Simulation and Tests of Multithreshold Charge Sharing Compensation Algorithm Implemented in SPC Readout Integrated Circuits Operating in Si and CdTe Pixel Detectors

This paper presents the tests of the charge-sharing compensation algorithm implemented in the single photon counting readout integrated circuit for Si and CdTe pixel detectors. The multi-threshold pattern recognition algorithm with four energy thresholds was tested in 96 × 192 pixel matrix with 100 μ m pixel pitch. With the readout pixel noise of only 124 el. rms and the threshold spread below 1 mV for all discriminators, the algorithm operates uniformly on the entire pixel matrix. The multi-threshold algorithm enables not only to measure radiation energy but also to increase the hit allocation accuracy. The algorithm performance was tested both with Si and CdTe detectors in the energy range from 6-150 keV. The hybrid detector module consisting of a sensor, readout IC, and back-end electronics was used for the food inspection on the fast-moving belt. The charge-sharing compensation algorithm, together with the time domain integration method implemented in the integrated circuit significantly improves the quality of images collected during tests. (This work is supported by the National Science Centre, Poland, project no. 2023/51/B/ST7/01782.)

Workshop topics

Front-end electronics and readout

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