Multi-pixel avalanche photodiodes for medium-energy electrons and its application

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Because distribution functions of medium-energy electrons vary from thermal (several keV) to non-thermal (in the range of 100 keV), investigating the energy spectra of several keV to 100 keV electrons will provide an important clue to understanding the heating and acceleration mechanisms of magnetospheric plasmas. Therefore, precise measurements of medium-energy electrons will directly address the scientific paradigms in magnetospheric physics, such as the particle acceleration by magnetic reconnection and the physics of collisionless shocks. However, it is difficult to accurately and reliably detect electrons in medium-energy range, since this range borders the techniques for lower-energy and higher energy. Avalanche Photodiode

(APD) is a promissing option for the detection of these electrons. From former reseaches, APD is known to offer a lower threshold of detection and a good energy resolution due to the internal gain. One of the effective solutions to use APD is to couple with electrostatic analyzers or magnets, in order to prevent lights or other noise sources. This requires a large sampling area for APDs. In this study, we developed brand-new APDs with larger sampling area using pixilated APD arrays with low noise feature. We are targeting from several keV to 100 keV with the covering area of

11 mm x 15 mm square divided by 2 x 4 channels. We also propose a new model of application for future missions.

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