DEEP UNDERGROUND NEUTRINO EXPERIMENT

Remote Control of Power Supplies

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2x2 Instillation Meeting

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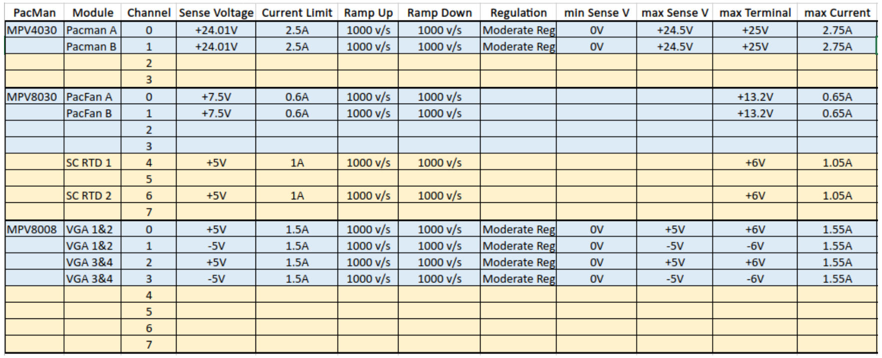
MPODs

- Using Three different MPODs:
  - MPV4030: Powers PACMANs
  - MPV8030: Powers Fans and RTDs
  - MPV8008: Powers Light VGAs
- Previously these systems were powered by bench top power supplies (BTPS).



PacMan	Module	Channel	Sense Voltage	Current Limit	Ramp Up	Ramp Down	Regulation	min Sense V	max Sense V	max Terminal	max Current
MPV4030	Pacman A	0	+24.01V	2.5A	1000 v/s	1000 v/s	Moderate Reg	0V	+24.5V	+25V	2.75A
	Pacman B	1	+24.01V	2.5A	1000 v/s	1000 v/s	Moderate Reg	0V	+24.5V	+25V	2.75A
		2									
		3									
MPV8030	PacFan A	0	+7.5V	0.6A	1000 v/s	1000 v/s				+13.2V	0.65A
	PacFan B	1	+7.5V	0.6A	1000 v/s	1000 v/s				+13.2V	0.65A
		2									
		3									
	SC RTD 1	4	+5V	1A	1000 v/s	1000 v/s				+6V	1.05A
		5									
	SC RTD 2	6	+5V	1A	1000 v/s	1000 v/s				+6V	1.05A
		7									
MPV8008	VGA 1&2	0	+5V	1.5A	1000 v/s	1000 v/s	Moderate Reg	0V	+5V	+6V	1.55A
	VGA 1&2	1	-5V	1.5A	1000 v/s	1000 v/s	Moderate Reg	0V	-5V	-6V	1.55A
	VGA 3&4	2	+5V	1.5A	1000 v/s	1000 v/s	Moderate Reg	0V	+5V	+6V	1.55A
	VGA 3&4	3	-5V	1.5A	1000 v/s	1000 v/s	Moderate Reg	0V	-5V	-6V	1.55A
		4									
		5									
		6									
		7									

Functionalities

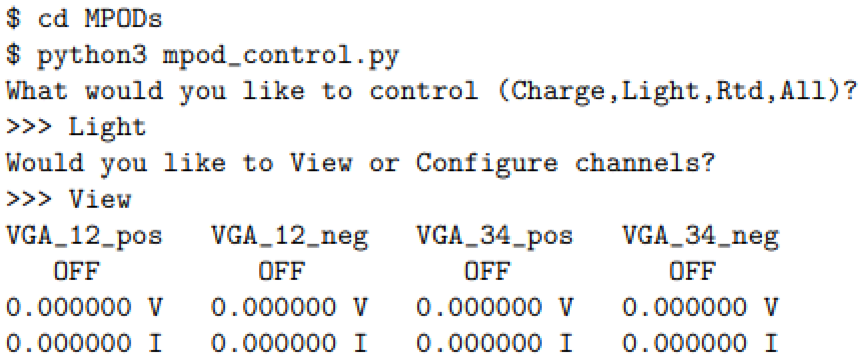
- Set Voltages/Currents.
- Ramp up and down.
- Turn on/off channels.
- Plots values in real-time.
- Creates log of measured values.
- Commands stored in a python Library.

