Evaluation of Kyoto's Event-Driven X-Ray Astronomical SOI Pixel Sensor with a Large Imaging Area


Introduction

We have been developing monolithic active pixel sensors, named "XRPX", based on the silicon-on-insulator (SOI) pixel technology for future X-ray astronomy satellites such as "FORCE" [Fig. 1] [1]. XRPX contains a comparator circuit in each pixel for hit trigger timing and a two-dimensional hit-pattern (position) output. The function allows us readout of pulse heights only from hit pixels on trigger output timing, which is referred to as the event-driven readout mode [2]. Thus, XRPX offers a good time resolution better than 10 µs and a high throughput reaching > 1 kHz in addition to the imaging and spectroscopic capabilities comparable to those of an X-ray CCD. Taking advantage of the good time resolution, we can significantly reduce non-X-ray backgrounds (NXB) by introducing an anti-coincidence technique (Fig. 2).

Recently, we processed XRPX5b with the largest imaging area in our XRPX series. In this poster, we report the first evaluation results of XRPX5b, especially whether the performance changes due to its large size.

X-ray Image

Event-Driven X-ray Image

Depletion Depth

Gain Uniformity

Summary

Device Description of XRPX5b

Spectral Performance

Reference