

BepiColombo MPO: Status update

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Abstract

BepiColombo is a joint project between ESA and the Japanese Aerospace Exploration Agency (JAXA). The Mission consists of two orbiters, the Mercury Planetary Orbiter (MPO) and the Mercury Magnetospheric Orbiter (MMO). The mission scenario foresees a launch of both spacecraft with an ARIANE V in July 2016 and an arrival at Mercury in the first half of 2024. From their dedicated orbits the two spacecrafts will be studying the planet and its environment. The MPO on BepiColombo will focus on a global characterization of Mercury through the investigation of its interior, surface, exosphere and magnetosphere. In addition, it will be testing Einstein's theory of general relativity. The MMO provided by JAXA focuses on investigating the wave and particle environment of the planet from an eccentric orbit.

A suite of state-of-art scientific instruments allow a wide range of scientific questions to be addressed like understanding of the origin and evolution of a planet close to its parent star, the detailed study of Mercury's figure, its interior structure and composition, the investigation of the interior dynamics and origin of Mercury's magnetic field. Further science goals are trying to understand exo- and endogenic surface modifications, cratering, tectonics, and volcanism. The composition, origin and dynamics of Mercury's exosphere and Mercury's magnetosphere will be addressed by combined measurements of both spacecraft. Last but not least scientist believe that they can use BepiColombo also as a laboratory to test Einstein's theory of general relativity, by performing high accurate positioning measurements of the spacecraft. All in all measurements performed by the instruments on BepiColombo will provide clues on the origin and formation of terrestrial planets and help to answer fundamental questions like: "How do Earth-like planets form and evolve in the Universe?"

Mercury is a small planet compared to the Earth and difficult to observe from the Earth, due to its close proximity to the bright Sun. For an in-depth study of

the planet and its environment, it is therefore necessary to operate a spacecraft equipped with scientific instrumentation around the planet. On the other hand the thermal and radiation environment close to the Sun and close to the hottest planet in the solar system is extremely aggressive, which makes this mission technically very challenging.

The BepiColombo mission will provide a rare opportunity to collect multi-point measurements in a planetary environment. This will be particularly important at Mercury because of short temporal and spatial scales in the Mercury's environment. It is foreseen that the orbits of MPO and MMO are selected in a way to allow close encounters of the two spacecraft throughout the mission. Such intervals are very important for the inter-calibration of similar instruments on the two spacecraft. They also provide scientifically valuable intervals to collect multi-point measurements in an environment where both spatial and temporal scales can be very short.

In order to ensure the science and technical performance of the spacecraft intense on-ground testing has to be performed. The environment around Mercury imposes strong requirements on the spacecraft design, particularly to all elements that are exposed to Sun and Mercury.

Recently, Proto Flight Models (PFM) of the two BepiColombo spacecraft are being integrated. Acceptance testing will be performed starting in Autumn 2014.

The overall status of the BepiColombo mission will be given with special emphasis on the scientific return of its MPO payload complement