Usage instructions

- Get a Kerberos ticket.
- ssh onto the server:
  - ssh -J acdemo@acd-gw01.fnal.gov acdemo@acd-srv01.fnal.gov
- Move into the “MPODs” directory.
- Use python3 to execute “mpod_control.py”.

User Interface

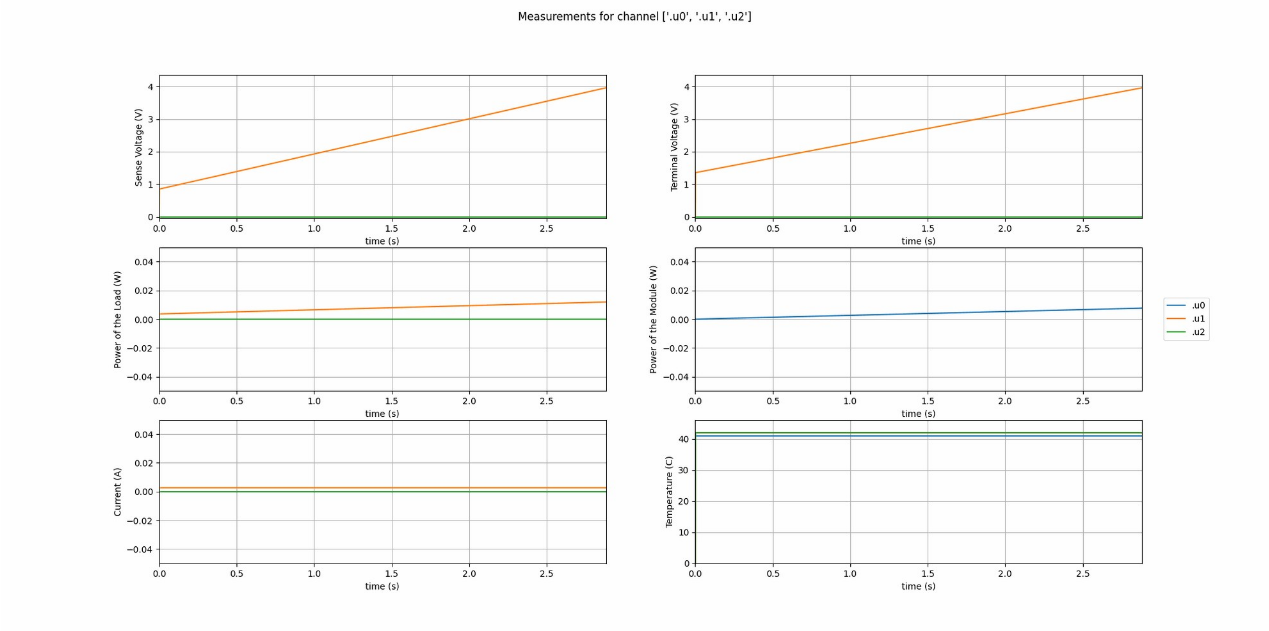
- There is a script for basic controls.
- Controls for:
  - Light VGAs
  - Charge Readout
  - RTDs
  - All channels
- Configure channels with default values.
- View outputs of the channels.



```
$ cd MPODs
$ python3 mpod_control.py
What would you like to control (Charge,Light,Rtd,All)?
>>> Light
Would you like to View or Configure channels?
>>> View
VGA_12_pos    VGA_12_neg    VGA_34_pos    VGA_34_neg
   OFF           OFF           OFF           OFF
0.000000 V    0.000000 V    0.000000 V    0.000000 V
0.000000 I    0.000000 I    0.000000 I    0.000000 I
```

