

Main topic: Radiation measurements

Keywords: Radiation measurement, neutron activation, HPGe detector

Purpose: Gamma (ray) spectrometry is a widely used measurement technique in which gamma ray spectra originating from radioactive isotopes are analyzed. The purpose of the experiment is to demonstrate the gamma spectrometry technique by performing gamma spectrum measurements for a selection of radioactive sources. The complex features in the recorded gamma spectra are visualized and their origins explained; radionuclide activities are determined on the basis of the measured spectra, the basic nuclear data and the calibrated detection efficiency.

Level of exercise: Basic Advanced Complex
Level of education: BSc MSc PhD

What you will learn:

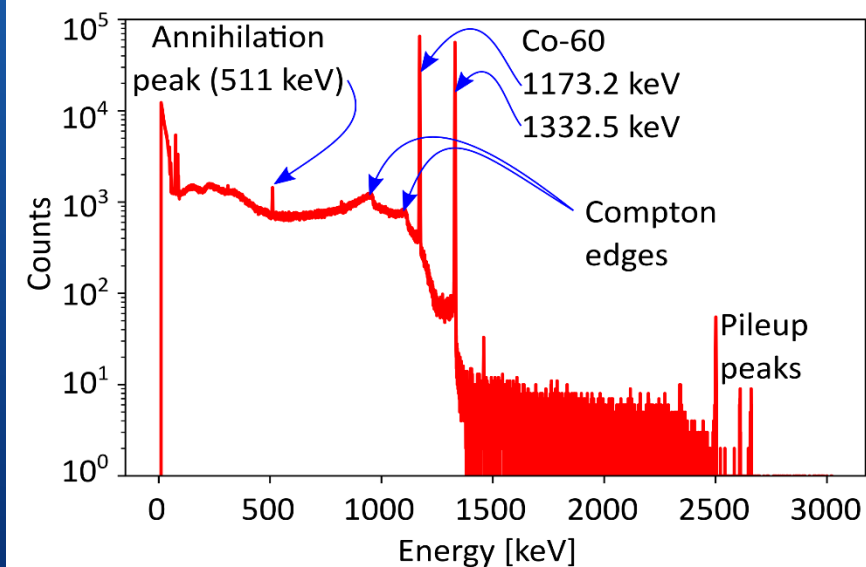
Students will gain experience in gamma spectrometry measurements, visualize and understand the complex features in recorded gamma spectra, analyze gamma spectra and determine the activity of radionuclides in measured radioactive sources.

Important information:

- Minimal size of student group: 4
- Maximal size of student group: 12
- Overall duration of the experiment (in wall clock hours): 3-4



Spectrum of a Co-60 source recorded with a HPGe detector



Possibility to perform experiment on demand: Yes No

Frequency of occurrence: on demand

Examination modalities: report

Teaching languages: English, Slovenian, Serbian/Croatian, Italian, French

Pre-knowledge required: Basics on radioactivity, interaction of gamma rays with matter, basics on gamma detection

Instruments required for exercise:

- HPGe detector and related software
- Handheld dosimeter

Execution:

- A multi-isotope standard is measured. Various gamma lines are detected and described.
- Previously irradiated samples of certified reference materials (e.g. Al-Au, Al-Co, Al-Th) are measured using gamma ray spectroscopy. Students identify the main characteristics (Backscatter and Compton edge, full energy peak, sum peak from pile-up, single and double escape peaks) in the gamma ray spectra.
- The activities of the radionuclides in the samples are determined on the basis of the calibrated detection efficiency.

Limitations:

None



Spectrum of a sample containing Mn, irradiated in the JSI TRIGA reactor, recorded with a HPGe detector

