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Distribution List

Recipient	Organisation	Recipient	Organisation
RSOC			
PDS-SBN			
All Rosetta PIs and TMs			

Change Record Sheet

Date	Iss.	Rev.	pp.	Description / Authority	CR No.
06 Mar 2000	D	1.1		initial Draft	
20 Aug 2000		1.2		applied corrections from E. Grayzeck and M. A'Hearn removed MODULUS as orbiter instrument through the draft proper document number inserted	
05 Feb 2001				added appropriate information in the table for data rights	
07 Feb 2001		1.3		rewrote the schedule section and added two schedule drawings	
21 Feb 2001		1.4		improved table of data types, data volumes	
14 Mar 2001		1.5		corrections and changes after discussion with Ed Grayzeck at SBN-UMD	
09 Apr 2001		1.6		changes due to comments from D. Koschny	
11 Apr 2001		2.0		ready for internal review	
16 May 2001	1	0			
27 Oct 2003	2	0	all	Updates, extensions, editorials. Updates w.r.t. new target comet 67P/Churyumov-Gerasimenko. Implementation of online PSA added → new chapter "The Planetary Science Archive", section "Online Distribution of Data" deleted, contents of section "Further Information" moved to "The Planetary Science Archive", volume and data set identified. SIS replaced by EAICD → appendix "Archive Volume Software Specification Outline for Instrument-Related Data" replaced by reference to EAICD template. Instrument appendices taken over by separate EAICDs. Clarification that the proprietary period is 6 months. Personal comments from U. Keller (2001) and SONC (Jul 2001, Oct 2003) incorporated. Appendix "Glossary of Selected Terms" deleted.	
05 Nov 2003	2	0		Changes agreed at DAWG telecon: Section 2, 2nd paragraph: Added that at least one asteroid fly-by is guaranteed. Section 2, 5th paragraph: Added that analyses of the gas and dust emission contribute to the selection of the landing site. Sections 7.4 & 7.6: Added that orbit files for the target comet and fly-by asteroid(s) will be delivered by the RMOC and formatted to PDS standards by the ESA-PDS team. Section 5, 2nd paragraph and section 6, 1st and 2nd paragraph: Clarification and correction that there is no restriction on the number of data sets	

Date	Iss.	Rev.	pp.	Description / Authority	CR No.
				being delivered. Section 5, item CATALOG: REF.CAT changed from optional to required. Required SOFTWARE.CAT added. Section 10.3 on the Naples lab data archive added. Appendix D: "The tables in this appendix refer to the edited raw data and calibrated data, i.e. data processing levels 1b and 2." added. Appendix F on Mandatory Keywords and Standard Values added.	
10 Nov 2003	2	0		Table of Open Issues added. RD6 updated: DDID, Issue B6, 23 Oct 2003. RD7 updated: Planetary Missions Science Archive Review Procedure, Issue 1, Revision 0, Nov 2003. Section 7.6, item (f): "all ancillary data" replaced by "all agreed ancillary data". Chapter 8, 1st paragraph: "in agreement with everybody" replaced by "in agreement with all parties". Tables in appendix D & E updated according to inputs by experiment teams. Inconsistencies are maked in red font. Appendix E: Corrected that there will be six archive deliveries during the cometary phases instead of four. "During the first Earth swing-by no science operations can be supported due to overlap with Mars Express and Huygens. This table represents no commitment by RSOC/RMOC that the given data volumes will be delivered. In particular, instrument operations during the cruise phases need to be confirmed." added.	
12 Nov 2003	2	0		Changes agreed at DAWG meeting and telecon: Document Signature Sheet: Replaced MODULUS by PTOLEMY, Dirk Möhlmann by Klaus Seidensticker, Berndt Feuerbacher by Hartmut Scheuerle. For Rosenbauer and Bibring added Lander Lead Scientist. End of section 5: Removed the last sentence and added three paragraphs explaining non-standard keywords and keyword values. Section 7.4, items (a)-(c), section 7.6, item (f) and section 8, 2nd paragraph after the 1st enumeration: Inserted "velocity" to make clear that the spacecraft orbit data files include the velocity. Open Issues: Removed no. 2. Appendix E: Added a table for the data volumes of the separate lander instruments. Appendix F, tab. 2 and examples in sections 16.1.1 & 16.1.2: Changed the abbreviation for the ground phase from GROU to GRND.	
19 Nov 2003	2	0		Tables in appendix D & E and tab. 3 in appendix F updated according to inputs by experiment teams.	
22 Dec 2003	2	1		Changes agreed at DAWG meeting on 09 Dec	

Date	Iss.	Rev.	pp.	Description / Authority	CR No.
				2003: RD4 updated. Section 2 and appendix F, table 2: DSM4 → RVM1, RV → RVM2 to agree with Mission Calendar (RD4). Appendix B: PDS level → CODMAC level corrected. Everywhere: Applicable level definition clearly indicated. Table in section 15.1 (appendix E) updated according to inputs by ALICE. Appendix F, table 1: Format for LABEL_REVISION_NOTE added. Appendix F, table 2: CVP1, CVP2 added. Accumulative mission phases APPR, ESCO, COM added. ENT → EXT corrected. Appendix F: New table with targets added. Appendix F: Definition of DATA_SET_ID/NAME extended to include multiple mission phases.	
06 Oct 2005	2	2		Updates of appendix F were discussed at DAWG #7 meeting and in subsequent e-mails.	
10 Jan 2006	2	3		Appendix F is moved to a separate document in order to facilitate frequent updating (see RD15). Distribution list is simplified.	

Open Issues

Date	Iss.	Rev.	pp.	Description / Authority	No.
05 Nov 2003	2	0		RSOC to define if solar system constants will be archived.	1
10 Nov 2003	2	0		Experiment teams and RSOC to specify which ancillary data will be archived.	3

Table of Contents

1. Introduction

1.1 Scope

As defined in the Rosetta Science Management Plan (AD2), a long-term data archive is created under the responsibility of the Rosetta Project Scientist who is supported by the Rosetta Science Operations Team. A requirement for a long-term data archive is a clear-cut structure and an easy file format (ASCII wherever possible) of all its elements which describe the mission, the spacecraft, the instruments, the data and their calibration. The Rosetta data archive will make use of the well-proven archive standards of the Planetary Data System (PDS).

This document defines the process of archiving. Data from all the Orbiter and Lander instruments and from the Rosetta spacecraft will be archived by a common effort from all the Orbiter and Lander instrument teams, the Lander Science Operations and Navigation Center (SONC), the Rosetta Mission Operations Center (RMOC), the Interdisciplinary Scientists and the ESA-PDS team. The ESA-PDS team includes members from the ESA Rosetta Science Operations Center (RSOC) and the PDS Small Bodies Node (SBN). The official Rosetta Science Data Archive will form part of the Planetary Science Archive (PSA) hosted at the Research and Scientific Support Department (RSSD) of ESA, with a data copy at the SBN.

The archiving process includes the design, generation, validation and transfer of the data archive. The archive will include raw and reduced data, calibration data, higher-level derived data products, documentation and software.

It is planned to revisit and update this document after the data from the Commissioning phase are archived in order to incorporate the lessons learned.

1.2 Contents

This Archive Plan covers all the issues concerning the Rosetta Science Data Archive as a whole and the instrument related issues similar for all Orbiter and Lander instruments. Orbiter and Lander experiments are handled differently in respect of the interfaces: While each of the Orbiter experiment teams interacts directly with the ESA-PDS team, the Lander experiment teams communicate mainly with the SONC which is the common Lander interface to the ESA-PDS team.

The document starts with an overview of the Rosetta mission (chapter 2) and then briefly explains the science operations (chapter 3). Chapter 4 gives an overview of the PSA.

Chapter 5 outlines the upper-level structure of a typical data set. As the Rosetta archive will be an online archive with electronic data delivery, one data set should correspond to one volume.

