

The role of Radionuclide Metrology in Nuclear Physics

Tuesday, 19 March 2019 16:00 (1 hour)

National Metrology Institutes (NMIs) involved in Radionuclide Metrology play an important role in enabling societal benefits from nuclear physics research (1). NMIs are responsible for the development and maintenance of primary measurement standards, distributed to end users to calibrate their own instruments in an uninterrupted 'traceability chain' of calibrations. NMIs compare their primary standards (with associated uncertainty budgets) with other NMIs through international comparison exercises co-ordinated by the Bureau International des Poids et Mesures (BIPM). The 'Mutual Recognition Arrangement' (CIPM MRA) is an arrangement among NMIs to allow for the mutual recognition of national measurement standards (and for measurement and calibration certificates issued by NMIs), thus meeting the increasing need to provide reliable and quantitative information on the comparability of national measurement services to a variety of users (governments, academic institutions, manufacturers, industry, etc).

A primary standard of radioactivity allows the decay rate from a source to be determined using a technique which does not itself need calibration, and underpins developments in characterising nuclear decay scheme parameters (such as photon emission intensities utilised in gamma-ray spectrometry). Since the activity of each radionuclide species depends on unique decay properties, different experimental techniques are required for the primary standardisations of individual radioisotopes. The particular technique depends on the radioactive decay mode(s), half-life, decay scheme of the daughter nucleus and branching ratios for competing decay modes. The main methodologies used for primary radionuclide standardization are discussed in this presentation.

(1) Patrick H. Regan, Steven M. Judge, John D. Keightley & Andy K. Pearce (2018). "Radionuclide Metrology and Standards in Nuclear Physics", Nuclear Physics News, 28:3, 25-29

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