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Monte-Carlo simulation of charge sharing in 2 mm thick pixelated CdTe sensor

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Pixel detectors allow for the measurement of position and energy of the incident particles. Readout chips of hybrid pixel detectors can be bump-bonded to pixelated sensors made of different materials. The R&D has made fine pitch pixelated CdTe/ CdZnTe sensors commercially available in the last decades. These sensors are used in medical imaging applications due to their high absorption efficiency in the X-ray spectrum [1]. The decreasing pixel pitch size causes the charge to spread across multiple pixels, due to the charge sharing effect and fluorescent photons [2]. These two effects cause signal induction in multiple pixels, thus distorting the measured spectra. Chargesharing compensation and hit allocation algorithms are needed to compensate for these effects. An investigation of charge spread across pixels is needed to develop such algorithms.

This work presents a Monte-Carlo simulation of a 2 mm thick 70 µm pixelated CdTe sensor upon the absorption of X-ray photons from a monochromatic X-ray beam. Based on the simulation outcome, we estimated the dependence of active pixels on photon energy, i.e., cluster size and total charge distribution between neighbouring pixels. The detailed results will be presented.

[1] M F Walsh et al., Journal of Instrumentation. 6 (2011), 1748-0221
[2] D. Pennicard et al., Journal of Instrumentation. 6 (2011), 1748-0221

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