 + 24 = 64 channels in the same FEMB
  - 128 channels per FEMB
  - Two power rails per FEMB

# Waveform


raw_wf_run_27380_evt_329_APA3_v
5500
5000
4500
4000
3500
3000
2500
6440 6445 6450 6455 6460 6465 6470 6475 6480
500
0
−50
−10
−15
−20


c1_n2
File Edit View Options Tools Help
ProjectionY of binx=561 [x=6479.5..6480.5]
Entries 10562
Mean 1931
Std Dev 0
end
Number of Entries
400
200
0
−200
−400
2500 3000 3500 4000 4500 5000 5500

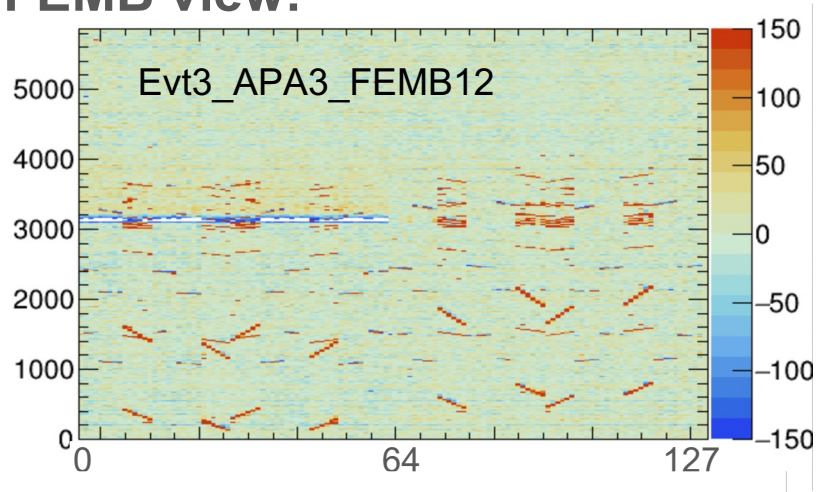

ProjectionY of binx=540 [x=6458.5..6459.5]
Entries 9314
Mean 1387
Std Dev 0
start
Number of Entries
300
200
100
0
−100
2500 3000 3500 4000 4500 5000 5500

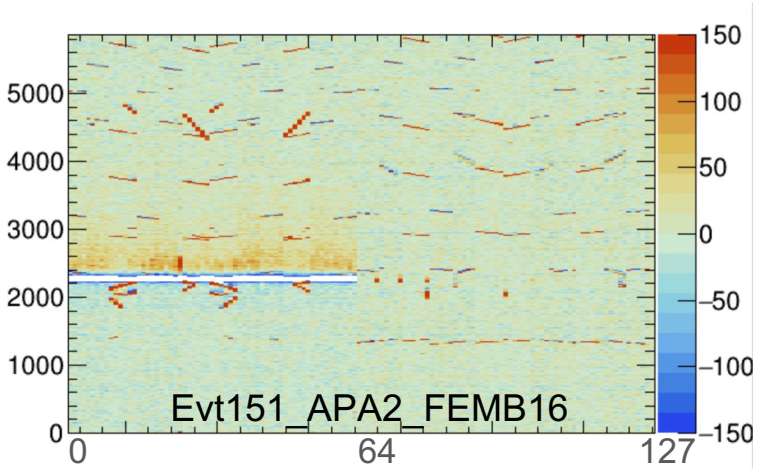

ProjectionY of binx=551 [x=6469.5..6470.5]
Entries −52747
Mean 0
Std Dev 0
middle
Number of Entries
200
0
−200
−400
−600
−800
−1000
−1200
−1400
−1600
2500 3000 3500 4000 4500 5000 5500

