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Announcement of Opportunity for Membership of the Science Board of the Martian Moons eXploration Mission (MMX)

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Contents

1 INTRODUCTION

The Martian Moons eXploration (MMX) mission is a JAXA mission that will fly to Phobos and Deimos, and will sample > 10 g of material from the surface of Phobos for return to Earth.

The key scientific goals of MMX are:

- To reveal the origin of Mars' moons, and to improve our understanding of planetary system formation and of primordial material transport around the border between the inner and outer regions in the early solar system.

- To observe processes that have impact on the evolution of the Mars system and to advance our understanding of Mars' surface environmental transition.

The mission will build on the technical and operational experience that JAXA has developed in the field of sample return from small bodies with the Hayabusa missions. The MMX mission is planned to be launched in 2024.

The MMX mission is foreseen to fly to Mars, approach Phobos and carry out studies of Phobos with its remote sensing instrument complement, before performing a sampling of Phobos surface material and deploying a small surface element. The surface craft will be based on Hayabusa 2's Mobile Asteroid Surface Scout (MASCOT) and provided by ESA Member States under a separate, direct agreement with JAXA. Later mission phases will involve a fly-by of Deimos to carry out remote-sensing studies prior to returning toward Earth. On approach to Earth a re-entry capsule containing the Phobos sample will be released for terrestrial atmospheric entry.

In order to achieve its scientific objectives, remote-sensing instruments planned to be onboard the MMX mission include:

- A narrow-angle camera (TElescopic Nadir imager for GeOmOrphology, TENGOO);
- A wide-angle multi-spectral camera (Optical RadiOmeter composed of CHromatic Imagers, OROCHI);
- A Light Detection And Ranging (LIDAR) instrument to measure altitude and albedo;
- A near infra-red spectrometer (0.9 – 3.6 μm) (Macroscopique Observatoire pour la Minéralogie, l'Eau, les Glaces et l'Activité, MacrOmega);
- A gamma-ray and neutron instrument (Mars-moon Exploration with GAmma rays and Neutrons, MEGANE);
- A dust instrument for particle size ≥ 10 μm (Circum-Martian Dust Monitor, CMDM);
- An ion mass spectrometer (Mass Spectrum Analyzer, MSA);

- A rover, jointly developed by CNES and DLR, that will land on Phobos prior to the sampling performed by the main spacecraft.

Following approval by the European Space Agency (ESA) Science Programme Committee (SPC) at their 158th meeting held in November 2018 of a Mission of Opportunity (MoO) participation by the Science Programme in the MMX mission, ESA solicits, through this Announcement of Opportunity (AO), proposals for membership of the MMX Science Board, a high-level team of scientists responsible for the overall science management of the MMX mission.

This AO is open to scientists affiliated with institutes in the ESA Member States.

2 MMX SCIENCE MANAGEMENT

To optimise the scientific utilisation of the mission and exploitation of the returned samples JAXA is appointing a top-level team of scientists, named the "Science Board" (SB) whose responsibility will be to manage the analysis of the remote sensing and in situ data returned from the mission overall and to define the strategy for the returned sample analysis. The SB is comprised of instrument Principal Investigators and other selected members.

The SB will be supported by a Science Working Team (SWT) organised in a number (currently 5) of dedicated scientific groups, called "Sub-Science Teams" (SSTs). Membership of the MMX SWT is foreseen to include instrument team members and other appointed members. The SSTs are envisaged to cover specific science themes within the overall objectives of MMX. The scope and composition of these teams will be defined by the SB.

The MMX PI will chair the SWT and will also be the interface to the MMX Project Manager, who is responsible for mission-related project matters.

Specific responsibilities of the SB include:

- Making recommendations related to mission and science operations, providing the basis for decisions to be made by the Project Manager;
- Continual assessment of the effectiveness and organisation of the SWT, and assisting the MMX PI in managing any conflicts or re-organisation, including setting up sub-groups within the SWT (such as SSTs);
- Promoting publication of multi-instrument studies as a major component of the MMX science output;
- In close coordination with the SWT, and in particular with members working in interdisciplinary fields, managing priorities, content and authorship for publications including science results from MMX;

- Making recommendations and decisions related to sample analysis, initiated after the return of the samples. This includes the management of analytical and curatorial aspects of returned sample science, with support by experts (e.g., cosmochemists, meteorite experts, curators);
- Ensuring that data are made available and used in the most effective manner within the SWT to best inform decision-making in science operations and maximise the science return via publication of key results that require interdisciplinary/multi-instrument studies;
- Defining the Science Management Plan of the mission including the data rights.

