

PMT Gain Study

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PMT Specifications

■ Hamamatsu R5912

Parameter	Description/Value	Unit
Spectral Response	300 to 650 (420 max)	nm
Photocathode Material	Bialkali	-
Window Material	Borosilicate glass	-
Dynode	Box and Line (10 stages)	-
Max Supply Voltage	1800	V



Measuring Gain

1. Pulse PMT with blue LED
@ 100 Hz
2. Record mean (μ_v) peak
height and standard
deviation (σ_v) of output
voltages, and $\int Vdt$ over
6000 triggers
3. Repeat for different input
voltages

G : Gain

N_s : Number of secondary electrons

N_p : Number of primary electrons

$$G \equiv \frac{N_s}{N_p}$$

$$\mu_v = CGN_p$$

$$\sigma_v = CG\sqrt{N_p}$$

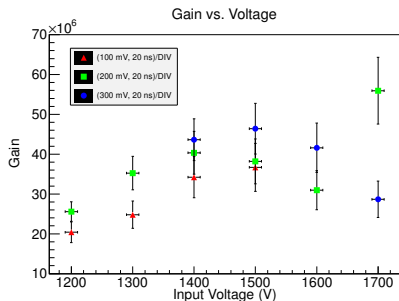
$$\Rightarrow N_p = (\mu_v/\sigma_v)^2$$

and

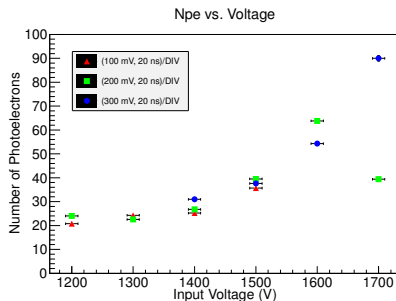
$$N_s = \frac{\int Vdt}{eR}$$

$$\Rightarrow G = \frac{\int Vdt}{eR} \left(\frac{\sigma_v}{\mu_v} \right)^2$$

Results I

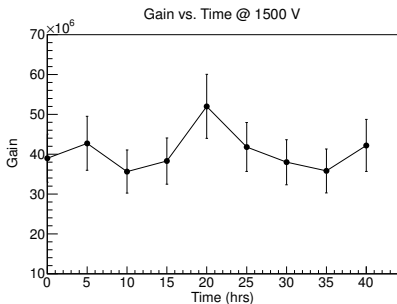


- Gain measurement over 3 oscilloscope resolutions

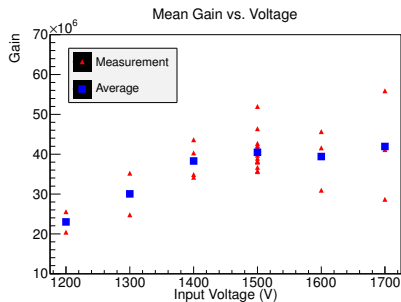


- N_{pe} as a function of input voltage

Results II



■ Gain fluctuation at constant voltage



■ Average gain over all measurements