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New design of High Energy Particle electron sennsor onboard ERG satellite with Geant4

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In inner radiation belt around the earth, plasma particles have energies ranging from eV to MeV. It is reported from satellites observations that particle flux suddenly increase or decrease during geomagnetic storms. Although several theoretical models tried to elucidate the generation and acceleration processes of the relativistic electrons in the radiation belts, it is not yet concluded. To understand the process, it is necessary to observe both of the particles and electromagnetic waves concurrently in magnetic equatorial plane. However, sufficient observations have not been done yet in this region. For this reason, small satellite ERG (Energization and Radiation in Geospace) is proposed. Instruments on board ERG observes wide energy range of particle (about 10 eV to 10 MeV) and plasma wave at the same time to investigate the mechanism of acceleration process of the relativistic electrons.
In the ERG particle energy rang, electrons with the energy of few hundreds of keV are notably important because these electrons are considered as "See" electrons to be relativistic electrons through acceleration processes. HEP-e detector aboard ERG observes electrons with this energy and is needed to detect the energy and pitch angle of the electrons accurately.
In this study, we calculated the performances of HEP-e detector with Monte Carlo simulation (Geant4). In order to understand the acceleration processes, HEP-e detector is demanded to have energy resolution about 10%@1MeV and to detect the pitch angle with angular resolution of 10 degree x 10 degree. We simulate the track of high energy particles in some detector configurations, to evaluate the energy resolution and the pitch angular resolution, including the effects of energy loss with the dead layer and particle scattering. Besides, we estimate the effects of background events which is caused by high energy particles penetrating the sensor box and contaminate true electron events. In this presentation we show results of these simulations and discussion about it.

Keywords: HEP, Si detector, Geant4