SRNL is a DOE National Laboratory
operated by Savannah River Nuclear Solutions.

We put science to work.™

Innovations

from Savannah River National Laboratory

U.S. DEPARTMENT OF ENERGY • SAVANNAH RIVER SITE • AIKEN • SC

srnl.doe.gov

SRNL Fast Facts

- National Laboratory for DOE Office of Environmental Management
- Supporting customers at SRS, DOE and other federal agencies nationally and internationally
- Applied research, development and deployment of practical, high-value and cost effect technology solutions in the areas of national security, clean energy and environmental stewardship
- Operated by Savannah River Nuclear Solutions for the U.S. Department of Energy near Aiken, S.C.

SRNL Office of Communications
803.725.4396

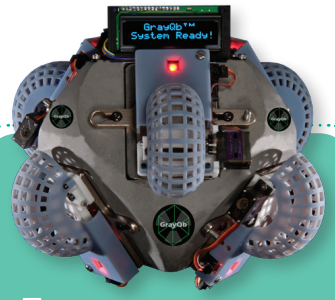
GrayQb™ 3D Radiation Mapping Device Safely Finds Source of Contamination

Nuclear facilities in the midst of cleanup due to normal routine or unexpected incident face a remarkable challenge: how to safely determine the exact location of radioactive contamination. Such determinations are typically performed with portable count rate instruments operated by personnel wearing protective gear, which can consume many man-hours and expose personnel to radiation or contamination. Some areas may be too small or confined or have limited entry for personnel access. Some areas may be too large, perhaps encompassing a city street, or problematic in another way, such as a fluctuating area of storm water runoff.

Scientists at the Savannah River National Laboratory have developed an innovative new technology named GrayQb™. This device is approximately the size of a soccer ball and can locate, identify, and generate a map of radioactive contamination within an enclosed area or outdoor environment or near water sources such as storm drains.

Out-of-the-box thinking: Common technology in an uncommon way

GrayQb™ uses multiple layers of Phosphor Storage Plates (PSPs) that are highly sensitive to radiation. Even in low dose rate environments, this device can be used to expedite radioactive contamination cleanup operations. The PSPs from GrayQb™ are read on a commercially available scanner in which special software records and translates the exposure data to define the type and location of the radioactive source.



Features

- Characterizes contamination at a wide range of dose rates (0.01 to over 1000MSv/hr; 1 to over 100,000 mR/hr)
- Sensitive to low dose rates for x-ray and gamma ray
- Minimizes personnel exposure
- Can provide qualitative ID of radioisotopes
- Detects gamma, alpha, beta and neutron radiation
- On-board electronics provide remote control and monitoring of the device
- Low exposure times due to the high sensitivity of phosphor storage plates
- Film used as radiation detector instead of imaging
- Full 360° coverage
- Provides results in minutes

Savannah River National Laboratory™
OPERATED BY SAVANNAH RIVER NUCLEAR SOLUTIONS

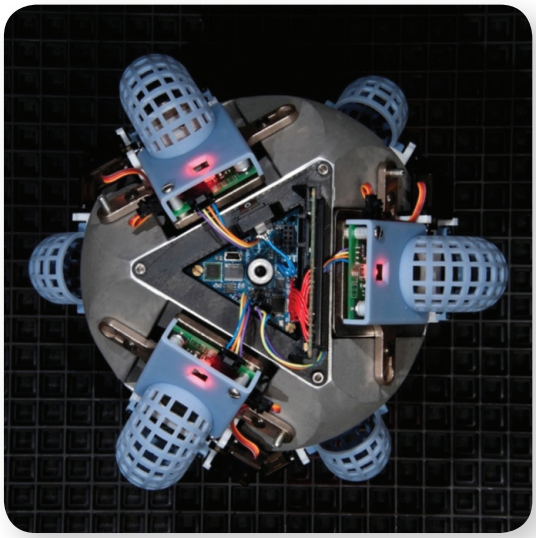
Savannah River NUCLEAR SOLUTIONS™
FLUOR • NEWPORT NEWS NUCLEAR • HONEYWELL

Innovations from Savannah River National Laboratory

Out-of-the-box thinking *(continued)*

PSPs are commonly used for imaging when the radiation source and dose rate are known, such as in medical imaging and non-destructive testing. PSPs allow high resolution, high sensitivity gamma detection, providing micrometer resolution and revealing milliroentgen levels of dose.

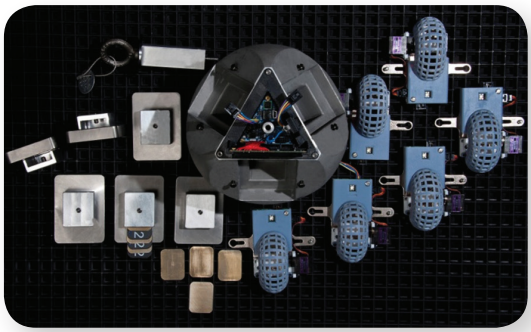
In order to provide energy determination and identification of an unknown radioactive source and its intensity, the PSPs in the GrayQb™ are stacked into layers, separated by attenuation materials such as metal or plastic that provide progressive shielding of the stacked PSPs. A radiation source deposits the highest dose to the outer-most PSP, with each successive layer receiving less than the previous one. Based on the amount of exposure to each layer, the energy of the radiation can be determined. Modified configurations using other film types can be used for alpha, beta, or neutron detection.



GrayQb™ upper view

Innovation from science to successful deployment

GrayQb™ is placed in an area of concern for a specific amount of time based on the expected dose rates. A set of motorized shutters shields the PSPs during placement and removal of the device. Once in position, the attenuated PSP layers are exposed to the sources in the area through a unique apparatus that locates the exact sites of radiation. GrayQb™ is then removed from the area and the PSPs are read in an optical scanner. Special software translates the PSP data into a map of the location, intensity, and energy of the source contamination. “Intensity” refers to the low-to-high radioactivity of the source, and “energy” refers to the type of radionuclide. This map can then be superimposed on a photograph or diagram of the contaminated area, allowing researchers to precisely identify contamination source and areas of concern.



GrayQb™ disassembled

JULY 2013 13CC00015KPIS014