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GEIGER COUNTER

The Geiger counter is a device used to measure ionizing radiation, and its operation is based on the ability of ionized gases to conduct electricity. The name of the device comes from the German physicist Hans Geiger, who developed this type of counter in collaboration with Walther Müller in the first half of the 20th century.

WORKING PRINCIPLE

The main component of the Geiger counter is the Geiger-Müller tube, a tube filled with gas at low pressure (about 0.1 atm), commonly helium or argon mixed with a small amount of alcohol or other gas to improve the efficiency of the device. The argon increases the movement of the electrons and the organic vapor allows the discharge to be cut off, limiting it to a very short duration (on the order of microseconds), which allows the counting of very close pulses.

The outside of the sensor is made of conductive material, the cathode, while the anode is an electrode, usually tungsten, which is located inside the tube. Both are connected to a high-voltage source and resistor in parallel with an amplifier and a digital counter. The tube has a window, normally made of a thin film of mica, through which ionizing radiation enters the tube (see Figure 1).

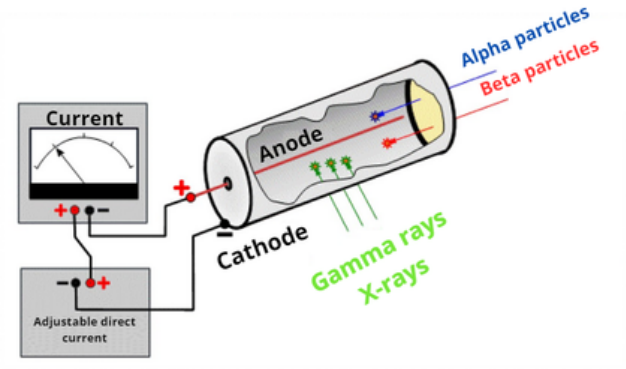

FIGURE 1. SCHEMATIC OF THE USE OF A GEIGER-MÜLLER TUBE. (CREDIT: WIKIPEDIA)

When the Geiger-Müller tube is exposed to ionizing radiation, the atoms of the fas inside the tube are ionized, i.e. they lose electrons and electron-ion pairs are produced. Wen electrical potential is applied between the cathode and the anode, the electrons move towards the anode and the ions move towards the cathode. If the voltage is high enough, the electrons released during the ionization of the gas acquire sufficient energy and generate more ionizations on their way to the inner electrode.

The electric current thus produced is detected by the counter.

In summary, each particle of ionizing radiation that enters the tube generates an electrical pulse. Recording the number of ionizing particles detected provides a measure of the intensity of the radiation.

FIGURE 2. FRONT (LEFT) AND SIDE (RIGHT) VIEWS OF THE GEIGER COUNTER IN THE AUGER VISITOR'S CENTER. (CREDIT: PIERRE AUGER OBSERVATORY)

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