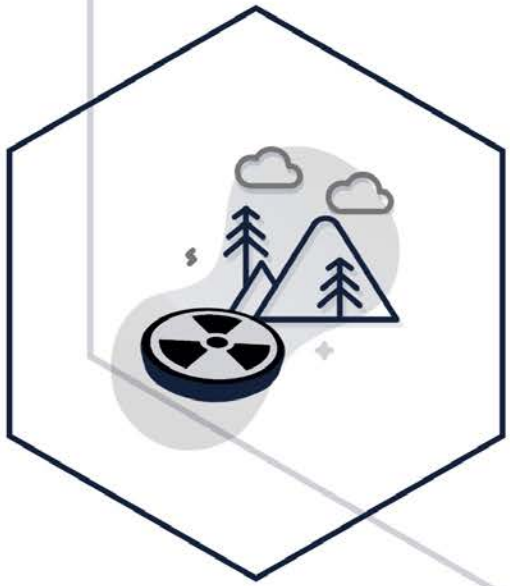
CAEN
Tools for Discovery

CAEN EDUCATIONAL
edu.caen.it



HANDBOOK OF EXPERIMENTS

SG6150E Environmental Radioactivity Outdoor

Environmental monitoring in field

Environmental radioactivity

EDUCATIONAL KIT

SP5640

CAEN S.p.A. · Via Vetraia 11, 55049 Viareggio (LU) Italy · www.caen.it — © 2026 CAEN S.p.A. All rights reserved.
Specifications are subject to change without notice.

CAEN EDUCATIONAL · SG6150E

Environmental monitoring in field

Categories: CAEN Experiments, Environmental radioactivity | Tags: Gamma detection, Gamma rays, Nuclear Physics, γ Spectroscopy

Difficult	Execution Time	Data Analysis	Radioactive Sources
		No	No

Hardware setup

This experiment guide is referred to the **SP5640** educational kit.

Equipment: SP5640 – Backpack Detector

Model	**SP5640**
Description	Backpack Detector

Purpose of the experiment

Increase of the familiarity with environmental radioactivity topic via measurements in field which combine nuclear engineering and computer science for a better comprehension of basic physics concepts.

Fundamentals

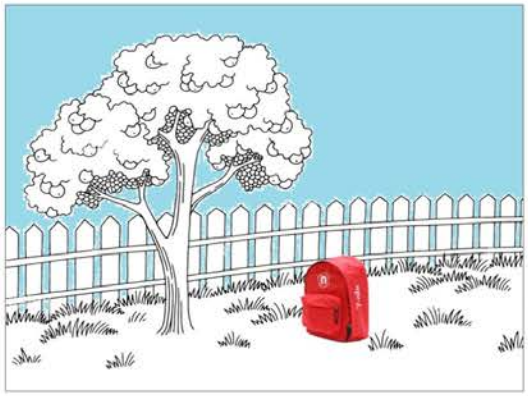
Radioactivity is a physical phenomenon occurring when an unstable nucleus undergoes a transition from one energy state to another. In addition to the cosmogenic radionuclides, natural sources include the so-called primordial radionuclides existing since the Earth formed and that have not completely decayed due to their long half-life (~10^9 years and longer). The most common isotopes in the Earth responsible for the so-called terrestrial radiation are Uranium (^{238}U), Thorium (^{232}Th), and Potassium (^{40}K), together with their multiple daughter products. It is estimated that 80% of the average annual dose for the world's population comes from natural background radiation. While ^{40}K undergoes one single decay, ^{238}U and ^{232}Th produce decay chains that comprise α, β, and/or γ decays.

In the outside environment, especially in case of in-situ γ-ray spectroscopy, there are many variables that could interfere with the measurement, such as the presence of vegetation or buildings and the morphology of the area affecting the field of view of the spectrometer.

Requirements

No other tools or instruments are needed.