Plotting Measurements

- Controlled with “measure.py”.
- Plots six values:
  - Terminal Voltage
  - Sense Voltage
  - Current
  - Temperature
  - Load Power
  - Module Power

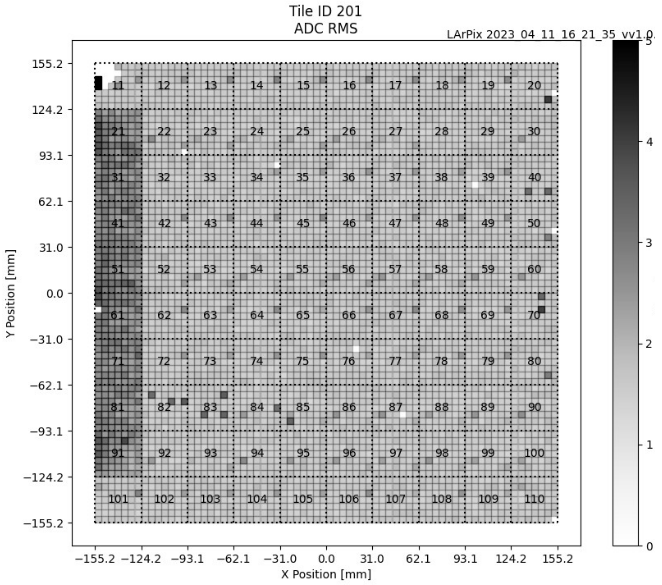


Testing MPODs

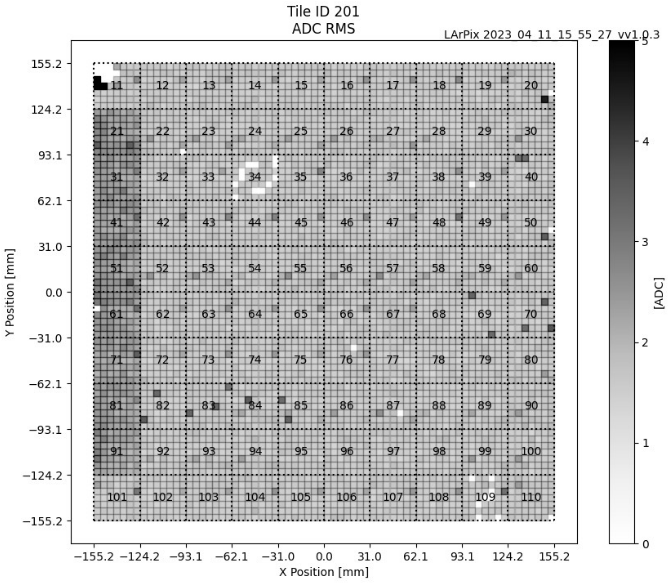
- Ran charge and light tests:
  - Module 0.
    - First using BTPS.
    - Repeated with MPODs.
- MPODs and interlocks preformed as expected.
- Observed lower noise in both charge and light tests.

Charge Testing

- Plots show RMS of pedestal voltages.
- Module 0 TPC 1 tile 1.
- MPODs have lower noise.



