

IoLS Updates

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CALCI Consortium Meeting

October 24th, 2024



Schedule updates

- Week of Nov. 11 will be the installation of PMTs (and PINdiode module)
 - All materials @CERN
- Week of Nov. 18 will be the laser feedthrough and periscope installation followed by the cryostat purge
 - All materials expected to arrive in the next couple of days
- Week of Nov. 25 will be the start of the liquid transfer from NP04 to NP02

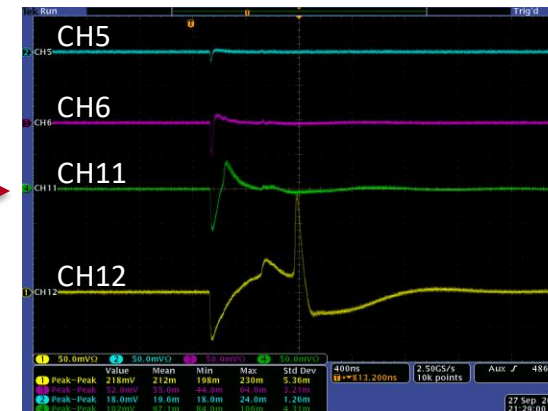
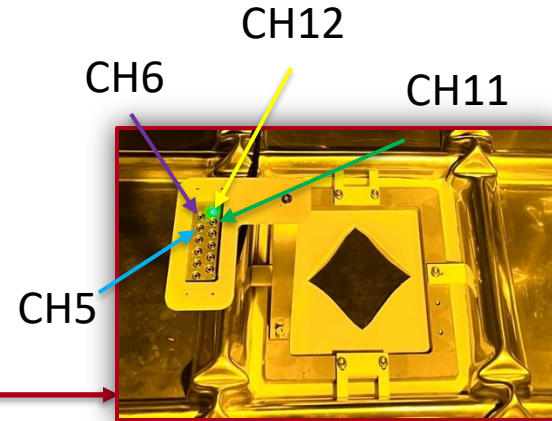
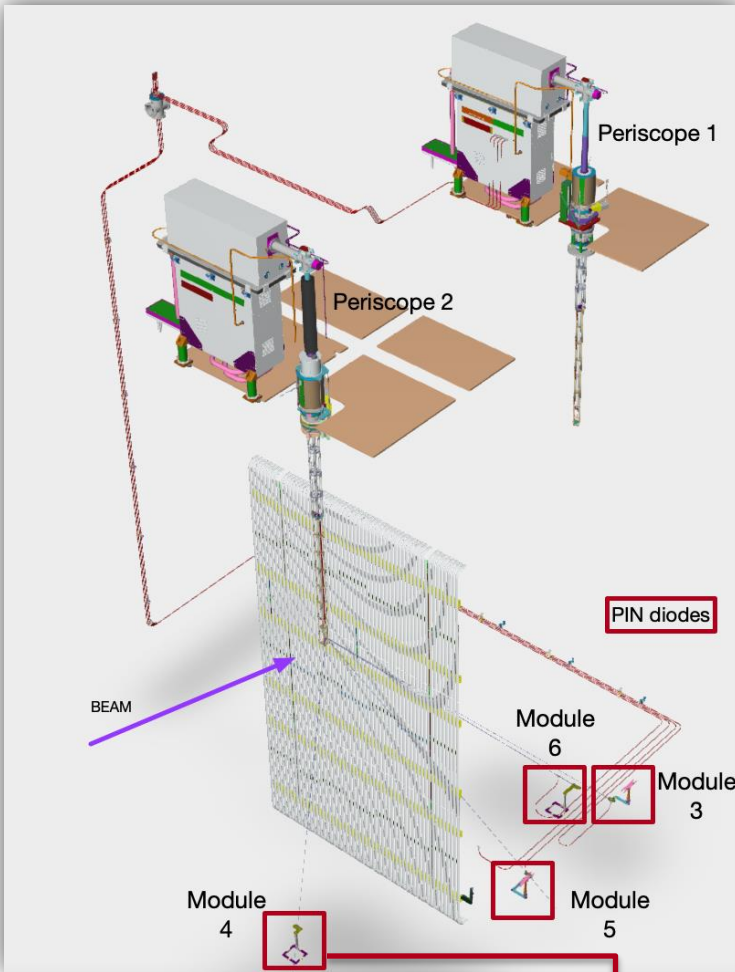
Laser Periscope 2 (P2) Updates

#	Server	Node Id	Display Name
1	open62541...	NS2[String]LS1.PM1.average_options	average_options
2	open62541...	NS2[String]LS1.PM1.average_options	average_options
3	open62541...	NS2[String]LS1.PM1.average_reading	average_reading
4	open62541...	NS2[String]LS1.PM1.average_window	average_window
5	open62541...	NS2[String]LS1.PM1.baud_rate	baud_rate
6	open62541...	NS2[String]LS1.PM1.id	id
7	open62541...	NS2[String]LS1.PM1.measurement_mode	measurement_mode
8	open62541...	NS2[String]LS1.PM1.measurement_options	measurement_options
9	open62541...	NS2[String]LS1.PM1.port	port
10	open62541...	NS2[String]LS1.PM1.pulse_length_options	pulse_length_options
11	open62541...	NS2[String]LS1.PM1.pulse_width	pulse_width
12	open62541...	NS2[String]LS1.PM1.range_options	range_options
13	open62541...	NS2[String]LS1.PM1.range_selected	range_selected
14	open62541...	NS2[String]LS1.PM1.serial_number	serial_number
15	open62541...	NS2[String]LS1.PM1.state	state
16	open62541...	NS2[String]LS1.PM1.trigger_threshold	trigger_threshold
17	open62541...	NS2[String]LS1.PM1.wavelength	wavelength
18	open62541...	NS2[String]LS1.A1.acceleration	acceleration
19	open62541...	NS2[String]LS1.A1.baud_rate	baud_rate
20	open62541...	NS2[String]LS1.A1.deceleration	deceleration
21	open62541...	NS2[String]LS1.A1.device_port	device_port
22	open62541...	NS2[String]LS1.A1.id	id
23	open62541...	NS2[String]LS1.A1.idle_current_setting	idle_current_setting
24	open62541...	NS2[String]LS1.A1.max_speed	max_speed
25	open62541...	NS2[String]LS1.A1.motor_state_options	motor_state_options
26	open62541...	NS2[String]LS1.A1.moving_current_setting	moving_current_setting
27	open62541...	NS2[String]LS1.A1.offset	offset
28	open62541...	NS2[String]LS1.A1.resolution_options	resolution_options
29	open62541...	NS2[String]LS1.A1.resolution_setting	resolution_setting
30	open62541...	NS2[String]LS1.A1.serial_number	serial_number
31	open62541...	NS2[String]LS1.A1.state	state
32	open62541...	NS2[String]LS1.A1.transmission	transmission
33	open62541...	NS2[String]LS1.A1.position	position

