Commissioning Notes

LArIAT Status Meeting
January 15th, 2015

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Outline

Update on this week activities and plans for next week:

- Cryogenic system
- TPC and electronics
- Light collection system → see Dung's talk for update on VUV SiPM
- Muon Range stack
- Magnets → see Doug's talk

Cryogenic System

- Only thing left is the insulation of the piping near the new phase separator, 1-2 hours of tech work

- Held by a short between detector and building ground, which needs to be found. In any case, the problem doesn't seem to be in the piping to be insulated

- Had a chat with Bryan (the tech performing the insulation) yesterday to illustrate the issue

- I'll have a walk-through with Bryan this morning or early next week. If he agrees that the short is not in the part to be insulated, he will do the job probably next week

TPC and electronics

- Last week, Bill, Johnny and Dean checked the channel mapping with the teensy pulser, found some mis-cabling and fixed it. Test needs to be repeated before closing when the last WRD card will come back from MSU
- Last week, Bill and Jonathan attempted to inject a pulser signal directly on the bias wires, failing to see any signal in the readout. That is a good news – it showed the filters were doing their job
- This week, Bill and I tested again the bias voltage of the wireplanes injecting a low (10 V) DC voltage on each plane (one at the time) and reading out with a voltmeter the voltage between a wire of the plane and the cryostat (ground) → same procedure adopted at Lab 6 before Run I
- Test produced results we don't understand, outlined in the e-log entry 5683:
  - Independently of the wireplane powered, the measured voltage in the collection plane ~ 0 V
  - Independently of the wireplane powered, there is always voltage in the shield plane
  - There may be hints of capacitive effects on the wires. This effect was not seen at Lab 6

TPC and electronics

WITH filter in place

Measured		C	I	S	<= Powered
	C	0.5	0.3	0.5	
	I	2.5	3.3	2.8	
	S	3.5	6.6	8.4	

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BYPASS filter box

Measured		C	I	S	<= Powered
	C	0.5	0.4	0.4	
	I	1.6	3.4	1.2	
	S	2.2	1.4	8.2	

C=Collection, I=Induction, S=Shield planes

- Needs to figure out whether the problem was in the test procedure (applied voltage may have been too low) or in the wireplanes/filter cards (only the shield one has been modified)
- Test could be repeated next week

Light collection system: PMTs (Will Foreman)

- ✔ Both PMTs (original ETL, new HMM from Gran Sasso) are operational in positive polarity mode. Capacitor (6.8nF) added to ETL base, and some connections on the new HMM base were repaired and a capacitor replaced

- ✔ Ordered better coupling capacitors (18nF, 2kV, X7R), which will reduce to ~6nF at 88K and PMT operating voltage. Should arrive next Tuesday

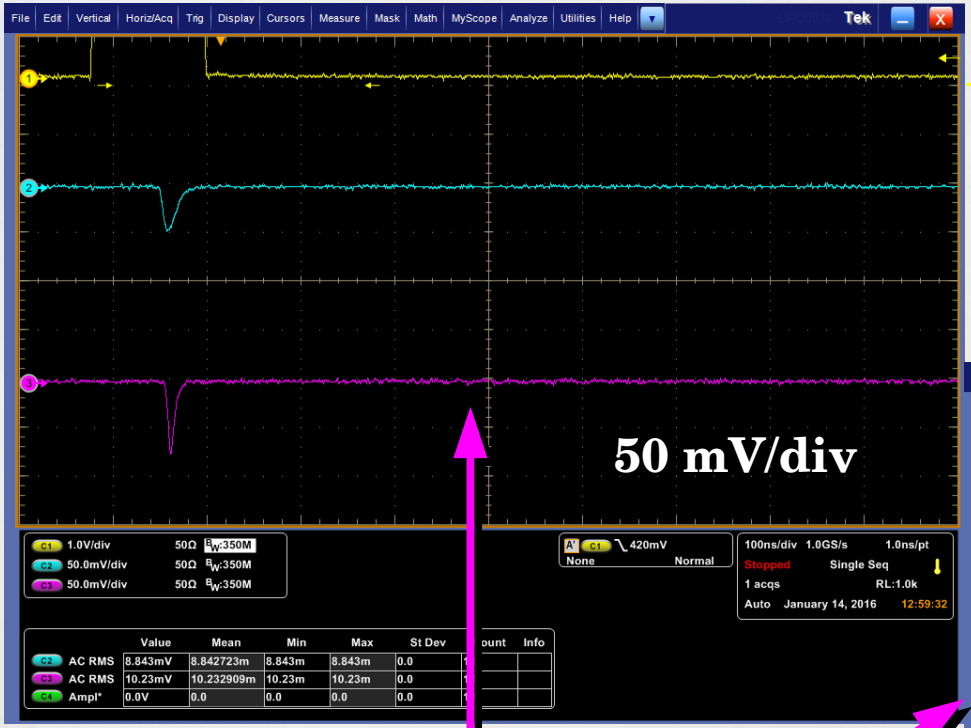
- ✔ New 6-pin FT ordered for outer flange → no need to combine grounds of both PMTs into same pin

- ✔ Dark box tests on 14th floor ongoing

- ✔ Getting a better understanding of voltage dividers, grounding, and signal coupling. Talking with Linda Bagby, MicroBooNE light folks. Added shunt resistors (50ohm) termination to each base (not present in default pos-polarity config!!)