Each experiment team prepares its data and transforms it into a PDS data product. The individual data products are collected by the ESA-PDS team, and proper use of the PDS standards is checked afterwards. Chapter 6 provides an overview of the necessary steps involved for the Orbiter and Lander experiment teams, the SONC and the ESA-PDS team. Chapter 7 specifies the roles of each of the participants in the archiving process, and assigns responsibilities for each of the archiving functions. The schedule for the data archiving is given in chapter 8.

Due to the long duration of the mission and possible loss of expertise, the RSOC built up a knowledge database which is further described in chapter 9.

Chapter 10 gives information about the ground-based observations archive for both the original target comet 46P/Wirtanen and the new target comet 67P/Churyumov-Gerasimenko.

Appendices A-C contain reference information to the Archive Plan.

The data types used by the Orbiter and Lander instruments and the estimated data volumes to be archived are listed in tables in appendices D and E, respectively. Details of the data archive structure and contents down to file level are specified by the Experiment to Archive Interface Control Documents (EAICD). The EAICDs are written by the individual Orbiter experiment teams and the Lander SONC and describe the edited raw data, calibration data, calibrated data, derived higher-level data products and merge products as well as the software algorithms for generating the PDS labelled data products.

1.3 Applicable Documents

AD1 Announcement of Opportunity, RO-EST-AO-001, Mar 1995.

AD2 Rosetta Science Management Plan, ESA/SPC(94)37, 14 Oct 1994.

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

AD4 Memorandum of Understanding between ESA and NASA concerning the International Rosetta Mission, ESA/C(2003)8, 29 Jan 2003 & ESA/C(2002)148, 25 Nov 2002.

AD5 Planetary Data System Standards Reference, JPL D-7669, Part 2, Version 3.6, 1 Aug 2003.

AD6 Planetary Science Data Dictionary Document, JPL D-7116, Revision E, 28 Aug 2002.

1.4 Reference Documents

RD1 [Mission]-[Instrument] to Planetary Science Archive Interface Control Document Template, SOP-RSSD-TN-017, Issue 1.0, 20 Aug 2003.

RD2 Planetary Data System Data Preparation Workbook, JPL D-7669, Part 1, Version 3.1, 17 Feb 1995.

RD3 Rosetta Consolidated Report on Mission Analysis Churyumov-Gerasimenko 2004, RO-ESC-RP-5500, Issue 5, Revision 0, Aug 2003.

RD4 Rosetta Mission Calendar, RO-ESC-TN-5026, Issue 2.1, Oct 2003.

RD5 RSOC Design Specification, RO-EST-PL-2010, Issue 1, Revision 0, 20 Oct 2003.

RD6 Data Delivery Interface Document (DDID), RO-ESC-IF-5003, Issue B6, 23 Oct 2003.

RD7 Planetary Missions Science Archive Review Procedure, SOP-RSSD-PR-004, Issue 1, Revision 0, Nov 2003.

RD8 PSA User Requirements, SOP-RSSD-RS-006, Issue 01, 20 Jun 2002.

RD9 PSA Architectural Design Document, SOP-RSSD-SP-004, Issue 0, Revision 1, 26 Nov 2002.

RD10 Data Management and Computation, Volume 1, Issues and Recommendations, National Academy Press, 1982, p. 167.

RD11 Issues and Recommendations Associated with Distributed Computation and Data Management Systems for the Space Sciences, National Academy Press, 1986, p. 111.

RD12 Directive 96/9/EC of the European Parliament and of the Council of 11 March 1996 on the Legal Protection of Databases.

RD13 Minutes of the 5th Science Working Team Meeting, Jan 2000.

RD14 Planetary Data System – National Space Science Data Center Memorandum of Understanding, 13 Jan 1994.

RD15 Rosetta Archive Conventions, RO-EST-TN-3372, Issue 1, Revision –, 10 Jan 2006.

2. Overview of the Rosetta Mission

The main objective of the Rosetta mission, which was approved in November 1993 as the Planetary Cornerstone mission of ESA's Horizon 2000 long-term program, is a rendezvous with a comet. A subsidiary aim is to have at least one close encounter with an asteroid en route to the comet. In-situ investigation of a cometary nucleus is regarded as of the utmost scientific interest. An Orbiter will carry a Lander to the nucleus and deploy it on the surface. The mission is a collaborative one, with NASA providing Orbiter payload elements and ground-support by the Deep Space Network (DSN).

The original target comet of Rosetta was 46P/Wirtanen, but after the failure of the Ariane 5 ECA in December 2002, the Ariane 5 P1+ was not ready to launch Rosetta in January 2003. In February 2003 the Science Working Team (SWT) approved to prepare for a mission to be launched in February-March 2004. This alternative mission will rendezvous with comet 67P/Churyumov-Gerasimenko in 2014. The baseline mission described in RD3 does not include any asteroid fly-bys, but several single and double asteroid fly-by alternatives are studied. At least one asteroid fly-by is guaranteed. The final decision will be taken after the implementation of the launcher injection correction manoeuvre when the actual propellant budget is known.

As far as possible, the mission will satisfy the objectives of the Comet Nucleus Sample Return Mission (as the mission was called previously) and will concentrate on the in-situ investigation of cometary matter and the structure of the nucleus, with the added potential of studying the evolution of the cometary processes as a function of heliocentric distance.

A fundamental question that has to be addressed by the mission is the extent to which the materials accessible to analyses can be considered as representative of the bulk material constituting the comet and of the early nebular condensates that constituted the cometesimals 4.57×10^{9} years ago. This representativity issue has to be addressed by first determining the global characteristics of the nucleus (mass, density, state of rotation), which can provide clues concerning vertical gradients and hence the relationship between the outer layers and underlying material.

The dust and gas activity observed around comets, as well as their rapid response to insolation, guarantees the presence of volatiles at or very close to the surface in active areas. Analysing material from these areas will therefore provide information on both the volatile and the refractory constituents of a cometary nucleus. The selection of a proper site for surface science investigations will be based on imaging and spectroscopic measurements of the surface as well as analyses of the gas and dust emission. The surface science site can be monitored during the surface investigations as well as during a large fraction of the activity cycle, which should help us to understand the heterogeneity in the composition of active regions.

The dust emission processes are induced by very low density gas outflows and should preserve the fragile texture of the cometary grains. These grains can be collected at low velocities (a few tens of meters per second) by the spacecraft after short travel times (of the order of minutes), which will minimise alterations induced by the interaction with the solar radiation. Similarly, gas analysed in jets or very close to the surface should yield information on the volatile content of the cometary material in each source region.

Based on these considerations, the prime scientific objective of the mission is to study the origin of comets, the relationship between cometary and interstellar material and its implications with regard to the origin of the solar system. The measurements to be made in support of this objective are:

(a) Global characterisation of the nucleus, determination of dynamic properties, surface morphology and composition.

(b) Determination of the chemical, mineralogical and isotopic compositions of volatiles and refractories in a cometary nucleus.

(c) Determination of the physical properties and the interrelation of volatiles and refractories in a cometary nucleus.

(d) Study of the development of cometary activity and the processes in the surface layer of the nucleus and the inner coma (dust-gas interaction).

(e) Global characterisation of asteroid(s), including determination of dynamic properties, surface morphology and composition.

Based on the Announcement of Opportunity for Rosetta Orbiter Investigations and Interdisciplinary Scientists issued by the Agency in March 1995 (AD1), the Science Programme Committee (SPC) in February 1996 endorsed the Orbiter payload for a 1-year Science Verification Phase and originally two Surface Science Packages (Champollion by NASA and CNES, and RoLand by a European consortium led by the DLR and MPAE) and five Interdisciplinary Scientists.

