Testing Fermilab PoF system in LAr III

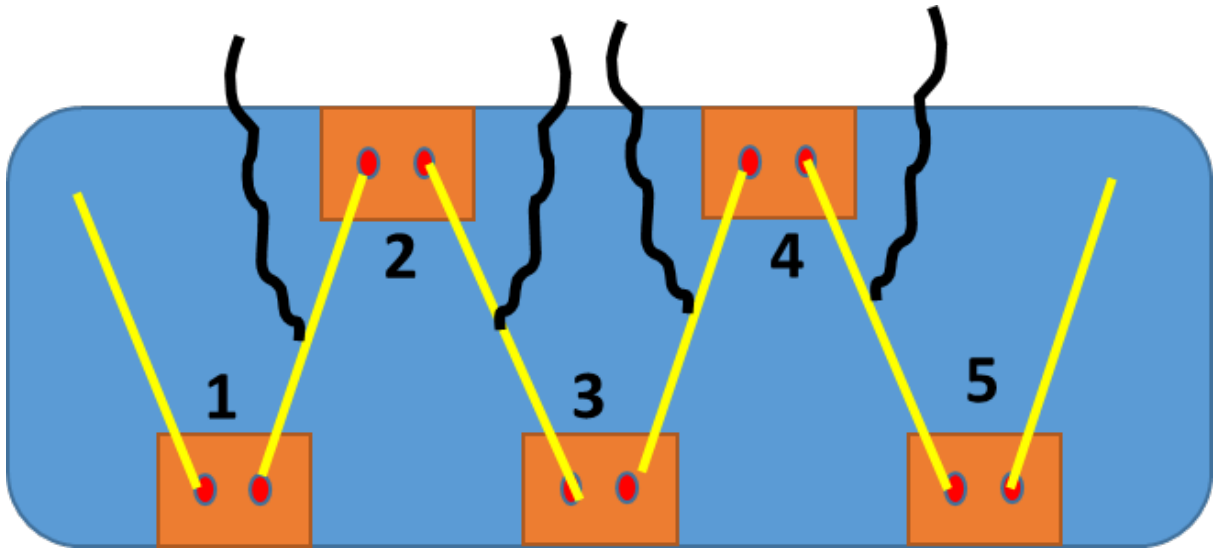
(Nov 18,2020)

