USE OF HIGH-PURITY GERMANIUM DETECTORS IN A TRANSPORTABLE *IN VIVO* MONITORING SYSTEM

M J Youngman

National Radiological Protection Board, Chilton, Didcot, Oxon OX11 0RQ, UK

ABSTRACT

The National Radiological Protection Board has recently commissioned a transportable *in vivo* monitoring system which would be used for measuring radionuclides in members of the public in the event of an accidental release from a nuclear installation. This paper briefly describes the system.

Two high-purity germanium (HPGe) detectors are used, one for measuring the torso to give an estimate of whole body activity, and one to measure iodine radioisotopes in the thyroid. Germanium detectors have been chosen for this application in preference to NaI(Tl) scintillation detectors because of their superior energy resolution.

A theoretical release from a nuclear reactor has been used to simulate gamma ray spectra that could be measured following an accident. The nature of these spectra, and the implications for detector resolution requirements are discussed.

INTRODUCTION

The transportable monitoring system comprises a shielded chair and two shielded detectors. To allow meaningful measurements to be made in contaminated areas, the lead shielding is up to 50 mm thick. The thyroid detector has a deep collimator so that it is only sensitive to activity present in and around the thyroid. The torso detector has a wider field of view and is sensitive to activity in the torso but not to activity in the subject's extremities. The detector mounts allow adjustment of the detectors to accommodate subjects of different sizes. A photograph of the system is shown in figure 1.

The system is designed to be transportable and to enable this the lead shielding has been fabricated in small sections. The system is transported in two trailers; one carries the detector supports and the other the lead shielding. The system can be assembled inside a building such as a reception centre set up to receive evacuees. Using the system inside a building gives better shielding, access to an electricity supply, and to facilities such as showers. It also allows the integration of this system with other measurements carried out at the reception centre e.g. measurements of skin contamination and thyroid activity with hand held probes. The system may also be used inside one of the trailers if necessary. The system has been deployed in two national emergency exercises.

Germanium detectors were chosen in preference to NaI(Tl) scintillation detectors, although the latter have been most frequently used for mobile *in vivo* monitoring. The predicted performance of both of these detector types in a range of possible reactor