Cold Box Status Report

Dec 13th 2024

Dante Totani - UCSB for the PDS team @ CERN

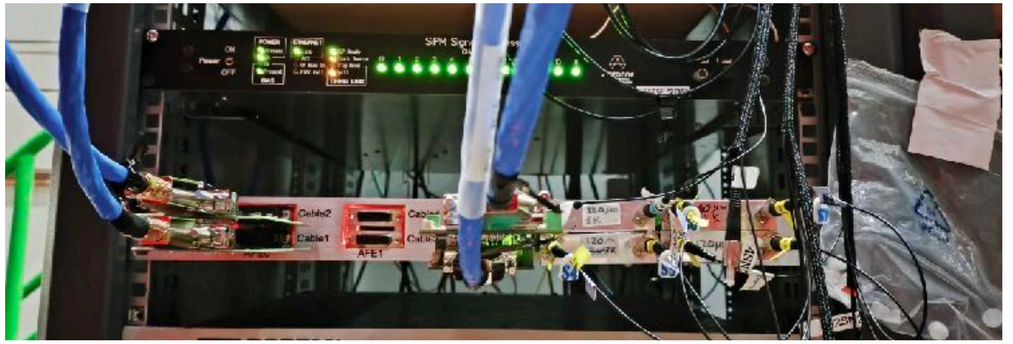
General Updates NP02/Cold Box

- NP02 Liquid transfer was completed yesterday (Thursday)

- The cold box condenser was turned off this morning
- All the LN2 has been diverted to the "NP04 to NP02 recondensation line"
- LN2 in the ColdBox condenser completely evaporated by 11:20 am this morning (Friday)
- The LAr level in the Cold Box started to slowly decrease
  - the cold box condition should remain acceptable for the missing tests for the next 3-4 days
  - the cathode modules should not be affected for ~7 days
- Monday we should know better the LAr level decrease rate

Data taking

- All the modules are read through a Daphne integrated into the DAQ
- An SSP is used to drive the calibration LED system
- Remote acquisition is ongoing (see data-taking plan)



Initial runs were also taken stand-alone using:

- Oscilloscope (mainly for WF's screenshot) + external LED driver
- CAEN + external LED driver
- stand-alone Daphne (spy-buffer + laptop) + external LED driver

There are folders in CERN Box for: CAEN, Daphne_StandAlone, Daphne_DAQ, TestStand

For detailed info about run, setup, etc. see:

https://docs.google.com/spreadsheets/d/1N9xcb2VVlzzDcNfBjlj_buhH9LiBTdG8-cnisb-orsI/edit?gid=1080269640#gid=1080269640

All data are in:

https://cernbox.cern.ch/files/spaces/eos/experiment/neutplatform/protodune/experiments/ColdBoxVD/December2024run?items-per-page=100&view-mode=resource-table-condensed&tiles-size=1&sort-by=name&sort-dir=desc

An example of run info in the spreadsheet:

https://docs.google.com/spreadsheets/d/1N9xcb2VVlzzDcNfBjlj_buhH9LiBTdG8-cnisb-orsI/edit?gid=1080269640#gid=1080269640

Membrane modules Fine Bias scan, single VGAIN

	Single VGAIN= 1000				
	LED 1160, best for M2	LED 1250, best for M3	LED 1200, best for M4	LED 1175, best for M1	LED 1750, large LED
Bias	RUN	RUN	RUN	RUN	RUN
[1210, 828]	34354	34342	34330	34379 - 34391	34367
[1203, 821]	34355	34343	34331	34380 - 34392	34368
[1196, 814]	34356	34344	34332	34381 - 34393	34369
[1189, 807]	34357	34345	34333	34382 - 34394	34370
[1182, 800]	34358	34346	34334	34383 - 34395	34371
[1175, 793]	34359	34347	34335	34384 - 34397	34372
[1168, 786]	34360	34348	34336	34385 - 34398	34373
[1161, 779]	34361	34349	34337	34386 - 34399	34374
[1154, 772]	34362	34350	34338	34387 - 34400	34375
[1147, 765]	34363	34351	34339	34388 - 34401	34376
[1140, 758]	34364	34352	34340	34389 - 34402	34377
[1133, 751]	34365	34353	34341	34403	34378

