R006-18
A 会場 ：11/6　AM2 （10:45-12:30）
11:15〜11:30

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Initial experiments of a particle sensor combining floating-mode APD and an electrostatic analyzer for low/medium-energy electrons

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Avalanche PhotoDiodes (APDs) are prevailing for medium-energy (10s-keV) electron detections with rough energy analyses in space observations. For instance, the electron detector system of the Medium-Energy Particle instrument for electrons (MEP-e) for ERG mission consists of an array of APDs [Kasahara et al., EPS 2018]. Kasahara et al. [NIM, 2012] reported that the minimum detectable energy with an APD is 5 keV at 20 ℃.

We aim to reduce the lowermost energy of electron energy analyses for medium-energy electron analyzers using floating-mode APD. In the future, we hope to apply APDs in low-energy electron analyzers.

To detect lower-energy electrons below 5 keV, we applied the floating voltage to APD so that the incident electrons could be accelerated up to energies enough large for APD detection.

In our previous research, we have already achieved the world-first detection of 10-eV electrons by applying +5 kV to APD. We found that the energy resolution for the floating mode did not decline compared to that for the non-floating mode. In this presentation, we report the results of experiments using floating-mode APD installed in an engineering model of MEP-e. After the electrons are filtered due to passing through the ElectroStatic Analyzer (ESA) of MEP-e, the electrons accelerated by the floating voltage are successfully detected by APD at the corresponding energy channels.

We could detect from a few tens of eV to 10-keV electrons by floating-mode APD while the energy range of MEP-e using normal APDs is from 7 to 87 keV. The energy resolution for the 5-keV electrons accelerated to 10 keV (the 5-kV floating mode) was 1.50 keV, which was comparable to our previous results. We have confidence that the floating-mode APDs applied to medium-energy electron analyzers for 10s-keV measurements allow us to lower the energy range of the analyzers. Our results also show that the floating-mode APDs could be applied as low-energy electron detectors with a high sensitivity and a rough energy analysis capability.