Major progress in commissioning activities for the Ionization Laser System:

- EndWall periscope design working stably
- Successfully aimed and hit PIN diodes channels using Class IV UV laser
- Calibration Interface Board (CIB) successfully used to trigger on laser shots → DAQ readout for P2 events
- Slow Controls (SC) integration of the Laser Systems progressing and nearly complete

Laser system SC parameters



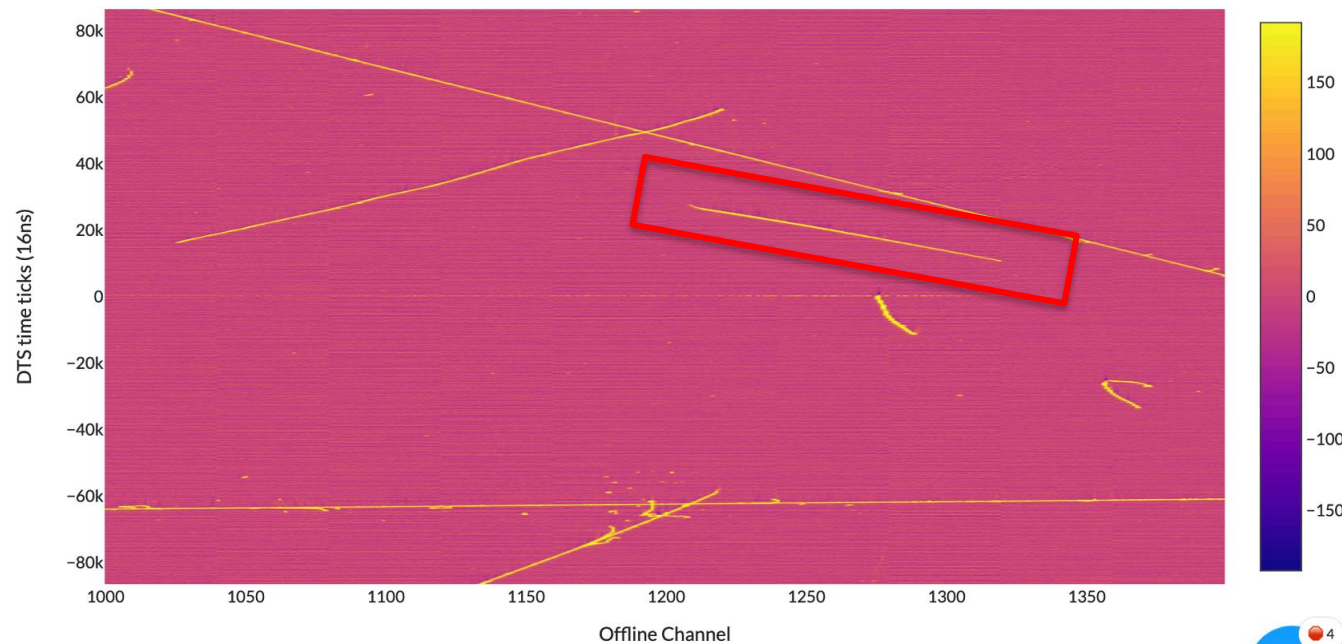
PIN diode CH12 and nearest neighbor response to UV in LAr from a direct hit to CH12

First Confirmed P2 Laser track events

ADC Counts: V-plane

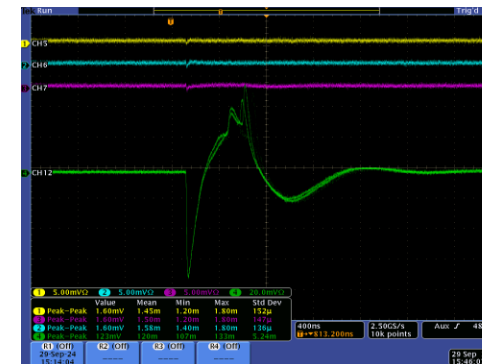
Run 29390 Trigger 1120, APA1

Powered by DUNE-DAQ



Event display for events triggered by P2 while aimed at PIN diode Module 5, CH12.

- P2 aimed at PIN diode Module 5, CH12
- Module is mounted onto bottom-end of the APA1 frame and sits beneath the field cage
 - Two field cage gaps must be crossed to hit
- Energy ramped up from 100 μJ \rightarrow 14 mJ
- Laser track entering the field cage and exiting the field cage captured in run 29390



