CE Status on APA7 (and a little bit protoDUNE)

Matthew Worcester (BNL)
for the CE team

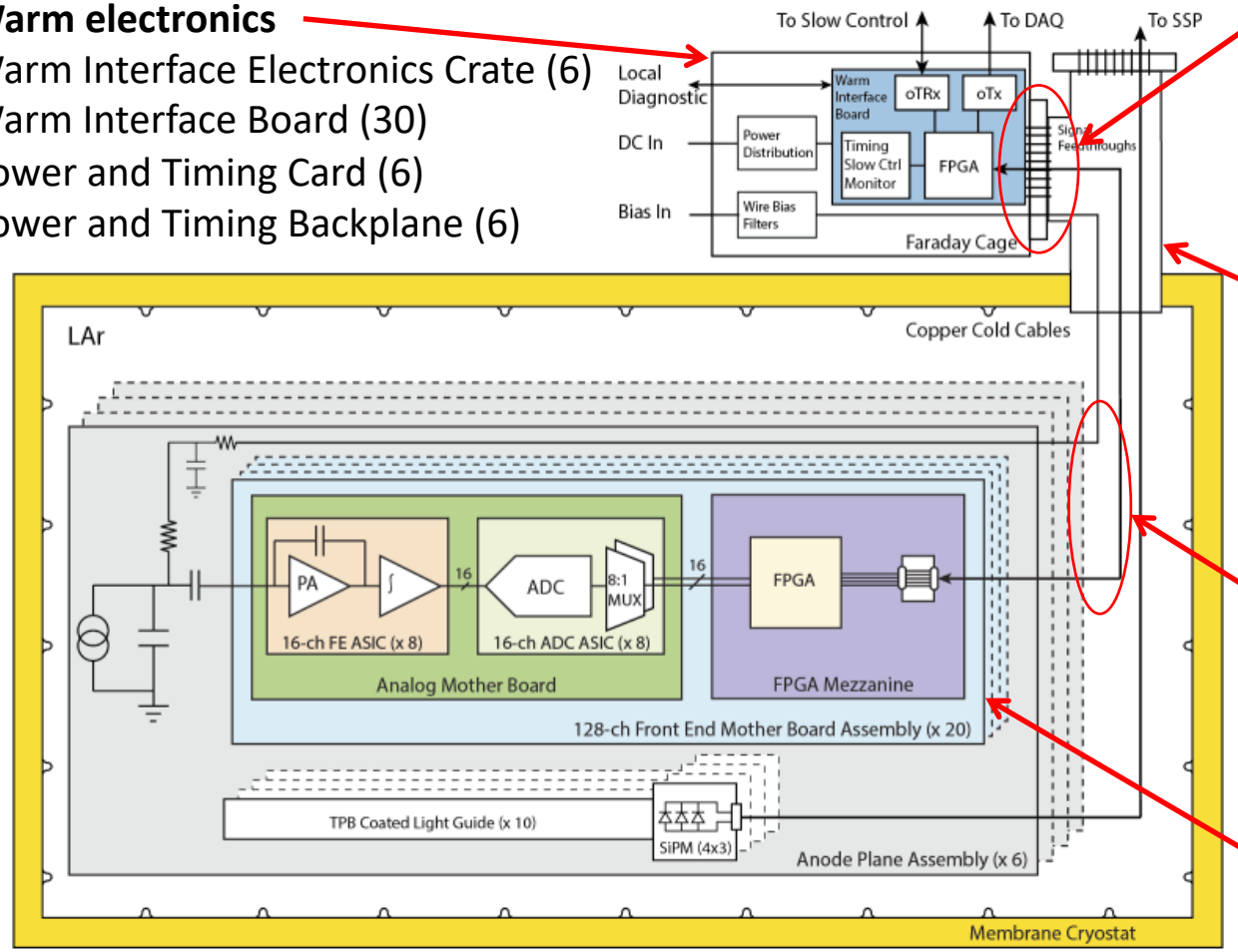
protoDUNE Operations Meeting
October 18, 2019

Outline

- protoDUNE cold electronics
- APA7 status
- protoDUNE status
- Conclusions

protoDUNE-SP Cold Electronics

Warm electronics
Warm Interface Electronics Crate (6)
Warm Interface Board (30)
Power and Timing Card (6)
Power and Timing Backplane (6)



