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# High Energy Resolution 4 cm wide Double-sided Silicon Strip Detectors for Semiconductor Compton Telescope

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Large area imaging spectrometer with good energy resolution based on double-sided Si strip detector (DSSD) is a key technology for a new generation of Gamma-ray astronomy. It is well suited as the scatterer detector of semiconductor Compton telescopes (SCTs) working at sub-MeV to MeV band. High energy resolution is of particular importance because it ensures better angular resolution and higher detection sensitivity, as well as wider energy range down to 100 keV. We are developing DSSDs and read-out ASICs with special care on the energy resolution. Recently, we developed a system of a 2.56 cm wide DSSDs (from HPK) read-out with low-noise analog ASICs, VA32TA (from Ideas), with a good energy resolution of 1.3 keV (FWHM) for 60 keV and 122 keV at 0 C (H. Tajima et al. IEEE 2004). The DSSDs are used in our prototype SCT, combined with CdTe pixel detectors, and a Compton reconstruction is achieved at an energy as low as 81 keV thanks to its high energy resolution (S. Watanabe et al. IEEE 2005).

In this work, we present our results on the new larger 4 cm wide DSSDs. This device is based on the 2.56 cm DSSD and designed to improve the detection area by a factor of 2.25 with minimum degradation of energy resolution. The thickness of the detector is 300 um. The strip pitch is 400 um with a gap of 100 um, and the strip length is 38.4 mm. There are 96 strips each on p and n sides implanted on orthogonal direction. The p-strips of the DSSD are connected directly to three ASICs, VA32TAs. The n-strips are connected via RC filter chip for AC connection (RC-chip) to another three ASICs. A bias voltage of 100 V is applied from the RC-chip. The system works well and a fine image with 241Am source is obtained. When operated at a temperature of -10 C, we obtain an energy resolution of 1.7 keV (FWHM) for the p-strips for 59.5 keV gamma-rays. Detail of this detector, read-out system and their performance will be addressed

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