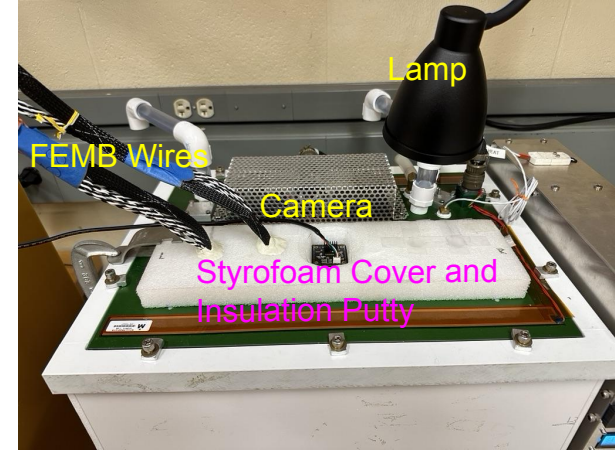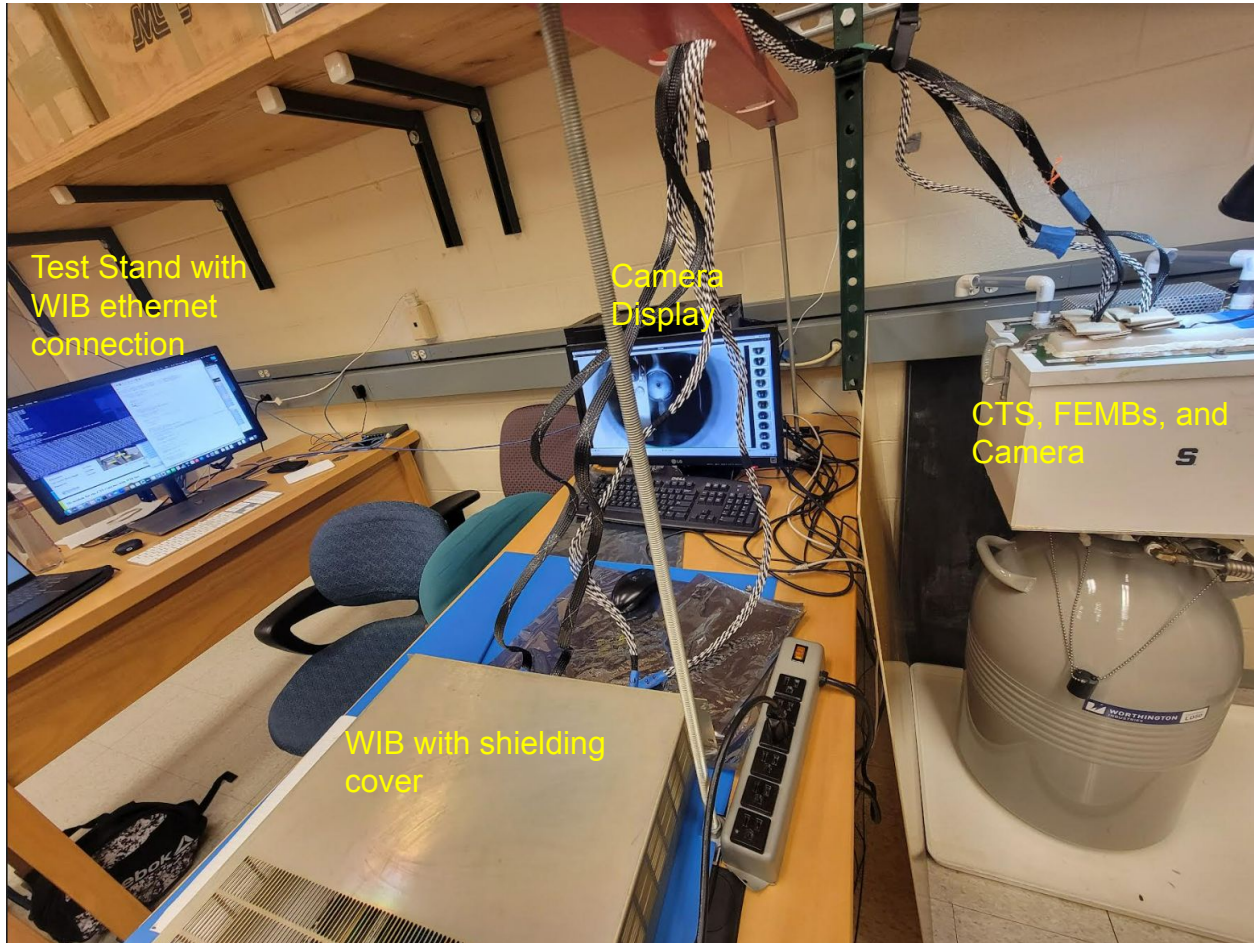# Report on UC FEMB Testing with BNL-Updated CTS Lid

