European Space Agency

Research and Science Support Department

Planetary Missions Division

**Venus Express
Archive Generation, Validation and Transfer Plan
VEX-RSSD-PL-001**

Issue 1.10

73 June 2004

Prepared by: J. Zender

esa

Document Signature Sheet

Approved:

Name	Function	Signature
Hakan Svedhem	VEX Project Scientist	
Gerhard Schwehm	Head of Planetary Mission Division, RSSD	
~~Rudolf Schmidt~~Don McCoy	VEX Project Manager	

Concurred:

Name	Function	Signature
Stas Barabash	PI, ASPERA	
Vittorio Formisano	PI, PFS	
Jean-Loup Bertaux	PI, SPICAV	
Bernd Häusler	PI, VeRa	
Pierre Drossart	PI, VIRTIS	
Giuseppe Piccioni	PI, VIRTIS	
W. J. Markiewicz	PI, VMC	
T. L. Zhang	PI, MAG	
A. Accomazzo	ESOC, VEX Spacecraft Operations Manager	

VENUS EXPRESS
Archive Generation, Validation and Transfer Plan

Document No.	: VEX-RSSD-PL-001
Issue/Rev. No.	: Issue 1.~~1~~0
Date	: ~~7~~3 June 2004
Page	: iii

Distribution List

Recipient	Organisation	Recipient	Organisation
Hakan Svedhem	VEX Project Scientist		
Gerhard Schwehm	Head of Planetary Mission Division, RSSD		
Don McCoy~~Rudolf Schmidt~~	VEX Project Manager		
Martin Kessler	Head of Science Operations and Data Support Division, RSSD		
Stas Barabash	PI, ASPERA		
Vittorio Formisano	PI, PFS		
Jean-Loup Bertaux	PI, SPICAV		
Bernd Häusler	PI,VeRa		
Pierre Drossart	PI, VIRTIS		
Giuseppe Piccioni	PI, VIRTIS		
W. J. Markiewicz	PI, VMC		
T.L. Zhang	PI, MAG		
A. Accomazzo	ESOC, VEX Spacecraft Operations Manager		

Change Record Sheet

Date	Iss.	Rev.	Description / Authority
3 June 2004	1	0	Issue 1.0 of Venus Express Archive Plan
7 June 2004	1	1	Introduction of section "The Definition of the Planetary Science Archive Standard". Consistent usage of the phrase "PSA required standard (equivalent to PDS Standard version 3.6)" through the document. Consistent usage of phrase "PDS CODMAC level" through the document Modifications to sections 4.4 and 4.7

Table of Contents

VENUS EXPRESS

Archive Generation, Validation
and Transfer Plan

Document No. : VEX-RSSD-PL-001
Issue/Rev. No. : Issue 1.~~1~~0
Date : ~~7~~3 June 2004
Page : vi

1. Introduction

1.1 Scope

The Venus Express scientific archive will be part of ESA's Planetary Science Archive (PSA). Its main use is to distribute spacecraft and experiment data in a well-defined format to the scientific community. The preparation and implementation of this archive is based on the experience and implementation of previous planetary missions from ESA.

The responsibility of the experiment archive preparation lies with the experimenter teams, the overall archive responsibility with the Venus Express Project Scientist, represented by the Venus Express Archive Manager.

The Planetary Science Archive (PSA) is based on the Planetary Data System (PDS) standard, but no formal or legal obligations towards the PDS as an institution exist.

This document defines the process of archiving spacecraft and ground-based observations and it's results. It includes the generation and validation of the individual archive products and their transfer to the final data repository. The archive will include raw and reduced data, calibration data, higher-level derived data products, documentation and software. The data will be offered via an online tool, the online PSA, to the scientific community.

1.2 Contents

An overview of the mission, the science operations and the planned science archive is given in chapter 2. Chapter 3 lists in detail the archiving process and it's goals, followed by the individual responsibilities (chapter 4) and the data delivery scheme (chapter 5).

Appendix A gives an overview of the instruments and their purpose. Appendix B gives contact details of involved colleagues. The data processing levels and their description is found in Appendix C. Appendices D to L give a minimal list of data products and its appropriate information for all experiments, spacecraft and science planning information. Appendices D to L are expected to be updated and extended long into the mission lifetime.

1.3 Readership

The initial readership is with the Principal Investigators and their team members. On the long term this archive plan is intended to give first level information to potential users of Venus Express scientific data.

1.4 Acronyms

ASPERA	Analyser of Space Plasmas and Energetic Atoms
AUX	Auxiliary Data
C&DH	Command and Data Handling
CODMAC	Council Committee on Data Management and Computation
DAWG	Data Archive Working Group
DDID	Data Delivery Interface Document
DDS	Data Distribution System
DLR	Deutsches Zentrum für Luft- und Raumfahrt
DMS	Data Management System
DPL	Data Processing Level
EAICD	Experiment to Planetary Science Archive Interface Control Document
EGSE	Electrical Ground Support Equipment
ESA	European Space Agency
ESTEC	European Space and Technology Center in Noordwijk, The Netherlands

VENUS EXPRESS
Archive Generation, Validation and Transfer Plan

Document No. : VEX-RSSD-PL-001
Issue/Rev. No. : Issue 1.~~1~~0
Date : ~~7~~3 June 2004
Page : 8

ESOC	European Space Operations Center in Darmstadt, Germany
FITS	Flexible Image Transport System
HKD	Housekeeping Data
HPD	Housekeeping Parameter Definition
MAG	Magnetometer
NASA	National Aeronautics and Space Administration
SFDU	System Formatted Data Unit
SWT	Science Working Team
SATT	Satellite Attitude Data
PDS	Planetary Data System
PFS	Planetary Fourier Spectrometer, High-resolution IR spectrometer
PI	Principal Investigator
PSA	Planetary Science Archive
PVV	PSA Validation and Verification Tool
RSSD	Research and Scientific Support Department of ESA
SPICAV	Spectroscopy for the Investigation of Characteristics of the Atmosphere of Venus
VERA	Venus Radio Science Experiment
VEXSOC	Venus Express Science Operations Center
VEXMOC	Venus Express Mission Operations Center
VIRTIS	UV-visible-IR Imaging Spectrometer
VMC	Venus Monitoring Camera
WDC	World Data Center

1.5 Applicable Documents

AD1 ESA-SCI(2001)6, Venus Express, Mission Definition Report, October 2001

AD2 Planetary Data System Standards Reference, JPL D-7669, Part 2, Version 3.6, 1 Aug 2003.

AD3 ESA Council, Rules Concerning Information and Data, ESA/C(89)95, Revision 1, 21 Dec 1989.

AD4 VEX-RSSD-SP-002, VEX Science Requirements Document, 8 March 2004, Issue 1.0

1.6 Reference Documents

RD 1 SOP-RSSD-PR-004, Planetary Missions Science Archive Review Procedure, Issue 1.0, 29 Oct. 2003.

RD2 ESA/SPC(2001)4, Call for Ideas of a mission re-using the Mars Express Bus

RD3 SOP-RSSD-TN-017, Experimenter to PSA ICD (EAICD) Template, Issue 1.0, 1 Sep 2003

RD4 RO-ESC-IF-5002, Data Delivery Interface Document (DDID), Issue B6, 23-Oct-03

RD5 Planetary Data System – National Space Science Data Center Memorandum of Understanding, 13 Jan 1994.

RD6 Planetary Data System Data Preparation Workbook, JPL D-7669, Part 1, Version 3.1, 17 Feb 1995.

RD7 Directive 96/9/EC of the European Parliament and of the Council of 11 March 1996 on the Legal Protection of Databases.

RD8   Planetary Science Data Dictionary Document, JPL D-7116, Revision E, 28 Aug 2002.

RD9   Venus Express: The First European Mission to Venus, J. Fabrega et al, IAC-03-Q2.06, pp1-11, 2003

2.   Overview

2.1   Venus Express Mission Overview

Venus Express is scheduled for launch from the Baikonour Cosmodrome in Kazakhstan in November 2005. It will be launched by a Soyuz-Fregat rocket and put immediately into its transfer orbit to Venus. The cruise phase will be 5 months and the Venus orbiting phase will last to nearly two Venusian years (about 500 Earth days).

The Venus Express mission consists of an orbiting, 3 axis stabilized spacecraft. The spacecraft is based on the Rosetta and Mars Express spacecraft. Also the instrumentation is made up of instruments that have been flown on Rosetta or Mars Express.