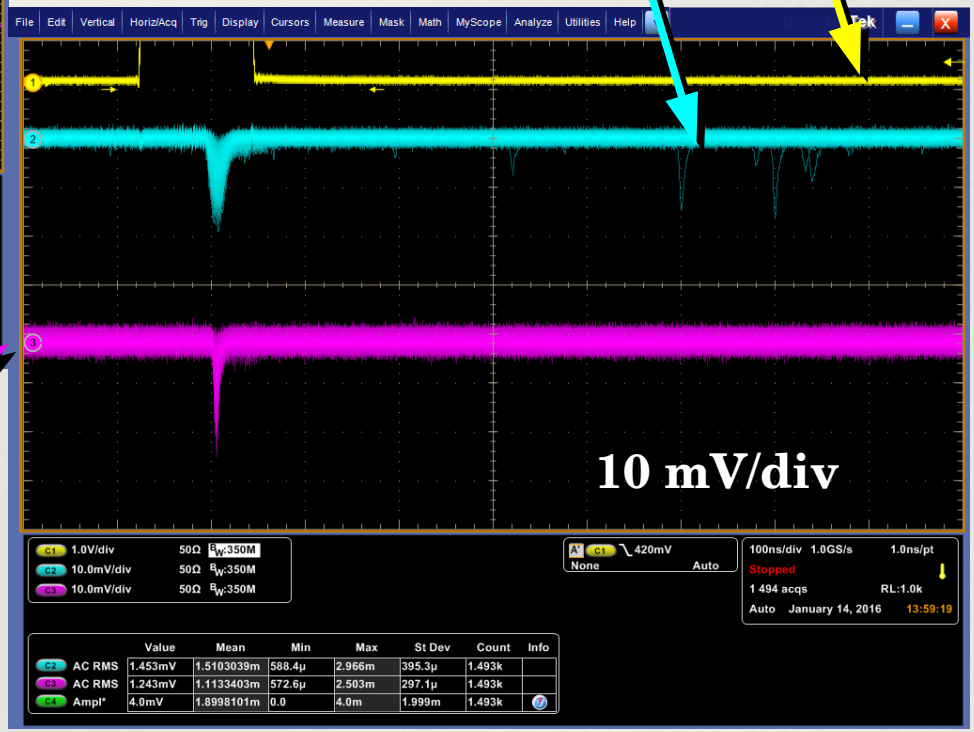
- ✔ Drawing up new schematics for both PMTs with their modified bases — will appear in updated light system documentation

