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Abstract:
A Compton camera based on Si and CdTe semiconductor imaging devices with high energy resolution is very attractive for the next generation Compton camera which should feature the high angular resolution together with the detection capability even at several 10 keV.

In this talk, we report on the development of high energy resolution DSSD stack modules which play a key role in the Si/CdTe Compton camera. We have developed a 4 cm × 4 cm wide area DSSD and succeeded to obtain 1.5 keV (FWHM) energy resolution at 60 keV by means of specially designed low noise analog VLSI. This scheme helps to obtain the best noise performance not only for the p-side but also for the n-side. Additionally, the mechanical structure to construct a stack consists of several ten layers of DSSDs becomes easy even with a pitch of a few mm, since the system does not need decoupling capacitors.
We have developed a first prototype with 2.56 cm × 2.56 cm size DSSDs. The energy resolution at 60 keV is obtained to be 1.8 keV (FWHM) for the p-side and 3.1 keV (FWHM) for the n-side, respectively. We found that the energy resolution is improved to be 1.5 keV if we add signals from both sides with proper weighting factor.

Furthermore, we reproduce DSSD energy response including inter strip event, based on 2-dimensional device simulator VENUS-2D and assumption of a simple charge induced model.