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Multi-threshold Window Discriminator Based on SAR Logic

The new class of X-ray imaging detectors allows us to capture an image in various energy ranges in one shot [1]. This technique is called X-ray color imaging, and it is becoming a promising method in many applications such as medical imaging, computed tomography, and material testing [2]. To measure the energy spectrum in one shot, discriminant circuits need to be integrated into the pixel front-end electronics. Several solutions of in-pixel discriminators exist. However, current designs suffer from a low number of discrimination bins and need to adjust each discrimination threshold separately, leading to relatively complicated calibration procedures [3].

This work will introduce a novel design of a multi-threshold window discriminator based on successive approximation register logic. This circuit realizes in-pixel binning to ten equidistant windows. Two variables are used for tuning the multi-threshold window discriminator: offset of first window and width of windows. Setting these parameters allows the user to fulfill the need for the target application. The results will be presented.

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