Good SPE level LED intensity				
Module	CH	MASK	Pulse width	LED intensity
M1	20-27	1	5 ticks	1175
M2	21-26	1	5 ticks	1160
M3	0-2	1	5 ticks	1250
M4	1-3	1	5 ticks	1200

BIAS [ADC]		BIAS [V]	
M1-M2	M3-M4	M1-M2	M3-M4
1210	828		
1203	821		
1196	814		
1189	807		
1182	800		
1175	793		
1168	786		
1161	779		
1154	772		
1147	765		
1140	758		
1133	751		

Data taking completed

CAEN data for all modules (SoF modules with Koheron):

- to be used as a reference for electronics performance wrt performance with Daphne
- SPE, (2-3 values of low LED to tune at the SPE level)
- Bias scan of membrane modules

Daphne Stand Alone (channels check):

- Medium-light for all modules, checking all Daphne channels work. VGAIN=1000. A lot of cosmetics and bkg light.
- Take cathode data with membrane warm stage on/off/disconnected

Daphne + SSP: DAQ:

(both HD-style and 1x VD-style have AFE compensators for all the data - M2 separate board, M3 and M4 incorporated in the warm stage)

- LED scan around SPE level illumination (~8 settings, at Vgain =1000)
- noise runs: data of noise with hd and vd, with PoF on (bias below breakdown on SiPMs)
- saturation events (huge LED at high VGAIN for CE saturation study/dynamic range. CE saturates before daphne)
- Vgain scan at SPE level for all membrane and cathode modules
- Vgain and BIAS scan at SPE level for all membrane modules
- LED scan from SPE level to saturation for linearity /dynamic range
- cathode measurement of SNR/SPE amplitude in the same conditions as the first data that was taken for "stability" check (ongoing)

Planned / Missing

Possible run during the week-end

- remote data taking, testing trigger primitives (Esteban) during the weekend?
- cosmics?

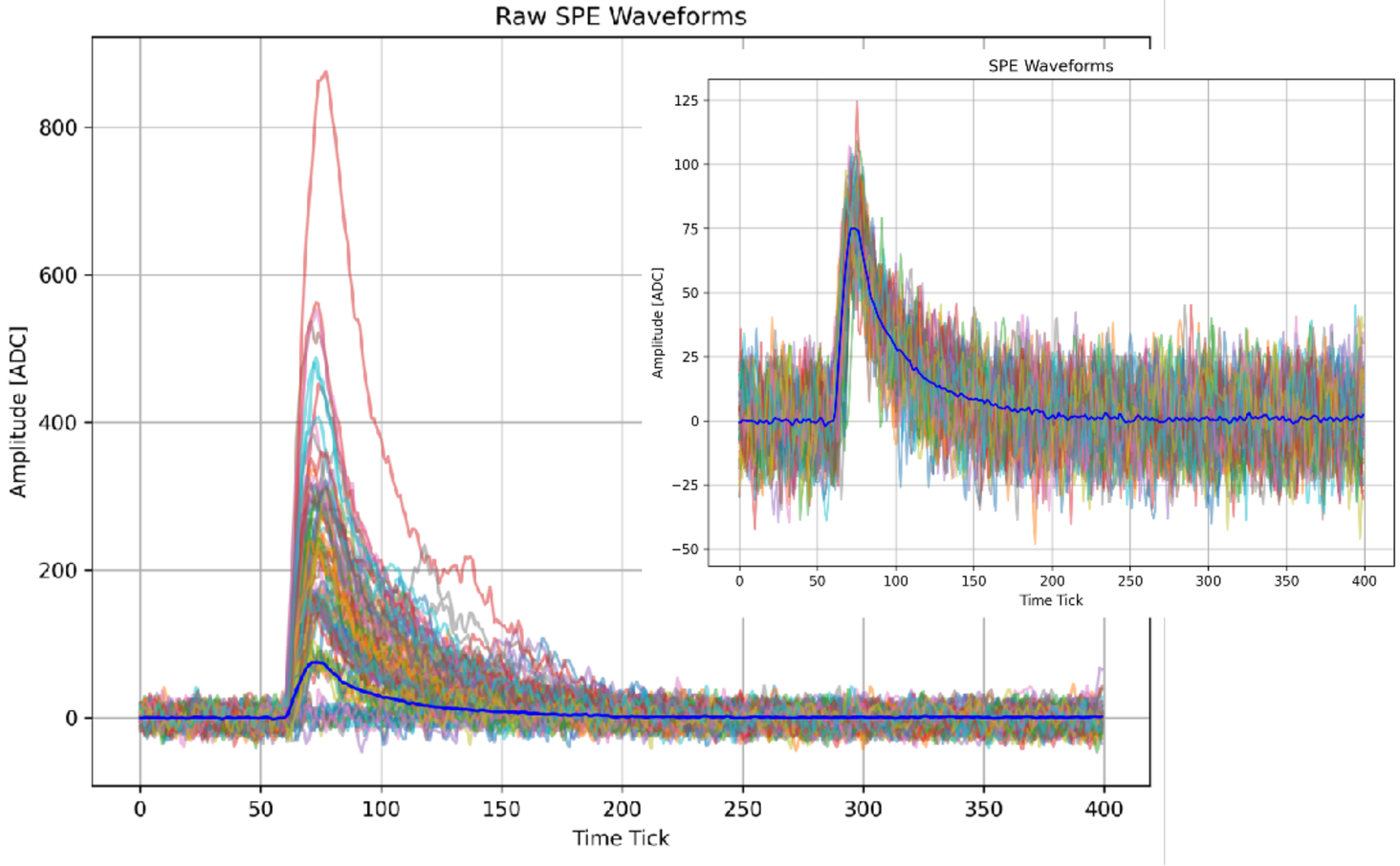
Missing, requiring Cold Box access:

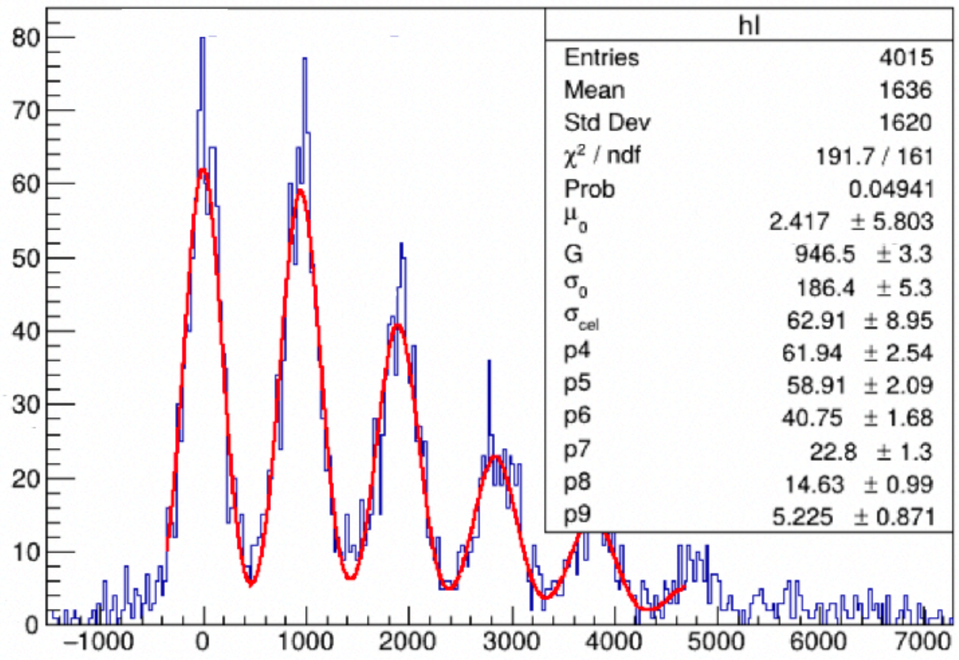
- cathode module with compensator
- noise run with pof off for the membrane modules
- check differences between receivers (same module, switch receivers (Daphne.. which VGAINI? -> 1000)
- check the effect of x-talk on Daphne in the SNR: take membrane data with SoF receivers off/disconnected.
- SoF cold electronics dynamic range with LED

- Monday we should have access to the Cold Box, almost all the missing tests will need the PoF.
- The LAr level decrease should not affect those tests.
- Not enough time to complete all of them

Snaps of preliminary analysis

See Federico slides/talk for last updates





Plot form Federico and Dante