EnVision

Science Management Plan

9 November 2023

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1. SUMMARY AND SCOPE

EnVision is an ESA mission in partnership with NASA, where NASA provides the Synthetic Aperture Radar payload (VenSAR), Deep Spasce Network (DSN) support and scientific contribution. EnVision aims to provide a holistic view of Venus planet from its inner core up to the upper atmosphere, studying the planet's history, activity and climate.

This Science Management Plan (SMP) describes the approach that will be implemented, up to and including the post operational phase, to achieve the mission's scientific objectives and to optimise its scientific return. The SMP provides a mission overview (Section 2), followed by a summary of the mission management scheme (Section 3), including the description of the science and programme management and responsibilities. Section 4 presents the data products and data rights, while Section 5 contains a description of the opportunities for participation in the mission, and Section 6 outlines the ground segment and operations. Section 7 deals with the science and project management, and Section 8 defines the communication and public outreach plans.

The SMP is approved by the Science Programme Committee, following a recommendation by the scientific advisory structure to the Science Programme and may be subject to revisions and updates at a later stage through the same approval loop if needed.

2. MISSION OVERVIEW

2.1. Scientific objectives

The primary goal of EnVision is to provide a holistic view of Venus, from its inner core up to the upper atmosphere, to understand why Earth's closest neighbour is so different. EnVision aims to characterise Venus' core and mantle structure, surface, and atmosphere, and to study past geologic processes, potential current-day activity and Venus climate evolution. The payload will enable also the search of evidence of ancient liquid water. The evolution of the atmosphere and interior of Venus are coupled, emphasising the need to study the atmosphere, surface, and interior of Venus as a system.

The EnVision science objectives will address the following high-level science questions:

- History – How have the surface and interior of Venus evolved?
- Activity – How geologically active is Venus?
- Climate – How are Venus' atmosphere and climate shaped by geological processes?

2.2. Mission description

The EnVision spacecraft (S/C) embarks five payloads and one experiment to address the mission science objectives:

- A dual-polarization Synthetic Aperture Radar (VenSAR), which will provide targeted SAR and stereo imagery, polarimetric imagery, radiometry and altimetry observations;

- An HF Subsurface Radar Sounder (SRS), which will probe the upper 100 m to 1 km of the planet's crust (depending on the surface properties);
- Three spectral-imager payload elements working as a coordinated suite:
  - A high-resolution near-InfraRed spectrometer (VenSpec-H);
  - A UV spectrometer (VenSpec-U);
  - A near-InfraRed spectral mapper (VenSpec-M);
- A Radio Science Experiment (RSE) that will exploit the spacecraft Telemetry Tracking and Command (TT&C) system to observe the planet's gravity field and a Master Reference Oscillator (MRO) to sound the structure and composition of the middle atmosphere and the cloud layer utilizing radio occultation.

EnVision is baselined to be launched with an Ariane 62, arriving at Venus after a ~15 months cruise. Following the orbit insertion, the final orbit circularisation will be achieved by aerobraking over a period of several months, followed by a nominal science phase of 6 Venus cycles (6 Venus sidereal days, or ~4 Earth years). EnVision will operate in a low Venus quasi-polar orbit, with inclination between 87° and 89° with altitudes varying from 220 km to 510 km and an orbital period of about 92 min.

Mission and science operations will be performed by the Mission Operations Centre (MOC) and by the Science Ground Segment (SGS), respectively.

3. OVERVIEW OF THE MISSION MANAGEMENT SCHEME

The overall EnVision mission management scheme is summarised in Figure 1. The ESA ground segment includes the Mission Operation Centre (MOC), the Science Operations Centre (SOC), and the ground stations network. The Science Ground Segment (SGS) is composed of the SOC, which includes the Planetary Science Archive (PSA), and contributions from the instrument teams (see Section 6.2 for further details).