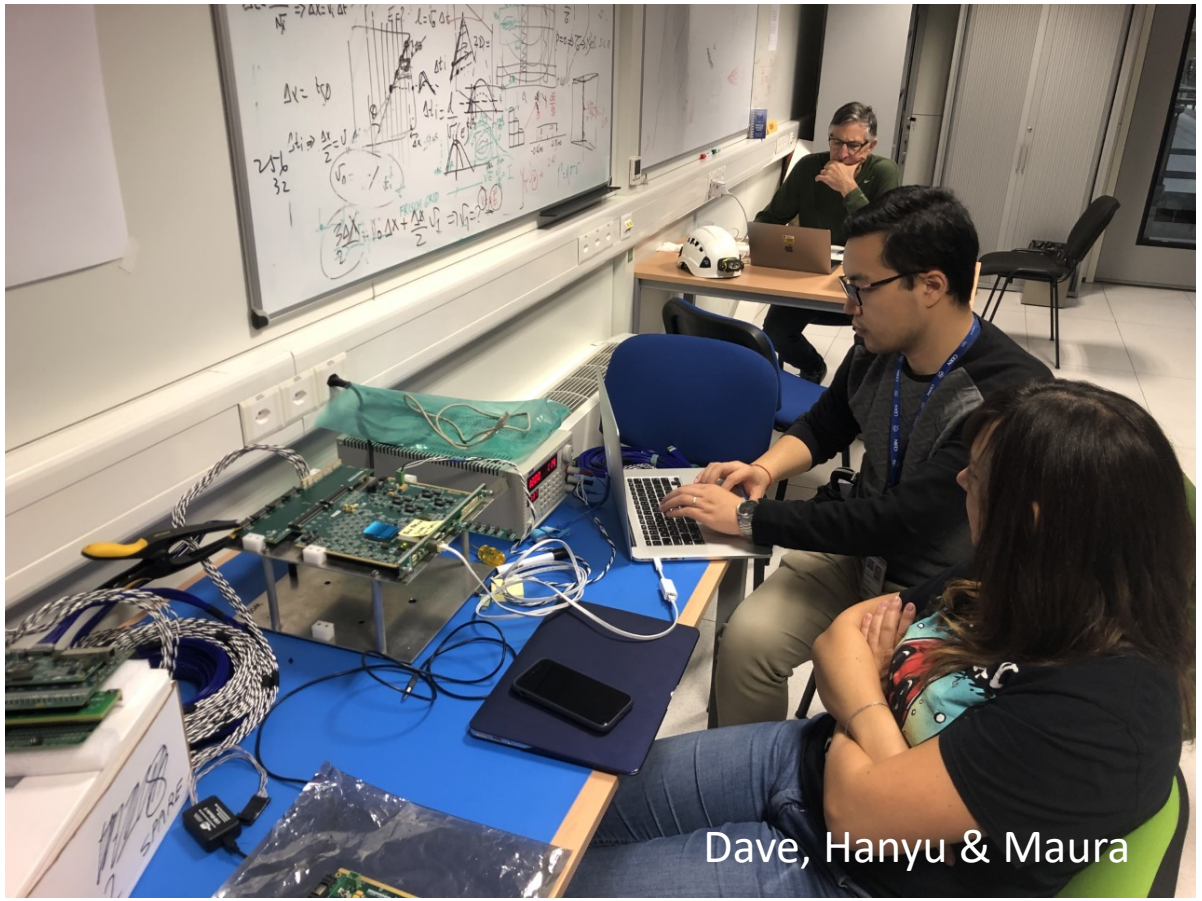
CE flange
Flange assembly with cable strain relief and flange PCB for cable/WIB connection (6)

Signal feed-through
Tee pipe with 14” Conflat flanges and crossing tube cable (CTC) support (6)

