AREA 1.3 – CANBERRA SOLUTION 1
FIXED/TRANSPORTABLE WIDE AREA BETA SURFACE CONTAMINATION MONITOR

FORM 2
(to be reported to Committee on Countermeasures for Contaminated Water Treatment and to be disclosed to public)

Technology Information	
Area	**1.3 Accumulation of contaminated water (Storage Tanks, etc.)** Technology for detection of minor leaks Improvement in the detection ability of beta rays on patrol
Title	Fixed/Transportable wide area β surface contamination monitor
Submitted by	CANBERRA

1. Overview of Technologies (features, specification, functions, owners, etc.)

Objective:

To propose simple and Inexpensive solution based on operational prototypes to detect Sr90 leaks with rapid response time.

Proposed Solution:

Wide-area beta surface detection system that is sensitive to Sr90 leaks with a rapid response time. The system will be used in a distributed architecture connected to a central station via wired or wireless network.

Main specifications:

-Type: Transportable or Fixed (several system placed around each tank). Can be also set in On-line mode

-Emitters: β

-Detector: Thin-Window GM tube with TTC technology

-Efficiency**:** Leaks of a few tens (10s) of liters can be detected within an hour or two of happening

-Less than 1 watt of power from a +6V source.

-Communication: wireless or via a wired RS485 connection

Description:

Each detection system would include a GM tube with electronics positioned in a waterproof container and shielded, with the window pointing down. The thin window makes it sensitive to the betas from Sr/Y90. The GM tube and shield is mounted at a suitable elevation to allow a large ground surface area to be measured.

A central control and display system shows graphically the evolution of the Sr90 detected by each detection system, generates periodic reports, and archives all the data for future use.

For this application the detector will normally be measuring background, both the normal environmental background and the increased background from the adjacent tanks. But if there is a leak from the adjacent tank, the water seen by the detector will be very radioactive, and the count rate from the detector will be very high. It is

important that the sensor does not saturate in case of high count rate and is still capable to provide accurate results instead of Zero (results in case of GM saturation).

The TTC circuit solves this problem. It turns off the High Voltage after each pulse for ~2mSec. Then it turns it back on and determines the time until the first count arrives. This is repeated many times. The average of all these values is the average seconds/count. The inverse of this value is the traditional counts/second. This method eliminates any dead-time within the GM tube and eliminates the extreme case at high count rates of infinite dead-time.

Owners: All of the key elements are manufactured by Canberra.

Note: More detailed description are available in Private appendix (Not to be disclosed to Public)

2. Notes (Please provide following information if possible.)

- Technology readiness level (including cases of application, not limited to nuclear industry, time line for application):

The sensor unit is based upon our Military line of RADIAC instruments. Canberra's ruggedized and Mil-spec instrumentation has long been supplied to the US and European military organizations. Thousands of these units have been provided.

More information can be obtained from this link:

www.canberra.com/products/militrary_radiacs/

- **Challenges**

The detectors need to be adequately shielded on the top and sides to reduce the background. Field tests are needed to determine the appropriate thickness.

Getting a wireless signal out from the forest of steel tanks can be challenging. Field tests are needed to confirm that this is reliable, or of the built-in wired mode should be used.

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- **Others (referential information on patent if any)**

For this project, the key feature of the electronics is the Patented Time-To-Count [TTC] circuit [patents 4,605,859US and 4,631,411US].