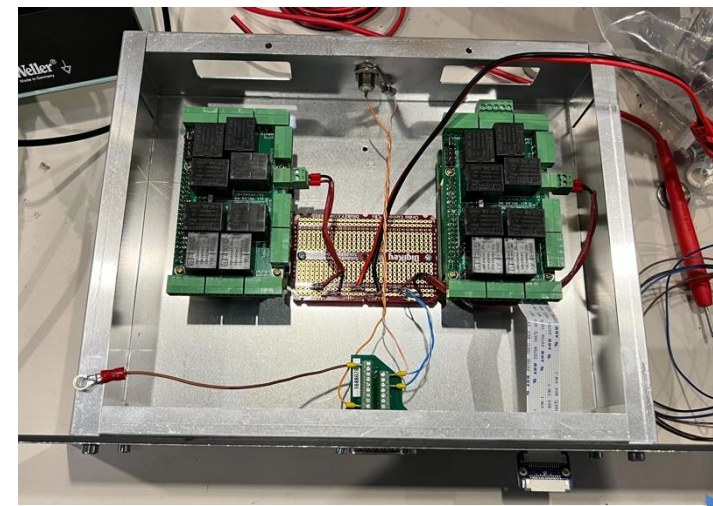
Response from PIN diode CH12 (green) to 100 μJ of UV



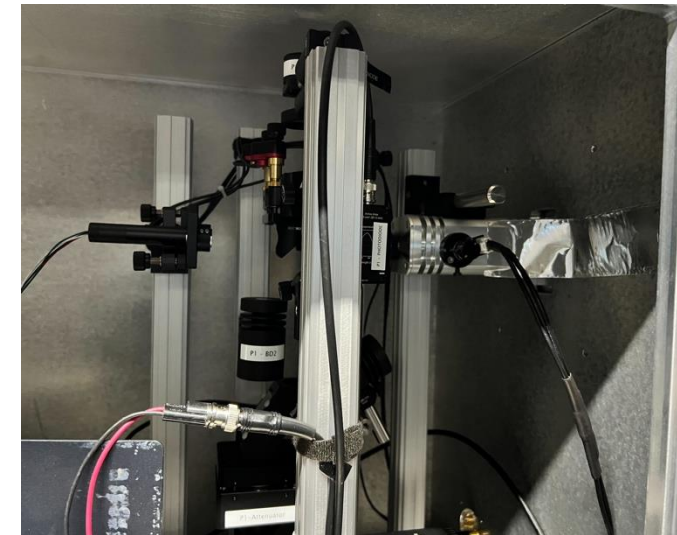
Response from PIN diode CH12 (green) to 14 mJ of UV

Shutter integration

- Shutter aligned for P1 & P2
 - Interface w/ CIB re-tested
- Completed the circuit for the optical switch on the linear stages
- CIB has a 50 Ohm termination at the input from the optical switch (needs to be removed or a buffer needs to be added)
 - Optical switch signal can be seen on the scope (High Z) and the (5V) transitions can be measured

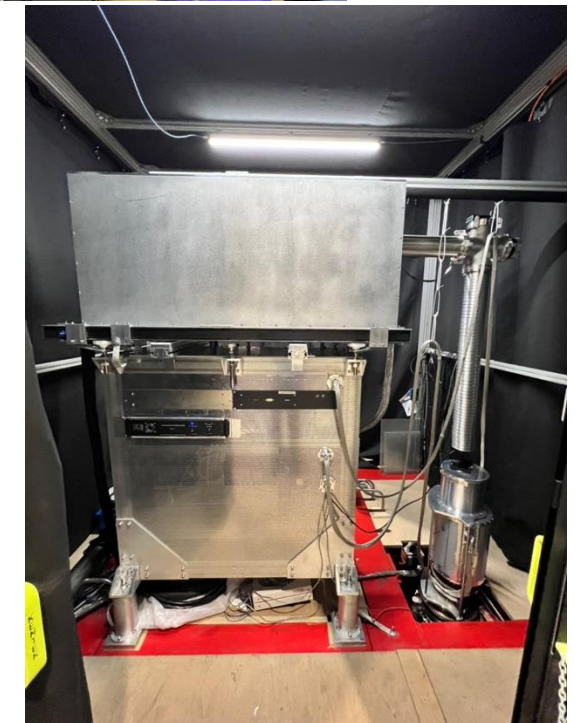
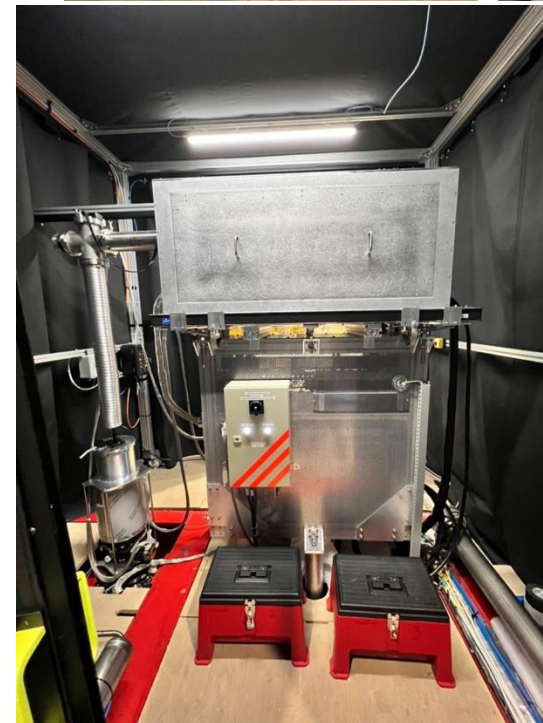
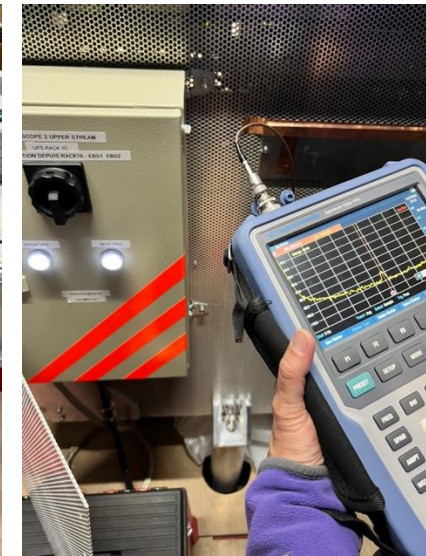
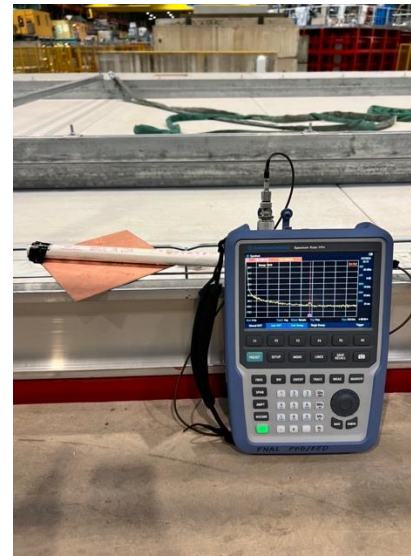


