

Measurement of the radioactivity of the water and air

Slovak University of Technology in Bratislava, Exercise STU-11

Main topic: Environmental measurement

Keywords: gamma measurement, beta activity measurement, environmental radiation, detection efficiency estimation

Purpose: This experiment demonstrates the fundamentals of radioactivity measurement in water and air. Two measurements of the water activity are performed by students. The first measurement is based on the sample evaporation and the second measurement is performed on solution from NPP drainage. In the air sample measurement, the students will measure the filter through which the air flow is maintained by compressor. At Finally, the students have to determine total volume activity of all liquid and air samples.

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

What you will learn:

The students will learn how to work with liquid and gaseous radioactive environmental samples, determine their activity, estimate decay curves, decay constants and total volume activity of used samples.

Important information:

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



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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: The radioactive decay law and decay chains, types and sources of radiation, detection efficiency calibration, data processing, detector types (NaI(Tl), GM, PIPS)

Instruments required for exercise:

- Marinelli beaker
- Low Background chamber
- NaI(Tl), GM, PIPS and iSOLO detector

Execution:

- The first measurement of water radioactivity is determined based on the total volume beta activity of a KCl sample. KCl is continuously evaporated and the final sample is dried at 120 °C temperature.
- 20 dm³ sample is placed in the special beaker, where the NaI(Tl) detector is placed. The measurement of beta radioactivity from air is based on the measurement of the air filter through which the flow of the air is maintained by compressor

Limitations:

Pregnant and breastfeeding women are not allowed to enter the controlled radiation area. Legal age (18) is required. For more information on precursors please visit <http://www.ujfi.fe.i.stuba.sk/kontakt.php>

