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Primary liquid scintillation radioactivity measurement capabilities of NMISA

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Abstract content
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The Radioactivity Standards (RS) laboratory of the National Metrology Institute of South Africa (NMISA) maintains the measurement standard for radioactivity in South Africa. Radioactivity standards and calibrations are mainly disseminated to the South African industry through secondary services.

Radioactivity standards are established through absolute activity measurements (also known as primary standardisations) of various radionuclides. To maintain accreditation and ensure uniformity of measurement, the RS laboratory participates in various types of international and regional activity comparisons. During a type 1 comparison a solution of a standardised radionuclide is sent to the International Bureau of Weights and Measures (BIPM) for measurement in the International Reference System (SIR), comprising a number of ionisation chambers. Type 2 comparisons are organised by a pilot lab that makes up a master solution of the specific radionuclide, from which each participating metrology institute receives a sample to standardise. Other types of key comparisons involve either a transfer instrument for measurements of short-lived radionuclides at the participating institute, or participation in the extended SIR for pure beta emitters. Results are collated by the BIPM and a key comparison reference value (KCRV) determined for purposes of establishing equivalence and traceability.

Primary measurements at NMISA are made on beta-gamma emitters via 4Pi-Beta-Gamma coincidence counting and on pure beta emitters via the Triple-to-Double Coincidence Ratio (TDCR) technique. The results from a primary beta-gamma measurement are used to obtain factors for a secondary standard ionisation chamber (IC) used at NMISA, thereby maintaining the standardisation for longevity. This factor can subsequently be used to convert the current produced by a radionuclide of unknown activity, measured in the IC, to an activity value. Through this process a chain of traceability to the national measurement standards and degrees of equivalence to the international community, are established. All results are reported with an uncertainty budget. This presentation describes the primary liquid scintillation measurement capabilities of the RS laboratory.

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Primary author: Mr VAN ROOY, Milton (Stellenbosch University)

Presenter: Mr VAN ROOY, Milton (Stellenbosch University)

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