

SUBMIT TO: AM129, James/Schirato
Hard X-Ray, Gamma-Ray, and Neutron Detector Physics II

ABSTRACT TITLE:

Position-sensitive germanium detectors for gamma-ray imaging and spectroscopy

AUTHOR LISTING:

Mark Amman
Ernest Orlando Lawrence Berkeley National Laboratory
1 Cyclotron Road, MS 70A-3363
Berkeley, CA 94720
Telephone: 510-486-5638
Fax: 510-486-5857
Email address: Mark_Amman@lbl.gov

Paul Luke
Ernest Orlando Lawrence Berkeley National Laboratory
1 Cyclotron Road, MS 70A-3363
Berkeley, CA 94720
Telephone: 510-486-4962
Fax: 510-486-5857
Email address: PNLuke@lbl.gov

PRESENTATION TYPE: Invited oral presentation

ABSTRACT TEXT:

INVITED

Gamma-ray imaging with position-sensitive germanium detectors offers the advantages of excellent energy resolution, high detection efficiency, and potentially good spatial resolution. The development of the amorphous-semiconductor electrical contact technology for germanium detectors has simplified the production of these position-sensitive detectors and has made possible the use of unique detection schemes and detector geometries. We have fabricated prototype double-sided orthogonal-strip detectors for gamma-ray imaging studies using this contact technology. With these detectors, we have demonstrated that a gamma-ray interaction event in the detector can be located in three dimensions. This more accurate determination of the interaction event positions should ultimately lead to better image resolution. We have also taken advantage of the bipolar blocking nature of the amorphous-semiconductor contacts in order to investigate the use of field-shaping electrodes. A set of field-shaping electrodes was formed by interconnecting every other strip electrode on one side of a detector. A bias applied between the remaining charge-sensing electrodes and this set of field-shaping electrodes improved the overall charge collection to the sensing electrodes and consequently the detector performance. In this paper, we summarize the development of

these position-sensitive detectors and present the results that we have obtained from our studies with these detectors.

KEYWORDS: gamma-ray imaging, gamma-ray spectroscopy, germanium detector, orthogonal strip, position sensing