

Brief Update on ongoing HCAL Commissioning

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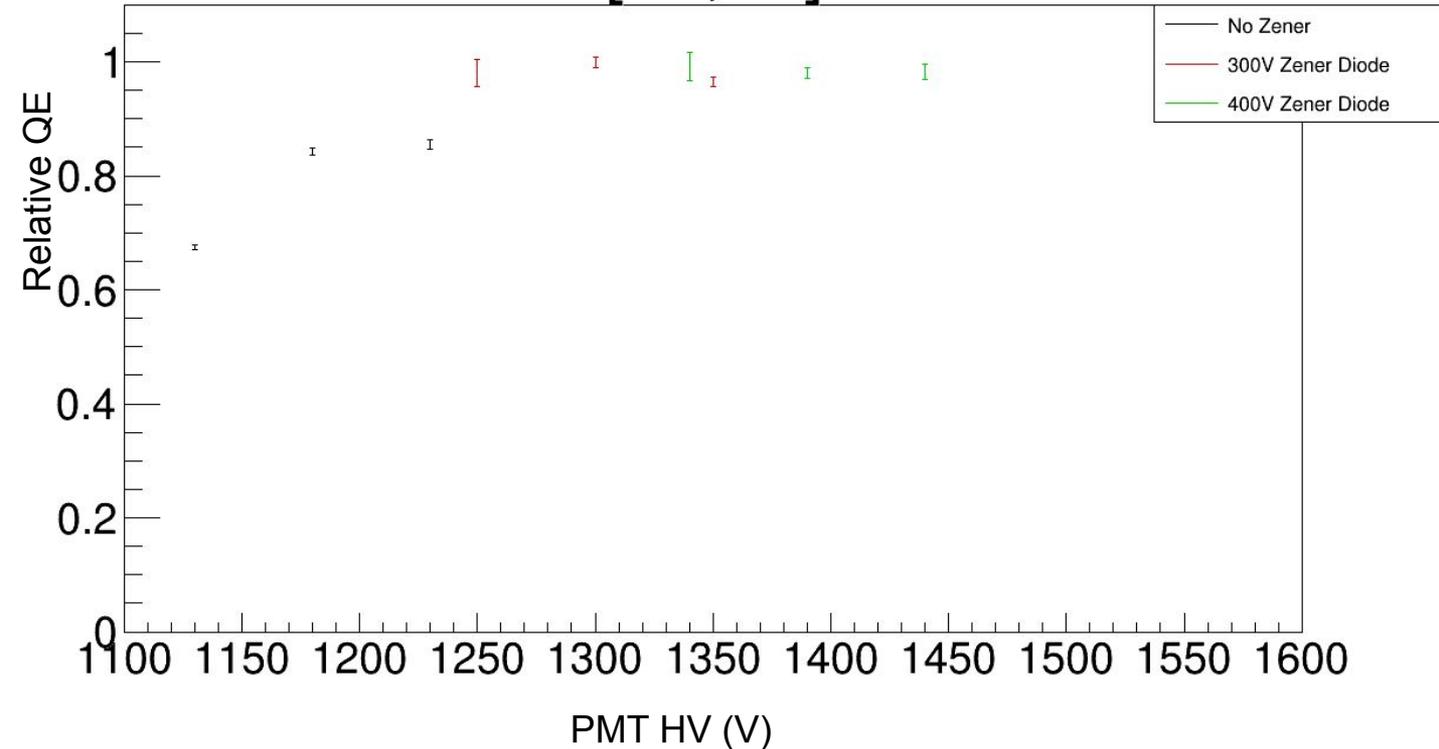
(with work from So Young, Alexis, Scott, Alex and
others)

Preparation of PMTs

- Two CMU undergrads (So Young and Alexis) are stationed at JLab for the summer and are preparing and re-testing the PMTs
 - Re-checking work I had previously done in Nov '18 to Jan '19, but this time using the front-end electronics that are now available and connected to half of the detector.
- Since now we have the amplifiers that we plan to use, we ran into saturation issues with the fADCs.
 - fADCs were set to 0.5 V full range, and now set to full range of 2V
 - Had to run PMTs at lower voltage
- Students performed a voltage scan and measured relative-QE (relative to one of the PMTs they used).
 - Voltage scans showed that the measured relative-QE changed by several percent if we changed the voltage by ± 50 V (would change more for larger changes)

Example using LED-5

[03,01]



LED5 is set to produce expected NPE @ ~8 GeV neutron/proton.

