

DESIGN AND CONSTRUCTION OF A SHIELD  
FOR MEASURING FALLOUT Cs-137  
FOR SOIL EROSION STUDIES.

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Very low levels of Cs-137 present on the top soil layers as a result of fallout from nuclear weapons testing is the only tracer that can be used to quantitatively estimate soil erosion at early stage (1). However the main problem encountered in trying to use this tracer is the measurement of such low levels of Cs-137 amidst the naturally occurring radiations which are much higher in intensity. At the Radioisotope Centre with many other radiation sources of differing strength the problem is even greater.

Isolating the 662 KeV Cs-137 gamma ray peak at such low levels need a very high resolution detector, which is more sophisticated than the more simple and familiar NaI (Tl) detector in that the high resolution detectors need to be operated at liquid nitrogen temperature.

In this work an ORTEC, pure germanium detector mounted on a 25 litre liquid nitrogen dewar was used. A shield had to be made to cut down the background radiation peak at 662 KeV to near zero to enable the measurement of very low Cs-137 in a kilogram of soil.

To reduce any background radiation arising from the shield, iron and lead used to construct the shield had to be specially selected to ensure that these materials were very old, over 40 years. The shield had to be of 7 cm thick lead to cut off radiation from the background to a very low level. To cut off low energy radiation arising from lead an inner shield of 5 mm thick old iron had to be included. To accommodate liquid nitrogen cooling a special stand had to be constructed to mount the shield. To enable handling, the shield had to be made in 8 parts, a collar for the bottom of the detector, 6 rings and a lid. The lid had to be mounted on wheels to enable one person to change samples. The details will be presented.

With the low efficiency of the pure germanium type of detector for gamma rays it is necessary to measure count rates as low as 2 counts per minute. The shield cut down the background count rate from 8 counts per minute to 1.5 counts per minute.

References: 1. Lwin, M.T., Dharmasiri, J.K., Dasanayaka, A.R. and Dharmawardena, K.G., "Measurement of Fallout Caesium-137 as a Tool for Soil Conservation in Sri Lanka", paper presented at the 44th Ann. Sess. of STAAS, Dec. 1988.