Venus Express carries out a global investigation of the Venusian atmosphere in terms of structure, composition and dynamics up to an altitude of 250 km. Details of the scientific goals, defined as science themes, can be found in the references [AD1, AD4]. Scientifc themes are defined in [AD4] and cover:

- Atmospheric Dynamics

- Atmospheric Structures

- Atmospheric Composition and Chemistry

- Cloud Layer and Hazes

- Radiative balance

- Surface properties and Geology

- Plasma environment and escape processes

The payload is composed of seven experiments :
- ASPERA : Analyser of Space Plasmas and Energetic Atoms
- PFS : High-resolution IR Fourier spectrometer
- SPICAV : Spectroscopy for the Investigation of Characteristics of the Atmosphere of Venus
- VeRa : Venus Radio Science instrument
- VIRTIS : UV-Visible-IR Imaging spectrometer
- VMC : Venus Monitoring Camera
- MAG : Magnetometer

ASPERA, PFS and SPICAV are inherited from Mars Express. VIRTIS, VeRa and MAG are inherited from Rosetta. Only VMC is a newly developed instrument. ASPERA is an imager of energetic neutral atoms and analyzer of space plasmas. It will allow ~~determining~~ the plasma induced atmospheric escape, as well as interaction of the solar wind with the ionosphere of Venus. Neutral particle imager and electron and ion spectrometer are mounted on scanning platform. The instrument will operate continuously to gather data concerning ion, electron and neutral atom distributions all around Venus.
MAG is an instrument designed to measure the magnetic field in the vicinity of the spacecraft. The instrument will operate continuously to gather data concerning magnetic fields associated with the planet or plasmas.
PFS is a Fourier IR spectrometer optimized for atmospheric studies with two channels of 10 and 20 km footprint respectively. It provides 3D temperature field measurements of the lower atmosphere up to 50 km

altitude, minor constituent variations (H20 and CO2) and optical properties of atmospheric aerosols, which allow studying the global atmospheric circulation. The instrument also provides data on the thermal inertia of the surface.

SPICAV is an UV and IR spectrometer devoted to the study of the atmosphere with both nadir and limb viewing modes. It will provide important measurements on the ozone content of the atmosphere as well as the coupling of O3 and H2O. In addition, stellar occultation techniques will provide vertical profiles of CO2, O3 and dust. SPICAV also contains an infrared spectrometer relying on absorption of the Sun's radiation in the infra-red to detect chemical species in the atmosphere such as water, carbon monoxide, hydrogen sulphide and trace gases such as methane and ethane. All these measurements are fundamental inputs to meteorological and dynamic models of the atmosphere. On Venus Express, SPICAV will be complemented by an additional infra-red channel called SOIR.

VeRa is a radio science experiment, which uses the Venus Express orbiter radio subsystem to sound the neutral and ionised atmosphere at occultation, determine the dielectric properties of the surface and observe gravity anomalies.

VIRTIS is a UV-Visible-IR spectrometer that will provide 4-dimensional information on Venus atmosphere (2D imaging + spectral dimension + temporal variations) and limited information about the surface. The observations will permit sounding of the composition and physical state of the atmosphere at various levels, from the ground up to the thermosphere; study of dynamical phenomena in the atmosphere, including propagation of possible quakes; retrieval of an emissivity map of the surface around 1 μm; study of surface/atmosphere interactions.

VMC is a specialized visual camera to monitor the Venus disc using a wide angle and multiple narrow band filters to provide imaging in the UV, visible and near IR to produce global spatial and temporal coverage of the Venus disk.
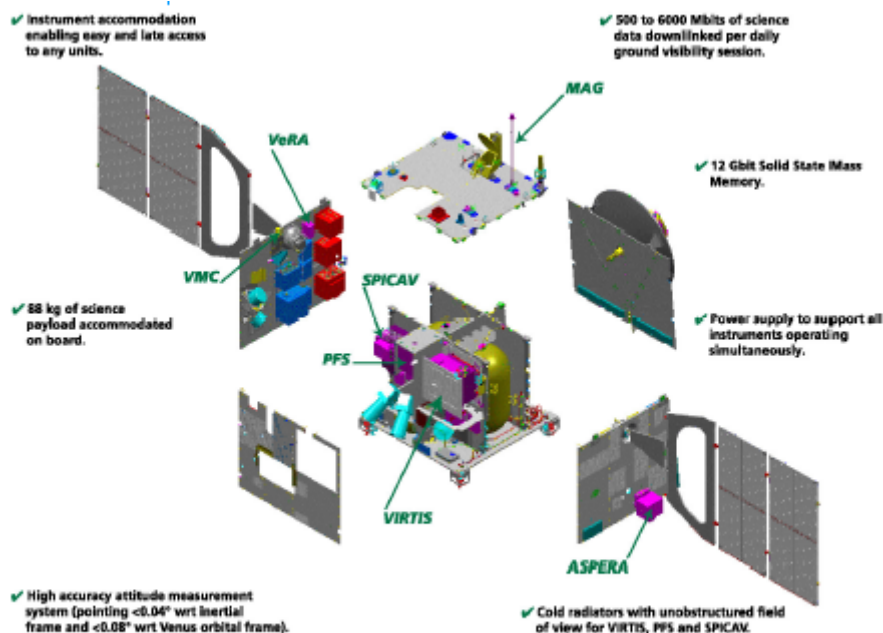
Venus Express Payloads and Accommodation on Spacecraft

2.2 Science Operations Overview

The primary responsibility for developing the payload operations strategy for the Venus Express Scientific Mission will be with the Venus Science Working Team (VEXSWT) chaired by the Project Scientist.

The ground segment of the Venus Express mission will consist of two major bodies: the Venus Express Mission Operations Center (VEXMOC) and the Venus Express Science Operations Center (VEXSOC). The VEXMOC will be located at ESOC in Darmstadt, Germany, and will be responsible for the Spacecraft operations and all the real time contacts with the spacecraft and payload, the overall mission planning, flight dynamics and spacecraft and payload data distribution.

The VEXSOC will be located at ESTEC in Noordwijk, The Netherlands. It is responsible to coordinate the overall scientific planning and to produce detailed experiment planning information.

The VEXSOC will be responsible for:

- the definition of scientific operations for all mission phases with expert PI team support

- mission planning and implementation of instrument operation schedules

- the maintenance of a quick-look science data facility

- creating together with the PIs at regular intervals or for mission highlights a summary of the main scientific results

- the preparation of guidelines for science data archiving and to create the Venus Express Data Archive

- supporting the PI teams in developing software for payload operations, e.g. generation of command sequences

- coordination and pre-checking of command sequences generated by the PI teams for the operation of their payload before submission to the VEXMOC

2.3 The Planetary Science Archive

The Venus Express data archive will be part of the Planetary Science Archive (PSA). The PSA is an online database implemented by ESA/RSSD and used for all ESA's planetary missions. It is accessible via http://www.rssd.esa.int/psa. The PSA supports the online ingestion of full data set releases as well as incremental updates of already existing data set releases.

In general, the data available on the PSA are available to everybody. The PSA supports however the concept of users and groups and therefore it can be guaranteed that the proprietary data will be only accessible to authorized users.

PSA users can query across instruments, missions and planetary targets. Downloads of individual data products or full data set releases are available via direct download or ftp-mechanisms. Email notification on subscribed data sets is possible.

VENUS EXPRESS

Archive Generation, Validation
and Transfer Plan

Document No.	: VEX-RSSD-PL-001
Issue/Rev. No.	: Issue 1.~~1~~0
Date	: ~~7~~3 June 2004
Page	: 12

2.4 The Definition of the Planetary Science Archive Standard

The PSA is based on the Planetary Data System standard from NASA, see [AD2], [RD6] and [RD8]. The PSA archive team aims to be fully PDS compatible, in exceptional cases the archive team might advise slight changes to the existing standard. ~~The PSA~~The 'PSA required standard' for the Venus Express mission is defined to be equivalent to the PDS Standard version 3.6, see [AD2]. The term 'PSA required standard' is used in this sense throughout this document.

3. The Archiving Process

3.1 Goals of the Archiving Process

In order to guarantee a high-value archive, a well-defined archiving process is needed, which ~~provides~~ the quality of the final data sets. In addition, a well-defined and documented process ensures that the progress along the archiving steps can be measured. Further, consistency in the contents, organization and naming of the archiving process and the archive itself is necessary. Using the PSA required standard (equivalent to PDS ~~S~~standard version 3.6) will ensure this.

3.2 The Archiving Steps

3.2.1 Pre-launch Preparations

(a) Initial agreement towards a common archiving standard. The Planetary Data System Standard is the base for ESA's Planetary Science Archive and its usage is herewith a requirement from ESA.

(b) Preparation of the Venus Express Archive Generation, Validation and Transfer Plan (this document, also called the Archive Plan). The Archive Plan is one common document for the whole Venus Express archive that describes the archive objectives, contents, organization, structure and standards as well as the archiving process and schedule, gives references to important archive documents, defines responsibilities and gives a rough idea about the data types and the data volume. The Archive Plan shall be signed a year before launch.

(c) Preparation of the *Experimenter to Planetary Science Archive Interface Control Documents* (EAICD). The EAICDs are separate documents from each experiment team giving detailed information about the data generated by the instruments and the data products to be archived. The EAICDs define the PDS data types used for the data products, the naming conventions and the contents of the directories. They describe the edited raw data (~~CODMAC~~PDS CODMAC level 2), calibration data, calibrated data (~~CODMAC~~PDS CODMAC level 3), derived higher-level data products and merge products as well as the software algorithms for reading the PDS-labeled data products. An EAICD template is provided by the PSA archive team [RD3]. At the commissioning phase the EAICDs should be issued.

