INFN GEM Update:

4/14/21-4/21/21

Ezekiel Wertz (onsite), Robert Perrino(remote), Evaristo Cisbani (remote), Holly Szumila-Vance (onsite), Chuck Long (onsite)

Recent Activities:

TEDF Hardware (Apr. 14-15)

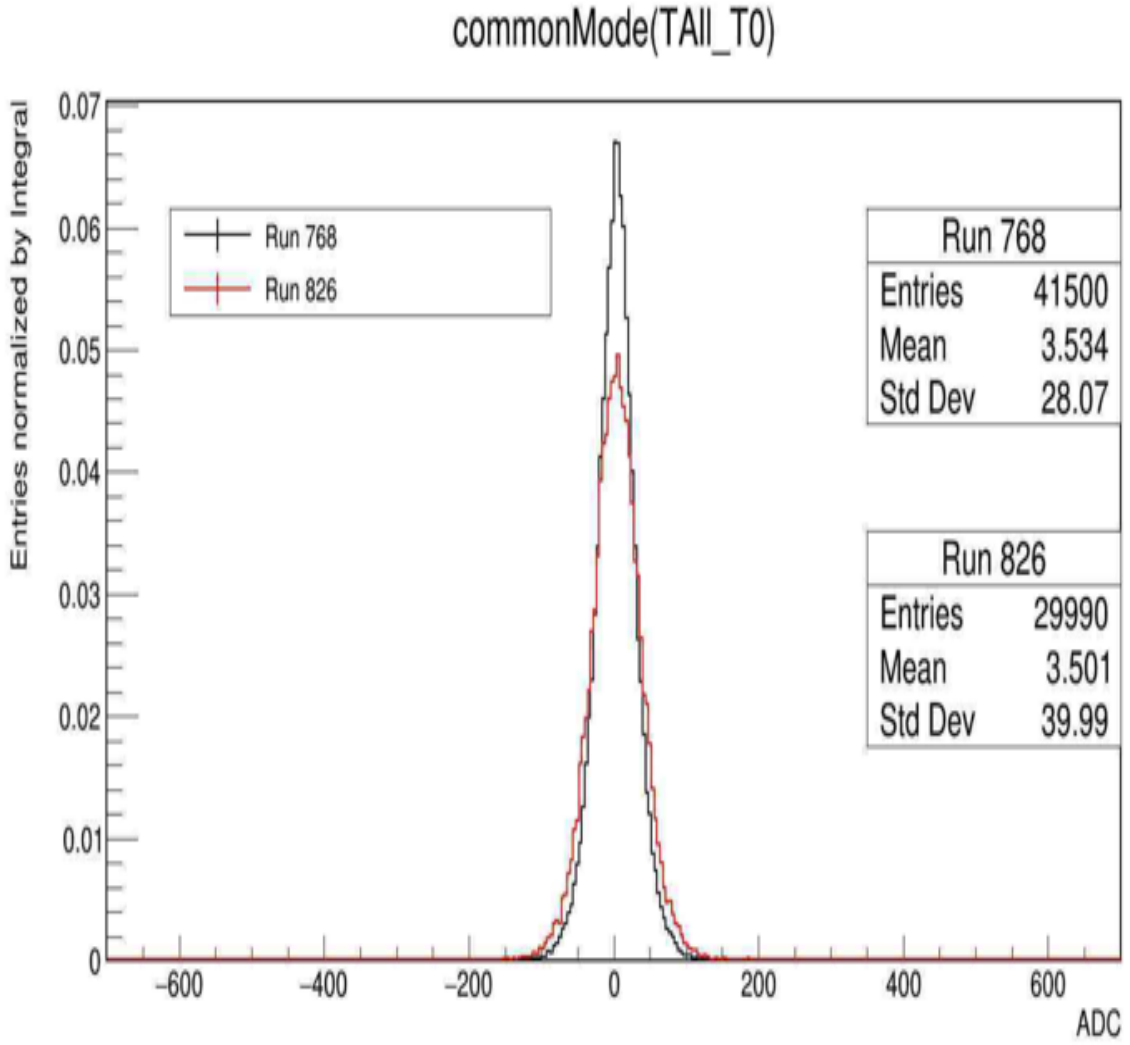
- Had 5 MPDs modified, while keeping 4 MPDs unmodified to try and reproduce consistent and reasonable noise plots by manipulating different schemes of MPDs in the VME crate.
- Have data for 2 unmodified, 4 unmodified, 2 modified, and 4 modified MPDs in the crate connected to J0 to compare to run 768.

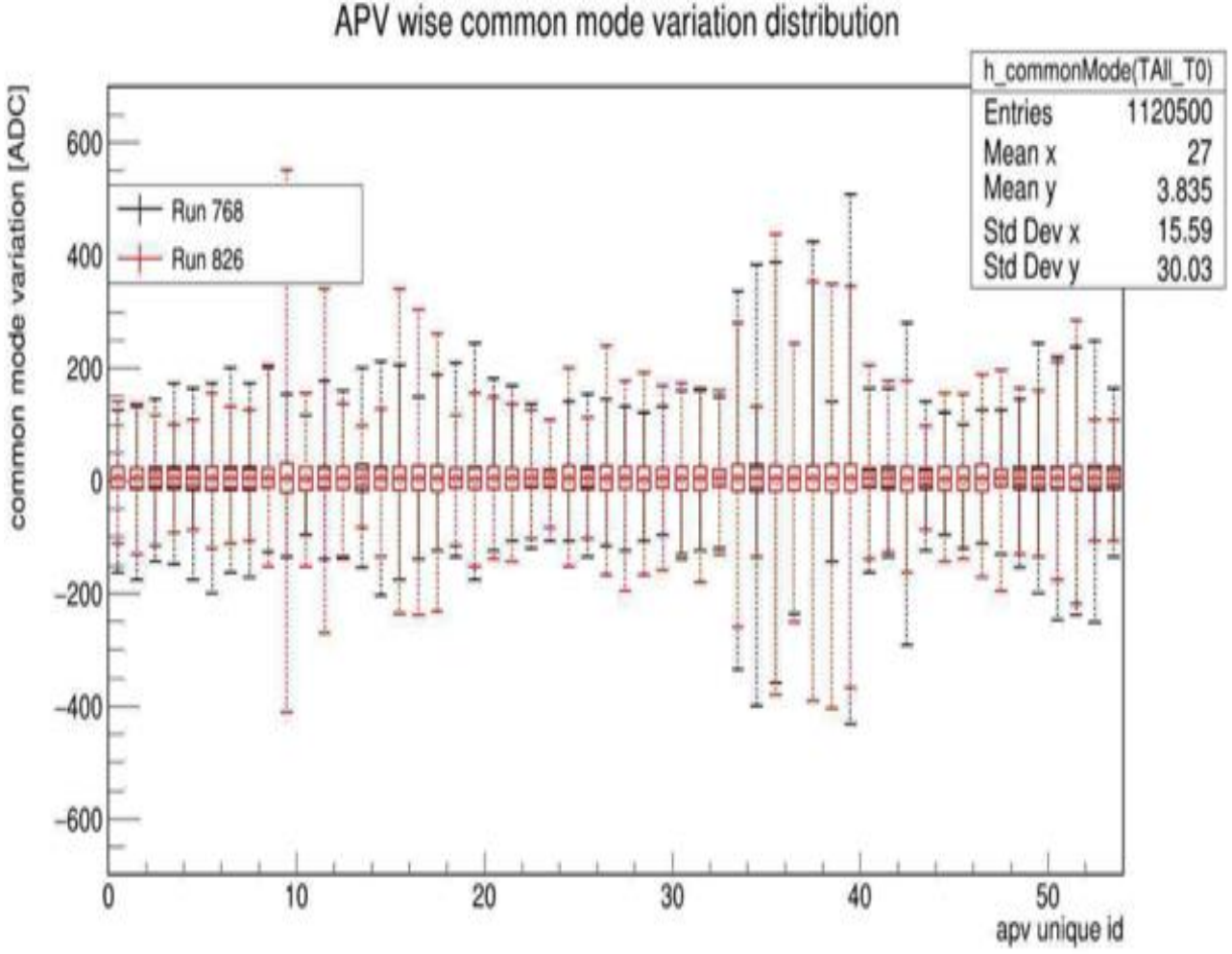
TEDF DAQ & Software(Apr. 14-15)

- Investigating Common Mode noise in INFN GEMs, focusing on unmodified, modified MPDs, and grounding.
- Sean and I update the plots in TEDF to optimize the macro that Xinzhan made for the comparison of common mode.

Common Mode Comparison: TEDF Apr. 12

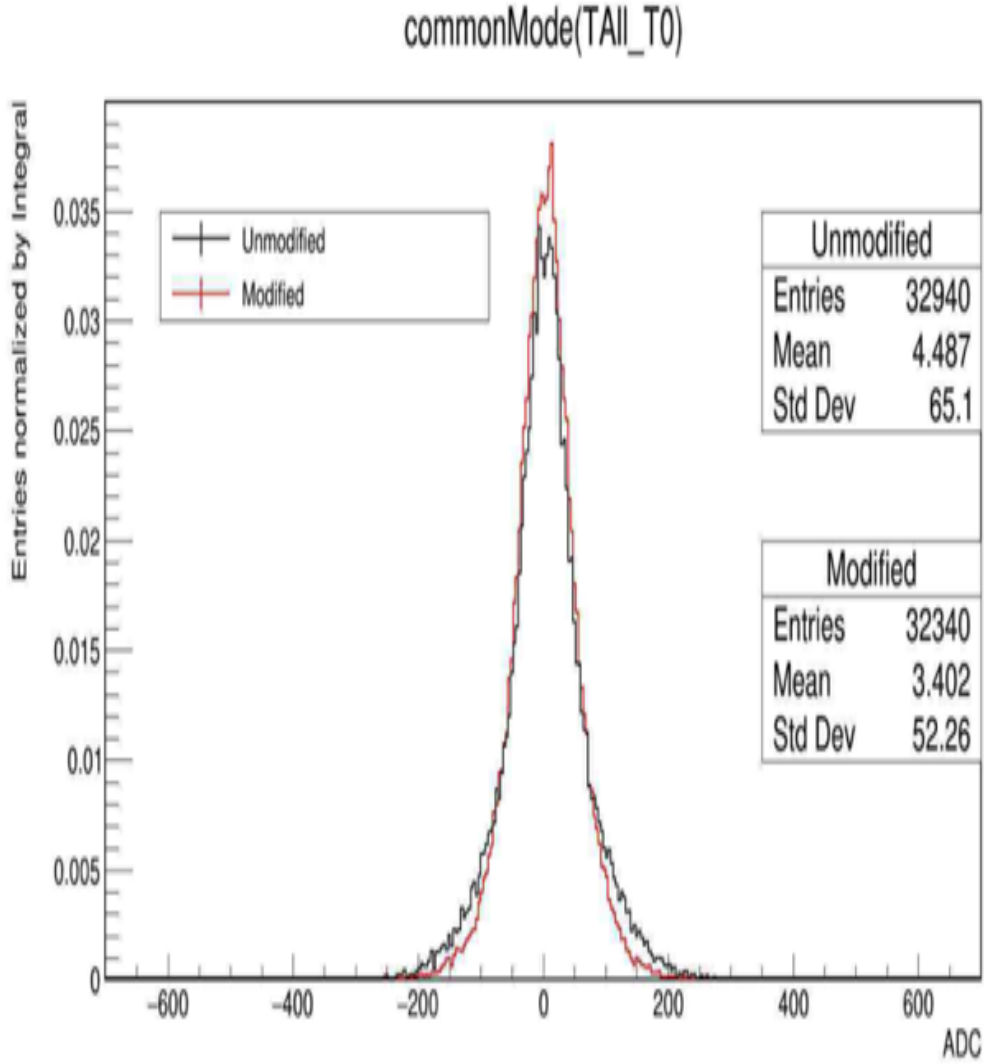
Run 768: all MPDs, no modified, narrow RMS, no faraday cage, originally from Apr. 5
Run 826: Unmodified MPDs slots 3-6, Modified slot 7, maybe slightly worse RMS, still narrow, faraday cage
Comparing MPDs in slots 3-6

