

B.2.7 Radon passive measurement

SG6146C



Purpose of the experiment

Get familiar with radon passive measurements by taking care of the proper sample preparation and exposure, as well as of acquiring the spectrum to calculate the Radon concentration.

Fundamentals

Radon is a naturally occurring radioactive gas produced by the breakdown of uranium in soil, rock, and water. Radon can be dangerous since it accumulates inside houses or buildings. Air pressure inside your home is usually lower than the pressure in the soil around the building foundation. Because of this difference in pressure, the building acts like a vacuum, drawing radon in through foundation cracks and other openings. Additionally, building materials — such as granite and certain concrete products — can give off radon.

It is usually recommended to make screening measurements to have a quick estimate of the highest concentration and take action in case the measurement exceeds 4 pCi/L (or 100 Bq/m³), which is the limit for a non-dangerous exposure to this element.

Ordering Options

Equipment	
Code	Description
WK5630ENAAAA	SP5630EN - Environmental Kit
or the Kit Plus	
WK5630XENAAA	SP5630ENP - Environmental Kit Plus




Marie Skłodowska Curie was a Polish and naturalized-French physicist and chemist who conducted pioneering research on radioactivity. She was the first woman to win a Nobel Prize, the first person and only woman to win twice in multiple sciences. Together with her husband, she was awarded half of the Nobel Prize for Physics in 1903, for their study into the spontaneous radiation discovered by Becquerel, who was awarded the other half of the Prize. In 1911 she received a second Nobel Prize, this time in Chemistry, in recognition of her work in radioactivity. Radium discovery opened the door to deep changes in the way scientists think about matter and energy. She also led the way to a new era for medical knowledge and the treatment of diseases.

<https://www.aip.org/history/exhibits/curie/brief/index.html>



Equipment

SP5630EN - Environmental Kit

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

p. 138

p. 138

Requirements

No other tool is needed.



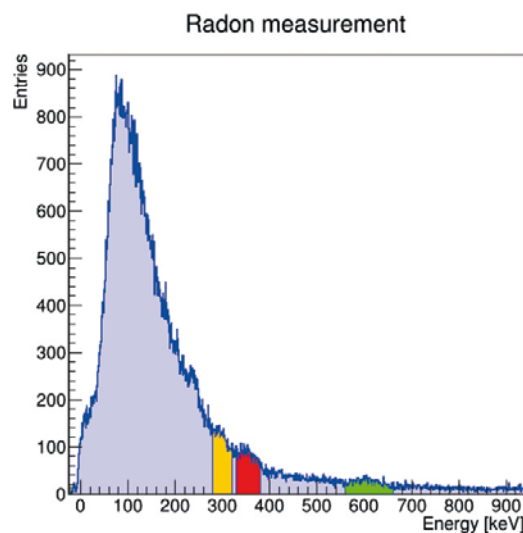
Experimental setup block diagram

Carrying out the experiment

Detailed instructions for this activity are reported in Sec. Error! Reference source not found. Error! Reference source not found.. Check the expiration date of the charcoal sample; if expired, or if the sample has already been used, bake it for some hours. Acquire the background spectrum with the i-Spector. Before starting the acquisition, make sure that the temperature is stable from the web interface. Once done, expose the sample for about 5-6 days, following the requirements of the closed house, and far away from wall, windows, etc., according to the Radon measurement procedure. Once ready, seal again the sample, wait at least three hours, and acquire the energy spectrum. Take few hours of acquisition with the exposed sample in the same condition of background acquisition.

Results

After the energy calibration and background subtraction, it is possible to select the region of interest (ROI) of the ^{214}Pb and ^{214}Bi decay products at 295 keV, 352 keV, and 609 keV. The counts can be used together with the calibration curves to calculate the Radon concentration. On request, Excel[®] spreadsheets examples can be provided to customers.



Radon spectrum: counts of the three ROI are summed and combined with the calibration curves. The result is $124 \pm 85 \text{ Bq/m}^3$. Longer acquisition time will improve the measurement resolution.