Charge Correction in X and Gamma Ray Detectors Based on CZT

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CZT, show some prerogatives as materials for X and gamma ray detection because of its properties, as high stopping power, good transport properties, and low leakage current even at room temperature. Nevertheless, despite the improvement in the grown techniques, its transport properties are limited, if compared with those of traditional materials for radiation detection. This fact leads to a reduction of spectroscopic properties especially when increases the penetration length of gamma-rays at high energies. Several methods have been proposed to link the interaction depth and the charge losses achieving good improvements in the spectroscopy but, in most cases, they produce only heuristic corrections without any clearly visible relation with some physical models. Bargholtz et al. have improved the spectroscopy digitizing the signals and fitting them with a model, but this method is very expensive in term of computing power because of the high number of fitting paramiters. In this work, we propose an hybrid approach to the problem. Once known the read-out electronic transfer function, the detector signal could be corrected using the photon impact depth (extracted from the discontinuity in the current signal) and the material transport parameters, obtained from two simple fitting procedure with only four free parameters for each fit. This method, based on the Zanio model, is not only useful to correct the charge losses but also to achieve the characteristic properties of CZT, because takes into account also the detrapping contribution. In the last year we have presented the results obtained with a simplified model, now we show those obtained with the complete model, with a more accurate fit that lead to a more precise measure of detrapping time. The transfer function used in the calculations is the one measured in our system; nevertheless the procedure employed and the calculation of the integral terms are immediately extendable to many other transfer function.