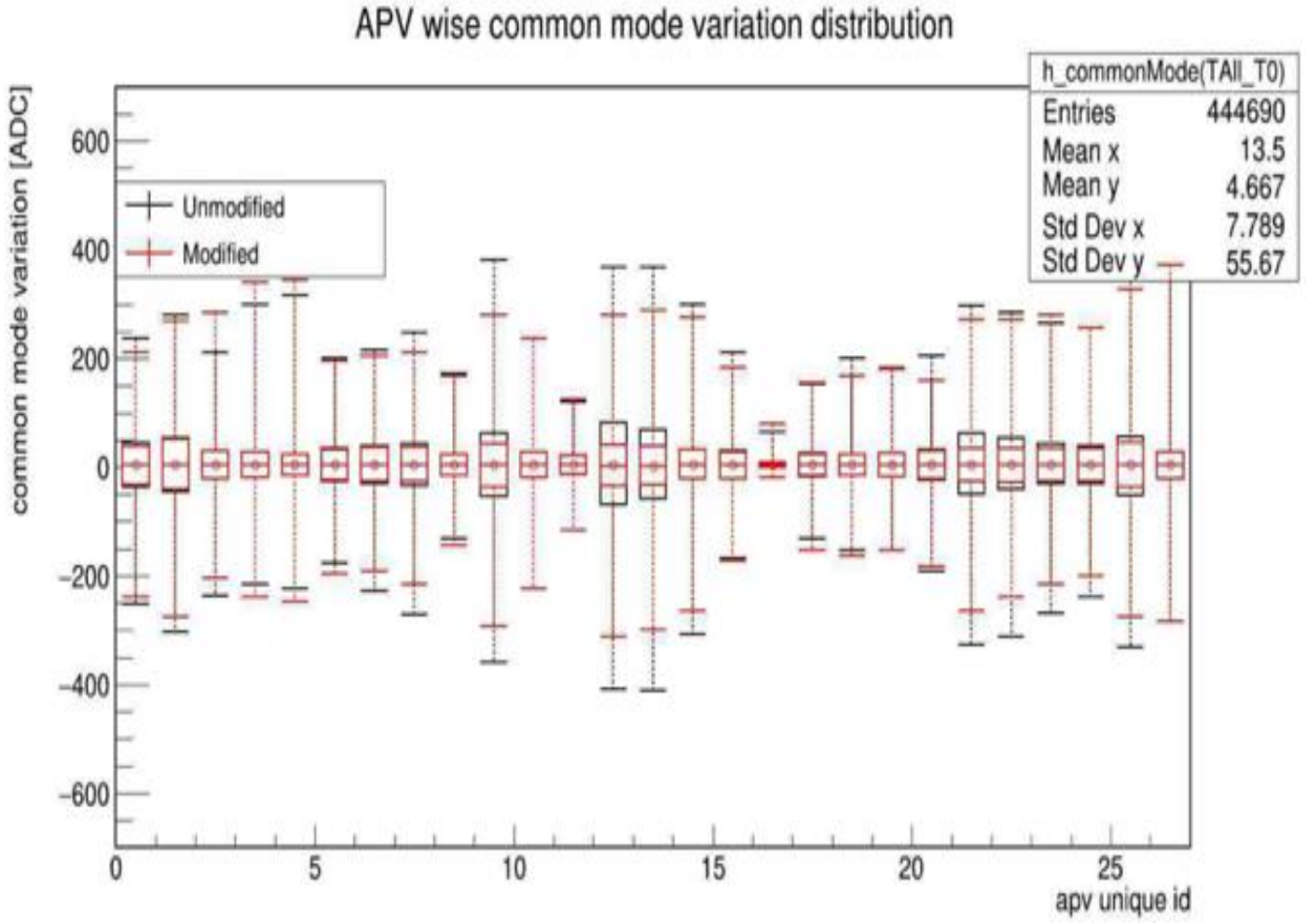




Common Mode Comparison: TEDF Apr. 12

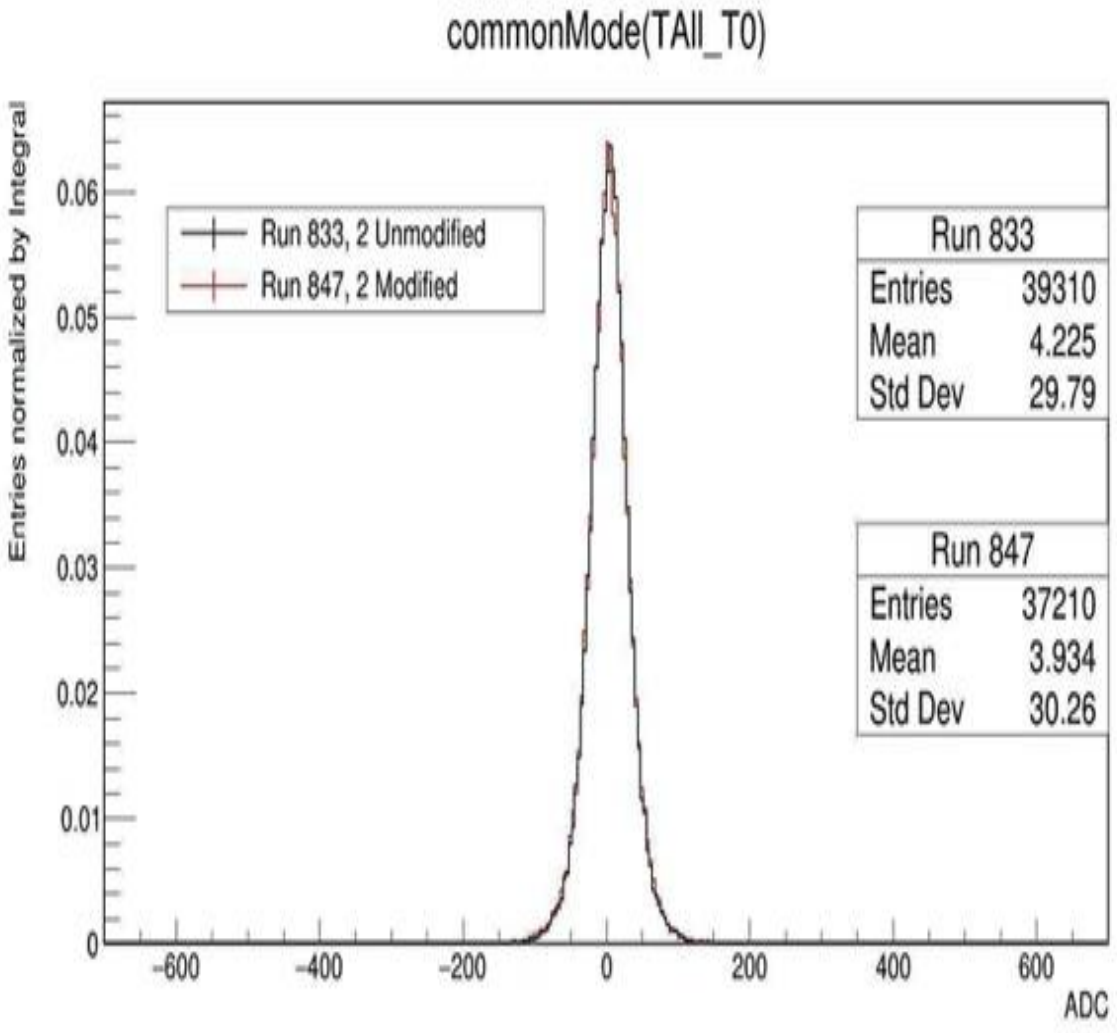
Run 831: only modified MPDs slots 7&8, faraday cage, wide RMS
Run 832: only unmodified MPDs slots 7&8, no faraday cage, wide RMS
Comparing MPDs in slots 7&8