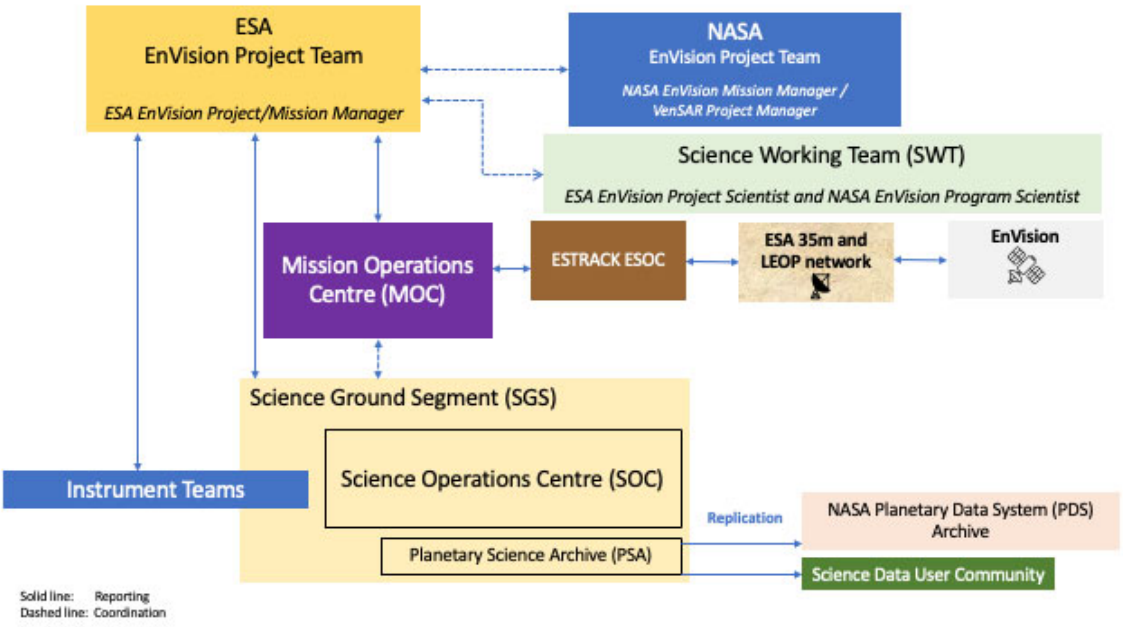

Figure 1. Overview of the EnVision mission management scheme.

The overarching responsibility for the EnVision mission rests with ESA's Directorate of Science. ESA responsibilities cover the mission architecture, the development and procurement of the spacecraft, the satellite integration and test activities, the launch services procurement, and the mission and science operations.

During the development and commissioning phases, an ESA-appointed Project Manager (PM) will be responsible for implementing and managing ESA's activities. After a successful commissioning review, a Mission Manager (MM) will take over the responsibility for the mission throughout its nominal and any extended phases.

The EnVision mission relies on the partnership with NASA, providing the VenSAR payload, a Ground System for the VenSAR instrument, DSN support for selected mission critical phases and science contribution, within the remit of an ESA-NASA Memorandum of Understanding (MOU[1]).

The other scientific instruments are provided by ESA Member States, within the remit of a Multi-Lateral Agreement (MLA[1]), including ESA and the national Funding Agencies. ESA Member States are also responsible to support payload safety, maintenance and operations throughout the mission and to provide contributions to the SGS.

[1] In case of conflicting provisions, precedence will be given to the MOU and MLA, over the present SMP.

4. DATA PRODUCTS AND DATA RIGHTS

4.1. Data products

The products will be classified according to the Planetary Data System – 4 standard (PDS4 standard[2]); an overview is provided in Table 1. The data delivery responsibilities are also summaries in Table 1 (more details in Section 4.2).