During the Science Verification Phase the payload was consolidated, and for programmatic and budgeting reasons NASA announced their withdrawal from the Champollion Lander. Subsequently CNES and the RoLand team merged their activities in the Rosetta Lander. The payload, as reconfirmed by the SPC in June 1997, is the following:

Rosetta Orbiter scientific investigations:

- ❑ Remote sensing:
  - OSIRIS (VIS imaging)
  - VIRTIS (VIS and IR mapping spectroscopy)
  - ALICE (UV mapping spectroscopy)
  - MIRO (microwave spectroscopy)
- ❑ Composition analysis:
  - ROSINA (neutral gas and ion mass spectrometry)
  - COSIMA (dust mass spectrometry)
- ❑ Dust physical properties:
  - MIDAS (dust grain morphology)
  - GIADA (dust velocity, impact momentum, mass flow)
- ❑ Nucleus large-scale structure:
  - CONSERT (radiowave sounding, nucleus tomography)
  - RSI (radio science)
- ❑ Comet plasma environment and solar wind interaction:
  - RPC (Rosetta plasma consortium)
    - > ICA (ion composition analyser)
    - > IES (ion and electron sensor)
    - > LAP (Langmuir probe)
    - > MAG (fluxgate magnetometer)
    - > MIP (mutual impedance probe)

Rosetta Lander scientific investigations:

- ❑ Imaging:
  - ROLIS (descent camera, close-up imager)
  - CIVA (panoramic micro-cameras, microscope)
- ❑ Composition analysis:
  - SD2 (sampling, drilling, distribution)
  - COSAC (gas chromatograph and spectrometer for molecular composition)
  - PTOLEMY (gas chromatograph and spectrometer for isotopic composition)
  - APXS (X-ray fluorescence, alpha-particle back-scattering)
- ❑ Surface and subsurface physical properties:

- MUPUS (density, mechanical and thermal properties)
- SESAME (acoustic and electrical properties, dust impacts)
  - > CASSE (acoustic sounding)
  - > PP (permittivity probe)
  - > DIM (dust impact monitor)

❑ Nucleus large-scale structure:
- CONSERT (radiowave sounding, nucleus tomography)

❑ Comet plasma environment and solar wind interaction:
- ROMAP (local magnetic field, plasma monitor)
  - > MAG (fluxgate magnetometer)
  - > SPM (energy analyser for ions and electrons)

The Lander payload will focus on in-situ measurements of the composition of the nucleus material. These measurements are aimed at determining the elemental, molecular, mineralogical and isotopic composition of the comet's surface and subsurface material. Highest priority is given to the elemental and molecular determination, as it is believed that some mineralogical and isotopic measurements can be carried out adequately from the Orbiter.

Rosetta will be launched in February-March 2004 by an Ariane 5 P1+ from Kourou. One Mars and three Earth gravity assists will be required to gain enough orbital energy to reach comet 67P/Churyumov-Gerasimenko in 2014. The spacecraft will stay with the comet for about 1.5 years on close orbits (2-25 nuclear radii) to monitor the development of the nuclear activity from its onset close to aphelion through perihelion.

To divide the 12-year mission in small temporal units with similar characteristics, the concept of mission phases was introduced. The selection is arbitrary, but reflects for most phases the usage of the instruments and going together with this the aim for the scientific investigations.

We distinguish the following mission phases (RD3, RD4):

- Launch (LEOP)
- Commissioning part 1 (CVP1)
- Cruise 1 (CR1)
- Commissioning part 2 (CVP2)
- Earth swing-by 1 (EAR1)
- Cruise 2 (CR2)
- Mars swing-by (MARS)
- Cruise 3 (CR3)
- Earth swing-by 2 (EAR2)
- Cruise 4 (CR4)
- Earth swing-by 3 (EAR3)
- Cruise 5 (CR5)
- Rendezvous manoeuvre 1 (RVM1)
- Cruise 6 (CR6)
- Rendezvous manoeuvre 2 (RVM2)
- Near comet drift (NCD)
- Far approach trajectory (FAT)
- Close approach trajectory (CAT)
- Transition to global mapping (TGM)
- Global mapping phase (GMP)
- Close observation phase (COP)
- Lander delivery and relay (SSP)
- Comet activity: low activity (LOW)
- Comet activity: moderate increase (MINC)
- Comet activity: sharp increase (SINC)
- Comet activity: high activity (HIGH)

- Near perihelion (PERI)
- Extended mission (EXT)

The mission phases FAT to COP together are called Approach (APPR), and LOW to PERI are named Escort (ESCO).

Each asteroid fly-by that can be realised comprises the following two mission phases:
- Asteroid approach (ASTA)
- Asteroid post fly-by (ASTP)

ASTA and ASTP together are termed Asteroid (AST). Note that asteroid fly-bys increase the number of Cruise phases.

3. Science Operations

The primary responsibility for developing the payload operations strategy for the Rosetta Scientific Mission is with the Rosetta Science Working Team (SWT) chaired by the Project Scientist.

The ground segment of the Rosetta mission consists of two major bodies: the Rosetta Mission Operations Center (RMOC) and the Rosetta Science Operations Center (RSOC).

The RMOC is located at ESOC in Darmstadt, Germany, and is responsible for the spacecraft operations and all real-time contacts with the spacecraft and payload, the overall mission planning, flight dynamics as well as spacecraft and payload data distribution.

The RSOC will be co-located with the RMOC at ESOC during the following phases:
- commissioning phase (CVP1/2)
- planetary swing-by phases (EAR1/2/3, MARS)
- asteroid fly-by phases (ASTA, ASTP) – at least one asteroid fly-by will be scheduled depending on the propellant budget
- wake-up operations
- comet approach phase (APPR)
- lander delivery phase (SSP)
- beginning of the comet escort phase (ESCO)

Otherwise the RSOC is located at ESTEC in Noordwijk, the Netherlands.

The Rosetta Science Management Plan (AD2) defines the tasks of the RSOC. The RSOC is responsible for:

(a) the definition of scientific operations for all mission phases with expert PI team support.

(b) mission planning and implementation of experiment operation schedules.

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

(d) the co-ordination and pre-checking of command sequences generated by the PI teams for the operations of their payload before submission to the RMOC.

(e) the analysis (with PI team support) of all mission critical science data necessary for spacecraft navigation and environmental hazard assessment. This includes processing and evaluation of the data from the navigation camera system.

(f) the maintenance of a quick-look science data facility.

(g) together with the PI teams, the creation of a summary of the main scientific results, at regular intervals or for mission highlights.

(h) the preparation of guidelines for science data archiving and - supported by the PI teams - to create the Rosetta Data Archive.

(i) make pre-processed data and the scientific data archive available to the scientific community in accordance with approval procedures and schedules as defined in the Experimenter Agreements.

The Lander has its own ground segment called RLGS (Rosetta Lander Ground Segment). It is composed of the LCC (Lander Control Center) located in Cologne, and of the SONC (Science Operations and Navigation Center) located in Toulouse. The SONC is responsible for the operations of the Lander experiments. The RSOC will check the consistency of Lander and Orbiter scientific operations by the means of the LOP (Lander Operations Plan). The SONC has similar functions as the RSOC, at Lander level.

More information about the Rosetta science operations can be found in the RSOC Design Specification (RD5).

4. The Planetary Science Archive

The Rosetta Science 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 of ESA's planetary missions. It is accessible via http://psa.rssd.esa.int (from January 2004 onwards). It builds on the JAVA architecture that is re-used from the Infrared Space Observatory (ISO), the Newton X-Ray Space Observatory (XMM) and Integral. The PSA supports the online ingestion of full data set releases as well as incremental updates of already existing data set releases.

The data available on the PSA are available to everybody interested in the data. As the PSA supports the concept of users and groups, proprietary data will be inaccessible to unauthorised 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.

More detailed information on the PSA can be found in the PSA User Requirements (RD8) and the PSA Architectural Design Document (RD9). It is consistent with the principles delineated in the reports of the U.S. National Academy of Sciences, RD10 and RD11.