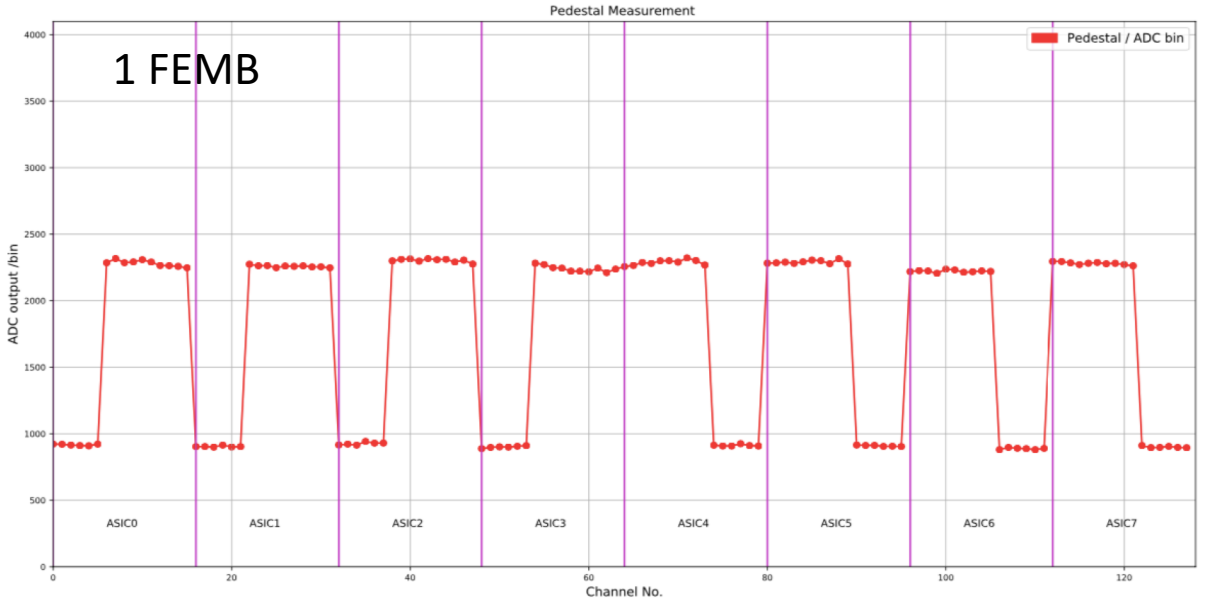
Cold cable
LV and data cable (120+120) to FEMB and APA wire-bias SHV cable (48)

Front End Motherboard
(FEMB) 128 channels of digitized wire readout enclosed in CE Box (120)

CE Boxes

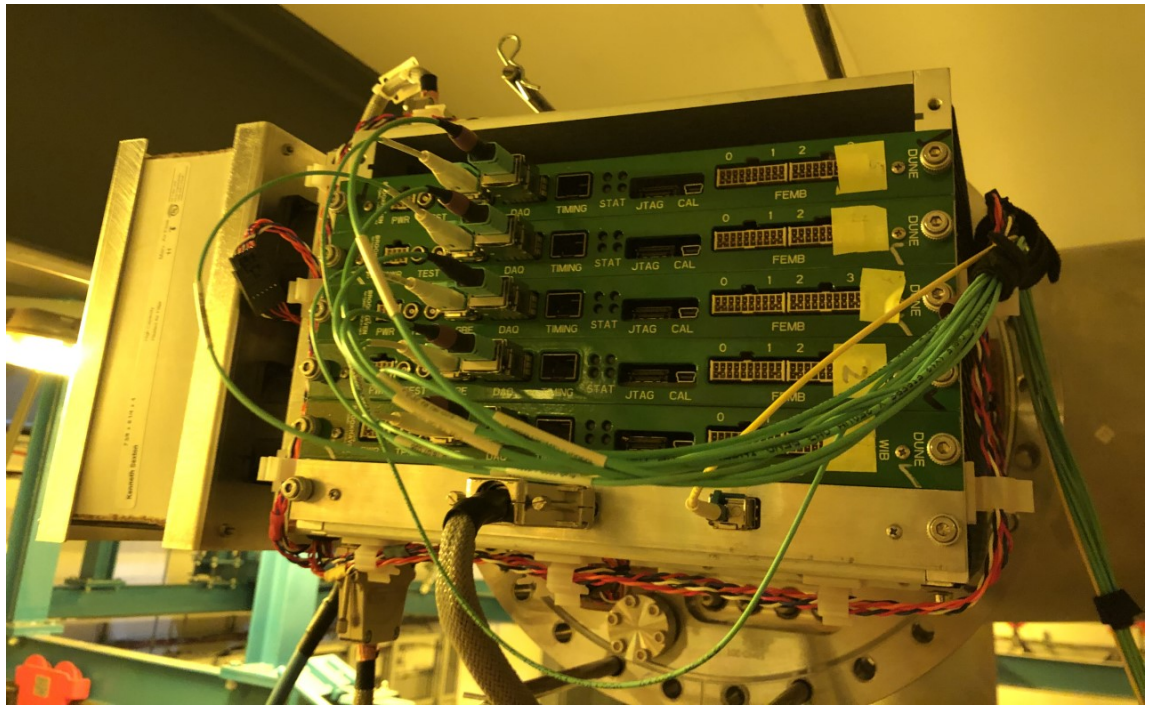


- 22 good CE boxes after testing
  - Baselines (plot below) are all good
  - ENC with toy TPC (150 pF) is normal
  - All channels respond to calibration pulser
- 1 FEMB was found with the known data cable connector failure