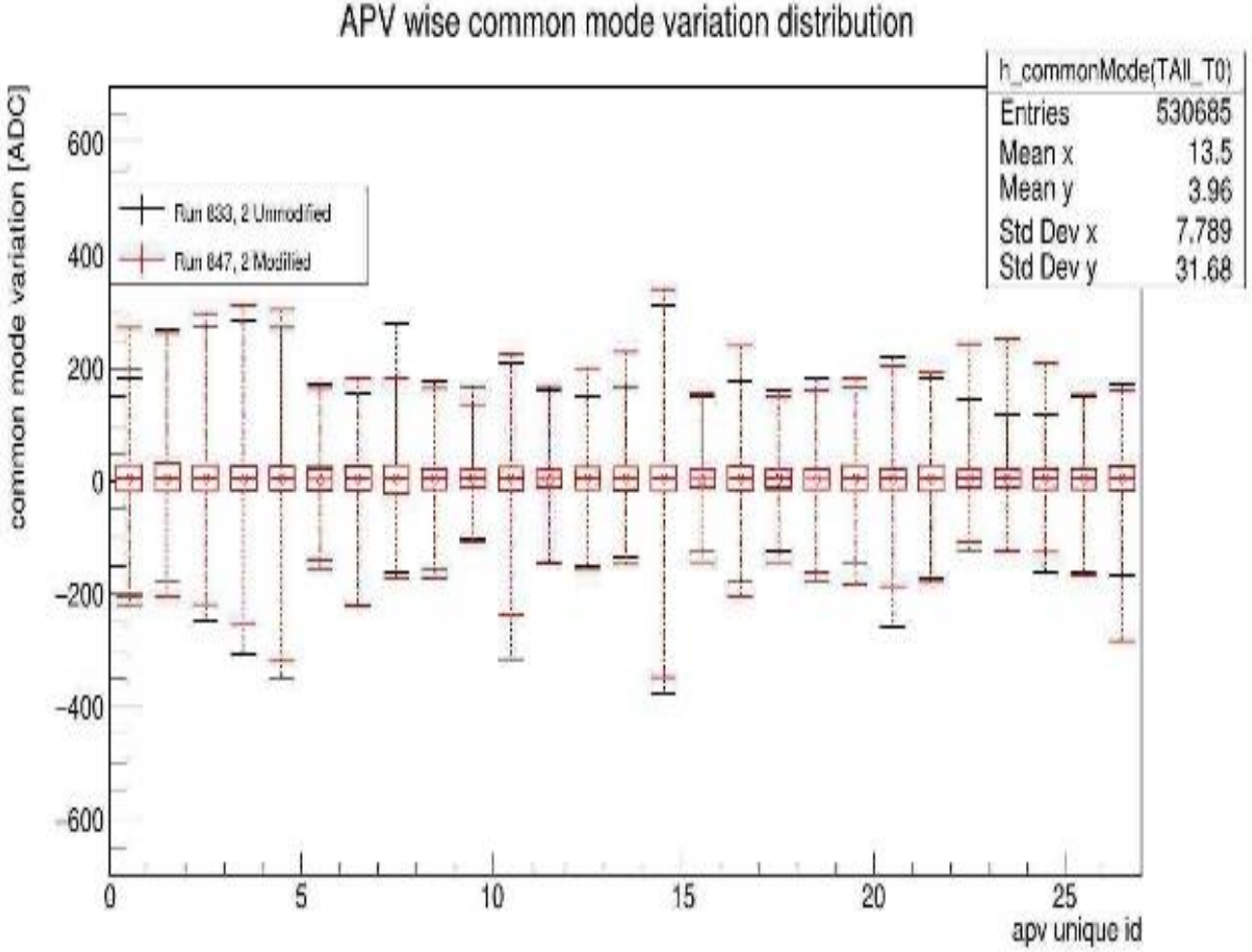




Common Mode Comparison: TEDF Apr. 15

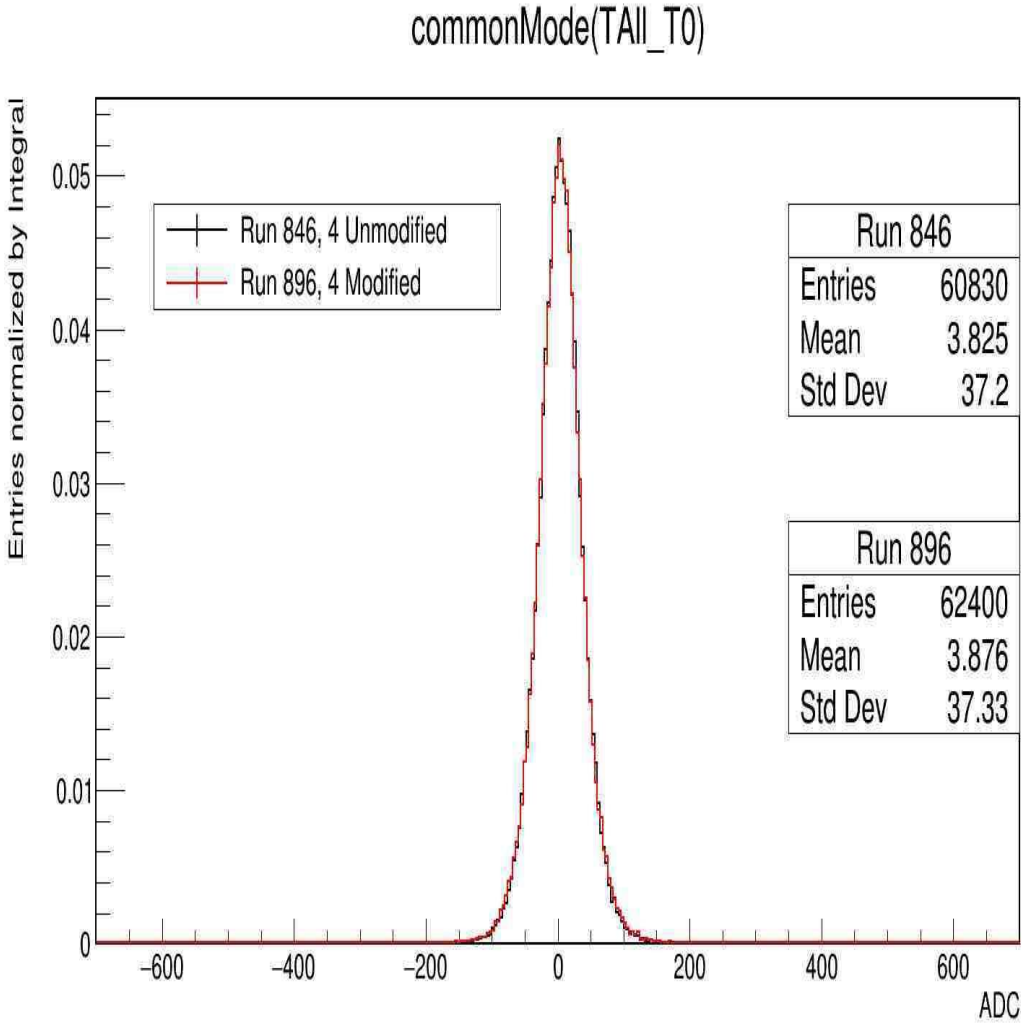
Run 833: only 2 unmodified MPDs slots 3&4,no faraday cage, narrow RMS,
Run 847: only 2 modified MPDs slots 3&4, no faraday cage, narrow RMS
Comparing MPDs in slots 3&4

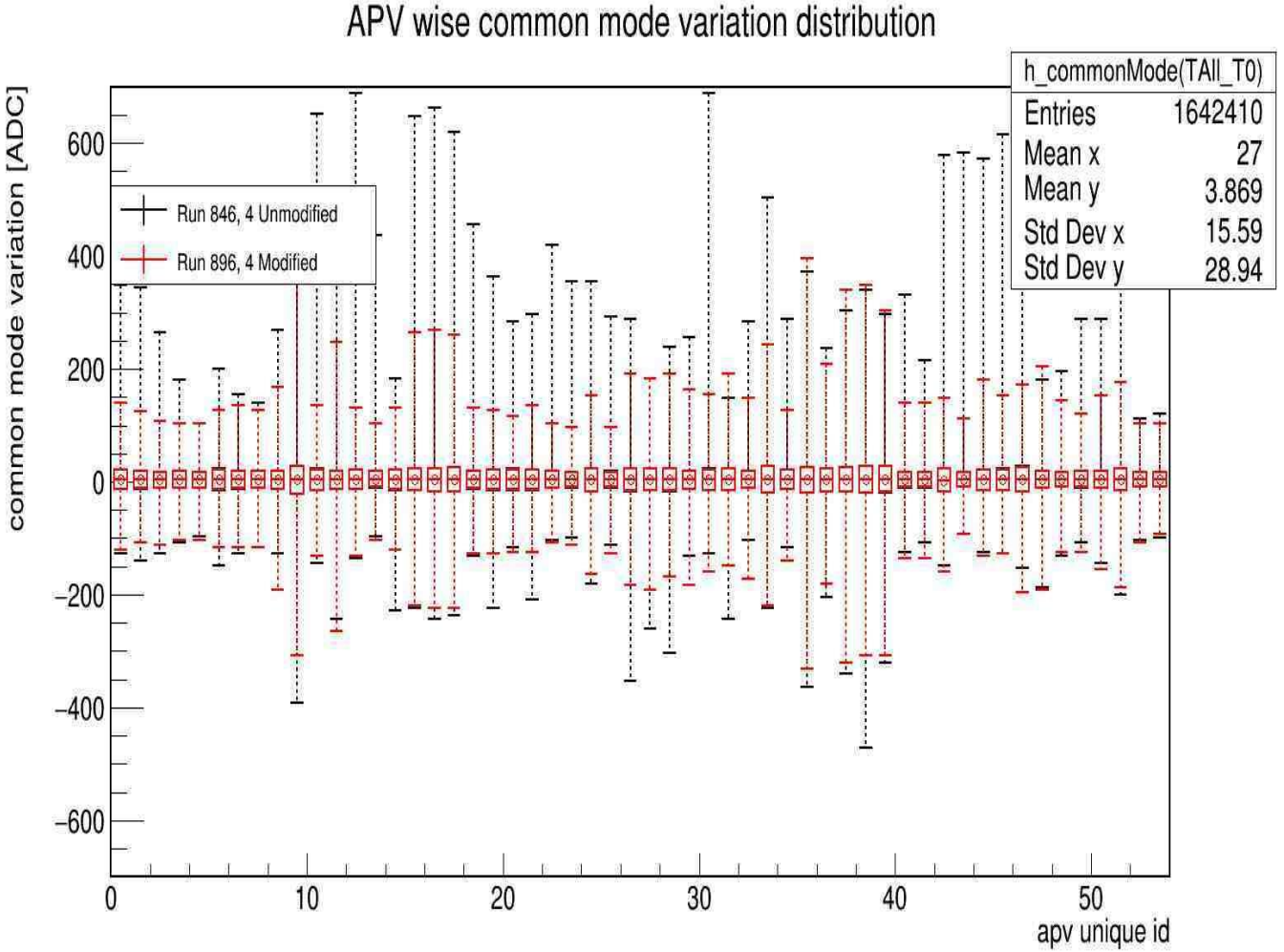




Common Mode Comparison: TEDF Apr. 15

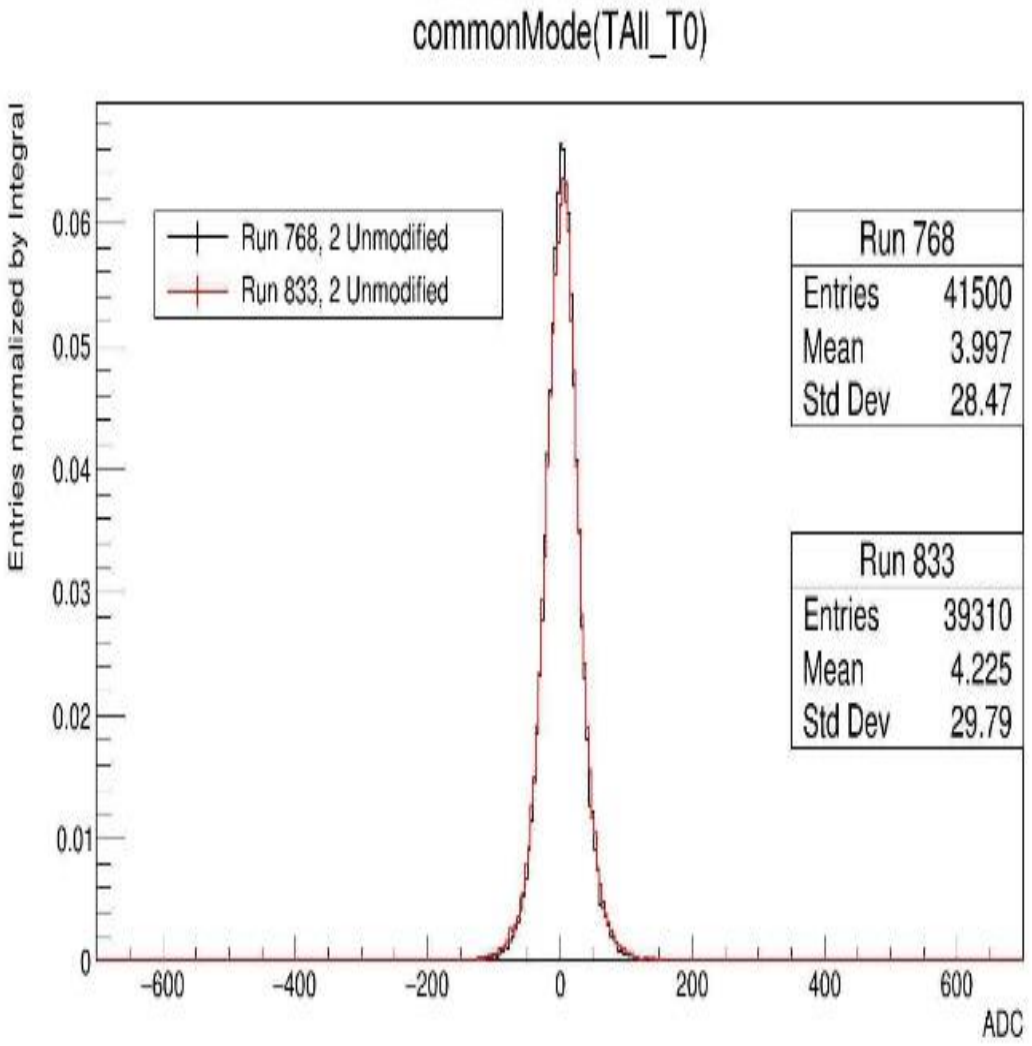
Run 846: only 4 unmodified MPDs slots 3-6, no faraday cage, narrow-ish RMS
Run 896: only 4 modified MPDs slots 3-6, no faraday cage, narrow-ish RMS
Comparing MPDs in slots 3-6