The underlying standard of the PSA is the Planetary Data System (PDS) standard from NASA, which is defined by the PDS Standards Reference (AD5), the Planetary Science Data Dictionary Document (AD6) and the PDS Data Preparation Workbook (RD2). More information is available on the web site http://pds.jpl.nasa.gov/. The PSA aims to be fully PDS compatible, in exceptional cases slight changes to the existing standard might be advised.

The Rosetta data archive will be implemented together with the Small Bodies Node of the PDS at the University of Maryland (UoM). A data copy of the PSA at ESA/RSSD will be maintained at the UoM.

5. The Archive Structure

The Rosetta archive will contain data from ground-based observations, important laboratory measurements, spacecraft data and instrument data, as well as derived or merged instrument data and e.g. models of the target comet and asteroids.

The Rosetta archive will be an online archive, where the data are delivered electronically. Thus there is no need to bundle several *data sets* into one *volume*, and **one data set should correspond to one volume**. A data set will include the data products as well as the secondary data, software and documentation that completely document and support the use of these data products. In general, the data products from the different instruments are contained in separate data sets, but merged data sets are possible. Data sets may include data products from one or more mission phases. Data products of different data processing levels must be contained in separate data sets. There is no restriction on the number of data sets that can be delivered.

The top-level structure of the **ROOT** directory of a typical Rosetta data archive volume (= data set) corresponds to chapter 19 of the PDS Standards Reference (AD5) and is summarised below:

- **AAREADME.TXT** file (required): This file describes the volume (= data set) as a whole. It gives an overview of the contents and organisation of the data set, general instructions for its use and contact information.
- **VOLDESC.CAT** file (required): This file contains the VOLUME object, which gives a high-level description of the contents of the volume (= data set).
- **ERRATA.TXT** (optional): This file describes errors and/or anomalies found in this and previous volumes (= data sets). As erroneous data sets should be corrected and delivered again, there is no need for this file.
- **CATALOG** directory (required): This directory contains the catalog object files for the entire volume (= data set).
  - > **CATINFO.TXT** (required): Description of the contents of the CATALOG directory.
  - > **MISSION.CAT** (required): PDS mission catalog information about the Rosetta mission will be provided by ESA.
  - > **INSTHOST.CAT** (required): PDS instrument host catalog information about the Rosetta spacecraft and the mounting relationship of the instruments within the spacecraft will be provided by ESA.
  - > **INST.CAT** (required): PDS instrument catalog information about the instrument (likely to be the same in all deliveries, unless updates are needed). There will be one file for each instrument providing data to this data set.
  - > **DATASET.CAT** (required): PDS data set catalog information about the data set currently being submitted.
  - > **REF.CAT** (required): PDS reference catalog information about the every journal article, book or other published reference mentioned in the above catalog objects or their components.
  - > **SOFTWARE.CAT** (required): PDS software catalog information about the software submitted in the data set.
  - > **TARGET.CAT** (optional): PDS target catalog information about the observation target, i.e. comet, asteroid, Earth or Mars, will be provided by ESA.
  - > **PERSON.CAT** (optional): PDS personnel catalog information about the instrument team responsible for generating the data products. There will be one file for each instrument team providing data to this data set.
- **DATA** directory (required): This directory contains the actual data such as images or tables. PDS labelled data files or data files with detached PDS label files are arranged in a logical subdirectory structure.
  - > Edited raw data (PSA level 1b).
  - > Calibrated data.
  - > Derived higher-level data products.
  - > Merge products derived in collaboration of several experiment teams using data from more than one instrument. Products from the Interdisciplinary Scientists will also be in this directory unless data are solely based on one instrument.

- **INDEX** directory (required): This directory contains the index files summarising all data products in the volume (= data set) by mode, key instrument parameters or mission phase, and organised to facilitate finding the data of interest for a particular scientific question. Information about the observation geometry of the data products is also included here, i.e. spacecraft position and attitude, illumination conditions etc. Information that is not accurately known at the time of delivery and thus will probably be updated later should be stored in the index files rather than in the data product labels.
  - > **INDXINFO.TXT** (required): Description of the contents of the INDEX directory.
  - > **INDEX.LBL** (required): Detached label for the index table INDEX.TAB. The INDEX_TABLE specific object should be used to identify and describe the columns of the index table.
  - > **INDEX.TAB** (required): Index of the data set in tabular format.
- **CALIB** directory (optional): This directory contains the calibration files used in the processing of the raw data or needed to use the data products in the volume (= data set). In addition, the description file CALINFO.TXT is required.
- **DOCUMENT** directory (optional): This directory provides documentation and supplementary and ancillary information to assist in understanding and using the data products in the volume (= data set). The documentation may describe the mission, spacecraft, instruments, data sets and calibration. The EAICD should be included. All documents must be present in ASCII format to ensure long-term readability. Document versions in other formats (Word, PDF, Framemaker, TeX etc.) are not required but encouraged. In addition, the description file DOCINFO.TXT is required.
- **EXTRAS** directory (optional): This directory is the designated area for housing useful but non-essential information beyond the scope of the PDS archive requirements. Examples are scientific papers, HTML or XML pages, tables and figures that describe the data products. Any format may be used. In addition, the description file EXTRINFO.TXT is required.
- **GAZETTER** directory (optional): This directory contains detailed information about the named features on the target bodies associated with the volume (= data set). The information given here needs *not* to be approved by the International Astronomical Union, but is provided as a convenience for the researchers in the future.
  - > **GAZINFO.TXT** (required): Description of the contents of the GAZETTER directory.
  - > **GAZETTER.TXT** (required): Text description of the structure and contents of the gazetter table GAZETTER.TAB.
  - > **GAZETTER.LBL** (required): Detached PDS label containing a formal description of the structure of the gazetter table GAZETTER.TAB.
  - > **GAZETTER.TAB** (required): Gazetter table.
- **GEOMETRY** directory (optional): This directory contains the files needed to describe the observation geometry for the data, i.e. trajectory and attitude of the spacecraft, shape model of target comet and asteroids. In addition, the description file GEOMINFO.TXT is required.
- **LABEL** directory (optional): This directory contains PDS labels and include files that are not packaged with the data products or in the data directory. Include files are files referenced by a pointer in a PDS label. Only files of type FMT, LBL and TXT may be located in the LABEL directory. In addition, the description file LABINFO.TXT is required.
- **SOFTWARE** directory (optional): This directory contains software for data calibration, visualisation and analysis. Algorithms concerning satellite information are supplied by

RMOC. Only public domain software may be included in PDS archives. Source code is preferable over executable code. The subdirectory structure should indicate the hardware platform and operating system/environment. In addition, the description file SOFTINFO.TXT is required.

- **BROWSE** directory (optional): This directory contains browse representations (quicklook, thumbnail) of the data products.

Each directory, except the DATA directory, must include a file named xxxxINFO.TXT, which briefly describes the contents of that directory.

In case that an important instrument characteristic cannot be described with an existing PDS keyword, new keywords will be defined. Keywords with a scope of use not limited to just a few instruments or the Rosetta mission are suited for new global keywords. These need to be approved by the PDS-SBN and the PDS Central node. The ESA-PDS team will collect the proposals for new global keywords from the experiment teams and submit the requests to the PDS nodes.

Instrument specific keywords with a limited scope of use will be defined within the namespace concept of the PDS standards. These keywords are preceded by the namespace of Rosetta, i.e. ROSETTA:<keyword_name> = … The ESA-PDS team is the custodian of the locally-defined keywords, endorsement by the PDS nodes is not needed. The experiment teams specify the mission specific keywords and their definitions in the EAICD.

Non-standard keyword values, e.g. PRODUCT_ID and INSTRUMENT_MODE_ID values, need to be added to the Planetary Science Data Dictionary (AD6). The experiment teams list their non-standard keyword values in the EAICD and the ESA-PDS team forwards them to the PDS nodes.