Data Levels	Definition	Responsibility
Level 1 Telemetry	Data as down-linked from the spacecraft, byte stream of data from the platform and one or more payloads.	ESA, immediate delivery to instrument teams
Level 2 Raw instrument data	Original data from the payloads (instrument source packet (ISP) data), including instrument housekeeping data, instrument health data, calibration data, instrument sampling information, etc.	ESA, immediate delivery to instrument teams
Level 2 Raw spacecraft data	Spacecraft housekeeping data, platform health information, Attitude and Orbit Control System (AOCS) information, orbit reconstruction, satellite tracking data, etc.	ESA, immediate delivery to instrument teams
Level 3 Calibrated data	Data converted to physical units, which makes values independent of the instrument. E.g. calibrated spectra, calibrated reflectivities, calibrated brightness temperatures, calibrated polarimetric variables, etc.	Instrument teams, delivery to ESA for archiving and public release within 6 months (see Sect. 4.2)
Level 4 Derived data	Results that have been distilled from one or more calibrated data products (e.g. surface emissivity maps, atmospheric trace gas concentrations, gravity or magnetic fields, etc.). Supplementary data, such as calibration tables or tables of viewing geometry, used to interpret observational data should be classified as “derived” if not easily matched to one or the other data categories.	Instrument teams, delivery to ESA for archiving and public release (see Sect. 4.2)

Table 1. EnVision data levels (PDS4 standard), description and responsibilities.

4.2. Data release and rights

Each instrument team will, for scientific purpose, have access to the Level 1 and Level 2 data of that instrument and relevant Level 2 spacecraft information (see Table 1), as soon as they become available at the ESA Science Operations Centre (SOC). Following in-orbit commissioning, the instrument teams will be responsible to calibrate and validate the data, create the validated and calibrated Level 3 data products, and deliver them to ESA as soon as

[2] See, e.g., PSA PDS4 ARCHIVING GUIDE, ESDC-PSA-TN-0002, available on line.

possible, at the latest within six months from Level 2 data reception. At any time, instrument teams will share data among themselves and with the whole SWT (see Section 7.1), to allow multi-instrument data analysis and enhance the scientific return from the EnVision mission. Instrument teams and members of the SWT will be asked to deliver the Level 4 data to ESA as soon as they are available for automatic archival (PDS4 standard) in the ESA-PSA and NASA-PDS databases, to maximise the EnVision mission scientific return. Any use of data for publication before they become publicly available will require agreement by the respective Instrument Lead Scientist(s) (ILSs). Data will be publicly released together with publications.

Level 1 to 3 data, including relevant science and auxiliary data (see Table 1), will be archived and made publicly available by ESA in the PSA and by NASA in the PDS. Observation geometry data will be provided using the Spacecraft Planet Instrument C-matrix Events (SPICE) information system.

Before public availability, selected data products will be released for outreach purposes in coordination among ESA, NASA and the relevant ILSs and data providers.

Instrument teams may agree on the delivery before launch to ESA of pipelines and associated documentation for processing of data up to Level 3 and for quick-look viewing of raw data. The SOC will offer to host the delivered pipelines by using ESA data tools and structures; the pipelines will be maintained and run by the instrument teams.

5. MISSION PARTICIPATION

Possible modes of participation in the EnVision mission are:

1. Instrument Lead Scientist (ILS), the scientific lead of a consortium providing an instrument;

2. Co-Instrument Lead Scientist (Co-ILS), that may be appointed if major developments are carried out in countries or institutions different from the one of the ILS; Co-ILSs will have the same rights as the ILS, but the ILS will be the scientific interface to ESA (or NASA as relevant);

3. Co-Investigator (Co-I), a member of an instrument consortium;

4. Interdisciplinary Scientist (IDS), an expert in specific overarching science themes connected to the mission objectives who takes advantage of synergistic use of the data delivered by several experiments;

5. Guest Investigator (GI), a scientist participating in the data collection and analysis of one or more instruments and/or performing laboratory studies, theoretical or numerical investigations essential for the interpretation of mission scientific data.