Alex Sousa,
for Hanel Kamdar, Vignesh Karthikeyan,
Grant Sooy, Yolandah Tulina, Cameron Wilson

DUNE FD CE QC Meeting
12/06/24

UC FEMB Testing Setup - Summer 2024

Test Stand with WIB ethernet connection

Camera Display

CTS, FEMBs, and Camera

WIB with shielding cover

Lamp

FEMB Wires

Camera

Styrofoam Cover and Insulation Putty

FEMBs 38, 39

Updated UC FEMB Testing Setup

- CTS Lid sent to BNL on July 23
- Modified lid received on October 23
- John Markus installed lid, added sink grounding, and modified metal plate to add a camera opening + support
- AS insulated main leakage points with museum putty

Testing setup at full immersion reached
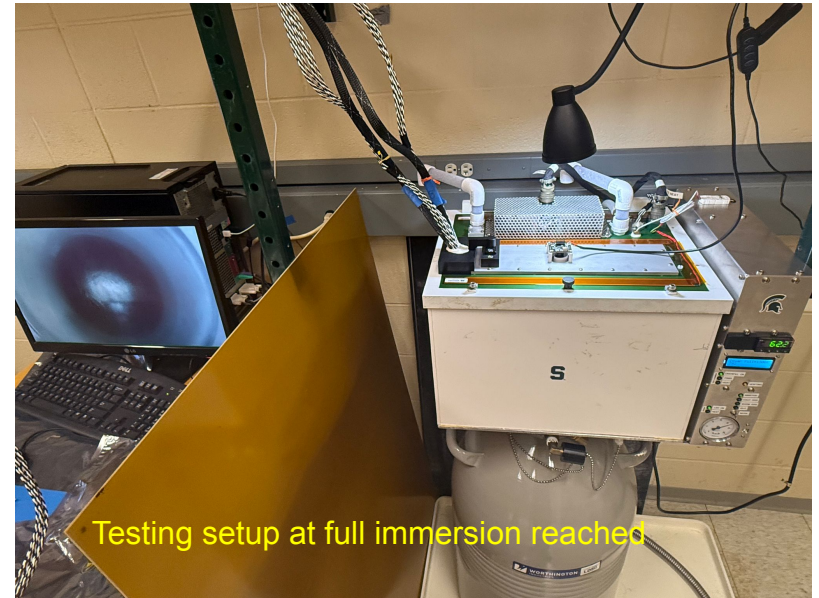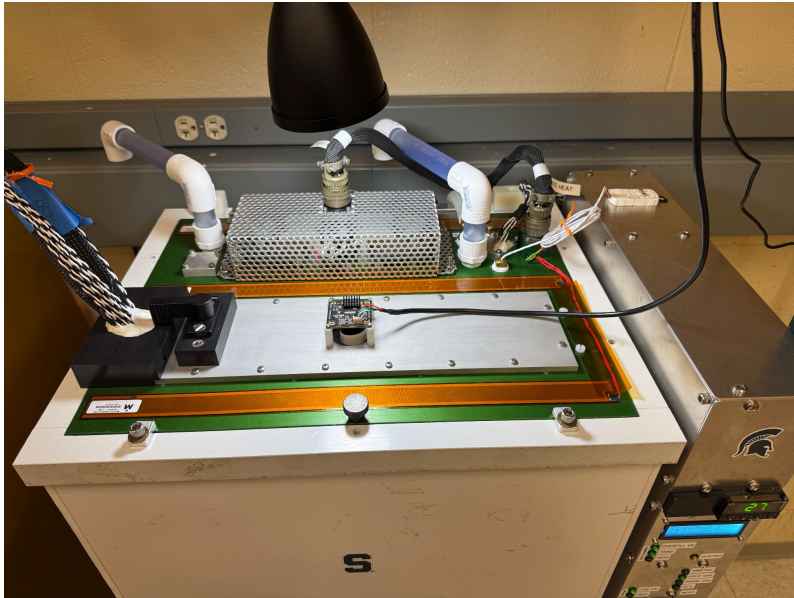
Comparison of Testing Results - Day 1

