Gamma spectrometry - STUK

Measurement
Gamma Spectrometry
Environmental
Water
Terrestrial
Air (particles)

Method used for matrices
Air (gases)
Biological
Foodstuff
Industrial products
Swipe filters

Separation Method
No separation

Radionuclide(s)
Gamma emitting radionuclides

Quantity of sample used (in kg, l, ...)
0.3 kg (k.p.) soil or sediment

Counting time for the method
16 hours

MDA of the technique
K-40: 20 Bq/kg, Cs-134, Cs-137: 0.5 Bq/kg, Co-60: 0.5 Bq/kg

FWHM (Energy MeV)
-

Method Evaluated
No

Method Accredited
Yes

Procedure

Description of the method

The activity concentration of gamma-emitting nuclides are measured with a low-background, high-resolution HPGe spectrometers. The detectors are placed in cylindrical background shields made of 12–14 cm thick lead. The inside of the shields are lined with cadmium and copper to absorb the x-rays from lead. The measured energy range is 30–2700 keV and the conversion gain is 8192 channels. The relative efficiency of the detectors range from 35% to 90% and energy resolution 1.6 keV to 2.0 keV at 1.33 MeV. The samples are measured in simple cylindrical beakers (diameters 42 mm and 74 mm, height 26 mm) or 0.5 liter standard reentrant (Marinelli) beaker on top of the detector endcap.

The efficiency calibrations of the detectors have been obtained with both separate single-line nuclides in water solution and multinuclide standard source. The following nuclides have been used: K-40, Cr-51, Co-57, Co-60, Zn-65, Y-88, Cd-109, Sn-113, Cs-137, Hg-203, Pb-210 and Am-241.
The spectra are analysed using either UniSampo/Shaman software package or STUK-developed GAMMA-99 computer code. The correction for sample height and density, as well as the effect of true coincidence summing, are taken into account in calculation of the results. The uncertainties include both statistical uncertainty and uncertainty due to the efficiency calibration.

Figure. Gamma spectrum of environmental sample.

Contact details

Radiation and Nuclear Safety Authority – STUK, Pia Vesterbacka, Email: pia.vesterbacka@stuk.fi