Absolute Magnetometer Attitude Reconstruction using Magnetospheric Modelling

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One of the main goals of the magnetometer experiment MPO-MAG on board of the Magnetospheric Planetary Orbiter (MPO) during the BepiColombo mission is the determination of the Mercury main magnetic field, especially in constraining the characteristics of the magnetic dipole offset.

In April 2020 BepiColombo had its Earth Gravity Assist manoeuvre on its way to planet Mercury. The topocentric distance was lower than three Earth radii and offered a unique opportunity to compare the magnetometer measurements to a multitude of simultaneous measurements of the magnetospheric environment of the Earth performed by several other spacecraft like THEMIS and MMS.

Using a great number of probing points to constrain models of the Earth magnetosphere and compare models to actual measurements of the MPO-MAG sensors enables us to determine the absolute sensor attitude to an accuracy of only a few arc minutes.

Knowing the absolute attitude of a magnetometer sensor in planetary orbiter missions is a key component for the magnetic main field determination.

We present the modelling approach to compare to measurements from MPO-MAG and a study showing the dependence of a mainfield determination on the accuracy of the sensor orientation.