(d) Regular Data Archive Working Group (DAWG) meetings will be held to discuss matters of interest for all teams and get a status report from each team. The DAWG meetings are usually twice a year during the whole lifetime of the mission.

(e) Regular Data Archive Working Group teleconferences will be held, usually one per month, starting at least 6 months before launch.

VENUS EXPRESS
Archive Generation, Validation and Transfer Plan

Document No.	:	VEX-RSSD-PL-001
Issue/Rev. No.	:	Issue 1.~~1~~0
Date	:	~~7~~3 June 2004
Page	:	13

3.2.2 Data Flow and Data Processing

(a) Satellite and instrument data are received by ESA ground stations or the DSN network, processed to raw data (~~CODMAC~~PDS CODMAC level 1) by ESOC and provided on the DDS [RD4].

(b) The experiment teams fetch their data and check for completeness and validity

(c) The experiment teams produce PDS labeled data products and send them to the PSA. This process should be highly automated both for the production of the PDS labeled data products and for the ingestion into the PSA database, as generating PDS labeled data manually is complicated and prone to errors. The PSA archive team provides a verification and validation tool. Each instrument team shall run this validation tool successful ~~outcome~~ on all their data sets before ~~a data set is~~ delivered to the PSA.

(d) The first deliveries will be checked and re-validated by the PSA archive team and then ingested into the online PSA. After the end of the proprietary period the data will ~~be~~ automatically available for public access. Before this, only users authorized by the Principal Investigator are allowed to access the data.

(e) The first deliveries will be checked for completeness of documentation, understandability of documentation, correctness of software algorithms, etc. An effort is made to find problems that could cause the peer review to reject the data set.

(f) If improved data products can be ingested into the PSA using the revision concept. Improved calibration information or updated ancillary data might be the cause of such improvements.

(g) Interdisciplinary scientists will propose and produce new data products. The PSA archive team will support the interdisciplinary scientists on the format and content of the proposed data sets.

3.2.3 Archive Validation and Distribution

(a) The Project Scientist or a representative arranges the peer reviews.

(b) Details, definition and goal of each peer review follows [RD1]

(c) Initially, the peer review team judges the EAICDs on their completeness and quality. This first review shall be done well before the first data delivery.

(d) The peer review team validates the data set. The tasks of the team can be best compared to the tasks of a referee for a paper to be published.

(e) Arising problems will be resolved by the instrument team. Data products where problems occurred and the peer review proposed a clear solution, do not have to undergo an additional peer review. In this case one could fallback to audio/visual teleconferences between a single member of the peer review, the instrument team and the PSA archive team.

(f) On the online PSA the data set(s) under peer review will be flagged

    a. 'Not Peer Reviewed', before a peer review

    b. 'In Peer Review', during a review process

    c. 'Peer Reviewed' after a successful peer review

(g) If a peer review fails, the appropriate data set(s) are taken out of the online PSA.

(h) The PSA archive team will continue to support the Venus Express data archive also after the end of the official Venus Express mission. This support includes the production of

additional information to increase the archive functionality. The PSA archive team will report to the ESA/RSSD Planetary Missions Division (SCI-SB).

4. Roles and Responsibilities

This section describes the roles and responsibilities of the personnel and organizations involved in generating, validating, transferring and distributing the archive elements. Each instrument is responsible for the production, the validation and delivery to the PSA; the ~~PSA~~ archive team has the responsibility to ensure that the archive meets the PSA required standard (equivalent to the PDS S~~s~~tandard version 3.6)~~s~~ (including peer review of the data), advising the project and science teams on archive related issues, maintaining active archives of instrument products for access by the science community.

4.1 Responsibilities of each Instrument Team

Each instrument team is responsible for

- Formatting all data files to the required PSA standard (equivalent to PDS Standard Version 3.6~~)~~, for describing completely the calibration and basic reduction procedures, for providing any software (as documented source code) that might be appropriate for recalibration or reprocessing, and for providing all necessary calibration data files.
- Providing PSA compatible (equivalent to PDS Standard 3.6) data sets to the PSA
- Provided data shall cover at least in-flight obtained data from the commissioning phase, cruise phase, nominal mission and an extended mission phase. Other instrument, calibration or flight spare instrument data from laboratory equipment shall be ingested if desirable by scientific community to ensure long-term interpretability of the in-flight data.
- Providing electronic copies of all documents needed to describe the instrument and its operation. Each instrument team is responsible for ensuring that there are no copyright restrictions on reproducing the documents in the scientific archive.
- Ensuring that the electronic documents are in a format ~~that is acceptable to the PSA and is~~ conform to the PSA~~DS~~ standard (equivalent to PDS Standard 3.6). Normally this means that critical documents must be provided in a plain ASCII format in addition to any format that includes formatting information. This, in turn, means that documents not provided with an ASCII version must be considered optional extras and are not used as documentation to any required information.
- Providing higher level products to the archive. These are detailed elsewhere. Each instrument team is responsible for collaborating with Interdisciplinary Scientists (IDSs) to ensure that higher-level products based on data from the appropriate instrument are properly archived.
- Providing suitable parameter tables that contain important instrumental parameters that are not included as keywords in the labels.
- Providing index tables to enable searching for desired data files in a straightforward manner. The index tables may be combined with the parameter tables if appropriate.
- Solving problems that have been identified in their data sets.
- Distribution of the data from its instrument to all members of the instrument team.
- Following the decisions done in the SWT and DAWG meeting in respect to standard frames and any other conventions.

4.2 Responsibilities of the Venus Express MOC

ESOC VEXMOC is responsible for

- Providing spacecraft auxiliary data as e.g. health and status information as ASCII files and sufficient documentation to understand these data; if these data sets should be

provided in binary format, the necessary software routines should be delivered to unpack these binary packets and to transform them into ASCII format.

- Providing non-spacecraft auxiliary data as e.g. event files, the command database, list of executed commands, etc, in ASCII format.

- Providing to the complete SFDU-labeled telemetry stream.

- Ensure long term storage of the telemetry data (PDS CODMAC level 1).~~PSA level 0 data~~

- ~~Ensure long term storage of the PSA level 1a data~~

4.3 Responsibilities of the Venus Express Flight Dynamics Team (FD)

The ESOC FD team is responsible for

- Providing to each of the instrument teams up-to-date information on the attitude and orbital position of the spacecraft at the time of all observations by any instrument.

- Providing sufficient meta-information to the orbit and attitude data to improve understanding of the context, e.g. link to science planning information.

- Providing to the complete details of the orbit and attitude of the spacecraft throughout the mission. This may involve some software tools, at the very least for interpolating tables with the appropriate precision, as well as the appropriate data tables.

- Providing retroactive updates to the orbital and attitude data products whenever the precision is improved.

4.4 Responsibilities of Interdisciplinary Scientists

Interdisciplinary scientists who develop higher-level data products are responsible for providing those products to the PSA archive team with all required ancillary information formatted and documented according to the PSA required standard (equivalent to PDS Standard version 3.6). These higher-level data products may include products based solely on data from one instrument or from a combined data source from different instruments and model data.

Interdisciplinary scientists shall propose all possible standard references well in advance of the data processing: geographic reference frame, standard atmosphere, solar spectrum used for spectrometers calibration, etc. The proposed standard references shall be discussed and endorsed by the SWT.

4.5 Responsibilities of the ESA PSA archive team

The PSA archive team is responsible for

- Ensuring the usability of the archive for the scientific community; this includes advising on understandability of documentation, suitability of formats, etc

- Ensuring preservation of a long-term copy of the SFDU-labeled telemetry stream, although this product will not be a part of the scientific archive. This will be obtained directly from ESOC and need not be provided by any instrument team.

- Advising the instrument teams regarding appropriate formats for the data from their instrument.

- Provide validation and verification software to the instrument teams.

- Validating the delivered data from the PI teams to guarantee compatibility to the PSA required standard~~.~~ (equivalent to the PDS Standard version 3.6).

- Conducting all peer reviews of the data, with support from the appropriate instrument team as needed.

- Depositing the final archive with "deep archiving" organizations such as the World Data Centers (tbc).

- Distributing the data to the worldwide scientific research community.

- In case of obligations from instrument teams towards other space agencies, the PSA archive team will deliver the data sets under consideration to the archival system of the agency <u>after</u> the end of the official Venus Express mission in a format and way <u>defined by</u> the PSA archive team. The obligations and contracts shall be made available to the PSA archive team immediately.

4.6   Ground-based Observers

Tbw

4.7   Responsibilities of Other Organizations

No other organizations have any rights <u>or obligations</u> towards the Venus Express Science Archive.

5.   Data Delivery Schedule to the PSA

The PSA archive will by all means respect the data rights defined in [AD1] and [AD3]. The data proprietary period of Venus Express is 6 months, after which the data shall be open to the scientific community.