DB15 w/ optical switch sig
and limit switches



Electrical review

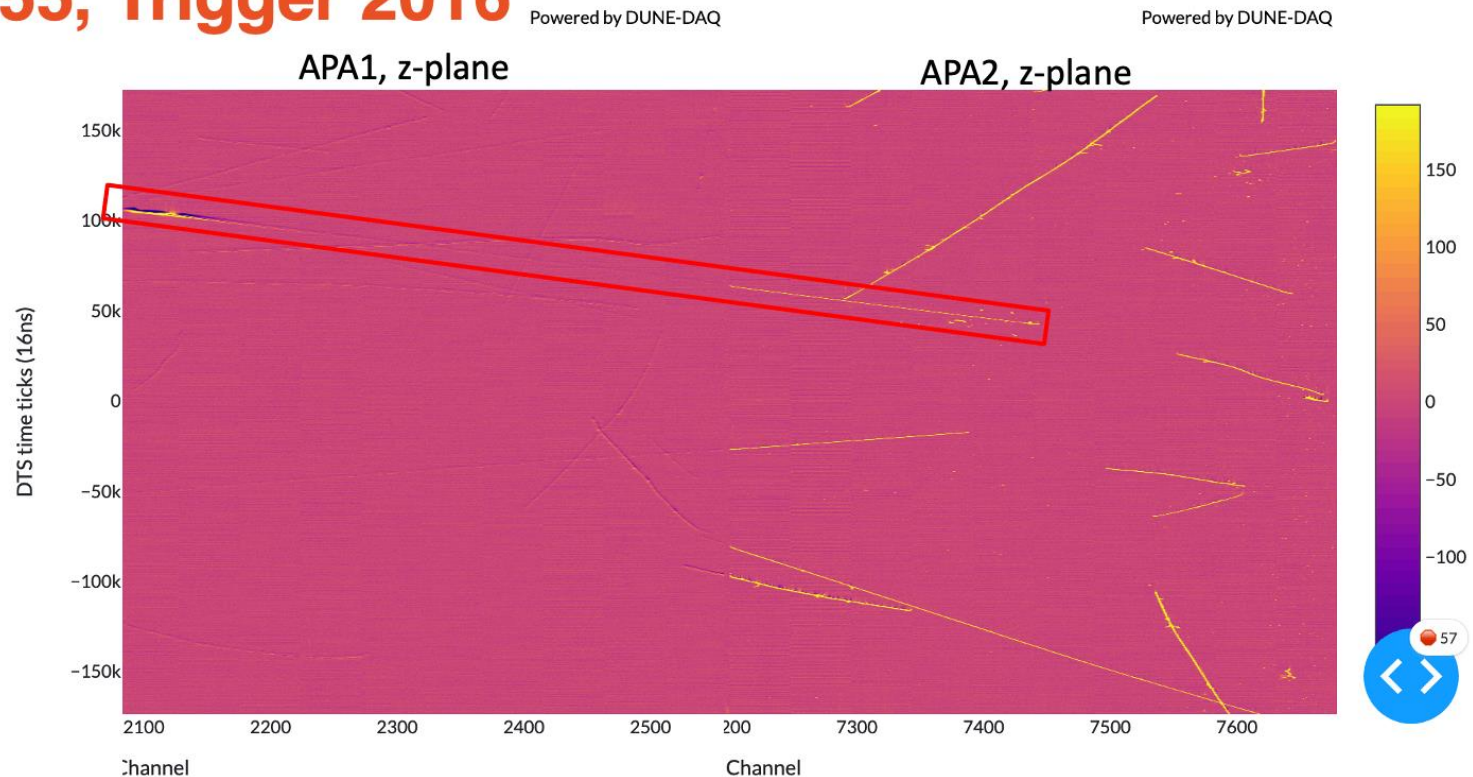
- Second grounding review by Terri & Linda in late September
 - No noticeable change in the noise found while searching w/ antenna and spectrum analyzer
 - (Not even with the fans running at full blast!)
 - Redid some of the grounding to lower the impedances and cleaned up existing grounding using wide, Aluminum tape



