

## Development of a Low-Noise Front-end ASIC for CdTe Detectors

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We have developed a series of front-end ASICs with spectroscopic capability for hard X-ray and gamma-ray imaging applications. Our latest ASIC, the "KW04H64" is designed for in-vivo molecular imaging, in which molecules are labeled with radioisotopes and injected into a small animal and their distribution in a body is detected externally. It requires a radiation detector that has good spatial and energy resolution and also covers a large detection area. The ASIC measures 7.12 mm x 8.03 mm and was implemented with X-fab 0.35 um CMOS technology. It consists of 64 readout channels and each channel contains a charge sensitive amplifier (CSA) including leakage current compensation function, a pole-zero cancellation circuit, two kinds of low pass filter (fast/slow shaper) capable of baseline adjustment for energy and timing measurement, a comparator, a sample and hold circuit, and a 10-bit Wilkinson ADC with common mode subtraction function. According to the photon energy range, the dynamic range can be changed by setting the register controlling the gain of the CSA. A novel function of the ASIC is that the voltage output of the fast shaper can be also digitized, which provides a user friendly method for adjusting the baseline of it. In the highest gain mode, the dynamic range is  $\sim 40,000 e^-$  and the noise performance is  $31 e^- + 5.1 e^-/pF$  from simulation. Besides the performance verification test of the ASIC itself, we also connected the ASIC to a CdTe detector and measured the spectrum of the radioactive sources of Am-241 and Ba-133. In this presentation, we will report on the results of the performance of the ASIC itself and the detector system, including the comparison with predictions made by simulations.

### Submission declaration

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