

A glimpse of Hermean and Venusian electromagnetic waves: A quick report of PWI observation during the Mercury and Venus Flybys

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The Plasma Wave Investigation (PWI) aboard the BepiColombo Mio (Mercury Magnetospheric Orbiter, MMO) will enable the first observations of electric fields, plasma waves, and radio waves in and around the Hermean magnetosphere and exosphere. The PWI has two sets of receivers (EWO with AM2P, SORBET) connected to two electric field sensors (MEFISTO and WPT) and two magnetic field sensors (SCM: LF-SC and DB-SC). After the launch on October 20, 2018, we began initial operations, confirmed that all receivers were functioning properly, and released the launch locks on the sensors. After full deployment of all sensors following insertion into Mercury orbit planned at the end of 2025, the PWI will start its real measurements in the electric field from DC to 10 MHz using two dipole antennae with a 32-m tip-to-tip length in the spin plane and in the magnetic field from 0.3 Hz to 20 kHz using a three-axis sensor and from 2.5 kHz to 640 kHz using a single-axis sensor at the tip of a 4.5-m solid boom extended from the spacecraft's side panel.

Unfortunately, long wire antennas for electric fields and the solid boom for magnetic fields are not yet deployed during the cruising phase. In this configuration, the PWI has observed magnetic-field turbulence during multiple flybys of Earth, Venus, and Mercury. This paper introduces glimpse of Hermean and Venusian electromagnetic waves during Earth fly-by in April 2020, the 1st Venus fly-by in October 2020, the 2nd Venus fly-by in August 2021, and the 1st Mercury fly-by in October 2021. We will provide the latest evaluations as a quick report, including (1) the capabilities of magnetic field observations with the first look of the Hermean plasma waves seen around the closest approach, and (2) electric wave turbulences which may be related to the electron plasma density.

Keywords: Mercury, Venus, plasma waves, plasma density