- Ran two days of testing last week
  - Day 1, Nov. 11, with students
  - Day 2, Nov. 14, AS-only
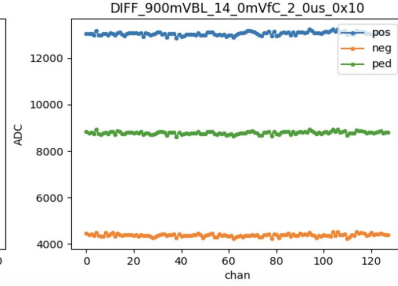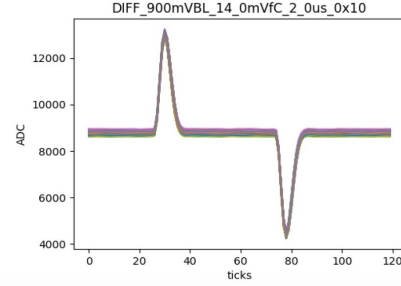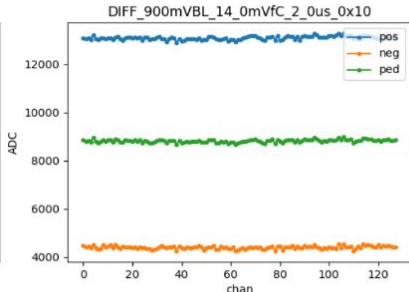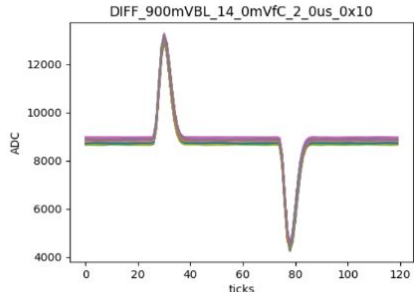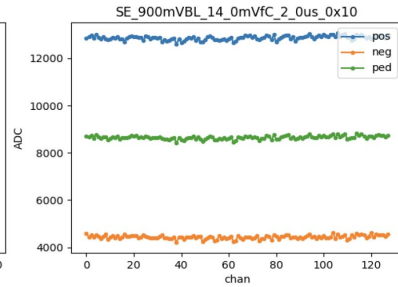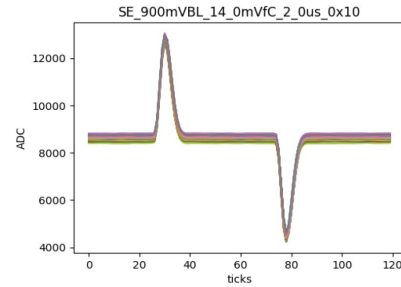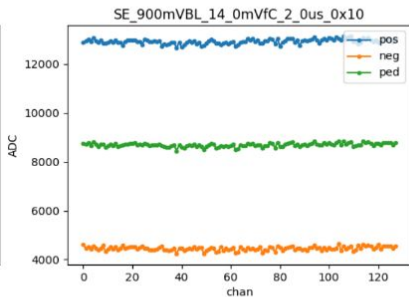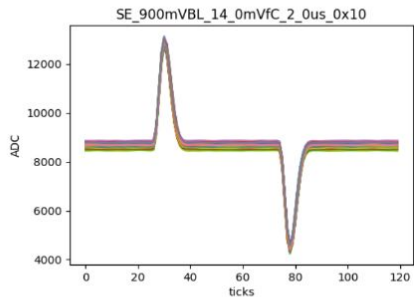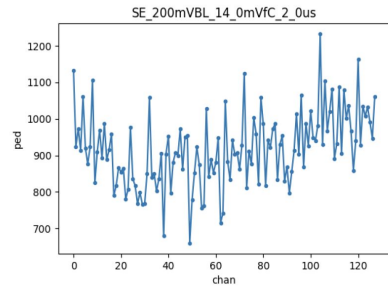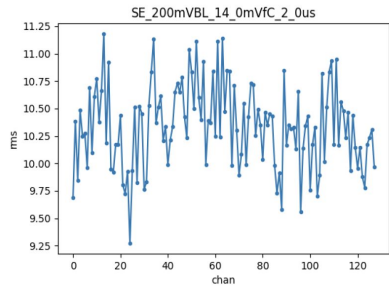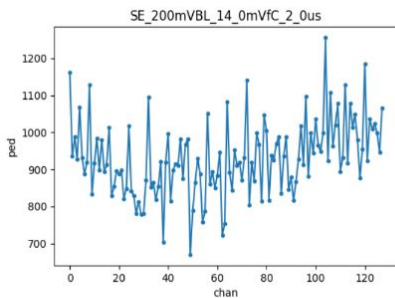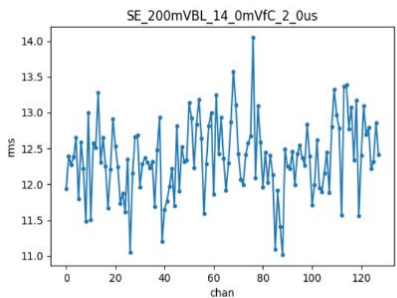
FEMB 38 Warm Test (6/20/24, Run 5)

