Development of High Energy Particle Instrument for Planetary Magnetospheric Exploration :Optimization of TOF by numerical design

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Concerning future missions of terrestrial and planetary magnetospheric exploration, we are developing new type high energy particle instrument to propose for the BepiColombo Mercury Magnetospheric Orbiter (MMO) one of spacecraft consisting of the BepiColombo Mission. BepiColombo MMO is an orbiter around Mercury, which ESA and ISAS cooperate to launch in order to investigate the structure of the Mercury magnetosphere and its dynamics. It is important to observe plasma and high energy particles directly in the Mercury magnetosphere. Aims of the high energy particle observations are as follows:

1.Reappraising high energy particle observations by Mariner 10
2.Investigation of the radiation belt and the ring current and their spatial distribution
3.Diagnostics of particle acceleration mechanisms and injection regions and magnetospheric magnetic field structure
4.Revealing the relation of magnetospheric disturbance and particle injection phenomena
5.Observation of solar particle and galactic cosmic ray

High energy particle instruments recently made in Japan were for Geotail and Planet-B missions. They are based on the same measurement principle. The high energy particle instruments (HEP-LD) on Geotail has a wide field of view and is able to cover all solid angle by one spin, but it is of large size and weight. On the other hand, The Planet-B instrument dose not has a wide field of view while it is light. A Light and compact instrument is essential in the future missions. In high energy particle observations by BepiColombo MMO, we aim to get detail information on energy, mass, pitch angle of high energy particles, which Mariner 10 instruments did not observe then. The high energy particle instrument designed by us is axialy symmetric. Energy analysis with SSD is possible from several tens of keV up to several MeV. Particle species measured by the time-of-flight technique are H, He, CNO, Na, K, Fe and electron.