5.1. Instrument Lead Scientist

Within the remit of the MLA, under the responsibility of the Lead Funding Agency (LFA) for each instrument, the Instrument Lead Scientist (ILS) will have the following responsibilities in science, science management, and science operation matters[3]:

(i) Establish an efficient and effective managerial scheme, which will be used through all phases of the instrument programme;

(ii) Organise the activities, assign tasks and guide other members of the instrument team;

(iii) Ensure that plans are established in a timely fashion and implemented such that the status reporting complies with the ESA requirements;

(iv) Comply with the management requirements (e.g., progress and programme reviews, change procedures, product assurance, etc.) defined in the Experiment Interface Document – Part A (EID-A);

(v) Ensure the compliance of the instrument design to the scientific requirements defined in the Science Requirement Document (SciRD);

(vi) Be member of and attend the meetings of the Science Working Team (SWT) (see Section 7.1) and other delegated entities/groups, as appropriate, and take an active part in their work; report on instrument development and provide summaries of the main scientific results;

(vii) Provide the scientific interface of the instrument team with ESA;

(viii) Provide adequate calibration of all parts of the instrument, both on the ground and in-flight. This includes the provision of required calibration data and software, along with a full instrument technical and science user manual for use by the general science user community;

(ix) Support the definition of and participate in the science, mission and instrument operations and data handling up to the end of the mission in accordance to the EID-A requirements;

(x) Exploit the scientific results of the mission and assure their distribution as widely as possible;

(xi) Provide the scientific data, in line with the EnVision mission data rights and delivery plan (see Section 4), including relevant data processing software and/or products,

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([3]) For VenSAR, The ILS is the VenSAR Project Scientist and some of these responsibilities are performed by the VenSAR Project Manager. In case of conflicting provisions, precedence will be given to the MOU, over the present SMP for VenSAR.

and associated documentation, in a format that will be agreed, for application by the general science community;

(xii) Support science communications and public relations activities of ESA and NASA and provide suitable information and data in a timely manner, as outlined in Section 8.

The financial support to the activities mentioned above will be provided by the relevant LFA, within the remit of the MLA (and the MoU between ESA and NASA, as applicable). Other national Funding Agencies supporting Co-ILS and Co-I teams are required to seek agreement with the LFA on financial matters related to the Co-ILS and Co-I team contributions.

The technical and programmatic management of each instrument for its design, production and delivery of hardware, software and ground segment elements will be detailed in the MLA (and the MoU between ESA and NASA, as applicable) and will be performed under the responsibility of the LFA providing financial support for the relevant instrument. Other national Funding Agencies providing contribution to (part of) these activities will seek agreement with the LFA on related financial matters; such contributions will be spelled out in the MLA.

5.2. **Co-Instrument Lead Scientist**

For instruments composed of more than one unit, one or more Co-ILSs can be appointed if a major development is carried out in a country or institution different from the one of the ILS. The responsibilities of the Co-ILSs are defined within the relevant instrument consortium for their respective contributions.

The financial support to the activities for which the Co-ILSs are responsible will be provided by their national Funding Agencies and will be supported by formal interagency agreements with the LFA, which holds overall responsibility with respect to instrument development and delivery to ESA. The relevant contributions will be spelled out in the MLA.

5.3. **Co-Investigator**

Members of each ILS-led consortium may be appointed as Co-Investigators (Co-Is). Each Co-I should have a well-defined role either with regard to hardware/software delivery or with regard to scientific support of the investigations within the instrument consortium. The ILS-led consortium may review the status of its members regularly and implement changes if required.

Each Co-I is required via the respective national Funding Agency to seek agreement on financial matters with the LFA of the instrument.

5.4. **Interdisciplinary Scientist (IDS)**

To ensure a top-level oversight of mission science, up to six Interdisciplinary Scientists (IDS) will be selected through an open Announcement of Opportunity (AO) process. The selection will be done jointly by ESA and NASA. One third of IDSs will be appointed by NASA. The IDSs will be selected three (TBC) years before launch and will be part of the SWT (see Section 7.1). The IDSs will be appointed for a first period of three years, renewable.

IDSs should not be affiliated to or reflect instrument specific domains, but rather cover mission-related science themes, and take part in the analysis of data from different EnVision instruments. IDSs will have the same data rights as the other SWT members (see Section 7.1). An IDS may also undertake specific tasks in areas such as modelling, laboratory experiments, science campaigns, science operation planning, hazard assessment and similar activities that may be required during the course of the mission.

