

# Updates from CERN

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CE Consortium Meeting 10/29/24

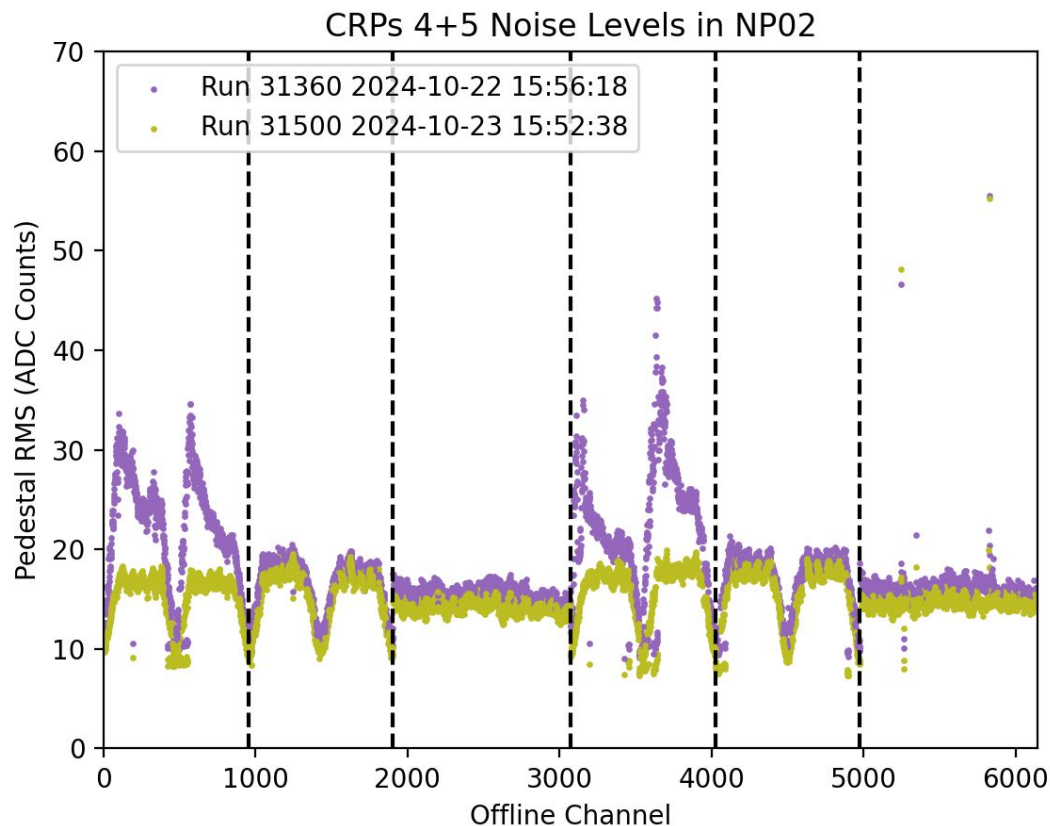
Roger Huang

# NP02 Flange Closure

- NP02 spare cables are now grounded and the flange for our electronics is closed
- Noise levels on bottom CRPs look good after flange closure