As a daily data release scheme is impractical and costly, two different phases are introduced: the data collection phase and the data preparation phase.

A <u>data collection phase</u> defines a period in which instrument data is acquired on board of the Venus Express spacecraft that is finally delivered as a unit (a delivery) to the PSA. A <u>data preparation phase</u> is the period of time following the data collection phase that is needed by the experimenter to reformat that data such that it is <u>compatible to the</u> PSA <u>required standard</u> ~~compatible~~<u>(equivalent to PDS Standard version 3.6)</u>. A data preparation phase ends with the delivery of data from the data collection phase to the PSA.

The PSA archive team might need several weeks to validate and verify the delivered data set before the data is made public at the online PSA.

The length of the phases shall be:

- Data collection phase: typically 3 months or less

- Data preparation phase: typically 5 months or less

- PSA internal preparation phase: 1 month~~s~~

The raw PDS-labeled data (~~CODMAC~~<u>PDS CODMAC</u> level 2) and the calibrated PDS-labeled data (~~CODMAC~~<u>PDS CODMAC</u> level 3) shall follow the upper delivery schedule.

Higher-level data or merged data shall be ingested into the PSA whenever they are available to the instrument team.

For deliveries before the end of the proprietary period, the PSA archive team will guarantee that the appropriate Principal Investigator opens the data for public access only after authorization. The PI team may use the online PSA for team internal distribution.

VENUS EXPRESS
Archive Generation, Validation
and Transfer Plan

Document No.   : VEX-RSSD-PL-001
Issue/Rev. No. : Issue 1.10
Date   : 73 June 2004
Page   : 17

VENUS EXPRESS
Archive Generation, Validation
and Transfer Plan

Document No. : VEX-RSSD-PL-001
Issue/Rev. No. : Issue 1.~~1~~0
Date : ~~7~~3 June 2004
Page : 18

Appendix A – Venus Express Instrument Description

Instrument	Description	Purpose
ASPERA	Four different sensors: - NPI (neutral particle imager) - NPD (neutral particle detector) - IMA (ion mass analyzer) - ELS (electron spectrometer) With the following characteristics: *(see table below)*	Studying the interaction processes between the Venus atmosphere and the solar wind and the impact on the atmosphere evolution.
PFS	IR high resolution specral sounding instrument	Studying the global 3-D measurements of the temperature field; Monitoring the upper cloud structure; Measurements of abundance of SO2, CO, H20, HDO, HCL, HF and search for H2S, CH4 and other gases
SPICAV	Spectral sounding instrument with 3 channels : - SPICAV-UV (118-320 nm) - SPICAV-IR (1.1-1.7 µm) - SPICAV-SOIR : (2.0-4.5 µm) additional higher-resolution infrared channel	Study the atmosphere by solar and stellar occultations and by nadir and limp viewing modes;
VeRa	Radio science experiment	Study of atmosphere, ionosphere and surface of Venus
VIRTIS	Imaging spectrometer with three data channels combined in two optical systems: • M (spectral mapping system) operates in visible and NIR with two	Providing a 4-dimensional study of Venus atmosphere (2D imaging + spectral dimension + temporal variations), the spectral variations

ASPERA sensor characteristics:

	NPI	NPD	IMA	ELS
Particles to be measured	ENA	ENA	Ions	Electrons
Energy Range [keV]	0.1-60	0.1-10	0.001-40	0.01-20
FOV [degree]	9x344	9x180	90x360	10x360
Angular Resolution [degree]	4.6x11.5	5x30	90x360	5x22.5
Time resolution [s]	32	32	32	32

VENUS EXPRESS
Archive Generation, Validation
and Transfer Plan

Document No. : VEX-RSSD-PL-001
Issue/Rev. No. : Issue 1.~~1~~0
Date : ~~7~~3 June 2004
Page : 19

Instrument	Description	Purpose
	detectors (0.25-5.0 µm, R~200, IFOV~0.25 mrad) with a scanning mirror. • H (high resolution spectrometer) operates in Vis/NIR with lower spatial resolution (2-5 µm, R~1200)	permitting a sounding at different levels of the atmosphere, from the ground up to the thermosphere.
VMC	Wide angle and multi-spectral imaging instrument; the bands are UV, visible and near IR	Obtain and study global spatial and temporal Venus disk;
MAG	Magnetometer	obtain magnetic field around s/c and study magnetic field from Venus and solar wind

VENUS EXPRESS
Archive Generation, Validation
and Transfer Plan

Document No. : VEX-RSSD-PL-001
Issue/Rev. No. : Issue 1.~~1~~0
Date : ~~7~~3 June 2004
Page : 20

Appendix B – Venus Express Personnel Overview

Instrument	Principal Investigator	Organisation	Archive Manager
ASPERA	Stas Barabash	Swedisch Insitute of Space Physics, Box 812 S-981 28 Kiruna Sweden	
PFS	Vittorio Formisano	IFSI-CNR/INAF Rome Italy	Federico Nespoli
SPICAV	Jean-Loup Bertaux	Service d'Aeronomie du CNRS BP 3 91371 - Verrieres le Buisson Cedex France	Aurélie Reberac
VeRa	Bernd Haeusler	Insitut fuer Raumffahrttechnik Universitaet der Bundeswehr Muenchen D-85577 Neubiberg	Markus Fels Martin Paetzold
VIRTIS	Pierre Drossart	L'Observatoire de Paris 61, avenue de l'Observatoire 75014 Paris	Stephane Erard
VIRTIS	Giuseppe Piccioni	CNR-IASF via del Fosso del Cavaliere 100 00133 Roma	
VMC	W. J. Markiewicz	Max-Planck-Institut fuer Aeronomie Max-Planck-Str. 2 37191 Katlenburg-Lindau	Dimitri Titov
MAG	Tielong Zhang	Institut für Weltraumforschung Österreichische Akademie der Wissenschaften Schmiedlstrasse 6 A 8042 GRAZ, Austria	Magda Delva
Auxilliary Data		Robert-Koch-Str Darmstadt Germany	A. Accomazzo VEX S/C Operations Manager
PSA		Keplerlaan 1 2200AG Noordwijk The Netherlands	J. Zender VEX Archive Manager

Appendix C – Definition of Processing Levels for Science Data Sets

~~CODMAC~~ ~~C~~PDS CODMAC C level	Type	Description
1	Raw Data	Telemetry data with data embedded.
2	Edited Data	Corrected for telemetry errors and split or decommutated into a data set for a given instrument. Sometimes called Experimental Data Record. Data are also tagged with time and location of acquisition. Corresponds to NASA Level 0 data.
3	Calibrated Data	Edited data that are still in units produced by i nstrument, but that have been corrected so that values are expressed in or are proportional to some physical unit such as radiance. No resampling, so edited data can be reconstructed. NASA Level 1A.
4	Resampled Data	Data that have been resampled in the ti me or space domains in such a way that the original edited data cannot be reconstructed. Could be calibrated in addition to being resampled. NASA Level lB.
5	Derived Data	Derived results, as maps, reports, graphics, etc. NASA Levels 2 through 5.
6	Ancillary Data	Nonscience data needed to generate calibrated or resampled data sets. Consists of instrument gains, offsets, pointing information for scan platforms, etc.
7	Correlative Data	Other science data needed to interpret space-based data sets. May include groundbased data observations such as soil type or ocean buoy measurements of wind drift.
8	User Description	Description of why the data were required, any peculiarities associated with the data sets, and enough documentation to allow secondary user to extract information from the data.
N	N	Not applicable

VENUS EXPRESS
Archive Generation, Validation
and Transfer Plan

Document No. : VEX-RSSD-PL-001
Issue/Rev. No. : Issue 1.~~1~~0
Date : ~~7~~3 June 2004
Page : 22

Appendix D, VMS Data Types and Definitions

Instrument Name	**Venus Monitoring Camera** (VMC)
Sensor Name	VMS-CCD
Data Set Name	"VENUS EXPRESS VENUS VMC EDITED DATA V1.0"
Data Set ID	VEX-V-VMC-2-EDITED-DATA-V1.0"
~~CODMAC~~PDS CODMAC DPL	2
PDS Data Type	Image
Expected Data Volume [Mbytes]	
Description	Data set contains the unprocessed VMC images
Data Set Requirements	Full radiometrical data and documentation information is given on the data set, especially - Bad pixels - Flat image files - Dark current files - Mounting alignments Full geometrical data and documentation information is given on the data set, especially - Geometrical information on CCD and pixel basis Further calibration information is given either in parameter files or within the data product labels, especially - Instrument related temperatures, voltages and other relevant housekeeping information - Spacecraft related temperatures, voltages and other relevant housekeeping information

