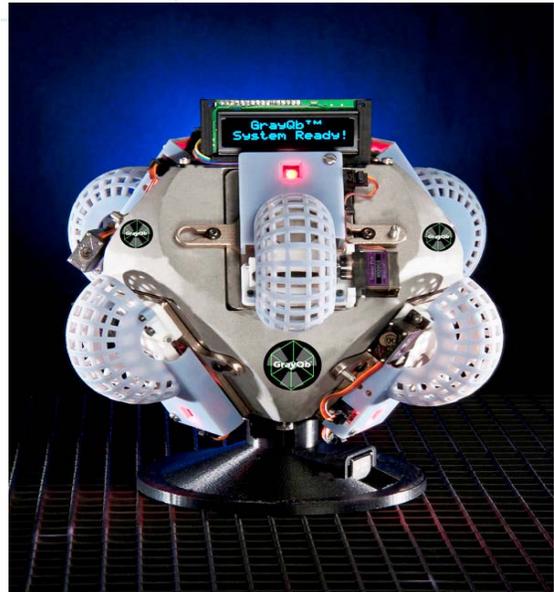


GrayQb™ - A 3D Radiation Mapping Device

Scientists at the Savannah River National Laboratory have developed and tested a device named GrayQb™, with accessories, to locate, identify, and generate a map of radioactive contamination within an enclosed area. GrayQb™ is a cubic device that utilizes multiple layers of Phosphor Storage Plates (PSPs) that are highly sensitive which translates into shorter counting times. Even with low dose rate environments, this device can be used to expedite radioactive contamination cleanup operations. The PSPs from GrayQb™ device are read on a commercially available scanner where special software records and translates the exposure data to define the type and location of the radioactive source(s).



Background

Nuclear facilities that perform cleanup operations as a routine or from an unexpected incident will need to determine the location of radioactive contamination in areas such as shielded enclosures or entire laboratory modules. These determinations are typically performed with portable count rate instruments operated by personnel wearing protective gear. These operations can be time-consuming and can expose personnel to unnecessary exposure. Some areas may be too small, confined, or have limited entry for personnel to access. Existing portable instruments may be difficult to deploy in these areas.

The PSPs used for GrayQb™ are commonly used for imaging purposes where the radiation source and dose rate are known. Common uses are medical imaging and non-destructive testing. This mature technology has been developed with the goal of “minimal dose” in mind, particularly with respect to reducing patient doses from medical imaging. The result is a high resolution, high sensitivity gamma detector material capable of micrometer resolution and mR levels of dose required. In order to provide energy determination and identification of a radioactive source and its intensity, the PSPs are stacked into a sandwich, separated by attenuation material such as metal, plastic, etc. An unknown radiation source will deposit the most dose to the outer-most PSP, with each successive layer beneath receiving less than the previous one. Based on the amount of exposure to each layer, the energy of the incident radiation can be determined. Modified configurations using other film types can be used for alpha, beta, or neutron detection.

at a glance

- characterizes contamination at a wide range of dose rates (0.01 to over 1000 mGy/hr; 1 to over 100,000 mR/hr)
- minimizes exposure to personnel
- able to detect gamma, alpha, beta, and neutron radiation
- on board electronics provides remote control and monitoring of the device
- low exposure times due to the high sensitivity of Phosphor Storage Plates (PSPs)
- full 360° coverage in all directions (4π – steradian view)
- patent pending

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SRNL is managed and operated for the U.S. Department of Energy
by Savannah River Nuclear Solutions, LLC

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How it Works

GrayQb™ is placed in a confined area for a predetermined span of time based on expected dose rates. A set of motorized shutters shield 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 collimation apparatus. GrayQb™ is then removed from the area where the PSPs are read in an optical scanner. Using special software, the data from the PSPs is translated into a map of the locations, intensities, and energies of the source contamination.



GrayQb™ Components

Features

- Film used as a radiation detector instead of imaging
- Sensitive to low dose rates for x-ray and gamma ray
- Can provide qualitative identification of radioisotopes
- Provides results in minutes

Technology transfer

The Savannah River National Laboratory (SRNL) is the U.S. Department of Energy's (DOE) applied research and development laboratory at the Savannah River Site (SRS). With its wide spectrum and expertise in areas such as homeland security, hydrogen technology, materials, sensors, and environmental science, SRNL's cutting edge technology delivers high dividends to its customers.

The management and operating contractor for SRS and SRNL is Savannah River Nuclear Solutions, LLC. SRNS is responsible for transferring its technologies to the private sector so that these technologies may have the collateral benefit of enhancing U.S. economic competitiveness.

for more information

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Partnering opportunities

SRNS invites interested companies with proven capabilities in this area of expertise to develop commercial applications for this process or product under a funds-in cooperative research and development agreement (CRADA) or licensing agreement. Qualifications should include past experience at bringing similar products to market, reasonable schedule for product launch, sufficient manufacturing capacity, established distribution networks, and evidence of sufficient financial resources for product development and launch. Companies interested in licensing will need to submit a business plan setting forth company qualifications, strategies, activities, and milestones for commercializing this invention.

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