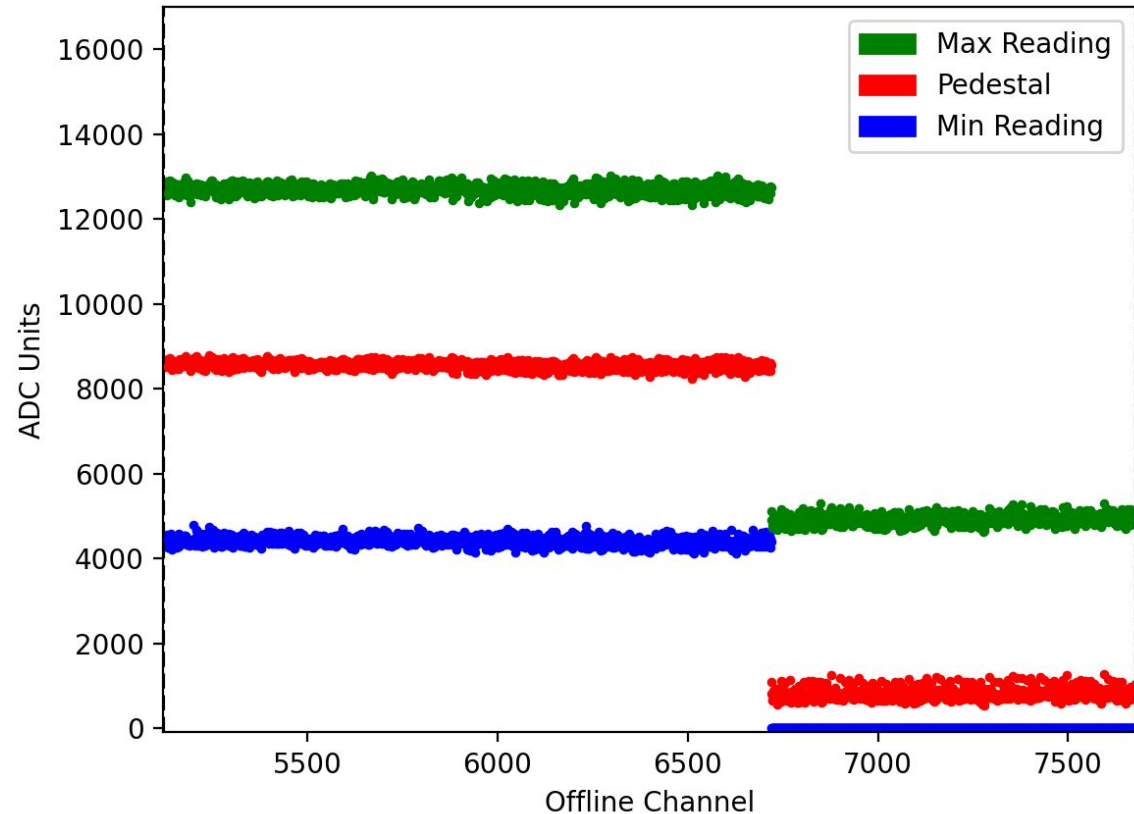
Plot from Herilala



# APA14 Coldbox Test

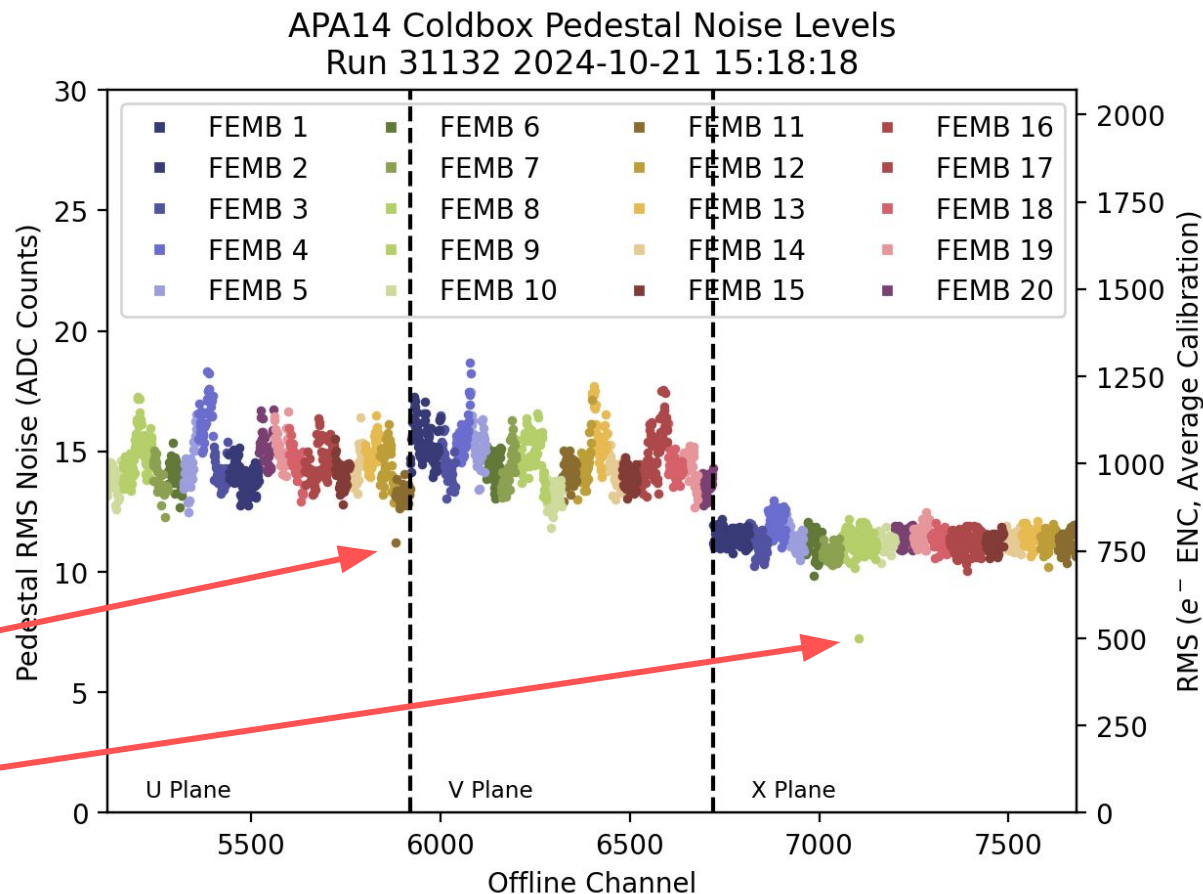
APA14 Coldbox Pulser Response After Warmup  
Run 32186 2024-10-28 09:42:58

- APA 14 was cold tested last week and extracted this week
- No issues with FEMBs throughout the test
  - 2 WIBs each fried a fuse at some point while connected to the FEMBs before the coldbox was closed, and had to be replaced



# Initial Warm Results

- Set of noise data taken right after the coldbox door was closed
- Results are right around what we expect
- Partially disconnected U wire (U761) matches the non-conformity report
- Disconnected X wire (X386) is not expected



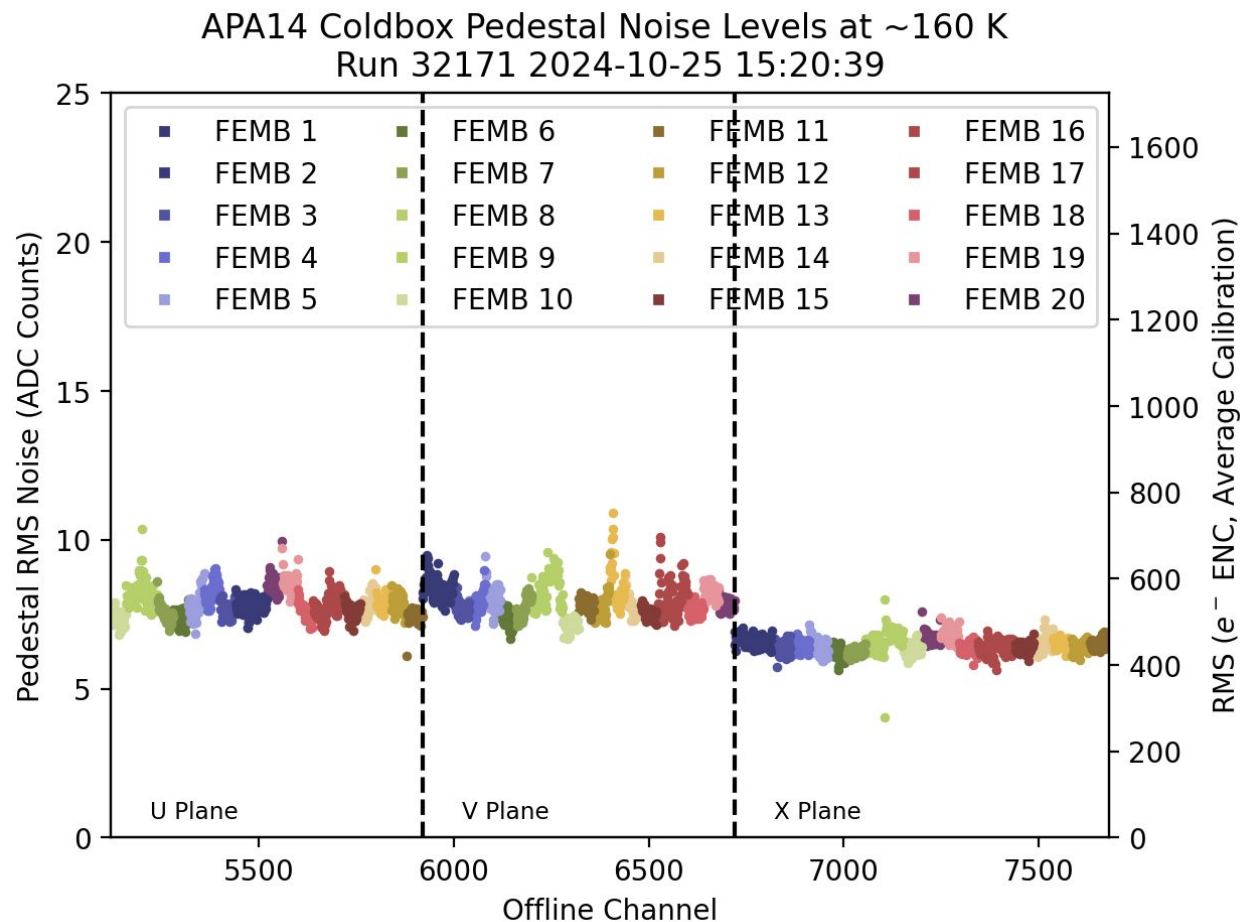
## Disconnected X Channel

- The wire for the disconnected X channel visibly looks fine
- But it's on FEMB 11, which was the one which suffered mechanical disturbance when the APA was being pushed in
- There's probably a broken connection somewhere between the wire and the FEMB - will investigate more during FEMB dismounting



