

# PMTDaq

A compact data acquisition system for PMT Gain measurements

# Personal Update!



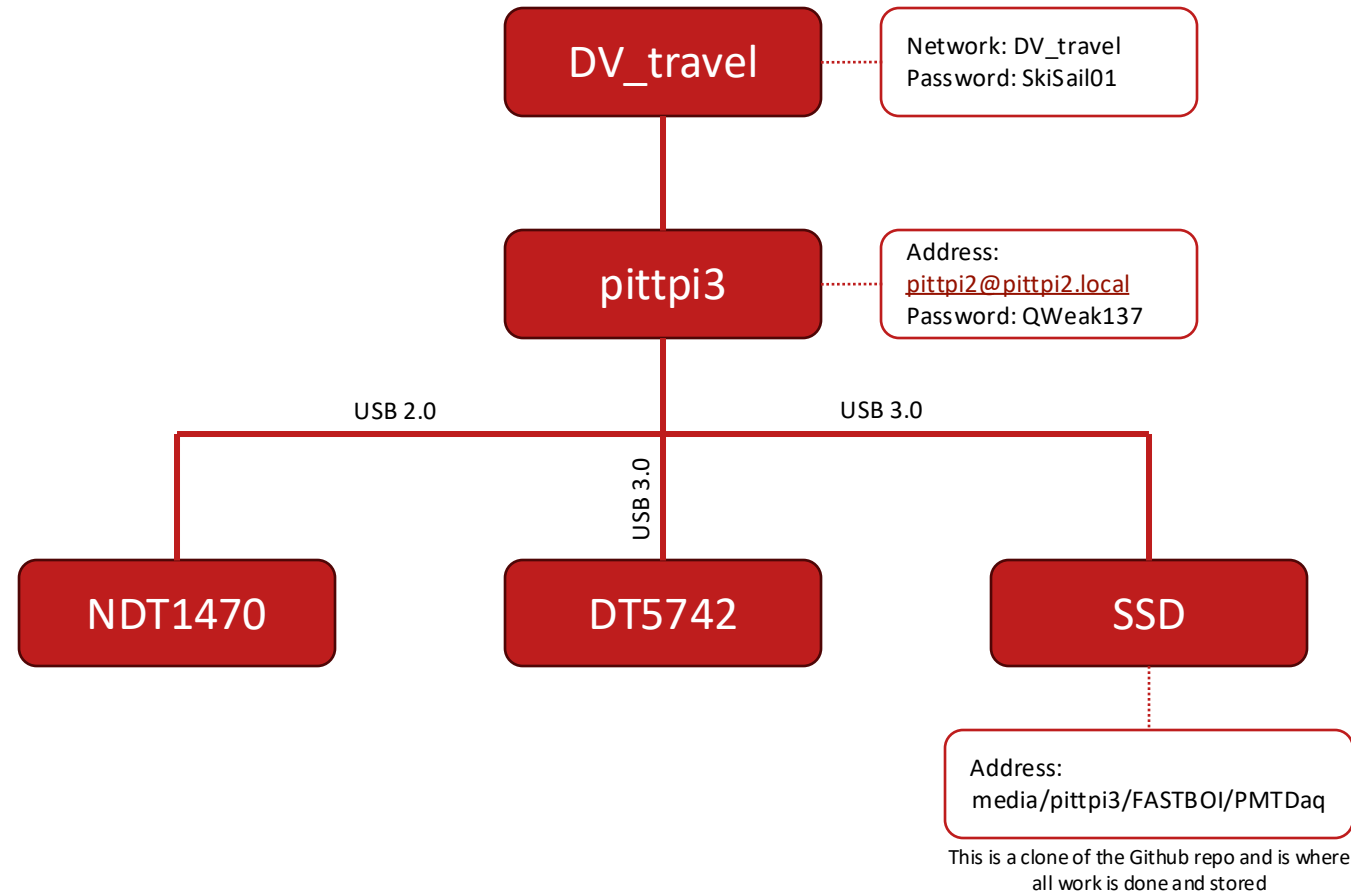
- 6 New River Diving athletes qualified to USA Diving Junior Nationals this weekend!
- New River Diving may have a new coach coming to join in the next week or so
  - This should relieve me from many of the responsibilities I have taken on over the last year and will give me more time to work on MOLLER things!

