High Resolution Depth of Interaction Gamma Radiation Detector

Tech ID: 24669 / UC Case 2014-9AE-0

SUMMARY

Researchers at UCLA have developed a method for improving the spatial resolution and sensitivity of gamma radiation detection for positron emission tomography (PET).

BACKGROUND

PET is a powerful imaging technique that has many applications in medicine such as clinical oncology and pre-clinical pharmacology. However, the limited spatial resolution and sensitivity of PET scanners has suppressed its potential in small animal studies. Unfortunately, efforts to increase sensitivity by using longer and narrower crystals for gamma radiation detection also lead to degradation of the spatial resolution. Inter-crystal scatter (ICS) events are a major source of error that leads to noise and degrades spatial resolution. A few methods have been developed to reduce the error associated with ICS events, but they typically require costly and demanding hardware and computational efforts that are not available for conventional Anger logic detectors.

INNOVATION

UCLA researchers from the department of molecular medical pharmacology have developed a technique that provides both high sensitivity and high spatial resolution for gamma radiation detectors. In this work, a phoswich depth of interaction (DOI) detector design composed of two layers of scintillator arrays made from cerium doped lutetium-yttrium oxyothosilicate (LYSO) and bismuth germanate (BGO) were used. The two layer detector configuration is designed to retrieve DOI information that will improve spatial resolution uniformity across the field of view and allow for high sensitivity detection. Furthermore, this detector allows identification of the majority of the cross layer crystal scatter (CLCS) events (the ICS events that deposit their energy in both layers), allowing a great reduction of this source of error.

APPLICATIONS

The technology could improve resolution and sensitivity for clinical and pre-clinical PET imaging.

ADVANTAGES

- Properly detects and identifies inter-crystal scatter
- Retrieves depth-of-interaction (DOI) information that improves spatial resolution uniformity

STATE OF DEVELOPMENT

This new design is expected to be implemented in the next generation small animal PET tomography being developed at the Crump Institute for Molecular Imaging, at UCLA.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	10,234,572	03/19/2019	2014-9AE

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OTHER INFORMATION

KEYWORDS

Gamma Ray Detector, Depth of Interaction, Spatial Resolution, Positron Emission Tomography, PET, Inter-Crystal Scatter

CATEGORIZED AS

- **Optics and Photonics**
  - All Optics and Photonics
- **Imaging**
  - Medical
  - Molecular
- **Medical**
  - Disease: Cancer
  - Disease: Cardiovascular and Circulatory System
  - Disease: Metabolic/Endocrinology
  - Disease: Musculoskeletal Disorders
  - Imaging
  - Research Tools
- **Research Tools**
  - Other

RELATED CASES

2014-9AE-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Copyright: A Statistical Atlas of the Mouse Trunk Region

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