# Cold Results

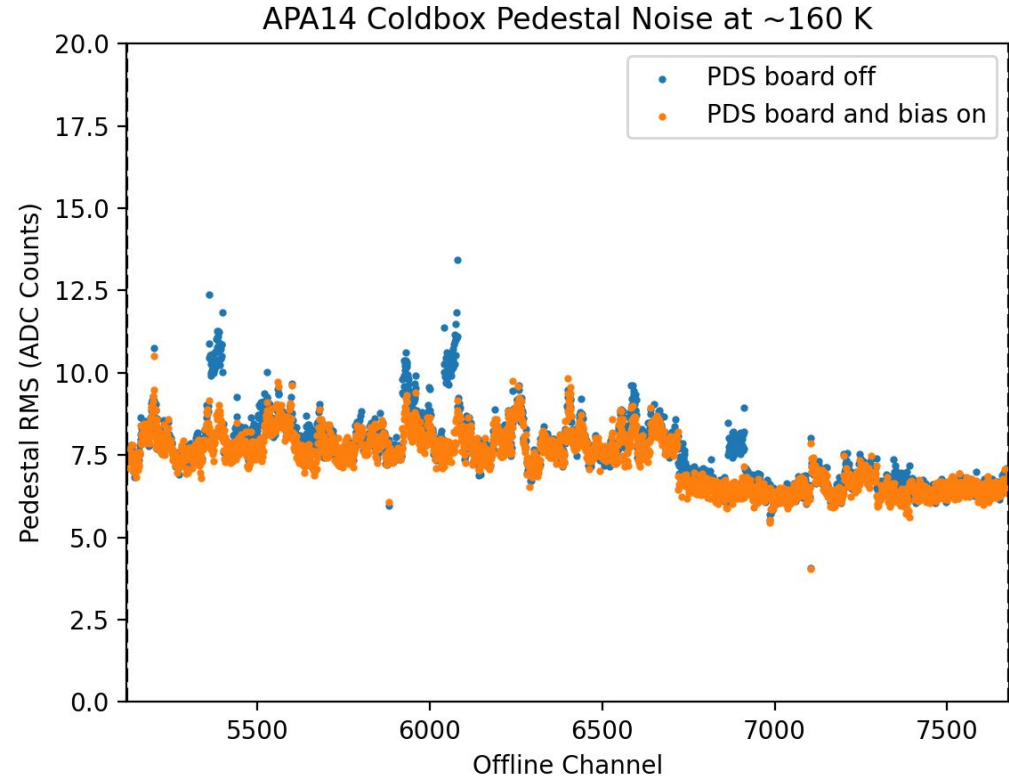
- Noise levels at cold (150-160 K) were as expected
- No new anomalies appearing at cold





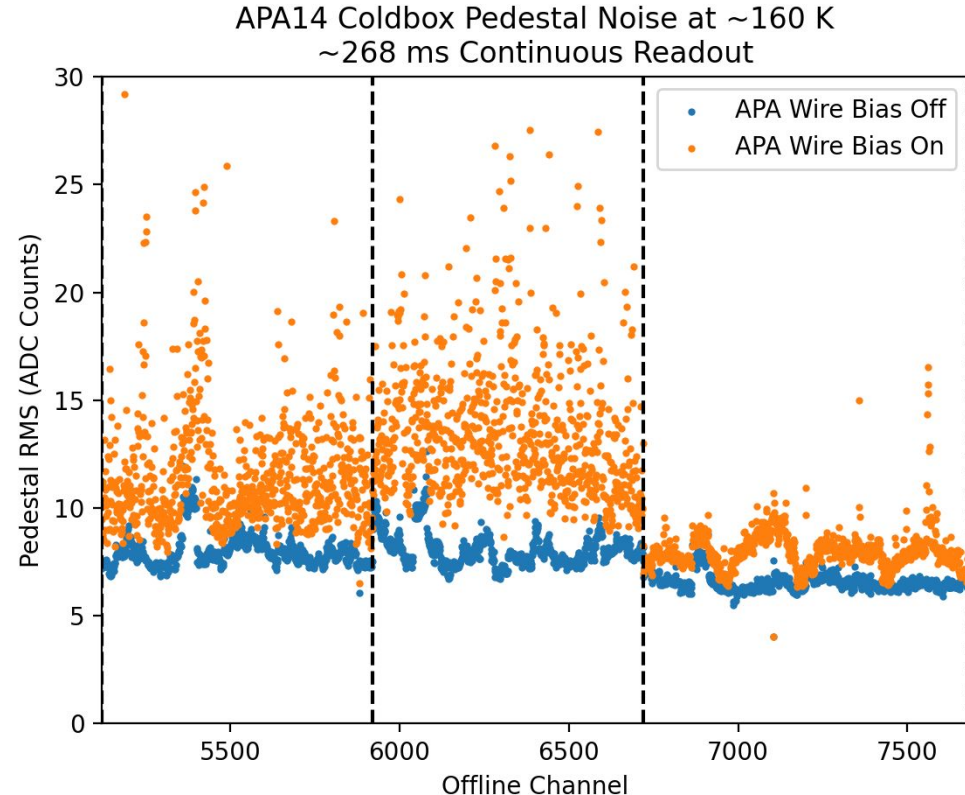
# Noise Test with PDS

- There is one PD module installed in this APA
- We observe a small increase in noise when the board is connected but powered OFF
  - Still to be fully understood, but this isn't outrageous



# Wire Bias Test

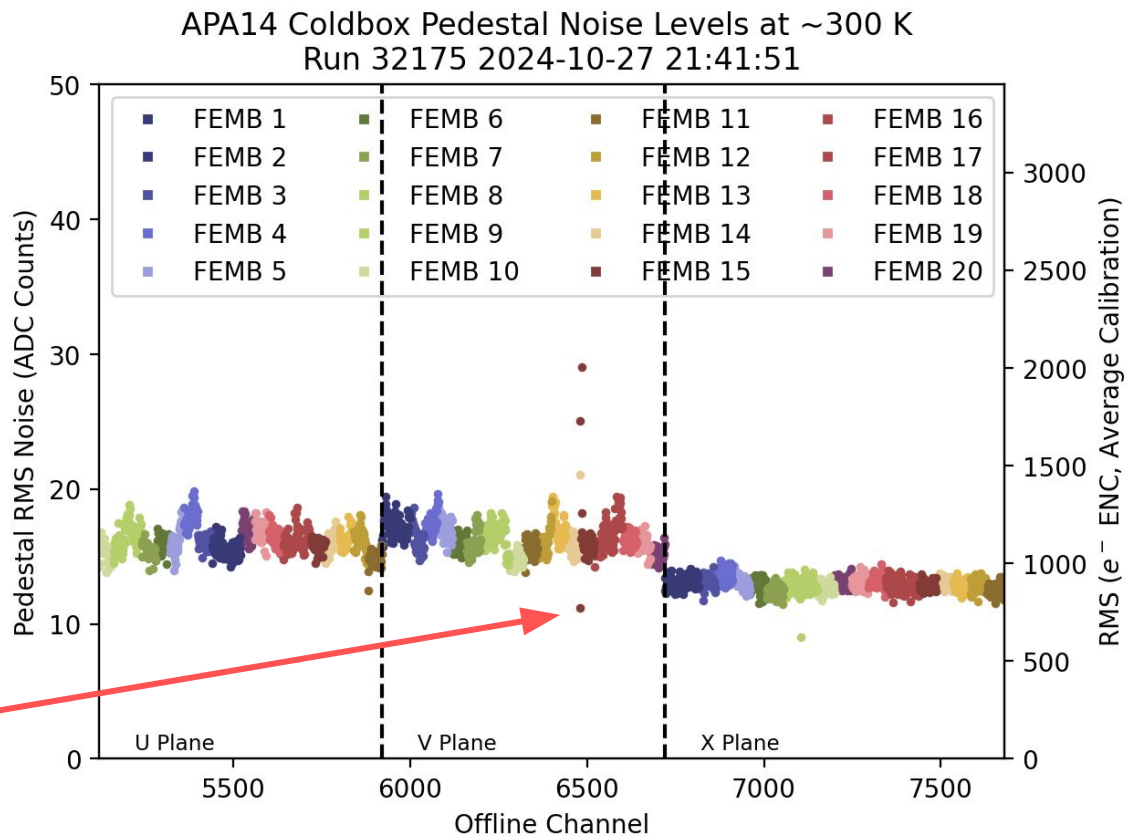
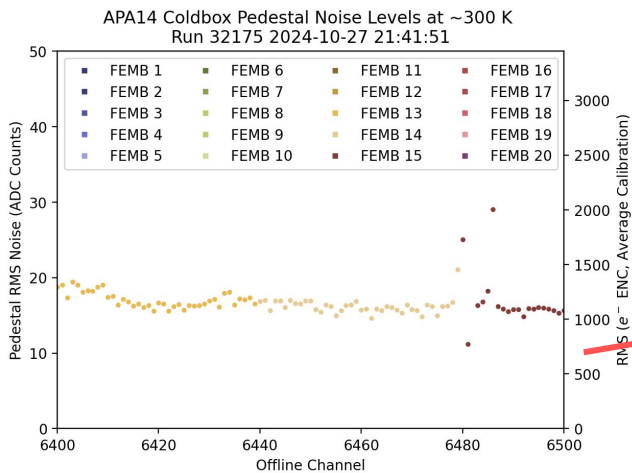
- Applied full wire bias (-665/-370/+820 V) and took data with a continuous 268 ms readout window
- Increased noise from low frequency oscillations is visible on all planes
- Current draw was 10 to 20 nA for X plane, 1 to 5 nA for U and G planes