Dante TOTANI

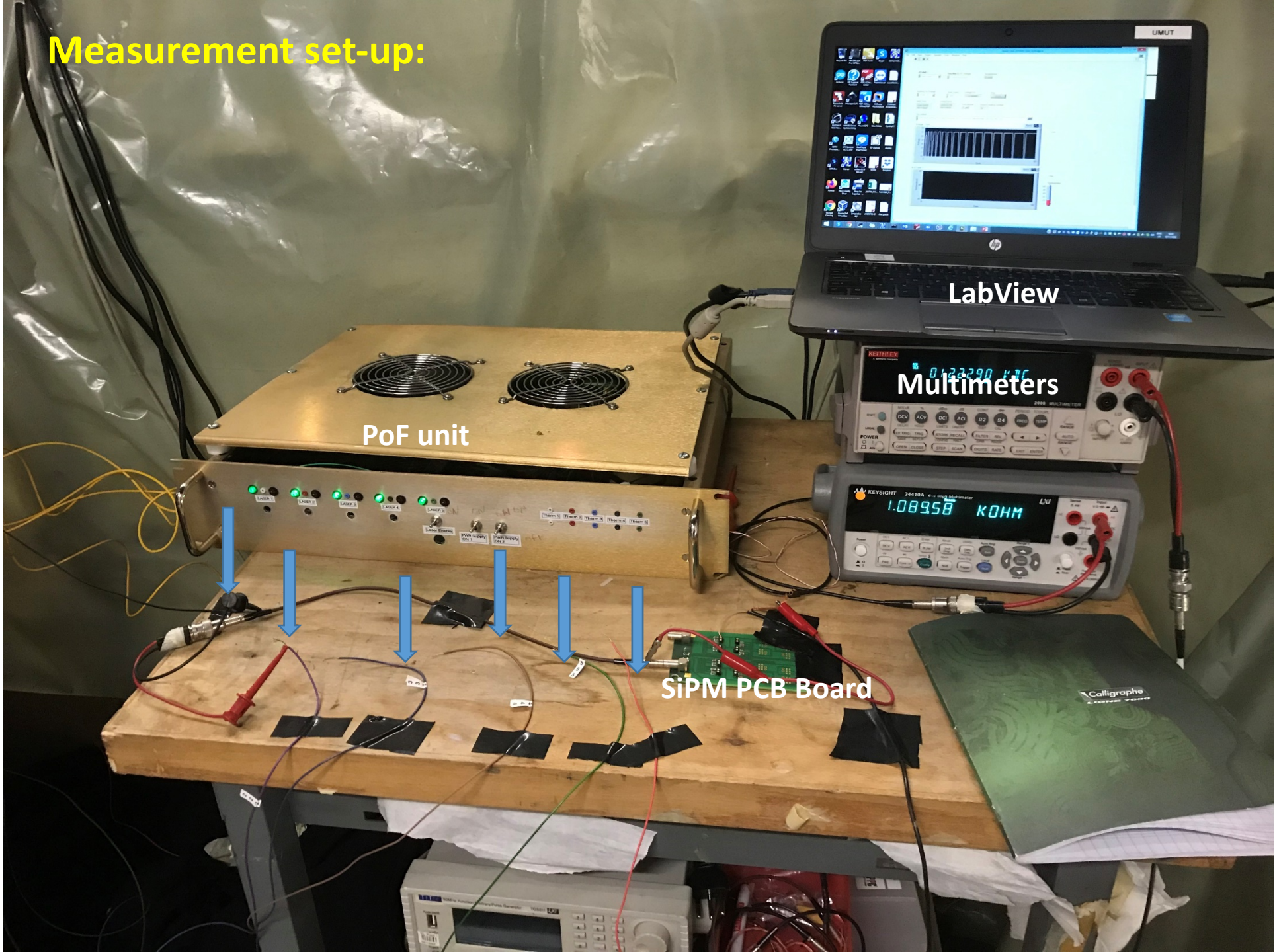
Umut KOSE

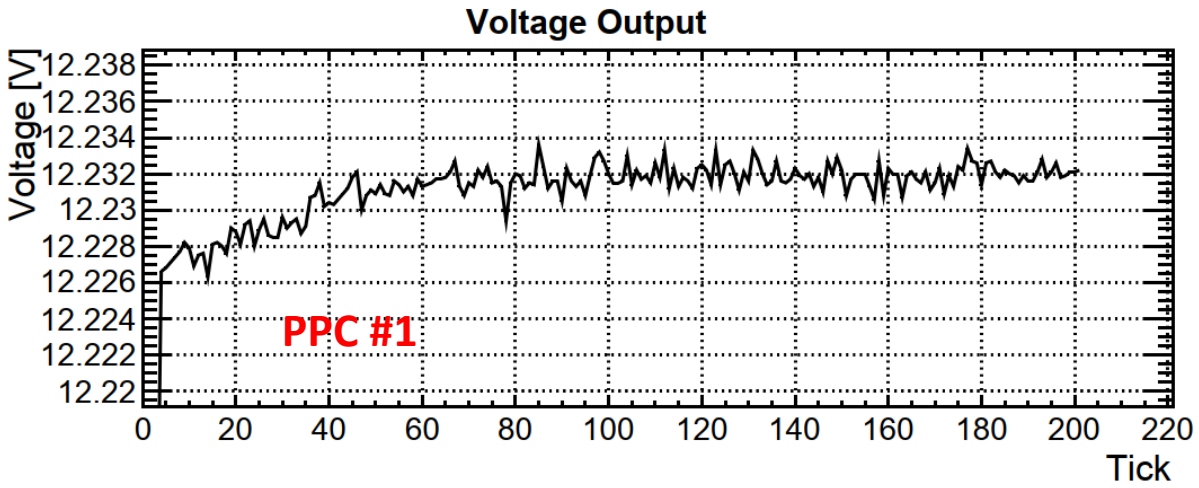
Before starting the test, liquid inside dewar very quite.
PoF units ON (all laser diodes w/ 510 Ohm resistors) with loads (resistors/SiPM PCB), liquid boils as before