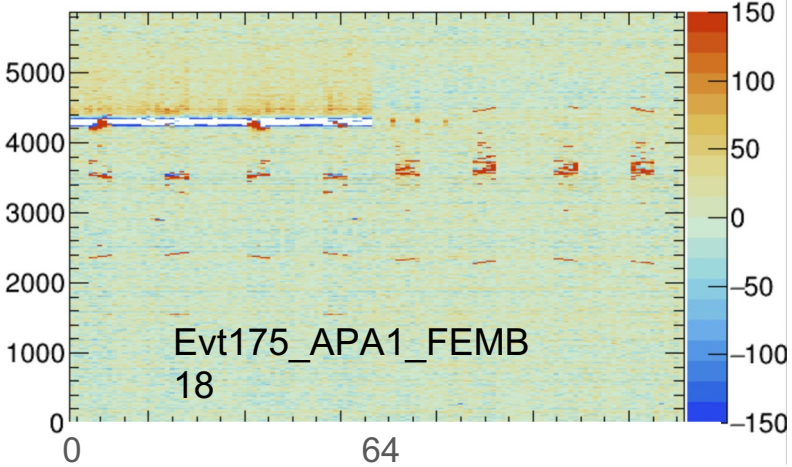
## Scan result:

| Run | Date | Type | Gain | Total # of Scanned triggers | Total # of identified FEMB “noise” | # in APA 1 | # in APA 2 | # in APA 3 | # in APA 4 |
|---|---|---|---|---|---|---|---|---|---|
| 27380 | 06/22 | beam | 14mV/fC | 565 | 37 | 3 | 10 | 13 | 11 |
| 27355 | 06/21 | beam | 14mV/fC | 1741 | 164 | 28 | 47 | 39 | 50 |
| 28052 | 07/18 | beam | 7.8mV/fC | 413 | 7 | 0 | 4 | 2 | 1 |
| 28084 | 07/20 | cosmic | 7.8mV/fC | 1271 | 136 | 14 | 46 | 37 | 29 |

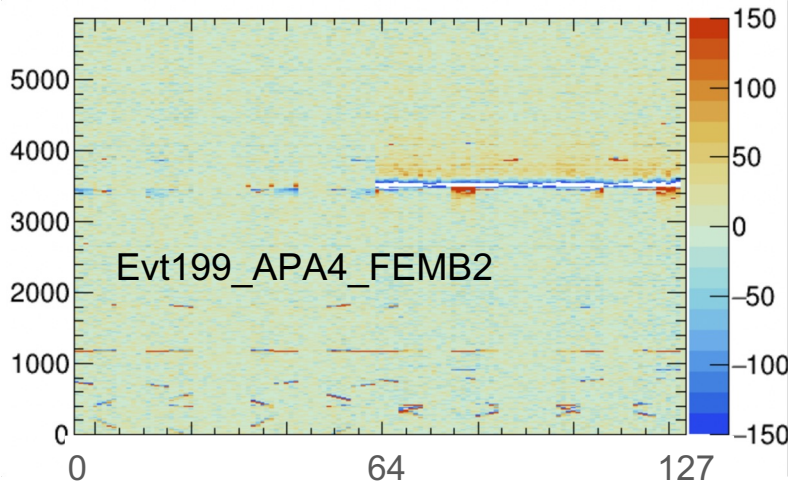
# In FEMB view:



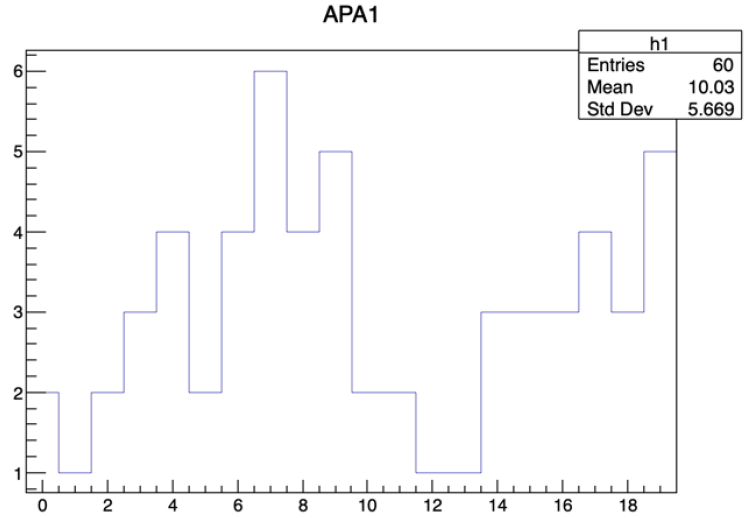



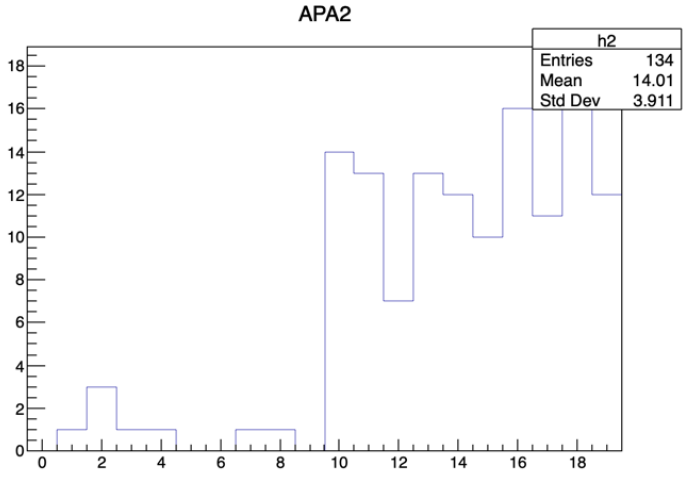



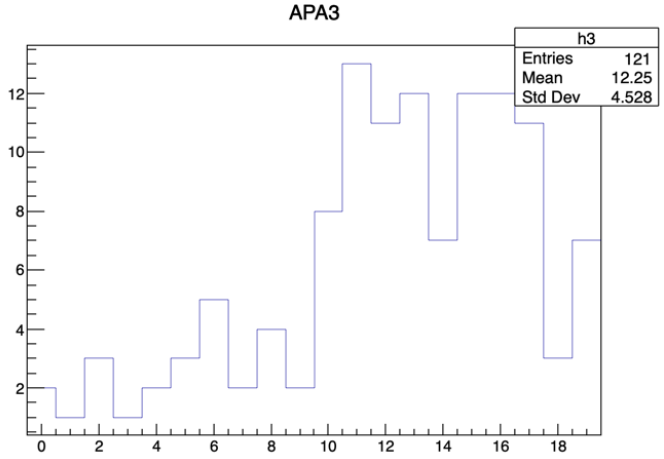

cold electronic channels

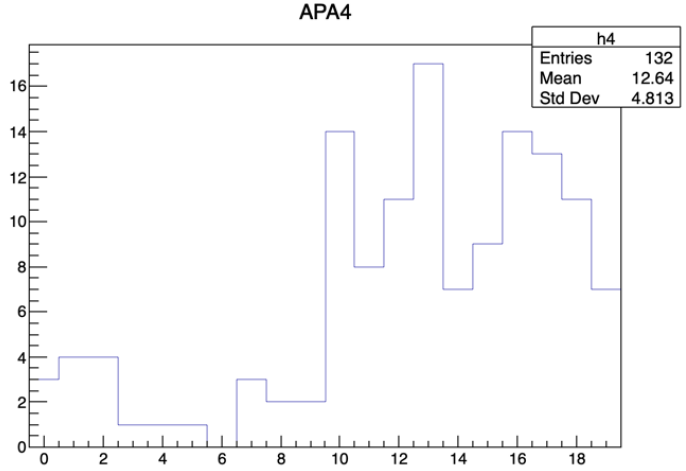



cold electronic channels


APA1
h1
Entries 60
Mean 10.03
Std Dev 5.669


APA2
h2