FEMB 38 Warm Test (11/11/24, Run 1)

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Testing Results - Day 1 and Day 2

- Day 1 CHK Cold test failed due to FEMB 38 data synchronization issues
  - Tried 4 CHK tests and 1 QC, but all failed with "Data of FEMB0 is not synchoronized". Post warm-up CHK test looked normal.
 - Had seen similar errors intermittently during Summer, thus not new behavior
  - During this test, we kept the WIB turned off until we reached FEMB immersion

- On Day 2, AS ran through the same test protocol, but skipped Warm QC in the interest of time
  - Warm CHK tests looked normal
  - This time, kept the WIB powered on for the warm->cold phase and got different behavior, but also one that we had seen before (see next)

Comparison of Testing Results - Day 2

Note very large RMS scale in this run
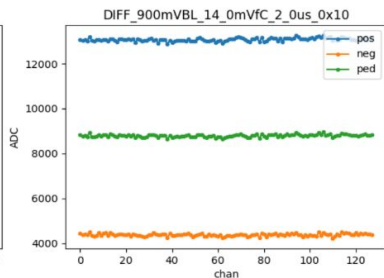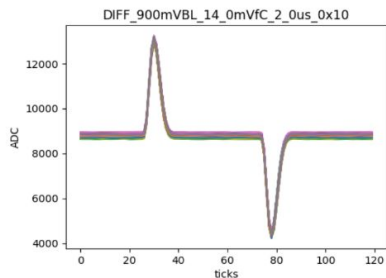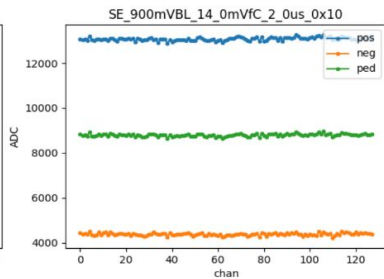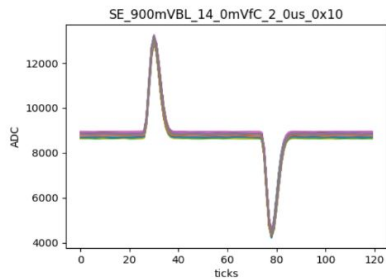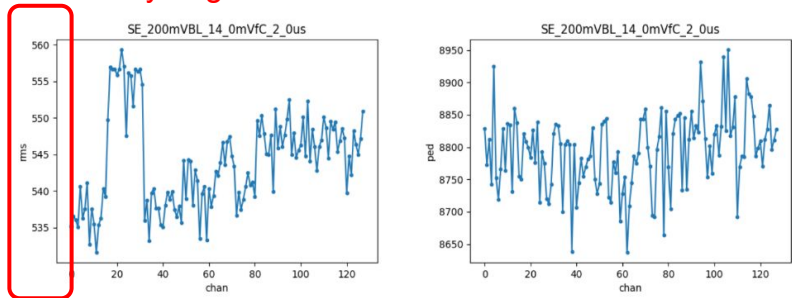
Note very large RMS scale in this run

FEMB 38 Cold Test (6/17/24, Run 1)

FEMB 38 Cold Test (11/14/24, Run 3)

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Comparison of Testing Results - Day 2