The proposals submitted by IDS candidates in response to the AO must describe clearly their scientific case, the relevance of their contribution to the mission and the instrument data sets needed to carry out their research programme. Financial endorsement by the relevant national funding agencies and/or other supporting institutions, should they require funds for their activity, is also required.

Scientists leading or involved in the (programmatic, scientific, or technical) management of the instruments or being responsible for hardware or software development and procurement activities, as well as other SWT members, are not eligible for IDS positions, while Co-Is of instrument teams may apply to become IDSs. The IDSs, like the ILSs, are expected to provide adequate support to the communications activities of ESA.

5.5. Guest Investigator (GI)

Up to fifteen Guest Investigators (GIs) will be selected through an open AO process. The selection will be done jointly by ESA and NASA. One third of GIs will be appointed by NASA. The GIs will be appointed for a first period of three years, renewable.

GIs are individual scientists who wish to make use of the data collected by one or more instruments, in combination, e.g., with data from other missions and/or ground-based observations, laboratory measurements and model simulations and/or assimilation. Their tasks will be agreed together with the relevant ILSs. The science proposed by GIs should not ovelap with that already covered by the instrument teams. The GIs are expected to participate to the instrument scientific activities and have access to data via the ILSs, with whom they are associated. GIs will also be invited to participate to specific activities of the SWT, including science communications.

Should the GIs require funds for their activity, they should secure them via their national funding agencies and/or other supporting institutions.

6. GROUND SEGMENT AND OPERATIONS

ESA will be responsible for the launch, early operations, commissioning, and operations of the spacecraft and payload.

The EnVision Ground Segment provides the means and resources to manage and control the mission via telecommands, to receive and process the telemetry from the satellite, and to produce, disseminate and archive the generated products (see Section 4).

ESA will establish an EnVision Mission Operations Centre (MOC) located at ESOC and a Science Operations Centre (SOC) located at ESAC. ESA-provided ground station(s) will ensure the necessary telecommanding and telemetry capabilities, complemented by NASA ground station network support for selected mission critical phases.

6.1. Mission Operations

The MOC is responsible for the operations of the EnVision spacecraft, and, in particular for the following tasks:

- Monitor and ensure the spacecraft (including payload) health and safety. Perform anomaly checks on a set of parameters (including payload), provide notifications of payload anomalies to the SOC and instrument teams, and react to contingencies and anomalies according to procedures provided by the instrument teams;
- Perform overall mission planning and implement the agreed spacecraft operations plan;
- Execute procedures to safeguard the spacecraft and payload and preserve data integrity;
- Perform uplink of the satellite and payload telecommands and receive telemetry through the ground stations and communications network;
- Perform maintenance of the satellite's on-board software;
- Maintain and perform uplinks of the platform on-board software and perform uplink of payload on-board software updates as generated, validated and delivered by the instrument teams via the SOC;
- Provide mission analysis, flight dynamics support including determination and control of the satellite’s orbit and attitude, and intervention in case of anomalies;
- Control the spacecraft attitude and maintain its orbit;
- Provide for each of the instruments telemetry data, spacecraft housekeeping and auxiliary data to the SOC for further processing and distribution;
- Set-up, maintain and run pipelines, ensuring the processing of spacecraft data from Level 1 to Level 2, including auxiliary data relevant for the scientific analysis (see Section 4.1);
- Produce and provide ancillary data to the SOC (orbit files, pointing information, housekeeping telemetry, etc.);
- Support the SGS on all aspects concerning spacecraft operations.

6.2. Science Ground Segment

The Science Ground Segment (SGS) consists of the Science Operations Centre (SOC), the Planetary Science Archive (PSA), and contributions from the instrument teams.

The SGS performs planning and scheduling of the observations/measurements to be conducted by the spacecraft, receives science data and housekeeping telemetry from the MOC, generates Level 2 science data products (see Section 4.1), and makes Level 1 and Level 2 data available to the instrument teams. Level 3 and Level 4 data (see Section 4), are archived and made public via the ESA-PSA and NASA-PDS archives.

ESA will capture science operation requirements for the SGS and monitor their implementation through the Science Implementation Requirements Document (SIRD) to be addressed by the

Science (operation) Implementation Plans (SIPs) of the SOC and each instrument team, for their respective areas of responsibility.

