# Design of the high-energy particle instruments (HEP-e) for electron measurements in the ERG mission

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It is known that the Earth's inner magnetosphere is the region where the space plasma particles have a wide range of energy from a few eV to more than 10 MeV. Although numerous in situ satellite measurements have been done in the past decades, the Earth's inner magnetosphere is still an unclear region in terms of scientific investigation, particularly in the area of space plasma dynamics. This region, however, is very important as a natural laboratory where high-energy particle acceleration can be directly measured in the dipolar field configuration, as well as for human activities in space including space weather prediction. Therefore, a Japanese exploration mission named 'Energization and Radiation in Geospace (ERG)' has been promoting to launch in the coming solar maximum around 2014, to observe the space plasma particles with the wide energy range, electric/magnetic fields and waves simultaneously.

Measurements of the high energy electrons are the key in this mission. A high energy particle instrument for electrons (HEP-e) is hence developed with the novel technique of solid state detector (SSD) for the energy analysis of incident particles. HEP-e consists of two sensor heads, HEP-e-Low and HEP-e-High in order to cover the energy range from 50 keV to 2 MeV. These two sensor heads have different geometry factors by a factor of nine but similar structures, which are called HEP-e-Low (50 keV - 1 MeV) and HEP-e-High (700 keV - 2 MeV), respectively. Each sensor head has three identical assemblies with a field of view of more than 60 deg x 10 deg each, and therefore can fulfill a 4 pi sr coverage after one full spin period. The single-sided silicon strip detector (SSSD) technique is used so as to give the angular information of the particle incidence with appropriate angular resolutions. A 12-micrometer aluminum coating plus a thin first layer of SSSD is used in HEP-e-Low for the discrimination/contamination of ions. A 250-micrometer aluminum foil is used in HEP-e-High for the elimination of the lower energy electrons. All the sensor heads are integrated in one plane and the total size is less than 200mm in diameter.

The latest design of HEP-e for the ERG mission is presented here.