Note very large RMS scale in this run

Note very large RMS scale in this run

Note: FEMB 39 failed CHK test for this Run

FEMB1 is on
ERROR: FEMB1 COLDATA current 0.586 out of range (0.1A,0.3A)
FEMB ID 39 faild current check, will skip this femb
FEMB1 is off
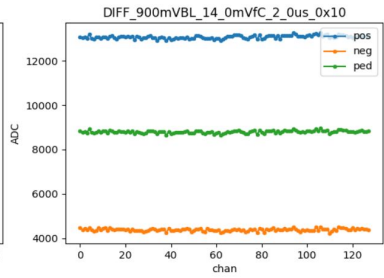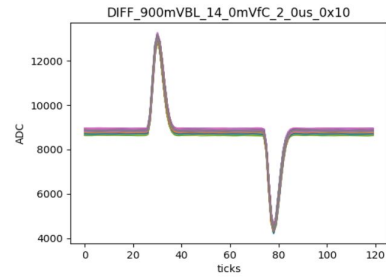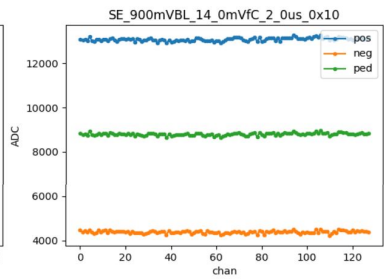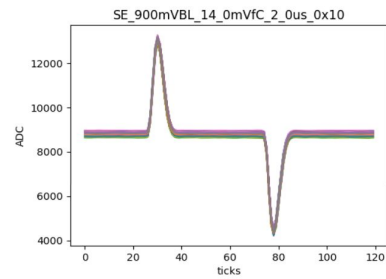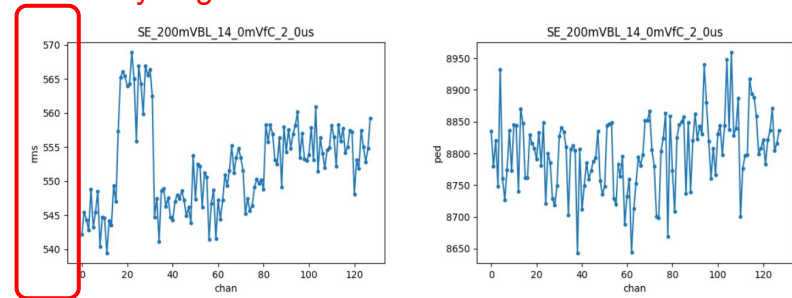
FEMB 38 Cold Test (6/17/24, Run 1)
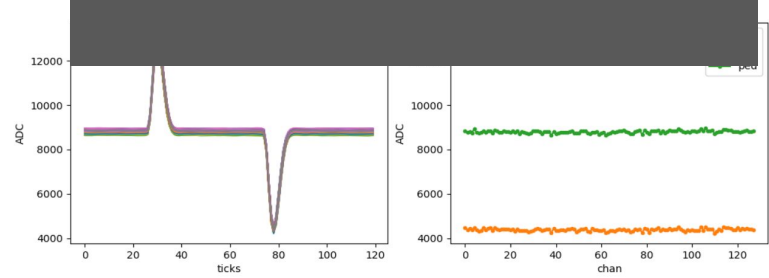
FEMB 38 Cold Test (11/14/24, Run 3)