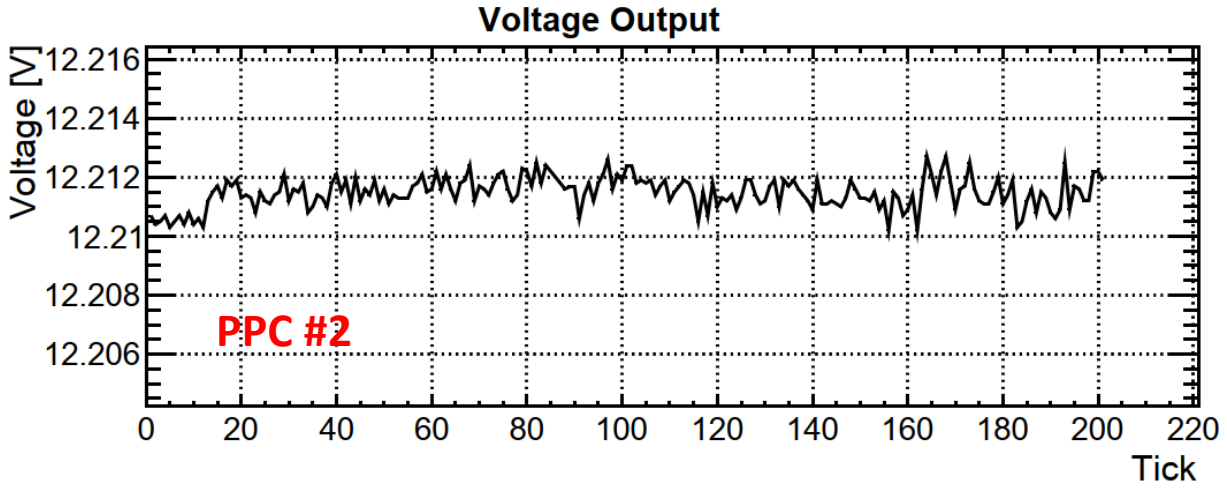
We wanted to read our each single PhotoVoltaic Power Converter (PPC) and also four in series, therefore we solder four more cables.