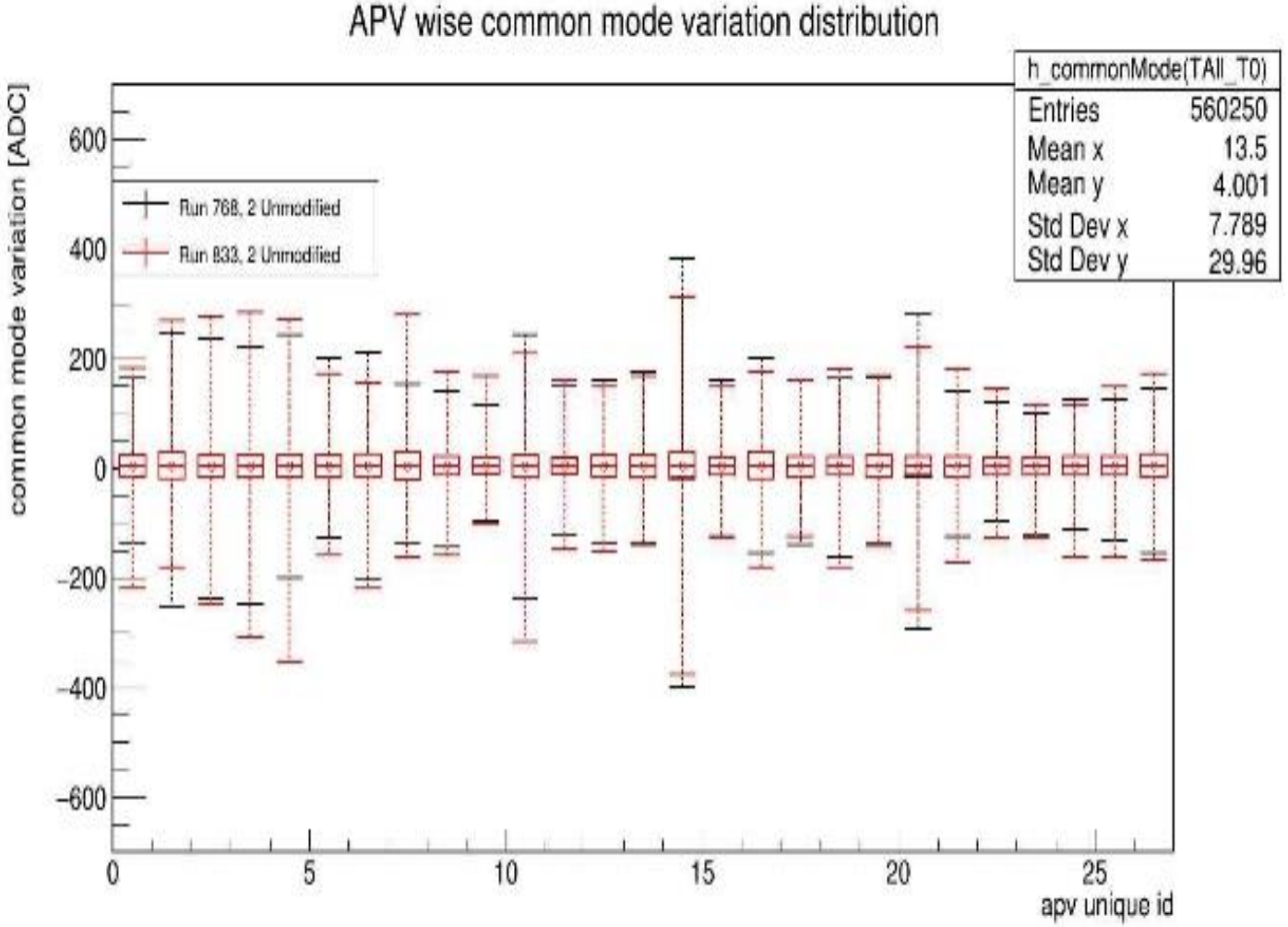




Common Mode Comparison: TEDF Apr. 15

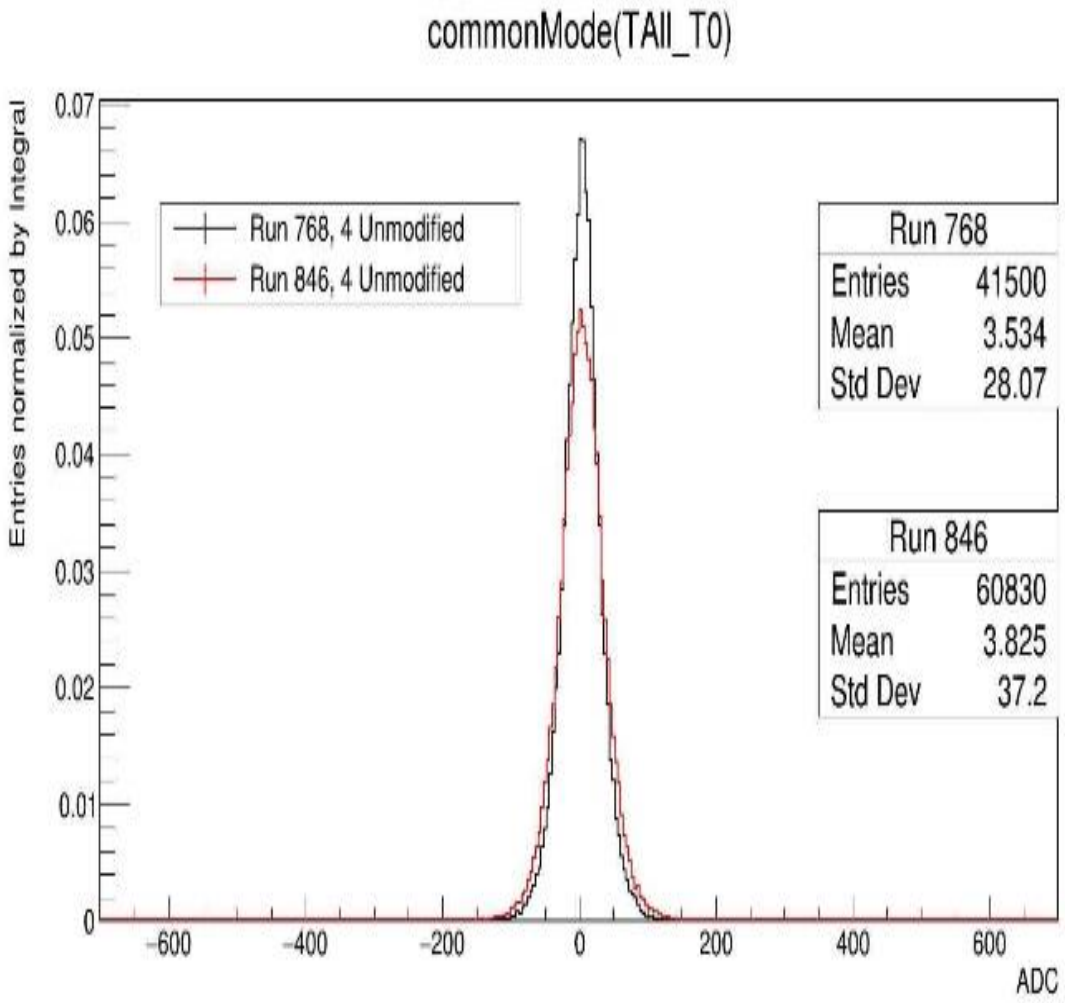
Run 768: all MPDs, no modified, narrow RMS, no faraday cage, originally Apr. 5
Run 833: only 2 unmodified MPDs slots 3&4, no faraday cage, narrow RMS,
Comparing MPDs in slots 3&4