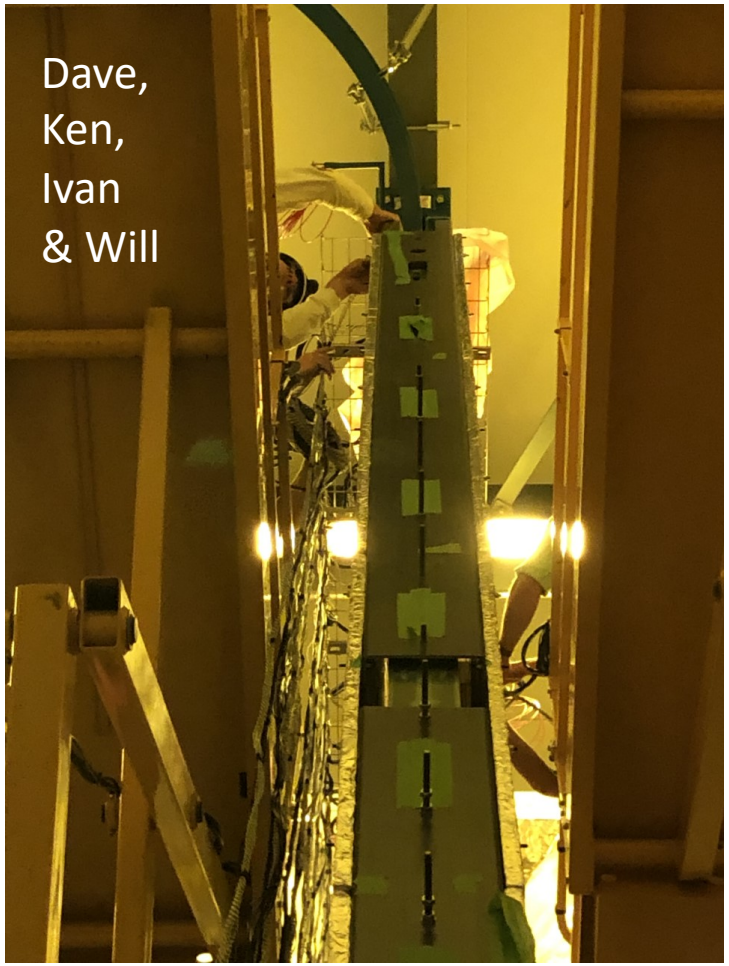


Cold Box Warm Electronics

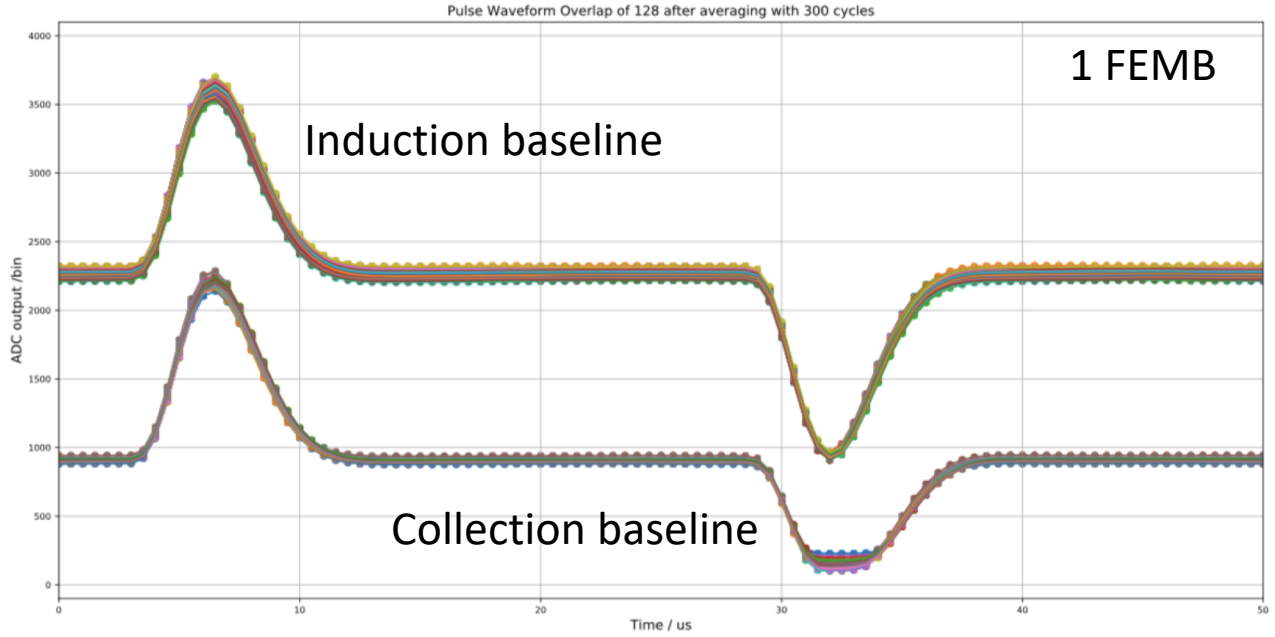
- CE flange + WIEC has been installed on the cold box
- All WIBs are configuring properly



