

High Voltage Control based on Raspberry Pi

Group 2



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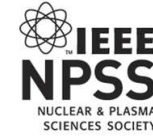
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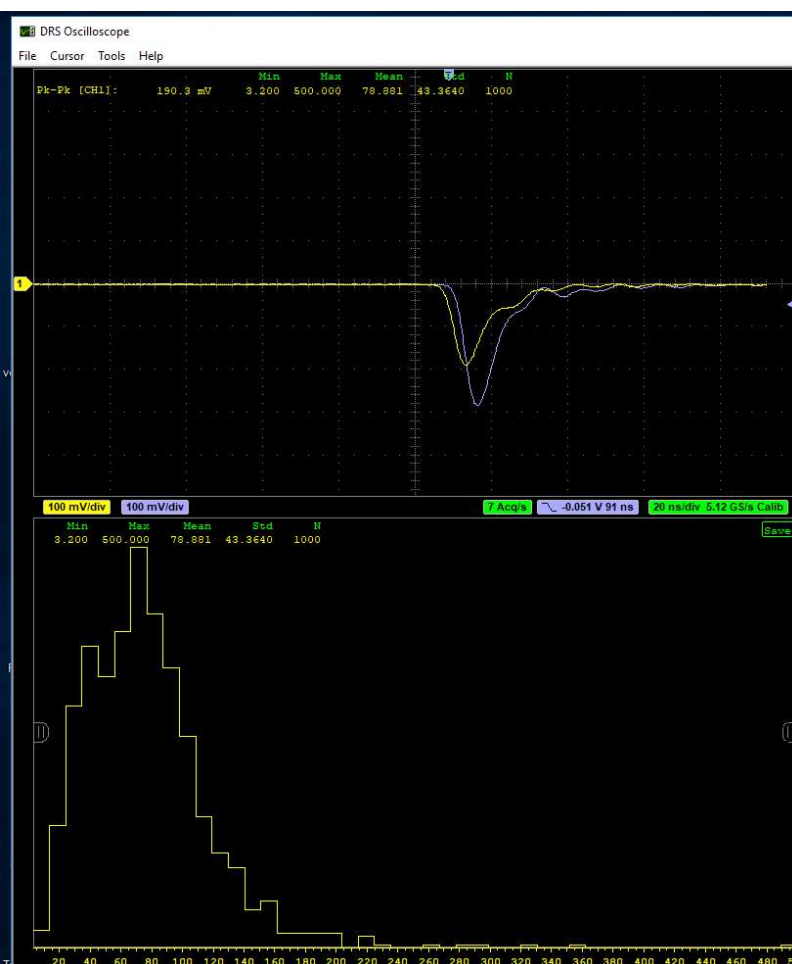
Outline

- Motivation
- Methodology
- Results
- Discussion of results
- Conclusion

Motivation

- The objective of the experiment was to use a Raspberry Pi and web technologies to control the high voltage input to PMT tube of large neutron detector.
- To observe how voltage variation impacts the sensitivity of scintillator radiation detector towards cosmic radiation.

Discussion



Select Measurements

CH1 CH2 CH3 CH4

Amplitude

Level	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Peak-Peak Amplitude	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
RMS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vertical slice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gated charge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Time

Frequency	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Period	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rise time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fall time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Positive width	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Negative width	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CH(x-1)-CH(x) delay	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Horizontal slice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Display Statistics Display Histograms