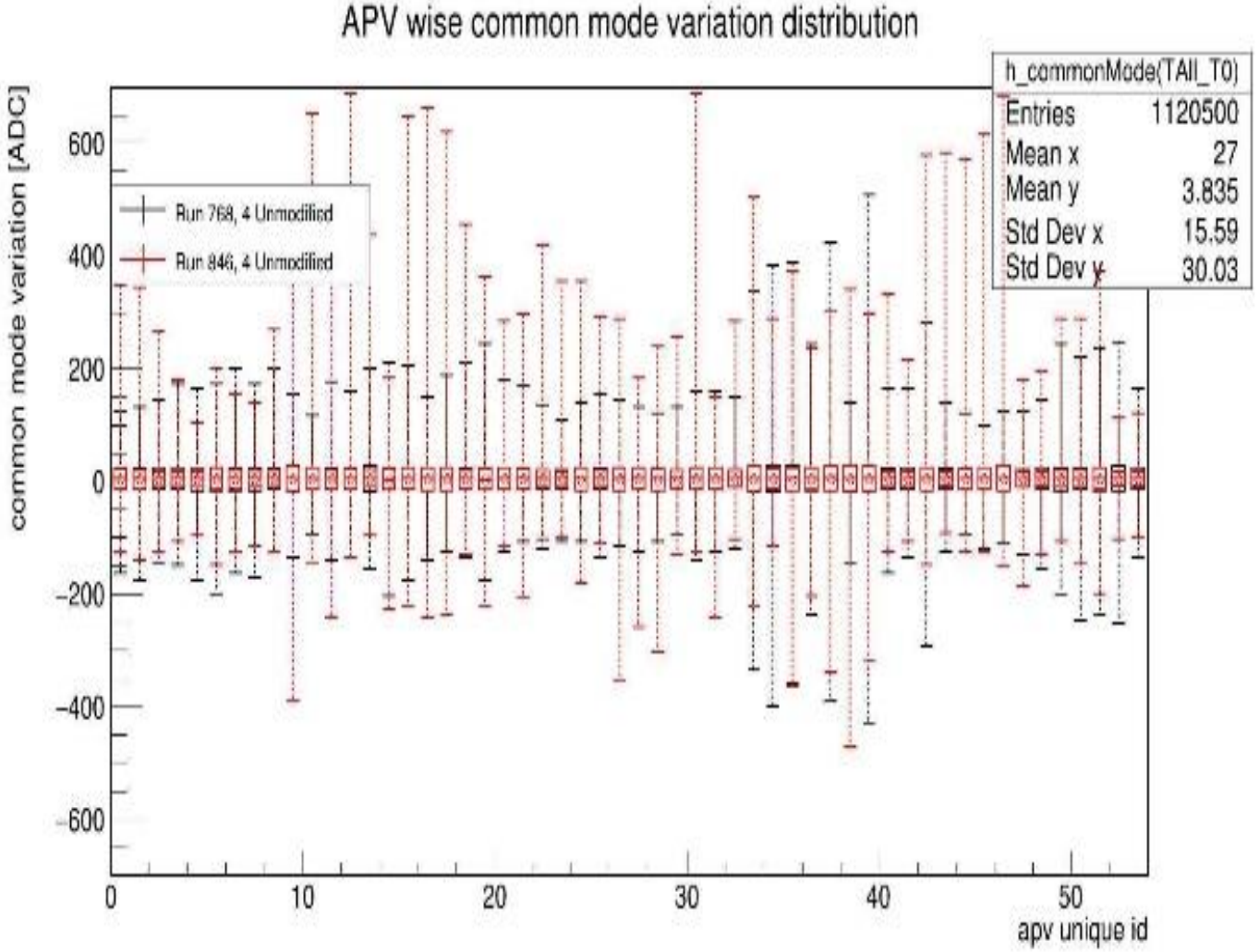




Common Mode Comparison: TEDF Apr. 15

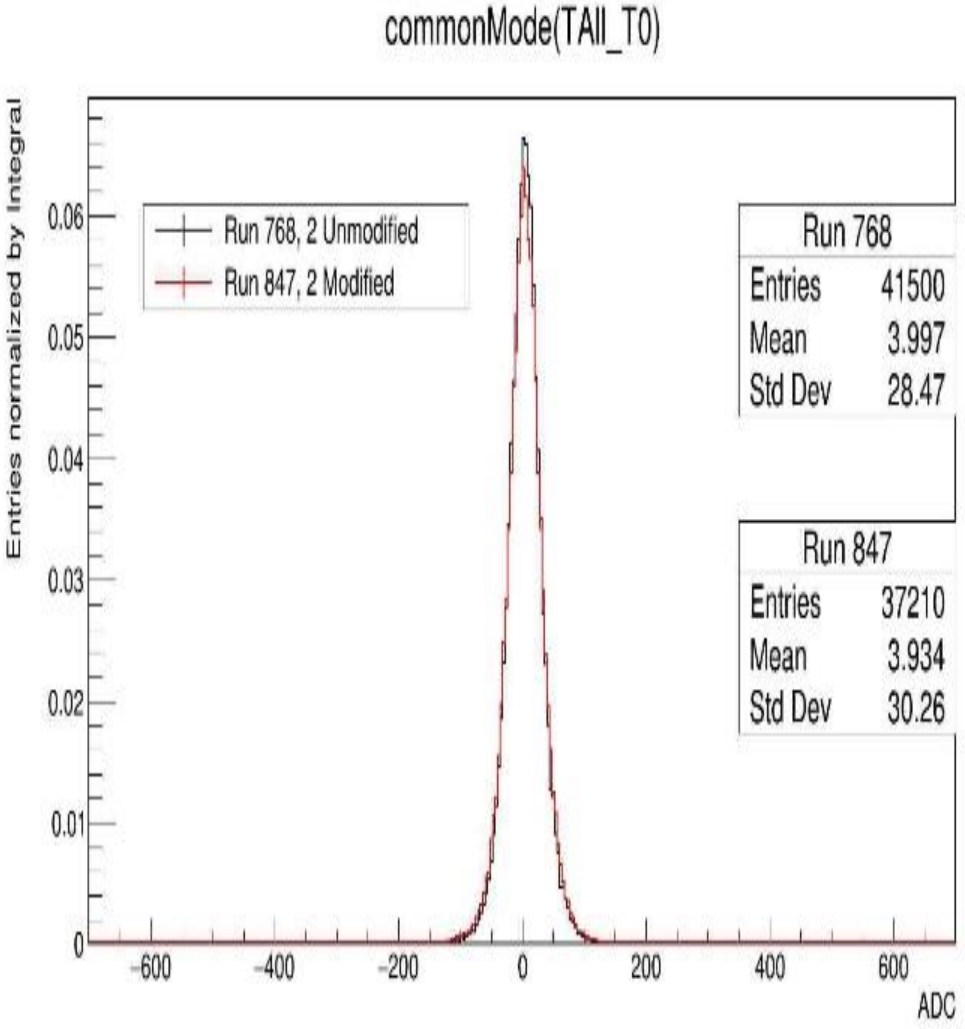
Run 768: all MPDs, no modified, narrow RMS, no faraday cage, originally Apr. 5
Run 846: only 4 unmodified MPDs slots 3-6, no faraday cage, narrow-ish RMS
Comparing MPDs in slots 3-6

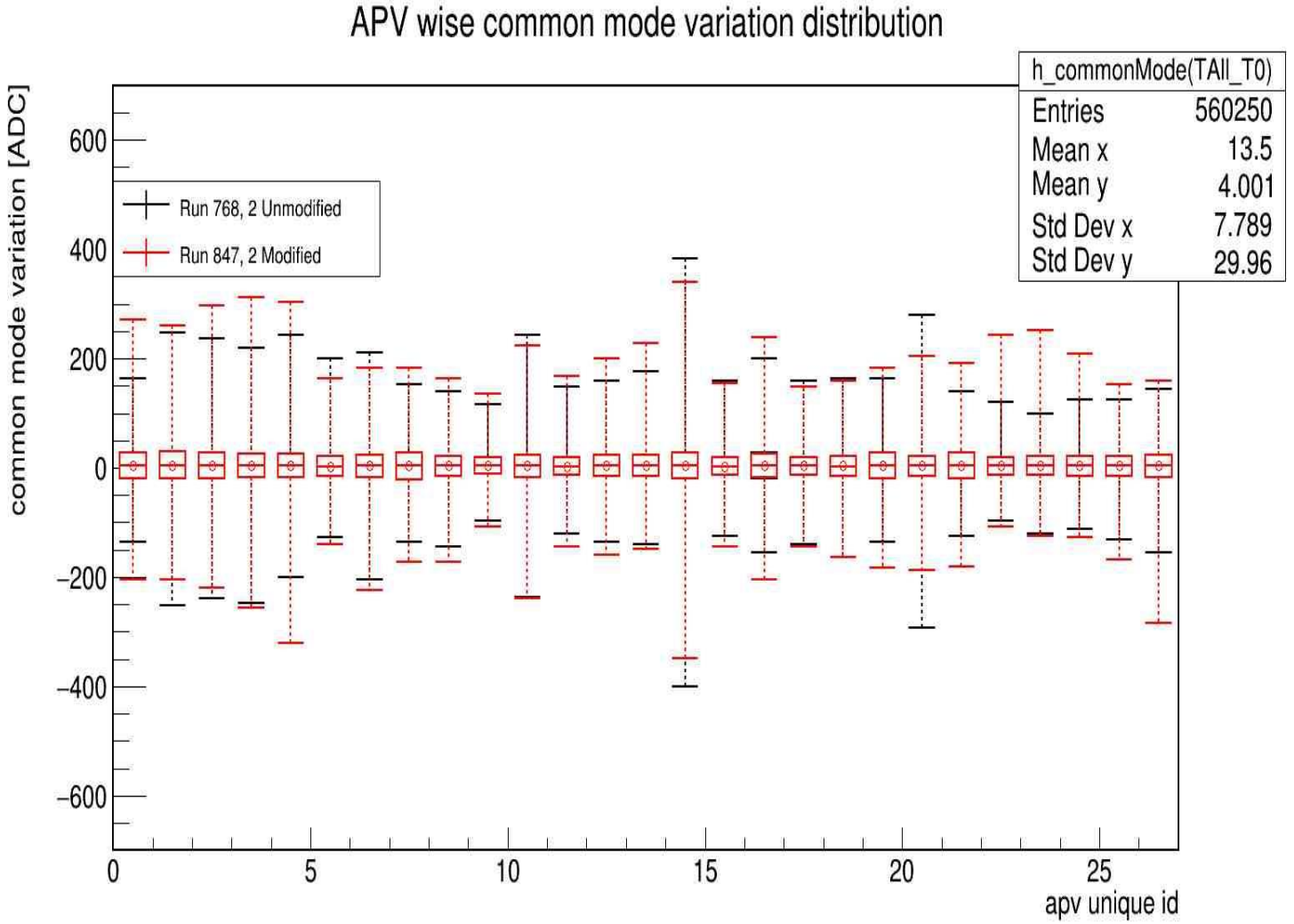




Common Mode Comparison: TEDF Apr. 15

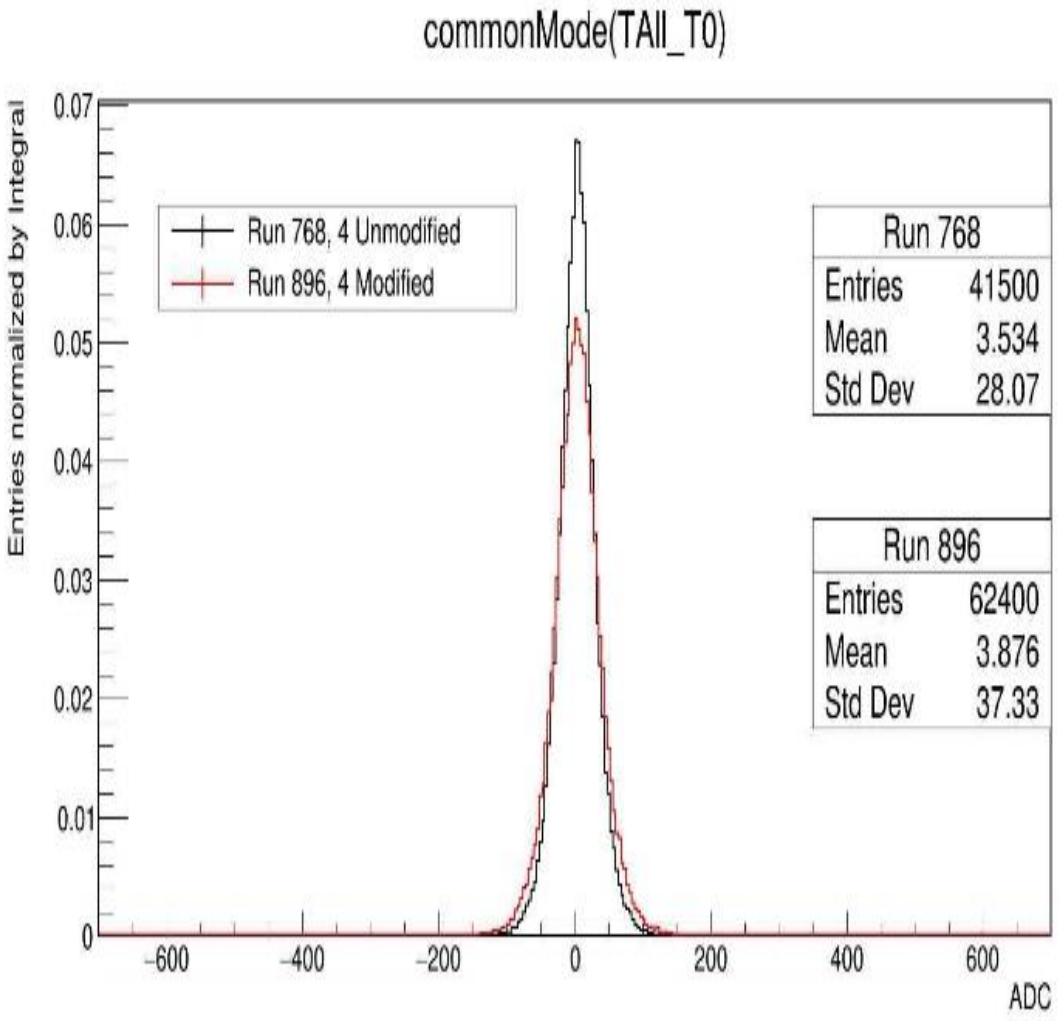
Run 768: all MPDs, no modified, narrow RMS, no faraday cage, originally Apr. 5
Run 847: only 2 modified MPDs slots 3&4, no faraday cage, narrow RMS
Comparing MPDs in slots 3&4

