

Modelling of CZT Strip Setectors

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Position-sensitive CZT detectors for astrophysical research in the five – several hundred keV range are being developed at UCSD and WU. These can be used for large area detector arrays in coded mask imagers and small-area focal plane detectors for focusing X-ray telescopes. The detectors have crossed-strip readout and optimized strip widths and gaps to improve energy resolution. A “steering electrode” between the anode strips improves charge collection. A model of charge drift in the detectors and charge induction on the electrodes has been developed to allow us a better understanding of these types of detectors and improve their design. Presently, the model calculates the electric field within the detector, the charges’ trajectories, mobility and trapping of holes and electrons, and charge induction on all electrodes including their time dependence. Additional effects are being added. The model is described and its predictions are compared with laboratory measurements. Results include (1) the dependence of various electrodes’ signals on interaction depth, transverse (to the strips) position, electron and hole trapping, strip width and gap, and bias, (2) trajectories of charges for various anode and steering electrode bias voltages, (3) a method to improve energy resolution by using depth of interaction information, and (4) an electrode geometry and bias optimized for the improved energy resolution. In general, the agreement of the model with the measurements is good.