

# TechBriefs

## Savannah River National Laboratory

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

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### At a glance

- > Ability to switch sensitivity
- > Improves Resolution
- > Reduced size
- > Uses Low Frequency Power Consumption
- > Cost Savings
- > U. S. Patent 8,884,228

### Contact Information

#### Partnering Opportunities

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### Modification of Solid State CdZnTe (CZT) Radiation Detectors with a High Sensitivity or High Resolution Operation

Researchers at the Savannah River National Laboratory (SRNL) have discovered a way of developing and progressing the current commercial capabilities of solid state CZT radiation detectors in the field.

#### Background

This invention is directed towards an improvement in CZT based gamma radiation spectrometers. The use of infrared (IR) light to enhance material performance and sensitivity is shown by incorporation.

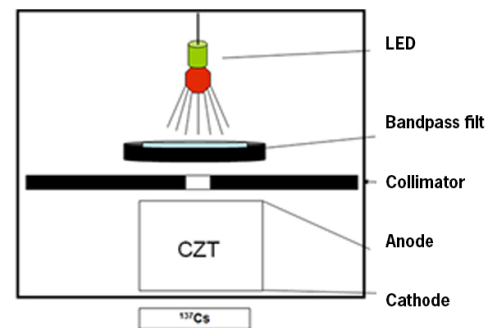
Wide bandgap semiconductors like cadmium zinc telluride (CZT) have progressed in the last 20 years to become a promising material

for gamma radiation spectrometers. The continued interest in CZT is attributed to its large absorption cross-section for gamma radiation due to high atomic number (stopping power) as well as its large bandgap that permits room temperature operation.

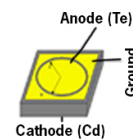
This technology also replaces the need for scintillator plus CZT based combination detectors because it has improved resolution plus increased sensitivity with the use of CZT alone. One merely has to use the infrared (IR) light to improve the sensitivity after finding a radiation source (in the absence of light) during a search process. The use of a "CZT only" detector helps decrease the cost and the size of the device as well.

#### How it works

Examples of manipulations that can be performed on a crystal include exposure to light, magnetic fields or physical stresses that have been applied to the surface. The efficiency of the carrier transport properties in CZT crystals is of great interest for the development of CZT based



SINGLE PIXEL



Response found to be independent of anode or cathode illumination



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### 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 of 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 SRNL is Battelle Savannah River Alliance, LLC. BSRA 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.

devices. In many cases, trapped charges in the crystal can affect both the hole and electron transport by as much as a factor of 10. By eliminating trapped charges in the low energy regime, both hole and electron transport efficiency can be increased throughout the entire volume of the crystal. In addition, an increase in the collection efficiency produces a higher signal to noise ratio. In the high energy regime, gamma sources produce excitation events in the entire bulk of the crystal. These events span the bulk of the crystal, allowing higher collection volumes. The ability to eliminate carrier traps in the bulk would increase the overall charge transport in the crystal and also result in a change in the internal electric field of the crystal. This behavior could have a beneficial effect to several CZT utilized applications.

Note: This design is not optimized for performance.

### Uses in Industry

This technology has possible usage capabilities for first responders, law enforcement, and border patrols.

### Partnering opportunities

SRNL invites interested companies with proven capabilities in this area of expertise to develop commercial applications for this process under a cooperative research and development agreement (CRADA) or licensing agreement. Interested companies will be requested to submit a business plan setting forth company qualifications, strategies, activities, and milestones for commercializing this invention. 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.

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