Tested 300 V and 400 V Zener diode → 300 V sufficient

Continuing Summer work

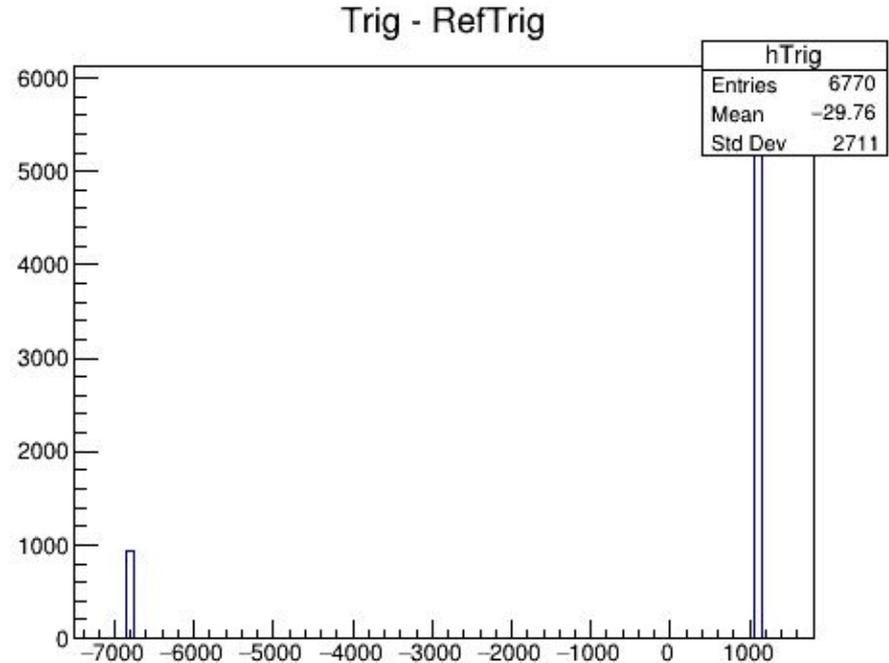
- Students will modify all 192 CMU PMT bases to add a 300 V zener diode
 - Diodes are already ordered and expected to arrive by Monday (at latest)
- They have tested all FADCs and identified 4 bad ones
 - Were given to Bill Gunning for repair → he says they may have a blown fuse and hopes to have them repaired by today.
 - We do not know what caused their failure, but we did have a crate overheat. Though, we are uncertain if they were all in that crate when it overheated.

DAQ Work during Summer

- Scott, Alex and myself worked on bringing in the F1TDCs online
- Had a few setbacks:
 - Don't have our second VXS crate and are using a borrowed VME64x crate
 - Had dead power supply → Alex found a spare power supply
 - Needed to revive CODA on second machine, but that also needed repair
- Finally, this Monday Scott and I were able to fully talk to the F1TDCs and decoded them properly
- We have very very preliminary tests using both LEDs and cosmics (more is ongoing)

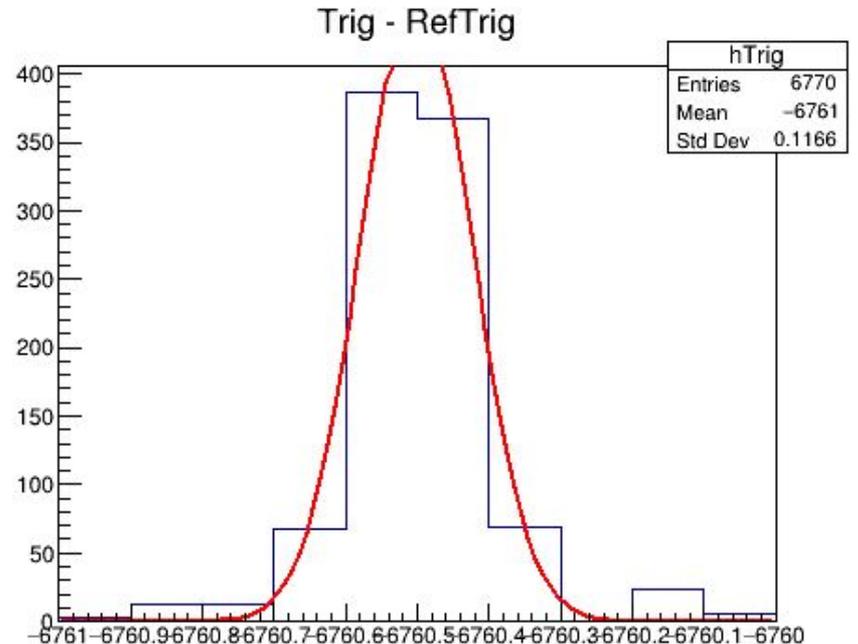
Very early tests with F1TDCs

- As a first test, sent two copies of the trigger to two different channels → plot their difference
- Strange 7.8 us separation between two peaks.
- Incidentally the full range of the TDC at 0.12 ns resolution is 7.8 us, so maybe this is expected behavior? Is there a constant I'm supposed to be subtracting?