P1 Upstream-Going Tracks

- P1 aimed towards upstream end of NP04
- ~25 degrees w.r.t. APA

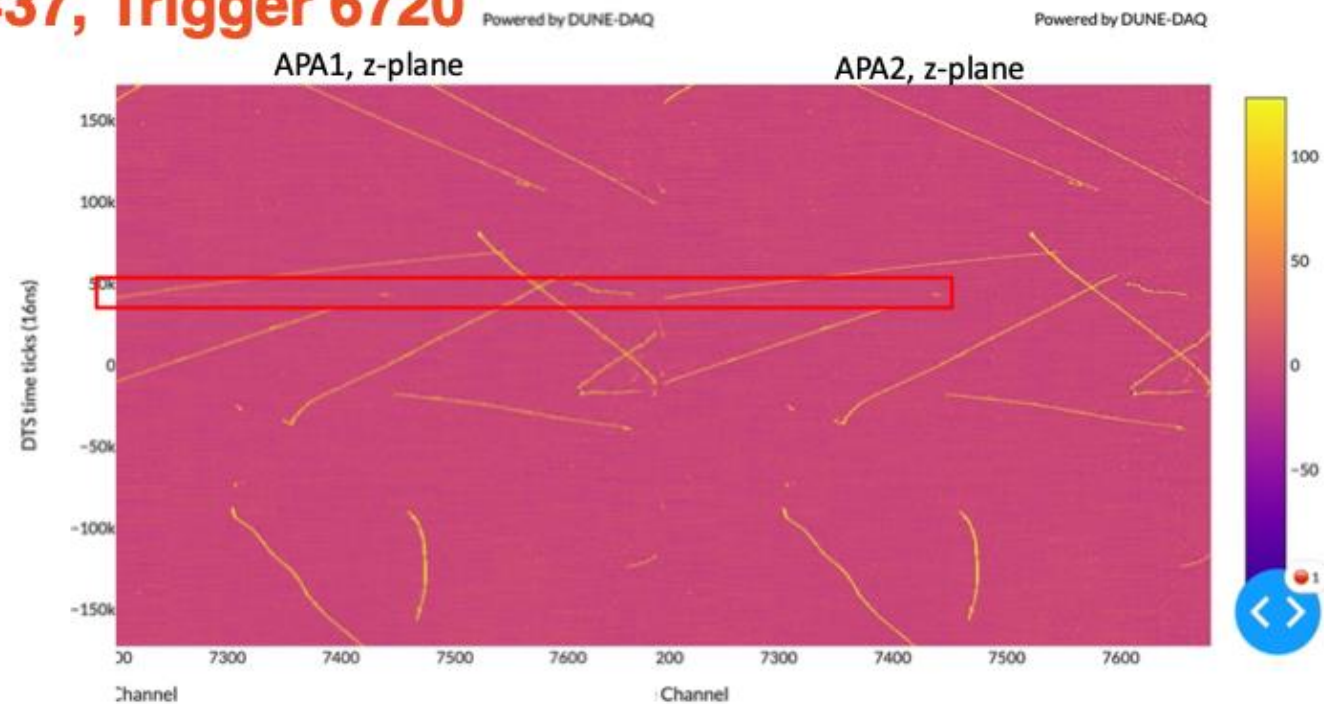
Run31355, Trigger 2016



P1-Parallel APA tracks (Oct. 23)

- Parallel tracks easy w/ P1
 - Rotated 25 degrees in opposite direction from previous run

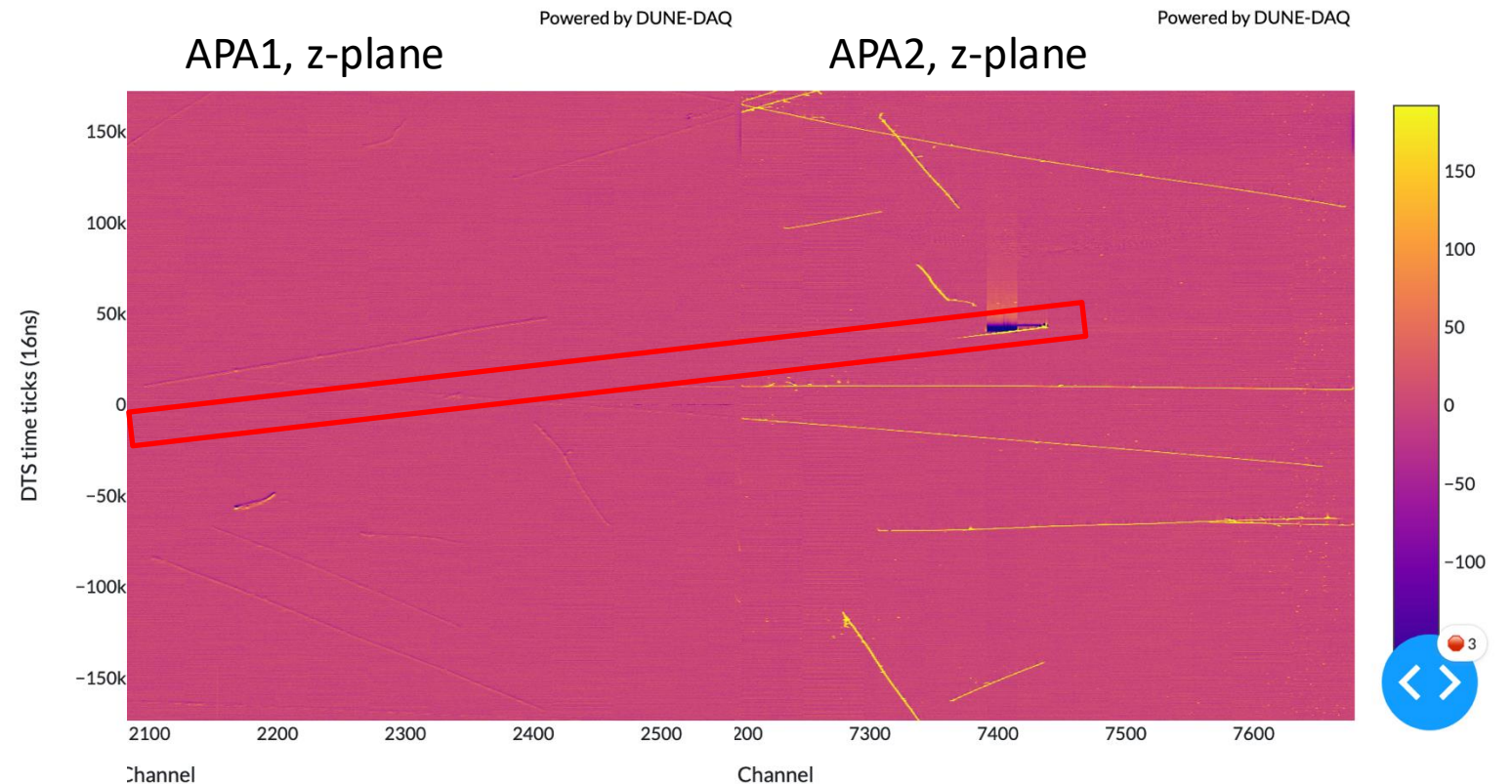
Run31437, Trigger 6720



P1 PINDiode tracks (Oct. 24)

