

Request Information

Permalink

Position-Sensitive Radiation Detector

Tech ID: 34317 / UC Case 2015-655-0

BACKGROUND

Position-sensitive radiation detection has been used in semiconductor detector development for decades. Traditional approaches have relied on segmented electrodes to achieve spatial resolution. Conventional semiconductor radiation detectors utilize segmented electrodes where each electrode segment is physically separated and individually read out to determine the position of radiation interactions. Traditional segmented electrode designs have long suffered from highly non-uniform electric fields within the detector volume, particularly at electrode edges and corners. These field concentrations can cause premature breakdown and inconsistent charge collection. This non-uniformity can also lead to position-dependent signal variations, pulse time dispersion, and potential electrical connections between adjacent electrodes from radiation damage. Moreover, common approaches to manufacturing of segmented electrodes requires precise mask alignment and complex fabrication processes, resulting in higher production costs and reduced yields.

TECHNOLOGY DESCRIPTION

To help address these challenges, researchers at UC Santa Cruz (UCSC) have developed a continuous electrode method (instead of segmented electrodes) and through AC coupling to achieve position sensitivity between the continuous electrode and segmented contacts placed on an insulating layer above. This approach creates uniform electric fields throughout the detector volume, as demonstrated by field modeling results showing dramatic improvement over conventional segmented approaches. By selecting resistor and capacitor (RC) time constants (preferably 1-25 nanoseconds) for the AC coupling mechanism, this technology enables position resolution through controlled charge sharing between contacts, while maintaining the benefits of a continuous electrode structure. The continuous electrode approach eliminates the field discontinuities that plague segmented designs, providing more uniform charge collection, reduced susceptibility to radiation damage, and simplified manufacturing processes.

APPLICATIONS

- ▶ position-sensitive detectors for PET, SPECT, CT
- ▶ high-energy physics detectors
- ▶ radiation monitoring detectors for defense
- ▶ satellite and spacecraft instrumentation

FEATURES/BENEFITS

- ▶ Lowers manufacturing costs through simpler electrode segmentation requirements and improved mask alignment tolerances.
- ▶ Eliminates field discontinuities and edge effects, providing consistent charge collection efficiency across entire detector area and reducing position-dependent signal variations.
- ▶ Provides precise control over charge sharing mechanism, allowing fine-tuning of position resolution.
- ▶ Continuous electrode structure eliminates vulnerable inter-electrode gaps where radiation damage may cause electrical bridging and detector failures.

INTELLECTUAL PROPERTY INFORMATION

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	9,613,993	04/04/2017	2015-655

RELATED MATERIALS

CONTACT

Marc Oettinger
marc.oettinger@ucsc.edu
tel: 831-502-0253.



OTHER INFORMATION

KEYWORDS

radiation detection, radiation detector, electrodes, segmented electrodes, semiconductor, semiconductor radiation detector, continuous electrode, AC-coupled, AC coupling, capacitance, capacitor, position-sensitive, position resolution

CATEGORIZED AS

- ▶ **Security and Defense**
 - ▶ Screening/Imaging
- ▶ **Semiconductors**
 - ▶ Design and Fabrication
- ▶ **Sensors & Instrumentation**
 - ▶ Analytical
 - ▶ Medical
 - ▶ Position sensors
 - ▶ Scientific/Research

RELATED CASES

2015-655-0

University of California, Santa Cruz
Industry Alliances & Technology Commercialization
Kerr 413 / IATC,
Santa Cruz,CA 95064

Tel: 831.459.5415
innovation@ucsc.edu
<https://officeofresearch.ucsc.edu/>
Fax: 831.459.1658

© 2025, The Regents of the University of California
[Terms of use](#)
[Privacy Notice](#)