Update on VD Coldbox DAPHNE Readout Tests

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DAQ Readout

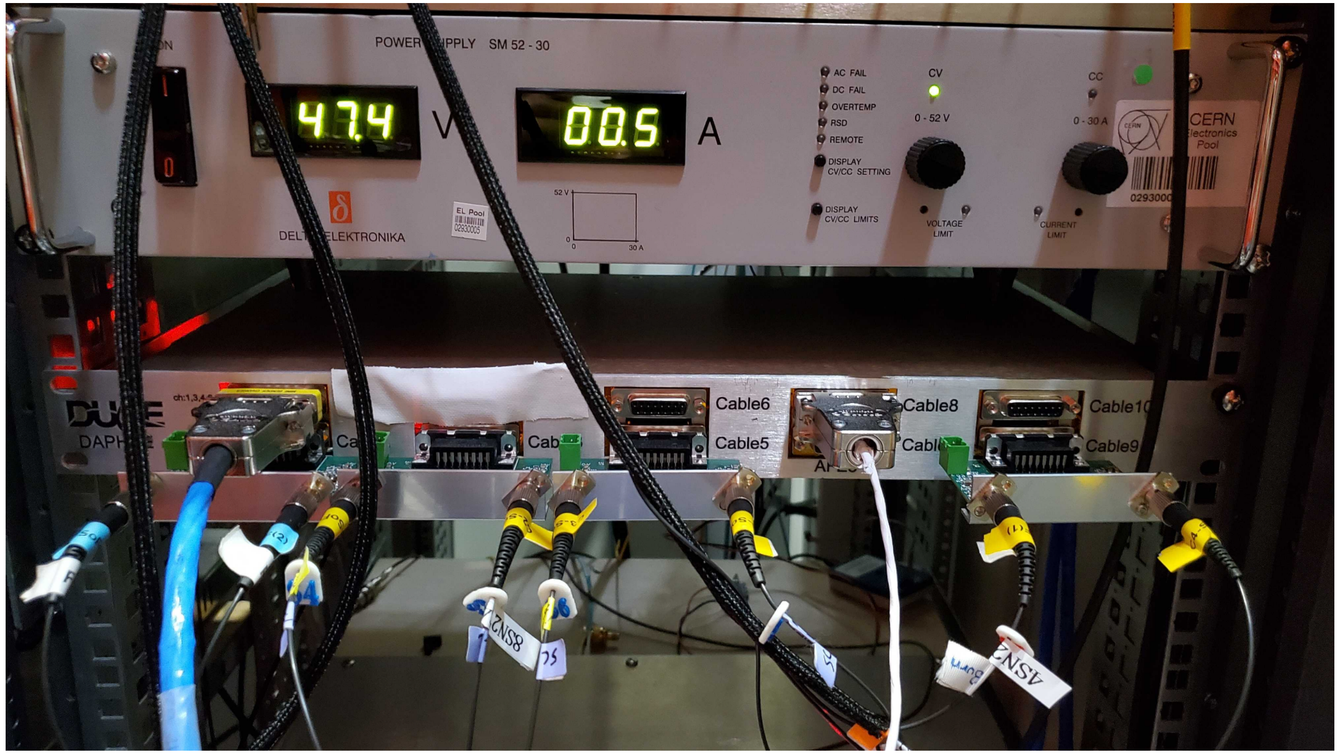
- We have started taking cosmics / PNS runs using the DAQ
  - Wes and Danaisis helping us with starting / stopping DAQ runs
  - April 15 we took a longish cosmics run with PDS and CRP (~6 hours). Though Laura Zambelli observed high noise in the PDS channels halfway through (subfile 141 and beyond) which persisted to the end of run. So only the first half is useful for analysis (CRP did not see the same high noise)
  - Long PNS runs with CRP+PDS during the day April 16, 17, 18. Also a few short runs done without PNS on, but still using the PNS trigger (useful for the analysis).
  - Plan to do long cosmic runs with PDS and CRP overnight (last night we were unable because of issues with CRP readout server)

DAPHNE Readout

- Due to unavailability of a second timing interface fiber (but also a few other issues) we were not able to run the two DAPHNEs with DAQ
  - Focus was put on trying to run the Milano DAPHNE with cathode and membrane in DAQ (which has been successful), different configurations tried (see analysis by Henrique).
  - Now we have a second timing interface fiber, so could try using the second DAPHNE. But on the DAQ side I understand that some work is needed to ensure a DAQ configuration that works with two DAPHNEs. I think on our side (DAPHNE) though we are ready.
  - PNS run ended today (Friday) around 2pm. Initial results from PDS and CRP already show in previous meetings, looking promising
  - But next week there will be time for us to do further calibration runs, so we may choose to pursue the second DAPHNE option which ***does not*** **require using the DAQ, so we can do calibration runs pretty easily with the two DAPHNEs.**

DAPHNE Configuration

- Analysis is on-going from calibration runs (presented by Henrique)
- Made a modification to the configuration to allow VD membrane to be on its own AFE. As it may be optimal to set the VGAIN on VD very low due to lower than expected gain in VD electronics
  - Moved VD to AFE3, HD to AFE0 (easier to move C4).
  - Analysis showed that VD membrane was giving very poor results in this configuration



