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

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We have been developing monolithic active pixel sensors, named "XRPIX", based on the silicon-on-insulator (SOI) pixel technology for future X-ray astronomy satellites. XRPIX has the function of event trigger and hit address outputs, which allows us to read out analog signals only of hit pixels on trigger timing. Thus, XRPIX offers a good time resolution better than 10 μs and a high throughput reaching > 1 kHz. The non-X-ray background can also be significantly reduced by applying the anti-coincidence technique. Recently, we processed "XRPIX5" with an imaging area of 21.9 mm $\times$ 13.8 mm, a pixel size of 36 μm $\times$ 36 μm, and the format of 608 $\times$ 384 pixels. XRPIX5 has a larger imaging area than other XRPIX series. In spite of the large size, we successfully obtained X-ray spectra from all regions of XRPIX5 and achieved the spectral performance comparable to previous XRPIX. The energy resolution is $\sim$ 420 eV (FWHM) at 6 keV and the readout noise is $\sim$ 37 e^- (rms) in the frame-by-frame readout mode. We also investigate the gain uniformity and the leak current among the pixels. Here, we report the evaluation results of XRPIX5.

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