6. The Archiving Process

6.1 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, organisation and naming of the archiving process and the archive itself is necessary. This will be ensured by using the PDS standard.

Single archiving steps are listed in this chapter as they appear during the process of data archiving. Most of the steps are repeated for each mission phase, ending in the generation of a number of data sets. Archiving steps of different mission phases usually overlap. E.g. one delivery of data sets could be under Peer Review, while the data of the next mission phase are collected by the ESA-PDS team.

6.2 The Archiving Steps

6.2.1 Pre-launch Preparations

(a) Initial agreement towards a common archiving standard was made in the Rosetta Science Management Plan (AD2).

(b) Preparation of the Rosetta Archive Generation, Validation and Transfer Plan (this document) was decided at a Science Working Team (SWT) meeting (RD13). The Archive GVT Plan is one common document for the whole Rosetta archive that describes the archive objectives, contents, organisation, 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.

(c) Preparation of the Experiment to Planetary Science Archive Interface Control Documents (EAICD). The EAICDs are separate documents from the individual Orbiter experiment teams and the Lander SONC that require detailed information about the data generated by the instruments. 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 (PSA level 1b), calibration data, calibrated data, derived higher-level data products and merge products as well as the software algorithms for generating the PDS labelled data products. An EAICD template is provided by ESA (RD1). Before the start of the commissioning phase the EAICDs should be progressed so far that they cover at least archiving of the edited raw data and calibration data. The EAICDs should be finalised before arrival at the comet. For preparation of the EAICDs the data engineers from the Orbiter experiment teams and the Lander SONC work closely together with the ESA-PDS team within the Data Archive Working Group (DAWG), in order to ensure the correct usage of the PDS standard and PDS tools and to share knowledge and experience.

6.2.2 Data Flow and Data Processing

(a) Satellite and instrument data are received by ESA ground stations or the DSN network, processed to PSA level 1a data by ESOC and provided on the DDS (RD6).

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

(c) The Orbiter experiment teams produce PDS formatted data sets and send them to the ESA-PDS team at the end of the proprietary period. This process should be highly automated both for the production of the PDS labelled data products and for the ingestion into the PSA, as generating PDS labelled data manually is tedious and prone to errors. ESA is providing the PSA Validation and Verification Tool (PVV) that supports the experiment teams in validating and verifying their keywords, labels and data sets.

(d) For the Lander, the SONC produces the PDS formatted data sets according to the specifications given by the Lander teams and provides these data sets to the ESA-PDS team as soon as the authorisation is given by the Lander PIs, but not later than the end of the proprietary period.

(e) The ESA-PDS team ingests the data sets from the Orbiter and Lander instruments into the PSA and makes them online accessible to the scientific community immediately. The PSA will clearly indicate for these data sets that they are "not peer reviewed". The ESA-PDS team will be hosted at ESTEC (ESA Rosetta Project) and at the University of Maryland (PDS Small Bodies Node).

(f) The ESA-PDS team checks for correctness of the data sets (data products, documentation, software). Not only the consistency with the PDS file naming scheme, file formats, data types etc. is examined, but also the completeness and understandability of the documentation, the correctness of the software algorithms etc. An effort is made to find problems which could cause the Peer Review to reject the data set.

(g) The Orbiter experiment teams and the Lander SONC will recalibrate data from earlier mission phases and correct errors, if necessary. In this case revised data sets are generated and delivered, replacing the initial ones. The new data sets have to undergo all the validation processes.

(h) The interdisciplinary scientists propose and produce new data products. The Rosetta DAWG decides whether the new data should be part of an already planned data set or if the products should form a data set on their own, e.g. as the ground-based observation archive. Either an amendment to an existing EAICD or a new EAICD dedicated to the new data product has to be written.

6.2.3 Archive Validation and Distribution

A detailed description of the review procedure can be found in the Planetary Missions Science Archive Review Procedure (RD7). Below a summary is given.

The review is a three-step process consisting of (i) the Peer Review of the Archive GVT Plan (this document) and the individual EAICDs (EAICD Review), (ii) the review of the first data delivery (Initial Peer Review) and (iii) the review of all data sets together after the final delivery (Final Peer Review).

(a) The ESA-PDS team arranges the Peer Reviews. Due to the large number of instruments on the Rosetta Orbiter and Lander it is proposed to appoint separate review panels for the individual experiments. The external review team members and the review chairpersons will be agreed on in the SWT.

(b) The Peer Review team verifies the data sets / documents. The tasks of the team can be best compared to the tasks of a referee for a paper to be published in a scientific journal.

(c) Arising problems (called "liens" in PDS jargon) will be resolved by the concerned Orbiter and Lander experiment teams, the SONC and the ESA-PDS team. Data sets where liens occurred and the Peer Review team proposed clear solutions to these liens, do not have to undergo an additional Peer Review. In case of more serious liens, revision and reviewing of the data sets will be iterated.

(d) Depending on the result of the Peer Review, the PSA will indicate the status of the reviewed data set as "successfully peer reviewed", "peer review is pending" or "failed peer review". At the conclusion of the review / revision process all data sets should be "successfully peer reviewed".

(e) When the Rosetta data archive is finally complete, the ESA-PDS team will send the archive to the National Space Science Data Center (NSSDC) and other suitable organisations for long-term archiving. These will treat the Rosetta data archive as any other PDS ingested archive.

7. Roles and Responsibilities

This section describes the roles and responsibilities of the personnel and organisations involved in generating, validating, transferring and distributing the Rosetta archive. Each Orbiter and Lander experiment team and the SONC are responsible for archive generation and validation. The RMOC is in charge of distributing the satellite and instrument data via the DDS and providing orbit, attitude and other ancillary data. The ESA-PDS team has the responsibility to ensure that the archive meets PDS standards (including Peer Review of the data sets), to advise the Orbiter and Lander experiment teams on archive related issues, to maintain active archives of the instrument data products for access by the science community and to interface with the NSSDC and other suitable organisations for "deep archiving" of all instrument data.

7.1 Responsibilities of each Orbiter Experiment Team

Each orbiter experiment team is responsible for

(a) formatting all data files to PDS standards, 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 calibration data files.

(b) providing electronic copies of all documents needed to describe the instrument and its operation. Each experiment team is responsible for ensuring that there are no copyright restrictions on reproducing the documents in the scientific archive.

(c) ensuring that the electronic documents are in a format that is acceptable to PDS. This means that critical documents must be provided in a plain ASCII format in addition to any format that includes formatting information. Other documents may be delivered in any established format, e.g. PDF or Word. The ESA-PDS team will convert these documents into bitmaps for long-term availability.

(d) providing higher-level data products to the archive. Each experiment team is responsible for collaborating with the Interdisciplinary Scientists (IDS) to ensure that higher-level data products based on data from the appropriate instrument are properly archived.

(e) providing suitable parameter tables which contain important instrumental parameters that are not included as keywords in the labels.

(f) 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.

(g) solving problems which have been identified in their data sets.

(h) guaranteeing accessibility of the data from its instrument to all members of the experiment team.

(i) whenever the SWT recommends a uniform cometary coordinate system, the experimenters should make any effort to use this system for their data products.

7.2 Responsibilities of the each Lander Experiment Team

Each Lander instrument PI has the same responsibilities as the orbiter PIs, which are described in 7.1, except for the points (a) and (d) where the SONC will ensure the data provision.

7.3 Responsibilities of the Rosetta Lander Ground Segment (RLGS)

The SONC, Toulouse

(a) is the interface of the ESA-PDS team to the Lander experiment teams.

(b) is responsible for delivering the PDS formatted data sets to the ESA-PDS team after formal authorisation by each Lander PI, but not later than the end of the proprietary period.

(c) should support the Lander experiment team in setting up their PDS format.

(d) should support the ESA-PDS team in peer reviewing the Lander data sets.

