Contribution ID: **90** Type: **Přednáška**

Didactic experiments with natural sources of radioactivity

Monday 4 November 2024 14:15 (15 minutes)

Radioactivity is a natural part of our environment. The fear of the unknown, which is associated with it, is often related to the lack of information about the given issue. The best teacher is one's own experience, therefore it is advisable to supplement theoretical knowledge with practical experience. The paper presents practical experiments aimed at understanding the basics of radioactivity in the environment. In practical experiments, only natural radioactivity is used and no laboratory sources of ionizing radiation. The use of such sources in teaching must be governed by valid legislation. In addition to other obligations, it is primarily necessary to observe the basic principles of radiation protection in activities leading to radiation exposure. The first principle is the justification of the activity leading to exposure, which means that the expected benefit outweighs the health damage that this activity can cause. For students who do not systematically prepare to work with sources of ionizing radiation, the justification of activities leading to exposure during teaching is questionable. The second reason for the absence of practical tasks with laboratory sources of ionizing radiation is the didactic intention to present radioactivity as a common and natural part of our environment. As opposed to laboratory sources of ionizing radiation, that evoke in students the idea that radioactivity is something artificial and dangerous.
The first two practical experiments are focused on dosimetry of natural ionizing radiation in the environment. The contrast between the two used measuring devices, whose production dates are separated by almost a quarter of a century, is interesting, however basic principle of their operation has not changed. The experiment task is already a classic didactic experiment of modeling the law of radioactive decay using dice. The fourth experiment presents a surprising method of sampling radon decay products from the air we normally breathe in the interiors of buildings. The fifth experiment demonstrates radioactivity as a common part of our life using the example of potassium, and students also get to know practically the concepts of beta radiation absorption and the efficiency of the Geiger-Müller detector. The sixth experiment makes it possible to track the paths of ionizing radiation particles in the diffusion cloud chamber. The last experiment is aimed at measuring the long-term concentration of radon in the interior using solid state nuclear track detectors.
Keywords: didactic experiments, radioactivity, environment

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Session Classification: Všeobecné aspekty radiační ochrany a vzdělávání

Track Classification: Všeobecné aspekty radiační ochrany a vzdělávání