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OPERATING INSTRUCTIONS

G.M. COUNTER

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OPERATING INSTRUCTIONS
G.M.COUNTER

DESCRIPTION

The instrument consists of E.H.T. Power Supply variable 150v to 1100 volts, counting system, G.M.Tube and Beta Source. The Power Supply, Counting System and presetable timer with three digit display . System is workable on 220v 50Hz.

The Description of various control are as follows.

AC/ON:-

This switch is to ON the instrument after plugging in A.C.Mains 220v,50Hz situated at the back side . Light in counter indicate its ON position.

E.H.T CONTROL :-

These are two potentiometers marked COARSE & FINE continus variable from 200v. to 1050 volts. The potential is available on sockets in back of instrument marked G.M. TUBE.

TIMING SET :-

This is an presetable timer can be set for 99.9 sec. by pushing down little buttons , time set is displayed in white digits. The time count down is displayed in window with Red LED display.

PUSH SWITCHs :-

RESET :-

As soon as this switch is pressed for 1 sec. the counter system set to zero and ready to take fresh reading. Before use press this switch so that any reading stored is washed out.
Press RESET switch for 5sec. for Old reading.

START:-

This will start counting system only after pressed .

STOP :-

This will stop the counting process if needed , for critical stop.

DIGITAL MULTIMETER :-

A Digital multimeter is provided with the insturment to check the E.H.T. given to G.M.TUBE across the Sockets provided for High voltage at front panel. Use Multimeter at 1000 volts D.C. , Disconnect Multimeter before Pressing Start button , to avoid any loading efect on G.M.Tube voltage.

SPECIFICATIONS

G.M. TUBE Specifications

Operating Voltage = 450 to 1000 volts.
TUBE Number = 120

COUNTING Specifications

PARALYSIS TIME	: 1 to 99.9 Sec. Presetable
RESOLVING TIME	: 0.1 sec.
PRESET TIME	: 1 to 99.9 sec.
DISPLAY	: 6 DIGIT L.E.D.
E.H.T. CHECK POINTS	: Red Sockets on back side . Voltage is checked on Digital Multiemter across Sockets at front panel .
DIMENSIONS	: 12 X 12 X 5 Inch.(Aprox.)(only counter)
WEIGHT	: 8kg. (Approx.)

GENERAL INFORMATION GEIGER-MULLER TUBE

Geiger-Muller radiation counted Tube (G.M.TUBE) are intended to detected Alpha particulars, Beta particulars, Gamma , or X-radiation.

G.M.TUBE consists of basically an electrode at a positive potential(anode) surrounded by a metal cylinder at a negative potential(Cethode). The cathode forms part of the envelope or is enclosed in a glass envelope. Ionizing events are initiated by quanta or particles entering the tube either through the window or through the cathode and colliding with the gas molecules.

The gas filling consists of a mixture of one or more rare gases and a quenching agent.

Quenching is the termination of the ionization current pulse in a G.M.TUBE . Effective quenching gas properties and the value of the anode resistor.

Tube sensitivity at extremely high close rates.

At dose rate exceeding the recommended maximum, a G.M.TUBE will produce the maximum number of counting pulses per second , limited by its dead time and the circuit in which it is incorporated.

However due to the characteristics of a specific circuit, the indicated counting rate may fall appreciable , even to zero.

If dose rate exceeding 10 times, the recommended maximum for window tubes, or 100 times for cylinder tubes are likely to be encountered . It is advisable to use a circuit that continuously indicate saturation.

STORAGE LIFE:-

If stored in a cool dry place, free from continuous or severe vibration, there is hardly any deterioration in the tube's Characteristics. A storage life of years is not unusual.

WARNING:-

Generally, life end of a G.M.TUBE is indicated by an increasing slope and shorter plateau. For older tubes, operation is recommended at the first third of the plateau.