(e) should deliver notebook-like ASCII data of all science planning information valuable for a long-term science archive.

7.4 Responsibilities of the RMOC

The RMOC is responsible for

(a) providing to each of the experiment teams up-to-date information on the orbital position, velocity and attitude of the spacecraft at the time of all observations by any instrument.

(b) providing to the ESA-PDS team complete details of the orbit, velocity 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.

(c) providing retroactive updates to the orbital, velocity and attitude data products whenever the precision is significantly improved.

(d) providing any other spacecraft ancillary data, e.g. health and status information as ASCII files, and sufficient documentation to understand these data. If the data are provided in binary format, the necessary software routines should be delivered to unpack these binary packets and to transform them into ASCII format.

(e) providing any other non-spacecraft ancillary data, e.g. event files, the command database, the list of executed commands, all in ASCII format.

(f) providing orbit files for the target comet and fly-by asteroid(s).

(g) providing to the ESA-PDS team the complete SFDU labelled telemetry stream.

(h) long term storage of the PSA level 1a data.

7.5 Responsibilities of Interdisciplinary Scientists

Interdisciplinary scientists who develop higher-level data products are responsible for providing those products to the ESA-PDS team with all required ancillary information, formatted and documented according to PDS standards. These higher-level data products may include products based solely on data from one instrument or on a combined data source from different instruments.

7.6 Responsibilities of the ESA-PDS Archiving Team

The ESA-PDS team is responsible for

(a) advising the Orbiter and Lander experiment teams regarding appropriate formats for the data products from their instrument.

(b) ensuring the usability of the archive by other scientists. This includes advising on understandability of documentation, suitability of formats, etc.

(c) validating the data sets delivered by the Orbiter experiment teams and SONC to be conform to the PDS format standard.

(d) conducting all Peer Reviews of the data, with support from the appropriate Orbiter and Lander experiment team and SONC as needed.

(e) coordinating any data sets containing data from several instruments, other than any coordination voluntarily undertaken by some experiment teams.

(f) formatting the spacecraft orbit, velocity and attitude data, all agreed ancillary data and the orbit files for the target comet and fly-by asteroid(s) from the RMOC to PDS standards.

(g) distributing the data to the worldwide scientific research community.

(h) depositing the final archive with "deep archiving" organisations including NASA's NSSDC and the WDC.

(i) ensuring preservation of a long-term copy of the SFDU labelled telemetry stream, although this product will not be a part of the scientific archive. This will be obtained directly from ESOC and need not to be provided by any experiment team.

7.7 Responsibilities of Other Organizations

Organisations such as NASA's National Space Science Data Center (NSSDC) and the World Data Center (WDC) are responsible for ensuring long-term preservation of the archive. Organisations TBD are responsible for providing suitable versions of the archive for educational and outreach users.

8. Delivery Schedule

The Planetary Science Archive (PSA) will by all means respect the data rights defined in AD2 and AD3. The original Rosetta proprietary period of 12 months (AD2) was later shortened to 6 months in agreement with all parties, because the participating U.S. teams usually have the obligation to distribute their data to the public immediately. This change is documented in the Memorandum of Understanding between ESA and NASA concerning the International Rosetta Mission (AD4).

The RMOC will make the satellite and instrument data available on the DDS soon after reception from the spacecraft and will keep them posted there for a period of at least 3 months. For detailed information see RD6. Within this period the Orbiter and Lander experiment teams have to download and verify their data and check the instrument and ancillary data for completeness. The RMOC will store and preserve these data for at least 10 years.

For all the mission phases before arrival at the comet 67P/Churyumov-Gerasimenko, the Orbiter experiment teams and SONC are granted a proprietary, validation and archive preparation period which starts at the end of the respective mission phase and lasts 6 months. Thus the ESA-PDS team expects delivery of the individual PDS formatted instrument data archives at the latest 6 months after the end of the single mission phases. For detailed schedule information of the mission phases please consult RD3 & RD4, which are the reference documents for defining the official start and end dates throughout the lifetime of the mission. Most of the archiving activities are based on the definition of mission phases.

If an experiment collects data during a cruise phase, then the proprietary, validation and archive preparation period of 6 months starts at the end of the cruise phase, which is the beginning of the next mission phase.

After arriving at the comet C-G, a continuous data flow is anticipated (mission phases Approach, Lander delivery and relay, Escort, Extended mission), and the Orbiter experiment teams are required to deliver PDS formatted data sets in 3-month intervals. The last proprietary, validation and archive preparation period of 6 months starts at the end of the Rosetta mission.

If the Lander survives more than 3 months, the SONC is also expected to deliver PDS formatted data sets in 3-month intervals until the end of the Lander lifetime. Otherwise the SONC will deliver the data from the comet 6 months after the end of the Lander mission.

The delivery schedule comprises the following steps:

(a) A full pre-comet mission phase or 3 months at the comet of data collection – and of course data validation, calibration, analysis etc. (data collection period)

(b) Followed by another 6 months ending in the preparation of the individual PDS formatted data archives by the Orbiter experiment teams and SONC. (proprietary, validation and archive preparation period)

(c) Delivery to the ESA-PDS team. The detailed delivery schedule for the individual Orbiter experiment teams and SONC to the ESA-PDS team will be negotiated timely in order to balance workload for the ESA-PDS team.

(d) The individual instrument data sets are ingested into the PSA by the ESA-PDS team and made online accessible to the scientific community immediately, with an indication for these data sets that they are "not peer reviewed". (archive merge period)

(e) Within the following 6 months the ESA-PDS team ensures the correctness of the data archive. (archive review phase)

12 months after the end of the Rosetta mission, the ESA-PDS team expects the last routine delivery from the Orbiter experiment teams and SONC. All data which have been recalibrated or reprocessed since the launch are expected to be delivered. The Orbiter and Lander experiment teams, SONC and Interdisciplinary Scientists are welcome to deliver further data sets and

information to the ESA-PDS team in the then following 10 years, thereby to ensure the accessibility of the latest calibration and processing efforts.

Spacecraft ancilliary data, especially orbit, velocity and attitude data, will be improved and redistributed as long as needed. At least one redistribution is foreseen 12 months after the end of the mission.

The following schedule is foreseen for the Peer Reviews:

(a) EAICD Review: The ESA-PDS team calls in and arranges the Peer Review of the individual EAICDs from the Orbiter experiment teams and SONC 3 months after the end of the Commissioning phase. This is 3 months before the delivery of the first PDS formatted instrument data archives, which is expected 6 months after the end of the Commissioning phase.

(b) Initial Peer Review: The first data sets containing data acquired at the comet C-G will be peer reviewed within 6 months after delivery.

(c) Final Peer Review: All data sets together will be reviewed within 6 months after the final delivery expected 12 months after the end of the Rosetta mission.

(d) The data sets containing data acquired during the mission phases before arrival at the comet C-G will be reviewed if justified by the scientific value of the data. Details are TBD.

(e) If it should be required or demanded by the PIs, additional Peer Reviews can be called in after other data deliveries to the ESA-PDS team.

(f) After a successful Peer Review or after problems (liens) are solved, the data sets are marked as "successfully peer reviewed" in the PSA.

ESA/RSSD will publish all available data sets within the Planetary Science Archive (PSA) which provides for long-term access by the scientific community on the public internet. The data sets on the archive will be improved and updated – as well as the technical equipment – for at least 10 years after the mission ends. A copy of the Rosetta data sets will be maintained at the Small Bodies Node of the PDS at the University of Maryland (UoM).

When problems are encountered by any of the involved parties in the process of preparation of an instrument part or a merged part of the data archive, the ESA-PDS team will publish the archive as it is within the PSA, after consultation with the Project Scientist. If a PI is convinced that the data set should not be published, he should bring his concern to the Project Scientist, deciding on this issue. Still existing uncertainties about calibrated or raw data will be indicated to users of the PSA.