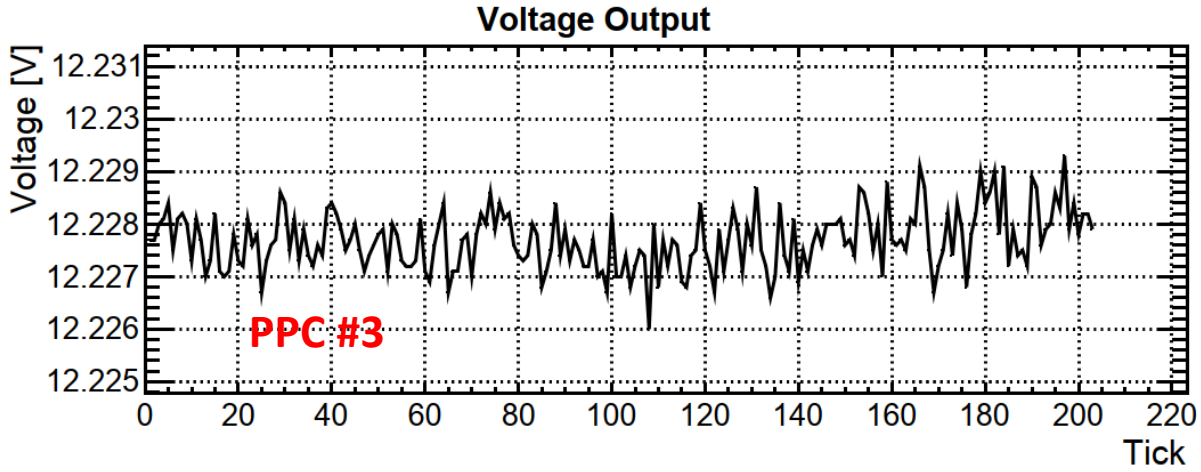


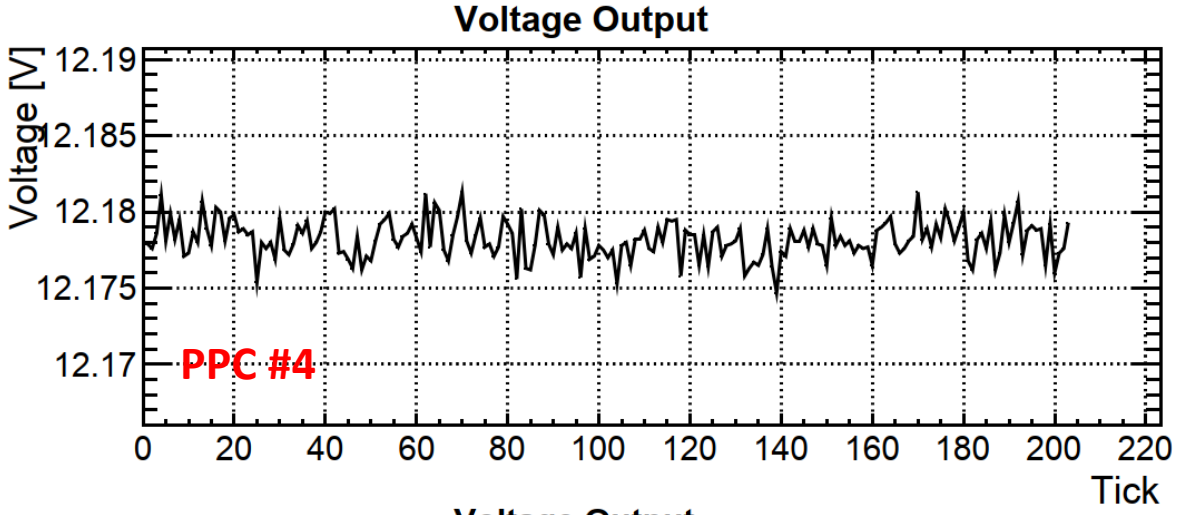
Measurement set-up:

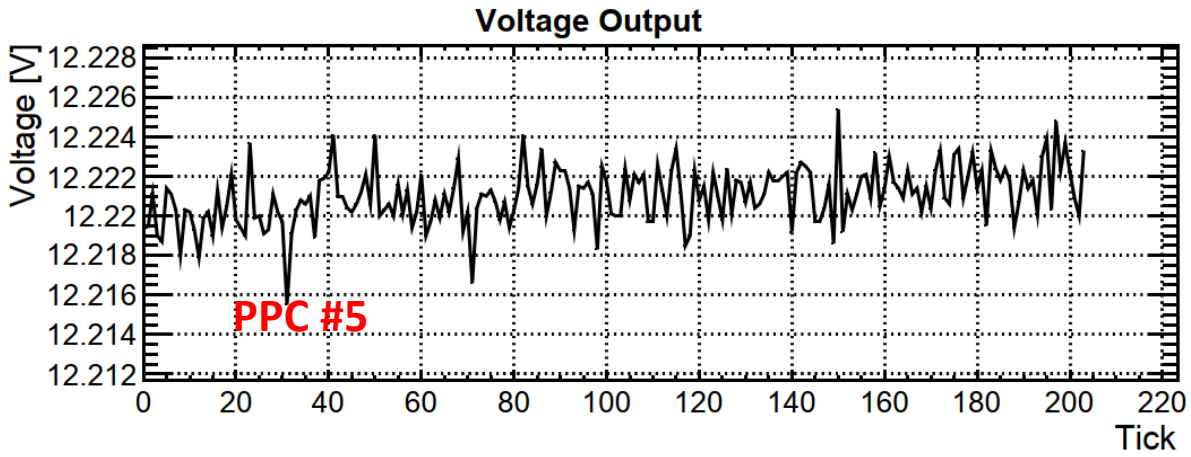


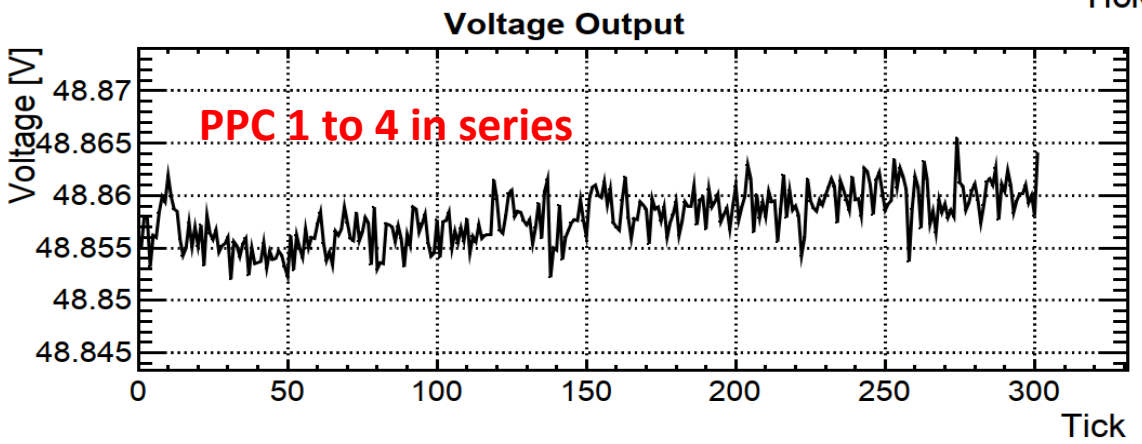

Voltage Output
Voltage [V]
12.238
12.236
12.234
12.232
12.23
12.228
12.226
12.224
12.222
12.22
PPC #1
0 20 40 60 80 100 120 140 160 180 200 220
Tick


Voltage Output
Voltage [V]
12.216
12.214
12.212
12.21
12.208
12.206
PPC #2
0 20 40 60 80 100 120 140 160 180 200 220
Tick


Voltage Output
Voltage [V]
12.231
12.23
12.229
12.228
12.227
12.226
12.225
PPC #3
0 20 40 60 80 100 120 140 160 180 200 220
Tick


Voltage Output
Voltage [V]
12.19
12.185
12.18
12.175
12.17
PPC #4
0 20 40 60 80 100 120 140 160 180 200 220
Tick


Voltage Output
Voltage [V]
12.228
12.226
12.224
12.222
12.22
12.218
12.216
12.214
12.212
PPC #5
0 20 40 60 80 100 120 140 160 180 200 220
Tick

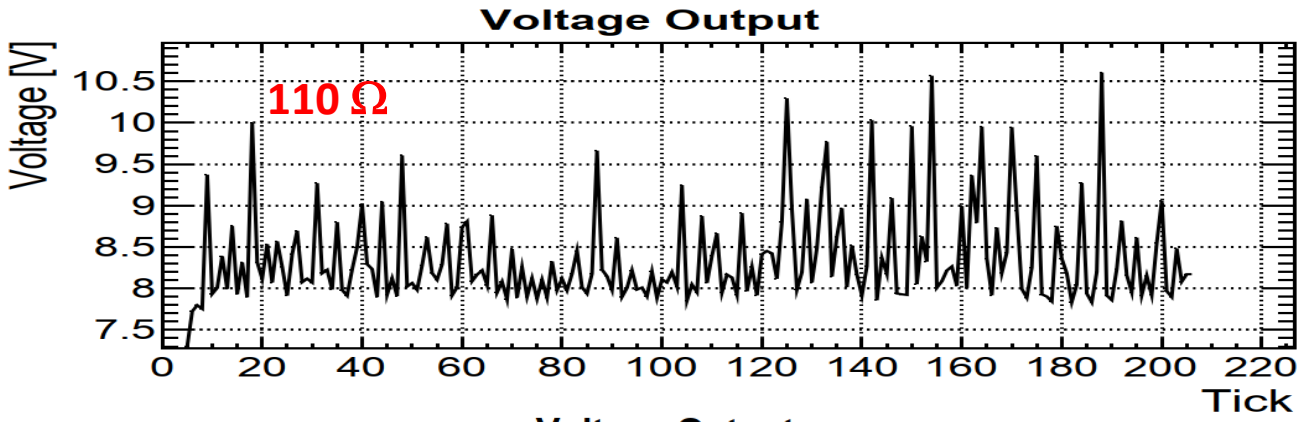

Voltage Output
Voltage [V]
48.87
48.865
48.86
48.855
48.85
48.845
PPC 1 to 4 in series
0 50 100 150 200 250 300
Tick

