In situ determination of the depth distribution of ^{137}Cs by means of gamma spectrometry of primary and forward scattered photons

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Stationary or mobile in situ gamma ray spectrometry is a useful tool for rapid estimations of environmental radioactivity inventories in the ground. A week point however, is that the vertical distribution of the activity in the ground must be known, in order to calculate the activity per unit surface area from an observed photon fluence rate. In the case of stationary measurements, the depth distribution in soil is commonly determined by analysing core samples by gamma spectrometry afterwards in the laboratory. In order to be representative, the number of samples to be analysed in the lab is roughly one hundred for each a 10x10 m^2 surface and a 30 cm depth module monitored. During mobile in situ spectrometry, large areas are covered and an on-line presentation of the result is given high priority. During such circumstances, traditional core sampling methods are not feasible and other more direct methods have to be used. One promising method for conversion of incoming spectral data in real time to both true area activity density and activity depth distribution is based on an analysis of the ratio between count rates from primary and forward scattered photons. The method is frequently referred to as the peak-to-valley ratio method. This contribution will describe our plans to adopt the peak-to-valley method to car-borne mobile gamma spectrometry using a large HPGe detector. Preliminary results from testing the method in the field, utilising a point source at different depths, will be presented.