

RadSearch Measurement Services

Introduction

ANTECH provides a measurement service for low and high activity radiation surveys for decommissioning, radiation clean-up and decontamination as well as measurement and assay of high activity areas and surfaces. The service involves the deployment of the ANTECH RadSearch Gamma Camera with a team of two operator analysts.



Figure 1.



Figure 2.

RadSearch Capabilities

ANTECH RadSearch is a novel radiation detection and measurement device with a detector head, consisting of a Lanthanum Bromide scintillation spectroscopic gamma ray detector, a video camera and a laser range finder. The detector head is mounted on a pan and tilt unit, which is itself mounted on a tripod, trolley or vehicle. The detector head and pan-tilt mechanism are connected to a remote monitoring station consisting of a small power supply unit and notebook computer. RadSearch is designed for radiation surveying, radioactive contamination measurement and radiation detection of both low and high activity sources. Figure 1 shows RadSearch deployed in a nuclear facility and Figure 2 shows RadSearch deployed with remote monitoring station in a laboratory.

RadSearch is able to scan an area or object to produce a video image of the scanned area overlaid with a map of the distribution of measured radiation intensity for a range of radionuclides selected from a library. Using the laser range finder measurement to correct for distance and angle, RadSearch identifies hot spots and calculates the total activity of the scanned area for each selected radionuclide in units of Bq or Ci. Radsearch also calculates the dose-rate arising from the scanned area and measured at the camera position in user selectable units of Sv or rem.

RadSearch Deployment

RadSearch is normally deployed with a team of two trained operators who are also skilled in data analysis. They execute a customer specified measurement plan, initially making sample measurements and then performing automated scans. Where facility rules permit, RadSearch can be set to perform longer duration detailed scans overnight in unattended mode. RadSearch can be both controlled and monitored over a wireless network during periods of unattended operation.

RadSearch is normally transported in three armoured cases. It can be deployed into an area and set up for operation in less than 15 minutes. Where cable connections are inconvenient, it can be powered by 24 Volts DC from two series connected 12 Volts batteries and controlled over wireless Ethernet from the remote monitoring station, which is simply a rugged notebook computer.

At the conclusion of the assignment, the customer is provided with a detailed report, which includes all of the scanned, and overlaid images, tables of measured results and both a dose-rate and activity map as appropriate. An example of the data included in the report is shown in Figure 3 (overleaf).

Where sources have been detected the spectrum plots of the gamma spectra for Scan Elements of interest are also included. Accompanying the report is a CD with all of the raw data obtained during the measurement campaign and a program that will run on a PC for data display. As all of the measured spectra are included in the measured data files, they can be re-analysed subsequently, for example, to search for additional radionuclides that might not have been considered at the time that the measurements were made.

RadSearch Performance Data

Performance data for RadSearch is shown in the tables below. The sensitivity of the detection level for the detector is less than 1 μCi for a point source of ^{137}Cs at 1 metre from the collimated detector (collimator barrel fitted) with a measurement time of 100 seconds. The measured Currie Detection Limit value is 0.91 μCi at 1 metre, with a background count rate in the region of interest of 0.178 counts/s. This results in a measured dose-rate at 1 metre of 0.0028 $\mu\text{Sv/h}$. RadSearch is able to measure at the detector a minimum dose-rate of less than 0.006 $\mu\text{Sv/h}$ (with a precision of 20%, 1 sigma). Data for the sensitivity of RadSearch at different distances is presented in Table 2.

Operating range	< 1 μCi to 0.5 Ci for Cs-137 in field of view at 1 metre
Dose rate range	0.003 $\mu\text{Gy/h}$ ($\mu\text{Sv/h}$) – 500 mGy/h (mSv/h) for Cs-137

Table 1.

Distance (metre)	Activity of Cs-137 (μCi) – 20% Precision	MDA of Cs-137 (μCi)
1	2	0.9
2	6	3.6
5	38	22.7
10	151	90.0
15	339	204.6
20	603	363.7

Table 2.

RadSearch Measurement Sensitivity and MDA for Cs-137 Point Sources measured with a 100 second measurement time. Column 1 is the distance between the source and detector in metres, column 2 is the measured activity for a measurement precision of 20% (1 sigma) and column 3 is the Minimum Detectable Activity (MDA) (1 sigma) based on the Currie Detection Limit protocol.



Figure 3. Example of a measurement report