APA7

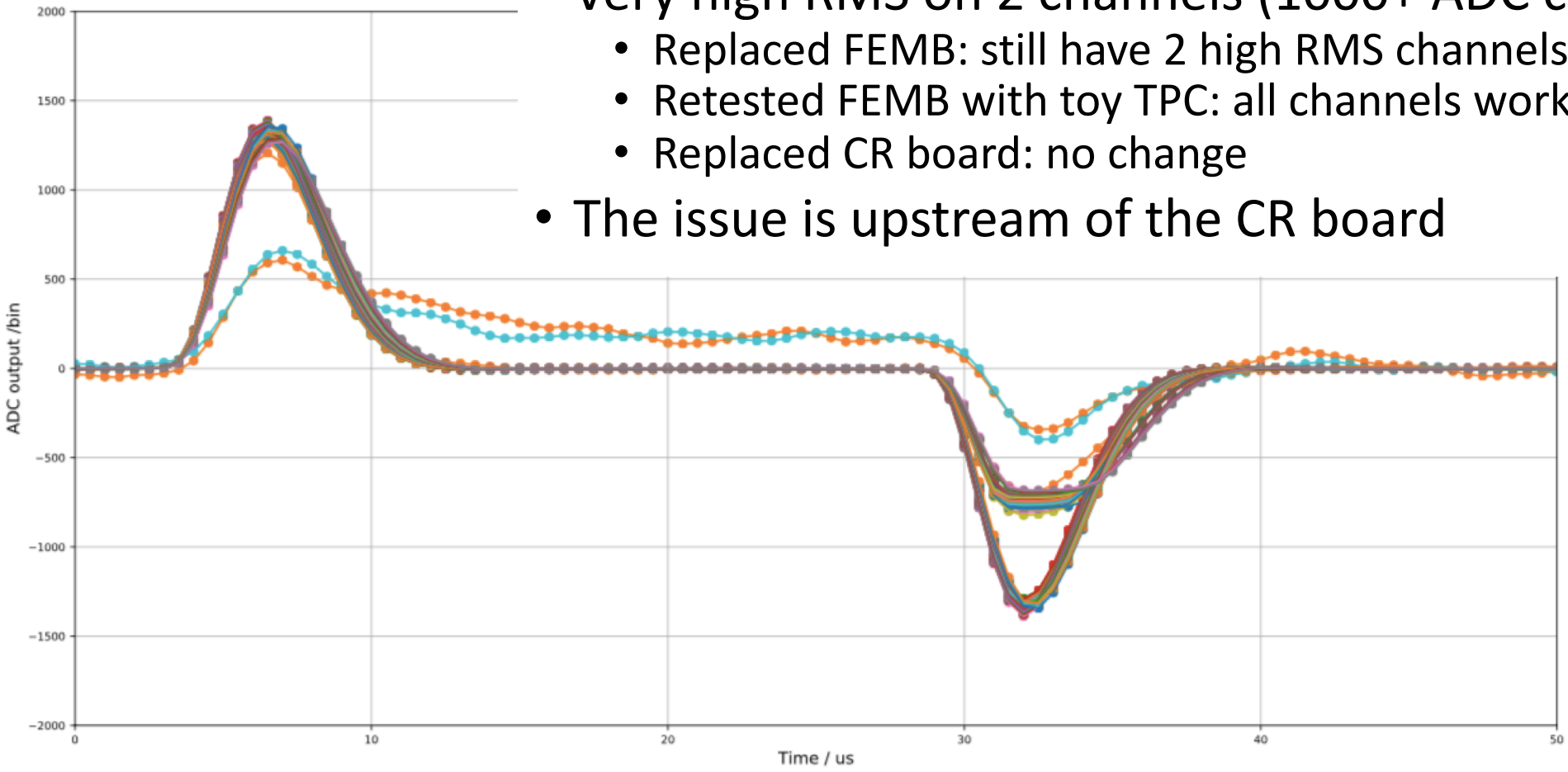


- 20 CE boxes have been installed on APA7
  - All 2,560 channels are responding to the calibration pulser
    - 2 channels on 1 FEMB show abnormal response (next slide)
- Plan to push APA7 into the cold box Monday