OPERATIONAL LIFE :-

The operational life of a G.M.TUBE is expressed in counts(Discharges). Theroretically the Quenching gas, ionized during a discharge , should be recombined between discharges.

However minute qualities will be chemically bound , no longer taking part in the quenching process. This will lead to a gradual reduction of the plateau length and for a given working voltage to an increased counting rate. This will be culminate in a continuous state of discharge of the tube rendering it useless.

Apart from the accumulated number of counts registered the ambient temperature during operation is of prime importance to the life of the tube . Temperature above 50°c changes in the gas mixture may occur, possible reducing the total numbers of count attainable. Short periods of operation(Not exceeding 1H.) upto approximately 70°c should not prove harmful, but life will progressively decrease with increasing temperature.

Thus , depending on application and circumstances , the quenching gas could exhausted in as little as a few hours or theoretically last for may year.

For these reason G.M.TUBE cannot be guaranteed unconditionally for a specified period of time.

IMPORTANCE PRECAUTIONS FOR USINg G.M.TUBE

1. Handle the G.M.Detector with extreme care.

2. Hold it in the middle of the body.

3. Do not touch the end window with finger.

4. Mount the detector carefully in the circular ring adaptor and place it in the G.M.Stand.

5. Connect the G.M.Detector leads with proper polarities. The central Anode pin to RED (+)Bannana plug and cathode wire lead to Black (-) Bannana plug. Reverse connection if done will damage the tube.

6. **DO NOT TOUCH THE GM TUBE.**

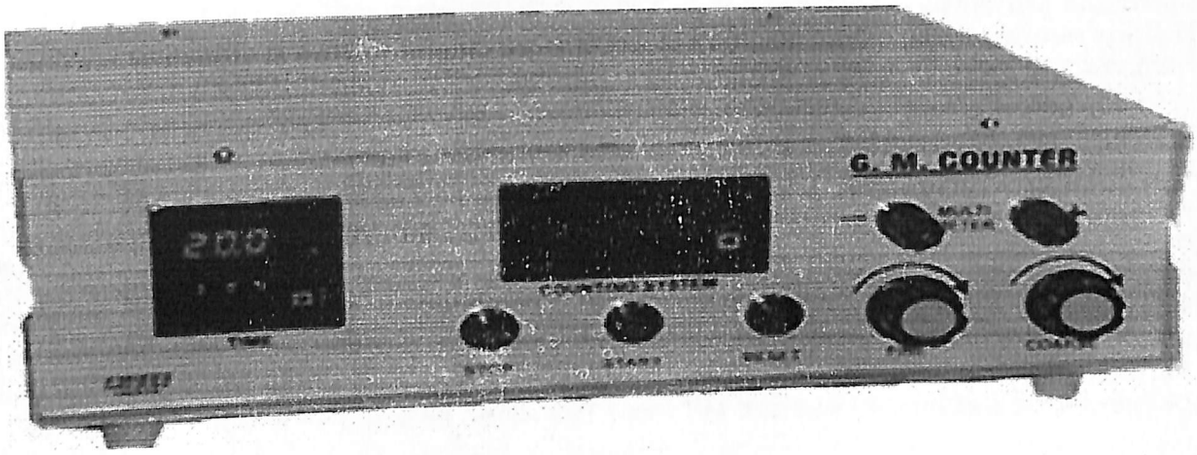
7. Always keep the G.M.Detector in the stand only . When you are not using for experiments keep it in a sperate place along with G.M.Stand by disconnecting the cable.

8. When you switch ON and OFF G.M. Counting system ensure EHT dial to be at minimum position.

9. **One Year Warranty is not applicable for G.M.Detector.**

10. Do not drop it or give jerks.

CAUTIONS :- 220 v 50Hz. or LEss voltage give incorrect results .HIGH VOLTAGE more than 230v 50Hz. may damage the instrument & Tube.



FRONT PANEL

Characteristics of G.M. Counter

Aim: To study the characteristics of the Geiger Muller (GM) counter and hence to determine its operating voltage.