# PMTDaq



- Relies on CAENpy
  - A python wrapper for the CAENDigitizer library
- GitHub link: <https://github.com/dvalmassei/PMTDaq>

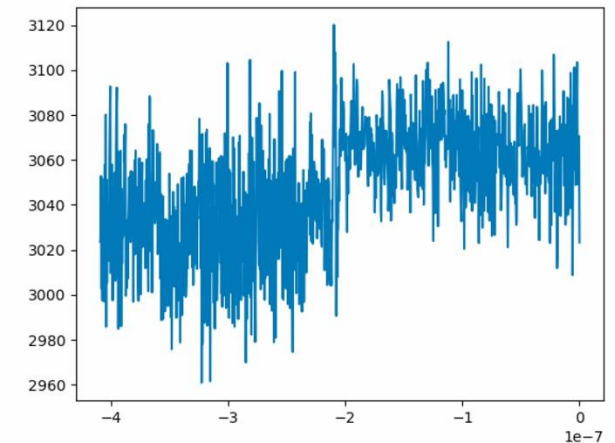
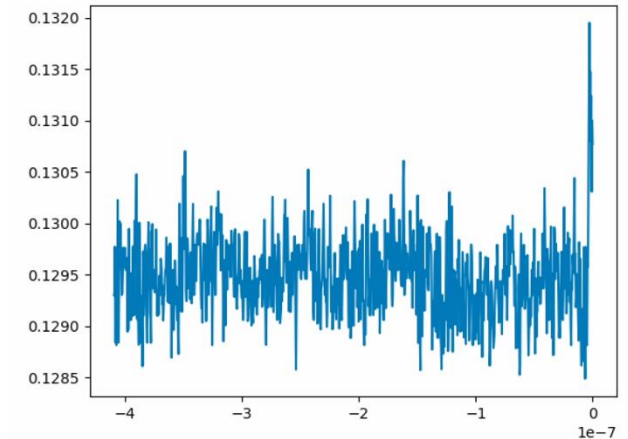
# Network



# self\_trigger\_setup.py



- In the command line: “python self\_trigger\_setup.py”
- Collects an event in Output Mode with the software trigger, then displays the Ch. 0 baseline
- After closing the pop-up window, user is prompted to set the DC Offset for Ch.0
- Collects an event in Transparent Mode
- Prompts user for Trigger Threshold
  - Note: neither dc offset nor trigger threshold are saved. This is simply an exercise for the user.
- Take note of DC offset and trigger threshold for later use



# HV\_scan\_smaller\_data.py



- Acquires Ch. 0 self triggered events
- Read README.md for full description
- Outputs “out.csv” for analysis.py which includes event no., channel no., amplitude (V), time (s), and set voltage