Instrument Name	**Venus Monitoring Camera** (VMC)
Sensor Name	VMS-CCD
Data Set Name	"VENUS EXPRESS VENUS VMC CALIBRATED DATA V1.0"
Data Set ID	VEX-V-VMC-3-RADIOM-CALIBRATED-DATA-V1.0
~~CODMAC~~PDS CODMAC DPL	3
PDS Data Type	Image
Expected Data Volume [Mbytes]	
Description	Data set contains the radiometrical calibrated VMC images
Data Set Requirements	Full geometrical data and documentation information is given on the data set, especially

VENUS EXPRESS
Archive Generation, Validation
and Transfer Plan

Document No.	: VEX-RSSD-PL-001
Issue/Rev. No.	: Issue 1.~~1~~0
Date	: ~~7~~3 June 2004
Page	: 23

	• Geometrical information on CCD and pixel basis

Instrument Name	**Venus Monitoring Camera** (VMC)
Sensor Name	VMS-CCD
Data Set Name	"VENUS EXPRESS VENUS VMC MAPPING DATA V1.0"
Data Set ID	VEX-V-VMC-5-MAPS-V1.0"
~~CODMAC~~PDS CODMAC DPL	5
PDS Data Type	Image
Expected Data Volume [Mbytes]	
Description	Data set contains the radiometrical and geometrical calibrated VMC maps
Data Set Requirements	

Instrument Name	**Venus Monitoring Camera** (VMC)
Sensor Name	VMS-CCD
Data Set Name	"VENUS EXPRESS VENUS VMC CLOUD MOVEMENT MOVIE DATA V1.0"
Data Set ID	VEX-V-VMC-5-CLOUD-MOVIES-V1.0
~~CODMAC~~PDS CODMAC DPL	5
PDS Data Type	Movie
Expected Data Volume [Mbytes]	
Description	Data set contains selected mpg movies representing cloud motions
Data Set Requirements	

Appendix E, SPICAV Data Types and Definitions

Instrument Name	SPICAV
Sensor Name	UV CHANNEL
Data Set Name	"VENUS EXPRESS VENUS SPICAV UV EDITED SPECTRA V1.0"
Data Set ID	VEX-V-SPICAV-2-EDITED-UV-SPECTRA-V1.0
~~CODMAC~~PDS CODMAC DPL	2
PDS Data Type	ARRAY
Expected Data Volume [Mbytes]	
Description	Dataset contains the raw spectra (measured digital numbers) measured during each orbit of the SPICAV UV channel.
Data Set Requirements	Calibration spectra obtained during orbits are given either in the CALIB directory. Dark current and flat field information is given in the CALIB directory. Documentation and calibration routines (or the algorithm) is given in the DOC directory

Instrument Name	SPICAV
Sensor Name	IR CHANNEL
Data Set Name	"VENUS EXPRESS VENUS SPICAV IR EDITED SPECTRA V1.0"
Data Set ID	VEX-V-SPICAV-2-EDITED-IR-SPECTRA-V1.0
~~CODMAC~~PDS CODMAC DPL	2
PDS Data Type	ARRAY
Expected Data Volume [Mbytes]	
Description	Dataset contains the raw spectra (measured digital numbers) measured during each orbit of the SPICAV IR channel.
Data Set Requirements	Calibration spectra obtained during orbits are given either in the CALIB directory . Dark current and flat field information is given in the directory. Documentation and calibration routines (or the algorithm) is given in the DOC directory

VENUS EXPRESS
Archive Generation, Validation
and Transfer Plan

Document No.   : VEX-RSSD-PL-001
Issue/Rev. No. : Issue 1.~~1~~0
Date   : 7~~3~~ June 2004
Page   : 25

Instrument Name	SPICAV
Sensor Name	UV CHANNEL
Data Set Name	"VENUS EXPRESS VENUS SPICAV UV CALIBRATED SPECTRA V1.0"
Data Set ID	VEX-V-SPICAV-3-CAL-UV-SPECTRA-V1.0
~~CODMAC~~PDS CODMAC DPL	3
PDS Data Type	SPECTRUM or ARRAY [tbd]
Expected Data Volume [Mbytes]	
Description	Dataset contains the calibrated spectra (wavelength assignment) measured during each orbit of the SPICAV UV channel.
Data Set Requirements	Source file information as file names of dark current, flat field, calibration spectra, orbit and attitude files are given either in the data labels or in a parameter file

Instrument Name	SPICAV
Sensor Name	IR CHANNEL
Data Set Name	"VENUS EXPRESS VENUS SPICAV IR CALIBRATED SPECTRA V1.0"
Data Set ID	VEX-V-SPICAV-3-CAL-IR-SPECTRA-V1.0
~~CODMAC~~PDS CODMAC DPL	3
PDS Data Type	SPECTRUM or ARRAY [tbd]
Expected Data Volume [Mbytes]	
Description	Dataset contains the calibrated spectra (wavelength assignment) measured during each orbit of the SPICAV IR channel.
Data Set Requirements	Source file information as file names of dark current, flat field, calibration spectra, orbit and attitude files are given either in the data labels or in a parameter file

Instrument Name	SPICAV
Sensor Name	UV
Data Set Name	VENUS EXPRESS VENUS SPICAV ATMOSPHERIC "TRANSMISSION FUNCTION V1.0"
Data Set ID	VEX-V-SPICAV-5-ATM-TRANS-V1.0
~~CODMAC~~PDS CODMAC DPL	5
PDS Data Type	ARRAY
Expected Data Volume [Mbytes]	
Description	Data set contains the atmospheric transmission function of altitude and wavelength for star and sun occultations.
Data Set Requirements	

Instrument Name	SPICAV
Sensor Name	UV CHANNEL
Data Set Name	"VENUS EXPRESS VENUS SPICAV UV ALBEDO V1.0"
Data Set ID	VEX-V-SPICAV-5-UV-ALBEDO -V1.0
~~CODMAC~~PDS CODMAC DPL	5
PDS Data Type	ARRAY
Expected Data Volume [Mbytes]	
Description	Data set contains UV albedo obtained during nadir observations on Venus. The brightness is given in absolute units as a function of line of sight altitude and wavelength ratio of current spectra by solar spectrum.
Data Set Requirements	

Instrument Name	SPICAV
Sensor Name	IR CHANNEL
Data Set Name	"VENUS EXPRESS SPICAV IR CHANNEL LIMB BRIGHTNESS V1.0"
Data Set ID	VEX-V-SPICAV-5-IR-LIMB-V1.0
~~CODMAC~~PDS	5

CODMAC DPL	
PDS Data Type	ARRAY [TBC]
Expected Data Volume [Mbytes]	
Description	Data set contains the limb brightness in absolute units as a function of line of sight altitude and wavelength ratio of current spectra by solar spectrum
Data Set Requirements	

Instrument Name	SPICAV
Sensor Name	SOIR
Data Set Name	"VENUS EXPRESS VENUS SPICAV SOLAR OCCULATATION HIGH RESOLUTION IR EDITED SPECTRA V1.0"
Data Set ID	VEX-V-SPICAVSOIR-2-EDITED-HR-IR-SPECTRA-V1.0
~~CODMAC~~PDS CODMAC DPL	2
PDS Data Type	ARRAY
Expected Data Volume [Mbytes]	
Description	Dataset contains the raw spectra (measured digital numbers) obtained during sun occultations of the SPICAV SOIR infrared channel.
Data Set Requirements	Calibration spectra are given either in the CALIB directory or in the DATA directory itself.
	Dark current and flat field information is given in the CALIB or DATA directory.
	Documentation and calibration routines (or the algorithm) is given in the DOC directory

Instrument Name	SPICAV
Sensor Name	SOIR CHANNEL
Data Set Name	"VENUS EXPRESS VENUS SPICAV SOLAR OCCULTATION HIGH RESOLUTION IR CALIBRATED SPECTRA V1.0"
Data Set ID	VEX-V-SPICAV-SOIR-3-CALIB-HR-IR-SPECTRA-V1.0
~~CODMAC~~PDS CODMAC DPL	3
PDS Data Type	SPECTRUM or ARRAY[tbd]
Expected Data Volume	

VENUS EXPRESS
Archive Generation, Validation
and Transfer Plan

Document No. : VEX-RSSD-PL-001
Issue/Rev. No. : Issue 1.~~1~~0
Date : ~~7~~3 June 2004
Page : 28

[Mbytes]	
Description	Dataset contains the calibrated spectra of the SOIR sensor measured during each occultation (pixel was converted to wavenumber).
Data Set Requirements	Source file information as file names of dark current, flat field, calibration spectra, orbit and attitude files are given either in the data labels or in a parameter file; Documentation and calibration routines (or the algorithm) is given in the DOC directory

Instrument Name	SPICAV
Sensor Name	SOIR CHANNEL
Data Set Name	"VENUS EXPRESS VENUS SPICAV SOLAR OCCULTATION HIGH RESOLUTION IR ATMOSPHERIC TRANSMISSION V1.0"
Data Set ID	VEX-V-SPICAV-SOIR-5-ATM-TRANSMISSION-V1.0
~~CODMAC~~PDS CODMAC DPL	5
PDS Data Type	SPECTRUM or ARRAY [tbd]
Expected Data Volume [Mbytes]	
Description	Dataset contains the atmospheric transmission as function of altitude and wavelength for sun occultation's.
Data Set Requirements	Derived data product from data processing level 3

