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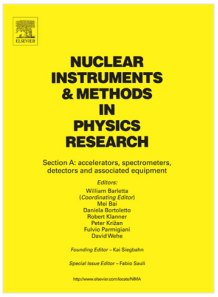

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Overcoming the planar contact geometry limitation for the measurement of transport properties and electric field distribution in X- and gamma ray detectors

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Abstract

Laser induced transient current technique (LI-TCT) was proven to be a successful tool for measuring at the same time carrier lifetime, carrier mobility, and electric field distribution in X- and gamma ray detectors with plain contacts on opposite surfaces. Unfortunately, the most performing detectors exploit more complicated contact geometries that, hindering hole contribution to signal formation, allow a much better spectroscopy. In this paper, a LI-TCT based method is presented, for the determination of transport parameters as well as electric field distribution directly in single carrier devices. The method's validity is demonstrated in twin CdZnTe detectors having similar material properties, but different weighting potentials.

Introduction

CdZnTe X- and gamma ray detectors are widely used for medical applications [1], environmental control [2], and security [3]. The realization of high quality detectors depends on the availability of CdZnTe crystals with optimal carrier mobility-lifetime product. This can be determined by irradiating a planar detector using alpha particles [4] or low energy x-rays [5] to create electron-holes pairs. The collection efficiency as a function of applied voltage is fitted by the use of Hecht equation [6]. Also photoconductivity measurements allow the determination of mobility-lifetime product, once surface recombination is taken