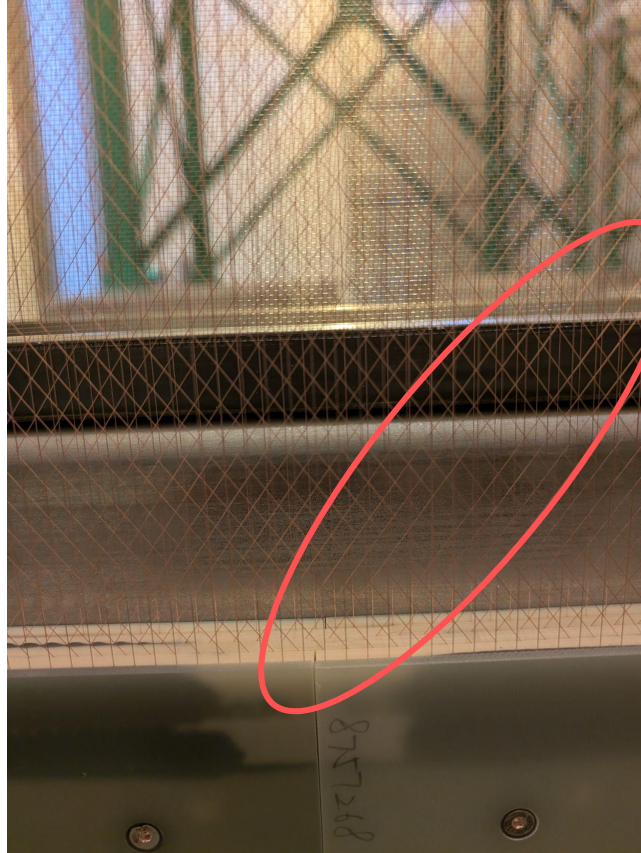
# Warmup Results

- During warmup a V wire (V562) became disconnected, at around 270 K



## Broken Wire during Warmup

Upon removal from the coldbox, we visually identified a broken V wire in the expected location



# Coldbox Summary

- APA14 cold test results look good: no unexpected features from cooldown, wire bias behaved as expected, and everything passed our checklist
- There was one disconnected X channel from before the test for which we need to track down the source
  - In the location where the APA was bumped while moving into the coldbox
- One V wire broke during the warmup
  - No longer connected to the headboard

Full set of electronics data for this coldbox test can be found under the APA14 Coldbox tab in [this spreadsheet](#)

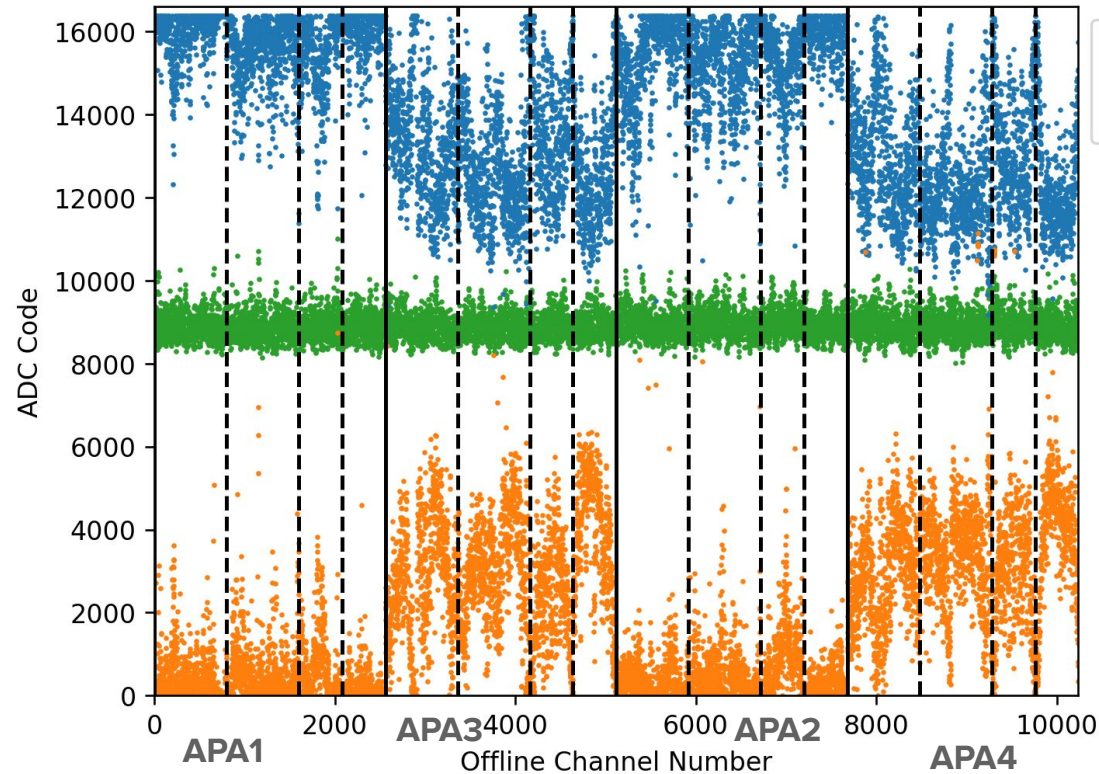
## NP04 Status

- We completed all of the pulser scans we were interested in, full list can be found in [this spreadsheet](#)
- Some noise tests with the laser and PDs can still be conducted at some point, but in general everybody is done with their NP04-related studies
- Remaining item is just to understand the ground shake events