Appendix F, PFS Data Types and Definitions

Instrument Name	PFS
Sensor Name	SWL (SHORT WAVELENGTH) INTERFEROGRAM
Data Set Name	"VENUS EXPRESS PFS EDITED SHORT WAVELENGTH INTERFEROGRAMS V1.0"
Data Set ID	VEX-V-PFS-2-EDITED-SWL-IFG-V1.0
~~CODMAC~~PDS CODMAC DPL	2
PDS Data Type	ARRAY
Expected Data Volume [Mbytes]	
Description	Data set contains the raw (edited) measured interferograms (measured digital numbers) in the short wavelength regime
`Data Set Requirements	Calibration interferograms and atmospheric information obtained during the pericenter passes are provided either in the CALIB or DATA directory. Dark current and other calibration information is given. Calibration documentation in form of calibration algorithm or calibration software is provided

Instrument Name	PFS
Sensor Name	LWL (LONG WAVELENGTH) INTERFEROGRAM
Data Set Name	"VENUS EXPRESS PFS EDITED LONG WAVELENGTH INTERFEROGRAMS V1.0"
Data Set ID	VEX-V-PFS-2-EDITED-LWL-IFG-V1.0
~~CODMAC~~PDS CODMAC DPL	2
PDS Data Type	ARRAY
Expected Data Volume [Mbytes]	
Description	Data set contains the raw (edited) measured interferograms (measured digital numbers) in the long wavelength regime
`Data Set Requirements	Calibration interferograms and atmospheric information obtained during the pericenter passes are provided either in the CALIB or DATA directory. Dark current and other calibration information is given. Calibration documentation in form of calibration algorithm or

	calibration software is provided

Instrument Name	PFS
Sensor Name	SWL (SHORT WAVELENGTH) SPECTRA
Data Set Name	"VENUS EXPRESS PFS EDITED SHORT WAVELENGTH SPECTRA V1.0"
Data Set ID	VEX-V-PFS-2-EDITED-SWL-SPECTRA-V1.0
~~CODMAC~~PDS CODMAC DPL	2
PDS Data Type	ARRAY/SPECTRA[TBD]
Expected Data Volume [Mbytes]	
Description	Data set contains the raw (edited) measured spectrograms (measured digital numbers) in the short wavelength regime
`Data Set Requirements	Calibration spectra and atmospheric information obtained during the pericenter passes are provided either in the CALIB or DATA directory. Dark current and other calibration information is given. Calibration documentation in form of calibration algorithm or calibration software is provided

Instrument Name	PFS
Sensor Name	LWL (LONG WAVELENGTH) SPECTRA
Data Set Name	"VENUS EXPRESS PFS EDITED LONG WAVELENGTH SPECTRA V1.0"
Data Set ID	VEX-V-PFS-2-EDITED-LWL-SPECTRA-V1.0
~~CODMAC~~PDS CODMAC DPL	2
PDS Data Type	ARRAY/SPECTRA[TBD]
Expected Data Volume [Mbytes]	
Description	Data set contains the raw (edited) measured spectrograms (measured digital numbers) in the long wavelength regime
`Data Set Requirements	Calibration spectra and atmospheric information obtained during the pericenter passes are provided either in the CALIB or DATA directory.

VENUS EXPRESS

Archive Generation, Validation and Transfer Plan

Document No.	: VEX-RSSD-PL-001
Issue/Rev. No.	: Issue 1.~~1~~0
Date	: ~~7~~3 June 2004
Page	: 31

	Dark current and other calibration information is given.
	Calibration documentation in form of calibration algorithm or calibration software is provided

Instrument Name	PFS
Sensor Name	SWL
Data Set Name	VENUS EXPRESS VENUS PFS CALIBRATED SHORTWAVELENGTH SPECTRA V1.0"
Data Set ID	VEX-V-PFS-3-CALIBRATED-SWL-SPECTRA-V1.0
~~CODMAC~~PDS CODMAC DPL	3
PDS Data Type	SPECTRUM
Expected Data Volume [Mbytes]	
Description	Data set contains calibrated and atmosphere corrected spectra obtained from the raw short wavelength spectra and interferograms
`Data Set Requirements	Source file information is given, e.g. product id of raw data, ancillary data files, etc

Instrument Name	PFS
Sensor Name	LWL
Data Set Name	VENUS EXPRESS VENUS PFS CALIBRATED LONGWAVELENGTH SPECTRA V1.0"
Data Set ID	VEX-V-PFS-3-CALIBRATED-LWL-SPECTRA-V1.0
~~CODMAC~~PDS CODMAC DPL	3
PDS Data Type	SPECTRUM
Expected Data Volume [Mbytes]	
Description	Data set contains calibrated and atmosphere corrected spectra obtained from the raw long wavelength spectra and interferograms
`Data Set Requirements	Source file information is given, e.g. product id of raw data, ancillary data files, etc

Instrument Name	PFS
Sensor Name	SWL/LWL
Data Set Name	VENUS EXPRESSS VENUS SURFACE PROPERTIES MAP V1.0"
Data Set ID	VEX-V-PFS-5-SURFACE-PROPERTIES-MAP-V1.0
~~CODMAC~~PDS CODMAC DPL	5
PDS Data Type	IMAGE/QUBE [TBD]
Expected Data Volume [Mbytes]	
Description	Data set contains derived, calibrated spectra of surface properties
`Data Set Requirements	Source information in form of pointers to original data or/and appropriate documentation

VENUS EXPRESS
Archive Generation, Validation
and Transfer Plan

Document No. : VEX-RSSD-PL-001
Issue/Rev. No. : Issue 1.~~1~~0
Date : ~~7~~3 June 2004
Page : 33

Appendix G, VIRTIS Data Types and Definitions

Instrument Name	VIRTIS
Sensor Name	M-Vis, M-IR, H
Data Set Name	"VENUS EXPRESS VENUS VIRTIS QUBES V1.0"
Data Set ID	VEX-V-VIRTIS-2-EDITED-DATA-V1.0
~~CODMAC~~PDS CODMAC DPL	2
PDS Data Type	QUBE for M-~~visible, M-IR~~ ~~channel (both visible and IR)~~ ~~and~~and for H ~~channel~~. Dimensions are a function of acquisition mode. Dark currents are included in the data qube objects as part of the observations.
Expected Data Volume [Mbytes]	
Description	This data set contains the measured spectral responses (measured digital numbers) from all three channel sensors. A separate file is produced for each sensor.
Data Set Requirements	Calibration information in form of dark current frames, flat field frames, bad pixels, etc are given and a *provisional* calibration algorithm (or software) is provided. Geometrical information is given in a 'geometrical qube' object accompanying the data qube.

Instrument Name	VIRTIS
Sensor Name	M-Vis, M-IR, H
Data Set Name	"VENUS EXPRESS VENUS VIRTIS CALIBRATED QUBES V1.0"
Data Set ID	VEX-V-VIRTIS-3-CALIBRATED-DATA-V1.0
~~CODMAC~~PDS CODMAC DPL	3
PDS Data Type	QUBE for M-~~visible and M-IR.~~ ~~channel (both visible and IR)~~ QUBE for H channel, with dimensions function of acquisition mode. In most modes, dark current are stored in separated Qube objects.
Expected Data Volume [Mbytes]	
Description	This data set contains the measured spectral responses (measured digital numbers) from all three channel sensors. A separate file is produced for each sensor.
Data Set Requirements	Calibration information in form of dark current frames, flat field frames, bad pixels, etc are given and a *refined* calibration algorithm

	(or software) is provided.
	Geometrical information is given in a 'geometrical qube' object accompanying the data qube.

Instrument Name	VIRTIS
Sensor Name	M-Vis, M-IR, H
Data Set Name	"VENUS EXPRESS VENUS VIRTIS MAPS V1.0"
Data Set ID	VEX-V-VIRTIS-5-MAPS-V1.0
~~CODMAC~~PDS ~~CODMAC~~ DPL	5
PDS Data Type	IMAGE, MAP…
Expected Data Volume [Mbytes]	
Description	Data set contains a selection derived products related to spatially extended observations e.g, surface maps, wind maps…
	Other possible products include graphics of atmosphere time evolution, spectra…
	Selected products for ESA public outreach are included.
Data Set Requirements	Source file pointers and information of source, calibration and geometrical information data.
	Geometrical information is given on a frame and pixel level.

