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Efficiency calibration of the laboratory based gamma-ray detector for various sample geometries

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Radioactivity has been present on earth since its formation and is part of the environment we live in. Humans are exposed every day to radioactivity through the radioactive elements that occur naturally in the environment. Radionuclides are found naturally in air, water, soil, plants and inside our bodies. In this study, radiometric measurements using various sample holders for environmental samples are performed. Available sample holders under study are Marinelli beaker (1l) and cylindrical pill bottle (100 ml). The gamma-ray spectrometry method is the tool used to analyse samples. For absolute photo peak efficiency measurements IAEA reference material RGU-1, RGIh-1 and potassium chloride powder were prepared for 100 ml pill bottles and the Marinelli beakers (1l) then each measured in HPGe detector for a day. Additionally, certified reference point sources bought from NMISA were also measured. From the known activities of the point sources and the prepared volume sources, photopeak efficiency was calculated and efficiency parameters for these geometries were obtained. Also Monte Carlo simulation was used to benchmark the parameters of the detector used to determine the activity concentration of environmental samples. Later will compare the experimental data of reference samples with correction factors of the simulation data to match the experimental data. For this contribution, the efficiency of the detector as function of gamma-ray energy in various measuring geometries will be known.

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