

Plasma Wave Investigation (PWI) onboard BepiColombo Mercury Magnetospheric Orbiter (MMO)

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In the Mariner10 encounters with Mercury in 1974, it was found that the planet has an intrinsic magnetic field, which forms a magnetosphere through the interaction with the solar wind. The observations of the plasma waves in Mercury magnetosphere provide important information in studying the energy exchange processes of plasmas under the environment of the very weak intrinsic magnetic field and the high dynamic pressure of solar wind. In order to study plasma wave phenomena in Mercury magnetosphere, we proposed and designed the plasma/radio wave observation system (PWI: Plasma Wave Investigation) onboard BepiColombo MMO spacecraft, which will be constructed under the collaboration between Japanese and European scientists. Since the MESSENGER spacecraft, which precedes the BepiColombo as the mission to Mercury, does not carry the plasma wave observation system, the first observations of plasma/ radio waves in Mercury magnetosphere will be conducted by the PWI of BepiColombo spacecraft. The PWI consists of 2 sets of receivers (EWO, and SORBET), two sets of electric field sensors (MEFISTO and WPT), two kinds of magnetic field sensors (LF-SC and DBSC) and the antenna impedance measurement component (AM2P). The onboard receivers observe both waveforms and FFT spectra in the frequency range from 0Hz to 10MHz for the electric field component and from 0.3Hz to 1MHz for the magnetic field component. They provide information on the detailed diagnosis of microscopic phenomena in Mercury magnetosphere. Since they also observe plasma densities and temperatures, the results allow us to study the macroscopic view of the Mercury magnetosphere. In the present paper, we will demonstrate the importance and roles of plasma/radio wave observations in Mercury and introduce the design of our PWI system onboard BepiColombo MMO spacecraft.