VENUS EXPRESS
Archive Generation, Validation and Transfer Plan

Document No. : VEX-RSSD-PL-001
Issue/Rev. No. : Issue 1.~~1~~0
Date : ~~7~~3 June 2004
Page : 35

Appendix H, ASPERA Data Types and Definitions

Instrument Name	ASPERA
Sensor Name	NPI-NORMAL
Data Set Name	"VENUS EXPRESS VENUS ASPERA NEUTRAL PARTICLE IMAGER NORMAL MODE EDITED/ENGINEERING DATA V1.0"
Data Set ID	VEX-V-ASPERA-2-NPI-NM-EDITED-DATA-V1.0
~~CODMAC~~PDS CODMAC DPL	2
PDS Data Type	ARRAY
Expected Data Volume [Mbytes]	
Description	Data set contains the raw/edited engineering data from the neutral particle detector in normal mode from each azimuthal sector
`Data Set Requirements	Calibration information is provided

Instrument Name	ASPERA
Sensor Name	NPI-NORMAL
Data Set Name	"VENUS EXPRESS VENUS ASPERA NEUTRAL PARTICLE IMAGER NORMAL MODE CALIBRATED DATA V1.0"
Data Set ID	VEX-V-ASPERA-3-NPI-NM-SCIENCE-DATA-V1.0
~~CODMAC~~PDS CODMAC DPL	3
PDS Data Type	ARRAY
Expected Data Volume [Mbytes]	
Description	Data set contains the science/calibrated data from the neutral particle detector in normal mode from each azimuthal sector
Data Set Requirements	

Instrument Name	ASPERA
Sensor Name	NPI-STEPPING
Data Set Name	"VENUS EXPRESS VENUS ASPERA NEUTRAL PARTICLE IMAGER DEFLECTION STEPPING MODE EDITED/ENGINEERING DATA V1.0"
Data Set ID	VEX-V-ASPERA-2-NPI-DS-EDITED-DATA-V1.0
~~CODMAC~~PDS CODMAC DPL	2
PDS Data Type	ARRAY
Expected Data Volume [Mbytes]	
Description	Data set contains the raw/edited engineering data from the neutral particle detector in deflection stepping mode from each azimuthal sector
`Data Set Requirements	Calibration information is provided

Instrument Name	ASPERA
Sensor Name	NPI-STEPPING
Data Set Name	"VENUS EXPRESS VENUS ASPERA NEUTRAL PARTICLE IMAGER DEFLECTION STEPPING MODE CALIBRATED DATA V1.0"
Data Set ID	VEX-V-ASPERA-3-NPI-DS-SCIENCE-DATA-V1.0
~~CODMAC~~PDS CODMAC DPL	3
PDS Data Type	ARRAY
Expected Data Volume [Mbytes]	
Description	Data set contains the science/calibrated data from the neutral particle detector in deflection stepping mode from each azimuthal sector
Data Set Requirements	

VENUS EXPRESS

Archive Generation, Validation
and Transfer Plan

Document No. : VEX-RSSD-PL-001
Issue/Rev. No. : Issue 1.~~1~~0
Date : ~~7~~3 June 2004
Page : 37

Instrument Name	ASPERA
Sensor Name	NPD
Data Set Name	"VENUS EXPRESS VENUS ASPERA NEUTRAL PARTICLE DETECTOR EDITED/ENGINEERING DATA V1.0"
Data Set ID	VEX-V-ASPERA-3-NPD-EDITED-DATA-V1.0
~~CODMAC~~PDS CODMAC DPL	2
PDS Data Type	ARRAY
Expected Data Volume [Mbytes]	
Description	
`Data Set Requirements	

Instrument Name	ASPERA
Sensor Name	NPD
Data Set Name	"VENUS EXPRESS VENUS ASPERA NEUTRAL PARTICLE DETECTOR CALIBRATED DATA V1.0"
Data Set ID	VEX-V-ASPERA-3-NPD-SCIENCE-DATA-V1.0
~~CODMAC~~PDS CODMAC DPL	3
PDS Data Type	ARRAY
Expected Data Volume [Mbytes]	
Description	
`Data Set Requirements	

VENUS EXPRESS
Archive Generation, Validation and Transfer Plan

Document No.	:	VEX-RSSD-PL-001
Issue/Rev. No.	:	Issue 1.~~1~~0
Date	:	~~7~~3 June 2004
Page	:	38

Instrument Name	ASPERA
Sensor Name	IMA-HP
Data Set Name	"VENUS EXPRESS VENUS ASPERA ION MASS H+ ANALYSER EDITED/ENGINEERING DATA V1.0"
Data Set ID	VEX-V-ASPERA-2-ION-HP-EDITED-DATA-V1.0
~~CODMAC~~PDS CODMAC DPL	2
PDS Data Type	ARRAY
Expected Data Volume [Mbytes]	
Description	Data set contains the energy steps from H+ from all anodes
Data Set Requirements	Calibration information is provided

Instrument Name	ASPERA
Sensor Name	IMA-HP
Data Set Name	"VENUS EXPRESS VENUS ASPERA ION MASS H+ ANALYSER SCIENCE/CALIBRATION DATA V1.0"
Data Set ID	VEX-V-ASPERA-3-ION-HP-EDITED-DATA-V1.0
~~CODMAC~~PDS CODMAC DPL	3
PDS Data Type	ARRAY
Expected Data Volume [Mbytes]	
Description	Data set contains the calibrated energy steps from H+ from all anodes
Data Set Requirements	

Instrument Name	ASPERA
Sensor Name	IMA-OP
Data Set Name	"VENUS EXPRESS VENUS ASPERA ION MASS ANALYSER O+ EDITED/ENGINEERING DATA V1.0"
Data Set ID	VEX-V-ASPERA-2-IMA-OP-EDITED-DATA-V1.0
~~CODMAC~~PDS CODMAC DPL	2
PDS Data Type	ARRAY
Expected Data Volume [Mbytes]	

VENUS EXPRESS
Archive Generation, Validation
and Transfer Plan

Document No.   : VEX-RSSD-PL-001
Issue/Rev. No. : Issue 1.~~1~~0
Date   : ~~7~~3 June 2004
Page   : 39

Description	Data set contains the edited energy steps from O+ from all anodes
Data Set Requirements	Calibration information is provided

Instrument Name	ASPERA
Sensor Name	IMA-OP
Data Set Name	"VENUS EXPRESS VENUS ASPERA ION MASS O+ ANALYSER CALIBRATED DATA V1.0"
Data Set ID	VEX-V-ASPERA-3-IMA-OP-SCIENCE-DATA-V1.0
~~CODMAC~~PDS CODMAC DPL	3
PDS Data Type	ARRAY
Expected Data Volume [Mbytes]	
Description	Data set contains the calibrated energy steps from O+ from all anodes
Data Set Requirements	

… and similar data sets for He+, >O+, He++ and for all masses.

Instrument Name	ASPERA
Sensor Name	ELS
Data Set Name	"VENUS EXPRESS VENUS ASPERA ELECTRON SPECTROMETER EDITED/ENGINEERING DATA V1.0"
Data Set ID	VEX-V-ASPERA-2-ELS-EDITED-DATA-V1.0
~~CODMAC~~PDS CODMAC DPL	2
PDS Data Type	ARRAY
Expected Data Volume [Mbytes]	
Description	
`Data Set Requirements	

Instrument Name	ASPERA
Sensor Name	ELS

VENUS EXPRESS
Archive Generation, Validation
and Transfer Plan

Document No.	: VEX-RSSD-PL-001
Issue/Rev. No.	: Issue 1.~~1~~0
Date	: ~~7~~3 June 2004
Page	: 40

Data Set Name	"VENUS EXPRESS VENUS ASPERA ELECTRON SPECTROMETER CALIBRATED DATA V1.0"
Data Set ID	VEX-V-ASPERA-3-ELS-SCIENCE-DATA-V1.0
~~CODMAC~~PDS CODMAC DPL	3
PDS Data Type	SPECTRA
Expected Data Volume [Mbytes]	
Description	
`Data Set Requirements	

Instrument Name	ASPERA
Sensor Name	SCANNING UNIT
Data Set Name	"VENUS EXPRESS VENUS ASPERA SCANNING UNIT EDITED/ENGINEERING DATA V1.0"
Data Set ID	VEX-V-ASPERA-2-SU-EDITED-DATA-V1.0
~~CODMAC~~PDS CODMAC DPL	2
PDS Data Type	ARRAY
Expected Data Volume [Mbytes]	
Description	
`Data Set Requirements	

Instrument Name	ASPERA
Sensor Name	SCANNING UNIT
Data Set Name	"VENUS EXPRESS VENUS ASPERA SCANNING UNIT CALIBRATED DATA V1.0"
Data Set ID	VEX-V-ASPERA-3-SU-CALIBRATED-DATA-V1.0
~~CODMAC~~PDS CODMAC DPL	3
PDS Data Type	ARRAY
Expected Data Volume [Mbytes]	
Description	
`Data Set Requirements	

VENUS EXPRESS
Archive Generation, Validation and Transfer Plan

Document No.   : VEX-RSSD-PL-001
Issue/Rev. No. : Issue 1.~~1~~0
Date   : ~~7~~3 June 2004
Page   : 41