Comparison of Testing Results - Day 2
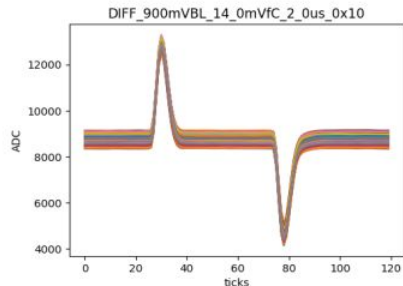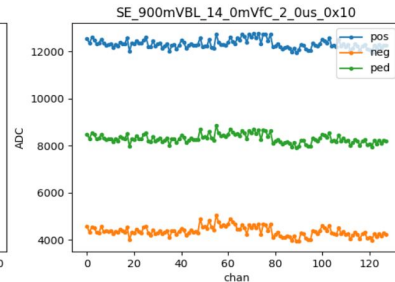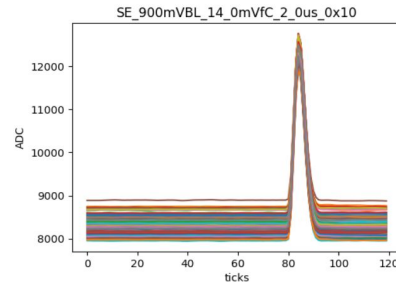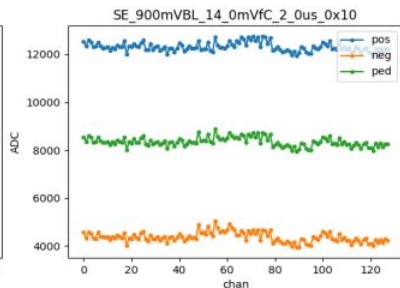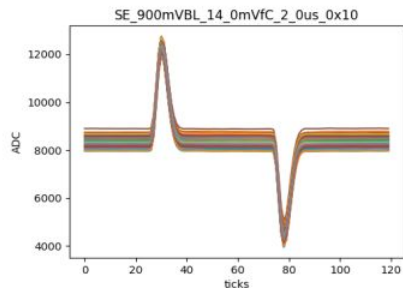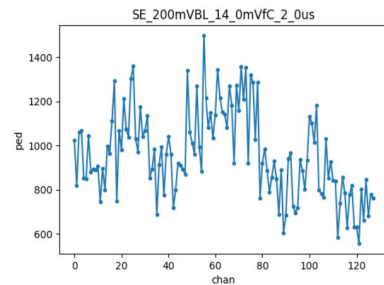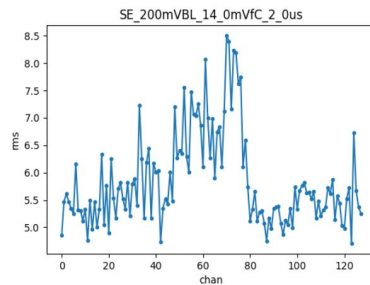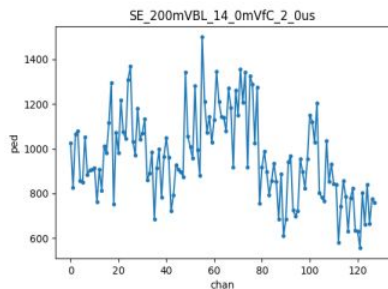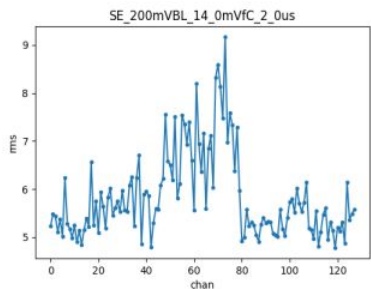
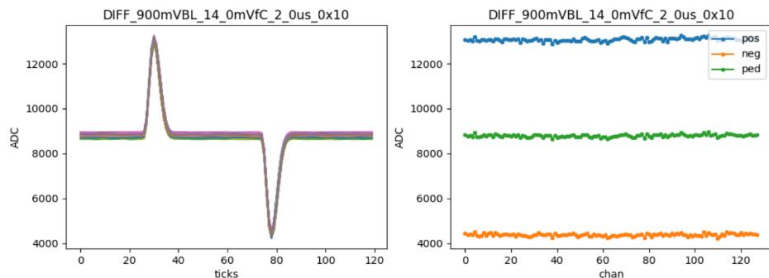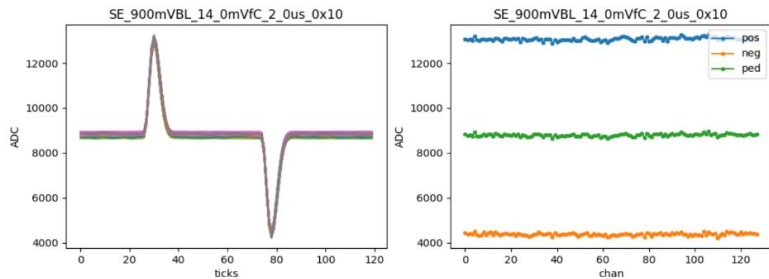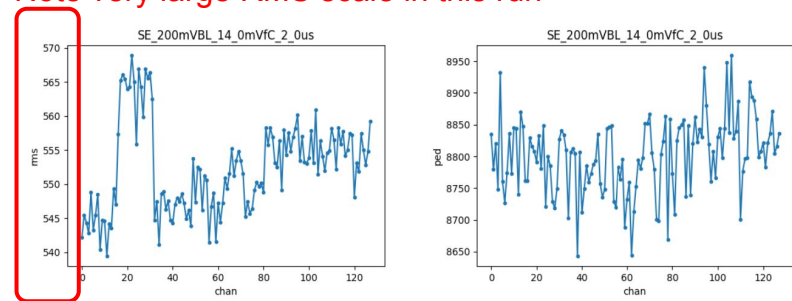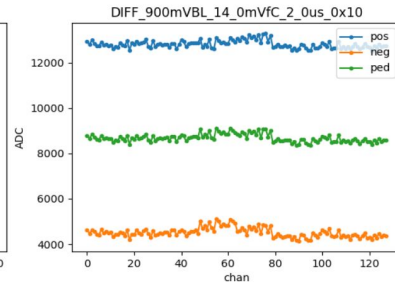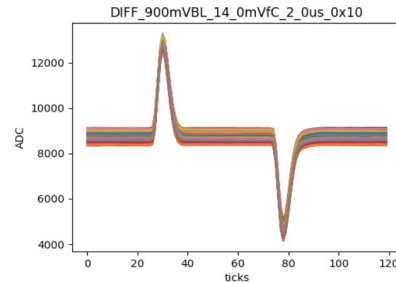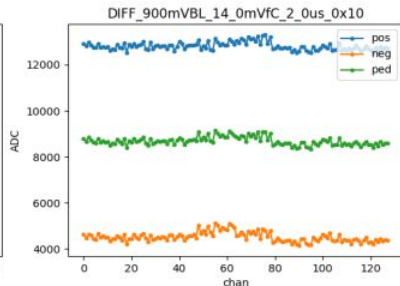FEMB 39 Cold Test (6/17/24, Run 1)