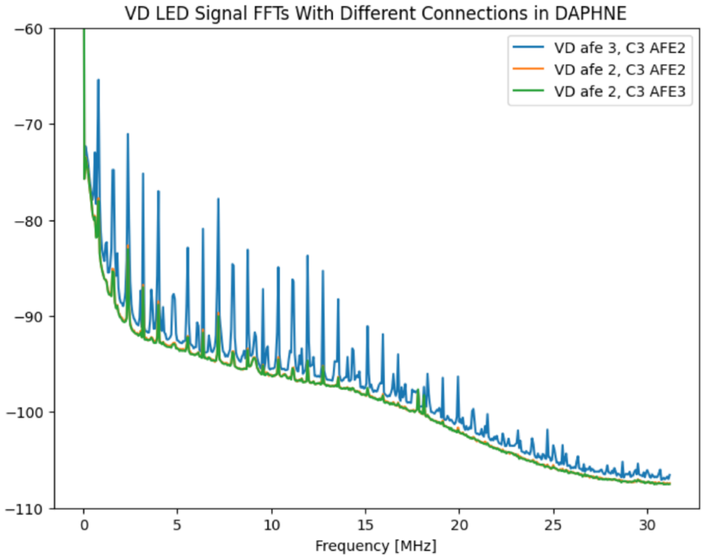
Run log spreadsheet, still being filled out

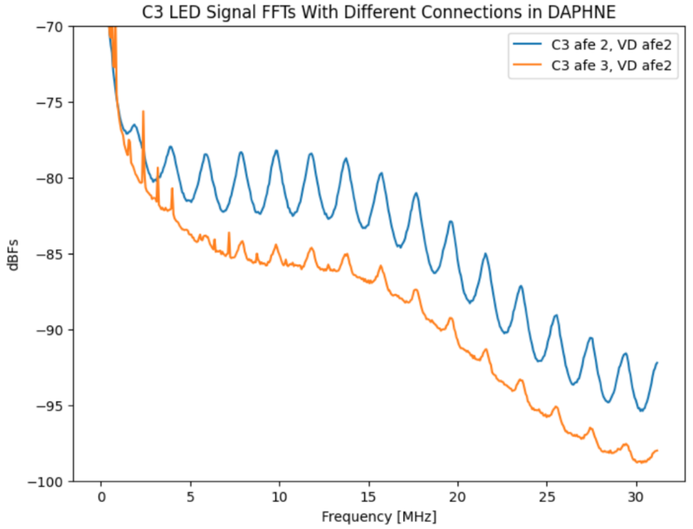
DAPHNE Configuration

- On the morning of April 18 we made a few modifications to the connections
  - Moved VD to AFE2, C3 to AFE3
  - FFTs showed the noise got better under these changes, so we decided to keep them (took some calibration data, results shown on the right).
  - The new configuration is better than the previous one with SNR
  - More data needed to assess impact on other channels

measured for VD:
@ AFE3: 0
@ AFE2: 3.42
@ AFE2, C3 @ AFE3: 3.66

But C3 is the following:
@ AFE2: 2.78 and 5.57
@ AFE3: 6.87 and 5.22





Plans for Next Week

- Coldbox will run until Thursday (can request longer)
- Henrique will arrive Monday, we will work on taking more calibration data and testing DAPHNE configurations
  - Of interest: Taking calibration data with the same DAPHNE configuration over several days, next week we will have the chance to do this.
  - CSU DAPHNE is available. Currently powered and setup alongside Milano DAPHNE (separate power supply). Can try moving membrane modules to CSU DAPHNE.
    - DAQ not required for calibration data. But a 2nd timing interface fiber is setup and connected to CSU DAPHNE. The timing interface is working.
    - This afternoon took some LED data with membrane connected to CSU DAPHNE. Analysis in progress.
- Should we request the run be extended to Friday? (or beyond?)

Decoding hdf5 data

- Use a python script based on https://github.com/DUNE/PDS to decode the DAPHNE hdf5 files produced by the DAQ and save into an easy to analyze format (still needs to be optimized for speed a bit, but takes 5-10 minutes to convert a file)
- Can find some decoded data in the form of .npz files on lxplus: /eos/experiment/neutplatform/protodune/experiments/ColdBoxVD/April2024run/PNS_PDS_data_decoded
  - Each channel saved to its own file. May explore different file formats (e.g. ROOT)

Runs with DAQ

15/04/2024	25004	Cosmics run with CRP+PDS (runs after subfile 141 too noisy)
16/04/2024	25032/ 25033	PNS off for these runs ... may be data here without neutrons useful for comparison to when PNS is on
16/04/2024	25034	PNS on
16/04/2024	25035	PNS off
16/04/2024	25036	PNS back on, long run
17/04/2024	25049	Short run of cosmics CRP+PDS to test readout server, no PNS. 100mHz trigger. PNS was on for last 5-10
17/04/2024	25050	PNS run started CRP+PDS. Ended ~5pm
17/04/2024	25066	Cosmics run CRP+PDS (to run overnight)
18/04/2024	25068/25071	PNS run CRP+PDS
18-19/04/2024	25074/25078	Cosmics runs CRP+PDS
19/04/2024	25079	~3min run with DAPHNE only using PNS trigger, no neutrons
19/04/2024	25080	~2 hr PNS run with DAPHNE only at 40Hz rate

Last Thoughts

- Next week we will have the chance to take much more calibration data
- I look some LED data with CSU and Milano DAPHNE today, i.e. moving membrane modules to CSU DAPHNE. Also taking data after each small change, to assess impacts of each effect
- Do we want to take data with CRP over the weekend?
  Are we okay with the lasers being on that long? (We have done a few overnight runs and things seem OK)