Accumulate 1000 measurements

Clear

Display Indicators

Close

Configure Trigger

CH1 CH2 CH3 CH4 EXT

Trigger logic

OR OR OR OR OR

- OR -

AND AND AND AND AND

Enable Transparent Trigger

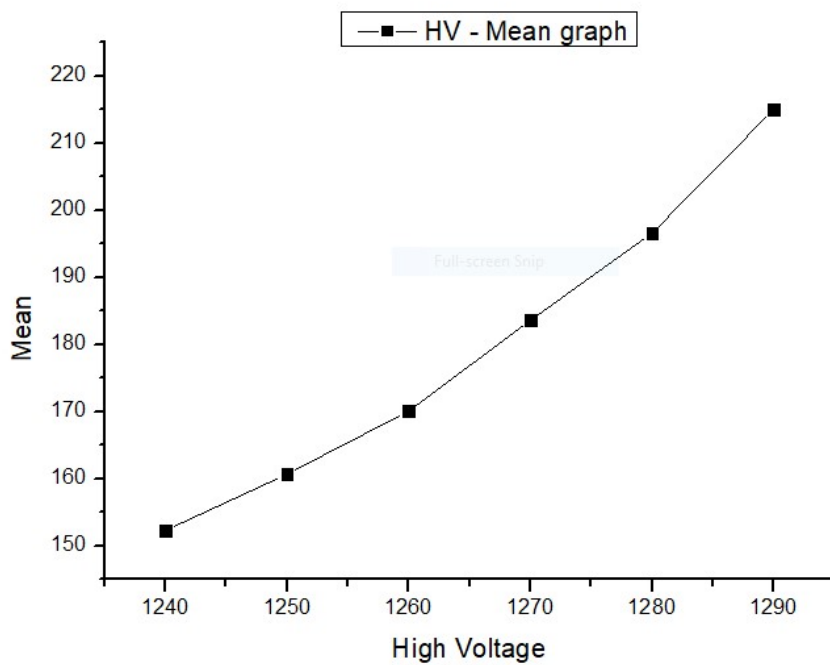
Trigger level

-0.067 -0.050 -0.067 -0.067 Volt

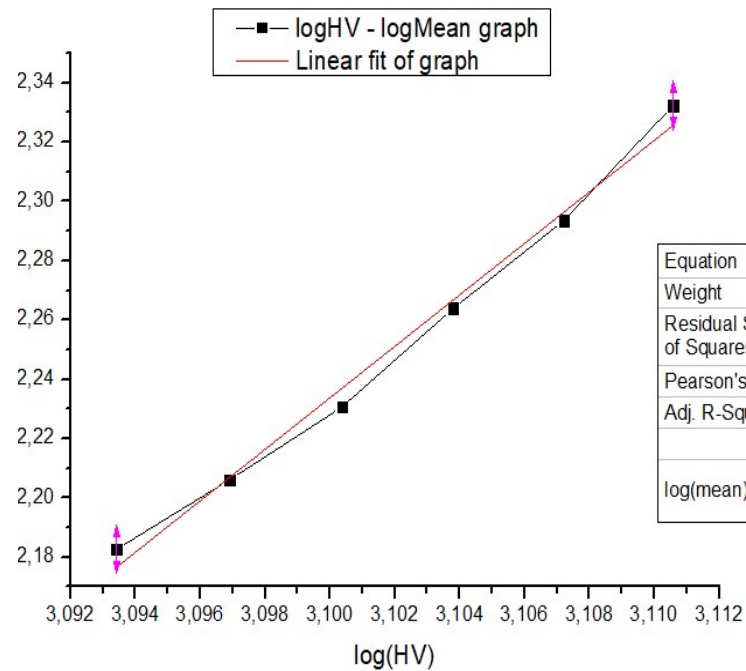


Results

$$A = a(E)^k$$



$$\log(A) = \log(a) + k \cdot \log(E)$$



Equation	y = a + b*x		
Weight	No Weighting		
Residual Sum of Squares	1,38884E-4		
Pearson's r	0,99556		
Adj. R-Square	0,98894		
		Value	Standard Error
log(mean)	Intercept	-24,67988	1,27256
	Slope	8,68183	0,41023

Conclusion

- Raspberry Pi can play a huge role in physics experiments, especially in web based remote control of high voltages and data acquisition.
- Based on the obtained results, the calculated value of k was found to be $k = 8.6$, hence the photomultiplier is sensitive to detect a weak signal.
- The results show that the photomultiplier had clipping, above threshold, which was $1.29\text{kV}_{\text{dc}}$.
- The k value matches the range of 8-9.5 in order for the multiplier to have a good gain.