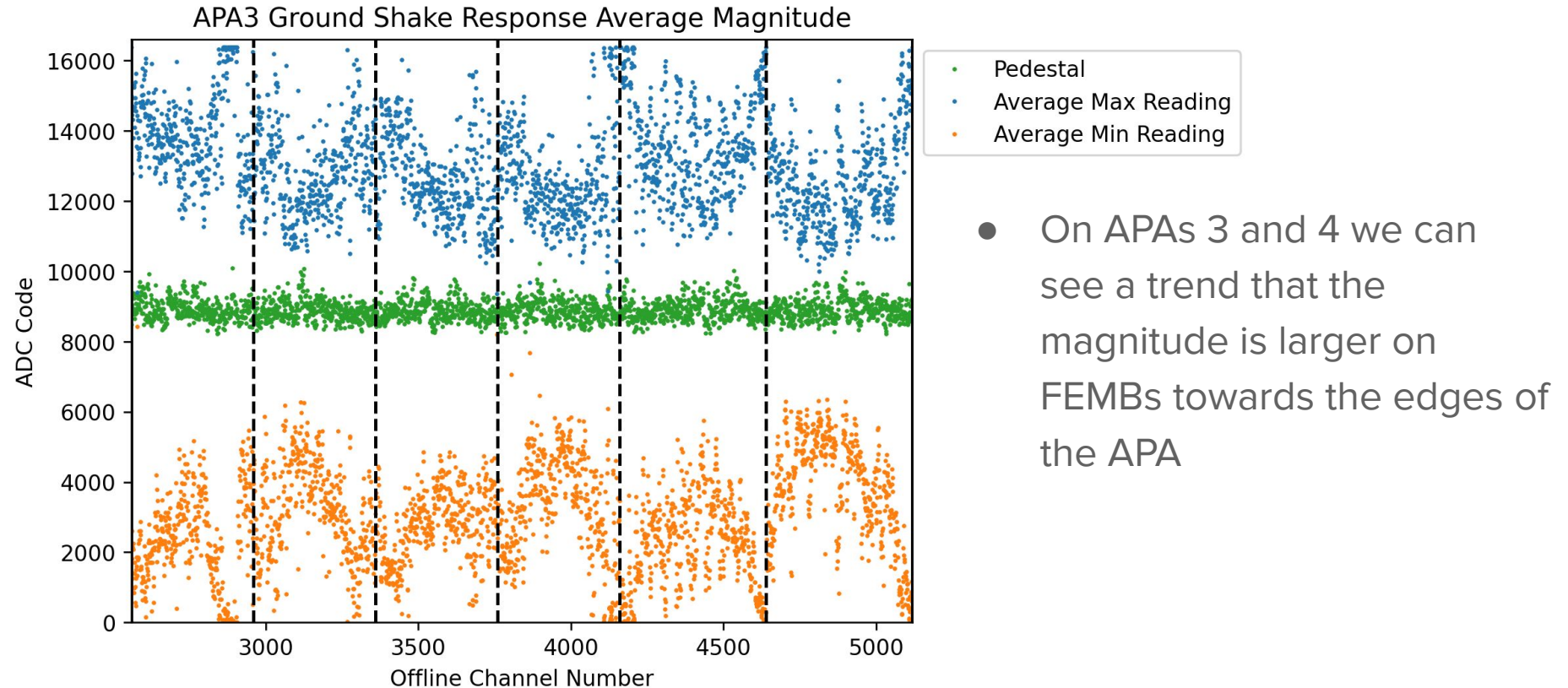
# Ground Shake Magnitudes

Average Magnitude of Ground Shake Responses



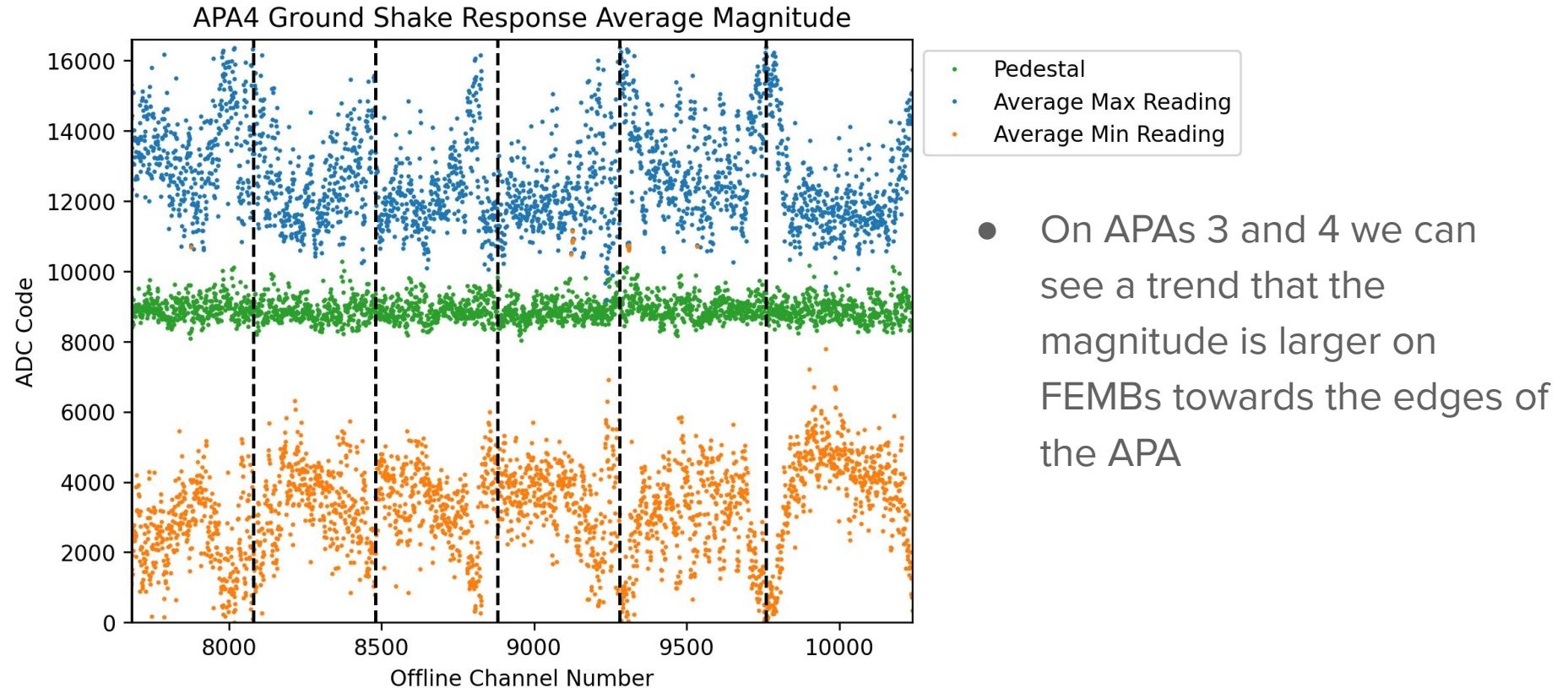
- APAs 3 and 4 on average clearly have smaller responses to the ground shake events than APAs 1 and 2