The ESA-PDS team will submit the final archive to "deep archiving" organisations including NASA's National Space Science Data Center (NSSDC) and the World Data Center (WDC) for long-term data preservation.

9. The Rosetta Knowledge Management System

The Rosetta Knowledge Management System (ROKSY) is complementary to the Rosetta Science Data Archive, as it preserves additional knowledge in documents and databases. ROKSY has been installed and all data from the Rosetta Document Management System (DMS) have been transferred. Payload data packages were uploaded. ROKSY is for pure internal usage by the RSOC, the RMOC and the experiment teams only. A password protected partition (named project in ROKSY) has been created for each experiment team. ROKSY is available on the public internet at http://roksy.esa.int/ (password protected).

The database contains the following items:

- documentation
- important communication items

- indexed videos of interviews with experiment teams
- laboratory test data and calibration data
- EQM test data and calibration data
- EGSE software
- science packets decommuting software
- analysis software

10. Ground-Based Observations Archive

In order to support the Rosetta mission, Earth- and satellite-based observations of the target comet and laboratory measurements are performed. The comet orbit, size, shape, composition and outgassing are essential for the design of the mission and spacecraft. Accurate information is used to plan the comet approach and Lander delivery and to develop the scientific observation scenarios.

10.1 46P/Wirtanen

The extensive ground-based observation data of the original target comet Wirtanen, especially those from the 1996/1997 apparition, are archived in the Rosetta Supplementary Archive. It is ingested into the PSA and PDS archives. The observations were collected in the native format of the observers and transformed to conform to PDS standards. However, a Peer Review of the data is not envisaged.

10.2 67P/Churyumov-Gerasimenko

The ground-observation campaigns an modelling activities are now focused on the new target comet Churyumov-Gerasimenko. The creation of a data set is foreseen as soon as the scientific data become available for the ESA-PDS team.

10.3 Laboratory Measurements

Laboratory data were obtained by the laboratory of Naples (under an ESA contract) in order to support various Rosetta instrument activities. Reference measurements were performed for several instruments on different mineral and gas samples. These data are incorporated into the PSA.

11. Appendix A – Acronyms and Abbreviations

ALICE	Orbiter experiment: Ultraviolet Imaging Spectrometer
APPR	Group of mission phases: Approach
APXS	Lander experiment: Alpha Proton X-Ray Spectrometer
AST	Group of mission phases: Asteroid
ASTA	Mission phase: Asteroid approach
ASTP	Mission phase: Asteroid post fly-by
AUX	Auxiliary Data
C&DH	Command and Data Handling
CASSE	SESAME instrument: Cometary Acoustic Sounding Surface Experiment
CAT	Mission phase: Close approach trajectory
C-G	67P/Churyumov-Gerasimenko
CIVA	Lander experiment: Comet Nucleus Infrared and Visible Analyser
CNES	Centre National d'Etudes Spatiales
CODMAC	Committee on Data Management and Computation
CONSERT	Orbiter experiment: Comet Nucleus Sounding Experiment by Radiowave Transmission
COP	Mission phase: Close observation phase
COSAC	Lander experiment: Cometary Sampling and Composition Experiment
COSIMA	Orbiter experiment: Cometary Secondary Ion Mass Analyser
CR1…6	Mission phase: Cruise 1…6
CVP1/2	Mission phase: Commissioning and verification phase part 1/2
DAWG	Data Archive Working Group
DCR	Document Change Request
DDID	Data Delivery Interface Document
DDS	Data Distribution System
DIM	SESAME instrument: Dust Impact Monitor
DLR	Deutsches Zentrum für Luft- und Raumfahrt
DMS	Document Management System
DSM4	Mission phase: Deep space manoeuvre 4
DSN	Deep Space Network
EAICD	Experiment to Planetary Science Archive Interface Control Document
EAR1/2/3	Mission phase: Earth swing-by 1/2/3
ESA	European Space Agency
ESCO	Group of mission phases: Escort
ESOC	European Space Operations Center in Darmstadt, Germany
ESTEC	European Space and Technology Center in Noordwijk, The Netherlands
EXT	Mission phase: Extended mission
FAT	Mission phase: Far approach trajectory
FITS	Flexible Image Transport System
GIADA	Orbiter experiment: Grain Impact Analyser and Dust Accumulator
GMP	Mission phase: Global mapping phase
GSE	Ground Support Equipment
HIGH	Mission phase: Comet activity: high activity
HKD	Housekeeping Data
HPD	Housekeeping Parameter Definition
ICA	RPC instrument: Ion Composition Analyser
IDS	Interdisciplinary Scientist
IES	RPC instrument: Ion and Electron Sensor
LAP	RPC instrument: Langmuir Probe
LCC	Lander Control Center at DLR, Cologne, Germany
LEOP	Mission phase: Launch and early operations
LOP	Lander Operations Plan

LOW	Mission phase: Comet activity: low activity
MAG	RPC instrument: Magnetometer
MAG	ROMAP instrument: Magnetometer
MARS	Mission phase: Mars swing-by
MIDAS	Orbiter experiment: Micro-Imaging Dust Analysis System
MINC	Mission phase: Comet activity: moderate increase
MIP	RPC instrument: Mutual Impedance Probe
MIRO	Orbiter experiment: Microwave Instrument for the Rosetta Orbiter
MPAE	Max-Planck-Institut für Aeronomie in Katlenburg-Lindau, Germany
MUPUS	Lander experiment: Multi-Purpose Sensors for Surface and Subsurface Science
NASA	National Aeronautics and Space Administration
NCD	Mission phase: Near comet drift
NRC	National Research Council
NSSDC	National Space Science Data Center
OSIRIS	Orbiter experiment: Optical, Spectroscopic and Infrared Remote Imaging System
PDS	Planetary Data System
PERI	Mission phase: Near perihelion
PI	Principal Investigator
PP	SESAME instrument: Permittivity Probe
PSA	Planetary Science Archive
PTOLEMY	Lander experiment: Gas chromatograph and mass spectrometer
PVV	PSA Validation and Verification Tool
RGS	Rosetta Ground Segment
RLGS	Rosetta Lander Ground Segment
RMOC	Rosetta Mission Operations Center
ROKSY	Rosetta Knowledge System
ROLIS	Lander experiment: Rosetta Lander Imaging System
ROMAP	Lander experiment: Rosetta Lander Magnetometer and Plasma Monitor
ROSINA	Orbiter experiment: Rosetta Orbiter Spectrometer for Ion and Neutral Analysis
RPC	Orbiter experiment: Rosetta Plasma Consortium
RSI	Orbiter experiment: Radio Science Investigation
RSOC	Rosetta Science Operations Center
RSSD	Research and Scientific Support Department of ESA
RV	Mission phase: Rendezvous
SATT	Satellite Attitude Data
SBN	Small Bodies Node
SD2	Lander experiment: Sampling, Drilling and Distribution Subsystem
SESAME	Lander experiment: Surface Electrical, Seismic and Acoustic Monitoring Experiment
SFDU	System Formatted Data Unit
SINC	Mission phase: Comet activity: sharp increase
SONC	Science Operations and Navigation Center for the Lander at CNES, Toulouse, France
SPC	Science Programme Committee
SPM	ROMAP instrument: Simple Plasma Monitor
SSP	Mission phase: Lander delivery and relay
SWT	Science Working Team
TGM	Mission phase: Transition to global mapping
UoM	University of Maryland
VIRTIS	Orbiter experiment: Visible and Infrared Thermal Imaging System
WDC	World Data Center

12. Appendix B – Definition of Processing Levels for Science Data Sets

Note: PSA levels are used throughout this document. The corresponding National Research Council (NRC) Committee on Data Management and Computation (CODMAC) and NASA levels are only given for reference.

