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# GEIGER-MULLER COUNTER

The hardships of dealing with radioactive materials is supplemented by the fact that their emissions are invisible and notoriously difficult to detect. This is why we cannot detect them conventionally. One solution is to somehow convert these invisible immeasurable quantities into detectable and measurable ones. This is exactly what a Geiger counter does.

## WORKING PRINCIPLE

A Geiger meter passes radioactive elements through an inert gas inside the machine. Due to their polar nature, radioactive particles ionize the gas they are dispersed in. The resulting ions can be easily detected relative to radioactivity itself. This is the working principle of the device.

## SETUP

A Geiger counter is a metal cylinder sealed in by a ceramic or mica window at one end. The thin films allow the radioactive particles in the surroundings to permeate it easily.

## METAL WIRE / ANODE

Running down the tube is a thin metal wire, usually composed of tungsten.

## ANODE

The end of the metal wire is connected to a large power supply at the other end, which accumulates a large positive charge. This end acts as a positive electrode - an anode.

## CATHODE

The curved surface of the metal tube acts as the negative electrode - the cathode.

## WORKING

### 1. IONIZATION

The cylinder is filled with an inert gas, such as Neon or Argon. As radioactive particles pass through, they ionize this gas. Positive and negative ions pop all around the cylindrical tube. Negatively charged electrons are instantly attracted to the anode, while the positive ions are repelled by the large positive charge and flow towards the cathode. Moreover, as the electrons move down the gas, they collide into more atoms, causing

a chain reaction of ionization that produces more ions and electrons. This is called Geiger discharge.

## GENERATION OF ELECTRIC PULSE

Subsequently, many electrons will arrive at the anode, generating a pulse of electricity that is measured on a meter.

Each pulse from the tube is calibrated to a count. Counts per second give an approximation of the strength of the radiation field. Counts can be read by a user via a visual readout. Visual readouts can be electric LCD screens.

The wire can also be connected to amplifiers and a loudspeaker to generate the famous "clicks" associated with Geiger meters.

## LIMITATIONS

Cheaper counters can detect gamma and beta rays, whereas the expensive ones detect alpha rays as well. However, one limitation of using this device is its inability to distinguish b.w these radiations ~~between~~ bcz the output pulse is of the same magnitude, regardless of the energy of the incident radiation.