

NYU Setup

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Lab versus CERN

Lab Setup

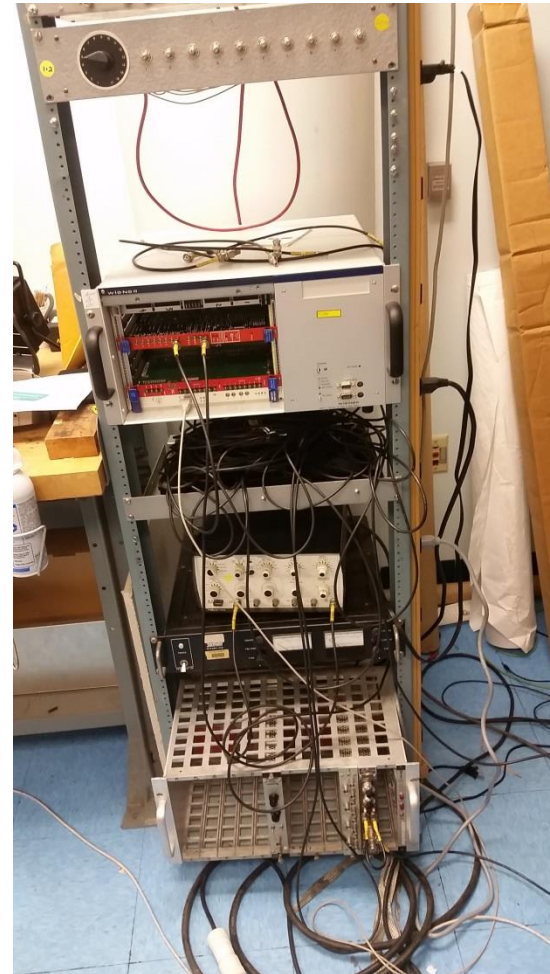
- Weiner VME Stack with an CAEN ADC converter
 - VME: Controller that acts as a conduit between the computer and ADC
 - ADC: Analog Digital Converter, takes data from PMT
- Taking data at 200Hz
- No time sensitivity (Yet...)
- Data coded in
- Newer PMT
- Hooked into a Pulse generator to create gate for data to be read, 300ns delay from gate creation, possible ringing in signal
- 16 channels (soon to be 32)
- 16 Bit read (soon to be 32)

CERN Setup

- Emorpho board
 - ADC& Time counter
 - Strange rollover counter on time
- Taking data ~30Hz
- Output is automatic
- Older gen PMT
- 30ms read delay, not connected to a pulse generator
- Relatively Expensive
- Can have a firmware update to do continuous read out
- Right now underground in old CMS counting Room
- 1 channel
- 32 bit read

Lab Setup at NYU

- Currently using an amplifier hooked into a pulse generator
- Pulse opens gate, then using cable, the signal is delayed from the PMT for 300 ns, the necessary length of time for the ADC to be ready to take data
- Looking to get better ADC and pulse generator



