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Study of Silicon drift sensor for Gamam-ray Compton Camera

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Compton camera used in the Hitomi SGD is a useful detector for soft gamma-ray in space observation. Si-pixel sensor with 3.4 mm pixels is used as scatterer in the SGD Compton camera. But this pixel size does not allow us to measure a direction of Compton-recoil electrons in the Si sensor, and thus the sensitivity is limited. To improve, it is important to measure the direction of recoil electrons and constrain the incoming direction of photons to a part of Compton ring. It is an advantage to use a silicon drift sensor for this point. The silicon drift sensor(SDD) has strip-like readout channels and a drift time of signal electrons gives information of hit positions in another axis. There are three advantages compared with Si-pixel sensor. One is that high position resolution is expected by measuring drift time and a smaller channel pitch. The second is that high energy resolution is expected by smaller capacitance. The third is that a low power consumption due to smaller numbers of readout channels. Low power consumption is very important for satellite.
We made the prototype silicon drift sensor whose size is $18 \times 46.5 \times 0.5\ \mathrm{mm}^3$ and 64 readout channels and $0.1 \times 0.07\ \mathrm{mm}^2$ channel size with Hamamatsu Photonics. We studied the basic properties of our prototype SDD especially about the depletion layer and the drift field with checking performance.

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