Entries 134
Mean 14.01
Std Dev 3.911

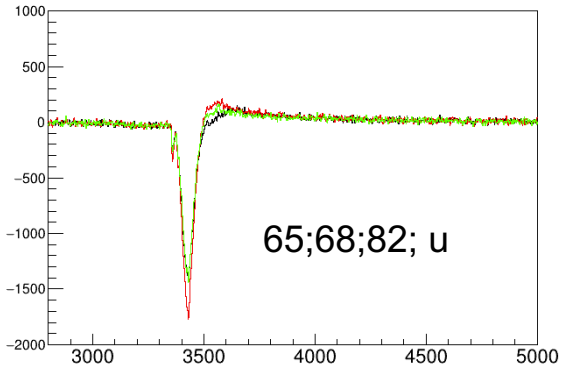

APA3
h3
Entries 121
Mean 12.25
Std Dev 4.528

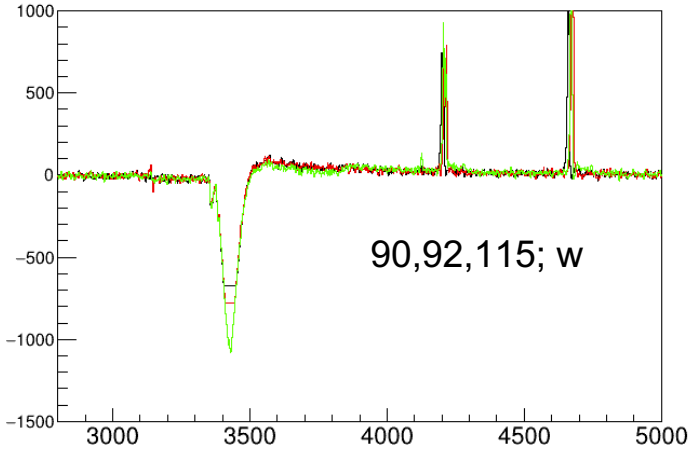

APA4
h4
Entries 132
Mean 12.64
Std Dev 4.813

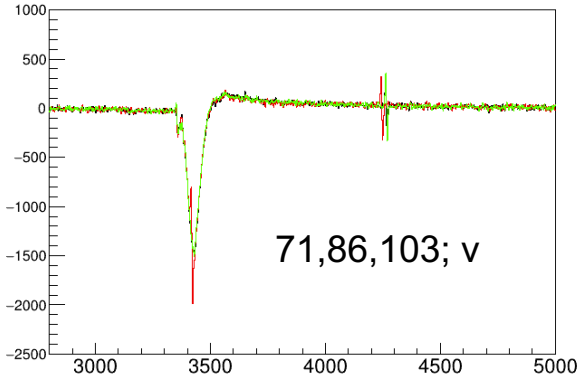
# 1D waveform comparison:

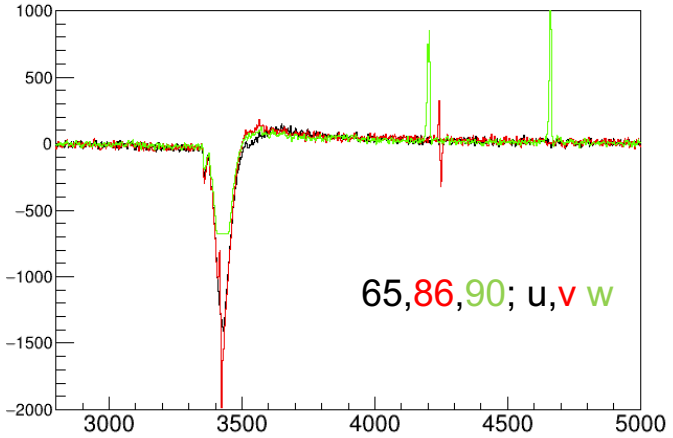
run_27380/Evt2845_APA1_group15

Gain: 14mV/fC



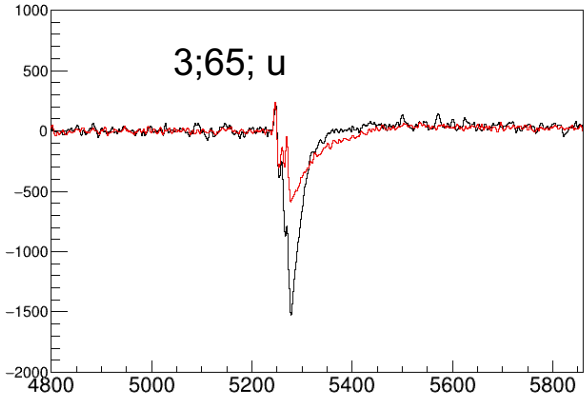



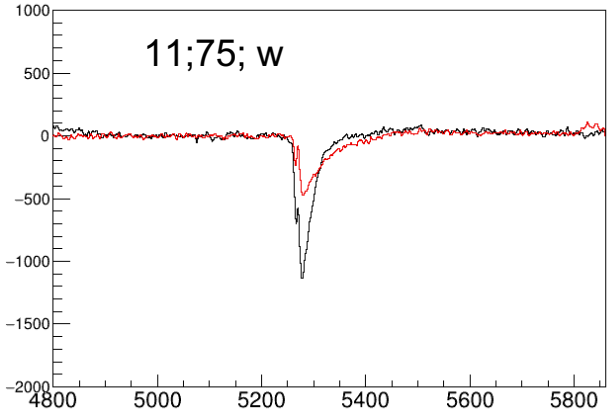



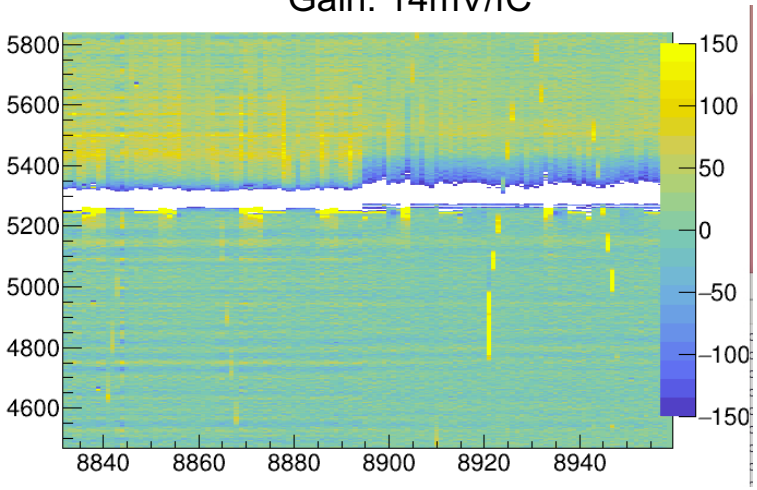
# 1D waveform comparison:

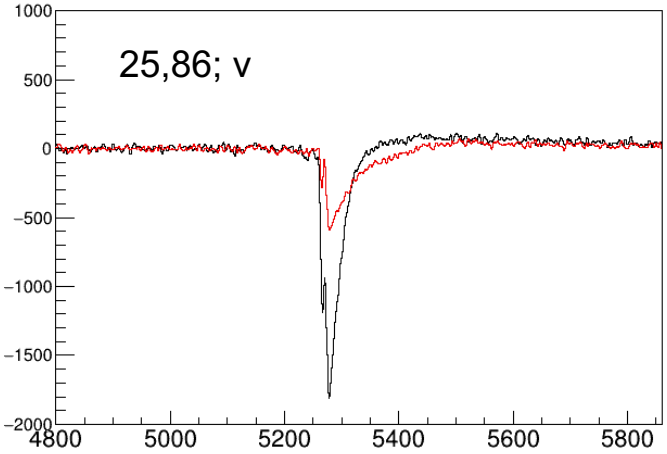
run_27380/Evt2672_APA3_group9



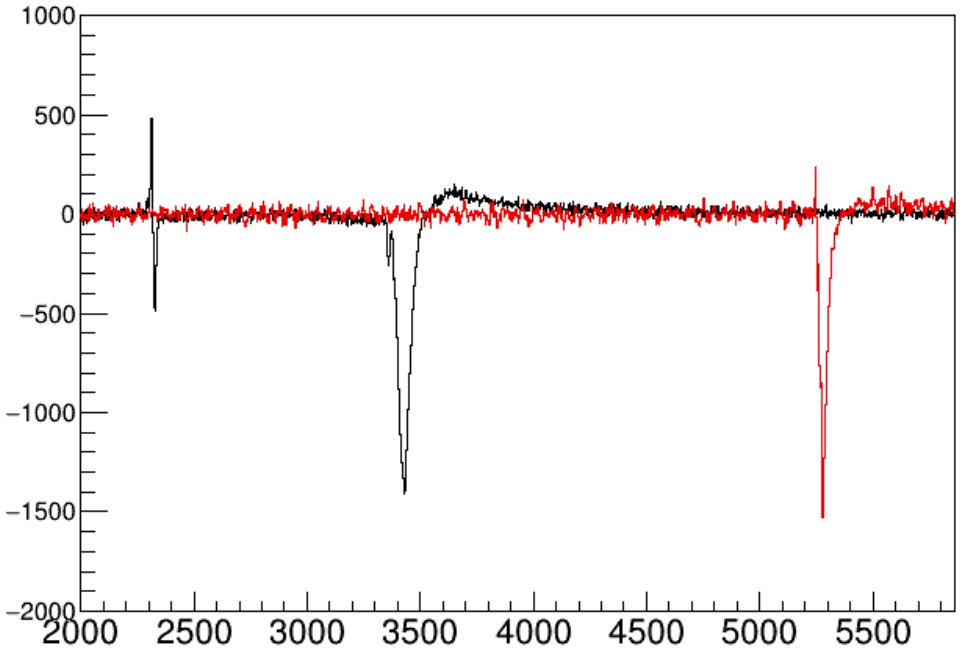

Gain: 14mV/fC



# 1D waveform comparison:

Gain: 14mV/fC

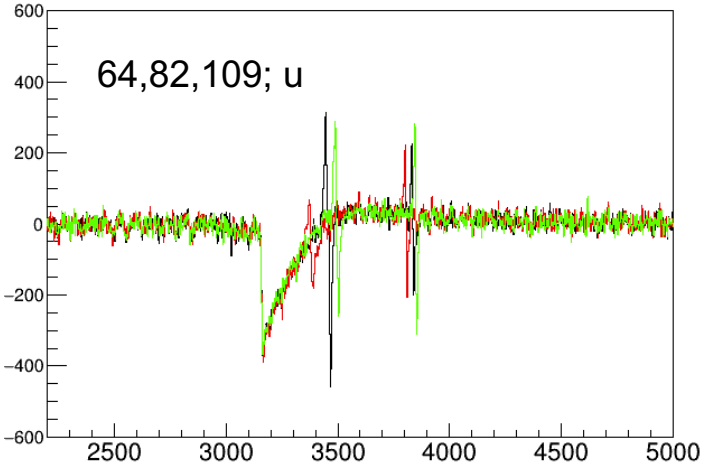


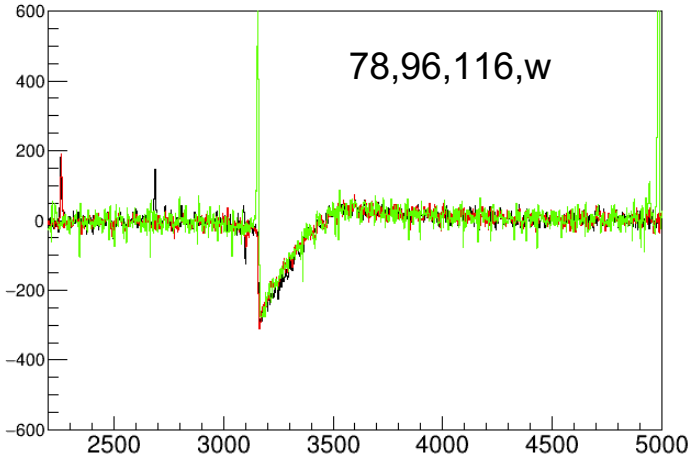

run_27380/Evt2845_APA1_group15 65;u
run_27380/Evt2672_APA3_group9 3;u

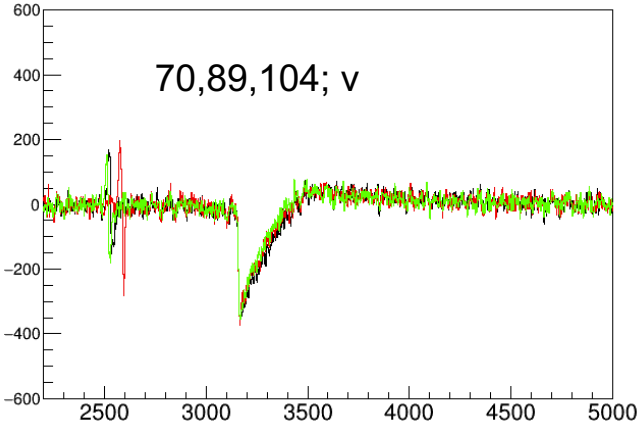
# 1D waveform comparison:

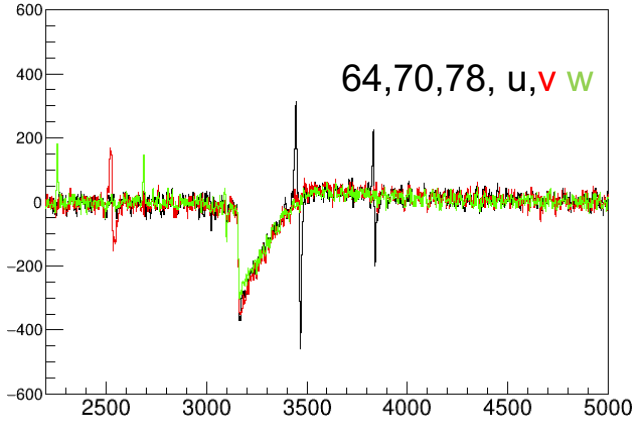
run_28084/Evt56_APA1_group19

Gain: 7.8mV/fC



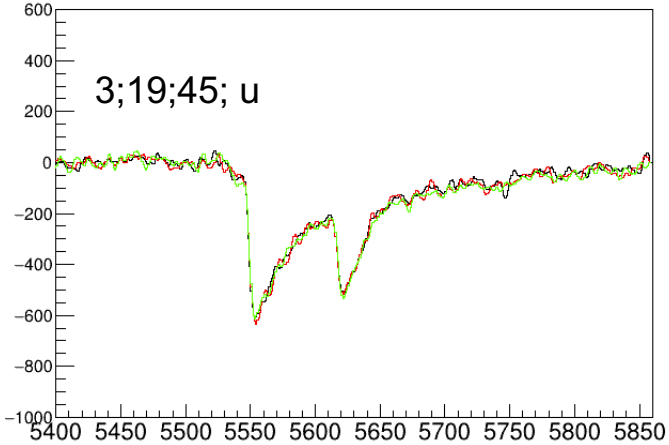



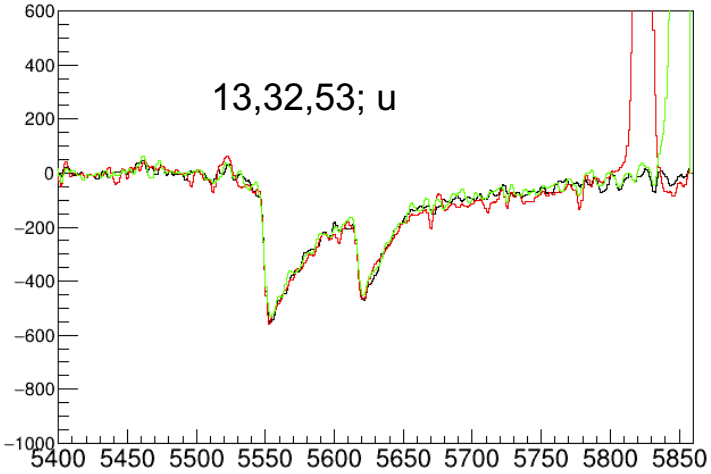



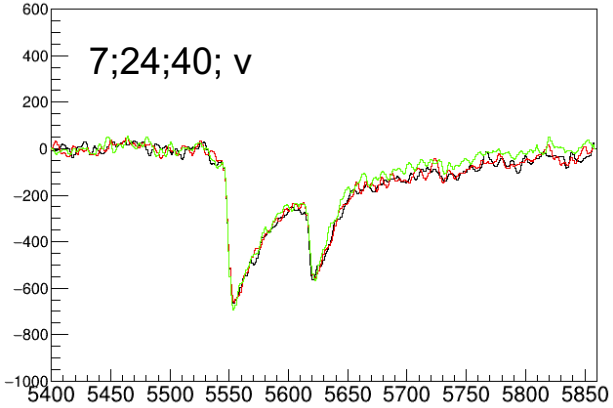
# 1D waveform comparison:

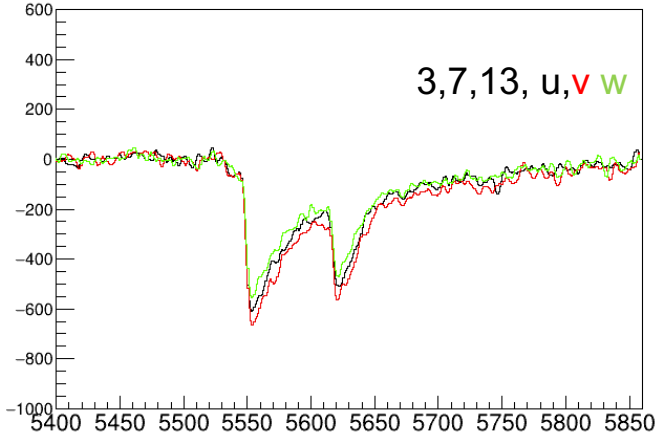
run_28084/Evt73_APA1_group10

Gain: 7.8mV/fC



Gain: 7.8mV/fC

run_28084/Evt16_APA1_group18