Measurement of environmental samples by semiconductor and scintillation detectors

Slovak University of Technology in Bratislava, Exercise STU-10

Main topic: Environmental measurement

Keywords: Environmental samples, radioactivity, contamination, calibration, gamma spectroscopy

Purpose: The basic objective of the experiment is to carry out a comprehensive analysis of samples from the environment. The area of the measurement of environmental samples is related to the measurement of low level activities, as a result of short acquisition time, low detection efficiencies and non-optimal measurement geometry. In case of measuring environmental samples, there are additional issues, which can influence the measurement, such as the interference of natural background, inhomogeneous dispersion in the sample, large number of contributing components or summation effect.

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

What you will learn:
The students will learn how to measure environmental samples and determine activity and identify contributing nuclides.

Important information:
- Minimal size of student group: 2
- Maximal size of student group: 4
- Overall duration of the experiment (in wall clock hours): 2

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Possibility to perform experiment on demand: ☒ Yes ☐ No
Frequency of occurrence: 2-5 times per year
Examination modalities: report
Teaching languages: English, Slovak

Pre-knowledge required: Tthe radioactive decay law, interaction of radiation with matter, nuclear data, types and sources of radiation, detector types (HPGe, NaITl, GM), MCA/MCS modes,
Instruments required for exercise:

- Marinelli beaker
- Low Background chamber
- HPGe, NaI(Tl) detector
- Multi-channel analyzer and personal computer

Execution:

- Energy and geometry calibration is performed by (Cs-137, Co-60) and volumetric (Eu-152) sources
- The measurement of background is carried out by Marinelli beaker filled with demi water
- The unknown environmental sample is prepared in the Marinelli beaker in liquid form
- The acquired gamma spectrum of the environmental sample is analyzed and gamma peaks are localized that serve to identify nuclides

Limitations:
Pregnant and breastfeeding women are not allowed to enter the controlled radiation area. Legal age (18) is required. Fore more information on precoders please visit http://www.ujfi.fei.stuba.sk/kontakt.php