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# Material dependence of bulk leakage current in CdZnTe detectors

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## ABSTRACT

The bulk leakage current in a semiconductor detector is an important parameter that affects the noise level and energy resolution of the detector. For detectors operating with ohmic contacts, the bulk leakage current is determined by the bulk resistivity of the semiconductor material. However, CdZnTe detectors typically utilize Schottky barrier type contacts, in which case the bulk leakage current is expected to depend on the contact behavior and not on the bulk resistivity of the material. We have studied the bulk leakage current and noise of CdZnTe detectors made from materials supplied by different manufacturers of CdZnTe crystals. The results indicate that there is a marked difference in bulk leakage currents among materials from different manufacturers and among different samples from the same manufacturer. In some cases, the bulk leakage current shows no correlation with the bulk resistivity of the materials. In other cases, the bulk leakage currents tend to be lower for lower resistivity materials, which is opposite from the commonly held expectation based upon ohmic contact device behavior. In this paper we present a summary of our electrical measurements on CdZnTe devices and present results indicating a possible relationship between leakage and bulk material properties, but the specific material properties and the mechanism responsible for the leakage current variation have yet to be determined.

**Keywords:** CdZnTe, metal-semiconductor contact, Schottky contact, ohmic contact, semiconductor detector, gamma-ray detector