



Contribution ID: 348

Type: **Oral Presentation**

Progress in Development of a Monolithic Active Pixel Detector for X-ray Astronomy with SOI CMOS Technology

Thursday 9 June 2011 16:00 (20 minutes)

The standard detector in X-ray Astronomy is CCD (charge coupled device) at the moment because of the remarkable imaging capability (~ 20 μm pixel) and energy resolution at the fano limit ($\text{FWHM} \sim 135$ eV @ 6 keV). However, the time resolution of CCD is poor (~ 1 Hz); this limits the observation of bright X-ray sources such as black holes. Thus, we have been developing a novel monolithic active pixel sensor having a good time resolution (~ 100 kHz) with the Silicon-On-Insulator (SOI) CMOS technology. We introduce the first prototype device, "XRPiX1", and its performance.

The detector has the format of 32×32 and the pixel size of $30 \mu\text{m} \times 30 \mu\text{m}$. Each pixel has the CDS (Correlated Double Sampling) circuit for noise reduction and the trigger function for signal detection. We confirmed that the CDS and the trigger functions work properly. We achieved the energy resolution of 260 eV (FWHM) at 8 keV in a single-pixel readout mode in which the multi-sampling digital filter is applicable to eliminate the readout noise. We identified the noise sources in the readout circuit, and evaluated them quantitatively. The results are fed back to the design of a next prototype device. The thickness of the depletion layer is $\sim 140 \mu\text{m}$. We also report the details of the other X-ray performances including the gain and the noise in the pixel-by-pixel readout mode.

Author: Mr NAKASHIMA, Shinya (Kyoto University)

Co-authors: Mr IWATA, Atsushi (A-R-Tec Corp.); Mr TAKEDA, Ayaki (SOKENDAI); Mr ICHIMIYA, Ryo (KEK/IPNS); Mr RYU, Syukyo (Kyoto University); Mr OHMOTO, Takafumi (A-R-Tec Corp.); Dr TSURU, Takeshi (Kyoto University); Mr IMAMURA, Toshifumi (A-R-Tec Corp.); Mr MIYOSHI, Toshinobu (KEK/IPNS); Dr ARAI, Yasuo (KEK/IPNS); Ms IKEMOTO, Yukiko (KEK/IPNS)

Presenter: Mr NAKASHIMA, Shinya (Kyoto University)

Session Classification: Astrophysics and Space Instr.

Track Classification: Astrophysics and Space Instrumentation