# APA 3 Ground Shake Magnitudes



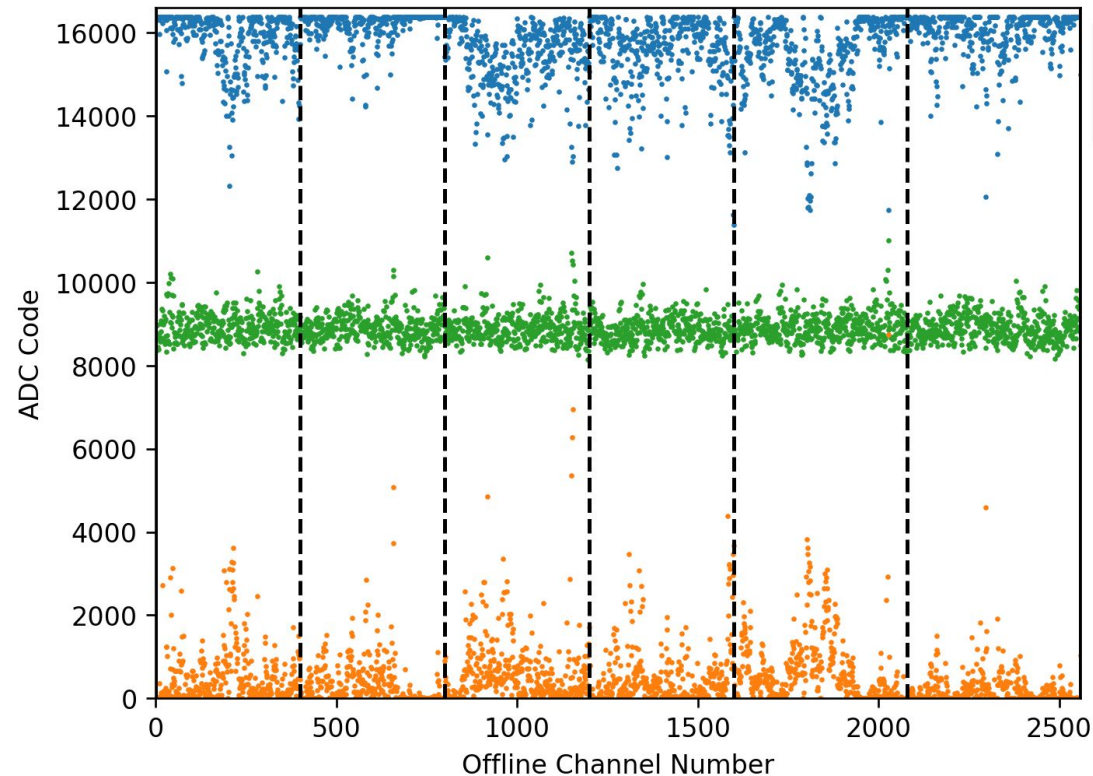


# APA 4 Ground Shake Magnitudes



# APA 1 Ground Shake Magnitudes

APA1 Ground Shake Response Average Magnitude

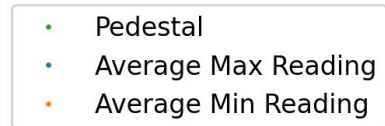
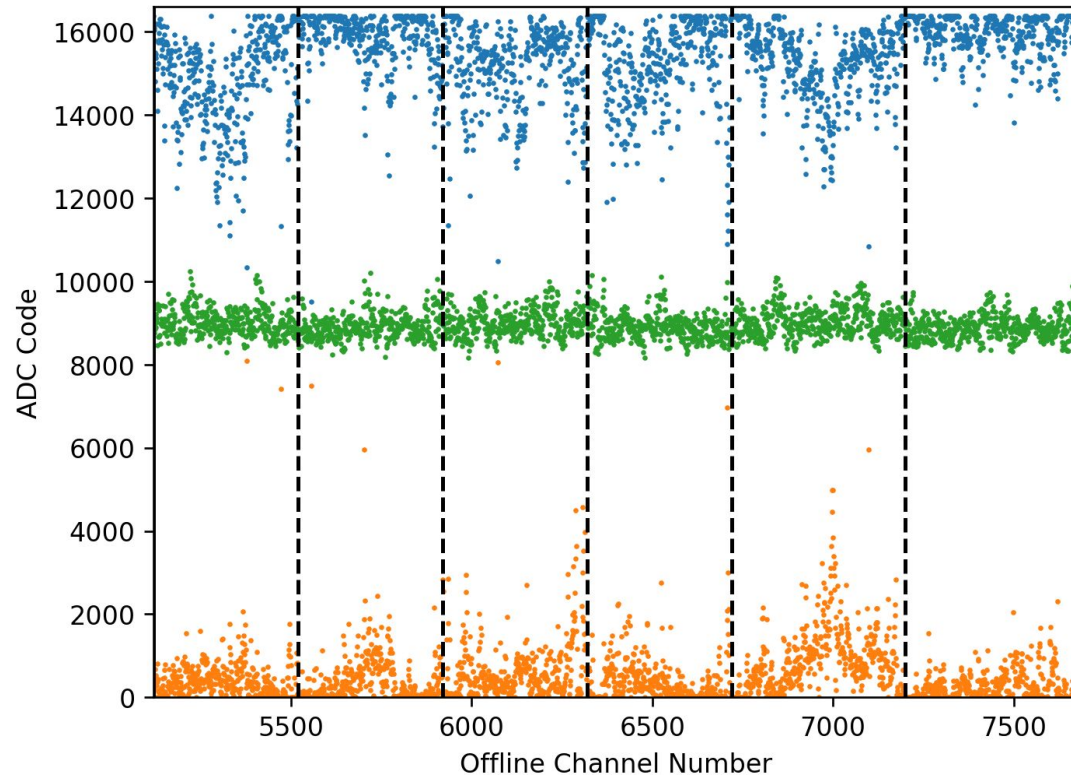


• Pedestal  
• Average Max Reading  
• Average Min Reading

- The trend of stronger response on FEMBs on the APA ends is less obvious on APAs 1 and 2 due to most of the events being saturating, but is plausibly there too

# APA 2 Ground Shake Magnitudes

APA2 Ground Shake Response Average Magnitude



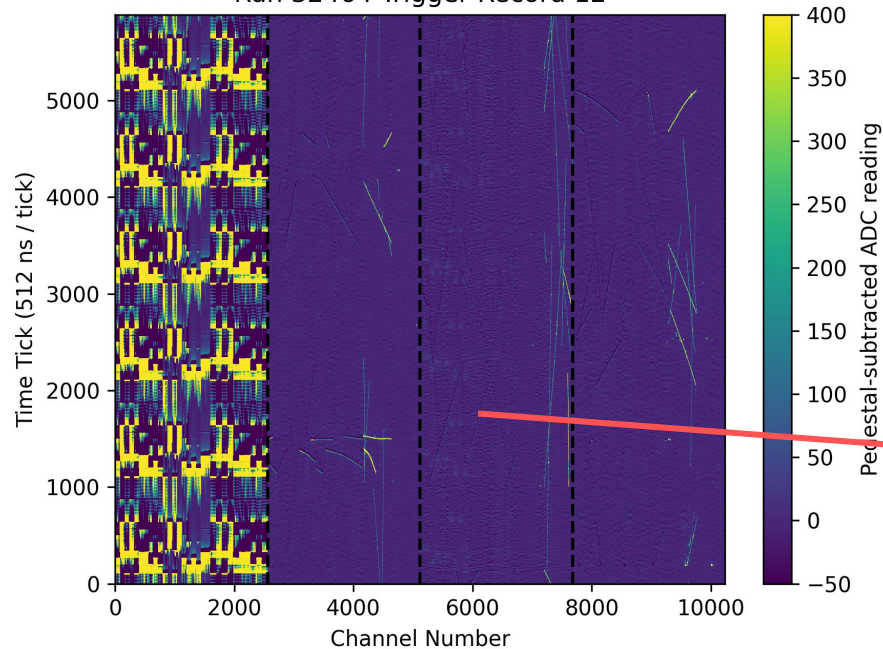
- The trend of stronger response on FEMBs on the APA ends is less obvious on APAs 1 and 2 due to most of the events being saturating, but is plausibly there too