FEMB 39 Cold Test (11/14/24, Run 5)

Summary Observations

- New CTS lid helps CTS run more efficiently, as chamber pressure and temperature are kept more consistently
  - Quicker to immerse and to warm up, gains of ~15-20 mins on a ~3h cycle
  - Better insulation - only saw a single drop of condensation directly below cable ingress on Day 1

- When FEMB tests run, Warm and Cold FEMB response consistent with previous testing
  - Slightly lower RMS noise, to be confirmed with further testing
  - Intermittent failure modes seen had been reported already during Summer testing
    - Causes remain unknown, but further investigations not warranted until we have a full up-to-date setup

- Passing note that thanks to the Testing Checklist and scripts we developed, we were up and running tests within ~15 mins of arriving at the lab, all while training a new student.

Date:
Daily Cycle Number:

Test Manager:

| #	Procedure	Initials	Comments
1	WIB is turned on: 12 V @ ~1.6V		
2	From a terminal window, run `wib_init.sh`		
3	Checked disk space in WIB (< 80%)? If more space needed, run `clear_data.py`		
4	In a second terminal window, ssh to WIB, get into script directory		
5	Record **date, test number, test type, CHK or QC, board #, room temp, room humidity, and construction.**		
6	Start CHK Warm Test; Record **Test Start time** and the **average current.**		
7	If CHK test completed, record **Test End Time.**		
8	Begin QC Warm testing: **Repeat step 5**, record **Test Start Time** and the **average current.**		
9	If QC test completed, record **Test End Time.**		
10	Turn on "Warm Gas" for 10 minutes (40-50°C) and record the **CTS Process Start** and the **Dewar Starting Volume.**		
11	Turn the CTS to "Cold Gas"		
12	Once the CTS reaches -30°C, turn to "Immersion" and record the **Dewar Vol (Immersion L3 start).**		
13	Start the CHK Cold Test, **repeat step 5**, record **Test Start** and **avg current.**		
14	If CHK test completed, record **Test End Time.**		
15	Begin QC Cold testing: **Repeat step 5**, record **Test Start Time** and the **average current.**		
16	If QC test completed, record **Test End Time.**		
17	Transfer data from WIB to test stand using `get_ana_data.sh`		
18	If testing is completed, CTS back to "Warm Gas"		
19	Once no frost or condensation are visible inside the CTS, record the **CTS Process End** time.		
20	If testing is done for the day, shutdown WIB with `shutdown -h now`, turn off CTS camera and lamp, turn off CTS.		