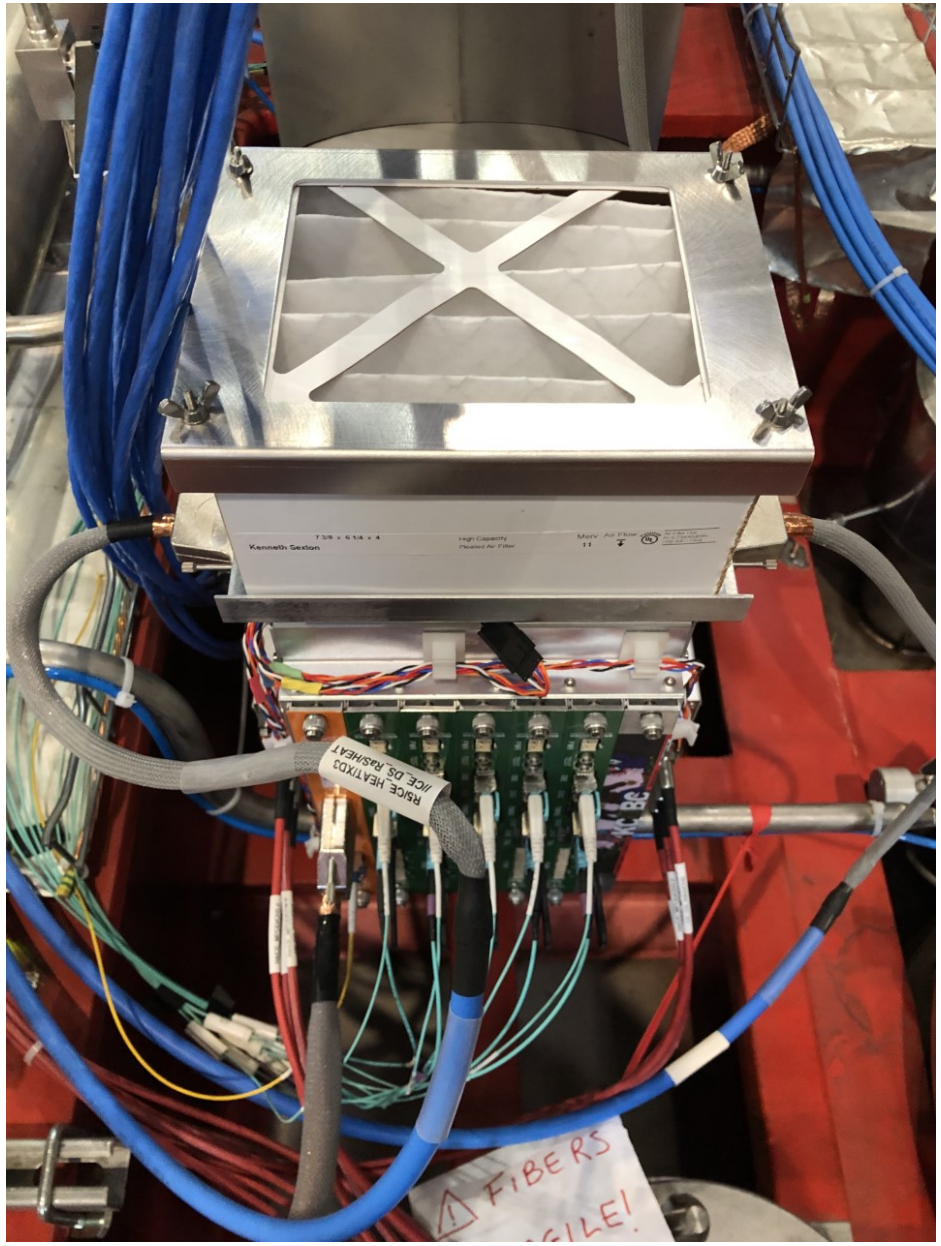
Abnormal Channels

- Very high RMS on 2 channels (1000+ ADC counts)
  - Replaced FEMB: still have 2 high RMS channels
  - Retested FEMB with toy TPC: all channels working correctly
  - Replaced CR board: no change
- The issue is upstream of the CR board