Run319, Trigger 6720

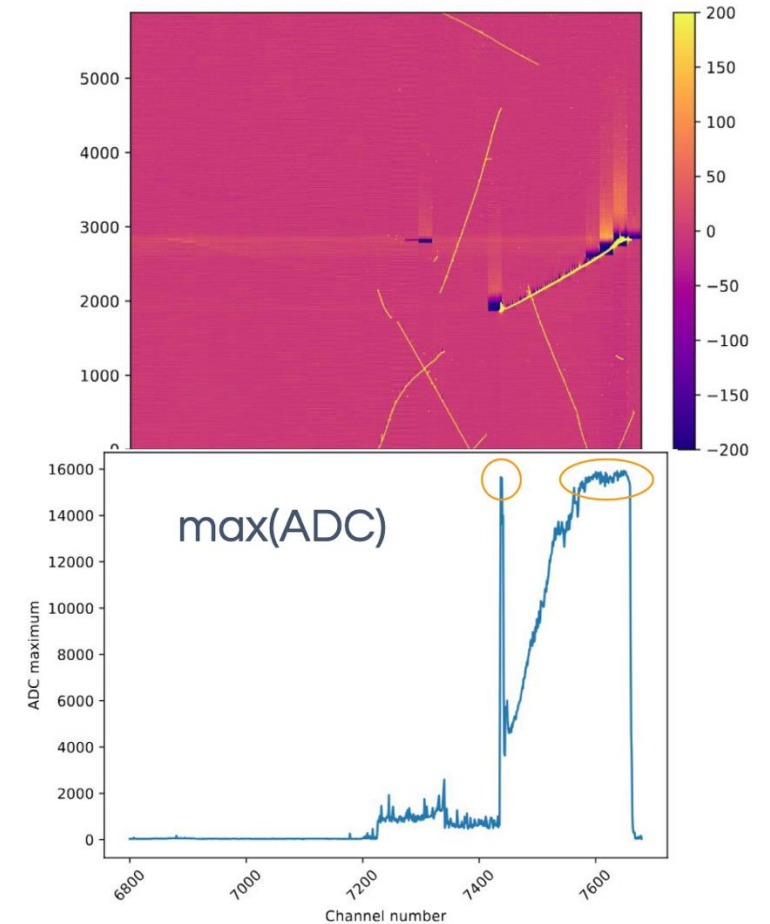
- Used the geoNavigator to generate the coordinates for any PINdiodes visible to P1
- Partial track and large signal observed in the right channel



Analysis

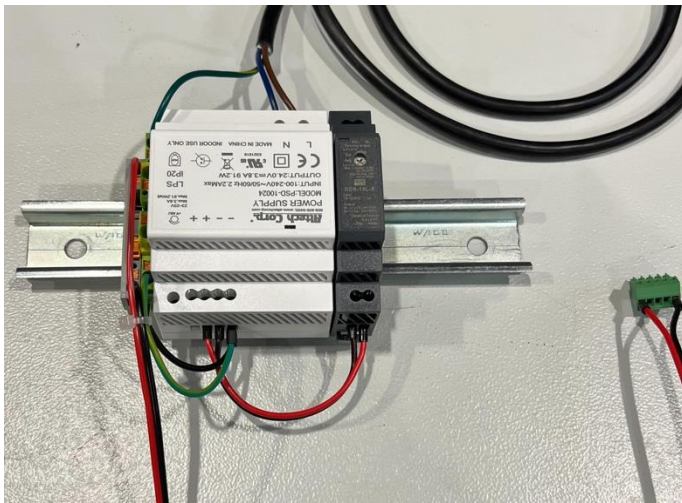
- Ramping up on the analysis
 - [Raw data studies](#) by W. Campanelli and C. Vilela @LIP
- MC Reco analysis being taken up by C. Palacios (SULI student @LANL) and new member of the team

TPC saturation



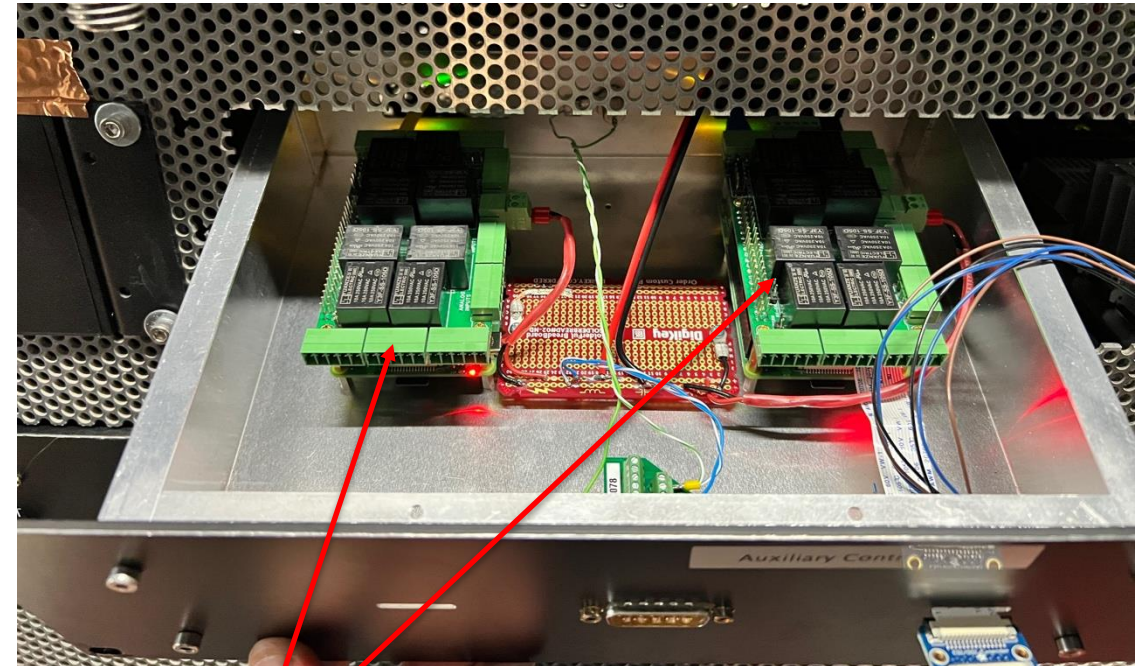
Miscellaneous

- Finished RPi Auxiliary Controls Box
 - Fans mounted inside the laser stand can be controlled remotely via Rpi and relay board
- Cleanroom re-organized and cleaned in preparation for arrival of P3