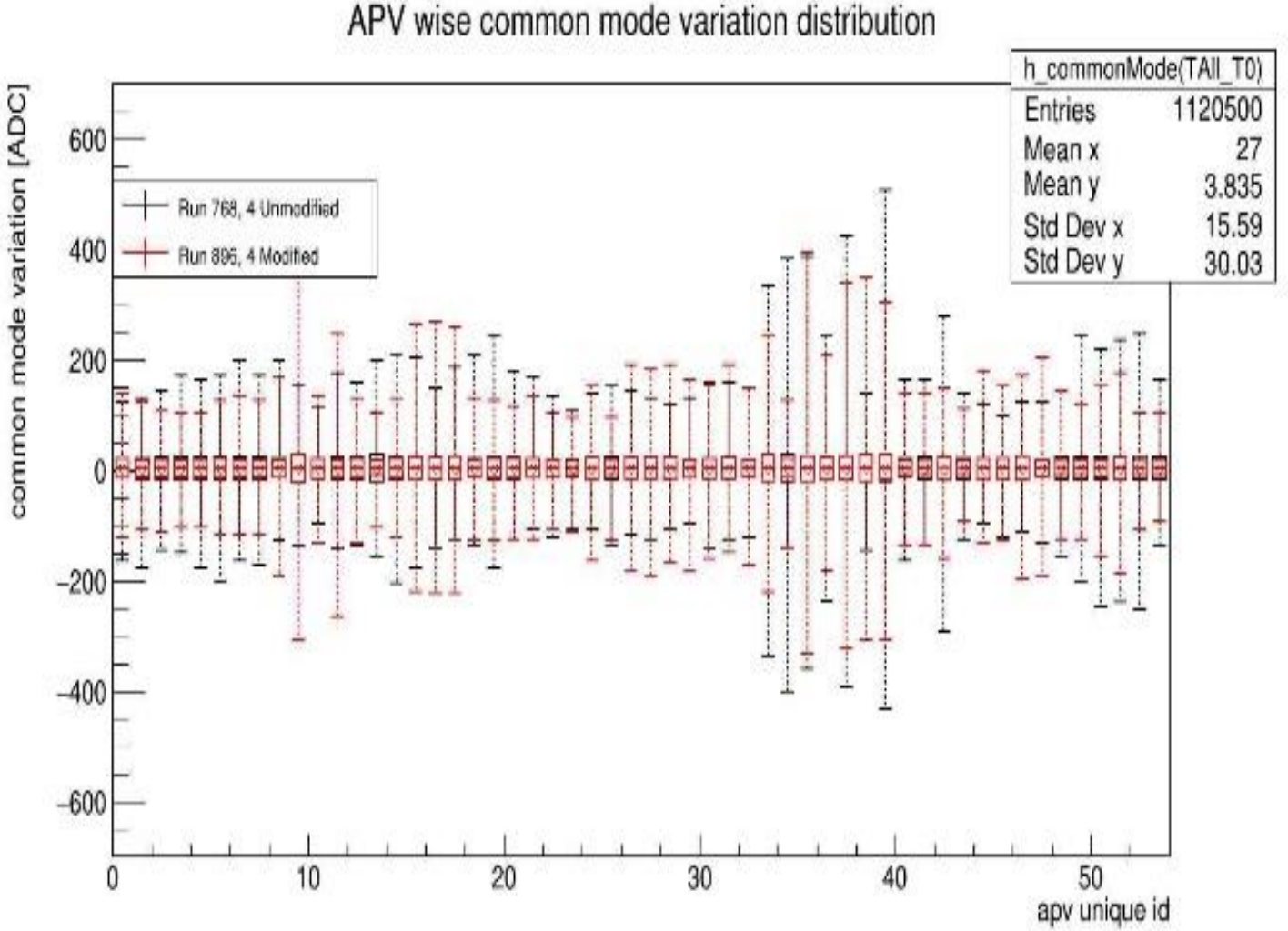




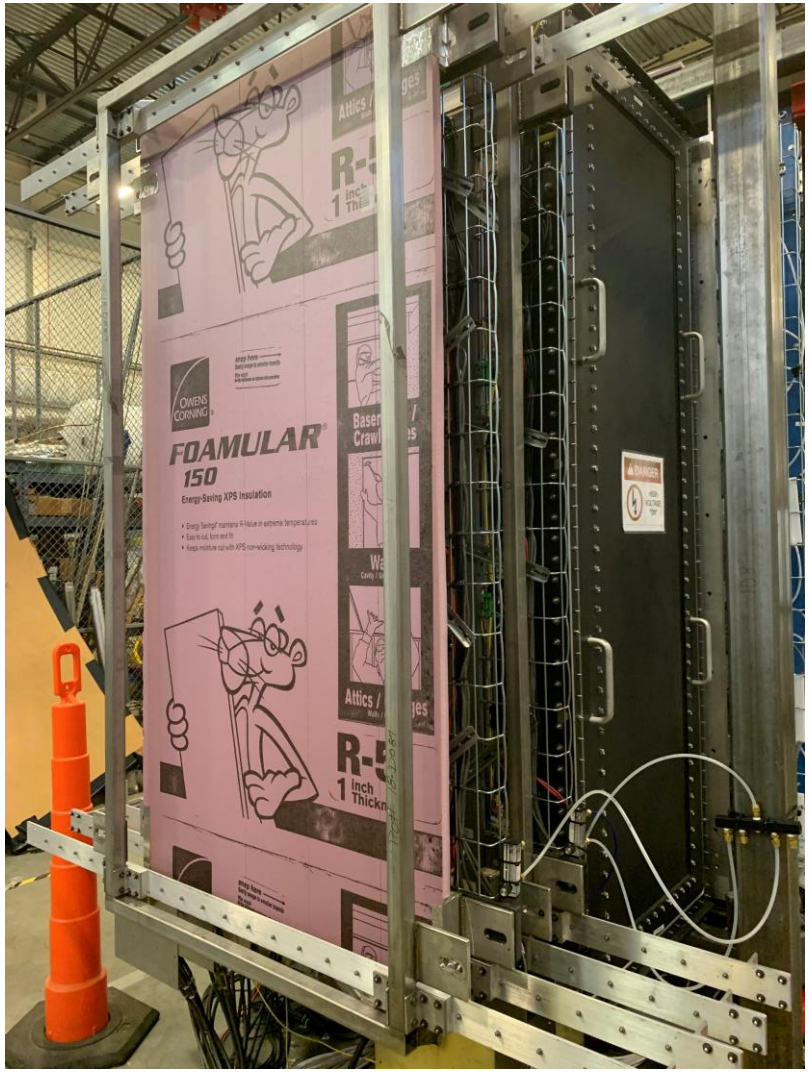
Common Mode Comparison: TEDF Apr. 15

Run 768: all MPDs, no modified, narrow RMS, no faraday cage, originally Apr. 5
Run 896: only 4 modified MPDs slots 3-6, no faraday cage, narrow-ish RMS
Comparing MPDs in slots 3-6





Location and Number of INFN GEMs



TEDF:

Front: Layer J0

Back: Layer J2

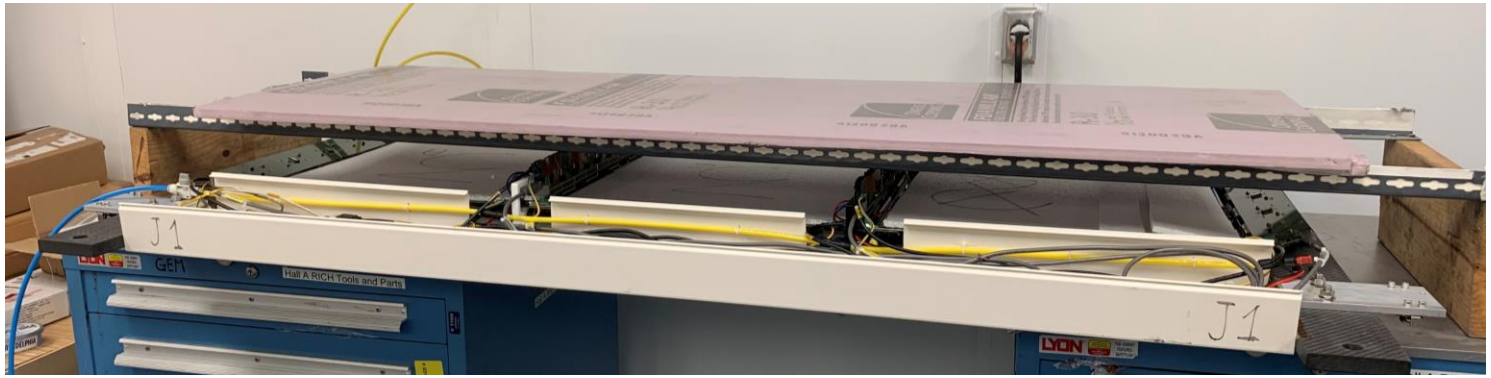
Test Lab:

Top: J4, shorted sector(s)

2nd from Top: J3

Old Picture, J0 and J2 are not there anymore

Layer J1 on back blue chest



Work for Test Lab GEMs

Goal: 2/3 of these GEMs need to go into SBS inline GEM stack.

Candidates are layers J1 and J3, due to time

Layer J1:

- Move layer to cosmic stand (~1/2 day with 4 people)
- Change plastic cable trays to metal cable trays, and recabling (2-3 days for 1 person)
- Check Low Level Plots, verifies readout electronics connections
- Evaluate Pedestals
- Take cosmic data to make sure HV working and evaluate Hit Maps

Layer J3:

- Change plastic cable trays to metal cable trays, and recabling (2-3 days for 1 person)
- Check Low Level Plots, verifies readout electronics connections
- Evaluate Pedestals
- Take cosmic data to make sure HV working and evaluate Hit Maps

Work for Test Lab GEMs

If time permits work on J4

Problem: lowest module on J4 has shorted sector(s)

Challenges: Not sure if there are enough working MPDs, patch panels, cables, and LV supply to have working as a 3rd GEM in cosmic stand

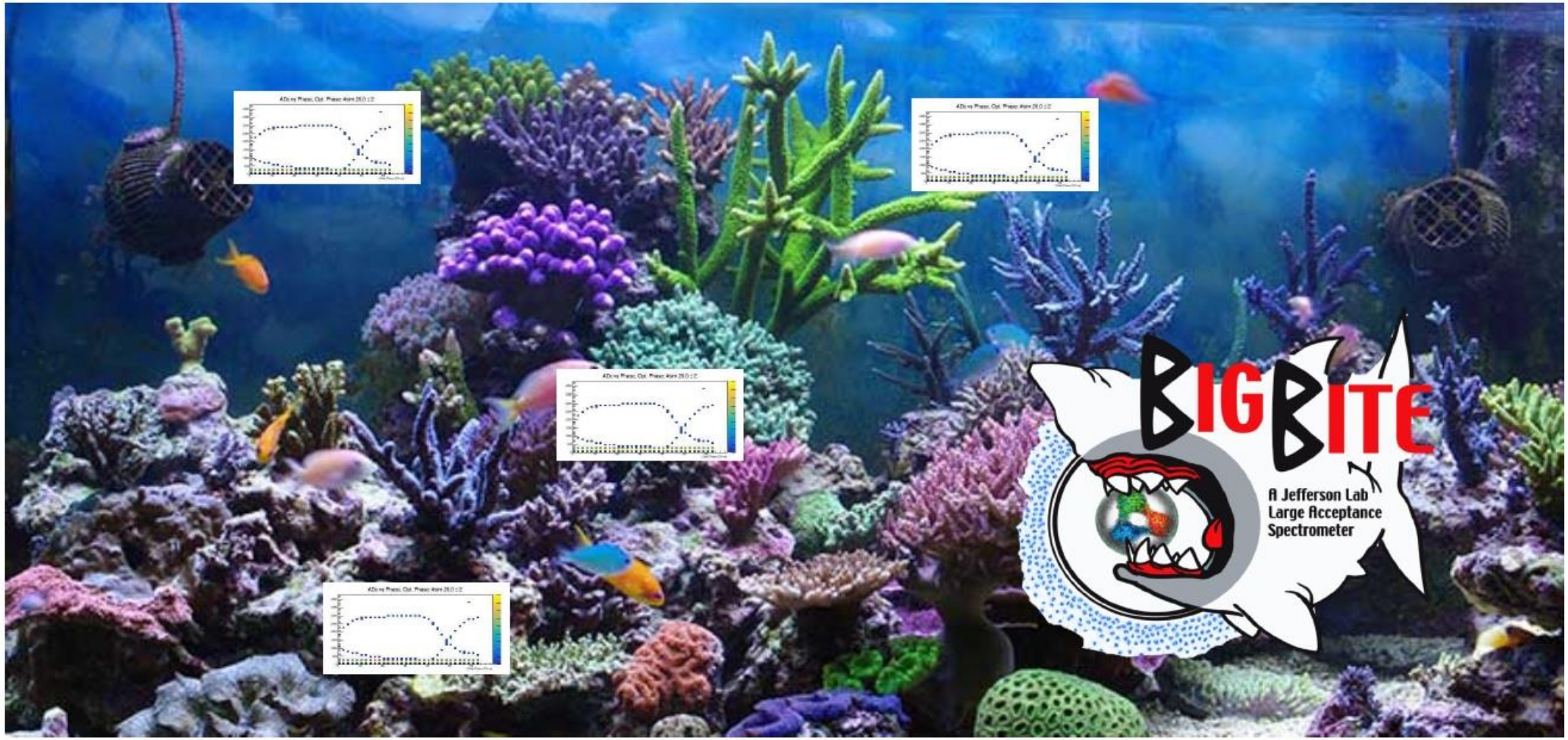
Layer J4:

- Check the lowest module has shorted sectors by measuring the resistance of each GEM foil via a multimeter
- Remove the lowest module from layer J4
- Move it to the single module setup and have gas flushing
- Apply ~ 100 V on the defective GEM foil
- With a thermal camera, look at the external protective resistors. These are soldered into the GEM Kapton foil. Current will flow on the shorted resistor, which is visible via the thermal camera.
- Unsoldered that external resistor
- Test the HV on the module. If the HV ramps fine and is stable return module to J4

What to do next?