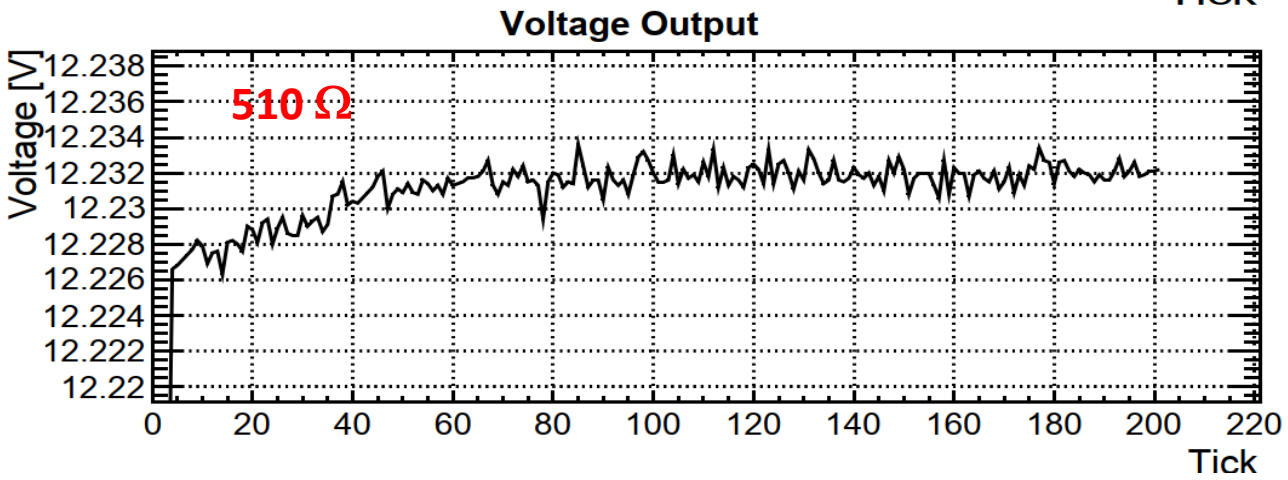
Results:

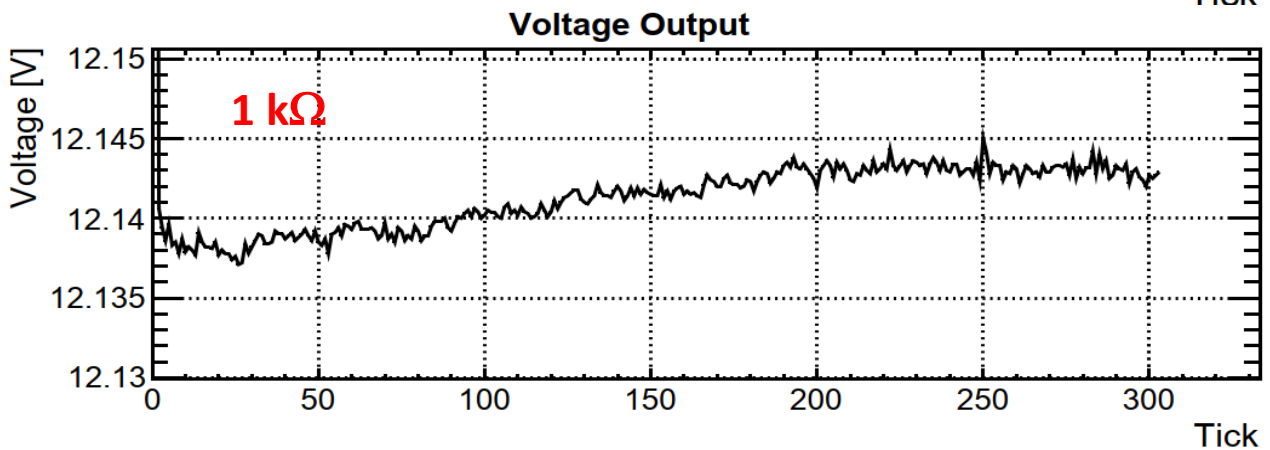
PPC	Voltage output (Volts)
1	12.23
2	12.21
3	12.23
4	12.18
5	12.22
Four in series (1 to 4 PPC)	48.86

- In this test we use 510 Ohm resistors on Laser Power module.
- SiPM PCB Board (includes some R and C) without SiPM is connected.

Next test: changing the resistor on Laser Power Module #1 (powering PPC #1)







?