Power rail for fans and RPIs

Auxiliary Controls Box



Relay boards

Rpi camera extender board

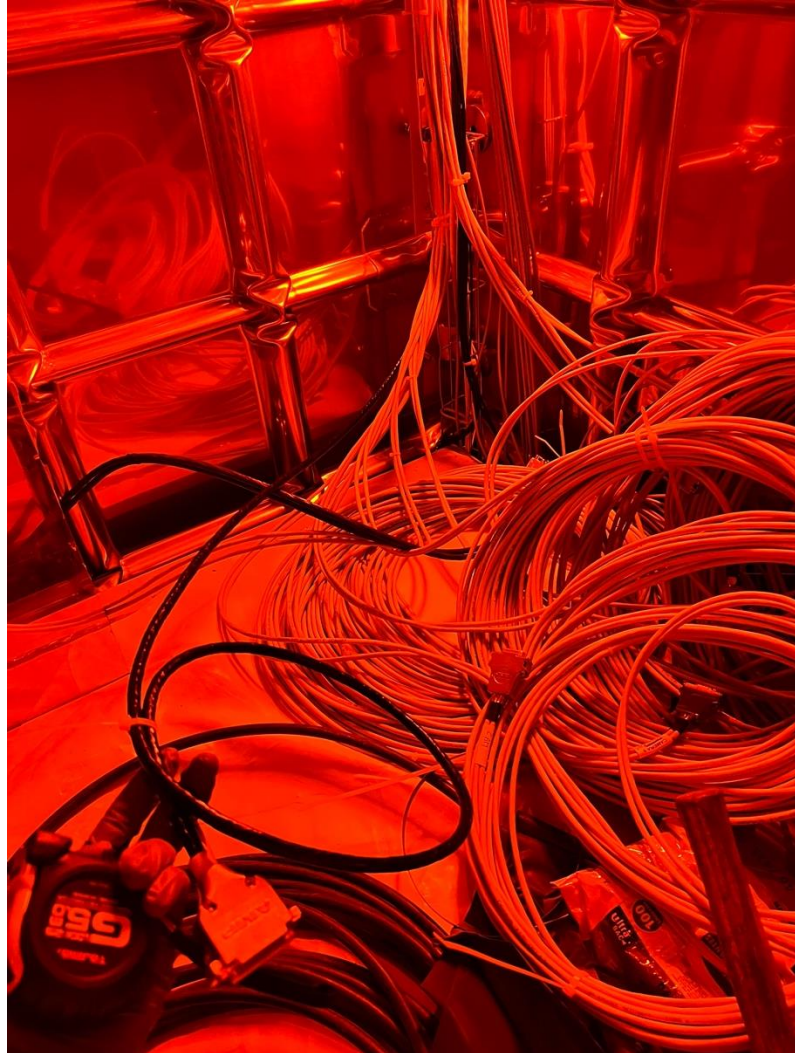
Schedule

- Many ongoing tests
 - Noise tests will take place this week
 - ~2 days requested by Roger et al.
 - Requires HV and bias to be OFF
 - Will check the noise contribution from IoLS to the cold electronics readout
 - DAQ performance tests (w/ HV and bias ON)
 - PDS tests (~5 days)
 - BSM study w/ neutrino data overnight

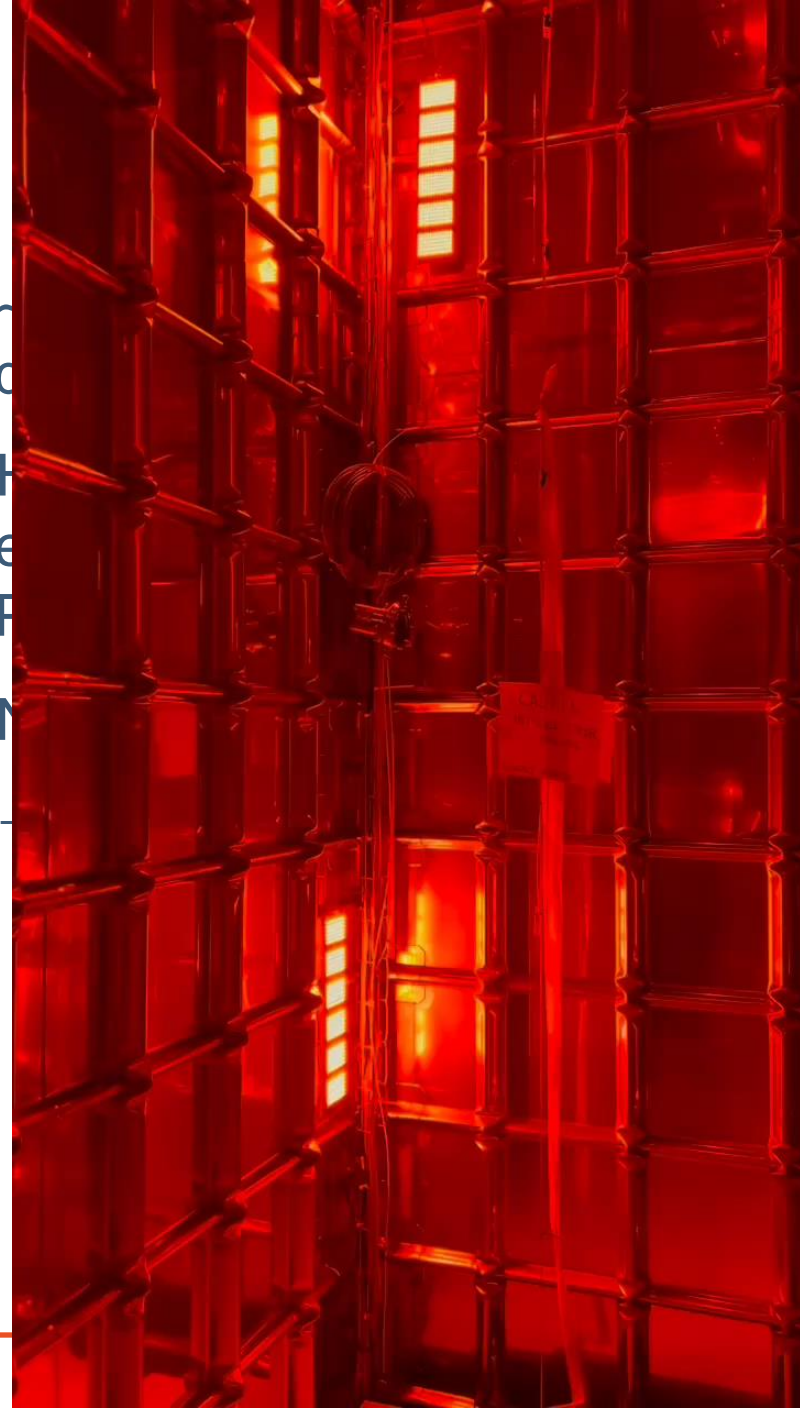
VD:

