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Monolithic Active Pixel Matrix with Binary Counters (MAMBO) ASIC, using a nested well structure to decouple the detector from the electronics

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Monolithic Active Matrix with Binary Counters (MAMBO) IV ASIC has been designed for detecting and measuring low energy X-rays from 6-12keV. A nested well structure with a buried n-well (BNW) and a deeper buried p-well (BPW) is used to electrically isolate the detector from the electronics. BNW acts as an AC ground to electrical signals and behaves as a shield. BPW creates a homogenous electric field in the entire detector volume. The ASIC consists of a matrix of 41×42 pixels, each of $105 \times 105 \mu\text{m}^2$. Each pixel contains analogue functionality accomplished by a charge preamplifier, CR-RC2 Shaper and a baseline restorer. It also contains a window comparator with Upper and Lower thresholds which can be individually trimmed by 4 bit DACs to remove systematic offsets. The hits are registered by a 12 bit counter which is reconfigured as a shift register to serially output the data from the entire ASIC.

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