## Notes:

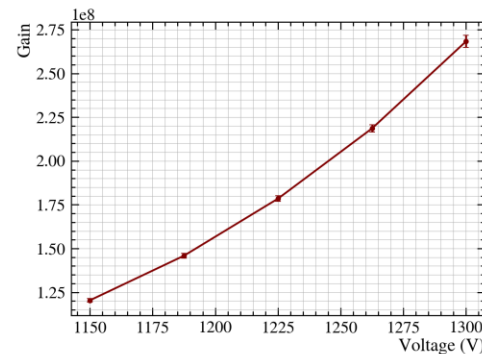
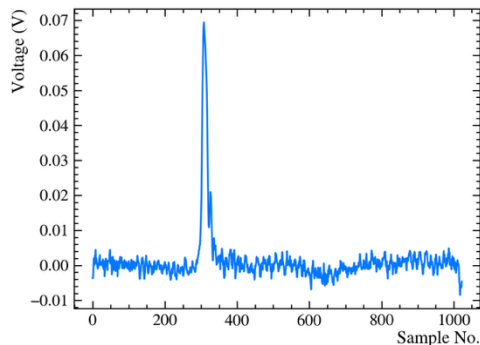
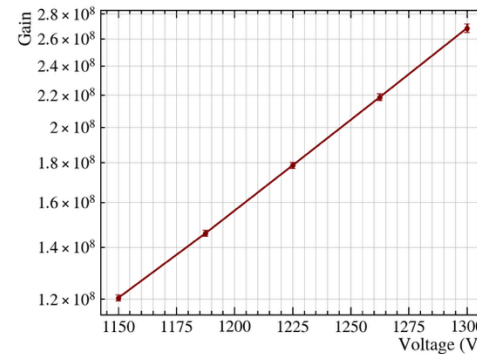
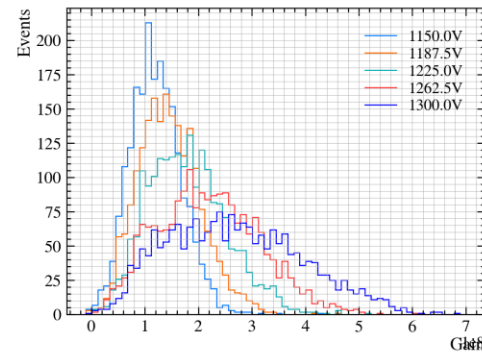
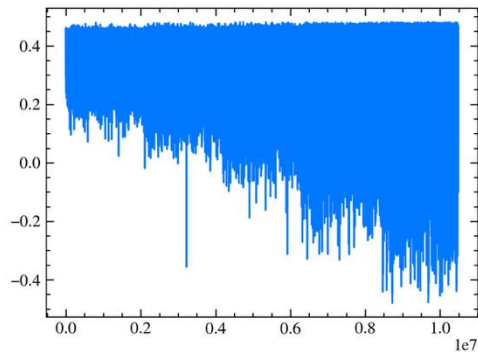
- Digitizer can store and transfer up to 1024 events at a time
- Will timeout at a given voltage after  $n\_events/2$  s
- Can abort at any time using KeyboardInterrupt

```
pittpi3@pittpi3:/media/pittpi3/FASTB01/PMTDaq $ python HV_scan_smaller_data.py -0.3 3010 100 1000 13]
00 8
HV connected with: CAEN NDT1470, SN:58466
Ramping voltage. This will take a moment...
Digitizer connected with: CAEN DT5742 digitizer, serial number 1055
Old value of register 0x1080: 00000800
0x1080 now: 00000BC2
Old value of register 0x10A8: 00000000
Writing 00000001 at register 0x10A8.
0x10A8 now: 00000001
Self trigger enabled for Ch.0
Old value of register 0x8000: 00000950
Writing 00000950 at register 0x8000.
0x8000 now: 00000950
Ready for Self-Triggered acquisition in Output Mode
HV ready.
Voltage measured at 1000.0 V and is drawing 233.25 uA and and reset event count...
Digitizer is enabled!
acquired 0 of 100 at 1000.0 V...
acquired 0 of 100 at 1000.0 V...
acquired 0 of 100 at 1000.0 V...
acquired 0 of 100 at 1000.0 V...
acquired 0 of 100 at 1000.0 V...
```

# analysis.py



- Calling “python analysis.py” will analyze “out.csv”
  - Can also call “python analysis.py <filename>” to analyze other files
- Produces plots below and “gain\_table.txt”, which is formatted close to the ELog table standard



MOELLER  
SAM | LAM | US-DS Scanner | DBM | MISC | mainz\_sept\_2023 | JLAB Test Beam  
ELOG for VT Detectors at JLAB May 2025 Test Beam  
Logged in as "Daniel Valm" | List | New | Edit | Delete | Reply | Duplicate | Find | Config | Logout | Help

Message ID: 24 Entry time: Thu Jun 12 11:48:02 2025

Author: Daniel Valmassel  
Subject: Electronics  
Title: LAM Top Gain

In situ gain measurement of ET 9305QKB 1331 at the Hall D Test Beam

Note: no correction has been applied to these values for cable length, base gain, or NIM crate electronics (i.e. this should be the gain of the entire system for a single PE at the Hall D ADC)

Voltage (gain)	std	err
1150	1.20406e+08	4.84571e+07 (1.07076e+06)
1187.5	1.45876e+08	5.91114e+07 (1.30619e+06)
1225	1.78483e+08	7.46222e+07 (1.64893e+06)
1262.5	2.18582e+08	9.69327e+07 (2.14193e+06)
1300	2.68319e+08	1.54016e+08 (3.40331e+06)

Attachment 1: Oscilloscope image of 128 averaged signals at 1000V with the LED on  
Attachment 2: first digitized signal in DS scanner HV scan data after pedestal correction and reflection about x-axis  
Attachment 3: Histogram of calculated charge by event  
Attachment 4: gain vs. voltage with linear y-axis  
Attachment 5: gain vs. voltage with log y-axis





# Anticipated Features



- Network
  - Integrated LED control
  - Integration to existing lab network (ie. printers)
- self\_trigger\_setup.py
  - Suggest DC Offset
  - Suggest Trigger Threshold
- HV\_scan.py
  - Automated DC Offset and Trigger Threshold w/ option for manual control
- Dark Box
  - PMT and LED Stand
  - Amplifier