- Cryostat sealed
- PINdiode cable routed by Xavier in early Oct.

PINdiode cable



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VD

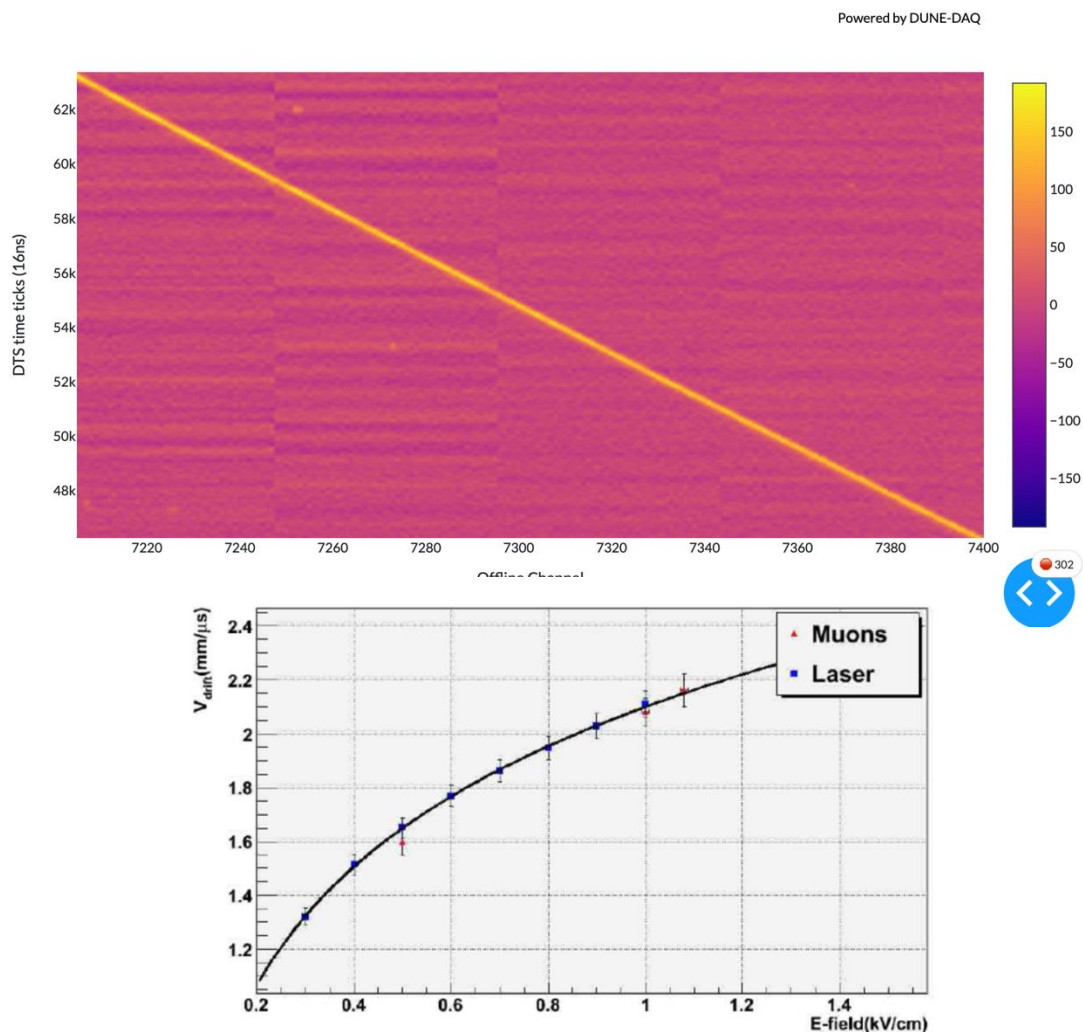
- Status of the VD roof:



Shipment 24

- Contains P3 parts (feedthrough, motors, periscope, quartz tubes, etc)
- Picked up yesterday, expect delivery by next week

Back-of-the-envelope calculation



- Track angle
 - 200 collection channels (4.875 mm wire pitch)
 - 897.5 mm
 - 17 kticks (16 ns) = 272 μ s
 - 1.65 mm/ μ s drift velocity at 500 V/cm
 - 448.8 mm
- $\text{Atan}(448.8/897.5) = 26$ degrees