PSA level	CODMAC level	NASA level	Description
0			The raw telemetry data as received at the ground receiving station or ground test GSE, organised by contacts or ground tests.
0a			The telemetry data as produced by the C&DH system on the spacecraft and passed to the telemetry subsystem. Level 0a contains transfer frame packets organised by contacts or ground tests.
1			Level 0 data that have been cleaned and merged, time ordered, and are in packet format. Cleaned, merged and time ordered means that duplicate data have been deleted, missing packets are padded out and the data are organised by days. The actual format of these data is the same as level 0a. This is the level which should be passed to the instrument GSEs for their processing.
1a	1		The level 1 data that have been separated by instrument. This is the level which is distributed by the DDS.
1b	2	0	Level 1a data that have been sorted by instrument data types and instrument modes. Data are in scientifically useful form, e.g. as images or individual spectra. These data are still uncalibrated.
2	3	1A	Level 1b with calibration and corrections applied to yield data in scientific units.
3	5	2-5	Higher level data products developed for specific scientific investigations.

13. Appendix C – Data Rights and Release Policy Including Public Information

Relevant section from the Rosetta Science Management Plan (AD2) "5.4 Rosetta Scientific Data Archive":

> The Rosetta data rights will follow the established rules (ESA/C(89)93). Therefore all scientific data obtained during the full mission duration will remain proprietary of the PI teams and the SSP teams for a maximum period of one year after they have been received from ESOC. After this period, the scientific data products from the mission have to be submitted to RSOC in a reduced and calibrated form such that they can be used by the scientific community. RSOC will prepare the Rosetta Scientific Data Archive within one year of the receipt of the complete data sets from the individual Rosetta science investigations. Based on current technology, the archive would be distributed as a set of CD-ROMs.
>
> There will be no proprietary period for data from NASA funded instruments. Data from such instruments will be placed in the public domain immediately following a short validation/calibration period.
>
> ESA will have – with the knowledge of the Principal Investigators and the SSP Team Members – unlimited access to all mission data being obtained, processed and analysed before archiving, for the sole purpose of public relations.

Relevant section from ESA's Rules Concerning Information and Data (AD3):

> 3. Rights in Data Resulting from Payload
>
> a) Experimenter's Right of Prior Access
>
> The Agency (acting on behalf of the Member States or on behalf of the participating States, as appropriate) shall be the owner of all data directly resulting from the in-flight operation of a payload flown on board a space vehicle provided free of charge to an Experimenter as part of an Agency program (this excludes any data which are required for the control of the payload itself). The Agency shall, however, grant the Experimenter an exclusive right of prior access to said data. The duration of the right of prior access shall be agreed between the Agency and the Experimenter(s) concerned and shall be approved by the relevant delegate body. The duration shall, however, not be shorter than half a year and shall not normally be longer than one year.
>
> The duration shall depend on, inter alia:
>
> - the extent and nature of the involvement of the Experimenter in the development of the payload,
> - the type and complexity of the data to be received from the payload,
>
> and shall take due account of the provisions in paragraph (i) below …

Relevant section from the Memorandum of Understanding between ESA and NASA concerning the International Rosetta Mission (AD4):

> Article 10 – Rights in and Distribution of Scientific Data
>
> 1. Science data obtained by the International Rosetta Mission investigators are to be released to the international scientific community after a period no longer than six months. The six-month period begins with the receipt by the Principal Investigator of usable science data and any associated Rosetta

spacecraft data in a form suitable for analysis. At the end of this period, the scientific data will become publicly available as specified in 10.2 below.

The Rosetta Scientific Data Archive is compliant with directive on databases from the European Union (RD12).

14. Appendix D – Rosetta Instrument Data Information Sheet

The tables in this appendix refer to the edited raw data and calibrated data, i.e. PSA data processing levels 1b and 2.

14.1 Rosetta Orbiter Instruments

Instrument	Raw data type	PDS data type
OSIRIS	TMI	IMAGE
VIRTIS	BINARY	QUBE
ALICE	FITS, ASCII	IMAGE, TABLE
MIRO	BINARY	SPECTRUM, TABLE
ROSINA	ASCII	TABLE, SPECTRUM
COSIMA	BINARY	TABLE, IMAGE, SERIES
MIDAS	ASCII, BINARY	IMAGE, TABLE, SPECTRUM, TIME_SERIES
GIADA	ASCII	TABLE
CONSERT	ASCII	TABLE
RSI	ASCII, BINARY	TABLE (tbc), TIME_SERIES (tbc)
RPCICA		TIME_SERIES (tbc)
RPCIES	ASCII	SPREADSHEET
RPCLAP		TIME_SERIES (tbc)
RPCMAG	ASCII	TIME_SERIES
RPCMIP		TIME_SERIES (tbc)
RPCPIU		

14.2 Rosetta Lander Instruments

Instrument	Raw data type	PDS data type
ROLIS		IMAGE
CIVA		IMAGE
SD2		TIME_SERIES (tbc)
COSAC		SPECTRUM (tbc)
PTOLEMY		
APXS		SPECTRUM (tbc), TIME_SERIES (tbc)
MUPUS		TIME_SERIES (tbc), TABLE (tbc)
SESAME-CASSE		TIME_SERIES (tbc), multi-dimensional ARRAY (tbc)
SESAME-PP		TIME_SERIES (tbc)
SESAME-DIM		TIME_SERIES (tbc)
CONSERT	ASCII	TABLE
ROMAP-MAG	BINARY	TABLE (tbc)
ROMAP-SPM	BINARY	TABLE (tbc)

15. Appendix E – Expected Data Volumes in MBytes

15.1 Rosetta Orbiter Instruments

Mission phase	OSIRIS	VIRTIS	ALICE	MIRO	ROSINA	COSIMA	MIDAS	GIADA	CONSERT	RSI	RPC-ICA	RPC-IES	RPC-LAP	RPC-MAG	RPC-MIP	RPC-PIU
Ground	400	5 000	60	300	10	5	50		10	–		tbd				
Commissioning	1 000	1 000	65	400	1	2	50		10	4 200		tbd				
Earth swing-by 1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Mars swing-by	2 000	700	15	300	0.5	–	3		1	–		50				
Earth swing-by 2	800		15	600	0.5	–	3		1	–		50				
Earth swing-by 3	800		15	700	0.5	–	3		1	–		50				
Asteroid fly-by	2 000		15	300	1	–	3		1	2 100		50				
Cruise phases	–		–	800	–	–	–		1	105 000		–				
Cometary phases	4×(300… 10 000)	6 500	3 000	10 000	4×(500… 2 500)	1 700	400		100	210 000		4×3 000				
Final delivery	5 000		–	–	–	300	500		–	–		6 000				
Total	**35 000**	**13 200**	**3 185**	**13 400**	**5 000**	**2 007**	**1 012**	**700**	**125**	**<1 000 000**		**18 200**		**200 000**		

The values given here are preliminary and reflect the knowledge of the experimenter and archive teams at the date of issuing this plan. During the cometary phases, the values represent the six deliveries expected for the nominal mission.

During the first Earth swing-by no science operations can be supported due to overlap with Mars Express and Huygens. This table represents no commitment by RSOC/RMOC that the given data volumes will be delivered. In particular, instrument operations during the cruise phases need to be confirmed.

15.2 Rosetta Lander Instruments

Mission phase	ROLIS	CIVA	SD2	COSAC	PTOLEMY	APXS	MUPUS	SESAME	ROMAP
Ground									
Commissioning									
Earth swing-by 1									
Mars swing-by									
Earth swing-by 2									
Earth swing-by 3									
Asteroid fly-by									
Cruise phases									
Cometary phases									
Final delivery									
Total									

The raw data volume of the Lander will be in the order of 1 GByte for the time of descent followed by 65 hours of operations. The data volume linearly increases for longer operations times.

15.3 Rosetta Ground Segment

The estimated volume of auxiliary data is 10 MBytes per day. Thus during the cometary phases the data volume will be about 6 GBytes.