Apparatus: - Geiger Counting System (GCS), GM tube and a radioactive source.

Principle: - When a gamma ray (or a charged particle) enters the gas filled GM tube, it ionizes the gas inside it and the electric field applied between the electrodes drifts the electrons towards the anode. The electrons thus collected at the anode are counter for various applied voltage using Geiger Counting System. A graph is plotted for applied voltages Vs corrected counts (N-N$_b$) and hence the operating voltage is determined from the graph.

Procedure: -The Geiger Counter System is connected to the GM tube, which is mounted on a stand (vertical mount). The radioactive source is placed in the source holder at a distance of about 5cm from the tube. The GCS is switched on and the counter is reset to zero. The high voltage is increased slowly from minimum until the counting just starts. This threshold voltage is noted. The preset time is set to be 20 seconds and the number of counts for this voltage is recorded. Now, the voltage (V) is increased in steps (say 20V) and the number of counts (N) is recorded every time. Increasing the voltage is stopped when the count rate suddenly increases. Any further increase in voltage may damage the GM tube. The number of count starts decreasing at this point. In this particular case the voltage should not be increased more than 650V.

The voltage is checked on digital multimeter at range 1000V D.C. after every setting, before taking readings the meter lead is disconnected so as to avoid unnecessary load across the G.M Tube

By removing the radioactive source, the background count (N$_b$) is recorded for 20 seconds.

A graph is plotted for applied voltage (V) Vs corrected count rate (N-N$_b$). The threshold voltage and the limits of the Geiger plateau are marked. The midpoint of the plateau region gives the operating voltage of the tube. The tube must always be operated with this voltage when it is used.

Result: -

i) Threshold voltage = ...V

ii) Operating voltage =.....V

1) Reset Counter after every set of reading by pressing reset switch.
2) Take Out, Beta Source after every reading with the help of fork.
3) Do not hold Beta Source with fingers directly or put it in vicinity to human body.

Graph: -

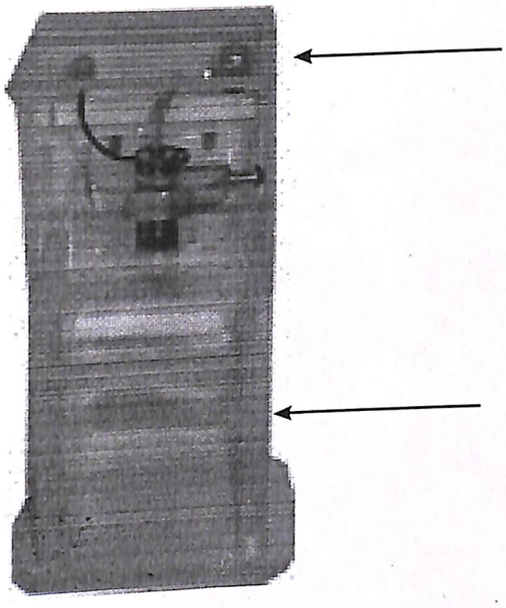
OA = Threshold voltage

BC = GM plateau

OD = Operating voltage

Reading from GCS

Background counter for 20s, N$_b$ = _____



Radioactive source

INSTRUCTIONS FOR HANDLING AND WINDOW G .M. DETECTOR

* Hold the detector with body in the middle only.

* Do not touch the End Window With finger. You may rupture the end window, thus damaging it permanently.

* Carefully takeout the detector from the packing box and GM Tube Stand with help of detector holder given with the stand .

* Now connect the detector Red Socket to Red Socket of GM COUNTER and Black with Black.

* Do not interchange or reverse connect these leads. if you reverse connect these leads you will demage the detector permanently.

* Once mounted into the stand, keepit and do not remove frequently. After use ,keep the G.M stand with detector together in a safe place.

* Do not operate the detector in the DISCHARGE for a long time. life will be reducted and detector may fail if you operate for long time.