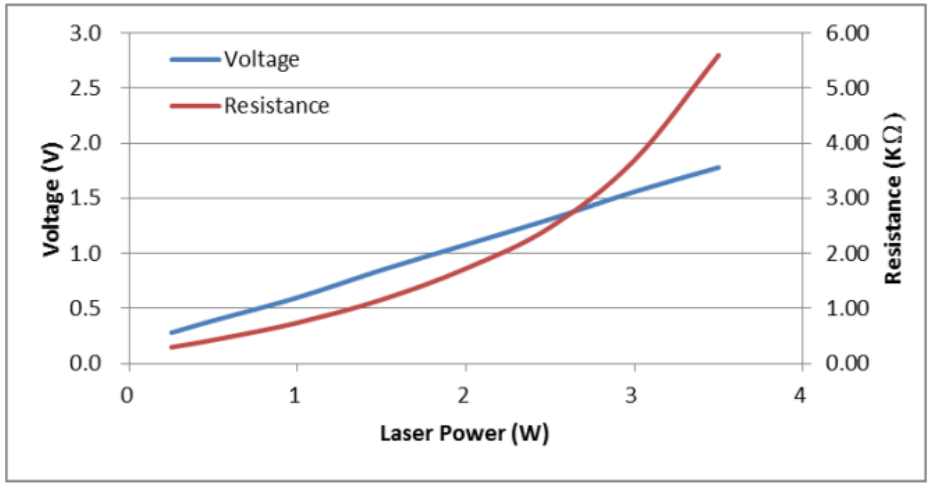
Specifications of the Laser Power Module

Device Type: 3W PPM
Part Number: PPM-003C50-3
Serial Number: 094398
Date: 2020.09.30

Laser Power Settings *

Laser Power (W)	0.25	0.50	1.00	1.50	2.00	2.50	3.00	3.50
Setting Voltage (V)	0.28	0.39	0.60	0.85	1.08	1.31	1.56	1.78
Resistance (KΩ)	0.30	0.43	0.74	1.16	1.73	2.47	3.69	5.60

** Voltage setting between Pin 1(LIS) and Pin 4(GND) to adjust laser power*
** Tested with 3 meter 62.5um fiber at 25 ℃ ambient*



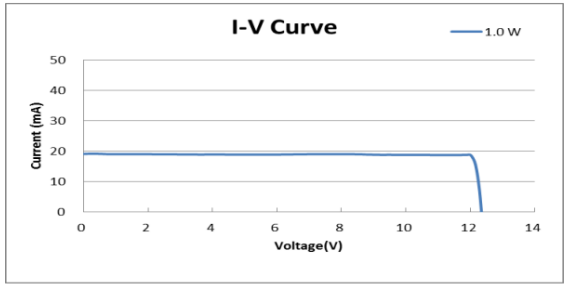
- **For 510 Ohm, we measure 0.472 Volts of setting voltage**

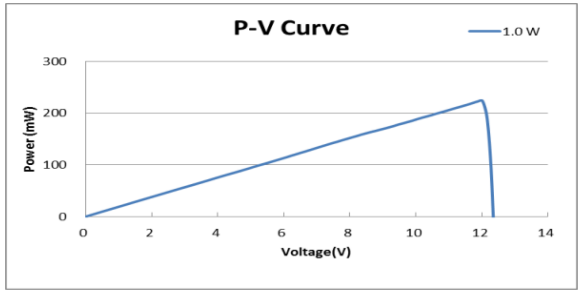
Specifications of Power converter in LN2

MH GoPower

Electrical Characteristics *

Optical Power (mW)	1000
Pmax(mW)	223.3
Vmax(V)	12.0
Imax(mA)	18.6
Efficiency (%)	22.3%





- **We think that since the maximum optical power to be used for PPC is 1W, using higher resistors on Laser module will not change the output voltage (even at higher it would saturate).**
- **Anyway with current setup we have proper output voltage to bias SiPMs.**
- **When we set laser power > 1 W, we saw increase on boiling the liquid. This means we should stay <= 1W with laser power in order to get PPC more efficient and not dissipating some much heat into the system.**

Summary:

Test in LAr continues.

We get more experience and knowledge with PoF system (thanks Bill for his suggestions and instructions)

Continue to study the response of PPC units.

Powering on SiPM in LAr by using four PPC in series.

See photos and videos in: https://cernbox.cern.ch/index.php/s/yw0sLUI5IOMXhIj

Keeping all slides and data sheets of PoF units in: https://cernbox.cern.ch/index.php/s/UjLWSss9CCVUtoF