Appendix I, VeRa Data Types and Definitions

Instrument Name	VeRa
Sensor Name	IFMS CL
Data Set Name	"VENUS EXPRESS VENUS VERA IFMS CLOSED LOOP DATA V1.0"
Data Set ID	VEX-V-VERA-2-IFMS-CL-EDITED-DATA-V1.0
~~CODMAC~~PDS CODMAC DPL	2
PDS Data Type	ARRAY/TABLE
Expected Data Volume [Mbytes]	
Description	Data set contains ranging, Doppler, auto gain and meteor data from the ESA station of the IFMS in closed loop mode
Data Set Requirements	Range calibration data is provided

Instrument Name	VeRa
Sensor Name	IFMS CL
Data Set Name	"VENUS EXPRESS VENUS VERA IFMS CLOSED LOOP DATA V1.0"
Data Set ID	VEX-V-VERA-3-IFMS-CL-CAL-DATA-V1.0
~~CODMAC~~PDS CODMAC DPL	3
PDS Data Type	ARRAY/TABLE
Expected Data Volume [Mbytes]	
Description	Data set contains ranging and residual frequency data from the ESA station of the IFMS in closed loop mode
Data Set Requirements	

Instrument Name	VeRa
Sensor Name	IFMS OL
Data Set Name	"VENUS EXPRESS VENUS VERA IFMS OPEN LOOP DATA V1.0"
Data Set ID	VEX-V-VERA-2-IFMS-OL-EDITED-DATA-V1.0
~~CODMAC~~PDS CODMAC DPL	2
PDS Data Type	ARRAY/TABLE
Expected Data Volume	

[Mbytes]	
Description	Data set contains ranging, Doppler, auto gain and meteor data from the ESA station of the IFMS in closed loop mode
Data Set Requirements	Range calibration data is provided

Instrument Name	VeRa
Sensor Name	IFMS OL
Data Set Name	"VENUS EXPRESS VENUS VERA IFMS OPEN LOOP DATA V1.0"
Data Set ID	VEX-V-VERA-3-IFMS-OL-CAL-DATA-V1.0
~~CODMAC~~PDS CODMAC DPL	3
PDS Data Type	ARRAY/TABLE
Expected Data Volume [Mbytes]	
Description	Data set contains spectral data, polarization data and residual frequency data
Data Set Requirements	

Instrument Name	VeRa
Sensor Name	DSN-CL
Data Set Name	"VENUS EXPRESS VENUS VERA DSN CLOSED LOOP DATA V1.0"
Data Set ID	VEX-V-VERA-2-DSN-CL-EDITED-DATA-V1.0
~~CODMAC~~PDS CODMAC DPL	2
PDS Data Type	ARRAY/TABLE
Expected Data Volume [Mbytes]	
Description	Data set contains data on navigation tracking files and orbit data from the NASA deep space antennas.
Data Set Requirements	

Instrument Name	VeRa
Sensor Name	DSN-OL
Data Set Name	"VENUS EXPRESS VENUS VERA DSN OPEN LOOP DATA V1.0"
Data Set ID	VEX-V-VERA-2-DSN-OL-EDITED-DATA-V1.0
~~CODMAC~~PDS CODMAC DPL	2

VENUS EXPRESS
Archive Generation, Validation and Transfer Plan

Document No.	: VEX-RSSD-PL-001
Issue/Rev. No.	: Issue 1.~~1~~0
Date	: ~~7~~3 June 2004
Page	: 43

PDS Data Type	ARRAY/TABLE
Expected Data Volume [Mbytes]	
Description	Data set contains radio science receiver files from the NASA deep space antennas.
Data Set Requirements	

Instrument Name	VeRa
Sensor Name	DSN OL
Data Set Name	"VENUS EXPRESS VENUS VERA DSN OPEN LOOP DATA V1.0"
Data Set ID	VEX-V-VERA-3-IFMS-OL-CAL-DATA-V1.0
~~CODMAC~~PDS CODMAC DPL	3
PDS Data Type	ARRAY/TABLE
Expected Data Volume [Mbytes]	
Description	Data set contains spectral data, polarization data and residual frequency data from the NASA deep space network antennas
Data Set Requirements	

Instrument Name	VeRa
Sensor Name	DSN CL
Data Set Name	"VENUS EXPRESS VENUS VERA DSN CLOSED LOOP DATA V1.0"
Data Set ID	VEX-V-VERA-3-DSN-CL-CAL-DATA-V1.0
~~CODMAC~~PDS CODMAC DPL	3
PDS Data Type	ARRAY/TABLE
Expected Data Volume [Mbytes]	
Description	Data set contains ranging and residual frequency data from the NASA deep space antennas in closed loop mode
Data Set Requirements	

VENUS EXPRESS

Archive Generation, Validation
and Transfer Plan

Document No. : VEX-RSSD-PL-001
Issue/Rev. No. : Issue 1.~~1~~0
Date : ~~7~~3 June 2004
Page : 44

Appendix J, Magnetometer Data Types and Definitions

Instrument Name	MAG
Sensor Name	
Data Set Name	"VENUS EXPRESS VENUS MAGNETOMETER ~~EDITED~~ UNCALIBRATED MAGNETICFIELD DATA V1.0"
Data Set ID	VEX-V-MAG-2 -UNCALIBRATED~~EDITED~~-MAGNET~~IF~~ICFIELD-VSO2000-~~SC~~FRAME-DATA-V1.0
~~CODMAC~~PDS CODMAC DPL	2
PDS Data Type	ARRAY/TABLE
Expected Data Volume [Mbytes]	
Description	Data set contains time, uncalibrated magnetic field data including s/c offsets, at 2 sensors (2x3 vector components), in VSO coordinate frame, quality flag for the data~~TBD~~.
Data Set Requirements	~~TBD~~

Remark: This data processing level needs further discussions as the coordinate transformation applied changes the data ambiguously. The data processing level during the cruise phase needs definition and update of these tables.

~~Instrument Name~~	~~MAG~~
~~Sensor Name~~	
~~Data Set Name~~	~~"VENUS EXPRESS VENUS MAGNETOMETER CALIBRATED MAGNETICFIELD DATA V1.0"~~
~~Data Set ID~~	~~VEX-V-MAG-2-CALIBRATED-MAGNETIFICFIELDSCFRAME-DATA-V1.0~~
~~CODMAC DPL~~	~~3~~
~~PDS Data Type~~	~~ARRAY/TABLE~~
~~Expected Data Volume [Mbytes]~~	
~~Description~~	~~TBD~~
~~Data Set Requirements~~	~~TBD~~

VENUS EXPRESS
Archive Generation, Validation
and Transfer Plan

Document No.	: VEX-RSSD-PL-001
Issue/Rev. No.	: Issue 1.~~1~~0
Date	: ~~7~~3 June 2004
Page	: 45

Instrument Name	MAG
Sensor Name	
Data Set Name	"VENUS EXPRESS VENUS MAGNETOMETER CALIBRATED MAGNETICFIELD DATA V1.0"
Data Set ID	VEX-V-MAG-2 -CALIBRATED-MAGNETICFIELD-————VSO 2000FRAME-DATA-V1.0
~~CODMAC~~PDS CODMAC DPL	3
PDS Data Type	ARRAY/TABLE
Expected Data Volume [Mbytes]	
Description	Data set contains time, calibrated magnetic field data (3 vector components) in VSO coordinate frame, quality flag for the data, S/C position (3 components) in TBD coordinate frame.
Data Set Requirements	~~Information on quality flag values and transformation from S/C frame to VSO is given in the DOC directory~~

Note:
the Venus Solar Orbital (VSO) coordinate system is defined as follows:
Venus-centered, X-axis to the Sun, Y-axis opposite to the planet's orbital velocity, Z-axis orthogonal to the planet's orbit and completes the orthogonal, right-handed set.

Appendix K, Spacecraft Ancillary and Auxiliary Data Types and Definitions

Instrument Name	N/A
Sensor Name	N/A
Data Set Name	"VENUS EXPRESS VENUS AUXILIARY DATA V1.0"
Data Set ID	VEX-V-AUX-2-AUXILIARY-AND-SC-HOUSEKEEPING-DATA-V1.0
~~CODMAC~~PDS CODMAC DPL	6
PDS Data Type	TABLE
Expected Data Volume [Mbytes]	
Description	Data set contains orbit, attitude and event information; selected spacecraft housekeeping information;
Data Set Requirements	ESOC documentation e.g. DDID shall accompany this dataset

Appendix L, Science Planning Data, Types and Definitions

Instrument Name	N/A
Sensor Name	N/A
Data Set Name	"VENUS EXPRESS VENUS SCIENCE PLANNING DATA V1.0"
Data Set ID	VEX-V-AUX-2-SCIENCE-PLANNING-DATA-V1.0
~~CODMAC~~PDS CODMAC DPL	6
PDS Data Type	TABLE
Expected Data Volume [Mbytes]	
Description	Data set contains additional information obtained during the science planning, e.g. definition of science scenarios;
Data Set Requirements	Science planning documentation shall be provided