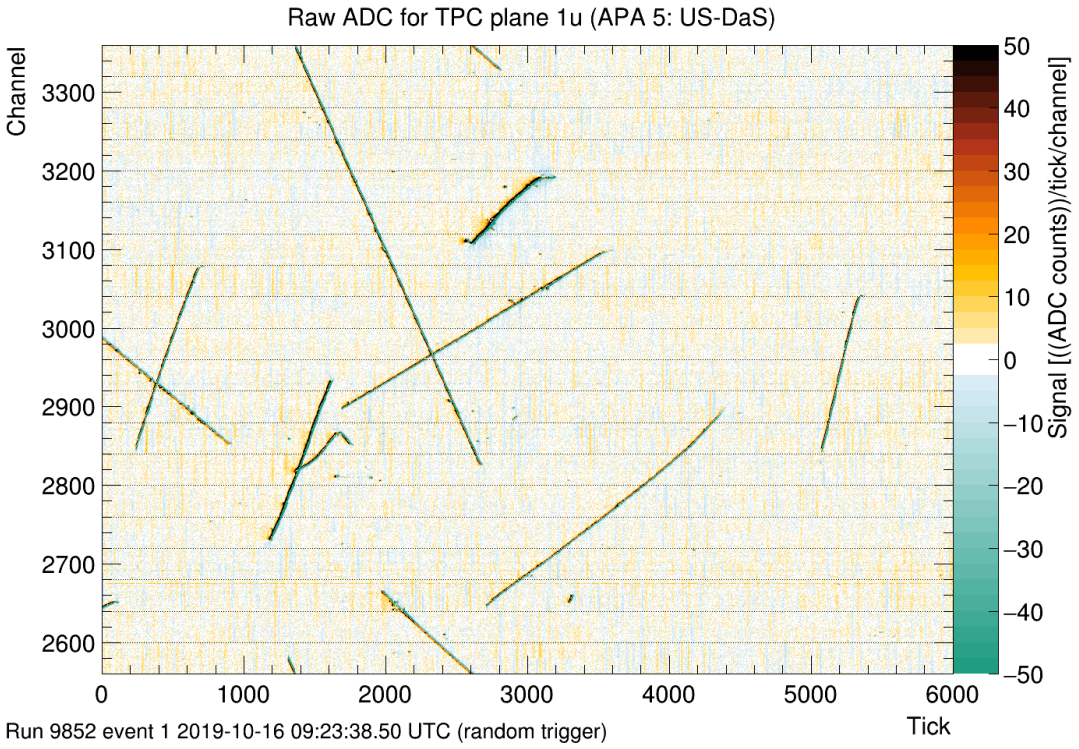
protoDUNE Work

- The WIBs were cleaned with compressed air
- New fan filters installed on all 6 WIEC
- After this work, run 9852 taken with all FEMBs
  - Full wire bias and drift HV
  - Cryostat shorted to building ground by APA7 work
- All WIBs/FEMBs configured well and the signals and noise are normal (next slide)

