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A calibration facility for in-situ gamma-ray detector efficiency

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Abstract content
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In-situ gamma-ray detectors can be used to measure the activity concentrations in for example soil or on river- or sea-beds. In order to extract the activity concentrations the gamma-ray detection efficiency of the detector needs to be characterized. A facility was recently constructed at iThemba LABS for such characterizations. The facility comprises a concrete brick castle, with dimensions 121 cm (height), 119 cm (width) and 134 cm (depth); which has a 10 cm diameter hollow PVC tube for inserting a detector to be characterized. The castle has a wall thickness of 55 cm (width) and 63 cm (depth) to reduce the background radiation from reaching the detector.

A sample of the concrete bricks were analyzed radiometrically in order to determine its average natural radioactivity content (40K, uranium and thorium series radionuclides). The spectrum measured with the detector in the castle contains contributions from the radionuclides. By comparing this spectrum with one simulated for the same source geometry and activity concentrations using a Monte Carlo code it is possible to characterize the detection efficiency of the detector. We present results associated with the characterization of a CsI scintillator detector using the new calibration facility.

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Noel M. Mkaza (Military Academy, Faculty of Military Science, Stellenbosch University, Saldanha, 7395) mkhujac@gmail.com

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Primary author: Mr SEHONE, Alfred (Military Academy, Faculty of Military Science, Stellenbosch University, Saldanha, 7395, South Africa)

Co-authors: Dr MALEKA, Peane (Department of Nuclear Physics, iThemba LABS NRF, Somerset West, 7129, South Africa); Prof. NEWMAN, Richard (Department of Physics, Stellenbosch University, P/Bag X1, Matieland, 7602, South Africa)

Presenter: Mr SEHONE, Alfred (Military Academy, Faculty of Military Science, Stellenbosch University, Saldanha, 7395, South Africa)

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