B.2.4 Soil sample identification

SG6143C

Difficulty	Execution Time	Data Analysis	Radioactive Sources
		YES	NO

Dedicated kit	
Description	pp.
SP5630EN Environmental kit	181

Requirements

No other tools are needed.

Equipment

SP5630EN - Environmental kit

Model	i-Spector - S2570B	Samples
Description	Intelligent Silicon Photomultiplier Tube	Samples

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Purpose of the experiment

Record the energy spectrum of the Soil sample and identify the peaks, after the energy calibration, by knowing the decay chain of Thorium and Uranium.

See the Application

Fundamentals

Natural radioactivity has several sources that can be classified into two broad categories: high energy cosmic rays incident on the Earth's atmosphere and releasing secondary radiation (cosmic contribution); and radioactive nuclides generated during the formation of the Earth and still present in the Earth's crust (terrestrial contribution).

The terrestrial contribution is mainly composed of the radionuclides of the uranium and thorium decay chains together with radioactive potassium. In most circumstances, radon, a noble gas produced in the radioactive decay of uranium, is the most important contributor to radiation exposure.

Natural radionuclides, both terrestrial and cosmogenic, migrate in the environment through different pathways: air, water, rock, soil, and the food chain. Radionuclides may then enter the human body through ingestion (food and drinking water) and inhalation giving the so-called internal exposure. External exposure is due to cosmic radiation and radiation from terrestrial radionuclides present in soil, rocks, and building materials.

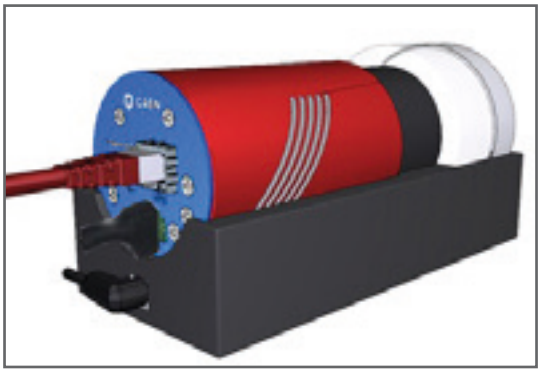
Carrying out the experiment

Put the i-Spector digital into the base and place the Soil box into the place-holder. Power on the i-Spector and connect the Ethernet cable. Wait until the temperature is stable from the web interface (it can take half an hour from power on).

Check the waveform, modify the threshold and gate width, if needed, then start the measurement of the energy spectrum.

More than 30 minutes of acquisition need with the Soil sample.

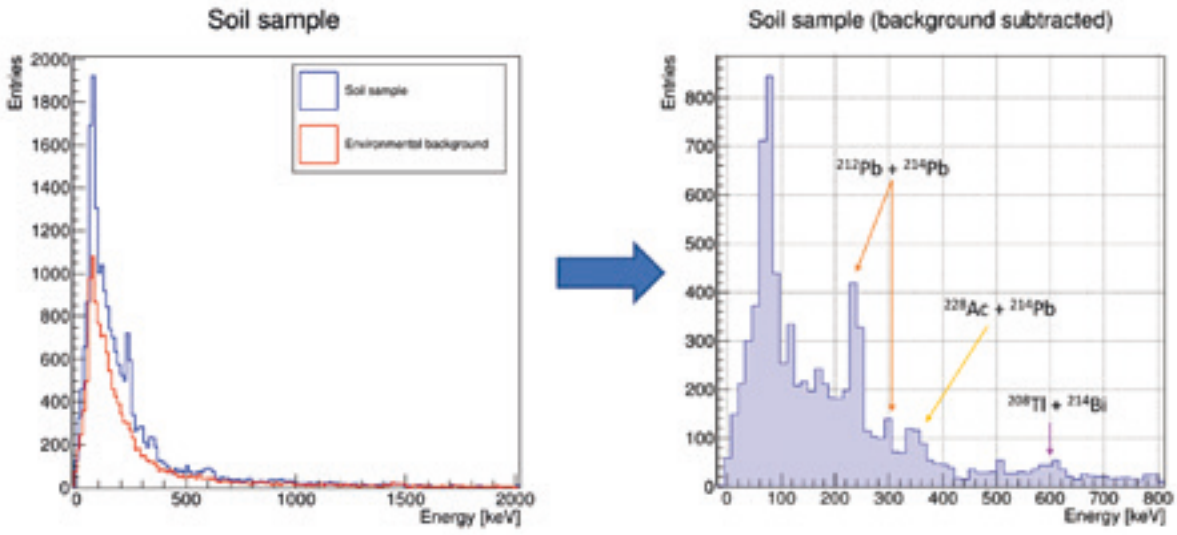
NOTE: in case of background measurement (ID.6141), settings and acquisition time must be the same. Lead blocks could help in distinguish clearer peaks but they must be used if just employed in background measurement only.



Experimental setup block diagram

Results

After the background subtraction, it is possible to recognize peaks coming from the Uranium or Thorium chain, as shown in the picture below.



Soil sample: total contribution and background on the left; background subtracted on the right. The visible peaks from the ^{238}U and ^{232}Th are highlighted in the spectrum.

This experiment is also possible with the following kits

E SP5630ENP
Environmental kit Plus
PREMIUM

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