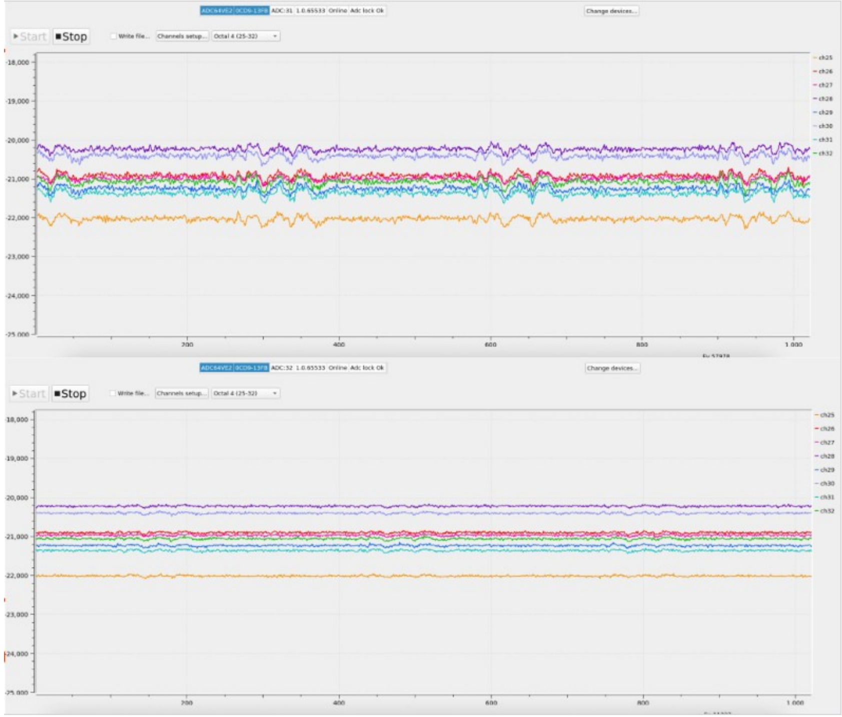
BTPS



MPODs

Light Testing

- Top shows noise while using the BTPS
- Bottom shows noise while using MPODs
- More information on light testing with MPODs at DUNE-doc-27776-v1 (by Jack Smedley)

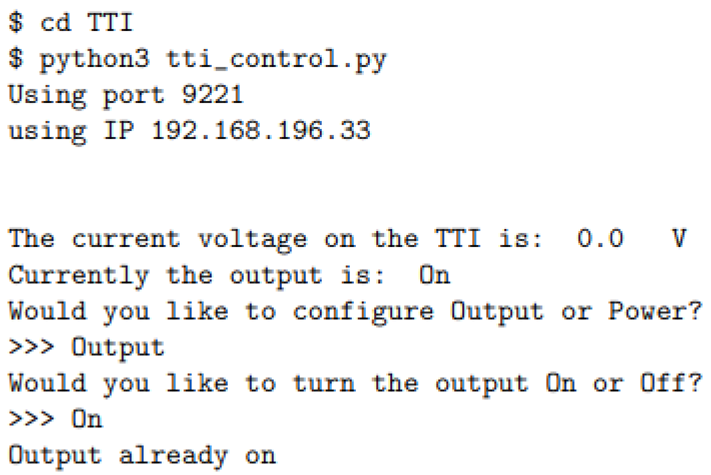


SiPM bias PS Usage

- Get a Kerberos ticket.
- ssh onto the server:
  - ssh -J acdemo@acd-gw01.fnal.gov acdemo@acd-srv01.fnal.gov
- Move into the “TTI” directory.
- Use python3 to execute “tti_control.py”.

SiPM bias PS Interface

- Voltage needs to be ramped slowly.
  - Otherwise we risk blowing a fuse.
- Ramping procedure was manual.
- Now controlled by script.
- You can also turn on/off output.
- User interface is similar to MPODs.



```
$ cd TTI
$ python3 tti_control.py
Using port 9221
using IP 192.168.196.33


The current voltage on the TTI is:  0.0   V
Currently the output is:  On
Would you like to configure Output or Power?
>>> Output
Would you like to turn the output On or Off?
>>> On
Output already on
```

Documentation

- Code is on the servers and is commented.
- Full usage instructions are included in “2×2 Modules - Acceptance and Checkout Procedures”.
- Results from module 0 CRO and LRO with MPODs is on DocDB.

Future work

- Adding MPVs and TTIs for all 4 modules.
- Multi-module controls:
  - Add controls for individual modules
  - Control all LRO or CRO channels

Supplemental Slides

Dependencies

- MPODs:
  - configparser
  - Influxdb
  - pysnmp
  - Various MIB files (in MPODs directory)
- TTI
  - configparser
  - socket