- Test Lab GEM Chambers
  - Change to metal cable trays for layers J1 and J3
  - Resolve Low Level Plots, due most likely to cable connections
  - Evaluate pedestal RMS plots and look for any noise cards, potentially altering APV cards
  - Once pedestals look good, take cosmic data and evaluate Hit Maps
  - If time permits resolve J4
- GEM Chambers in BigBite
  - Setup any remaining software/programs for INFN GEMs in TEDF configuration.
  - Take DAQ runs at least once a day to test DAQ stability.
  - Setup cosmic trigger.
  - Systematic check of clock phase.
  - Take pedestal data and check multiple analysis forms: common mode subtraction, zero suppression, etc. for all TEDF GEMs
  - Look for any noise issues and see if we need to adjust grounding.
  - Compare spacers for 1st track mount of BigBite Frame.
  - Test GEM HV with Low Level Tests and Pedestals.
  - Documentation for LV, Low Level Troubleshooting,and in general. Basically manual update.

Questions?



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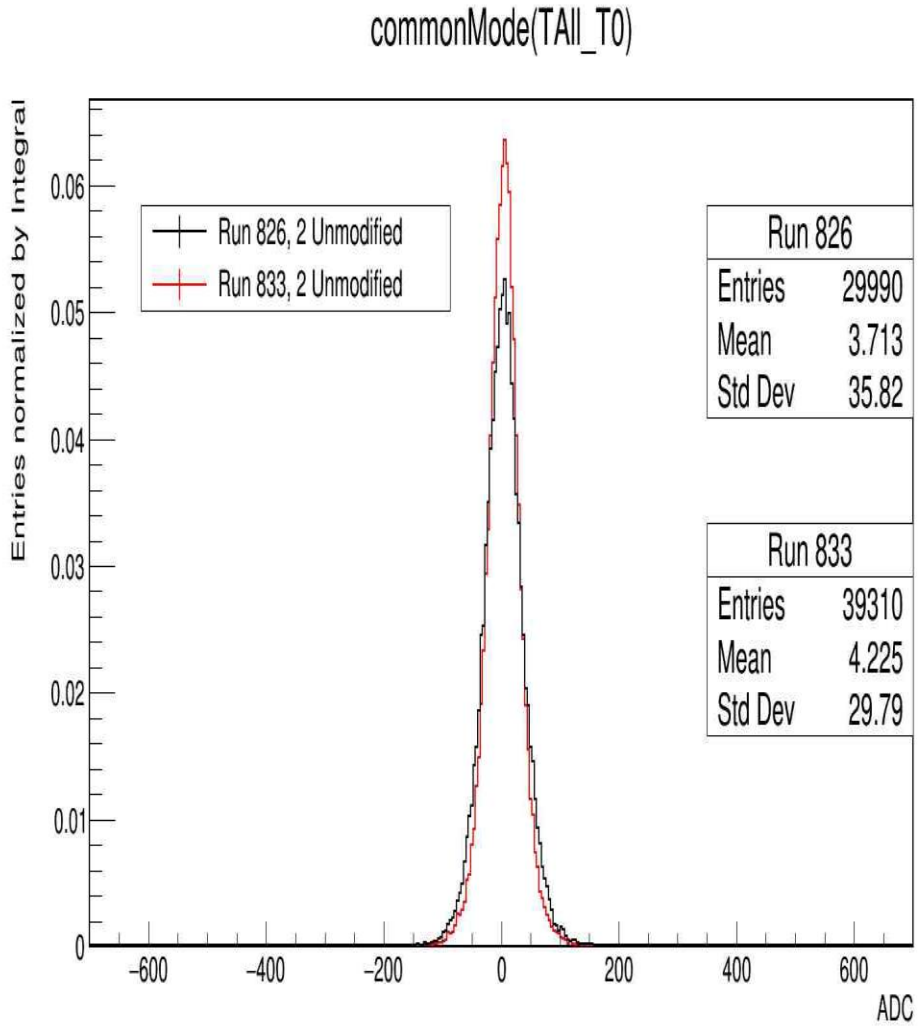

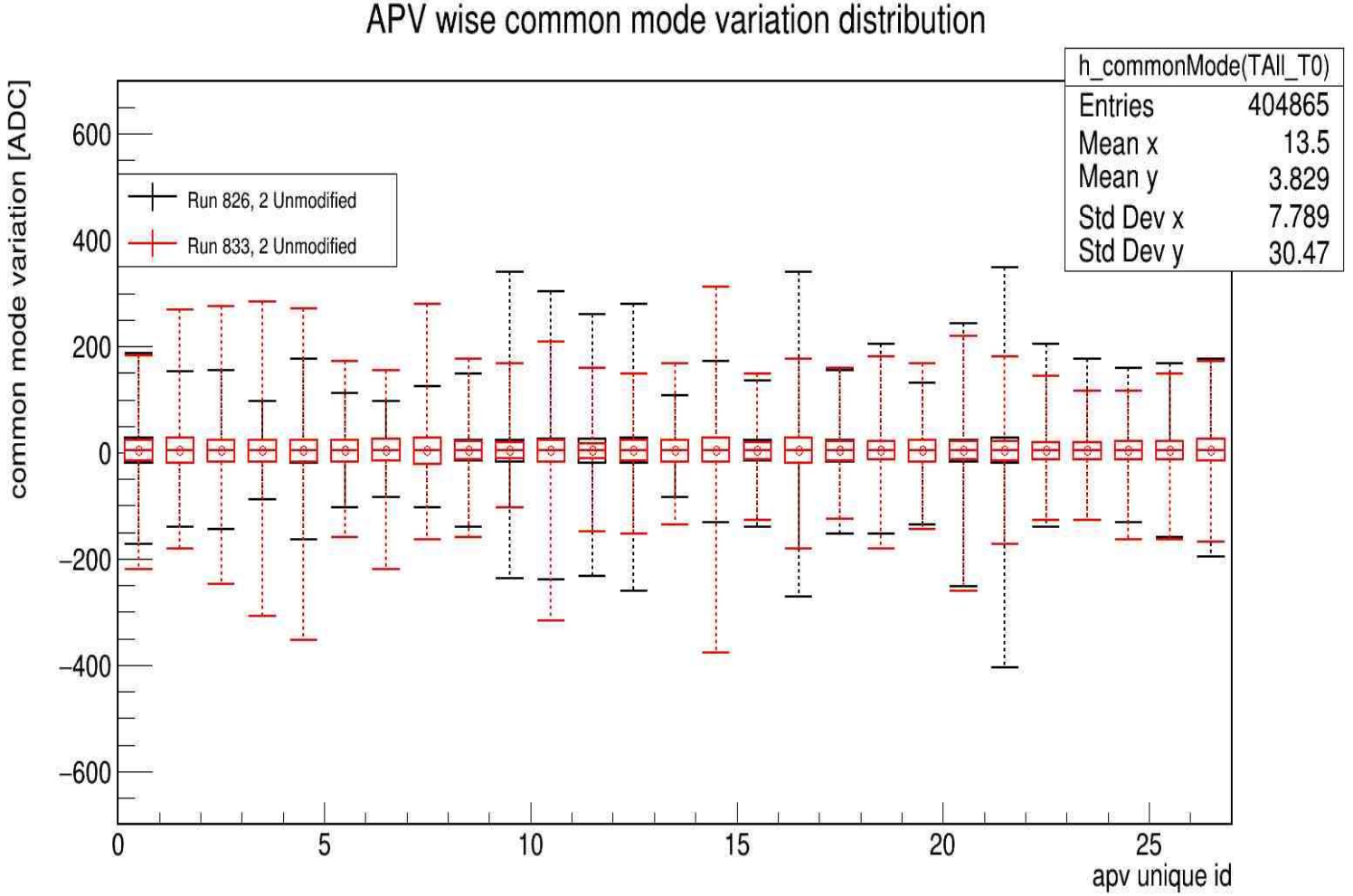

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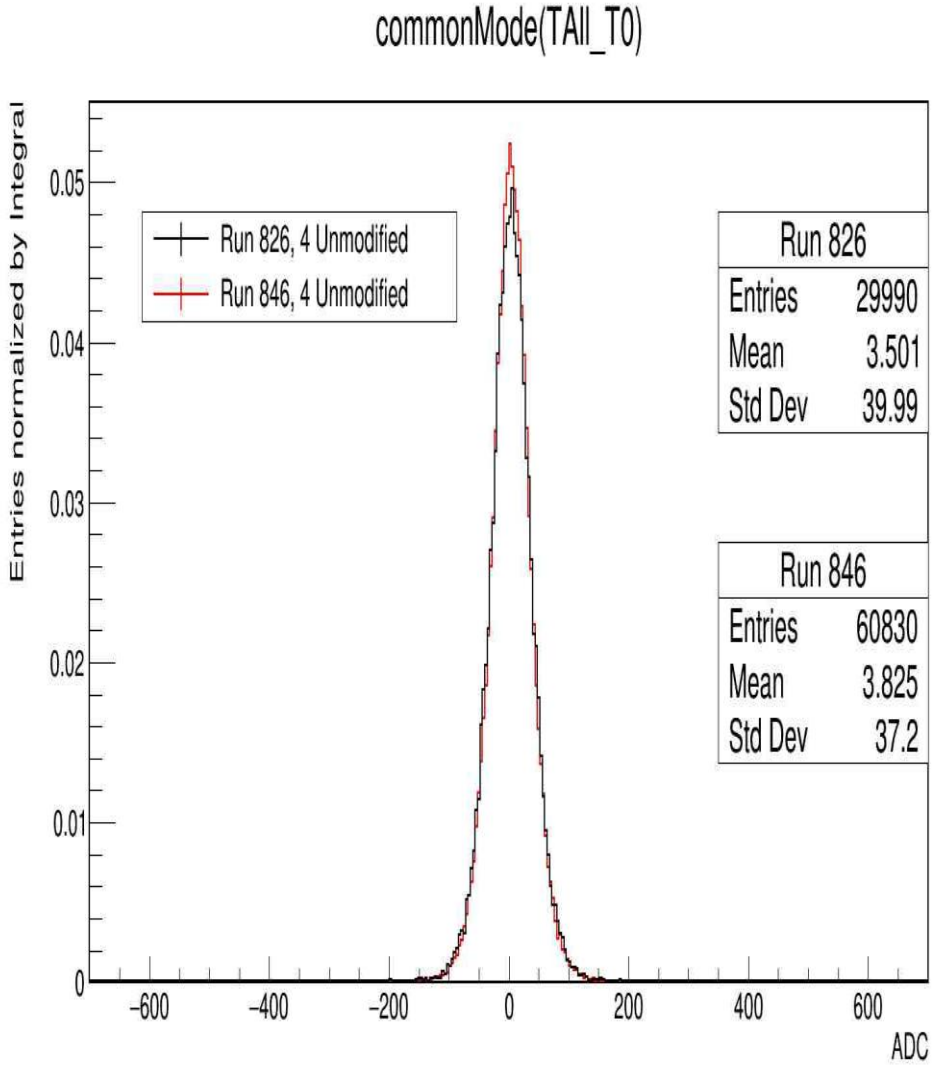

