

Courses in radionuclide metrology

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Uncertainty evaluation and traceability in metrology

The course addresses the principles and good practices in uncertainty evaluation, in accordance with the Guides to the expression of Uncertainties in Measurement, written by the Joint Committee for Guides in Metrology (JCGM), and adopted at the international level. The importance of sound and realistic uncertainty evaluation in physics and metrology is discussed around some examples. The classical method of propagation of uncertainties, using the law of propagation of variances is described, together with the alternative Monte Carlo evaluation method. This latter approach is illustrated by an example in the field of ionizing radiation metrology.

The course describes also the international system of units (SI) and its relations to the physical constants. The methods used to assure traceability at national and international levels are detailed and examples of international comparisons in the field of radionuclide metrology are discussed.

The goal of the course is to give practical tools for uncertainty evaluation and expression, which can be used in any field of physical measurements.

Date and place: 22 February 2023, 14:00 – 17:00 h, B29a Seminar and online via zoom

Primary measurement methods in ionizing radiation metrology. Metrology of radon in air and water

The direct methods of measurement allowing the definition of radioactivity standards and units are described: defined solid angle alpha counting, coincidence counting, liquid scintillation counting (CIEMAT/NIST and TDCR methods), Cerenkov counting, etc. The principles and limitations of each method are described and illustrated by examples. The uncertainty budget of each method is also discussed.

After a short description of radon (^{222}Rn) and thoron (^{220}Rn) decay chain, the course exposes the main methods of measurement of the activity of radon in air and in water: ionization chambers, track-etch detectors, silicon detectors, gamma spectrometers and organic scintillators. The principles, limitations and uncertainty budget of each method are discussed and illustrated by examples. Then the course will focus on the measurement of radon by Liquid Scintillation Counting with a discussion on specific issues related to the half-life of ^{214}Po in the measurement of ^{222}Rn and ^{212}Po in the measurement of ^{220}Rn .

Date and place: 23 February 2023, 15:00 – 17:00 h, B29a Seminar and online via zoom