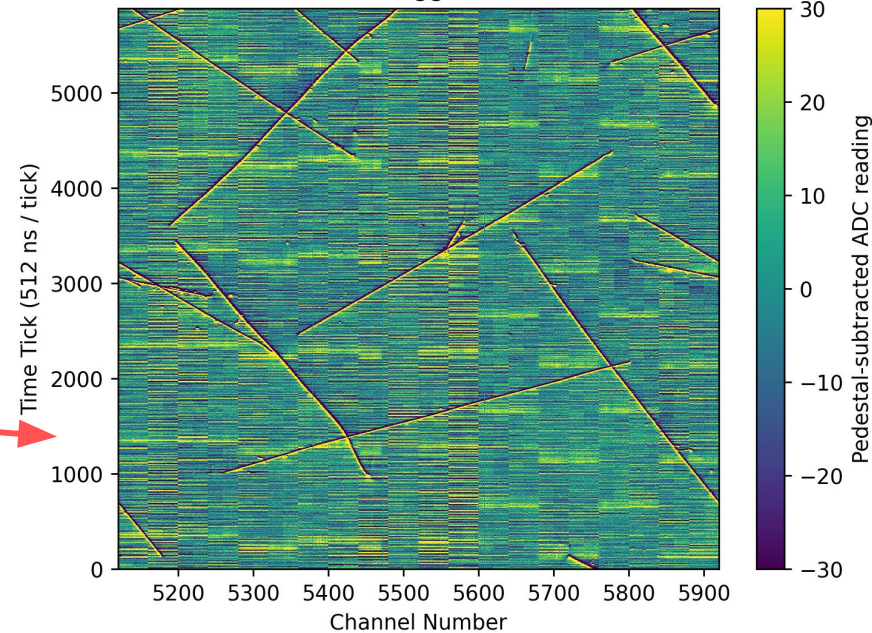
# Induced Signals on APA 2 from APA 1

Injecting a large amount of charge into APA 1 induces response in APA 2 U plane

NP04 Event display 2024-10-29 14:25:05  
Run 32464 Trigger Record 12

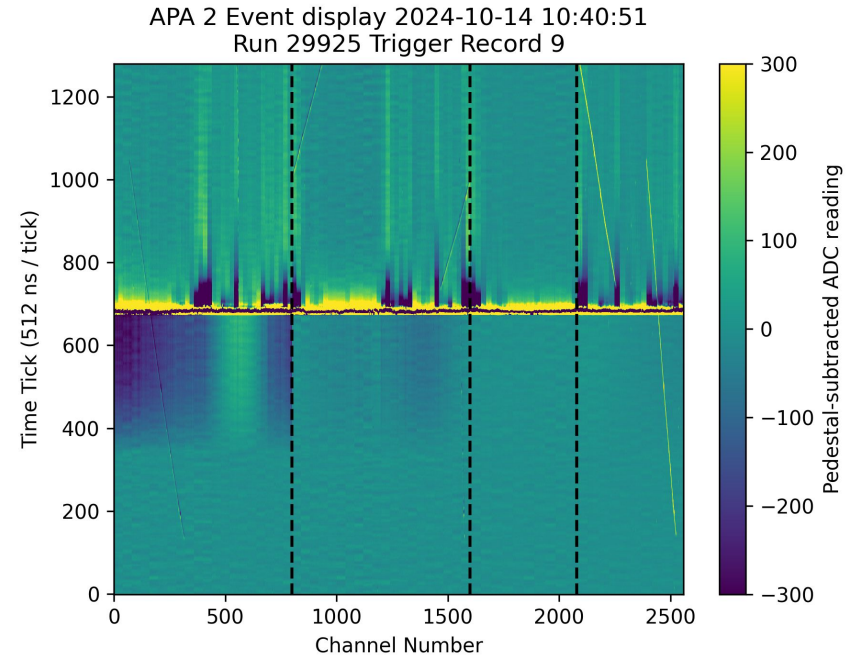
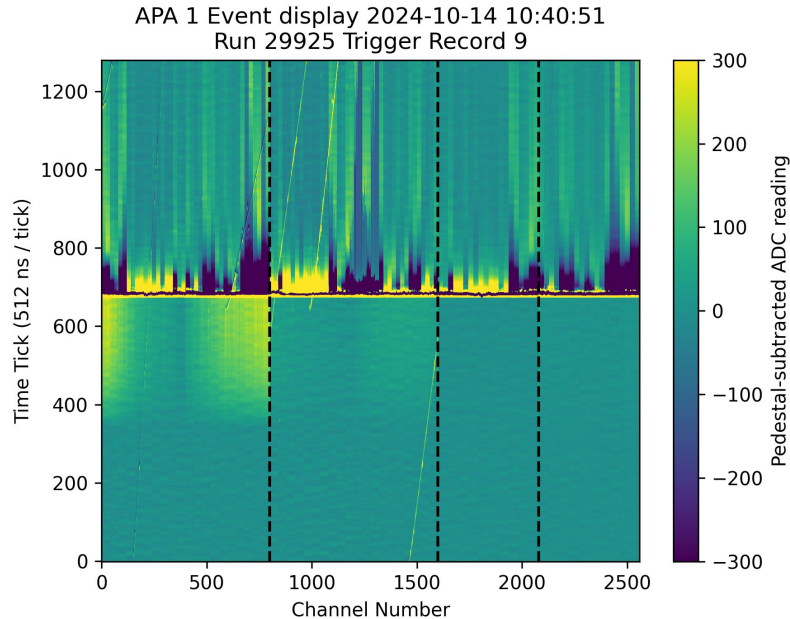


APA 2 Event display 2024-10-29 14:25:05  
Run 32464 Trigger Record 12



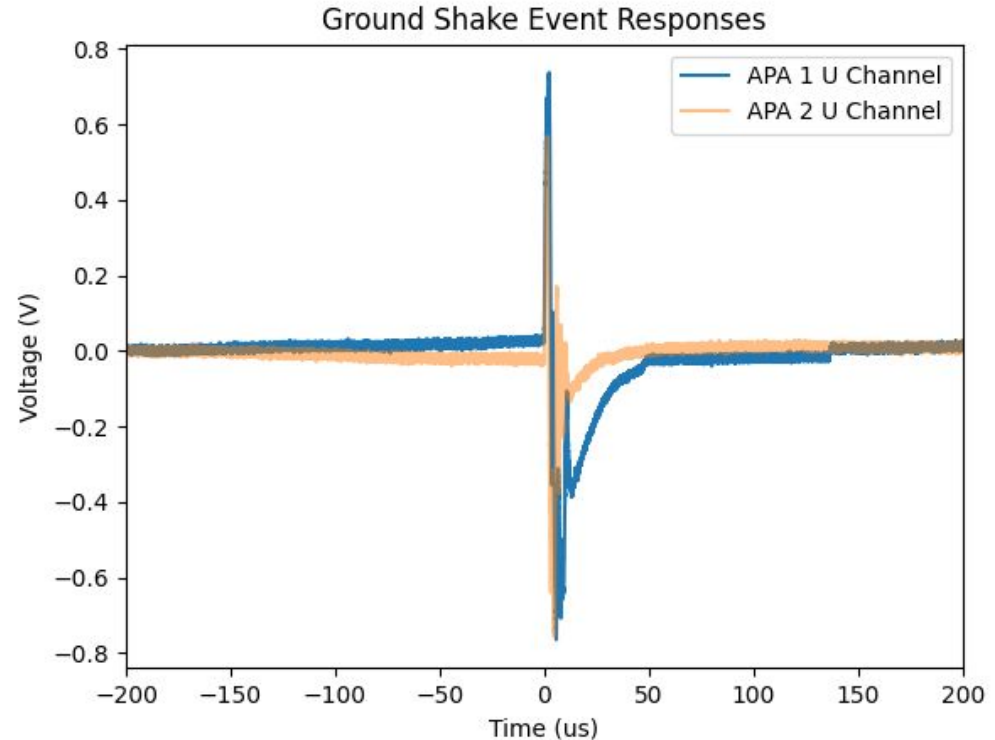
# Ground Bounce Precursors

- Reminder: there's some kind of precursor signal to every ground bounce event seen on the 1st induction plane of APAs 1 and 2, with positive polarity on APA 1 and negative polarity on APA 2