Calibrations

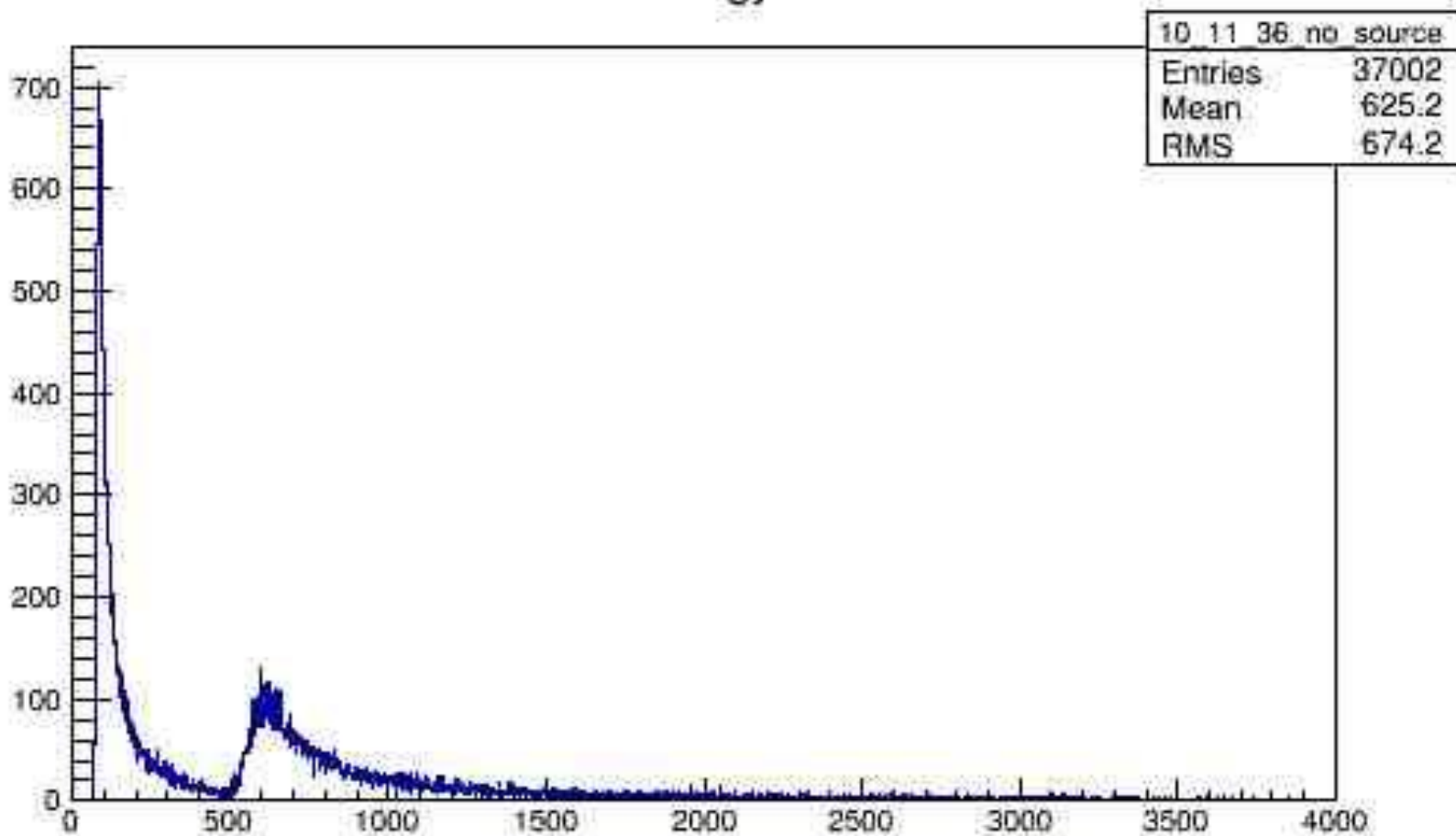
- As of right now, I have just finished calibrating the PMT and read out software to be able to convert the raw data from the PMT into data that is correctly given in MeV
- This is established by use of known energy signatures and comparing their expected peaks to those read in our machine

Calibrations

- Calibrations done using γ -ray sources
 - In Lab:
 - Cs137
 - Co60
 - Sr90—Actually a β source, but still useful as scintillator is in use

