

ベピコロombo MMO 搭載プラズマ / 粒子観測装置 (MPPE)

齋藤 義文 [1]; 高島 健 [2]; 浅村 和史 [3]; 平原 聖文 [4]; 横田 勝一郎 [1]; 笠原 慧 [5]
[1] 宇宙研; [2] 宇宙研; [3] 宇宙研; [4] 名大・STE 研; [5] ISAS/JAXA

Mercury Plasma/Particle Experiment (MPPE) on BepiColombo/MMO

Yoshifumi Saito[1]; Takeshi Takashima[2]; Kazushi Asamura[3]; Masafumi Hirahara[4]; Shoichiro Yokota[1]; Satoshi Kasahara[5]
[1] ISAS; [2] ISAS, JAXA; [3] ISAS/JAXA; [4] STEL, Nagoya Univ.; [5] ISAS/JAXA

Mercury is one of the least explored planets in our solar system. Except the recent Mercury orbiter MESSENGER, no spacecraft has visited Mercury since Mariner 10 made three flybys two in 1974 and one in 1975. In order to elucidate the detailed plasma structure and dynamics around Mercury, an orbiter BepiColombo MMO (Mercury Magnetospheric Orbiter) is going to be launched in 2014 as a joint mission between ESA and ISAS/JAXA. Although the plasma scientific payload of Mariner 10 was very limited, it made a very important discovery that Mercury possesses an intrinsic magnetic field, whose intensity was in a very intriguing range in terms of comparative planetary magnetospheres. The dominance of the dipole term in the spherical harmonic expansion of Mercury's magnetic field suggests that the interaction between the solar wind and Mercury's magnetosphere should be Earth-like, in contrast to the cases of Mars and Venus where the planetary magnetic fields have only local effects on the interaction. On the other hand, because of its small size and gravity, Mercury has very different environmental characteristics compared to the Earth. In the near future, new results obtained by MESSENGER will reveal the unexpected plasma/particle environment around the Moon.

Mercury Plasma/Particle Experiment (MPPE) is a comprehensive instrument package for plasma, high-energy particle and energetic neutral atom measurements. It consists of 7 sensors: two Mercury Electron Analyzers (MEA1 and MEA2), Mercury Ion Analyzer (MIA), Mass Spectrum Analyzer (MSA), High Energy Particle instrument for electron (HEP-ele), High Energy Particle instrument for ion (HEP-ion), and Energetic Neutrals Analyzer (ENA). Instrument CDR of MPPE sensors were held in March-May 2010. Although some action items were left, all the MPPE sensors were approved to proceed to FM development status. Currently most part of the flight model MPPE sensors have already been fabricated and are waiting for laboratory calibration and environmental tests. One of the important development items was the thermal design of the instrument. Since the thermal environment around Mercury is quite severe, the thermal input from the open area of the plasma/particle sensors should be minimized. Each sensor has its own thermal shield that is thermally insulated from the analyzer. Although it was very difficult to keep the sensor temperature within an acceptable range while minimizing the thermal input to the spacecraft, MPPE sensors have overcome this severe problem. The detailed observation mode of MPPE sensors was also considered. Since the expected telemetry rate is much lower than the total data generated by the sensors, integrated observation mode including all the MPPE sensors was created in order to maximize the science output. The final software programming of the Mission Data Processors is on going in order to realize the integrated MPPE observation modes.