6.2.1 Science Operation Centre

The SOC is responsible for the following tasks:

- Support the science operations planning by providing a centralised planning system;
- Prepare the long-term and short-term payload operations plan to be submitted to the MOC, based on inputs from the instrument teams and harmonised by the SWT;
- Handle payload operations and maintenance requests from the instrument teams and issue them to the MOC;
- Set-up, maintain and run pipelines, ensuring the processing of instrument data from Level 1 to Level 2 (see Section 4.1), based on inputs (routine, calibration files and algorithms) agreed with the instrument teams;
- Support processing from Level 2 to Level 3 as needed (see Section 4.2);
- Distribute Level 1 and Level 2 data products and additional auxiliary data to the instrument teams;
- Define, develop, operate and maintain the EnVision data archive, part of the ESA-PSA, populate it with the data and mission products produced by the instrument teams for all mission phases (including spacecraft navigation data produced by ESA), and distribute the data products (Levels 1 to 4) to the community;
- Make data processing tools available to the community, as agreed to with the instrument teams;
- Support the scientific user community;
- Support the MOC in the preparation of the payload operations during the commissioning phase.

6.2.2 Instrument team contribution to the SGS

The Instrument teams, as part of the SGS activities, are responsible to:

- Support the definition of the science operations;
- Support the preparation of the instrument operation timelines;
- Perform calibration of their instrument on ground and in-flight;
- Monitor the operation of their instrument, perform maintenance operations and optimise instrument performance;
- Deliver the calibrated and validated scientific data ((level 3 and level 4 data; see Section 4.1 and Section 5.1), and associated documentation, to the EnVision data archive (in a format that will be agreed with the ESA SOC for application by the general science community) along with instrument technical and science user manual useful for the general science user community;
- Provide to the MOC/SOC inputs (e.g., calibration files and algorithms/routines) agreed with ESA and needed for the Level 1 to Level 2 data processing (see Section 4.1);
- Prepare an User Operation Manual as needed for the MOC and SOC activities;
- Provide access to negotiated processed and analysed data for public relation purposes; this material will not be used for scientific publications;

- Provide expert support to the MOC and/or SOC during payload commissioning and critical operations;
- Provide inputs for the definition and implementation of scientific data handling and archiving;
- Provide support required by other instrument teams for science planning purposes, as mutually agreed within the SWT;
- In case of an instrument anomaly provide the needed expertise for resolution.

7. SCIENCE AND PROJECT MANAGEMENT

The overall EnVision mission management scheme is summarised in Section 3.

Details on the terms and conditions governing the relation among ESA and the Funding Agencies with respect to the provision for the EnVision scientific payload, including the provision of software packages, and the elements of the SGS are specified in the MLA.

The terms and conditions governing the cooperation between ESA and NASA with respect to the provision of the VenSAR payload, a Ground System for the VenSAR instrument, ground station network support for selected mission critical phases and scientific contribution, are specified in the ESA-NASA MOU.

7.1. Science Working Team

The EnVision SWT will be appointed by ESA in coordination with NASA after the mission has been adopted. The ESA EnVision Project Scientist and the NASA EnVision Program Scientist will co-chair the SWT.

The co-chairs act as the scientific interface to the ESA Project/Mission Manager and NASA EnVision Mission Manager and VenSAR Project Manager in their respective organizations.

The SWT will advise ESA and NASA on all aspects of the mission potentially affecting its scientific performance. It will assist the ESA EnVision Project Scientist and the NASA EnVision Program Scientist in maximising the overall scientific return of the mission within the established boundary conditions. It will act as an EnVision mission focal point for the scientific community.

The SWT members will have the data access rights as indicated in Section 4.2.

The SWT will be asked to review top-level requirements (in all areas of the project) that impact science return and assist in potential mission requirements trade-offs.

Members of the SWT may perform specific scientific and/or technical tasks, as needed during mission development and operations.

