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Variation of the absolute efficiency of the HPGe detector as a function of the density of the sample

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Measurement of absolute activity of a gamma emitter requires the knowledge of detector efficiency for a given geometry. The activity of the sample can then be calculated by measuring the full energy peak for a given period of time.

The experimental determination of the detector efficiency is usually done using calibration standards. For extended source geometries if the density of the sample is different to the sample under study a correction factor should be applied to the measured efficiency. This correction factor is the measure of the extent of the variation of the efficiency.

In this study these correction factors have been calculated for an extended source of cylindrical geometry for five different sample densities ranging from 0.605 g/cm^3 to 1.147 g/cm^3 with respect to a standard sample density of 1.00 g/cm^3. The gamma energy range covered was from 200 keV to 1000 keV. A large variation (4.07 –1.61) of the correction factor was observed for the sample with the lowest density, which is a cockle flesh sample. For the other four densities the correction factor was nearly uniform in the energy range studied.

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