Light collection system: Dark Box test



LED trigger

HMMT PMT

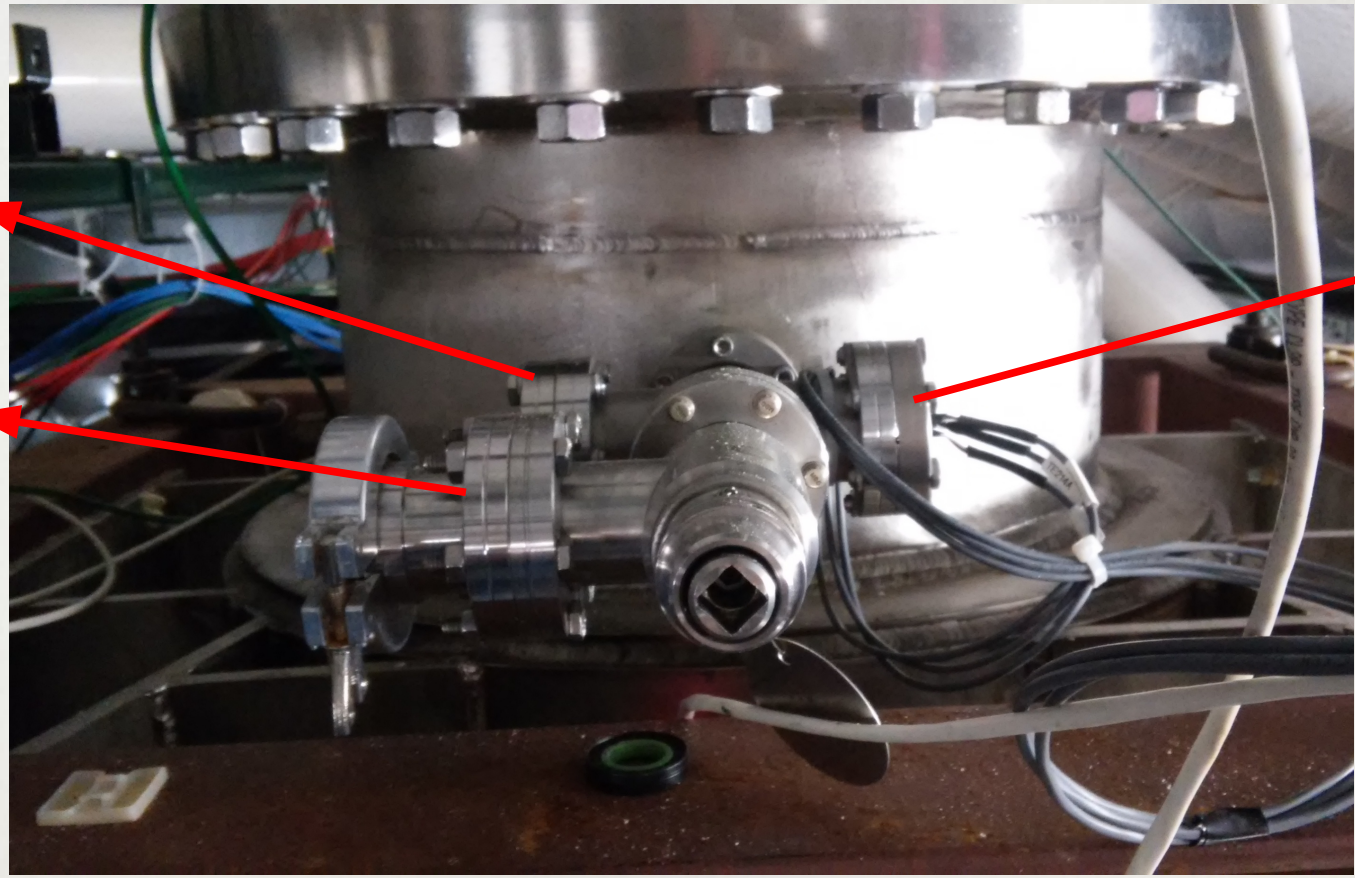


ETL PMT

Light collection system: SiPMs

- ✔ For RunII, use SensL 6mm and one HMM 12mm array
- ✔ Replaced op-amp on HMM from ADA4891 -> OPA656 to use same op-amp supply for all boards
- ✔ "HMM B" died near the end of last run as noted in e-log. Not yet investigated, likely just burnt out
- ✔ Enough room on 10-pin FT to accommodate these + VUV SiPM, with 1 pin to spare
- ✔ Will need extra pin, 11 total, if we want to include 3-SiPM superarray (on way back from Italy after modifications/tests by Dante)
- ✔ Alternative solution is to use a different FT for the 3-SiPM superarray. There is a blank CF40 flange on the chimney, above the front flange, and two new10-pin, 1 kV spare FTs
- ✔ Issue #1: I gave a quick look yesterday and couldn't find the FTs – need to find out where they ended up
- ✔ Issue #2: PMTs, SiPMs, VUV SiPM and super array are all mounted on the same holder → cannot close the PMT flange until we have the superarray in hand (if we want to introduce it)

Light collection system: SiPMs



Light collection system: plans

- ✔ Jan 15-18:
  - Finish tests in air
- ✔ Jan 18-22:
  - Drill holes on G10 holder to accommodate VUV SiPM
  - Test in LN2 at PAB or Uchi of PMT + SiPM + VUV SiPM system
  - TPB deposition onto ETL PMT + one SiPM
  - install light system + inner flange (with connections done in-situ) if we decide not to wait for the superarray (or if the superarray arrives in time)
- ✔ Feb 1-5:
  - Install outer flange whenever new 6-pin FT arrives

Muon Range stack

- Characterization of small PMTs for new scintillator slabs ongoing (Tapasi)

- Recovered a group of new small PMTs sharing the same HV connector and needing a new termination for the signal cables. Tapasi is taking care of it.

Conclusion: activities expected next week

- Cryogenic system: insulation of the cryostat - phase separator piping section

- TPC and electronics: repetition of the bias voltage test (after scratching our heads on what went wrong the first time)

- Light collection system: holder modification to accommodate VUV SiPM, cold test of PMT + SiPM + VUV SIPM system, TPB deposition and inner flange installation (we anyway should first discuss about the 3 SiPM superarray)

- Muon Range stack: continuation of small PMTs characterization

Conclusion: help needed

- Looking for a lion-hearted, brave volunteer to inter-calibrate the USTOF and DSTOF systems: PMTs of US and DS TOF are of different models and there is a ~10 ns delay in the response between the two sets. We need someone for a precision measurement of such delay

- If anyone needs help in the commissioning task he/she is involved to, you can speak now and/or let us (me, Jason, Jen, Flavio) know so that we can better coordinate the effort

- In the likely event I forgot any activity happened this week, my apologies!