The SWT will consist of the following members:

- Instrument Lead Scientists (see Section 5.1);

- One Instrument Co-Lead Scientist per instrument team, if relevant (see Section 5.2);
- Interdisciplinary Scientists (see Section 5.4).

One ILS and one Co-ILS for each of the five payload elements (VenSAR, SRS, VenSpec-H, VenSpec-U, VenSpec-M) and for the experiment (RSE) listed in Section 2.2 will be members of the SWT.

The SWT may invite Co-ILSs who are not members of the SWT, Co-Is and other scientists to participate in the SWT meetings.

In case of decisions requiring a vote, there will be one vote for each of the five payload elements (VenSAR, SRS, VenSpec-H, VenSpec-U, VenSpec-M) and for the experiment (RSE) listed in Section 2.2; the IDSs will also have voting rights.

The operations timeline will be recommended by the SWT. Final approval and responsibility for the mission operations remains with ESA.

The SWT may be supported by working groups, which will be established by the SWT as needed.

7.2. Steering Committee

An MLA will be established between ESA and the ESA Member States participating in EnVision to formalise the commitments, responsibilities and deliverables of all parties. In case of conflicting provisions, the MLA will prevail over the present SMP. A Steering Committee with representatives from the ESA Member States participating in EnVision will be set up to oversee the timely fulfilment of the obligations of all parties to the MLA and address any issues that may arise in that context.

8. COMMUNICATION AND PUBLIC OUTREACH

Agreements regarding public outreach activities will be established between ESA, NASA, relevant funding authorities, and other institutions involved in the mission. The terms and conditions contained in these agreements will be applicable on the relationships between the funding authorities and the various scientific investigators. The implementation of such agreements will be tracked by the SWT and as part of the standard project reviews.

ESA, in coordination with NASA, will have responsibility for the science communications, educational and outreach activities related to EnVision. ESA and NASA will have the right to use any data acquired by EnVision for outreach purposes, in coordination with the relevant ILS(s) and/or with the holders of the data rights as applicable, as covered by the ESA Rules on Information, Data and intellectual Property (ESA/REG/008).

Approximately one year before the spacecraft Qualification and Acceptance Review, a public outreach coordination group will be established in close collaboration between ESA, NASA, the relevant bodies funding the provision of the scientific payload in the Member States and

other institutions involved in the mission. Interactions between these parties will coordinate the outreach effort and guarantee consistency between all applicable documents and policies.

Until launch, outreach activity will focus on hardware deliveries and the launch campaign. After launch, a regular flow of science results from the mission will be prepared in a manner suitable for communication and public outreach purposes.

9. Acronyms

AO	Announcement of Opportunity
AOCS	Attitude and Orbit Control System
Co-I	Co-Investigator
DSN	Deep Space Network
EID-A	Experiment Interface Document – Part A
ESA	European Space Agency
ESAC	European Space Astronomy Centre (ESA)
ESOC	European Space Operations Centre (ESA)
GI	Guest Investigator
IDS	Interdisciplinary Scientist
ILS	Instrument Lead Scientist
ISP	Instrument Source Packet
LFA	Lead Funding Agency
MLA	Multi-Lateral Agreement
MM	Mission Manager
MOC	Mission Operations Center
MOU	Memorandum of Understanding
MRO	Master Reference Oscillator
NASA	National Aeronautics and Space Administration
PDS	Planetary Data System (NASA Archive)
PM	Project Manager
PSA	Planetary Science Archive (ESA Archive)
RSE	Radio Science Experiment
S/C	Spacecraft
SciRD	Science Requirement Document
SGS	Science Ground Segment
SIP	Science (operation) Implementation Plan
SIRD	Science Implementation Requirements Document
SMP	Science Management Plan
SOC	Science Operations Center
SPICE	Spacecraft Planet Instrument C-matrix Events
SRS	Subsurface Radar Sounder
SWT	Science Working Team
TT&C	Telemetry Tracking and Command
VenSAR	Synthetic Aperture Radar
VenSpec-H	High-resolution near-InfraRed spectrometer
VenSpec-U	UV Spectrometer
VenSpec-M	Near-InfraRed spectral mapper