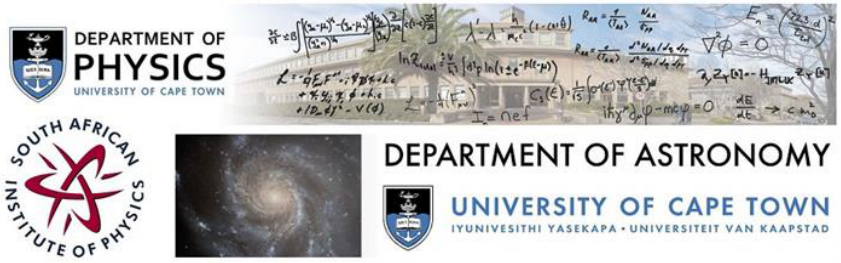

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Secondary standard instrumentation used at NMISA for radioactivity measurement

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Abstract content
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The NMISA Radioactivity Standards Laboratory maintains SA's national measurement standard for radioactivity. Primary measurement standards obtained from absolute measurement methods are checked for uniformity and equivalence by regular participation in international and regional key comparisons. Due to the fleeting nature of radioactivity, the absolute standardizations are maintained through the calibration of secondary standard instrumentation. This traceability chain of activity measurements is disseminated to the user community via three instrument types, namely an ionization chamber (IC), a high purity germanium detector (HPGe) and a commercial liquid scintillation counter.

Most measurements for the nuclear medicine community are made with an ionization chamber using radionuclide specific calibration factors. These factors are obtained by transferring the absolute standardization made on the given radionuclide to the IC. Radionuclide factors obtained for more than fifteen radionuclides have been compared with normalised factors supplied by the IC manufacturer, with excellent agreement throughout. The manufacturer's factors were normalised due to a loss of the original N₂ gas pressure during repairs to the IC. Where absolute standardizations on certain radionuclides have not yet been undertaken for NMISA to derive a factor, the manufacturer's normalised factor can be utilised with confidence.

Where environmental radioactivity and radioactivity in consumer products are a concern, NMISA can carry out low level gamma-ray spectroscopy measurements on the samples and products, using a vertical HPGe detector, to ensure that they are safe and below the legally acceptable radioactivity limit. Samples are most commonly analysed for the following radionuclides: Co-60, Cs-134, Cs-137 (in milk, water, black mussels/ fish, green leafy vegetables, grass, soil, sediment and sewage) and I-131 in milk.

A commercial liquid scintillation counter is available for detecting small amounts of beta and alpha radioactivity. This computer-controlled benchtop analyser is used to measure primarily pure beta-emitters such as H-3 (tritium) in fresh surface water, C-14 and Sr-90 in milk.

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