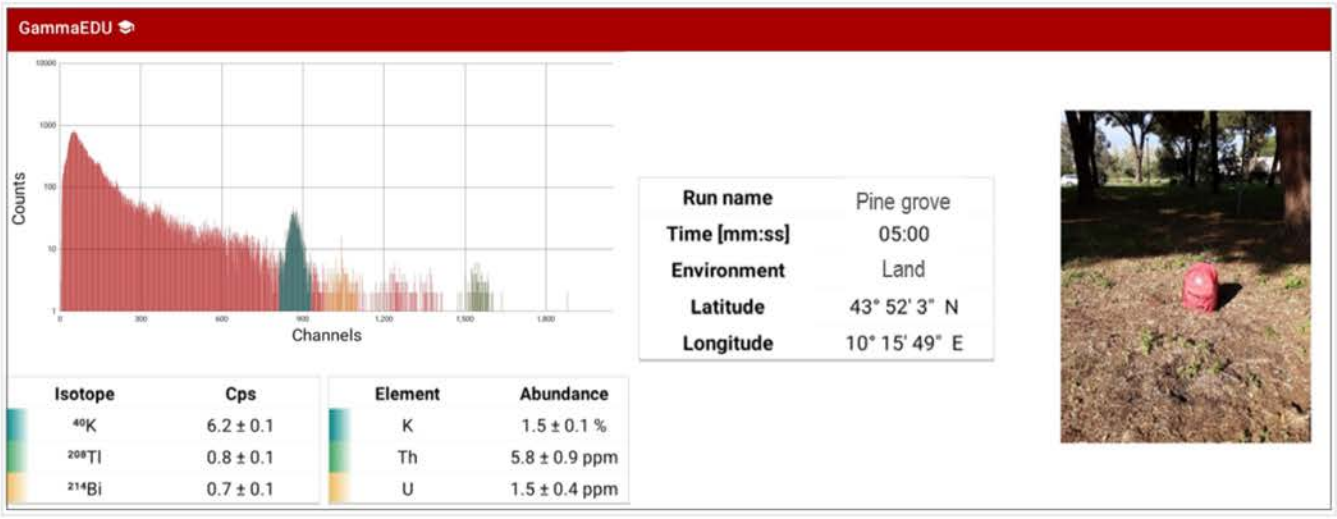
Carrying out the experiment



- Power on the *γ*-stream inside the red backpack.
- Power on the tablet and associate the two devices via Bluetooth.
- Take care that the γstream internal battery is charged, otherwise use the external power system.
- Start the measurement campaign in land field and place the backpack on the floor almost 1m far from the trees, manhole or other construction.
- Set the acquisition time to about 5 minutes and see the results. If the statistic is not enough increasing the acquisition time.
- It is good practice to repeat the measurement in order to obtain the mean and standard deviation of the result.

Results

The measurement results are compared to the reference values in the terrestrial crust. The discrepancy in the reference levels can be explained by the building material, distance from soil and more. This kind of measurement is important for the evaluation of natural radiation exposure from building materials [2013/59/ Euratom Directive and by UNSCEAR (United Nations Scientific Committee on the Effects of Atomic Radiation)].



Experimental result of in-situ γ-ray spectroscopy taken place in Viareggio, Italy.

HEADQUARTERS

CAEN S.p.A.

Via Vetraia 11
55049 - Viareggio
Italy

Phone +39 0584 388 398
Fax +39 0584 388 959
info@caen.it
www.caen.it



WORLDWIDE

CAEN GmbH

Brunnenweg 9
64331 Weiterstadt
Germany
Phone +49 212 254 40 77
Fax +49 212 254 40 79
info@caen-de.com
www.caen-de.com

CAEN Technologies, Inc.

1 Edgewater Street - Suite 101
Staten Island, NY 10305
USA
Phone: +1 (718) 981-0401
Fax: +1 (718) 556-9185
info@caentechnologies.com
www.caentechnologies.com

CAENspa INDIA Private Limited

B205, BLDG42, B Wing,
Azad Nagar Sangam CHS,
Mhada Layout, Azad Nagar, Andheri (W)
Mumbai, Mumbai City,
Maharashtra, India, 400053
info@caen-india.in
www.caen-india.in

CAENsn SAS

Gare du Nord Business Centre 14,
Rue De Dunkerque
75010 Paris
France
info@caen-sn.fr
www.caen-sn.fr