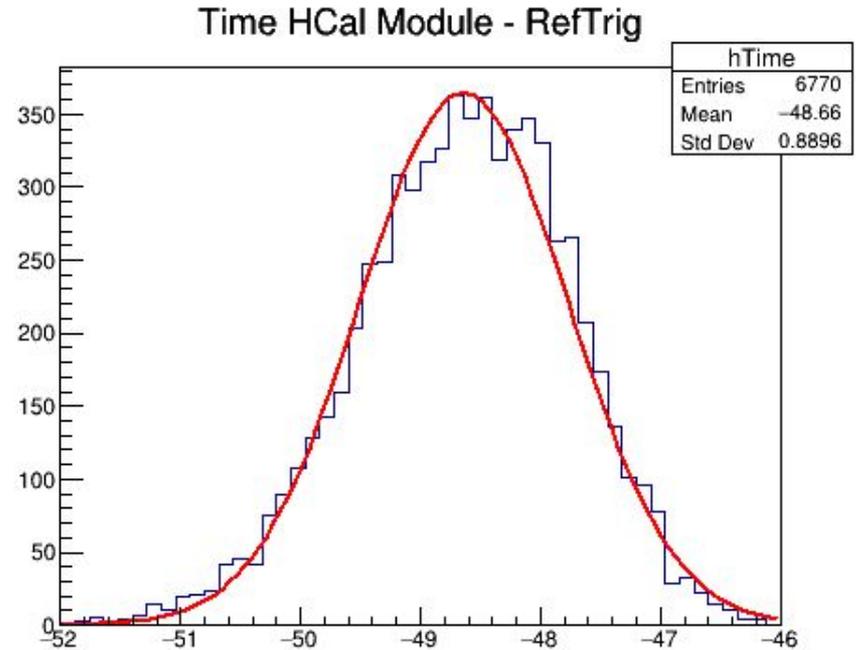
Very early tests with F1TDCs (with no cuts)

- If we zoom we see a width of only ~ 0.12 ns
- That's pretty much the resolution of the TDCs, so things are pretty consistent.



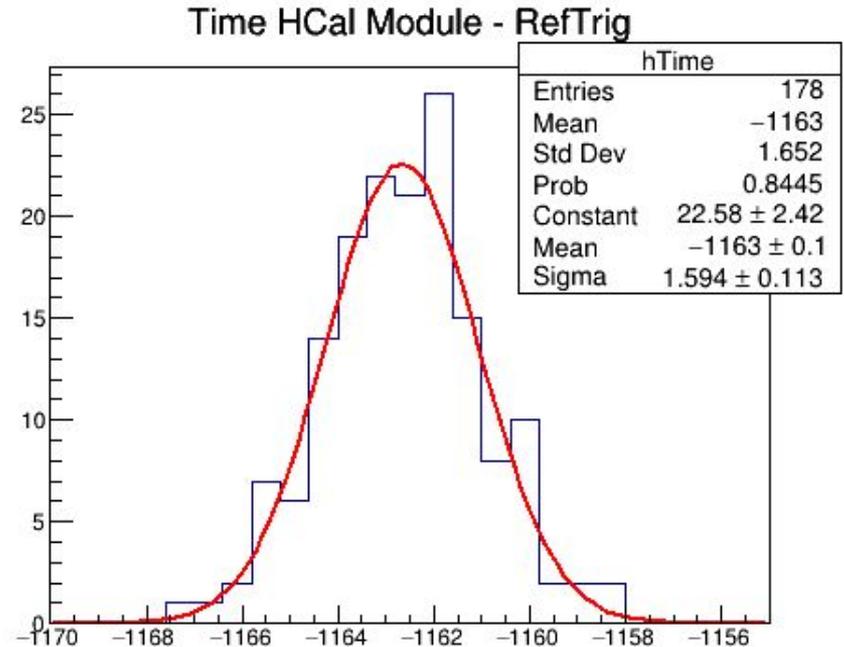
Very early tests with F1TDCs (with no cuts)

- Now measure LED time with respect to reference trigger (zoomed in on one of the two peaks)
- Doesn't look too bad \rightarrow 0.9 ns standard deviation (without subtracting off the 0.12 ns trig-resolution)



Very early tests with F1TDCs (with no cuts)

- Now with cosmics (zoomed in on one of the two peaks)
 - Coincidence between two modules is the trigger, and then look at the time of the module in between
- Overnight got only 178 cosmics so far
 - Get 1.6 ns width so far
- Will repeat, but this time use trigger scintillator and more modules to improve statistics.



VERY VERY VERY PRELIMINARY
(Data from this morning)

Continuing DAQ work

- Continue to perform cosmic tests with F1TDCs
 - Integrate fADC and TDC readout so that we can do a more realistic timing test
- Continuing work on the DAQ
 - Need to setup the “summer” trigger (where we use 4x4 clusters to build a trigger)
 - Maybe try to get the two crates to talk to each other (if possible)