# Analog Pickoff

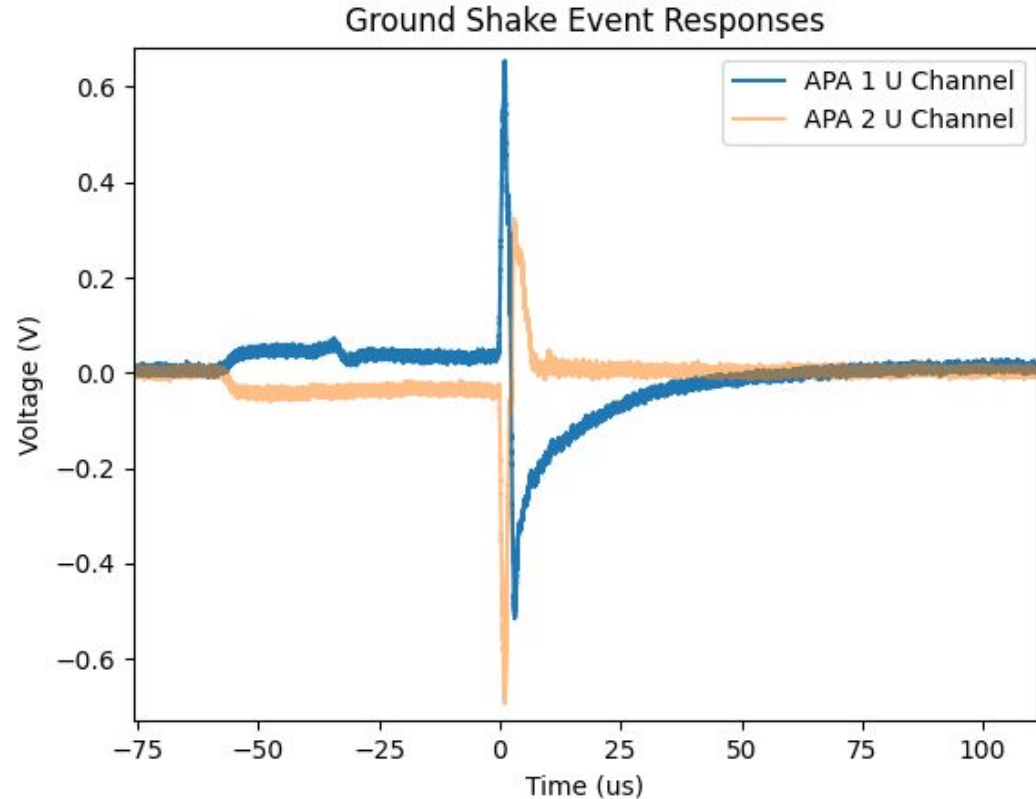
- Directly reading out the analog signal for a couple of these U channels through the WIB front panel, we see this precursor rise/drop there too





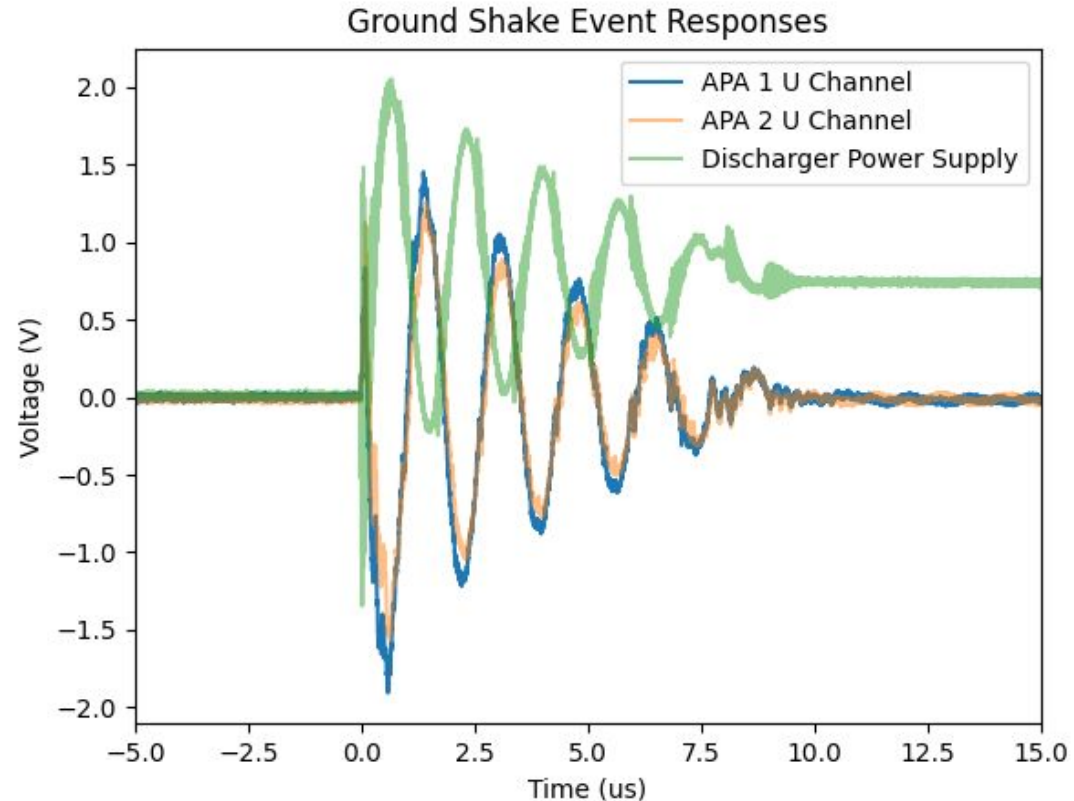
# Analog Pickoff

- While reading out the analog signals with an oscilloscope, we saw several instances of this kind of perfectly opposite polarity signals in the APA 1 and 2 U channels we were reading
  - Sometimes they looked like clean bipolar or unipolar pulses too



# Discharge Tests

- We ran tests where we would discharge up to 1 kV into the cryostat roof while using the oscilloscope analog readout
- Confirmed we could induce large signals in the TPC electronics by discharging into the cryostat roof



## NP04 Summary

- Still not clear what to do about the ground shake events
- After seeing that the cause seems to be on the APA 1 and 2 side, we tried powering off their bias and powering off their electronics completely, but saw no obvious effect on the ground shake rate
- Also tried unplugging the collection bias from APA 3 to try to replicate APA 1 conditions, but saw no obvious change
- We'll continue investigating with the analog monitor to try to correlate with other monitoring systems or with things we do on the cryostat