GAMMA-SPECTROMETRY OF EXTENDED SOURCES FOR ANALYSING ENVIRONMENTAL SAMPLES

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Measurements of the environmental activity concentration by gamma-ray spectrometers quire the determination of the **full-energy-peak efficiency** η, as a function of photon energy er the region for which the detector is suitable. This can be done either **experimentally** or **by lculation**. For very simple cases (single gamma-transition, point-like source positioned far from mple shaped detector, etc.) its determination is quite straightforward. In this case a unique (E_γ) function characterises the detection efficiency. However, if the decay scheme of the studied cleus is more complex, cascade effects modify the detection efficiency. Similarly, the actual tection efficiency depends on the actual detection geometry (e.g. extended source), on the self-sorption occuring in the material of the source, and so on.

All these effects are generally treated as corrections or modifications of the simplest case ues. These modifications are especially relevant when applied for large volume samples of vironmental origin.

Corrections due to self-absorption and cascade coincidence phenomena can be complished by means of various theoretical, empirical and experimental procedures. This study empts to summarise the state-of-the-art and offers an elaborate solution of Monte Carlo mulation by carefully tailoring its input to the actual problem.

The experimental determination of the detector efficiency with calibration sources is ually easier and more accurate than with calculations. However, there are cases when a

measurement is just not possible either because no calibration sources are available, or they can not be prepared. In such a situation calculations (simulations) have to be used.

In order to achieve reliable results, these calculations should be validated. In this context validation means that calculations should be done for cases which can be made also experimentally, and the results of the calculations should be compared with the experimentally measured values. If this comparison is satisfactory, one can rely on the result of the calculations also in cases, when no direct experimental determination is possible.

In this work calculations are made (applying GEANT MC) for experimental situations that were really performed. The results of this comparison will be presented and discussed during the talk.

Part of this work has been performed in the Institute of Nuclear Techniques of Technical University Budapest (INT TUB), using a **HPGe** coaxial detector (called **POP-TOP**). Another part has been performed in Brunel University of West London, using **HPGe** low energy detector with **Be** window (called **LO_AX** detector), directly developed for low energy spectrometry.

Most of the calculations have been made parallel with both HPGe detectors but for the sake of shortness I will present some data for LO_AX and other calculations for POP-TOP detector.