For reference, the 5 SSTs presently envisaged would cover the following themes:

- Origin of Phobos and Deimos (OPD);
- Early Solar System Evolution (ESSE);
- Martian Moon Surface Science (MMS);
- Mars Science (MS);
- Martian Moons Geodesy (MMG).

The present AO regards the selection of up to two members to the Science Board for scientists affiliated with institutes within the ESA Member States. Membership to SSTs for scientists affiliated with institutes within the ESA Member States is planned to be managed via future AO issues by the ESA Science Programme.

The ESA-selected Science Board Members will serve for a renewable term of three years, and possibly for the duration of the MMX Science Board activities.

The MMX Science Board will meet regularly to discuss mission status, relevant science topics, and to plan mission science related activities. It is anticipated that the Science Board will meet 1—2 times a year and have other interactions via teleconferences, and will meet more frequently as launch approaches.

3 APPOINTMENT REQUIREMENTS AND CONDITIONS

This call is open to scientists affiliated with institutes located in the ESA Member States and is for the category of 'Science Board Member' for the MMX mission.

Proposals should demonstrate the candidate's expertise in one or more of the MMX science objectives and the expected contribution to the mission science in general. The proposals should also include an explicit mention of the time commitment to the MMX Science Board activities and the endorsement and support from the head of the applicant's institution to their application.

Following evaluation of the proposals by ESA, the Director of Science will appoint, in concurrence with JAXA, any successful European candidates to the MMX Science Board. The appointments will be *ad personam*.

Selected candidates are expected to attend the meetings of the MMX Science Board and participate in the other activities of the Science Board. ESA will cover the cost of travel and subsistence in connection with these meetings; the participation will be subject to ESA approval.

Each ESA-appointed MMX Science Board member would be required to submit an annual report of his or her MMX science-related activities to ESA. At the end of the three-year interval, the Director of Science will decide, in concurrence with JAXA, whether or not to extend the appointment for a further term. The Director of Science may decide to discontinue the appointment at any time, based on the evolution of the MMX mission.

4 PROPOSAL CONTENTS

Proposals submitted in response to the AO are limited in length to 8 A4 pages (minimum font size 11 pt), and must contain the following information:

- A cover letter stating the proposer's name, affiliation, title, position, institute, address, telephone number and e-mail address (max. 1 page);
- A description of the proposer's scientific expertise and experience that is relevant to the MMX science objectives and of the experience in leading and coordinating scientific collaborations (max. 2 pages);
- A description of the proposed contributions to MMX activities and a statement concerning the time availability of the proposer (max. 4 pages);
- A Letter of Endorsement of the application signed by the proposer's Head of Institute. If the proposal needs specific resources to accomplish its activities which are to be provided by the proposer's institute then the endorsement should include these too (max. 1 page).

Proposals must be submitted electronically in PDF format by the deadline indicated in Table 1. For details, see Section 6.

5 EVALUATION CRITERIA

The following criteria will be used (in no particular order) in assessing and evaluating individual proposals:

- The proposer's competence and experience in fields related to the MMX science objectives;
- The importance and relevance of the proposed contributions to the MMX science objectives;

- The proposer's ability to help lead and coordinate the activities of a scientific team of experts;
- Adequacy of the time that the proposer intends to devote to activities related to the MMX Science Board role, and;
- Adequacy of any resources required by the proposer to carry out activities related to the MMX Science Board role.

6 PROPOSAL SUBMISSION

Proposals must be submitted electronically in PDF format (file size cannot exceed 10 MB) according to the instructions on the following webpage:

https://cosmos.esa.int/web/mmx-ao-sb-2019

and according to the deadlines listed in Table 1.

Proposers will receive confirmation upon successful receipt of their Proposals.

Table 1: AO schedule and deadlines

Date	Event
11 June 2019	Release of this AO
20 August, 12:00 (noon) CEST	Proposals due
October 2019	Appointment of European Science Board members

Enquiries regarding this AO should be addressed to:

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ACRONYMS

AO	Announcement of Opportunity
CNES	Centre National d'Etudes Spatiales
Co-I	Co-Investigator
Co-PI	Co-Principal Investigator
DLR	Deutsches Zentrum für Luft- und Raumfahrt
ESA	European Space Agency
JAXA	Japan Aerospace Exploration Agency
MMX	Martian Moons eXploration
MoO	Mission of Opportunity
PDF	Portable Document Format
PI	Principal Investigator
SB	Science Board
SPC	Science Programme Committee of ESA
SST	Sub-Science Team
SWT	Science Working Team