

Experiment – 1

Objective : Study of Geiger-Muller Counter and counting statistics by γ -ray source.

Sources : γ -ray source

Scope of Expt : (i) Draw the operational characteristics curve of the counter, showing threshold, operating voltage and the onset of break-down. There should be at least 10 points on the curve.

(ii) Study the distribution curve of the counts from radioactive decay. Find mean value and standard deviation (σ). Take at least 200 ~ 250 points.

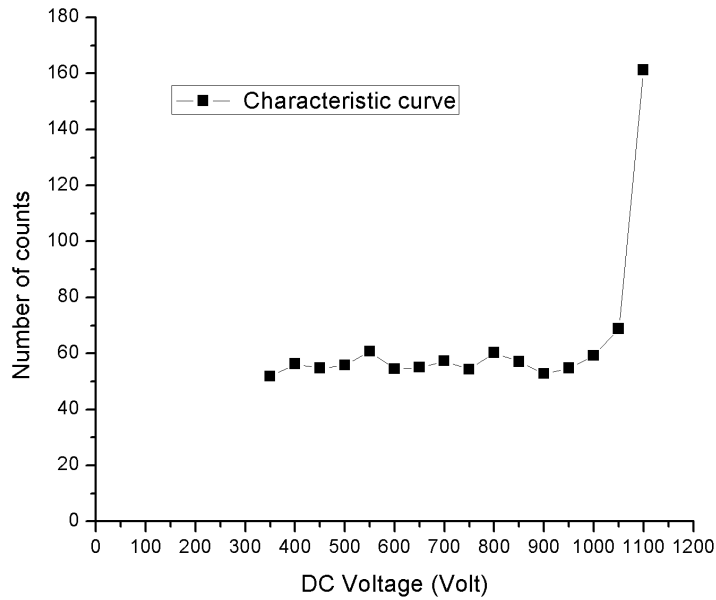
Theory : Write theory for GM counter in details.

Operational characteristics curve of GM Tube.

- (i) Set counting time for 30 sec or more. Set no. of run as 1.
- (ii) Set your source in slot 4.
- (iii) Set your HV to 0 by turning the HV Pot and then RUN. Note your counts. This is RUN-1
- (iv) Repeat the same for RUN-2 and note down your counts.
- (v) Increase your HV in a step of 50 and take RUN-1 and RUN-2. Note it down.
- (vi) Repeat (v) in a step of 50 [from 0 to 250], step of 20 [from 250 to 350], step of 50 [from 350 to 950], and step of 20 [from 950 to 1100 or 1120].
- (vii) Make proper table and draw the graph.

HV	No of Counts		Average Counts		HV	No of Counts		Average Counts
	Run-1	Run-2				Run-1	Run-2	
0					650			
50					700			
100					750			
150					800			
200					850			
250					900			
270					950			
290					970			
310					990			
330					1010			
350					1030			
400					1050			
450					1070			
500					1090			
550					1110			
600					1120			

Characteristic Graph :



Study of distribution curve of the counts :

- Set operating voltage as HV = 650 V (middle of the flat portion of graph)
- Set counting time for 10 sec or more. Set no. of run as 1.
- Keep the source at 3rd slot
- Start counting and note down the counts.
- Repeat (iv) atleast 100 or 200 times.
- Make a table: No of counts vs Frequency of counts.
- Plot No of counts vs Frequency of counts and fit it with a **Gaussian distribution**

$$F(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$$

No of Counts	Frequency Of counts	No of Counts	Frequency Of counts
39	11	46	17
40	9	47	9
41	13	48	11
42	4	49	12
43	13	50	7
44	7	51	6
45	14	52	4