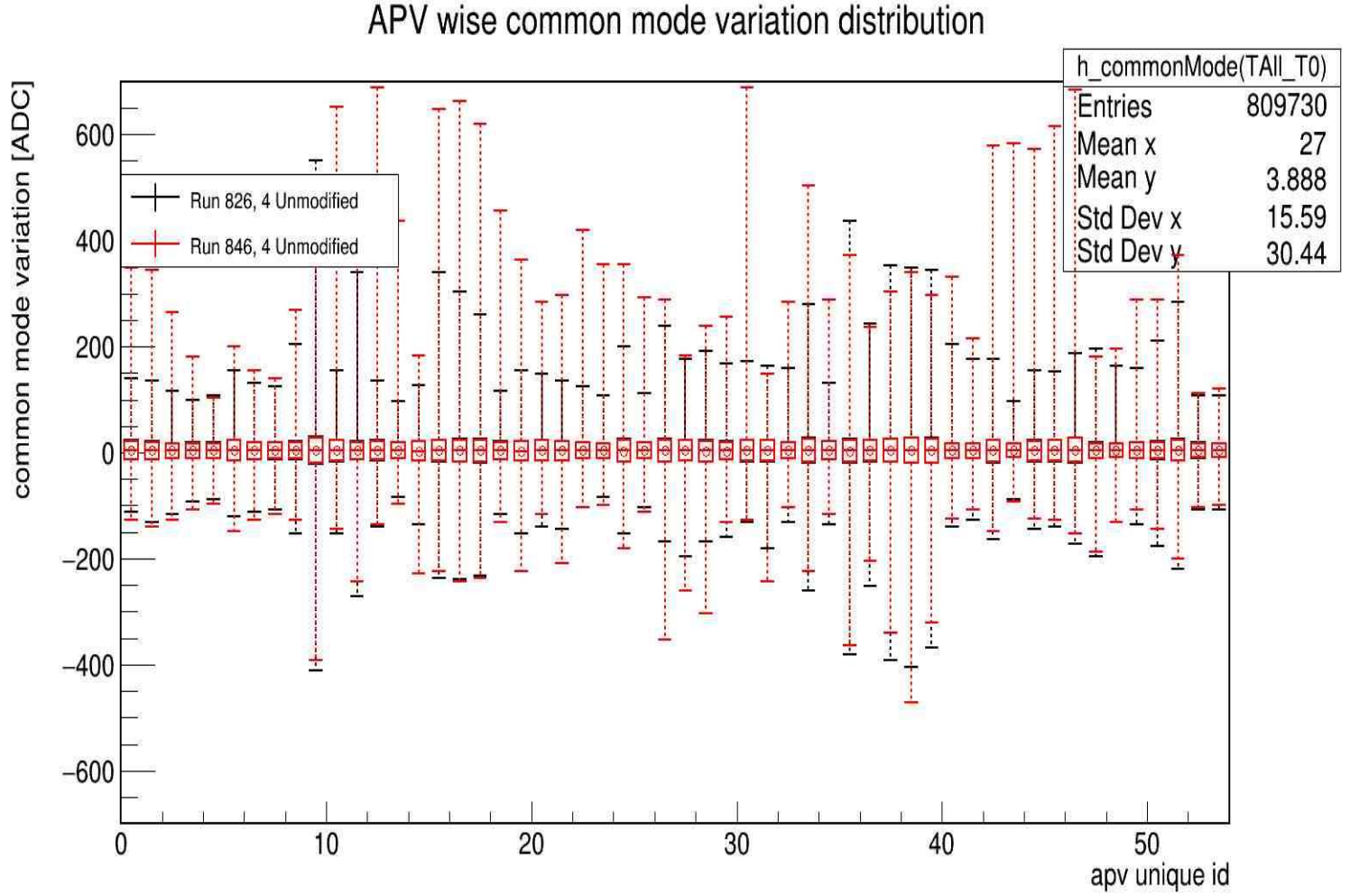

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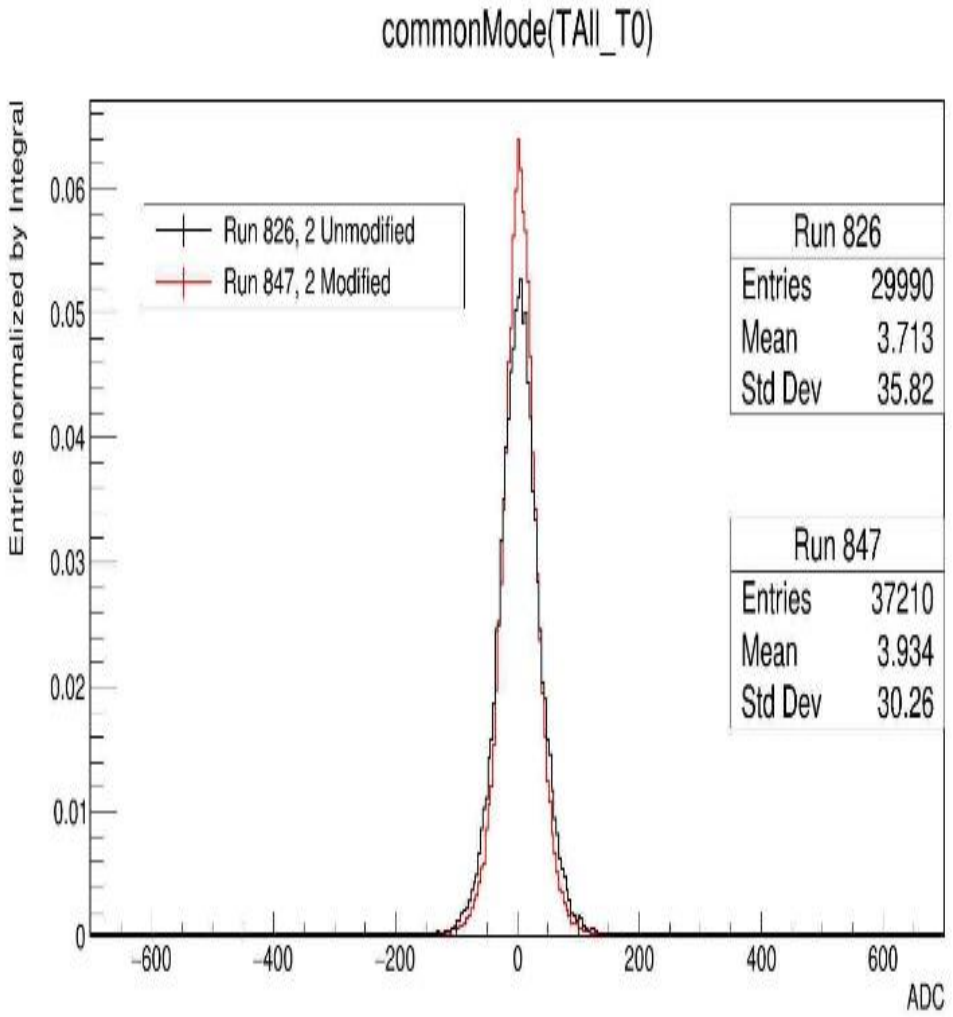

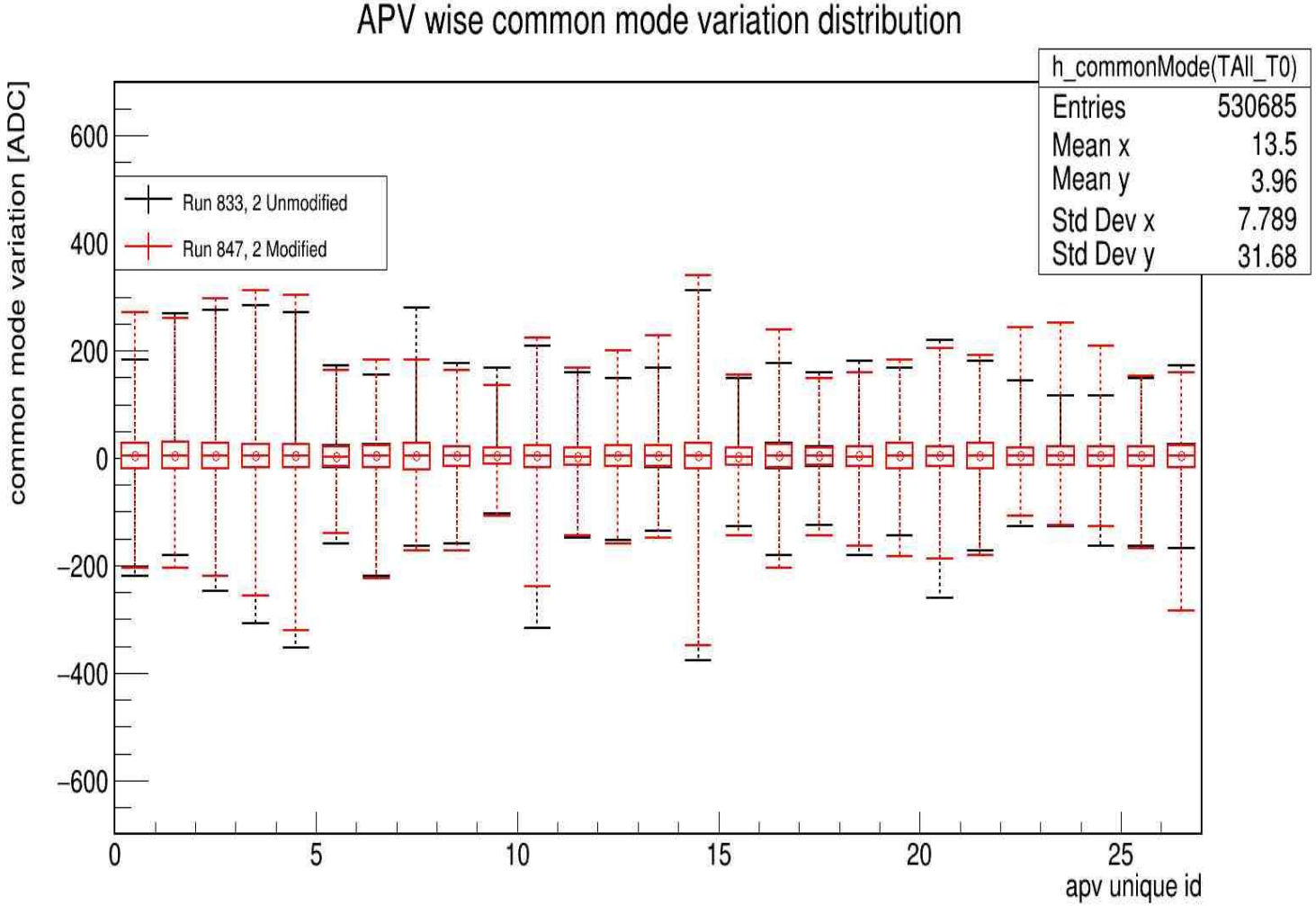

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