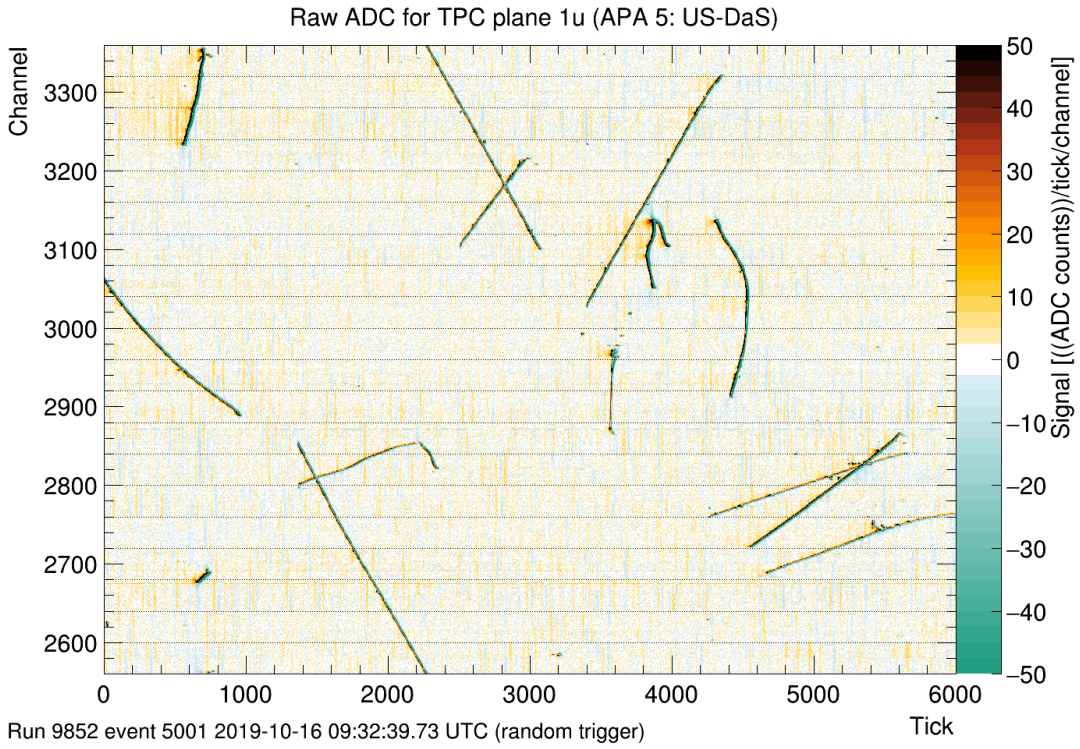


Example events (run 9852)

Preliminary offline analysis thanks to David Adams:
https://internal.dunescience.org/people/dladams/protodune/data/dqmw/run009852/



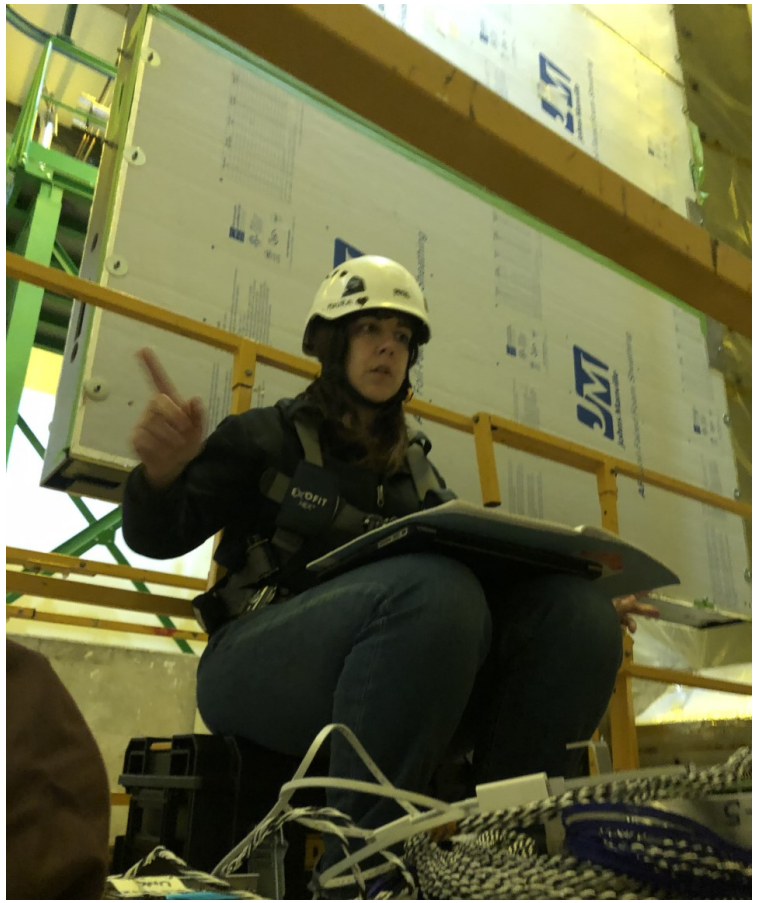
Raw ADC: event 1



Raw ADC: event 5001

Conclusions

- The protoDUNE-SP CE continues to function at a high level after one year of cryogenic operation
- Good progress this week on APA7: building a strong team for future test cycles



Thanks to the CE team at CERN this week: Dave, Hanyu, Ivan, Ken, Maura, & Will
Extra thanks to the CERN experts: Giovanna, Xavier, Serhan, & Roland


Well done!