

Geiger counter

A Geiger counter is probably the most sensitive instrument you will come across at school. Each click you hear represents the radiation from the decay of a single radioactive atom.

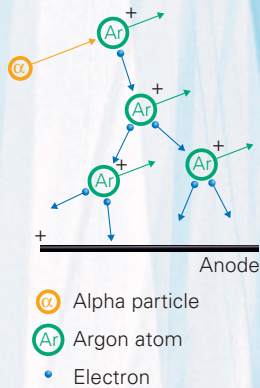
A Geiger counter detects all the alpha and beta radiation which enters the tube. It also detects some gamma radiation, but 98% of gamma radiation passes through it unaffected.



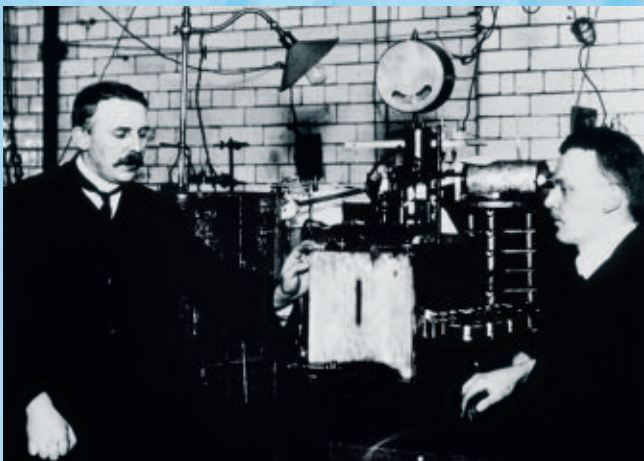
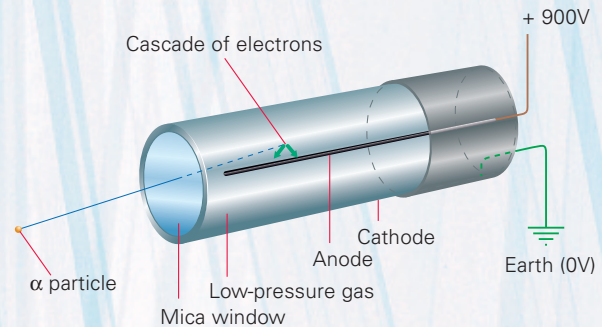
Philippe Psaltis/SPL

An alpha particle collides with an argon atom; an electron is knocked off the atom, and so the argon atom becomes a positive ion.

The electron is attracted towards the anode. If it collides with another argon atom, another electron is released. Each of these may then ionise more argon atoms. Eventually a cascade of billions of electrons reaches the anode. This flows as a pulse of current in the external circuit.

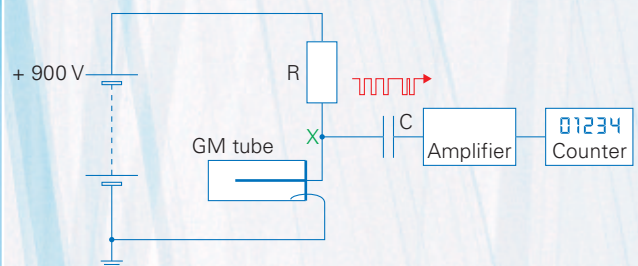


The Geiger-Müller (GM) tube is a metal or glass cylinder, which acts as the cathode. A central metal rod is the anode. At one end of the tube is a thin 'window' of mica. Radiation can enter the tube through this window. Inside the tube is a low-pressure inert gas, usually argon or neon.



Peter Fowler/SPL

Hans Geiger (right, inventor of the Geiger counter) and Ernest Rutherford (who discovered the structure of the atom) in their laboratory at Manchester University, about 1908



The GM tube and the resistor R form a potential divider. When radiation ionises the gas in the GM tube, its resistance drops. The voltage at point X drops. A sequence of pulses passes through the capacitor C to the amplifier and counter.