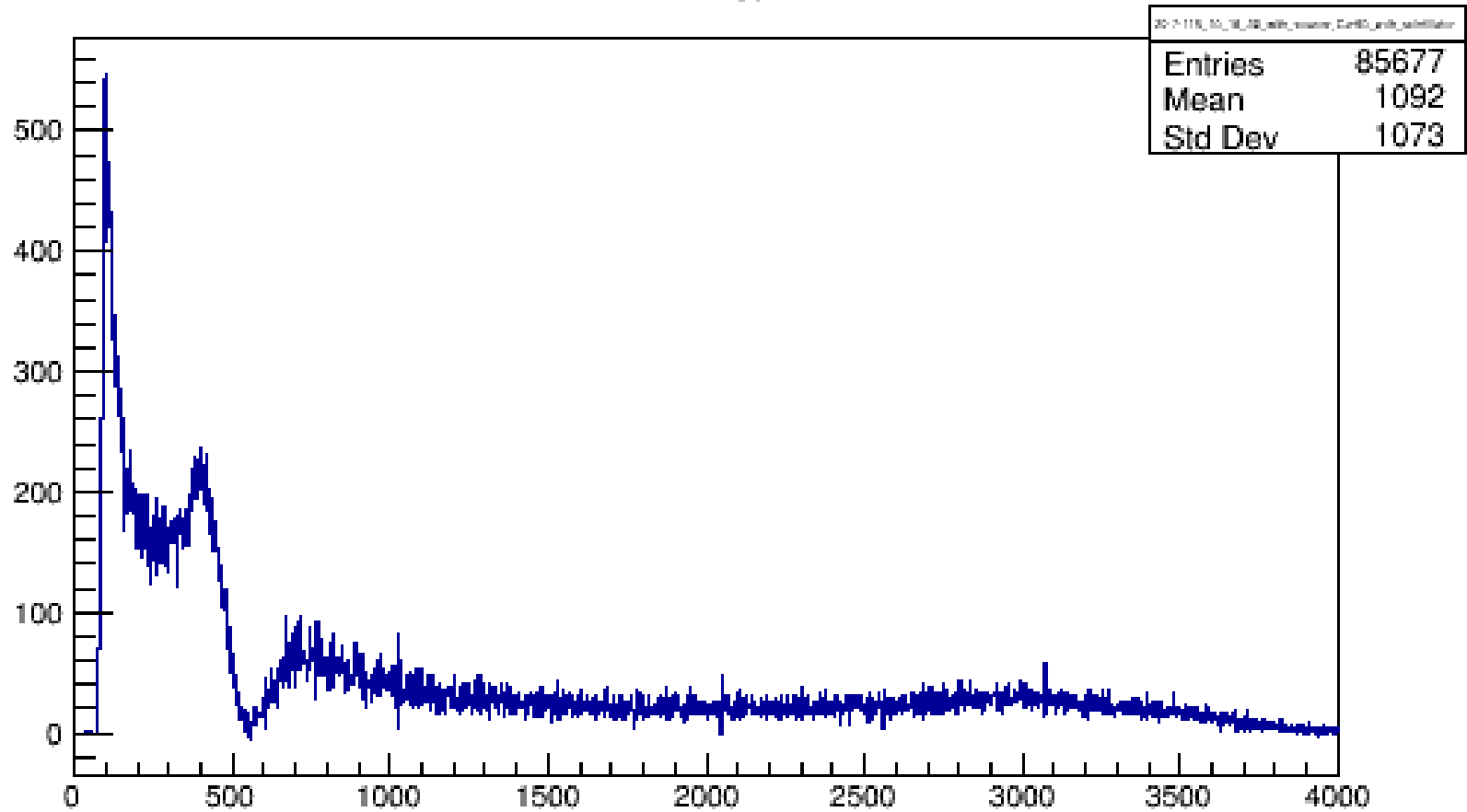
Background

Energy



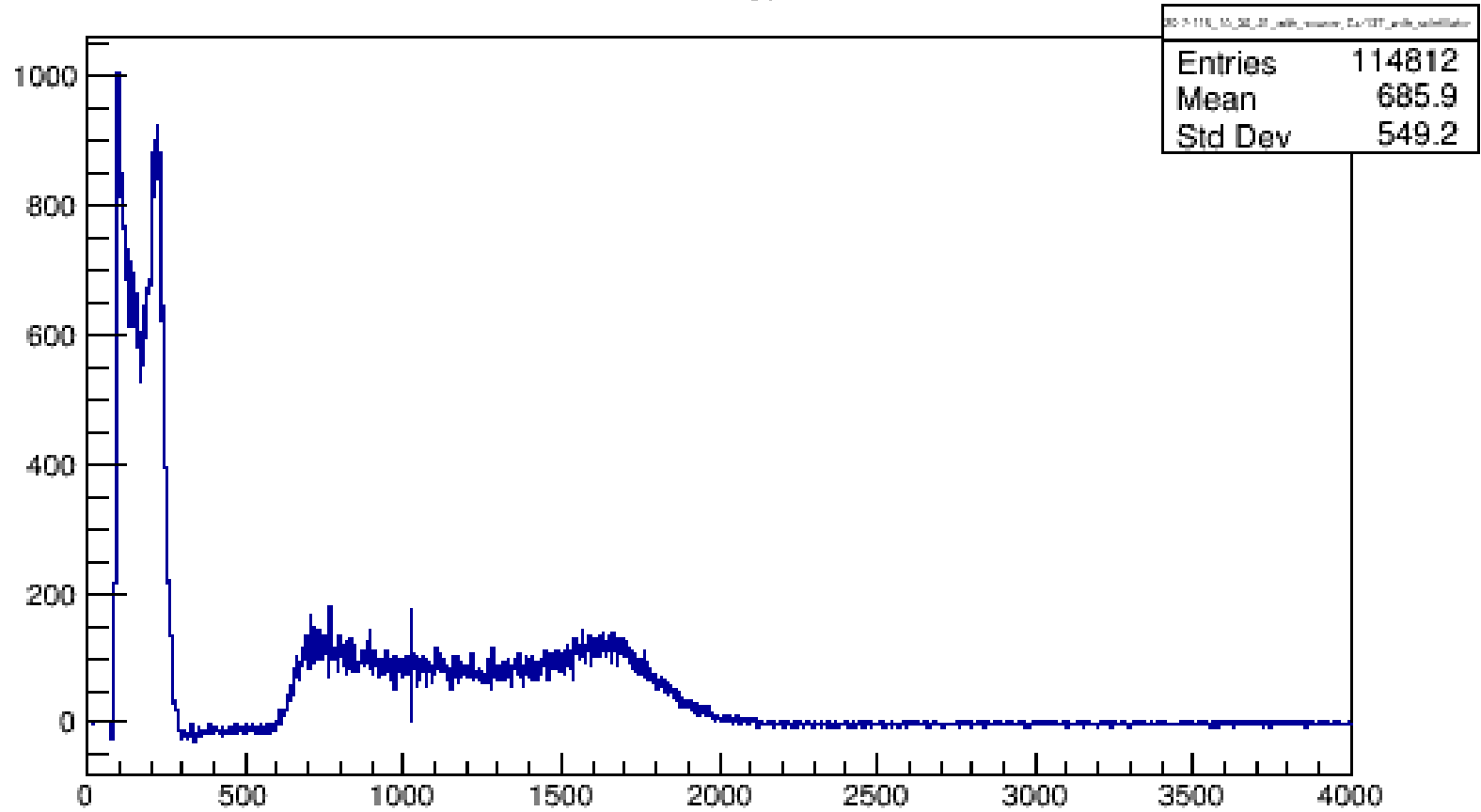
Cobalt

Energy



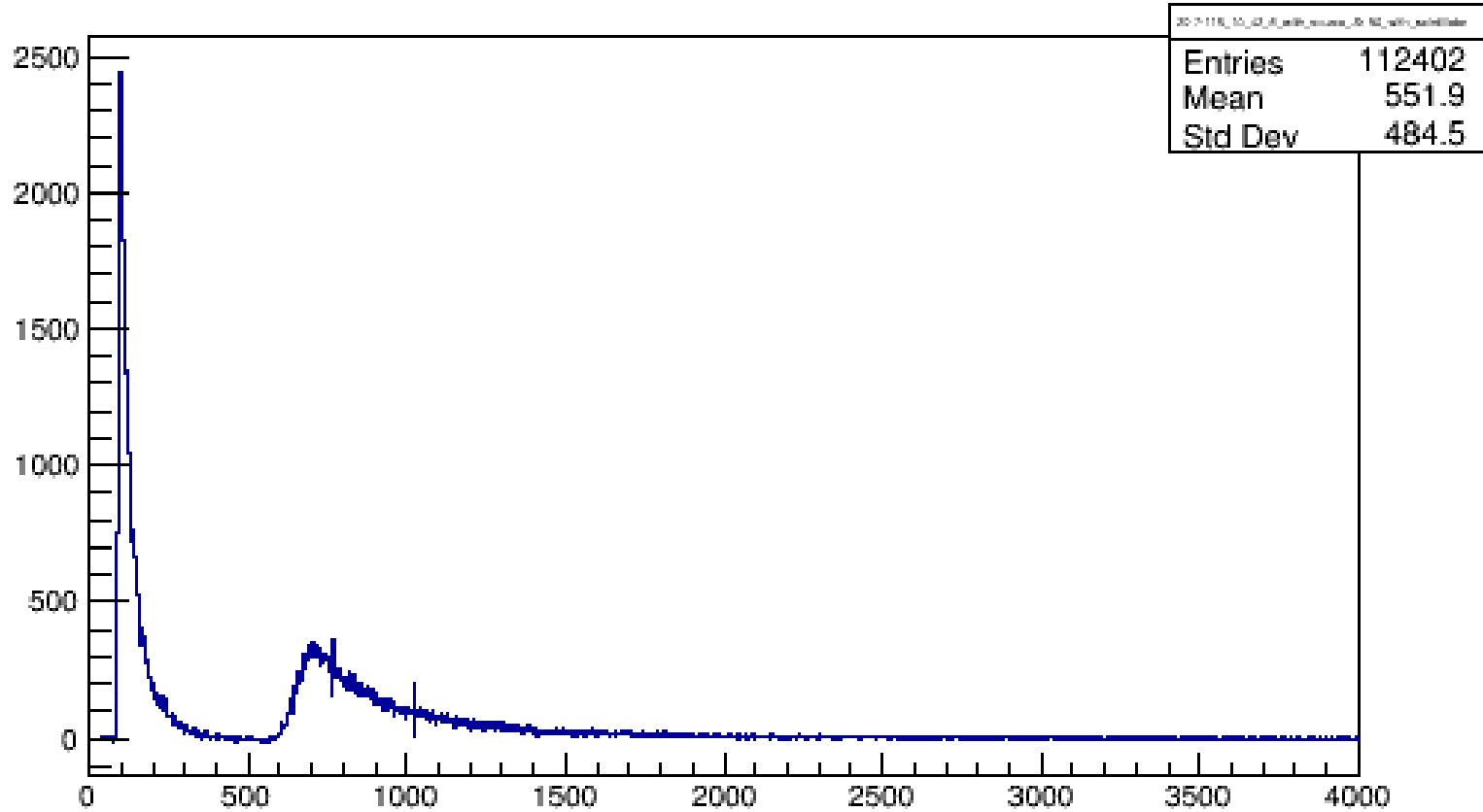
Cesium

Energy



Strontium

Energy

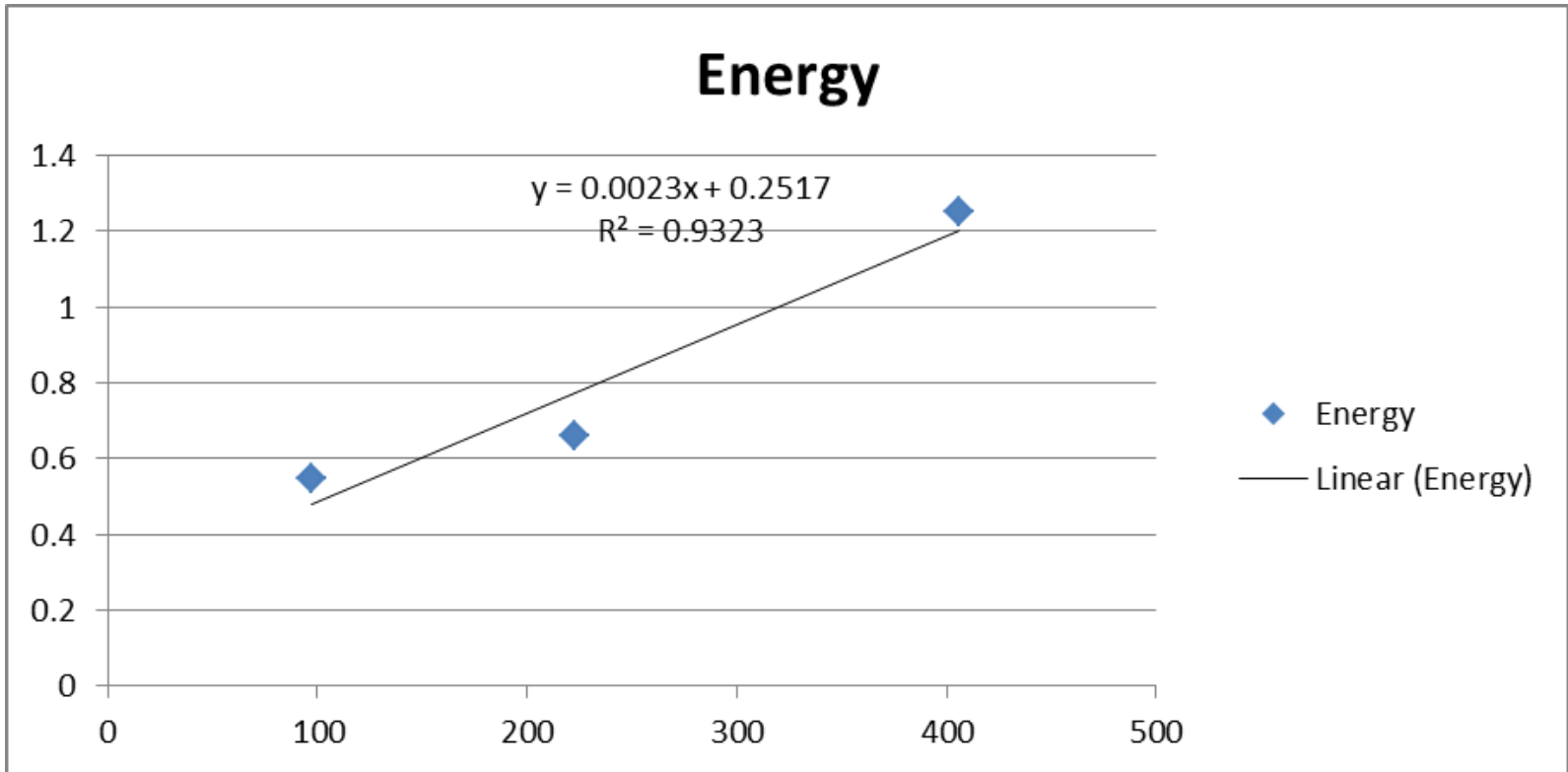


Preliminary Lab results

- From Co60, Cs137, and Sr90 a Linear fit was derived

| Seen | Observed | Source |
|------|---|--------|
| 406 | 1.25 | Co60 |
| 223 | 0.662 | Cs137 |
| 97 | 0.546 | Sr90 |
| Rule | $\text{True} = 0.0023 * \text{observed} + 0.2517$ | |

Preliminary Lab Results



Future Work

- First Goal: Try out new CAEN v1743 ADC
- Understand readout, and do calibration on CERN data
- Study single photon efficiency
- Test the behavior of the PMT in an Magnetic field, using a Helmholtz coil
- Eventually get to ~50 PMTs continually taking data while CERN is active
 - Sub plan: make a GUI for the code I have written for the VME

Works Cited

- [1] R. Essig, J.A. Jaros, W. Wester, P.H. Adrian, S. Andreas, *et al.*
- [arXiv:1311.0029](https://arxiv.org/abs/1311.0029) (2013)
- [2] Andrew Haas, Christopher S. Hill, Eder Izaguirre, Itay Yavin, Looking for milli-charged particles with a new experiment at the LHC, Physics Letters B, Volume 746, 30 June 2015, Pages 117-120, ISSN 0370-2693, <http://dx.doi.org/10.1016/j.physletb.2015.04.062>
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