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# Design of Mission Data Processor (MDP) aboard BepiColombo/MMO: The physical basis of the MMO Science Operation Plan

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epiColombo / Mercury Magnetospheric Orbiter (MMO) is and mostly dedicated to the first detailed study of magnetic field, waves, and particle environment of the planet Mercury. Four main scientific targets are set for the MMO spacecraft from the Bepi-Colombo mission objectives. They are expected to significantly advance comparative studies of the magnetic fields and magnetospheres of terrestrial planets: 1) Structure and origin of Mercury's magnetic field, 2) Structure, dynamics, and physical processes in Mercury's magnetosphere, 3) Structure, variation, and origin of Mercury's exosphere, and 4) The inner solar system. The MMO payload selected by JAXA in 2005 consists of 5 instruments / instrument packages, wide-range observational capabilities for charged particles and energetic neutral atoms, magnetic field, electric field / plasma waves / radio waves, dust, and exospheric constituents. MGF (Magnetic Field Investigation) for magnetic field with 2 sub instruments, MPPE (Mercury Plasma Particle Experiment) for plasma and neutral particles with 7 sub instruments, and PWI (Plasma Wave Investigation) for electric field, plasma waves, and radio waves with 7 sub instruments will be provided by large consortia of world-leading scientists and experts from Japan, Europe and other countries. Those payload packages will perform in-situ measurements of particles and fields in the magnetosphere of Mercury and its solar wind environment. MSASI (Mercury Sodium Atmosphere Spectral Imager), an imaging system is also included for the study of the sodium exosphere. MDM (Mercury Dust Monitor) covers the dust information around Mercury and the inner heliosphere. Those scientific payload groups are under unified and coordinated controls of the observational mode and time resolution by MDP (Mission Data Processor) provided by JAXA, in order to fulfil the science objectives of this mission. The MDP is

the key device, the physical basis of the science operation concept of the MMO. It is designed for a unified controller for all payloads aboard the spacecraft in order to act the MMO spacecraft as “a single science instrument package”. In this talk, the hardware, software, and operation planning of the MDP is presented. It is also the basis of the JAXA’s future scientific spacecraft, e.g. SCOPE (cross Scale COupling in Plasma universE), a mission to study the cross-scale coupling in the plasma universe, ERG (Energization and Radiation in Geospace), a mission to investigate energization and radiation in geospace, and future outer planetary missions which are now planed in JAXA.