

SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
Near-Earth and Interplanetary Communications (1)

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TELECOMMUNICATION SYSTEM SPECIFIC TO HIGH TEMPERATURE ENVIRONMENT FOR
JAXA MERCURY EXPLORATION PROGRAM**Abstract**

BepiColombo is the joint Mercury mission between JAXA and ESA. It is composed of two satellites supplied by each organization and an ESA cruise module as their carrier. They will be launched in 2014 and it will take around six years to reach their orbits circulating Mercury. The JAXA satellite aims to reveal a magnetospheric structure surrounding Mercury and its formation mechanism. A direct search of a sodium atmosphere in the orbit and an observation of interplanetary dusts are also among its important missions. Thus, the satellite is named as Mercury Magnetospheric Orbiter (MMO). In cooperation with the ESA satellite sensing Mercury surface and inner structure, the mission challenges a total understanding of the existence of the magnetosphere of the planet. MMO is a spin-stabilized satellite. The spin axis is kept perpendicular to the Sun direction. It uses its fast spin for extending long wires and booms working as an antenna in itself or a structure to hold magnetic sensors away from the satellite body. The body is shaped as octahedral prism with its height direction parallel with the spin axis. The eight side panels work as a main shield from the hard illumination of the Sun and Mercury. Most of components are placed inside and protected from the heat injection. MMO uses X-band for its telecommunication. Its system is configured from a JAXA standard set except for antennas. It employs a high gain antenna (HGA) and an omni-directional antenna on its top and bottom deck respectively. They are stowed when it is stacked with the ESA satellite and cruise module. Because they are outside and exposed to the harsh heat environment during the mission, they must survive by themselves. Designs specific to this purpose have been applied. An additional horn antenna pointed perpendicular to the spin axis was placed on the top deck. It works as a lighthouse and makes signals in the same manner as a semaphore when HGA pointing is not available. It enables MMO keeping a deep space telecommunication link even when it is heavily influenced by the spin Doppler fluctuation. We will discuss detailed MMO telecommunication system and introduce its latest status under development.