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SPARK CHAMBER

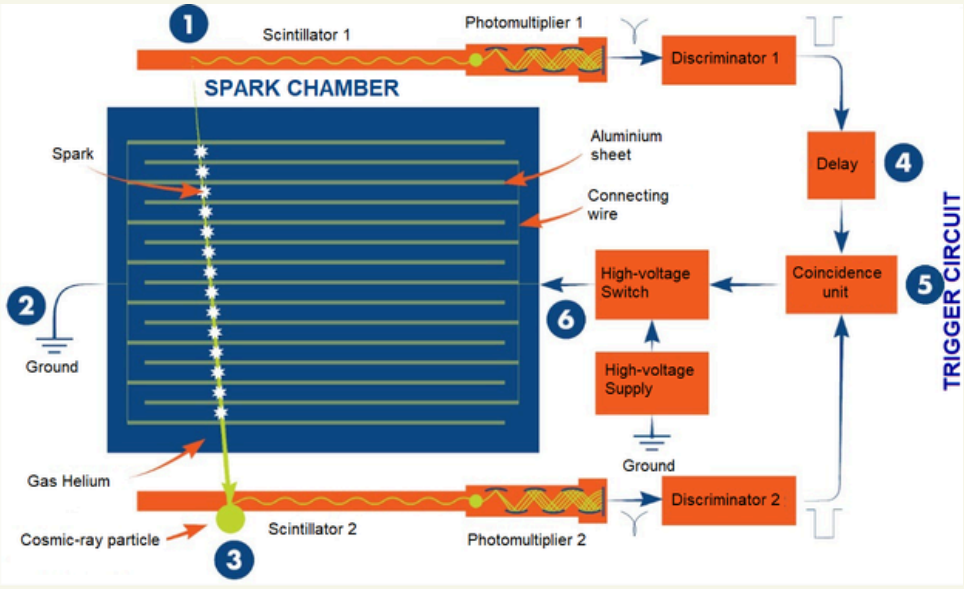
A large part of natural environmental radioactivity is due to cosmic rays, which come from space and are mainly atomic nuclei of hydrogen (protons), helium, carbon, oxygen, etc., accelerated to a very high speed. When entering the atmosphere, cosmic particles collide violently with atmospheric gas molecules and produce "atmospheric showers" or "atmospheric showers" of secondary particles. Some of these particles generated in the atmosphere, mainly muons and electrons, reach the ground and can be detected. The "Spark Chamber" is a device that allows the existence of these particles to be verified, at least those that have an electric charge. This equipment detects them and allows their trace or path that they followed to be visualized, thanks to the sparks that are produced in their passage.

WORKING PRINCIPLE

At the top and bottom of the chamber (see figure) there are 2 plastic scintillator plates (1 and 3). The chamber has several modules, formed by 2 parallel grounded plates (2) and a plate in the center, connected to a high-voltage generator (6). The chamber is filled with helium. When a charged particle, normally a muon, passes through the entire device, it ionizes the gas contained in the chamber and also causes the emission of light in the scintillators.

DESCRIPTION OF OPERATION

- The light from each scintillator plate is converted into an electrical signal; the two electrical signals arrive almost simultaneously. This coincidence is detected by a small electronic circuit that produces a very fast 8 kV pulse (depending on the design) transmitted to each electrode (5).



Spark Chamber diagram. The numbers are explained in the text. (Image modified from: Discovering particles: fundamental building blocks of the Universe)

- The central plate suddenly drops to -8000 V, and sparks can be formed where the gas has been ionized by the passage of the charged particle.
- The sparks align along the track and allow the particle's trajectory to be visualized, slightly delayed.
- After the passage of a muon, the chamber has a dead time, which is necessary to recharge the capacity of the electrical circuit made up of resistors and capacitors.

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