Gain Calibration of Multi-anode Photomultiplier Tubes

Paul Karchin, Alfredo Gutierrez and Brian Jankowski
Wayne State University

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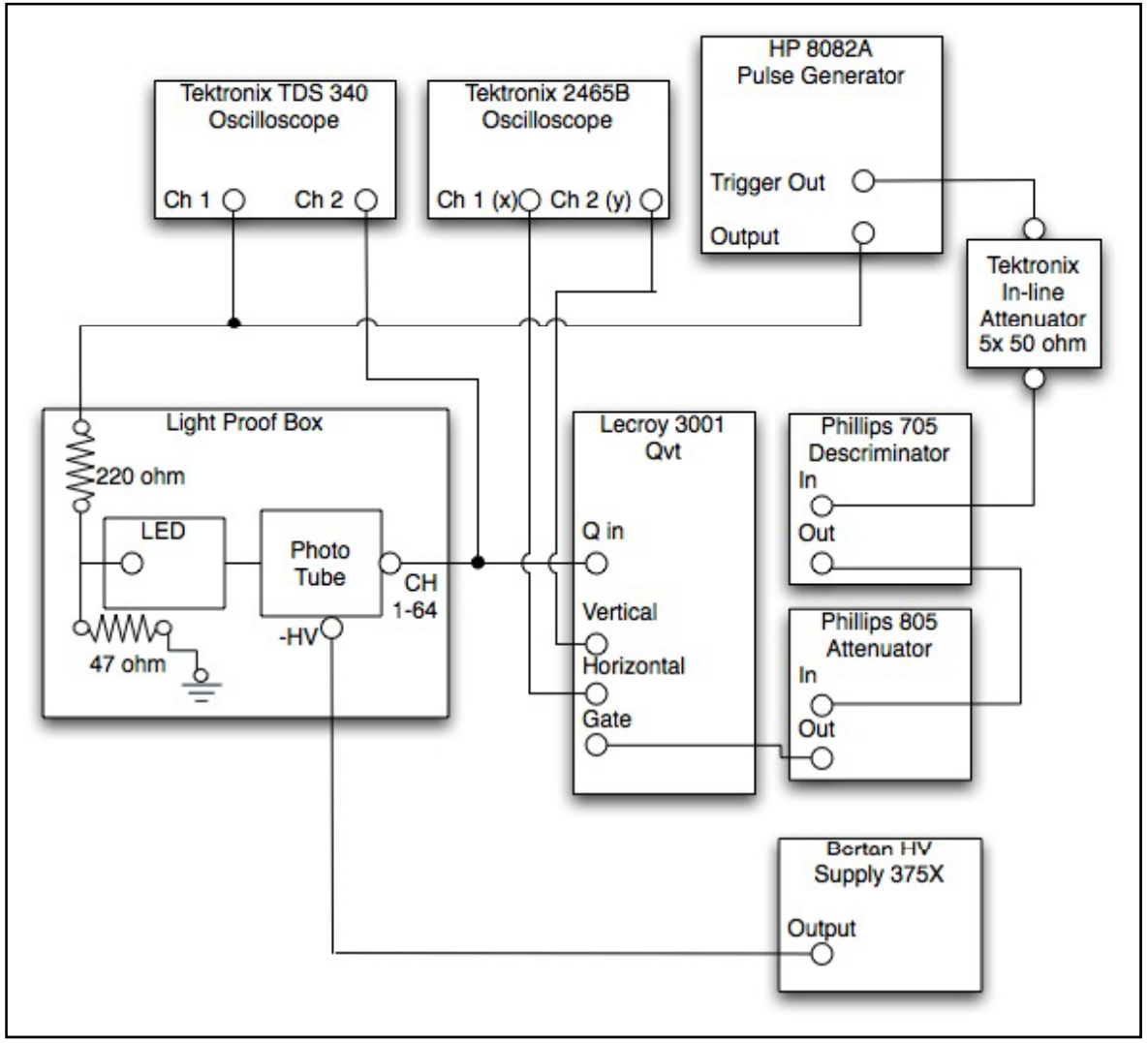
Goals

- Hamamatsu MAPMT as baseline readout
- Calibrate gain of each channel
- Absolute and relative gain

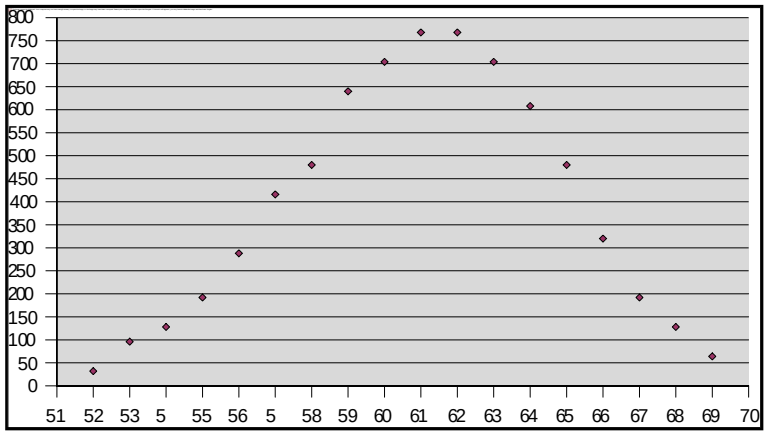
Method

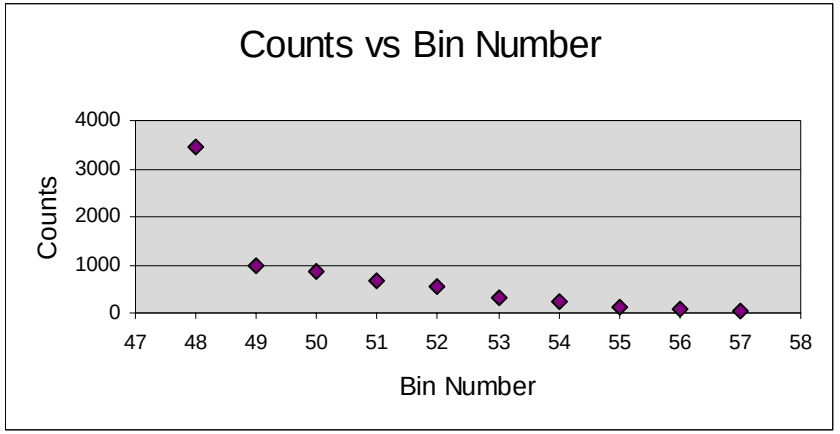
- Fast (10ns) light pulse from LED
- record pulse charge distribution with LeCroy QVT
- extract PMT gain and mean # pe (npe) from charge mean and variance assuming Poisson statistics
- Vary LED pulse amplitude and MAPMT HV

Calibration Instrumentation



MAPMT Charge Distributions





Large mean # pe

Small mean # pe

Gain and npe determined assuming Poisson statistics

Two Methods:

- charge mean and variance (width method)
- pedestal to total charge ratio (pedestal method)

Results

- pedestal and width methods agree within about 10%
- gain = 700,000 for npe = 1 but gain = 450,000 for npe = 10
- Same tube calibrated independently at Univ. Bern
- WSU and Bern gain measurements same with npe approx. 10 and HV approx 800. v.
- typical spec-sheet gain is 300,000 at 800 v

Conclusions & Outlook

- npe and gain values are reasonable
- Gain dependence on npe was not expected – is this a mis-measurement or real?
- Camac readout of QVT will speed future measurements